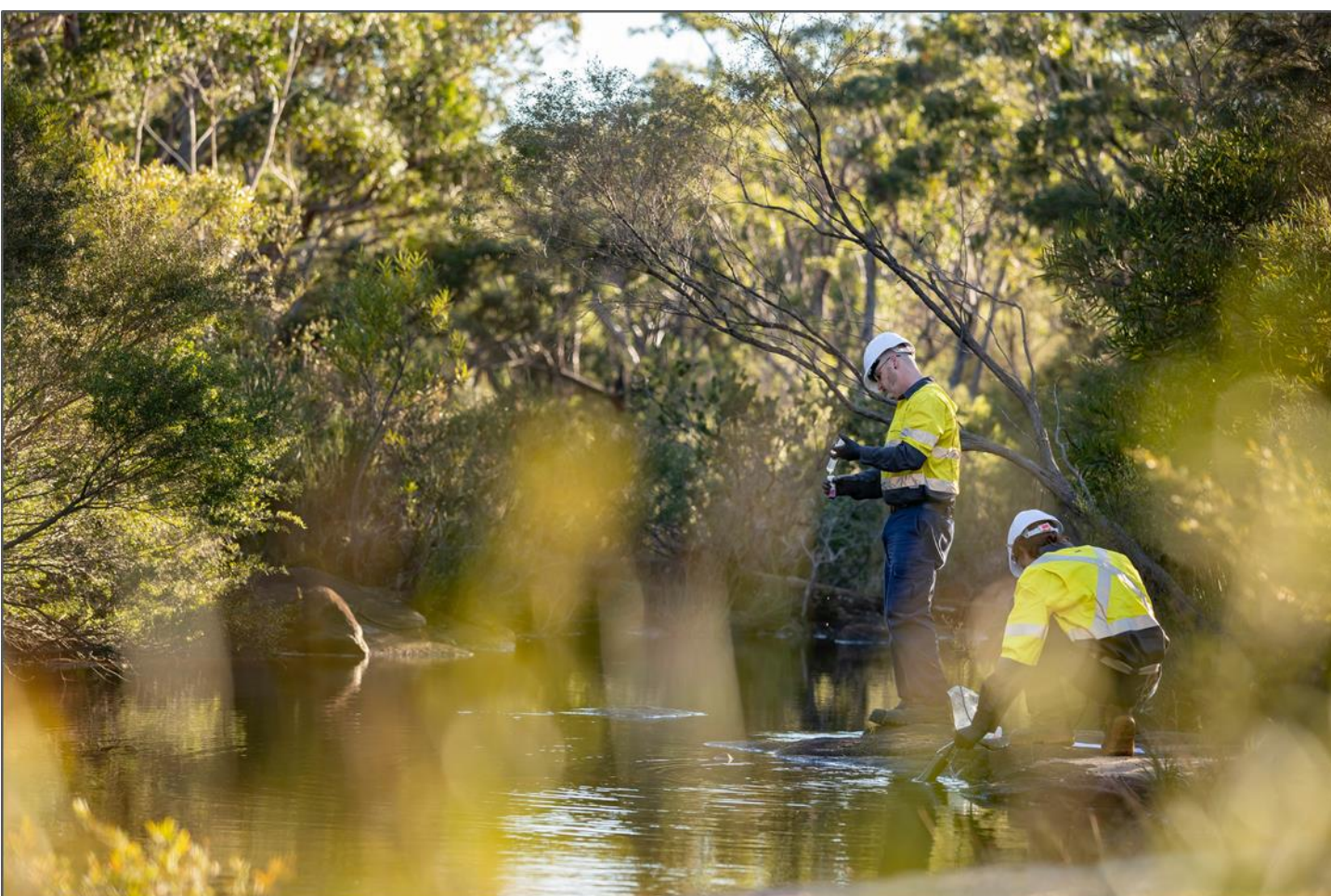




ILLAWARRA
METALLURGICAL COAL

BULLI SEAM OPERATIONS



ANNUAL REVIEW FY19



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Table 1: Annual Review Title Block

Name of operation	Bulli Seam Operations (BSO)
Name of operator	South32 Illawarra Metallurgical Coal (S32IMC)
Project approval #	08_0150
Name of holder of development consent / project approval	Illawarra Coal Holdings Pty Ltd
Mining lease #	CCL 767, CCL 724, CL 388, CL 381, ML 1382, ML 1433, ML 1574, ML 1678, ML 1698, ML 1473, MPL 200, MPL 201
Name of holder of mining lease	Illawarra Coal Holdings Pty Ltd, Endeavour Coal Pty Ltd
Water approvals #	10WA117285, 10WA117999, 10WA103794, 10WA118778, 10WA118766
Name of holder of water approvals	Endeavour Coal Pty Ltd
MOP/RMP start date	1 October 2012
MOP/RMP end date	30 September 2020
Annual Review start date	01 July 2018
Annual Review end date	30 June 2019

I, Craig Manz, certify that this audit report is a true and accurate record of the compliance status of South32 – Illawarra Metallurgical Coal – Bulli Seam Operations for the period 01 July 2018 – 30 June 2019 and that I am authorised to make this statement on behalf of Illawarra Coal Holdings Pty Ltd and Endeavour Coal Pty Ltd.

Note.

- a) The Annual Review is an 'environmental audit' for the purposes of section 122B (2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.
- b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).

Name of authorised reporting officer	Craig Manz
Title of authorised reporting officer	General Manager Appin Mine
Signature of authorised reporting officer	
Date	30 September 2019

1. STATEMENT OF COMPLIANCE

Table 2: Statement of Compliance

Approval	Purpose	Issue Date	Expiry date	Compliant?
08_0150	Bulli Seam Operations Project Approval under Section 75J of the EP&A Act 1979. ¹	22/12/2011	31/12/2041	No
EPBC 2010/5350	Federal Government approval of the Bulli Seam Operations Project under Sections 130(1) and 133 of the EPBC Act 1999.	15/05/2012	15/05/2042	No
EPBC 2010/5722	Federal Government approval of the Appin Mine Ventilation Shaft No.6 under Sections 130(1) and 133 of the EPBC Act 1999.	01/04/2011	01/04/2041	Yes
EPL2504	Environment Protection Licence for Bulli Seam Operations	14 Feb 2001	No expiry	No
Mining Lease / Sub-Lease	Number			
Coal Lease	388	22 Jan 1992	22 Jan 2034	Yes
Mining Lease	1382	20 Dec 1995	20.12.2037	Yes
Mining Lease	1433	24 Jul 1998	23 Jul 2019	Yes
Mining Lease	1574	09 Jul 2008	30 Dec 2023	Yes
Mining Lease	1678	27 Sep 2012	26 Sep 2033	Yes
Mining Lease	1698	26 Jun 2014	26 Jun 2035	Yes
Consolidated Coal Lease	724	4 Jul 1991	18 Dec 2031	Yes
Consolidated Coal Lease	767	29 Oct 1991	08 Jul 2021	Yes
Coal Lease	381	24 Oct 1991	24 Oct 2033	Yes
Mining Purposes Lease	200	13 Jan 1982	13 Jan 2024	Yes
Mining Purposes Lease	201	1 Jan 1982	13 Jan 2024	Yes
Mining Lease	1473	20 Nov 2000	29 Nov 2021	Yes
Water Approval/Access Licence	Number			
Water Approval	10WA117285 - Mountbatten	15 Nov 2011	14 Nov 2026	Yes
Water Approval	10WA117999 – Brennans Creek Dam	15 Nov 2012	14 Nov 2027	Yes
Water Approval	10WA103794 – Brennans Creek Dam Diversion	1 Jul 2011	30 Jun 2024	Yes
Water Approval	10WA118778 - Appin	1 Jul 2013	18 Feb 2028	Yes
Water Approval	10WA118766 – West Cliff	1 Jul 2013	24 Jun 2028	Yes

¹ A notice of Modification under Section 75W of the Environmental Planning and Assessment Act 1979 28 October 2016 incorporated the VS#6 Approval requirements into the BSO Approval.

Groundwater Access Licence	36481 – West Cliff	Yes
Groundwater Access Licence	36477 - Appin	Yes
Groundwater Access Licence	37464 - Appin	Yes
Surface Water Access Licence	35519 – Brennans Creek Dam	Yes
Surface Water Access Licence	30145 – Mountbatten	Yes

Table 3: Non-compliances

Relevant approval	Condition #	Condition description (summary)	Compliance status	Comment	Where addressed in Annual Review
EPBC 2010/5350	Condition 6	Monitoring results are to be reported within 30 days of every 12-month anniversary.	Non-compliant	Coal Wash Emplacement Annual Monitoring Report was not submitted by the due date.	Section 11
EPL2504	Condition L2.1	Not to exceed concentration limits for pollutants	Non-compliant	Exceedance of the 100 th percentile limit for oil and grease at LDP 3/4 (sewage treatment plant irrigation at Appin North).	Section 6.3 and Section 11
08_0150	Condition 12 of Schedule 2	Ensure all equipment on site is maintained and operated in a proper and efficient manner	Non-compliant	Discharge of water with elevated levels of ferric chloride from Appin East into the Georges River.	Section 11
EPL2504	Condition O1, O2 and L1	Activities must be carried out in a competent manner and plant and equipment must be maintained.	Non-compliant	Discharge of water with elevated levels of ferric chloride from Appin East into the Georges River.	Section 11
08_0150	Condition 12 of Schedule 2	Ensure all equipment on site is maintained and operated in a proper and efficient manner	Non-compliant	Flocculant tank at Appin North between EP2 and EP3 was not banded.	Section 11
EPL2504	Condition O1 and O2	Activities must be carried out in a competent manner and plant and equipment must be maintained.	Non-compliant	Flocculant tank at Appin North between EP2 and EP3 was not banded.	Section 11
EPL2504	Condition L3.1	Not to exceed discharge volumes at discharge point	Non-compliant	The volume of water discharged from LDP 24 exceeded the allowable discharge volume on two occasions in June.	Section 6.3 and Section 11
EPL2504	Condition L2.4	Not to exceed water concentration limits	Non-compliant	The result for Biological Oxygen Demand at LDP 22 was 90 mg/L on 5 June 2019, which exceeded the limit of 50 mg/L.	Section 6.3 and Section 11
EPL2504	Condition M2.2	Requirement to monitor concentration of pollutants discharged in accordance with Australian Standard.	Non-compliant	The dust deposition gauge samples were not collected within 30+2 days.	Section 11

Refer to Section 11 for more detail regarding these non-compliances.

The predictions and Statement of Commitments from the BSO Environmental Assessment (EA) are incorporated into the BSO federal EPBC and state EP&A Project Approval conditions. An assessment of compliance with the conditions of these approvals is considered to be an assessment of compliance against the predictions in the EA. Compliance with the state and federal conditions is assessed in the following documents:

- Appendix I: BSO EPBC Approval 2010/5350 Compliance Report; and
- Appendix J: BSO Project Approval Compliance Report.

2. INTRODUCTION

2.1. BACKGROUND

This Annual Review for the Bulli Seam Operations (BSO) details the environment and community performance for the 12-month period ending 30 June 2019 and meets the requirements set out in the *Post approval requirements for State significant mining developments - Annual Review Guideline* (NSW DPE, October 2015).

The Annual Review has been prepared to meet the requirements of Condition 4 of Schedule 6 of the BSO Project Approval 08_0150 (the approval) and the NSW Resources Regulator requirement to submit an Annual Environmental Management Report (AEMR) under the Mining Leases for the BSO.

A copy of the report is publicly available via the South32 website under Bulli Seam Operations: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

2.2. OVERVIEW OF OPERATIONS

The NSW Government granted approval for the Bulli Seam Operations (BSO) Project in December 2011. The BSO combined future mining operations and provided for the continuation of coal mining operations at Appin Mine and West Cliff Colliery. The Bulli Seam underground longwall mining operations have transitioned wholly to the Appin areas (Area 9 and Area 7) following completion of longwall mining activities at West Cliff in early 2016. The locations of all sites associated with the BSO are illustrated in Plan 1: Regional Location Plan.

Appin Mine

Appin Mine consists of the merged Appin and Tower Collieries. Appin Mine is owned and operated by Endeavour Coal Pty Ltd, a subsidiary company of Illawarra Coal Holdings Pty Ltd (ICHPL) which is 100% owned by South32 Limited. Appin Colliery (located at Appin) commenced operations in 1962 and Tower Colliery (located at Douglas Park) commenced operation in 1978. The underground infrastructure, roadways, conveyor and ventilation systems were joined in 2003 to become Appin Mine. The original Appin Colliery (now Appin Colliery – East) is located adjacent to Appin Village, approximately 37 kilometres northwest of Wollongong.

Tower Colliery (now Appin Colliery - West) was officially opened in November 1978. Following the sinking of the access and ventilation shafts, underground development of the mine was undertaken from 1978 through to 1988 when longwall operations were introduced. Tower Colliery completed extraction of 20 longwall blocks between 1988 and September 2002. The mine was redeveloped underground to establish mining operations in the current longwall Area 7 and Area 9 mining domains.

Key areas associated with the current Appin operations include the Appin Colliery - East (Appin East) Pit Top site (Plan 3), the Appin Colliery - West (Appin West) Pit Top site (Plan 4), the Appin East No.1 and No.2 fan site (Plan 5), the Appin East No.3 fan site (Plan 6), the Appin West No.6 fan site (Plan 7) and the Douglas Park substation site (Plan 8).

Appin Colliery – North and West Cliff Coal Preparation Plant

Appin Colliery – North (formerly West Cliff Colliery) and the West Cliff Coal Preparation Plant (WCCPP) is located approximately 26km northwest of Wollongong, NSW. Appin Colliery - North (Appin North) is operated by Endeavour Coal Pty Ltd, a subsidiary company of Illawarra Coal Holdings Pty Ltd (ICHPL) which is 100% owned by South32 Limited.

South32 Illawarra Metallurgical Coal (S32IMC) has conducted underground coal mining operations at Appin North since 1997. Prior to this, Appin North was operated by Kembla Coal and Coke Pty Limited (KCC). Longwall mining at Appin North concluded in early 2016. The latest mining area, Area 5, was completed in February 2016 and consists of part of Consolidated Coal Lease 767 and Coal Lease 381, which were both transferred from Appin Colliery to Appin North in 1997. Appin North merged with Appin Mine in February 2016.

Key areas of the Appin North Site include the pit top (Plan 10), the West Cliff Emplacement Area (Plan 9: West Cliff and Appin North Layout) and WCCPP (Plan 11: West Cliff Coal Preparation Plant) and the redundant North Cliff Mine site within the Dharawal National Park Area (Plan 12: North Cliff Site Plan).

2.3. MINE CONTACTS

Table 4: Mine Contacts

Position	Name	Number
General Manager Appin Mine	Craig Manz	(02) 4629 2305
Specialist Environment – Appin West and East	Simon Pigozzo	0402 480 559
Specialist Environment – Appin North and West Cliff Coal Preparation Plant	David Gregory	(02) 4640 4126
Lead Environment	Chris Schultz	(02) 4286 3384

3. APPROVALS

Table 5, Table 6 and Table 7 describe the Development Approvals, Mining Leases, Licences and Exploration Leases associated with the BSO.

Table 5: Development Approvals associated with the BSO

Document	Issue Date	Expiry date
Appin Gas Drainage Project – Initial	Oct 2009	
Appin Gas Drainage Project – 2010	Dec 2010	
Appin Gas Drainage Project – 2012	Feb 2012	
Bulli Seam Operations Project Approval (NSW Government)	22 Dec 2011	31 Dec 2041
Bulli Seam Operations Project Approval (EPBC Act)	15 May 2012	15 May 2042
No. 6 Ventilation Shaft (NSW Government)	4 May 2011	Now Consolidated into the BSO Approval
No. 6 Ventilation Shaft (EPBC Act)	1 Apr 2011	1 Apr 2041

Table 6: Mining Leases and Licences associated with the BSO

Mining Lease / Sub-Lease	Number	Issue Date	Expiry Date
Coal Lease	388	22 Jan 1992	22 Jan 2034
Mining Lease	1382	20 Dec 1995	20 Dec 2037
Mining Lease	1433	24 Jul 1998	23 Jul 2019 ²
Mining Lease	1574	09 Jul 2008	30 Dec 2023
Mining Lease	1678	27 Sep 2012	26 Sep 2033
Mining Lease	1698	26 Jun 2014	25 Jun 2035
Consolidated Coal Lease	724	4 Jul 1991	18 Dec 2031
Consolidated Coal Lease	767	29 Oct 1991	08 Jul 2029
Coal Lease	381	24 Oct 1991	24 Oct 2033
Mining Purposes Lease	200	13 Jan 1982	13 Jan 2024
Mining Purposes Lease	201	13 Jan 1982	13 Jan 2024
Mining Lease	1473	20 Nov 2000	19 Nov 2021
Environment Protection Licence	2504	14 Feb 2001	No expiry
Water Approvals	10WA117999	15 Nov 2012	14 Nov 2027
	10WA103794	1 July 2011	30 June 2024
	10WA118778	1 July 2013	18 Feb 2028
	10WA118766	1 July 2013	24 June 2028
	10WA117285	15 Nov 2011	14 Nov 2026
Groundwater Access Licence	36481 – West Cliff	N/A	
Groundwater Access Licence	36477 - Appin	N/A	

² ML1433 renewal was applied for on 18/07/2018 and is still pending.

Table 6: Mining Leases and Licences associated with the BSO

Groundwater Access Licence	37464 - Appin	N/A
Surface Water Access Licence	35519 – Brennans Creek Dam	N/A
Surface Water Access Licence	30145 – Mountbatten	N/A

Table 7: Exploration Leases associated with the BSO

Mining Lease / Sub-Lease	Site	Issue Date	Expiry Date
A199	West Cliff	27 Jun 1980	27 Jun 2024
A201	Appin	27 Jun 1980	27 Jun 2024
A248	Appin	13 May 1981	13 May 2021
A306	West Cliff	19 Jul 1983	27 Jun 2024
A312	Appin	10 Aug 1983	10 Aug 2023
A370	Appin	8 May 1986	27 Jun 2024
A395	Appin	23 Nov 1987	10 Aug 2023
A396	Appin/West Cliff	28 Jun 1988	27 Jun 2024
A397	West Cliff	4 Aug 1987	27 Jun 2024
A432	West Cliff	12 Feb 1991	31 Aug 2023
EL 4470	Appin	5 Jan 1993	5 Jan 2021

4. OPERATIONS SUMMARY

4.1. EXPLORATION

During the reporting period, small-scale surface exploration was conducted for the BSO. One exploration hole was drilled and rehabilitated to the satisfaction of the landowner.

4.2. LAND PREPARATION

Mine Safety Gas Drainage

There were no land preparation works relating to Mine Safety Gas Drainage during the FY19 reporting period. Refer to Section 8.1- Rehabilitation for the reporting period for more information.

Emplacement Operations

The following works were undertaken during the reporting period:

- clearing of approximately 2.4 hectares in Stage 3;
- establishing the growth medium for ~3 hectares in Stage 3; and
- continued deposition of coal wash.

The rehabilitated emplacement areas were inspected regularly to determine the progress and effectiveness of the rehabilitation. The monitoring program consists of quarterly inspections undertaken by a S32IMC Environmental representative which are supplemented by a more extensive annual monitoring program. The annual monitoring program was undertaken in Summer FY19. The report is provided in Appendix A: Annual Rehabilitation Report.

4.3. CONSTRUCTION

The following construction activities were undertaken during the FY19 reporting period.

LDP 24 upgrades

Works commenced at LDP 24 on a continuous real-time monitoring system for pH and conductivity. This work was requested by the Environment Protection Authority (EPA). This monitoring system upgrade will be completed and fully operational by September 2019.

Site Security and Fatigue Management Project

S32IMC has commenced works to construct site entry control points to manage the risk of unauthorised entry to the BSO sites and portals and effectively manage fatigue amongst the workforce.

The project was approved in December 2018 with work commencing shortly thereafter. The construction work has been performed across all S32IMC sites using sub-contractors specialising in the different fields of work.

The work included the installation of approximately 6,000 m of fencing, 17 turnstiles, 6 swinging gates, 15 boom gates and trenching for power and comms to the various installations.

S32IMC estimate completion of construction activities to occur in October 2019.

Brennans Creek Dam Pipeline (BCD) Upgrade

The BCD Pipeline Upgrade works involved replacing an existing water pipeline that supplies the Appin North surface with Brennans Creek Dam Water. The Department of Planning, Industry and Environment (DPIE) (formerly the Department of Planning and Environment) approved the works in March 2019. Laying of the new pipe and removal of the old pipework commenced April 2019 and will be completed in FY20.

Appin West Surface Water Tanks

As part of a self-sustainable approach for underground operations, i.e. less reliance on Sydney Water consumption, capital works have commenced to store greater volumes of treated water.

During the reporting period, it was identified through inspections that the existing permeate tank for the integrated membrane system (IMS) IMS1 & IMS 2a plants required extensive repairs. Additionally, it was identified that the tank does not provide sufficient storage capacity if the Water Filtration Plant (WFP) is offline. S32IMC concluded that in order address this shortfall, the existing 500 kL permeate tank will be removed from service during FY20 and replaced with 2 x 1.6 ML process water tanks.

The tank foundations will be prepared and cast during September 2019, with the installation of the tanks commencing after the curing of the foundations. The break-ins to the existing water services, Sydney Water, and permeate line will be executed during October 2019. The water pipework from the process water tanks will be connected to the buried service mains during November 2019.

The process water system is scheduled to be complete towards the end of FY20.

Water Filtration Plant Expansion

Works to expand the Appin West WFP continued during the reporting period (Figure 1). As part of the Appin West WFP, the IMS 2 plant upgrade has progressed well in FY19, with the project moving from the commissioning phase to operational ramp-up.

Integration of the new systems with the old systems have resulted in stable peak operations of the system with expected positive outputs, however consistency in operational throughput has been variable, in part due to mine water supply for processing and the necessity to undertake some modifications for defect rectification and/or plant operational improvement.

Works have progressed to install online monitoring of discharge quality and volume to the environment. Further technical studies and data collection has been undertaken as part of an impact assessment for the anticipated changes to the Environment Protection Licence (EPL) 2504 conditions.



Figure 1: Water Filtration Plant Expansion (IMS2a) - Main processing facility.

Minor Improvement Programs

Other improvement projects completed throughout the FY include;

- Appin North
 - Bulk Coal Winder structural repairs – Oct 18 to April 19 – to replace deteriorated structure of the bulk coal winder at surface and seam level.
 - No.2 shaft redundant pipe work removal – June 19 – removal of redundant deteriorated pipes in the vertical shaft minimising risk of fall from height of plant.
 - No.1 shaft fan duct and impeller replacement – December 18 and July 19 – replacement of deteriorated impellers and ductwork to maintain adequate ventilation of the mine.
- Appin West
 - Winder structural repairs – Jan 19 ongoing into FY20 – repairs of deteriorated structure at seam and in the shaft to prevent fall from height of plant.
 - Administration building upgrades – FY19 and FY20 – additional office space to accommodate additional staff to support operations.
 - Water pipework installation – FY19 and FY20 – part of Appin West WFP upgrade project to provide additional processed water to sustain underground operations with increased activity.

Off-site Storage Facility

An off-site storage facility was established during the reporting period for critical spares and consumables associated with Dendrobium Mine and Appin Mine. The facility is located in Unanderra.

4.4. MINING

Longwall Status

The BSO underground longwall mining operations have transitioned wholly to the Appin areas following completion of longwall mining activities at Appin North in early 2016. Appin Mine extracts coal from the Bulli Seam within the Southern Coalfield. The BSO underground longwall mining operations consists of three surface locations: Appin North, Appin West and Appin East.

Extraction of Longwall 902 commenced on 12 May 2018 and was completed on 3 April 2019, having extracted 2144m. Appin Area 7 Longwall 708A extraction commenced on 2 April 2019 and as of 30 June 2019 had extracted 558m, with 636m remaining.

Longwall Production

Appin extracted 3.66 million tonnes of Run of Mine (ROM) coal via roadway development and longwall extraction methods for the reporting period, a 106% increase from the FY18 reporting period. The ROM production levels from FY09 through to the current reporting period are provided in Figure 2.

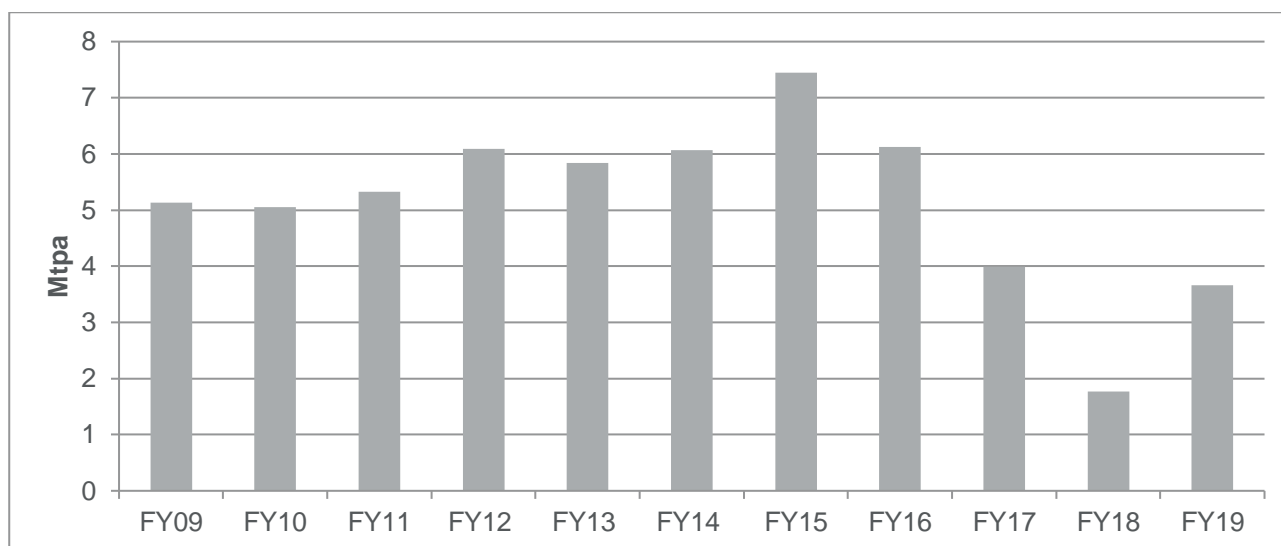


Figure 2: ROM production – BSO (in million tonnes per annum [Mtpa])

The average yield for the reporting period was 83%. The production and waste summary for the reporting period is provided in Table 8.

Table 8: Production Summary

	Approval Limit	Previous Reporting Period	This Reporting Period
Waste rock/Overburden	N/A	N/A	N/A
ROM Coal/Ore	10.5 MT	1.771 MT	3.660 MT
Coarse Reject (Coal Wash Tonnes) ³	N/A	0.356 MT	0.563 MT
Saleable Product	9.3 MT ⁴	1.381 MT	3.037 MT

4.5. MINERAL PROCESSING

Mineral processing facilities include the WCCPP, the West Cliff Emplacement Area (WCEA) and the Dendrobium CPP (located at the Port Kembla Steelworks). The majority of ROM coal from Appin Mine is directed to the WCCPP for processing. The WCEA is used to emplace coal wash from the WCCPP and Dendrobium CPP.

ROM coal is transported to the WCCPP by:

- coal trucks from the Appin East site, along Appin and Wedderburn Roads; and
- bulk coal winder at Appin North, transported underground from Appin Area 7 and 9.

ROM Coal from Appin Mine is also directed to the Dendrobium CPP on an 'as required' basis to maintain work continuity and maintain reduced stockpile sizes at the Appin Site. ROM coal is transported via Mt Ousley to the Dendrobium CPP (located within the BlueScope Steel complex). Clean coal from the WCCPP is trucked

³ Total processing waste produced at West Cliff CPP (includes Appin Coal Wash) for Annual Review period only – does not include coal wash produced at Dendrobium CPP

⁴ Transport Limit

to BlueScope Steel (Port Kembla Steel Works) coal handling facilities or to the Port Kembla Coal Terminal for distribution.

Daily road haulage volumes associated with both the Appin and WCCPP sites is available on the South32 website: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

4.6. ORE AND PRODUCT STOCKPILES

No coal is stockpiled at Appin West as ROM coal is transported underground to Appin East or the WCCPP. The Appin West coal storage bins are currently under care and maintenance.

Appin East has a total raw coal stockpiling capacity of up to 50,000 tonnes. The stockpile is recovered with front-end loaders directly into the coal haulage trucks for transport by road to either the WCCPP or Dendrobium CPP.

Appin North operates six primary coal stockpiles for both clean coal and raw coal. The stockpile capacities at Appin North are outlined in Table 9.

Table 9: Appin North Stockpiles Capacities

Area	Capacities
No.1 Stockpile	650,000 t nominal capacity - 600,000 t coking coal, 30,000 t Middlings coal
No.2 Stockpile	150,000 t nominal capacity – generally coking coal
No.3 Stockpile	600,000 t nominal capacity – generally coking coal
No.4 Stockpile	800,000 t nominal capacity – generally Appin ROM coal
No.5 Stockpile	90,000 t nominal capacity – generally Appin ROM coal
No.6 Stockpile	90,000 t nominal capacity – generally Appin ROM coal

A Stockpile and Slope Stability Management Plan is in place to manage the stockpile operations. This plan is a framework document where the operational risks and controls are documented. Risks associated with the stockpile operations are also detailed in the WCCPP Risk Register, which is reviewed regularly by the site management team to test the effectiveness of controls.

Monitoring and management review indicates that the current plan effectively controls all potential stockpile management issues effectively.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The actions in **Table 10** were identified in the previous Annual Review. No actions relating to the previous Annual Review were identified by regulatory agencies.

Table 10: Actions from Previous Annual Review

Action Required	Requested by	Where covered in this Annual Review
1. The Appin West Water Filtration Plant will continue to be upgraded with expected completion in November 2018, followed by commissioning.	S32IMC	Section 4.3
2. The Appin North administration building will undergo modifications in FY19 to increase office space	S32IMC	This project is no longer being progressed.
3. Underground construction, service borehole works and electrical commissioning activities at the Vent Shaft 6 concrete/ballast borehole will occur in FY19.	S32IMC	The pipeline has been redesigned, with the project largely delayed due to funding. Budget and planning should allow for this project to be completed in FY20/21
4. Continuation of the Environment Improvement Program (EIP2) to improve water quality and aquatic health in the Georges River downstream of licenced discharge point 10 including new water quality limits for LDP10 by June 2019.	S32IMC	Section 6.3
5. Continuation of <i>Persoonia hirsuta</i> Research Program	S32IMC	Section 6.7
6. Continually improving process control systems for BCD discharge	S32IMC	Section 6.3

6. ENVIRONMENTAL PERFORMANCE

6.1. AIR POLLUTION

Environmental Management

Air quality is managed in accordance with the BSO Air Quality, Greenhouse Gas & Energy Management Plan (AQGHGMP) which details the air quality and emissions control measures for the project, compliance procedures, monitoring programs, evaluation protocols, notification and communication processes.

The AQGHGMP was prepared to comply with the intent and requirements of Condition 12 of Schedule 4 of the BSO Project approval.

The objectives of the AQGHGMP are to:

- provide the framework for the responsible management of air quality and emissions associated with the project;
- describe the control measures for management of dust, odour, greenhouse gas (GHG) and other emissions to atmosphere;
- prevent adverse air quality impacts on the local communities and environment;
- describe the compliance criteria for air quality for the project;
- describe the air quality monitoring program along with data review and reporting;
- comply with the relevant requirements of Environment Protection Licence (EPL) No. 2504 and the BSO Project approval;
- describe measures for the reduction of project GHG emissions; and
- comply with South32 and other relevant standards and requirements.

The AQGHGMP incorporates:

- collection and measurement of dust samples from strategically placed dust deposition gauges at representative sites;
- use of real-time air quality monitors: fixed Optical Photometers, portable Optical Photometers;
- use of a High Volume Air Sampler (HVAS) to determine compliance with air quality criteria; and
- visual inspections and audits.

Table 10: BSO Air Quality Monitoring Sites and their Function					
Site ID	Location	Parameter	Measurement Method	Frequency?	Function
AE-DD14	SE zone of Stockpile Area at property boundary	Particulate Matter g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Particulate dust deposition rate at SE corner of Stockpile at property boundary Operational Control - Stockpile and internal roadway dust control measures performance reference
AE-DD15	NE zone of stockpile area	Particulate Matter g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Particulate dust deposition rate at NW corner of Appin East pit top property boundary Amenity goal reference Operational Control - Site dust control performance reference
AE-DD16	NW property boundary of pit top facility	Particulate Matter g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Particulate dust deposition rate at NW corner of Appin East pit top property boundary Amenity goal reference Operational Control - Site dust control performance reference
AE-DD17	NE corner of pit top property boundary and coal stockpile vehicle entry/exit point	Particulate Matter g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Particulate dust deposition rate at NE corner of Appin East pit top property boundary Amenity goal reference Operational Control - Stockpile and public road dust control measures performance reference
AE-DD18	SW zone of Stockpile Area	Particulate Matter – g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Particulate dust deposition rate at SE corner of Stockpile Operational Control - Stockpile and internal roadway dust control measures performance reference
AE-PF1	NE corner of pit top property boundary – coal stockpile vehicle entry/exit point	Particulate Matter: PM ₁₀	Real-time Photometer (fixed)	Continuous	Real-time monitoring of dust emissions at the coal stockpile area truck entry/exit point onto public roads Real-time Operational Control – Stockpile, internal roads and public road dust control measures performance reference monitor
AE-PF3	NW corner of Appin East pit top boundary between nearest residential receivers	Particulate Matter: PM _{2.5} , PM ₁₀	Real-time Photometer (fixed)	Continuous	Amenity goal reference Real Time Operational Control Site dust control performance reference
AE-HV1	NW corner of Appin East pit top boundary between nearest residential receivers	Particulate Matter - PM ₁₀ and TSP monitor	High Volume Air Sampler	As Required	Amenity goal reference Review against land acquisition levels Real Time Operational Control Site dust control performance reference
AW-DD1	Appin West pit top – adjacent mine access road, employee car park and EDL power plant	Particulate Matter g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Particulate dust deposition rate at Appin West pit top Operational Control – Site and road dust control measures performance reference
AW-DD2	Appin West property boundary at Mine Entrance Point off Douglas Park Drive	Particulate Matter g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Particulate dust deposition rate at the Appin West Mine Gate Entrance Point and the public road Amenity goal reference Operational Control – Site and mine access road dust control measures performance reference
W-DD1	Appin North southern property boundary at the Wedderburn Rd and-Appin Rd junction	Particulate Matter – g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Particulate dust deposition rate at the Wedderburn Rd and-Appin Rd junction Operational Control – Mine entrance road and coal truck dust control measures performance reference Amenity goal reference
W-DD3	Appin North pit-top south site	Particulate Matter – g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Operational Control – Site dust control performance reference for the Appin North pit-top south site
W-DD8	Brennans Creek Dam	Particulate Matter – g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Operational Control – Site dust control performance reference. Indicator for dust deposition rates between the emplacement area activities and the nearest Appin township residential area

Table 10: BSO Air Quality Monitoring Sites and their Function

Site ID	Location	Parameter	Measurement Method	Frequency?	Function
					Baseline and historical dust deposition trends related to the expansion of the emplacement area north towards the nearest residential receivers. Amenity goal reference
W-DD10	Appin North property boundary between the product stockpiles adjacent to Wedderburn Road and the Dharawal State Conservation Area boundary	Particulate Matter – g/m ² /month Ash, Combustible Solids, Insoluble Solids	Deposition Gauge	Monthly	Site dust control performance reference for product stockpiles and Wedderburn Road coal truck transport corridor.
W-PF1	Appin North southern property boundary at the Wedderburn and Appin Road intersection	Particulate Matter: PM ₁₀	Real-time Photometer (Fixed)	Continuous	Fixed monitor for real-time monitoring of dust emissions at the Wedderburn Road and Appin Road intersection. Real-time Operational Control – Roadway dust emissions.

Environmental Performance

Results of air quality monitoring are reported online every 14 days, in accordance with Section 66 (6) of the Protection of the Environment Operations (POEO) Act, and Schedule 6, Condition 11 of the BSO Project Approval; and on an annual basis to the EPA via the EPA Annual Return (Appendix B: 2018/19 EPA Annual Return for EPL 2504). The online report is available via the following link: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

A comprehensive summary of all air monitoring results for the BSO is provided in this section.

Dust Deposition Gauge Monitoring

The Appin West, Appin East and Appin North sites non-operational gauges were below the long-term criteria/amenity goal of 4 g/m²/month for deposited dust during the reporting period that applies to particulate emissions on any residence on privately owned land. This is evident at all sites located near the perimeter of the Appin West, Appin East and Appin North sites (i.e. AE-DDG14, 15, 16 and 17; AW-DD1 and DD2; and WC-DD1, DD3 and DD8). The long term trends are consistent across all sites.

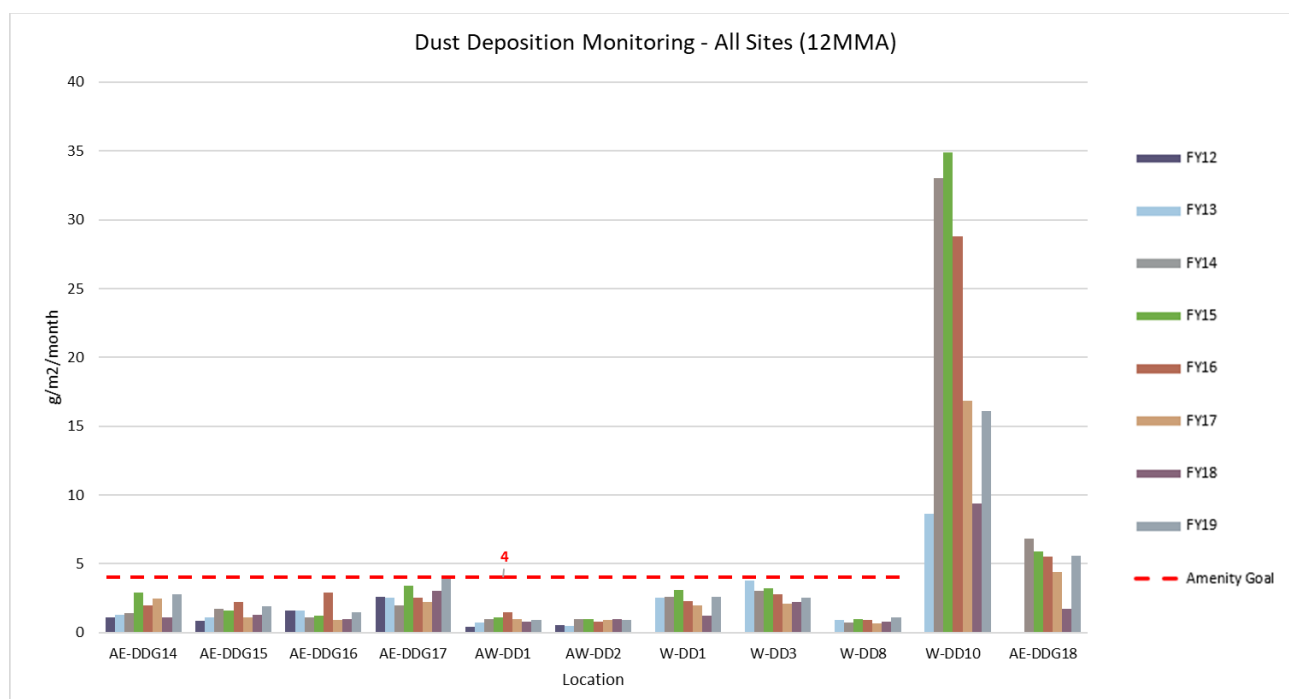


Figure 3: Comparison annual averages from FY12 to FY19 for insoluble solids.

W-DD10 and AE-DDG18 are operational gauges located within the mine site (i.e. operational land). These gauges provide an indication of effectiveness of the sites immediate dust control measures, and the long-term criteria for deposited dust do not apply at these sites. The long term trends are reasonably consistent across reporting periods.

Real-time Monitoring

As described in the BSO AQGHGMP, if the optical photometer at Appin East (AE-PF3) indicates average dust levels greater than 80% of the air quality criteria in Condition 9 of Schedule 4 of the Project Approval, additional monitoring will be undertaken using the HVAS (AE-HV1) to assess compliance. The apparent maximum average PM₁₀ dust levels were measured above the 80% criteria once during the reporting period. This exceedance was attributed to regional bush fires and hazard reduction burn events, along with severe dust events, rather than dust emissions generated by BSO activities.

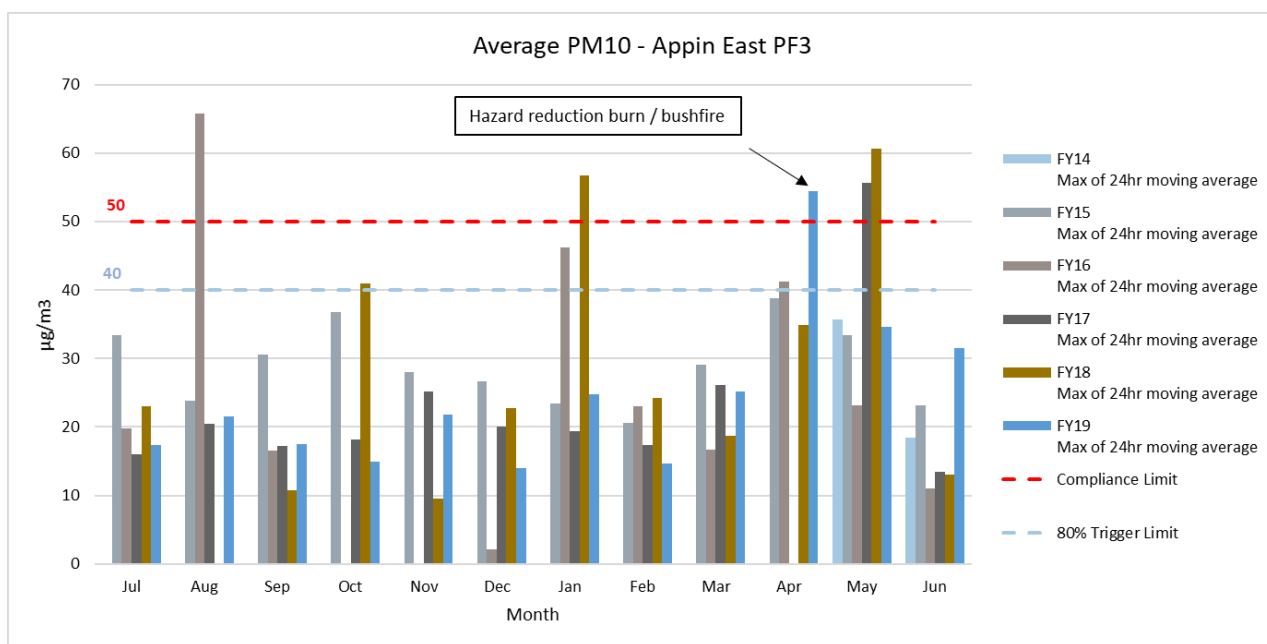


Figure 4: PM₁₀ average 24-hour levels and maximum 24-hour levels at Appin East.

6.2. EROSION AND SEDIMENT

Environmental Management

Most activities at the Appin East, Appin West, and Appin North Pit Top sites are undertaken on relatively flat areas. High activity areas are generally sealed. There are minimal exposed earthen areas at all sites. Internal unsealed roads are maintained to prevent dust, primarily through dust suppression sprays and water cart application. Sediment fences are installed where required to filter sediment from drainage and/or seepage points. Sediment is controlled by multiple techniques across the three sites, however the common practices include a series of dams and water treatment facilities. Where required, discharged water [under the EPL] is monitored for suspended solids.

Areas that have the potential to be contaminated by surface operations at the Appin West Pit Top are contained within the catchment of the surface water dams which are designed to capture and treat a 1:10 year, 72-hour rainfall event. The surface water dam contains a spillway designed for up to a 1:1000-year rainfall event to maintain the engineering integrity of the structure and reduce the risk of erosion and sediment release (through Licenced Discharge Point (LDP) 25). Prior to the release of surface water from the surface water dam (via LDP23), water passes through a fibre filter (perlite) unit which is designed to remove suspended solids, and insoluble oil and grease.

Appin East Pit Top utilises very similar arrangements to Appin West, with a series of surface water ponds capable of holding up to 22,000 L of surface water. The surface water management is split into two main dams. These earthen dams are used to capture, treat and recycle surface and stormwater runoff from the Pit Top. Water is harvested from the main dam for dust suppression and the truck wheel wash. Water can also be pumped through the treatment system and into the sediment dam which can be drawn through the Dynasand filter for discharge into the Georges River through LDP19.

The potential for erosion at the emplacement area is managed in accordance with the West Cliff Coal Wash Emplacement Area Management Plan. The following activities are undertaken to minimise the likelihood of erosion within the emplacement area:

- compaction of emplaced material;
- profiling of finished areas to designed gradients; and
- revegetation of the WCEA (once material is emplaced to meet design criteria).

Sediment is controlled by a series of sedimentation ponds, which have a combined capacity of ~200 ML. Water is treated at several locations across the site prior to transfer into Brennans Creek Dam (BCD) to comply with the EPL limits.

The water management systems across the BSO are regularly inspected by the site environmental representatives to ensure that each system is operating as efficiently as possible.

Environmental Performance

Routine water quality monitoring of Total Suspended Solids (TSS) across the BSO has not identified any issues associated with erosion and sedimentation. The Appin West, Appin East and Appin North sites are operating within the licence limits for TSS.

6.3. SURFACE WATER

Environmental Management

Surface water management across the BSO is completed in accordance with EPL 2504 and the approved BSO Surface Water Management Plan (SWMP). The SWMP details the control measures, compliance procedures, monitoring programs, evaluation protocols, notification and communication processes for surface water management for the BSO. This plan has been prepared to satisfy Condition 16 of Schedule 4 of the BSO Project Approval.

The objectives of the SWMP are to:

- provide a water balance for the project including sources, usage and discharge quality;
- outline the process to reduce the impacts on biota from the Brennans Creek Dam (BCD) discharge;
- establish responsibilities for the surface water management at the BSO;
- comply with all relevant regulatory requirements, Environmental Protection Licence 2504 and South32 policies and standards for water management;
- describe the water management systems including measures to comply with discharge limits and minimise potable water usage;
- outline the framework for water monitoring, auditing and reporting; and
- specify investigation and communication processes in response to water related issues and complaints.

For specific surface water management strategies and controls, please refer to the SWMP found at: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

Environmental Improvements

BCD Automation

The continuous water quality monitoring system at BCD is currently being upgraded with new equipment and increased automation. The current monitoring location has been moved closer to the discharge point and the system will be automated to respond to water quality changes as well as regulate discharge flows into Brennans Creek and BCD storage volume.

Further improvements at Appin North under EIP2 are discussed in [Pollution Reduction Programs](#).

Environmental Performance

Results of the surface water monitoring are reported online every 14 days as per the requirements of Section 66(6) of the POEO Act; and Condition 11 of Schedule 6 of the BSO Project Approval; and on an annual basis to the EPA via the Annual Return (see Appendix B: 2018/19 EPA Annual Return for EPL 2504). The online report is accessible via the following link: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

A summary of results from the BSO monitoring program is included in **Table 11**.

Water Quality

Compliance with the EPL 2504 limits was achieved across nine of the eleven monitoring sites across the BSO during the reporting period. Non-compliances at each of the sites are discussed in **Table 11**. With the exception of the non-compliances discussed in **Table 12**, the trends for discharge water quality remain relatively consistent over the life of the operation.

Water Discharge

There was one exceedance during the reporting period, where discharge volume exceeded the EPL limits for discharge (see **Table 12**). The trends for discharge volumes are relatively consistent over the life of the operation, taking into account the influence of rainfall. It is expected that the volume of water to be discharged through LDP24 will increase over the next reporting period with an increase in the allowable volume licenced to be discharged through LDP24.

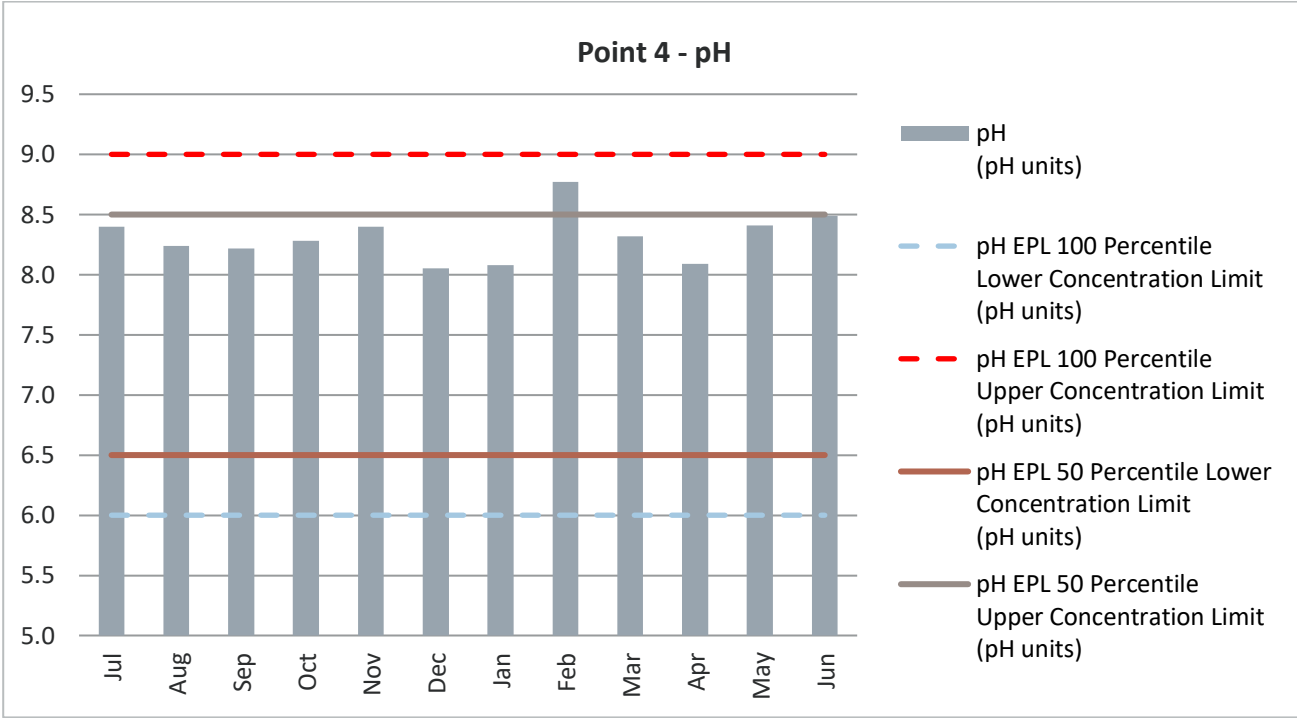
Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO

Monitoring Site	EPL Compliant (Y/N)	Comments	Data																																																																																																																																		
Point 3/4	No	<p>Oil and Grease sample result over the EPL 100 percentile limit in December 2018 (13 mg/L). Anomalous result, no visual evidence of oil/grease on the surface of the sample point, unknown cause. Resampling was carried out shortly thereafter with results below detection limit. Please see the below link for long term data illustrations.</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>	<div><p>Point 4 - Oil & Grease</p><table><tr><th>Month</th><th>FY19 (mg/L)</th><th>FY12 Average (mg/L)</th><th>FY13 Average (mg/L)</th><th>FY14 Average (mg/L)</th><th>FY15 Average (mg/L)</th><th>FY16 Average (mg/L)</th><th>FY17 Average (mg/L)</th><th>FY18 Average (mg/L)</th><th>EPL 100 Percentile Limit (mg/L)</th></tr><tr><td>Jul</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Aug</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Sep</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Oct</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Nov</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Dec</td><td>13.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Jan</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Feb</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Mar</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Apr</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>May</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr><tr><td>Jun</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>5.0</td><td>10.0</td></tr></table></div>	Month	FY19 (mg/L)	FY12 Average (mg/L)	FY13 Average (mg/L)	FY14 Average (mg/L)	FY15 Average (mg/L)	FY16 Average (mg/L)	FY17 Average (mg/L)	FY18 Average (mg/L)	EPL 100 Percentile Limit (mg/L)	Jul	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Aug	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Sep	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Oct	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Nov	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Dec	13.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Jan	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Feb	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Mar	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Apr	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	May	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	Jun	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0
	Month	FY19 (mg/L)	FY12 Average (mg/L)	FY13 Average (mg/L)	FY14 Average (mg/L)	FY15 Average (mg/L)	FY16 Average (mg/L)	FY17 Average (mg/L)	FY18 Average (mg/L)	EPL 100 Percentile Limit (mg/L)																																																																																																																											
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Yes	<p>All samples were well below the compliance limit for BOD. 50% of the samples collected during FY19 were below the limit of reporting. Please see the below link for long term data illustrations.</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>	<div><p>Point 4 - BOD</p><table><tr><th>Month</th><th>BOD (mg/L)</th><th>Biochemical Oxygen Demand (mg/L)</th><th>BOD EPL 100 Percentile Concentration Limit (mg/L)</th></tr><tr><td>Jul</td><td>13.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Aug</td><td>2.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Sep</td><td>4.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Oct</td><td>17.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Nov</td><td>2.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Dec</td><td>2.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Jan</td><td>2.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Feb</td><td>8.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Mar</td><td>2.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Apr</td><td>2.0</td><td>30.0</td><td>50.0</td></tr><tr><td>May</td><td>5.0</td><td>30.0</td><td>50.0</td></tr><tr><td>Jun</td><td>10.0</td><td>30.0</td><td>50.0</td></tr></table></div>	Month	BOD (mg/L)	Biochemical Oxygen Demand (mg/L)	BOD EPL 100 Percentile Concentration Limit (mg/L)	Jul	13.0	30.0	50.0	Aug	2.0	30.0	50.0	Sep	4.0	30.0	50.0	Oct	17.0	30.0	50.0	Nov	2.0	30.0	50.0	Dec	2.0	30.0	50.0	Jan	2.0	30.0	50.0	Feb	8.0	30.0	50.0	Mar	2.0	30.0	50.0	Apr	2.0	30.0	50.0	May	5.0	30.0	50.0	Jun	10.0	30.0	50.0																																																																															
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Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO

Yes

Only one out of 12 samples returned a result with pH greater than 8.5 which is still within the 50-percentile limit allowance. All samples were compliant with the 100 percentile limits. Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>



Point 10 conductivity, pH and turbidity is monitored via an online continuous monitoring system. During the reporting period, the discharge relied upon dilution to achieve the conductivity limit of 2 mS/cm. The dilution system is automated to maintain electrical conductivity of 1.95 mS/cm. The daily average for conductivity, pH and turbidity for Point 10 are illustrated in the graphs to the right.

There were 6 instances where the daily average for conductivity exceeded 2 mS/cm; however, this is still within the 20 percent allowance for that analyte (limit for conductivity being an 80-percentile limit).

There were no instances where average daily pH exceeded the licence limits.

There is no licence limit for turbidity. Peaks are generally attributed to high rainfall events causing large catchment inflows to BCD. Monthly samples for TSS and Total Dissolved Solids (TDS) were within the compliance limits.

An issue occurred with the pump that collects a water sample for turbidity, EC and pH at LDP10 in March 2019. Continuous monitoring of water quality did not occur for a week as a result.

There was one instance where COD exceeded the limit of 50 mg/L; however, this is still within the 10 percent allowance for that analyte (limit for conductivity being a 90-percentile limit).

Exceedance of 90th percentile limit for Aluminium at LDP10. A result of 860 ug/L was recorded and the limit in EPL 2504 is 800 ug/L. There was overall compliance with the 90th percentile limit over the reporting period.

Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>

The long term trends indicate an improvement in discharge water quality over time, particularly in relation to copper, zinc, total nitrogen, nickel, lead, cobalt and aluminium. This is likely due to the implementation of the floating offtake in BCD.

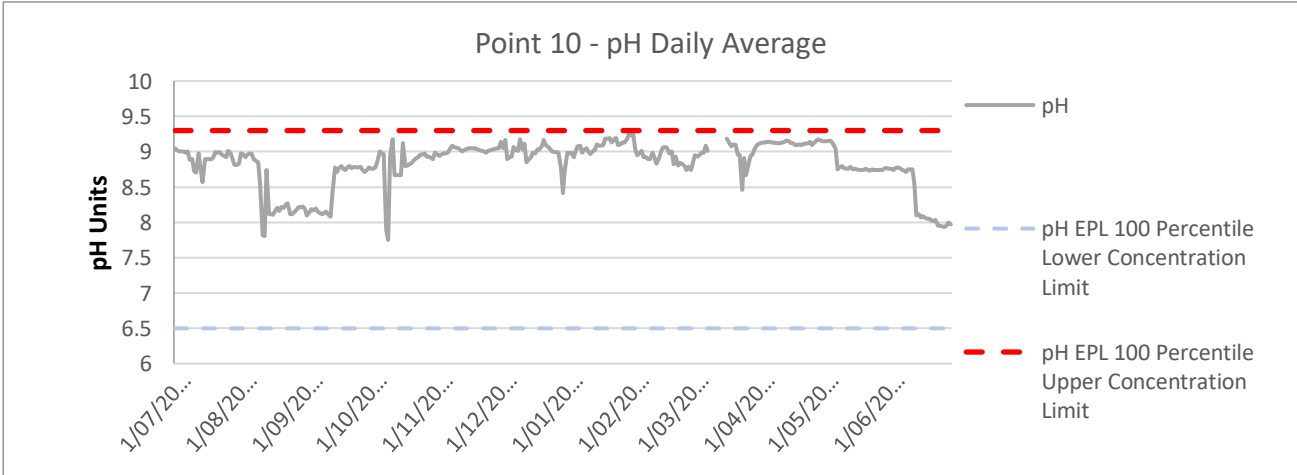
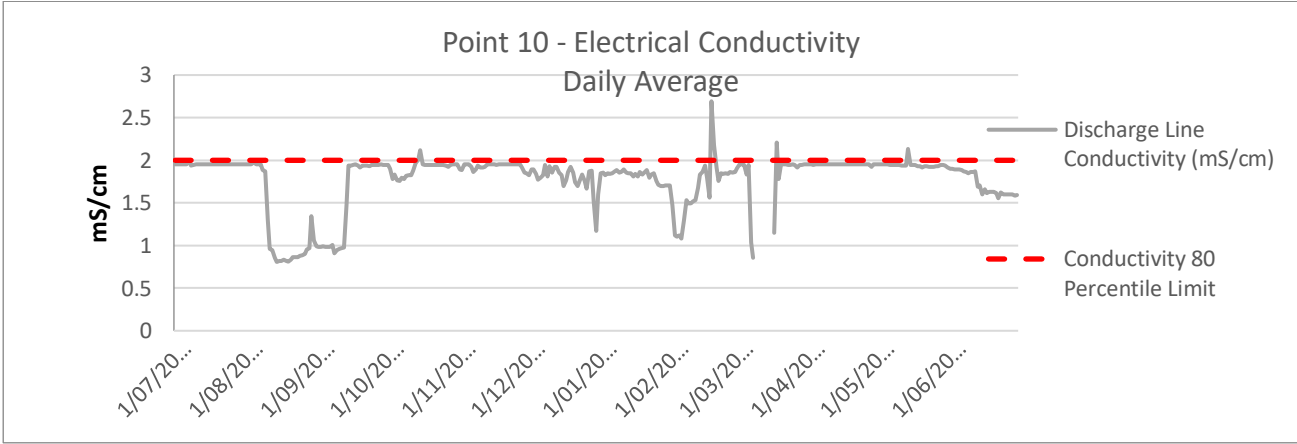


Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO

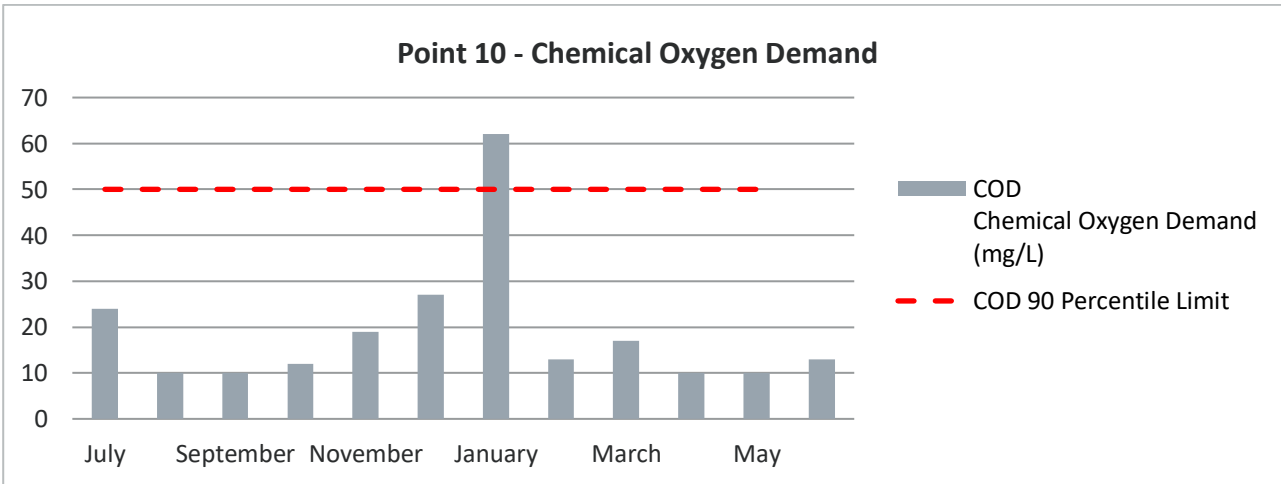
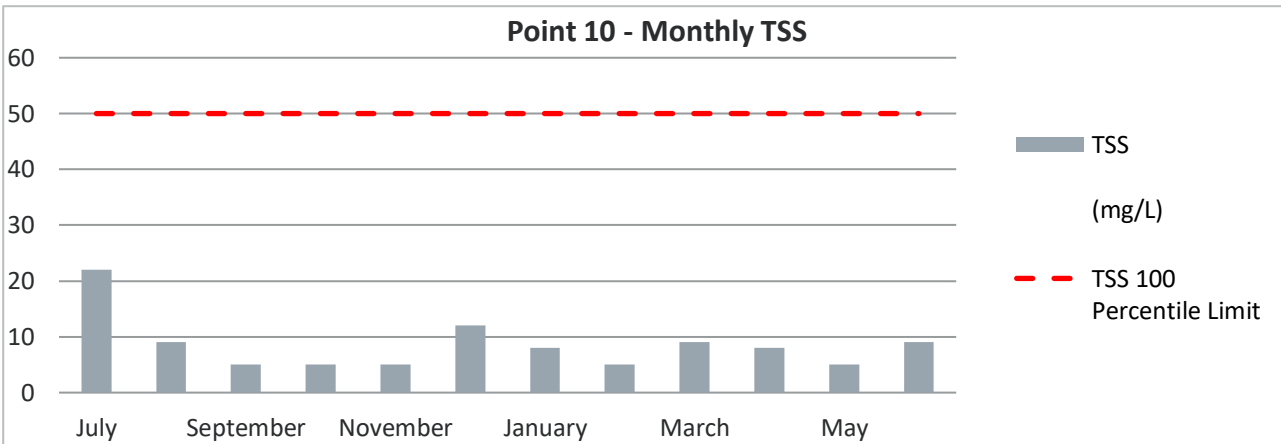
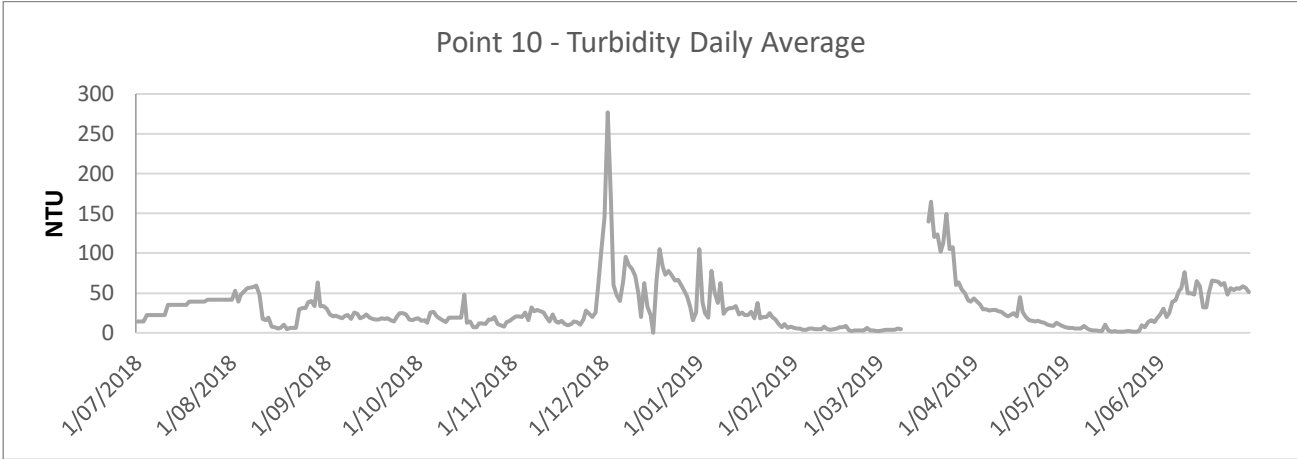
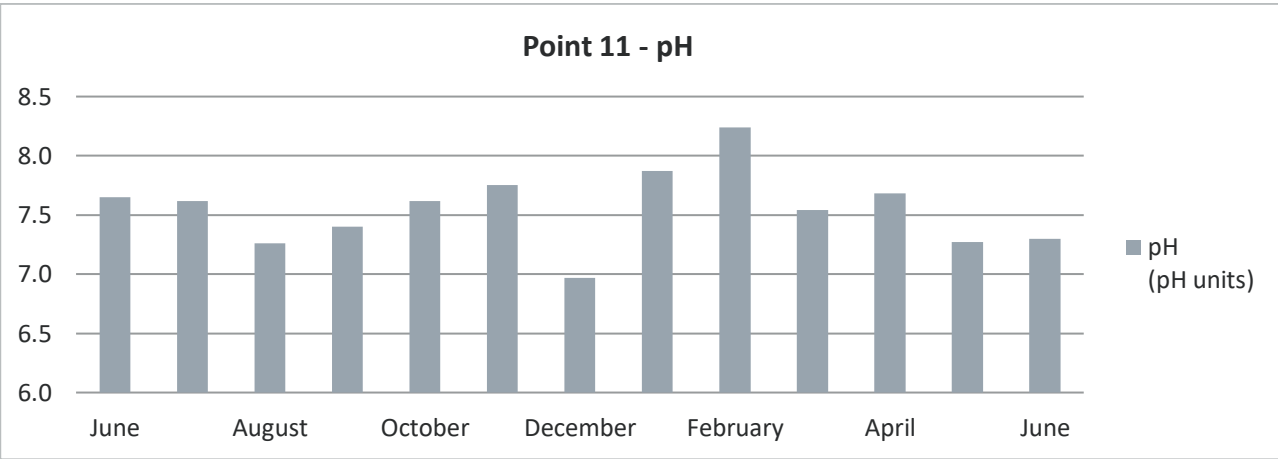
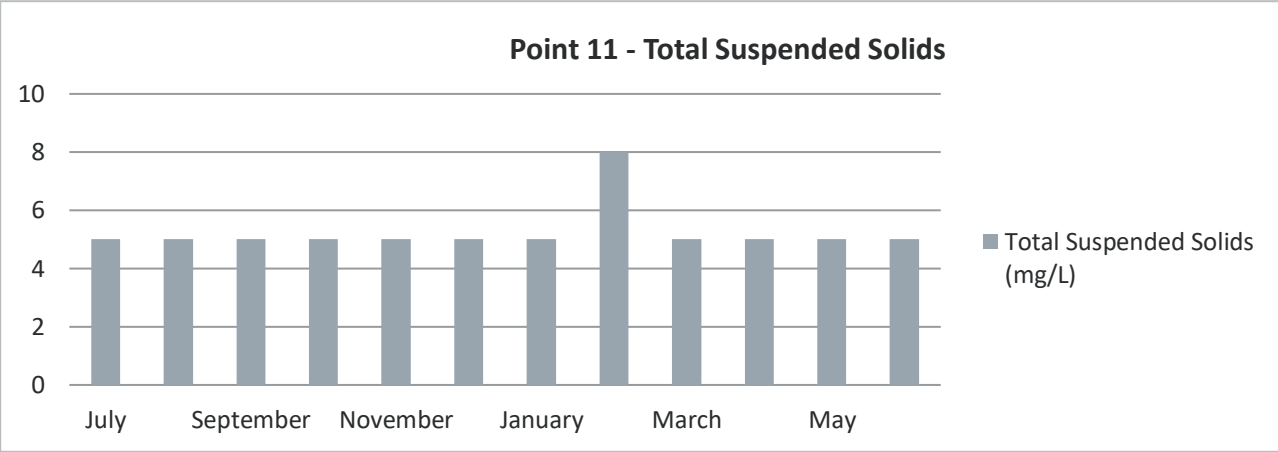
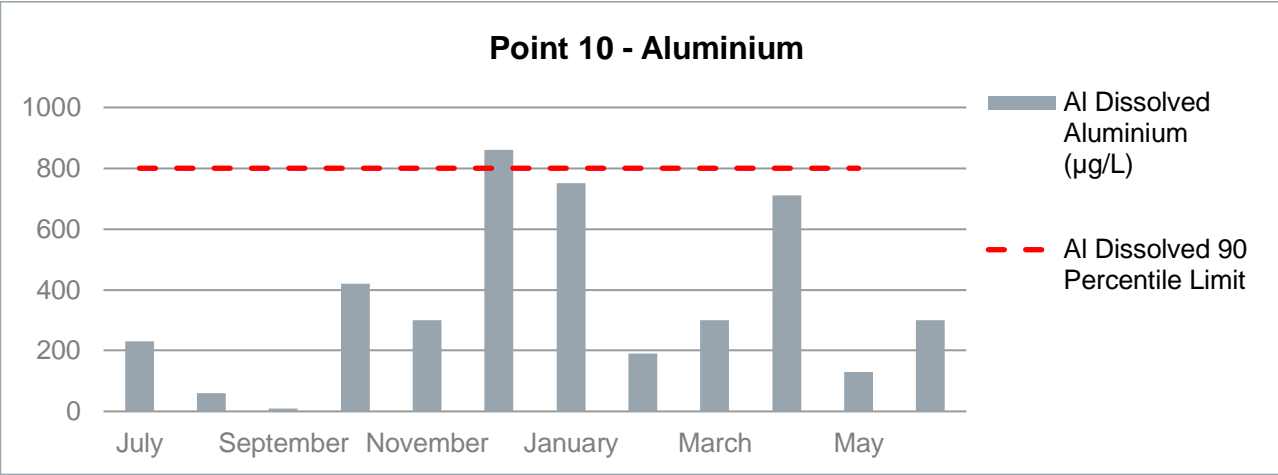


Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO

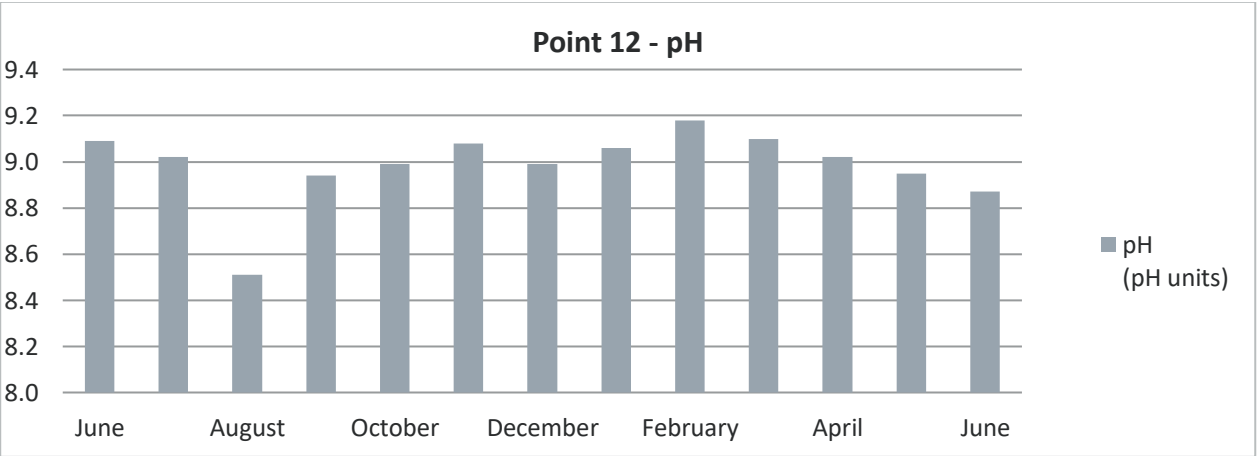
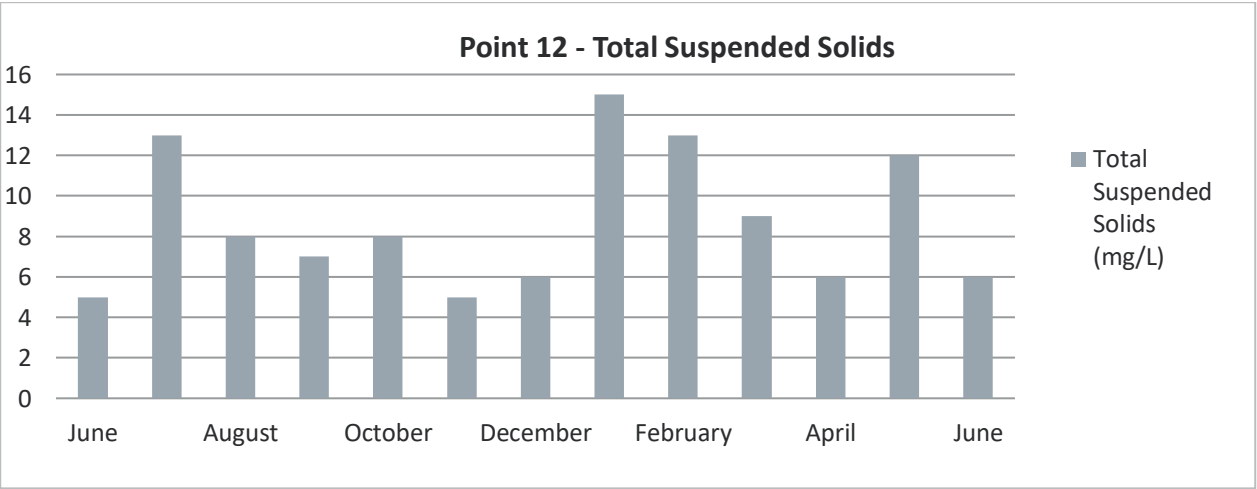
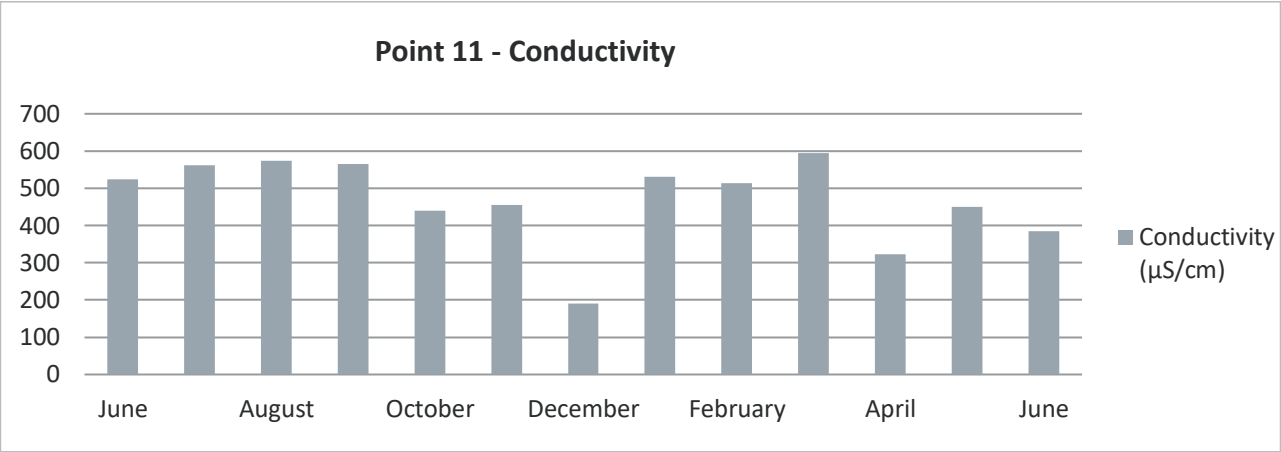


Point 11

Yes

There are no licence limits for Point 11. Point 11 is within the Georges River, upstream from the confluence of Brennans Creek. Monthly TSS, pH and conductivity are illustrated to the right.
Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>

Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO



Point 12

Yes

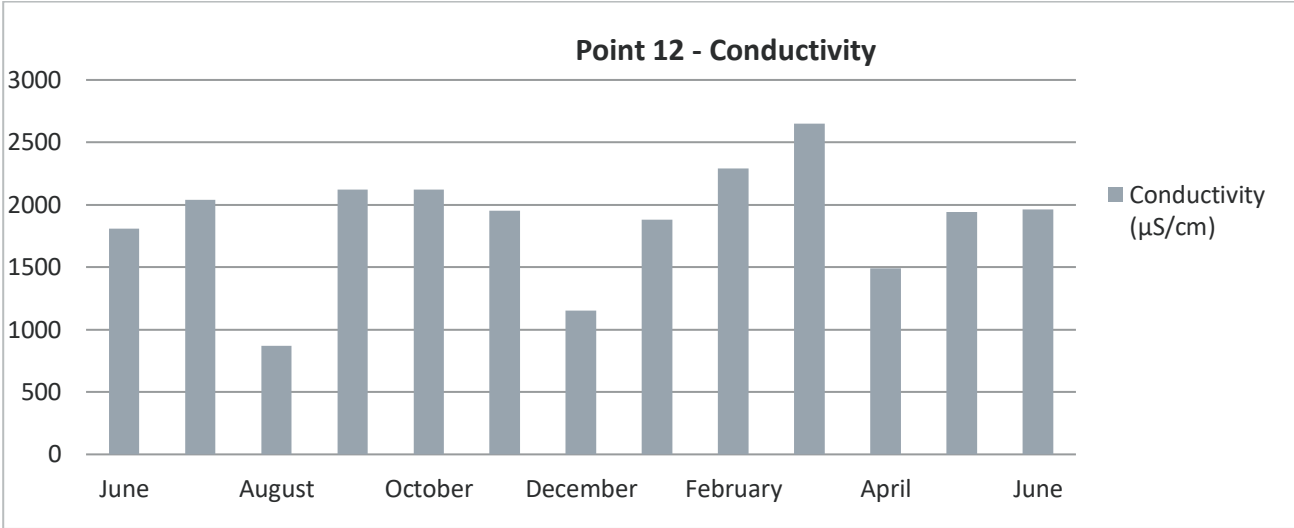
Point 12 is situated downstream of the confluence of Brennans Creek. Monthly TSS, pH and conductivity are illustrated to the right. Water quality at Point 12 is generally consistent with the chemistry at Point 10. EC is influenced by discharge from BCD.

Please see the below link for long term data illustrations.

<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>

Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO

Point 18 Yes S32IMC no longer discharge from this point.

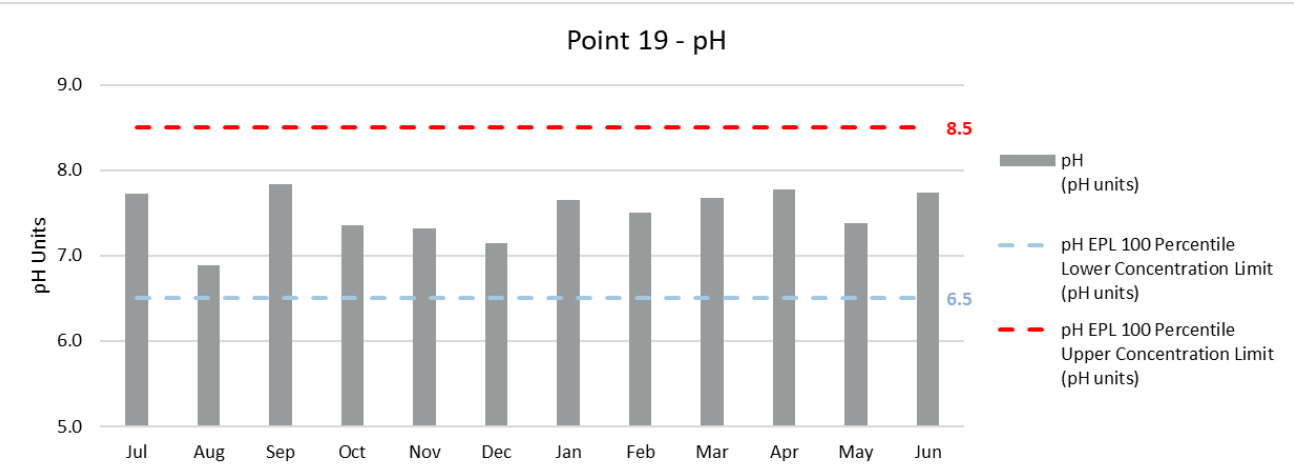


Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>

Point 19 Yes

FY19 results displayed typical and expected compliance against pH. pH units fluctuated in-line with long-term trends dictated by rainfall and temperature. Warmer months see less rainfall, higher solar insolation and lower pH, most likely due to flora and algal activity.

Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>



TSS

FY19 TSS concentration followed the long-term trends of being well below the EPL 100 percentile concentration limit. The reporting period saw +65% of samples below the limit of reporting.

Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>

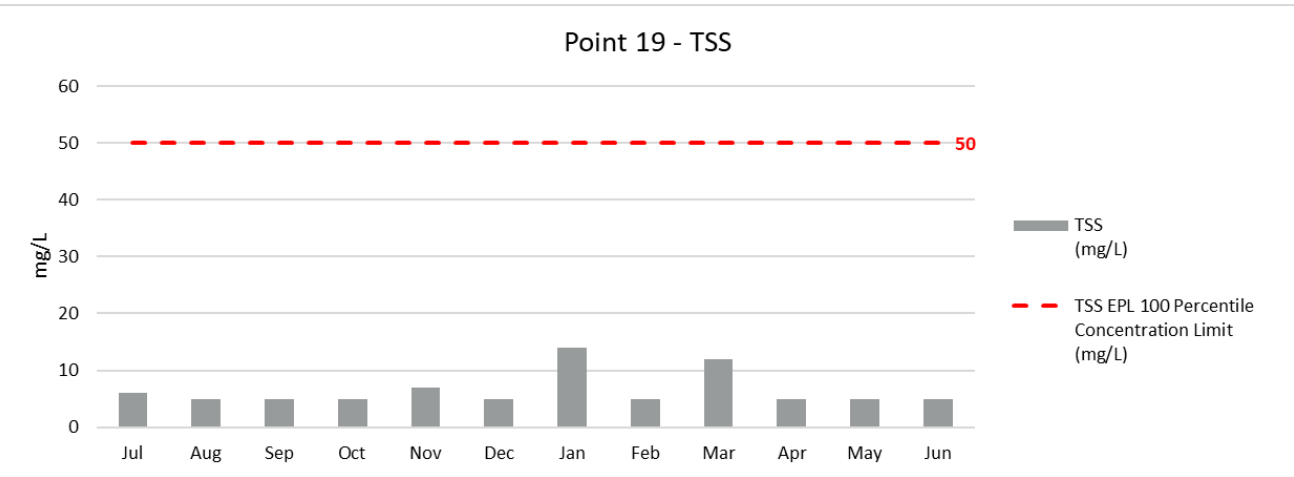
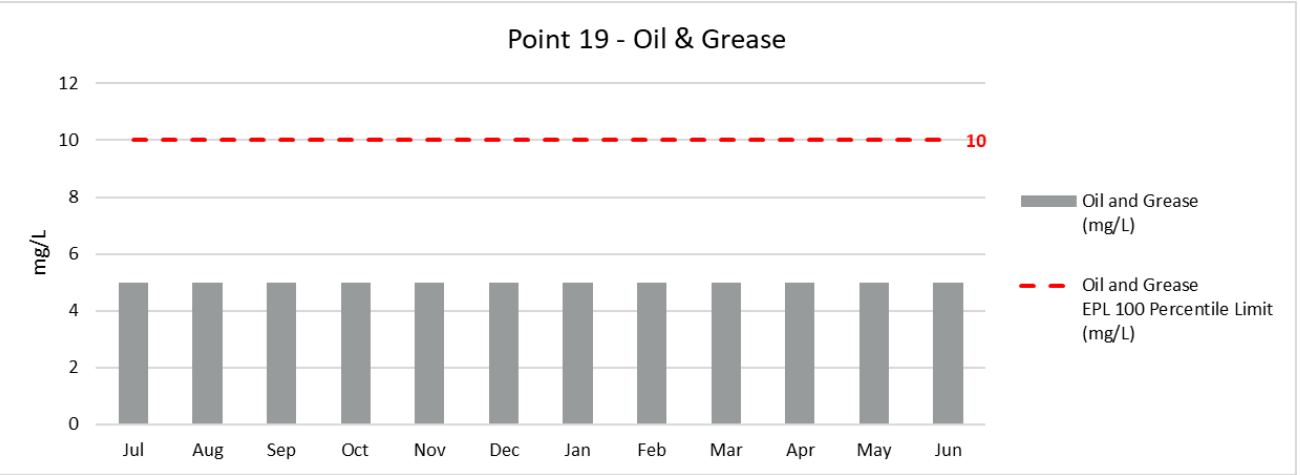


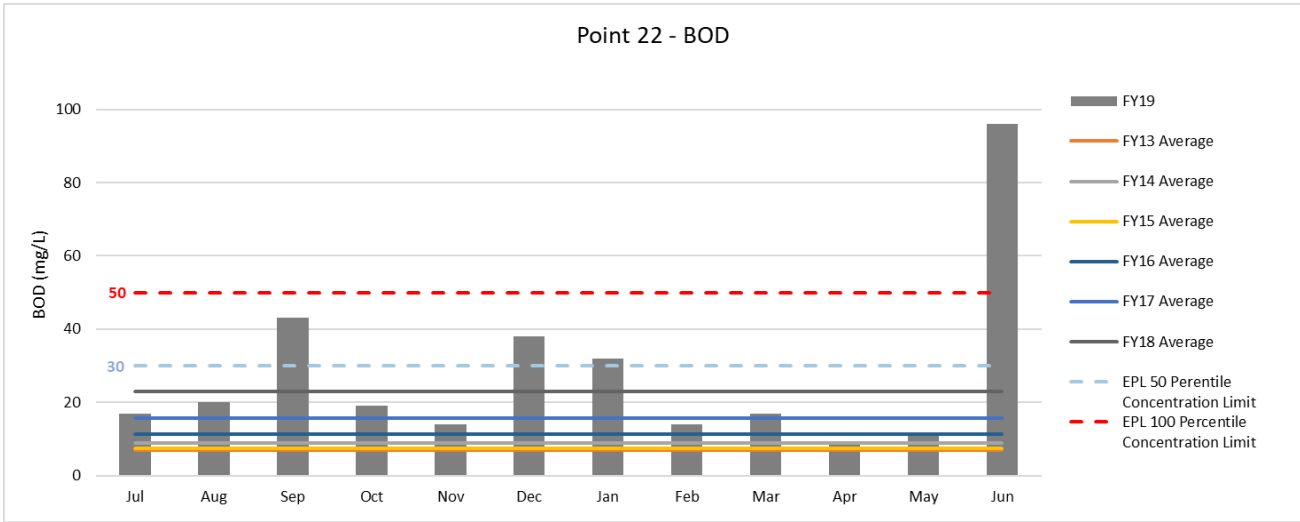
Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO

Oil & Grease		
Similarly to TSS, FY19 Oil & Grease concentrations did not exceed the EPL 100 percentile concentration limit, nor the limit of detection (5mg/L).		
The above is also true for the long-term data, with the LDP failing to register a concentration above the limit of reporting.		
Please see the below link for long term data illustrations.		
https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents		



Point 20	Yes	S32IMC no longer discharges from this point.	Please see the below link for long term data illustrations. https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents
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BOD		
FY19 BOD sample result over the EPL 100 percentile limit in June 2019 (96 mg/L). There have been no identified issues at the Sewage Treatment Plant that would have resulted in this exceedance of criteria. Further investigative sampling recorded BOD back below EPL Limit (20 mg/L). The exact cause of the exceedance is unknown. One possible reason for exceedance is that sampling can take place while the system is not running, and samples may be sourced from stagnant water in-pipe. The average BOD for FY19 is below the 50-percentile concentration limit.		
No		
Long-term data analysis for BOD concentration illustrates a more sensitive system with EPL 50 Percentile exceedances during warmer periods and following periods of inactivity. This correlates with a design change to the system to accommodate for peak pulse flows, with the installation of balance ponds. S32IMC have been focussing on improving the efficacy of the plant to accommodate this change.		
Please see the below link for long term data illustrations.		
https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents		



Point 22	Please see the below link for long term data illustrations. https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents	
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pH		
FY19 displayed typical and expected compliance against pH. pH units remained steady, in-line with long-term trends dictated by temperature. Warmer months see higher solar insolation and higher pH, most likely due to biological activity.		
Yes		
Please see the below link for long term data illustrations.		
https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents		

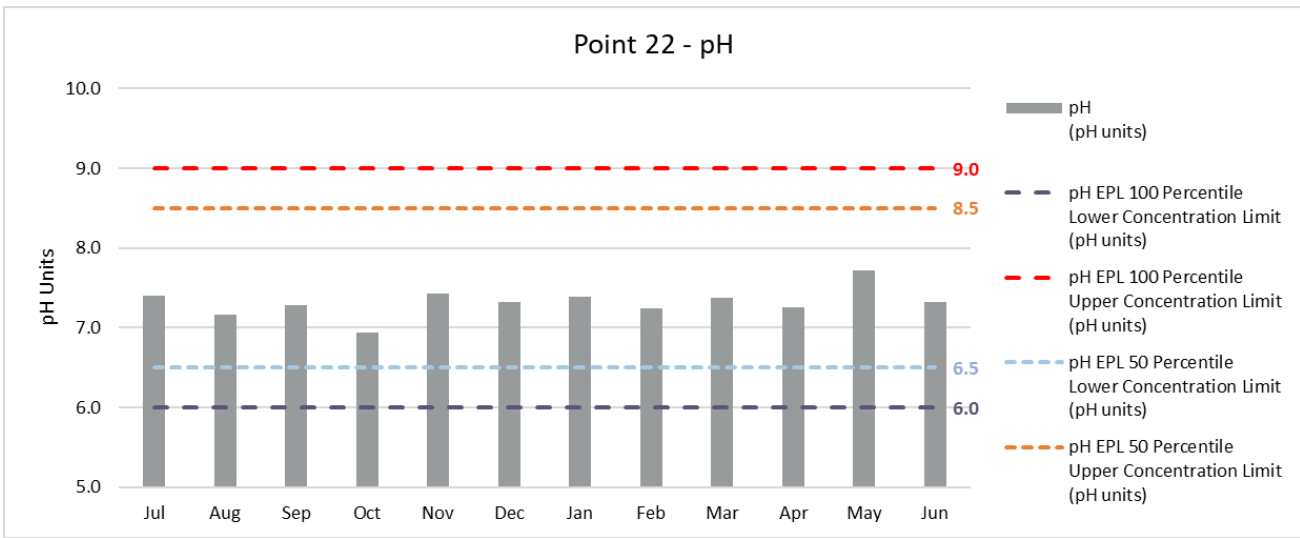


Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO

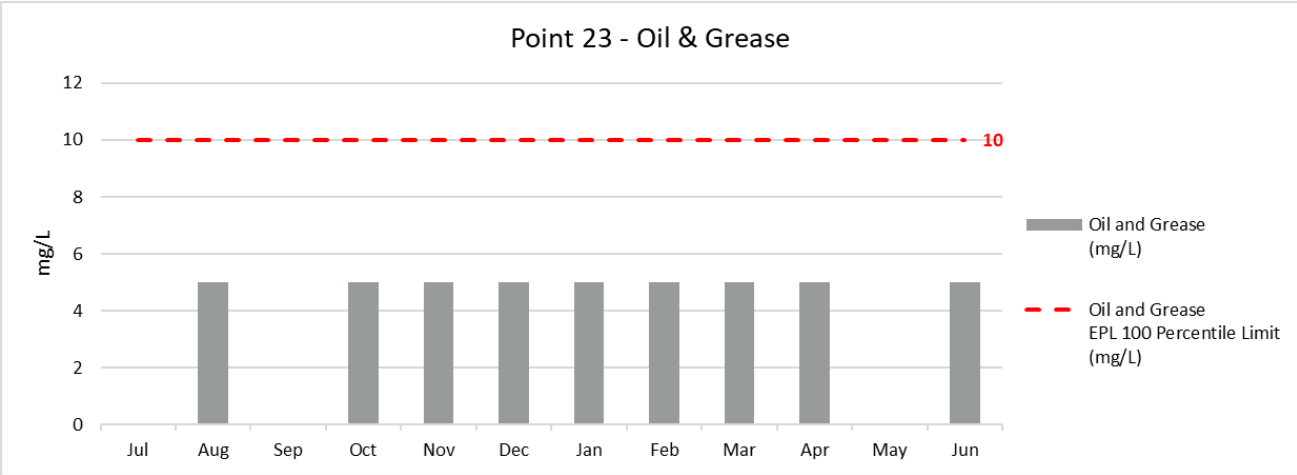
Point 23	Yes	<p>Oil & Grease</p> <p>FY19 Oil & Grease concentration did not exceed the EPL 100 percentile concentration limit. The reporting period saw +80% of samples below the limit of reporting. This is in-line and as expected with long-term trends.</p> <p>Please see the below link for long term data illustrations.</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>	<p>Point 22 - Oil & Grease</p> <table><tr><th>Month</th><th>Oil and Grease (mg/L)</th></tr><tr><td>Jul</td><td>5.0</td></tr><tr><td>Aug</td><td>5.0</td></tr><tr><td>Sep</td><td>5.0</td></tr><tr><td>Oct</td><td>5.0</td></tr><tr><td>Nov</td><td>6.0</td></tr><tr><td>Dec</td><td>6.0</td></tr><tr><td>Jan</td><td>5.0</td></tr><tr><td>Feb</td><td>5.0</td></tr><tr><td>Mar</td><td>5.0</td></tr><tr><td>Apr</td><td>5.0</td></tr><tr><td>May</td><td>5.0</td></tr><tr><td>Jun</td><td>5.0</td></tr></table>	Month	Oil and Grease (mg/L)	Jul	5.0	Aug	5.0	Sep	5.0	Oct	5.0	Nov	6.0	Dec	6.0	Jan	5.0	Feb	5.0	Mar	5.0	Apr	5.0	May	5.0	Jun	5.0
		Month	Oil and Grease (mg/L)																										
		Jul	5.0																										
Aug	5.0																												
Sep	5.0																												
Oct	5.0																												
Nov	6.0																												
Dec	6.0																												
Jan	5.0																												
Feb	5.0																												
Mar	5.0																												
Apr	5.0																												
May	5.0																												
Jun	5.0																												
<p>pH</p> <p>FY19 displayed typical and expected compliance against pH. pH units remained steady in-line with long-term trends dictated by rainfall and temperature. Warmer months see less rainfall, higher solar insolation and lower pH, most likely due to flora and algal activity. However, with the added control of discharge only being required during periods of high precipitation, the likelihood of an exceedance is slim. Historically, IMC has only seen 2 exceedances since February 2014.</p> <p>Please see the below link for long term data illustrations.</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>	<p>Point 23 - pH</p> <table><tr><th>Month</th><th>pH (pH units)</th></tr><tr><td>Jul</td><td>6.5</td></tr><tr><td>Aug</td><td>7.5</td></tr><tr><td>Sep</td><td>6.5</td></tr><tr><td>Oct</td><td>7.8</td></tr><tr><td>Nov</td><td>7.8</td></tr><tr><td>Dec</td><td>7.9</td></tr><tr><td>Jan</td><td>7.4</td></tr><tr><td>Feb</td><td>7.8</td></tr><tr><td>Mar</td><td>7.8</td></tr><tr><td>Apr</td><td>7.9</td></tr><tr><td>May</td><td>6.5</td></tr><tr><td>Jun</td><td>7.8</td></tr></table>	Month	pH (pH units)	Jul	6.5	Aug	7.5	Sep	6.5	Oct	7.8	Nov	7.8	Dec	7.9	Jan	7.4	Feb	7.8	Mar	7.8	Apr	7.9	May	6.5	Jun	7.8		
Month	pH (pH units)																												
Jul	6.5																												
Aug	7.5																												
Sep	6.5																												
Oct	7.8																												
Nov	7.8																												
Dec	7.9																												
Jan	7.4																												
Feb	7.8																												
Mar	7.8																												
Apr	7.9																												
May	6.5																												
Jun	7.8																												
<p>TSS</p> <p>FY19 TSS concentration followed the long-term trends of being well below the EPL 100 percentile concentration limit. The reporting period saw +50% of samples below the limit of reporting. Similarly to the above, this is obtained through the discharge control.</p> <p>Long-term trends indicate that the perlite filters installed prior to this LDP must be monitored and replaced annually to ensure TSS is not exceeded.</p> <p>Please see the below link for long term data illustrations.</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>	<p>Point 23 - TSS</p> <table><tr><th>Month</th><th>TSS (mg/L)</th></tr><tr><td>Jul</td><td>0</td></tr><tr><td>Aug</td><td>10</td></tr><tr><td>Sep</td><td>0</td></tr><tr><td>Oct</td><td>15</td></tr><tr><td>Nov</td><td>5</td></tr><tr><td>Dec</td><td>5</td></tr><tr><td>Jan</td><td>5</td></tr><tr><td>Feb</td><td>5</td></tr><tr><td>Mar</td><td>12</td></tr><tr><td>Apr</td><td>5</td></tr><tr><td>May</td><td>0</td></tr><tr><td>Jun</td><td>5</td></tr></table>	Month	TSS (mg/L)	Jul	0	Aug	10	Sep	0	Oct	15	Nov	5	Dec	5	Jan	5	Feb	5	Mar	12	Apr	5	May	0	Jun	5		
Month	TSS (mg/L)																												
Jul	0																												
Aug	10																												
Sep	0																												
Oct	15																												
Nov	5																												
Dec	5																												
Jan	5																												
Feb	5																												
Mar	12																												
Apr	5																												
May	0																												
Jun	5																												

Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO

Oil & Grease

FY19 Oil & Grease concentration did not exceed the EPL 100 percentile concentration limit. The reporting period saw 100% of samples below the limit of reporting. This is in-line and as expected with long-term trends, again due to the systems controls.

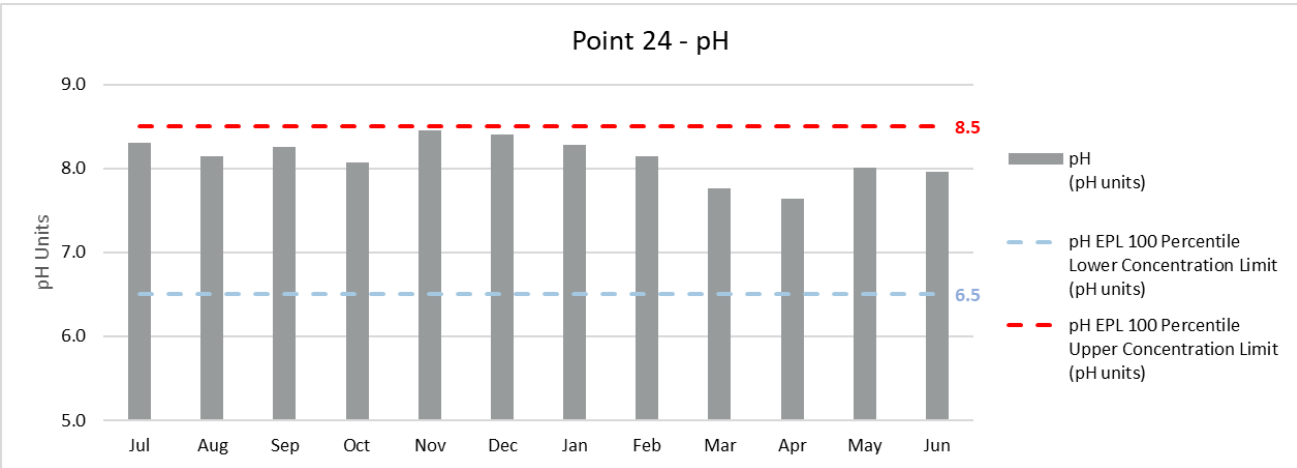
Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>



pH

FY19 displayed typical and expected compliance against pH. pH units fluctuated in-line with feed plant parameters and the changing chemistry of the source water. With the added control of the discharge coming from the Water Filtration Plant, the likelihood of an exceedance is slim. Historically, S32IMC has only seen one exceedance since records began in 2012, most likely due to in-line probe drift.

Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>



Point 24

Yes

TSS

FY19 TSS concentration followed the long-term trends of being well below the EPL 100 percentile concentration limit. The reporting period saw +80% of samples below the limit of reporting. Similarly to the above, this is achieved through the discharge control.

Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>

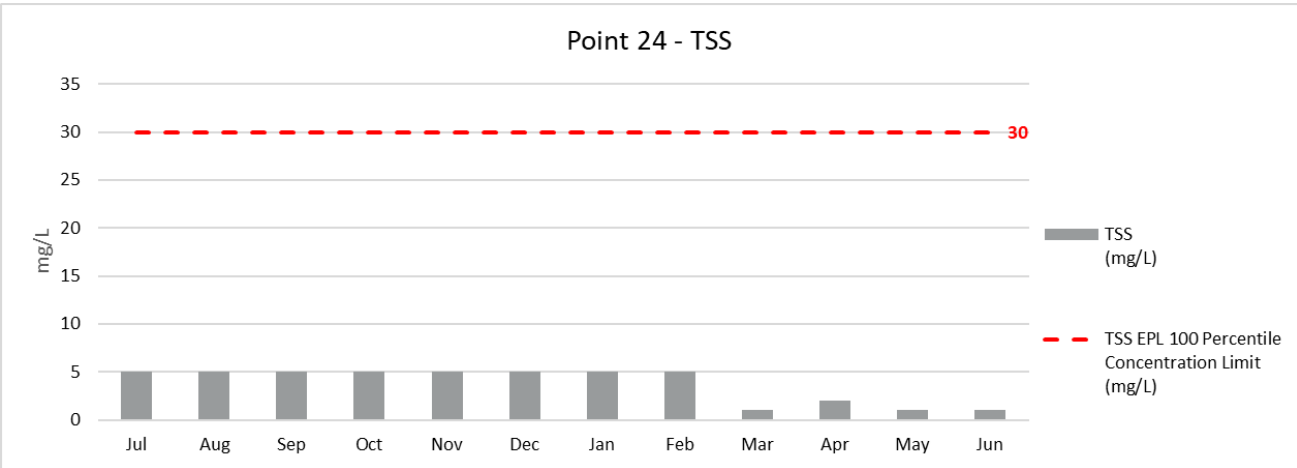


Table 11: Summary of Compliance with EPL Water Quality Limits Across BSO

Oil & Grease

FY19 Oil & Grease concentrations did not exceed the EPL 100 percentile concentration limit. The reporting period saw 100% of samples below the limit of reporting. This is in-line and as expected with long-term trends, again due to the systems controls.

Please see the below link for long term data illustrations.
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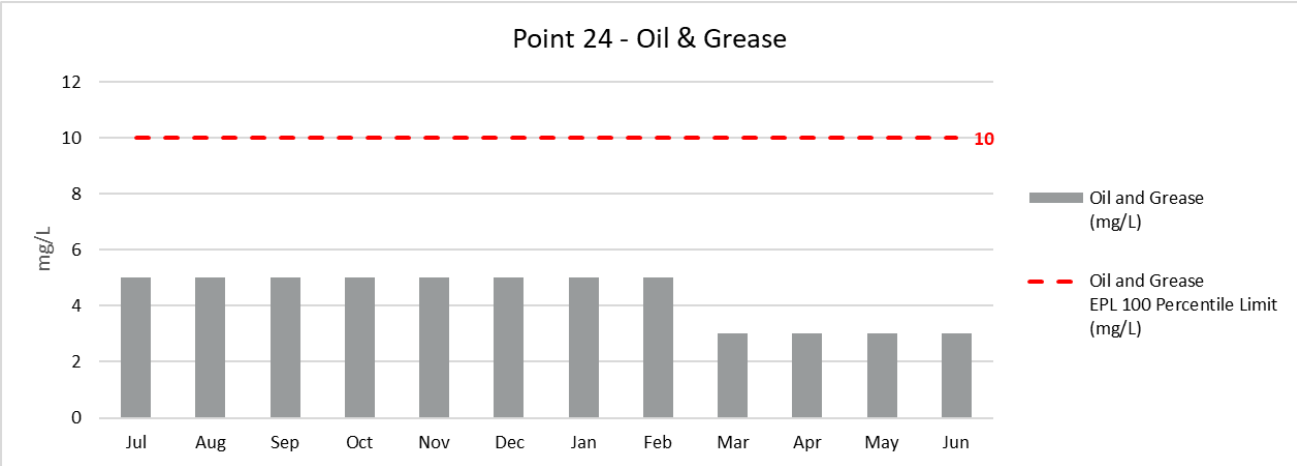


Table 12: Summary of Compliance with EPL Discharge Volume Limits Across BSO

Monitoring Site	EPL Compliant (Y/N)	Comments	Data																																							
Point 4	Yes	<p>Point 4 discharges fluctuate based on the overall demand on the Sewage Treatment Plant (STP). Irrigation occurs on average twice per month for approximately 3 hours at a time. The STP operates under a Licence issued by Wollondilly Shire Council.</p> <p>Please see the below link for long term data illustrations.</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>	<div><p>Point 4 - Discharge Volume</p><table border="1"><thead><tr><th>Month</th><th>Average Flow (kL/Day)</th></tr></thead><tbody><tr><td>Jul</td><td>65</td></tr><tr><td>Aug</td><td>75</td></tr><tr><td>Sep</td><td>70</td></tr><tr><td>Oct</td><td>100</td></tr><tr><td>Nov</td><td>65</td></tr><tr><td>Dec</td><td>20</td></tr><tr><td>Jan</td><td>0</td></tr><tr><td>Feb</td><td>2</td></tr><tr><td>Mar</td><td>10</td></tr><tr><td>Apr</td><td>20</td></tr><tr><td>May</td><td>20</td></tr><tr><td>Jun</td><td>20</td></tr></tbody></table></div>	Month	Average Flow (kL/Day)	Jul	65	Aug	75	Sep	70	Oct	100	Nov	65	Dec	20	Jan	0	Feb	2	Mar	10	Apr	20	May	20	Jun	20													
Month	Average Flow (kL/Day)																																									
Jul	65																																									
Aug	75																																									
Sep	70																																									
Oct	100																																									
Nov	65																																									
Dec	20																																									
Jan	0																																									
Feb	2																																									
Mar	10																																									
Apr	20																																									
May	20																																									
Jun	20																																									
Point 10	Yes	<p>Flows from Brennans Creek Dam (BCD) consist of a gravity feed from the reclaim pond (Point 10, seepage from BCD) dilution waters as required (mixed with Point 10 & 13 waters), spillway overflows (Point 1) and dam discharge (Point 13) via a floating offtake. Flows do fluctuate with rainfall and dam storage volume. During the reporting period, S32IMC continued to provide supplementary flows to maintain pool levels downstream in the Georges River. There was one minor spill event (water spilling over the spillway) that occurred during March 2019. Flows have generally decreased into 2019 due to the ongoing drought causing low storage volumes. There was a period of no discharge in March 2019 for modelling flow recession downstream. The data collected during this time will be used for catchment modelling.</p> <p>Please see the below link for long term data illustrations.</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>	<div><p>Point 1, 10, 13 and Dilution - Total Daily Discharge to Brennans Creek</p><table border="1"><thead><tr><th>Date</th><th>Total Daily Discharge (kL/Day)</th></tr></thead><tbody><tr><td>1/07/2018</td><td>3000</td></tr><tr><td>1/08/2018</td><td>2500</td></tr><tr><td>1/09/2018</td><td>1000</td></tr><tr><td>1/10/2018</td><td>2000</td></tr><tr><td>1/11/2018</td><td>3000</td></tr><tr><td>1/12/2018</td><td>4500</td></tr><tr><td>1/01/2019</td><td>5000</td></tr><tr><td>1/02/2019</td><td>4000</td></tr><tr><td>1/03/2019</td><td>1500</td></tr><tr><td>1/04/2019</td><td>13000</td></tr><tr><td>1/05/2019</td><td>5000</td></tr><tr><td>1/06/2019</td><td>2000</td></tr></tbody></table></div>	Date	Total Daily Discharge (kL/Day)	1/07/2018	3000	1/08/2018	2500	1/09/2018	1000	1/10/2018	2000	1/11/2018	3000	1/12/2018	4500	1/01/2019	5000	1/02/2019	4000	1/03/2019	1500	1/04/2019	13000	1/05/2019	5000	1/06/2019	2000													
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1/07/2018	3000																																									
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1/01/2019	5000																																									
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1/03/2019	1500																																									
1/04/2019	13000																																									
1/05/2019	5000																																									
1/06/2019	2000																																									
Point 13	Yes	As above.	As above																																							
Point 18	Yes	S32IMC no longer discharge from this point.	<p>Please see the below link for long term data illustrations.</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>																																							
Point 19	Yes	<p>FY19 discharge volume for LDP19 was typical and as expected. Daily maximum flow was well below the EPL volume limit. This is due to flow rate constraints with the system set-up. Risk management and compliance against this limit is achieved through engineering. Pump capacities are the limiting factor to ensure compliance is achieved.</p> <p>Average flow for the 12-month period and relative to long-term trends, show typical peaks and troughs. The system expects larger average flows biannually, in an effort to reduce dam levels for the coming season.</p> <p>Please see the below link for long term data illustrations.</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>	<div><p>Point 19 - Discharge Volume</p><table border="1"><thead><tr><th>Month</th><th>Max Flow (kL/Day)</th><th>Average Flow (kL/Day)</th></tr></thead><tbody><tr><td>Jul</td><td>1050</td><td>200</td></tr><tr><td>Aug</td><td>1100</td><td>250</td></tr><tr><td>Sep</td><td>1100</td><td>250</td></tr><tr><td>Oct</td><td>1100</td><td>650</td></tr><tr><td>Nov</td><td>1050</td><td>350</td></tr><tr><td>Dec</td><td>1050</td><td>800</td></tr><tr><td>Jan</td><td>1100</td><td>250</td></tr><tr><td>Feb</td><td>1100</td><td>300</td></tr><tr><td>Mar</td><td>1150</td><td>500</td></tr><tr><td>Apr</td><td>1100</td><td>350</td></tr><tr><td>May</td><td>1100</td><td>300</td></tr><tr><td>Jun</td><td>1100</td><td>400</td></tr></tbody></table></div>	Month	Max Flow (kL/Day)	Average Flow (kL/Day)	Jul	1050	200	Aug	1100	250	Sep	1100	250	Oct	1100	650	Nov	1050	350	Dec	1050	800	Jan	1100	250	Feb	1100	300	Mar	1150	500	Apr	1100	350	May	1100	300	Jun	1100	400
Month	Max Flow (kL/Day)	Average Flow (kL/Day)																																								
Jul	1050	200																																								
Aug	1100	250																																								
Sep	1100	250																																								
Oct	1100	650																																								
Nov	1050	350																																								
Dec	1050	800																																								
Jan	1100	250																																								
Feb	1100	300																																								
Mar	1150	500																																								
Apr	1100	350																																								
May	1100	300																																								
Jun	1100	400																																								

Table 12: Summary of Compliance with EPL Discharge Volume Limits Across BSO

Point 20	Yes	S32IMC no longer discharge from this point.	<div>Please see the below link for long term data illustrations.</div> <div>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</div>																																							
Point 22	Yes	<div>FY19 discharge volumes for LDP22 are as expected. The system is engineered to ensure compliance. Pump and discharge volumes can only be set to three settings; a daily maximum of 70kL/Day, 50kL/Day, or 30kL/Day to ensure compliance against the EPL.</div> <div>Please see the below link for long term data illustrations.</div> <div>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</div>	<div>Point 22 - Discharge Volume</div> <table><caption>Point 22 - Discharge Volume Data (kL/Day)</caption><thead><tr><th>Month</th><th>Max Flow</th><th>Average Flow</th></tr></thead><tbody><tr><td>Jul</td><td>48</td><td>25</td></tr><tr><td>Aug</td><td>70</td><td>35</td></tr><tr><td>Sep</td><td>50</td><td>30</td></tr><tr><td>Oct</td><td>50</td><td>28</td></tr><tr><td>Nov</td><td>35</td><td>30</td></tr><tr><td>Dec</td><td>30</td><td>30</td></tr><tr><td>Jan</td><td>32</td><td>15</td></tr><tr><td>Feb</td><td>35</td><td>22</td></tr><tr><td>Mar</td><td>38</td><td>25</td></tr><tr><td>Apr</td><td>72</td><td>28</td></tr><tr><td>May</td><td>50</td><td>30</td></tr><tr><td>Jun</td><td>70</td><td>28</td></tr></tbody></table>	Month	Max Flow	Average Flow	Jul	48	25	Aug	70	35	Sep	50	30	Oct	50	28	Nov	35	30	Dec	30	30	Jan	32	15	Feb	35	22	Mar	38	25	Apr	72	28	May	50	30	Jun	70	28
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Feb	35	22																																								
Mar	38	25																																								
Apr	72	28																																								
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Jun	70	28																																								
Point 24	No	<div>Daily maximum discharge volume limits were exceeded twice during the month of June 19 (3/6 - 3.46 ML and 8/6 - 3.34 ML) as part of testing and production ramp up with the use of IMS2a. IMS2a allows for a more consistent volume of water to be sent to environment. The monthly average for the period of June was ~1.59 ML/day with an increased quality of water discharged (between 500 µS/cm to 1000 µS/cm).</div> <div>With the onset of production testing of IMS2a (in conjunction with IMS1) late in this FY, S32IMC are seeing a strong increase in daily average flow volumes, when compared to long-term trends. It is expected this will begin to taper and plateau as the mine further develops, and the need for water treatment and discharge is increased.</div> <div>Please see the below link for long term data illustrations.</div> <div>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</div>	<div>Point 24 - Discharge Volume</div> <table><caption>Point 24 - Discharge Volume Data (kL/Day)</caption><thead><tr><th>Month</th><th>Max Flow</th><th>Average Flow</th></tr></thead><tbody><tr><td>Jul</td><td>400</td><td>300</td></tr><tr><td>Aug</td><td>1100</td><td>200</td></tr><tr><td>Sep</td><td>300</td><td>100</td></tr><tr><td>Oct</td><td>300</td><td>100</td></tr><tr><td>Nov</td><td>100</td><td>100</td></tr><tr><td>Dec</td><td>100</td><td>100</td></tr><tr><td>Jan</td><td>600</td><td>100</td></tr><tr><td>Feb</td><td>700</td><td>200</td></tr><tr><td>Mar</td><td>1100</td><td>600</td></tr><tr><td>Apr</td><td>1800</td><td>800</td></tr><tr><td>May</td><td>2200</td><td>700</td></tr><tr><td>Jun</td><td>3400</td><td>1600</td></tr></tbody></table>	Month	Max Flow	Average Flow	Jul	400	300	Aug	1100	200	Sep	300	100	Oct	300	100	Nov	100	100	Dec	100	100	Jan	600	100	Feb	700	200	Mar	1100	600	Apr	1800	800	May	2200	700	Jun	3400	1600
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Pollution Reduction Programs

There are currently no PRPs underway at the BSO. PRP19 and PRP20 have been incorporated into the Georges River Environment Improvement Program (EIP2).

EIP2 – Georges River Environment Improvement Program

The EIP for the Georges River incorporates:

- improvement projects as per the previous PRP19 requirements; and
- monitoring to verify improvements to aquatic health as the above projects are commissioned. Monitoring includes (based on previous PRP20 requirements):
 - quantitative sampling of macroinvertebrates;
 - ecological assessment processes using DNA extracted from sediment;
 - ecotoxicity testing;
 - in-stream water quality; and
 - laboratory water testing.

The EIP aims to improve the aquatic health of the Upper Georges River by reducing the concentration of pollutants discharging from LDP10 and monitor the changes to biota in-stream and within the sediment of the Upper Georges River as water quality improvement projects are commissioned.

In April 2019 the EPA issued a Notification of Intention to Make Licence Changes to EPL 2504. The EPA indicated an intention to revoke EIP2 by legal notice and replace it with a program of works that directs Endeavour Coal to achieve specific water quality limits at LDP10 and LDP24 within a defined timeframe. S32IMC has been in regular discussion with the EPA with regards to the Notification of Intention and is currently preparing a Program of Works that will be submitted to the EPA by the end of September 2019. A Georges River Community Stakeholder Meeting will be held mid-September 2019 prior to submitting the proposed program.

Under EIP2, S32IMC has held regular meetings with community stakeholders to review progress of PRP19 projects and monitoring results from PRP20 (Table 13).

The Progress Meetings include representatives from the EPA, Georges River Combined Councils Committee (GRCCC), Wollondilly and Campbelltown local councils, Georges River Environmental Alliance (GREA); National Parks Association of NSW (NPA NSW), Illawarra Coal Community Consultative Committee (IC CCC) and Western Sydney University (WSU).

lists the community stakeholder meetings that have been held since 2014.

Table 13: Summary of the Georges River Community Stakeholder Meetings held since 2014

Date	Type	Purpose of Meeting	Outcome
Spring 2014	Progress Meeting	Review of PRP20 results (Yr1) and discuss water strategy for PRP19.	Water strategy for PRP19 endorsed by the attendees.
Spring 2015	Progress Meeting	Review of PRP20 results (Yr2) and PRP19 update.	Consensus to establish a Technical Working Group to improve monitoring program under PRP20, develop water

Table 13: Summary of the Georges River Community Stakeholder Meetings held since 2014

Date	Type	Purpose of Meeting	Outcome
			quality limits and flow requirements for Point 10. Representatives from GRCCC and Western Sydney University nominated to attend.
Autumn 2016	Technical Group	Working 1 st Technical Working Group meeting to share monitoring results and establish water quality limits and flow principals for Point 10.	Monitoring results consistent between all parties. Agreed on river health objectives.
Winter 2016	Progress Meeting followed by 2 nd Technical Working Group meeting	Site visit to Appin West Water Filtration Plant and discuss water quality and flow principles for Point 10.	In principle support for flow and water quality and endorsed changes to PRP20 monitoring program (increased monitoring frequency etc.).
Winter 2016	Technical Group	Working Further development of flow and water quality principles.	Consensus to replace PRP19/20 with Environment Improvement Program. S32IMC to submit licence amendment application to include EIP, extend deadline for water quality limits under PRP19 and extend interim limits for Point 10 (with some concentration reductions). The stakeholders will be consulted on the proposed changes.
Spring 2016	Progress Meeting	Seek endorsement for submission of the EIP.	Endorsement from attendees to submit EIP. The attendees requested that the following be noted: <ul style="list-style-type: none"> • They recognised the value of the in-depth consultative process and the goodwill it generates; • The group appreciated the effort made by South32 to improve the water quality of the Georges River; • The group understood that the current targets need to be realistic and look forward to further planned improvements to pH and salinity.
Spring 2017	Progress Meeting	Tour of the Water Filtration Plant at Appin West and presentation on the EIP: <ul style="list-style-type: none"> • progress on Improvement projects; 	S32IMC may submit licence variation to extend dates for water projects and interim limits due to WFP commissioning date being delayed.

Table 13: Summary of the Georges River Community Stakeholder Meetings held since 2014

Date	Type	Purpose of Meeting	Outcome
		<ul style="list-style-type: none"> • recap on previous data; and • latest results. 	
Autumn 2018	Progress Meeting	Presentation on the EIP: <ul style="list-style-type: none"> • progress on Improvement projects; • recap on previous data; and • latest results. 	Additional licence variation required to extend the deadline for water improvement projects and Increase the flow from LDP24. 2017 monitoring report available on the S32IMC website.
Summer 2018/2019	Progress Meeting	Site Tour – Appin West WFP Update on water improvement projects. Discuss limits for LDP24.	Licence to be varied to cater for additional limits at LDP 24. S32IMC to apply for interim limits for the duration of the Production Proving Period. S32IMC to assess impacts of environmental discharge from LDP24 during WFP Production Proving Period.

6.4. GROUNDWATER

At Appin North, water make resulting from strata water inflow is collected in pits and low points in the underground workings where it is mixed with water delivered underground from surface storage. This strata water is brought to the surface either as moisture contained within the coal or as surplus underground water which is pumped to the surface. Once on the surface, the water is piped to the concrete settling tanks where it is used as the main supply for the WCCPP. There were no incidents of groundwater pollution within the report period.

At Appin West, mine water is pumped from the underground working to the surface for treatment in the Appin West WFP from where it is either blended and piped underground for use or discharged to the environment via LDP24.

Groundwater monitoring associated with hydrocarbon land contamination is discussed in Section 6.5.

6.5. CONTAMINATED LAND

Environmental Management

Appin East

As previously reported, during the 2010/11 reporting period, S32IMC investigated a small area of the Appin East site that had formerly been used as a fuel dispensing station. The decommissioned fuelling area was being excavated for road construction to upgrade coal loading facilities at the site.

Preliminary investigations found the decommissioned fuelling area contained elevated concentrations of Total Petroleum Hydrocarbons (TPH) C10-C36. S32IMC endeavoured to remove the majority of contaminated material from the decommissioned fuelling area to reduce environmental and health risks and ensure the site is suitable for continued industrial land use.

During the excavation and grading works, three previously unknown underground diesel storage tank pits were discovered. Leakage of diesel was evident in all three underground storage tank pits.

Validation sampling of the floor of the excavated area continued to show elevated concentrations of TPH but concentrations of aliphatic and aromatic hydrocarbon compounds were below the National Environment Protection Measure (NEPM) health investigation guidelines for human health. The consultant's validation report indicated that the land remaining in the investigation area and around the excavations is suitable for continued industrial land use based on application of the NEPM health investigation guidelines and that the remaining in-situ contamination is not perceived to compromise the ongoing use of the site for industrial purposes.

A monitoring program was established in 2011, with sampling conducted at four locations – T1, P1, P2 and P3. As per the BSO Project Surface Water Management Plan, boreholes are sampled six-monthly. T1 is used to monitor for potential contamination from the old Appin Tip which is located upstream of the site (Figure 5).

South32 are investigating the installation of a bioremediation land farm to further remediate and lower the risk of leaching within the previously identified and stockpiled soils.

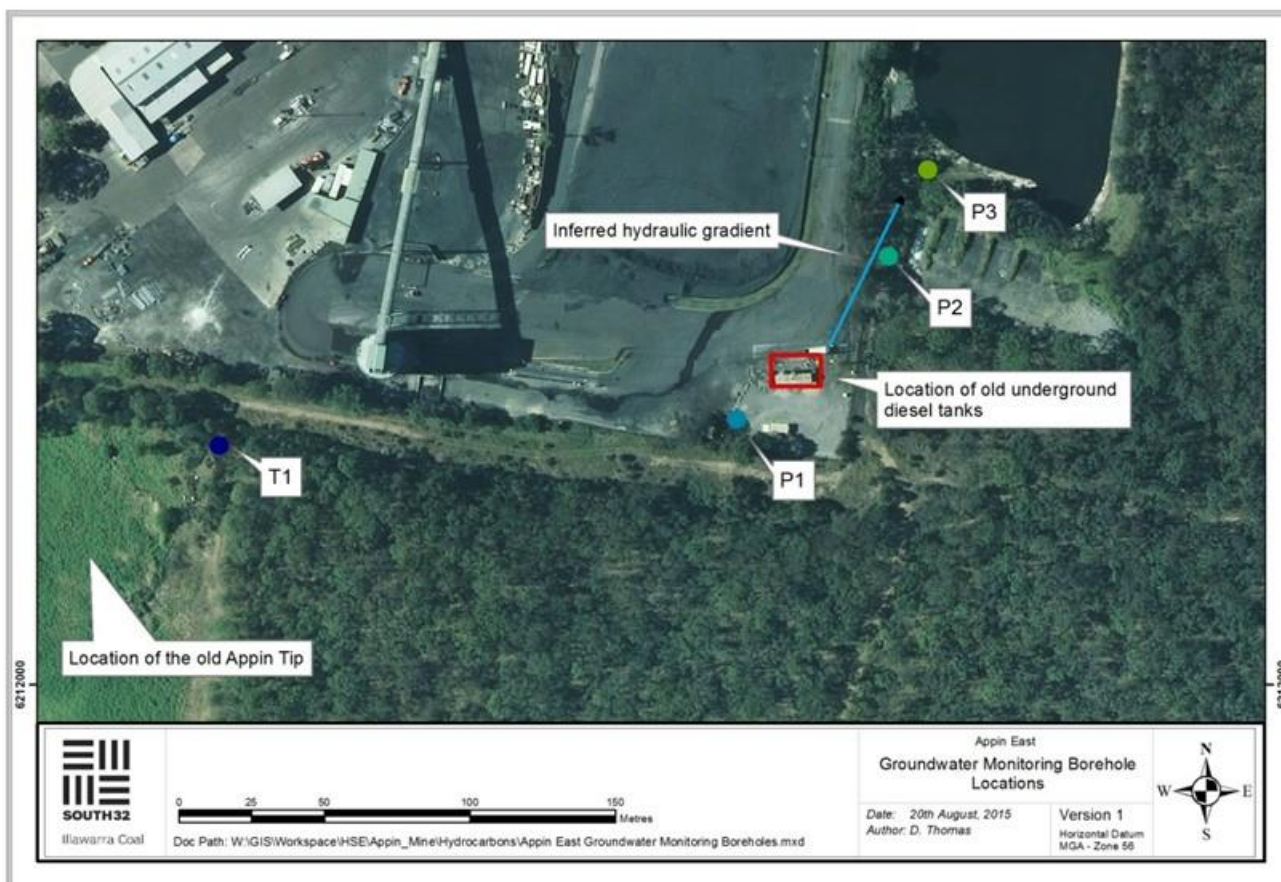


Figure 5: Groundwater Monitoring Bores locations at Appin East.

Appin North

As previously reported, during the 2009/10 reporting period Appin North and the WCCPP completed a site inspection to identify indicators of contamination and a risk assessment was conducted with relevant staff.

The site inspection identified a small groundwater seep which was discharging into one of the site dirty water catchment ponds (Pond P3). The lab analysis of the seep confirmed that the seep contained traces of hydrocarbons and therefore triggered the reporting requirements under Section 60 of the Contaminated Land Management Act 1997 (CLM Act).

A comprehensive contamination site assessment was completed by an environmental consultant during the 2010/11 reporting period. The assessment involved drilling of nine boreholes (BH1 to BH9), screening of 39

soil samples and laboratory analysis of 15 soil samples. Two groundwater bores (BH8 and BH9) were also installed as part of the investigation.

Analysis of the results suggested that the majority of the investigation area appeared to be free of contamination with only four of the samples indicating relatively low levels of contamination, three of which were located within 2.5 metres of a recently decommissioned and removed Underground Petroleum Storage System (UPSS). The concentrations were relatively low in the context of an industrial site and analysis indicates the concentrations were likely to be well below NEPM health investigation guidelines for the industrial land use. In addition, a preliminary assessment of the soils waste classification suggested that the soil is likely to be classified as general solid waste.

Environmental Performance

Appin East

Since the first round of monitoring, all samples across all sites have been uncontaminated with respect to BTEX (Benzene, Toluene, Ethylbenzene and Xylene).

During the FY19 reporting period, the results from all boreholes were below the observable limit for TPH (50 µg/L). Samples taken at three of the boreholes in the previous reporting period show elevated levels of TPH, however this is attributed to potential contamination during the sampling process as samples taken since show TPH below the observable limit. The most recent samples taken at T1 showed TPH levels below the Limit of Reporting, indicating that there was no potential contamination from the old Appin Tip.

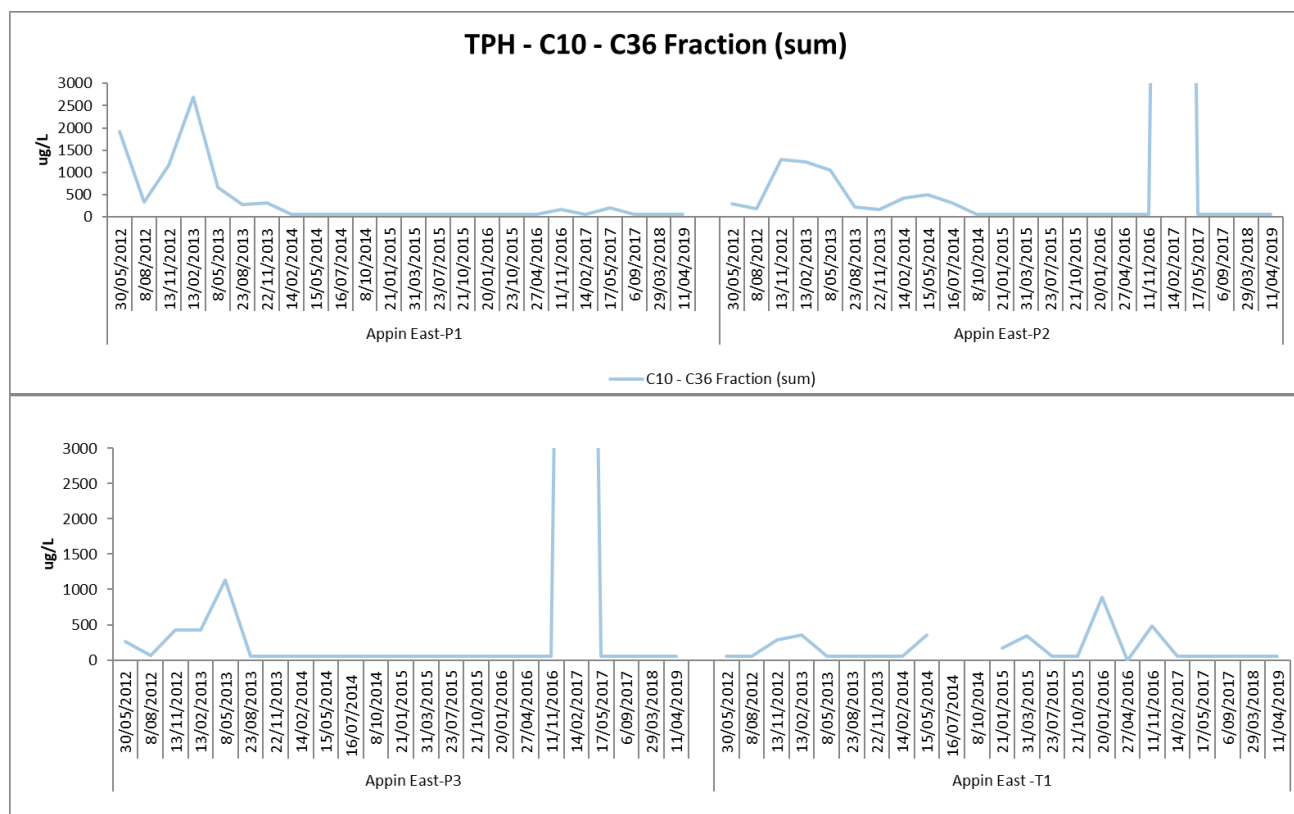


Figure 6: Total Petroleum Hydrocarbons (C10 – C36 Fraction (Sum)) since monitoring began in 2012 at Appin East

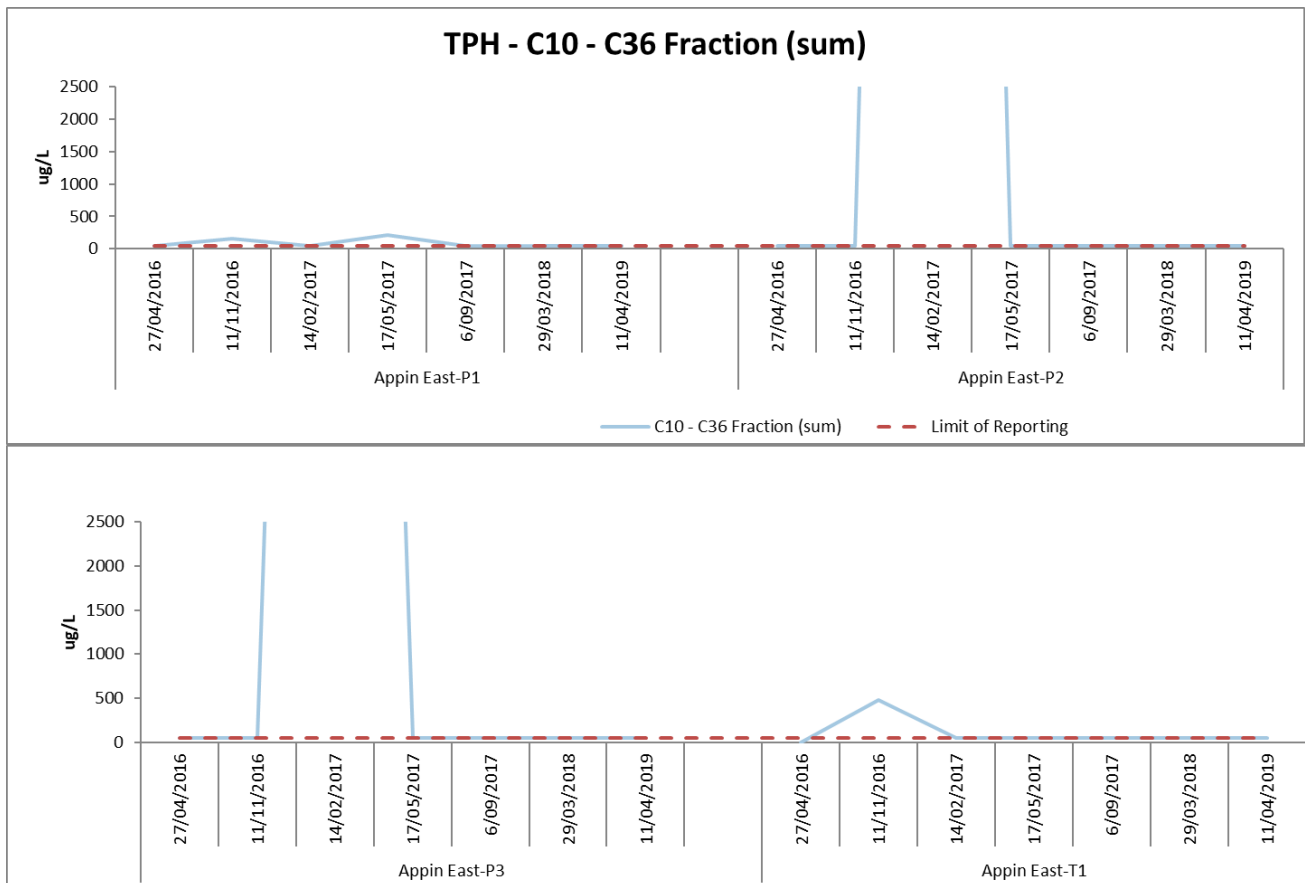


Figure 7: Short-Term Total Petroleum Hydrocarbons (C10 – C36 Fraction (Sum)) at Appin East

Appin North

Since the first sampling campaign, TPH concentrations had generally trended downwards in BH8. TPH concentrations had ranged between 2050 µg/L in Feb 2012 down to 260 µg/L in August 2012 (Figure 8). The carbon chain range for BH8 is between C10 – C28 indicating that diesel is a potential source of contamination at this location. This is consistent with data reported in the validation report which was submitted to the EPA in August 2010 which indicated there was a small hot spot of contamination remaining.

BH8 was unintentionally buried by coal wash material in FY18, meaning the hole was unable to be sampled. During the reporting period, the borehole was recovered and resampled in April 2019. The results indicate a C-fraction concentration of 200 µg/L. Further analysis will take place in October 2019.

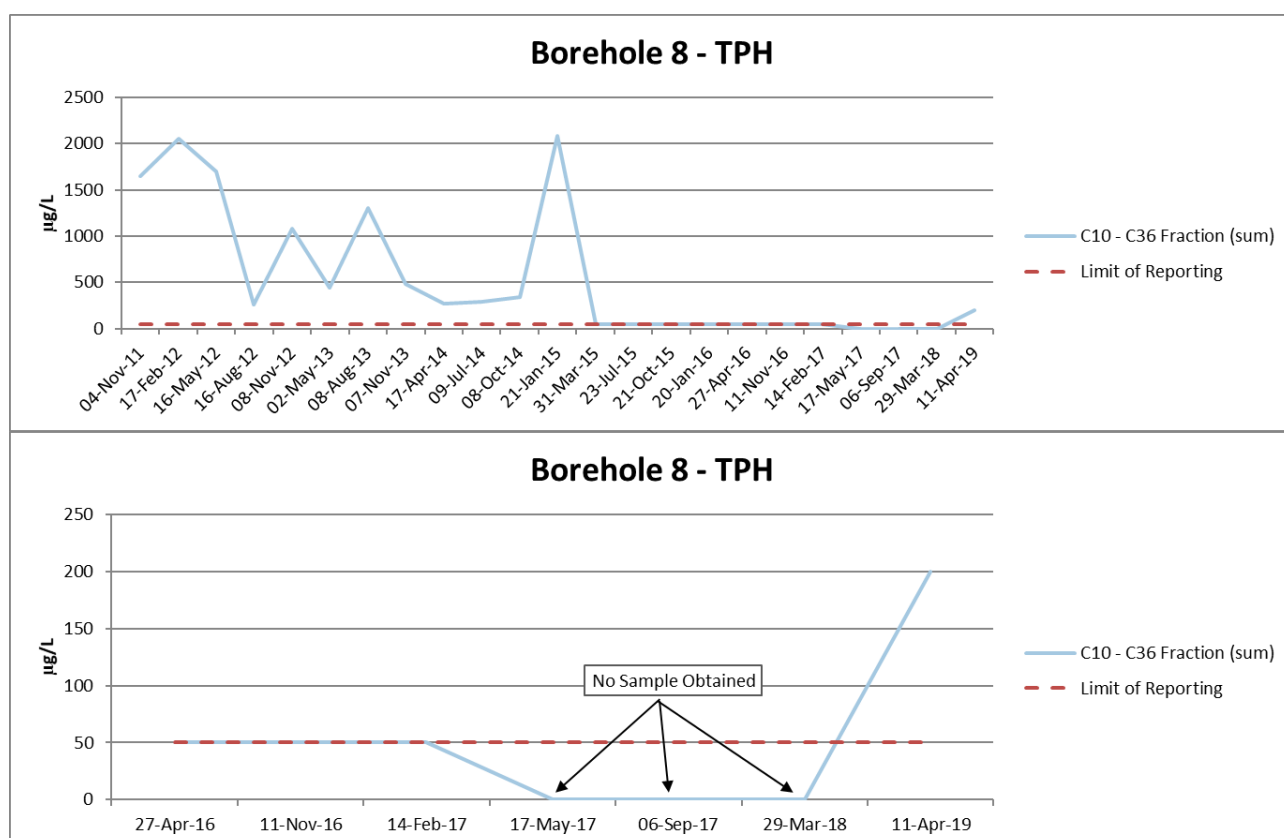


Figure 8: Long & Short-Term Total Petroleum Hydrocarbons (C10 – C36 Fraction (Sum) µg/L) in BH8 at Appin North.

6.6. WASTE

General Waste

General waste is segregated on all sites to maximise reuse and recycling opportunities in accordance with the BSO Waste Management Plan. The waste streams applicable to the BSO are specified in Table 14.

Table 14: Main waste streams for BSO

Waste Stream	Treatment
Timber	Recycled off site
Cardboard and paper	Recycled off site
Printer Cartridges	Recycled off site
Oils (mineral and synthetic)	Recycled off site
Oily waters	Recycled or disposed off-site
Steel and Scrap Metal	Recycled off site
Sewage effluent (treated)	Appin North – Treatment and irrigated onsite Appin West – Treatment and irrigated onsite Appin East – Disposed via town sewage system
Industrial filters	Off-site treatment and disposal
Bathroom water	Appin North - Spray irrigated to land on site Appin West - Spray irrigated to land on site

	Appin East –Connected to town sewerage system
Particulate filters	Off-site treatment and disposal
Hazardous waste	Off-site treatment and disposal
General Waste	Landfill and reused at ResourceCo (see Section Waste Reduction and Recycling)

Solid waste volumes generated at the BSO (including Appin West, Appin East and Appin North) for the reporting period are provided in Table 15.

Table 15: Waste Volumes – BSO

		General Waste	General Waste (ResourceCo)	Industrial Waste (Filters)	Timber	Metal	Cardboard	Commingle
Quantity FY15	(Tonnes)	1146	-	381	234	1349	30	17
Quantity FY16	(Tonnes)	1323	-	380	225	1344	20	17
Quantity FY17	(Tonnes)	1080	-	268	147	935	21	14
Quantity FY18	(Tonnes)	782	-	243	62	936	15	7
Quantity FY19	(Tonnes)	1023	424	352	75	967	22	17

Approximately 48% more waste was disposed as landfill for the reporting period when compared to the previous financial year. This is attributed to the increase in production levels following the prohibition notice in FY18.

Waste Reduction and Recycling

In February 2019, S32IMC and its main waste contractor began redirecting wastes from landfill, to a unique processing facility in an attempt to reduce the waste footprint of S32IMC. A Cleanaway and ResourceCo joint venture Resource Recovery Facility, located in Wetherill Park, processes dry non-recyclable waste. Combustible materials are turned into Processed Engineered Fuel (PEF) (Figure 9), diverting approximately 94% of waste material from landfill (note that this opportunity was not available for the full FY). There are two distinct grades of PEF manufactured, Low Calorific Value (CV) and High CV, which have independent finished product streams. Both processed engineered fuels comply with the requirement of the Clean Energy Regulator under the Emissions Reduction Fund.

Based on FY19 waste figures from BSO, 75 tonnes of timber and 22 tonnes of cardboard waste were generated on site. Redirecting this waste to the recycling facility is an alternative end-of-life treatment and final disposal of products opportunity. A portion of the 1023 tonnes of general sorted waste may also be sent to the recovery facility in future.

It is forecasted that in FY20 better yields will be achieved and higher volumes redirected to the recovery facility as segregation and acceptance standards are better understood and implemented on a site-based level.



Figure 9: Processed Engineered Fuel (PEF) Stockpile at the ResourceCo facility

Coal Wash

Coal wash is a by-product of processing ROM coal. During FY19, a total of 0.994 Mt of coal wash (from Dendrobium Mine and Appin Mine) was emplaced at the WCEA. S32IMC received approval to expand the WCEA (i.e. Stage 3) from DPIE on 20 December 2007. The Stage 3 Emplacement Area provides an additional 33.5 Mt of coal wash emplacement with an expected emplacement life of 10 to 15 years (based on projected coal wash volumes).

S32IMC received approval for Stage 4 of the WCEA on 22 December 2011. The Stage 4 Emplacement Area will provide an additional 59.4 million tonnes of coal wash emplacement with an expected life to 2048.

Table 16 outlines the capacity and status of each of the coal wash emplacement areas.

Table 16: West Cliff Emplacement Area – Capacity and Status.

Emplacement Stage	Estimated Capacity	Emplacement Status
1	4.6	Complete
2	20.8	Complete
3	33.5	Current
4	59.4	Not Yet Commenced

Coal Wash Management and Research

During the reporting period, S32IMC diverted approximately 402,000 tonnes of coal wash for beneficial uses in the local region (i.e. as an engineered fill in housing developments and Roads and Maritime Services (RMS) road infrastructure projects, and for the development of arterial and agricultural roads), with over 3.5 Mt diverted since 2009. S32IMC has a long-term agreement with Lend Lease at Calderwood, and with the RMS on the Albion Park Bypass project, that should see a large volume of coal wash diverted for beneficial uses in FY20 and beyond. S32IMC has also developed a pipeline of major projects that will require engineered fill for the next five years.

S32IMC is continuing with its Coal Wash Road Base Project, which utilises coal wash with other recycled materials such as fly ash to produce a material suitable for a variety of applications. S32IMC has aligned itself with three universities (University of Wollongong, University of Sydney and University of Newcastle) and two

other industry partners (RMS and Douglas Partners) and has been successful in securing an Australian Research Council (ARC) Linkage Project grant of \$590k to conduct research into the long-term performance of this material in roads and railways. The three-year project will be finalised in mid-2020.

S32IMC will continue to research, develop and implement alternative uses for coal wash in order to minimise the volume emplaced at the WCEA in future. S32IMC is currently supporting an Australian Coal Association Research Program funded project with the University of Wollongong and Commonwealth Scientific and Industrial Research Organisation (CSIRO), identifying opportunities to utilise coal wash in value added products (i.e. used for underground strata support or as a geopolymer binder in bricks and pavements).

Considerable previous work has been carried out on the alternative uses of coal wash, including ongoing monitoring of potential contaminants when coal wash is used for landfill or emplacement.

The economics, environmental and social factors of finding alternative uses for coal wash has changed. From initial discussions with users of coal wash and, in particular, fine tailings in previous and current trials, the major concerns and barriers to other potential uses include:

- Meeting the standards/legislation for the use of industrial wastes. In some cases, standards don't exist and there is a need to develop standards that will have widespread application.
- Testing of coal wash to ensure it is fit-for-purpose.
- Finding suitable low-cost economic binders and components for pasting and blending.
- Transport costs for moving coal wash to alternative processing sites.

Previous and current research carried out by the Faculty of Engineering and Information Science at the University of Wollongong, has delivered the below research projects:

- Brickmaking using coal wash - research in the 1990s, shown to be technically viable, but not economic at that time.
- Polymer linings for roadways - developed a strong understanding of the surface binding properties of coal wash and stone.
- Pasting trials at Peabody's Metropolitan mine to produce pillars, reducing the transport of fine coal wash over public roads with the inherent environmental issues.
- Pasting of Glencore's Liddell fine tailings to produce a cemented product that can be Dry Stacked in the mine void, potentially eliminating the need for future tailings dams, as well as reducing acid mine drainage and heavy metal leaching, so that the quality of groundwater is significantly improved.
- Producing manufactured soils by blending fine coal wash and green waste, carried out by SOILCO with technical support from the University of Wollongong and TAFE NSW Illawarra Institute.
- The Utilization of Washery Tailings: presentation to the Mining Engineers association of India, Ahmedabad, June 2017.
- A previous ARC project that blended fine coal wash with steelmaking BOS slag, to produce a "concrete", used successfully in extending the breakwaters at Port Kembla harbour.
- A current ARC project aimed at blending fine coal wash with bottom ash from power stations and bitumen, to produce a product suitable for road surfaces.
- Development of a novel hybrid fibre reinforced polymer tubular standing roof supports for longwall mining, which can use unscreened coal wash as a component of the fill material.

S32IMC will continue to be involved in research, the development of, and implementation of alternative uses for coal wash in order to minimise the volume emplaced at the WCEA in future.

Underground Coal Wash Emplacement

S32IMC submitted a revised Underground Coal Wash Emplacement Trial to the Department in 2013. The revised plan proposed to defer the trial for 5 years for the following reasons:

- S32IMC's focus on diverting material from surface emplacement via alternative beneficial uses continues to provide good outcomes;
- the declaration of Dharawal National Park has eliminated a significant area of potentially suitable roadways for underground coal wash emplacement; and
- the trial replicates what has been demonstrated by another Southern District Colliery.

During the reporting period S32IMC engaged a mining consultant with experience in underground coal wash emplacement to develop a conceptual Emplacement Trial. Areas of consideration for the consultant include methods of emplacement used elsewhere within the industry, technical aspects of underground emplacement within a high productivity mining setting, suitable underground storage areas, equipment suitability and estimates of capital and operating costs.

Sewage

During the reporting period, ongoing monitoring and inspections were conducted on the two BSO sewage treatment plants (Appin West and Appin North). Appin East is connected to town sewage.

There are Smith and Loveless Sewage Treatment Plants (STP) on the Appin West and Appin North sites that discharge into maturation ponds. The treated effluent is irrigated on site via LDP22 (Appin West) and LDP3/4 (Appin North). A waste water maintenance contractor is periodically used to assist with the operational aspects of the Appin West and Appin North STPs to minimise the likelihood of any issues occurring.

Monitoring of the STP effluent at both sites is completed monthly in accordance with conditions specified in EPL 2504. Monitoring results are reported annually via the EPA Annual Return and are made available to the public via the web based environmental monitoring report which is issued every 14 days.

Appin WAC Disposal

Weak Acid Cation Regenerate (WAC), a waste stream from the Appin WFP, is transported offsite to a licenced waste management facility. The total volume of WAC transported off-site during the reporting period was 4.06 ML, an increase of 0.23ML compared to the previous reporting period.

Appin Water Treatment Plant Biological Sludge

The Appin West backwash treatment plant was commissioned in April 2009. One of the by-products of the Backwash Treatment process is an organic sludge. The total volume of sludge reused as a soil conditioner offsite at the WCEA during the reporting period was approximately 396 kL.

6.7. THREATENED FLORA AND FAUNA

Environmental Management

Threatened flora and fauna communities at the BSO are managed in accordance with the following approved plans:

- West Cliff Coal Wash Emplacement Area Management Plan;
- Broad-headed Snake Management Plan;
- Southern Brown Bandicoot Management Plan;
- *Persoonia hirsuta* Offset Management Plan;
- Strategic Biodiversity Offset Plan;
- Ventilation Shaft No.6 Biodiversity Management Plan;
- Sandstone Shale Transition Forest Offset Management Plan; and
- Surface and Groundwater Quality Monitoring and Adaptive Management Plan for Water Sensitive Commonwealth Environmental Protection and Biodiversity Conservation (EPBC) Listed Species.

These plans include the management and mitigation measures for threatened species or habitats that occur on BSO sites and are available on the South32 website: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

Persoonia hirsuta is listed as “Endangered” under both the NSW Threatened Species Conservation Act and EPBC Act. A substantial population of *Persoonia hirsuta* is known to exist on the Appin North site. Several of the *Persoonia hirsuta* are located within operational areas such as high voltage transmission lines on site.

Acacia bynoeana is listed as “Threatened” under the NSW Threatened Species Conservation Act and “Vulnerable” under the Commonwealth EPBC Act. The species has previously been recorded along existing roads, tracks and disturbed areas at Appin North.

Pultenaea aristata is listed as “Vulnerable” under the NSW Threatened Species Conservation Act and the EPBC Act. The species has been recorded in areas of impeded drainage in woodland adjoining the main access road and in the vicinity of the southern extent of Stage 3 Emplacement Area. 41 *P. aristata* have been identified within the rehabilitating emplacement area (See Appendix A: Annual Rehabilitation Report).

Flora and fauna aspects associated with mine subsidence are detailed in Section 6.15.

Environmental Performance

Broad-headed Snake and Southern Brown Bandicoot

There have been no instances in the reporting period that required the implementation of mitigation measures for Broad-headed Snakes (as outlined in the approved management plan).

There were no instances in the reporting period that required implementation of mitigation measures for the Southern Brown Bandicoot.

Persoonia hirsuta - Ongoing Research and Conservation Management

In Summer 2018, S32IMC conducted its sixth round of annual condition monitoring of the *Persoonia hirsuta* population at Appin North. The monitoring was completed in accordance with the approved *P. hirsuta* Offset Management Plan, which complies with EPBC Approval Condition 2 of EPBC 2010/5350. The monitoring was completed over two days in December 2018 during the peak flowering period for the species. The report is included as Appendix C: Annual *Persoonia Hirsuta* Condition Monitoring Report.

In accordance with Condition 3 of EPBC 2010/5350, S32IMC is undertaking targeted research on *Persoonia hirsuta* including:

- habitat and demography;
- population genetics;
- seed biology, germination and recruitment and propagation, and
- pollination.

Refer to Appendix F: 2018/19 Nepean River BioBank Site Annual Report – *Persoonia Research Status and Strategy* for more detail.

In May 2019, 128 *Persoonia hirsuta* propagates (including seedlings and cuttings) were translocated to the *Persoonia* Offset at Appin North. The plants had been propagated by the Mt Annan Royal Botanic Gardens (RBG), some grown from seed, others from cuttings, collected from different locations. The aim of the translocation is to boost the population within the Offset to at least 44 individuals (back to baseline population) and develop a translocation procedure that can be applied to this species. The new plants are being closely monitored.

Shale Sandstone Transition Forest Offset/BioBank Site

The EPBC approval conditions for the BSO require a biodiversity offset of at least 44.9 ha of Shale Sandstone Transition Forest (SSTF), as well as an Offset Management Plan. In 2012, S32IMC identified a suitable site in Douglas Park NSW, within the Wollondilly Local Government Area. The land is approximately 86 ha in size which includes bushland, a transmission line easement, a small paddock, and several access tracks. The Offset area is comprised of two parcels of land, separated from each other by Douglas Park Drive.

In-line with the EPBC conditions at the time (2012), S32IMC provided an Offset Management Plan as well as ecological survey information. The original SSTF Offset Plan was approved by the Department of the Environment (DotE) in June 2013. In 2014, S32IMC was granted an additional 18 months to secure the Offset for long term conservation purposes.

The northern area is located within Lot 1 DP 1101129. It is bordered to the north by private property, the Cataract River to the east and south, and Douglas Park Drive to the west. The southern area is located within Lot 1 DP216237 and Lot 7 DP1082237. It is bordered by Douglas Park Drive to the east, Clements Creek to the north and west, and private property to the south. The Appin West Colliery Pit Top is located approximately 200 metres to the north on the opposite side of Clements Creek. The land is currently owned by S32IMC.

Past land use of the study area involved agricultural practices and probably timber cutting.

The study area is connected to other vegetated areas along the Cataract River to the north and Clements Creek to the south.

In October 2015, S32IMC made an application to the NSW Office of Environment & Heritage (OEH) to have the SSTF offset secured via a BioBanking Agreement under Part 7A Division 2 of the Threatened Species Conservation Act 1995. The BioBanking Agreement was finalised and executed on 1 February 2017. The Offset is now managed in accordance with the BioBanking Agreement, ID Number 215.

The 2019 Annual Report is provided as Appendix D: 2018/19 Appin West BioBank Site Annual Report.

Ventilation Shaft No.6 Offset

The Appin No. 6 Ventilation Shaft Site project approval required S32IMC to secure, manage and monitor an 8.7 hectare offset of Cumberland Plain Woodland (CPW) such that an improve or maintain outcome would be achieved for threatened biodiversity.

The offset area (MZ5) is located to the north of the Appin No. 6 Ventilation Shaft site on the Mountbatten Stud property at Douglas Park NSW (Plan 7). An initial assessment of the proposed offset area was conducted by Niche Environment and Heritage Pty Ltd (Niche) in December 2010 to assess the suitability of the site to be used as an offset for the unavoidable impacts associated with the development site. Niche determined that the site was CPW and, under management, would improve to benchmark condition over time. The initial inspection of MZ5 also resulted in the discovery of a population of the threatened plant, *Pimelea spicata* (spiked rice-flower), adding significant conservation value to the offset area.

In accepting the offset proposal, the DPIE and DotE provided a number of approval conditions relating to the reservation, management and monitoring of management actions within MZ5. One of the conditions required S32IMC to implement a formal monitoring program for both the management of the native vegetation on the site and the extent and health of the *Pimelea spicata* population.

The 2018 monitoring results indicate that, in relation to the floristic composition and improvement through the site, on average, the bushland on the site is outside of benchmark attribute values for the CPW but is showing trends towards benchmark values.

An assessment of the change in size and distribution of the threatened plant population of *Pimelea spicata* was undertaken as part of the 2016/17 monitoring program and was not repeated this year. The next scheduled census of the *Pimelea spicata* population is in 2021/22.

Recommendations in relation to the on-going management of the site include continued treatment of African Olive and African Boxthorn, seasonal spraying of Blackberry and continued treatment of exotic vines and exotic perennial grasses, and to consider management actions that may relieve environmental stress on the overstorey associated with potential Bell Miner-related dieback, such as undertaking primary weed management works and then thinning areas of Native Blackthorn (*Bursaria spinosa*).

One instance of unauthorized grazing occurred in May 2019. Cattle gained access to the offset area through a gate that had been intentionally left open.

Refer to Appendix E: 2018/19 Ventilation Shaft No.6 Offset Annual Monitoring Report.

Nepean River BioBank Site

Niche was commissioned by S32IMC to conduct a BioBanking assessment of an offset site along Menangle Road at Douglas Park NSW, which is now to be referred to as the Nepean River BioBank Site. The assessment was conducted in May and November 2016. BioBanking Agreement 382 was made on 8 May 2018. The site provides in-perpetuity management and security for 67.41 hectares of woodland and forest communities, including two critically endangered ecological communities, as well as habitat that supports the threatened Cumberland Plain Land Snail.

Refer to Appendix F: 2018/19 Nepean River BioBank Site Annual Report for a summary of the activities undertaken for the reporting period.

6.8. WEEDS

Environmental Management and Performance

Appin East and Appin West

Environmental inspections (which include weed identification) are undertaken at the Appin East and Appin West sites. When noxious weeds are identified they are removed and treated. Maps outlining the weed growth areas are provided to the grounds maintenance personnel to assist with identifying the target locations. During the reporting period active weed management included:

- regular spraying of weed zones by licenced contractors; and
- regular audits of the effectiveness of weed management activities.

Appin North

Ongoing grounds maintenance is undertaken by a contractor who has a regular schedule of work. The annual emplacement rehabilitation monitoring program includes the identification and proposed management strategies to control weed growth within the emplacement areas. Focus areas for weed control are determined through this program. Records of areas targeted are maintained for future reference. Targeted weed control within the emplacement area was undertaken by a contractor during the year which included slashing of perennial grasses.

6.9. BLASTING

No surface blasting activities were undertaken on site during the reporting period. Minor blasting activities underground are undertaken using approved management plans.

6.10. OPERATIONAL NOISE

Environmental Management

Noise across the BSO is managed in accordance with the approved BSO Noise Management Plan. The plan was prepared to satisfy Condition 5 of Schedule 4 of the Project Approval and details the relevant noise criteria, compliance procedures and controls relating to the mining operations.

The objectives of this plan are to:

- provide the framework for the responsible management of noise emissions associated with the project;
- describe the control measures for management of noise emissions;
- prevent adverse noise impacts on the amenity of local communities and environment;
- describe compliance criteria for noise for the project;
- describe compliance criteria exceedance assessment protocols;
- describe the noise monitoring program;
- comply with the relevant requirements of Environment Protection Licence (EPL) No. 2504 and the BSO Project approval;
- describe measures for the reduction of noise emissions; and
- comply with South32 and other relevant standards and requirements.

A copy of the Plan is available on the South32 website: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

Monitoring Program

A noise monitoring program has been developed to comply with Condition 5(f) of Schedule 4 of the Project Approval.

The objectives of the noise monitoring program are to:

- measure noise levels experienced by nearby residential receivers;
- assess the effectiveness of the existing noise controls;
- measure project related noise levels;
- detect any adverse developments in Project noise;
- measure Residential Background Level (RBL) noise; and
- acquire sufficient and reliable data to inform the assessment of compliance with noise criteria.

Assessment criteria have been established for each monitoring location, as outlined in the Noise Management Plan. The criteria enables an assessment of compliance to be made against the noise levels outlined in the Project Approval. The site-specific assessment criteria were developed using the following methodology:

- adoption of the most stringent noise levels as outlined in the Project Approval; and
- where relevant, the noise levels were adjusted (to take into account monitoring location verses receivers) using the noise contours from the BSO Noise Impact Assessment.

The program consists of attended monitoring using handheld portable monitors. The attended monitoring is undertaken at the nominated monitoring locations to confirm compliance.

Environmental Performance

Quarterly attended monitoring was conducted in accordance with the approved monitoring program for the reporting period. Results of the monitoring are reported online and summarised in Table 17.

The assessed noise levels generated from BSO were below the day, evening and night assessment criteria in Table 17 on all but three occasions, all of which did not exceed the criteria by more than 2 dB and therefore achieved compliance.

Table 17: Noise Survey Points and Results.

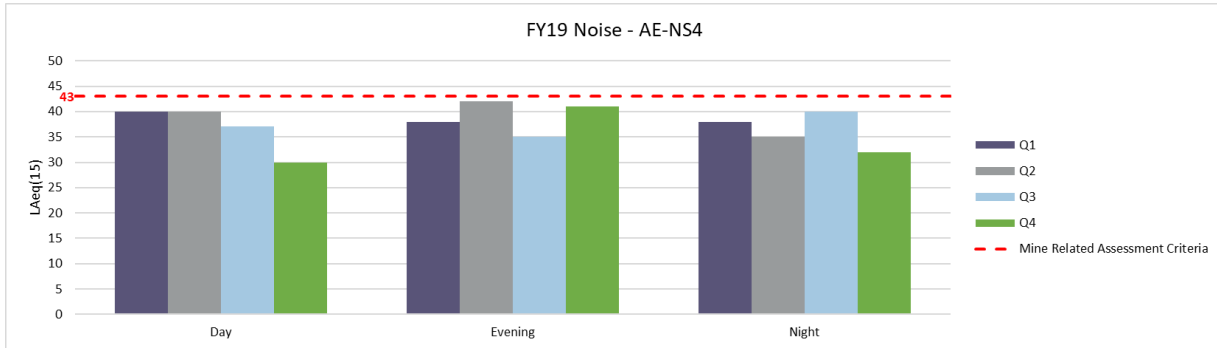
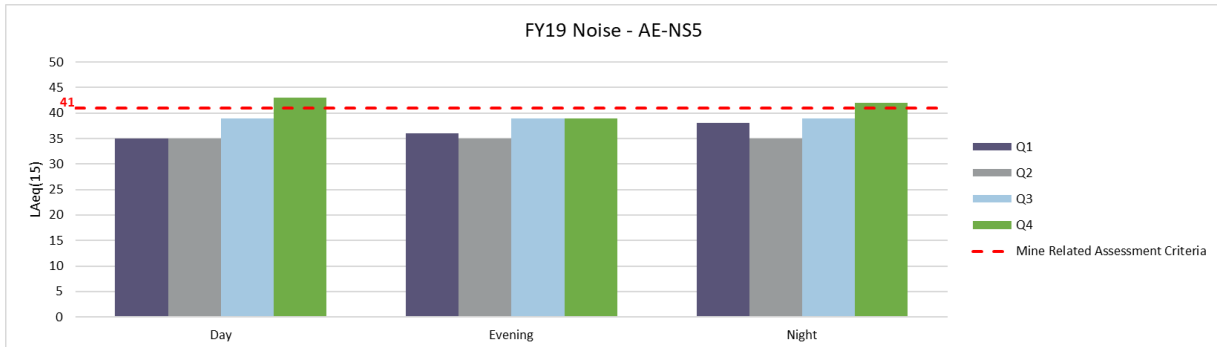
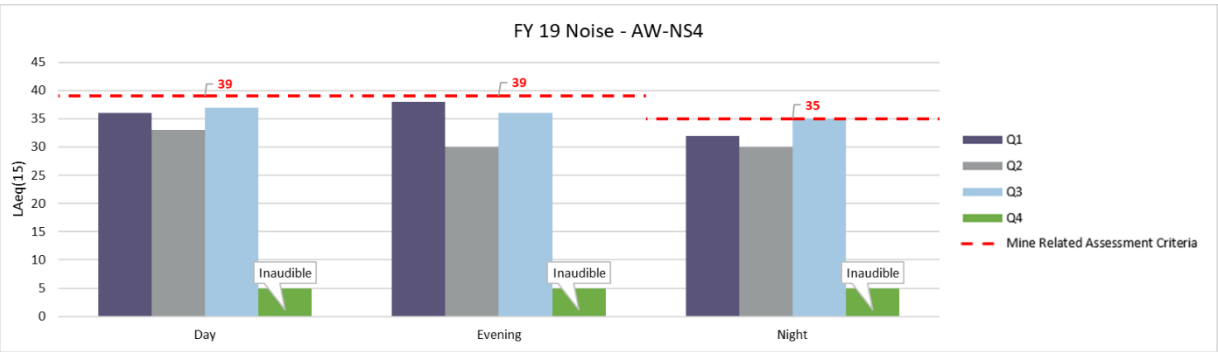
Survey Point ID	Type	Receivers	Assessment Criteria		Locality	Function	Data Summary	Comments
			LAeq (15 min)	LA1 (1 min)				
AE-NS4	Attended	Appin township	43	52	Located in paddock between Illawarra and Toggarai St North of Pit Top behind receiver 137	Noise from AE		Compliant
			(day, evening and night)	(night)				
AE-NS5	Attended	Appin No.1 and No.2 receivers	41	50	Northamptondale Road between the No.2 Shaft Site and power plant project and the nearest residential receivers in the South to East quadrant from site.	Noise levels between Shaft Site and the nearest residential receivers to the SE		Compliant (exceedence);
			(day, evening and night)	(night)				
<p>FY19 exhibited compliance across the assessment criteria. Day monitoring displayed a slightly higher than average trend, however still showing regular peaks and troughs associated with weather effects (temperature inversions, winds, etc.). Appin road still dominates as the overriding noise source at this location.</p> <p>Please see the below link for long term data illustrations. https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents</p>								<p>FY19 Site noise was clearly audible and was observed to be the dominant noise source across Q4. Following analysis of spectral data, a 2dB low frequency penalty was applied for low frequency characteristics. The survey point still achieved compliance as the measured noise level is not more than 2 dB above the criteria.</p> <p>Long term trend analysis shows the FY19 average higher than previously recorded, however this is most likely due to abnormal weather effects (temperature inversions), and delays in maintenance scheduling.</p> <p>Please see the below link for long term data illustrations. https://www.south32.net/our-business/illawarra-metallurgical-coal/documents</p>

Table 17: Noise Survey Points and Results.

AW-NS4	Attended	Appin West receivers					
		South-west of Appin West; and Appin West receivers near Hume Highway	39 (day and evening) 49 (night) 35 (night)	Ashwood Road, South-west of Appin West Pit Top	Noise level for Appin West Receivers South-west of Appin West; and Appin West Receivers near Hume Highway		

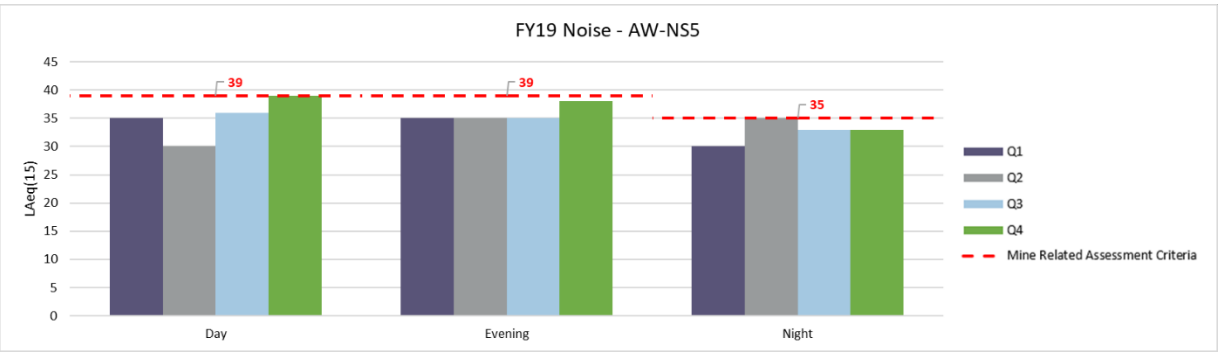


Compliant

FY19 exhibited compliance across the assessment criteria. Q4 returned 'inaudible' results across all sampling periods. This is likely attributed to favourable weather (winds). Day and evening monitoring displayed a lower-than-average trend when compared to historic data, however still showing regular peaks and troughs associated with long-term trends.

Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>

AW-NS5	Attended	All other Appin West receivers	39 (day and evening) 53 (night) 35 (night)	Between nearest residential receivers on Douglas Park Drive and the Appin West Pit Top	Noise level at AW property boundary; Noise levels between AW and nearest residential receivers on Douglas Park Drive		
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Compliant

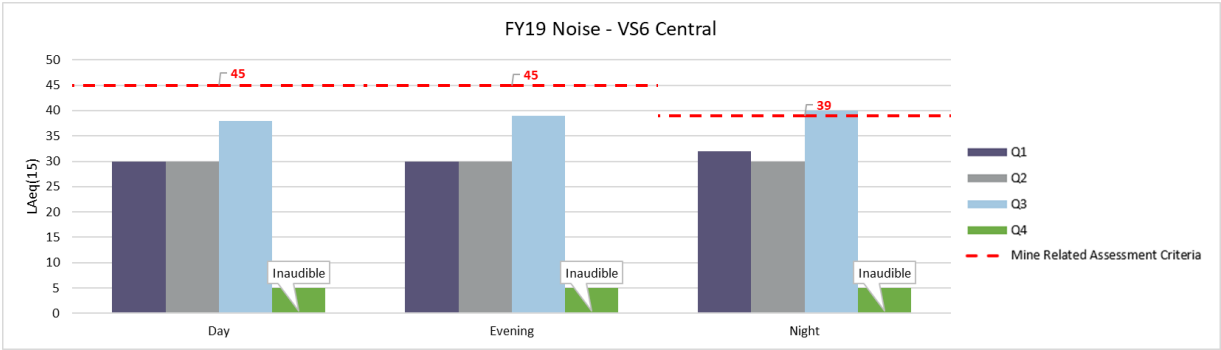
FY19 exhibited compliance across the assessment criteria.

Comparitively, 2019 had a higher-than-average 'Day' result, when compared to longer data trands. However, deviation is evident for this monitoring period, perhaps due to variability in daily pit top activity.

Please see the below link for long term data illustrations.
<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>

Table 17: Noise Survey Points and Results.

VS6 Central Attended Douglas Park Township and Receivers 45 day and evening) 49 (night) 39 (night) Duggan Street behind Douglas Park Public School Noise level between VS6 area and the nearest residential receivers to the West of site



Compliant (exceedence);

FY19 Q3 Site noise was clearly audible and was observed to be the dominant noise source across each sampling period. Noise measured was below the sleep disturbance criteria. The survey point still achieved compliance as the measured noise level is not more than 2 dB above the criteria. Q4 returned 'inaudible' results across all sampling periods.

Long term trend analysis shows the FY19 average higher than previously recorded averages, however this is due to abnormally high Q3 results.

Please see the below link for long term data illustrations.

<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>

6.11. VISUAL, STRAY LIGHT

The Appin West Pit Top is not directly visible by nearby residential receivers. Lighting located on the man and materials winder is partially visible from some residences at Wilton however it has not been raised by the community as an issue.

At Appin East, operations are not directly visible from nearby residential receiver locations. Lighting located at the top of the coal storage bins is partially visible from some residences however it has not been raised by the community as an issue.

Due to the relatively remote location of Appin North there are no significant issues regarding light pollution.

There were no lighting impacts from construction activities undertaken during the reporting period. Emissions of stray light continued to be assessed periodically in conjunction with other monitoring outside of daylight hours.

To minimise the visual disturbance from the Vent Shaft No.6 site, exposed areas have been revegetated. The most significant feature for minimising visibility of the site is the earthen noise barrier that was constructed using coal wash. This bund has also been revegetated.

6.12. ABORIGINAL HERITAGE AND NATURAL HERITAGE

Aboriginal and natural heritage at Appin North is managed in accordance with the approved West Cliff Coal Wash Emplacement Area Management Plan. This Plan outlines the management/mitigation measures relating specifically to each heritage site located within or in close proximity to the WCEA. A copy of the plan is available at: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

The location of all heritage sites at Appin North is shown on Plan 15.

Aboriginal and natural heritage aspects associated with subsidence from the underground mining activities are detailed in Section 6.15 of this report.

6.13. SPONTANEOUS COMBUSTION

No incidence of spontaneous combustion occurred within this reporting period.

Bulli Seam coal has a very low propensity to spontaneous combustion. Sampling programs (at BSO) are in place to detect any changes in coal quality that could potentially lead to spontaneous combustion occurring in coal stockpiles or refuse emplacements.

Routine and statutory inspections are used to identify any heating or spontaneous combustion events. In addition, a real-time carbon monoxide (CO) monitoring system exists, and all mine officials carry CO handheld monitors.

6.14. BUSHFIRE

The risk of bushfire at Appin West, Appin East and Appin North is managed by a combination of preventative and ready response activities. Bushfire management on both sites is achieved through the formation of a fire break around the site perimeter fence-line and the establishment of an extensive firefighting water pipeline around the sites (with booster pump facilities).

Appropriate site personnel are trained in emergency response and firefighting and have a supply of readily available firefighting equipment on the sites.

6.15. MINE SUBSIDENCE

Approvals

Appin Area 7 Longwalls 705 – 710

The Subsidence Management Plan (SMP) for Appin Area 7 Longwalls 705 to 710 was approved by the Department of Trade, Investment, Regional Infrastructure and Services (DTIRIS), now DPIE on 28 February 2012 (for Longwalls 705 and 706) and 28 September 2012 (for Longwalls 707 to 710). Longwalls 705 to 710 SMP is supported by a number of management plans addressing social, cultural, environmental and infrastructure aspects of the mining area.

Approval for the most recent variation to the Longwall 709-710 layout was received 4 October 2018.

During the reporting period, Appin Mine commenced extracting coal in Longwall 708A on 2 April 2019 and as of 30 June 2019 had extracted 558m, with 636m remaining.

Appin Area 9 Longwalls 901 - 904

The Extraction Plan (EP) for Appin Area 9 Longwalls 901 - 904 was approved by the Department of Planning and Environment (now DPIE) on 10 September 2014. The Longwalls 901 – 904 EP is supported by a number of management plans addressing social, cultural, environmental and infrastructure aspects of the mining area.

S32IMC applied to the DPIE to vary the EP Approval for Longwalls 901 - 904 on 24 March 2015 to shorten the commencing end of Longwall 901 by 418m. The Division of Resources and Energy (now Resources Regulator) approved the variation on 29 April 2015. The latest longwall 903-904 variation was approved 21 March 2019.

Extraction of Longwall 902 commenced on 12 May 2018 and was completed on 3 April 2019, having extracted 2144m.

Appin North Area 5 Longwalls 37 – 38

The Appin North Area 5 Extraction Plan (EP) for Longwalls 37 and 38 was approved by the Department of Planning and Infrastructure (now DPIE) on 24 March 2014. SMP approval was granted by DTIRIS on 28 March 2014. The EP is supported by a number of management plans addressing cultural, environmental and infrastructure aspects of the mining area.

Longwall 38 was completed on 1 February 2016. The area has undergone post-mining monitoring in the reporting period as part of the approved monitoring program.

Appin Area 7 and 9 Monitoring and Management Programs

Surface features in the vicinity of mining during the reporting period include:

- the Nepean River and associated tributaries;
- Harris Creek and associated tributaries;
- cliffs, rocky outcrops and steep slopes;
- Aboriginal and European heritage; and
- buildings and infrastructure.

Monitoring activities within the SMP area includes:

- water flow, pool water levels and water quality monitoring;
- photographic and observational monitoring to identify mining-induced fractures, strata gas releases, iron staining and rock falls;
- aquatic ecology monitoring;
- Aboriginal and European heritage items; and
- built features.

The results of these monitoring programs are provided below.

Landscape Features

During the reporting period monitoring of environmental features was carried out in accordance with the Appin Longwall 705 to 710 SMP and Longwall 901 to 904 EP. Monitoring was conducted within the zone of influence during baseline, mining and post-mining periods (where applicable).

No new gas release zones were identified during the extraction of Longwall 707A and Longwall 707B. Furthermore, no previously recorded gas zones were active during the reporting period.

Six previously unobserved gas release zones were observed in the Nepean River, during the extraction of Longwall 902, by the S32IMC Environmental Field Team (EFT) during routine inspections (AA9_LW902_001 and AA9_LW902_006). Additionally, 18 of the 26 gas release zones attributed to Longwall 901 were observed as active during the reporting period. Each gas zone had an estimated emission rate of <3000 L/min, and triggered a TARP Level 1 response under the Water Management Plan.

For all observed impacts, the appropriate TARPs were applied, actions implemented, and key stakeholders notified as required by the approved SMP and EP. Predicted and observed impacts to landscape features associated with Longwalls 707A, 707B and 902 are summarized and presented in Table 18. The relevant End of Panel Reports provide more detailed analysis of impacts to landscape features as a result of longwall extraction.

Table 18: Predicted vs Observed Impacts for Landscape Features for Area 7 and Area 9

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Nepean River water levels	Unlikely for any significant change in water level along the Nepean River	NR0 decline in water level relative to benchmark. Other sites had water levels within baseline range (HGEO 2019). Recommended assessment not possible due to discontinued flow monitoring by WaterNSW.	Further analyses will be conducted and presented in the next End of Panel Report.
Surface waters in the mining areas	Potential for surface water diversion directly above or adjacent the mining area	No impacts observed	N/A

Table 18: Predicted vs Observed Impacts for Landscape Features for Area 7 and Area 9

Gas releases	Likely that gas emissions could occur in the Nepean River	Gas releases identified for Area 9 only	<ul style="list-style-type: none"> Continued monitoring program Reported impacts to key stakeholders Summarised impacts and recorded in End of Panel Report and Annual Review
Iron staining	Minor iron flocs are expected to occur in the Nepean River. No change in water quality is predicted	No impacts observed	N/A
Fracturing	Minor fracturing may occur in the bed of the Nepean River	No impacts observed	N/A
Creeks	Possible for localised increase in ponding, flooding or scouring	No impacts observed	N/A
Cliffs	Possible minor isolated rock falls. Unlikely that any large cliff instabilities would occur	No impacts observed	N/A
Steep Slopes	Unlikely that there would be any significant impacts to steep slopes	No impacts observed	N/A

Surface Water

Inspections carried out by the EFT include monitoring for iron staining and gas releases in the river and tributaries. No areas of iron staining were identified during the reporting period.

Data for pH, electrical conductivity, dissolved oxygen, total iron and total manganese are compared at sites upstream and downstream of mining in order to identify any significant water quality change. TARP limits have been established for water quality adjacent to the mining and downstream at monitoring sites.

The Longwall 902 reporting period was characterised by widely variable water quality in the Nepean River. During the reporting period, Level 1 and 2 TARP levels have been triggered for electrical conductivity at NR0, SW3(NR1) and NR2 and Level 1 TARP levels have been triggered for pH at NR0 and SW3 (NR1). Although the observed increases in water salinity may be due to the unusually low rainfall during 2017 and 2018, similar deviations from the baseline mean were not observed at the upstream control site NR110. The TARP triggers occurred between May 2018 and March 2019 and surface water quality in the Nepean River has since returned to baseline levels.

No TARP trigger levels were identified to date for Longwall 707. Table 19 provides a summary of the predicted and observed impacts for surface waters during the reporting period.

Table 19: Predicted vs Observed Impacts for Surface Water for Area 7 and Area 9

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Nepean River	Unlikely for any significant change in water level along the Nepean River	No mining-induced water level change has been observed Flow monitoring has been discontinued by WaterNSW (recommenced January 2018) Decline in water level identified at site 'NR0' was	Reference datum at 'NR110' has been reinstalled, as per recommendation from the Surface Water Assessment

		also identified at reference site 'NR110' The cause to the observed reduction in water level is uncertain due to dislocated reference datum at 'NR110'	
	Potential for surface water flow diversion is very low	No surface water flow diversion has been observed	N/A
	Strata gas emissions into the river likely, with some associated reduction in dissolved oxygen possible	Gas zones observed in the Nepean River. No associated reduction in dissolved oxygen has been observed	<ul style="list-style-type: none"> Continued monitoring program Reported impacts to key stakeholders Reported in End of Panel Report and Annual Review
	Low likelihood of ferruginous springs. Significant impacts on Nepean River pH, iron and dissolved oxygen not predicted	No new iron staining or seeps identified	N/A
Harris River	Mine subsidence induced ferruginous springs possible, with potential impacts on water quality	No subsidence induced fracturing or iron staining observed in Harris Creek	N/A

Groundwater

Piezometer and bore monitoring data have been used to determine pre-mining groundwater levels and quality. Monitoring undertaken includes deep groundwater (e.g. Bulgo Sandstone and coal seams) and the Hawkesbury Sandstone (shallow groundwater). Targeted monitoring to a depth of approximately 10 m below the level of the Nepean River has been established to determine if there are any changes to groundwater contributions to base flow of the river resulting from mining.

Groundwater data is collected during the mining period, then analysed and interpreted for reporting in the End of Panel Report as outlined in the relevant SMP and EP.

Extraction of Longwall 707 was completed on 19 June 2018. A comprehensive groundwater assessment is included in the Longwall 707 End of Panel Report.

Extraction of Longwall 901 was complete on 8 September 2017. A comprehensive groundwater assessment was included as part of the Longwall 901 End of Panel Report. Extraction of Longwall 902 was completed on 31 March 2019. A comprehensive groundwater assessment is included in the Longwall 902 End of Panel Report. A summary of the groundwater observations in Areas 7 and 9 is below. The location of groundwater monitoring bores can be found in Plan 20.

Monitoring Sites in Area 9

No adverse interconnection of aquifers and aquitards has been observed within 20 m of the plateau surface and no increased rate of groundwater recharge into the plateau has been observed as a result of Longwall 702 - 707 extraction.

Borehole EAW5 [S1913] is located approximately 2.2 km north to northwest of Longwall 707. Pressure head declined linearly at EAW5 in the Hawkesbury Sandstone and a clear difference in the behaviour of groundwater pressures above and below the Bald Hill Claystone was observed. This is evidence of the contiguous nature of the claystone across the Appin Area 7 region, and evidence of the pre-mining separation between shallow and deep aquifer heads.

No TARP trigger levels related to aquifer/aquitard interconnection or changes in recharge have been reached as a result of Longwall 707 extraction.

Borehole EAW7 (S1936) is located over Longwall 706. Only one piezometer, installed 65 m below ground level, was operational during extraction of Longwall 707. The remaining piezometers were disconnected prior

to Longwall 706 extraction for safety reasons. No water head changes associated with Longwall 707 extraction were observed.

No groundwater level reduction TARPs were triggered during extraction of Longwall 707 in any private bores and no changes outside of predictions for the vibrating wire piezometer monitoring bores occurred.

A decline in groundwater pressure occurred in the Hawkesbury Sandstone at monitoring bore S1941, located 630 m from Longwall 902. The observed groundwater pressure reductions are within the predicted range for the upper two sensors and greater than the predicted range for the lower sensor (but less than the level 1 TARP). No significant change in groundwater chemistry is noted for the reporting period.

A daily water balance is maintained by S32IMC. The balance tracks daily volumes of water pumped into the mine (supply), within the mine, and from the mine into storage and/or discharge. The rate of groundwater inflow to the Appin Mine workings is determined by subtracting the water supply volume (to Area 7 and Area 9) from the total volume of water pumped to storage. The TARP level for mine inflow is based on the 20-day moving average of inflow to Area 7 and Area 9 separately. The Area 9 20-day moving average mine inflow fluctuated between approximately 0 to 1.7ML/day during the extraction of Longwall 902, below the TARP Level 1 trigger of 2.7 ML/day. The Area 7 20-day moving average mine inflow did not reach or exceed the TARP level.

Aquatic Ecology

Within the Appin Areas 7 and 9 mining domain, significant aquatic habitat is limited to the Nepean River and its tributaries. Four species of aquatic macrophytes and five species of native fish were identified in the Environmental Impact Statement and SMP studies. No threatened fish or invertebrate species were identified during field surveys. The area is potentially within the range of two threatened species (Macquarie Perch and Sydney Hawk Dragonfly) listed under the Threatened Species Conservation Act.

Mine subsidence can result in fracturing and a net vertical uplift of the river bed, resulting in reductions in water depth. It was predicted that these effects could impact flow, connectivity and water quality and could also reduce availability of aquatic habitat. The Nepean River within the mining areas is generally a deep, continuous slow-flowing pool created by the damming effect of Douglas Park and Menangle Weirs. This would minimise the risk the potential impacts on aquatic ecology resulting from reduced water flow and / or depth caused by any fracturing or net uplift of the river bed. Any impacts on water flow would be expected to be minimal due to the flooded nature of the river system.

The latest round of aquatic ecology monitoring was completed in November 2018, as part of the ongoing aquatic ecology monitoring program. At this time, extraction of Longwall 707B had been completed and Longwall 902 had commenced. The assessment focused on the effects of extraction on aquatic habitats and biota in relevant sections of the Nepean River, comparing results from surveys undertaken since 2002. Monitoring undertaken by S32IMC and specialist consultants during extraction of Longwalls 705, 706, 707A, 707B, 901 and 902 identified gas releases in the Nepean River. No fracturing, changes in water levels and flow or changes in water quality have been attributed to mining.

There were no observed impacts to indicators of aquatic ecology (number of taxa and biotic indices derived from macroinvertebrate sampling) that could be attributed to extraction of Area 7 and Area 9 longwalls. This was expected, given that no more than minor gas releases have been observed in the Nepean River associated with mining. No changes in water quality, water level or stream flow due to mining were observed due to these releases. Statistically significant differences in these indicators among surveys and reaches on the Nepean River, where present, were attributed to natural spatial and temporal variation, rather than mining.

Similarly, there was no evidence of any changes to fish and aquatic macrophytes attributable to mining. The fish assemblage sampled in the Nepean River following the commencement of extraction of these longwalls was comparable with that sampled prior to extraction and no fish kills or any other observations that may suggest an impact due to mining have been observed.

Over the course of the monitoring program, large changes in the distribution of aquatic macrophytes have occurred. There is no evidence that these changes are attributed to mining. Changes to bank and river bed morphology due to flood events appears to have resulted in substantial localised changes in the coverage of

macrophytes independent of mining. Refer to the relevant End of Panel Reports for greater analysis of aquatic ecology within the mining area.

A summary of predicted and observed impacts on aquatic ecology for the reporting period for Appin Area 7 and Appin Area 9 is provided in Table 20 and Table 21 respectively.

Table 20 : Predicted vs Observed Impacts for Aquatic Ecology for Appin Area 7

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Aquatic Ecology	Exposure of wetted substrata in some limited shallow areas of the river, potentially arising due to minor reductions in water depth caused by net uplift of the river bed	No reported change in water level apart from the normal fluctuations associated with rainfall and WaterNSW releases. No exposed wetted substrata observed	N/A
	Potential water loss or reduced flow due to fracturing of the river bed. However, this was not expected to result in significant water loss or reduced flow due to the flooded nature of this reach	No fracturing observed in the Nepean River and no water loss observed	N/A
	Components of aquatic ecology such as flow characteristics, connectivity and water quality should not be impacted by any predicted subsidence	No reported surface water flow diversions, impacts on water quality or connectivity of aquatic plant components	N/A
	Alterations to the composition of macrophyte beds due to small reductions in water depth. However, this is not expected to have a significant impact on the overall habitat in the survey area	No alterations to the composition of macrophyte beds observed. No mining induced dieback has been observed though some changes in distributions likely associated with recent high flow events and associated scouring of banks.	N/A
	Possible that gas emissions may have impacts on water quality	No evidence of significant impacts on water quality due to gas releases	N/A
	Potential impacts on fish and macroinvertebrates due to mine subsidence are considered unlikely	No evidence of mining induced impact on either fish or macroinvertebrates	N/A

Table 21: Predicted vs Observed Impacts for Aquatic Ecology for Appin Area 9

Location	Attribute	Predicted Impacts	Observed Impacts	Completed Actions
Nepean River	Ponding, flooding and scouring of stream banks	There are unlikely to be any measurable impacts on the availability or connectivity of aquatic habitats in the downstream reach of the Nepean River due to its flooded nature and very low gradient.	None identified during observations of aquatic macroinvertebrates, fish and aquatic macrophytes at aquatic ecology monitoring sites in 2018.	N/A

	Fracturing of bedrock and diversion of surface flows	It is considered unlikely that there would be any net loss of water from the catchment. No significant changes in the quantity or quality of permanent aquatic habitat.	None identified during observations of aquatic macroinvertebrates, fish and aquatic macrophytes at aquatic ecology monitoring sites in 2018.	N/A
	Gas releases	Minor gas releases, associated iron precipitate and reductions in concentrations of dissolved oxygen are likely to occur due to extraction.	None identified during observations of aquatic macroinvertebrates, fish and aquatic macrophytes at aquatic ecology monitoring sites in 2018.	N/A
Drainage Lines	Fracturing of bedrock and diversion of surface flows	Effects to aquatic habitat and biota due to any diversion of flows and draining of pools in drainage lines would be minimal, due to the limited aquatic habitat provided by these areas.	No fracturing observed in drainage lines.	N/A

Terrestrial Ecology

Assessments of significance have been completed for an endangered community and threatened flora and fauna species in the mining area. The assessments focused on flora and fauna that could potentially be impacted by subsidence. The following aspects were assessed:

- native vegetation communities;
- threatened flora; and
- threatened fauna and fauna habitat.

Plant communities, fauna habitats, threatened species, populations and ecological communities have not been significantly impacted by subsidence during the reporting period as outlined in Table 22.

Table 22: Predicted vs Observed Impacts for Terrestrial Ecology for Area 7 and Area 9

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Vegetation communities and fauna habitat	Minor impacts to riparian habitats on the Nepean River through changes in water levels, desiccation, gas release and minor fracturing	No impacts observed	N/A
	Minor impacts to vegetation due to rock falls, an increase in ponding, flooding or cracking to drainage lines and creeks	No impacts observed	N/A
Threatened flora	Unlikely that any threatened flora would be significantly impacted	No impacts observed	N/A
Threatened fauna	Unlikely that threatened fauna or habitats will be significantly impacted	No impacts observed	N/A

Cultural Heritage

European Heritage

No historical sites are located above the mining area.

Aboriginal Heritage

No impacts to Aboriginal heritage sites were recorded during the reporting period.

Surface Infrastructure

Surface infrastructure located within or near the mining areas includes the following:

- Optical fibre cables (Telstra, Optus, NextGen and Powertel).
- Main Southern Railway and associated infrastructure.
- HW2 Hume Highway and associated infrastructure.
- Local roads and drainage culverts.
- Power Infrastructure.
- Copper telecommunications cables.
- Potable water and Sewerage networks.
- Building structures, pools, water tanks and farm dams.
- Groundwater bores.
- Heritage structures.
- Nepean Twin Bridges at Douglas Park.
- Pumps in the Nepean River.
- Upper Canal, Cataract Tunnel and associated infrastructure.
- Survey Control Marks.

A summary of the observed impacts during the reporting period for Appin Area 7 is provided in Table 23. Impacts attributed to Appin Area 9 are summarised in Table 24.

Table 23: Predicted vs Observed Impacts for Surface Infrastructure for Area 7 in FY19

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Local Road	Minor cracking and localised heaving of the road surface in some locations above the longwall	Minor cracking observed in the road in the location of a culvert near the commencing end of LW707A and cracking and deterioration of pavement near top of hill above the longwall.	N/A
HW2 Hume Highway	No impacts on the safety or serviceability of the highway after the implementation of the management strategies	No adverse impacts on safety or serviceability. Humps formed on both carriageways.	Remediated by re-shaping of the pavement surface as part of Management Plan responses.
Main Southern Railway	No impacts on the safety or serviceability of the railway after the implementation of the management strategies	Changes in track geometry recorded and remediated in accordance with the established Management Plan. No adverse impacts to safety and serviceability	Track geometry realigned in accordance with Management Plan.
Douglas Park Twin Bridges	Impacts unlikely after the implementation of the TARP	No reported impacts	N/A
Moreton Park Road Bridge (south)	Impacts unlikely after the detailed investigation, analysis and implementation of the TARP	No reported impacts	N/A
Power Infrastructure	Impacts unlikely, but minor mitigation measures may be required	No reported impacts	N/A
Copper telecommunications cables	Impacts unlikely	Small levels of signal loss measured	N/A
Optical fibre cables	Impacts unlikely with the implementation of the management strategies including OTDR monitoring and mitigation	Small levels of signal loss measured and a high loss / break in DGPK 102 Loss of signal along the Telstra optical fibre cable adjacent to the Main Southern Railway at 69.3 km.	High loss / break in DGPK 102 was reported to relevant authorities and asset owners and has been fully repaired The cable was excavated and replaced with a new 100 m section of cable in conduit.
Building structures	Typically Category A Tilt Impacts, with 1 x Category B Tilt Impact. Typically Category 0 Strain Impacts, With 6 x Category 1 Strain Impacts, 4 x Category 2 Strain Impacts	Building structures remained in safe and serviceable conditions during the extraction of LW707A and LW707B.	Claims that have been lodged are being managed by Subsidence Advisory NSW (SA NSW) through the relevant legislation
Pools	In ground pools could be more susceptible to ground strains	No reported Impact	Claims that have been lodged are being managed by SA NSW through the relevant legislation
Water tanks	Impacts unlikely	No reported impacts	Claims that have been lodged are being managed by SA NSW through the relevant legislation

Table 23: Predicted vs Observed Impacts for Surface Infrastructure for Area 7 in FY19

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Farm dams	Potential for minor cracking or leakage	Gas release observed in one private dam (Site AA7_LW707_001) and soil cracking observed around another private dam (no adverse impacts)	S32IMC delivering water as required
Heritage structures	Impacts unlikely	No reported impacts	N/A
Groundwater bores	Potential for blockage or reduction in the capacity of the groundwater bores	Gas release and iron staining to water expelled from borehole GW102584.	Borehole capped and Water Management Plan developed for the property.
Pumps in the Nepean River	Impacts unlikely	No reported impacts	N/A
The Upper Canal, Cataract Tunnel and associated infrastructure	Impacts unlikely	No reported impacts	N/A
Survey control marks	Small far-field horizontal movements which could require re-establishment	Small far-field horizontal movements	N/A

Table 24: Predicted vs Observed Impacts for Surface Infrastructure for Area 9 in FY19

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Local Road	Minor cracking and localised heaving of the road surface in some locations above the longwall	No reported impacts (not directly mined beneath by LW902)	N/A
Main Southern Railway	No impacts on the safety or serviceability of the railway after the implementation of the management strategies	Changes in track geometry recorded and remediated in accordance with the established Management Plan. No adverse impacts to safety and serviceability	Track geometry realigned in accordance with Management Plan.
Douglas Park Twin Bridges	Impacts unlikely after the implementation of the TARP	No reported impacts	N/A
Moreton Park Road Bridge (south)	Impacts unlikely after the detailed investigation, analysis and implementation of the TARP	No reported impacts	N/A
Power Infrastructure	Impacts unlikely, but minor mitigation measures may be required	No reported impacts. Tilt of a private pole was observed; however, investigations found that it was not mining related	N/A
Copper telecommunications cables	Impacts unlikely	No reported impacts	N/A
Optical fibre cables	Impacts unlikely with the implementation of the management strategies	No reported impacts	N/A

	including OTDR monitoring and mitigation		
Potable Water network	Impacts unlikely, but minor mitigation measures may be required	No reported impacts	N/A
Sewerage Network	Impacts unlikely, but minor mitigation measures may be required	No reported impacts	N/A
Building structures	Typically Category A Tilt Impacts, with 1 x Category B Tilt Impact. Typically Category 0 Strain Impacts, With 6 x Category 1 Strain Impacts, 4 x Category 2 Strain Impacts	Houses have remained in safe and serviceable conditions. There were three claims submitted to SA NSW relating to the houses: 1. Differential movement between a veranda slab and a residential structure (not occupied); 2. minor (non-structural) cracking inside another house; and 3. Sticky internal doors and leaking bathroom waterproofing (house with an existing claim from LW901).	N/A
Pools	In ground pools could be more susceptible to ground strains	One claim related to a pool and pool gates.	N/A
Water tanks	Impacts unlikely	No reported impacts.	N/A
Farm dams	Potential for minor cracking or leakage	One claim submitted to SA NSW for potential impact on a farm dam. An investigation found that the changes were due to low rainfall and were not related to longwall mining.	N/A
Heritage structures	Impacts unlikely	No reported impacts	N/A
Groundwater bores	Potential for blockage or reduction in the capacity of the groundwater bores	One confirmed impact to private borehole; WMP developed with landholder in accordance with the Built Features Management Plan. One pump retracted from borehole prior to active subsidence for shearing mitigation. Further inspections will be conducted following the extraction of Longwall 903.	S32IMC is negotiating Water Management Plans with landholders, investigating impacts and delivering water where appropriate
Pumps in the Nepean River	Impacts unlikely	No reported impacts	N/A
The Upper Canal, Cataract Tunnel and associated infrastructure	Impacts unlikely	No reported impacts	N/A
Survey control marks	Small far-field horizontal movements which could require re-establishment	Small far-field horizontal movements	N/A

Appin North Monitoring and Management Programs

Longwall 38 ceased extraction on 1 February 2016. Appin North subsidence monitoring has moved into the post-mining phase and inspections are being carried out in accordance with the Longwall 37-38 EP.

Surface features in the vicinity of mining include:

- Georges River and associated tributaries;
- rocky outcrops and steep slopes;
- local roads;
- an aero-club airfield;
- Aboriginal and European heritage; and
- buildings and infrastructure.

Monitoring activities include:

- water flow, pool water levels and water quality monitoring;
- photographic and observational monitoring to identify mining-induced fractures, strata gas releases, iron staining and rock falls;
- aquatic ecology monitoring;
- Aboriginal and European heritage items; and
- buildings and infrastructure.

Monthly monitoring of Georges River and its tributaries is undertaken by the S32IMC EFT with fortnightly targeted inspections of Georges River pools that are observed to be below baseline level. Low pool levels recently observed on the Georges River are due to the current rainfall deficit reducing baseflows in the river and limiting available release from the upstream BCD. A Georges River catchment water balance was commissioned during the reporting period which will help inform success criteria for proposed Georges River remediation, as well as inform the Georges River Improvement Plan.

Monitoring activities include:

- Photographic and observational monitoring including cliff lines and landscape features;
- Water flow, pool water levels and water quality monitoring; and
- Shallow groundwater level monitoring

Landscape Features

Post-mining monitoring of natural features above and adjacent to Longwall 37 and 38 includes regular inspections of the Georges River as well as riparian features and cliffs.

Pool water levels, flows, water quality, photographic and observational monitoring are undertaken to identify any impacts such as fractures, strata gas releases, iron staining or rock falls from cliffs, steep slopes or rock outcrops. There were no new impacts identified as the level of subsidence for Longwall 38 has diminished (see).

Table 25: Predicted vs Observed Impacts for Landscape Features for Appin North Area 5 during the reporting period.

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Georges River and tributaries	Negligible environmental consequences including: negligible diversion of flows or changes in the natural drainage behaviour of pools; negligible gas releases and iron staining; and negligible increase in water cloudiness. over at least 80% of the stream length subject to vertical subsidence >20mm. No subsidence impact or environmental consequence greater than minor.	No new impacts observed	N/A
Cliffs	Cliffs of "special significance": Negligible impact (that is occasional rock falls displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 0. 5% of the total face area of such cliffs) within any longwall mining domain. Other cliffs: Minor impacts (that is occasional rock falls, displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 3% of the total face area of such cliffs within any longwall mining domain)	No impacts observed	N/A
Access Track	Minor impacts	No impacts observed	N/A

Surface Water

The monitoring program provides a basis for the comparison of flow, pool level and water quality in the area before, during and after mining as outlined in the Appin North Area 5 Longwalls 37 to 38 EP.

During the reporting period the pH, dissolved oxygen, oxidation reduction potential and salinity levels in the Georges River and tributary sites maintained a similar variability, with no significant change from the baseline range, along with no significant change in trend or extended adverse changes being observed. No TARP trigger levels were reached for pH.

The levels of manganese, nickel and zinc in the Georges River maintained similar pre-Longwall 38 variability, with no significant change to the observed ranges as a result of extraction of Longwall 38.

During monitoring for Longwall 38, below-baseline levels were reported for Georges River pools; GR_Pool 60, GR_Pool 59, GR_Pool 58, GR_Pool 57, GR_Pool 56, GR_Pool 54 and GR_Pool 44. These pools have been reported during the extraction of previous longwalls and have been attributed to Longwall 35 impacts. During significant rainfall events and increased mitigatory flow from BCD, these pools continue to show water levels

similar to baseline. However, these water levels decrease during periods of low rainfall and reduced releases from BCD.

Remediation options for impacted sections of the Georges River as a result of Longwalls 32 to 38 have been proposed in the Georges River Remediation Plan which is currently being reviewed to incorporate findings from the trial undertaken during the reporting period, which involved the cessation of discharge from BCD and the monitoring of water recession in pools, as well as the results from the Georges River Catchment Modelling.

A summary of the observed surface water impacts for Longwall 38 is provided in **Table 26**.

Table 26: Predicted vs Observed Impacts for Surface Water for Appin North Area 5

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Georges River	<p>Negligible environmental consequences including:</p> <ul style="list-style-type: none"> negligible diversion of flows or changes in the natural drainage behaviour of pools; negligible gas releases and iron staining; Negligible increase in water cloudiness. <p>Over at least 80% of the stream length subject to vertical subsidence >20mm.</p> <p>No subsidence impact or environmental consequence greater than minor.</p>	<p>Based on analysis of the long-term water quality records for designated upstream and downstream sites of Longwall 38, no significant water quality impacts were observed or measured within the Georges River.</p> <p>Fracturing and diversion of flow with lower pool levels. Pool water levels respond to increased releases from Brennans Creek Dam.</p>	<ul style="list-style-type: none"> Monitoring program continued Reported to key stakeholders Reported in End of Panel Report and Annual Review Monitoring program reviewed Impacts reviewed against Performance Measures Technical specialist notified and advice on CMAs sought Impacts to Georges River included in Remediation Plan- to be approved and implemented

Groundwater

Post mining monitoring of groundwater in the Hawkesbury Sandstone in the Appin North subsidence area has continued as outlined in the Longwall 37-38 Extraction Plan.

No adverse interconnection of aquifers and aquitards has been observed within 20m of the plateau surface and no increased rate of groundwater recharge into the plateau has been observed in the post-mining period.

No TARP trigger levels related to aquifer or aquitard interconnection or changes in recharge have been observed in the post-mining period.

Water levels in Piezometers GR27, GR28, GR70 and WC54 were not affected by subsidence during or after extraction of Longwall 38. The water level in WC95 fell by approximately 9m and was reported as a Level 1 TARP during Longwall 38 extraction. During the reporting period the water level in WC95 exhibited a decreased rate of recession and showed a general increase of higher water levels due to rainfall events. It remains within predicted levels for this reporting period.

No increased groundwater inflow to the Appin North mine workings following extraction of Longwall 38 has occurred and no TARP trigger levels have been reached.

Aquatic Ecology

The latest round of aquatic ecology monitoring was completed in October 2017. The monitoring program focuses on three main indicators:

- aquatic habitat, including fish habitat, aquatic macrophytes and riparian vegetation;
- aquatic macroinvertebrates sampled in accordance with the Australian River Assessment System (AUSRIVAS); and
- fish sampled using backpack electrofishing.

The data collected following November 2013 suggest that some localised impacts to aquatic habitat, macroinvertebrates and fish that were affected by the physical mining impacts observed at this time and associated with the extraction of Longwall 35, have recovered to some degree. Recovery is most evident at Site 8, where pool water levels and flow appeared normal during subsequent surveys. While recovery in fish and macroinvertebrate indicators is also evident at Site 9, this site still appears to be affected by reductions in aquatic habitat and connectivity due to persistent low pool water levels and flow, which were below baseline levels in some sections in November 2015 and November 2016. Recovery that has been observed is almost certainly a result of the restoration (at least temporarily) of pool water levels and flow in affected areas of the Georges River following the increased water releases from BCD. This measure would have reduced impacts to aquatic ecology related to reduced water levels and flow and changes to river connectivity. The finding that two biotic indices (OE50 Taxa Score and SIGNAL2 Index) appear to have reduced at the Impact Treatment relative to the Control Treatment following mining, does, however, suggest that impacts on macroinvertebrates have persisted to some degree following the physical mining impacts first observed in November 2013. In any case, the magnitude of the reductions has so far been small, and unlikely to be of ecological concern.

The impacts to aquatic ecology that have persisted since November 2013 are likely associated with the direct loss of aquatic habitat and river connectivity due to lowering of pool water levels and loss of flow following subsidence. Impacts to river connectivity from reduced flow and water levels associated with subsidence would also be expected to affect the ability of fish to move upstream and downstream of the affected areas, although there is no evidence of this in the data. Importantly, so far impacts to aquatic ecology appear localised to the areas directly affected by these physical mining impacts. It is considered that flow and pool water levels will need to be maintained when possible (i.e. via increased releases from BCD) until any natural and / or planned remediation has taken place.

There is no conclusive evidence to suggest the extraction of Longwalls 36 and 37 has had any impact on indicators of aquatic ecology. This is not surprising considering that no physical impacts (additional to those observed for Longwall 35), or any significant impacts to water quality have been attributed to mining of these longwalls. Similarly, there is no evidence that the relatively minor physical impacts observed during extraction of Longwall 38 have affected aquatic ecology. Despite this, it is possible that the cumulative effect of any impact associated with extraction of the Area 5 longwalls, may have contributed to the severity, extent and rate of recovery of impacts to aquatic ecology attributed to Longwall 35.

Additional monitoring and assessment of aquatic ecology is recommended following remediation proposed for this section of the Georges River.

A summary of predicted and observed impacts on aquatic ecology is provided in Table 27.

Table 27: Predicted vs Observed Impacts for Aquatic Ecology for Appin North Area 5

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Aquatic Ecology	Threatened species, threatened populations, or endangered ecological communities: - negligible environmental consequences	<p>Mining impacts in the Georges River due to extraction of Longwall 35, recovered to some degree in December 2014, but have persisted in subsequent surveys.</p> <p>There is no evidence to suggest the extraction of Longwalls 36 to 38 has had any impact on aquatic ecology, though it is possible that extraction of these longwall may have contributed to the severity, extent and rate of recovery of impacts to aquatic ecology attributed to Longwall 35.</p> <p>At this stage impacts to aquatic ecology appear restricted to the areas directly affected by physical mining impacts, though there was iron staining present in the river downstream of Site 9 downstream to Site 10, located adjacent to Longwalls 36 and 37. No impacts have been detected at downstream control Site 11. Further analysis will be undertaken to confirm the extent of any impacts to aquatic ecology and if they have persisted downstream of the areas directly affected by physical mining impacts.</p>	N/A

Terrestrial Ecology

A baseline Terrestrial Flora and Fauna Assessment (Flora Search, 2009; Biosphere, 2009) was undertaken in support of the BSO Environmental Assessment. The Study Area for these assessments included the Longwalls 37 and 38. Supplementary field surveys for terrestrial biodiversity were undertaken by Niche (2013), for the purposes of the Longwalls 37 and 38 EP.

Subsidence effects are unlikely to have a significant impact on any threatened flora or fauna species (Niche, 2013). However, impacts may lead to the alteration of habitat and the alteration of the natural flow regimes of rivers, stream, floodplains and wetlands following longwall mining (Niche, 2013).

Visual inspections of vegetation communities within the Longwalls 37 and 38 Study Area are undertaken as a part of routine landscape water monitoring programs. Post-mining monitoring focuses on detecting changes to vegetation communities and fauna habitat present within the Longwalls 37 and 38 Study Area.

No impacts to vegetation have been observed in the post-mining period as shown in **Table 28**.

Table 28: Predicted vs Observed Impacts for Terrestrial Ecology for Appin North Area 5

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Ecology	Threatened species, threatened populations, or endangered ecological communities: - negligible environmental consequences	No impacts observed.	N/A

Cultural Heritage

European Heritage

No historical sites were located above Longwall 38.

Aboriginal Heritage

There were no post mining impacts identified as a result of longwall extraction in the reporting period. Impacts have previously been noted to Aboriginal shelter sites Georges River No. 2 (AHIMS # 52-2-2243) and Georges River No. 3 (52-2-2243). These impacts were a result of subsidence movements from Longwall 35 and Longwall 36. See relevant End of Panel reports for more information.

Surface Infrastructure

Subsidence monitoring programmes are developed in consultation with key stakeholders and ensure that all key infrastructure and other surface features located above the extraction areas are closely monitored to assess subsidence movements and impacts.

Appin North Area 5 concluded active mining with the completion of Longwall 38 on 1 February 2016. The area has undergone post mining monitoring as part of the approved monitoring program and no survey monitoring has been undertaken in FY19. There were no reported impacts to any built features in FY19 in Appin North Areas 5.

All survey reports are checked, reviewed and assessed by the S32IMC Survey Team with additional reviews undertaken by the S32IMC Subsidence Management Review Committee which meets on a monthly basis.

6.16. HYDROCARBON CONTAMINATION

Refer to Section 6.5.

6.17. METHANE MANAGEMENT

The in-seam gas content of Appin mining areas is in the order of 12 to 14 cubic metres of methane per tonne of in-situ coal. A comprehensive underground methane drainage program is maintained, which includes a network of drill holes and pipes to recover a large proportion of this gas by in-seam and cross-measure drainage. Methane drainage is necessary to provide a safe, compliant and productive underground mining environment.

Drainage gas extraction, utilisation and venting rates are summarised and reported monthly for Greenhouse Gas (GHG) accounting. During this period the Appin monitoring systems, procedures and figures reported were audited (reasonable assurance) as required by statutory and internal requirements.

Mine Safety Gas Drainage

At Appin North, no surface gas drainage activities were undertaken as underground operations have ceased.

In Appin Areas 7 and 9, gas drainage is now entirely undertaken by the underground gas drainage network before being piped to the surface and utilised by the offsite Energy Developments Limited (EDL) Plants (West and East). When there is more gas available from the mine than can be consumed by EDL, the flaring systems are initiated to abate the methane content of the gas.

Based on operational monitoring of flares at intervals of 15 minutes, the flares at the Appin West Gas Drainage Plant ran for approximately 68 days, and the flares at the Appin East Plant ran for approximately 38 days during the reporting period.

Mine safety gas drainage well sites in Appin Areas 7 and 9 have been rehabilitated. During the reporting period a successful level of grass cover over the rehabilitated gas well areas has been achieved.

Mine Methane Extraction

The methane gas extracted from the coal seam by the underground gas extraction network is directed to the surface, via the gas drainage plants, from where it is piped to the electricity generation plants and used to generate electricity. The electricity generation plants are operated by EDL. A total of 1516 ktCO₂-e was recovered and transferred (i.e. abated) to the EDL Power Plant.

Mine Ventilation Fans

During the reporting period, approximately 1225 kt CO₂-e was emitted to atmosphere from the Appin Mine Ventilation System, up 8% when compared to FY18. The average CH₄ concentration was 0.29% (no change from FY18) and the average CO₂ concentration was 0.17% (down from 0.22% in FY18).

Decarbonisation Program

S32IMC has set relatively aggressive greenhouse gas emission targets, with a short-term target of maintaining scope 1 emissions at FY15 levels through to the end of FY21, and then to progressively reduce emissions, such that the business is carbon neutral by 2050. The goal of carbon neutrality by 2050 aligns South32 with the Paris Agreement, as well as the NSW aspirational target for 2050. S32IMC commenced work towards its contribution to this goal during FY19, with a concept study to identify a roadmap towards meeting both of South32's greenhouse gas emission targets on a local scale within S32IMC.

During FY19, the development of IMC's decarbonisation concept was completed, and endorsed by IMC senior management. Based on IMC's emission profile, the bulk of the effort in terms of greenhouse gas emission reduction needs to focus on increased gas capture (through improved gas drainage and gas management) and develop options for the treatment of ventilation air methane (VAM), with carbon off setting to deal with remnant greenhouse gas emission.

The S32IMC decarbonisation plan identifies a suite of greenhouse gas emission reduction projects over four time-based phases, with projects identified to meet greenhouse gas emission targets for each phase (pending favourable project feasibility assessment and planning development approval where required):

1. Current phase – until the end of FY21, the focus is on small improvements, mainly in the area of improved management of legacy goaf areas, and an improvement in the practical execution of post drainage programs, targeting a long-term average Post Drainage Capture Efficiency of 67%. During this phase, pre-feasibility and feasibility studies for the initial projects being implemented beyond FY21 are planned;
2. Phase 1, FY22 to FY28 – introduction of larger projects, largely based on currently available technologies such as improved underground pressure balancing to reduce inactive and legacy goaf gas emissions and potentially VAM destruction at existing upcast shafts (pending favourable feasibility study results and appropriate planning approvals);
3. Phase 2, FY29 to FY38 – increased scale and intensity of greenhouse gas reduction initiatives, for example, increased intensity of underground post drainage activities, increased scale of VAM destruction, and potentially the introduction of VAM development options (pending feasibility study outcomes and planning approval); and
4. Phase 3, FY39 and beyond – increased scale of VAM development options at all sites and off set remaining emissions with carbon credits.

At concept study level, this approach has been shown to produce net carbon neutrality in scope 1 emissions by 2050.

6.18. HAZARDOUS MATERIAL MANAGEMENT

Storage

Oils are stored in purpose-built facilities with appropriate bunding and firefighting provisions available. A licenced contractor is engaged to remove and recycle and/or dispose of used/waste oil and grease products through appropriately licenced facilities.

Diesel fuel is brought to the Appin Pit Tops by road tanker and stored in above ground bunded tanks, from where it is transferred to diesel pods for underground use or direct to machinery.

Appin has two chlorine dioxide dosing plants; one at the Appin West Pit Top, and the other at BCD. Both units are still in use. Combined, there is approximately 6000 L of Sodium Hypochlorite and 6000 L of Hydrochloric Acid stored in these locations.

All explosives / detonators for the Appin operations are currently stored at the explosives storage facility located at the Appin West mine site. Storage facility capacity information is provided in **Table 29**.

Table 29: Explosives and Detonator Storage – Appin

Site	Type	Capacity
Appin West	1.1D Explosive	550 kg
	1.1B Detonators	5000 detonators

Details of the bulk chemical storage locations and manifest quantities associated with the Appin operation are provided in **Table 30**.

Table 30: Summary of Dangerous Goods Storage at manifest quantities - Appin

Storage Area ID	Proper Shipping Name	UN No.	Class / Division	PG	Type	Design Capacity	Typical Quantity
ABT 01	Hydrochloric Acid 33%	1789	8	II	AGT	12,500L	12,500L
ABT 02	Sodium Hydroxide 35%	1824	8	III	AGT	1,800L	1,800L
ABT 03	Sodium Hypochlorite 12.5%	1791	8	III	AGT	1,800L	1,800L
ABT 04	Hydrochloric Acid 9%	1789	8	III	AGT	3,000L	3,000L
ABT 05	Sodium Chlorite 7.5%	1908	8	III	AGT	3,000L	3,000L
ABT 06	Hydrochloric Acid 33%	1789	8	II	AGT	15,000L	15,000L
ABT 07	Sodium Chlorite 7.5%	1908	8	III	AGT	2,000L	2,000L
ABT 08	Sodium Hydroxide 35%	1824	8	III	AGT	2,000L	2,000L
ABT 09	Citric Acid		N/A		AGT	2,000L	2,000L

There is one monitoring gauge (moisture scanner) at the Appin East Surface Elevator Belt that contains low emission radioactive isotopes. This gauge is licenced and maintained as per the legal requirements. The gauge is housed in an appropriate container and is inspected and tested in accordance with legislative requirements.

There are several monitoring gauges (moisture scanners) in the WCCPP that contain low emission radioactive isotopes and these gauges are licenced and maintained as per legal requirements. All gauges are housed in appropriate containers and are inspected and tested in accordance with legislative requirements.

6.19. NORTH CLIFF

The North Cliff Mine Site and access road is located between O'Hares Creek and Stokes Creek. The majority of the site is gently sloping in a northerly direction towards O'Hares Creek. The mine site covers an area of approximately 10.3 hectares of which approximately 6.5 hectares is undisturbed by mining activities. The North Cliff site is shown in Plan 12: North Cliff Site Plan.

Access to the site is along 10B and 10C Fire Trails from an intersection on the Bulli/Appin Road, 6 km northwest of Bulli Pass. The 4.5 km long access road is included in the mine site Consolidated Coal Lease CCL724.

Land Ownership and Approvals

The North Cliff Mine Site and access road is covered by CCL724, which includes the surface and land below to an unlimited depth over the mine site and to a depth of 15m over the access road. Consent to establish the mine was granted in 1981 by the Minister for Planning and Environment under Section 101 of the Environment Planning and Assessment Act 1979 and subsequently amended under Section 102 of the Act.

History

Mining operations commenced at the site in 1983, with mining operations restricted to a single unit continuous miner. The ROM product was brought to the surface through the No.4 shaft and into a 400-tonne surge bin, from which the product was loaded into trucks and transported to Appin North for processing.

Mining operations ceased at North Cliff in 1990 at which time all underground equipment was removed from the site. The two shafts were temporarily sealed with concrete caps with additional security fencing and associated signage installed to prevent unauthorised access. A number of the buildings and associated structures, and various other pieces of equipment were also removed from site. Periodic inspections are undertaken by the Site Environmental Representative.

Remaining Infrastructure

As specified above, most of the infrastructure that was located on the North Cliff site was removed following closure of the mine in 1990. The major structures remaining on the site include:

- No.3 shaft head frame;
- No.4 shaft head frame; and
- Sub-station base slabs.

There are also various items of redundant equipment on the site, however these are not posing an environmental or safety hazard. There has been no equipment removed from site during the reporting period.

Site Security

The North Cliff Site is enclosed with a 1.8-metre-high fence with two locked entry gates. The site security fencing is inspected on a regular basis.

Site Rehabilitation

An area on the site between the two shafts was used for the disposal of spoil excavated from the sinking of the shafts. The spoil heap, which covers an area of approximately 3.5 ha and contains 55,000 m³ of loosely tipped shale and sandstone, has been graded, shaped and regenerated with local vegetation species.

The Bulli Seam Operations Conceptual Closure Plan details the remaining site-specific closure works to be undertaken at this site. A summary is provided below:

- Conduct gas drainage and ventilation studies to determine the linkage (if any) between the underground workings at Appin North and North Cliff, then from this study determine a suitable methodology for accessing and sealing the shafts.
- Review and liaise with external stakeholders regarding final end land use at the site.
- Prepare a site-specific Rehabilitation Management Plan (RMP) for North Cliff and gain external approvals from Resource Regulator and other relevant external stakeholders.
- Fill and seal No. 3 and No. 4 shafts in accordance with RMP and external approval requirements.
- Demolish and remove any redundant infrastructure from the site.
- Remediate any contaminated soil by removal, encapsulation or land farming on site.
- Re-profile site as per the final landform design to reduce the slope lengths by constructing contour banks and armouring channels to prevent erosion.
- Revegetate disturbed areas as per the final revegetation/landscape plan utilising local species.
- Other works as required to achieve the final land end use per the Rehabilitation Management Plan.
- Develop ongoing maintenance management plans.

Post Closure works will include:

- monitor frequently until vegetation establishment, and then on a minimum 12 monthly basis for at least five years after works have been completed (or surface mining lease relinquished); and
- carry out weed control and replanting/reseeding as necessary.

Site investigations and planning for the sealing and rehabilitation of the North Cliff Colliery site under the Legacy Site and Rehabilitation Program are planned in FY20.

Water Management

Surface drainage mainly flows in open channels to the site pond located at the northwest corner of the site. The pond is a permeable structure that filters the water that passes through the wall. Water that overflows the dam in wet weather events or passes through the wall flows through open sedge-land before entering an unnamed creek and into O'Hares Creek. There is no environmental impact associated with these discharge events on the receiving environment. No issues were identified with the site drainage system during the reporting period. No hydrocarbons or chemicals are stored at the site.

Air Quality

The generation of windblown dust from the North Cliff Mine Site is unlikely to cause any adverse impacts on air quality in the community due to the isolated location of the site. A large proportion of the disturbed areas are largely compacted hence further reducing the likelihood of generating significant emissions of wind-blown dust.

Noxious Weeds

The site management measures to monitor and control the growth of noxious weeds on the mine site include the use of a weed control specialist to inspect the mine site if required. No issues requiring action were identified during the reporting period.

Archaeological Sites

Archaeological surveys were carried out in 1977 and 1983. The studies identified one aboriginal site, a single axe groove on an exposed rock shelf; located within the fenced mine site area. No damage occurred to this site during the development or operation of the mine. No damage was identified at this site during the reporting period.

Environmental Inspections

Regular environmental inspections of the North Cliff site are completed during the reporting period. The inspections cover multiple aspects including, but not limited to site security and safety, surface drainage, erosion, weed management, archaeological sites, dust and hydrocarbon management.

6.20. PUBLIC SAFETY

No incidents involving the general public occurred during the reporting period. Safety risks associated with the site activities are addressed and controlled as listed in Table 31.

Table 31: Site Safety Risks and Control Mechanisms

Potential Safety Risk	Control Mechanism
External persons attending site	Site reception office – sign in/out procedure in place for visitors. Site inductions / awareness sessions for persons undertaking activities on site. Company representative accompanies visitors to the North Cliff site.
General vehicle traffic	Designated and sign posted roads and rules. Periodic speed monitoring along Wedderburn Road. Key locked gates to site (North Cliff).
Public roadway conditions	Routine daily inspections of public roads for evidence of coal spilled from trucks. Use of road sweepers to clean roads as required Coal Trucks - Loads covered before travelling on public roads. All trucks leaving the Appin North and Appin East site must pass through the truck wash prior to exiting the site.
Exposure to hazardous chemicals	Designated storage facilities and signage. Chemaalert system in place. Procedures in place for bringing chemicals into site.
Personnel Health and Hygiene	Monitoring programs in place for noise, respirable dust, hazardous materials exposure. PPE requirements enforced and periodically audited. Hazardous areas are delineated with warning signs and notices.
Radiation apparatus	Certified and registered installations – annual inspections by certifying officer. Licences in place for all radiation apparatus.
Heavy vehicle movements on site	Reversing alarms. South32 Fatal Risk Controls. Authorised / licenced operators.
Working at heights	Standards and procedures for working at height activities.
Confined Spaces	Standards and procedures for working in confined spaces.
Explosive atmospheres	Explosion protected and intrinsically safe equipment – monitoring of the underground environment.
Fire	Firefighting infrastructure in place to protect persons and property.
Potential at risk activities	Formal risk assessment / task analysis process in place to assess risks and ensure sufficient controls are in place prior to the work/activity commencing.
Surface and underground vehicles	Vehicle standards in place - rotating beacons / seat belts / roll bar protection where relevant. Light vehicle policy for surface vehicles.

7. WATER MANAGEMENT

7.1. WATER SUPPLY AND USE

Appin West

Mine water is processed at the Appin West Water Filtration Plants [IMS 1 & 2a] to produce treated water. This treated water is supplied to the Appin Mine underground mining operations. Any shortfall in underground supply is made up using potable water provided by Sydney Water. Potable water is used for site administration buildings, workshops, the bathhouse and as a back-up for underground operations.

Water Filtration Plant Improvements

See Section 4.3 for IMS 1 and 2a updates.

Appin East

Potable water is supplied by Sydney Water to the Appin East site via a 600 kL surface tank. This tank provides potable water for the bathhouse, workshops, administration buildings, Appin No.2 shaft area, EDL Appin East Power Plant and nearby mine-owned cottages.

Surface water runoff from rainfall is captured in the main surface dam and is used as supply for the truck washing facilities, dust suppression on haulage roads and stockpiles and dirty equipment hose down.

In addition, a pipeline has been installed to temporarily dilute discharge from BCD to reduce salinity levels in-line with the EPL. This pipeline will potentially be used as future water supply to the WCCPP during drought as projects under PRP19/EIP2 are completed (see Section [Pollution Reduction Programs](#)).

Table 32 provides an overview of the potable water usage associated with the Appin West and Appin East sites for the reporting period.

Table 32: Potable Water Usage for the Appin West and Appin East sites

Area	Usage FY18 (ML)	Usage FY19 (ML)	Variance (ML)	Comments
Appin East & West	906	671	-235	Less demand from Appin North washery for dilution of salinity levels in BCD (Relevant to East only).

An estimate of the volume of clean and dirty water stored on site at the end of the reporting period is provided in Table 33.

Table 33: Stored Water - Appin

Water Type	Volumes Held (m ³)		
	Start of Reporting Period	At End of Reporting Period	Storage Capacity
Clean water	2.8	2.8	2.8
Dirty water	30	30	33.3
Controlled discharge water (salinity trading schemes)	2.4	2.4	2.4
Contaminated water	N/A	N/A	N/A

Appin North

The Appin North site is primarily reliant on water from BCD. Some potable water is trucked to site and stored in a surface tank for use in the bathhouse and office facilities. Most water is sourced from BCD from where it is pumped, following chlorine dioxide treatment, for use in the following areas:

- Appin North underground areas for dust suppression;
- WCCPP and associated infrastructure; and
- Appin North Pit Top.

The table below illustrates the estimated BCD water demand for Appin North.

Table 34: BCD Demand Summary ⁵	
Demand	Demand Rate (ML/Day)
WCCPP	0.53
Underground Areas	1.25
Dust Suppression	0.34
Truck Wash	0.05
Wash Down	0.04

A summary of the water usage for the reporting period, compared to the previous reporting period, is provided in **Table 35**.

Table 35: Water Usage Comparison – Appin North			
Type	Usage FY18 (ML)	Usage FY19 (ML)	Comment
Potable Water	0.69	1.00	Nil
Recycled (BCD) Water	736.10	649	Nil

An estimate of the volume of clean and dirty water stored on site at the end of the reporting period is provided in Table 36.

Table 36: Stored Water – Appin North			
Water Type	Volumes Held (m ³)		
	Start of Reporting Period	At End of Reporting Period	Storage Capacity
Clean water	161	161	307
Dirty water	200	200	237
Controlled discharge water (salinity trading schemes)	N/A	N/A	N/A
Contaminated water	N/A	N/A	N/A

⁵ Data derived from WSP (2019).

Water Take

Table 37: Water taken by the operation during the reporting period

Water Licence No.	Approval	Access Licence Ref.	Water Sharing Plan	Water Source	Water Management Zone	Entitlement	Passive take / Inflows / Active Pumping	Total
35519	10WA117999	10AL117998	Greater Metropolitan Region Unregulated River Water Sources	Southern Sydney Rivers Water Source	Georges River Catchment Management Zone	2750	Active Pumping (BCD)	292.79 ML
36477	10WA118778	10AL118777	Greater Metropolitan Region Groundwater Sources	Sydney Basin Nepean Groundwater Source	Nepean Management Zone 2	303	Passive Take / Inflows (Appin West)	220.62 ML
30145	10WA117285	10AL117284	Greater Metropolitan Region Unregulated River Water Sources	Hawkesbury and Lower Nepean Rivers Water Source	Menangle Weir Management Zone	53	Active Pumping (VS6)	1.206 ML

7.2. SURFACE WATER

Surface water management at the BSO is undertaken in accordance with EPL 2504 and the approved BSO Surface Water Management Plan. Specifics of the site water management systems are provided in the BSO Surface Water Management Plan which is available on the South32 regulatory information website: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

Appin West

The filter modules at the EPL LDP23, are planned to undergo routine maintenance in July 2019, including replacement of the filters and screens. No additional works have been completed at the site. All oily water separators underwent routine servicing, including complete cleaning and change out of the gravity fed (passive) separators (baffle plate systems), and servicing and sleeve replacement of the centrifugal (active) separator.

Appin East

The silt trap/dosing pit associated with the main surface water dam has undergone standard maintenance during this reporting period, including silt removal. The dynasand and first flush systems have undergone standard maintenance and cleaning to ensure systems are fully operational. All passive separators underwent routine servicing.

Appin North

The seep that was identified in the reclaim pond at BCD in March 2010 continues to be monitored regularly with results including flow measurements, piezometer readings and visual inspections, reported through to the consultant geotechnical engineer periodically. A V-notch weir and concrete bunding was installed in FY16 to improve the accuracy of monitoring. There has been no change to the characteristics (i.e. volume, clarity etc.) of the seep for the reporting period.

Surveillance reports are prepared every five years by the consultant geotechnical engineer. The latest report was submitted to the Dams Safety Committee in March 2017. Intermediate inspections are being conducted regularly by S32IMC.

Surface run-off associated with the emplacement area, operates in accordance with the approved Coal Wash Emplacement Area Management Plan which is available on the South32 website.

Appin Ventilation No.6 Shaft Site

During the reporting period, surface runoff was captured on site surface dams prior to discharge into Harris Creek via EPL LDP36. Water quality checks were carried out prior to any discharge.

No dosing of flocculant was necessary during this reporting period.

7.3. GROUNDWATER MANAGEMENT

Appin West

During the reporting period, excess groundwater from the Appin operations was pumped to the surface at Appin West for treatment via the Appin West WFP. The treated water is re-used underground and/or discharged via EPL LDP24. Discharge volumes at LDP24 are made available to the public via the web based environmental monitoring report, which is issued every 14 days. Refer to Table 12 for discharge volumes.

The monitoring system for LDP24 now includes a continuous monitoring system for pH and EC.

Appin North

Water for underground use is delivered from BCD to the underground operations via a gravity fed pipeline. Groundwater and surplus mine water can be pumped to the surface for use in the WCCPP. During the reporting period approximately 460ML (calculation) of water was delivered underground with approximately 162ML (calculation) of surplus underground water pumped to the surface for use in the WCCPP or treated and

released to BCD. The closed loop system came into effect in March 2019 in accordance with the requirements of EIP2 (See *Pollution Reduction Programs*). The aim of the closed loop system is to prevent mine and process waters entering BCD and hence improve the water quality of BCD over time. Excess waters in Pond 3 are being used for dust suppression on coal stockpiles, haul roads and the active coal wash emplacement area. Overflows from Pond 3 into P4a are being filtered through the coal wash emplacement area before entering the emplacement underdrainage system.

7.4. RAINFALL

Figure 10 displays the annual rainfall for the region since FY11 at Menangle (Menangle Bridge), NSW.

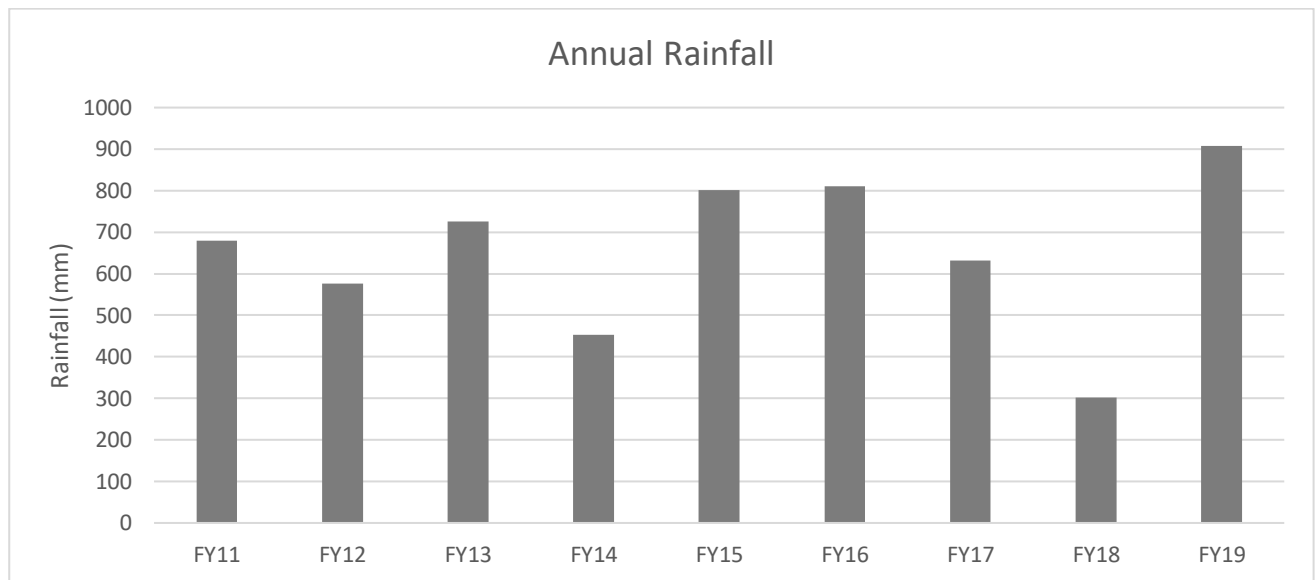


Figure 10: Annual rainfall – Menangle (BOM site #68216).

8. REHABILITATION

8.1. REHABILITATION FOR THE REPORTING PERIOD

Buildings

No demolition of buildings was undertaken during the reporting period.

Rehabilitation of Disturbed Land

Progressive rehabilitation of the WCEA has been undertaken during the reporting period in accordance with the approved West Cliff Coal Wash Emplacement Area Management Plan.

The following works were undertaken during the reporting period:

- clearing of approximately 2.4 hectares in Stage 3;
- establishing the growth medium for ~3 hectares in Stage 3; and
- continued deposition of coal wash.

Figure 11 shows the performance of rehabilitation on Stage 2 of the emplacement.



Figure 11: Stage 2 emplacement rehabilitation (Seeded in 2007).

Refer to Appendix A: Annual Rehabilitation Report for further detail of the success of the rehabilitation of the Emplacement Area.

The rehabilitation status is provided in Table 38.

Table 38: Rehabilitation Status

Location	Area Affected/Rehabilitation (ha)		
	Previous Report (FY18)	This Report (FY19)	Forecast (FY20)
A Total Mine Footprint	28377	28377 ⁶	28377
B Total Active Disturbance	147	148	148
C Land Being Prepared for Rehabilitation	9	11 ⁷	5
D Land Under Active Rehabilitation	14	15 ⁸	16
E Completed Rehabilitation	37	38 ⁹	38

Legacy Sites and Rehabilitation Program

The Legacy Sites and Rehabilitation Program consisted predominantly of initial site investigations and approvals planning in the reporting period. This has included:

- Appointment of a dedicated project manager in February 2019.
- Overall review of the legacy sites including inspections, desktop review of archived files and reviews of current legislation, regulations and guidelines relevant to the works. S32IMC procedures and policies have also been reviewed to develop an understanding of the means of internal approvals and associated personnel.
- Investigations to confirm tenure and land ownership for numerous sites where this data has not been available.
- Grouping of projects with primary criteria being governed by the external approval pathways that vary dependent upon land ownership and tenure.
- Prioritisation of projects including review of previous documents, risk assessments and other relevant information.
- Commencement of external approvals process of multiple higher priority projects including procurement of relevant studies, and planning documentation.
- Submission of external approval applications and liaison with external stakeholders.
- Preparation of tender documents and calling tenders for upcoming projects.

Site investigations and planning for the sealing and rehabilitation of the North Cliff Colliery site are planned for FY20.

8.2. REHABILITATION TRIALS AND RESEARCH

Refer to Section 6.7 for details on the *Persoonia hirsuta* translocation trial that was undertaken in May 2019.

⁶ Consists of the size of the Project Approval boundary for BSO (BSO mining lease footprint) only.

⁷ Landform Establishment & Growth Medium Development phases

⁸ Ecosystem and Land Use Establishment Phase

⁹ Ecosystem and Land Use Development and Relinquishment Phases

8.3. FURTHER DEVELOPMENT OF THE FINAL REHABILITATION PLAN

The BSO Mining Operations Plan (MOP) addresses the rehabilitation requirements and objectives for all domains associated with the combined BSO sites. The MOP outlines a range of post land use options that are potentially available for the BSO sites upon completion of operations. The future final land use objectives are yet to be decided upon and agreed due to timing of the eventual closure of BSO related sites. There has been no further development of this plan.

A request to extend the period for the MOP until September 2020 was submitted to and approved by DPIE (Resources Regulator) in the reporting period. It is planned for the MOP to be converted to a Rehabilitation Management Plan (RMP) in FY20, pending the release of the RMP Guideline by the Resources Regulator.

The Rehabilitation Cost Estimate (RCE) for the BSO was reviewed in FY19 according to the latest RCE tool from DPIE. The latest RCE is attached as Appendix G: Rehabilitation Cost Estimate.

9. COMMUNITY

At the completion of this reporting period, the Appin Mine (consisting of Appin West, Appin North and Appin East operations) employed approximately 1100 employees and contractors¹⁰.

The closest township to Appin West surface operations is the village of Douglas Park, which is located approximately 4 km to the north west of the surface operations. The current underground mining operations (i.e. Area 7 and Area 9) are located on the outskirts of the Douglas Park village.

The closest township to Appin North surface operations is the village of Appin, which is located approximately 4 km to the north west of the operations.

Appin East Pit Top is located on the outskirts of Appin.

9.1. ENVIRONMENTAL COMPLAINTS

During this reporting period eight complaints were received in relation to BSO operations (including Pit Tops and exploration work). Details of the complaints received, and the actions taken, are provided in Appendix H: BSO Community Complaints Report FY19. A summary of all complaints received across the BSO in FY19 is included in Figure 12. An analysis of complaints since 2012 is included in Figure 13. It is noted that there has been a decrease in complaints over time.

All complaints received are recorded in the South32 information management system in accordance with the EPL and Project Approval conditions. The S32IMC Community Call Line is a 24-hour, 7 day per week call centre for enquiries and complaints. A S32IMC representative responds to the contact and liaises with operational personnel to attend to any issue(s) of concern within a reasonable timeframe.

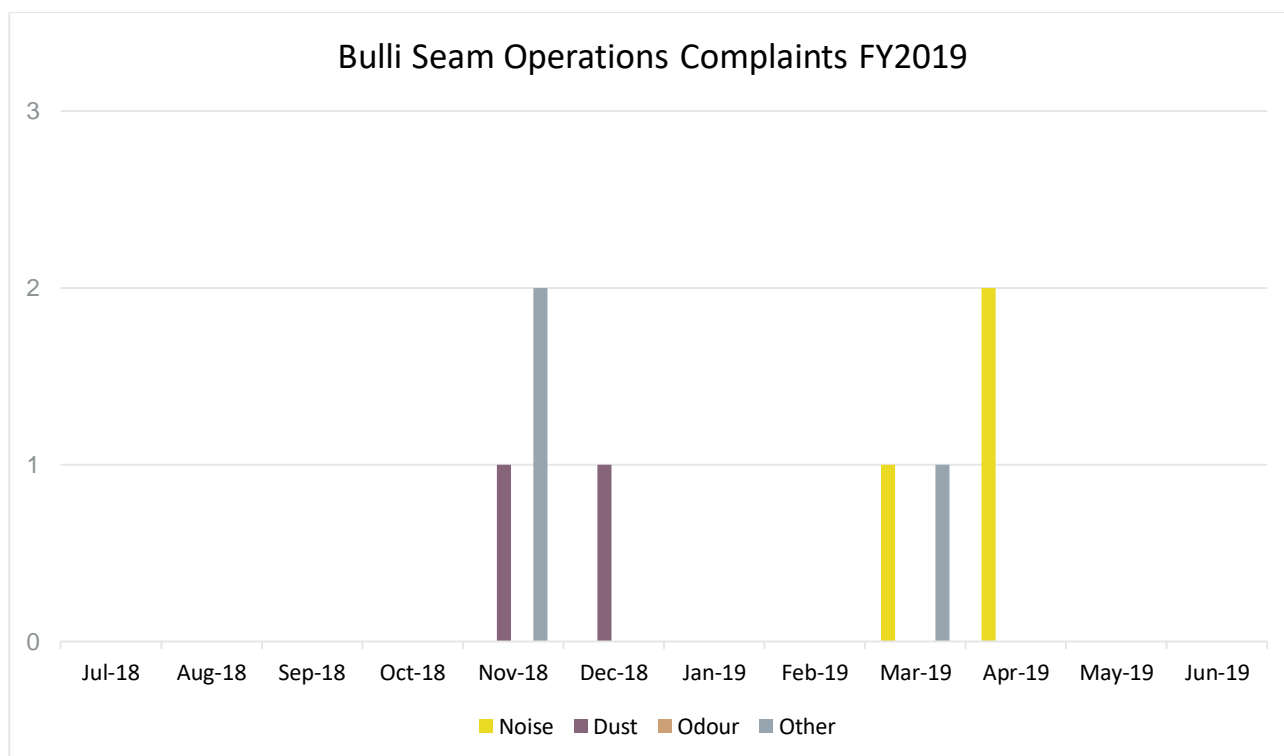


Figure 12: Summary of complaints for FY19

¹⁰ This is comprised of 660 employees and 528 contractors. It should be noted that contractors are only reportable if they are in SAP, otherwise the Finance Team gets the total amount of contractor hours claimed and divides by 40 to get an FTE equivalent.

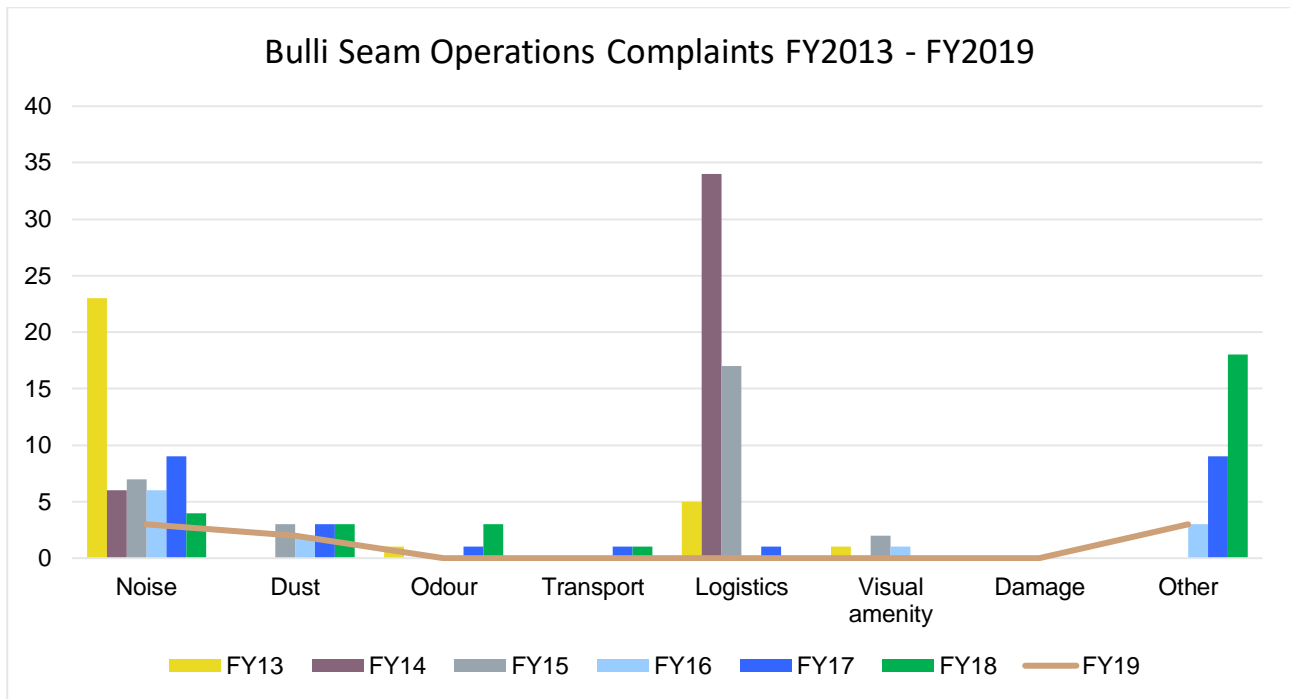


Figure 13: Analysis of community complaints since 2012 for the BSO

9.2. COMMUNITY ENGAGEMENT

S32IMC's Corporate Affairs and Communications team manages regular community engagement activities as per the S32IMC Stakeholder Engagement Management Plan, with the support of operational and functional team members as appropriate. The plan identifies key stakeholders and appropriate communication and engagement methods.

Key regional stakeholders include:

- communities surrounding the Appin Mine operations;
- local government;
- State government agencies and authorities including DPIE, Water NSW, Office of Environment and Heritage, SA NSW and others;
- employees and contractors;
- community and special interest groups;
- the indigenous community – Tharawal Aboriginal Land Council and others;
- local schools and volunteer groups; and
- the broader regional community.

Community information is provided in accordance with the S32IMC Stakeholder Engagement Management Plan. Communication methods include:

- community newsletters via letter box drops;
- door knocks;
- media releases and other media activities;
- community notice boards;
- community perception surveys;
- the 'Regulatory Information' webpage on the South32 website; and
- stakeholder group presentations and information sessions.

S32IMC directly manages the following Appin Mine stakeholder committees and working groups:

- Illawarra Coal Community Consultative Committee (ICCCC);
- Douglas Park Advisory Panel; and
- Illawarra Coal Community Partnerships Program Board.

Table 39 provides a summary of the information presented to the ICCC during the reporting period.

Table 39: Summary of Information Presented to the Illawarra Coal Community Consultative Committee during the Reporting Period.

Month	Presentation
July 2018	The role of Subsidence Advisory NSW (SA NSW) in subsidence management; how to lodge a claim with SA NSW; changes to the Coal Mine Subsidence Compensation Act 2017; the NSW BioBanking Scheme and lands aligned with the scheme that are owned by S32IMC.
October 2018	The distinctions between a Mine Subsidence District/exploration lease/mining lease; South32's acquisition of Arizona Mining; a visit by South32 CEO to S32IMC operations – including a tour of Mountbatten House in Douglas Park; S32IMC's support of the i98FM Illawarra Convoy and other community projects in the area.
November 2018	The current condition of Mountbatten House and S32IMC's planned steps to remediate damage; recent community complaints related to dust and incorrectly sent mail; S32IMC's support of the University of Wollongong Science Fair.
January 2019	Enterprise Bargaining Agreement negotiations for trades and operators at Appin operations; progress on a wet stone dusting trial to reduce dust emissions from ventilation shafts; development of a weed management program for property near Mountbatten House.
April 2019	Progress made on the Mountbatten stable/church renovations; extraction status of current longwalls; plans for S32IMC to commemorate the 40 th Anniversary of the Appin

Table 39: Summary of Information Presented to the Illawarra Coal Community Consultative Committee during the Reporting Period.

	Mine Disaster; the latest contributions of the Community Partnership Program; water improvement steps being investigated for Georges River.
June 2019	S32IMC activities to recognise National Reconciliation Week; property impacts from Longwall 902; concerns about dams and private water boreholes; community complaints received about ventilation shaft noise.

The minutes of community meetings are made available to the public on the South32 Regulatory Information webpage: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

9.3. DOUGLAS PARK ADVISORY PANEL

A purpose-formed community representative group, the Douglas Park Advisory Panel, was established by S32IMC in April 2010 to provide input to the preparation of the Ventilation Shaft No. 6 Environmental Assessment. Since approval and commencement of construction, meetings have continued with other local issues discussed including Mine Subsidence. The Douglas Park Advisory Panel operates under agreed Terms of Reference and is facilitated by S32IMC. The Panel comprises seven representatives of the Douglas Park Township.

Table 40 provides a summary of the information presented to the Douglas Park Advisory Panel during the reporting period.

Table 40: Douglas Park Advisory Panel Meetings during the Reporting Period.

Month	Presentation
September 2018	Annual Review summary and auditing requirements; update on Ventilation Shaft 6 operations; community complaints received since last meeting; environment and survey updates; Community projects and initiatives.
November 2018	Update on South32 global operations – including South Africa Energy Coal continuing operations and acquisition of Arizona mining; CEO Graham Kerr's visit and tour of S32IMC logistics chain and legacy sites; update on concrete and ballast borehole project.
February 2019	Appointment of new Chief Financial Officer and Chief Marketing Officer; Update on Enterprise Bargaining Agreement negotiations; Update on wet stone dusting trial; Weed Management in Douglas Park; Mountbatten renovations.
March 2019	Property management update – including Mountbatten renovations; Complaints since last meeting; Mining progress update; Environmental update; News on Community Partnerships Program.
June 2019	S32IMC's activities for National Reconciliation Week; Ongoing works at Mountbatten stables; complaints received since last meeting; Environment and Survey update; Events supported by S32IMC – including UNSW Career Fair and Wollondilly Illuminate Festival.

During the reporting period, members of the Douglas Park Advisory Panel were also kept informed of operational matters relating to Appin Mine operations in Douglas Park through email updates.

9.4. COMMUNITY PARTNERSHIPS PROGRAM

S32IMC has an overriding commitment to supporting the communities in which we operate. As part of this commitment, the Illawarra Coal Community Partnerships Program (CPP) was established to provide support for community projects and initiatives in the regions surrounding our Bulli Seam Operations.

Since being established in 2004, the program has provided support to a range of community groups and not-for-profit organisations.

The CPP is funded by three cents per saleable tonne of coal from S32IMC's Bulli Seam Operations. The program is administered by a board of community and S32IMC representatives, which ensures community-based decision making on the allocation of funds.

During the past 12 months the Board has committed over \$202,308 for community projects in the local Wollondilly area.

Some local not-for-profit groups to benefit from program funding in 2018/19 included:

- St James Anglican Church Menangle;
- Appin Mens Shed;
- Lifeline Macarthur; and
- Douglas Park Volunteer Fire Brigade.

The CPP Board continued its support for Life Education with funding to Appin, Douglas Park and Wilton Public Schools to enable children to visit the Life Education mobile learning centre. Life Education aims to empower the young to make the best choices for a safe life, through leading drug and health education programs. S32IMC has supported Life Education in the Wollondilly area since 2008.

9.5. ILLAWARRA CONVOY

For the fourteenth consecutive year, S32IMC has helped raise money for children with cancer by launching another successful i98FM Illawarra Convoy. Held in November 2018, the event saw 721 trucks and 965 motorbikes travel 70 kilometres from S32IMC's Appin North Colliery at Appin, through the streets of the Illawarra, to finish up at the new home of Convoy, The Illawarra Regional Airport. The Convoy is organised by local radio station i98FM and is the largest truck convoy in the Southern Hemisphere. It raises funds for the Illawarra Community Foundation, an initiative that helps local families living with potentially life-threatening illnesses gain access to a variety of activities and resources.

The 2018 Convoy raised \$2 million. More than \$13 million has been raised since the inaugural event in 2005.

9.6. COMPLAINTS/ENQUIRIES MANAGEMENT

S32IMC maintains a 24-hour Community Call Line (free call 1800 102 210) and a general email address (ICEquiries@south32.net). These avenues are promoted as the primary point of contact throughout S32IMC's suite of communications for persons who seek to lodge a complaint or make a general enquiry.

Complaints and enquiries are recorded in an internal event reporting system, and processes are in place ensure the complaint / enquiry is responded to within 24 hours and actioned in a timely manner. Complaints and resolutions are reported on the South32 website each month in the Community Complaints Report.

All complaints recorded during the reporting period are attached as Appendix H: BSO Community Complaints Report FY19.

10. INDEPENDENT AUDIT

10.1. Environmental Audits

The S32IMC Environmental Management System has been certified to the International Standard ISO14001 since May 2003. ISO14001 Certification for the BSO operations was maintained following an external audit in June 2019.

Appin East, Appin West, Appin North and the WCCPP are included in S32IMC's schedule of certified ISO 14001:2017 sites. Each of these operational sites, as well as the Emplacement Area has been regularly audited for compliance against this Standard.

KPMG undertook a reasonable assurance audit for NGER (National Greenhouse and Energy Reporting) for the reporting period.

The audits/management reviews undertaken during the reporting period are provided in Table 41.

Table 41: Environmental Audits Undertaken During Reporting Period

Date	Type	Internal	External	Comments
June 2019	Annual ISO14001		x	Surveillance
June 2019	Self Assessment	x		Assessment undertaken against the elements of the South32 Environment Standard by Global Environment Team.
Ongoing	Management plan governance checks	x		Governance Checks are conducted internally as a part of ISO14001 certification. A schedule has been developed and checks are undertaken as per the schedule.

The auditing process requires demonstration of adequacy of systems to manage environmental aspects and impacts related to site activities. The systems audited include legal compliance, document control, records, corrective action, monitoring and control, training and management of risks.

In the ISO14001 Audit undertaken by SAI Global in June 2019, one major non-conformance and three minor non-conformances were identified.

Major Non-conformance

- Failure to undertake management review in the reporting period. Action: Management review was conducted for Dendrobium Mine in the reporting period and is yet to be conducted for Appin Mine.

Minor non-conformances

- Document review – documents out of date/out of review period. Action: Document reviews being progressed. All documents identified as out of date during the audit have been updated.
- Governance Reviews – schedule not met. Action: Schedule has been reinstated. Governance reviews are being undertaken in accordance with schedule.
- Findings from Triennial Audit not captured in action tracking system. Action: The actions have been identified (they were captured) and now updated in the action tracking system.

An Independent Environmental Audit (IEA) of the BSO is undertaken every three years. The most recent IEA was conducted in January-March 2017. The review identified 10 medium level non-conformances, 5

administrative non-conformances and 5 observations. Eight of the ten non-conformances related to exceedances of water discharge concentration limits; the other two reported non-conformances related to project noise exceedances.

All actions to address recommendations made in the 2017 IEA Report were completed in the previous reporting period.

The next triennial IEA is scheduled to be undertaken in October 2019.

10.2. Environmental Risk Register

Environmental risks associated with the site operations are recorded in the Environmental Aspects and Impacts Register. The Environmental Aspects and Impacts Register is reviewed regularly and is the basis of the Environmental Improvement Plan.

11. INCIDENTS, NON-COMPLIANCES AND EXCEEDANCES DURING THE REPORTING PERIOD

There was one reportable environmental incident during the reporting period. This related to the discharge of water from a sediment pond at Appin East into the Georges River that contained elevated concentrations of ferric chloride. Further detail is provided in Table 42.

Non-compliances with approvals during the reporting period are detailed in Table 40, details of exceedances with criteria are provided in Table 43 and regulatory actions in the reporting period are provided in Table 44.

Table 42: Non-compliances during the reporting period

NC1	
Non-compliance	Monitoring results were not reported within 30 days of the 12-month anniversary of implementation date for the Coal Wash Emplacement Staging and Rehabilitation Plan.
Date	18 September 2018
Details of non-compliance	Report was not submitted by the due date. The report was submitted on 28 September 2018. This is a non-compliance with Condition 6 of EPBC 2010/5350.
Location	N/A
Cause of non-compliance	The Annual Rehabilitation Report was submitted to the EPBC as an attachment to the Annual Review. The Annual Review was submitted on 28 September which falls after the required EPBC due date for rehabilitation monitoring results (being 18 September).
Actions taken to mitigate adverse effects of non-compliance	No specific action taken at the time.
Actions taken to prevent reoccurrence	Dates for submission of reports have been entered into the action tracking system.
NC2	
Non-compliance	Discharge of water from a sediment pond at Appin East that contained elevated concentrations of ferric chloride into the Georges River.
Date	18 October 2018
Details of non-compliance	Water was discharged from the sediment pond at Appin East that contained elevated levels of ferric chloride. Ferric chloride is a flocculant used for water treatment. A pump used for dosing the water flowing into the sediment pond was changed out with a pump with a greater capacity. This resulted in overdosing of the pond and this water was discharged to the Georges River. This was a non-compliance with Condition 12 of Schedule 2 of Project Approval 08_0150 and Conditions O1, O2 and L1.1 of EPL 2504. Two Penalty Notices were issued by the EPA for failing to maintain or operate equipment in a proper and efficient manner and for causing pollution of waters.
Location	Appin East Sediment Pond

Cause of non-compliance	A pump used for dosing the water flowing into the sediment pond was changed out with a pump with a greater capacity.
Actions taken to mitigate adverse effects of non-compliance	Clean up procedures were implemented promptly with the discharge pumped back to the sediment ponds from the river.
Actions taken to prevent reoccurrence	An automated system has been implemented that turns off the dynasands pump based on pH levels. A dosing system review was undertaken, and improvements have been implemented, including changing the sequence for dosing of coagulant and flocculant. A procedure has been developed for the dosing system and this has been communicated to relevant employees.
NC3	
Non-compliance	Flocculant tank at Appin North was identified to be not bunded.
Date	15 March 2019
Details of non-compliance	A flocculant tank used for the storage of Magnasol was observed during an inspection of the Appin North site by the EPA. The tank was not bunded. This was a non-compliance with Condition O1 and O2 of EPL 2504 and Condition 12 of Schedule 2 of Project Approval 08_0150. A Formal Warning Letter was issued by the EPA for this non-compliance. It is noted that there had been no leakage from the tank and there was a very low risk of potential environmental harm.
Location	Appin North Emplacement Ponds
Cause of non-compliance	The requirement for the bunding of this tank was not identified when the tank was relocated to the area.
Actions taken to mitigate adverse effects of non-compliance	A temporary bund was installed around the tank.
Actions taken to prevent reoccurrence	The tank has now been decommissioned.
NC4	
Non-compliance	Exceedance of water discharge volume limits from LDP24 at Appin West.
Date	3 and 8 June 2019
Details of non-compliance	The volume limit of 3000 kL/day was exceeded on 3 and 8 June 2019. Stage 2a of the water filtration plant was in production proving and the volume of water discharged to the environment was 3460 kL and 3334 kL on 3 and 8 June respectively. This was a non-compliance with Condition L3.1 of EPL 2504 and Condition 15 of Schedule 4 of the Project Approval.
Location	Appin West Water Filtration Plant
Cause of non-compliance	The staff at the water filtration plant were of the incorrect understanding that the discharge limits had been increased as a result of numerous discussions with the

	community and the regulatory agencies regarding the potential to increase the limit, as well as the submission of a licence variation to increase the limit.
Actions taken to mitigate adverse effects of non-compliance	Controls were implemented to ensure the volume limit was not exceeded.
Actions taken to prevent reoccurrence	The volume limit has now been increased to 4700 kL/day through a review of EPL 2504 undertaken by the EPA.
NC5	
Non-compliance	Exceedance of oil and grease limit at LDP3/4 at Appin North.
Date	18 December 2018
Details of non-compliance	An oil a grease result of 13 mg/L was recorded at the Appin North waste water irrigation area. This is a non-compliance with the 100 th percentile limit of 10 mg/L as per Condition L2 of EPL 2504 and Condition 15 of Schedule 4 of the Project Approval.
Location	Appin North
Cause of non-compliance	No cause for the non-compliance was identified.
Actions taken to mitigate adverse effects of non-compliance	Further sampling was undertaken, and no further oil and grease non-compliances have been recorded.
Actions taken to prevent reoccurrence	No specific actions taken.
NC6	
Non-compliance	Exceedance of Biological Oxygen Demand (BOD) limit at LDP22 at Appin West.
Date	5 June 2019
Details of non-compliance	A BOD result of 96 mg/L was recorded at the Appin West waste water irrigation area. This is a non-compliance with the 100 th percentile limit of 50 mg/L as per Condition L2 of EPL 2504 and Condition 15 of Schedule 4 of the Project Approval.
Location	Appin West Irrigation Area
Cause of non-compliance	No cause for the non-compliance was identified.
Actions taken to mitigate adverse effects of non-compliance	Further sampling was undertaken, and no further BOD non-compliances have been recorded.

Actions taken to prevent reoccurrence	No specific actions taken.
NC7	
Non-compliance	Failure to collect dust deposition gauges within 30+-2 days.
Date	26 June 2019
Details of non-compliance	The dust deposition gauges for the Appin operations were not collected within 30+-2 days as required by Australian Standard 3580.10.1-2003, as listed in EPL 2504. This is a non-compliance with Condition M2 of EPL 2504.
Location	Appin East, West and North
Cause of non-compliance	The replacement sample bottles had not yet been received by the laboratory and there were no spare sample bottles available.
Actions taken to mitigate adverse effects of non-compliance	The DDGs were collected on the 30+3 day.
Actions taken to prevent reoccurrence	A spare set of sample bottles has now been sourced.

Table 43: Exceedances of criteria during reporting period

EX1	
Exceedance	Exceedance of noise impact assessment criteria at Ventilation Shaft 6 Central.
Date	21 March 2019
Details of exceedance	<p>Exceedance of noise impact assessment criteria at Ventilation Shaft 6. Noise monitoring recorded a result of 40 dBA against the noise impact assessment criteria of 39 dBA during the night-time period.</p> <p>Note that for the determination of compliance, the NSW Industrial Noise Policy states in Section 11.1.3:</p> <p><i>A development will be deemed to be in non-compliance with noise consent or licence condition of the monitored noise level is more than 2dB above the statutory noise limit specified in the consent or licence condition.</i></p>
Location	Monitoring location VS6 Central.
Cause of exceedance	The cause of the exceedance was the use of a temporary air compressor at the site.
Actions taken to mitigate adverse effects of exceedance	No immediate actions taken as the results required analysis.
Actions taken to prevent reoccurrence	Site personnel advised of results. The temporary air compressors were removed.
EX2	
Exceedance	Exceedances of noise impact assessment criteria at AE-NS5.
Date	13 June 2019
Details of exceedance	<p>Exceedance of noise impact assessment criteria at monitoring location AE-NS5 occurred as follows:</p> <ul style="list-style-type: none"> a measurement of 43 dBA was recorded at 4:03 pm (an exceedance of the 41 dBA (day) criteria by 2 dBA), noting the application of a 2 dBA low frequency noise penalty, and a measurement of 42 dBA was recorded at 11:52 pm (an exceedance of the 41 dBA (night) criteria by 1 dBA), noting the application of a 2 dBA low frequency noise penalty. <p>Note that for the determination of compliance, the NSW Industrial Noise Policy states in Section 11.1.3:</p> <p><i>A development will be deemed to be in non-compliance with noise consent or licence condition of the monitored noise level is more than 2dB above the statutory noise limit specified in the consent or licence condition.</i></p>
Location	Monitoring location AE-NS5 (80 Northamptondale Road), located in the vicinity of Ventilation Shaft 2
Cause of exceedance	The cause of the exceedance was likely the fans at Ventilation Shaft 2.

Actions taken to mitigate adverse effects of exceedance	No immediate actions taken as results required analysis.
Actions taken to prevent reoccurrence	Site personnel advised of results. Maintenance of the fans was undertaken, and further work has been scheduled.
EX3	
Exceedance	Exceedance of upper 50 th percentile limit for pH at LDP3/4.
Date	15 February 2019
Details of exceedance	Exceedance of upper 50 th percentile limit for pH at LDP3/4. The 50 th percentile limit is 8.5 pH units. There was overall compliance with the 100 th percentile limit of 9 pH units over the reporting period.
Location	Appin North Irrigation Area
Cause of exceedance	The cause of the exceedance was not identified.
Actions taken to mitigate adverse effects of exceedance	No actions taken. There were no adverse effects of the exceedance.
Actions taken to prevent reoccurrence	No actions proposed.
EX4	
Exceedance	Exceedance of 90 th percentile limit for Aluminium at LDP10.
Date	18 December 2018
Details of exceedance	Exceedance of 90 th percentile limit for Aluminium at LDP10. A result of 860 ug/L was recorded and the limit in EPL 2504 is 800 ug/L. There was overall compliance with the 90 th percentile limit over the reporting period.
Location	LDP10, located at Brennans Creek Dam
Cause of exceedance	The cause of the exceedance was possibly as a result of high rainfall over this period that resulted in increased turbidity and increased dosing of water to meet total suspended solids water quality concentration limits.
Actions taken to mitigate adverse effects of exceedance	Weekly water sampling was undertaken. There were no adverse effects of the exceedance.
Actions taken to prevent reoccurrence	Implementation of a semi-automated dosing system at Pond P4a.

EX5	
Exceedance	Exceedance of 50 th percentile limit for Biological Oxygen Demand (BOD) at LDP22.
Date	25 September and 5 December 2018, and 4 January 2019
Details of exceedance	Exceedance of 50 th percentile limit for BOD at LDP22. Results of 43, 38 and 32 mg/L were recorded respectively and the limit in EPL 2504 is 30 mg/L. There was overall compliance with the 50 th percentile limit over the reporting period.
Location	LDP22, located at Appin West
Cause of exceedance	The cause of the exceedance was not identified. It may have been as a result of stagnant water in the sampling line.
Actions taken to mitigate adverse effects of exceedance	No actions taken. There were no adverse effects of the exceedance.
Actions taken to prevent reoccurrence	No actions proposed.
EX6	
Exceedance	Exceedance of 90 th percentile limit for Chemical Oxygen Demand (COD) at LDP10.
Date	3 January 2019
Details of exceedance	Exceedance of 90 th percentile limit for COD at LDP10. A result of 62 mg/L was recorded and the limit in EPL 2504 is 50 mg/L. There was overall compliance with the 90 th percentile limit over the reporting period.
Location	LDP10, located at Brennans Creek Dam
Cause of exceedance	The cause of the exceedance was not identified.
Actions taken to mitigate adverse effects of exceedance	No actions taken. There were no adverse effects of the exceedance.
Actions taken to prevent reoccurrence	No actions proposed.

Table 44: Regulatory action during reporting period	
Regulatory Action	Detail
Official Caution	None issued
Warning Letters	Formal Warning Letter issued 3 June 2019 by EPA for an unbanded flocculant tank at Appin North.
Penalty Notices	Two Penalty Notices in the amount of \$15,000 each issued on 7 February 2019 for the event on 18 October 2018 relating to the discharge of water from a sediment pond at Appin East that contained elevated concentrations of ferric chloride.
Prosecution Proceedings	None commenced

Please refer to the following reports for specific compliance information:

Appendix B: 2018/19 EPA Annual Return for EPL 2504

Appendix I: BSO EPBC Approval 2010/5350 Compliance Report; and

Appendix J: BSO Project Approval Compliance Report

12. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

12.1. MINE OPERATIONS

During the next reporting period underground operations will continue in Area 7 and Area 9.

12.2. PROJECTS

The following projects will be progressed in the next reporting period:

- Extension/upgrades to the Appin West Water Filtration Plant, including construction of surface water tanks.
- Establishment of a Water Filtration Plant for Appin North.
- Installation of additional parking area at West Cliff Washery.
- Installation of additional office space at Appin West.
- Pre-feasibility studies for Ventilation Shaft 7 near Douglas Park.
- Upgrade of the Appin North bulk coal winder.
- Completion of site security upgrades.
- Upgrades to the Ventilation Shaft 3 Electrical Sub-station.
- Upgrade of the No. 4 stockpile pad to deliver geotechnical and environmental improvements.
- Site investigations and planning for the sealing and rehabilitation of the North Cliff Colliery site under the Legacy Site and Rehabilitation Program.

12.3. ENVIRONMENTAL MANAGEMENT

The following activities will be progressed in the next reporting period:

- completion of commissioning of the Appin West Water Filtration Plant (IMS2a);
- completion of a continuous monitoring system for LDP24;
- continuation of the Environment Improvement Program (EIP2) to improve water quality and aquatic health in the Georges River downstream of LDP10;
- continuation of the *Persoonia hirsuta* Research Program;
- continually improving process control systems for BCD discharge;
- implementation of an air quality monitoring program in Douglas Park in response to community concerns regarding particulate emissions from Ventilation Shaft 6; and
- continue to progress the current phase of the decarbonisation program.

13. REFERENCES

13.1. Document References

S32IMC, Bulli Seam Operations Air Quality and Greenhouse Gas Management Plan

S32IMC, Bulli Seam Operations Environmental Management Strategy

S32IMC, BSO Mining Operations Plan – October 2012 – September 2019

S32IMC, West Cliff Stockpile and Slope Stability Management Plan.

S32IMC, BSO Water Management Plan.

S32IMC, West Cliff Coal Wash Emplacement Area Management Plan.

S32IMC, BSO Waste Management Plan.

NSW Department of Planning & Environment (2015). Annual Review Guideline, Post approval requirements for State Significant Developments, October 2015.

NSW EPA (2016), Environment Protection Licence No.2504.

WSP (2019). Draft Georges River Catchment Modelling Stage 2. Report prepared for S32IMC.

13.2. Acronyms used in Annual Review

Table 45: Acronyms used in Annual Review

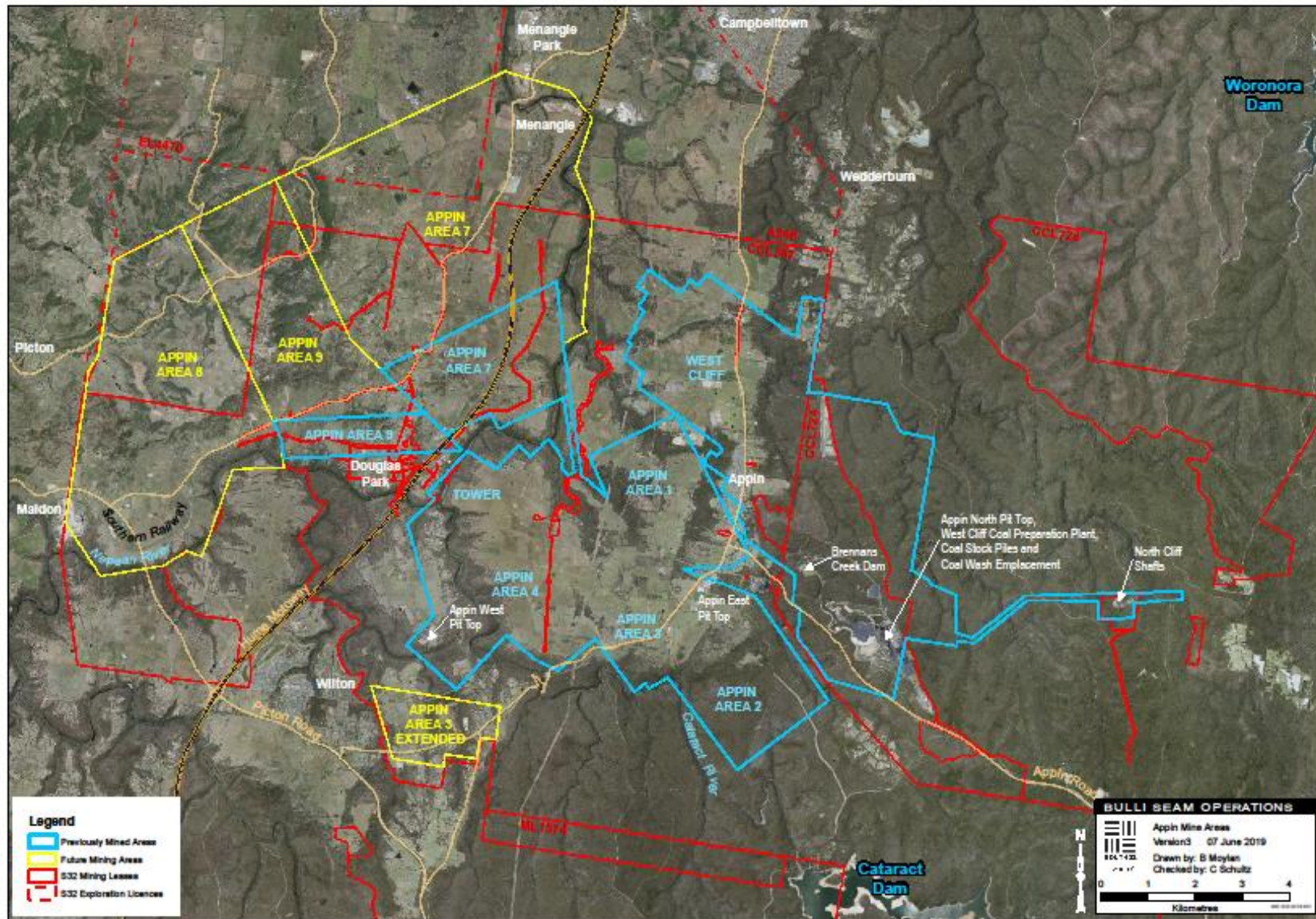
Acronym	Definition	Acronym	Definition
AQGHGMP	Air Quality and Greenhouse Gas Management Plan	LW	Longwall
AWWFP	Appin West Water Filtration Plant	MOP	Mining Operations Plan
ARC	Australian Research Council	NATA	National Association of Testing Authorities
BCD	Brennans Creek Dam	NEPM	National Environment Protection Measure
BSO	Bulli Seam Operations	OEH	Office of Environment and Heritage (now Biodiversity Conservation Division)
CCL	Consolidated Coal Lease	PEF	Processed engineered fuel
CO	Carbon monoxide	PM _{2.5}	Particulate matter 10 microns
CPP	Community Partnerships Program	PM ₁₀	Particulate matter 10 microns
CPW	Cumberland Plain Woodland	PRP	Pollution Reduction Program
CV	Calorific Value	RCE	Rehabilitation Cost Estimate
DDG	Dust Deposition Gauge	RMP	Rehabilitation Management Plan
DotE	Department of the Environment	RMS	Roads and Maritime Services
DPIE	Department of Planning, Industry and Environment ¹¹	ROM	Run of Mine
DTIRIS	Department of Trade, Investment, Regional Infrastructure and Services	S32IMC	South32 Illawarra Metallurgical Coal
EC	Electrical conductivity	SA NSW	Subsidence Advisory NSW
EDL	Energy Developments Limited	SBO	Strategic Biodiversity Offsets
EIP	Environment Improvement Program	SMP	Subsidence Management Plan
EFT	S32 Environmental Field Team	SSTF	Shale Sandstone Transition Forest
EP	Extraction Plan	STP	Sewage Treatment Plant
EPA	Environment Protection Authority	SWMP	Surface Water Management Plan
EPBC	Environment Protection and Biodiversity Conservation	TARP	Trigger Action Response Plan
EPL	Environment Protection Licence	TSS	Total Suspended Solid
FY	Financial Year	TPH	Total petroleum hydrocarbons
GHG	Greenhouse Gas	VAM	Ventilation Air Methane
HVAS	High volume air sampler	WFP	Water Filtration Plant
ICCCC	Illawarra Coal Community Consultative Committee	WMP	Water Management Plan
IMS	Integrated membrane system	WCCPP	West Cliff Coal Preparation Plant
LDP	Licensed Discharge Point	WCEA	West Cliff Emplacement Area

¹¹ Previously Department of Planning and Environment, Department of Planning, Department of Urban Affairs and Planning

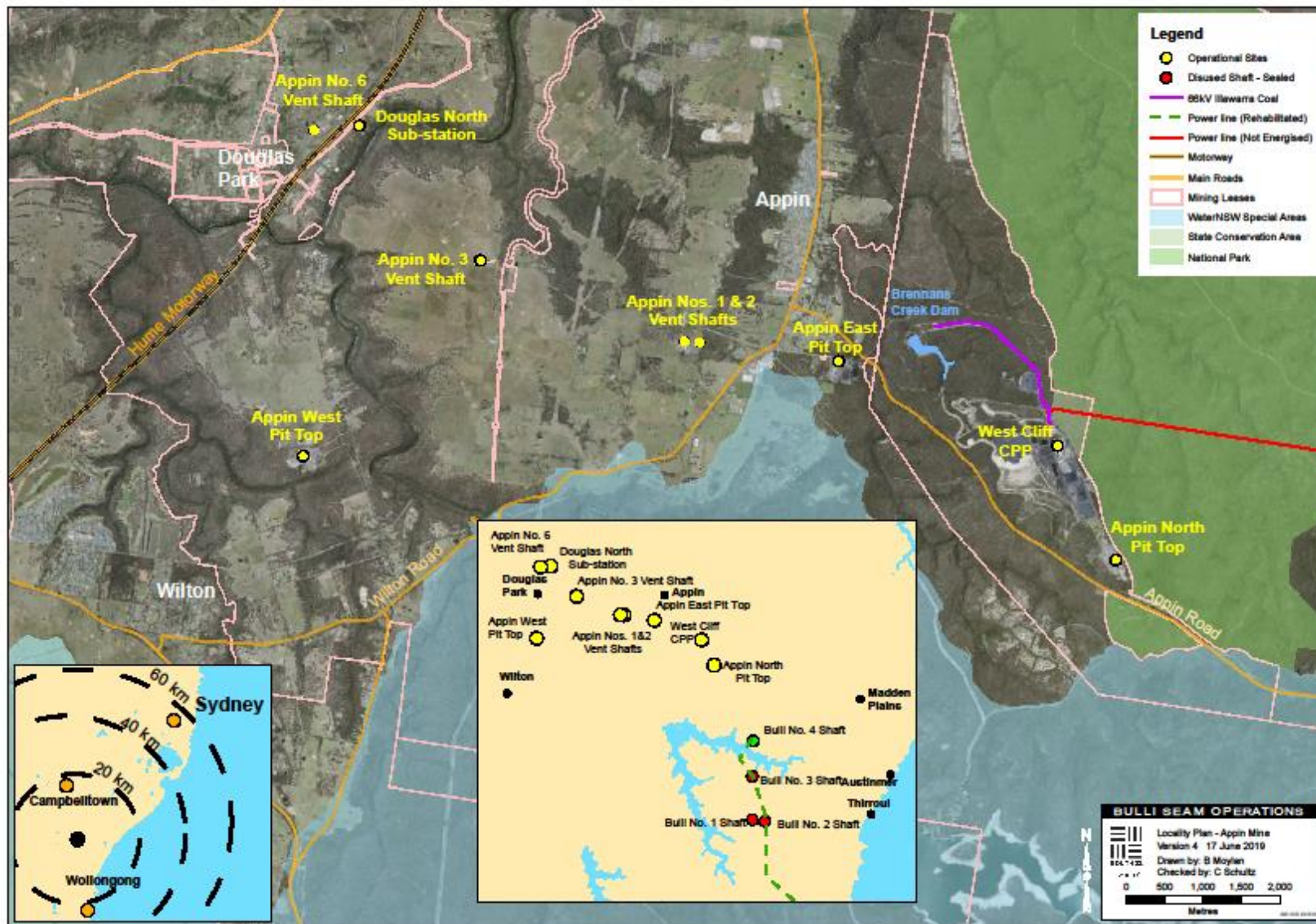
14. PLANS

Plan 1	Regional Location Plan
Plan 2	Appin Shaft Locality Plan
Plan 3	Appin East Mine Site
Plan 4	Appin West Mine Site
Plan 5	No.1 & No.2 Shaft Site
Plan 6	No.3 Shaft Site
Plan 7	No.6 Shaft Site
Plan 8	Douglas North Substation
Plan 9	West Cliff and Appin North Layout
Plan 10	Appin North Pit Top
Plan 11	West Cliff Coal Preparation Plant
Plan 12	North Cliff Site Plan
Plan 13	Land Preparation Plan – Coal Wash Emplacement
Plan 14	Appin East Gas Drainage Plant and Pipeline Upgrade
Plan 15	West Cliff Emplacement Cultural Heritage Sites
Plan 16	FY19 Subsidence Areas
Plan 17	Appin Area 7 FY19 Surface Water Monitoring
Plan 18	Appin Area 9 FY19 Surface Water Monitoring
Plan 19	Appin Area 9 – Annual Review Gas Zones
Plan 20	Groundwater Monitoring Sites in Area
Plan 21	Mine Extraction Plan
Plan 22	Biodiversity Offset Locations

PLAN 1: REGIONAL LOCATION PLAN



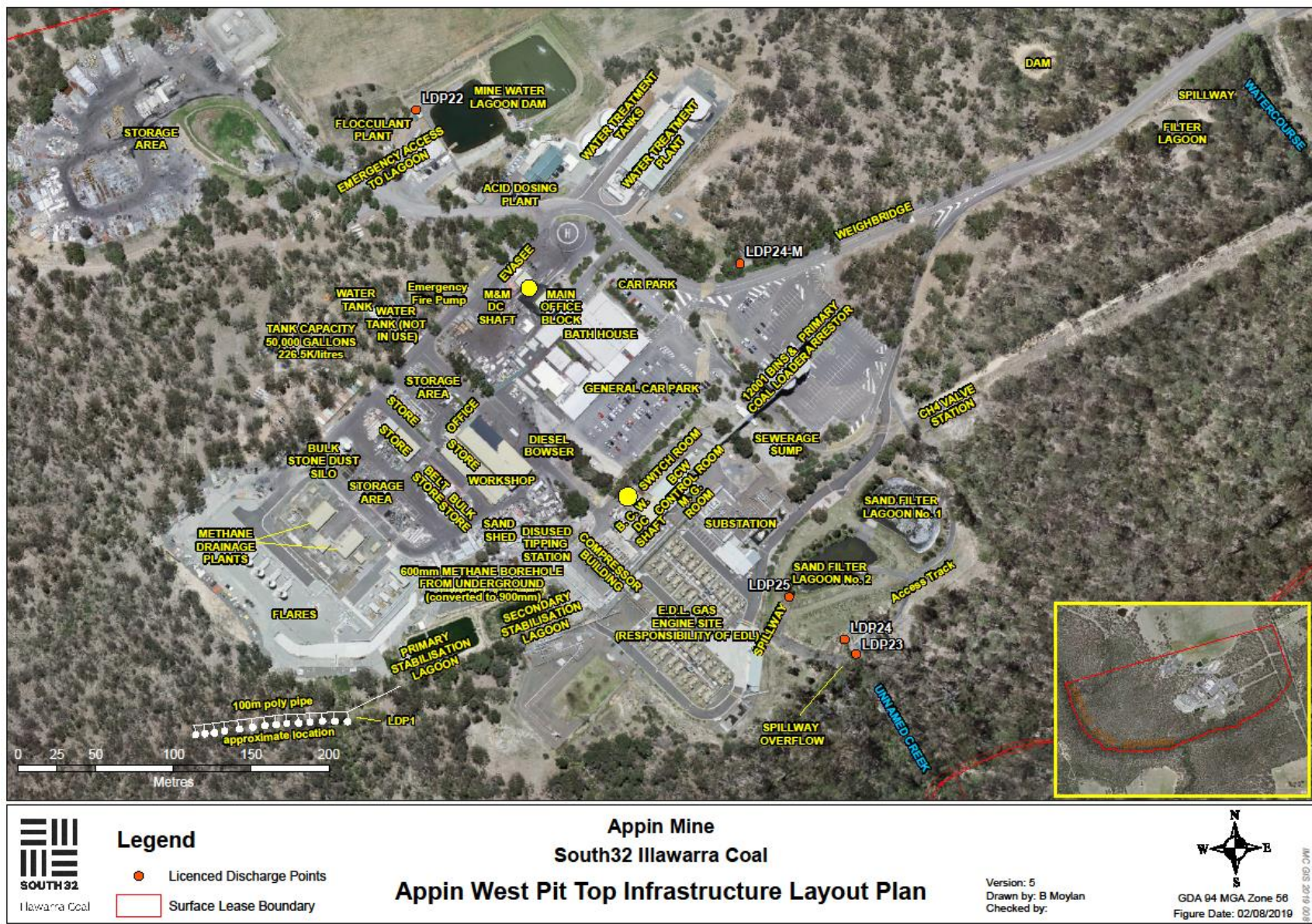
PLAN 2: APPIN SHAFT LOCALITY PLAN



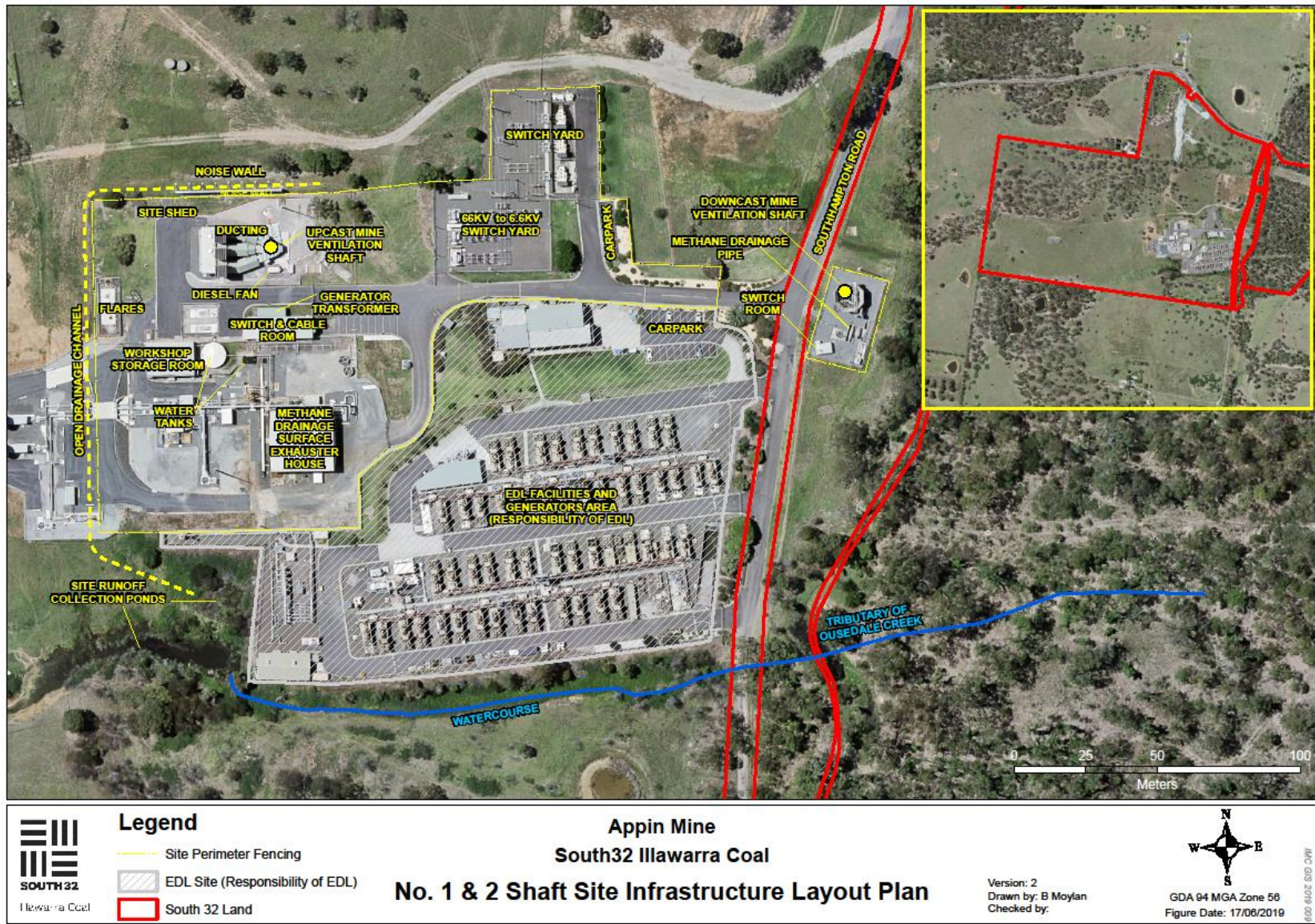
PLAN 3: APPIN EAST MINE SITE



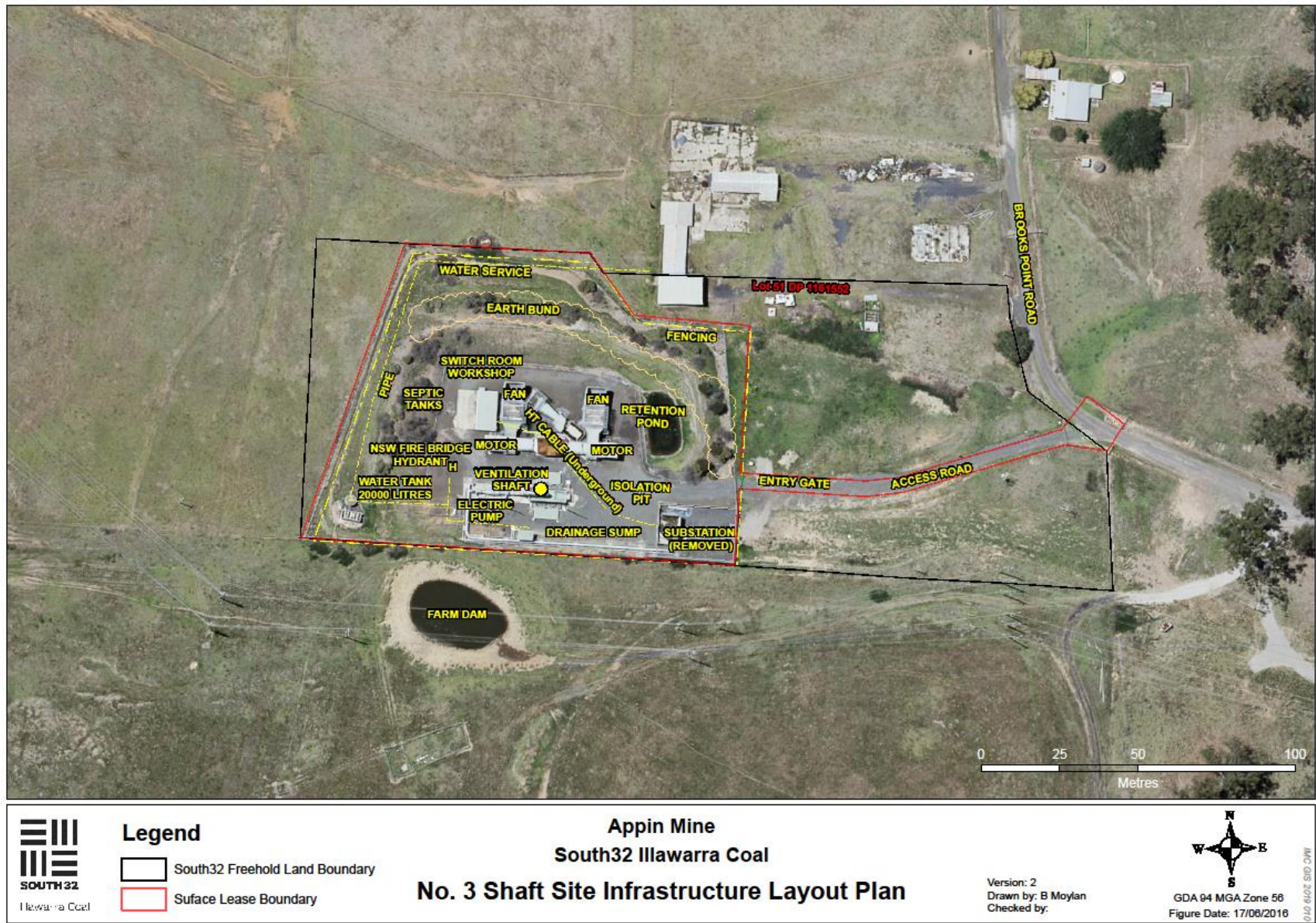
PLAN 4: APPIN WEST MINE SITE



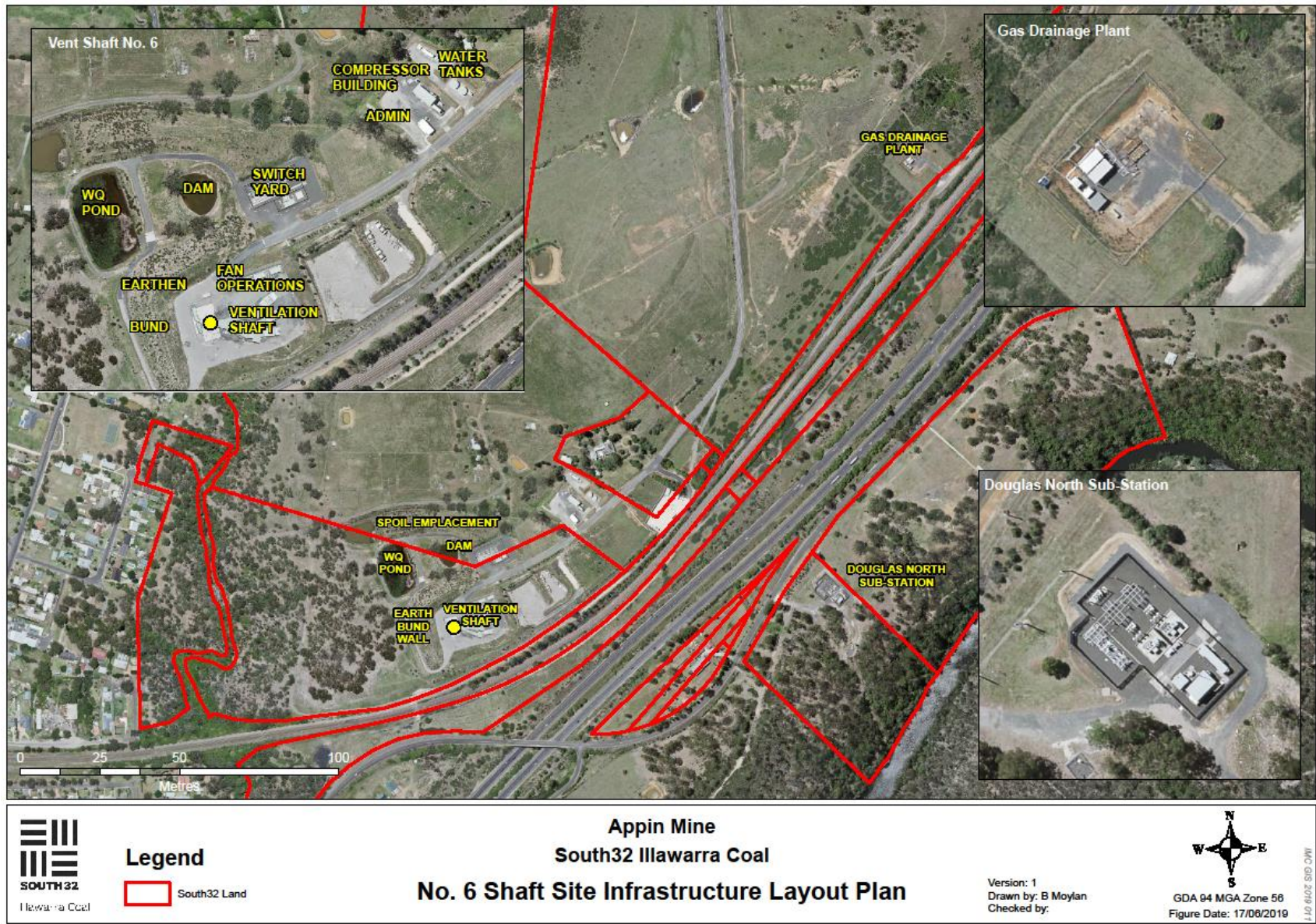
PLAN 5: NO.1 & NO.2 SHAFT SITE



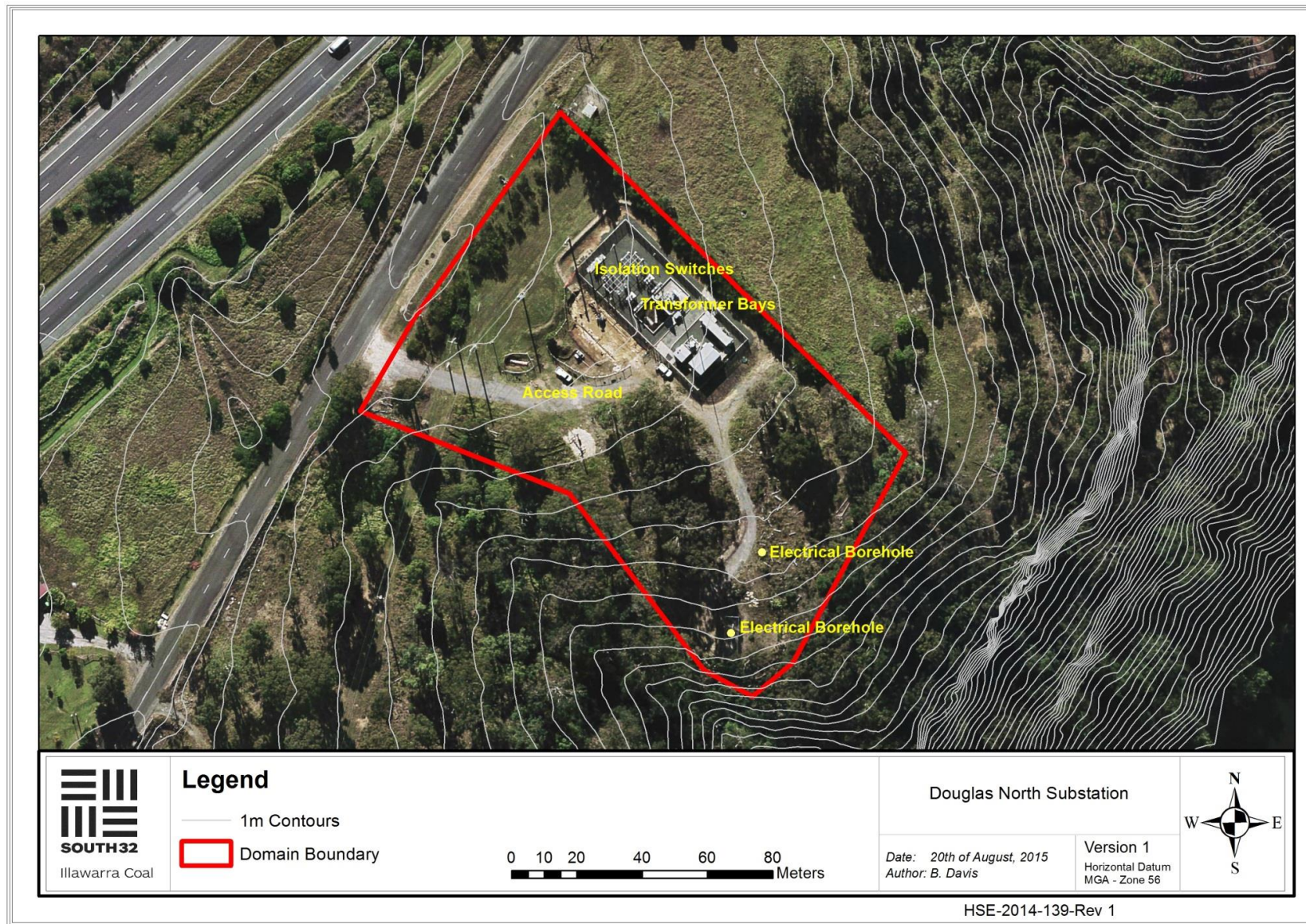
PLAN 6: NO.3 SHAFT SITE



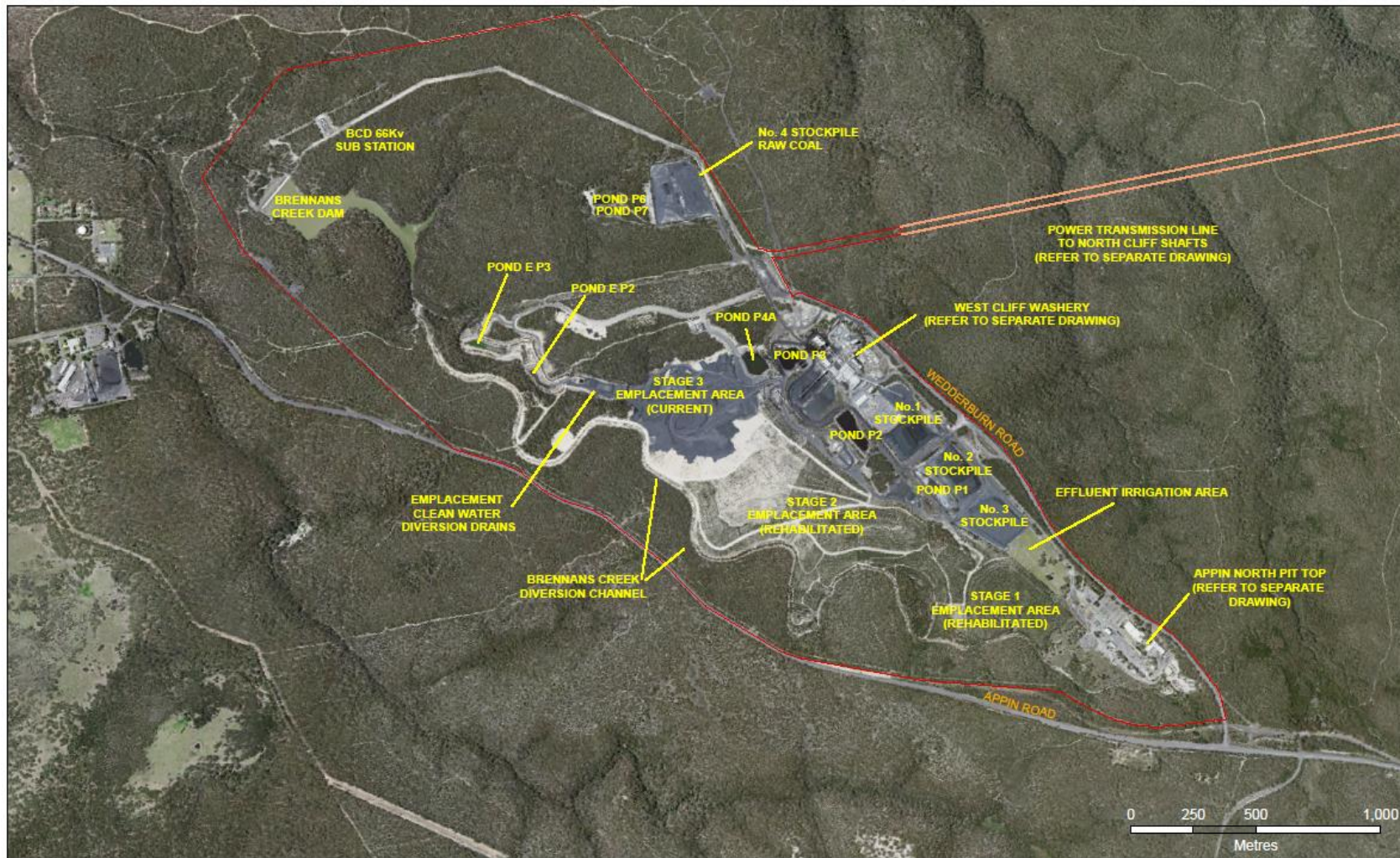
PLAN 7: NO.6 SHAFT SITE



PLAN 8: DOUGLAS NORTH SUBSTATION



PLAN 9: WEST CLIFF AND APPIN NORTH LAYOUT



Legend

Surface Lease Boundary

South32 Illawarra Coal West Cliff and Appin North Layout

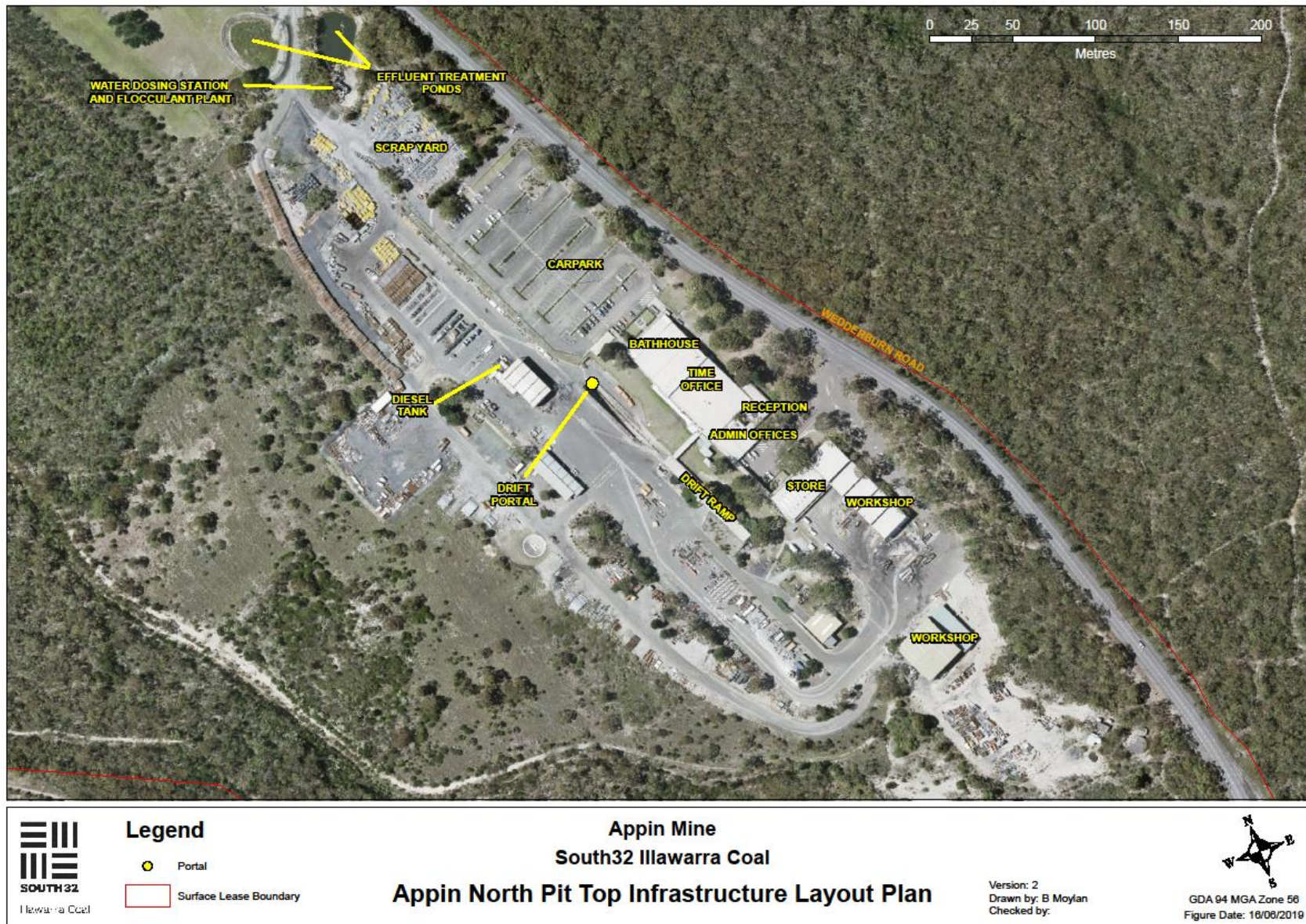
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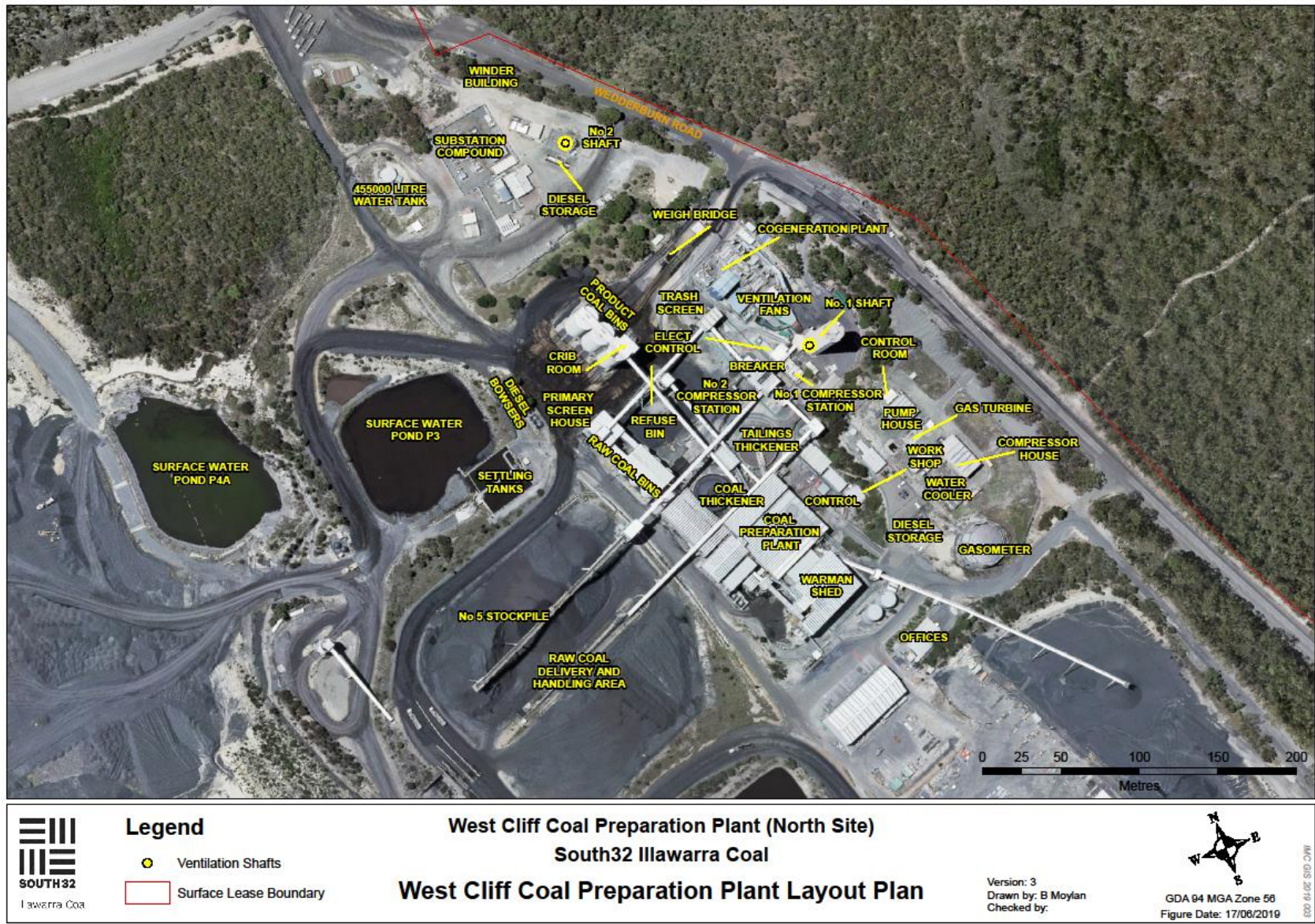
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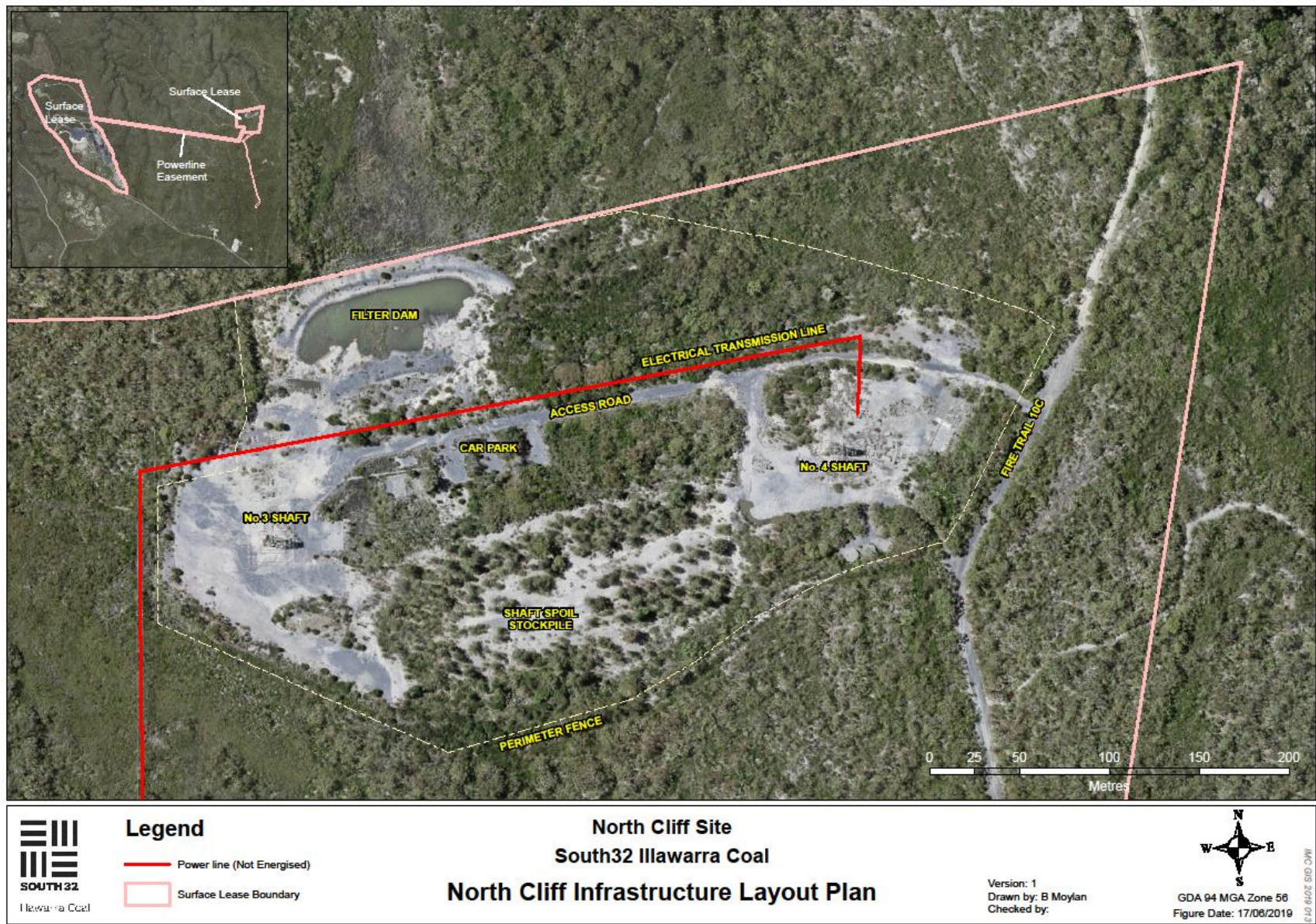
PLAN 10: APPIN NORTH PIT TOP



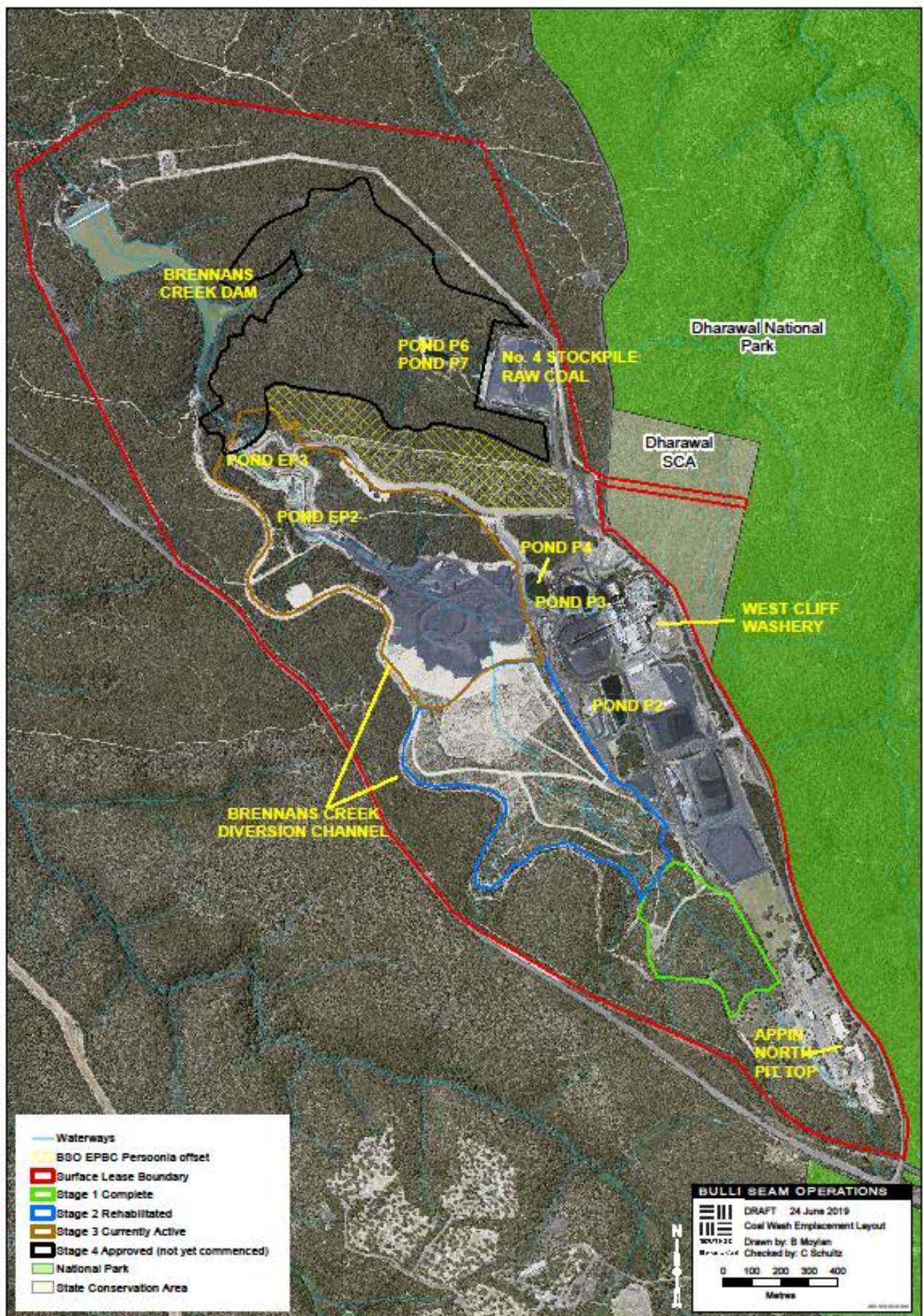
PLAN 11: WEST CLIFF COAL PREPARATION PLANT



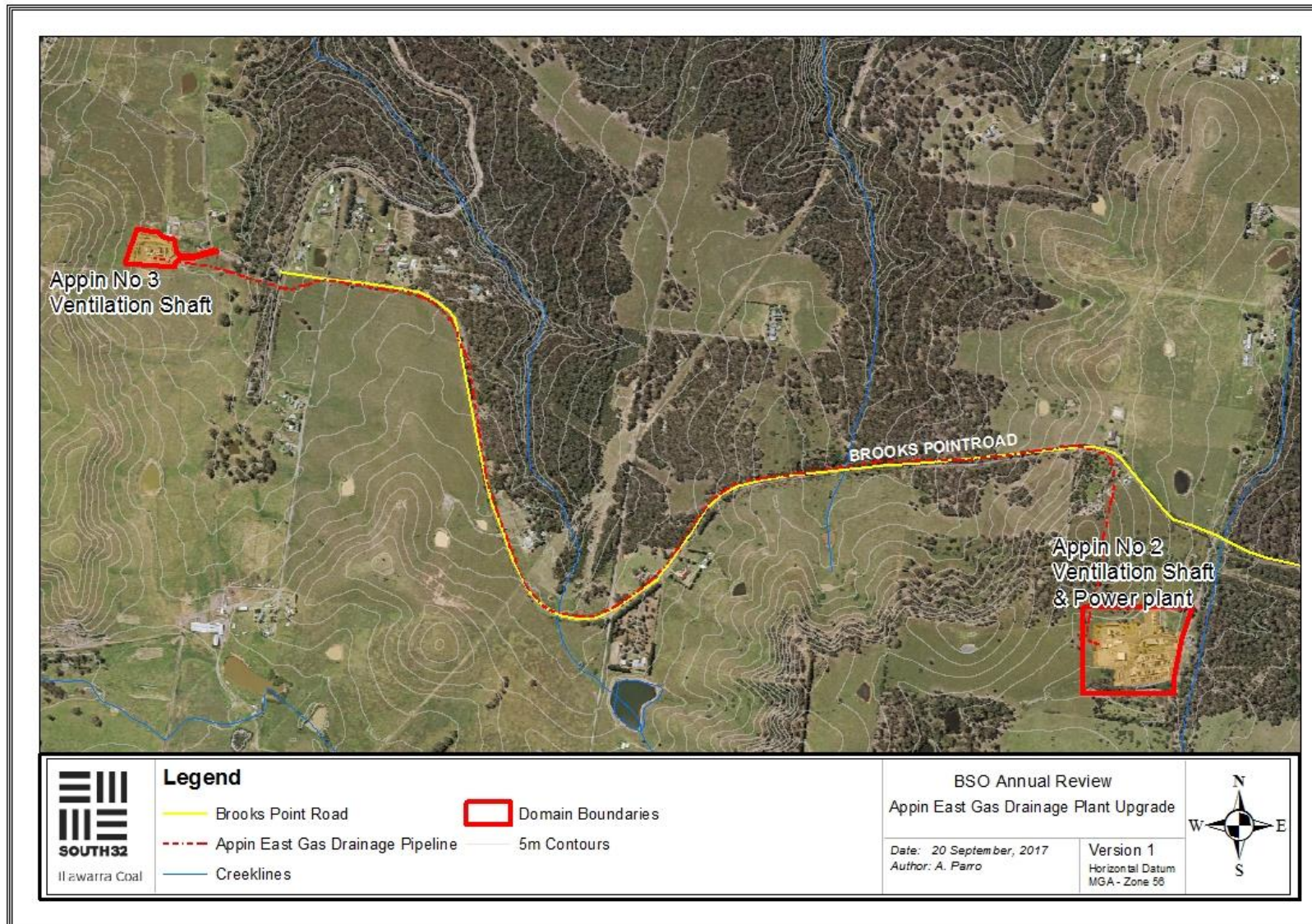
PLAN 12: NORTH CLIFF SITE PLAN



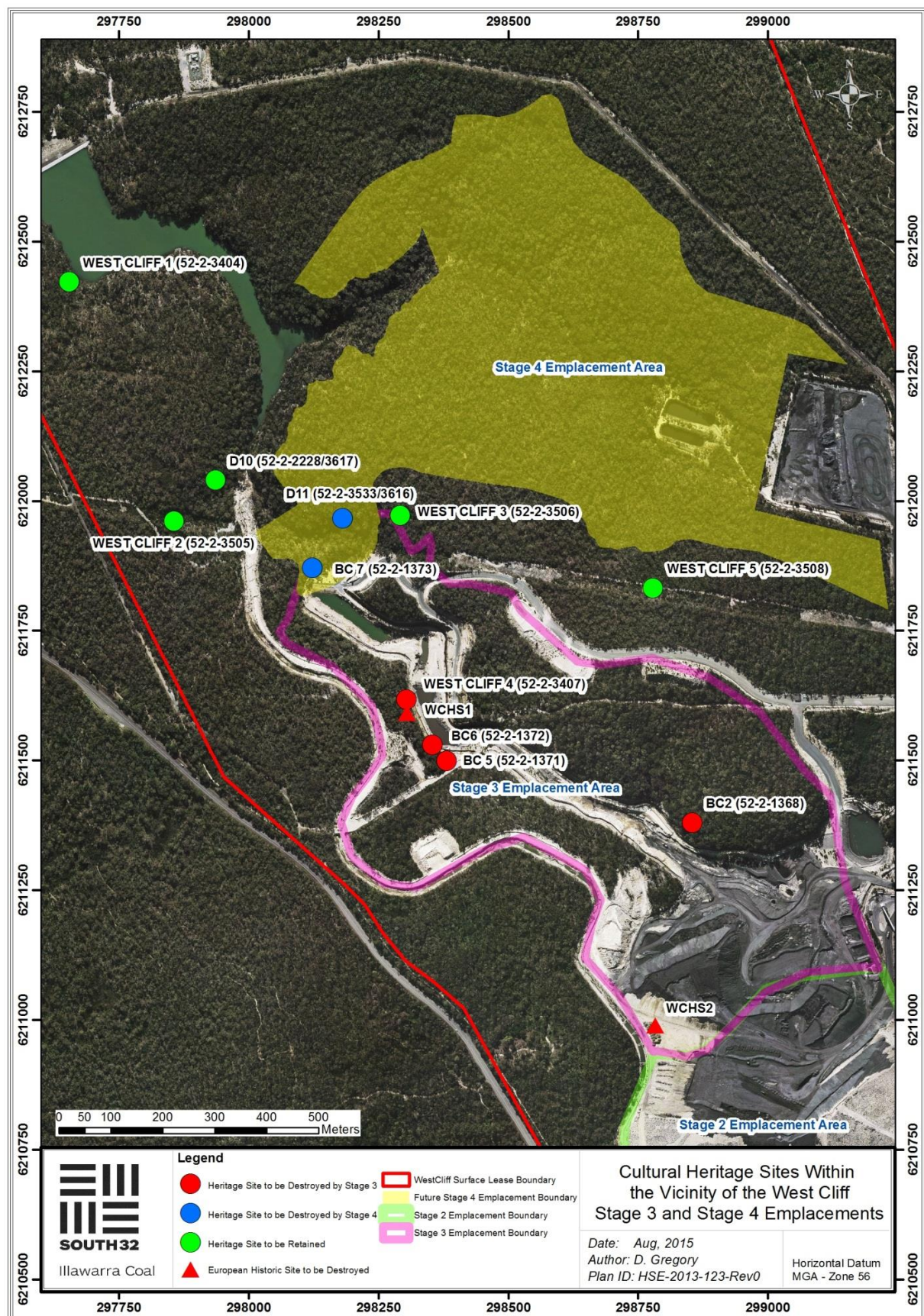
PLAN 13: LAND PREPARATION PLAN – COAL WASH EMPLACEMENT



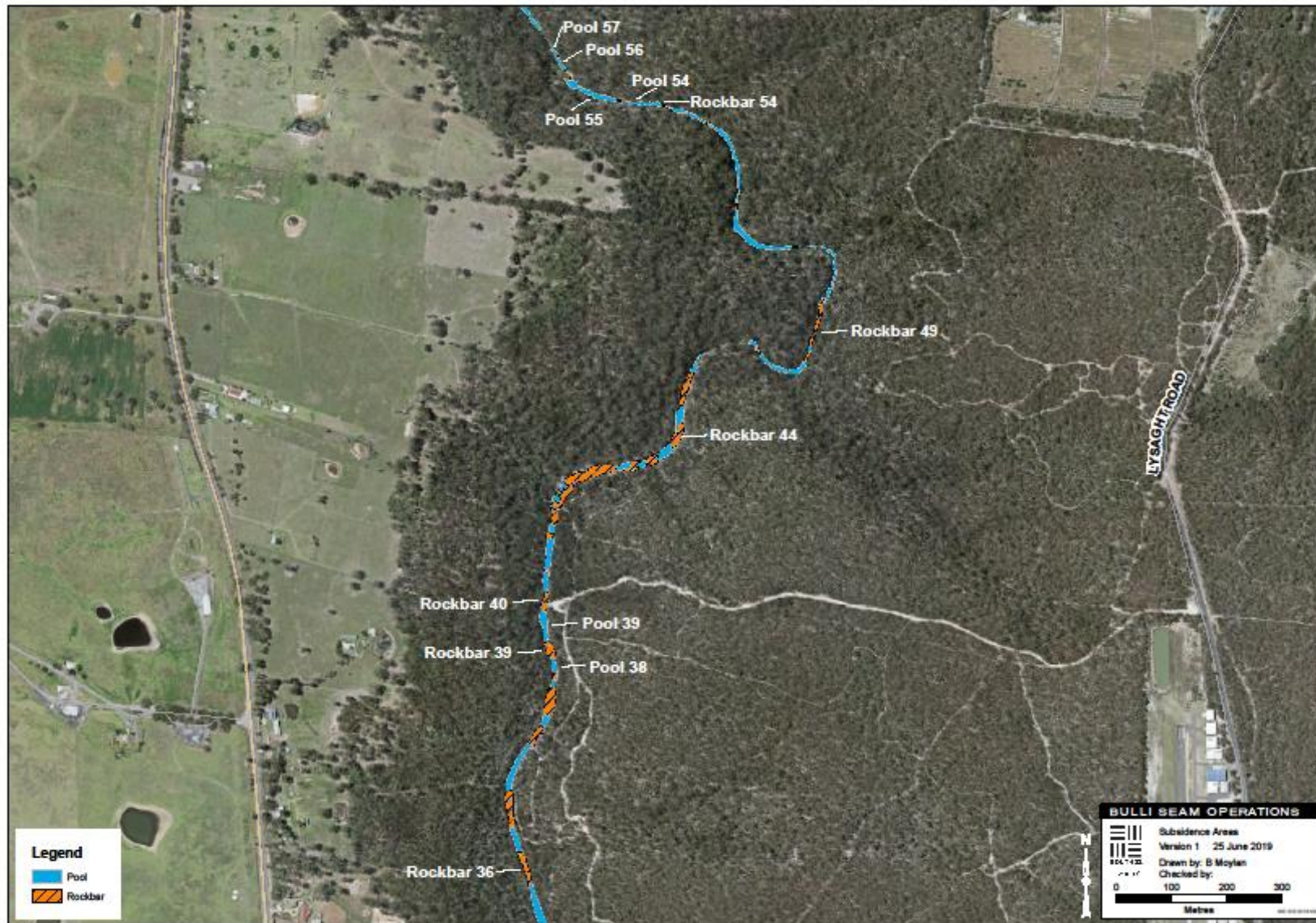
PLAN 14: APPIN EAST GAS DRAINAGE PLANT AND PIPELINE UPGRADE



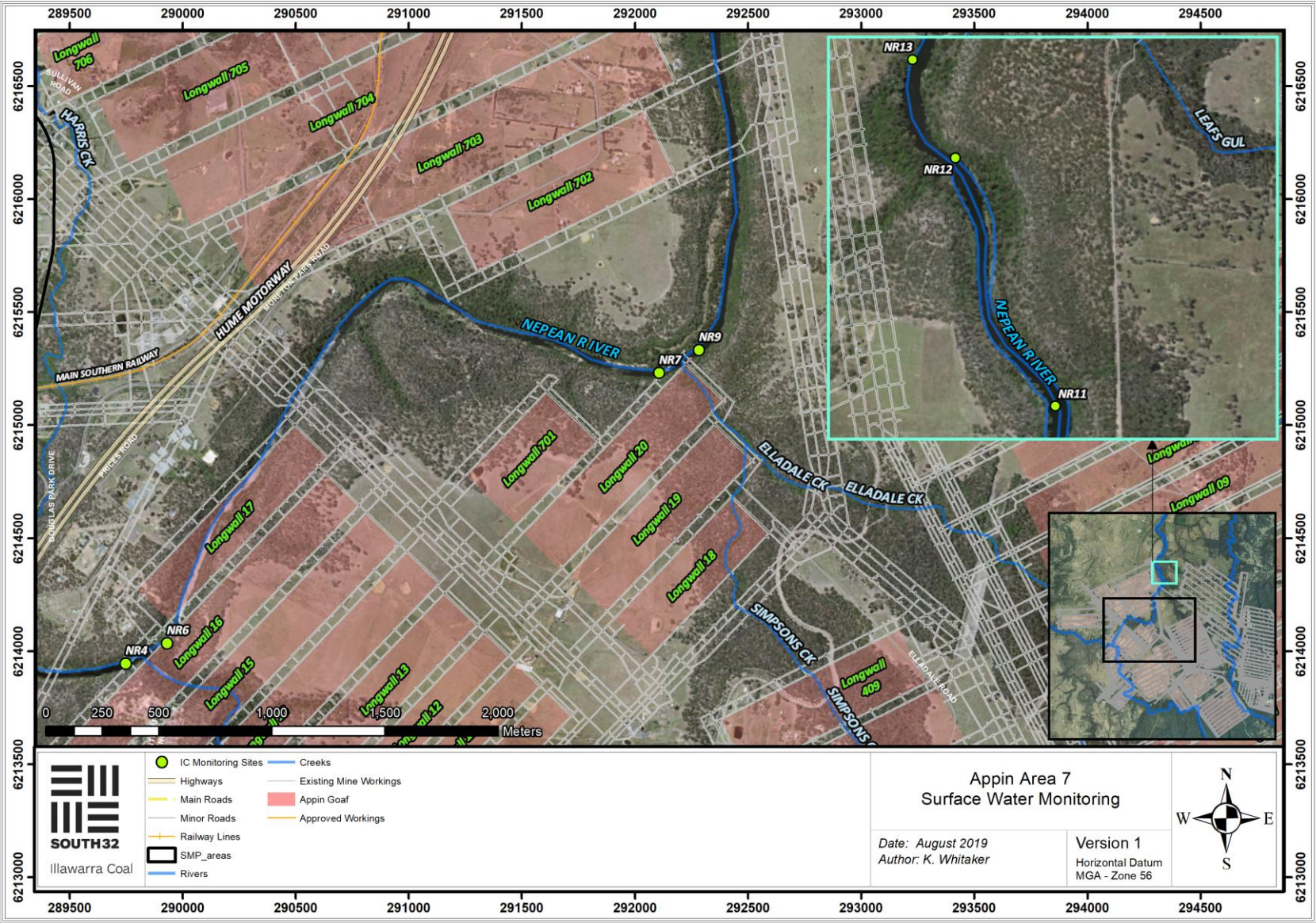
PLAN 15: WEST CLIFF EMBLACEMENT CULTURAL HERITAGE SITES



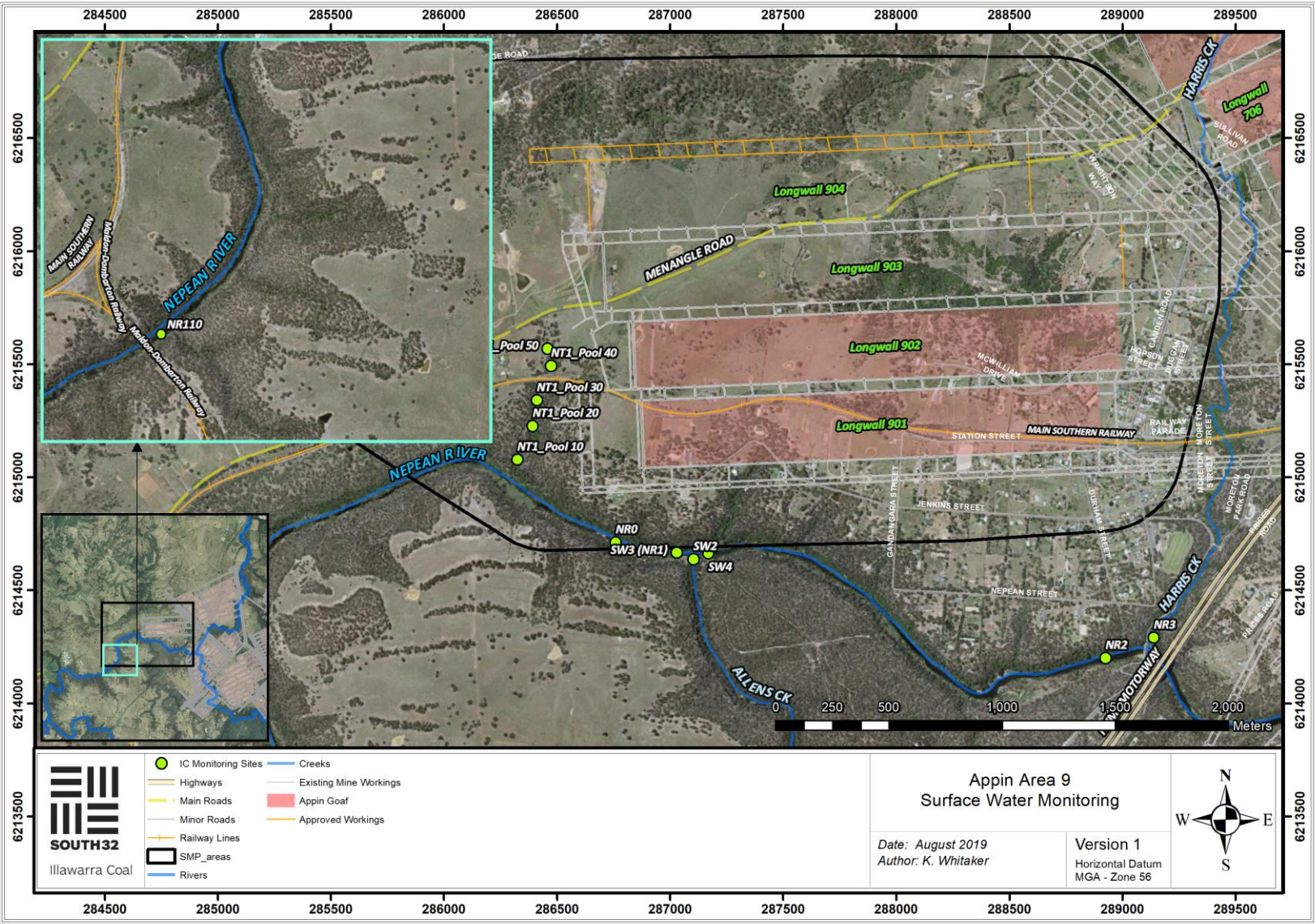
PLAN 16: FY19 SUBSIDENCE AREAS



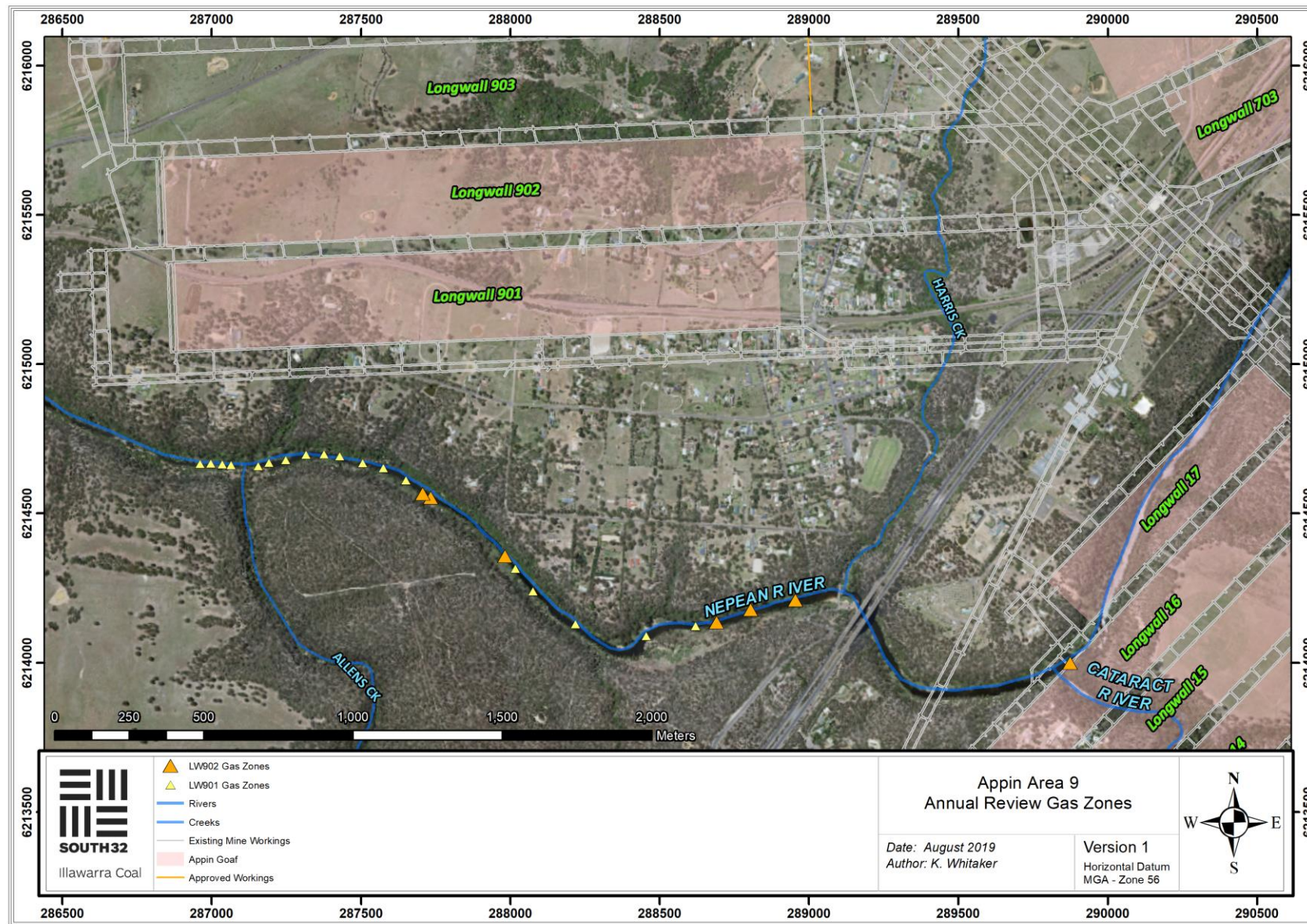
PLAN 17: APPIN AREA 7 FY19 SURFACE WATER MONITORING



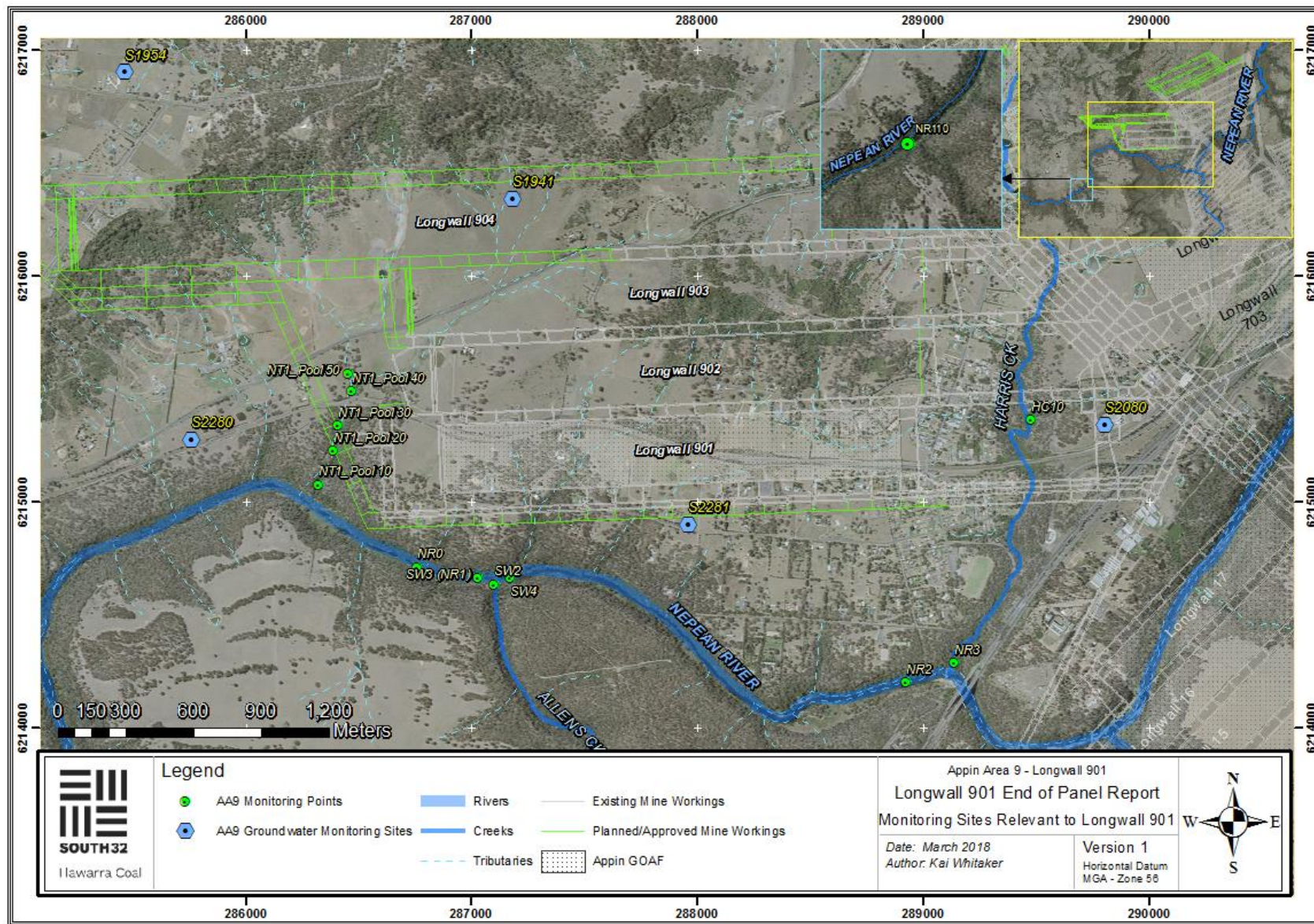
PLAN 18: APPIN AREA 9 FY19 SURFACE WATER MONITORING



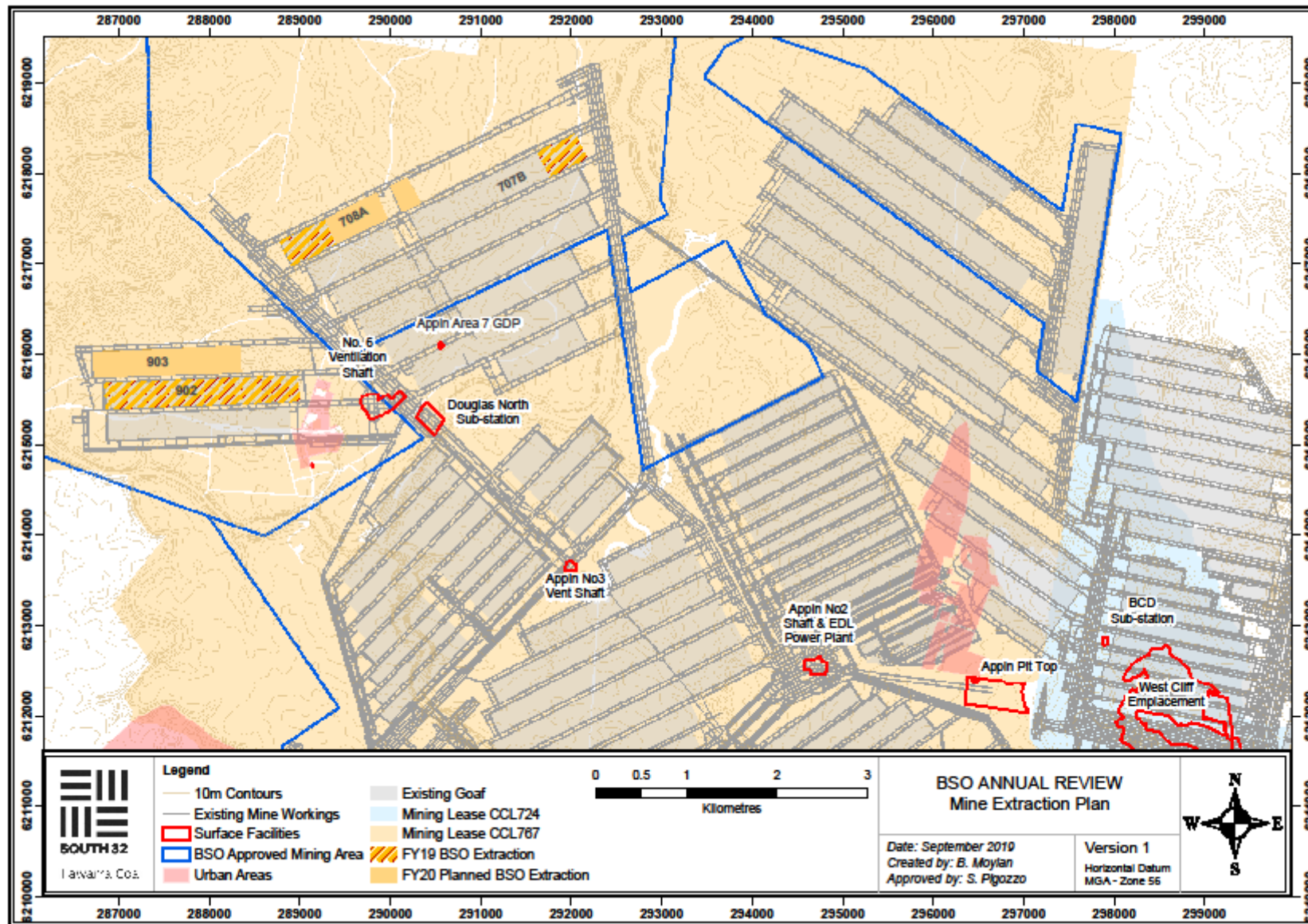
PLAN 19: APPIN AREA 9 – ANNUAL REVIEW GAS ZONES



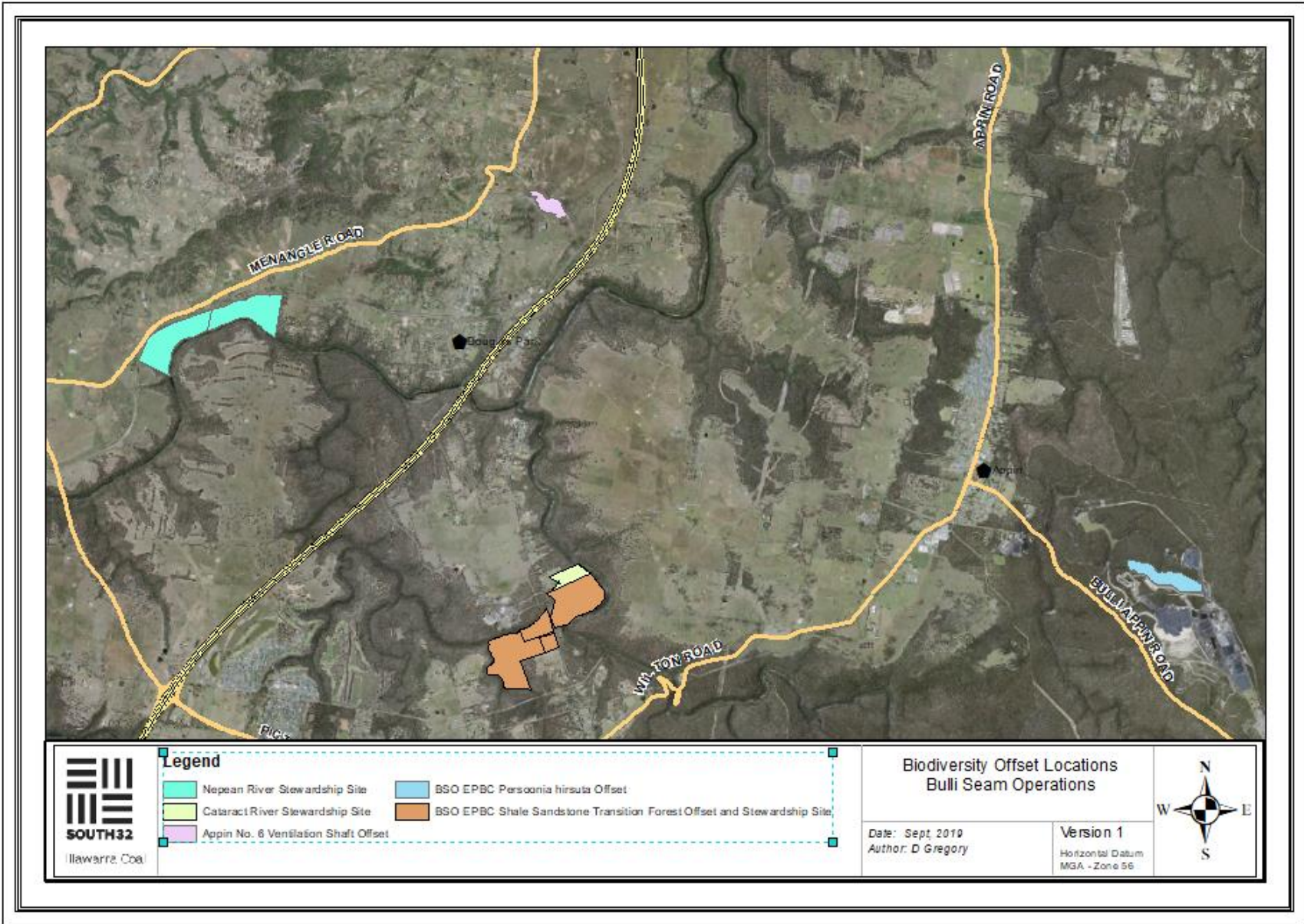
PLAN 20: GROUNDWATER MONITORING SITES IN AREA



PLAN 21: MINE EXTRACTION PLAN



PLAN 22: BIODIVERSITY OFFSET LOCATIONS



APPENDICES

APPENDIX A: ANNUAL REHABILITATION REPORT

MONITORING REPORT - EMPLACEMENT REHABILITATION YEAR 8

Illawarra Coal 2018



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INTRODUCTION

REQUIREMENT FOR MONITORING

Stage 3 Consent

The development consent for the Stage 3 Emplacement at West Cliff Colliery Emplacement required Illawarra Coal (IC) to implement a formal monitoring program for all past, present and future emplacement rehabilitation activities on the site. The Stage 3 consent was replaced by the Bulli Seam Operations (BSO) Part 3A and EPBC Act approvals in 2011.

BSO Part 3A and EPBC Act Approvals

IC received Project Approval for current and proposed operations within the BSO for 30 years from the:

- NSW Department of Planning and Environment (DPE) under the *Environmental Planning and Assessment Act 1979* in December 2011; and
- Department of the Environment (DoE) under the *Environment Protection and Biodiversity Conservation Act 1999* in May 2012.

Both contain conditions relating to the emplacement operations, as summarised in Table 1.

Table 1: Condition requirements of the EPBC and Part 3A approvals relating to emplacement rehabilitation

BSO Project Approval Condition 17	EPBC Project Approval Clause 6:
<p>The Proponent shall prepare and implement a West Cliff Emplacement Area Management Plan for the project to the satisfaction of the Director-General. This plan must be prepared in consultation with OEH and be submitted to the Director-General for approval by the end of June 2013. This plan must include:</p> <p>a) detailed design plans which include options for reducing, avoiding and/or managing impacts on Aboriginal heritage sites in and adjacent to the south-western fringe of the proposed Stage 4 footprint (including sites: 52-2-2228/3617, 52-2-1373, 52-2-3533/3613 and 52-2-3506</p> <p>(b) management strategies to ensure no impacts to Aboriginal heritage site 52-2-3505 other than negligible impacts, including consideration of potential staged development of the emplacement and/or buffer areas;</p> <p>(c) management strategies for the protection and conservation of <i>Persoonia hirsuta</i>;</p> <p>(d) management strategies for the protection and conservation of the Broad-headed Snake and the Southern Brown Bandicoot;</p> <p>(e) a comprehensive groundwater monitoring program for the Brennans Creek valley, including the area of the emplacement;</p> <p>(f) provide for progressive rehabilitation of the emplacement area, including through:</p> <ul style="list-style-type: none"> - maximising opportunities for natural regeneration; - maximising retention of suitable habitat species; - appropriate weed and pest control strategies; and - planting only endemic species in habitat mixes appropriate for soil, slope and aspect. 	<p>The person taking the action must provide a Coal Wash Emplacement Staging and Rehabilitation Plan (the Staging Plan) for the stage 4 coal wash emplacement area to the Minister for approval. Clearing of vegetation for stage 4 coal wash area must not occur until the Staging Plan has been approved by the Minister. The Staging Plan must include, but not be limited to:</p> <p>Measures to limit the clearing of native vegetation to no more than 60 hectares;</p> <p>Provision for the progressive staging of coal wash emplacement to ensure at all times a minimum 100 m wide habitat corridor is maintained linking the <i>Persoonia hirsuta</i> core population with habitat adjacent to the Stage 4 coal wash emplacement area;</p> <p>Measures to ensure that, if the corridor is to include land previously used as emplacement areas (either in whole or part), native re-vegetation is established to the extent that it facilitates the movement of pollination vectors for <i>Persoonia hirsuta</i>;</p> <p>Staging of emplacement from east to west;</p> <p>Provision for progressive rehabilitation of the emplacement area, including through:</p> <p>Staged clearing of native vegetation within the stage 4 coal wash emplacement area;</p> <p>Maximising opportunities for natural regeneration, including through salvage, storage and re-use of site top soil and maximising the retention time of suitable habitat species within the stage 4 coal wash emplacement area adjacent to active emplacement areas to assist re-colonisation of native species to rehabilitated areas;</p> <p>Key performance objectives for site rehabilitation, including indicative timelines, performance measures, management actions and responsibilities and accountabilities;</p>

BSO Project Approval Condition 17	EPBC Project Approval Clause 6:
	<p>Planting only endemic species in habitat mixes appropriate for the local surrounding environment, soil, slope and aspect, in accordance with relevant published guidelines; and</p> <p>Appropriate weed and pest control strategies.</p> <p>Monitoring and rehabilitation actions including but not limited to, measures to assess the success of management actions, natural regeneration and revegetation. The reporting of monitoring results must be submitted to the department within 30 days of every 12 month anniversary of the implementation date of the Staging Plan; and</p> <p>Unless otherwise agreed to in writing by the Minister, the Staging Plan must be implemented and remain implemented for a minimum period of 10 years at which point a revised plan taking into account the monitoring referred to above must be submitted to and approved by the Minister.</p>

Emplacement Management Plan

The BSO Emplacement Area Management Plan was approved on 16th November 2016 by DOPE.

The rehabilitation monitoring commitments outlined in this plan are outlined in Table 2.

Table 2: Monitoring requirements from the Coal Wash Emplacement Area Management Plan

Type	Who	Frequency	Aspects monitoring	Output
Quarterly Inspection	Site Environmental Representative	Quarterly	Photographic records at pre-determined sites located within the rehabilitated area of the emplacement.	Report (internal) and photographic database.
Annual Inspection	Qualified ecologists or suitably trained site environmental representative	Annual	<p>Quadrat monitoring in rehabilitation and surrounding areas*</p> <p>Fixed photo points throughout the emplacement**</p> <p>Random meander transects (every three years) in rehabilitated areas***</p> <p>Fauna Monitoring****</p>	Report (internal). Outcomes from monitoring summarised in the BSO Annual Review Report appended to the BSO Annual Review.

*Biometric assessments are required annually, starting at 1 year after translocation. Surveys at control sites only required once every three years and the benchmarks as calculated remain so for the ensuing three-year period.

**Photo point monitoring is required annually and done in conjunction with the above.

***Meanders for threatened plants are undertaken every three years.

****Fauna monitoring using camera traps is required annually, starting 5 years after translocation or as deemed appropriate depending on the maturity of the revegetation.

PURPOSE OF THIS REPORT

The purpose of this report is to provide the results of the 2018 annual monitoring for the emplacement rehabilitation works.

SURVEY DESIGN

AIM

To measure, over time, the success of the rehabilitation of the Emplacement Area, particularly the regeneration of natural vegetation and placement of specific habitat features including rocks and logs.

This will be achieved through monitoring of biometric attributes, fixed photo points and threatened plant meander surveys, as well as measuring the presence/absence of fauna within the various rehabilitation sites of varying age.

KEY PERFORMANCE CRITERIA

The monitoring program is designed to monitor the success of the following criteria:

1. Adequate regeneration of translocated communities: Exposed Sandstone Scribbly Gum Woodland (ESSW) and Sandstone Gully Peppermint Forest (SGPF). Regeneration to reflect the composition and structure of the two communities.
 - i. Biometric attributes within local benchmarks
 - ii. No more than 20 percent weed cover in translocated compartments;
2. The degree to which fauna (native) use the rehabilitated emplacement including constructed habitats and nest boxes.

METHODS

Biometric Vegetation Assessment

This assessment utilises the original BioBanking Assessment Methodology (OEH 2014). This methodology is used as it is a ready-made vegetation condition assessment, incorporating parameters (known as 'site attributes') that reflect changes in condition over time against benchmarks. Furthermore, the methodology allows for the calculation of local benchmark data, thereby providing a more accurate picture of the condition of the suitable vegetation types locally.

Vegetation plots (50 x 20 metres) were established within each of the monitoring zones and data for the following site attributes was collected:

- Native Plant Species Richness;
- Native Overstorey Cover;
- Native Midstorey Cover;
- Native Groundcover (Grasses);
- Native Groundcover (Shrubs);
- Native Groundcover (Other);
- Exotic Plant Cover;
- Total Length of Fallen Logs.

Control Sites

Six locations were chosen as control sites (**Error! Reference source not found.**). Monitoring the controls sites will:

- Allow measurement of the success of soil translocation within the Emplacement through the comparison of a range of site condition attributes with local benchmark conditions;
- Provide long term data regarding the condition of local vegetation types and the targets for rehabilitation; and
- Account for any stochastic variability within the local ecosystems (e.g. bushfire, climate, etc.) and allow for the consideration of such variability in relation to the outcomes on the site.

The six locations chosen as control sites were stratified evenly (three of each) between the two locally dominant vegetation types; ESSW and SGPF.

Monitoring Sites

Stratification of the monitoring sites, within the Emplacement, occurred according to their treatment histories, age and the respective areas they occupied in hectares. Accordingly, 11 monitoring sites were chosen across three different treatment types in 2011. This was expanded to 15 plots across four separate treatments in 2014, and 17 plots in 2017 across five treatments (Plan A & Plan B). Monitoring sites are listed in Table 3: Monitoring site locations.

Table 3: Monitoring site locations

Site	Easting	Northing	Emplacement Stage
a1-228	299842	6210193	1
a1-230	299758	6210171	
a1-232	299857	6210092	
a2a-237	299578	6210253	2a
a2a-239	299649	6210350	
a2a-240	299509	6210386	
a2b-241	299515	6210493	2b
a2b-242	299322	6210565	
a2b-243	299136	6210510	
a2b-244	299093	6210408	
a2b-245	299388	6210627	
a2c-042	299259	6210803	2c
a2c-043	299223	6210746	
a2d-001	298798	6210768	2d
a2d-002	298848	6210678	
a2e-001	299093	6210797	2e
a2e-002	299018	6210885	

Local Benchmarks

Local benchmark data was collected at six control sites. The BioBanking Local Benchmark Calculator is then used to calculate the benchmark levels and the range of values for each of the collected attributes. The control sites were nominated based on Revised Biometric Vegetation Types (RBVTs as defined by OEH in the Biometric Vegetation Types Database) as either the Red Bloodwood – Scribbly-Gum Heathy Woodland RBVT or the Sydney peppermint – Smooth-Barked

Apple – Red Bloodwood Shrubby Open Forest RBVT of the Sydney Metropolitan Catchment Management Authority (CMA). It was considered that the Emplacement was likely to regenerate to a state that was an artificial combination of both RBVTs and therefore no attempt has been made to stratify the survey on the basis of these types.

Table 4 below shows the local benchmark values for each of the biometric attributes using data from the control sites collected in 2015, 2016 and 2017. Data from these years was used as the Local Benchmark. The data was entered into the Local Benchmark Calculator. Variation from previous benchmarks may be due to the limitations with survey methods due to a change in personnel conducting the monitoring.

Table 4: Local benchmarks

Attribute	Benchmarks (2018)	
	Lower	Upper
Native Plant Species	-	>= 42
Native Overstorey Cover	1.9	17.7
Native Midstorey Cover	4.4	16.0
Native Ground Cover (Grasses)	0.0	75
Native Ground Cover (Shrubs)	30.0	72.6
Native Ground Cover (Other)	28.8	66.6
Number of Trees with Hollows*	-	>= 2
Total Length of Fallen Logs	-	>= 34

* Included here for completeness only. As discussed above, trees with hollows are unlikely to develop within the life of the project.

Photo Point Vegetation Monitoring

Permanent photographic points have been established at each of the biometric vegetation plots.

Threatened Plant Random Meander

A random meander for threatened plants (Cropper 1993) is conducted through the Emplacement. This method is the most appropriate and accurate for the purposes of the monitoring survey. Two people, approximately 10 metres apart, traverse the Emplacement. Targeted species included those known to exist locally (some within the West Cliff Colliery surface lease-area) and include; *Acacia bynoeana*, *Epacris purpurascens* var. *purpurascens*, *Grevillea parviflora* ssp. *parviflora*, *Melaleuca deanei*, *Persoonia hirsuta*, *Persoonia nutans* and *Pultenaea aristata*.

Fauna Using Camera Traps

Camera traps are becoming the preferred survey method over traditional cage traps or hair tubes as they are more efficient and less labor intensive, and non-invasive. The method is well documented for monitoring small to medium sized mammals. Some useful resources are Eyre et al (2018) and Meek et al. (2012).

Camera traps are deployed to the rehabilitating areas, using a passive survey approach (i.e. non-baited). The sites target specific habitat features i.e. logs, log hollows and rock crevasses/overhangs to determine occupation. As a rule, a minimum of one trap is placed per rehabilitation compartment. Refer to Plan B.

Infra-red cameras are used and are placed to aim the lens at the core body zone of the animal. The cameras are placed approximately 20-30 cm above the ground and no more than 2-3m from the feature (Meek *et al.* 2012).

The recommended minimum deployment time is 12 nights (Meek et al. 2012).

Timing

Biometric assessments are required annually, starting at one year after translocation.

Surveys at control sites are only required once every three years and the benchmarks presented in this report are used for the ensuing three year period.

Photo point monitoring is required annually and done in conjunction with the above.

Meanders for threatened plants are undertaken every three years.

Fauna monitoring using camera traps is required annually, starting five years after translocation or as deemed appropriate, depending on the maturity of the revegetation.

Criteria can be measured most easily in spring by noting flowering, seed production, seedling growth and establishment.

2018 RESULTS AND DISCUSSION

BIOMETRIC VEGETATION ASSESSMENT

Native Plant Species Richness

The local benchmark for Native Plant Species Richness is ≥ 42 species per plot.

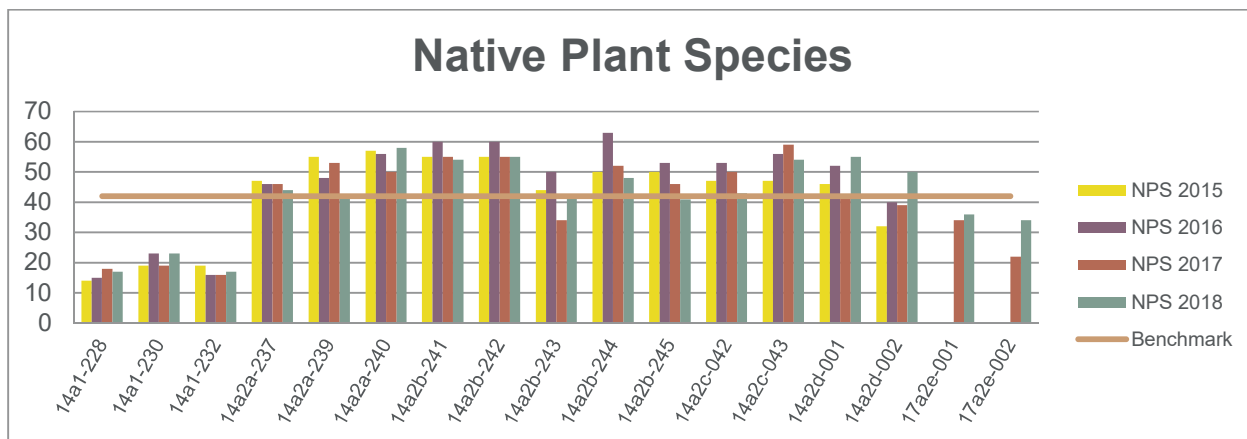


Figure 1 Number of native plant species at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d and 2e for 2018

The plots in Area 1 had low species richness in comparison to benchmark; however, this was also the case in previous years (2011 to 2016) and is a consistent result (Figure 1). This is due to the differing nature of the methodology used in comparison to stage 2 i.e. Stage 1 has shallower topsoil and is planted with tube stock (predominantly Acacia's and Eucalypts).

The plots in Area 2a had an average of 48 species per plot in 2018, slightly lower than the average of 50 species per plot of previous years monitoring. Rehabilitation in this area commenced in 2007 and it is expected that species richness will approach benchmark as certain species thrive and out compete others.

The plots in Area 2b had an average of 48 species per plot which is consistent with the 2017 data year and lower than data for 2016 (average of 57). The average remains above benchmark.

The native plant species richness of Areas 2c and 2d (last five years) are all above benchmark levels, with the average for Area 2c (49) lower than 2017 data (55) and the average for area 2d (53) higher

than 2017 data (41). It is expected that these species richness figures will increase further at these locations as the treatments establish. The newly treated Area 2e received results below benchmark (average of 35), however this is an increase from 2017 data (average of 28) and is expected to continue to increase with time and as the treatments establish further.

The high native species richness present in Area 2 may reflect the immaturity of the translocation areas, in that it shows that no particular species has had time to establish dominance and out-compete other species. It is expected that these sites in Area 2 will see a decline in species diversity over time and approach benchmark levels as certain species thrive and out compete others for resources and space (Niche 2015).

Native Overstorey Cover

Local benchmark for Native Overstorey Cover is 1.9 – 17.7 percent foliage cover.

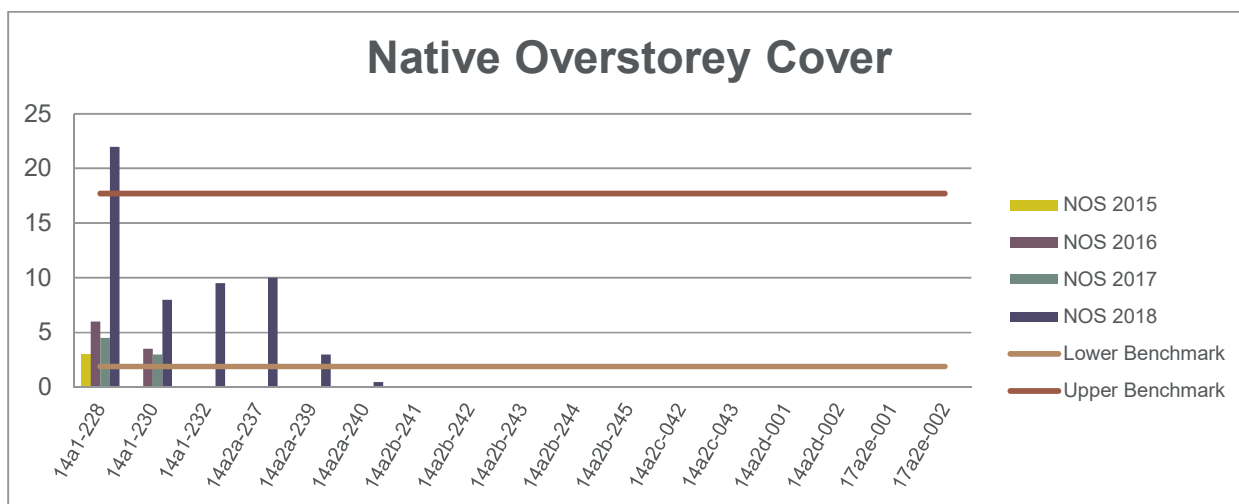


Figure 2 Native overstorey cover collected at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d and 2e for 2018

Areas 1 and 2a are the only areas mature enough to have recorded native overstorey as cover (Figure 2). The dramatic increase in overstorey cover in 2018, compared with previous years, may in part be due to placement of the transect. Despite all efforts to maintain a consistent bearing for the monitoring transect, even a slight change in angle can result in differing results. It is clear, however, that the canopy in Areas 1 and 2 are developing within benchmark values.

The areas subject to rehabilitation in 2b-e are too immature to have recorded native overstorey as cover, despite all dominant overstorey species being recorded within the monitoring plots. All canopy species within the plots were present only as shrubs or sub-shrubs and were considered a component of the midstorey or groundcover (shrubs < 1 metre). Therefore, none of the sites in Area 2b-e are within the benchmark range for Native Overstorey Cover. As the translocation areas establish and mature it is expected that Native Overstorey Cover will increase and approach benchmark levels.

Native Midstorey Cover

The local benchmark for Native Midstorey Cover is 4.4 – 16.0 percent foliage cover.

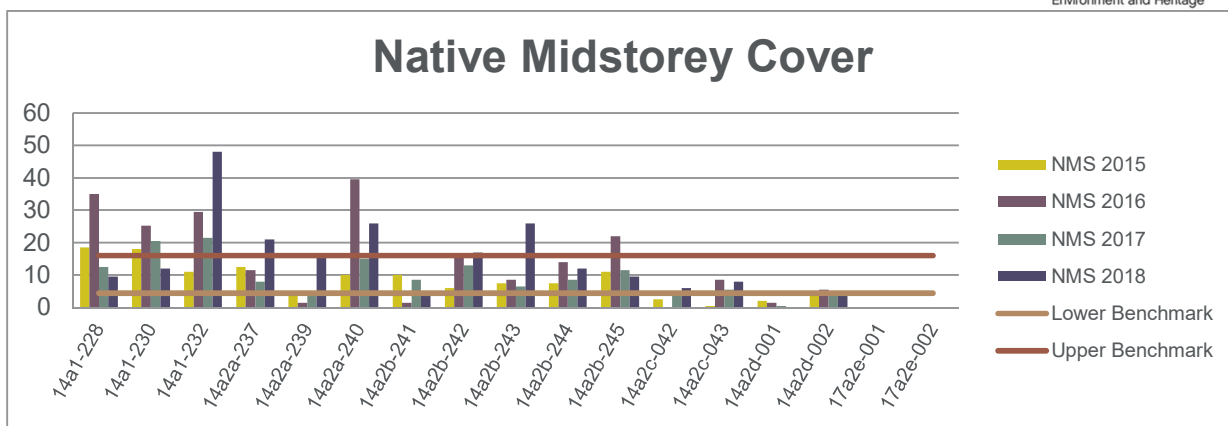


Figure 3 Native Midstorey Cover collected at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d and 2e for 2018

Most of the treatment areas demonstrated within or above benchmark values for native mid-storey cover (Figure 3). There have been some clear increases in both Area 1 and Area 2. The increases can be explained by maturity of some species whose natural life form is now above one metre (i.e. shrubs that were less than one metre in previous years are now large shrubs or small trees over one metre). The areas showing values greatly above benchmark may be a factor of the immature canopy contributing to the midstorey cover. It is likely that midstorey cover in Area 2c and Area 2d will increase further in coming years as the rehabilitation areas mature.

Native Ground Cover (Shrubs)

The local benchmark for Native Groundcover (Shrubs), i.e., woody plants < 1 metre: 30.0 – 72.6 per cent.

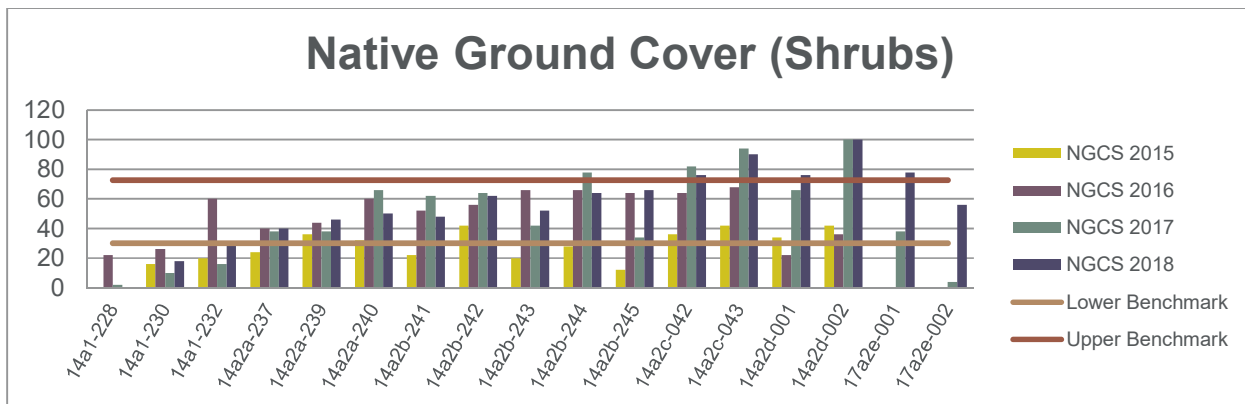


Figure 4 Native ground cover – Shrubs at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d and 2e for 2018

Most plots are within (or exceeding) the benchmark range for the attribute (Figure 4). The low ground cover in A1 may be because the bulk of the species within this treatment are either canopy or small tree species. Low ground cover in the newly treated Area 2e is increasing with time.

Native Ground Cover (Grasses)

The local benchmark for Native Groundcover (Grasses) is 0.0 – 75.0 per cent. Grass cover is naturally very low in the control sites, as is typical of Sydney Coastal Dry Sclerophyll Forests, hence the low and broad benchmark range for the attribute.

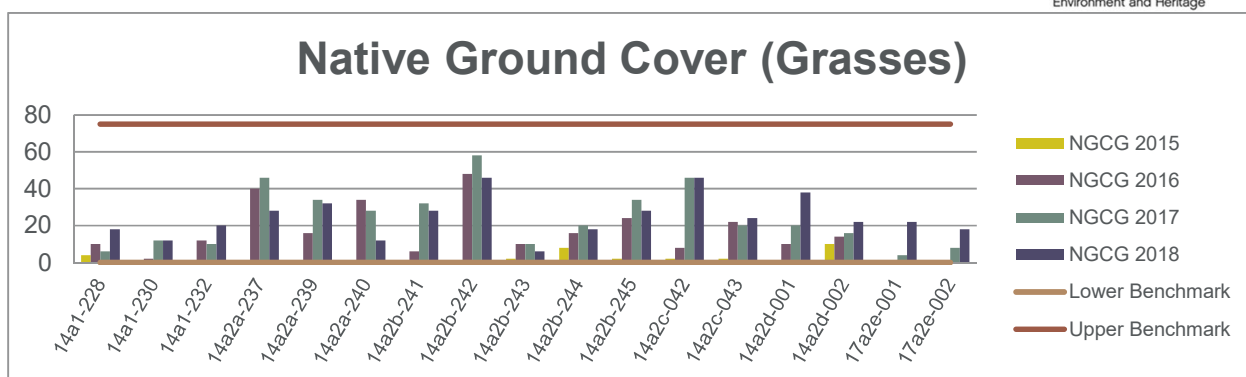


Figure 5 Native ground cover – Grasses at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d and 2e for 2018

Given that zero (0) is the lower benchmark for Native Groundcover (Grasses), all treatments are within benchmark for this attribute (Figure 5). This is entirely reasonable given that the translocated soils are from Sydney Coastal Dry Sclerophyll Forests, which are naturally higher in cover for herbs and forbs than grass cover. Grass cover also requires an open environment and since most of the treatments have resulted in a relatively dense mid-storey and shrub layer, native grass is difficult to establish. Percent cover of native grasses is not necessarily indicative of ecosystem health in Sydney Coastal Dry Sclerophyll Forests and the attribute is within benchmark in all treatment areas. In saying this, increases in native grass cover are shown in some of the areas.

Native Ground Cover (Other)

The local benchmark for Native Ground Cover (Other), i.e., herbs and forbs other than grasses is 28.8 – 66.6 per cent.

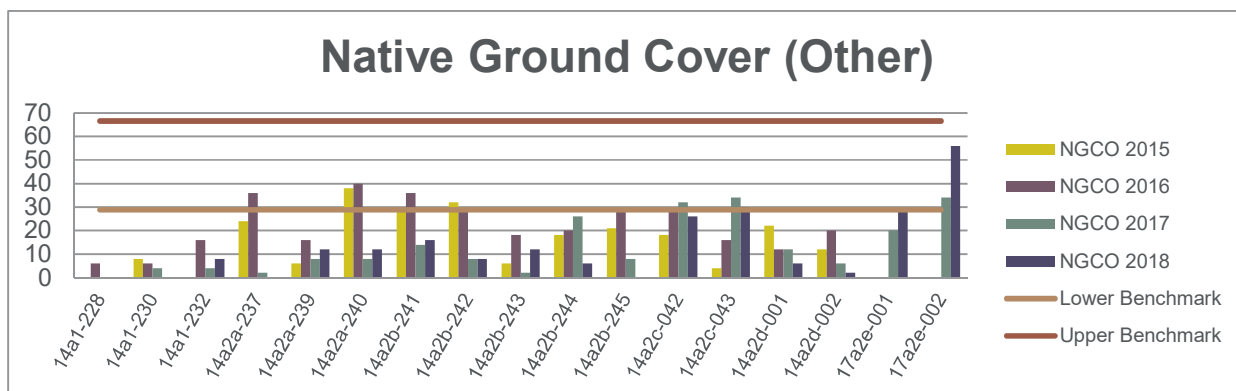


Figure 6: Native ground cover – Other at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d and 2e for 2018

Area 1 continues to experience low levels in Native Ground Cover (Other), which along with low native grass cover appears symptomatic of the treatment history and the subsequent density of the shrub and mid-storey layers (Figure 6). Other areas are at or below benchmark for Native Groundcover (Other), this is potentially due to the limitations with survey methods due a change in personnel conducting the monitoring. Area 2e is showing the highest percentage of Native Ground Cover (Other).

Exotic Plant Cover

There is no local benchmark for exotic plant cover. Whilst it is assumed that there would be 0 – 5% exotic plant cover within the control plots, a target of <20% has been chosen for all rehabilitation areas.

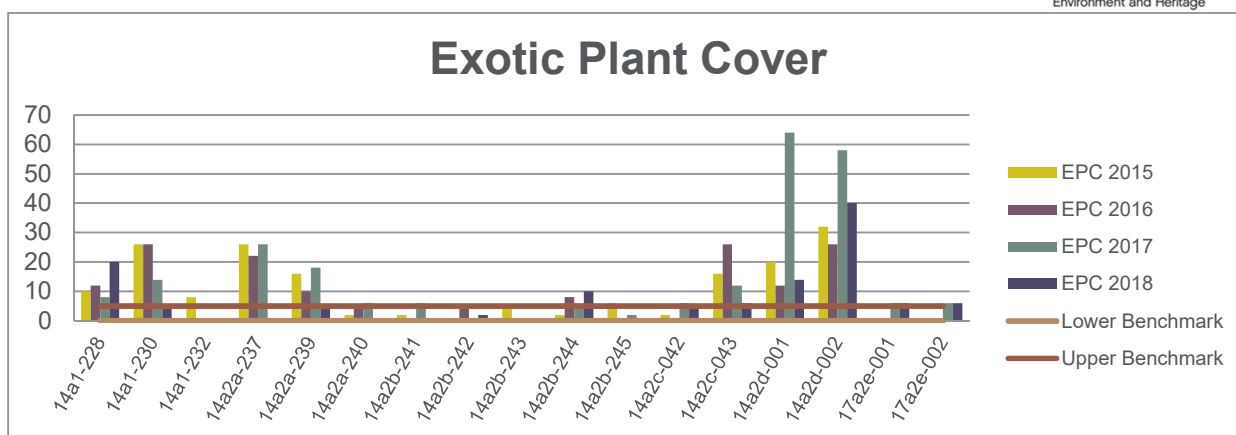


Figure 7: Exotic Plant Cover at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d and 2e for 2018

Most sites fall below the target of 20% exotic plant cover with the exception of a few plots (Figure 7). The dominant weeds in these areas include *Eragrostis curvula* (African lovegrass), *Andropogon virginicus* (Whisky Grass), *Conyza bonariensis* (Fleabane), and *Hypochaeris radicata*. *Pennisetum clandestinum* (Kikuyu), *Cortaderia selloana* (Pampas grass) and *Cynodon dactylon* (Common Couch) are all exotic perennial grasses that have dominated localised patches within the Emplacement and also require management.

Length of Fallen logs

The local benchmark for Length of Fallen Logs is ≥ 34 metres within the 20 x 50 metre plot.

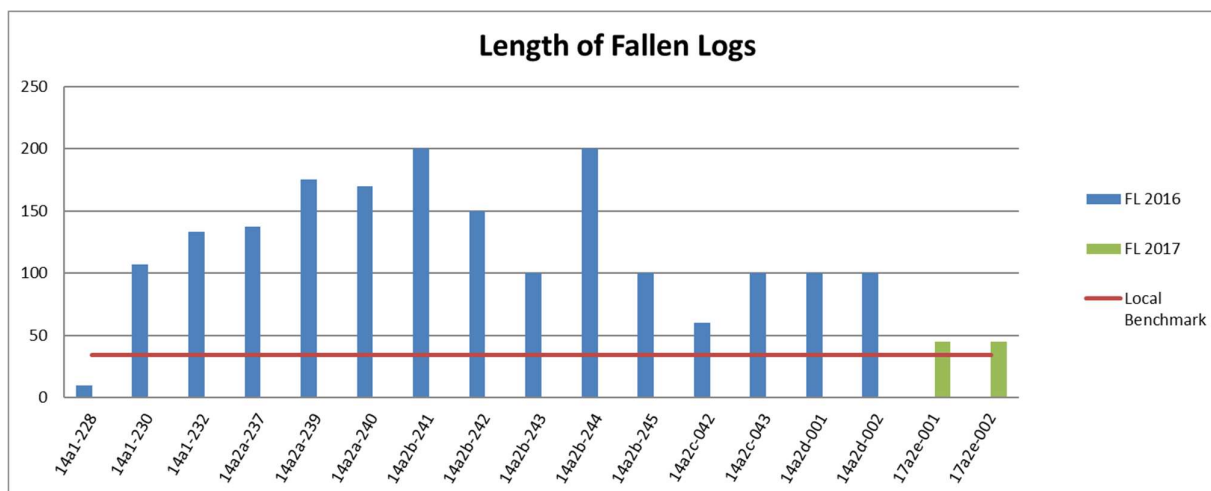


Figure 8 length of fallen logs within all plots (data obtained in 2016 and 2017)

All plots and areas have substantial log length, well above the benchmark levels (Figure 8). This was due to the targeted movement of this material along with the soil translocation. These figures are not expected to change dramatically over time, however the graph above serves to demonstrate that an adequate amount of logs have been moved with the translocation. Given the limitations on the amount of logs available to the Emplacement as a resource, the current on-site strategy for log placement has been substantially reduced and will still meet benchmark levels.

PHOTO-POINT MONITORING

Photo-point monitoring, illustrating the changes in vegetation cover at each of the monitoring sites is provided in Appendix 1 (Plates 1 to 17). In general, all treatment areas have a good cover of native vegetation as a response to translocation and/or direct-seeding.

THREATENED PLANT RANDOM MEANDER

Threatened plant meanders are undertaken every 3 years. The last meander was completed in early 2018. At the time, *Pultenaea aristata* (14 individuals) and *Persoonia hirsuta* (two individuals) were detected within the Emplacement during the surveys conducted in Autumn 2017. *Pultenaea aristata* is listed as vulnerable under the NSW *Biodiversity Conservation Act 2016* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, while *Persoonia hirsuta* is listed as endangered under both Acts. *Pultenaea aristata* has continued to have success in re-establishing to maturity within the Emplacement (refer to previous monitoring reports).

Threatened plant occurrences within the Emplacement will be regularly monitored by IC environmental staff.

FAUNA

Camera traps were deployed across nine sites in the mature rehabilitation areas (5568 camera hours) in May 2019. Cameras were placed to target specific habitat features (

Figure 9 and Table 5).

Table 5: Camera Trap Locations

Site Name	Feature	Location
Site 1	Log Hollow	E299740, N6210188
Site 2	Grass Shelter	E299631, N6210209
Site 3	Animal Path Crossroad	E299329, N6210450
Site 4	Small Animal Path	E299180, N6210491
Site 5	Animal Path Crossroad	E299131, N6210553
Site 6	Small Animal Path	E299639, N6210284
Site 7	Kangaroo Run-through	E299724, N6210176
Site 8	Rock Shelter	E299602, N6210279
Site 9	Nest Box	E299164, N6210493



Figure 9: Example of a camera site (Camera Trap site 6 – Small Animal Path, Emplacement Stage 2)

The survey detected 26 native species; 12 of which were mammals, 13 birds and 1 reptile. The results are summarised in

Table 6 below. The species type for genus *Pseudomys* within the table was not able to be specified due to the poor quality of the nocturnal images.



Table 6: Fauna records from the camera trap survey

Species	Common Name	Native vs Introduced? (N/I)	Threatened Species (Y/N)	Site									Total
				1	2	3	4	5	6	7	8	9	
<i>Macropus Robusta</i>	Common Wallaroo	N	N				1		1	6			8
<i>Antichinus Stuartii</i>	Brown Antichinus	N	N						2		1		3
<i>Trichosurus vulpecula</i>	Common Brustailed Possum	N	N							1			1
<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum	N	N				1	2	5		3		11
<i>Wallabia bicolor</i>	Swamp Wallaby	N	N	5			7	5	4	25	6	1	53
<i>Macropus giganteus</i>	Eastern Grey	N	N							10			10
<i>Vulpes vulpes</i>	Fox	I	N	1				1	1	1	1		5
<i>Felix catus</i>	Domestic Cat	I	N										0
<i>Rattus norvegicus</i>	Brown Rat	I	N				3				2		5
<i>Rattus fuscipes</i>	Bush Rat	N	N				7		8		4	2	21
<i>Petaurus breviceps</i>	Sugar Glider	N	N								2		2
<i>Tachyglossus aculeatus</i>	Echidna	N	N			1	1		2				4
<i>Perameles nasuta</i>	Long Nosed Bandicoot	N	N								5		5
<i>Pseudomys (Unknown)</i>	Rodent (Small)	N/I	N					6	8				14
<i>Oryctolagus cuniculus</i>	Rabbit	I	N				1	20	4				25
<i>Sericornis frontalis</i>	White-browed Scrub Wren	N	N		1	4	2		6				13
<i>Acanthiza reguloides</i>	Buff-rumped Thornbill	N	N						2				2

<i>Phylidonyris novaehollandiae</i>	<i>New Holland Honeyeater</i>	N	N				2				2		4
<i>Eopsaltria australis</i>	<i>Eastern Yellow Robin</i>	N	N	2					7		1		10
<i>Phaps elegans</i>	<i>Brush Bronzewing</i>	N	N			1		1					2
<i>Phaps chalcoptera</i>	<i>Common bronzewing</i>	N	N				1						1
<i>Malurus cyaneus</i>	<i>Superb Fairywren</i>	N	N			2			1				3
<i>Platycercus elegans</i>	<i>Crimson Rosella</i>	N	N					1					1
<i>Colluricincla harmonica</i>	<i>Grey Shrike-thrush</i>	N	N			1		3	2		2		8
<i>Nesoptilotis leucotis</i>	<i>White-eared Honeyeater</i>	N	N				2	1					3
<i>Cinclosoma punctatum</i>	<i>Spotted Quail-thrush</i>	N	N					1					1
<i>Caligavis chrysops</i>	<i>yellow-faced Honeyeater</i>	N	N					1					1
<i>Psophodes olivaceus</i>	<i>Eastern Whipbird</i>	N	N		4	1	2	2	5				14
<i>Pseudonaja textilis</i>	<i>Eastern Brown Snake</i>	N	N			1							1
Camera Nights				24	24	24	28	28	28	28	24	24	Total Hours
Camera Hours				576	576	576	672	672	672	672	576	576	5568

CONCLUSION

This report provides a description of the methodologies used and the outcomes achieved from the eighth season of monitoring the rehabilitation success in Stages 1 and 2 of the Emplacement. For the most part, the rehabilitation areas were within or above the local benchmarks for most of the biometric attributes. Treatment area 1 remains in the poorest condition and fails to meet the benchmarks for most attributes.

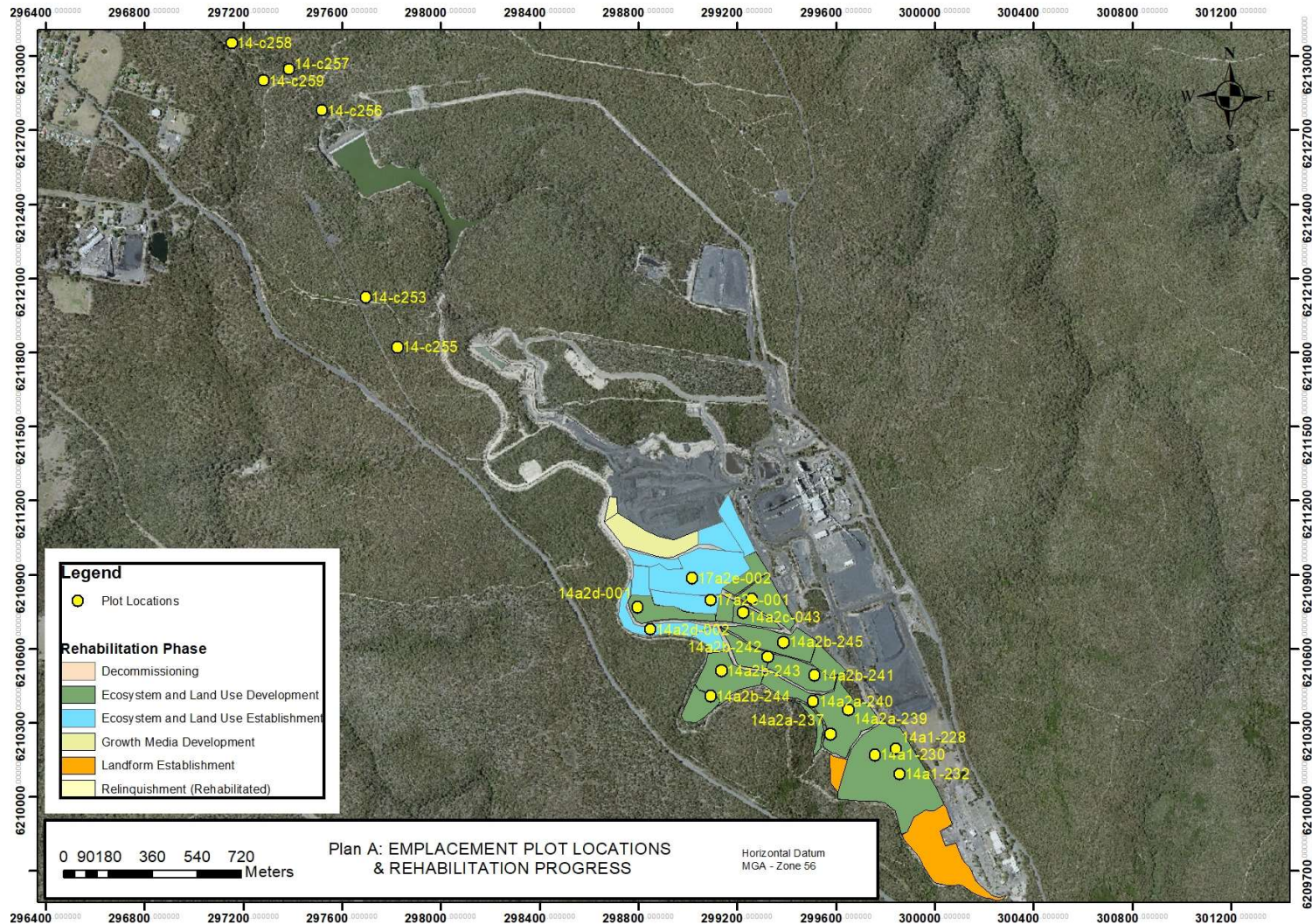
Weed incursion remains the key threat to the rehabilitation of the Emplacement. African Lovegrass was observed as one of the dominant weeds throughout the monitoring program. It is likely to spread and out-crowd native plants if not treated. Weed management will continue to be a major focus for 2019.

Two threatened plant species, *Pultenaea aristata* and *Persoonia hirsuta*, were detected within the Emplacement during the 2018 survey and both species remain. The *Persoonia hirsuta* individuals are considered a significant observation and will contribute to the understanding of the species' capacity for regeneration within the rehabilitation areas.

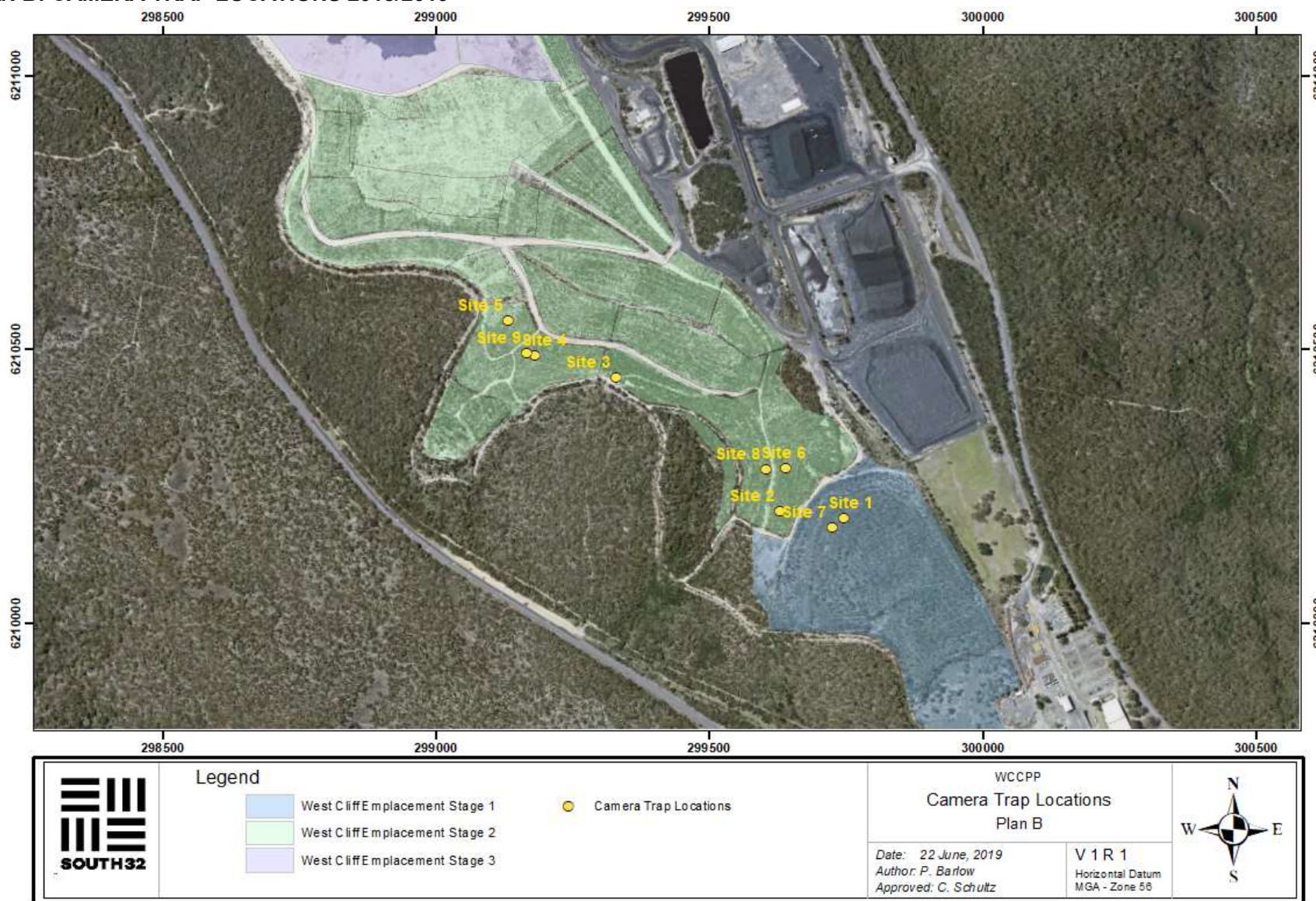
The habitat features within the rehabilitation are clearly being occupied by native mammals. As the rehabilitation matures, it is expected that native fauna abundance will increase further.

PLANS

PLAN A: EMPLACEMENT PLOT LOCATIONS AND REHABILITATION PROGRESS



PLAN B: CAMERA TRAP LOCATIONS 2018/2019



APPENDIX 1: PHOTO POINT MONITORING



Plate 1: Site A1_228 (left 2010, right 2018)



Plate 2: Site A1_230 (left 2010, right 2018)



Plate 3: Site A1-232 (left 2011, right 2018)



Plate 4: A2a_237 (left 2010, right 2018)



Plate 5: Site A2a_239 (left 2010, right 2018)



Plate 6: Site A2a_240 (left 2010, right 2018)



Plate 7: Site A2b_244 (left 2010, right 2018)



Plate 8: Site A2b_241 (left 2010, right 2018)



Plate 9: Site A2b_242 (left 2010, right 2018)



Plate 10: Site A2b_243 (left 2010, right 2018)



Plate 11: Site A2b_245 (left 2010, right 2018)



Plate 12: Site A2c-042 (left 2012, right 2018)



Plate 13: A2c-043 (left 2012, right 2018)

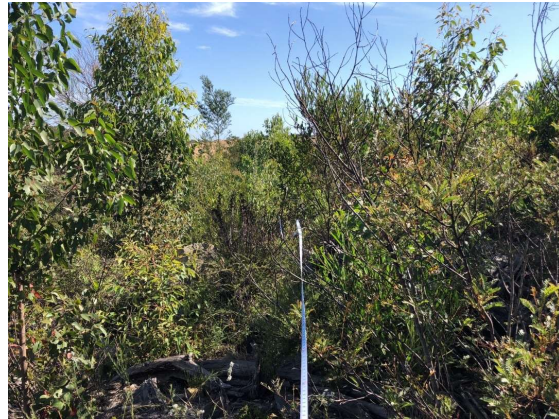


Plate 14: A2d-001 (left 2015, Right 2018)



Plate 15: A2d-002 (left 2015, right 2018)



Plate 16: 17a2e-001 (left 2017, right 2018)



Plate 17: 17a2e-002 (left 2017, right 2018)

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APPENDIX B: 2018/19 EPA ANNUAL RETURN FOR EPL 2504



Our Reference: Licence No. 2504

ENDEAVOUR COAL PTY LIMITED
PO BOX 514
UNANDERRA NSW 2526

01-Feb-2019

LICENCE 2504 - ANNIVERSARY NOTICE

I refer to Environment Protection Licence No. 2504, issued to ENDEAVOUR COAL PTY LIMITED by the Environment Protection Authority (EPA), under the *Protection of the Environment Operations Act 1997* (the POEO Act).

This letter is to remind you of the annual licensing obligations, in particular the requirement to submit an Annual Return and annual licence fees.

Annual Return

Condition R1.5 of your licence requires that you complete and submit an Annual Return within 60 days of the end of each reporting period.

You can complete and submit your Annual Return online via eConnect EPA - the EPA's licensing portal at: www.epa.nsw.gov.au/licensing/econnectepa.htm.

Your environment protection licence Annual Return is due to the EPA by:

01-Apr-2019

If you do not submit the Annual Return by the due date you may receive a fine of up to \$3000.

If you are unable to submit your Annual Return online, you must complete the attached Annual Return and send it to the EPA by Registered Post to the following address:

Regulatory and Compliance Support Unit
Environment Protection Authority
PO Box A290
SYDNEY SOUTH NSW 1232



Licence Fees

Once your Annual Return is received by the EPA, the information provided will inform the EPA's determination of your environmental management category which the EPA will use to calculate the annual licence administrative fee. Once the EPA has determined your annual fee a Tax Invoice/Statement will be sent to you.

If the licensed activities are subject to Load-Based Licensing (LBL), payment of a load-based fee may also be required. The EPA will calculate the load based fee using the data you provide in the Annual Return. If the payment of a load based fee is required a separate Tax Invoice/Statement will be sent to you.

The licence fees will need to be paid to the EPA by **31-May-2019**.

For information on risk-based licensing please refer to the EPA's website at:
www.epa.nsw.gov.au/licensing/licencereg.htm.

As of 1 July 2016 the EPA will not consider environmental improvement works in the calculation of the environmental management category. For further information regarding this change please refer to www.epa.nsw.gov.au/licensing/EMCP.htm.

The EPA is committed to assisting the licensed community to meet its obligations under the POEO Act. Please refer to: www.epa.nsw.gov.au/licensing for guidance on completing annual returns. If you have any questions relating to the submission of the Annual Return or payment of the licence fee, please contact the EPA on 02 9995 5700.

Yours sincerely

A handwritten signature in blue ink, appearing to read "Christopher Kelly".

CHRISTOPHER KELLY
Head Regulatory and Compliance Support Unit
Environment Protection Authority

12/1

Annual Return

ENDEAVOUR COAL PTY LIMITED



ANNUAL RETURN

LICENCE NO	2504
LICENCE HOLDER	ENDEAVOUR COAL PTY LIMITED
REPORTING PERIOD	01-Feb-2018 to 31-Jan-2019

If your licence has been transferred, suspended, surrendered or revoked by the EPA during this reporting period, cross out the dates above and specify the new dates to which this Annual Return relates below:

REVISED REPORTING PERIOD ____/____/____ to ____/____/____

(Note: the revised reporting period also needs to be entered in Section H)

THIS ANNUAL RETURN MUST BE RECEIVED BY THE EPA BEFORE 02-Apr-2019

Your Annual Return must be completed, including certification in Section H, and submitted to the EPA no later than 60 Days after the end of the reporting period for your licence.

Failure to submit this Annual Return within 60 days after the reporting period ends may result in:

- the issue of a Penalty Notice for \$1500 (individuals) or \$3000 (corporations);
- OR
- prosecution.

Please send your completed Annual Return by **Registered Post** to:

Regulatory and Compliance Support Unit
Environment Protection Authority
PO Box A290
SYDNEY SOUTH NSW 1232

It is an offence to supply any information in this form to the EPA that is false or misleading in a material respect, or to certify a statement that is false or misleading in a material respect.

THERE IS A MAXIMUM PENALTY OF \$250,000 FOR A CORPORATION OR \$120,000 FOR AN INDIVIDUAL.

Details provided in this Annual Return will be available on the EPA's Public Register in accordance with section 308 of the *Protection of the Environment Operations Act 1997*.

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Annual Return

ENDEAVOUR COAL PTY LIMITED



Use the checklist below to ensure that you have completed your Annual Return correctly.

(✓ the boxes)

CHECKLIST		
<input checked="" type="checkbox"/>	Section A:	All licence details are correct
<input checked="" type="checkbox"/>	Section B1:	You have entered the correct number in the complaints table
<input checked="" type="checkbox"/>	Section B2 – B3:	If there are tables, you have provided the required details
<input checked="" type="checkbox"/>	Section C:	You have answered question 1, and 2 if applicable
<input checked="" type="checkbox"/>	Section D:	If applicable, you have completed all load calculation worksheets
<input checked="" type="checkbox"/>	Section E:	You have answered question 1, 2, 3, 4, 5 and 6 if applicable
<input checked="" type="checkbox"/>	Section F:	You have answered question 1, 2 and 3 if applicable
<input checked="" type="checkbox"/>	Section G:	You have answered question 1 and question 2, 3 and 4 or question 5 through to 11 if applicable
<input checked="" type="checkbox"/>	Section H:	The Annual Return has been signed by appropriate person(s) and, if applicable, the revised reporting period entered
<input checked="" type="checkbox"/>	Make a copy of the completed Annual Return and keep it with your licence records	

Please send your completed Annual Return by **Registered Post** to:

**Regulatory and Compliance Support Unit
Environment Protection Authority
PO Box A290
SYDNEY SOUTH NSW 1232**

A handwritten signature in black ink, appearing to be 'JE. 10/10'.

A Statement of Compliance - Licence Details

ALL licence holders must check that the licence details in Section A are correct

If there are changes to any of these details you must advise the EPA and apply as soon as possible for a variation to your licence or for a licence transfer.

Licence variation and transfer application forms are available on the EPA website at: <http://www.epa.nsw.gov.au/licensing>, or from regional offices of the EPA, or by contacting us on telephone 02 9995 5700.

If you are applying to vary or transfer your licence you must still complete this Annual Return.

A1 Licence Holder

Licence Number	2504
Licence Holder	ENDEAVOUR COAL PTY LIMITED
Trading Name (if applicable)	
ABN	38 099 830 476
ACN	099 830 476

A2 Premises to which Licence Applies (if applicable)

Common Name (if any)	3. WEST CLIFF AND NORTH CLIFF COLLIERIES
Premises	WEDDERBURN ROAD APPIN NSW 2560
Common Name (if any)	1. APPIN COLLIERY
Premises	OFF APPIN ROAD APPIN NSW 2560
Common Name (if any)	2. APPIN WEST COLLIERY
Premises	DOUGLAS PARK DRIVE DOUGLAS PARK NSW 2569

A3 Activities to which Licence Applies

Mining for coal
Waste disposal (application to land)
Coal works

A4 Other Activities (if applicable)

Electricity generation
Resource Recovery

Annual Return

ENDEAVOUR COAL PTY LIMITED



A5 Fee-Based Activity Classifications

Note that the fee based activity classification is used to calculate the administrative fee.

Fee-based activity	Activity scale	Unit of measure
Mining for coal	> 5,000,000.00	T annual production capacity
Waste disposal by application to land		capacity
Coal works	> 5,000,000.00	T annual handing capacity

A6 Assessable Pollutants (Not Applicable)

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B Monitoring and Complaints Summary

B1 Number of Pollution Complaints

Number of complaints recorded by the licensee during the reporting period. If no complaints were received enter nil in the attached box, otherwise complete the table below.	6
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Pollution Complaint Category	Number of Complaints
Air	4
Water	0
Noise	1
Waste	0
Other	1

B2 Concentration Monitoring Summary

For each monitoring point identified in your licence complete all the details for each pollutant listed in the tables provided below.

If concentration monitoring is **not** required by your licence, **no tables** will appear below.

Note that this does not exclude the need to conduct appropriate concentration monitoring of assessable pollutants as required by load-based licensing (if applicable).

Monitoring Point 4

Discharge Quality Monitoring. Volume Monitoring. - West Cliff and North Cliff Collieries., Sampling tap in settling chamber of STP.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Biochemical oxygen demand	milligrams per litre	12	12	2	10	35

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ENDEAVOUR COAL PTY LIMITED



Oil and Grease	milligrams per litre	12	12	<5	6	13
pH	pH	12	12	7.8	8.1	8.4

Discharge & Monitoring Point 10

Discharge to waters

Discharge quality monitoring

Volume monitoring - West Cliff and North Cliff Collieries., Piped Discharge outlet labelled "Point 10" on map titled "Bulli Seam Operations Point 10 Discharge Water EPL Variation" dated 12 January 2015 (Doc No: HSE-2015-140-Rev0). Flowmeter location is denoted as "FM10" on the map.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	12	12	321	828	1330
Aluminium (dissolved)	milligrams per litre	12	12	10	339	860
Arsenic (dissolved)	micrograms per litre	12	12	2	9	16
Bicarbonate	milligrams per litre	12	12	291	638	1330
Cadmium (dissolved)	micrograms per litre	12	12	<0.1	<0.1	<0.1
Chemical oxygen demand	milligrams per litre	12	12	10	19	62
Cobalt (dissolved)	micrograms per litre	12	12	1	2	3
Conductivity	microsiemens per centimetre	12	12	825	1997	2770
Copper (dissolved)	micrograms per litre	12	12	<1	2	3
Lead (dissolved)	micrograms per litre	12	12	<1	1	2

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ENDEAVOUR COAL PTY LIMITED



Manganese (dissolved)	micrograms per litre	12	12	3	8	22
Nickel (dissolved)	micrograms per litre	12	12	31	93	134
Nitrogen (ammonia)	micrograms per litre	12	12	10	96	440
Nitrogen (total)	micrograms per litre	12	12	200	683	1100
Oil and Grease	milligrams per litre	12	12	<5	<5	<5
Oxidised nitrogen	micrograms per litre	12	12	10	90	250
pH	pH	12	12	7.9	8.7	9.2
Total dissolved solids	milligrams per litre	12	12	447	1107	1600
Total suspended solids	milligrams per litre	12	12	<5	8	22
Turbidity	nephelometric turbidity units	Continuous	Continuous	0.00	22.75	276.97
Zinc (dissolved)	micrograms per litre	12	12	7	13	30

Monitoring Point 11

Ambient water quality monitoring- West Cliff and North Cliff Collieries., Georges River located approximately 50 metres upstream of the confluence with Brennans Creek labelled "LDP11" on map titled "West Cliff and North Cliff Mine" dated May 2010.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Conductivity	microsiemens per centimetre	12	12	191	492	594
pH	pH	12	12	7.0	7.4	7.9

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ENDEAVOUR COAL PTY LIMITED



Total suspended solids	milligrams per litre	12	12	<5	<5	<5
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Monitoring Point 12

Ambient water quality monitoring - West Cliff and North Cliff Collieries., Georges River located approximately 50 metres downstream of the confluence with Brennans Creek labelled "LDP12" on map titled "West Cliff and North Cliff Mine" dated May 2010.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Conductivity	microsiemens per centimetre	12	12	870	1768	2150
pH	pH	12	12	8.5	9.0	9.2
Total suspended solids	milligrams per litre	12	12	<5	8	15

Monitoring Point 14

Dust Monitoring - Appin Colliery, Dust Gauge "AE-DD14" is located to the SE of the coal stockpile on the property boundary.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.4	1.0	1.7
Combustible solids	grams per square metre per month	12	12	0.3	1.1	2.1
Insoluble solids	grams per square metre per month	12	12	0.7	2.1	3.8

Monitoring Point 15

Dust Monitoring - Appin Colliery, Dust Gauge "AE-DD15" is located to the east of the coal stockpile near the sediment pond

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ENDEAVOUR COAL PTY LIMITED



Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.4	0.8	2.2
Combustible solids	grams per square metre per month	12	12	0.3	0.9	1.8
Insoluble solids	grams per square metre per month	12	12	0.7	1.7	4

Monitoring Point 16

Dust Monitoring - Appin Colliery, Dust Gauge "AE-DD16" is located on the north property boundary near the Sydney Water tank.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.4	0.8	1.9
Combustible solids	grams per square metre per month	12	12	0.3	0.8	2.3
Insoluble solids	grams per square metre per month	12	12	0.7	1.6	3.5

Monitoring Point 17

Dust Monitoring - Appin Colliery, Dust Gauge "AE-DD17" is located at the NE corner of the property boundary near the truck exit/entry point.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.4	1.7	5.3
Combustible solids	grams per square metre per month	12	12	0.2	2.2	7.7

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ENDEAVOUR COAL PTY LIMITED



Insoluble solids	grams per square metre per month	12	12	0.6	3.9	13.0
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Discharge & Monitoring Point 18

Discharge to waters.

Discharge quality and volume monitoring

(Stormwater Discharge) - Appin East Colliery, Underflow from the filter lagoon discharging through a v-notch weir labelled "LDP18" on map titled "Appin East Pit Top" dated May 2010.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Oil and Grease	milligrams per litre	0	0	0	0	0
pH	pH	0	0	0	0	0
Total suspended solids	milligrams per litre	0	0	0	0	0

** No discharge from this point during reporting period

Discharge & Monitoring Point 19

Discharge to waters. Discharge quality and volume monitoring.

(Surface Water Discharge) - Appin East Colliery, Dyna Sand Filter outlet at location labelled "LDP19" on map titled "Appin East Pit Top" dated May 2010.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Oil and Grease	milligrams per litre	12	12	<5	5	5
pH	pH	12	12	6.9	7.4	7.9
Total suspended solids	milligrams per litre	12	12	<5	14	6

Discharge & Monitoring Point 20

Discharge to land.

Discharge quality and volume monitoring.

(Spray Irrigation Discharge) - Appin East Colliery, Envirocycle Irrigation Area as indicated by highlighted area labelled "LDP20" on map titled "Appin East Pit Top" dated May 2010.

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ENDEAVOUR COAL PTY LIMITED



Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Biochemical oxygen demand	milligrams per litre	0	0	0	0	0
Oil and Grease	milligrams per litre	0	0	0	0	0
pH	pH	0	0	0	0	0

** No longer discharging from this point

Discharge & Monitoring Point 22

Discharge to utilisation area.

Water quality monitoring

Volume Monitoring. - Appin West Colliery, The 100mm poly pipe from the secondary stabilisation lagoon of the sewage treatment plant labelled "LDP22 Sample Location" on Plan A07-1240 "Appin West Effluent Irrigation Area" dated 30.08.11. The application area is labelled LDP22 "Irrigation Area"

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Biochemical oxygen demand	milligrams per litre	12	12	5	22	43
Oil and Grease	milligrams per litre	12	12	<5	5	6
pH	pH	12	12	6.9	7.3	7.5

Discharge & Monitoring Point 23

Discharge to waters.

Water quality monitoring.

Discharge volume monitoring. - Appin West Colliery, Piped discharge outlet for storm water labelled "LDP23" on map titled "Appin West Pit Top" dated May 2010.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Oil and Grease	milligrams per litre	8	8	<5	<5	<5

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ENDEAVOUR COAL PTY LIMITED



pH	pH	8	8	7.4	7.6	7.9
Total suspended solids	milligrams per litre	8	8	<5	14	52

** No discharge Apr 18, May 18, Jul 18, Sep 18.

Discharge & Monitoring Point 24

Discharge to waters.

Water quality monitoring. Discharge volume monitoring - Appin West Colliery, Piped discharge outlet for minewater labelled "LDP24" on map titled "Appin West Pit Top" dated May 2010.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Conductivity	microsiemens per centimetre	12	12	954	1072	1160
Oil and Grease	milligrams per litre	12	12	<5	<5	<5
pH	pH	12	12	7.7	8.1	8.5
Total suspended solids	milligrams per litre	12	12	<5	6	16

Monitoring Point 26

Dust Monitoring - Appin Colliery, Dust Gauge "AE-DD18" is located at the SW corner of the coal stockpile next to the loading bin

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.7	1.9	3.9
Combustible solids	grams per square metre per month	12	12	0.5	2.9	7.4
Insoluble solids	grams per square metre per month	12	12	1.2	4.8	11.3

Monitoring Point 27

JE. 11/12

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ENDEAVOUR COAL PTY LIMITED



PM10 Monitoring - Appin Colliery, Photometer "AE-PF1" is located at the NE corner of the property boundary near the truck entry/exit point.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
PM10	micrograms per cubic metre	Continuous	Continuous	0.00	12.75	56.07

Monitoring Point 28

PM10 Monitoring - Appin Colliery, Photometer "AE-PF3" is located at the NW corner of the property boundary.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
PM10	micrograms per cubic metre	Continuous	Continuous	4.72	8.33	60.59

Monitoring Point 29

Dust Monitoring - Appin West Colliery, Dust Gauge "AW-DD1" is located at the pit top between the mine access road, employee car park and EDL power plant.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.3	0.5	1.1
Combustible solids	grams per square metre per month	12	12	0.1	0.3	0.5
Insoluble solids	grams per square metre per month	12	12	0.4	0.8	1.5

Monitoring Point 30

Dust Monitoring - Appin West Colliery, Dust Gauge "AW-DD2" is located at the junction of the mine access road and Douglas Park Drive.

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Annual Return

ENDEAVOUR COAL PTY LIMITED



Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.2	0.4	0.7
Combustible solids	grams per square metre per month	12	12	0.1	0.5	0.9
Insoluble solids	grams per square metre per month	12	12	0.4	0.9	1.4

Monitoring Point 31

Dust Monitoring - West Cliff Colliery, Dust Gauge "W-DD1" is located at the junction of Wedderburn Rd and Appin Rd.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.2	1.2	2.9
Combustible solids	grams per square metre per month	12	12	0.4	1.2	2.3
Insoluble solids	grams per square metre per month	12	12	0.6	2.3	5.2

Monitoring Point 32

Dust Monitoring - West Cliff Colliery, Dust Gauge "W-DD3" is located at the pit top south site.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	1.1	1.7	2.8
Combustible solids	grams per square metre per month	12	12	0.5	1.0	1.6
Insoluble solids	grams per square metre per month	12	12	1.7	2.7	4.2

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ENDEAVOUR COAL PTY LIMITED



Monitoring Point 33

Dust Monitoring - West Cliff Colliery, Dust Gauge "AW-DD8" is located at Brennan Creek dam.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.3	0.6	1.1
Combustible solids	grams per square metre per month	12	12	0.1	0.4	0.7
Insoluble solids	grams per square metre per month	12	12	0.4	1.0	1.7

Monitoring Point 34

Dust Monitoring - West Cliff Colliery, Dust Gauge "W-DD10" is located on Wedderburn Road next to the product stockpiles.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	4.3	7.3	10.2
Combustible solids	grams per square metre per month	12	12	3.5	6.5	10.1
Insoluble solids	grams per square metre per month	12	12	7.8	13.8	20.3

Monitoring Point 35

PM10 Monitoring - West Cliff Colliery, Photometer "W-PF1" is located at the junction of Appin Road and Wedderburn Road.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
PM10	micrograms per cubic metre	Continuous	Continuous	11.26	16.01	124.53

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Annual Return

ENDEAVOUR COAL PTY LIMITED



Discharge & Monitoring Point 36

Discharge to waters. Discharge quality monitoring - Douglas Park Vent Shaft No.6, Piped discharge outlet from primary sedimentation dam as described in the Vent Shaft No.6 Water Management Plan.

Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Electrical conductivity	microsiemens per centimetre	1	1	507	507	507
pH	pH	1	1	7.6	7.6	7.6
Total suspended solids	milligrams per litre	1	1	5	5	5

** Only discharging in Dec 18 during reporting period

B3 Volume or Mass Monitoring Summary

For each monitoring point identified in your licence complete the details of the volume or mass monitoring indicated in the tables provided below.

If volume or mass monitoring is not required by your licence, **no tables** will appear below.

Note that this does not exclude the need to conduct appropriate concentration monitoring of assessable pollutants as required by load-based licensing (if applicable).

Monitoring Point 4

Discharge Quality Monitoring. Volume Monitoring. - West Cliff and North Cliff Collieries.

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	High result
kilolitres per day	Continuous	Continuous	0	79	6485

Discharge & Monitoring Point 10

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ENDEAVOUR COAL PTY LIMITED



Discharge to waters
Discharge quality monitoring
Volume monitoring - West Cliff and North Cliff Collieries.

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	High result
kilolitres per day	Continuous	Continuous	238	429	609

Monitoring Point 13

Volume monitoring - West Cliff and North Cliff Collieries.

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	High result
kilolitres per day	Continuous	Continuous	0	1537	4299

Discharge & Monitoring Point 18

Discharge to waters.
Discharge quality and volume monitoring
(Stormwater Discharge) - Appin East Colliery

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	High result
kilolitres per day	Continuous during discharge	0	0	0	0

** No discharge for reporting period

Discharge & Monitoring Point 19

Discharge to waters. Discharge quality and volume monitoring.
(Surface Water Discharge) - Appin East Colliery

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	High result
kilolitres per day	Continuous during discharge	Continuous	0	288	1135

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ENDEAVOUR COAL PTY LIMITED



Discharge & Monitoring Point 20

Discharge to land.
Discharge quality and volume monitoring.
(Spray Irrigation Discharge) - Appin East Colliery.

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	High result
kilolitres per day	Continuous during discharge	0	0	0	0

** No discharge during reporting period

Discharge & Monitoring Point 22

Discharge to utilisation area.
Water quality monitoring
Volume Monitoring. - Appin West Colliery

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	High result
kilolitres per day	Continuous	Continuous	0	27	71

Discharge & Monitoring Point 24

Discharge to waters.
Water quality monitoring. Discharge volume monitoring - Appin West Colliery

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	High result
kilolitres per day	Continuous	Continuous	0	226	1529

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C Statement of Compliance - Licence Conditions

C1 Compliance with Licence Conditions

(☒ the boxes)

- 1 Were all conditions of the licence complied with (including monitoring and reporting requirements)? ☐ Yes ☒ No

(✓ a box)

- 2 If you answered 'No' to question 1, please supply the following details for each non-compliance in the format, or similar format, provided on the following page.

Please use a separate page for each licence condition that has not been complied with.

- a) What was the specific licence condition that was not complied with?
- b) What were the particulars of the non-compliance?
- c) What were the date(s) when the non-compliance occurred, if applicable?
- d) If relevant, what was the precise location where the non-compliance occurred?

Attach a map or diagram to the Statement to show the precise location.

- e) What were the registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance?
- f) What was the cause of the non-compliance?
- g) What action has been, or will be, taken to mitigate any adverse effects of the non-compliance?
- h) What action has been, or will be, taken to prevent a recurrence of the non-compliance?

3. How many pages have you attached?

Each attached page must be initialed by the person(s) who signs Section G of this Annual Return

4

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ENDEAVOUR COAL PTY LIMITED



C2 Details of Non-Compliance with Licence

Licence condition number not complied with
B2
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Oil & Grease sample result over EPL 100 Percentile Limit for December 2018
If required, further details on particulars of non-compliance
N/A
Date(s) when the non-compliance occurred, if applicable
18/12/18
If relevant, precise location where the non-compliance occurred (attach a map or diagram)
West Cliff Monitoring Point 4 West Cliff Effluent Pump and Spray Irrigation
If applicable, registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
N/A
Cause of non-compliance
An investigation was conducted however deemed inconclusive as there was no visible presence of surface oil or grease during inspection at the sample site or that may have been directed to Point 4.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
Anomalous result. Unknown cause. Future results back below 100 Percentile Limit.
Action taken or that will be taken to prevent a recurrence of the non-compliance
N/A

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ENDEAVOUR COAL PTY LIMITED



C2 Details of Non-Compliance with Licence

Licence condition number not complied with
B2
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Total suspended solids (TSS) sample result over EPL 100 Percentile Concentration Limit for March 2018
If required, further details on particulars of non-compliance
N/A
Date(s) when the non-compliance occurred, if applicable
22/3/18
If relevant, precise location where the non-compliance occurred (attach a map or diagram)
Appin Water Quality Monitoring Point 23 Appin West Stormwater release
If applicable, registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
N/A
Cause of non-compliance
Storm filter medium replaced and cartridge mesh repaired following event, subsequent samples returned to normal levels.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
N/A
Action taken or that will be taken to prevent a recurrence of the non-compliance
N/A

A handwritten signature in black ink, appearing to be 'JE' followed by a flourish.

Annual Return

ENDEAVOUR COAL PTY LIMITED



C2 Details of Non-Compliance with Licence

Licence condition number not complied with
O2.1 Maintenance of plant and equipment
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Discharge of Ferric Chloride Flocculant into Georges River
If required, further details on particulars of non-compliance
<p>On 18 October, a ferric chloride flocculant dosing pump was taken out of service for maintenance. A replacement pump was installed that was not a direct replacement for the old pump. The new pump discharged ferric chloride at a higher rate, overdosing the sediment dam and discharging water containing elevated levels into the Georges River.</p> <p>Point 19 has limits for oil and grease, pH and total suspended solids. The discharge of ferric chloride is not permitted by the licence. The water pollution incident resulted in orange-brown turbid water to enter the river, and a localised reduction in pH.</p>
Date(s) when the non-compliance occurred, if applicable
18-19 October 2018
If relevant, precise location where the non-compliance occurred (attach a map or diagram)
Point 19 Georges River
If applicable, registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
N/A
Cause of non-compliance
Failure to maintain or operate plant/equipment at the premises.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
<p>Actions taken include:</p> <ul style="list-style-type: none">- Immediately stopping the discharge- Notifying the EPA- Pump installed to recover ferric chloride rich water which was sent back to site for treatment- Conducting extensive monitoring and recovering material from the river where possible- Around the clock supervision of the affected section of the river until water quality parameters returned to normal levels- Providing an incident report to EPA- Carrying out an aquatic health assessment
Action taken or that will be taken to prevent a recurrence of the non-compliance
An automated control system is now in place to shut-off the discharge if pH reaches the licence limit.

A handwritten signature in black ink, appearing to be 'JE 118', located at the bottom right of the page.

Annual Return

ENDEAVOUR COAL PTY LIMITED



C2 Details of Non-Compliance with Licence

Licence condition number not complied with
L1.1 <i>Pollution of waters</i>
Summary of particulars of the non-compliance (NO MORE THAN 50 WORDS)
Discharge of Ferric Chloride Flocculant into Georges River
If required, further details on particulars of non-compliance
<p>On 18 October, a ferric chloride flocculant dosing pump was taken out of service for maintenance. A replacement pump was installed that was not a direct replacement for the old pump. The new pump discharged ferric chloride at a higher rate overdosing the sediment dam and discharging water containing elevated levels into the Georges River.</p> <p>Point 19 has limits for oil and grease, pH and total suspended solids. The discharge of ferric chloride is not permitted by the licence. The water pollution incident resulted in orange brown turbid water to enter the river, and a localised reduction in pH.</p>
Date(s) when the non-compliance occurred, if applicable
18-19 October 2018
If relevant, precise location where the non-compliance occurred (attach a map or diagram)
Point 19 Georges River
If applicable, registration numbers of any vehicles or the chassis number of any mobile plant involved in the non-compliance
N/A
Cause of non-compliance
Failure to maintain or operate plant/equipment at the premises.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance
<p>Actions taken include:</p> <ul style="list-style-type: none"> - Immediately stopping the discharge - Notifying the EPA - Pump installed to recover ferric chloride rich water which was sent back to site for treatment - Conducting extensive monitoring and recovering material from the river where possible - Around the clock supervision of the affected section of the river until water quality parameters returned to normal levels - Providing an incident report to EPA - Carrying out an aquatic health assessment
Action taken or that will be taken to prevent a recurrence of the non-compliance
An automated control system is now in place to shut-off the discharge if in the future, pH reaches the license limit.

D Statement of Compliance - Load-Based Fee Calculation Worksheets

If you are not required to monitor assessable pollutants by your license, no worksheets will appear below. Please go to Section E.

If assessable pollutants have been identified on your license (see license condition L2), complete the following worksheets for each assessable pollutant to determine your load-based fee for the license fee period to which this Annual Return relates.

Loads of assessable pollutants must be calculated using any of the methods provided in the EPA's Load Calculation Protocol for the relevant activity. A Load Calculation Protocol would have been sent to you with your license. If you require additional copies you can download the Protocol from the EPA's website or you can contact us on telephone 02 9995 5700.

You are required to keep all records used to calculate license fees for four years after the license fee was paid or became payable, whichever is the later date.

PENALTIES APPLY FOR SUPPLYING FALSE OR MISLEADING INFORMATION

D1 - D8 (Not Applicable)

E Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan (PIRMP) Under Section 153A of the POEO Act 1997

- 1 Have you prepared a PIRMP as required under s153A of the Protection of the Environment Operations Act 1997?

(✓ a box)

☒ Yes

☐ No

If you answered 'Yes' to question 1, please tick the appropriate box to indicate the following:

- 2 Is the PIRMP available at the premises?

(✓ a box)

☒ Yes

☐ No

- 3 Is the PIRMP available in a prominent position on a publicly accessible web site?

(✓ a box)

☒ Yes

☐ No

If the PIRMP is available on a publicly accessible web site please indicate clearly below the address of the web site where the PIRMP can be accessed:

Web site Address

- 4 Has the PIRMP been tested in the last 12 months?

(✓ a box)

☒ Yes

☐ No

If you answered 'Yes' to question 4 please indicate clearly below the date that the PIRMP was last tested:

The PIRMP was last tested on

- 5 Has the PIRMP been updated?

(✓ a box)

☐ Yes

☒ No

If you answered 'Yes' to question 5 please indicate clearly below the date that the PIRMP was last updated:

The PIRMP was last updated on

- 6 How many times has the PIRMP been activated in this reporting period?

If the PIRMP has been activated, please indicate clearly below the date/s when the PIRMP was activated:

The PIRMP was activated on

The EPA's guidelines for preparation of pollution incident response management plans are available at

<http://www.epa.nsw.gov.au/legislation/20120227egpreppirmp.htm>

F Statement of Compliance - Requirement to Publish Pollution Monitoring Data Under Section 66(6) of the POEO Act 1997

1 Are there any conditions attached to your license that require pollution monitoring to be undertaken?

(✓ a box)

☒ Yes

☐ No

If you answered 'Yes' to question 1, please tick the appropriate box to indicate the following:

2 Do you operate a web site?

(✓ a box)

☒ Yes

☐ No

3 Is the pollution monitoring data published on your web site in accordance with the EPA's written requirements for publishing pollution monitoring data?

(✓ a box)

☒ Yes

☐ No

If you publish pollution monitoring data on a web site please indicate clearly below the address of the web site where the pollution monitoring data can be accessed:

Web site address

The EPA's written requirements for publishing pollution monitoring data are available at
<http://www.epa.nsw.gov.au/legislation/20120263reqpubpmdata.htm>

Note - if you do not maintain a web site, you must provide a copy of any monitoring data that relates to pollution, to any person requests a copy of the data at no charge to the person requesting the data.

G Statement of Compliance - Environmental Management Systems and Practices

- 1 Do you have an environmental management system (EMS) certified to ISO 14001 or any other demonstrated equivalent system¹? (see note below on demonstrated equivalent)

(✓ a box)

☒ Yes

☐ No

If your answer to question 1 is 'No', please proceed to question 5. If your answer to question 1 is 'Yes', please proceed to question 2.

- 2 When was the last check of the EMS² completed (see note below on check of EMS)?

9 / 2 / 2018

- 3 Were there any non-conformances related to environmental issues identified in the last check of the EMS?

(✓ a box)

☒ Yes

☐ No

- 4 If there were non-conformances identified, were these non-conformances rectified?

(✓ a box)

☒ Yes

☐ No

If you answered 'No' to question 1, please answer questions 5 - 11. If you answered 'Yes' to question 1 please proceed to section H. Questions 5-11 relate to any documented environmental practices, procedures and systems in place. Refer to <http://www.epa.nsw.gov.au/licensing/EMCP.htm> for guidance on how to complete questions 5 to 11. If unsure of the answer, tick No.

- 5 Have you conducted an assessment of your activities and operations to identify the aspects that have a potential to cause environmental impacts and implemented operational controls to address these aspects?

(✓ a box)

☐ Yes

☐ No

- 6 Have you established and implemented an operational maintenance program, including preventative maintenance?

(✓ a box)

☐ Yes

☐ No

- 7 Do you keep records of regular inspections and maintenance of plant and equipment?

(✓ a box)

☐ Yes

☐ No

- 8 Do you conduct regular site audits to assess compliance with environmental legal requirements and assess conformance to the requirements of any documented environmental practices, procedures and systems in place?

(✓ a box)

☐ Yes

☐ No

- 9 Are the audits of documented environmental practices, procedures and systems undertaken by a third party?

(✓ a box)

☐ Yes

☐ No

- 10 Have you established and implemented an environmental improvement or management plan?

(✓ a box)

☐ Yes

☐ No

- 11 Do you train staff in environmental issues that may arise from your activities and operations and keep records of this

(✓ a box)

☐ Yes

☐ No

¹ Demonstrated equivalent refers to an environmental management system that the EPA considers is equivalent to the accountability, procedures, documentation and record keeping requirements of an ISO 14001 system. For further information go to:

<http://www.epa.nsw.gov.au/resources/licensing/150402-environmental-management-systems-guidelines.pdf>

² Undertaking a 'check of an EMS' refers to the ISO 14001 requirements that an organisation demonstrates conformity to the requirements of its EMS and to the standard, these checks require third-party certification that requirements have been met.

ENDEAVOUR COAL PTY LIMITED



If you are uncertain about who is entitled to sign or which category to tick, please contact us on telephone 02 9995 5700.

If the license holder is:	the Annual Return must be signed and certified by one of the following:
an individual	<input type="checkbox"/> the individual license holder, or <input type="checkbox"/> a person acting on behalf of the individual license holder in accordance with a power of attorney for the individual. A copy of the power of attorney must be submitted with the Annual Return.
a company	<input type="checkbox"/> by two directors, or <input checked="" type="checkbox"/> by a director and a company secretary, or <input type="checkbox"/> if a proprietary company that has a sole director who is also the sole company secretary - by that director, or <input type="checkbox"/> by a person delegated to sign a copy of the Annual Return on the company's behalf in accordance with the Corporations Act 2001. Delegation of authority must be submitted with the Annual Return, or. <input type="checkbox"/> by affixing the common seal, in accordance with the Corporations Act 2001
a public authority other than a Council	by the Chief Executive Officer of the public authority, or by a person delegated to sign on the public authority's behalf in accordance with its legislation.
a local Council	<input type="checkbox"/> by the General Manager in accordance with s377 of the Local Government Act 1993 , or <input type="checkbox"/> by affixing the seal of the Council in a manner authorised under the Local Government Act 1993.

It is an offence to supply any information in this form that is false or misleading in a material respect, or to certify a statement that is false or misleading in a material respect. There is a maximum penalty of \$250,000 for a corporation or \$120,000 for an individual.

- declare that the information in the Monitoring and Complaints Summary in section B of this Annual Return is correct and not false or misleading in a material respect, and
- certify that the information in the Statement of Compliance in sections A, C, D, E, F and G and any pages attached to Section C is correct and not false or misleading in a material respect.

If your licence has been transferred, suspended, surrendered or revoked by the EPA during this reporting period, cross out the dates below and specify the new dates to which this Annual Return relates below:

For the reporting period 01-Feb-2018 to 31-Jan-2019 or / / to / /

SIGNATURE: *K. Hees*

NAME: ROBIN LEES
(printed)

POSITION: COMPANY SECRETARY

DATE: 22 / March / 2019

SEAL (if signing under seal)

PLEASE ENSURE THAT ALL APPROPRIATE BOXES HAVE BEEN COMPLETED AND THAT THE CHECKLIST ON PAGE 2 OF THE ANNUAL RETURN HAS BEEN COMPLETED

en je

APPENDIX C: ANNUAL *PERSOONIA HIRSUTA* CONDITION MONITORING REPORT

ANNUAL PERSOONIA HIRSUTA CONDITION MONITORING REPORT



Illawarra Coal, 2018 Survey

Contents

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OVERVIEW

Illawarra Coal conducted its sixth round of annual condition monitoring of the *Persoonia hirsuta* population at West Cliff. The monitoring was undertaken in accordance with the approved *P. hirsuta* Offset Management Plan, which complies with EPBC Approval Condition 2. The monitoring was completed over 2 days in December 2018 during the peak flowering period for the species.

REVIEW OF PREVIOUS SURVEYS

FloraSearch 2009

A study by FloraSearch (2009) was conducted to quantify the distribution of *P. hirsuta* prior to construction of the Stage 3 Coal Wash Emplacement and indicated a local high density of the species on the broad ridgetop to the north-east of Brennans Creek and low density occurrences on the ridgetops to the north and south of the core population. Beyond these the concentrations were widely scattered isolated individual plants.

At least 88 plants of *P. hirsuta*, or approximately 66% of the total population, were identified by FloraSearch (2009) within the core population. Of the core patch, approximately 20 plants have been lost to the Stage 3 emplacement development and at least seven are within the footprint of Stage 4 emplacement.

Niche 2012 (Baseline Study)

Niche Environment and Heritage undertook a field survey of the core *P. hirsuta* population in November 2012 to establish a baseline population estimate and distribution of *P. hirsuta* for the Offset Management Plan. Two representatives from Illawarra Coal were also present and assisted with the surveys.

44 individuals were recorded within the core population area. A single individual was recorded approximately 14 metres to the north of the core population area and it is assumed that it will be impacted by the Stage 4 emplacement. Height and age class were also recorded.

A further nine individuals were recorded within the West Cliff lease area in areas where the species had been previously recorded, seven along Brennans Creek Road to the north and three along the south-west boundary with the Appin Road easement.

The core population was in good condition. The core area had a good level of inherent resilience (capacity to regenerate), a high level of native plant species richness, a low level of exotic plant cover and all structural layers are intact (canopy, mid-storey, shrubs and ground-cover).

The previous southern extension of the core population had been impacted by the construction of an approved haul road, which resulted in an indirect impact through edge effects. However, whilst the increased light levels and altered drainage had locally altered the native vegetation in a narrow, localised strip along this edge, the condition of this vegetation was still good with a low level of exotic cover. Some exotic perennial grasses, such as *Eragrostis curvula* (African lovegrass) and *Chloris truncata* (Rhodes grass) occurred occasionally along the road and track edges within the mine site and exclusion of these exotics from the core *P. hirsuta* population was considered a high priority.

It was estimated that the core *Persoonia* area had not experienced a fire event for up to 24 years. This was evident in the senescing (dead or dying) *Banksia ericifolia*, the low cover of annual herbs, grasses and obligates seeding short-lived shrubs. The fire history map for the study area (Wollondilly Bush Fire Risk Management Plan 2007) supported this, with the last reported fire event mapped around 1989.

Spring 2013

The 2013 survey was undertaken by Illawarra Coal. The total Offset population (Core population) in 2013 was 38 plants. Discounting 5 new plants that were identified during this survey, the Offset area had experienced an overall population decline of 11 plants since baseline (2012). It was concluded that the majority of the *P. hirsuta* plants in the Offset were reaching the end of their natural lifecycle; there appeared to be no recruitment occurring at the time which was likely a natural occurrence as no evidence suggested otherwise.

Spring 2014

The 2014 survey was undertaken by Illawarra Coal. The total Offset population in 2014 was 36 plants. Discounting 8 new plants that had been identified in the Offset since baseline (2012), the Offset area had experienced an overall population decline of 16 plants. Again, there were no visible impacts from dust or apparent disease and it was concluded that the mortality was due to the plants reaching the end of their natural lifecycle.

Three immature plants were identified (estimated age between 1 and 2.5 years). All were situated on cleared easement. Recruitment within the population was limited to previously disturbed areas.

One mature plant was discovered within the Stage Two Emplacement rehabilitation.

Spring 2015

The total count of live plants in the Offset in spring 2015 was 29. Discounting 9 new plants that had been identified in the Offset since baseline (2012), the Offset area had experienced an overall population decline of 24 plants. Although the vegetation remained in good condition, the *P. hirsuta* population in the Offset continued to decline because of the plants reaching senescence and the absence of a germination cue. Any recent recruitment of *P. hirsuta* (3 immature plants in 2014) had been limited to previously disturbed areas (in this case a powerline easement). Other known (healthier) populations at Couridjah and Yanderra, NSW, had a more recent fire history than West Cliff (D. Gregory pers.obs.).

Spring 2016

The total count of live plants within the Offset in 2016 was 11:

- Discounting 9 new plants that had been identified in the Offset since baseline (2012), the Offset area had experienced an overall population decline of 42 plants:
 - 16 of these were burned as part of the approved conservation burn trial in April 2016; and
 - 26 are likely due to age related causes;
- No new plants were identified in the Offset during 2016.

There appeared to be no recruitment occurring during 2016.

Spring 2017

The total count of live plants within the Offset in 2017 was 10:

- 1 new plant was identified in the Offset during 2017.
- All 10 plants were identified post-baseline. Discounting the 10 plants that had been identified in the Offset since baseline (2012), the offset has declined by 44 plants.
 - 28 plants have died likely due to age related causes (since the baseline in 2012);
 - 16 plants were burned as part of the approved conservation burn trial in April 2016;

A seedling was identified within the powerline corridor on Dam Road, indicating recruitment is occurring but limited to previously disturbed areas.

2018 SURVEY

Aim

To inspect all *P. hirsuta* plants to determine:

1. Survivorship and recruitment:
 - a. Condition;
 - b. Reproductive activity and age to maturity; and
 - c. Any imminent threat or risk to the plants health (e.g. apparent disease, excessive dust deposition).

Methods

All *P. hirsuta* plants were inspected to record the following attributes:

- Height and width;
- Age class;
- Condition; and
- Comments on any imminent threat or risk to the plants health (e.g. apparent disease, excessive dust deposition).

Height was measured using a tape measure, measuring from the ground surface to the point on the plant, without physically moving any part of the plant. Condition was defined using a combination of factors, including the percent cover of leaves, colour of leaves and the presence or absence of fruit or flowers, rating condition from 0 to 6, or from very poor condition to excellent condition (Appendix A).

Any new individuals were recorded with a Garmin GPS. The plants were also flagged with fluorescent, biodegradable flagging tape.

Results

Offset Population

The total count of live plants within the Offset in 2018 was 10:

- 28 plants have died likely due to age related causes (since the baseline in 2012);
- 16 plants were burned as part of the approved conservation burn trial in April 2016; and
- No new plants were identified in the Offset during 2018.

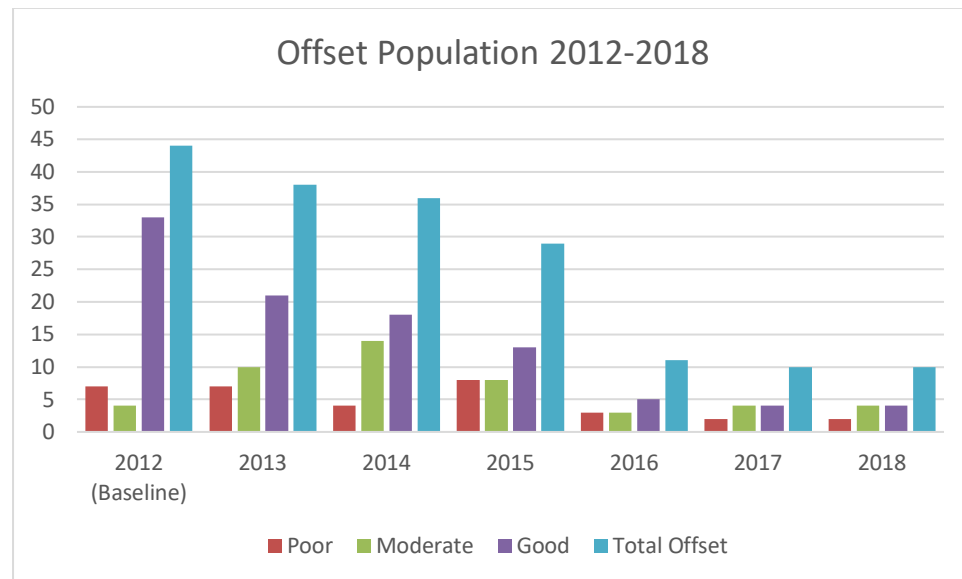


Figure 1: Comparison of *Persoonia hirsuta* condition and population within the Offset across years.

West Cliff Other Areas

An additional 23 live individuals are being monitored within the surrounding West Cliff lease (see Figure 3):

Total Site Count

The total count for live *P. hirsuta* plants at West Cliff in spring 2018 was 33, including 31 plants that have been identified post-baseline (2012). Excluding these, there has been a decrease of 61 plants relative to the 2012 baseline population of 63. The 61 includes the 16 plants that were burned as part of the conservation burn trial in April 2016. This was in accordance with Illawarra Coal's research strategy as stated in the approved *P. hirsuta* Offset Management Plan.

The results are tabulated in Appendix B.

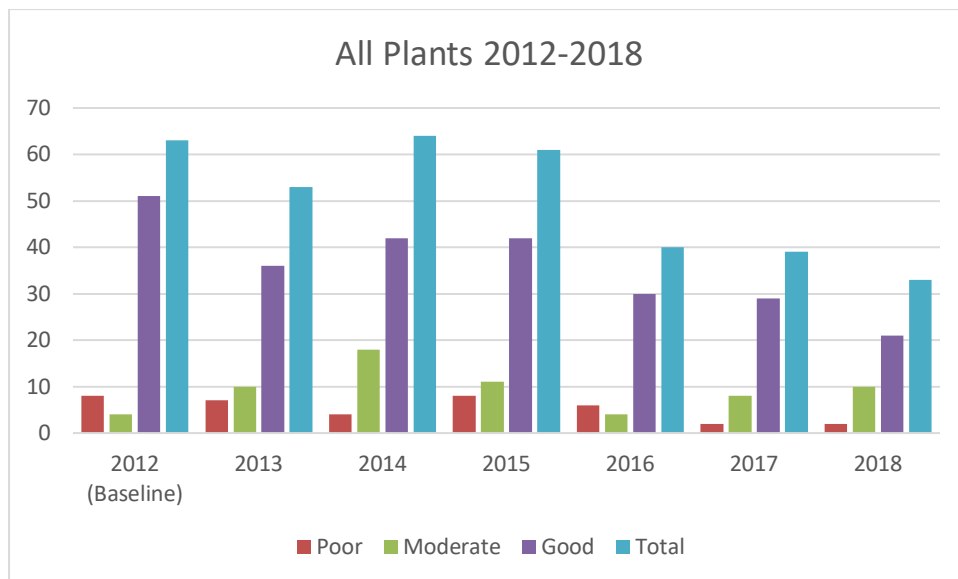


Figure 2: Comparison of condition and population of all plants across years

Discussion

The overall health of the core population of *P. hirsuta* is declining as the plants are reaching the end of their natural lifecycle. This is more prevalent in plants that are located within dense bush rather than those beneath powerlines or on the roadside.. The plants in 2018 appeared to exhibit less fruit and flower production compared to previous years, potentially associated with the drought.

The vegetation in the Offset and surrounding West Cliff site remains in good condition. The conservation burn area is regenerating well. Illawarra Coal is monitoring the site for emergent seedlings. No recruitment of *P. hirsuta* within the burn trial area has been observed.

The two *Persoonia hirsuta* individuals growing in the coal wash emplacement rehabilitation is considered a significant observation and will contribute to the understanding of the species' capacity for regeneration within the rehabilitation areas.

As per previous years, recruitment is limited to previously disturbed areas (beneath powerlines).

Ongoing Research and Conservation Management

In accordance with EPBC 2010/5350 Condition 3, Illawarra Coal is undertaking targeted research on *Persoonia hirsuta* including:

- Habitat and demography
- Population genetics;
- Seed biology, germination and recruitment and propagation, and
- pollination

Refer to Appendix C – *Persoonia Research Status and Strategy* for more detail.

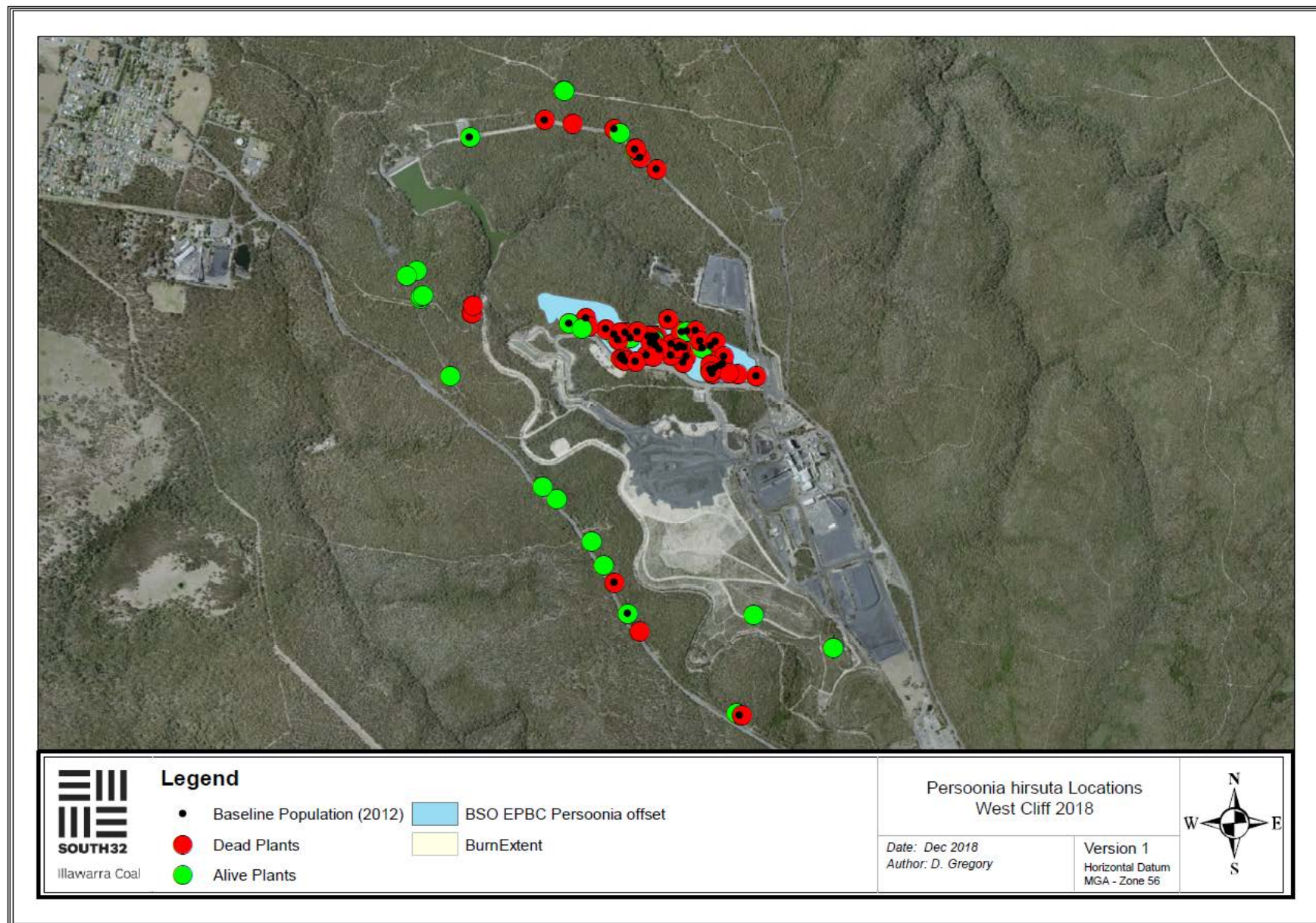


Figure 3: *P. hirsuta* records.

REFERENCES

Alison Haynes Honours Thesis (2015). Conservation genetics of the rare and endangered plant, *Persoonia hirsuta* (Proteaceae). University of Wollongong, NSW.

Auld, T. D, & Ooi, M. K.J. (2008). Applying seed germination studies in fire management for biodiversity conservation in south-eastern Australia. *Web Ecology*, 8 (1), 47-54.

BHPBIC *Persoonia hirsuta* Offset Management Plan

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Myerscough, P.J., Whelan, R.J. & Bradstock, R.A. (2000) Ecology of Proteaceae with special reference to the Sydney region. *Cunninghamia* 6(4): 951–1015.

Stephanie Wilmott Honours Thesis (2013). The Demography and Habitat Characteristics of *Persoonia hirsuta*. University of Wollongong, NSW.

APPENDIX A: RATING SYSTEM USED TO DETERMINE THE CONDITION OF *P. HIRSUTA* INDIVIDUALS

Rating	Condition	Determinants
0	Very Poor	0-15% cover of leaves 100% of leaves dull or browning No fruits or flowers
1	Poor	15-30% cover of leaves >75% of leaves dull or browning No fruits or flowers
2	Fairly Poor	30-45% cover of leaves >50% of leaves dull or browning No fruit or flowers
3	Moderate	45-60% cover of leaves 50% of leaves dull or browning Some fruits or flowers
4	Good	60-75% cover of leaves <50% leaves dull or browning Presence of fruits or flowers
5	Very good	75-90% cover of leaves <25% of leaves dull or browning Presences of fruits or flowers
6	Excellent	90-100% cover of leaves 0% leaves dull or browning Presence of fruits or flowers

APPENDIX B: RECORDS FROM 2018

Area	Label	Height (mm)	Width (mm)	Age Class	Condition	Eastin g	Northin g
Emplacement Rehab	DG023	300	700	Mature	Moderate	299655	6210366
Emplacement Rehab	DG033	560	600	Mature	Very Good	299277	6210523
Non core non impacted	ns027	---	---	Dead	Dead	298819	6212634
Non core non impacted	ns028	---	---	Dead	Dead	298718	6212726
Non core non impacted	ns029	---	---	Dead	Dead	298619	6212825
Non core non impacted	ns030	---	---	Dead	Dead	298290	6212866
Non core non impacted	ns031	460	1900	Mature	Moderate	297935	6212786
Non core non impacted	ns033	400	1000	Mature	Good	298682	6210531
Non core non impacted	ns034	400	1300	Mature	Good	299213	6210048
Non core non impacted	ns035			Dead	Dead	298619	6210678
Non core non impacted	cm021	400	1500	Scenescent	Dead	298740	6212688
Non core non impacted	DG003	1000	1200	Mature	Good	297701	6212019
Non core non impacted	DG004	600	1200	Mature	Very Good	297704	6212032
Non core non impacted	DG005	700	800	Mature	Very Good	298346	6211073
Non core non impacted	DG006	400	1000	Mature	Moderate	298511	6210872
Non core non impacted	DG007	600	1900	Mature	Excellent	298568	6210760
Non core non impacted	PM001	500	800	Mature	Very Good	299196	6210059
Non core non impacted	DG013	400	1000	Mature	Moderate	297712	6212037
Non core non impacted	DG014			Dead	Dead	297943	6211952
Non core non impacted	DG015	600	1500	Mature	Very Good	297684	6212156
Non core non impacted	DG017			Dead	Dead	297944	6211953
Non core non impacted	DG008	900	900	Mature	Moderate	298644	6212804
Non core non impacted	DG018	600	1300	Mature	Very Good	298381	6213005

Non core non impacted	DG019	300	700	Mature	Good	298379	6213004
Non core non impacted	DG020	550	900	Mature	Good	298377	6213006
Non core non impacted	DG021	700	1300	Mature	Very Good	298382	6213005
Non core non impacted	DG022	800	800	Mature	Moderate	297842	6211654
Non core non impacted	DG024	---	---	Dead	Dead	298422	6212851
Non core non impacted	JC001	---	---	Dead	Dead	297951	6211989
Non core non impacted	JC002	900	1900	Mature	Excellent	297637	6212132
Non core non impacted	DG027	---	---	Dead	Dead	299223	6210048
Non core non impacted	SG001	300	200	Juvenile	Good	298278	6211131
Non core non impacted	DG028	100	50	Juvenile	Excellent	298718	6212731
Non core non impacted	DG029	---	---	Dead	Dead	298721	6212729
Non core non impacted	ER001/DG012	560	1000	Mature	Excellent	298717	6212727
Non core non impacted	DG031	---	---	Dead	Dead	298719	6212730
Non core non impacted	DG032			Dead	Dead	298738	6210444
Offset	DG025	500	700	Mature	Moderate	298475	6211914
Offset	ns001	---	---	Dead	Dead	299291	6211655
Offset	ns002	---	---	Dead	Dead	299134	6211714
Offset	ns003	---	---	Dead	Dead	299073	6211686
Offset	ns004	---	---	Dead	Dead	299095	6211692
Offset	ns005	---	---	Dead	Dead	299083	6211666
Offset	ns006	200	800	Mature	Moderate	298950	6211791
Offset	ns007	---	---	Dead	Dead	298960	6211747
Offset	ns008	---	---	Dead	Dead	298946	6211718
Offset	ns009	---	---	Dead	Dead	298888	6211752
Offset	ns010	---	---	Dead	Dead	298772	6211754
Offset	ns011	---	---	Dead	Dead	298663	6211731
Offset	ns012	---	---	Dead	Dead	298651	6211741

Offset	ns013	---	---	Dead	Dead	29866 4	6211744
Offset	ns014	250	600	Mature	Good	29861 9	6211853
Offset	ns015	---	---	Dead	Dead	29857 9	6211877
Offset	ns017	---	---	Dead	Dead	29907 4	6211798
Offset	ns018	---	---	Dead	Dead	29882 0	6211843
Offset	ns019	---	---	Scenescent	Dead	29879 8	6211844
Offset	ns020	---	---	Dead	Dead	29867 3	6211861
Offset	ns021	800	1100	Mature	Moderate	29880 6	6211827
Offset	ns022	800	1100	Mature	Moderate	29880 7	6211825
Offset	ns024	---	---	Dead	Dead	29881 5	6211801
Offset	ns025	700	1700	Mature	Good	29869 5	6211834
Offset	ns026	---	---	Dead	Dead	29893 1	6211797
Offset	cm001	---	---	Dead	Dead	29911 9	6211704
Offset	cm002	350	100	Mature	Poor	29903 7	6211788
Offset	cm003	---	---	Dead	Dead	29893 3	6211799
Offset	cm004	---	---	Dead	Dead	29888 9	6211807
Offset	cm005	---	---	Dead	Dead	29883 3	6211781
Offset	cm006	---	---	Dead	Dead	29866 9	6211727
Offset	cm007	---	---	Dead	Dead	29863 8	6211825
Offset	cm008	---	---	Mature	Dead	29840 5	6211903
Offset	cm009	---	---	Dead	Dead	29848 5	6211930
Offset	cm010	---	---	Dead	Dead	29893 3	6211865
Offset	cm011	500	500	Mature	Fairly Poor	29896 3	6211868
Offset	cm012	---	---	Dead	Dead	29900 3	6211871
Offset	cm013	---	---	Dead	Dead	29902 5	6211820
Offset	cm014	---	---	Dead	Dead	29909 8	6211818
Offset	cm015	---	---	Dead	Dead	29878 1	6211844
Offset	cm016	---	---	Dead	Dead	29872 8	6211863

Offset	cm017	---	---	Dead	Dead	29913 8	6211748
Offset	cm018	---	---	Dead	Dead	29871 9	6211724
Offset	cm019	---	---	Dead	Dead	29879 2	6211812
Offset	cm020	---	---	Dead	Dead	29891 8	6211790
Offset	DG001	---	---	Dead	Dead	29908 9	6211685
Offset	DG002	---	---	Dead	Dead	29880 2	6211746
Offset	AH001	---	---	Dead	Dead	29907 4	6211709
Offset	AW001	---	---	Dead	Dead	29920 4	6211662
Offset	AW002	---	---	Dead	Dead	29915 9	6211671
Offset	DG009	---	---	Dead	Dead	29864 6	6211861
Offset	DG010	---	---	Scenescent	Dead	29849 8	6211889
Offset	DG011	520	400	Mature	Excellent	29840 6	6211903
Offset	CB004	---	---	Dead	Dead	29907 4	6211676
Offset	CF001	400	800	Mature	Excellent	29846 6	6211878
Stage 4	ns016	---	---	Dead	Dead	29887 3	6211924

APPENDIX C: PERSOONIA HIRSUTA RESEARCH STRATEGY AND STATUS

EPBC Approval (2010/5350) Condition 3 – South32 Illawarra Coal Persoonia Research Status Update and Strategy

Prepared by: David Gregory – IC Land and Biodiversity Specialist

Review Date: 22nd June 2018

Condition Requirement	Status
3. The person taking action must engage a suitably qualified expert to undertake and make publically available targeted research to inform conservation knowledge of Persoonia hirsuta. The research must:	<p>The ‘targeted research’ is being undertaken by both the University of Wollongong and Royal Botanic Gardens and Domain Trust. The following research has been completed by University of Wollongong to date:</p> <ol style="list-style-type: none"> 1. Honours project #1 titled The Demography and Habitat Characteristics of the Endangered Persoonia hirsuta (submitted 2013) 2. Honours project #2 titled Conservation genetics of the rare and endangered plant, Persoonia hirsuta (proteaceae) (submitted 2015) 3. Honours Project #3 (Continuation of #2) titled Can the seed bank act as a reservoir of genetic diversity? A Conservation genetic study of Persoonia hirsuta <p>UOW will publish the outcomes from this work. We expect the final paper/s to be available mid-late 2018.</p> <p>The following research is underway with the Royal Botanic Gardens and Domain Trust:</p> <ol style="list-style-type: none"> 1. Trial propagation using cuttings collected from the West Cliff and other populations. The aim is to develop a population of stock plants at the nursery which will be used to collect seed for germination trials and translocation. This project is ongoing, progress has been slow due to the overall success rate for this species being very low. 2. ACARP 24013 (2017). <i>Managing and conserving native plant species in the mining environment - seed germination biology and alternative ex situ storage of Persoonia germplasm for restoration</i>. This work is a collaborative project between Illawarra Coal, Centennial Coal and Royal Botanic Gardens and Domain Trust and is funded by the Australian Coal Association Research Program (ACARP). The research had two main aims: <ol style="list-style-type: none"> a. To optimise propagation of Persoonia, through seed and vegetative material, with a focus on several species relevant to current mining leases in South-Eastern Australia. The objectives within this aim include: <ol style="list-style-type: none"> i. - Optimising the collection of seed and vegetative material ii. - Understanding dormancy preventing high rates of seed germination for multiple species and optimising germination conditions to establish cultivation protocols iii. - Trialling various approaches to vegetative propagation. b. To determine the most appropriate ex situ conservation options for successful reintroduction of these species as part of restoration programs. The following objectives were addressed: <ol style="list-style-type: none"> i. Determination of the long-term suitability of seedbanking for Persoonia ii. Identification of optimal conditions for the successful propagation and healthy growth and survival of Persoonias in the nursery iii. Establishment of a protocol for storage of germplasm as seed (seedbanking) and plantlets (tissue culture) to maximise survivorship.

Condition Requirement	Status
	<p>The above project (Phase 1) commenced February 2015 and completed in March 2017. This project was granted further funding in 2016 and extended for two years (Phase 2) (to conclude late 2019) to include high interest native plants in mine site restoration programs and Propagation, translocation and re-introduction of plants for the establishment of offset populations. Mt Annan RBG are currently undergoing seed collections, germination and pollinator observations. To date, the project has resulted in successful germination of <i>P. hirsuta</i> seed in the nursery. The next stage will involve translocations of plants grown from seed in the nursery back to the mine site. Phase 1 has resulted in several published research articles.</p> <p>3. PhD (Collaboration with Royal Botanic Gardens and Western Sydney University) titled <i>Addressing Drivers of Dieback in an Endangered Tree Species, Persoonia hirsuta (Hairy Geebung)</i>. The aim of this project is to assess environmental factors that may be linked to dieback, particularly those related to beneficial and detrimental microbes and to plant nutrition. These factors will be assessed in field and glasshouse experiments and using state-of-the-art laboratory techniques. This project will commence mid-2018 and run for the next 3 years.</p>
a. Document current understanding of <i>Persoonia hirsuta</i> ecology and genetics;	<p>UOW honours project #1 - Thesis titled <i>The demography and Habitat Characteristics of the Endangered Persoonia hirsuta</i> by Stephanie Wilmott. Project was completed in October 2013. The study investigated the following:</p> <ul style="list-style-type: none"> • Current distribution and abundance • Soil stored seed bank – to determine if seed is dispersed or retained directly under the plant; and • Habitat requirements – Indicator species, soil particle size/composition and elevation <p>Current understanding of genetics was summarised in the Conservation Genetics Projects (UOW project #2 & #3) which is summarised in Condition (5) below. UOW will publish the outcomes of these works in a paper late 2018.</p>
b. Outline previously documented management and conservation actions;	This will be outlined in the final report when published.
c. Investigate: i. Pollination biology	Royal Botanic Gardens have commenced pollinator observations on <i>P. hirsuta</i> . This work will form part of the ACARP research mentioned above.
ii. Requirements of its pollinators	As above.
iii. Soil seed bank dynamics and the role of various disturbances (including fire) in germination and recruitment;	<p>Soil seed bank was investigated as part of project #1 as mentioned above. This study found that all of the sites where <i>P. hirsuta</i> populations were present were found to have high levels of disturbance. The type of disturbance and the level of disturbance <i>P. hirsuta</i> can tolerate, and perhaps benefit from, was not tested experimentally. The RBG ACARP project will attempt to develop a robust and informative experimental framework for examining germination cues for <i>Persoonia</i> species seed, including temperature, chemical, physical and temporal treatments. Soil stored seed was also a topic of investigation in the UOW project #3.</p> <p>The University of Wollongong was engaged by Illawarra Coal to investigate post-fire seedling emergence patterns at a site consisting of approximately 8000 m² of dry sclerophyll forest at Yanderra, on the edge of the Southern Highlands, NSW. The site was burned in a wildfire in late October 2013. This study was the first</p>

Condition Requirement	Status
	<p>to record the spatial and temporal pattern of post-fire seedling emergence in <i>P. hirsuta</i> and found that of 16 burned skeletons, the seed banks immediately below 10 of them produced a flush of seedlings mostly seven months after the fire (Alison Haynes Thesis 2015). The results were published in the UOW project #2 (Conservation Genetics).</p> <p>Illawarra Coal conducted an ecological burn within the West Cliff <i>Persoonia</i> Offset in April 2016. The aim of the burn was to promote germination of <i>P. hirsuta</i> and increase the density of the species within the area. IC prepared a Burn Plan and designed a post-fire monitoring program and is currently monitoring for seedlings.</p>
iv. Phenology and seasonal growth of <i>Persoonia hirsuta</i>	<p>Illawarra Coal is conducting annual population and condition surveys at West Cliff. These surveys examine the growth, health and survival of the plants growing within the Offset area at West Cliff. An annual report is provided to DOE each year in accordance with EPBC 2010/5350 Condition (h).</p>
v. Population genetic structure, levels of genetic diversity, minimum viable population size and management actions	<p>UOW honours project #2 - titled <i>Conservation Genetics of the Rare and Endangered Persoonia hirsuta (Proteaceae)</i>. Project was completed July 2015 and investigated the following:</p> <ul style="list-style-type: none"> • Developing and optimising a set of species-specific microsatellite primers suitable for fine scale population genetic analysis in this study, and in later studies of paternity analyses. • Using microsatellite data from adult plants to estimate patterns of allelic and genotypic diversity, fine and coarse scale genetic differentiation and mating systems; and • Investigating the species' demographic response to fire by taking advantage of a wildfire in October 2013 that burned one of the adult stands, providing the opportunity to document spatial and temporal patterns of seedling emergence and growth. <p>Further research in this area continued under Honours project # 3 – Completed Nov 16.</p> <p>There were five major aims of this project:</p> <ul style="list-style-type: none"> • Extract and amplify DNA of a reliable and workable quality from <i>Persoonia hirsuta</i> seed material using PCR. • Select and optimise markers based on quality, repeatability and variability. • Use material from each of two populations to genotype seed from canopy and soil stored seed bank to: <ul style="list-style-type: none"> ○ Verify that seed genotypes were reflective of the embryo, whilst not containing maternal DNA ○ Compile a representative sample of the seed bank • Infer patterns of mating using paternity analyses, estimation of pollen dispersal distances and variation in male reproductive success across time. Calculate single and multilocus outcrossing rates. • Compare levels and partitioning of genetic diversity within the adult and seed bank populations.
vi. Impact of dieback disease and control techniques on <i>Persoonia hirsuta</i> and its habitat; and	<p>PhD (Collaboration with Royal Botanic Gardens and Western Sydney University) titled <i>Addressing Drivers of Dieback in an Endangered Tree Species, Persoonia hirsuta (Hairy Geebung)</i>.</p> <p>The aim of this project is to assess environmental factors that may be linked to dieback, particularly those related to beneficial and detrimental microbes and to plant nutrition. These factors will be assessed in field and glasshouse experiments and using state-of-the-art laboratory techniques. This project will commence mid-2018 and run for the next 3 years.</p>

Condition Requirement	Status
vii. Impact of fire on <i>Persoonia hirsuta</i> and its habitat	As mentioned above, <i>UOW Conservation Genetics...</i> (Project #2) thesis Investigated the species' demographic response to fire by taking advantage of a wildfire in October 2013 that burned one of the adult stands, providing the opportunity to document spatial and temporal patterns of seedling emergence and growth. IC has conducted an ecological burn within the Offset in 2016 and is monitoring to measure the plants' response to fire at West Cliff.

Key Milestones	Target Completion Date	Status
1. Demography and Habitat Project Completed	Nov 2013	Completed Nov 2013
2. Conservation Genetics Project Completed	June 2015	Honours Thesis completed June 15, UOW currently publishing this work.
3. Mating Systems Project Complete	Oct 2016	Completed Oct 2016
4. Annual population monitoring Completed	Dec 13, 14, 15, 16 & 17	Dec 13, 14, 15, 16 & 17 completed
5. Mt Annan Propagation Trials using cuttings completed	Trial 1 WC cuttings collected by – June 2014 Trial 2 (Couridjah) cuttings collected by – Dec 2014 Trial 3 WC cuttings collected by – March 2015 Trial 4 – WC cuttings collected by end of 2016 Trial 5 – WC and Yanderra April 2018	Trial 1 completed with no success Trial 2 ongoing, no long-term success Trial 3 underway, 16 cuttings successful to begin with, but mortality high – No plants have since survived. Trial 4 Mortality high, few plants remaining in nursery and progress very slow. Trial 5 – Cuttings have been potted but no root establishment yet.
6. Conduct Ecological burn – West Cliff Offset	Autumn 2016 (depending on findings from ACARP and 2015 population census).	Burn completed in Apr 2016. Commenced post-fire monitoring program. No <i>P. hirsuta</i> seedlings recorded to-date.
7. Royal Botanic Gardens ACARP Project Report Completed	May 2017 (Part 1). Oct 2019 (Part 2)	Project commenced February 2015 – Ongoing. Has been extended into a second project –further funding for another two years.
8. PhD Project (RBG & UWS)	March 2021	Not yet commenced
9. Submit Final Project Report	June 2021	Original deadline was May 2017 – Request submitted to extend by another two years - Granted. Additional request submitted to extend till 2021 to allow for PhD project and additional work being undertaken by RBG.

END OF REPORT

APPENDIX D: 2018/19 APPIN WEST BIOBANK SITE ANNUAL REPORT



Landcare Australia

**Annual Report for
Biodiversity Conservation Trust
April 2018 - May 2019**

Appin West BioBanking Site (ID: 215)

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1. BioBanking Annual Reporting Table

BioBank Site Annual Report					
Location Details					
BioBanking agreement ID: 215		Name of landowner - Endeavour Coal Pty Ltd. All conservation land management works undertaken by Landcare Australia on behalf of Endeavour Coal Pty Ltd.			
Reporting date: 7 May 2019 (period April 2018 - May 2019)		Property address: 140 Douglas Park Drive Douglas Park			
Management actions	Required completion time and frequency	Action completed (Yes/No)	Actual completion date/s	Description of actions undertaken (including reference to management zones), any variations and the reasons for variation.	Visual observations and other comments (including reasons for non-completion)
1. Management of grazing for conservation	Ongoing	Yes	Quarterly site visits for this reporting period, include: 26 Apr 2018, 22 Oct 2018, 4 Jan 2019, 20 Feb 2019	Excluding the one horse observed in the eastern section of MZ1 in Oct 2018, no other stock observed in all management zones on each site visit. The fence allowing the neighbour's horse to enter the site was repaired to prevent further access to the site. Significant grazing by stock animals continues to occur on the private property (to the south) without incursion into the site.	No other observed evidence of stock grazing, trampling or other traces of stock animals.
2. Weed control	Ongoing – (4 times per year)	Yes	Quarterly site visits	Weed control at MZ1, MZ2, MZ3 and Transmission easement and edges of MZ6 and MZ7 adjoining easement on each site visit using herbicide and hand pulling of species listed in BioBanking Agreement (BBA) 215. Maintenance Sweeps for key weed threats through MZ4, MZ6 and MZ7. No access permitted to MZ5 due to the high cliffs and gorges, however no weeds observed in adjoining management zones during maintenance sweeps. Herbicides have been used on the BioBanking site at the quarterly site visits to undertake management actions (i.e. weed control) in each respective	Additional herbicide treatment required in MZ1, MZ2, MZ3 and the transmission easement for Blue periwinkle, Paterson's curse, Bridal creeper, African lovegrass, Stinking Roger, Thistle, Fleabane, Paddy's lucerne and woody species such as Privet. As per the BBA, areas previously disturbed require ongoing control for at least the following 10 years, after which time these zones are to be reassessed for the need for further control.


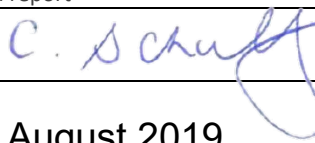
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				management zone as listed in the BBA. A list of herbicide used at each visit is available (if required).	
3. Management of fire for conservation	Ongoing	Yes	Quarterly site visits.	<p>No evidence of recent fire activity during all six site visits (BBA suggests last burn/wildfire was in 2004).</p> <p>No ecological burns are planned in any zone until at least 2026 and then the site will be reconsidered for future ecological burns in a mosaic pattern across the site.</p>	Heavy senescence of <i>Acacia spp.</i> (predominantly <i>A. decurrens</i>) in MZ1, MZ2 and MZ7. Fuel loads vary in all management zones but are at least 15 -20 tonnes per hectare or greater across the site.
4. Management of human disturbance	Ongoing	Yes	Quarterly site visits.	<p>Signage and fencing as per the BBA have been installed and are in good working order.</p> <p>Minor repairs required on the northern boundary to ensure no further incursions of horses onto the site from the neighbouring property.</p> <p>No waste has been observed on the site during quarterly site visits this year.</p>	<p>Access for management purposes includes South32 and Landcare Australia (land management contractor) staff.</p> <p>There is no ability for stock or unauthorized motor vehicles to access the site with the current exclusion fencing in place.</p> <p>Routine inspections conducted at each site visit to ensure fencing is secure and that there have been no incursions (except for the horse observed as listed in item 1 above).</p> <p>Former OEH mapping shows there is a spotlight location on the site as part of ongoing Koala surveys in South Western Sydney.</p>
5. Retention of native vegetation	Ongoing	Yes	Quarterly site visits.	No native vegetation has been removed, killed, destroyed or poisoned onsite.	No evidence or observation of recent ringbarking or tree felling (since commencement of the BBA) on the site.
6. Planting or seeding	Autumn 2018	Yes	15 May and 22 May 2018, then ongoing at quarterly site visits.	<p>As per the Section 6.6 of the BBA, a planting program has been implemented as a "local planting day", with preparation on 15/05/18 and planting on 22/05/18 for the species listed in the planting schedule.</p> <p>250 canopy tubestock were watered on 22/10/18, 04/01/19 and 20/02/19.</p> <p>Currently there is a 90% success rate in survivability of the canopy species planted.</p>	Bulk water and management access has been completed (in accordance section 3.5 of the BBA) for ongoing maintenance of the tubestock at the planting area in MZ3.
7. Retention of dead timber	Ongoing	Yes	Quarterly site visits.	No dead timber (standing or fallen) has been removed and no additional timber has been	Observations made during maintenance sweeps for all zones during annual and quarterly sites visits.

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				introduced to the site since commencement of the BBA.	
8. Erosion control	Ongoing	Yes	Quarterly site visits.	No areas identified across the site which currently require any supplementary erosion control or stabilisation.	Observations made during maintenance sweeps for all zones during annual and quarterly sites visits.
9. Retention of rocks	Ongoing	Yes	Quarterly site visits.	No rock removal has occurred on the site since the commencement of the BBA.	Site monitored for rock removal at either quarterly or annual site visits to the respective management zones.
10. Control of feral and overabundant native herbivores	Ongoing	Yes	Quarterly site visits	Negligible feral or overabundant native herbivory (wallabies, kangaroo scats, but good floral recruitment observed).	In accordance with the BBA annual inspection required for species traces. Opportunistic observations made during weed control and maintenance sweeps for all zones during either the annual and/or quarterly site visits.
11. Vertebrate pest management	Ongoing	Yes	Quarterly site visits.	Minimal rabbit scratching/scat mounds observed in transmission easement (20/02/2019). No rabbit burrow/warrens found on property, numerous (generally inactive) wombat burrows also did not show signs of rabbits in residence. Fox scat was observed in the transmission easement (20/02/2019). No evidence of goats or deer observed in the immediate areas.	No pest animals observed during any site visits (only scats). The pest management plan is not due for review until 2021, however liaison with Sydney Region Local Land Service will continue so as to determine if and when a fox/wild baiting program should be undertaken on the site.
12. Nutrient control	Ongoing	Yes	Quarterly site visits.	Nil	No fertilizers have been used on the site since the commencement of the BBA.
13. Control of exotic fish species	N/A	N/A	N/A	N/A	No action required under the BBA
14. Maintenance or reintroduction of natural flow regimes	Ongoing	Yes	Ongoing	No artificial structures installed to impede the natural flow regimes on the site.	Natural flow regimes are maintained on the site in accordance with the BBA
Incident or event that has adverse effect on biodiversity values on biobank site					
Incident or event including adverse impacts (e.g. natural events)			Action taken and proposed recommended actions		
			Nil incidents or events in this reporting period		
Records submitted with this report					
<input checked="" type="checkbox"/> Photographs taken at the photo points set in the BioBanking agreement – see attached					
<input checked="" type="checkbox"/> Results of the inspections required to be conducted in item 1.3 of annexure D to the BioBanking agreement – see attached					
<input checked="" type="checkbox"/> Results of any monitoring, inspections, surveys required in Annexures C and D to the BioBanking agreement – see attached					


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Signature and certification	
I hereby declare that the information supplied in this report is accurate and complies with the reporting requirements under item 2 of the Annexure D to the BioBanking agreement Note: If the land that forms the biobank site is owned by multiple persons, each landowner must sign this annual report	
Signed: 	Signed:  on Behalf of Endeavour Coal Pty Ltd
Date: 7 August 2019	Date: 8 August 2019







2. Photo Points

Location of Photopoints					
Projected Coordinate System: GDA 94, MGA – Zone 56					
Photopoint Ref.	Easting	Northing	Feature	Direction of Photo	Comment (Date)
PP1	289949	6210260	Planted and regenerating native pasture	NSEW	1 Star Picket in clearing, flagged
PP2	289844	6210546	Shale Sandstone Transition Forest (EEC)	NSEW	1 Star Picket in clearing, 20m from original site. Flagged
PP3	290152	621692	Acacia thicket in subtle drainage line from adjoining property's dam outfall.	NSEW	1 Star Picket in clearing, flagged
PP4	290223	6210758	Centre of old Bore site, in regeneration area, at end of access track.	NSEW	1 Star Picket in clearing, flagged
PP5	290390	6210874	Centre of main access track to western block, in centre of powerline alignment.	NSEW	New Photopoint established ~15m from original GPS location, which will not interfere with slashing regime (see Feature column) (2/3/18).
PP6	290321	6211031	Powerpole (ID869210) marker, viewing weed management (and future revegetation) in slashed grass area	NSEW	New Photopoint established approximately 15m from original GPS location, using Powerpole (ID 869210) in centre of easement/slashed area (2/3/18).
PP7	290420	6211172	Garden plant escapee/weed management, east of boundary fence maintenance track.	NSEW	New Photopoint established approximately 20m from original GPS location. New Site is next to patch of succulents (Removed 24-25/10/17), approximately 10m from property boundary with adjacent house block, due east from carport (25/10/17). 1 Star Picket in clearing, flagged (2/3/18).
PP8	290631	6211462	Regeneration of track. Marker within vegetation, south-east of track bend.	NSEW	Original photopoint not found. New Photopoint established and flagged (2/3/18).
PP9	290788	6211293	Regeneration of formerly cleared area	NSEW	New photopoint established approximately 15m from original GPS location. Used bifurcated Eucalypt in NW corner of clearing / turning circle (25/10/17). 1 Star Picket in clearing, flagged (2/3/18).
PP10	291044	6211381	Did not visit point (2/3/18 and 20/2/19). No access located in Cataract River Gorge	NSEW	Did not visit point (2/3/18 and 20/3/19). No access allowed to Cataract River Gorge (WHS)




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PP#	Direction	October 2017	February 2018	February 2019
PP1	N			
PP1	E			







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PP#	Direction	October 2017	February 2018	February 2019
PP1	S			
PP1	W			

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PP#	Direction	October 2017	February 2018	February 2019
PP2	N			
PP2	E			

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PP#	Direction	October 2017	February 2018	February 2019
PP2	S			
PP2	W			

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PP#	Direction	October 2017	February 2018	February 2019
PP3	N			
PP3	E			







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PP#	Direction	October 2017	February 2018	February 2019
PP3	S			
PP3	W			

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PP#	Direction	October 2017	February 2018	February 2019
PP4	N			
PP4	E			

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PP#	Direction	October 2017	February 2018	February 2019
PP4	S			
PP4	W			







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PP#	Direction	October 2017	February 2018	February 2019
PP5	N			
PP5	E			





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PP#	Direction	October 2017	February 2018	February 2019
PP5	S			
PP5	W			

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PP#	Direction	October 2017	February 2018	February 2019
PP6	N			
PP6	E			







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PP#	Direction	October 2017	February 2018	February 2019
PP6	S			
PP6	W			



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PP#	Direction	October 2017	February 2018	February 2019
PP7	N			
PP7	E			




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PP#	Direction	October 2017	February 2018	February 2019
PP7	S			
PP7	W			

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PP#	Direction	October 2017	February 2018	February 2019
PP8	N			
PP8	E			







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PP#	Direction	October 2017	February 2018	February 2019
PP8	S			
PP8	W			

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PP#	Direction	October 2017	February 2018	February 2019
PP9	N			
PP9	E			

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PP#	Direction	October 2017	February 2018	February 2019
PP9	S			
PP9	W			

3. Results of the inspections required - as per item 1.3 of Annexure D to the BioBanking Agreement

1. *Percentage of ground cover present on the biobank site for the purpose of item 1.1 of Section 1 of Annexure C* (reporting - 12 monthly) – Minimal stock incursion (excluding individual horse since previous reporting period) has allowed groundcover to be maintained as a similar density across the site over the previous 2 years due to the installation of the exclusion fencing (refer to photopoints for further detail).
2. *Number of stock and date/s when the stock have entered the management zones of the biobank site* (reporting - 6 monthly) – One stock incursion to the eastern side of MZ 1 in Oct 2018, the fence was repaired and there has been no further evidence of stock on the site since the installation of the fencing.
3. *Physical condition of fencing and gates to ensure they are maintained to the standard listed in Annexure D section 1.3 of the BBA:*
 - a. Currently maintained to the standard to exclude stock from the site and inspected annually (inspected 26/4/2018 and 20/02/19).
 - b. Currently maintained to a standard to control human disturbance and inspected annually (inspected 26/4/2018 and 20/02/19).
 - c. Currently maintained to a standard to control feral or overabundant herbivores and/or vertebrate pests and inspected annually (inspected 26/4/2018, 22/10/2018, 04/01/2019 and 20/02/19) - Negligible feral or overabundant native herbivory observed in all management zones.
4. *Records of any human disturbance on the biobank site* – (reporting 6 monthly) – Nil human disturbance observed at the site (inspected on 26/04/18, 22/10/18, 04/01/19 and 20/02/19).
5. *Evidence of erosion* – (reporting 6 monthly) - No areas identified across the management zones which currently require any supplementary erosion control or stabilisation (inspected on 26/04/18, 22/10/18, 04/01/19 and 20/02/19).
6. *Evidence of Waste* – (reporting 6 monthly) – No evidence of waste was observed during the quarterly site visits on 26/4/18, 22/10/18, 04/01/19 and 20/2/19.

4. Site visit April 2018

4.1. Weeds

Template for reporting of monitoring activities		
Management Zone	Date	Observations and assessment of monitoring
MZ 1	26/04/18	Treatment of exotic weeds and grasses with herbicide and hand-pulling of weeds.
MZ 2	26/04/18	Undertaken in conjunction with weed control works at MZ 1. Treatment of exotic weeds and grasses with herbicide and hand-pulling of weeds.
Transmission line (TL) and associated cleared area	26/04/18	Undertaken in conjunction with weed control works at MZ 1 and MZ 2. Treatment of exotic weeds and grasses with herbicide and hand-pulling of weeds.
MZ 3	26/04/18	Undertaken in conjunction with weed control works at MZ 1 and MZ 2. Treatment of exotic weeds (particularly Paterson's curse) and grasses with herbicide and hand-pulling of weeds.
MZ 4	26/04/18	Maintenance sweep targeting key weed threats, concentrating along existing tracks.
MZ 5	26/04/18	Management zone not visited: no access due to high-risk cliffs. No weeds observed in adjacent management zones.
MZ 6	26/04/18	Undertaken in conjunction with weed control works in MZ 7. Maintenance sweep targeting key weed threats, concentrating along existing tracks.
MZ 7	26/04/18	Undertaken in conjunction with weed control works at MZ 6. Maintenance sweeps targeting specific exotic grasses with herbicide including African lovegrass.

Diary template for weed control management			
Date	Management Zone	Description and type of activity undertaken or observation made	Minor variations (details and reasons)
26/04/18	1,2,3 and TL	<p>Weed control, herbicide and hand pulling of:</p> <ul style="list-style-type: none"> - Blue periwinkle (<i>Vinca major</i>), - Paterson's' curse (<i>Echium plantagineum</i>) - African lovegrass (<i>Eragrostis curvula</i>), - Spear thistle (<i>Cirsium vulgare</i>), - Bridal creeper (<i>Asparagus asparagoides</i>), - <i>Agapanthus sp.</i> and <i>Yucca sp.</i> - Small leaved privet (<i>Ligustrum sinense</i>) <p>Low threat weeds treated:</p> <ul style="list-style-type: none"> - Cat's Ear (<i>Hypochaeris radicata</i>), - Ribwort (<i>Plantago lanceolata</i>) 	Will need to revisit MZ 1, MZ 2 and transmission line (TL) to treat Periwinkle, Paterson's curse, Bridal creeper and Privet regrowth.

Diary template for weed control management			
Date	Management Zone	Description and type of activity undertaken or observation made	Minor variations (details and reasons)
26/04/18	MZ 6 and 7	Maintenance sweep and herbicide treatment of African lovegrass and Paterson's curse.	Still need to target new growth of African lovegrass and Paterson's curse
26/04/18	MZ 1, 2, 3, TL, 6, 7	Site walk to observe any pests or evidence of presence via scats.	N/A

4.2. Fire

Template for reporting of monitoring activities		
Management Zone	Date	Observations and assessment of monitoring
MZ 1, 2, 3, TL, 6, 7	26/04/18	No evidence of recent fire activity during site visit (Management report suggests last burn was in 2004). Heavy senescence of <i>Acacia spp.</i> in MZ 2 and MZ 7 continues. Fuel loads approx. 15-20 tonnes per hectare on average.

Diary template for fire management activities			
Date	Management Zone	Description and type of activity undertaken or observation made	Minor variations (details and reasons)
26/04/18 15/05/18 22/05/18	MZ 1, 2, 3, TL, 6, 7	No fire management activities undertaken except for opportunistic observation during weeding activities.	N/A

4.3. Pest Animals

1. Template for reporting of monitoring activities		
Management Zone	Date	Current level of impact on vegetation This column must record impacts as Negligible, Minimal, Moderate or High
MZ 1, 2, 3, TL, 6, 7	26/04/18	Eastern grey kangaroo and scats observed, minimal grazing by native herbivores in all zones.

Diary template for feral and overabundant herbivore management			
Date	Management Zone	Description and type of activity undertaken This column must include details of the feral and overabundant herbivores targeted, control techniques, and numbers controlled.	Minor variations (details and reasons)
26/04/18	All	No specific pest management work undertaken except for opportunistic observation during weeding activities.	N/A

5. Site visit October 2018

5.1. Weeds

Template for reporting of monitoring activities		
Management Zone	Date	Observations and assessment of monitoring
MZ 1	22/10/18	Treatment of exotic weeds and grasses with herbicide and hand pulling of weeds.
MZ 2	22/10/18	Undertaken in conjunction with weed control works at MZ 1. Treatment of exotic weeds and grasses with herbicide and hand-pulling of weeds.
Transmission line (TL) and associated cleared area	22/10/18	Undertaken in conjunction with weed control works at MZ 1 and MZ 2. Treatment of exotic weeds and grasses with herbicide and hand-pulling of weeds.
MZ 3	22/10/18	Undertaken in conjunction with weed control works at MZ 1 and MZ 2. Treatment of exotic weeds (particularly Paterson's curse) and exotic grasses with herbicide and hand-pulling of weeds inside tree guards. Watering of 250 tubestock planted in May 2018.
MZ 4	22/10/18	Maintenance sweep targeting key weed threats, concentrating along existing tracks.
MZ 5	22/10/18	Management zone not visited: no access due to high-risk cliffs. No weeds observed in adjacent management zones.
MZ 6	22/10/18	Undertaken in conjunction with weed control works in MZ 7. Maintenance sweep targeting key weed threats, concentrating along existing tracks.
MZ 7	22/10/18	Undertaken in conjunction with weed control works at MZ 6. Maintenance sweeps targeting specific exotic grasses with herbicide including African lovegrass.

Diary template for weed control management			
Date	Management Zone	Description and type of activity undertaken or observation made	Minor variations (details and reasons)
22/10/18	1,2,3 and TL	Weed control, herbicide and hand pulling of: <ul style="list-style-type: none"> - Blue periwinkle (<i>Vinca major</i>), - Paterson's curse (<i>Echium plantagineum</i>) - African lovegrass (<i>Eragrostis curvula</i>), - Spear thistle (<i>Cirsium vulgare</i>), - Bridal creeper (<i>Asparagus asparagoides</i>), - Small leaved privet (<i>Ligustrum sinense</i>) Low threat weeds treated: <ul style="list-style-type: none"> - Cat's Ear (<i>Hypochaeris radicata</i>), - Ribwort (<i>Plantago lanceolata</i>) 	Will need to revisit MZ 1, MZ 2 and transmission line (TL) to treat Periwinkle, Paterson's curse, Bridal creeper and Privet regrowth.
22/10/18	MZ 6 and 7	Maintenance sweep and herbicide treatment of African lovegrass and Paterson's curse	Still need to target new growth of African lovegrass and Paterson's curse
22/10/18	MZ 1, 2, 3, TL, 6, 7	Site walk to observe any pests or evidence of presence via scats.	N/A

5.2. Fire

Template for reporting of monitoring activities		
Management Zone	Date	Observations and assessment of monitoring
MZ 1, 2, 3, TL, 6, 7	22/10/18	No evidence of recent fire activity during site visit (Management report suggests last burn was in 2004). Acacia spp. in MZ 2 and MZ 7 continue to exhibit senescence. Fuel loads approx. 15 -20 tonnes per hectare on average.

Diary template for fire management activities			
Date	Management Zone	Description and type of activity undertaken or observation made	Minor variations (details and reasons)
22/10/18	MZ 1, 2, 3, TL, 6, 7	No fire management activities undertaken except for opportunistic observation during weeding activities.	N/A

5.3. Pest Animals

2. Template for reporting of monitoring activities		
Management Zone	Date	Current level of impact on vegetation This column must record impacts as Negligible, Minimal, Moderate or High
MZ 1, 2, 3, TL, 6, 7	22/10/18	Minimal grazing by native herbivores in all zones.

Diary template for feral and overabundant herbivore management			
Date	Management Zone	Description and type of activity undertaken This column must include details of the feral and overabundant herbivores targeted, control techniques, and numbers controlled.	Minor variations (details and reasons)
22/10/18	All	No specific pest management work undertaken except for opportunistic observation during weeding activities.	N/A

6. Site visits in January and February 2019

6.1. Weeds

Template for reporting of monitoring activities		
Management Zone	Date	Observations and assessment of monitoring
MZ 1	4/1/19 20/2/19	Treatment of exotic weeds and grasses with herbicide and hand pulling of weeds.
MZ 2	4/1/19	Undertaken in conjunction with weed control works at MZ 1.

Template for reporting of monitoring activities		
	20/2/19	Treatment of exotic weeds and grasses with herbicide and hand-pulling of weeds.
Transmission line (TL) and associated cleared area	4/1/19 20/2/19	Undertaken in conjunction with weed control works at MZ 1 and MZ 2. Treatment of exotic weeds and grasses with herbicide and hand-pulling of weeds.
MZ 3	4/1/19 20/2/19	Undertaken in conjunction with weed control works at MZ 1 and MZ 2. Treatment of exotic weeds (particularly Paterson's curse) and exotic grasses with herbicide and hand-pulling of weeds inside tree guards. Watering of 250 tubestock planted in May 2018.
MZ 4	4/1/19 20/2/19	Maintenance sweep targeting key weed threats, concentrating along existing tracks.
MZ 5	4/1/19 20/2/19	Management zone not visited: no access due to high-risk cliffs. No weeds observed in adjacent management zones.
MZ 6	4/1/19 20/2/19	Undertaken in conjunction with weed control works in MZ 7. Maintenance sweep targeting key weed threats, concentrating along existing tracks.
MZ 7	4/1/19 20/2/19	Undertaken in conjunction with weed control works at MZ 6. Maintenance sweeps targeting specific exotic grasses with herbicide including African lovegrass.

Diary template for weed control management			
Date	Management Zone	Description and type of activity undertaken or observation made	Minor variations (details and reasons)
4/1/19 20/2/19	1, 2, 3 and TL	Weed control, herbicide and hand pulling of: <ul style="list-style-type: none"> - Blue periwinkle (<i>Vinca major</i>), - Paterson's' curse (<i>Echium plantagineum</i>) - African lovegrass (<i>Eragrostis curvula</i>), - Spear thistle (<i>Cirsium vulgare</i>), - Bridal creeper (<i>Asparagus asparagoides</i>), - Small leaved privet (<i>Ligustrum sinense</i>) Low threat weeds treated: <ul style="list-style-type: none"> - Cat's Ear (<i>Hypochaeris radicata</i>), - Ribwort (<i>Plantago lanceolata</i>) 	Will need to revisit MZ 1 and MZ 2 and Transmission line (TL) to treat Periwinkle, Paterson's curse, Bridal creeper and Privet regrowth.
4/1/19 20/2/19	MZ 6 and 7	Maintenance sweep and herbicide treatment of African lovegrass and Paterson's curse	Continue to target Paterson's curse and African lovegrass as they re-emerge
4/1/19 20/2/19	MZ 1, 2, 3, TL, 6, 7	Site walk to observe any pests, or evidence of presence via scats	N/A

6.2. Fire

Template for reporting of monitoring activities		
Management Zone	Date	Observations and assessment of monitoring
MZ 1, 2, 3, TL, 6, 7	4/1/19 20/2/19	No evidence of recent fire activity during site visit (Management report suggests last burn was in 2004). Acacia spp. in MZ2 and MZ7 continue to exhibit senescence. Fuel loads approx. 15 -20 tonnes per hectare on average

Diary template for fire management activities			
Date	Management Zone	Description and type of activity undertaken or observation made	Minor variations (details and reasons)
4/1/19 20/2/19	MZ 1, 2, 3, TL, 6, 7	No fire management activities undertaken except for opportunistic observation during weeding activities	N/A

6.3. Pest Animals

3. Template for reporting of monitoring activities		
Management Zone	Date	Current level of impact on vegetation This column must record impacts as Negligible, Minimal, Moderate or High
MZ 1, 2, 3, TL, 6, 7	4/1/19 20/2/19	Minimal grazing by native herbivores in all zones.
TL	20/2/19	Rabbit scat mounds and fox scat observed in TL easement.

Diary template for feral and overabundant herbivore management			
Date	Management Zone	Description and type of activity undertaken This column must include details of the feral and overabundant herbivores targeted, control techniques, and numbers controlled.	Minor variations (details and reasons)
4/1/19 20/2/19	All	No specific pest management work undertaken except for opportunistic observation during weeding activities.	N/A

APPENDIX E: 2018/19 VENTILATION SHAFT NO.6 OFFSET ANNUAL MONITORING REPORT



Offset Site Monitoring Report 2018

Appin No.6 Ventilation Shaft Offset Area

Prepared for South 32 Illawarra Coal

4 December 2018

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Cover photograph: Cumberland Plain Woodland within Offset area MZ5.

Executive summary

As part of the project approval (MP 10_0079) and EPBC Approval (2010/5722) for the Appin Ventilation Shaft Site No.6, South 32 Illawarra Coal is required to implement a formal monitoring program of the management actions that were approved for the associated offset site at the Mountbatten Stud property at Douglas Park, NSW. This report is the seventh annual report for the monitoring program, conducted by Niche Environment and Heritage (Niche) in November 2018.

The aim of the monitoring program is to demonstrate the success of the management actions through the collection of empirical data, mapping and photographic record for the offset site. The monitoring methodology employs fixed floristic plots to collect vegetation condition data, population estimates of the threatened plant species *Pimelea spicata* (conducted every five years), strategic photo-point monitoring and vegetation distribution mapping.

The 2018 monitoring results in relation to the floristic composition and improvement through the site, indicate that, on average, the bushland on the site is outside of benchmark attribute values for the Cumberland Plain Woodland but is showing trends towards benchmark values.

An assessment of the change in size and distribution of the threatened plant population of *Pimelea spicata* (spiked rice-flower) was undertaken as part of the 2016/17 monitoring program and was not repeated this year. The next scheduled census of the *Pimelea spicata* population is in 2021/22.

Recommendations in relation to the on-going management of the site include continued treatment of African Olive and African Boxthorn, seasonal spraying of Blackberry, continued treatment of exotic vines and exotic perennial grasses and consider management actions that may relieve environmental stress on the overstorey associated with potential Bell Miner-related dieback, such as undertaking primary weed management works and then thinning areas of Native Blackthorn (*Bursaria spinosa*).

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1. Introduction

1.1 Background

The Appin No. 6 Ventilation Shaft Site project approval requires South 32 Illawarra Coal to secure, manage and monitor an 8.7 hectare offset of Cumberland Plain Woodland (CPW) such that an improve or maintain outcome would be achieved for threatened biodiversity.

The offset area is known as MZ5 and is located to the north of the Appin No. 6 Ventilation Shaft site on the property known as Mountbatten Stud at Douglas Park NSW (Figure 1). An initial assessment of the proposed offset area was conducted by Niche in December 2010 to assess the suitability of the site to be used as an offset for the unavoidable impacts associated with the development site. Niche determined that the site was indeed CPW and, under management, would improve to benchmark condition over time. The initial inspection of MZ5 also resulted in the discovery of a population of the threatened plant, *Pimelea spicata*, adding significant conservation value to the offset area.

In accepting the offset proposal, the Department of Planning and Environment (DPE) and Department of Environment and Energy (DoEE, now Department of Environment and Energy, DEE) provided a number of approval conditions relating to the reservation, management and monitoring of management actions within MZ5. One of the conditions required Illawarra Coal to implement a formal monitoring program for both the management of the native vegetation on the site and the extent and health of the *Pimelea spicata* population.

Conditions 2(c) (v – vii) of the NSW project approval (MP10_0079) and condition 3(d) of the EPBC Approval (2010/5722) are the conditions that require a monitoring and performance evaluation program to be implemented (Table 1).

Table 1. Conditions of approval requiring a monitoring program

Approval	Condition of Approval
NSW approval	2(c)(v) – A program to monitor the effectiveness of these measures, and progress against the performance and completion criteria
	2(c)(vi) – A description of the potential risks to re-vegetation, and a description of the contingency measures that would be implemented to mitigate these risks
	2(c)(viii) – Details of who would be responsible for monitoring, reviewing and implementing the plan
Commonwealth approval	3(d) The plan must include key milestones, performance indicators, corrective actions and timeframes for the completion of all actions outlined in the plan for the life of the project

1.2 Purpose and objectives

The aim of the monitoring program is to demonstrate the success of the management actions through the collection of empirical data, mapping and establishment of a photographic record for the offset site. The specific objectives of this report are:

1. To describe and evaluate the re-vegetation and bush regeneration works undertaken to date against the key performance criteria as detailed in the *Biodiversity Management Plan* (BMP) for the site (South 32 Illawarra Coal 2017);
2. To outline any problems encountered during works and how these were managed;

3. To recommend alterations or additions to management actions as required; and
4. To provide an analysis of vegetation monitoring results, including;
 - Comparison of data from Monitoring plots to benchmark condition levels for CPW,
 - Visual comparative analysis of photo point monitoring locations,
 - Vegetation and condition mapping at a scale deemed appropriate to inform management decisions.

Mapping will include:

1. Location of vegetation monitoring plots
2. Photo point monitoring locations
3. Baseline mapping of native vegetation and condition within MZ5.

The 2016 monitoring report included the details regarding the latest results of the *Pimelea spicata* population census, along with associated mapping. The 2021/2022 monitoring report will contain the next *Pimelea spicata* population census.



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2. Management Actions

2.1 Management actions undertaken

Since 2011, management actions have been conducted at both the offset site (MZ5) and the voluntary management area (MZ6) to enhance and maintain native biodiversity. Stock has been excluded from the offset area by the installation of a fence around the site boundary, which was installed in 2011.

Toolijooa Bushland Restoration Pty Ltd (Toolijooa) has been conducting the bushland restoration works at both M5 and M6 sites since 2011. The last bush regeneration works were undertaken in 2016, with no works undertaken in the 2017 or 2018 monitoring period. The 2016 monitoring report (Niche 2016) details the most recent bush regeneration works undertaken at MZ5 and MZ6. Planned bush regeneration works to be undertaken in 2019 include monthly maintenance visits by a team of four bush regenerators, as recommended by Toolijooa.

Weeds treated across the site since 2011 include:

- Herbaceous species *Bidens pilosa* Cobbler's Peg, *Brassica sp.*, *Cirsium vulgare* Spear Thistle, *Conyza* spp. Fleabane, *Echium plantagineum* Paterson's Curse, *Ehrharta erecta* Panic Veldt Grass, *Modiola caroliniana* Modiola, *Onopordum acanthium* Scotch Thistle, *Paspalum dilatatum* Paspalum, *Pennisetum clandestinum* Kikuyu, *Plantago lanceolata* Ribwort Plantain, *Senecio madagascariensis* Fireweed, *Solanum nigrum* Blackberry Nightshade, *Sonchus oleraceus* Common sowthistle, *Verbena bonariensis* Purpletop, *Xanthium* sp Noogoora Burr;
- Woody weeds (*Lycium ferocissimum* African Boxthorn, *Olea europaea* subsp. *cuspidata* African olive) and vines (*Araujia sericifera* Moth Vine, *Delairea odorata* Cape Ivy and *Rubus sp.* Blackberry).

2.2 Management actions compared to BMP

The current management actions have addressed the recommended actions proposed in the BMP (South 32 Illawarra Coal 2017) for the site. These have been compared in Table 2. It should be noted that the actions are on-going.

Table 2. Proposed and current management actions in the BMP

Action	Description	Performance Target (Milestones)	Completion Status
MZ5 Fencing	<ul style="list-style-type: none"> The first action within the offset area will be to exclude stock. Existing four-strand post-and-wire fence will be utilised and additional fencing installed where required. No barbed-wire will be used and the bottom strand will have a clearance of 400mm above the ground to allow the movement of native fauna. Stock will be herded out of the area prior to fencing taking place. 	Four-strand post-and-wire fence installed, no strands barbed and 400 mm separation from ground to lowest strand.	Fence installed. On-going monitoring.

Action	Description	Performance Target (Milestones)	Completion Status
Bush Regeneration in MZ5	<ul style="list-style-type: none"> Primary, secondary and maintenance weed management within MZ5 will target the treatment of Blackberry, African Olive, Lantana, African boxthorn, privet, Cape ivy and a variety of exotic perennial grasses such as African Lovegrass, Rhodes Grass, Kikuyu and Couch. All weed management works will be supervised by a suitably qualified bush regenerator. A team of four bush regenerators will be engaged for five days for the primary weeding and then a team of two for one day every four months thereafter for secondary and maintenance weed management as required. 	<p>Engagement of suitably qualified bush regeneration contractor to implement primary, secondary and maintenance weed management program.</p> <p>Annual vegetation condition assessment</p> <p>Improvement in condition of offset bushland to within, or as near as possible to, benchmark condition levels.</p>	Currently being conducted. On-going. Planned bush regeneration works for 2019. Section 4 of this report regarding vegetation condition to benchmarks.
<i>Pimelea spicata</i> Monitoring program	<ul style="list-style-type: none"> Design a program to determine the success of management or the need for intervention. Annual population counts within permanent plots. 5 yearly population census. Condition of individual plants from mixed cohorts. Condition of habitat. Annual inspections of fencing to ensure maintenance and up-keep. Regular site visits the potential presence of stock and/or feral herbivores that have breached fencing to ensure that such impact is eliminated by fencing and that trapped stock or feral herbivores are freed. Monitoring against stochastic events. 	Sustainable <i>Pimelea spicata</i> population with population numbers staying level with or exceeding current numbers.	Census proposed to occur every five years. Most recent census undertaken in early 2017 and reported on in the 2016 monitoring report. Details regarding the <i>Pimelea spicata</i> population will be provided in the 2021 monitoring report. This report provides general observations for the species and presence within plots.
MZ6 Fencing	<ul style="list-style-type: none"> The first action within the native vegetation area will be to exclude stock. Existing four-strand post-and-wire fence will be utilised and additional fencing installed where required. No barbed-wire will be used and the bottom strand will have a clearance of 400mm above the ground to allow the movement of native fauna. Stock will be herded out of the area prior to fencing taking place. 	Four-strand post-and-wire fence installed, no strands barbed and 400 mm separation from ground to lowest strand.	Fence erected. On-going monitoring.
Bush Regeneration in MZ6	<ul style="list-style-type: none"> Weed management within MZ6 will target the treatment of Blackberry, African Olive, lantana, African Boxthorn, privet, Cape ivy and a variety of exotic perennial grasses such as African lovegrass, Rhodes grass, Kikuyu and couch. All weed management works will be supervised by a suitably qualified bush regenerator. 	<p>Engagement of suitably qualified bush regeneration contractor to implement weed management program.</p> <p>Improvement in condition of offset bushland to within, or as near as possible to, benchmark condition levels.</p>	Currently being conducted. On-going. Planned bush regeneration works for 2019. Section 4 of this report regarding vegetation condition to benchmarks.

3. Methodology

3.1 Key performance criteria

The priority management actions, performance criteria and timeframes for the works in MZ5, as described in the BMP, are provided in Appendix 1. The key elements include:

- Engagement of suitably qualified bush regeneration contractor to implement a primary, secondary and maintenance weed management program.
- Annual vegetation condition assessment.
- Improvement in condition of offset bushland to within, or as near as possible to, benchmark condition levels.
- Sustainable *Pimelea spicata* population with population numbers staying level with or exceeding current numbers.

Utilising these elements, Niche developed the monitoring methodology described in Section 3.2.

3.2 Monitoring methodology

The monitoring methodology will follow that outlined in the BMP.

Fixed plot vegetation monitoring for 2018 was conducted on 19 and 20 November 2018 by Sian Griffiths (Niche - Senior Botanist and Accredited BioBanking Assessor) and Alex Parro (South 32 Illawarra Coal).

3.2.1 Fixed plot vegetation monitoring

The plot monitoring incorporated the following (Figure 2):

1. Five fixed BAM (Biodiversity Assessment Method) plots within MZ5, monitored annually.
2. Five fixed BAM plots within MZ6, monitored annually.
3. Comparison of site collected attribute data with the benchmarks for the PCT 850 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain (CPW) from the PCTs Benchmarks Database. The BAM site attributes and their methods of measurement are provided in Appendix C.

Historically, monitoring the fixed plot vegetation monitoring has used the BioBanking Plot methodology. However, in 2017 a new industry standard was developed in association with the *Biodiversity Conservation Act 2016* (BC Act). Biodiversity Assessment Method (BAM) Plots have replaced BioBanking Plots as the standard method of collecting attribute data. As such, BAM plots were utilised in the 2017 and 2018 monitoring instead of BioBanking Plots in order to collect data consistent with updated methodologies, PCTs and benchmarks.

3.2.2 *Pimelea spicata* population Census

Monitoring of the *Pimelea spicata* population takes place annually as part of the fixed plot vegetation monitoring, with estimates of percent cover of *Pimelea spicata* occurring within the BioBanking Plots. *Pimelea spicata* occurs within BAM plots MZ5-001, MZ5-003, MZ5-004. These plots coincide to some extent with the monitoring plots used to count *Pimelea spicata* during the population census, as detailed below. Annual observations within the BAM plots can monitor the extent of the population throughout zone MZ5 within areas monitored by Niche.

A population census of the *Pimelea spicata* population in the study area occurs once every five years to estimate the population size and determine the health of the population. With monitoring of the presence

of the species undertaken annually, it is determined that a full population census undertaken every five years is adequate. If the species was determined not to be present in plots where it is known to previously occur during the annual monitoring, this would trigger a full population census regardless of its scheduled timeframe.

The original census of the *Pimelea spicata* population was undertaken in October 2012 and a second census was undertaken in February 2017. The next *Pimelea spicata* census is due in 2021/2022.

3.2.3 Photo-point monitoring

The photo-point monitoring was planned as follows:

1. Five fixed photo-points were sited within MZ5, coincident with the BAM plots.
2. Five fixed photo-points were sited within MZ6, coincident with the BAM plots.
3. An additional five photo-points were located within 200 metres of the external boundary of MZ5 to enable a visual assessment of the health of the vegetation in that area. Opportunistically favourable locations for photo-points were also recorded.

The photo-point locations are those shown in Figure 2.

3.2.4 Vegetation distribution monitoring

1. The boundary of the native vegetation within MZ5 and MZ6 will be mapped annually using a hand held GPS and interpretation of the available aerial imagery.
2. The mapped vegetation boundary will be compared each year, with the expectation that the extent of native vegetation within the offset area will increase with management.

3.3 Survey stratification

Stratification of the monitoring sites within the offset area was determined on-site whilst conducting the first round of monitoring surveys in spring 2012. Stratification was based on condition such that an accurate comparison of the improvement in that condition could be gained over time. Three broad condition categories existed on the site:

1. Woodland.
2. Blackthorn (*Bursaria spinosa*) thicket.
3. Pasture.

Five BAM plots were conducted in each of MZ5 and MZ6 (ten in total) and distributed over the three condition types as shown in Table 3 and Figure 2.

Table 3. Location of monitoring sites

Management Zone	Area (ha)	Monitoring Site	Easting	Northing	Condition Class
MZ5	8.7	MZ5-001	290285	6216759	Woodland
		MZ5-002	290360	6216591	Woodland
		MZ5-003	290365	6216665	Woodland
		MZ5-004	290195	6216725	Blackthorn thicket
		MZ5-005	290017	6216883	Pasture
MZ6	12.43	MZ6-006	289842	6216418	Woodland
		MZ6-007	289990	6216474	Woodland
		MZ6-008	289852	6216665	Woodland
		MZ6-009	289925	6216342	Pasture
		MZ6-010	289974	6216678	Blackthorn thicket

* Easting and Northing provided in GDA94, MGA Zone 56.

3.4 Data analysis and interpretation

A series of key attributes were identified for assessing the current condition of the vegetation and habitats at the Offset Area, the restoration pathways and progress towards attaining the conservation objectives. These attributes relate to species richness and percent cover of native plants in vegetation layers, as well as fauna habitat features and canopy regeneration. This monitoring report presents the 2018 monitoring data according to these key attributes.

Basic statistical analyses have been conducted incorporating temporal variation (i.e. changes over time) in vegetation condition to assess the magnitude and direction of change in vegetation communities.

Statistical analysis conducted involved temporal comparisons of means and standard errors (variability in data between quadrats) between the average survey data from 2012 to 2018. Key attributes which would be most informative for management input were selected for comparison, such as native species diversity, per cover of exotics and native canopy cover. Calculations of mean and standard error was not conducted where less than three plots were undertaken within a plant community type as this is not enough data to provide meaningful or statistically robust analysis. Therefore, analysis was limited to the woodland plots in MZ5 and MZ6.

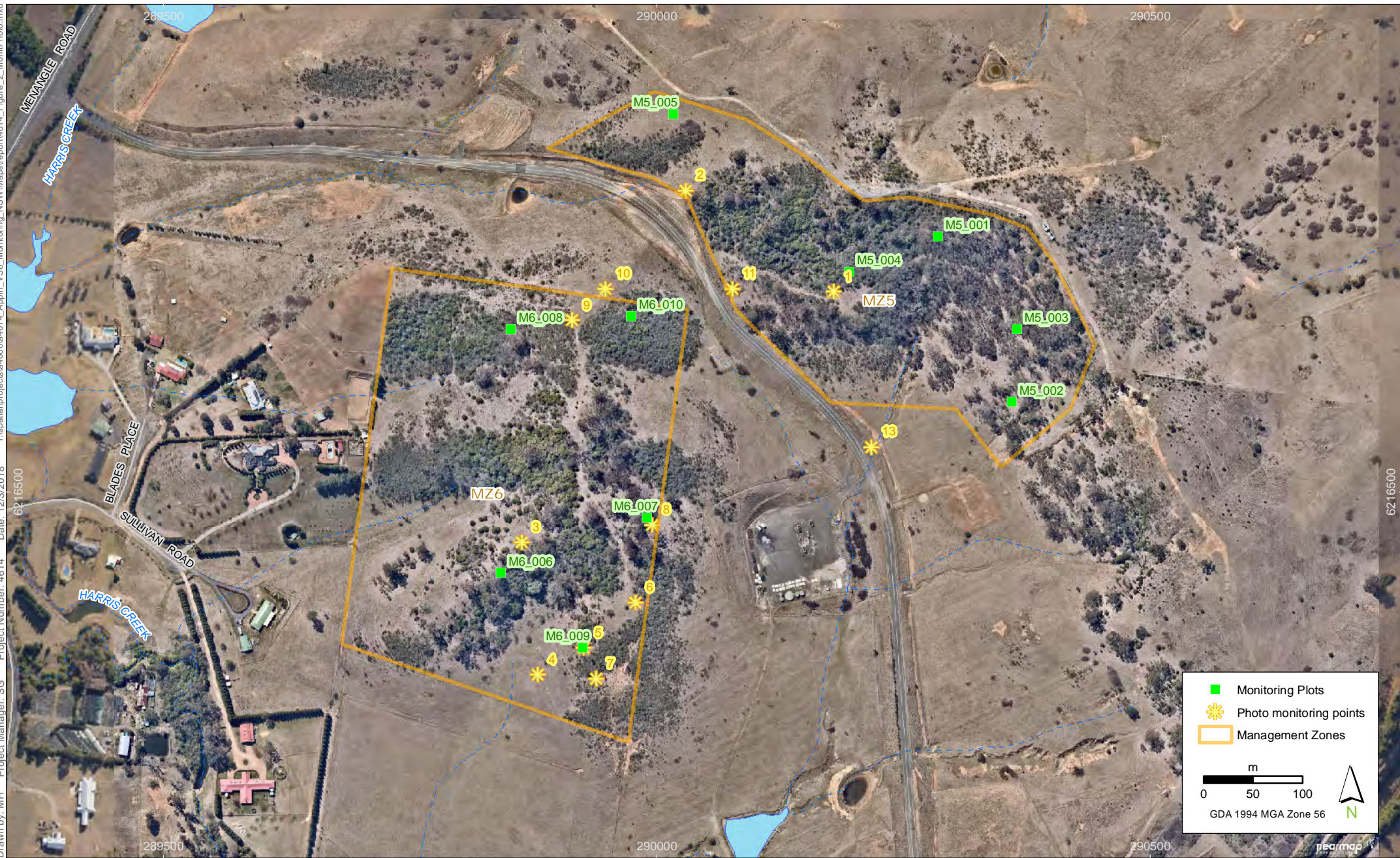
Benchmark values based on the Plant Community Type (PCT) accessed from the Vegetation Information System (VIS) database were used to provide an indication of the condition of the vegetation in a broader context. It should be noted that these benchmark values are not site specific and therefore are not intended to represent a target for measuring restoration success. Comparison of site values with benchmark values is intended to provide a broader context for interpreting the restoration pathway and the trajectory of change as management measures are implemented (direction of change).

3.5 Limitations

Some plant species are cryptic and can only be detected when flowering at certain times of the year. For example some orchids flower within certain seasons and cannot be detected at other times of the year.

The density of blackthorn at plots 004 and 010 prevented the placement of the 50 metre transect tape. An estimate of the BioBanking attributes were therefore used for the plot. Different staff to previous monitoring

events were used and this may introduce observer bias in the results. Analysis of results should be undertaken with these limitations in mind.



Monitoring plot and photo point monitoring locations

Appin Mine Ventilation Shaft No. 6 - Biodiversity Offset Monitoring 2018

FIGURE 2

Imagery: (c) LPI 2016-03-05

4. Results

4.1 Flora recorded

A total of 82 species were recorded across ten floristic plots within the study area during the 2018 monitoring event. The number of species recorded varies slightly with each monitoring event, with 81 species recorded in 2017, 83 species recorded in 2016, 96 species recorded in 2015 and 2014, 85 species recorded in 2013 and 90 species recorded in 2012. The observed differences are likely attributed to seasonal variation.

During the current monitoring, 31 species were exotic which accounts for 37 percent of species recorded. This is an increase in percent of exotic species recorded when compared to 2017 (28 percent), but a decrease to that recorded in 2016 (46 percent of species exotic), 2015 monitoring (45 percent of species were exotic), and 2014 monitoring (55 percent of species were exotic).

4.2 Assessment of site attribute data

4.2.1 Woodland



Plate 1. Woodland during 2018 at monitoring plot MZ5-003

Plot Data

BAM site attribute data was collected at six sites that corresponded to a woodland structure. Three of the sites were collected from MZ5 and three were collected from MZ6. The data collected is contained in Table 4 (2018, 2017 data) and Table 5 (2012-2016 data), which also includes the benchmarks for each of the site

attributes for the relevant PCT. The relevant PCT is 850 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain. Benchmarks for 2012-2016 data are for BVT HN529.

Figure 3 and Figure 4 show the temporal change for key attributes for woodland plots in MZ5 and MZ6 respectively and compare the average values to benchmarks (shown as line graphs).

MZ5 offset site and MZ6 voluntary management site woodland plot comparison

Table 4. Comparison of woodland plots to PCT benchmarks (2017 and 2018)

Plot	Composition (Richness)						Structure (Cover)						Function			
	T	S	G	F	Fe	O	T	S	G	F	Fe	O	NLT	LC	FL	HTW
Benchmark	5	8	12	15	2	5	52	18	61	10	1	5	3	35	40	
MZ5																
M5_001 (2018)	1	2	4	12	0	4	20	45.1	10.6	4.1	0	1.3	1	87	36	10.1
M5_002 (2018)	2	1	5	8	0	4	15	15	46.5	1.4	0	0.4	0	37	2	1
M5_003 (2018)	2	2	2	10	0	5	23	15.1	15	6.1	0	0.9	1	38	0	3
Average	1.7	1.7	3.7	10.0	0.0	4.3	19.3	25.1	24.0	3.9	0.0	0.9	0.7	54.0	12.7	4.7
M5_001 (2017)	2	2	6	9	0	4	20	40.1	25.6	4.1	0	0.5	1	56	8	5.2
M5_002 (2017)	2	1	5	8	0	3	16	10	27.1	1.2	0	0.3	0	22	1	17
M5_003 (2017)	2	2	2	8	0	4	17	9.1	20.5	7.3	0	0.8	1	64	3	4.5
Average	2.0	1.7	4.3	8.3	0.0	3.7	17.7	19.7	24.4	4.2	0.0	0.5	0.7	47.3	4.0	8.9
MZ6																
M6_006 (2018)	4	1	5	11	0	3	23	20	12.6	5.7	0	0.3	2	71	24	6
M6_007 (2018)	1	1	2	7	0	2	20	12	9	2.8	0	0.2	3	77	50	20.4
M6_008 (2018)	1	2	5	11	0	5	10	53	18.6	4.7	0	0.9	1	75	8	2.6
Average	2.0	1.3	4.0	9.7	0.0	3.3	17.7	28.3	13.4	4.4	0.0	0.5	2.0	74.3	27.3	9.7
M6_006 (2017)	3	1	6	10	0	2	19	15	24.1	4.2	0	0.3	2	52	18	7.2
M6_007 (2017)	1	1	7	6	0	4	20	25	18.3	7.4	0	0.4	6	48	51	15.9
M6_008 (2017)	1	2	8	11	0	4	10	50	21.4	4.2	0	0.5	1	61	4	4.2
Average	1.7	1.3	7.0	9.0	0.0	3.3	16.3	30.0	21.3	5.3	0.0	0.4	3.0	53.7	24.3	9.1

T – Tree, S – Shrub, G – Grass, F – Forb, Fe – Fern, O – Other; NLT – Number of Large Trees, LC – Litter cover, FL – Length of Fallen Logs. HTW – High Threat Weeds

Table 5. Comparison of woodland plots to PCT benchmarks (2012-2016)

	NPS	NOS		NMS		NGCG		NGCS		NGCO		EPC	NTH	OR	FL
		L	U	L	U	L	U	L	U	L	U				
Benchmark	29	18.5	23.5	20	30	23	31	0	5	11.75	19.75	0	0	1	0
MZ5															
M5_001 (2016)	22		3.5		26		44		28		22	24	1	1	37
M5_002 (2016)	17		6		1.2		94		8		8	24	1	1	2
M5_003 (2016)	23		0.5		17.5		76		4		8	16	1	1	10
Average 2016	21		3.3		14.9		71.3		13.3		12.7	21.3	1	1	16.3
M5_001 (2015)	24		1		41.5		92		10		4	56	1	1	15
M5_002 (2015)	20		4.5		1.5		86		2		18	36	1	1	0
M5_003 (2015)	23		0.5		22.5		68		16		6	64	1	1	8
Average 2015	22		2.0		21.8		82.0		9.3		9.3	52.0	1.	1	7.7
M5_001 (2014)	21		0		62.5		26		26		6	10	1	1	12
M5_002 (2014)	17		7.5		0		78		2		0	12	1	1	3
M5_003 (2014)	16		30		53		22		28		9	14	2	1	0
Average 2014	18		12.5		38.5		42		18.5		5	12	1	1	5
M5_001 (2013)	12		9		20.5		58		10		42	39	1	1	12
M5_002 (2013)	18		2		1.5		82		0		30	44	1	1	6
M5_003 (2013)	17		24		3		6		2		16	23	2	1	0
Average 2013	16		11.6		8.3		48		4		29	35	1	1	6
M5_001 (2012)	17		5.5		24		66		8		50	24	1	1	8
M5_002 (2012)	18		6.5		3		92		2		18	50	1	1	6
M5_003 (2012)	21		22.5		1		3.8		3.4		12	6	2	1	0
Average 2012	19		11.5		9.3		53.9		4.5		26.6	26.6	1	4.6	4.6
MZ6															
M6_006 (2016)	23		10		15		88		16		20	24	6	1	32
M6_007 (2016)	16		16		10		36		20		4	64	8	1	70
M6_008 (2016)	24		10.5		30		70		14		16	30	1	1	10
Average (2016)	21		12.2		18.3		64.7		16.7		13.3	39.3	5	1	37.3
M6_006 (2015)	16		0		60		85		0		6	50	1	0	0
M6_007 (2015)	18		16		7.5		26		16		10	42	4	1	40
M6_008 (2015)	14		8.5		13.5		76		12		6	64	1	1	8
Average (2015)	16		8		27		62		9		7	52	2	1	16
M6_006 (2014)	27		18		8		60		6		30	48	2	1	16
M6_007 (2014)	21		17		0		26		16		24	16	4	1	10
M6_008 (2014)	17		8		16		50		0		16	44	1	1	8
Average 2014	21		14		8		45		7		23	36	2	1	11
M6_006 (2013)	22		26		16		90		2		30	34	2	1	22

	NPS	NOS		NMS		NGCG		NGCS		NGCO		EPC	NTH	OR	FL
		L	U	L	U	L	U	L	U	L	U				
M6_007 (2013)	20		22		0		22		12		16	44	4	1	20
M6_008 (2013)	18		12		12		60		12		18	34	1	1	10
Average (2012)	20		20		9.3		57.3		8.6		21.3	37.3	2.3	1	17.3
M6_006 (2012)	20		26.5		10.5		82		4		44	42	2	1	22
M6_007 (2012)	18		34.5		0		8		18		6	14	4	1	14
M6_008 (2012)	22		18		10		72		0		22	52	1	1	8
Average (2012)	20		26.3		6.8		54.0		7.3		24	36	2.3	1	14.6

NPS – Native Plant Species richness, NOS – Native Over-storey cover, NMS – Native Mid-storey cover, NGCG – Native Ground-cover (grasses), NGCS – Native Ground-cover (shrubs), NGCO – Native Ground-cover (other), EPC – Exotic Plant Cover, NTH – Number of Trees with Hollows, OR – Over-storey regeneration, FL – Length of Fallen Logs. L – Lower Benchmark, U – Upper Benchmark

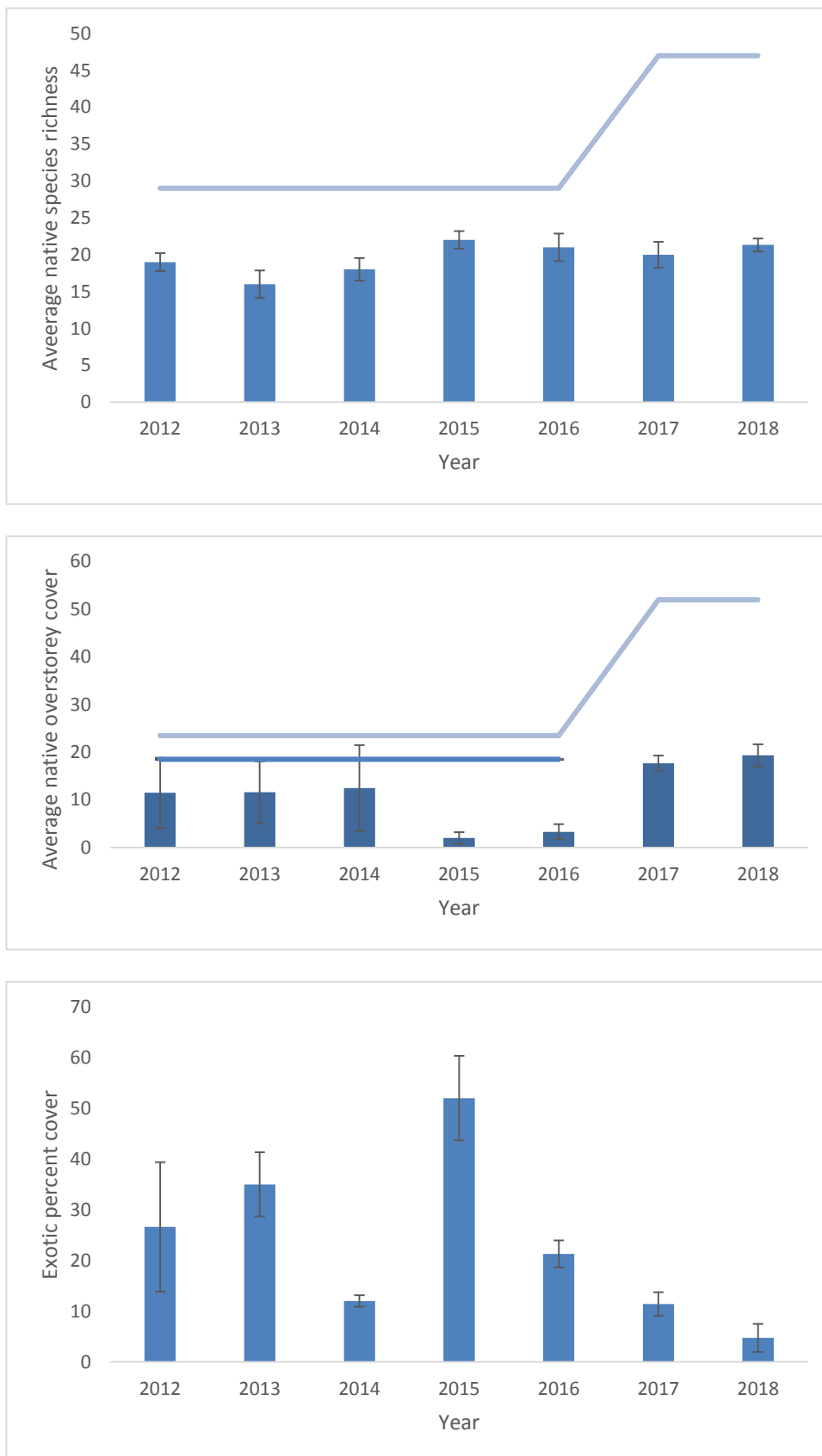


Figure 3: Comparison of key attributes for woodland plots in MZ5 (HN529/PCT850) (Note only High Threat Weeds (HTW) measured in 2017 and 2018, as per BAM methodology)

Mean (±SE) 2012-2018 quadrat data ($n = 3$). Benchmark values/ranges shown as line graphs.

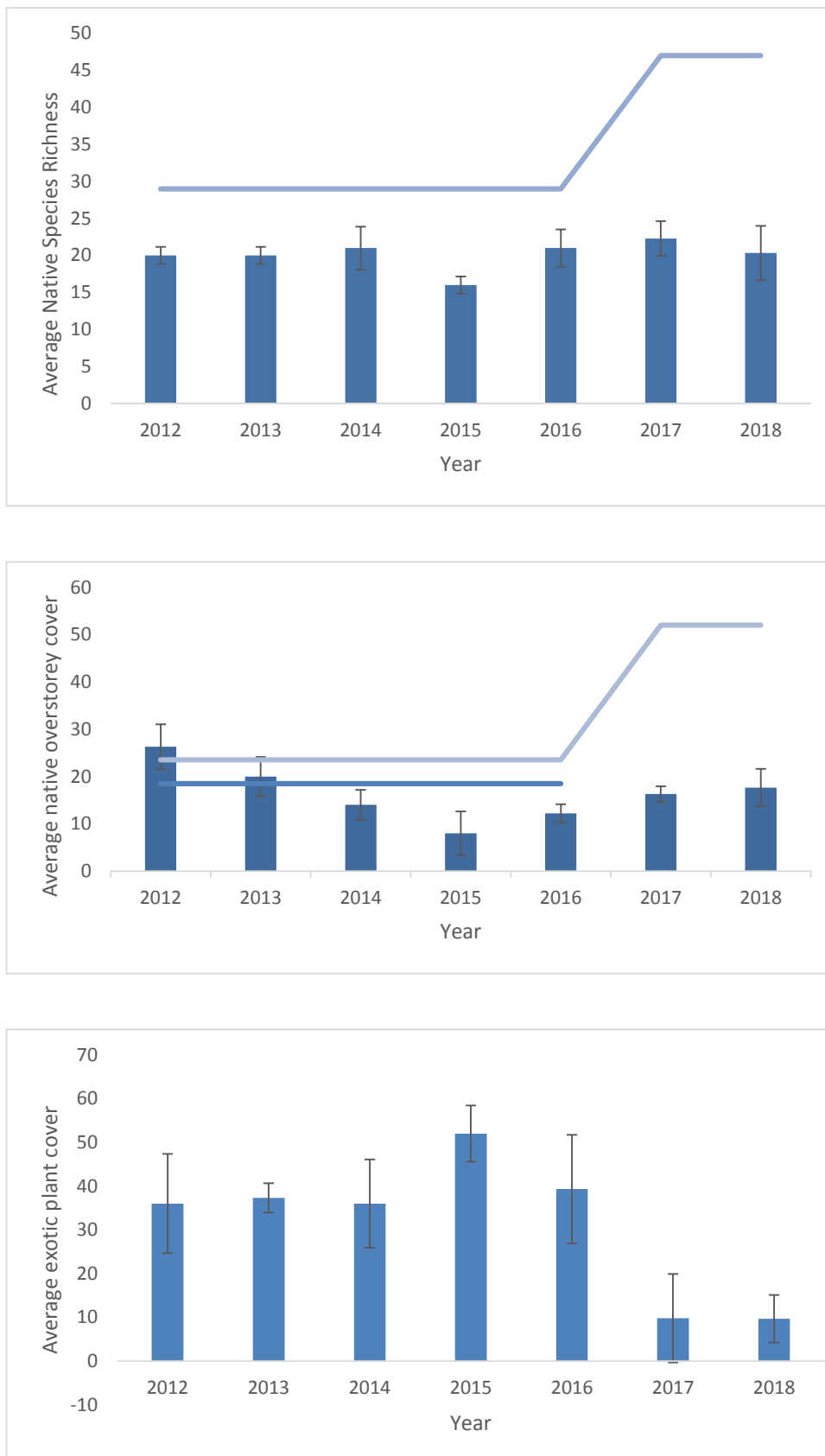


Figure 4: Comparison of key attributes for woodland plots in MZ6 (HN529/PCT850)

Mean (\pm SE) 2012-2018 quadrat data ($n = 3$). Benchmark values/ranges shown as line graphs.

Discussion

Compositionally, the data 2018 shows the woodland plots remaining below benchmark values for all growth forms, as was the case in 2017. The average native species richness for 2018 was 21 in MZ5 (roughly equivalent to previous monitoring data of 20 native species recorded in 2017, 21 native species recorded on average in 2016, 22 native species recorded on average in 2015, and 18 native species recorded on average in 2014). The average native species richness for 2018 in MZ6 was 20 (a slight decrease from 2017 data of 22 native species on average). Values of native species richness remains below benchmark in both MZ5 and MZ6 (Figure 3 and 4). It is likely over time with the continual management of the site that the offset is likely to reach benchmark condition.

Structurally, the percent cover of all growth forms remained below benchmark in 2018 for the woodland plots, with the exception of shrub cover, which was above benchmark, as was the case in 2017. The average native overstorey cover (tree cover) for 2018 was below benchmark, but slightly higher than 2017 (see Figure 3 and Figure 4). Given the current management of the site and the fact that five of the six plots had regenerating overstorey species (stem size class <5 cm and 5-9cm DBH present), it is considered that MZ5 and MZ6 is likely to maintain a healthy overstorey canopy in future years. Regeneration of eucalypts were observed throughout the site.

Native ground-cover grasses (grass cover/NGCG) averaged lower than benchmark in 2018 and 2017 and higher than the benchmark range during all previous monitoring years, though it should be noted that the benchmark values have increased using the BAM benchmarks. The 2018 and 2017 monitoring data shows a substantial decrease in native ground-cover grasses compared with 2016, however again it should be noted that the method for collecting cover data has changed with BAM.

Native ground-cover shrubs (shrub cover/NGCS) was above benchmark in 2018, 2017 and 2016. As mentioned in the previous monitoring report this is likely attributed to the regeneration of blackthorn which have increased over the monitoring years. The score is likely to increase with management of the site and recruitment growth. Native ground-cover other (NGCO) remained below benchmark in 2018 and 2017, which was a decrease from 2016 where this attribute was within benchmark for the first time since monitoring commenced and had increased compared with 2015 on average. Again, the change in methodology could be attributed to this change.

Functionally, average litter cover was again above benchmark values in 2018 and all other attributes were below benchmark (as was the case in 2017).

Trees with hollows (NTH) were present in three of the six plots in 2018 (down from being present in four of the six plots in 2017).

The length of fallen logs (FL) remained well below the benchmark of 40 m in all of the woodland plots, but had increased in 2018 compared with 2017 data.

Exotic plant cover (EPC) during 2018 was lower in MZ5 compared with 2017 data (5% in 2018 down from 11% in 2017), but roughly the same in MZ6 for both 2018 (9.7%) and 2017 (9.8%). Exotic cover in 2018 and 2017 was much lower than previous years (see Figure 3 and Figure 4). This reflects the historic bush restoration works, which have involved woody weed control as well as management of other weeds. However, again the different methodology for collecting data could also be attributed to this change. Woody weeds such as African Olive and African Boxthorn are persisting in the woodland area throughout MZ5 and MZ6 and it is recommended that woody weed control be undertaken in this area in 2019.

4.2.2 Blackthorn thicket



Plate 2. Blackthorn thicket in plot MZ5-004

Plot Data

BAM site attribute data was collected at two sites within patches of Blackthorn thicket. One site was located within the M5 offset site, and the other in the M6 voluntary management site. The data collected are contained in Table 6 (2018 and 2017 data) and Table 7 (2012-2016 data), which also includes the benchmarks for each of the site attributes for the relevant PCT. The relevant PCT is 850 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain. Benchmarks for 2012-2016 data are for BVT HN529.

MZ5 offset site and MZ6 voluntary management site blackthorn thicket plot comparison

Table 6. Comparison of blackthorn thicket plots to PCT benchmarks (2017)

Plot	Composition (Richness)						Structure (Cover)						Function			
	T	S	G	F	Fe	O	T	S	G	F	Fe	O	NLT	LC	FL	HTW
Benchmark	5	8	12	15	2	5	52	18	61	10	1	5	3	35	40	
M5_004 (2018)	0	2	6	7	0	5	0	66	31	0.9	0	0.5	0	52	0	26.1
M5_004 (2017)	0	2	6	7	0	4	0	42	29.1	2.7	0	0.4	0	40	0	10.1
M6_010 (2018)	0	1	4	6	0	4	0	60	11.2	1.9	0	0.4	0	50	0	15.2
M6_010 (2017)	0	1	3	5	0	5	0	45	19.1	7.3	0	0.6	0	39	0	10.1

T – Tree, S – Shrub, G – Grass, F – Forb, Fe – Fern, O – Other; NLT – Number of Large Trees, LC – Litter cover, FL – Length of Fallen Logs. HTW – High Threat Weeds

Table 7. Comparison of blackthorn thicket plots to PCT benchmarks (2012-2016)

	NPS	NOS		NMS		NGCG		NGCS		NGCO		EPC	NTH	OR	FL
		L	U	L	U	L	U	L	U	L	U				
Benchmark	29	18.5	23.5	20	30	23	31	0	5	11.75	19.75	0	0	1	0
M5_004 (2016)	16		0		37.5		80		4		24	18	0	0	0
M5_004 (2015)	16		0		45		75		5		20	25	0	0	0
M5_004 (2014)	18		0		20		70		28		22	55	0	0	0
M5_004 (2013)	15		0		18		84		22		24	55	0	0	0
M5_004 (2012)	18		0		11		82		26		32	67	0	0	0
M6_010 (2016)	18		0		60		65		10		8	60	0	1	0
M6_010 (2015)	10		12		10.5		74		20		2	38	3	1	15
M6_010 (2014)	18		0		50		54		2		32	28	0	0	0
M6_010 (2013)	20		0		60		62		12		20	10	0	0	0
M6_010 (2012)	20		0		53		56		14		18	10	0	0	0

NPS – Native Plant Species richness, NOS – Native Over-storey cover, NMS – Native Mid-storey cover, NGCG – Native Ground-cover (grasses), NGCS – Native Ground-cover (shrubs), NGCO – Native Ground-cover (other), EPC – Exotic Plant Cover, NTH – Number of Trees with Hollows, OR – Over-storey regeneration, FL – Length of Fallen Logs. L – Lower Benchmark, U – Upper Benchmark

Discussion

The results for blackthorn thicket during 2018 were relatively similar to the previous monitoring years, through shrub cover had increased in 2018. Results for the plots within the blackthorn thicket should be interpreted with caution, as the thicket both MZ5 and MZ6 were so dense that it prevented access to much

of the plot and it was not possible to run the 50 m transect out. As such, estimates were used to gather the data in 2015, 2016, 2017 and 2018.

Compositionally, blackthorn thickets plots scored below benchmark for all growth form groups in 2018 (with the exception of other growth form for MZ5-004), but was fairly consistent with previous years. Native plant species richness (NPS) has scored below the benchmark in all monitoring years, including 2018. However, this was to be expected given the thicket of Blackthorn.

Structurally, the percent cover of all growth forms remained below benchmark for the woodland plots in 2018 and 2017, with the exception of shrub cover, which was above benchmark in both years. No canopy species were recorded within the thicket, therefore native overstorey cover (tree cover/NOS) and overstorey regeneration (presence of stem size class <5 cm DBH/OR) were zero, as expected. Shrub cover was given a score higher than benchmark during 2018 and 2017, which is relatively consistent with previous years data (native midstorey cover). It has been raised previously in the Niche (2017, 2016, 2015, 2014 and 2012) monitoring reports that, given the density of these thickets, there would be some ecological benefit to thinning the blackthorn within the woodland areas to diversify the habitat structure. One such ecological benefit may be in controlling the Bell Bird population, as discussed below. As previously stated, the density of blackthorn in these areas is considered unnaturally high.

Native ground-cover grasses (NGCG) was below benchmark in 2018 and 2017 and was lower than previous years. Native ground-cover other (NGCO) was also well below previous monitoring years in 2018 and 2017. The lower cover values could be attributed to the long period of dry weather preceding the surveys in 2018 and 2017 and also partly due to the change in method of estimating percent cover.

EPC has been given a score of 5-10 percent in 2018 (down from 10-11 percent in 2017), again lower than previous years. Exotic cover is relatively high throughout the blackthorn thickets due to the presence of exotic perennial grasses, Blackberry (*Rubus fruticosus*), African Boxthorn (*Lycium ferrocissimum*) and African Olive (*Olea europaea* subsp. *cuspidata*). The presence of African Olive in the midstorey and groundlayer is of concern, with numerous seedlings developing underneath the larger specimens. *Lantana camara* (Lantana) was also recorded in the groundlayer of MZ6-010 plot. Weed maintenance should be undertaken in this area to prevent African Olive and Lantana dominating.

Trees with hollows (NTH) and the length of fallen logs (FL) were zero in 2018 and 2017 within the blackthorn thickets, as expected in the absence of native overstorey cover.

As recommended in previous monitoring reports, bush regeneration works should continue and focus on the removal of African Olive and Blackberry within the vicinity of plot MZ5-004, due to the presence of the threatened plant, *Pimelea spicata*. Any management in this area should be conducted with care so as to minimise any impact to *Pimelea spicata* individuals. It is significant in this area as the population of *Pimelea spicata* is largely associated with the Blackthorn thicket.

During the monitoring surveys in 2018 and 2017, it was noted that Bell Miners were abundant in the MZ5 area. Management actions to reduce the Bell Miner colony should be considered as the birds seem to be having an impact on mature overstorey in woodland areas in MZ5. Eucalypt dieback in association with Bell Miners is listed as a Key Threatening Process on the NSW *Biodiversity Conservation Act 2016* (Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners).

An independent review of bell miner associated dieback was commissioned by Office of Environment and Heritage, which details management recommendations for bell miner associated dieback (Silver and Carnegie 2017):

- Prevention:

- Disturbance of the canopy should be minimised where possible.
- Where the canopy is disturbed, rehabilitation should focus on re-establishment of a canopy as soon as possible to limit unnatural understorey density.
- Site rehabilitation should include ongoing management of invasive weeds, particularly those that minimise natural regeneration and can act as superior nesting sites for Bell miners.
- Exclusion of fire is an artificial disturbance activity that can lead to woody weed invasion. Appropriate fire regimes should be designed and implemented.
- Treatment
 - A site assessment should be undertaken to ensure that Bell miners are present and psyllid attack is the primary cause of dieback.
 - If the prevailing vegetation community is naturally dense in the understorey or midstorey then consideration should be given to not intervening in the site as Bell Miner associated dieback (BMAD) may be a natural process there.
 - At sites with an unnatural level of understorey and/or midstorey density the viability of the seed bank for rehabilitation without planting should be assessed.
 - In sites with high value assets being impacted by BMAD (e.g. threatened flora or fauna) consideration should be given to culling of Bell miners followed by site rehabilitation. This has been shown to have an immediate reduction on exclusion of other bird species for example.
 - The primary aim of site treatment should be to reduce the occurrence of superior nesting sites for the Bell miner. The method best to use to achieve this will depend on site-specific characteristics.

Management at the offset site would involve initially undertaking primary weed management works surrounding areas of woodland, or where emergent canopy species occur within Blackthorn thicket. Weed management would first involve removing all woody weeds, including African Olive and African Boxthorn; then thinning areas of Native Blackthorn (*Bursaria spinosa*).

4.2.3 Pasture



Plate 3. Plot (MZ5-005) within pasture land during 2018

Plot Data

BioBanking site attribute data was collected at two sites dominated by pasture. One site was located within the MZ5 offset area and the other in the M6 voluntary management area. The data collected are contained in Table 8 (2018 and 2017 data) and Table 9 (2012-2016 data), which also include the benchmarks for each of the site attributes for the relevant PCT. The relevant PCT is 850 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain. Benchmarks for 2012-2016 data are for BVT HN529.

Table 8. Comparison of pasture plots to PCT benchmarks (2018 and 2017)

Plot	Composition (Richness)						Structure (Cover)						Function			
	T	Sb	G	F	Fe	O	T	S	G	F	Fe	O	NLT	LC	FL	HTW
Benchmarks	5	8	12	15	2	5	52	18	61	10	1	5	3	35	40	
M5_005 (2018)	0	2	4	4	0	3	0	2.1	28	20.7	0	0.3	0	24	0	6.5
M5_005 (2017)	0	1	6	3	0	1	0	1	22.1	2.1	0	0.1	0	28	0	11.1
MZ6_009 (2018)	0	1	4	8	0	2	0	5	13.2	0.8	0	1.1	0	24	0	5
MZ6_009 (2017)	0	1	5	5	0	2	0	4	18.1	0.5	0	0.2	0	14	0	23.5

T – Tree, S – Shrub, G – Grass, F – Forb, Fe – Fern, O – Other; NLT – Number of Large Trees, LC – Litter cover, FL – Length of Fallen Logs. HTW – High Threat Weeds

Table 9. Comparison of the pasture plots to PCT benchmarks (2012-2016)

	NPS	NOS		NMS		NGCG		NGCS		NGCO		EPC	NTH	OR	FL
		L	U	L	U	L	U	L	U	L	U				
Benchmark values	29	18.5	23.5	20	30	23	31	0	5	11.75	19.75	0	0	1	0
M5_005 (2016)	10		0		0		90		0		8	56	0	0	0
M5_005 (2015)	12		0		0		94		0		4	72	0	0	0
M5_005 (2014)	14		0		0		76		0		2	50	0	0	0
M5_005 (2013)	10		0		0		86		0		0	64	0	0	0
M5_005 (2012)	12		0		0		78		0		0	74	0	0	0
M6_009 (2016)	13		0		1.2		88		0		10	52	0	1	0
M6_009 (2015)	18		0		44		2		0		0	99	0	1	0
M6_009 (2014)	13		0		0		38		6		12	76	0	0	0
M6_009 (2013)	14		0		0		50		0		0	68	0	0	0
M6_009 (2012)	16		0		0		58		0		0	70	0	0	0

NPS – Native Plant Species richness, NOS – Native Over-storey cover, NMS – Native Mid-storey cover, NGCG – Native Ground-cover (grasses), NGCS – Native Ground-cover (shrubs), NGCO – Native Ground-cover (other), EPC – Exotic Plant Cover, NTH – Number of Trees with Hollows, OR – Over-storey regeneration, FL – Length of Fallen Logs. L – Lower Benchmark, U – Upper Benchmark

Discussion

Compositionally, pasture plots scored below benchmark for all growth form groups, but was fairly consistent in 2018 with previous years. Total native plant species richness (NPS) was lower than each of the woodland and blackthorn thicket condition classes for both MZ5 and MZ6. As stated in the previous monitoring reports this is an indication of the poor condition in these areas, the high percentage cover of exotic pasture grasses and few key native grasses (NGCG) such as Weeping Grass (*Microlaena stipoides*), Kangaroo Grass (*Themeda australis*) and Wallaby Grass (*Rytidosperma racemosum*).

As discussed in previous monitoring reports (Niche 2012, 2013, 2015, 2016, 2017), effective regeneration of these areas would be difficult without some re-vegetation of overstorey species, though in time blackthorn

is likely to establish. As discussed in Niche (2014) better patches of pasture that are dominated by native grasses should be prioritised if any weed management work is conducted in these pastures. Chilean Needle Grass was recorded in the pasture plot in MZ6 in 2018 and 2017 and is observed to be dominant in parts of pasture surrounding the woodland areas. This exotic grass is very invasive and should be appropriately controlled as part of the bush regeneration program.

4.3 Photo-points

Photo-point monitoring was conducted at each of the locations shown in Figure 2. A selection of the photo points has been provided in Appendix D. Changes evident include increased cover of ground and shrub layer over the monitoring period (2012 to present). Woody weed control is required in 2018, evident by the increase in woody weeds in the photo point monitoring.

4.4 Vegetation distribution monitoring

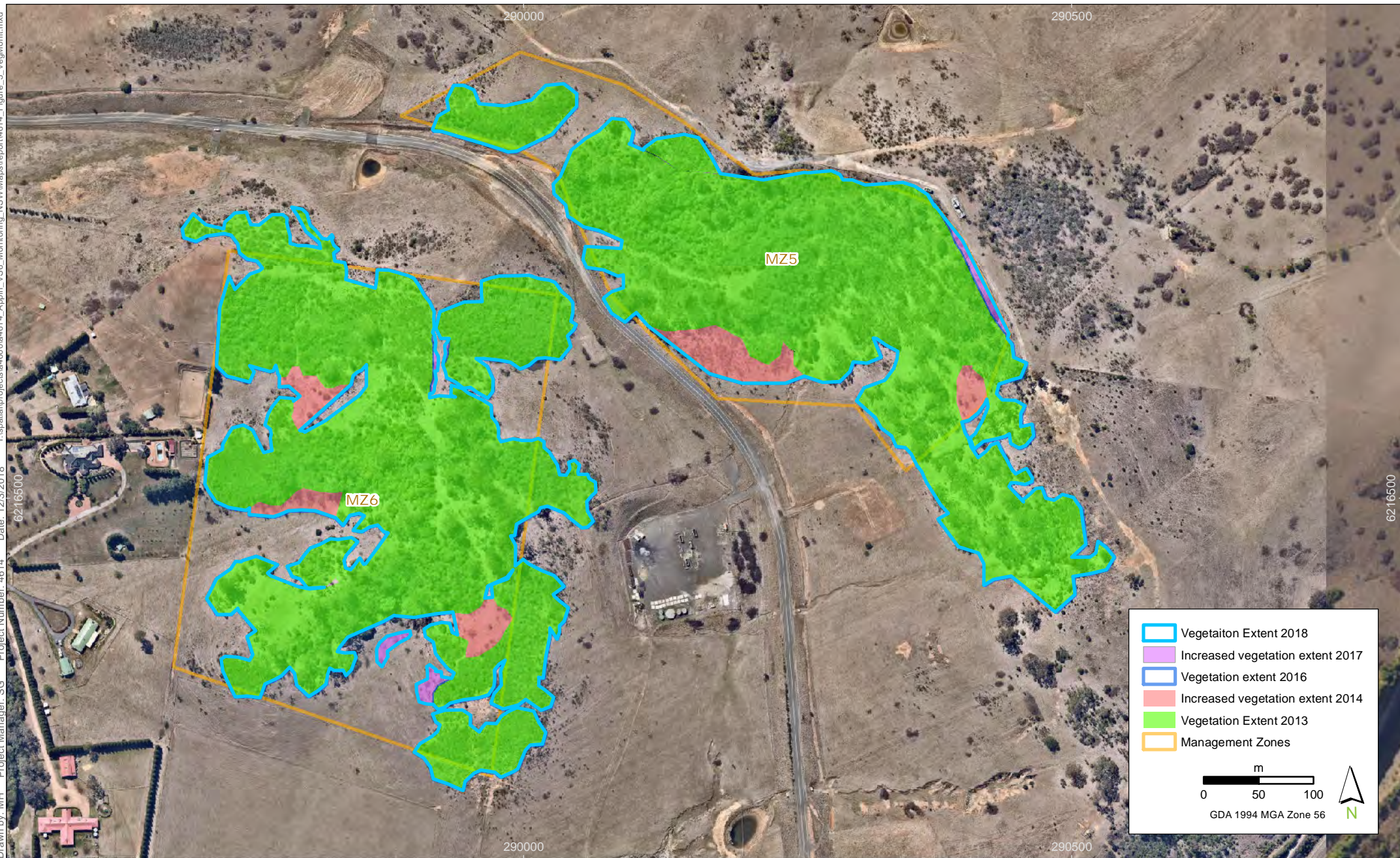
The extent of the wooded native vegetation of the site was mapped using aerial photography from NearMap (latest imagery September 2018) and data from the field surveys. The results were then compared with previous monitoring years.

Based on the results, no detectable increase in woody native vegetation cover was detected since the 2017 monitoring event. The increases in woody vegetation cover since the monitoring has been undertaken is shown in Table 10.

The extent is illustrated in Figure 5.

Table 10. Woody native vegetation increases per monitoring year

Management zone	2011 (NPWS 2003)	2012	2013	2014	2015	2016	2017	2018
M5 Woody vegetation	5.28 ha	6.58 ha (1.3 ha increase)	6.73 ha (0.15 ha increase)	7.19 ha (0.46 ha increase)	7.19 ha (no detectable increase since 2014)	7.19 ha (no detectable increase since 2014)	7.27 ha (0.08 ha increase)	7.27 ha (no detectable increase since 2017)
M6 Woody vegetation	4.49 ha	7.99 ha (3.5 ha increase)	8.34 ha (0.35 ha increase)	8.79 ha (0.45 ha increase)	8.79 ha (no detectable increase since 2014)	8.79 ha (no detectable increase since 2014)	8.91 ha (0.12 ha increase)	8.91 ha no detectable increase since 2017)
Total native woody vegetation	9.77 ha	14.57 ha	15.07 ha	15.98 ha	15.98 ha	15.98 ha	16.18 ha	16.18 ha



5. Recommendations

The management actions recommended in the BMP are provided in Table 2. A summary of the management actions implemented throughout 2017-18, and a qualitative assessment of the outcomes and recommendations for 2018-19 are each described below.

5.1 Fencing and stock management

Description/Requirement – Stock exclusion through the upgrading of existing fences and installation of new fences where required. Stock excluded from offset area (MZ5).

Enacted management – New four-strand post and wire fencing was installed in 2011 and stock removed from the offset area.

Outcome (spring 2018) – Fencing was intact. No recent evidence of stock in offset areas during field survey.

Recommendations for 2019

1. Continue to ensure integrity of fencing through regular inspections of the site;
2. Continue to exclude stock from MZ5.

5.2 Bush regeneration

Description/Requirement – Primary, secondary and maintenance weed management by Toolijooa has been conducted since 2011 in the MZ5 offset area, and the MZ6 voluntary management area.

Weed species targeted include: Blackberry (*Rubus fruticosus*), African Olive (*Olea europaea* subsp. *cuspidata*), Lantana (*Lantana camara*), African Boxthorn (*Lycium ferocissimum*), Privet (*Ligustrum* spp.), Cape Ivy (*Delairea odorata*) and a variety of exotic perennial grasses such as African lovegrass (*Eragrostis curvula*), Rhodes grass (*Chloris gayana*), Chilean needle grass and Kikuyu (*Pennisetum clandestinum*).

Enacted management – Toolijooa have been engaged to carry out bush regeneration actions since 2011. No bush regeneration works were undertaken in 2017 or 2018, but planned bush regeneration works in 2019 include monthly maintenance inspections with a team of four bush regenerators.

Outcome (spring 2018) – Evidence of weed control shows in the data, with a reduction in EPC in both MZ5 and MZ6. However, the dramatic reduction in exotic plant cover during 2018 and 2017 may be a consequence of the different method of data collection, given that no bush regeneration works were undertaken in 2017 or 2018. Weeds, particularly woody weeds, continue to be an issue that requires attention in both the MZ5 and MZ6 zones.

Recommendations for 2019

1. Continue the bush regeneration works, and target woody and vine weeds within better condition areas and drip-lines of large trees and adjacent to regenerating overstorey plants.
2. Ensure that herbaceous weeds and introduced grasses are targeted within woodland areas.
3. Areas which have had large woody weed removal should be followed up to ensure herbaceous weeds do not dominate, and promote native regeneration.
4. Targeted spraying of Blackberry (or otherwise recommended treatment) throughout site. Ensure that those areas previously treated are re-inspected and follow up conducted where required.
5. Targeted removal of Chilean Needle Grass, which is beginning to dominate in parts of the pasture areas surrounding the woodland.

6. Ensure staff of the bush regeneration company are familiar with *Pimelea spicata* so as to identify it and avoid it during bush regeneration activities and especially weed spraying.
7. Selectively remove/trim areas of blackthorn thicket surrounding eucalypts. This will help reduce Bell Birds from occupying the site.

5.3 Monitoring of native vegetation and *Pimelea spicata*

Description/Requirement – Design a program to determine the success of management or the need for intervention including assessment of improvement in the condition of native vegetation, annual *Pimelea spicata* population counts, assessment of species and habitat condition and monitoring against stochastic environmental events.

Enacted management – Niche was engaged to develop and implement a monitoring strategy. The methodology is based on the *BioBanking Assessment Methodology* (DECCW 2014) (now modified to be consistent with the Biodiversity Assessment Method (OEH 2017)), photographic records and formalised *Pimelea spicata* population counts.

Outcome (spring 2018) – Monitoring of native vegetation was undertaken in November 2018, using five fixed BAM plots in MZ5, five fixed BAM plot in MZ6 and a number of photo points. Monitoring of *Pimelea spicata* was conducted for the 2016/2017 monitoring year, using five fixed monitoring plots established in 2012. Monitoring of *Pimelea spicata* was not required for the period covered by this monitoring report. The next scheduled population census of *Pimelea spicata* is in 2021/22.

Recommendation for future monitoring

1. Conduct the next monitoring of native vegetation in spring 2019.
2. Conduct the next monitoring of *Pimelea spicata* during its correct flowering period (October-November) in 2021.
3. Maintain annual presence/absence monitoring for *Pimelea spicata* within plots, and continue opportunistic observations of the presence and spread of the species throughout the offset area.
4. Ensure staff of the bush regeneration company are familiar with *Pimelea spicata* so as to identify it and avoid it during bush regeneration activities and especially weed spraying.

6. Conclusion

The aim of this report was to demonstrate the results of the on-going management actions at the offset and voluntary management areas associated with the Appin Ventilation Shaft Site No.6 site. The on-going management actions at these sites has resulted in improved vegetation condition overall measured by the collection of empirical data, through undertaking annual mapping of the vegetation extent on the site and through a photographic record.

For the most part, the site requires an on-going commitment to weed management and ecological restoration in order to reach a benchmark state and successfully achieve and improve or maintain outcome for biodiversity.

Recommendations for future adaptive management and monitoring of the management zones include:

1. Continue to ensure integrity of fencing through regular inspections.
2. Continue to ensure stock remains excluded from MZ5 in order to ensure the recovery and conservation of the *Pimelea spicata* population.
3. Continue to target woody and vine weeds within better condition areas and drip-lines of large trees and adjacent to regenerating overstorey plants.
4. Conduct herbaceous weed management and introduced grass management within areas of woodland and immediate surrounds.
5. Continue targeted spraying of Blackberry (or otherwise recommended treatment) throughout site. This includes re-visiting areas that have been previously treated to ensure treatment has been effective.
6. Consider management actions to reduce the Bell Miner colony which seems to be having an impact on mature overstorey. This would involve initially undertaken primary works surrounding areas of woodland, or where emergent canopy species occur within Blackthorn thicket. This would first involve removing all woody weeds, including African Olive and African Boxthorn; then thinning areas of Native Blackthorn (*Bursaria spinosa*).
7. Consider feral herbivore control (rabbits), as evidence of rabbit occupation within *Pimelea spicata* habitat was observed in 2016.
8. Ensure bush regeneration staff are familiar with the identification of *Pimelea spicata*.
9. Maintain the timing of annual vegetation monitoring surveys to late October to beginning of December such that the data collected for the species richness and native ground-cover attributes are optimised.

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Appendix A. Management actions, performance criteria, corrective actions and timeframes

Action	Description	Performance Target (Milestones)	Corrective Actions	Timeframe
1. MZ5 and MZ6 Fencing	<ul style="list-style-type: none"> The first action within the offset area will be to exclude stock. Existing four-strand post-and-wire fence will be utilised and additional fencing installed where required. No barbed-wire will be used and the bottom strand will have a clearance of 400mm above the ground to allow the movement of native fauna. Stock will be herded out of the area prior to fencing taking place. 	<ul style="list-style-type: none"> Four-strand post-and-wire fence has been installed, no strands barbed and 400 mm separation from ground to lowest strand. 	(a) Maintenance of fencing – fencing to be inspected at regular intervals and repairs made as required.	Every 3 months
2. Bush Regeneration in MZ5	<ul style="list-style-type: none"> Primary, secondary and maintenance weed management within MZ5 will target the treatment of Blackberry, African Olive, Lantana, African Boxthorn, Privet, Cape Ivy and a variety of exotic perennial grasses such as African lovegrass, Rhodes Grass, Kikuyu and Couch. All weed management works will be supervised by a suitably qualified bush regenerator. A team of four bush regenerators will be engaged for five days for the primary weeding and then a team of two for one day every four months thereafter for secondary and maintenance weed management as required. 	<ul style="list-style-type: none"> Engagement of a suitably qualified bush regeneration contractor to implement primary, secondary and maintenance weed management program has occurred. Annual vegetation condition assessment has commenced. Improvement in condition of offset bushland to within, or as near as possible to, benchmark condition levels – on-going. 	(b) On-ground weed management regime to be adaptable and able to respond to changing conditions and weed problems. Given that the Offset Area has an intact soil profile and moderate resilience, sound bush regeneration methods and observance of integrated pest management should minimise the need for corrective actions. (c) Weed management program in Offset Area to be annually reviewed and altered actions documented and implemented. (d) Revegetation with locally collected native vegetation of local genetic stock as recommended by an appropriately qualified expert.	Annually

Action	Description	Performance Target (Milestones)	Corrective Actions	Timeframe
3. <i>Pimelea spicata</i> Monitoring program	<ul style="list-style-type: none"> Design a program to determine the success of management or the need for intervention. Annual population counts within permanent plots. 5 yearly population census. Condition of individual plants from mixed cohorts. Condition of habitat. Annual inspections of fencing to ensure maintenance and up-keep. Regular site visits the potential presence of stock and/or feral herbivores that have breached fencing to ensure that such impact is eliminated by fencing and that trapped stock or feral herbivores are freed. Monitoring against stochastic events. 	<ul style="list-style-type: none"> Sustainable <i>Pimelea spicata</i> population with population numbers staying level with or exceeding current numbers. 	<p>(e) Annual count trigger for intervention is significant loss of population (>20% of monitored population within BioBanking Plots). Response: undertake full scale census.</p> <p>(f) Stochastic events such as one off fire events will reset the baseline population size which will be determined after a population census immediately after the event and then again at six, twelve, eighteen and twenty four months post disturbance.</p> <p>(g) 5 yearly population census trigger for intervention is:</p> <ul style="list-style-type: none"> (i) >35% decline in population from preceding census; or (ii) Two consecutive (over two census) declines of >20%; or (iii) Area of occupancy is mapped to decrease to 50% or lower than originally mapped. <p>Intervention Actions:</p> <ul style="list-style-type: none"> a) Stop regeneration works; b) Consult with experts (RBG Mt Annan); c) Implement actions as recommended by experts; additional actions may include slashing of competing native grasses, thinning of competing native shrubs or trees (e.g., <i>Bursaria spinosa</i>), ecological burning or resting of weed management until the population stabilises.. Crash grazing should only be utilised as a last resort. In emergency situations, plant rescue and re-introduction may be required. 	Annually as part of the fixed plot vegetation monitoring and population census undertaken every five years
4. Bush Regeneration in MZ6	<ul style="list-style-type: none"> Weed management within MZ6 will target the treatment of Blackberry, African Olive, Lantana, African Boxthorn, Privet, Cape Ivy and a variety of exotic perennial grasses such as African Lovegrass, Rhodes Grass, Kikuyu and Couch. All weed management works will be supervised by a suitably qualified bush regenerator. 	<ul style="list-style-type: none"> Engagement of a suitably qualified bush regeneration contractor to implement weed management program has occurred Improvement in condition of offset bushland to within, or as near as possible to, benchmark condition levels – on-going. 	<p>(a) On-ground weed management regime to be adaptable and able to respond to changing conditions and weed problems. Given that the native vegetation areas have an intact soil profile and moderate resilience, sound bush regeneration methods and observance of integrated pest management should minimise the need for corrective actions.</p> <p>(b) Weed management program in native vegetation area to be annually reviewed and altered actions documented and implemented.</p>	Annually

Appendix B. Plant species list (2018)

Family	Species	Common Name	Mz5-001	Mz5-002	Mz5-003	Mz5-004	Mz5-005	Mz6-006	Mz6-007	Mz6-008	Mz6-009	Mz6-010
Acanthaceae	<i>Brunoniella australis</i>	Blue Trumpet	0.5	0.3	3	0.2		1	0.5	0.5	0.1	0.5
Anthericaceae	<i>Arthropodium milleflorum</i>	Pale Vanilla-lily			0.1			0.1				
Apocynaceae	<i>Araujia hortorum</i> *		0.1			0.1						
Asparagaceae	<i>Asparagus asparagoides</i> *	Bridal Creeper	0.1			0.1						0.1
Asteliaceae	<i>Astelia spp.</i>			0.1	0.1							
Asteraceae	<i>Bidens pilosa</i> *	Cobbler's Pegs						0.1	0.1	0.1		
Asteraceae	<i>Calotis cuneata</i>	Mountain Burr-Daisy								0.1		
Asteraceae	<i>Carthamus lanatus</i> *	Saffron Thistle					1		0.1			
Asteraceae	<i>Cirsium vulgare</i> *	Spear Thistle					0.1					
Asteraceae	<i>Delairea odorata</i> *	Cape Ivy	2		1	1						
Asteraceae	<i>Helichrysum spp.</i>							1				
Asteraceae	<i>Hypochaeris radicata</i> *	Catsear			0.1		0.1				0.1	
Asteraceae	<i>Lagenifera stipitata</i>	Blue Bottle-daisy	0.1		0.1							
Asteraceae	<i>Lagenophora stipitata</i>	Common Lagenophora				0.1						
Asteraceae	<i>Senecio madagascariensis</i> *	Fireweed	0.1		0.1		0.1	0.1	0.1			0.1
Asteraceae	<i>Sigesbeckia orientalis subsp. orientalis</i>	Indian Weed	0.1									
Asteraceae	<i>Sonchus oleraceus</i> *	Common Sowthistle	0.1				0.1					
Asteraceae	<i>Vittadinia cuneata</i>	A Fuzzweed						1	0.3			
Cactaceae	<i>Opuntia stricta</i> *	Common Prickly Pear, Smooth Pest Pear	0.1						0.1			
Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell				0.1						
Campanulaceae	<i>Wahlenbergia stricta</i>	Tall Bluebell	0.1	0.1	0.1			1		0.1	0.1	
Caryophyllaceae	<i>Paronychia brasiliensis</i> *	Chilean Whitlow Wort, Brazilian Whitlow						0.1	0.1			
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush	0.2		1			0.5	0.3	2		
Chenopodiaceae	<i>Einadia trigonos</i>	Fishweed	0.2		0.5			0.5	1	1		
Clusiaceae	<i>Hypericum gramineum</i>	Small St John's Wort		0.1							0.1	

Family	Species	Common Name	Mz5-001	Mz5-002	Mz5-003	Mz5-004	Mz5-005	Mz6-006	Mz6-007	Mz6-008	Mz6-009	Mz6-010
Convolvulaceae	<i>Convolvulus erubescens</i>	Pink Bindweed		0.1	0.1	0.1	0.1			0.1	0.1	
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	0.5	0.5	1	0.2	0.1	0.2	0.1	0.5	0.1	1
Cyperaceae	<i>Carex inversa</i>	Knob Sedge						0.1				
Fabaceae (Faboideae)	<i>Desmodium rhytidophyllum</i>			0.1				0.1		0.1	0.1	
Fabaceae (Faboideae)	<i>Desmodium varians</i>	Slender Tick-trefoil	0.1	0.1	0.1	0.1	0.1	0.1		0.1		0.1
Fabaceae (Faboideae)	<i>Glycine clandestina</i>	Twining glycine	0.1	0.1	0.1	0.1			0.1	0.1		0.1
Fabaceae (Faboideae)	<i>Glycine tabacina</i>	Variable Glycine	0.1	0.1	0.5	0.1	0.1	0.1		0.5	1	0.1
Fabaceae (Faboideae)	<i>Medicago sativa*</i>	Lucerne					0.1					
Fabaceae (Mimosoideae)	<i>Acacia asparagoides</i>								0.1			
Fabaceae (Mimosoideae)	<i>Acacia implexa</i>	Hickory Wattle								8		
Geraniaceae	<i>Geranium solanderi</i>	Native Geranium					0.5					
Goodeniaceae	<i>Scaevola ramosissima</i>	Purple Fan-flower		0.1								
Lamiaceae	<i>Scutellaria humilis</i>	Dwarf Skullcap	2									
Malvaceae	<i>Sida rhombifolia*</i>	Paddy's Lucerne			0.1		0.1	0.1	0.1	0.1		0.1
Myrsinaceae	<i>Anagallis arvensis*</i>	Scarlet Pimpernel	0.1			0.1	0.1				0.1	0.1
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple						5				
Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark						8		10		
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box		10	8			8	20			
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum	20	5	15			2				
Oleaceae	<i>Olea europaea*</i>	Common Olive	8	1	1	25	0.5			0.5		
Oleaceae	<i>Olea europaea subsp. africana*</i>							5	12			15
Oxalidaceae	<i>Oxalis perennans</i>		0.1		0.1	0.1		0.1		0.1	0.1	0.1
Pittosporaceae	<i>Bursaria spinosa</i>	Native Blackthorn	45		15	65	2	20	12	45	5	60
Plantaginaceae	<i>Plantago debilis</i>	Shade Plantain										0.1
Plantaginaceae	<i>Plantago lanceolata*</i>	Lamb's Tongues		0.1	0.1		0.5	0.1	0.1	0.1	0.5	0.1
Plantaginaceae	<i>Veronica plebeia</i>	Trailing Speedwell	0.1	0.1	0.1		0.1	0.2	0.5	0.1	0.1	0.1

Family	Species	Common Name	Mz5-001	Mz5-002	Mz5-003	Mz5-004	Mz5-005	Mz6-006	Mz6-007	Mz6-008	Mz6-009	Mz6-010
Poaceae	<i>Aristida ramosa</i>	Purple Wiregrass		5				2		5	2	
Poaceae	<i>Aristida vagans</i>	Threeawn Speargrass					3					
Poaceae	<i>Bothriochloa macra</i>	Red Grass		0.5				0.5			3	
Poaceae	<i>Briza maxima</i> *	Quaking Grass										
Poaceae	<i>Chloris truncata</i>	Windmill Grass								0.1		
Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass	0.1									
Poaceae	<i>Echinopogon ovatus</i>	Forest Hedgehog Grass				0.5						
Poaceae	<i>Ehrharta longiflora</i> *	Annual Veldtgrass	0.2		0.1							
Poaceae	<i>Holcus lanatus</i> *	Yorkshire Fog								5		
Poaceae	<i>Lolium perenne</i> *	Perennial Ryegrass		0.1	0.1		1	0.1	0.1			
Poaceae	<i>Microlaena stipoides</i>	Weeping Grass	5	25	10	15	15	5		8	8	8
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass							5			
Poaceae	<i>Nassella neesiana</i> *	Chilean Needle Grass									5	
Poaceae	<i>Oplismenus imbecillis</i>		0.5			0.5						1
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum					5				5	0.1
Poaceae	<i>Pennisetum clandestinum</i> *	Kikuyu Grass					10					
Poaceae	<i>Poa labillardierei</i> var. <i>labillardierei</i>	Tussock	1		0.5	0.5			0.2			
Poaceae	<i>Rytidosperma</i> spp.		5	8	5	10	5	5	4	5		2
Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass									0.2	
Poaceae	<i>Sporobolus indicus</i> *	Parramatta Grass									2	
Poaceae	<i>Themeda triandra</i>			8		5	5			0.5		0.2
Polygonaceae	<i>Rumex crispus</i> *	Curled Dock					0.1					
Ranunculaceae	<i>Clematis aristata</i>	Old Man's Beard	1		0.1	0.1		0.1	0.1	0.1		0.1
Rosaceae	<i>Rubus fruticosus</i> *	Blackberry complex		1		0.1	0.1					
Rosaceae	<i>Rubus</i> spp.*						0.1					
Rubiaceae	<i>Asperula conferta</i>	Common Woodruff	0.1	0.1		0.1	20		0.1	0.1	0.1	0.1
Rubiaceae	<i>Galium gaudichaudii</i>	Rough Bedstraw	0.1			0.1						
Rubiaceae	<i>Galium propinquum</i>	Maori Bedstraw			0.1							

Family	Species	Common Name	Mz5-001	Mz5-002	Mz5-003	Mz5-004	Mz5-005	Mz6-006	Mz6-007	Mz6-008	Mz6-009	Mz6-010
Solanaceae	<i>Lycium ferocissimum</i> *	African Boxthorn			1			1	8	0.1		
Solanaceae	<i>Solanum prinophyllum</i>	Forest Nightshade	0.1							0.1		
Thymelaeaceae	<i>Pimelea spicata</i>	Spiked Rice-flower	0.1		0.1	1						
Verbenaceae	<i>Lantana camara</i> *	Lantana							0.2	2		
Verbenaceae	<i>Verbena bonariensis</i> *	Purpletop					0.1					
Verbenaceae	<i>Verbena rigida</i> *	Veined Verbena		0.2			0.1				2	

Appendix C. Biodiversity Assessment Method: measuring vegetation integrity attributes (OEH 2017)

Composition

- Assessment of composition is based on the number of native plant species (richness) observed and recorded by the assessor within a plot for each growth form group shown in Table 3 of the BAM (OEH 2017).
- The assessor must assign a native plant species to a growth form group according to the definitions set out in Appendix 4 of the BAM. An assessor must allocate a species to one growth form group based on the adult/mature growth form of the species.
- The minimum vegetation survey data required to be recorded by the assessor for composition at each 20m x 20m condition plot are:
 - (a) full species name (*Genus species*) for the three dominant native species within each growth form group. Dominant native species means those native species that contribute most to the total cover of the growth form group, and
 - (b) genus name or the full species name where practicable for all other species. Practicable means that sufficient plant material is present to make a species level identification and the assessor has sufficient skills and knowledge to make the identification in the field
 - (c) whether each species is native, exotic, or high threat exotic
 - (d) the growth form group to which each native species has been allocated.
- The composition of each growth form group is assessed by counting the number of different native plant species recorded within each growth form group within each 20m × 20m condition plot.

Structure

- Structure is the assessment of foliage cover for each growth form group within the 20m x 20m plot boundary. Foliage cover for a growth form group is the percentage of cover of all living plant material of all individuals of the species present for that group. This includes leaves, twigs, branchlets and branches as well as canopy overhanging the plot even if the stem is outside the plot.
- The assessor must record an estimate of the foliage cover for each native and exotic species present within the 20m x 20m plot. Foliage cover estimates for each species must draw from the following number series: 0.1, 0.2, 0.3,.....1, 2, 3,.....10, 15, 20, 25,.....100%.
- The assessor must not use methods such as Braun-Blanquet (or other) classes, or a transect point intercept method to record the foliage cover score for a growth form group.
- The structure of each growth form group for the 20m x 20m plot is recorded by the assessor as the sum of all the individual foliage cover estimates of all native plant species recorded within each growth form group within each plot.
- The assessor must assign each non-native (exotic) plant species a foliage cover estimate and either E (exotic) or HTE (high threat exotic).

Function

- The number of large trees, tree stem size class, tree regeneration and length of fallen logs is recorded within a 1000m² plot.
- Tree stem size classes should be measured at 1.3m above ground height, referred to as 'diameter at breast height over bark' or DBH.
- Tree stem size classes are: <5, 5–9, 10–19, 20–29, 30–49, 50–79, and 80+ cm DBH and include all species in the tree growth form group.
- Only living trees contribute to counts for determination of presence and for a multi-stemmed tree, only the largest living stem is included in the count.

- The number of large trees is a count of all living stems with a DBH equal to or greater than the large tree benchmark DBH size for that PCT or vegetation class.
- For a multi-stemmed tree, at least one living stem must be equal to or greater than the large tree benchmark DBH size to count as a large tree.
- Stem size class is based on the presence or absence of living tree stems within size classes that fall between regenerating stems (<5cm DBH) and the large tree benchmark DBH size(s).
- For a multi-stemmed tree, only the largest living stem is counted for determining the presence or absence of stems within each size class.
- Regeneration is based on the presence or absence of living trees with stems <5cm DBH.
- The length of fallen logs is the total length in metres of all woody material greater than 10cm in diameter that is dead and entirely or in part on the ground within the 20m x 50m plot. Where logs extend outside of the plot, the assessor must only record the length of fallen log that is contained within the plot.
- Litter cover is assessed as the average percentage ground cover of litter recorded from five 1m x 1m plots evenly located along the central transect. Litter cover includes leaves, seeds, twigs, branchlets and branches (<10cm in diameter). The assessment of litter cover must include all plant material that is detached from a living plant. Dead material still attached to a living plant (such as a grass) is assessed as litter cover where it is in contact with the ground. Dead material still attached to a living plant that is not in contact with the ground, or litter suspended in the canopies of other plants is not assessed as litter cover. Litter cover should be considered as the two-dimensional litter layer and includes litter under the canopies of erect plants.
- The number of trees with hollows is determined by counting the number of trees with hollows that are visible from the ground in the 20m x 50m plot. The number of trees with hollows can include native species allocated to the shrub growth form group. It must include both living and dead trees.
- The number of trees with hollows does not contribute to the vegetation integrity score. The presence of hollow bearing trees is used as part of the habitat suitability assessment for some threatened species in Chapter 6 and for identifying the credit class for biodiversity credits in Chapter 11 of the BAM.

Appendix D. Photo point monitoring



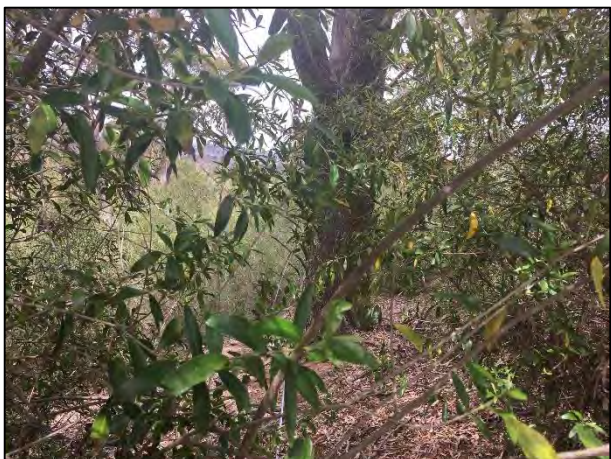
Derived grassland and area of woodland from MZ6-009 (photo point 5) during 2012, 2013, 2014, 2015, 2016, 2017 and 2018



Derived grassland from photo point 4 during 2012, 2013, 2014 2015, 2016, 2017 and 2018.



Area of erosion from photo point 7 during 2012, 2013, 2014, 2015, 2017 and 2018.



MZ6_006 during 2012, 2013, 2014, 2015, 2016, 2017 and 2018. Note the obvious cover differences between the years. Woody weed control required in 2019.



MZ6_007 during 2012, 2013, 2014, 2015, 2016, 2017 and 2018. Note the ground cover since 2012. Woody weed control required in 2019.



Regenerating woodland from MZ5_002 during 2012, 2013, 2014, 2015, 2016, 2017 and 2018. Note the increase in the regeneration of *Bursaria spinosa* within the woodland understory.



Derived grassland from M5_005 during 2012, 2013, 2014, 2015, 2016, 2017 and 2018.

Niche Environment and Heritage

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APPENDIX F: 2018/19 NEPEAN RIVER BIOBANK SITE ANNUAL REPORT



Landcare Australia

**Annual Report for
Biodiversity Conservation Trust
September 2018 – August 2019**

Nepean BioBanking Site (ID: 382)

Contents

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1. BioBanking Annual Reporting Table

BioBank Site Annual Report					
Location Details					
BioBanking agreement ID: 382		Name of landowner – Endeavour Coal Pty Ltd. All conservation land management works undertaken by Landcare Australia (engaged in December 2018) on behalf of Endeavour Coal Pty Ltd.			
Reporting date: 1 August 2019 (period September 2018 - August 2019).		Property address: 1025 and 1235 Menangle Rd, Douglas Park			
Management actions	Required completion time and frequency	Action completed (Yes/No)	Actual completion date/s	Description of actions undertaken (including reference to management zones), any variations and the reasons for variation.	Visual observations and other comments (including reasons for non-completion)
1. Management of grazing for conservation	Ongoing	Yes	Recorded at the following site visits including: 21/03/2019 25/03/2019 02/04/2019 10/04/2019 17/04/2019 23/04/2019 30/04/2019	No stock observed in all management zones on each site visit listed. Significant grazing by stock animals continues to occur on the private property (to the north, south and east) without incursion into the site.	No observed evidence of recent stock grazing, trampling or other traces of stock animals.
2. Weed control	Ongoing – (4 times per year)	Yes	Quarterly site visits.	Weed control at MZ1 and MZ2 using herbicide and hand-pulling of species listed in BioBanking Agreement (BBA) 382. Infestation of Prickly Pear in MZ1 and MZ2 not listed in the BBA. However, approx. 60% of existing Prickly Pear population removed to date. Maintenance Sweeps for key weed threats through MZ3 and the accessible parts of MZ4. No access permitted to MZ5 due to the high cliffs and gorges, however no weeds observed	Additional herbicide treatment required in MZ1 and MZ2. African lovegrass, Stinking Roger, Thistle, Fleabane, Paddy's Lucerne, Prickly Pear and woody species such as Small Leaved Privet and African Boxthorn. As per the BBA, areas previously disturbed require ongoing control for at least the following 10 years, after which time these zones are to be reassessed for the need for further control.

BioBanking Agreement 382 - Annual Report (September 2018 to August 2019)
Photo Points, Inspections, Monitoring and Reporting

BioBank Site Annual Report					
Location Details					
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Reporting date: 1 August 2019 (period September 2018 - August 2019).		Property address: 1025 and 1235 Menangle Rd, Douglas Park			
Management actions	Required completion time and frequency	Action completed (Yes/No)	Actual completion date/s	Description of actions undertaken (including reference to management zones), any variations and the reasons for variation.	Visual observations and other comments (including reasons for non-completion)
				<p>in adjoining management zones during maintenance sweeps.</p> <p>Herbicides have been used on the BioBanking site at the quarterly site visits to undertake management actions (i.e. weed control) in each respective management zone as listed in the BBA. A list of herbicide used at each visit is available (if required).</p>	
3. Management of fire for conservation	Ongoing	Yes	Quarterly site visits.	<p>No evidence of recent fire activity during site visits (BBA suggests no burn as far back as 1962).</p> <p>No ecological burns are planned in any zone until at least 2024 and then the site will be reconsidered for future ecological burns in a mosaic pattern across the site.</p>	Fuel loads vary in all management zones but are at least 20 -25 tonnes per hectare or greater across the site.
4. Management of human disturbance	Ongoing	Yes	Quarterly site visits.	<p>Temporary signage has been installed and is in good working order, currently awaiting new permanent signage from BCT which will be installed onsite in accordance with the BBA.</p> <p>Fencing on the western boundary is to be replaced in the week commencing August 5 2019.</p>	<p>Access for management purposes includes South32 and Landcare Australia (land management contractor) staff.</p> <p>There is no ability for stock or unauthorized motor vehicles to access the site with the current exclusion fencing in place.</p>

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BioBank Site Annual Report					
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Reporting date: 1 August 2019 (period September 2018 - August 2019).		Property address: 1025 and 1235 Menangle Rd, Douglas Park			
Management actions	Required completion time and frequency	Action completed (Yes/No)	Actual completion date/s	Description of actions undertaken (including reference to management zones), any variations and the reasons for variation.	Visual observations and other comments (including reasons for non-completion)
				<p>There has been no observations or evidence of incursions onto the site from the neighbouring properties.</p> <p>No waste has been observed on the site during site visits this year.</p>	Routine inspections conducted at each site visit to ensure fencing is secure and that there have been no incursions.
5. Retention of native vegetation	Ongoing	Yes	Quarterly site visits.	<p>No native vegetation has been removed or poisoned onsite.</p> <p>A small number of trees (<10) on the southern boundary will be removed in accordance with the BBA in preparation for the installation of the new southern boundary fence.</p>	No evidence or observation of recent ringbarking or tree felling (since commencement of the BBA) on the site.
6. Planting or seeding	Autumn and Spring 2019	Yes	May, June and July 2019 - 3300 species.	<p>As per the BBA, a planting program of 3300 tree and shrub species were planted in the western section of MZ1 from the species listed in the planting schedule of the BBA.</p> <p>The remaining species (3380 trees and shrubs) are to be planted in MZ1 West and MZ1 East in October 2019.</p> <p>Currently there is a 95% success rate in survivability of the species planted to date.</p>	Jute matting, guarding, staking and watering with a diluted seasol solution and crystals for each tube stock at the time of planting.


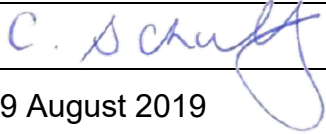
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Reporting date: 1 August 2019 (period September 2018 - August 2019).		Property address: 1025 and 1235 Menangle Rd, Douglas Park			
Management actions	Required completion time and frequency	Action completed (Yes/No)	Actual completion date/s	Description of actions undertaken (including reference to management zones), any variations and the reasons for variation.	Visual observations and other comments (including reasons for non-completion)
7. Retention of dead timber	Ongoing	Yes	Quarterly site visits.	No dead timber (standing or fallen) has been removed and no additional timber has been introduced to the site since commencement of the BBA.	Observations made during maintenance sweeps for all zones during quarterly sites visits.
8. Erosion control	Ongoing	Yes	Quarterly site visits.	No areas identified across the site which currently require any supplementary erosion control or stabilisation.	Observations made during maintenance sweeps for all zones during quarterly sites visits.
9. Retention of rocks	Ongoing	Yes	Quarterly site visits.	No rock removal has occurred on the site since the commencement of the BBA.	Site monitored for rock removal at quarterly site visits to the respective management zones.
10. Control of feral and overabundant native herbivores	Ongoing	Yes	Quarterly site visits.	Minimal feral or overabundant native herbivory observed during site visits. Several common native mammals and bird species observed from the trail cameras installed in proximity to the fox baiting stations (see below).	In accordance with the BBA annual inspection required for species traces. Opportunistic observations made during weed control and maintenance sweeps for all zones during either the annual and/or quarterly site visits.
11. Vertebrate pest management	Ongoing Autumn and Spring	Yes	CPE program completed in spring and autumn each year.	Candid Pest Ejectors (CPEs) with baits and 1080 capsules were installed at two sites, each with trail cameras within the vicinity to record any movements around each CPE.	CPE sites were visited weekly to check CPE bait and capsule and monitor and retrieve camera footage (23/04/2019, 30/04/2019). One fox was observed taking the bait at CPE1 (footage at 14:30-15:30 and at 17:35). Several other foxes observed from trail cameras during April 2019.

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Photo Points, Inspections, Monitoring and Reporting

BioBank Site Annual Report					
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Reporting date: 1 August 2019 (period September 2018 - August 2019).		Property address: 1025 and 1235 Menangle Rd, Douglas Park			
Management actions	Required completion time and frequency	Action completed (Yes/No)	Actual completion date/s	Description of actions undertaken (including reference to management zones), any variations and the reasons for variation.	Visual observations and other comments (including reasons for non-completion)
					On 30 th April both CPEs and trail cameras were removed from site as per the LLS spring fox and wild dog baiting program.
12. Nutrient control	Ongoing	Yes	Quarterly site visits.	N/A	No fertilizers (except for diluted seasol for the seedlings) have been used on the site since the commencement of the BBA.
13. Control of exotic fish species	N/A	N/A	N/A	N/A	No action required under the BBA
14. Maintenance or reintroduction of natural flow regimes	Ongoing	Yes	Ongoing	An artificial rock structure was installed (i.e. rock crossing) over the management trail to allow ongoing 4WD vehicle access for weeding and planting in MZ1 east. The rock crossing will not impede water flow within the tributary.	Natural flow regimes are maintained on the site in accordance with the BBA
Incident or event that has adverse effect on biodiversity values on biobank site					
Incident or event including adverse impacts (e.g. natural events)			Action taken and proposed recommended actions		
			No incidents or events recorded during this reporting period		
Records submitted with this report					
<input checked="" type="checkbox"/> Photographs taken at the photo points set in the BioBanking agreement – see attached					
<input checked="" type="checkbox"/> Results of the inspections required to be conducted in item 1.3 of annexure D to the BioBanking agreement – see attached					
<input checked="" type="checkbox"/> Results of any monitoring, inspections, surveys required in Annexures C and D to the BioBanking agreement – see attached					



BioBanking Agreement 382 - Annual Report (September 2018 to August 2019)
Photo Points, Inspections, Monitoring and Reporting

Signature and certification	
I hereby declare that the information supplied in this report is accurate and complies with the reporting requirements under item 2 of the Annexure D to the BioBanking agreement Note: If the land that forms the biobank site is owned by multiple persons, each landowner must sign this annual report	
Signed: 	Signed:  for Endeavour Coal Pty Limited
Date: 8 August 2019	Date: 29 August 2019

2. Photo Points

Location of Photopoints					
Projected Coordinate System: GDA 94, MGA – Zone 56					
Photopoint Ref.	Easting	Northing	Feature	Direction of Photo	Comment (Date)
PP1	285862	6215244	Weed control and boundary fence	NE/NW	1 Star Picket, flagged
PP2	284670	6214464	Weed control and boundary fence	SE/NW	1 Star Picket, flagged
PP3	284753	6214555	Revegetation CPW Zone 1	N/S	1 Star Picket, flagged
PP4	284780	6214738	NA	NA	GPS was showing photopoint on rail easement - deleted
PP5	284810	6214720	Revegetation CPW Zone 1	E/W	1 Star Picket, flagged
PP6	284930	6214751	Cumberland Plain Woodland Zone 2	N/S	1 Star Picket, flagged
PP7	285161	6214854	Grey Myrtle Dry Rainforest edge	SE	New Photopoint established approximately 30m east of original GPS location to improve accessibility. 1 Star Picket, flagged
PP8	285353	6214845	NA	NA	GPS was showing photopoint was inaccessible on edge of gorge - deleted
PP9	285412	6215024	Cumberland Plain Woodland Zone 2	NE/NW	1 Star Picket, flagged
PP10	286216	6215177	Riparian Scrub edge	E/W	New Photopoint established approximately 100m north of original GPS location to improve accessibility. 1 Star Picket, flagged
PP11	286265	6215312	Shale Sandstone	E/W	1 Star Picket, flagged

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PP#	Direction	25 March 2019	March 2020	March 2021
PP1	NE			
PP1	NW			

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PP2	SE			
PP2	NW			
PP3	N			

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PP3	S			
PP5	E			
PP5	W			

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PP6	N			
PP6	S			
PP7	SE			

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PP9	NE			
PP9	NW			
PP10	SE			

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PP10	NW			
PP11	E			
PP11	W			

3. Results of the inspections required by the BioBanking Agreement

1. *Percentage of ground cover present on the biobank site for the purpose of item 1.1 of Section 1 of Annexure C* (reporting - 12 monthly) – Implementation of stock exclusion (using existing fencing) prior commencement of the BBA has allowed for groundcover to regenerate across all management zones (personnel observation by Rob Porter).
2. *Number of stock and date/s when the stock have entered the management zones of the biobank site* (reporting - 6 monthly) – No evidence of stock on the site since monitoring under the BBA commenced in March 2019.
3. *Physical condition of fencing and gates to ensure they are maintained to the standard listed in Annexure D section 1.3 of the BBA:*
 - a. Currently maintained to the standard to exclude stock from the site on the eastern and northern boundaries. Fencing is in poor condition on southern/western boundary and is to be replaced (week commencing 5 August, 2019) and inspected annually (last inspected 10/04/2019).
 - b. Currently maintained to a standard to control human disturbance on the eastern and northern boundaries. Fencing is in poor condition on southern/western boundary and is to be replaced (week commencing 5 August 2019) and inspected annually (last inspected 10/04/2019).
 - c. Currently maintained to a standard to control feral or overabundant herbivores and/or vertebrate pests and inspected annually last (inspected 10/04/2019) – Minimal feral or overabundant native herbivory observed in all management zones to date.
4. *Records of any human disturbance on the biobank site* – (reporting 6 monthly) – Nil human disturbance observed at the site (inspected on 21/03/2019, next inspection due in late-August 2019).
5. *Evidence of erosion* – (reporting 6 monthly) - No areas identified across the management zones which currently require any supplementary erosion control or stabilisation (inspected on 21/03/2019). Next inspection scheduled for late-August, 2019).
6. *Evidence of Waste* – (reporting 6 monthly) – No evidence of waste was observed during the quarterly site visit on 21/03/2019. Next inspection scheduled for late-August, 2019.

4. Landcare Australia Site Visits March, April, May, June and July, 2019

Landcare Australia site visit 21st, 25th March & 2nd April, 2019 – Rob Porter, Lisa Bulmer.

Site walkover and establishment of photopoints, and including taking required photos taken at each photopoint. Biobank signs and Canid Pest Ejector (CPE) signs were secured to all gates surrounding the Biobank site. Liaised with adjoining property owners regarding the fox baiting program.

Landcare Australia site visit 10th April 2019 – Rob Porter, Michael Delmenico, Luke Van Der Meer. Commencement of weed management in MZ1 and MZ2, weed sweeps in MZ3 and MZ4. Constructed a creek crossing in preparation for the upcoming planting event.

Landcare Australia site visit 17th April 2019 – Rob Porter, Lisa Bulmer, Luke Van Der Meer, Jake Skinner. Weed management in MZ1 and MZ2 and weeds sweeps in MZ3 and MZ4. Commencement of pest vertebrate management: CPE with bait and 1080 capsule were installed at two sites within the Biobank, each with trail cameras within the vicinity to record any movements around each CPE. CPE sites were visited weekly to check CPE bait and capsule and monitor and retrieve camera footage (23/04/2019, 30/04/2019). On 30th April both CPEs and trail cameras were removed from site.

Landcare Australia site visit 23rd, 24th, 28th, 29th & 30th May 2019 – Rob Porter, Michael Delmenico, Lisa Bulmer, Luke Van Der Meer, Jake Skinner. Works in west MZ1. Preparations for planting involving vegetation slashing and digging holes with augers. Commencement of planting natives involving use of water absorption crystals, jute planting mats and tree guards. Watering plantings with diluted Seasol solution.

Landcare Australia site visit 1st, 2nd, 3rd, 4th and 5th June 2019 – Rob Porter, Michael Delmenico, Luke Van Der Meer, Jake Skinner. Works in west MZ1. Continuation of planting natives involving use of water absorption crystals, jute planting mats and tree guards. Watering plantings with diluted Seasol solution.

Landcare Australia site visit 9th and 23rd July 2019 – Rob Porter, Michael Delmenico, Luke Van Der Meer, Jake Skinner. Works in west MZ1. Continuation of planting natives involving use of water absorption crystals, jute planting mats and tree guards. Watering plantings with diluted Seasol solution.

4.1. Weeds

Template for reporting of monitoring activities		
Management Zone	Date	Observations and assessment of monitoring
MZ 1	10/04/2019 17/04/2019	Treatment of exotic weeds and grasses with herbicide and hand-pulling of weeds undertaken in conjunction with MZ2. Maintenance sweep targeting key weed threats.

MZ 2	10/04/2019 17/04/2019	Treatment of exotic weeds and grasses with herbicide and hand-pulling of weeds undertaken in conjunction with MZ1. Maintenance sweep targeting key weed threats.
MZ 3	10/04/2019 17/04/2019	Maintenance sweep targeting key weed threats.
MZ 4	10/04/2019 17/04/2019	Maintenance sweep targeting key weed threats in accessible sections of this zone.
MZ 5	10/04/2019 17/04/2019	No activity conducted – no access to gorge.

Diary template for weed control management			
Date	Management Zone	Description and type of activity undertaken or observation made	Minor variations (details and reasons)
10/04/2019 17/04/2019	1, 2, 3, 4	<p>Weed control, herbicide & hand pulling of:</p> <ul style="list-style-type: none"> <i>Opuntia stricta</i>, Prickly Pear <i>Lycium ferocissimum</i>, African Boxthorn <i>Rubus fruticosus</i>, Blackberry <i>Verbena rigida</i>, Purpletop <i>Conyza bonariensis</i>, Fleabane <i>Tagetes minuta</i>, Stinking Roger <i>Asparagus asparagoides</i>, Bridal creeper <i>Ligustrum lucidum</i>, Broad-leaf Privet <i>Ligustrum sinense</i>, Narrow-leaf Privet <i>Cirsium vulgare</i>, Spear Thistle <i>Eragrostis curvula</i>, African Lovegrass 	<p>Will need to revisit MZ1 and MZ2 to continue treating the key threat weed species listed. Continue weed sweeps in MZ3 and MZ4.</p> <p>The BBA does not list presences of Prickly Pear onsite. Along with African Boxthorn it is one of the more prevalent invasive weed species identifiable on the site and will require significant follow-up for emergents</p>

4.2. Fire

Template for reporting of monitoring activities		
Management Zone	Date	Observations and assessment of monitoring
1, 2, 3, 4, 5	21/03/2019 10/04/2019 17/04/2019	No evidence of recent fire activity during site visit (Management report suggests no burns reported on the property since 1962).

Diary template for fire management activities			
Date	Management Zone	Description and type of activity undertaken	Minor variations (details and reasons)
21/03/2019	All	No specific fire management activities undertaken except for opportunistic	N/A

10/04/2019 17/04/2019		observation during weeding and fox baiting activities.	
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4.3. Native herbivores

Template for reporting of monitoring activities			
Management Zone	Date	Current level of impact on vegetation This column must record impacts as Negligible, Minimal, Moderate or High	Observations and assessment of monitoring
All	21/03/2019 25/03/2019 10/04/2019 17/04/2019 23/04/2019 30/04/2019	No specific native herbivore management work undertaken except for opportunistic observation during weeding and fox baiting activities.	Trail cameras set up for fox baiting revealed several common native mammal and bird species regularly traverse the site

Diary template for overabundant herbivore management			
Date	Management Zone	Description and type of activity undertaken This column must include details of the overabundant herbivores targeted, control techniques, and numbers controlled.	Minor variations (details and reasons)
21/03/2019 25/03/2019 10/04/2019 17/04/2019 23/04/2019 30/04/2019	All	No specific native herbivore management work undertaken except for opportunistic observation during weeding and fox baiting activities.	N/A

4.4. Vertebrate (feral) pests

Template for reporting of monitoring activities			
Management Zone	Date	Current level of impact on vegetation or threatened fauna species This column must record impacts as Negligible, Minimal, Moderate or High	Observations and assessment of monitoring
All	21/03/2019 25/03/2019 17/04/2019 23/04/2019 30/04/2019	Several common native animal species have been observed on several occasions within the site from general observations and trail cameras installed in April 2019 during the LLS fox and wild dog baiting program.	Natives species observed include: Common Wombat Eastern Grey Kangaroo Swamp Wallaby Superb Lyrebird

MZ3	17/04/2019	Minimal - no threatened native fauna has been observed within the site to date by Landcare Australia. Common species observed may be impacted by the presence of foxes.	One fox was observed taking the bait at CPE1 (footage at 14:30-15:30 and at 17:35).
MZ3	17/04/2019 20/04/2019	Minimal-no threatened native fauna has been observed within the site to date by Landcare Australia. Common species observed may be impacted by the presence of foxes.	One fox was observed near CPE2 (footage at 16:55 on 17 th and at 08:25 on 20 th).
MZ3	23/04/2019	Minimal-no threatened native fauna has been observed within the site to date by Landcare Australia. Common species observed may be impacted by the presence of foxes.	One fox was observed in east MZ3 by Lisa Bulmer when on site.

Diary template for vertebrate pest management			
Date	Management Zone	Description and type of activity undertaken This column must include details of the vertebrate pests targeted, control techniques applied and numbers controlled.	Minor variations (details and reasons)
21/03/2019 25/03/2019 17/04/2019 23/04/2019 30/04/2019	All	Setup for LLS fox and wild dog baiting program including installation of signage, setup of trail cameras and CPEs.	N/A
17/04/2019 23/04/2019 30/04/2019	MZ3	CPE with bait and 1080 capsule were installed in two sites including CPE1 in east MZ3 and CPE2 in central MZ3. Each CPE has a trail camera within its vicinity. Video and photo analysis, and site observations will be used for ongoing monitoring.	At least 1 fox had taken a 1080 capsule bait on 17/04/2019 at CPE1

4.5. Nest boxes

Template for reporting of nestbox monitoring				
Nest box type and location (Easting and Northing)	Date	Evidence of occupation (e.g. scratches, chew marks, whitewash)	Species recorded	Observations and assessment of monitoring (e.g. breeding events occurring? Feral species present?)
271 nest boxes installed across site.	Installed between	N/A	N/A	N/A

BioBanking Agreement 382 - Annual Report (September 2018 to August 2019)
Photo Points, Inspections, Monitoring and Reporting

Refer to separate PDF attachment for location and box type	09/07/2019 and 12/07/2019			
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APPENDIX G: REHABILITATION COST ESTIMATE

Rehabilitation cost estimate provided only for Department of Planning, Industry and Environment (Resources Regulator). The Rehabilitation Cost estimate is commercial in nature. Please contact the Department or Illawarra Metallurgical Coal representative for further information.

APPENDIX H: BSO COMMUNITY COMPLAINTS REPORT FY19

COMPLAINTS REPORT

June 2019

BULLI SEAM OPERATIONS



Bulli Seam Operations - Community Complaints Report

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
	June		No complaints made for the month.	
	May		No complaints made for the month.	
Appin Mine Ventilation Shaft Number 6	April	25/04/2019	Resident contacted the community officer directly by text message at 7.51am regarding noise from Ventilation Shaft 6 through the night and early morning.	The community officer responded to the resident the same day and advised the matter would be followed up on the next business day (tomorrow). The Surface Mechanical Coordinator advised the compressor had not been operating however investigations were continuing. The resident was provided an update on 26 April and indicated he was appreciative of the work being completed and would like an update on investigations next week.
Appin Mine Ventilation Shaft Number 6	April	12/04/2019	Resident contacted the community officer directly by text message at 2.35am regarding noise from Ventilation Shaft 6 through the night and early morning.	The community officer advised the resident the issue was being investigated by return text message at 12.35pm. The compressor previously causing the noise had not been turned on at the site and there was no cause for noise from Ventilation Shaft 6. The resident was provided the outcome the same day and encouraged to keep track of when noise occurs, so investigations could continue as required.
	March	15/03/2019	A resident called the Illawarra Coal Community Call Line at 11.35am to report delivery of a community newsletter to a 'No Junk Mail' household. The resident did not wish to receive this type of mail.	The concern was reported immediately to the Environment team. Planned noise monitoring was completed at the site the night the complaint was received and determined temporary air compressors installed at the site to be the cause of the noise. Noise walls were placed around the compressors and the use of the compressors was limited where possible. New fans are planned to be installed in July which have a lower noise impact. The resident was satisfied with the approach.
	February		No complaints made for the month.	

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
	January		No complaints made for the month.	
Appin Mine Ventilation Shaft Number 6	December	7/12/2018	A resident called the Illawarra Coal Community Officer at 6.15pm on 7 December to advise dust could be seen over Ventilation Shaft Number 6.	The incident was immediately reported to the Appin Site and it was determined a fan swap was occurring at the time. The restart of the fan that occurs as part of this activity stirred up the dormant stone dust which resulted in the short puff of dust from the vent shaft. The resident was provided the outcome of investigation at 6.38pm of the same evening and was satisfied with the result.
	November	27/11/2018	A resident contacted Illawarra Coal via the Community Call Line on 27 November 2018 to request access to the Ventilation Shaft No. 6 Access Road for the purpose of a photoshoot for a trucking company. The resident asked for the access to be provided on 3 December 2018. Illawarra Coal advised it would investigate if this was possible and get back to the resident before 30 November (the end of the week).	The resident was advised by return call on 29 November 2018 that Illawarra Coal was not able to accommodate the request given increased vehicle movements were expected on the Access Road from 3 December. The resident advised they was not satisfied and asked if other dates would be suitable. Illawarra Coal was able to accommodate the request on the afternoon of 29 November, however the resident noted this did not provide sufficient time to arrange the photographer. The resident and Illawarra Coal were unable to agree on a suitable time that met the resident's expectations and the safety and operational needs of Illawarra Coal.
	October		No complaints made for the month.	
	September		No complaints made for the month.	
	August		No complaints made for the month.	
	July		No complaints made for the month.	

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
	June	20/06/2018	A resident contact Illawarra Coal via the Community Call Line at 1pm to advise her phone and internet had been interrupted and believed it was as a result of Appin's mining operations.	The complainant was contacted immediately (1.15pm) and the incident was also investigated by site to confirm Appin mining operations had not been the cause of interruptions to the landholder's phone/internet. The community specialist had informed the landholder that Telstra were digging up the fibre optic cable and this was likely to be the cause of the interruption. The complainant then proceeded to express dissatisfaction about the Company's operations and the proximity of the number 6 ventilation shaft from their property. The landholder advised her family had experienced mine subsidence and other impacts as a result of Illawarra Coal's operations. The Community Specialist confirmed mining had not occurred the area of the landholder's property, and if they experience any issues as a result of the Shaft to notify Illawarra Coal at the time of the event to ensure an investigation and appropriate action could be taken.
	May		No complaints made for the month.	
Appin Mine Ventilation Shaft Number 6	April	27/04/2018	A resident sent a text message to a Community Officer's mobile regarding a grey dust coming from Number 6 Ventilation Shaft.	The complainant was responded to immediately and the incident was reported to the Ventilation Officer and Environment Supervisor. The stone dusting was noticed on the surface by an employee and stopped after calling control. Dust mitigation measures are being investigated along with improved maintenance underground. The complainant expressed concerns about the amount of dust being emitted in the air from the operation of the Ventilation Shaft. The Complainant was advised that the dust was stopped and was satisfied with the action and interested in ongoing dust mitigation.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Mine Ventilation Shaft Number 6	April	14/04/2018	A resident called the Community Officer's mobile regarding a grey dust coming from Number 6 Ventilation Shaft.	The complainant was responded to immediately and incident was reported to the Ventilation Officer and Environment Supervisor. The complaint was investigated and underground conditions and stone dusting along with strong winds resulted in extra dust being blown from the shafts. Dust mitigation measures are being investigated along with improved maintenance underground. The complainant was advised of the investigation and the cause and is concerned that this issue will keep occurring.
Appin West	March	28/03/2018	A resident called the Community Officer's mobile and left a message regarding ongoing noise issues at the Appin West Gas Drainage plant. The Complainant advised the flares were noisy again.	The call directed to the onsite supervisor to investigate the complaint. The complainant was phoned back on 29 March 2018 at 2.00 pm and was advised that the investigation is underway. The onsite supervisor investigated the site and advised the flares on site were running at full capacity and he reduced the capacity to half on the 29 March 2018. The Complainant was advised of the action and was satisfied with the outcome. The Site Supervisor in the future will manage the site to ensure the flares are not running at capacity.
Appin Mine Ventilation Shaft Number 6	March	18/03/2018	A call was made directly to the Community Officer's mobile regarding excess dust being emitted from Number 6 Ventilation Shaft, which was visible from their house. The resident complained about the activities and wanted to understand if any mitigation measures will be undertaken in future.	The complaint was sent to the ventilation officer for investigation. The investigation identified the incident corresponded to recent stone dusting underground. The climate conditions at the time of the complaint were extreme winds and contributed to the dust being visible. Ongoing mitigation measures are being investigated. The complainant was advised of the complaint investigation.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Mine	February	19/02/2018	A call was received via the community call line regarding the owner of a truck company who has driven over a bump in the north bound lane in December 2017 on Hume Highway and ascertained damage to the truck.	The Hume Highway is regularly monitored and the incident was identified prior to receiving the complaint. The appropriate restoration works have been completed and monitoring continues on the Hume Highway. The RMS was advised and consulted with during the restoration works and are satisfied with the outcome. The complainant has been advised of the restoration works and happy that it is complete.
Appin Mine Ventilation Shaft Number 6	January	26/01/2018	Resident called the Community Specialists directly and provided details regarding odour from number 6 Ventilation Shaft. The complainant reported a damp smell and advised it has been occurring for the last couple of days and is particularly bad during easterly winds.	The environmental team investigated the complaint, which identified the damp smell coming from the ventilation shaft. The smell was not deemed offensive or out of the ordinary for a ventilation shaft. Regular monitoring of the ventilation shaft has been scheduled. The community member was advised of the ongoing investigations and was happy it was being recorded.
Appin Mine Ventilation Shaft Number 6	January	10/01/2018	Resident called the community call line regarding an odour coming from the Number 6 Ventilation Shaft. The resident was phoned back the same day by the Community Specialist and were provided details regarding the smell, which was a dam smell and advised it has been occurring for a number of weeks now and is particularly bad during easterly winds.	The environmental team investigated the complaint, which identified the damp smell coming from the ventilation shaft. The smell was not deemed offensive or out of the ordinary for a ventilation shaft. Regular monitoring of the ventilation shaft has been scheduled. The community member was contacted to advise them of our ongoing investigations. They advised they will phone back if the odour becomes worse.
	December		No complaints made for the month.	
	November		No complaints made for the month.	

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin West	October	19/10/2017	Resident called the community call line regarding the ongoing issue of noise from the Appin West Gas Drainage plant. The Complaint advised that the flares seem to be causing the issues.	Community Specialist advised the complainant nothing had changed with the gas plant since it was turned back on. All noise monitoring conducted, including the constant monitoring over a 4 week period, indicated the noise was audible however within consent conditions. Despite this, South32 installed some noise mitigating measures at the plant in light of the concern. The complainant still believed the noise to be of nuisance and would be speaking to local Council. A meeting with complainant has been offered.
Appin Projects	October	16/10/2017	Resident raised an issue during a community meeting regarding odour from the Number 6 Ventilation Shaft. The resident advised the odour from the ventilation shaft was getting much worse over the last five weeks and could notice it from the road.	The incident was referred to the environmental department who have conducted 3 separate sensory assessments of the ventilation shaft over a one week period. After conducting investigations of the odour coming from the Number 6 Ventilation Shaft, the inspection identified a smell which was described as a wet damp smell that was only just noticeable. The smell was not deemed offensive or out of the ordinary for a ventilation shaft. Regular monitoring of the Ventilation shaft has been scheduled. The community member was advised of the Company's investigation and the commitment to regularly monitor the ventilation shaft, who was happy with the outcome.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	October	13/10/2017	Complaint received from landholder regarding the Appin Pipeline Project. The complainant advised during the trenching of the pipeline, a ditch area that was filled with gravel has since expanded leaving a hole beside the resident's driveway.	The complaint was immediately reported to the project team for investigation. The project team investigated the complaint to look at what they can do to rectify the area, noting the previous condition remained compliant with Council regulations. The outcomes of the investigation and rectification work resulted in the installation of a new pipe and headwall under the driveway and backfilling around the pipe to extend the width of the driveway by approximately 1.5m. The complainant was happy with this response and the action taken by the Project team.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	October	9/10/2017	Complaint received from landholder in relation to the Appin Pipeline Project. The complainant advised the condition of the road had potentially caused damage to their car (specifically tyre damage and potential stone chips to the paint).	The complaint was immediately reported to the Project Manager for further investigation. As part of this investigation the team undertook a review of the entire road to assess if further work was required during the interim period. The condition of the road was deemed in good condition and compliant with Wollondilly Shire Council's approved traffic management plan and other project approval requirements i.e. ensuring sediment controls are in place etc. At the time the complaint was received, the Project were in the process of finalising the final road repair scope of work with Council. The Project advised they will commence this work as soon as it is approved to avoid any unnecessary delays. The complainant was advised of this outcome and other steps the Company had taken to reduce impact to local residents such as applying a two-coat spray seal to a 500m stretch of the road and widening it to allow greater room for two cars; reducing water cart movements to avoid the build up of mud on the road; providing residents with 2x car wash vouchers; and providing regular project update letters. An offer was also made to meet with the resident in person - there has been no response to

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	September	28/09/2017	Complaint received from landholder in relation to the Appin Pipeline Project. The complainant noted the condition of Brooks Point Road had potentially caused damage to two of their tyres. No formal request for reimbursement was made.	The complaint was immediately reported to the Project Manager for further investigation. As part of the investigation, Illawarra Coal's community team responded to the call to obtain further details regarding the location of the road where the tyre was believed to be damaged. The Project undertook a full review of the section on the road to identify if any interim improvement work needed to occur. The investigation found the damage to the tyre in the area stated could not solely be because of the Project's operations i.e. there was no potholes in this area or other impacts that could indicate the damage was as a result of the project's activities. The resident was advised of the outcome and appreciated how the project dealt with the matter (investigating the nominated section of road and seeing if interim work was required). The landholder advised they were not seeking for reimbursement of the tyres and could contact Illawarra Coal if they had any further issues.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	September	4/09/2017	Complaint received from a landholder in relation to the Appin Pipeline Project. The resident raised concerns regarding: project trucks believed to be speeding; signage along the roadside after hours (believed to be inadequate); and the effects of dust and mud generated as a result of the Project's activities.	The complaint was immediately reported to the Project for investigation. The resident was advised: a tool box talk had been undertaken at the next shift regarding driving to the conditions; and that speed limits in areas where construction is not present reverts to the Council approved limit of 80km/hr (the resident was unaware of this and thought all vehicles had to travel at 40km/hr for the entire length of the road). Other action taken included installing additional reflective lighting on the concrete barriers (please note that all signage in place before the complaint was received is compliant with the Traffic Management Plan, approved by Wollondilly Shire Council). Lastly, the resident was advised the Project recently reduced the number of water cart movements to avoid pooling of water on the side of the road, and that we are currently investigating options for residents to receive a voucher to have their car washed. A car wash voucher was later provided to all residents of Brooks Point Road (2 per property).
Appin East pit top	August	30/08/2017	Complaint received from a landholder in relation to a planned power outage that occurred on 30 August at Appin East Mine site. The outage caused an electric pump that supplies water to the neighbouring property to cease for a period of 12 hours. The property had access to power during this time, just not water.	The complaint was immediately reported to the community team and the mine site for investigation. Action taken included contacting the resident to advise of the anticipated duration of the outage (12 hours), and apologise for the inconvenience caused. The site were advised that the property manager is to be involved in all future outages so affected residents can be given warning if it is expected to affect their water supply. All affected residents were sent a letter apologising for any inconvenience caused and received a rental reduction on their next payment to compensate for this matter.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	August	23/08/2017	Complaint received from landholder in relation to the Appin Pipeline Project. The resident expressed concern regarding the impacts the project is having on local residents. This included the condition of the road, traffic wait times during construction periods, and the time taken to complete the project.	The complaint was immediately reported to the Project team for investigation. Action taken included responding to the resident within 24 hours to advise water cart movements had been reduced significantly to avoid the build-up of water of the road; minimising the use of traffic lights where possible, and when traffic lights are required, ensuring the hold time is set to a minimal wait time that is safe and complies with the Traffic Management Plan approved by Wollondilly Shire Council; and on Monday 28 August applying a temporary one coat spray seal to a 500 metre section of the road to help improve the road surface until the project is complete and final road restoration work occurs. The resident was advised of the outcomes of the investigation and action taken by the Company.
Appin Projects	August	16/08/2017	Complaint received from landholder in relation to Appin Pipeline Project Resident. The resident was concerned about the condition of the road in particular with the water cart making the road muddy (note – the water cart is in place to help manage dust suppression). The resident also advised they had noticed the Project's work trucks speeding along Brooks Point Road.	The complaint was reported to the project team immediately. A plan has been established where the Project will only water the road once per day during the week and twice on the weekend. This was communicated to the landholder, who was happy with the reduction. The Project manager also spoke to the site in relation to truck drivers speeding on the road. This was brought up in prestart meetings. The resident was pleased with the outcome of the investigation and said they had noticed an improvement in the condition on the road since reducing the water cart movements.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	August	14/08/2017	Complaint received from landholder in relation to the Appin Pipeline Project and use of water cart movements. The resident advised the project were over- watering the road in order to suppress dust in the area and this was causing the road to be wet and muddy in sections. The resident explained this was also a nuisance for locals who were having to regularly clean their cars.	The complaint was immediately reported to the Project team for investigation. Action taken included reducing the amount of water cart movements per day and on weekends. The Project advised they were also investigating an interim solution to the dusty areas of the road (i.e. applying a one coat seal). The resident was advised of this outcome.
Appin Projects	August	10/08/2017	Complaint received from landholder in relation to Appin Pipeline Project's truck movements. Please note the resident advised it was in relation to an event that was caused two weeks ago, (reported to Illawarra Coal on 10 August 2017). The resident advised a truck exiting Northamptondale Road had taken a wide turn onto Brooks Point Road and caused the driver to have to brake and slightly edge off the road to enable the truck to pass in front of them.	The complaint was immediately reported to the Project team. The team advised they had undertaken a toolbox talk session with the truck drivers on 11 August advising them to be mindful of oncoming traffic from Brooks Point Road when exiting Northamptondale Road. The resident was advised of the outcome and is satisfied with the Company's approach to dealing with this matter.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	July	27/07/2017	Complaint received from landholder in relation to Appin Pipeline Project's use of dust suppression. The resident advised the water cart deliveries (used to suppress the dust) were causing areas of Brooks Point Road to overflow with water (particularly in the low point drains). This was resulting in the local resident's cars getting dirty. It was explained to the resident that the water cart movements had increased to assist in managing the dust in the areas where the team are working. The resident was understanding of this and asked if the movements could be reduced over the weekend.	The complaint was immediately reported the Project team. The team advised the extra water cart movements were necessary during periods of high-wind to manage the dust. The team agreed to reduce the water cart operations over the weekend effective immediately. The landholder was satisfied with this result.
Appin Projects	July	20/07/2017	Complaint received from landholder in relation to Appin Pipeline Project's traffic control operations. The landholder advised that the traffic control workers had accessed a portion of his land and erected signage pertaining to traffic control operations without his consent. The landholder also mentioned that some workers had parked in an area that located within his property boundary.	After investigating the location of the traffic control workers, it was deemed they were located within the landholders property boundary. Action taken included immediately removing equipment from the landholder's property and holding a toolbox talk / shift briefing to set up traffic control only within the approved zone (as per the Traffic Management Plan approved by Wollondilly Shire Council). The project also requested all vehicles park within the project compound and not on private access roads. An account of the actions taken by the project team were reported back to the landholder who was happy with the result.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin West	July	18/07/2017	A resident called the community call line regarding the ongoing issue of excessive noise from the Appin West Gas Drainage plant. The complainant felt that the flares were the cause of the noise source.	The Complaint was referred to the project team who advised that the flares were running at the time of the complaint. The investigation is ongoing and noise assessments identified that the flares are under noise regulations at the boundary. The complainant was advised of the noise testing and offered a meeting to discuss the results but has not taken this up.
Appin Projects	July	12/07/2017	Complaint received during a meeting with a landholder and the project team regarding the Appin Pipeline Project and associated work trucks noted to have been speeding along Brooks Point Road. The landholder also mentioned the workers had left rubbish on the nature strip out the front of his property (fruit peels, plastic wrappers).	The project team acted on the complaint and immediately held a tool box talk with all workers regarding a notice not to leave any rubbish on site – all rubbish is to be collected and deposited in the garbage bin at the site office at the end of each day. A tool box talk was also held separately with the truck drivers reinforcing the construction speed limit of 40km / per hour in the construction area along Brooks Point Road, as well as a reminder to be mindful of other passenger vehicles using the road. The landholder was pleased with the Project's quick action
Appin Projects	July	12/07/2017	Complaint received during a meeting with a landholder and the project team regarding the Appin Pipeline Project and associated work trucks believed to be speeding along Brooks Point Road.	The project team acted on the complaint and immediately held a tool box talk with all truck drivers reinforcing the construction speed limit of 40km / per hour in the construction area along Brooks Point Road, as well as a reminder to be mindful of other passenger vehicles using the road. The landholder was pleased with the Project's timely response and action taken.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	July	11/07/2017	Call received from landholder via the community call line regarding odour from Illawarra Coal's operations	The complaint was investigated and identified that the gas plant, had not been operating on that day. However minimal venting was occurring intermittently during the day (from EDL operations), and with the right environmental conditions, may result in the landholder noticing it. The complaint was advised of the outcome and was happy with the investigation.
Appin Pit Top	July	4/07/2017	Resident called an employee to report a speeding mine vehicle heading towards the Appin Pit Top entrance.	Incident reported to Mine Manager who organised the matter to be raised at the next shift briefing, advising the workforce to be mindful of the community when driving to and from site.
Appin West	July	3/07/2017	Resident called the community call line regarding the ongoing issue of excessive noise from the Appin West Gas Drainage Plant. The Complainant advised that the flares seem to be causing the issues.	The Complaint was referred to the project team who advised that the flares were running at the time of the complaint. A site inspection was offered to the complainant of the premises, but he could not attend and advised he would reschedule.
Appin West	June	24/06/2017	Received an email and a call via the community call line from a resident who has advised that the noise from the flares at the Appin West Gas Drainage Plant is very noisy.	Contacted the site regarding the noise and spoke to the site supervisor. This is an ongoing issue and we are looking at what improvements can be made. The noise wall extension will occur over the next week. Illawarra Coal have been in regular contact with the complainant to advise of the work we are doing and continue to do. The complainant understands we are trying to work on the issue.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	June	14/06/2017	Resident called regarding the condition of the road repair work associated with the pipeline project. The resident advised on Thursday 8th June at 4:30pm they drove through the section of road with the traffic lights and moved over onto the muddy section and slipped of the road and hit a pot hole. The resident claimed this damaged the rim and it was required to be repaired.	The complaint was reported to the Project Manager, and since the incident the road has been dressed with road base to cover the muddy sections. The complainant has been advised that we would not reimburse for the rim and we are concentrating on making improvements to the road. He was happy with this.
Appin Projects	June	14/06/2017	Resident called the Community Call Line on 14 June regarding the condition of the road repair work associated with the Appin Pipeline Project. The complainant noted the condition of the road had potentially caused the damage to one of her rear tyres (pertaining to the condition of the road on 8 June). No formal request for reimbursement was made.	The complaint was immediately reported to the Project Manager for further investigation. As part of the investigation, Illawarra Coal's community team responded to the call to obtain further details regarding the condition of the road and damage to the residents tyre. In consultation with the landholder and the Project, immediate action was taken to improve the condition of the road including laying and grading road base to cover muddy sections of the road (from a former rainfall event). The resident, after inspecting the additional improvement work, was satisfied with the outcome of the investigation.
Appin West	June	14/06/2017	Resident called the community call line regarding the ongoing issue of excessive noise from the Appin West Gas Drainage plant. The Complaint advised that the flares seem to be causing the issues.	The Complaint was referred to the project team who advised that the flares were running at the time of the complaint. Noise walls are to be extended over the next two weeks. The complainant was advised we will monitor it. The complainant advised it was ok the next day. We continue to work with the complainant on ensuring we can overcome this issue.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin Projects	June	9/06/2017	Resident called regarding the condition of the road repair work. The resident was concerned that the rain had made everything muddy and this was very slippery and was unsafe. The resident also advised people she knew had damaged their tyres as a result of the road.	The complaint was reported to the Project Manager who advised the road would be dressed with road base to cover the muddy areas. The complainant since has been happy with the road condition.
Appin Projects	May	29/05/2017	Resident complaint regarding Appin Pipeline Project and associated road repair work being undertaken which resulted in a resident's personal blue metal stockpile being mistakenly removed and used with the project's road upgrade.	The complaint was reported to the Project Manager and the blue metal material replaced within one day. The Manager apologised for the misunderstanding. The resident was satisfied with the outcome.
Appin Projects	May	24/05/2017	Resident complaint regarding Appin Pipeline Project and associated traffic impacts which prevented them from getting through the area (due to narrow width of road).	The complaint was immediately reported to the Project Manager and the narrow section of road was widened to ensure the resident's truck could safely pass through the area. The Project Manager and Community Specialist also visited the resident to discuss updates regarding the project and any impacts the traffic works may be having on his business.
Appin West	May	23/05/2017	Resident complaint and noise from the flares at the Appin West Gas Drainage Plant. It was noisy 22/5/17, including the night, and continues to be loud	Ongoing investigation completed and noise was determined to be within regulations. Compressor 4 was off during the time of the complaint. While no action is necessary a noise wall will be installed at the flares and compressors and noise attenuation of compressor 4 progressed. This outcome was provided to the resident and a meeting is scheduled for 1 June to close out the issue.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin West	May	19/05/2017	Resident complaint about noise from the Appin West Gas Drainage Plant. The noise was audible at 2.30am. Also note that the gas works on the other side is making a ringing noise	Noise logger data from a property 660m away was reviewed and noise determined to be within regulatory requirements. Ongoing investigations with a noise concern from a nearby resident have resulted in identification of a noisy compressor at the plant. Investigations are underway to fix the issue and install appropriate noise attenuation to appease the resident. This compressor was on at the time of this complaint and has since been tagged out and will remain non-operational until the end of the following week. Resident was advised to contact Jemena Gas Networks in regards to the ringing noise.
Appin West	May	19/05/2017	Resident complaint about continuing noise from the Appin West Gas Drainage Plant. It was quiet Monday - Tuesday before becoming loud on Wednesday. The noise is loud and constant.	Advised the investigation is continuing and reiterated the noise logger at the property is assisting to determine the main source of the noise. Issue raised to HSE Lead as a priority.
Appin Projects	May	19/05/2017	Resident complaint regarding condition of section of Brooks Point Road where works are underway as part of the Appin Pipeline Project.	The complaint was immediately reported to the Project Manager and the area of the road (identified) was repaired within the hour by adding and compacting additional road base. The resident was satisfied with these outcomes and the quick response from the Project team.
Appin Projects	May	8/05/2017	Resident complaint regarding condition of section of Brooks Point Road where works are underway as part of the Appin Pipeline Project.	The complaint was immediately reported to the Project Manager and the area of the road (identified) was repaired within one hour by adding and compacting additional road base. The resident also suggested additional signage of 'share the road' be displayed along the road - this was also actioned within one day. The resident was satisfied with these outcomes.

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
Appin West	May	5/05/2017	<p>Resident complaint about noise from the Appin West Gas Drainage Plant. The noise was loud at the time of the call and resident believed Illawarra was moving too slow on resolving the issue.</p> <p>Further call made 6.5.2017 when the noise was audible in the home at 5.40am.</p>	Noise monitoring from the last 2 complaints showed noise to be well within legal requirements however investigations were continuing. Supervisor Energy and Surface Gas took a field visit to determine the noise - air compressor. This is being investigated further. Handheld monitoring will be conducted as planned 9/5 at 6pm during which the air compressors will be turned on and off. A static monitor will be in the field by the end of the week
Appin West	April	30/04/2017	Resident complained about further noise from the Appin West flares. The noise is still very loud. Requested a static noise monitor be placed at the property	Investigation continuing under various operating scenarios. The plant operated fairly consistently over the weekend however the EDL power generation was higher on Friday and Sunday nights. Handheld monitoring to be conducted one evening. A static monitor will be placed in the field when it becomes available
Processing & Logistics	April	25/04/2017	A rock or piece of coal hit driver's windscreen when driving on Appin Road from a coal truck driving in the opposite direction	Reported to Processing and Logistics to investigate incident, which showed a coal truck was in the area at the time of incident.
Appin West	April	20/04/2017	Resident complaint about increasing noise from the Appin West flares over the last month. The noise can be heard inside the house and is keeping them awake	Initial investigations into reliability issues with the flares and the operational fire rate resulted in the flare fire rate being reduced the following day. It was noted the noise did not change after the reduction and further investigation identified the two large pumps were attributing to the noise. The pumps were switched out for two smaller pumps which did reduce the noise.
	March		No complaints made for the month.	
	February		No complaints made for the month.	

Operation/Project	Month	Date	Nature of Complaint	Actions / Follow Up
	January		No complaints made for the month.	
Appin Mine Ventilation Shaft Number 6	December	29/12/2016	Resident complaint about the presence of stone dust at the property emitted from ventilation shaft number 6 during planned works 27/12/2016.	Event reported and investigated
Appin Mine Ventilation Shaft Number 6	December	27/12/2016	Resident complained about dust being emitted from ventilation shaft number 6 during planned works	Event reported and investigated. Real time dust monitoring results were reviewed and discussed with the landowner. Relevant government agencies were notified of the concern.
Ventilation Shaft 3	December	21/12/2016	Resident complained about dust being emitted from ventilation shaft number 3 during a testing period	The matter was rectified by notifying the site, discussing with the landholder, subsequently the dust had stopped.

APPENDIX I: BSO EPBC APPROVAL 2010/5350 COMPLIANCE REPORT

Note: Annual report is under revision to address departmental feedback. Once finalised, the revised report will be uploaded to the S32 website.



Bulli Seam Operations Annual Compliance Report – August 2019 (EPBC 2010/5350)

Date of submission: 14 August 2019

South32 Website Upload Request Date: 14 August 2019

Abbreviations:

DOtEE – Federal Department of the Environment & Energy

DOPE – NSW Department of Planning and the Environment

OEH – NSW Office of Environment and Heritage

CCL – Consolidated Coal Lease

UOW – University of Wollongong

EPBC – Environment Protection and Biodiversity Conservation

ACARP – Australian Coal Association Research Program

IMC – Illawarra Metallurgical Coal

In accordance with condition 14 of the EPBC approval (2010/5350) within three months of every 12 month anniversary of the commencement of the action, the person taking the action must publish a report on their website addressing compliance with each of the conditions of this approval, including implementation of any management plans as specified in the conditions. Documentary evidence providing proof of the date of publication and non-compliance with any of the conditions of this approval must be provided to the department at the same time as the compliance report is published.

Condition	Condition Summary	Status	Compliant Y/N
1	<u>Persoonia Hirsuta</u> Approval holder must legally secure the approved offset area for conservation for the duration of the EPBC approval.	Proposed offset area submitted to DOtEE in the Persoonia hirsuta Offset Management Plan. Application submitted on 26 Nov 2013 to amend CCL724 via a s238 Condition under the Mining Act 1992 to legally secure a Persoonia Offset Area at West Cliff Mine as required by our Bulli Seam Operations EPBC Approval (2010/5350). The Minister for Resources and Energy amended CCL 724 on 23 March 2014.	Yes



Condition	Condition Summary	Status	Compliant Y/N
2	<p><u>Persoonia Hirsuta</u></p> <p>Develop a management plan for the <i>Persoonia hirsuta</i> offset area.</p> <p>Annual monitoring requirements and provide results of the monitoring to the Dept within a timeframe.</p> <p>No clearing of Stage 4 emplacement area permitted until the Offset MP has been approved by the Minister.</p>	<p>Persoonia management plan was submitted to DOtEE prior to the 31st December 2012 and approved on 22 November 2013 (ref 2013/10882). The latest revision (version 8) was approved April 2019. Plan is available on our website. https://www.south32.net/docs/default-source/illawarra-coal-bulli-seam-operations/management-plans/epbc-approval/bulli-seam-operations-project-hirsuta-offset-management-plan.pdf?sfvrsn=c3d12502_15</p> <p>Persoonia hirsuta Condition Reports submitted as required in 2013, 2014, 2015 (submitted late), 2016, 2017 and 2018.</p> <p>Clearing for Stage 4 coal-wash has not yet been undertaken.</p>	<p>Yes - 2015</p> <p>Persoonia</p> <p>Condition Report submitted late.</p>
3	<p><u>Persoonia Hirsuta</u></p> <p>Engage a suitably qualified expert to undertake targeted research to inform conservation activities. Make research publicly available.</p>	<p>IMC received an extension to the deadline for finalising and reporting the research to 30 June 2021.</p> <p>The research strategy is included within the approved Offset MP (see link above).</p>	<p>Yes</p>
4	<p><u>Shale/Sandstone Transition Forest</u></p> <p>Implement the approved SSTF Offset MP.</p> <p>Legally secure the offset for long term conservation.</p>	<p>In 2012, IC provided an offset management plan as well as ecological survey information to comply with these conditions. The plan was approved by the Department of the Environment & Energy (DOtEE) in June 2013. In 2014, IC</p>	<p>Yes</p>



Condition	Condition Summary	Status	Compliant Y/N
		<p>requested an extension to the deadline to have the offset secured in perpetuity. DOfEE granted an additional 18 months, making the deadline March 2016.</p> <p>In October 2015, IC made an application to NSW Office of Environment & Heritage (OEH) to have the SSTF offset secured via a BioBanking Agreement under Part 7A Division 2 of the <i>Threatened Species Conservation Act 1995</i>. The BioBanking Agreement was finalised and executed on 1st February 2017.</p>	
5	<p><u>Shale/Sandstone Transition Forest</u></p> <p>Provide a management plan for shale/sandstone transition forest.</p>	<p>Management plan submitted and approved on 7th June 2013. The revised Plan was updated and approved on 2nd September 2014.</p> <p>The Management Plan was updated in 2018 and re-submitted to the Department to reflect the new offset mechanism (BioBanking). Condition 5A was added to the EPBC approval in May 2018:</p> <div> <p>Conditions attached to the approval</p> <p>5A If the Shale Sandstone Transition Forest is legally secured as a registered NSW BioBanking site, the management plan developed under the NSW BioBanking Agreement for that site is an Offset Management Plan for the purposes of Condition 4. The annual reporting required under that scheme may be provided to the department in place of the reports containing monitoring results required at Condition 5c, on the proviso that all measures specified in Condition 5 are covered.</p> </div> <p>The 2017/18 and 2018/19 SSTF monitoring was conducted under the requirements of the Biobanking Agreement. The annual monitoring report for 2017/18 was provided to DOfEE on 31 May 2018 which is later than “30 days of every 12-month anniversary of the date the Offset is protected in perpetuity” (technically required by March 2018 as a requirement of Condition 5c). S32IC delayed submission of the report until the DOfEE decision to revise Condition 5. S32IC received the Department’s decision May 2018.</p> <p>The 2019 annual report will be completed in accordance with the BioBanking</p>	Yes



Condition	Condition Summary	Status	Compliant Y/N
		Agreement and will be provided to the DOfEE in Aug 2019 once completed.	
6	<u>Coal Wash Emplacement Staging and Rehabilitation Plan</u> Develop a Coal Wash Emplacement Staging and Rehabilitation Plan for stage 4 coal wash emplacement area. Submission of rehabilitation monitoring results	The West Cliff Coal Wash Emplacement Area Management Plan (available on our website) incorporates the requirements of both the EPBC Act approval and NSW EP&A Act. The latest version of the Plan was approved by DOfEE on 18 th Aug 2017. 2017/18 Results were provided in the Annual Review which is published on our website. A link to the 2018 report was provided by email to DOfEE on 28 th Sept 2018 meaning the reporting of monitoring results was not within the 30 days of every 12-month anniversary of the implementation date of the Plan (Condition 6f).	No
7	<u>Southern Brown Bandicoot and Broad Headed Snake Management Plan or Plans</u> Develop a Southern Brown Bandicoot and Broad Headed Snake conservation management plan or plans.	Draft Plans completed and submitted to DOfEE on the 15 th May 2013. Plans revised following comments from DOfEE and OEH. Final Plans re-submitted to DOfEE and OEH on 29 April 2014. Plans approved on the 28 May 2014. The Plans were revised in 2016 and resubmitted to DOfEE for approval. The revised Southern Brown Bandicoot Plan was approved November 2017. The revised Broad-headed Snake Plan was approved 17 th Jan 2019. The current Plans are available on the S32IC website.	Yes
8	<u>Surface and Ground Water Quality Monitoring and Adaptive Management Plan</u> Develop a Surface and Ground Water Quality Monitoring and Adaptive Management Plan for species listed in the EPBC Act.	Original Plan submitted on the 30 th September 2012 to DOfEE. Plan was approved on 3 July 2014. The Plan was revised and submitted to DOfEE on 29 th June 2017; The latest version was approved on 29 August 2018. Current Plan is available on the S32IC website.	Yes
9	<u>Mine Closure Environmental Management Plan</u> Develop a mine closure plan 3 years prior to closure for	Plan not yet submitted. To be submitted in the mine closure plan.	Yes



Condition	Condition Summary	Status	Compliant Y/N
	EPBC Act listed species.		
10	<u>Mine Closure Environmental Management Plan</u> Management for EPBC listed bats through the decommissioning of mining equipment.	Plan not yet submitted. To be submitted in the mine closure plan.	Yes
11	<u>Shapefiles</u> Provide offset area shapefiles to the DOE.	Shapefiles provided on 26 November 2013.	Yes
12	<u>Notification of Actual Date of Commencement</u> Notification date of commencement to be supplied to DSEWPaC.	Letter sent to DOtEE 31 May 2012.	Yes
13	<u>Publication Requirements</u> publish all management plans, reports, strategies or agreements with the Department	Undertaken as required. See website.	Yes
14	<u>Compliance Report</u> Publish a report on website addressing compliance with each of the conditions of this approval.	This compliance report meets this condition. The 2013, 14, 15,16,17 and 18 reports were submitted and are available on our website. The 2013 compliance report was submitted five days after the due date required by the condition. This was found to be non-compliant due to late submission of the compliance report. All other reports have been submitted on time.	Yes – See comments regarding the 2013 report.
15	<u>Accurate Records Must be Maintained</u> Maintain accurate records substantiating all activities associated with or relevant to the conditions of approval.	Documents are maintained in the IMC controlled document registers.	Yes
16	<u>Minister's Approval of the Modification to a Management Plan, Report, Strategy or Agreement</u> Apply to the minister for approval to modify management	Undertaken as required.	Yes



Condition	Condition Summary	Status	Compliant Y/N
	plans, reports, strategies or agreements.		
17	<u>Minister's Modification to a Management Plan, Report, Strategy or Agreement</u> Comply with the minister's request to modify management plans, reports, strategies or agreements.	No requests received from the Minister.	Yes
18	<u>Independent Auditor</u> Commission and pay the full cost for independent environmental auditor of the project.	Independent Environmental Audit was conducted by ERM. The Audit commenced January and completed February 2017; the report was provided to Illawarra Coal on 22 nd March 2017. A copy of the report was provided to DOtEE on 22 March 2017 to satisfy Condition 18 (g). EPBC condition (2) was found to be administratively non-compliant as one of the Annual Persoonia condition-monitoring reports was submitted late (2015 report). EPBC condition (14) was previously found to be non-compliant in the 2013 Independent Environmental Audit due to late submission of the 2013 compliance report (5 days late). This most recent report t is available on the South32 website. The next audit is scheduled for October 2019.	Yes
19	<u>Unsatisfactory Commencement of Action</u> If work has not commenced within 5 years of approval, written approval needs to be obtained from the minister.	Work commenced 15 th May 2012 as per date of commencement letter sent to Department of the Environment.	Yes

APPENDIX J: BSO PROJECT APPROVAL COMPLIANCE REPORT

Schedule 2 Administrative Conditions		
Condition	Condition Summary	Status
1	<u>Obligation to Minimise Harm to the Environment</u> Prevent and/or minimise any harm to the environment.	Management Plans developed and implemented to minimise harm to the environment.
2	<u>Terms of Approval</u> Carry out projects in accordance with the EA, Statement of Commitments, PPR and conditions of this approval.	Management Plans and monitoring developed to meet EA, Statement of Commitments, PPR and conditions of this approval.
3	<u>Terms of Approval</u> If there is any inconsistency between the above documents, the more recent document shall prevail to the extent of the inconsistency. However, the conditions of this approval shall prevail to the extent of any inconsistency.	Not triggered during the Reporting Period.
4	<u>Terms of Approval</u> Comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of: (a) any strategies, plans, programs, reviews, audits, reports or correspondence that are submitted in accordance with this approval; and (b) The implementation of any actions or measures contained in these documents.	Requirements from the Secretary are included in the Management Plans.
5	<u>Limits on Approval – Mining Operations</u> Carry out mining operations on the site until 31 December 2041.	Mining operations were undertaken during the reporting period. The cessation date has not been triggered.
6	<u>Limits on Approval – Coal Extraction and Production</u> Ensure that no more than 10.5 million tonnes of ROM coal is extracted from the site in a financial year, or transport more than 9.3 million tonnes of product coal from the site in a financial year.	Coal extraction and transportation was below the limits as specified in the approval during the reporting period.
6A	<u>Limits on Approval – Appin Ventilation Shaft No.6</u> Operate Appin Ventilation Shaft No. 6 until 31 December 2041, unless otherwise agreed by the Secretary.	Ventilation occurred during the reporting period. The cessation date has not been triggered.
7	<u>Limits on Approval – Hours of Operation</u> Undertake mining operations and mine ventilation activities 24 hours a day, 7 days a week.	Mining operations and construction are in accordance with hours of operation.
7A	<u>Limits on Approval – Hours of Operation</u> Comply with the construction and operating hours listed in Table 1A for the Appin Ventilation Shaft No.6,	

8	<p><u>Surrender of Consents and Approval</u></p> <p>Surrender all existing development consents and project approvals for mining operations relied on by the Proponent for the site (other than this approval) in accordance with Sections 75YA and 104A of the EP&A Act.</p>	<p>Letters sent on 29 July 2014 to DoPE and 1 Aug 2014 to WSC advising that Illawarra Coal Holdings Pty Ltd surrenders all existing development consents and project approvals for mining (including Wollondilly Shire Council approvals for: Shaft and Electrical Substation 22 January 1972; Appin Mine 22 February 1972; West Cliff Mine 17 April 1975; West Cliff Extended 3 September 1986; Washing of Appin Coal at West Cliff 25 March 1997) operations relied on by the Proponent for the site (other than the Bulli Seam Operations Approval), subject to and in accordance with the regulations.</p> <p>A notice of Modification under Section 75W of the Environmental Planning and Assessment Act 1979 28 October 2016 incorporated the VS#6 Approval requirements into the BSO Approval.</p>
9	<p><u>Surrender of Consents and Approval</u></p> <p>Prior to the surrender of these consents and/or approvals, the conditions of this approval (including any notes) shall prevail to the extent of any inconsistency with the conditions of these consents and/or approvals.</p>	<p>Conditions transferred to updated management plans.</p>
10	<p><u>Structural Adequacy</u></p> <p>Ensure all new buildings and structures, and any alterations or additions to existing buildings and structure that are part of the project are constructed in accordance with the relevant requirements of the BCA and any additional requirements of the MSB where the building or structure is located on land within declared Mine Subsidence Districts.</p>	<p>New buildings and structures were project managed by the engineering team to the relevant building codes.</p>
11	<p><u>Demolition</u></p> <p>Ensure that all demolition work is carried out in accordance with <i>Australian Standard AS 2601-2001: The Demolition of Structures</i>, or its latest version.</p>	<p>Demolition carried out in the reporting period was undertaken to the required standard.</p>
12	<p><u>Operation of Plant and Equipment</u></p> <p>Ensure that all plant and equipment used at the site is maintained in a proper and efficient condition and is operated in a proper and efficient manner.</p>	<p>Operations are conducted in accordance with approved management plans.</p> <p>Daily, weekly and monthly inspections of plant, equipment and site areas are conducted. This includes a number of system generated maintenance work orders. Regular site environmental inspections are undertaken to address inspections for leaking machinery and equipment.</p> <p>Mine machinery and equipment are maintained and serviced accordingly.</p> <p>Non-compliance with this condition was identified on two occasions:</p>

- ferric chloride spill into the Georges River from Appin East, and
 - unbunded flocculant tank at Appin North.
- Details of these non-compliances are provided in Section 11.

13	<u>Staged Submission of Strategies, Plans or Programs</u>	Management Plans submitted as required.
	Submit any strategies, plans or programs required by this approval on a progressive basis.	

14	<u>Strategic Biodiversity Offsets</u>	Biodiversity offset strategy is in place.
	Provide a biodiversity offset pursuant to this approval (including any biodiversity offset that is required under the conditions of a subordinate approval issued in accordance with this approval), the Secretary may, in consultation with OEHL, accept in satisfaction of the requirement for the biodiversity offset, the provision of land that has conservation values which exceed the conservation values required to meet the relevant offsetting requirement.	

Schedule 3 – Specific Environmental Conditions – Underground Mining

Condition	Condition Summary	Status/Other Documents
1.	<u>Subsidence – Performance Measures – Natural and Heritage Features, etc.</u> Ensure that the project does not cause any exceedances of the performance measures.	For all observed impacts, the appropriate TARPs were applied, actions implemented and key stakeholders notified as required by the approved Subsidence Management Plan and Extraction Plan. See Section 6.15 of this AR for summary of the predicted vs observed impacts.
2.	<u>Offsets</u> Provide a suitable offset to compensate for the impact or environmental consequence.	Condition not triggered during Reporting Period.
3.	<u>Performance Measures – Built Features</u> Ensure that the project does not cause any exceedances of performance measure.	For all observed impacts, the appropriate TARPs were applied, actions implemented and key stakeholders notified as required by the approved Subsidence Management Plan and Extraction Plan. See Section 6.15 of this AR for summary of the predicted vs observed impacts.
4.	<u>Performance Measures – Built Features</u> Any dispute between the Proponent and the owner of any built feature over the interpretation is to be settled by the Secretary	For all observed impacts, the appropriate TARPs were applied, actions implemented and key stakeholders notified as required by the approved Subsidence Management Plan and Extraction Plan. See Section 6.15 of this AR for summary of the predicted vs observed impacts.
5.	<u>Extraction Plans</u> Prepare and implement an Extraction Plan for first and second workings within each longwall mining.	SMPs and Extraction Plans prepared as required. Approved plans are available on the regulatory website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents
6.	<u>Extraction Plans</u> Ensure that the management plans include an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval and a detailed description of the measures that would be implemented to remediate predicted impacts.	The Subsidence Management Plans and Extraction Plans are available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents
7.	<u>First Workings</u> Carry out first workings within the project area, other than in accordance with an approved extraction plan.	Link to Subsidence Management Plans and Extraction Plans https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents
8.	<u>Payment of Reasonable Costs</u> Pay all reasonable costs incurred by the Department to engage suitably qualified, experienced and independent	Condition not triggered during Reporting Period.

experts to review the adequacy of any aspect of an Extraction Plan.

9.	<p><u>Improved Understanding and Prediction of Subsidence Impacts</u></p> <p>Prepare and implement a program to improve its prediction and understanding of subsidence impacts (in particular sub-surface impacts and impacts on groundwater resources).</p>	See section 6.15 of this Annual Review for information on the BSO Environmental Research Program.
10.	<p><u>Improved Understanding and Prediction of Environmental Consequences on Significant Natural Features</u></p> <p>Prepare and implement a Research Program and allocate \$1,000,000 in total to this program for expenditure over a period of seven years from the date of the program's approval.</p>	As above.

Schedule 4 – Specific Environmental Conditions – General

Condition	Condition Summary	Status/Other Documents
1.	<p><u>Noise – Noise Impact Assessment Criteria</u></p> <p>Ensure that the noise generated does not exceed the identified criteria at any residence on privately-owned land or on more than 25 percent of any privately-owned land.</p>	Condition 1 has been superseded by Condition 2.
2.	<p><u>Noise – Noise Impact Assessment Criteria</u></p> <p>Ensure noise generated does not exceed the identified criteria at any residence on privately-owned land or on more than 25 percent of any privately-owned land.</p>	Three exceedances of the noise impact assessment criteria were recorded in FY19. See Section 11 for more detail.
2A	<p><u>Construction Noise</u></p> <p>Ensure noise generated by construction relating to the Appin East Mine Safety Gas Management Project is managed</p>	No activities relating to this project were conducted during this reporting period.
2B	<p><u>Construction Noise</u></p> <p>Ensure noise generated by construction relating to the Appin Ventilation Shaft No. 6 does not exceed the criteria in Table 2A.</p>	No construction activities relating to this project were conducted during this reporting period.
3.	<p><u>Noise Mitigation</u></p> <p>Implement noise mitigation measures upon receiving written request from identified residents.</p>	Noise barriers were erected during the reporting period at Ventilation Shaft 6 around temporary compressors after community complaint. Noise levels were within compliance.
4.	<p><u>Operating Conditions</u></p> <p>The Proponent shall:</p> <p>(a) implement best management practice, including all reasonable and feasible noise mitigation measures, to minimise the construction, operational and road traffic noise generated by the project;</p> <p>(b) operate a comprehensive noise management system on site that uses real-time noise monitoring data for mining</p>	<p>Best practice measures and the monitoring program are detailed in the Noise Management Plan. The plan is available on the website:</p> <p>https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.</p>

operations and the implementation of noise mitigation measures to ensure compliance with the relevant conditions of this approval; and

(c) regularly assess the real-time noise monitoring to ensure compliance with the relevant conditions of this approval, to the satisfaction of the Secretary.

5.	<p><u>Noise Management Plan</u> Prepare and implement a Noise Management Plan.</p>	<p>The Noise Management Plan has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents. The requirements of the plan are being implemented.</p>
6.	<p><u>Road Traffic Noise Mitigation</u> If after the end of June 2013, road traffic noise generated by the project (including employee vehicles) results in an exceedance by more than 2 dB(A) of the NSW criteria for road traffic noise on Douglas Park Drive or Macarthur Road at any residence on privately-owned land, then the Proponent shall, upon receiving a written request from the landowner, implement reasonable and feasible noise mitigation measures (such as double-glazing, insulation, and/or air conditioning) at the residence in consultation with the landowner. If within 3 months of receiving this request from the landowner, the Proponent and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.</p>	<p>Condition not triggered during Reporting Period.</p>
7.	<p><u>Air Quality & Greenhouse Gas – Odour</u> Ensure that no offensive odours are emitted from the site.</p>	<p>Issues regarding odour have been raised by two residents in the vicinity of Ventilation Shaft 6 during community consultation during the reporting period. Odour has not been identified as a wider community concern.</p>
8.	<p><u>Greenhouse Gas Emissions</u> Implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the site.</p>	<p>The Air Quality and Greenhouse Gas Management Plan has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents. See Section 6.17 for information on the decarbonisation program.</p>
9.	<p><u>Air Quality Criteria</u> Ensure all reasonable and feasible avoidance and mitigation measures are employed so that the particulate emissions generated by the project do not exceed the criteria.</p>	<p>Air quality criteria were achieved during the reporting period. Air quality data is reported on the South32 website at: https://www.south32.net/our-</p>

10.	<p><u>Air Quality Acquisition Criteria</u></p> <p>If the particulate matter emissions generated by the project exceed the criteria in Tables 7, 8 and 9 at any residence on privately-owned land or on more than 25 percent of any privately owned land, then upon receiving a written request for acquisition from the landowner the Proponent shall acquire the land in accordance with the procedures in Conditions 5 - 6 of Schedule 5.</p>	Condition not triggered during Reporting Period.
11.	<p><u>Operating Conditions</u></p> <p>Implement best practice air quality management on site, including all reasonable and feasible measures to minimise the off-site odour, fume and dust emissions generated by the project, including from any spontaneous combustion on site.</p>	<p>Best practice measures are detailed in the Air Quality and Greenhouse Gas Management Plan. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents. The requirements of the plan are being implemented.</p>
12.	<p><u>Air Quality & Greenhouse Gas Management Plan</u></p> <p>Prepare and implement a detailed Air Quality & Greenhouse Gas Management Plan.</p>	<p>The Air Quality and Greenhouse Gas Management Plan has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents. The requirements of the plan are being implemented.</p>
13.	<p><u>Meteorological Monitoring</u></p> <p>Ensure that there is a suitable meteorological station operating in the vicinity of the site.</p>	Weather station installed at Appin North, Appin West and Ventilation Shaft No. 6 site.
14.	<p><u>Compensatory Water Supply</u></p> <p>Provide a compensatory water supply to any owner of privately-owned land whose water supply is adversely impacted (other than an impact that is negligible) as a result of the project.</p>	Water supplied as per the management plan.
15.	<p><u>Surface Water Discharge</u></p> <p>Ensure all surface water discharges from the site (including from the Brennans Creek Dam) comply with the discharge limits (both volume and quality) set for the project in any EPL.</p>	Exceedances of water quality criteria occurred during the reporting period. See Section 11 for details.
16.	<p><u>Surface Water Management Plan</u></p> <p>Prepare and implement a Surface Water Management Plan.</p>	<p>The Surface Water Management Plan has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents. The requirements of the plan are being implemented.</p>

17.	<p><u>West Cliff Coal Wash Emplacement Area – West Cliff Coal Wash Emplacement Area Management Plan</u></p> <p>Prepare and implement a West Cliff Coal Wash Emplacement Area Management Plan.</p>	<p>The West Cliff Coal Wash Area Management Plan has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents. The requirements of the plan are being implemented.</p>
18.	<p><u>West Cliff Coal Wash Emplacement Area Biodiversity Offset Strategy</u></p> <p>Provide a suitable biodiversity offset strategy to compensate for the impacts of Stage 4 of the West Cliff Coal Wash Emplacement Area.</p>	<p>Throughout the period from 2013-2016, S32IMC undertook numerous meetings and held discussions with senior officers of the Department of Environment and Planning, Office of Environment and Heritage, relevant Ministerial Offices and Water NSW in relation to the suitability of the proposed offsets.</p> <p>In March 2016, the final Strategic Biodiversity Offset was submitted to the Department of Planning and Environment for approval. The final Strategy was endorsed by OEH.</p>
19.	<p><u>West Cliff Coal Wash Emplacement Area Biodiversity Offset Strategy</u></p> <p>Provide appropriate long-term security for the offset areas by 31 December 2012.</p>	As above.
20.	<p><u>Underground Coal Wash Emplacement Trial</u></p> <p>Prepare and undertake an Underground Coal Wash Emplacement Trial.</p>	See Section 6.6.
21.	<p><u>Project Surface Infrastructure Management – Gas Drainage Management Plan</u></p> <p>Prepare and implement a Gas Drainage Management Plan.</p>	<p>Plans submitted and approved. http://www.south32.net/our-operations/australia/illawarra-coal/regulatory-document</p>
22.	<p><u>Surface Activities Management</u></p> <p>Prepare and implement a Surface Activities Management Plan.</p>	<p>Gas Drainage Management Plans have been submitted and approved. The plans are available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.</p>
23.	<p><u>Upper Canal</u></p> <p>The Proponent shall not cause any damage to the Upper Canal during the construction and operation of the Appin East Mine Gas Safety Management Project.</p>	No impacts identified to date
23A	<p><u>Upper Canal</u></p> <p>Proponent shall undertake a dilapidation survey and undertake vibration monitoring prior to construction of Appin East Mine Safety Gas Project.</p>	A dilapidation survey of the canal was completed
23B	<p><u>Upper Canal</u></p> <p>Proponent shall undertake a dilapidation survey following the completion of construction of the Appin East Mine Safety Gas Project.</p>	A dilapidation survey of the canal was completed

24.	<u>Heritage – Heritage Management Plan</u> Prepare and implement a Heritage Management Plan.	The Heritage Management Plan has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents . The requirements of the plan are being implemented.
25.	<u>Transport – Monitoring of Coal Transport</u> Keep accurate records of the amount of coal transported from the site (on a daily basis) and make these records publicly available on its website at the end of each financial year.	Records of coal transport are maintained. These records are on our website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents
26.	<u>Traffic Management Plan</u> Prepare and implement a Traffic Management Plan.	The Heritage Management Plan has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents . The requirements of the plan are being implemented.
26A	<u>Traffic Management Plan</u> Proponent to ensure that safe access to Ventilation Shaft No. 6 is provided from public roads.	Intersection was constructed to ensure safe access.
27.	<u>Visual – Visual Amenity and Lighting</u> Minimise the visual impacts, and particularly the off-site lighting impacts, of the main infrastructure area and associated ancillary surface works.	Lighting requirements has been implemented to minimise offsite impacts.
28.	<u>Waste</u> Minimise the waste (including coal reject) and ensure that the waste generated by the project is appropriately stored, handled and disposed of.	Waste management has been undertaken in accordance with the Waste Management Plan. See Section 6.6.
29.	<u>Waste</u> Prepare and implement a Waste Management Plan.	The Waste Management Plan has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents . The requirements of the plan are being implemented.
30.	<u>Bushfire Management</u> Ensure that the project is suitably equipped to respond to any fires on site; and assist the Rural Fire Service and emergency services as much as possible if there is a fire in the surrounding area.	Sites are equipped to manage bushfires. Asset protection zones are maintained.
31.	<u>Rehabilitation – Rehabilitation Objectives</u> Rehabilitate the site to describe satisfactory level.	Rehabilitation conducted in accordance with the Mining Operations Plan.
32.	<u>Progressive Rehabilitation</u> Carry out the rehabilitation of the site progressively.	Rehabilitation conducted in accordance with rehabilitation management plan.

33.	<u>Rehabilitation Management Plan</u> Prepare and implement a Rehabilitation Management Plan.	The Mining Operations Plan has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents . The requirements of the plan are being implemented. An extension to the October 2012 to September 2019 plan was sought and approved in FY19. The period of the plan has been extended to September 2020.
34-36	<u>Biodiversity</u> Proponent shall enter into a suitable arrangement to offset the clearing of Cumberland Plain Woodland to develop the Appin East Mine Gas Safety Management Project	Management Plans are in place. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents . Biobanking agreements and retirement of credits address this condition.

Schedule 5 – Additional Procedures

Condition	Condition Summary	Status/Other Documents
1.	Notification of Landowners Notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the project is again complying with the relevant criteria.	As noted in Section 11, three exceedances of noise impact assessment criteria were recorded in the reporting period. Notification was not made to the adjacent landowners. Clarification on the requirement was sought from the Department as the exceedances did not constitute non-compliances, and a response has not yet been received.
2.	Independent Review As required commission a suitably qualified, experienced and independent person, to consult with the landowner to determine his/her concerns, conduct monitoring to determine whether the project is complying with the relevant criteria.	Condition not triggered during reporting period.
3.	Independent Review If the independent review determines that the project is complying with the relevant criteria in Schedule 4, then the Proponent may discontinue the independent review with the approval of the Secretary. If the independent review determines that the project is not complying with the relevant impact assessment criteria in Schedule 4, and that the project is primarily responsible for this non-compliance, then the Proponent shall: (a) implement all reasonable and feasible mitigation measures, in consultation with the landowner and appointed independent person, and conduct further monitoring until the project complies with the relevant criteria; or	Condition not triggered during reporting period.

(b) secure a written agreement with the landowner to allow exceedances of the relevant criteria, to the satisfaction of the Secretary.

If the independent review determines that any relevant acquisition criteria in schedule 4 are being exceeded and that the project is primarily responsible for this non-compliance, then upon receiving a written request from the landowner, the Proponent shall acquire all or part of the landowner's land in accordance with the procedures in Conditions 4-5 below.

	Land Acquisition	
4.	Make a binding written offer to the landowner within 3 months of receiving a written request.	Condition not triggered during reporting period.
	Land Acquisition	
5.	Pay all reasonable costs associated with the land acquisition process.	Condition not triggered during reporting period.

Schedule 6 – Environmental Management, reporting and Auditing

Condition	Condition Summary	Status/Other Documents
1.	<u>Environmental Management Strategy</u> Prepare and implement an Environmental Management Strategy for the project.	The Environmental Management Strategy has been submitted and approved. The plan is available on the website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents . The requirements of the plan are being implemented.
2.	<u>Management Plan Requirements</u> Ensure management plans required under this approval are prepared in accordance with any relevant guidelines.	Management Plans have been prepared in accordance with relevant guidelines.
3.	<u>Adaptive Management</u> Assess and manage project-related risks to ensure there are no exceedances of criteria.	Actions have been implemented to address exceedances of criteria. Further detail is provided in Section 11.
4.	<u>Annual Review</u> Review the environmental performance of the projects.	This condition has been addressed in this Annual Review.
5.	<u>Revision of Strategies, Plans and Programs</u> Review and revise strategies, plans and programs within 3 months of the annual review, the submission of an incident report, submission of an audit report and/or modification to the conditions of this approval.	Management Plans were reviewed and submitted to the Department in August/September 2018. These plans were subsequently approved.
6.	<u>Community Consultative Committee</u> Establish and operate a new Community Consultative Committee (CCC) which must be operated in general accordance with the <i>Guidelines for Establishing and</i>	Community Consultative Committee is operating in accordance with the Department's <i>Community Consultative Committee Guidelines: State Significant Projects</i> .

Operating Community Consultative Committees for Mining Projects (Department of Planning, 2007, or its latest version), and be operating by 30 September 2012.

7.	<p><u>Reporting – Incident Reporting</u></p> <p>Notify the Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment and provide a detailed report on the incident.</p>	<p>Notification was made to the regulatory agencies following the discharge of water from the sediment pond at Appin East that contained elevated levels of ferric chloride. See Section 11 for more detail.</p>
8.	<p><u>Regular Reporting</u></p> <p>Regularly report on the environmental performance on the website.</p>	<p>Monitoring data is reported in the 14-day EPL Report. This data is available on the South32 website at: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.</p>
9.	<p><u>Independent Environmental Audit</u></p> <p>Commission and pay the full cost for independent environmental auditor of the project.</p>	<p>Environmental Resources Management Australia Pty Ltd (ERM) was engaged by IC to carry out an Independent Environmental Audit of the BSO in FY17. A copy of the Audit findings can be found on South32 Regulatory webpage. https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.</p>
10.	<p><u>Independent Environmental Audit</u></p> <p>Within 6 weeks of the completion of this audit provide a copy of the audit report.</p>	<p>As above.</p>
11.	<p><u>Access to Information</u></p> <p>From 30 June 2012, make copies of specified documents publicly available on the website and keep them up to date.</p>	<p>All approved plans, strategies and monitoring results are on the south32 Regulatory Webpage. https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.</p>