Annual Review
Sunnyside Coal Mine

Name of operation	Sunnyside Coal Mine
Name of operator	Whitehaven Coal Mining Pty Ltd
Development consent/project approval number	PA 06_0308
Name of holder of development consent/project approval	Namoi Mining Pty Ltd
Mining lease number	ML 1624
Name of holder of mining lease	Namoi Mining Pty Ltd
Water licence number	WAL 29537
Name of holder of water licence	Namoi Mining Pty Ltd
MOP start date	6 November 2018
MOP end date	5 November 2025
Annual review start date	1st January 2021
Annual review end date	31st December 2021

I, Andrew Raal, certify that this audit report is a true and accurate record of the compliance status of Sunnyside Coal Mine for the period January 1st 2021 until December 31th 2021, and that I am authorised to make this statement on behalf of Namoi Mining Pty Ltd.

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

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

Name of authorised reporting officer	Andrew Raal
Title of authorised reporting officer	Superintendent - Closed Mines
Signature of authorised reporting officer	
Date	27/06/2022

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TABLES

FIGURES

1 STATEMENT OF COMPLIANCE

The compliance status of the Sunnyside Coal Mine as at 31st December 2021 is summarised in Table 1a. Non-compliances that occurred during the reporting period are listed in Table 1b. Items from the 2019 Audit Action Plan, and their due date, are summarised in table 9

Table 1a Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
PA 06_0308 Consolidated	Yes
EPL 12957	Yes
ML 1624	Yes
WAL 29537	Yes

Table 1b Non-compliances

Relevant Approval	Schedule (Condition) Number	Condition Description (summary)	Compliance status	Comment	Where Addressed in Annual Review
None					

Note: Non-compliances identified within the Independent Environmental Audit undertaken during a previous reporting period (2019) are listed in Table 9.

Compliance status key for Table 1b

Risk level	Colour code	Description
High		Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium		Non-compliance with: • potential for serious environmental consequences, but is unlikely to occur; or • potential for moderate environmental consequences, but is likely to occur
Low		Non-compliance with: • potential for moderate environmental consequences, but is unlikely to occur; or • potential for low environmental consequences, but is likely to occur

2 INTRODUCTION

This is the twelfth Annual Review (AR), formerly Annual Environmental Management Report, produced for the Sunnyside Coal Mine (SCM), and it has been prepared in accordance with Conditions 4 and 5 of Mining Lease (ML 1624) (Mining Act 1992) and Condition 5 (Schedule 5) of PA 06_0308 (consolidated). The AR follows the format required by the NSW Government Annual Review Guideline (October 2015).

Covering the period from 1st January 2021 to 31st December 2021 (the reporting period), where relevant the AR provides information on historical aspects of the operation and longer-term trends in environmental monitoring results.

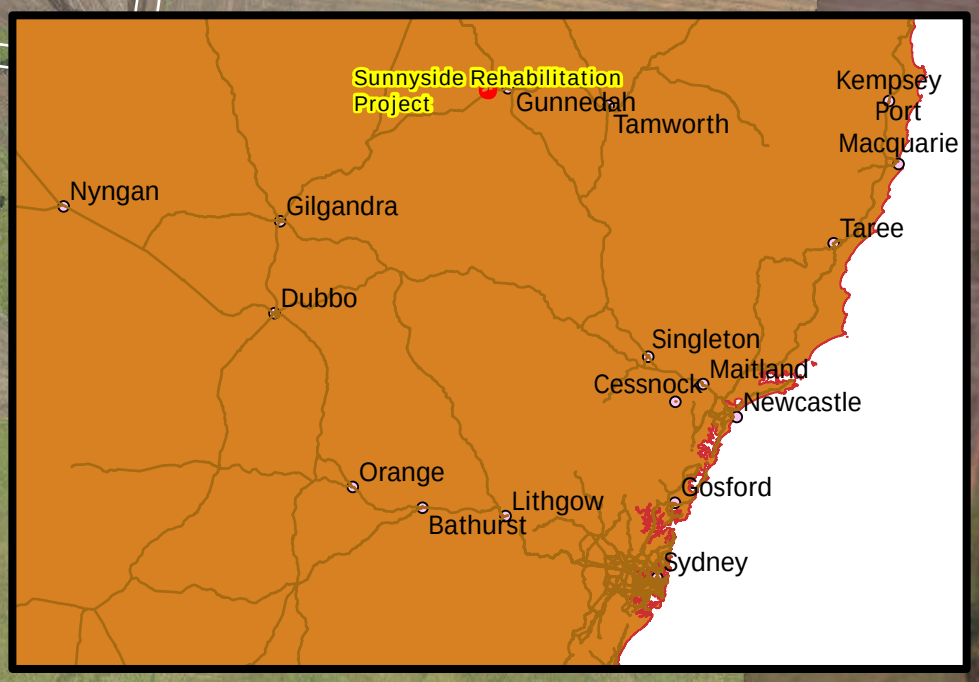
The Sunnyside Coal Mine is located within the Gunnedah Shire, approximately 15 km west of Gunnedah.The mine is owned by Namoi Mining Pty Ltd (NMPL) and operated by Whitehaven Coal Mining Pty Ltd. Both companies are wholly owned subsidiaries of Whitehaven Coal Limited (WCL).

Mining and coal transporting operations at SCM ceased in May 2013, with recommencement of mining activities on 12th September 2017. Mining operations for coal ceased in August 2019, with coal crushing and transporting activities ceasing on the 27th of October 2019. Site activities are currently limited to aftercare, maintenance, water management and rehabilitation.

2.1 Mine Contacts

The management personnel responsible for operational and environmental performance at the SCM and their relevant contact details are as follows:

- Mr Daryl Robinson, Environmental and Rehabilitation Manager Gunnedah Open Cut Operations, (02) 6740 7000.
- Mr Andrew Raal, Superintendent Closed Mines – oversees day to day environmental and rehabilitation performance across the site. Contact: (02) 6740 7009.



Datum: MGA Zone 56	Author: A.Raal	Image:	LiDAR, March 2021, UAV Dec 2021
Date: Jan 2022	Size/Scale: 1:7,000 (A3)		

Figure 1: Location
Sunnyside Rehabilitation Project

- ML1624 / EPL Boundary
- Conservation area (Koala Corridor)
- Final Depression High Wall
- Water Storage
- Koala Fence
- DA Disturbance Boundary
- SCM Extraction Extent
- Highwall Drain Design

MCR127: ~Spatial\ARCGIS\Sunnyside\Sunnyside.gdb

3 APPROVALS

3.1 Tenements, Licences, and Approvals

Table 3.1 identifies the approvals in place for SCM at the end of the reporting period, the issuing / responsible Authority, dates of issue, expiry date and relevant comments.

Table 3.1 Tenements, Licences and Approvals

Issuing / Responsible Authority	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
Department of Planning, Industry and Environment (DPIE)	Project Approval (PA) 06_0308	24th September 2008	Mining operations expire 5th November 2020, other conditions remain	PA modified December 2019 to update Annual Review period.
Environment Protection Authority (EPA)	Environment Protection Licence No. 12957	19th September 2017	N/A	Update to reflect recommencement of operations
Resource Regulator (NSW Resources and Geoscience (RR)	ML 1624	5th November 2008	5th November 2029	
Division of Resources and Geoscience	Mining Operations Plan (MOP)	6th November 2018	5th November 2025	Amendment A submitted (August 2020)
Department of Primary Industry - Water	WAL 29537 (90WA822534) 90BL253767 90BL253768 90BL253769 90BL254686 90BL254687 90BL254688 90BL254689 90BL254690	27th April 2009 9th Feb 2007 9th Feb 2007 9th Feb 2007 26th Mar 2008 26th Mar 2008 26th Mar 2008 26th Mar 2008 26th Mar 2008	17th January 2025 Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity Perpetuity	Licence to be transferred in 2022 Test Test Test Monitoring Monitoring Monitoring Monitoring Monitoring

4 OPERATIONS SUMMARY

4.1 Mining Operations

Mining operations during the reporting period included aftercare and maintenance of rehabilitation activities, with removal of non-fixed infrastructure. **Table 4.1** presents the production summary at the end of the reporting period.

Table 4.1 Production Summary

Material	Approved Limit	Previous Reporting Period (actual)	This Reporting Period (actual)	Next Reporting Period (forecast)
Waste Rock/Overburden	4.9 M m^3	0	0	0
ROM Coal/Ore	1 Mtpa [2]	0	0	0
Reject material	n/a	0	0	0
Saleable Product	n/a	0	0	0

[3] Environmental Assessment

[2] PA 06_0308 Consolidated

4.2 Other Operations

4.2.1 Hours of Operations

Rehabilitation activities were undertaken during the reporting period within permitted operating times, i.e. 7:00am to 10:00pm Monday to Friday and 7:00am to 6:00pm on Saturdays, and not on public holidays.

4.2.2 Infrastructure Management

All fixed infrastructure has been dismantled and removed including all bitumen from internal roads. Fuel tanks were removed.

Remaining infrastructure includes one demountable building, large amounts of poly pipe, heavy vehicle tyres, five water tanks, one non-operational generator and a koala fence. All remaining infrastructure (excluding koala fence) will be removed from site in the first half of 2022.

4.2.3 Exploration Drilling

There was no exploration drilling undertaken during the reporting period.

4.3 Next Reporting Period

Site is in aftercare and maintenance. The site gate has been locked and the site is only accessed for inspection and ongoing maintenance. Continue monitoring of rehabilitation trials for effectiveness of seed coatings which commenced in 2021. Authorisation for the highwall drain has been sought for the purpose of preventing

any run-on water from the Sunnyside hill from cascading down the highwall slopes. Remaining infrastructure will be removed from site in the first half of 2022.

5 ENVIRONMENTAL PERFORMANCE

The following sub-sections document the implementation and effectiveness of the various control strategies adopted at SCM, together with monitoring data for the reporting period. Existing monitoring sites are given in Figure 2. Life of mine monitoring data is included as Appendices in this AR, where relevant, to allow for discussion on longer-term trends.

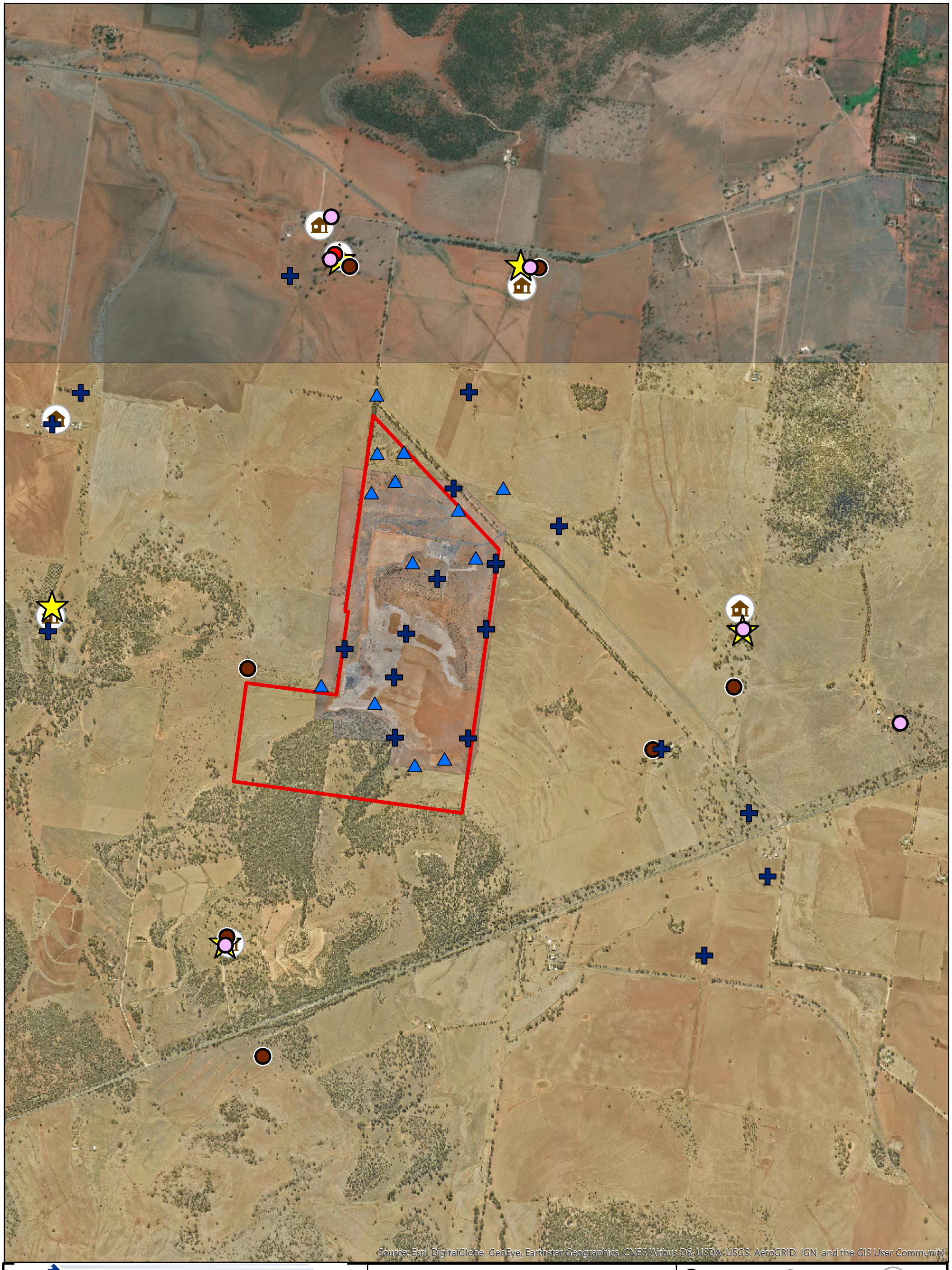
5.1 Air Quality

5.1.1 Criteria

Air quality criteria applicable to SCM are specified in PA 06_0308 (consolidated) Schedule 3, **Tables 7, 8 & 9**, which are summarised below.

- Acceptable mean annual increase in deposited dust – 2 g/m2/month.
- Mean annual dust deposition (all sources) – 4 g/m2/month.
- Mean annual Total Suspended Particulate (TSP) matter (all sources) concentration – 90 μg/m3.
- Mean annual PM10 particulate level – 30 μg/m3.
- 24-hour average PM10 particulate level – 50 μg/m3.

Monitoring of deposited dust is undertaken on a continuous monthly basis whilst PM_{10} levels are monitored every 6 days.



WHITEHAVEN COAL

Datum:	MGA Zone 56	**Author:**	A.Raal
Date:	February-2020	**Size/Scale:**	NTS

Sunnyside Sampling Locations

Noise
Groundwater Bores
Deposited Dust
PM10 HVAS
Surface Water
SCM Blast Monitors
Homestead
ML 1624
N

MCR016: C:\TempPath\zzzz\Spatial\ARCGIS\Sunnyside\Sunnyside.gdb

5.1.2 Environmental Management Measures

Sunnyside rehabilitation has been completed for all disturbed areas, and has good vegetation cover. No permanent mobile equipment on site.

5.1.3 Dust Monitoring

Deposited Dust

Annual average for all depositional gauges were below guideline levels of annual average of 4 g/m^2/month for all monitoring sites for the 2021 reporting period. Depositional dust monitoring data for the reporting period is given in **Table 5.1.3a.**

Table 5.1.3a Deposited Dust Monitoring Data Summary

Site (Figure 2)	EPL ID no.	Property Name	Approval Criteria Annual mean (g/m^2/month)	Annual Mean Total Insoluble Solids (g/m^2/month)
SD1	1	Ferndale	4	1.3
SD3	2	Plainview	4	1.1
SD4		Lilydale	4	1.4
SD5	4	Ivanhoe	4	1.2
SD6	5	Illili	4	1.0
SD7	6	Innisvale	4	0.9
SD8		Woodlawn	4	1.6

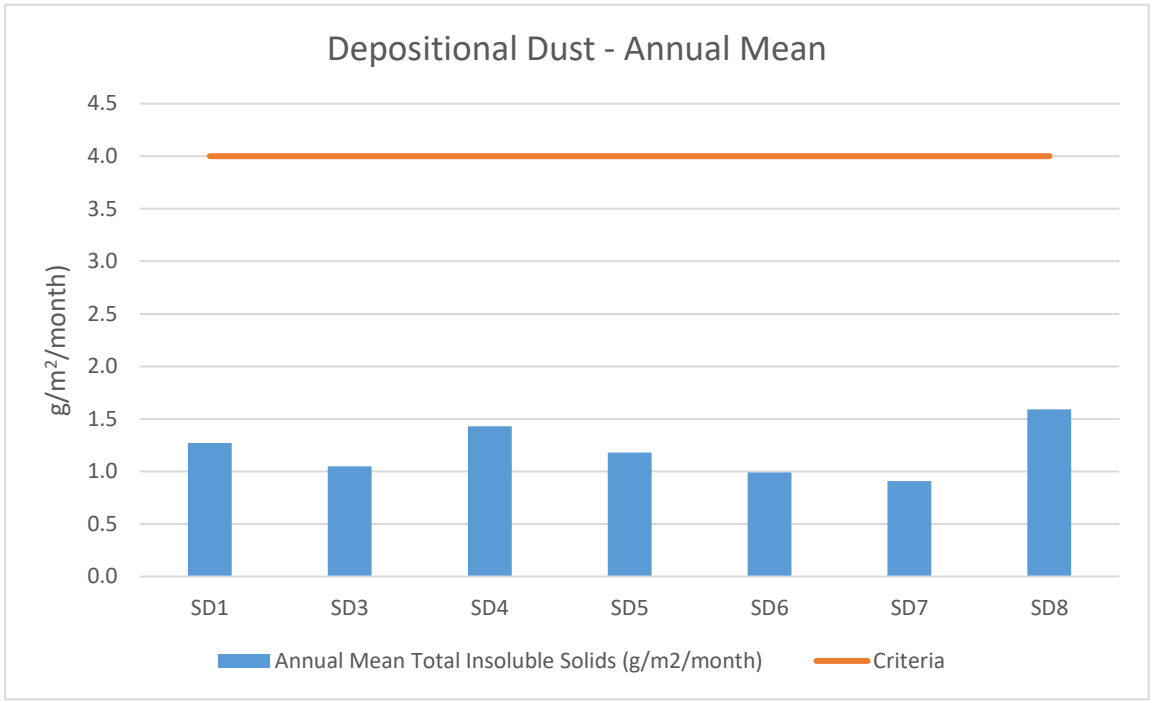


Figure 3 Annual Average Depositional Dust

HVAS/PM10 Dust

SCM has one High Volume Air Sampler (HVAS - PM_{10}) located at the property Illili (EPL ID 7), to the north-west of the mine site which takes a sample every 6 days for a 24h period. The annual mean value for 2021 was 6.57 µg/m³ within the EA annual prediction of 22.1 µg/m³. Sixty-one samples were taken with 0 events that were over the 24h 50 µg/m³ guideline limit (**Table 5.1.3b**).

Table 5.1.3b PM10 Monitoring Summary

Month	PM10 (µg/m³)					
Jan	3.4	4.8	16.4	11.	18.7	
Feb	3.3	9.9	9.4	2.9	6.8	
Mar	12.5	9.	14.4	1.3	3.5	
Apr	8.8	9.9	17.2	9.2	14.8	
May	4.5	0.8	3.7	6.3	1.5	
Jun	13.4	2.4	<0.1	1.6	<0.1	
Jul	<0.1	4.9	1.5	<0.1	0.8	5.4
Aug	4.2	<0.1	3.7	6.9	2.	6.8
Sep	<0.1	12.7	12.1	5.9	7.	
Oct	10.	1.1	9.4	6.	10.8	
Nov	7.1	9.8	25.5	2.2	3.6	
Dec	7.1	9.8	25.5	2.2	3.6	

The 12-month rolling average particulate matter (PM10) for 2021 is illustrated below (**Figure 4).**

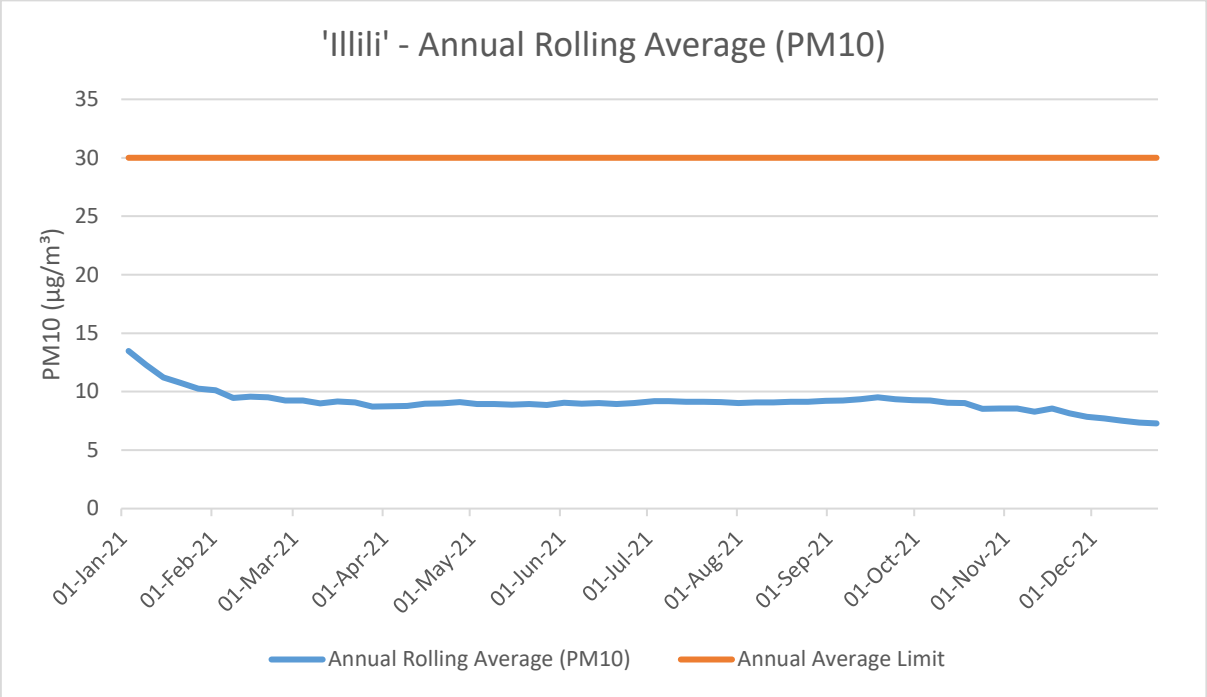


Figure 4 Illili PM10 Annual Rolling Average (full data set)

5.1.4 Key Environmental Performance/Management Issues

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

5.1.5 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period, as activities will be limited to aftercare and maintenance.

5.2 Biodiversity

5.2.1 Threatened Flora

Investigations into the occurrence of threatened flora within the Project Approval Area were undertaken as part of the Environmental Assessment by Geoff Cunningham Natural Resource Consultants Pty Ltd in 2007, following field surveys in October and December 2006. The investigation identified no significant impact on threatened flora species, endangered ecological communities, endangered flora populations or critical habitat as a consequence of the development, either because they do not exist in the area or avoidance is possible due to project design.

Investigations identified a remnant of the White Box Yellow Box Blakely's Red Gum Woodland endangered ecological community within the study area but concluded that it would not be affected in any significant manner by the mine.

A remnant of the Native Vegetation on Cracking Clay Soils of the Liverpool Plains endangered ecological community was also identified within the study area. It was

noted that a small section of this community would be temporarily affected by the Coocooboonah Lane re-alignment but the community would be rehabilitated and enhanced following rehabilitation after mining ceases. It was assessed that this action, due to its temporary impact and final environmental enhancement, would not require approval under the Commonwealth EPBC Act.

Much of the area has been cleared in the past and most of this cleared area has been cultivated. The vegetation on the cleared areas has been invaded by introduced species. The establishment of the mine site did not involve clearing of native vegetation and as such no biodiversity offsets were required.

5.2.2 Threatened Fauna

Investigations into the occurrence of threatened fauna within the Project Approval Area were undertaken by Kevin Mills and Associates as part of the Environmental Assessment, following surveys conducted in September 2006. These investigations identified that the proposed development was unlikely to significantly affect any of the threatened species, fauna populations or communities listed under the Threatened Species Conservation Act 1995, or their habitats.

It was also concluded that development of the mine was not likely to have a significant impact on any matter of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act 1999*. Referral to the Commonwealth Minister for the Environment for assessment and approval was therefore not warranted.

The area surrounding the mine site supports a viable koala population. NMPL has undertaken a number of measures to minimise the impacts on this population, including:

- Relocating the southern section of Coocooboonah Lane to avoid disturbing remnant koala habitat;
- Erecting a koala-proof fence around the active mine area;
- Minimising clearing and utilising local tree species for revegetation with an emphasis on koala feed trees. This has continued since the last reporting period with koala feed trees planted in koala corridor.

5.2.3 Ecological Monitoring

Introduction

A detailed annual ecological assessment of rehabilitated areas and analogue sites was undertaken by Aspect Ecology Pty Ltd in October 2021. Monitoring was undertaken using the Whitehaven Annual Rehabilitation Monitoring Methodology (WARMM—Aspect Ecology 2020a).

Monitoring in the Woodland Domain comprised:

- One repeat analogue grassy white box woodland site;

- Two newly established analogue grassy white box woodland site; and
- Eight woodland rehabilitation structural sites:
    - Six repeat monitoring plots within the rehabilitation years 2010, 2011, 2012 and 2013;
    - Two newly established sites representing rehabilitation seasons 2019 and 2020/1; and
- One categorical point assessment, captured for the purpose of monitoring a polygon that did not have a structural site.

Monitoring in the Pasture Domain comprised:

- One repeat analogue site;
- Two newly established analogue sites in adjacent pastures;
- Two repeat monitoring transects, one in each rehabilitation establishment years 2019 and 2020 (first monitored in 2020); and
- Seven newly established monitoring transects in 2020 and 2021 rehabilitation; and
- Twelve categorical point assessments at notable locations within the Pasture rehabilitation, aimed at highlighting priority areas and further improving rehabilitation data spatial coverage.

Woodland Domain - Groundcover

Native vegetation, leaf litter and mulch and are collectively termed "vegetative surface cover" (CMOP tbl 17 & 25). As exotic vegetation is at odds with the Woodland Domain objective, it's contribution to cover was excluded from assessment against cover target. The completion criteria state that vegetative surface cover is to be greater than 85% (CMOP tbl17).

All values observed in the rehabilitation in 2021 were below the minimum completion criteria value of 85% **(Figure 5).** The target value observed in analogue sites for local PCT 589 in 2021 exceeded completion criteria value, with 91.5% vegetative cover observed. Total ground cover (native and exotic) increased steadily through the three survey years in 4 out of 5 rehabilitation sites, with the proportion of bare earth inversely declining. The exception was the 2013 rehabilitation site, where total cover increased between 2019 and 2020 then remained stable between 2020 and 2021 **(Figure 5).**

Figure 5 Average Percentage Cover of Groundcover Components within each Rehabilitation Year at Sunnyside Coal Mine, comparing 2019, 2020 and 2021 Monitoring Seasons.

Tree Density < 2m

Tree density ***< 2m*** comprised mostly of seedling planted in 2020, with a few individuals from previous planting campaigns and further follow-up plantings in 2021. The highest seedling densities were found in the SSR19114 (60 stems/ha) and SSR1994 (70 stems/ha). This reflects the relatively high density of seedling plantings carried out in sections of the 2010 rehabilitation in 2020, which was warranted due to the low density of established trees in that rehabilitation year.

Site SSR19114 (first seeded in 2010) exhibited a density of 70 stems/ha which has remained constant since the previous survey in 2020, indicating low levels of seedling mortality. At site SSR19114 (first seeded in 2010) the density had increased substantially from the 10 stems/ha recorded in 2020; this is due to the presence of new seedlings— *Brachychiton populneus*— most probably representing those planted in July 2021. In contrast, the density of seedlings at site SSR19104 (seeding

commenced 2010) had declined substantially from 50 stems/ha to 10 stems/ha and the rehabilitation site where seeding commenced in 2011 also exhibited a decline in seedlings from 30 stems/ha to 0 stems/ha; both indicating seedling mortality at these locations with no individuals recruited in the >2 m height class. The density of trees in the > 2m height class in fact decreased for the 2011 rehabilitation site **(Figure 7)**. The 2012 rehabilitation site had a moderate decline in seedling density, reducing from 20 stems/ha to 10 stems/ ha, while the site where rehabilitation commenced in 2013 remained at 0 stems/ha. It should be noted that the low densities of seedlings in years 2011–2013 is not of concern as these areas have high densities of established saplings **(Figure 7).**

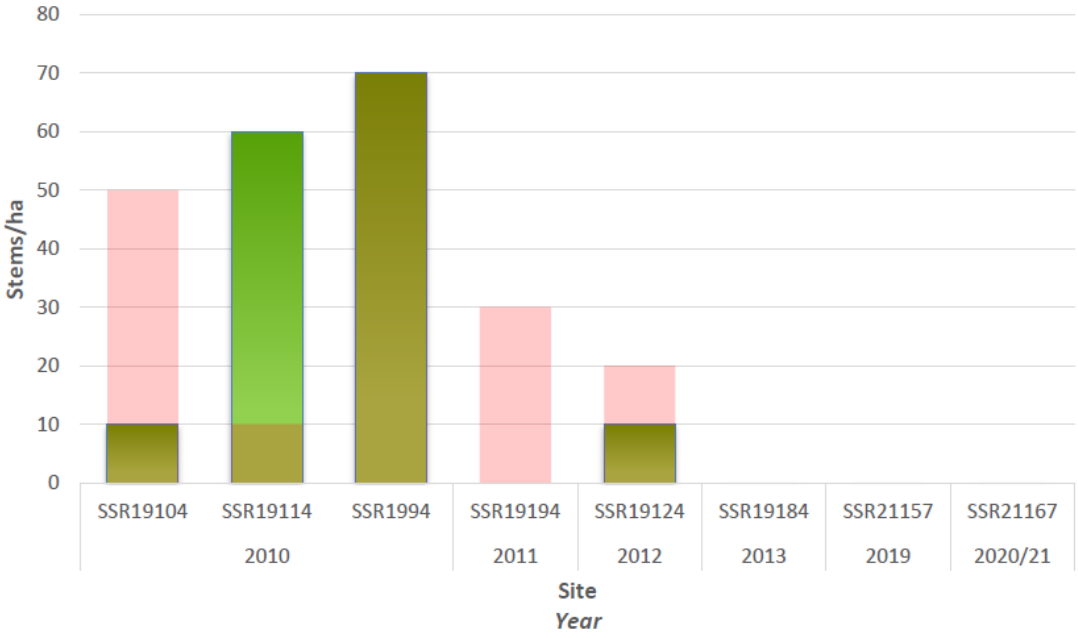


Figure 6 Density of tree seedlings within rehabilitation sites at Sunnyside Coal Mine, grouped by year seeded. Semi-transparent red represents a decrease in density between 2019 and 2021 monitoring events, solid light green represents an increase.

> 2m Tall Tree Density

The greater than 2m height class is relevant to the older Woodland rehabilitation (years seeded 2010–2013). Density of trees >2m tall was relatively stable between the 2019 and 2021 monitoring events. The 2011 rehabilitation site saw a moderate decline, and there was a slight decline in the 2010 site SSR19114. The 2010 site SSR1994 exhibited an increase in density due to trees recruiting from the <2m cohort; the 2012 rehabilitation site also saw an increase in density.

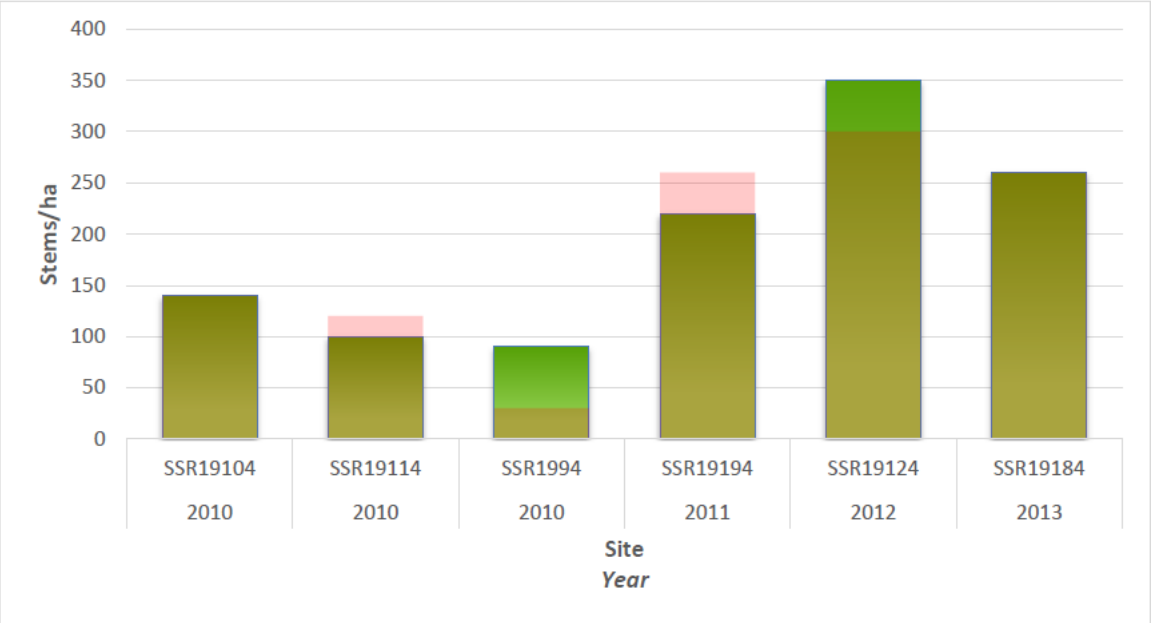


Figure 7 Density of trees greater than 2 m tall within older rehabilitation sites at Sunnyside Coal Mine, grouped by year seeded. Semi-transparent red represents a decrease in density between 2019 and 2021 monitoring events, solid light green represents an increase

Fauna

Noted habitat features included occasional small rocks and the developing tree canopy, with stag tree emplacements at one site. Native animals sighted included Eastern Grey Kangaroos and numerous birds. Macropods scats were almost always present within sites. Feral animal traces were common and included rabbit and pig scats, and one pig carcass.

Conservation Domain

No additional work was done in the Koala corridor areas.

Pasture Domain - Groundcover

The average combined total of bare ground and litter exceeded the completion criteria minimum of 85% within all pasture rehabilitation sites surveyed at Sunnyside Mine. Between 2020 and 2021, vegetative cover values increased in the single repeat monitoring site established in 2019. Meanwhile, over the same period, vegetative cover values decreased in pasture rehabilitation established in 2020.

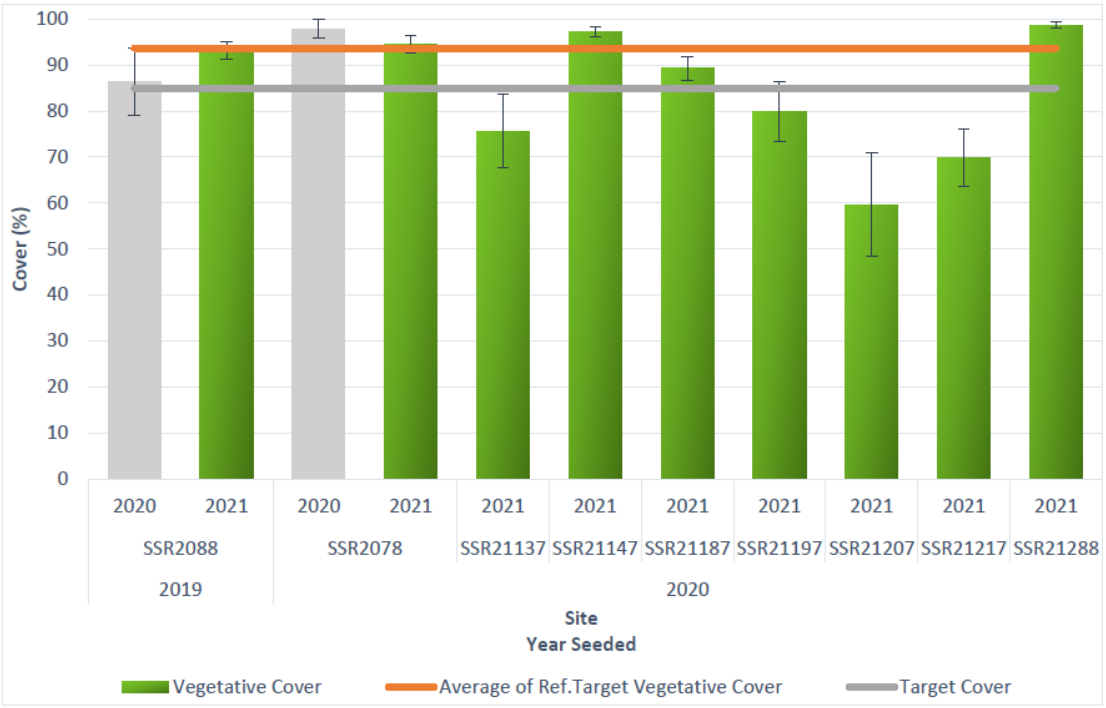


Figure 8 Combined Pasture completion criteria ground cover components (vegetation, leaf litter, and mulch) at Sunnyside Mine. Line shows minimum MOP completion criteria target of 85%. Bars show standard error of the mean.

Groundcover at pasture rehabilitation sites in SCM was mostly very high with almost 42% of all sites exceeding 91% total groundcover. One third of all RPA sites had 81–90% total groundcover present. Fewer sites had 61% to 80% total groundcover and no sites had 60% or less cover (**Figure 9**).

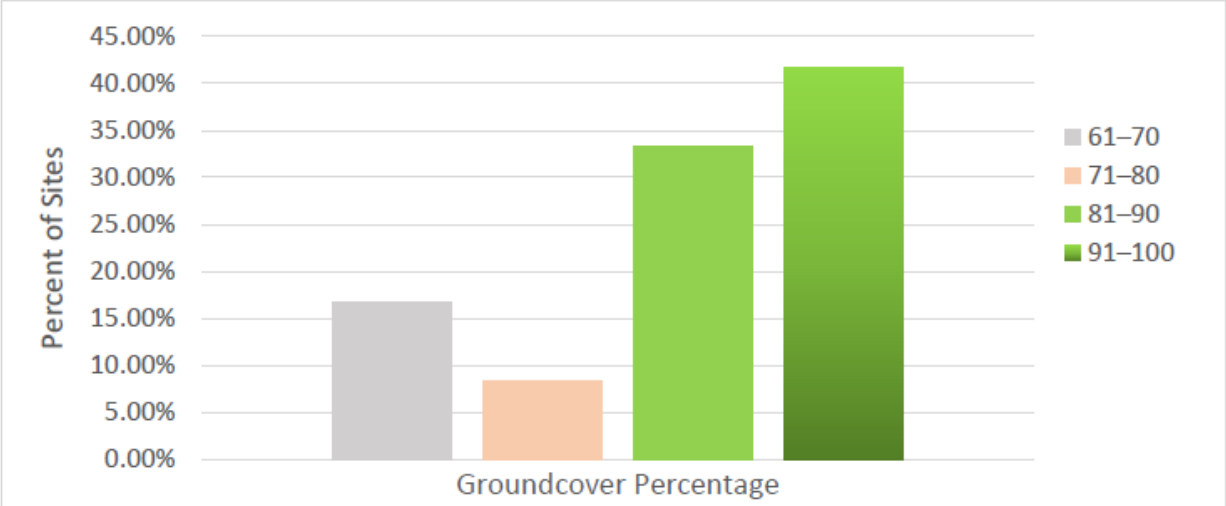


Figure 9 Groundcover of woodland sites at Sunnyside Mine, grouped into 10% increments. Bar height represents the percent of total sites with that cover range.

Species Composition

Exotic grasses in the pasture domain at SCM were usually abundant at 42% of RPAs and common at a further 25% of sites. Sites with low exotic grass cover were rare with only 8% each having rare or occasional classifications. Exotic weeds in the pasture domain at SCM were classified as occasional at 50% of sites and common at a further 16% of sites. Weeds excluding exotic grasses were also rare at 16% of RPA sites.

Recommendations

It is recommended that:

- Additional tree seedling plantings be carried out where there has been high seedling mortality, especially in the 2010 rehabilitation in the vicinity of site SSR19104;
- Take steps to improve native Woodland groundcover diversity, using species recorded in the analogue sites once the necessary techniques are determined.
- Eradicate grass weeds from 2019 and 2020 Woodland rehabilitation; and
- Monitor Pasture rehabilitation dominated by oats for the establishment of perennial grasses and introduce supplementary seed of appropriate species if necessary.

Refer to Table 12.1 in Appendix 1 that outlines recommendations based on the annual ecological report findings, addressing specified actions within the CMOP Trigger Action Response Plan.

5.2.4 Weeds

TDA undertook weed inspections and treatment at Sunnyside Mine in October 2021. The main weeds treated on site was Broadleaf weeds located near the front gate and side of hill. Other weed species that were treated include Marshmallow, Smooth Mustard, Sticky beaks, Russian Vetch, and Onion Weed. Weed treatment was carried out using a spot spraying method.

5.2.5 Feral Animal Control

Two camera traps were monitoring during the reporting period to monitor wildlife numbers and movement at Sunnyside. Results indicated Wild dogs (0), Rabbits (22), Cat (6) and Deer (0), a low population of Hare (44) and Foxes (62) a medium population of Pigs (29) and high abundance or kangaroos (286).

Fox baiting using 1080 was undertaken in March, June and July 2021, baits were checked weekly and replaced. Of the baits laid in March, 26% were effective, 33% were effective in June and only 11% were taken up in July. Higher bait take up is likely due to more feed been available due to high rodent numbers in the area.

5.2.6 Koala Management

During the reporting period no koalas were spotted onsite by mine personal. AMBS Ecology & Heritage undertook two nights of koala spotting with thermal cameras in December 2021, and utilised a thermal drone. No Koalas were found on the mining lease during the survey.

One koala was picked up on drone survey to the south of the mining lease.

A total of 1,213 Hiko seedlings were planted on void slopes and overburden dump.

5.2.7 Performance/Management Issues

No major issues.

5.2.8 Proposed Improvements to Environmental Management

In response to the recommendations outlined in section 5.2.3, Whitehaven Coal commit to the following;

- Undertake a field survey to confirm areas of rehabilitation where tree seedlings have high mortality rates.
- Using results from the annual ecological assessment and field survey, a re-planting plan will be developed and executed if required.
- Consult with Agronomist to address weeds.
- In addition to annual ecological monitoring, rehabilitation will continue to be monitored on a monthly basis and reported on within the monthly inspection checklist, to ensure rehabilitation areas are reflecting species presence and abundance of analogue sites.

Improved rainfall has led to improved grass cover and vegetation cover. A strategy to manage tropical grasses and increase the number of native grass species within Woodland areas is being developed.

5.3 A vegetation trial on seed coating commenced in 2021 and is discussed in section 8.1.1. Blasting

There is no further blasting to occur on site.

5.3.1 Proposed Improvements to Environmental Management

No improvements are proposed for the next reporting period. All blasting at the mine site has ceased. Blast monitors have been decommissioned and removed.

5.4 Operational Noise

5.4.1 Criteria

Operational noise criteria for SCM are specified in PA 06_0308 and EPL 12957, as follows:

Table 5.4.1 Operational Noise Criteria

Location	Day	Evening
	$L_{Aeq\ (15\ min)}$	$L_{Aeq\ (15\ min)}$
All privately-owned land	35	35

5.4.2 Environmental Management Measures

Control of noise generation and propagation at the mine is by a combination of general source and propagation path methods including:

- There is no longer any bulk haulage or movement of material on site. Only activities are aftercare and maintenance
- No afterhours work carried out
- No general maintenance of equipment on site

5.4.3 Noise Monitoring Results

Approval to no longer carry out attended noise monitoring was received from the EPA and the Noise management plan was amended accordingly and was approved by DPIE in September 2020. There were no noise complaints registered for the reporting period and no attended noise monitoring results recorded.

5.4.4 Key Environmental Performance/Management Issues

Any maintenance or aftercare activities are to be within daylight hours.

5.4.5 Proposed Improvements to Environmental Management

None. There is no permanent equipment stationed on site. Any maintenance activities will be during day hours.

5.5 Waste Management

During the reporting period there were no activities onsite requiring additional material brought to site and no additional waste produced. There is no equipment onsite requiring a maintenance monitoring. Due to no waste generated by the site during the reporting period, there is no activity to base a comment on the effectiveness of the waste management process as defined in the Sunnyside Coal Mine WMP.

All waste will be removed off site in the first half of 2022, this includes;

- Removal of polypipe for reuse at another mine site
- Heavy vehicle tyres will be sent to recycler

5.6 Aboriginal Heritage Management

5.6.1 Environmental Management Measures

An assessment of the cultural heritage of the mine site was conducted by Archaeological Surveys and Reports Pty Ltd (ASR). Prior to the investigation, ASR contacted the Red Chief Local Aboriginal Land Council (LALC) and Bigundi Biame Gunnedarr Traditional People to arrange for site officers to assist in the survey. A representative from each group was present for the site survey conducted on the 12th September 2006 and the coal transport route survey on the 7th December 2006. The ASR assessment was used in the preparation of the Environmental Assessment for the mine, undertaken by R.W. Corkery & Co. Pty Ltd on behalf of Namoi Mining Pty.

Four sites were recorded during the investigation, as detailed in 7.5.2. Only one site (AGG1) was recorded within the mine site while the three isolated artefact sites were identified to the south of the mine site.

All Aboriginal Heritage sites are managed in accordance with the Sunnyside Coal Mine Aboriginal Cultural Heritage Management Plan, prepared in accordance with Schedule 3 Condition 32 of PA 06_0308 Consolidated.

5.6.2 Consultation

No soil stripping of previously undisturbed areas took place during the reporting period. No additional Aboriginal cultural heritage items were discovered during the reporting period and no consultation with Aboriginal stakeholders was conducted. Known heritage sites are listed in **Table 5.6.2**. A review of heritage sites found that site OS1 was not previously registered. It was reinvestigated by consultant Archaeologist (Whincop archaeology) and the site was registered with AHIMS in July 2020 as Sunnyside – OS1.

Table 5.6.2 Aboriginal Artefacts

Site Name	Site Type	Site Description/Comments
Sunnyside AGG1	Axe Grinding Groove	Axe grinding groove at the rim of a cliff-like scarp (beside a small water-filled natural depression in the rock). Dimensions: 28cm (L) x 6cm (W) x 2cm (D). Located approximately 150m from the southern side of the open cut area.
Sunnyside ISO1	Isolated Artefact	Flake with possible retouch to one margin located on the bank beside the upper reaches of a dry creek (on a vehicle track). Dimensions: 21 x 12 x 3mm
Sunnyside ISO2	Isolated Artefact	Proximal fragment of a flake located on the bank beside the upper reaches of a dry creek. Dimensions: 22 x 22 x 5mm.
Sunnyside OS1	Artefact Scatter	Artefact scatter of at least ten artefacts in a lozenge-shaped area of 30 x 8m, on the upper slopes down slope of a contour bank down slope of a saddle. Artefact types: flakes and flaked pieces, including a backed blade.

Source: Modified after ASR (2007) – EA SCSC Part 7

5.6.3 Key Environmental Performance/Management Issues

The preservation conveyor belt strip was removed from the axe grinding grove that is located south of the mine pit, as blasting is no longer taking place. Inspections found no impact on the heritage site.

5.6.4 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

5.7 Natural Heritage

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

5.8 Spontaneous Combustion

5.8.1 Environmental Management Measures

A carbonaceous test procedure was developed to identify and manage any carbonaceous material within 5m of the final landform. A total of 99 test pits to identify carbonaceous material with potential for spontaneous combustion were dug to at least 5m below final landform in 2020. All carbonaceous material buried on site in +5m below final landform.

5.8.2 Key Environmental Performance/Management Issues

No incidence of spontaneous combustion occurred.

5.8.3 Proposed Improvements to Environmental Management

As final rehabilitation has been completed and conformation that there is no material with a potential for spontaneous combustion within 5m of the final landform, no further management activities are required.

5.9 Bushfire Management

5.9.1 Environmental Management Measures

SCM is located within an area of cleared agricultural land.

Measures to deal with bushfires include the following;

- Hot work permit system to manage activities that could potentially cause fire.

- Whitehaven Coal have engaged a firefighting contract company LRM Fire and Rescue on a retainer bases to assist in case of any fire breakout.

5.9.2 Key Environmental Performance/Management Issues

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

5.9.3 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

5.10 Environmental Performance Summary

An environmental performance summary for SCM is presented in Table 5.10.

Table 5.10 Environmental Performance

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / Key Management Implications	Implemented / proposed management actions
Air Quality	Refer Section 6.1.1	No recorded PM10 exceedances of the 24h limit of 50 µg/m³.	Nil.	Ongoing implementation of the Air Quality Management Plan.
Biodiversity	EIS prediction of no impact on known koala population.	No recorded impact on koala population. No koala deaths recorded onsite.	Nil	Additional tree planting in the koala corridors
Heritage	EIS prediction of potential blast impact on a recorded site.	No recorded impact on site.	Nil	Blasting has ceased on site
Spontaneous Combustion	EIS prediction of no material spontaneous combustion	No in-pit spontaneous combustion found during the year.	Nil	Test pitting for carbonaceous material to ensure no material with potential for SponCom within 5m of final landform has been completed.
Noise	35dB	No exceedances	Nil	Site activities limited to aftercare and maintenance.
Blasting	<115dB overpressure	No exceedances	Nil- all blasting has ceased.	Nil.

6 WATER MANAGEMENT

The SCM lies within the catchment of the Namoi River. The majority of the surface water runoff flows northwards across the mine site. It then flows into Coocooboonah Creek which flows north-west within a constructed waterway paralleling Coocooboonah Lane. From there, it flows into Rock Well Creek then into Native Cat Creek which continues to flow north-west for 6km. Runoff then flows northwards within Collygra Creek where it flows across a floodplain area before flowing into the Namoi River some 25km north of the Mine Site. The remainder of the mine's surface water flows south into Coocooboonah Creek ultimately flowing into the Namoi River to the north.

The design of sediment dams is to prevent off site runoff of water with TSS values above guideline levels. There are no longer any exposed surface areas on site generating high sediment runoff.

Two wet weather discharge points are nominated in the current EPL 12957. These are Storage Dam 3 (EPL ID No. 9) and Storage Dam 4 (EPL ID No. 10). Two additional monitoring points are nominated on the EPL for water quality monitoring during discharge events. These are Coocooboonah Creek Upstream (CCUS – EPL ID No. 11) and Coocooboonah Creek Downstream (CCDS – EPL ID No. 12).

6.1.1 Surface Water Management

All sediment basins, storage dams and associated banks and drains have been designed and constructed in accordance with the *Managing Urban Stormwater: Soils and Construction Vol 2E Mines and Quarries* (DECC, 2008) in conjunction with the references to Volume 1 (Landcom, 2004).

6.1.2 Surface Water Monitoring Results

SCM has a requirement to undertake surface water monitoring on a quarterly basis in addition to the monitoring of any wet weather discharge event.

Summary of water quality results are given in **Table 6.1.2**, and complete surface water quality monitoring results are provided in Appendix 1.

Table 6.1.2 Summary Surface Water Monitoring Results

Storage	No. Samples	Annual Average Oil and Grease	Annual Average Conductivity µS/cm	Annual Average pH
SD4	4	<5	402.5	7.9
Production Bore Dam	0	Dam removed		
Void	0	Dam removed, void is free draining		
SB4	3	<5	294	7.8
SD3	0	Dam dry during sample runs		

SB2	4	<5	274	8.12
SD2	0	Dam removed		

Quarterly monitoring results show that water quality within onsite storages was generally consistent with historical analysis. SD3 was dry when quarterly sampling was conducted for the reporting period. As part of rehabilitation non-essential dams were removed this included SD2, Production Bore dam and the Void was backfilled (Nov 2020) above groundwater level.

There were no wet weather discharges during the reporting period.

6.1.3 Key Environmental Performance/Management Issues

No non-conformances or changes were made to surface water management program during the reporting period.

6.1.4 Proposed Improvements to Environmental Management

No improvements are proposed within the next reporting period.

6.1.5 Water Take

SCM groundwater licence (WAL 29537) is for 120 units from the Gunnedah - Oxley Basin. Licence is planned to be transferred during the next reporting period. There was no water take during the reporting period.

Water storage on site at end of reporting year was 14.92 ML from rainfall capture after record third quarter rainfall. Dams with water included SD3 (1.7ML), SD4 (3.52ML), SB4 (3.6ML), SB2 (6.12ML).

6.2 Groundwater Management

6.2.1 Environmental Performance/Management

The mine's performance with respect to groundwater performance/management, the prevention of pollution, and the assessment of impacts on groundwater availability to other surrounding users, has been assessed through groundwater level and chemistry monitoring undertaken at a series of piezometers and bores within the Project Area and adjacent properties.

6.2.2 Groundwater Monitoring

The details of groundwater monitoring throughout the reporting period are listed in

Table 6.2.2**.** Complete monitoring datasets are provided in Appendix 2.

Groundwater sampling and analysis was undertaken by Acirl Pty Ltd (ALS) during the reporting period. Below are some points to note regarding monitoring locations and frequencies:

- Bore 27356 has not been monitored since June 2012. The windmill located over the bore has been dismantled and removed from site.
- Standing Water Level (SWL) data is unavailable for bores 27356, 44884, 3709
- Werona bore pump was last used in 2019. Since then the bore pump and generator have been removed. As of March 2021, water levels were at 19.66 mbgl.

Table 6.2.2 Groundwater Monitoring Points

Site ID (see Figure 2)	Registered Bore No. & Licence No	Property/ Location	Frequency		Purpose
			SWL*[2], EC*[3] and pH	Representative Metals and Ions	
P1*[1]	GW968386 90BL253767	"Plainview"	Quarterly	Six monthly	To determine existing status and any impacts
P2*[1]	GW968387 90BL253768	"Ferndale"	Quarterly	Six monthly	
P3	GW968388 90BL253769	"Sunnyside"	Quarterly	Six monthly	
P7	GW968392 90BL254689	"Sunnyside"	Quarterly	Six monthly	To determine existing status and any impacts
P8	GW968393 90BL254690	"Sunnyside"	Quarterly	Six monthly	
3709*[1]	N/A	"Ivanhoe"	Quarterly	Six monthly	
22497*[1]	N/A	"Coocooboonah"	Quarterly	Six monthly	
44677*[1]	N/A	"Werona"	Quarterly	Six monthly	

44884*[1]	N/A	"Lilydale"	Quarterly	Six monthly	
6249*[1]	N/A	"Lilydale"	Quarterly	Six monthly	
901460	GW901460 90BL249138	"Illili"	Quarterly	Six monthly	To determine existing status and any impacts
27356	GW027356 90BL020042	"Sunnyside"	Quarterly	Six monthly*[5]	
45061	N/A	"Coocooboonah"	Quarterly	Six monthly	
Werona Production	90BL255246	"Werona"	Quarterly	Six monthly*[5]	
*[1] Non-Company owned bore		*[2] SWL – Standing Water Level		*[3] EC = Electrical Conductivity	
*[4] Company production bore		*[5] – Not available this reporting period due to lack of access			

6.2.2.1 Groundwater levels

Groundwater levels have remained stable with slight rise in sync with increased rainfall at year end. Mine void was closed and made free draining in December 2020.

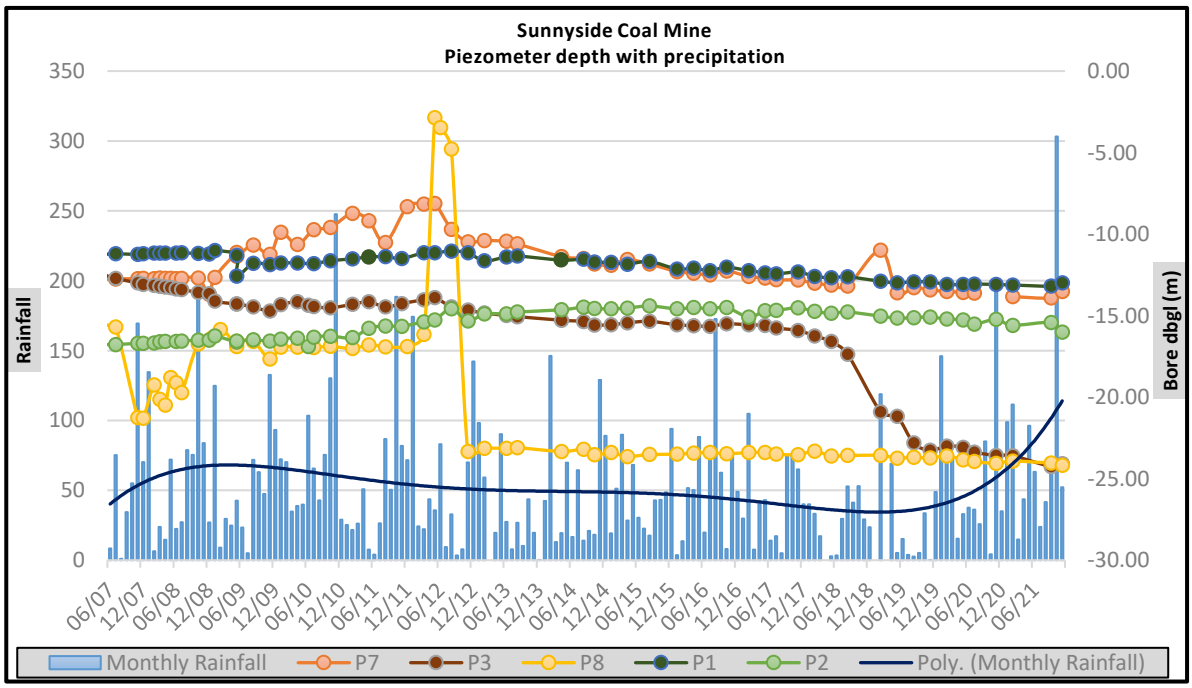


Figure 10 Monitoring piezometer water depth

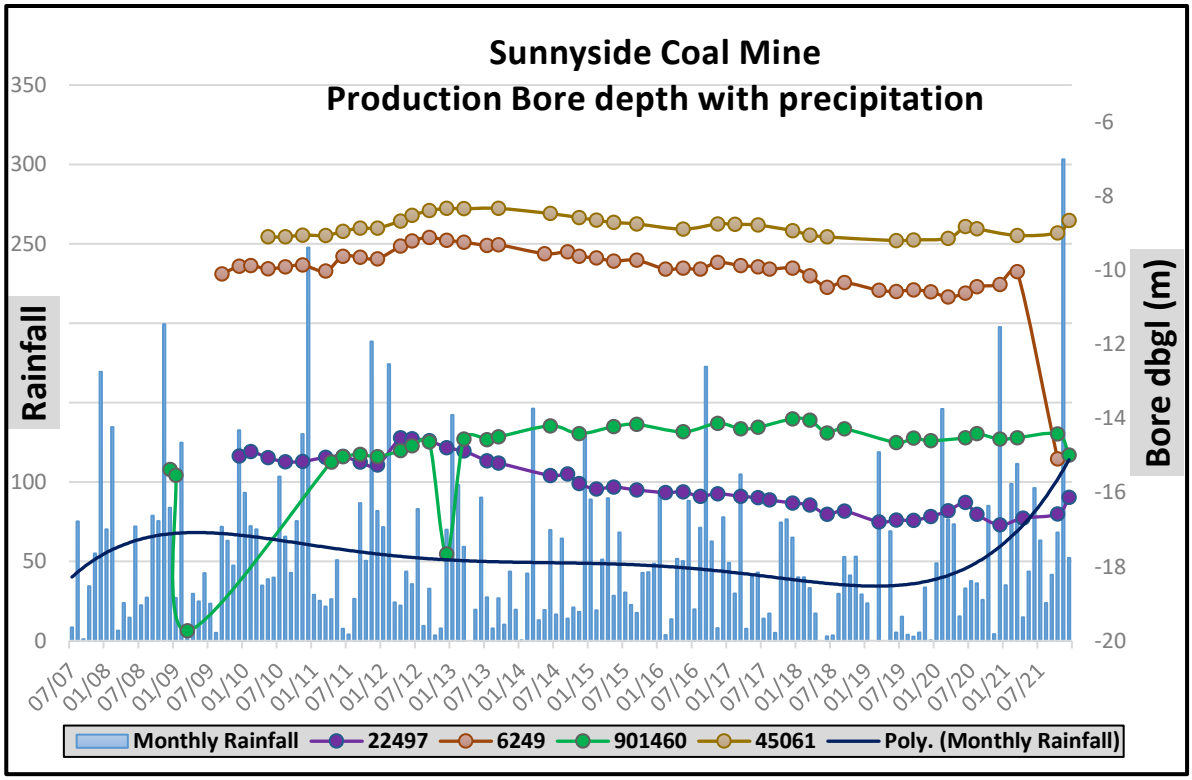


Figure 11 Production bore water depth

6.2.3 Groundwater quality

Analysis of samples taken during the reporting period has shown that groundwater quality has remained generally in line with historical data at most locations monitored. Production Bore 6249 was equipped with new pump by landowner. Readings take in October and December 2021 found the bore to be dry this is likely due to pumping for agricultural purposes. Production Bore 901460 recorded a drop of 0.57m. Water quality has been compared to the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) (ANZECC) guidelines for stock watering (cattle). Groundwater has constant quality (very low metals, and pH between7-8) across the monitoring region except for sodium and associated conductivity which varies depending on local geology and groundwater source. Sodium levels fluctuate from 123mg/l (Piezometer P8) to 784mg/l (Piezometer P3).

6.2.4 Groundwater Management

There is no groundwater extraction and the void has been backfilled and is free draining. Groundwater from surrounding bores, as well as the mine piezometers will continue to be monitored to assess any changes in groundwater quality or level.

6.2.5 Key Environmental Performance/Management Issues

No groundwater extraction occurred during the reporting period.

6.2.6 Proposed Improvements to Environmental Management

No proposed improvements. Ongoing monitoring to monitor for any changes.

7 REHABILITATION

7.1 Rehabilitation Performance during the Reporting Period

7.1.1 Status of Mining and Rehabilitation

The status of mining and rehabilitation at the completion of the reporting period is presented in **Figure 12.** All infrastructure will be removed from site in the first half of 2022.

Outstanding rehabilitation works include:

- Two remaining exploration drill holes require sealing
- Two water dams (1.08ha) to be removed and filled after vegetation has successfully established and rehabilitation is safe and stable.
- Highwall drain to divert rainfall run-on water away from the highwall batters.
- Aftercare and maintenance of rehabilitated areas, monitoring of seed coating trial and infill planting where required.

Table 7.1.1 Rehabilitation Status

Mine Area Type [1]	Previous Reporting Period	This Reporting Period (Actual)	Next Reporting Period (Forecast)
	2020	2021	2022
A. Total Mine Footprint	107.82	107.82	107.82
B. Total Active Disturbance	1.08	1.08	**1.08
C. Land Being Prepared for Rehabilitation	0	0	0
D. Land Under Active Rehabilitation	97.02	97.02	97.02
E. Completed Rehabilitation	0	0	0

Footprint exclude 17.6ha conservation area (Koala Corridors)

**Two dams to be filled/rehabilitated after ecosystem sustainability has been achieved

7.1.2 Post Rehabilitation Land Uses

The overall closure goal for the Sunnyside Coal Mine is to establish a stable and safe landform that is commensurate with the surrounding topography and which maximises the return to an appropriate agricultural land use comparable to the pre-mining land use, but is considerate of the fact that the landform is a backfilled mining area.

The post-mining landform will include approximately 17.6 hectares (ha) of land rehabilitated with woodland species on dump and highwall slopes to enhance biodiversity values of the area, with additional, ±17.2 ha of trees planted on areas undisturbed by mining activities along the eastern, northern and western boundaries of the property to enhance the wildlife corridors (Conservation).

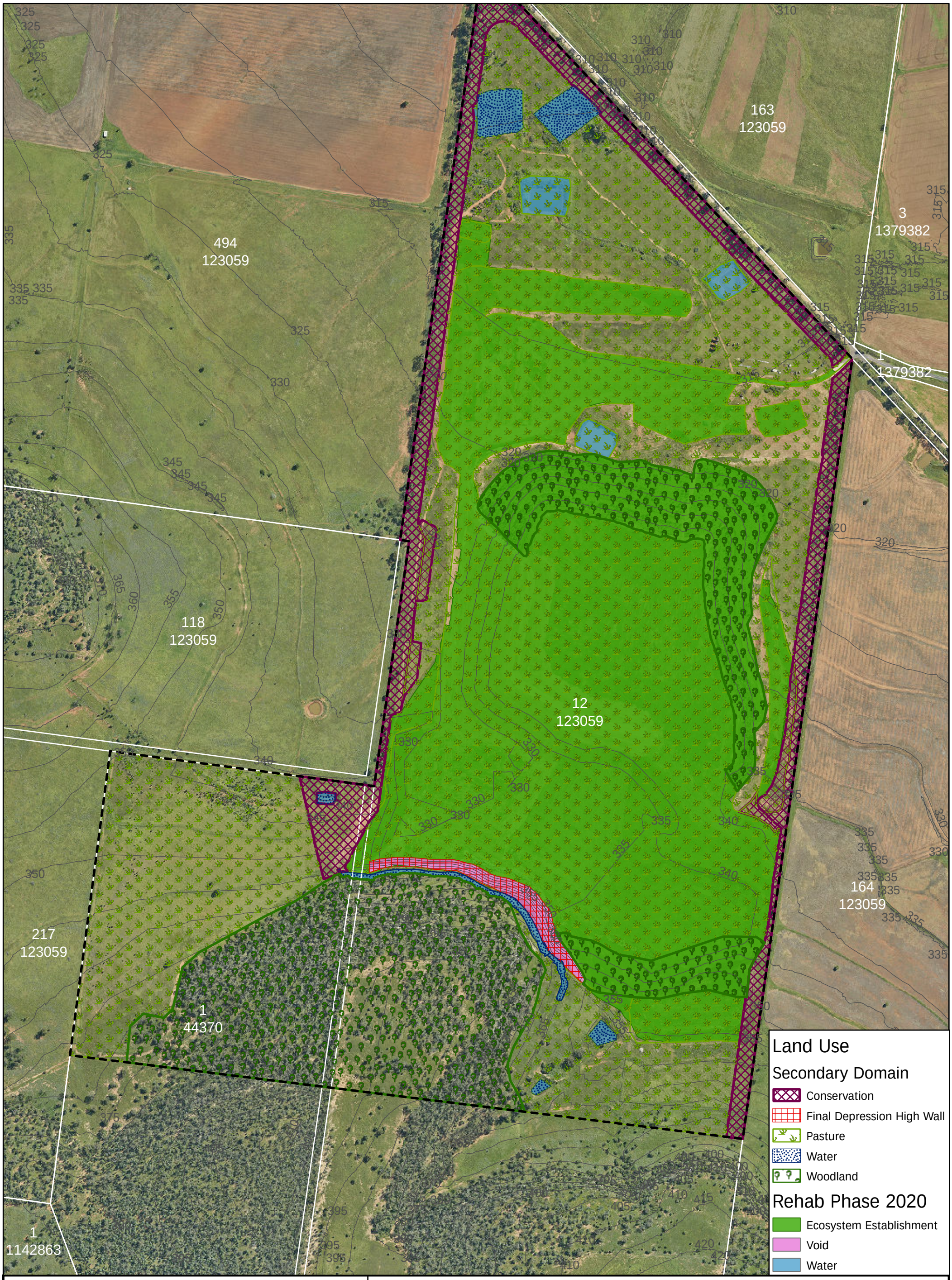


Fig 12 Status Mining and Rehab

Datum: MGA Zone 56 Author: A.Raal Image: LiDAR March 2021

Date: March-2021 Size/Scale: 1:7,500 (A3)

7.1.3 Rehabilitation Undertaken

Rehabilitation to final landform and seeding was completed in 2020. In February 2021 rehabilitation trial plots were established to measure the difference between coated and non-coasted grass seed, using thirty 60mx30m plots with various treatments of coated and uncoated grass seeds (see section 8.1.1). On 21 July 2021, 1,173 Hiko seedlings were planted on void slopes consisting of White box, Yellow box, Kurrajong, Narrow leafed iron bark, Blakely red gum and Spear grass. Final planting for the reporting period was carried out at the beginning August and involved 40 Hiko seedlings made up of a mix of White box, Narrow leaf ironbark and Kurrajong.

7.1.4 Rehabilitation Monitoring

Monitoring consists of;

- Monthly site inspection by site environmental officer for weeds, feral animals, visual condition of planted tube stock and for signs of erosion.
- Annual detailed ecological assessment of rehabilitated areas and analogue sites by consultant ecologists.
- Two camera traps were installed in 2018 to monitor for feral animal abundance and wildlife movement.
- A camera was placed on Sunnyside highwall that takes daily photograph of site changes over the southern rehabilitated void and discard dump.

7.1.5 Weeds Management

Weed management is discussed in section 5.2.4.

7.1.6 Renovation or Removal of Buildings

All fixed buildings, concrete pads and bitumen road base were removed. Concrete and bitumen were taken to Gunnedah Shire Council tip. Infrastructure remaining onsite is discussed in section 5.2.2.

7.1.7 Other Rehabilitation Undertaken

No further rehabilitation was undertaken.

7.1.8 Departmental Sign-off of Rehabilitated Areas

Departmental sign-off has not been requested for any rehabilitated areas.

7.1.9 Variations in Activities against MOP/RMP

Sunnyside closure MOP was approved in January 2019, Amendment was submitted in August 2020. There were no variations against the Closure MOP.

7.1.10 Trials, Research Projects and Initiatives

Seed coating trial commenced in the first quarter of 2021 at the site of the rehabilitated ROM pad consisting of thirty 60mx30m trial plots that had various treatments of coated and uncoated grass seeds.

7.1.11 Key Issues to Achieving Successful Rehabilitation

Three key issues to achieving successful rehabilitation are: -

- Establishment of vegetation species to meet Plant Community Types (PCT).
- Management of weeds and feral animals
- Ongoing monitoring and maintenance of drainage lines and drop structures

7.2 Actions for Next Reporting Period

- Infill planting of tree tube stock where required
- Ongoing Weed management,
- Rehabilitation/sealing of two remaining exploration drill holes.
- Establishing high wall drain.
- Ongoing monitoring of seed coating trial.
- Pasture grass control in woodland areas

8 COMMUNITY

SCM maintains a designated complaints line and, in the event of a complaint, details pertaining to the complainant, complaint and action taken are recorded.

No complaints were received during the reporting period.

Last five years of complaints are listed in **Table 8**. Due to the low number of complaints graphing the data is not practical.

Table 8 Community Complaints

Community complaints			
Year	Number of complaints	Aspect	Comment
2021	None		
2020	None		
2019	None		

2018	1	Water	Metallic taste in rainwater tank
2017	None		
2016	1	Air quality	Odor and fumes from mine

Any complaints that are made are reported to the Community Consultative Committee and documented in the AR and the annual EPA Return. A complaints register is also maintained on Whitehaven's website.

Community contributions are managed regionally by Whitehaven Coal corporate office.

9 INDEPENDENT AUDIT

An Independent Environmental Audit (IEA) was undertaken by ERM in 2019. The next IEA is scheduled to be completed by September 2022.

Non-compliances with project approvals identified by the IEA were risk ranked by the auditor in accordance with the compliance status key for **Table 1b,** and SCM subsequently developed an Audit Action Plan for these non-compliances. Items from the 2019 Audit Action Plan, and their due date, are summarised in **Table 9.** All actions have been completed with the required timeframe.

Table 9 2019 IEA Outstanding Action Table

Condition/Plan	IEA Proposed Action	IEA Action Status
Minister's Conditions of Approval PA 06_0308		
3.2.7	Water Management Plan to be updated in accordance with Schedule 5 Condition 5.	Closed
5.5A	Develop document and record tracking system.	Closed
Minister's Conditions of Approval PA 06_0308		
5.5A	Ensure that a review of management plans is undertaken to ensure alignment with the latest MOD and that this review and future reviews consider the Rehabilitation and Landscape Management Plan.	Closed
5.10	Ensure monthly EPL monitoring data is included within the Published Monthly EPL monitoring data published on the website. Ensure complaints are updated on the website on a monthly basis. Where no complaints are received, upload a complaint register stipulating this.	Closed
Statement of Commitments		

5.3	In the next modification of the CoA, request an update of the SoC to remove timing requirements for removal of industrial waste.	Ongoing
9.16	Where mature vegetation clearing activities are conducted, ensure records of vegetation clearance permits are maintained.	Closed
9.17	Where vegetation disturbance is to occur, ensure associated permit, inspection and control measures are in place to manage the potential identification and relocation of nesting and roosting hollows, as well as nests.	Closed
12.5	Ensure that training provided to all staff and contractors, is appropriately detailed that it supports the commitment to "help raise awareness and ameliorate any impact on heritage sites".	Closed
16.2	Develop formal induction kit for new non-local employees, where applicable.	Closed
Mining Lease 1624		
3b	Ensure that when the MOP is next updated this inconsistency is removed.	Closed
Water Management Plan		
3.2.7	Review and update WMP to establish groundwater trigger levels, benchmarks and contingency criteria. It should be noted that coal mining at SCM is now complete and therefore interaction with the groundwater due to this activity is now ceased.	Closed

10 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

10.1 Reportable Incidents

None for the reporting period

10.2 Non-compliances

None for the reporting period

10.3 Regulatory Actions

No regulatory actions were issued to Sunnyside in 2021.

11 ACTIONS TO BE COMPLETED IN THE NEXT REPORTING PERIOD

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

- Undertake closure and rehabilitation activities in accordance with the MOP;
- The continuation of environmental monitoring and management;
- Review and revision of various Environmental Management Plans; and Continued community liaison and engagement with local stakeholders.

12 APPENDICES

12.1 Appendix 1: Recommendations for triggers of CMOP Trigger Action Response Plan

Table 12.1 Recommendations based on report findings, addressing specified actions within the CMOP Trigger Action Response Plan

Parameter	Trigger	Trigger Response Element	Recommendations and Comment
Weeds	2nd Level: Monitoring indicates substantial weed infestation in Ecosystem Establishment phase significantly exceeding analogue sites.	Undertake weed management to remove introduced weed species.	To begin remedying the substantial increase in exotic cover since the 2020 monitoring, carry out targeted spot spraying in areas of spread, focussing on around tree seedlings, or where native ground cover diversity is a risk. Care is to be taken to avoid off-target spray impacts. Spraying should be done at a time when sufficient new growth is present for herbicide uptake. Effective removal of some exotic species may require insights from field trials. However targeted spraying should be carried out as part of ongoing maintenance.
		Investigate management measures to reduce weeds via additional soil amelioration	It is unclear how additional soil amelioration will address weed issues. Additional nitrogen is likely to encourage weeds. By altering soil pH, addition of gypsum can decrease the competitiveness of some weeds, especially broadleaf species, but may favour exotic pasture grasses (Stephenson & Rechcigl 1991), which are the main problematic weeds at Sunnyside. It should be noted, however, that the adding of carbon, which is not within standard mine protocols but instead targeted specifically at weed management, has had success within experimental plots in White Box woodlands (Prober et al. 2005). Such measures will be critically assessed as part of the ground cover establishment literature review (Aspect Ecology in prep B).
Pest animals	1st Level: Pest animal species are causing damage to rehabilitation.	Consult with relevant government agencies to recommend and implement	While not quantified in this study, field observations indicate that pigs are causing minor damage to rehabilitation,

		an appropriate pest animal control campaign.	therefore it is recommended that this measure be actioned if it has not been already.
Native Species Richness	1st/2nd Level: Less than the relevant minimum target criteria met*	Review methods used by revegetation contractor; seed or seedling quality, soil quality or weather conditions since time of revegetation to determine if it is the cause of delayed native species richness.	For the pre-2019 rehabilitation, this action was undertaken in Aspect (Ecology 2021b) it was found that the issues were the seed mix. See the historical findings outlined in Section 5.1.2 of Ecology (2020b), which cites the 2009/2010, 2010/2011 & 2011/2012 AMERs. Any more detailed records on methods used by the revegetation contractor or seed mix cannot be located (Aspect Ecology 2019). Climatic or edaphic factors can be ruled out as issues: because no native seeds were broadcast, so they were not the cause of the lack of germination.
		Engage a suitably qualified person to investigate causes for revegetation failure and recommend remedial actions.	For 2019 and 2020/21, seed mix data was not available, however it is presumed that the number of native seeded species was substantially higher than the four and seven native species respectively observed. It is recommended that the Trigger Response Element be actioned. It is suspected that the low native species richness is the result of poor germination in long- stockpiled soil, and competitive weed presence, especially Buffel Grass, that had built up in the stockpile seedbank.
		Undertake a field survey to identify which species are not present in revegetation areas.	The species present in the Woodland Domain is recorded and site data is available to scrutinise individual polygons. These data can be compared with seed mix data to determine which species are not present in revegetation areas.
		Re-seed or maintenance planting of revegetation areas with unsatisfactory species richness.	Undertake maintenance planting as required. Reseeding of native species can be undertaken where competition from exotics is not too great.

		Implement appropriate management actions including revising rehabilitation procedures if required.	This action needs to be undertaken as a priority once the exotic groundcover has been eradicated/significantly reduced.
			Management actions should include taking steps to improve native groundcover diversity, using species recorded in the analogue sites, once the necessary techniques are determined.
Native Grass Cover	1st/2nd Level: Less than the relevant minimum target criteria met*	Review the methods used by the revegetation contractor; seed or seedling quality, and soil quality or weather conditions since time of revegetation to determine if it is the cause of delayed native groundcover (grasses).	See historical findings outlined in Section 5.1.2 of Aspect Ecology 2021b, which cites the 2009/2010 and 2010/2011 AMERs. Any more detailed records on methods used by the revegetation contractor or seed mix cannot be located (Aspect Ecology 2019). Climatic or edaphic factors can be ruled out as issue, as no native seeds were broadcast.
		Engage a suitably qualified person to investigate causes for germination failure and recommend remedial actions	Germination failure is not the issue as no native seeds were broadcast.
		Undertake a field survey to identify likely causes of unsatisfactory germination rates	Germination failure is not the issue as no native seeds were broadcast.
		Re-seed areas with unsatisfactory cover	This action needs to be undertaken as a priority once the exotic groundcover has been eradicated/significantly reduced.
		Review seeding procedures including seasonal mixes, timing and seed rate per hectare	Records of these procedures were not retained. New procedures should be formulated, as part of a Rehabilitation Implementation Plan.

			Seed mixes, species used should only be those native species recorded from the analogue sites or where they are known to occur locally.
		Implement appropriate management actions including revising rehabilitation procedures if required	Applicable actions be determined and actioned as part of a Rehabilitation Implementation Plan.
Pasture Composition	Pasture composition is not consistent with the sown seed mix and or, analogue sites during the Ecosystem Establishment phase.	Investigate the likely causes of unsatisfactory germination and/or growth rates.	Check seed mix to determine if perennial native grasses were present in mix. If yes, then germination may be an issue at some sites
			Monitor pasture rehabilitation for the establishment of perennial grasses, and introduce supplementary seed of appropriate species if necessary.
		Re-seed unsatisfactorily covered areas.	This trigger action relates to cover, not composition. Cover is mostly good or satisfactory. Lower cover sites should be monitored. If cover does not improve, supplementary seeding with perennial native grasses is recommended.
		Review seeding procedures including seasonal mixes, timing and seed rate per hectare.	Review seed mix composition and rate to ensure adequate rates of appropriately selected perennial native grasses.

12.2 Appendix 2: Surface Water Monitoring Data

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: Production Dam; Northing: 224418; Easting: 6570412

	13-May-21	04-Nov-21
Rec ID	**80386**	**83109**
Lab Ref	**91030**	**93029**
Comments	NO SAMPLE	Filled in - Dry

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: SB2; Northing: 224854; Easting: 6568067

	09-Feb-21	13-May-21	05-Aug-21	04-Nov-21
Rec ID	**79324**	**80392**	**81348**	**83104**
Lab Ref	**89978**	**91036**	**91992**	**93024**
Antimony (total)	<0.001	<0.001	0.003	<0.001
Appearance	Slight Turbid	Slight Turbid	Slight Turbid	Clear
Arsenic-Total (mg/L)	0.002	0.002	<0.001	<0.001
Colour	Brown	Brown	Brown	Clear
EC - Field	280.	325.	290.	300.
Electrical Conductivity @ 25°C (µS/cm)	273.	296.	272.	253.
Molybdenum (total)	0.003	0.004	0.002	0.004
Odour	Nil	Nil	Nil	Nil
Oil & Grease	<5	<5	<5	<5
pH (pH Unit)	8.7	8.4	8.2	9.7
pH Value (pH Unit)	7.26	8.06	7.79	9.37
Selenium-Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Temperature	26.	16.1	11.5	23.3
Total Organic Carbon	3.	2.	3.	6.
Total Suspended Solids (TSS)	58.	27.	11.	<5

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: SB3; Northing: 224537.0332; Easting: 6569855.774

	13-May-21	04-Nov-21
Rec ID	**80393**	**83105**
Lab Ref	**91037**	**93025**
Comments	NO SAMPLE	Filled in - Dry

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: SB4; Northing: 224383.713; Easting: 6569783.0221

	09-Feb-21	13-May-21	05-Aug-21	04-Nov-21
Rec ID	**79325**	**80394**	**81346**	**83106**
Lab Ref	**89979**	**91038**	**91990**	**93026**
Antimony (total)	<0.001	<0.001	<0.001	
Appearance	Clear	Slight Turbid	Slight Turbid	
Arsenic-Total (mg/L)	0.002	<0.001	<0.001	
Colour	Clear	Brown	Brown	
Comments				Dry - Muddy basin
EC - Field	355.	330.	240.	
Electrical Conductivity @ 25°C (µS/cm)	352.	306.	224.	
Molybdenum (total)	0.002	0.002	0.002	
Odour	Nil	Nil	Nil	
Oil & Grease	7.	<5	<5	
pH (pH Unit)	8.4	8.5	8.6	
pH Value (pH Unit)	7.6	8.2	7.68	
Selenium-Total (mg/L)	<0.01	<0.01	<0.01	
Temperature	24.	15.3	9.2	
Total Organic Carbon	4.	5.	4.	
Total Suspended Solids (TSS)	13.	25.	43.	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: SB5; Northing: 224944.083; Easting: 6569671.7898

	09-Feb-21	13-May-21	05-Aug-21	04-Nov-21
Rec ID	**79326**	**80395**	**81345**	**83107**
Lab Ref	**89980**	**91039**	**91989**	**93027**
Antimony (total)	<0.001	<0.001	<0.001	
Appearance	Turbid	Turbid	Turbid	
Arsenic-Total (mg/L)	0.001	0.002	<0.001	
Colour	Brown	Brown	Brown	
Comments				Dry - grassy basin
EC - Field	265.	390.	180.	
Electrical Conductivity @ 25°C (µS/cm)	251.	197.	145.	
Molybdenum (total)	0.001	<0.001	<0.001	
Odour	Nil	Nil	Nil	
Oil & Grease	<5	<5	<5	
pH (pH Unit)	8.3	8.1	8.1	
pH Value (pH Unit)	7.46	7.98	7.66	
Selenium-Total (mg/L)	<0.01	<0.01	<0.01	
Temperature	25.1	12.	8.5	
Total Organic Carbon	3.	2.	5.	
Total Suspended Solids (TSS)	110.	53.	26.	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: SD1; Northing: 225055.9165; Easting: 6569362.7446

	09-Feb-21	13-May-21	05-Aug-21	04-Nov-21
Rec ID	**79323**	**80390**	**81344**	**83102**
Lab Ref	**89977**	**91034**	**91988**	**93022**
Antimony (total)	<0.001	<0.001	<0.001	<0.001
Appearance	Slight Turbid	Slight Turbid	Slight Turbid	Turbid
Arsenic-Total (mg/L)	0.003	0.003	<0.001	0.003
Colour	Brown	Brown	Brown	Brown
EC - Field	280.	250.	330.	570.
Electrical Conductivity @ 25°C (µS/cm)	274.	212.	320.	564.
Molybdenum (total)	0.003	0.002	<0.001	0.002
Odour	Nil	Nil	Nil	Nil
Oil & Grease	<5	<5	<5	<5
pH (pH Unit)	8.9	8.3	8.3	8.6
pH Value (pH Unit)	8.45	8.22	8.19	8.26
Selenium-Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Temperature	22.7	13.4	9.4	22.5
Total Organic Carbon	8.	3.	18.	21.
Total Suspended Solids (TSS)	26.	47.	27.	108.

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: SD2; Northing: 224648.2654; Easting: 6569332.6818

	13-May-21	04-Nov-21
Rec ID	**80391**	**83103**
Lab Ref	**91035**	**93023**
Comments	NO SAMPLE	Removed - Dry

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: SD3; Northing: 224662.6955; Easting: 6568025.5527

	09-Feb-21	13-May-21	05-Aug-21	04-Nov-21
Rec ID	**79327**	**80388**	**81342**	**83100**
Lab Ref	**89981**	**91032**	**91986**	**93020**
Comments	DRY	DRY - GRASSY	Dry -grassy basin	Dry - grassy basin

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: SD4; Northing: 224060.2377; Easting: 6568539.0248

	09-Feb-21	13-May-21	05-Aug-21	04-Nov-21
Rec ID	**79322**	**80389**	**81341**	**83101**
Lab Ref	**89976**	**91033**	**91985**	**93021**
Antimony (total)	<0.001	<0.001	<0.001	<0.001
Appearance	Slight Turbid	Clear	Clear	Turbid
Arsenic-Total (mg/L)	0.002	<0.001	<0.001	0.002
Colour	Brown	Clear	Clear	Brown
EC - Field	395.	400.	345.	520.
Electrical Conductivity @ 25°C (µS/cm)	392.	380.	332.	506.
Molybdenum (total)	0.004	0.003	0.002	0.005
Odour	Nil	Nil	Nil	Nil
Oil & Grease	<5	<5	<5	5.
pH (pH Unit)	8.5	8.	8.1	8.2
pH Value (pH Unit)	7.8	8.26	7.67	7.94
Selenium-Total (mg/L)	<0.01	<0.01	<0.01	<0.01
Temperature	23.7	15.1	11.4	21.9
Total Organic Carbon	7.	8.	10.	28.
Total Suspended Solids (TSS)	58.	17.	<5	72.

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: VOID (Sunnyside VOID); Northing: 224405.3582; Easting: 6568425.9888

	13-May-21	04-Nov-21
Rec ID	**80387**	**83108**
Lab Ref	**91031**	**93028**
Comments	NO SAMPLE	Removed - Dry

Outliers: 0

Field Name	Result	Outlier Comment

12.3 Appendix 3: Ground Water Monitoring Data

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: 22497; Northing: 226528.408; Easting: 6566793.9615

	15-Apr-21	08-Sep-21	10-Dec-21
Rec ID	**80068**	**82358**	**83758**
Lab Ref	**90712**	**92343**	**93678**
Aluminium (total) (mg/L)	0.16	0.03	
Ammonia as Nitrogen (N)	5.05	0.74	
Appearance	Slight Turbid	Slight Turbid	
Arsenic-Total (mg/L)	<0.001	<0.001	
Barium (total)	0.154	0.07	
Beryllium (total)	<0.001	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	331.	564.	
Boron (total)	<0.05	<0.05	
Cadmium-Total (mg/L)	<0.0001	<0.0001	
Calcium-Dissolved (mg/L)	20.	14.	
Carbonate Alkalinity as CaCO3 (mg/L)	<1	<1	
Chloride (mg/L)	488.	265.	
Chromium-Total (mg/L)	<0.001	<0.001	
Cobalt	<0.001	<0.001	
Colour	Brown	Brown	
Copper-Total (mg/L)	0.034	0.003	
EC - Field	1,540.	1,490.	1,510.
Electrical Conductivity @ 25°C (µS/cm)	2,000.	1,740.	
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	<1	
Ionic Balance (%)	4.36	3.7	
Iron-Total (mg/L)	9.82	2.36	
Lead-Total (mg/L)	0.008	<0.001	
Magnesium-Dissolved (mg/L)	79.	52.	
Manganese (total)	0.235	0.061	
Mercury-Total (mg/L)	<0.0001	<0.0001	
Nickel-Total (mg/L)	0.002	<0.001	
Nitrate as N (mg/L)	0.12	0.01	
Nitrite + Nitrate as N (mg/L)	0.14	0.03	
Nitrite as N (mg/L)	0.02	0.02	
Odour	Nil	Nil	
pH (pH Unit)	7.6	7.9	7.8
pH Value (pH Unit)	8.05	8.27	
Potassium-Dissolved (mg/L)	72.	69.	

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Purge Type	Bail	Bail	
Selenium-Total (mg/L)	<0.01	<0.01	
Sodium-Dissolved (mg/L)	215.	246.	
Stick up	0.2	0.2	0.2
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	1.	2.	
Temperature	21.3	16.7	19.8
Total Alkalinity as CaCO3 (mg/L)	331.	564.	
Total Anions	20.4	18.8	
Total Cations	18.7	17.4	
Total Dissolved Solids @180°C-Total (mg/L)	1,100.	964.	
Vanadium	<0.01	<0.01	
Water Depth to Stand	16.89	16.78	16.33
Zinc (total)	0.502	0.037	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: 27356; Northing: 224912.785; Easting: 6569803.28

	08-Sep-21
Rec ID	**82361**
Lab Ref	**92345**
Comments	Unable to sample -

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: 44677 Werona Tanks; Northing: 222328.0678; Easting: 6570216.8968

	18-Mar-21	08-Sep-21	10-Dec-21
Rec ID	**80224**	**82354**	**83754**
Lab Ref	**90868**	**92339**	**93674**
Aluminium (total) (mg/L)		<0.01	
Ammonia as Nitrogen (N)		0.01	
Appearance		Clear	
Arsenic-Total (mg/L)		<0.001	
Barium (total)		0.242	
Beryllium (total)		<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)		673.	
Boron (total)		0.14	
Cadmium-Total (mg/L)		<0.0001	
Calcium-Dissolved (mg/L)		262.	
Carbonate Alkalinity as CaCO3 (mg/L)		<1	
Chloride (mg/L)		1,730.	
Chromium-Total (mg/L)		0.007	
Cobalt		<0.001	
Colour		Clear	
Comments	PUMP OVER BORE	Sample taken from tank. No	
Copper-Total (mg/L)		0.003	
EC - Field		6,220.	6,810.
Electrical Conductivity @ 25°C (µS/cm)		6,810.	
Hydroxide Alkalinity as CaCO3 (mg/L)		<1	
Ionic Balance (%)		0.92	
Iron-Total (mg/L)		0.1	
Lead-Total (mg/L)		<0.001	
Magnesium-Dissolved (mg/L)		321.	
Manganese (total)		0.025	
Mercury-Total (mg/L)		<0.0001	
Nickel-Total (mg/L)		0.005	
Nitrate as N (mg/L)		2.08	
Nitrite + Nitrate as N (mg/L)		2.08	
Nitrite as N (mg/L)		<0.01	
Odour		Nil	
pH (pH Unit)		7.5	7.2
pH Value (pH Unit)		7.93	

Potassium-Dissolved (mg/L)		10.	
Purge Type		Tap	
Selenium-Total (mg/L)		<0.01	
Sodium-Dissolved (mg/L)		648.	
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)		214.	
Temperature		18.	20.5
Total Alkalinity as CaCO3 (mg/L)		673.	
Total Anions		66.7	
Total Cations		67.9	
Total Dissolved Solids @180°C-Total (mg/L)		4,440.	
Vanadium		<0.01	
Zinc (total)		0.112	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: 44884; Northing: 226251.5937; Easting: 6568123.6077

	18-Mar-21	08-Sep-21	10-Dec-21
Rec ID	**79763**	**82351**	**83751**
Lab Ref	**90414**	**92336**	**93671**
Aluminium (total) (mg/L)	0.05	<0.01	
Ammonia as Nitrogen (N)	0.38	0.34	
Appearance	Clear	Clear	
Arsenic-Total (mg/L)	0.006	0.002	
Barium (total)	0.409	0.244	
Beryllium (total)	<0.001	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	1,020.	1,100.	
Boron (total)	0.08	0.09	
Cadmium-Total (mg/L)	0.0058	<0.0001	
Calcium-Dissolved (mg/L)	9.	19.	
Calcium-Total (µg/L)	24,000.		
Calcium-Total (mg/L)	24.		
Carbonate Alkalinity as CaCO3 (mg/L)	41.	<1	
Chloride (mg/L)	261.	291.	
Chromium-Total (mg/L)	<0.001	<0.001	
Cobalt	0.007	<0.001	
Colour	Clear	Clear	
Copper-Total (mg/L)	0.098	0.21	
EC - Field	2,640.	2,170.	2,180.
Electrical Conductivity @ 25°C (µS/cm)	2,450.	2,550.	
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	<1	
Ionic Balance (%)	9.13	4.59	
Iron-Total (mg/L)	4.95	0.32	
Lead-Total (mg/L)	0.026	0.006	
Magnesium-Dissolved (mg/L)	23.	43.	
Magnesium-Total (µg/L)	34,000.		
Magnesium-Total (mg/L)	34.		
Manganese (total)	0.075	0.015	
Mercury-Total (mg/L)	<0.0001	<0.0001	
Nickel-Total (mg/L)	0.004	<0.001	
Nitrate as N (mg/L)	0.01	<0.01	
Nitrite + Nitrate as N (mg/L)	0.01	<0.01	
Nitrite as N (mg/L)	<0.01	<0.01	

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Odour	Nil	Nil	
pH (pH Unit)	7.8	8.	7.8
pH Value (pH Unit)	8.4	8.27	
Potassium-Dissolved (mg/L)	5.	4.	
Potassium-Total (µg/L)	4,000.		
Potassium-Total (mg/L)	4.		
Purge Type	Tap	Tap	
Selenium-Total (mg/L)	<0.01	<0.01	
Sodium-Dissolved (mg/L)	490.	531.	
Sodium-Total (µg/L)	526,000.		
Sodium-Total (mg/L)	526.		
Stick up	0.47	0.47	
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	1.	8.	
Temperature	19.3	10.7	17.5
Total Alkalinity as CaCO3 (mg/L)	1,060.	1,100.	
Total Anions	28.6	30.4	
Total Cations	23.8	27.7	
Total Dissolved Solids @180°C-Total (mg/L)	1,440.	1,520.	
Vanadium	<0.01	<0.01	
Zinc (total)	2.98	0.415	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: 45061 Coocooboonah; Northing: 226935.4925; Easting: 6567303.1717

	18-Mar-21	08-Sep-21	10-Dec-21
Rec ID	**80226**	**82363**	**83759**
Lab Ref	**90870**	**92347**	**93679**
Comments		SWL Only - Unable to	
Stick up	0.1		0.1
Water Depth to Stand	9.16	9.09	8.76

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: 6249; Northing: 226815.754; Easting: 6567710.997

	18-Mar-21	08-Sep-21
Rec ID	**79762**	**82364**
Lab Ref	**90413**	**92348**
Aluminium (total) (mg/L)	0.02	
Ammonia as Nitrogen (N)	7.28	
Ammonium as N	7.28	
Appearance	Clear	
Arsenic-Total (mg/L)	<0.001	
Barium (total)	0.281	
Beryllium (total)	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	293.	
Boron (total)	<0.05	
Cadmium-Total (mg/L)	<0.0001	
Calcium-Dissolved (mg/L)	88.	
Calcium-Total (µg/L)	118,000.	
Calcium-Total (mg/L)	118.	
Carbonate Alkalinity as CaCO3 (mg/L)	<1	
Chloride (mg/L)	655.	
Chromium-Total (mg/L)	<0.001	
Cobalt	<0.001	
Colour	Clear	
Comments		SWL Only - Unable to
Copper-Total (mg/L)	0.005	
EC - Field	2,670.	
Electrical Conductivity @ 25°C (µS/cm)	2,510.	
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	
Ionic Balance (%)	2.49	
Iron-Total (mg/L)	4.78	
Lead-Total (mg/L)	<0.001	
Magnesium-Dissolved (mg/L)	106.	
Magnesium-Total (µg/L)	101,000.	
Magnesium-Total (mg/L)	101.	
Manganese (total)	0.98	
Mercury-Total (mg/L)	<0.0001	
Nickel-Total (mg/L)	0.002	
Nitrate as N (mg/L)	0.01	

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Nitrite + Nitrate as N (mg/L)	0.01	
Nitrite as N (mg/L)	<0.01	
Odour	Nil	
pH (pH Unit)	7.8	
pH Value (pH Unit)	7.96	
Potassium-Dissolved (mg/L)	16.	
Potassium-Total (µg/L)	12,000.	
Potassium-Total (mg/L)	12.	
Purge Type	Bail	
Selenium-Total (mg/L)	<0.01	
Sodium-Dissolved (mg/L)	224.	
Sodium-Total (µg/L)	219,000.	
Sodium-Total (mg/L)	219.	
Stick up	0.33	
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	6.	
Temperature	18.6	
Total Alkalinity as CaCO3 (mg/L)	293.	
Total Anions	24.4	
Total Cations	23.3	
Total Dissolved Solids @180°C-Total (mg/L)	1,780.	
Vanadium	<0.01	
Water Depth to Stand	10.37	15.42
Zinc (total)	0.056	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Data Point: 901460; Northing: 223859; Easting: 6571173

	18-Mar-21	06-Sep-21	10-Dec-21
Rec ID	**80227**	**82362**	**83760**
Lab Ref	**90871**	**92346**	**93680**
Comments	PUMP OVER BORE	SWL Only - Unable to	
Stick up			0.4
Water Depth to Stand	14.92	14.82	15.39

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: Ivanhoe 3709; Northing: 222301.0604; Easting: 6568883.2261

	29-Apr-21	06-Sep-21	16-Dec-21
Rec ID	**80228**	**82323**	**83761**
Lab Ref	**90872**	**92308**	**93681**
Aluminium (total) (mg/L)	0.01	<0.01	
Ammonia as Nitrogen (N)	0.01	<0.01	
Appearance		Slight Turbid	
Arsenic-Total (mg/L)	0.002	0.002	
Barium (total)	0.244	0.225	
Beryllium (total)	0.001	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	925.	878.	
Boron (total)	0.18	0.17	
Cadmium-Total (mg/L)	0.0001	<0.0001	
Calcium-Dissolved (mg/L)	160.	126.	
Carbonate Alkalinity as CaCO3 (mg/L)	1.	<1	
Chloride (mg/L)	1,370.	1,280.	
Chromium-Total (mg/L)	0.001	<0.001	
Cobalt	0.0001	<0.001	
Colour		Slight Brown	
Copper-Total (mg/L)	0.065	0.042	
EC - Field	5,700.	4,700.	5,140.
Electrical Conductivity @ 25°C (µS/cm)	5,960.	5,720.	
Hydroxide Alkalinity as CaCO3 (mg/L)	1.	<1	
Ionic Balance (%)	0.04	0.49	
Iron-Total (mg/L)	3.08	7.05	
Lead-Total (mg/L)	0.008	0.011	
Magnesium-Dissolved (mg/L)	225.	220.	
Manganese (total)	0.053	0.069	
Mercury-Total (mg/L)	0.0001	<0.0001	
Nickel-Total (mg/L)	0.002	0.001	
Nitrate as N (mg/L)	0.01	1.01	
Nitrite + Nitrate as N (mg/L)	0.79	1.01	
Nitrite as N (mg/L)	0.79	<0.01	
Odour		Nil	
pH (pH Unit)	7.	6.9	7.2
pH Value (pH Unit)	7.81	7.64	
Potassium-Dissolved (mg/L)	12.	11.	

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Purge Type	TAP	Tap	
Selenium-Total (mg/L)	0.01	<0.01	
Sodium-Dissolved (mg/L)	775.	701.	
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	165.	99.	
Temperature	17.8	17.8	21.2
Total Alkalinity as CaCO3 (mg/L)	925.	878.	
Total Anions	60.6	55.7	
Total Cations	60.5	55.2	
Total Dissolved Solids @180°C-Total (mg/L)	3,650.	3,240.	
Vanadium	0.01	<0.01	
Zinc (total)	3.11	3.08	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: P1; Northing: 225592; Easting: 6569560

	18-Mar-21	08-Sep-21	16-Dec-21
Rec ID	**79764**	**82353**	**83753**
Lab Ref	**90415**	**92338**	**93673**
Aluminium (total) (mg/L)	0.06	0.02	
Ammonia as Nitrogen (N)	0.6	0.11	
Ammonium as N	0.6		
Appearance	Clear	Clear	
Arsenic-Total (mg/L)	<0.001	<0.001	
Barium (total)	0.219	0.189	
Beryllium (total)	<0.001	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	915.	929.	
Boron (total)	0.11	0.1	
Cadmium-Total (mg/L)	<0.0001	<0.0001	
Calcium-Dissolved (mg/L)	114.	141.	
Calcium-Total (µg/L)	159,000.		
Calcium-Total (mg/L)	159.		
Carbonate Alkalinity as CaCO3 (mg/L)	<1	<1	
Chloride (mg/L)	852.	792.	
Chromium-Total (mg/L)	<0.001	<0.001	
Cobalt	<0.001	<0.001	
Colour	Clear	Clear	
Copper-Total (mg/L)	0.001	<0.001	
EC - Field	4,070.	3,830.	3,780.
Electrical Conductivity @ 25°C (µS/cm)	4,000.	4,010.	
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	<1	
Ionic Balance (%)	6.29	0.51	
Iron-Total (mg/L)	0.27	0.09	
Lead-Total (mg/L)	<0.001	<0.001	
Magnesium-Dissolved (mg/L)	229.	238.	
Magnesium-Total (µg/L)	244,000.		
Magnesium-Total (mg/L)	244.		
Manganese (total)	0.302	0.089	
Mercury-Total (mg/L)	<0.0001	<0.0001	
Nickel-Total (mg/L)	<0.001	<0.001	
Nitrate as N (mg/L)	0.04	0.52	
Nitrite + Nitrate as N (mg/L)	0.04	0.52	

Nitrite as N (mg/L)	<0.01	<0.01	
Odour	Nil	Nil	
pH (pH Unit)	7.3	7.4	7.4
pH Value (pH Unit)	8.	7.92	
Potassium-Dissolved (mg/L)	9.	7.	
Potassium-Total (µg/L)	7,000.		
Potassium-Total (mg/L)	7.		
Purge Type	Bail	Bail	
Selenium-Total (mg/L)	<0.01	<0.01	
Sodium-Dissolved (mg/L)	336.	360.	
Sodium-Total (µg/L)	360,000.		
Sodium-Total (mg/L)	360.		
Stick up	0.96	0.96	
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	113.	96.	
Temperature	20.	18.5	21.2
Total Alkalinity as CaCO3 (mg/L)	915.	929.	
Total Anions	44.7	42.9	
Total Cations	39.4	42.5	
Total Dissolved Solids @180°C-Total (mg/L)	2,510.	2,290.	
Vanadium	<0.01	<0.01	
Water Depth to Stand	14.08	14.15	13.95
Zinc (total)	0.021	0.024	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: P2; Northing: 225012; Easting: 6570423

	18-Mar-21	08-Sep-21	16-Dec-21
Rec ID	**79765**	**82352**	**83752**
Lab Ref	**90416**	**92337**	**93672**
Aluminium (total) (mg/L)	0.19	0.15	
Ammonia as Nitrogen (N)	<0.01	<0.01	
Ammonium as N	0.01		
Appearance	Clear	Clear	
Arsenic-Total (mg/L)	<0.001	<0.001	
Barium (total)	0.076	0.064	
Beryllium (total)	<0.001	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	779.	769.	
Boron (total)	0.11	0.11	
Cadmium-Total (mg/L)	<0.0001	<0.0001	
Calcium-Dissolved (mg/L)	131.	152.	
Calcium-Total (µg/L)	172,000.		
Calcium-Total (mg/L)	172.		
Carbonate Alkalinity as CaCO3 (mg/L)	<1	<1	
Chloride (mg/L)	792.	725.	
Chromium-Total (mg/L)	<0.001	<0.001	
Cobalt	<0.001	<0.001	
Colour	Clear	Clear	
Copper-Total (mg/L)	0.007	0.004	
EC - Field	3,970.	3,750.	3,590.
Electrical Conductivity @ 25°C (µS/cm)	3,880.	3,830.	
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	<1	
Ionic Balance (%)	4.8	0.15	
Iron-Total (mg/L)	0.4	0.2	
Lead-Total (mg/L)	<0.001	<0.001	
Magnesium-Dissolved (mg/L)	232.	227.	
Magnesium-Total (µg/L)	236,000.		
Magnesium-Total (mg/L)	236.		
Manganese (total)	0.024	0.059	
Mercury-Total (mg/L)	<0.0001	<0.0001	
Nickel-Total (mg/L)	0.002	0.003	
Nitrate as N (mg/L)	4.2	6.6	
Nitrite + Nitrate as N (mg/L)	4.2	6.6	

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Nitrite as N (mg/L)	<0.01	<0.01	
Odour	Nil	Nil	
pH (pH Unit)	7.6	7.5	7.5
pH Value (pH Unit)	8.11	7.85	
Potassium-Dissolved (mg/L)	15.	11.	
Potassium-Total (µg/L)	11,000.		
Potassium-Total (mg/L)	11.		
Purge Type	Bail	Bail	
Selenium-Total (mg/L)	<0.01	<0.01	
Sodium-Dissolved (mg/L)	324.	335.	
Sodium-Total (µg/L)	338,000.		
Sodium-Total (mg/L)	338.		
Stick up	0.82	0.82	
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	300.	249.	
Temperature	19.5	18.4	20.9
Total Alkalinity as CaCO3 (mg/L)	779.	769.	
Total Anions	44.2	41.	
Total Cations	40.1	41.1	
Total Dissolved Solids @180°C-Total (mg/L)	2,520.	2,230.	
Vanadium	<0.01	<0.01	
Water Depth to Stand	16.41	16.24	16.01
Zinc (total)	0.056	0.087	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: P3; Northing: 224211; Easting: 6568768

	18-Mar-21	08-Sep-21	16-Dec-21
Rec ID	**79766**	**82357**	**83757**
Lab Ref	**90417**	**92342**	**93677**
Aluminium (total) (mg/L)	0.74	0.45	
Ammonia as Nitrogen (N)	0.1	0.04	
Ammonium as N	0.1		
Appearance	Clear	Clear	
Arsenic-Total (mg/L)	0.003	0.003	
Barium (total)	0.14	0.12	
Beryllium (total)	<0.001	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	720.	741.	
Boron (total)	0.24	0.23	
Cadmium-Total (mg/L)	<0.0001	<0.0001	
Calcium-Dissolved (mg/L)	313.	266.	
Calcium-Total (µg/L)	279,000.		
Calcium-Total (mg/L)	279.		
Carbonate Alkalinity as CaCO3 (mg/L)	<1	<1	
Chloride (mg/L)	2,290.	2,240.	
Chromium-Total (mg/L)	0.001	0.001	
Cobalt	0.122	0.086	
Colour	Clear	Clear	
Copper-Total (mg/L)	0.005	0.005	
EC - Field	8,240.	7,280.	6,950.
Electrical Conductivity @ 25°C (µS/cm)	8,320.	8,110.	
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	<1	
Ionic Balance (%)	3.34	0.84	
Iron-Total (mg/L)	2.4	1.95	
Lead-Total (mg/L)	0.004	0.004	
Magnesium-Dissolved (mg/L)	479.	428.	
Magnesium-Total (µg/L)	481,000.		
Magnesium-Total (mg/L)	481.		
Manganese (total)	2.91	5.31	
Mercury-Total (mg/L)	<0.0001	<0.0001	
Nickel-Total (mg/L)	0.007	0.008	
Nitrate as N (mg/L)	0.62	0.61	
Nitrite + Nitrate as N (mg/L)	0.62	0.61	

Nitrite as N (mg/L)	<0.01	<0.01	
Odour	Nil	Nil	
pH (pH Unit)	6.6	6.9	7.
pH Value (pH Unit)	7.67	7.42	
Potassium-Dissolved (mg/L)	36.	35.	
Potassium-Total (µg/L)	38,000.		
Potassium-Total (mg/L)	38.		
Purge Type	Bail	Bail	
Selenium-Total (mg/L)	<0.01	<0.01	
Sodium-Dissolved (mg/L)	806.	742.	
Sodium-Total (µg/L)	784,000.		
Sodium-Total (mg/L)	784.		
Stick up	0.44	0.44	0.44
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	296.	243.	
Temperature	18.6	18.2	20.4
Total Alkalinity as CaCO3 (mg/L)	720.	741.	
Total Anions	85.1	83.	
Total Cations	91.	81.7	
Total Dissolved Solids @180°C-Total (mg/L)	6,030.	5,090.	
Vanadium	<0.01	<0.01	
Water Depth to Stand	24.03	24.7	24.53
Zinc (total)	0.047	0.077	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: P7; Northing: 225185.172; Easting: 6569323.237

	18-Mar-21	08-Sep-21	10-Dec-21
Rec ID	**79767**	**82356**	**83756**
Lab Ref	**90418**	**92341**	**93676**
Aluminium (total) (mg/L)	0.02	0.02	
Ammonia as Nitrogen (N)	0.02	<0.01	
Ammonium as N	0.02		
Appearance	Clear	Clear	
Arsenic-Total (mg/L)	<0.001	<0.001	
Barium (total)	0.069	0.064	
Beryllium (total)	<0.001	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	763.	756.	
Boron (total)	0.16	0.16	
Cadmium-Total (mg/L)	<0.0001	<0.0001	
Calcium-Dissolved (mg/L)	167.	139.	
Calcium-Total (µg/L)	156,000.		
Calcium-Total (mg/L)	156.		
Carbonate Alkalinity as CaCO3 (mg/L)	<1	<1	
Chloride (mg/L)	1,370.	1,340.	
Chromium-Total (mg/L)	<0.001	<0.001	
Cobalt	<0.001	<0.001	
Colour	Clear	Clear	
Copper-Total (mg/L)	<0.001	<0.001	
EC - Field	5,870.	5,530.	5,810.
Electrical Conductivity @ 25°C (µS/cm)	5,840.	5,880.	
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	<1	
Ionic Balance (%)	3.48	1.68	
Iron-Total (mg/L)	<0.05	<0.05	
Lead-Total (mg/L)	<0.001	<0.001	
Magnesium-Dissolved (mg/L)	270.	253.	
Magnesium-Total (µg/L)	261,000.		
Magnesium-Total (mg/L)	261.		
Manganese (total)	0.037	0.015	
Mercury-Total (mg/L)	<0.0001	<0.0001	
Nickel-Total (mg/L)	<0.001	<0.001	
Nitrate as N (mg/L)	5.48	5.26	
Nitrite + Nitrate as N (mg/L)	5.48	5.26	

Nitrite as N (mg/L)	<0.01	<0.01	
Odour	Nil	Nil	
pH (pH Unit)	6.9	7.	7.
pH Value (pH Unit)	7.92	7.64	
Potassium-Dissolved (mg/L)	20.	19.	
Potassium-Total (µg/L)	20,000.		
Potassium-Total (mg/L)	20.		
Purge Type	Bail	Bail	
Selenium-Total (mg/L)	<0.01	<0.01	
Sodium-Dissolved (mg/L)	732.	702.	
Sodium-Total (µg/L)	701,000.		
Sodium-Total (mg/L)	701.		
Stick up	0.45	0.45	0.45
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	230.	189.	
Temperature	19.5	18.6	21.6
Total Alkalinity as CaCO3 (mg/L)	763.	756.	
Total Anions	58.7	56.8	
Total Cations	62.9	58.8	
Total Dissolved Solids @180°C-Total (mg/L)	3,920.	3,370.	
Vanadium	<0.01	<0.01	
Water Depth to Stand	14.28	14.37	13.96
Zinc (total)	0.012	<0.005	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: P8; Northing: 225122.483; Easting: 6568894.834

	18-Mar-21	08-Sep-21	10-Dec-21
Rec ID	**79768**	**82355**	**83755**
Lab Ref	**90419**	**92340**	**93675**
Aluminium (total) (mg/L)	0.14	0.05	
Ammonia as Nitrogen (N)	6.27	5.79	
Ammonium as N	6.27		
Appearance	Clear	Clear	
Arsenic-Total (mg/L)	<0.001	<0.001	
Barium (total)	0.142	0.133	
Beryllium (total)	<0.001	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	313.	315.	
Boron (total)	<0.05	<0.05	
Cadmium-Total (mg/L)	<0.0001	<0.0001	
Calcium-Dissolved (mg/L)	82.	82.	
Calcium-Total (µg/L)	99,000.		
Calcium-Total (mg/L)	99.		
Carbonate Alkalinity as CaCO3 (mg/L)	<1	<1	
Chloride (mg/L)	316.	280.	
Chromium-Total (mg/L)	<0.001	<0.001	
Cobalt	0.012	<0.001	
Colour	Clear	Clear	
Copper-Total (mg/L)	0.002	<0.001	
EC - Field	1,650.	1,440.	1,521.
Electrical Conductivity @ 25°C (µS/cm)	1,600.	1,570.	
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	<1	
Ionic Balance (%)	6.67	5.2	
Iron-Total (mg/L)	0.55	0.31	
Lead-Total (mg/L)	<0.001	<0.001	
Magnesium-Dissolved (mg/L)	69.	63.	
Magnesium-Total (µg/L)	69,000.		
Magnesium-Total (mg/L)	69.		
Manganese (total)	1.81	1.53	
Mercury-Total (mg/L)	<0.0001	<0.0001	
Nickel-Total (mg/L)	0.002	0.001	
Nitrate as N (mg/L)	0.02	0.02	
Nitrite + Nitrate as N (mg/L)	0.02	0.02	

Nitrite as N (mg/L)	<0.01	<0.01	
Odour	Nil	Slight Sulfur	
pH (pH Unit)	6.7	6.9	6.8
pH Value (pH Unit)	7.7	7.21	
Potassium-Dissolved (mg/L)	14.	10.	
Potassium-Total (µg/L)	11,000.		
Potassium-Total (mg/L)	11.		
Purge Type	Bail	Bail	
Selenium-Total (mg/L)	<0.01	<0.01	
Sodium-Dissolved (mg/L)	125.	118.	
Sodium-Total (µg/L)	123,000.		
Sodium-Total (mg/L)	123.		
Stick up	0.75	0.75	0.75
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	126.	100.	
Temperature	19.8	18.7	21.4
Total Alkalinity as CaCO3 (mg/L)	313.	315.	
Total Anions	17.8	16.3	
Total Cations	15.6	14.7	
Total Dissolved Solids @180°C-Total (mg/L)	985.	792.	
Vanadium	<0.01	<0.01	
Water Depth to Stand	24.67	24.8	24.92
Zinc (total)	0.018	0.012	

Outliers: 0

Field Name	Result	Outlier Comment

WHITEHAVEN COAL

Area/Site: *Sunnyside*
From Date: *01-Jan-2021* **To Date:** *31-Dec-2021*
Standard: *<Blank>*

Data Point: Werona Production; Northing: 222511; Easting: 6570420

	18-Mar-21	08-Sep-21
Rec ID	**79769**	**82360**
Lab Ref	**90420**	**92344**
Aluminium (total) (mg/L)	0.18	
Ammonia as Nitrogen (N)	1.68	
Ammonium as N	1.68	
Appearance	Clear	
Arsenic-Total (mg/L)	<0.001	
Barium (total)	0.3	
Beryllium (total)	<0.001	
Bicarbonate Alkalinity as CaCO3 (mg/L)	649.	
Boron (total)	0.1	
Cadmium-Total (mg/L)	<0.0001	
Calcium-Dissolved (mg/L)	89.	
Calcium-Total (µg/L)	129,000.	
Calcium-Total (mg/L)	129.	
Carbonate Alkalinity as CaCO3 (mg/L)	<1	
Chloride (mg/L)	533.	
Chromium-Total (mg/L)	0.013	
Cobalt	<0.001	
Colour	Clear	
Comments		Unable to sample - Pump
Copper-Total (mg/L)	0.003	
EC - Field	2,900.	
Electrical Conductivity @ 25°C (µS/cm)	2,780.	
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	
Ionic Balance (%)	4.32	
Iron-Total (mg/L)	0.5	
Lead-Total (mg/L)	<0.001	
Magnesium-Dissolved (mg/L)	98.	
Magnesium-Total (µg/L)	101,000.	
Magnesium-Total (mg/L)	101.	
Manganese (total)	0.073	
Mercury-Total (mg/L)	<0.0001	
Nickel-Total (mg/L)	0.001	

WHITEHAVEN COAL

Area/Site: ***Sunnyside***
From Date: ***01-Jan-2021*** **To Date:** ***31-Dec-2021***
Standard: ***<Blank>***

Nitrate as N (mg/L)	<0.01	
Nitrite + Nitrate as N (mg/L)	<0.01	
Nitrite as N (mg/L)	<0.01	
Odour	Nil	
pH (pH Unit)	7.1	
pH Value (pH Unit)	7.94	
Potassium-Dissolved (mg/L)	13.	
Potassium-Total (µg/L)	10,000.	
Potassium-Total (mg/L)	10.	
Purge Type	Bail	
Selenium-Total (mg/L)	<0.01	
Sodium-Dissolved (mg/L)	312.	
Sodium-Total (µg/L)	325,000.	
Sodium-Total (mg/L)	325.	
Stick up	0.67	
Sulfate as SO4 - Turbidimetric-Dissolved (mg/L)	38.	
Temperature	19.8	
Total Alkalinity as CaCO3 (mg/L)	649.	
Total Anions	28.8	
Total Cations	26.4	
Total Dissolved Solids @180°C-Total (mg/L)	1,570.	
Vanadium	<0.01	
Water Depth to Stand	20.33	
Zinc (total)	0.035	

Outliers: 0

Field Name	Result	Outlier Comment