SOUTH32 Illawarra Metallurgical Coal

APPIN MINE
ANNUAL REVIEW FY20

Table of Contents

Figures

Tables

Table 1: Annual Review Title Block	
Name of operation	Appin Mine
Name of operator	South32 Illawarra Metallurgical Coal (IMC)
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	1 July 2019
Annual Review end date	30 June 2020

I, Chris Schultz certify that this audit report is a true and accurate record of the compliance status of South32 – Illawarra Metallurgical Coal – Appin Mine for the period 1 July 2019 – 30 June 2020 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	Chris Schultz
Title of authorised reporting officer	Lead Environment (under Power of Attorney issued June 2020)
Signature of authorised reporting officer	
Date	30 September 2020

1. STATEMENT OF COMPLIANCE

Table 2: Statement of Compliance				
Approval	**Purpose**	**Issue Date**	**Expiry date**	**Compliant?**
MP08_0150	BSO Project Approval under Section 75J of the *EP&A Act 1979*.[1]	22 Dec 2011	31 Dec 2041	No
EPBC 2010/5350	Federal Government approval of the BSO Project under Sections 130(1) and 133 of the *EPBC Act 1999*.	15 May 2012	15 May 20142	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*.	1 Apr 2011	1 Apr 2041	No
EPL 2504	Environment Protection Licence for Appin Mine	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 Dec 2037	Yes
Mining Lease	1433	24 Jul 1998	23 Jul 2019[2]	Yes
Mining Lease	1574	9 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

[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 Project Approval.
[2] ML1433 renewal was applied for on 18 July 2018 and is still pending.

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
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
PA 08_0150	Condition 29 of Schedule 4	Waste Management Plan to be prepared and implemented	Non-compliant	Waste was disposed on site not in accordance with the plan on two occasions.	Section 11
EPL 2504	Condition O2.1	Plant and equipment to be maintained in proper and efficient condition.	Non-compliant	Conductivity probe failed which resulted in the flow of undiluted water in Brennans Creek.	Section 11
EPL 2504	Condition P1.3	Off-site discharge only permitted through licence discharge point.	Non-compliant	Discharge from Brennans Creek Dam reclaim sump did not flow through LDP 10.	Section 11
PA 08_0150	Condition 2 of Schedule 4	Noise not to exceed noise criteria	Non-compliant	Exceedance of noise criteria at AE-NS5 greater than 2 dBA on three occasions	Section 6.8 and Section 11
EPL 2504 PA 08_0150	Condition L2 Condition 15 of Schedule 4	pH must be within the specified ranges	Non-compliant	pH exceeded the lower 100 %ile limit for pH at LDP 19.	Section 6.3 and Section 11
EPL 2504 PA 08_0150	Condition L2.4 Condition 15 of Schedule 4	Water quality of discharged water must be within defined limits	Non-compliant	Biochemical oxygen demand 100 %ile limit was exceeded at LDP 22 on two occasions	Section 6.3 and Section 11
EPBC 2010/5350	Condition 18	Appointment of Independent Environmental Audit team to be endorsed by the Minister	Non-compliant	Endorsement of the IEA team was not obtained prior to the audit being undertaken.	Section 11
EPL 2504 PA 08_0150	Condition L2.4 Condition 15 of Schedule 4	Water quality of discharged water must be within defined limits	Non-compliant	Biochemical oxygen demand 100 %ile limit was exceeded at LDP 3.	Section 6.3 and Section 11
EPL 2504	Condition M2.2	Air quality monitoring equipment required to run continuously	Non-compliant	Air quality monitoring unit AE-PF3 failed resulting in loss of data.	Section 11

Compliance status key for Table 3.

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

Refer to Section 11 for more detail regarding the non-compliances listed in Table 3.

The predictions and Statement of Commitments from the Bulli Seam Operations (BSO) Project Environmental Assessment (EA) are incorporated into the Appin Mine federal *Environment Protection and Biodiversity Conservation Act* (*EPBC Act*) and state *Environmental Planning and Assessment Act* (*EP&A Act*) 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 B: 2019/20 EPA Annual Return for EPL 2504;
- Appendix J: Appin Mine EPBC Approval 2010/5350 Compliance Report;
- Appendix K: Appin Mine Project Approval Compliance Report; and
- Appendix L: Appin Mine Independent Environmental Audit 2019 - Action Response Table.

2. INTRODUCTION

2.1 Background

This Annual Review for Appin Mine details the environment and community performance for the 12-month period ending 30 June 2020, 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 Project Approval) and the NSW Resources Regulator requirement to submit an Annual Environmental Management Report (AEMR) under the Mining Leases for Appin Mine.

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

2.2 Overview of Operations

The NSW Government granted approval for the BSO Project in December 2011. The BSO Project combined the Appin Mine and West Cliff Colliery mining operations and provided for the continuation of coal mining operations to 31 December 2041. Appin Mine 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 Appin Mine are illustrated in Plan 1: Regional Location Plan.

Appin Mine, Cordeaux Colliery and Dendrobium Mine (and associated facilities) collectively operate as South32 Illawarra Metallurgical Coal (IMC).

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 7).

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.

IMC 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 last 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 9), the West Cliff Emplacement Area (Plan 8) and WCCPP (Plan 10) and the redundant North Cliff Mine site within the Dharawal National Park Area (Plan 11).

2.3 Mine Contacts

The site contacts for Appin Mine are provided in Table 4.

Table 4: Mine Contacts

Position	Name	Number
General Manager Appin Mine	Richard Johnson	(02) 4640 2322
Specialist Environment – Appin West and East	Simon Pigozzo	0402 480 559
Specialist Environment – Appin North and WCCPP	David Gregory	(02) 4640 4126
Lead Environment	Chris Schultz	(02) 4286 3384

3. APPROVALS

Table 5, Table 6 and Table 7 describe the Project Approvals, Mining Leases, Licences and Exploration Leases associated with Appin Mine.

Table 5: Development Approvals associated with Appin Mine

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	
Project Approval (NSW Government)	22 Dec 2011	31 Dec 2041
Project Approval *(EPBC Act*)	15 May 2012	15 May 2042
No. 6 Ventilation Shaft (NSW Government)	4 May 2011	Now Consolidated into Project Approval
No. 6 Ventilation Shaft (*EPBC Act*)	1 Apr 2011	1 Apr 2041

Table 6: Mining Leases and Licences associated with Appin Mine

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
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 10WA103794 10WA118778 10WA118766 10WA117285	15 Nov 2012 1 Jul 2011 1 Jul 2013 1 Jul 2013 15 Nov 2011	14 Nov 2027 30 Jun 2024 18 Feb 2028 24 Jun 2028 14 Nov 2026
Groundwater Access Licence	36481 – West Cliff	N/A	
Groundwater Access Licence	36477 - Appin	N/A	
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	
Radiation Licence West Cliff Washery (EPA)	5061052	26 Jul 2020	Renewed annually

Table 7: Exploration Leases associated with Appin Mine			
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 [3]
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
EL 8972	Appin	29 Apr 2020	29 Apr 2026

[3] A248 and EL4470 renewal will be applied for prior to expiry.

4. OPERATIONS SUMMARY

4.1 Mining

4.1.1 Longwall Status

Appin Mine underground longwall mining operations have transitioned wholly to Appin Areas 7 and 9 following completion of longwall mining activities at Appin North (West Cliff Area 5) in early 2016. Appin Mine extracts coal from the Bulli Seam within the Southern Coalfield. Appin Mine underground longwall mining operations are accessed from three surface locations: Appin North, Appin West and Appin East.

During the reporting period, Longwall 708A progressed approximately 770m to finish on 20 October 2019.

Extraction of Longwall 903 commenced on 1 November 2019 and is expected to be completed in March 2021. As of 30 June 2020, it had progressed approximately 1,415 m.

Appin Area 7 Longwall 708B extraction commenced on 24 April 2020 and is expected to be completed in October 2021. As of 30 June 2020, Longwall 708B had progressed approximately 370 m.

4.1.2 Longwall Production

Appin Mine extracted 3.56 million tonnes of Run of Mine (ROM) coal via roadway development and longwall extraction methods for the reporting period, a 3% decrease from the FY19 reporting period. The ROM production levels from FY09 through to the current reporting period are provided in Figure 1.

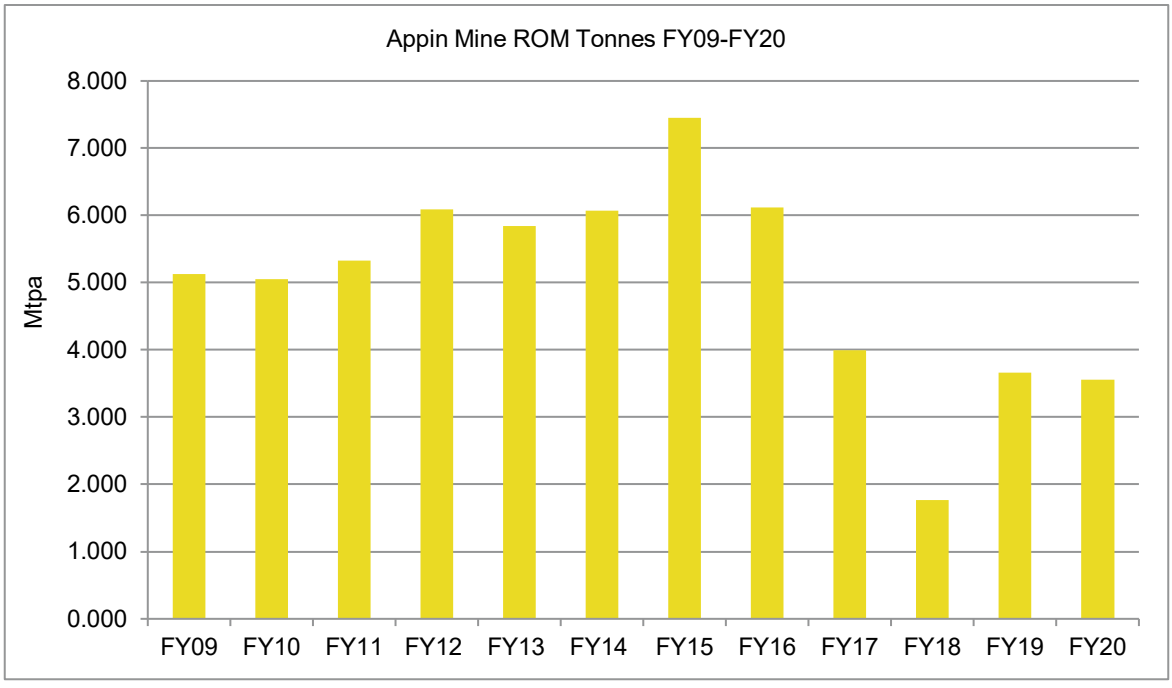


Figure 1: ROM production – Appin Mine (in million tonnes per annum [Mtpa])

The start and finish dates for longwalls in the current Appin mining domain are provided in Table 8 and Table 9.

Table 8: Area 7 Longwall Start and Finish Dates		
Longwall Number	**Start Date**	**Finish Date**
701	27 Oct 2007	9 May 2008
702	18 Sep 2008	20 Apr 2009
703	22 Oct 2009	3 Mar 2011
704	7 May 2011	29 Jul 2012
705	7 Sep 2012	27 Mar 2014
706	23 Apr 2014.	28 Nov 2015
707A	7 Jan 2016	16 Aug 2016
707B	26 Sep 2016	19 Jun 2018
708A	2 Apr 2019	20 Oct 2019
708B	24 Apr 2020	Estimated Oct 2021

Table 9: Area 9 Longwall Start and Finish Dates		
Longwall Number	**Start Date**	**Finish Date**
901	19 Jan 2016	8 Aug 2017
902	12 May 2018	3 Apr 2019
903	1 Nov 2019	Estimated Mar 2021

The average yield for the reporting period was 85%. The production and waste summary for the reporting period is provided in Table 10.

Table 10: Production Summary

	Approval Limit	**Previous Reporting Period**	**This Reporting Period**	**Next Reporting Period**[4]
Waste rock/Overburden	N/A	N/A	N/A	N/A
ROM Coal/Ore	10.5 Mt	3.660 Mt	3.561 Mt	4.579 Mt
Coarse Reject (Coal Wash Tonnes) [5]	N/A	0.563 Mt	0.622 Mt	0.869 Mt
Saleable Product	9.3 Mt[6]	3.037 Mt	3.180 Mt	3.847 Mt

[4] Estimate.
[5] Total processing waste produced at WCCPP for Annual Review period only – does not include coal wash produced at Dendrobium CPP
[6] Transport Limit.

4.2 Mineral Processing

Mineral processing facilities include the WCCPP, the Coal Wash Emplacement Area (CWEA) and the Dendrobium Coal Preparation Plant (DCPP) (located at the Port Kembla Steelworks). The majority of ROM coal from Appin Mine is directed to the WCCPP for processing. The CWEA is used to emplace coal wash from the WCCPP and DCPP (if beneficial reuse options are not available). 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 transported to the DCPP via Mt Ousley on an 'as required' basis to maintain work continuity and maintain reduced stockpile sizes at the Appin sites.

Clean coal from the WCCPP is trucked to BlueScope Steel (Port Kembla Steel Works) coal handling facilities or to the Port Kembla Coal Terminal (PKCT) 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.

4.3 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 and transferred directly into the coal haulage trucks for transport by road to either the WCCPP or DCPP.

Appin North operates six primary coal stockpiles for both clean coal and raw coal. The stockpile capacities at Appin North are outlined in Table 11.

Table 11: Appin North Stockpiles Capacities

Area	Capacities
No.1 Stockpile	350,000 t nominal capacity - 300,000 t coking coal, 50,000 t Middlings coal
No.2 Stockpile	150,000 t nominal capacity – generally coking coal
No.3 Stockpile	400,000 t nominal capacity – generally coking coal
No.4 Stockpile[7]	450,000 t nominal capacity – generally Appin ROM coal
No.5 Stockpile	70,000 t nominal capacity – generally Appin ROM coal
No.6 Stockpile	30,000 t nominal capacity – generally Appin ROM coal

A Stockpile and Slope Stability Management Plan is in place to manage the stockpile operations. The plan is a framework 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.

[7] Upgrade of the No. 4 stockpile pad commenced in FY20 and is scheduled to be completed in FY21.

Monitoring and management reviews indicate that the current plan effectively controls all potential stockpile management issues effectively.

4.4 Construction

The following construction activities were undertaken during the FY20 reporting period.

4.4.1 Site Security and Fatigue Management Project

IMC commenced works to construct site entry control points to manage the risk of unauthorised entry to Appin Mine sites and portals, and effectively manage fatigue amongst the workforce.

The project was approved by the IMC Investment Committee in December 2018 and commenced shortly thereafter. The construction work has been performed across all IMC sites, including Cordeaux Colliery, using sub-contractors specialising in the different fields of work.

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

Site security activities were completed and commissioned at Appin Mine in June 2020 and are currently in use.

In response to COVID-19, IMC implemented further security measures to prevent the spread of COVID-19. In March 2020, IMC implemented a staggered shift pattern (Monday to Thursday and Friday to Sunday) and revised rosters to ensure that segregation is achieved. All personnel accessing IMC's operational sites are subjected to temperature checks at all access points prior to entry at the turnstiles. Anyone exhibiting a temperature above 37.3 degrees and/or COVID-19 symptoms are excluded from the workplace.

Plate 1: Site security entry control point

4.4.2 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 work was completed as generally in accordance with the Project Approval. Laying of the new pipe and removal of the old pipework was completed in FY20.

4.4.3 LDP 10 Upgrades

The continuous water quality monitoring system at Licence Discharge Point (LDP) 10 (BCD discharge) was relocated closer to the discharge point, and upgraded with new probes, a submerged sample pump and sample tank/chamber. LDP 10 now has dual probes to provide redundancy and improve the reliability of the monitoring system. The system communicates with the BCD Automation System (refer to Section 4.4.4).

Plate 2: LDP 10 continuous monitoring station

4.4.4 BCD Automation System

The BCD automation system manages daily discharge flows according to dam water level and quality. The system checks dam levels daily and determines a discharge rate based on parameters within a lookup table. Common interlocks that manage the device will shut the discharge valves if the system is not operating as designed. If required, the system can control conductivity using dilution but also has a drought function to minimise water usage during water restrictions. Water quality alarms and response are also incorporated into its design.

4.4.5 LDP 24 upgrades

Works commenced at LDP 24 on a continuous real-time monitoring system for pH and conductivity. The monitoring system upgrade was completed during September 2019 and commissioned in October 2019.

Enclosed in a shed, the monitoring station consists of dual pH and conductivity analysers with transmitters and a magnetic flow meter to meet the EPL 2504 (Point 24) requirements. The monitoring system is integrated with the controls at the Appin West Plant (AW WTP) (Integrated Membrane System (IMS) 1 and IMS 2a)).

Plate 3: LDP 24 Monitoring Station Shed

Plate 4: LDP 24 Sampling Chamber

4.4.6 Appin West Surface Water Tanks

As part of a self-sustainable approach for underground operations, with the aim to be less reliant on Sydney Water consumption, capital works commenced to store greater volumes of treated water (permeate) on the Appin West Pit Top.

As reported during the FY19 reporting period, it was identified that the existing permeate tanks for IMS 1 and IMS 2a required extensive repairs. Additionally, it was identified that the tanks did not provide sufficient storage capacity if the AW WTP was offline. IMC concluded that to address this

shortfall, the existing 500 kL permeate tank was to be removed from service during FY20 and replaced with 2 x 1.6 ML process water tanks.

The tank foundations commenced in November 2019, and tank construction has progressed through the early part of 2020. At the completion of FY20, the tanks and pipework have been installed with one final feed line closing spool yet to be installed to complete the supply from the AW WTP. Commissioning of the system will occur in early FY21 and be brought online at the same time as underground piping infrastructure.

4.4.7 Water Treatment Plants

4.4.7.1 Appin North

The prefeasibility and feasibility study on the Appin North WTP (AN WTP) progressed during the reporting period. The AN WTP will treat underground mine water from Area 5 and emplacement underdrainage water to achieve discharge of higher quality water to the Georges River. Work will continue in FY21, including finalising the engineering design and commencing construction.

4.4.7.2 Appin West

Works to expand the AW WTP, including construction of surface water tanks and the IMS 2a plant upgrade, were completed during the reporting period.

During the reporting period, the new IMS plant has produced consistent output by integrating with the existing plant to produce steady state operations with improved reliability. The AW WTP has been operating as per design to dewater underground water storages, supply process water to underground mining operations, and ensure compliance with the EPL 2504 requirements for environmental discharges.

The throughput of the AW WTP has varied with the volumes of water supplied from underground for processing. Environmental factors also influence water quality on the surface, including seasonal temperature variation. This specifically applies to the surface bio-lagoon i.e. Dam 2.

The new continuous real-time monitoring system for pH and conductivity commissioned at LDP 24 is integrated with the AW WTP (refer to Section 4.4.5). Water quality assessments of the discharges to the environment are ongoing to ensure compliance with revised water quality limits in EPL 2504 can be achieved, noting that plant operation may need to be amended. Further studies will be required to evaluate impacts of discharges on the environment. Additional details regarding this project are provided in Section 6.3.3.

Plate 5: Reverse osmosis skid at AW WTP – IMS 2a

4.4.8 Minor Improvement Projects

Other improvement projects progressed throughout the FY include:

- Appin North
    - Installation of additional parking area at the WCCPP – completed in FY20.
    - Upgrade of the Appin North bulk coal winder – planning was ongoing in FY20. Execution scheduled for FY21. Expected completion in FY23.
    - Installation of Appin North Gas Drainage Plant – planned to commence in FY21. Expected completion in FY22.
    - Upgrade of the No. 4 stockpile pad to deliver geotechnical and environmental improvements - commenced in FY20 and scheduled for completion in FY21.

- Appin West
    - Installation of additional office space and a bathhouse at Appin West – completed in FY20. Existing temporary buildings were no longer fit for purpose, and access by the underground workforce is concentrated at the Appin West Pit Top.
    - Water pipework installation – FY19 and FY20 – part of Appin West WTP upgrade project to provide additional processed water to sustain underground operations with increased activity. This project is ongoing in FY21. One final feed line closing spool is yet to be installed to complete the supply from the AW Water Tanks to the AW WTP.
    - Fencing of the shale sandstone transition forest adjacent to pit-top operational areas was completed in FY20.
    - A Dust-A-Side product trial was conducted at Appin West Pit Top using emulsion of bitumen in water to suppress dust on roads and hardstand areas. Initial results indicate the trial was successful, and the use of this product at other sites will be further investigated.

- Appin East
    - The surface water dosing automation commenced. It is expected to be completed in early FY21 (see Section 6.3.2).
    - Investigations into the upgrade of the Ventilation Shaft 3 substation have been put on hold following the mine plan review, and IMC are reviewing future power requirements for its operations.

- Pre-feasibility Studies for Ventilation Shaft 7 (Mountbatten property)
    - Pre-feasibility studies for the proposed Ventilation Shaft 7 progressed in FY20. Following the completion of a mine plan review, plans for an additional ventilation shaft on the Mountbatten property in Douglas Park are no longer being considered. The outcome of the review was provided to relevant community and local government stakeholders in May 2020.
    - IMC are reviewing options for future ventilation shafts required to support underground mining operations.

- Air quality monitoring system for Ventilation Shaft 6
    - A program was designed and implemented to understand the contribution from Ventilation Shaft No. 6 (VS6) on the ambient air quality of Douglas Park. The results of the program determined VS6 has negligible influence on the air quality in the area.
    - The Community Consultative Committee and Douglas Park Advisory Panel were presented the full results in May 2020 by EMM Consulting, an independent consultancy firm that assisted with the program design and preparing the results. The meeting minutes are available on the South32 website https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.

4.5 Land Preparation

4.5.1 Mine Safety Gas Drainage

There were no land preparation works relating to Mine Safety Gas Drainage during the FY20 reporting period.

4.5.2 Emplacement Operations

The following works were undertaken during the reporting period:

- establishing growth medium for ~3 ha and seeding of ~3 ha in Stage 3; and
- continued deposition of coal wash.

The rehabilitated emplacement areas were inspected regularly to assess the progress and effectiveness of the rehabilitation. The monitoring program consists of quarterly inspections undertaken by an IMC Environmental representative, which are supplemented by an extensive annual monitoring program. The annual monitoring program was undertaken in Spring FY20. The report is provided in Appendix A: Annual Emplacement Rehabilitation Report.

4.6 Exploration

During the reporting period, eight exploration boreholes were drilled in the Appin area:

- two were drilled in the Exploration Authorisation 248 (A248); and
- four were drilled in EL 4470, both of which are situated north of CCL 767.

Figure 2 shows the location of FY20 boreholes drilled in the Appin area.

All of the borehole sites were subject to a Review of Environmental Factors (REF), and landholder negotiations, allowing access to sites.

Landholder approved rehabilitation is complete for three of the eight sites. The remaining sites are either in-progress or awaiting final demobilisation.

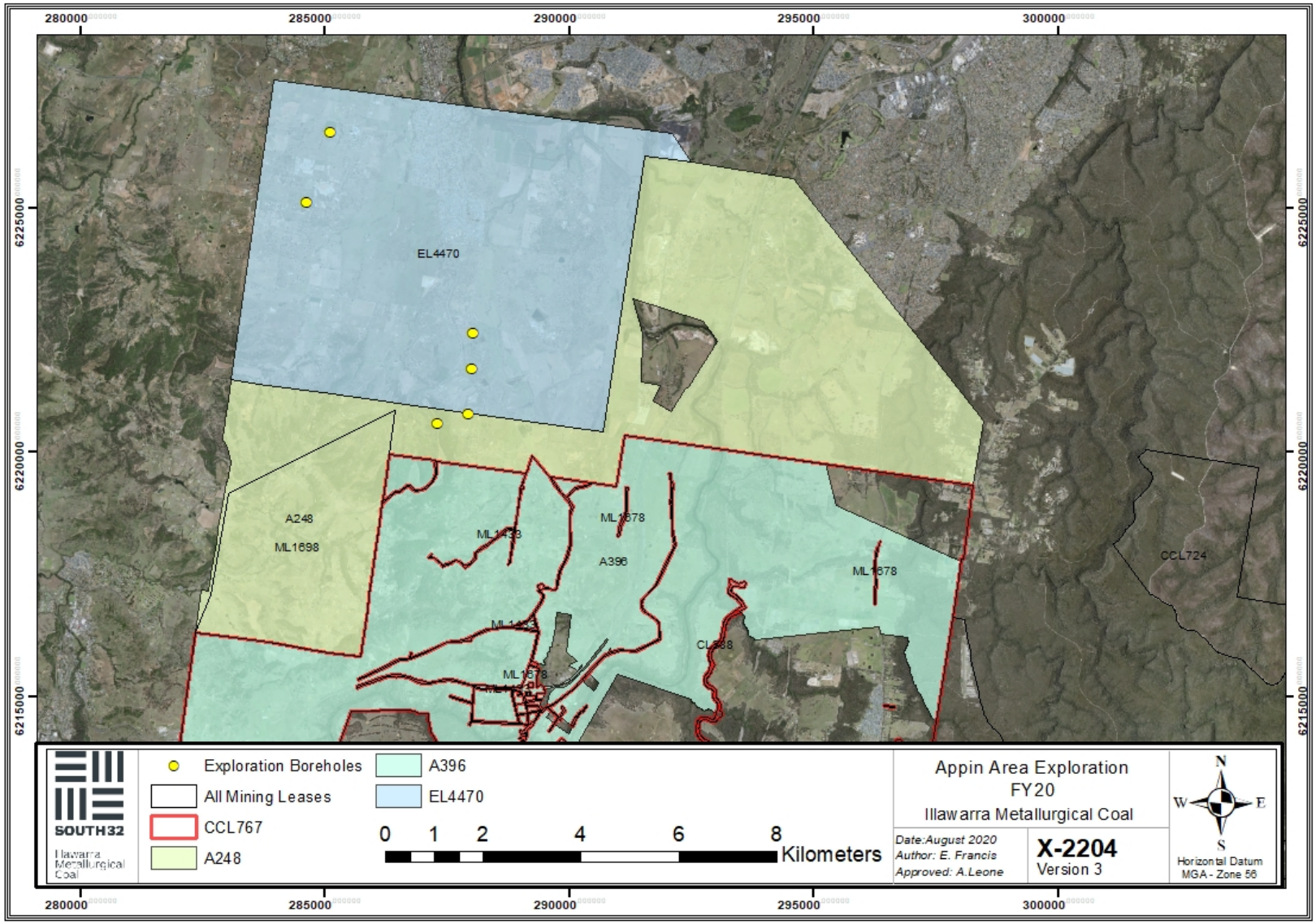


Figure 2: FY20 Exploration, Appin Area

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Activities identified by IMC in the FY19 Annual Review to be completed in the FY20 reporting period are shown in Table 12.

No actions were identified by regulatory agencies relating to the FY19 Annual Review.

Table 12: Actions from Previous Annual Review

Action Required	Requested by	Where covered in this Annual Review
1. Extension/upgrades to the Appin West Water Filtration Plant, including construction of surface water tanks.	IMC	Section 4.4
2. Establishment of a Water Treatment Plant for Appin North.	IMC	Section 4.4
3. Installation of additional parking area at West Cliff Washery.	IMC	Section 4.4
4. Installation of additional office space at Appin West.	IMC	Section 4.4
5. Pre-feasibility studies for Ventilation Shaft 7 near Douglas Park.	IMC	Section 4.4
6. Upgrade of the Appin North bulk coal winder.	IMC	Section 4.4
7. Completion of site security services.	IMC	Section 4.4
8. Upgrades to the Ventilation Shaft 3 Electrical Sub-station.	IMC	Section 4.4
9. Upgrade of the No. 4 stockpile pad to deliver geotechnical and environmental improvements.	IMC	Section 4.4
10. Site investigations and planning for the sealing and rehabilitation of the North Cliff site under the Legacy Site and Rehabilitation Program.	IMC	Section 6.20
11. Completion of commissioning of the Appin West Water Filtration Plant (IMS2a).	IMC	Section 4.4
12. Completion of a continuous monitoring system for LDP24.	IMC	Section 4.4
13. Continuation of the Environment Improvement Program (EIP2) to improve water quality and aquatic health in the Georges River downstream of LDP10.	IMC	Section 6.3
14. Continuation of *Persoonia hirsuta* Research Program	IMC	Section 6.5
15. Continually improving process control systems for BCD discharge	IMC	Section 6.3
16. Implementation of an air quality monitoring program in Douglas Park in response to community concerns regarding particulate emissions from Ventilation Shaft 6.	IMC	Section 4.4
17. Continue to progress the current phase of the decarbonisation program.	IMC	Section 6.17.4

6. ENVIRONMENTAL PERFORMANCE

6.1 Air Pollution

6.1.1 Environmental Management

Air quality is managed in accordance with the Appin Mine Air Quality, Greenhouse Gas and 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 Project Approval.

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 and portable Optical Photometers;
- use of a High Volume Air Sampler (HVAS) to determine compliance with air quality criteria; and
- visual inspections and audits.

Details of air quality monitoring locations for Appin Mine are provided in Table 13.

Table 13. Appin Mine 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

Table 13. Appin Mine Air Quality Monitoring Sites and their Function

Site ID	Location	Parameter	Measurement Method	Frequency?	Function
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 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.

6.1.2 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 Condition 11 of Schedule 6 of the Project Approval; and on an annual basis to the EPA via the EPA Annual Return (Appendix B: 2019/20 EPA Annual Return for EPL 2504) and in the Annual Review. The online report is available on the South32 website: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.

A comprehensive summary of all air monitoring results for Appin Mine is provided in this section. Graphs of long-term trends are provided in Appendix C: Appin Mine Long-Term Environmental Monitoring Graphs.

6.1.2.1 Dust Deposition Gauge Monitoring

The Appin West, Appin East and Appin North sites' non-operational gauges have a long-term criteria/amenity goal of 4 g/m^2/month for deposited dust during the reporting period that applies to particulate emissions on any residence on privately owned land. Elevated dust deposition levels were recorded over the reporting period, primarily over the period November 2019 to January 2020.

The elevated dust levels are attributed to major bushfire events and drought in the region during the reporting period. Between October 2019 and February 2020 major bushfires were experienced in areas around Wollemi National Park, Wollondilly, Braidwood and the Shoalhaven. The above-average results were compounded by below average rainfall and hazard reduction burns experienced during the period, resulting in drier conditions and high dust loading.

This effect of these events 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 W-DD1, DD3 and DD8). Long-term trends are consistent across all sites.

The data between the site DustTrak units (see Section 6.1.2.2) and regional air quality for PM_{10} correlated very well across three NSW Department of Planning, Industry and Environment (DPIE) sites.

Compliance with the long-term criteria for deposited dust was achieved at all non-operational gauges.

Dust deposition monitoring results for FY12 to FY20 are shown in Figure 3.

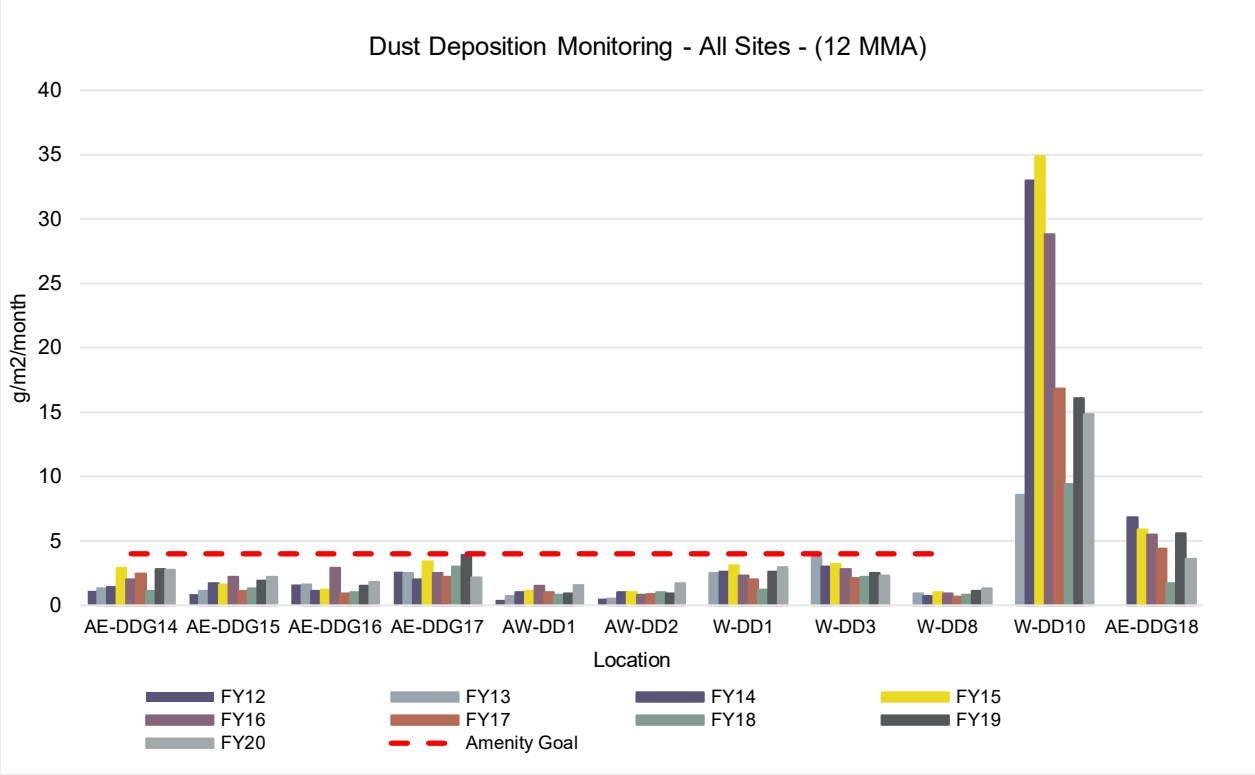


Figure 3: Annual averages from FY12 to FY20 for insoluble solids

W-DD10 and AE-DDG18 are operational gauges located within the mine site (i.e. on operational land). These gauges provide an indication of effectiveness of the sites 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, with an ongoing improvement evident.

6.1.2.2 Real-time Monitoring

As described in the 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 (i.e. 40 µg/m^3), additional monitoring will be undertaken using the HVAS (AE-HV1) to assess compliance. The maximum average PM_{10} levels at AE-PF3 exceeded the air quality criteria (50 µg/m^3) between October 2019 and January 2020. These exceedances are shown in Figure 4.

As noted previously, the exceedances are attributed to major bushfire events and drought in the region during the reporting period. Between October 2019 and February 2020 major bushfires were experienced in areas around Wollemi National Park, Wollondilly, Braidwood and the Shoalhaven. The above-average results were compounded by below average rainfall and hazard reduction burns experienced during the period, resulting in drier conditions and high dust loading.

As the exceedances were as a result of extraordinary events, the HVAS was not run.

AE-PF1 (also located at Appin East) also recorded exceedances over these months.

W-PF1 at Appin North recorded four exceedances (maximum of the 24-hour moving average) during the period November 2019 to February 2020.

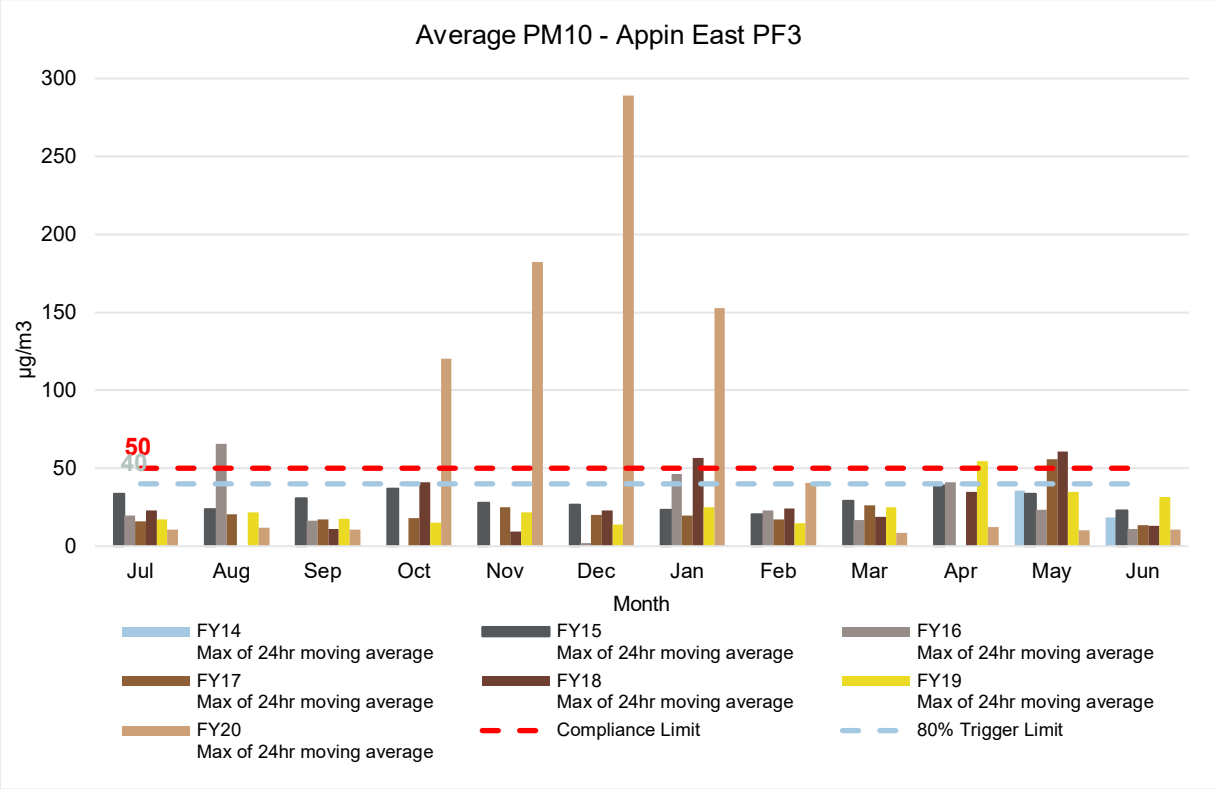


Figure 4: PM_{10} average 24-hour levels and maximum 24-hour levels at Appin East

6.2 Erosion and Sediment

6.2.1 Environmental Management

Most activities at the Appin East, Appin West, and Appin North Pit Top sites are undertaken on relatively flat areas. Highly trafficked 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 gravimetric separation using a series of dams and water treatment facilities. Water treatment techniques include flocculation to increase the rate that particles settle out of suspension. Discharged water is monitored for suspended solids in accordance with EPL 2504.

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

6.2.1.1 Appin West

During the reporting period, IMC began trialling a dust suppressant at the Appin West Pit Top. The emulsion of bitumen in water is formulated to suppress dust on roads, hardstands and laydown areas in industrial environments such as mines, quarries and construction sites. The product is used as a spray-on treatment and forms an impermeable seal so that roads and other dust-bearing surfaces are dust and mud free and functional in all weather conditions.

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 LDP 25). Prior to the release of surface water from the surface water dam (via LDP 23 into Sandy Gully), water passes through a fibre filter (perlite) unit which is designed to remove suspended solids, and insoluble oil and grease.

6.2.1.2 Ventilation Shaft 6

The Ventilation Shaft 6 site is in the operation phase and the majority of the site is either vegetated or sealed, so surface runoff no longer requires treatment under normal operating conditions.

Stormwater is settled in the surface water basins and discharged to Harris Creek via LDP 36.

6.2.1.3 Appin East

Appin East Pit Top utilises 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 dams. These earthen dams are used to capture, treat and recycle surface and stormwater runoff from the pit top.

Due to particle suspension of on-site dust and coal fines, surface and stormwater generated from pit-top runoff requires treatment prior to capture and storage in the surface dams. Surface water is dosed with a coagulant and flocculant prior to gravimetric separation, before passing through an overflow pipe into the main surface dam. Water is harvested from the main dam for dust suppression. Water can also be pumped into the sediment dam where it is drawn through the secondary-treatment system, the Dynasand filter, for discharge into the Georges River through LDP 19.

6.2.1.4 Appin North

The potential for erosion at the CWEA is managed in accordance with the CWEA Management Plan. The following activities are undertaken to minimise the likelihood of erosion within the CWEA:

- compaction of emplaced material;
- profiling of finished areas to designed gradients; and
- revegetation of the CWEA (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 BCD to comply with the water quality limits in EPL 2504.

6.2.2 Environmental Performance

Routine water quality monitoring of Total Suspended Solids (TSS) across Appin Mine 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

6.3.1 Environmental Management

Surface water management across Appin Mine is completed in accordance with EPL 2504 and the approved Appin Mine 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 Appin Mine. The plan has been prepared to satisfy Condition 16 of Schedule 4 of the Project Approval.

Specifics of the site water management systems are provided in Appin Mine SWMP which is available on the South32 regulatory information website:

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

6.3.2 Environmental Improvements

6.3.2.1 Appin West

The filter modules at LDP 23 are planned to undergo routine maintenance in early FY21, including replacement of the filters and screens. No additional works have been completed at the site during the reporting period.

All oily water separators undergo quarterly routine servicing, including complete cleaning and change out of the gravity fed (passive) separators (baffle plate systems) if damaged, and annual servicing and sleeve replacement of the centrifugal (active) separator.

6.3.2.2 Appin East

Appin East utilises a coagulant and flocculant dosing system to treat surface water runoff entering the pit top dams prior to controlled-discharge into the environment. The upgrades, that were initiated during this reporting period, seek to implement changes to the dosing process design, and additionally the chemicals used to encourage flocculent formation.

The installation will allow for automated and variable dosing rates to accommodate for fluctuations in surface water flow rate and changes in water quality.

IMC expect the upgrades to be completed and commissioned in early FY21.

The silt trap/dosing pit associated with the main surface water dam has undergone routine maintenance during this reporting period, including silt removal.

The first flush system has undergone routine maintenance and cleaning to ensure the system is fully operational. The Dynasands filtration system was inspected and required no servicing. All passive separators underwent routine servicing.

6.3.2.3 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 IMC.

The continuous water quality monitoring system at BCD has been upgraded with new equipment and increased automation (refer to Section 4.4).

Further improvements at Appin North under the Georges River Aquatic Health Monitoring Program are discussed in Section 6.3.7.3.

Surface run-off associated with the CWEA, operates in accordance with the approved CWEA Management Plan which is available on the South32 website.

6.3.2.4 Appin Ventilation No.6 Shaft Site

During the reporting period, surface water runoff was captured on site in surface dams prior to discharge into Harris Creek via LDP 36. Water quality checks were carried out prior to any discharge. No dosing of flocculant was necessary during this reporting period.

6.3.3 Environmental Performance

Results of the surface water monitoring are reported on the South32 website every 14 days as per the requirements of Section 66(6) of the *POEO Act* and Condition 11 of Schedule 6 of the Project Approval; and on an annual basis to the EPA via the Annual Return (see Appendix B: 2019/20 EPA Annual Return for EPL 2504) and in the Annual Review. The online report is accessible at this link: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.

A summary of results from Appin Mine monitoring program is included in Table 14.

6.3.3.1 Water Quality

Compliance with water quality limits in Condition L2 of EPL 2504 was achieved across most monitoring sites at Appin Mine during the reporting period. There were four non-compliances recorded over the reporting period. In addition to these non-compliances, five biochemical oxygen demand (BOD) exceedances at LDP 22 and 22 exceedances of electrical conductivity at LDP 10 were recorded during the reporting period. These non-compliances and exceedances are discussed in Table 14, and Section 11.

With the exception of the non-compliances and exceedances discussed in Table 14, the trends for discharge water quality remain relatively consistent over the life of the operation.

The requirement to sample for oil and grease was removed following revisions to EPL 2504 in September 2019.

In April 2019, the EPA issued IMC with a Notification of Intention (NoI) to make licence changes to provide greater certainty in the achievement of water quality outcomes, address the ongoing delays in environmental improvements and to provide for greater public involvement in the regulatory decision-making process. IMC reviewed measures that could be undertaken to meet the proposed water quality concentration limits in the NoI and made a commitment to the EPA to progress the proposed improvements. To formalise this commitment, the EPA issued a Notice of Variation to EPL 2504 in March 2020. The EPA revoked EIP2 and attached Special Condition E1.1 to the EPL requiring the installation and operation of a water treatment plant at Appin North and amplification of the Appin West water treatment plant to meet revised water quality concentration limits. The EPA specified concentration values that the WTPs must be designed to meet and the requirement to develop an aquatic health monitoring program to verify improvements to the aquatic health of the Georges River.

6.3.3.2 Water Discharge

There were no non-compliances with the EPL 2504 discharge volume limits over the reporting period (see Table 15). The trends for discharge volumes are relatively consistent over the life of the operation, taking into account the influence of rainfall.

The EPL daily volume limit for allowable discharge through LDP 24 increased in September 2019 from 3,000 kL/day to 4,700 kL/day. The volume of water discharged through LDP 24 increased during the reporting period.

Graphs of long-term trends for water quality and discharge are provided in Appendix C: Appin Mine Long-Term Environmental Monitoring Graphs.

Table 14: Summary of Compliance with EPL Water Quality Limits Across Appin Mine

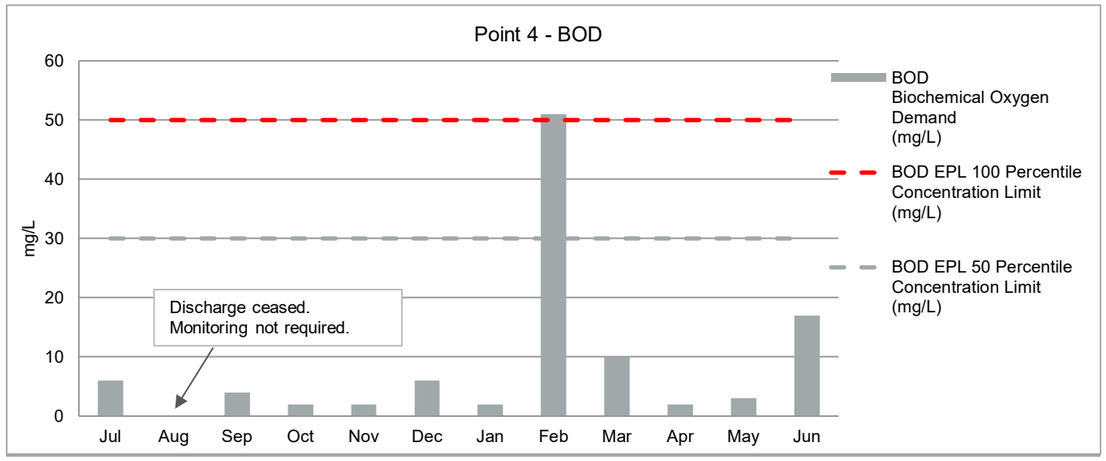
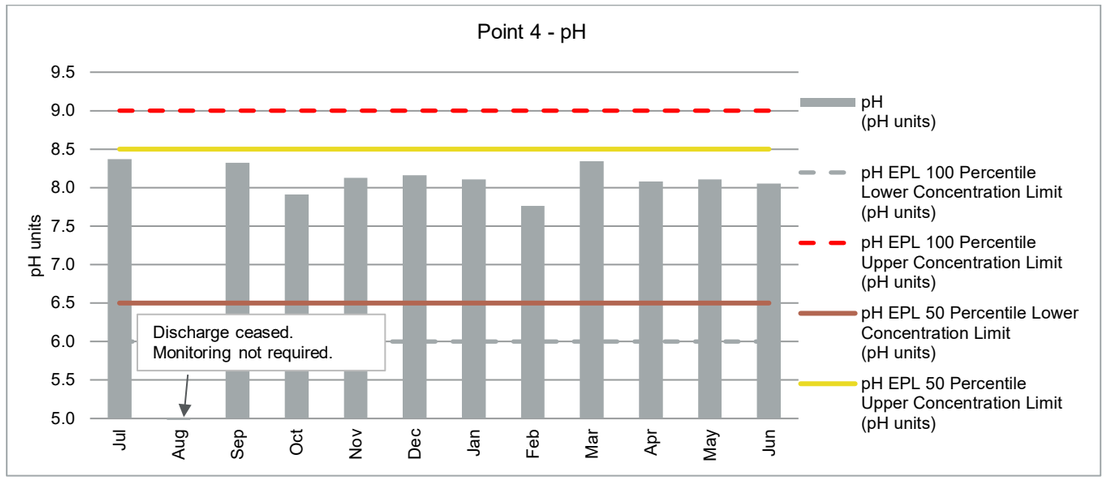
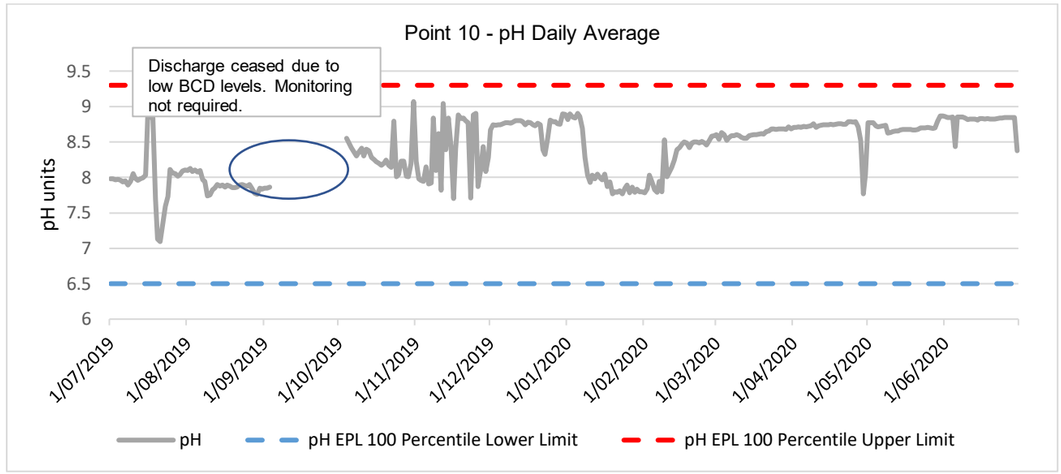
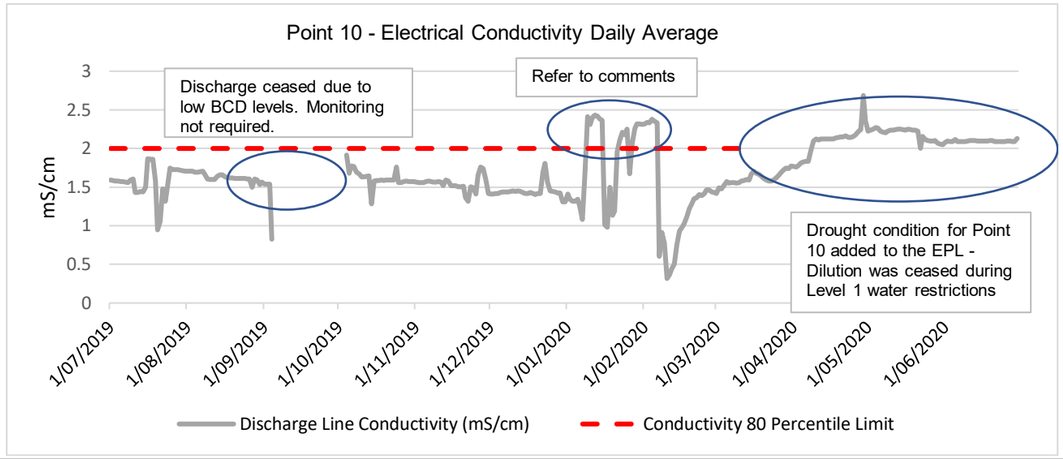
Monitoring Site	EPL Compliant (Y/N)	Comments	Data
Point 3/4	No	**BOD** An exceedance of the BOD 100th percentile water quality criteria of 50 mg/L was recorded on 7 February 2020. The result was 51 mg/L. There was an event prior to the recording of the exceedance where an excessive amount of soap entered the sewage treatment plant, which may have contributed to the higher BOD results due to impact on the nutrient digesting microbes. There was no identified environmental harm associated with this event. Sampling was not required in August 2019 as there was no discharge.	
	Yes	**pH** All samples returned a pH result within the 50-percentile limit. Sampling was not required in August 2019 as there was no discharge.	

Table 14: Summary of Compliance with EPL Water Quality Limits Across Appin Mine

Point 10	Yes	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 (up until 13 March 2020 when the drought condition for Point 10 came into effect (Condition L2.6 of EPL 2504)). The dilution system is automated to maintain electrical conductivity below 2 mS/cm. The daily average for conductivity, pH and turbidity for Point 10 are illustrated in these graphs. There were 22 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). This occurred over the period between 2 January and 8 February 2020. During this time, the BCD water level fell to 9 m and the valves were closed in accordance with the BCD Trigger Action Response Plan. However, there was some minor leakage that occurred through the valves (~40 KL per day (Point 10 and Point 13 combined)). The leakage was still monitored. 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. Discharge ceased from BCD during the period 5 September to 3 October 2019. During this time, the BCD water level fell to below 9m and the valves were closed in accordance with the BCD Trigger Action Response Plan. The EPA was notified accordingly. The monthly EPL sample was taken from undiluted BCD in January 2020. Continuous monitoring is not required during periods of no discharge. For the period 5 October to 30 November, in-situ readings or averages were used for pH and turbidity while the continuous monitoring system was being upgraded to the new system (Refer to Section 4.4.3). There were no exceedances of alkalinity (as calcium carbonate), aluminium, arsenic, bicarbonate alkalinity cadmium, cobalt, copper, lead, manganese, nickel, nitrogen (total), oxidised nitrogen, zinc or chemical oxygen demand. 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. There were no grab sample results for February because there was no discharge until 8 February when BCD spilled over due to >300mm of rain between February 8 and 10. A sample could not be acquired during overflow.





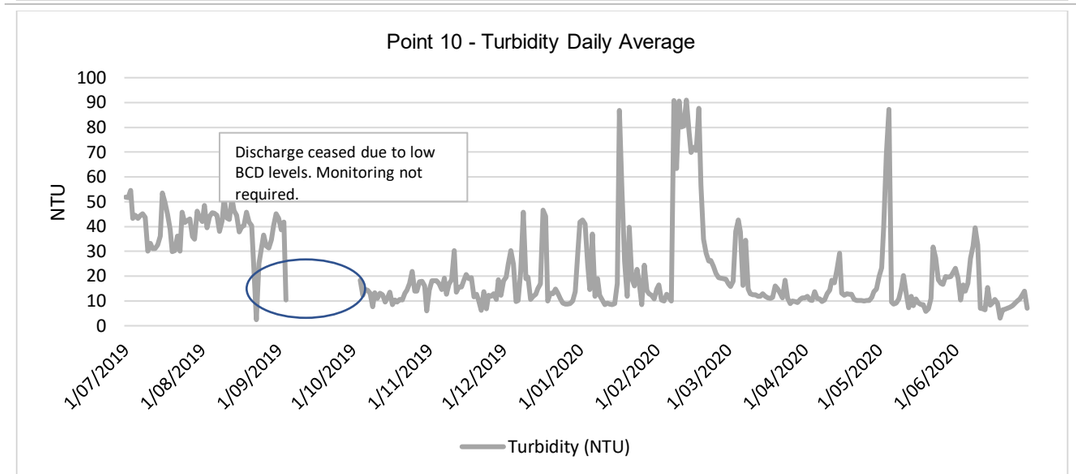
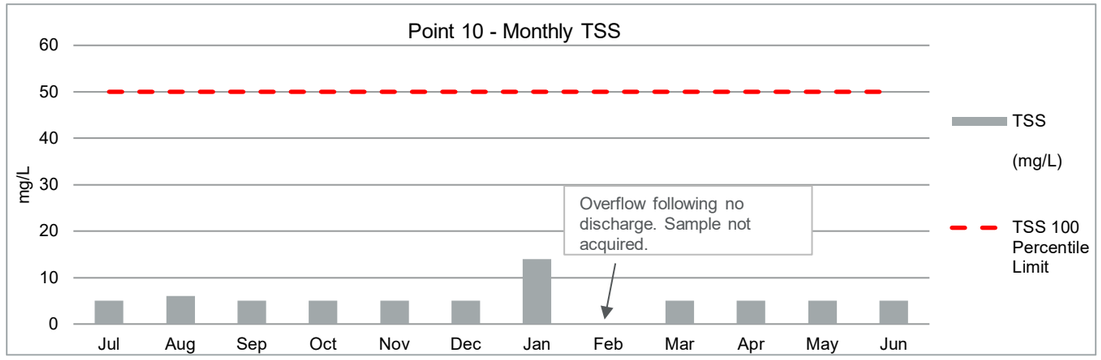
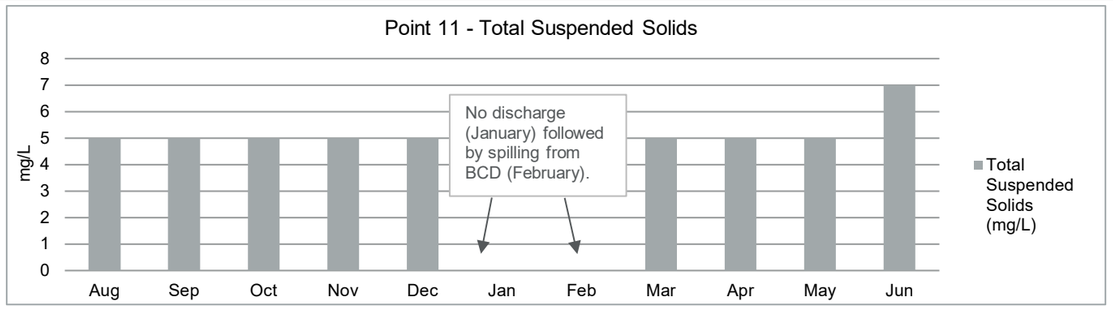
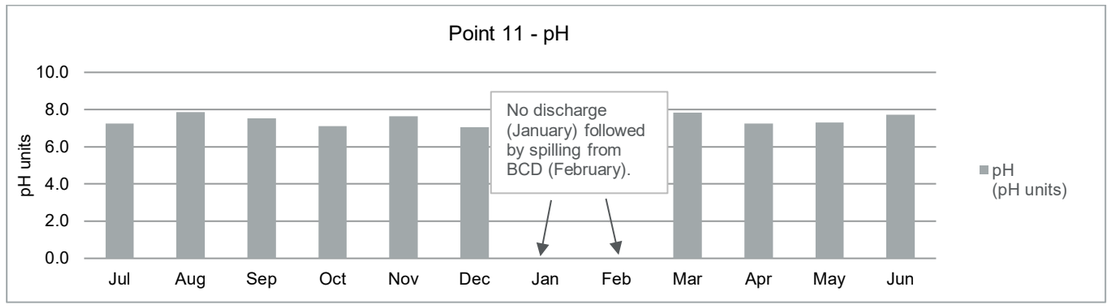


Table 14: Summary of Compliance with EPL Water Quality Limits Across Appin Mine





Point 11	Yes	**TSS, pH and Conductivity** 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 in these graphs. Pool was dry and unable to be sampled in January 2020. No sample was collected in February 2020 due heavy rainfall and BCD overtopping preventing safe access.



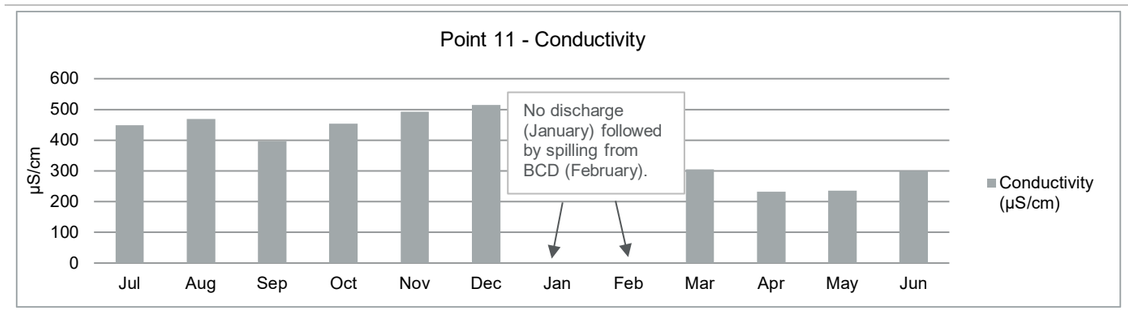
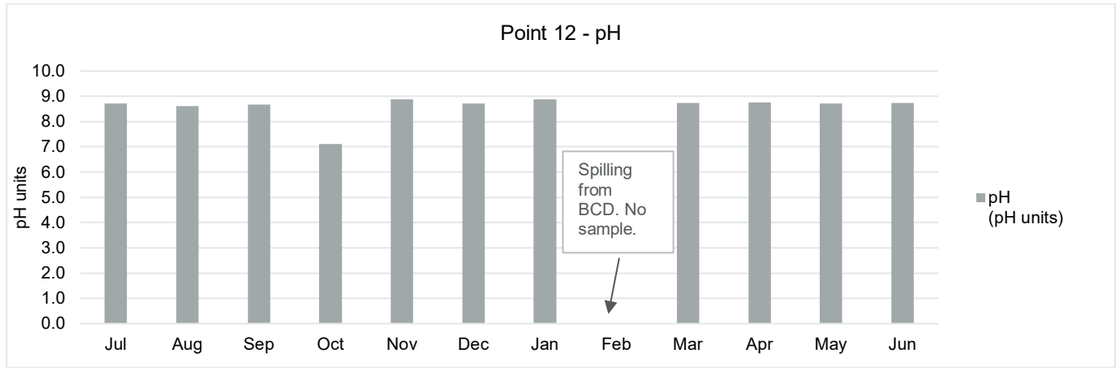
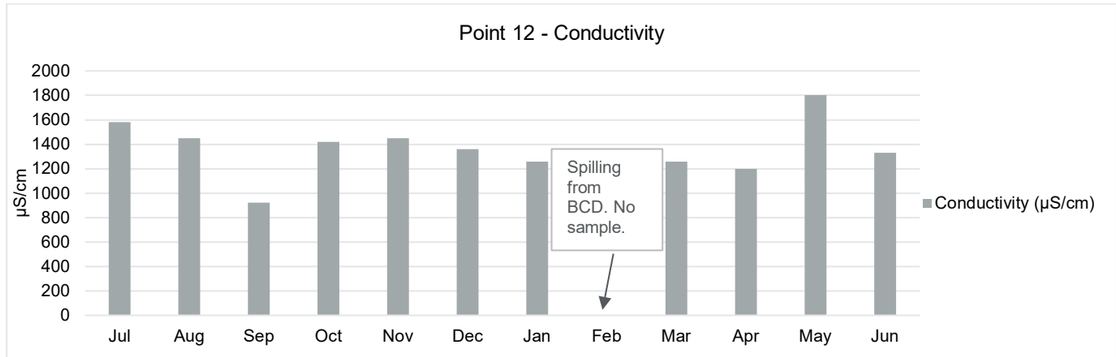


Table 14: Summary of Compliance with EPL Water Quality Limits Across Appin Mine

Point 12	Yes	**TSS, pH and Conductivity** Point 12 is situated downstream of the confluence of Brennans Creek. Monthly TSS, pH and conductivity are illustrated in these graphs. Water quality at Point 12 is generally consistent with the chemistry at Point 10. EC is influenced by discharge from BCD. No sample was collected in February 2020 due heavy rainfall and BCD overtopping preventing safe access.
Point 18	Yes	IMC no longer discharge from this point.





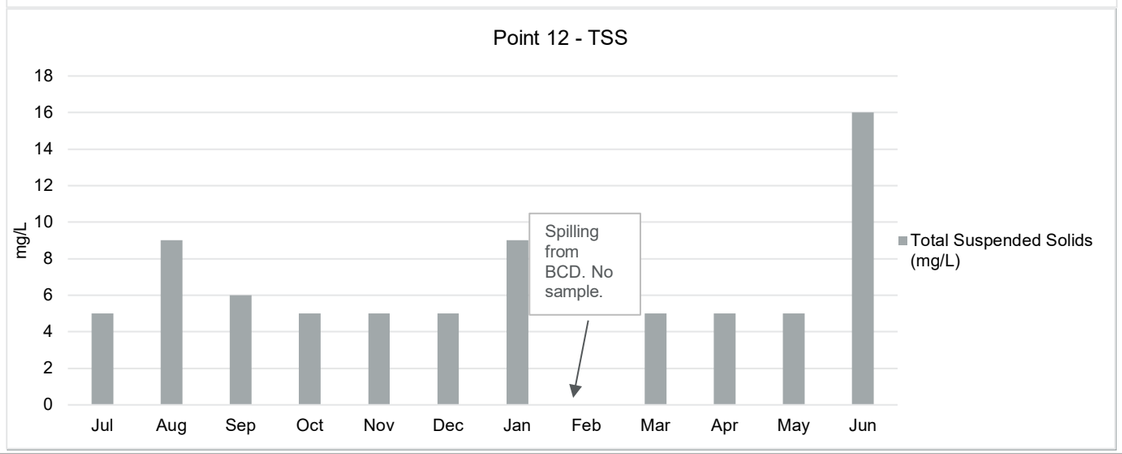
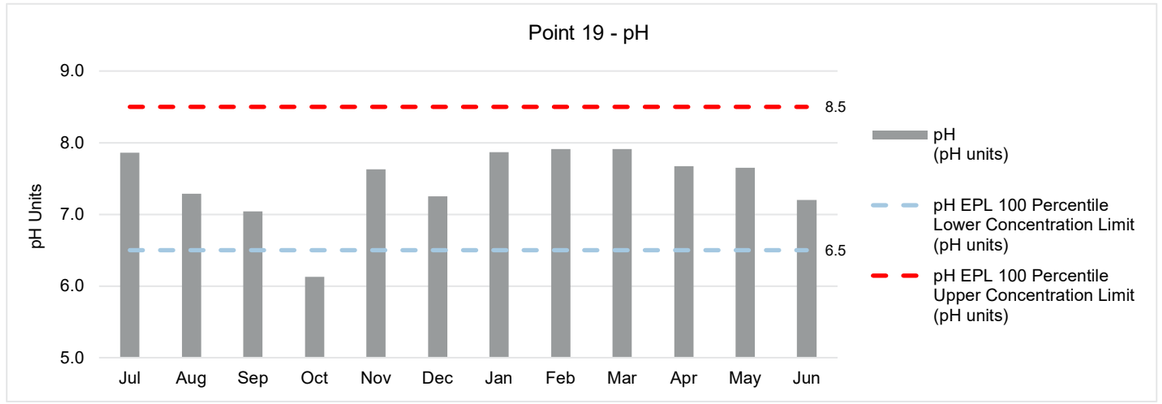
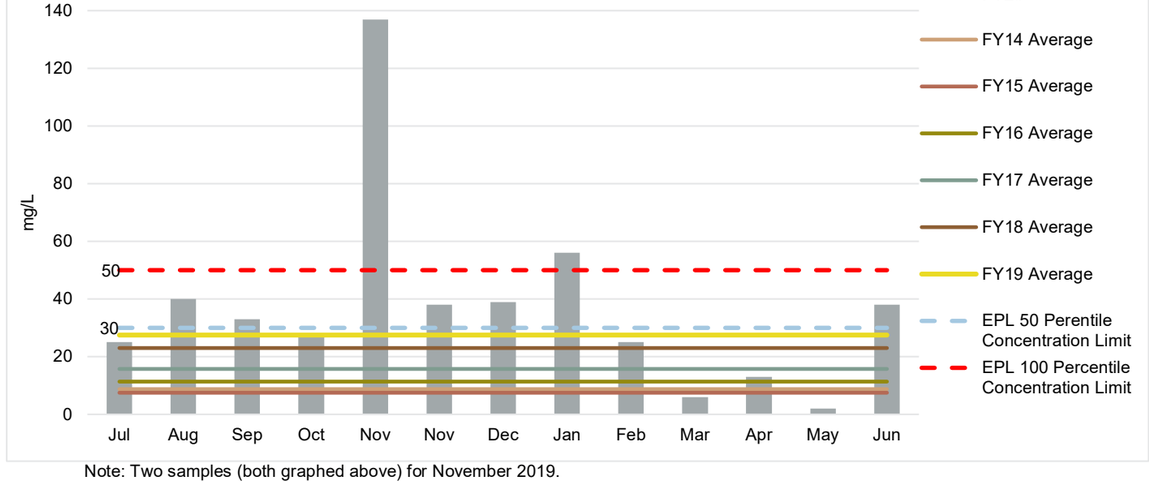


Table 14: Summary of Compliance with EPL Water Quality Limits Across Appin Mine

Point 19	No	**pH** A result of 6.13 pH units was recorded during discharge at LDP 19, which is an exceedance of the 100th percentile lower concentration limit of 6.5. The result was recorded on 3 October 2019. IMC considers that the result was a laboratory error. A request was submitted to retest the sample however all of the sample had been used and this was not possible. Field tests undertaken on this date, in addition to the results from the in-line monitoring, indicate that the water in the dam was within the water quality concentration limits. Other results for FY20 achieved 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. There were no exceedances of TSS or oil and grease (no longer required under EPL).
Point 20	Yes	IMC no longer discharges from this point.
Point 22	No	**BOD** An exceedance of the BOD 100th percentile water quality criteria of 50 mg/L was recorded on 5 November 2019. The result was 137 mg/L. This is recorded as a non-compliance. During a site inspection it was identified that there was no aeration occurring at the sewage treatment plant. On investigation it was identified that the aeration pump had tripped due to a power failure. The Residual Current Device (RCD), now tripped, did not reset when the power was restored. The Programmable Logic Controller (PLC) did not register that the aerator had not turned back on. Water from the effluent ponds continued to be pumped to LDP 22, and the water was irrigated to the irrigation area. An exceedance of the BOD 100th percentile water quality criteria of 50 mg/L was recorded on 8 January 2020. The result was 56 mg/L. This is recorded as a non-compliance. It was noted that there had been very low throughput of the plant, which led to increased holding times in balance dams. This led to increased dam temperature and microbiological growth, which in turn increased BOD. In August 2019, advice was provided by the sewage treatment plant servicing agent, that the aerobic bioreactor (tank) was not generating enough biomass, and thus its efficacy was lowered. The cause was from aerating the balance feed pond (Dam 1), which holds effluent prior to the aerated sewage tank. In addition to these non-compliances, there were five exceedances of the 50-percentile limit (30 mg/L) during the reporting period. The average BOD for all samples for FY20 was 35 mg/L. 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, which saw the installation of balance ponds. Consequently, changes in temperature in the feed pond and neighbouring effluent (treated) dam typically affect the efficacy of digestion within the dam, resulting in variations in BOD concentration. This was shown late in the reporting period when duplicate samples from LDP 22 were submitted for analysis and returned significantly different results. IMC have been focussing on improving the efficacy of the plant to accommodate this change to the system.





Note: Two samples (both graphed above) for November 2019.

Table 14: Summary of Compliance with EPL Water Quality Limits Across Appin Mine

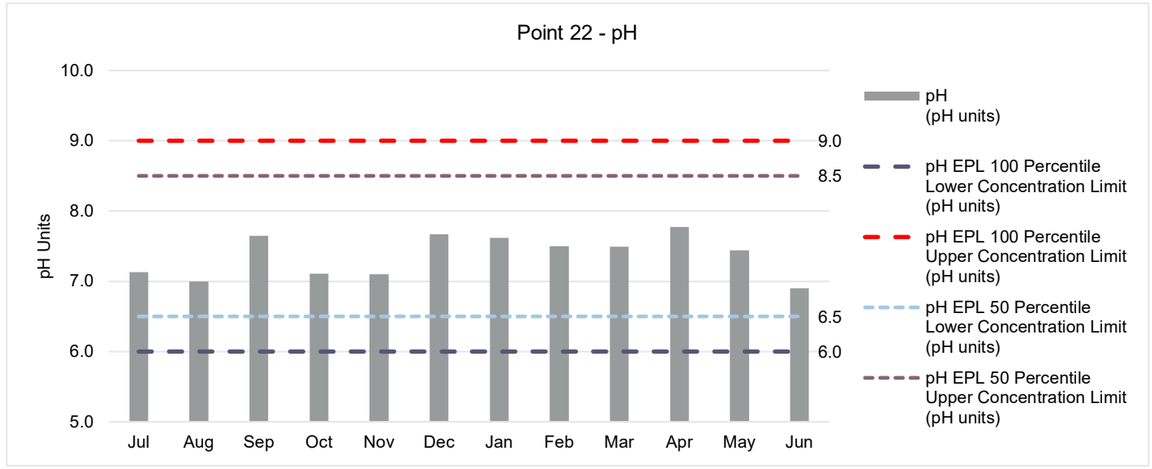
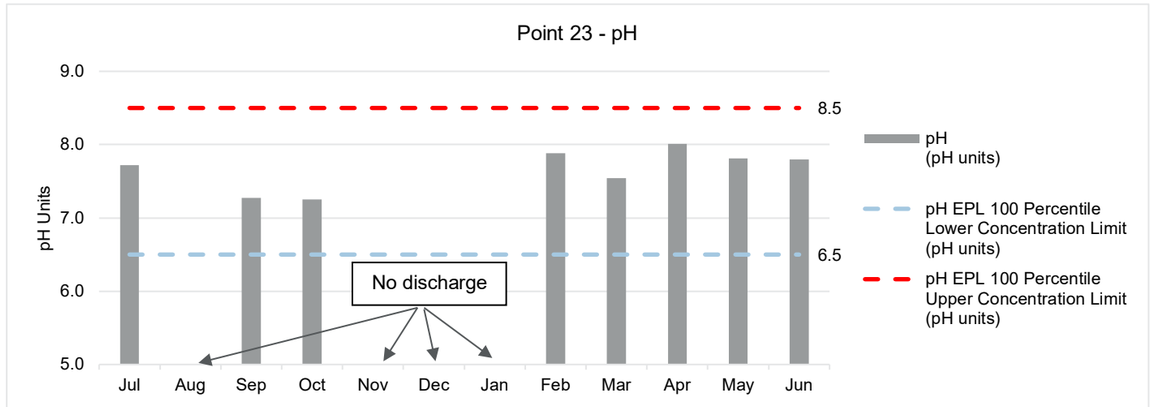
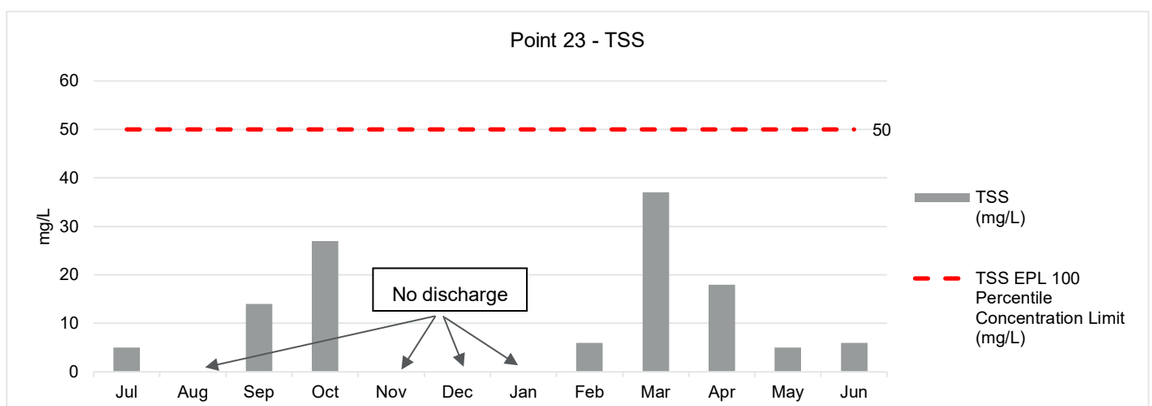
	Yes	**pH** FY20 displayed typical and expected compliance against pH. pH units remained steady, in-line with long-term trends dictated by temperature. Warmer months see higher solar insolation and higher pH, most likely due to biological activity.	
Point 23	Yes	**pH** FY20 displayed typical and expected compliance against pH. There was no discharge for the months of August, November, December or January. pH units remained steady in-line with long-term trends dictated by rainfall and temperature. Historically, 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 two exceedances since February 2014.	
		TSS FY20 TSS concentration followed the long-term trends of being well below the EPL 100 percentile concentration limit. The reporting period saw two samples (~ 30%) below the limit of reporting. Similarly to the above, this performance is achieved through the discharge control. Long-term trends indicate that the perlite filters installed as part of the treatment for this LDP must be monitored and replaced annually to ensure TSS is not exceeded.	

Table 14: Summary of Compliance with EPL Water Quality Limits Across Appin Mine

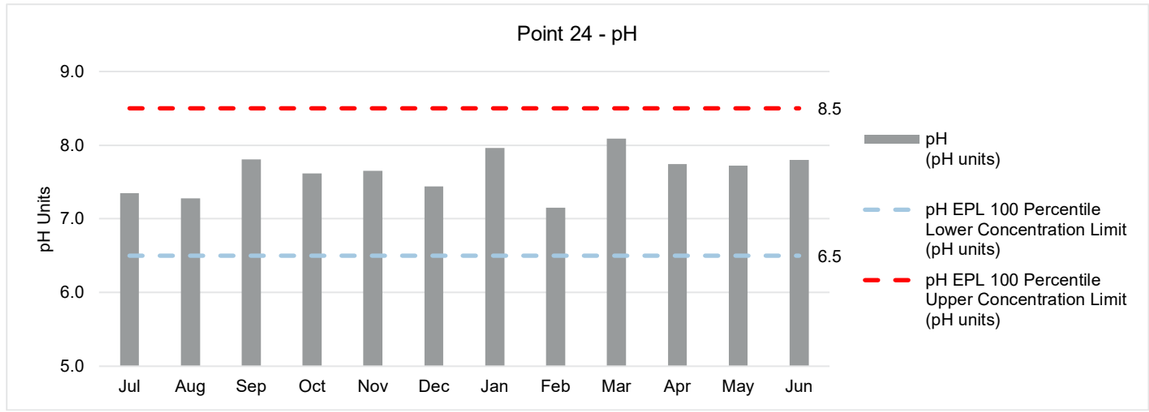
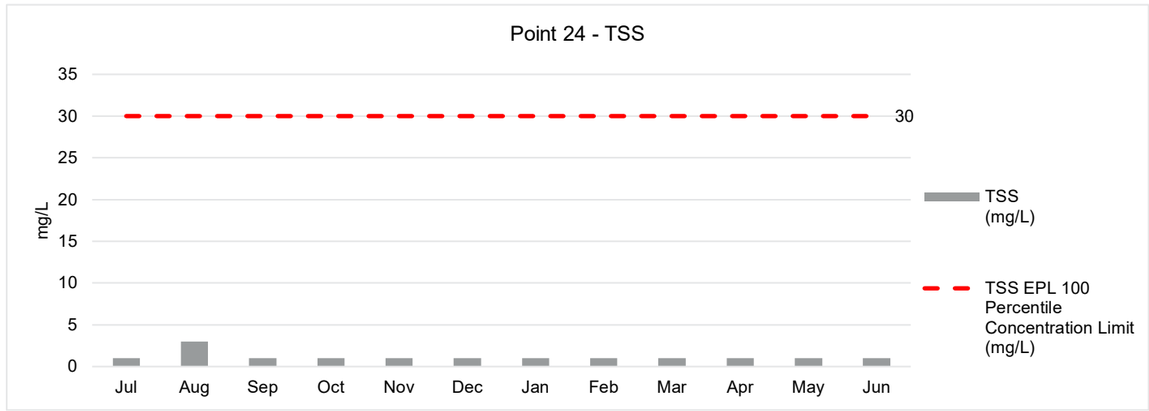
Point 24	Yes	**pH** EPL 2504 was varied in March 2020 to include requirements for continuous monitoring results for pH and conductivity at LDP24. PLC software changes that were made to log continuous monitoring experienced errors during the months of April and May, which were resolved for the June reporting period. Discharge data was still being recorded from March and shows compliance with the limits. FY20 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 Treatment Plant, the likelihood of an exceedance is slim. Historically, IMC has only seen one exceedance since records began in 2012, most likely due to in-line probe drift.	
		TSS FY20 TSS concentration followed the long-term trends of being well below the EPL 100 percentile concentration limit. The reporting period saw +90% of samples below the limit of reporting (1 mg/L). Similarly to the above, this is achieved through the discharge control.	

Table 15: Summary of Compliance with EPL Discharge Volume Limits Across Appin Mine

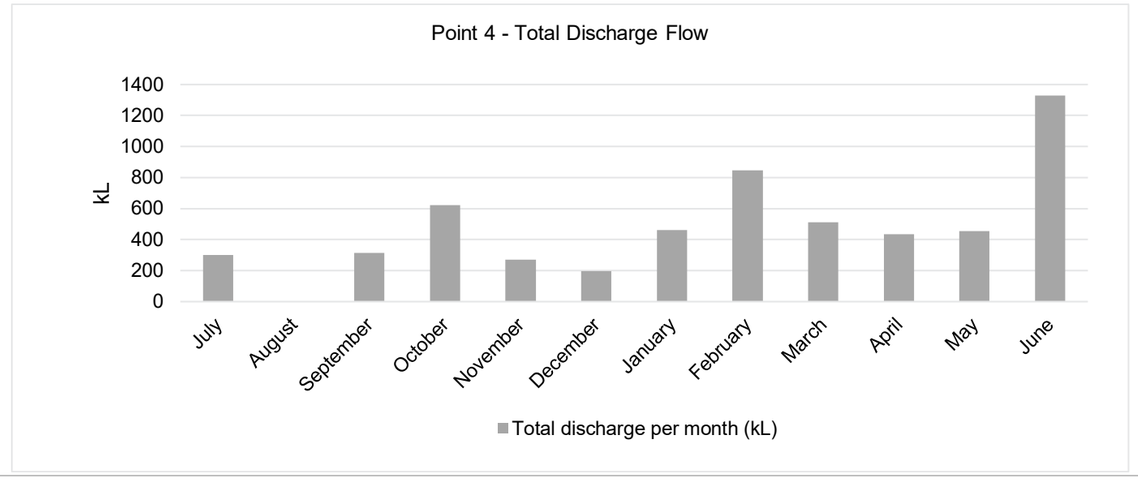
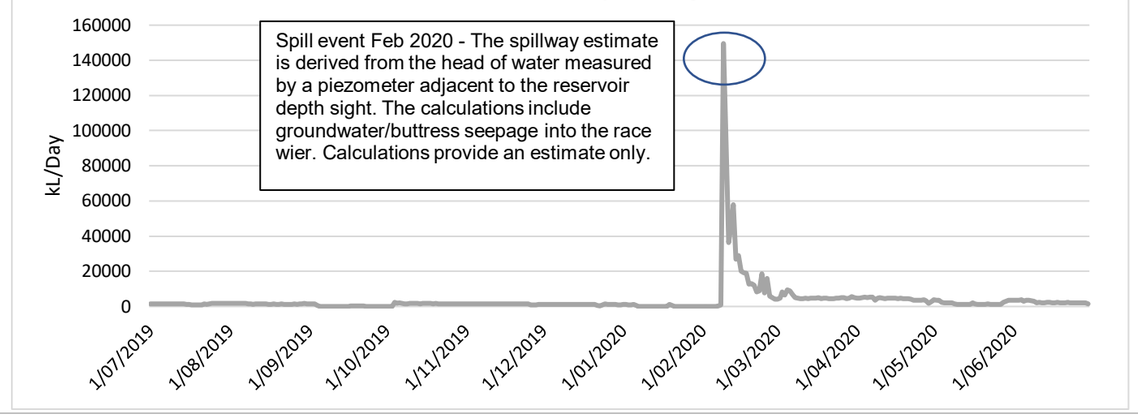
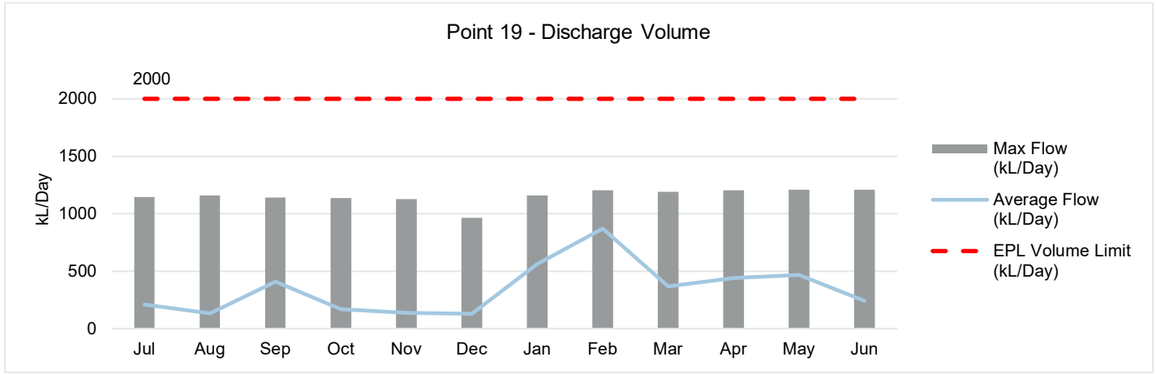
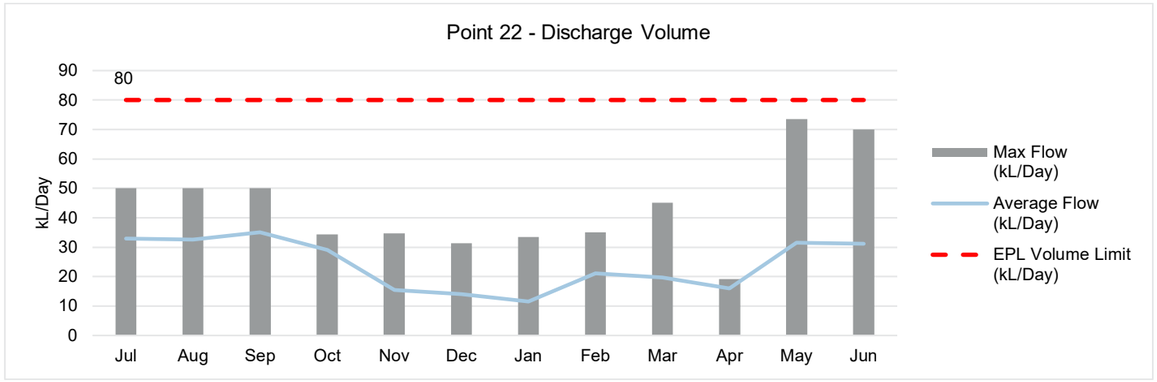
Monitoring Site	EPL Compliant (Y/N)	Comments	Data
Point 4	Yes	Point 4 discharges fluctuate based on the overall demand on the Sewage Treatment Plant (STP). Irrigation occurs on average twice per month for approximately 3 hours at a time. The STP operates under a Licence issued by Wollondilly Shire Council. New flow meter telemetry was installed in June 2020 including a new data logger. All data prior to June 2020 is from manual meter readings. The amount of discharge per month varies, depending on the demand and use of the bathhouse facilities at Appin North.	
Point 10	Yes	Flows from BCD consist of a gravity feed from the reclaim pond (Point 10, seepage from BCD), dilution waters as required (mixed with Point 10 and 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, IMC continued to provide supplementary flows to maintain pool levels downstream in the Georges River. As discussed in Section 4.4.4, flows are automated based on dam water level and operate in accordance with the BCD Trigger Action Response Plan. There was a major spill event (water spilling over the spillway) that occurred during February/March 2020. This was the result of >200mm rainfall. Flows were generally low throughout 2019 and January 2020 due to the ongoing drought causing low storage volumes. Discharge ceased during the period from 5 September to 3 October 2019. During this time, the BCD water level fell to <9m and the valves were closed in accordance with the BCD Trigger Action Response Plan. The EPA were notified accordingly.	
Point 13	Yes	As per Point 10.	As per Point 10.
Point 18	Yes	IMC no longer discharge from this point.	

Table 15: Summary of Compliance with EPL Discharge Volume Limits Across Appin Mine

Point 19	Yes	FY20 discharge volume for LDP 19 are 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. 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. The purpose of this system is to reduce dam levels for cleaning, and in preparation for the coming wet season. Consequently, higher average flows are experienced due to the period of increased discharge.
Point 20	Yes	IMC no longer discharge from this point.
Point 22	Yes	FY20 discharge volumes for LDP 22 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 70 kL/day, 50 kL/day, or 30 kL/day to ensure compliance against the EPL. With discharge volumes dictated by sewage production, long-term trends are sporadic, which can be expected with fluctuations in personnel hours.
Point 24	Yes	Daily maximum discharge volume limits were compliant during the reporting period. Due to expansion of the AW WTP in the previous reporting period, IMC expected to observe an increase in daily average flow volumes at LDP 24 in FY20. However, discharge volume did not experience a consistent increase in FY20 when compared to long-term trends. In September 2019, the daily volume limit for allowable discharge through LDP 24 increased from 3,000 kL/day to 4,700 kL/day. A monthly volume limit of 93,000 kL/month was imposed.





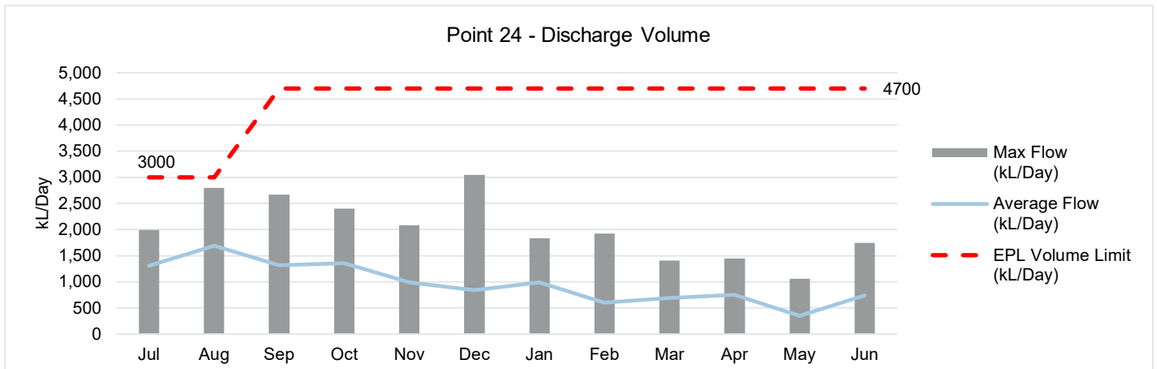
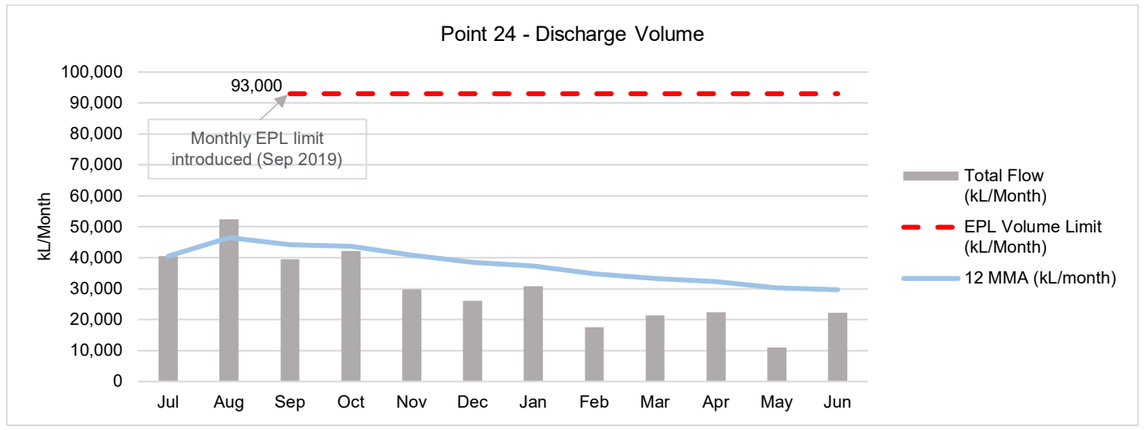


Table 15: Summary of Compliance with EPL Discharge Volume Limits Across Appin Mine



6.3.3.3 Pollution Reduction Programs

There are currently no PRPs underway at Appin Mine. PRP19 and PRP20 were incorporated into the Georges River Environment Improvement Program (EIP2). In March 2020, EIP2 was revoked by the EPA, and a condition was added to EPL 2504 for the program of works for water treatment, revised water quality limits for LDP 10 and LDP 24, minimum volume discharge limits for LDP 10, ecotoxicity monitoring requirements and assessment criteria and the obligation to prepare an aquatic health monitoring program. Ongoing discussions with the EPA were held over the reporting period prior to the issue of the variation.

6.3.3.4 EIP2 – Georges River Environment Improvement Program

The EIP for the Georges River incorporated:

- improvement projects as per the previous PRP19 requirements; and
- monitoring to verify improvements to aquatic health as the above projects are commissioned. Monitoring included (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 aimed to improve the aquatic health of the Upper Georges River by reducing the concentration of pollutants discharging from LDP 10 and monitor the changes to biota in-stream and within the sediment of the Upper Georges River as water quality improvement projects are commissioned.

As noted in Section 6.3.7.3, EIP2 was revoked in the variation to EPL 2504. Condition E3 required the submission of an Aquatic Health Monitoring Program to the EPA by 30 June 2020. The ongoing program is similar to the program undertaken under EIP2, to enable the analysis of results from previous years to identify trends.

Under EIP2, IMC has held regular meetings with community stakeholders to review progress of PRP19 projects and monitoring results from PRP20 and EIP2. Two meetings were held with the Georges River Stakeholder Group over this reporting period. These meetings have been held since 2014. Table 16 provides a summary of the meetings held in FY20. Details of meetings prior to this reporting period are provided in previous Annual Reviews.

These 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).

Table 16: Summary of the Georges River Community Stakeholder Meetings held in FY20

Date	Type	Purpose of Meeting
Spring 2019	Progress Meeting	Update on discussions with the EPA regarding projects for improving discharge water quality following the issue of a Notice of Intention to Make Licence Changes, including the construction of the Appin North Water Treatment Plant and additional treatment capacity at Appin West. Update on the Georges River Remediation Plan, installation of loggers and pool level monitoring results.
Autumn 2020	Progress Meeting	Discussed variation to EPL 2504 with the addition of a drought condition, program to implement water treatment works, revised discharge water quality limits and aquatic health monitoring. Discussed proposed aquatic health monitoring program and latest results from current program. Update on water treatment projects.

The latest Aquatic Health Monitoring Report (2019) provides an overview of the long-term trends (2013 - 2019) in microbenthic communities, water quality and ecotoxicology data. It focuses on the Autumn and Spring 2018 and 2019 results. The long-term trends in water chemistry showed that conductivity and the concentrations of aluminium, nickel, zinc and ammonia generally declined over time.

The analysis of the long-term macrobenthic data showed that the Discharge Monitoring treatment had a higher mean abundance of macrobenthic invertebrates than the Reference treatment. Abundances varied greatly in all sites across the sampling period and as such, there were no clear temporal patterns. The long-term trends indicate that Family richness was similar across all treatments. However, as argued in the report, the ecological soundness of both endpoints is debatable.

There were marked differences in SIGNAL scores between the Reference and Discharge Monitoring treatments, indicating a lower level of ecological integrity in the Discharge Monitoring sites. SIGNAL scores suggested that the ecological integrity of the system improved with downstream distance. However, due to high variability, no clear temporal trend was evident.

The ecotoxicological tests on the Point 10 discharge waters showed that historically the waters were harmful to macroinvertebrates. The findings also indicate there has been a decline in toxicity with regards to the *Paratya australiensis* 10-day acute and *Ceriodaphnia dubia* survival assays, however, *Ceriodaphnia dubia* reproduction was still being affected.

Collectively, the long-term ecological, water quality and ecotoxicological data indicates that the discharge waters continue to affect the benthic communities and other aquatic biota in the upper-most discharge sites.

The full report is available here:

https://www.south32.net/docs/default-source/illawarra-coal-bulli-seam-operations/licenses/eip2-2020-report_final.pdf?sfvrsn=a813859a_6.

6.4 Contaminated Land

6.4.1 Environmental Management

6.4.1.1 ***Appin East***

As previously reported, during the 2010/11 reporting period, IMC 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. IMC 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 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).

IMC were initially investigating the installation of a bioremediation land farm to further remediate and lower the risk of leaching within the previously identified and stockpiled soils. However, after further testing of the soils, have determined that a bioremediation facility is not required, and the material can be classed as 'General Waste' under the Part 1 of the NSW's EPA Waste Classification Guidelines.

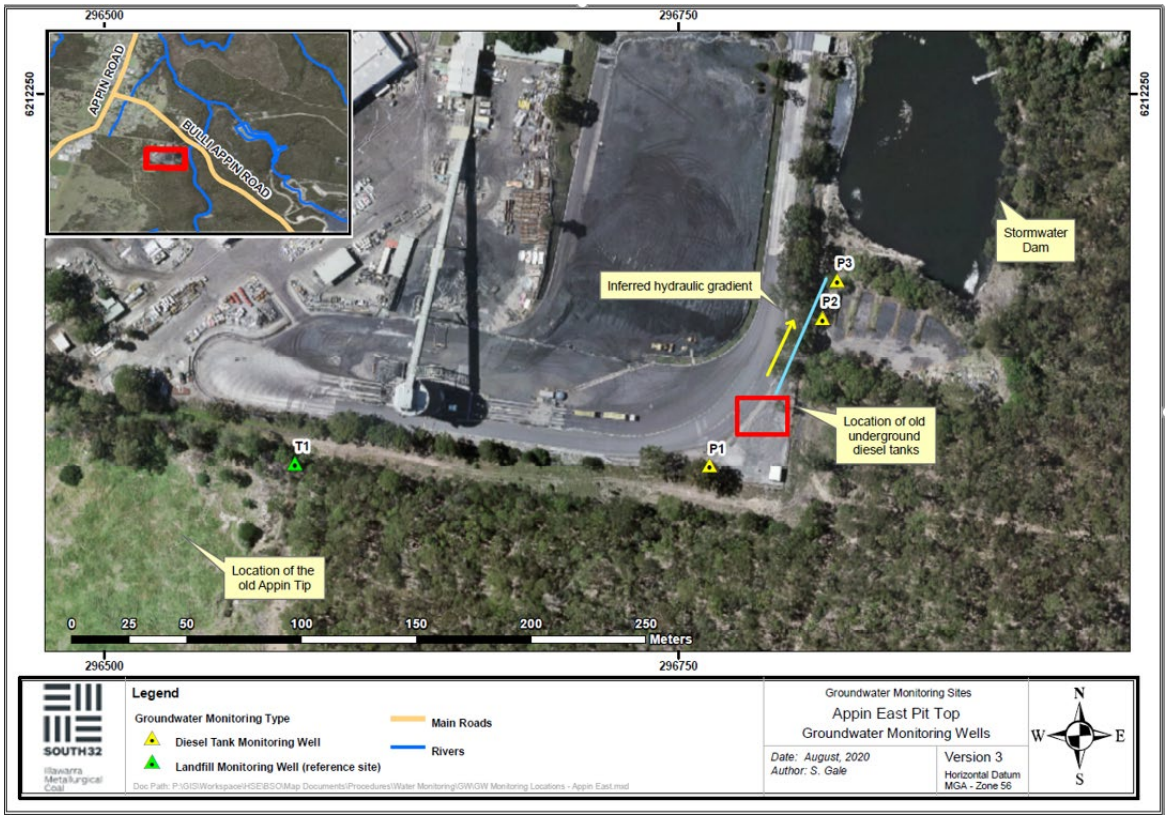


Figure 5: Groundwater Monitoring Bore locations at Appin East

6.4.1.2 *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.

6.4.2 *Environmental Performance*

6.4.2.1 *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 FY20 reporting period, the results from three boreholes, P2, P3 and T1, were below the observable limit for TPH (50 µg/L). The May 2020 result for borehole P1 at Appin East was slightly above the observable limit for TPH at 160 µg/L (Figure 6 and Figure 7). Samples taken at three of the boreholes in the FY18 reporting period show elevated levels of TPH, however this was attributed to potential contamination during the sampling process as most 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.

Based on the long-term results, it is proposed that the groundwater monitoring program is discontinued in future reporting periods.

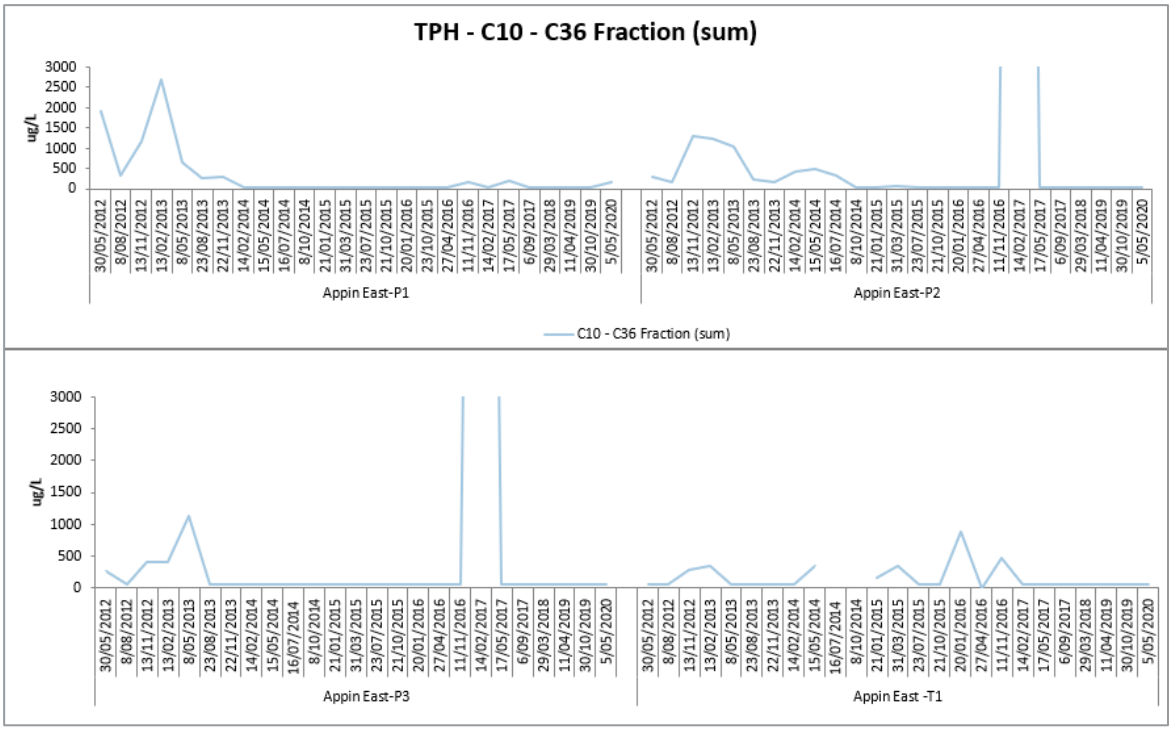


Figure 6: TPH (C10 – C36 Fraction (Sum)) 2012 – 2020 at Appin East

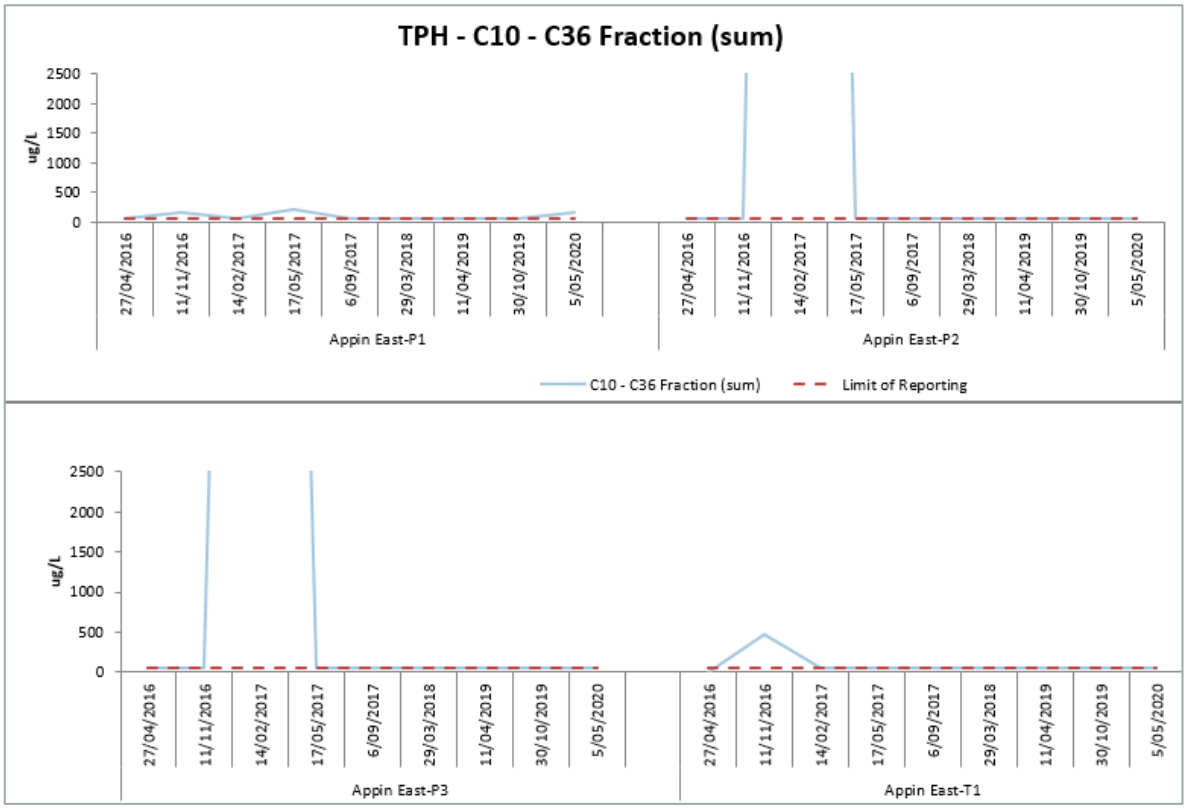


Figure 7: Short-Term TPH (C10 – C36 Fraction (Sum)) at Appin East

6.4.2.2 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 and Figure 9). 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. The borehole was recovered and resampled in April 2019. The results indicate a C-fraction concentration of 200 µg/L. The hole was dry and unable to be sampled in October 2019 and May 2020.

Based on the long-term results, it is proposed that the groundwater monitoring program is discontinued in future reporting periods.

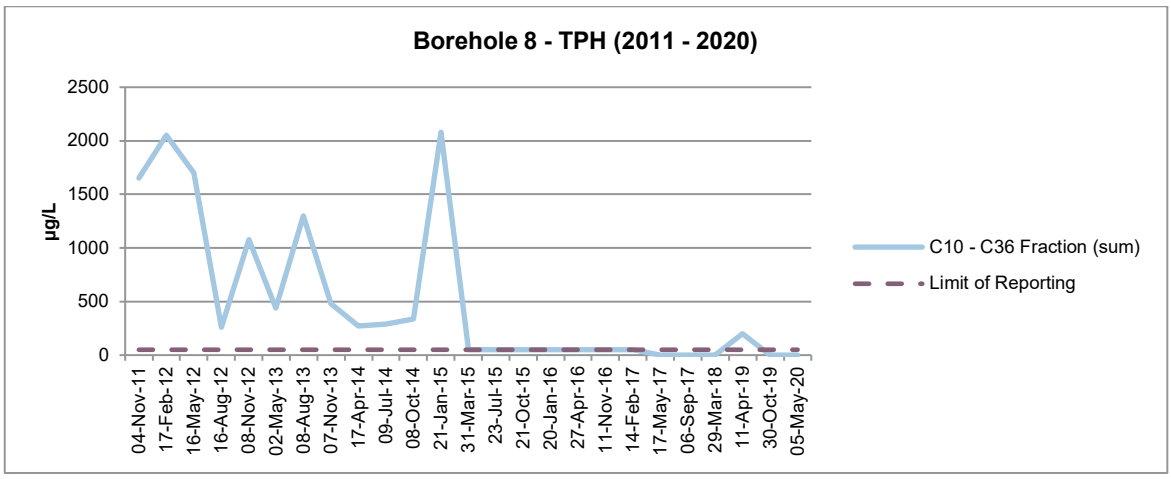


Figure 8: 2011 – 2020 TPH (C10 – C36 Fraction (Sum)) in BH8 at Appin North

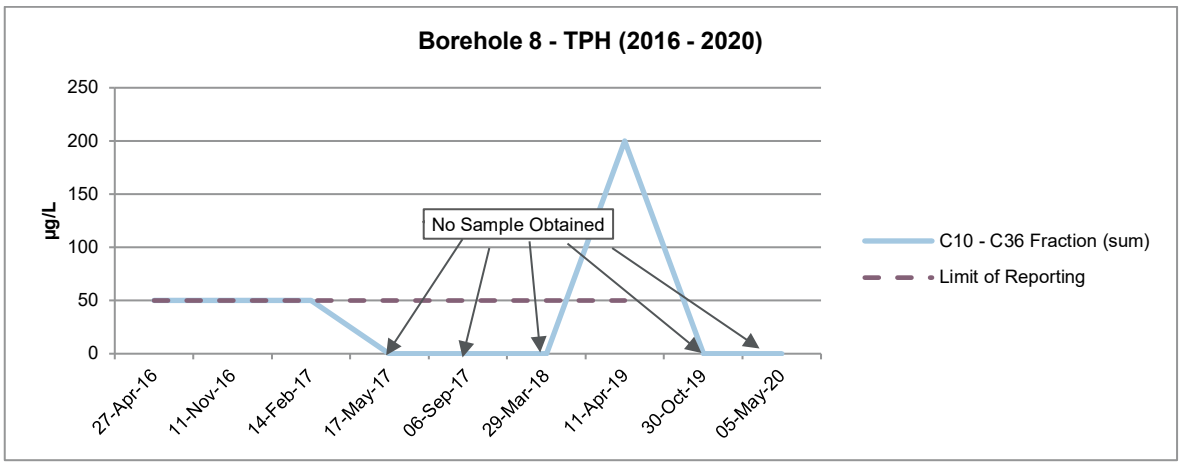


Figure 9: 2016 – 2020 TPH (C10 – C36 Fraction (Sum)) in BH8 at Appin North

6.5 Threatened Fauna and Flora

6.5.1 Environmental Management

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

- 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;
- Biodiversity Management Plan;
- Shale Sandstone Transition Forest Offset Management Plan; and
- Adaptive Management Plan for Water Sensitive EPBC Listed Species.

These plans include the management and mitigation measures for threatened species or habitats that occur on Appin Mine 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 Biodiversity Conservation Act 2016* and *EPBC Act*. A substantial population of *Persoonia hirsuta* is known to exist on the Appin North site. Several of the *Persoonia hirsuta* plants are located within operational areas such as high voltage transmission lines on site.

Acacia bynoeana is listed as "Endangered" under the *NSW Biodiversity Conservation Act 2016* 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 Biodiversity Conservation Act 2016* 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 the Stage 3 CWEA. *P. aristata* have been identified within the rehabilitating emplacement area (See Appendix A: Annual Emplacement Rehabilitation Report).

Flora and fauna aspects associated with mine subsidence are detailed in Section 6.14.

6.5.2 Environmental Performance

6.5.2.1 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.

6.5.2.2 Persoonia hirsuta - Ongoing Research and Conservation Management

IMC conducted the seventh round of annual condition monitoring of the *Persoonia hirsuta* population at Appin North. 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 by two Niche ecologists over two days in November 2019 during the peak flowering period for the species. The report is included as Appendix D: Annual *Persoonia hirsuta* Condition Monitoring Report.

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

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

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 Mount Annan Botanic Garden, some grown from seed, others from cuttings, collected from different locations. The aim of the translocation is to boost the population within the offset area to at least 44 individuals (back to baseline population) and develop a translocation procedure that can be applied to this species. The plants continued to be monitored during FY20. Mortality has been relatively high, predominantly due

to the drought and initial high herbivory rates. A chart illustrating the average plant health over time is included below. Of the 128 plants, 29 remain alive. Most alive plants have put on new growth since planting (Figure 10 and Plate 6).

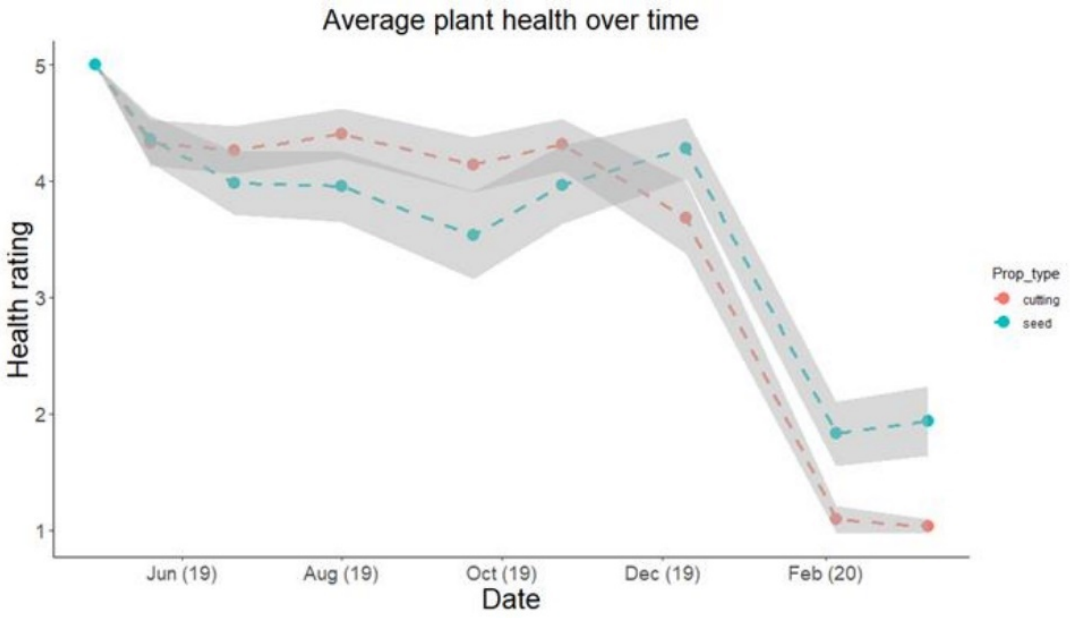


Figure 10: Average plant (propagate) health

Plate 6. Healthy Persoonia hirsuta propagate showing new growth

6.5.2.3 Shale Sandstone Transition Forest Offset/BioBank Site

The EPBC approval conditions for Appin Mine 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, IMC 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), IMC 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, IMC 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 IMC.

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, IMC 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 (BA 215). BA 215 details an annual works program (weed management, tree planting, monitoring etc). These works are carried out by Landcare and are summarised in the 2020 Annual Report provided as Appendix E: 2019/20 Appin West BioBank Site Annual Report.

6.5.2.4 Ventilation Shaft No.6 Offset

The Appin No. 6 Ventilation Shaft Site project approval required IMC 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, 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 IMC 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.

Landcare were engaged to undertake weed management at the site during the reporting period. The works focused on the treatment/removal of African Olive and Blackberry, which are prevalent at the site. This will continue throughout FY21.

The 2019 monitoring results indicate that, on average, the bushland on the site is outside of benchmark attribute values for the CPW but is showing trends towards benchmark values. An increase in exotic species may be due to the lack of bush regeneration works within 2017 and 2018, although after works during 2019 this should decrease again with time after follow up treatments.

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 in this reporting period. 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. Refer to Appendix F: 2019/20 Ventilation Shaft No.6 Offset Annual Monitoring Report.

6.5.2.5 ***Nepean River Biodiversity Stewardship Site***

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

BA 382 details an annual works program (weed management, tree planting, monitoring etc). These works are carried out by Landcare and are summarised in the 2020 Annual Report provided as Appendix G: 2019/20 Nepean River BioBank Site Annual Report.

6.5.2.6 ***Cataract River BioBank Site***

A BioBanking agreement (BA 345) for the Cataract River BioBank Site was finalised on 6 February 2019.

The site provides in-perpetuity management of approximately 8.53 ha (Lot 1, DP 572548). The property contains a critically endangered ecological community. IMC is required to undertake passive monitoring of the site until the BioBanking Trust Fund Deposit has reached 80 percent of the Total Fund Deposit. Once reached, IMC must commence all active management actions.

During the year, IMC engaged a contractor to remove asbestos that was identified on the property. The works consisted of a soil scrape of ground surfaces within three locations:

- Area 1: Approximately 5 m x 5 m
- Area 2: Approximately 16 m x 8 m
- Area 3: Approximately 17 m x 8 m

The Biodiversity Conservation Trust was consulted accordingly.

All three areas have since been rehabilitated with 500 seedlings of local grass, shrub species and 50 seedlings representing canopy species local to the area.

Plate 7: Rehabilitation following the removal of asbestos at the Cataract River Biobank Site

In addition to the asbestos removal, a new fence was installed to prevent livestock from entering the site.

6.6 Weeds

6.6.1 Environmental Management and Performance

6.6.1.1 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 inspections that review the effectiveness of weed management activities.

6.6.1.2 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. Targeted weed control within the emplacement area was undertaken by a contractor during the year which included slashing of perennial grasses and weed spraying.

6.7 Blasting

No surface blasting activities were undertaken at Appin Mine during the reporting period. Minor blasting activities underground are undertaken using approved management plans.

6.8 Operational Noise

6.8.1 Environmental Management

Noise across Appin Mine is managed in accordance with the approved 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.

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

6.8.1.1 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 enable 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 Appin Mine Noise Impact Assessment.

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

6.8.2 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 Appin Mine were generally below the day, evening and night assessment criteria as listed in Table 17. On three occasions noise levels generated were greater than 2 dBA over the $LA_{eq,15min}$ assessment criteria in the Noise Management Plan at location

AE-NS5 and therefore were reported as a non-compliance[8]. The results were recorded on 10 September 2019 (43 dBA), 11 September 2019 (50 dBA) and 24 February 2020 (45 dBA). The limit at this location is 40 dBA. These non-compliances are discussed in Section 11.

Appin Mine reported two exceedances against the $LA_{eq,15min}$ criterion at location AE-NS5. These were recorded on 17 November 2019 (42 dBA) and 20 May 2020 (41 dBA). These exceedances are discussed in Section 11.

Non-compliances recorded were likely attributable to the fans and gearboxes associated with Ventilation Shaft 2. Maintenance and corrective actions have been undertaken during the reporting period to reduce noise including:

- fan impeller cleaning for fans 1,2 and 3;
- replacement of gearboxes in the Stage 2 part of the gas plant;
- new sound attenuators and Variable Inlet Vanes (VIVs) for each of the three fans. The VIV replacement should reduce the noise from the fan as it will allow more accurate and less turbulent regulation of the air flow through the fans; and
- targeted, off-cycle noise survey completed to determine if new sound attenuators and VIVs were successful in minimising noise.

The site experienced an improvement in noise levels in May 2020.

A review was undertaken by the noise consultant of the noise monitoring data at AE-NS5. It was indicated that the analysis of the site noise contribution at the time of the February 2020 non-compliance was inconclusive, and it may have been as a result of extraneous noise. The investigation infers that the Ventilation Shaft 2 site is the source of low frequency noise and identified high frequency noise contributions from the neighbouring EDL facility. Additional work is required to identify the equipment contributing to overall noise levels, and to determine the contributions of Ventilation Shaft 2 and the EDL facility at the monitoring location.

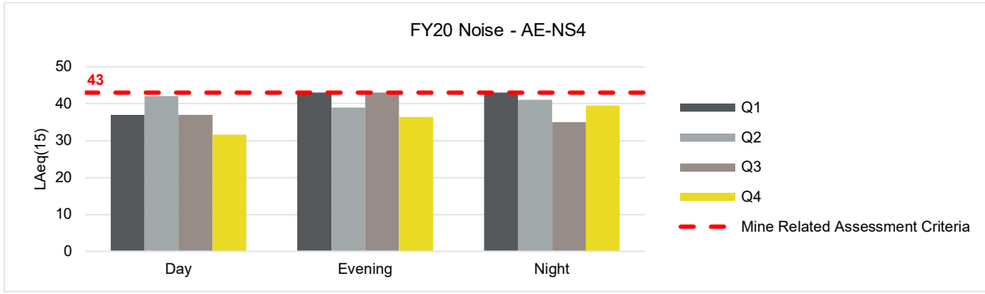
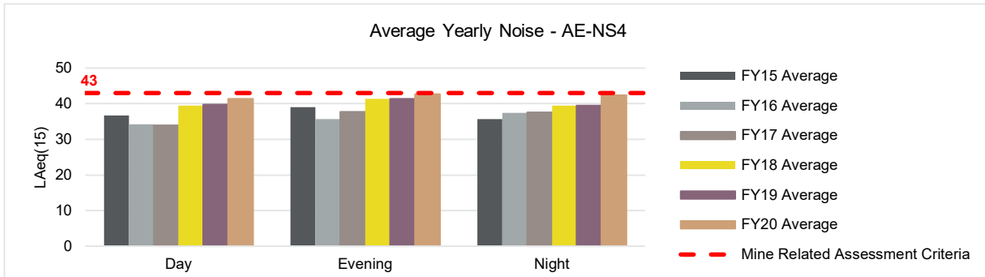
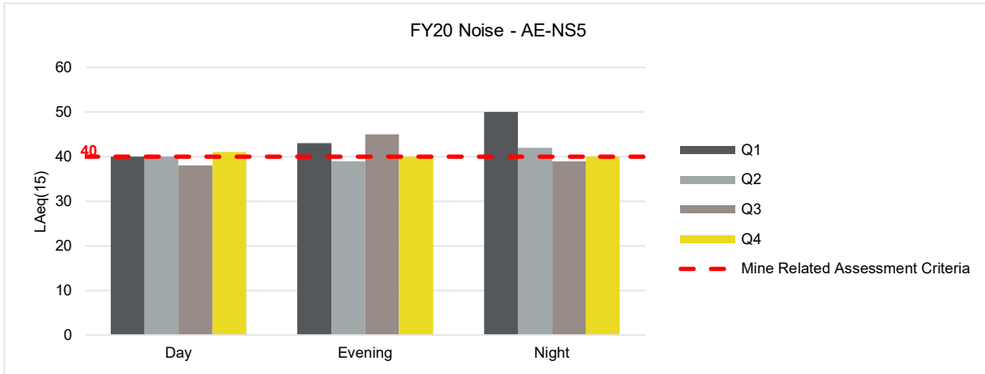
In accordance with the approved Noise Management Plan, continuous real-time noise monitoring was undertaken during the reporting period as required for supplementary investigations or following an exceedance. A continuous real-time monitoring system was deployed three times near monitoring site AE-NS5, at the Gas Extraction Plant and Ventilation Shaft 2, to ascertain the source of noise causing exceedances at the location. The real-time monitoring investigations were undertaken on 27 to 28 November 2019, 21 to 24 February 2020 and 19 to 22 May 2020. The monitoring periods coincided with quarterly monitoring, and the results were provided to the noise consultant to help determine compliance at the location.

Graphs of long-term nose monitoring trends are provided in Appendix C: Appin Mine Long-Term Environmental Monitoring Graphs.

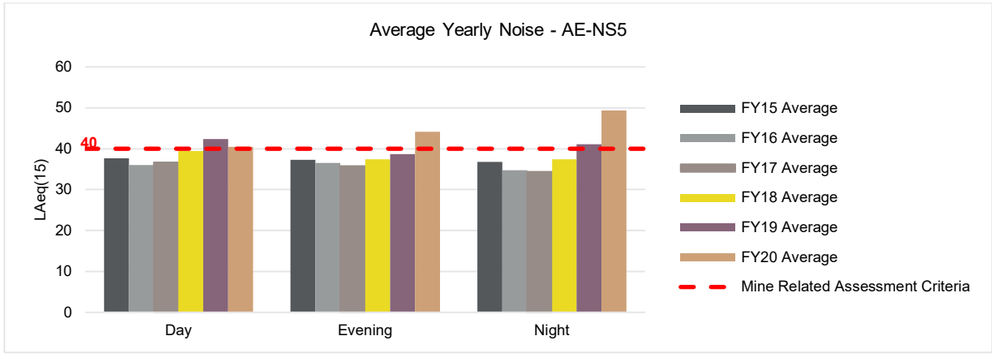
[8] Note that for the determination of compliance, the NSW Industrial Noise Policy states in Section 11.1.3:

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.

Table 17: Noise Survey Points and Results.

Survey Point ID	Type	Receivers	Assessment Criteria $LA_{eq\ (15\ min)}$	Assessment Criteria $LA_{1\ (1\ min)}$	Locality	Function	Data Summary	Comments
AE-NS4	Attended	Appin township	43 (day, evening and night)	52 (night)	Located in paddock between Illawarra and Toggarai St North of Pit Top behind receiver 137	Noise from AE	 	Compliant FY20 exhibited compliance with the assessment criteria. Noise generated from site was audible at the monitoring location. Appin Road still dominates as the overriding noise source at this location. Monitoring for day, evening and night displayed a slightly higher than average trend when compared to the previous reporting period. However, it is most likely due to regular peaks and troughs associated with weather effects (temperature inversions, winds, etc.).
AE-NS5	Attended	Appin No.1 and No.2 receivers	40[9] (day, evening and night)	50 (night)	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		Non-compliant FY20 site noise was clearly audible and was observed to be the dominant noise source across Q1, Q2, Q3 and Q4. Three non-compliances of noise criteria greater than 2 dBA over the assessment criteria in the Noise Management Plan were recorded at AE-NS5: • a noise level of 43 dBA (with 2 dBA low frequency noise penalty applied) was recorded at 9.17 pm on 10 September 2019; • a noise level of 50 dBA (with 5 dBA low frequency noise penalty applied) was recorded at 12:13 am on 11 September 2019; and • a noise level of 45 dBA (with a 2 dBA low frequency noise penalty

[9] 40 dBA is the assessment criteria adopted in the BSO Noise Management Plan dated 25/05/2017. This is not consistent with the Project Approval, which states the noise criteria at the relevant sensitive receivers at this location is 41 dBA.

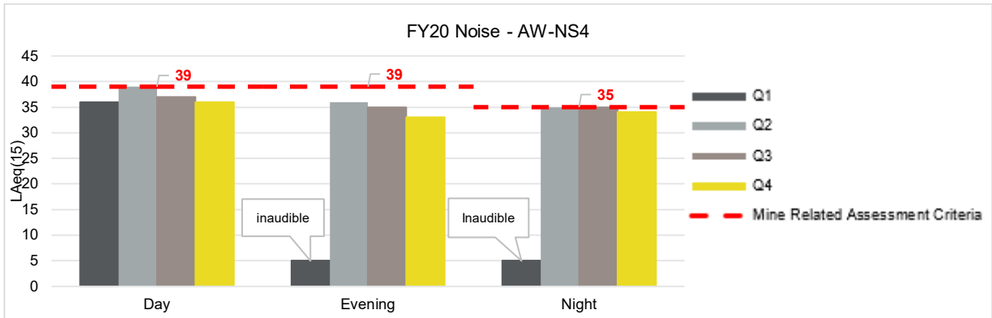


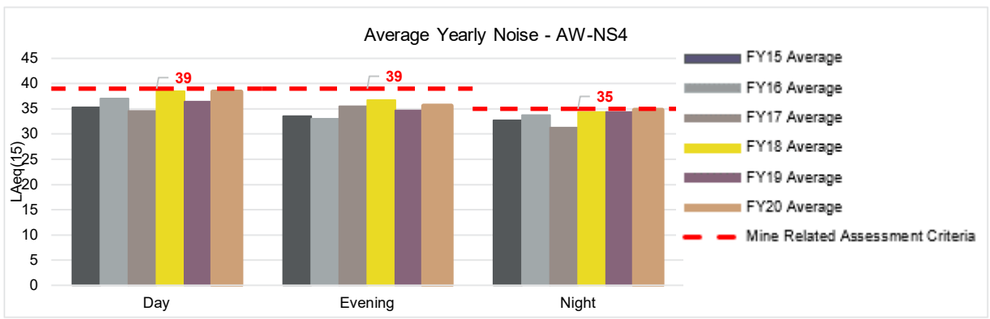
applied) was recorded at 8:43 pm on 24 February 2020.

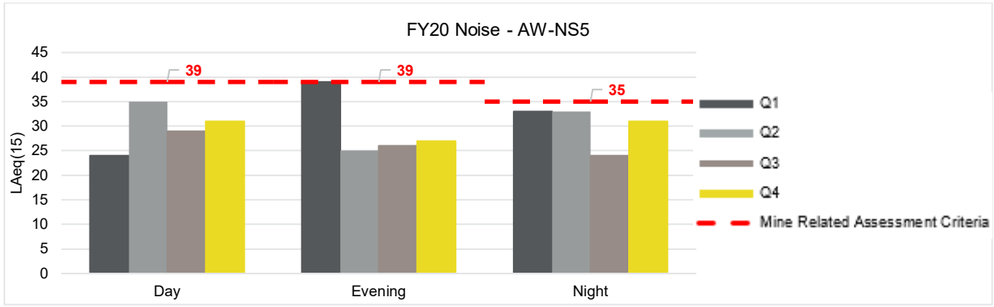
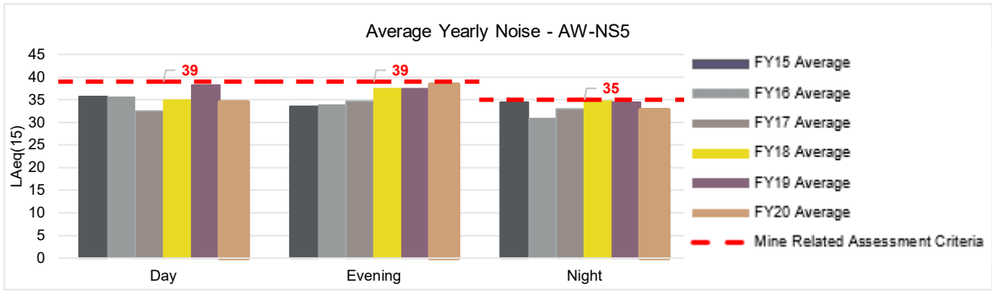
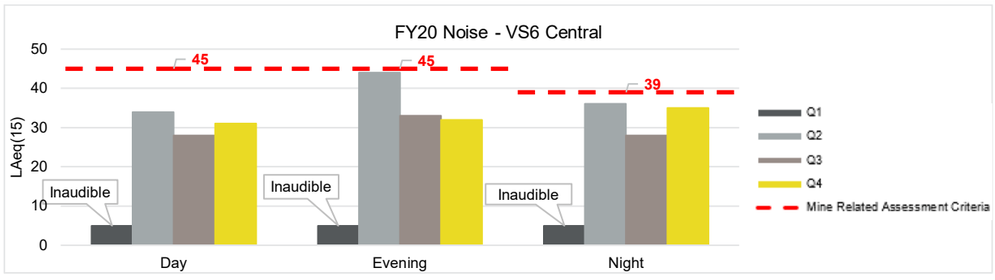
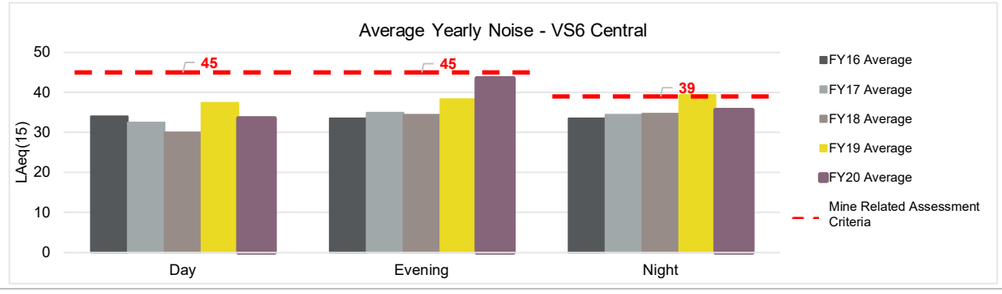
Two exceedances were recorded at AE-NS5:

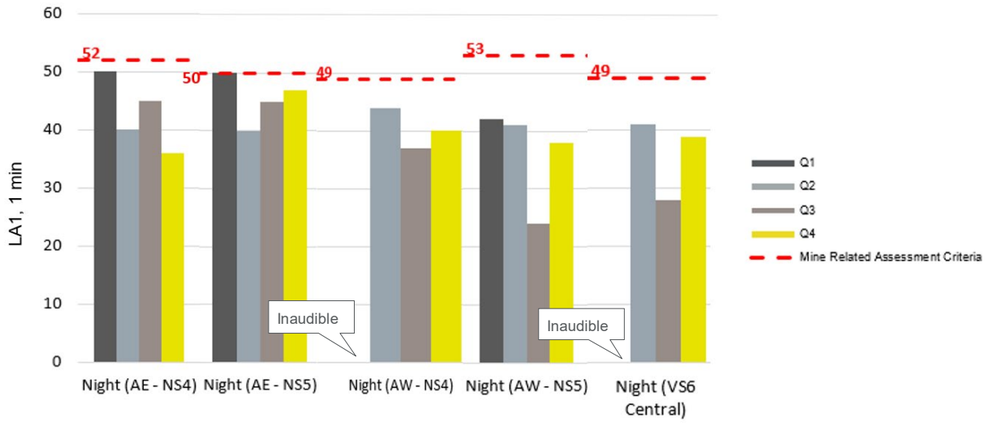
- a noise level of 42 dBA (with a 5 dBA low frequency noise penalty applied) was recorded at 11:01 pm on 27 November 2019; and
- a noise level of 41 dBA (with a 2 dBA low frequency noise penalty applied) was recorded at 12:51 pm on 20 May 2020.

Long term trend analysis shows the FY20 average higher than previously recorded for the evening and night period. However this is may be due to abnormal weather effects (temperature inversions).

AW-NS4	Attended	Appin West receivers South-west of Appin West; and Appin West receivers near Hume Highway	39 (day and evening) 35 (night)	49 (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 FY20 exhibited compliance with the assessment criteria. Q1 returned 'inaudible' results for the evening and night sampling periods. Day and evening monitoring displayed a marginally higher-than-average trend when compared to historic data, however still showing regular peaks and troughs associated with long-term trends.



AW-NS5	Attended	All other Appin West receivers	39 (day and evening) 35 (night)	53 (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	 	Compliant FY20 exhibited compliance with the assessment criteria. Comparitively, 2020 had a higher-than-average 'Evening' result, when compared to longer data trands. However, deviation is evident for this monitoring period, which may be due to variability in daily pit top activity. 'Day' and 'Night' averages decreased from FY19.
VS6 Central	Attended	Douglas Park Township and Receivers	45 day and evening) 39 (night)	49 (night)	Duggan Street behind Douglas Park Public School	Noise level between VS6 area and the nearest residential receivers to the West of site	 	Compliant: In Q2 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. Q1 returned 'inaudible' results across all sampling periods. Long term trend analysis shows the FY20 average higher than previously recorded averages for the 'Evening' period, however this is due to abnormally high Q2 results.

$LA_{1(1\ min)}$ AE-NS4, AE-NS5, AW-NS4, AW-NS5, VS6 Central	Attended	Various (see above)	NA	49 to 53 (see graph)	Various (see above)	Various (see above)		Compliant: Noise measured was below the assessment criteria for $LA_{1,1min}$ across all monitoring sites for FY20. Q1 returned 'inaudible' results for AW – NS4 and VS6 Central. For long-term graphs see Appendix C: Appin Mine Long-Term Environmental Monitoring Graphs.

6.9 Visual, Stray Light

The Appin West Pit Top is not directly visible by nearby residential receivers. Lighting located on the personnel 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.

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. This bund has also been revegetated.

6.10 Aboriginal Heritage

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

Aboriginal aspects associated with subsidence from the underground mining activities are detailed in Section 6.14 of this report.

6.11 Natural Heritage

The location of all heritage sites at the CWEA are shown on Plan 13.

Natural heritage aspects associated with subsidence from the underground mining activities are detailed in Section 6.14 of this report.

6.12 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 Appin Mine) are in place to detect any changes in coal quality that could potentially lead to spontaneous combustion occurring in coal stockpiles or the CWEA.

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 underground, and all mine officials carry CO handheld monitors.

6.13 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).

Asset Protection Zones (APZs) are maintained as required.

There were no bushfires on IMC property in the reporting period, however bushfires did occur in the vicinity.

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

6.14 Mine Subsidence

6.14.1 Approvals

6.14.1.1 ***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) on 28 February 2012 (for Longwalls 705 and 706) and 28 September 2012 (for Longwalls 707 to 710). On 17 April 2020, the SMP submitted to DPIE on 1 July 2008, and its subsequent amendments, was granted a new approval from the Resources Regulator on 17 April 2020 until 31 December 2024.

The Longwalls 705 to 710 SMP is supported by management plans addressing social, cultural, environmental and infrastructure aspects of the mining area.

Appin Longwall 708 is divided in to two sections - A and B, to step around a geological feature. During the reporting period, Longwall 708A progressed approximately 770 m to finish on 20 October 2019. Longwall 708B began extraction on 24 April 2020 and as of 30 June 2020 had progressed approximately 370 m.

6.14.1.2 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 management plans addressing social, cultural, environmental and infrastructure aspects of the mining area.

IMC applied to DPIE to vary the EP Approval for Longwalls 901 - 904 on 24 March 2015 to shorten the commencing end of Longwall 901 by 418 m. DPIE approved the variation on 29 April 2015. The latest longwall 903-904 variation was approved 21 March 2019.

Extraction of Longwall 903 commenced on 1 November 2019 and as of 30 June 2020, had progressed approximately 1415 m.

6.14.1.3 Appin (West Cliff) Area 5 Longwalls 37 – 38

The Area 5 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 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.

6.14.2 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 EP/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.

6.14.2.1 Landscape Features

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

No new Appin Area 7 gas release zones were identified on the Nepean River during the extraction of Longwall 708A and Longwall 708B. Furthermore, no previously recorded gas zones were active during the reporting period.

Three previously unobserved Appin Area 9 gas release zones were observed in the Nepean River during the reporting period. Gas release zones were identified and reported by the IMC Environmental Field Team (EFT) during routine inspections (AA9_LW902_007, AA9_LW902_008 and AA9_LW903_001). As of the June 2020 inspection of the Nepean River, there were 11 active gas release zones, of a total of 35 reported since the start of LW901. Each gas zone had an estimated emission rate of less than 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. Table 18 shows the Nepean River gas release zones identified. The Longwall 902 End of Panel (EOP) Report was published in September 2019. Longwall 902 was completed in FY19 with specialist assessments available toward the end of FY19 reporting period. Consequently, results were included in the FY19 Annual Review. Field observations from the FY20 reporting period are included below.

6.14.2.2 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.

Table 19 provides a summary of the predicted and observed impacts for surface waters during the reporting period. Further analysis will be included in respective EOP reports for Appin Longwalls 708 and 903.

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	No impacts observed	N/A
Surface waters in the mining areas	Potential for surface water diversion directly above or adjacent the mining area	No impacts observed	N/A
Gas releases	Likely that gas emissions could occur in the Nepean River	Gas releases identified for Area 9 only. Three new gas release zones identified in the reporting period.	• Continued monitoring program • Reported impacts to key stakeholders • Summary included in 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

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 impacts observed	N/A
	Potential for surface water flow diversion is very low	No impacts 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. Specialist analysis of water quality will be included in respective EOP reports	• Continued monitoring program • Reported impacts to key stakeholders • Reported in Annual Review
	Low likelihood of ferruginous springs. Significant impacts on Nepean River pH, iron and dissolved oxygen not predicted	No impacts observed. Specialist analysis of water quality will be included in respective EOP reports	N/A
Harris River	Mine subsidence induced ferruginous springs possible, with potential impacts on water quality	No impacts evident. Specialist analysis of water quality will be included in respective EOP reports	N/A

6.14.2.3 Groundwater

Piezometer and bore monitoring data have been used to determine pre-mining groundwater levels and quality. Groundwater data is collected during the mining period, then analysed and interpreted for reporting in the EOP Report as outlined in the relevant SMP and EP.

6.14.2.3.1 Appin Area 7

No longwall in Area 7 was completed in FY20 therefore no EOP report was produced during the reporting period. Extraction of Longwall 708A was carried out between April and October 2019. Longwall 708B commenced in April 2020 and will continue in FY21. By the end of June 2020 Longwall 708B had progressed approximately 370 m. The EOP Report for Longwall 708 will incorporate results from 708A and 708B.

Borehole EAW5 (S1913) is located approximately 1.2 km north to northwest of Longwall 708. Pressures in the Hawkesbury Sandstone (HBSS) have been monitored by three piezometers installed in the bore. At October 2019, the recorded water levels/pressures in the two upper piezometers were higher than the lowest observed in the baseline period. The pressure in the piezometer located at 194 m was 5 m below the baseline records.

Borehole EAW7 (S1936) is located over Longwall 706. Only one piezometer, installed at 65 m below ground level, has been operational during extraction of Longwall 708. The remaining piezometers failed by shear and were disconnected during Longwall 706 extraction for safety reasons. No FY20 records from the borehole were available for this report.

Data from boreholes EAW5 and EAW7 are collected annually. A comprehensive groundwater assessment will be included in the Longwall 708 EOP Report.

6.14.2.3.2 Appin Area 9

Longwall 902 was completed in FY19 with results included in the FY19 Annual Review. Extraction of Longwall 903 commenced in November 2019 and by the end of June 2020 it had progressed approximately 1170 m.

Three piezometers are monitoring the HBSS in borehole Appin West 9 (S1941), located 185 m from Longwall 903. At the end of FY20 the observed groundwater pressures for the upper two sensors were equal or higher than the baseline records. The sensor located at the depth of 201.6 m recorded the water pressure about 15 m lower than the baseline. Most of the observed decline occurred during LW 901 extraction, and in FY 2020 the pressure head reduced by 1.7 m.

No significant changes to the HBSS water levels/pressures were observed in boreholes Harris Creek 6 (S2281) and Harris Creek 7 (S2280).

Data was collected early in FY20 (July 2019) from piezometers in boreholes Appin West 18 (S1954) and Appin West 58 (S2080). Borehole Appin West 51 (S2060) was remediated in July 2019.

All the piezometer data that are not available at this time will be collected and comprehensively assessed for the Longwall 903 EOP Report.

6.14.2.4 Aquatic Ecology

Within the Appin Area 7 and 9 mining domains, 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 minimises the risk of 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, undertaken in November 2019, included post-extraction monitoring for Longwalls 705, 706, 707A, 707B and 708A, and further pre-extraction monitoring for Longwalls 708B to 710. This monitoring also provided further post-extraction monitoring for Longwalls 901 and 902 and the first year of post-extraction monitoring for Longwall 903. Monitoring of Longwalls 701 to 704 ceased in 2014, following the collection of at least two years of post-extraction data for each longwall.

Monitoring undertaken by IMC and other specialist consultants during extraction of these longwalls identified gas releases in the Nepean River. No fracturing, changes in water levels or flow have been attributed to mining. Some minor and short-term changes in water quality in the Nepean River in Appin Area 9 have been observed. As of January 2019, no active gas releases occurred in Appin Area 7 while eleven gas release zones were active in Appin Area 9.

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 these longwalls. This was not surprising given no more than minor gas releases and change in water quality have been observed in the Nepean River associated with mining. No changes in water quality were observed due to gas releases, neither were any changes in water levels or diversions of flow. Statistically significant differences in these indicators among Phases (i.e. 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. Most recently, high flows that have occurred in the river appear to have had a substantial effect on the extent of aquatic macrophytes at some sites in the current survey. Despite this, the species composition of macrophytes has been relatively consistent and the number and type of species identified in November 2019 were very similar to those identified in December 2013 and 2014 and November 2015, 2016, 2017 and 2018. Given the absence of any observed macrophyte desiccation and die-back, there is no evidence to suggest that changes in macrophyte diversity and distributions are outside what would be expected due to natural variation. In particular, changes to bank and river bed morphology due to recent flood events appears to have resulted in substantial localised changes in the coverage of macrophytes, independent of mining.

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 mining induced dieback has been observed though changes to bank and river bed morphology due to recent flood events appears to have resulted in substantial localised changes in the coverage of macrophytes, independent of mining.	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 2019.	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 2019.	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 2019.	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

6.14.2.5 *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

6.14.2.6 *Cultural Heritage*

No historical sites are located above the current mining area.

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

6.14.2.7 *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 surface infrastructure impacts during the reporting period for Appin Area 7 is provided in Table 23. Surface infrastructure impacts attributed to Appin Area 9 are summarised in Table 24.

Table 23: Predicted vs Observed Impacts for Surface Infrastructure for Area 7 in FY20

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Local Road	Minor cracking and localised heaving of the road surface in some locations above the longwall	Bump in subsidence profile and the pavement developed in two locations on Menangle Road during the extraction of LW708A	Menangle Road was proactively repaired on two occasions prior to the development of safety or serviceability issues
Hume Highway	No impacts on the safety or serviceability of the highway after the implementation of the management strategies	No reported impacts	N/A
Main Southern Railway	No impacts on the safety or serviceability of the railway after the implementation of the management strategies	No reported impacts	N/A
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	No reported impacts	N/A
Optical fibre cables	Impacts unlikely with the implementation of the management strategies including OTDR monitoring and mitigation	No reported impacts	N/A
Building structures	A low frequency of minor impacts and very low frequency of more significant impacts were predicted	1 x Property with Category 3 impact from the previous longwall (LW707) was acquired by Subsidence Advisory NSW during this period. All other building structures remained in safe and serviceable conditions during the extraction of LW708A.	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	2 x impacts to water tank plumbing.	Claims that have been lodged are being managed by SA NSW through the relevant legislation
Farm dams	Potential for minor cracking or leakage	No impacts attributed to mine subsidence.	Claims that have been lodged are being managed by SA NSW through the relevant legislation
Heritage structures	Impacts unlikely	No reported impacts	N/A
Groundwater bores	Potential for blockage or reduction in the capacity of the groundwater bores	No reported impact.	N/A.
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	Marks are likely to be exposed to the full range of mining induced subsidence movements. Marks within the area of influence have been noted as ‘disturbed’ in the SCIMS database.	Marks have been exposed to the full range of mining induced subsidence movements.	Following the completion of subsidence in the area a network of survey marks will be re-established to the satisfaction of NSW Spatial Services.

Table 24: Predicted vs Observed Impacts for Surface Infrastructure for Area 9 in FY20

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Local Road	Minor cracking and localised heaving of the road surface in some locations above the longwall	Bump in subsidence profile and the pavement developed in one location on Menangle Road during the extraction of LW903	Menangle Road was proactively repaired on one occasion prior to the development of safety or serviceability issues.
Main Southern Railway	No impacts on the safety or serviceability of the railway after the implementation of the management strategies	Minor 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 including OTDR monitoring and mitigation	No reported impacts	N/A
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	A low frequency of minor impacts and very low frequency of more significant impacts were predicted	No new impacts.	Claims that have been lodged are being managed by SA NSW through the relevant legislation
Pools	In ground pools could be more susceptible to ground strains	No new impacts.	Claims that have been lodged are being managed by SA NSW through the relevant legislation
Water tanks	Impacts unlikely	1 x impact to water tank plumbing.	Claims that have been lodged are being managed by SA NSW through the relevant legislation
Farm dams	Potential for minor cracking or leakage	No impacts attributed to mine subsidence.	Claims that have been lodged are being managed by SA NSW through the relevant legislation
Heritage structures	Impacts unlikely	No reported impacts	N/A
Groundwater bores	Potential for blockage or reduction in the capacity of the groundwater bores	No reported impacts	N/A
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	Marks are likely to be exposed to the full range of mining induced subsidence movements. Marks within the area of influence have been noted as ‘disturbed’ in the SCIMS database.	Marks have been exposed to the full range of mining induced subsidence movements.	Following the completion of subsidence in the area a network of survey marks will be re-established to the satisfaction of NSW Spatial Services.

6.14.3 Appin Area 5 Monitoring and Management Programs

Longwall 38 ceased extraction on 1 February 2016. Monitoring of the Georges River continues, providing pre-remediation data for the Georges River Rehabilitation Plan (GRRP). Monitoring activities currently include:

- photographic and observational monitoring including the Georges River and its tributaries, cliff lines and landscape features;
- water flow, pool water levels and water quality monitoring; and
- shallow groundwater level monitoring

Monthly monitoring is undertaken by the IMC EFT with fortnightly targeted inspections of Georges River pools that are observed to be below baseline level. Below baseline water levels were recorded during the FY20 reporting period. Below baseline pool levels have previously been reported and are assessed in detail in the GRRP.

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

The GRRP was approved by the Resources Regulator on 24 April 2020. It updates the proposed rehabilitation of the Georges River, following the completion of extraction of Area 5. It is included in the Appin Mine Mining Operations Plan, provided to DPIE for approval in July 2020. The GRRP was provided to DPIE for endorsement during the reporting period, which was received on 26 June 2020. IMC are currently arranging for land access agreements to undertake the approved GRRP.

6.14.3.1 ***Landscape Features***

Post-mining monitoring includes regular inspections of the Georges River as well as riparian features and cliffs.

There were no new impacts identified as the level of subsidence for Longwall 38 has diminished (see Table 25).

6.14.3.2 ***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 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 recorded 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.

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

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

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

Aspect	Predicted Impacts	Observed Impacts	Completed Actions
Georges River	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.	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. Fracturing and diversion of flow with lower pool levels. Pool water levels respond to increased releases from Brennans Creek Dam.	• Monitoring program continued • Reported to key stakeholders • Reported in EOP Report and Annual Review • Monitoring program reviewed • Impacts reviewed against Performance Measures • Technical specialist notified and advice on Corrective Management Actions (CMAs) sought • Impacts to Georges River included in GRRP, which was approved at the end of FY20.

6.14.3.3 Groundwater

Post mining monitoring of groundwater in the HBSS in Area 5 has continued as outlined in the Longwall 37-38 EP.

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 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 9 m and was reported as a Level 1 TARP during Longwall 38 extraction. During the reporting period the water level in WC95 exhibited recession at reduced rates during dry periods and increases following rainfall events. At the end of the reporting period the water level in the borehole was about 1 m below the lowest level observed during baseline and about 8.3 m higher than the lowest level recorded following mining. These changes remain within predictions.

6.14.3.4 Aquatic Ecology

No specialist aquatic ecology monitoring was undertaken during the reporting period as the post-mining period of this program is complete. Results from specialist aquatic ecology monitoring have been included in previous Annual Reviews.

Observations of aquatic ecology habitat is captured as part of monthly inspections undertaken by the IMC EFT. Apart from low water levels observed in some pools during the reporting period, no specific impacts to aquatic ecology were evident.

Specialist aquatic ecology monitoring will continue following the implementation of the remediation program of the Georges River.

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

6.14.3.5 Terrestrial Ecology

A baseline Terrestrial Flora and Fauna Assessment (Biosphere, 2009) was undertaken in support of the BSO Project Environmental Assessment. The Study Area for the assessment included 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 and 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 27: Predicted vs Observed Impacts for Aquatic Ecology for Area 5			
Aspect	**Predicted Impacts**	**Observed Impacts**	**Completed Actions**
Aquatic Ecology	Threatened species, threatened populations, or endangered ecological communities: - negligible environmental consequences	No specialist monitoring undertaken in the reporting period. Observational monitoring continues with no impacts evident in the reporting period.	N/A

Table 28: Predicted vs Observed Impacts for Terrestrial Ecology for 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

6.14.3.6 Cultural Heritage

No historical sites were located above Longwall 38.

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 (AHIMS # 52-2-2243). These impacts were a result of subsidence movements from Longwall 35 and Longwall 36. See relevant EOP reports for further information.

6.14.3.7 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 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 FY20. There were no reported impacts to any built features in FY20 in Area 5.

6.15 Hydrocarbon Contamination

Refer to Section 6.4.

6.16 Hazardous Material Management

6.16.1 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 in use; one at the Appin West Pit Top, and the other at BCD. Combined, there are approximately 6000 L of Sodium Hypochlorite and 6000 L of Hydrochloric Acid stored in these locations.

Details of the bulk chemical storage locations and manifest quantities associated with the Appin West and Appin North operations are provided in Table 29 and Table 30. No dangerous goods stored at Appin East are at manifest quantities.

Table 29: Summary of Dangerous Goods Storage at manifest quantities - Appin West

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	12,500 L	12,500 L
ABT 02	Sodium Hydroxide 35%	1824	8	III	AGT	1,800 L	1,800 L
ABT 03	Sodium Hypochlorite 12.5%	1791	8	III	AGT	1,800 L	1,800 L
ABT 04	Hydrochloric Acid 9%	1789	8	III	AGT	3,000 L	3,000 L
ABT 05	Sodium Chlorite 7.5%	1908	8	III	AGT	3,000 L	3,000 L
ABT 06	Hydrochloric Acid 33%	1789	8	II	AGT	15,000 L	15,000 L
ABT 07	Sodium Chlorite 7.5%	1908	8	III	AGT	2,000 L	2,000 L
ABT 08	Sodium Hydroxide 35%	1824	8	III	AGT	2,000 L	2,000 L
ABT 09	Citric Acid		N/A		AGT	2,000 L	2,000 L

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

Storage Area ID	Proper Shipping Name	UN No.	Class / Division	PG	Type	Design Capacity	Typical Quantity
ABT 01	Sodium Chlorite 7.5%	1908	8	III	AGT	4,000 L	3,000 L
ABT 02	Hydrochloric Acid 9%	1789	8	III	AGT	4,000 L	3,000 L

6.16.2 Explosives

All explosives / detonators for the Appin operations are currently stored at the explosives storage facility located at the Appin East mine site. Storage facility capacity information for Appin East and Appin West is provided in Table 31 andTable 32 respectively.

Table 31: Explosives and Detonator Storage – Appin East

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

Table 32: Explosives and Detonator Storage – Appin West		
Site	**Type**	**Capacity**
Appin West	1.1D Explosive	550 kg
	1.1B Detonators	5000 detonators

6.16.3 Radiation Gauges

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. 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.

6.17 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.

Results of the GHG accounting for FY20 are summarised in Table 33 and Figure 11. Long-term results for FY15 to FY20 are shown in Figure 12.

Table 33: Summary of Greenhouse Emissions - Appin Mine		
Emission Type	**Unit**	**FY20 Total**
Scope 1	kt $CO_{2\text{-}e}$	2151
Scope 2	kt $CO_{2\text{-}e}$	208

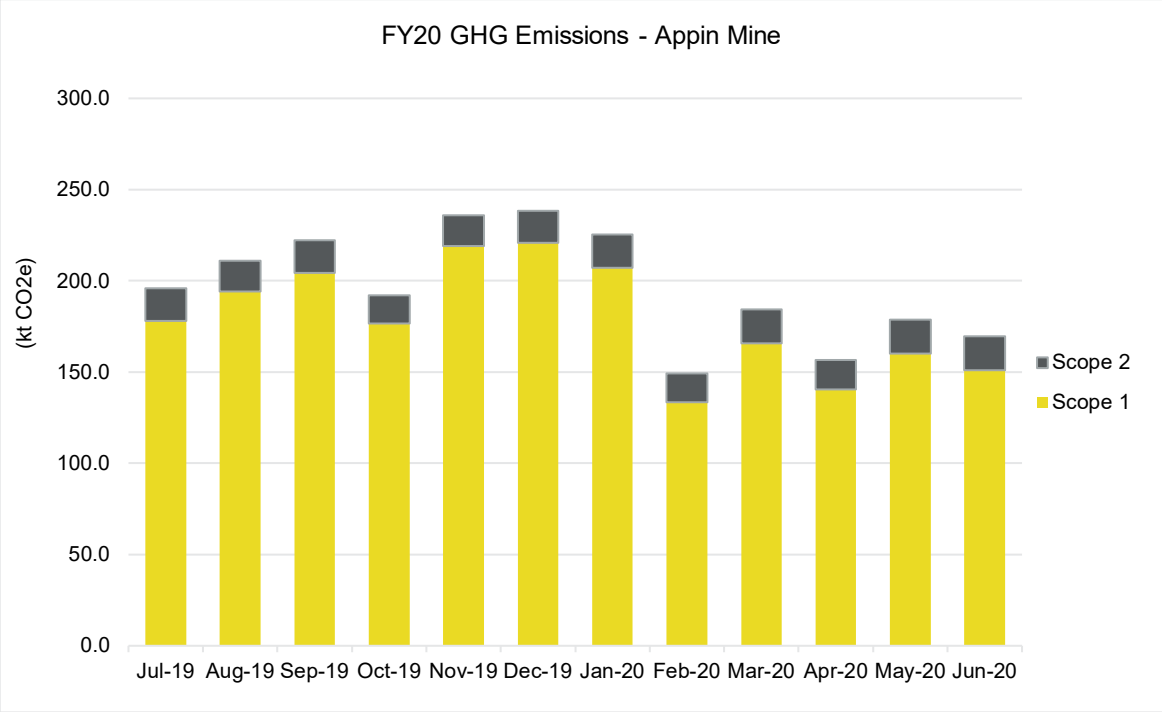


Figure 11: FY20 GHG Emissions - Appin Mine

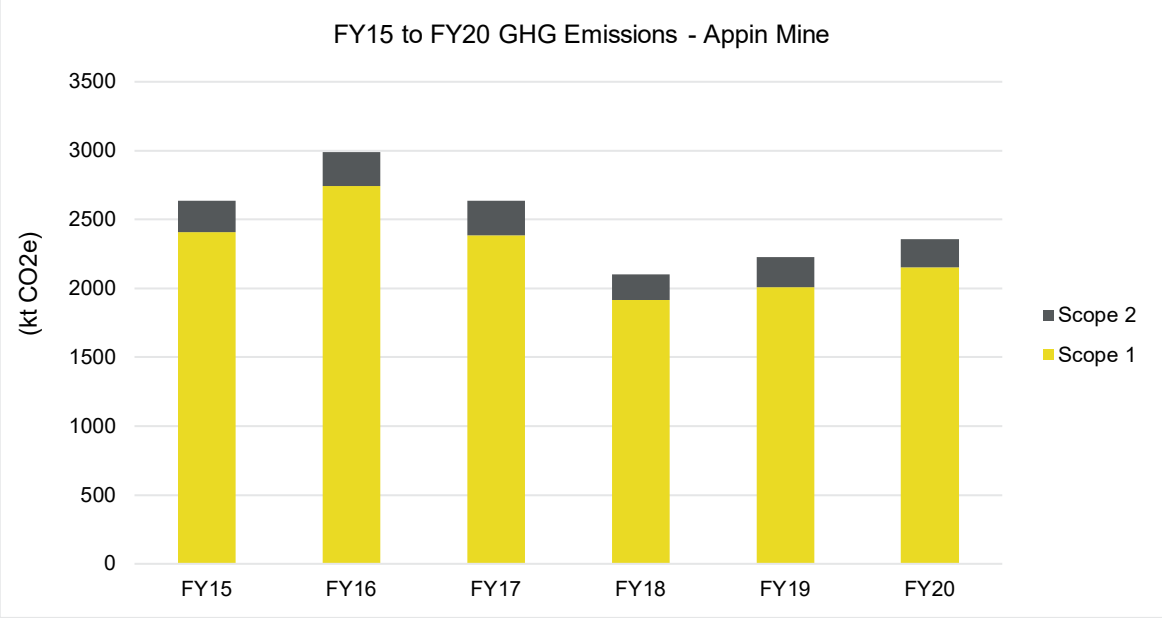


Figure 12: FY15 to FY20 GHG Emissions - Appin Mine

6.17.1 Mine Safety Gas Drainage

At Appin North, no surface gas drainage activities were undertaken as underground operations have ceased in Area 5.

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 Energy Developments Limited (EDL) Plants (West and East). When there is more gas available from the mine than can be utilised by EDL, the flaring systems are initiated to abate the methane content of the gas.

The flares at the Appin West Gas Drainage Plant and Appin East Plant were not in operation during FY20. All gas has been utilised at EDL for power generation, with some minor venting during plant changes and transitions.

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 maintained.

6.17.2 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. A total of 1239 kt CO_2-e was recovered and transferred (i.e. abated) to the EDL Power Plant.

6.17.3 Mine Ventilation Fans

During the reporting period, approximately 2083 kt CO_2-e was emitted to atmosphere from the Appin Mine Ventilation System, up 7% when compared to FY19 (1942 kt CO_2-e). The average CH_4 concentration was 0.28% (down from 0.29% in FY19) and the average CO_2 concentration was 0.16% (down from 0.17% in FY19).

6.17.4 Decarbonisation Program

IMC 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.

During FY19, IMC completed a concept level study that proposed a phased roadmap of projects with the aim of delivering the goal of carbon neutrality by 2050 through a combination of increased gas capture, treatment of ventilation air methane (VAM), and offsetting. During FY20, work towards delivering key projects associated with the roadmap to carbon neutrality began. This work has been in the areas of increasing longwall gas capture, projects to address emissions from legacy goaf areas, and work on the implementation of VAM treatment technology.

Increases in longwall gas capture have been achieved with additional underground drilling programmes being trialled during FY20. This has seen directionally drilled holes targeting gas bearing strata below the longwall being drilled in addition to the existing patterns, as well as increased lead time associated with directionally drilled holes specifically targeting the Balgownie Seam (a gas source that is generally within 10 m of the working section). This builds on work over the previous 2-3 years that has seen the introduction of directionally drilled holes aiming to intersect the goaf void to extract gas under vacuum (horizontal goaf holes, or HGHs), and the initial attempts at Balgownie Seam drainage. To date, this work has not yet reached the targeted long-term average of 67% PDCE (post drainage capture efficiency, the proportion of gas released due to longwall extraction that is captured), averaging 56.2% to the end of June in FY20. However, performance did achieve 65-67% PDCE during December, January, and February demonstrating that this goal is achievable, however, low longwall coal production and the startup of a new longwall during the final quarter of FY20 has impacted PDCE. Compared to South32's base year of FY15, PDCE has increased from 51.4% to 56.6% representing a reduction in GHG emission of approximately 86kt CO_2-e during FY20.

A project to extract methane from legacy goaves in the Appin North area and flare to reduce greenhouse gas emissions, was commenced during FY20. During FY20, this project moved through pre-feasibility into feasibility stage. It is expected that the feasibility study for this project will be completed in early FY21, however, the project will be put on hold following the completion of the

feasibility study due to capital expenditure restrictions. At this stage, funding to execute this project is included in the FY22 budget.

Study work relating to the introduction of VAM abatement technology also commenced during FY20. This work has focussed on four areas, representing different time frames that will be required to implement increasing greenhouse gas emission reductions associated with the decarbonisation roadmap. This involves:

1. Recommissioning the MEGTEC Vocsidizer at Appin North (the former 'WestVAMP' facility) – this will involve reconfiguration of the existing equipment to operate at lower methane concentrations in ventilation air, or moving the existing equipment to a different shaft within IMC.
2. Consideration of the feasibility of a full scale VAM unit using existing commercial scale VAMMIT (CSIRO's VAM Mitigation Technology) equipment.
3. Consideration of the feasibility of existing commercial scale Regenerative Thermal Oxidisers on new and existing IMC shafts.
4. Engagement with prominent tertiary institutes regarding development of future VAM technology.

All study work relating to the introduction of VAM abatement technology has been placed on hold ahead of commencing pre-feasibility studies due to capital constraints.

6.18 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 34.

Table 34: 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. Site Security Infrastructure including fencing, turnstiles and boom gates.
General vehicle traffic	Designated and sign posted roads and rules. Periodic speed monitoring along Wedderburn Road. Key locked gates to site (North Cliff). Site Security Infrastructure including fencing and boom gates.
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 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. Chemalert 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. Personal protective equipment 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 Safety Standard – Surface Transport Management Plan. Authorised / licenced operators.
Working at heights	Working at Heights and Dropped Objects Standard of Engineering Practice, procedures and permitting system for working at height activities.
Confined Spaces	Confined Spaces Standard of Engineering Practice, task procedures and permitting system for accessing 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	Risk Management Standard detailing 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	Surface and Underground Transport Management Plans detailing requirements for vehicle movements including vehicle standards - rotating beacons / seat belts / roll bar protection where relevant. Light vehicle policy for surface vehicles.

6.19 Waste Management

6.19.1 General Waste

General waste is segregated on all sites to maximise reuse and recycling opportunities in accordance with the Appin Mine Waste Management Plan. The waste streams applicable to Appin Mine are listed in Table 35.

Table 35: Main waste streams for Appin Mine

Waste Stream	Treatment
Timber	Recycled off site
Cardboard and paper	Recycled off site
Commingle	Recycled off site
Printer Cartridges	Recycled off site
Oils (mineral and synthetic)	Recycled off site
Oily waters	Treated on site or recycled or disposed off-site
Steel and Scrap Metal	Recycled off site
Sewage effluent	Appin North – Treated and irrigated on-site Appin West – Treated and irrigated on-site Appin East – Disposed via town sewage system
Industrial filters (oil filters)	Off-site recycling, treatment and disposal
Bathhouse 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 (exhaust fumes)	Off-site treatment and disposal
Hazardous waste	Off-site treatment or disposal
General Waste	Landfill and reused at ResourceCo (see Section Waste Reduction and Recycling)
Weak acid cation (WAC) regenerate	Removed off site for treatment/disposal
Brine	Removed off site for disposal
Biosolids	Transfer to drill mud ponds at CWEA
Drilling muds and waters	Transfer to drill mud ponds at CWEA
Electronic waste	Recycled off site
Concrete waste	Recycled off site

Solid waste volumes generated at Appin Mine (including Appin West, Appin East, Appin North and WCCPP) for the reporting period are specified in Table 36. Waste generated from exploration activities (drilling muds) and by the AW WTP for FY20 are also included in Table 36.

Table 36: Main waste quantities for Appin Mine

Waste Stream	FY15	FY16	FY17	FY18	FY19	FY20
General Waste (tonnes)	1146	1323	1080	782	1023	335
General Waste (ResourceCo) (tonnes)	-	-	-	-	424	1255
Industrial filters (tonnes)	381	380	268	243	352	754
Timber (tonnes)	234	225	147	62	75	5
Metal (tonnes)	1349	1344	935	936	967	1062
Cardboard (tonnes)	30	20	21	15	22	29
Commingle (tonnes)	17	17	14	7	17	388
WAC (ML)						4.5
Brine (ML)						123
Biosolids (ML)						0.5
Drilling Muds (ML)						5
Electronic Waste (tonnes)						0.026 [10]

Approximately 82% more waste was recycled in the reporting period when compared to the previous financial year. This is attributed to the increase in waste being diverted to ResourceCo in FY20.

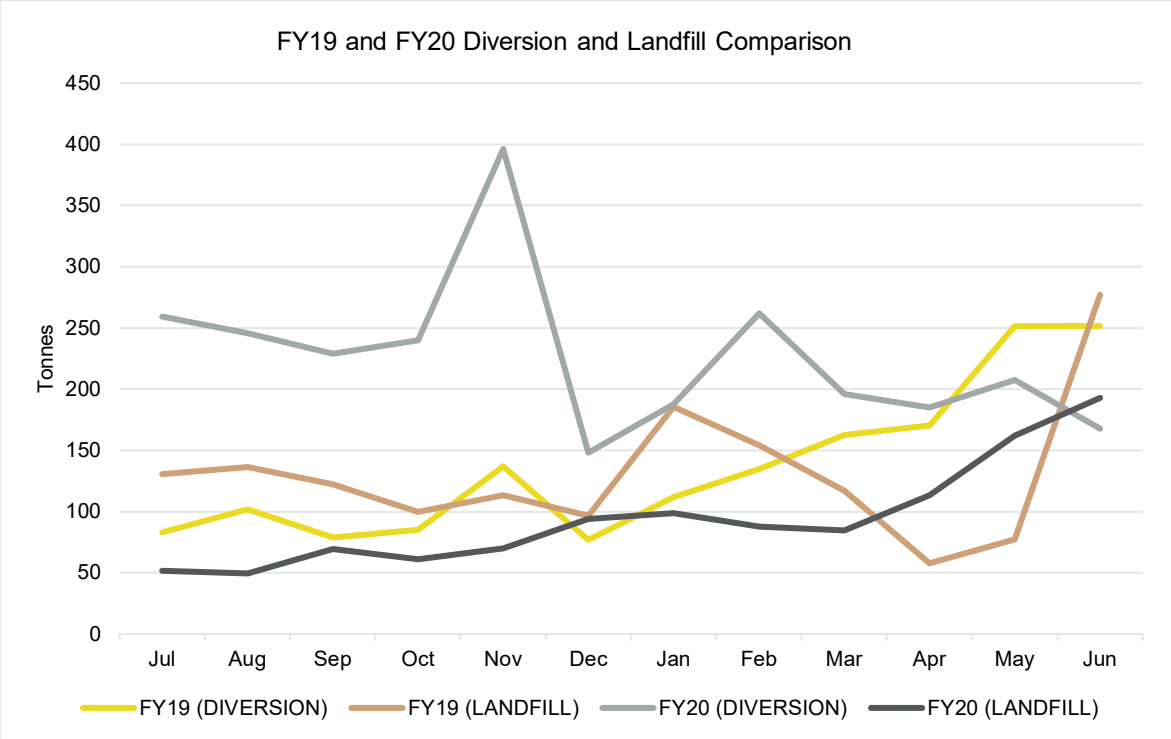


Figure 13: Landfill / disposal and recycled comparison – FY19 and FY20

[10] Recorded e-waste disposed at the Regional Operations Centre (ROC) via the University of Wollongong (UoW) e-waste bin. E-waste is recycled by an external recycling vendor.

6.19.2 Waste Reduction and Recycling

In FY19, IMC and its main waste contractor began redirecting wastes from landfill in an attempt to reduce the waste footprint of IMC. 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), diverting approximately 94% of waste material from landfill. The processed engineered fuels, Low Calorific Value (CV) and High CV, comply with the requirement of the Clean Energy Regulator under the Emissions Reduction Fund.

Based on FY20 waste figures from Appin Mine, five tonnes of timber and 29 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.

FY20 achieved better yields and higher volumes redirected to the recovery facility as segregation and acceptance standards are better understood and implemented on a site-based level. Approximately 72% of total solid waste for Appin Mine was recycled during the reporting period. This was an increase from FY19, which saw approximately 52% of total solid waste for Appin Mine recycled. Figure 13 displays tonnes diverted for recycling and disposed as landfill for FY19 and FY20. During the reporting period, there was an increase in waste disposed as landfill for approximately six weeks between April and May 2020. This occurred while a waste sorting machine was waiting to be inducted on the Appin North site. As a result, the end of the reporting period saw a reduction in waste being diverted for recycling and increase in waste disposed as landfill.

6.19.3 Coal Wash

Coal wash is a by-product of processing ROM coal. During FY20, a total of 0.654 Mt of coal wash from the WCCPP was emplaced at the CWEA. In addition, 14,000 tonnes of ROM coal/grout material from Dendrobium Mine was emplaced. IMC received approval to expand the CWEA (i.e. Stage 3) from DPIE on 20 December 2007. The Stage 3 CWEA provides an additional 33.5 Mt of coal wash emplacement with an expected emplacement life of approximately five years as of June 2020 (based on projected coal wash volumes).

IMC received approval for Stage 4 of the CWEA on 22 December 2011. The Stage 4 CWEA will provide an additional 26.0 Mt of coal wash emplacement with an expected life to 2048.

Table 37 outlines the capacity and status of each of the coal wash emplacement areas.

Table 37: CWEA – Capacity and Status

Emplacement Stage	Estimated Capacity (Mt)	Emplacement Status
1	4.6	Complete
2	20.8	Complete
3	33.5	Current
4	26.0	Not Yet Commenced

6.19.3.1 Coal Wash Management and Research

During the reporting period, IMC diverted approximately 1.3 Mt of coal wash from the DCPP for beneficial uses (i.e. as an engineered fill in housing developments and Roads and Maritime Services (RMS) road infrastructure projects, for the development of arterial and agricultural roads, and under an Operational Purpose Deduction (OPD) to improve a stockpile design at WCCPP), with nearly 5 Mt diverted since 2009. IMC has a long-term agreement with Lend Lease at Calderwood, Western Earth Moving at Tullimbar, and with the RMS on the Albion Park Bypass project, that should continue to see a large volume of coal wash diverted for beneficial uses in FY21 and beyond. IMC has also developed a pipeline of major projects that will require engineered fill for the next five years.

IMC 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. IMC has aligned 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 by the end of 2020.

IMC will continue to research, develop and implement alternative uses for coal wash in order to minimise the volume emplaced at the CWEA in future. IMC 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 following 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 basic oxygen steel (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 hybrid fibre reinforced polymer tubular standing roof supports for longwall mining, which can use unscreened coal wash as a component of the fill material.

IMC 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 CWEA in future.

IMC have also developed a trial for a new coal product destined for Vietnam that is a blend of high ash coal product constituted of coal wash that has been subjected to additional processing and Illawarra High Ash Coking Coal which is commonly referred to as Illawarra Energy Coal.

Two trial shipments totalling 119,000 tonnes have been exported and further shipments are planned, pending the successful trial of this new coal product. There is potential for the development of a continuing new market for the new blended product of coal wash and Illawarra Energy Coal.

6.19.3.2 Underground Coal Wash Emplacement Trials

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

- IMC'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 IMC engaged a mining consultant (Mine Advice) with experience in underground coal wash emplacement to develop a conceptual Emplacement Trial. Areas of consideration for the consultant included 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. The Mine Advice technical and economic evaluation concluded:

- There is a very long distance (>12 km) between the coal wash facility and active mining areas, resulting in significant technical and financial constraints on slurry pumping.

- Capital investment in the order of A$8 million would be required to commission the surface facilities and plant for a small-scale one-off trial system. Additional plant and equipment would be required to support the trial.

- Operational costs (including amortisation) were estimated in the order of $166 per tonne emplaced.

- Existing Appin mine workings do not allow substantial volumes to be emplaced due to:

    - restrictions following the declaration of Dharawal National Park;
    - the large numbers of existing roadways used within the current mine ventilation system (these roadways are safety critical to supply air to working areas and diluting seam gas);

- the compacted nature of the immediate overburden above extracted longwall panels; and
- some goaf areas being flooded and all containing large quantities of methane.

- Emplacing pumped coal wash behind active mining contains substantial technical problems.

- Without effective solutions to the above, the inevitable conclusion would be as per that reached by Professor Palarski (2005) in his review of the Appin Mine, namely that "it should be stated that at present the use of traditional hydraulic and high-density fill (cemented fill) in existing longwalls of a very high output is from a technological point of view, impossible".

IMC considers the work completed to date, including the assessment by Mine Advice, along with IMC's commitment to undertake best endeavours to direct coal wash to beneficial use in preference to surface emplacement has fulfilled Condition 20 of Schedule 4 of the Project Approval. IMC received advice from DPIE on 3 September 2020 that the Department considers that South32 has met the intent of Condition 20 of Schedule 4.

6.19.4 Sewage

During the reporting period, ongoing monitoring and inspections were conducted on the two Appin Mine sewage treatment plants.

There are Smith and Loveless Sewage Treatment Plants (STPs) on the Appin West and Appin North sites that discharge into maturation ponds. The treated effluent is irrigated on site via LDP 22 (Appin West) and LDP 4 (Appin North). A waste water maintenance contractor is periodically engaged to review operational performance and 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 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.

6.19.5 WAC Disposal

WAC, a waste stream from the AW WTP, is transported off-site to a licenced waste management facility. The total volume of WAC transported off-site during the reporting period was 4.51 ML, an increase of 0.45 ML compared to the previous reporting period. This was due to increased throughput of the AW WTP.

6.19.6 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 transferred to the CWEA in the reporting period was approximately 480 kL.

6.19.7 Brine Disposal

Brine is a by-product of the WTP process. Approximately 123 ML was generated in FY20. The brine is transported by truck to LDP 5 under EPL 3241 located at Marley Place, Unanderra. The brine is discharged into the same location as the dewatering discharge from Dendrobium Mine, which provides dilution for the brine as it is released into Allans Creek.

6.20 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 ha of which approximately 6.5 ha 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 (CCL) 724.

6.20.1 Land Ownership and Approvals

The North Cliff Mine Site and access road is covered by CCL 724, which includes the surface and land below to an unlimited depth over the mine site and to a depth of 15 m 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.

6.20.2 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 the WCCPP 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 Specialist Environment.

6.20.3 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, including several large above ground water tanks. However, these are not posing an environmental or safety hazard. There has been no equipment removed from site during the reporting period.

6.20.4 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.

6.20.5 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 m^3 of loosely tipped shale and sandstone, has been graded, shaped and has regenerated with local species.

The Appin Mine 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 land use at the site.
- Prepare a site-specific Rehabilitation Management Plan (RMP) for North Cliff and gain external approvals from Resources 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 RMP.
- 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 site did not commence in FY20 but will occur under the Legacy Site and Rehabilitation Program. As of August 2020, there is no planned rehabilitation at North Cliff Mine scheduled for FY21.

6.20.6 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.

6.20.7 Air Quality

The generation of windblown dust from the North Cliff 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.

6.20.8 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.

6.20.9 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.

6.20.10 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.

7. WATER MANAGEMENT

7.1 Water Licences

The water take for Appin Mine over the reporting period is provided in Table 38.

Note: 1 unit = 1 ML.

Table 38: Water Take – Appin Mine

Water Licence No.	Water Sharing Plan, Source and Management Zone	Entitlement (units)	Total (ML)
10AL117284	Greater Metropolitan Region Unregulated River Water Sources Hawkesbury and Lower Nepean Rivers Water Source Menangle Weir Management Zone	53.00	53.00
10AL117998	Greater Metropolitan Region Unregulated River Water Sources Southern Sydney Rivers Water Source Georges River Catchment Management Zone	2750.00	1156.74
10AL118765	Greater Metropolitan Region Groundwater Sources Sydney Basin Central Groundwater Source	274.00	274.00
10AL118777	Greater Metropolitan Region Groundwater Sources Sydney Basin Nepean Groundwater Source Nepean Management Zone 2	303.00	221.41
10AL119248	Greater Metropolitan Region Groundwater Sources Sydney Basin Nepean Groundwater Source Nepean Management Zone 2	300.00	214.58

7.2 Compensatory Water

Under relevant provisions of the Project Approval (Condition 14 of Schedule 4), IMC shall 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, in accordance with the approved SWMP. IMC is currently supplying compensatory water as per the Table 39 and Table 40 below.

Table 39: Compensatory Water – Groundwater Bores

Bore	Mining Location	Impact	Current Status	Actions / Agreements	Water Supply Rate
Unregistered	Appin Area 5 LW38 tailgate	Reduced yield due to initial reduction in SWL.	Re-optimisation works underway.	Lifting the bore pump identified the pump was significantly blocked with iron and manganese precipitates and was significantly oversized for its application. SWL has significantly recovered following initial recession. IMC currently project managing design and installation of re-optimised set-up to overcome reduced yield.	Up to 1 x 13 kL per week. Typically supplied at 1 x 13 kL per month.
GW108312	Appin Area 7 LW707B	Pre-emptively grouted to avoid gas release in high traffic area.	Currently investigating long-term supply options in consultation with RMS.	Currently RMS organising water deliveries as required, with reimbursement sought from IMC.	As required, due to significant seasonal fluctuations in water demand.
Initially Unregistered Licence: 10WA121956	Appin Area 9 LW901/902 chain pillar	Possible reduced yield.	Currently investigating long-term supply options.	Compensatory supply of water provided until long-term solution can be arranged.	2 x 13 kL loads per fortnight.
GW072249	Appin Area 9 LW901/902 chain pillar	Reduced yield.	Re-optimisation works underway.	IMC currently project managing design and installation of re-optimised set-up to overcome reduced yield.	2 x 13 kL loads per fortnight.
GW105388	Appin Area 9 LW709	Reduced yield.	On-hold pending further negotiations following DPIE Secretary Review.	Subject to DPIE Secretary Review.	6 x 13 kL loads per week.

Table 40: Compensatory Water – Farm Dams

Mining Location	Impact	Current Status	Actions / Agreements	Water Supply Rate
Appin Area 7 LW706	Release of strata gas.	Matter Resolved.	Compensation for dam provided by SA NSW under *Mine Subsidence Compensation Act 1961 (MSC Act 1961)*.	As required. Up to 1 x 13 kL loads per month until 31 October 2020 provided in good faith – 12 months from the completion of subsidence at the property following LW708A.

7.3 Groundwater

7.3.1 Appin West

During the reporting period, excess groundwater from the Appin underground operations was pumped to the surface at Appin West for treatment via the Appin West WTP. The treated water is either blended and piped underground for reuse, and/or discharged to the environment via LDP 24. Discharge volumes at LDP 24 are made available to the public via the web based environmental monitoring report, which is issued every 14 days. Refer to Table 15 for discharge volumes.

The monitoring system for LDP 24 now includes a continuous monitoring system for pH and EC.

7.3.2 Appin East

During the reporting period, groundwater from the Appin 'White Panel' storage area was pumped to the surface and stored in a 1,400 L tank at Appin East. The water is dosed with sodium hypochlorite to inhibit microbiological growth, before being re-used underground for fire suppression, and mine-services uses (hose-down, belt maintenance, etc.).

7.3.3 Appin North

Water for underground use is delivered from BCD to the underground operations via a gravity fed pipeline. 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. Groundwater and surplus mine water can be pumped to the surface for use in the WCCPP from Area 5 if required. During the reporting period approximately 259 ML (calculation) of water was delivered underground with 0.007 ML of surplus underground water pumped to the surface for use in the WCCPP. The remaining ~300 ML of BCD water was used in the WCCPP, for dust suppression (watercarts), washdown and the truck wash. Excess water in Pond 3 and Pond 4a continued to be used for dust suppression on the active coal wash emplacement area with the water being filtered through the CWEA before entering the emplacement underdrainage system.

The planned AN WTP will treat water currently stored in Area 5. There were no incidents of groundwater pollution within the report period.

Groundwater monitoring associated with previous land contamination due to hydrocarbons is discussed in Section 6.4.

7.4 Water Supply and Use

7.4.1 Appin West

Mine water is processed at the WTPs [IMS 1 and 2a] to produce treated water (permeate). This treated water is supplied to the Appin Mine underground mining operations. Any shortfall in underground supply is supplemented by potable water provided by Sydney Water. Excess permeate is discharged to the environment via LDP 24. Potable water is used for site administration buildings, workshops, the bathhouse, fire emergency services, Appin West Gas Extraction Plant, and as a back-up for underground operations.

Table 41 provides an overview of the potable water usage associated with the Appin West site for the reporting period.

Table 41: Potable Water Usage for Appin West				
Area	**Usage FY19 (ML)**	**Usage FY20 (ML)**	**Variance (ML)**	**Comments**
Appin West	56	72	+16	Slightly reduced supply from Appin West Water Treatment Plant.

7.4.2 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, fire emergency services, 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 reused as supply for the dust suppression on haulage roads and stockpiles, along with the dirty equipment hose down.

Table 42 provides an overview of the potable water usage associated with the Appin East site for the reporting period.

Table 42: Potable Water Usage for Appin East				
Area	**Usage FY19 (ML)**	**Usage FY20 (ML)**	**Variance (ML)**	**Comments**
Appin East	615	296	- 319	Less demand for dilution of salinity levels in BCD.

7.4.3 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:

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

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. Dilution ceased in March 2020 following the addition of the drought condition for Point 10 (EPL 2504 Condition L2.6).

A summary of the water usage for the reporting period, compared to the previous reporting period, is provided in Table 43.

Table 43: Water Usage Comparison – Appin North			
Type	**Usage FY19 (ML)**	**Usage FY20 (ML)**	**Comment**
Potable Water	1.00	1.49	Nil
Recycled (BCD) Water	649	518	Nil

7.5 Rainfall

Figure 14 displays rainfall data for FY20 at Menangle (Menangle Bridge), NSW. Figure 15 shows the annual rainfall for the region since FY15 from the Appin East DustTrack unit. Figure 16 displays the annual rainfall for the region since FY12 from the Bureau of Meteorology (BOM) station located at Menangle Bridge.

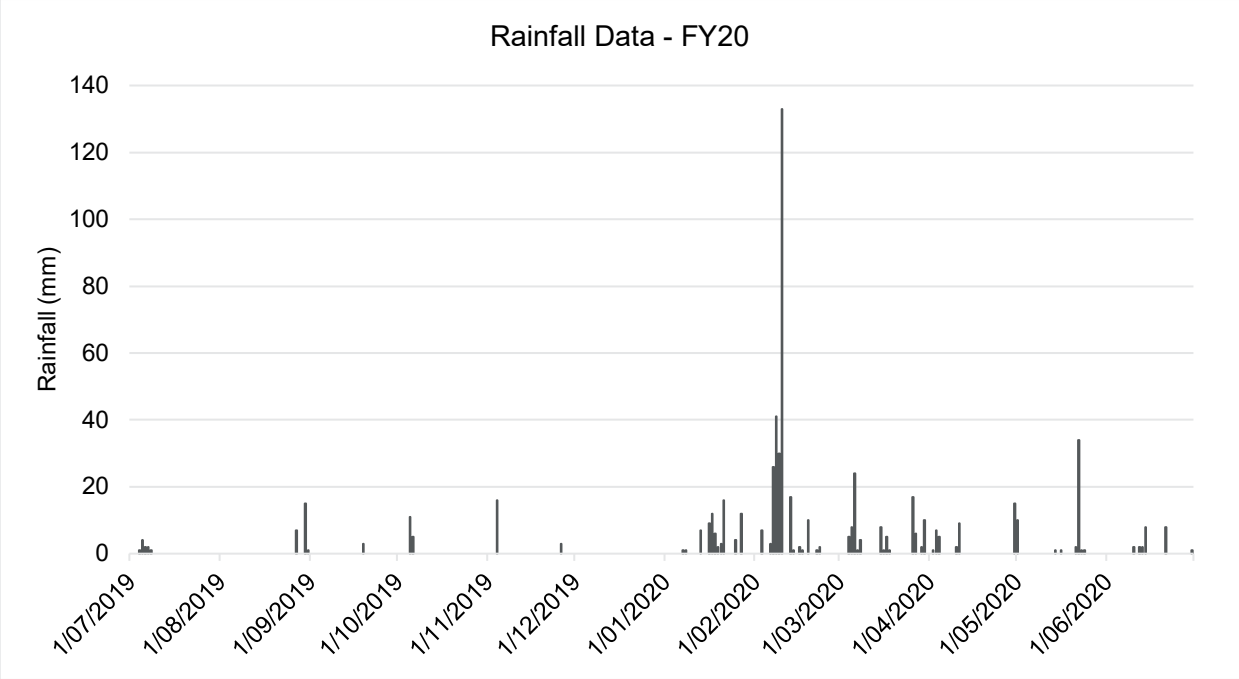


Figure 14: FY20 rainfall data - Menangle (BOM site #68216).

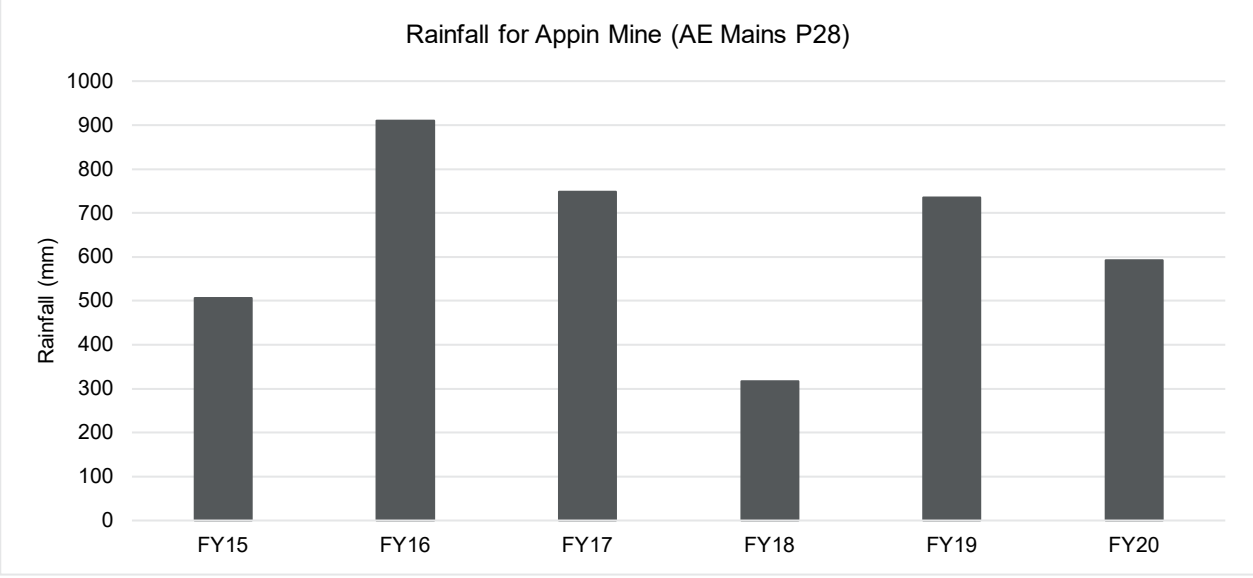


Figure 15. FY15 to FY20 rainfall data - Appin East (AE Mains P28 DustTrak II)

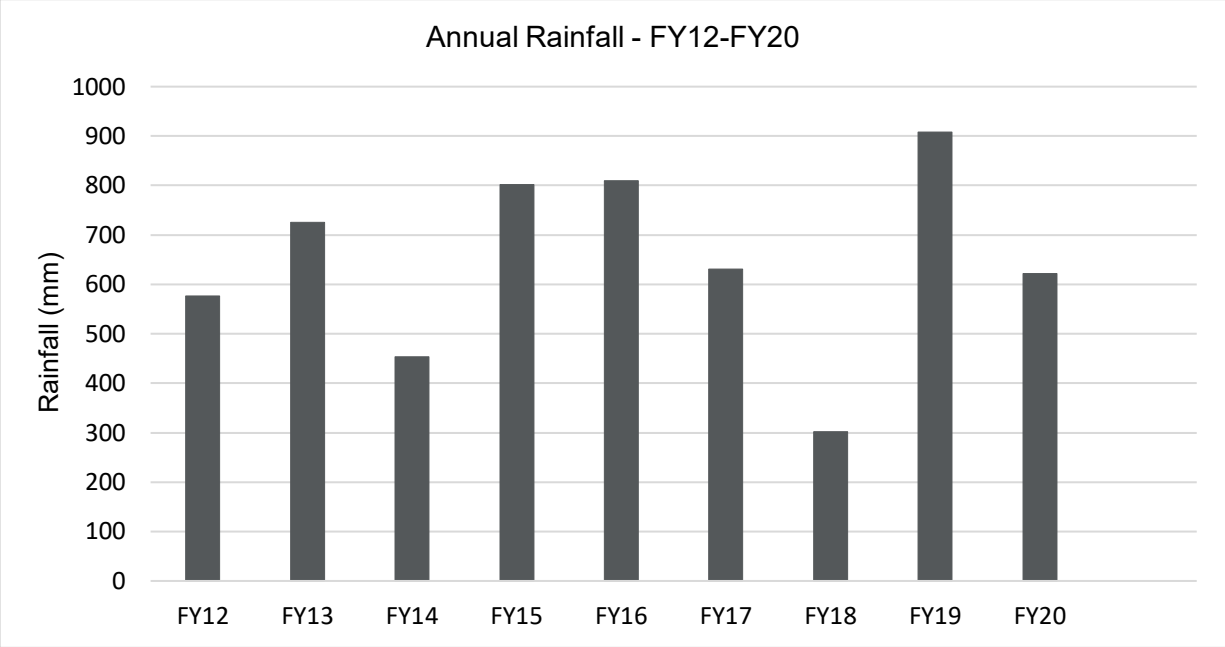


Figure 16: Annual rainfall – Menangle (BOM site #68216).

8. REHABILITATION

8.1 Rehabilitation for the Reporting Period

8.1.1 Buildings

No demolition of buildings was undertaken during the reporting period.

8.1.2 Rehabilitation of Disturbed Land

Progressive rehabilitation of the CWEA has been undertaken during the reporting period in accordance with the approved CWEA Management Plan.

The following works were undertaken during the reporting period:

- establishing the growth medium for ~3 ha and seeding of ~3 ha in Stage 3; and
- the planting of 50 trees in the Cataract River BioBank site to meet the requirements for the removal of SSTF trees at Appin West (refer Section 6.5.2.6).

Plate 8 shows the performance of rehabilitation on Stage 2 of the emplacement.

Plate 8: Stage 2 emplacement rehabilitation FY20 (Seeded in 2007).

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

In addition, tree planting and monitoring of revegetation at the BioBank sites was undertaken during the reporting period. For more detail, refer to Section 6.5 and the following annual reports included as appendices to this report:

- Appendix A: Annual Emplacement Rehabilitation Report
- Appendix D: Annual *Persoonia hirsuta* Condition Monitoring Report

- Appendix E: 2019/20 Appin West BioBank Site Annual Report
- Appendix F: 2019/20 Ventilation Shaft No.6 Offset Annual Monitoring Report
- Appendix G: 2019/20 Nepean River BioBank Site Annual Report

The rehabilitation status is provided in Table 44.

Table 44: Rehabilitation Status (Cumulative)

Location	Area Affected/Rehabilitation (ha)		
	Previous Report (FY19)	This Report (FY20)	Forecast (FY21)
A Total Mine Footprint	28377	28377 [11]	28377
B Total Active Disturbance	148	158 [12]	158
C Land Being Prepared for Rehabilitation	11	9 [13]	9
D Land Under Active Rehabilitation	15	21 [14]	24
E Completed Rehabilitation [15]	38	42 [16]	44

8.1.3 Legacy Sites and Rehabilitation Program

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

A study was identified to investigate the connectivity between North Cliff and the current operational underground workings of Appin Colliery. However, the study did not progress in FY20. Once this work is completed, it will be used to develop the shaft sealing methodology for the North Cliff site that is critical to developing the rehabilitation plan for the site.

The focus of the Legacy Sites and Rehabilitation Program in FY20 was sites associated with Dendrobium Mine. See the Dendrobium Mine and Cordeaux Colliery Annual Review on the South32 website for details https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents.

8.2 Rehabilitation and Research

Refer to Section 6.5.2.2 for details on the *Persoonia hirsuta* translocation trial that is ongoing.

As part of the GRRP, approved by the Resources Regulator on 24 April 2020 (See Section 6.14.8), IMC commenced a water balance study in 2018. Stage 1 was finalised in October 2019, and Stage 2 is planned to be finalised in FY21.

[11] Consists of the size of the Project Approval boundary for the BSO Project (mining lease footprint) only.
[12] Increase due to updates to the emplacement rehabilitation dataset undertaken in FY20.
[13] Landform Establishment and Growth Medium Development phases.
[14] Ecosystem and Land Use Establishment Phase.
[15] Note that no areas of rehabilitation have been signed off as complete by the Resources Regulator to date.
[16] Ecosystem and Land Use Development and Relinquishment Phases.

A Georges River Catchment Model has been developed by consultants WSP to support the GRRP. The initial stage (Stage 1) of the Georges River Catchment Model included developing a water balance model of the Upper Georges River pool and rockbar system and assessing the performance of proposed measures to remediate mine subsidence impacts to the system. Stage 2 of the model extended the pool water balance model to include Appin North and WCCPP surface operations, including BCD and upstream water management infrastructure.

8.3 Further Development of the Final Rehabilitation Plan

The Appin Mine Mining Operations Plan (MOP) addresses the rehabilitation requirements and objectives for all domains associated with the combined Appin Mine sites. The MOP outlines a range of post land use options that are potentially available for Appin Mine 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 Appin Mine related sites.

A request to extend the period for the MOP until September 2020 was submitted to and approved by DPIE (Resources Regulator) in FY19. The MOP was updated to both reflect changes in operations as well as meet the draft requirements of a Rehabilitation Management Plan (RMP) in FY20. The MOP was submitted to DPIE (Resources Regulator) in July 2020. The Appin Mine Closure Plan was reviewed in FY20.

The Rehabilitation Cost Estimate (RCE) for Appin Mine was reviewed in FY20 according to the latest RCE tool from DPIE. The latest RCE is attached[17] as Appendix H: Rehabilitation Cost Estimate.

[17] The RCE is Commercial in Confidence and is only provided to the Resources Regulator.

9. COMMUNITY

IMC operates a 24 hour Community Call Line (free call 1800 102 210) and a general email address *illawarracommunity@south32.net*. The call line and email address enable the community to request and provide feedback about operational activities and lodge complaints on any aspect of the Appin Mine operations. The call line number and email address have been advertised throughout the reporting period in all correspondence distributed to the community.

A complaint received by IMC in whatever format is investigated and resolved by the Community Team. The appropriate team member will investigate the complaint and seek assistance from the relevant site or operational personnel. Where required, additional details will be sought from the complainant where there is insufficient information for investigation (where contact details are provided).

Community complaints must be responded to within 24 hours of the complaint being received. (Note: this timeframe relates to contact with the complainant, not resolution/investigation of the matter). Some complaints require ongoing investigation and remedial action to address the nature of the complaint.

Complaint information is provided publicly on the South32 website and to the Community Consultative Committee, Douglas Park Advisory Panel, IMC management, and government agencies on a regular basis.

All complaints recorded during the reporting period are attached as Appendix I: Appin Mine Community Complaints Report FY20.

At the completion of this reporting period, Appin Mine employed approximately 1200 employees and contractors [18].

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 Complaints

During this reporting period seven complaints were received in relation to Appin Mine operations (including Pit Tops and exploration work). Details of the complaints received, and the actions taken, are provided in Appendix I: Appin Mine Community Complaints Report FY20. A summary of all complaints received across Appin Mine in FY20 is included in Figure 17. An analysis of complaints since FY13 is included in Figure 18. It is noted that there has been a decrease in complaints over time.

[18] As at August 2020. It should be noted that contractors are only reportable if they are in SAP, otherwise the Finance Team receives the total amount of contractor hours claimed and divides by 40 to get an FTE equivalent.

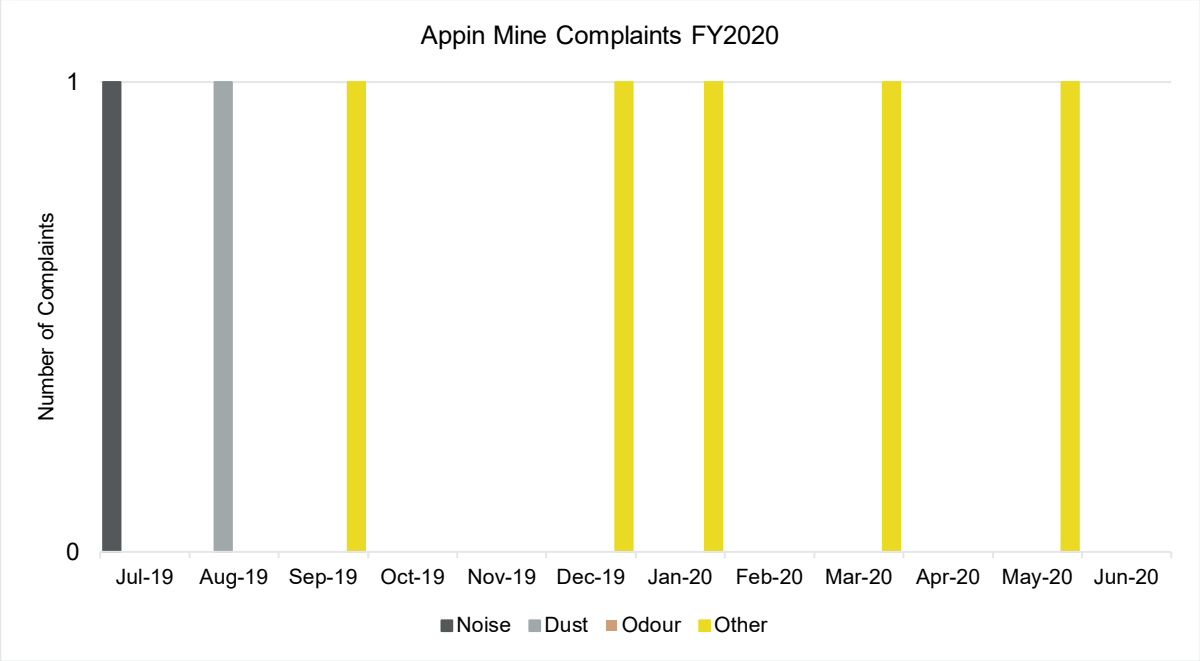


Figure 17: FY20 Community Complaints for Appin Mine

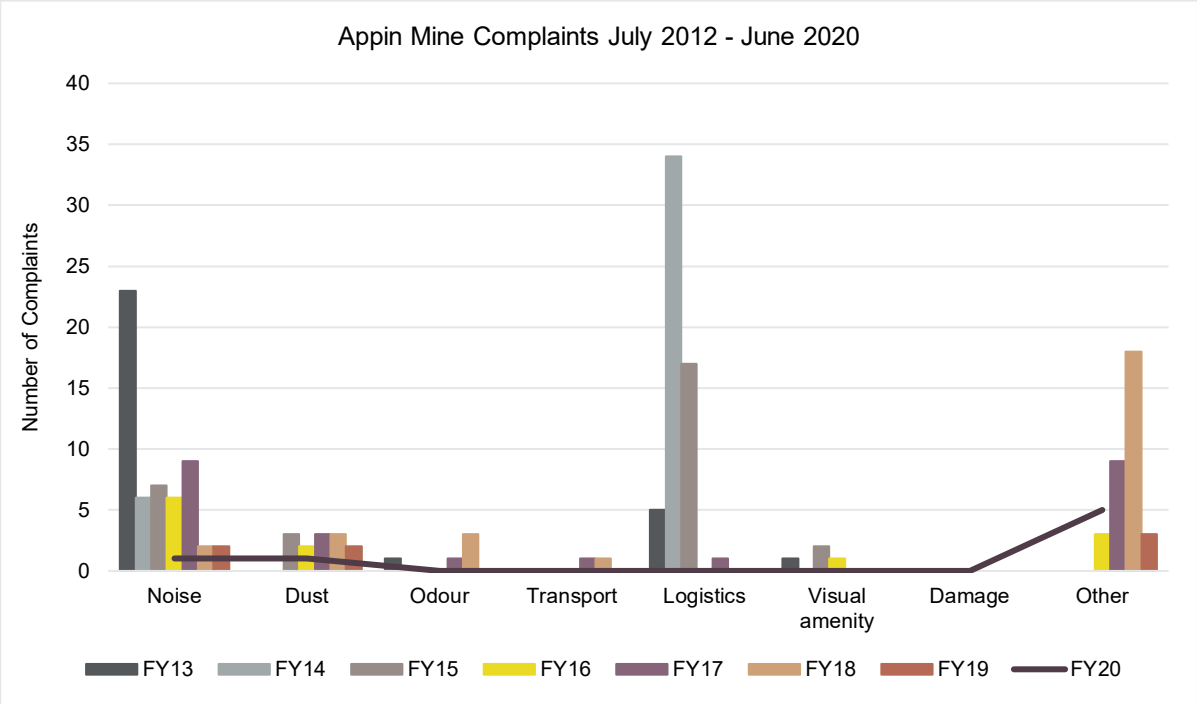


Figure 18: Community complaints from FY13 for Appin Mine

9.2 Community Engagement

IMC's Corporate Affairs team manages regular community engagement activities as per the IMC 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, WaterNSW, EPA, Resources Regulator, Subsidence Advisory 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 IMC 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 IMC regulatory page on the South32 website; and
- stakeholder group presentations and information sessions.

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

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

9.2.1 Illawarra Coal CCC

In accordance with Condition 6 of Schedule 6 of the Project Approval, IMC has established and operates the ICCCC. The ICCCC is operated in accordance with the Community Consultative Committee Guideline for State Significant Projects and has been operating since September 2012.

The ICCCC provides a forum that enables regular two-way communication between IMC and the community/stakeholders and promotes open discussion on IMC's Appin Mine operations. The basis of discussion includes information on mining operations, environmental performance of the mine, and community relations activities, and issues/outcomes as they arise during mining activity. Topics discussed in the meeting generally reflect community concerns and interests at the time.

The ICCCC nominally comprises 11 members including representatives of IMC, local councils, local community and other key stakeholders who have an interest in IMC's operations and the potential impacts of mining in the area. The committee is chaired by an independent chairperson, who is appointed by the Secretary of the DPIE. Formal meetings are generally held every two months.

Table 45 provides a summary of the information presented to the ICCCC during the reporting period.

Table 45: Summary of information presented to the ICCCC during the reporting period

Month	Presentation
August 2019	IMC provided an update on the Appin Mine Memorial, presenting the artwork concept which was unveiled at the 40th Anniversary in July 2019; An increase in our saleable production by 57 per cent compared to FY2018.
October 2019	IMC shared correspondence with an auditor conducting the Independent Environmental Audit for Appin Mine. The audit is conducted every 3 years; Bulli Seam Operations Annual Review for FY19 was submitted; Provided an update on projects required to meet water quality concentration criteria proposed by the EPA; A report was shared on various non-compliances.
December 2019	IMC indicated the plan to meet water quality concentration limits has been submitted to the EPA; Advised the Independent Environmental Audit Report is complete; The Georges River Remediation Plan was submitted to the Resources Regulator; update on Mountbatten House Conservation Management Plan (CMP).
January 2020	IMC indicated that draft licence conditions were issued on 15 January and a response has been provided to the EPA. It was indicated that the EPA will be distributing the draft licence conditions to the community (Georges River Working Group); Reported exceedances of air quality criteria were recorded due to regional bushfires and dust, however they are not recorded as a non-compliance.
March 2020	IMC held a meeting with EPA on 24 February 2020 to provide an update on water treatment projects. It was noted that the Appin West water treatment plant project is running slightly behind schedule; Georges River Remediation Plan was submitted to DPIE; Nepean Biobanking Site update; Update provided on five air quality monitoring sites have been established for three months around Douglas Park.

Table 45: Summary of information presented to the ICCCC during the reporting period	
May 2020	EMM Consultant attended meeting to provide update on air quality monitoring results; Based on the results from the local monitoring for the period November 2019 to April 2020, there appears to be little influence from VS6 on ambient concentrations within the Douglas Park locality; the Mountbatten property locations are no longer being considered for a proposed new ventilation shaft.

The minutes of community meetings are made available to the public on the South32 webpage: https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents. The March and May 2020 meetings were held by Skype due to COVID-19 restrictions.

9.2.2 Douglas Park Advisory Panel

A purpose-formed community representative group, DPAP was established by IMC 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. DPAP operates under an agreed Terms of Reference and is facilitated by IMC. The DPAP comprises seven representatives of the Douglas Park Township.

Table 46 provides a summary of the information presented to DPAP during the reporting period.

Table 46: DPAP meetings during the reporting period	
Month	**Presentation**
August 2019	IMC provided an update on the Appin Mine Memorial, presenting the artwork concept which was unveiled at the 40th Anniversary in July 2019; An increase in our saleable production by 57 per cent compared to FY2018.
October 2019	Bulli Seam Operations Annual Review for FY19 was submitted to the Department; A report was shared on various non-compliances.
December 2019	IMC shared the Georges River Remediation Plan was submitted to Resources Regulator; update on Mountbatten House Conservation Management Plan (CMP).
January 2020	IMC Reported exceedances of air quality criteria were recorded due to regional bushfires and dust, however they are not recorded as a non-compliance.
March 2020	IMC provided update that Georges River Remediation Plan was submitted to DPIE; Nepean Biobanking Site update; Update provided on five air quality monitoring sites have been established for three months around Douglas Park.
May 2020	EMM Consultant attended meeting to provide update on air quality monitoring results; Based on the results from the local monitoring for the period November 2019 to April 2020, there appears to be little influence from VS6 on ambient concentrations within the Douglas Park locality; the Mountbatten property locations are no longer being considered for a proposed new ventilation shaft.

The March and May 2020 meetings were held by Skype due to COVID-19 restrictions.

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

9.3 IMC Community Partnerships Program

IMC has an overriding commitment to supporting the communities in which we operate. As part of this commitment, the CPP was established to provide support for community projects and initiatives in the regions surrounding our Appin Mine.

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 Appin Mine. The program is administered by a board of community and IMC representatives, which ensures community-based decision making on the allocation of funds.

During the past 12 months the Board has committed over $129,500 for community projects in the local Wollondilly area. Some local not-for-profit groups to benefit from program funding in 2019/20 included:

- Appin Public School;
- Appin Volunteer Rural Fire Brigade;
- Cawdor Volunteer Rural Fire Brigade;
- Douglas Park Volunteer Fire Brigade;
- Menangle Volunteer Rural Fire Brigade;
- Wilton Volunteer Rural Fire Brigade;
- Lifeline Macarthur; and
- Menangle Mens Shed Association.

The CPP 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. IMC has supported Life Education in the Wollondilly area since 2008.

Individuals and organisations in the local community are encouraged to apply for funding. Applications for funding under the CPP are assessed against a range of selection criteria, which can be viewed at:

https://www.south32.net/docs/default-source/illawarra-coal-bulli-seam-operations/2020---illawarra-coal-cpp---grant-guidlines-application-form-and-compliance-certificate.pdf?sfvrsn=54afada7_8.

9.4 Illawarra Convoy

For the fifteenth consecutive year, IMC has helped raise money for children with cancer by launching another successful i98FM Illawarra Convoy. Held in November 2019, the event saw 751 trucks and 937 motorbikes travel 70 kilometres from IMC'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 2019 Convoy raised $2.7 million. More than $16 million has been raised since the inaugural event in 2005.

10. INDEPENDENT AUDIT

10.1 Environmental Audits

The audits/management reviews undertaken during the reporting period are provided in Table 47.

Table 47: Environmental Audits undertaken during reporting period

Date	Type	Internal	External	Comments
October 2019	IEA		X	Undertaken by ERM
April 2020	Annual ISO 14001		X	Certification (Desktop)
June 2020	Annual ISO 14001		X	Certification (Site Inspection)
June 2020	Self-Assessment	X		Self-assessment of compliance with the South32 Environment Standard
June 2020	Reasonable Assurance Audit	X	X	Review of externally reported greenhouse gas and water data
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.

10.1.1 Independent Environmental Audit

An Independent Environmental Audit (IEA) of Appin Mine is undertaken every three years. The most recent IEA was conducted in October 2019, with the report submitted in December 2019. The IEA identified 12 non-compliances, 14 administrative non-compliances and six observations.

An action plan to address the non-compliances and observations was developed and submitted to DPIE and DoTEE. The action plan is provided in Appendix L: Appin Mine Independent Environmental Audit 2019 - Action Response Table.

The next triennial IEA is scheduled to be undertaken in October 2022.

10.1.2 ISO 14001

The IMC Environmental Management System has been certified to the International Standard ISO 14001 since May 2003. ISO 14001 Certification for Appin Mine operations was maintained following an external audit in April (desktop due to COVID-19 restrictions) and June 2020 (site inspections). No non-conformances were identified.

Appin East, Appin West, Appin North and the WCCPP are included in IMC's schedule of certified ISO 14001:2015 sites. Each of these operational sites, as well as the CWEA has been regularly audited for compliance against this standard.

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.

All ISO 14001 Actions from 2019 were completed, as confirmed by the 2020 audit.

10.1.3 Environment Standard Self Assessment

This reporting period's Environment Self Assessment was conducted by the IMC Environmental Team. It was found that the requirements of the Environment Standard are largely in place with some opportunities to update existing processes. All corrective actions were raised in the action tracking system utilised by IMC and will be closed out as required.

10.1.4 KPMG

KPMG undertook a reasonable assurance audit for NGER (National Greenhouse and Energy Reporting) and water data for the reporting period. This audit commenced in June and was completed in July 2020.

10.1.5 Governance Reviews

The below Governance Reviews were conducted for Appin Mine during the reporting period:

- Air Quality and Greenhouse Gas Management Plan;
- Pollution Incident Response Management Plan;
- Adaptive Management Plan for Water Sensitive EPBC Act Listed Species;
- Coal Wash Emplacement Area Management Plan;
- Broadheaded Snake Management Plan;
- *Persoonia Hirsuta* Offset Management Plan;
- Southern Brown Bandicoot Management Plan;
- Shale Sandstone Transition Forest Offset Management Plan;
- Noise Management Plan;
- Surface Water Management Plan; and
- Waste Management Plan.

From these, the majority of corrective actions raised were administrative. All corrective actions were raised in the action tracking system utilised by IMC and closed out as required. Changes required to the respective management plan are recorded in the Management Plan Review Log.

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

Non-compliances recorded during the reporting period are detailed in Table 48, details of exceedances with criteria are provided in Table 49 and regulatory actions in the reporting period are provided in Table 50. Non-compliances identified in the IEA are listed in Appendix L: Appin Mine Independent Environmental Audit 2019 - Action Response Table.

Table 48: Non-compliances during the reporting period

NC1	
Non-compliance	Disposal of hydrocarbon contaminated waste not in accordance with the Waste Management Plan (Condition 29 of Schedule 4).
Date	9 July 2019
Details of non-compliance	Hydrocarbon contaminated waste from the reagents bund at the WCCPP was incorrectly disposed of in the drill mud slurry ponds at Appin North. This is non-compliant with the waste management practices as outlined in the Waste Management Plan. There was no environmental harm associated with this event.
Location	Appin North drill mud ponds
Cause of non-compliance	It had not been identified that waste oil was leaking into the bund and that the bund contents had been contaminated (noting that the bund also contained coal fines). Contamination was not identified until the material was disposed of.
Actions taken to mitigate adverse effects of non-compliance	Samples were taken. The material was isolated while the samples were being analysed. The material was disposed of in a suitable location.
Actions taken to prevent reoccurrence	The Bund, Sump and Oily Water Separator Management Procedure (IMCP0184) was developed that clearly identifies the locations where material from bunds can be disposed.
NC2	
Non-compliance	Disposal of hydrocarbon contaminated waste not in accordance with the Waste Management Plan (Condition 29 of Schedule 4).
Date	17 July 2019
Details of non-compliance	Hydrocarbon contaminated waste from the oily water separator at Appin North was incorrectly disposed of at a pad at Appin North. This is non-compliant with the waste management practices as outlined in the Waste Management Plan. There was no environmental harm associated with this event.

Location	Appin North Pit Top
Cause of non-compliance	It had not been identified by the contractor undertaking the activity that the sump contents had been contaminated with hydrocarbons (noting that the bund also contained coal fines). It was only when the material was disposed of that the issue was identified.
Actions taken to mitigate adverse effects of non-compliance	The material was cleaned up and disposed of at an appropriate off-site location.
Actions taken to prevent reoccurrence	The Bund, Sump and Oily Water Separator Management Procedure (IMCP0184) was developed that clearly identifies the locations where material from sumps can be disposed.
NC3	
Non-compliance	Conductivity probe failed that resulted in the flow of undiluted water off-site. This was a non-compliance with Condition O2.1 of EPL 2504.
Date	15 July 2019
Details of non-compliance	The conductivity probe used to activate the dilution water pump to provide dechlorinated Sydney Water downstream of the BCD at LDP10 failed. This resulted in the flow of undiluted water from BCD into Brennans Creek from 15 July to 19 July 2019. Conductivity was being continually recorded over this period.
Location	Appin North - BCD
Cause of non-compliance	The non-compliance occurred due to the failure of the conductivity probe. This was possibly due to the cleaning frequency.
Actions taken to mitigate adverse effects of non-compliance	There were no actions available to be taken to mitigate the effect of the non-compliance. There was no identified environmental harm associated with the event.
Actions taken to prevent reoccurrence	A regular cleaning and maintenance program has been implemented. Condition L2.6 has now been included in EPL 2504 that states licence concentration limits for electrical conductivity do not have to be met for the discharge of water into the Georges River from BCD in the period that any drinking water restrictions are in place for the area of operations.
NC4	
Non-compliance	Discharge of water off-site not through a licence discharge point. This is a non-compliance with Condition P1.3 of EPL 2504.

Date	29 September 2019
Details of non-compliance	Following the cessation of discharge from Brennans Creek Dam (BCD), a pump was installed in the reclaim pond that collects seepage from BCD to pump it back into BCD. On 29 September 2019 it was identified that a hose connection failed that resulted in water flowing into Brennans Creek, bypassing LDP 10. The quality of the water would have had an electrical conductivity between 2000 and 2500 µs/cm. It is estimated, based on the capacity of the pump, that 0.125 ML of water was discharged as a worst-case scenario
Location	Appin North – Brennans Creek Dam
Cause of non-compliance	The cause of the non-compliance was the failure of a hose connection.
Actions taken to mitigate adverse effects of non-compliance	When the failure was identified, the pump was turned off and the hose connection repaired. There was no identified environmental harm associated with the event.
Actions taken to prevent reoccurrence	There were no specific actions taken in response to this event.
NC5	
Non-compliance	Exceedance of noise criteria in Condition 2 of Schedule 4 of PA 08_0150 at AE-NS5.
Date	11 September 2019 and 24 February 2020
Details of non-compliance	Exceedances of noise criteria greater than 2 dBA over the limit in Condition 2 of Schedule 4 were recorded at AE-NS5: • a noise level of 43 dBA (with a 2 dBA low frequency noise penalty applied) was recorded at 9.17 pm on 10 September 2019; and • a noise level of 50 dBA (with 5 dBA low frequency noise penalty applied) was recorded at 12:13 am on 11 September 2019; and • a noise level of 45 dBA (with a 2 dBA low frequency noise penalty applied) was recorded at 8:43 pm on 24 February 2020. The limit at this location is 40 dBA.
Location	Monitoring location AE-NS5 (80 Northamptondale Road), located in the vicinity of Ventilation Shaft 2.
Cause of non-compliance	The cause of the non-compliance is inconclusive. Contribution may have come from the fans at Ventilation Shaft 2, or the Energy Developments Limited gas plant located between Ventilation Shaft 2 and the noise monitoring location.

Actions taken to mitigate adverse effects of non-compliance	Extensive works have been undertaken at the Ventilation Shaft 2 site. This has included replacing gearboxes in the gas extraction plant and replacing sound attenuators and variable inlet vanes in the ventilation shaft.
Actions taken to prevent reoccurrence	Additional noise monitoring undertaken by the noise consultant remained inconclusive of the source of the February non-compliance, and it may have been a result of extraneous noise. Continued monitoring is undertaken as per Condition 5(f) of Schedule 4 of PA 08_0150.
NC6	
Non-compliance	Exceedance of BOD 100th percentile limit at LDP 22 at Appin West. This is a non-compliance with Condition L2 of EPL 2504 and Condition 15 of Schedule 4 of the Project Approval.
Date	5 November 2019
Details of non-compliance	An exceedance of the BOD 100th percentile water quality criteria of 50 mg/L was recorded on 5 November 2019. The result was 137 mg/L.
Location	Appin West Irrigation Area
Cause of non-compliance	During a site inspection it was identified that there was no aeration occurring at the sewage treatment plant. On investigation it was identified that the aeration pump had tripped due to a power failure. The Residual Current Device (RCD), now tripped, did not reset when the power was restored. The Programmable Logic Controller (PLC) did not register that the aerator had not turned back on. Water from the effluent ponds continued to be pumped to LDP 22, and the water was irrigated to the irrigation area. There was no identified environmental harm associated with this event.
Actions taken to mitigate adverse effects of non-compliance	Frequent monitoring and effluent discharge sampling were carried out until the system returned back to normal (see EX3).
Actions taken to prevent reoccurrence	Changes were made to the PLC that now checks all components of the system in a batch. If any issues are identified, the system will alarm to the control room and an email will be sent to responsible personnel to advise what aspect of the system needs to be checked and rectified.
NC7	
Non-compliance	Exceedance of BOD 100th percentile limit at LDP 22 at Appin West. This is a non-compliance as per Condition L2 of EPL 2504 and Condition 15 of Schedule 4 of the Project Approval.
Date	8 January 2020

Details of non-compliance	An exceedance of the BOD 100th percentile water quality criteria of 50 mg/L was recorded on 8 January 2020. The result was 56 mg/L.
Location	Appin West Irrigation Area
Cause of non-compliance	It was noted that there had been very low throughput of the plant, which led to increased holding times in balance dams. This led to increased dam temperature and microbiological growth, which in turn increased BOD. In August 2019, advice was provided by the sewage treatment plant servicing agent, that the aerobic bioreactor (tank) was not generating enough biomass, and thus its efficacy was lowered. The cause was from aerating the balance feed pond (Dam 1), which holds effluent prior to the aerated sewage tank. There was no identified environmental harm associated with this event.
Actions taken to mitigate adverse effects of non-compliance	Frequent monitoring and effluent discharge sampling were carried out until the system returned back to normal.
Actions taken to prevent reoccurrence	The system has been reinstated to the original set-up. Dam 1 mixers are now aerators and the aerobic bioreactor tank is a polishing tank. Supplementary aeration of Dam 2 was completed for four days following the event, but then ceased.
NC8	
Non-compliance	Exceedance of the 100th percentile limit for pH at LDP 19, which is a non-compliance with Condition L2 of EPL 2504 and Condition 15 of Schedule 4 of the Project Approval.
Date	3 October 2019
Details of non-compliance	A result of 6.13 pH units was recorded during discharge at LDP 19, which is an exceedance of the 100th percentile lower concentration limit of 6.5.
Location	LDP 19, located at Appin East Pit Top
Cause of non-compliance	IMC considers that the result was a laboratory error. A request was submitted to retest the sample however all of the sample had been used and this was not possible. Field tests undertaken on this date, in addition to the results from the in-line monitoring, indicate that the water in the dam was within the water quality concentration limits.
Actions taken to mitigate adverse effects of non-compliance	Laboratory advised of the results of the investigation.
Actions taken to prevent reoccurrence	Field testing to continue when samples are collected.

NC9	
Non-compliance	Failure to obtain endorsement of the IEA team as required by Condition 18 of EPBC Approval 2010/5350.
Date	9 December 2019
Details of non-compliance	Endorsement of the Minister was not sought prior to undertaking the IEA.
Location	Appin Mine
Cause of non-compliance	Audit was planned under Condition 9 of Schedule 6 of the Project Approval. It was an oversight that approval from the Minister under the EPBC Approval was missed.
Actions taken to mitigate adverse effects of non-compliance	Approval was sought and received 9 December 2019.
Actions taken to prevent reoccurrence	The requirement to seek endorsement from the Minister has been included in the Environmental Compliance/Conformance Assessment and Reporting Procedure (IMCP0186)
NC10	
Non-compliance	Exceedance of BOD 100th percentile limit at LDP 3/4 at Appin North. This is a non-compliance as per Condition L2 of EPL 2504 and Condition 15 of Schedule 4 of the Project Approval.
Date	7 February 2020
Details of non-compliance	An exceedance of the BOD 100th percentile water quality criteria of 50 mg/L was recorded. The result was 51 mg/L.
Location	Appin North Irrigation Area
Cause of non-compliance	There was an event prior to the recording of the exceedance where an excessive amount of soap entered the sewage treatment plant. This may have contributed to higher BOD results as it may have impacted on the nutrient digesting microbes. There was no identified environmental harm.
Actions taken to mitigate adverse effects of non-compliance	Frequent monitoring and effluent discharge sampling was carried out until the system returned back to normal.
Actions taken to prevent reoccurrence	The issue was communicated to site personnel.

NC11	
Non-compliance	Air quality monitoring equipment did not operate continuously as required by Condition M2.2 of EPL 2504.
Date	9 February 2020
Details of non-compliance	The DustTrak located at monitoring point AE-PF3 ceased to transmit data to the hosting site on 9 February 2020. It is a requirement that air quality is continuously monitored at this location. The fault was noted on 3 March 2020.
Location	Appin East
Cause of non-compliance	The cause of the failure was water damage due to a heavy rainfall event.
Actions taken to mitigate adverse effects of non-compliance	Photometer AE-PF1 was used to confirm performance of air quality control measures for the period that AE-PF3 is not operational. Data from photometer Point 27 - AE-PF1, located at the north east corner of the property boundary, did not detect any exceedances of the PM_{10} 24 hr average since 9 February 2020.
Actions taken to prevent reoccurrence	The damaged equipment was replaced, and water proofing undertaken. The equipment is regularly inspected.
NC12	
Non-compliance	Documents were not made available on the South32 website as required by Condition 11 of Schedule 6 of PA 08_0150.
Date	20 April 2020
Details of non-compliance	It was identified by a member of the community that the Community Consultative Committee minutes had not been recently updated on the South32 website.
Location	Appin Mine
Cause of non-compliance	A technical issue was identified in the South32 website. The minutes had been uploaded, however they were not visible to the public.
Actions taken to mitigate adverse effects of non-compliance	The technical issue was rectified.
Actions taken to prevent reoccurrence	The website is regularly checked to ensure currency of documentation.

NC13	
Non-compliance	Effluent from the sewage treatment plant was being irrigated on an adjoining property, which is a non-compliance with Condition 1b) of Application 101.2010.60.08.
Date	4 March 2020
Details of non-compliance	Effluent from the Appin West sewage treatment plant has been irrigated on an area on an adjoining property. Application 101.2010.60.08 does not permit the irrigation of effluent outside of the boundary of the land as defined in the application.
Location	Appin West Irrigation Area
Cause of non-compliance	Approval to irrigate on the area had been sought and approved by the EPA. However, a recent review of the application identified that this was not permitted.
Actions taken to mitigate adverse effects of non-compliance	Irrigation on the adjoining property ceased. No environmental harm associated with this activity have been identified.
Actions taken to prevent reoccurrence	Alternative disposal options are being investigated.
NC14	
Non-compliance	Underground mining operations associated with Longwalls 707-710 were conducted after 30 September 2019 without an approved SMP. This is an offence under Section 379D of the *Mining Act.*
Date	30 September 2019
Details of non-compliance	Underground mining operations associated with Longwalls 707-710 were conducted after 30 September 2019 without an approved SMP.
Location	Appin Mine (Area 7)
Cause of non-compliance	It was not identified that there was an expiry date on the approval.
Actions taken to mitigate adverse effects of non-compliance	An application was submitted, and a new approval issued on 17 April 2020. The SMP Approval expiry has been extended to 31 December 2024.
Actions taken to prevent reoccurrence	The obligations register has been reviewed to ensure expiry dates are identified and directed to the accountable manager prior to that date.

Table 49: Exceedances of criteria during reporting period

EX1	
Exceedance	Exceedance of noise criteria in Condition 2 of Schedule 4 of PA 08_0150 at AE-NS5.
Date	27 November 2019 and 20 May 2020
Details of exceedance	Exceedances of noise criteria in Condition 2 of Schedule 4 were recorded at AE-NS5: • a noise level of 42 dBA (with a 5 dBA low frequency noise penalty applied) was recorded at 11:01 pm on 27 November 2019; and • a noise level of 41 dBA (with a 2 dBA low frequency noise penalty applied) was recorded at 12:51 pm on 20 May 2020. The limit at this location is 40 dBA.
Location	Monitoring location AE-NS5 (80 Northamptondale Road), located in the vicinity of Ventilation Shaft 2.
Cause of exceedance	The cause of the non-compliance is inconclusive. Contribution may have come from the fans at Ventilation Shaft 2, or the Energy Developments Limited gas plant located between Ventilation Shaft 2 and the noise monitoring location. Note that for the determination of compliance, the NSW Industrial Noise Policy states in Section 11.1.3: *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.*
Actions taken to mitigate adverse effects of exceedance	Extensive works have been undertaken at the Ventilation Shaft 2 site. This has included replacing gearboxes in the gas extraction plant and replacing sound attenuators and variable inlet vanes in the ventilation shaft.
Actions taken to prevent reoccurrence	Additional noise monitoring undertaken by the noise consultant remained inconclusive of the source of the February non-compliance, and it may have been a result of extraneous noise. Continued monitoring is undertaken as per Condition 5(f) of Schedule 4 of PA 08_0150.
EX2	
Exceedance	Exceedance of 50th percentile limit for BOD at LDP 22 in Condition L2.4 of EPL 2504.
Date	8 August 2019
Details of exceedance	Exceedance of 50th percentile limit for BOD at LDP 22. Result of 40 mg/L was recorded and the limit in EPL 2504 is 30 mg/L.
Location	LDP 22, located at Appin West

Cause of exceedance	The cause of the exceedance is likely to be that the sample was collected from the line under no flow and it was stagnant effluent.
Actions taken to mitigate adverse effects of exceedance	An additional sample was collected on 16 August 2019. The sample was undertaken under flow and the result was 13 mg/L. The system continued to be monitored. There was no environmental harm associated with the exceedance.
Actions taken to prevent reoccurrence	No actions proposed.
EX3	
Exceedance	Exceedance of 50th percentile limit for BOD at LDP 22 in Condition L2.4 of EPL 2504.
Date	13 November and 5 December 2020
Details of exceedance	Exceedance of 50th percentile limit for BOD at LDP 22. Results of 38 mg/L and 39 mg/L respectively were recorded and the limit in EPL 2504 is 30 mg/L.
Location	LDP 22, located at Appin West
Cause of exceedance	Following the event as outlined in NC6, a further sample was undertaken in November 2019 which exceeded the 50th percentile limit. The system was continuing to improve. The further exceedance in December 2019 may have been attributable to the continued improvement of the system, or warm weather and evaporation may have also contributed.
Actions taken to mitigate adverse effects of exceedance	The system continued to be monitored. There was no environmental harm associated with the exceedances.
Actions taken to prevent reoccurrence	No actions proposed.
EX4	
Exceedance	Exceedance of 50th percentile limit for BOD at LDP 22 in Condition L2.4 of EPL 2504.
Date	3 June 2020
Details of exceedance	Exceedance of 50th percentile limit for BOD at LDP 22. A result of 38 mg/L was recorded and the limit in EPL 2504 is 30 mg/L.
Location	LDP 22, located at Appin West
Cause of exceedance	The cause of the exceedance was likely due to the slow turnover of the treated effluent discharge pond.

Actions taken to mitigate adverse effects of exceedance	No actions taken. There was no environmental harm associated with the exceedance.
Actions taken to prevent reoccurrence	No actions proposed.
EX5	
Exceedance	Exceedance of 80th percentile limit for conductivity at LDP 10 in Condition L2.5 of EPL 2504.
Date	2 January to 8 February 2020.
Details of exceedance	There were 22 instances (for the FY20 period) 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). This occurred during the period 2 January and 8 February 2020. During this time, the BCD water level fell below 9 m and the valves were closed in accordance with the BCD Trigger Action Response Plan. However, there was some minor leakage that occurred through the valves (~40 KL per day (Point 10 and Point 13 combined). The leakage was still monitored in accordance with the requirements of the EPL, however exceeded the conductivity limit of 2000 microsiemens as there was no dilution available.
Location	LDP 10 and LDP 13 (Brennans Creek Dam)
Cause of exceedance	Leakage of non-diluted dam water likely caused by scale build up on the internal walls of the discharge pipelines. This would have prevented the valves from fully closing. The BCD discharge automation system disabled the dilution waters (as required) in response to low water levels in BCD.
Actions taken to mitigate adverse effects of exceedance	No action taken. There was no environmental harm associated with the exceedance.
Actions taken to prevent reoccurrence	The pipeline at LDP 10 was descaled. The LDP 10 and LDP 13 valves will be replaced in FY21.

Table 50: Regulatory action during reporting period

Regulatory Action	Detail
Official Caution	An Official Caution was issued by the Resources Regulator for longwall operations being undertaken after 30 September 2019 without an approved Subsidence Management Plan. Refer to NC14.
Warning Letters	None issued.
Penalty Notices	None issued.
Prosecution Proceedings	None commenced.

Refer to the following reports for specific compliance information:

Appendix B: 2019/20 EPA Annual Return for EPL 2504;

Appendix J: Appin Mine EPBC Approval 2010/5350 Compliance Report;

Appendix K: Appin Mine Project Approval Compliance Report; and

Appendix L: Appin Mine Independent Environmental Audit 2019 - Action Response Table

12. ACTIVITIES PROPOSED IN THE NEXT REPORTING PERIOD

12.1 Mine Operations

During the next reporting period underground operations will continue in Area 7 and Area 9. Development and extraction will continue into the currently approved panels of LW904 and LW709 and beyond to LW905 and LWs 710-711 subject to all necessary approvals being in place.

Construction activities in the next reporting period are detailed in Section 4.4.

12.2 Exploration

The planned activities for FY21 include a continuation of exploration in Areas 7 and 9 in support of the current mining domain (pre/post-mining monitoring hole and resource definition) as well as future mining domains (geological/geotechnical investigation and resource definition). Planned exploration for Area 7 and 9 includes:

- pre/post-mining monitoring boreholes;
- geotechnical investigations (including for potential surface infrastructure); and
- exploration boreholes in advance of the longwall.

It is also proposed to explore in the Exploration Tenements adjoining the current mining areas to increase geological and gas reservoir understanding. Exploration in the newly approved EL8972 (Figure 19), as well as in CCL767 (A396), A248, and EL4470 is due to begin in FY21. In summary, this includes:

- continuation of exploration drilling (resource definition);
- geotechnical investigations; and
- 2D and 3D seismic data acquisition.

Two of these boreholes are currently in progress in CCL767 – one coal quality borehole, and one surface-to-inseam borehole to define the location of the Wandinong fault, a large regional structure which informs mine plan extent. Location of these boreholes is shown in Figure 19, marked in yellow. Figure 19 also shows the distribution and priority status of boreholes currently planned for this area to FY24. Priority 1 boreholes, marked in blue, are planned for drilling in FY21. This includes:

- six water monitoring/coal exploration boreholes in the newly approved EL8972, to establish baseline hydrogeological data for this previously unexplored area;
- two boreholes in CCL 767 (A396); and
- three in A248 and one in EL4470.

Further to this, five coal quality boreholes from the Priority 2 list (marked in green in Figure 19) will be selected for drilling in EL8972 in FY21.

Landholder negotiation for the boreholes in established mining lease and exploration tenements are well under way. Engagement and negotiation with the community and landholders in EL8972 is to commence in July 2020. All planned borehole locations shown in Figure 19 are subject to some adjustment based on landholder preferences as well as budgetary considerations.

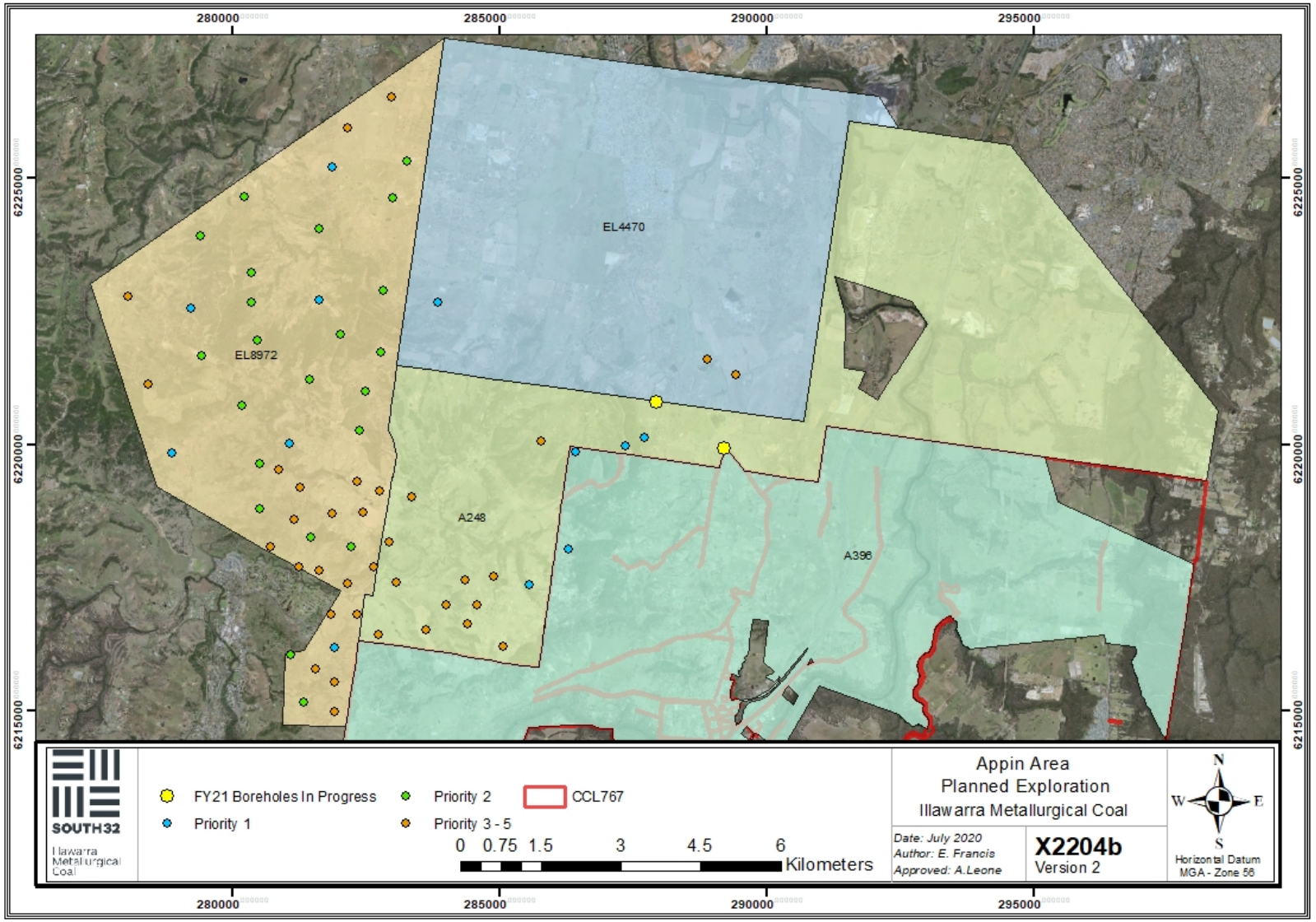


Figure 19: Planned boreholes, Appin Area

12.3 Projects

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

- Construction of the Appin North WTP and improvements to the Appin West WTP.
- Installation of Appin North Gas Drainage Plant. Installation of gas and flaring equipment is scheduled to be completed in FY22. It involves installation of vacuum pumps, pipe range, and a vent stack.
- Commissioning of Appin West Water Tanks, and upgrades to underground piping infrastructure.
- Decommissioning of 8000 t product bins at the WCCPP. Preliminary plans indicate the project will include constructing a new primary stockpile and truck load out bins to the south of the current washery processing building, including a high-level conveyor, primary stockpile, reclaim conveyor and automated truck load-out. Work is planned to commence in FY21 and continue into FY24.
- Construction of a new coal wash haul road at Appin North.
- Pre-feasibility studies of future ventilation infrastructure required to support Appin Mine underground operations.
- Upgrades to the Appin North bulk coal winder, scheduled to commence in FY21.
- Appin East surface water dosing system automation expected to be completed and commissioned by September 2020.
- Upgrades to the Appin East Diesel Underground Storage Tank. The tank has been installed underground and will be used for refuelling mobile equipment in the underground workings. As of August 2020, the tank has been installed but not yet commissioned.
- Switchyard upgrades at multiple sites and locations across Appin Mine to replace old infrastructure. The project scope includes No. 2 Vent Shaft, Appin North, Appin East and Appin West. The upgrades are expected to be completed by June FY21.
- Upgrade of the No. 4 stockpile pad to deliver geotechnical and environmental improvements, commenced in FY20 and will be completed in FY21.
- Replacing the BCD discharge valves (LDP 10 and LDP 13).

12.4 Environmental Management

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

- Commence monitoring under the Georges River Aquatic Health Program.
- Continue the *Persoonia hirsuta* Research Program and submit the final research report to the Department of Agriculture, Water and the Environment (DAWE).
- Continue to improve process control systems for BCD discharge.
- Progress approvals, planning and environmental assessments required to undertake the work described in the GRRP.
- Continue to progress the current phase of the decarbonisation program.
- Implement improvements from Air Quality Monitoring Plan review (pending capital availability).

13. REFERENCES AND ASSOCIATED DOCUMENTS

Biosphere, Bulli Seam Operations, Appendix F- Terrestrial Flora Assessment (2009).

IMC, Appin Mine Air Quality and Greenhouse Gas Management Plan.

IMC, Appin Mine Environmental Management Strategy.

IMC, Appin Mine Mining Operations Plan – 1 October 2012 – 30 September 2020.

IMC, Appin Mine Surface Water Management Plan.

IMC, Coal Wash Emplacement Area Management Plan.

IMC, Appin Mine Waste Management Plan.

IMC, Stockpile and Slope Stability Management Plan.

IMC, Georges River Rehabilitation Plan.

IMC, Longwall 902 End of Panel Report (2019).

Niche, West Cliff Longwalls 37-38 Extraction Plan Terrestrial Flora and Fauna Assessment (2013).

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

NSW EPA (2020), Environment Protection Licence No. 2504.

13.1 Acronyms used in Annual Review

Table 51: Acronyms used in Annual Review

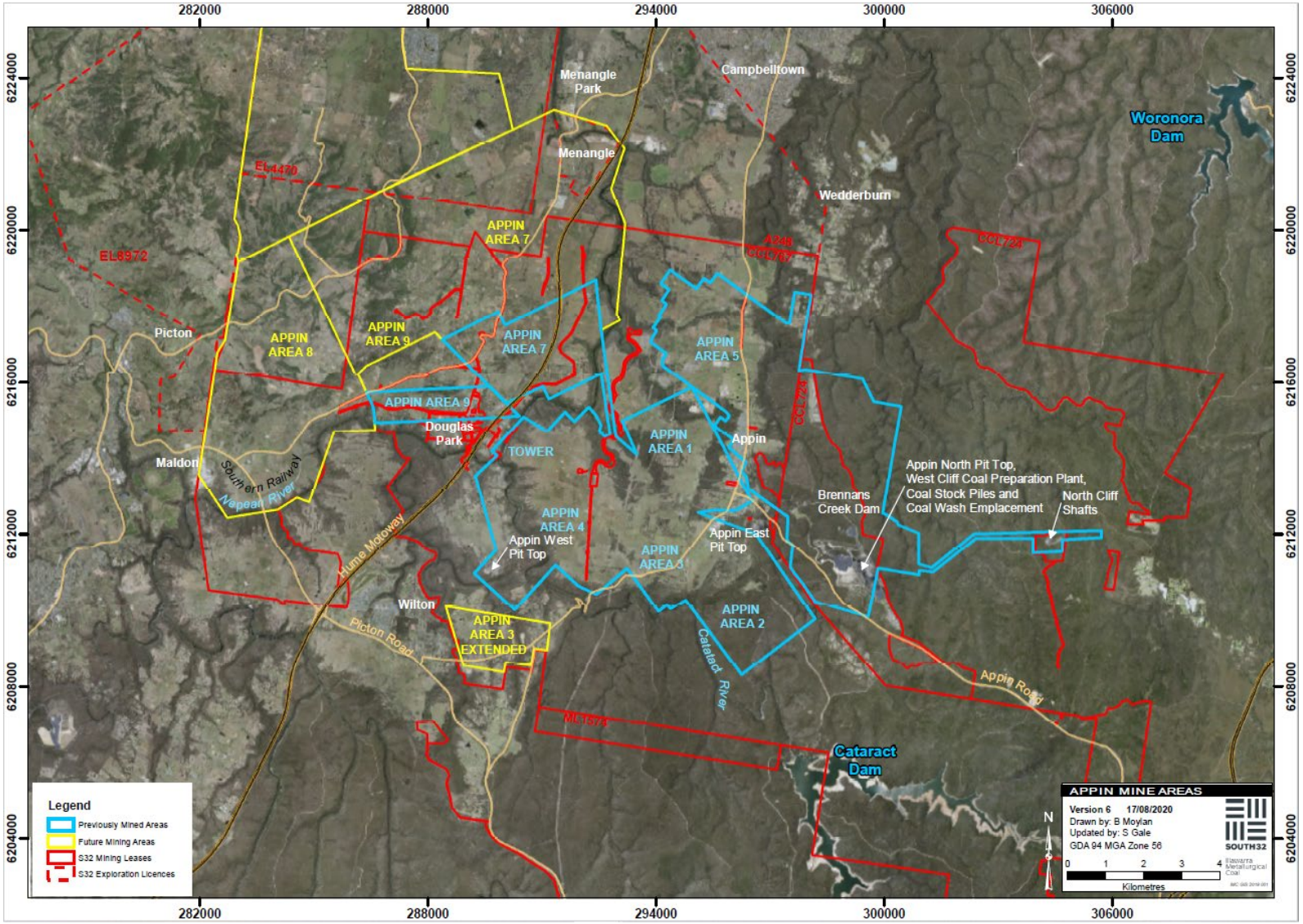
ACRONYM	DEFINITION	ACRONYM	DEFINITION
AQGHGMP	Air Quality and Greenhouse Gas Management Plan	LW	Longwall
AW WTP	Appin West Water Treatment Plant	MOP	Mining Operations Plan
ARC	Australian Research Council	NATA	National Association of Testing Authorities
BCD	Brennans Creek Dam	NEPM	National Environment Protection Measure
BSO	Bulli Seam Operations	OEH	Office of Environment and Heritage (now Biodiversity Conservation Division)
CCL	Consolidated Coal Lease	PEF	Processed engineered fuel
CMA	Corrective Management Action	$PM_{2.5}$	Particulate matter 2.5 microns
CO	Carbon monoxide	PM_{10}	Particulate matter 10 microns
CPP	Community Partnerships Program	PRP	Pollution Reduction Program
CPW	Cumberland Plain Woodland	RCE	Rehabilitation Cost Estimate
CV	Calorific Value	RMP	Rehabilitation Management Plan
DDG	Dust Deposition Gauge	RMS	Roads and Maritime Services
DotE	Department of the Environment	ROM	Run of Mine
DPIE	Department of Planning, Industry and Environment [19]	IMC	South32 Illawarra Metallurgical Coal
DTIRIS	Department of Trade, Investment, Regional Infrastructure and Services	SA NSW	Subsidence Advisory NSW
EC	Electrical conductivity	SBO	Strategic Biodiversity Offsets
EDL	Energy Developments Limited	SMP	Subsidence Management Plan
EIP	Environment Improvement Program	SSTF	Shale Sandstone Transition Forest
EFT	South32 Environmental Field Team	STP	Sewage Treatment Plant

[19] Previously Department of Planning and Environment, Department of Planning, Department of Urban Affairs and Planning

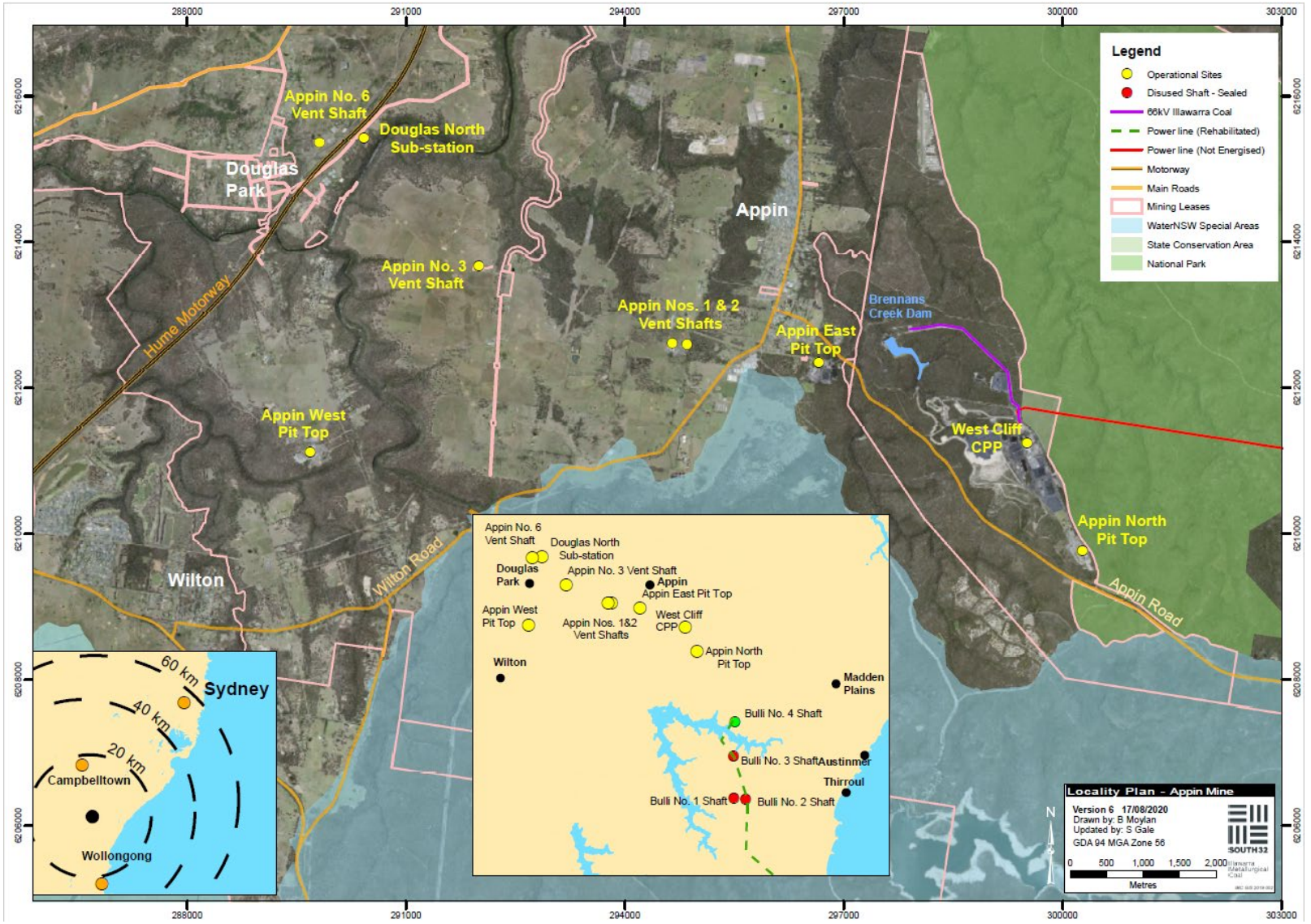
EP	Extraction Plan	SWMP	Surface Water Management Plan
EPA	Environment Protection Authority	TARP	Trigger Action Response Plan
EPBC	Environment Protection and Biodiversity Conservation	TSS	Total Suspended Solid
EPL	Environment Protection Licence	TPH	Total petroleum hydrocarbons
FY	Financial Year	VAM	Ventilation Air Methane
GHG	Greenhouse Gas	WTP	Water Treatment Plant
HVAS	High volume air sampler	WMP	Water Management Plan
ICCCC	Illawarra Coal Community Consultative Committee	WCCPP	West Cliff Coal Preparation Plant
IMS	Integrated membrane system	CWEA	Coal Wash Emplacement Area
LDP	Licence Discharge Point		

14. PLANS

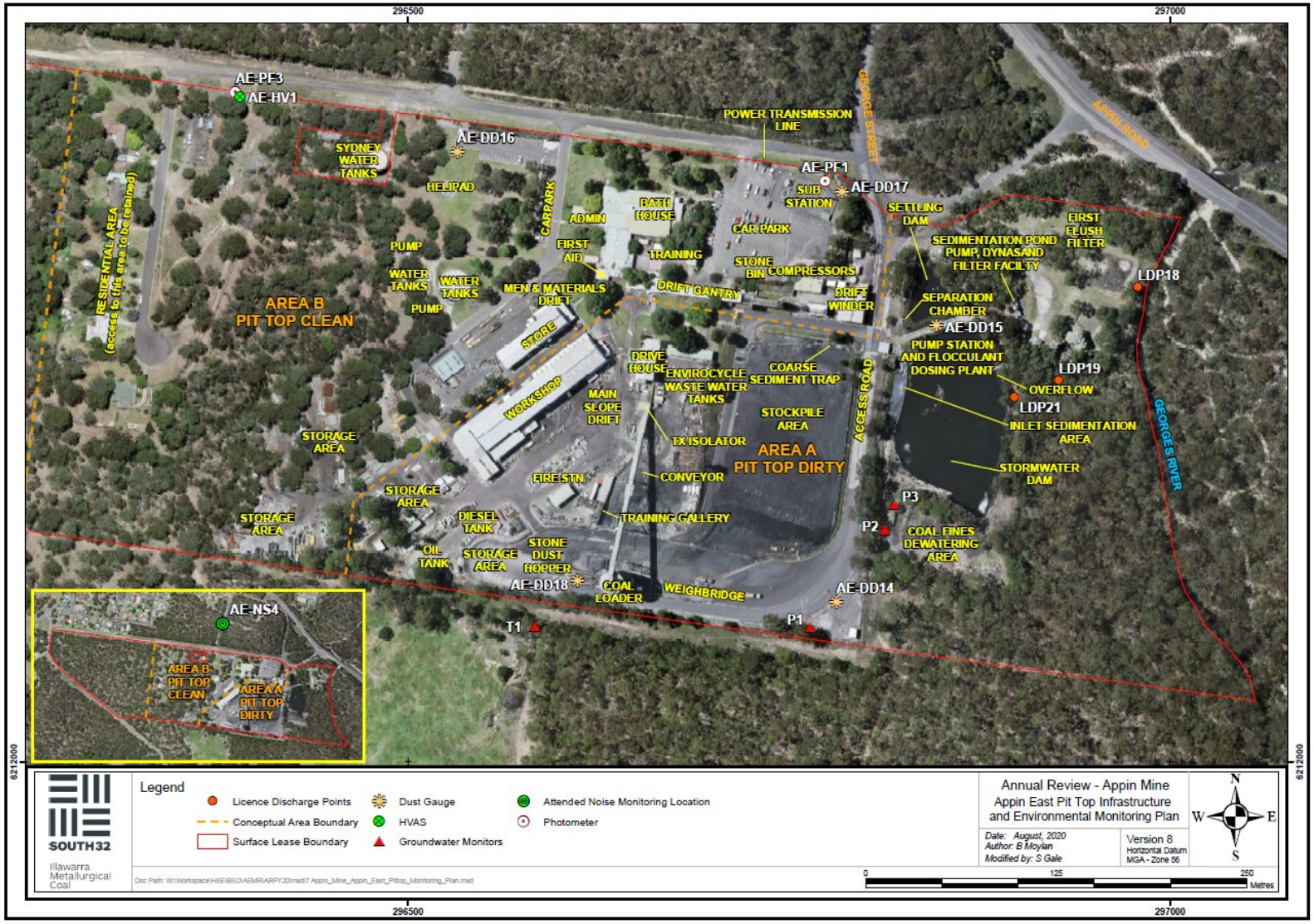
Plan 1: Regional Location Plan



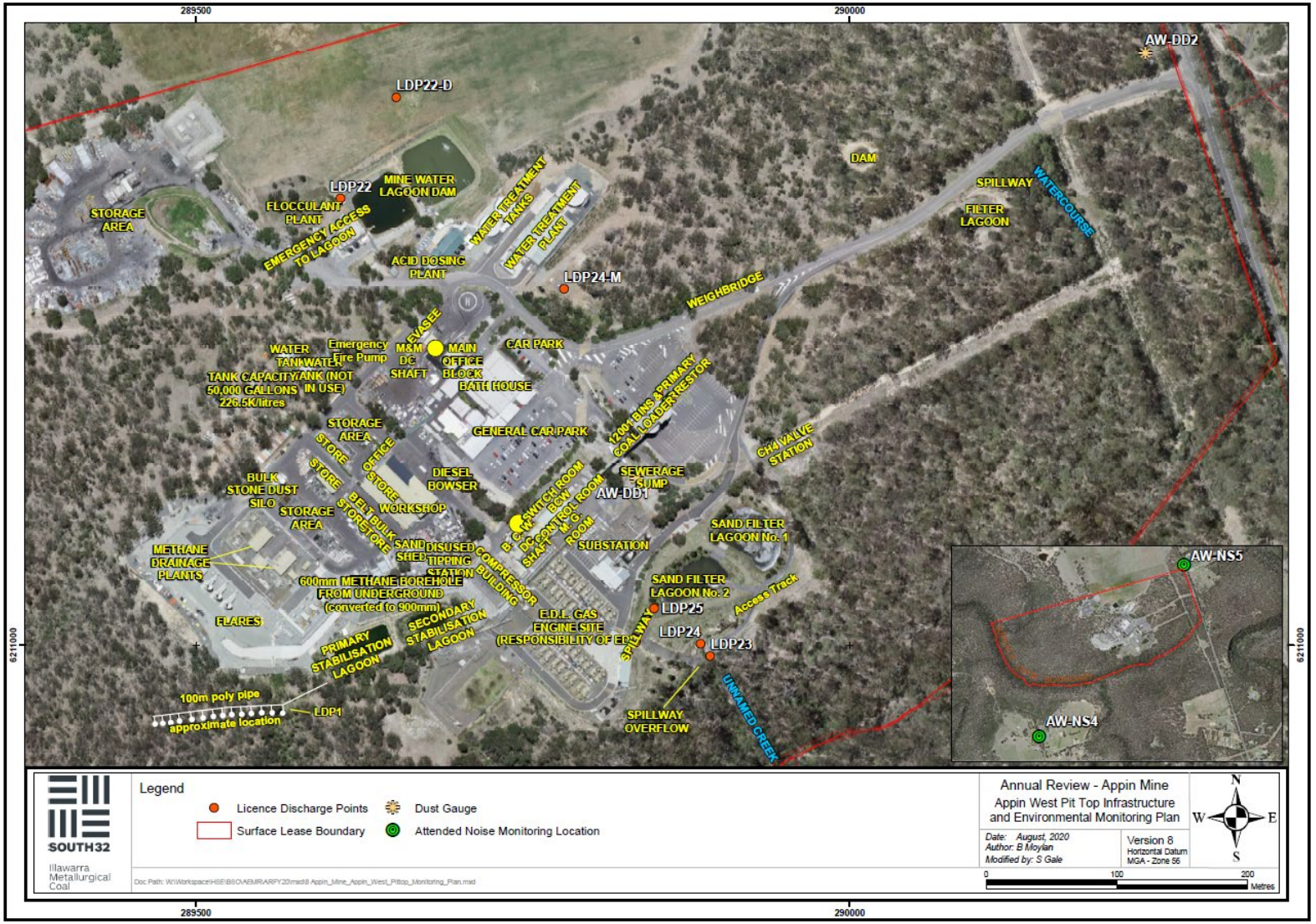
Plan 2: Appin Shaft Locality Plan



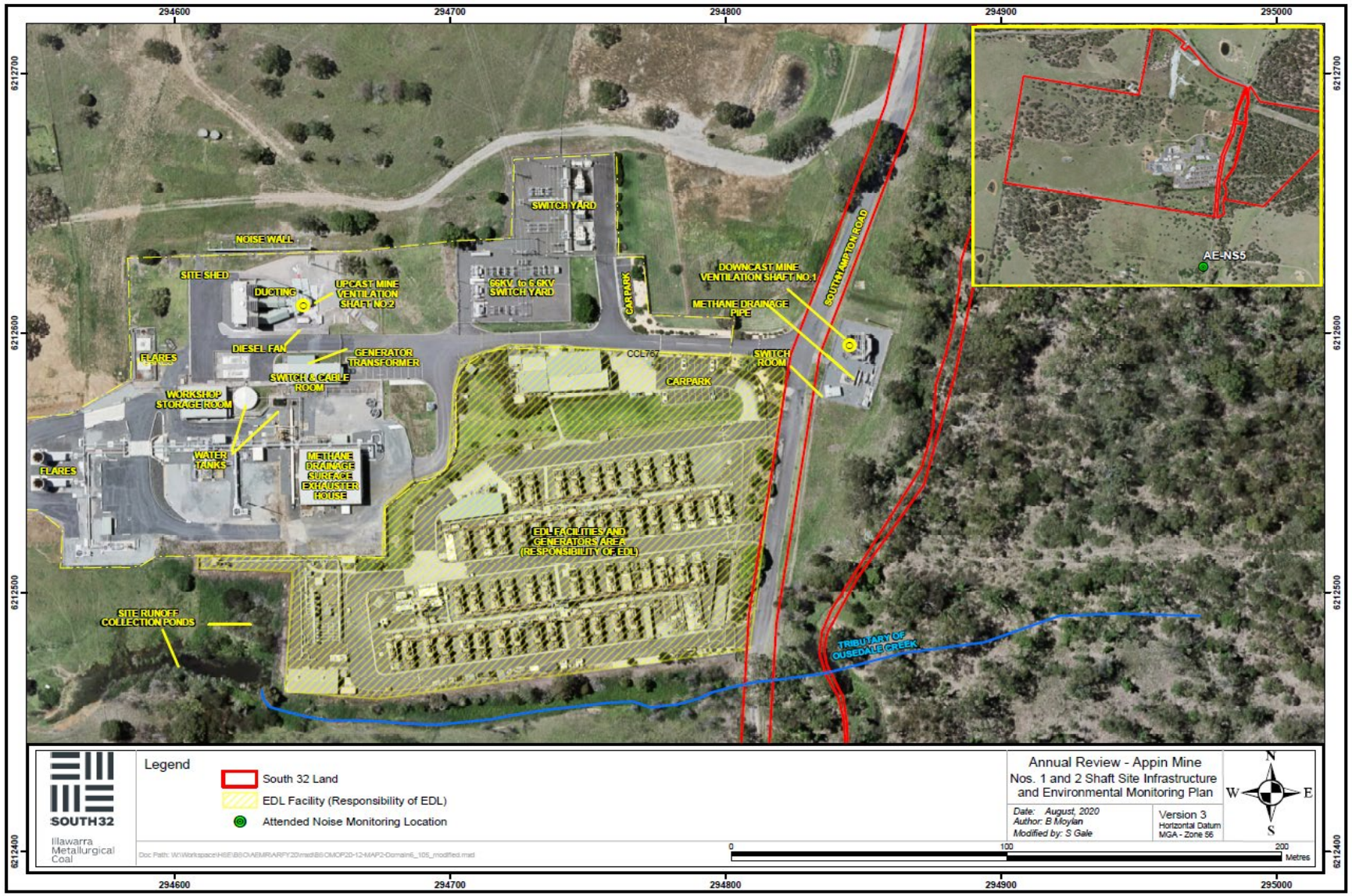
Plan 3: Appin East Mine Site



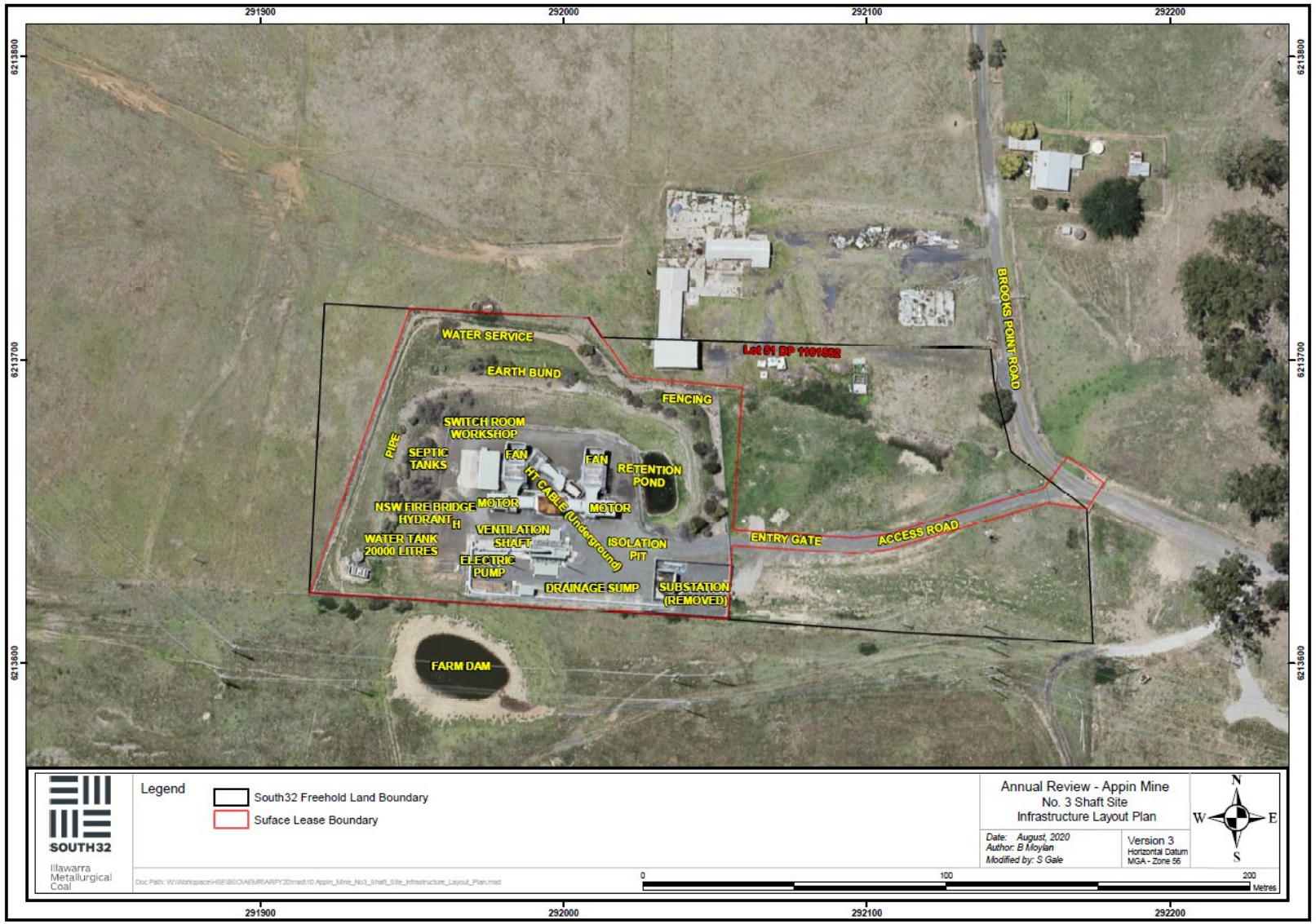
Plan 4: Appin West Mine Site



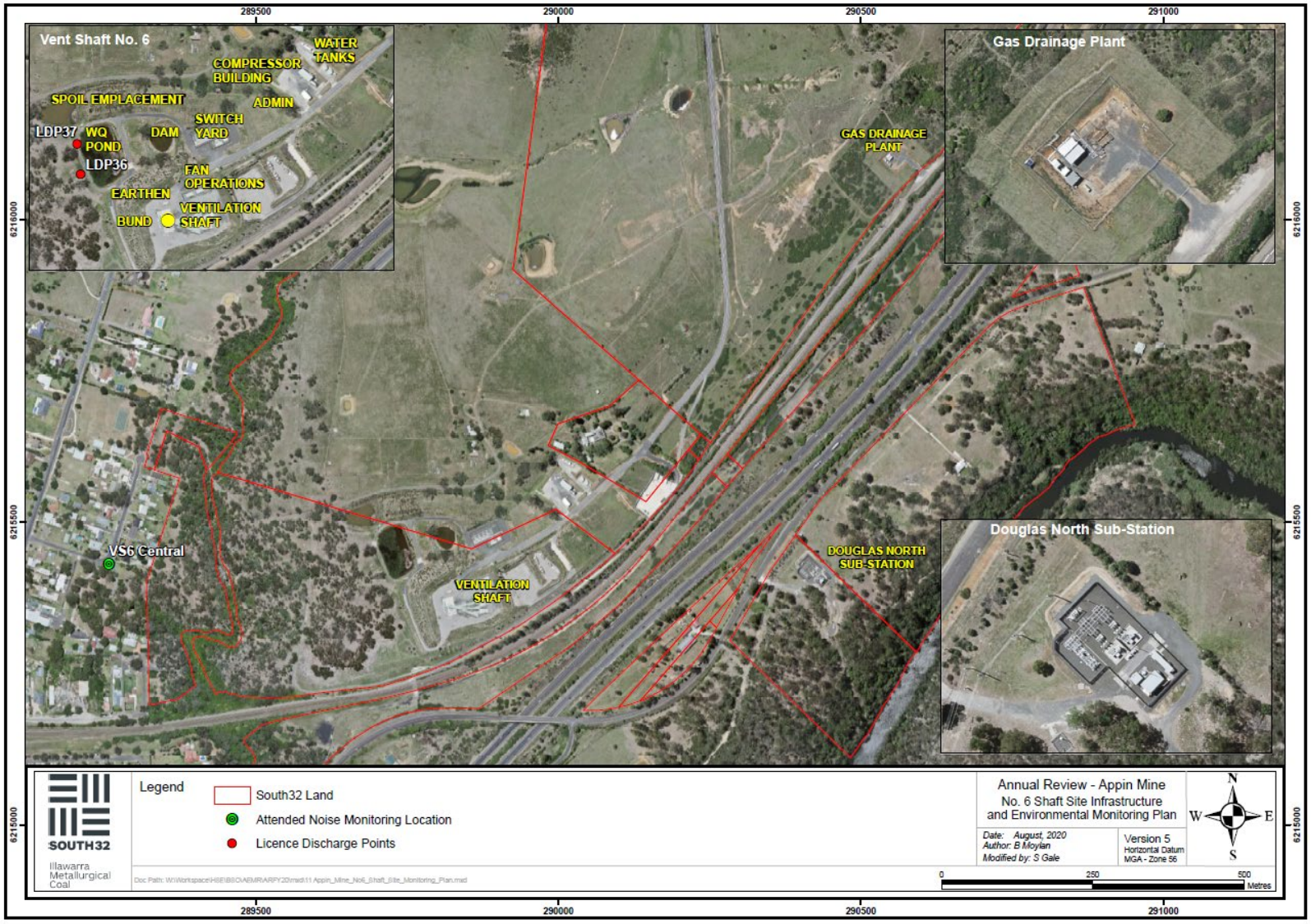
Plan 5: No. 1 and No. 2 Ventilation Shaft Site



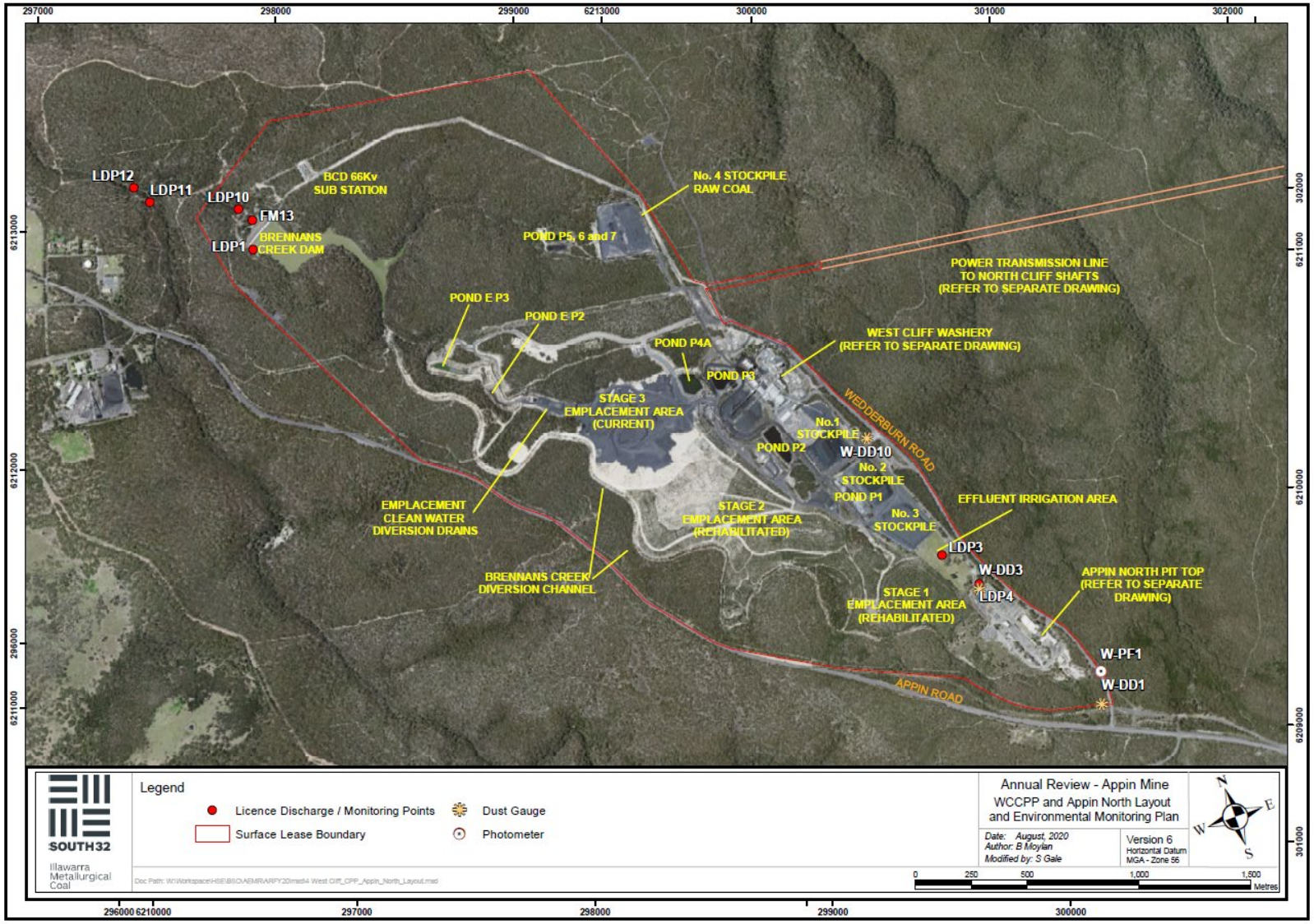
Plan 6: No. 3 Ventilation Shaft Site



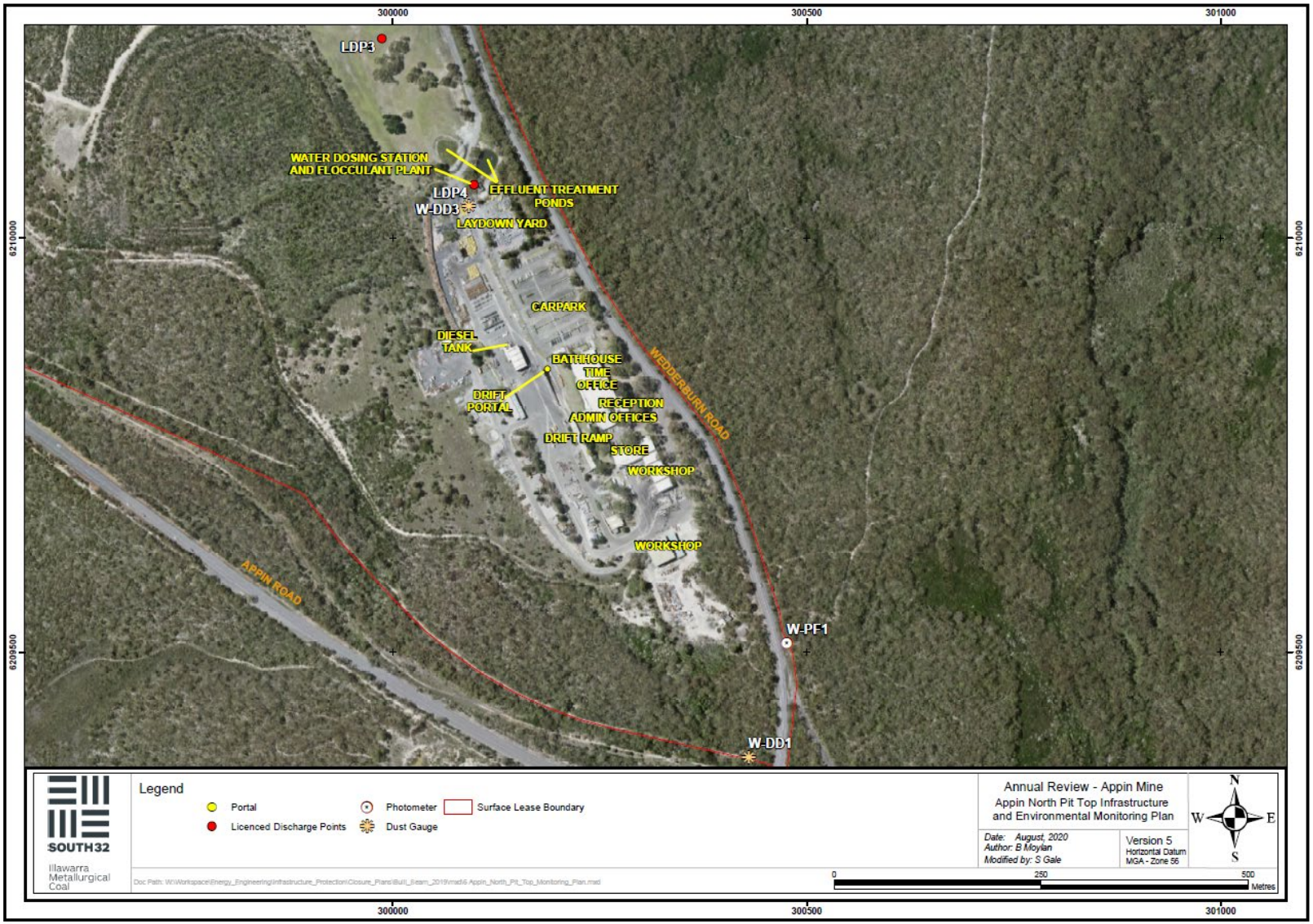
Plan 7: No. 6 Ventilation Shaft Site



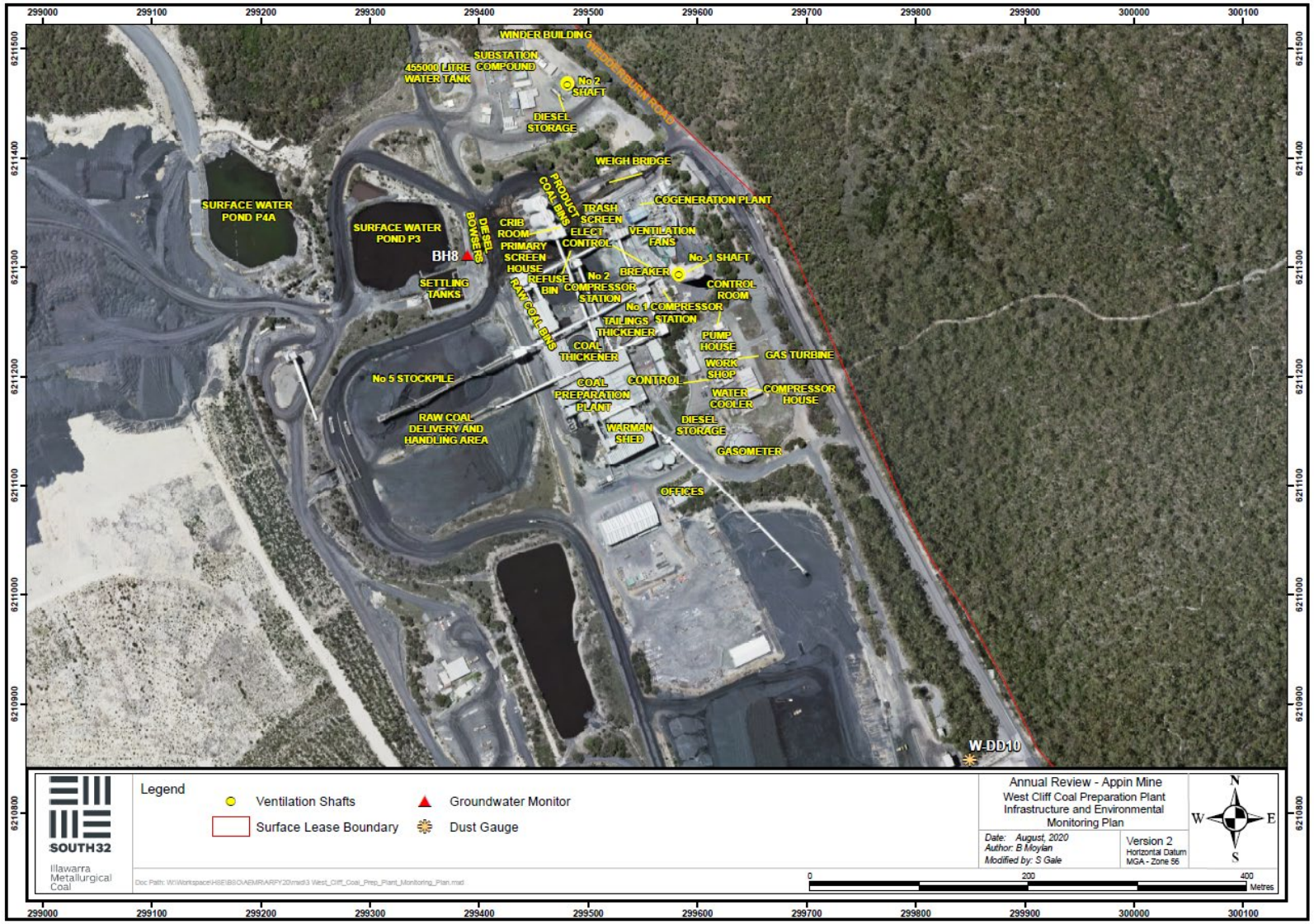
Plan 8: WCCPP and Appin North Layout



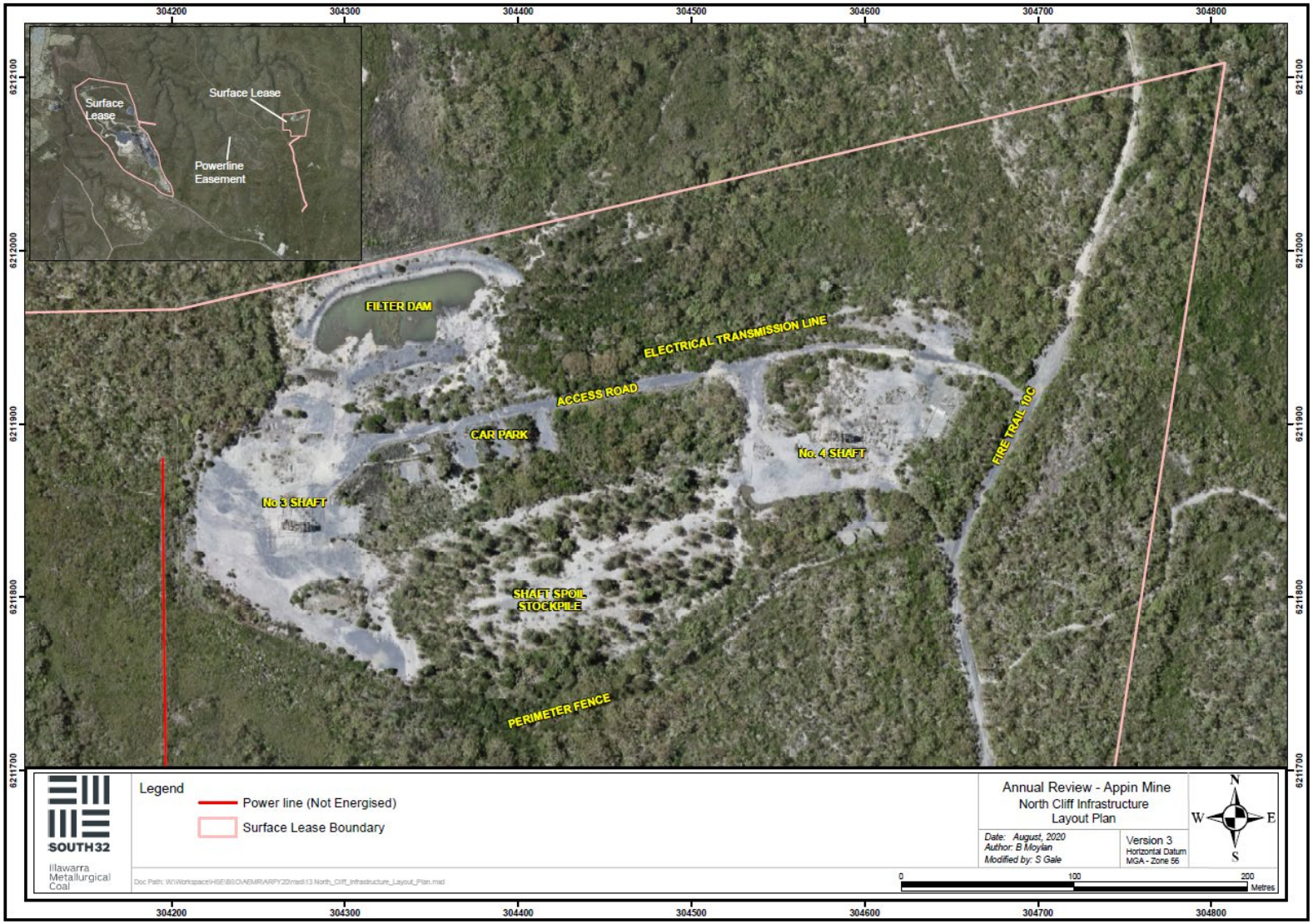
Plan 9: Appin North Pit Top



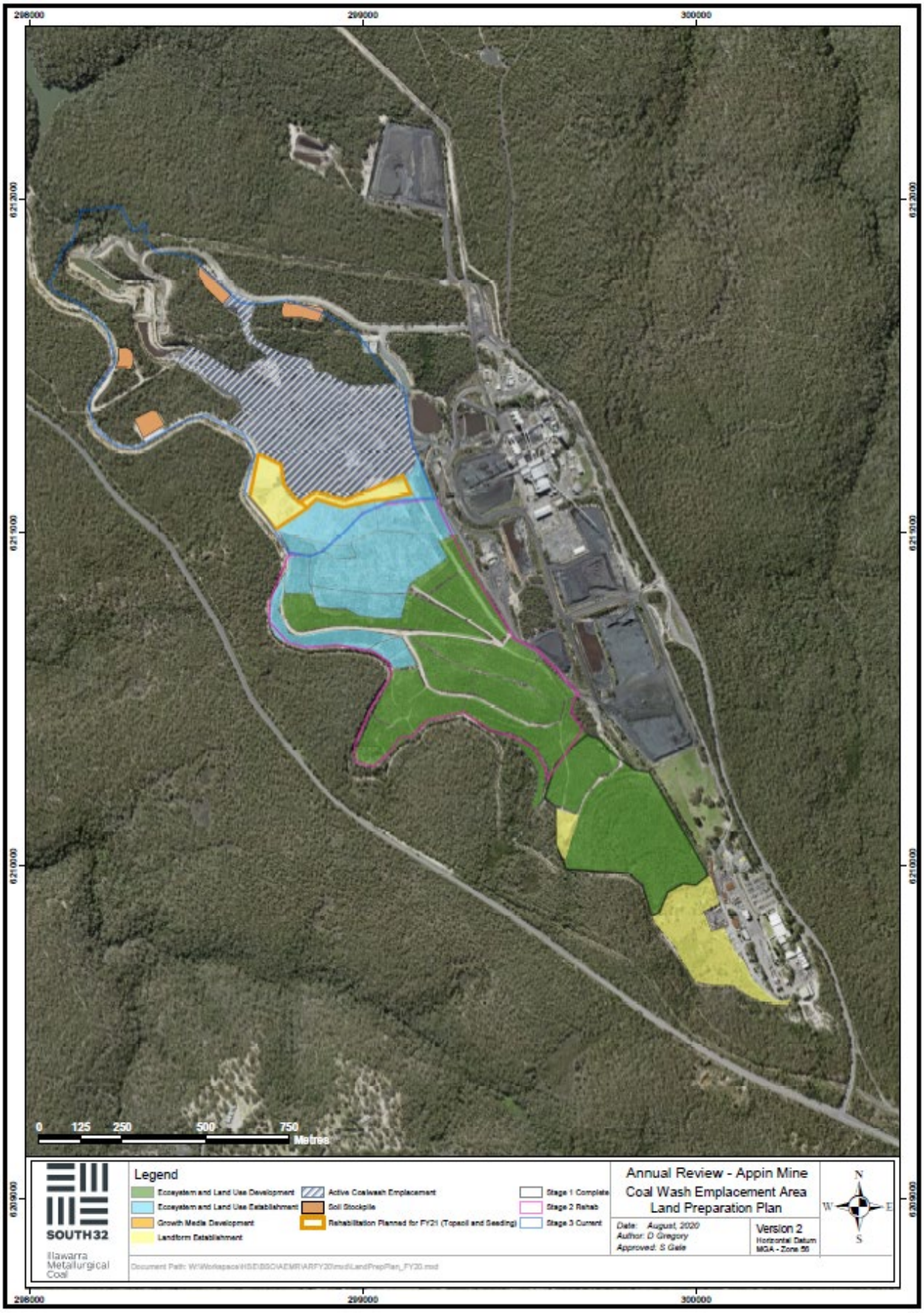
Plan 10: West Cliff Coal Preparation Plant



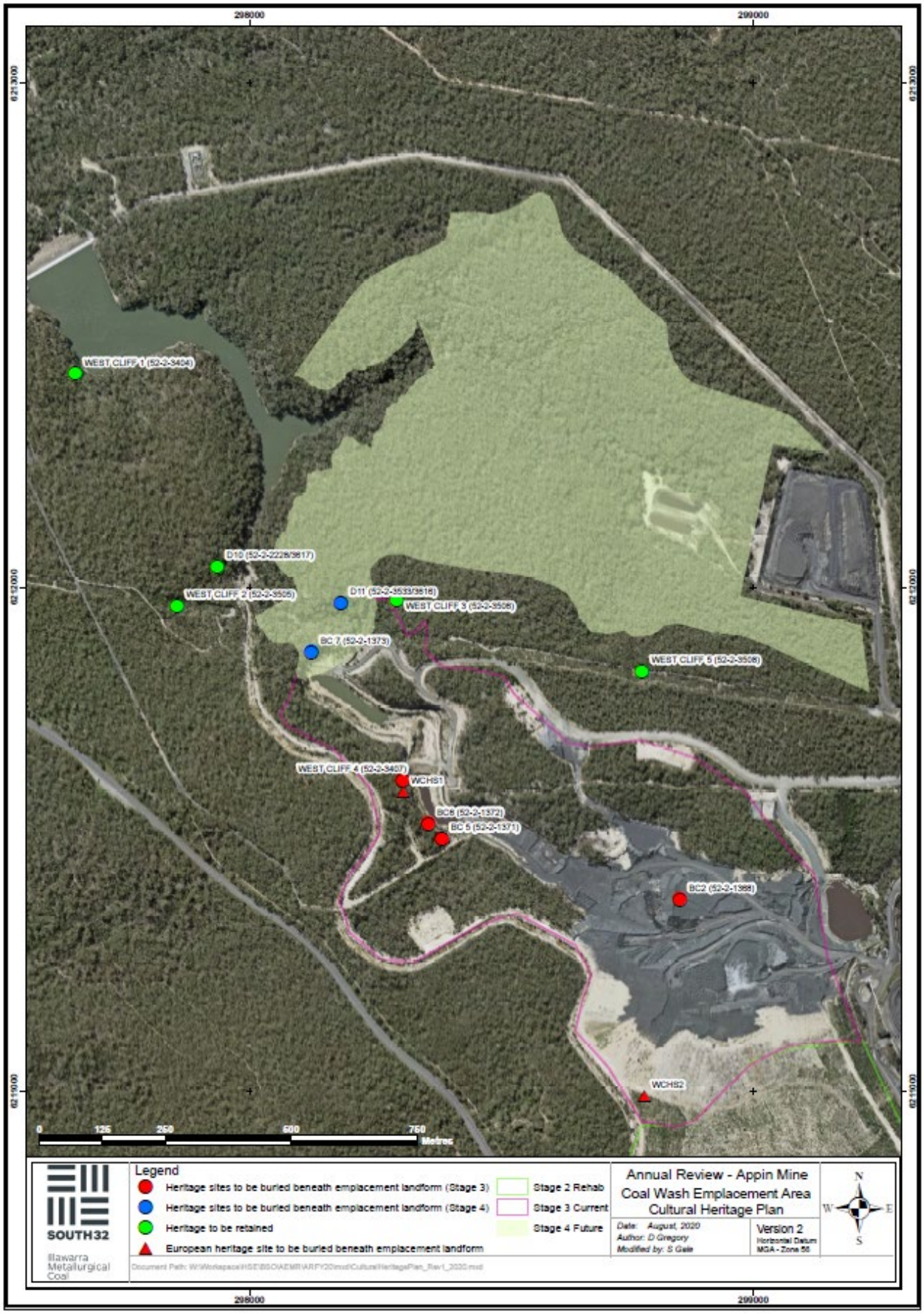
Plan 11: North Cliff Site Plan



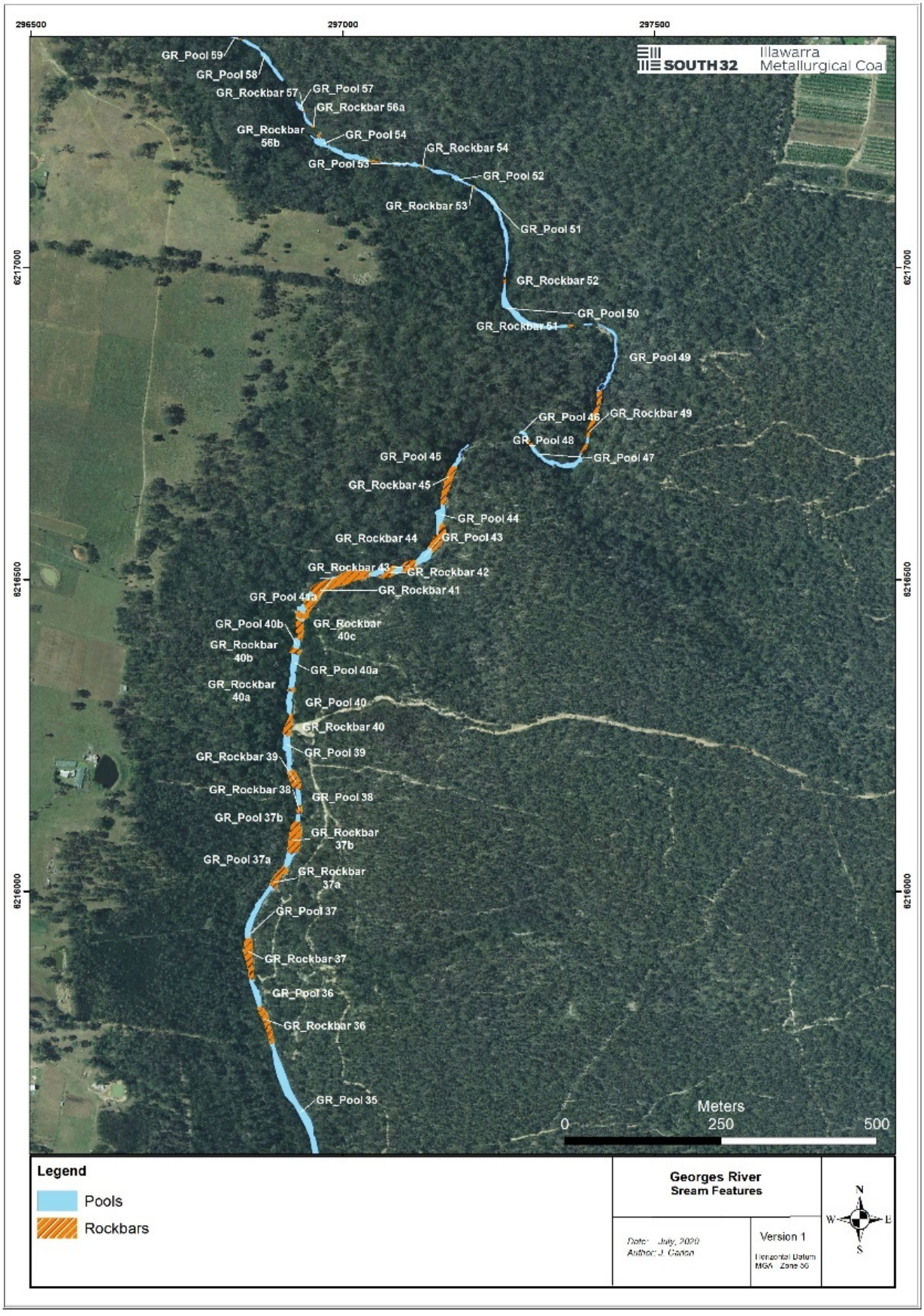
Plan 12: Land Preparation Plan – CWEA



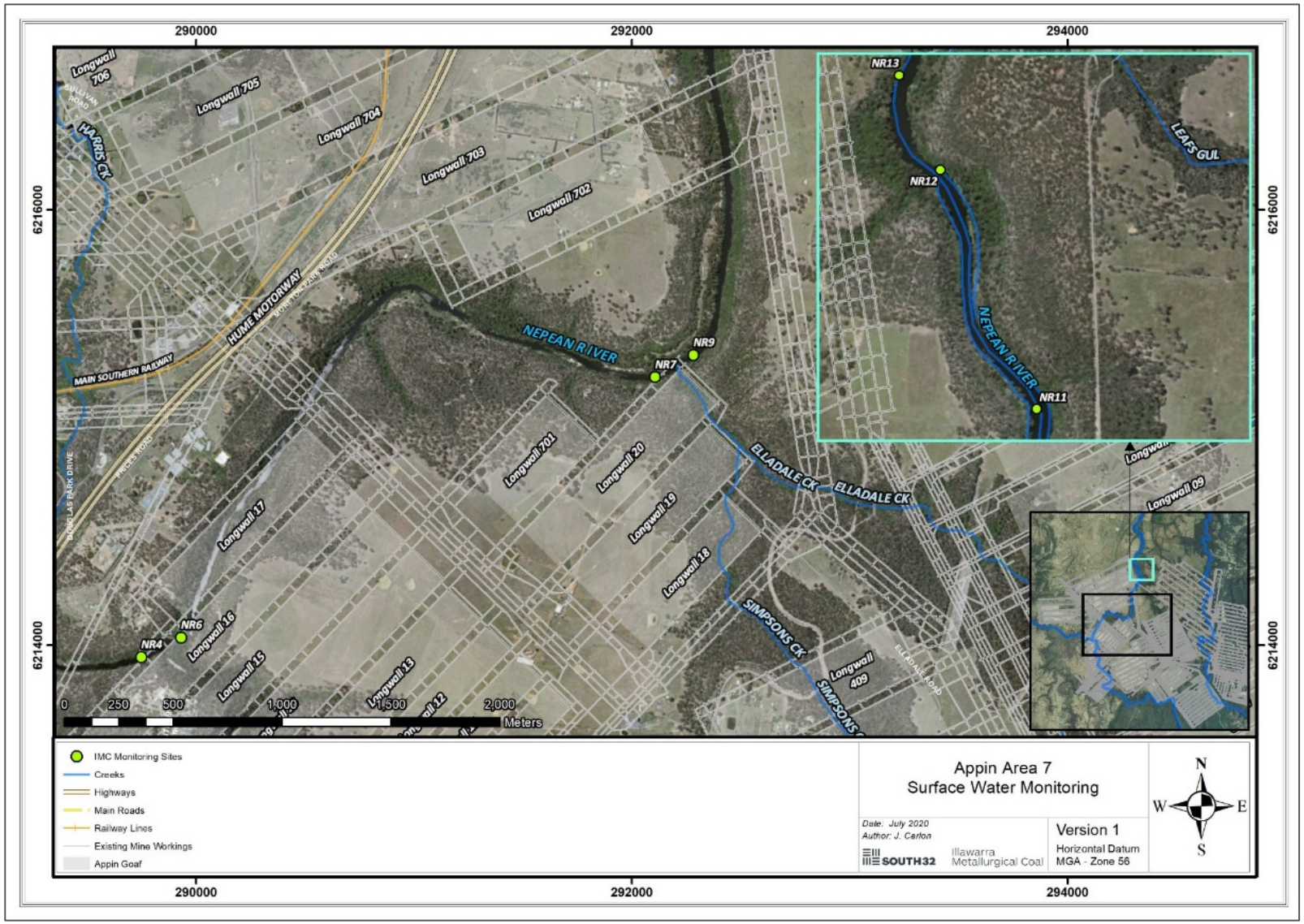
Plan 13: CWEA Cultural Heritage Sites



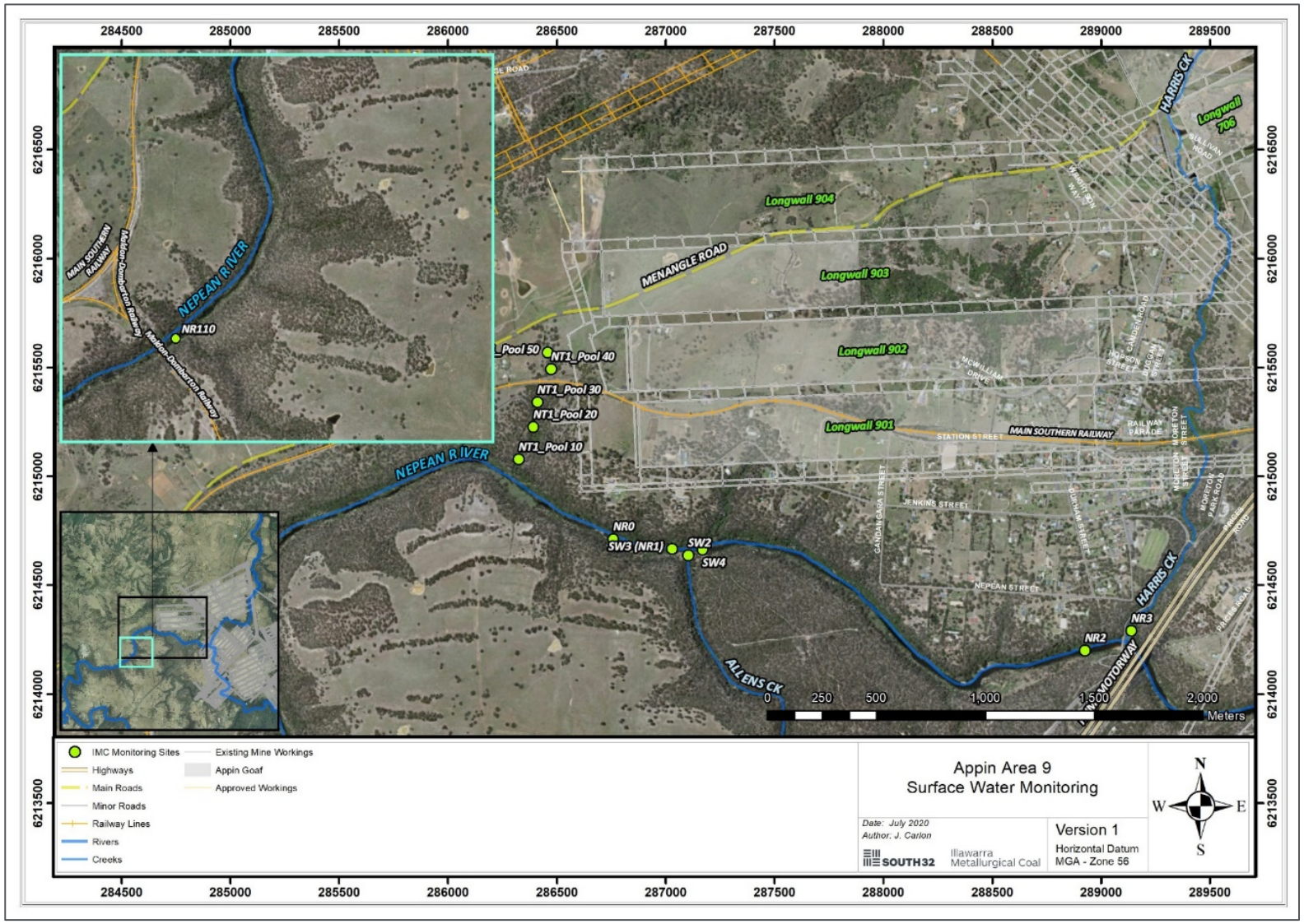
Plan 14: FY20 Subsidence Areas



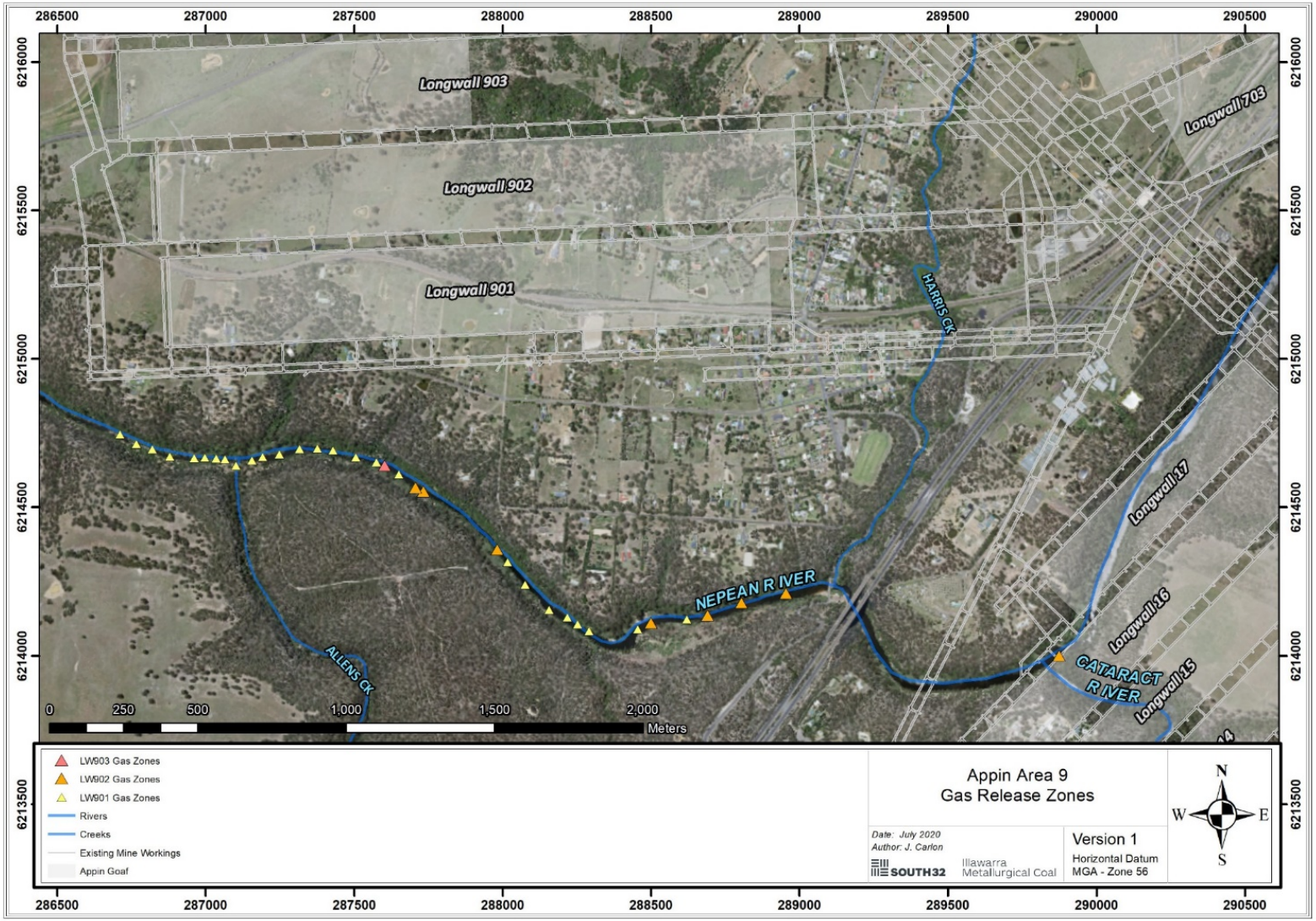
Plan 15: Appin Area 7 FY20 Surface Water Monitoring



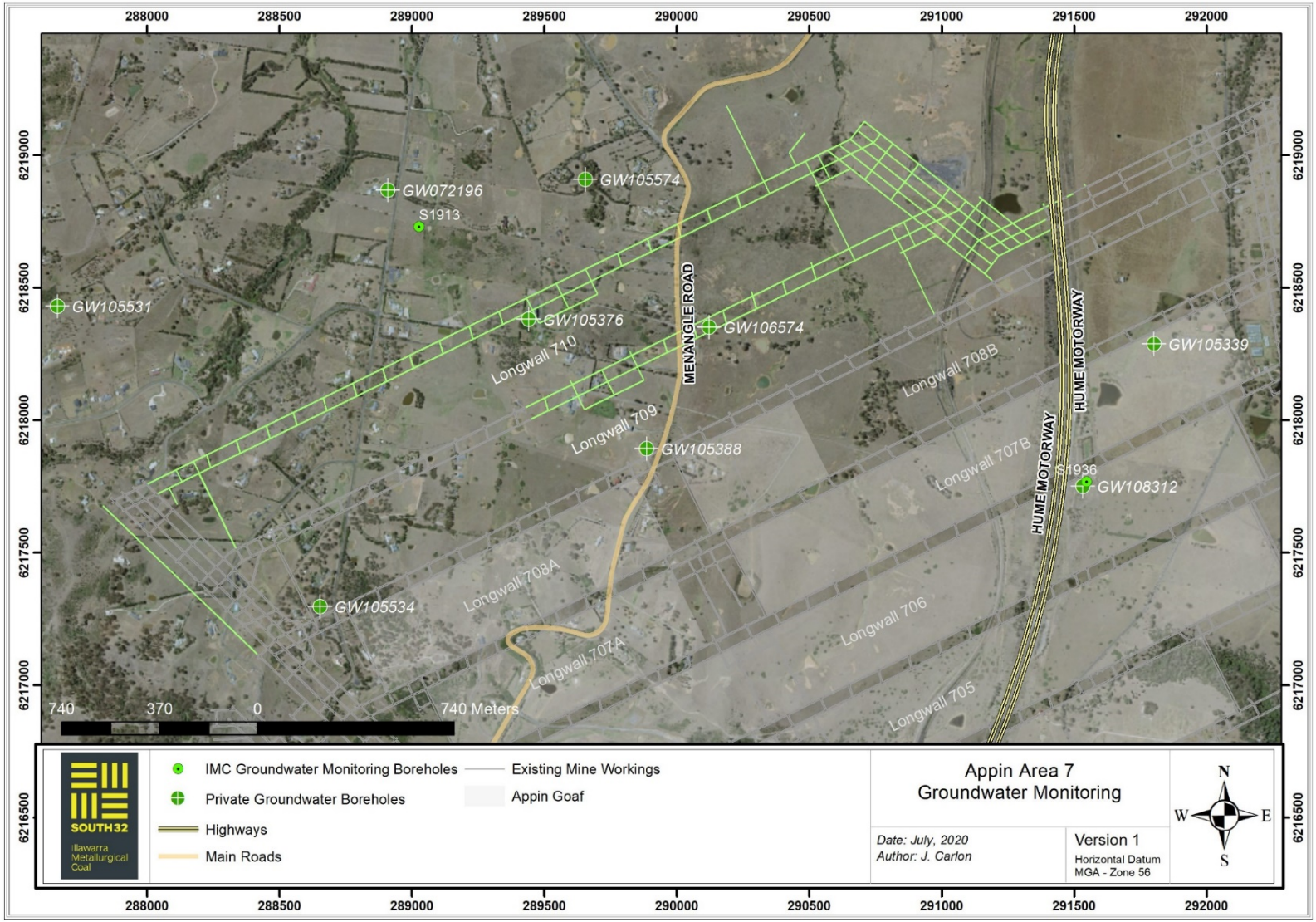
Plan 16: Appin Area 9 FY20 Surface Water Monitoring



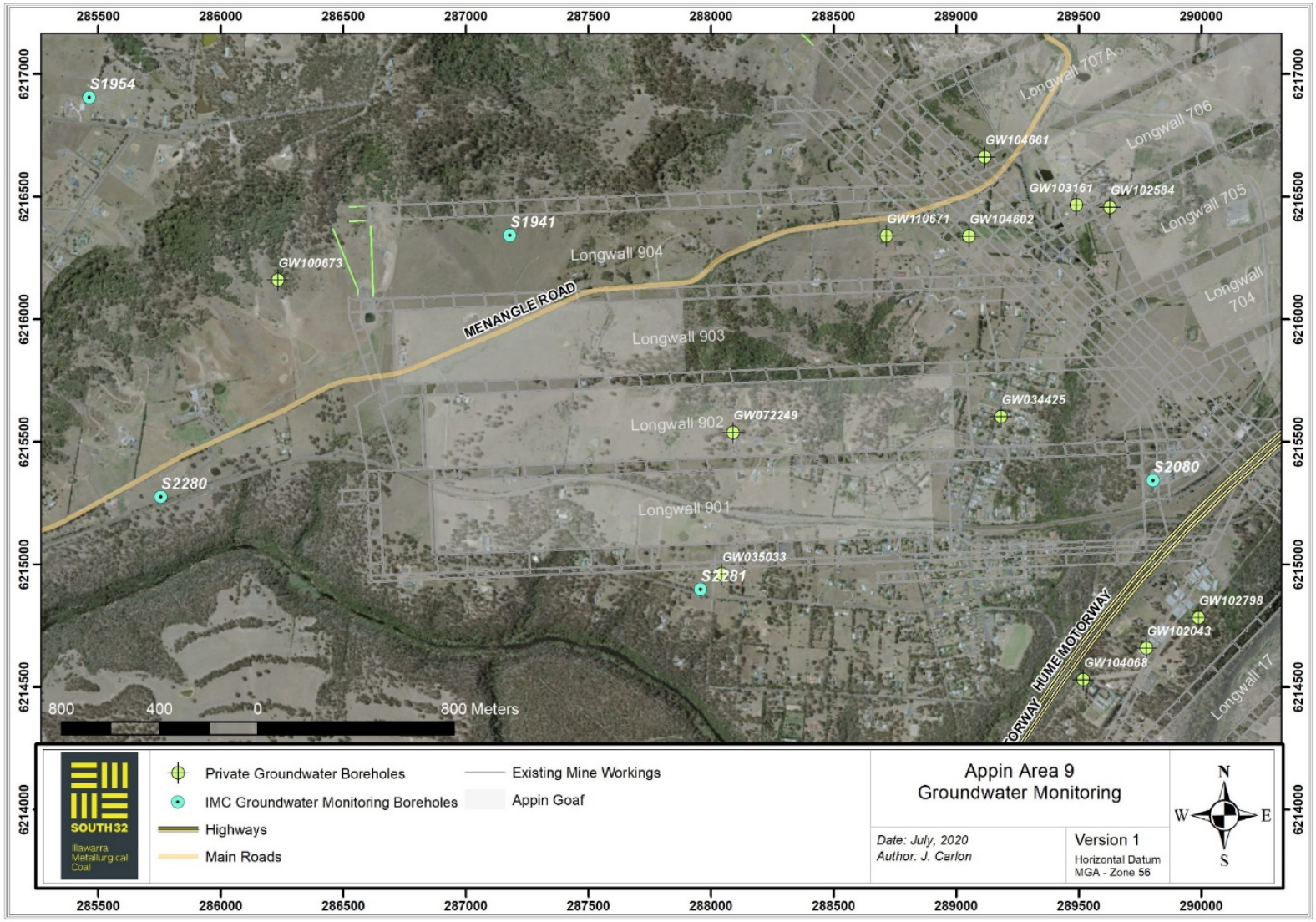
Plan 17: Appin Area 9 – FY20 Gas Zones



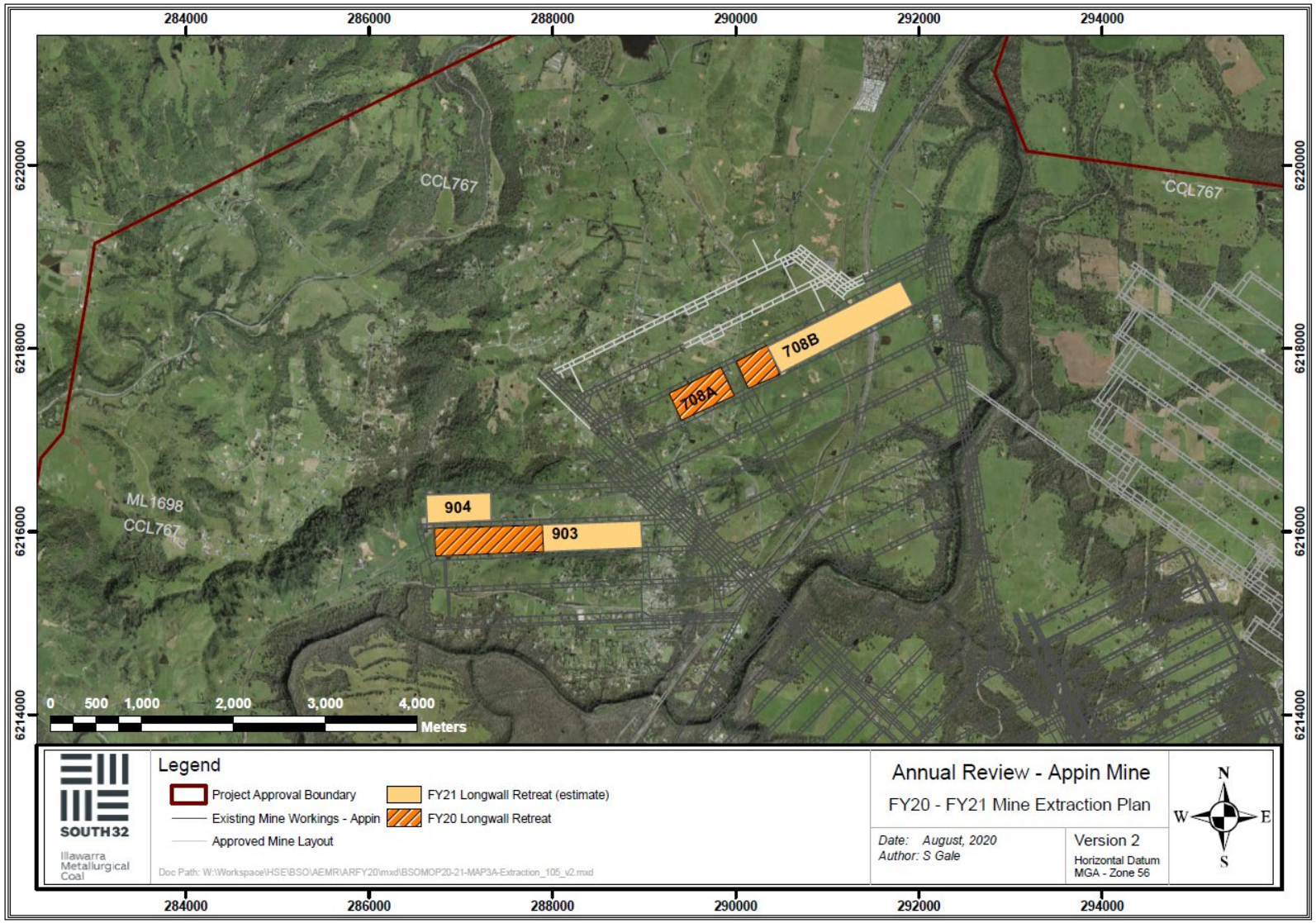
Plan 18: Groundwater Monitoring Sites in Area 7



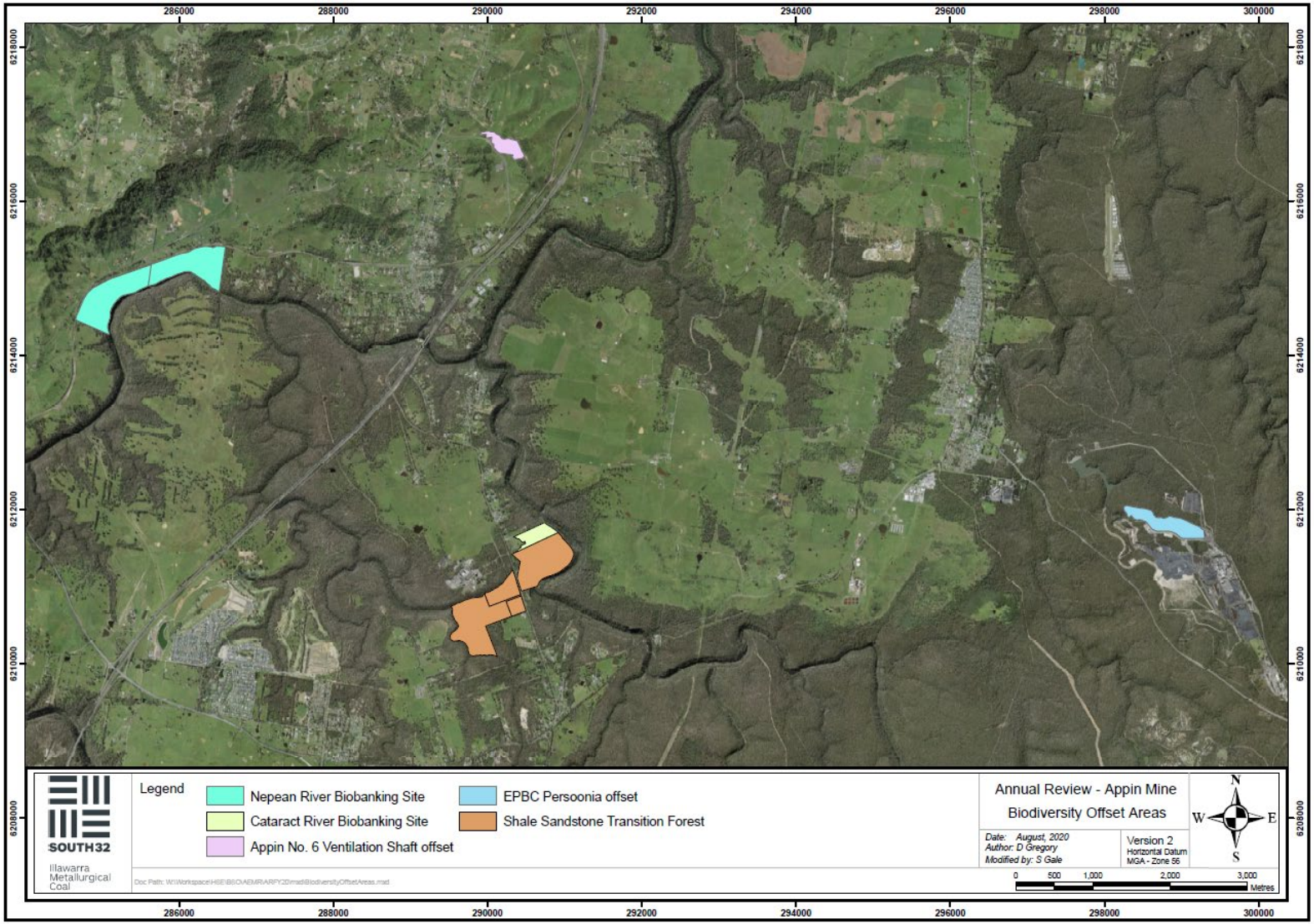
Plan 19: Groundwater monitoring in Appin Area 9



Plan 20: Mine Extraction Plan – FY20 and FY21



Plan 21: Biodiversity Offset Locations



15. APPENDICES

Appendix A: Annual Emplacement Rehabilitation Report

MONITORING REPORT - EMPLACEMENT REHABILITATION YEAR 9

Illawarra Coal 2019

Environment and Heritage

CONTENTS

INTRODUCTION

REQUIREMENT FOR MONITORING

Stage 3 Consent

The development consent for the Stage 3 Emplacement at West Cliff Colliery Emplacement (the site) 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:
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: 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 (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; (c) management strategies for the protection and conservation of *Persoonia hirsuta*; (d) management strategies for the protection and conservation of the Broad-headed Snake and the Southern Brown Bandicoot; (e) a comprehensive groundwater monitoring program for the Brenan's Creek valley, including the area of the emplacement; (f) provide for progressive rehabilitation of the emplacement area, including through: - 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.	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: Measures to limit the clearing of native vegetation to no more than 60 hectares; 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 *Persoonia hirsuta* core population with habitat adjacent to the Stage 4 coal wash emplacement area; 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 *Persoonia hirsuta*; Staging of emplacement from east to west; Provision for progressive rehabilitation of the emplacement area, including through: Staged clearing of native vegetation within the stage 4 coal wash emplacement area; 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; Key performance objectives for site rehabilitation, including indicative timelines, performance measures, management actions and responsibilities and accountabilities;

BSO Project Approval Condition 17	EPBC Project Approval Clause 6:
	Planting only endemic species in habitat mixes appropriate for the local surrounding environment, soil, slope and aspect, in accordance with relevant published guidelines; and Appropriate weed and pest control strategies. 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 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.

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	Quadrat monitoring in rehabilitation and surrounding areas* Fixed photo points throughout the emplacement** Random meander transects (every three years) in rehabilitated areas*** Fauna Monitoring****	Report (internal). Outcomes from monitoring summarized 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 2019 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 (Plan A). 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) and 19 plots in 2019. 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	
a2f-001	298755	6211092	2f
a2f-002	298932	6211007	

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 (2019)	
	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.

2019 RESULTS AND DISCUSSION

BIOMETRIC VEGETATION ASSESSMENT

Native Plant Species Richness

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

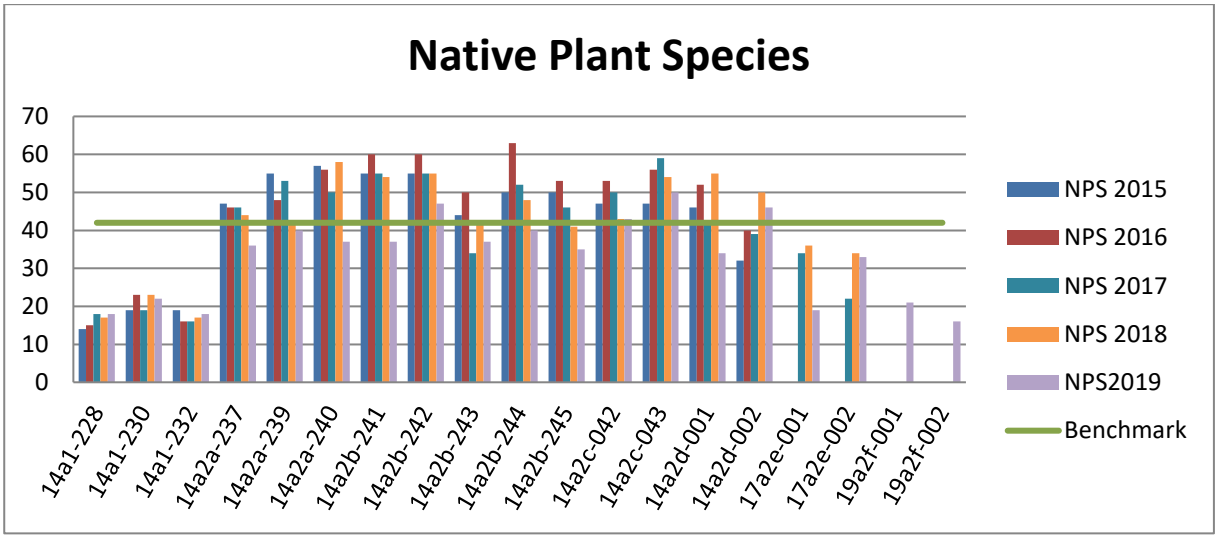


Figure 1 Number of native plant species at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d, 2e and 2f for 2019

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 and Eucalypts).

The plots in Area 2a had an average of 37 species per plot in 2019, slightly lower than the average of 48 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 39 species per plot which is slightly lower than the average with the 2018 data year and lower than data for 2016 (average of 57). The average has just fallen under above benchmark but is expected to approach benchmark after species composition changes due to shade and outcompeting resources.

The native plant species richness of Areas 2c and 2d (last six years) are all above benchmark levels, with the average for Area 2c (46) lower than 2018 data (49) and the average for area 2d (40) lower than 2018 data (53). Area 2e (treated in 2017) received results below benchmark (average of 26), this is a decrease from 2018 data (average of 35) although is expected to continue to increase with time and as the treatments establish further. The newly treated Area 2f received results below benchmark (average of 18.5). It is expected that these species richness figures will increase further at these locations as the treatments establish.

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.

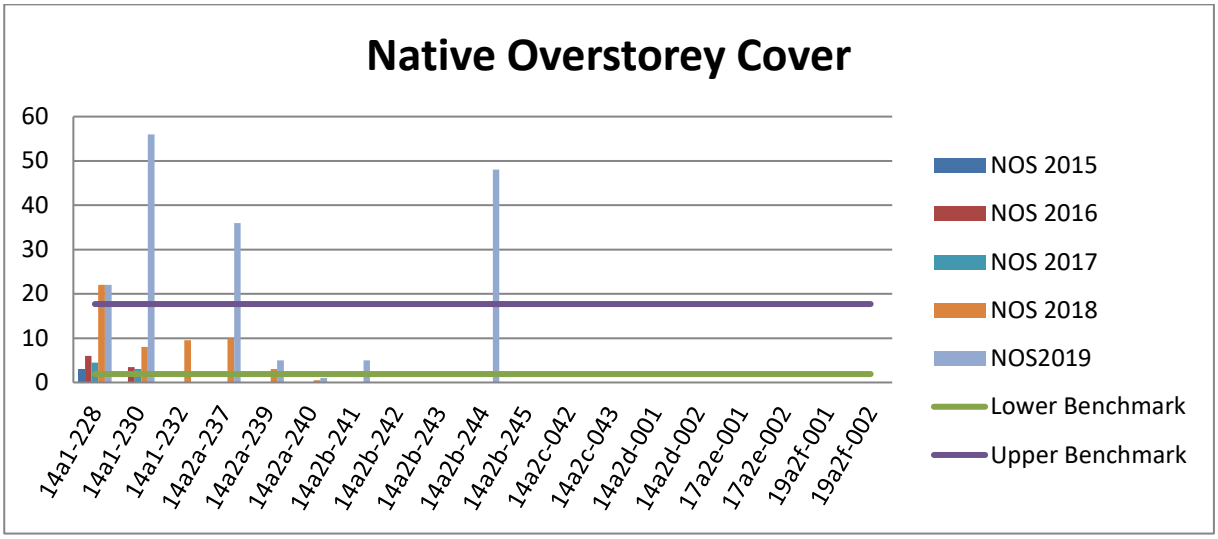


Figure 2 Native overstorey cover collected at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d, 2e and 2f for 2019

Areas 1, 2a and 2b are the only areas to have recorded native overstorey as cover in 2019 (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. Overstory cover is slowly increasing in the newer areas and will continue as the plants become established.

The areas subject to rehabilitation in 2c-f are too immature to have recorded native overstorey 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 2c-f 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.

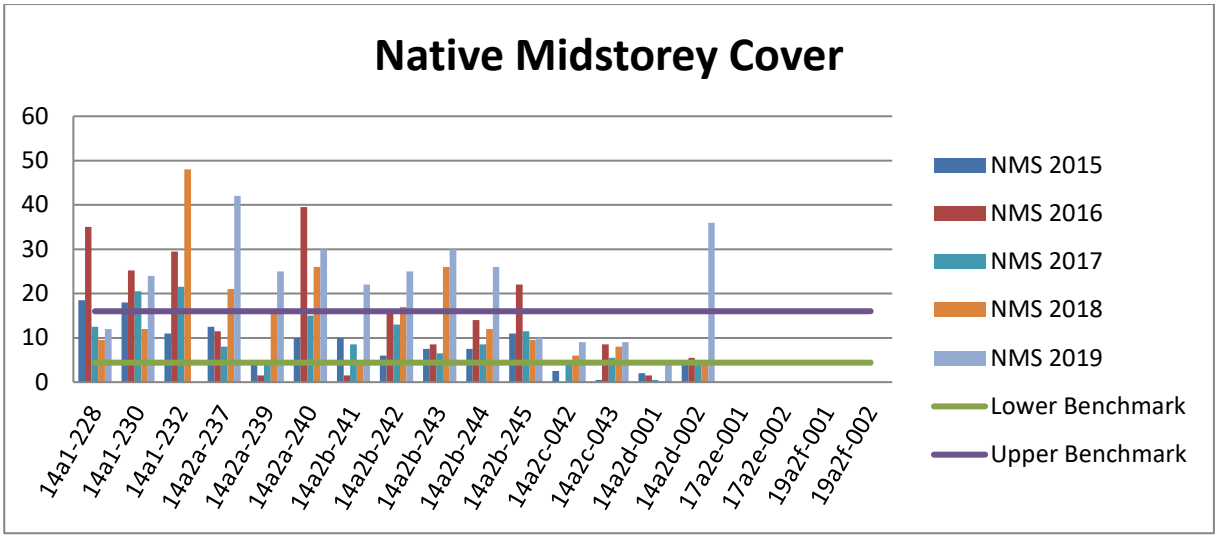


Figure 3 Native Midstorey Cover collected at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d, 2e and 2f for 2019

Most of the treatment areas demonstrated within or above benchmark values for native midstorey 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.

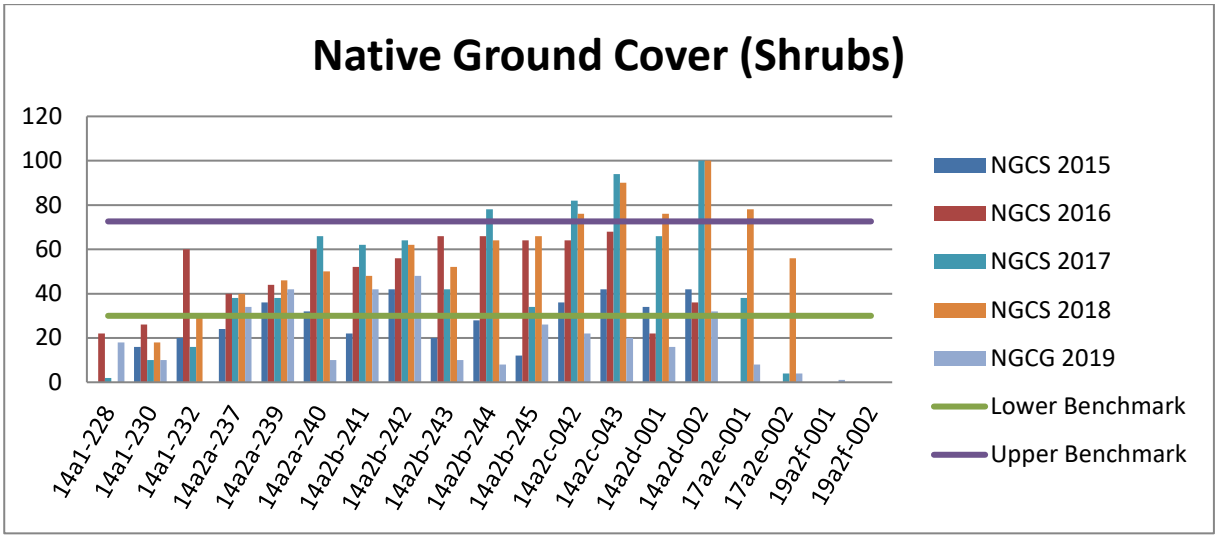


Figure 4 Native ground cover – Shrubs at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d, 2e and 2f for 2019

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 and 2f will increase 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.

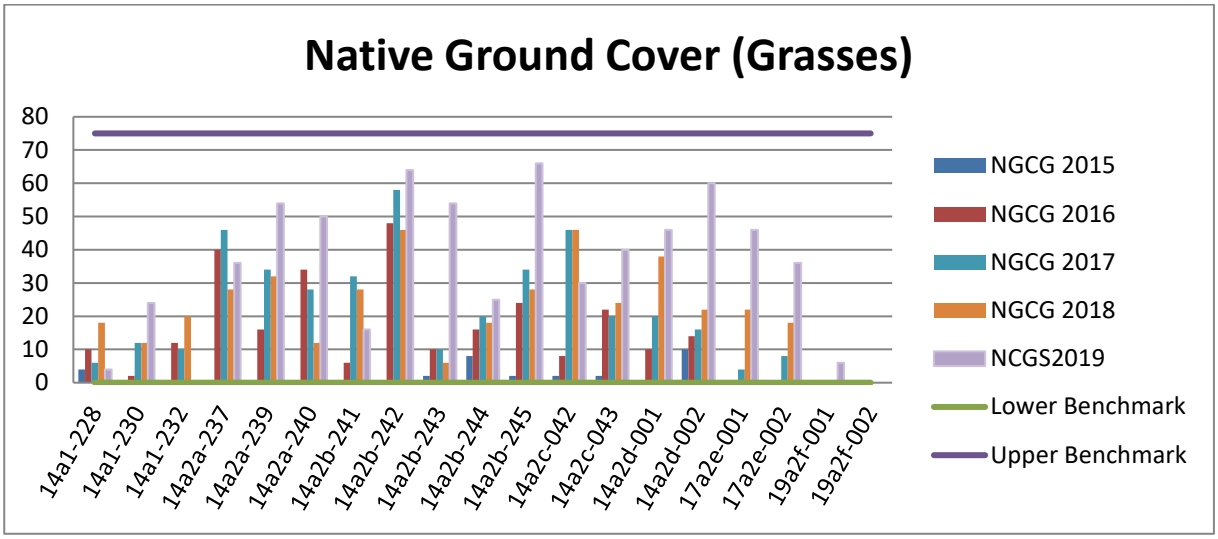


Figure 5 Native ground cover – Grasses at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d, 2e and 2f for 2019

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 midstorey 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.

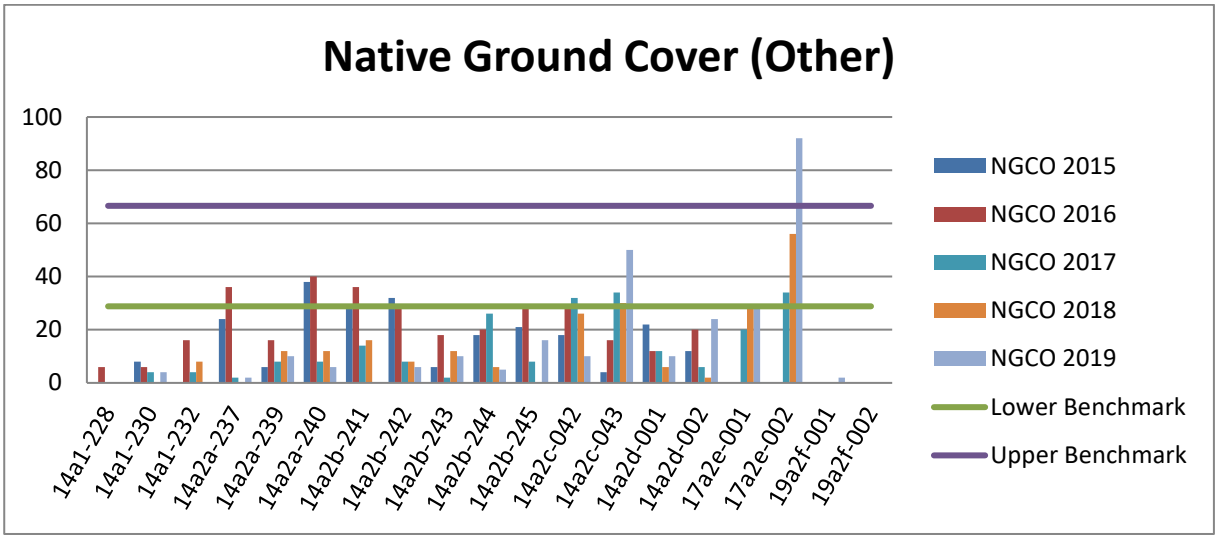


Figure 6: Native ground cover – Other at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d, 2e and 2f for 2019

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 midstorey 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) and low ground cover in the newly treated Area 2f will increasing with time.

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.

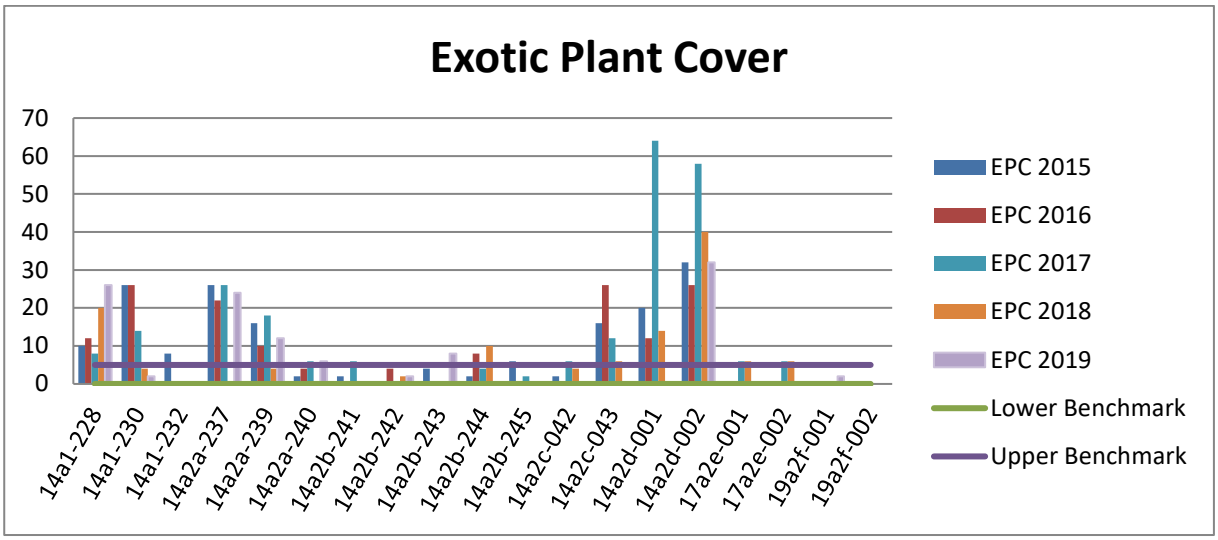


Figure 7: Exotic Plant Cover at the monitoring plots for rehabilitation areas 1, 2a, 2b, 2c, 2d and 2e and 2f for 2019

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.

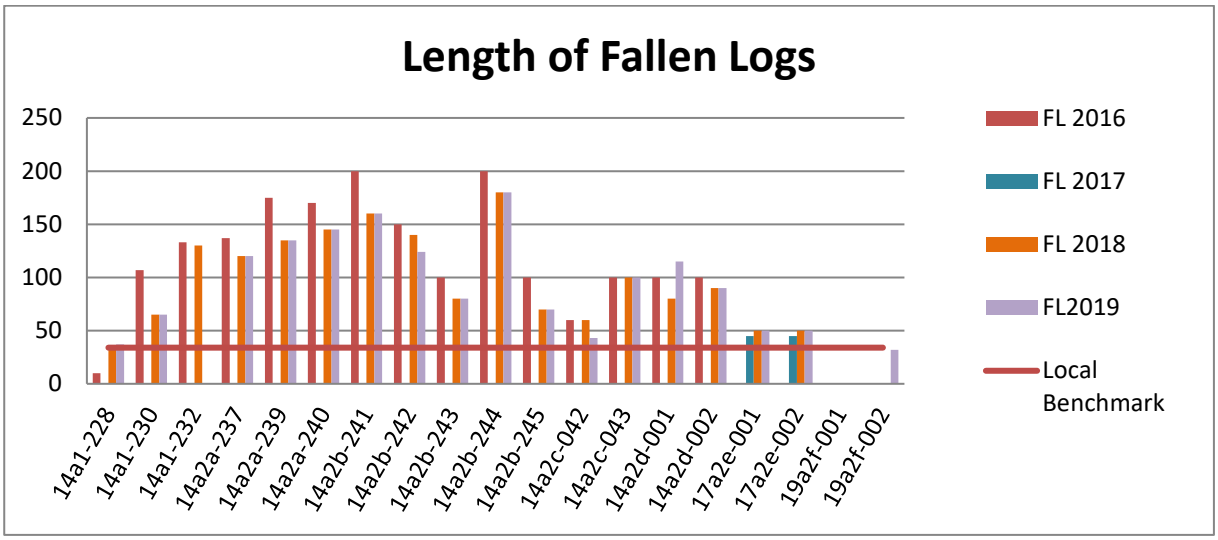


Figure 8 length of fallen logs within all plots (data obtained in 2016, 2017, 2018 and 2019)

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 18). 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). The next threatened plant meander will be in 2021.

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 (5,184 camera hours) in November/ December 2019. Cameras were placed in general habitat of the rehabilitation areas, all of which were attached low to the ground against a tree (Figure 9 and Table 6).

Table 5: Camera Trap Locations

Site Name	Latitude	Longitude
Site 1	-34.22775898	150.8195912
Site 2	-34.22834944	150.8233015
Site 3	-34.22921573	150.8237724
Site 4	-34.2314362	150.8269832
Site 5	-34.22804159	150.8191242
Site 6	-34.22705987	150.8186227
Site 7	-34.22704795	150.8188638
Site 8	-34.22461643	150.8158124
Site 10	-34.23025805	150.8259794

The survey detected eight native species; five of which were mammals, three birds and two reptiles. The results are summarised in Table 7 below.

Table 6: Fauna records from the camera trap survey

Species	Common Name	Native vs Introduced	Threatened Species	Site									Total
				1	2	3	4	5	6	7	8	10	
Macropus robusta	Common Wallaroo	Native	No				1						1
Antichinus stuartii	Brown Antichinus	Native	No							3	1		4
Wallabia bicolor	Swamp Wallaby	Native	No			6	21		2	1			30
Vulpes vulpes	Fox	Introduced	No				1			1			2
Tachyglossus aculeatus	Echidna	Native	No								1		1
Oryctolagus cuniculus	Rabbit	Introduced	No								2		2
Sericornis frontalis	White-browed Scrub Wren	Native	No				1				1		2
Lichenostomus leucotis	White-eared Honeyeater	Native	No	1									1
Rhipidura rufifrons	Rufus Fantail	Native	No	1									1
Mus musculus	House mouse	Introduced	No								1		1
	Unknown. black bird	Native	No							2			2
		Camera Nights		12	48	48	48	48	10	39	11	48	324
		Camera Hours		288	0	1,152	1,152	0	240	936	264	1,152	5,184

N.B. Cameras 1,5,6 and 7 were falsely triggered due to poor positioning near young vegetation which moves within the wind, because of this the cameras ran out of batteries earlier than anticipated. Cameras 2 and 5 did not record any data.

CONCLUSION

This report provides a description of the methodologies used and the outcomes achieved from the ninth 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.

Weed incursion remains the key threat to the rehabilitation of the Emplacement. African Love grass 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 2020.

Two threatened plant species, *Pultenaea aristata* and *Persoonia hirsuta,* were not detected within the Emplacement during the 2019 monitoring data but have previously been detected in 2016, 2017 and 2018. Despite all efforts to maintain a consistent bearing for the monitoring transect, even a slight change in angle can result in differing results in floristics and potentially a constraint on the detection of threatened species efforts within plots. 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 and will be continued to be considered during future monitoring.

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

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m
GDA 1994 MGA Zone 56

MONITORING REPORT - EMPLACEMENT REHABILIATION YEAR 9
Monitoring Site Locations

Niche PM: Sian Griffiths
Niche Proj. #: 5342
Client: Illawarra Coal - South 32

Figure 9

public/NSW_Imagery:

niche Environment and Heritage

0 75
m
GDA 1994 MGA Zone 56

Niche PM: Sian Griffiths
Niche Proj. #: 5342
Client: Illawarra Coal - South 32

MONITORING REPORT - EMPLACEMENT REHABILIATION YEAR 9
Camera Track Locations

Figure 10

APPENDIX 1: PHOTO POINT MONITORING


Plate 1: Site A1_228 (left 2010, right 2019)


Plate 2: Site A1_230 (left 2010, right 2019)


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


Plate 4: A2a_237 (left 2010, right 2019)

Plate 5: Site A2a_239 (left 2010, right 2019)

Plate 6: Site A2a_240 (left 2010, right 2019)

Plate 7: Site A2b_244 (left 2010, right 2019)

Plate 8: Site A2b_241 (left 2010, right 2019)


Plate 9: Site A2b_242 (left 2010, right 2019)


Plate 10: Site A2b_243 (left 2010, right 2019)


Plate 11: Site A2b_245 (left 2010, right 2019)


Plate 12: Site A2c-042 (left 2012, right 2019)


Plate 13: A2c-043 (left 2012, right 2019)


Plate 14: A2d-001 (left 2015, Right 2019)


Plate 15: A2d-002 (left 2015, right 2019)


Plate 16: 17a2e-001 (left 2017, right 2019)

Plate 17: 17a2e-002 (left 2017, right 2019)

Plate 18: 19a2f-001 (2019)

Plate 19:19a2f-002 (2019)

References

Cropper, S.C. (1993) Management of Endangered Plants. CSIRO Publications Victoria.

Eyre TJ, Ferguson DJ, Hourigan CL, Smith GC, Mathieson MT, Kelly, AL, Venz MF, Hogan, LD & Rowland, J. 2018. Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland. Department of Environment and Science, Queensland Government, Brisbane.

Niche Environment & Heritage (2015). Rehabilitation Monitoring Report Year 5 – West Cliff Colliery Coal Wash Emplacement Area. Report prepared for Illawarra Coal.

Meek, P., Ballard, G. and Fleming, P. (2012). An introduction to camera trapping for wildlife surveys in Australia.

OEH (2014). BioBanking Assessment Methodology 2014. https://www.environment.nsw.gov.au/resources/biobanking/140661BBAM.pdf

Appendix B: 2019/20 EPA Annual Return for EPL 2504

Annual Return

ENDEAVOUR COAL PTY LIMITED

Licence 2504

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 Environment Protection Authority (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-and-regulation/licensing or from regional offices of the EPA, or by contacting by telephone 02 9995 5700.

If you are applying to vary or transfer your Licence, you must still complete and submit 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

Reporting period : From: 1-2-2019 To: 31-1-2020

A2. Premises to which Licence Applies (if applicable)

Common name (if any) : 3. APPIN COLLIERY - NORTH (AND WESTCLIFF COAL PREP PLANT)

Premises : WEDDERBURN ROAD APPIN 2560 NSW

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

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	> 0.00	capacity
Coal works	> 5,000,000.00	T annual handing capacity

A6. Assessable Pollutants (if applicable)

Note that the identification of assessable pollutants is used to calculate the **load-based fee.**
The following assessable pollutants are identified for the fee-based activity classifications in the licence:

B. Monitoring and Complaints Summary

B1. Number of Pollution Complaints

Pollution Complaint Category	Complaints
Air	1
Water	0
Noise	3
Waste	0
Other	4
Total complaints recorded by the licensee during the reporting period	**8**

B2. Concentration Monitoring Summary

For each concentration monitoring point identified in your licence, details are displayed below. If concentration monitoring is not required by your licence, **no data** will appear below.
If data was provided from an uploaded file, the file name will be displayed below instead of any data.
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, Sampling tap in settling chamber of sewage treatment plant.
lat. long. -34.231323 150.829629

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Biochemical oxygen demand	milligrams per litre	11	11	<2	4	10
pH	pH	11	11	7.9	8.2	8.8

Discharge & Monitoring Point 10

Discharge to waters
Discharge quality monitoring
Volume monitoring, Pipe discharge outlet from Brennans Creek dam to the creek.
lat. long. -34.206432 150.802706

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	12	13	499	750	1160
Aluminium (dissolved)	milligrams per litre	12	13	50	224	710
Arsenic (dissolved)	micrograms per litre	12	13	1	6	17
Bicarbonate alkalinity	milligrams per litre	12	13	441	641	991
Cadmium (dissolved)	micrograms per litre	12	13	<0.1	<0.1	<0.1
Cobalt (dissolved)	micrograms per litre	12	13	<1	1	2
Conductivity	microsiemens per centimetre	Continuous	Continuous	828	1667	2692
Copper (dissolved)	micrograms per litre	12	13	<1	2	5
Lead (dissolved)	micrograms per litre	12	13	<1	<1	<1
Manganese (dissolved)	micrograms per litre	12	13	3	12	28
Nickel (dissolved)	micrograms per litre	12	13	31	67	127
Nitrogen (ammonia)	micrograms per litre	12	13	13	150	330
Nitrogen (total)	micrograms per litre	12	13	140	603	1200
Oxidised nitrogen	micrograms per litre	12	13	20	178	400
pH	pH	Continuous	Continuous	7.1	8.3	9.3
Total dissolved solids	milligrams per litre	12	13	606	1039	1540
Total suspended solids	milligrams per litre	12	13	<5	7	14
Turbidity	nephelometric turbidity units	Continous	Continous	1.45	26.29	165
Zinc (dissolved)	micrograms per litre	12	13	<5	9	31

Monitoring Point 11

Ambient water quality monitoring, Georges River approximately 50 metres upstream of the confluence with Brennans Creek.
lat. long. -34.204883 150.798824

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Conductivity	microsiemens per centimetre	11	11	322	458	595
pH	pH	11	11	7.1	7.4	8.2
Total suspended solids	milligrams per litre	11	11	<5	5	8

Monitoring Point 12

Ambient water quality monitoring, Georges River approximately 50 metres downstream of the confluence with Brennans Creek.
lat. long. -34.204099 150.798345

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Conductivity	microsiemens per centimetre	12	12	924	1648	2650
pH	pH	12	12	7.1	8.1	9.2
Total suspended solids	milligrams per litre	12	12	<5	8	13

Monitoring Point 14

Dust Monitoring, Dust Gauge "AE-DD14" is located to the SE of the coal stockpile on the property boundary at Appin East.
lat. long. -34.212468 150.794151

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.6	1.8	5.9
Combustible solids	grams per square metre per month	12	12	0.6	1.7	4.3

Insoluble solids	grams per square metre per month	12	12	1.5	3.4	7.8

Monitoring Point 15

Dust Monitoring, Dust Gauge "AE-DD15" is located to the east of the coal stockpile near the sediment pond at Appin East.
lat. long. -34.210667 150.794870

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.5	1.5	6.3
Combustible solids	grams per square metre per month	12	12	0.2	1.2	2.2
Insoluble solids	grams per square metre per month	12	12	0.7	2.7	7.7

Monitoring Point 16

Dust Monitoring, Dust Gauge "AE-DD16" is located on the north property boundary near the Sydney Water tank at Appin East.
lat. long. -34.209582 150.79148798

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.3	1.3	6.1
Combustible solids	grams per square metre per month	12	12	0.2	0.7	1.4
Insoluble solids	grams per square metre per month	12	12	0.6	1.9	7.4

Monitoring Point 17

Dust Monitoring, Dust Gauge "AE-DD17" is located at the NE corner of the property boundary near the truck exit/entry point at Appin East.
lat. long. -34.209866 150.794218

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.7	1.5	4.6
Combustible solids	grams per square metre per month	12	12	0.5	1.4	2.5
Insoluble solids	grams per square metre per month	12	12	1.3	2.9	6.4

Discharge & Monitoring Point 18

Discharge to waters.
Discharge quality and volume monitoring, Underflow from the stormwater filter lagoon discharging through a v-notch weir.
lat. long. -34.210467 150.796312

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

Discharge & Monitoring Point 19

Discharge to waters. Discharge quality and volume monitoring., Dyna Sand Filter outlet for treated stormwater.
lat. long. -34.211010 150.795734

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
pH	pH	12	12	6.1	7.0	7.9
Total suspended solids	milligrams per litre	12	12	<5	6	12

Discharge & Monitoring Point 22

Discharge to utilisation area.
Water quality monitoring.
Volume Monitoring., The 100mm poly pipe from the secondary stabilisation lagoon of the sewage treatment plant which discharges to the utilisation area.
lat. Long. -34.217742 150.716151

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Biochemical oxygen demand	milligrams per litre	12	15	9	38	137
pH	pH	12	15	6.7	7.2	7.2

Discharge & Monitoring Point 23

Discharge to waters
Water quality monitoring
Discharge volume monitoring, Piped discharge outlet for stormwater.
lat. long. -34.220956 150.719136

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
pH	pH	7	7	7.3	7.6	7.9
Total suspended solids	milligrams per litre	7	7	<5	10	27

Discharge & Monitoring Point 24

Discharge to waters
Water quality monitoring. Discharge volume monitoring, Piped discharge outlet for mine water.
lat. long. -34.220870 150.719059

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Alkalinity (as calcium carbonate)	milligrams per litre	4	4	68	266	426
Aluminium (dissolved)	milligrams per litre	1	1	<0.01	0.01	0.02
Arsenic (dissolved)	micrograms per litre	4	4	<1	2	3
Bicarbonate alkalinity	milligrams per litre	4	4	68	262	415
Cadmium (dissolved)	micrograms per litre	4	4	<0.1	<0.1	<0.1

Cobalt (dissolved)	micrograms per litre	4	4	<1	1	1
Conductivity	microsiemens per centimetre	12	12	123	800	1040
Copper (dissolved)	micrograms per litre	4	4	<1	<1	<1
Lead (dissolved)	micrograms per litre	4	4	<1	<1	<1
Manganese (dissolved)	micrograms per litre	4	4	<1	<1	<1
Nickel (dissolved)	micrograms per litre	4	4	<1	12	19
Nitrogen (ammonia)	micrograms per litre	4	4	0.10	0.15	0.19
Nitrogen (total)	micrograms per litre	4	4	0.2	0.2	0.3
Oxidised nitrogen	micrograms per litre	4	4	0.01	0.03	0.06
pH	pH	12	12	7.3	7.6	8.1
Total dissolved solids	milligrams per litre	4	4	68	326	496
Total suspended solids	milligrams per litre	12	12	<1	2	5
Total suspended solids	milligrams per litre	12	12	<1	2	5
Zinc (dissolved)	micrograms per litre	4	4	<5	<5	<5

Monitoring Point 26

Dust Monitoring, Dust Gauge "AE-DD18" is located at the SW corner of the coal stockpile next to the loading bin at Appin East.
lat. long. -34.212081 150.791488

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.7	2.1	6.7
Combustible solids	grams per square metre per month	12	12	1.1	2.4	4.8
Insoluble solids	grams per square metre per month	12	12	1.8	4.5	10.1

Monitoring Point 27

PM10 Monitoring, Photometer "AE-PF1" is located at the NE corner of the property boundary near the truck entry/exit point at Appin East.
lat. long. -34.209797 150.794101

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
PM10	micrograms per cubic metre	Continous	Continuous	0	26.891	3652

Monitoring Point 28

PM10 Monitoring, Photometer "AE-PF3" is located at the NW corner of the property boundary Appin East.
lat. long -34.209197 150.789919

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
PM10	micrograms per cubic metre	Continuous	Continuous	0	16	2252

Monitoring Point 29

Dust Monitoring, Dust Gauge "AW-DD1" is located at the pit top between the mine access road, employee car park and EDL power plant at Appin West.
lat. long. -34.219845 150.718644

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.4	1.2	5.5
Combustible solids	grams per square metre per month	12	12	0.1	0.4	0.9
Insoluble solids	grams per square metre per month	12	12	0.5	1.6	6.4

Monitoring Point 30

Dust Monitoring, Dust Gauge "AW-DD2" is located at the junction of the mine access road and Douglas Park Drive at Appin West.
lat. long. -34.216847 150.722905

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.3	1.3	6.1
Combustible solids	grams per square metre per month	12	12	0.1	0.5	1.5
Insoluble solids	grams per square metre per month	12	12	0.5	1.8	7.4

Monitoring Point 31

Dust Monitoring, Dust Gauge "W-DD1" is located at the junction of Wedderburn Rd and Appin Rd at Appin North.
lat. long. -34.237619 150.833065

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.5	1.7	6.9
Combustible solids	grams per square metre per month	12	12	0.8	1.3	2.3
Insoluble solids	grams per square metre per month	12	12	1.5	3.0	9.1

Monitoring Point 32

Dust Monitoring, Dust Gauge "W-DD3" is located at the pit top south site at Appin North.
lat. long. -34.231528 150.829625

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.9	1.9	5.3
Combustible solids	grams per square metre per month	12	12	0.3	0.7	1.3

Insoluble solids	grams per square metre per month	12	12	1.2	2.6	6.5

Monitoring Point 33

Dust Monitoring, Dust Gauge "AW-DD8" is located next to Brennan Creek dam at Appin North.
lat. long. -34.207160 150.803994

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	0.1	1.2	5.2
Combustible solids	grams per square metre per month	12	12	0.1	0.3	0.9
Insoluble solids	grams per square metre per month	12	12	0.2	1.5	6.1

Monitoring Point 34

Dust Monitoring, Dust Gauge "W-DD10" is located on Wedderburn Road next to the product stockpiles at Appin North.
lat. long. -34.224207 150.827109

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Ash	grams per square metre per month	12	12	4.5	7.8	11.3
Combustible solids	grams per square metre per month	12	12	4.9	8.3	10
Insoluble solids	grams per square metre per month	12	12	9.4	16.1	21.1

Monitoring Point 35

PM10 Monitoring, Photometer "W-PF1" is located at the junction of Appin Road and Wedderburn Road at Appin North.
lat. long. -34.236380 150.833600

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
PM10	micrograms per cubic metre	Continuous	Continuous	0	34.727	4655

Discharge & Monitoring Point 36

Discharge to waters. Discharge quality monitoring - Douglas Park Vent Shaft No.6, Piped discharge outlet from stormwater dam.
lat. long. -34.180977 150.718149

Pollutant	Unit of measure	No. of samples required	No. of samples collected and analysed	Lowest sample value	Mean of sample	Highest sample value
Conductivity	microsiemens per centimetre	1	1	578	578	578
pH	pH	1	1	7.9	7.9	7.9
Total suspended solids	milligrams per litre	1	1	29	29	29

B3. Volume or Mass Monitoring Summary

For each volume or mass monitoring point identified in your licence, details are displayed below. If volume or mass monitoring is not required by your licence, **no data** will appear below.
If data was provided from an uploaded file, the file name will be displayed below instead of any data.
Note that this does not exclude the need to conduct appropriate volume or mass monitoring of assessable pollutants are required by load-based licensing (if applicable).

Monitoring Point 4

Discharge Quality Monitoring. Volume Monitoring, Sampling tap in settling chamber of sewage treatment plant.
lat. long. -34.231323 150.829629

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	Highest result
kilolitres per day	Continuous	Continuous during discharge	0	144.2	351.7

Discharge & Monitoring Point 10

Discharge to waters
Discharge quality monitoring
Volume monitoring, Pipe discharge outlet from Brennans Creek dam to the creek.
lat. long. -34.206432 150.802706

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	Highest result
kilolitres per day	Continuous	Continuous during discharge	0	1789.73	5074.57

Monitoring Point 13

Volume monitoring, Flow monitoring location for point 10 discharge
lat. long. -34.207050 150.803135

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	Highest result
kilolitres per day	Continuous	Continuous	0	854	3677

Discharge & Monitoring Point 18

Discharge to waters.
Discharge quality and volume monitoring, Underflow from the stormwater filter lagoon discharging through a v-notch weir.
lat. long. -34.210467 150.796312

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

Discharge & Monitoring Point 19

Discharge to waters. Discharge quality and volume monitoring., Dyna Sand Filter outlet for treated stormwater.
lat. long. -34.211010 150.795734

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	Highest result
kilolitres per day	Continuous during discharge	Continuous	0	288	1163

Discharge & Monitoring Point 22

Discharge to utilisation area.
Water quality monitoring.
Volume Monitoring., The 100mm poly pipe from the secondary stabilisation lagoon of the sewage treatment plant which discharges to the utilisation area.
lat. Long. -34.217742 150.716151

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	Highest result
kilolitres per day	Continuous during discharge	Continuous	0	25	73

Discharge & Monitoring Point 24

Discharge to waters
Water quality monitoring. Discharge volume monitoring, Piped discharge outlet for mine water.
lat. long. -34.220870 150.719059

Unit of measure	Frequency	No. of measurements made	Lowest result	Mean result	Highest result
kilolitres per day	Continuous during discharge	Continuous	0	1045.8	3460
KL/month	Continuous during discharge	Continuous	6949	32026.17	52427

C. Statement of Compliance - Licence Conditions

C1. Compliance with Licence Conditions

Were all conditions of the licence complied with (including monitoring and reporting requirements)?	**No**

C2. Details of Non-Compliance with Licence

Licence condition number not complied with ▼
Condition L2
Summary of particulars of the non-compliance ▼
LDP 22 effluent discharge exceeded BOD limits for EPL 2504.
Further details on particulars of non-compliance, if required ▼
Monthly sampling of LDP 22 returned a BOD result of 56 mg/L at the Appin West waste water irrigation area, which is an exceedance of the 100th percentile limit of 50 mg/L.
Number of times occurred ▼
1
Date(s) when the non-compliance occurred, if applicable ▼
8/1/20
Cause of non-compliance ▼

Very low throughput of the plant (due to reduced manning), led to increased holding times in balance dams. This resulted in increased dam temperature & microbiological growth, in turn increasing BOD. In Aug 2019, advice was provided by the sewage treatment plant servicing agent, that the aerobic bioreactor (tank) was not generating enough biomass, & thus its efficacy was lowered. The cause was from aerating the balance feed pond (Dam 1), which holds effluent prior to the aerated sewage tank.

Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼

Frequent monitoring and effluent discharge sampling was carried out until the system returned to normal. There was no identified environmental harm.

Action taken or that will be taken to prevent a recurrence of the non-compliance ▼

The system has been reinstated to the original set-up. Dam 1 mixers are now aerators and the aerobic bioreactor tank is a polishing tank. Supplementary aeration of Dam 2 was completed for four days following the event, but then ceased.

Uploaded Document Name ▼

APPIN WEST.pdf

Uploaded Document Description ▼

Map - Appin West

Licence condition number not complied with ▼

Condition L2

Summary of particulars of the non-compliance ▼

Exceedance of pH criteria at LDP19.

Further details on particulars of non-compliance, if required ▼

A result of 6.13 pH units was recorded during discharge at LDP19, which is an exceedance of the 100 percentile lower concentration limit of 6.5.

Number of times occurred ▼

1

Date(s) when the non-compliance occurred, if applicable ▼

3/10/19

Cause of non-compliance ▼

It is considered that this result was a laboratory error. A request was submitted to retest the sample however all of the sample had been used and this was not possible. Field tests undertaken on this date, in addition to the results from the in-line monitoring, indicate that the water in the dam was within the water quality concentration limits.

Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼

Laboratory advised of the results of the investigation.

Action taken or that will be taken to prevent a recurrence of the non-compliance ▼

Field testing to continue when samples are collected. pH sampling methodology changed to also include sampling via probe and titrator in lab to reduce erroneous results due to outgassing and sample chemistry changes during holding times.

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APPIN EAST.pdf

Uploaded Document Description ▼

Map - Appin East

Licence condition number not complied with ▼
Condition L2
Summary of particulars of the non-compliance ▼
LDP 22 effluent discharge exceeded BOD limits for EPL 2504.
Further details on particulars of non-compliance, if required ▼
Monthly sampling of LDP 22 returned a BOD result of 96 mg/L at the Appin West waste water irrigation area, which is an exceedance of the 100th percentile limit of 50 mg/L.
Number of times occurred ▼
1
Date(s) when the non-compliance occurred, if applicable ▼
5/6/19
Cause of non-compliance ▼
There were no identifiable reasons as to why this exceedance occurred.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼
The waste water system was monitored for any issues. There was no identified environmental harm.
Action taken or that will be taken to prevent a recurrence of the non-compliance ▼
Resampling took place immediately. The system continued to be monitored. Resampling indicated compliance with criteria.
Uploaded Document Name ▼
APPIN WEST.pdf
Uploaded Document Description ▼
Map - Appin West

Licence condition number not complied with ▼
Condition L2.4
Summary of particulars of the non-compliance ▼
LDP 22 effluent discharge exceeded BOD limits for EPL 2504.
Further details on particulars of non-compliance, if required ▼
Monthly sampling of LDP 22 returned a BOD result of 137 mg/L at the Appin West waste water irrigation area, which is an exceedance of the 100th percentile limit of 50 mg/L.
Number of times occurred ▼
1
Date(s) when the non-compliance occurred, if applicable ▼
5/11/19
Cause of non-compliance ▼

During the weekly inspection of the Appin West sewage treatment plant, observed no aeration occurring at the plant. On investigation identified the aeration pump had tripped due to a power failure. The Residual Current Device, now tripped, didn't reset when power was restored. The Programmable Logic Controller didn't register that the aerator hadn't turned back on. Water from the effluent ponds continued to be pumped to Licence Discharge Point 22, & the water was irrigated to the irrigation area

Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼

Frequent monitoring and effluent discharge sampling was carried out until the system returned to normal. A follow up sample was collected on 13 November. The result was 38 mg/L. There was no identified environmental harm.

Action taken or that will be taken to prevent a recurrence of the non-compliance ▼

Change management and scoping to install suitable Residual Current Device and logic control/alarms is underway.

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APPIN WEST.pdf

Uploaded Document Description ▼

Map - Appin West

Licence condition number not complied with ▼

Condition L3

Summary of particulars of the non-compliance ▼

Exceedance of volumetric discharge limit at LDP24.

Further details on particulars of non-compliance, if required ▼

The volume limit of 3000 kL/day was exceeded on 3 and 8 June 2019. Integrated Membrane System (IMS) Stage 2a of the water treatment 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.

Number of times occurred ▼

2

Date(s) when the non-compliance occurred, if applicable ▼

3 and 8/6/19

Cause of non-compliance ▼

The exceedance of discharge volumes occurred as both IMS1 and IMS2a were on line and the underground water usage was low. As a result, the excess water was discharged to the environment. IMS2a was in the production proving period and therefore was required to maximise water throughput. The average daily discharge over the month of June was 1590 kL/day.

Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼

The discharge volume limits were recommunicated to water treatment plant personnel. There was no identified environmental harm.

Action taken or that will be taken to prevent a recurrence of the non-compliance ▼

An application had been submitted to the EPA for increasing the discharge volume limit from 3000 kL/day to 4700 kL/day with the additional water treatment plant capacity from IMS2a. This increase was approved on 2 September 2019.

Uploaded Document Name ▼

APPIN WEST.pdf

Uploaded Document Description ▼
Map - Appin West

Licence condition number not complied with ▼
Condition M2.2
Summary of particulars of the non-compliance ▼
Dust Deposition Gauge bottles were not changed out within 30+/-2 days as required.
Further details on particulars of non-compliance, if required ▼
Dust Deposition Gauge bottles were not changed out in accordance with Australian Standard 3580.10.1-2003 (30+/-2 days) as required.
Number of times occurred ▼
1
Date(s) when the non-compliance occurred, if applicable ▼
26/6/19
Cause of non-compliance ▼
There was a delay in the return of the bottles to ALS Wollongong (the company that analyses the samples) from Newcastle. Replacement bottles were not available, resulting in the inability to change out the sample bottles within the 30+-2 day timeframe as required by the standard.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼
The DDGs were changed out the following day. There was no environmental harm.
Action taken or that will be taken to prevent a recurrence of the non-compliance ▼
An additional set of bottles is now being retained on site.
Uploaded Document Name ▼
APPIN.pdf
Uploaded Document Description ▼
Maps - Appin - All

Licence condition number not complied with ▼
Condition O1 and O2
Summary of particulars of the non-compliance ▼
Flocculant tank not bunded.
Further details on particulars of non-compliance, if required ▼
During a site inspection by the EPA, it was identified that a flocculant tank located adjacent to EP3, used to store Magnasol, was not bunded. The EPA issued a Show Cause Notice on 17 April 2019. A Formal Warning Letter was issued on 3 June 2019.
Number of times occurred ▼
1
Date(s) when the non-compliance occurred, if applicable ▼

15/3/19
Cause of non-compliance ▼
Tank was installed without bunding.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼
A temporary dirt bund was installed. There was no environmental harm.
Action taken or that will be taken to prevent a recurrence of the non-compliance ▼
Tank has been decommissioned.
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APPIN NORTH.pdf
Uploaded Document Description ▼
Map - Appin North

Licence condition number not complied with ▼
Condition O2.1
Summary of particulars of the non-compliance ▼
Failure of probe in Brennans Creek Dam (BCD) discharge monitoring system.
Further details on particulars of non-compliance, if required ▼
It was identified on 19 July that the conductivity probe used to activate the dilution water pump to provide dechlorinated Sydney Water downstream of the Brennans Creek Dam (BCD) at LDP10 had failed. This resulted in the flow of undiluted water from BCD into Brennans Creek from 15 July to 19 July 2019.
Number of times occurred ▼
1
Date(s) when the non-compliance occurred, if applicable ▼
15 - 22/7/19
Cause of non-compliance ▼
Failure of conductivity probe, possibly due to cleaning frequency.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼
A water sample was taken on 18 July 2019 and 19 July 2019 using a Horiba probe. The readings for conductivity were 2620 uS/cm and 2680 us/cm respectively. Conductivity was being continuously monitored over this period. The conductivity was consistently reading around 2600 uS/cm. This probe does not inform the operation of the pump. There was no identified environmental harm. Discharge from BCD was isolated and ceased on 19 July 2019 to allow time for the probe to be cleaned. BCD discharge recommenced on 22 July 2019.
Action taken or that will be taken to prevent a recurrence of the non-compliance ▼
The probe cleaning frequency was reviewed, and a more frequent cleaning program implemented.
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BCD.pdf

Uploaded Document Description ▼
Map - Brennans Creek

Licence condition number not complied with ▼
Condition P1.3
Summary of particulars of the non-compliance ▼
Burst pipe resulting in non-monitored Water Discharging into Brennans Creek
Further details on particulars of non-compliance, if required ▼
Following cessation of discharge from Brennans Creek Dam (BCD) 4/9/19, pump was installed in reclaim pond that collects seepage from BCD to pump back into BCD. 29/9/19, btwn 6am & midday, hose connection failed resulting in water flowing into Brennans Ck, bypassing LDP10. The water would have had an electrical conductivity btwn 2000 & 2500 us/cm. It is estimated, based on capacity of the pump, 0.125ML of water was discharged in a worst case scenario. Water didn't flow to Georges River.
Number of times occurred ▼
1
Date(s) when the non-compliance occurred, if applicable ▼
29/9/19
Cause of non-compliance ▼
A hose connection failed that resulted in water flowing into Brennans Creek, bypassing LDP10.
Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼
Contractor utilised to clean sediment out of sampling sump for LDP10. There was no identified environmental harm.
Action taken or that will be taken to prevent a recurrence of the non-compliance ▼
Hose connection was repaired.
Uploaded Document Name ▼
BCD.pdf
Uploaded Document Description ▼
Map - Brennans Creek

D. Statement of Compliance - Load Based Fee Calculation

If you are not required to monitor assessable pollutants by your licence, **no data** will appear below.

If assessable pollutants have been identified on your licence, the following worksheets for each assessable pollutant will determine your load based fee for the licence fee period to which this Annual Return relates.

Loads of assessable pollutants must be calculated using any of the methods provided in EPA's Load Calculation Protocol for the relevant activity. A Load Calculation Protocol would have been already sent to you with your licence. 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 licence fees for four years after the licence fee was paid or became payable, whichever is the later date.

E. Statement of Compliance - Requirement to Prepare PIRMP

Have you prepared a Pollution Incident Response Management Plan (PIRMP) as required under section 153A of the Protection of the Environment Operations (POEO) Act 1997?	**Yes**

Is the PIRMP available at the premises?	**Yes**
Is the PIRMP available in a prominent position on a publicly accessible website?	**Yes**
Address of the web page where the PIRMP can be accessed ▼	
https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents	
Has the PIRMP been tested?	**Yes**
The PIRMP was last tested on	**9-8-2019**
Has the PIRMP been updated?	**Yes**
The PIRMP was last updated on	**2-10-2019**
Number of times the PIRMP was activated in this reporting period?	**0**
The PIRMP was activated on	**N/A**

F. Statement of Compliance - Requirement to Publish Pollution Monitoring Data

Are there any conditions attached to your licence that require pollution monitoring to be undertaken as required under section 66(6) of the Protection of the Environment Operations (POEO) Act 1997?	**No**

G. Statement of Compliance - Environment Management System and Practices

Do you have an ISO 14001 certified Environmental Management System (EMS) OR any other system that EPA considers is equivalent to the accountability, procedures, documentation and record keeping requirements of an ISO 14001 certified EMS?	**Yes**

When was the last check (As per ISO 14001) of the EMS completed?	**6-6-2019**
Were there any non-conformances related to environmental issues identified in the last check of the EMS?	**Yes**
If there were non-conformances identified, were these non-conformances rectified?	**Yes**

H. Signature and Certification

This Annual Return may only be signed by person(s) with legal authority to sign it as set out in following categories: an Individual, a Company, a Public authority or a Local council.

It is an offence under section 66 of the Protection of the Environment Operations Act 1997 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 and $120,000 for an individual.

I/We

- declare that the information in the Monitoring and Complaints Summary in Section B of this Annual Return application is correct and not false or misleading in a material respect, and
- certify that the information in the Statement and Compliance in sections A, C, D, E, F, G and H and any other pages attached to Section C is correct and not false or misleading in a material respect.

Signature	
Name	
Position	
Date	/ /

Declaration

I 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

I certify that the information in the Statement of Compliance in section 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.

Signature	
Name	
Position	
Date	/ /

Declaration

I 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

I certify that the information in the Statement of Compliance in section 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.

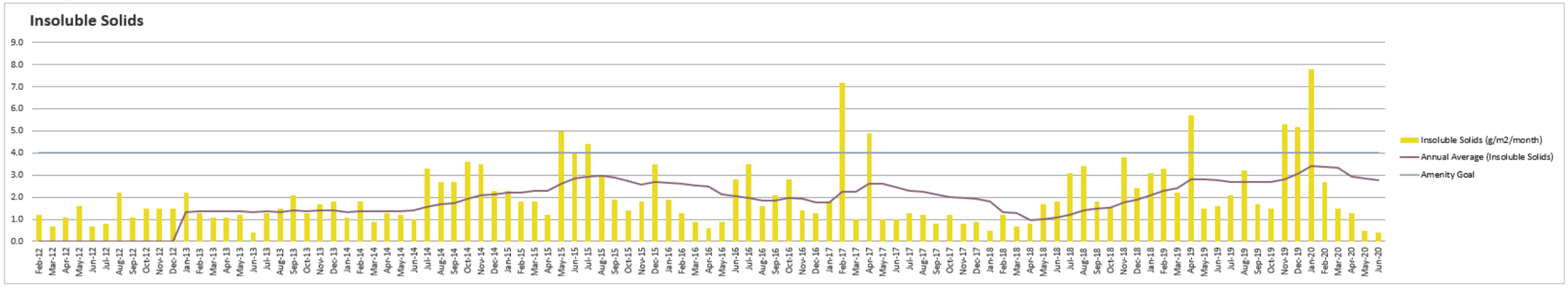
Appendix C: Appin Mine Long-Term Environmental Monitoring Graphs

Appendix C – Long-term Monitoring Data

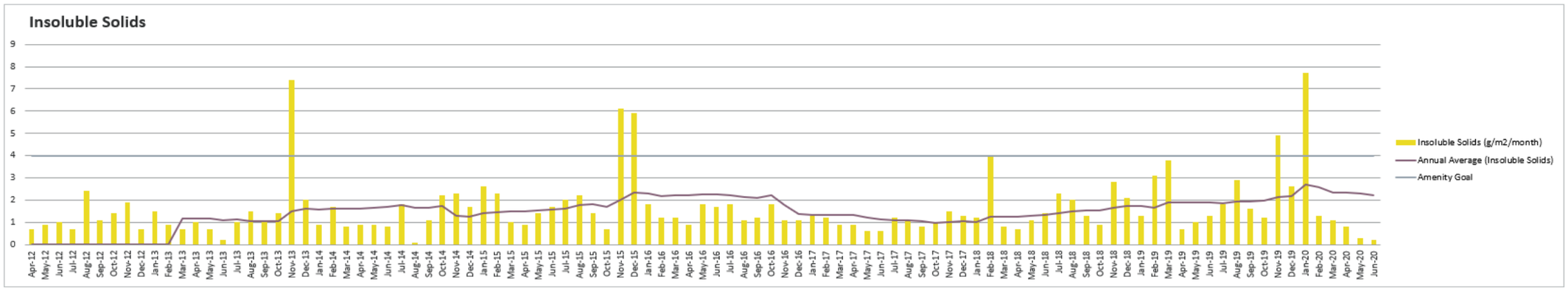
Dust Monitoring

Appin East

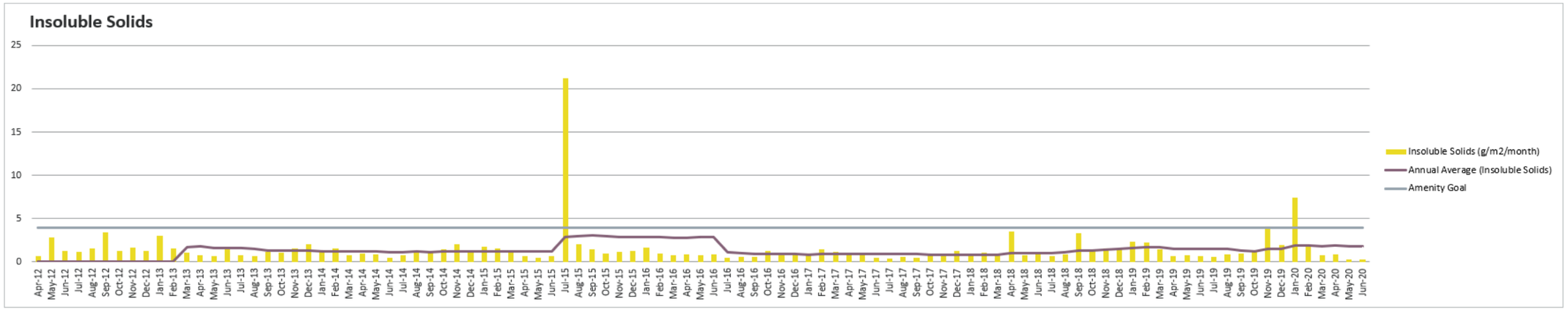
Dust Deposition Results – AE-DDG14 - 12MMA



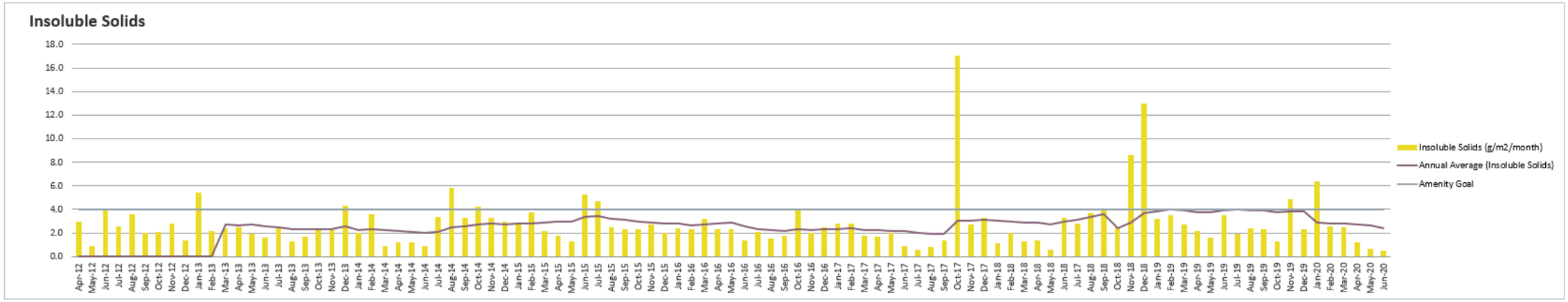
Dust Deposition Results – AE-DDG15 - 12MMA



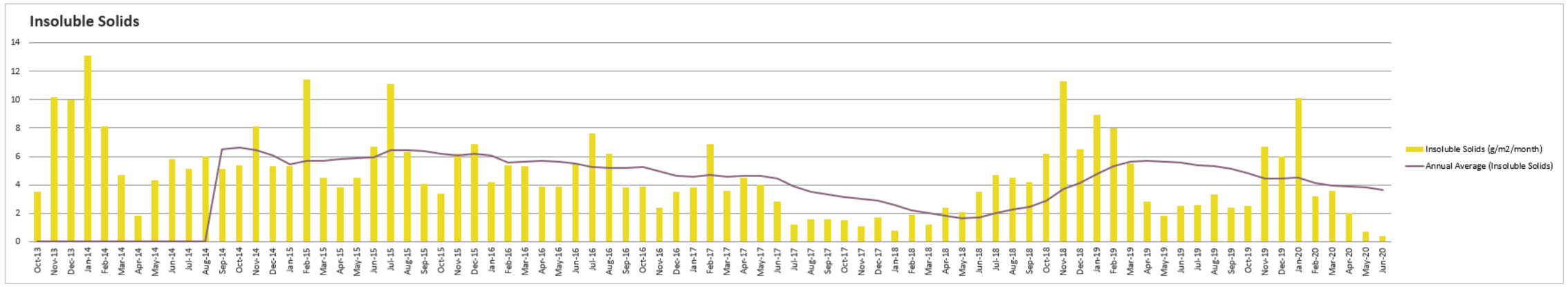
Dust Deposition Results – AE-DDG16 - 12MMA



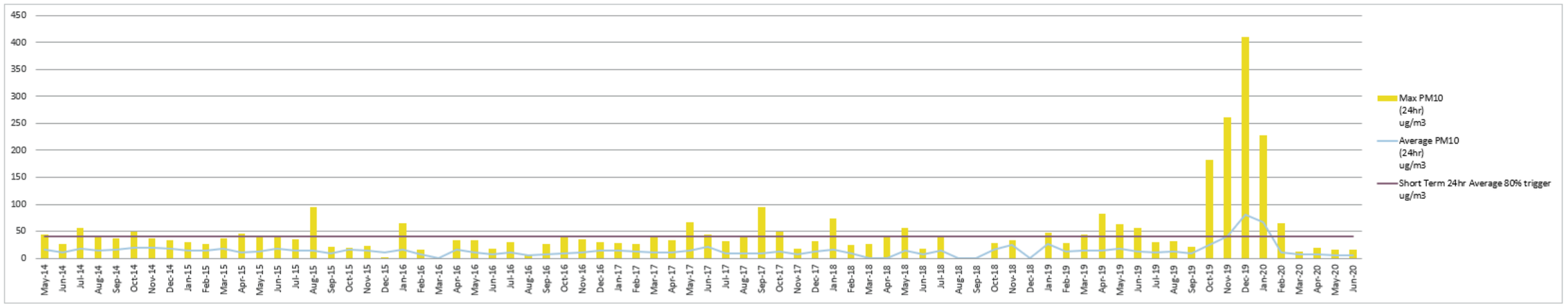
Dust Deposition Results – AE-DDG17 - 12MMA



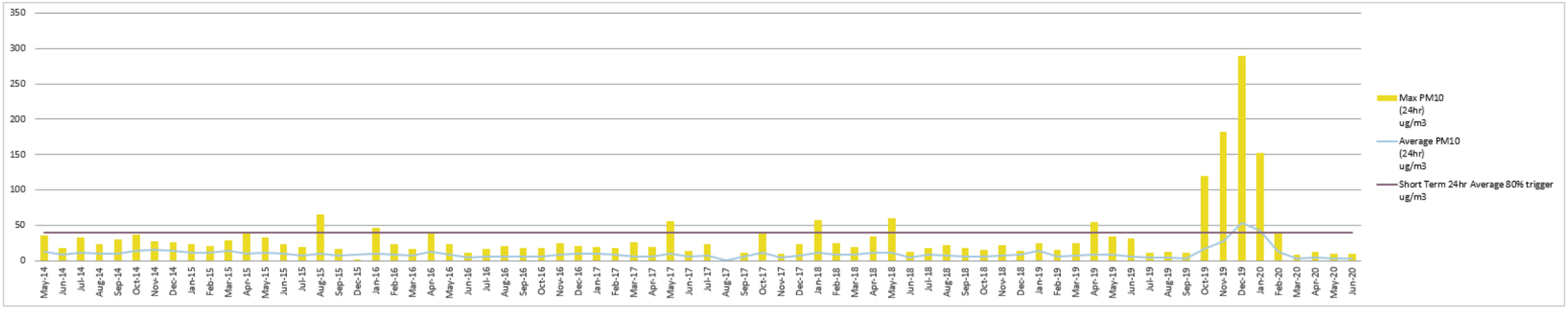
Dust Deposition Results – AE-DDG18 - 12MMA



Optical Photometer (DustTrak) – AE-PF1 – 24-hour average (PM_{10})

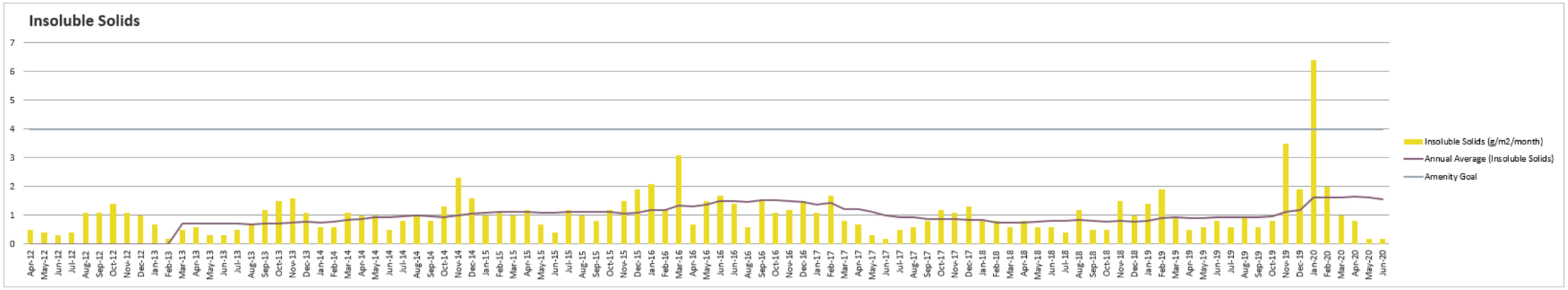


Optical Photometer (DustTrak) – AE-PF3 – 24-hour average (PM_{10})

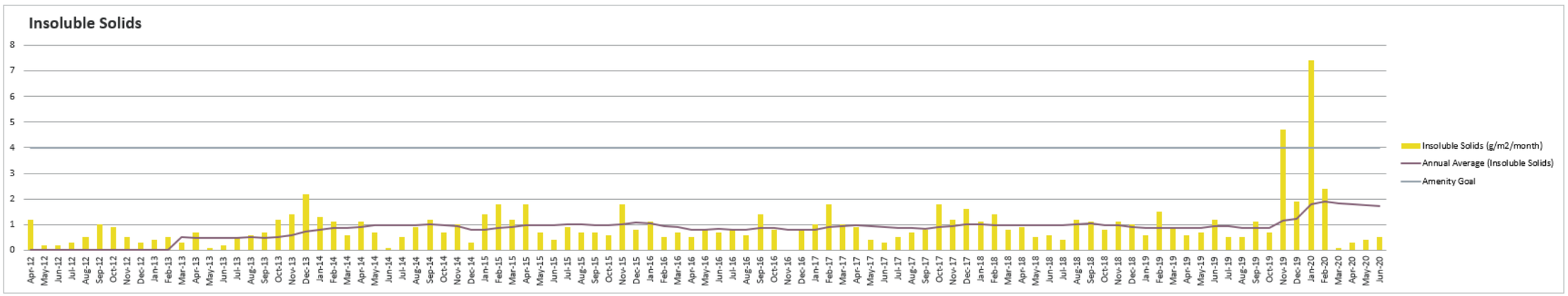


Appin West

Dust Deposition Results – AW-DD1 - 12MMA

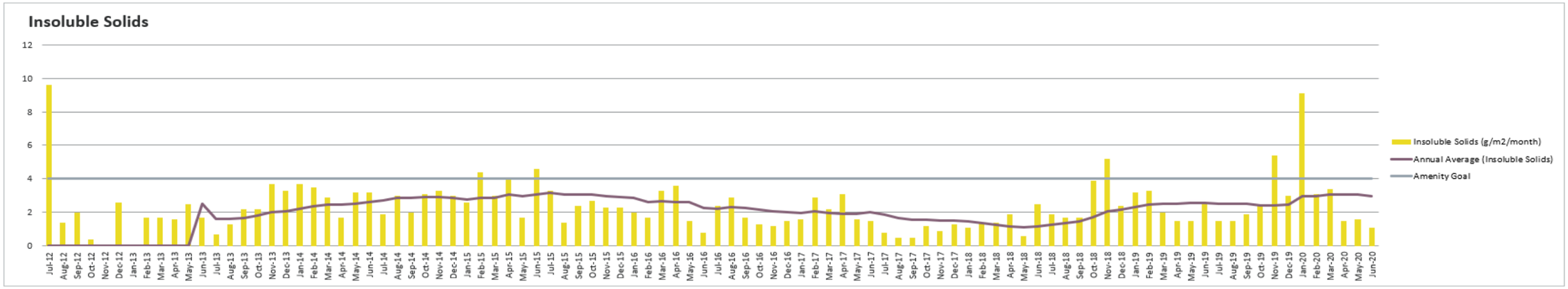


Dust Deposition Results – AW-DD2 - 12MMA

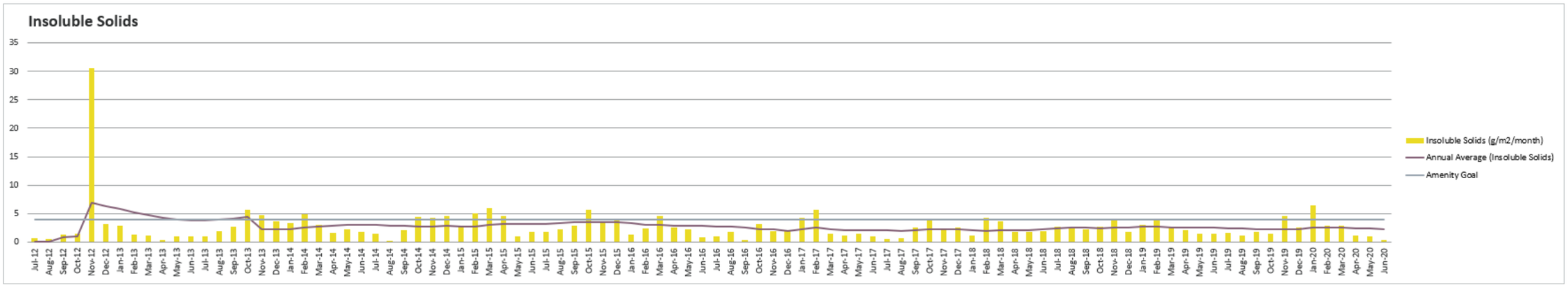


Appin North

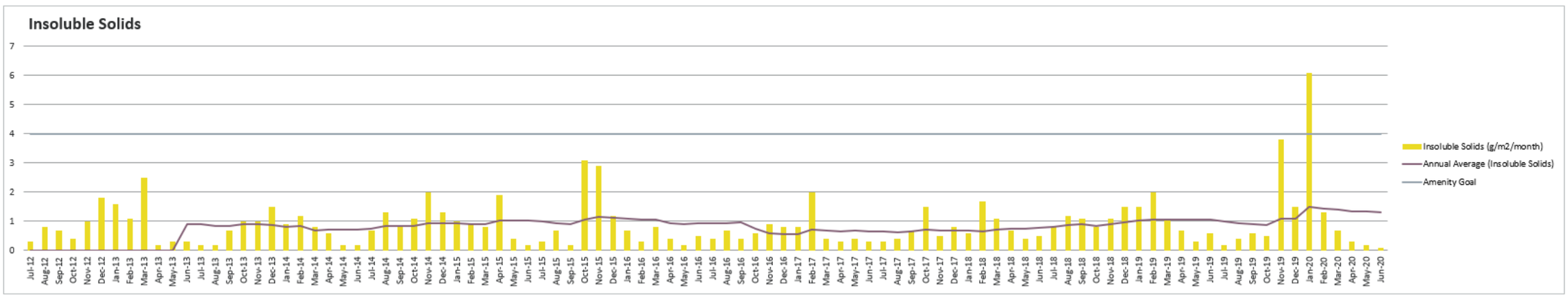
Dust Deposition Results – W-DD1 - 12MMA



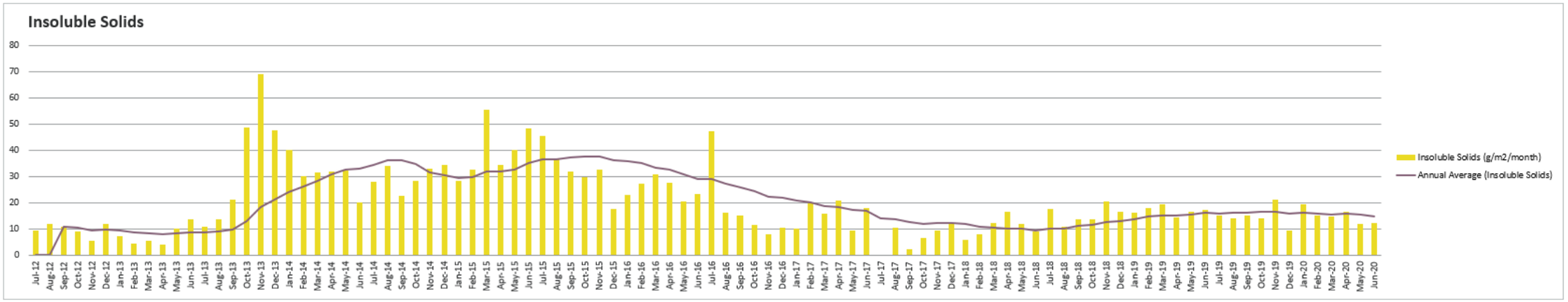
Dust Deposition Results – W-DD3 - 12MMA



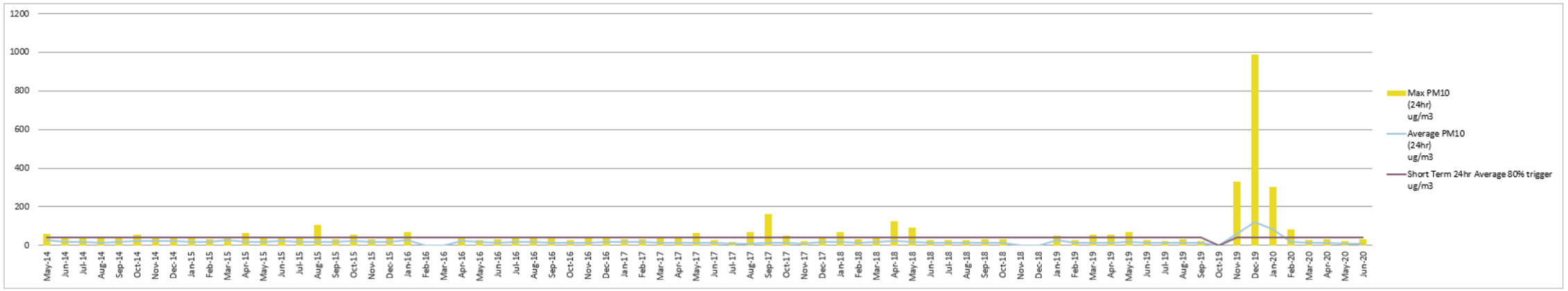
Dust Deposition Results – W-DD8 - 12MMA



Dust Deposition Results – W-DD10 - 12MMA



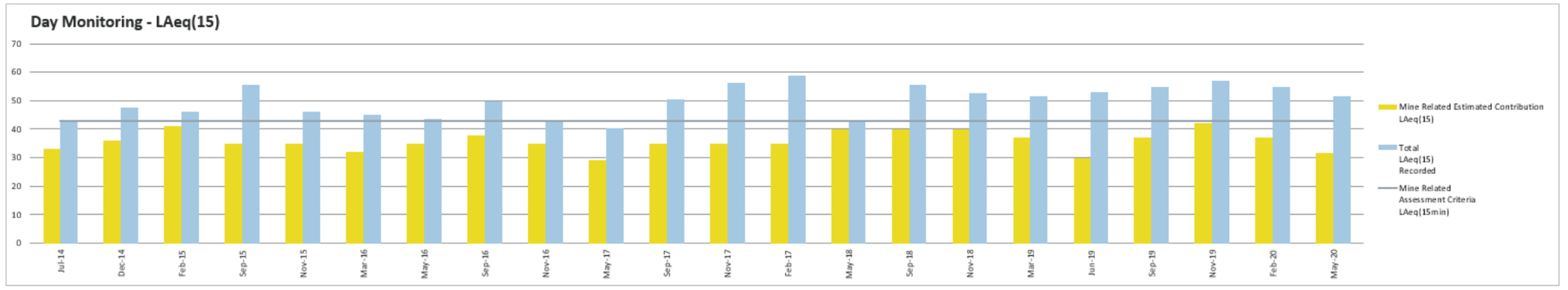
Optical Photometer (DustTrak) – W-PF1 – 24-hour average (PM_{10})

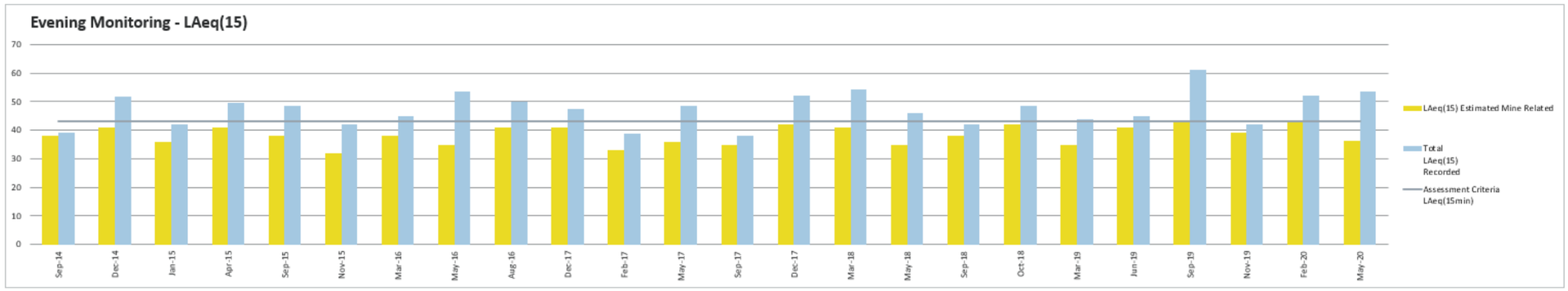


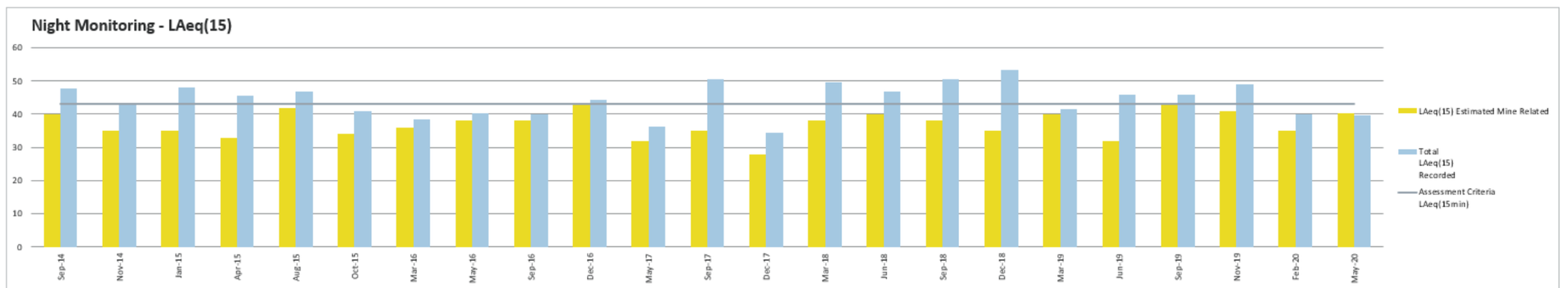
Noise

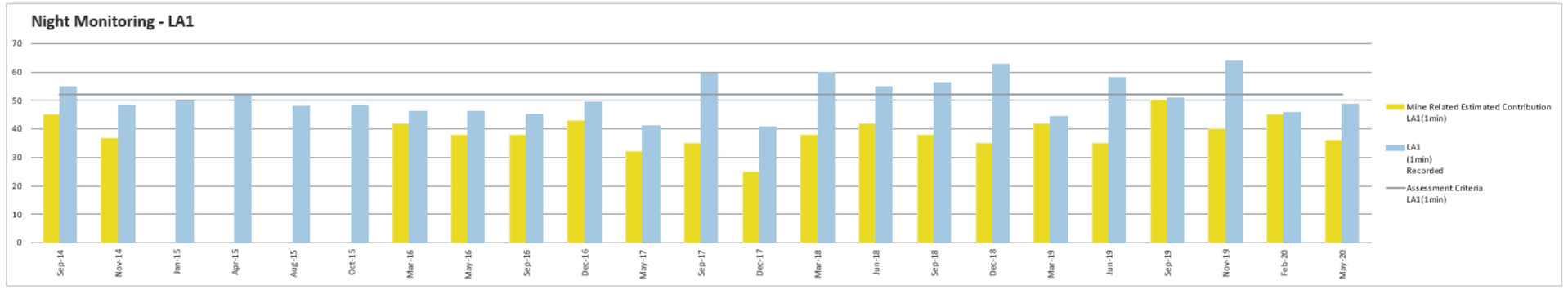
Appin East

Noise Monitoring Results – AE-NS4

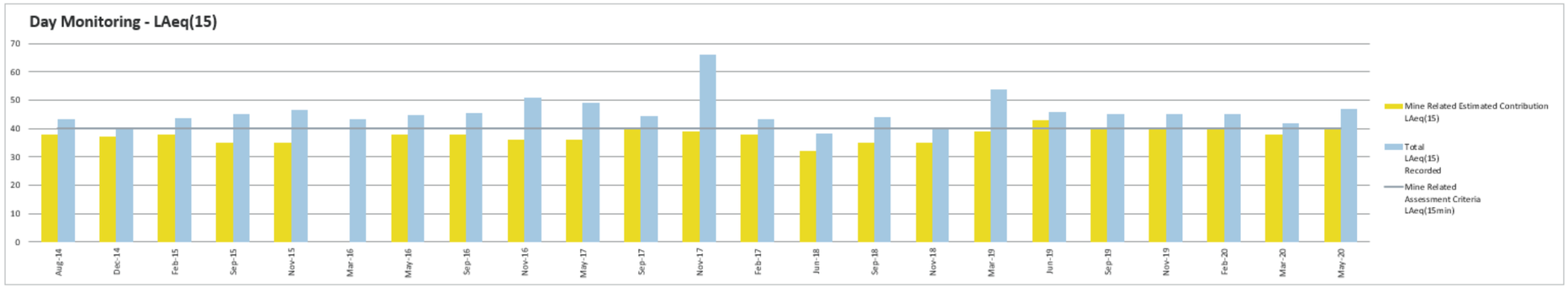


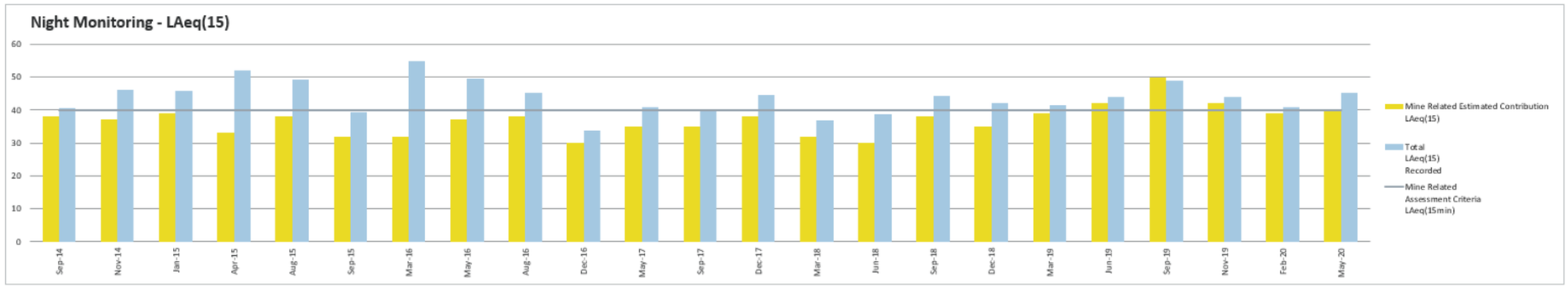


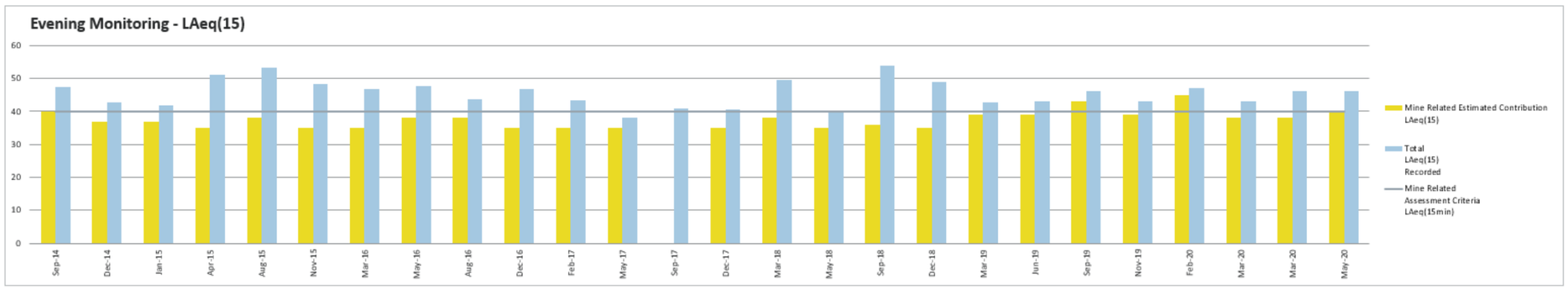


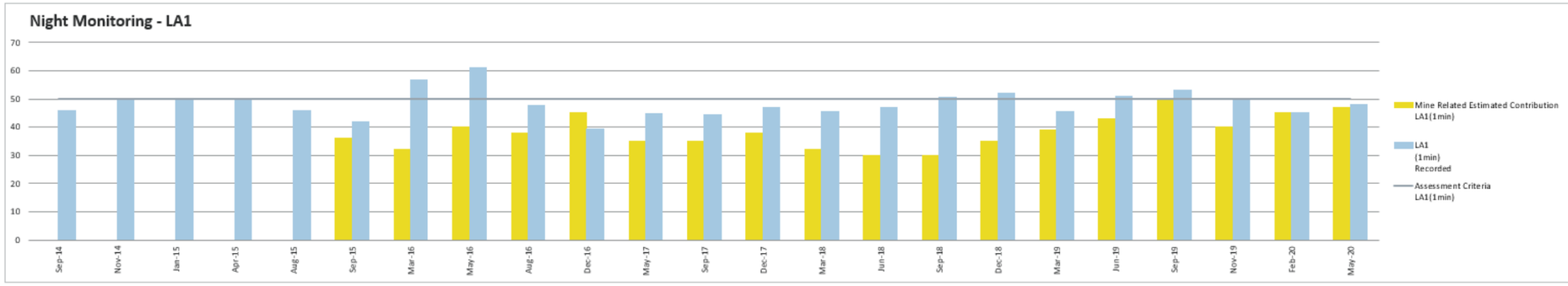


Noise Monitoring Results – AE-NS5



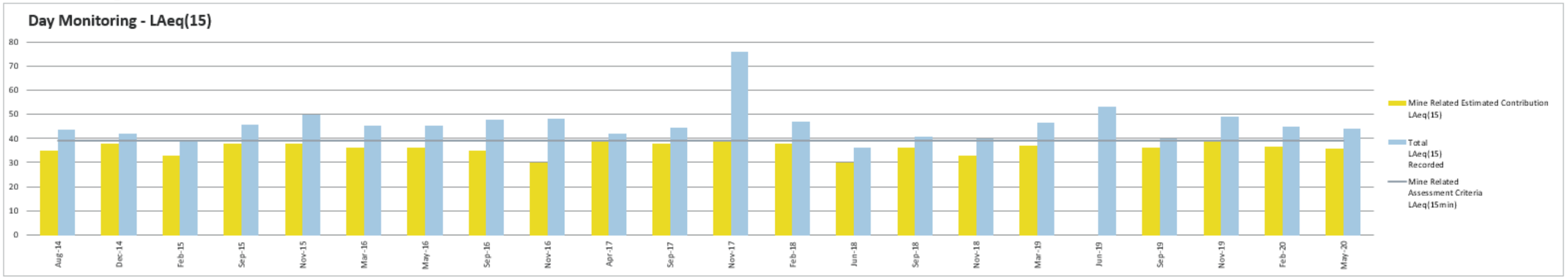


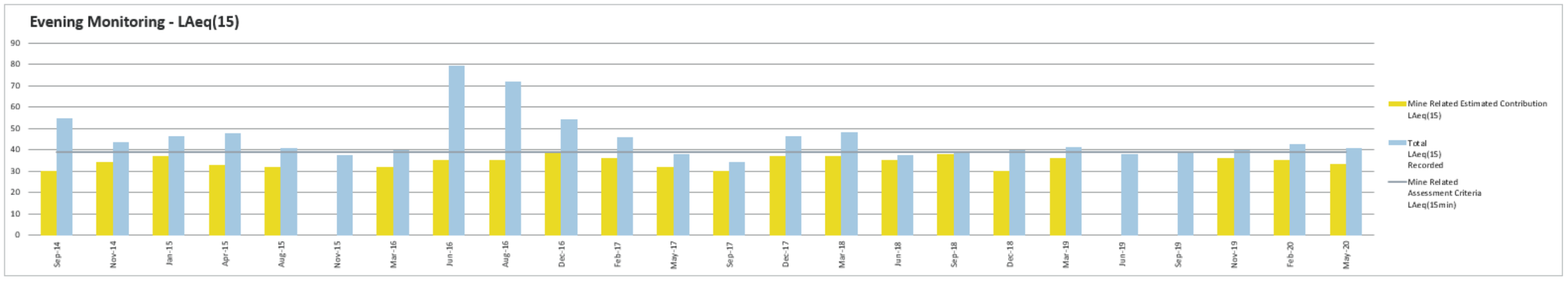


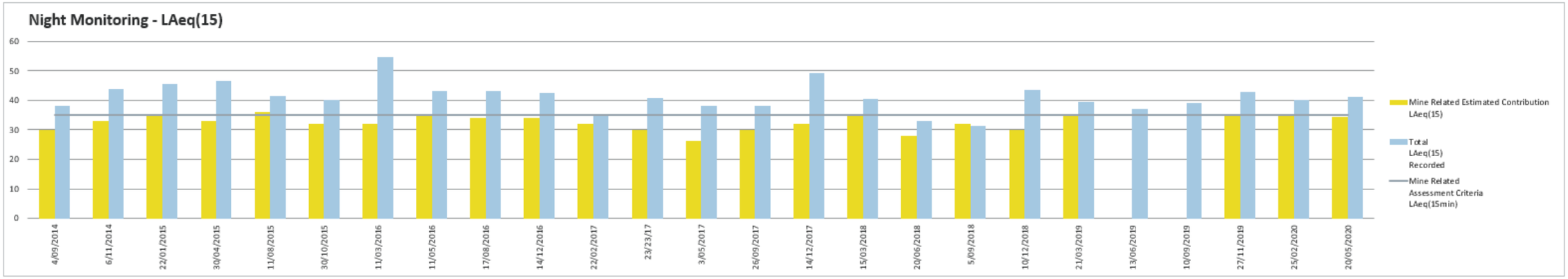


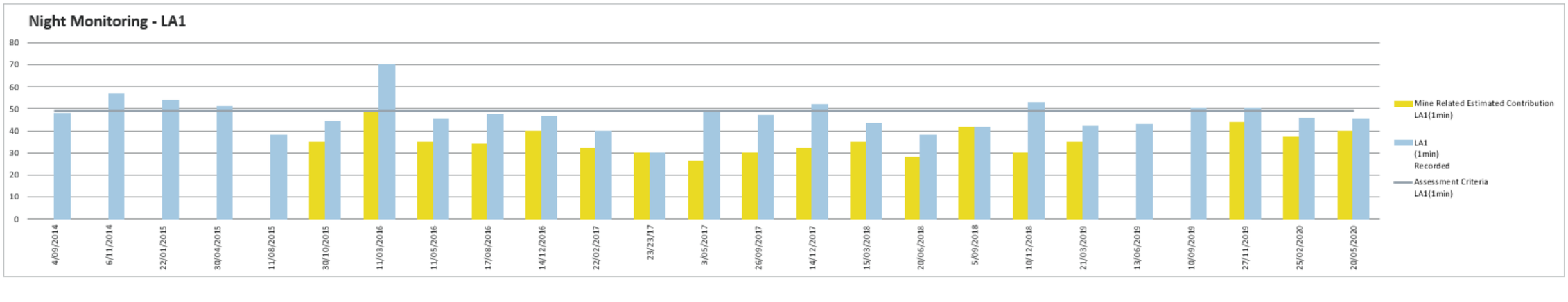
Appin West

Noise Monitoring Results – AW-NS4

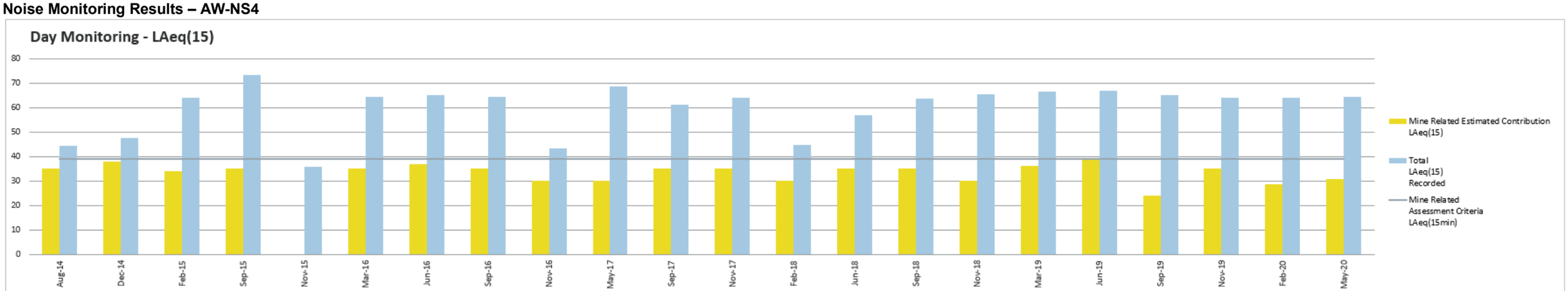


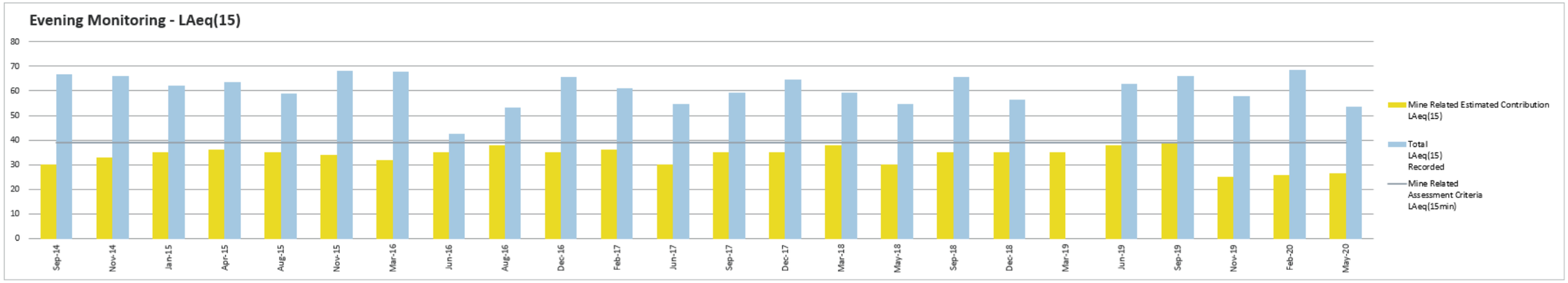


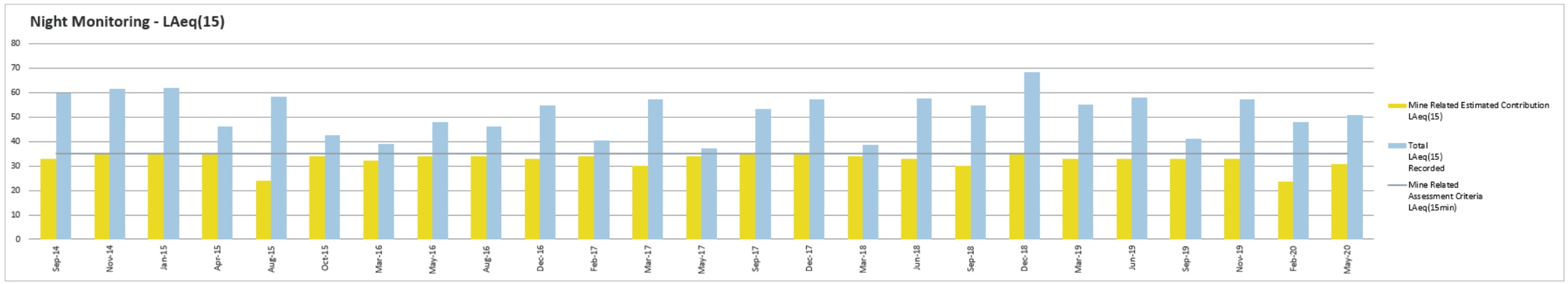


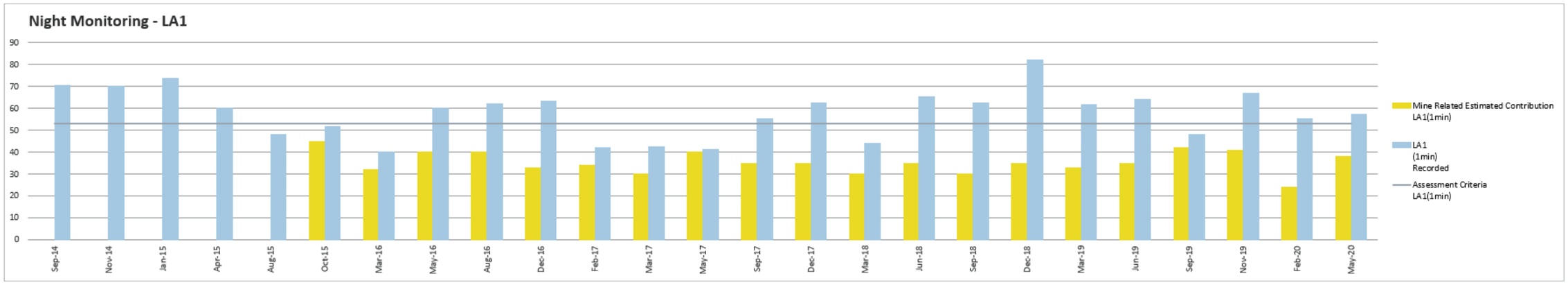


Noise Monitoring Results – AW-NS4

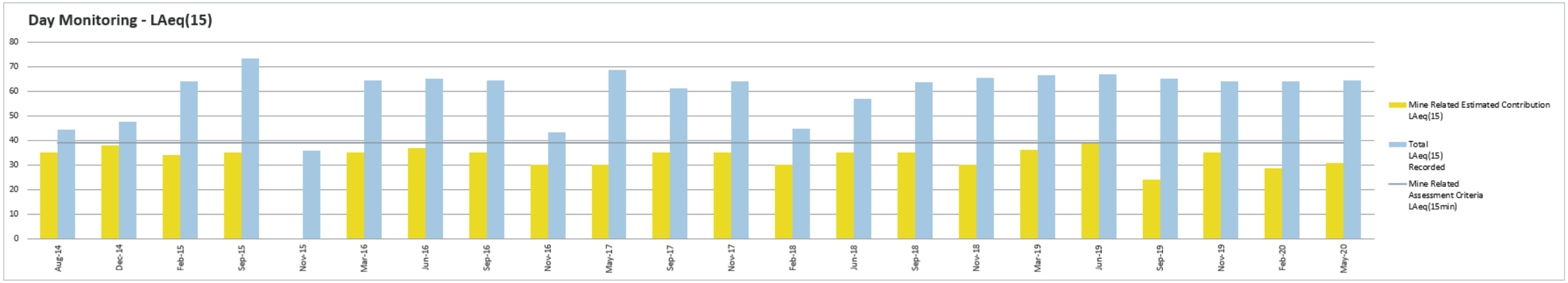


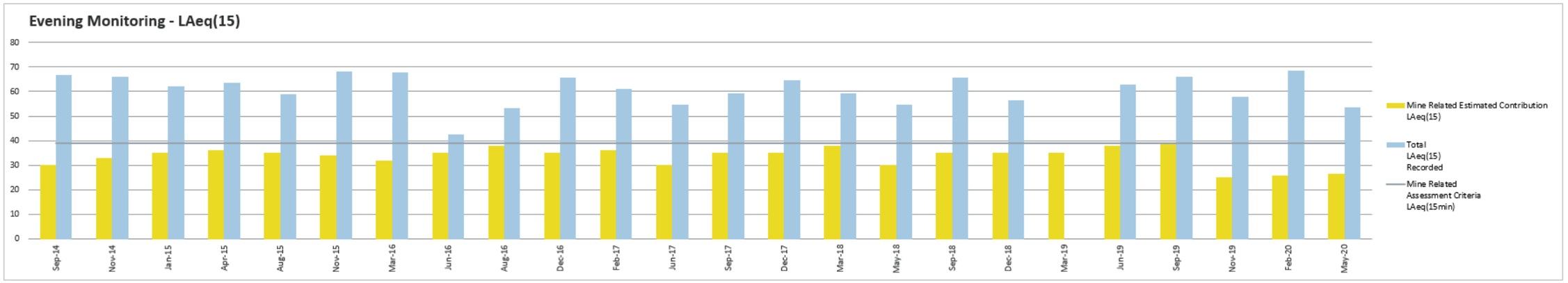

Evening Monitoring - LAeq(15)
80
70
60
50
40
30
20
10
0
Sep-14
Nov-14
Jan-15
Apr-15
Aug-15
Nov-15
Mar-16
Jun-16
Aug-16
Dec-16
Feb-17
Jun-17
Sep-17
Dec-17
Mar-18
May-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Nov-19
Feb-20
May-20
Mine Related Estimated Contribution LAeq(15)
Total LAeq(15) Recorded
Mine Related Assessment Criteria LAeq(15min)

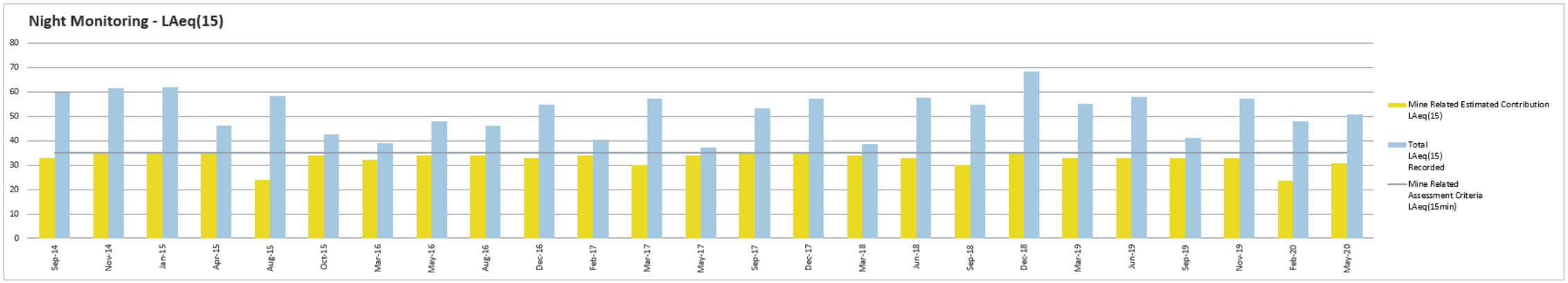

Night Monitoring - LAeq(15)
80
70
60
50
40
30
20
10
0
Sep-14
Nov-14
Jan-15
Apr-15
Aug-15
Oct-15
Mar-16
May-16
Aug-16
Dec-16
Feb-17
Mar-17
May-17
Sep-17
Dec-17
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Nov-19
Feb-20
May-20
Mine Related Estimated Contribution LAeq(15)
Total LAeq(15) Recorded
Mine Related Assessment Criteria LAeq(15min)

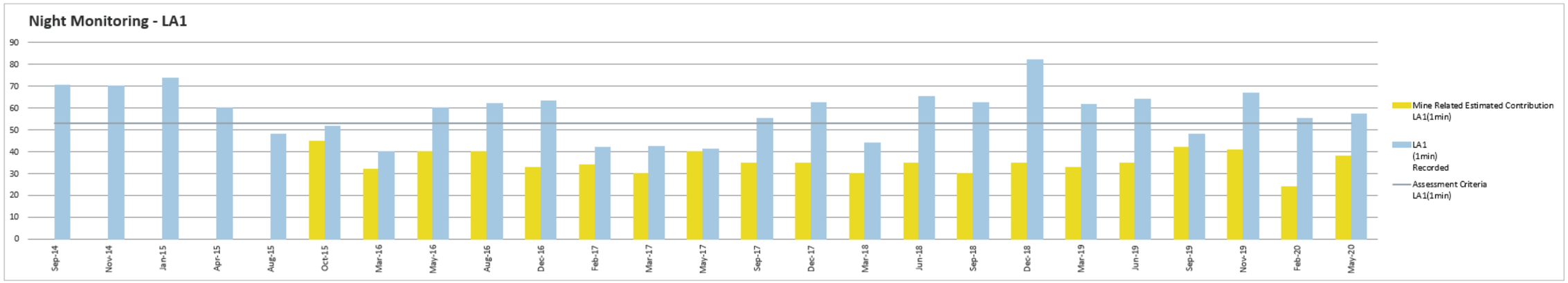

Night Monitoring - LA1
90
80
70
60
50
40
30
20
10
0
Sep-14
Nov-14
Jan-15
Apr-15
Aug-15
Oct-15
Mar-16
May-16
Aug-16
Dec-16
Feb-17
Mar-17
May-17
Sep-17
Dec-17
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Nov-19
Feb-20
May-20
Mine Related Estimated Contribution LA1(1min)
LA1 (1min) Recorded
Assessment Criteria LA1(1min)

Noise Monitoring Results – AW-NS5



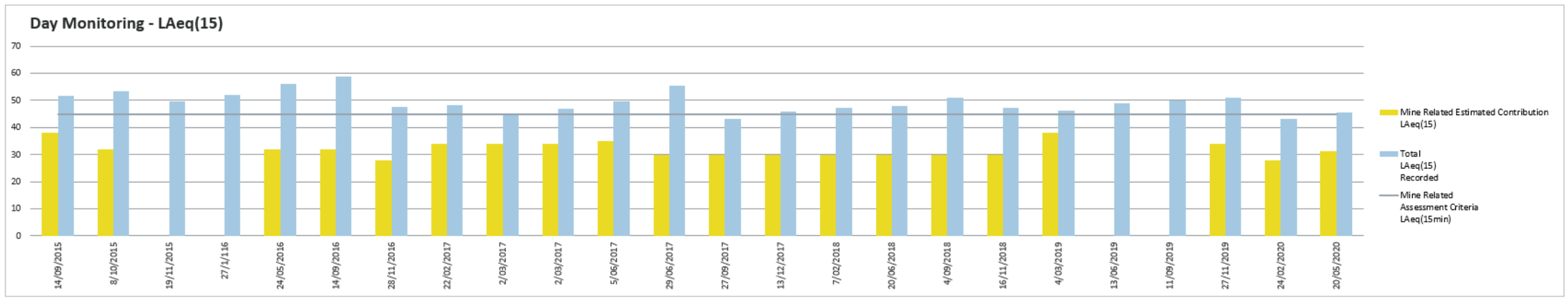


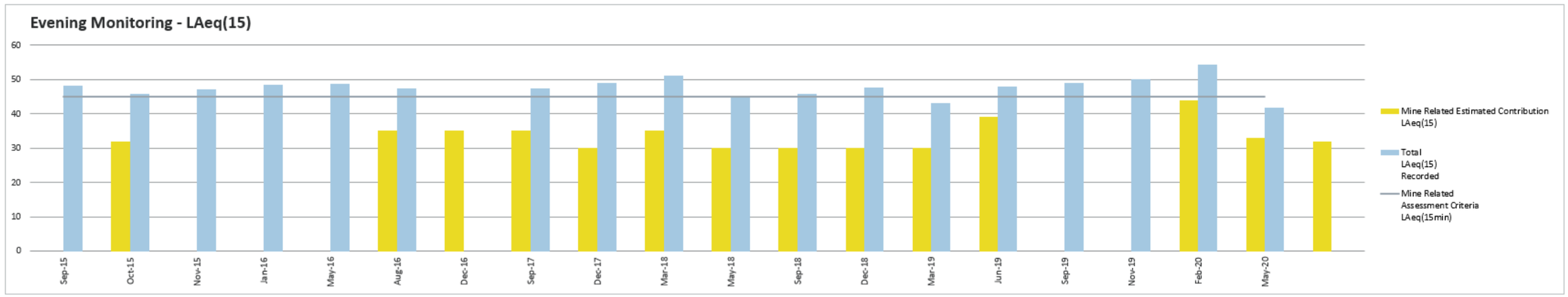


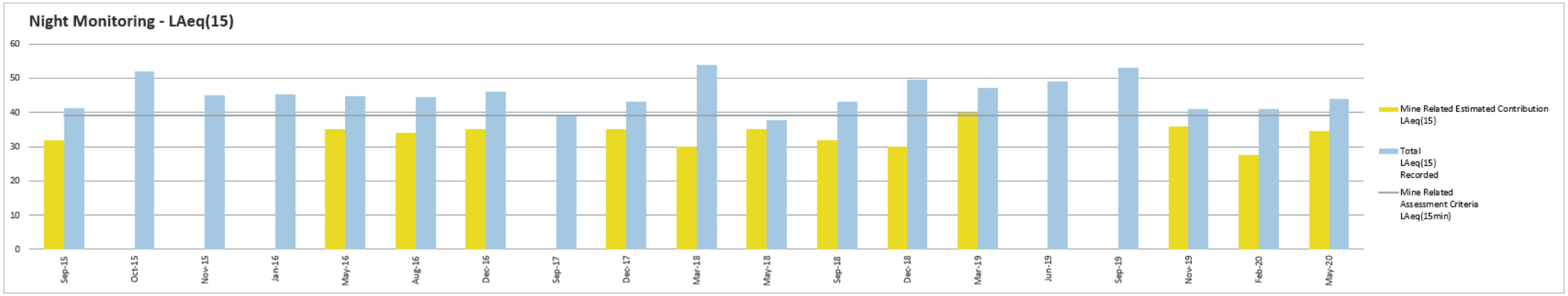


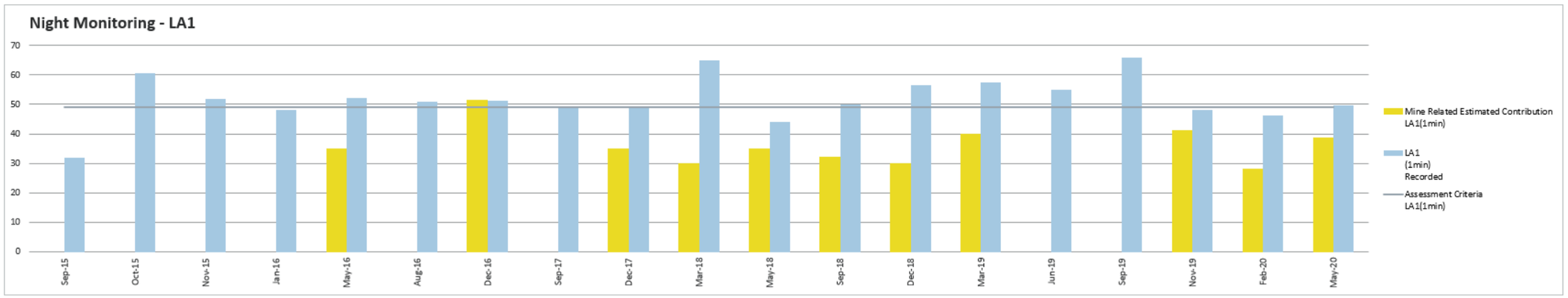
Ventilation Shaft 6

Noise Monitoring Results – VS6 Central



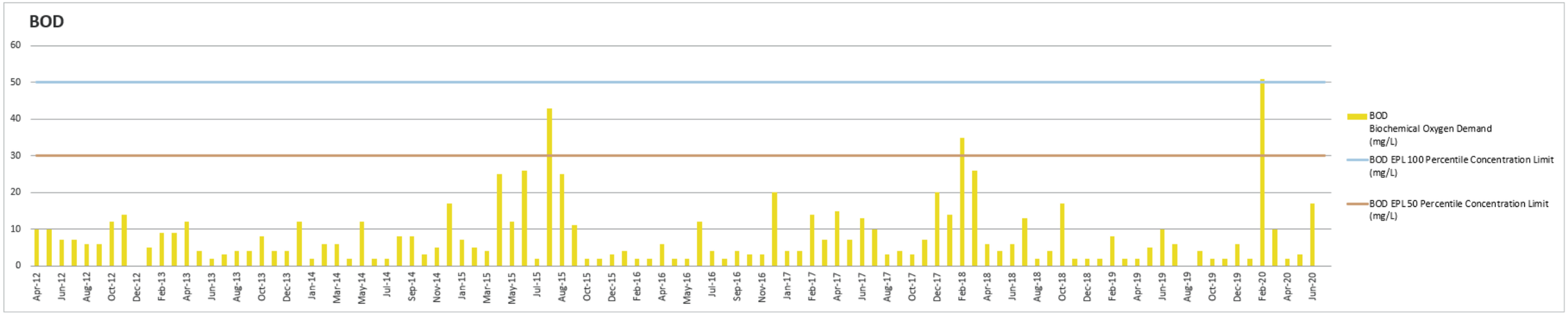


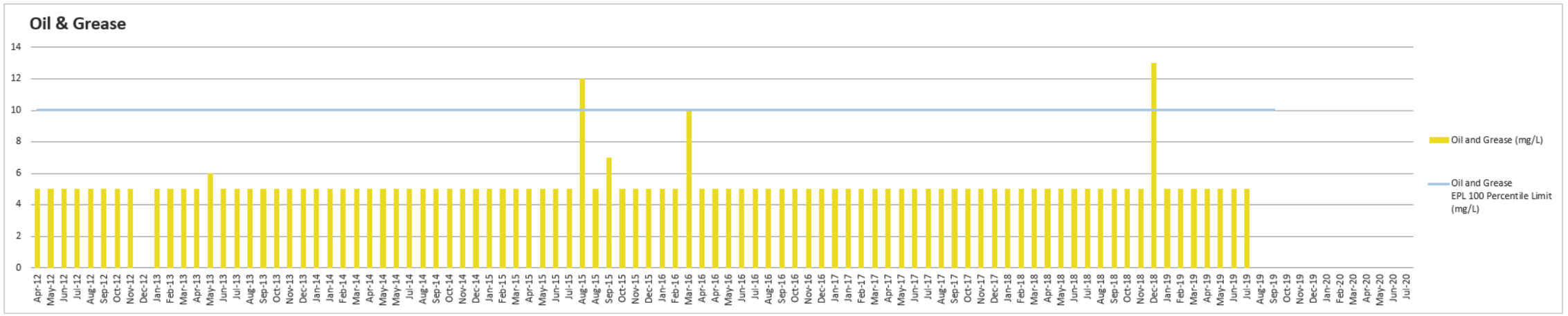

Night Monitoring - LAeq(15)
60
50
40
30
20
10
0
Sep-15
Oct-15
Nov-15
Jan-16
May-16
Aug-16
Dec-16
Sep-17
Dec-17
Mar-18
May-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Nov-19
Feb-20
May-20
Mine Related Estimated Contribution LAeq(15)
Total LAeq(15) Recorded
Mine Related Assessment Criteria LAeq(15min)

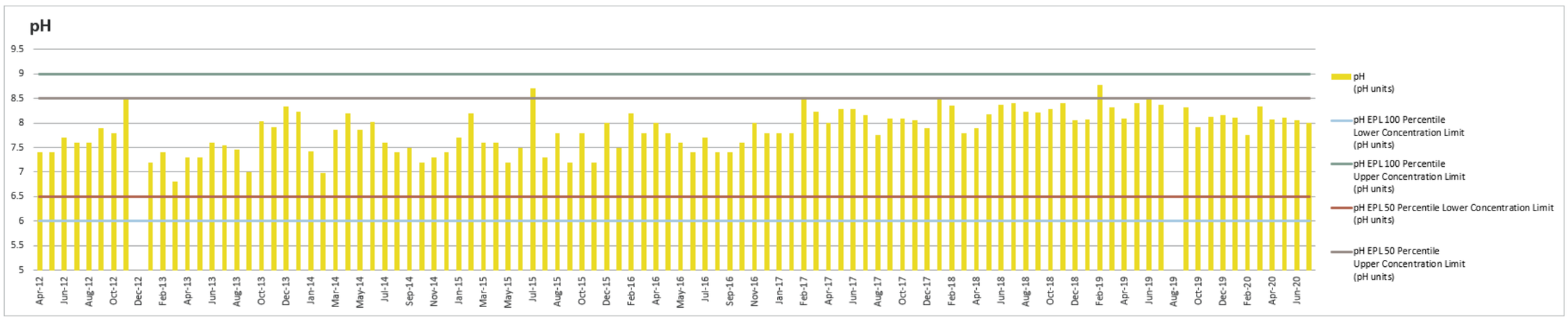

Night Monitoring - LA1
70
60
50
40
30
20
10
0
Sep-15
Oct-15
Nov-15
Jan-16
May-16
Aug-16
Dec-16
Sep-17
Dec-17
Mar-18
May-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
Nov-19
Feb-20
May-20
Mine Related Estimated Contribution LA1(1min)
LA1 (1min) Recorded
Assessment Criteria LA1(1min)

Water Quality

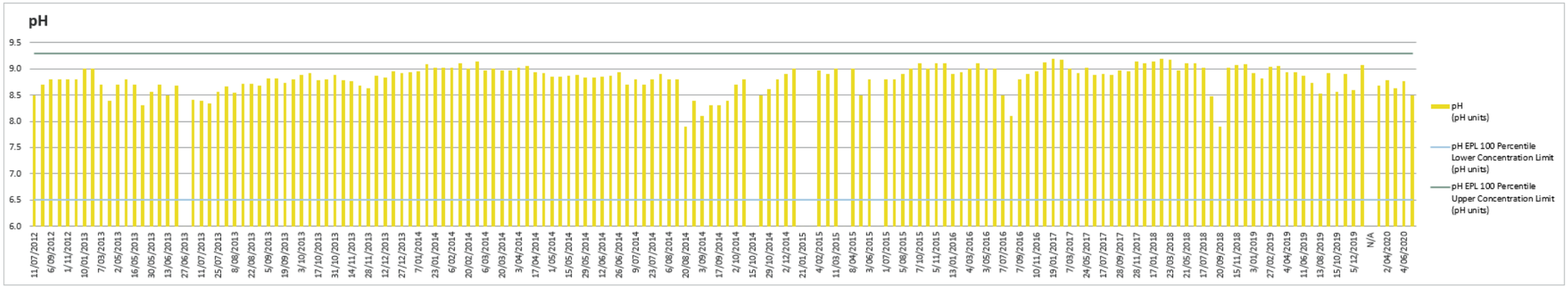
Water Quality Monitoring Results – Point 3/4

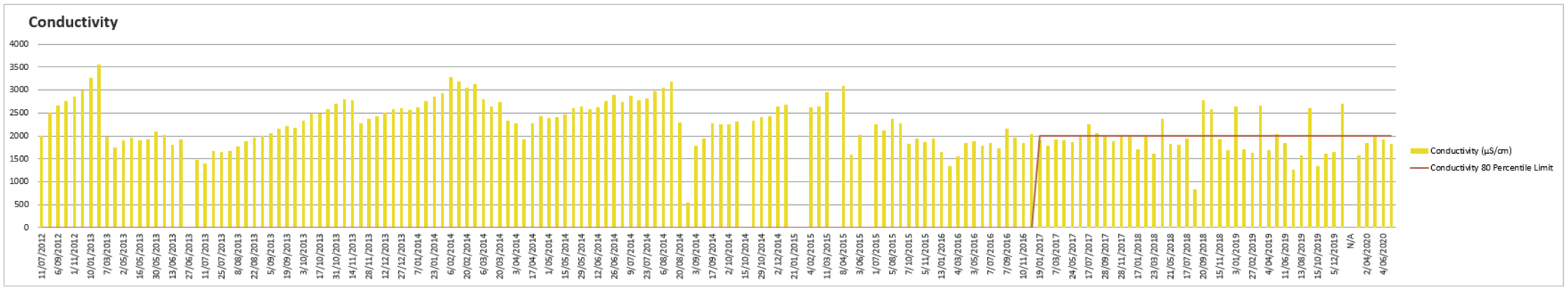


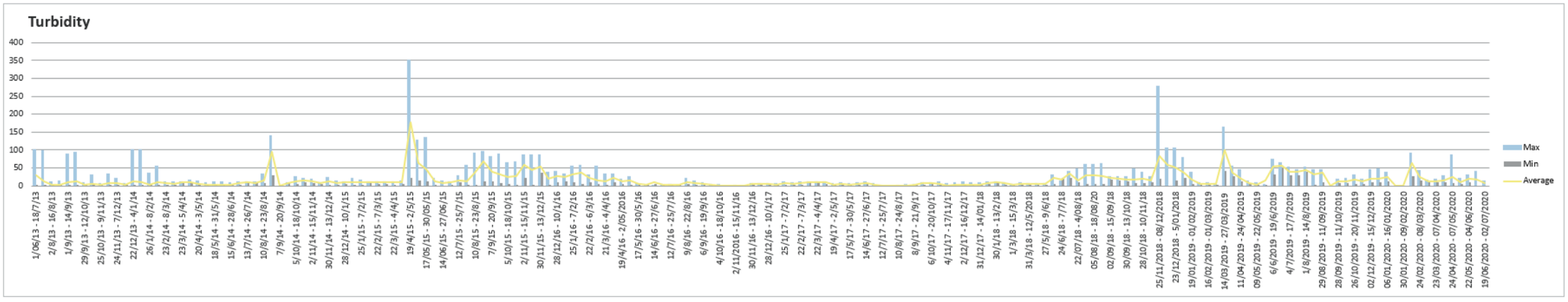


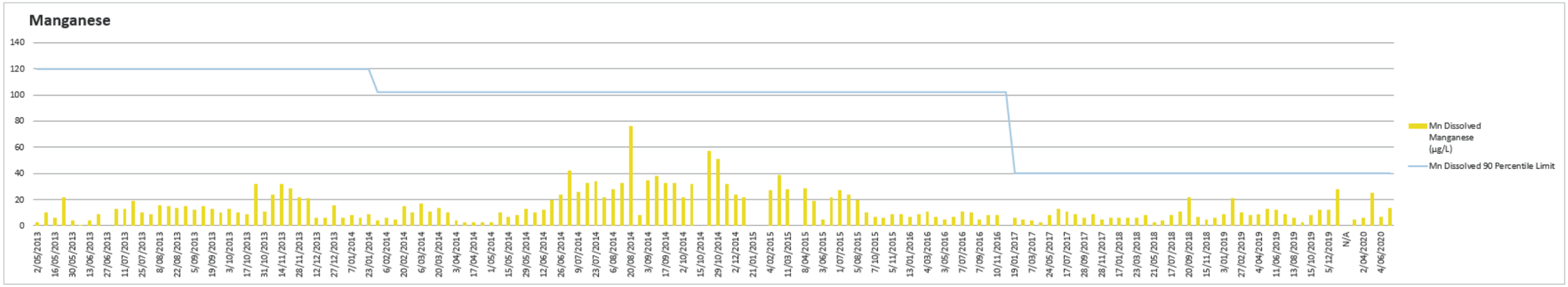


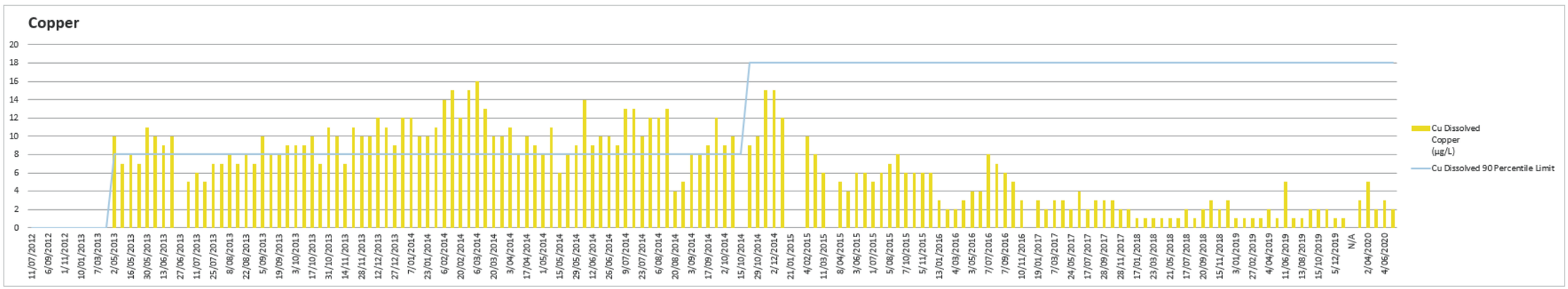
Water Quality Monitoring Results – Point 10 – Grab Sample

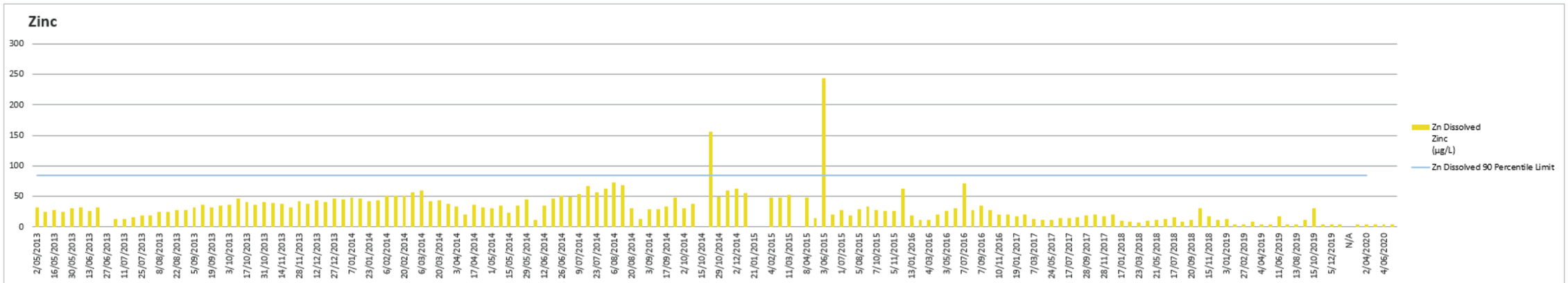


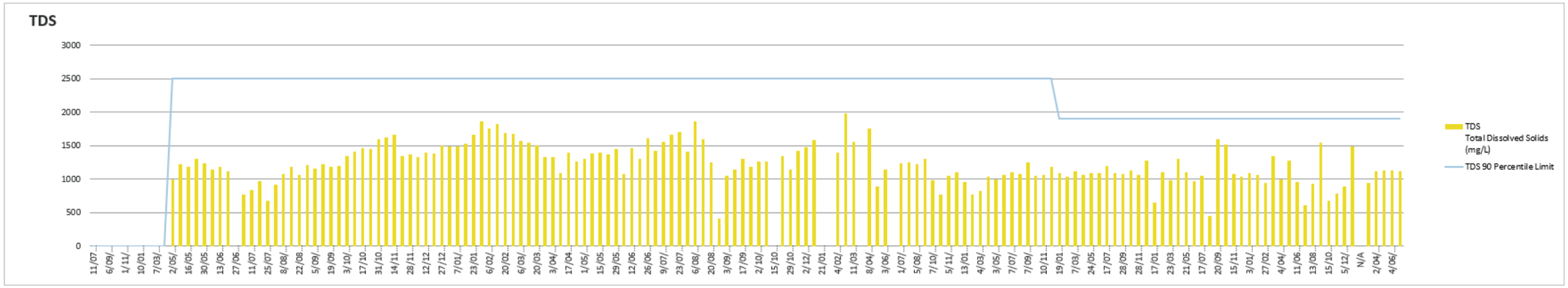


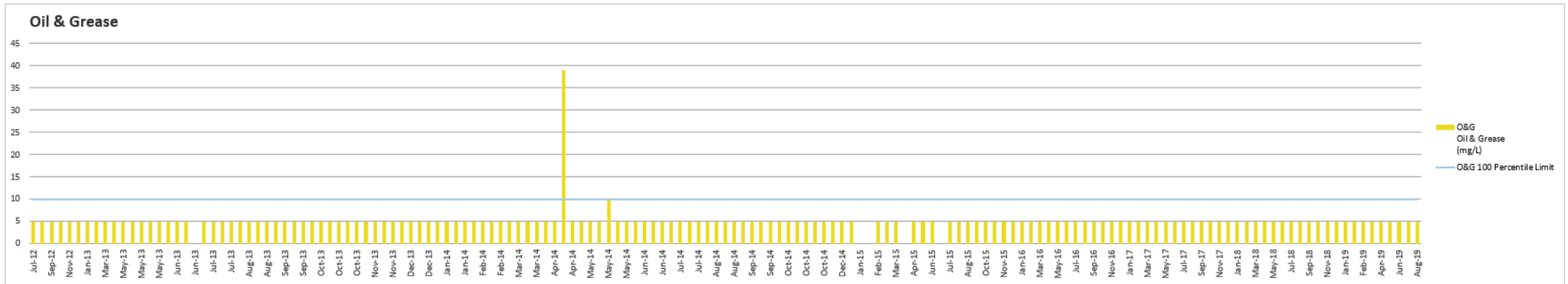


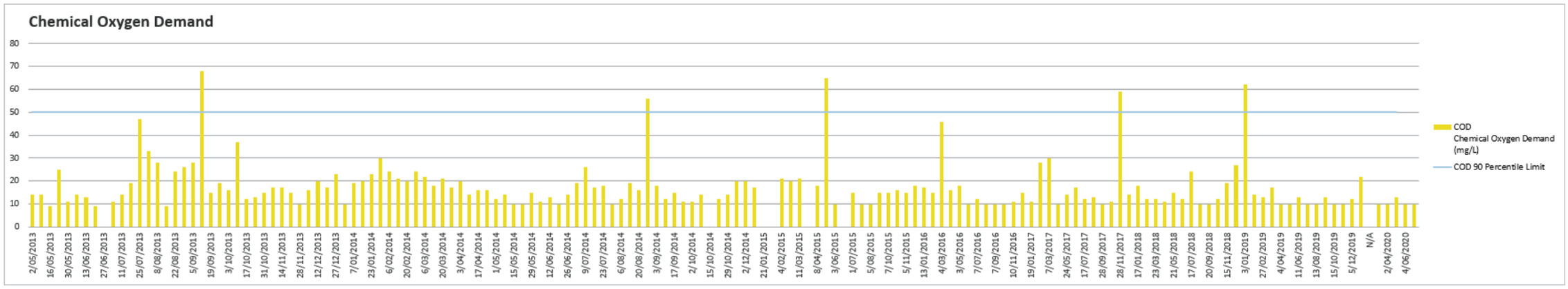

Manganese
140
120
100
80
60
40
20
0
2/05/2013
16/05/2013
30/05/2013
13/06/2013
27/06/2013
11/07/2013
25/07/2013
8/08/2013
22/08/2013
5/09/2013
19/09/2013
3/10/2013
17/10/2013
31/10/2013
14/11/2013
28/11/2013
12/12/2013
27/12/2013
7/01/2014
23/01/2014
6/02/2014
20/02/2014
6/03/2014
20/03/2014
3/04/2014
17/04/2014
1/05/2014
15/05/2014
29/05/2014
12/06/2014
26/06/2014
9/07/2014
23/07/2014
6/08/2014
20/08/2014
3/09/2014
17/09/2014
2/10/2014
15/10/2014
29/10/2014
2/12/2014
21/01/2015
4/02/2015
11/03/2015
8/04/2015
3/06/2015
1/07/2015
5/08/2015
7/10/2015
5/11/2015
13/01/2016
4/03/2016
3/05/2016
7/07/2016
7/09/2016
10/11/2016
19/01/2017
7/03/2017
24/05/2017
17/07/2017
28/09/2017
28/11/2017
17/01/2018
23/03/2018
21/05/2018
17/07/2018
20/09/2018
15/11/2018
3/01/2019
27/02/2019
4/04/2019
11/06/2019
13/08/2019
15/10/2019
5/12/2019
N/A
2/04/2020
4/06/2020
Mn Dissolved Manganese (µg/L)
Mn Dissolved 90 Percentile Limit

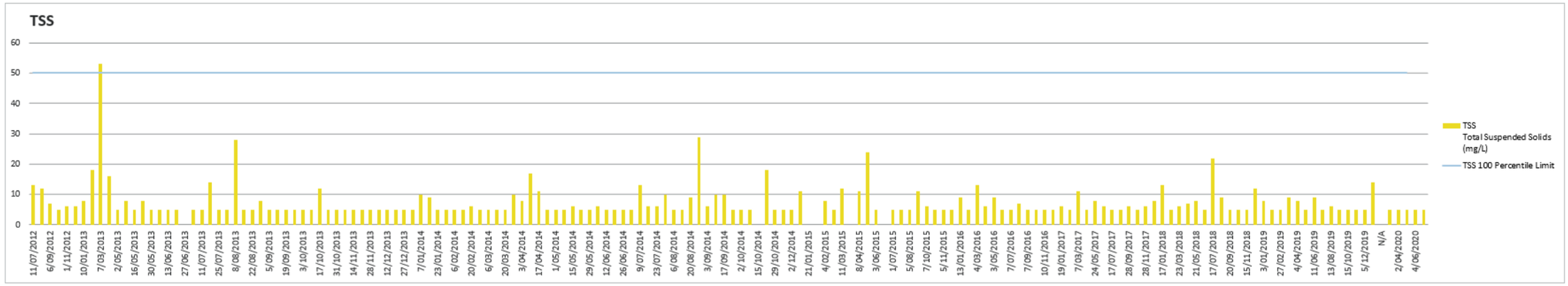

Copper
20
18
16
14
12
10
8
6
4
2
0
11/07/2012
6/09/2012
1/11/2012
10/01/2013
7/03/2013
2/05/2013
16/05/2013
30/05/2013
13/06/2013
27/06/2013
11/07/2013
25/07/2013
8/08/2013
22/08/2013
5/09/2013
19/09/2013
3/10/2013
17/10/2013
31/10/2013
14/11/2013
28/11/2013
12/12/2013
27/12/2013
7/01/2014
23/01/2014
6/02/2014
20/02/2014
6/03/2014
20/03/2014
3/04/2014
17/04/2014
1/05/2014
15/05/2014
29/05/2014
12/06/2014
26/06/2014
9/07/2014
23/07/2014
6/08/2014
20/08/2014
3/09/2014
17/09/2014
2/10/2014
15/10/2014
29/10/2014
2/12/2014
21/01/2015
4/02/2015
11/03/2015
8/04/2015
3/06/2015
1/07/2015
5/08/2015
7/10/2015
5/11/2015
13/01/2016
4/03/2016
3/05/2016
7/07/2016
7/09/2016
10/11/2016
19/01/2017
7/03/2017
24/05/2017
17/07/2017
28/09/2017
28/11/2017
17/01/2018
23/03/2018
21/05/2018
17/07/2018
20/09/2018
15/11/2018
3/01/2019
27/02/2019
4/04/2019
11/06/2019
13/08/2019
15/10/2019
5/12/2019
N/A
2/04/2020
4/06/2020
Cu Dissolved Copper (µg/L)
Cu Dissolved 90 Percentile Limit

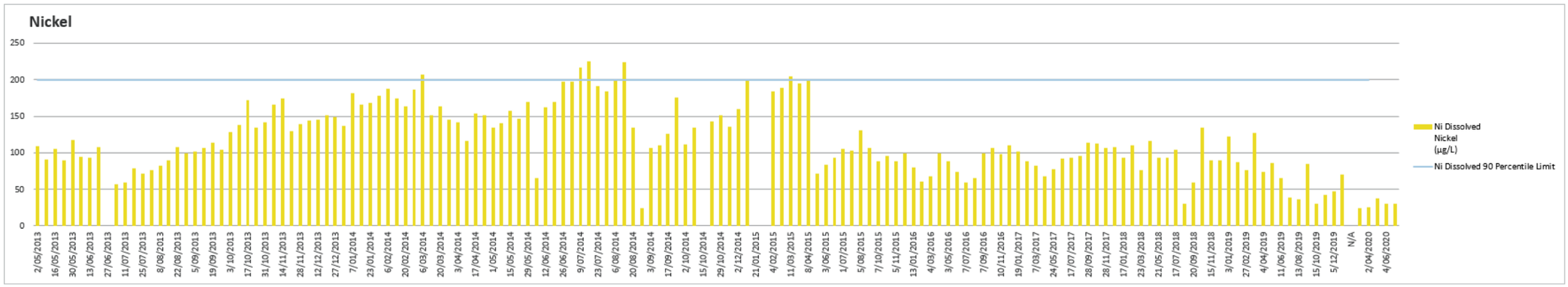

Zinc
300
250
200
150
100
50
0
2/05/2013
16/05/2013
30/05/2013
13/06/2013
27/06/2013
11/07/2013
25/07/2013
8/08/2013
22/08/2013
5/09/2013
19/09/2013
3/10/2013
17/10/2013
31/10/2013
14/11/2013
28/11/2013
12/12/2013
27/12/2013
7/01/2014
23/01/2014
6/02/2014
20/02/2014
6/03/2014
20/03/2014
3/04/2014
17/04/2014
1/05/2014
15/05/2014
29/05/2014
12/06/2014
26/06/2014
9/07/2014
23/07/2014
6/08/2014
20/08/2014
3/09/2014
17/09/2014
2/10/2014
15/10/2014
29/10/2014
2/12/2014
21/01/2015
4/02/2015
11/03/2015
8/04/2015
3/06/2015
1/07/2015
5/08/2015
7/10/2015
5/11/2015
13/01/2016
4/03/2016
3/05/2016
7/07/2016
7/09/2016
10/11/2016
19/01/2017
7/03/2017
24/05/2017
17/07/2017
28/09/2017
28/11/2017
17/01/2018
23/03/2018
21/05/2018
17/07/2018
20/09/2018
15/11/2018
3/01/2019
27/02/2019
4/04/2019
11/06/2019
13/08/2019
15/10/2019
5/12/2019
N/A
2/04/2020
4/06/2020
Zn Dissolved Zinc (µg/L)
Zn Dissolved 90 Percentile Limit

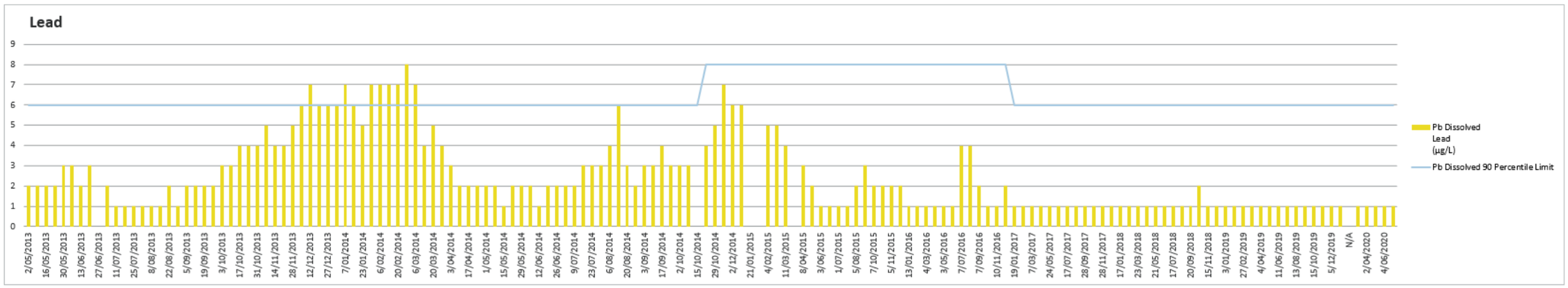

TDS
3000
2500
2000
1500
1000
500
0
TDS
Total Dissolved Solids
(mg/L)
TDS 90 Percentile Limit


Oil & Grease
45
40
35
30
25
20
15
10
5
0
O&G
Oil & Grease
(mg/L)
O&G 100 Percentile Limit


Chemical Oxygen Demand
80
70
60
50
40
30
20
10
0
COD
Chemical Oxygen Demand
(mg/L)
COD 90 Percentile Limit


TSS
60
50
40
30
20
10
0
11/07/2012
6/09/2012
1/11/2012
10/01/2013
7/03/2013
2/05/2013
16/05/2013
30/05/2013
13/06/2013
27/06/2013
11/07/2013
25/07/2013
8/08/2013
22/08/2013
5/09/2013
19/09/2013
3/10/2013
17/10/2013
31/10/2013
14/11/2013
28/11/2013
12/12/2013
27/12/2013
7/01/2014
23/01/2014
6/02/2014
20/02/2014
6/03/2014
20/03/2014
3/04/2014
17/04/2014
1/05/2014
15/05/2014
29/05/2014
12/06/2014
26/06/2014
9/07/2014
23/07/2014
6/08/2014
20/08/2014
3/09/2014
17/09/2014
2/10/2014
15/10/2014
29/10/2014
2/12/2014
21/01/2015
4/02/2015
11/03/2015
8/04/2015
3/06/2015
1/07/2015
5/08/2015
7/10/2015
5/11/2015
13/01/2016
4/03/2016
3/05/2016
7/07/2016
7/09/2016
10/11/2016
19/01/2017
7/03/2017
24/05/2017
17/07/2017
28/09/2017
28/11/2017
17/01/2018
23/03/2018
21/05/2018
17/07/2018
20/09/2018
15/11/2018
3/01/2019
27/02/2019
4/04/2019
11/06/2019
13/08/2019
15/10/2019
5/12/2019
N/A
2/04/2020
4/06/2020
TSS
Total Suspended Solids
(mg/L)
TSS 100 Percentile Limit


Nickel
250
200
150
100
50
0
2/05/2013
16/05/2013
30/05/2013
13/06/2013
27/06/2013
11/07/2013
25/07/2013
8/08/2013
22/08/2013
5/09/2013
19/09/2013
3/10/2013
17/10/2013
31/10/2013
14/11/2013
28/11/2013
12/12/2013
27/12/2013
7/01/2014
23/01/2014
6/02/2014
20/02/2014
6/03/2014
20/03/2014
3/04/2014
17/04/2014
1/05/2014
15/05/2014
29/05/2014
12/06/2014
26/06/2014
9/07/2014
23/07/2014
6/08/2014
20/08/2014
3/09/2014
17/09/2014
2/10/2014
15/10/2014
29/10/2014
2/12/2014
21/01/2015
4/02/2015
11/03/2015
8/04/2015
3/06/2015
1/07/2015
5/08/2015
7/10/2015
5/11/2015
13/01/2016
4/03/2016
3/05/2016
7/07/2016
7/09/2016
10/11/2016
19/01/2017
7/03/2017
24/05/2017
17/07/2017
28/09/2017
28/11/2017
17/01/2018
23/03/2018
21/05/2018
17/07/2018
20/09/2018
15/11/2018
3/01/2019
27/02/2019
4/04/2019
11/06/2019
13/08/2019
15/10/2019
5/12/2019
N/A
2/04/2020
4/06/2020
Ni Dissolved
Nickel
(µg/L)
Ni Dissolved 90 Percentile Limit


Lead
9
8
7
6
5
4
3
2
1
0
2/05/2013
16/05/2013
30/05/2013
13/06/2013
27/06/2013
11/07/2013
25/07/2013
8/08/2013
22/08/2013
5/09/2013
19/09/2013
3/10/2013
17/10/2013
31/10/2013
14/11/2013
28/11/2013
12/12/2013
27/12/2013
7/01/2014
23/01/2014
6/02/2014
20/02/2014
6/03/2014
20/03/2014
3/04/2014
17/04/2014
1/05/2014
15/05/2014
29/05/2014
12/06/2014
26/06/2014
9/07/2014
23/07/2014
6/08/2014
20/08/2014
3/09/2014
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(µg/L)
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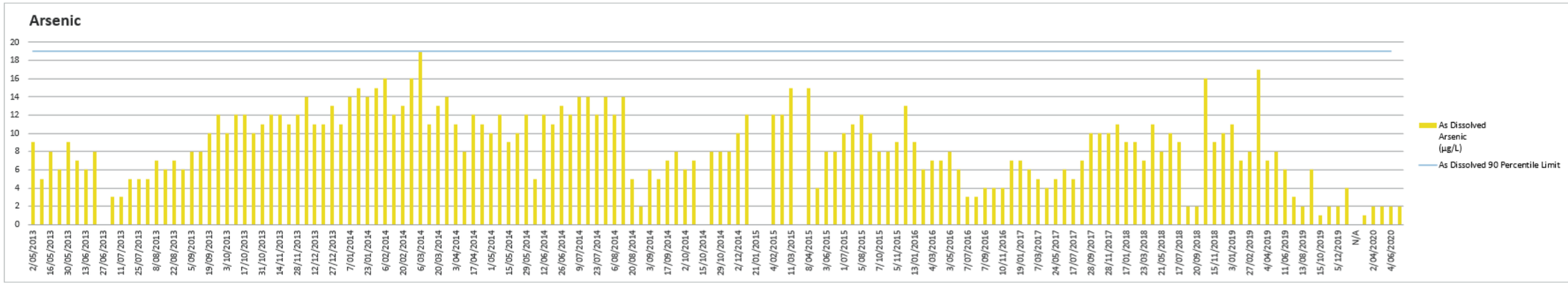

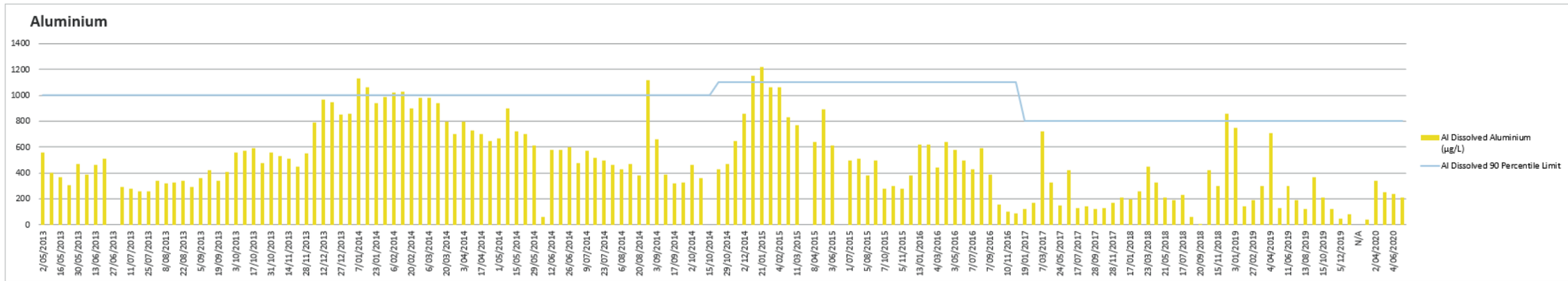

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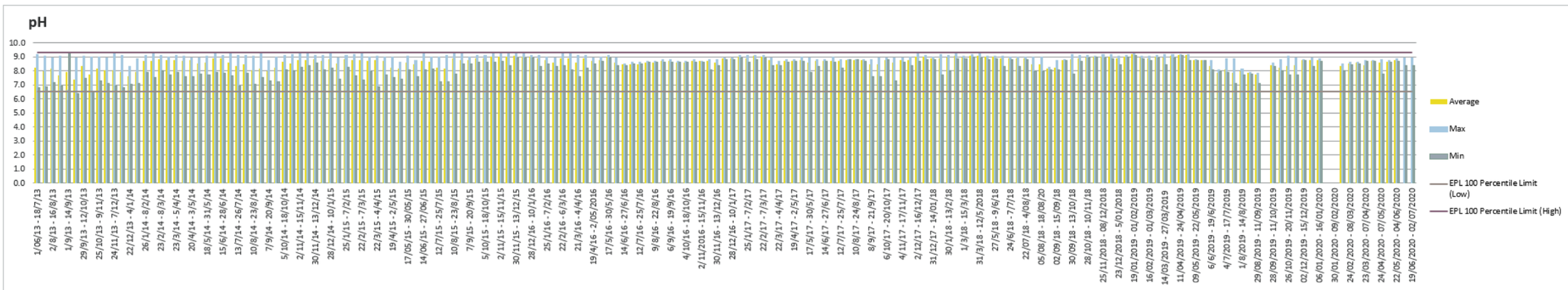

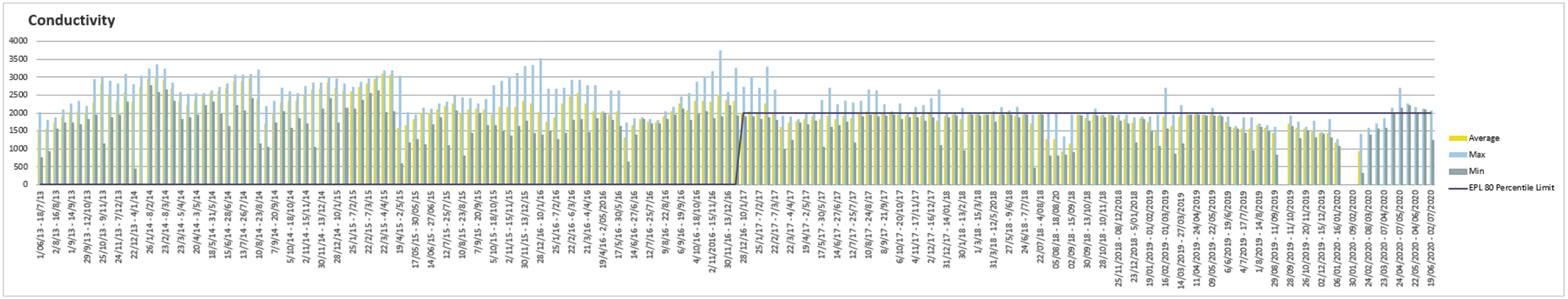

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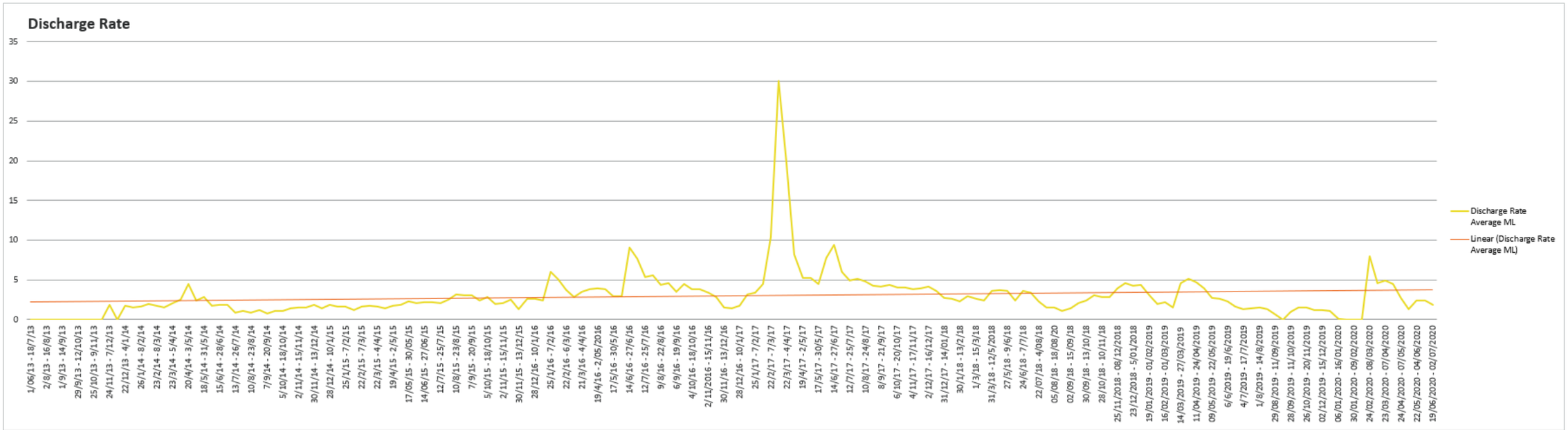

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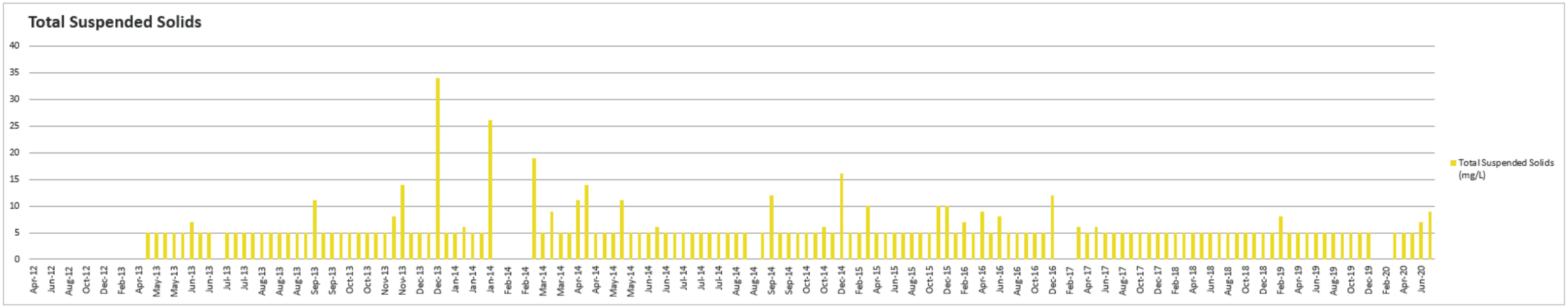

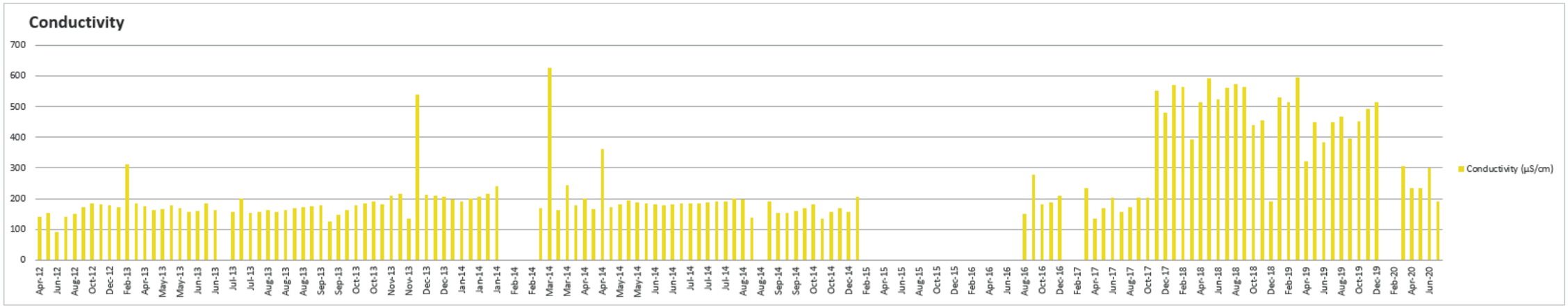

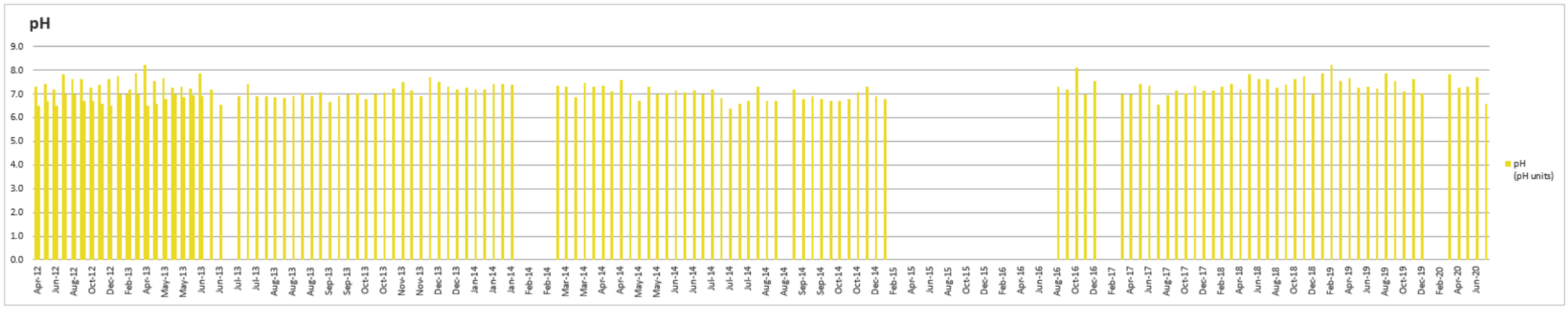

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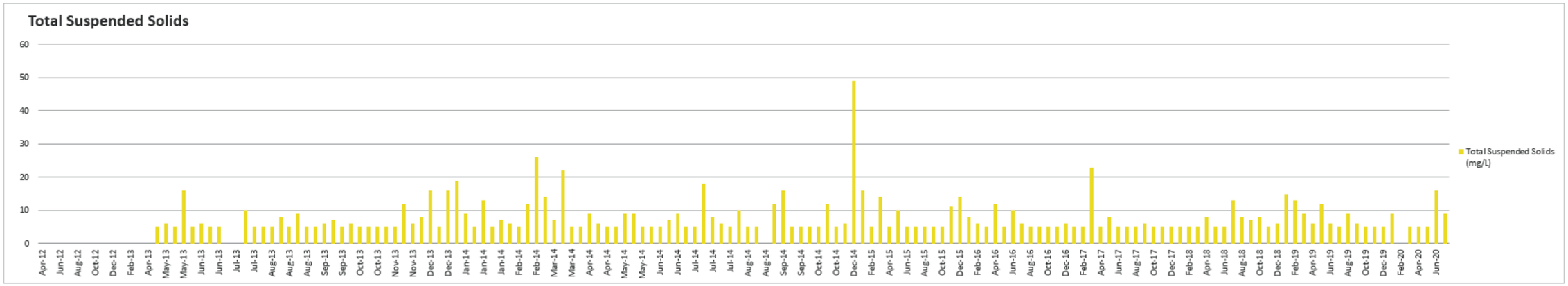

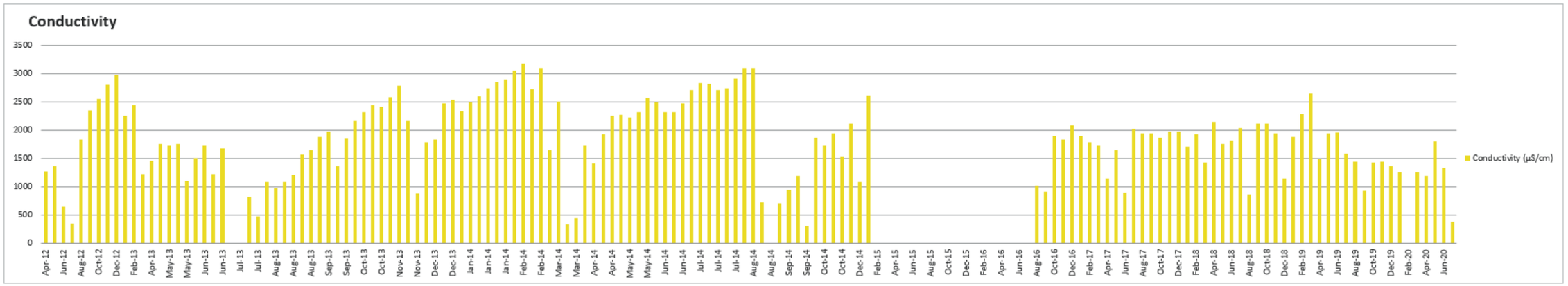

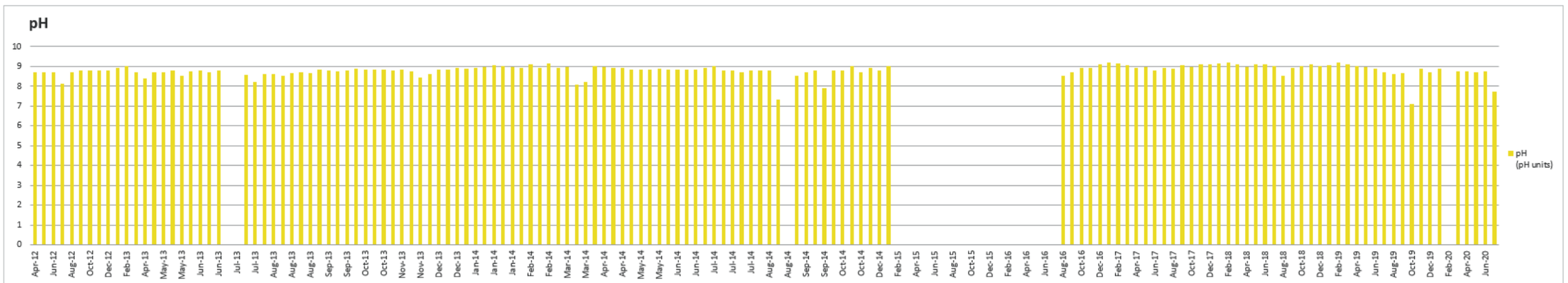

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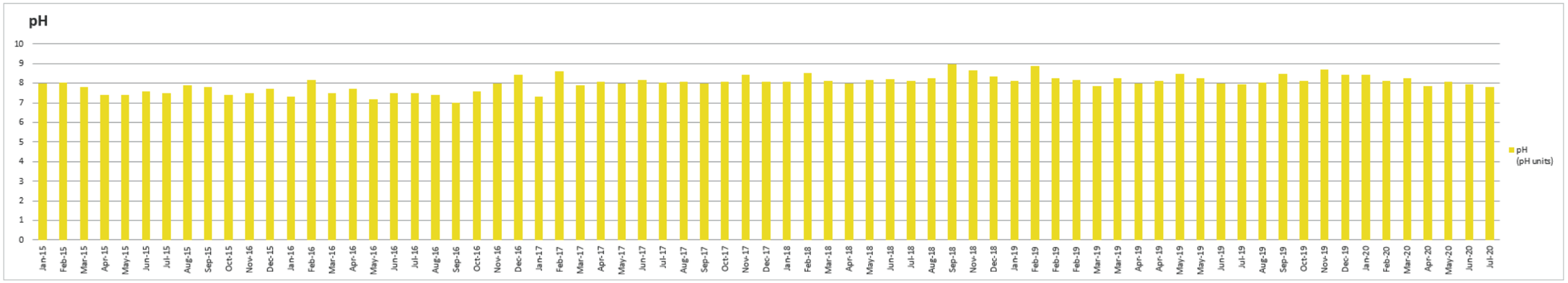

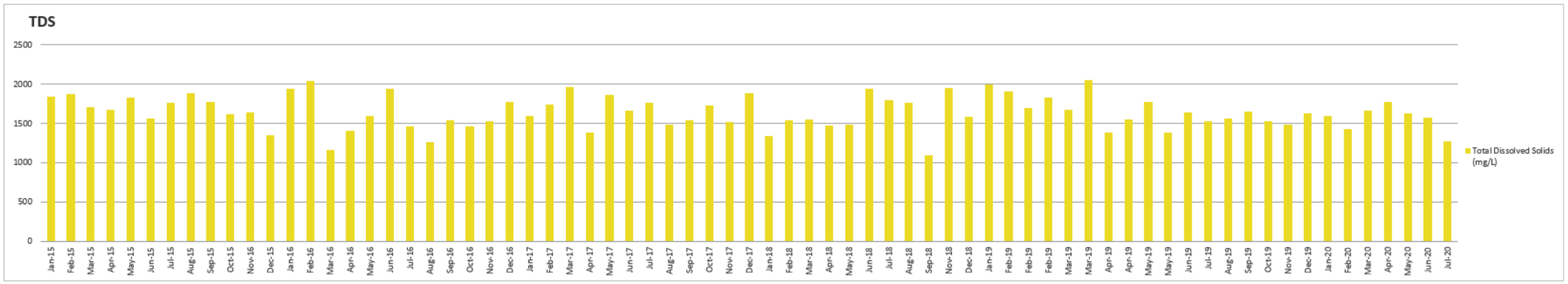

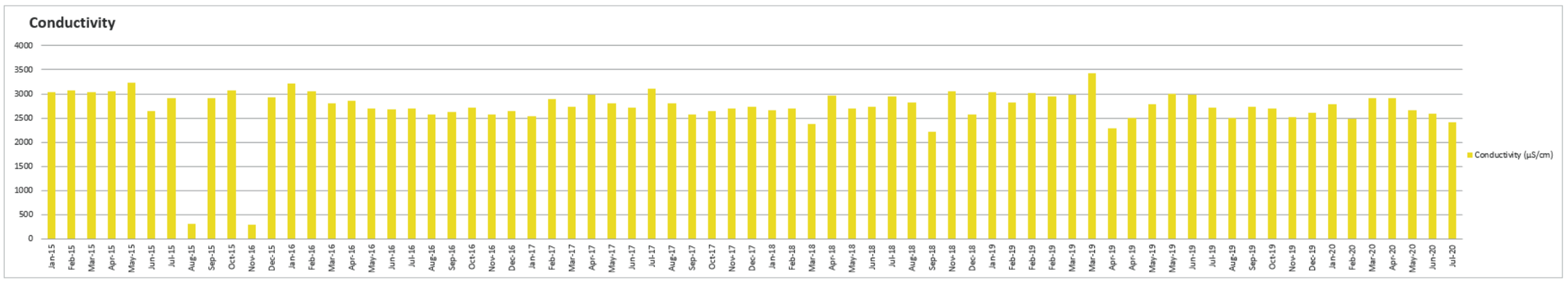

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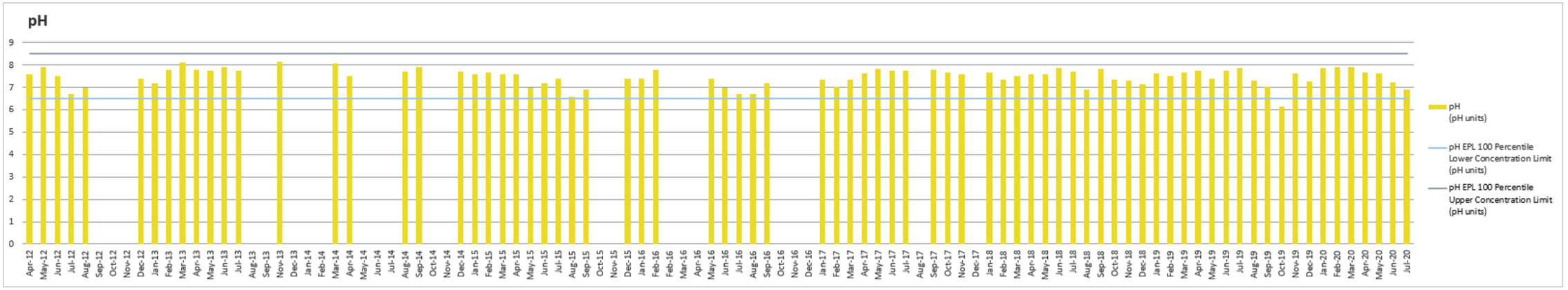

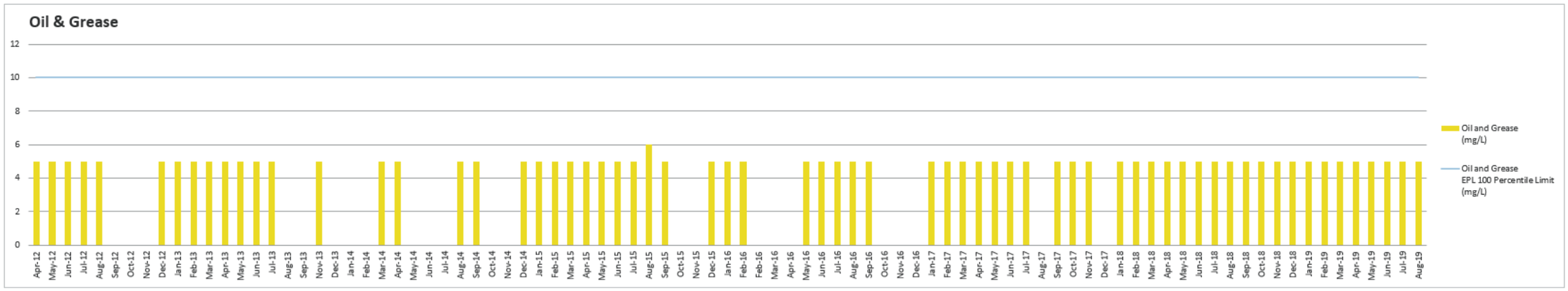

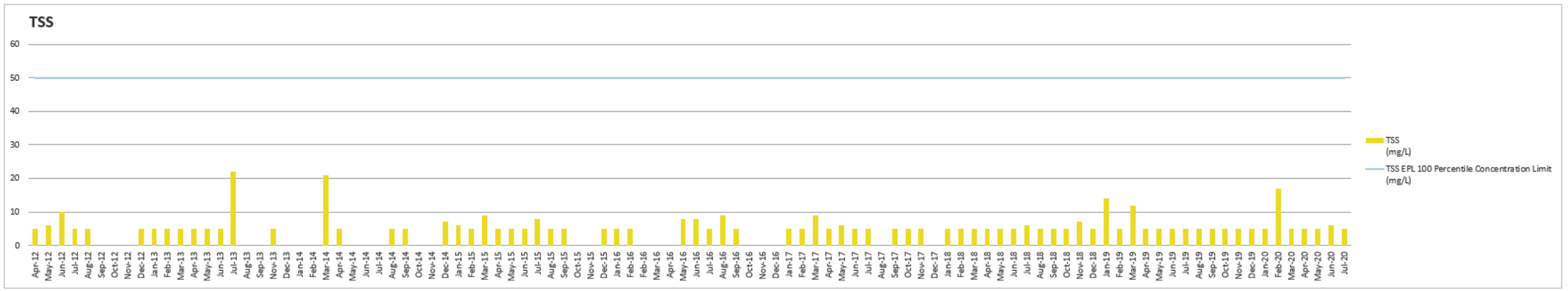

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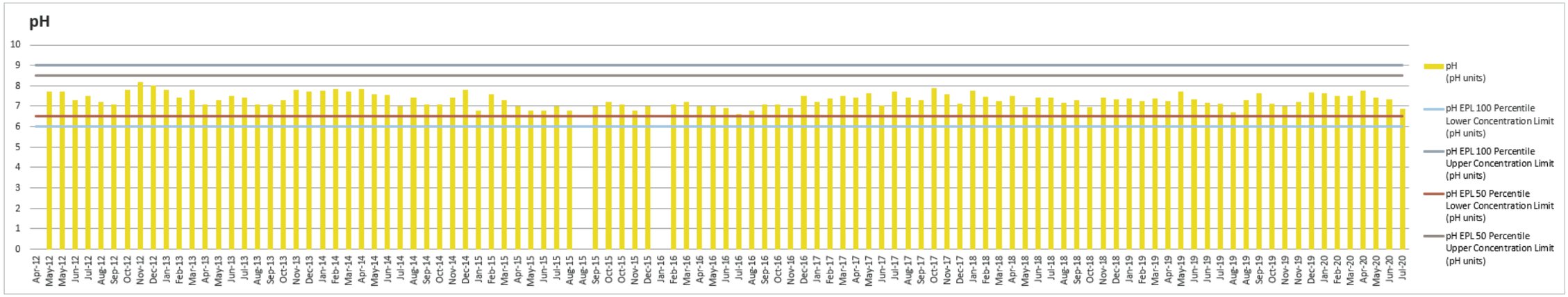

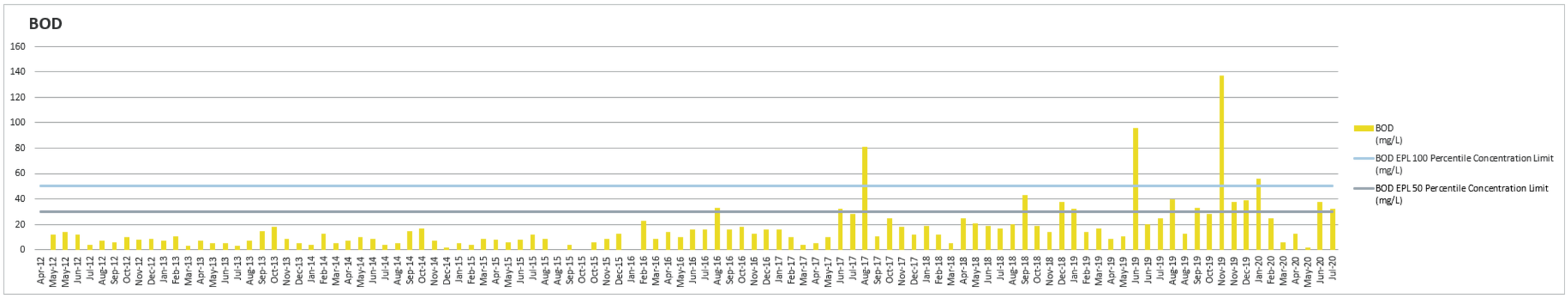

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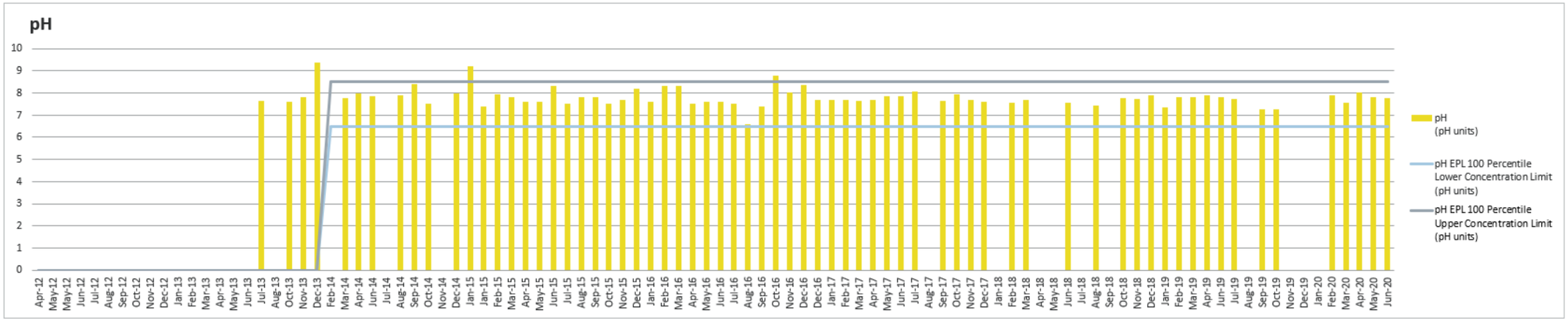

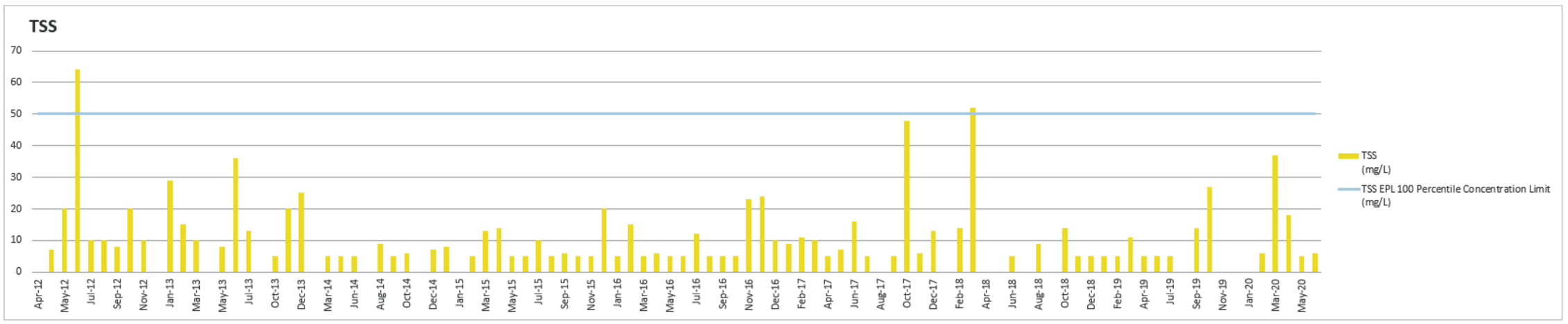

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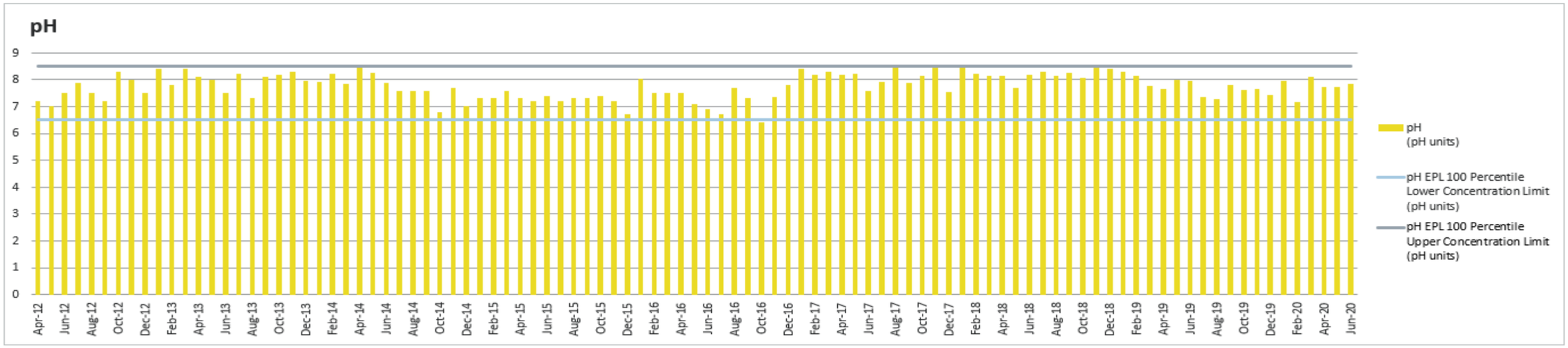

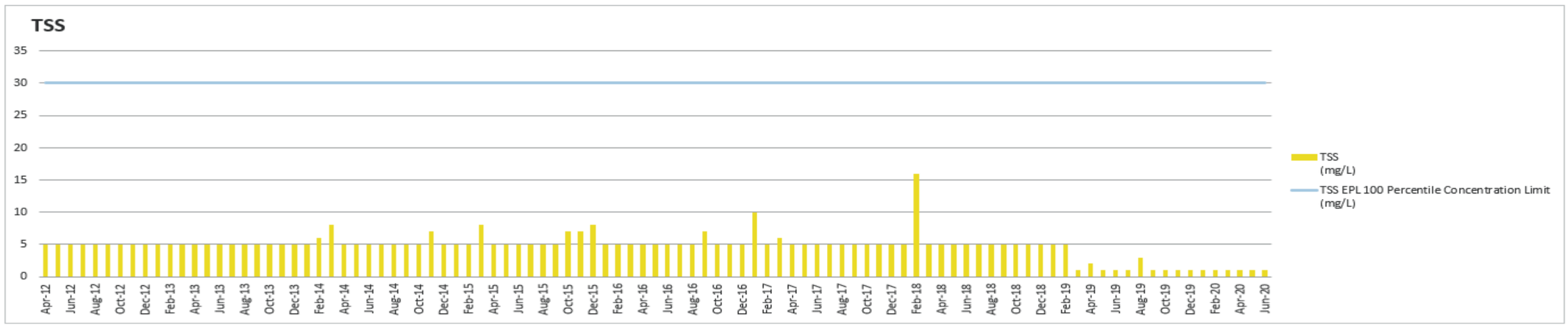

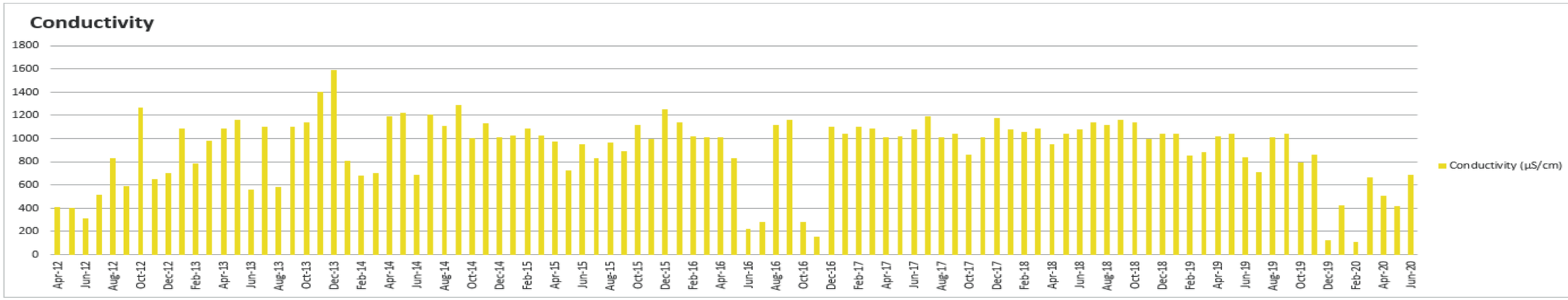

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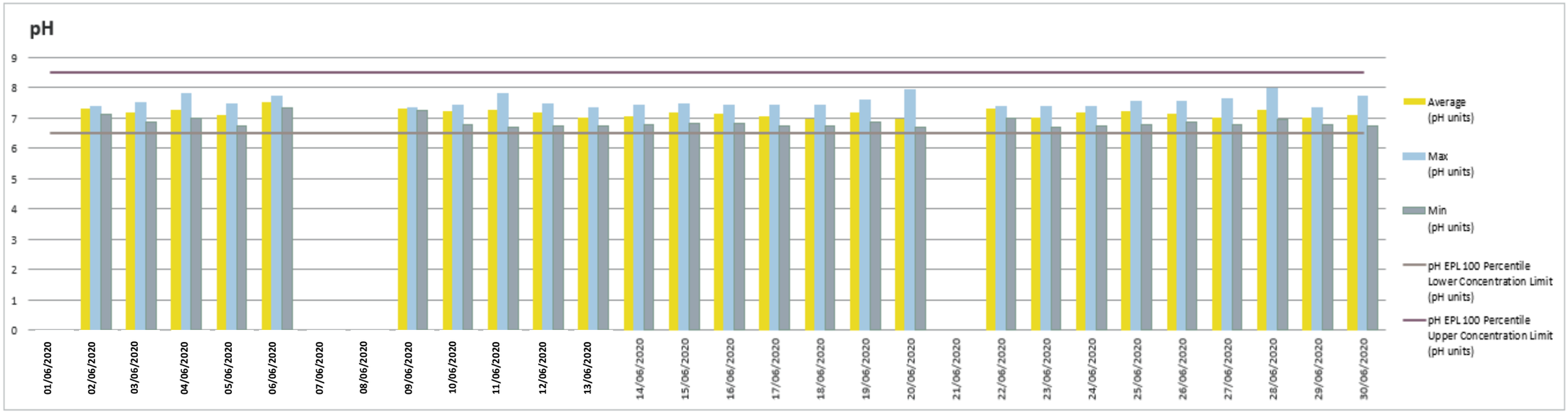

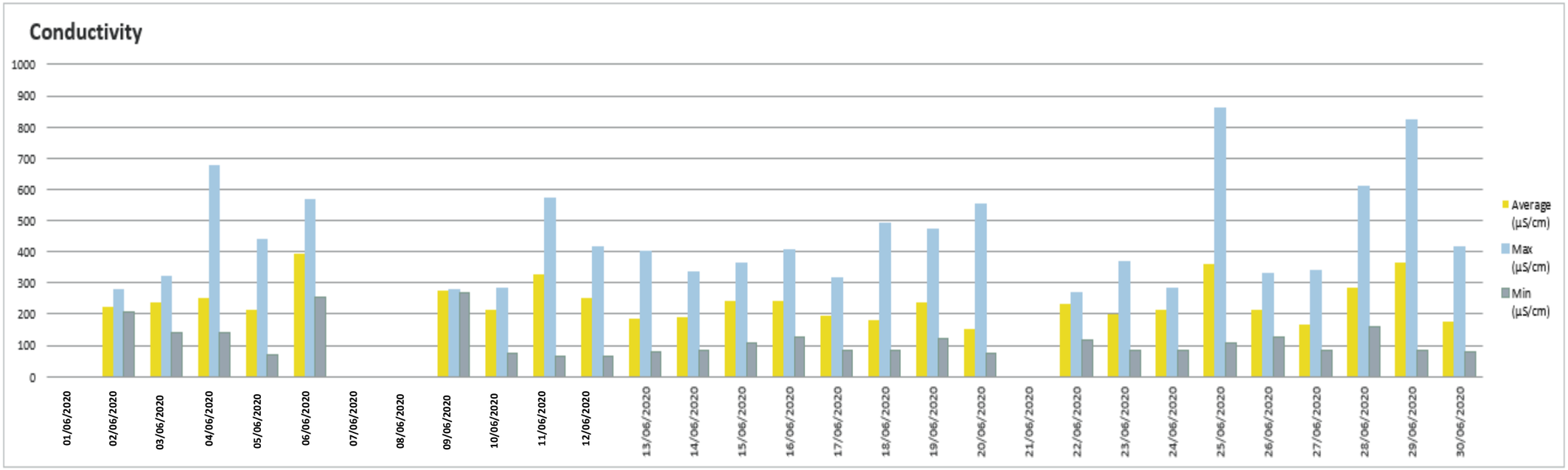

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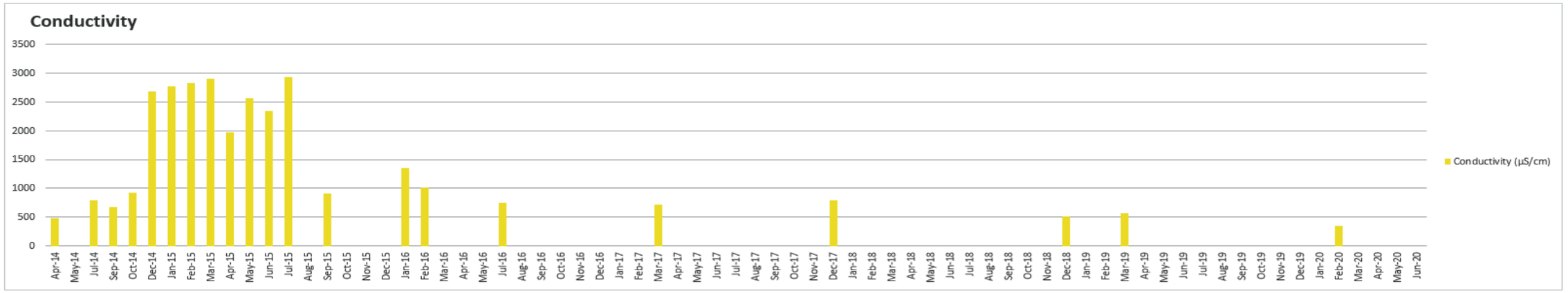

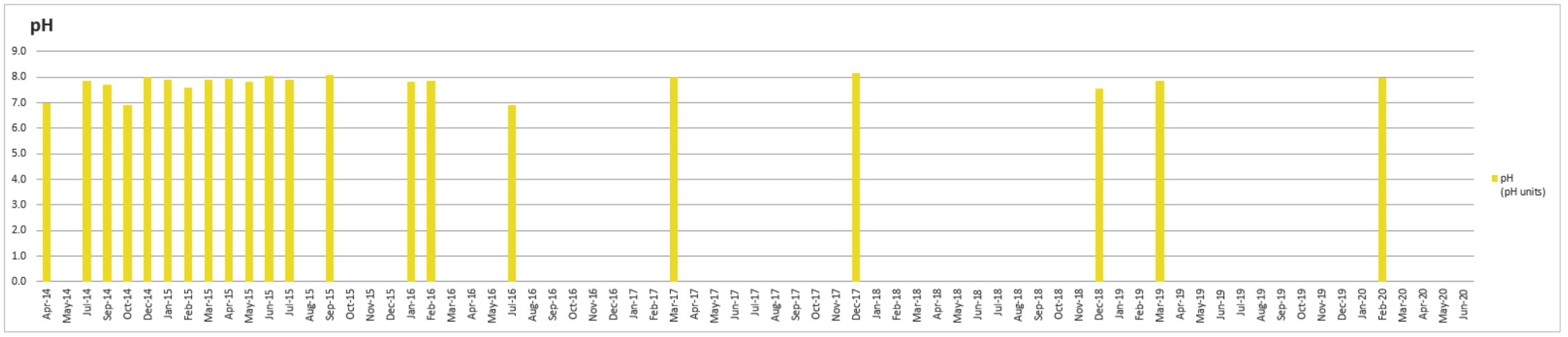

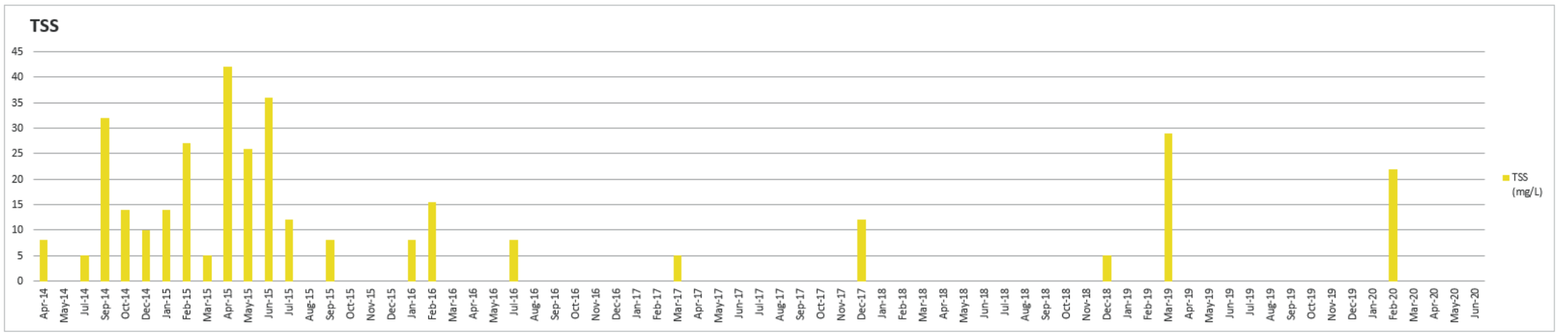

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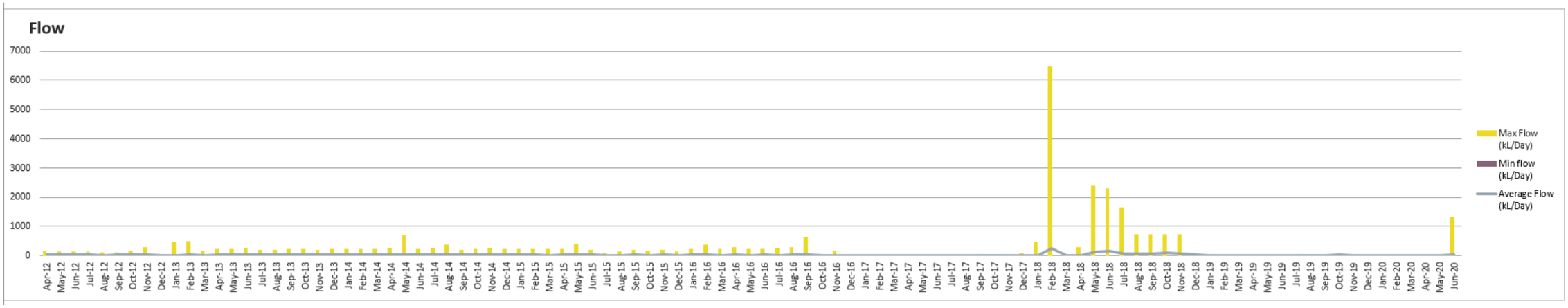

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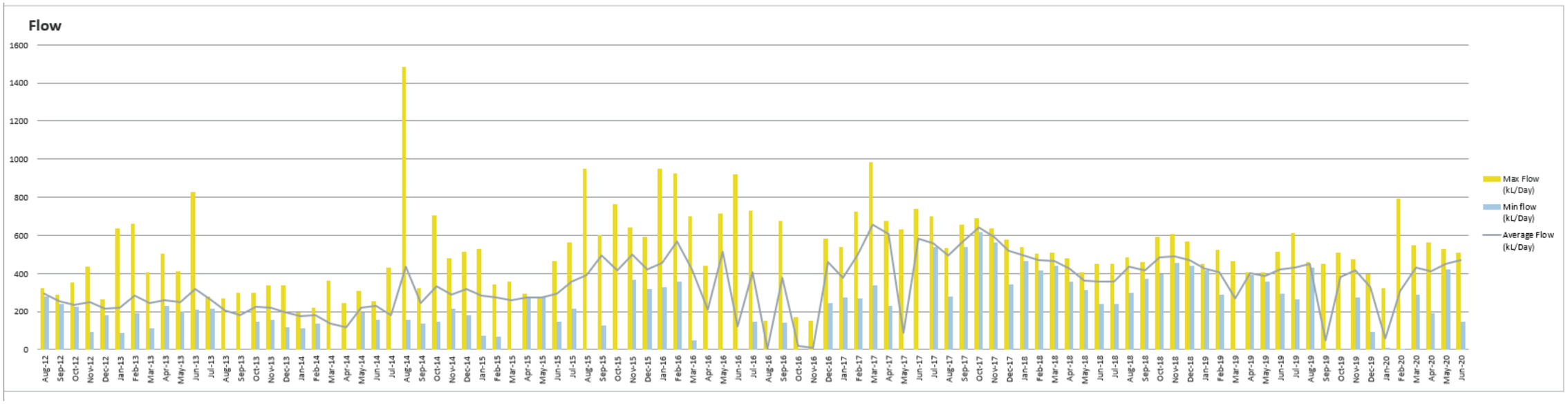

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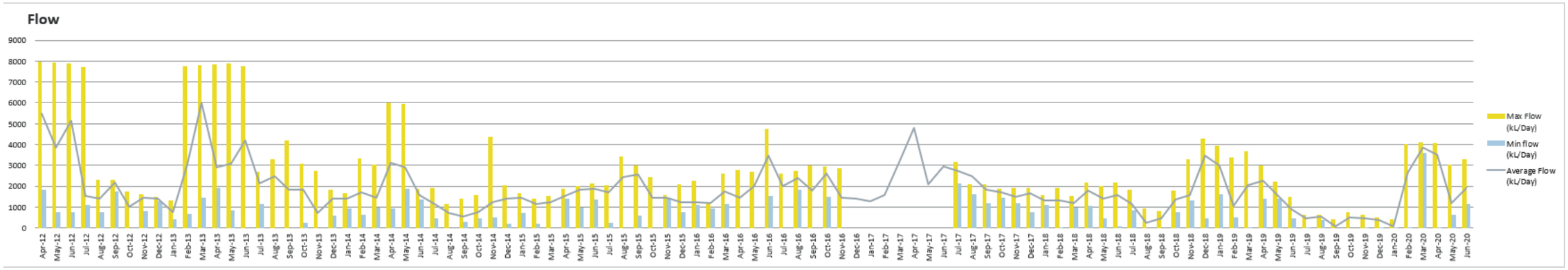

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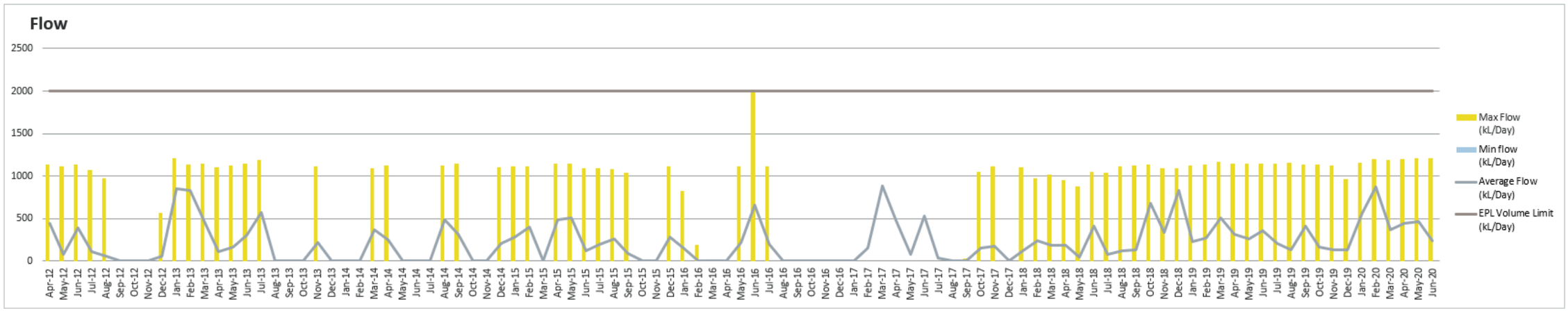

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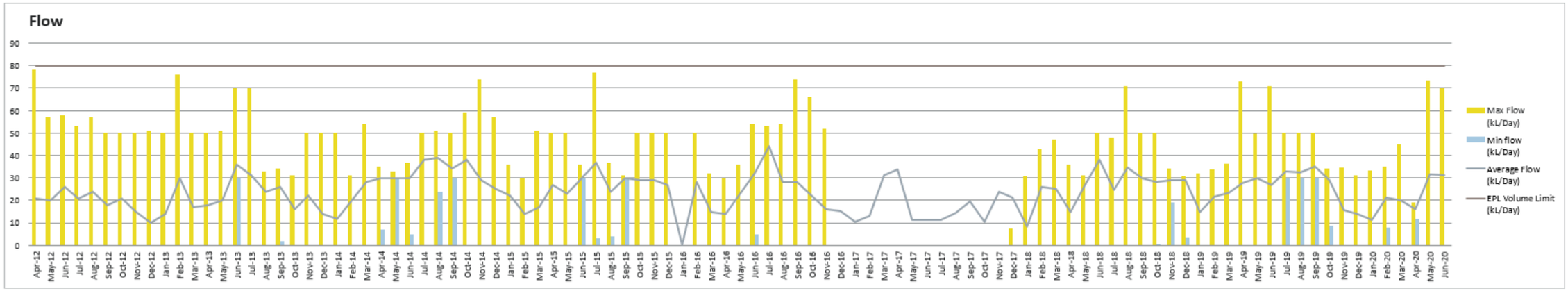

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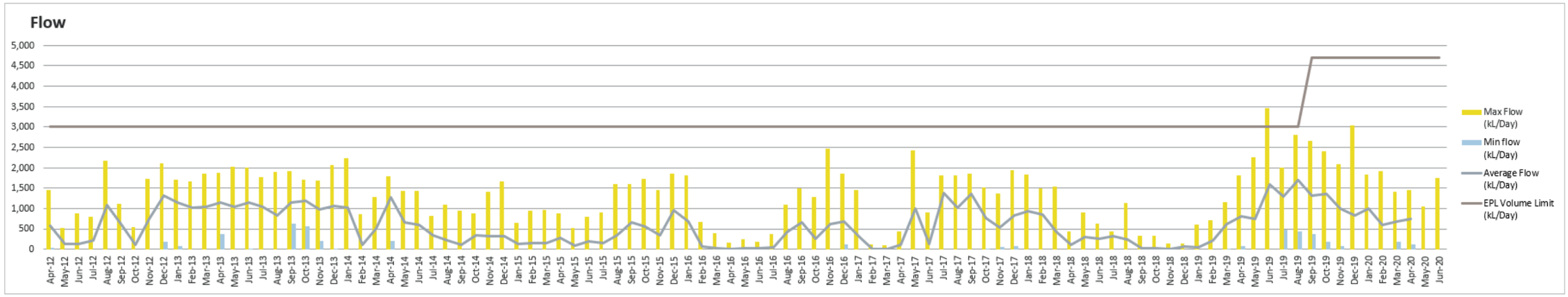


Appendix D: Annual *Persoonia Hirsuta* Condition Monitoring Report

ANNUAL *PERSOONIA HIRSUTA* CONDITION MONITORING REPORT

Illawarra Metallurgical Coal, 2019 Survey

Contents

OVERVIEW

Illawarra Coal conducted its seventh 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 by two Niche ecologists over 2 days in November 2019 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.

A total of 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 gayana* (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 obligate 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.

Spring 2018
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.

SPRING 2019

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 2019 was 10:

- one plant has died likely due to age related causes (since the baseline in 2012).
- 128 plants were translocated from the Mount Annan Botanic Gardens and placed adjacent to the offset area.
- One new plant (SH004) was identified in the Offset during 2019, within the demarcated fencing near CF001.

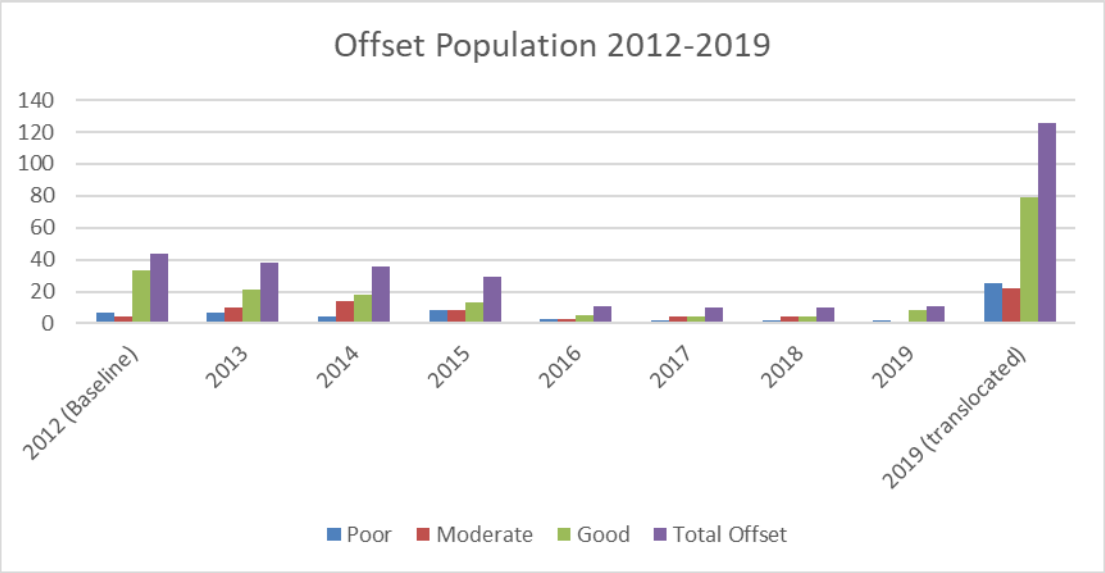


Figure 1: Comparison of *Persoonia hirsuta* condition and population within the Offset across years.

West Cliff Other Areas

An additional 28 live individuals are being monitored within the surrounding West Cliff lease (see Figure 3), five new individuals were identified within the non core non impacted area along the Dam Road, adjacent to previously live skeletons of *P.hirsuta*.

Translocation Area

A new area of *Persoonia hirsuta* was planted by the Australian Botanical Gardens in 2019. These additional 128 individuals are being monitored within the surrounding West Cliff lease (see Figure 2 and Figure 3), two of these individuals have since died. Please note the tags on the individual plants did not have an individual identification number and results may vary from the botanical gardens labelling system.

Total Site Count

The total count for live *P.hirsuta* plants at West Cliff in spring 2019 was 175, including plants that have been identified post-baseline (2012) and the additional 128 plants translocated (Figure 2). Excluding these, there has been a decrease of three plants in 2019, two of the translocated individuals and one in the non-impact area.

The results are tabulated in Appendix B.

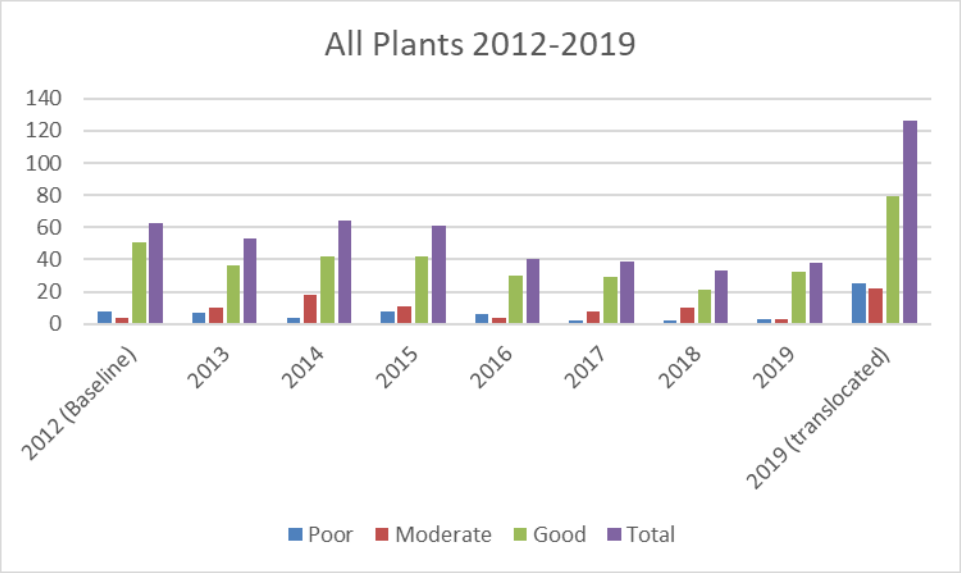


Figure 2: Comparison of condition and population of all plants across years

Discussion

The overall health of the core population of *P. hirsuta* is good as the plants are producing flowers and fruits in most cases. Flowering and fruiting is more prevalent in plants that are located within dense bush rather than those beneath powerlines or on the roadside.

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 to date.

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.

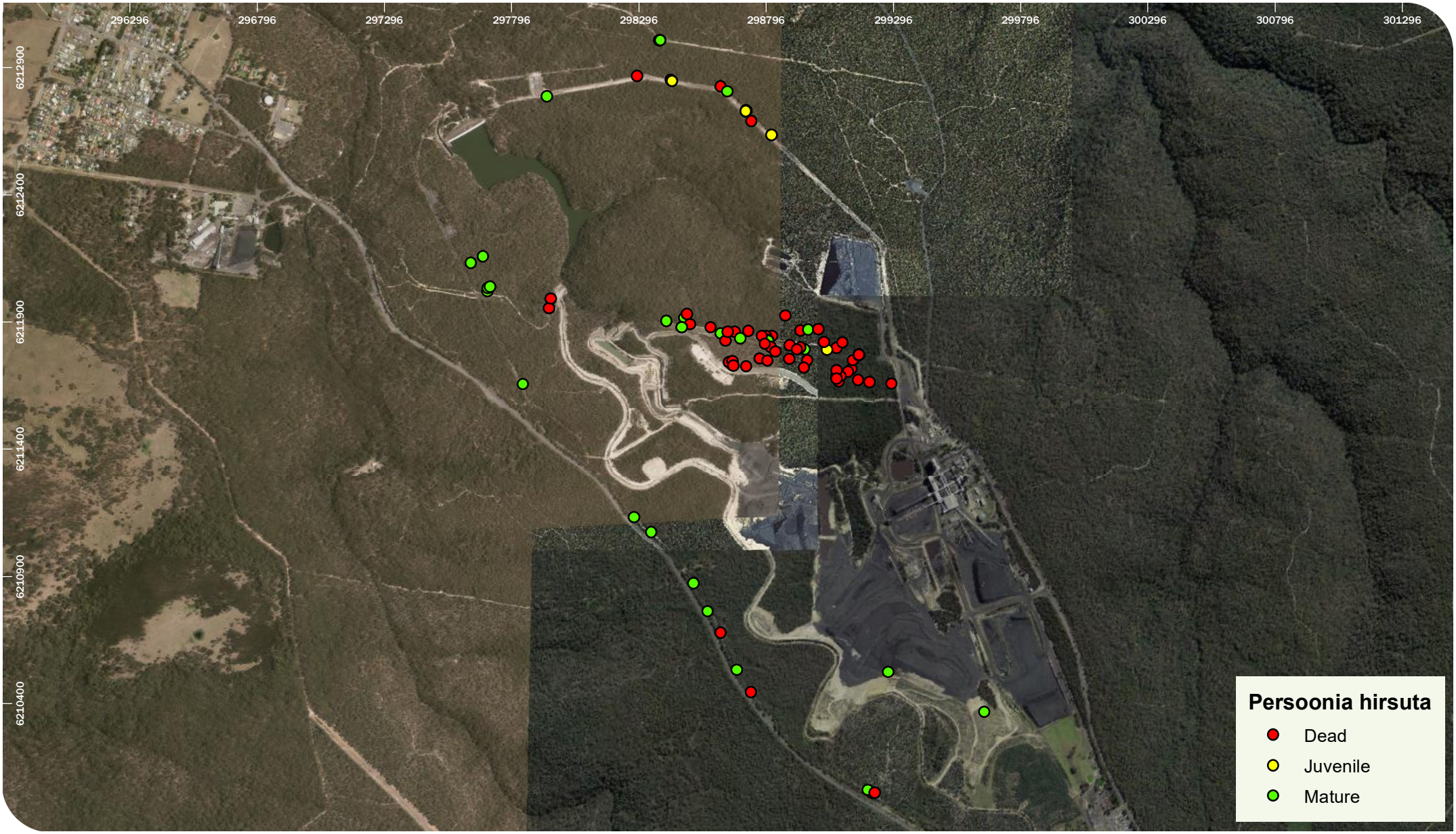
As per previous years, recruitment is limited to previously disturbed areas (beneath powerlines) or close to a skeleton of a previously known record.

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.



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ANNUAL PERSOONIA HIRSUTA CONDITION MONITORING REPORT

Persoonia hirsuta locations - West Cliff 2019

Niche PM: Sian Griffiths
Niche Proj. #: 5342
Client: Illawarra Coal - South 32

Figure 3

REFERENCES

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BHPBIC *Persoonia hirsuta* Offset Management Plan

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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 2019

Area	2019 Label	Label	Height (mm)	Width (mm)	Age Class	Condition	E	N
Emplacement Rehab	-	DG023	250	700	Mature	Moderate	299655	6210366
Emplacement Rehab	-	DG033	400	700	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	600	800	Mature	Moderate	297935	6212786
Non core non impacted	-	ns033	400	900	Mature	Very Good	298682	6210531
Non core non impacted	-	ns034	500	1500	Mature	Excellent	299213	6210048
Non core non impacted	-	ns035			Dead	Dead	298619	6210678
Non core non impacted	-	cm021	400	1500	Senescent	Dead	298740	6212688
Non core non impacted	-	DG003	1000	1300	Mature	Very Good	297701	6212019
Non core non impacted	-	DG004	600	1400	Mature	Very Good	297704	6212032
Non core non impacted	-	DG005	700	700	Mature	Very Good	298346	6211073
Non core non impacted	-	DG006	500	1100	Mature	Very Good	298511	6210872
Non core non impacted	-	DG007	700	1800	Mature	Excellent	298568	6210760
Non core non impacted	-	PM001	400	800	Mature	Excellent	299196	6210059
Non core non impacted	-	DG013	450	950	Mature	Excellent	297712	6212037
Non core non impacted	-	DG014			Dead	Dead	297943	6211952
Non core non impacted	-	DG015	600	1600	Mature	Excellent	297684	6212156
Non core non impacted	-	DG017			Dead	Dead	297944	6211953
Non core non impacted	-	DG008	750	1000	Mature	Very Good	298644	6212804
Non core non impacted	-	DG018	1100	1300	Mature	Very Good	298381	6213005
Non core non impacted	-	DG019	600	700	Mature	Very Good	298379	6213004
Non core non impacted	-	DG020	800	1300	Mature	Very Good	298377	6213006
Non core non impacted	-	DG021	600	1400	Mature	Very Good	298382	6213005
Non core non impacted	-	DG022	800	700	Mature	Very Poor	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	850	1700	Mature	Excellent	297637	6212132
Non core non impacted	-	DG027			Dead	Dead	299223	6210048
Non core non impacted	-	SG001	300	200	Mature	Excellent	298278	6211131
Non core non impacted	-	DG028			Dead		298718	6212731
Non core non impacted	-	DG029			Dead	Dead	298721	6212729
Non core non impacted	-	ER001/DG012	520	1000	Mature	Excellent	298717	6212727
Non core non impacted	-	DG031			Dead	Dead	298719	6212730
Non core non impacted	-	DG032					298738	6210444
Offset	-	DG025	700	600	Mature	Good	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	700	800	Mature	Fairly Poor	298950	6211791
Offset	-	ns007			Dead	Dead	298960	6211747

Area	2019 Label	Label	Height (mm)	Width (mm)	Age Class	Condition	E	N
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	298664	6211744
Offset	-	ns014	400	800	Mature	Moderate	298619	6211853
Offset	-	ns015			Dead	Dead	298579	6211877
Offset	-	ns017			Dead	Dead	299074	6211798
Offset	-	ns018			Dead	Dead	298820	6211843
Offset	-	ns019			Scenescent	Dead	298798	6211844
Offset	-	ns020			Dead	Dead	298673	6211861
Offset	-	ns021	700	1000	Mature	Good	298806	6211827
Offset	-	ns022	800	1100	Mature	Good	298807	6211825
Offset	-	ns024			Dead	Dead	298815	6211801
Offset	-	ns025	700	1300	Mature	Very Good	298695	6211834
Offset	-	ns026			Dead	Dead	298931	6211797
Offset	-	cm001			Dead	Dead	299119	6211704
Offset	-	cm002	300	100	Juvenile	Poor	299037	6211788
Offset	-	cm003			Dead	Dead	298933	6211799
Offset	-	cm004			Dead	Dead	298889	6211807
Offset	-	cm005			Dead	Dead	298833	6211781
Offset	-	cm006			Dead	Dead	298669	6211727
Offset	-	cm007			Dead	Dead	298638	6211825
Offset	-	cm008			Mature	Dead	298405	6211903
Offset	-	cm009			Dead	Dead	298485	6211930
Offset	-	cm010			Dead	Dead	298933	6211865
Offset	-	cm011	550	800	mature	Good	298963	6211868
Offset	-	cm012			Dead	Dead	299003	6211871
Offset	-	cm013			Dead	Dead	299025	6211820
Offset	-	cm014			Dead	Dead	299098	6211818
Offset	-	cm015			Dead	Dead	298781	6211844
Offset	-	cm016			Dead	Dead	298728	6211863
Offset	-	cm017			Dead	Dead	299138	6211748
Offset	-	cm018			Dead	Dead	298719	6211724
Offset	-	cm019			Dead	Dead	298792	6211812
Offset	-	cm020			Dead	Dead	298918	6211790
Offset	-	DG001			Dead	Dead	299089	6211685
Offset	-	DG002			Dead	Dead	298802	6211746
Offset	-	AH001			Dead	Dead	299074	6211709
Offset	-	AW001			Dead	Dead	299204	6211662
Offset	-	AW002			Dead	Dead	299159	6211671
Offset	-	DG009			Dead	Dead	298646	6211861
Offset	-	DG010			Senescent	Dead	298498	6211889
Offset	-	DG011	750	600	Mature	Excellent	298406	6211903
Offset	-	CB004			Dead	Dead	299074	6211676
Offset	-	CF001	600	1300	Mature	Excellent	298466	6211878
Stage 4	-	ns016			Dead	Dead	298873	6211924
Non core non impacted	-	SH001	250	80	Juvenile	Excellent	298819	6212634
Non core non impacted	-	SH002	100	100	Juvenile	Excellent	298717	6212727

Area	2019 Label	Label	Height (mm)	Width (mm)	Age Class	Condition	E	N
Non core non impacted	-	SH003	100	10	Juvenile	Excellent	298427	6212845
Non core non impacted	-	YN001	150	100	Juvenile	Excellent	298427	6212845
Non core non impacted	-	YN002	50	10	Juvenile	Excellent	298427	6212845
Offset	-	SH004	200	500	Mature	Excellent	298466	6211878
Translocated	PB001	A2018-0172/7-3	80	90	Juvenile	Good	299162	6211770
Translocated	PB002	P2017-1049/1-55	320	100	Juvenile	Very Good	299162	6211770
Translocated	PB003	P2017-2068/2-31	280	100	Juvenile	Very Good	299162	6211770
Translocated	PB004	A2018-0172/7-106	20	100	Juvenile	Good	299162	6211770
Translocated	PB005	P2017-2068/2-34	50	60	Juvenile	Very Good	299162	6211770
Translocated	PB006	P2017-1049/1-48	190	120	Juvenile	Fairly Poor	299162	6211770
Translocated	PB007	P2017-1049/1-11	380	150	Juvenile	Very Good	299162	6211770
Translocated	PB008	A2018-0172/7-12	100	30	Juvenile	Good	299162	6211770
Translocated	PB009	P2017-2068/2-63	120	120	Juvenile	Good	299162	6211770
Translocated	PB010	A2018-0172/7-35	120	40	Juvenile	Good	299162	6211770
Translocated	PB011	P2017-2068/2-28	100	35	Juvenile	Fairly Poor	299162	6211770
Translocated	PB012	A2018-0172/7-36	110	50	Juvenile	Very Good	299162	6211770
Translocated	PB013	A2018-0172/7-33	60	80	Juvenile	Fairly Poor	299162	6211770
Translocated	PB014	A2018-0172/7-27	150	130	Juvenile	Very good	299162	6211770
Translocated	PB015	P2017-2068/2-75	200	120	Juvenile	Good	299162	6211770
Translocated	PB016	A2018-0172/7-2	220	130	Juvenile	Very Good	299162	6211770
Translocated	PB017	A2018-0172/7-10	115	115	Juvenile	Very Good	299162	6211770
Translocated	PB018	A2018-0172/7-1	100	60	Juvenile	Very Good	299162	6211770
Translocated	PB019	P2017-2068/2-102	230	100	Juvenile	Very Good	299162	6211770
Translocated	PB020	P2017-1049/1-23	200	80	Juvenile	Fairly Poor	299162	6211770
Translocated	PB021	A2018-0172/7-50	110	110	Juvenile	Good	299162	6211770
Translocated	PB022	P2017-1049/1-20	230	150	Juvenile	Very Good	299162	6211770
Translocated	PB023	A2018-0172/7-64	100	100	Juvenile	Very Good	299162	6211770
Translocated	PB024	NOTAG-62	110	70	Juvenile	Very Good	299162	6211770
Translocated	PB025	P2017-1049/1-1	370	200	Juvenile	Very Good	299162	6211770
Translocated	PB026	A2018-0172/7-61	100	120	Juvenile	Very Good	299162	6211770
Translocated	PB027	P2017-1049/1-14	260	110	Juvenile	Very Good	299162	6211770
Translocated	PB028	A2018-0172/7-45	40	10	Juvenile	Very Poor	299162	6211770
Translocated	PB029	A2018-0172/7-32	15	30	Juvenile	Fairly Poor	299162	6211770
Translocated	PB030	P2017-1049/1-87	300	185	Juvenile	Moderate	299162	6211770
Translocated	PB031	P2017-1049/1-63	300	120	Juvenile	Good	299162	6211770
Translocated	PB032	A2018-0172/7-74	70	25	Juvenile	Fairly Poor	299162	6211770
Translocated	PB033	P2017-1049/1-4	120	50	Juvenile	Moderate	299162	6211770
Translocated	PB034	A2018-0172/7-76	110	120	Juvenile	Good	299162	6211770
Translocated	PB035	A2018-0172/7-30	110	120	Juvenile	Very Good	299162	6211770
Translocated	PB036	A2018-0172/7-29	70	30	Juvenile	Moderate	299162	6211770
Translocated	PB037	P2017-2068/2-35	130	100	Juvenile	Good	299162	6211770
Translocated	PB038	P2017-1049/1-44	350	180	Juvenile	Very Good	299162	6211770
Translocated	PB039	P2017-2068/2-2	340	130	Juvenile	Very Good	299162	6211770
Translocated	PB040	A2018-0172/7-26	100	20	Juvenile	Fairly Poor	299162	6211770
Translocated	PB041	P2017-2068/2-58	230	270	Juvenile	Good	299162	6211770
Translocated	PB042	A2018-0172/7-30	70	50	Juvenile	Good	299162	6211770
Translocated	PB043	A2018-0172/7-40	20	20	Juvenile	Fairly Poor	299162	6211770
Translocated	PB044	P2017-2068/2-44	260	70	Juvenile	Moderate	299162	6211770
Translocated	PB045	P2017-1049/1-105	270	150	Juvenile	Good	299162	6211770
Translocated	PB046	P2017-1049/1-18	160	110	Juvenile	Good	299162	6211770

Area	2019 Label	Label	Height (mm)	Width (mm)	Age Class	Condition	E	N
Translocated	PB047	A2018-0172/7-52	100	70	Juvenile	Good	299162	6211770
Translocated	PB048	P2017-2068/2-5	500	230	Juvenile	Very Good	299162	6211770
Translocated	PB049	A2018-0172/7-65	160	170	Juvenile	Very Good	299162	6211770
Translocated	PB050	A2018-0172/7-7	160	50	Juvenile	Moderate	299162	6211770
Translocated	PB051	P2017-2068/2-24	140	150	Juvenile	Moderate	299162	6211770
Translocated	PB052	P2017-1049/1-41	430	260	Juvenile	Very Good	299162	6211770
Translocated	PB053	P2017-1049/1-16	250	130	Juvenile	Very Good	299162	6211770
Translocated	PB054	A2018-0172/7-50	50	120	Juvenile	Very Good	299162	6211770
Translocated	PB055	A2018-0172/7-56	150	50	Juvenile	Very Good	299162	6211770
Translocated	PB056	P2017-1049/1-57	250	30	Juvenile	Moderate	299162	6211770
Translocated	PB057	A2018-0172/7-3	110	50	Juvenile	Moderate	299162	6211770
Translocated	PB058	A2018-0172/7-60	100	70	Juvenile	Good	299162	6211770
Translocated	PB059	P2017-2068/2-39	270	150	Juvenile	Good	299162	6211770
Translocated	PB060	A2018-0172/7-40	120	80	Juvenile	Very Good	299162	6211770
Translocated	PB061	P2017-2068/2-22	250	150	Juvenile	Very Good	299162	6211770
Translocated	PB062	A2018-0172/7-42	120	120	Juvenile	Fairly Poor	299162	6211770
Translocated	PB063	P2017-2068/2-6	220	200	Juvenile	Very Good	299162	6211770
Translocated	PB064	A2018-0172/7-61	110	90	Juvenile	Fairly Poor	299162	6211770
Translocated	PB065	A2018-0172/7-9	100	50	Juvenile	Good	299162	6211770
Translocated	PB066	P2017-2068/2-11	200	140	Juvenile	Very Good	299162	6211770
Translocated	PB067	P2017-1049/1-115	170	10	Juvenile	Very Poor	299162	6211770
Translocated	PB068	A2018-0172/7-121	110	20	Juvenile	Moderate	299162	6211770
Translocated	PB069	P2017-2068/2-48	230	140	Juvenile	Good	299162	6211770
Translocated	PB070	A2018-0172/7-32	150	60	Juvenile	Good	299162	6211770
Translocated	PB071	A2018-0172/7-51	210	90	Juvenile	Good	299162	6211770
Translocated	PB072	P2017-1049/1-59	200	120	Juvenile	Moderate	299162	6211770
Translocated	PB073	P2017-1049/1-24	210	150	Juvenile	Good	299162	6211770
Translocated	PB074	P2017-1049/1-38	200	50	Juvenile	Moderate	299162	6211770
Translocated	PB075	P2017-1049/1-4	380	160	Juvenile	Very Good	299162	6211770
Translocated	PB076	P2017-2068/2-21	250	170	Juvenile	Moderate	299162	6211770
Translocated	PB077	A2018-0172/7-108	150	5	Juvenile	Very Poor	299162	6211770
Translocated	PB078	P2017-1049/1-23			Dead	Dead	299162	6211770
Translocated	PB079	A2018-0172/7-71	70	70	Juvenile	Fairly Poor	299162	6211770
Translocated	PB080	A2018-0172/7-20	70	60	Juvenile	Fairly Poor	299162	6211770
Translocated	PB081	P2017-1049/1-14	220	150	Juvenile	Good	299162	6211770
Translocated	PB082	A2018-0172/7-85	110	50	Juvenile	Fairly Poor	299162	6211770
Translocated	PB083	P2017-2068/2-25	100	40	Juvenile	Moderate	299162	6211770
Translocated	PB084	A2018-0172/7-118	110	50	Juvenile	Moderate	299162	6211770
Translocated	PB085	A2018-0172/7-38	100	100	Juvenile	Very Poor	299162	6211770
Translocated	PB086	P2017-1049/1-43	350	200	Juvenile	Very Good	299162	6211770
Translocated	PB087	P2017-2068/2-102	150	150	Juvenile	Moderate	299162	6211770
Translocated	PB088	A2018-0172/7-34	150	70	Juvenile	Good	299162	6211770
Translocated	PB089	NO TAG -52	100	50	Juvenile	Very Poor	299162	6211770
Translocated	PB090	P2017-2068/2-55	220	100	Juvenile	Moderate	299162	6211770
Translocated	PB091	A2018-0172/7-29	200	130	Juvenile	Good	299162	6211770
Translocated	PB092	A2018-0172/7-49	100	80	Juvenile	Good	299162	6211770
Translocated	PB093	A2018-0172/7-17	200	35	Juvenile	Good	299162	6211770
Translocated	PB094	P2017-2068/2-26	110	100	Juvenile	Very Poor	299162	6211770
Translocated	PB095	P2017-2068/2-111	110	130	Juvenile	Good	299162	6211770
Translocated	PB096	A2018-0172/7-103	30	10	Juvenile	Very Poor	299162	6211770

Area	2019 Label	Label	Height (mm)	Width (mm)	Age Class	Condition	E	N
Translocated	PB097	P2017-2068/2-15	100	20	Juvenile	Poor	299162	6211770
Translocated	PB098	P2017-2068/2-114	150	100	Juvenile	Good	299162	6211770
Translocated	PB099	A2018-0172/7-112	40	30	Juvenile	Moderate	299162	6211770
Translocated	PB100	A2018-0172/7-18	120	50	Juvenile	Moderate	299162	6211770
Translocated	PB101	P2017-2068/2-41	130	70	Juvenile	Good	299162	6211770
Translocated	PB102	P2017-1049/1-31	180	100	Juvenile	Good	299162	6211770
Translocated	PB103	P2017-2068/2-13	60	40	Juvenile	Moderate	299162	6211770
Translocated	PB104	P2017-1049/1-33	220	150	Juvenile	Fairly Poor	299162	6211770
Translocated	PB105	A2018-0172/7-7	100	120	Juvenile	Very Good	299162	6211770
Translocated	PB106	A2018-0172/7-54	70	30	Juvenile	Moderate	299162	6211770
Translocated	PB107	P2017-2068/2-36	50	20	Juvenile	Good	299162	6211770
Translocated	PB108	P2017-2068/2-27	110	40	Juvenile	Good	299162	6211770
Translocated	PB109	P2017-2068/2-119	210	110	Juvenile	Good	299162	6211770
Translocated	PB110	P2017-2068/2-117	220	100	Juvenile	Good	299162	6211770
Translocated	PB111	A2018-0172/7-64	120	100	Juvenile	Good	299162	6211770
Translocated	PB112	P2017-1049/1-16	110	40	Juvenile	Moderate	299162	6211770
Translocated	PB113	A2018-0172/7-82	100	100	Juvenile	Good	299162	6211770
Translocated	PB114	A2018-0172/7-13	150	60	Juvenile	Good	299162	6211770
Translocated	PB115	A2018-0172/7-21	100	50	Juvenile	Good	299162	6211770
Translocated	PB116	A2018-0172/7-8	100	50	Juvenile	Good	299162	6211770
Translocated	PB117	A2018-0172/7-37	200	110	Juvenile	Good	299162	6211770
Translocated	PB118	A2018-0172/7-46	150	100	Juvenile	Good	299162	6211770
Translocated	PB119	A2018-0172/7-53	100	20	Juvenile	Very Poor	299162	6211770
Translocated	PB120	A2018-0172/7-42	150	30	Juvenile	Fairly Poor	299162	6211770
Translocated	PB121	P2017-1049/1-47	210	150	Juvenile	Very Good	299162	6211770
Translocated	PB122	P2017-1049/1-9	350	200	Juvenile	Very Good	299162	6211770
Translocated	PB123	P2017-1049/1-6	250	200	Juvenile	Very Good	299162	6211770
Translocated	PB124	A2018-0172/7-5	80	50	Juvenile	Moderate	299162	6211770
Translocated	PB125	P2017-2068/2-19	150	100	Juvenile	Good	299162	6211770
Translocated	PB126	A2018-0172/7-107	100	10	Juvenile	Poor	299162	6211770
Translocated	PB127	P2017-1049/1-12	200	200	Juvenile	Good	299162	6211770
Translocated	PB128	NOTAGE-78			Dead	Dead	299162	6211770

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:	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: 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 hirsute UOW will publish the outcomes from this work. We expect the final paper/s to be available mid-late 2018. The following research is underway with the Royal Botanic Gardens and Domain Trust: 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). *Managing and conserving native plant species in the mining environment - seed germination biology and alternative ex situ storage of Persoonia germplasm for restoration.* 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: 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: 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: 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
	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 P. hirsuta 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. *3.* PhD (Collaboration with Royal Botanic Gardens and Western Sydney University) titled *Addressing Drivers of Dieback in an Endangered Tree Species, Persoonia hirsuta (Hairy Geebung).* 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.
a. Document current understanding of *Persoonia hirsuta* ecology and genetics;	UOW honours project #1 - Thesis titled *The demography and Habitat Characteristics of the Endangered Persoonia hirsuta* by Stephanie Wilmott. Project was completed in October 2013. The study investigated the following: • 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 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.
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 *P. hirsuta*. 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;	Soil seed bank was investigated as part of project #1 as mentioned above. This study found that all of the sites where *P.hirsuta* populations were present were found to have high levels of disturbance. The type of disturbance and the level of disturbance *P. hirsuta* 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 *Persoonia* species seed, including temperature, chemical, physical and temporal treatments. Soil stored seed was also a topic of investigation in the UOW project #3. 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

Condition Requirement		Status
		to record the spatial and temporal pattern of post-fire seedling emergence in *P. hirsuta* 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). Illawarra Coal conducted an ecological burn within the West Cliff *Persoonia* Offset in April 2016. The aim of the burn was to promote germination of *P. hirsuta* 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.
iv.	Phenology and seasonal growth of *Persoonia hirsuta*	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).
v.	Population genetic structure, levels of genetic diversity, minimum viable population size and management actions	UOW honours project #2 - titled *Conservation Genetics of the Rare and Endangered Persoonia hirsuta (Proteaceae).* Project was completed July 2015 and investigated the following: • 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. Further research in this area continued under Honours project # 3 – Completed Nov 16. There were five major aims of this project: • Extract and amplify DNA of a reliable and workable quality from *Persoonia hirsuta* 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: o Verify that seed genotypes were reflective of the embryo, whilst not containing maternal DNA o 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 *Persoonia hirsuta* and its habitat; and	PhD (Collaboration with Royal Botanic Gardens and Western Sydney University) titled *Addressing Drivers of Dieback in an Endangered Tree Species, Persoonia hirsuta (Hairy Geebung).* 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.

Condition Requirement	Status
vii. Impact of fire on *Persoonia hirsuta* and its habitat	As mentioned above, *UOW Conservation Genetics*… (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 *P. hirsuta* 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 E: 2019/20 Appin West BioBank Site Annual Report

Landcare Australia

Annual Report for the NSW Biodiversity Conservation Trust 2019-2020

Appin West BioBanking Site (ID: 215)

Contents

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: 19 August 2020		Property address: 140 Douglas Park Drive, Douglas Park, 2569			
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: 29 April 2019, 16 Oct 2019, 5 Nov 2019 12 May 2020 6 August 2020	No stock observed in all management zones on each site visit. Grazing by stock animals continues to occur on the private property (to the north and south) without any known incursion into the site.	No other observed evidence of 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 Line (TL) easement and edges of MZ6 and MZ7 adjoining easement on each site visit using herbicide spot spraying, with a quick spray™ unit (in the TL) and hand-pulling of weed species listed in BioBanking Agreement (BBA) 215. Maintenance sweeps for key weed threats through MZ6 and MZ7. No access permitted to MZ4 and MZ5 due to the high cliffs and gorges, however no weeds observed in adjoining management zones during maintenance sweeps.	Ongoing herbicide treatment required in MZ1, MZ2, MZ3 and the transmission line easement for Blue Periwinkle, Paterson's Curse, Bridal Creeper, African Lovegrass, Stinking Roger, Spear Thistle, Fleabane, Paddy's Lucerne and other woody species such as Small Leaved 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.

				Herbicides have been used on the BioBanking site during 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).	
3. Management of fire for conservation	Ongoing	Yes	Quarterly site visits.	No evidence of recent fire activity during all five site visits (BBA suggests last burn/wildfire was in 2004). 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.	Heavy senescence of Acacia *spp*. (predominantly *A. decurrens*) in MZ1, MZ2 and MZ7. Fuel loads vary in all Management Zones but are at least 20 tonnes per hectare or greater across the site.
4. Management of human disturbance	Ongoing	Yes	Quarterly site visits. Specific site visit for illegal timber felling in MZ1 On 9 August 2019	Signage and fencing as per the BBA have been installed and are in good working order. In August 2019, a breach report was prepared and submitted to the BCT in regard to trespass and damage to the boundary fence and the illegal felling of CPW species including, Ironbark species. No additional waste has been observed on the site during quarterly site visits this year.	Access for management purposes includes South32 and Landcare Australia (land management contractor) staff. There is no ability for stock or unauthorized motor vehicles to access the site with the current exclusion fencing in place. Routine inspections conducted at each site visit to ensure fencing is secure and that there have been no incursions. Any incursions and associated impacts are reported to South32 and the BCT as per BBA.
5. Retention of native vegetation	Ongoing	Yes	Quarterly site visits.	Several CPW canopy species were illegally felled in MZ1 in August 2019. Some sections of the trees were removed from the site, no other evidence of vegetation being killed, destroyed or poisoned onsite occurred during this reporting period.	No evidence or observation of recent ringbarking or tree felling onsite (except for the reported incident) since commencement of the BBA).

6. Planting or seeding - maintenance	Ongoing	Yes	Ongoing at quarterly site visits and specific watering in MZ3 on 20 Aug 2019.	As per the Section 6.6 of the BBA, a planting program was 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. Currently there is a 90% success rate in survivability of the canopy species planted. However, the seedlings are being significantly grazed by native and non-native herbivores on the site (see Section 10, below). 225 of the remaining tubestock were watered as required during quarterly site visits and additionally on 20 August 2019 due to the persistent dry weather conditions at the time.	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. Specific site visit for illegal timber felling in MZ1 On 9 Aug 2019	As indicated in Section 4 (above) CPW canopy species were illegally removed. No additional timber has been introduced to the site since commencement of the BBA.	Observations made during maintenance sweeps for all zones during annual and quarterly sites visits.
8. Erosion control	Ongoing	Yes	Quarterly site visits.	No areas identified across the site that 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 in all areas except MZ3. Grazing in MZ3 is likely by wallabies, kangaroos and goats (no goat scats observed onsite to date).	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. No rabbit burrow/warrens found on property.	The pest management plan is not due for review until 2021.

				Numerous (generally inactive) wombat burrows also did not show signs of rabbits in residence. Fox scats were observed in the transmission line easement (29 April 2019, 6 August 2020). No goat scats have been observed during quarterly site visits. However, there is potential for goats to access the site (and graze in MZ3) as goats have been be sighted in the same gorge at another site serviced by Landcare Australia at Douglas Park	Liaison with Greater Sydney Region LLS is currently in progress so as to include the site in the regions upcoming Spring and Autumn fox baiting program due the presence of fox scats at 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**
Trespass and fence cut in MZ1 during August 2019 leading to Several CPW species illegally felled in MZ1.	Fence repaired and additional biobanking signage installed along the boundary fence to the site. Breach Report submitted to the BCT and recommendations completed
Observation that the boundary fence in eastern section of MZ1 had been damaged during a quarterly site visit on 6 August 2020	Unknown reason as why fence had been damaged (possibly from a tree) scheduled for repairs to be completed by 21 August 2020.

Records submitted with this report
☑ Photographs taken at the photo points set in the BioBanking agreement – see attached
☑ Results of the inspections required to be conducted in item 1.3 of annexure D to the BioBanking agreement – see attached
☑Results of any monitoring, inspections, surveys required in Annexures C and D to the BioBanking agreement – see attached

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:
Date: 11 August 2020	Date:

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 forked Eucalypt in NW corner of clearing / turning circle (25/10/17). New photopoint established and flagged in clearing (2/3/18).

PP#	Direction	23-25 October 2017	February 2018	February 2019	July 2020
PP1	N				
PP1	E				
PP1	S				

PP1	**W**				
PP2	**N**				
PP2	**E**				

PP2	**S**				
PP2	**W**				
PP3	**N**				

PP3	**E**				
PP3	**S**				
PP3	**W**				

PP4	**N**				
PP4	**E**				
PP4	**S**				

PP4	**W**				
PP5	**N**				
PP5	**E**				

PP5	**S**				
PP5	**W**				
PP6	**N**				

PP6	**E**				
PP6	**S**				
PP6	**W**