Centennial Coal

CENTENNIAL COAL
NEWSTAN COLLIERY
ANNUAL REVIEW

March 2017

Centennial Coal
Environment Matters

Name of Operation	Newstan Colliery
Name of Operator	Centennial Newstan Pty Ltd
Development Consent/ Project Approval #	DA 73_11_98 and SSD-5145
Mining Lease #	Consolidated Coal Leases 727, 746, 763 and 764. Mining Leases 1380, 1452, 1480, 1586, and 1587. Mining Purposes Leases 304, 305, 327, 328. Private Lands Lease 497.
Name of Holder of Mining Lease	Centennial Newstan Pty Ltd
Water License #	
Name of Holder of Water License	Centennial Newstan Pty Ltd
MOP/RMP Start Date	August 2015
MOP/RMP End Date	August 2018
Annual Review Start Date	January 2016
Annual Review End Date	December 2016

I, Mick Cairney, certify that this audit report is a true and accurate record of the compliance status of Newstan Colliery for the period January 2016 to December 2016 and that I am authorized to make this statement on behalf of Centennial Newstan Pty Ltd.

Note:

a) *The Annual Review is an 'environmental audit' for the purposes of s122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion) in an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

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

Name of Authorised Reporting Officer	Mick Cairney
Title of Authorised Reporting Officer	Executive General Manager Operations
Signature of Authorised Reporting Officer	M Cairney
Date	27-3-17

Contents

List of Tables

List of Figures

List of Appendices

Appendix 3: Hunter Eco Flora Monitoring Report

List of Plans

NS2541A – Surface Water Monitoring Locations

NS3332 – Location of Air, Noise, Weather Monitoring Points

NS3294_R1 - Mine Domains at Commencement of MOP (PLAN 2)

NS3294A_R1 - Mine Domains at Commencement of MOP (PLAN 2a)

NS3295_R1 - MOP Mining & Rehabilitation Year 1,2,3 (PLAN3)

NS3351 - Newstan Colliery AEMR Plan 2016 & Proposed 2017

1 STATEMENT OF COMPLIANCE

Table 1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
DA 73-11-98	No
SSD-5145	No
EPL 395	No
Mining Lease 1380	Yes
Mining Lease 1452	Yes
Mining Lease 1480	Yes
Mining Lease 1586	Yes
Mining Lease 1587	Yes

Table 2: Non-Compliances

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Section addressed in Annual Review
EPL 395	L2.4	Concentration limits	Low	Exceedance of TSS limit at LDP2 of 178mg/L (EPL limit is 50mg/l) on 6 January 2016	Section 11
EPL 395	L2.4	Concentration limits	Low	Exceedance of bicarbonate alkalinity limit at LDP1 of 724mg/L (EPL limit is 711mg/l) on 3 August 2016	Section 11
EPL 395	L2.4	Concentration limits	Low	Exceedances of bicarbonate alkalinity limit at LDP1 of 718mg/L and 733mg/L (EPL limit is 711mg/l) on 14 September 2016	Section 11
EPL 395	M2.2	Air Monitoring	Administrative	Instrument	Section 11

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Section addressed in Annual Review
		Requirements		fault on Hill Top TSP high volume air sampler (HVS1) on 1/11/16.	
EPL 395	M2.2	Air Monitoring Requirements	Administrative	Instrument fault on Hill Top TSP high volume air sampler (HVS1) on 7/11/16.	Section 11
EPL 395	M2.2	Air Monitoring Requirements	Administrative	Instrument fault on Water Tank TSP high volume air sampler (HVS2) on 7/11/16.	Section 11
EPL 395	M2.2	Air Monitoring Requirements	Administrative	Instrument fault on Hill Top TSP high volume air sampler (HVS1) on 13/11/16.	Section 11
EPL 395	M2.2	Air Monitoring Requirements	Administrative	Instrument fault on Hill Top PM10 high volume air sampler (HVS1) on 13/11/16.	Section 11
SSD-5145	Schedule 3 Condition 13	Pollution of waters	Low	Refer to EPL 395 non-compliance (06/01/16).	Section 11
SSD-5145	Schedule 3 Condition 7	Air quality criteria	Administrative	Exceedance of 24 hour average PM10 limit at Water Tank high volume air sampler (HV2) on 7/11/16. The result was	Section 11

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Section addressed in Annual Review
				impacted by poor regional air quality due to bushfire activity in the region.	
DA 73-11-98	Schedule 2 Condition 1	Harm to the environment	Low	Refer to EPL 395 non-compliance (06/01/16).	Section 11
DA 73-11-98	Schedule 2 Condition 6.1C	Air quality criteria	Administrative	Exceedance of 24 hour average PM10 limit at Water Tank high volume air sampler (HV2) on 7/11/16. The result was impacted by poor regional air quality due to bushfire activity in the region.	Section 11

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

The Northern Coal Logistics Project (NCL), owned and operated by Centennial Northern Coal Services Pty Limited (Northern Coal Services) and Centennial Newstan Pty Limited (Centennial Newstan) is located on the western side of Lake Macquarie approximately 140 kilometers north of Sydney in New South Wales. NCL comprises of the existing approved surface coal handling and processing facilities at the Newstan Colliery Surface Site and Mandalong Mine – Cooranbong Entry Site, along with existing private haul road and rail loading infrastructure (**Figure 1**).

For the purposes of this report Newstan will only be incorporated within this Annual Review. Cooranbong Site Services and Cooranbong Haul Road have been incorporated in the Mandalong Colliery Annual Review.

Figure 1: Regional Context

2.1 OVERVIEW

Newstan Colliery comprises the underground workings and surface infrastructure of:

- The Newstan Colliery underground workings;
- The Newstan Colliery surface infrastructure; and
- The Northern Coal Services Coal Handling and Preparation Plant (CHPP) and associated infrastructure and rail loop.

Underground coal mining operations commenced in the area now known as Newstan Colliery in 1887 and continued under existing use rights until 1999. On 14 May 1999 the then Minister for Urban Affairs and Planning granted Development Consent DA 73-11-98 under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the Newstan Colliery Life Extension Project following the submission of the Newstan Colliery Life Extension Project EIS. This development consent enabled existing mining and mining related activities to continue, along with the expansion of mining into the "Life Extension Area" and upgrade of surface facilities at the Newstan Colliery Surface Site and Awaba Colliery Surface Site. Development Consent DA 73-11-98 has been modified on the following occasions, with the last modification approved in December 2015.

- 23 September 2007 to allow the mining of LW24 and the construction of a ventilation shaft at Awaba (**Mod 1**),
- 1 December 2009 to allow for the Washing of Mandalong Coal (**Mod 2**),
- 26 November 2010 to allow for the Washing of Awaba Coal **(Mod 3**),
- 16 March 2012 to allow for the recommencement of first workings, bord and pillar mining in an area referred to as Main West (**Mod 4**),
- 19 November 2012 to allow for washing up to 4 Mtpa of Mandalong coal, and to transport excavated material produced from the shafts at Awaba to Newstan Colliery (**Mod 5**),
- 7 January 2014 to adjust the approved Consolidated Consent Boundary in the Main West Mining Area to include the four excluded areas. The areas are proposed to be consolidated for administrative reasons to ensure all workings around the Main West Mining Area are regulated under Development Consent DA 73-11-98 (**Mod 6**), and
- 1 December 2015 to adjust the approval to prevent overlap of conditions with Development Consent SSD-5145. (**Mod 7**).

2.2 SCOPE

This Annual Review details the progress of environmental management covering Newstan Colliery for the period 1 January 2016 to 31 December 2016. The Annual Review has been prepared in accordance with the Newstan Colliery conditions of consent as detailed in SSD-5145 and DA 73-11-98.

The other operations covered by SSD-5145 are described in the Mandalong Annual Review required by SSD-5145.

2.3 SUMMARY OF WORKS

2.3.1 Newstan Colliery

The Newstan Colliery surface facilities area includes: offices, a workshop and bathhouse as well as equipment and materials storage areas. The Newstan Colliery has approval to produce up to 4.5 Mtpa of coal from the Newstan Colliery.

Newstan Colliery underground operations were put on care and maintenance in August 2014. There was no production in 2016 and none planned for 2017.

The underground operations were maintained during the January to December 2016 reporting period. No other construction activities were undertaken during the reporting period.

2.3.2 Northern Coal Services Coal Handling and Preparation Plant (CHPP)

The Newstan Colliery surface facilities area includes: offices, a workshop and bathhouse as well as coal handling infrastructure consisting of a coal preparation plant, truck loading bins and a rail loading facility.

The NCS has approval to produce handle and process up to 4.5 Mtpa of coal from the Newstan Colliery, up to 0.88 Mtpa of coal from the Awaba Colliery and up to 6 Mtpa from the Mandalong Mine. The CHPP also has approval to receive waste rock material from Mandalong Mine, Mandalong Southern Extension Project and Newstan Extension of Mining Project.

2.3.3 Mineral Processing

The coal handling and preparation plant (CHPP) processes Newstan ROM coal for domestic and export markets as well as coal from various other Centennial operations for the export market. Newstan has approval to process up to 8 million tonnes per annum of ROM coal through the Newstan CHPP. Newstan CHPP operations for the reporting period are summarised in Table 5.

Table 3: Centennial Newstan Environmental Contact Details

Name	Position	Email	Phone
	Mine Manager		
	Environment & Community Coordinator		

3 APPROVALS

Table 4: Environmental approvals held by Centennial Newstan.

Name	Description	Issued By	Expiry Date	Renewal Procedure
CCL727	Pit top, SREA, NREA & surrounds	Dept. Primary Industry (Mineral Resources)	11/08/2027	Manager Title and Property-North
MPL304	Part NREA	Dept. Primary Industry (Mineral Resources)	25/03/2035	Manager Title and Property-North

Name	Description	Issued By	Expiry Date	Renewal Procedure
MPL305	Water Tanks	Dept. Primary Industry (Mineral Resources)	25/03/2035	Manager Title and Property-North
ML1380 *	Mining Lease	Dept. Primary Industry (Mineral Resources)	18/09/2016	Manager Title and Property-North
ML1452	Mining Lease	Dept. Primary Industry (Mineral Resources)	06/07/2020	Manager Title and Property-North
ML1480	Part NREA	Dept. Primary Industry (Mineral Resources)	20/07/2023	Manager Title and Property-North
CCL764	Area between the rail loops and the haul roads	Dept. Primary Industry (Mineral Resources)	18/05/2021	Manager Title and Property-North
CCL763	Parcel land south of the pit top, including Stony Creek Pipeline,	Dept. Primary Industry (Mineral Resources)	09/06/2022	Manager Title and Property-North
PLL497	NA	Dept. Primary Industry (Mineral Resources)	24/08/2017	Manager Title and Property-North
CCL746	Area above underground workings, within Crown Land.	Dept. Primary Industry (Mineral Resources)	31/12/2028	Manager Title and Property-North
MPL327 *	Awaba Nitrogen Plant	Dept. Primary Industry (Mineral Resources)	05/08/2015	Manager Title and Property-North

Name	Description	Issued By	Expiry Date	Renewal Procedure
MPL328 *	Part Awaba Stockpile	Dept. Primary Industry (Mineral Resources)	05/08/2015	Manager Title and Property-North
ML1586	Mining Lease	Dept. Primary Industry (Mineral Resources)	13/10/2022	Manager Title and Property-North
ML1587	Surface area incl SREA.	Dept. Primary Industry (Mineral Resources)	23/10/2027	Manager Title and Property-North
Mine Operations Plan (MOP)	Summary of Mining and Processing Activities – Newstan and Awaba	NSW Trade & Investment – Division of Resources & Energy	2018	MOP approved for the period August 2015 – August 2016
Newstan Colliery Development Consent DA 73-11-98	Permits development and works to occur as described in the EIS	NSW Department of Planning & Environment	July 2020	Permits development and works to occur as described in the EIS
Centennial Norther Coal Services Development Consent SSD-5145	Receipt, handling, processing and transport of run-of-mine coal from Centennial Coal's underground operations at Mandalong Mine, Newstan Colliery and Awaba Colliery.	NSW Department of Planning & Environment	31/12/2045	Requires new development consent after expiry date.
Environmental Protection Licence 395	Permits scheduled activity "coal mining" and discharge of water from licensed discharge points.	Environment Protection Authority	Perpetual	Requires payment and Annual Return February each year

** A renewal application has been lodged with the Department of Industry - Division of Resources & Energy and as such the mining lease remains in full force at the time of drafting this report.*

3.1 DEVELOPMENT CONSENTS

Development Consent DA 73-11-98 for Newstan Colliery

In 1998, Powercoal Pty Limited, the (then) owners of Newstan, submitted an Environmental Impact Statement (Umwelt, 1998) to the New South Wales Department of Planning (DoP), seeking approval for the expansion of Newstan, in an area referred to as the Life Extension Area (LEA). On 14 May 1999, the then Minister for Urban Affairs and Planning, granted development consent under Part 4 of the EP&A Act for the Newstan Colliery Life Extension Area pursuant to Development Application DA 73-11-98. This development consent has since been modified on the following occasions:

- 23 September 2007 to allow the mining of LW24 and the construction of a ventilation shaft at Awaba (Mod 1),
- 1 December 2009 to allow for the Washing of Mandalong Coal (Mod 2),
- 26 November 2010 to allow for the Washing of Awaba Coal (Mod 3),
- 16 March 2012 to allow for the recommencement of first workings, bord and pillar mining in an area referred to as Main West (Mod 4),
- 19 November 2012 to allow for washing up to 4 Mtpa of Mandalong coal, and to transport excavated material produced from the shafts at Awaba to Newstan Colliery (Mod 5),
- 7 January 2014 to adjust the approved Consolidated Consent Boundary in the Main West Mining Area to include the four excluded areas. The areas are proposed to be consolidated for administrative reasons to ensure all workings around the Main West Mining Area are regulated under Development Consent DA 73-11-98 (Mod 6), and
- 1 December 2015 to adjust the approval to prevent overlap of conditions with Development Consent SSD-5145. (Mod 7).

This development consent applies to the Pit Top Area, Coal Handling and Preparation Plant (CHPP), stockpile areas, the rail loop, haulage roads, Northern Reject Emplacement Area (NREA) including the tailings dam and water management dams, Southern Reject Emplacement Area (SREA) and underground operations, including the ventilation site at Awaba.

An application was made under Section 100 of the *Coal Mine Health and Safety Act 2002* on 27 November 2006 to construct stages two through to five of the Southern Reject Emplacement Area (SREA) tailings storage facility. Approval was granted by the chief inspector of coal mines on 10 January 2007.

Development Consent SSD-5145 for Northern Coal Services Project

Development Consent SSD-5145 for the Northern Coal Services Project was approved by the Department of Planning & Environment (DPE) on 29 September 2015. The approval consolidates the receipt, handling, processing and transport of run-of-mine coal from Centennial Coal's underground operations at Mandalong Mine, Newstan Colliery and Awaba Colliery.

The surface infrastructure and operations at the Cooranbong Entry Site are part of the Northern Coal Services Project SSD-5145, however continue to be managed by Centennial Mandalong.

3.2 MINING AUTHORITIES

Newstan Colliery holding comprises a number of leases as shown in **Table 4.**

3.3 ENVIRONMENT PROTECTION LICENCE

Centennial Newstan holds Environment Protection Licence (EPL) 395 under the Protection of the Environment Operations Act 1997.

3.4 AUTHORISATIONS & EXPLORATION LICENCES

The Newstan Colliery holding comprises a number of leases as shown in **Table 4**.

The Newstan Awaba MOP Complex was approved by DRE in August 2015 and is approved until August 2018.

3.5 CONSENT CONDITIONS – ANNUAL REVIEW REQUIREMENTS

Schedule 5 Condition 11 of SSD-5145 and Schedule 2 Condition 9.1 of DA 73-11-98 (MOD 7) include the requirement for an Annual Review.

The 2015 Annual Review was provided to DPE, DRE, LMCC, NOW, EPA, NPWS and the Newstan Colliery CCC consistent with DA 73-11-98 condition 9.1.

4 OPERATIONS SUMMARY

Table 5: Production Summary

Material	Approved Limit (and source)	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
ROM Coal	4.5 Mtpa	1.433	0.888	2.6
Saleable product	4.5 Mtpa	1.329	0.817	2.4
Transport (rail)	8 Mtpa	1.320	0.769	2.4
Hours of operation	24/7	24/7	24/7	24/7

Production figures in Table 5 consist of coal from Mandalong which may also be included in the Mandalong Annual Review. 9792 tonnes of product coal were trucked to Eraring during the reporting period. No coal was extracted from Newstan Colliery during the reporting period.

4.1 EXPLORATION

There was no exploration drilling in 2016.

Five exploration drill holes were completed in the 2011 calendar year as part of the Newstan exploration programme. Twenty-two exploration drill holes (including two large diameter drill holes) were completed in the 2010 calendar year. All drill sites completed in 2011 and 2010 have been rehabilitated.

A modification to the Newstan Stage 1 Exploration Area for an additional eighteen exploration drill sites was granted by Industry and Investment NSW (I&I) on 9 April 2009. Approval for the Newstan Lochiel Stage 2 exploration area was granted by I&I on 13 July 2009, approving fourteen exploration drill sites. A modification to both the Stage 1 and Stage 2 Newstan Lochiel exploration areas was granted by I&I on 4 November 2009, approving the development of four large diameter drill holes across the two exploration areas.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The DPE in a letter dated 2 June 2016 considered the 2015 Annual Review to be generally in accordance with the conditions of approval. The DPE identified a number of items to be addressed in the 2016 Annual Review as detailed in **Table 6**.

The DRE in a letter dated 27 February 2017 considered the 2015 Annual Review to be to the satisfaction of the Minister and Secretary. The DRE identified a number of items to be documented in the Annual Review as detailed in **Table 6**.

Table 6: Actions from Previous Annual Review

Action Required	Requested By	Action Taken	Where addressed in Annual Review
Update the Water Management Plan	Department of Planning & Environment	Water Management Plan submitted and awaiting approval.	Section 7.1
Update the Air Quality & Greenhouse Gas Management Plan	Department of Planning & Environment	Air Quality & Greenhouse Gas Management Plan submitted and awaiting approval.	Section 6.2
Develop Rehabilitation Management Plan / Mining Operations Plan	Department of Planning & Environment	The current MOP is approved for the period August 2015 – August 2018. No variation to the MOP is proposed for the next reporting period.	N/A
Update the Erosion & Sediment Control Plan	Department of Planning & Environment	Erosion and Sediment Control Plan submitted and awaiting approval.	Section 7.1
Reporting of non-compliances to the DPE as per the approval	Department of Planning & Environment	Noted.	Section 11
Recontouring and revegetation of the old reject emplacement areas in the NREA are documented in the	Department of Resources & Energy	Noted.	Section 8.2

AEMR (Annual Review)			
Rehabilitation of sinkholes to be documented in the AEMR (Annual Review)	Department of Resources & Energy	Noted.	Section 6.3
Results of monitoring (eg flora and fauna monitoring) undertaken against the rehabilitation completion criteria as presented in the Mining Operations Plan currently being prepared, is reported in the rehabilitation section of future AEMR's (Annual Reviews)	Department of Resources & Energy	The design of the ecological monitoring program will be reviewed to enable evaluation of rehabilitation works against nominated completion criteria.	Section 12

6 ENVIRONMENTAL PERFORMANCE

Schedule 2 Condition 9 of DA 73-11-98 and Schedule 5 Condition 11of SSD-5145 require the presentation and discussion on all monitoring required under the Development Consents and other approvals. **Table 7** includes a summary of the monitoring required by the Development Consents, current status and report section in the Annual Review.

Table 7: Summary of Monitoring Requirements

Monitoring Type	Status	Report Section
Noise Monitoring	Quarterly	**Section 6.1**
Air Quality Monitoring	Ongoing	**Section 6.2**
Meteorological Monitoring	Ongoing	**Section 6.7**
Surface Water Monitoring Groundwater Monitoring	Ongoing Ongoing	**Section 7.1** **Section 7.2**
Rehabilitation Monitoring	Annual survey	**Section 8**

6.1 NOISE

The Northern Region Noise Management Plan has been developed to ensure that operational and construction noise impacts on the local community are minimised and appropriate management measures are identified and response protocols detailed should noise criteria be exceeded and to comply with statutory approval conditions. The plan was submitted to the DPE for approval in July 2016.

Quarterly attended noise monitoring was conducted to assess operational noise levels compared to the noise limits specified by Schedule 3 Condition 2 of.SSD-5145.

Operator attended noise surveys were conducted during February, June, August and November 2016 at each of the seven (7) locations during day, evening and night periods to determine the character and relative contribution of ambient noise sources and mine contributions.

The Newstan EIS predictions for noise found that the noise emission levels at NC1 and NC2 were below or marginally (1 dBA) above the then daytime (39 dBA) and night-time (38 dBA) assessment criteria during calm and adverse weather conditions.

Noise emissions levels at NC4 and NC5 are below or only marginally (2dBA) above the then daytime (37 dBA) and night time (35 dBA) assessment criteria during calm conditions. During adverse weather conditions noise emissions may be up to 4 dBA (daytime) and 6 dBA (night time) above the assessment criteria when using the front end loader.

The Main West EA found that the potential noise impacts are predicted to meet the project specific noise criteria at all resident locations, with the exception of NC3. The NC3 site was predicted to have a 2 dBA exceedance of project specific noise criteria (35 dBA night time) under a temperature inversion.

The Northern Coal Services EIS found that the potential noise impacts are predicted to meet the project specific noise criteria at all resident locations, with the exception of NC3. The NC3 site is predicted to exceed the project specific noise criteria by up to 1dBA during night time calm conditions and by up to 4dBA and during night time temperature inversions for the current existing and approved operations.

In order to minimise noise generated by train operations at Newstan Colliery, the following operating procedures have been implemented, except in emergency situations.

1. The procurement of a fleet of new locomotives has allowed for the elimination of bank engines and the use of BRM new generation locomotives. They are considerably quieter and environmentally friendly.
2. No bank engines are now being used.
3. The use of the Locomotive horn at level crossings at Newstan Colliery is restricted to EMERGENCY use only. The headlight and ditch lights shall be used to provide adequate warning.
4. The use of the Locomotive horn prior to moving the train at Newstan Colliery is restricted to EMERGENCY use only.
5. All shunting shall be carried out with radio communication. The use of the locomotive horn is prohibited.
6. Train ‘run-ins’ and ‘run-outs’ shall be managed professionally by the train crew, ensuring correct use of the automatic (train) brake and independent brake. Four new locomotives are now required where previously six or seven were needed. The new locomotives were delivered throughout 2012/2013.
7. A 6 metre high bund wall was constructed at the south-eastern end of the Rail Loop stockpile in 2012.

6.1.1 Summary of Noise Monitoring Results

Global Acoustics Pty Ltd, were engaged by Centennial Newstan to conduct quarterly noise compliance assessments for the Newstan Colliery in accordance with the Development Consent criteria.

Table 8: Summary of Noise Monitoring

Monitoring Quarter	Compliance status
Quarter 1 February	Activities from Newstan Colliery complied with the relevant development consent noise limits during the Q1 monitoring at all monitoring locations.
Quarter 2 June	Activities from Newstan Colliery complied with the relevant development consent noise limits during the Q2 monitoring at all monitoring locations.
Quarter 3 August	Activities from Newstan Colliery complied with the relevant development consent noise limits during the Q3 monitoring at all monitoring locations.
Quarter 4 November	Activities from Newstan Colliery complied with the relevant development consent noise limits during the Q4 monitoring at all monitoring locations.

6.1.2 Newstan Shaft Site (Awaba) Noise Monitoring

The requirements for the Newstan Ventilation Shaft Site at Awaba impact assessment criteria are included in the Table 9 in accordance with Newstan's Development Consent condition 6.4 D and the Newstan Colliery Modification of Development Consent Statement of Environmental Effects (2007).

Table 9: Newstan shaft site noise monitoring criteria

	Noise Criteria $L_{Aeq(15\ minute)}$ Noise Goals (dBA)		
Location	**Day**	**Evening**	**Night**
All privately owned residences	38 dBA	40 dBA	36 dBA

No noise monitoring was conducted during the reporting period due to no operational activities occurring at the Newstan ventilation shaft site at Awaba.

6.2 AIR QUALITY

The Northern Region Air Quality and Greenhouse Gas Management Plan has been developed to ensure that operational and construction air quality impacts on the local community are minimised, appropriate management measures identified and response protocols detailed should air quality criteria be exceeded and to comply with statutory approval conditions. The plan was submitted to the DPE for approval in July 2016.

6.2.1 Dust Deposition Gauges

Originally there was a total of 9 depositional dust gauges located around the Newstan Colliery pit top facilities and Fassifern. Dust gauge 8 was decommissioned in 2005 due to the tree growth in the private garden that the gauge was located in (no longer compliant with the relevant standard) and continual vandalism by school children. Dust Gauge 7 was removed and decommissioned by a private land owner to allow fill to be placed in the owner's horse paddock. Dust Gauge 7 was re-instated in August 2009 to the south-east of Newstan Colliery at the Fassifern Archery Complex.

Newstan currently has eight depositional dust gauges located around the Colliery pit top facilities, NREA, SREA and Fassifern. The following graph, Figure 2, displays Newstan's Monthly Rolling Annual Average Dust Deposition in 2016 (Insoluble Solids).

The Newstan Life Extension EIS results for DG's 1 to 8 found the monthly averages and annual averages were below 2 g/m2/month, which is within the EPA goal of 4 g /m2/month annual average. The EIS states that increases between 1 and 2 g/m2/month due to the Newstan extension would therefore be acceptable given the existing deposition levels. Annual average dust deposition rates due to existing operations were predicted to be approximately 1 g/m2/month or less at Fassifern and surrounding districts.

Table 10: Summary of depositional dust results between January 2016 and December 2016 surrounding Newstan Colliery.

	Insoluble Solids (Combustible Matter + Ash) g/m^2/month							
	DG1	**DG2**	**DG3**	**DG4**	**DG5**	**DG6**	**DG7**	**DG9**
Long Term Average	1.2	3.3	1.4	1.9	4.2	2.0	3.8	2.6
Average 2016 (Reporting Period)	0.6	0.7	0.9	2.1	1.1	1.2	1.2	1.0
Air Quality Criteria	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0

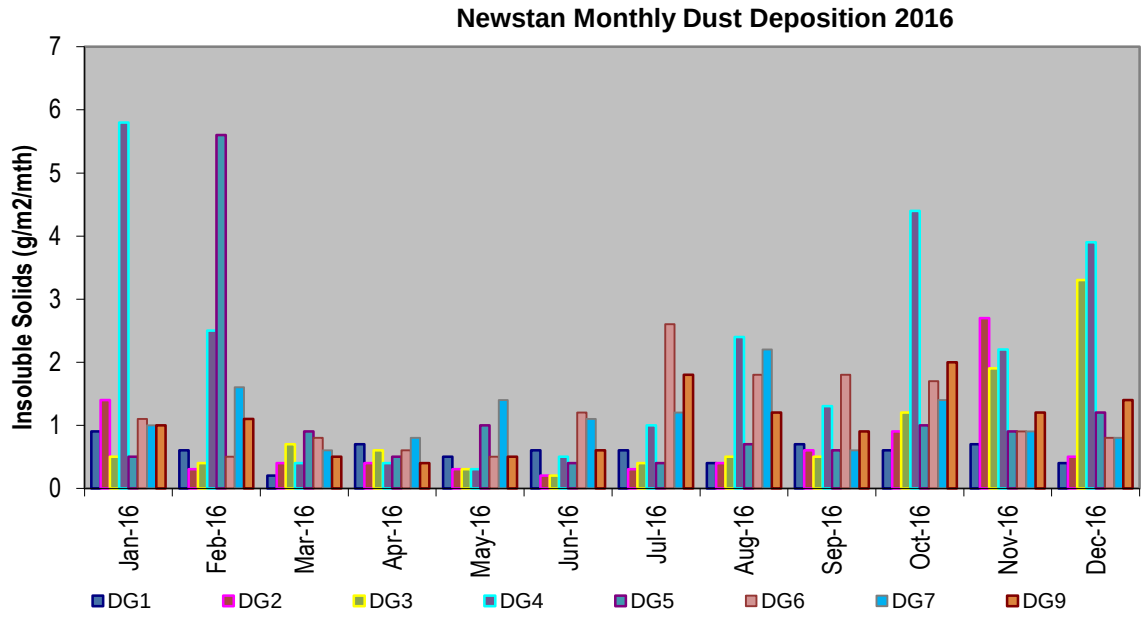

Figure 2: Newstan Monthly Dust Deposition 2016

All particulate dust gauges recorded an annual average particulate monitoring result below the development consent limit of 4g/m2/month for the annual averaging period.

Dust gauge 1 has remained relatively stable since 2001, while the results for dust gauges 2, 5, 6, 7 and 9 have decreased. Some high results at dust gauges 3 and 4 have resulted in an increasing trend due to spikes in 2012 and 2015. Visual inspections of the samples showed that approximately 90% of the samples were insect matter and or bird droppings.

Dust monitoring locations are provided in Plan NS3332.

6.2.2 High Volume Dust Sampling

The EIS states that the annual average TSP levels are predicted to be approximately 10 µg/m3 at Wakefield and Fassifern. This is less than measured background levels indicating that other local dust sources may also be contributing to TSP levels in the area. Predictions for the expansion up to 3 mtpa using the front end loader method showed an annual average TSP concentrations at the nearest residence to the northwest of the existing emplacement area increase by 5 µg/m3 above those predictions made for the existing case. Emissions were not predicted to cause exceedances of the air quality goal of 90 µg/m3 (annual average for TSP). Assuming that approximately 50% of total TSP is PM10, the annual average goal of 50 µg/m3 is not predicted to exceed after the initial expansion for PM10.

The Main West Mining Project EA states that the results of dispersion modelling indicate no potential for exceedance of the annual average TSP and PM10 assessment criteria at the nearest non-project related receptors. The dispersion modelling predicted a likelihood of exceedances at the nearest sensitive receptor of regulatory guidelines for PM10 as a 24 hour average. Background concentrations of PM10 also contribute significantly to predicted likelihood of exceedances of 24 hour PM10.

High volume dust sampling was undertaken to monitor dust deposition rates and concentrations of Total Suspended Particulates (TSP) and Suspended Particles PM10 and PM2.5.

The Hill Top High Volume dust sampling point (HVS1) is located to the north of the NREA near Culgan's property. The Water Tank High Volume Dust Sampling point (HVS2) is located to the south of Newstan Colliery near the Fassifern Railway Station. It was not possible to locate the southern high volume dust sampler at the Fassifern Public School as required by the Development Consent DA 73-11-98, due to the need to undertake extensive tree clearing at the school. The site chosen is located closer to the mine site.

Table 11 displays the annual average PM10 (ug/m3) at HVS1 and HVS2 since monitoring commenced in 2007, while Table 12 shows the Annual Average TSP. Table 11 demonstrates a significant reduction in the annual average PM10 levels at the Newstan Colliery since 2007, especially at HVS2.

Table 11: Annual Average PM10 (ug/m3) at HVS1 and HSV2

Annual Average PM10 (ug/m3)		
Year	**Hill Top (HVS1)**	**Water Tank (HVS2)**
2007	18.6	25.6
2008	16.0	25.8
2009	16.6	19.4
2010	11.6	16.2
2011	14.3	17.7
2012	12.5	17.0
2013	13.3	16.1
2014	11.9	14.7
2015	11.5	12.8
2016	11.0	12.4

Table 12: Annual Average TSP (ug/m3) at HVS1 and HSV2

Annual Average TSP (ug/m3)		
Year	**Hill Top (HVS1)**	**Water Tank (HVS2)**
2007	32.2	47.3
2008	33.0	53.2
2009	31.5	38.5
2010	22.5	30.3
2011	24.2	33.7
2012	21.2	34.3
2013	22.3	29.3

Annual Average TSP (ug/m3)		
Year	Hill Top (HVS1)	Water Tank (HVS2)
2014	21.4	27.9
2015	17.9	24.0
2016	18.0	20.3

Newstan's Development Consent specifies the following criteria for TSP or PM10.

Table 13: Development Consent Long Term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion
Total suspended particulate (TSP) matter	Annual	90 µg/m^3
Particulate matter <10 µm (PM_{10})	Annual	30 µg/m^3

Table 14: Development Consent Short Term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion
Particulate matter <10 µm (PM_{10})	24 hour	50 µg/m^3

Figure 3 displays the rolling annual average and 24 hour results for high volume dust sampling results for PM10. Figure 4 displays the Rolling Annual average and the 24 hour results for TSP at the Hill Top Location (HVS1) and Water Tank Location (HVS2).

The rolling annual average results for both locations were below the criteria for TSP of 90 µg/m3 (annual average), and PM10 of 30 µg/m3 (annual average) during the reporting period. There was one PM10 24 hour result above the criteria of 50 µg/m3 on the 7 November 2016 at the HVS2 monitor. Review of the incident identified that the reading was likely the result of poor regional air quality conditions due to bushfire activity in the region. Further discussion of this monitoring result is provided in Section 11.

The Newstan EPL 395 requires a sampling frequency for high volume air samplers to be every 6 days for TSP and PM10 at the two monitoring locations. A number of make up runs were conducted as a result of shortened monitoring runs occurring on the schedule 6-day cycle during November 2016 due to instrument faults. On two occasions during November 2016, valid data was not collected for the HVS1 TSP monitor due to a motor failure on the unit. Further discussion of the monitoring conducted outside of the 6-day cycle and instrument failures causing invalid results is provided in Section 11.

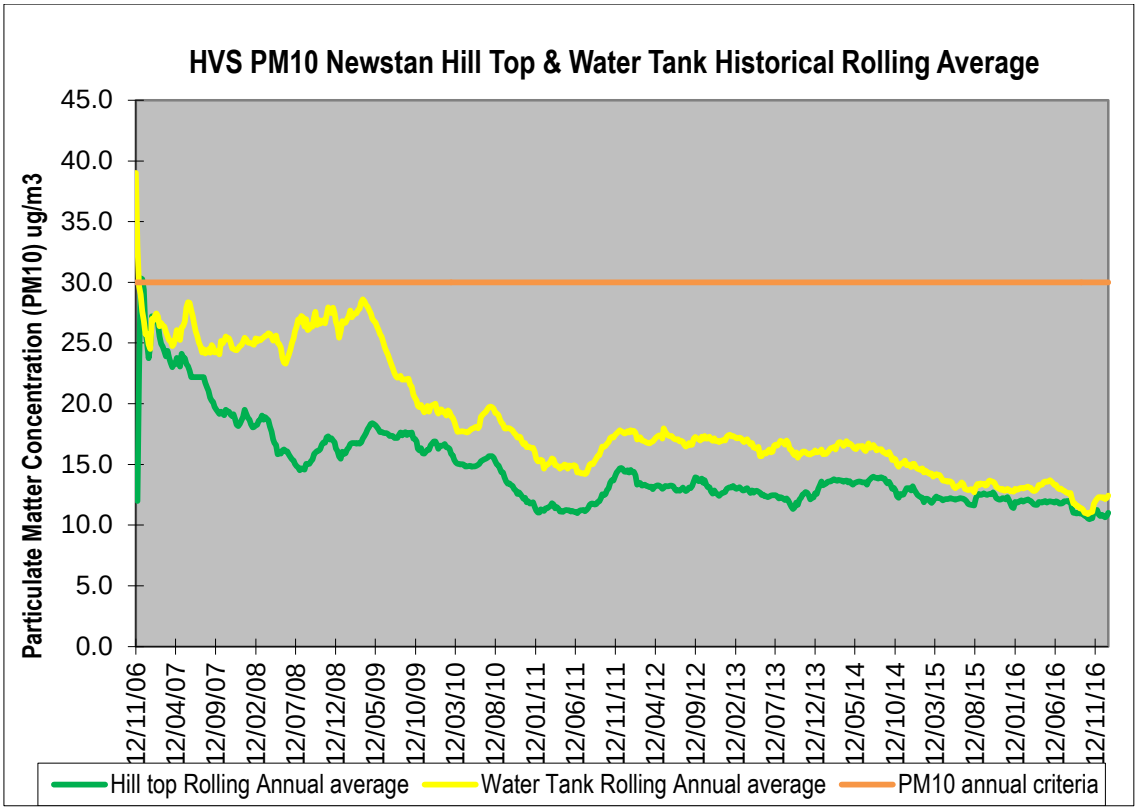

Figure 3: Newstan Rolling Annual Average for High Volume Dust Sampling for PM10

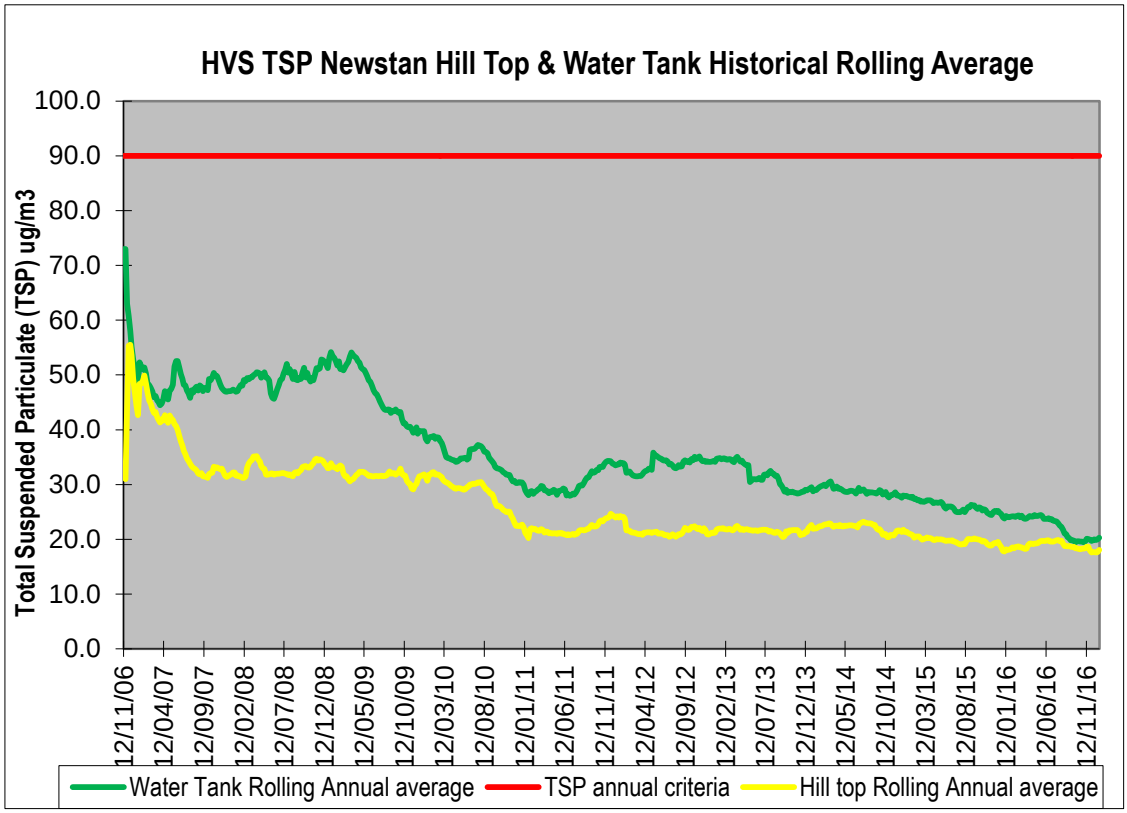

Figure 4: Newstan Rolling Annual Average for High Volume Dust Sampling for TSP

Figure 5 displays the 24 hour results for high volume dust sampling results for PM2.5 during the reporting period. The annual average high volume dust for PM2.5 was 6µg/m3 and 7µg/m3 for Hill Top and Water Tank respectively.

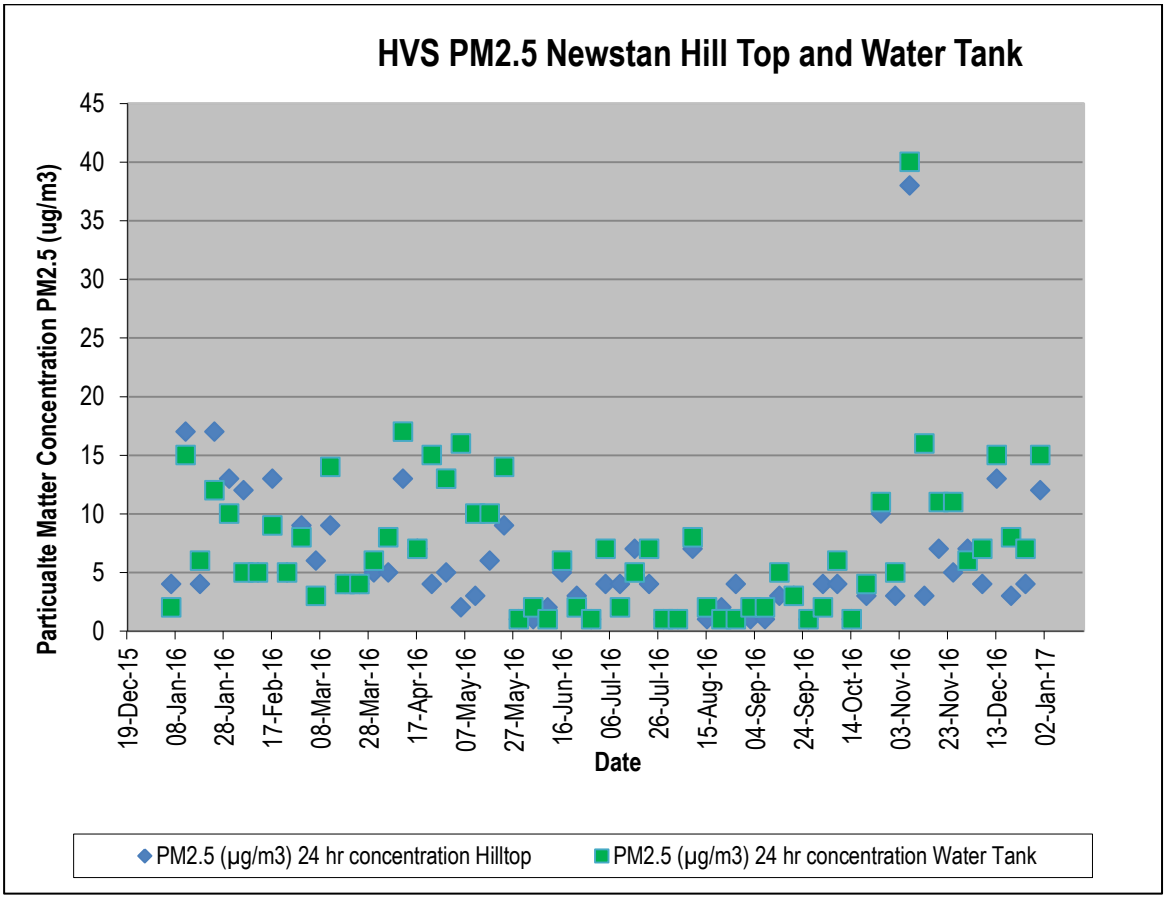

Figure 5: Newstan High Volume Dust Sampling for PM2.5

6.2.3 Greenhouse Gas Monitoring

Table 15 provides a summary of Newstan's main Greenhouse Gas emissions for the 2016 AEMR reporting period. The Post Mining Activities has been included for the first time in 2015.

Table 15: Greenhouse Gas Emissions FY2012 - FY2016

Emissions Summary (CO2-eT)					
	FY2012	FY2013	FY2014	FY2015	FY2016
Electricity	31,566	31,391	28,960	18,556	10,624
Diesel	4,032	2,978	2,194	1,612	889
Fugitives – CH4	70,173	121,292	118,170	97,525	100,000
Fugitives – CO2	825	1581	910	1,077	1,020
Post Mining Activities*			9,691	2,084	0
Total of above GHG Emissions (tonnes)	**106, 596**	**157,243**	**159,925**	**122,736**	**112,533**

* Note Emissions from Post Mining activities (e.g. surface stockpile), previously not included in the AEMR.

6.3 SUBSIDENCE

Newstan Colliery did not mine coal in 2016. Yearly Subsidence Monitoring was carried out above the Main West Area (first workings only mining) in November 2016. Survey monitoring points levelled were on Transgrid transmission towers above the mine workings area, part of the old LW24B cross line, and MW Line 1 – which follows the edge of a bush track above 304 and Main West 4 Panels.

Subsidence modelling predictions for this first workings mining method were for up to 20mm. It is generally accepted that there can be up to +/-20mm of natural ground movement – due to the natural expansion and contraction of soils and clays. Note that when mining coal - a 100m mining barrier was maintained around Tension Tower #18 on Transmission Line 93.

The Monitoring of Transmission Towers in the first workings area show subsidence between +5 to -16mm after first workings mining. Monitoring along part of LW24B (XL21-44) shows subsidence between +2 to -21mm following first workings mining.

Monitoring along the bush track shows subsidence between +6 to -24mm. Monitoring points 1MW13-18 (-22mm to -24mm) are located in a low lying area.

Note that survey field method accuracy is +/- 5mm.

No visible signs of subsidence were observed while carrying out these surveys.

Newstan and Awaba Colliery have a joint rehabilitation program. In 2016 a series of sinkholes in the same locality above the Awaba workings were rehabilitated in accordance with the approved Awaba Colliery Sinkhole Management Plan which outlines a methodology for the effective rehabilitation and maintenance of sinkholes. The 2016 sinkhole rehabilitation activities are reported within the Awaba Colliery AEMR. Any sinkholes or subsidence cracks identified are added to the rehabilitation program and they are rehabilitated in accordance to environmental and public safety risk.

Sinkholes associated with underground mining generally occur in areas that have a shallow depth of cover (less than 50m), weak overburden and geological discontinuities. Subsidence Rehabilitation will be ongoing during 2016.

6.4 BIODIVERSITY

The Northern Region Biodiversity Management Plan has been developed to guide the management of terrestrial and aquatic biodiversity at a regional scale and to comply with statutory approval conditions. The plan was submitted to the DPE for approval in December 2016. Various biodiversity monitoring programs have been established to assess biodiversity impacts and inform implementation of adaptive management measures for improved environmental outcomes.

6.4.1 Annual Flora and Fauna Monitoring

Condition 3.4 and 8.5 of Development Consent DA 73-11-98 require an Annual Ecological Monitoring Program at Newstan Colliery. Surveys conducted over the site targeted birds, microbats and invertebrates along with habitat.

This report can be found in Appendix 3.

6.4.2 Tetratheca juncea

Hunter Eco consultants undertook the annual monitoring of Tetratheca juncea within the NREA and SREA in September 2016 to determine if longwall mining and its associated activities had impacted populations identified in the Newstan Life Extension Area Environmental Impact Assessment Study. The monitoring undertaken in 2016 suggested that the number of clumps in each REA quadrat have been steadily increasing over time. Regression analysis indicates that the apparent trend is not significant for the NREA at the 95% confidence level but is significant for the SREA. The monitoring concluded that it was apparent that the presence of the reject emplacement areas had not had a negative impact on the viability of the associated *Tetratheca juncea* populations and that there was no evidence that the overall habitat in the monitored areas had declined in quality between monitoring occasions.

This report can be found in Appendix 4.

The Longwall TJ transect monitoring ceased in 2014.

6.5 HERITAGE

In 2012 Centennial Coal developed the Centennial's Northern Holdings Aboriginal Cultural Heritage Management Plan. This document aims to provide a consistent approach to consultation between Centennial and the Aboriginal community as well as identify standard Aboriginal cultural heritage monitoring and management requirements. A revised Northern Region Aboriginal Cultural Heritage Management Plan was submitted to DPE in July 2016 and was approved on 15 September 2016.

The LEA EIS identified rock shelters within sandstone outcrops on ML1452 to the east of current mining operations. It also suggested that there may be potential sites along Lords Creek that may be impacted by subsidence repair works in Lords Creek. Mining has not occurred in the eastern sections of ML1452 therefore there has been no potential for impact on the rock shelters. LW24 and 25 were shortened such that no mining occurred under Lords Creek hence the need to undertake subsidence repair works in Lords Creek is negated.

The LW24 SEE identified a scar tree approximately 400m north-west of LW24. This scar tree has not been impacted by mining operations.

Due to Newstan Colliery being on care and maintenance during the reporting period, no pre and post mining monitoring was required to be conducted to assess any impacts on archaeological heritage as a result of mine subsidence.

6.6 WASTE

All opportunities for waste avoidance and minimisation are considered by all staff and contractors across all areas including; contracts, purchasing, equipment procurement and waste generation processes.

Waste oil and greases are stored in tanks and drums within bunded areas for removal by a licenced waste management contractor for recycling or disposal. Oil water separation is achieved by the use of hydro-cyclone oil water separators at Newstan flows from vehicle work and storage areas and the wash down bays.

Hydrocarbon spill kits are inspected monthly by a licenced waste management contractor and re-stocked as required. Oily rag bins and oil filter bins are also serviced on a monthly basis.

Office paper and cardboard is collected and recycled by a licenced waste management contractor. Metals are collected and stored in steel bins onsite prior to removal. In 2016, a total of 199 tonnes of scrap steel was recycled. This compares with 392 tonnes recycled in 2015 due to a major clean-up of equipment at Newstan.

General refuse and non-recyclable materials are sorted and stored in 15m steel bins. The material was collected by a licenced waste management contractor for disposal. In 2016, 65 tonnes of refuse material was taken off-site for disposal.

Of the total waste collected at Newstan in 2016 (277 tonnes), approximately 77% was recycled including steel, plastics, liquid waste, oils, paper and cardboard, filters grease, oily rags and oil filters. This compares with a recycling result of 71% in 2015.

6.7 RAINFALL MONITORING RESULTS

The total monthly rainfall data is shown below in Table 16.

Table 16: Rainfall at Newstan Colliery for the Period January 2016 to December 2016.

2016 Month	Newstan Colliery Total Rainfall (mm)
January	398
February	27.8
March	51.5
April	23
May	14.5

2016 Month	Newstan Colliery Total Rainfall (mm)
June	170.5
July	67.8
August	77.5
September	56.5
October	60.0
November	40.5
December	63.5
Total	1051.10

A total of 1051.10 mm of rainfall was recorded at Newstan Colliery during the reporting period. The total annual rainfall for 2016 was less than the total rainfall recorded in 2015 (1591.8). The wettest period was in January 2016 recording 398mm.

7 WATER MANAGEMENT

7.1 SURFACE WATER MANAGEMENT

Water monitoring is undertaken in accordance with the Revised Water Management Plan, Development Consent and Environment Protection Licence 395 requirements. Newstan Colliery's Environmental Protection Licence (EPL) was last varied on 17 November 2015.

The basis of the mine's water management is based on reuse of water on site including sediment laden runoff contained in sediment dams.

Water runoff is concentrated via a network of kerb and guttering, collection sumps, pipes and drains, sediment sumps and pollution control dams. Water is then pumped to Connolly's Dam for reuse in the coal preparation plant.

An assessment of the potential impact on LT Creek and Lords Creek was undertaken for the Main West Project Approval. The Newstan Colliery pit top lies within the upper catchment of LT Creek. The creek consists of a North Arm and South Arm that combine within the residential/ commercial area of Fassifern before flowing into Fennell Bay on the western side of Lake Macquarie. LT Creek is originally an ephemeral system but discharges into LT creek have continued for over 35 years and the North Arm has been receiving water from the underground mine water storage since 2001 via LDP001; this has resulted in a continuous baseflow within LT Creek.

The Newstan Colliery, Surface Water Quality Assessment examined the existing surface water quality in order to determine background and baseline values for the watercourses associated with discharge from Newstan Colliery's operations. The assessment found that downstream water quality in LT Creek has generally been slightly to moderately alkaline and brackish, and generally within the background trigger value limits for LT Creek (North Arm).

Underground mining in the Main West Area was within the catchment of Lords Creek. Lords Creek is a tributary of Jigadee Creek, Jigadee Creek drains to Dora Creek, which is a major tributary of Lake Macquarie. Surface impacts have been negligible and cannot

be measured. The potential surface water impacts associated with Main West have been identified and assessed. It is concluded that surface impacts to Lords Creek are negligible.

The underground water management system at Newstan Colliery involves mine water injections into, and extractions out of, an underground mine water storage. The underground storage is a combination of the goaf in the Great Northern and Fassifern seam workings at Newstan Colliery. The Water Management Plan reports that the existing outputs from the underground water system are:

- extraction of water from the underground storage via the Fassifern No. 1 borehole (up to 11.0 ML/day); and
- discharge through the underground emergency discharge pipeline (known as the "Stony Creek pipeline" & EPL Point 17).

Water extracted from underground storage is transferred and discharged to the North arm of LT Creek via LDP001. Investigations by GHD have identified that underground water extraction (via the Fassifern No. 1 borehole) of 11 ML/day is required under operational conditions to maintain the underground water level at least 2 metres below the invert of the Stony Creek pipeline (EPL Point 17). Newstan Colliery received an EPL variation in October 2012 to increase the volume of water discharged through LDP001 from the current EPL limit of 7 ML/day to 11 ML/day. This variation also included discharge limits for a range of pollutants. All 2016 non-compliances associated with the EPL are documented in Section 11.

In 2014 Newstan commissioned the Clean Water Plant at Newstan Colliery. This allows Newstan to treat water from the surface and the Fassifern Seam, prior to discharging through LDP001. The CWP employs coagulation, flocculation, sedimentation, and filtration treatment to reduce the turbidity, concentration of total suspended solids (TSS) and as a by-product also reduce the total (unfiltered) metal concentrations before water is discharged to LT Creek via LDP001. Water that was previously transferred directly from the Fassifern Underground Storage to LDP001 is now directed to McKendry's Dam and treated by the CWP at a maximum rate of 14 ML/day. Water treated by the CWP may also be used to supply mining processes and the CPP at Newstan. The CWP does not remove all total metals and dissolved metals.

With the increase in LDP001 volume discharge and the installation of the CWP, Newstan Colliery has generally been able to maintain the Fassifern Storage at a low level. In 2016 an intense east coast low rainfall event resulted in a discharge from EPL Point 2 (Final Pollution Control Dam).

Exceedances of limits LDP001 and LDP002 during the reporting period are discussed in further detail within Section 11.

Figures 6, 7, 8 and 9 show the pH, total suspended solids (TSS), oil & grease & conductivity for discharge waters through LDP001 in 2016. Note: If results are less then the limit of reporting, a value of 0 is put in for the development of the below graphs.

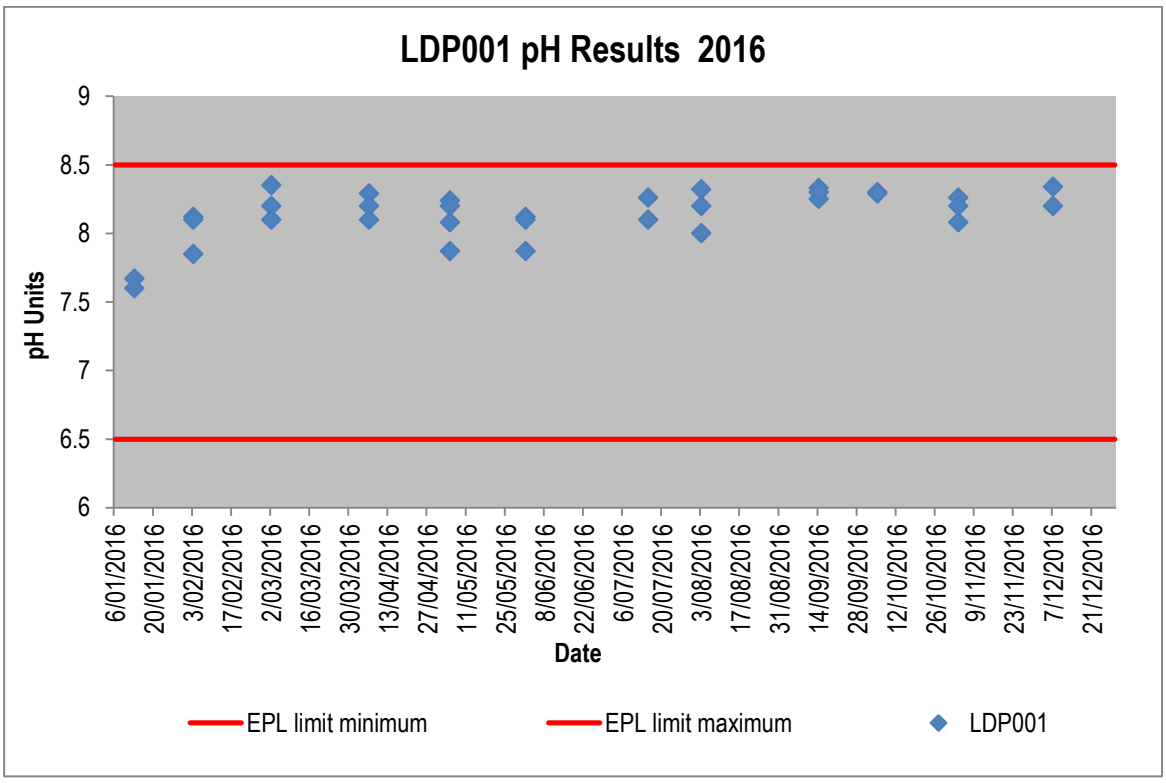

Figure 6: LDP001 pH Result 2016

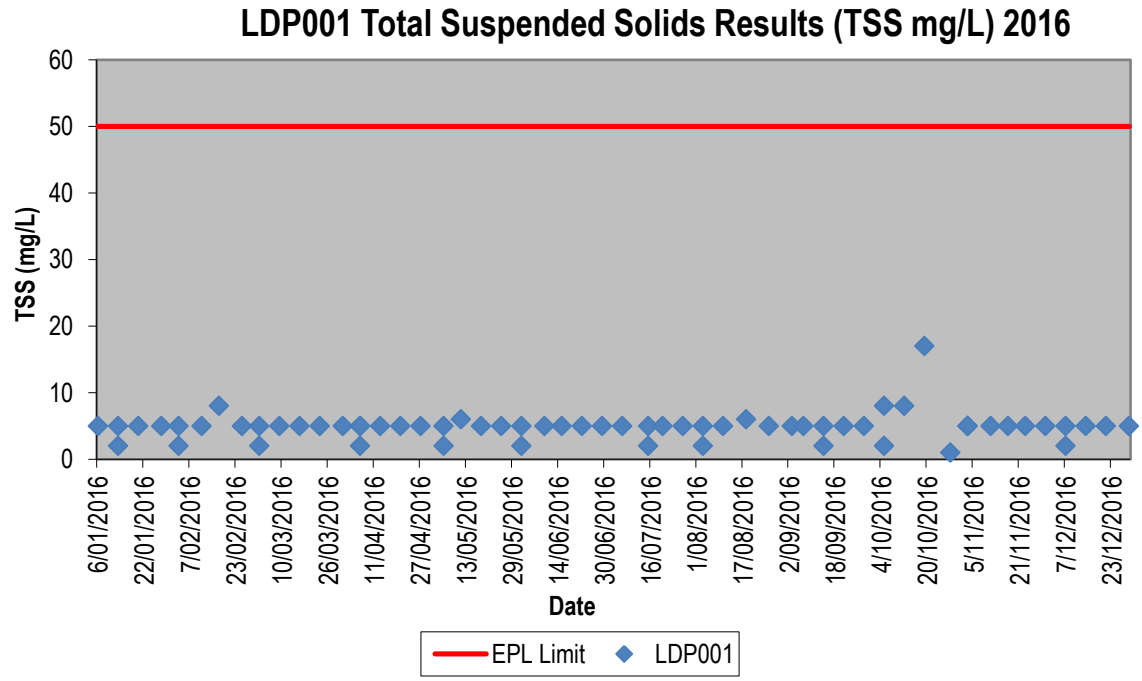

Figure 7: LDP001 Total Suspended Solids Result 2016

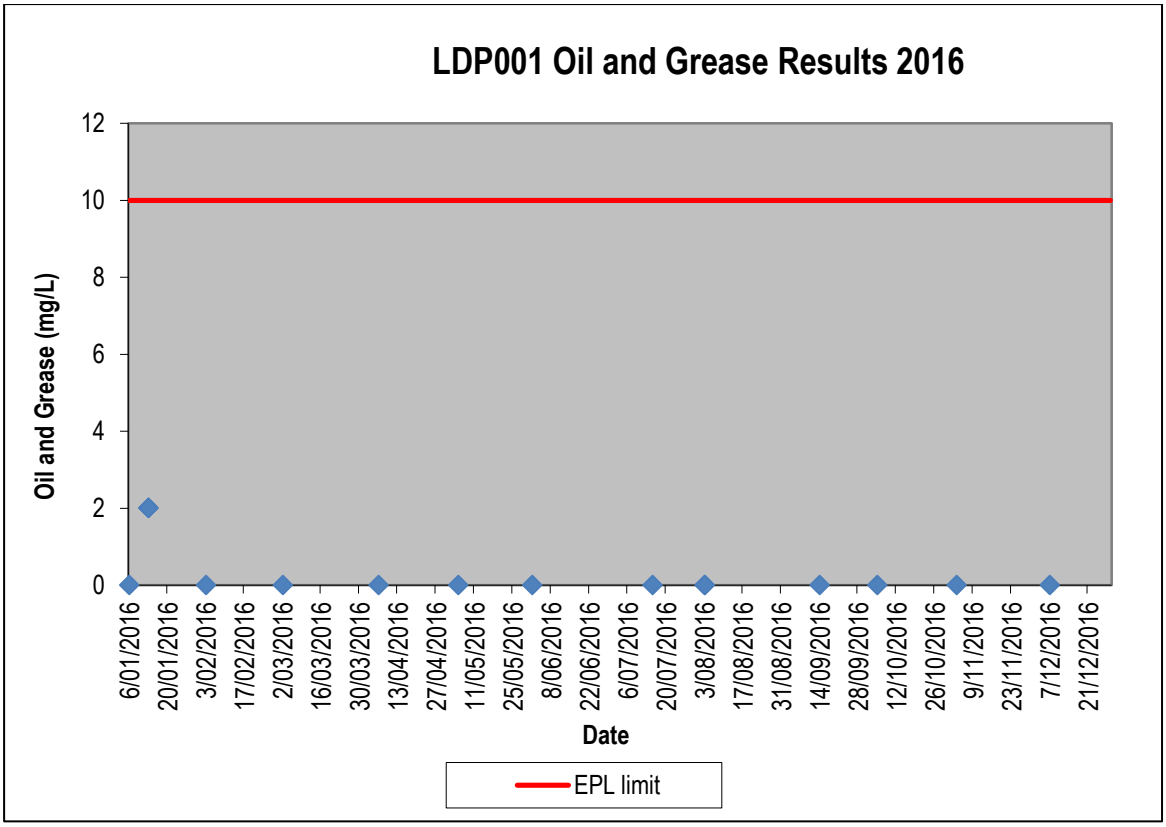

Figure 8: LDP001 Oil and Grease Result 2016

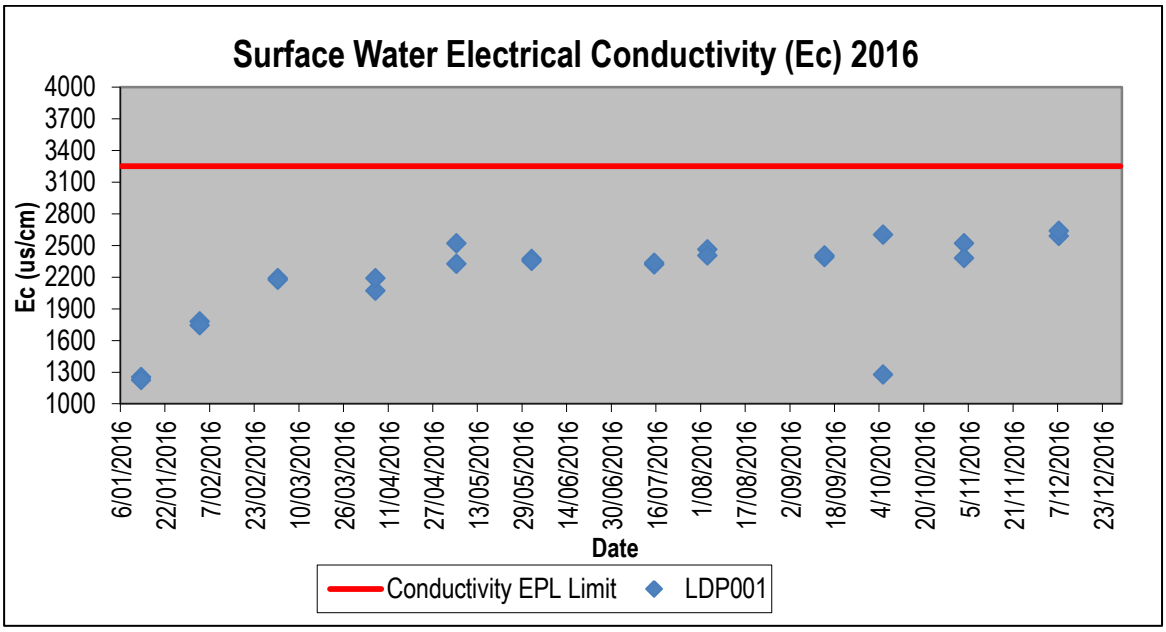

Figure 9: LDP001 Electrical Conductivity Result 2016

An historical overview of monitoring results (including metals) is provided in the report in Appendix 2. Surface monitoring locations are provided in Plan– NS2541A.

A summary of the water volume and quality data of EPL monitoring points can be found in Table 17 and Table 18. There were two exceedances of the bicarbonate alkalinity limit of 711 mg/L from LDP001 during the reporting period. These exceedances are discussed in detail in Section 11. All other parameters in Table 17 and Table 18 were within EPL limits.

On 6 January 2016, an overflow of the Final Pollution Control Dam through LDP002 occurred during East Coast low rain event, resulting in an exceedence of the total suspended solids limit of 50 mg/L. This exceedance is discussed in detail in Section 11.

Table 17: Licenced Discharge Points Volume

Frequency	Licenced discharge point	No. of measurements made	Lowest result (ML/day)	Mean result (ML/day)	High result (ML/day)
Daily during any discharge	LDP001	345	0.013	8.178	10.944
Daily during any discharge	LDP002	2	0.0029	3.888	7.774
Daily during any discharge	LDP017	No discharge occurred during reporting period			

Table 18: LDP001 Water Quality Summary

Pollutant	Unit of measure	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Aluminium (dissolved)	milligrams per litre	12	25	LOR	0.00	0.01
Arsenic (dissolved)	milligrams per litre	12	25	LOR	0.00	0.0003
Barium (dissolved)	milligrams per litre	12	25	0.058	0.10	0.149
Bicarbonate alkalinity	milligrams per litre	12	25	210	596.56	733
Boron (dissolved)	milligrams per litre	12	25	0.10	0.19	0.28
Cadmium (dissolved)	milligrams per litre	12	25	LOR	0.00	LOR
Calcium (dissolved)	milligrams per litre	12	25	16	30.21	48
Chloride (dissolved)	milligrams per litre	12	25	190	334.28	470
Chromium (total)	milligrams per litre	12	25	LOR	0.00	0.007

Pollutant	Unit of measure	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Cobalt (dissolved)	milligrams per litre	12	25	LOR	0.00	0.0003
Conductivity	Microsiemens per centimetre	Continuous	358	1116.1	2216	2669.78
Copper (dissolved)	milligrams per litre	12	25	LOR	0.00	0.003
Iron (dissolved)	milligrams per litre	12	25	LOR	0.002	0.018
Lead (dissolved)	milligrams per litre	12	25	LOR	0.00	0.002
Lithium (dissolved)	milligrams per litre	12	25	0.005	0.12	0.169
Magnesium	milligrams per litre	12	25	5.88	11.09	17
Manganese (dissolved)	milligrams per litre	12	25	LOR	0.00	0.001
Mercury (dissolved)	milligrams per litre	12	25	LOR	0.00	LOR
Molybdenum (dissolved)	milligrams per litre	12	25	0.004	0.02	0.028
Nickel (dissolved)	milligrams per litre	12	25	0.004	0.007	0.01
Nitrogen (total)	milligrams per litre	12	25	LOR	0.23	0.41
Oil and Grease	milligrams per litre	12	82	LOR	0.27	2
pH	pH	Continuous	358	6.51	7.56	8.31
Phosphorus (total)	milligrams per litre	12	25	LOR	0.002	0.007
Potassium (dissolved)	milligrams per litre	12	25	2.51	4.07	5.1
Selenium (total)	milligrams per litre	12	25	LOR	0.00	0.006
Sodium	milligrams per litre	12	25	228	481.44	600
Sulfate (dissolved)	milligrams per litre	12	25	25	99.16	135
TKN-N	milligrams per litre	12	25	LOR	0.05	0.25
Total sulfate	milligrams per litre	12	25	25	99.16	135

Pollutant	Unit of measure	No. of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Total suspended solids	milligrams per litre	52	62	LOR	0.61	8
Turbidity	Nephelometric turbidity units	Continuous	358	0.05	0.23	10.59
Zinc (dissolved)	milligrams per litre	12	25	LOR	0.005	0.022

The Water Management Plan was revised and submitted to the DPE for approval in July 2016. The Mine Water Discharges Management Plan was submitted to the DPE for approval in September 2016.

7.2 GROUNDWATER MANAGEMENT

Newstan has eighteen groundwater monitoring bores that were installed to establish groundwater baseline conditions for the proposed Awaba Open Cut Mine. Even though the application for the Awaba Open Cut Mine was withdrawn, it was determined appropriate to continue monitoring the groundwater bores to determine the impact of longwall mining on the groundwater levels and quality. Biannual analyses monitoring and reporting of water level, pH and electrical conductivity (EC) is undertaken.

The EIS states that in the Eastern part of the Life Extension Area (LEA) where the depth of cover ranges up to 400 metres, the height of interconnected fracturing of 80 metres is considered to have very low to negligible probability of tapping into any surface alluvial aquifers. In the far western part of the LEA with the depth of cover reduced to as low as 50 metres in the vicinity of Palmers Creek, there is an increased potential for drainage of alluvium aquifers into the mine workings.

It was considered that the potential for significant mine water inflows from the surface alluvial deposits is minimal and the rate of water inflow into the mine in the proposed LEA should be similar to that experiences from the earlier workings in the existing Newstan Colliery.

The SEE subsidence predictions for LW24, and the general concept of strata disturbance above longwall mines, indicates that vertical fracturing may extend to a height of 100m above LW24. Therefore the shallow aquifers within the SEE boundary may potentially be impacted where the depth of cover between the longwall panel and base of alluvium is less than 100m. The cover thickness review indicated that the thickness is greater than 100m over the whole of LW24. It was considered that there is minimal risk of impacting the alluvium of Lords Creek.

In all subsided areas there may be shallow surface cracking. Where this occurs beneath saturated alluvium of regolith and does not provide hydraulic connection to the mine, there is still potential for short-term loss of alluvium /regolith groundwater in this zone of increased permeability. This may lead to very temporary, minor lowering of groundwater levels that will only persist for as long as is required to fill the new void cracks.

Where the Main West Area underlies the Lords Creek alluvium (north-eastern section), the depth of cover is approximately 70 – 90 metres. At this depth of cover it is very

unlikely that fractures would develop and that there would be loss of groundwater from the alluvium for the past bord and pillar mining.

Any reduction in groundwater levels within the Lords Creek alluvium is also unlikely, based on the predicted subsidence calculations. It is predicted that the vertical subsidence above the proposed Main West mine area will be less than 20 millimetres and that surface impacts will be negligible and cannot be measured.

Monitoring of groundwater levels within Lords Creek alluvium indicates that recent mining, using longwall mining methods, adjacent to the Main West Area has not resulted in a reduction in groundwater levels or a loss of groundwater from the alluvium.

Therefore it is unlikely that the bord and pillar workings within the Main West Area will impact the groundwater in the overlying Lords Creek alluvium. It is not anticipated that mining within the Western Zone will impact on alluvial groundwater or groundwater-dependent ecosystems.

The Modification to Development Consent (DA-73-11-95 Mod 4) in 2012 required the preparation of a Groundwater Monitoring Program for the Main West Mining Area. This management plan has been submitted for approval. This monitoring plan stipulates quarterly monitoring of MB10, MB11, MB12, MB13 & MB15 for depth to water, conductivity and pH which commenced in 2013.

The shallow bores are purged and sampled with foot valves and tubing dedicated to each bore, whereas the deeper bores (MB02-MB06, MB16 and MB18), monitoring the coal seam aquifers, are sampled with a Bennett Auto Sample Pump with tubing dedicated to each well.

Baseline water samples were collected from the installed bores during the first sampling round in October 2005. Subsequent monthly sampling to date has involved measurement of water level and field measurement of pH and EC.

Table 19: Alluvial Aquifer Results for 2016

Alluvial Aquifers									
Monitoring Bore		MB9	MB10	MB11	MB12	MB13	MB14	MB15	MB17
Groundwater Level (Baseline)	mbgs	0.96	3	2.52	5.33	4.88	3.73	5.88	2.63
Groundwater Level (Historical Average)	mbgs	1.41	2.59	2.48	4.92	4.71	3.50	4.06	2.76
Groundwater Level (2016)	mbgs	1.48	2.74	2.76	3.98	4.84	3.37	2.44	2.82
Chemical Parameters									
pH (Baseline)	pH unit	7.16	5.98	5.85	6.2	6.55	6.33	5.71	6.53
pH (Historical Average)	pH unit	5.75	6.13	6.05	6.55	6.56	6.42	6.00	6.16
pH (2016)	pH unit	5.92	6.49	6.69	7.07	6.83	6.89	6.49	6.76
Electrical Conductivity (Baseline)	uS/cm	300	1000	2400	1000	600	580	100	225
Electrical Conductivity (Historical Average)	uS/cm	257	1424	3492	1461	792	478	300	192
Electrical Conductivity (2016)	uS/cm	229	1155	3738	994	1012	404	260	196

Graphs of water level, pH and EC trends for the history of the bores are shown on Figures 10, 11 and 12 respectively.

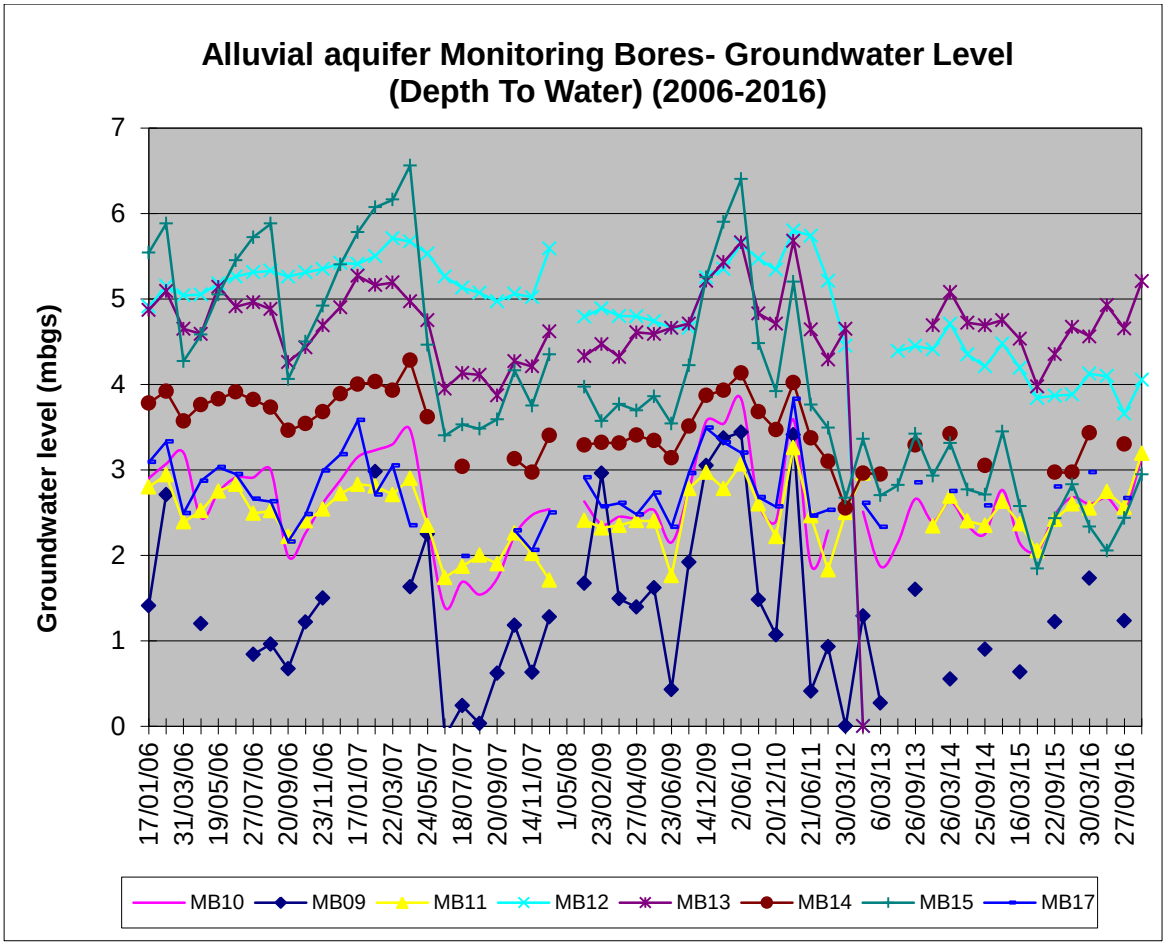

Figure 10: Alluvial aquifer monitoring bores – level trends (2006 – 2016)

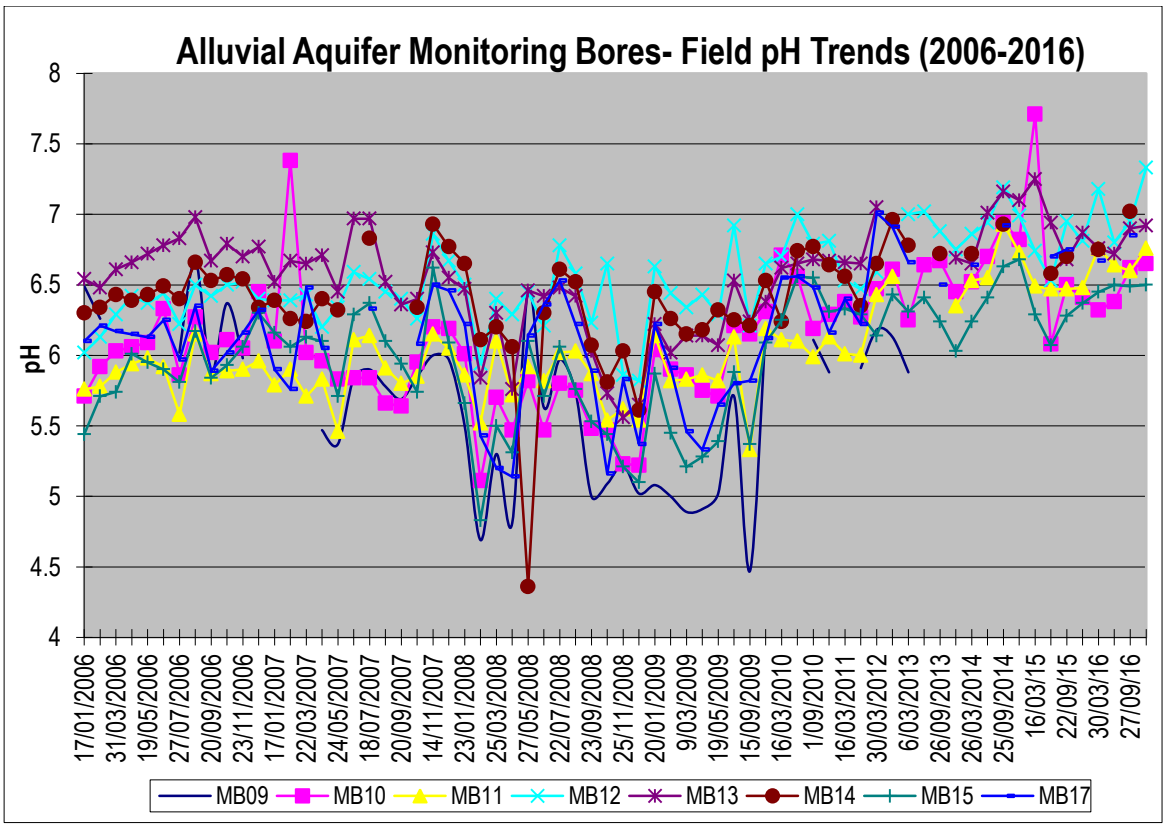

Figure 11: Alluvial aquifer monitoring bores – pH trends (2006 – 2016)

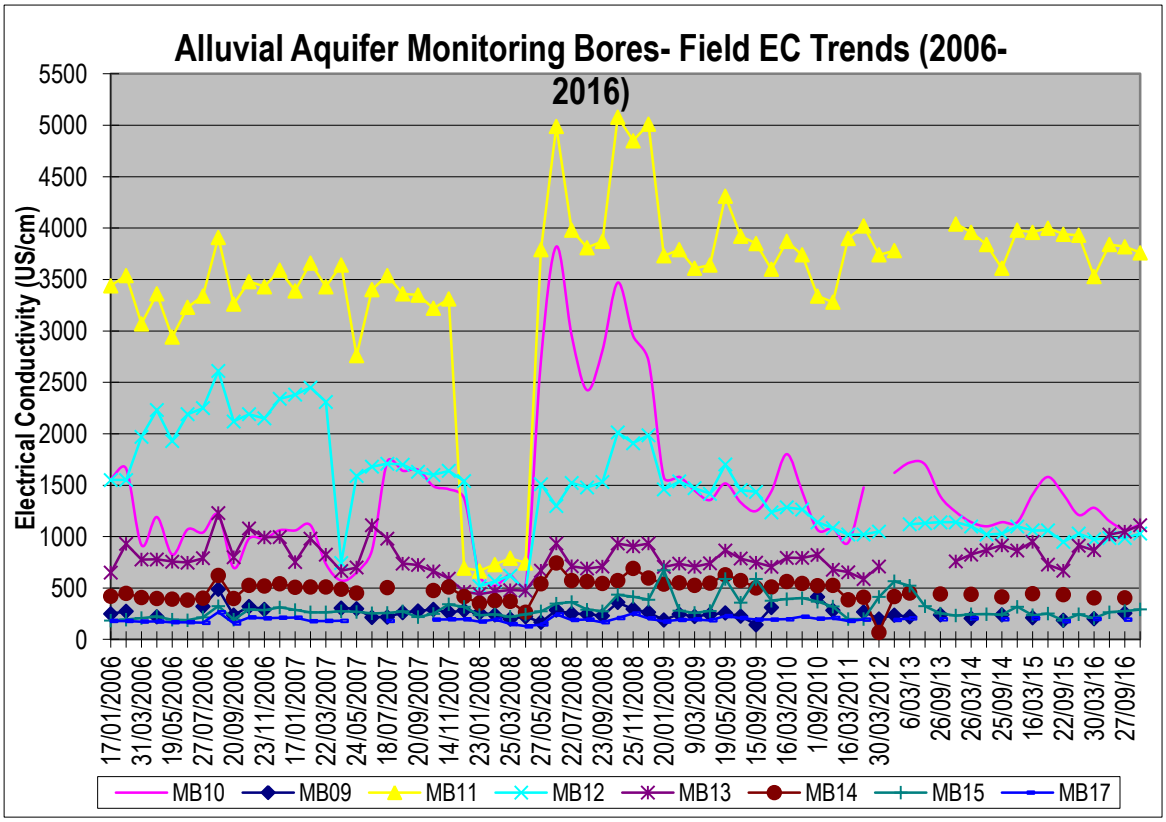

Figure 12: Alluvial aquifer monitoring bores – Ec trends (2006 – 2016)

The water levels indicate that generally the aquifer levels are higher then baseline and the average water levels over the historical monitoring period. The data indicates a slightly acidic to neutral pH generally in the range of 5.8 to 6.6 for 2016 for the alluvial groundwater, which is similar to baseline and historical data. The electrical conductivity (EC) has a wide range of 257-3492μS/cm. This large range may reflect the recharge source of the alluvial groundwater at the monitoring locations by either;

- direct surface infiltration from rainfall, giving relatively low EC readings; or
- upward leakage or lateral flow from the Permian sediments into the alluvium, giving higher EC readings.

Figure 12 indicates that monitoring bore MB11 has relatively high EC levels (although variable), ranging from 666 to 5080 μS/cm. The EC of the remainder of the bores is generally less than 2000μS/cm.

Table 20: Coal Seam Bedrock Aquifer Results for 2016

Coal Seam										
Monitoring Bore		**MB1**	**MB2**	**MB3**	**MB4**	**MB5**	**MB6**	**MB16**	**MB18**	**MB19**
Groundwater Level (Baseline)	mbgs	29.78	11.25	9.9	22.01	24.35	45.17	33.28		
Groundwater Level (Historical Average)	mbgs	30.02	11.45	10.53	20.10	24.17	44.69	33.38	19.37	21.51
Groundwater Level (2016)	mbgs	NA	NA	9.53	18.84	23.49	45.41	33.01	21.78	24.15
Chemical Parameters										
pH (Baseline)	pH unit	6.79	6.53	6.73	5.64	6.39	6.51	6.1		
pH (Historical Average)	pH unit	6.88	6.01	7.19	5.34	6.24	6.58	5.94	7.11	6.70
pH (2016)	pH unit	NA	NA	6.98	4.88	6.37	6.92	6.12	7.26	6.38
Electrical Conductivity (Baseline)	uS/cm	3020	1620	652	291	1820	1440	780		
Electrical Conductivity (Historical Average)	uS/cm	2820	1340	1247	209	1708	1289	623	2049	1780
Electrical Conductivity (2016)	uS/cm	NA	NA	453	477	1770	1280	511	1070	72

Graphs of water level, pH and EC trends for the history of the bores are shown on Figures 13, 14, and 15 respectively.

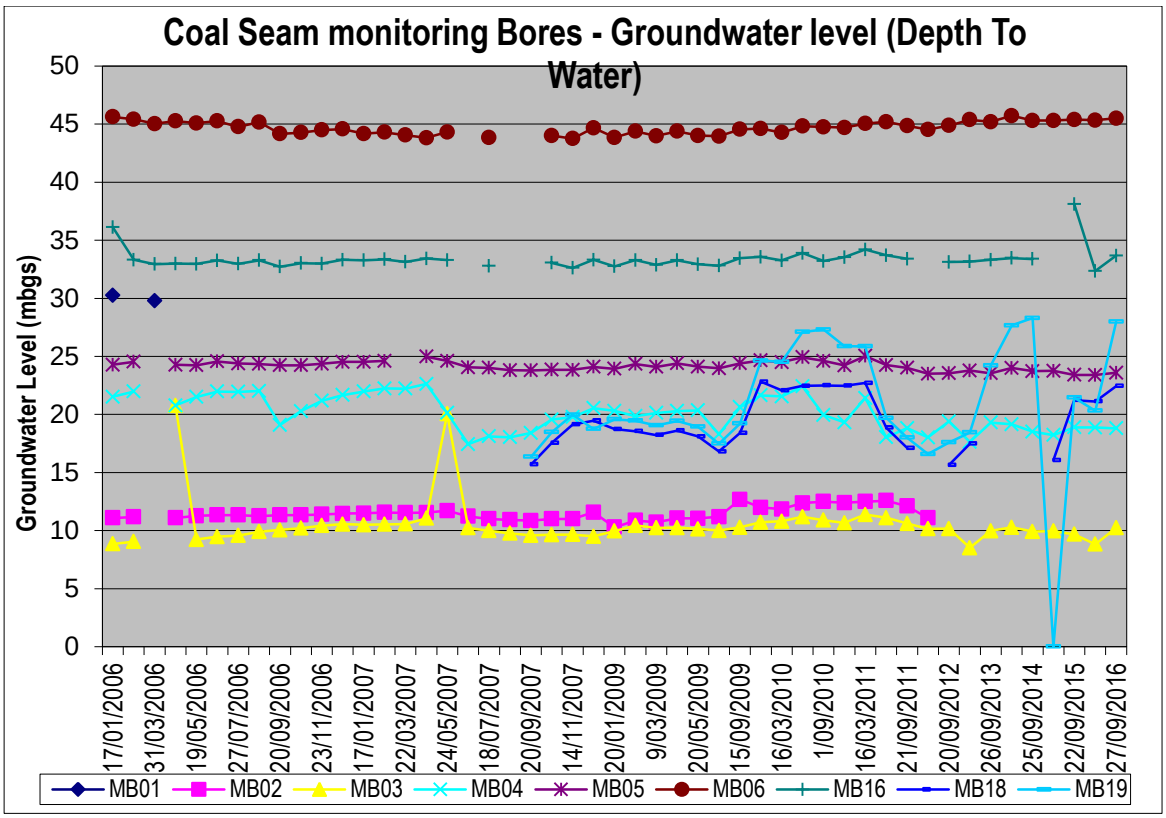

Figure 13: Coal Seam monitoring bores – level trends (2006 -2016)

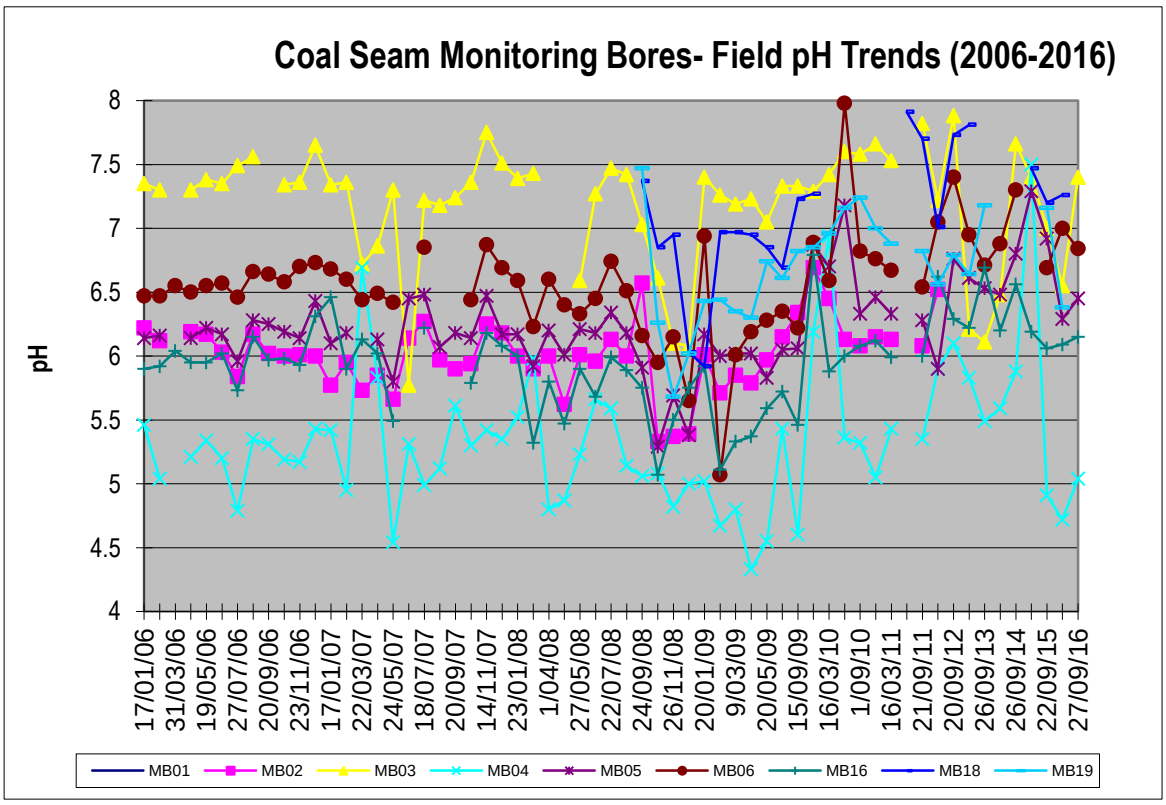

Figure 14: Coal Seam monitoring bores – pH trends (2006 -2016)

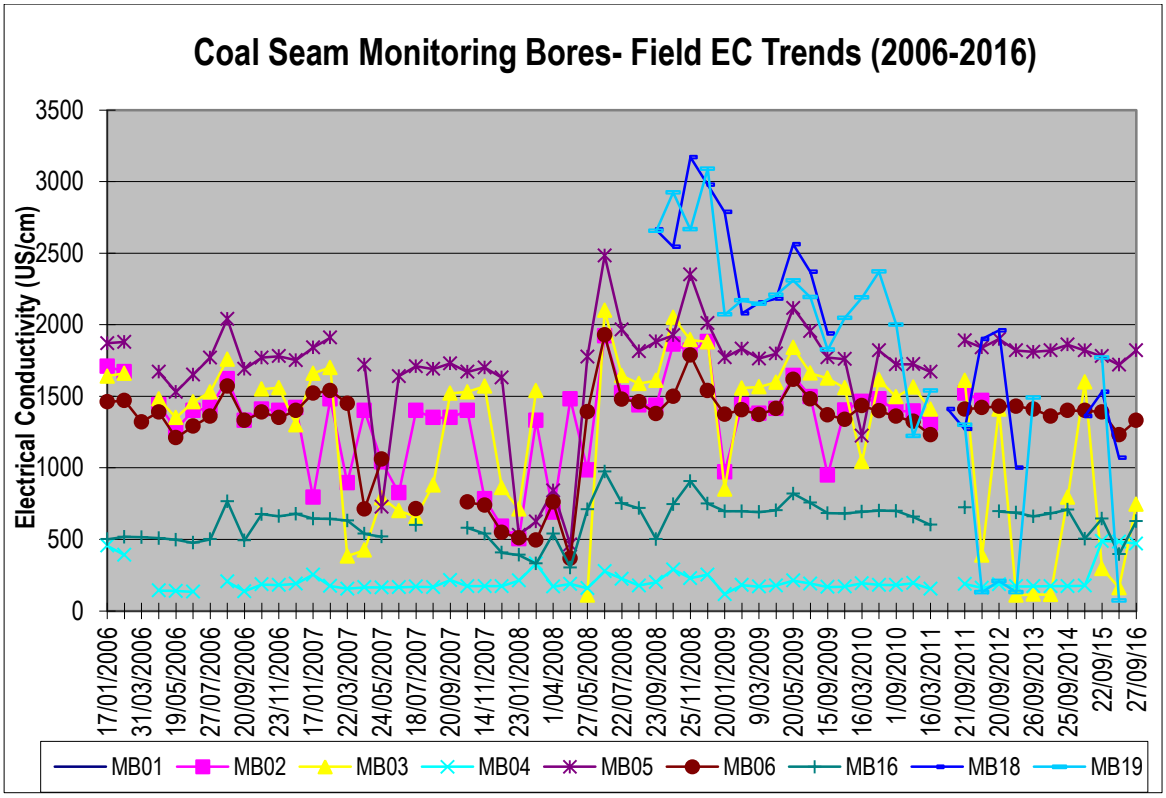

Figure 15: Coal Seam monitoring bores – Ec trends (2006 -2016)

The water levels within the Coal Seam bores were generally stable in 2016. The pH trends shown on Figure 14 indicate that groundwater from the coal seams were quiet variable, ranging from 4.72 to 7.4 during 2016. This could be a result of direct filtration into the shallower bores such as MB18.

Groundwater samples collected from the coal seam monitoring bores have a variable EC with the average conductivities ranging from 72µS/cm to a high of 1820 µS/cm in 2016 as shown on Figure 15.

7.3 Water Budget

Newstan utilises potable and recycled water for surface operations and recycled water from dams and old workings for underground operations.

Potable water is used in the bathhouse and amenity systems. All other operations utilise recycled water from the colliery dams, Fassifern No 1. Bore, and the Clean Water Plant. The Clean Water Plant at Newstan Colliery commenced operating in December 2013.

The average volume of water discharged from LDP001 during the reporting period was 7.77 ML per day with a total of approximately 2509.3ML being discharged for the year. Water from LDP001 discharges to the By-wash Dam where it is allowed to discharge to LT Creek.

A summary of discharges recorded by Newstan Colliery is provided in Table 22.

Table 21: Discharge Data Recorded by Newstan for 2015

Discharge Point	Total Annual Discharge (ML)
LDP001	2509.3
LDP002	7.78
EPL Point 17 Stony Creek Pipeline	0

8 REHABILITATION

8.1 Buildings

No additional buildings were undertaken during the report period at Newstan. No buildings were removed during the reporting period.

8.2 Rehabilitation of Disturbed Land

The NREA tailings dam is approximately 70% capped at the end of the reporting period. These works are planned to continue in the 2017 reporting period when waste rock / chitter material becomes available. The NREA tailings dam also serves as an emplacement area for waste rock / chitter material. Coarse rejects are transported by truck from the CPP to the NREA where it is used as a rehabilitation capping material, as well as an emplacement area for course rejects material.

Progressive stabilisation and rehabilitation of disturbed areas is undertaken with all land disturbance activities associated with the Newstan Colliery activities.

Re-contouring of the old reject emplacement areas in the NREA continued during the reporting period. Capping and revegetation of this area was also undertaken during the reporting period, and seeding of rehabilitation growth media with a native species mix of an area of approximately 2.1ha completed.

In accordance with the current approved MOP Rehabilitation inspections will be undertaken to check for:

- Evidence of soil erosion;
- Evidence of cap slumping / settlement;
- Highwall instability (SREA)
- Slope instability
- The presence of declared weeds.

Rehabilitation monitoring will include flora and fauna monitoring methodologies as per the Flora & Fauna Management Plan, as well as any observed occurrences of invertebrate recolonisation (ants, soil faunal communities establishing). This monitoring commenced annually in 2015 and will continue until completion criteria have been satisfied.

Maintenance will be undertaken as required until the rehabilitation success criteria has been achieved, and continued until lease surrender.

Table 23 displays a rehabilitation summary for the Newstan Colliery.

Table 22: Newstan Awaba Rehabilitation Summary

Domain	Area Affected / Rehabilitated (ha)	
	Total Area at MOP start (Plan 3A)	Total Area at end of reporting period
Mine Lease Area		
Mine Lease(s) Area	3989.9	3989.9
Domain 1: Infrastructure Area		
Active Mining Area	102	102
Decommissioning	-	-
Landform Establishment	-	-
Growth Medium Development	-	-
Ecosystem and Land Use Establishment	-	-
Ecosystem and Land Use Sustainability	-	-
Relinquished Lands	-	-
Total	102	102
Domain 2: Tailings Storage Facility		
Active Mining Area	56.2	54.1
Decommissioning	-	-
Landform Establishment	7.0	7.0
Growth Medium Development	-	-
Ecosystem and Land Use Establishment	11.7	13.8
Ecosystem and Land Use Sustainability	20.8	20.8
Relinquished Lands	-	-
Total	95.7	95.7
Domain 3: Water Management Area		
Active Mining Area	11.8	11.8
Decommissioning	-	-
Landform Establishment	-	-
Growth Medium Development	-	-

Domain	Area Affected / Rehabilitated (ha)	
	Total Area at MOP start (Plan 3A)	Total Area at end of reporting period
Ecosystem and Land Use Establishment	-	-
Ecosystem and Land Use Sustainability	-	
Relinquished Lands	-	-
Total	11.8	11.8
Domain 5: Stockpiled Material		
Active Mining Area	12.0	12.0
Decommissioning	-	-
Landform Establishment	-	-
Growth Medium Development	-	-
Ecosystem and Land Use Establishment	-	-
Ecosystem and Land Use Sustainability	-	-
Relinquished Lands	-	-
Total	12.0	12.0-
Domain 8: Underground Mining Area		
Active Mining Area	0 (Area above workings is 5088 ha)	0
Decommissioning	-	-
Landform Establishment	-	-
Growth Medium Development	-	-
Ecosystem and Land Use Establishment	-	-
Ecosystem and Land Use Sustainability	-	-
Relinquished Lands	-	-
Total	-	-

* Estimate only

8.3 Rehabilitation Trials and Research

No rehabilitation trials or research was undertaken at Newstan Colliery during the reporting period. Rehabilitation works undertaken to date on the NREA and SREA have proven successful therefore negating the need to undertake rehabilitation trials.

Analogue Rehabilitation areas were chosen in 2014 in accordance with the Flora & Fauna Management Plan to provide comparative data for the Rehabilitation of the Newstan Colliery lease area. Monitoring at these locations commenced in 2015. The areas chosen include historical rehabilitation site in the NREA, and the Fauna Corridor to the west of the Colliery. The Annual Monitoring Report can be found in Appendix 3.

9 COMMUNITY CONSULTATION

A Community Consultative Committee (CCC) has been in place at Newstan since 1999. In 2011 Awaba Colliery was joined into the Newstan Colliery CCC. The Committee generally meets quarterly to review the environmental performance of the mine and other relevant matters. Minutes of the meeting are kept and distributed by the independent Chairman. The minutes are also available on the Centennial Newstan website. Meetings of the Newstan and Awaba Colliery CCC were held in February, June and December during the reporting period.

9.1 Community Sponsorship

Newstan Colliery continues to support the local community through various sponsorship avenues and in 2016 provided sponsorship to the Hunter Research Foundation.

9.2 Community Complaints

There were two community complaints regarding Newstan Colliery operations during the 2016 reporting period.

Table 23: Newstan Complaints 2016

Record of Complaints				
Site	**Date & Time of Complaint**	**Complaint Method**	**Nature of Complaint**	**Newstan/Awaba Response**
Newstan	04/05/16	Phone	Delivery truck noise and speed	Newstan had two particularly noisy trucks removed from the delivery job. Newstan advised the resident that they would speak to the company about speed but had no control over driving on residential roads.
Newstan	18/08/16	Phone	Delivery truck noise	One truck was removed from the delivery fleet as a result of brake noise. An alternate delivery route was established and the monitoring of delivery truck movements was increased to assess delivery truck noise.

The Newstan community complaints and enquiries line is in place and contactable on 1800 247 662. Callers are directed to the Environment and Community Coordinator.

Table 24: Newstan Complaints Summary 2010 - 2016

Record of Complaints	
Year	**Total**
2010	21
2011	19
2012	5
2013	6
2014	0
2015	0
2016	2

10 INDEPENDENT AUDIT

An Independent Environmental Audit of Newstan's operations was completed by MCW Environmental Pty Ltd in May 2015. An action plan was prepared in response to the recommendations listed in the 2015 and was provided to the Department of Planning and Environment. A summary of progress against the Action Plan items is provided Table 26.

Table 25: Newstan Colliery Independent Environmental Audit Action Plan 2015

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
DA-73-11-98	1	**General** There is an obligation on the Applicant to prevent and minimise harm to the environment throughout the life of the project. This requires that all practicable measures are to be taken to prevent and minimise harm that may result from the construction, operation and, where relevant, decommissioning of the development.	Newstan has developed an Environmental Management Strategy and a number of Environmental Management Plans outlining the systems, processes and measures in place to prevent and /or minimise harm to the environment from Newstan operations. Other than where issues have been identified, in general the site appeared to be implementing its management system. An assessment of the implementation of the various management plans was conducted and is presented under the relevant Conditions and in the main section of this report. In 2013 Newstan constructed a Clean Water Plant (CWP) which it commissioned in early 2014. The CWP uses coagulation, flocculation, sedimentation and filtration to reduce turbidity and concentration of TSS prior to discharge to LT Creek via LDP001. Water that was previously discharged directly from the Fassifern underground Storage is now directed to and treated by the CWP as is surface runoff on-site. Newstan submitted the CWP project for the Engineers Australia Excellence Awards and the Australian Water Association Industry Awards in 2014 for leading practice incorporating extremely efficient design, full automation and low maintenance operation. During the audit period Newstan recorded a number of non-compliances and reportable incidents. Newstan was issued with two Penalty Infringement Notices (PINs) by the EPA for exceedances of TSS concentratrion limits at Point 1 and Point 2 on the 20.12.13. Newstan requested that the EPA review the PINS by letter dated 13.01.14 and they were subsequently revoked by the EPA. At the time of the audit, Newstan and the EPA were in arbitration over licence conditions. Incidents are discussed further in the main section of this report. While there was general compliance with the condition, on the basis of the reportable incidents occurring and the PINs issued by the EPA during the audit period,	Non-compliant Refer to recommendations made throughout the report.	Noted and addressed below. As discussed in depth with the auditors, the PINs issued to Newstan by the EPA were revoked. Newstan does not agree it is non-compliant against this condition due to the issuing of PINs by the EPA as shown by the evidence provided.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
			Newstan are considered non-compliant with the condition.			
DA-73-11-98 3.2 (e)		(d) The Applicant shall also prepare the following environmental management plans: - Archaeology and cultural management plan (refer condition 3.3) - Flora and fauna management plan (refer condition 3.4) - Erosion and sediment control plan (refer condition 3.5(a)) - Soil stripping management plan (refer condition 3.5(c)) - Landscape management plan (refer condition 3.7) - Bushfire management plan (refer condition 3.8) - Land management plan (refer condition 3.9(a)) - Wetland management plan (refer condition 3.9 (c)) - Site water management plan (refer condition 4.1) - Dust management plan (refer condition 6.1) - Noise management plan (refer condition 6.4(d)) (e) The management plans are to be revised/updated at least every 5 years or as otherwise directed by the Director-General in consultation with the relevant government agencies. They will reflect changing environmental requirements or changes in technology/operational practices. Changes shall be made and approved in the same manner as the initial environmental management plan. The plans shall also be made publicly available at LMCC within two weeks of approval of the relevant government authority.	(e) The following plans had not been revised and approved within the 5 year timeframe: - Environmental Management Strategy (2010) (revised and submitted in 2014, awaiting DPE approval) - Erosion and Sediment Control Plan (2006) - Soil Stripping Management Plan (2010) - Bushfire Management Plan (2009) - Land Management Plan (2010) - Water Management Plan (2006) (revised in 2009 and called the Revised Water Management Plan – RWMP however this has not been approved by the DP&E). On the basis of the above plans not been revised /approved in the last 5 years, this condition has been assessed as non-compliant.	Non-compliant **REC 04 NEWSTAN IEA 2015:** Review, update and/or seek approval of the following environmental management plans: - Environmental Management Strategy - Erosion and Sediment Control Plan (2006) - Soil Stripping Management Plan (2010) - Bushfire Management Plan (2009) - Land Management Plan (2010) - Water Management Plan Refer also to discussion of improvement opportunities of individual plans in main report.	Noted and addressed below.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
DA-73-11-98 3.3 (A)		**Heritage Assessment and Management** (A) The Applicant shall prior to construction of surface facilities or secondary workings within identified areas of archaeological sensitivity within the LEA: (i) Prepare an archaeology and cultural management plan which shall include, but not be limited to: (a) identification of any future salvage, excavation, monitoring, and protection of any heritage and archaeological items, within the area of the surface facilities, particularly the waste emplacement and coal stockpile areas, Awaba Colliery, and the area within the LEA prior to and during development; (b) measures to undertake test excavations along Lords Creek to verify the archaeological potential of those areas identified as having low archaeological sensitivity at least one year prior to finalisation of the route of channelisation or other proposed works along Lords Creek; c) details of proposed investigations of rock shelters and grinding groove sites identified as having potential to contain archaeological deposit to be undertaken prior to mining being undertaken in the vicinity of the identified sites. The investigation will include test excavations undertaken in accordance with a permit issued under section 87 of the National Parks and Wildlife Act 1974, under a research design which is acceptable to the Aboriginal community and OEH; (d) measures to protect Aboriginal sites from subsidence and mine working impacts, in consultation with OEH, the Aboriginal community and local residents to ensure integration of measures to protect Aboriginal sites; (e) identification and documentation of Aboriginal cultural heritage issues; (f) details of a monitoring program to	(A) Centennial Coal prepared an Aboriginal Cultural Heritage Management Plan (ACHMP) for its Northern Holdings which includes Newstan, Awaba, Myuna, Mannering and Mandalong mines. This Plan was approved by the DP&E by letter dated 26.11.12. In its letter the DP&E stated that the plan addresses the specific requirements of the development consent relating to Aboriginal heritage management. The Plan was developed in consultation with the various Aboriginal parties who had registered an interest to participate in the consultation processes for projects across Centennial's northern operations as well as OEH, LMCC and the CCC. A summary of the consultation process is presented in the ACHMP Aboriginal Consultation Log dated November 2012. An assessment of the adequacy of the plan is included in the main report. Newstan has also prepared an Archaeology and Cultural Management Plan for non-Aboriginal heritage which was last approved in 2006. It was reported that Newstan is in the process of revising this Plan for DP&E approval.	A (i) (b-f) Compliant A (i) (a) Non-compliant (non-Aboriginal) **REC 02 NEWSTAN IEA 2015:** Update the 2006 Archaeology and Cultural Management Plan to address the requirements of this Condition for non-Aboriginal heritage and cultural management.	Recommendations to be considered when updating the Archaeology and Cultural Heritage Management Plans.	A revised Northern Region Aboriginal Cultural Heritage Management Plan was submitted to DPE in July 2016 and was approved on 15 September 2016.

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		document the effects of subsidence and mining works on Aboriginal sites and areas of archaeological sensitivity. The plan shall be prepared in consultation with OEH, the Local Aboriginal Land Council, LMCC, and to the satisfaction of the Director-General, and shall be considered by the Applicant when completing the final underground mine layout.				
DA-73-11-98 3.4(a)		**Flora and Fauna Assessment and Management** (a) The Applicant shall prior to commencement of any construction works for surface facilities in the relevant area or secondary workings within the LEA, prepare and implement a Flora and Fauna Management Plan for the management of flora and fauna issues for the areas of the proposed surface facilities and LEA. The Plan shall be prepared in consultation with OEH and LMCC, and to the satisfaction of the Director-General, and shall include but not be limited to: (i) a detailed assessment of the current characteristics and ecological values of existing ecosystems likely to be affected by the development; (ii) strategies to minimise the net loss of ecologically significant vegetation communities within DA area as a result of the development, including the provision of compensatory areas of equivalent ecological and habitat value where necessary; (iii) strategies to provide increased security for existing habitats and communities (including the strengthening of riparian communities, the management of Tetratheca juncea plants in the vicinity of the proposed surface facilities, particularly in and around the northern and southern reject emplacement areas), and LEA, and habitats	(a) The Flora and Fauna Management Plan was revised and submitted to the OEH and LMCC for consultation by letter dated 21.05.14. A letter was received from the OEH stating that it does not review management plans (11.06.14). No comments were received by the LMCC. The DP&E reviewed the plan and requested minor amendments (by email dated 22.07.14). The Plan was amended accordingly and approved by the DP&E by letter dated 25.08.14. Table 1 of the Plan lists where in the document these requirements have been addressed. A review of the adequacy of the management plans is provided in the main section of the report. <u>Implementation</u> No major clearing had occurred during the audit period. Some clearing was required for the installation of two permanent monitoring stations upstream and downstream of the mine water discharge that flows into an unnamed creek ultimately flowing into Stony Creek. Hunter Eco was engaged to assess the ecological impacts of the disturbance and conduct a 7-part test. Newstan's Permit to Clear or Disturb Land form had been completed and signed off by the Environment and Community Manager (dated 12.02.13). The revised Plan states that nest boxes will be erected to replace hollows which cannot be salvaged at a ratio of one box per hollow bearing tree. No nest boxes were installed during the audit period as no hollow bearing trees were reportedly removed.	Compliant (preparation) Non-compliant (implementation)	The Annual Ecological Monitoring Report has been undertaken since the audit which will satisfy this condition as being compliant.	Annual Ecological Monitoring has commenced and is ongoing.

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		of other threatened species such as the Squirrel Glider and Threatened Bat Species identified in the species impact statement; (iv) strategies to manage the impact of surface water management, erosion and sediment control measures, and flooding mitigation measures on flora and fauna, including the impact of heavy machinery; (v) details of monitoring the mine's impacts on native vegetation and threatened fauna and flora, and outline contingency measures should impacts be identified as occurring (refer also condition 8.5); (vi) measures to monitor the impacts on threatened species populations shall address: 1. methods of clearing near existing vegetation and measures to protect existing vegetation from the edge affects. Consideration of buffers is essential, especially near drainage lines. 2. measures to reduce sediment into drainage lines. 3. subsidence impacts on Tetratheca juncea through a monitoring program. This program will be co-ordinated with a surveyed and levelled line to determine drops in the terrain, following mine subsidence; 4. development of a program to specifically monitor the success or otherwise of proposed ameliorative measures in relation to the threatened flora and fauna species over five years from the commencement of construction in the relevant area. The monitoring is to be undertaken by experienced Botanist(s)/ Zoologist(s). Annual progress reports and a final report outlining the implementation and success or otherwise of the ameliorative measures shall be included in the AEMR during the monitoring period. (vii) measures to maintain trees with denning	Weed management was undertaken by Hunter Land Management (HLM) for large areas and SNK for minor areas. A copy of HLM's weed spraying report for the 4-6th March 2015 was sighted. The 2006 Flora and Fauna Management included a requirement for - Monitoring of the condition and composition of vegetation communities in the subsidence area. - Monitoring of forest and woodland areas in the study area to ensure that habitat for native flora and fauna is maintained. - Undertake vegetation monitoring on an annual basis and report in the AEMR. - Monitoring of rehabilitation areas on an annual basis to assess the development and success of the rehabilitation and implement any necessary remedial works. - Following construction, surveys will be conducted for a period of five years to monitor the effect of the development on threatened fauna identified as occurring in the area. The 2012 IEA assessed this Condition as non-compliant on the basis that the above requirements of the Plan had not been implemented. This Plan was still relevant for part of the audit period (April 2012 to May 2014) prior to the approval of the revised plan. The revised Plan includes a comprehensive monitoring program including annual vegetation and fauna surveys and biennial habitat health assessment. At the time of the audit site inspection, Newstan was awaiting the draft report of the first annual ecological survey. Tetratheca juncea monitoring above longwalls 22-24 (in accordance with the previous version of the management plan) continued during the audit period (sighted reports for surveys conducted in 2012, 2013 and 2014). Whilst it is noted that the commencement of the monitoring program would demonstrate compliance with this requirement going forward, the lack of ecological			

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		hollows for the protection of threatened arboreal fauna species such as the Squirrel Glider and small Bats. In the event that trees and/or nesting value relevant to these species are felled and tree hollows relocated to augment habitat, and/or in the event that individual animals are captured and relocated during construction, this work shall be undertaken by a Zoologist with knowledge and experience in the implementation of such ameliorative techniques for these species; (viii) a large scale plan showing quadrat number locations for Tetratheca juncea together with a table showing sub-population sizes and their relevant co-ordinates. In particular, this information is required where populations will be lost by the Northern and Southern Reject Emplacement Areas; (ix) strategies to maintain and enhance wildlife corridors around and through the site for the movement of fauna particularly for arboreal mammals, small birds, and squirrel gliders. (x) development of a protocol for identifying and managing significant impacts on any threatened flora and fauna species not identified in the EIS, during development through construction or operation of the coal mine.	monitoring (with the exception of Tetratheca juncea) during the audit period in accordance with the 2006 Plan has resulted in this Condition being assessed as non-compliant with regards to implementation.			
DA-73-11-98 3.4(e)		(e) Any fencing of native vegetation which is to be retained shall not consist of barbed wire fencing.	Most of the fencing used on site is barbed wire boundary fencing to deter unauthorised access onto the site. It was reported that native vegetation to be retained is generally not fenced. The extent of the use of barbed wire fencing was not able to be determined during the audit site inspection.	Indeterminate	Noted.	
DA-73-11-98 3.5 (a)		a) The Applicant shall prepare Erosion and Sediment Control Plans for the surface facilities, particularly the waste reject emplacement areas, and the LEA in consultation with LMCC and to the	Newstan had prepared an Erosion and Sediment Control Plan (ESCP) in 2006 prior to the commencement of work in the relevant areas. Consultation and approval of the 2006 plan was assessed in previous IEA.	Non-compliant **REC 05 NEWSTAN IEA 2015:** Revise the ESCP to	Noted. Erosion and Sediment Control	The Erosion and Sediment Control Plan was revised

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		satisfaction of DWE and Director-General, and submit these Plans to the EPA as part of applications for a licence under the Protection of the Environment Act. The Plans shall be prepared and implemented prior to the commencement of work in the relevant areas.	The ESCP was revised in 2012 and a Draft submitted to LMCC for consultation by letter dated 21.12.12. The LMCC conducted a site visit to assist in assessing the Plan and provided comments by letter dated 15.02.13. Newstan was yet to revise the plan to address the LMCC comments and seek approval of the revised plan. On the basis that the 2012 Plan was yet to be approved and the 2006 approved plan no longer reflecting the operations taking place at the time of the audit site inspection, this requirement has been assessed as non-compliant.	incorporate LMCC comments and changes that have occurred on site since 2012 and obtain relevant approvals.	Plan to be updated and resubmitted for approval.	and submitted to the DPE for approval in July 2016.
DA-73-11-98 3.5 (b)		(b) The Erosion and Sediment Control Plans shall include: (i) consideration and management of erosion and sedimentation of surface watercourses/water bodies, including LT Creek and all creeks within the LEA; and (ii) consideration of LMCC's Erosion and Sediment Control Policy and Code of Practice. (iii) a program for reporting on the effectiveness of the sediment and erosion control systems and performance against objectives contained in the approved erosion and sediment control management plans, and EIS. (refer also condition (d) (i) below)	The LMCC comments on the Draft 2012 ESC stated that the plan generally complies with the requirements of the "Blue Book" however it requested that minimum design criteria for the sediment basins be changed from the 90th percentile to the 95th percentile to reflect the sensitivity of the receiving environment. The LMCC also requested that the plan include more recent figures at a scale showing finer detail (1:2000 – 1:5000 was recommended). As discussed above at the time of the audit site inspection the Plan had not been revised to incorporate the LMCC comments and reflect changes that have occurred on site since 2012. On this basis this requirement has been assessed as non-compliant. Refer also to assessment of adequacy in the main section of this report.	As above	Noted. Erosion and Sediment Control Plan to be updated and resubmitted for approval.	The Erosion and Sediment Control Plan was revised and submitted to the DPE for approval in July 2016.
DA-73-11-98 4.1 (a)		**Water Management** (a) The Applicant shall: prior to the commencement of construction of each of the new surface facilities at Newstan Colliery, and prior to first workings within the LEA, prepare water management plans for the relevant developments, in consultation with DWE, EPA, LMCC, and DRE and to the satisfaction of the Director-General, which shall include, but not be limited to, the following matters: (i) management of the quality and quantity of surface and ground water within the areas	The Water Management Plan was prepared and approved by the DP&E on the 28.09.06. The 2006 plan was reviewed during previous IEAs in 2006 and 2009. In 2008 a Pollution Reduction Program (PRP) was added to Newstan's EPL requiring a Revised Water Management Plan (RWMP) (this was later removed by variation dated 13.07.11). The 2012 IEA assessed the consultation requirements of this plan however at the time, the Plan (Revision 9) was yet to be approved by DP&E. The RWMP has not been updated since 2009 and has not been approved by the DP&E. On this basis, this	a) Non-compliant **REC 03 NEWSTAN IEA 2015:** Revise the RWMP to reflect the changes that have occurred on site since this time (2009) and obtain relevant approvals of the document.	The WMP is required to be updated as part of the NCLP which is required to be submitted for approval to DoPE by March 2016. This will satisfy this condition as being compliant by the next audit.	The Water Management Plan was revised and submitted to the DPE for approval in July 2016.

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		covered by the water management plans, which shall include preparation of monitoring programs as provided by CoC 8.2. (ii) management of stormwater and general surface runoff diversion to ensure separate effective management of clean and dirty water; (refer also condition 3.5 (d) (ii)). (iii) measures to prevent the quality of any surface waters being degraded below the relevant water quality prior to construction, particularly in LT Creek and all creeks within the LEA due to the operation of the mine workings; (iv) investigation into opportunities to reduce the mine water discharge into LT Creek in consultation with the EPA and include the results of such investigations in the Annual Environmental Management Report; (v) identification of any possible adverse effects on water supply sources of surrounding land holders, as a result of the underground mining operations in the LEA and surface mine works, and implementation of mitigation measures as necessary; (vi) identification of changes in flow of surface waters including all creeks within the LEA, particularly in Lord's Creek, due to subsidence, and LT Creek particularly due to the southern and northern waste emplacement areas and coal stockpiling areas; (vii) identification of any stream rehabilitation works required to ameliorate subsidence effects on stream flows within Lords Creek; (viii) contingency plans for managing adverse impacts of the development on surface and groundwater quality, including the matter in condition 4.1(d)(iv); (ix) identification of the fresh quality groundwater resources within the project area, including the development of appropriate protection strategies;	condition has been assessed as non-compliant. The 2012 IEA reviewed the RWMP and found it to generally include the matters outlined in this CoC with the following exceptions: (xi) Plan states that monitoring in the vicinity of natural watercourses and longwall mining areas is undertaken on a continual basis. The Plan should be more specific about what type of monitoring is undertaken and at what frequency. (xiii) The Plan refers to Centennial's EMS as a means for reporting and recording against environmental performance. The Plan should include a program for specifically assessing and reporting against the effectiveness of the water management system and performance against RWMP objectives and EIS. Since the above review, the following changes have occurred on site relating to water management: - construction and operation of the CWP - upgrade of the FPCD - increase to the daily discharge limit from LDP 1 - Stony Creek pipeline now a licensed discharge point (Point 7) The RWMP does not reflect the above changes as well as the recommendations from the previous IEA. Further details of the adequacy of the plan and opportrunities for improvement are provided in the main section of this report.			

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		(x) projection of potential groundwater changes during mining (short term) and post-mining (long term) with particular attention given to the affect of changes to groundwater quality and mobilisation of salts; (xi) a monitoring and remediation strategy for all streams which may be adversely affected by subsidence including bed fracturing and/or degradation of the stream channel. Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DWE. (xii) consideration of the State Wetlands Management Policy for all significant downstream wetlands that may be effected by mining activity within the LEA or the relevant area. (xiii) a program for reporting on the effectiveness of the water management systems and performance against objectives contained in the approved site water management plans, and EIS;			

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
DA-73-11-98 4.1 (c)		c) obtain a license with DWE under part 5 of the Water Act (1912) prior to construction of all new excavations, test bores and production bores (including dewatering bores) that intersect the groundwater.	c) The previous IEA reported that Newstan proposed (letter dated 09.07.10) to relinquish the 25 monitoring bore licences held (listed in Table 1 of the letter) and replace them with licenses with alternative conditions for 16 of the bores (listed in Table 2 of the letter). Newstan also applied for monitoring bore licences for two existing bores (listed in Table 3 of the letter). In addition, Newstan proposed to relinquish the extraction licence applying to the By-wash Dam and extraction from LT Creek as several conditions of the licence were considered to no longer be valid and requested that a new licence be issued. Newstan also applied for an additional 3 extraction licences. It was reported in the 2012 IEA that, despite numerous repeated requests, no response was provided by NOW. Further to the above, during this audit period, the licence application was re-submitted on the 16.10.13. A meeting was held with NOW on the 15.02.15 at which Newstan was requested to provide additional information. On the basis that the resolution of the licence relinquishment and additional licence application is unknown this condition has been assessed as Indeterminate.	c) Indeterminate **REC 06 NEWSTAN IEA 2015:** Continue to work with NOW to resolve groundwater extraction licence relinquishment and additional licence application.	Newstan will continue to correspond with NOW to obtain water licences for Newstan Colliery.	Ongoing
DA-73-11-98 4.1		**General Terms of Approval EPA** (ii) Discharge Concentration Limits The Applicant shall only discharge water from the development in accordance with the provisions of a current Environmental Protection Licence.	(ii) Newstan reported exceedances of the discharge concentration limits specified by its EPL during the audit period. Refer to assessment of compliance with EPL.	(ii) Non-compliant Refer to recommendations in main section of report and EPL compliance assessment table	Newstan has continued to progress upgrades to the water management system since the last audit most notably with the construction of the Clean Water Plant in 2013.	
DA-73-11-		**Assessment of LT Creek and Water Re-use Options** The Applicant shall undertake an	Newstan commissioned GHD to undertake an assessment of water quality and stream health to meet	Non-compliant **REC 07 NEWSTAN IEA**	Newstan to resubmit the LT	No further action

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
98 4.2		assessment of water quality and stream health in LT Creek and mine water re-use options to the satisfaction of the Director-General. This assessment must: (a) be prepared in consultation with the CCC, EPA, NOW and LMCC and be submitted to the Director-General by the end of March 2013 for approval; (b) review the history of operations at Newstan Colliery and describe any historical impacts from discharges from the Colliery on water quality and stream health in LT Creek; (c) identify the source(s) of exceedances of ANZECC water quality criteria for waters discharged from the site; (d) establish appropriate water quality criteria for waters discharged from the site; (e) identify any reasonable and feasible options for the improvement of water management at Newstan Colliery including water treatment, re-use or transfer; and (f) provide a proposed timetable for the implementation of reasonable and feasible measures identified in (d) above.	the requirements of this Condition. The Draft report (LT Creek Water Quality and Newstan Reuse Assessment March 2013) was submitted for consultation to the CCC, EPA, NOW and LMCC by letters dated 20.03.13. It was reported that no comments were received from any of the agencies and the report was submitted to the DP&E for approval on the 28.03.13. The DP&E reportedly requested further consultation with the agencies and so letters were sent to the EPA, LMCC and NOW asking if further information was required. It was reported that the Environment and Community Coordinator had a meeting with the LMCC to discuss the report in December 2013 however no further action has been taken since this time. It was reported that Newstan intends to resubmit the report to the DP&E for approval. On the basis of this report not being resubmitted to the DP&E, nor approved by the DP&E this Condition has been assessed as non-compliant.	**2015:** Re-submit the LT Creek Water Quality and Newstan Reuse Assessment Report (March 2013) to the DP&E for approval. If required, work with DP&E to achieve approval.	Creek Water Quality and Newstan Reuse Assessment Report to DP&E.	required – no longer a condition in DA-73-11-98 (MOD7).
DA-73-11-98 6.4A		**Operational Noise Criteria** The Applicant shall ensure that noise from the development (excepting the Newstan ventilation shaft site at Awaba) does not exceed the noise criteria in Table 4.	The operational noise criteria specified by this CoC came into effect with MOD 4 on the 16.03.12. Newstan reported exceedances with these criteria in the 2012, 2013 and 2014 AEMRs as summarised in the noise section of the main report. No exceedances were recorded at any monitoring locations during any periods in December 2014 and Quarter 1 2015 (reviewed noise monitoring reports by Global Acoustics). Based on the non-compliances reported, this Condition has been assessed as non-compliant. Further discussion of measures implemented to minimise noise is provided under Condition 6.4B below and in the main section of this report.	Non-compliant	Noted. Newstan Colliery has continued to implement operational upgrades to decrease noise from its operations including the installation of triple vf drives throughout the washery.	Newstan is continuing to calibrate the real time noise monitor and optimise the system to assist site management of noise.

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		Table 4: Noise criteria **Location** / **Shoulder dB(A)** $L_{Aeq(15\ min)}$ / **Day dB(A)** $L_{Aeq(15\ min)}$ / **Evening dB(A)** $L_{Aeq(15\ min)}$ NC1 – Davis: 35 / 35 / 35 NC2 – Culgan: 38 / 38 / 35 NC3 – Orrock: 39 / 39 / 37 NC4 – Phelps: 35 / 35 / 35 NC5 – Parnell: 35 / 35 / 35 NC6 – Fassifern Primary School: N/A / 35 / N/A Notes: *-To interpret the locations referred to in Table 4, see Figure 1 in Appendix 2; and* *-Noise generated by the development is to be measured in accordance with the relevant* *requirements and exemptions (including certain meteorological conditions) of the NSW Industrial* *Noise Policy.* *- Day is defined as the period from 7am to 6pm;* *- Evening is defined as the period from 6pm to 10pm;* *- Night is defined as the period from 10pm to 6am: and* *- Shoulder is defined as the period from 6am to 7am.* However, these criteria do not apply if the Applicant has an agreement with the relevant owner/s of these residences/land to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.			Newstan has also installed a real time noise monitor which will assist the site to manage noise from its operations.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
DA-73-11-98 6.4B		**Operating Conditions** The Applicant shall: (ii) regularly assess the real-time noise monitoring and meteorological forecasting data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this consent; (iii) minimise the noise impacts of the development during temperature inversions;	(ii) At the time of the audit, the real-time noise monitor was yet to be installed. It is understood that the original site nominated by Centennial's noise experts was not practical as it was not on land owned by Centennial and there was no power supply to the site. Centennial, in consultation with its experts have selected a new site on Centennial land (adjacent to the rail loop). These changes to the location of the monitoring location compounded to delays in installing the monitor. It was reported that the monitor had been ordered at the time of the audit and civil works had commenced to lay power to the site, however on the basis that it was not operational during the audit period, this Condition has been assessed as non-compliant. It was reported that the real time noise monitor is scheduled to be operational by the end of July 2015. (iii) During attended monitoring, consultants use the data logged by the on-site meteorological station to identify temperature inversions. However this is done and provided to Newstan with the quarterly noise monitoring reports and is therefore not able to be used to minimise impacts during the temperature inversion. On this basis, this requirement has been assessed as non-compliant. It was reported that updates were going to be made to the meteorological station so that it can have these capabilities in the future.	(ii) Non-compliant (iii) Non-compliant	The real time noise monitor has been installed and is currently in a calibration phase.	Newstan is continuing to calibrate the real time noise monitor and optimise the system to assist site management of noise.
DA-73-11-98 8.2		**Surface and Groundwater** (a) (ii) The Applicant shall prepare a detailed monitoring program in respect of ground and surface water quality and quantity, including water in and around the Newstan mine site, Northern and Southern Emplacements, and LEA, and also consistent with condition 4.1(b)(iv), during construction works, mine operations and post mine operations in consultation with DWE, EPA, and to the satisfaction of the Director-General. The monitoring program shall also include surveys of drainage channels within the LEA to update	(a) ii) The surface water monitoring program is included within the Revised Water Management Plan (RWMP, 2009). The RWMP was prepared in consultation with the OEH and NOW and submitted to the DP&E for approval, however was not formally approved by the DP&E (refer also to CoC 4.1). On the basis that the RWMP and the Plan has not been approved by the DP&E and has not been updated since 2009 this part of the condition is considered Indeterminate.	(a) (ii) Indeterminate **REC 03 NEWSTAN IEA 2015:** Revise the RWMP to reflect the changes that have occurred on site since 2009 and continue to seek relevant approvals of the Plan from DP&E. **REC 08 NEWSTAN IEA 2015:** Update the surface water	The WMP is required to be updated as part of the NCLP which is required to be submitted for approval to DoPE by March 2016. This will satisfy this condition as being compliant by the next audit.	The Water Management Plan was revised and submitted to the DPE for approval in July 2016.

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		information obtained in the preparation of Property Subsidence Management Plans. The monitoring program shall be prepared prior to commencement of construction in the relevant area.		monitoring program in the RWMP to include the requirements of the current EPL.		

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
DA-73-11-98 8.5		**Flora and Fauna Monitoring** The Applicant shall prepare a detailed monitoring program of habitat areas, including any wetlands and aquatic habitats, during the development and for a period after the completion of the development to be determined by the Director-General in consultation with LMCC, OEH and DRE. The program shall monitor impacts attributable to the development and include monitoring of the success of any restoration or reconstruction works. The Applicant shall include the monitoring program in the Flora and Fauna Management Plan (condition 3.4). The Applicant shall carry out any further works required by the Director-General as a result of the monitoring. A summary of monitoring results shall be included in the AEMR.	The monitoring program is outlined in Section 5 of the Flora and Fauna Management Plan (2014). The program was expanded to include details of additional monitoring to address the requirements of Condition 3.4 that were not included in the previous version of the plan. This includes: - Annual Photo monitoring - Annual Vegetation surveys (species diversity, species abundance, dominant species and vegetation height and presence of dieback) - Annual Bird surveys - Annual Bat surveys - Annual General fauna (camera traps) - Biennial habitat health assessment The previous Plan (2006) committed to annual vegetation monitoring, monitoring of rehabilitation areas, subsidence areas and fauna surveys but did not include details on the type of monitoring proposed at what frequency and which locations. The 2012 IEA assessed this Condition as non-compliant on the basis that ecological monitoring (other than Tetratheca juncea) was not undertaken and made a number of recommendations relating to expanding the monitoring program and revising the Plan. During this audit period annual Tetratheca juncea surveys over longwalls 22-24 and in the NREA and SRE continued with the following reports sighted: - *Monitoring of Tetratheca juncea over longwalls 22-24 and in buffer areas NREA and SREA – 2013 season* (Hunter Eco, October 2013) - *Monitoring of Tetratheca juncea over longwalls 22-24 for years 2006-2014* (Hunter Eco, October 2014) - *Monitoring of Tetratheca juncea at the Northern and Southern Reject Emplacement Areas* (Hunter Eco, October 2014). However other ecological monitoring did not commence until 2015. At the time of the audit site inspection, Newstan was awaiting the draft report of the first annual ecological survey from the ecological consultants engaged to undertake this work (RPS). The auditors sighted the proposal provided by RPS to undertake the annual ecological survey and noted it included the monitoring committed to in the Plan. On the basis that ecological monitoring (with the exception of Tetratheca juncea) had not been undertaken during the audit period, this condition has	Non-compliant No action required as monitoring now commenced.	The Annual Ecological Monitoring Report has been undertaken since the audit which will satisfy this condition as being compliant.	Annual Ecological Monitoring has commenced and is ongoing.

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
DA-73-11-98 8.8 (ii) (g)		(ii) The Applicant shall, at its own expense: (g) forward a copy of these minutes to the Director-General; and	The CCC minutes were not forwarded to the DP&E.	(g) Non-compliant **REC 09 NEWSTAN IEA 2015:** Ensure CCC meeting minutes are forwarded to the DP&E.	Minutes to be forwarded to DP&E.	No further action required – no longer a condition in DA-73-11-98 (MOD7).
DA-73-11-98 8.9		**Independent Environmental Audit** (iii) Within 3 months of submitting the audit report to the Director-General, the Applicant shall review, and if necessary revise the strategies/plans/programs required under this consent to the satisfaction of the Director-General.	(iii) The Flora and Fauna Management Plan was still at a draft stage in December 2012, it was approved in August 2014. Other plans updated and approved during this audit period include: - Air Quality and Greenhouse Gas Management Plan (December 2012) - Noise Management Plan (December 2012) - Pollution Incident Response Management Plan (October 2014) Not all of the management plans were revised following the 2012 IEA to address the recommendations from the adequacy review (e.g RWMP and Aboriginal Cultural Heritage). Refer also to main section of report and Appendix B. On the basis of these actions remaining outstanding, this requirement has been assessed as non-compliant.	(iii) Non-compliant **REC 01 NEWSTAN IEA 2015:** Develop process for managing non-compliances identified from audits (internal and external),and closing out recommendations	Newstan will continue to manage its compliance through the site compliance database.	
EPL 395 L1.1		**Pollution of Waters** Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	Newstan reported non-compliance with this condition in its 2012 and 2013 Annual Returns on the following occasions: - 6.03.12 to 7.09.12: unlicensed discharge to Stony Creek - 1.03.13: turbid water discharge from LDP002 - 18.11.13: turbid water discharge from LDP001 In addition, Newstan reported the following incidents to the EPA via the pollution hotline in 2015: - 09.04.15: seepage of water into LT Creek through electrical pit - 21.04.15 to 23.04.15: overflow of turbid water from	Non-compliant	Stony Creek has been licenced on the Newstan EPL since the date of the recorded non compliances. Newstan has continued to progress upgrades to the water management system since the	

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			FPCD through LDP002 Based on the above incidents and related exceedance of the EPL criteria, this Condition was assessed as non-compliant during the audit period. Incidents and water management are discussed further in the main report.		last audit specifically with the construction of the Clean Water Plant in 2013.	
EPL 395 L2.1		**Concentration Limits** For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.	During the audit period Newstan recorded a number of exceedances of these concentration limits): In December 2013 / January 2014 Newstan commissioned a Clean Water Plant (CWP). The CWP uses coagulation, flocculation, sedimentation and filtration to reduce turbidity and concentration of TSS prior to discharge from LDP001. At the time of the audit Newstan was in arbitration with the EPA regarding the pollutant concentration limits imposed by this EPL. This is discussed further in the main report.	Non-compliant	Newstan has continued to progress upgrades to the water management system since the last audit specifically with the construction of the Clean Water Plant in 2013.	Newstan Colliery received an EPL variation in November 2015 with many amendments to concentration limits. This variation should lead to fewer concentration exceedances at site.
EPL 395 L3.1		**Volume and Mass Limits** For each discharge point or utilisation area specified below (by a point number), the volume/mass of: (a) liquids discharged to water; or; (b) solids or liquids applied to the area; must not exceed the volume/mass limit specified for that discharge point or area: Point 1: 11,000 kilolitres per day	In December 2013 Newstan installed a CWP and upgraded its pipeline and pumping system. The CWP allows for greater control of the water level within the Fassifern Seam and better management of surface water across the site using the CWP CITECT system. A v-notch weir was installed at LDP001 to monitor volume discharged. If the limit at LDP001 is reached, the discharge to LDP001 is switched off and alarms raised to investigate. Newstan personnel are able to log on to the CWP CITECT system and check dam levels, start / stop pumps etc. The Discharge limit at LDP001 was increased from 7,000 kL to 11,000 kL by EPL variation dated 15.10.12. Since this time, Newstan has reported the following exceedances with the volume limit:	Non-compliant	Upgrades to the water management system since the last audit through the installation of the clean water plant, are designed to prevent exceedances of concentration limits specified by the EPA by automation of the site water management	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
			- 2.03.13: 12,384 kL discharged following a significant rainfall event (152 mm in 27 hours prior to discharge). - 22 to 23.04.15: 11,519 kL discharged following major storm. While Newstan have been typically compliant with the condition, based on the two exceedences listed, Newstan are considered non compliant with this condition.		system.	
EPL 395 M2.2		Air Monitoring Requirements POINT 7,8,9,10,11,12,13,14 Pollutant / Units of measure / Frequ Particulates - Deposited Matter / grams per square metre per month / Month POINT 15,16 Pollutant / Units of measure / Frequ Particulate matter / micrograms per cubic metre / Every Total suspended particles / micrograms per cubic metre / Every	A non-compliance was reported with this Condition in the 2012 and 2013 EPL Annual Returns as the following air quality monitoring was not undertaken: - TSP at EPA Monitoring point 16-HVS2 on 09.01.12 - PM_{10} at EPA Monitoring point 16-HVS2 on 11.09.12 due to a power outage; - TSP at EPA Monitoring point 16-HVS2 on 11.09.12 due to a power outage; - Particulates – deposited matter at EPA Monitoring Point 13-D7 for the monthly sample of 20 March to 19 April 2012 due to vandalism of the dust gauge. - PM_{10} at EPA Monitoring point 16-HVS2 on the 15.03.15, 21.05.13 and 27.05.13 due to an electrical failure within the sampler - Particulates – deposited matter at EPA Monitoring Point 10-D4 for the monthly sample of 18 March to 18 April 2013 due to vandalism of the dust gauge. AM-19 refers to AS 3580.10.1-1991. Depositional dust monitoring was undertaken by AECOM. AECOM developed a procedure, Ambient Measurement Procedure – Dust Deposit Gauges which references AS 3580.1.1:2003. AM-18 refers to AS 3580.9.6-1990 and AM-15 refers to AS 2724.3-1984. The February 2015 Environmental Monitoring Report of TSP, PM_{10} and $PM_{2.5}$ provided by Carbon Based stated	Non-compliant	Upgrades have been made to the power supply to the HVAS to prevent power outages. Newstan will continue to manage airborne dust from site as per the AQ&GHG Management Plan.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
			that the following Australian Standards were used: - AS3580.9.3 for TSP - AS3580.9.6 for PM_{10} AS 3580.9.3 is not listed within the EPA publication, *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* however it is noted AS3580.9.6 has superseded AS 2724.3-1984 and the EPA publication has not been reviewed since January 2007. On the basis of the non-compliances reported in the 2012 and 2013 Annual Returns this condition was deemed non-compliant.			
EPL 395 M2.3		Water and/ or Land Monitoring Requirements *Summarised below (see EPL 365 for full requirements)* <u>Point 1 (LDP001)</u>: - Metals: weekly by composite sample. - Conductivity: daily by composite sample - Total suspended solids, oil and grease and pH: weekly by composite sample - Turbidity: weekly by grab sample <u>Point 2 (LDP002)</u> - Metals: weekly during any discharge by grab sample. - Conductivity, oil and grease, pH, total suspended solids and turbidity: within the first 6 hours of any discharge occurring; and every seven days thereafter for the duration of the discharge <u>Point 3, 4, 6, 20 (ambient water quality)</u> - Metals: monthly during discharge by grab sample.	A non-compliance was reported with this Condition in the 2012 and 2013 Annual Returns as the sampling method and frequency for LDP001 and Point 19 (WMP03) was not in accordance with the requirement. The Licence Variation dated 15.10.12 changed the sampling method from grab sampling to composite sampling and the frequency from weekly to daily. Newstan continued to use weekly grab sampling whilst it was in the process of procuring, installing and commissioning the composite samplers. These were installed in April 2013. The composite samplers at LDP001 and Point 19 were observed during the audit site inspection. <u>Note re Special Frequency 1</u> Newstan has developed a procedure (EWP002–Environmental Monitoring During Discharge Events) which outlines the step by step process for sampling during discharge events. This was reviewed by the auditors and considered to be a comprehensive and well written procedure. Some opportunities for improving the procedure were identified (refer to recommendations). It was reported that where Newstan is required to take a sample within the first 6 hours of any discharge occurring this is managed in the following way: - water levels are monitored in the CWP CITECT	Non-compliant **REC 10 Newstan IEA 2015** Update EWP002-Environmental Monitoring During Discharge Events, to include the plan referenced in the EPL for monitoring locations (plan NS3303). Also ensure procedure includes monitoring requirements for EPA Monitoring Point 20 (WMP 16) during discharge events).	Noted.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		- Conductivity, oil and grease, pH, total suspended solids and turbidity: within the first 6 hours of any discharge occurring; and every seven days thereafter for the duration of the discharge Point 17 (Stony Ck Pipeline Outlet) -Metals: within the first 6 hours of any discharge occurring; and every seven days thereafter for the duration of the discharge - Conductivity, temperature and turbidity: continuously during any discharge (subject to the following note) - oil and grease, pH and total suspended solids: within the first 6 hours of any discharge occurring; and every seven days thereafter for the duration of the discharge Point 18 (ambient water quality) -Temperature: continuously during any discharge (subject to the following note – b) Point 19 (ambient water quality) - Metals: weekly by composite sample Note Special Frequency 1 means in the event of a discharge, a grab sample of the water discharged must be collected: a) within the first 6 hours of any discharge occurring; and b) every seven days thereafter for the duration of the discharge; Special Frequency 2 means continuous sampling during any discharge, subject to the following in respect of Point 17 and Point 18. (a) A continuous monitoring system will be	system; - If either the FPCD, Graunchs, Fassifern's storage or Connolly's dam gets to 80% an alarm sounds and an automated phone call is made to a prioritised list of Newstan personnel on rotation until someone answers the call. - Newstan personnel are able to log on to the CWP CITECT system and check dam levels, start / stop pumps etc. - if it becomes apparent that a discharge is imminent, the Environmental Coordinator takes the grab sample and stores it for pick up by AECOM for preparation and analysis by the laboratory as per Procedure EWP002. In 2015, the requirement for monitoring within the first 6 hours of any discharge was triggered during the following events: - 21.04.15 – overflow of Graunchs Dam through LDP001 - 21.04.15 – overflow of FPCD through LDP002 - 23.04.15 – overflow of Clean Water Dam In its written report for the 21-23 April 2015 incident to the EPA dated 5.05.15, Newstan stated the dates and times of the discharges and the dates and times sampling was undertaken. Based on this information Newstan undertook sampling within 6 hours of the discharges occurring at all but one location (Point 6) where it was deemed unsafe to collect samples late at night during extreme storm conditions. Samples were taken at this location at 8:45am the next day when it was safe to do so. Note re Special Frequency 2 (a) The continuous monitoring system was installed at Stony Creek on the 15.10.13. The EPA was notified of the completion of its installation by letter dated 8.11.13. The EPA was previously notified (by letter dated 11.03.13 that there would be a delay in the implementation of the monitoring system due to significant rain which raised the water levels in the Fassifern seam to within the 2m buffer of the inlet to the			

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		implemented by 31 March 2013, weather permitting. It is noted that, to minimise the possibility of a flow of mine wastewater though the pipeline during installation and excavation works, the installation of continuous monitoring equipment will not commence until there is a two (2) metre buffer from the water level in the seam to the Stony Creek pipeline inlet. (b) In the event of a discharge occurring prior to the implementation of continuous monitoring being installed, hourly monitoring must be carried out. This monitoring will commence within the first six (6) hours of any discharge occurring.	Stony Creek pipeline. b) Newstan reported that Point 17 (Stony Creek pipeline) commenced discharging on the 22.03.13. This was prior to the continuous monitoring system being completed as discussed above. It was reported that for this event, environmental consultants AECOM were undertaking hourly monitoring to satisfy this condition. In addition Newstan reported that Point 17 commenced discharging on the 11.05.15 at 8:20am. By this stage the continuous monitoring system had already been installed. The auditors were provided with a spreadsheet ("Stony Creek 2015) which included the half hourly temperature, conductivity and turbidity monitoring data for Point 17 for the period 8 am 11.05.15 to 03.06.15. Based on the non-compliances reported by Newstan in 2012 & 2013 as indicated above, Newstan were considered to be non-compliant with this condition.			
EPL 395 U2.1		**PRP6 Macroinvertebrate and Eco-toxicological Monitoring Program** The licensee must implement an environmental monitoring program that will monitor the impacted sites of LT and Stony Creeks against control, where control means a system of the same Riverstyle™ (Brierley & Fryirs) as LT and Stony Creek monitoring reaches but not impacted by point source mining groundwater discharges or other major point source discharges. The monitoring program must be undertaken by a suitably qualified and experienced person and: a) include macroinvertebrate monitoring twice a year (Autumn and Spring) at: i) four or more locations downstream of LT Creek licensed discharge point 1 that includes site within the intertidal estuarine zone; and	At the time of the audit site inspection Newstan and the EPA were in arbitration and as advised by letter from Newstan's lawyers Ashurst Australia dated 18.05.15 it was agreed by both parties that Conditions U2 and E1 are not to have effect until the Court finally resolves the proceedings.	Not to have Effect – subject of arbitration at time of audit.	PRP 6 was completed on 23 October 2015 and has been removed from EPL395. An ongoing macroinvertebrate and ecotoxicological program has been established in accordance with Condition E1 of EPL395.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		ii) two or more locations downstream of Stony Creek licensed discharge point 17 that includes a site within the intertidal estuarine zone; and iii) at a number of control locations that are the same Riverstyle™ (Brierley & Fryirs) as the impacted monitoring site reaches, which must include an estuarine non impacted site; b) include ecotoxicological assessment 3 times within a 6 month period from the date of the issue of this licence, with the timeframe between sampling events more than 7 weeks, that includes assessment of the toxic effects of the clean water treatment plant at licensed discharge point 1 to Eastern Rainbow Fish embryo development and post-hatch survival (10d exposure), freshwater shrimp (*Paratya australiensis*) survival (10d exposure) and freshwater cladoceran *C.dubia* reproductive impairment (8d exposure); thence c) ecotoxicological assessment twice annually, with the timeframe between sampling events more than 4 months, that includes assessment of the toxic effects of the clean water treatment plant at licensed discharge point 1 to Eastern Rainbow Fish embryo development and post-hatch survival (10d exposure), freshwater shrimp (*Paratya australiensis*) survival (10d exposure) and freshwater cladoceran C.dubia reproductive impairment (8d exposure). Note 1: Control does not mean 'natural' and unimpacted by humans in the context of this study.				

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
EPL 395 U2.2		The licensee must prepare an ecotoxicological report for monitoring undertaken at condition U2.1 b) that is prepared by a suitably qualified and experienced person. This report must be provided to the EPA's Regional Manager Hunter at Hunter.region@epa.nsw.gov.au within two months from completion of the ecotoxicological assessment in condition U2.1 b).	As above	Not to have Effect – subject of arbitration at time of audit.	PRP 6 was completed on 23 October 2015 and has been removed from EPL395. An ongoing macroinvertebrate and ecotoxicological program has been established in accordance with Condition E1 of EPL395.	
EPL 395 U2.3		The licensee must prepare a macroinvertebrate and ecotoxicological report prepared by a suitably qualified and experienced person that reports on the monitoring undertaken in Condition U2.1 a) and Condition U2.1 c). The report: a) must be provided to the EPA with the Annual Return (noting that from the commencement of this Licence, only the Spring macroinvertebrate monitoring would have taken place within the 2014 licence period); and b) analysis must incorporate, but must not be limited to a beyond before after control impact (beyond BACI) style assessment comparing impacted and control sites but also include an assessment of macroivertebrate assemblage dissimilarity between impacted and control sites highlighting the taxa / impact responsible for the majority of the dissimilarity. At the completion of two years and then three years of monitoring the macroinvertebrate and ecotoxicological report must incorporate temporal analysis of the preceeding data	As above	Not to have Effect – subject of arbitration at time of audit.	PRP 6 was completed on 23 October 2015 and has been removed from EPL395. An ongoing macroinvertebrate and ecotoxicological program has been established in accordance with Condition E1 of EPL395.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		dating back to the commencement of the environmental study. This PRP must be completed by 27 February 2017.				
EPL 395 E1.1		**Special Conditions** **Water Treatment Plant Commissioning Study** The licensee must undertake a Water Treatment Plant (WTP) Commissioning Study for the Newstan Clean Water Treatment Plant prepared by a suitably qualified and experienced person. The study must: a) monitor daily inflow to the WTP and daily outflow from the WTP testing for the pollutants identified in condition U1.1 c), and including the total fraction of individual metals mentioned in condition U1.1 c) for 7 consecutive days; thence after b) monitor weekly inflow to the WTP and weekly outflow from the WTP testing for the pollutants identified in condition U1.1 c), for eight weeks (using a range of days of the week); and that this monitoring must include i) a range of volumetric throughputs to test treatment efficiencies and residence time. Note: The laboratory analytical tests must be able to test the pollutants (analytes) at an appropriate level of detection such that change can be detected. The results of "<LOR" are not acceptable in a commissioning study where the intention is	Newstan sought clarification (by letter dated 07.01.14) regarding the note in this condition re LOR reporting. It also advised the EPA that it would not be able to complete the report within the stipulated timeframe and sought an extension. Court proceedings have since commenced between Newstan and the EPA and as advised by letter from Newstan's lawyers Ashurst Australia dated 18.05.15 it was agreed by both parties that Conditions U2 and E1 are not to have effect until the Court finally resolves the proceedings.	Not to have Effect – subject of arbitration at time of audit.	This condition was removed from EPL 395 in November 2015.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		to detect a reduction.				
EPL 395 E1.2		On completion of the monitoring identified in condition E1.1 the licensee must provide a report to the EPA, prepared by a suitably qualified and experienced person. The report must: a) analyse and report the efficiency of the clean water treatment plant in removing pollutants at a variety of flow rates and residence times and include near maximum flow rates that would be discharged in accordance with the maximum volumetric licence limit (11,000ML/day); c) compare and contrast the monitoring results to the targeted design treatment concentrations identified in Condition U1.1 c); and b) include recommendations of the most effective flow rate and the resultant treatment reductions that can be achieved. Note: The laboratory analytical tests must be able to test the pollutants (analytes) at an appropriate level of detection such that change can be detected. The results of "<LOR" are not acceptable in a commissioning study where the intention is to detect a reduction. The Report must be provided to the EPA's Manager Hunter Region at hunter.region@epa.nsw.gov.au within 3	As above	Not to have Effect – subject of arbitration at time of audit.	This condition was removed from EPL 395 in November 2015.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
		months of the issue of this licence variation (17 December 2014).				
CCL 764 2		**Environmental Harm** The proponent shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation or rehabilitation of the development.	Refer to DA 73-11-98 Condition 1	Non-compliant Refer to recommendations made throughout the report	Noted.	
CCL 764 18		**Prevention of Soil Erosion and Pollution** 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 authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan. For the purpose of this condition, water shall be taken to include any watercourse, waterbody or groundwaters. The lease holder must observe and perform any instructions given by the Director-General in this regard.	Newstan operates under an Environmental Protection Licence (EPL395) which outlines criteria for water quality discharges and monitoring requirements for dust and water quality. Refer to assessment of compliance with EPL. Newstan has developed a number of management plans to manage the environmental impacts of its operations, specifically a Revised Water Management Plan, Erosion and Sediment Control Plan and Air Quality and Greenhouse Gas Management Plan. Refer to main report for further discussion of these issues Newstan had undertaken significant works during the audit period to upgrade its water management system, including: - increasing the capacity of the Final Pollution Control Dam - completing the clean water diversion drain around the	Non-compliant	Noted.	

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
			SREA - installing a Clean Water Treatment Plant - upgrades to the pipeline and pumping system and increases in pumping capacity - upgrades to the CITECT system following construction of the CWP. The CWP CITECT system allows for remote management and movement of water across the site and incorporates alarms when trigger levels are reached. - increasing the daily discharge limit (volume) in its EPL from 7ML/day to 11 ML/day from LDP001. The previous IEA (2012) identified an area of erosion at the discharge of the clean water diversion drain where the northern arm drains into LT Creek. The IEA reported that the clean water diversion drain had diverted water into an undefined drainage line which has as a result eroded in some areas down to bedrock and potentially led to some sediment build up in LT Creek. During the audit site inspection on the 11.05.15, the auditors inspected this area and observed that works had been undertaken to extend the rock lined channel approximately, 10m, however the auditors were not able to gain access to the land (as this was private land) to observe the drainage line beyond this point. Newstan noted that no works had been undertaken beyond the area sighted due to it being on private land. No areas of significant erosion were observed during the site visit on the 11.05.15. On the basis of the non-compliances with the EPL relating to water pollution, Newstan is considered Non-compliant with this condition.			

Title	Condition No	Requirement	Comments	Compliance/ Recommendations	Newstan Comments	Updates since audit
ML 1452 33 (a)		**Catchment areas** - (a) Operations shall be carried out in such a way as not to cause any pollution of the Lake Macquarie Catchment Area.	(a) Newstan operates under an Environmental Protection Licence (EPL 395) which outlines criteria for water quality discharges and monitoring requirements for dust and water quality. Refer to assessment of compliance with EPL. Some aspects of the licence have not been complied with and some pollution events have been reported. While Newstan are generally compliant with this condition, on the basis of some events of pollution occurring, Newstan are considered Non Complaint with this condition. Full details are presented in the compliance assessment of the EPL.	(a) Non-compliant	Noted. Addressed in conditions of EPL.	

The next Independent Environmental Audit of the Newstan Colliery operations in accordance with SSD-5145 and DA 71-11-98 is required to be undertaken by 14 May 2018.

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

Table 26: Non-Compliance 1

Nature of the incident/non-compliance	Licence limit exceedance – water
Date of incident/ non-compliance (if known; if not known state not known)	6 January 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	LDP002 – Final Pollution Control Dam
Detail the cause of the incident/non-compliance	Overflow of FPCD through LDP002 during East Coast low rain event resulted in an exceedence of TSS at 178 mg/L (limit 50 mg/L). Discharge occurred from the 6th - 7th January. PIRMP activated and government departments notified.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Government agencies notified in accordance with PIRMP requirements.

Table 27: Non-Compliance 2

Nature of the incident/non-compliance	Community complaint.
Date of incident/ non-compliance (if known; if not known state not known)	4 May 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Delivery vehicle to Newstan Colliery.
Detail the cause of the incident/non-compliance	Complaint received from community resident regarding VENM delivery trucks exceeding speed limits through Fassifern. Community member also noted that one of the trucks had particularly loud brakes.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Two trucks were removed from the job due to loud brakes. Trucking company notified about the complaint and to adhere to site rules or would be removed from the job.

Table 28: Non-Compliance 3

Nature of the incident/non-compliance	Licence limit exceedance – water
Date of incident/ non-compliance (if known; if not known state not known)	3 August 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Exceedance of bicarbonate alkalinity limit at LDP001.
Detail the cause of the incident/non-compliance	Water quality variability is understood to increase with lower water levels in the workings and has likely contributed to the exceedance.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Discharge from LDP001 was ceased when the results were received. Updated TARP to include increased frequency of water quality monitoring and enhanced aeration at 20m bgl water level in the Fassifern seam.

Table 29: Non-Compliance 4

Nature of the incident/non-compliance	Community complaint.
Date of incident/ non-compliance (if known; if not known state not known)	18 August 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Delivery vehicle to Newstan Colliery.
Detail the cause of the incident/non-compliance	Complaint received from community resident regarding VENM delivery trucks exceeding speed limits through Fassifern. Community member also noted that one of the trucks had particularly loud brakes.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	One truck was removed from the delivery fleet as a result of brake noise. Trucking company notified about the complaint and requested to mitigate the issue. An alternate delivery route was established and the monitoring of delivery truck movements was increased to assess delivery truck noise.

Table 30: Non-Compliance 5

Nature of the incident/non-compliance	Licence limit exceedance – water
Date of incident/ non-compliance (if known; if not known state not known)	14 September 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Exceedance of bicarbonate alkalinity limit at LDP001.

Detail the cause of the incident/non-compliance	Water quality variability is understood to increase with lower water levels in the workings and has likely contributed to the exceedance.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Discharge from LDP001 was ceased when the results were received. Enhanced aeration through increased residence time and circulation in surface water storages.

Table 31: Non-Compliance 6

Nature of the incident/non-compliance	Monitoring frequency – air quality
Date of incident/ non-compliance (if known; if not known state not known)	1 November 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Hill Top TSP high volume air sampler (HVS1)
Detail the cause of the incident/non-compliance	High volume air sampler produced an unrepresentative result (unrealistically low) due to a motor failure.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Instrument fault was rectified.

Table 32: Non-Compliance 7

Nature of the incident/non-compliance	Monitoring frequency – air quality
Date of incident/ non-compliance (if known; if not known state not known)	7 November 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Hill Top TSP high volume air sampler (HVS1)
Detail the cause of the incident/non-compliance	High volume air sampler produced an unrepresentative result (unrealistically low) due to a motor failure.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Instrument fault was rectified.

Table 33: Non-Compliance 8

Nature of the incident/non-compliance	Exceedence of criteria – air quality
Date of incident/ non-compliance (if known; if not known state not known)	7 November 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Water Tank PM10 high volume air sampler (HV2)
Detail the cause of the incident/non-compliance	Exceedance of 24 hour average PM10 limit at Water Tank high volume air sampler (HV2) on 7/11/16. The result (51ug/m3) was impacted by poor regional air quality due to bushfire activity in the region. The corresponding result from the adjacent TEOM real-time PM10 monitor was 47.4ug/m3 confirming compliance with air quality criteria. The Hill Top high volume air sampler (HVS1) was predominantly upwind of the mine for approximately 83% of the time on 7 November 2016 and recorded a result of 47 ug/m3 indicating that the poor air quality was likely the result of a regional extraordinary event, in this case caused by bushfire activity in the region.

Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Real-time alerts notified personnel of elevated PM10 levels and operations were advised of the poor air quality and to continue employment of measures to ensure no dust was being generated from site activities. No significant dust generation from operational activities and as such, no modifications to operations were required. Written incident report submitted to the DPE on 13 January 2017.

Table 34: Non-Compliance 9

Nature of the incident/non-compliance	Monitoring frequency – air quality
Date of incident/ non-compliance (if known; if not known state not known)	7 November 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Water Tank TSP high volume air sampler (HVS2)
Detail the cause of the incident/non-compliance	High volume air sampler did not run due to filter blockage.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Instrument fault was rectified. Make-up monitoring run was conducted on 15 November 2016.

Table 35: Non-Compliance 10

Nature of the incident/non-compliance	Monitoring frequency – air quality
Date of incident/ non-compliance (if known; if not known state not known)	13 November 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Hill Top TSP high volume air sampler (HVS1)
Detail the cause of the incident/non-compliance	High volume air sampler did not run due to filter blockage.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Instrument fault was rectified. Make-up monitoring run was conducted on 15 November 2016.

Table 36: Non-Compliance 11

Nature of the incident/non-compliance	Monitoring frequency – air quality
Date of incident/ non-compliance (if known; if not known state not known)	13 November 2016
The location of the incident/ non-compliance (include a figure if appropriate), if known	Hill Top PM10 high volume air sampler (HVS1)
Detail the cause of the incident/non-compliance	High volume air sampler did not run for complete 24 hour period due to instrument fault.
Detail action that has been, or will be, taken to mitigate any adverse effects or prevent recurrence of the incident/ non-compliance	Instrument fault was rectified. Make-up monitoring run was conducted on 15 November 2016.

12 ACTIVITES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Table 37: Activities to completed in the next reporting period

Newstan Colliery
Revision & update to Bushfire Management Plan. Revision & update to Land Management Plan. Revision & update to Landscape Management Plan. Review the design of the ecological monitoring program to enable evaluation of rehabilitation works against nominated completion criteria.

Centennial Coal

Centennial Coal

HISTORICAL REVIEW FOR SURFACE WATER MONITORING AT NEWSTAN COLLIERY

Newstan Colliery

2016

Mining Leases
Owned and Operated by
Centennial Newstan Pty Ltd
ABN 68 101 508 865

Centennial Coal
Environment Matters

1. LDP001 ANALYTES

The discharge analytes for LDP001 have been included from 2010, as regular sampling of several analytes commenced at this time.

Where an outlier has caused the graph to become unreadable, a second graph has been added which excludes the outliers to provide more detail. All units in the graphs are in mg/L, with the exception of pH (pH units) and Conductivity (µS/cm).

The Environmental Protection Licence (EPL) 395 was modified in November 2015. These new limits have been included on the graphs. Where there is no longer a EPL limit the limit may be seen as 0. These metals are still required to be monitored as per EPL requirements. There are no discharge limits within the Newstan Development Consent (DA 73-11-98).

The majority of the water discharged through LDP001 was from an underground water storage called the Fassifern Seam. However if the rainfall exceeded the capacity of Graunch's Dam, this may also flow through LDP001. In 2013 a Clean Water Plant was commissioned at Newstan Colliery, and now the majority of the water discharged through LDP001 is treated through the CWP prior to discharge through LDP001.

While the limits only apply to either dissolved or total metals, both dissolved and total (where available and applicable) have been provided in the attached graphs to give an overall view of the water quality results from LDP001.

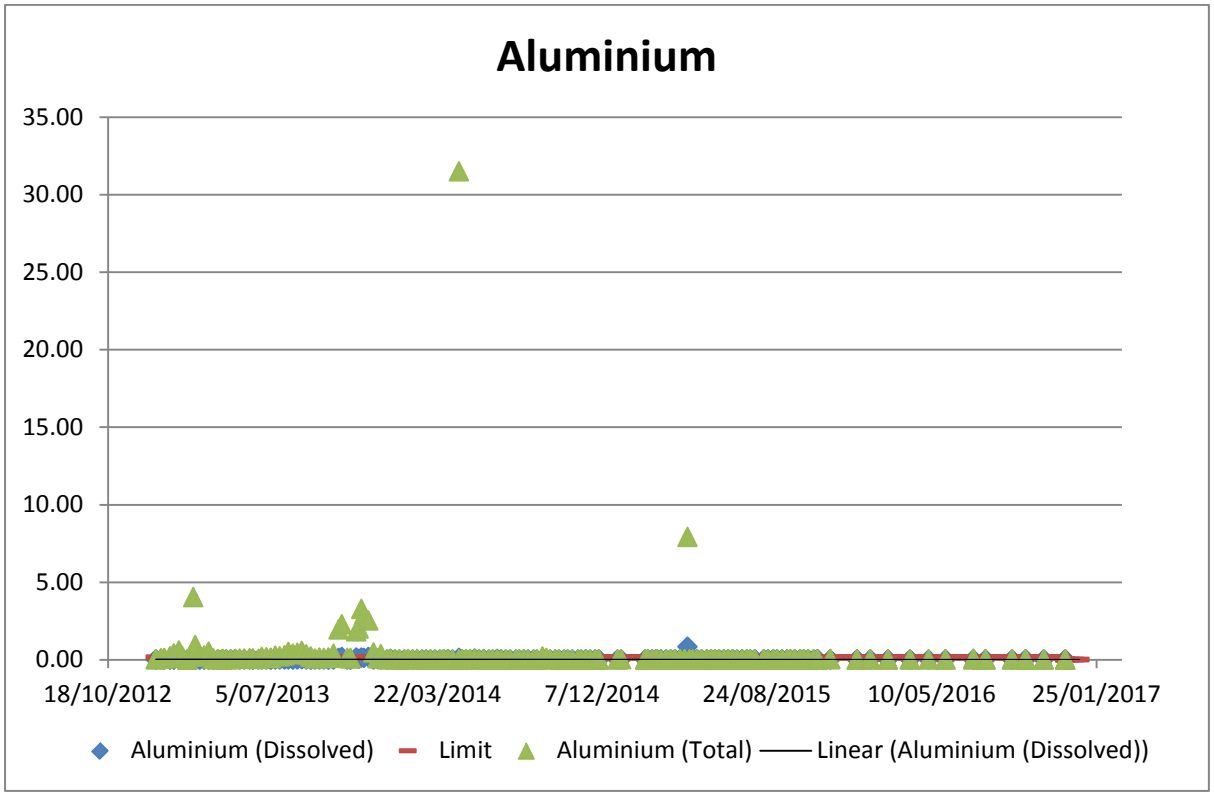
The following analytes are generally below the licence criteria, and have remained relatively stable since 2010: aluminium, barium, cadmium, copper, lead, manganese, mercury, nitrogen, oil & greases, phosphorus, selenium, TKN, and zinc.

Note some lead results are above the limits, however this is due to contamination during the commissioning of the composite samplers, and are not licence exceedences. The results have been left in to provide a completed monitoring set.

Bicarbonate alkalinity, boron, calcium, chromium, conductivity, molybdenum, nickel and silica are generally below the licence limits, and have a decreasing trend.

Sulphate exceeded the limits on several occasions in late 2012 and early 2013, however has been below the limit since mid 2013. The pH and chloride at LDP001 have been trending upwards over time, with lithium exceeding a few times in 2014.

TSS may exceed the limits at times, but this generally aligns with overflows from Graunch's Dam through LDP001, rather then the water discharged from the underground Fassifern Seam.


Aluminium
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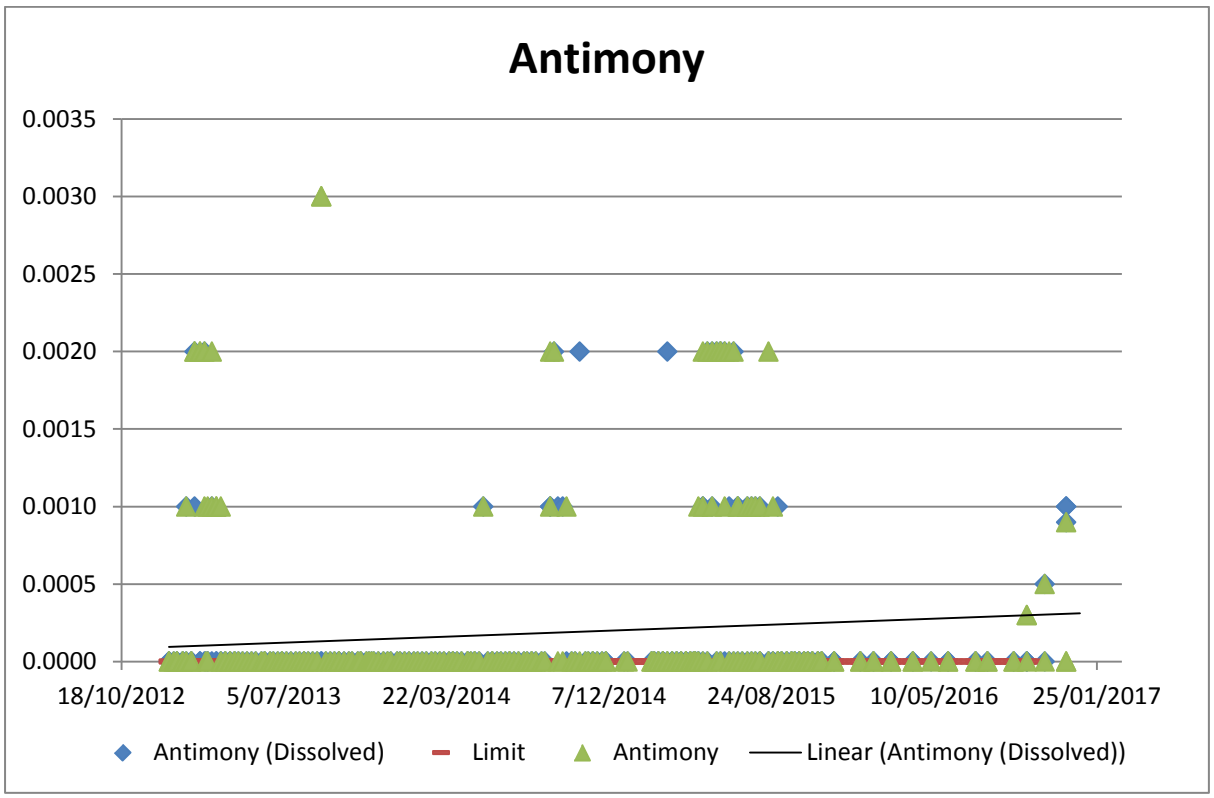
30.00
25.00
20.00
15.00
10.00
5.00
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Aluminium (Dissolved)
Limit
Aluminium (Total)
Linear (Aluminium (Dissolved))


Antimony
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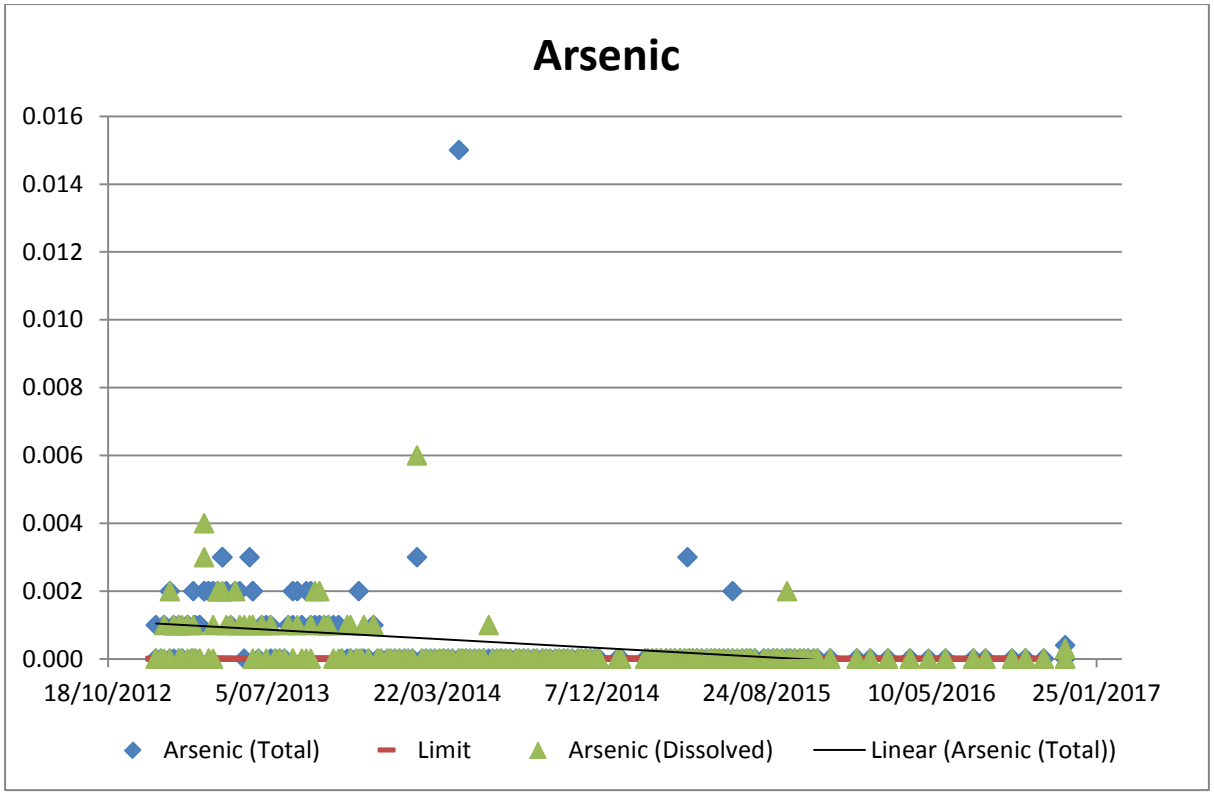
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Antimony (Dissolved)
Limit
Antimony
Linear (Antimony (Dissolved))


Arsenic
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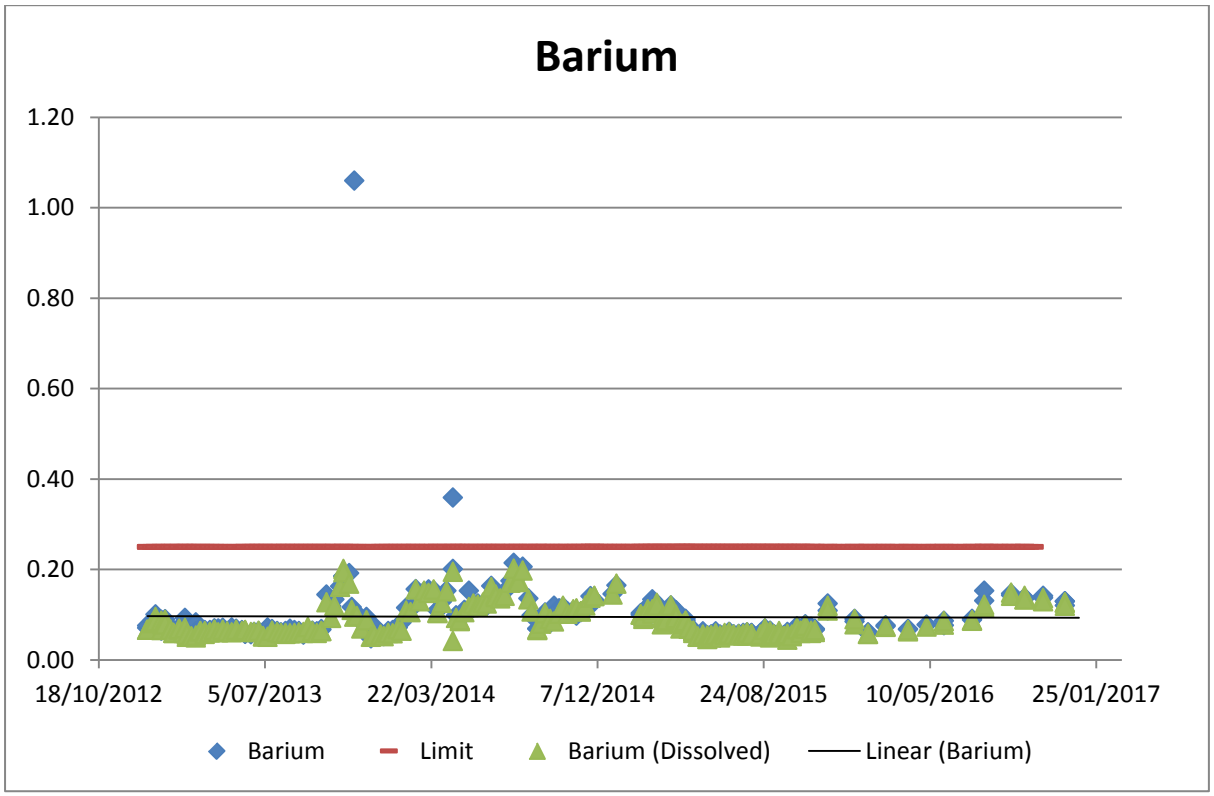
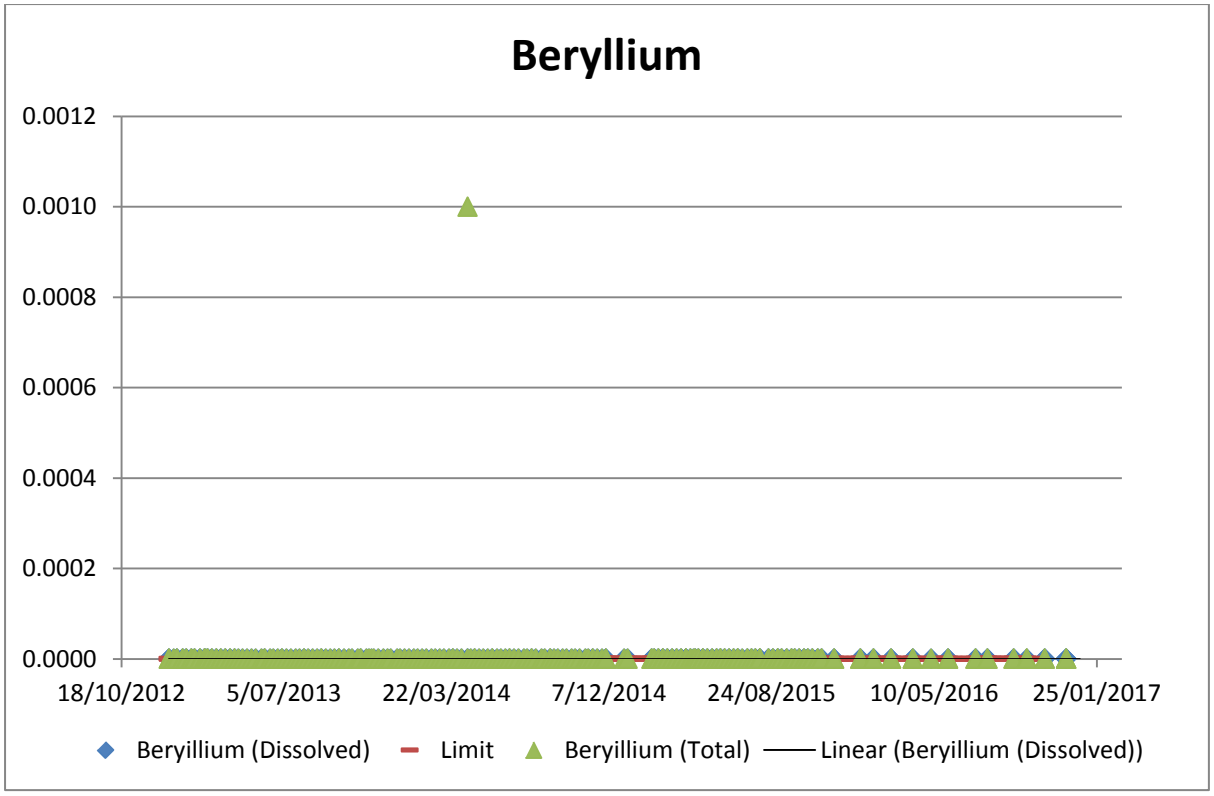
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Arsenic (Total)
Limit
Arsenic (Dissolved)
Linear (Arsenic (Total))


Barium
1.20
1.00
0.80
0.60
0.40
0.20
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Barium
Limit
Barium (Dissolved)
Linear (Barium)


Beryllium
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0.0004
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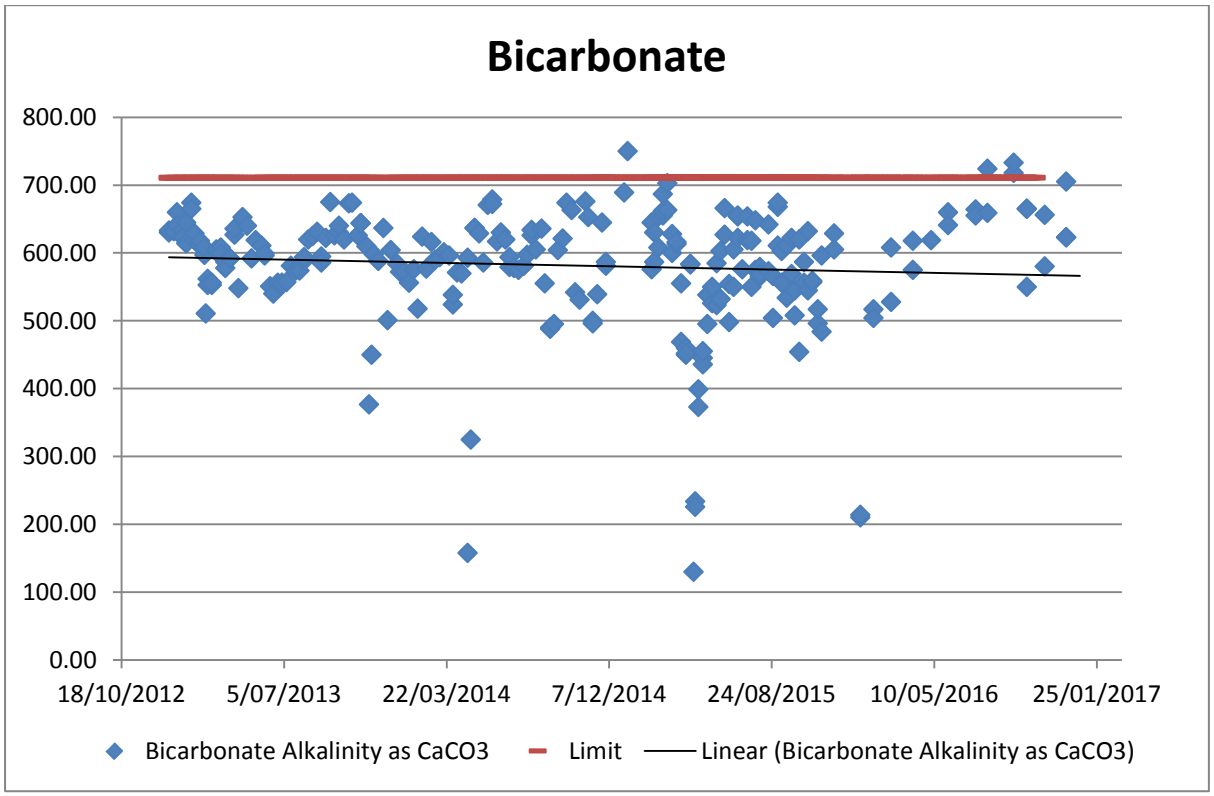
0.0000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Beryllium (Dissolved)
Limit
Beryllium (Total)
Linear (Beryllium (Dissolved))


Bicarbonate
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
18/10/2012
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22/03/2014
7/12/2014
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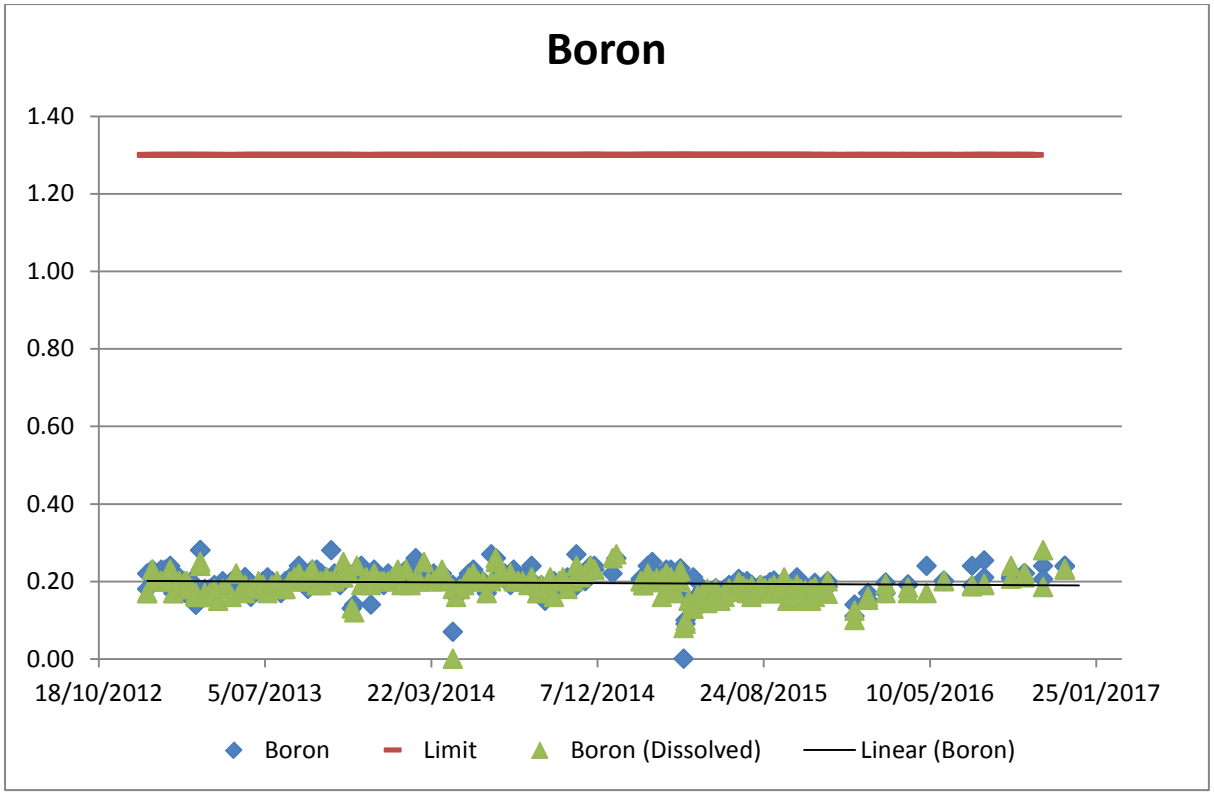
10/05/2016
25/01/2017
Bicarbonate Alkalinity as CaCO3
Limit
Linear (Bicarbonate Alkalinity as CaCO3)


Boron
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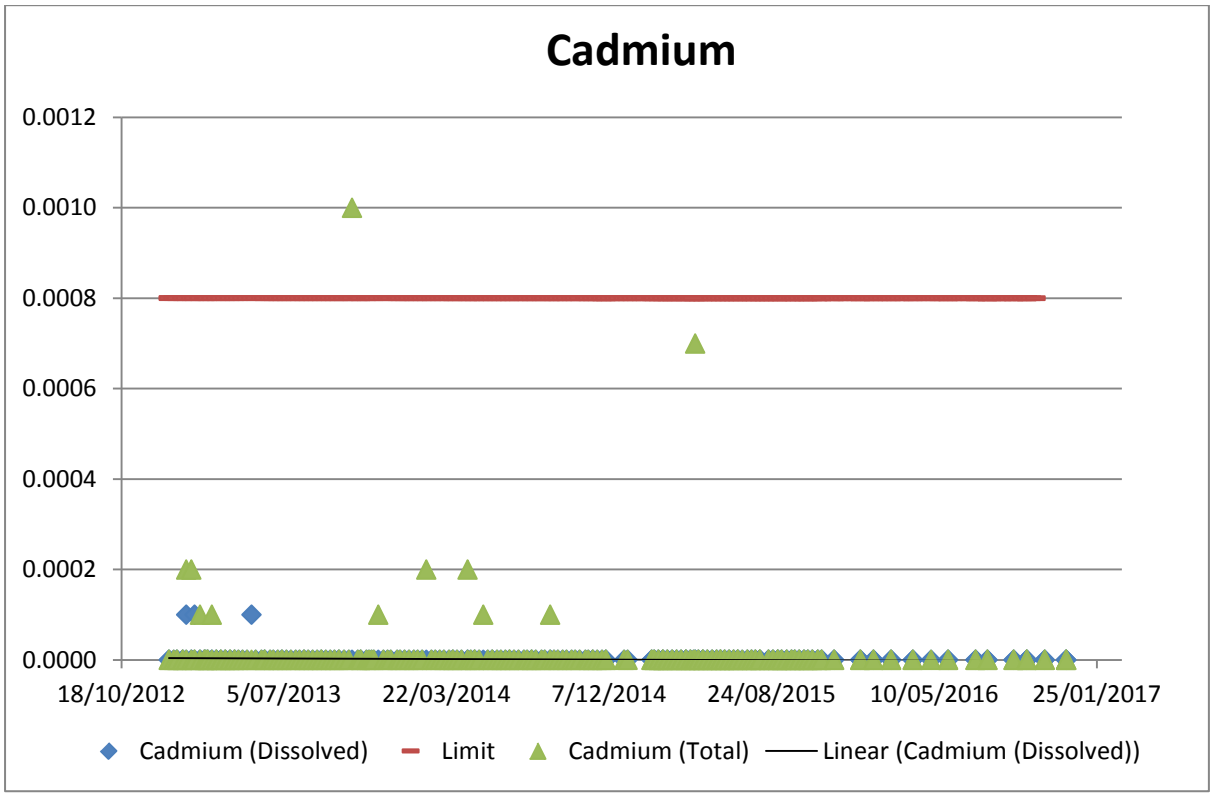
1.20
1.00
0.80
0.60
0.40
0.20
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Boron
Limit
Boron (Dissolved)
Linear (Boron)


Cadmium
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0.0010
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0.0006
0.0004
0.0002
0.0000
18/10/2012
5/07/2013
22/03/2014
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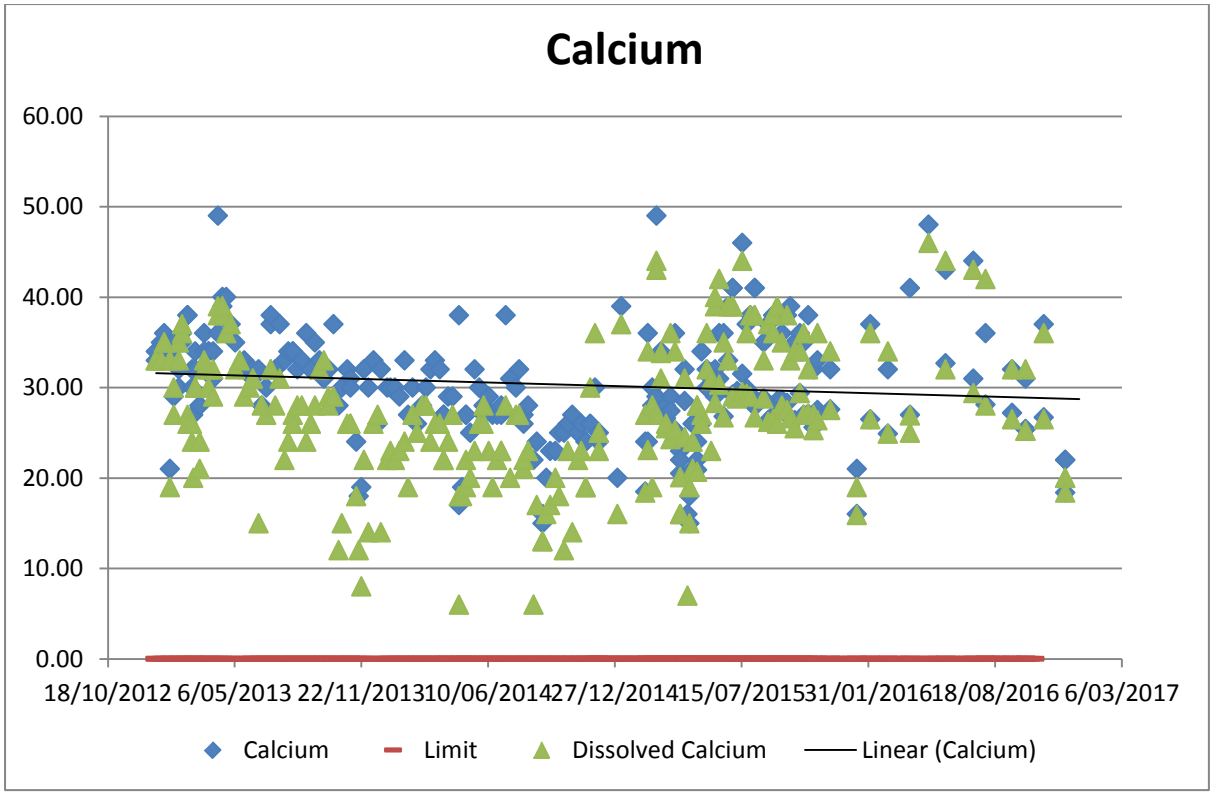
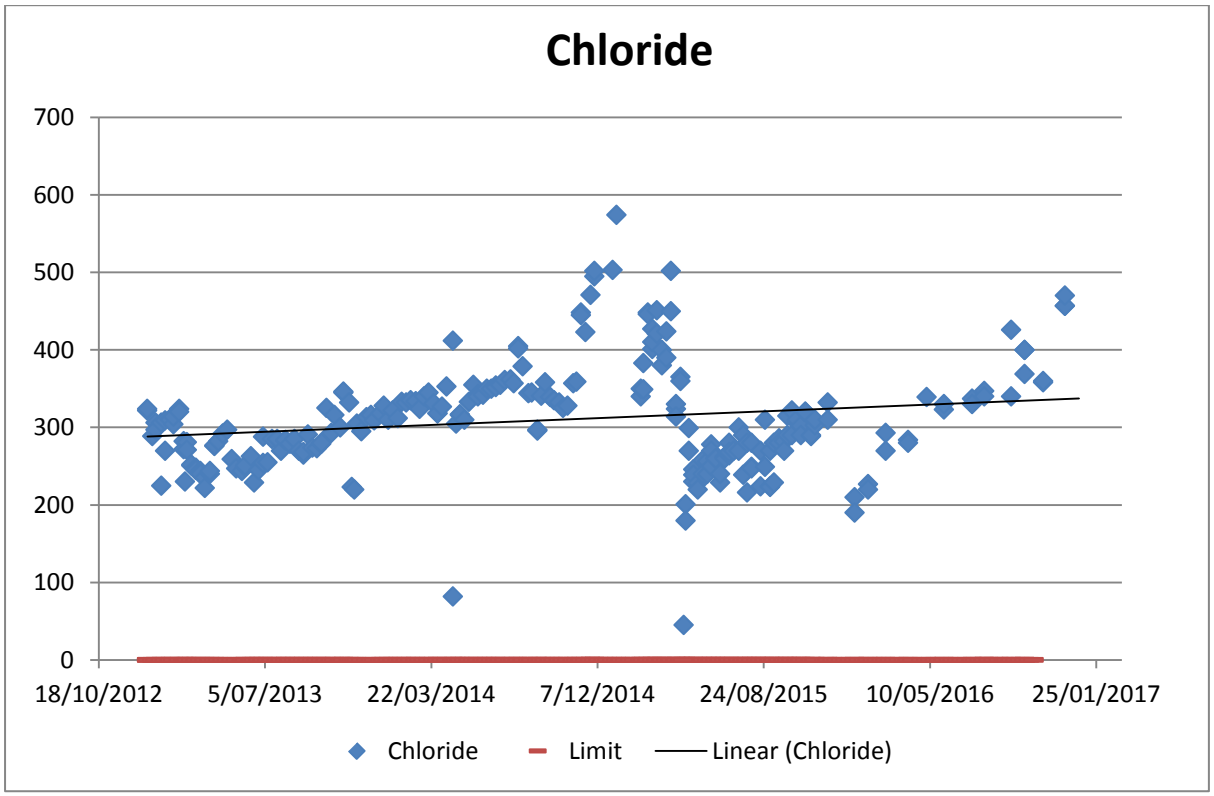
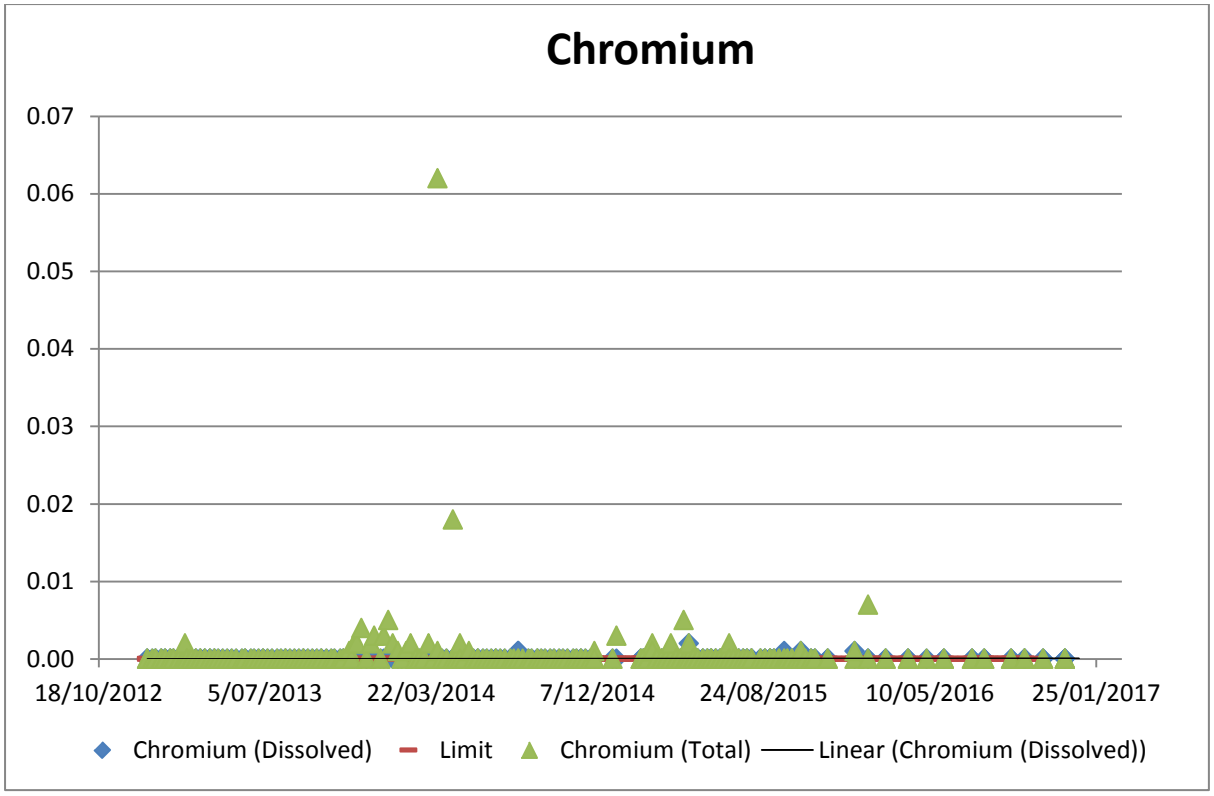
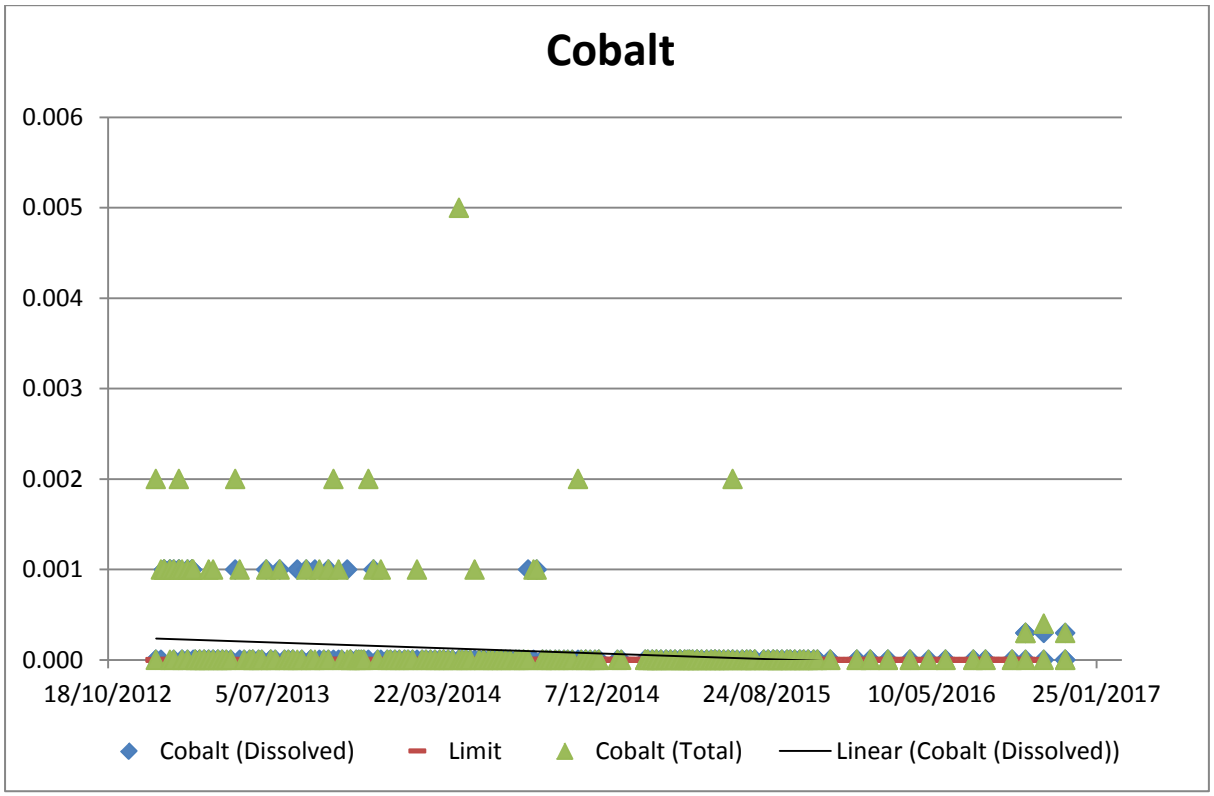
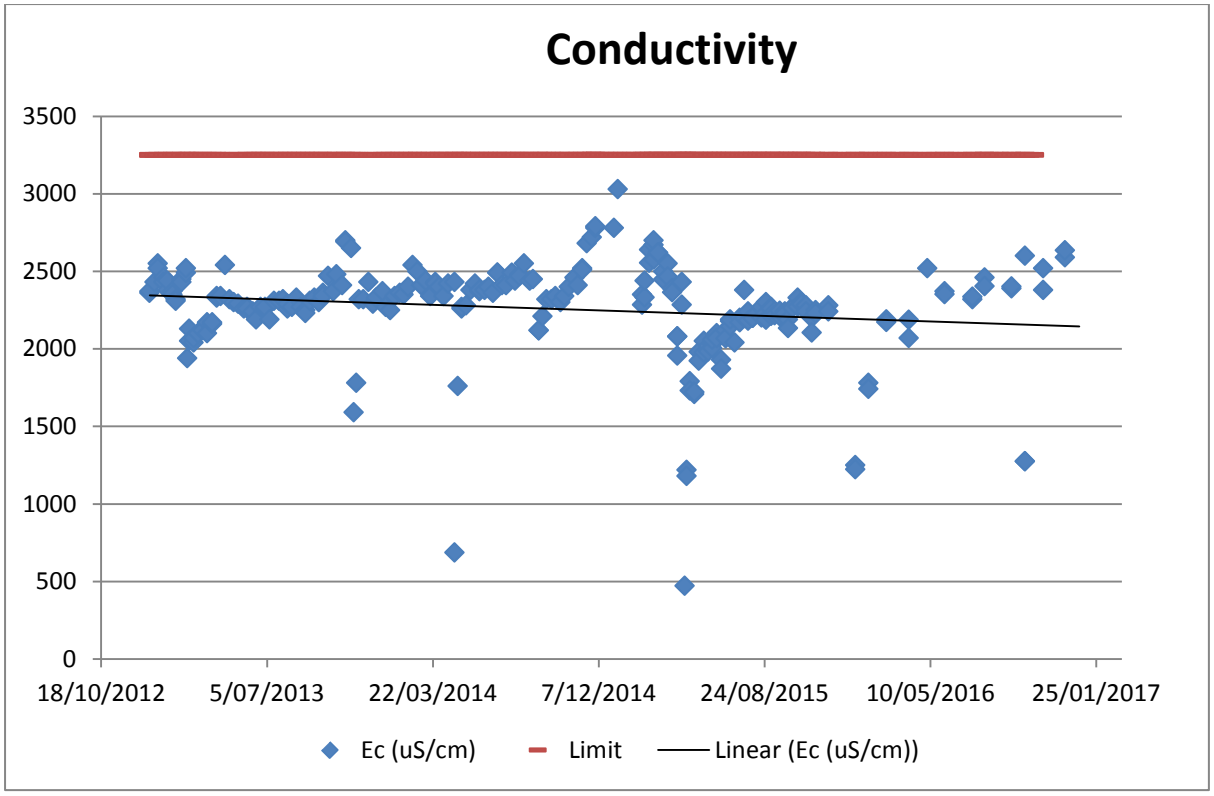
Limit
Cadmium (Total)
Linear (Cadmium (Dissolved))

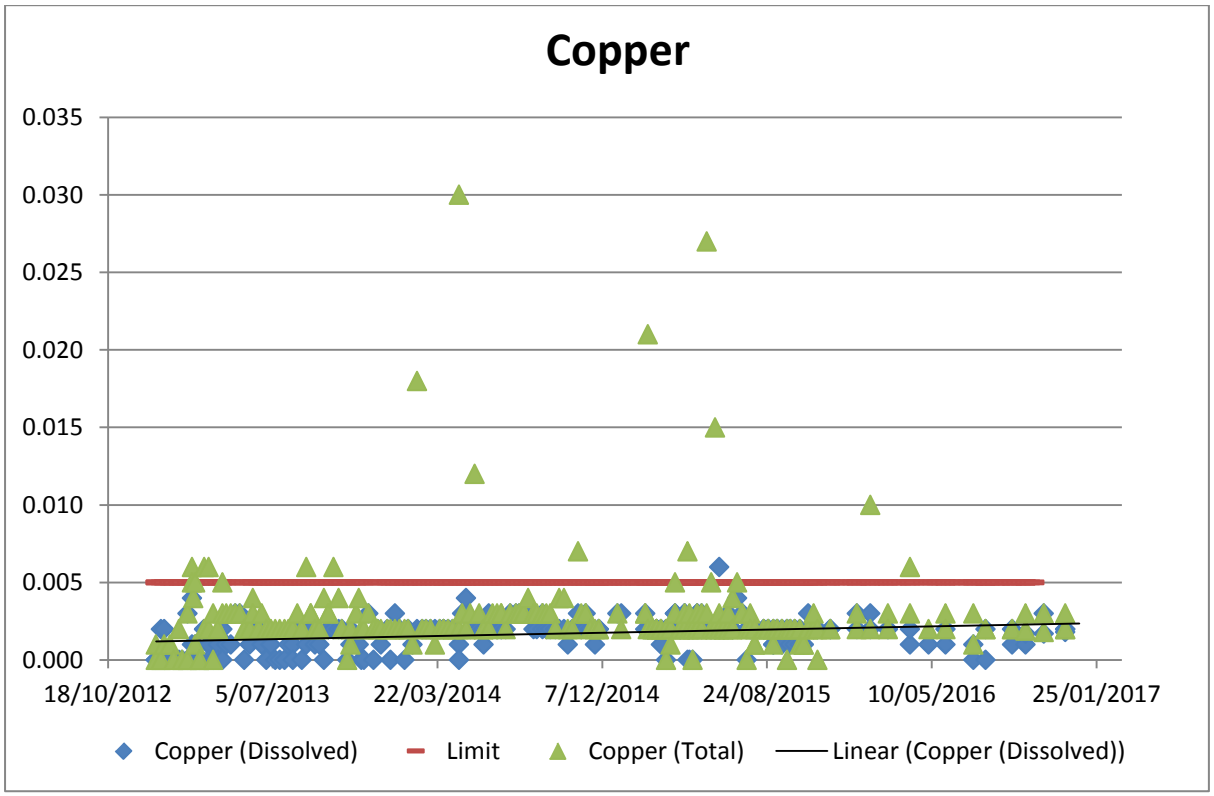

Calcium
60.00
50.00
40.00
30.00
20.00
10.00
0.00
18/10/2012 6/05/2013 22/11/2013 10/06/2014 27/12/2014 15/07/2015 31/01/2016 18/08/2016 6/03/2017
Calcium
Limit
Dissolved Calcium
Linear (Calcium)

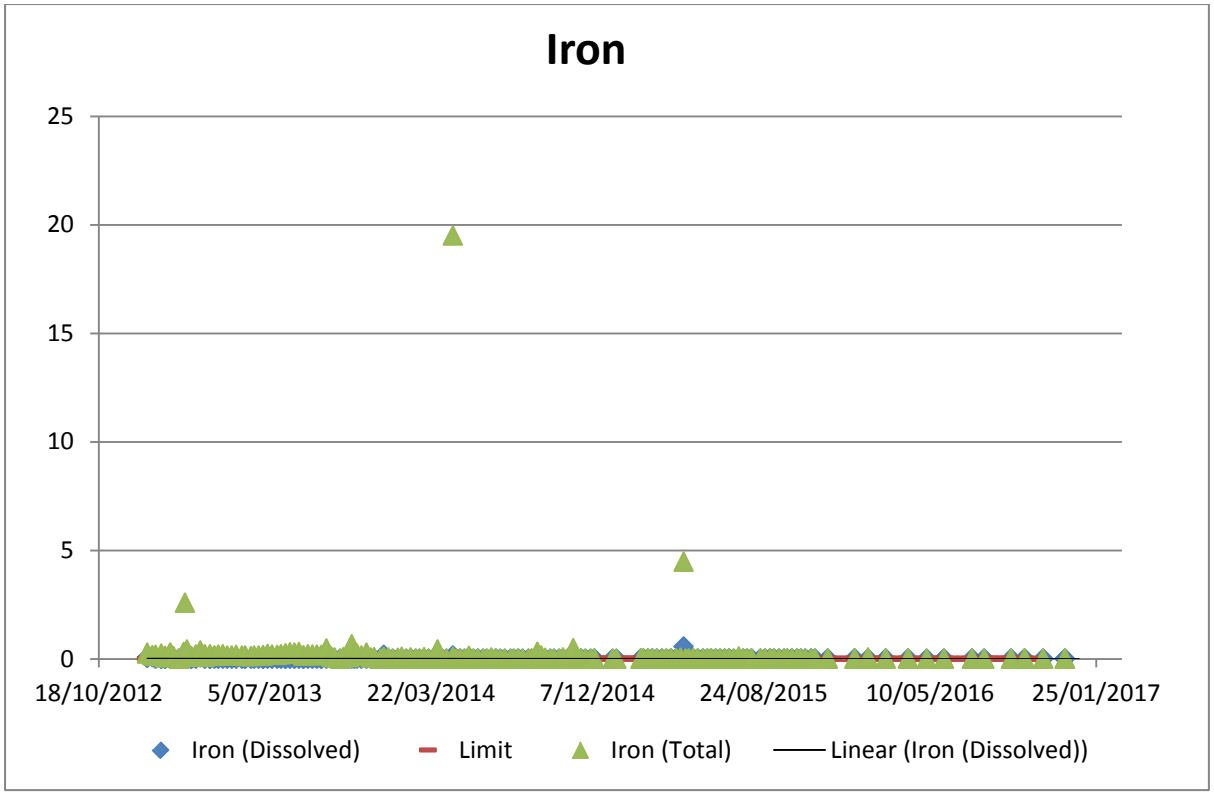

Chloride
700
600
500
400
300
200
100
0
18/10/2012 5/07/2013 22/03/2014 7/12/2014 24/08/2015 10/05/2016 25/01/2017
Chloride
Limit
Linear (Chloride)

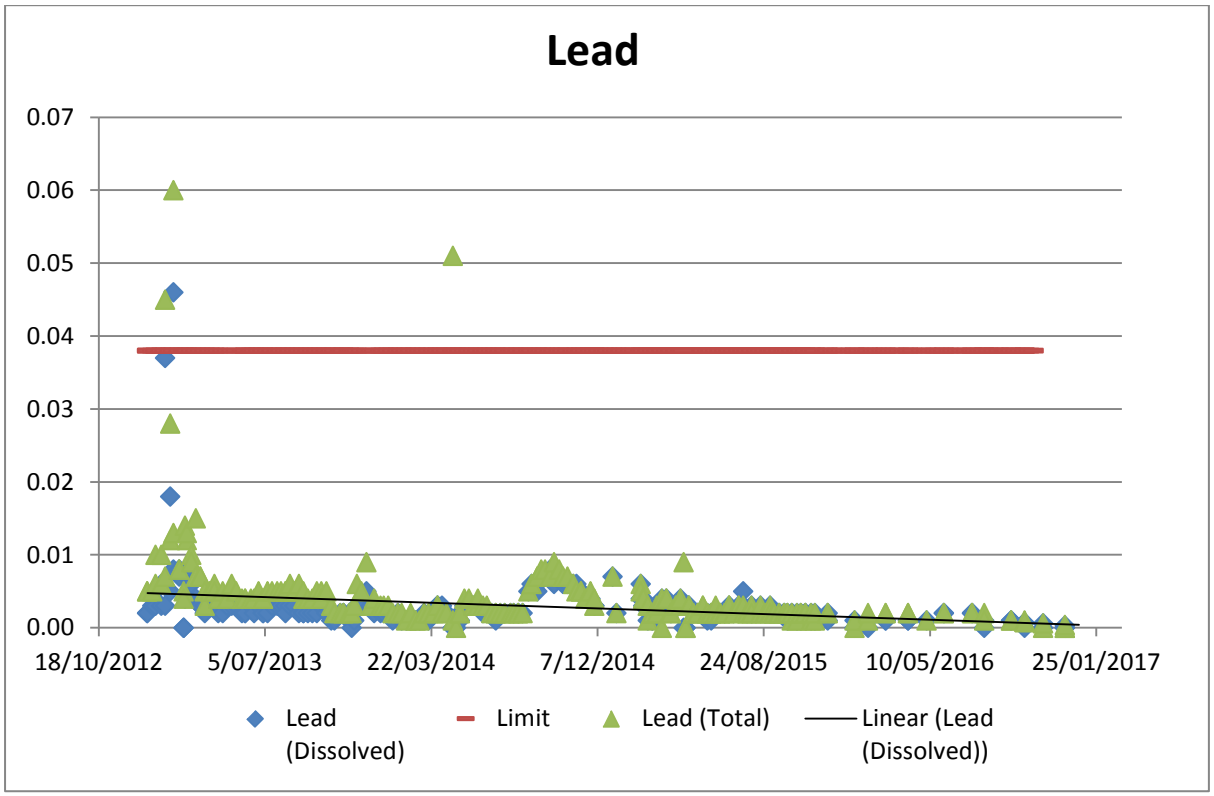

Chromium
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Chromium (Dissolved)
Limit
Chromium (Total)
Linear (Chromium (Dissolved))

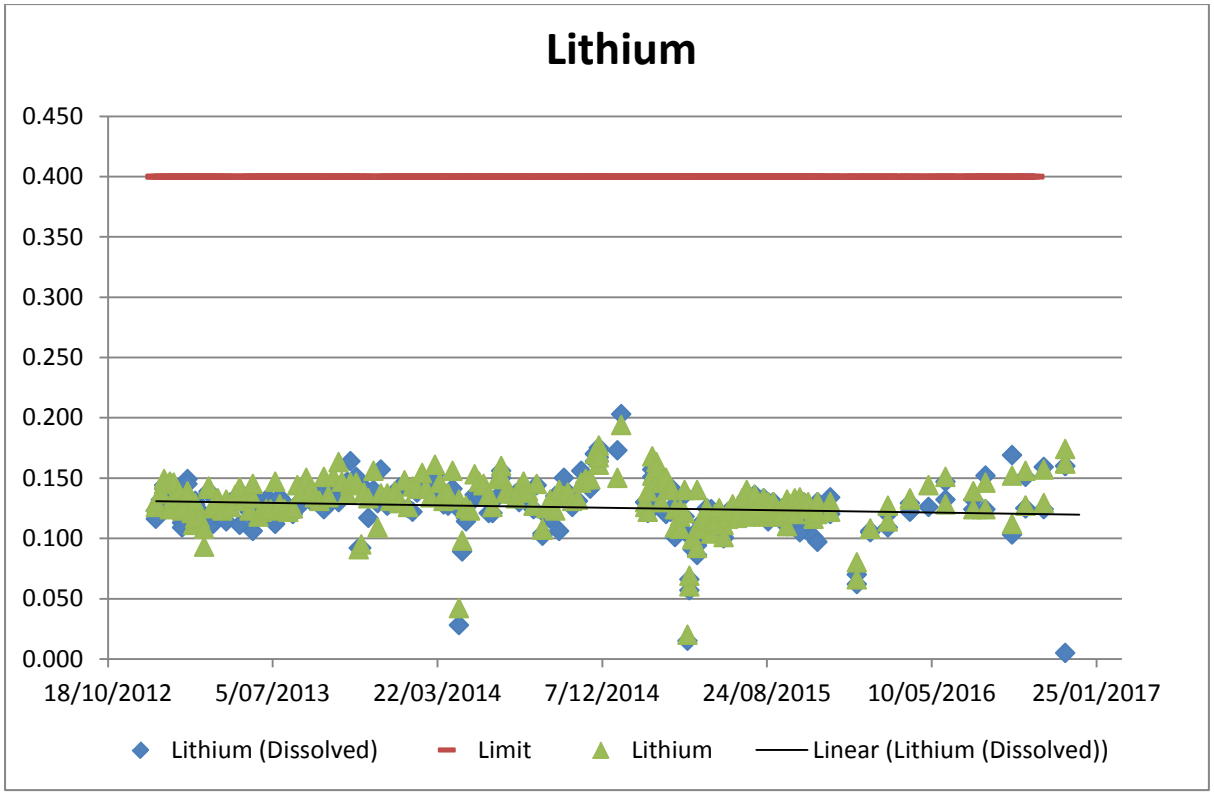

Cobalt
0.006
0.005
0.004
0.003
0.002
0.001
0.000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Cobalt (Dissolved)
Limit
Cobalt (Total)
Linear (Cobalt (Dissolved))

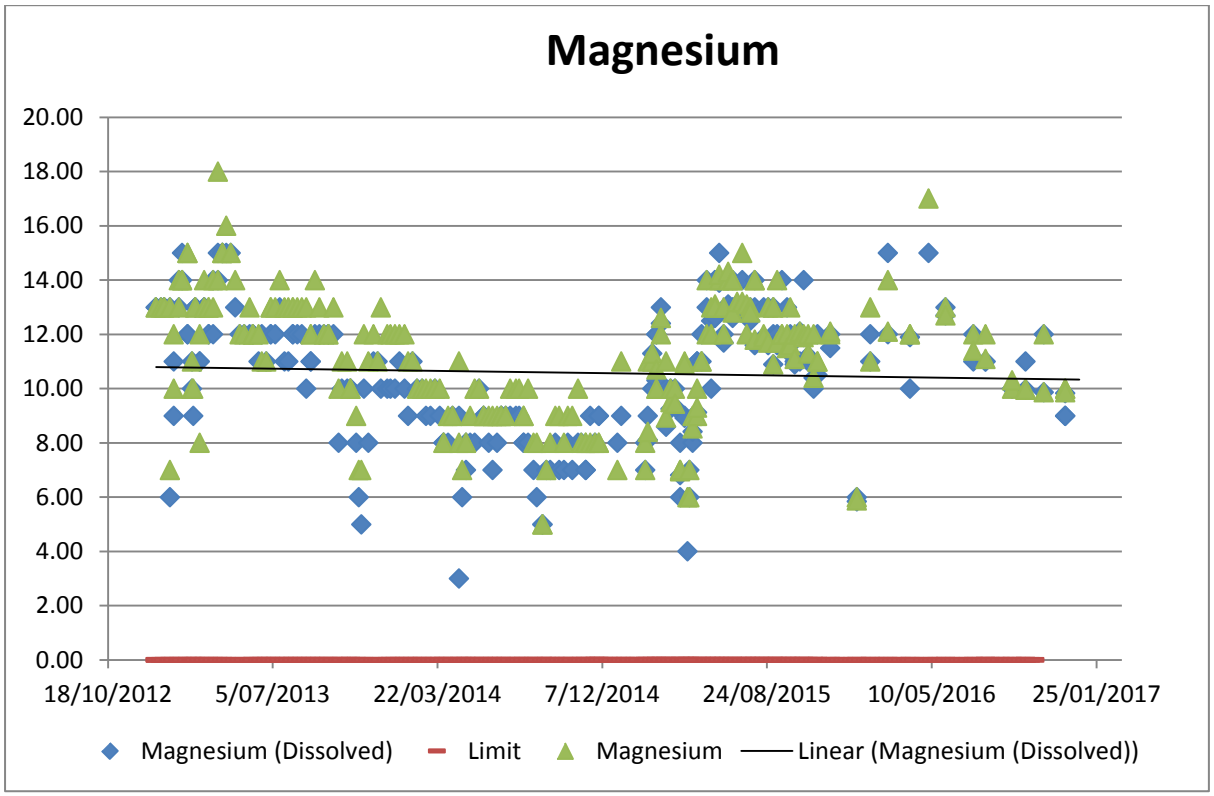

Conductivity
3500
3000
2500
2000
1500
1000
500
0
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Ec (uS/cm)
Limit
Linear (Ec (uS/cm))

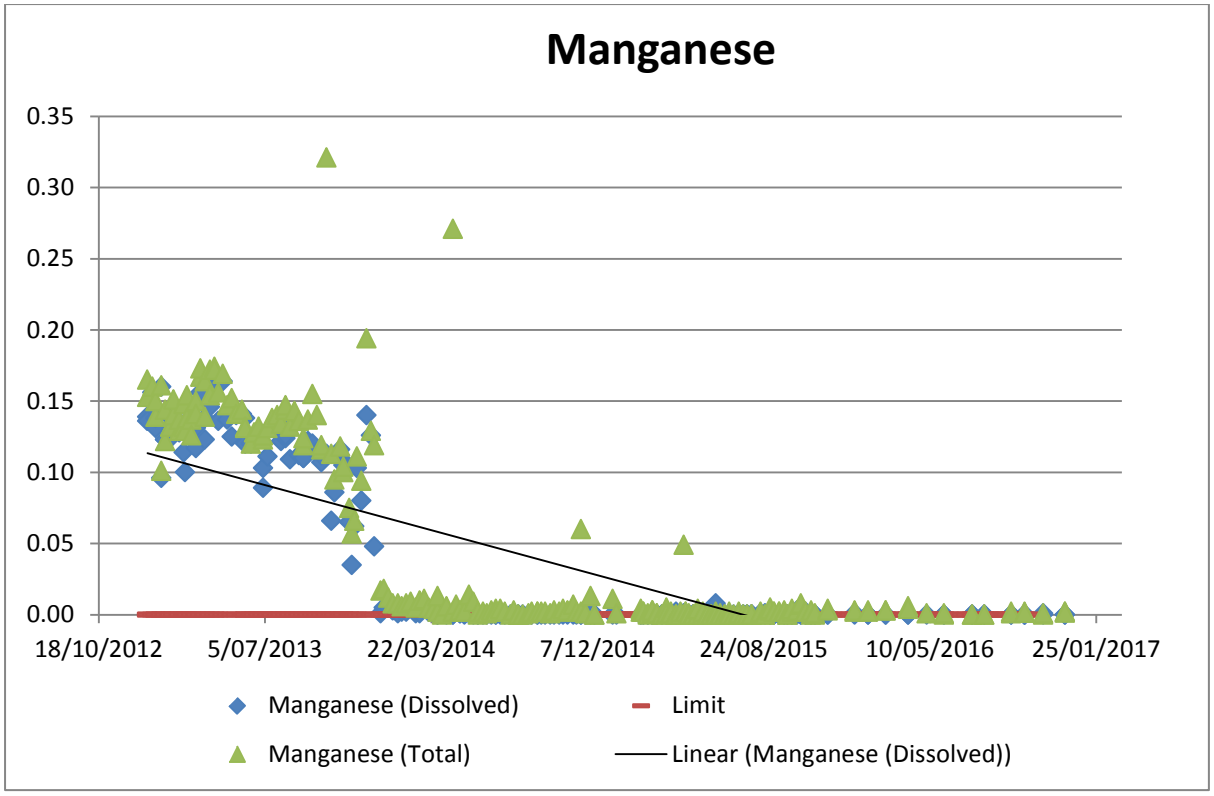

Copper
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Copper (Dissolved)
Limit
Copper (Total)
Linear (Copper (Dissolved))

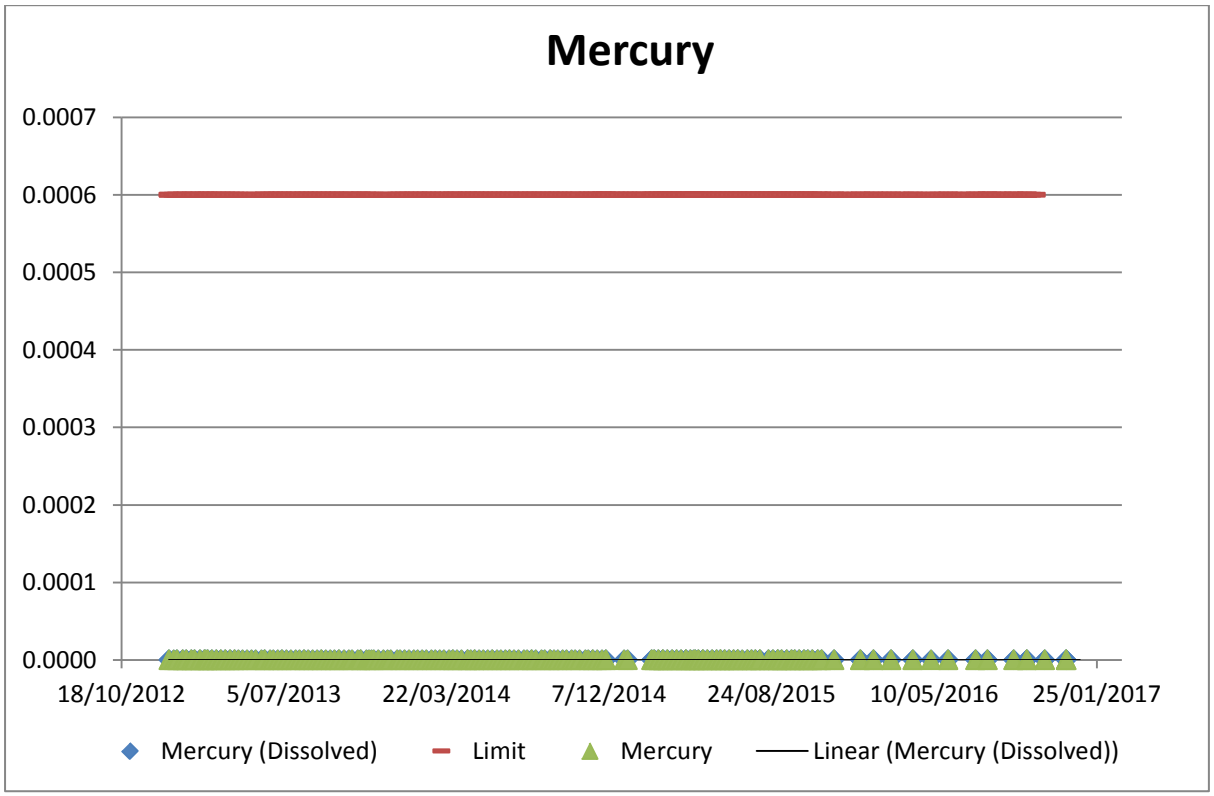

Iron
25
20
15
10
5
0
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Iron (Dissolved)
Limit
Iron (Total)
Linear (Iron (Dissolved))

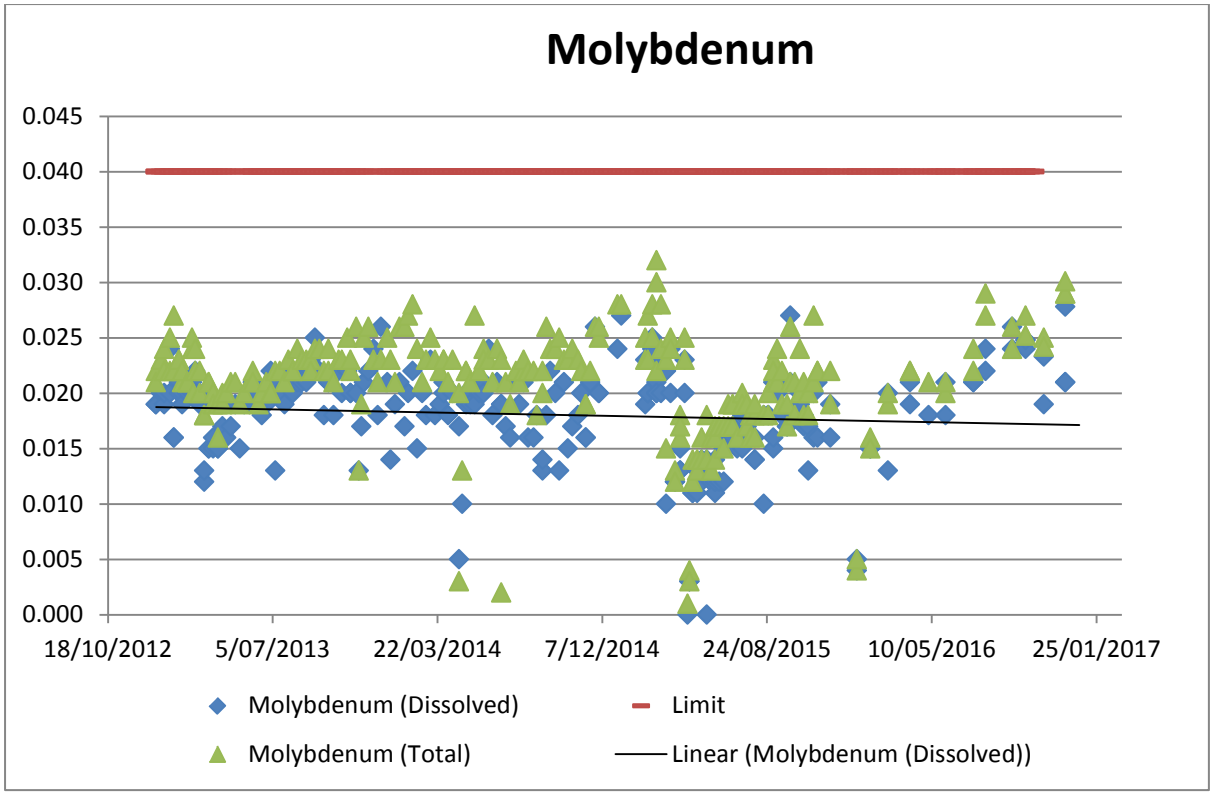

Lead
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Lead (Dissolved)
Limit
Lead (Total)
Linear (Lead (Dissolved))

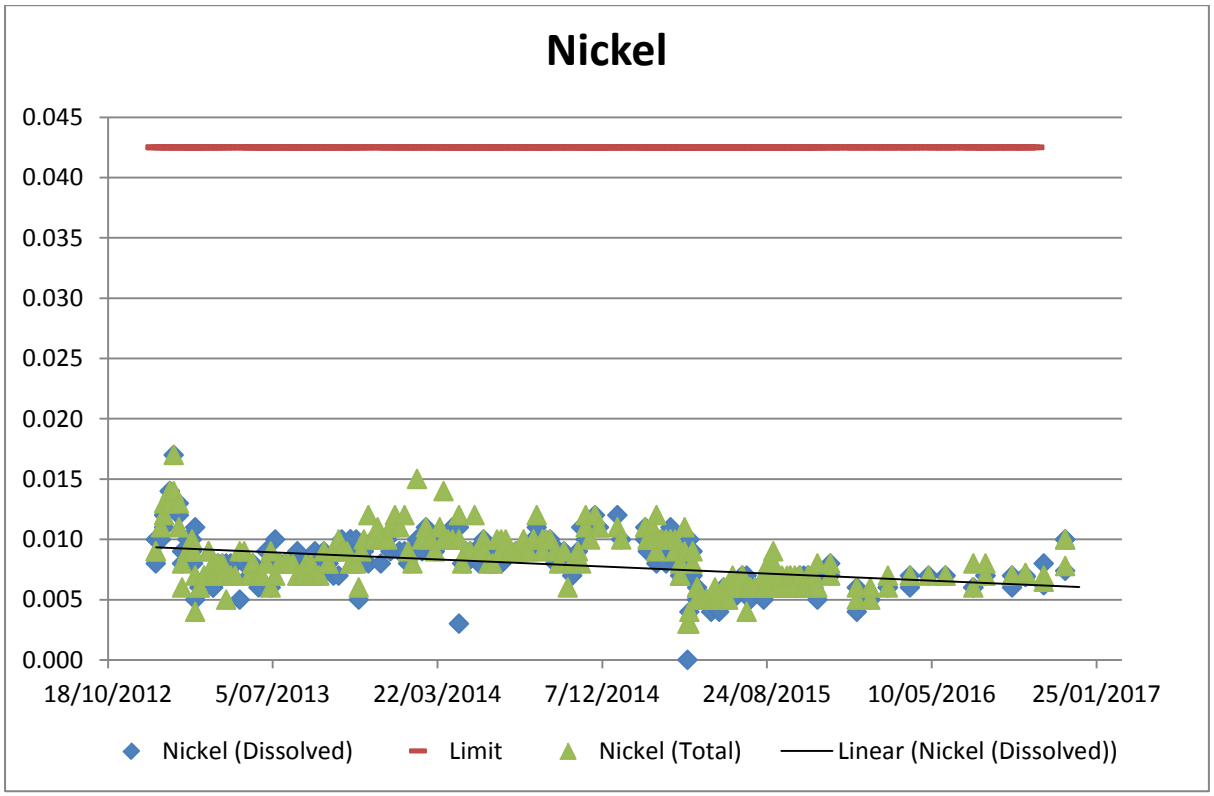

Lithium
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Lithium (Dissolved)
Limit
Lithium
Linear (Lithium (Dissolved))

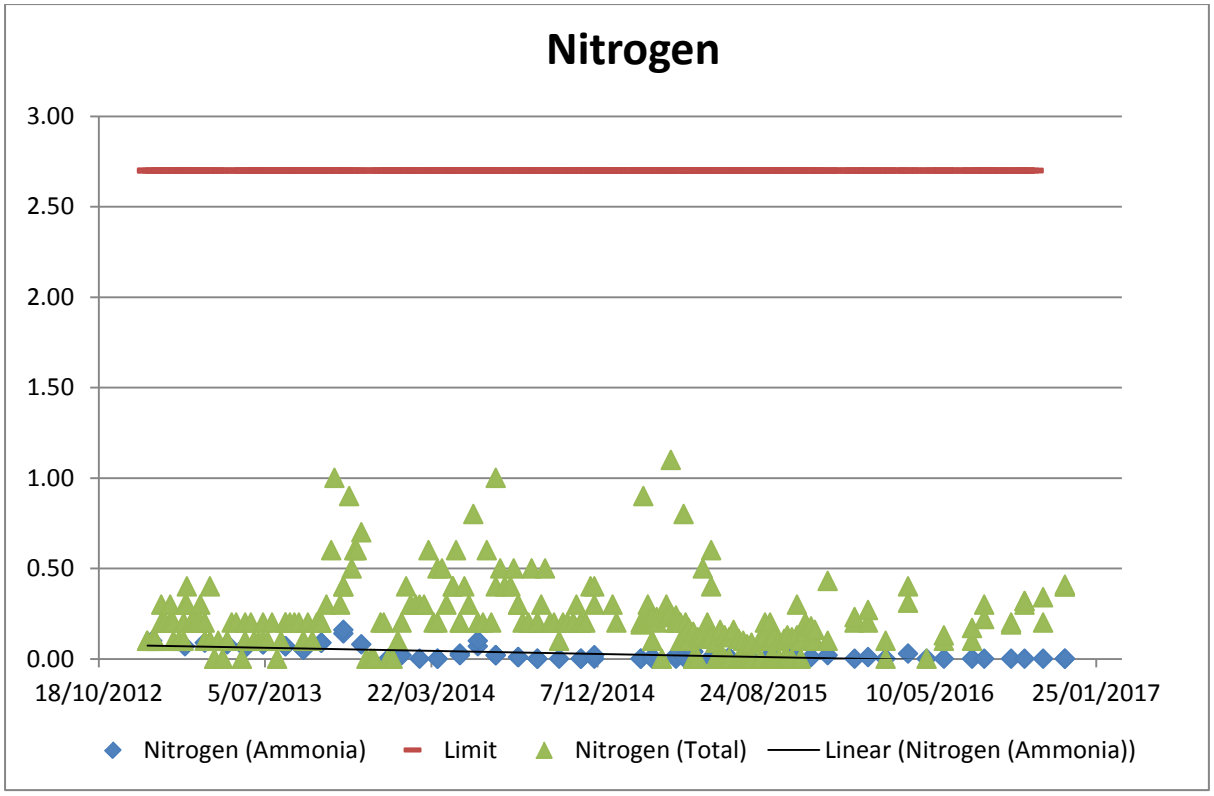

Magnesium
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Magnesium (Dissolved)
Limit
Magnesium
Linear (Magnesium (Dissolved))

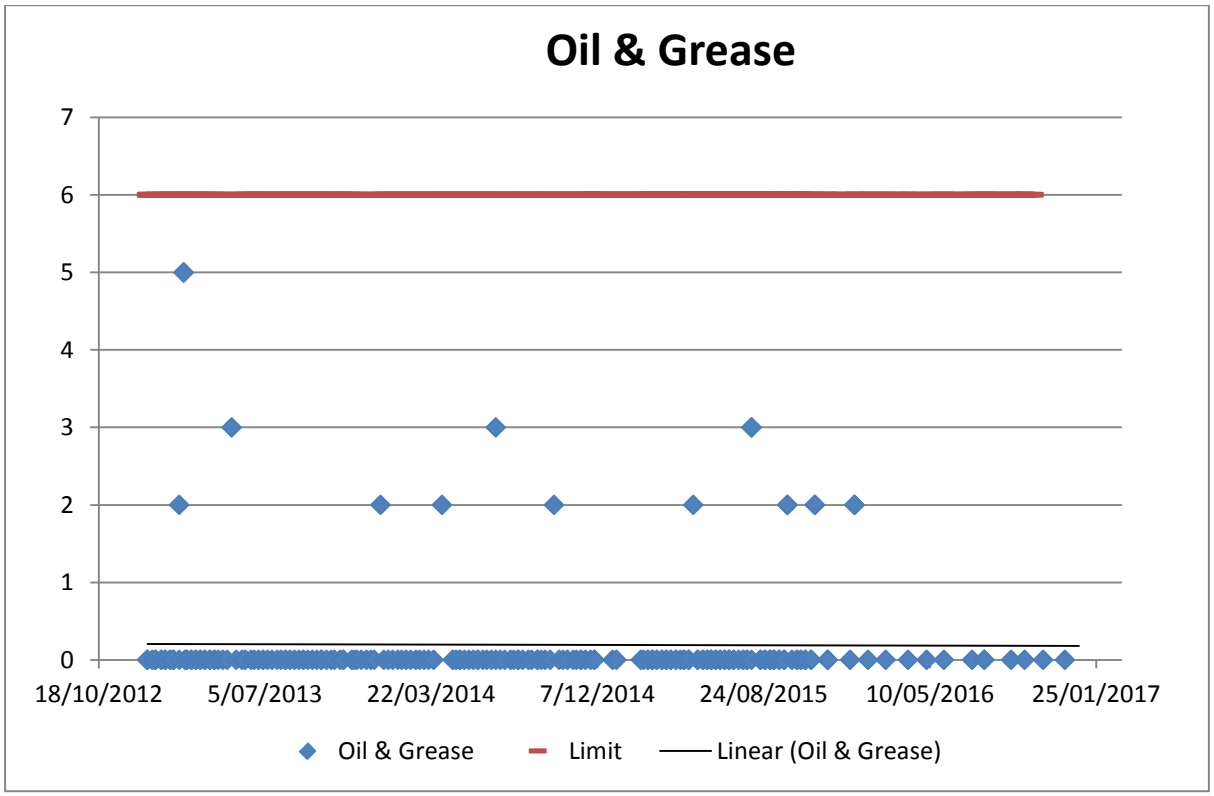

Manganese
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Manganese (Dissolved)
Limit
Manganese (Total)
Linear (Manganese (Dissolved))

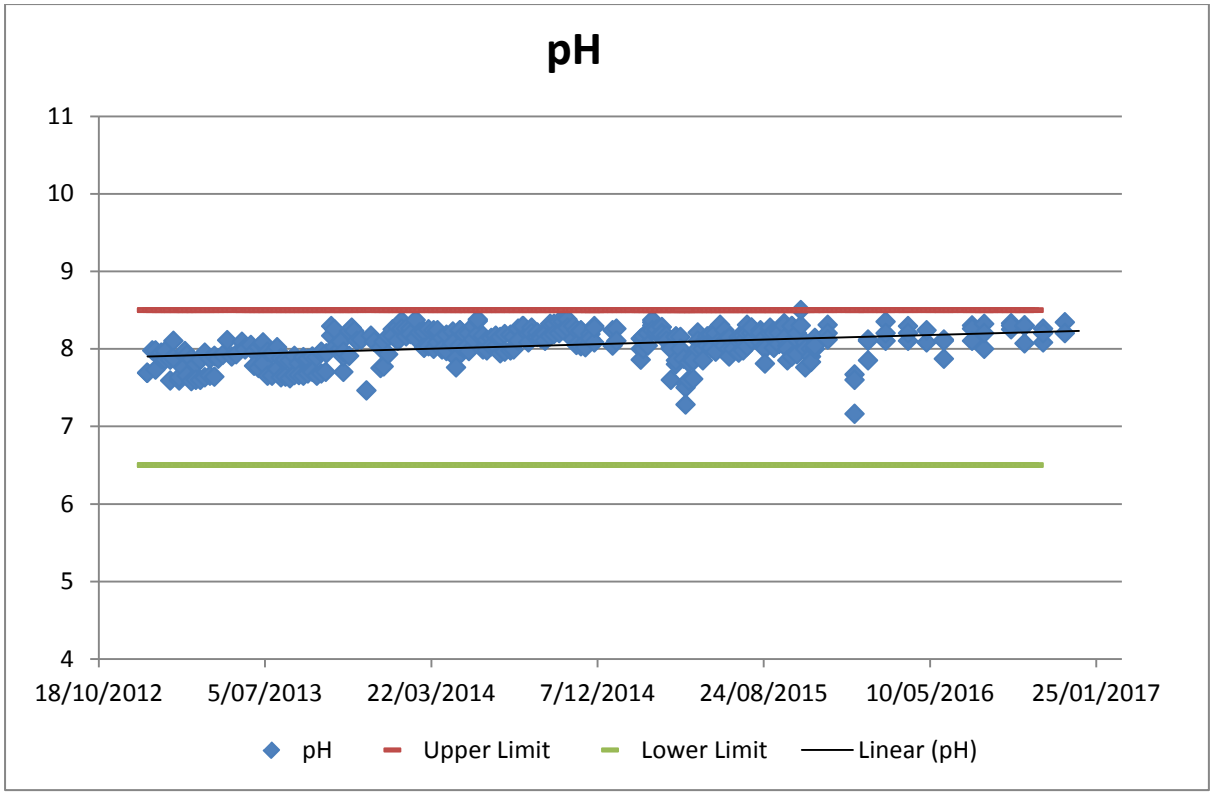

Mercury
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0.0000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Mercury (Dissolved)
Limit
Mercury
Linear (Mercury (Dissolved))

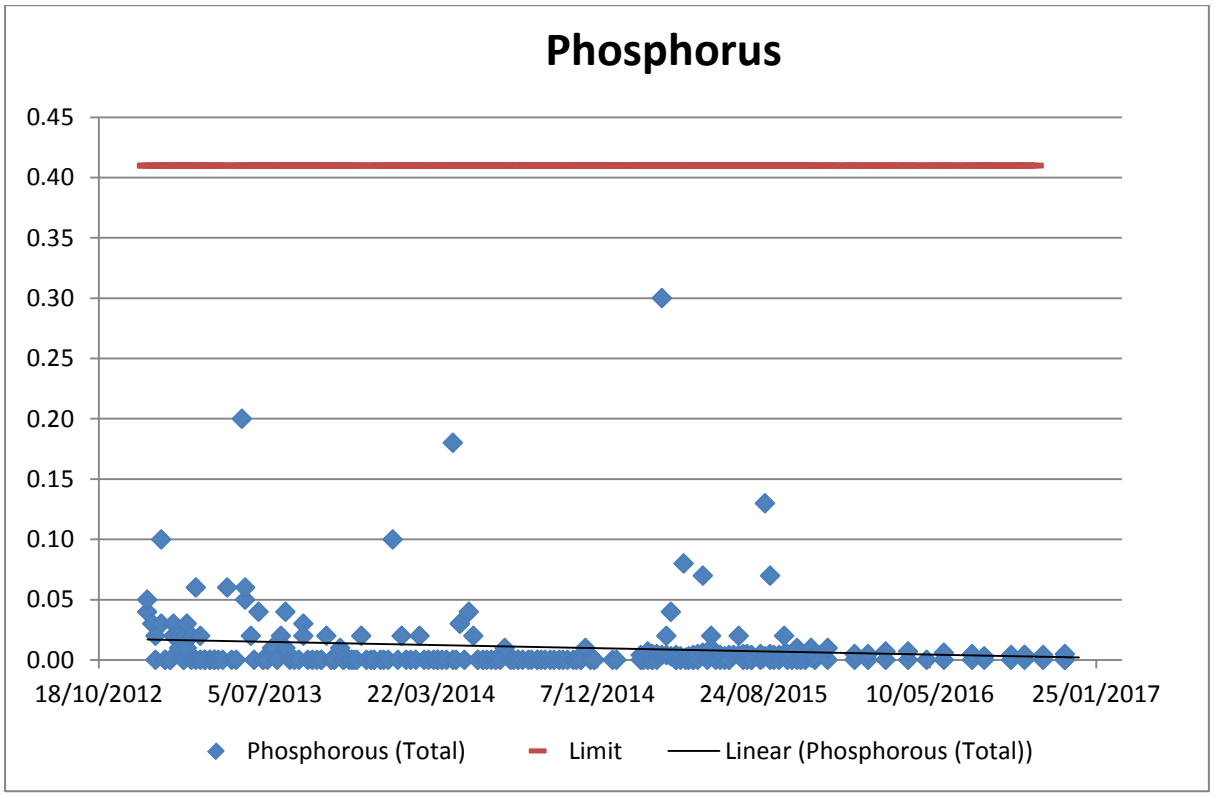

Molybdenum
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Molybdenum (Dissolved)
Limit
Molybdenum (Total)
Linear (Molybdenum (Dissolved))

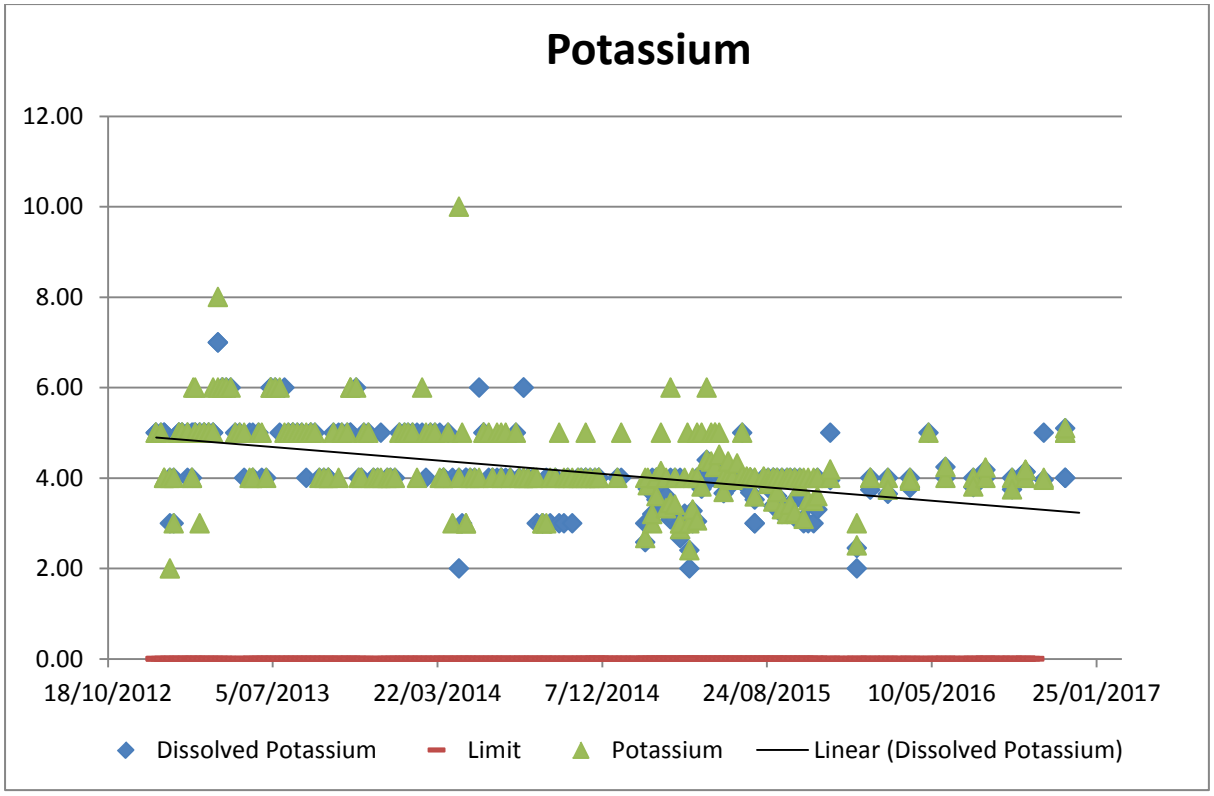

Nickel
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Nickel (Dissolved)
Limit
Nickel (Total)
Linear (Nickel (Dissolved))

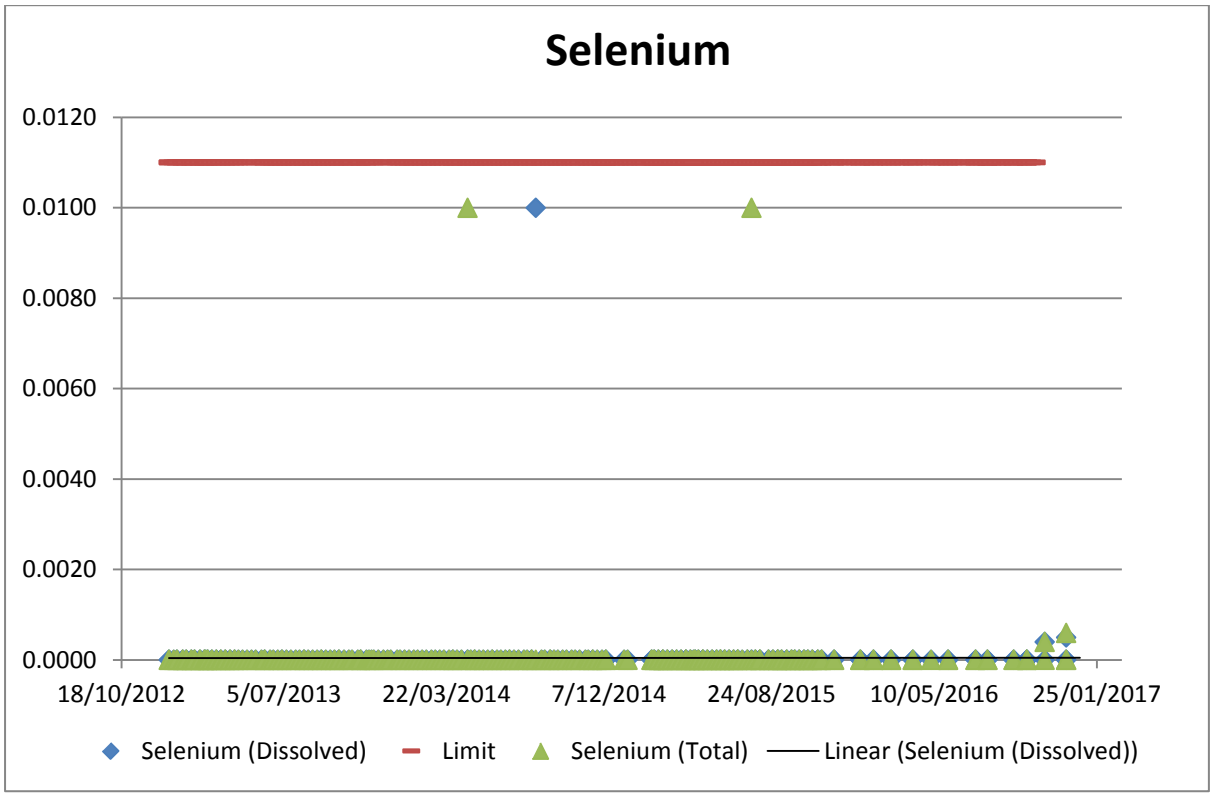

Nitrogen
3.00
2.50
2.00
1.50
1.00
0.50
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Nitrogen (Ammonia)
Limit
Nitrogen (Total)
Linear (Nitrogen (Ammonia))

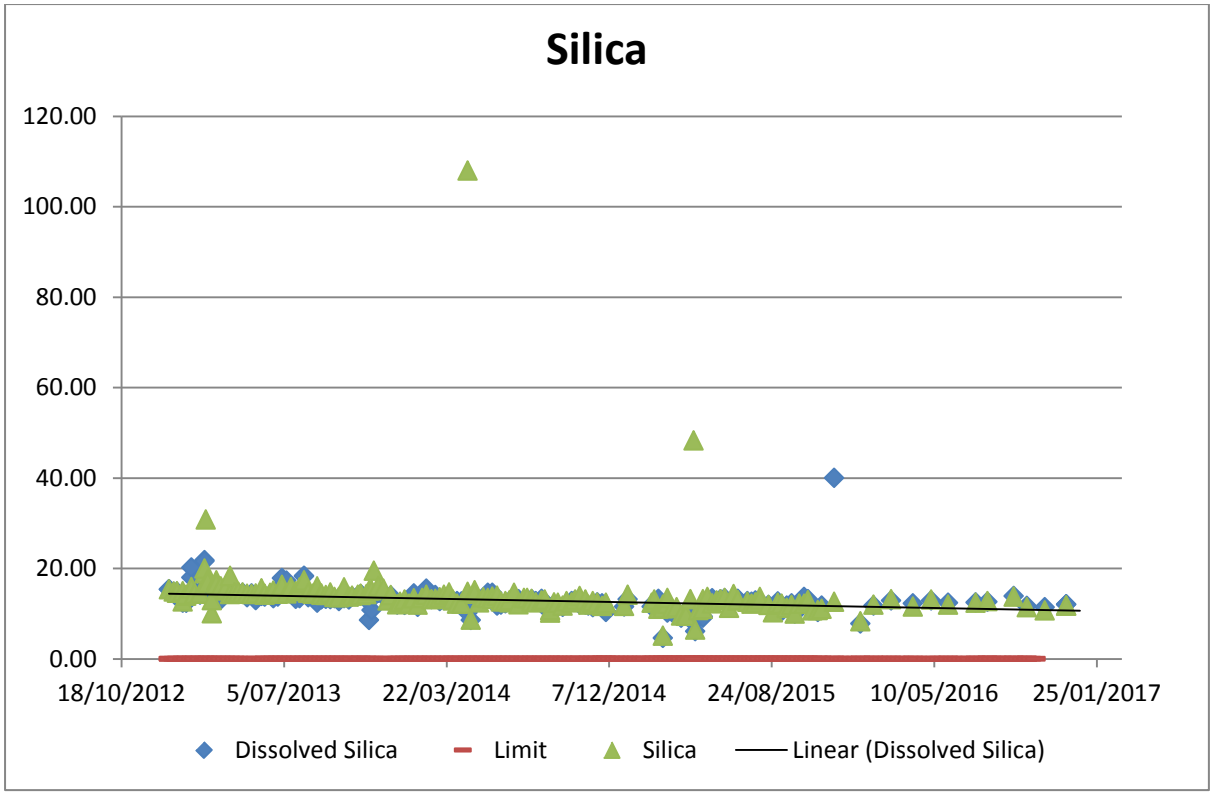

Oil & Grease
7
6
5
4
3
2
1
0
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Oil & Grease
Limit
Linear (Oil & Grease)

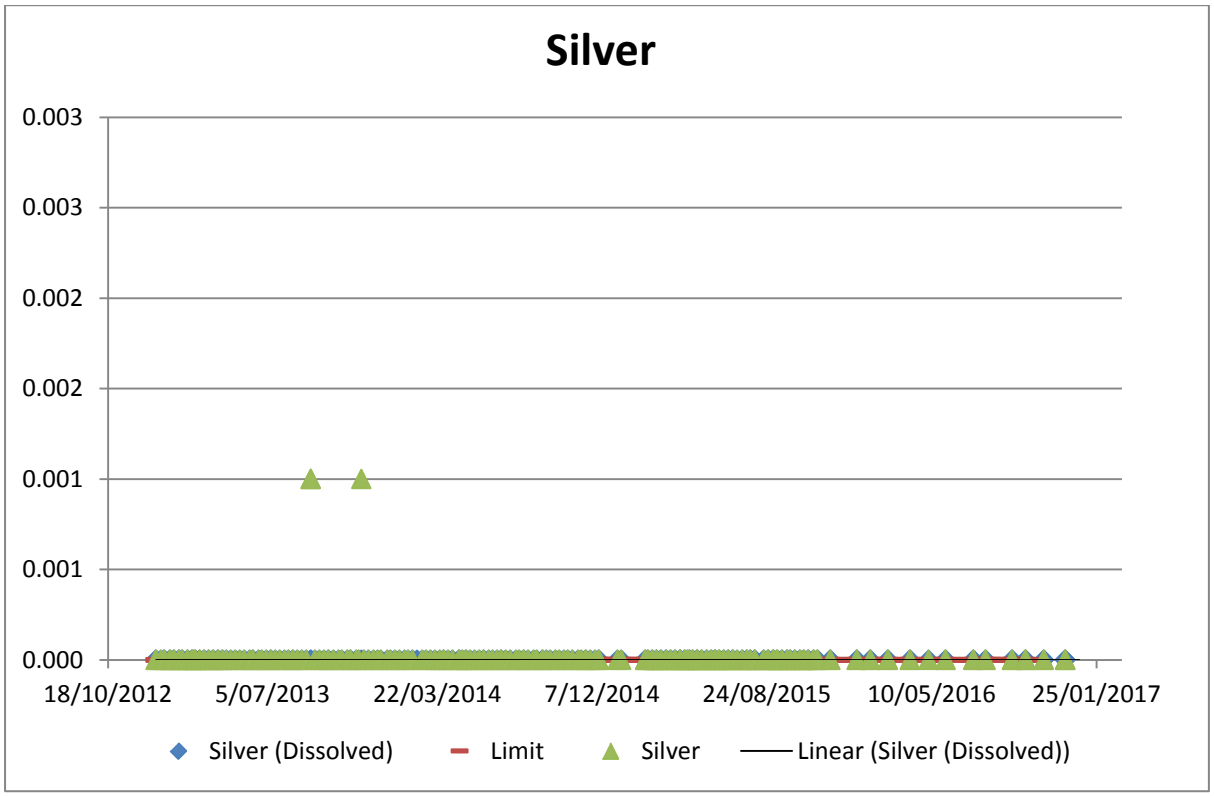

pH
11
10
9
8
7
6
5
4
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
pH
Upper Limit
Lower Limit
Linear (pH)

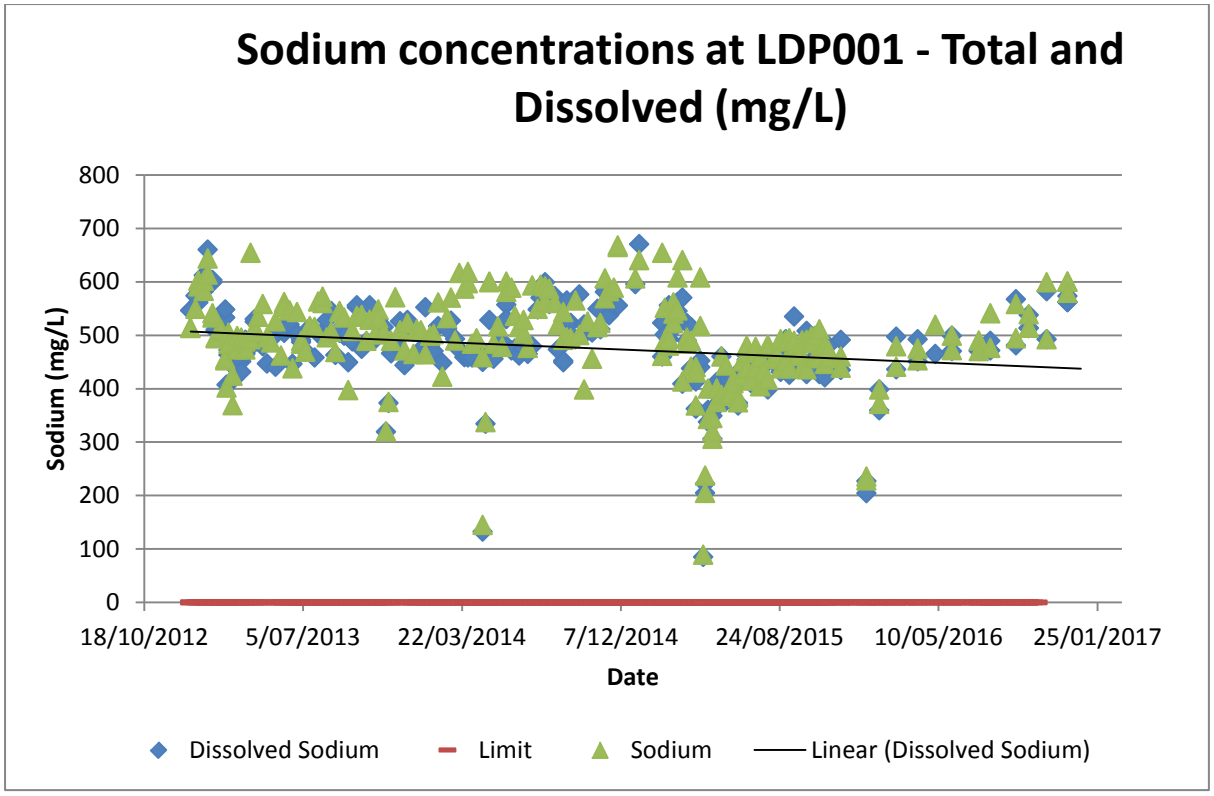

Phosphorus
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Phosphorous (Total)
Limit
Linear (Phosphorous (Total))

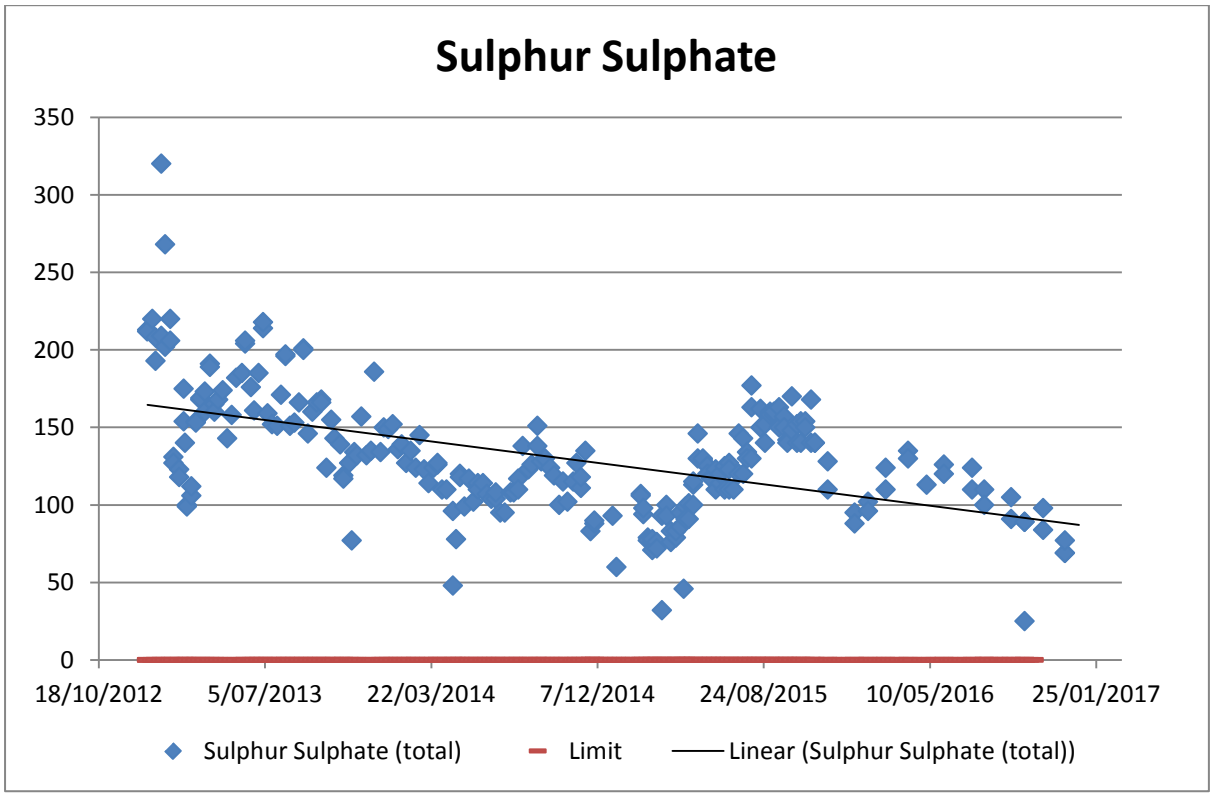

Potassium
12.00
10.00
8.00
6.00
4.00
2.00
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Dissolved Potassium
Limit
Potassium
Linear (Dissolved Potassium)

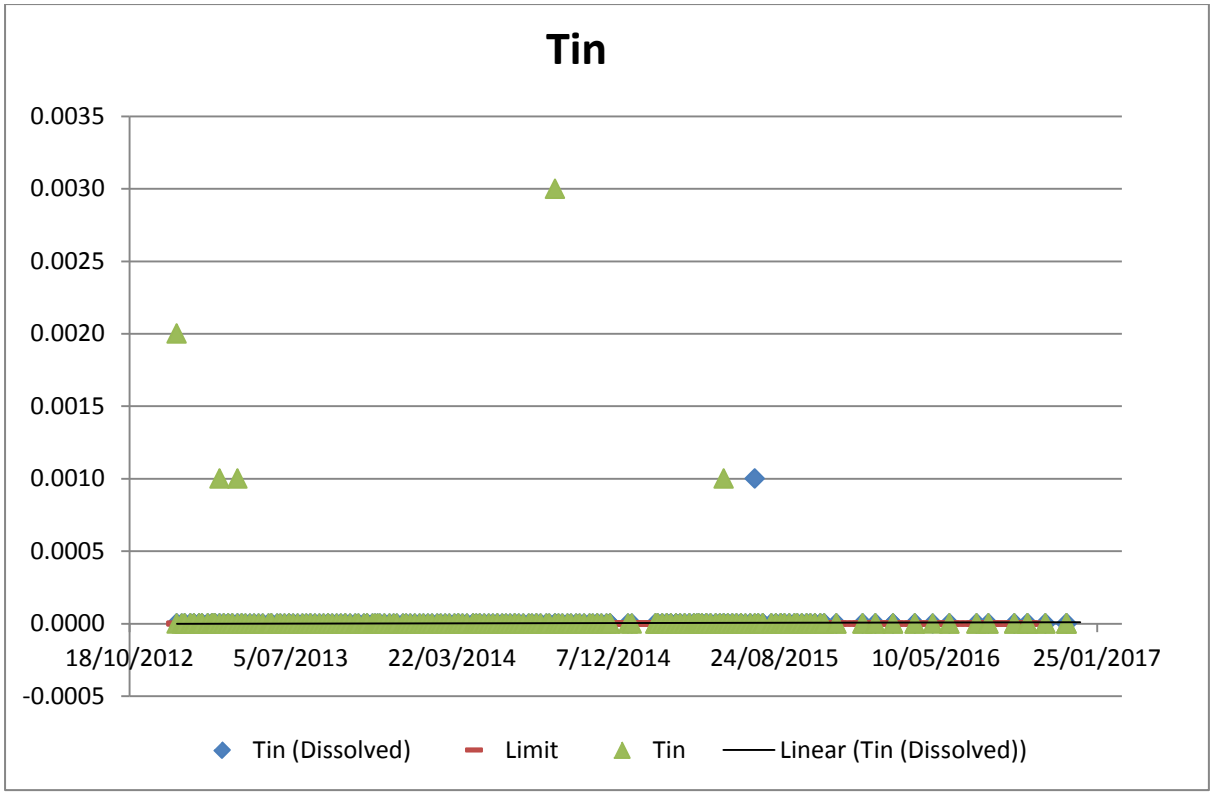

Selenium
0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
0.0000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Selenium (Dissolved)
Limit
Selenium (Total)
Linear (Selenium (Dissolved))

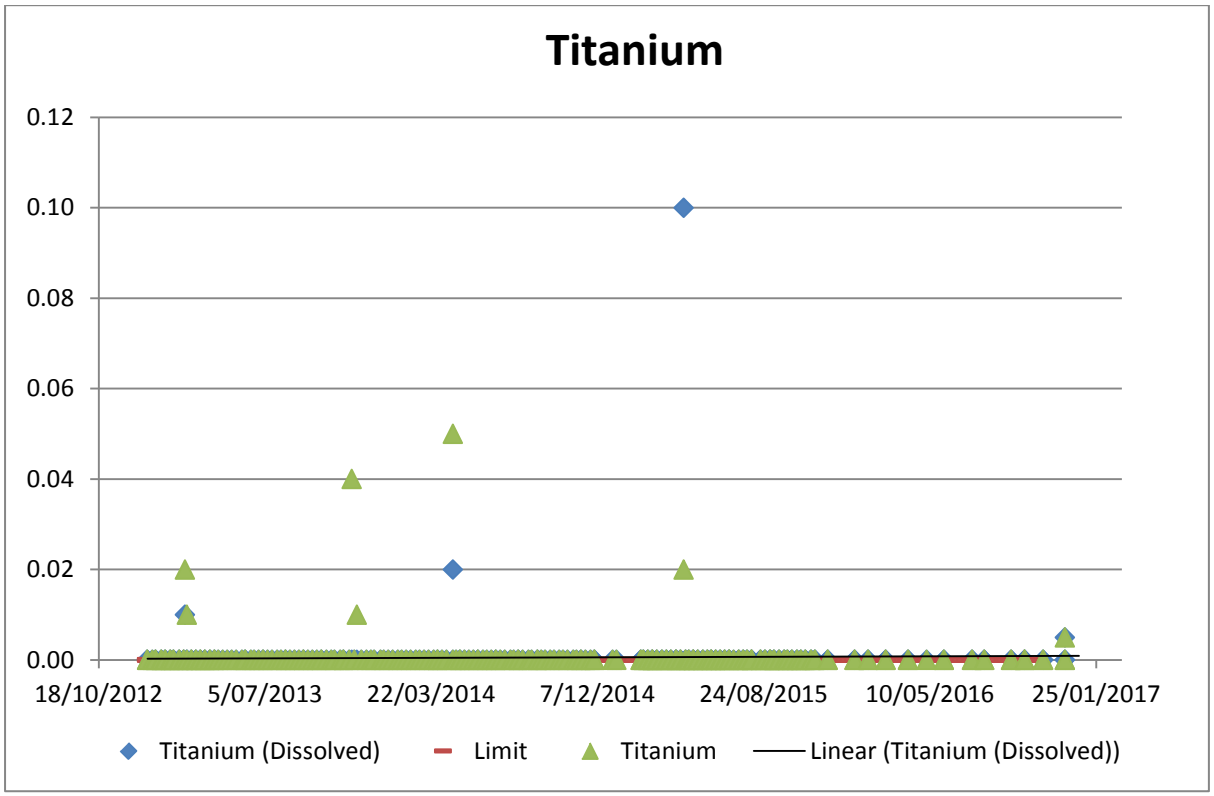

Silica
120.00
100.00
80.00
60.00
40.00
20.00
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Dissolved Silica
Limit
Silica
Linear (Dissolved Silica)

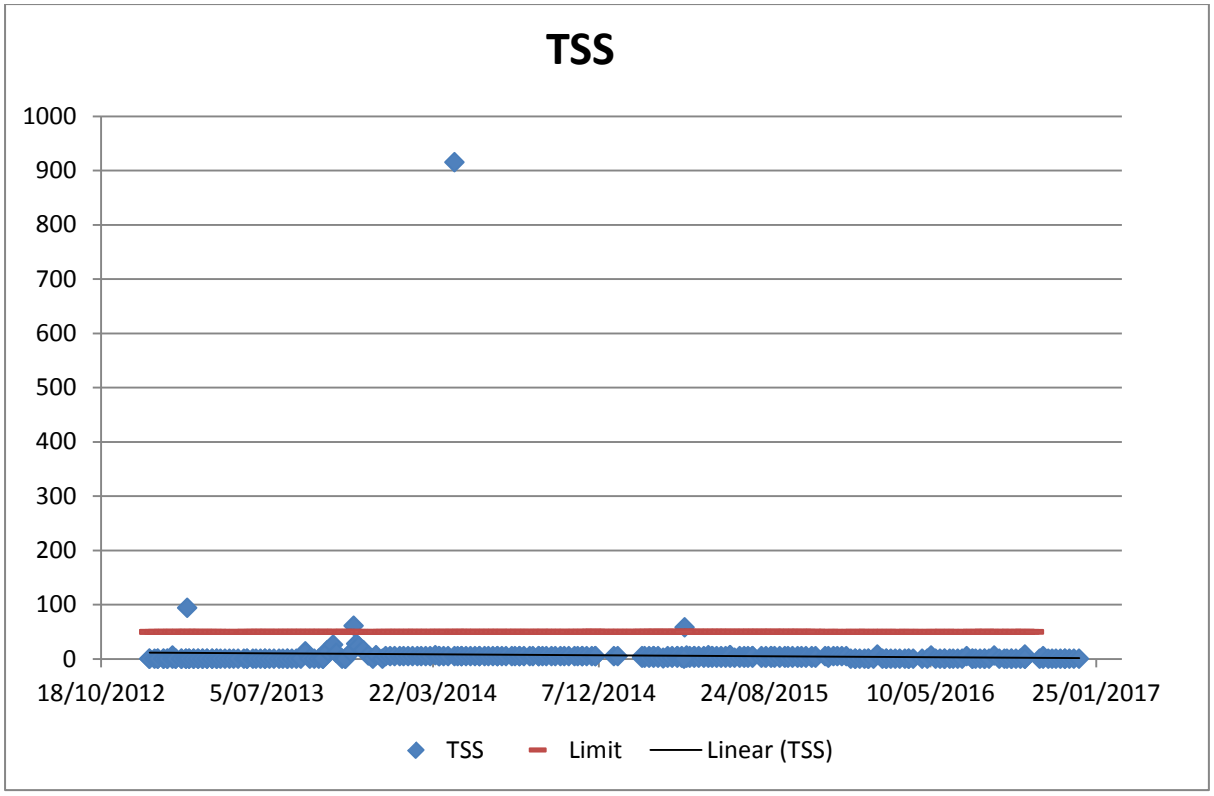

Silver
0.003
0.003
0.002
0.002
0.001
0.001
0.000
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Silver (Dissolved)
Limit
Silver
Linear (Silver (Dissolved))

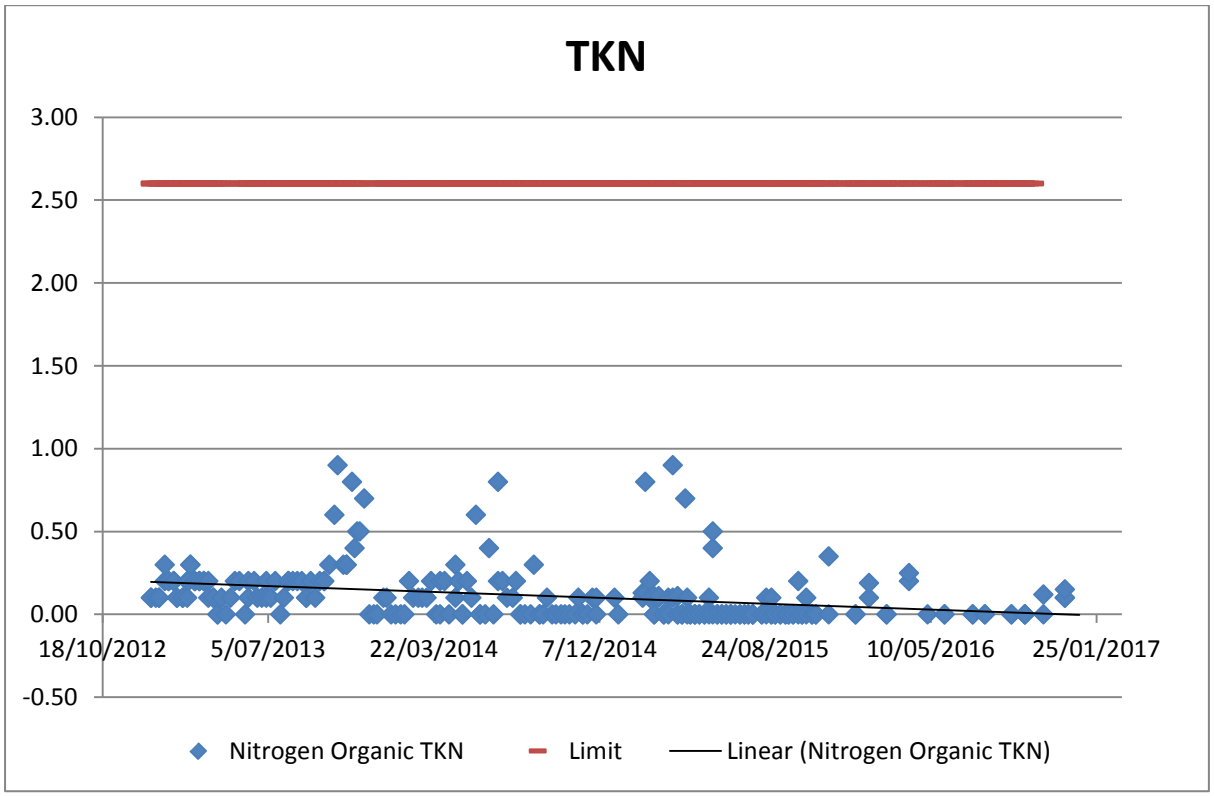

Sodium concentrations at LDP001 - Total and Dissolved (mg/L)
Sodium (mg/L)
800
700
600
500
400
300
200
100
0
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Date
Dissolved Sodium
Limit
Sodium
Linear (Dissolved Sodium)

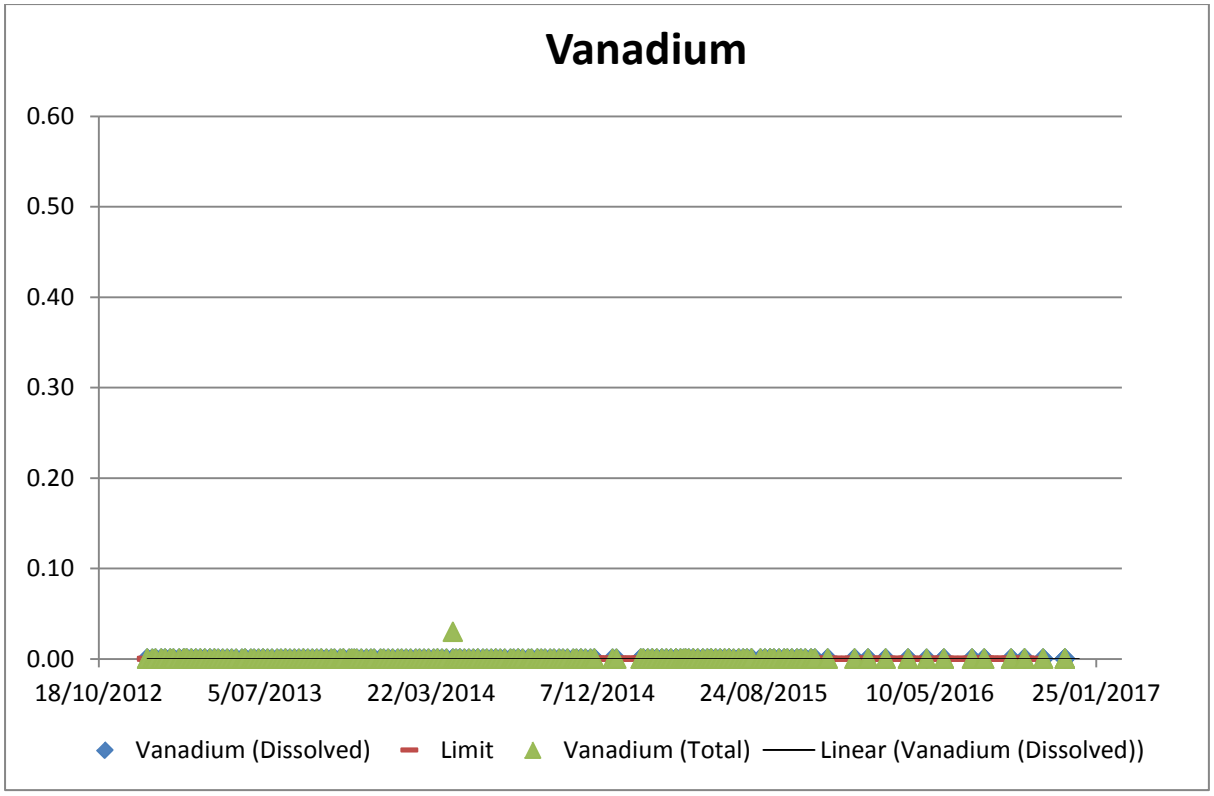

Sulphur Sulphate
350
300
250
200
150
100
50
0
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Sulphur Sulphate (total)
Limit
Linear (Sulphur Sulphate (total))

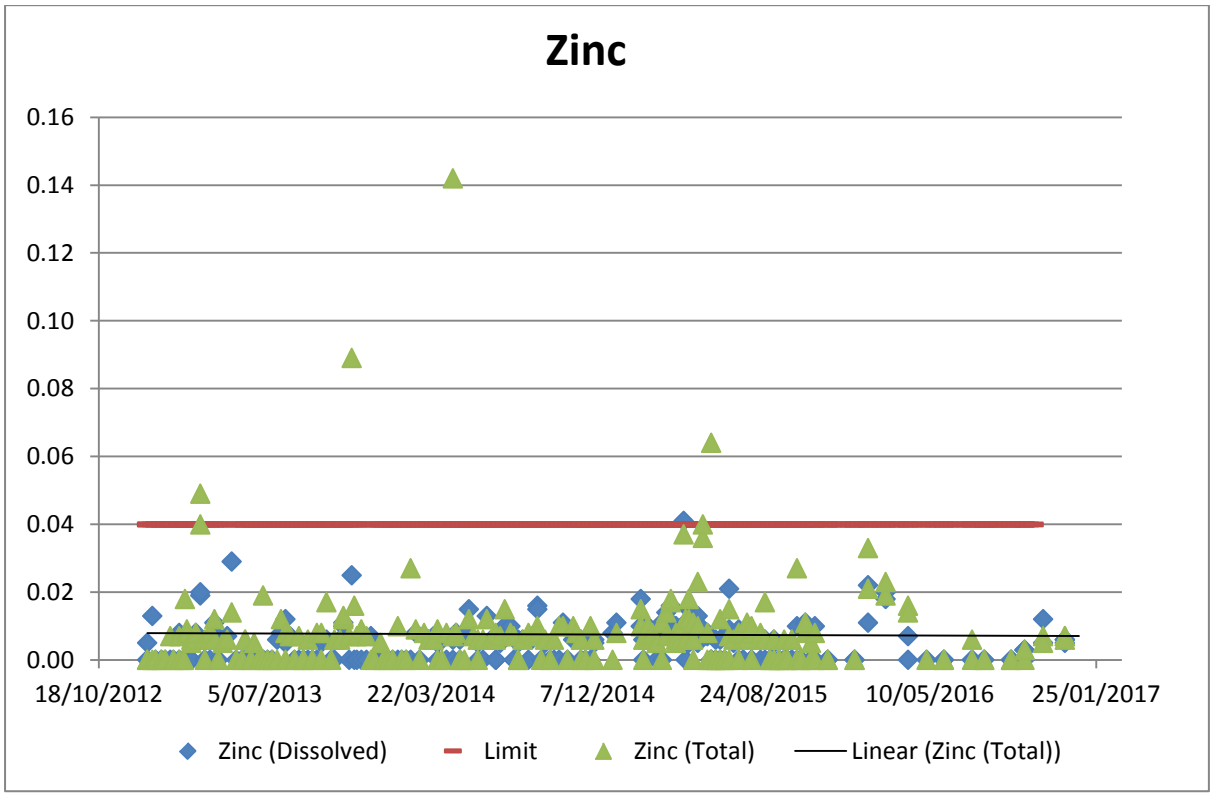

Tin
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
-0.0005
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Tin (Dissolved)
Limit
Tin
Linear (Tin (Dissolved))


Titanium
0.12
0.10
0.08
0.06
0.04
0.02
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Titanium (Dissolved)
Limit
Titanium
Linear (Titanium (Dissolved))


TSS
1000
900
800
700
600
500
400
300
200
100
0
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
TSS
Limit
Linear (TSS)


TKN
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Nitrogen Organic TKN
Limit
Linear (Nitrogen Organic TKN)


Vanadium
0.60
0.50
0.40
0.30
0.20
0.10
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Vanadium (Dissolved)
Limit
Vanadium (Total)
Linear (Vanadium (Dissolved))


Zinc
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
18/10/2012
5/07/2013
22/03/2014
7/12/2014
24/08/2015
10/05/2016
25/01/2017
Zinc (Dissolved)
Limit
Zinc (Total)
Linear (Zinc (Total))

RPS

2016 ANNUAL FAUNA MONITORING REPORT
Newstan Colliery

Prepared for ***Centennial Coal Newstan***

12 JANUARY 2017

Prepared by:

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Version / Date: 1 | 12/01/2017

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In preparing this report RPS has made certain assumptions. We have assumed that all information and documents provided to us by the Client or as a result of a specific request or enquiry were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. As such we would not be aware of any reason if any of the assumptions were incorrect.

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Document Status

Version	Purpose of Document	Orig	Review	Review Date
		Joe May		

Approval for Issue

Name	Signature	Date

Contents

Tables

Figures

Appendices

Summary

RPS Australia East Pty Ltd (RPS) was commissioned by Centennial Coal Pty Ltd to undertake the annual ecological monitoring program for the Newstan Colliery, which is located approximately 19 kilometres south-west of Newcastle in New South Wales (NSW). The Newstan Colliery complex is hereafter referred to as the "project area". This Annual Monitoring Report (AMR) details the methods and results for the surveys of habitat, flora, diurnal birds, Microchiropteran bats (microbats) and invertebrates.

Surveys conducted over the project area targeted birds, microbats and invertebrates. Birds and bats are excellent bio-indicators of a habitat's health. They are known to respond to environmental changes over many spatial scales (Temple and Weins, 1989; Gaisler et al. 2006) and can yield results that are data rich and efficient to collect (Carignan and Villard 2002). They are also highly suited to monitoring as they can be monitored efficiently over large spatial scales; are easy to accurately identify; have stable taxonomy and relatively well known ecology and behaviour; are reasonably long-lived; and hold a high position in food chains where they may integrate the effects of environmental stresses over time (Furness et al. 1993; Read et al. 2000; Lantz and Martinez-Espineira 2008). These surveys were conducted in conjunction with habitat and/or flora assessments in order to ascertain whether there are were correlations with species diversity and habitat complexity both between sites and across years.

The objective of this monitoring program is to confirm whether there have been any discernible impacts on the surrounding terrestrial habitats (outside of approved disturbance areas) as a result of mining operations and to monitor the efficacy of rehabilitation areas. In addition, specific recommendations have been provided with the management objective of enhancing the species richness and structural diversity of each site and the project area as a whole.

Flora and Habitat Monitoring

Habitat and flora assessments showed expected results, with reference sites having a higher ecological condition than rehabilitation sites. Reference sites presented a higher availability of resources including mature trees, foraging resources, ground habitat features, hollows and flora diversity. Low weed presence was observed at reference sites, while a high degree of weed establishment was evident at all rehabilitation sites.

Diurnal Bird Monitoring

Diurnal bird surveys were performed at selected sites during spring of 2016. The 2016 diurnal bird surveys recorded 66 different bird species across 10 sites, as well as opportunistically across Centennial Newstan, during the monitoring events. One threatened species listed as 'Vulnerable' under the TSC Act were recorded namely, the Little Lorikeet (*Glossopsitta pusilla*).

Microbat Monitoring

A total of nine microbat species were detected during the 2016 surveys. Of the nine species detected, four are listed as threatened, including the Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) Little Bentwing Bat (*Miniopterus australis*), Eastern Freetail Bat (*Mormopterus norfolkensis*) and Large-eared Pied Bat (*Chalinolobus dwyeri*). All four are listed as Vulnerable under the TSC Act while the Large-eared Pied Bat is also listed as Vulnerable under the EPBC Act.

Invertebrate Monitoring

A total of 87 invertebrate morphospecies were detected during the 2016 surveys. Due to the level of identification, it is unable to be determined whether these species are native or exotic.

The highest diversity and abundance across the monitoring sites was recorded within Rehab C/3.

1.0 Introduction

RPS has been engaged by Centennial Coal Pty Ltd to undertake the 2016 Annual Ecological Monitoring Program at Newstan Colliery in Fassifern, NSW, approximately 19km southwest of Newcastle (see **Figure 1**).

This is the second survey of the monitoring program, which is to continue on an annual basis until determined by the Director-General. As per the conditions of consent for DA73-11-98, this monitoring program has been undertaken in accordance with the Flora and Fauna Management Plan, Newstan Colliery (RPS 2014), to satisfy Conditions 3.4 and 8.5. The monitoring content includes habitat assessments, avifauna, microbat and invertebrate surveys and flora quadrats at rehabilitation sites and control sites with additional use of infrared cameras to detect any local fauna.

Surveys conducted over Centennial Newstan targeted birds, microbats and invertebrates. Birds and bats are considered to be one of the best bio-indicators of a habitat's health. They are known to respond to environmental changes over many spatial scales (Temple and Weins, 1989; Gaisler et al. 2006) and can yield results that are data rich and efficient to collect (Carignan and Villard 2002). They are also highly suited to monitoring as they can be monitored efficiently over large spatial scales; are easy to accurately identify; have stable taxonomy and relatively well known ecology and behaviour; are reasonably long-lived; and hold a high position in some food chains where they may integrate the effects of environmental stresses over time (Furness et al. 1993; Read et al. 2000; Lantz and Martinez-Espineira 2008). These surveys were also conducted in conjunction with habitat and/or flora assessments in order to ascertain whether there are any correlations with species diversity and habitat complexity both between sites and across years.

This Annual Monitoring Report (AMR) details the survey methods and results as well as providing an evaluation of the rehabilitation works against nominated success criteria.

1.1 Objectives and Scope of Works

The objective of this monitoring program is to confirm if there have been any discernible impacts on the surrounding terrestrial habitats as a result of mining operations and to monitor the efficacy of rehabilitation areas through indicator species. In addition, specific recommendations have been provided with the management objective of enhancing species richness and structural diversity. The scope of works for the annual monitoring involves collecting and analysing data for diurnal birds, micro-bats and invertebrates, as well as specific habitat attributes and flora quadrats over 13 sites. However, not all the above mentioned methodologies are prescribed for each of the 13 sites.

1.2 Qualifications and Licensing

1.2.1 Qualifications

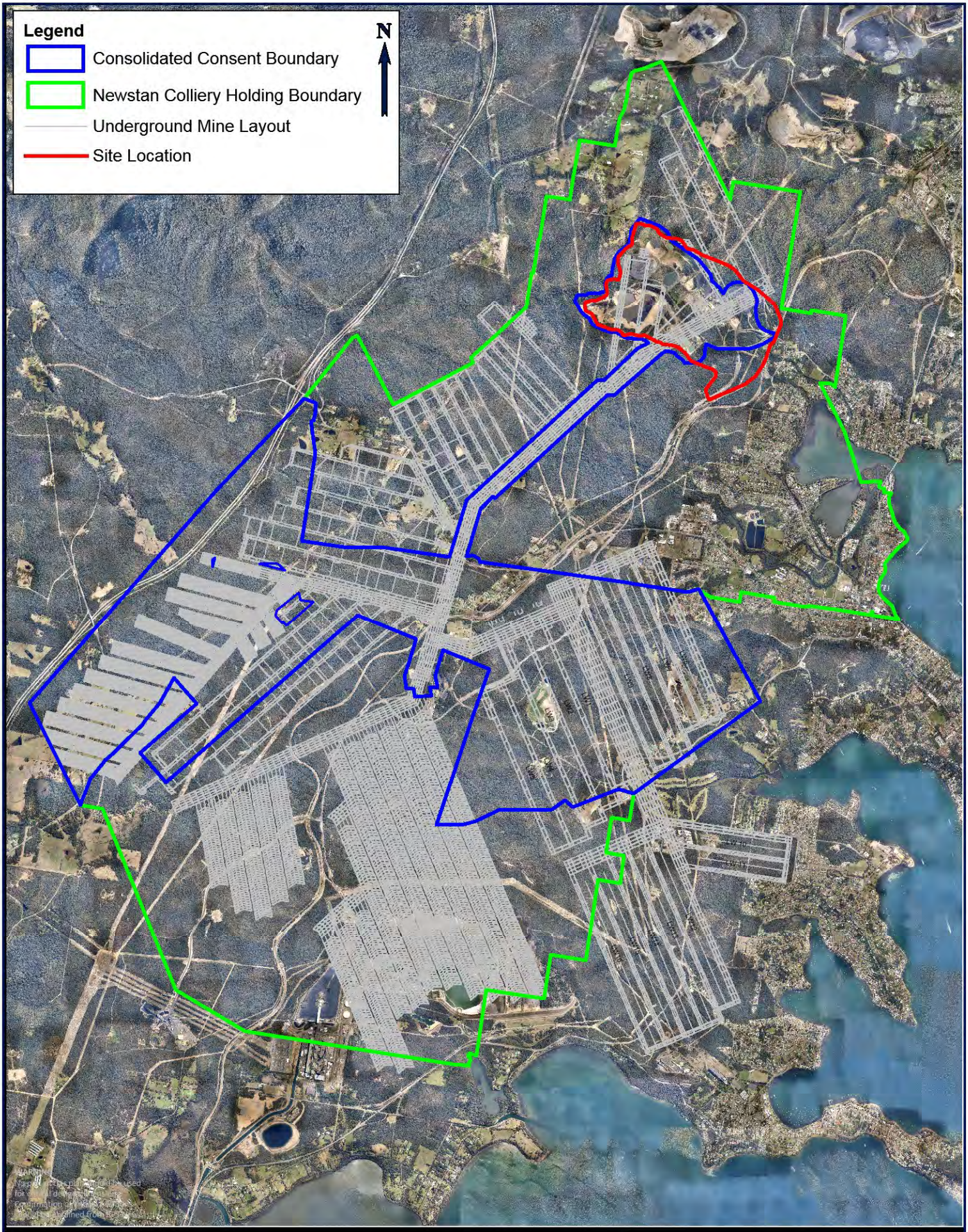
The principal authors of this report are Joe May M Env. Sc. & Mgt. (Ecologist) and Janene Devereux B Sc. (Ecologist) of RPS.

1.2.2 Licensing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Scientific Investigation Licence S100536 (Valid 30 December 2016);
- Animal Research Authority (Trim File No: 16/361) issued by NSW Department of Primary Industries (Valid 21 March 2017);
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 16/361) issued by NSW Department of Primary Industries (Valid 21 March 2019); and

- Certificate of Accreditation of a Corporation as an Animal Research Establishment (Trim File No: 01/1522 & Ref No: AW2001/014) issued by NSW Agriculture (Valid 22 May 2017).



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kilometres

TITLE: FIGURE 1: NEWSTAN COLLIERY LOCATION | LOCATION: NEWSTAN COLLIERY | DATUM: DATUM | PROJECTION: MGA ZONE 56 | DATE: 4/06/2015 | PURPOSE: ECOLOGY | LAYOUT REF: J:\JOBS\Centennial\All Jobs\122363 Newstan Annual Monitoring\10 - Drafting\MapInfo Workspaces\Eco\Report Figures | VERSION (PLAN BY): A-A4 (AB - NW)

CLIENT: CENTENIAL COAL
JOB REF: 122363

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2.0 Methodology

A total of 13 sites were chosen by Centennial Newstan in collaboration with RPS, consisting of a combination of rehabilitation and reference sites. **Table 1** below shows a breakdown of the survey effort between the sites including bird surveys, Anabat (echo location recording devices), invertebrate surveys, infrared cameras, flora quadrats and habitat assessments. The field-work for the Annual Ecological Monitoring Program was undertaken during 10 to 14 October 2016. The locations of the monitoring sites are shown in **Figure 2**.

Table 1 Survey Method Type per Monitoring Site

Survey Site	Flora Quadrat	Bird Census	Invertebrate Survey	Infrared Camera	Anabat	Habitat Assessment
Rehabilitation Site A	X	X	X		X	X
Rehabilitation Site B	X	X	X		X	X
Rehabilitation Site C	X	X	X		X	X
Analogue Site 1	X	X	X		X	X
Analogue Site 2	X	X	X		X	X
Bat Alley					X	
EEC (Endangered Ecological Community)	X	X		X	X	X
Dominant Community	X	X	X	X	X	X
By-Wash				X		
WMP03		X		X		
SP004		X		X		
REA Site 1				X	X	
REA Site 2				X	X	

2.1 Weather Conditions

The closest weather station providing daily weather summaries is located within the site. Daily temperatures (maximum and minimum) and rainfall experienced during the survey period are provided in **Table 2** below.

Table 2 Daily Weather Observations During the Survey Period

Date	Minimum temperature (°C)	Maximum temperature (°C)	Total Rainfall (mm)
10 October 2016	14.9	32.7	4.5
11 October 2016	10.8	21.0	2.5
12 October 2016	7.0	21.5	0.0
13 October 2016	11.0	16.6	7.0
14 October 2016	8.2	19.2	0.5

TITLE: FIGURE 2: MONITORING LOCATIONS

LOCATION: NEWSTAN COLLIERY

DATUM: DATUM
PROJECTION: MGA ZONE 56

DATE: 4/06/2015
PURPOSE: ECOLOGY

LAYOUT REF: J:\JOBS\Centennial\All Jobs\122363 Newstan Annual Monitoring\10 - Drafting\MapInfo Workspaces\Eco\Report Figures
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2.2 Habitat Descriptions

Detailed habitat assessments for the 2016 monitoring period were undertaken at Rehabilitation Sites A, B and C, Analogue Sites 1 and 2, EEC (Endangered Ecological Community) and Dominant Community. The below data was chosen and collected by RPS, with consideration of the habitat analysis techniques described in Bayley and Brouwer (2004). Recorded habitat attributes include:

Physical features including:

- Topographic position;
  - Slope;
  - Aspect;
  - Structure;
  - Patch size;
  - Patch shape;
  - Width if linear;
  - Connectivity;
  - Linear type;
  - Geology;
  - Soil colour and texture; and
  - Surface water bodies within 100 m.
- Plant diversity and health including:
  - Exposed soil;
  - Lichen;
  - Litter;
  - Herbs/ forbs;
  - Grasses;
  - Grassland condition;
  - Grassland height;
  - Grassland species diversity;
  - Dieback;
  - Mistletoe;
  - Litter tree base;
  - DBH ranges and percentage cover;
  - Shrub species;
  - Shrub layer species diversity;
  - Canopy species;
  - Canopy layer species diversity;
  - Canopy layer structural diversity;

  - Patch health;
  - Canopy description;
  - Understory description; and
  - Tree species percentage (%) of cover.
- Habitat value including:
  - Rock on rock;
  - Overhangs/caves;
  - Mistletoe;
  - Terrestrial and Arboreal termite mounds;
  - Hollow; structure, size classes, number, status and relative abundance;
  - Number of habitat trees;
  - Scratches on smooth tree trunks; and
  - Loose tree bark.
- Level of disturbance including:
  - Fire;
  - Number of cut stumps;
  - Presence of grazing and, if so, by what animal species;
  - Presence of erosion and, if so, what type;
  - Dumping;
  - Weed cover abundance; and
  - Dominant weed species.

The above variables have been analysed by using a habitat typology assessment developed by RPS.

Specimens of plant species that could not be identified in the field were collected and identified according to nomenclature in Harden (1992, 1993, 2000 and 2002).

2.3 Diurnal Bird Census

Birds were surveyed for 20 minutes at each designated site. Surveys were restricted to mornings or late afternoons in order to record birds during peak activity periods. All birds observed or heard within or flying over the site were recorded. Birds that were detected outside the search area of a site were recorded separately as opportunistic. Where threatened bird species were detected, a hand held *Trimble* differential global positioning system (D-GPS) with accuracy to less than one metre (m), was used to record the locations.

2.4 Invertebrate Survey

Invertebrate populations were sampled over the survey period from 10 to 14 October 2016. Weather conditions ranged from 32.7°C max to 19.2°C max with both fire and rainy conditions.

There are a number of methods that can be employed to capture invertebrates; however, the chosen method was selected due to the wider coverage of insect diversity collection. The chosen method was the Yellow Pan Trap method outlined by the Oliver et al. (1999).

Flying invertebrates are attracted to the colour of yellow and as such were sampled using yellow pans (plastic plates with a diameter of 230 mm and a depth of 25 mm) containing a soap solution (Oliver et al., 1999; Dahms, 1997) (refer to **Plate 1**). Each pan was pegged to the ground using two skewers, as to prevent disturbance by other mobile fauna in the area.

Each site had a transect consisting of three yellow pans set 5 m apart, which were sampled on Wednesday and Friday mornings. A sieve was used to collect all insects, and as a result, invertebrates <0.5 mm were not included in the sampling process. The filtered material was placed in sampling jars containing methylated spirits and labelled appropriately. All pans and sieves were inspected thoroughly after each filtering process and washed out to ensure all invertebrates were removed.

Plate 1: Yellow Invertebrate Tray

2.4.1 Invertebrate Sorting and Identification

Invertebrates were sorted and identified to morphospecies or Recognisable Taxonomic Units (RTUs). This is a recognised methodology that has been utilised as a time and cost efficient technique to sort and identify invertebrates for biological surveys (Beattie and Oliver, 1994). No classification reference material or technical training is required and invertebrates are separated based on differentiating characteristics. Morphospecies can be used as surrogates for species provided that the correspondence between morphospecies and species is approximately one to one and that each morphospecies is unique (Beattie & Oliver, 1994).

Each sampling jar was individually sorted in a shallow tray containing a small amount of methylated spirits. Invertebrates were sorted into morphospecies using easily identifiable features that distinguished them from other sampled invertebrates. A photo record of each morphospecies and corresponding label was taken. **Plate 2** shows two examples of identified morphospecies.

Plate 2: Examples of invertebrate morphospecies analysis

2.4.2 Analysis

Raw data from invertebrate sorting and identification was tabulated in an excel spreadsheet and the following was calculated for each site;

- Total number of the type of invertebrate (diversity);
- Total number of individual invertebrates (abundance); and
- Species unique to a specific site.

2.5 Microbat Monitoring

Microbat species were monitored using in situ echolocation call recorders (Anabats). Recorders were set to record calls from 6pm to 6am each day. Microbat calls were recorded using the Anabat SD11 system (Titley Scientific) and recorded calls were analysed by a recognised expert in the field (Dr Anna McConville of Echo Ecology). No trapping of microbats was performed as part of the annual monitoring.

Anabats were placed at selected sites, as displayed in **Table 1**. The units were positioned to maximise calls recorded along potential microbat flyways. A *Trimble* hand held D-GPS accurate to less than one metre was used at each site to record the position of each Anabat device for each survey.

2.6 Infrared Cameras

Remote sensor infrared cameras were used across seven of the sites to detect nocturnal and diurnal fauna. Each camera was tied to a tree at approximately 0.5 m from the ground and angled towards the ground. Tinned mackerel was used as bait and placed within the camera's centre focal point on the ground to attract fauna. A total of 28 camera trap nights were undertaken over the survey period.

2.7 Flora Quadrat

A total of seven floristic 20 x 20 m quadrats were undertaken across the Project Area. Each quadrat was undertaken with reference to current NSW mapping standards (Sivertsen, 2009) whereby floristic data was collected using a six point Braun-Blanquet cover abundance scale. The applied Braun-Blanquet cover abundance scale assigns each species to one of these six cover abundance classes which are considered indicative of the dominance of these species within the quadrat. Where relevant, vegetation communities were described in accordance with the Lower Hunter and Central Coast Regional Environment Management Strategy (LHCCREMS) (NPWS 2000) vegetation map units (MU). Additionally, structural features of the vegetation within the quadrat and other relevant habitat features (e.g. soil type; presence of rock; slope) were also recorded.

2.8 Limitations

Not all flora species are detectable throughout all times of any given year and it is unlikely that all species would be detected during surveys undertaken once a year. For example, cryptic orchids flower within specific seasons and cannot be detected at other times of the year. Also, vegetation structure and cover abundance was estimated visually and, as a result, there is likely to be an element of observer bias. Where possible, this observer bias has been limited by using guides and charts for measurements (National Committee on Soil and Terrain, 2009).

The flowering and fruiting plant species that attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources more accessible to threatened fauna species fail. As a consequence, threatened species may be absent from some areas where potential habitat exists for extended periods.

3.0 Results

A total of 53 bird species, six mammals and six microbat species were observed within Centennial Newstan during the 2016 survey period. Six species are listed as Vulnerable under the TSC Act including:

- White-bellied Sea-Eagle (*Haliaeetus leucogaster*);
- Little Lorikeet (*Glossopsitta pusilla*);
- Little Bentwing Bat (*Miniopterus australis*); and
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*).
- Eastern Freetail Bat (Mormopterus norfolkensis)
- Large-eared Pied Bat (Chalinolobus dwyeri).

TITLE: FIGURE 3: THREATENED SPECIES LOCATIONS

LOCATION: NEWSTAN COLLIERY

DATUM: DATUM
PROJECTION: MGA ZONE 56

DATE: 4/06/2015
PURPOSE: ECOLOGY

LAYOUT REF: J:\JOBS\Centennial\All Jobs\122363 Newstan Annual Monitoring\10 - Drafting\MapInfo Workspaces\Eco\Report Figures
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3.1 Mine Rehabilitation Sites

3.1.1 Rehabilitation Site A

Rehabilitation Site A is situated in the mine rehabilitation area that has been subject to vegetation rehabilitation through direct seeding. It is the most western site of the three rehabilitation sites. Rehabilitation Site A is displayed in **Plate 3**.

Plate 3: Regenerating Acacias and non-native grasses at Rehabilitation A

3.1.1.1 Flora Quadrat

A total of 29 flora species were recorded at Rehabilitation Site A including 18 native and 11 exotic flora, compared with 24 species in 2015, including 14 native species and 10 exotic species. Vegetation within the site does not correspond to any MU within LHCCREMS vegetation mapping (NPWS 2000) as the species selected for rehabilitation were primarily chosen for quick re-establishment. No threatened flora species listed under the TSC Act or EPBC Act were identified within the quadrat.

3.1.1.2 Diurnal Bird Surveys

The 2016 surveys within Rehabilitation A recorded nine bird species, compared with ten species that were recorded in 2015. All recorded species are locally common species including the Grey Fantail (*Rhipidura albiscapa*) and Spotted Pardalote (*Pardalotus punctatus*). No threatened species listed under the TSC Act or EPBC Act were recorded at this site during surveys. A list of all recorded bird species is provided in **Appendix 1**.

3.1.1.3 Microbat Monitoring

The Anabat results for Rehabilitation Site A are provided in Attatchment 2 (Express 1 10/10/2016).

3.1.1.4 Invertebrate Surveys

A total of 35 morphospecies were detected at Rehabilitation Site A, compared with 10 found at the same site in 2015. A list of all morphospecies per site is outlined in **Appendix 3**.

3.1.1.5 Habitat Assessment

3.1.1.5.1 Physical Features

Rehabilitation Site A is a north facing site on a hill top and side. The site was characterised as regenerating shrubland.

3.1.1.5.2 Plant Diversity

Given the site is a rehabilitation area, the vegetation does not represent an existing vegetation community and the selected flora species are a combination of native and exotic. The dominant species within the site was a combination of Acacia species. The canopy layer was absent. The shrub layer largely consisted of regenerating trees (100–200 mm DBH) and saplings, with no mature trees occurring across the site. The ground cover was dominated by extremely dense patches of exotic grasses.

3.1.1.5.3 Level of Disturbance

The site displayed a high level of disturbance as a result of high weed presence, low quality soil type (largely reject material from the mine itself) and existing largely as a monoculture of Acacia species.

3.1.1.5.4 Potential Habitat

At present, foraging resources are largely limited to the flowering of Acacia species and weed species. As a result, fewer local bird species would utilise the site. Exotic grass species dominate the ground cover, restricting the presence of native grasses, herbs and forbes. It also limits the presence of small ground dwelling mammals and skinks that are unable to penetrate the thick grass. The site is accessible by macropods that would utilise the grassy areas to rest and forage. No logs, hollows, termite mounds or areas of rock were present within this site.

3.1.1.5.5 Overall Value

The habitat resources within Rehabilitation Site A were considered to be poor, due to the lack of structural diversity and native species richness. As the site is regenerating, improvement in habitat condition is a possibility over time, particularly with the continued growth of juvenile eucalypt species.

3.1.2 Rehabilitation Site B

Rehabilitation Site B is situated in the mining rehabilitation area that has been subject to vegetation rehabilitation through direct seeding. It is situated between Rehabilitation Site A and Rehabilitation Site C. **Plate 4** displays Rehabilitation Site B.

Plate 4: Regenerating Acacias and non-native grasses at Rehabilitation B

3.1.2.1 Flora Quadrat

A total of 27 flora species were recorded at Rehabilitation Site B including 11 native and 16 exotic flora species. Vegetation within the site does not correspond to any MU within LHCCREMS vegetation mapping (NPWS 2000) as the species selected for rehabilitation were primarily chosen for quick reestablishment. No threatened flora species listed under the TSC Act or EPBC Act were identified within the quadrat.

3.1.2.2 Diurnal Bird Surveys

The 2016 surveys within Rehabilitation Site B recorded nine bird species compared with four species that were recorded in 2015. All species were locally common including the Eastern Yellow Robin (*Eopsaltria australis*) and Sacred Kingfisher (*Todiramphus sanctus*). No threatened species listed under the TSC Act or EPBC Act were recorded at this site during surveys. A list of all recorded bird species is provided in **Appendix 1**.

3.1.2.3 Microbat Monitoring

The Anabat results for Rehabilitation Site B are provided in Attatchment 2 (Express 2 10/10/2016).

3.1.2.4 Invertebrate Surveys

A total of 37 invertebrate morphospecies were detected at Rehabilitation Site B, compared with 25 at the same site in 2015. A list of all morphospecies per site is outlined in **Appendix 3**.

3.1.2.5 Habitat Assessment

3.1.2.5.1 Physical Features

Rehabilitation Site B is a north-east facing site on a hill top and side. The site was characterised as regenerating shrubland.

3.1.2.5.2 Plant Diversity

Given the site is a rehabilitation area, the vegetation does not represent an existing vegetation community and the selected flora species are a combination of native and exotic. The dominant species within the site was a combination of Acacia species, with lesser dominant eucalypt species occurring. The canopy layer was absent. The shrub layer largely consisted of regenerating trees (100–200 mm DBH) and saplings, with no mature trees occurring across the site. The ground cover was dominated by exotic grasses however some native ground covers were observed.

3.1.2.5.3 Level of Disturbance

The site displayed a high level of disturbance as a result of abundant weed presence and exists largely as a monoculture of Acacia species. A thick layer of crushed rock was also layered above the soils and acts as a prevention to soil erosion.

3.1.2.5.4 Potential Habitat

At present, foraging resources are largely limited to the flowering of Acacia species and weed species. As a result, fewer local bird species would utilise the site. Exotic grass species dominate the ground cover, restricting the presence of native grasses, herbs and forbes. It also limits the presence of small ground dwelling mammals and skinks that are unable to penetrate the thick grass. The site is accessible by macropods that would utilise the grassy areas to rest and forage. No logs, hollows, termite mounds or areas of rock were present within this site.

3.1.2.5.5 Overall Value

Habitat resources within Rehabilitation Site B were considered to be poor, due to the lack of structural diversity and native species richness. As the site is regenerating, improvement in habitat condition will occur, particularly with the continued growth of juvenile eucalypt species.

3.1.3 Rehabilitation Site C

Rehabilitation Site C is situated in the mining rehabilitation area that has been subject to vegetation rehabilitation through direct seeding. It is situated to the east of Rehabilitation Site B. **Plate 5** displays Rehabilitation Site C.

Plate 5: Regenerating Acacias and non-native grasses at Rehabilitation C

3.1.3.1 Flora Quadrat

A total of 31 flora species were recorded at Rehabilitation Site C including 17 native and 13 exotic flora species. Vegetation within the site does not correspond to any MU within LHCCREMS vegetation mapping (NPWS 2000), as the species selected for rehabilitation were primarily chosen for quick reestablishment. No threatened flora species listed under the TSC Act or EPBC Act were identified within the quadrat.

3.1.3.2 Diurnal Bird Surveys

The 2016 surveys at Rehabilitation C recorded 12 bird species, compared with 6 species that were recorded in 2015. No threatened species listed under the TSC Act or EPBC Act were recorded at this site during surveys. A list of all recorded bird species is provided in **Appendix 1**.

3.1.3.3 Microbat Monitoring

The Anabat results for Rehabilitation Site C are provided in Attachment 2 (Express 2 11/10/2016).

3.1.3.4 Invertebrate Surveys

A total of 45 invertebrate morphospecies were detected at Rehabilitation Site C, compared with 19 being observed at the same site in 2015. A list of all morphospecies per site is outlined in **Appendix 3**.

3.1.3.5 Habitat Assessment

3.1.3.5.1 Physical Features

Rehabilitation Site C is a north east facing site on a hill top and side. The site was characterised as regenerating shrubland.

3.1.3.5.2 Plant Diversity

Given the site is a rehabilitation area, the vegetation does not represent an existing vegetation community and the selected flora species are a combination of native and exotic. The dominant species within the site was a combination of Acacia species. The canopy layer was absent. The shrub layer largely consisted of regenerating trees (100–200 mm DBH) and saplings, with no mature trees occurring across the site. The ground cover was dominated by exotic grasses however areas of leaf litter and bare ground gave rise to the establishment of native ground cover.

3.1.3.5.3 Level of Disturbance

The site displayed a high level of disturbance as a result of high weed presence and exists largely as a monoculture of Acacia species.

3.1.3.5.4 Potential Habitat

At present, foraging resources are largely limited to the flowering of Acacia species and weed species. As a result, few local bird species are likely to utilise the site. Exotic grass species dominate the ground cover, however some native ground covers were observed. Small mammals and reptiles may utilise the site for foraging. The site is accessible by macropods that would utilise the grassy areas to rest and forage. No logs, hollows, termite mounds or areas of rock were present within this site.

3.1.3.5.5 Overall Value

Habitat resources within Rehabilitation Site C were considered to be poor, due to the lack of structural diversity and native species richness. As the site is regenerating, improvement in habitat condition is a possibility over time, particularly with the continued growth of juvenile eucalypt species.

3.1.4 Analogue Site 1

Analogue Site 1 is a more advanced rehabilitation area within the Newstan Colliery project area. It is situated within the western corner of the project application area boundary in close proximity to Miller Road. **Plate 6** displays Analogue Site 1.

Plate 6: Analogue Site 1 Vegetation

3.1.4.1 Flora Quadrat

A total of 22 flora species were recorded at Analogue Site 1 including 12 native and 10 exotic flora species. Vegetation within the Analogue Site 1 appears to be most similar to MU 30 Coastal Plains Smooth-barked Apple Woodland (NPWS 2000), the most dominant community in the project area. No threatened flora species listed under the TSC Act or EPBC Act were identified within the quadrat.

3.1.4.2 Diurnal Bird Surveys

No bird species were recorded in Rehabilitation A, compared with 10 bird species that were recorded in 2015. A list of all recorded bird species is provided in **Appendix 1**.

3.1.4.3 Microbat Monitoring

The Anabat results for Analogue Site 1 are provided in Attachment 2 (Express 2 13/10/2016).

3.1.4.4 Invertebrate Surveys

A total of 29 invertebrate morphospecies were detected at Analogue Site 1, compared with 18 at the same site in 2015. A list of all morphospecies per site is outlined in **Appendix 3**.

3.1.4.5 Habitat Assessment

3.1.4.5.1 Physical Features

Analogue Site 1 occurred on a mid slope south-westerly aspect. The site was characterised as open forest (30-70% foliage cover (PFC)).

3.1.4.5.2 Plant Diversity

The vegetation within the site comprised a dry, open forest dominated by *Corymbia maculata* (Spotted Gum). The canopy largely consisted of regenerating eucalypt trees (100–200 mm DBH) and saplings, with mature trees only occurring sporadically across the site. There shrub layer was primarily exotic species such as *Verbena bonariensis* (Purpletop) as well as various Acacia species. The ground cover was dominated by exotic grasses, particularly *Chloris gayana* (Umbrella Grass).

3.1.4.5.3 Level of Disturbance

Given that the site is an existing rehabilitation area, signs of disturbance are apparent through the dense weed presence and lack of habitat resources. A track runs parallel to the site that encourages the continued spread of weeds, and easy access by exotic fauna species.

3.1.4.5.4 Potential Habitat

No tree hollows were observed within Analogue Site 1. Naturally formed tree stumps and logs were not detected on site. Other characteristics of potential habitat such as loose tree bark or termite mounds were also absent from the site.

3.1.4.5.5 Overall Value

The patch is considered to be ‘low’ in regards to its health as the vegetation lacks diversity within canopy layer species and displays low structural diversity within all strata. However, this is expected to improve over time as the habitat matures.

3.1.5 Analogue Site 2

Analogue Site 2 is located outside the Newstan Colliery pit top to the north eastern corner. It is largely a regenerating area aimed at representing MU 30, however, due to its' regenerating nature, it consists primarily of juvenile eucalypts and a dense layer of Acacia species.

Plate 7 Analogue Site 2 Vegetation

3.1.5.1 Flora Quadrat

A total of 30 flora species were recorded at Analogue Site 2 including 14 native and 16 exotic flora species. Vegetation within the site does not correspond to any MU within LHCCREMS vegetation mapping (NPWS 2000), as the species selected for rehabilitation were primarily chosen for quick reestablishment. No threatened flora species listed under the TSC Act or EPBC Act were identified within the quadrat.

3.1.5.2 Diurnal Bird Surveys

The 2016 surveys at Analogue Site 2 recorded 16 bird species. All recorded species are locally common species including the White-throated Gerygone (*Gerygone olivacea*) and Lewin's Honeyeater (*Meliphaga lewinii*). No threatened species listed under the TSC Act or EPBC Act were recorded at this site during surveys. A list of all recorded bird species is provided in **Appendix 1**.

3.1.5.3 Microbat Monitoring

The Anabat results for Analogue Site 2 are provided in Attachment 2 (Express 1 11/10/2016).

3.1.5.4 Invertebrate Surveys

A total of 42 invertebrate morphospecies were detected at Analogue Site 2, compared with 25 at the same site in 2015. A list of all morphospecies per site is outlined in **Appendix 3**.

3.1.5.5 Habitat Assessment

3.1.5.5.1 Physical Features

Rehabilitation Site A is a north facing site on a hill top and side. The site was characterised as regenerating shrubland.

3.1.5.5.2 Plant Diversity

The site was determined to be relatively young in its development, with the canopy predominantly comprised of dense stands of *Melaleuca armillaris* to 4 m in height, with no mature trees occurring. The shrub layer was mostly dominated by exotic species such as *Sporobolus fertilis* (Parramatta Grass) as well as multiple Acacia species. The grassy ground cover was predominately exotic, but included small areas of leaf litter and bare soil.

3.1.5.5.3 Level of Disturbance

The site had high weed dispersal and no sign of erosion or dumping.

3.1.5.5.4 Potential Habitat

The site was limited in its resource availability. No mature trees were observed, thus no hollows were available. Exotic grass species dominate the ground cover, however some native ground covers were observed. Small mammals and reptiles may utilise the site for foraging. The site is accessible by macropods that would utilise the grassy areas to rest and forage. No logs, hollows, termite mounds or areas of rock were present within this site.

3.1.5.5.5 Overall Value

The patch is considered to be ‘low’ in regards to its health as the vegetation lacks diversity within canopy layer species and displays low structural diversity within all strata. However, this is expected to improve over time as the habitat matures.

3.2 Reference Sites

3.2.1 Bat Alley

Bat Alley is a disused mine shaft to the north east of Newstan Colliery that hosts known populations of threatened bat species. The area has been conserved for conservation purposes and has been afforded a 50m buffer for protection and site preservation. This site was targeted for microbat species only during the 2016 surveys.

3.2.1.1 Microbat Monitoring

The Anabat results for Bat Alley are provided in Attachment 2 (Express 2 12/10/2016).

3.2.2 EEC

The EEC site is located to the southeast of the mining area and contains riparian vegetation surrounding a permanent inundated area and creek. The site is dissected by multiple tracks and an electrical easement. Plate 7 displays vegetation within the EEC site.

Plate 8: Looking south into the EEC Site

3.2.2.1 Flora Quadrat

A total of 29 flora species were recorded at the EEC site including 28 native and one exotic flora species. Based on the floristic structure and diversity of vegetation within the EEC site, the vegetation community is delineated as MU 43 Wyong Paperbark Swamp Forest under LHCCREMS (NPWS 2000) which corresponds to the TSC Act listed EEC Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions.

3.2.2.2 Diurnal Bird Surveys

During the 2015 surveys a total of 21 bird species were recorded, resulting in the highest diversity of all surveyed sites. Recorded species were limited to locally common bird species including the Silvereye (*Zosterops lateralis*), Sulphur-crested Cockatoo (*Cacatua galerita*) and Superb Fairy-wren (*Malurus cyaneus*). No threatened species listed under the TSC Act or EPBC Act were recorded during surveys. A list of all recorded bird species is provided in **Appendix 1**.

3.2.2.3 Microbat Monitoring

The Anabat results for Rehabilitation Site A are provided in Attachment 2 (Express 1 14/10/2016).

3.2.2.4 Infrared Camera Surveys

The following fauna was detected at the EEC site:

- Red-necked Wallaby (*Macropus rufogriseus*);
- Eastern Yellow Robin (*Eopsaltria australis*); and
- Red Fox (*Vulpes vulpes*).

3.2.2.5 Habitat Assessment

3.2.2.5.1 Physical Features

The EEC site occurred within a creek line. The site was characterised as closed forest (>70% foliage cover (PFC)).

3.2.2.5.2 Plant Diversity

The vegetation within the site comprised a wet, closed forest dominated by *Melaleuca linariifolia* (Flax-leaved Paperbark). The canopy consisted of random middle aged trees (200-400 mm DBH) and saplings, with few mature trees occurring across the site. The shrub layer was dominated by *Gahnia sieberiana* (Red-fruited Saw-sedge) while the ground cover was dominated by various ferns, sedges and grasses. Leaf litter was dense in parts with moderate amount accumulating at the base of canopy trees.

3.2.2.5.3 Level of Disturbance

The vegetation observed within this site exhibited signs of disturbance due to fire. This was evident by the presence of a scorched understory, a rejuvenating understory and fire scars on trees. Healthy regeneration was observed to be occurring despite the recent (less than 12 months old) damage from fire.

Exempting fire damage, the level of disturbance to the site was considered to be low. Only one exotic flora species (*Lantana camara*) was detected within the quadrat. Two access tracks and an easement dissect the surrounding vegetation which makes the site more accessible to exotic fauna species and weed encroachment.

3.2.2.5.4 Potential Habitat

A variety of canopy trees including Melaleuca, Angophora and Corymbia species offer flowers, nectar and pollen at different times of year for bird and arboreal mammal species, including migratory species. Only one small hollow was identified within the assessed area, however, logs of differing sizes were prevalent offering denning habitat for small mammals and reptiles. No termite mounds were observed.

3.2.2.5.5 Overall Value

The site is considered to be in good health as it offers various ecological resources, demonstrates structural and species diversity and displays low levels of disturbances.

3.2.3 Dominant Community

This site was situated outside the mining disturbance footprint to the south west, in relatively undisturbed vegetation. Vegetation within the site represents the most dominant vegetation community within the Newstan Colliery project area, which is MU 30 Coastal Plains Smooth-barked Apple Woodland. **Plate 9** depicts this site.

Plate 9: Dominant Community site with MU 30 vegetation

3.2.3.1 Flora Quadrat

A total of 27 flora species were recorded at site Dominant Community all of which were native flora species. Based on the floristics determined during the flora quadrat the vegetation on site is considered to be MU 30 Coastal Plains Smooth-barked Apple Woodland. This MU is not commensurate with any TSC Act or EPBC Act EEC.

3.2.3.2 Diurnal Bird Surveys

The 2016 surveys recorded 10 species of birds with 2015 surveys recording 11 species. All recorded species consisted of locally common bird species such as the Spotted Pardalote (*Pardalotus punctatus*) and Yellow-faced Honeyeater (*Lichenostomus chrysops*). No threatened species listed under the TSC Act or EPBC Act were recorded in the Dominant Community site. A list of all recorded bird species is provided in **Appendix 1**.

3.2.3.3 Microbat Monitoring

The Anabat results for Dominant Community site are provided in Attachment 2 (Express 1 12/10/2016).

3.2.3.4 Invertebrate Surveys

A total of 26 morphospecies of invertebrates were recorded at the Dominant Community Site, compared with 14 at the same site in 2015. A list of all morphospecies per site is outlined in **Appendix 3**.

3.2.3.5 Habitat Assessment

3.2.3.5.1 Physical Features

The Dominant Community site occurred on an upper ridge with a south-westerly aspect. The site was characterised as open forest (30-70% foliage cover (PFC)) and was located approximately 150 metres south of the reject emplacement area for Newstan Colliery.

3.2.3.5.2 Plant Diversity

The vegetation within the site comprised a dry, open forest dominated by *Angophora costata* (Smooth-barked Apple). The shrub layer and ground cover consisted of native flora species with both moderate structural and high species diversity.

3.2.3.5.3 Level of Disturbance

The level of disturbance within the site was considered to be low. No exotic flora species were detected within the quadrat, no erosion was observed and only minor evidence of fire was observed.

3.2.3.5.4 Potential Habitat

Angophora costata trees are known for producing hollows, and the vegetation type at this site is dominated by *A. costata*. Various sized hollows were observed within the assessed area and based on the vegetation type, many hollows are expected to exist within the remaining areas of this MU.

This MU is also known habitat for the threatened *Tetratheca juncea* (Black-eyed Susan). No individuals were detected at the site during surveys because the surveys were undertaken outside of the flowering period for this species. However, this species is known to occur within the immediate area and has potential to occur.

3.2.3.5.5 Overall Value

The site is considered to be in good health as it offers various ecological resources, demonstrates structural and species diversity and displays low levels of disturbances.

3.2.4 By-Wash

By-Wash, WMP03 and SP004 sites were existing aquatic monitoring sites and were selected due to their close proximity to riparian zones. The By-Wash site was approximately 5m from the edge of the most northern dam within Newstan Colliery. Flora species diversity and habitat resources were low with a monoculture of *Dodonaea triquetra* (Large-leaf Hop-bush) within the shrub layer at the site.

3.2.4.1 Infrared Camera Surveys

Infrared cameras detected the following fauna at WMP03:

- Brushtail Possum (*Trichosurus vulpecula*); and
- Wild dog (*Canis sp.*).

3.2.5 WMP03

WMP03 was in close proximity to a dam weir at the northern portion of the Newstan Colliery project area. Two tracks were adjacent to the site, however the vegetation within the site was in relatively good condition.

3.2.5.1 Diurnal Bird Surveys

A total of 9 species were recorded at WMP03 during the 2016 surveys, compared with 17 in 2015. No threatened species listed under the TSC Act or EPBC Act were recorded at this site during surveys. A list of all recorded bird species is provided in **Appendix 1**.

3.2.5.2 Infrared Camera Surveys

Infrared cameras detected the following fauna at WMP03:

- Variegated fairy-wren (*Malurus lamberti*);
- Bush Rat (*Rattus fuscipes*);
- Australian Raven (*Convus coronoides*); and
- Eastern Whipbird (*Psophodes olivaceus*).

3.2.6 SP004

SP004 is situated adjacent to a riparian zone which contains a permanent creek, to the far west of Newstan Colliery. Vegetation within the site contains a variety of ground cover, shrub and canopy species offering resources for a wide range of local bird species.

3.2.6.1 Diurnal Bird Surveys

A total of 20 species were recorded at WMP03 during the 2016 surveys, compared with 13 in 2015. No threatened species listed under the TSC Act or EPBC Act were recorded at this site during surveys.

A list of all recorded bird species is provided in **Appendix 1**.

3.2.7 REA Site 1

REA Site 1 is located within a relatively undisturbed area of MU30, situated in the north eastern corner of Newstan Colliery.

3.2.7.1 Microbat Monitoring

The Anabat results for REA Site 1 are provided in Attachment 2 (Express 1 11/10/2016).

3.2.7.2 Infrared Camera Surveys

No animals were recorded at REA Site 1.

3.2.8 REA Site 2

REA Site 2 was situated to the north of the Newstan Reject Emplacement Area, to the south of Miller Road. The area was adjacent to a track and showed signs of disturbance such as weeds and visible rubbish

3.2.8.1 Microbat Monitoring

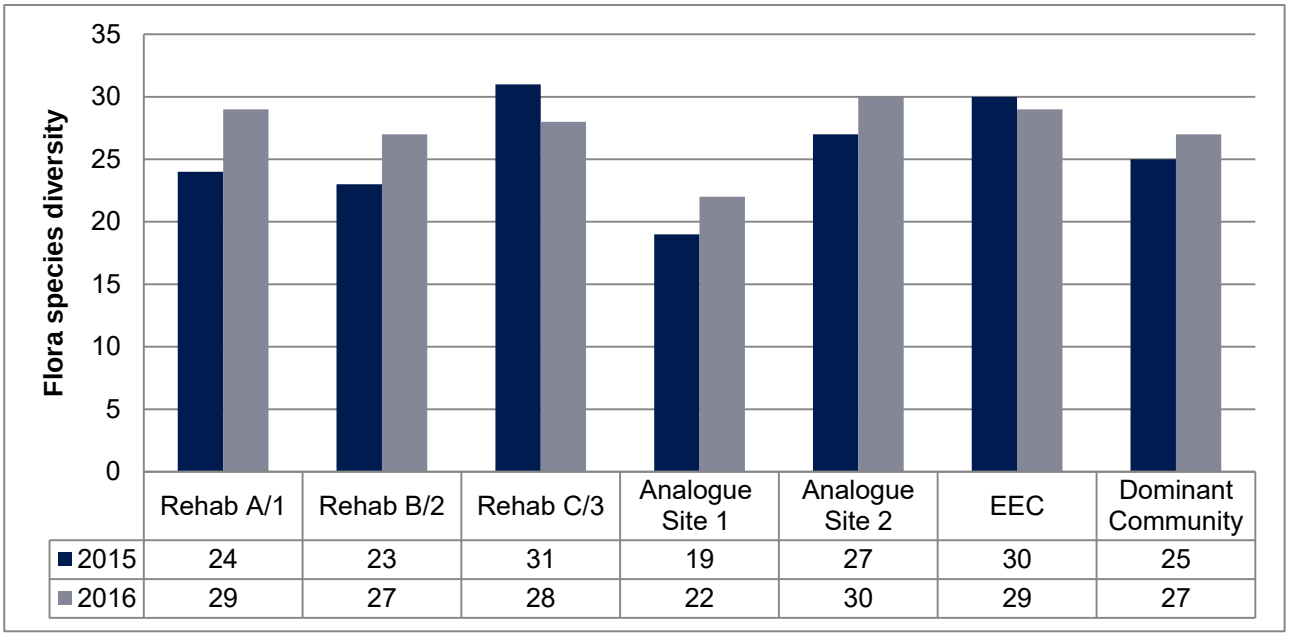
The Anabat results for REA Site 2 are provided in Attachment 2 (Express 1 13/10/2016).

3.2.8.2 Infrared Camera Surveys

No animals were recorded at REA Site 2.

3.3 Flora Species Assemblages

A total of 143 flora species were detected from those sites that were selected for flora quadrats. A comparison between flora diversity in 2015 and 2016 is provided in **Figure 3**. No threatened flora was detected during surveys. The EEC site contained the Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, which is listed as an Endangered Ecological Community under the TSC Act. Results are provided for each monitoring site below, and a tabulated record of results for each site is provided in **Appendices 1 to 3**.

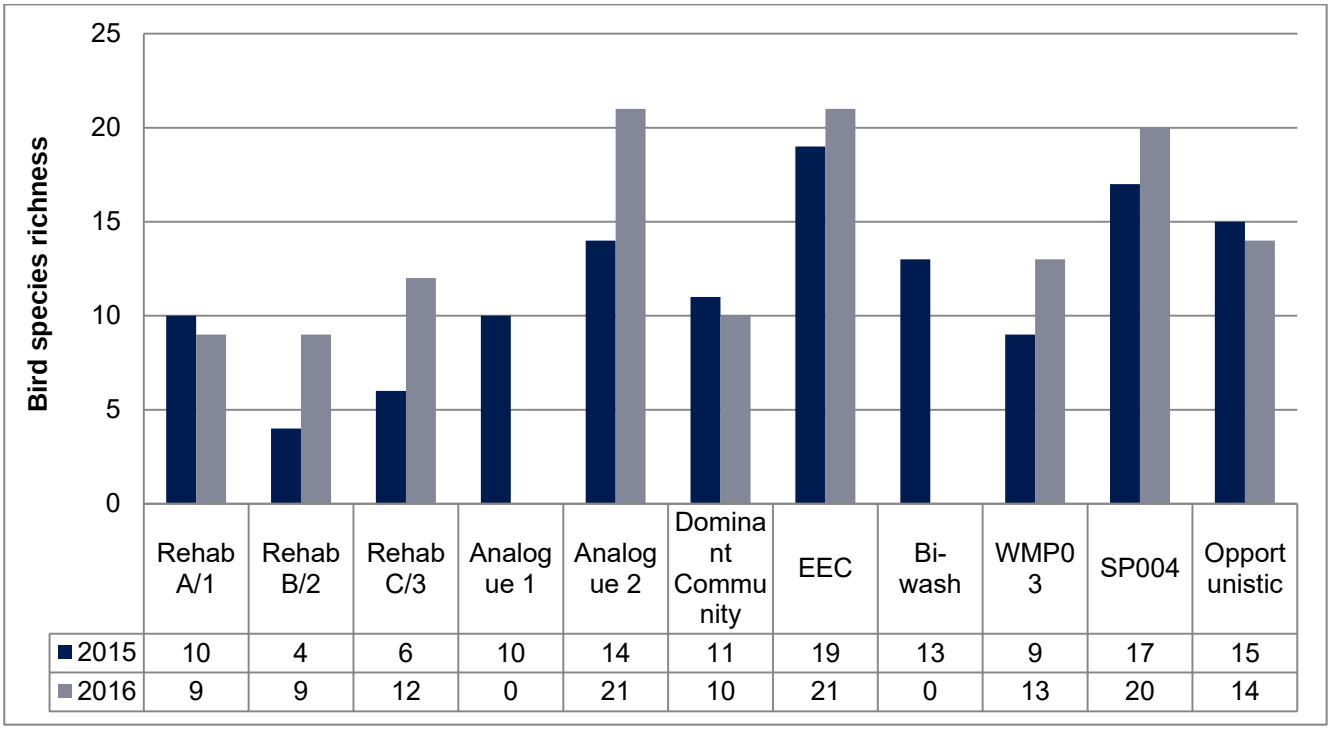


	Rehab A/1	Rehab B/2	Rehab C/3	Analogue Site 1	Analogue Site 2	EEC	Dominant Community
2015	24	23	31	19	27	30	25
2016	29	27	28	22	30	29	27

Figure 4 Comparison of Flora Species Diversity in 2015 and 2016 comparison

3.4 Bird Species Assemblages

In total, 48 bird species were detected in the rehabilitation sites, while 64 birds species were detected in the rehabilitation sites. **Figure 5** demonstrates the differences in bird species diversity between all monitoring sites. One threatened bird species was detected at the SP004 reference site which was listed as Vulnerable under the *Threatened Species Conservation Act 1995*, specifically, the Little Lorikeet (*Glossopsitta pusilla*). No threatened bird species were found to occur within the rehabilitation sites. A full list of the species found can be found in **Appendix 1**.



	Rehab A/1	Rehab B/2	Rehab C/3	Analogue 1	Analogue 2	Dominant Community	EEC	Bi-wash	WMP03	SP004	Opportunistic
2015	10	4	6	10	14	11	19	13	9	17	15
2016	9	9	12	0	21	10	21	0	13	20	14

Figure 5 Bird Species Diversity in 2015 and 2016 comparison

3.5 Microbat Species Assemblages

During the 2016 surveys, a total of six species were confidently detected, with one additional species having been probably identified. The Little Bentwing Bat (*Miniopterus australis*), which is listed under the TSC Act as Vulnerable, was confidently detected. Three other species were potentially detected, including the Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*), Eastern Freetail Bat (*Mormopterus norfolkensis*), both listed as Vulnerable under the TSC Act and the Large-eared Pied Bat (*Chalinolobus dwyeri*) which listed as Vulnerable under both the TSC and EPBC Act.

Figure 5 illustrates bat species richness between all sites. A list of all recorded microbat species is provided in **Appendix 2**.

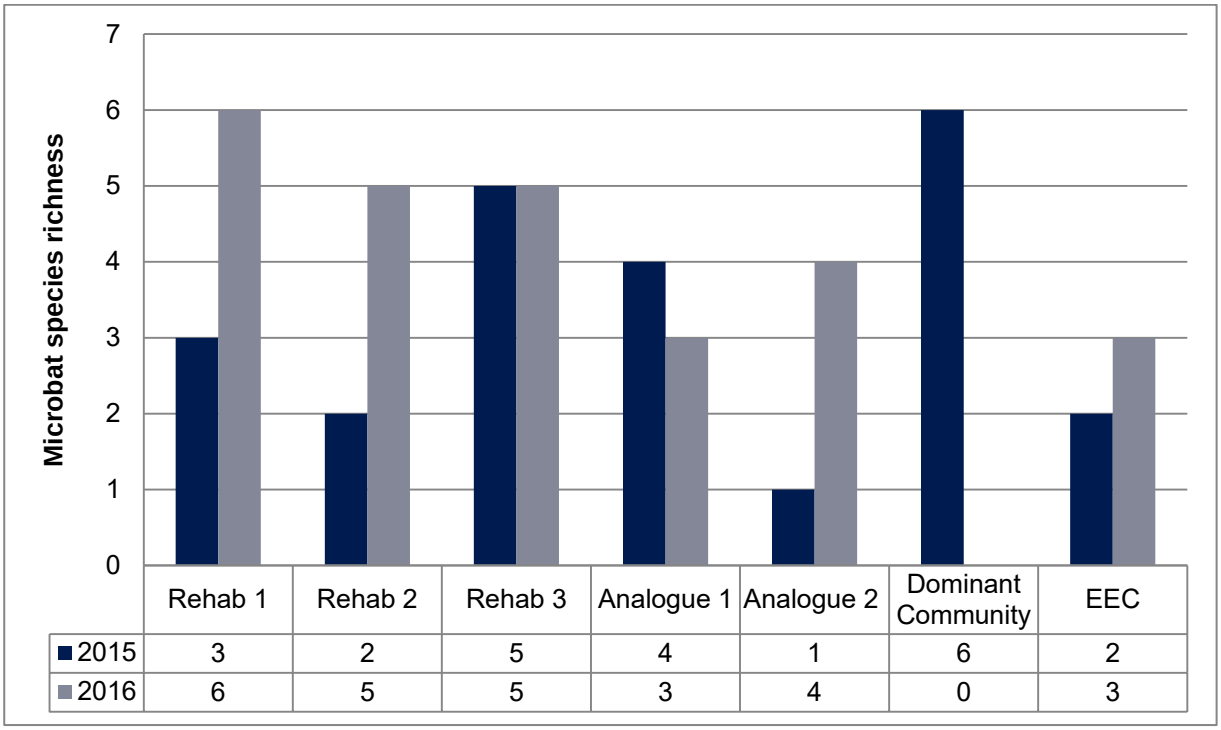


Figure 6 Microbat Species Richness between sites in 2015 and 2016

Invertebrate Species Assemblages

Morphospecies abundance and diversity was not dissimilar across all sites, including both rehabilitation and reference sites. Surveys in 2015 indicated that abundance was much lower in the reference site (Dominant Community), when compared to most other rehabilitation sites. Continued monitoring will allow for further understanding of differences (if they exist) between rehabilitation and reference sites.

Figure 6 compares species diversity and abundance between sites. **Appendix 3** contains a full invertebrate species list for each site.

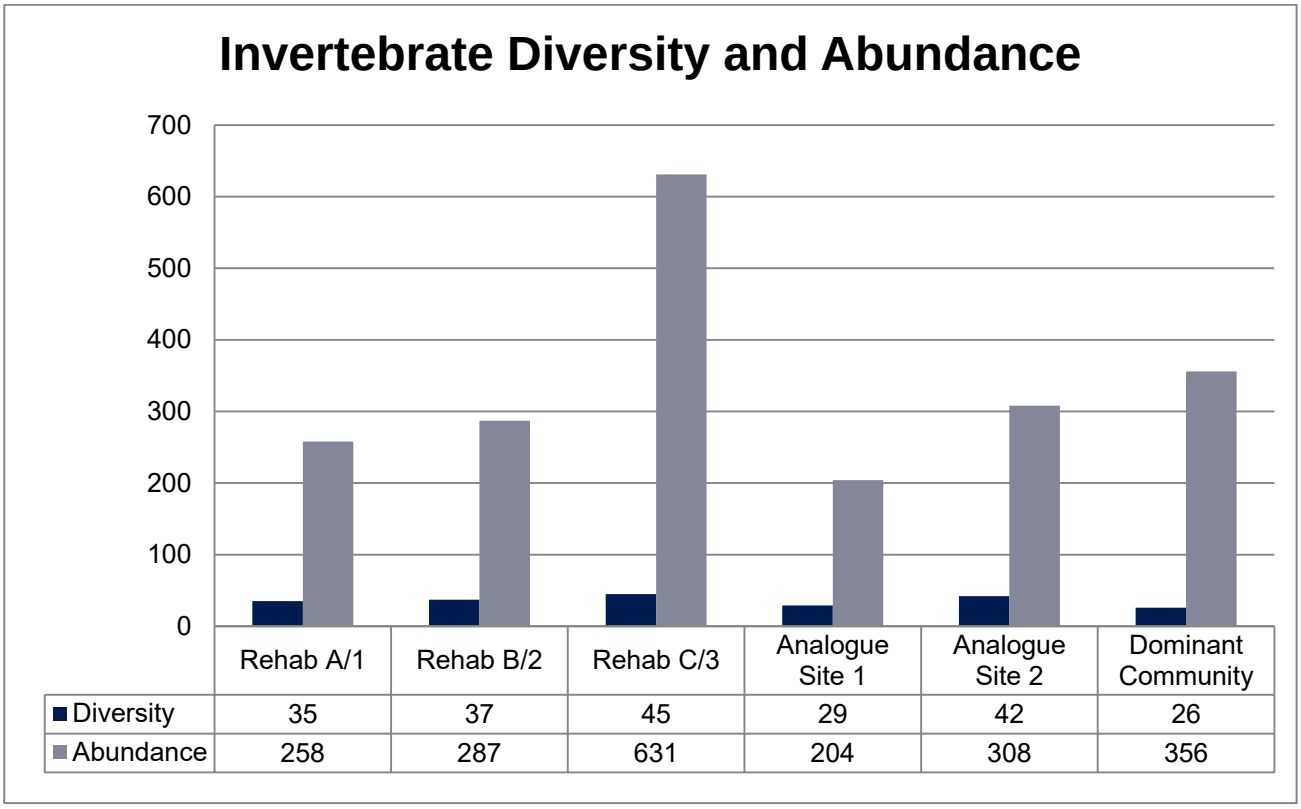


Figure 7 Invertebrate Species Diversity and Abundance in 2015

4.0 Referencing

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5.0 Acronyms and Units

APIA	Australian Petroleum Industry Association
DERM	Department of Environment and Resource Management (Queensland)
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (Federal) (formerly DEWHA)
EP Act	Environment Protection Act 1994

Appendix 1

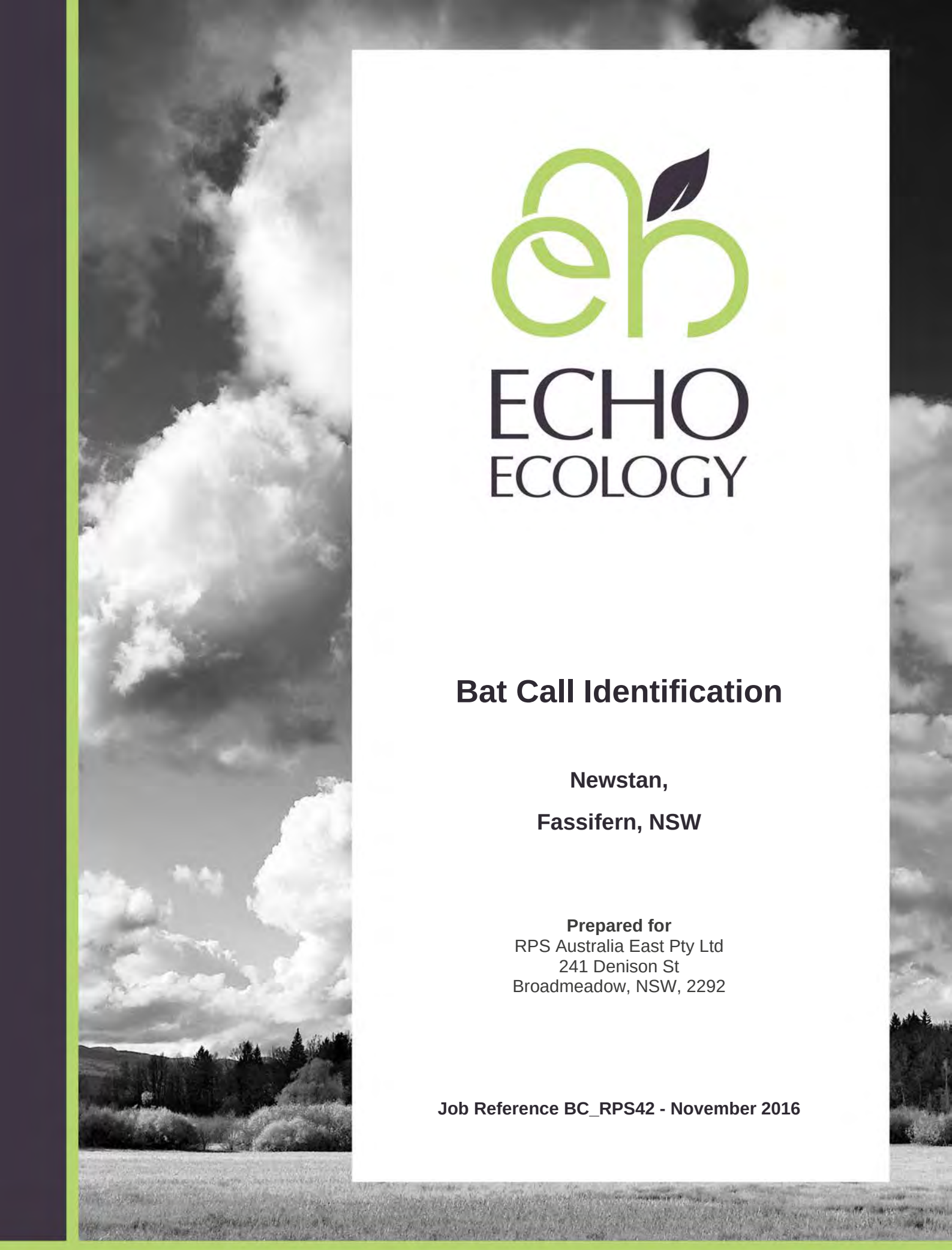
Bird Species List

Common Name	Scientific Name
Australian Magpie	*Cracticus tibicen*
Australian Raven	*Corvus coronoides*
Australian Reed-Warbler	*Acrocephalus australis*
Australian Wood Duck	*Chenonetta jubata*
Bell Miner	*Manorina melanophrys*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
Brown Cuckoo-Dove	*Macropygia amboinensis*
Brown Thornbill	*Acanthiza pusilla*
Channel-billed Cuckoo	*Scythrops novaehollandiae*
Crested Pigeon	*Ocyphaps lophotes*
Eastern Koel	*Eudynamys orientalis*
Eastern Rosella	*Platycercus eximius*
Eastern Spinebill	*Acanthorhynchus tenuirostris*
Eastern Whipbird	*Psophodes olivaceus*
Eastern Yellow Robin	*Eopsaltria australis*
Fan-tailed Cuckoo	*Cacomantis flabelliformis*
Golden Whistler	*Pachycephala pectoralis*
Grey Butcherbird	*Cracticus torquatus*
Grey Fantail	*Rhipidura albiscapa*
Grey Goshawk	*Accipiter novaehollandiae*
Grey Shrike-thrush	*Colluricincla harmonica*
Laughing Kookaburra	*Dacelo novaeguineae*
Lewin's Honeyeater	*Meliphaga lewinii*
Little Corella	*Cacatua sanguinea*
Little Lorikeet	*Glossopsitta pusilla*
Magpie-lark	*Grallina cyanoleuca*
Masked Lapwing	*Vanellus miles*
Noisy Friarbird	*Philemon corniculatus*
Noisy Miner	*Manorina melanocephala*
Peregrine Falcon	*Falco peregrinus*
Pied Butcherbird	*Cracticus nigrogularis*
Pied Currawong	*Strepera graculina*
Purple Swamphen	*Porphyrio porphyrio*

Common Name	Scientific Name
Rainbow Lorikeet	*Trichoglossus haematodus*
Red-browed Finch	*Neochmia temporalis*
Restless Flycatcher	*Myiagra inquieta*
Rufous Whistler	*Pachycephala rufiventris*
Sacred Kingfisher	*Todiramphus sanctus*
Silvereye	*Zosterops lateralis*
Spotted Pardalote	*Pardalotus punctatus*
Sulphur-crested Cockatoo	*Cacatua galerita*
Superb Fairy-wren	*Malurus cyaneus*
Variegated Fairy-wren	*Malurus lamberti*
Weebill	*Smicrornis brevirostris*
Welcome Swallow	*Hirundo neoxena*
White-bellied Cuckoo-shrike	*Coracina papuensis*
White-bellied Sea-Eagle	*Haliaeetus leucogaster*
White-cheeked Honeyeater	*Phylidonyris niger*
White-eared Honeyeater	*Lichenostomus leucotis*
White-throated Gerygone	*Gerygone olivacea*
Willie Wagtail	*Rhipidura leucophrys*
Yellow-faced Honeyeater	*Lichenostomus chrysops*
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*

Appendix 2

Anabat Results



ECHO ECOLOGY

Bat Call Identification

Newstan,

Fassifern, NSW

Prepared for
RPS Australia East Pty Ltd
241 Denison St
Broadmeadow, NSW, 2292

Job Reference BC_RPS42 - November 2016

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This report has been prepared to document the analysis of digital ultrasonic bat echolocation calls received from a third party. The data was not collected by the author and as such no responsibility is taken for the quality of data collection or for the suitability of its subsequent use.

This report was authored by

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Contents

List of Tables

List of Figures

1.0 INTRODUCTION

This report has been commissioned by RPS Australia East Pty Ltd to analyse bat echolocation call data (Anabat, Titley Electronics) collected from Fassifern, NSW. Data was provided electronically to the author. This report documents the methods involved in analysing bat call data and the results obtained only.

2.0 METHODS

The identification of bat echolocation calls recorded during surveys was undertaken using AnalookW (Chris Corben, Version 4.2d) software. The identification of calls was undertaken with reference to Pennay et al. (2004) and through the comparison of recorded reference calls from the Sydney Basin. Reference calls were obtained from the NSW database and from the authors personal collection.

Each call sequence ('pass') was assigned to one of five categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species
- Probable - Pass identified to species level and there is a low chance of confusion with another species
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species
- Species group - Pass could not be identified to species level and could belong to one of two or more species. Occurs more frequently when passes are short or of poor quality
- Unknown - Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Call sequences that were less than three pulses in length were not analysed and were assigned to 'Unknown' and only search phase calls were analysed. Furthermore, some species are difficult to differentiate using bat call analysis due to overlapping call frequencies and similar shape of plotted calls and in these cases calls were assigned to species groups.

The total number of passes (call sequences) per unit per night was tallied to give an index of activity.

It should be noted that the activity levels recorded at different sites may not be readily able to be compared. Activity levels should not be compared among species as different species have different detectability due to factors such as call loudness, foraging strategy and call identifying features. Activity comparisons among sites are dependent on many variables which need to be carefully controlled during data collection and statistically analysed. Influential variables include wind, rain, temperature, duration of recording, season, detector and microphone sensitivity, detector placement, weather protection devices etc.

Nomenclature follows the Australian Chiroptera taxonomic list described by Reardon et al. (2015).

2.1 Characteristics Used to Differentiate Species

Miniopterus australis was differentiated from *Vespadelus pumilus*, by characteristic frequency or the presence of a down-sweeping tail on pulses.

Chalinolobus morio calls were differentiated from those of *Vespadelus* sp. by the presence of a down-sweeping tail on the majority of pulses. We do not confidently identify *Vespadelus troughtoni* from bat calls in this region as it overlaps in frequency with both *Vespadelus pumilus* and *Vespadelus vulturnus* and we find it difficult to distinguish based on other call characteristics.

Calls from *Miniopterus orianae oceanensis* were differentiated from *Vespadelus* spp. by a combination of uneven consecutive pulses and the presence of down-sweeping tails.

Calls from *Mormopterus* spp. were differentiated by the presence of mainly flat pulses. *Mormopterus ridei norfolkensis* was differentiated from *Mormopterus norfolkensis* in long call sequences with little pulse alternation.

Chalinolobus gouldii was differentiated from other species by the presence of curved, alternating call pulses.

Scotorepens orion, *Scoteanax rueppellii* and *Falsistrellus tasmaniensis* were unable to be differentiated from one another. *Falsistrellus tasmaniensis* is most frequently recorded from more elevated locations in the region and so its occurrence within the study area is unlikely. However, some records exist from coastal lowlands and so we have included it in our species groups as a precautionary measure. We do not distinguish *Falsistrellus tasmaniensis* from *Scotorepens orion* where they overlap in frequency.

Rhinolophus megaphyllus and *Austronomus australis* were differentiated from other bat species on the basis of characteristic frequency.

3.0 RESULTS

A total of 1,492 call sequences were recorded, of which 548 call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, 263 call sequences (48 %) were able to be confidently identified (those classified as either definite or probable identifications) to species level (Table 3-1). Species recorded confidently within the site include:

- *Austronomus australis* (White-striped Free-tailed Bat)
- *Chalinolobus gouldii* (Gould's Wattled Bat)
- *Chalinolobus morio* (Chocolate Wattled Bat)
- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus orianae oceanensis* (Eastern Bent-winged Bat)
- *Mormopterus ridei* (Ride's Free-tailed Bat)
- *Rhinolophus megaphyllus* (Eastern Horseshoe Bat)

Additionally, the following bat species potentially occurred within the site, but could not be confidently identified (those calls classified as possible or as a species group):

- *Mormopterus norfolkensis* (Eastern coastal Free-tailed Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Scotorepens orion* (Eastern Broad-nosed Bat)
- *Vespadelus darlingtoni* (Large Forest Bat)
- *Vespadelus pumilus* (Eastern Forest Bat)
- *Vespadelus regulus* (Southern Forest Bat)
- *Vespadelus troughtoni* (Eastern cave bat)
- *Vespadelus vulturnus* (Little Forest Bat)

It should be noted that additional bat species may be present within the site but were not recorded by the detectors (or are difficult to identify by bat call) and habitat assessment should be used in conjunction with these results to determine the likelihood of occurrence of other bat species.

Table 3-1 below summarises the results of the bat call analysis.

Table 3-1: Results of bat call analysis (number of passes per site per night)

IDENTIFICATION	Express 1 10/10/2016	Express 1 11/10/2016	Express 1 12/10/2016	Express 1 13/10/2016	Express 1 14/10/2016	Express 2 10/10/2016	Express 2 11/10/2016	Express 2 12/10/2016	Express 2 13/10/2016	Express 2 14/10/2016
DEFINITE										
Austronomus australis	12	4	1	-	5	20	5	8	-	-
Chalinolobus gouldii	3	2	-	19	2	-	-	-	1	-
Chalinolobus morio	-	-	-	-	-	-	-	-	-	2
Miniopterus australis	-	1	-	6	-	-	4	1	8	17
Mormopterus ridei	1	5	1	17	-	-	2	-	-	1
Rhinolophus megaphyllus	2	5	1	6	1	2	2	33	8	7
PROBABLE										
Austronomus australis	1	-	-	-	-	-	-	-	-	-
Chalinolobus gouldii	10	1	1	6	3	1	-	-	-	-
Miniopterus australis	-	-	-	-	-	1	1	-	-	-
Miniopterus orianae oceanensis	3	1	-	-	-	1	1	10	-	3
Mormopterus ridei	-	-	-	3	-	-	1	-	-	-

IDENTIFICATION	Express 1 10/10/2016	Express 1 11/10/2016	Express 1 12/10/2016	Express 1 13/10/2016	Express 1 14/10/2016	Express 2 10/10/2016	Express 2 11/10/2016	Express 2 12/10/2016	Express 2 13/10/2016	Express 2 14/10/2016
POSSIBLE										
Chalinolobus gouldii	2	-	-	-	-	-	-	-	-	-
Miniopterus orianae oceanensis	1	-	-	-	-	-	-	-	-	-
Mormopterus norfolkensis	-	-	-	1	-	-	-	-	-	-
SPECIES GROUPS										
Chalinolobus gouldii / Mormopterus norfolkensis / Mormopterus ridei	5	1	-	11	1	-	-	-	-	-
Chalinolobus gouldii / Mormopterus ridei	2	1	1	1	3	-	1	-	-	-
Chalinolobus gouldii / Scoteanax rueppellii	2	-	1	-	-	2	-	-	-	-
Chalinolobus morio / Vespadelus pumilus / Vespadelus vulturnus / Vespadelus troughtoni	-	-	11	5	-	-	-	74	-	5
Falsistrellus tasmaniensis / Scotorepens orion	1	-	-	-	-	-	-	-	-	-
Falsistrellus tasmaniensis / Scotorepens orion / Scoteanax rueppellii	3	1	1	-	-	1	-	-	-	-
Miniopterus australis / Vespadelus pumilus	-	-	-	-	-	-	-	-	-	1
Miniopterus orianae oceanensis / Vespadelus darlingtoni / Vespadelus regulus	17	6	-	1	-	23	17	8	7	52
Mormopterus norfolkensis / Mormopterus ridei	-	1	-	-	-	-	-	-	-	-

IDENTIFICATION	Express 1 10/10/2016	Express 1 11/10/2016	Express 1 12/10/2016	Express 1 13/10/2016	Express 1 14/10/2016	Express 2 10/10/2016	Express 2 11/10/2016	Express 2 12/10/2016	Express 2 13/10/2016	Express 2 14/10/2016
Vespadelus darlingtoni / Vespadelus regulus	-	-	-	-	-	-	1	-	-	-
Vespadelus pumilus / Vespadelus vulturnus / Vespadelus troughtoni	-	-	-	-	-	-	-	13	-	-
UNKNOWN										
'Noise' files	620	-	1	4	2	140	5	8	3	6
Unknown	34	12	3	27	5	18	9	6	5	36
TOTAL	**719**	**41**	**22**	**107**	**22**	**209**	**49**	**161**	**32**	**130**

4.0 SAMPLE CALLS

A sample of the calls actually identified from the site for each species is given below.

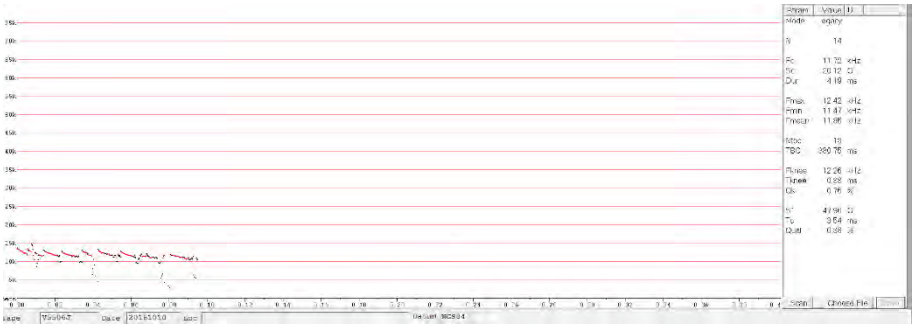

Figure 4-1: *Austronomus australis* definite call

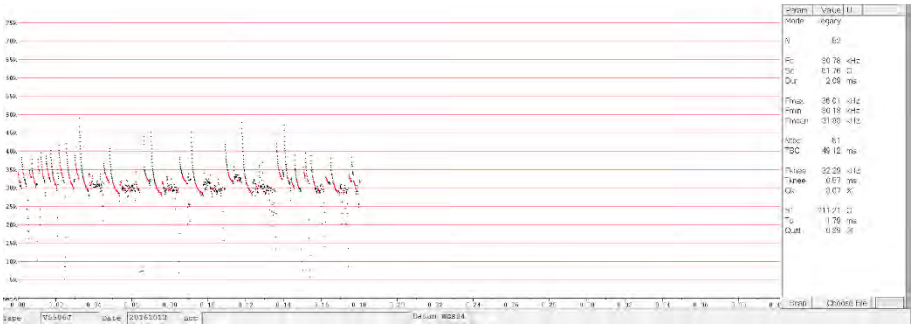

Figure 4-2: *Chalinolobus gouldii* definite call

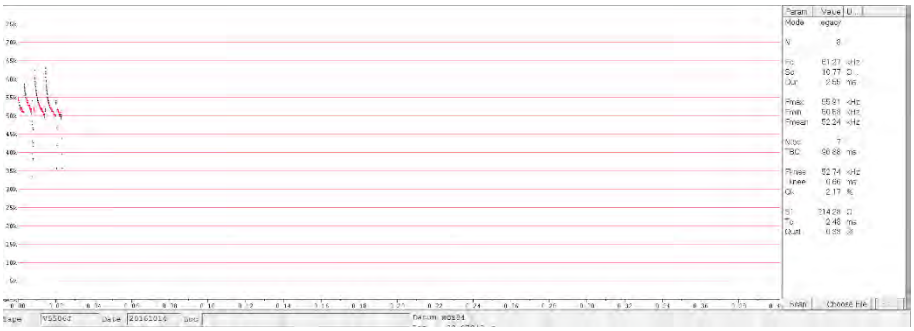

Figure 4-3: *Chalinolobus morio* definite call

Figure 4-4: *Miniopterus australis* definite call

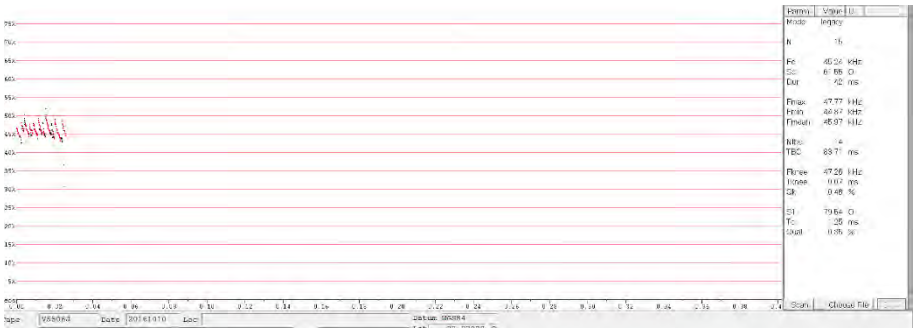

Figure 4-5: *Miniopterus orianae oceanensis* probable call

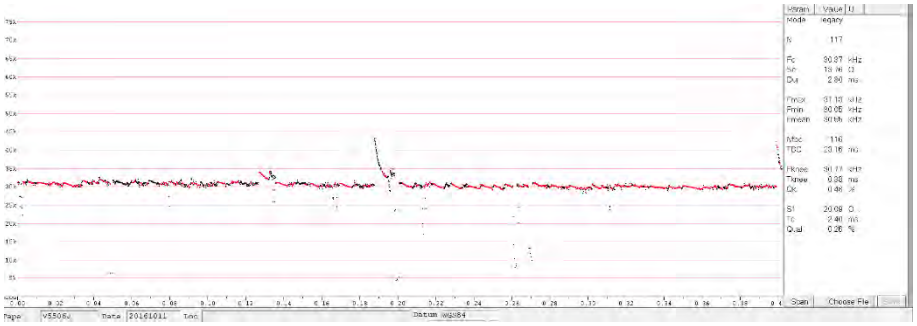

Figure 4-6: *Mormopterus ridei* definite call

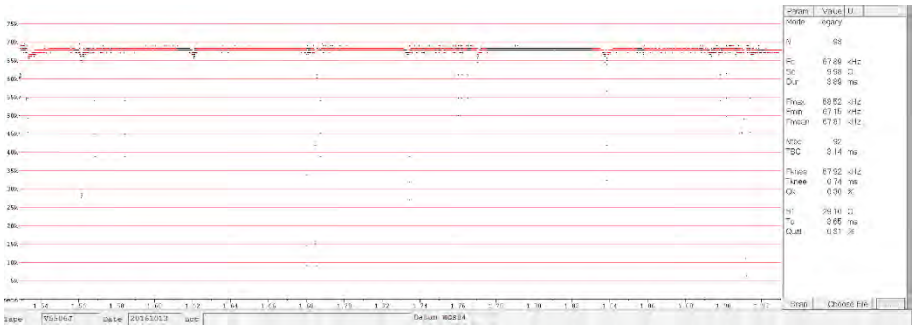

Figure 4-7: *Rhinolophus megaphyllus* definite call

5.0 REFERENCES

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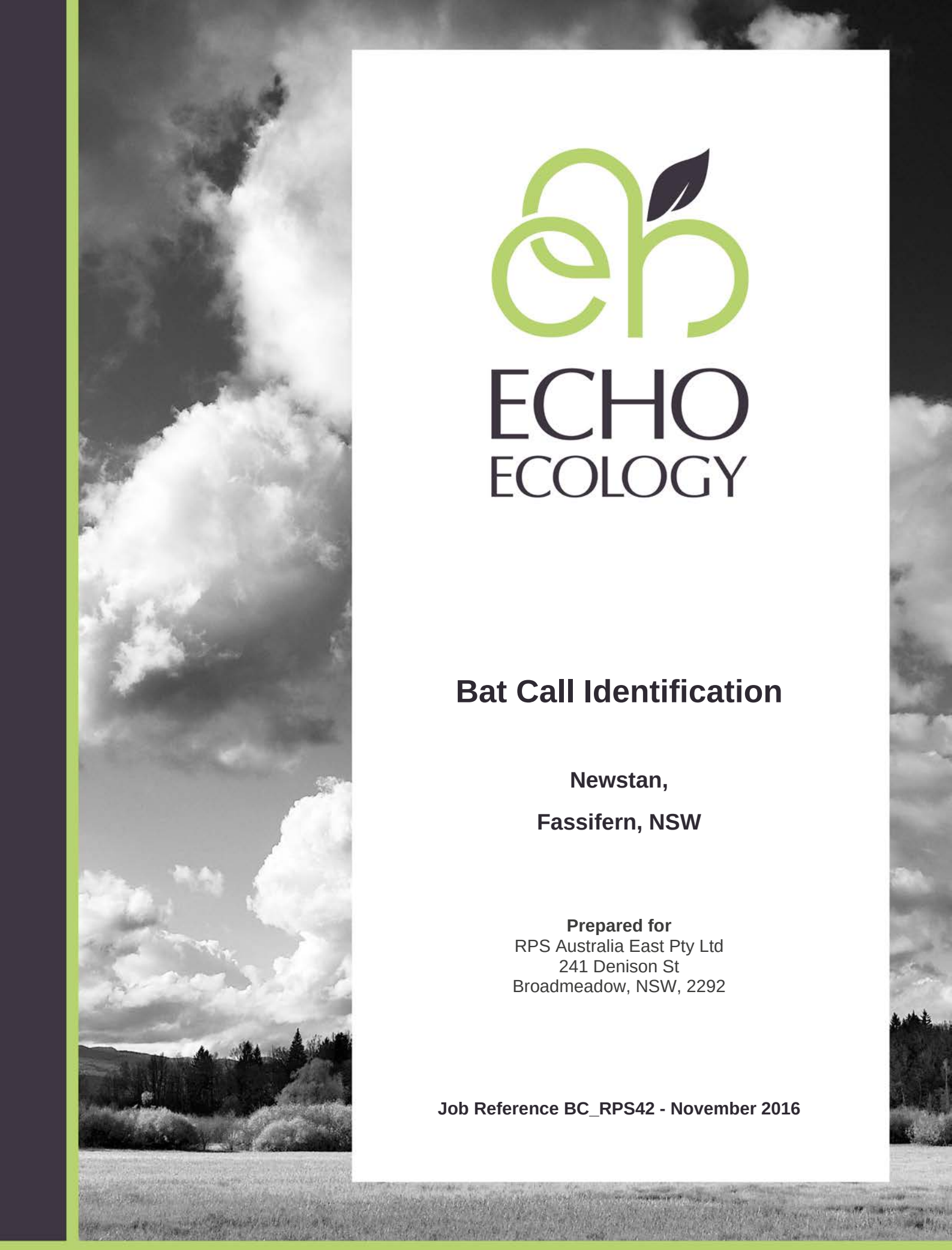
Appendix 3

Invertebrate Results

Morphospecies	Rehab A/1	Rehab B/2	Rehab C/3	Analogue Site 1	Analogue Site 2	Dominant Community
B/W Butterfly	1				2	
Apis mellifera	1			2	1	2
Meat ant 1	49					
Sugar Ant 1	1	3	5		2	2
Small black ant	44		12	11	33	
Small brown ant	1	2	114	2		58
Small moth	2					
House fly	2		3		30	
Large fly 1	1		3		1	
Striped fly	2		2			
Tiny fly	38	21	25	35	53	87
Midges	18	13	7	22	10	28
Tiny stout fly	3	5	15	5		2
Hemiptera 1	19	36	29	10	8	80
Strepsiptera	1		1			
Tiny wasp	11	62	47	17	9	16
Winged ants	2					
Arachnids	4	1	1	2	2	
Small black spider	1		1	1	2	2
Small stout fly	1				10	
Red abd dipteran	2	1	1		1	
Black hemipteran	3		1	7	4	
Wingless hemipteran	6		12		10	11
Tiny grasshopper	1					
Tiny cricket	1					
Psocoptera sp	2	3	6		1	
Tiny lepidoptera	2	3	1	1	2	1
Amphipod 1	2	31	229	11	1	
Coleoptera 1	1					
Coleoptera 2	1	1	3			
Tiny mosquito	2		3			
Springtail	11	29	8	11	25	20

Morphospecies	Rehab A/1	Rehab B/2	Rehab C/3	Analogue Site 1	Analogue Site 2	Dominant Community
Collembola 2	20		10		10	13
Thysanoptera sp	1	2	28	3		3
Medium orange spotted butterfly			3		2	
Actual housefly		6		2	5	
Bush fly				23	5	
Green ant 1	1	7	5	5	4	3
Large fly 2					1	
Wolf spider					2	
Large Bush Fly				15	1	1
Blow fly				2	1	
Metallic fly					1	
Tiny butterfly					1	
Small metallic fly			12	1	2	3
Elatid					1	
Medium black wasp					2	1
Small black wasp			2	2	4	
Coleoptera 3		1			1	
Coleoptera 4					1	
S light brown spider					1	
Jumping spider					1	
Unidentified 1			1		3	
Tiny black beetle					2	
Grey slater like		1	20		50	8
Grass dart			1	1		
White spotted wasp		1	1			
Gnaphosid sp		9	6	2		
Small stout fly			1			3
Long ovi fly		1	1			
Hemipteran 2		1	2			
Small mosquito		2	1			
Small blk/org wasp		4	1			
Small black stout legs			1			
Tiny long petiole wasp		2	1			
Brown Spiny Ant			1			
Tiny striped beetle		1	1			
Proboscid beetle			1			
Bull Ant			2			

Morphospecies	Rehab A/1	Rehab B/2	Rehab C/3	Analogue Site 1	Analogue Site 2	Dominant Community
Aphid sp.		1				
Brown spot beetle		1		1		
Cricket 2		1				
Tan thorax beetle		2				
Small tan fly		3				
Small slender fly		2				5
Small black wasp 2		18		6		
Small black wasp 3		7				
Coleoptera 5		1				
Red abd bugs		2				
Bull ant 2						2
Nyssus albopunctatus						2
Blattodea 1						1
Medium black wasp 2						1
Tiny brown beetle						1
Medium long black wasp				1		
Stripe wing fly				2		
Reduvidae 1				1		



ECHO ECOLOGY

Bat Call Identification

Newstan,

Fassifern, NSW

Prepared for
RPS Australia East Pty Ltd
241 Denison St
Broadmeadow, NSW, 2292

Job Reference BC_RPS42 - November 2016

Echo Ecology Pty Ltd ABN 73 162 118 710 • PO Box 4132 Crescent Head, NSW 2440 Australia • **P:** 0423 801 779 • **E:** info@echoecology.com.au • **W:** echoecology.com.au

This report has been prepared to document the analysis of digital ultrasonic bat echolocation calls received from a third party. The data was not collected by the author and as such no responsibility is taken for the quality of data collection or for the suitability of its subsequent use.

This report was authored by

Dr Anna McConville
PhD, B.Env.Sc.

Contents

List of Tables

List of Figures

1.0 INTRODUCTION

This report has been commissioned by RPS Australia East Pty Ltd to analyse bat echolocation call data (Anabat, Titley Electronics) collected from Fassifern, NSW. Data was provided electronically to the author. This report documents the methods involved in analysing bat call data and the results obtained only.

2.0 METHODS

The identification of bat echolocation calls recorded during surveys was undertaken using AnalookW (Chris Corben, Version 4.2d) software. The identification of calls was undertaken with reference to Pennay et al. (2004) and through the comparison of recorded reference calls from the Sydney Basin. Reference calls were obtained from the NSW database and from the authors personal collection.

Each call sequence ('pass') was assigned to one of five categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species
- Probable - Pass identified to species level and there is a low chance of confusion with another species
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species
- Species group - Pass could not be identified to species level and could belong to one of two or more species. Occurs more frequently when passes are short or of poor quality
- Unknown - Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Call sequences that were less than three pulses in length were not analysed and were assigned to 'Unknown' and only search phase calls were analysed. Furthermore, some species are difficult to differentiate using bat call analysis due to overlapping call frequencies and similar shape of plotted calls and in these cases calls were assigned to species groups.

The total number of passes (call sequences) per unit per night was tallied to give an index of activity.

It should be noted that the activity levels recorded at different sites may not be readily able to be compared. Activity levels should not be compared among species as different species have different detectability due to factors such as call loudness, foraging strategy and call identifying features. Activity comparisons among sites are dependent on many variables which need to be carefully controlled during data collection and statistically analysed. Influential variables include wind, rain, temperature, duration of recording, season, detector and microphone sensitivity, detector placement, weather protection devices etc.

Nomenclature follows the Australian Chiroptera taxonomic list described by Reardon et al. (2015).

2.1 Characteristics Used to Differentiate Species

Miniopterus australis was differentiated from *Vespadelus pumilus*, by characteristic frequency or the presence of a down-sweeping tail on pulses.

Chalinolobus morio calls were differentiated from those of *Vespadelus* sp. by the presence of a down-sweeping tail on the majority of pulses. We do not confidently identify *Vespadelus troughtoni* from bat calls in this region as it overlaps in frequency with both *Vespadelus pumilus* and *Vespadelus vulturnus* and we find it difficult to distinguish based on other call characteristics.

Calls from *Miniopterus orianae oceanensis* were differentiated from *Vespadelus* spp. by a combination of uneven consecutive pulses and the presence of down-sweeping tails.

Calls from *Mormopterus* spp. were differentiated by the presence of mainly flat pulses. *Mormopterus ridei norfolkensis* was differentiated from *Mormopterus norfolkensis* in long call sequences with little pulse alternation.

Chalinolobus gouldii was differentiated from other species by the presence of curved, alternating call pulses.

Scotorepens orion, *Scoteanax rueppellii* and *Falsistrellus tasmaniensis* were unable to be differentiated from one another. *Falsistrellus tasmaniensis* is most frequently recorded from more elevated locations in the region and so its occurrence within the study area is unlikely. However, some records exist from coastal lowlands and so we have included it in our species groups as a precautionary measure. We do not distinguish *Falsistrellus tasmaniensis* from *Scotorepens orion* where they overlap in frequency.

Rhinolophus megaphyllus and *Austronomus australis* were differentiated from other bat species on the basis of characteristic frequency.

3.0 RESULTS

A total of 1,492 call sequences were recorded, of which 548 call sequences were able to be analysed (ie were not 'noise' files or bat calls of short length). Of the bat calls, 263 call sequences (48 %) were able to be confidently identified (those classified as either definite or probable identifications) to species level (Table 3-1). Species recorded confidently within the site include:

- *Austronomus australis* (White-striped Free-tailed Bat)
- *Chalinolobus gouldii* (Gould's Wattled Bat)
- *Chalinolobus morio* (Chocolate Wattled Bat)
- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus orianae oceanensis* (Eastern Bent-winged Bat)
- *Mormopterus ridei* (Ride's Free-tailed Bat)
- *Rhinolophus megaphyllus* (Eastern Horseshoe Bat)

Additionally, the following bat species potentially occurred within the site, but could not be confidently identified (those calls classified as possible or as a species group):

- *Mormopterus norfolkensis* (Eastern coastal Free-tailed Bat)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Scotorepens orion* (Eastern Broad-nosed Bat)
- *Vespadelus darlingtoni* (Large Forest Bat)
- *Vespadelus pumilus* (Eastern Forest Bat)
- *Vespadelus regulus* (Southern Forest Bat)
- *Vespadelus troughtoni* (Eastern cave bat)
- *Vespadelus vulturnus* (Little Forest Bat)

It should be noted that additional bat species may be present within the site but were not recorded by the detectors (or are difficult to identify by bat call) and habitat assessment should be used in conjunction with these results to determine the likelihood of occurrence of other bat species.

Table 3-1 below summarises the results of the bat call analysis.

Table 3-1: Results of bat call analysis (number of passes per site per night)

IDENTIFICATION	Express 1 10/10/2016	Express 1 11/10/2016	Express 1 12/10/2016	Express 1 13/10/2016	Express 1 14/10/2016	Express 2 10/10/2016	Express 2 11/10/2016	Express 2 12/10/2016	Express 2 13/10/2016	Express 2 14/10/2016
DEFINITE										
Austronomus australis	12	4	1	-	5	20	5	8	-	-
Chalinolobus gouldii	3	2	-	19	2	-	-	-	1	-
Chalinolobus morio	-	-	-	-	-	-	-	-	-	2
Miniopterus australis	-	1	-	6	-	-	4	1	8	17
Mormopterus ridei	1	5	1	17	-	-	2	-	-	1
Rhinolophus megaphyllus	2	5	1	6	1	2	2	33	8	7
PROBABLE										
Austronomus australis	1	-	-	-	-	-	-	-	-	-
Chalinolobus gouldii	10	1	1	6	3	1	-	-	-	-
Miniopterus australis	-	-	-	-	-	1	1	-	-	-
Miniopterus orianae oceanensis	3	1	-	-	-	1	1	10	-	3
Mormopterus ridei	-	-	-	3	-	-	1	-	-	-

IDENTIFICATION	Express 1 10/10/2016	Express 1 11/10/2016	Express 1 12/10/2016	Express 1 13/10/2016	Express 1 14/10/2016	Express 2 10/10/2016	Express 2 11/10/2016	Express 2 12/10/2016	Express 2 13/10/2016	Express 2 14/10/2016
POSSIBLE										
Chalinolobus gouldii	2	-	-	-	-	-	-	-	-	-
Miniopterus orianae oceanensis	1	-	-	-	-	-	-	-	-	-
Mormopterus norfolkensis	-	-	-	1	-	-	-	-	-	-
SPECIES GROUPS										
Chalinolobus gouldii / Mormopterus norfolkensis / Mormopterus ridei	5	1	-	11	1	-	-	-	-	-
Chalinolobus gouldii / Mormopterus ridei	2	1	1	1	3	-	1	-	-	-
Chalinolobus gouldii / Scoteanax rueppellii	2	-	1	-	-	2	-	-	-	-
Chalinolobus morio / Vespadelus pumilus / Vespadelus vulturnus / Vespadelus troughtoni	-	-	11	5	-	-	-	74	-	5
Falsistrellus tasmaniensis / Scotorepens orion	1	-	-	-	-	-	-	-	-	-
Falsistrellus tasmaniensis / Scotorepens orion / Scoteanax rueppellii	3	1	1	-	-	1	-	-	-	-
Miniopterus australis / Vespadelus pumilus	-	-	-	-	-	-	-	-	-	1
Miniopterus orianae oceanensis / Vespadelus darlingtoni / Vespadelus regulus	17	6	-	1	-	23	17	8	7	52
Mormopterus norfolkensis / Mormopterus ridei	-	1	-	-	-	-	-	-	-	-

IDENTIFICATION	Express 1 10/10/2016	Express 1 11/10/2016	Express 1 12/10/2016	Express 1 13/10/2016	Express 1 14/10/2016	Express 2 10/10/2016	Express 2 11/10/2016	Express 2 12/10/2016	Express 2 13/10/2016	Express 2 14/10/2016
Vespadelus darlingtoni / Vespadelus regulus	-	-	-	-	-	-	1	-	-	-
Vespadelus pumilus / Vespadelus vulturnus / Vespadelus troughtoni	-	-	-	-	-	-	-	13	-	-
UNKNOWN										
'Noise' files	620	-	1	4	2	140	5	8	3	6
Unknown	34	12	3	27	5	18	9	6	5	36
TOTAL	**719**	**41**	**22**	**107**	**22**	**209**	**49**	**161**	**32**	**130**

4.0 SAMPLE CALLS

A sample of the calls actually identified from the site for each species is given below.

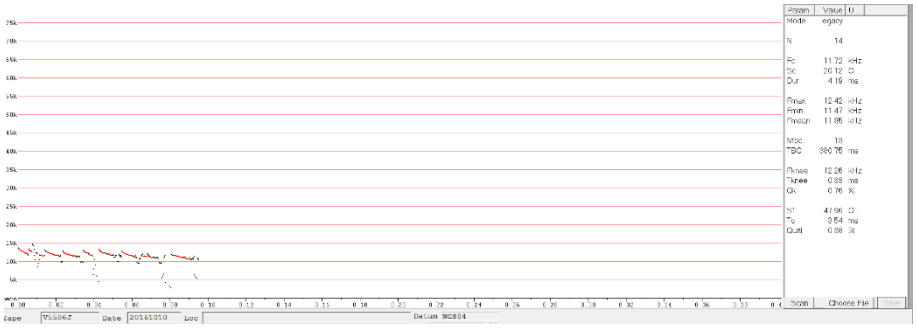


Figure 4-1: *Austronomus australis* definite call

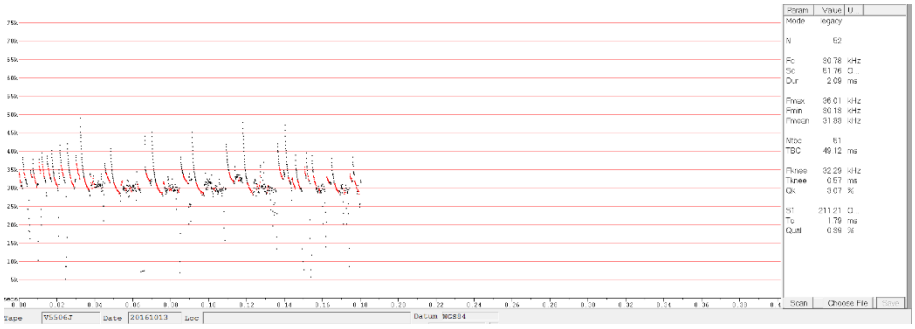


Figure 4-2: *Chalinolobus gouldii* definite call

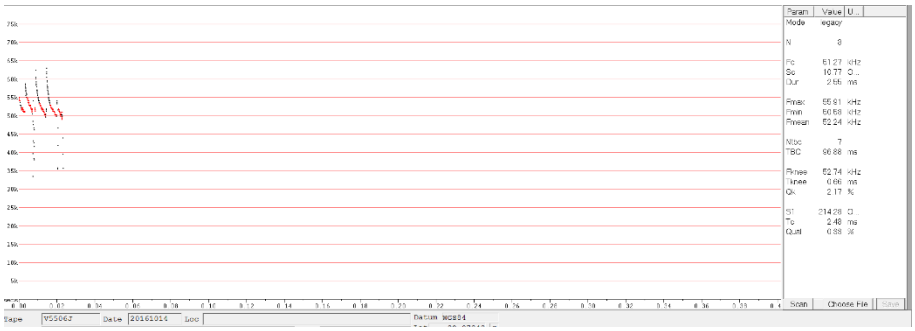


Figure 4-3: *Chalinolobus morio* definite call

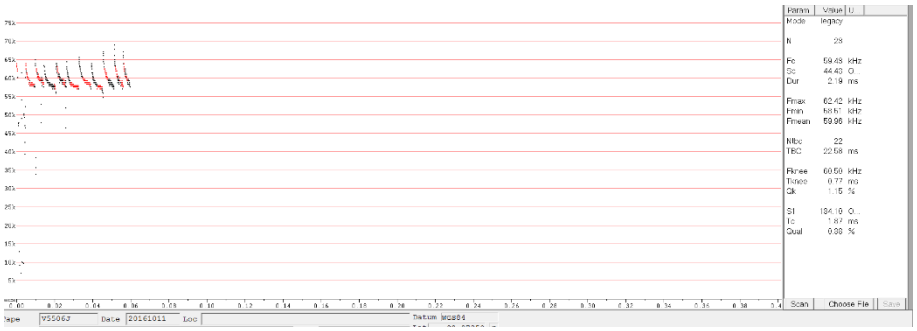


Figure 4-4: *Miniopterus australis* definite call

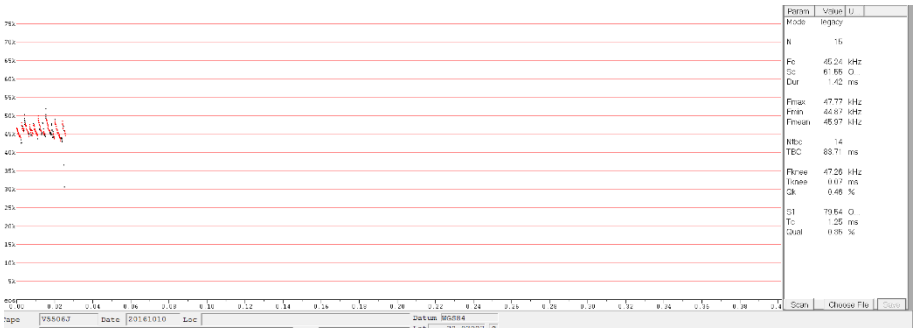


Figure 4-5: *Miniopterus orianae oceanensis* probable call

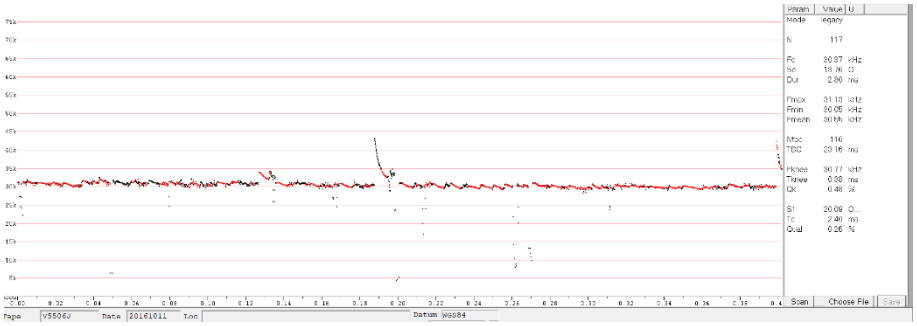


Figure 4-6: *Mormopterus ridei* definite call

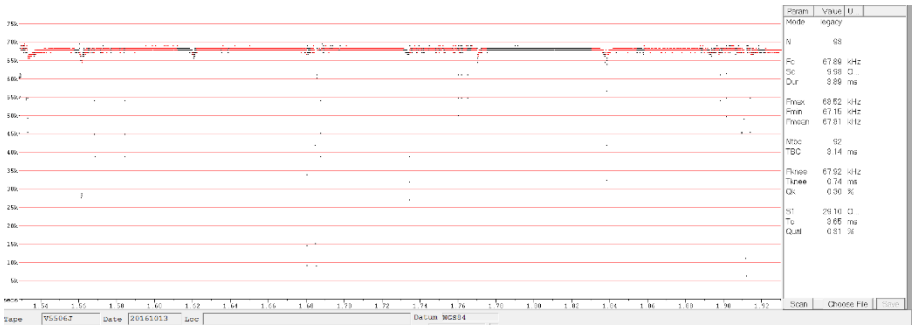


Figure 4-7: *Rhinolophus megaphyllus* definite call

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Appendix 3

Invertebrate Results

Morphospecies	Rehab A/1	Rehab B/2	Rehab C/3	Analogue Site 1	Analogue Site 2	Dominant Community
B/W Butterfly	1				2	
Apis mellifera	1			2	1	2
Meat ant 1	49					
Sugar Ant 1	1	3	5		2	2
Small black ant	44		12	11	33	
Small brown ant	1	2	114	2		58
Small moth	2					
House fly	2		3		30	
Large fly 1	1		3		1	
Striped fly	2		2			
Tiny fly	38	21	25	35	53	87
Midges	18	13	7	22	10	28
Tiny stout fly	3	5	15	5		2
Hemiptera 1	19	36	29	10	8	80
Strepsiptera	1		1			
Tiny wasp	11	62	47	17	9	16
Winged ants	2					
Arachnids	4	1	1	2	2	
Small black spider	1		1	1	2	2
Small stout fly	1				10	
Red abd dipteran	2	1	1		1	
Black hemipteran	3		1	7	4	
Wingless hemipteran	6		12		10	11
Tiny grasshopper	1					
Tiny cricket	1					
Psocoptera sp	2	3	6		1	
Tiny lepidoptera	2	3	1	1	2	1
Amphipod 1	2	31	229	11	1	
Coleoptera 1	1					
Coleoptera 2	1	1	3			
Tiny mosquito	2		3			
Springtail	11	29	8	11	25	20

Morphospecies	Rehab A/1	Rehab B/2	Rehab C/3	Analogue Site 1	Analogue Site 2	Dominant Community
Collembola 2	20		10		10	13
Thysanoptera sp	1	2	28	3		3
Medium orange spotted butterfly			3		2	
Actual housefly		6		2	5	
Bush fly				23	5	
Green ant 1	1	7	5	5	4	3
Large fly 2					1	
Wolf spider					2	
Large Bush Fly				15	1	1
Blow fly				2	1	
Metallic fly					1	
Tiny butterfly					1	
Small metallic fly			12	1	2	3
Elatid					1	
Medium black wasp					2	1
Small black wasp			2	2	4	
Coleoptera 3		1			1	
Coleoptera 4					1	
S light brown spider					1	
Jumping spider					1	
Unidentified 1			1		3	
Tiny black beetle					2	
Grey slater like		1	20		50	8
Grass dart			1	1		
White spotted wasp		1	1			
Gnaphosid sp		9	6	2		
Small stout fly			1			3
Long ovi fly		1	1			
Hemipteran 2		1	2			
Small mosquito		2	1			
Small blk/org wasp		4	1			
Small black stout legs			1			
Tiny long petiole wasp		2	1			
Brown Spiny Ant			1			
Tiny striped beetle		1	1			
Proboscid beetle			1			
Bull Ant			2			

Morphospecies	Rehab A/1	Rehab B/2	Rehab C/3	Analogue Site 1	Analogue Site 2	Dominant Community
Aphid sp.		1				
Brown spot beetle		1		1		
Cricket 2		1				
Tan thorax beetle		2				
Small tan fly		3				
Small slender fly		2				5
Small black wasp 2		18		6		
Small black wasp 3		7				
Coleoptera 5		1				
Red abd bugs		2				
Bull ant 2						2
Nyssus albopunctatus						2
Blattodea 1						1
Medium black wasp 2						1
Tiny brown beetle						1
Medium long black wasp				1		
Stripe wing fly				2		
Reduvidae 1				1		

Centennial Coal

Monitoring of *Tetratheca juncea* at the Northern and Southern Reject Emplacement Areas

Newstan Mine

September 2016

HUNTER ECO

Centennial Coal Environment Matters

Centennial Newstan

Monitoring of Tetratheca juncea *in NREA and SREA buffer areas*

2016 season

HUNTER ECO

Colin Driscoll
Environmental Biologist
NPWS Scientific Licence SL101245

CONTENTS

FIGURES

TABLES

Monitoring of *Tetratheca juncea* in NREA and SREA buffer areas

2016 season

1 Introduction

Centennial Newstan has conducted underground coal mining for over 125 years. Mines have been located about 3 km south west of the Awaba township and situated between the Main Northern Railway and the F3 Freeway, and in the Wakefield area. Operations are currently under Care and Maintenance as of August 2014.

There are two reject emplacement areas, the northern reject emplacement area (NREA) and southern reject emplacement area (SREA), near the Newstan coal handling and preparation plant off Miller Road north west of Toronto. The presence of *Tetratheca juncea* was to be monitored within one permanent 10 m square quadrat located near the buffer areas of each REA (**Figure 2**).

Reject emplacement area monitoring commenced in 2008. Past reports are Winning (2006b, 2007, 2008, 2009) and Hunter Eco (2010, 2011, 2012, 2013, 2014, 2015). This report presents the results of the 2016 monitoring.

2 Methods

Tetratheca juncea is a clonal plant made up of clumps of stems somewhat like a grass tussock and to complicate matters these stems can form an aggregated group spread over a few square meters. This makes defining a single plant difficult and a convention has been established where a single clump is defined as a group of stems separated from the next group of stems by a minimum of 30 cm (Payne et al. 2002). This convention was used for this monitoring.

Results were reported as the number of clumps recorded within each of the 10 m square permanent quadrats.

Figure 1 The monitoring locations in the reject emplacement areas

The flowering period for *Tetratheca juncea* is generally quoted as being from late July through to December. However, flowering over that period does not maintain the same intensity. Peak flowering occurs around late September to early October (Driscoll 2013) and this means that clump counts can vary considerably depending on the date of survey. **Table 1** shows the date of each survey.

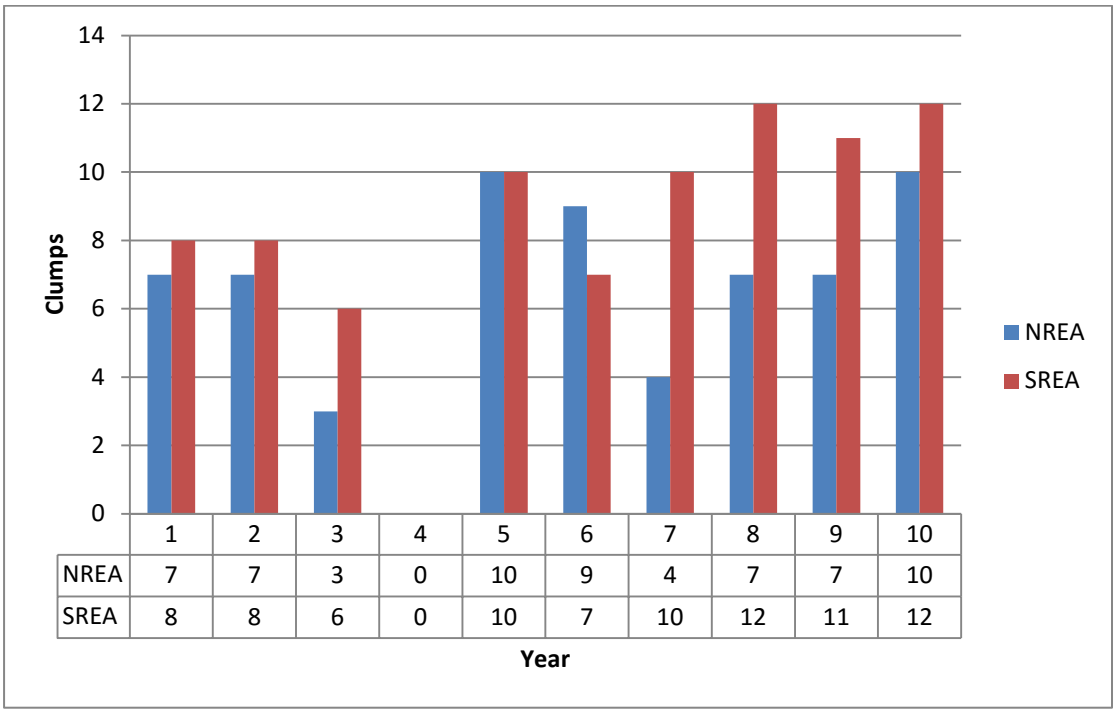
Table 1 Date of annual surveys

Survey year	NREA & SREA
2008	8/1/2008, 4/11/2008
2009	30/11/2009
2010	Not surveyed[1]
2011	27/10/2011
2012	17/10/2012
2013	16/10/2013
2014	20/10/2014
2015	15/10/2015
2016	23/9/2016

[1] Hunter Eco field surveyor was unable to locate the corner markers of the permanent quadrats due to works having been carried out that disturbed part of both sites and destroyed some markers (Hunter Eco 2010); subsequently these were found.

3 Results

Figure 2 shows the clump counts over time for the two REA quadrats.



	1	2	3	4	5	6	7	8	9	10
NREA	7	7	3	0	10	9	4	7	7	10
SREA	8	8	6	0	10	7	10	12	11	12

Figure 2 Comparison of annual clump counts for the two REA sites

Key to monitoring dates

1	2	3	4	5	6	7	8	9	10
8/01/08	4/11/08	30/11/09	Not surveyed in 2010	27/10/11	17/10/12	16/10/13	20/10/14	15/10/15	23/9/16

4 Discussion

Figure 2 suggests that the number of clumps in each REA quadrat have been steadily increasing over time, particularly for the SREA. Regression analysis indicates that the apparent trend is not significant for the NREA at the 95% confidence level ($F_{1,9}$=0.69, p=0.434) but is significant for the SREA ($F_{1,9}$=10.87, p=0.013).

5 Conclusion

Monitoring to date has shown considerable variation in clump counts between years for each REA quadrat. However, it is apparent that the presence of the reject emplacement areas has not had a negative impact on the viability of the associated *Tetratheca juncea* populations. There was no evidence that the overall habitat in the monitored areas had declined in quality between monitoring occasions.

6 References

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NREA monitoring quadrat

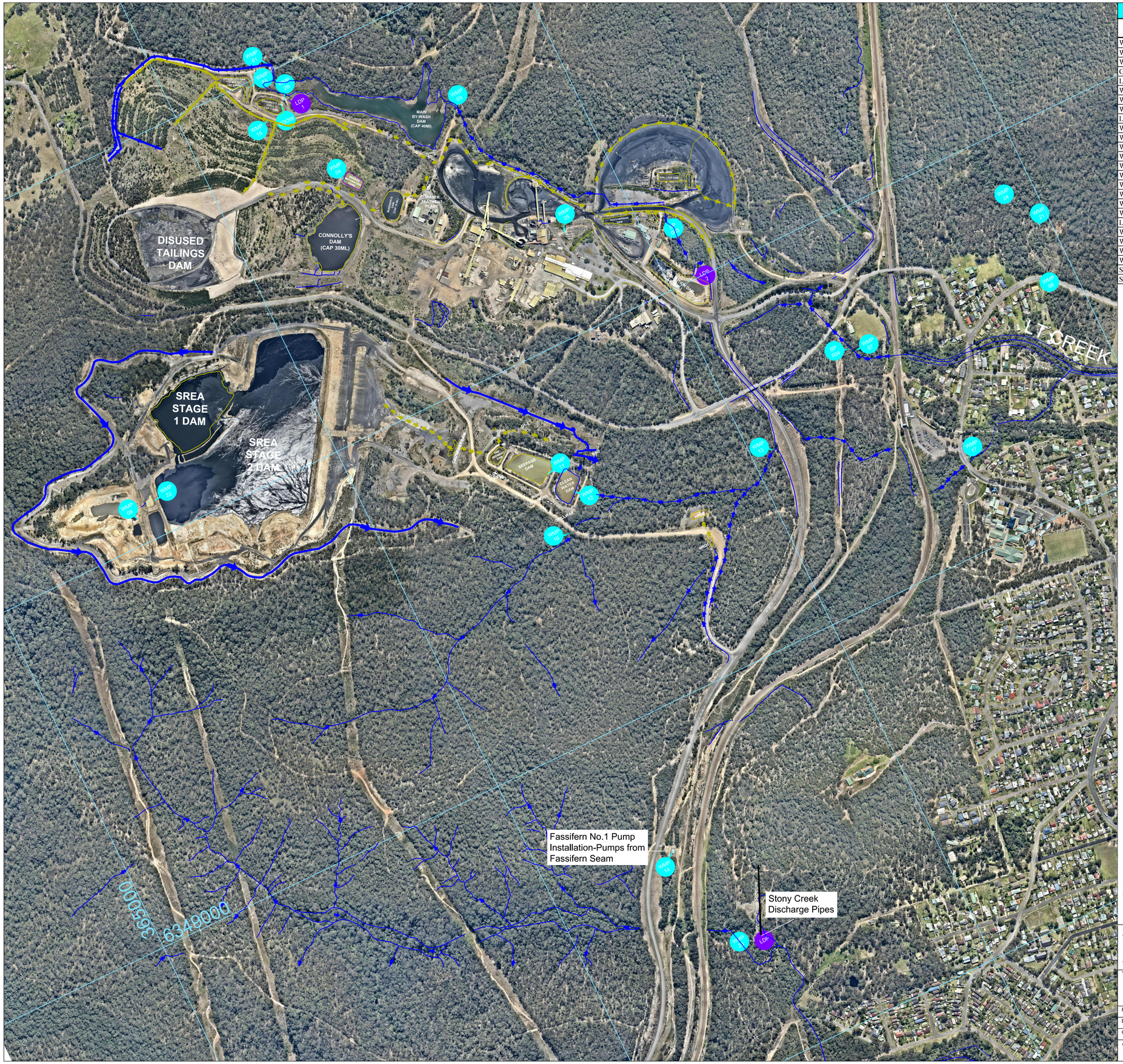
NREA *Tetratheca juncea* patch

SREA monitoring quadrat

SREA *Tetratheca juncea* patch

Centennial Coal

Centennial Coal Company Limited
P O Box 1000
Toronto NSW 2283
www.centennialcoal.com.au



SURFACE WATER MONITORING POINTS			
Name	**Easting**	**Northing**	**Description**
WMP01	366287	6351020	Upstream of LDP001
WMP2A	366211	6350984	Graunch's Dam Cell 1
WMP2B	366282	6350913	Graunch's Dam Cell 2
GDOW	366271	6350911	Graunch's Dam Overflow Weir
LDP001	366292	6350908	EPL Point 1 - Also known as WMP02
WMP03	366691	6350695	EPL Point 19 - By wash Dam Weir - Downstream of LDP001
WMP04	366335	6350646	Sewage Maturation Pond
WMP05	366806	6350261	Waste Water Treatment Plant
LDP002	367072	6350010	EPL Point 2 - Also known as WMP06
WMP07	367377	6349639	LT Creek downstream of Colliery U/S of Railway, D/S of Miller Rd
WMP08	367927	6349578	Seepage from the GNS into tributary of LT Creek sampled South of Macquarie St
WMP09	365438	6350067	Upstream of the SREA
WMP11	366483	6349698	SREA Seepage Dam
WMP12	366526	6349628	SREA Clean Water Dam (proposed LDP003)
WMP13	367063	6349491	EPL Point 6 - Southern branch LT Creek U/S of Eraring Haul Road
WMP14	366282	6350913	Pump line from Fassifern Seam No.1 Bore
WMP15	366225	6350887	NREA seepage pipe
WMP16	366470	6349529	EPL Point 5 - SREA LT Creek Side catchment
WMP17	367525	6349240	Southern Branch LT Creek below Railway Station
LDP	366466	6348315	EPL Point 17 - Stony Creek Pipeline - Also Known as WMP19
WMP20	366404	6348341	EPL Point 18 - Located in a tributary of Stony Creek, upstream of WMP19
WMP21	367970	6349726	Located within the Wetland system, upstream of WMP8
WMP22	365501	6350094	The decant from Stage 2-4 dam into the Fassi seam
WMP24	367920	6349844	Seepage from the GNS into tributary of LT Creek sampled North of Macquarie St
SP003	367071	6350187	EPL Point 3 - Upstream LDP002
SP004	367366	6349650	EPL Point 4 - Downstream LDP002

LEGEND

- LDP 1 — Water Monitoring Point - and Licenced Discharge Point
- WMP 8 — Water Monitoring Point
- Clean Water Runoff
- Dirty Water Runoff

North

0 100m 200m 300m 400m

ENDORSEMENTS

- *Aerial image referenced from Nearmap dated 6th October 2016.*
- *The co-ordinate system for all data shown on this plan is Map Grid of Australia 1994 (MGA94).*

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Centennial Newstan Pty Ltd (ACN 101 508 865)

NEWSTAN COLLIERY
Surface Plan

Centennial Newstan

TITLE:

LOCATION OF WATER MONITORING POINTS (NORTH)

REVISED: C.Cluderay	DRAWN: A.Field	All Distances are in metres unless otherwise shown.	A1
DATE: 02/03/2017	Plot File: N:\SHARED\PLOTS\NEWSTAN\PDF\Enviro\NS2541A_2017_0302.pdf		
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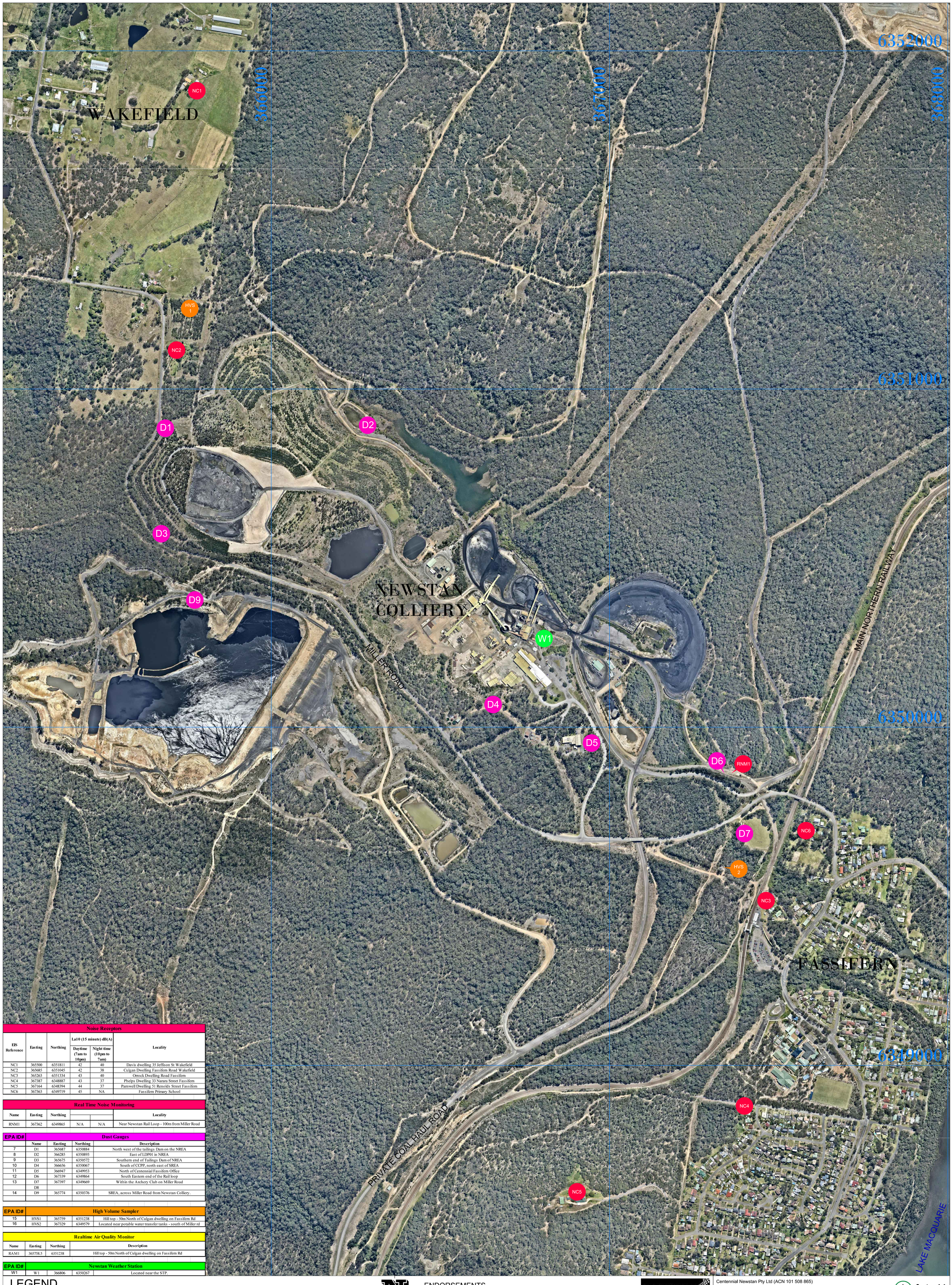
APPROVED: G.Watson			



Noise Receptors

EIS Reference	Easting	Northing	La10 (15 minute) dB(A) Daytime (7am to 10pm)	La10 (15 minute) dB(A) Night time (10pm to 7am)	Locality
NC1	365500	6351811	42	40	Davis dwelling 35 Jeffison St Wakefield
NC2	365685	6351045	42	38	Culgan Dwelling Fassifern Road Wakefield
NC3	365263	6351334	43	40	Orrock Dwelling Road Fassifern
NC4	367387	6348887	43	37	Phelps Dwelling 33 Narara Street Fassifern
NC5	367164	6348394	44	37	Parnwell Dwelling 51 Renolds Street Fassifern
NC6	367363	6349719	45	NA	Fassifern Primary School

Real Time Noise Monitoring

Name	Easting	Northing			Locality
RNM1	367362	6349865	N/A	N/A	Near Newstan Rail Loop - 100m from Miller Road

Dust Gauges

EPA ID#	Name	Easting	Northing	Description
7	D1	365687	6350884	North west of the tailings Dam on the NREA
8	D2	366285	6350893	East of LDP01 in NREA
9	D3	365675	6350572	Southern end of Tailings Dam of NREA
10	D4	366656	6350067	South of CCPP, north east of SREA
11	D5	366947	6349953	North of Centennial Fassifern Office
12	D6	367339	6349864	South Eastern end of the Rail loop
13	D7	367397	6349669	Within the Archery Club on Miller Road
	D8			
14	D9	365774	6350376	SREA, across Miller Road from Newstan Colliery.

High Volume Sampler

EPA ID#				
15	HVS1	365759	6351238	Hill top - 50m North of Culgan dwelling on Fassifern Rd
16	HVS2	367329	6349579	Located near potable water transfer tanks - south of Miller rd

Realtime Air Quality Monitor

Name	Easting	Northing	Description
RAM1	365758.5	6351238	Hill top - 50m North of Culgan dwelling on Fassifern Rd

Newstan Weather Station

EPA ID#				
W1	W1	366806	6350267	Located near the STP.

LEGEND

- D7 — Dust Gauge
- NC1 — Noise Monitoring
- HVS 2 — High Volume Sampler
- RNM1 — 3D Real Time Noise Monitoring
- RAM 1 — Realtime Air Quality Monitor
- W1 — Weather Monitoring Station

MGA-94

0km 0.5km 1km

ENDORSEMENTS

- *Aerial image referenced from Nearmap dated 6th October 2016.*
- *The co-ordinate system for all data shown on this plan is Map Grid of Australia 1994 (MGA94).*

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Centennial Newstan Pty Ltd (ACN 101 508 865)

NEWSTAN COLLIERY
Surface

Centennial Newstan

TITLE:

Location of Air, Noise, Weather Monitoring Points

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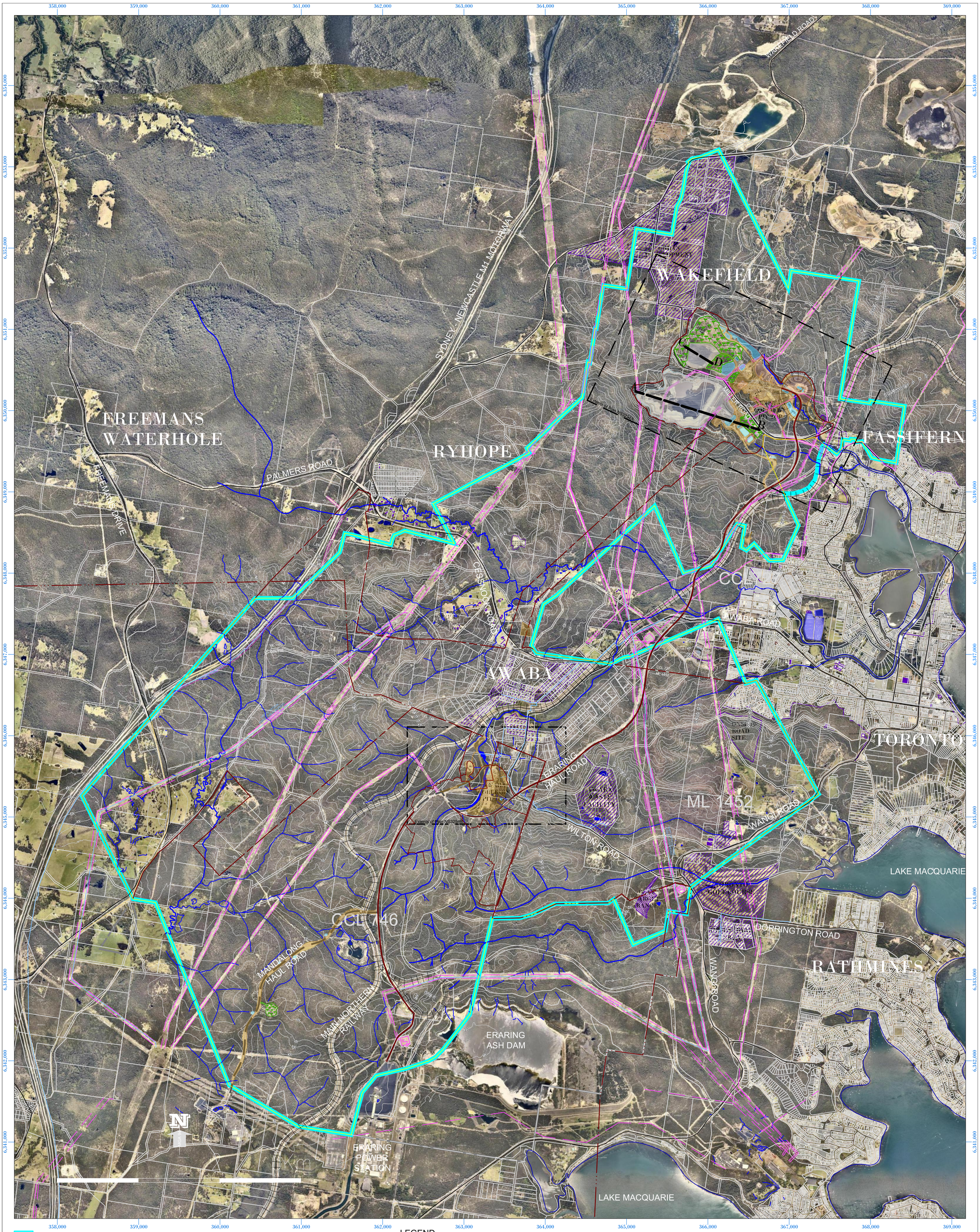
CHECKED: M.Gale			
APPROVED: G.Watson	SCALE: 1 : 5,000		NS 3332



LEGEND

- MOP August 2015 TO August 2018 Boundary
- Colliery Holding Boundary
- Lease Boundaries
- Cadastre Boundary
- DA 73-11-98 Mod 6 - January 7th 2014
- PA 10_0038 - May 13th 2011
- DA 97/800 Mod 10 - November 26th 2014
- M1 Motorway
- Major Roads
- Main Northern Railway
- Coal Haulage Road
- Transmission Lines
- Optic Fibre Cable
- Building & Surface Features
- Dams & Water Storage
- Surface Contour (AHD)
- Major Creek / Water Course / Lake
- Lake Macquarie
- Cross Section Location - (Refer to Plans NS3298 & NS3299 for X-Section details).
- Extents of Plans NS3294A & NS3294B - showing Pit Top Area Domains

Primary Domains

- Domain 1 - Infrastucture Areas
- Domain 2 - Tailings Storage Facility
- Domain 3 - Water Management Area
- Domain 5 - Stockpiled Material
- Domain 8 - Underground Mining Area

Secondary Domains

- Domain E - Rehabilitation Area - Woodland

I, Grant Alan Watson being a Mine Manager (Mining Engineering Manager) pursuant to the Work Health and Safety (MInes) Regulation 2014, do hereby certify that to the best of my knowledge and belief, this plan conforms to the accuracy & standards required by NSW Trade & Investment - Division of Resources and Energy.

New South Wales Mine Managers Certificate of Competency No. 2602

Signed : _____

Date : _____

I, Craig Cluderay, being a Registered Mining Surveyor pursuant to the Surveying and Spatial Information Act 2002, do hereby certify that to the best of my knowledge and belief, this plan conforms to the accuracy & standards required by NSW Trade & Investment - Division of Resources and Energy.

New South Wales (BOSSI) Certificate of Registration Identification No. 8324

Signed : _____

Date : _____

ENDORSEMENTS

- *Aerial image referenced from NearMap on the 19th October 2014.*
- *For details regarding Consolidated Coal Leases held by Centennial Newstan refer to plans PC1, PC6, PC7 & PC8.*
- *The co-ordinate system for all data shown on this plan is Map Grid of Australia 1994 (MGA94).*

Centennial Newstan Pty Ltd (ACN 101 508 865)

NEWSTAN COLLIERY
West Borehole and Young Wallsend Seam

TITLE:

Mining Operations Plan
Mine Domains at Commencement of MOP (Plan 2)

DRAWN: C.Cluderay	REV 1: C.Cluderay - 30/06/2015	All Distances are in metres unless otherwise shown.	A0
DATE: 14/11/2014	FILE: N:\SHARED\PLOTS\NEWSTAN\Projects\MOP 2015-2018\NS3294_R1.pdf		
CHECKED: V.Howat	SCALE: 1 : 15000		NS 3294_R1
APPROVED:			

LEGEND

- MOP August 2015 TO August 2018 Boundary
- Colliery Holding Boundary
- Lease Boundaries
- Cadastre Boundary
- Rehab Area A — Terrestrial Ecology Site
- Major Roads
- Main Northern Railway
- Surface Contour (AHD)
- Major Creek / Water Course / Lake
- Lake Macquarie
- Transmission Lines
- Cross Section Location - Refer to Plans NS3298 & NS3299 for X-Section details

Primary Domains

- Domain 1 - Infrastucture Areas
- Domain 2 - Tailings Storage Facility
- Domain 3 - Water Management Area
- Domain 5 - Stockpiled Material
- Domain 8 - Underground Mining Area

Secondary Domains

- Domain E - Rehabilitation Area - Woodland

I hereby certify that the information shown hereon, to the best of my knowledge and belief is correctly represented.

Signed: _____ Date: ___/___/___
C.Cluderay - Registered Mining Surveyor

Signed: _____ Date: ___/___/___
G.Watson - Mining Engineering Manager

ENDORSEMENTS

- *Aerial image referenced from NearMap on the 8th May 2015.*
- *The co-ordinate system for all data shown on this plan is Map Grid of Australia 1994 (MGA94).*

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Centennial Newstan Pty Ltd (ACN 101 508 865)

NEWSTAN COLLIERY

West Borehole and Young Wallsend Seam

Centennial Newstan

TITLE: Mining Operations Plan - Newstan Pit Top Area
Domains at Commencement of MOP (Plan 2A)

DRAWN: C.Cluderay	REV 1: C.Cluderay - 30/06/2015	All Distances are in metres unless otherwise shown.	A1
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APPROVED:			

CCL727

ML 1452

CCL746

0 1 2 3Km

LEGEND

- MOP August 2015 TO August 2018 Boundary
- Colliery Holding Boundary
- Lease Boundaries
- Newstan Colliery Young Wallsend / West Borehole Workings
- Surface Contour (AHD)
- DA 73-11-98 Mod 6 - January 7th 2014
- PA 10_0038 - May 13th 2011
- DA 97/800 Mod 10 - November 26th 2014

Primary Domains

- Domain 1 - Infrastucture Areas
- Domain 2 - Tailings Storage Facility
- Domain 3 - Water Management Area
- Domain 5 - Stockpiled Material
- Domain 8 - Underground Mining Area

Secondary Domains

- Domain E - Rehabilitation Area - Woodland

MOP Year 1,2,3 - Rehabilitation Phases

- Landform Establishment
- Ecosystem and Landuse Establishment
- Ecosystem and Landuse Sustainability

I, Grant Alan Watson being a Mine Manager (Mining Engineering Manager) pursuant to the Work Health and Safety (MIne) Regulation 2014, do hereby certify that to the best of my knowledge and belief, this plan conforms to the accuracy & standards required by NSW Trade & Investment - Division of Resources and Energy.

New South Wales Mine Managers Certificate of Competency No. 2602

Signed : _____

Date : _____

I, Craig Cluderay, being a Registered Mining Surveyor pursuant to the Surveying and Spatial Information Act 2002, do hereby certify that to the best of my knowledge and belief, this plan conforms to the accuracy & standards required by NSW Trade & Investment - Division of Resources and Energy.

The certification of accuracy for Newstan Mine Workings is only for workings mined or proposed to be mined and drawn during the period of appointment as Mine Surveyor at Newstan Colliery.

New South Wales (BOSSI) Certificate of Registration Identification No. 8324

Signed : _____

Date : _____

ENDORSEMENTS

- *Aerial image referenced from NearMap on the 19th October 2014*
- *For details regarding Consolidated Coal Leases held by Centennial Newstan refer to plans PC1, PC6, PC7 & PC8.*
- *The co-ordinate system for all data shown on this plan is Map Grid of Australia 1994 (MGA94).*

NOTE:

No Planned Annual Sequence of Mining Within the Duration of this MOP

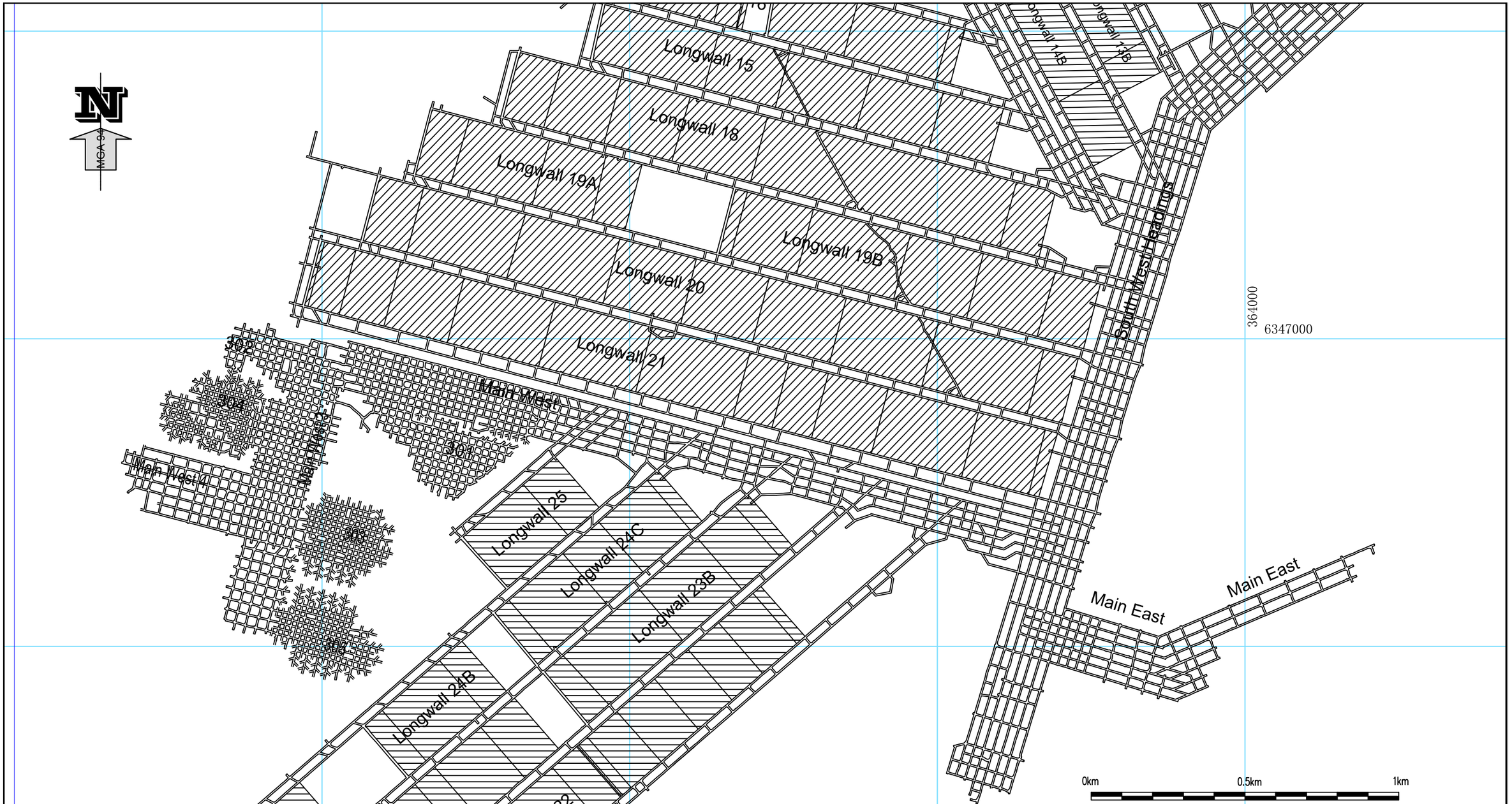
Centennial Newstan Pty Ltd (ACN 101 508 865)

NEWSTAN COLLIERY
West Borehole and Young Wallsend Seam

TITLE:

Mining Operations Plan
Mining and Rehabilitation Year 1,2,3 (Plan 3)

DRAWN: O.Mostyn	REV 1: C.Cluderay - 30/06/2015	All Distances are in metres unless otherwise shown.	A0
DATE: 13/11/2014	FILE: N:\SHARED\PLOTS\NEWSTAN\Projects\MOP 2015-2018\NS3295_R1.pdf		
CHECKED: V.Howat	SCALE: 1 : 15000		NS 3295_R1
APPROVED:			



NEWSTAN COLLIERY AEMR PLAN
As Worked January 2016 to December 2016; and Proposed for 2017

LEGEND
- 1 Jan 2016 to 31 Dec 2016
- 1 Jan 2017 to 31 Dec 2017

Note:
- No workings Mined in 2016
- No workings Proposed for 2017
- Mine Operations currently Suspended
- Mine is on Care and Maintenance

Centennial Newstan

Centennial Newstan Pty Ltd (ACN 101 508 865)

DATE 11/01/17 **NS3351**

LOCATION	NEWSTAN
SEAM	Young Wallsend & West Borehole
DRAWN	C.Cluderay
PLOT FILE	NS3351.PDF
APPROVED	
SCALE	1:12,500