Centennial Coal

CENTENNIAL COAL
CLARENCE COLLIERY
ANNUAL REVIEW

March 2016

Centennial Coal
Environment Matters

Table 1: Annual Review Title Block

Name of Operation	Clarence Colliery
Name of Operator	Clarence Colliery Pty Ltd
Development Consent/ Project Approval #	DA 504-00
Mining Lease #	CCL705, ML1353, ML1354, ML1583, ML1721
Name of Holder of Mining Lease	Coalex Pty Ltd & Clarence Coal Investments Pty Ltd
Water License #	WAL36479
Name of Holder of Water License	Coalex Pty Ltd & Clarence Coal Investments Pty Ltd
MOP/RMP Start Date	01/01/2014
MOP/RMP End Date	31/12/2017
Annual Review Start Date	01/01/2015
Annual Review End Date	31/12/2015

Contents

1. STATEMENT OF COMPLIANCE

Table 2: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
DA 504-00	NO
Mining Lease 1353	YES
Mining Lease 1354	YES
Mining Lease 1583	YES
Consolidated Coal Lease 705	NO
Exploration Lease 5072	YES
EPL726	NO
Water Access Licence 36479	YES

Table 3: Non-Compliances

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Page # addressed in Annual Review
DA 504-00	Schedule 3, Condition 3	Except as may be expressly provided by an Environment Protection Licence, the Applicant shall comply with section 120 of the *Protection of the Environment Operations Act 1997* during the carrying out of the development.		Overtopping of a temporary coal fines holding cell, resulting in bridging of the leachate drain, causing the discharge of material off site.	Section 11 – Incidents and Non-Compliances During the Reporting Period
DA 504-00	Schedule 3, Condition 16A	The Applicant shall prepare and implement a revised Noise Management Plan for the development, with a particular focus on reducing rail noise, to the satisfaction of the Secretary. This plan must be prepared in consultation with EPA, provide for the implementation of the Applicant's commitments in Appendix 4, and be submitted to		Revised Noise Management Plan submitted to the Secretary by 31 October 2014, however additional modifications were required. As a result, noise modelling was completed and the updated plan was submitted 12/02/2016	Section 6 – Environmental Performance

		the Secretary for approval by 31 October 2014.			
CCL705	16	Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorized by a relevant approval, and in accordance with an accepted Mining Operations Plan		Overtopping of a temporary coal fines holding cell, resulting in bridging of the leachate drain, causing the discharge of material off site.	Section 11 – Incidents and Non-Compliances During the Reporting Period
EPL726	L2.4	Water and/or Land Concentration Limits; Filterable Manganese 100 percentile concentration limit		Following an unexpected power outage at Clarence Colliery, the Water Treatment Plant had a reduced capacity to treat manganese for a short period of time, resulting in a Filterable Manganese concentration of 0.582mg/L recorded at LDP002, with a concentration limit of 0.500mg/L.	Section 11 – Incidents and Non-Compliances During the Reporting Period
EPL726	L2.4	Water and/or Land Concentration Limits; Total Suspended Solids (TSS) 100 percentile concentration limit		Following 150mm of rainfall over a 48-hour period, a significant volume of surface water run off left site via LDP002 with an elevated Total	Section 11 – Incidents and Non-Compliances During the Reporting Period

				Suspended Solids (TSS) concentration of 103mg/L, with a license limit of 0.30mg/L.	
EPL726	L2.4	Water and/or Land Concentration Limits; Filterable Iron 100 percentile concentration limit		A malfunction within the Dissolved Air Flotation (DAF) unit of the Water Treatment Plant causing a reduced capacity to treat Iron, resulting in a Dissolved Iron concentration of 0.65mg/L at LDP002, above the license limit of 0.05 mg/L	Section 11 – Incidents and Non-Compliances During the Reporting Period
EPL726	1.1	Limit Conditions, Pollution of waters		Overtopping of a temporary coal fines holding cell, resulting in bridging of the leachate drain, causing the discharge of material off site.	Section 11 – Incidents and Non-Compliances During the Reporting Period

Note: Compliance Status Key for Table 3

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

2. INTRODUCTION

Clarence Colliery Pty Ltd (Clarence Colliery) is an underground coal mining operation located within the NSW Western Coalfields (**Appendix 1**). Clarence Colliery is a wholly owned subsidiary of Centennial Coal Company Limited (which is a wholly owned subsidiary of Banpu Public Company) and has been appointed as the management entity for the Clarence Joint Venture. Centennial Coal Company Limited has an 85% share in the Clarence Joint Venture comprised of a number of wholly owned subsidiaries including Coalex Pty Ltd (51% share), Clarence Coal Investments Pty Ltd (29% share) and Centennial Clarence Pty Ltd (5% share). The remaining 15% share in the Clarence Joint Venture is held by SK Networks Resources Australia Pty Ltd. Operations at Clarence Colliery commenced in 1979. Coal is extracted from the Katoomba coal seam using bord and pillar partial extraction methods supplying coal to both domestic and export markets.

Clarence Colliery is located approximately 15 kilometres east of Lithgow, to the north of Chifley Road (continuation of the Bells Line of Road) and the Main Western Rail Line. Newnes Junction village is located approximately 900 metres to the south-east of the site and contains a small number of residential dwellings. Clarence Village is also located approximately 1.5 kilometres to the south-west of the site.

A number of extractive industries are also located in close proximity to Clarence Colliery including the Hanson Quarry located immediately to the west and the disused Rocla Quarry located to the southeast of the site respectively. The Newnes Kaolin Project is an approved quarry, which is proposed to be established to the south-east of the site. Land to the east of the site is protected under the Blue Mountains National Park, one of the eight protected areas making up the World Heritage Listed Greater Blue Mountains Area (UNESCO 2013). The Newnes State Forest is located to the north and west of Clarence Colliery. Clarence Colliery is located within the Hawkesbury-Nepean Catchment and discharges water to the Wollangambe River which eventually drains to the Colo River.

The principal components of the existing operations include:

- An underground coal mine with maximum production levels of three million tonnes per annum (Mtpa).
- Associated pit top area containing surface infrastructure including:
- Mine administration and bath house building;
- Store and workshop building;
- Water treatment plant;
- Rail loop and load out facilities;
- Conveyor systems to transfer coal from the underground mine to the pit top facilities including the load out on the rail loop;
- Run-of-Mine stockpile area;
- Ventilation facility;
- Washed coal stockpile area;
- Coal Handling and Preparation Plant (CHPP);
- One active and four partially rehabilitated existing Reject Emplacement Areas (REA);
- Various water management structures include storage and leachate dams and irrigation area which forms part of the water management on site;
- Sewage treatment plant; and
- A downcast ventilation shaft located on the Newnes Plateau.

Table 4: Contact Details for Key Mine Site Personnel

Name	Title	Phone
Brian Nicholls	Mine Manager	02 6353 8033
Martin Howe	Environment and Community Coordinator	02 6353 8039
Enquiries and Complaints Line	Daytime Contact	02 6353 8000
	Afterhours Contact	02 6353 8010

3. APPROVALS

Table 5 below identifies all relevant approvals held at Clarence Colliery.

Table 5: Key Approvals

Licence/Approval/Consent	Approval/Number	Approval Authority	Date Granted-Expiry/Renewal Date
Development Consents			
Original Development Consent	IRM.GE.76	Blaxland Shire Council	Approved 15/06/1976
Development Consent Modification	IRM.GE.76	Lithgow City Council	Approved 21/07/1993
Development Consent	174/93	Lithgow City Council	Approved 15/02/1994
Development Consent	DA504-00	Department of Planning & Environment	19/12/2005-31/12/2026
Licenses			
Environmental Protection Licence	EPL726	Environment Protection Authority	02/07/2014-Renewed Annually 1st of January
Radiation Management Licence	RML5078394	Environment Protection Authority	08/02/2016-08/02/2017
Dangerous Goods Licence	NDG020999	WorkCover Authority NSW	05/03/2015-Perpetuity
Bore Licence Leachate Transfer	10BL604765	NSW Office of Water	12/12/2012-11/12/2017
Bore Licence CLRP1	10BL161964	NSW Office of Water	13/08/2003-Perpetuity
Bore Licence CLRP2	10BL161965	NSW Office of Water	13/08/2003-Perpetuity
Bore Licence CLRP3	10BL602213	NSW Office of Water	10/12/2007-Perpetuity
Bore Licence CLRP4	10BL161962	NSW Office of Water	30/08/2003-Perpetuity
Bore Licence CLRP5,	10BL602211	NSW Office of	10/12/2007-

CLRP7, CLRP10		Water	Perpetuity
Bore Licence CLRP6	10BL602212	NSW Office of Water	10/12/2007-Perpetuity
Bore Licence CLRP 12	10BL604063	NSW Office of Water	07/07/2010-Prepetuity
Bore Licence CLRP 11, 13, 14	10BL604099	NSW Office of Water	05/07/2010-Perpetuity
Bore Licence CLRP 15, 16	10BL604098	NSW Office of Water	05/07/2010-Perpetuity
Bore Licence CLRP 17, 20	10BL605316	NSW Office of Water	30/01/2013-Perpetuity
Bore Licence CC114	10BL602819	NSW Office of Water	09/03/2009-Perpetuity
Bore Licence CC115	10BL602820	NSW Office of Water	09/03/2009-Perpetuity
Bore Licence HV1, HV2, HVU1, HVU2	10BL603337	NSW Office of Water	07/09/2009-Perpetuity
Bore Licence	10BL605494	NSW Office of Water	12/12/2013-Perpetuity
Bore Licence CLRP18, 22	10BL605612	NSW Office of Water	11/08/2014-Perpetuity
Surface Licence Main Dam	10WA118714	NSW Office of Water	30/06/2015-30/06/2016
Water Access Licence 36479	10WA118758	NSW Office of Water	22/10/2015-22/10/2016
Surface Authority Town Water Supply	10SA001409	NSW Office of Water	30/09/2007-30/09/2017
Exploration Licence	EL5072	Department of Primary Industries	11/11/2010-11/11/2015*
Authorisations			
Authorisation 307	A307	Department of Primary Industries	21/05/2015-24/08/2019
Authorisation A416	A416	Department of Primary Industries	21/05/2015-24/08/2019
Authorisation A451	A451	Department of Primary Industries	27/03/2015-24/08/2019
Project Approval			
Reject Emplacement Area II	Section 126	Department of Primary Industries	Approved 19/06/1992
Reject Emplacement Area III	Section 126	Department of Primary Industries	Approved 07/10/1993
Reject Emplacement Area IV	Section 100	Department of Primary Industries	28/03/2011-01/07/2015
Reject Emplacement Area IVa extension	Section 100	Department of Primary Industries	18/09/2013-01/09/2017
Reject Emplacement Area VI	Section 100	Department of Primary Industries	11/08/2014-04/08/2017

Leases			
Consolidated Coal Lease	CCL705	Department of Trade and Investment, Regional Infrastructure and Services	20/12/2006-20/12/2027
Mining Lease	ML1353	Department of Trade and Investment, Regional Infrastructure and Services	02/03/2015-21/07/2036
Mining Lease	1354	Department of Trade and Investment, Regional Infrastructure and Services	02/03/2015-21/07/2036
Mining Lease	1583	Department of Trade and Investment, Regional Infrastructure and Services	09/07/2006-09/07/2027
Mining Operations Plan			
Mining Operations Plan	N/A	Department of Trade and Investment, Regional Infrastructure and Services	01/01/2014 – 31/12/2017
Subsidence Management Plans			
Subsidence Management Plan	900 Area	Department of Trade and Investment, Regional Infrastructure and Services	22/01/2014 – 31/01/2019
Subsidence Management Plan	800 Area	Department of Trade and Investment, Regional Infrastructure and Services	01/11/2013 – 31/10/2018
Subsidence Management Plan	700 Area	Department of Trade and Investment, Regional Infrastructure and Services	08/05/2009-01/05/2014
Subsidence Management Plan	700 West Area	Department of Trade and Investment, Regional Infrastructure and Services	18/06/12-01/06/2017

Subsidence Management Plan	Eastern Area	Department of Trade and Investment, Regional Infrastructure and Services	10/2005-01/06/2013
Subsidence Management Plan	CCL705 Outbye Areas	Department of Trade and Investment, Regional Infrastructure and Services	08/05/2009-01/05/2014
Subsidence Management Plan	CCL705 Outbye Areas (Panels 302, 305, 306, 307, 400, 403 and 406)	Department of Trade and Investment, Regional Infrastructure and Services	08/05/2009-01/05/2014
Subsidence Management Plan	CCL705 Outbye Areas (Panels 314 & 316)	Department of Trade and Investment, Regional Infrastructure and Services	19/02/2010-01/02/2015
Subsidence Management Plan	CCL705 Outbye Areas (Panel 402 Only)	Department of Trade and Investment, Regional Infrastructure and Services	27/03/2009-01/01/2010
Subsidence Management Plan	CCL705 Outbye Areas (Panel 602 Only)	Department of Trade and Investment, Regional Infrastructure and Services	30/01/2009-01/01/2010
Access Agreement			
Access Agreement	Q648-100	State Rail Authority	10/07/1981-Life of Loop
Occupation Permit			
Occupation Permit		Forests NSW	Renewed Annually

*Renewal lodged and documentation yet to be received

4. OPERATIONS SUMMARY

Table 6: Production Summary

Material	Approved Limit (and source)	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Waste Rock/ Overburden	NA	0	0	0
ROM Coal	3,000,000	2,557,938	2,765,226	2,931,380
Coarse reject	250,000*	151,204	275,242**	230,000
Fine reject (Tailings)	NA	24,268		
Saleable product	N/A	2,357,805	2,366,436	2,700,000

*Approval limit of 250,000T coarse reject applies to emplacement within REA 6 only.

**275,242T annual coarse reject production, of which 250,000T emplaced into REA 6 and the remainder blended back in to washed product coal for sale when market conditions allow.

4.1. Other Operations

Table 7: Operations Summary

	Approved Limit (and source)	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Comment (if applicable)
Transport (rail)	N/A	2,200,750	2,215,176	
Transport (road)	200,000 DA 504-00*	157,055	151,260	

*100,000 to the West as per approved haulage route

It is of note that no coal was transported by road to the west during the reporting period.

Significant Activities – Reporting Period

No exploration was completed during this reporting period.

No construction was completed during this reporting period.

The 5 yearly review of the EPL726 continued throughout the reporting period. No outcomes have been reached.

Wollangambe River

The most notable activity completed during the reporting period is the ongoing remediation of the Wollangambe River and associated drainage line, following the overtopping of a temporary coal fines holding cell, noted in Table 3 Non-Compliances. Please refer to Appendix 9 – Land Remediation Plan, and Appendix 10 – Wollangambe Remediation Plan, for detailed information regarding the remediation process implemented both on the impacted land zones and within the Wollangambe River.

Reject Management Strategy – Update

Reject emplacement areas were originally approved in 1976. A modification to the location, size and duration of use to the approved REAs was made in 1993 (REA I, II and III). Further emplacements were sought under a new development consent in 2000 (approved in 2005 as DA 504-00) for REA IV and V. Under DA 504-00 REA VI was contemplated, however, approval was not granted at that time.

In 2012, the need for additional reject emplacement areas was identified. The Clarence Colliery surface area is constrained by topography and land ownership such that the construction of additional emplacement areas is, and will be, largely confined to the existing surface disturbance areas. With the exception of REA V, REA VI is the last remaining surface area available for reject emplacement. As such, REA VI provides for short term emplacement until such time as longer term, viable and sustainable options can be sourced and implemented.

The need for alternative options for the emplacement of reject and fines produced through the washing process had been a focus of pre-feasibility assessment since 2009. In 2009, Centennial Clarence installed a series of belt press filters at the Washery, thereby recovering a greater proportion of fine material for a product market. In 2014, investigations into further refinement of the fines circuit for product recovery commenced such that by September 2015, improved recovery has been achieved, resulting in no further requirement for fines emplacement on site.

Also in 2014, pre-feasibility of the re-use of reject material as road base commenced. These options are discussed in further detail below.

Changes to coal quality and market demand for Clarence coal has resulted in a change to the rate of production of reject and fines materials. The current capacity of the existing REAs will be exhausted at a faster rate than previously predicted. Sourcing options for the emplacement or re-use of these waste streams is a significant constraint to the viability of the Clarence Colliery.

On 2 July 2015, the outer wall of REA III collapsed resulting in the loss of over 1000 tonnes of reject and fine materials. A large quantity of this material made its way to the Wollangambe River, within the Blue Mountains National Park and the Greater Blue Mountains World Heritage Area. This incident is the subject of investigation by the Division of Resources and Energy, Environment Protection Agency and the Office of Environment and Heritage.

Since this incident, Centennial Coal has implemented a strategic review of all reject emplacement areas across the Company. This review is being driven by senior management and the Board of the Company.

The November 2014 Reject Management Strategy

As noted above, in November 2014 Clarence Colliery submitted a Reject Management Strategy in accordance with the relevant conditions of consent. This Strategy identified a number of potential options for the emplacement of reject for the life of Clarence's operations. These were:

- Utilisation of the approved, but not yet constructed, REA V
- Disposal of reject materials underground
- Emplacement of reject material in neighbouring sand and/or kaolin operations
- Beneficial re-use opportunities, including use of reject as road base

The Strategy identified that, whilst all options had various levels of potential, the most viable long term option to secure the future of reject emplacement at Clarence was the disposal of reject at the neighbouring Hanson Quarry.

The Strategy identified five (5) actions that would be pursued, these were:

1. Complete construction of REA VI
2. Explore available capacity at the neighbouring Hanson Quarry
3. Within 4 years, explore the possibility of re-use of reject for road base
4. Within 5 years continue to explore opportunities for reject emplacement at neighbouring operations; and
5. Within 5 years review the ability and available technology for the emplacement of reject materials underground.

Details on the progress of these actions are included below.

Progress on the 2014 Strategy

Complete Construction of REA VI

Construction of REA VI was completed in late 2014. Current utilisation of the facility suggests that the capacity of this facility will be reached in late 2016.

As a result, Centennial has commenced a detailed investigation into commissioning REA V within the constraints of the existing approvals for the operation. Design works have commenced such that a smooth transition from REA VI to REA V can be achieved with limited disruption to operations.

Exploration of Available Capacity at Hanson Quarry

Consultation with the neighbouring Hanson Quarry has been ongoing throughout 2015. In principle agreement for the utilisation of a portion of the existing sand quarry has been reached between the parties.

Development consent will be required for the utilisation of the Hanson Quarry, were the parties to reach a viable commercial agreement. The studies required to support a development application have commenced.

Re-Use of Reject for Road Base

Since the 2014 Strategy was submitted, Centennial has continued to pursue the option of using reject material as a road base. Centennial has consulted with, and gained the support of, the Office of Environment and Heritage Sustainability Advantage Program. An exemption under the relevant waste legislation is required before rejects can be used for such a purpose and Centennial is working with Sustainability Advantage to obtain an exemption. If successful, a third party will undertake the re-use of reject for road base on projects in the western region.

Similar investigations have been undertaken into the refinement of extruded fines to create a product suitable to transport to market. A trial on drying characteristics is currently underway, and if successful a pilot program will commence on site in early 2016.

The construction of the Wallerawang Power Station intersection upgrade was delayed during 2014. This project, involving the transport of coal fines to local domestic power stations will commence by the end of March 2016.

Continue to Explore Emplacement at Neighbouring Operations

As detailed above, Centennial is continuing to consult with neighbouring operations to maximise the use of void capacity for reject emplacement.

Review Ability and Available Technology for Underground Emplacement

Given the high focus on the first four elements of the Strategy, little progress has been made on this option during 2015.

Consultation

Since the submission of the 2014 Strategy, Centennial has consulted with the OEH Sustainability Advantage team to identify and progress opportunities for the efficient and cost effective reuse of reject and tailings materials across a number of operations, with a key focus on Clarence Colliery.

No consultation has been undertaken with the Sydney Catchment Authority (now WaterNSW) or the Environment Protection Agency regarding the Strategy.

Significant consultation has occurred with the Environment Protection Agency regarding reject and fines management and water management on site since the incident of 2 July 2015.

Conclusion

The most viable and efficient long term strategy for reject management at Clarence Colliery continues to be the utilisation of dis-used voids at neighbouring quarrying operations. Whilst some progress has been made on this during 2015, Centennial recognises the need to find short term storage and re-use options to maximise existing capacities. Sufficient time will be required for the necessary commercial agreements to be reached and an appropriately scaled development approval obtained.

As noted above, the operational viability of the Clarence Colliery is contingent on finding a long term, sustainable solution to reject emplacement and Centennial Coal remains committed to working towards this objective.

4.2. Next Reporting Period

For the 2016 reporting period, Clarence Colliery is forecast to produce approximately 2.93 MT of ROM coal. It is anticipated Clarence will also be constructing Reject Emplacement Area 5 (REA5), with operational commissioning likely to take place early 2017.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Table 8: Actions from previous Annual Review

Action Required	Requested By	Action Taken	Where addressed in Annual Review
Include a review surface water quantity and quality monitoring in 2015 Annual Review	Department of Planning and Environment	Included review in this document.	Section 7 – Water Management
Include a summary of complaints in 2015 Annual Review	Department of Planning and Environment	Included summary in this document.	Section 9 - Community
Include an outline of any reportable incidents In 2015 Annual Review	Department of Planning and Environment	Included summary in this document.	Section 11 – Incidents and Non-Compliances During the Reporting Period

6. ENVIRONMENTAL PERFORMANCE

Noise

Operator attended noise measurements were conducted during the day on Wednesday 18 February 2015, evening and night-time period on Monday 2 March 2015 at monitoring location M1.

The mine noise contribution (LAeq(15minute)) during the day, evening and night-time attended surveys was estimated to be LAeq(15mintue) 36 dBA, LAeq(15mintue) 45 dBA and LAeq(15mintue) 45 dBA, respectively. This contribution meets the relevant consent limits for the day time period. However, noise level exceedances of up to 10 dB were measured during the evening and night-time period. The major contributor to the exceeded noise levels were the tonal reversing alarms on the frontend loaders operations on the stockpiles.

It is relevant to note that analysis of the metrological weather conditions during the evening and night-time operator attended noise monitoring indicated that temperature inversions were present which enhanced the noise from Clarence Colliery. The consent conditions are not based on temperature inversions being present as they are not a typical feature of the area. Therefore, measurements at this location were considered to be conducted during non prevailing weather conditions. As a result, it is considered that the mine noise would comply with the consent level during the evening and night-time periods under prevailing atmospheric weather conditions. Please refer to Appendix 11 – Clarence Colliery Noise Compliance Assessment 2015, for further information.

Table 9: Noise Impact Criteria

Location	Day	Evening	Night
Residences on privately owned land	38	36	35

Comprehensive noise modelling has since been completed as well as investigations into “quaker” and attenuated alarms. A revised Noise Management Plan was re-submitted to the Department of Planning and Environment following consultation with the Environment Protection Authority, addressing mitigation measures employed at the site to address the above.

Air Quality

Dust monitoring data indicated that monthly dust deposition results for 2015 ranged from below the detection limit to 0.1 g/m2/month at DG 2 up to 5.8 g/m2/month at DG 3. Depositional dust gauge results for 2015 are shown in Table 10 below. The results are all below the annual average air quality criteria of 4 g/m2/month.

During the sampling periods of February and March, anomalous deposited dust concentrations were recorded across all three dust gauges. Following microscopic analysis of the samples, it was discovered that a large percentage of the deposition was foreign to the typical site soil profile, and also was considered highly unlikely to have been deposited via natural, typical airborne means. Following consultation with the EPA and Department of Planning, it was decided the results would not be used for compliance or annual average calculations. However for comparison, Figure 1 below depicts the 12 monthly rolling averages including these anomalous, whilst Figure 2 excludes them.

Table 10: Air Quality Monitoring – Depositional Dust Gauges

Dust Gauge	Pollutant	Unit of Measure	# Samples Collected and Analyzed	Lowest Sample Vale	Mean of Sample	Highest Sample Value
DG1	Particulates – Deposited Matter	Grams per meter square per month	12	0.4	0.8	1.1
DG2	Particulates – Deposited Matter	Grams per meter square per month	12	<0.1	0.9	5.4
DG3	Particulates – Deposited Matter	Grams per meter square per month	12	0.6	2.4	5.8

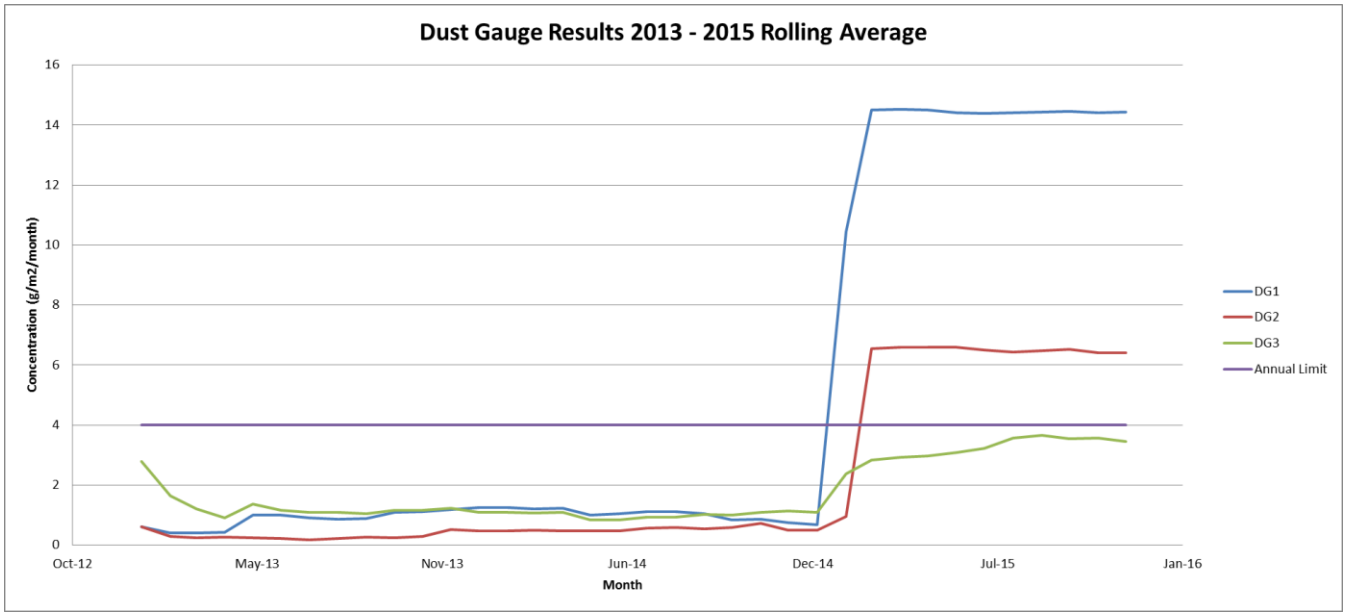

Figure 1. Clarence Dust Gauge Rolling 12 Monthly Average, 2013 - 2015

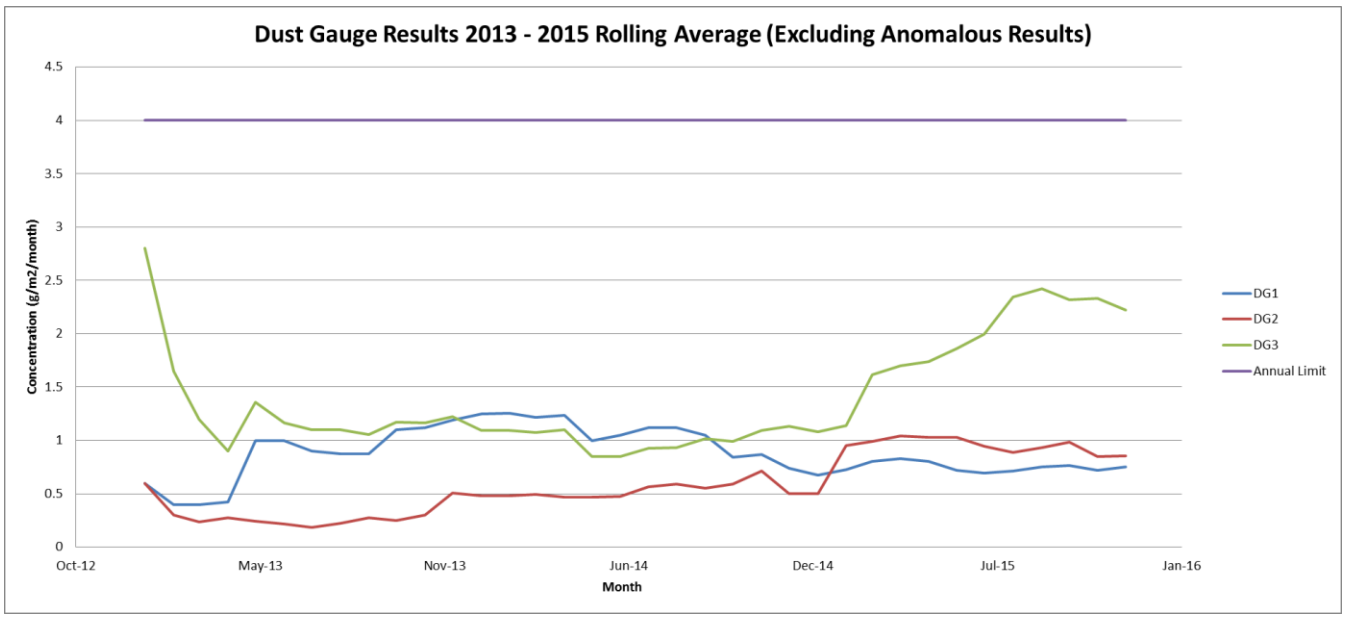

Figure 2. Clarence Dust Gauge Rolling 12 Month Average, 2013 – 2015 (Excluding Anomalous Results)

It is considered that the results depicted in Figure 2 are more representative of the overall air quality impact of the site, being consistently below the predicted average of 4g/m2/month.

Monitoring for PM10 and TSP occurred during the reporting period as required under the Clarence Development Consent and outlined in the relevant Environmental Impact Statements and Environmental Air Quality Monitoring Program. TSP measurements were below the impact criteria with an annual average of 7.02 ug/m3, slightly higher than the 2014 annual average of 6.59 ug/m3. Similarly, PM10 measurements were below the impact criteria with the annual average of 2.18 ug/m3, less than the 2014 average of 5.77 ug/m3.

Table 11: Air Quality Monitoring – PM10 and TSP

Pollutant	Averaging Period	Criterion	Measurement
Total Suspended Particulate (TSP) matter	Annual	90 ug/m3	7.02 ug/m3
Particulate matter <10 um (PM10)	Annual	30 ug/m3	2.18 ug/m3
Particulate matter <10 um (PM10)	24 hour	50 ug/m3	5.10 ug/m3

Figure 3 below indicates that TSP averages have increased over the previous 3 reporting periods, while the concentrations remain well below the Long Term Impact Assessment Criteria.

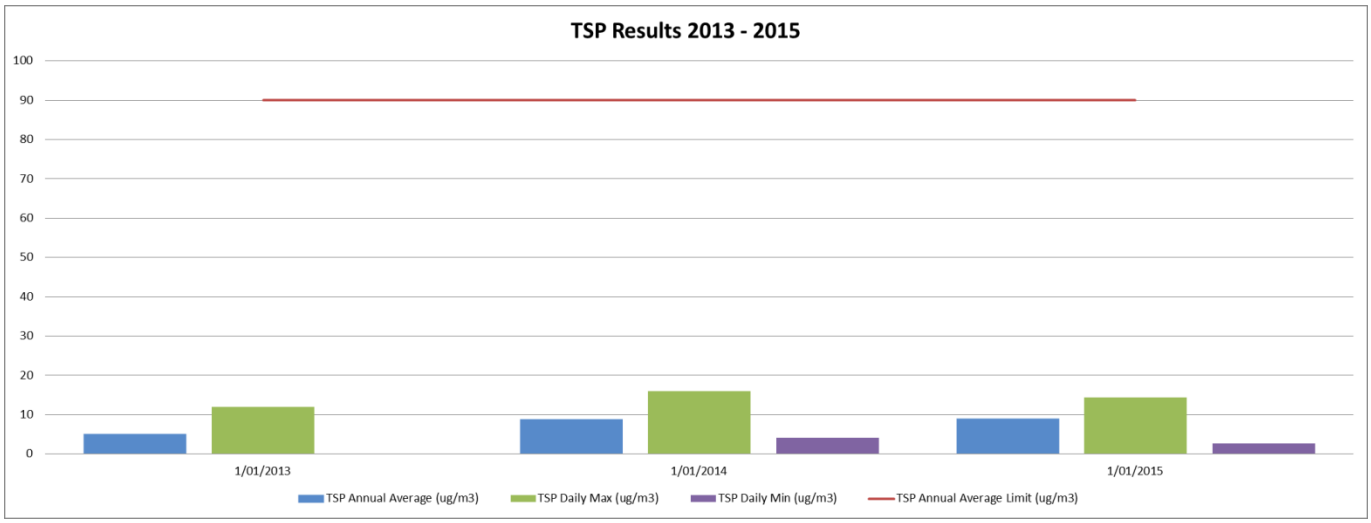

Figure 3. Total Suspended Particulate results for 2013 – 2015

Comparatively, Figure 4 clearly depicts a decrease in both annual average and daily maximum concentrations, whilst also indicating PM10 results are significantly below both the long term and short term impact assessment criteria.

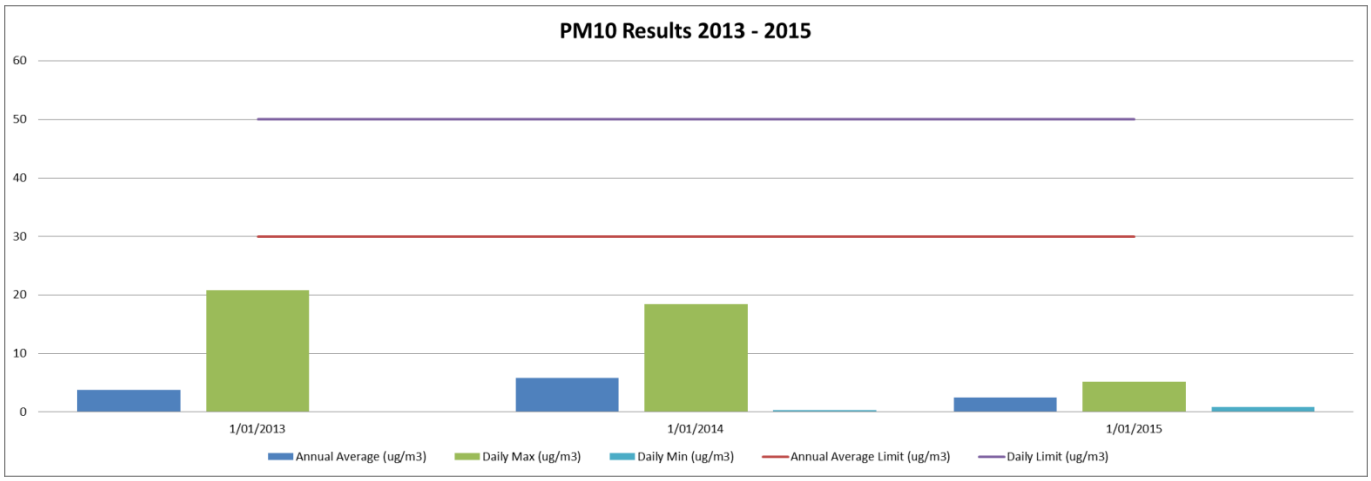

Figure 4. PM10 results 2013 – 2015

Meteorological Monitoring

Meteorological monitoring is undertaken at the Clarence Automated Weather Station, with Figure 5 below depicting monthly rainfall as well as monthly temperature average, minimum and maximum (where available).

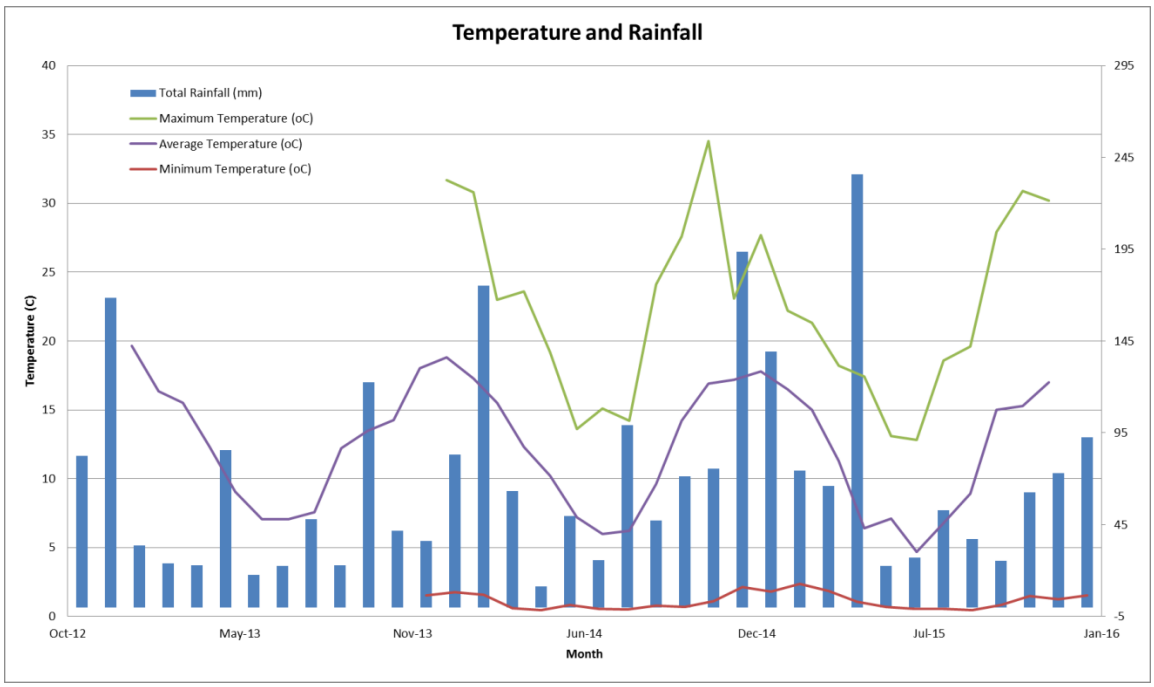

Figure 5. Clarence Monthly Temperature and Rainfall

Figure 6 depicts the 2015 windrose plot for Clarence, indicating the predominant wind direction in a south westerly direction.

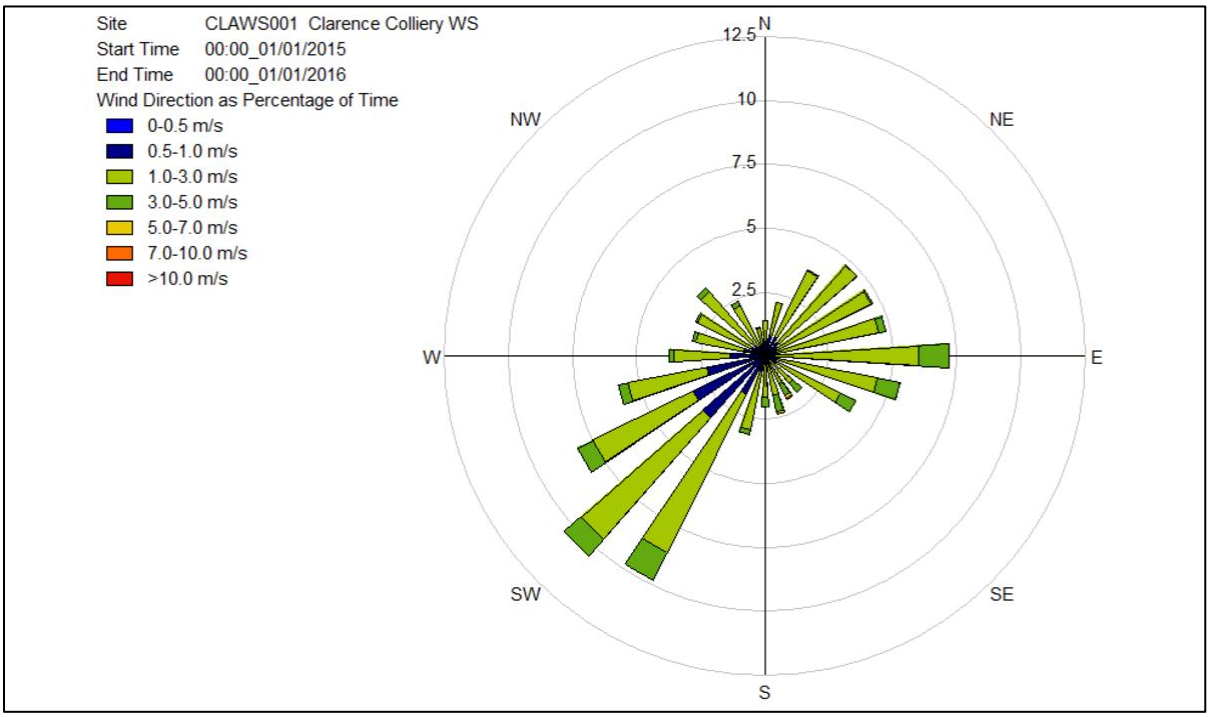

Figure 6. 2015 Windrose

Heritage

No sites of cultural significance were undermined during the reporting period.

A Western Region Aboriginal Cultural Heritage Sub-Committee was established in 2015. Two meetings were held in May and December 2015. The meeting invitees include Registered Aboriginal Groups, the Office of Environment and Heritage and Centennial representatives. An update was held on activities completed in the previous three months and upcoming three months. Discussions during 2015 included Aboriginal Groups

involvement in due diligence surveys, access to heritage sites on Centennial land and regarding site specific heritage activities. No European Heritage activities were undertaken in 2015.

Flora

Flora monitoring at pagoda, heath and wet gully sites within the Clarence Colliery Outbye, Eastern and 700 Western SMP Areas was undertaken by Roger Lembit of Gingra Ecological Surveys.

Eastern SMP and 700 Western SMP Areas

A total of six sites in the Eastern area (with two control sites) and two sites in the Clarence 700 West area (with one control site) were monitored (**Table 12**).

Table 12. 700 Heath/Pagoda Flora Monitoring Sites (Eastern and 700 West Areas)

Site	Location	Easting (AMG)	Northing (AMG)
Clarence East			
PAG01	Gorilla Rock	246648	6299845
PAG02	Gorilla Rock	246650	6299734
PAG03	Waratah East	247146	6300517
PAG04	Waratah East	246938	6300594
PAG05 (C)	Waratah North	247857	6303770
PAG06 (C)	Waratah North	247783	6303720
Clarence West (700 Area)			
CLW01	Heath	241669	6295394
CLW06 (C)	Heath - Paddy's Creek ridge	240367	6298981

Note: (C) denotes control site

Monitoring surveys involved recording vegetation structure, dominant species, estimated cover and height for each stratum, full floristics, estimated cover abundance for each species using a modified Braun-Blanquet scale and condition ranking for plant species using a five point scale. Observations of general condition of vegetation in less sensitive forest and woodland habitats were also recorded.

Plants were generally in good condition with plants at the burnt sites continuing to show a typical post fire growth response. Competition for nutrients and water and the proliferation of a range of insect predators in response to the post fire conditions had led to some instances of plant disease in a small range of plant species. Leaf predation of Banksia plants was observed at CLW_01. At PAG_01 tip dieback of *Stylidium graminifolium* plants was observed. Yellowing of *Banksia cunninghamii* plants was observed at PAG_03.There were no other instances of poor plant health at the other Clarence East sites.

Species richness within quadrats in summer 2015 was at the low end of the previously recorded range at the two unburnt sites, PAG_04 and PAG_06. At burnt sites species richness in autumn 2015 was broadly similar to levels recorded in spring 2014 and summer 2015 apart from CLW_06 where a higher than normal number of species were recorded. Species richness over the last 18 months has been greater than the average levels recorded in the nine years prior to the fire. This is consistent with response to fire in this type of habitat.

There was no evidence of death or dieback which could be attributed to an effect of subsidence.

Outbye SMP Area

Four vegetation monitoring quadrats were established within the heath vegetation in the Outbye Area. There were also two control sites (**Table 13**).

Table 13. 700 Area Heath/Pagoda Flora Monitoring Sites (Eastern and 700 Areas)

Site	Location	Easting (MGA)	Northing (MGA)
CLAO 01	Above 307 south of Bungleboori Creek	245023	6297763
CLAO 02	Above 307 south of Bungleboori Creek	245092	6297707
CLAO 03	Above 402, north of Bungleboori Creek (completed June 2009)	245504	6298627
CLAO 04	Adjacent to 602, north of Bungleboori Creek (completed April 2009)	245294	6299168
PAG05 (C)	North of Waratah Ridge	247962	6303960
PAG06 (C)	North of Waratah Ridge	247888	6303910

Note: (C) denotes control site

Monitoring surveys involved recording vegetation structure, dominant species, estimated cover and height for each stratum, full floristics, estimated cover abundance for each species using a modified Braun-Blanquet scale and condition ranking for plant species using a five point scale. Observations of general condition of vegetation in less sensitive forest and woodland habitats were also recorded.

Leaf predation of Banksia plants was observed at CLAO_01. Leaf galls were noted on *Dillwynia elegans* plants at CLAO_03.

These observations were consistent with natural patterns of plant health given the seasonal conditions and time since fire.

In summer 2015 average species richness was recorded as 34.5 species or 101% of the spring 2012 level. Autumn 2015 saw the average species richness at 32.0 species, within the pre-fire range. There was an increase in average species richness in spring 2015 to 36.0 species. This is a normal post fire response.

No exotic species were recorded at any of the Clarence Outbye sites in spring 2015.

There are no clear long term trends indicating a change in abundance of the more common shrub or ground layer species present at each site.

800 SMP Area

Plants were in good condition and continued to show a vigorous post fire recovery response. Leaf predation of Banksia plants was observed at CLAE_06.

For the period prior to the October 2013 bush fire total species richness ranges from a high of 298 records in spring 2012 to a low of 252 records in autumn 2010. The total number of species records in autumn 2013 was 266, which fell within the range of previous records. In summer and autumn 2012, there were 274 records.

Species richness in summer 2014 was within the pre-fire range with 277 records. This indicates a rapid post-fire recovery as the survey took place 112 days after the fire. Subsequent germination of seedlings in the post-fire environment has seen species richness exceed pre-fire levels with 324 records in autumn 2014, 317 records in spring 2014, 307 records in summer 2015, 310 records in autumn 2015 and 304 records in spring 2015.

There have only been two records for an exotic species at the 800 area sites since monitoring commenced. Fleabane (*Conyza* sp.) was recorded as rare at CLAE_08 in summer 2010 and Yorkshire Fog (*Holcus lanatus*) was recorded as rare at CLAE_08 in autumn 2012. Disturbance associated with damage by feral pigs was recorded in proximity to this site in April 2009.

There have been no subsequent records of exotic species at any of the 800 area sites. The bare ground layer evident at the sites following the bush fire did not lead to any new weed occurrences, even in the Olearia Swamp sites which had been affected previously by feral pigs. There has been a high level of waterlogging within the Swamp in the vicinity of CLAE_08 which would have precluded proliferation of weed species.

900 SMP Area

Two sites were established along an arm of Paddys Swamp in the Clarence 900 area in November 2014. This area was affected by the October 2013 bushfire. The two sites are presented in **Table 14**.

Table 14. 900 Area Flora Monitoring Sites

Site	Location	Easting (MGA)	Northing (MGA)
PSB 01	Paddys Swamp Branch	241338	6298523
PSB 02	Paddys Swamp Branch	241404	6298617

Species richness at PSB_01 was significantly greater in 2015 reflecting recovery from the October 2013 bush fire. At PSB_02 species richness was slightly higher on average than recorded in the baseline November 2014 sampling. Again, this is attributable to the fire recovery pattern observed across the fire ground.

There were no recorded instances of plant disease at either site in spring 2015.

One exotic species, Catsear (*Hypochaeris radicata*) has regularly been recorded at PSB_01 and in spring 2015 this species was uncommon.

Catsear was also recorded at Site PSB_02 in spring 2014, but has not subsequently been recorded at the site.

There are a range of disturbance factors already operating in the vicinity of these two sites. This includes drainage works associated with the abandoned sand mine 600 meters to the south, a trail bike track to the north of PSB_01 and the impacts of the 2013 bush fire.

Fauna

Fauna monitoring at Clarence Colliery was undertaken by Biodiversity Monitoring Services. Fieldwork for the 700 Area (Eastern, Western and Outbye), 800 Area (Eastern Portion) and 900 Area was completed.

In 2008 sites were established within both the Outbye and 700 SMP Application Areas and in 2009 sites were established to commence baseline surveys within the '800 Area' to identify impacts (if any) of mining induced subsidence on native fauna.

Two additional sites were established in 2014 to commence baseline surveys within the 900 Area to identify impacts (if any) of mining induced subsidence on native fauna.

Extraction within the reporting period occurred in the 800 Area (810 panel) and the 900 Area (901, 902, 903a, 905 and 907 panels). No extraction occurred within proximity of the monitoring sites over the 700, Outbye, or Eastern SMP Areas during 2015.

Fauna monitoring undertaken uses the methods of setting traps including Elliot traps, tomahawk cage traps, glider traps and pitfall traps, additional monitoring includes spotlighting, hair funnels, remote cameras, bird surveys, call broadcasting, herpetological searches, bat call detection, animal track recognition and opportunistic observations.

Criteria Used to Monitor Fauna

A set of criteria that is used to monitor and compare fauna populations within the SMP areas over time includes:

- Species richness of faunal groups;
- Diversity indices of faunal groups;
- Capture rates of individual species;
- Population status of species;
- Contribution to the faunal assemblages by threatened species, species dependent upon woodland and by species declining in the Central West;
- Habitat complexity scores; and
- Comparisons between Treatment and Control sites.

-

700 Western SMP Area

Six long term fauna monitoring sites have been established within the Western Subsidence Management Plan (SMP) areas including (**Figure 7**):

- *CLW01* – Control site, not undermined, pagoda landscape;
- *CLW02* – Undermined November 2009, swamp landscape;
- *CLW03* – Undermined October 2010, swamp landscape;
- *CLW04* – Control site, not undermined, swamp landscape;
- *CLW05* – Control site, not undermined, swamp landscape; and
- *CLW06* – Undermined November 2011, pagoda landscape.

A total of 73 bird, nine reptile, four amphibian and 19 native (plus five introduced) mammal species were located within the Clarence Colliery Western SMP Application areas during the 2015 surveys. A total of 115 bird, 23 reptile, 34 native mammal and 10 amphibian species have been recorded from the areas. The diversity of all species was higher than previously, and the biodiversity values were well within the range measured at Newnes.

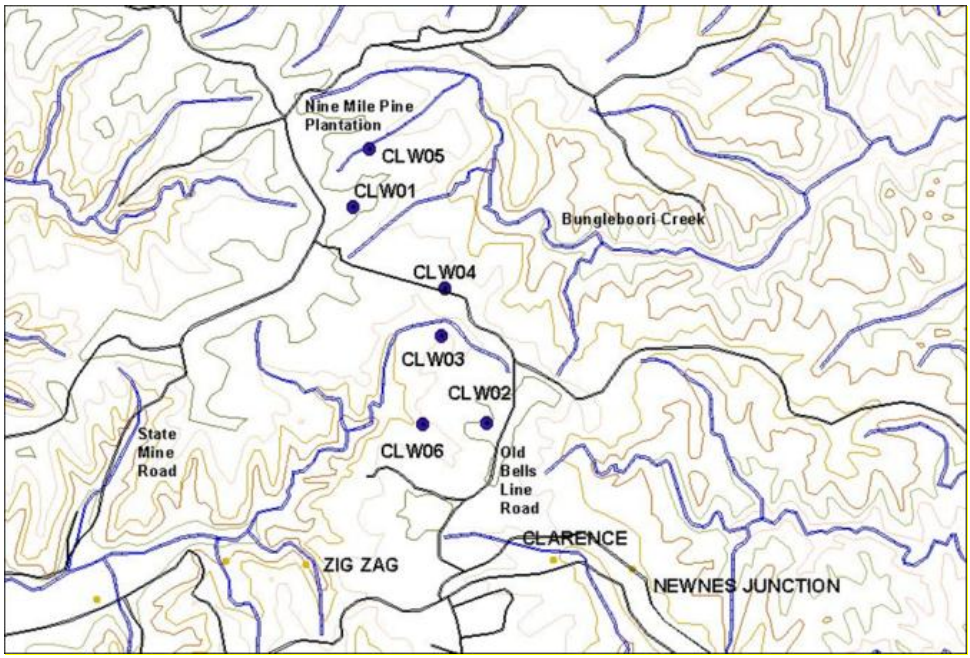

Figure 1. Location of Fauna Monitoring Sites in 700 Western SMP Areas

Twenty-one threatened species have been located within Clarence Colliery Western SMP Application areas as a result of the surveys up to 2015. These are the Gang-gang Cockatoo, Glossy Black-cockatoo, Turquoise Parrot, Brown Treecreeper, Hooded Robin, Scarlet Robin, Flame Robin, Varied Sittella, Masked Owl, Powerful Owl, Squirrel Glider, Eastern Pygmy-possum, Large-eared Pied Bat, Greater Broad-nosed Bat, Large-footed Myotis, Eastern False Pipistrelle, Eastern Bentwing Bat, Little Pied Bat, Blue Mountains Water Skink, Giant Burrowing Frog and the Giant Dragonfly. Some of these species are dependent upon large areas of native woodland for populations to survive. In the Newnes Plateau region woodland habitat has been retained (albeit logged), and these threatened species are still to be located. Several of the threatened species are found in most years e.g. Gang-gang Cockatoo, Flame and Scarlet Robins and Eastern Bent-wing Bat.

Few of the threatened species would be directly affected by subsidence-induced changes to their preferred habitat, with exception of the Large-eared Myotis, Eastern Bent-wing Bat, Blue Mountains Water Skink and Giant Dragonfly. The bats can roost in caves and overhangs and the Blue Mountains Water Skink and Giant Dragonfly are associated with wet swamps. Both habitats can be directly affected by subsidence effects (cliff collapse and swamp drainage) but there is no evidence of such impacts occurring in the Clarence West SMP areas. For a second year there has been sightings of a Turquoise Parrot occurred in Clarence West Colliery. This species is associated with edges of woodland and open grassland and the Turquoise Parrot may have been attracted to the area because of the loss of middle storey cover as a result of the State Mine fire.

Despite searching preferred habitats during the warmer months in 2015, there was no evidence of the presence of the Blue Mountains Water Skink and Purple Copperwing Butterfly in the area, but the Giant Dragonfly was located at CLW05. Seven threatened species were located during 2015.

The configuration of survey sites established in 2006 adequately samples the two major environments within Clarence Colliery Western SMP Application areas i.e. pagoda and wetland (swamp). These sites provide the best possible data for the long-term monitoring of terrestrial vertebrates. The survey techniques used have been successful in locating a wide range of species, including new records for the Newnes Plateau region. The pagoda habitat mainly comprises low heath that is characteristic of pagoda and hilltop environments at Newnes Plateau.

The Western SMP areas appear to be productive, in terms of fauna diversity values. At this stage 20 threatened species are known to occur within the area and there are several species that have been located that are considered as being of conservation concern in this region e.g. Beautiful Firetail, Rufous Fantail, Long-nosed Bandicoot. The area can be considered to be heavily disturbed by recreational activities, particularly trail bikes, and this must be brought into consideration when assessing any changes in the biodiversity.

The major influence upon the fauna populations (and vegetation) within Clarence West has been the State Mine fire that burnt out all the sites in the area. Fire is a natural part of Australian ecosystems and the State Mine fire that burnt prior to the survey of the Clarence West area is typical of a high intensity burn. It has been observed that this fire appeared to be of greater intensity than that which occurred in 1997 (Roger Lembit pers. comm.). The effects from the fire will last for many years and it was opportune that we could enter the area so soon after the fire was extinguished at Newnes Plateau (within a week of the fire burning in Clarence West). At this stage, the data provides an important baseline for monitoring the recovery from fire by fauna in the future. It also provides important data to compare the rates of recovery within areas that have been previously mined and those still to be mined or used as controls.

Although species richness and biodiversity indices have remained constant or risen over the years and do not appear to be affected by the State Mine fire, habitat characteristics and animals numbers, particularly small ground mammals have declined in 2013 and 2014 but are starting to recover in 2015. Some habitat characteristics have recovered whilst others are still lower than before the fire.

At present, there appears to be no evidence of potential effects from subsidence upon the fauna diversity at Clarence Colliery.

Outbye SMP Area

Three sites surveyed in 2015 have been established within the Outbye SMP Area including (**Figure 2**):

- *Heath North (Site 1)* – Sandstone Plateaux Tea Tree – Dwarf Sheoak – Banksia Rock Heath Sandstone Plateau and Ridge Scribbly Gum Silvertop Ash Shrubby Woodland;
- *Gully (Site 2)* – Pagoda Rock Sparse Shrubland and Newnes Sheltered Peppermint – Brown Barrel Shrubby Forest; and
- *Heath South (Site 3)* - Exposed Blue Mountains Sydney Peppermint – Silvertop Ash Shrubby Woodland.

A total of 49 bird, five reptile, four amphibian and 12 native (plus five introduced) mammal species were located within Clarence Colliery Outbye SMP Application area during the 2015 surveys.

Although the number of amphibian species has been low over the years (possibly due to the cold conditions during most surveys), bird, reptile and mammal species diversities were typical of that expected from the Central Tablelands.

In 2015, three new bird species (Whistling Kite, Varied Sittella, Grey Butcherbird), two new mammal species (House Mouse, Horse), two new reptile species (Yellow-bellied Water Skink, Cunningham's Spiny-tailed Skink) and two frog species (Blue Mountains Tree Frog, Bibron's Toadlet) were recorded. All of these species have been located within the Newnes Plateau area over the years. It is likely that new species will be added each year as the surveys progress over time.

Six threatened species have been located within the Clarence Colliery Outbye SMP Application Area as a result of the surveys in 2015. These were the Gang Gang Cockatoo, Flame Robin, Scarlet Robin, Varied Sittella, Eastern Bentwing Bat and Eastern False Pipistrelle.

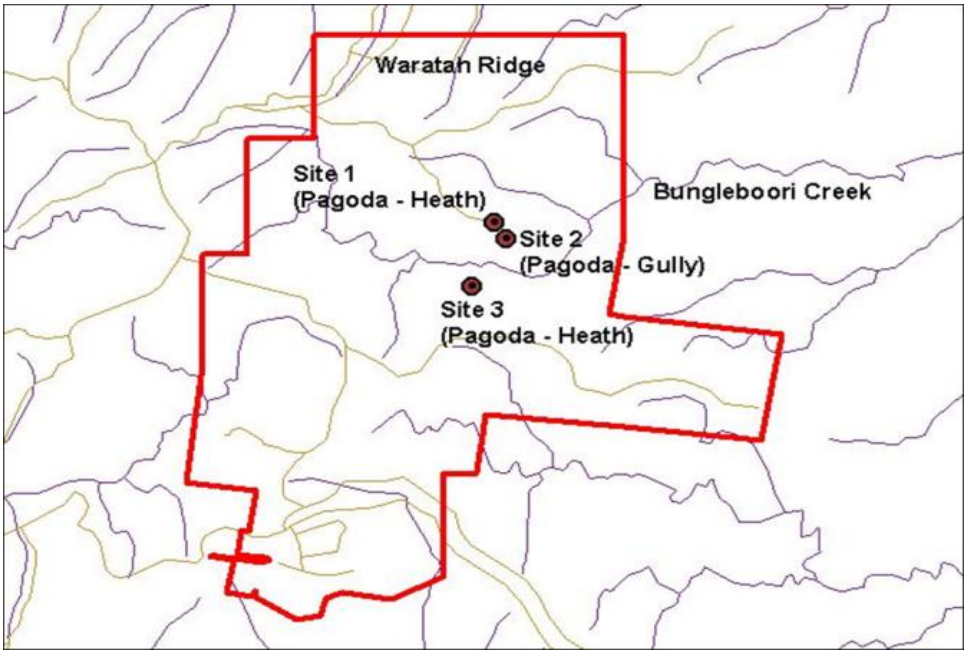

Figure 2. Location of Fauna Monitoring Sites in Outbye SMP Area

None of the threatened species should be directly affected by subsidence-induced changes to their preferred habitat and there is no indication that underground mining at Clarence Colliery has affected the population status of this threatened species or any other species.

As data continues to accumulate from the on-going surveys, it will be possible to track changes to the terrestrial vertebrate fauna within the Clarence Colliery Outbye Colliery SMP Application Area and the 314/316 area. At present, there appears to be no evidence of potential effects from subsidence upon the fauna diversity at Clarence Colliery. The major effects have been from the State Mine fire that burnt through the Clarence Colliery area and resulted in the loss of habitat and possibly fauna. The Spring 2013 fauna monitoring survey report for the Clarence Outbye area gives a picture of the impacts from the fire.

Eastern SMP Area

The three sites surveyed in 2015 were the same as that surveyed in previous years including (**Figure 9**):

- *BNS02 (Bungleboori North 1)* – a swamp located within the pine forest east of Waratah Ridge Road. The swamp supports a mix of swamp and Blue Mountains Sandstone Plateau Forest;
- *PAG01/02* – a pagoda and steep hill overlooking Bungleboori Creek. This site samples Pagoda Complex and Blue Mountains Sandstone Plateau Forest vegetation, as well as habitats unique to the cliffline environment; and

PAG03/04 – a pagoda and steep hill overlooking Bungleboori Creek, similar to PAG01/02.

A total of 54 bird, six reptile, two amphibian and 18 native (plus three introduced) mammal species were located within the Clarence Colliery Eastern SMP Application area during the 2015 surveys. A total of 104 bird, 27 reptile, 31 native mammal and five amphibian species have been recorded from the Area since 2004.

Although the number of amphibian species has been low over the years (possibly due to the cold conditions during most surveys), bird, reptile and mammal species diversities were typical of that expected from the Central Tablelands.

-

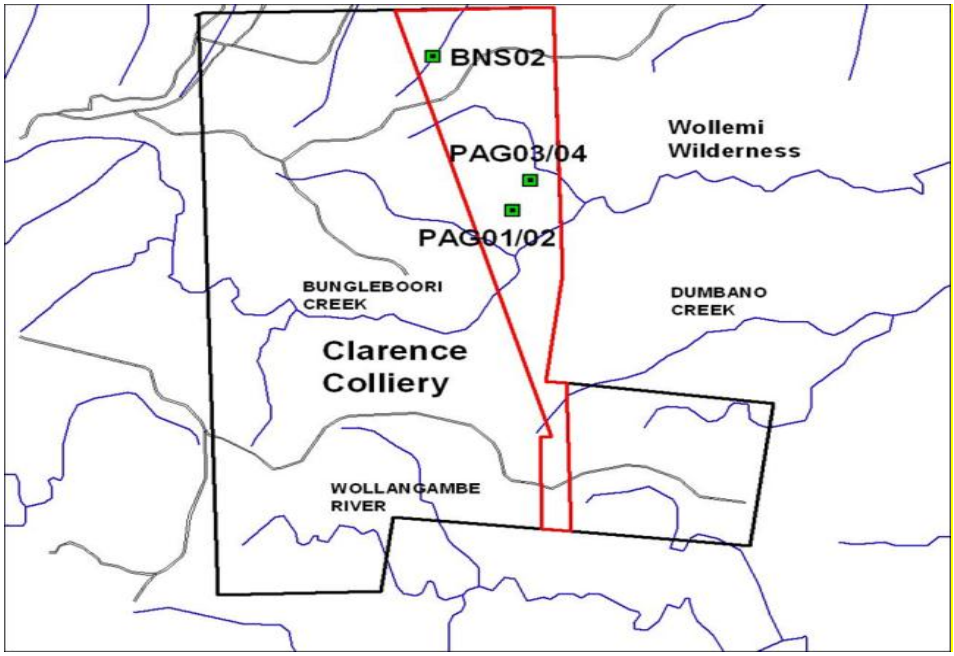

Figure 9. Location of Fauna Monitoring Sites in 700 Eastern SMP Areas

Fourteen threatened species have been located within the Clarence Colliery Eastern SMP Application Area as a result of the surveys between 2004 and 2015. These are the Gang-gang Cockatoo, Glossy Black-cockatoo, Powerful Owl, Brown Treecreeper, Hooded Robin, Flame Robin, Scarlet Robin, Varied Sittella, Spotted-tailed Quoll, Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Bentwing Bat, Large-footed Myotis and Broad-headed Snake. Most of these species are dependent upon large areas of native woodland for populations to survive. In the Newnes Plateau region woodland habitat has been retained (albeit logged), and these threatened species are still located. Some threatened species have been located consistently over the years e.g. Eastern Bentwing Bat, Flame and Scarlet Robins and Gang-gang Cockatoo. In 2015, seven threatened species were located – Gang-Gang Cockatoo, Scarlet Robin, Varied Sittella, Large-eared Pied Bat, Eastern Bentwing Bat, Eastern False Pipistrelle and the Broad-headed Snake.

None of the threatened species would be directly affected by subsidence-induced changes to their preferred habitat, except for the Large-footed Myotis. This species roosts within rock shelters, such as caves and rocky overhangs, and hunts over water. Both of these habitats are found in the Clarence Eastern SMP Area but, at this stage, there is no indication that underground mining at Clarence Colliery has affected the population status of this threatened species or any other species. Mining activities at Clarence result in 3 – 10cm of subsidence and ongoing surveys have shown that this amount of subsidence (including tilts and strains) is not sufficient to cause negative consequences on rock shelters, pagodas and clifflines.

The configuration of survey sites established in previous years adequately samples the two major environments within the Clarence Colliery Eastern SMP Application Area i.e. pagoda and wetland (swamp). These sites provide the best possible data for the long-term monitoring of terrestrial vertebrates. The survey techniques used have been successful in locating a wide range of species, including new records for the Newnes Plateau region. However, it is recommended that the BNS02 site be moved to another nearby site to ensure the continuation of control data.

As data continues to accumulate from the on-going surveys, it will be possible to track changes to the terrestrial vertebrate fauna within the Clarence Colliery Eastern SMP Application Area. As extraction in the Eastern SMP Area was completed early in 2009, it is evident from the above analyses that there have been no significant differences in the indices measured over the years. At present, there is no evidence of potential effects from subsidence upon the fauna diversity at Clarence Colliery.

800 Area (Eastern Portion)

During the reporting period Clarence continued development in the 800 Area located within the eastern portion of ML 1583. Three sites were established during 2009 and fauna surveys were undertaken in autumn, spring and summer in that year and annually up to 2014. The sites include (**Figure**):

- *800 Swamp 1 Site* - samples Newnes Plateau Shrub Swamp in the central part of the 800 Area;
- *800 Heath Site* - samples Montane heath vegetation south of Dumbano fire trail; and
- *800 Swamp 2 Site* - samples the woodland and gully vegetation in the eastern part of the 800 Area.

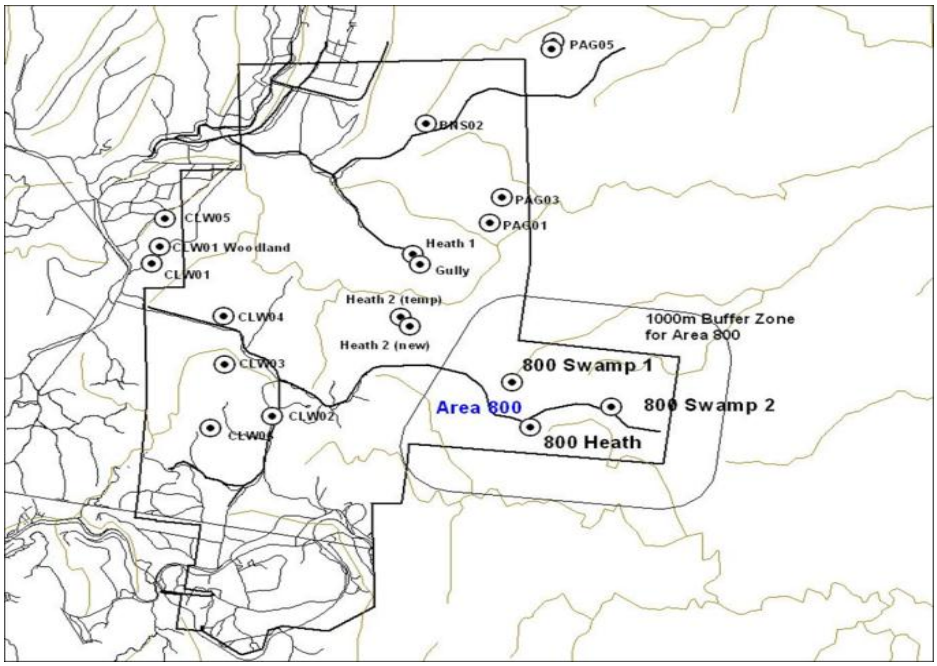

Figure 10. Location of Fauna Monitoring Sites in 800 SMP Area

A total of 39 bird, 15 native mammal (plus four introduced mammal), nine reptile and three amphibian species were located during the surveys. Six threatened species were located during the 2015 surveys. These were the Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Bent-wing Bat, Eastern Pygmy-possum, Flame Robin and the Scarlet Robin.

The fauna monitoring surveys of 800 Area in 2015 have shown that the choice of survey sites was successful, in terms of the number of individuals and diversity of species within the main fauna groups surveyed. Also, there were sufficient numbers and diversities of these fauna groups to be able to calculate a set of diversity indices that form part of the baseline monitoring database.

Given the low levels of subsidence from previous mining at Clarence Colliery, and the predicted low levels (3–10cm) of subsidence for Area 800, the risk of adverse impacts on fauna within this area is considered to be low.

900 Area

With the expansion of mining into the Area 900 at Clarence Colliery it is necessary to monitor fauna populations within the area, particularly within any swamps considered as Endangered. Two sites have been selected in the north and south of the area and their locations are shown in **Figure 22**.

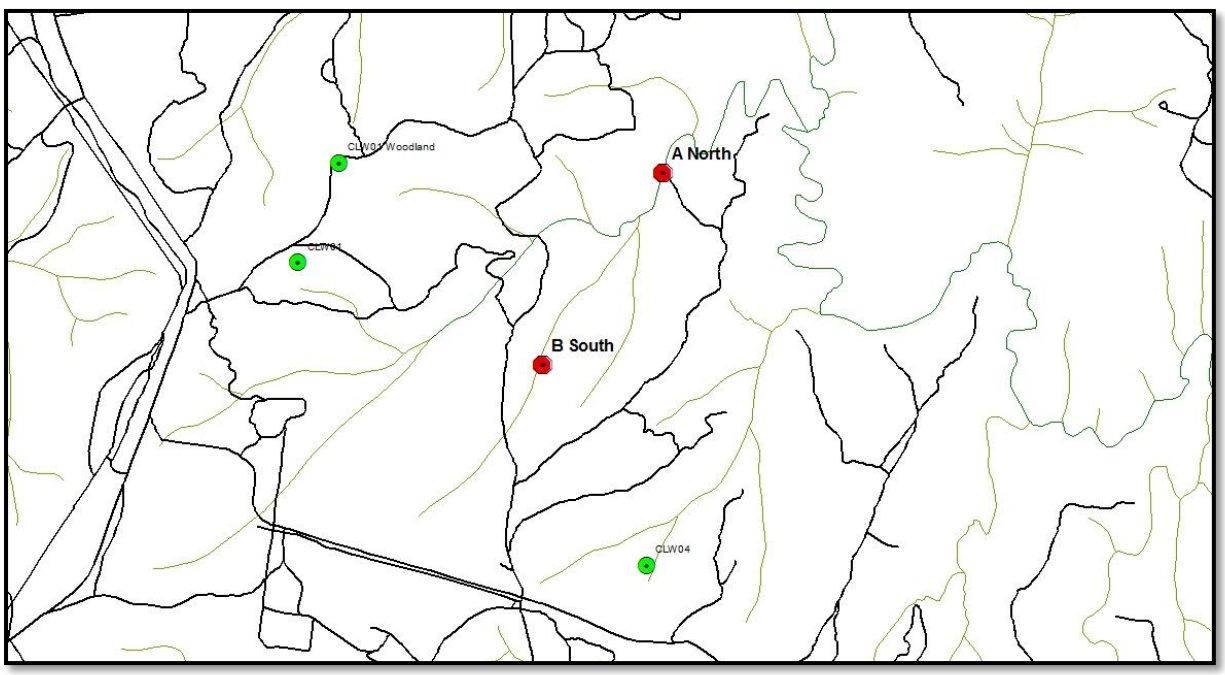

Figure 11. Location of Fauna Monitoring Sites in 800 SMP Area

Site A North is located along Paddys Creek, a tributary to Bungleboori Creek. The site covers the creekline and surrounding woodland and low heathy shrub. Along the western edge of the site is a cliffline about 50 m high. The site was burnt in the 2013 State Mine fire and the vegetation is still recovering. Consequently, little of the original shrub cover exists at present. The burnt remains of a pipeline run beside the creek, possibly connected with the nearby quarry.

Site B South is also located along Paddys Creek, but further towards the headwaters. The site covers the creekline and associated riparian area, as well as the surrounding woodland. A deep trench had been dug beside the creek, presumably to drain the area. The site was burnt in the 2013 State Mine fire and the vegetation is still recovering. Consequently, little of the original shrub cover exists at present. The burnt remains of a pipeline run beside the creek, possibly connected with the nearby quarry.

A total of 51 bird, 13 native mammal (four introduced mammals), seven reptile and two amphibian species were located during the surveys.

The fauna monitoring survey of Area 900 i.e. panels 913 and 917, has shown that the choice of survey sites was successful, in terms of the number of individuals and diversity of species within the main fauna groups surveyed. Also, there were sufficient numbers and diversities of these fauna groups to be able to calculate a set of diversity indices that form part of the baseline monitoring database. However, as with that found in other sites within Clarence Colliery that have been affected by the 2013 State Mine fire, fauna numbers and diversity were low, particularly concerning mammals. It is anticipated that populations will build up over time and the 2015 results show an increase in bird and mammal diversities and numbers. Eight threatened species were located during the surveys, the Gang-gang Cockatoo, Flame Robin, Scarlet Robin, Varied Sittella, Eastern Pygmy-Possum, Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Bentwing Bat and Giant Dragonfly.

Given the low levels of subsidence from previous mining at Clarence Colliery, and the predicted low levels (30mm) of subsidence for Area 900, the risk of adverse impacts on fauna within this area is considered to be low. However, further monitoring is recommended to provide accurate baseline and comparison data. This should be undertaken during three seasons of the year (autumn, spring and summer) to ensure natural variability of fauna populations are taken into consideration.

Cliffline and Pagoda Photographic Monitoring

Photographic monitoring of clifflines and pagodas occurred on four occasions during 2015. The two pagoda sites surveyed in the Clarence Colliery Eastern SMP Area cover land where underground mining (partial extraction) has occurred (sites PAG01/02 and PAG03/04).

Cliffline monitoring over the 902 and 904 panels was undertaken in March 2015 and then again in August 2015. No impacts were identified during the inspection

Photographic Monitoring of Swamps

During 2015, partial extraction occurred beneath three swamps including “Swamp 2” above the 810 panel and “CLW04” above the 905 panel and Bungleboori #4 above the 901 panel. Both the Swamp 2 and CLW04 swamps are visited quarterly through the ecological monitoring. No impacts were noted from these survey efforts. CLRP 5 lies adjacent to Bungleboori #4 swamp and it showed no impacts to groundwater levels.

During 2015, four photographic monitoring efforts were made out to the far inbye end of 810 and 812 panel. These inspections occurred in February, May, August and November. No subsidence impacts were noted. The primary observation was the ongoing recovery from the bushfire.

There was no evidence of any mining related impacts detected during 2015 from photographic monitoring of swamps.

Subsidence

SMP Applications, Variations and Approvals

During 2015, the following SMP applications and variations occurred:

900 Area

- The 900 Area Variation 2 was submitted on the 4th December 2014 and was approved on 10th February 2015. The main components of this variation included:
    - Reducing the length of the 903a panel

- Changing the 11 heading 903 panel to two separate panels including a six heading (907) and a seven heading (905) panels
- Introduced 909 as a five headings mains
- Renaming of 903a to 903 panel
- 911 panel changed from a seven heading to a six heading panel
- Extraction of 901 mains

800 Area

- The 800 Area Variation 3 was submitted on the 3rd September 2015 and approved on 16th November 2015. The primary components of this variation included:
  - Minor extraction changes to 806, 808, 812, 814, 816 and 818 due to various changes to development driveage
  - Minor changes to the limit of workings at the far eastern end (or far inbye ends of the panel)
  - Reassessment of pillar stabilities given changes to the geological model, specifically, increases in depths of cover
- The 800 Area Limited Subsidence Monitoring Program for the 812 and 814 Panels was submitted on 19th March 2015 and was approved on 13th August 2015.

Subsidence / Environmental Monitoring

- A request to reduce environmental monitoring associated with expired SMPs was submitted to the DTIRIS on the 21st March 2014. A response was received 2nd April 2015. The approval to reduce environmental monitoring in the Eastern Area was not approved.
- A variation (or addendum report) to the 900 Area Subsidence Monitoring Program was submitted on 1st December 2014. The variation included reducing the length of the 903 Line because the 903 Panel had been reduced and no longer passed underneath the approved 903 line. This variation was approved on 4th December 2014.
- The Mid Panel Review for the 810 Panel was submitted on 9th March 2015.

Mining Activities

During 2015, the following mining activities took place:

- Extraction commenced in 902 Panel on 3rd November 2014 and was completed on 23rd February 2015.
- Extraction commenced in the 903a panel on 6th December 2014 and was completed on 12th February 2015.
- Development of 907 Panel commenced on 6th April 2015 and was completed on 19th October 2015.
- Extraction of 907 Panel commenced on 20th October 2015 and will continue into 2016.
- Development of 905 Panel commenced on 17th February 2015 and was completed on 11th September 2015.
- Extraction of 905 Panel commenced on 15th September 2015 and was completed on 20th November 2015.
- Extraction commenced in the 810 panel on 25th November 2014 and was completed on 31st March 2015 (following this date, the FCT was demobilised offsite for a major overhaul. It returned to site in September 2015).
- Extraction commenced in 901 Panel on 25th February 2015 and was completed on 2nd April 2015.
- Development of 812 panel commenced on 18th November 2014 and continued throughout the year.
- Development of the 814 panel commenced on 23rd September 2015 (following the return of the FCT) and continued throughout the year.
- Development of the 801S Mains continued throughout the 2015 year, ceasing on 26th March 2015.
- Development of 808 Panel commenced on 26th October 2015 and continued throughout the year.
- Development of the 801N Mains commenced on 25th May 2015 and ceased on 23rd October 2015.
- Development of the 818 Panel commenced on 31 March 2015 and ceased on 22 May 2015. It commenced again on 6th July 2015 and ceased on 15th September 2015.

- Development within the far inbye end of the 706 Panel commenced on 15th December and continued for the remainder of the year.

Subsidence Monitoring

- Resurvey of the 700A and 700B subsidence monitoring lines over the period 8 - 14 January to coincide with 24 months post 716 panel, 36 months post extraction of 712 panel, 48 months post extraction 710 panel and 60 months post extraction of 702 and 704 panels.
- Resurvey of rock marks around Lithgow No.2 Dam on 10th June 2015 and 3rd December 2015 as the 6 monthly post mining surveys for the DSC approvals.
- Resurvey of the Lithgow No.2 Dam wall on 10th June 2015 and the 3rd December 2015 as the 6 monthly post mining surveys for the DSC approvals.
- Valley closure monitoring of the Lithgow No.2 Dam Wall carried out on 10th June 2015 and the 3rd December 2015 as the 6 monthly post mining surveys for the DSC approvals.
- Resurvey of the 707 subsidence monitoring line on 2nd June 2015 (DSC requirements) and 17th November for the 12 monthly post mining.
- Resurvey of the U subsidence monitoring line on 30th July 2014 for 72 months post extraction of panels 400, 402 and 403.
- Resurvey of the 609 D subsidence monitoring line on 25th March 2015 for longer term monitoring.
- Resurvey of the 609 A subsidence monitoring line on 18th March 2015 for longer term monitoring.
- Resurvey of the H and I subsidence monitoring lines on 18th February 2015 (H Line) and on 18th February 2015 (I Line) for longer term monitoring of the 612 Panel.
- Resurvey of the W and Z subsidence monitoring lines on 7th September 2015 for 84 months post extraction of 306 panel.
- Resurvey of the 700A and 700B subsidence monitoring lines on 1st July 2015 and 2nd July 2015 (respectively) for the 6 monthly survey required by the DSC Approvals.
- The 800A line was installed on the 13th November 2014 and was surveyed for the first 3 months post extraction on 4th May 2015.
- The 800B line was installed on the 3rd November 2014 and was surveyed on 11th February 2015 for the three months post extraction and then surveyed again on 5th May 2015 for the six months post extraction. The 800B line was again surveyed on 17th November 2015 for the annual post extraction survey.
- The 800C Line was installed on 14th October 2015 well before development underneath the subsidence line.
- The 900A line was surveyed on the 6th March 2015 for the 3 monthly post extraction of 902 panel. The 900A line was surveyed again on 28th August 2015 for its first annual survey of 902 and 904 panels.
- The 903 line was surveyed on 11th December 2015 for the first 3 months post extraction of the 905 panel.
- The 700F line was resurveyed on 1st September 2015 for annual post extraction of 716 panel.
- The power poles associated with the 66kV (811 feeder) powerlines were surveyed on 23 March 2015. These power poles and powerlines are located near the 903a panel. A condition assessment of the power poles was also undertaken in March 2013.
- Surface subsidence management inspections.

Underground Monitoring

The following underground monitoring was undertaken in 2015.

- Underground roof monitoring (Tell-Tales) in 903, 905, 810, 901, 907 (although extraction of the 907 Panel was not completed at the time this report was prepared) and 902 panels (where accessible).
- Underground geotechnical audits.
- Visual inspections of underground conditions and stability.
- Regular measurement of roadway widths and intersection heights.
- Underground panel audits.

Geotechnical and Subsidence Monitoring

903 Panel

Extraction within the 903 Panel commenced on 6th December 2014 and finished on 23rd February 2015. Apart from some minor localised floor heave, there were no abnormal mining conditions experienced during the extraction of the 903 Panel.

Operations Management and Audit

Operational audits of the development process and partial pillar extraction process took place by Undermanager's and other colliery officials. The panel was also audited by an external geotechnical consultant prior to extraction. Post extraction audits were undertaken by the day shift Undermanager and the Clarence Geologist on 25th February 2015. Refer to the following reports (attached):

- Geotechnical Assessment – 903A Panel Pre Extraction Audit (4th December 2014). This reported included recommended restrictions and tell tale locations for the Manner and Sequence Plan Proposed for Partial Extraction; and
- Letter report to the Inspector of Coal Mines dated 27th February 2015 including brief report associated with the post extraction audit.

An audit of pillar roadway width and height was conducted across all headings in the 903 Panel prior to extraction. The as spalled width and height measurements are provided in Average width was 5.7m with a standard deviation of 0.4m. Average height was 2.8m with a standard deviation of 0.2m.

Lifting depths were of the order of 11-12m. Additional fenders and stooks were left, where required and/or as stipulated in the Manner and Sequence plans prior to lifting. In most areas of floor heave, lifting depths were reduced.

No bottom coal appeared to have been taken at any point.

The end of panel audits found no visual indicators of any form of large scale instability in the 903 panel.

Underground Stability

The timber breaker props were installed as required. Some of the props were bowed, indicating minor convergence. Minor floor heave was apparent in very localised sections of the panel, specifically in irregular zones from 11 cut through inbye. Within these areas, some timber props were noted to be snapped after extraction was completed. No appreciable roof deterioration or skin loss was observed in the lifts or roadways.

Underground Mapping

A geotechnical audit of the ground conditions and support practices in the 903 Panel was undertaken prior to the planned partial extraction operation. The purpose of the audit was to review the available data, assess its accuracy and adequacy for the purposes of the planned partial extraction (i.e. single-sided lifting) operation. Data used in the audit included mine plans (depth of cover, geological structures, proposed extraction sequences), underground mapping data, extraction experiences in the 708 – 716 panels as well as elsewhere from the 600 area. The audit was used to determine secondary support and extraction sequences.

Underground Monitoring

Geotechnical audits of the 903 panel were undertaken, including prior to extraction, during extraction and at the completion of extraction.

One roof Tell-Tale was installed in 903 panel. This roof Tell-Tale was read by the deputies during lifting. The instrument was located in or adjacent to an area of poor conditions. The Tell-Tale indicated negligible movement, with a maximum of 1mm at the D17 intersection.

No rib Tell-Tales were installed in 903 panel.

It is concluded there were no visual indicators of large-scale instability of any form in the 903 panel extracted area.

Subsidence Monitoring

No subsidence monitoring was undertaken above the 903 panel.

Inspections

Surface inspections above the 903 panel have not detected any sign of surface cracking or other impacts.

905 Panel

Extraction within the 905 Panel commenced on 15th September 2015 and finished on 20th November 2015. Apart from some minor localised floor heave, there were no abnormal mining conditions experienced during the extraction of the 905 Panel.

Operations Management and Audit

Operational audits of the development process and partial pillar extraction process took place by Undermanager's and other colliery officials. The panel was also audited by an external geotechnical consultant prior to extraction. Post extraction audits were undertaken by Mr. David Hill of Golder Associates along with the Clarence Geologist on 7th October 2015 and 17th December 2015. Refer to the following reports (attached):

- Geotechnical Assessment - 905 Panel Pre Extraction Audit (4th September 2015). This reported included recommended restrictions and tell tale locations for the Manner and Sequence Plan Proposed for Partial Extraction; and
- Letter report to Clarence Technical Services Manager dated 13th January 2016 including brief report associated with the post extraction audit.

An audit of pillar roadway width and height was conducted across all headings in the 905 Panel prior to extraction. Average width was 5.7m with a standard deviation of 0.3m. Average height was 2.8m with a standard deviation of 0.2m.

Lifting depths were generally in the order of 11-12m. Additional fenders and stooks were left, where required and/or as stipulated in the Manner and Sequence plans prior to lifting. In most areas of floor heave, lifting depths were reduced.

No bottom coal appeared to have been taken at any point.

The end of panel audits found no visual indicators of any form of large scale instability in the 905 panel.

Underground Stability

The timber breaker props were installed as required. Some of the props were bowed, indicating minor convergence. Minor floor heave was apparent in localised sections of the panel, specifically in the 18-19 cut throughs where approximately 200mm of floor heave was recorded. In these areas, props bowed significantly where extraction took place. No appreciable roof deterioration or skin loss was observed in any of the lifts or roadways.

Underground Mapping

A geotechnical audit of the ground conditions and support practices in the 905 Panel was undertaken prior to the planned partial extraction operation. The purpose of the audit was to review the available data, assess its accuracy and adequacy for the purposes of the planned partial extraction (i.e. single-sided lifting) operation. Data used in the audit included mine plans (depth of cover, geological structures, proposed extraction sequences), underground mapping data, extraction experiences in the 903 panel as well as panels from the 700 areas. The audit was used to determine secondary support and extraction sequences.

Underground Monitoring

Geotechnical audits of the 905 panel were undertaken, including prior to extraction, during extraction and at the completion of extraction.

Four roof Tell-Tales were installed in the 905 panel. All roof Tell-Tales were read by the deputies during lifting. The majority of these instruments were located in or adjacent to areas of moderate to poor (i.e. yellow or red) conditions. These Tell-Tales recorded no movement.

No rib Tell-Tales were installed in the 905 panel.

It is concluded there were no visual indicators of any form of large-scale instability in the 905 panel extracted area.

Subsidence Monitoring

The 903 line lies above the 905 Panel. The 903 line was surveyed once throughout 2015 to measure subsidence development over the first 3 months post extraction. Maximum subsidence was recorded to be 11mm which is within Condition Green of the subsidence TARP.

Inspections

Surface inspections above the 905 panel have not detected any sign of surface cracking or other impacts.

810 Panel

Extraction within the 810 Panel commenced on 25th November 2014 and finished on 31st March 2015. There were no abnormal mining conditions experienced during the extraction of the 810 Panel. It is important to note that only

half of the panel was extracted (ie. Extraction of the C, D and E Headings). The A and B Headings remain first workings only to enable access into the far inbye end of the panel for pumping purposes.

Operations Management and Audit

Operational audits of the development process and partial pillar extraction process took place by Undermanagers and other colliery officials. The panel was also audited by an external geotechnical consultant prior to extraction. Post extraction audits were undertaken by the day shift Undermanager and the Clarence Geologist on 13th April 2015.

- Geotechnical Assessment - 810 Panel Pre Extraction Audit (21st November 2014). This reported included recommended restrictions and tell tale locations for the Manner and Sequence Plan Proposed for Partial Extraction; and
- Letter report to Inspector of Coal Mines dated 16th April 2015 including brief report associated with the post extraction audit.

An audit of pillar roadway width and height was conducted across all headings in the 810 Panel prior to extraction. Average width was 5.6m with a standard deviation of 0.3m. Average height was 2.9m with a standard deviation of 0.1m.

Lifting depths were of the order of 11 - 12m. Additional fenders and stooks were left, where required and/or as stipulated in the Manner and Sequence plans prior to lifting.

No bottom coal appeared to have been taken at any point.

The end of panel audits found no visual indicators of any form of large scale instability in the 810 panel.

Underground Stability

The timber breaker props were installed as required. Some of the props were bowed, indicating minor convergence. No floor heave was apparent. No appreciable roof deterioration or skin loss was observed in the lifts or roadways.

Underground Mapping

A geotechnical audit of the ground conditions and support practices in the 810 Panel was undertaken prior to the planned partial extraction operation. The purpose of the audit was to review the available data, assess its accuracy and adequacy for the purposes of the planned partial extraction (i.e. single-sided lifting) operation. Data used in the audit included mine plans (depth of cover, geological structures, proposed extraction sequences), underground mapping data, extraction experiences in the 600 and 700 areas. The audit was used to determine secondary support and extraction sequences.

Underground Monitoring

Geotechnical audits of the 810 panel were undertaken, including prior to extraction, during extraction and at the completion of extraction.

Thirteen roof Tell-Tales were installed in 810 Panel. All roof Tell-Tales were read by the deputies during lifting. The majority of these instruments were located in or adjacent to areas of moderate to poor (i.e. yellow or red) conditions. Results from the Tell-Tales indicate negligible movement, with a maximum of 4mm recorded for the “total” anchor and 1mm recorded for the “lower” anchor at D40. This was first measured on the 26th May 2014 with later measurements failing to record further movement (at least up until the latest measurement which was conducted on 16th February 2015).

No rib Tell-Tales were installed in 810 Panel.

It is concluded there were no visual indicators of any form of large-scale instability in the 810 panel extracted area.

Subsidence Monitoring

There are two subsidence lines associated with the 810 Panel. The 800A line runs almost across the middle of the panel and the 800B line extends from the far inbye end of the panel mainly to measure potential off panel subsidence.

The 800A line was surveyed once throughout the year to measure movement within 3 months of extraction (4th May 2015). The maximum subsidence recorded was 8mm.

The 800B line was surveyed three times throughout the reporting period. The first survey was carried out 3 months after extraction commenced on 11th February 2015. It was surveyed again 6 months after extraction commenced on 5th May 2015. It was surveyed again 12 months after extraction commenced on 17th November 2015. The range of movement recorded over all three surveys was +/-4mm. This indicates that there has been no real movement as these results fit within the survey tolerances for inherent error.

Inspections

Surface inspections above and in the near vicinity of the 810 Panel have not detected any sign of surface cracking or other impacts.

902 Panel

Extraction within the 902 Panel commenced on 3rd November 2014 and finished on 23rd February 2015. There were no abnormal mining conditions experienced during the extraction of the 902 Panel. It is noted that extraction of the panel commenced outbye from 32 – 2 cut through. This was due to the occurrence of a first workings zone as approved in development consent DA 504-00.

Operations Management and Audit

Operational audits of the development process and partial pillar extraction process took place by Undermanagers and other colliery officials. The panel was also audited by an external geotechnical consultant prior to extraction. Post extraction audits were undertaken by the day shift Undermanager and the Clarence Geologist on 10th March 2015. Refer to the following reports (attached):

- Geotechnical Assessment – 902 Panel Pre Extraction Audit dated (22nd October 2014) including recommended restrictions and tell tale locations for the Manner and Sequence Plan Proposed for Partial Extraction; and
- Letter report 13th March 2015 including brief report associated with the post extraction audit.

An audit of pillar roadway width and height was conducted across all headings in the 902 panel prior to extraction. Average width was 5.5m with a standard deviation of 0.3m. Average height was 3.0m with a standard deviation of 0.1m.

Lifting depths were of the order of 11m. Additional fenders and stooks were left, where required and/or as stipulated in the Manner and Sequence plans prior to lifting.

No bottom coal appeared to have been taken at any point.

The end of panel audits found no visual indicators of any form of large scale instability in the 902 panel.

Underground Stability

The timber breaker props were installed as required. Some of the props were bowed, indicating minor convergence. No floor heave was apparent. No appreciable roof deterioration or skin loss was observed in the lifts or roadways.

Underground Mapping

A geotechnical audit of the ground conditions and support practices in the 902 Panel was undertaken prior to the planned partial extraction operation. The purpose of the audit was to review the available data, assess its accuracy and adequacy for the purposes of the planned partial extraction (i.e. single-sided lifting) operation. Data used in the audit included mine plans (depth of cover, geological structures, proposed extraction sequences), underground mapping data, extraction experiences in the 702, 704 and 904 well as panels from the general 600 and 700 areas. The audit was used to determine secondary support and extraction sequences.

Underground Monitoring

Geotechnical audits of the 902 panel were undertaken, including prior to extraction, during extraction and at the completion of extraction.

Two roof Tell-Tales were installed in 902 Panel. All roof Tell-Tales were read by the deputies during lifting. The majority of these instruments were located in or adjacent to areas of moderate to poor (i.e. yellow or red) conditions. These Tell-Tales recorded no movement.

No rib Tell-Tales were installed in the 902 Panel.

It is concluded there were no visual indicators of any form of large-scale instability in the 902 panel extracted area.

Subsidence Monitoring

The 900A line overlies the 902 and 904 Panels. The 900A line was surveyed twice throughout the reporting period. The first survey was undertaken on 6th March 2015 and was carried out for the 3 months post extraction of the 902 panel. The second survey was carried out on 28th August 2015 as the annual survey for both the 902 and the 904 Panels. Maximum subsidence recorded was 31mm.

Inspections

Surface inspections above the 902 Panel have not detected any sign of surface cracking or other impacts.

901 Panel

Extraction within the 901 Panel commenced on 25th February 2015 and finished on 2nd April 2015. There were no abnormal mining conditions experienced during the extraction of the 901 Panel.

Operations Management and Audit

Operational audits of the development process and partial pillar extraction process took place by Undermanagers and other colliery officials. The panel was also audited by an external geotechnical consultant prior to extraction. Post extraction audits were undertaken by the day shift Undermanager and the Clarence Geologist on 14th April 2015. Refer to the following reports (attached):

- Geotechnical Assessment – 901 Panel Pre Extraction Audit (dated 9th February 2015) including recommended restrictions and tell tale locations for the Manner and Sequence Plan Proposed for Partial Extraction; and
- Letter report to Inspector of Coal Mines dated 17th April 2015 including brief report associated with the post extraction audit.

An audit of pillar roadway width and height was conducted across all headings in the 901 Panel prior to extraction. Average width was 5.6m with a standard deviation of 0.3m. Average height was 2.9m with a standard deviation of 0.1m.

Lifting depths were of the order of 11m. Additional fenders and stooks were left, where required and/or as stipulated in the Manner and Sequence plans prior to lifting.

No bottom coal appeared to have been taken at any point.

The end of panel audits found no visual indicators of any form of large scale instability in the 901 Panel.

Underground Stability

The timber breaker props were installed as required. Some of the props were bowed, indicating minor convergence. No floor heave was apparent. No appreciable roof deterioration or skin loss was observed in the lifts or roadways.

Underground Mapping

A geotechnical audit of the ground conditions and support practices in the 901 Panel was undertaken prior to the planned partial extraction operation. The purpose of the audit was to review the available data, assess its accuracy and adequacy for the purposes of the planned partial extraction (i.e. single-sided lifting) operation. Data used in the audit included mine plans (depth of cover, geological structures, proposed extraction sequences), underground mapping data, extraction experiences in the 902 and 904 panels as well as conditions experienced in the 700 Area. The audit was used to determine secondary support and extraction sequences.

Underground Monitoring

Geotechnical audits of the 901 Panel were undertaken, including prior to extraction, during extraction and at the completion of extraction.

No roof or rib Tell-Tales were installed in 901 Panel as a result of the generally good conditions within the panel.

It is concluded there were no visual indicators of any form of large-scale instability in the 901 panel extracted area.

Subsidence Monitoring

No subsidence monitoring was undertaken above the 901 panel.

Inspections

Surface inspections above the 901 panel have not detected any sign of surface cracking or other impacts.

Previously Extracted Areas

Subsidence monitoring results from previously extracted panels are discussed in detail in the Subsidence Management Status Reports (SMSR's). A summary of results is provided below. All results from 2015 were less than the 100mm (+/-25mm) maximum predicted.

608, 610, 612 and 614 Panels

The H line measured maximum subsidence of 100mm over 612 Panel as surveyed on 18th February 2015. Previous results have indicated subsidence results along the H line up to 101mm so the February 2015 results generally indicate a trend towards stability. The 2015 survey strongly reflected the 2014 results with minimal

differences between results. The 2016 survey is scheduled for February 2016 and just like the 2015 survey, procedure and marker condition will continue to be a focus.

As for specific panels that the line overlies, the 606 panel measured a maximum of 21mm, the 608 panel measured a maximum of 35mm and the 610 panel measured a maximum of 66mm. The 612 panel measured a maximum of 100mm of subsidence, however, looking closely at the data behaviour across that part of the line, this peg may be an outlier and if this is the case, the subsidence from this panel may well be closer to 80mm. It is noted however, that a field inspection of the peg indicated no sign of obvious damage. The 614 panel measured a maximum subsidence of 22mm.

The results are within Condition Amber of the SMP and within the 100mm +/-25mm maximum predicted. No further action is required as there has already been a review of mine design for later panels.

The I line measures subsidence along the 612 panel and it is located above the spine pillars. The I line measured maximum subsidence of 91mm on 24th February 2011, a maximum of 95mm on 27th February 2012, a maximum of 95mm on 26th February 2013, a maximum of 95mm on 24th February 2014 over the 612 panel and a maximum of 100mm on 18th February 2015. It is noted that one peg (peg I-27) recorded movement of 110mm and based on the behaviour of the data set, appears to be a knocked/disturbed peg. Apart from peg I-27, the latest results are within the 100mm +/-25mm maximum predicted.

It is important to note that pegs I2-I27 all show a consistent reduction of between 5-7mm when comparing 2014 and 2015 data. It is noted that the data behaviour is similar, (ie. Nature of the lines on the graph) but with a consistent reduction, which is curious and may be survey error. In any case, the next survey will provide further data to confirm the data set.

Previous surface inspections have found no evidence of any surface damage around the H and I lines and no further action is required at this stage.

No strain or tilt is measured along the H and I lines.

700 Area

There are two subsidence lines that were surveyed across the 700 Area during 2015. The 700A and 700B lines are carried out twice yearly with the Annual survey carried out in January and a mid year survey carried out in line with DSC commitments. The dates of surveys are presented in **Table 1**.

Table 15. 700 A-E Scheduled Subsidence Surveys 2015

Subsidence lines in 700 Area	2014 Annual Survey *60mnths post 702* *60mnths post 704* *48mnths post 708* *48mnths post 710* *36mnths post 712* *24mnth post 714* *12mnth post 716*	2015 Annual Survey *72mnths post 702* *72mnths post 704* *60mnths post 708* *60mnths post 710* *48mnths post 712* *36mnth post 714* *24mnth post 716*	2015 DSC Survey
700A	20/01/2014	14/01/2015	01/07/2015
700B	20/01/2014	08/01/2015	02/07/2014

The 700B line results from 2015 are all generally less than 50mm.

- maximum subsidence over 702 panel was recorded to be 35mm, almost the same as the 2014 result of 34mm,
- maximum subsidence over 704 panel was recorded to be 36mm, similar to the 2014 result of 32mm,
- maximum subsidence over 708 panel was recorded to be 40mm which is more than the maximum 33mm result of 2014 survey and less than the 43mm recorded in 2013,
- maximum subsidence over 710 panel was recorded to be 44mm which is similar to the 43mm recorded in 2014,
- maximum subsidence over 712 panel was recorded to be 47mm, similar to the 46mm recorded in 2014; and
- maximum subsidence recorded over 714 panel was recorded to be 38mm, which is similar to the maximum subsidence result of 40mm recorded from the 2014 surveys.

All subsidence results are less than the 100mm performance criteria and within condition green of the subsidence TARP.

The 700A line results from 2015 were all less than 50mm.

- maximum subsidence over 702 panel was recorded to be 47mm (January) and 46mm (July), very similar to the 2014 result of 47mm,
- maximum subsidence over 704 panel was recorded to be 45mm (January) and 43mm (July), very similar to the 2014 result of 45mm,
- maximum subsidence over 708 panel was recorded to be 32mm (January) and 28mm (July), which is less than that the 2014 survey which recorded a maximum of 35mm but is very similar to the 2013 result of 27mm,
- maximum subsidence over 710 panel was recorded to be 35mm (January) and 31mm (July) which is less than the 2014 result of 39mm,
- maximum subsidence over 712 panel was recorded to be 43mm (January) and 38mm (July) which less than the 2014 result of 43mm but similar to the 2013 result of 37mm.
- Measured subsidence over the first two headings of 714 panel were recorded to be 42mm (January) and 31mm (July) which is more than that recorded in 2014 at 25mm.

An interesting remark is that the Summer (January) results show more subsidence (albeit minor and within survey error) than the Winter (July) results.

All subsidence results are less than the 100mm performance criteria.

700W Area

Panel 707 and 700 Mains

Resurvey of the 707 line occurred on the 2nd June 2015 as per the DSC monitoring requirements and again on the 17th November 2015 as the annual survey. It is noted that some of the pegs along the 707 line (pegs 1 – 69) were affected by the October 2013 bushfires. Whilst some of the pegs were affected by the fire (dropped pins from melted components of the feno marker), they were not destroyed therefore these pegs will continue to be surveyed.

Maximum subsidence along the 707 line measuring subsidence from the 707 panel was 29mm in July survey and then 16mm in the November survey. .

Additional pegs (70 – 78) were installed in December 2013 to measure subsidence above the extracted 700 Mains. Maximum subsidence above the 700 Mains was measured as 15mm in the June survey and then measured as 5mm in the November survey.

Subsidence results remain within Condition Green of the 700W Areas SMP and well within the 100mm maximum predicted.

Panel 716

Resurvey of the 700F line occurred on the 1st September 2015 as the first 24months post mining survey. A number of feno markers were lost in the October 2013 bushfire as a direct result of the fire (burnt) and/or loss of markers from bull dozer activity.

Maximum subsidence recorded along the 700F line measured 10mm at peg 9, located above the remnant pillar in between the B and C Heading adjacent to the spine pillar, similar to 13mm recorded in 2014.

Subsidence results remain within Condition Green of the 700W Areas SMP and well within the 100mm maximum predicted.

Outbye Areas

Panel 306

Resurvey of the W and Z lines occurred on 7th September 2015 for seven years post extraction of 306 Panel. Results for W line show maximum subsidence of 38mm at peg W-116 at the southern tip of the line. This southern portion of the subsidence line overlies old first workings associated with the 208 panel as well as the solid coal barrier in between 208 and 302 panels. The data set, at present, does not appear to be showing any obvious behavioural trends. Maximum subsidence recorded over the 302 panel is 17mm.

Maximum subsidence for the Z cross line is 12mm. The Z line crosses the W line at the northern end and essentially represents the fluctuation in subsidence results associated with the W line at its northern end. It is

interesting to note that the Z Line and the northern end of the W line, lie adjacent to the Bungleboori Creek and associated clifflines which may act as a non-clamped cantilever, fluctuating up and down by magnitudes in the order of 5-6cm. However, this is only a theory at this stage and further monitoring of these lines will be carried out in 2016.

Subsidence results remain within Condition Green of the Outbye Areas SMP and well within the 100mm maximum predicted.

Strains and tilts are no longer measured along the W and Z lines.

Panels 400, 402 and 403

Resurvey of the U line occurred on 30th July 2015, six years after completion of the extraction of panels 400, 402 and 403. Maximum measured subsidence was 27mm at peg 42 (over panel 400). Subsidence results are very similar to those measured during earlier surveys.

Subsidence results for the U line remain within Condition Green of the Outbye Areas SMP and well within the 100mm maximum predicted.

Tilts and strains are no longer measured along the U line.

609 Area

Resurvey of the 609 A and 609 D lines occurred on 18th March 2015 and 25th March 2015 respectively. The resurveys were for longer term monitoring of the older partial extraction areas and the survey in 2015 was the 11th year of surveys. A number of pegs have been lost to bushfires, Forest NSW pine plantation clearing, Forest NSW road widening/traffic and natural deterioration. It is noted that most of the pegs are wooden stakes. On the whole, only 31% of pegs along the 609A Line remain in a state that they can be measured and 50% of pegs along the 609D Line remain in a state that can be measured.

Photo 1 shows the cleared pine plantation area where a large proportion of the subsidence line used to be located. **Photos 2** and **3** show bushfire damaged pegs.

Photo 1. Cleared Pine Plantation

Photo 2. Peg A34

Photo 3. Peg A15

The survey results from 2015 for the 609 A line lie between the 2011 and 2013 results. A close inspection of the data shows that when the 2014 results are directly compared to the 2015 results, the measurements differ mostly by +/-2mm. One peg differs by 4mm (Peg A83) and one peg differs by 14mm (A62). On inspection of the behaviour of the line, the A62 peg result is an outlier and likely to be a result of the peg weathering/deteriorating.

Maximum recorded subsidence over the 609D panel was 68mm (similar to the 2014 result of 66mm). Maximum recorded subsidence over the 609C panel was 105mm, although this is likely to be an outlier. With this consideration, maximum subsidence is more likely to be 93mm (the same as that recorded in 2014). Maximum subsidence over the 609B panel was recorded to be 96mm (similar to the 2014 result of 95mm). Maximum subsidence recorded over the 609A panel is 65mm (similar to the 2014 result of 63mm).

Maximum subsidence for 609 D was 111mm at pegs D59 (which is the same as 2014 where it recorded 112mm).

Pegs D51, D77 and D82 again appear outliers and are ignored. The field inspection carried out on 23 November 2011 noted the following impacts to the four pegs:

- Peg 49 – was broken and rotten (not suitable for survey)
- Peg 51 – most likely hit or run over
- Peg 77 – was noted to be on an angle, impacted by some surface disturbance
- Peg 82 – was located in an area that had been locally disturbed

Nearly all pegs measured the same or less subsidence during the 2015 survey when compared to the 2014 survey with the exception of two pegs (D38 and D22) where both pegs measured additional subsidence of 1mm. Given that this number is so small, it is likely to be a result of the survey accuracy. This is a good result overall, showing that the line is likely to be reaching stability.

Photos 4 – **5** show deterioration and/or other impacts to pegs along the 609 D Line.

Photo 4. Peg D73

Photo 5. Peg D15

The higher than expected subsidence along 609A and 609D lines could have been influenced by the following factors all working in combination:

- The area is located in the deepest area of the mine with depth of cover up to 315m;
- Continuous lifting occurred between the main panel (609) and the subsidiary panels (609 A-D);
- The barrier between 609B and 609C is nominally 36m after lifting; and

- The area has now been flooded.

Continuous lifting between main panels and subsidiary panels no longer occurs. Typically two rows of pillars are not lifted between mains and subsidiary panels.

It is noted that prior to flooding, and 4 years after completion of extraction of 609 panels, 609 D line had stabilised at approximately 40mm above the 609 panels. Similarly, 609 A line had stabilised prior to flooding at approximately 30mm nearly 2 years after completion of extraction.

The 609 area was approved under Section 138 of the former *Coal Mines Regulation Act 1982*. A Trigger Action Response Plan (TARP) did not form part of the Subsidence Management Plan prepared under the Section 138 approval. Whilst results are near the elastic limit of the overburden strata (100±25mm), a surface inspection on 23rd November 2011 and again on 23rd December 2014 found no evidence of any surface impacts. Groundwater monitoring in the nearby CLRP2 borehole has not detected any groundwater impacts.

No strains or tilts are measured for 609 A line.

900 Area

As discussed previously**,** the 900A line overlies the 904 and the 902 Panel. The three monthly post extraction subsidence survey for 902 Panel recorded a maximum of 28mm of movement and the annual survey carried out on 28th August 2015 recorded a maximum subsidence of 27mm. The annual survey for the extraction of 904 Panel recorded a maximum subsidence of 31mm. Unfortunately, two pegs were damaged throughout the reporting period. Peg A23 was vandalised, but can still be measured. **Photo 6** shows the damage sustained to this peg. Peg A24 was a rock marker and it has been damaged beyond repair. **Photo 7** shows the damage sustained to this marker.

Photo 6. Peg A23

Photo 7. Peg A24

No strains or tilts are measured for 900 A line.

Subsidence results for 900 A line remain within Condition Green of the 900 Area SMP and well within the 100mm maximum predicted.

The results from the 903 line have been previously discussed and will not be repeated here.

800 Area

As discussed previously**,** the 800A line overlies the 810 Panel (along with the 812, 814 and 816 panels). The 800B line lies at the extremity (or far inbye end) of 810 panel and the 800C line lies at the extremity (or far inbye end) of the 812 panel. The 800C line has been installed, but it has not been triggered (at the time of writing this report) as the extraction of the 812 panel had not commenced as of 31 December 2015.

The results from the 800A and 800B subsidence surveys have been reported previously and will not be repeated here.

All results were within condition green of the subsidence TARP.

Approval to Discontinue Subsidence Line Monitoring

Clarence has approval to discontinue the following subsidence lines:

- 609A (levels are still required to be carried out), 609D (levels are still required to be carried out), 609B, 609C, 609E over the 609 panel series;
- F, G and X lines over the 330 Area;
- V, R, S and T lines over the 611 panel series;

- 605&602 line over 605 and 607 panels;
- 700C, 700D and 700E over the 700 Area;
- 700A and 700B (levels are still required to be carried out) over the 700 and 700W Area;
- 700F (only measure those pegs that survived the bushfire and bulldozer impacts) over the 700W Area; and
- W and Z (levels are still required to be carried out) over the Outbye Area.

Greenhouse Gases

Clarence undertakes monitoring of greenhouse gas emissions for reporting under the National Greenhouse and Energy Reporting (NGER) Program. Under the Program Clarence reports on:

- Greenhouse gas emissions;
- Energy production; and
- Energy consumption.

Of the six greenhouse gases identified in the Kyoto Protocol, Clarence Colliery produces one of these, carbon dioxide (CO2).

In an effort to improve overall energy efficiency across the site, Clarence is systematically replacing conventional conveyor drives with variable speed drives, reducing unnecessary current draw and improving drive torque per operating hour. Compressed air audits also were undertaken during the reporting period. A number of leaks in the compressed air delivery system were identified and rectified, reducing the energy load on the air compressors.

Greenhouse gas emissions reported through the NGER reporting program for the 2015 financial year reporting period (as reported) are listed in **Table 16**.
Scope 1 emissions refer to direct emission sources from Clarence. Scope 2 emissions refer to indirect emissions from the consumption of energy or heat produced by another organisation.

Table 16. Greenhouse Gas Emissions 2014 Reporting Period (CO2 –e T)

Scope (CO2-e T)	**2011**	**2012**	**2013**	**2014**	**2015**
Scope 1	7,133	8,925	9,289	9,876	12,116
Scope 2	31,764	33,007	38,380	39,287	39,121

7. WATER MANAGEMENT

Water is managed at Clarence in accordance with the Clarence Colliery Water Management Plan, which was completed in consultation with relevant agencies and stakeholders. Clarence reviewed the Water Management Plan during Quarter 1 of the reporting period. The review included updating the Plan in accordance with applications and approval conditions of the operation of REA VI. The review also included the removal of monitoring shallow piezometers within Happy Valley Swamp, due to having being destroyed during the 2013 State Mine Bushfire. Moving forward the Clarence Water Management Plan will be a component of the Western Regional Water Management Plan, which is anticipated to be updated in 2016 to include changes made a the Water Treatment Plant, as well as improvements to the Leachate Management System.

During the reporting period Clarence continued its Water Strategy Team established in 2012 to improve the Clarence Water Management System through a whole of mine approach. The team includes representatives from all departments and meet on a regular basis to identity, assess and schedule improvement projects. Significant improvements to the water management system were completed including:

- Continued monitoring of the quality and quantity of underground water and improved water
- accounting;
- Continued monitoring of the quality and quantity of surface water and improved water accounting;
- Decommissioned the Primary Arrestor Slurry Pump to eliminate water being pumped into temporary holding facilities;
- De silting of the Primary Arrestor, Grit Trap and Leachate Dam 1;
- Continued optimisation and upgrades to the Clarence Water Treatment Plan, including installation of real time water quality instrumentation;
- Improvements to underground dewatering infrastructure;
- Implementation of Leachate Dam 3 and associated pumping operations;
- Improvements to the CHPP recycled water dust suppression sprinkler system (including train loading dust suppression); and
- Introduction of new aquatic ecology monitoring sites located on and adjacent to the Wollangambe River.

Water Strategy Team Meetings will continue during the 2016 reporting period with focus on the following:

- Ongoing monitoring of surface and underground water quality and quantity;
- Continued improvements and optimisation of the Mine Water Treatment Plant;
- Improvements to underground water delivery and pumping systems;
- Improvements to maintenance of Grit Trap and Pit Top water runoff management; and
- Improvements to the whole of site Leachate Management System

It is important to note that Table 17 reports on the WATER YEAR which is from 1 July to 30 June, not the calendar year.

Table 17: Water Take

License #	Water Sharing Plan, source and management zone (as applicable)	Entitlement	Passive take / inflows	Active pumping	TOTAL
WAL36479	Sydney Basin Richmond Groundwater Source	6623	0	5,874	5,874

Volume is reported in annual megalitres (ML)

Surface Water

Table 18: Discharge Water Volume (Annual)

Licence Discharge Point (LDP)	Volume Discharged (ML)
LDP001	0
LDP002	5,151 ML
LDP003	0
LDP004	0

Table 19: Water Quality LDP002

Pollutant	Unit of measure	No. of samples required by license	No. of samples you collected and analyzed	Lowest sample value	Mean of sample	Highest sample value
Arsenic	Milligrams Per Liter	12	14	<0.001	<0.001	<0.001
Boron	Milligrams Per Liter	12	15	<0.05	<0.05	<0.05
Cadmium	Milligrams Per Liter	12	14	<0.0001	<0.0001	<0.0001
Chloride	Milligrams Per Liter	12	14	2	3.4	4
Chromium (hexavalent)	Milligrams Per Liter	12	15	<0.001	<0.001	0.001
Copper	Milligrams Per Liter	12	15	<0.001	<0.001	<0.001
Filterable iron	Milligrams Per Liter	12	14	<0.05	0.05	0.65
Filterable manganese	Milligrams Per Liter	12	14	0.057	0.228	0.582
Fluoride	Milligrams Per Liter	12	15	<0.1	<0.1	0.1
Lead	Milligrams Per Liter	12	15	<0.001	<0.001	0.004
Mercury	Milligrams Per Liter	12	15	<0.0001	<0.0001	<0.0001
Oil and Grease	Milligrams Per Liter	12	15	<5	<5	10
pH	Milligrams Per Liter	12	16	6.33	7.08	7.93
Selenium	Milligrams Per Liter	12	15	<0.01	<0.01	<0.01
Silver	Milligrams Per Liter	12	13	<0.001	<0.001	<0.001
Sulfate	Milligrams Per Liter	12	14	103	118	140
Total Suspended Solids	Milligrams Per Liter	12	17	<5	6.35	103
Zinc	Milligrams Per Liter	12	14	0.059	0.105	0.411

Figure 11 through to Figure 28 below depict water quality results for the past 3 years, including trend line for the entire period. Where concentrations are displayed as 0mg/l, the true result is below the limit of reporting for that parameter.

Figure 11 below depicts the pH results recorded throughout 2013- 2015 at LDP002, including the Licence Concentration Limit's. The average pH for the reporting period was 7.1; with all results within the criteria identified in the 2000 Environmental Impact Statement, of between 6.5-8.5.

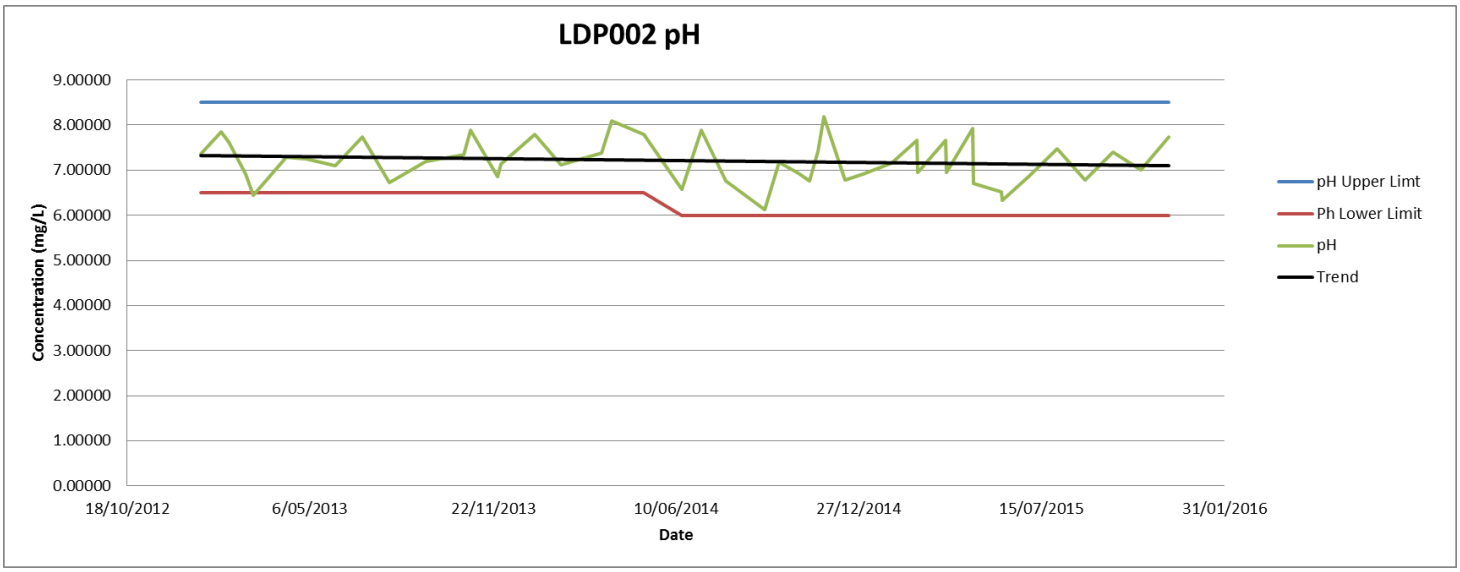

Figure 11. LDP002 pH Results 2013-2015

Figure 12 below depicts the TSS results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. Excluding the 1 elevated result recording following a significant rain fall event, TSS results were consistently lower than the criteria identified in the 2000 Environmental Impact Statement, of non filterable levels less than 30 mg/L.

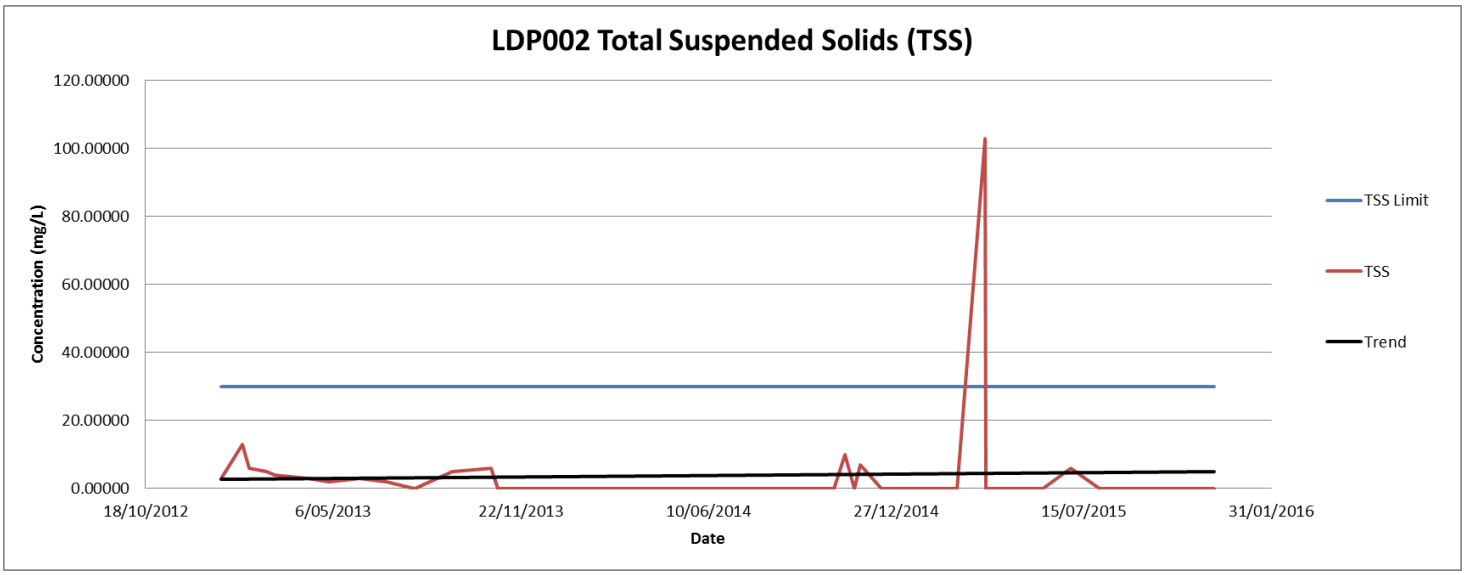

Figure 12. LDP002 TSS Results 2013-2015

Figure 13 below depicts the Filterable Manganese results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. There have been 2 Licence exceedances within the period; however, the trend indicates decreasing filterable manganese concentrations, resultant of improved performance at the Water Treatment Plant.

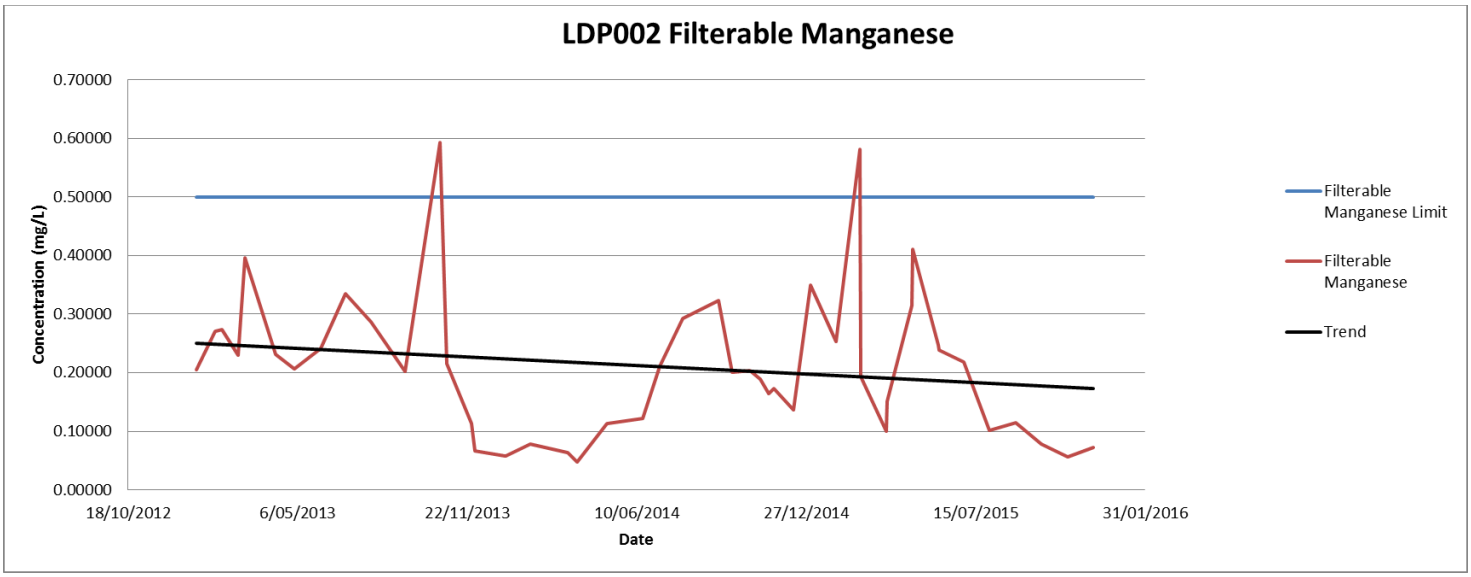

Figure 13. LDP002 Filterable Manganese Results 2013-2015

Figure 14 below depicts the Filterable Iron results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. Despite 1 Licence exceedance during the reporting period, the trend indicates decreasing Filterable Iron concentrations, resultant of improved performance at the Water Treatment Plant.

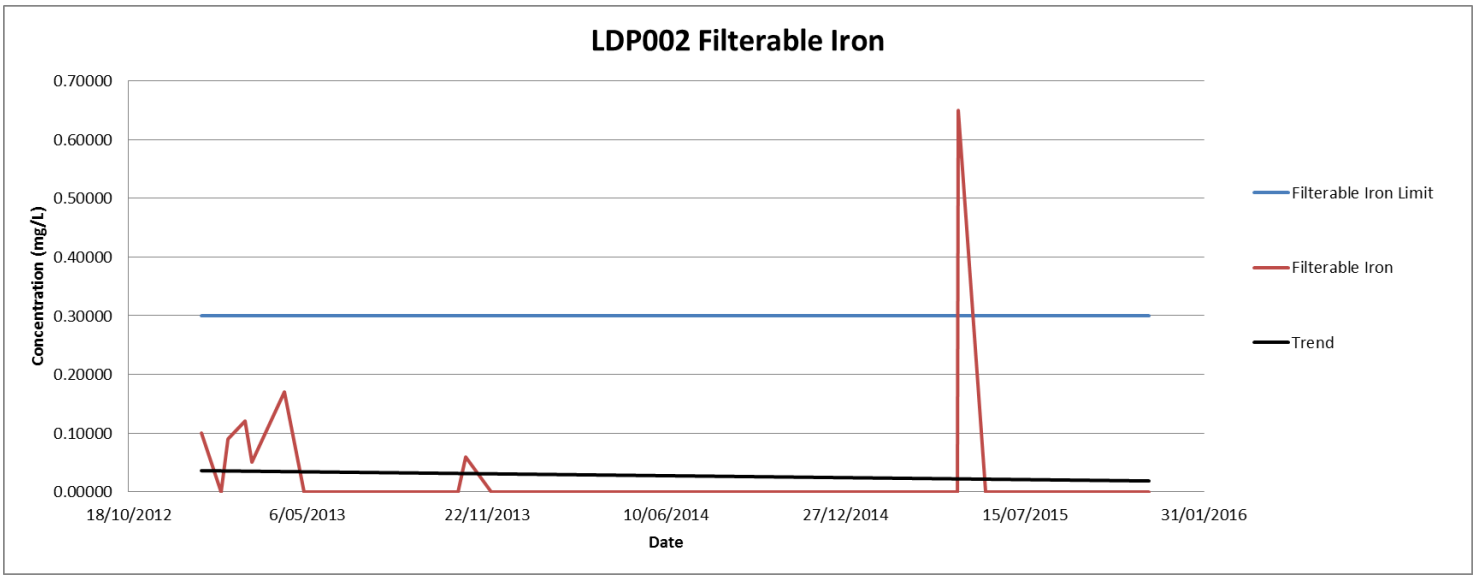

Figure 14. LDP002 Filterable Iron Results 2013-2015

Figure 15 below depicts the Oil and Grease results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. Whilst there have been no Licence exceedances, the trend would indicate to slightly increasing oil and grease concentrations. Clarence will continue to monitor this trend, and act accordingly should it continue to increase. Despite this trend, oil and grease concentrations remain lower than the criteria identified in the 2000 Environmental Impact Statement, of oil and grease concentrations of no more 20 mg/L.

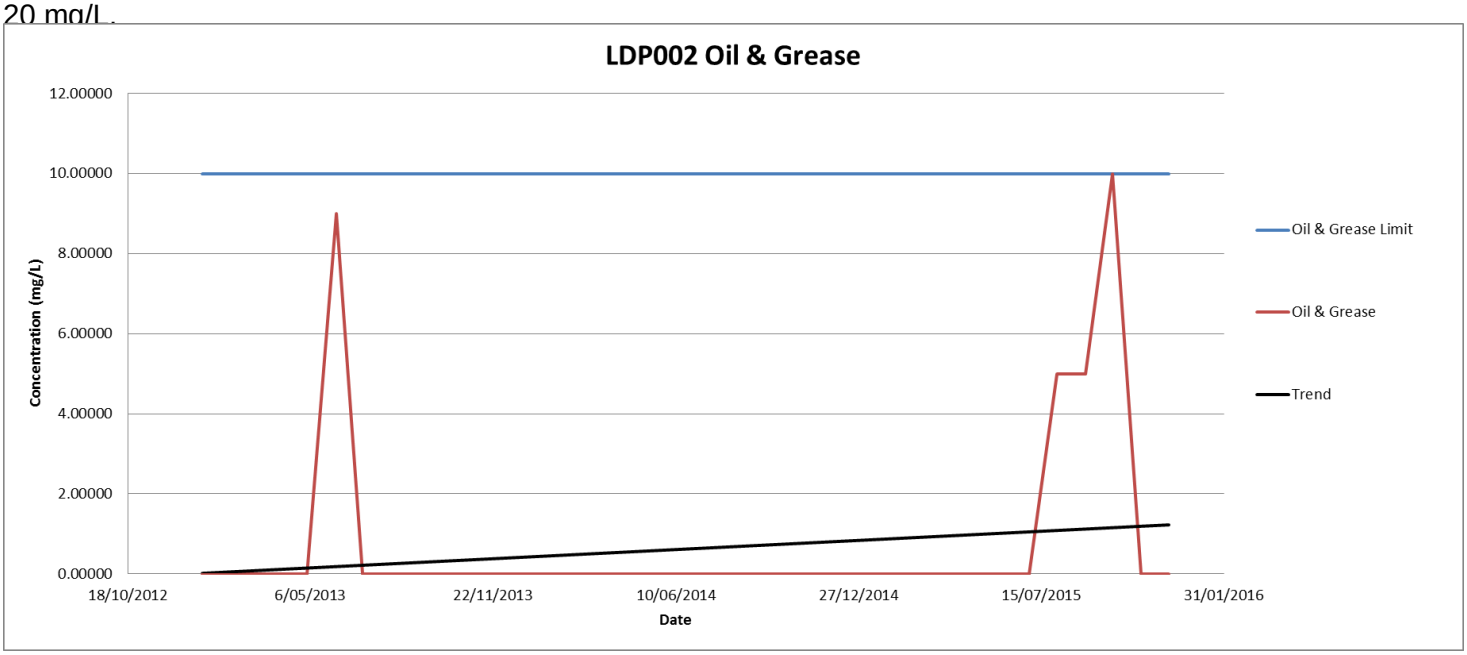

Figure 15. LDP002 Oil and Grease Results 2013-2015

Figure 16 below depicts the Arsenic results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. On 1 occasion was the recorded concentration greater than the limit of reporting.

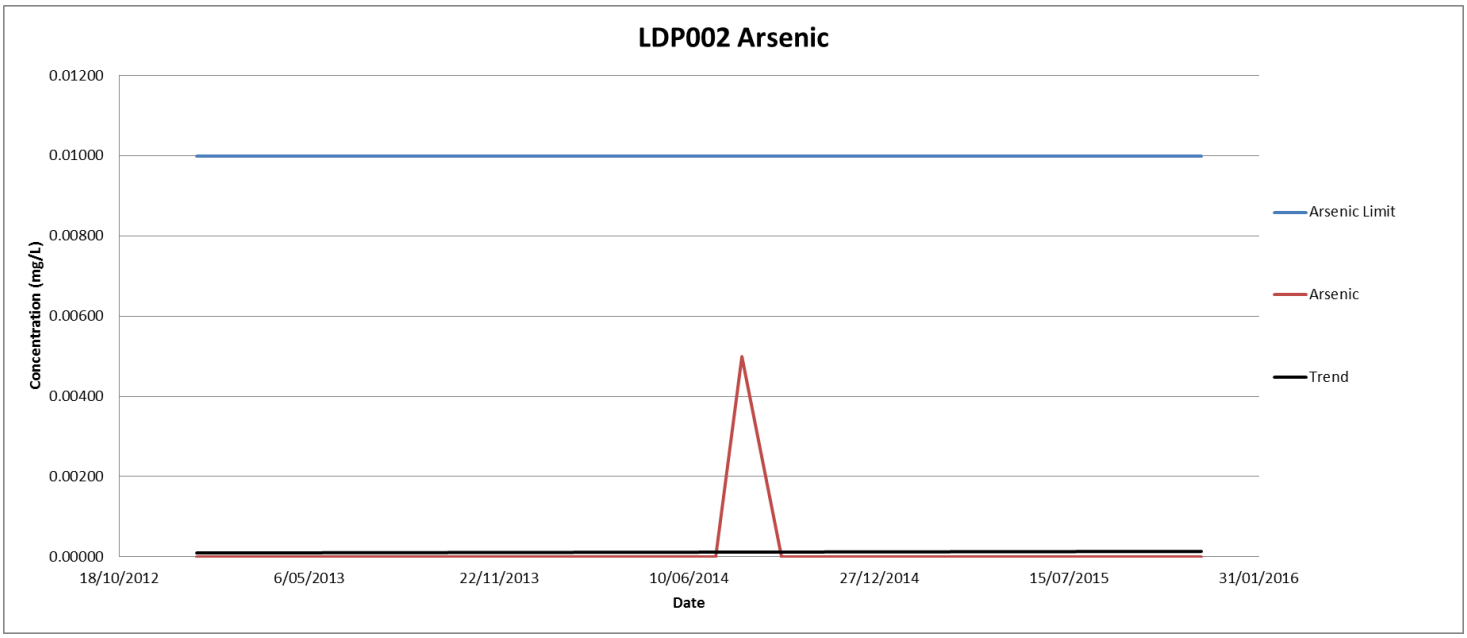

Figure 16. LDP002 Arsenic Results 2013-2015

Figure 17 below depicts the Boron results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. The concentration was consistently recorded below the limit of reporting, and significantly below the Licence Concentration Limit.

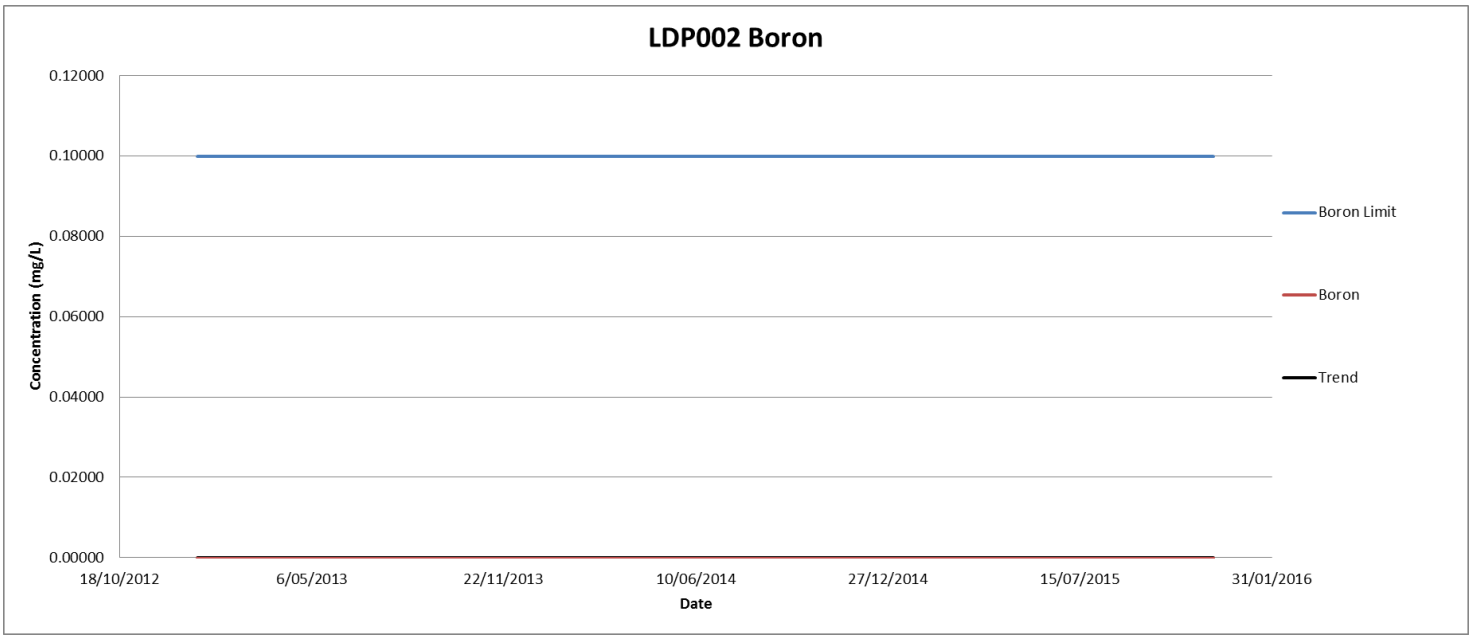

Figure 17. LDP002 Boron Results 2013-2015

Figure 18 below depicts the Cadmium results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. On 2 occasions the concentration limit was recorded above the limit of reporting, however the concentration remained consistently below the limit of reporting, and significantly below the Licence Concentration Limit

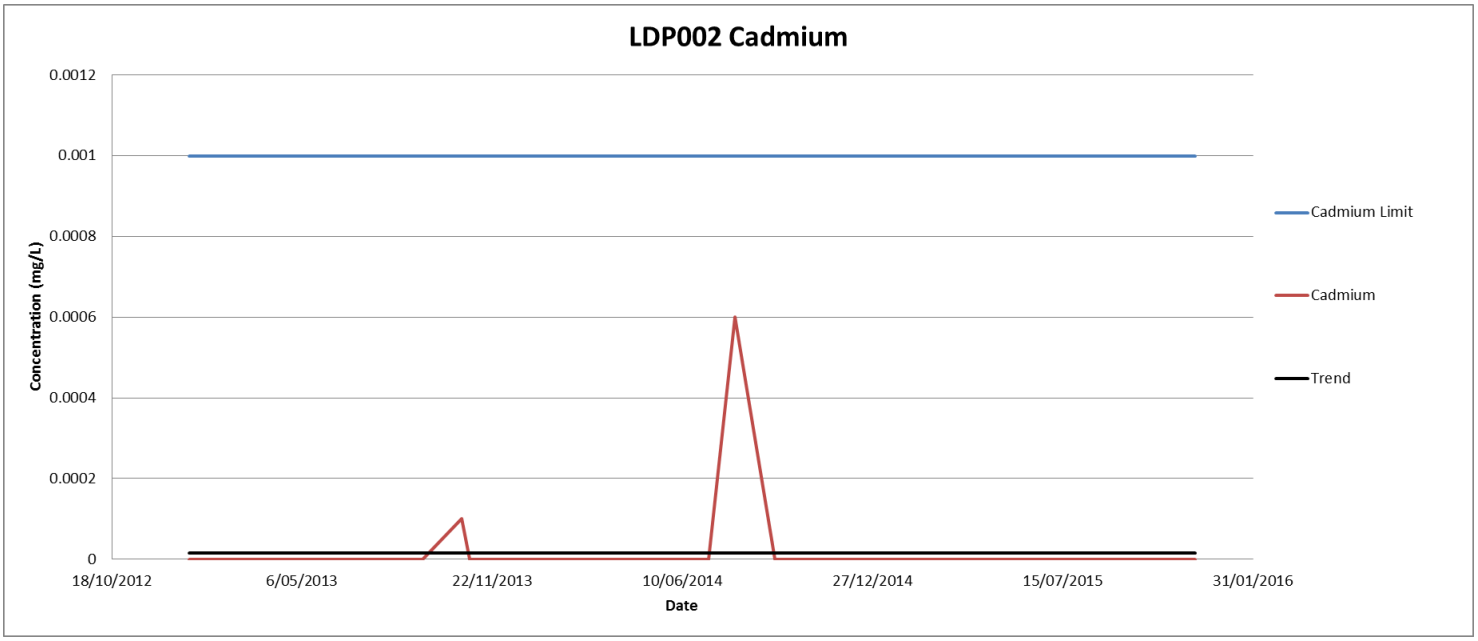

Figure 18. LDP002 Cadmium Results 2013-2015

Figure 19 below depicts the Chloride results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. The trend indicates decreasing Chloride concentrations, resultant of improved performance at the Water Treatment Plant. These results remain below the Licence Concentration Limit

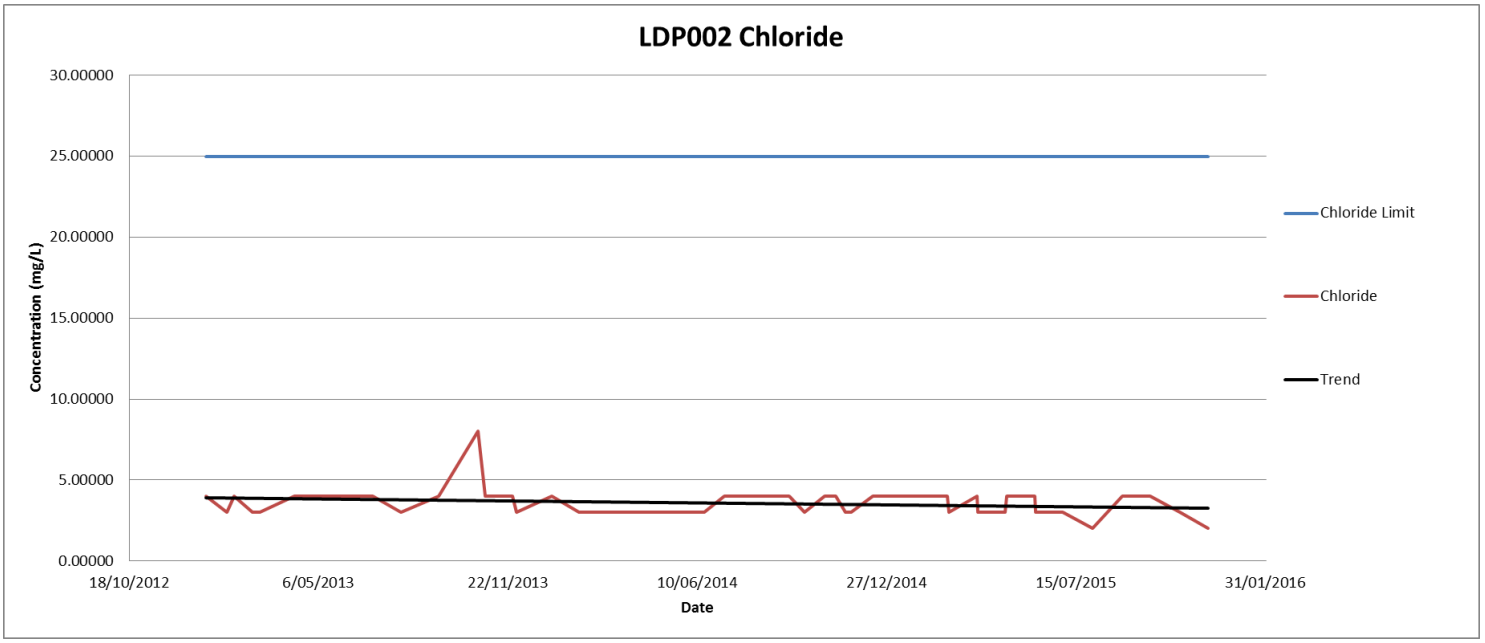

Figure 19. LDP002 Chloride Results 2013-2015

Figure 20 below depicts the Chromium Hexavalent results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. The concentration was consistently recorded below the limit of reporting, and significantly below the Licence Concentration Limit.

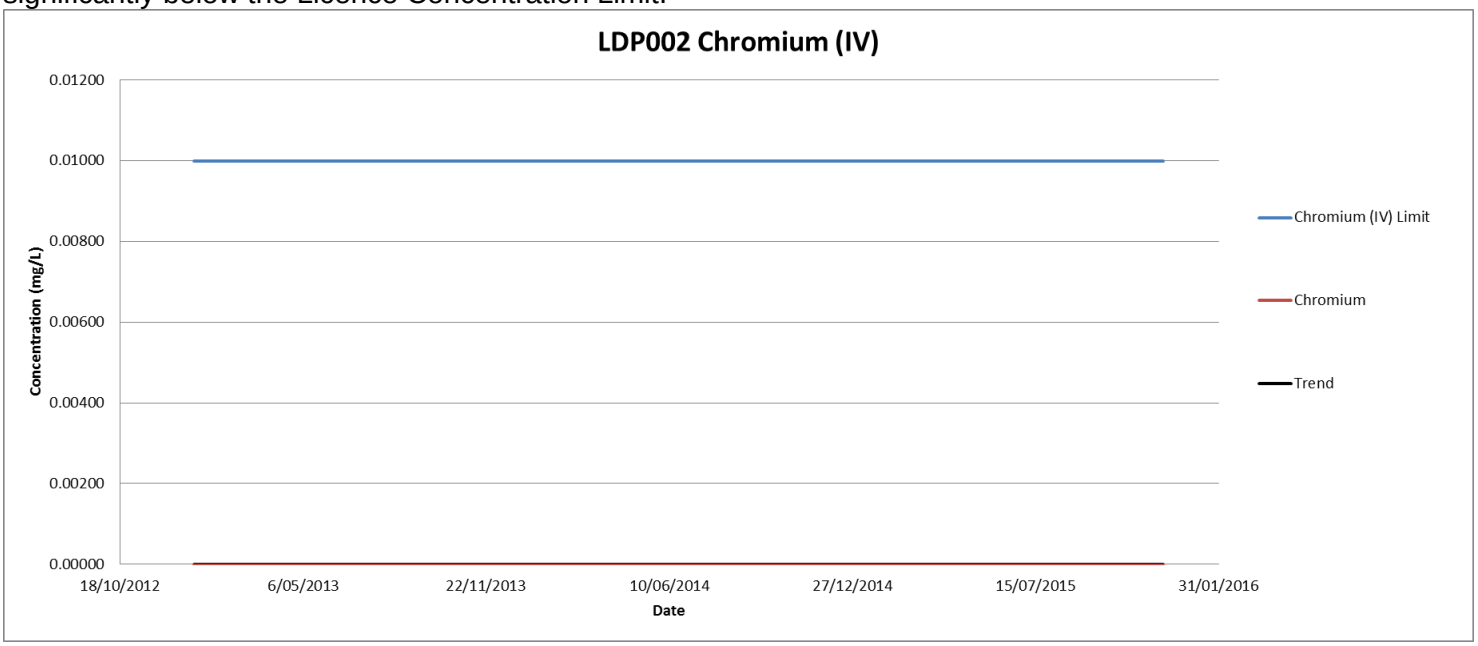

Figure 20. LDP002 Chromium Hexavalent Results 2013-2015

Figure 21 below depicts the Copper results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. The trend indicates decreasing Copper concentrations, resultant of improved performance at the Water Treatment Plant. These results remain below the Licence Concentration Limit

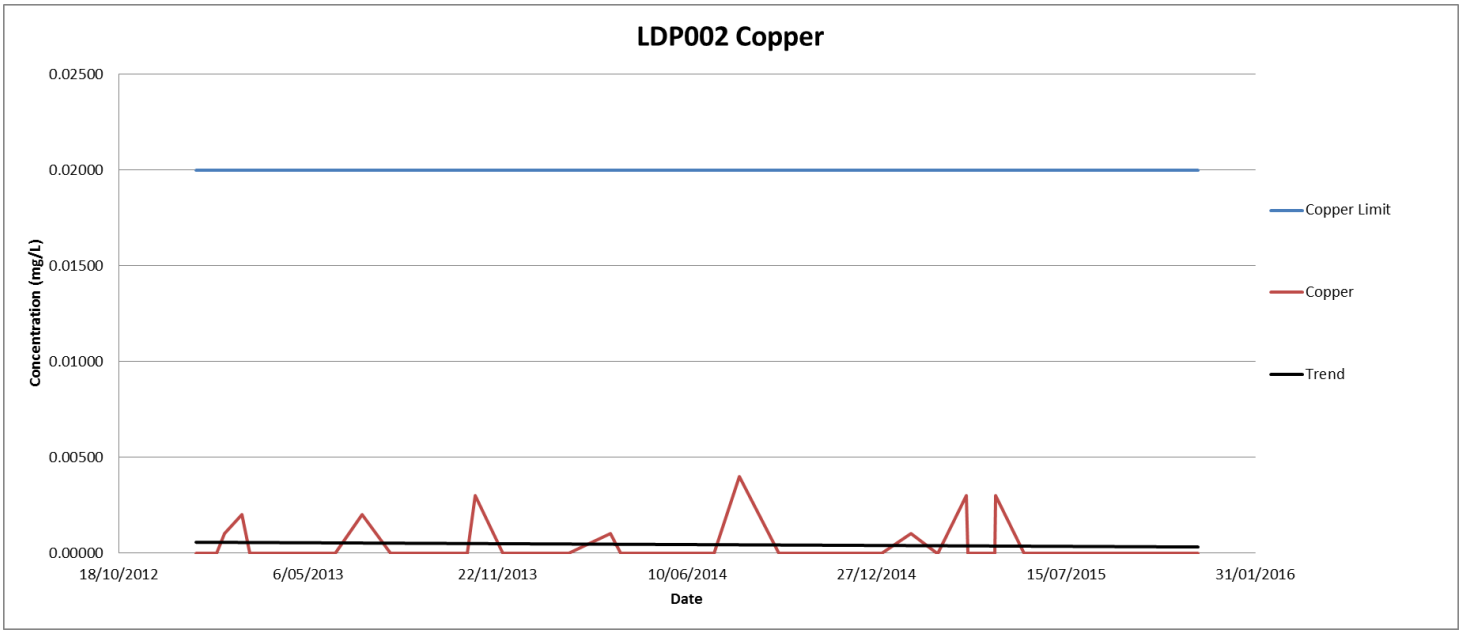

Figure 21. LDP002 Copper Results 2013-2015

Figure 22 below depicts the Fluoride results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. These results remain below the Licence Concentration Limit

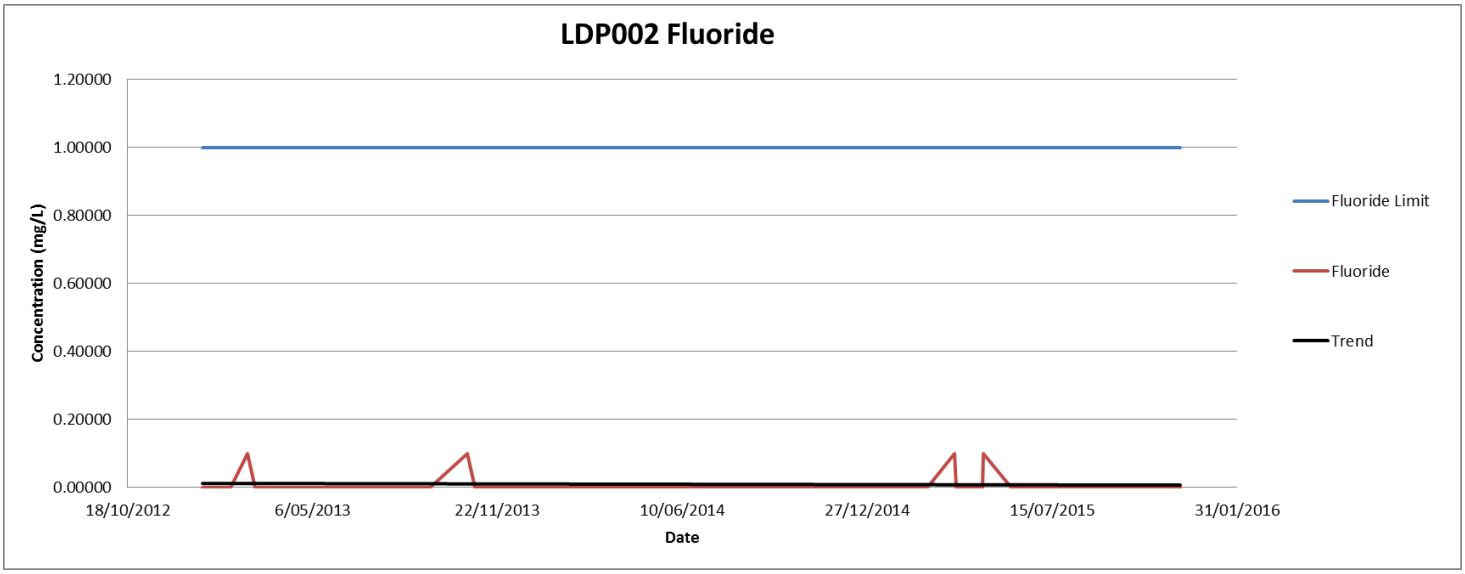

Figure 22. LDP002 Fluoride Results 2013-2015

Figure 23 below depicts the Lead results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. Whilst there have been no Licence exceedances, the trend would indicate to slightly increasing Lead concentrations. Clarence will continue to monitor this trend, and act accordingly should it continue to increase.

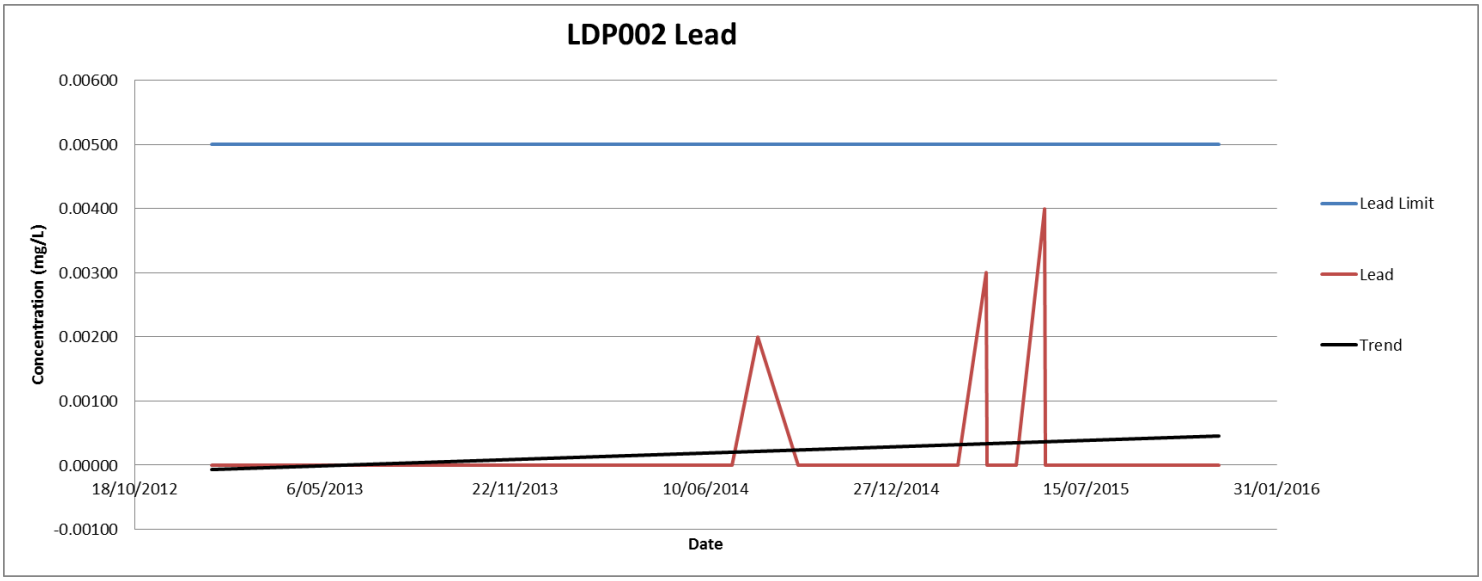

Figure 23. LDP002 Lead Results 2013-2015

Figure 24 below depicts the Mercury results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. The concentration was consistently recorded below the limit of reporting, and significantly below the Licence Concentration Limit.

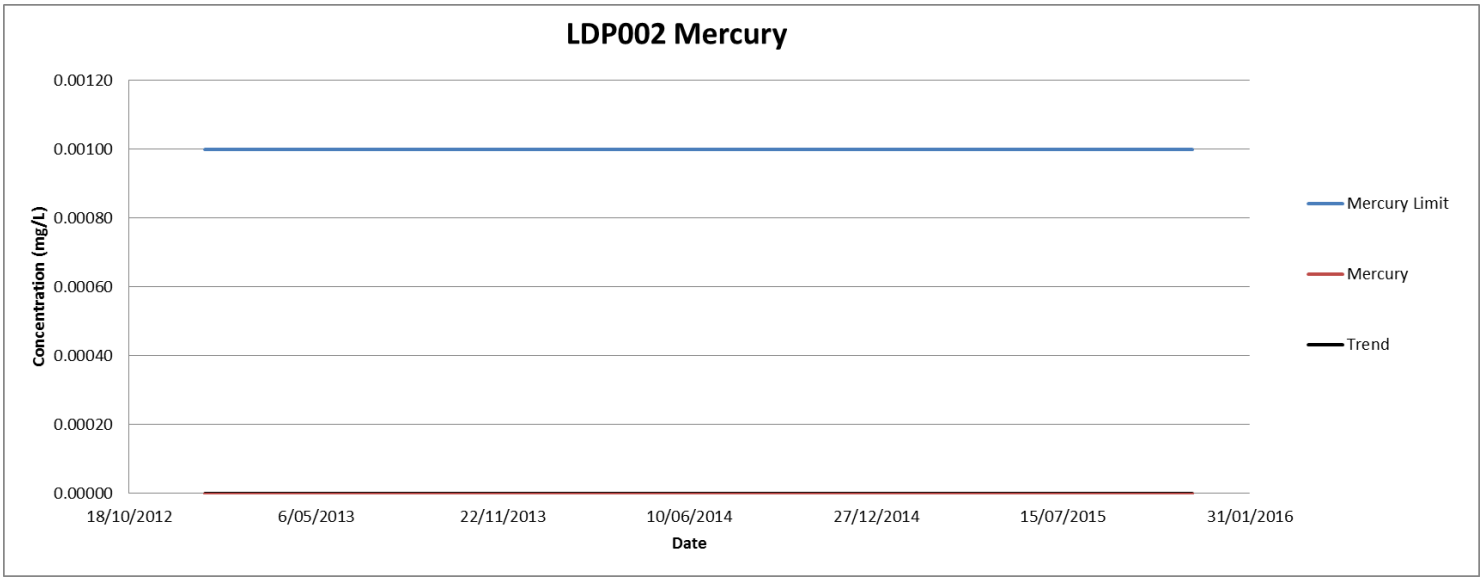

Figure 24. LDP002 Mercury Results 2013-2015

Figure 25 below depicts the Selenium results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. The concentration was consistently recorded below the limit of reporting, and significantly below the Licence Concentration Limit.

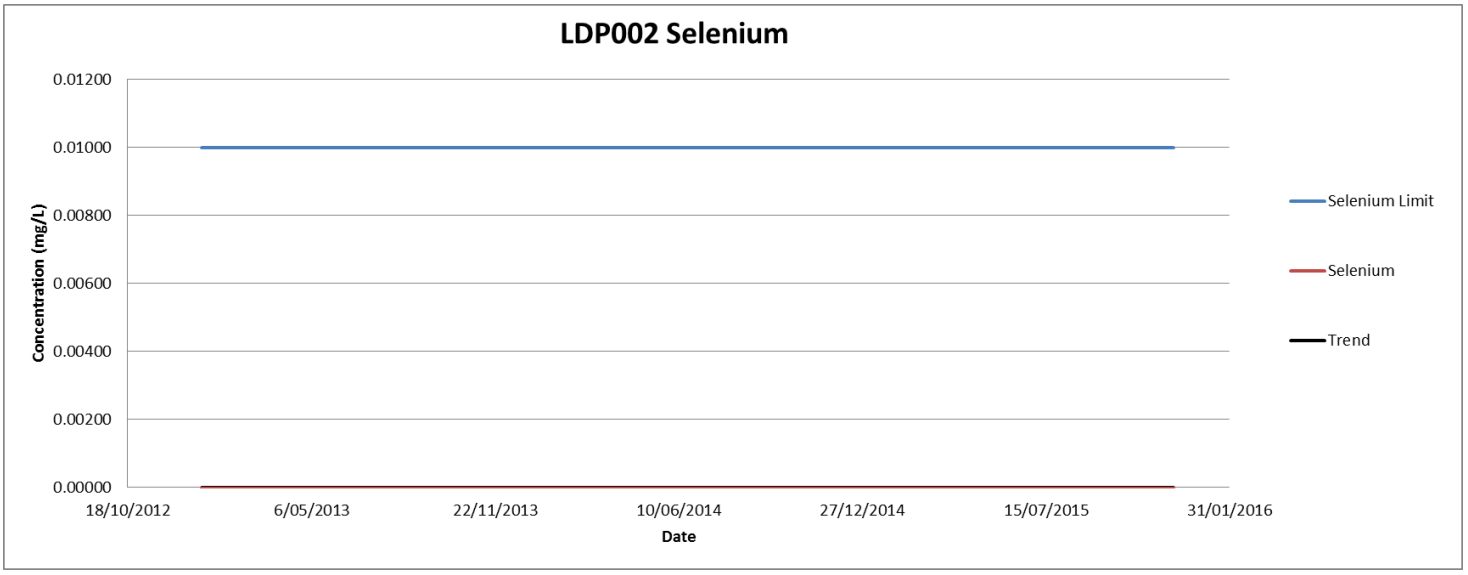

Figure 25. LDP002 Selenium Results 2013-2015

Figure 26 below depicts the Silver results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. The concentration was consistently recorded below the limit of reporting, and significantly below the Licence Concentration Limit.

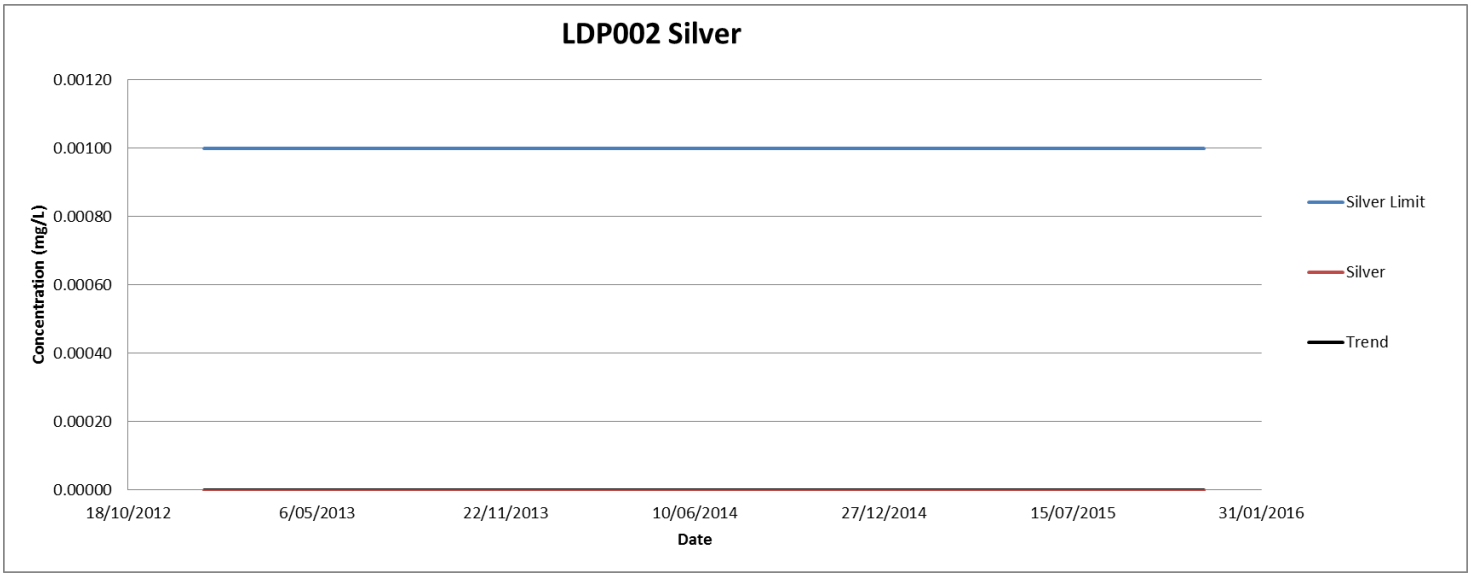

Figure 26. LDP002 Silver Results 2013-2015

Figure 27 below depicts the Sulfate results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. The downward trend indicates decreasing Sulfate concentrations, resultant of improved performance at the Water Treatment Plant.

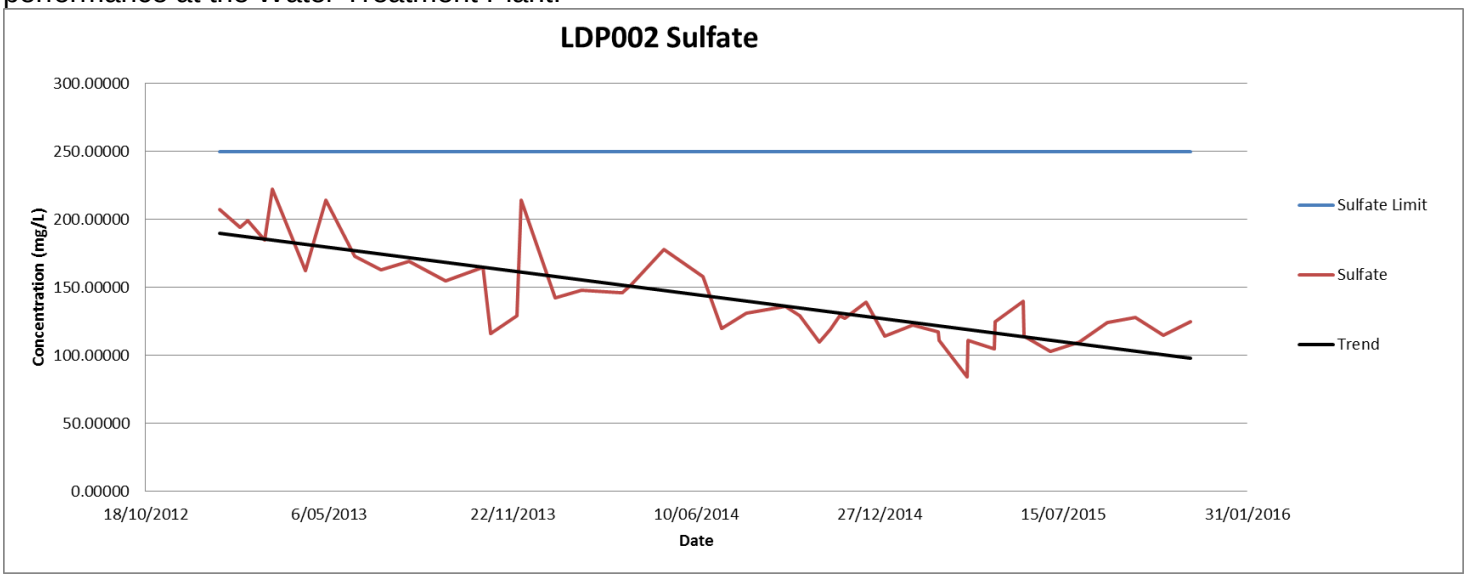

Figure 27. LDP002 Sulfate Results 2013-2015

Figure 28 below depicts the Zinc results recorded throughout 2013-2015 at LDP002, including the Licence Concentration Limit. These results remain below the Licence Concentration Limit

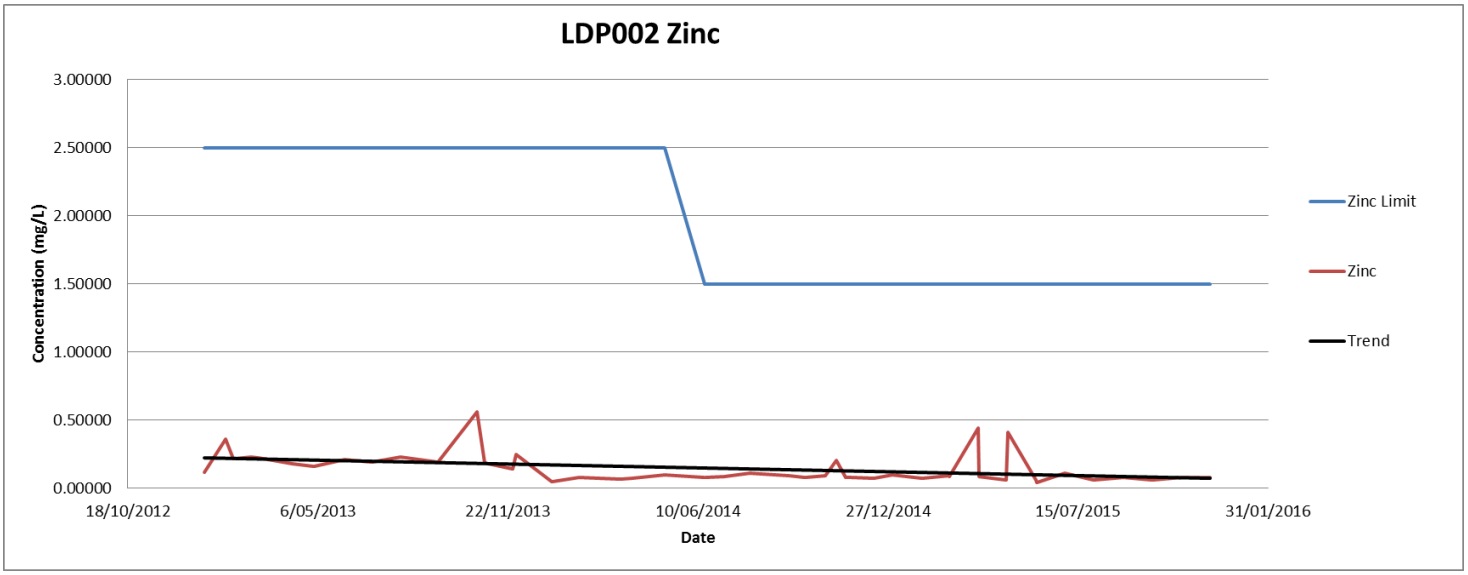

Figure 28. LDP002 Zinc Results 2013-2015

Groundwater

Groundwater monitoring sites and the relevant SMP area are outlined in **Table 20**. The location of all sites is shown on Plan CL618 (Combined Surface Monitoring Points). A summary of results is presented herein.

Table 20. Groundwater Piezometers at Clarence

Piezometer	Installed	Area
CLRP1	2004	Eastern Area SMP, within 330 Area
CLRP2	2004	Eastern Area SMP, above 611E panel
CLRP3	2006	Eastern Area SMP, above 612 panel
CLRP4	2008	South of mining areas
CLRP5	2008	700 Area SMP, north of 700 area panels
CLRP6	2008	700 Area SMP, above 702/704 panels
CLRP7	2008	700 Area SMP, south of 700 area panels
CLRP10	2008	700 Area SMP, above 706 panel
CC113	2008	700 Area SMP, south of 700 area panels
CLRP8	Existing bore	Clarence Township. Piezo installed 2009
CC114	2009	800 Area SMP Application Area
CC115	2009	800 Area SMP Application Area
HV1	2009	Happy Valley Swamp (700 Area SMP)
HV2	2009	Happy Valley Swamp (700 Area SMP)
HVU1	2009	Happy Valley Upper Swamp (700 Area SMP)
HVU2	2009	Happy Valley Upper Swamp (700 Area SMP)
CLRP11	2010	700 West SMP Application Area
CLRP12	2010	700 West SMP Application Area
CLRP13	2010	800 Area SMP Application Area
CLRP14	2011	800 Area SMP Application Area
CLRP15	2011	Lithgow No.2 Dam
CLRP16	2011	Lithgow No.2 Dam
CLRP17	2013	800 Area SMP Application Area
CLRP18	2014	900 Area SMP Application Area
CLRP19	2013	800 Area SMP Application Area
CLRP22	2014	900 Area SMP Application Area

All sites are downloaded every 2 months. Following download, data is analyzed for any trends or potential mining related impacts and presented in a report. Results are summarised in each SMSR as they fall due.

Establishment of Piezometers

In August 2004, nested piezometer sites CLRP1 and CLRP2 were installed as baseline monitoring for the Eastern Area SMP. CLRP3 was then installed as an additional site in January 2006. CLRP1, CLRP2 and CLRP3 have been used to measure background groundwater levels and the subsequent impact from mining over a number of years.

CLRP4, CLRP5 CLRP6 CLRP7 CLRP10 and CC113 were installed to measure any potential impact from mining within the 700 Area. The first panel in the 700 Area (702 panel) completed extraction in early December 2009.

CLRP8 was an existing borehole located in the Clarence Township. Clarence Colliery installed a piezometer in the bore to measure potential impacts on the water supply for the Clarence village.

CC114 and CC115 were installed to collect background data for the 700 West/800 Area SMP applications. These piezometers have not been undermined, but do provide data with the potential to detect groundwater related impacts beyond the mining area.

Shallow piezometers were installed in Happy Valley Swamp (HV1 and HV2) and Happy Valley Upper Swamp (HVU1 and HVU2) in December 2009. The two piezometers in each Swamp directly measure any impact on groundwater base flows from undermining each swamp. Unfortunately, these piezometers were destroyed by the 2013 bushfires.

CLRP11, CLRP12 and CLRP13 were installed to collect further baseline data for the 700 West/800 Area SMP Application. Again, these piezometers have not been undermined, but do provide data with the potential to detect groundwater related impacts beyond the mining area.

CLRP15 and CLRP16 are located either side of the Lithgow No.2 Dam and are used to monitor potential impact on the dam from mining within the Dam Notification Area. It is noted that mining activities within the Lithgow No.2 Dam Notification Area ceased in late September 2013 with the completion of extraction of the 716 Panel.

CLRP17 and CLRP19 were installed to collect background data for the 800 Area SMP application in 2013. These piezometers have not been undermined, but do provide data with the potential to detect groundwater related impacts beyond the mining area.

CLRP22 and CLRP18 were installed to collect background data for the 900 Area SMP application in December 2014. These piezometers have only recently been installed and will collect baseline data until the piezometers are subject to underground development and partial extraction.

Multi-Level Piezometers

CLRP1

As noted previously, pillar removal was carried out in Panel 330 immediately to the north of this bore in late 2004. This resulted in a significant depressurisation of the Katoomba seam, as measured by piezometer 1. In December 2013, first workings in panel 803 were developed over 10km to the east. There was no evidence of any permanent mining-related impacts in the three piezometers higher up in the bore (including the two in the Banks Wall Sandstone), although piezometer 2 just above the roof of the seam did show partial depressurisation followed by near-complete recovery. Since that time there have been no further indications from the data recorded to the present of any mining-related impacts. Pillar extraction occurred in Panel 803 during July 2014, with no apparent impact. Pressures recorded in the two Banks Wall Sandstone piezometers remained above pre-mining levels. During the current period, first workings occurred in the 800 area, between 2 – 4 km east of the hole, with no discernible impact on groundwater pressures.

Monitoring results for piezometric height at CLRP1 is presented in **Figure .**

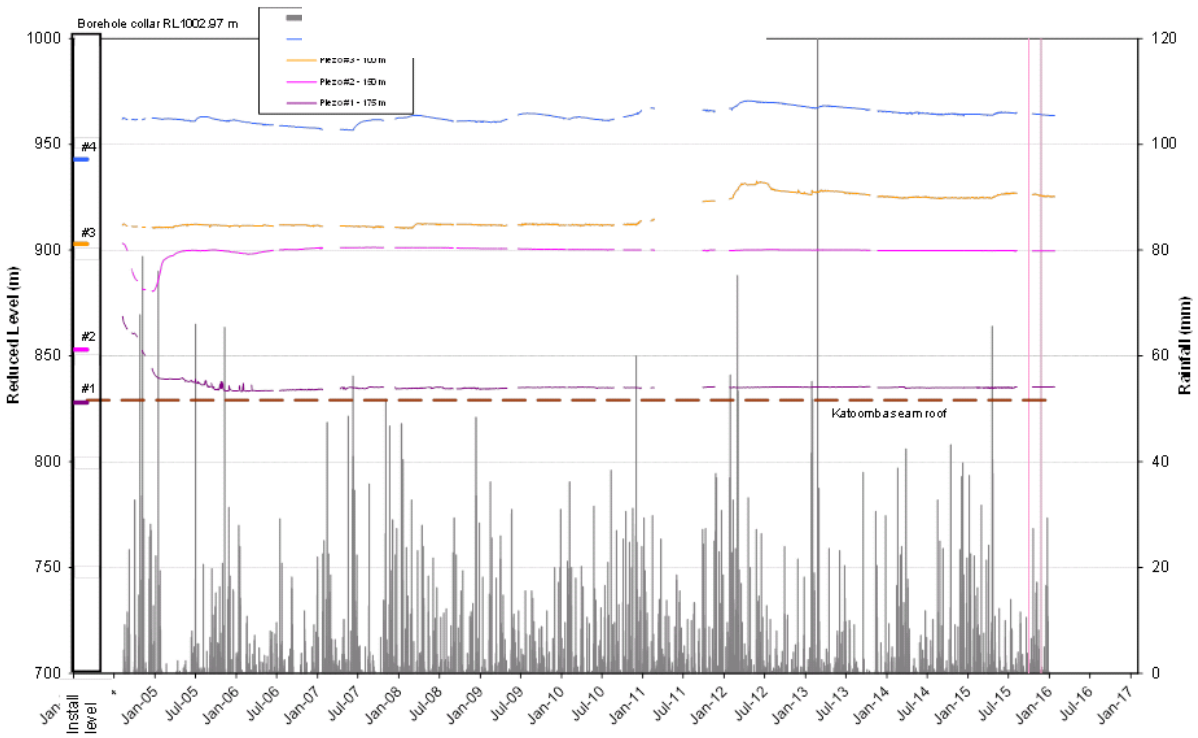

Figure 29. CLRP1 Piezometric Height

CLRP2

The previous level trend, established over many years, has continued in piezometer 2. Piezometers 3 and 4, in the upper sequence, both maintained level trends, following the small rises in pressure that coincided with the heavy rainfall in mid-April. All pressures remain above pre-mining levels.

Total depressurisation occurred in piezometer 1 in the coal seam in August 2007 after mining below the borehole, as would be expected. The other three piezometers showed no negative impact from mining at the time, and continue to show no impact from the mining.

Monitoring results for piezometric height at CLRP2 is presented in **Figure .**

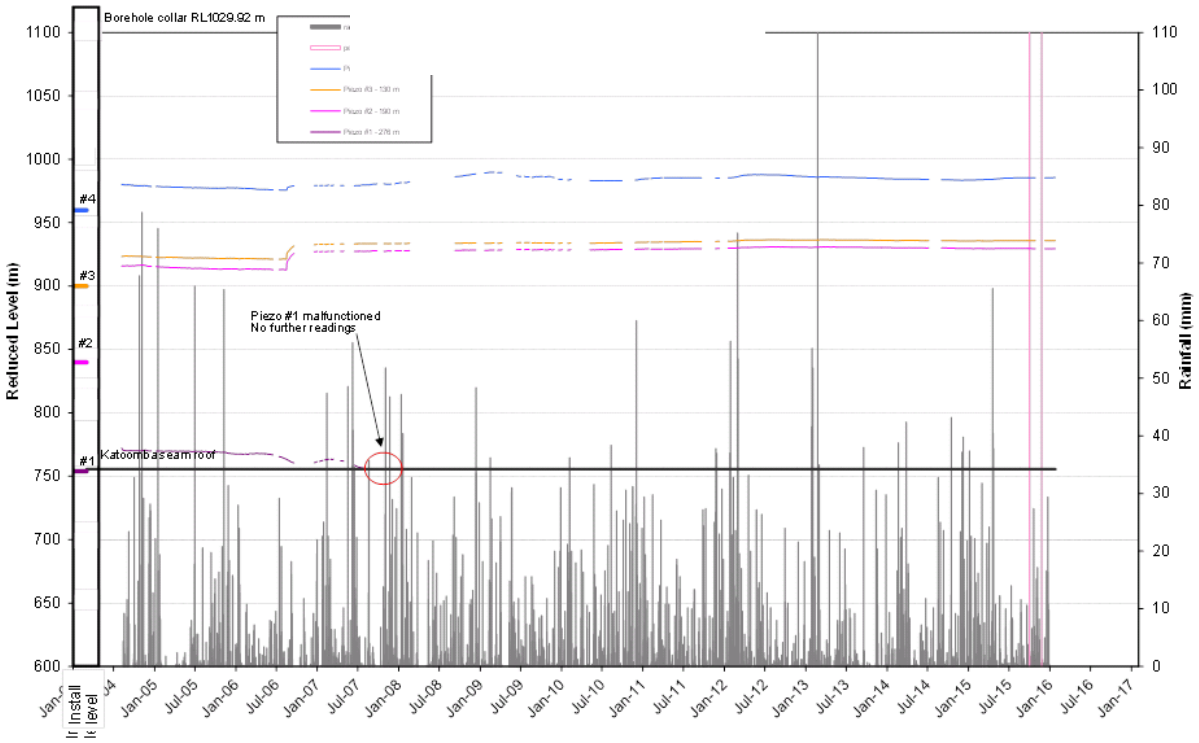

Figure 30. CLRP2 Piezometric Height

CLRP3

The CLRP3 borehole was undermined shortly after it was installed in 2006, with no mining-related impacts evident in the data up to the present.

Monitoring results for piezometric height at CLRP3 is presented in **Figure 31.**

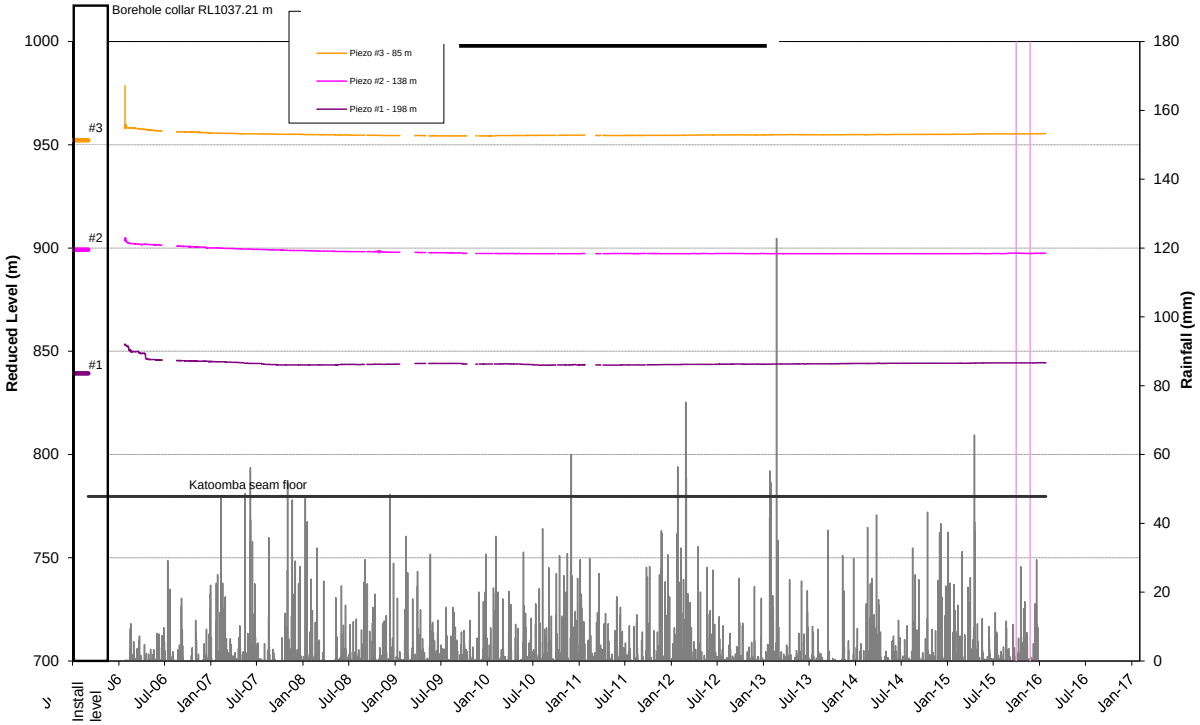

Figure 31. CLRP3 Piezometric Height

CLRP6

Partial extraction occurred in Panel 702 in September 2009 directly beneath this borehole, and the adjacent Panel 704 was partially extracted in December 2009. First workings in Panel 706, 250 m to the west, were driven during February 2012. During the current period mining occurred approximately 2 km to the north. There is no evidence from the available data of any adverse mining-related impacts on the strata containing the two functional piezometers during any of the mining.

Monitoring results for piezometric height at CLRP6 is presented in **Figure .**

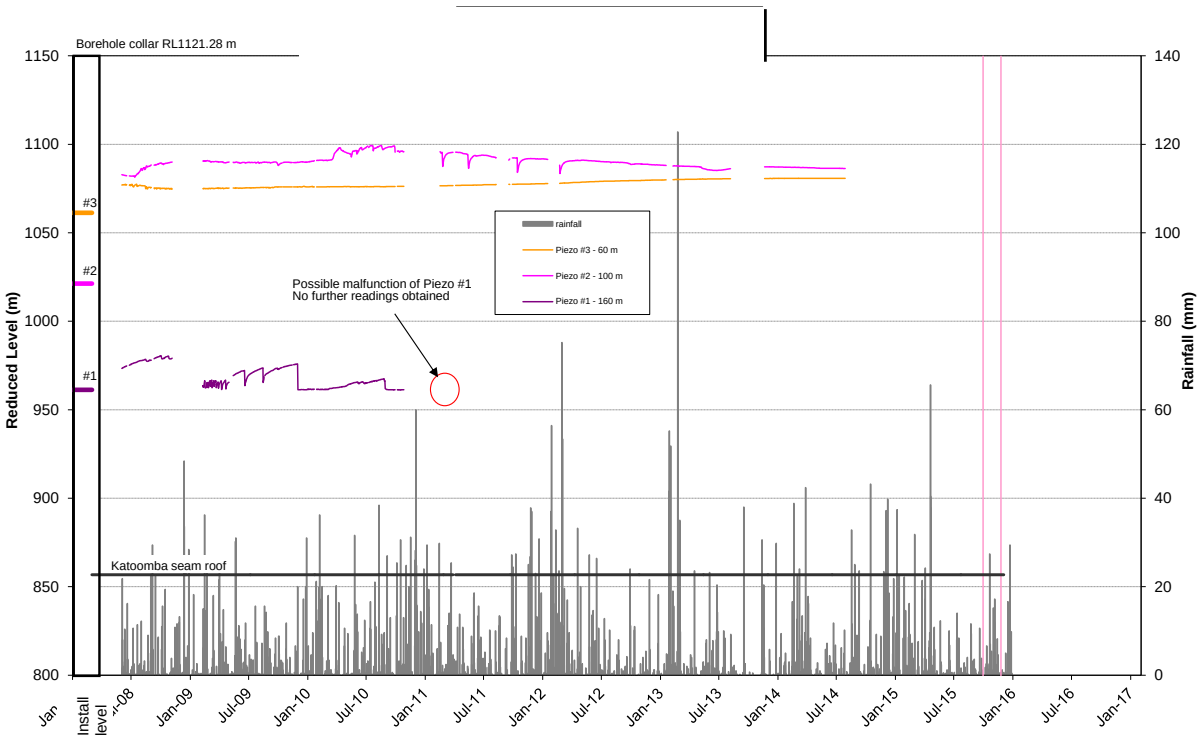

Figure 32.CLRP6 Piezometric Height

CC114

During the period, first workings and pillar extraction occurred in the 800 area, 2 – 4 km to the east. There is no indication of mining impact in the data.

Monitoring results for Piezometric height at CC114 is presented in **Figure .**

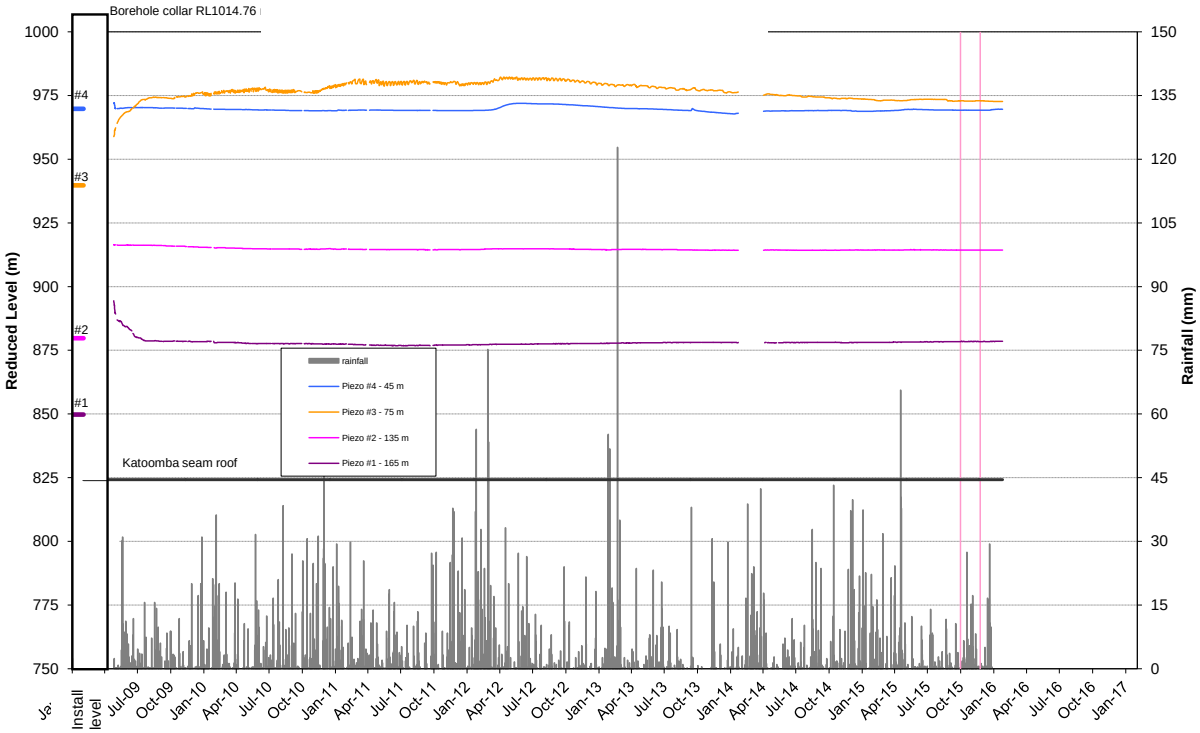

Figure 33. CC114 Piezometric Height

CC115

During the current period, mining occurred 1 – 2 km east and west of the piezometer. The apparent pressure drops in the data record are likely to be calibration effects related to installation of the new data logger. During May 2015, the borehole was directly undermined by first workings in Panel 812. The small but distinct drop and recovery in the lowest piezometer, located approximately 13 m above the working horizon, is most likely to be a mining impact. It is notable that immediately after the 1.4 m drop that pressure head started to recover. Simultaneously, higher piezometers also responded, with smaller pressure trend drops. No instruments showed a drop to negative values, and the upper strata have not been affected by development of a permeability connection to the workings. The movements are mining-induced, and according to expectations. They do not appear to have had a significant or permanent impact on the groundwater system.

Monitoring results for Piezometric height at CC115 is presented in **Figure 34.**

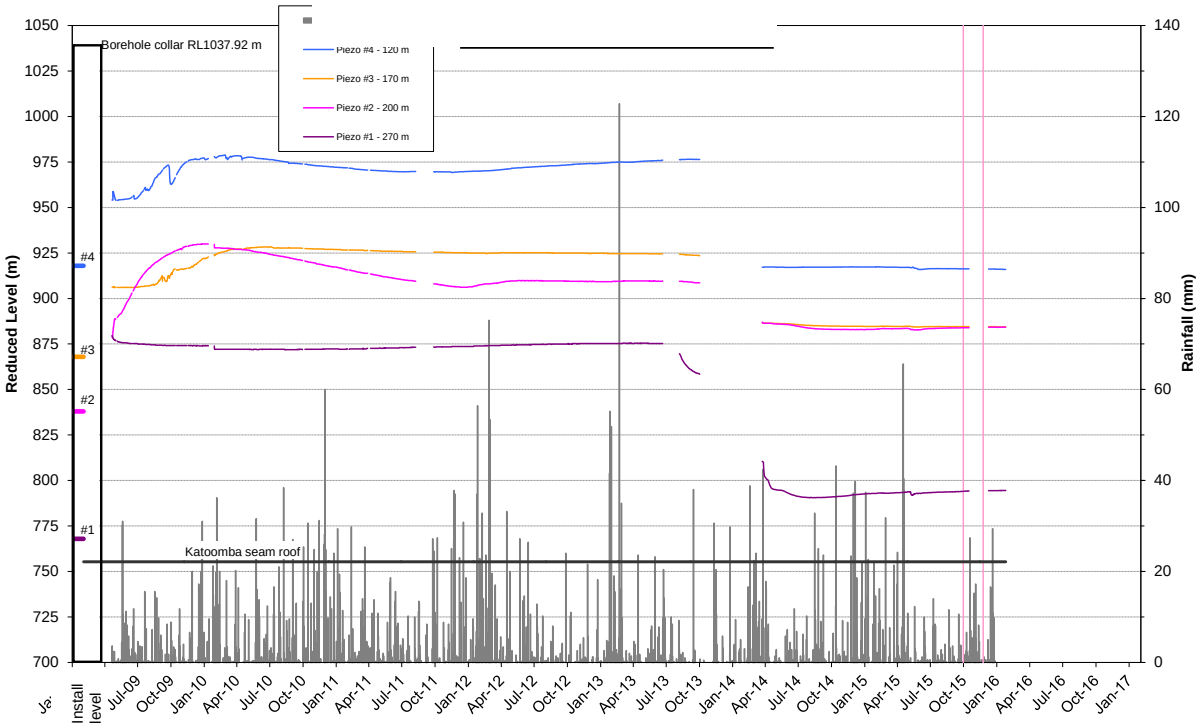

Figure 34. CC115 Piezometric Height

CLRP11

Pillar extraction previously occurred in Panel 716, c. 700 m east of CLRP11, and during the current period in the 900 area, c. 2.5 km northeast. None of the data indicate any mining impact.

Monitoring results for Piezometric height at CLRP11 is presented in **Figure .**

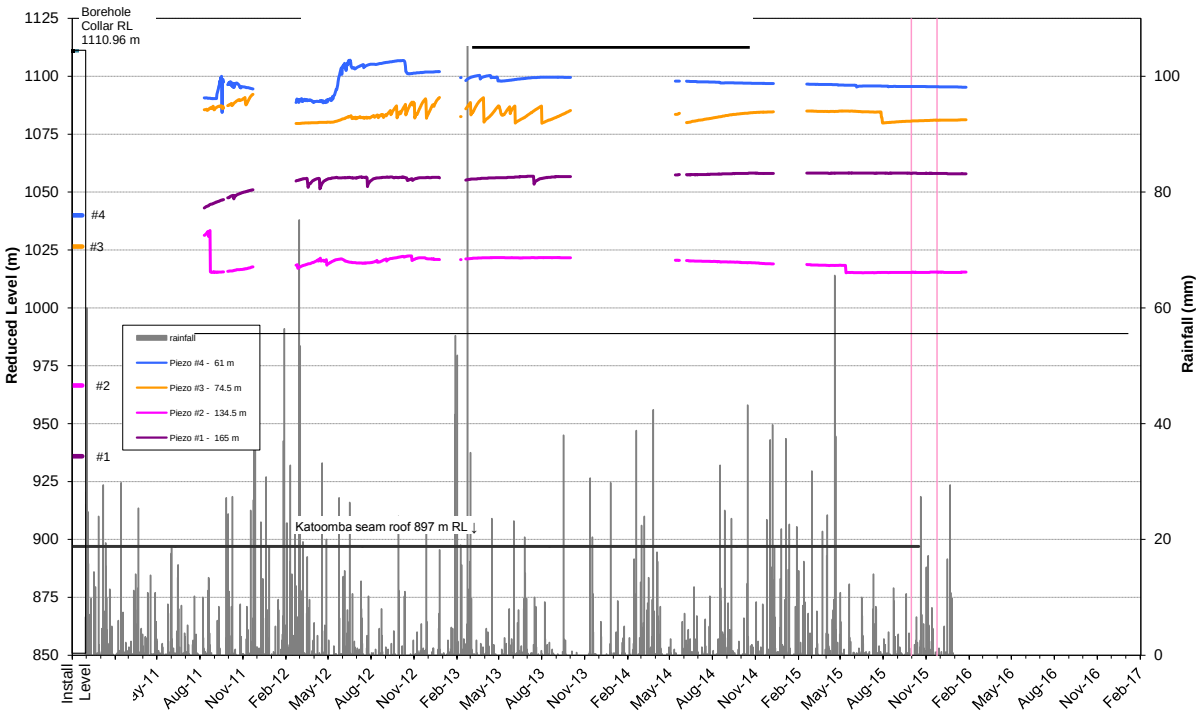

Figure 35. CLRP11 Piezometric Height

CLRP12

First workings and pillar extraction occurred in Panel 716 during July – August 2013, over 800 m to the east-southeast of CLRP12. First workings were driven in the 900 area during the current period approximately 1.2 km east of the piezometer. Given the unreliable nature of most of the data, it is hard to identify any mining impact. However, pressure trends in the uppermost piezometer have been unchanged, and it is clear that mining is having no impact on the near-surface unconfined aquifer.

Monitoring results for Piezometric height at CLRP12 is presented in **Figure .**

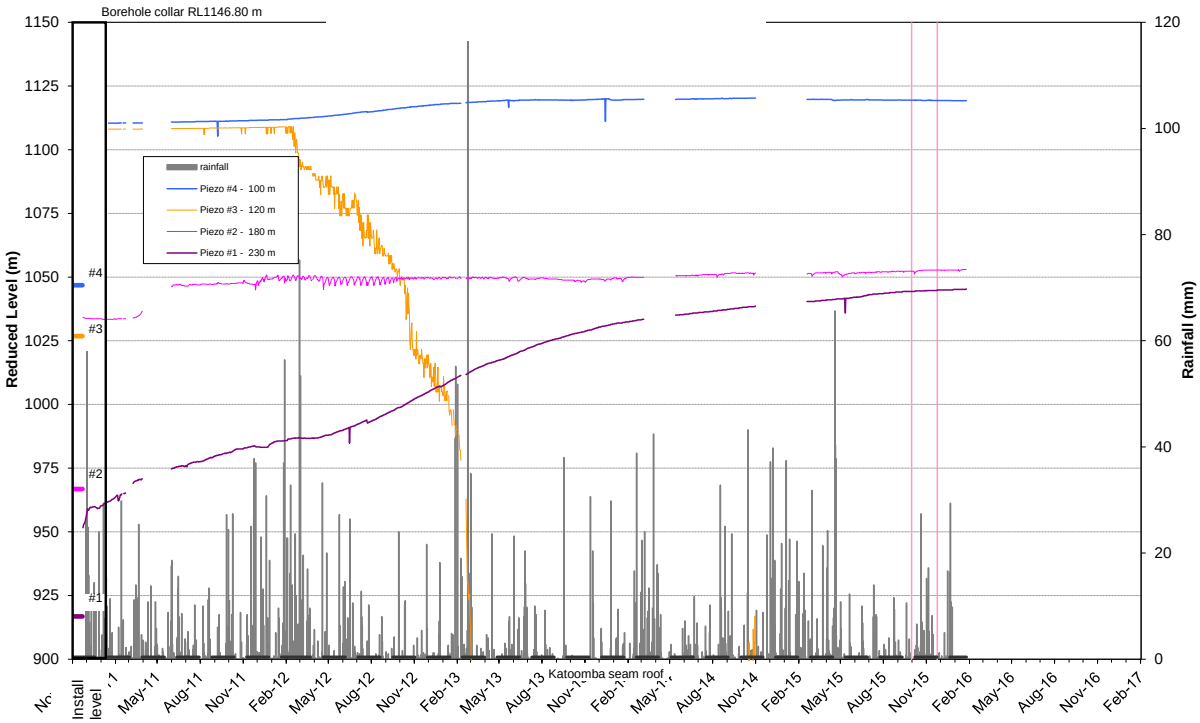

Figure 36. CLRP12 Piezometric Height

CLRP13

CLRP13 is approximately 1 km away from the mining activity in the 800 area, to the north and northeast. The upper aquifer piezometer, 4, with a reliable dataset, shows no recognisable mining impact. The slow decline in piezometer 1, located in the sequence above the working horizon, is probably related to progressive dewatering of the lower sequence. This is an expected result, observed elsewhere on the Newnes Plateau, and is not significant in relation to the near-surface aquifer.

Monitoring results for Piezometric height at CLRP12 is presented in **Figure .**

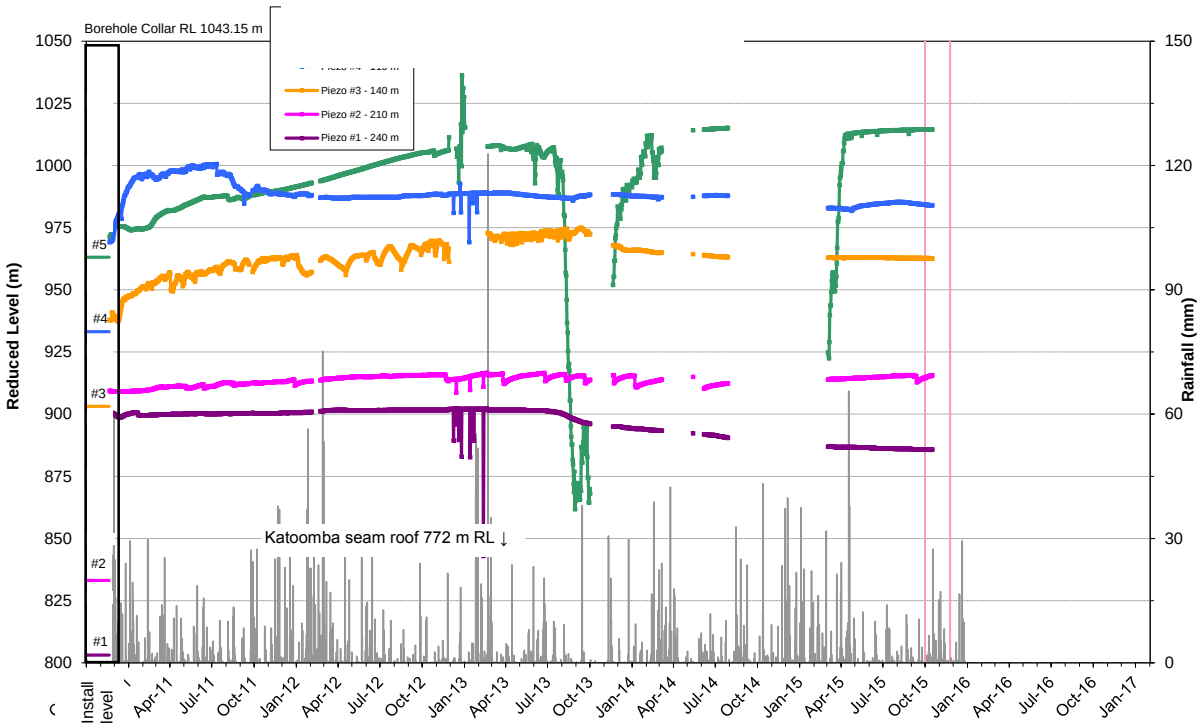

Figure 37. CLRP12 Piezometric Height

CLRP14

During the current period, there are no data for piezometers 2 and 3 after 25 August 2014, and for piezometer 1 after 6 December 2014. The installation was serviced 3 June 2015. No data were recovered at the most recent download; the data logger problems appear to be continuing.

The lowest piezometer had been showing similar stable pressure trends in available data. The similarity of pressure previously observed in piezometers 1 and 2 suggests that the instruments are in hydrogeological continuity.

The uppermost piezometer 4 showed a level trend in available data. Piezometer 4 commenced producing more stable data, although, for a few days after 19 August 2014, the pressure head varied by up to 1 m daily. The cause of this anomalous behaviour is unclear, but it is transient, unprecedented, and likely to be non-significant.

It is notable that all absolute pressure values are lower than before the installation of the new data logger, by up to approximately 20 m of head. A similar effect was also observed in CC115, which also had a new Campbell Scientific data logger installed. In comparison, CLRP11, which was damaged by bushfire and repaired without installation of a new data logger, shows no offset in the limited data available. These observations suggest that the offsets are a result of calibration differences between the old and new data loggers. This should be reviewed by the data logger installers.

Mining impacts:

Pillar extraction in the 800 area has occurred previously under the piezometers; first workings were 1 km northeast and east. The available data record shows no mining impact.

Monitoring results for Piezometric height at CLRP14 is presented in **Figure.**

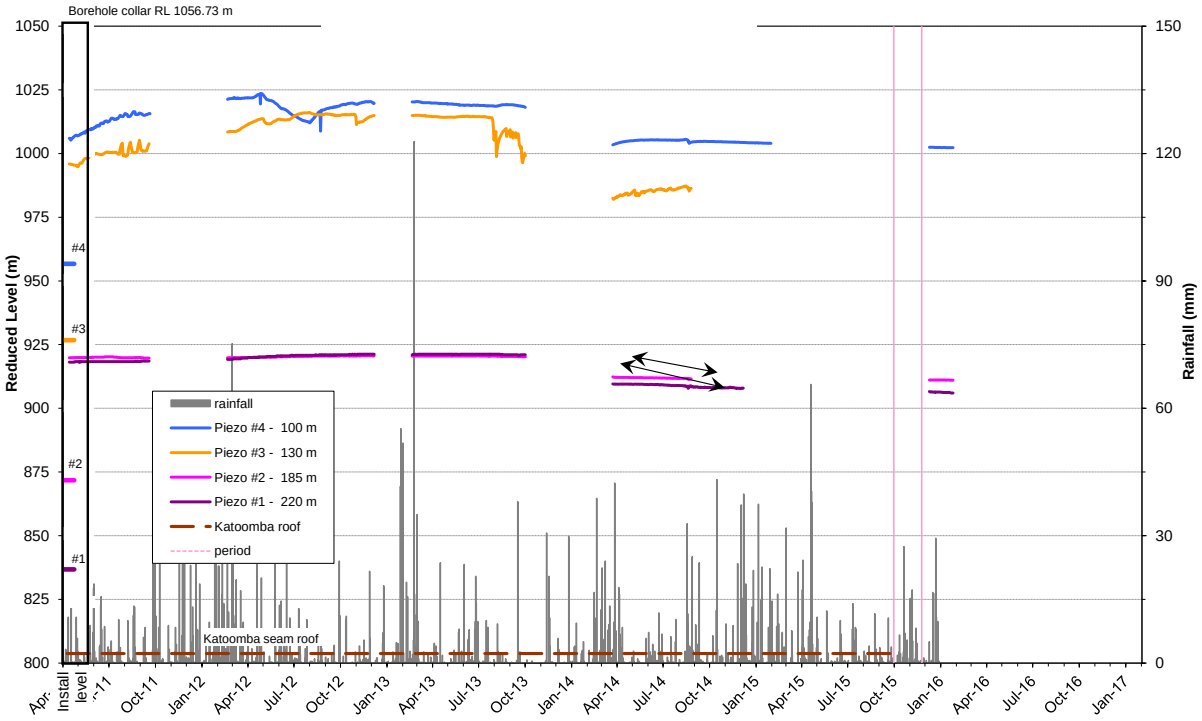

Figure 38. CLRP14 Piezometric Height

CLRP15

First workings in 707 panel were about 250 m east of the borehole at the end of July 2012, and partial extraction was completed in August 2012. Pillar extraction in panel 716 approached to within approximately 750 m during August – September 2013. During the period, mining occurred at approximately 3.5 km distance to the north, in Panels 905 and 907. The level trends and evidence of flow towards the reservoir indicate that there is no recognisable impact from mining.3

Monitoring results for piezometric height at CLRP15 is presented in **Figure.**

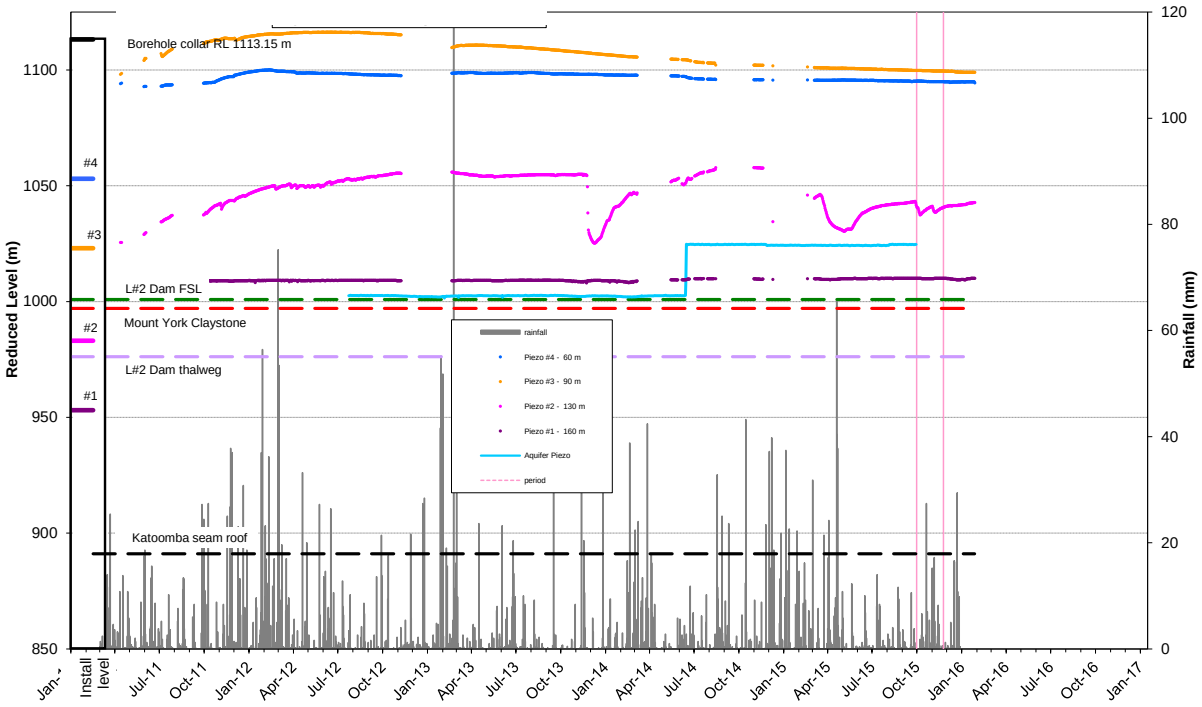

Figure 39. CLRP15 Piezometric Height

CLRP16

Trends in both piezometers are above the FSL of Lithgow 2 Dam. Piezometer 2, located just above the level of the reservoir thalweg at the dam, continues the previous level.

Pillar extraction in 716 panel was more than 1 km northeast of the borehole in August – September 2013. Pillar extraction in 700 Panel occurred over 1.8 km m the east during March 2014. Mining in Panels 905 and 907 during the period was over 3 km to the north. There is no evidence of mining impact in the groundwater record. Monitoring results for piezometric height at CLRP16 is presented in **Figure .**

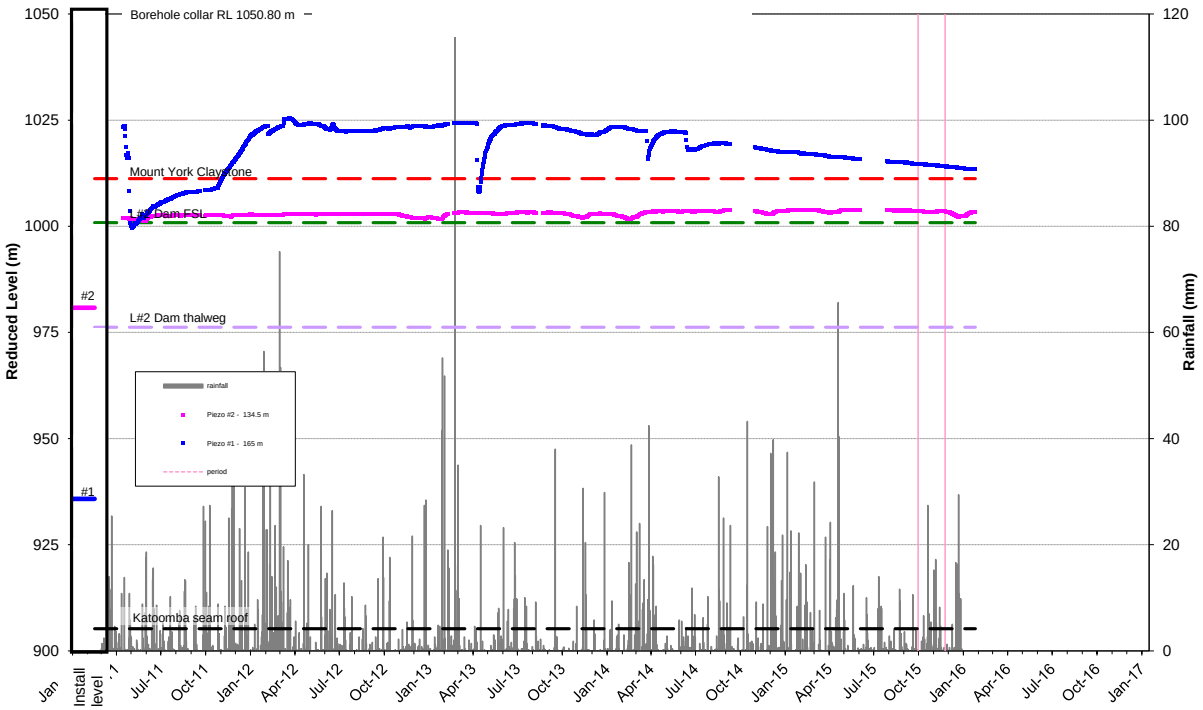

Figure 40. CLRP16 Piezometric Height

CLRP17

CLRP17 commenced logging on 23 March 2014. In the current period, data are available up to 16 October 2015. The available data show steady trends with positive groundwater pressures, and continue trends seen previously.

All three piezometers now show very steady, level positive pressure trends.

Mining impacts:

First workings in the 800 area were 0.2 – 0.5 km from the piezometer. The very slow decline in the lower piezometers may be due to stabilisation of the piezometers after installation, or may reflect gradual dewatering of strata as a result of mining first workings. The steady, level trends in the uppermost piezometer indicate that there has been no dewatering in the near-surface aquifer. There is no evidence of mining impact in the groundwater record.

Monitoring results for piezometric height at CLRP17 is presented in **Figure .**

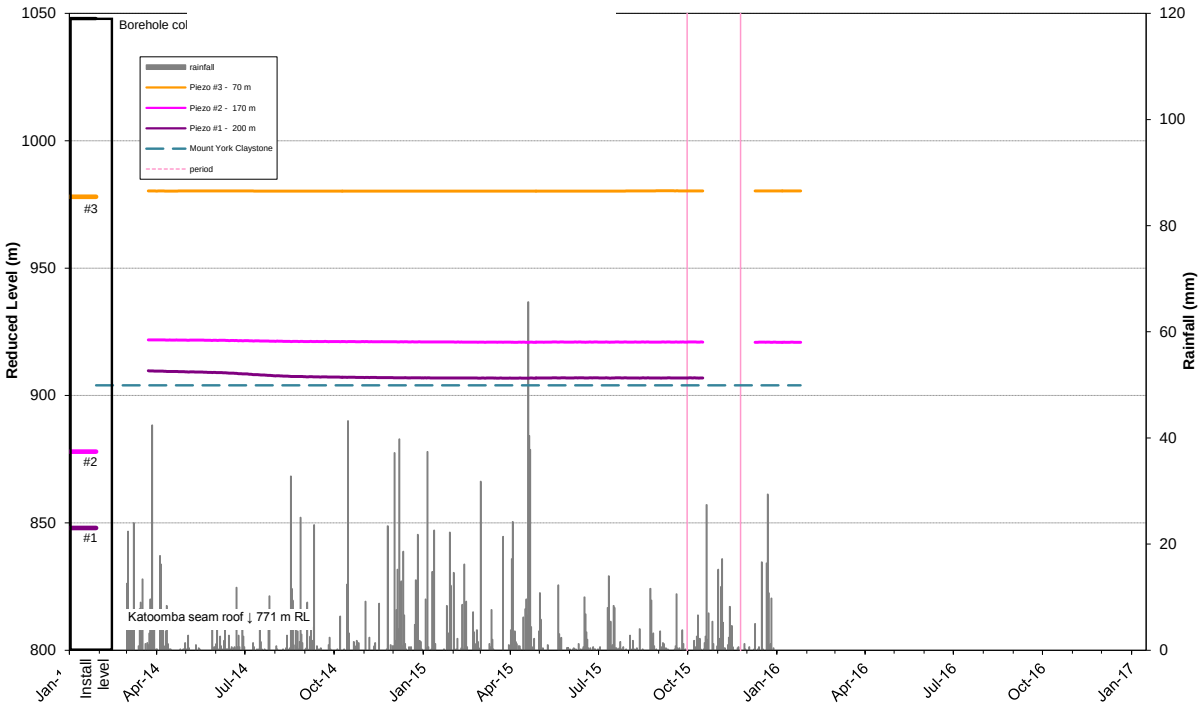

Figure 41. CLRP17 Piezometric Height

CLRP18

CLRP18, located northwest of the old longwall mining area, commenced logging 9 December 2014. Initially, the data logger was programmed to collect readings every 2 minutes. This very high frequency is unnecessary, and likely to run the battery down. The logger was reprogrammed to take readings once per day from 31 January 2015. Both piezometers show a drop in pressure on this date — of approximately 3 m in piezometer 1, and 19 m in piezometer 2; the trends are continuous across the drop. These apparent pressure changes are most likely artefacts caused by the change in the logger program associated with the change in frequency. The logger program should be reviewed. For the current period, data are available up to the 16 October 2015.

Both piezometers show positive pressure. Piezometer 1, located in the sequence approximately 100 m above the working horizon but below the Mount York Claystone, showed an initial drop in pressure head of approximately 13 m, due to stabilisation of the groundwater system after installation. Subsequently, the piezometer recovered sharply, settled into a steadily climbing trend, and then levelled off. The pressure trend continued the decline that started during the previous period. It is uncertain whether these data are reliable. However, the monitoring period has been brief and ongoing data collection will confirm the reliability of the data.

Piezometer 2, located in the sequence above the Mount York Claystone, shows a stable pressure trend, with a head only approximately 13 m below ground surface prior to the 31 January 2015 pressure drop. The change in trend seen in some holes following the mid-April storms is not observed at this site.

Mining impacts:

The nearest current mining is c. 3.5 km south-southwest of the installation. Old workings lie approximately 1 km to the east. There is no indication in the current data of any mining impact.

Monitoring results for piezometric height at CLRP19 is presented in **Figure .**

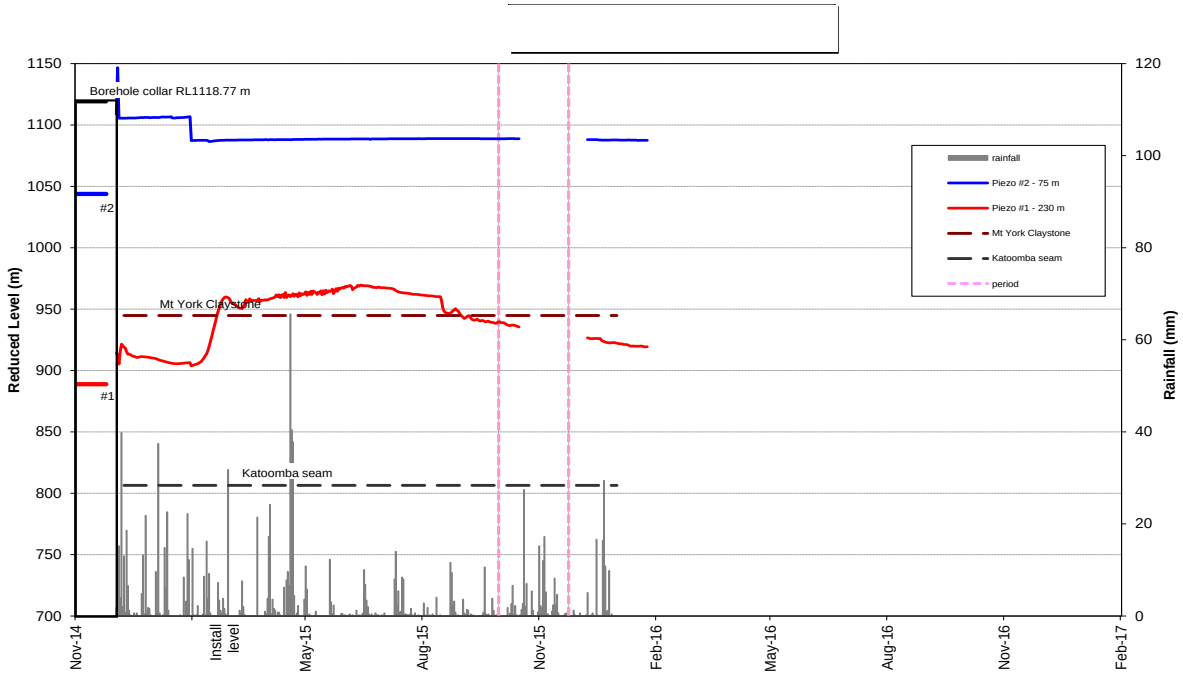

Figure 42. CLRP18 Piezometric Height

CLRP19

CLRP19 commenced logging on 23 March 2014. All piezometers record positive groundwater pressures. For the current period, data are available up to the 16 October 2015.

The data showed a very slow decline in pressure in piezometer 1, and similarly slow increases in pressure in piezometers 2 and 3, which then levelled off to stable trends before slowly declining again. Previous pressure trends continue in the available data.

In Piezometer 1, installed approximately 100 m above the working horizon but below the Mount York Claystone, the pressure trend was initially level, with a head that lies near the top of the Mount York Claystone (the regional aquiclude). The coincidence suggests that this is a confined aquifer with no significant leakiness or formation damage in the cap rock, which is controlling pressure in the underlying aquifer. As this piezometer is installed in a low permeability unit, pressures can take some time to dissipate, possibly explaining that the slow decline may be due to gradual stabilisation of the borehole after installation.

Mining impacts:

First workings in the 900 area directly undermined the installation during the period. The data show no impact from mining. The slow decline in piezometer 1 is most likely due to slow stabilisation after installation, and does not appear to be an impact caused by mining.

Monitoring results for piezometric height at CLRP19 is presented in **Figure .**

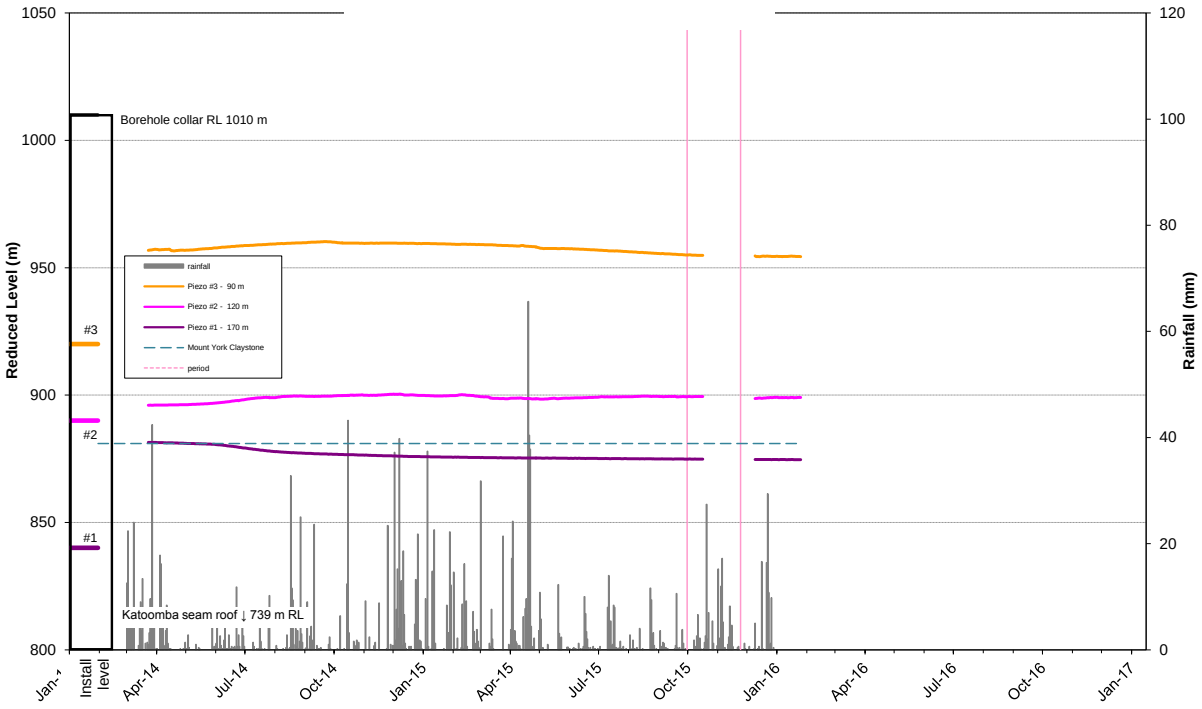

Figure 43. CLRP19 Piezometric Height

CLRP22

CLRP22, located northwest of the old longwall mining area, commenced logging 9 December 2014. Initially, the data logger was programmed to collect readings every 2 minutes. This very high frequency is unnecessary, and likely to run the battery down. The logger was reprogrammed to take readings once per day from 31 January 2015. For the current period, data are available up to the 16 October 2015.

Trends observed previously continue in the available data. Piezometer 1, installed approximately 100 m above the working horizon but below the Mount York Claystone, showed a slowly rising pressure trend, with pressure that lies near the top of the Mount York Claystone (the regional aquiclude). The rising trend has since stabilised. The coincidence suggests that this is a confined aquifer with no significant leakiness or formation damage in the cap rock, which is controlling pressure in the underlying aquifer.

Piezometer 1, installed approximately 100 m above the Mount York Claystone, showed a level trend.

Mining impacts:

The nearest mining during the period was over 3 km southwest of the installation. Old workings lie more than 400 m to the east. There is no indication in the current data of any mining impact.

Monitoring results for piezometric height at CLRP19 is presented in **Figure .**

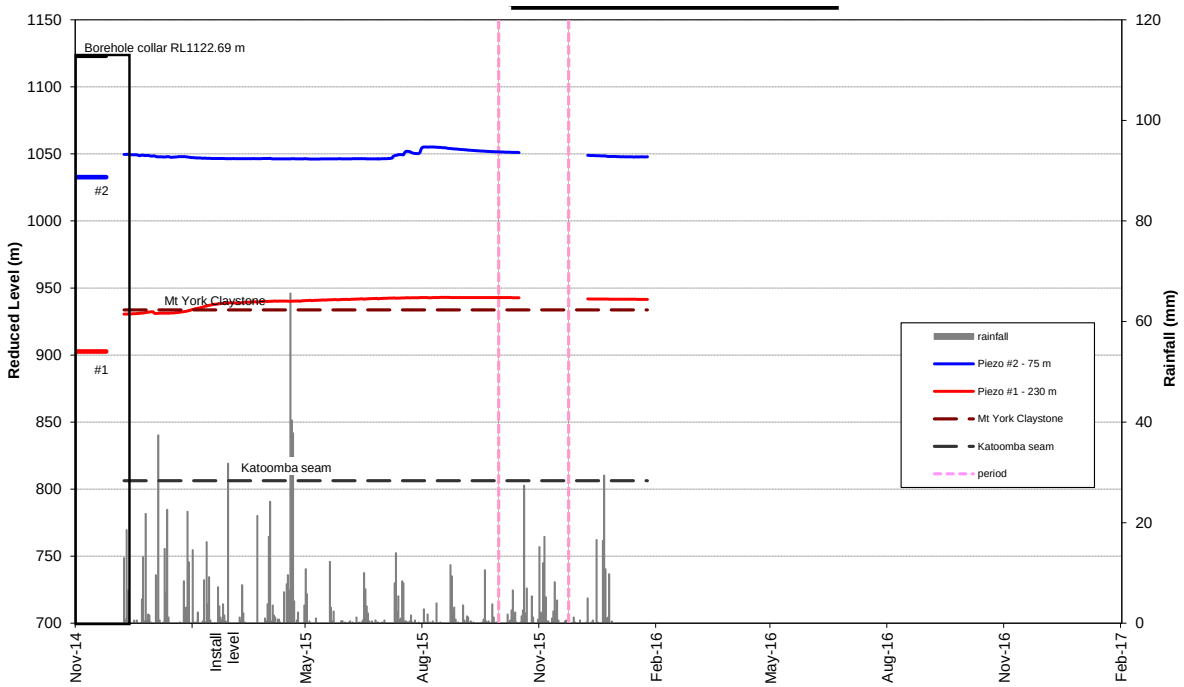

Figure 44. CLRP22 Piezometric Height

Open Hole Piezometers

In general, the piezometers continued the broadly level trends they have showed over time. Piezometers in the south, including CLRP8 and CLRP7, showed a flattening of the rising trend that had occurred after heavy rainfall in mid-April. With the recent dry weather, this observation remains consistent with the previous conclusion that rainfall directly recharges the Clarence Aquifer in the southern area, where the Clarence Aquifer crops out, or is very close to surface.

Groundwater levels in all of these holes stand at or near historically high levels in the data record extending back to 2008, related to the generally wetter conditions between late 2010 and early 2013.

Minor noisy data and distinct small negative spikes in the record for CLRP8, in Clarence village, appear to be related to localised pumping of groundwater for domestic use. CLRP7 shows sporadic spikes related to groundwater sampling, including at the end of the current period.

Mining impacts:

CLRP10 was directly undermined by panel 706 (1st workings only) in September 2011. Pillar extraction occurred in panel 708, approximately 250 m west of CLRP10, in April 2011. Panel 704, approximately 150 m east of CLRP10, was developed in April 2009, with partial pillar extraction in March 2010. In January and February 2014, pillar extraction occurred in Panel 700, approximately 700 – 900 m west-southwest of CLRP10.

First workings in panel 902 undermined CLRP5 during December 2013 – January 2014. During the current period, first workings occurred in Panels 905 and 907, at distances of around 0.5 – 1.5 km northwest.

There is no evidence of any mining-related impacts on any of these piezometers, based on the continuing uniform responses of the piezometers.

Monitoring results for Clarence open hole piezometers are presented below in **Figure** .

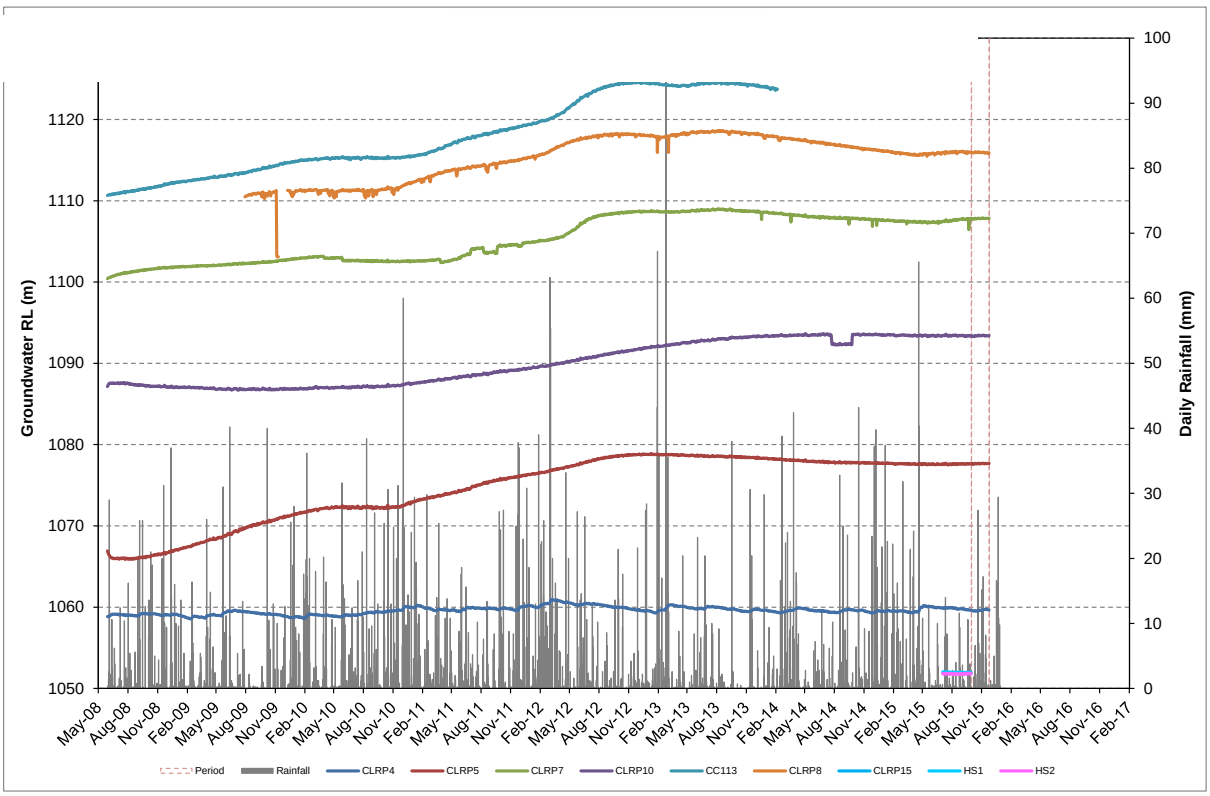

Figure 45. Clarence Open Hole Piezometer

8. REHABILITATION

Rehabilitation at Clarence has progressed generally in accordance with the current Mining Operations Plan and as outlined in the 2000 Clarence Environmental Impact Statement, the 2013 Modification 2 Environmental Assessment and the 2013 Modification 3 Environmental Assessment.

Currently Reject Emplacement Area's 1, 2 and 4 have been rehabilitated with ongoing maintenance and monitoring taking place. The rehabilitation monitoring program at Clarence was developed in 2012, and currently includes 7 transects (4 rehabilitation, 3 analogue). Following the 2013 State Mine Bushfire that impacted all of the monitoring transects, both Ecosystem Function Analysis and the Landscape Function Analysis indicators significantly decreased.

Reject Emplacement Area 3 remains partially rehabilitated, with Reject Emplacement Area 6 currently operational.

The 2015 monitoring results and overall site performances indicated an improvement from last year, showing signs of recovery from the impacts of the State Mine Bushfire that occurred in the locality in October 2013. Some of the impacts from the bushfire that are still evident in the monitoring results are as follows:

- Ground cover (particularly basal grass cover and organic litter) has generally increased compared to last year but is still much lower than that observed prior to the bushfire. The proportion of bare ground is also much higher than that observed prior to the bushfire. This can be seen through the results of the photographic monitoring provided in Appendix 8;
- The decrease in the ground cover has favoured the germination and establishment of lower and midstorey shrubs and for most sites there has been an increase in the number of shrubs in the lower strata. The number of individuals in the mid and upper storeys has increased compared to last year but is still generally lower than that observed prior to the bushfire;
- Canopy cover was again absent at most of the rehabilitation sites and low at all analogue sites. However most canopy species have survived the fire with regrowth observed at the time of the survey, and canopy cover should redevelop in the coming years as vegetation recovers; and
- Species diversity has increased at all sites compared to last year, with different species showing various responses to the fire. For example, Petrophile pulchella, which were all observed to be dead in the 2014 monitoring, have reappeared in 2015 with the emergence of regrowth. Acacia species are also showing signs of recovery, with Acacia gunni and Acacia longilfolia also reappearing after being absent in last year's monitoring results.

Overall performances have all improved across rehabilitation and analogue sites. The monitoring program was designed so that the performance of each monitoring transect can be extrapolated to the broader REA within which it is located. As such, the best rehabilitation performance was achieved in REA I and REA II which returned 'satisfactory' ratings against the analogue benchmarks. However, overall rehabilitation performance was 'poor' in REA III, and 'very poor' in REA IV.

With the removal of ground cover following the bushfire and the increase in bare ground in rehabilitated areas, soils are more exposed to the effect of erosion, and active erosion was again observed at most rehabilitated sites. REA III and REA IV were the most affected with moderately severe gullies occurring in places, and tunneling erosion occurring at REA IV. The lack of ground cover and low densities of woody vegetation at these sites is a concern for achieving a stable landform. Erosion at REA I and REA II is more controlled with higher vegetation densities providing soil stability.

Prevalence and impact of weeds and feral animals overall appeared to be minimal, although rabbit scats were observed at RHB 2. Regular visual inspections of pests and weeds should continue and the weed control program maintained as required to promote rehabilitation success. This will be particularly important following the fire, as the increase in exposed areas may promote weed incursion. However, it is noted that the risk for weed incursion post-fire is to some extent mitigated by the lack of weed seed source from the surrounding native bushland areas.

Future monitoring events will continue to provide information as to the resilience of the rehabilitated vegetation communities, and rates of recovery from an intense and widespread disturbance event (bushfire). Monitoring results are presented in Appendix 8.

8.1. Next Reporting Period

Planning for the rehabilitation of Reject Emplacement Area 3 will progress in 2016, however this is dependent upon the outcome of ongoing multi departmental investigations following an indecent that occurred at Clarence on July 2nd 2015 (further detail regarding this incident provided in Section 11).

Drainage repair and land stabilization works are scheduled to be completed in 2016 at Reject Emplacement Area 4, as well as native grass ground coverage trials.

Depending on construction timing of Reject Emplacement Area 5, partial rehabilitation may be completed on the lower batters of Reject Emplacement Area 6 including capping, spreading of topsoil, direct seeding and brush matting.

The key lessons learned from the annual monitoring program and the key factors to address in 2016 in order to improve the performance of post mined rehabilitated lands at Clarence include:

- Undertake maintenance direct seeding with a view to increase basal ground cover, thereby promoting soil stability and reducing the risk for further surface erosion, and also enhancing organic matter. In areas where erosion is present and or remedial works are undertaken the seeding mix should contain endemic fast germinating and winter growing species together with a combination of sterile cover crop species;
- Undertake maintenance tube stock plantings of endemic canopy species in areas where trees and shrubs are failing to establish.
- Undertake regular walkthrough of rehabilitated areas to visually monitor erosion and consider implementing remediation works as required if overall landform stability gets compromised.
- Due to the lack of topsoil, the rehabilitated areas would greatly benefit from the addition / spread of organic material on the ground to enhance ground cover and organic matter. This can be in the form of brush material from local native plants, wood chips, compost, etc.
- Maintain vigilance and continue the implementation of the pro-active weed control program. Weed incursion may be promoted post-fire, and it is recommended that a regular (at least monthly) walk through the rehabilitated areas is undertaken to detect potential onset of weeds; and
- Continuation of the annual rehabilitation monitoring program, and undertake the next round of monitoring in autumn 2016 to enable comparison with data recorded to date.

Table 21: Rehabilitation Status

Mine Area Type	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
	Year 2014 (ha)	Year 2015 (ha)	Year 2016 (ha)
A. Total mine footprint[1]	82	82	82
B. Total active disturbance[2]	49	49	54
C. Land being prepared for rehabilitation[3]	0	0	4
D. Land under active rehabilitation[4]	28	28	28
E. Completed rehabilitation[5]	0	0	0

9. COMMUNITY

Clarence Colliery undertakes community engagement through planned and unplanned activities outlined in the Clarence Stakeholder Engagement Plan and below. During the 2015 reporting period Clarence Colliery contributed through monetary and in kind donations to the following events and/or organizations;

- Bender-Rushworth Walk Against Cancer
- Movember
- Ironfest
- NAIDOC Week

The Clarence Colliery Community Consultative Committee (CCC) was established in 2006. Committee meeting minutes are available online at the Centennial Coal website (www.centennialcoal.com.au). The Clarence CCC met four times during 2015. Information present in the meetings include operational, environmental and community performance updates.

Specific items discussed during committee meetings in 2014 include:

- Rehabilitation Activities, including a detailed review of the remediation efforts following the July 2nd incident
- Water Management Activities and Improvements;
- Life of Mine REA planning and progress
- EPL Review progress;

[1] **Total Mine Footprint:** includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities. As such it is the sum of total active disturbance, decommissioning, landform establishment, growth medium development, ecosystem establishment, ecosystem development and relinquished lands (as defined in the DRE MOP/RMP Guidelines). Please note that subsidence remediation areas are excluded.
[2] **Total Active Disturbance:** includes all areas requiring rehabilitation
[3] **Land being prepared for rehabilitation:** includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE MOP/RMP Guidelines)
[4] **Land under active rehabilitation:** includes areas under rehabilitation and being managed to achieve relinquishment – includes 'ecosystem and land use establishment' and 'ecosystem and land use sustainability (as defined under the DRE MOP/RMP Guidelines)
[5] **Completed rehabilitation**: requires formal sign off from DRE that the area has successfully net the rehabilitation land use objectives or completion criteria

- Community Activities and Involvement;
- Environmental monitoring and performance; and
- Environmental incidents/complaints.

One community complaint was received during the 2015 reporting period. The complaint was regarding a coal train restricting pedestrian access to cross the Clarence Rail Siding and Western Line near the former Newnes Junction Station.

Investigation into the complaint occurred. The crossing point in question is not a formal pedestrian crossing point and therefore fencing was erected along the rail corridor to prevent further public access. In order to minimise any inconvenience to the resident, the local bus route was redirected, eliminating the requirement for the illegal and dangerous rail crossing activities.

Table 22: Community Complaints

	2011	2012	2013	2014	2015
Complaints	0	1	5	0	1
Type	NA	Dust	Noise	NA	Rail Operations

10. INDEPENDENT AUDIT

Clarence Colliery are currently in the process of completing its 5 yearly Independent Environmental Audit, as stipulated by DA 504-00, with the final report due to be submitted early Quarter 3, 2016.

11. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

Table 23: Incident/Non-Compliance Summary

Nature of the incident/non-compliance	An unplanned power outage at Clarence Colliery caused a reduced capacity for the Water Treatment Plant to treat manganese for a short period of time, resulting in a Filterable Manganese concentration of 0.582mg/L recorded at LDP002, with a license limit of 0.500mg/L
Date of incident/ non-compliance (if known; if not known state not known)	02/03/2015
The location of the incident/ non-compliance (include a figure if appropriate), if known	LDP002 at Clarence Colliery
Detail the cause of the incident/non-compliance	An unplanned power outage caused by lightning across the Clarence Colliery site, caused a reduced capacity for water

	treatment at the Water Treatment Plant.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	Water samples taken from the Clarence Colliery Main Dam, directly downstream of LDP002 on the same day as the exceedance, returned a Filterable Manganese concentration of 0.421mg/L, indicating no adverse effect of the non-compliance.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	In-line, real time Manganese probe has been installed at the Water Treatment Plant to provide continuous feedback on water treatment.

Nature of the incident/non-compliance	Following 150mm of rainfall over a 48-hour period, a significant volume of surface water run off left site via LDP002 with an elevated Total Suspended Solids (TSS) concentration of 103mg/L, with a license limit of 0.30mg/L.
Date of incident/ non-compliance (if known; if not known state not known)	21/04/2015
The location of the incident/ non-compliance (include a figure if appropriate), if known	LDP002 at Clarence Colliery
Detail the cause of the incident/non-compliance	A significant rain fall event that generated a volume of surface water run off that was not contained by the dirty water management system.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	Water samples taken from the Clarence Colliery Main Dam, directly downstream of LDP002 on the same day as the exceedance, returned a TSS concentration of 40mg/L, indicating no adverse effect of the non-compliance.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	On-going maintenance and monitoring of the dirty water and leachate management system to ensure maximum operating capacity at all times, as well as a detailed review of site surface water management.

Nature of the incident/non-compliance	A malfunction within the Dissolved Air Flotation (DAF) unit of the Water Treatment

	Plant causing reduced capacity to treat Iron, resulting in a Dissolved Iron concentration of 0.65mg/L at LDP002, with a license limit of 0.05 mg/L
Date of incident/ non-compliance (if known; if not known state not known)	05/05/2015
The location of the incident/ non-compliance (include a figure if appropriate), if known	LDP002 at Clarence Colliery
Detail the cause of the incident/non-compliance	A malfunction within the Dissolved Air Flotation (DAF) unit of the Water Treatment Plant causing reduced capacity of Iron, resulting in a Dissolved Iron concentration of 0.65mg/L at LDP002.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	Water samples taken from the Clarence Colliery Main Dam, directly downstream of LDP002 on the same day as the exceedance, returned a Filterable Iron concentration of <0.05mg/L, indicating no adverse effect of the non-compliance.
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	Real time, continuous monitoring equipment has been installed at the Water Treatment Plant, providing continuous feedback on the functionality of the plant.

Nature of the incident/non-compliance	Overtopping of a temporary coal fines holding cell, resulting in bridging of the leachate drain, causing the discharge of material.
Date of incident/ non-compliance (if known; if not known state not known)	02/07/2015
The location of the incident/ non-compliance (include a figure if appropriate), if known	REA 3 at Clarence Colliery – Plan attached.
Detail the cause of the incident/non-compliance	Overtopping of a temporary coal fines holding cell, resulting in bridging of the leachate drain, causing the discharge of material.
Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance	The following actions were taken to minimise the potential for further impact: of the discharge from REA 3:

	• Clarence ceased all activities and pumping to REA 3 on the 2nd July. The EPA issued a Clean-Up Notice 1531813 to cease all activities at or undertaken in relation to REA 3 except to make safe or contain further pollution and DRE issued Prohibition Notice served under Section 195 of the Work Health & Safety Act 2011 prohibiting any further pumping of fines material. • The installation of sediment fence, straw bales, and other sediment control devices and structures, installed at nominal 50 m intervals as well as where required for additional pollution control down the full length of the drainage line. • The installation of 6 In-Stream Coir-Log-Fines-Entrapment-Structures (ISCLFES) at strategic locations down the river between 3.5 km and 12 km • The development and implementation of a daily inspection and maintenance regime of the REA toe drain leachate drain and drainage line sediment fence installation. • The development and implementation of a weekly inspection and maintenance regime of the ISCLFES's • Immediate Engagement of the "Bush Doctor" and additional labour to commence clean up of material from the affected drainage line within 50 m of the confluence of the drainage line with the Wollangambe River. • Liaison with NPWS to enter the National Park to inspect the Wollangambe River. • Manual removal of fines material from the river to bulka bags • Removal of bulka bags by helicopter from the drainage line and National Park • Reinstatement of the area between the toe of the northern wall and the contour drain around REA 3 • Development and implementation of land and water

	remediation plans in consultation with EPA, DRE, OEH, NPWS. • Ongoing Consultation with regulatory authorities
Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance	• The pipe that feeds material from the fines thickener tank has been disconnected and tagged out of service • Preparation of Tailings Discharge Incident of REA 3 Clarence Colliery NSW Geotechnical Report, (previously provided) • Dress Down South Failure Side from the Access Road Bench as described in the Work Method Statement for Reinstatement of NE Wall Failure (previously provided) • Northern Failure Side Remediation as described in the Work Method Statement for Reinstatement of NE Wall Failure (previously provided) • Toe of the Slope Remediation as described in the Work Method Statement for Reinstatement of NE Wall Failure (previously provided) • All works, emplacement of coarse reject material and coal fines, ceased 2 July 2015 • The reinstatement of REA 3 wall, bench and leachate drain was completed 10 July 2015 • Water from the Primary arrester and the Water Treatment Plant slurry system have been re directed to Leachate Dam 1

The above mentioned July 2nd incident that resulted in coal material being discharged into the Wollangambe River remains apart of ongoing, multi departmental investigations. During the reporting period, Clarence worked closely with the EPA, NPWS, OEH, DRE and many other stakeholders to ensure that all efforts were made to limit the impact of the incident, as well as ensure that something of its nature would not happen again.

Table 24: Summary of Reportable Incidents and Regulatory Actions

Compliance Type	Agency	Number	Response
Incidents	EPA, DRE, OEH, DoPE	6	As described in Section 11.
Caution Notices	NA		
Warning Letters	NA		
Penalty Notices	NA		
Prosecutions	NA		

Note: This table includes actions taken by DPE, DRE and the EPA during the reporting period.

12. ACTIVITES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

The activities proposed for 2016 are generally in accordance with the 2000 Clarence Environmental Impact Statement as well as both the 2013 Environmental Assessments (Modifications 2 and 3) and include;

- Land preparation and community consultation associated with Reject Emplacement Area 5
- Revision of the Mining Operations Plan to include the future Reject Emplacement Area 5 and updated mine schedule
- Ongoing land and aquatic remediation work following the July 2nd incident, as well as investigating the rehabilitation opportunities at Reject Emplacement Area 3
- Continued rehabilitation monitoring and land management
- Upgrade of the Water Treatment Plant, pending outcomes of the 5 Yearly EPL Review
- Ongoing surface water management improvements, including implementation of the Polishing Lagoon Transfer.

Centennial Coal

Clarence Colliery Pty Ltd
c/o Level 18, BT Tower
1 Market Street
Sydney NSW 2000
www.centennialcoal.com.au