BHP

Annual Environmental Protection and Management Program Report

Olympic Dam

1 July 2021 – 30 June 2022

Distribution

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Contents

Figures

Tables

INTRODUCTION

Purpose and scope

This annual environmental protection and management program report (annual EPMP report) presents data relating to the environmental management of the BHP Olympic Dam operations for the period 1 July 2021 to 30 June 2022 (FY22).

The objectives are to:

- Meet the requirements of clause 11 of the Olympic Dam and Stuart Shelf Indenture (the Indenture).
- Report performance against environmental outcomes, compliance criteria and leading indicators presented in the 2021 Environmental Protection and Management Program (EPMP).
- Report performance against targets and continuous improvement actions contained in the 2021 EPMP.
- Document the results of the deliverables presented in the Monitoring Programs (MPs) of the 2021 EPMP.

The 2021 EPMP was submitted to the Indenture Minister in May 2021 and subsequently approved.

Report structure

A description of the EPMP structure against which reporting is based is given below.

The reporting against outcomes is achieved through a hierarchy of data reporting (deliverables) and statements of compliance leading to an assessment of whether or not the environmental outcome has been met based on the methodology described in the associated Monitoring Programs. The main chapters in the report are aligned to the five key environmental aspect ID's contained within the EPMP. Each ID is related to an area of the operation for which specific environmental management measures are required.

The reporting hierarchy then takes the following form:

- Deliverables from the various MPs are included in the most relevant chapter, and a presentation of data and discussion of results is provided.
- The results of the deliverables contribute to the compliance statement for the compliance criteria under which they are reported (and in some cases to other compliance criteria, in which case appropriate cross-referencing is provided).
- These compliance criteria then provide a statement of achievement of the environmental outcome.

Performance against targets and continuous improvement actions is reported separately but still within the relevant ID chapter.

Table 1 contains a summary of each Environmental Management Program (EM Program) ID. This provides an overview of the outcomes and has the following elements:

- The environmental outcome to be achieved
- A 'traffic light' style indicator to indicate whether the outcome (and the associated compliance criteria and leading indicators) has been achieved (based on the findings of the assessment).
- A statement that summarises whether or not the environmental outcome was achieved (based on the findings of the assessment), and why.

EPMP STRUCTURE

Background

The structure of the EPMP report is closely aligned with the structure of the BHP Olympic Dam Corporation Pty Ltd (ODC) 2021 EPMP, and in particular the EM Program contained within that document. The EPMP consists of a number of documents which form a portion of the Environmental Management System (EMS) requirements. A brief summary of each document within the EPMP is shown in Table 1.

Table 1: EPMP Structure.

Document	Content summary
EMM	General overview of the EPMP. Purpose and scope. Regulatory framework. Background information about Olympic Dam. Overview of the structure and requirements of the Environmental Management System. Glossary of defined terms. Cross-referencing of EPMP content to approval conditions and the requirements of the Mining Code.
EM Program	Addresses potentially significant environmental aspects and impacts identified through analysis and prioritisation of environmental risks, legal obligations and community concerns. Documents the processes, systems and actions used to manage those aspects and impacts.
MP(s)	Address assessment and performance of the EM Program's outcomes, compliance criteria and targets, control mechanisms and legal and other requirements.
Actions, Targets and Major Changes	Captures continuous improvement opportunities and development opportunities that can assist in achieving future environmental outcomes and improving ODC's environmental performance, environmental improvement targets and the action plan to achieve such targets.
Mine Closure and Rehabilitation Plan	A plan for closure and rehabilitation of the mine, including the environmental outcomes expected to be achieved indefinitely, and options for progressive rehabilitation.

The EM Program addresses the potentially significant environmental aspects and impacts that have been identified through an analysis and prioritisation of the environmental risks, legal obligations and community concerns relevant to BHP Olympic Dam Corporation Pty Ltd (ODC) Olympic Dam Operations. It documents the processes, systems, criteria and other requirements designed to manage the prioritised aspects and impacts, including (as appropriate):

- The environmental values, and the key risks to those values;
- The environmental outcomes that BHP aims to achieve relating to potential environmental impacts;
- Clear, specific and measurable compliance criteria that demonstrate achievement of the outcome(s);
- Leading indicator(s) criteria, providing early warning of trends that indicate a compliance criteria may not be met;
- The management and operational controls in place to deal with the environmental risk (of the impacts), including any regulatory conditions; and
- Contingency options to be used in the event that identified risks are realised.

EXECUTIVE SUMMARY

Overview

The FY22 Annual EPMP Report's purpose is to demonstrate compliance against the 2021 Environmental Protection and Management Program (EPMP).

Data from monitoring programs is presented as evidence against compliance criteria under the Environmental Management Program (EM Program) IDs.

Considerable progress against environmental outcomes and compliance criteria in the 2021 EPMP and actions and targets was made during the reporting period.

Major Achievements

Major achievements for the reporting period include:

- Approximately 12,111 tonnes of recyclable material was transported offsite during FY22. Materials included plastics, metals including legacy waste, hydrocarbons, batteries, timber and tyres. This is the highest level achieved since operations commenced at Olympic Dam for the third consecutive year.
- Together with the Kingoonya Landscape Group, ODC hosted a flora and fauna workshop in Roxby Downs in May 2022. The workshop was open to the public and covered identification of native and pest plants, and feral control. ODC is committed to engaging and educating the community on flora and fauna threats in the region.
- Two small buttresses for the TSF1 east wall and the TSF4 south wall were constructed in FY22, reinstating the FoS to above the threshold value (Peak Scenario).
- ODC has identified the wetland wailer, an audio-based bird deterrent as a feasible option to trial at the TRS. Field trials of the wetland wailer commenced in October of FY22.The wetland wailer combines natural bird vocalisations and electronic sounds to create a 350m radius that is uncomfortable for birds to remain in. The use of natural and electronic sounds, in combination with multiple speakers, changes in duration and strobe lighting prevents birds from habituating to the patterns of the deterrent.
- During FY22 BHP entered into renewable energy supply arrangements that will see Olympic Dam reduce its emission position to zero for 50 per cent of its electricity consumption by 2025, based on current forecast demand. The agreement will be supplied by Iberdrola Renewable Energy Park near Port Augusta in South Australia, which will be Australia's largest solar-wind hybrid plant once in operation in July 2022.

Compliance summary

Table 2 lists the environmental outcomes for each EM Program ID. Next to each outcome 'traffic light' style indicators have been used to allow for overview assessment of achievement of the outcome, as follows:

- Environmental outcome achieved
- Significant progress towards achieving the Environmental outcome
- Environmental outcome not achieved

The approved 2021 EM Program contained 22 environmental outcomes, 25 compliance criteria and 15 leading indicators. Additional to these the EPMP contained 10 targets, and 20 actions, which are aspirational and support the environmental outcomes and compliance criteria against which ODC is assessed.

20 of the 22 environmental outcomes and 24 of the 25 compliance criteria were achieved or were within prescribed limits with 1 achieving significant progress towards the Environmental Outcome and I outcome not achieved. 14 of the 15 leading indicators were met. All targets and actions were achieved or significantly progressed.

The outcome for ID3.1 Particulate Emissions has been classified as 'significant progress towards achieving the Environmental Outcome' as a result of particulate matter (PM10) results above the compliance criteria threshold on two occasions at Olympic Dam Village. In FY22, two ground level PM_{10} dust concentrations at Olympic Village derived from construction sources at Olympic Dam exceeded the PM_{10} 24 hour average of 50µg/m^3. The investigations concluded that the high particulate loadings derived from construction sources were caused by regional dust events. No dust related complaints were reported and therefore ODC does not consider these events to have caused adverse impacts to public health. No community complaints were received relating to dust events in FY22.

The outcome for ID 5.1.1 Residents in Roxby Downs, Andamooka and Woomera have a favourable view of ODC has been classified as not achieved. The 2022 Community Perception Survey showed that ODC is viewed favourably (trusted) by 31% of respondents in its local communities, this was a decrease from 50% in 2020. A decrease in trust was recorded across all BHP assets and coincides with a fall in trust recorded against other resource companies included as comparators. This survey also marks the first time that trust has been measured since BHP took the decision not to proceed with the expansion of the Olympic Dam mine in 2020, a decision which was not received favourably by the local community. The survey also showed an opportunity to establish greater trust with community, with trust among stakeholders (interviewees who have a direct relationship with ODC and who undertook a more thorough survey) increasing from 40% in 2020 to 50% in 2022. This was underpinned by an appreciation of BHP's visibility in the local community and the consultative and practical ways in which ODC supports the local community, but coupled with concerns about communication of decisions to the community and unmet expectations of consistent behaviour and communications.

At the end of FY22, the average drawdown at S1 was 4.7m (BHP Olympic Dam 2022c) which exceeds the leading indicator of 4.5m. The rapid increase in drawdown to 4.7m at S1 is localised to the monitoring well. Other wells closer to wellfield B do not record a similar response (OB1, OB3, OB6, and WCB2). The cause of the anomalous drawdown has been confirmed as a split in the fibreglass reinforced plastic (FRP) casing of the well. A project to replace the well is scheduled for completion in FY23.

Table 2: FY22 Compliance Summary.

ID 1 USE OF NATURAL RESOURCES ID 1.1 Land Disturbance and Rehabilitation	
Environmental outcome	Outcome Statement
No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of the construction, operation and closure of Olympic Dam	No significant adverse impacts to populations of listed species as a result of the construction and operation of Olympic Dam occurred. No closure activities were undertaken in FY22. No significant clearing of listed species or listed species potential habitat occurred in FY22. No significant adverse impact was detected for *Eriocaulon carsonii* ssp. *carsonii* as a result of aquifer level drawdown. The Australasian Darter (*Anhinga novaehollandiae* N=1) was observed interacting with the TRS during FY22. Due to the one listed individual encountered at the TRS, no significant adverse impact to a population of listed bird occurred as a result of the operation of Olympic Dam.
ID 1.2 Aquifer Level Drawdown	
Environmental outcome	Outcome Statement
No significant adverse impacts to existing third-party users' right to access water from within the GAB wellfield Designated Areas for the proper development or management of the existing use of the lands as a result of ODC activities.	No significant adverse impacts to existing third-party users' right to access water from within the GAB wellfield Designated Areas for the proper development or management of the existing use of the lands as a result of ODC activities occurred. Drawdown and percentage wellhead pressure loss at pastoral bores remains less than the predicted long-term impact as presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2016), and significantly less than the maximum drawdown area defined within the 10 m contour.
No significant adverse impacts to the availability and quality of groundwater to existing Stuart Shelf third-party users as a result of groundwater drawdown associated with ODC activities.	No significant adverse impacts to the availability and quality of groundwater to existing Stuart Shelf third-party users as a result of groundwater drawdown associated with ODC activities occurred. Regional groundwater levels are stable.
No significant adverse impact on groundwater-dependent listed species or ecological communities as a result of groundwater drawdown associated with ODC activities.	Drawdown remains less than the predicted long-term impact and was within compliance criteria limits for FY22. Environmental flow rates at GAB springs remained above predicted long term impacts as presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2016). Monitoring showed no indication of a significant adverse impact on groundwater-dependent listed species or ecological communities as a result of groundwater drawdown associated with ODC activities.

ID 2 STORAGE, TRANSPORT AND HANDLING OF HAZARDOUS MATERIALS

ID 2.1 Chemical and Hydrocarbon Spills

Environmental outcome	Outcome Statement
No significant site contamination of soils, surface water or groundwater, as a result of the transport, storage or handling of hazardous substances associated with ODC's activities.	No significant contamination of soils, surface water or groundwater leading to actual or potential environmental harm due to the transport, storage or use of hazardous substances associated with ODC activities occurred during FY22.

ID 2.2 Radioactive Process Material Spills

Environmental outcome	Outcome Statement
No adverse impacts to public health as a result of radioactive process material spills from ODC's activities.	ODC has consistently operated in a manner that limits radiation dose to members of the public, from operational activities and radioactive emissions, to less than a small fraction of the International Commission on Radiological Protection (ICRP) 1mSv/y limit. During FY22 there were no radioactive process material spills outside operational areas. As a result, there are no adverse radiation exposure impacts to the public from activities undertaken by ODC.
No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive process material spills from ODC's activities.	No significant impacts to populations of listed species or ecological communities were recorded as a result of operational activities, including the effects from any radioactive process material spills. Impacts to listed species and ecological communities are avoided by ensuring that there is no uncontrolled loss of radioactive material to the natural environment. As there was no loss of radioactive material to the undisturbed environment in FY22, no impact to populations of listed species or ecological communities occurred.

ID 3 OPERATION OF INDUSTRIAL SYSTEMS

ID 3.1 Particulate Emissions

Environmental outcome	Outcome Statement
No adverse impacts to public health as a result of particulate emissions from ODC's activities.	No adverse impacts to public health as a result of particulate emissions from operations conducted by ODC occurred during FY22. Two high dust events occurred during FY22. ODC undertook a review of the dust monitoring program in FY22 and determined it was adequate for monitoring ODC's contribution to dust levels at nearby sensitive receptor sites of Olympic Village and Roxby Downs. No community complaints were received relating to dust events in FY22.

ID 3.2 Sulphur dioxide emissions

Environmental outcome	Outcome Statement
No adverse impacts to public health as a result of sulphur dioxide (SO2) emissions from ODC's activities.	Environment Protection (Air Quality) Policy 2016 Ground Level Concentration (GLC), levels for ambient air quality are based on the protection of human health. Roxby Downs and Olympic Village ambient SO2 analyser results for the reporting period showed no exceedance of the GLC for ambient air quality SO2 at either Olympic Village or Roxby Downs Township. An annual review of monitoring data collected at sensitive receptors (ambient ground level concentrations) has shown there were no adverse impacts to public health as a result of sulphur dioxide (SO2) emissions from ODC's activities during FY22.

ID 3.3 Saline aerosol emissions	
Environmental outcome	Outcome Statement
No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of ODC's activities.	No significant adverse impact to populations of listed species from saline aerosol emissions was observed during FY22. Observations made during environmental inspections and supported by data collected during various flora and fauna monitoring programs, did not find any significant adverse impacts to listed species.

ID 3.4 Radioactive emissions	
Environmental outcome	Outcome Statement
No adverse impacts to public health as a result of radioactive emissions from ODC's activities.	ODC has consistently operated in a manner that limits radiation dose to members of the public, from operational activities, to less than a small fraction of the 1 mSv/yr public dose limit prescribed by the International Commission on Radiological Protection (ICRP). As a result, there are no adverse radiation exposure impacts to the public from activities undertaken at ODC.
No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive emissions from ODC's activities.	There were no significant adverse impacts to populations of listed species or ecological communities as a result of ODCs activities. Monitoring of radiation doses to the public and the deposition of 238U at non-human biota (NHB) assessment sites is used as an indicator of the potential exposure of listed species to radioactive emissions. Deposition of 238U at non-human biota assessment sites was at a level which poses no significant adverse impacts to non-human biota.

ID 3.5 Greenhouse gas emissions	
Environmental outcome	Outcome Statement
Contribute to stabilising global atmospheric greenhouse gas concentrations to minimise environmental impacts associated with climate change.	BHP's climate change strategy focuses on reducing our operational greenhouse gas (GHG) emissions, investing in low emissions technologies, promoting product stewardship, managing climate-related risk and opportunity and working with others to enhance the global policy and market response. As a BHP group asset, ODC operates under the BHP group strategy.

ID 4 GENERATION OF INDUSTRIAL WASTES ID 4.1 Embankment stability of TSF	
Environmental outcome	Outcome Statement
No significant TSF embankment failure.	During FY22 the Tailings Storage Facilities (TSFs) were managed in accordance with the Tailings Retention System (TRS) Operations, Maintenance and Surveillance Manual (BHP Olympic Dam 2021d) and the Tailings Retention System Management Plan (BHP Olympic Dam 2022) and no embankment failures occurred.

ID 4.2 Tailings seepage	
Environmental outcome	Outcome Statement
No significant adverse impact on vegetation as a result of seepage from the TSF.	No significant adverse impact to vegetation as a result of seepage from the TSFs has occurred. Eighty metres AHD (20 m below ground level) is considered as the level below which groundwater cannot interact with the root zone of plants in the Olympic Dam region. Groundwater levels in the vicinity of the TSFs remain below 80 mAHD.

No compromise of current and future land uses on the SML or adjoining areas as a result of seepage from the TSF.	No compromise of current and future land uses on the SML or adjoining areas has occurred as a result of seepage from the TSFs. Groundwater levels in the vicinity of the TSFs remain below 80 mAHD and sampling indicates that seepage is being attenuated.
No compromise of the environmental values of groundwater outside the SML as a result of seepage from the TSF.	No compromise of the environmental values of groundwater outside the SML has occurred as a result of seepage from the TSFs. Sampling indicates that seepage is being attenuated within the SML, and groundwater levels of bores along the SML boundary are consistent with other regional bores. Seepage modelling confirms that there are no expected future offsite impacts.

ID 4.3 Fauna interaction with Tailings Retention System

Environmental outcome	Outcome Statement
No significant adverse impacts to listed species (South Australian, Commonwealth) as a result of interactions with the Olympic Dam TRS	No significant adverse impacts to listed species as a result of interactions with the Olympic Dam Tailings Retention System (TRS) have occurred. One Australasian Darter *(Anhinga novaehollandiae* N=1) individual was observed interacting with the TRS during FY22. Due to the one listed individual encountered at the TRS, no significant adverse impact to a population of listed bird occurred as a result of the operation of Olympic Dam.

ID 4.4 Solid waste disposal

Environmental outcome	Outcome Statement
No significant adverse impacts as a result of management of solid waste.	The Resource Recovery Centre (RRC) effectively manages solid waste as per the EPA approved Landfill Environmental Management Plan 2021 (LEMP). No evidence of actual or potential environmental harm was identified through routine auditing or based on the reporting of materials disposed of to the landfill. Therefore, it can be concluded that no significant adverse impacts resulted from the management of solid waste at Olympic Dam during FY22.

ID 4.5 Radioactive waste

Environmental outcome	Outcome Statement
No adverse impacts to public health as a result of radioactive waste from ODC's activities.	ODC has consistently operated in a manner that limits radiation dose to members of the public from radioactive waste, to less than a small fraction of the International Commission on Radiological Protection (ICRP) 1 mSv/yr limit. As a result, there were no adverse radiation exposure impacts to the public from activities undertaken at Olympic Dam in the reporting period.
No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive waste from ODC's activities.	During the reporting period there were no significant adverse impacts to populations of listed species or ecological communities as a result of ODCs activities. Monitoring of radiation doses to the public and the deposition of ^{238}U at non-human biota assessment sites is used as an indicator of the potential exposure of listed species to radioactive waste. Deposition of ^{238}U at non-human biota assessment sites during the reporting period was at a level which poses no significant adverse impacts to non-human biota.

ID 5 INTERACTION WITH COMMUNITIES

ID 5.1 Community interaction

Environmental outcome	Outcome Statement
Residents in Roxby Downs, Andamooka and Woomera have a favourable view of ODC.	The 2022 Community Perception Survey showed that ODC is viewed favourably (trusted) by 31% of respondents in its local communities, this was a decrease from 50% in 2020. A decrease in trust was recorded across all BHP assets and coincides with a fall in trust recorded against other resource companies included as comparators. It is important to note that data collection for this metric is now completed in a different way as explained throughout the report.

Note: Individual monitoring programs are referred to in this document with a two letter abbreviation as follows: Fauna – FA; Flora – FL; Great Artesian Basin – GA; Groundwater – GW; Environmental Radiation – ER; Airborne Emissions – AE; Energy Use and Greenhouse Gas (GHG) Emissions – EG; Waste – WA; Surface water – SW; Social Effects – SE.

1 Use of natural resources

1.1 Land disturbance and rehabilitation

1.1.1 Environmental Outcome

No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of the construction, operation and closure of Olympic Dam.

No significant adverse impacts to populations of listed species as a result of the construction and operation of Olympic Dam occurred in FY22. No closure activities were undertaken in FY22.

No significant clearing of listed species occurred in FY22.

No significant adverse impact was detected for *Eriocaulon carsonii* ssp. *carsonii* as a result of aquifer level drawdown.

No significant adverse impacts to listed species as a result of interactions with the Olympic Dam Tailings Retention System (TRS) have occurred.

One Australasian Darter (*Anhinga novaehollandiae),* listed as Rare under the National Parks and Wildlife Act 1972 (NPW Act), was observed interacting with the TRS during FY22. The individual Australasian Darter was observed during weekly monitoring conducted every Thursday morning by the Environment department. In addition, opportunistic monitoring is completed each day by Tailings Retention System (TRS) technicians. Due to the low number (n=1) of listed species encountered at the TRS, no significant adverse impact to a population of listed birds occurred as a result of the operation of Olympic Dam.

1.1.2 Compliance criteria

No significant impact to the size of an important population of a community of native species dependent on natural discharge of groundwater from the Great Artesian Basin, including *Eriocaulon carsonii*.

Note: Significant impact is as defined in the Significant Impact Guidelines and greater than predicted in the EIS.

Potential impacts to communities of native species dependent on natural discharge of groundwater from the Great Artesian Basin (GAB) are discussed in Chapter 1.2 on Aquifer Level Drawdown. Within the region studied, populations of *Eriocaulon carsonii* ssp. *carsonii* was found at 24 spring vents in the Hermit Hill, North East and Lake Eyre springs complexes in FY22. *E.carsonii* ssp. *carsonii* was recorded for the first time in several years at two springs in FY22. It had not previously been recorded since 2016 at HHS072 and at HHS075. *Eriocaulon carsonii* ssp. *carsonii* was found for the first time in FY22 at HHS173. *E.carsonii* ssp. *carsonii* can easily be obscured by other species and at these spring vents it was particularly cryptic, growing amongst very thick *Phragmites australis* at the beginning of the tail. The average abundance of *Eriocaulon carsonii* ssp. *carsonii* observed in FY22 (13.25±2) was lower than FY21 (17.5±2), FY20 (15±2) and FY19 (14±3). Using a Chi Square analysis for dependent samples, the average abundance of the 27 springs identified as suitable *Eriocaulon carsonii* ssp. *carsonii* habitat from FY16-FY22 has shown that there has been no significant impact to the size of an important population of *Eriocaulon carsonii* ssp. *carsonii* ($X^2 = 3.14$, df = 5, p = 0.3213). Differences in the average abundance of *E.carsonii* ssp. *carsonii* is likely due to the cryptic nature of the species. Using average abundance and presence of *E.carsonii* ssp. *carsonii* as indicators, it is assumed that no significant impact occurred in FY22.

No loss of an important population of Plains Rat (*Pseudomys australis*).

No loss of an important population of Plains Rat occurred as a result of land disturbed by ODC activities. No known critical habitat was cleared during FY22. No pre-clearance surveys were undertaken in FY22 due to the limited land disturbing projects undertaken.

In a broader regional context, Arid Recovery completed annual pitfall trapping in March 2022 in the vicinity of the Olympic Dam SML, with some trapping sites on the SML. Trapping occurred on dune habitats, which are less preferred by plains rats but are used by the species during boom periods following good rainfall. The survey recorded five plains rats, four within the Arid Recovery Reserve and one on the outside of the reserve on Andamooka Station. This is in comparison to FY21 trapping, where 90 individuals were trapped from swale sites. In addition to this monitoring, Arid Recovery also translocated 49 plains rats for release at the Australian Wildlife Conservancy's Pilliga fenced reserve. The additional trapping occurred in May 2022 and focussed on core plains rat habitat of swales and cracking clay. 90 individuals were trapped from inside the reserve and provided further indication of the status of plains rats in the region. These trends indicate that plains rats continue to benefit from the invasive predator free Arid Recovery Reserve, which sustains a substantial population of vulnerable species that otherwise has markedly lower persistence and occupancy of the surrounding landscape.

1.1.3 Leading Indicators

None applicable.

1.1.4 Deliverables (FA 3.1)

An annual report of monitoring and control actions for feral and abundant species undertaken within the SML and surrounding areas.

During FY22, a total of 116 cat traps were set with an average of 10 traps set per month. A total of 15 cats were caught. Therefore, the overall trap success rate was 12.9%. Areas of focus included Roxby Downs Village, Olympic Dam Village and office buildings on the SML. A further cat control initiative implemented during FY22 included the deployment of a Felixer device at various locations in and close proximity to the Resource Recovery Centre on the SML. A total of 21 cats were targeted by the Felixer in FY22 from a total of 299 operational nights. Equipment faults explained the 66 down day/nights.

Throughout FY22, no wild dogs were observed opportunistically on the SML. ODC remains committed to work in conjunction with the South Australian Arid Lands Landscape Board (SAALLB) to opportunistically control wild dog numbers (see SA Arid Lands Wild Dog Management Plan 2015).

In FY16, ODC together with Arid Recovery re-established a historical spotlight transect program that monitors the density of rabbits, cats, foxes and kangaroos in the Olympic Dam region. ODC worked with the Department of Primary Industries and Resources South Australia (PIRSA) to facilitate the release of a Korean strain of rabbit haemorrhagic disease virus (RHDV) known as K5 in the Roxby Downs region in March FY17, a subsequent release of the RHDV K5 virus occurred within the Arid Recovery Reserve in December 2021 (Figure 1). From July 2016 to April 2022, a significant decline in rabbit density has been observed at the Andamooka transect ($F_{1,32} = 23.25$, $p < 0.001$; $R^2 = 0.44$) and at the Roxby Downs transect ($F_{1,32} = 28.85$, $p < 0.001$; $R^2 = 0.49$; Figure 1). While it appears that the release of the K5 virus may have had a negative impact on rabbit densities in the region, it must be noted that no additional evidence was observed (e.g. no rabbit carcasses were observed that could have been laboratory tested for evidence of the K5 virus).

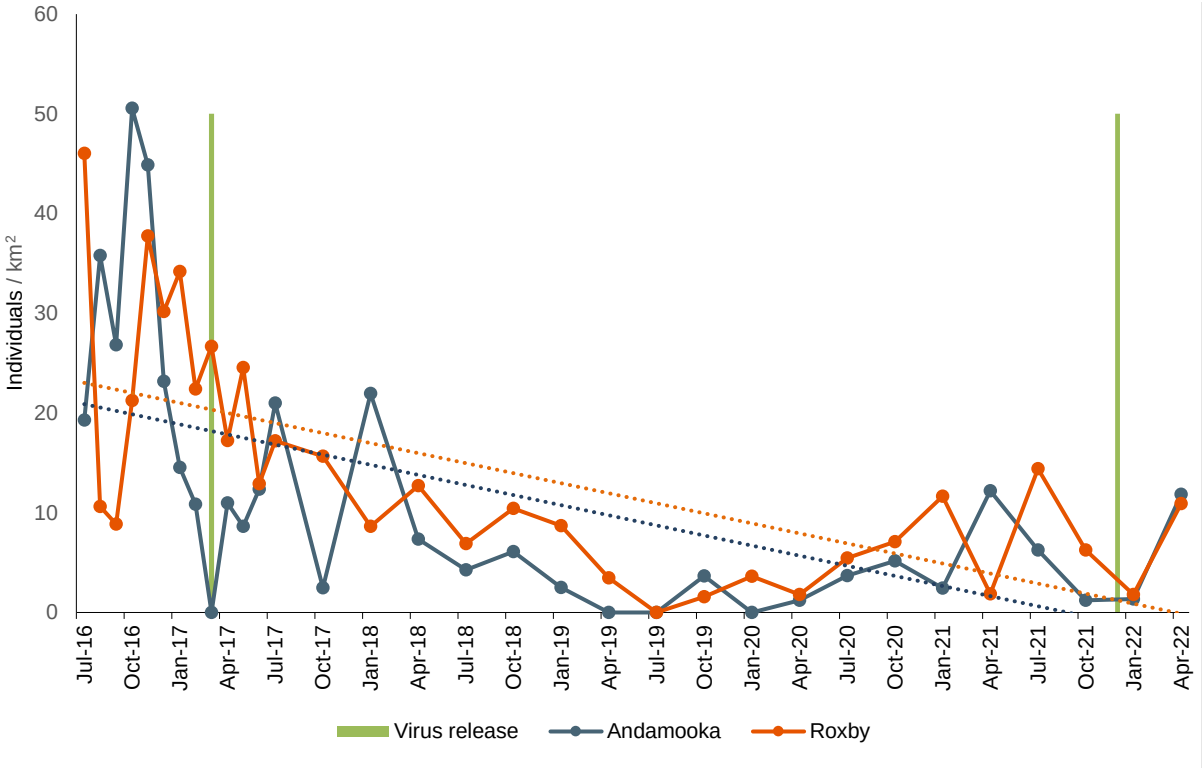


Figure 1: The density of rabbits observed pre- and post- K5 virus release.

An assessment of the abundance of specific feral and abundant species within the region.

Quarterly spotlight counts of two transects within the Olympic Dam region showed that rabbits and kangaroos existed in the highest density compared to other introduced or abundant species (i.e. foxes, cats and wild dogs) during FY22 (Figure 2). While kangaroo numbers remain stable, rabbit numbers have overall continued to decline to below numbers observed pre RHDV K5 release in 2016. Overall rabbit numbers observed during 2022 continued to fluctuate and did not appear to have a significant decline following the December 2021 re-release of RHDV K5.

Due to the cautious nature of wild dogs, it is recognised that the spotlight transect method may not be the most effective for capturing wild dog abundance data.

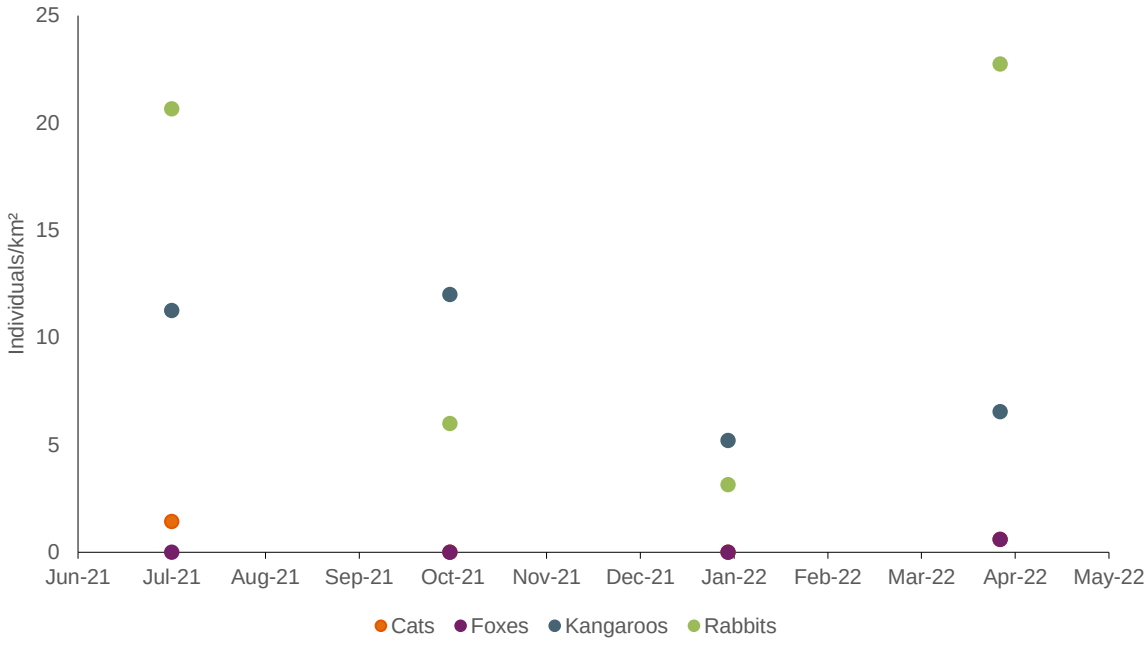


Figure 2: Density of rabbits, cats, and kangaroos observed in the Olympic Dam region in FY22.

1.1.5 Deliverables (FL 3.3)

Define and map the current distribution of extreme and high risk weed species within the Olympic Dam region, Roxby Downs Municipality, the expanded SML and Gosse Springs SEB areas.

Identification of whether measures are required to control declared weeds and plant pathogens in the operations area.

ODC completes a minimum 16 hours of routine pest plant monitoring each month. A total of 13 pest plant species were recorded as active during FY22. Of these, seven are declared under Landscape SA Act, two species are listed as Weeds of National Significance (WONs) and five species are identified as Priority Weeds in SAAL. Control efforts for a number of these species were undertaken throughout FY22. High spring and summer rainfall throughout FY22 continued to contribute to previously dormant Buffel grass infestations becoming active. Therefore, it was determined that control measures were still required for the continued management of pest plants.

New pest plant infestations were recorded within the Emerald Springs SEB in FY22. The new infestations are along the Oodnadatta track in drainage depressions and have been sprayed to prevent spreading into the SEBs. No new infestations were detected in the Gosse Springs SEB.

The FY22 distribution of declared and other high risk pest plant species, including infestations recorded since FY11 that are known to still be active, are shown in Figure 3 - 5. Blackberry Nightshade, Horehound, Saffron Thistle, and Salvation Jane controlled along the powerline to Port Augusta, not pictured in maps. In many cases a single GPS location may reference a large infestation area, and as such distribution of weeds may be more extensive than what is depicted in the maps. Thirteen declared or high risk weed species were observed as active in FY22 within the OD region, Roxby Downs Municipal area, SML and Emerald Springs SEB (Table 3). All pest plant data collected by ODC since 2000 is also available via SA Nature Maps.

Table 3: A list of declared and other high risk weed species active on the SML, Municipal lease region during FY22.

Species	Declared Landscape Act	Priority Weeds in SAAL	Weeds of National Significance	Other High Risk weeds
Athel Pine	X	X	X	
Blackberry Nightshade		X		
Buffel grass	X			
Couch Grass				X
Caltrop	X			
Fountain grass	X	X		
Horehound				X
Innocent Weed	X	X		
Paddy Melon				X
Prickly pear	X	X	X	
Ruby Dock				X
Saffron Thistle				X
Salvation Jane	X			

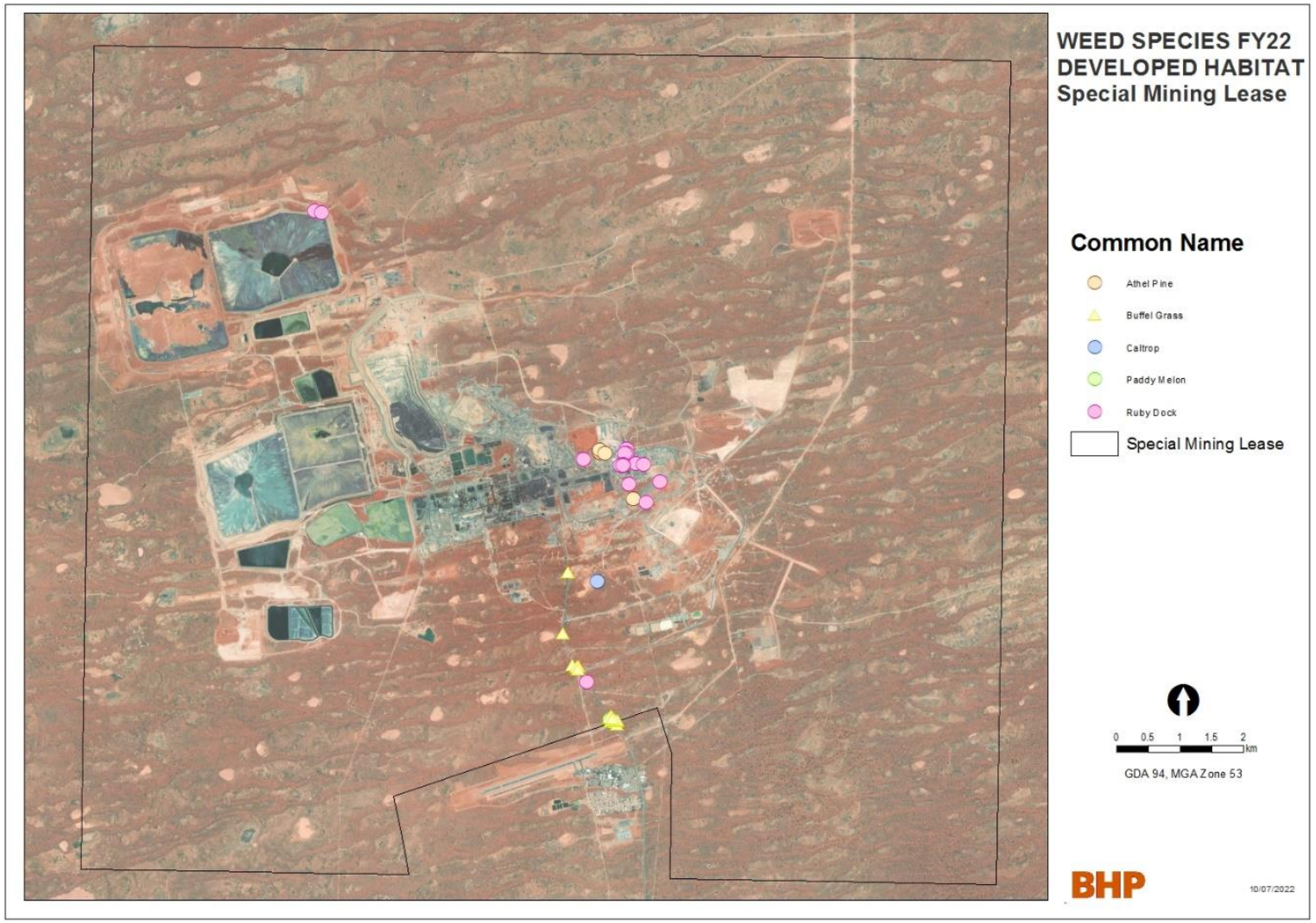


Figure 3: Locations of declared and high risk weed species on the SML active in FY22.

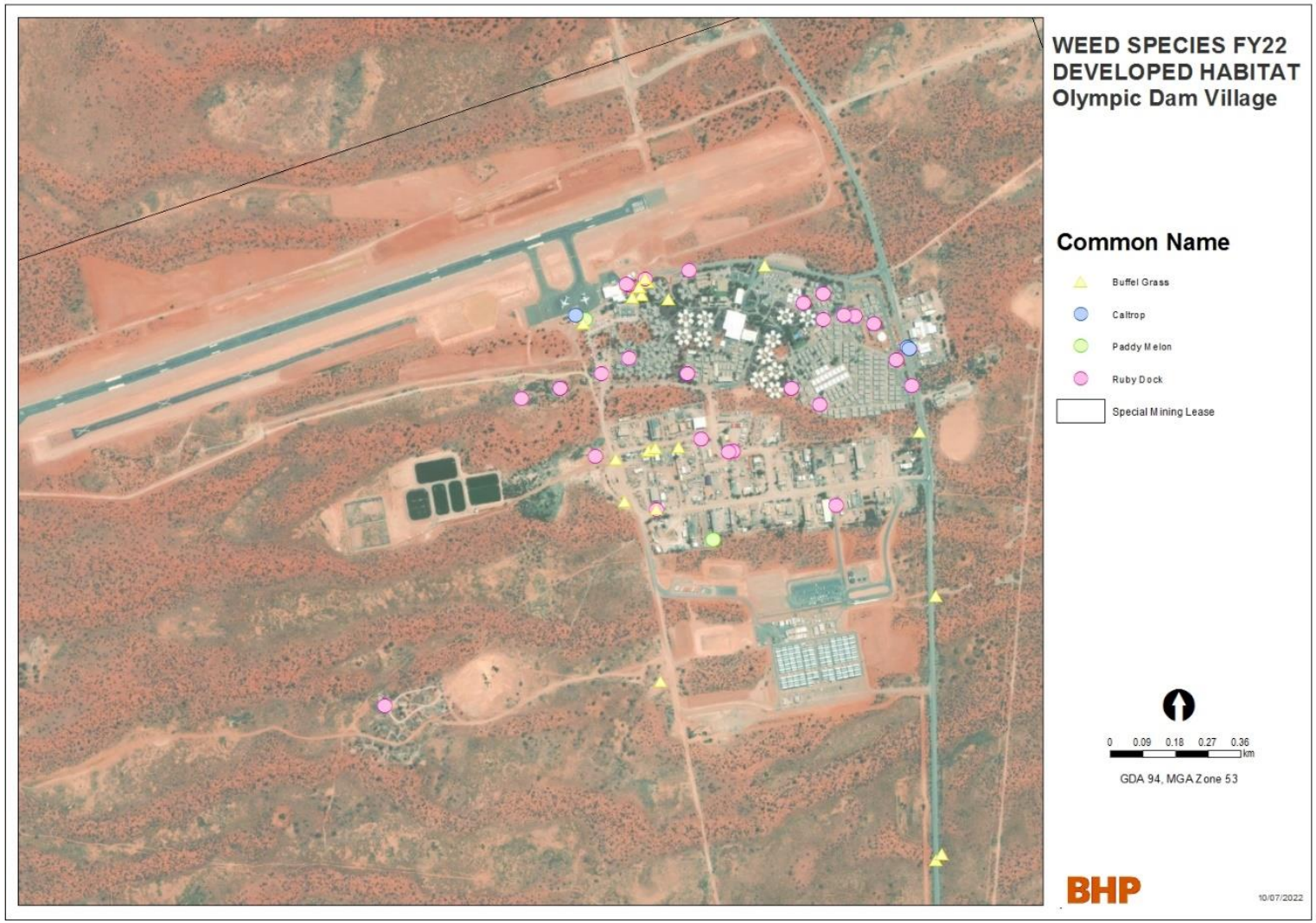


Figure 4: Locations of declared and high risk weed species at Olympic Dam Village active in FY22.

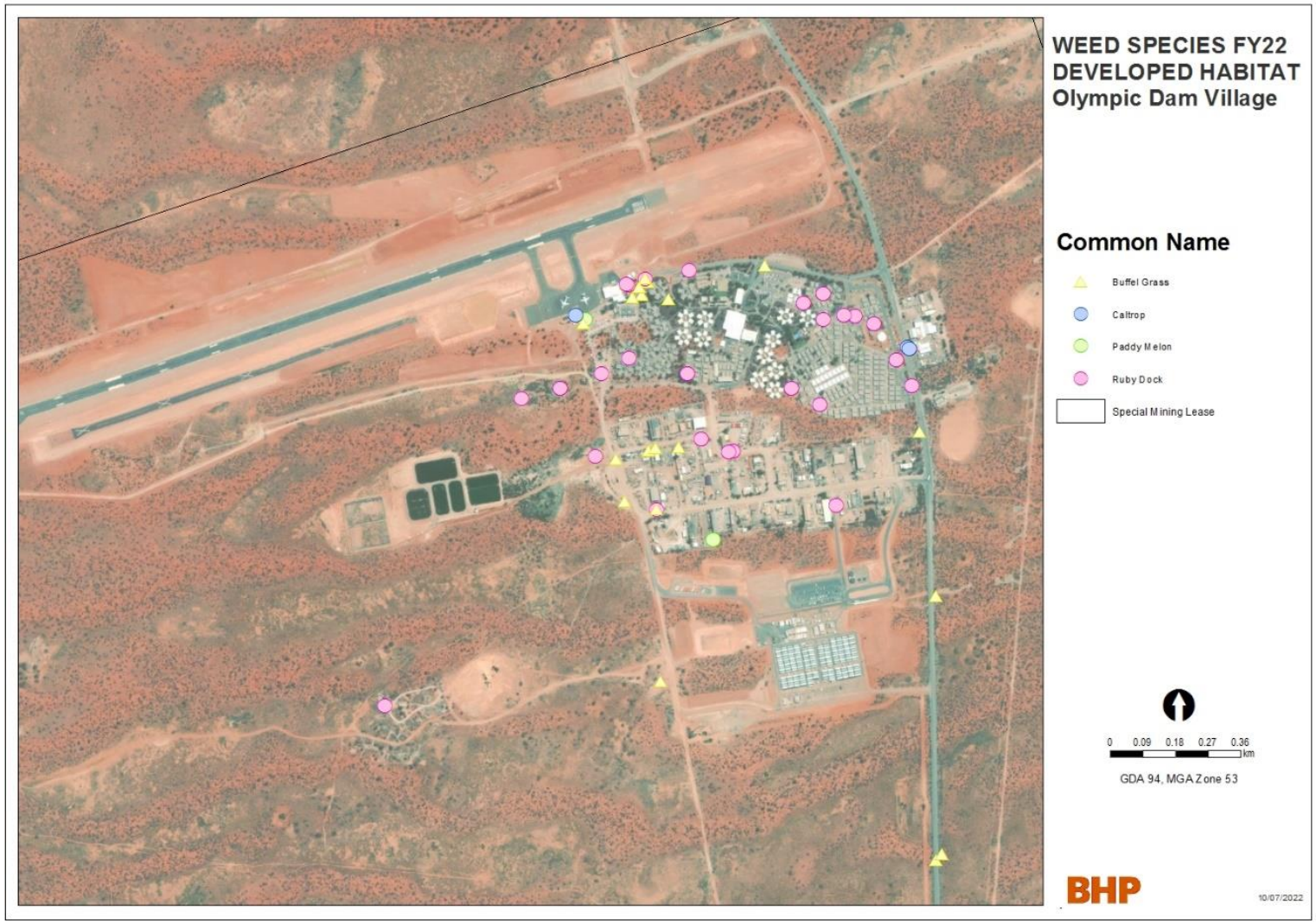


Figure 5: Locations of Declared and high risk weed species in the Roxby Downs urban area active in FY22.

1.1.6 Deliverables (FL 3.4)

A map of the known locations of listed species within the impact area of the Olympic Dam operation.

A statement of impacts to, and measures undertaken to avoid listed species.

Listed species include species known to occur in the region that are either listed as threatened or greater under state, national and/or international legislation and have the potential to be adversely impacted by operations. This includes species that have a wider distribution within the state, interstate or overseas and are therefore not considered to be critically dependent on existing populations within the potential impact area.

A bi-annual desktop assessment determined that one listed flora species of international significance, one listed flora species of national significance, and eleven listed flora species and one listed community of state significance were identified as potentially occurring in the impact area of the Olympic Dam operation. Western Tarvine *(Gilesia biniflora*), listed as Rare, and the threatened ecological community (TEC) Mulga (*Acacia aneura*) low woodland on sand plains, listed as Vulnerable under the NPW Act are known to exist on the SML (Figure 6). No known listed flora species were impacted by disturbance activities during FY22 (Figure 6). Efforts are made wherever possible to avoid these species during the Land Use Permit (LUP) process.

The desktop assessment determined that five listed fauna species of international significance, fourteen listed fauna species of national significance and seventeen listed fauna species of state significance were identified as potentially occurring in the impact area of the Olympic Dam operation. Fauna species re-introduced to Arid Recovery or species known to interact with the TRS were excluded from this assessment. Nomadic and migratory species known to interact with the TRS are discussed separately in chapter 4.3 Fauna Interaction with the Tailings Retention System.

An important population of Plains Rat is known to inhabit the Arid Recovery reserve and during favourable conditions, it is known to expand its population into the SML. Vegetation types that are considered potential habitat for the Plains Rat include, chenopod shrublands (*Atriplex vesicaria / Maireana astrotricha)*, cotton bush *(Maireana aphylla*) gilgais, canegrass (*Eragrostis australasica*) swamps and ephemeral dominated plains (Figure 7). These vegetation types are often associated with large swale areas greater than 1 km^2 that have drainage lines and cracking clays, which constitutes critical habitat for the Plains Rat. Efforts are made wherever possible to avoid potential Plains Rat habitat using the internal LUP process.

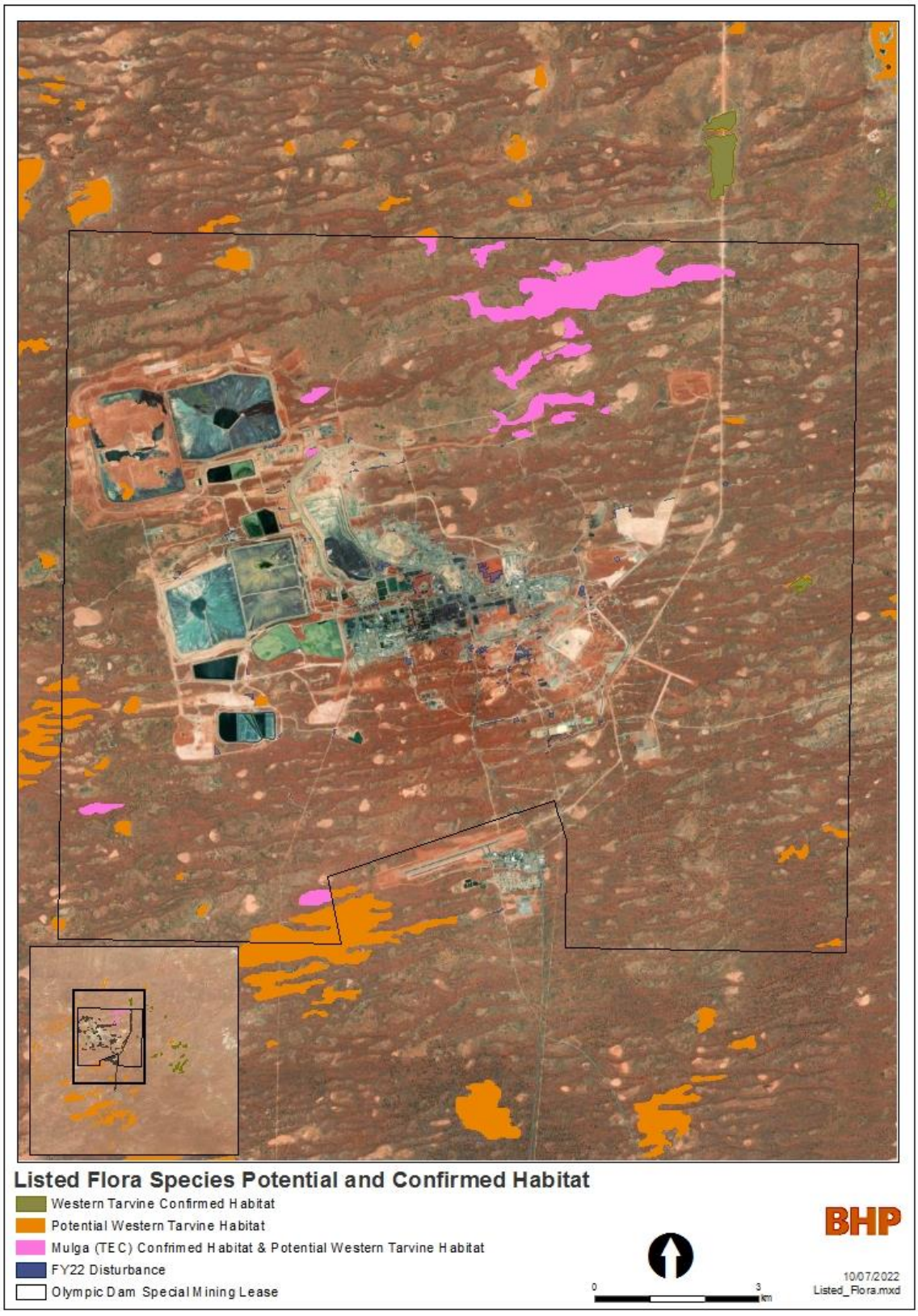


Figure 6: Potential and confirmed habitats of listed flora species.

Figure 7: Listed fauna species potential habitat.

A map of the direct disturbance impact footprint of ODC's Olympic Dam activities.

A statement of comparison between the impact footprint of ODC's Olympic Dam activities (i.e. within and outside the SML) and the offset areas under SEB processes, to account for 58.3 SEB points per hectare of native vegetation disturbed within the SML or as per the approved native vegetation plan for disturbances outside of the SML.

At the end of FY19 the remaining Gosse Springs SEB credit was converted to SEB points to align with to *Native Vegetation Regulations 2017*. The Gosse SEB balance remaining in reserve at the end of FY19, 4,424.3 ha was converted to 31,339 SEB points. Therefore, tracking the progress of disturbance and offset areas no longer involves the life of mine ratio of 8ha.

In 2019, the Emerald Springs SEB Native Vegetation Management Plan (Barron 2018a) was approved to establish a SEB offset area of 38,022 ha that is equivalent to 267,143 SEB points. The Native Vegetation Clearance Proposal for the SML accompanied the submission, which determined that 58.36 SEB points are required to be deducted from the Emerald Springs SEB credit for each hectare of native vegetation clearance (Barron 2018b).

Spatial analysis techniques were utilised on geo-referenced orthoimagery for FY22. During this reporting period, satellite imagery of the vast majority of the SML was captured on a quarterly basis, offering an accurate account of the timing of land disturbance. Disturbances identified as occurring between these dates were digitised and are represented in Figure 8. The total area of disturbance that occurred during FY22 was 15.12 ha (Table 4). This brings the total disturbance relating to ODC (rehabilitation areas, Roxby Downs town facilities, water pipelines and other associated infrastructure) to 5790.12 ha. Not all land clearance associated with ODC previously required an offset, but all disturbance in FY20, FY21, and FY22 was subject to an offset. The majority of disturbance for FY22 was attributed to minor business as usual activities to support raise bore infrastructure and backfill operations.

The Town Water Dam Relife project sought Native Vegetation Council Approval and 232.4 points were deducted from the Emerald Springs SEB. The balance of Gosse Springs SEB remains the same as end of FY21, at 25,706.75 points.

Disturbance in FY22 that occurred on the SML was offset using the Emerald Springs SEB, at the above-mentioned ratio of 58.3 points per hectare. A balance of 215,814.41 points remains for Emerald Springs SEB (Table 4).

Table 4: Areas of Disturbance and SEB Offset Areas as at June 2022.

Total land cleared by ODC up to end of FY22 (ha)	5,790.12	
Total land cleared by ODC in FY22 (ha)	15.12	
	Points remaining in Gosse end of FY21	***25,706.75****
	Points consumed in Gosse in FY22	**No points consumed from Gosse in FY22**
	Points remaining in Emerald end of FY21	***216,928.30****
	Points consumed in Emerald in FY22	**881.496**
	Points remaining in Emerald end of FY22	**215,814.41**

**During FY22 the approach to SEB offsetting accounting was reviewed and data accuracy improved. This resulted in the offsetting of additional SEB points from Gosse Springs and Emerald Springs associated with disturbance from FY20 and FY21. Therefore, the values presented as FY21 final have been restated.*

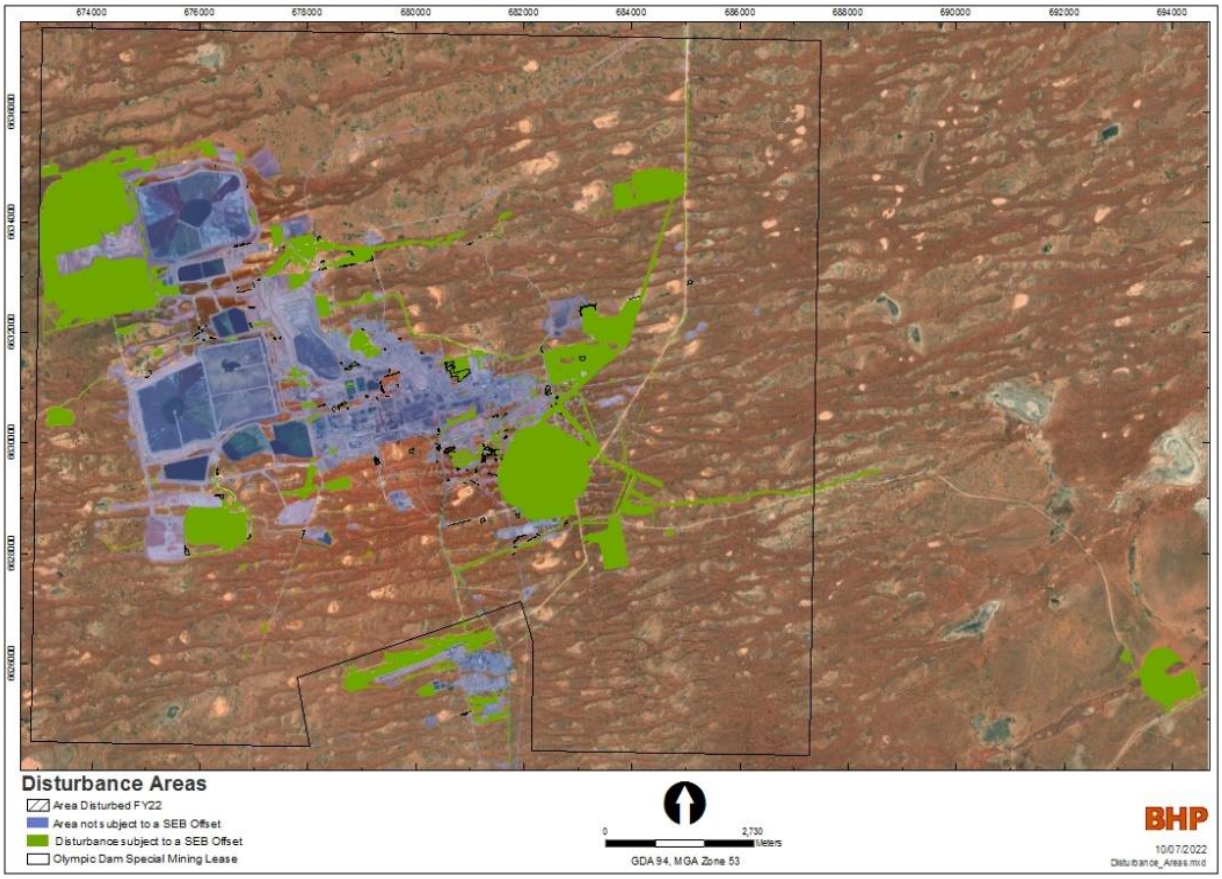


Figure 8: Areas of disturbance as at June 30 2022 (SML).

1.1.7 Deliverables (FL 3.5)

A summary of actions achieved from the SEB implementation plans within the fiscal year through the Annual EPMP Report.

An annual report to the government on SEB management outcomes through the Annual EPMP Report.

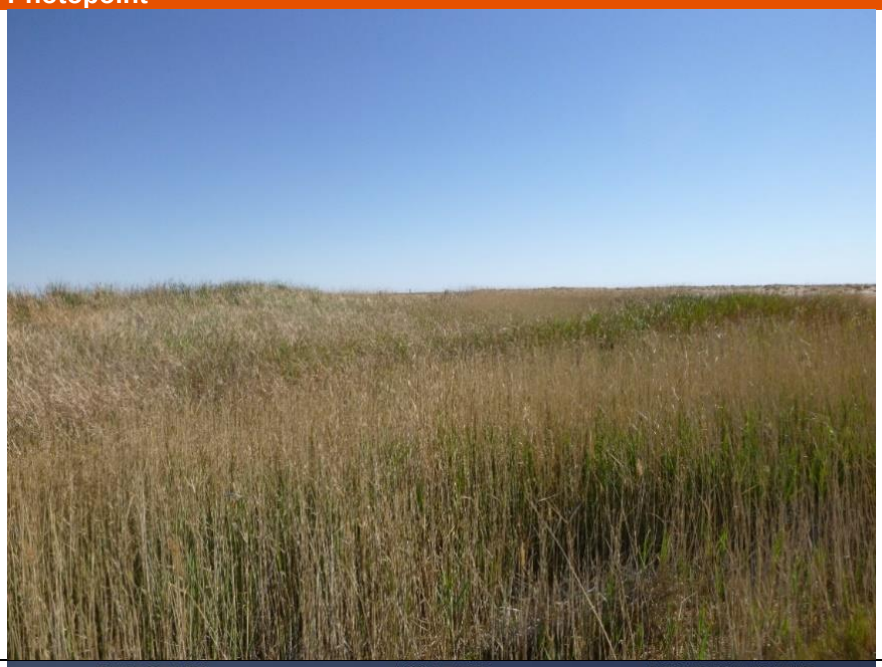
Shapefiles of the SEB areas for inclusion in relevant departmental databases.

To meet the requirements of the Native Vegetation Council annual standard monitoring and progress report for the SEB areas the following data is presented for both Emerald Springs (Table 5 -Table 7) and Gosse Springs (Table 8-Table 9) SEB. As part of the Native Vegetation Heritage Agreement, shapefiles for Emerald Springs and Gosse Springs SEB were sent to PIRSA and DEM in FY22.

Emerald Springs SEB

In FY19, ODC obtained approval for the Emerald Springs SEB in accordance with Schedule 1, Part 5 (Mining and petroleum activities), Division 1 – Mining Operations, 28 - Operations of the Native Vegetation Regulations 2017 under the Native Vegetation Act 1991. The Native Vegetation Heritage Agreement has not yet been secured and is with the State for assessment.

Table 5: Photographic Monitoring Record Sheet.

Site Reference	Photopoint
LES001	
LES001 – athel pine	

Site Reference	Photopoint
LES001 - tail	
LES001 - tail	

Site Reference	Photopoint
LWS007	
LWS009	

Site Reference	Photopoint
LWS012	
LWS014	

Site Reference	Photopoint
LWS015	
LWS016	

Table 3.2.1 of the Emerald Springs SEB Management Plan (Barron 2018a) outlines the management actions and timing of the agreed actions. Once-off actions are outlined in Table 6.

Table 6: Once-off management actions required for the Emerald Springs SEB in FY22.

	Action	Timing
1.	Cattle are to be mustered and removed.	Completed FY20
2.	Fence along the northern side of the Oodnadatta Track (~50km), including behind the Curdimurka Siding, including a gate at the main access points for springs and monitoring bores.	This action was reviewed in FY21. NVC approved an amendment to the Emerald Springs Native Vegetation Management Plan to remove this requirement. Instead, the Curdimurka paddock was destocked and the existing pastoral fence used to separate stocked paddocks from the Emerald Springs SEB.
3.	Improved signage, including at the Lake Eyre Lookout, Curdimurka Siding and at regular intervals along the Oodnadatta Track to encourage tourists to remain in controlled areas	FY21 and ongoing in FY22.
4.	NVC approved ODC's commitment to the Arabana people to not remove the athel pine within the Emerald Spring 1km2 fence line. This decision was for Heritage reasons.	Ongoing
5.	In late FY21 the NVC agreed to review both the Gosse and Emerald Springs Native Vegetation Management Plan updates in the same cycle as other EPMP documentation.	Ongoing

Ongoing management is captured through 1SAP Work Management. This entails quarterly inspections of the SEB areas, with a focus on fence maintenance, pest plant, and pest animal control. In FY22 new pest plant infestations were detected along the Oodnadatta Track. No large feral herbivores (horse, camel, cattle) or signs (tracks and scats) were observed in the Emerald Springs SEB in FY22. Based on quarterly inspections conducted by the Environment department and ongoing monitoring completed by the Stuart Creek sub-lessee the management actions for Emerald Springs SEB are effective and no negative changes to native vegetation have occurred.

Table 7: Progress works record for Emerald Springs SEB.

Action as listed in the NVMP	Action undertaken in FY22	Effectiveness of action
Domestic Livestock	During monitoring by the Environment team and Stuart Creek Station sub-lessee, no observations of cattle or their tracks and scats	Effective
Public Access	Unauthorised access of Emerald occurred but remained on tracks.	Effective
Feral herbivores	No horses or camels detected in SEB. No increase in rabbit activity occurred in FY22.	Effective
Invasive and declared weeds	New weed infestations detected in Emerald Springs SEB along the Oodnadatta Track	Effective
Health of GAB springs	Continued monitoring cover and abundance of vegetation within GAB springs within Emerald Springs SEB including Walkarinna as part of the GAB Springs monitoring program	Effective

Gosse Springs SEB

During FY22 the Gosse Springs Native Vegetation Plan was adhered to, and management actions undertaken.

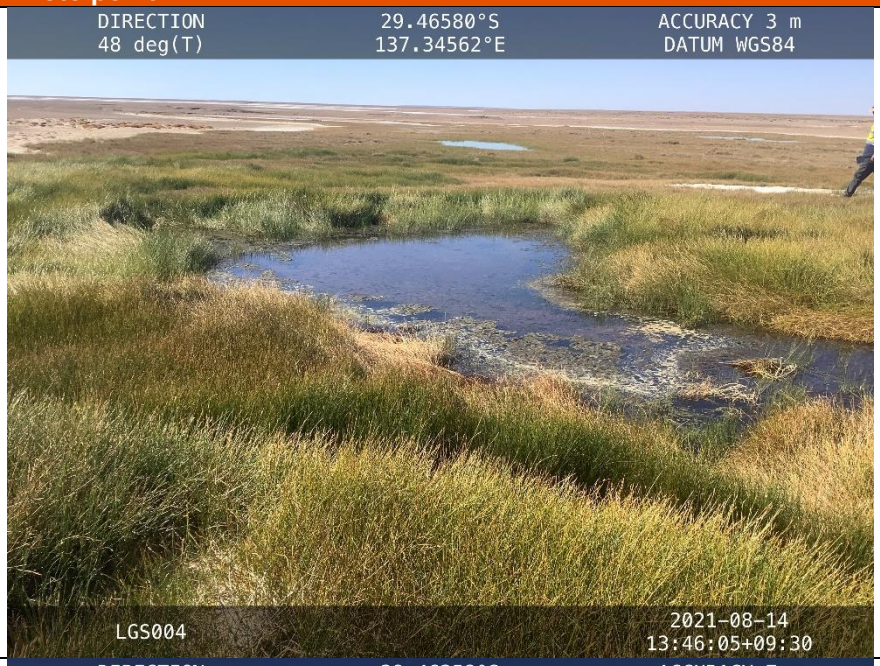
Quarterly inspections for feral animals and pest plants continued during FY22. In late FY21 'poo-plot' photo points were introduced to Gosse Springs SEB. All large herbivore manure was removed from a

key location between LGS001, LGS002, and LGS003 and has been monitored quarterly for feral tracks and scats. The inspections did not record feral animals or new pest plants in the SEB area. Public access was managed through the continued inspection of signage and access routes. Camera traps were also established within the Gosse Springs SEB for continuous monitoring of wildlife visiting LGS001 and LGS002. Photo points are established for all spring vents within Gosse Springs SEB, with selected images displayed in Table 8.

Table 8: Photographic Monitoring Record Sheet.

Site Reference	Photo point
PP1	
PP2	

Site Reference	Photo point
PP3	
PP4	

Site Reference	Photo point
LGS004	
LMS004	

Site Reference	Photo point
LFE006	
LFE007	

Table 9: Progress - works record for the Gosse Springs SEB.

Action as listed in the NVMP	Action undertaken in FY22	Effectiveness of action
Domestic Livestock	During monitoring by the Environment team and Stuart Creek Station sub-lessee, no observations of cattle or their tracks and scats	Effective
Public Access	Increase in off-road driving after rainfall particularly in Gosse. Fencing along the Oodnadatta will be discussed in FY23 to prevent unauthorised access.	Ineffective
Road Maintenance	No road maintenance occurred in FY22 but is planned for FY23 after substantial rainfall in FY22.	Effective

Action as listed in the NVMP	Action undertaken in FY22	Effectiveness of action
Exploration Activities	BHP did not conduct exploration activities in Gosse Spring SEB.	Effective
Feral herbivores	No horses or camels detected in SEB. No increase in rabbit activity occurred in FY22.	Effective
Invasive and declared weeds	No new weed infestations detected in Gosse Springs SEB.	Effective
Health of GAB springs	Continued monitoring cover and abundance of vegetation within GAB springs within Gosse Springs SEB including Gosse, Fred and McLachlan as part of the GAB Springs monitoring program	Effective

1.1.8 Targets FY22

None applicable.

1.1.9 Actions FY22

Continue to implement actions and identify progressive rehabilitation opportunities in the Mine Closure Plan

Several actions associated with the cessation of the 2011 Olympic Dam expansion pre-commitment works continued throughout FY22. The Rehabilitation Strategy actions associated with these works are described in Table 10. Regular photo point monitoring has shown that in some areas where specific stabilisation measures were adopted, an increase in vegetation coverage has occurred. See Figure 9 to Figure 12 as examples. Areas where compaction and saline water were used to minimise passive dust generation have showed signs of natural re-vegetation.

The open pit area is now surrounded by works associated with the underground expansion of the Southern Mine Area. Therefore, no further rehabilitation plans are in place for areas associated with pre-commitment works.

Due to the underground mining method used at Olympic Dam, large scale rehabilitation works were not required during FY22. The LUP process requires temporary disturbances (i.e. excavation for pipe maintenance and cable installations) to be remediated through topsoil replacement and scarification to promote natural re-vegetation. In FY22 progressive rehabilitation continued where possible but was limited due to the relatively low annual clearance undertaken.

Table 10: Rehabilitation Strategy actions undertaken in FY22.

Rehabilitation Strategy Action	Comment
Set-up photo monitoring points for the area cleared for the proposed contractor's village on Andamooka Station to visually monitor soil stability.	Six monitoring sites were established in May 2012 and continue to be monitored on a biannual basis through photo points. The area continues to show progressive re-establishment of local plant species (Figure 9 to Figure 12).
Regular inspection of proposed contractor's village area for erosion.	The site of the proposed contractor's village is inspected during biannual photo point monitoring and other time-in-field excursions. Minor erosion from high rainfall events is visible within the Hiltaba area but does not warrant corrective action.

Figure 9: Photo point ENV 492 at Hiltaba taken May 2013.

Figure 10: Photo Point ENV 492 at Hiltaba taken March 2022 showing natural re-vegetation is occurring.

Figure 11: Photo Point ENV 490 at Hiltaba taken May 2013.

Figure 12: Photo Point ENV490 at Hiltaba taken March 2022.

Review closure risks and assumptions through annual workshop.

The FY22 Annual Closure and Rehabilitation Plan review included a Closure Planning Workshop in February 2022. This workshop was held with the relevant internal stakeholders.

The following were implemented to update the Closure Estimates for the Current and Life of Asset Disturbances and associated Closure Risk Register:

- Closure execution commences in FY2106. The last year of mine production is anticipated to be FY2105.
- The closure dates and associated risks are updated through the annual corporate alignment process.
- The closure cost estimate was updated to reflect the commencement of tailings deposition into TSF6 in FY22.

Align pest plant and animal control with SA Arid Lands Landscape Group objectives.

ODC has worked with the SA Arid Lands Landscape Board (formally SAAL NRM Board) to align our pest plant and animal control efforts with SA Arid Lands Landscape Group regional objectives. As a result, ODC is working towards expanding its influence to pastoral leaseholders in regards to pest plant and animal management (BHP Olympic Dam 2019a; BHP Olympic Dam 2019b). The SAAL Landscape Board is currently completing consultation via the Landscape Groups on updates of the district weed strategies. ODC will adopt and implement changes to monitoring programs based on the outcomes of the finalised weed strategies.

1.1.10 Continuous Improvement FY22

Together with the Kingoonya Landscape Group, ODC hosted a flora and fauna workshop in Roxby Downs in May 2022. The workshop was open to the public and covered identification of native and pest plants, and feral control. ODC is committed to engaging and educating the community on flora and fauna threats in the region.

1.2 Aquifer level drawdown

1.2.1 Environmental Outcome

No significant adverse impacts to existing third-party users' right to access water from within the GAB wellfield Designated Areas for the proper development or management of the existing use of the lands as a result of ODC activities.

No significant impact to third-party users has occurred. Drawdown and percentage wellhead pressure loss at pastoral bores remains less than the predicted long-term impact as presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2016), and less than the maximum drawdown area defined within the 10m contour.

No significant adverse impacts to the availability and quality of groundwater to existing Stuart Shelf third-party users as a result of groundwater drawdown associated with ODC activities.

No significant impact to groundwater for existing Stuart Shelf third-party users has occurred. Regional groundwater levels are stable.

No significant adverse impact on groundwater-dependent listed species or ecological communities as a result of groundwater drawdown associated with ODC activities.

Drawdown remains less than the predicted long-term impact and was within compliance criteria limits for FY22. Environmental flow rates at GAB springs remained above predicted long term impacts as

presented in the EIS (Kinhill Engineers 1997, updated Golder Associates 2016). Monitoring showed no indication of a significant adverse impact on groundwater-dependent listed species or ecological communities as a result of groundwater drawdown associated with ODC activities (see Section 1.2.4).

1.2.2 Compliance criteria

A 4 m drawdown limit at the point on the designated area for Wellfield A that is mid-way between GAB8 and HH2 based on the 12-month moving average

At the end of FY22 average drawdown between GAB8 and HH2 was 1.55 m (BHP Olympic Dam 2022c).

A 4 m drawdown limit for Wellfield B at the point between monitoring bores S1 and S2 (measured as the average drawdown of the two bores) and based on the 12-month moving average

At the end of FY22, the average drawdown between S1 and S2 was 2.2 m (BHP Olympic Dam 2022c). The rapid increase in drawdown to 4.9m at S1 is localised to the monitoring well. Other wells closer to wellfield B do not record a similar response (OB1, OB3, OB6, and WCB2). The cause of the anomalous drawdown has been confirmed as a split in the FRP casing of the well. A project to replace the well is scheduled for completion in FY23.

A drawdown footprint for Wellfield B, measured as the area contained within the 10 m drawdown contour, that is less than or equal to 4,450 km^2 .

At the end of FY22, the area contained within the 10 m drawdown contour line was 2,889 km^2 (BHP Olympic Dam 2021c).

No material change in the availability and quality of groundwater at existing bores in the Stuart Shelf area operated by third-party users.

Monitored water levels and quality in the Stuart Shelf area are consistent with historical levels, and do not indicate any change in the availability of groundwater at existing third party users (see sections 1.2.7 and 1.2.8).

1.2.3 Leading Indicators

A Drawdown trend at monitoring bore S1 that may exceed 4.5m in the next 12 months

The rapid increase in drawdown to 4.9m at S1 is localised to the monitoring well. Other wells closer to wellfield B do not record a similar response (OB1, OB3, OB6, and WCB2). The cause of the anomalous drawdown has been confirmed by downhole geophysical investigation as a break in the FRP casing of the well. A project to decommission and replacement the well is planned in the first half of FY23 (BHP Olympic Dam 2022c).

A drawdown footprint for Wellfield B, measured as the area contained within the 10 m drawdown contour that is greater than 4,000 km2

At the end of FY22, the area contained within the 10 m drawdown contour line was 2,889 km^2 (BHP Olympic Dam 2021c).

A hydraulic gradient between wells in the NESB and HH2 exceeding 0.0009 meters calculated as the six-monthly moving mean hydraulic gradient between HH2 and NESB wells GAB7, GAB8, GAB10, GAB11 and GAB19.

The FY22 hydraulic gradient between wells in the NESB (GAB7, GAB8, GAB10, GAB11, and GAB19) and HH2 remained above or equal to the leading indicator of 0.0009 m/m (6 month moving average) during the reporting period (BHP Olympic Dam 2022c).

A combination of the following factors that can be attributed to water extraction from Wellfields A and B:

- **Evidence that flow reductions at GAB springs in the vicinity of the wellfields may exceed the predictions made in the Olympic Dam Environmental Impact Statements of 1982 and 1997.**

  GAB spring flow reductions did not exceed the predictions make in the Olympic Dam Environmental Impact Statements of 1982 and 1997.

- **Evidence of water quality change at GAB springs.**

  As in previous years, statistically significant linear regression coefficients over the entire record (different from zero at the 95% confidence level) were identified. In FY22 two GAB spring sites were identified as having regression coefficients outside that range, with one (Bopeechee HBO007) indicating increasing salinity and one (Old Finniss HOF033) showing a decreasing trend.

  The increasing salinity trend observed at Bopeechee HBO007 continued in FY22. This small spring has seen an increase in large herbivore disturbance in recent years causing the minor discharge from the vent pool to cease which may be causing the vent pool water to increase salinity concentration as salts left from evaporation are concentrated in the vent pool. The other monitoring springs in the Bopeechee group do not display an increasing salinity trend. The Bopeechee spring group is on third party land and BHP is not responsible for the management of herbivores at this site.

  The decreasing trend observed since the mid 2000's continued at Old Finniss HOF033 in FY22.

A continued drawdown trend at GAB pastoral bores that may exceed the predictions of the Olympic Dam Environmental Impact Statement of 1997.

In general, drawdown at pastoral bores remains less than the predicted long-term impact as presented in the EIS (Kinhill Engineers, 1997, updated Golder 2016). Maximum drawdown (19.0m) was at Muloorina in FY22 (BHP Olympic Dam 2022c).

A drawdown trend or changes in groundwater quality in the Stuart Shelf area that may impact on existing third-party users.

No drawdown trend or changes in water quality were detected in FY22 which could impact on existing third-party users. There are no third-party groundwater users within 45km of the Olympic Dam mining lease. Data presented in sections1.2.7 and 1.2.8 of this report demonstrates no drawdown trend or changes to groundwater quality within the Stuarts Shelf area.

1.2.4 Deliverables (FL 3.2)

An evaluation of the composition of vegetated wetlands within the GAB springs.

In FY22 GAB spring flora monitoring was completed in August 2021. During FY22, flora monitoring of 108 GAB springs was undertaken. Usually 110 spring vents are attempted to be monitored, however, HHS134, and HHS170 were not accessed in FY22 due to them being significant Heritage sites. In total, 30 flora species were observed. The greatest number of species observed on one spring was 9 (CBC013, HHS161, LGS006), while the least number of plants observed on one spring was zero (WWS013). Cattle evidence, such as pugging suggested that grazing by stock was responsible for the lack of flora observed at WWS013.

The abundance of plant species observed was plotted against the occupancy, where occupancy is calculated as the percent of springs on which a species occurred and abundance is the percent of quadrats, for each spring, on which a species occurred, averaged over all springs. Similar to previous monitoring results, *Cyperus laevigatus* and *Phragmites australis* were the most abundant species. Followed by *Fimbristylis dichotoma, Sporobolus virginicus* and *Machaerina* (formerly *Baumea) juncea*. *Eriocaulon carsonii* ssp. *carsonii* was also moderately abundant, however, springs with *Eriocaulon carsonii* ssp. *carsonii* are targeted in this survey.

Using the Bray-Curtis dissimilarity metric, springs with a species composition greater than 50% similarity were grouped together. Spring WWS013 was excluded from the analysis as it had no flora species present (FY16-FY22). Similarly, the two springs that were not monitored were not analysed (HHS134 and HHS170). Monitoring results from FY22 identified ten dendrogram groups (n=108 springs) (Figure 13). In comparison, the FY17 analysis identified 12 dendrogram groups and the FY18, FY19 and FY20 analysis identified 9 dendrogram groups. In FY21 there were seven groups identified. Modifications to the Bray-Curtis metric used by Datasticians (Griffin and Dunlop 2016) and GHD (2017) were not documented and are therefore impossible to recreate. This could then result in discrepancies in dissimilarities presented in years prior to FY18.

In FY22, LWS014 was clustered on its own in group 1 and was characterised by a dominance of *Cyperus laevigatus* (96.6%) and equal parts Frankenia sp.*, Tecticornia indica* and *Melaleuca glomerata* (Table 11). The Gosse vents, LGS003, LGS005, and LGS006 all had no standing water and were clustered together in FY21 and again in FY22, making up Group 2. Group 2 was characterised by *C.laevigatus* combined with dryland species such as Trianthema sp, and *Calocephalus platycephalus.* Group 3 comprised of seven springs characterised together by their relatively high abundance of *C.laevigatus and Typha domingensis* comparative to other species. The Walkarinna springs, LWS007, LWS009 and LWS0112 were clustered together in group 4 and were characterised by high proportions of *C.laevigatus* combined with *Melaleuca glomerata.* Groups 5, 7 and 9 consisted of one spring each, CBC001, LWS015 and HHS123 respectively. Spring CBC001 was characterised by a blend of *C.laevigatus* (59%), *Frankenia foliosa* (46%)*,* along with *Nitraria billardierei* (13.5%)*.* Spring LWS015 was characterised by its high proportion of *Phragmites australis* (88%), with *M.glomerata* (47%). Following on from FY21, HHS123 was again clustered in its own group 9. Group 9 was distinguished by its dominance of *Machaerina juncea* (70%). Group 6 was made up of 19 springs characterised together by high abundance of *C.laevigatus* (97%) along with high species diversity with low abundances. Group 8 had the most springs (n=70 springs) clustered together based on high *P.australis* (80%) abundance along with *C.laevigatus* (25%) with high species diversity. Spring HHS125 which had been grouped with LWS016 in FY20 and constituted its own group in FY21, again clustered with LWS016 in group 10 in FY22. Group 10 was characterised by high abundance of *Sporobolus virginicus* (87%). The occurrence of *E.carsonii* ssp. *carsonii* is explored further in the next section.

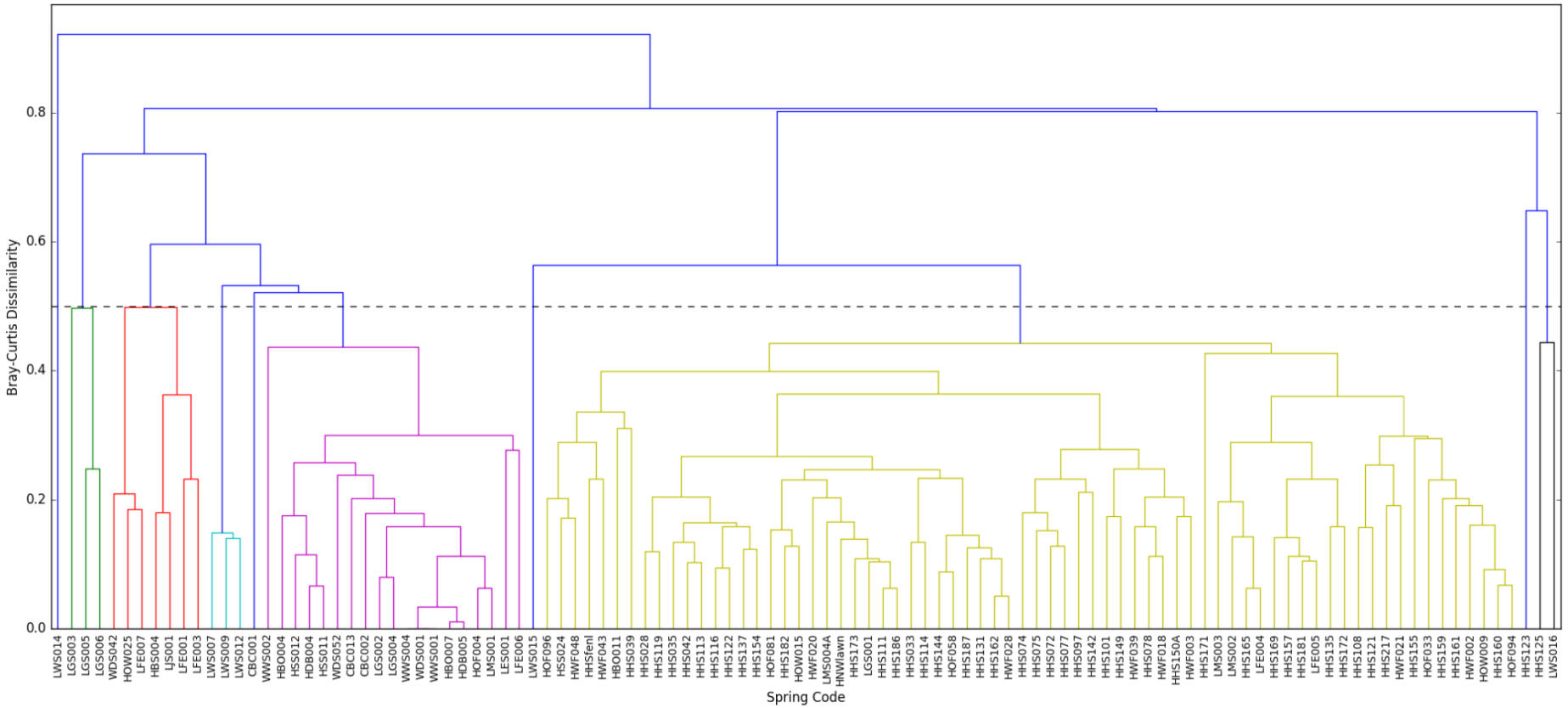


Figure 13: GAB springs grouped according to species composition (>50 % similarity) using hierarchal clustering. Springs groups are depicted by different colours and are in order 1-10 from left to right.

Table 11: Average abundance (%) of species within each dendrogram group.

Species	FY22 Dendrogram Group *n=number of springs in group									
	1 (n=1)	2 (n=3)	3 (n=7)	4 (n=3)	5 (n=1)	6 (n=19)	7 (n=1)	8 (n=70)	9 (n=1)	10 (n=2)
Acacia stenophylla			0.82					1.13		
Atriplex limbata		7.5								
Atriplex holocarpa		2.62				0.37		0.31		
Atriplex nummularia ssp.			2.62			0.99		1.07		3.33
Atriplex sp.			0.82					0.03		
Calocephalus platycephalus		24.17				2.12		0.38		
Cyperus laevigatus	96.67	33.33	54.21	24.10	59.46	97.65	5.88	25.34	44.44	
Enchylaena tomentosa		1.67	0.37					0.43		
Eriocaulon carsonii ssp. *carsonii*						3.5		3.40	13.89	
Fimbristylis dichotoma						8.74		17.66	36.11	
Frankenia foliosa					45.95					
Frankenia sp.	3.33		0.39				23.53	0.07		
Gahnia trifida								5.62		
Juncus kraussii								1.88	5.56	14.71
Machaerina juncea								16.65	69.44	27.94
Maireana tomentosa ssp. *tomentosa*		1.67				0.16		0.61		
Melaleuca glomerata	3.33			43.38			47.06			
Myoporum montanum		0.83	2.11		2.70	0.26		2.37		
Nitraria billardierei			0.39		13.51	0.78		0.04		
Osteocarpum sp.										3.33
Phragmites australis						3.53	88.24	80.52		
Salsola australis		2.5								
Sclerolaena diacantha		5.0	1.544			0.37				
Spergularia rubra			2.87			3.38	35.29	0.039		
Sporobolus virginicus			35.16			2.26		10.81	30.56	86.57
Stenopetalum nutans								0.30		
Tecticornia indica	3.33		1.16	2.56	8.11	1.68	17.65	0.18		
Trianthema sp.		41.67	0.51	0.44	1.67					
Triraphis mollis								0.04		
Typha domingensis			43.70			2.89				
Species diversity	**4**	**10**	**13**	**3**	**5**	**16**	**6**	**23**	**6**	**6**

A comparison of the abundance and distribution of *Eriocaulon carsonii* ssp. *carsonii*, per impact zone, with previously reported values, to determine any impacts to GAB springs.

Within the region studied, populations of *Eriocaulon carsonii* ssp. *carsonii* were found at 24 spring vents in the Hermit Hill, North East and Lake Eyre springs complexes in FY22. *E.carsonii* ssp. *carsonii* was found again for the first time in several years at two springs in FY22. It had not previously been recorded since 2016 at HHS072 and at HHS075. *E.carsonii* ssp. *carsonii* was found for the first time in FY22 at HHS173. At these springs, *E.carsonii ssp carsonii* was particularly cryptic, growing amongst very thick *P.australis* at the beginning of the tail. *E.carsonii* ssp. *carsonii* occurred within the Hermit Hill (n=19), Gosse (n=2), West Finniss (n=1), North West (n=1) and Sulphuric (n=1) spring groups (Table 12). *E.carsonii* ssp. *carsonii* was uncommon and limited in abundance where it did occur. It ranged in percentage abundance on any one spring vent on which it occurred from 1 – 32.4%. *E.carsonii* ssp. *carsonii* occurred on both spring vents and tails.

Using a Chi Square analysis for dependent samples, the average abundance of the 27 springs identified as suitable *Eriocaulon carsonii* ssp. *carsonii* habitat from FY16-FY22 has shown that there has been no significant negative impact to the size of an important population of *E.carsonii* ssp. *carsonii* (X^2 = 3 .14, df = 6, p = 0.3213; Figure 14) .Rather differences observed between 2015 and other years is likely to do with a difference in observers.

Table 12: Comparison of *E. carsonii* ssp. *carsonii* results in FY15 – FY22.

Spring group	Spring vent	2014 cover class (UoM^2)	2015 % abundance	2016	2017	2018	2019	FY21	FY22
Hermit Hill	HHS028	-	8.7	13.5	29.7	21.6	16.2	32.43	32.43
	HHS033	-	1.6	2.7	5.4	5.4	10.8	13.51	10.81
	HHS035	-	0.0	2.8	11.1	8.3	11.1	5.56	5.56
	HHS072	1 (M)	1.4	0.0	0.0	0.0	0.0	0.0	5.41
	HHS074	1 (M)	2.7	5.1	0.0	0.0	0.0	15.38	5.13
	HHS075	0 (M)	1.4	0.0	0.0	0.0	0.0	0.0	2.7
	HHS077	-	0.0	7.7	7.7	7.7	15.4	23.08	17.95
	HHS078	-	5.5	20.5	11.8	2.9	35.3	35.29	17.65
	HHS114	1 (S)	1.7	0.0	0.0	0.0	0.0	0.0	0.0
	HHS116	2 (M)	1.4	8.3	8.3	8.3	8.3	19.44	11.11
	HHS119	2 (S)	0.0	0.0	22.2	8.3	38.9	30.56	27.78
	HHS121	-	0.0	2.9	17.1	31.4	11.4	5.71	8.57
	HHS122	2 (M)	0.0	2.8	0.0	16.7	11.1	16.67	13.89
	HHS123	-	6.3	30.5	8.3	25	19.4	27.78	13.89
	HHS131	1 (M)	1.8	4.7	2.4	7.1	7.1	9.5	4.76
	HHS144	1 (S)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	HHS150A	1 (M/S/T)	2.6	5.4	8.1	10.8	5.4	5.41	8.11
	HHS154	1 (T)	0.0	0.0	0.0	0.0	0.0	2.7	2.7
	HHS155	-	3.9	15.0	17.5	20	20	25	15

		2014	2015	2016	2017	2018	2019	FY21	FY22
	HHS173	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.81
	HHSfenl	6 (T)	13.0	10.5	17.5	7.1	14.3	18.57	22.86
North West	HNWlawn	1 (T)	1.7	0.0	2.9	2	2	1	1
Old Finniss	HOF058	1 (S)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sulphuric	HSS012	2 (M)	3.2	2.7	5.4	5.4	5.4	18.92	13.51
West Finniss	HWF043	3 (S/T)	9.8	11.5	9.6	15.4	23.1	21.15	13.46
Gosse	LGS002	2 (M/T)	12.3	18.0	8.0	14	12	6	20
	LGS004	3 (S/T)	18.9	26.7	45.0	53.0	17	35	33

Notes:

1. HHS028, HHS035, HHS174 recorded the same value in FY21 and FY22
2. Because of the change in monitoring program, not all of the results are directly comparable.
3. Up until (and including) 2014, springs units were monitored separately: A spring unit is a morphological component of a spring: the vent, mound, or tail. The vent is the source of most of the water. The vent is usually set in the top or side of the mound ('m') (if the spring has a mound). The tail ('t') is an area with an outflow of water away from the vent. A spring ('s') may possess some or all of these components. For monitoring *E. carsonii* ssp. *carsonii* and grazing impacts, the mound and tail have generally been treated separately (no monitoring occurs on the vent). Over 2005-2014, we followed the procedure established by Kinhill Stearns (1984) and Fatchen and Fatchen (1993). However, past monitoring has been inconsistent: PPK (2002) and Badman (2004; 2005) treat an "undifferentiated spring plus any tail" as a single unit (Badman, 2005:16).
4. Up until (and including) 2014, the monitoring was targeted at finding and recording *E. carsonii* ssp. *carsonii*. While the 2015 monitoring included all identifiable springs where *E. carsonii* ssp. *carsonii* has ever been recorded, the method quantifies species abundance for all species present on the site, rather than focussing on searching for the generally very small *E. carsonii* ssp. *carsonii* populations.
5. Up until (and including) 2014, cover was estimated using the Domin-Krajina rank score (see Griffin and Dunlop, 2014). In 2015 and 2016, abundance was calculated directly from the percentage of quadrats on which a species occurred.

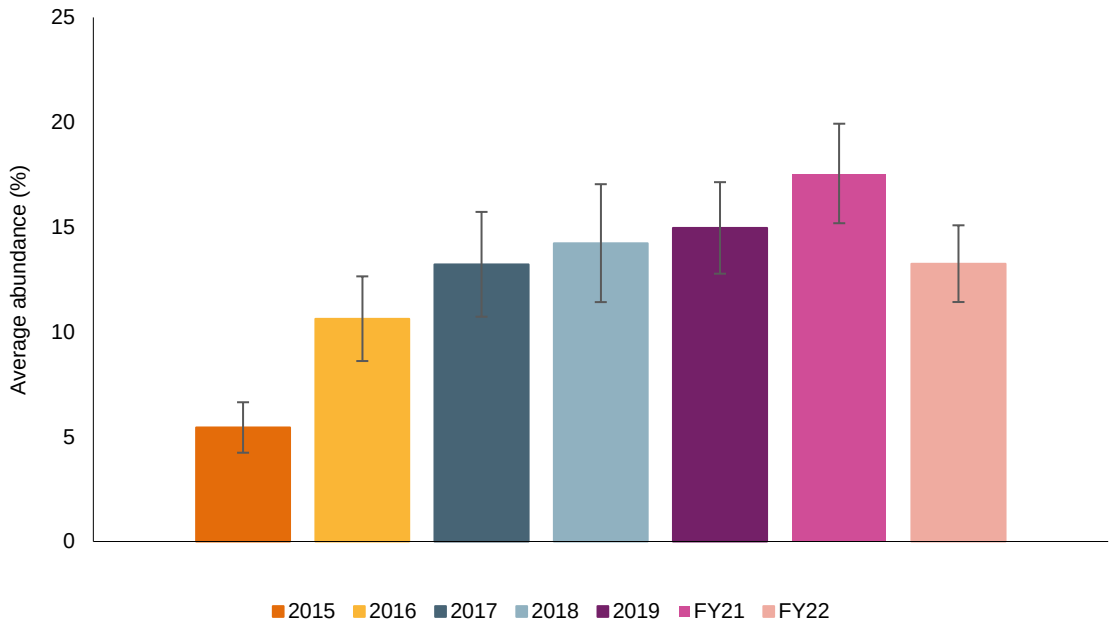


Figure 14: The abundance (mean ± SEM) of *Eriocaulon carsonii* ssp. *carsonii* from 2015-FY22 across the 27 springs identified as suitable *Eriocaulon carsonii* ssp. *carsonii* habitat.

1.2.5 Deliverables (GA 3.5)

Collated domestic and industrial water use efficiency data, to assess performance against improvement targets.

In FY22 the GAB Industrial Water Efficiency of the operation was 1.14 kL/t compared to the target of 1.16 kL/t and actual of 1.1 kL/t for FY21.

Historical GAB industrial water efficiency is given in Figure 15.

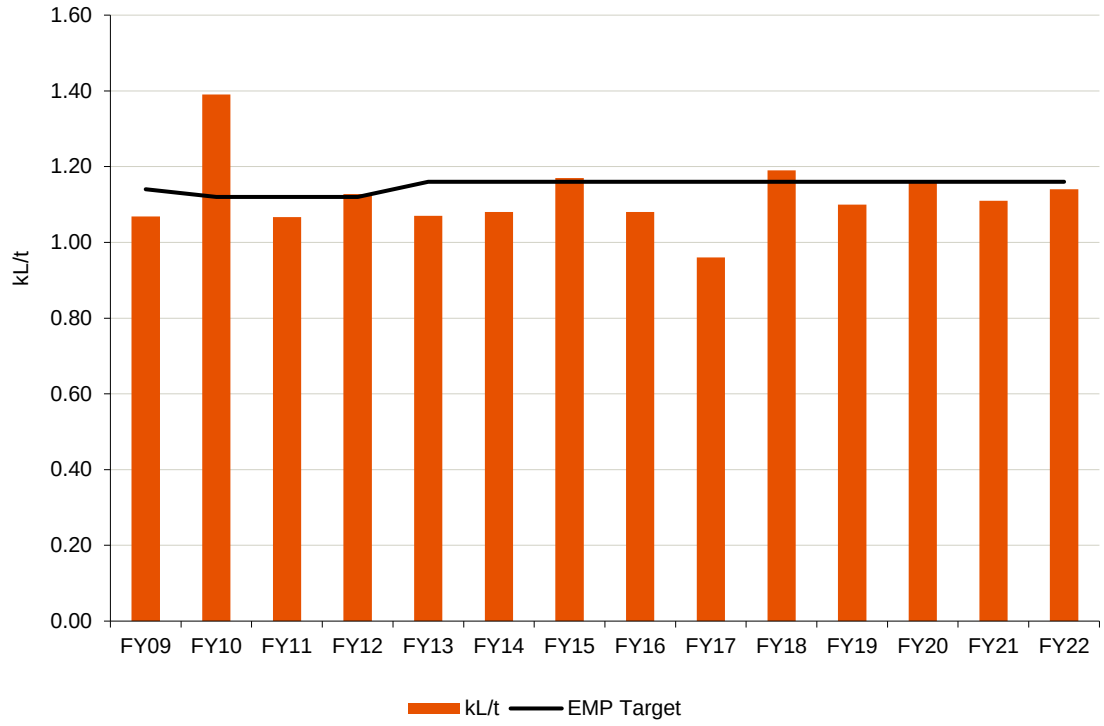


Figure 15: Historical industrial GAB water efficiency.

Domestic water use during FY22 averaged 2.19 ML/d compared to 2.32 ML/d in FY21, below the target of 3.2 ML/d. Historical domestic water use is given in Figure 16.

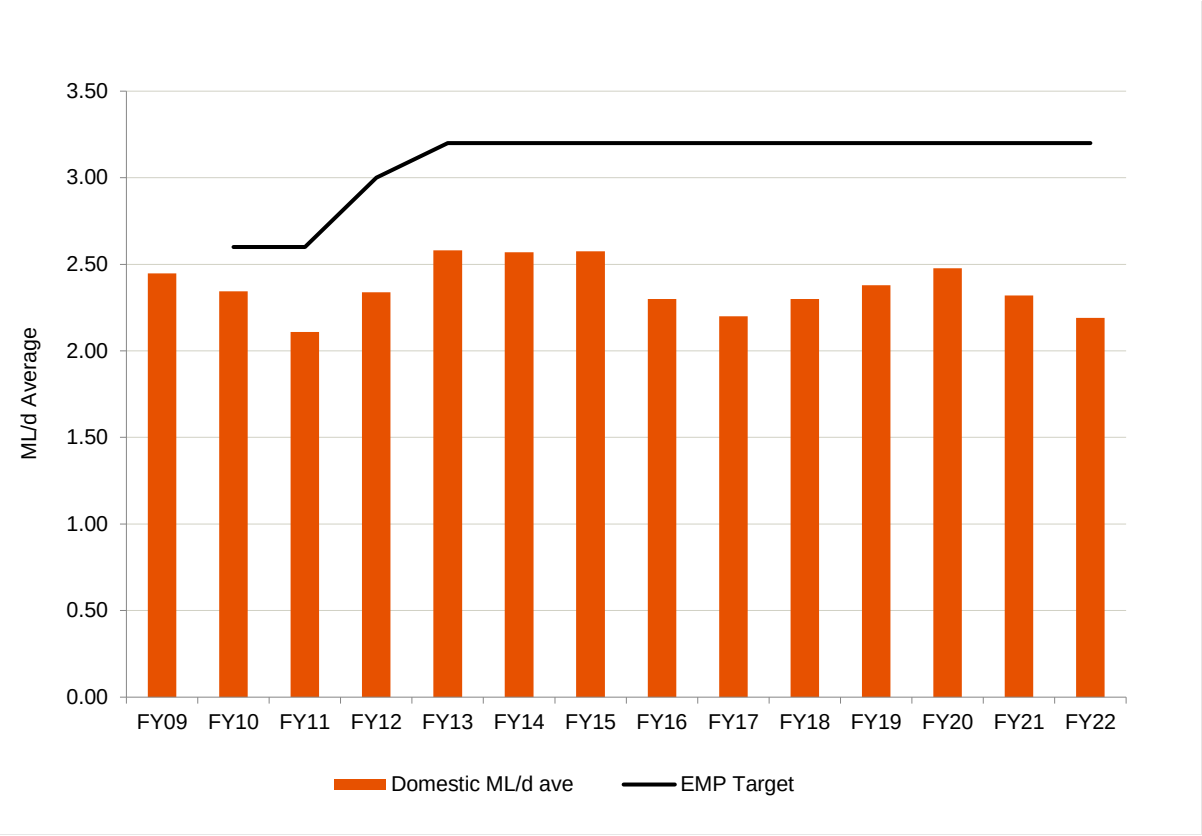


Figure 16: Historical domestic water use (note there was no target in FY09).

Ten-year water use schedule to be submitted to the Indenture Minister by 1 January annually.

The current 10-year water use schedule, as provided to the Minister for Energy and Mining in January 2022, is presented in Appendix 9 of the FY22 Annual Wellfields Report (BHP Olympic Dam 2022c). An updated schedule will be provided by 1 January 2023.

Further development of existing wellfield infrastructure may be required to supply additional capacity to the operation as part of the 10 year water forecast. The 10 year forecast includes current business as usual (Bau) operations.

To realise the forecasted future abstraction rates additional production wells and associated pipeline infrastructure may be required. This additional water take is expected to come from Wellfield B and no exploration for additional wellfields is currently planned.

1.2.6 Deliverables (GW 3.1)

A review of abstraction rates and trends and an assessment with respect to groundwater levels.

Saline water was abstracted from the Arcoona Quartzite throughout FY22 from the Saline Wellfield located south of the Mine offices. Additional saline water was sourced from the Andamooka Limestone aquifer within the vicinity of the TRS facility to manage underground seepage rates.

Some of this saline water was used in construction projects throughout the operations. A portion was added to process water storages to reduce the volume of GAB water required, whilst the remainder was discharged to the mine water disposal pond for evaporation. An average of 2.4 ML/d was abstracted over the period, compared to 4.5 ML/d during the previous reporting period as shown in Figure 17.

Groundwater levels in the Saline Wellfield area and TRS area are shown in section 1.2.7, Figure 23 and Figure 24

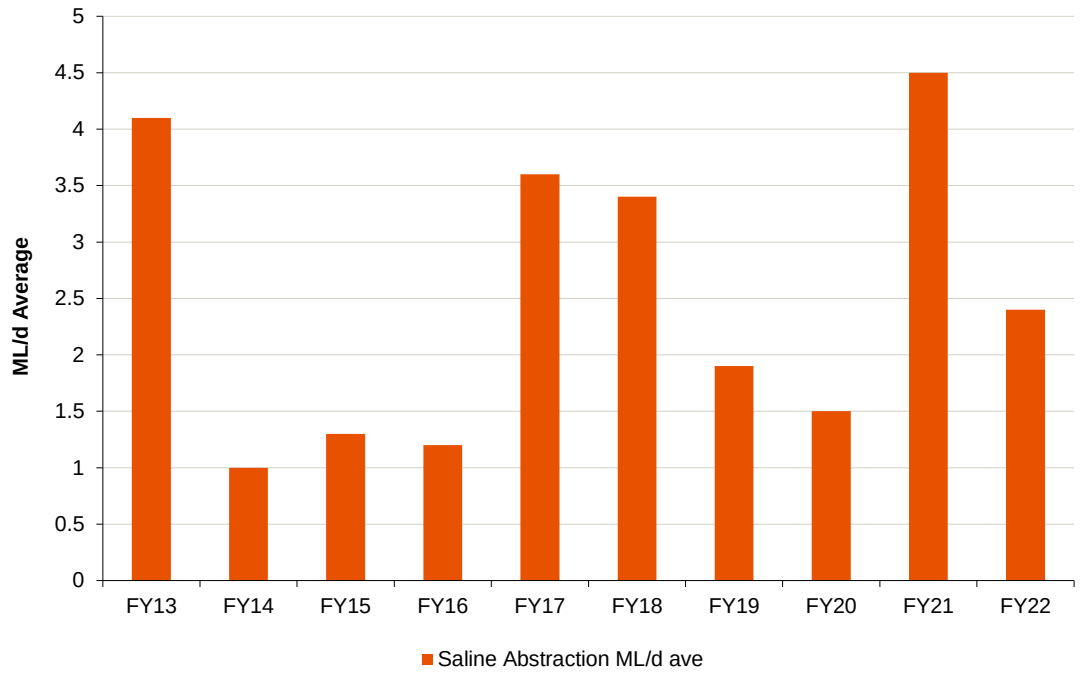


Figure 17: Historical saline abstraction rates (ML/d)

The mine water balance is a summary of the volume of water going into and out of the underground mine. It includes saline water abstracted from local bores that is added to surface storages and used around site. The balance (presented in Figure 18) is generated from a combination of measured, derived and estimated data.

An estimate of the volume of groundwater discharge to underground.

Groundwater inflow to the mine occurs at several intersections with the underground operations (Figure 18). Total natural inflow is estimated to be approximately 5.0 ML/d, the majority entering via upcast raise bores. Additional natural inflow comes into the mine via other entry points, including downcast raise bores, exploration drill holes and shafts. Much of the total inflow to the mine is transported to the surface as ore content or exhausted to the atmosphere as aerosols or moisture-laden air via upcast raise bores, estimated at around 3.3 ML/d.

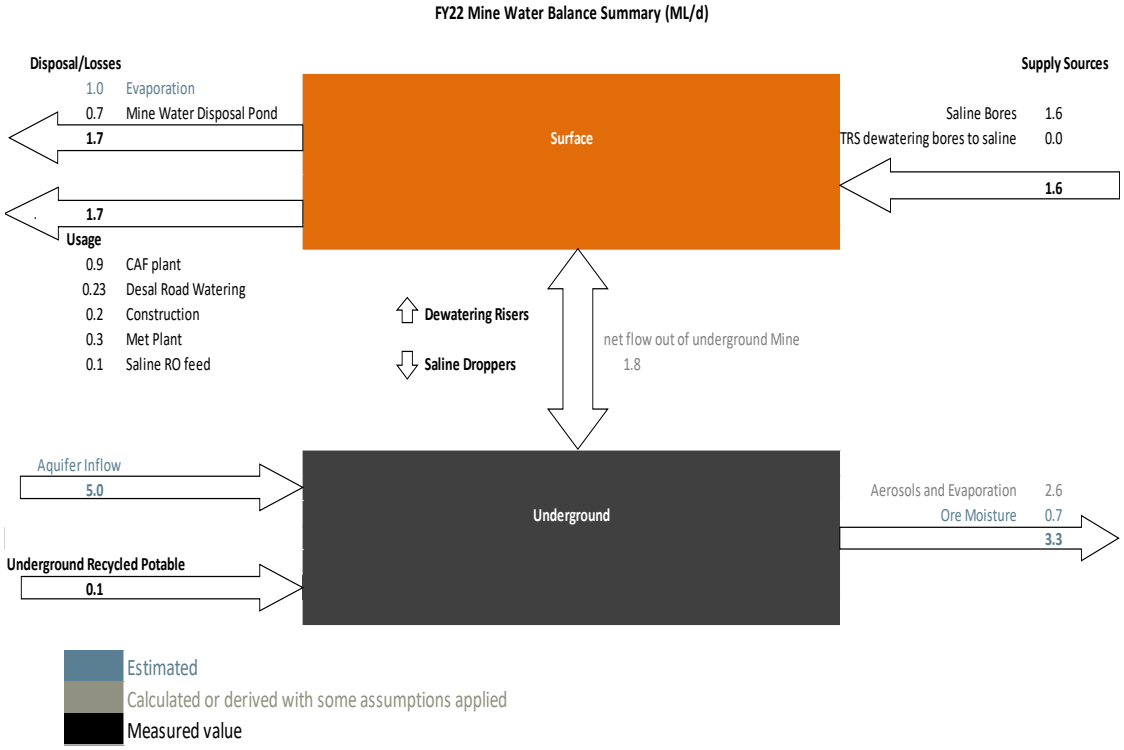


Figure 18: FY22 Saline (Mine) water balance summary (ML/d) (totals may differ from individual values due to rounding).

1.2.7 Deliverables (GW 3.2)

A review of the trends in local and regional groundwater levels and a comparison with historical groundwater levels.

The Olympic Dam groundwater monitoring network is shown in Figure 19. The groundwater cross section (Figure 20) and hydrograph (Figure 21, Figure 23) show limited changes in groundwater levels beneath the TSF between June 2021 and June 2022 with the exception of an anomaly at LT09.

In September 2021 BHP noted a 10.81m rise in groundwater level at monitoring bore LT09 which was confirmed in February 2022 and observed again in June 2022. Other monitoring wells in proximity to LT09 (including wells located around TSF1-4 facility, adjacent EP 1/2 or water storage dams) have not recorded a rise in groundwater.

The rise is water level at LT09 is not considered to be response to increased seepage from the TSF 1-4 or EP facilities as all other monitoring wells in the area are stable (i.e. LT15, LT16, LT20 being the closest to LT09).

In September 2022 BHP undertook a downhole CCTV investigation of LT09 with results showing a blockage in the well column at approx. 32.4m bgl. A water sample collected from the well above the blockage returned a field conductivity value of 8,620 µS/cm. The Andamooka limestone aquifer which LT09 is cased in typically has a field EC in the ~30,000's. The measured value from LT09 is lower suggesting an inflow of freshwater. Other wells near LT09 (i.e. LT15) had an EC value of 29900 µS/cm in 2021.

The rise in apparent groundwater level in LT09 coincides with increased rainfall events over the past 18-months. It is concluded that the well casing blockage/failure has allowed ponded surface rainfall to enter the well casing and due to the blockage, it is unable to drain away. This has resulted in the increased measured water level and decreased conductivity result. The well will be decommissioned and removed from the groundwater monitoring program.

Monitoring bore LT18 was decommissioned and redrilled with LT18A to the south-eastern of the original well. The rapid decline in water level observed at LT18A since 2018 is due to the construction of the Bob Crew underground mine decline which passes beneath the monitoring well and causes a localised dewatering response.

The maximum groundwater level recorded below the TSF for the current reporting period was 69.33 mAHD at LT67 (Figure 23). The rising trend at LT67 was being addressed with the installation of a dewatering system however several of the dewatering wells have since failed. A project to provide an improved solution has been initiated and groundwater levels are not expected to exceed the compliance criteria of 20 m below the ground surface (80mAHD).

Groundwater level contours in the Andamooka limestone aquifer beneath the perimeter of the TSF (Figure 22) have increased slightly at LT09 on the south eastern corner of TSF 3 (as discussed above), reduced on the northern wall of TSF1/2 due to pumping at the LP02 bore for use as supplementary process water and risen under TSF5 as discussed above. There is a continued rise in groundwater levels beneath TSF 5 (Figure 23) which can be attributed to the ongoing use of this facility. All groundwater levels are below compliance limits of 80 mAHD however wells LT65 and LT67 are rising at a rate greater than expected. As noted above, a project to manage the groundwater level rise has been initiated. The water level in this area will continue to be managed to maintain compliance with agreed compliance levels.

Groundwater levels for bores in the vicinity of the underground mine (Figure 24) continue to show depressurisation of the geological units, consistent with ongoing mine depressurisation activities.

Limestone aquifer bores in the vicinity of Roxby Downs (Figure 25) demonstrate generally stable groundwater levels during FY22. LM43 and LM46 observed groundwater levels remain steady due to continued minimal discharge of water to the mine water disposal pond.

Historical level monitoring indicates steady groundwater levels over time with no overarching trends that would indicate material change in the availability at existing bores in the Stuart Shelf area operated by third-party users (section 1.2.2).

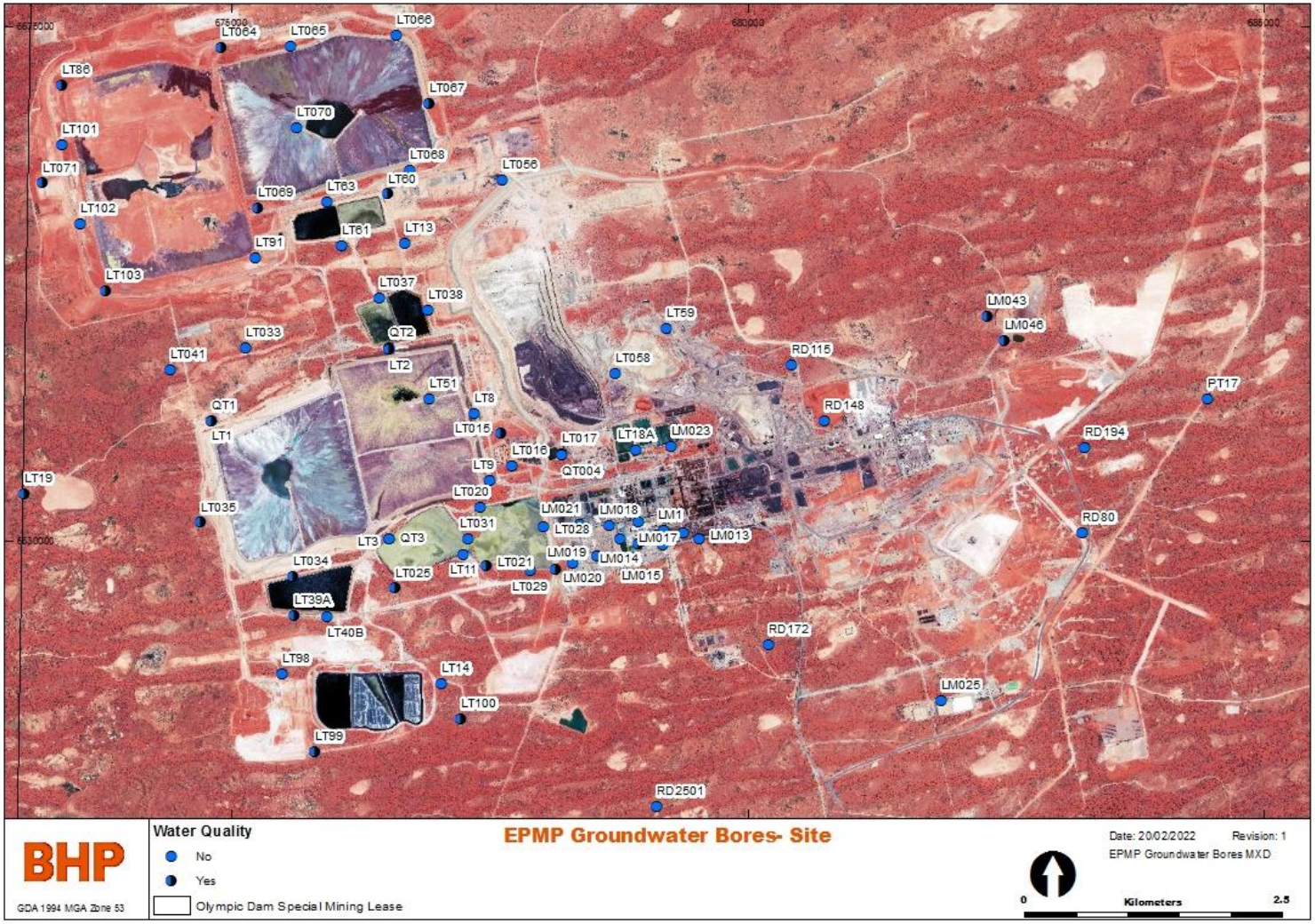


Figure 19: Location of key mine area bores.

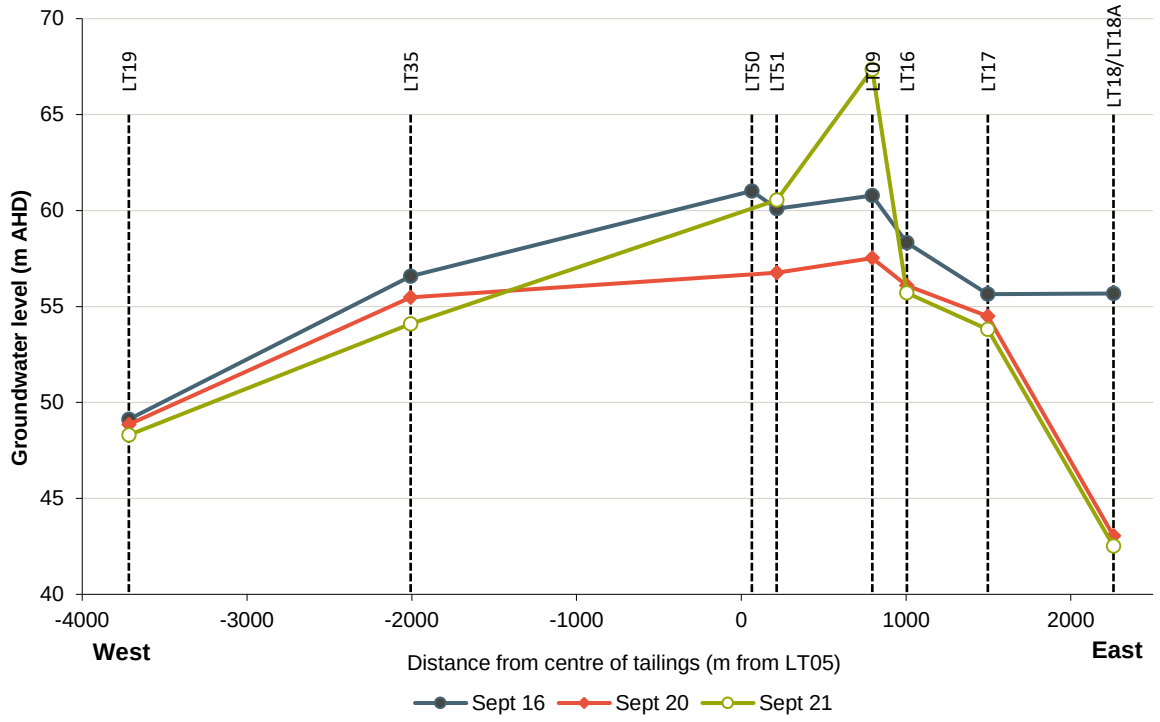


Figure 20: Change in groundwater elevation along an east-west cross-section from LT19 to LT18A, through the centre of the TSF.

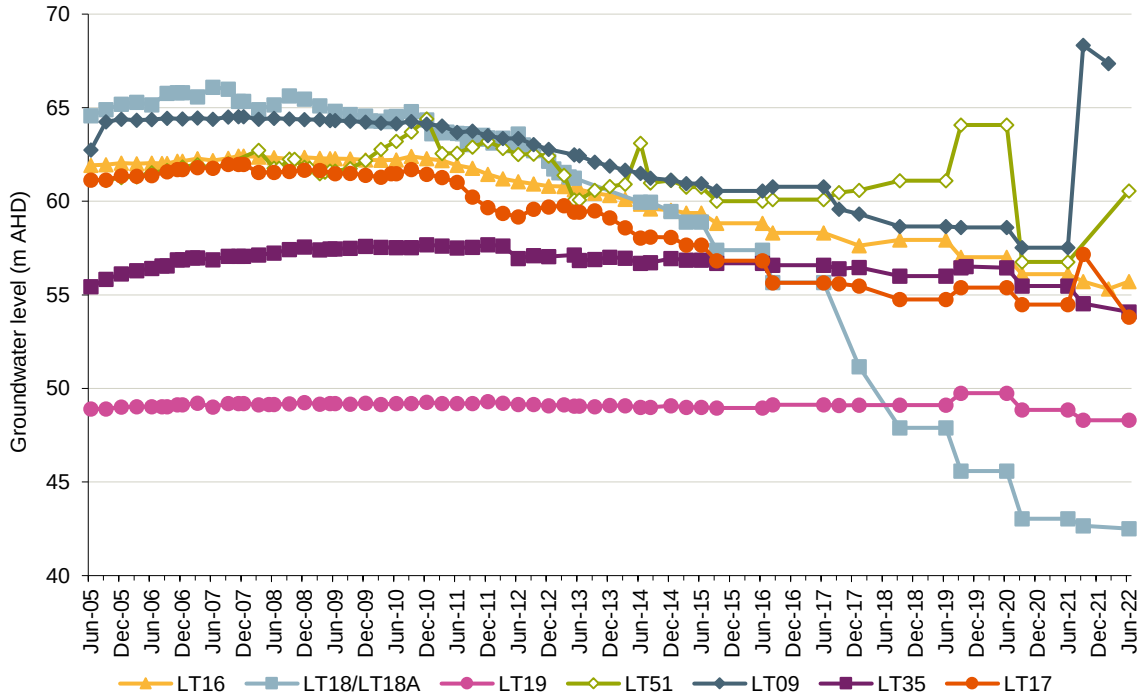
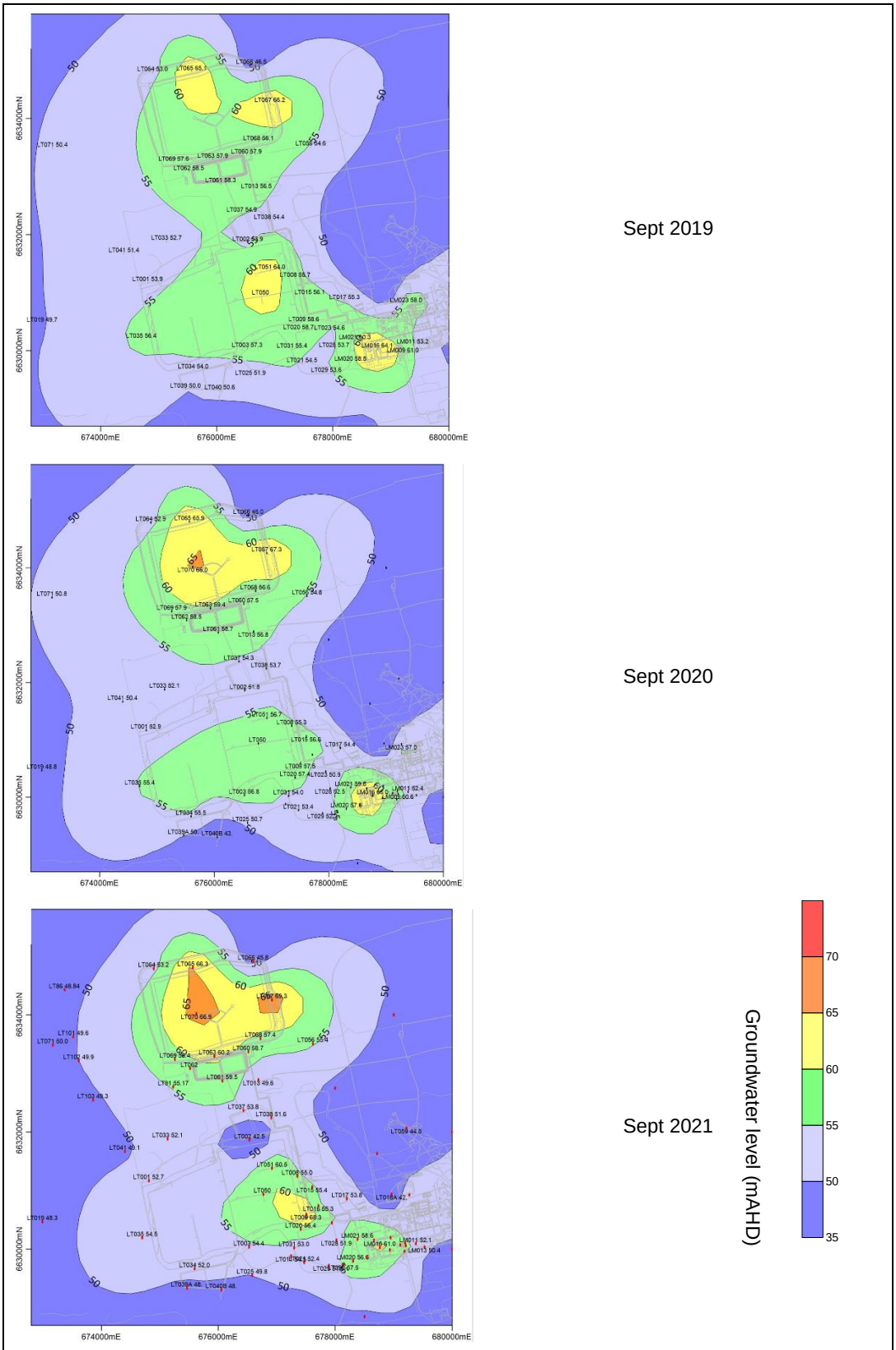


Figure 21: Groundwater levels for Andamooka Limestone bores in the vicinity of the TSF



Datum: GDA94

Projection: MGA94

Zone: 53

Figure 22: TRS area groundwater levels (mAHD) Andamooka Limestone Aquifer.

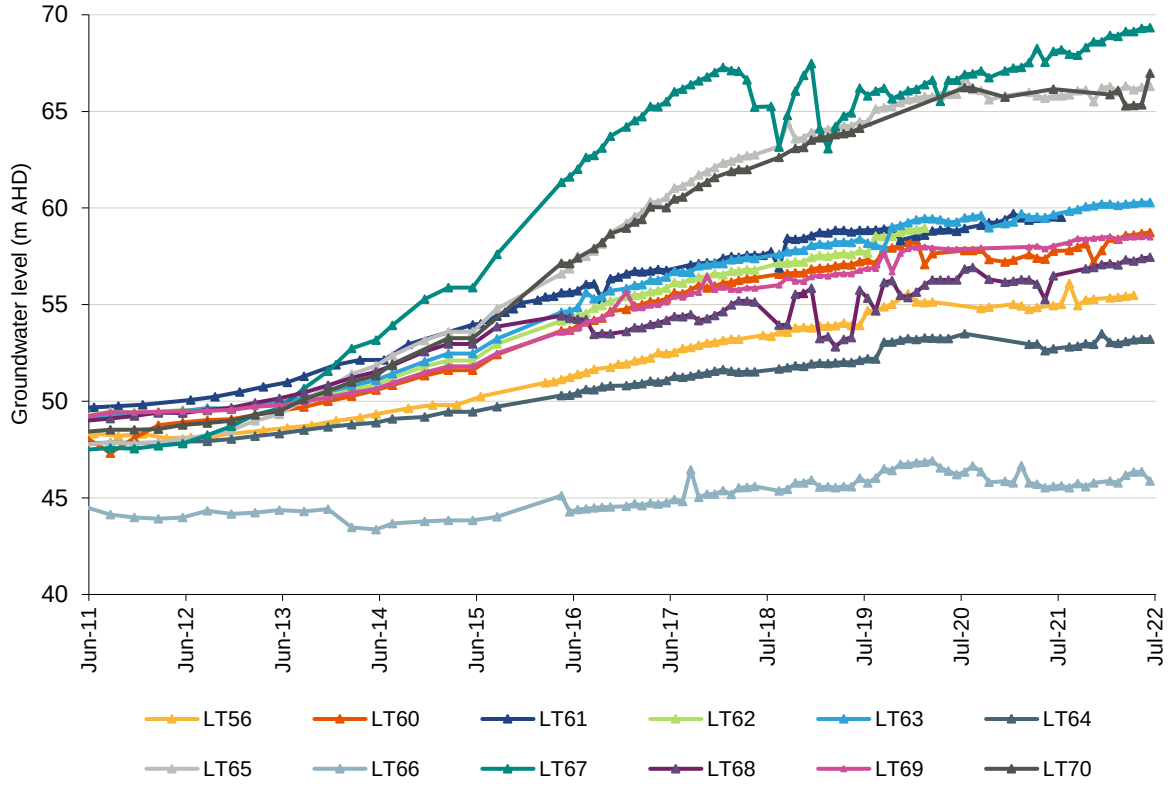


Figure 23: Groundwater levels for bores in the vicinity of TSF 5.

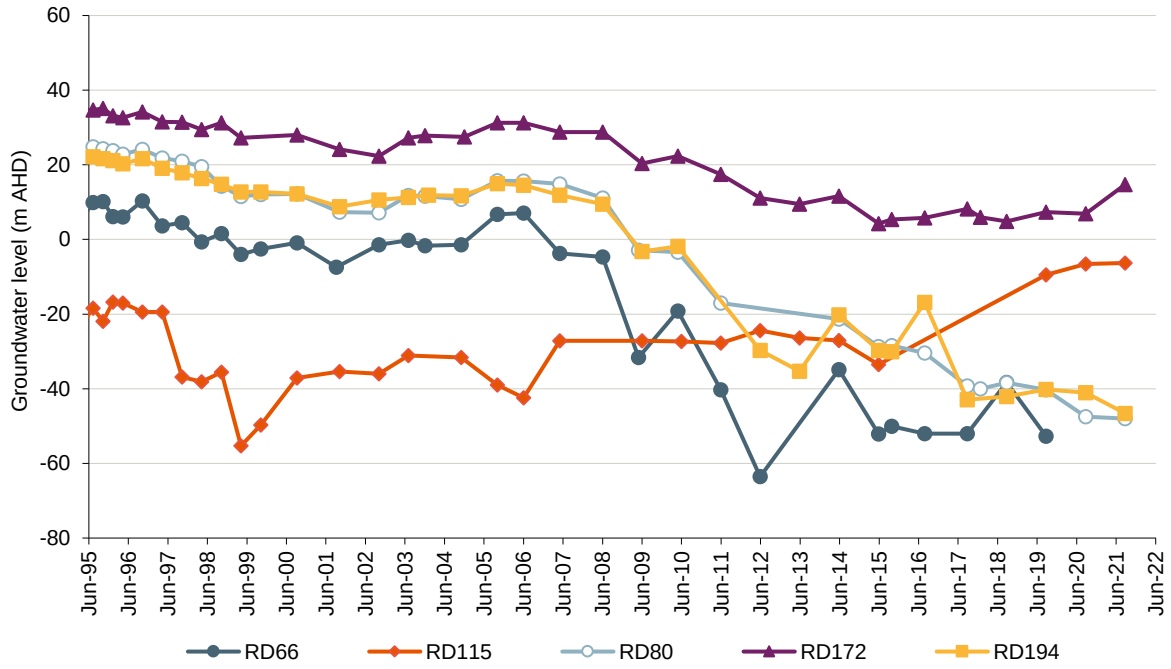


Figure 24: Groundwater levels for exploration drill holes in the vicinity of the underground mine.

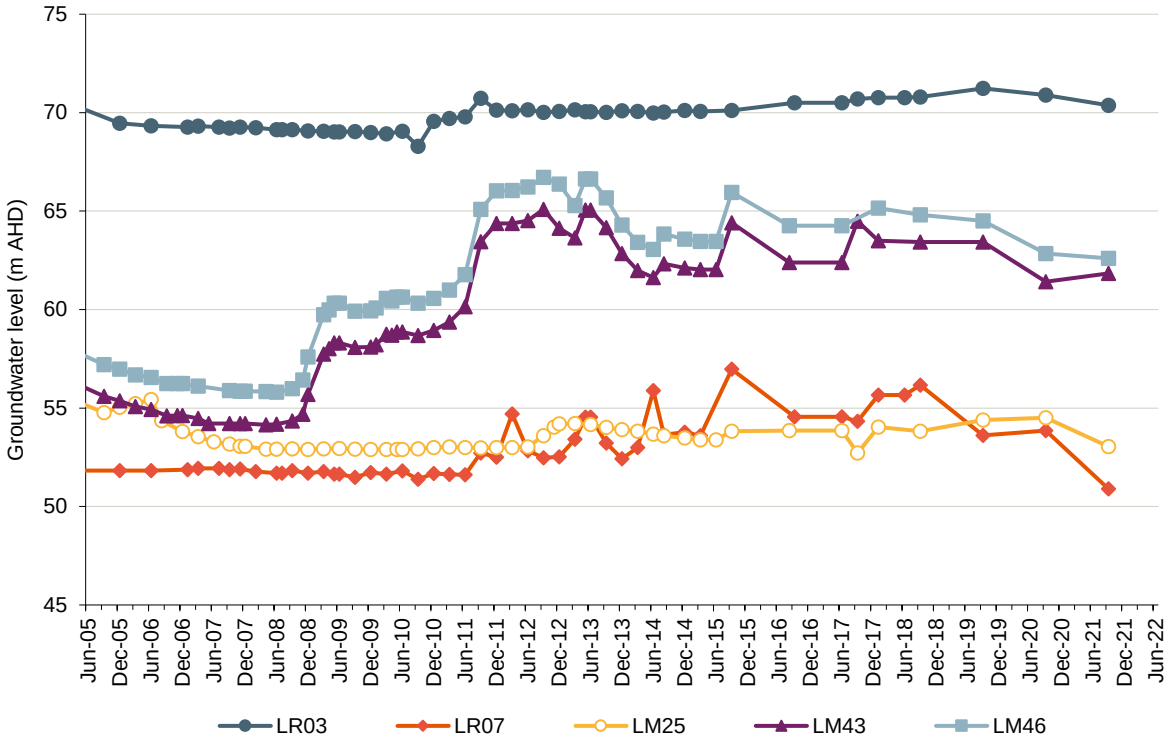


Figure 25: Groundwater levels for Andamooka Limestone bores in the vicinity of Roxby Downs (LR) and the Mine Water Pond (LM).

Data showing the tracking of trends towards leading indicators for groundwater impacts, and an alert to management when levels approach the leading indicators.

Data for groundwater level was collected, with a discussion of results in section 1.2.7. Leading indicator trigger levels were not reached.

1.2.8 Deliverables (GW 3.3)

A review of trends in groundwater quality and a comparison to ANZECC criteria.

Groundwater in the vicinity of the Olympic Dam Operation occurs at depth and is highly saline making it unsuitable for human or livestock consumption and largely inaccessible. The local groundwater does not meet any of the beneficial use categories listed under ANZECC guidelines.

Groundwater salinity has generally remained stable and within the range that could be reasonably expected for natural variation within the aquifer. TDS from monitoring wells around the base of the TRS facility ranged from 16,000 mg/L at LT15 to 43,300 mg/L at LT17. Regional wells TDS ranged from 8,470 mg/L at LR3 to 33,100 and 29,400 mg/L at LR8 and LR9. LR3 is located next to the Roxby Downs potable water dam and TDS is influenced by historical leakage from the dam of high quality water, LR9 is to the south west of the SML, is hydraulically up gradient of the mine and representative of aquifer background, LR8 is to the north of the SML, hydraulically down gradient of the mine.

Groundwater pH ranges from monitoring wells around the base of the TRS facility ranged from 6.91 at LT25 to 7.68 at LT39. Regional well pH ranged from 7.25 at LR9 (up-gradient background of the SML) to 7.43 in LR8 (down gradient of the SML) and 7.86 in LR3 (town potable water dam influenced).

Concentrations of copper in all groundwater monitoring bores sampled during the FY22 monitoring program were reported below ANZECC (2000) guidelines for livestock consumption of 0.4 mg/L (Figure 26).

While elevated concentrations of elemental uranium continue to be detected in the groundwater in the vicinity of evaporation pond two (LT25), the mine water disposal pond (LM46) and 3 wells at the base

of the tailings facility (LT1, LT15 and LT64), uranium concentrations are lower than the adopted ANZECC (2000) guidelines for livestock consumption of 0.2 mg/L in all other wells (Figure 27).

An elemental uranium concentration in excess of the ANZECC livestock guidelines has been detected at bores LT1 (0.231 mg/L), LT15 (0.238 mg/L), LT25 (0.476 mg/L), LT64 (0.204 mg/L) and LM46 (0.255 mg/L). LT1, LT15, LT25 and LT64 are located at the base of the tailings facility and are highly susceptible to changes in tailings pond use rates. Other monitoring wells in the area do not display an elevated uranium concentration (Figure 27). LM46 is located adjacent to the mine water disposal pond and is heavily influenced by discharge of saline mine water. Monitoring well LM43 which is located to the north of the mine water disposal pond does not display an elevated uranium level (0.041 mg/L).

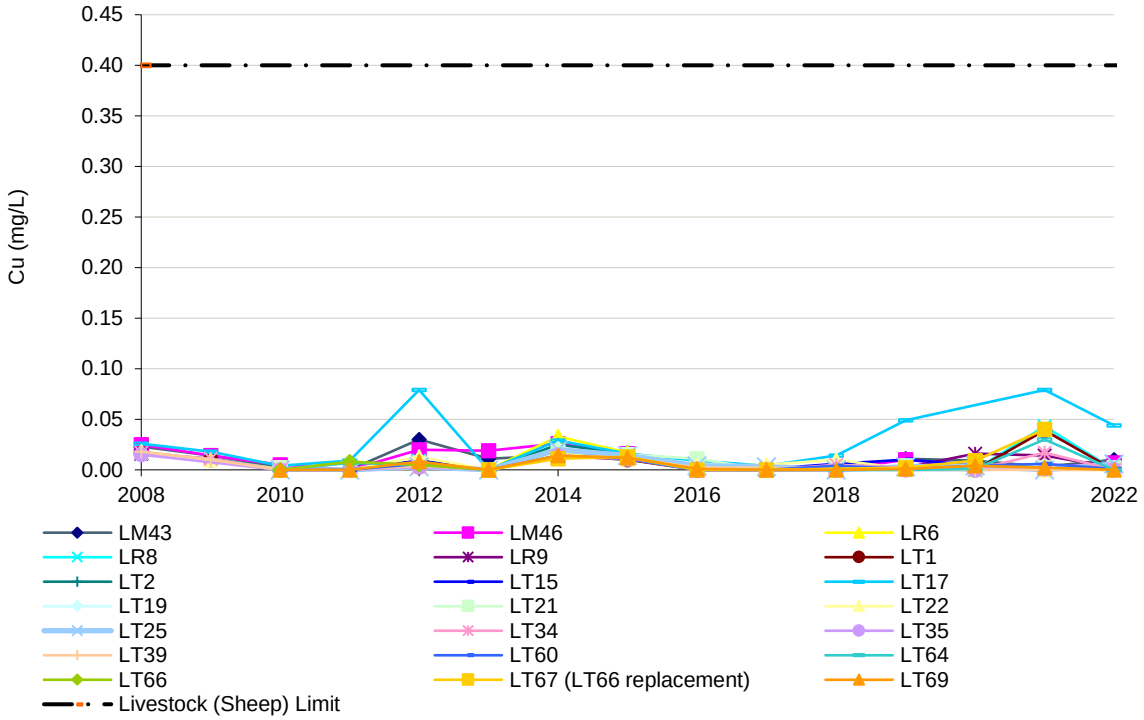


Figure 26: Olympic Dam on-site and regional groundwater monitoring bores: copper concentration.

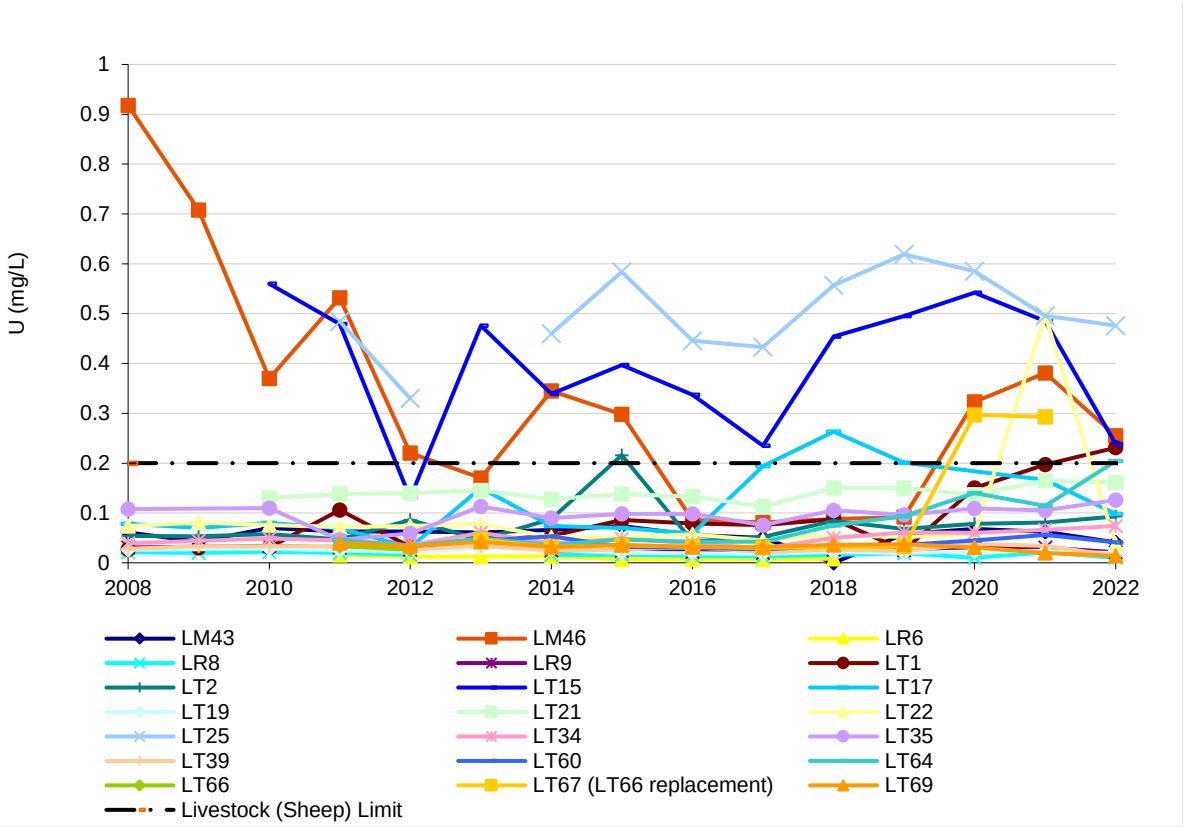


Figure 27: Olympic Dam on-site and regional groundwater monitoring bores: uranium concentration.

1.2.9 Deliverables (WA 2.3)

Records of the water levels in the MWDP.

Records of ground water levels in the vicinity of the MWDP.

To determine any potential environmental impacts of the Mine Water Disposal Pond (MWDP), water levels were monitored via local groundwater bores. Stable groundwater levels at LM43 and LM46 were observed due to consistently minimal water discharge rates into the pond during FY22 (Figure 25).

Records of quantities of water disposed of into the MWDP.

Quantities of water disposed of into the MWDP were measured and recorded each day, and reconciled monthly as part of the Saline Water balance (see Figure 18). An average of 0.7 ML per day was disposed into the MWDP during FY22.

1.2.10 Deliverables (WA 2.4)

Records of pond levels and pond wall condition (sewer ponds).

Sewage waste generated by Olympic Village (OV) is gravity fed to three on site chambers and pumped to the OV treatment facility west of the camp. The treatment facility consists of primary and secondary storage ponds and a permanent evaporation pan. The secondary ponds are mechanically aerated. Testing and monitoring of water quality continued throughout FY22 under 1SAP programmed maintenance, with results remaining within guideline thresholds. The OV treatment facility is inspected daily for security, inflow, wall integrity and available freeboard in storage ponds. Freeboard is reported daily and recorded. Inflow was recorded daily and averaged at ~223kL/day for FY22.

During FY22, A maintenance issue occurred in relation to the new clay lining of the lagoons, where wave action was found to be eroding the new embankment. The lagoons were taken offline, the clay lining repaired, and a geotextile layer put on, covered with 225mm rock (rip rap) to prevent any future

impact to the embankment. Operationally, there were three changes to the system but there were no issues associated with the changes:

- Temporary floating pumps were installed at ODV WWTP to boost the transfer of treated effluent from the secondary lagoons to the final storage lagoons during the SCM period as inflows were too high to rely on gravity alone to maintain stable lagoon levels.
- Connection of the temporary camp discharge into the Primary lagoon (as per DoH approval WWI-10723) to allow operation of the temporary camp across the SCM period. A total of 17.8ML of raw sewage was transferred from the new camp to the ODV WWTP during the SCM.
- Connection of the transfer pipeline between ODV WWTP and Roxby Downs WWTP (as per DoH approval WWI-10724) to allow partially treated effluent to be utilised by the council Recycled Water System. The transfer of treated effluent from the ODV WWTP to the RD WWTP began on the 21st July 2021. A total of 65.9 ML was transferred to the RD WWTP across this financial year.

Sewage waste generated by the Mine and Process plant is treated onsite. The onsite facility consists of a lined primary lagoon and two lined evaporation ponds. Inflow for FY22 averaged at ~299kL/day which is greater than design capacity due to increased site activities. Trucking wastewater from the onsite sewer lagoons began on the 20th July 2021 and ended on the 31st October 2021. A total of 7.09 ML was trucked to the ODV WWTP. Mechanical aeration began on the onsite evaporation lagoon in early September 2021. These actions ensured freeboard levels were maintained during the high inflows to the lagoons during the SCM 21

1.2.11 Deliverables (GW 3.5)

Data demonstrating that radionuclide concentrations are below upper limits.

Surface ponds which hold groundwater used for road watering were monitored and analysed during FY22 for specific radionuclides. Results from samples analysed in September 2021 were below the upper limit for radionuclide ^{238}U and ^{226}Ra of 50 Bq/L and 5Bq/L respectively (Table 13, Figure 28, Figure 29).

Table 13: Radionuclide analysis for dust suppression water.

	Analyte	^{238}U (Bq/L)	^{230}Th (Bq/L)	^{226}Ra (Bq/L)	^{210}Pb (Bq/L)	^{210}Po (Bq/L)
Upper Limits		50		5		
Sample site	Date					
A Block Dam	Sept 2021	4.9	0.07	0.40	0.086	0.04
D Block Dam	Sept 2021	16.0	0.021	1.15	0.14	0.024
F Block Dam	Sept 2021	7.9	0.020	0.24	0.18	0.008
Mine Water Disposal Pond	Sept 2021	6.3	0.015	0.59	0.057	0.003
Saline Water Dam 1	Sept 2021	5.6	0.17	1.17	0.17	0.17
Saline Water Dam 2	Sept 2021	2.8	0.12	0.55	2.9	0.09
TSF5 Construction Pond	Sept 2021	0.60	0.011	0.41	-0.02	-0.001
Barrier Wall Turkey Nest	Sept 2021	0.024	0.009	0.59	0.01	-0.003
Desal Road Wetting Pond	Sept 2021	0.014	0.004	0.35	-0.02	0.003

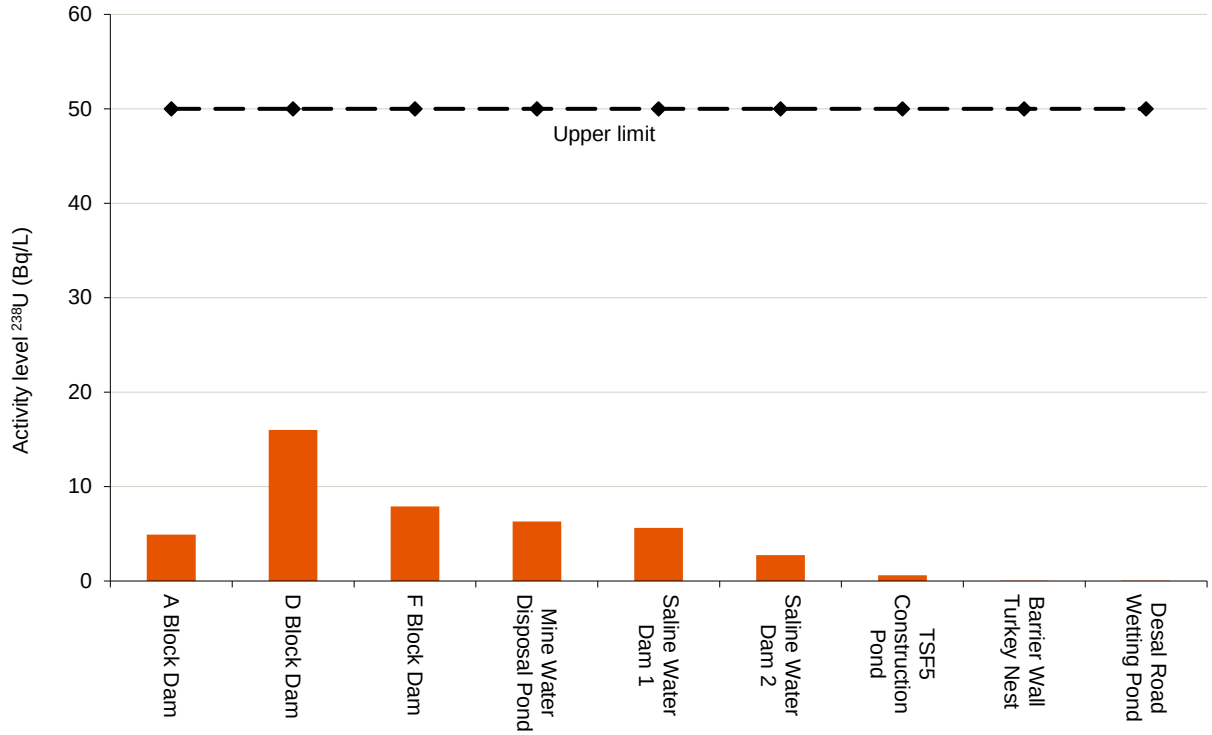


Figure 28: Mine water sample ^{238}U levels and upper limit FY22.

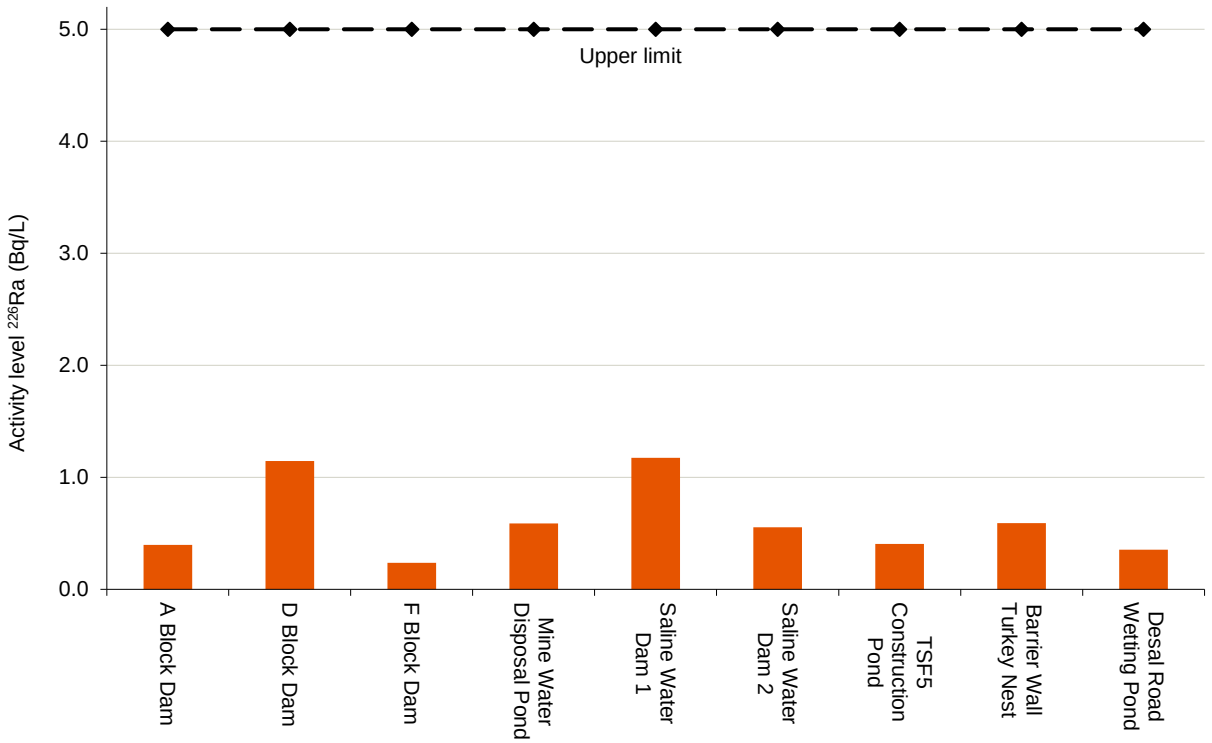


Figure 29: Mine water sample ^{226}R levels and upper limit FY22.

A review of results and provision for increased monitoring frequency where concentrations are trending towards upper limits.

No samples collected during FY22 showed levels above upper limits.

1.2.12 Targets FY22

Maintain an industrial water efficiency of 1.16kL/t at the budgeted production rate.

In FY22 the GAB Industrial Water Efficiency of the operation was 1.14 kL/t compared to the target of 1.16 kL/t and actual of 1.11 kL/t for FY21.

Historical GAB industrial water efficiency is given in Figure 15.

Maintain a domestic water use target of 3.2 ML/d average

Domestic water use during FY22 averaged 2.19 ML/d, below the target of 3.2 ML/d.

1.2.13 Actions FY22

Continue implementation of water use conservation and recycling initiatives.

During FY22 there was a focus on continuing the conservation and recycling of high quality GAB water. During the SCM21 major shutdown there was a focus on the minimisation of GAB water for industrial cleaning and deconstruction dust suppression with local saline water used wherever possible.

Continue substitution of saline water for high quality water where possible.

Saline water continues to be used in lieu of high-quality water where feasible, including use in processing, cement aggregate fill (CAF), road watering, construction and underground drilling activities.

A limited volume of saline water containing lower concentrations of chlorides (compared to SML saline wellfields) has been sourced from the groundwater mound beneath the TRS and is being utilised to augment the process water stream. Total saline volume use is restricted as the metallurgical process is highly susceptible to increased chloride concentrations which degrades infrastructure and affects plant performance. Approximately 0.6 ML/d is being added to the process water stream with chloride concentration being managed to protect infrastructure and production.

2 Storage, transport and handling of hazardous materials

2.1 Chemical / hydrocarbon spills

2.1.1 Environmental Outcome

No significant site contamination of soils, surface water or groundwater, as a result of the transport, storage or handling of hazardous substances associated with ODC's activities.

No significant contamination of soils, surface water or groundwater leading to actual or potential environmental harm due to the transport, storage or use of hazardous substances associated with ODC activities occurred in undisturbed areas of the SML during FY22.

2.1.2 Compliance criteria

No site contamination leading to material environmental harm (as defined in the EMM) arising from hydrocarbon/chemicals spills within the SML and Wellfields Designated Areas.

Note: Measurement and monitoring is carried out in response to a specific event, and in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999 or Environment Protection (Water Quality) Policy 2015. Remediation and monitoring programs are in place for historical contaminated sites.

During FY22, 52 chemical/hydrocarbon spills were reported within the Event Management Solution (EMS) as having occurred within the SML and Wellfield designated areas. All spills were contained and cleaned up as soon as practicable. As a result, no chemical/hydrocarbon spills within the SML and Wellfield designated areas led to actual or potential environmental harm occurring as part of ODC activities.

Hazardous substance spills which occurred within the operational areas of the SML were appropriately contained and cleaned up as soon as practicable with each event captured in the EMS. Of the chemical and hydrocarbon spills recorded within the operational area in FY22, one triggered additional reporting under the Environment Protection Act 1993 for actual or potential environmental material harm. The one externally reportable event spill included a hydrocarbon spill, where an unauthorised wash bay was used to clean drilling equipment. This externally reportable spill did not lead to actual environmental harm (as defined in the EMM).

Three legacy hydrocarbon spill sites exist (the 3ML tank on the SML; PS1 and PS6A in the Wellfields area), which are being actively monitored and managed. The hydrocarbon plume at the 3ML tank has been the subject of a Remediation Management Plan and subsequent Groundwater Management Plan (GMP) which requires 3 yearly monitoring between 2016 and 2025 to confirm plume stability. A monitoring event was conducted in 2019 (next monitoring confirmed for October 2022) and no contingency or trigger values were exceeded with the conclusion that no further action above the GMP plan is required at this time.

PS1 remediation has successfully treated a groundwater volume in excess of 4ML since commencing operation in late 2014. The PS1 Remediation Management Plan was updated in FY21 after a review of previous remediation effort and options assessment consulted that the current active remediation option has reached end of life. A change from active to passive remediation was implemented and the Groundwater Management Plan for PS1 updated with relevant triggers and targets to support the

remediation technique change. During FY22, light non-aqueous phase liquids (LNAPL) was not observed in any monitoring wells and contingency plan triggers were not exceeded.

PS6A remediation has treated groundwater in excess of 12ML since commencing operation in mid-2014 and recovered approximately 39,800L of LNAPL. The PS6A system was inactive during FY20/21 and the rebound response monitored. An assessment of remediation effectiveness was prepared in FY21, which updated the estimate of plume volume and recommended an expansion of the existing active remediation system. The upgraded infrastructure was installed in September 2020 and approximately doubles the extractive capacity. Since the restart of the treatment plant, it is estimated that the plant has treated approximately 5.6 ML of impacted groundwater. The estimated volume of product (LNAPL) removed from impacted groundwater since the restart is approximately 7,100 L.

Therefore, it is concluded that no site contamination leading to new material environmental harm (as defined in the EMM) has arisen from hydrocarbon/chemical spills within the SML and wellfields designated areas.

2.1.3 Leading Indicators

None Applicable.

2.1.4 Targets FY22

Finalise updated spills register to align with the Global Event Management System roll out.

The spills register was finalised and aligned with the Event Management Solution in FY20 and continues to operate to plan.

Corrective actions for all reportable spills of chemicals and hydrocarbons are implemented in a timely manner and do not result in material environmental harm (as defined in the EMM).

Note: Spills are reportable if they result in potential or actual material environmental harm in accordance with the EP Act 1993

One reportable hydrocarbon spill occurred within the operational area, triggering external reporting requirements as outlined under the Environment Protection Act 1993.

A hydrocarbon spill occurred in the southern mining area (SMA) backfill, where a concrete pad was used as an unauthorised wash bay for cleaning of drilling equipment by a contracting partner. The spill impacted an area of 10m^2 and between 40 – 80cm deep. The contaminated soil was excavated, containerised and disposed of at an offsite licenced facility. An investigation into the event determined that the purpose of the concrete pad was misunderstood as a wash pad. As a corrective action, an information document was created for the site outlining the purpose and intent of wash down facilities on the SML. The document includes information to prevent the likelihood of a similar event occurring again, with content covering appropriate design, wastewater disposal, maintenance, facility owner, audit checklist and a map of all locations.

2.1.5 Actions FY22

Maintain a register of recordable chemical and hydrocarbon spills and corrective actions.

Note: In FY22 ODC aligned with BHP Minerals Australia to define an internally recordable spill of chemicals and/or hydrocarbons is defined as any amount (previously 10 litre threshold) outside of a bund, in a single event.

During FY22 a register of recordable chemical and hydrocarbon spills and corrective actions was maintained through the EMS. In FY22 there was a total of 52 spill events, one of which was externally reported. The 51 internally recordable events comprised of 33 chemical spills and 18 hydrocarbon spills. Majority of these spills (48) occurred above ground on the SML and were a result of loss of containment from plant equipment across site. The remaining 3 spills were reported off-site (1 at Olympic Dam Airport and 2 associated with sewage infrastructure).

Internally reportable chemical and hydrocarbon spills decreased in FY22 in comparison to FY21, as shown in Figure 30.

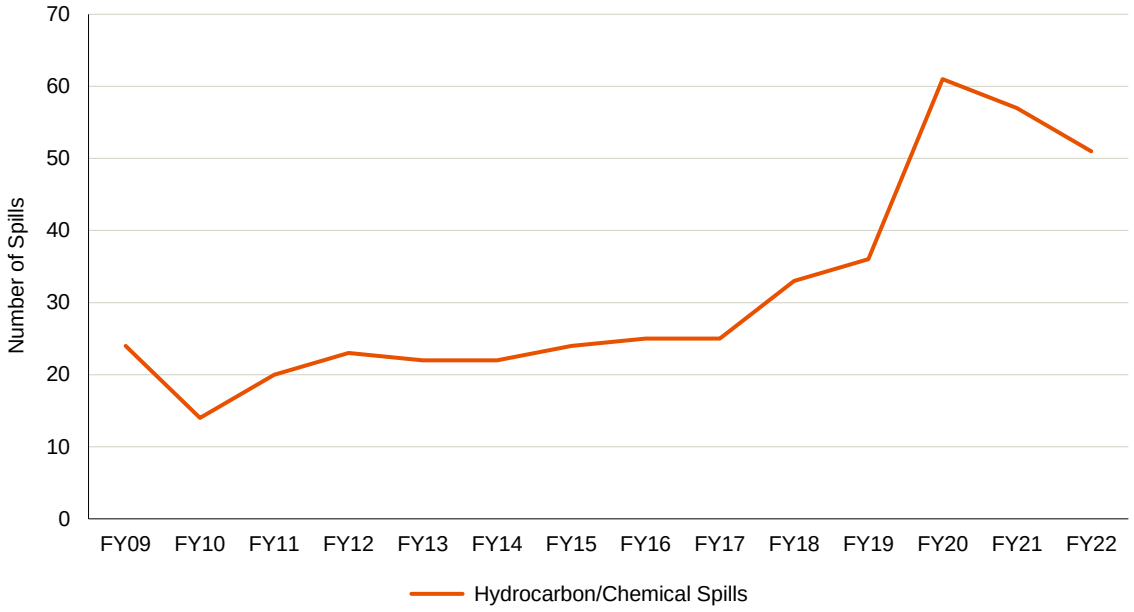


Figure 30: Historical hydrocarbon/chemical spills to FY22.

Continue to implement environment improvement plans for areas of concern, as identified through the annual Aspects and Impacts risk register review.

OD is continuing to implement inspections and maintenance on bunded areas to ensure spill management methodology is maintained.

Implement the PFAS Environment Improvement Program as required by EPA Exemption 51301.

OD is executing projects to ensure complete phase out of all prohibited firefighting foam (PFFF) in accordance with Clause 13A of the Environment Protection (Water Quality) Policy 2015 (WQ Policy) through the undertaking of the following:

1. A sitewide review of handheld fire extinguishers (as defined in the WQ Policy) at the ODC operated sites has been completed, with all PFFF extinguishers removed from site;
2. Replacement of 12 small deluge systems and the decontamination of two large deluge systems has commenced in accordance with EPA approved phase out plans;
3. Management of bulk PFFF and contaminated infrastructure appropriately; and
4. Verification to confirm removal and decontamination, including by engaging an external expert consultant. Verification to confirm removal and decontamination activities through the engagement of an external expert consultant has commenced.

Implement the Foam Management Plan as required by EPA Exemption 51301 to ensure all PFAS firefighting foam is appropriately managed during the phase out program

During the phase out of PFFF, all PFFF will be managed in accordance with the approved Foam Management Plan. The foam management plan provides the required approach to spill clean-up management, investigations, maintenance and inspections, and storage and disposal requirements for PFFF affected media.

2.2 Radioactive process material spills

2.2.1 Environmental Outcome

No adverse impacts to public health as a result of radioactive process material spills from ODC's activities.

ODC has consistently operated in a manner that limits radiation dose to members of the public, from operational activities and radioactive emissions, to less than a small fraction of the International Commission on Radiological Protection (ICRP) 1mSv/y limit.

During FY22, one reportable radioactive process material spill occurred within the USX operational area outside of the designated bund. This spill was immediately cleaned up and resulted in no harm to human health, safety or the environment.

As a result, there were no adverse impacts to public health as a result of radioactive process material spills from ODC's activities.

No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive process material spills from ODC's activities.

No significant impacts to populations of listed species or ecological communities were recorded as a result of operational activities, including the effects from any radioactive process material spills. Impacts to listed species and ecological communities are avoided by ensuring that there is no uncontrolled loss of radioactive material to the natural environment. As there was no loss of radioactive material to the undisturbed environment in FY22, no impact to populations of listed species or ecological communities occurred.

2.2.2 Compliance criteria

A dose limit for radiation doses to members of the public of 1 mSv/y above natural background.

The total estimated dose (FY22) to members of the public at Roxby Downs Air Quality Monitoring Site (RD AQMS) and Olympic Village Air Quality Monitoring Site (OV AQMS) contributed by ODC operations was 0.053 mSv and 0.053 mSv respectively. For more detail refer to section 3.4 Radioactive Emissions.

No significant radioactive contamination arising from uncontrolled loss of radioactive material to the natural environment.

Note: Significant is defined as requiring assessment and remedial action in accordance with the NEPM 1999 or EPP 2015 and the Mining Code. Measurement and monitoring are carried out in response to a specific event.

In FY22 there were 18 radioactive process material spills, of which one was reportable, within the surface operational area. The majority of these spills were in the concentrator and hydromet areas and were a result of leaking or failed pipes or instrument reading failure. Of the spills in FY22 none required assessment and remedial action in accordance with the National Environment Protection Measure (NEPM) (Assessment of Site Contamination) 1999, Environment Protection (Water Quality) Policy (EPP) 2015 or the Code of Practice Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (the Mining Code).

As stated in section 2.2.1 above, there was no uncontrolled loss of radioactive material to the natural environment in FY22.

2.2.3 Leading Indicators

None applicable.

2.2.4 Targets FY22

Finalise updated spills register to align with the Global Event Management System roll out

The spills register was aligned in FY20 to the Global Event Management Solution and continues to operate to the intent.

No spill of Radioactive Process Material into an undisturbed environment.

There was no uncontrolled loss of radioactive process material to the undisturbed environment in FY22.

Corrective actions resulting from a reportable spill of radioactive process material are executed in a timely manner to ensure no adverse impacts to human health.

One reportable radioactive process material spill occurred in FY22, which was contained within the operational area and did not impact on undisturbed areas or result in adverse impacts to human health.

In November 2021 less than 1kg of ammonium diuranate (ADU) spilt onto scaffolding used inside the calciner bund within the precipitation compound. The contaminated scaffolding was dismantled and placed onto stillage pallets and stored in a securely fenced compound area of the UOC. This movement resulted in secondary loss of containment. The investigation found that the event was caused by misunderstanding of procedures regarding secondary containment. All areas affected were cleaned and decontaminated. Control measures have been put in place to stop this occurring in the future.

2.2.5 Actions FY22

Maintain a register of recordable spills of radioactive process material resulting from operations at Olympic Dam.

Note: Reportable and recordable spills of radioactive process material as defined by the Criteria and Procedures for Recording and Reporting Incidents as SA Uranium Mines (DEM), known as 'Bachmann Criteria'

A register of recordable spills was maintained during FY22 and there were 18 recordable radioactive process material spills across site (of which one was reportable). The spills occurred at the SX, Hydromet, Concentrator, Feed Prep and TRS (see Figure 31 below).

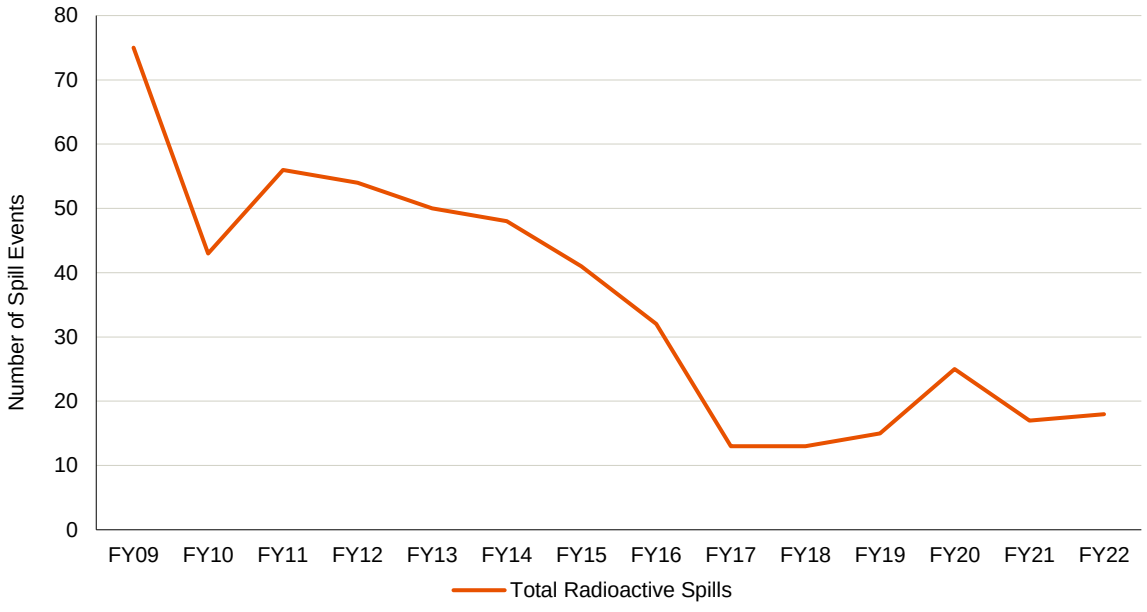


Figure 31: Historical radioactive process material spills to FY22.

Continue to implement environment improvement plans for areas of concern as identified in the annual Aspects and Impacts risk register review.

All areas continued with planned maintenance tasks for tanks, pipes and bunds. These plans are captured and monitored through 1SAP. The adherence to planned maintenance ensures less radioactive process material spills as demonstrated in Figure 31.

3 Operation of industrial systems

3.1 Particulate emissions

3.1.1 Environmental Outcome

No adverse impacts to public health as a result of particulate emissions from ODC's activities.

No adverse impacts to public health occurred as a result of particulate emissions from ODC operations during FY22. In FY22, two ground level PM_{10} dust concentrations at Olympic Village derived from construction sources at Olympic Dam exceeded the PM_{10} 24 hour average of 50µg/m^3. The investigations concluded that the high particulate loadings derived from construction sources were caused by regional dust events. ODC does not consider these events to have caused adverse impacts to public health. No community complaints were received relating to dust events in FY22.

3.1.2 Compliance criteria

Ground level PM10 dust concentrations at Roxby Downs and Olympic Village, derived from construction and/or operational sources at Olympic Dam must not exceed the PM10 24-hour average of 50 µg/m^3.

Note: ODC utilises the Environment Protection (Air Quality) Policy 2016 Ground Level Concentration (GLC) thresholds for assessing compliance at sensitive receiver locations.

In FY22, two ground level PM10 dust concentrations at Olympic Village derived from construction sources at Olympic Dam exceeded the PM10 24 hour average of 50 µg/m3. These events were investigated and corrective actions pursued as per section 3.1.6.

In addition to the two high dust events, the EPA was notified within 24 hours of three other high dust events based off raw, un-validated data. These three events were investigated utilising validated data. Following the investigations the root cause was determined to be equipment failure, which caused false high dust readings. These three events where equipment failed during the day were not high-dust events in the validated data and therefore only the two true events are represented in Figure 32.

3.1.3 Leading Indicators

None applicable.

3.1.4 Deliverables

Records of particulate emissions from Smelter 2 to assess compliance with the emission limits of EPA Licence 1301 and to compare against schedule 4 of the Environment Protection (Air Quality) Policy 2016 as shown in Table 3.1 of the Monitoring Program – Airborne Emissions.

Smelter stack emissions and analysis for particulate concentrations are undertaken periodically to assess the performance of gas cleaning systems. Particulate emissions from the Acid Plant Tails Stack (APTS), Concentrate Dryer Stack and Main Smelter Stack were tested during FY22 with results summarised below in Table 14 and Table 15.

As shown in Table 14 emissions tested by isokinetic testing from the Main Smelter Stack, Acid Plant Stack and Concentrator Dryer Stack met requirements of the Environment Protection (Air Quality) Policy 2016 and EPA Licence 1301 (condition U-1068) (100mg/Nm^3) during the reporting period. All

stack bypass events were recorded and reported in the quarterly smelter emissions report as per EPA Licence condition U-1066.

Table 14: Measured particulate concentrations at the Main Smelter Stack and Acid Plant Stack (mg/Nm³).

	Main Smelter Stack (mg/Nm³)	Acid Plant Tails Stack (mg/Nm³)
July 2021	16	N/A
February 2022	16	N/D

N/A – (Not Applicable) Below testing detection limits

N/D- (Not Determined) Sampling undertaken but results were not determined

Table 15: Measured particulate concentrations at the Concentrate Dryer Stack (mg/Nm³).

	Concentrate Dryer Stack (mg/Nm³)
July 2021	52
February 2022	157

Records of particulate emissions from Calciners A and B to assess against the relevant particulate pollutant level specified in Environment Protection (Air Quality) Policy 2016 (see Table 3.1 of the Monitoring Program – Airborne Emissions).

Particulate emission testing is managed through scheduled maintenance (1SAP), Calciner A and B are tested on a quarterly basis by isokinetic sampling. The isokinetic stack-sampling filters are used to capture particulates and are analysed for ^{238}U activity. Results from the uranium analysis, together with data obtained from the process control system, are used to estimate total uranium discharged from the stacks, and subsequently reported in the LM1 Radiation Annual Report.

Scheduled sampling of the Calciner gas cleaning systems occurred in July 2021 and in February, March and April 2022. Out of sequence monitoring was due to maintenance activities. Results from this testing are summarised in Table 16 .Point source emission results are assessed against Table 3.1 of the Monitoring Program – Airborne Emissions and did not exceed the compliance limit for ODC.

Table 16: Measured particulate concentrations in Calciner emissions (mg/Nm³).

	Calciner A (mg/Nm³)	Calciner B (mg/Nm³)
July 2021	*	16
February 2022	*	36
March 2022	17	*
April 2022	2	30

*Offline for maintenance

3.1.5 Deliverables (AE 3.3)

Records of particulate and hydrogen sulphide emissions from the Slimes Treatment Plant to assess against the pollutant levels in the Environment Protection (Air Quality) Policy 2016 (see Table 3.1 of the Monitoring Program – Airborne Emissions)).

Particulate and hydrogen sulphide emissions from the Slimes Treatment Plant are measured on a biannual basis by isokinetic sampling. Any measurement above 100 mg/Nm^3 for particulates from the Saunders Furnace roaster scrubber or above 5 mg/Nm^3 of hydrogen sulphide from the NOx Scrubber are to be reported to EPA and investigated.

These values were not exceeded during FY22 as shown in Table 17.

Table 17: Measured particulates and Hydrogen Sulphide concentrations (mg/Nm³).

	Saunders Furnace Particulates (mg/Nm³)	NOx Scrubber Hydrogen Sulphide (mg/Nm³)
October 2021	30	<0.05
June 2022	56	<0.06

3.1.6 Deliverables (AE 3.6)

Records of real-time monitoring of particulates to ensure that concentrations at Roxby Downs remain within the compliance criteria.

The real-time dust monitoring system records ground level dust concentration data at 10 minute intervals at Olympic Dam Village and Roxby Downs sensitive receptor sites (Figure 35). The real time operational dust concentration results for Roxby Downs and Olympic Village are shown in Figure 32 and Figure 33. The Northern Background control site is located to the north of the surface processing operations within the Arid Recovery Reserve with real time average background PM_{10} concentration for FY22 summarised in Figure 34.

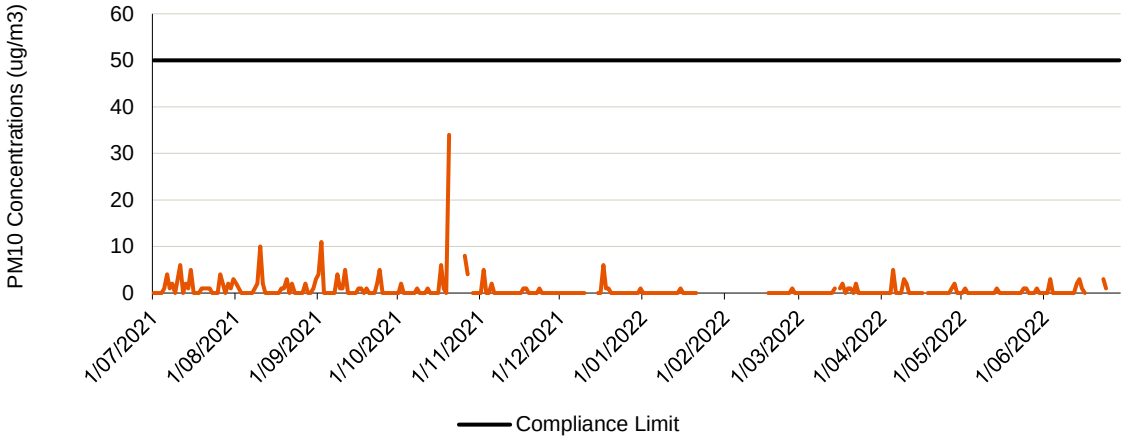


Figure 32: Real time PM_{10} 24-hour 'operational contribution' dust concentrations at Roxby Downs (FY22).

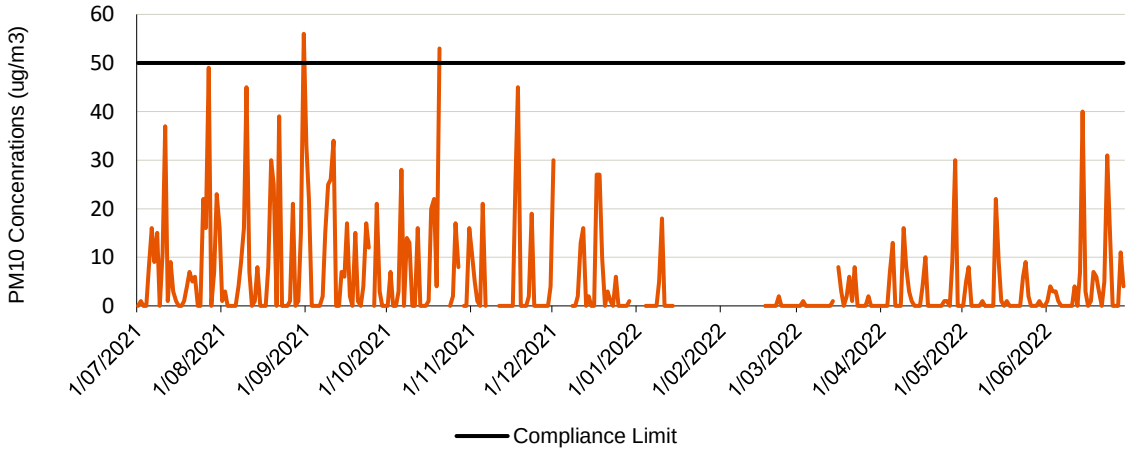


Figure 33: Real time PM_{10} 24-hour 'operational contribution' dust concentrations at Olympic Village (FY22). 2 of the events over the compliance limit.

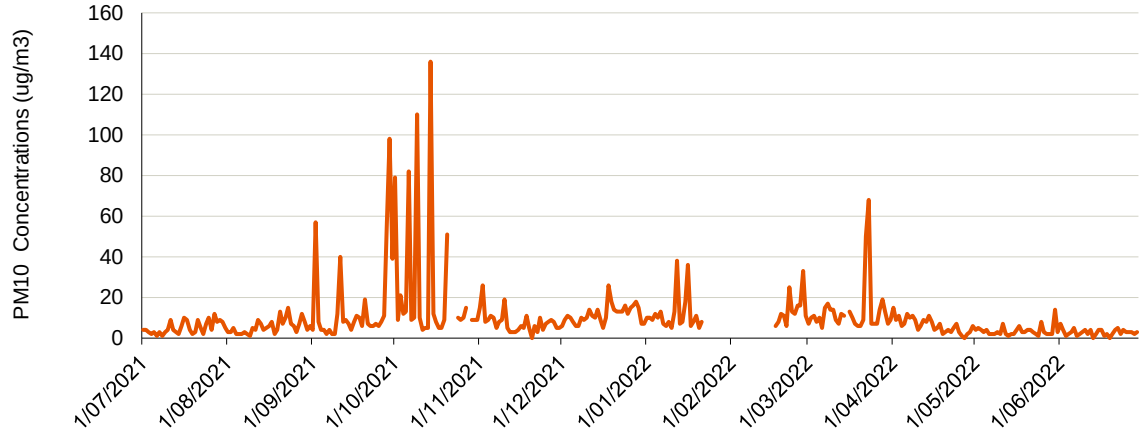


Figure 34: Real time dust concentrations at Northern Background Station (FY22).

To determine the PM_{10} contribution from Olympic Dam operations, the sensitive receivers at Roxby Downs and Olympic Village are given an operational wind vector, which defines the wind directions for which the sensitive receivers are deemed downwind of Olympic Dam operations (Figure 35). Dust concentrations measured at the Northern Background (control site) are then subtracted from the dust measurements recorded at the sensitive receptors for the wind directions within the operational wind vector.

A report is automatically generated daily to indicate whether the 24 hour PM_{10} average concentration from the OD wind vector has exceeded 50 ug/m^3 at Olympic Village or Roxby Downs. This prompts an investigation by the Olympic Dam Environment Team to determine whether the dust event was due to construction or operational sources. In FY22, following this procedure, two dust events were identified at Olympic Village, and were determined to be regional dust events (refer to Table 18). No events were recorded at Roxby Downs receptor.

Table 18: FY22 high dust events.

Date	Roxby Downs PM10 24hour Average contribution from OD wind vector (µg/m3)	Olympic Village PM10 24hour Average contribution From OD wind vector (µg/m3)
31/09/2021	3	56
20/10/2021	34	53

Provision of real-time particulate information to inform the management of dust producing activities at the operation.

The real time dust monitoring stations record live data at 10 minute intervals, with all information stored and managed on the Airodis air management database. A daily report is distributed to internal stakeholders, which shows both background and operationally contributed PM_{10} dust levels for the previous 24 hours.

Weather warnings, issued by the Bureau of Meteorology (BOM) are distributed to all Olympic Dam staff in response to extreme weather events to assist operational areas in managing dust producing activities. Dust suppression is undertaken as per the site Dust and Emission Management Plan which describes fugitive source emission controls and measurement. An automatic alert system has been implemented to automatically alert high dust generating activity area owners to cease operations, or increase dust controls, when weather conditions are unfavourable.

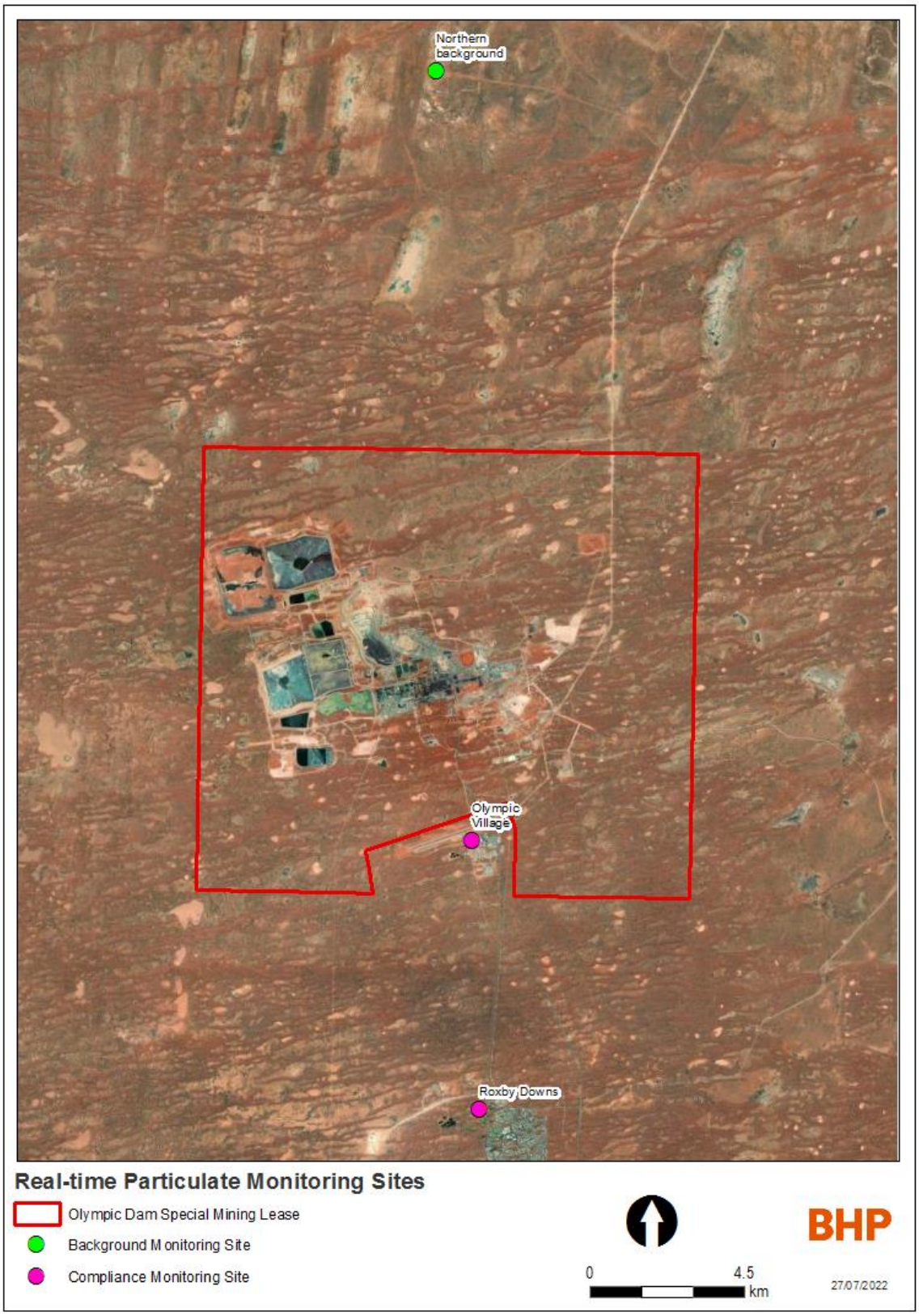


Figure 35: Location of real time dust monitoring sites.

3.1.7 Deliverables (FL 3.1)

A report on the annual changes in perennial communities within and surrounding the SML.

Provide a comparative assessment on perennial species existing at different distances from the Main Smelter Stack.

In FY22, 62 permanent quadrats (i.e. sites) were monitored for perennial vegetation (Figure 36) *Acacia ligulata* followed by *Dodonea viscosa* have had the greatest relative abundance in every year FY11-FY22.

Similar to previous years, *Acacia ligulata* continues to significantly decrease at both Treatment and Control sites, while *Dodonea viscosa* continues to significantly increase at both Treatment and Control sites (Table 19). *Callitris glaucophylla* continued to significantly decrease at Control sites (Table 19). In addition, *Acacia ramulosa* significantly decreased at Treatment sites, while *Acacia aneura* significantly increased at Control sites (Table 19). *Pimelea microcephala* significantly increased at Treatment sites but is not found at any Control sites.

Excluding relationships found in *Acacia ramulosa* and *Acacia aneura*, similar changes at both Treatment and Control sites indicates that changes in species composition are not due to impacts from the mine.

In addition, Simpson's index values average over a maximum of 16 years showed that plant diversity could not be linked to proximity of the mine. Therefore, it is likely that the operation is not having an ongoing impact on species diversity in the surrounding region. A regression analysis determined that plant species diversity averaged over 2006 to 2021 did not significantly change with distance from the operation (up to 27 km from the main smelter stack; $F_{1,60} = 0.079$, $p = 0.708$; $R^2 = 0.002$; Figure 37).

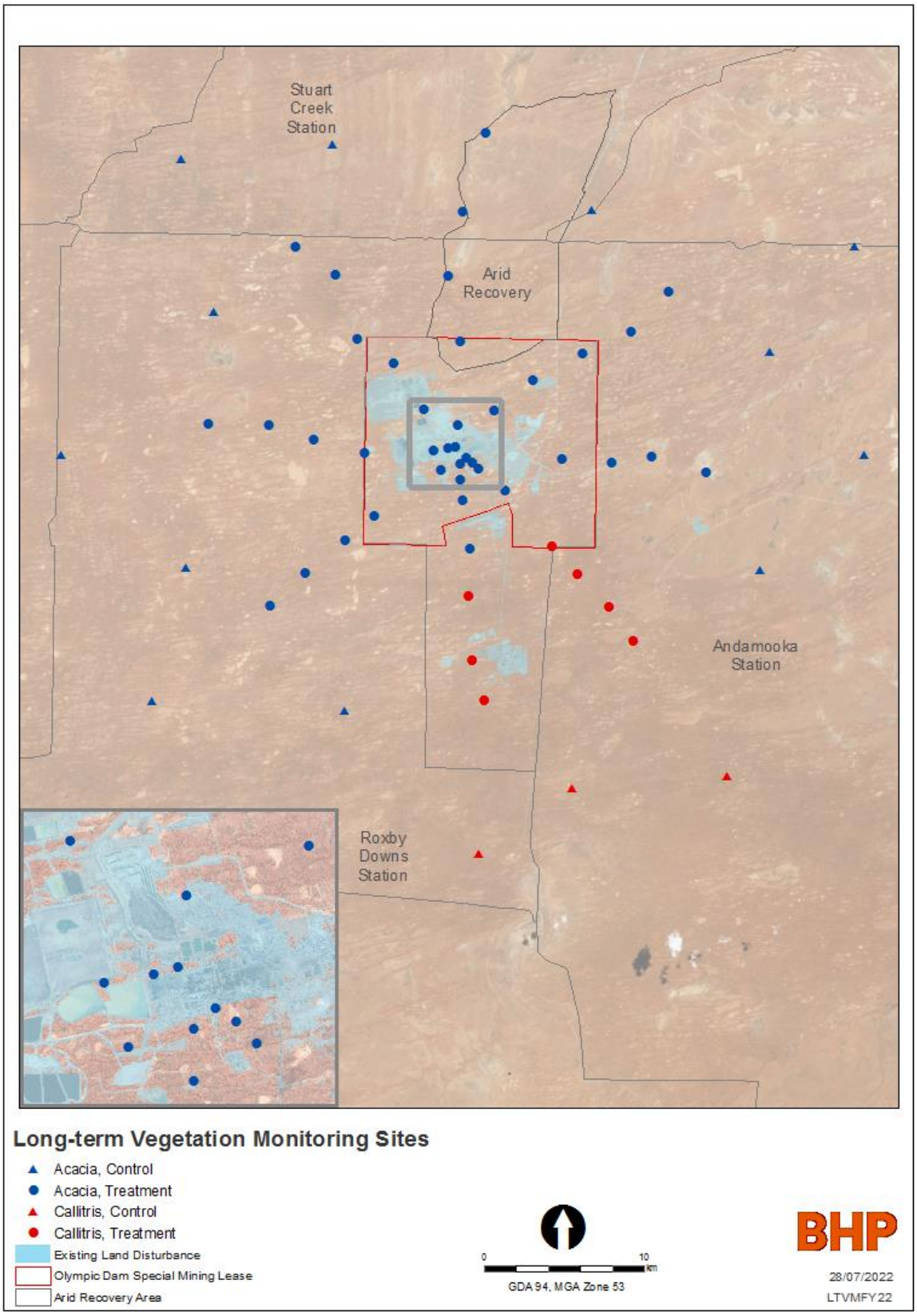


Figure 36: Location of radial sample sites monitored in FY22.

Table 19: Linear regression analysis results for all species in Treatment and Control sites from FY12 to FY22.

Species code	Treatment		Control	
ACAN	$F_{1,9}$ = 0.95, p = 0.356	R^2 = 0.095	$F_{1,9}$ = 23.98, p = 0.002	R^2 = 0.727
ACLI	$F_{1,9}$ = 47.81, p < 0.001	R^2 = 0.841	$F_{1,9}$ = 66.73, p <0.001	R^2 = 0.881
ACOS	$F_{1,9}$= 0.27, p = 0.615	R^2 = 0.033	-	-
ACRA	$F_{1,9}$ = 5.20 p = 0.048	R^2 = 0.366	$F_{1,9}$ = 0.68, p = 0.429	R^2 = 0.070
ALOL	$F_{1,9}$ = 1.72, p = 0.222	R^2 = 0.160	$F_{1,9}$ = 1.81, p = 0.211	R^2 = 0.167
CAGL	$F_{1,9}$ = 2.57, p = 0.143	R^2 = 0.222	$F_{1,9}$ = 11.92, p = 0.007	R^2 = 0.569
DOVI	$F_{1,9}$ = 33.34, p < 0.001	R^2 = 0.787	$F_{1,9}$ = 49.22, p < 0.001	R^2 = 0.845
ERGL	$F_{1,3}$ = 9.56, p = 0.054	R^2 = 0.767	$F_{1,3}$ = 2.67, p = 0.201	R^2 = 0.470
ERLO	$F_{1,9}$ = 1.40, p = 0.266	R^2 = 0.135	-	-
ERMA	$F_{1,2}$ = 0.01, p = 0.950	R^2 = 0.002	-	-
GUQU	$F_{1,9}$ = 0.82, p = 0.390	R^2 = 0.083	-	-
HALE	$F_{1,7}$ = 0.08, p = 0.780	R^2 = 0.011	-	-
LYAU	$F_{1,9}$ = 4.62, p = 0.060	R^2 = 0.339	-	-
PIMI	$F_{1,7}$ = 8.81, p = 0.021	R^2 = 0.557	-	-
PIAN	$F_{1,9}$ = 0.44, p = 0.526	R^2 = 0.046	-	-
SAAC	$F_{1,4}$ = 0.03, p = 0.881	R^2 = 0.006	-	-
SALA	$F_{1,9}$ = 0.84, p = 0.382	R^2 = 0.085	-	-
SASP	-	-	-	-
SEPE	$F_{1,9}$ = 1.74, p = 0.220	R^2 = 0.161	$F_{1,8}$ = 1.160, p = 0.313	R^2 = 0.127

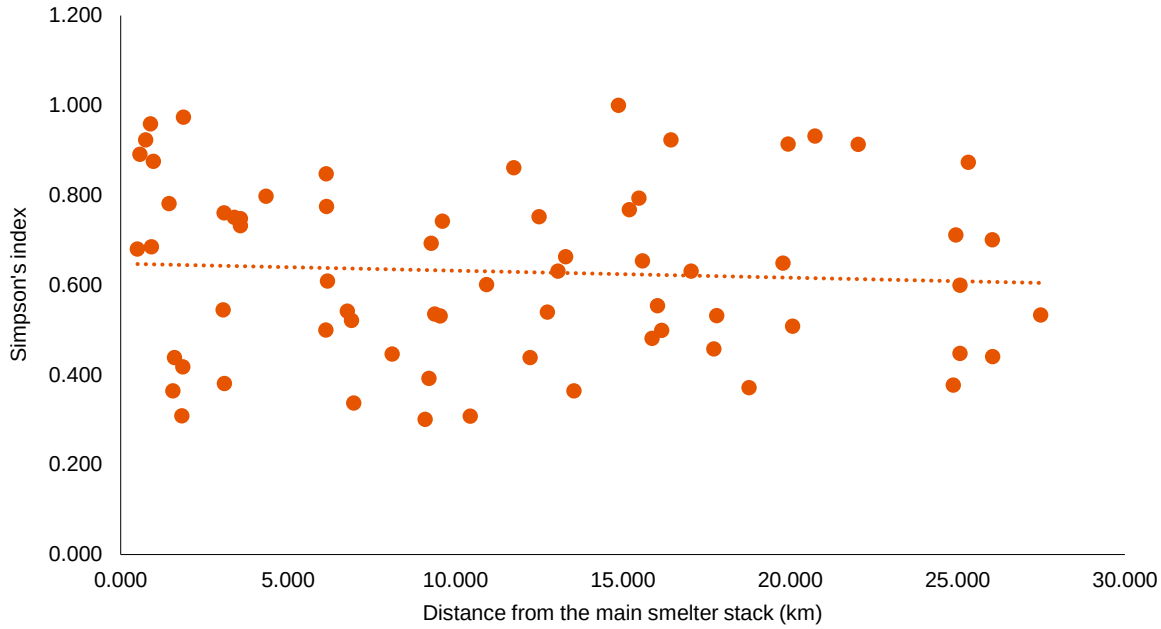


Figure 37: Simpson's index averaged over 2006 to 2021 for each site and plotted against the distance of the site from the main smelter stack.

3.1.8 Target FY22

Review the dust monitoring system to ensure it is applicable to current mining operations.

Throughout FY20-22 Olympic Dam Corporation (ODC) experienced a number of high dust events in relation to the compliance commitment that ground level PM_{10} dust concentrations at Roxby Downs and Olympic Village derived from construction and operational sources at Olympic Dam must not exceed the PM10 24-hour average of 50µg/m^3.

ODC engaged Environmental Recourses Management (ERM) to undertake a technical review of the implementation and operation of the Olympic Dam Air Quality Monitoring System. The objectives of the investigation were to:

- Assess whether the system was still representative of the BHP operational footprint and current air quality model for Business as Usual (BaU) operations.

ERM confirmed that the existing monitoring system is fit for purpose.

3.1.9 Actions FY22

Implement an Environmental Improvement Plan should any significant increase of operationally contributed PM_{10} 24 hour average of 50µg/m^3 occur over the year.

Roxby Downs received 350mm (BHP RD Air Quality Monitoring System) of rainfall since October 2021 which has led to groundcover vegetation increasing significantly. No high dust events have been recorded since October 2021. A Dust Management Procedure was introduced in FY22 to provide the Operations and high dust generating activity Area Owners detail about Trigger Action Response Plans, access to leading alerts about unfavourable conditions, and additional controls such as dust sealants.

3.2 Sulphur dioxide emissions

3.2.1 Environmental Outcome

No adverse impacts to public health as a result of sulphur dioxide (SO2) emissions from ODCs operations.

Environment Protection (Air Quality) Policy 2016, Ground Level Concentration (GLC) levels for ambient air quality are based on the protection of human health. Roxby Downs and Olympic Village ambient SO_2 analyser results for the reporting period showed no exceedance of the Environment Protection (Air Quality) Policy 2016 for ambient air quality SO_2 at either Olympic Village or Roxby Downs Township.

An annual review of monitoring data collected at sensitive receptors (ambient ground level concentrations) has shown there were no adverse impacts to public health as a result of sulphur dioxide (SO_2) emissions from ODC's activities during FY22.

3.2.2 Compliance criteria

Annual average SO_2 concentration of less than 0.02 ppm at sensitive receivers, Olympic Village and Roxby Downs.

The measured annual average SO_2 concentrations for the reporting period was 0.0007 ppm and 0.0013 ppm at Roxby Downs and Olympic Village respectively, which is less than the 0.02 ppm Environment Protection (Air Quality) Policy 2016 GLC limit.

24hour average SO_2 concentration of less than 0.08 ppm at sensitive receivers, Olympic Village and Roxby Downs.

The measured maximum 24hour average SO_2 concentrations for the reporting period was 0.0011 ppm and 0.0020 ppm for Roxby Downs and Olympic Village respectively. This is below the 0.08 ppm Environment Protection (Air Quality) Policy 2016 GLC limit.

One hour average SO_2 concentration of less than 0.2 ppm at sensitive receivers, Olympic Village and Roxby Downs.

The measured maximum hourly average SO_2 concentration for the reporting period was 0.0020 ppm for Roxby Downs and 0.0025 ppm for Olympic Village, which is less than the 0.2 ppm Environment Protection (Air Quality) Policy 2016, GLC limit.

3.2.3 Leading Indicators

None applicable.

3.2.4 Deliverables (AE 3.1)

Calibration records for SO_2 analysers on the Main Smelter Stack and Acid Plant Tails Gas Stack.

The Acid Plant Tails Gas Stack (APTS) and Main Smelter Stack (MSS) SO_2 analysers were maintained in accordance with site procedures and manufacturer's recommendations throughout the reporting period. Calibration maintenance plans (CMPs) are scheduled through 1SAP and are automatically generated. These CMPs are part of Olympic Dams' pollution control register and monitored for completion frequently. Currently, the in-stack real time SO_2 and particulate analysers on the MSS and the APTS are calibrated on a weekly and quarterly basis. All calibration maintenance plans were completed for FY22 and the calibration records are kept electronically. The APTS analyser was found to be malfunctioning while coming out of SCM21 and beginning acid production in late-November to early-December 2021. In lieu of the APTS analyser for the two week period, the temperature rise throughout the converter catalyst beds was used to infer conversion extent and approximate SO_2 emissions.

Records of SO_2 emissions from the Smelter 2 to assess compliance with the emission limits of EPA Licence 1301 and to compare against Schedule 4 of the Environment Protection (Air Quality) Policy 2016, as shown in Table 3.1 in the Monitoring Program – Airborne Emissions.

Isokinetic sampling of the Main Smelter Stack and Acid Plant Tails Gas Stack was undertaken in July 2021 for sulphur trioxide and sulphur dioxide and sulphur dioxide in February 2022. The results indicate continued compliance with the requirements of EPA Licence 1301 and the Environment Protection (Air Quality) Policy 2016. Table 20 and Table 21 display the results for FY22.

Table 20: Smelter 2 Main Smelter Stack sampling results FY22.

Sampling Point Main Smelter Stack	Total acid gas emissions (mg/Nm^3)	Sulphur trioxide and acid mist emissions* (mg/Nm^3)	Sulphur dioxide emissions ** (mg/Nm^3)
Reporting Level	**3000**	**100**	**2400**
February 2022	-	-	250
July 2021	277	9	268

* Expressed as sulphur trioxide equivalent
** EPA Licence 1301 Licence requirement level without sulphur trioxide

Table 21: Smelter 2 Acid Plant Tails Stack sampling results FY22.

Sampling Point Acid Plant Tails Gas Stack	Total acid gas emissions (mg/Nm3)	Sulphur trioxide and acid mist emissions* (mg/Nm3)	Sulphur dioxide emissions ** (mg/Nm^3)
Reporting Level	**3000**	**100**	**2400**
February 2022	-	<1	370
July 2021	745	2	743

* Expressed as sulphur trioxide equivalent
** EPA Licence 1301 Licence requirement level without sulphur trioxide

Data to confirm that approximately 99 per cent of all SO_2 generated during the smelting process is captured.

The percentage of SO_2 recovery for the reporting period FY22 was 99.22%. This recovery result has increased from FY21 (99.11%) and FY20 (98.97%). The capture rate is compliant with the required approximate of 99% SO_2 capture deliverable.

Records to assess compliance with the monitoring and reporting requirements of EPA Licence 1301 and the EP (Air Quality) Policy (see Table 4.1).

ODC compiles a report for the EPA every quarter outlining the operation (greater than ten minutes) of the Acid Plant Bypass Stack, the Flash Furnace Bypass Stack, the Electric Furnace Bypass Stack, or either of the Anode Furnace Bypass Stacks. With each operation, the date and time is recorded, along with the duration, reason for the event, and the actions to remedy the situation. Daily reports are sent to the Environment team outlining each event and Metallurgists provide the information on causes and actions. The quarterly report to the EPA also includes a summary of events resulting from the start-up or abnormal/emergency operation of the Acid Plant, which results in the total acid gas content of the Acid Plant Tail Stack exceeding $3000mg/m^3$. Event details include the date and time, duration, cause and action(s) taken to remedy the situation. Similarly, events where the emission level exceeds $3000mg/m^3$ of residual gases from the Main Smelter Stack are also recorded in the quarterly report.

The monitored ground level concentration of sulphur dioxide concentration is continuously recorded at Olympic Village and Roxby Downs and is maintained in the Airodis database. The ground level concentration of sulphur dioxide is reviewed each day via a daily report, along with the daily stack events. This process is managed via procedures and work management held within the 1SAP system.

Continuous monitoring of sulphur dioxide emissions from the Acid Plant Tails Stack and Main Smelter Stack using continuous in-stack instrument occurs. In stack analysers are calibrated and maintained to manufacturer standard, and this process is controlled by the 1SAP work management system. The total acid gas emissions from the Acid Plant Tails Stack and the total sulphur trioxide emissions from the Main Smelter Stack are tested annually, managed by the 1SAP system.

3.2.5 Deliverables (AE 3.4)

Records of ground level SO_2 concentrations at Olympic Village and Roxby Downs Township to assess compliance with the ground level SO_2 concentration requirements of the Ambient Air Quality NEPM and the values contained in schedule 2 of the Environment Protection (Air Quality) Policy

Ambient SO_2 1 hour, 24 hour, and 1 year average (mean) concentrations for FY22 at Olympic Dam Village and Roxby Downs were measured by real time continuous ambient SO_2 monitors in accordance with EPA Licence 1301 Condition (U-1072).

The measured maximum average 1 hour, 24 hour, and 1 year concentrations for Roxby Downs and Olympic Village results along with the applicable EPA (Air Quality) Policy 2016 Ground Level Concentration (GLC) values, are presented in Table 22below. The results of the measured concentration for the FY22 reporting period show that no exceedance of the GLC for ambient air quality limits of SO_2 occurred at Olympic Village or Roxby Downs Township (Figure 38-Figure 43) sensitive receiver monitoring locations.

Table 22: Average ambient SO_2 concentrations at Roxby Downs and Olympic Village.

	Annual average concentration (ppm)	Maximum 24 hour average concentration (ppm)	Maximum Hourly average concentration (ppm)
EPA (Air Quality) Policy 2016	**0.02**	**0.08**	**0.2**
Roxby Downs	0.0007	0.0011	0.0020
Olympic Village	0.0013	0.0020	0.0025

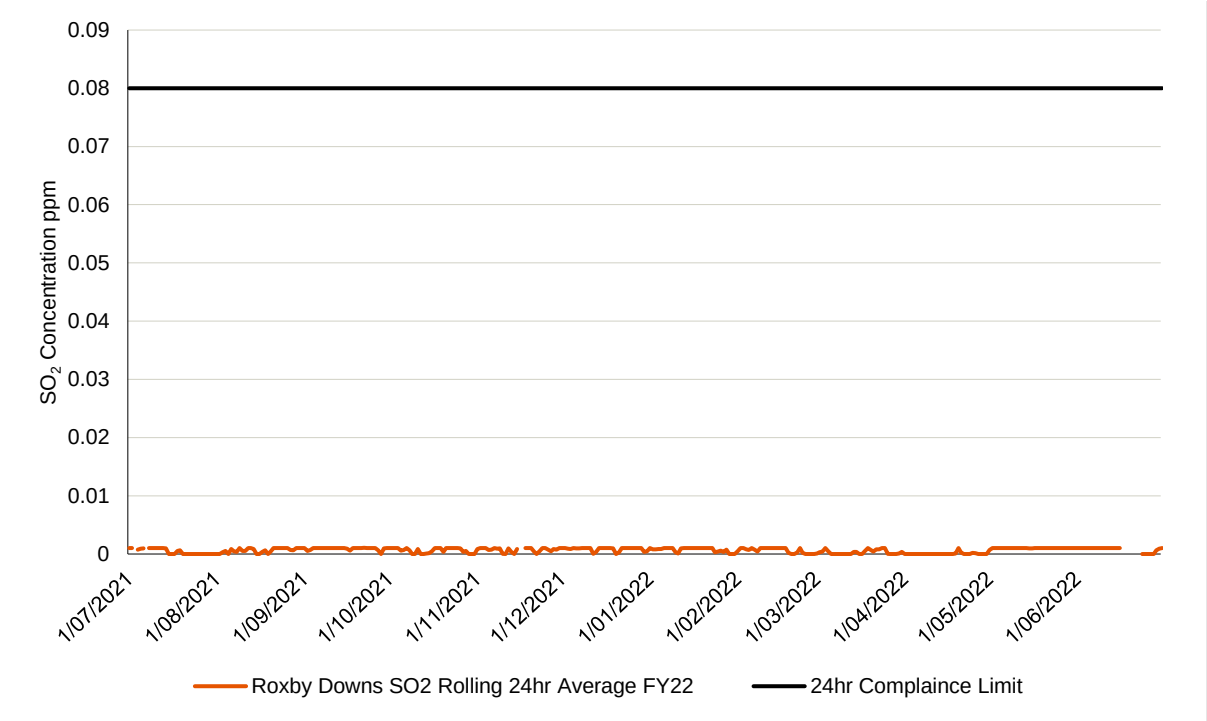


Figure 38: Measured 24hr average SO_2 concentration at sensitive receptor, Roxby Downs.

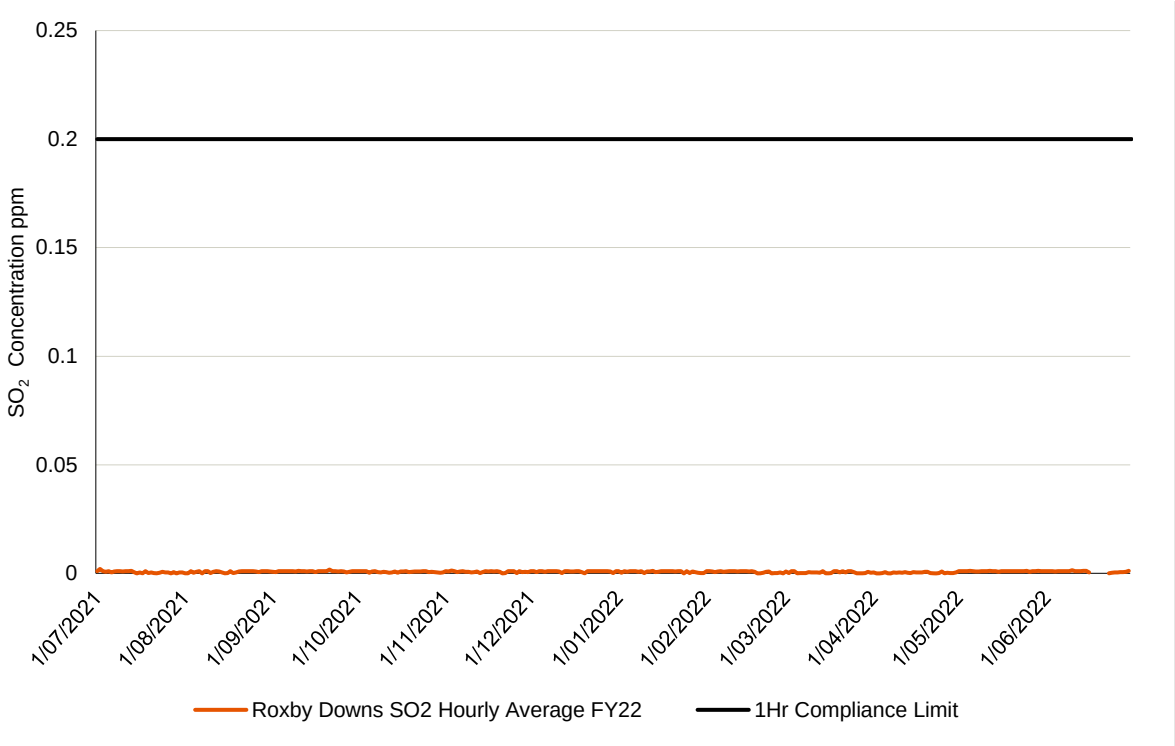


Figure 39: Measured hourly average SO_2 concentration at sensitive receptor, Roxby Downs.

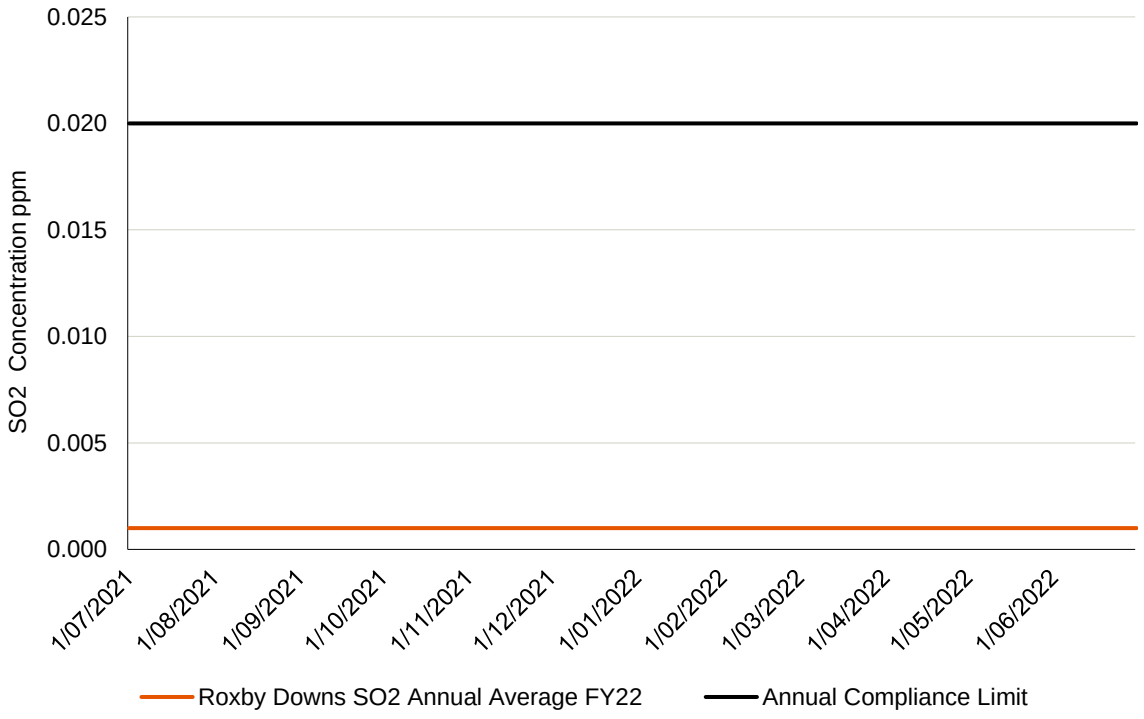


Figure 40: Measured annual average SO_2 concentration at sensitive receptor, Roxby Downs.

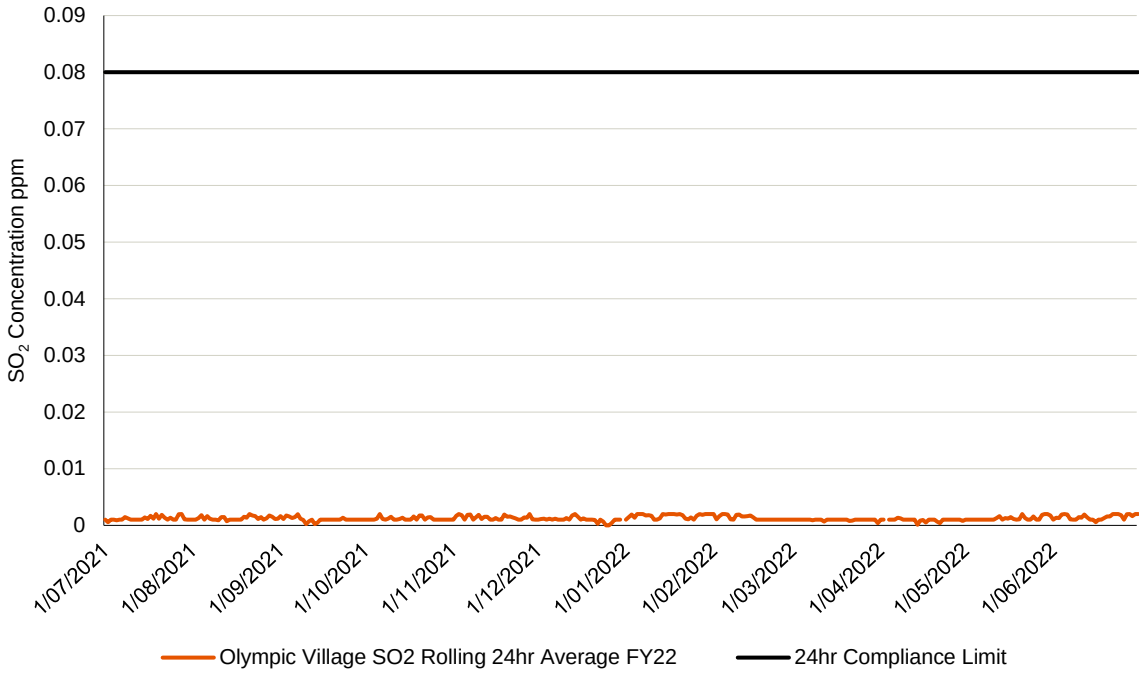


Figure 41: Measured 24hr average SO_2 concentration at sensitive receptor, Olympic Dam.

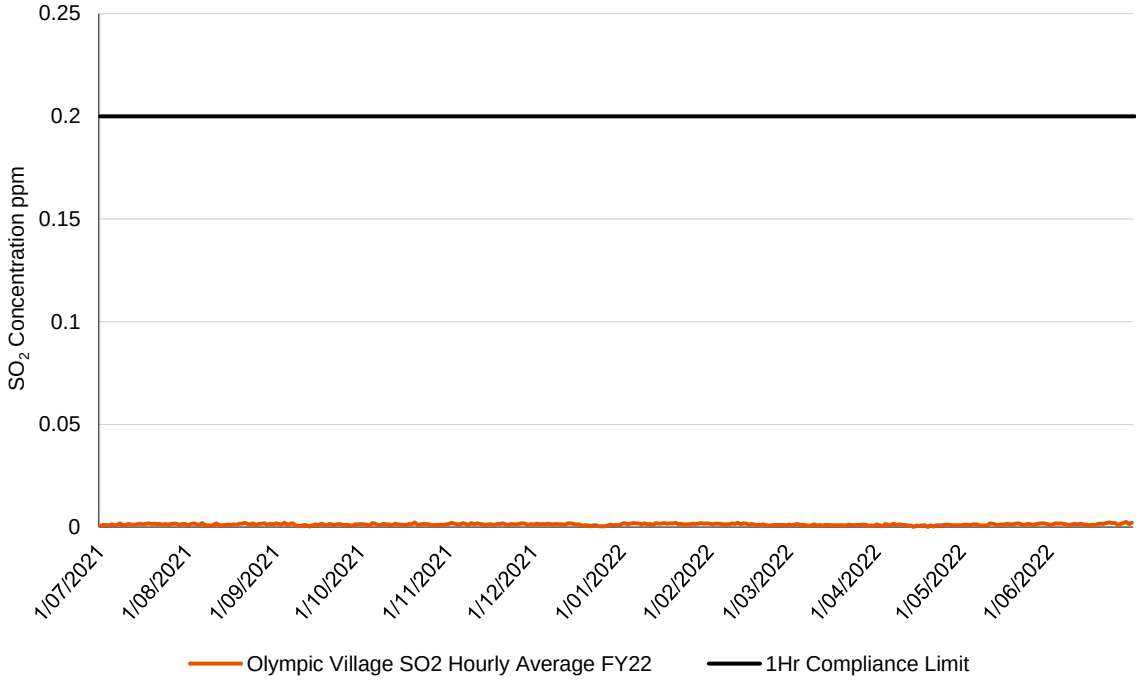


Figure 42: Measured hourly average SO_2 concentration at sensitive receptor, Olympic Dam.

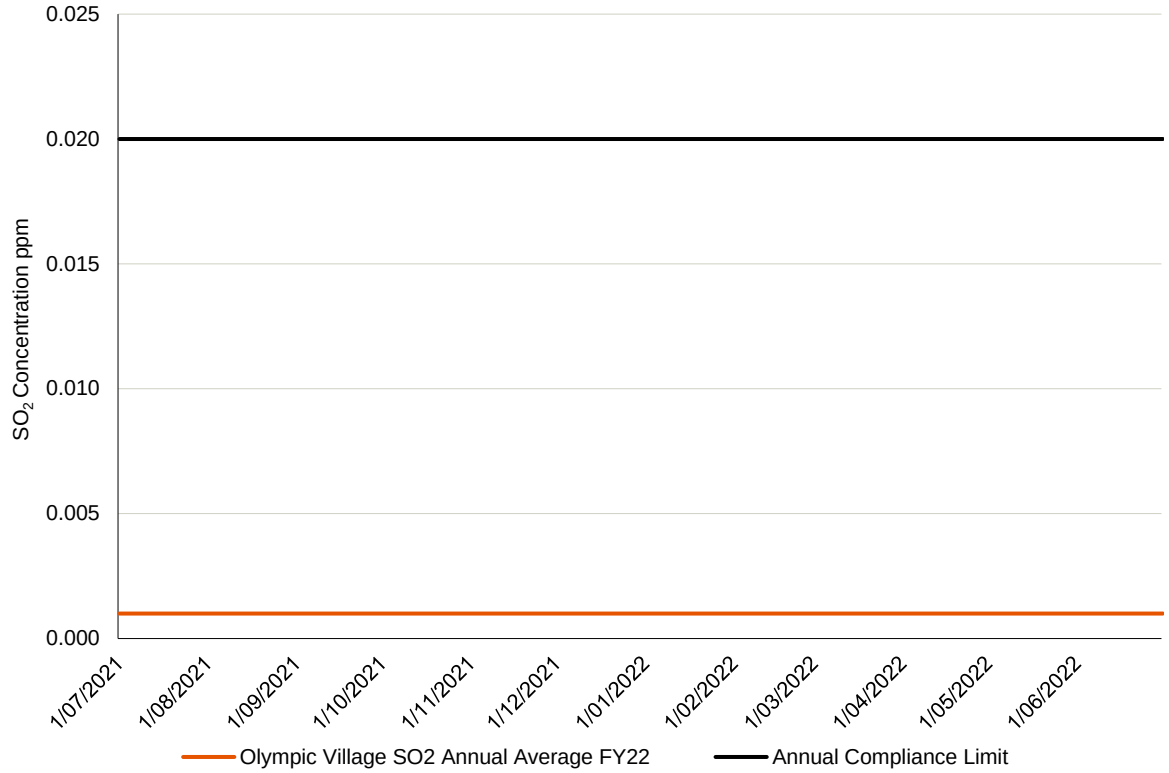


Figure 43: Measured annual average SO_2 concentration at sensitive receptor, Olympic Dam.

3.2.6 Targets FY22

Capture Approximately 99 percent of all SO_2 generated during the smelting process.

This Target has been achieved for FY22, refer to section 3.2.4 deliverables.

3.2.7 Actions FY22

None applicable.

3.3 Saline aerosol emissions

3.3.1 Environmental Outcome

No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of ODC's activities.

No significant adverse impact to populations of listed species from saline aerosol emissions was observed during FY22. Observations made during environmental inspections and supported by data collected during various flora and fauna monitoring programs, did not find any significant adverse impacts to listed species.

3.3.2 Compliance criteria

No loss of an important population of Plains Rat (*Pseudomys australis*) due to habitat loss.

There was no loss of an important population of Plains Rat during FY22 as a result of saline aerosol emissions. No loss of habitat to support an important population of Plains Rat was observed during the annual monitoring of emission impacts to vegetation, which are used to assess impacts to flora within the potential impact area. Standards for raise bore design (see section 3.3.5) ensure pollution controls are applied consistently to all new raise bores, which ensures that the majority of the salt deposited is reduced to a small radius surrounding the raise bore. If there are impacts from saline aerosols to vegetation outside of the raise bore hardstand the land is mapped as disturbed and offset as part of the Land Use Permit process.

3.3.3 Leading Indicators

None applicable.

3.3.4 Deliverables (AE 3.5)

Records from background salt deposition monitoring jars at the edge of the SML against the background limit of 20mg/m^2/day.

A system of salt deposition monitoring jars is located on the edge of the SML, north, south, east and west (Figure 34) In October 2021, salt deposition readings at sE and sS were above the target threshold of 20mg/m2/day. sS was again above the target threshold of 20mg/m2/day in June 2022. The above-target samples were analysed again and results repeated. The source of the high results cannot be determined. All remaining monitoring results reported for FY22 were below the target threshold. Salt deposition monitoring results from FY22 are presented in Figure 45.

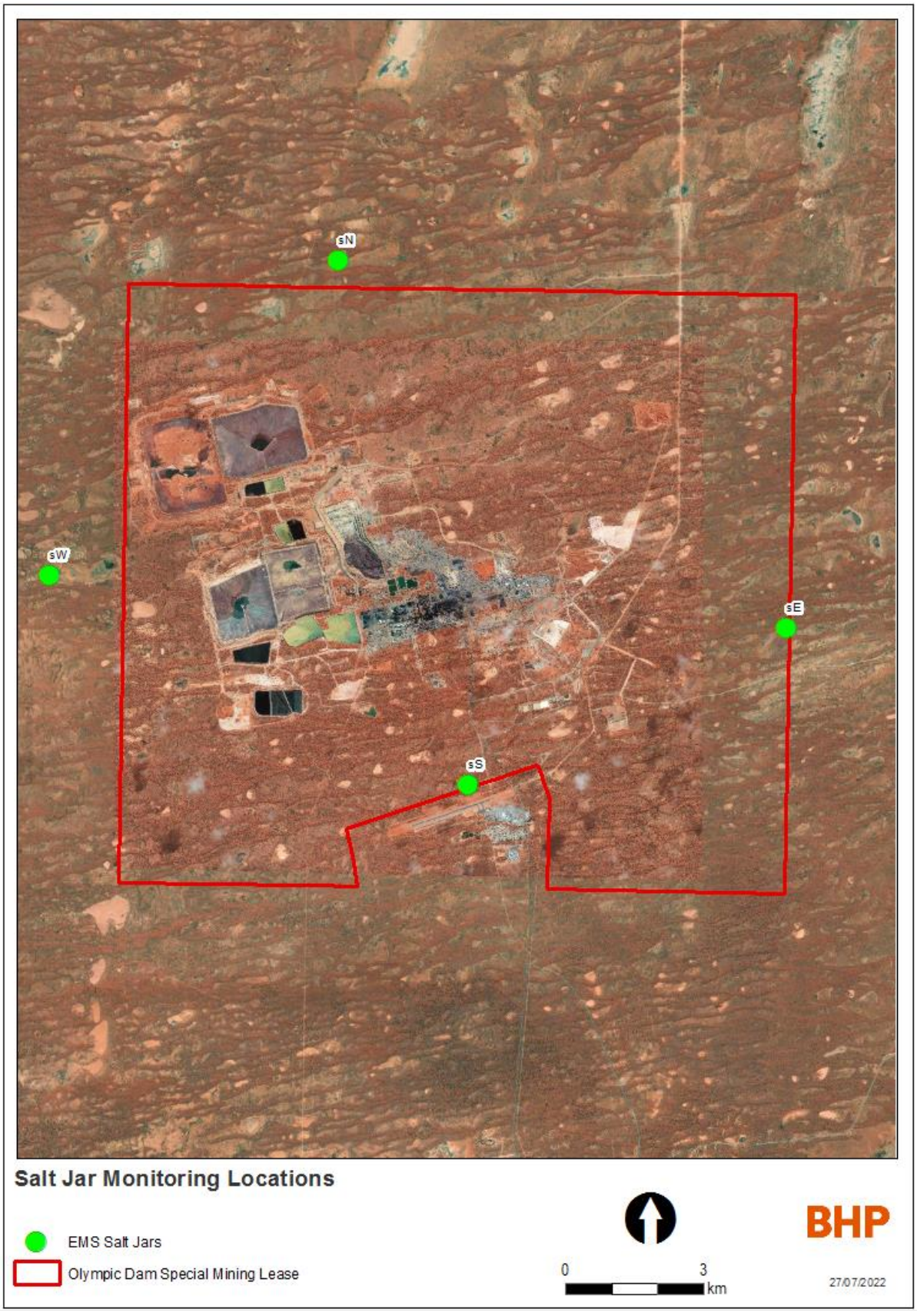


Figure 44: Salt Jar deposition monitoring locations FY22.

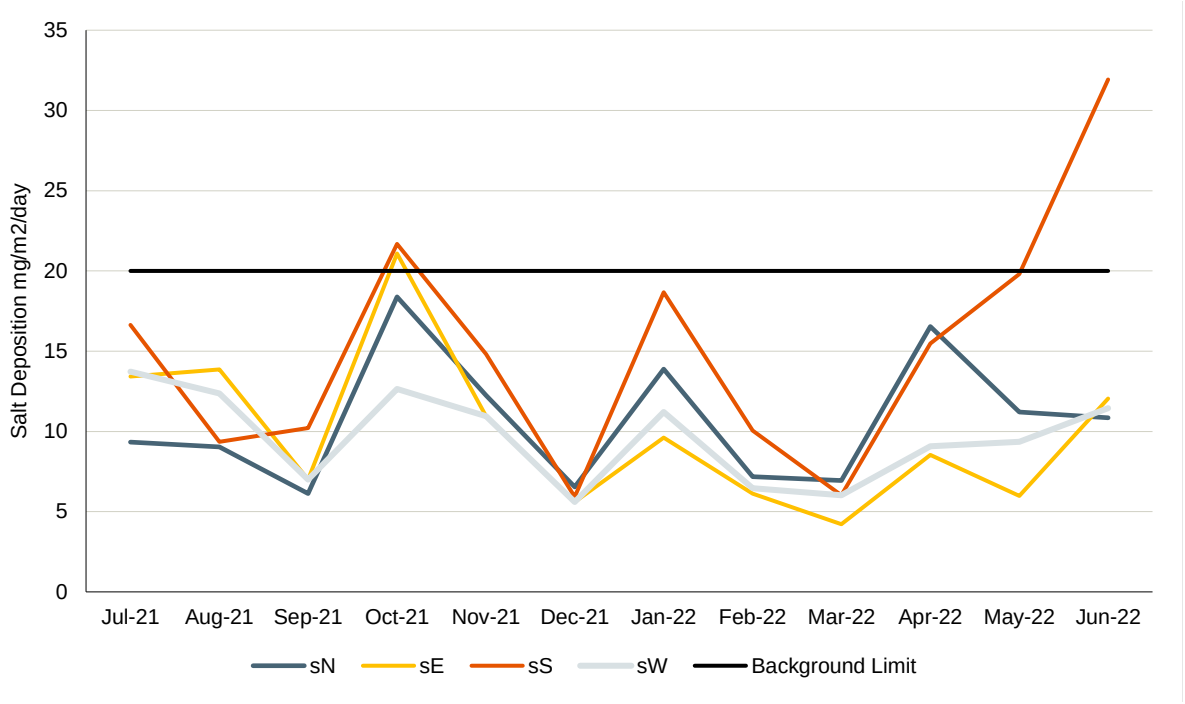


Figure 45: Salt deposition at monitored raise bores for FY22.

A statement of impacts to the Plains Rat.

Impacts to flora within the impact zone of the operation are modelled through monitoring of long term changes to perennial vegetation (see Chapter 3.1 Particulate Emissions). Results of these programs and historical fauna programs have demonstrated that the impact to flora and fauna is largely restricted to the vicinity of the operation and is rainfall dependent. No Plains Rats were observed to be impacted directly by saline emissions in FY22.

3.4 Radioactive emissions

3.4.1 Environmental Outcome

No adverse impacts to public health as a result of radioactive emissions from ODCs activities.

ODC has consistently operated in a manner that limits radiation dose to members of the public, from operational activities, to less than a small fraction of the 1mSv/yr public dose limit prescribed by the International Commission on Radiological Protection (ICRP). As a result, there are no adverse radiation exposure impacts to the public from activities undertaken at ODC.

No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive emissions from ODCs activities.

There were no significant adverse impacts to populations of listed species or ecological communities as a result of ODCs activities. Monitoring of radiation doses to the public and the deposition of ^{238}U at non-human biota (NHB) assessment sites is used as an indicator of the potential exposure of listed species to radioactive emissions. Deposition of ^{238}U at non-human biota assessment sites was at a level which poses no significant adverse impacts to non-human biota (see section 3.4.7).

3.4.2 Compliance criteria

Radiation doses to members of the public less than 1 mSv/y above natural background.

The total estimated dose (FY22) to members of the public at Roxby Downs Monitoring Site (RDMS) and Olympic Village Monitoring Site (OVMS) contributed by ODC operations was 0.053 mSv and 0.053 mSv respectively.

Deposition of project originated ^{238}U less than 25 Bq/m^2/y at non-human biota assessment sites.

The average deposition of U-238, calculated as an average of results at the four monitoring sites was determined to be 0.6 Bq/m^2/y, well below the 25 Bq/m^2/y compliance criteria.

3.4.3 Leading Indicators

Indications that a dose constraint of 0.3 mSv/y to members of the public above natural background will be exceeded.

Indications that a reference level of 10 µGy/h for impacts on non-human biota above natural background will be exceeded.

Note: The reference level for non-human biota is set as an interim criteria until an agreed national approach is determined.

No leading indicators were triggered. Doses to members of the public are below Olympic Dam's internal dose constraint of 0.3mSv/yr. Similarly, the reference level of 10uGy/h for impacts on non-human biota has not been triggered, as outlined in section 3.4.7.

3.4.4 Deliverables (ER 3.2)

Data leading to calculated estimates of annual radiation doses to members of the public in the critical groups identified.

The annual dose attributable to radon decay products (RDP) and radionuclides in dust is calculated and added to calculate the total annual effective dose for members of the public. The underlying calculation for each radionuclide is:

$$\text{Dose} = \text{Net Concentration} \times \text{Dose Conversion Factor} \times \text{Hours Per year}$$

Where the concentration is in nJ/m3 (for Radon Decay Products) or µBq/m3 (for radionuclides in dust) and there are 8760 hours in a regular year. The dose conversion factor is different for each radionuclide.

Radon Decay Products

Monthly RDP averages and the five year rolling average for RDMS and OVMS during the reporting period are shown in Figure 46.

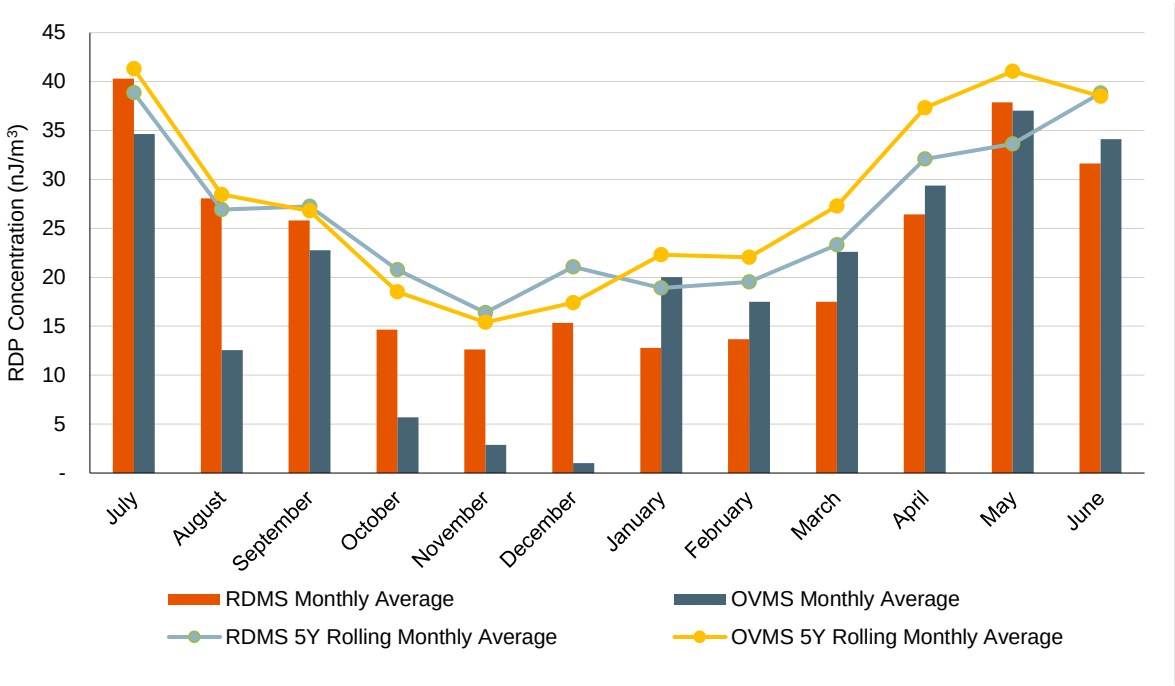


Figure 46: FY22 Radon Decay Products (RDP) monthly trends.

The estimated dose (FY22) from radon decay products to members of the public at RDMS and OVMS contributed by ODC operations was 0.052 mSv and 0.051 mSv respectively. The dose results demonstrate that the dose to members of the public (as measured at RDMS and OVMS) due to RDP resulting from ODC operations is a small fraction of the applicable dose limit.

Analysis of historical monitoring data suggests that there is little operation related RDP concentration at these monitoring sites and the main source of RDP exposure at both OVMS and RDMS is from natural radiation background which shows significant seasonal variations as seen in Figure 46 (above).

Radionuclides in Dust Dose Assessment

Monthly concentrations of the long-lived radionuclides, ^{238}U, ^{230}Th, ^{226}Ra, ^{210}Pb and ^{210}Po for the 5-year period FY18-FY22 are shown in Figure 47 to Figure 51 (includes environmental background taken at Roxby Downs Homestead in 2006 and 2007).

The estimated FY22 radiation doses to members of the public at RDMS and OVMS due to long lived radionuclides in dust were 0.0007 mSv and 0.0016 mSv (adjusted for background) respectively. These correspond to 0.07 % and 0.16% of the public dose limit of 1 mSv respectively. It is to be noted that the dust sampling and the radionuclide analysis processes have inherent uncertainties which contribute to the fluctuations seen in the radionuclide trends.

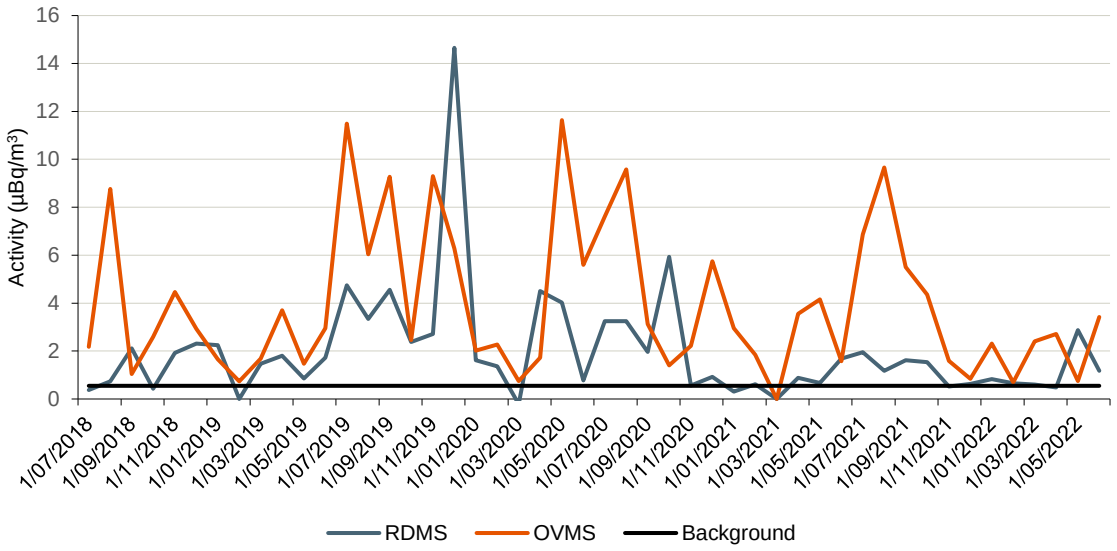


Figure 47: ^{238}U concentration for the 5-year period FY18-FY22 (PM_{10}).

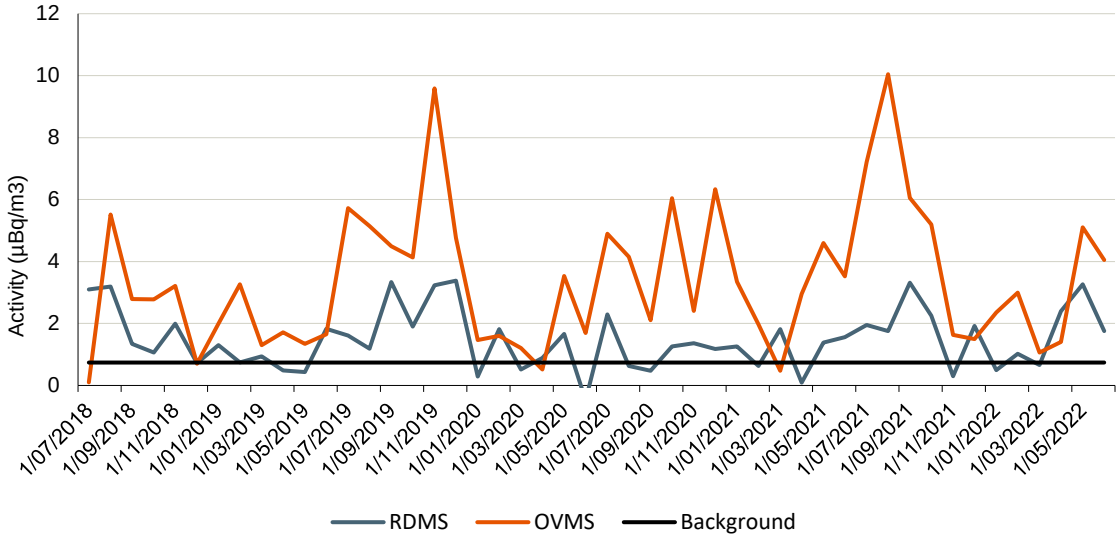


Figure 48: ^{230}Th concentration for the 5-year period FY18-FY22 (PM_{10}).

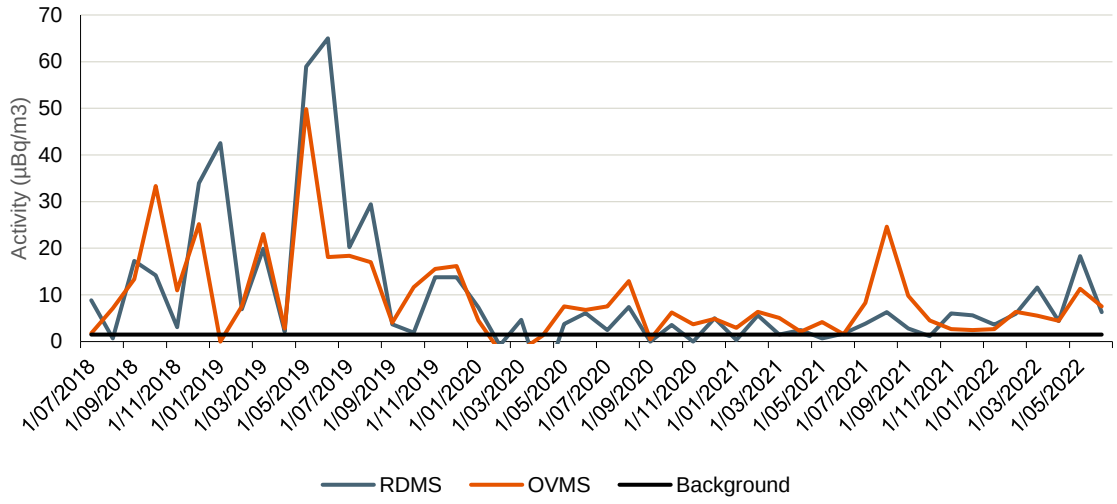


Figure 49: ^{226}Ra concentration for the 5-year period FY18-FY22 (PM_{10}).

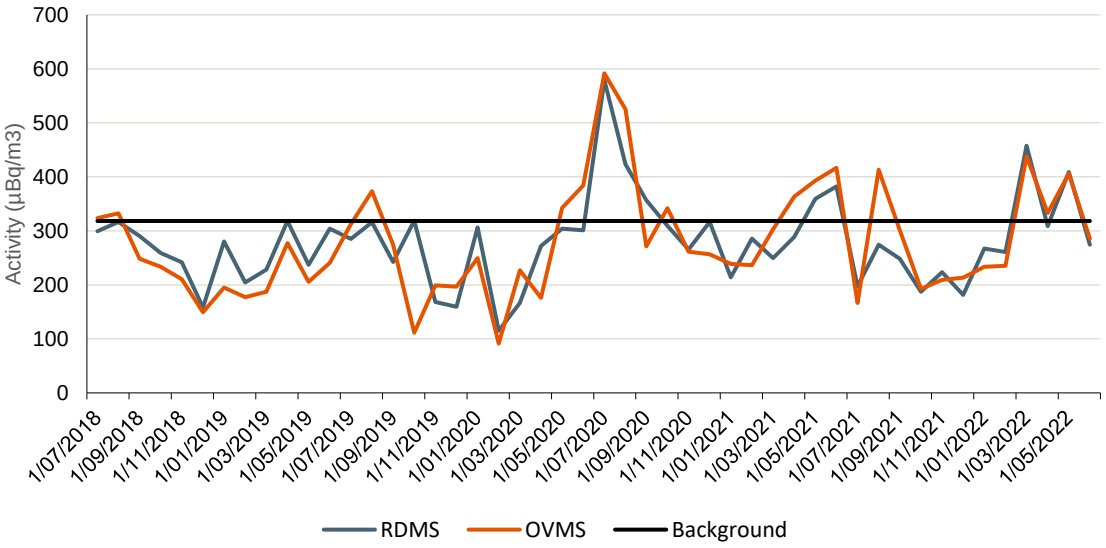


Figure 50: ^{210}Pb concentration for the 5-year period FY18-FY22 (PM_{10}).

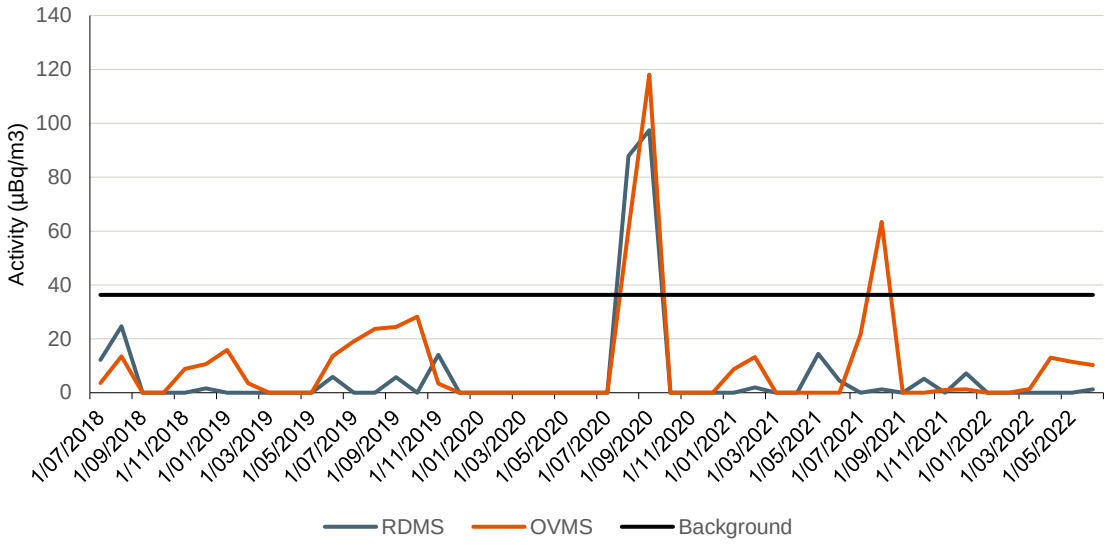


Figure 51: ^{210}Po concentration for the 5-year period FY18-FY22 (PM_{10}).

Total Dose to Members of the Public

The total estimated dose (FY22) to members of the public at RDMS and OVMS contributed by ODC operations was 0.053mSv and 0.053 mSv respectively, well below the 1 mSv/year public dose limit and Olympic Dam's internal dose constraint of 0.3mSv/yr. Figure 52 shows the annual trend of public doses at RDMS and OVMS.

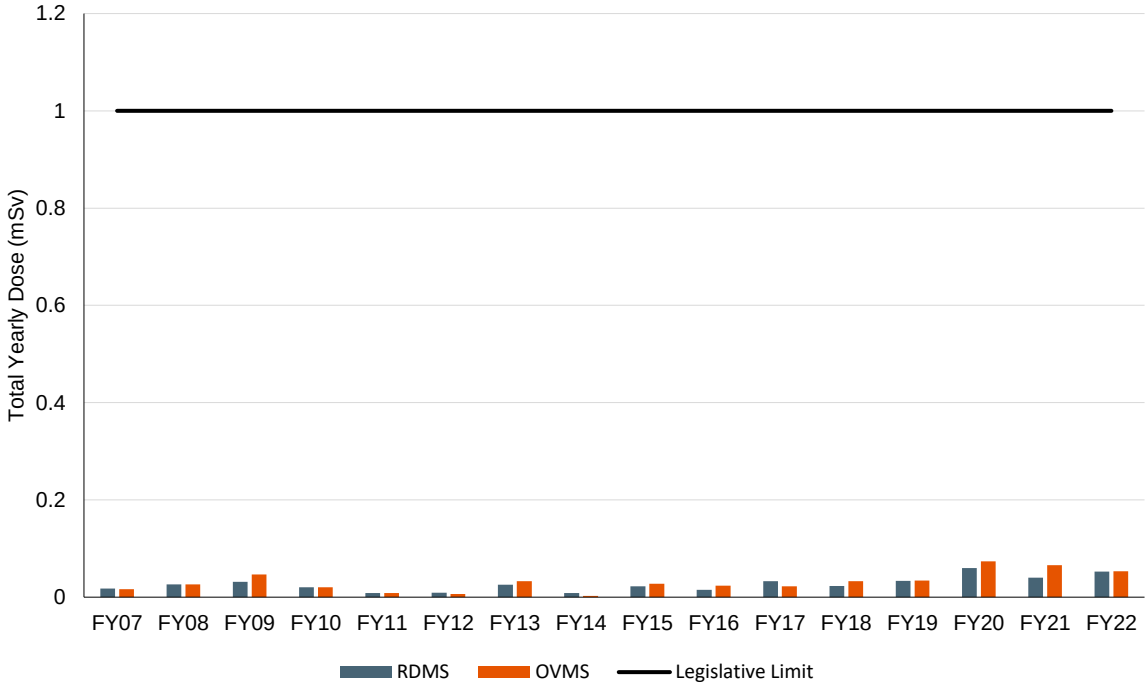


Figure 52: Yearly total effective dose trends for RDMS and OVMS.

3.4.5 Deliverables (ER 3.3)

Records from passive dust deposition monitoring sites and comparison with the annual compliance rate of 25 Bq/m^2/y at the NHB monitoring sites.

An assessment of the impacts to reference plants and animals (ARPANSA 2010) for the appropriate ERICA Tier level, including as necessary comparison of the results with the reference level of 10 µGy/h.

Dust deposition

Passive dust monitoring data for FY22 indicated an average project-originated (after background subtraction) ^{238}U deposition rate of 0.60 Bq/m^2/yr. Passive dust (PD) monitoring sites PD1, PD4, PD8 and PD13 were used for this assessment (Figure 53), with site PD14 used as the background site. The results, shown in Table 23, are well below the criterion of 25 Bq/m^2/yr.

Table 23: FY22 - Project originated dust and ^{238}U deposition.

Location	Project Originated Total Dust Deposition* (g/m^2/y)	Project Originated ^{238}U Deposition* (Bq/m^2/y)	Compliance Criteria (Bq/m^2/y)
PD1	9.74	0.84	25
PD4	32.0	0.77	25
PD8	-	0.04	25
PD13	3.29	0.76	25

* Cells left blank indicate that the result was less than background measurement

Dose rate reference level

The ERICA software tool (v1.3.1.51) was used to assess the significance of measured radionuclide dust deposition data, with a Tier 2 analysis conducted for all default terrestrial organisms. Table 24 shows the results of the ERICA analysis. It can be seen that dose rates for all organisms are less than 10% of the reference dose level of 10 µGy/h.

The risk quotient is a unit-less measure that compares the calculated NHB dose rate with the reference dose level.

Table 24: FY22 - Erica screening dose level and risk quotients.

Organism	Total Dose Rate (µGy/h)	Reference Level (µGy/h)	Risk Quotient
Bird	0.0100	10	0.001
Grasses & Herbs	0.0545	10	0.00545
Mammal - small-burrowing	0.0125	10	0.00125
Mammal - large	0.0117	10	0.00117
Reptile	0.0125	10	0.00125
Shrub	0.0858	10	0.00858
Tree	0.00372	10	0.000372
Lichen & Bryophytes	0.226	10	0.0226

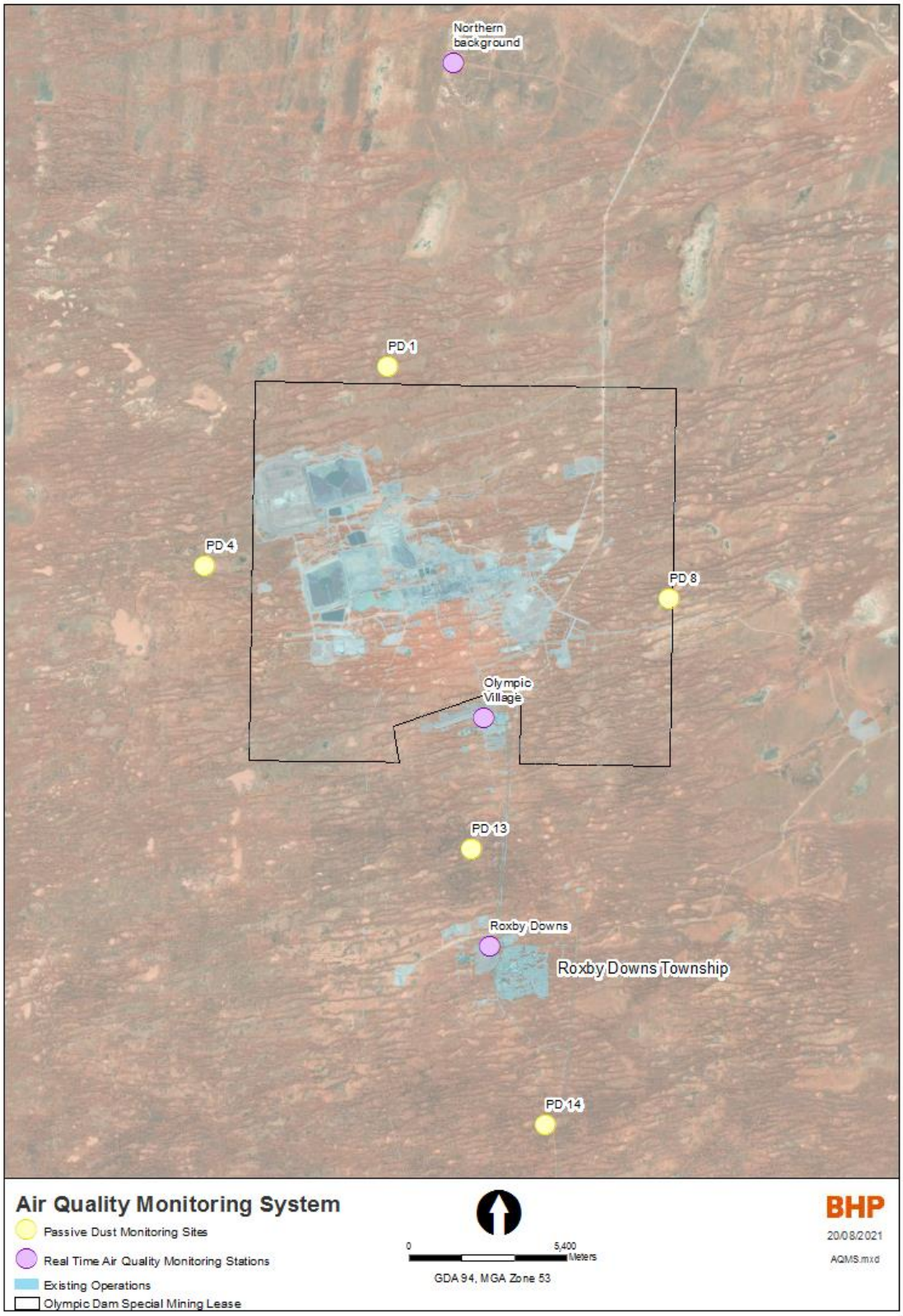


Figure 53: Location of dust deposition monitoring sites.

3.4.6 Deliverables (ER 3.4)

A database of radionuclide concentrations in the environment over the long-term.

A database of radionuclide concentrations in has been maintained since 2005. Figure 47 to Figure 51 show the monthly trends of radionuclide concentration at RDMS and OVMS.

3.4.7 Targets FY22

Maintain radiation doses as low as reasonably achievable, social and economic factors taken into account, as assessed through the annual Radiation Management Plan review.

The results of the monitoring program have shown operational contributions to radiation dose for members of public to be extremely low being less than 10% of the public dose limit of 1mSv/yr.

3.4.8 Actions FY22

None applicable.

3.5 Greenhouse gas emissions

3.5.1 Environmental Outcome

Contribute to stabilising global atmospheric greenhouse gas concentrations to minimise environmental impacts associated with climate change.

BHP's climate change strategy focuses on reducing our operational greenhouse gas (GHG) emissions, investing in low emissions technologies, promoting product stewardship, managing climate-related risk and opportunity and working with others to enhance the global policy and market response. As a BHP group asset, ODC operates under the BHP group strategy.

3.5.2 Compliance criteria

Progress on OD GHG reduction and abatement opportunities that contribute to BHP strategy and response to climate change, reported annually.

BHP exceeded the short-term target with a 15 per cent decrease in operational GHG emissions from our adjusted FY2017 baseline[1] (BHP, 2022).

In 2020 BHP set a medium-term target to reduce operational GHG emissions (Scope 1 and Scope 2 from our operated assets) by at least 30% from FY2020 levels by FY2030. Our FY2030 target was informed by our Pathways to Net Zero (P2NZ) project which was established to understand opportunities to achieve and maintain net zero operational emissions by 2050. The P2NZ project has identified a range of options for decarbonisation of BHP's operated assets. The key areas of focus are renewable electricity, low or zero-carbon material movement (e.g. reducing diesel use in mining equipment) and reducing hard-to-abate emissions.

See section 3.5.4 for a discussion of emission reduction opportunities and achievements.

[1] FY2017 baseline has been adjusted for Discontinued operations (Onshore US assets and Petroleum) and the divestment of BMC and for methodological changes (use of Intergovernmental Panel on Climate Change (IPCC) Assessment Report 5 Global Warming Potentials and the move to a facility-specific emissions calculation methodology for fugitives at Caval Ridge). These adjustments have also been applied to FY2018-FY2022 emissions stated in this table to aid comparability.

3.5.3 Leading Indicators

None applicable.

3.5.4 Deliverables (EG 3.1)

Calculation of the site-wide Scope 1 and Scope 2 GHG emissions, expressed as kilotonnes carbon equivalent (kt CO2-e).

Calculation of the site-wide GHG emission intensities, expressed as carbon equivalent intensity (kg CO2-e/t milled).

GHG emissions were calculated using the National Greenhouse and Energy Reporting guidelines and emissions intensity was calculated and reported internally within BHP in line with monthly corporate reporting requirements. The calculated GHG emission intensity in FY22 was 66.5 kg $CO_{2\text{-}e}$/t ore milled, compared to 73.1 kg $CO_{2\text{-}e}$/t ore milled in FY21 (Table 25). The lower intensity reflects a lower South Australian electricity emissions grid factor compared to the FY21 financial year. The South Australian grid factor continued the reducing trend seen over a number of years as a result of the increased proportion of renewables in the State electricity grid. Decreased Scope 1 and Scope 2 emissions are due to the major smelter maintenance shutdown (September 2021 to January 2022), which reduced the amount of ore milled.

Table 25: GHG emissions and intensity.

Financial year	Total emissions (kt $CO_{2\text{-}e}$)	Scope 1 (kt $CO_{2\text{-}e}$)	Scope 2 (kt $CO_{2\text{-}e}$)	GHG intensity (kg $CO_{2\text{-}e}$/t ore milled)
FY22	511.3	182.3	328.9	66.5
FY21*	693.9	233.7	459.2	73.1

**Small adjustments have been noted in the FY21 numbers to reflect actuals*

An annual report on BHP initiatives and progress on GHG and energy reduction and abatement opportunities that contribute to BHP strategy and response to climate change, and OD's contribution to that strategy.

BHP's Annual Report 2022 (BHP 2022) reports on the progress of our long term goal to achieve net zero by 2050 and to reduce operational GHG emissions by at least 30 per cent from FY2020 levels by 2030.

Due to the significant contribution of grid electricity to the Olympic Dam GHG emissions profile, the focus of the operational decarbonisation plan in the near to mid-term for Olympic Dam is on the transition to renewable energy. Diesel displacement and the elimination of remaining emissions will be continually reviewed to capitalise technological maturity and market readiness.

In FY22 BHP entered into renewable energy supply arrangements that will see Olympic Dam reduce its emission position to zero for 50 per cent of its electricity consumption by 2025, based on current forecast demand. The agreement will be supplied by Iberdrola Renewable Energy Park near Port Augusta in South Australia, which will be Australia's largest solar-wind hybrid plant.

Testing also continued on two battery electric vehicles for underground operation. Although trials progressed in FY22, COVID-19 related supply chain issues caused delays.

Olympic Dam will continue to explore opportunities to accelerate the move to 100% renewable energy by 2050.

3.5.5 Targets FY22

None applicable.

3.5.6 Actions FY22

None applicable.

4 Generation of industrial wastes

4.1 Embankment stability of TSF

4.1.1 Environmental Outcome

No significant TSF embankment failure.

During FY22 the Tailings Storage Facilities (TSFs) were managed in accordance with the Tailings Retention System (TRS) Operations, Maintenance and Surveillance Manual (BHP Olympic Dam 2021d) and the Tailings Management Plan (BHP Olympic Dam 2021e) and no embankment failures occurred.

4.1.2 Compliance Criteria

No significant radioactive contamination arising from uncontrolled loss of radioactive material as a result of an embankment failure to the natural environment.

Note: Any embankment failure that leads to a reportable spill under the Bachmann Criteria will be considered significant. Significant is defined as requiring assessment and remedial action in accordance with the NEPM or EPP and the Mining Code. Measurement and monitoring is carried out in response to a specific event.

No uncontrolled loss of radioactive material to the natural environment as a result of an embankment failure occurred during FY22. To manage the risk of embankment failure, the rate of rise of tailings was maintained below 2 m per annum and the supernatant pond area was maintained below the 71 ha target set for this purpose.

4.1.3 Leading Indicators

Indications that the rate of rise of tailings will exceed an average of 2 m per annum.

The rate of rise of tailings has been limited to 2 m per annum or less for all cells to ensure consolidation of tailings material. During the reporting period, tailings were distributed to TSF cells 4 and 5 with an average rate of rise of the perimeter tailings beach of 0.71 m per annum, with TSF4 and TSF5 at 0.60 m and 0.82 m respectively. TSF6 underwent commissioning during FY22 with an average rate of rise of the perimeter beach of <1 m.

Indications that the rate of rise of pore pressure within or adjacent to the TSF embankment will exceed the rate of rise of tailings.

Assessing pore pressure against the rate of rise provides an indication of whether excess pore pressures are developing in the embankment. The rise in phreatic levels at Vibrating Wire Piezometer (VWP) locations over the past year is less than or equal to the average rate of rise in tailings. As reported in the FY21 EPMP report, several piezometers had previously shown erroneous measurements, due to equipment malfunction. Where required, this infrastructure was replaced throughout FY22.

Indications that the maximum supernatant pond area of individual TSF cells will exceed 15 ha for TSF1, 23 ha for TSF2/3, 90 ha for TSF4, and 135 ha for TSF5.

Note: Each TSF has been assigned a maximum supernatant pond size which is calculated using critical operating parameters, surface contours and an allowance for significant rainfall events. Operating beyond these ponds sizes may not result in embankment failure but are considered an appropriate leading indicator in which operating processes should be reviewed. Similar to TSF1-5, a leading indicator supernatant pond size will be determined for TSF6 post-commissioning.

A leading indicator for the maximum supernatant pond area for TSF6 was set at 150 ha during FY22 (post commissioning). The supernatant ponds are visually checked against marker poles daily, surveyed monthly and checked quarterly using satellite imagery. Over FY22 the recorded pond sizes were below the leading indicator sizes.

4.1.4 Deliverables (WA 2.1)

The tailings stored at the TSFs have a concentration over the 10 Bq/g exemption limit and also a total activity over the 10,000 Bq exemption limit for Radium, which defines it as a radioactive material under Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) guidelines (ARPANSA 2021).

Monitoring of the TSFs, including rate of rise of tailings, supernatant pond areas and pore pressure all contribute to management of the TSFs to ensure no uncontrolled loss of radioactive material to the natural environment or significant embankment failure.

Monitoring data showing the size and location of the supernatant liquor ponds in each TSF cell on a monthly basis (EPA 31543.U-535).

Large supernatant liquor ponds have the potential to impact upon embankment stability by increasing the phreatic surface within the tailings and embankments, which in turn can lower the strength of the tailings and embankment materials. The TSF pond areas during FY22 are shown in Figure 54. Despite a return to normal rainfall levels over the period, particularly through Q2 FY22, the ponds have been minimal in size.

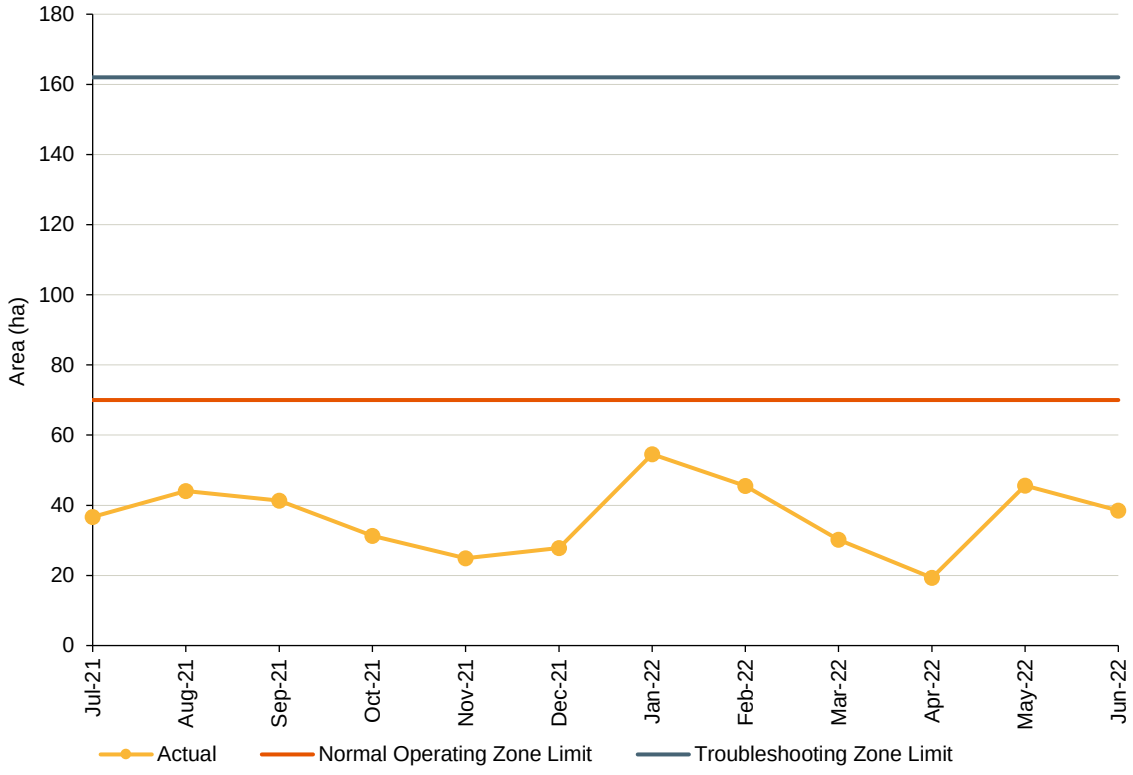


Figure 54: TSF Pond areas (ha) for FY22.

Monitoring data showing the rate of rise of tailings in each TSF cell.

At current processing rates, approximately 8 - 9 Mtpa of tailings, containing low levels of radioactivity are disposed of in the TSFs annually.

The rate of rise of tailings has been limited to 2 m per annum or less for all cells to ensure consolidation of tailings material. During the FY22 reporting period, tailings were distributed to TSF cells 4 and 5 with an average rate of rise of the perimeter tailings beach of 0.62 m per annum. This is a decrease from FY21 due to reduced tailings production that resulted from the Smelter campaign shutdown and the commissioning of cell 6 but is in line with our long-term rates of rise. The TSF6 rate of rise remained at <1 m per annum, focussing on existing borrow pit locations within the impoundment floor.

Tailings delivery to TSF cell 4 prior to 2003 was biased towards the internal east wall as the availability of this wall for tailings deposition was largely unaffected by wall-raising activities, resulting in a higher beach level when compared to the external wall. A plan was initiated in 2003 to address this issue and bias the tailings delivery to the TSF cell 4 external walls. For FY22, the rate of rise along the cell 4 east wall reduced to 0.28 m. This is largely due to the commissioning of cell 6, with three cells in operation simultaneously.

No significant impacts have resulted from the difference in height between the internal east wall and external walls of TSF cell 4. Reduced deposition to the east wall will continue, gradually bringing it in line with other walls. Further, TSF cell 4 is planned to be removed from service during FY23.

The elevation of tailings in the cells illustrated in Figure 55 gives an indication of the rate of rise of the perimeter tailings beaches.

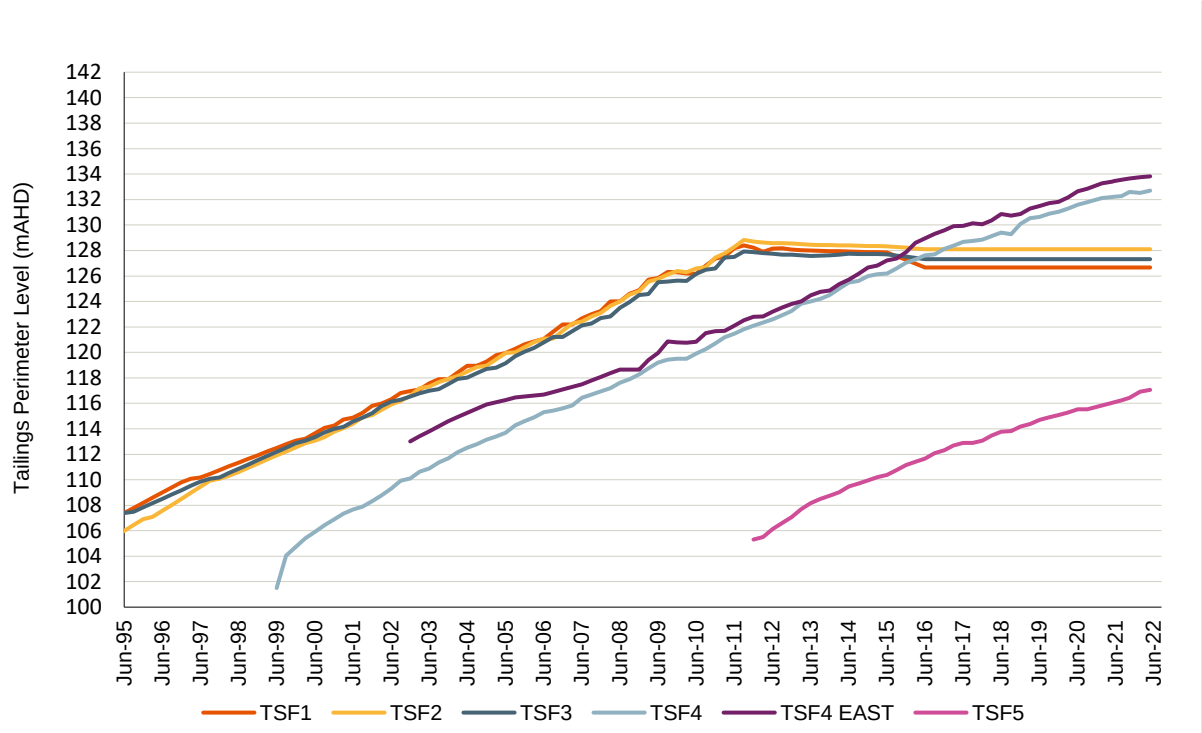


Figure 55: TSF rate of tailings rise.

Monitoring data showing the pore pressures within tailings adjacent to the external walls of the TSF.

Piezometers are monitored to assess the pore pressures within the tailings adjacent to the embankments of the TSFs (Figure 56 - Figure 58). All piezometers are monitored on a 3-weekly basis. Piezometers used include standpipe and vibrating wire piezometers. The majority of the network is now fully automated, including trigger alarms for critical operating parameters for embankment stability.

The Australian National Committee on Large Dams (ANCOLD 2019) provides minimum Factors of Safety (FoS) for different loading conditions. Results of the biennial stability assessment undertaken in FY21 are presented in Table 26 below. All results are for the current height of the embankments,

with each Section being a conservative representation of a portion of the TSF. Values below the ANCOLD threshold values are in italics.

During FY22 the Engineer of Record (EoR) updated the trigger levels for the phreatic pore pressures critical operating parameters (SRK 2022). This included a review of the stability for current conditions. Table 27 provides a summary of the most recent FoS results. The key reasons for the change in stability factors between FY21 and FY22 are;

- Section 1: Includes local ramp geometry.
- Section 3: Includes local ramp geometry.
- Section 5: Includes TSF4 buttress completed in Jan-22.
- Section 7: Includes TSF5 Separable Portion 1 buttress construction completed Feb-21.
- Section 9: Includes TSF1 buttress completed in Jan-22.

Table 26: Stability Analysis Results (SRK, 2020).

TSF Status	Wall Section	Peak FoS (min – 1.5)	Post-peak FoS (min – 1.0)	Section
Active	TSF4 North Wall	1.63	*<1*	*3*
	TSF4 West Wall	1.52	*<1*	*4*
	TSF4 South Wall	*1.44*	*<1*	*5*
	TSF5 North Wall	1.55	*<1*	*6*
	TSF5 East Wall	1.53	*<1*	*7*
	TSF5 South Wall	1.67	*<1*	*8*
Inactive	TSF1 East Wall	*1.3*	*<1*	*9*
	TSF2/3 N/East Wall	1.55	*<1*	*1*
	TSF2/3 East Wall	N/A	N/A	*10*
	TSF3 North Wall	1.52	*<1*	*2*

Table 27: TSF Critical Operating Parameter & Trigger Action Response Plan Review (SRK 2022) [1] – North wall value retained from SRK 2020.

TSF Status	Wall Section	Peak FoS (min – 1.5)	Post-peak FoS (min – 1.0)	Section
Active	TSF4 North Wall	1.63	<1	3
	TSF4 West Wall	1.50	<1	4
	TSF4 South Wall	1.50	<1	5
	TSF5 North Wall	1.53	<1	6
	TSF5 East Wall	1.58	<1	7
	TSF5 South Wall	1.60	<1	8
Inactive	TSF1 East Wall	1.50	<1	9
	TSF2/3 N/East Wall	1.70	<1	1

TSF2/3 East Wall	1.62	<1	10
TSF3 North Wall	1.55	<1	2

[1] – North wall value retained from SRK 2020

In order to further reduce the already low risk of TSF failure, the recent ANCOLD guideline update[2] and the Global Industry Standard for Tailings Management[3] provide renewed guidance on the method for assessment of post peak (strain softened or liquefied) tailings strengths, in particular that the design should be independent of triggering mechanisms and it is now recommended to adopt residual tailings strengths regardless of whether these values are likely to be reached or not. This differs from the previous approach that assessed the deformations expected and estimated the strength loss expected from that deformation.

The reduction in FoS is not due to any issues with, or changes to, the TSFs themselves and plans are in place to address the outcome of this change.

As a part of its commitment to TSF integrity, the following actions were completed or are in progress by BHP:

Peak Scenario

Two small buttresses for the TSF1 east wall and the TSF4 south wall were constructed in FY22, reinstating the FoS to above the threshold value.

Post Peak Scenario

- A buttress is already in place on TSF4, and an expansion of this buttress is in the design phase. Once construction is completed the post peak FoS will be within target.
- The TSF5 west wall was buttressed as part of the TSF6 project executed in FY21. A project for buttressing the remainder of the walls to reinstate the post peak FoS to greater than the updated guidance will commence execution at the beginning of FY23.
- TSFs 1-3 have not been in operation since 2011. Hence they are not being actively loaded, nor the phreatic levels recharged and they continue to be monitored in accordance with the ANCOLD guidelines. A closure cover trial is planned to commence within the next two years. The performance of this cover trial will demonstrate the options for full closure that provide for long-term stability. These options will then progress to a detailed design stage. Following a suitable monitoring period, the full closure of TSFs 1-3 will be implemented.

[2] Australian National Committee on Large Dams. Planning, Design Construction Operation and Closure Addendum. July 2019.

[3] Global Tailings Review.org, Global Industry Standard for Tailings Management, August 2020.

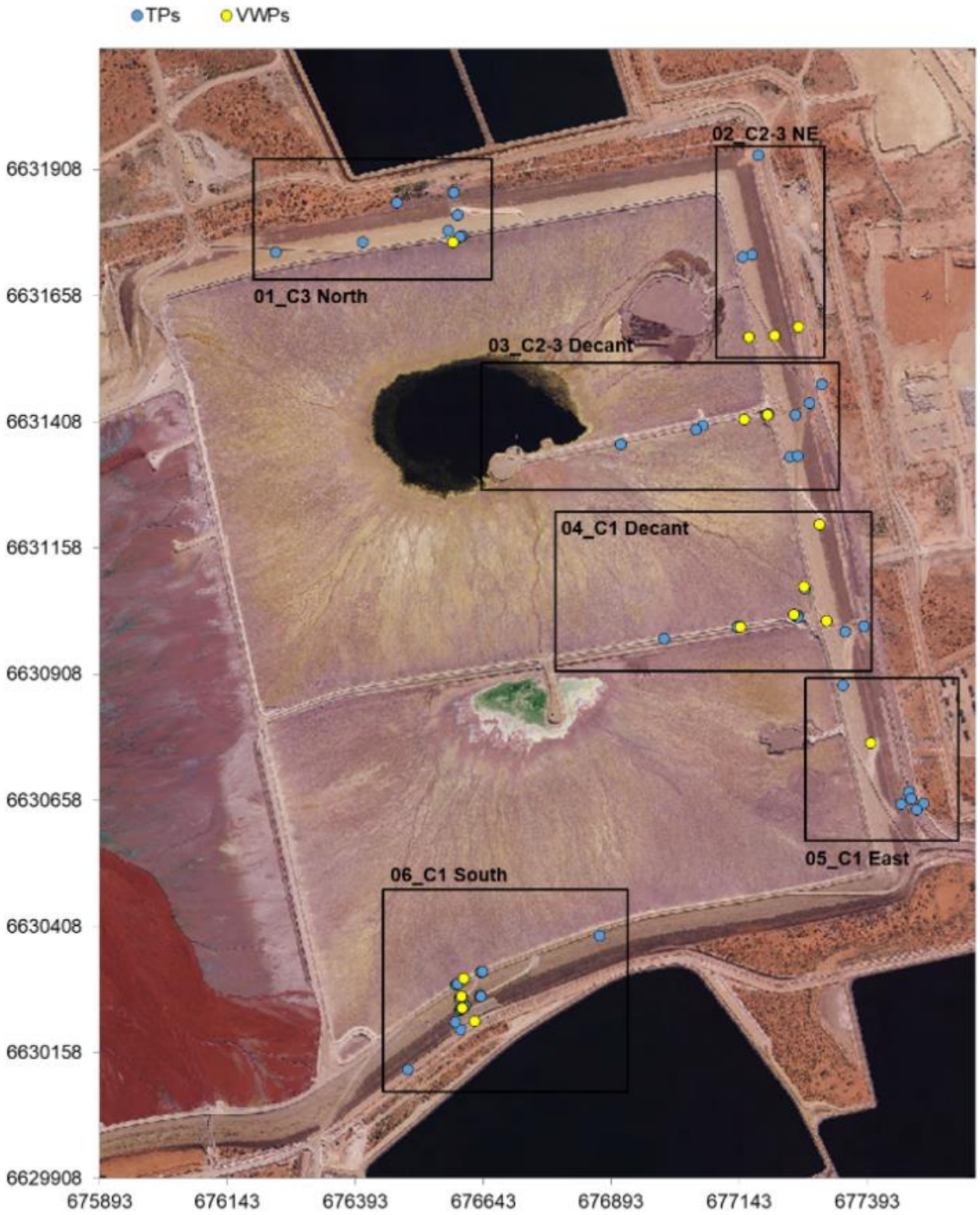


Figure 56: TSF 1-3 piezometer locations.

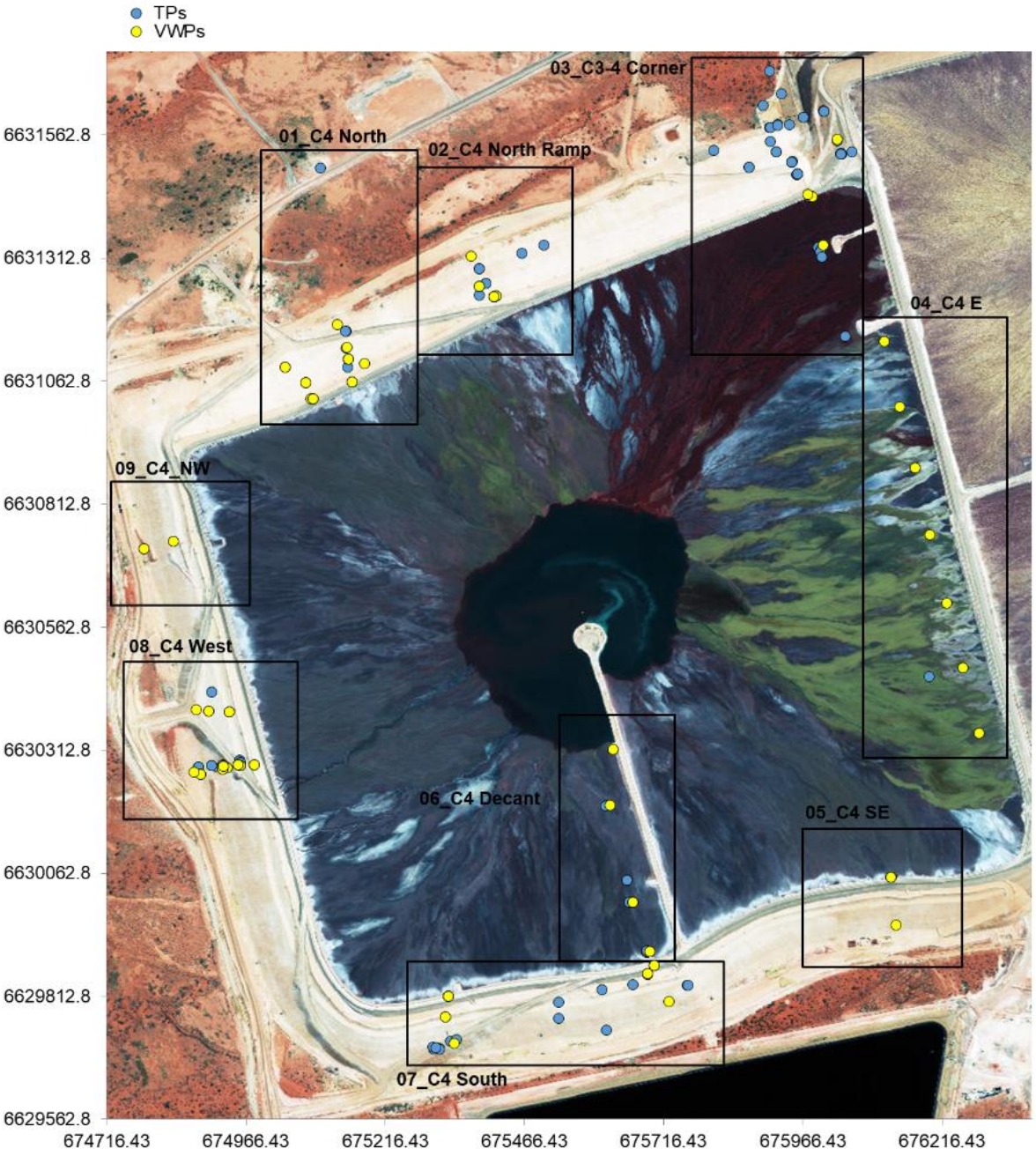


Figure 57: TSF 4 piezometer locations.

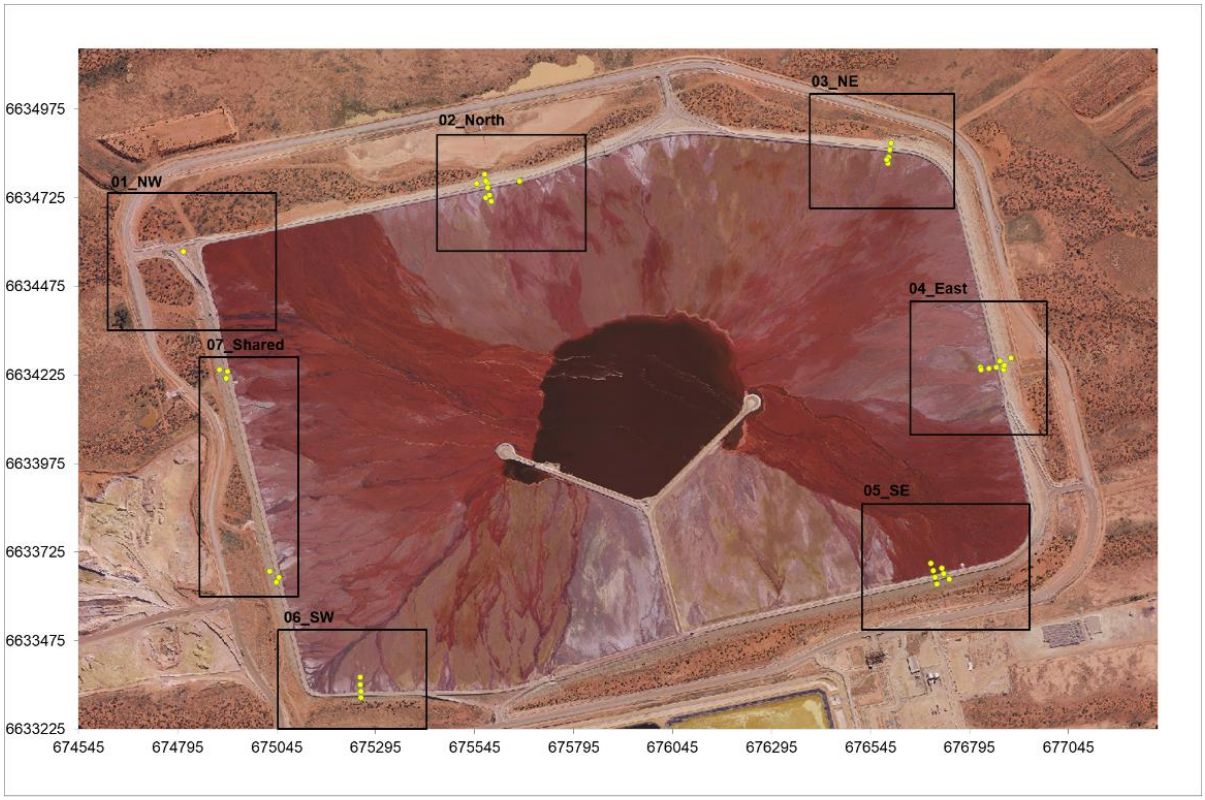


Figure 58: TSF 5 piezometer locations.

Piezometers located in the east, north and south walls and decants of TSFs 1-3 generally show a gradual pressure drop consistent with the cessation of tailings deposition in October 2011. For example, the variation of VWP readings along the TSF1 east wall and the TSF3 north wall are shown in Figure 59 and Figure 60. Note, negative pore pressures have been excluded and the sections shown below differ from previous reports, as the level had dropped below the base of the instruments installed.

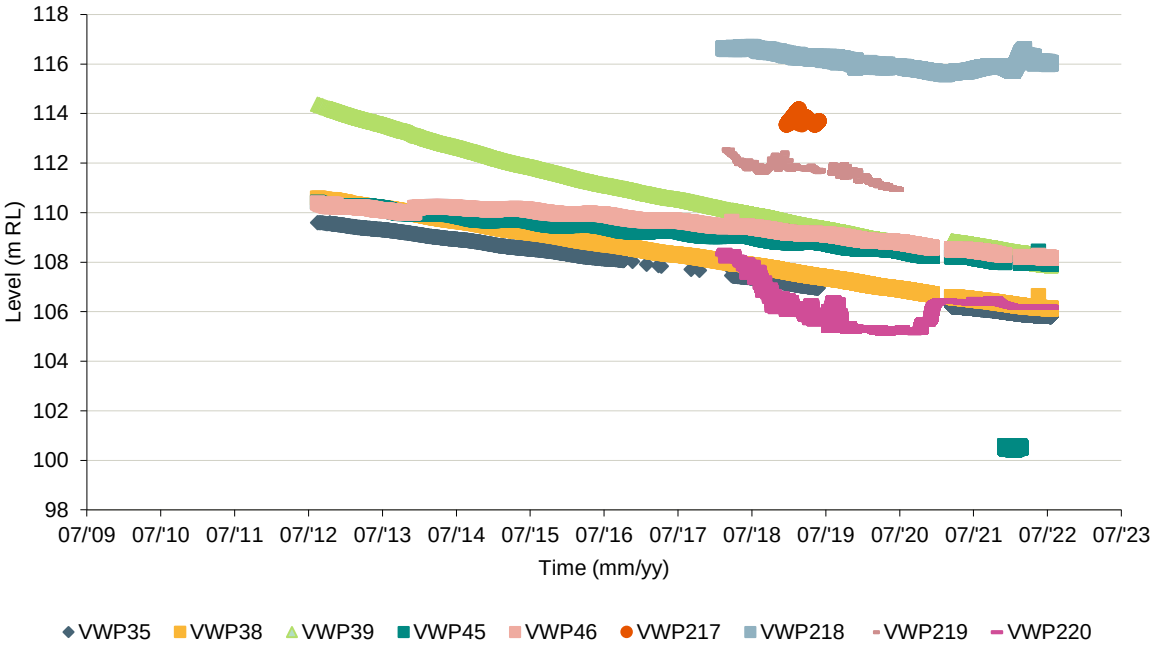


Figure 59: TSF 1 East wall VWP readings (04_C1 Decant).

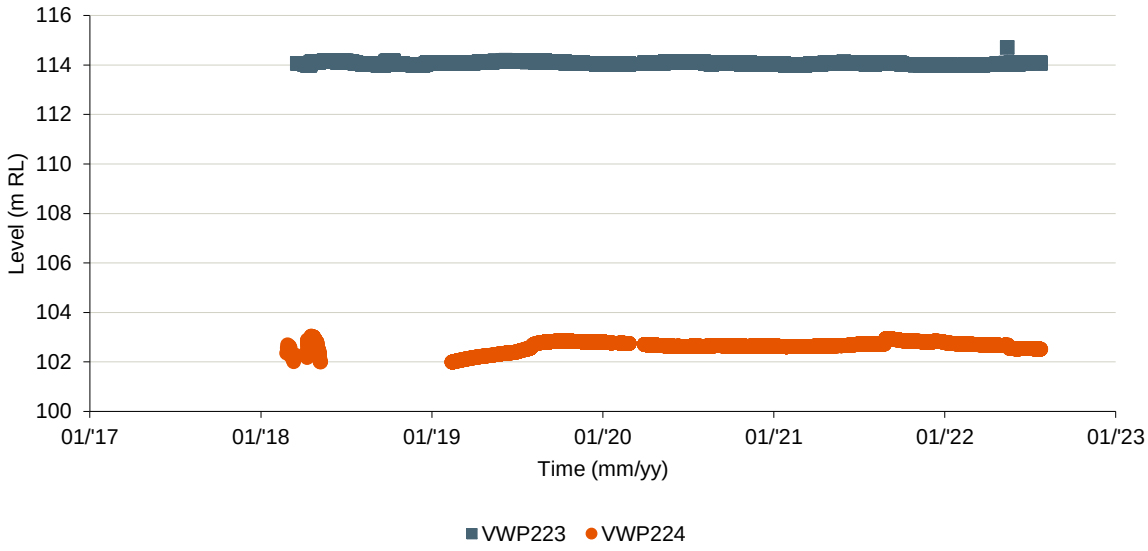


Figure 60: TSF 3 North wall VWP readings (01_C3 North).

Piezometers installed in the tailings and upper embankment of TSF4 show levels have been largely constant over the period. A gradual rising trend can be seen in some of the VWP readings in Figure 61 and Figure 62, however this is normal given tailings deposition is still occurring on the cell.

Two piezometers in the western wall of TSF4 (VWP311 and VWP314) had shown unusual changes throughout FY21 and FY22. Readings in VWP314 trended positive and did not correlate with nearby equipment. Site investigations and installation of new monitoring equipment verified readings from older infrastructure were erroneous, with the newly installed VWP358 (Feb-2022) showing negative pore pressures within the foundation (i.e. conditions were dry). VWP311 has continued to show unrealistic trends which suggests equipment failure which is subject to ongoing investigations.

On the north wall of TSF4 VWP253 has previously shown a cyclic pattern of rises and falls. Throughout FY22 a continued decrease was evident in this piezometer. The results from this VWP are not considered of concern by the EoR.

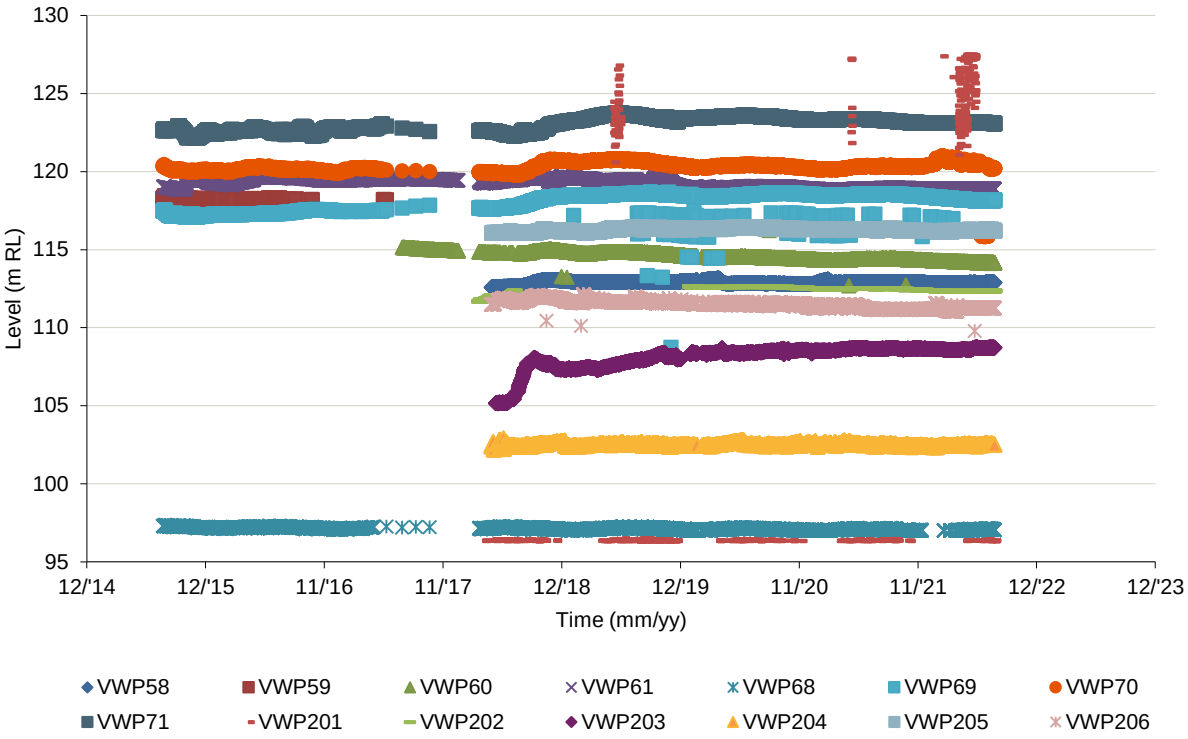


Figure 61: TSF 4 South Wall VWP readings (07_C4 South).

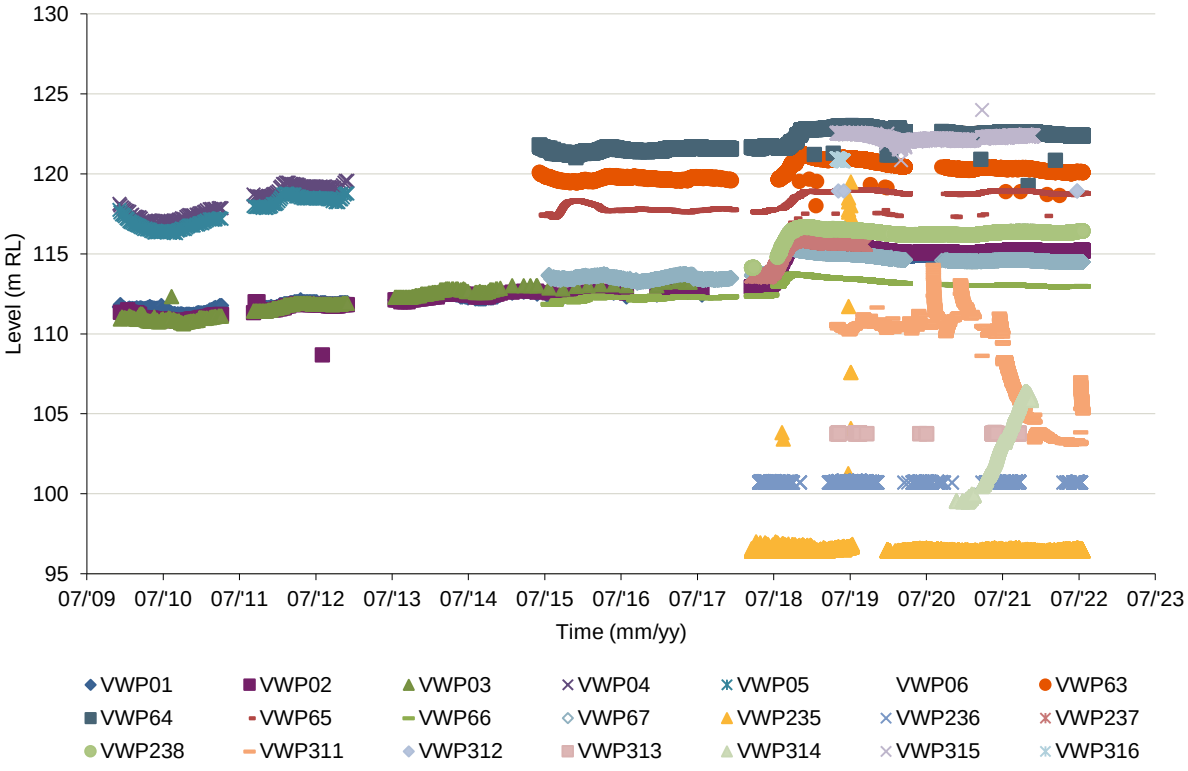


Figure 62: TSF 4 West Wall VWP readings (08_C4 West).

Piezometers installed in the tailings and upper embankment of TSF5 show levels have been relatively constant over the period, with minor fluctuations. A gradual increase can be discerned, which is as expected as tailings continue to be added in this TSF. For example, the variation of VWP readings along the TSF5 south-east and north-east walls are shown in Figure 63 and Figure 64.

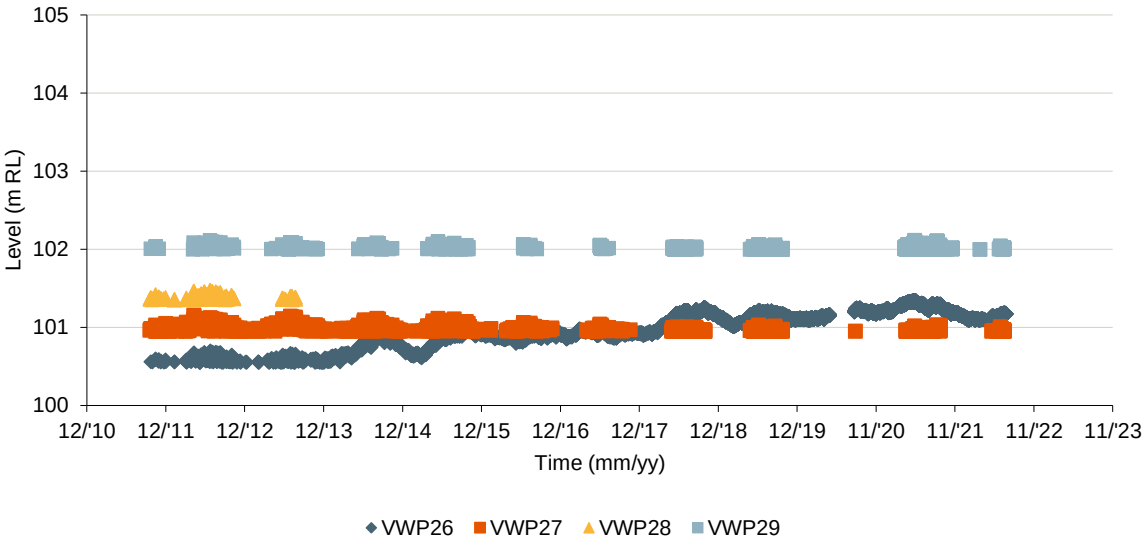


Figure 63: TSF 5 South East side VWP readings (05_SE-S1).

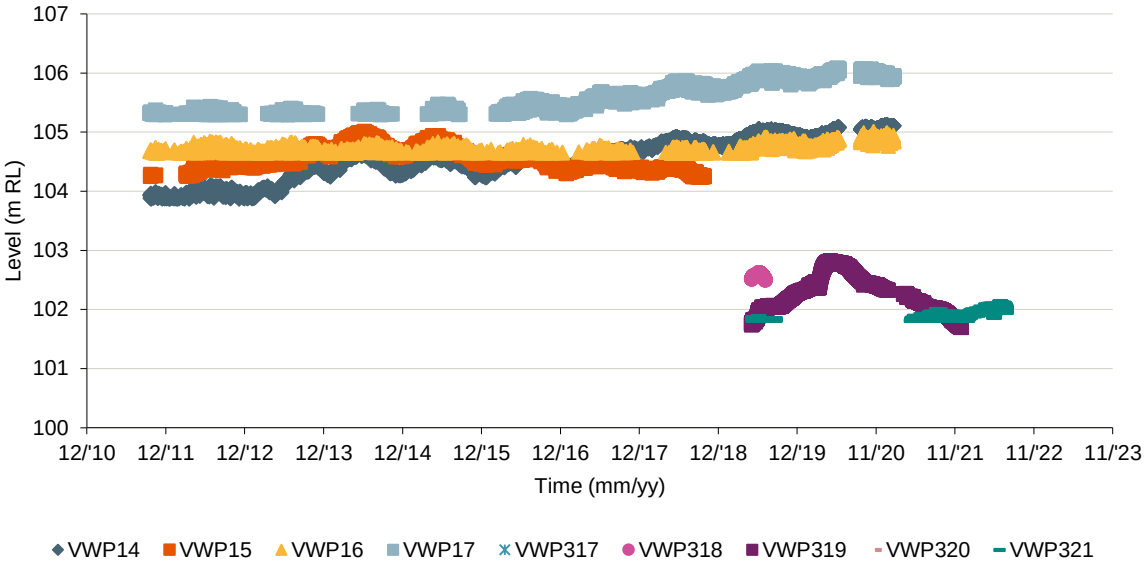


Figure 64: TSF 5 north wall VWP readings (02_North - S1).

VWP017 and VWP321 through the TSF5 north wall have shown a steady and minor increase over time and will continue to be monitored given the FoS threshold values.

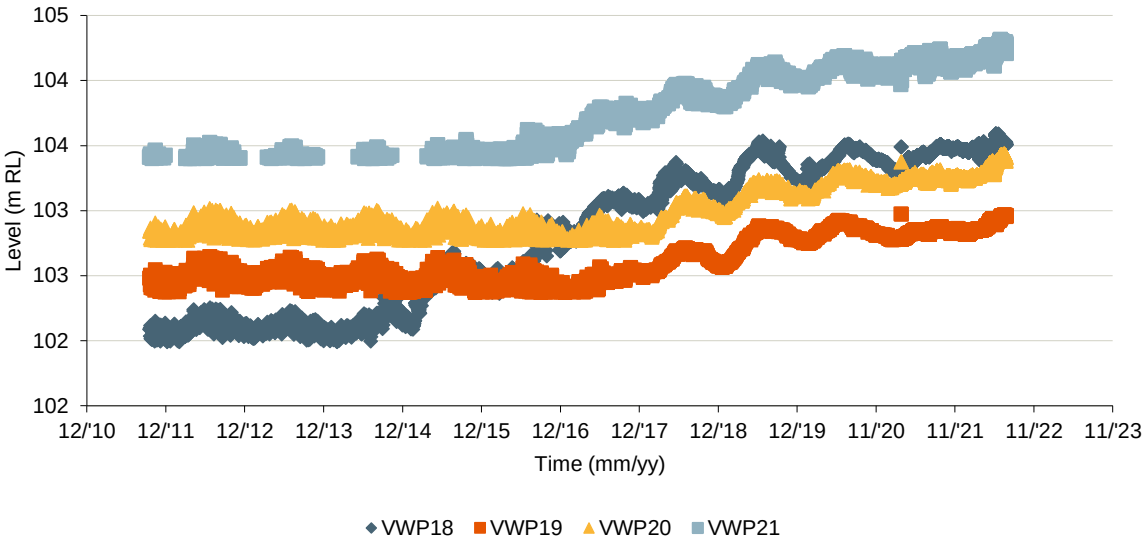


Figure 65: TSF5 north east side VWP readings (03_NE).

During FY22 the TRS was reviewed by SRK, with two 6-monthly operational reviews and one annual comprehensive review covering the period July 2021 - June 2022.

The reviews were carried out in accordance with BHP's Our Requirements for Tailings Storage Facilities and Water Storage Facilities and the ANCOLD Guidelines referenced previously. All reviews confirmed that the TRS, including the TSFs and Evaporation Ponds, are in good condition and are well managed.

A review of the water balance on an annual basis (EPA 31543.500-435).

See Section 4.2 Tailings Seepage.

4.1.5 Targets FY22

None applicable.

4.1.6 Actions FY22

Undertake periodic (2-3 year) CPTu testing of tailings to confirm strength parameters used in stability analysis.

CPTu testing of all the TSFs was commenced in May 2022 with planned completion of the testing program in July 2022. The results will be used by SRK to assess the stability (reported above).

4.2 Tailings seepage

4.2.1 Environmental Outcome

No significant adverse impact on vegetation as a result of seepage from the TSF.

No significant adverse impact to vegetation as a result of seepage from the Tailings Storage Facilities (TSFs) has occurred. Eighty metres AHD (20 m below ground level) is considered as the level below which groundwater cannot interact with the root zone of plants in the Olympic Dam region. Groundwater levels in the vicinity of the TSFs remain below 80 mAHD.

No compromise of current and future land uses on the SML or adjoining areas as a result of seepage from the TSF.

No compromise of current and future land uses on the Special Mining Lease (SML) or adjoining areas has occurred as a result of seepage from the TSFs. Groundwater levels in the vicinity of the TSFs remain below 80 mAHD and sampling indicates that seepage is being attenuated.

No compromise of the environmental values of groundwater outside the SML as a result of seepage from the TSF.

No compromise of the environmental values of groundwater outside the SML has occurred as a result of seepage from the TSFs. Sampling indicates that seepage is being attenuated within the SML, and groundwater levels of bores along the SML boundary are consistent with other regional bores. Seepage modelling confirms that there are no expected future offsite impacts.

4.2.2 Compliance criteria

Maintain groundwater level (attributable to seepage from the TSF) outside the external perimeter road of TSF Cells 1 to 5 to not higher than 80 mAHD (20 m below ground level).

Note: The same groundwater level criteria will be adopted for TSF 6 post-commissioning.

Groundwater monitoring results indicate that the groundwater level has not reached a level higher than 80 mAHD outside of the TSF and external perimeter road footprint for TSF cells 1 to 6 (refer Figure 11 in Section 1.2 – Aquifer Level Drawdown). The maximum groundwater level recorded within the external perimeter road footprint for TSF cells 1 to 6 during the current reporting period was 69.33 mAHD at LT67.

All TSF seepage attenuated within the SML, as demonstrated by a numerical geochemical model and confirmed by monitoring.

Geochemical modelling was carried out for the Expansion EIS (BHP Billiton Olympic Dam 2009) and demonstrated that all TSF seepage would be attenuated within the SML. This modelling was updated in 2015 (SRK 2015) and again in 2020 (SRK 2020) to account for the current mine configuration (underground only) and including the recently constructed TSF6.. Within the timeframe assessed (10,000 years), the modelling results indicate that no impacts on baseline groundwater quality at the mine lease boundary (SML) would be expected as travel times are predicted to be well beyond this timeframe and there is expected to be significant attenuation of pollutants within the SML.

Laboratory analysis of on-site and regional groundwater monitoring bores confirms the attenuation of TSF seepage within the SML. Samples from regional monitoring bores collected during FY22 contained analytical concentrations either below limits of reporting, or within concentrations previously reported (see Chapter 1.2 - Aquifer Level Drawdown).

4.2.3 Leading Indicators

A measurement of groundwater level outside the external perimeter road of the TSF that exceeds 70 mAHD (30 m below ground level) as a result of seepage.

The leading indicator value was not reached at any wells during FY22. The maximum groundwater level recorded below the TSFs for the current reporting period was 69.33 mAHD at LT67.

The groundwater depth at bore LT67 is continuing to gradually rise and may exceed the leading indicator in FY23. BHP is currently progressing projects that are expected to reverse the increasing groundwater level trend at this location well before the compliance criteria is exceeded, and will ultimately bring the level back below the leading indicator value.

A numerical geochemical model trend that indicates that all TSF seepage may not be attenuated within the SML should the trend continue.

No geochemical seepage trend was noted during FY22. Laboratory analysis of on-site and regional groundwater monitoring bores, when combined with groundwater level data, confirms the validity of the 2015 and 2020 geochemical modelling (SRK 2015) findings that all TSF seepage would be attenuated within the SML.

4.2.4 Deliverables (WA 2.1)

A review of the water balance on an annual basis (EPA 31543.U-518).

Unaccounted liquor is the liquor balance inputs (refer to Figure 66 for FY22 inputs) minus the liquor balance outputs (refer Figure 67 for FY22 outputs). For FY22 the input liquor volume for TSF cells 4 and 5 was the same as the output liquor volume (8,534 ML), with contribution to inputs and outputs represented in Figures 66 and 67.

As seen in Figure 67, the water balance for TSF cells 4, 5 and 6 indicates that disposal of liquor via evaporation is approximately 48.7% of the total inputs. This is lower than FY21 but aligns with the long-term range of 40-50%. The water balance also shows 18.7% of liquor input due to rainfall in FY22 (refer Figure 66), which was higher than the previous 3 years.

Flushing liquor is liquor pumped out of the Evaporation Ponds (EPs) to the TSFs for the purpose of flushing lines and to enhance evaporation.

Seepage from pond areas has been calculated based on the average supernatant pond areas for TSF cells 1 – 5 (13.8 ha) and using an assumed tailings permeability of $2x10^{-8}$ m/s.

In FY22, the seepage calculation for TSF6 was based on an average pond area of 4.8 ha and an assumed clay permeability of $1x10^{-9}$ m/s. Liquor retained in tailings was assumed to be 30% of the weight of tailings solids deposited. This was based on previous testing of in-situ tailings.

A discussion on groundwater levels in the vicinity of the TSFs in FY22 is provided in Section 1.2 - Aquifer Level Drawdown.

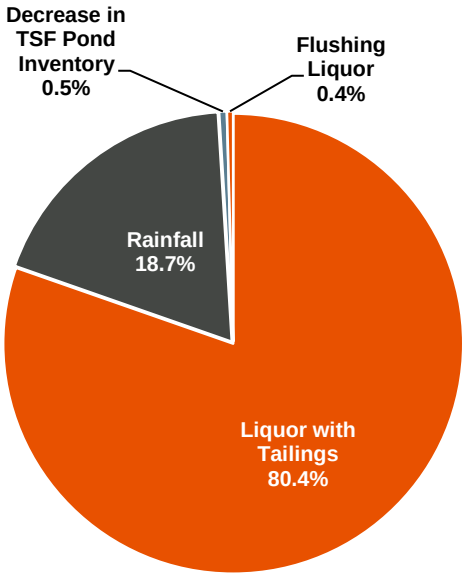


Figure 66: TSF Cells 4, 5, & 6 Liquor Balance – Inputs, FY22.

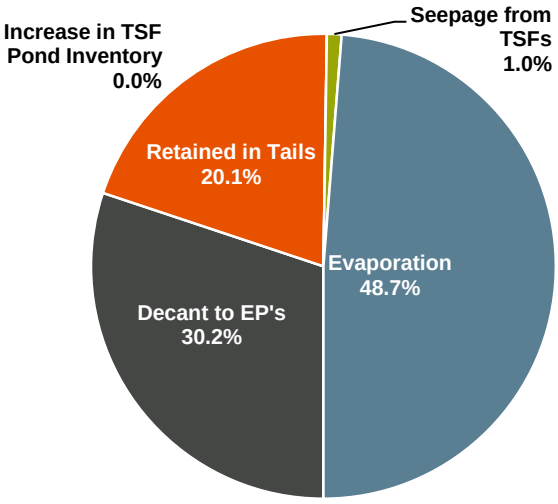


Figure 67: TSF Cells 4, 5, & 6 Liquor Balance – Outputs, FY22.

4.2.5 Deliverables (WA 2.2)

Monitoring data showing the liquor level in each cell of the EPs.

Figure 68 shows the liquor levels in the EEPs with respect to freeboard limits. Freeboard in the EPs consists of allowances for wind, waves and rainfall runoff.

EP4A is approaching the limit of its freeboard capacity, only receiving occasional flows such as seepage and pigging flows. EP5B remained out of service for the reporting period. EP6A/B/C were commissioned throughout FY22 (December 2021 – April 2022).

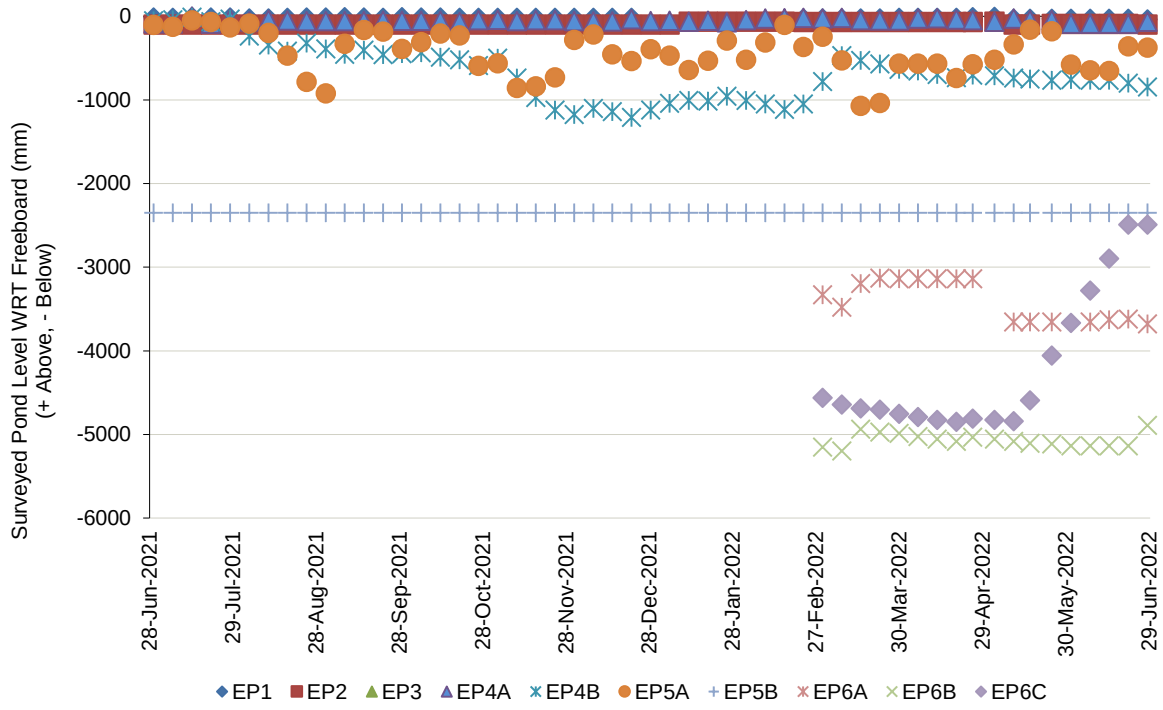


Figure 68: Evaporation Pond Liquor Levels.

Monitoring data showing the overall (solids and liquor) inventory in the EPs.

Figure 69 shows the EP capacity in relation to the normal maximum operational storage capacity. Additional pond capacity is available as a contingency to allow for large rainfall events.

The capacity of the system was within the normal operating limit over the reporting period. As EP6A/B/C were commissioned during the reporting period they have added additional capacity to the system.

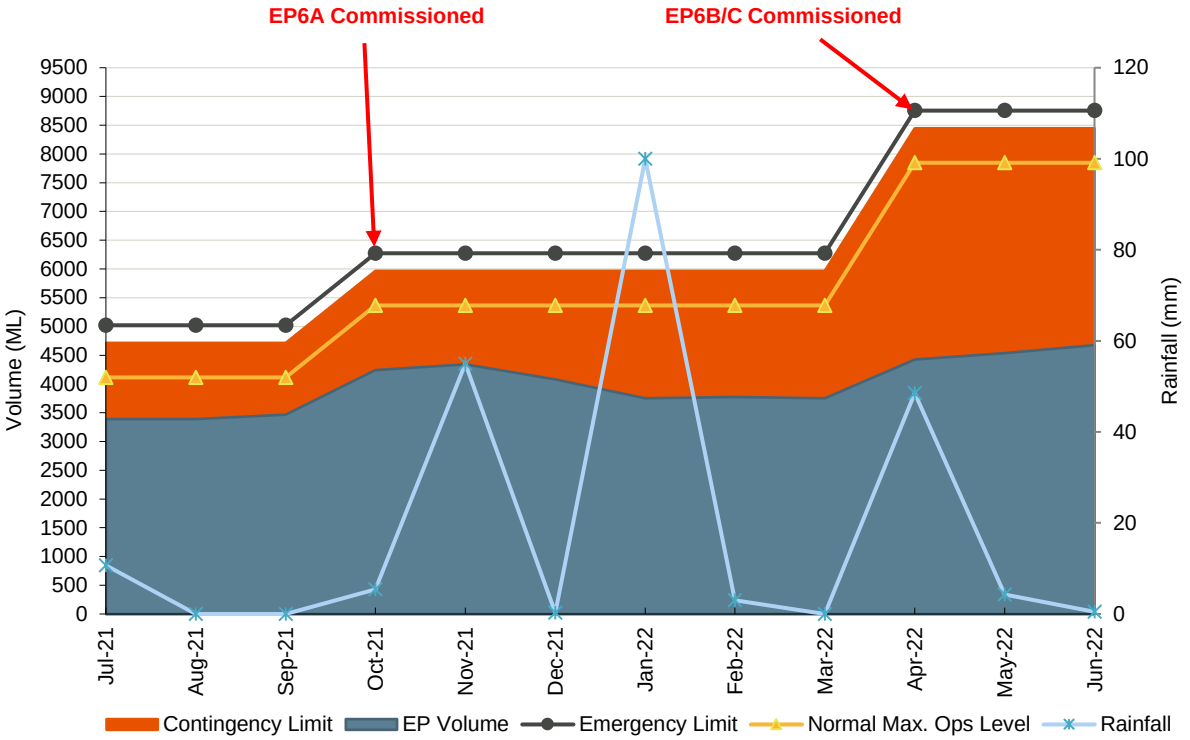


Figure 69: Evaporation pond capacity and rainfall.

Results of a liquor balance for each EP cell.

Figure 70 shows the cumulative evaporation trends for the EPs. A liquor balance is performed to highlight cells with potential significant leaks by comparison of the apparent evaporation from each cell of each EP. The comparison is carried out on a monthly basis.

The evaporation response for each cell is broadly consistent, demonstrating that significant unexplained losses have not occurred. Variations between each pond can be attributed to usage, and the overall evaporation loss is consistent with previous years.

EP5A showed the highest evaporation rate, however this is consistent with higher usage than the other ponds, and the total value is in line with previous years. EP4B showed a lower value than EP5A, but this is in line with expectations. For EP4A, the solids are approaching the freeboard limit and use is limited while EP3 recorded a similar value to FY21 records.

Testing and commissioning of EP6A/B/C was completed in the reporting period. As a result, Figure 70 represents the cumulative apparent evaporation from April 2022 onwards. Full year data will be available in the FY23 report.

During the reporting period EPs 1 and 2 were used sporadically and EP5B was out of service.

Evaporation cells occasionally dry out when the free liquor is evaporated, exposing the surface of the precipitated solids built up in the cell. During these periods a liquor level is not able to be measured and the cumulative evaporation trends level out. Under these circumstances the water balance method is no longer effective in confirming cell integrity. However, as the cell is inactive there is minimal, if any, free liquor available and therefore very little potential for seepage from these cells.

Groundwater level data collected in and around the ponds is used as an additional control to detect seepage from the EPs (refer Chapter 1.3 - Aquifer Level Drawdown) and to support the liquor balance calculations.

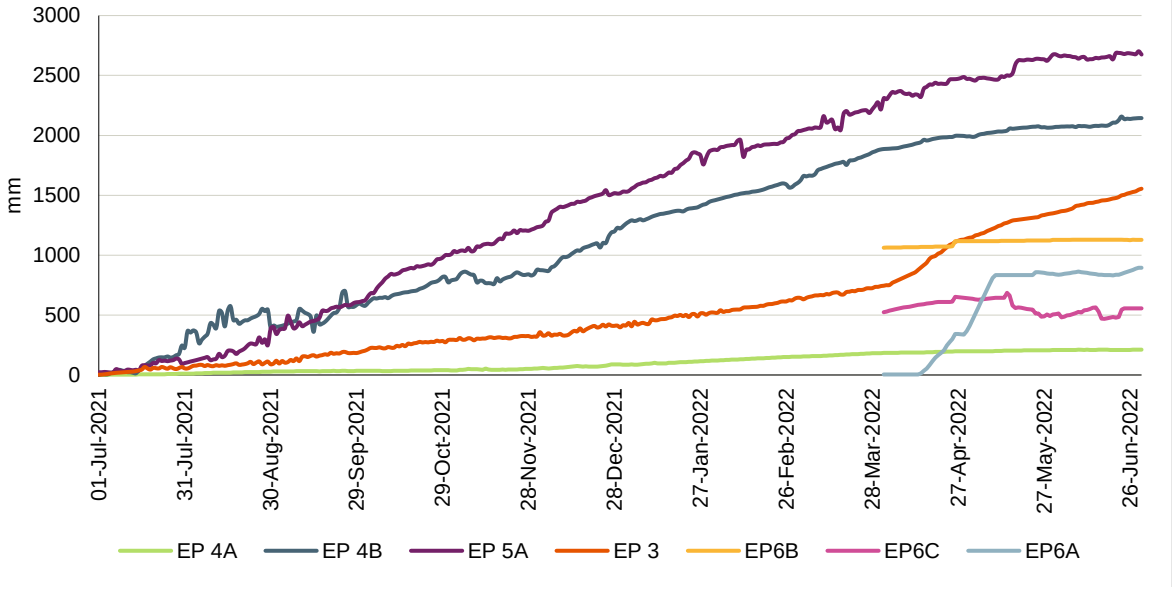


Figure 70: All EP Liquor Balance – cumulative apparent evaporation.

4.2.6 Targets FY22

None applicable.

4.2.7 Actions FY22

Identify and install additional liquor interception systems as required.

No new liquor interception systems were installed over the reporting period. A refresh of the TSF5 toe drain system is part of the TSF5 buttress program of works, scheduled to commence at the beginning of FY23.

A summary of seepage locations is shown in Table 28 with spatial locations shown in Figure 71 and Figure 72. Two new seepage areas were identified during the FY22 reporting period, located in the north ramp of TSF4 (west side) and the south east corner TSF4. Two seepage locations at the base of the TSF5 west wall have been removed as they have been covered by the TSF6 east wall.

Table 28: List of monitored perimeter features.

Identifier	Location	Discovery Date	Summary of Status (FY22)
Cell 1			
C1S-03	South wall of TSF cell 1 on the embankment face	Feb 2008	Filter blanket installed over area. Becoming damper over the reporting period.
C1E-14S	East wall of TSF cell 1 at the toe and pipe corridor	2008	Interception drain, sump and pump is returning seepage to EP2. Seepage flows show steady trends with FY21 over the reporting period.
C1E-14N	East wall of TSF cell 1 at the toe	2008	Interception drain, sump and pump is returning seepage to EP2. Dampness continues to expand around and beyond drain. Seepage flows show steady trends with FY21 over the reporting period.
C1E-17, C1E-18	Cell 1 crest of starter embankment and at toe	2009	Interception trench, sump and pump in place. Dampness expanding to the north, and to the east. Continued gradual decrease in seepage flows be observed. C1E-18 area covered with buttress activities during FY22.
Cell 2			
C2E-01, C2E-02	East wall of cell 2 at the embankment toe	2009	Interception trench, sump and pump in place. Some dampness noted. The flows have been largely constant with pumps operating continuously..
Cell 3			
C3E-05 &06	East wall of cell 3 at the embankment toe	October 2016	Filter blanket, drain and pump system installed. Flows fluctuate between 1-10 m^3 per day. Dampness extending beyond the drain to the east.
C3NE-07	Northeast corner of cell 3	Dec 2010	Area has become dry.
C3N-13	North wall of TSF3	Sept 2018	Area covered by mini buttress.
C3N-15	North wall of cell 3 at the embankment toe	August 2016	Area covered by mini buttress. Dampness evident at toe of mini buttress.
C3/4CN -22	Intersection of TSF cell 3 and TSF cell 4 at toe	Apr 2008	Beneath Cell 3-4 buttress. Flows into sump have stayed low over the reporting period similar to previous years.
Cell 4			
C4N-09	Eastern side of the north ramp of cell 4	November 2012	Flow has shown slight reduced trends.
C4S-28	South wall TSF4 adjacent ramp	2006	Area covered by mini buttress construction with sand blanket installed.
C4E-39	Base of the TSF4 east wall	June 2022	Damp area at base of TSF4 south-east corner.
C4NW-14	North ramp TSF4 west side	June 2022	Area slightly damp showing very minor signs of seepage
Cell 5			
C5S–0 to 2	South wall near western corner	June 2020	Damp patches, remaining steady over the reporting period.
C5S-12 to 14	South wall TSF5 towards eastern corner	January 2018	Damp strips in clay pan below sand dune, continuing to expand.
C5E-28	Eastern wall towards northern corner	June 2019	Damp patches at toe of embankment, continuing to expand.
C5NE-31	NE corner of TSF5	July 2019	Damp patches at toe of dam, gradually becoming damper and extending to the north.
C5N-40	North wall of TSF5	April 2017	Damp zone along service track, increasing in dampness over the reporting period extending north east and west.

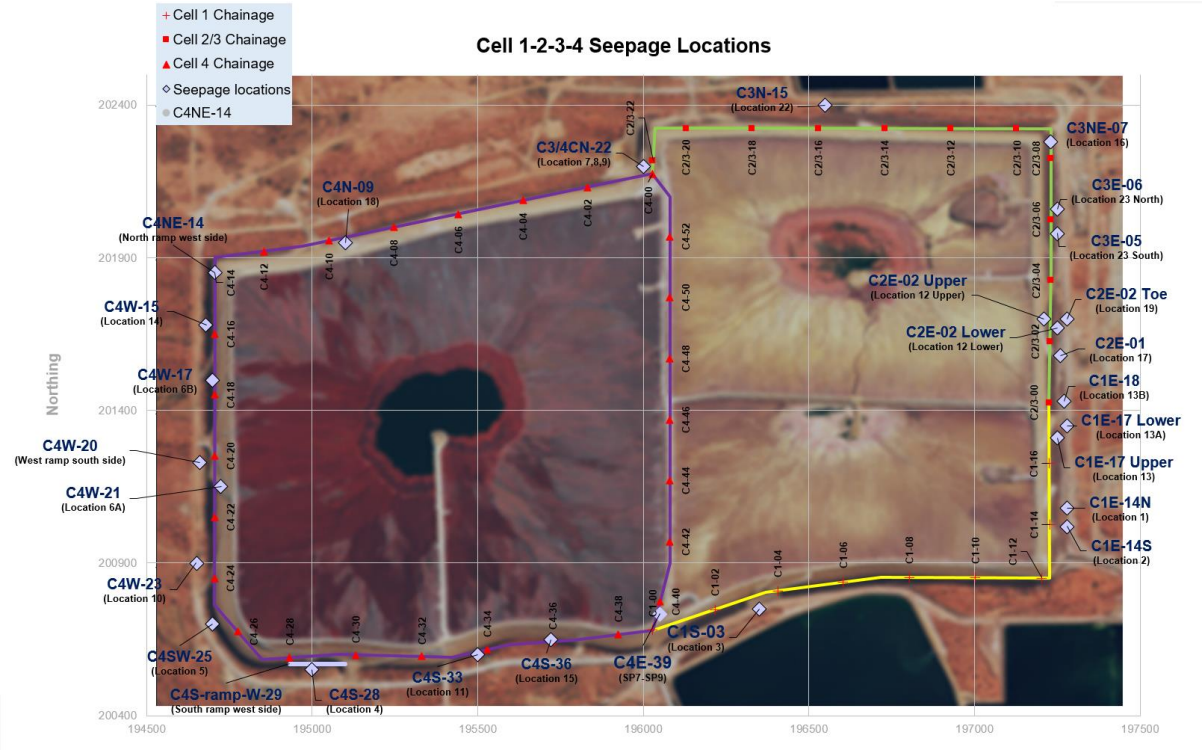


Figure 71: Location of Perimeter Features, Cells 1, 2, 3 and 4.

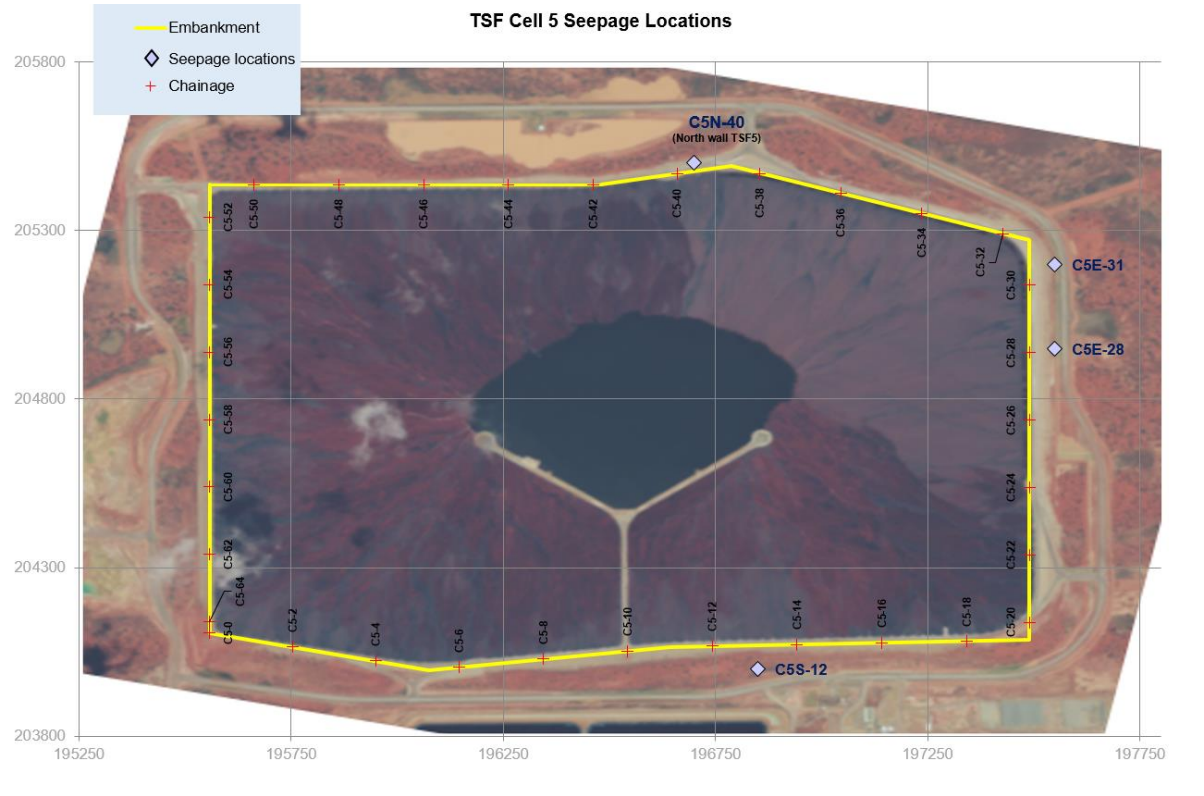


Figure 72: Location of perimeter features, Cell 5.

4.3 Fauna interaction with Tailings Retention System

4.3.1 Environmental Outcome

No significant adverse impacts to listed species (South Australian, Commonwealth) as a result of interactions with the Olympic Dam TRS.

No significant adverse impacts to listed species as a result of interactions with the Olympic Dam Tailings Retention System (TRS) occurred in FY22.

The Australian Darter (*Anhinga novaehollandiae*; n=1) listed as Rare under the *National Parks and Wildlife Act 1972* (NPW Act), was observed interacting with the TRS during FY22. One individual is extremely low in terms of overall population and therefore it is concluded that there were no significant adverse impacts to South Australian or Commonwealth listed species as a result of interactions with the TRS.

4.3.2 Compliance criteria

No significant adverse impact on the size of an important population of Banded Stilt (*Cladorhynchus leucocephalus*) as a result of interactions with the Olympic Dam TRS.

Note: Significant impact is as defined in the Significant Impact Guidelines and greater than predicted in the EIS

The Banded Stilt listed under the NPW Act was not observed within the TRS during routine weekly monitoring undertaken by trained Environment personnel in FY22. No Banded Stilts were observed in the opportunistic observations recorded by the TRS Technicians in FY22.

4.3.3 Leading Indicators

None applicable.

4.3.4 Deliverables (FA 3.3)

An assessment of fauna activity and losses within the TRS.

An evaluation of the effectiveness of control measures and targets in reducing the number of listed migratory birds lost within the TRS.

During FY22, 32 different bird species and five other animal species were observed during the weekly monitoring of the TRS. A total of 299 live animals were observed throughout the year, with nine showing signs of being affected by the TRS liquor (Figure 73). It is unclear whether all affected species died as a result of contact with, or ingestion of liquor. The most abundant alive bird species recorded was the White-backed Swallow (*Cheramoeca leucosterna)* with a total of 94 individuals observed. All 94 individuals were recorded as unimpaired, with 89 individuals flying and 5 individuals observed roosting on infrastructure.

A total of 66 dead animals were observed throughout FY22, comprising of 61 birds and 5 reptiles. The most abundant bird species recorded as dead was the Silver Gull (*Chroicocephalus novaehollandiae*; n=14).

Overall, there has been a significant decrease in the number of alive and dead birds observed at the TRS from FY13 to FY21 (Alive: $F_{1,40} = 4.396$ $p = 0.042$; $R^2 = 0.1036$; Dead: $F_{1,40} = 8.059$ $p = 0.007$, $R^2 = 0.1750$; Figure 74). The variability in the numbers observed is most likely explained by environmental factors, such as rainfall (Figure 75).

New controls are still being evaluated prior to undertaking further trials and therefore they cannot currently be analysed for their effectiveness at reducing listed migratory species.

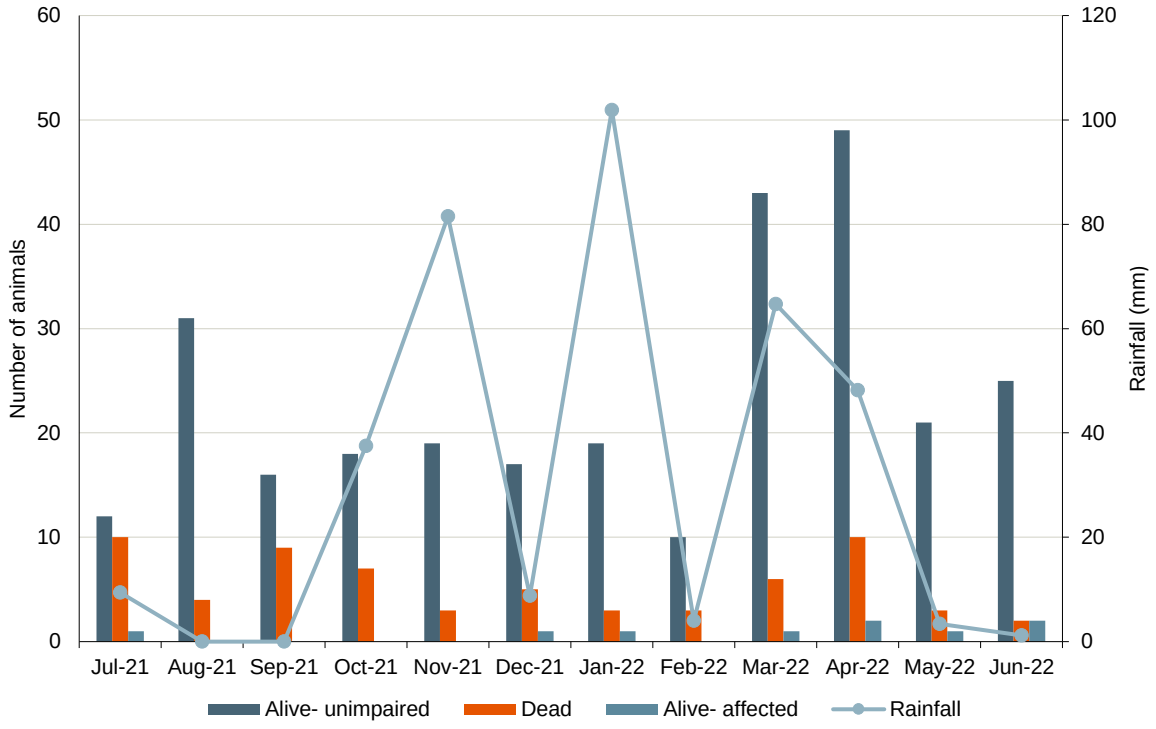


Figure 73: Monthly summary of all weekly monitoring for FY22, showing total number of animals recorded within the TRS as either alive-unimpaired, alive-affected, or dead. Rainfall data presented is collected from the Roxby Downs weather station.

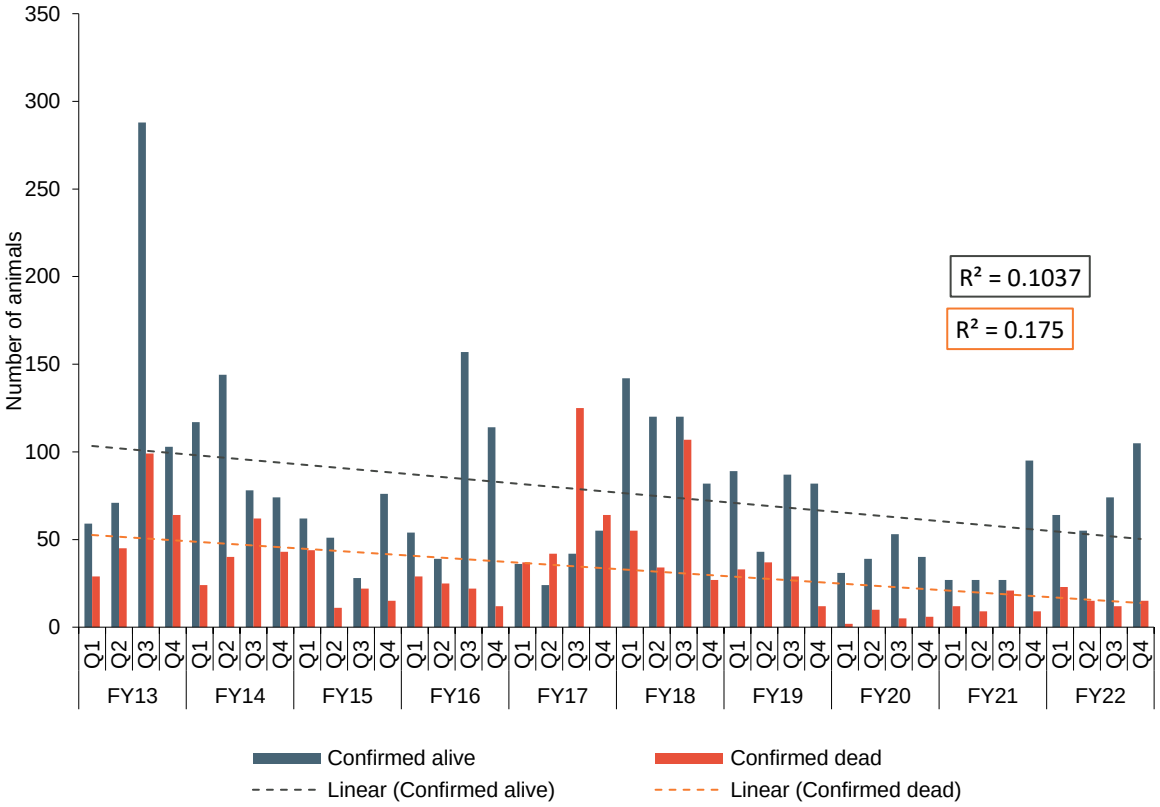


Figure 74: Quarterly summary of all weekly monitoring since FY13, showing total number of animals recorded within the TRS. Dashed lines represent linear trends.

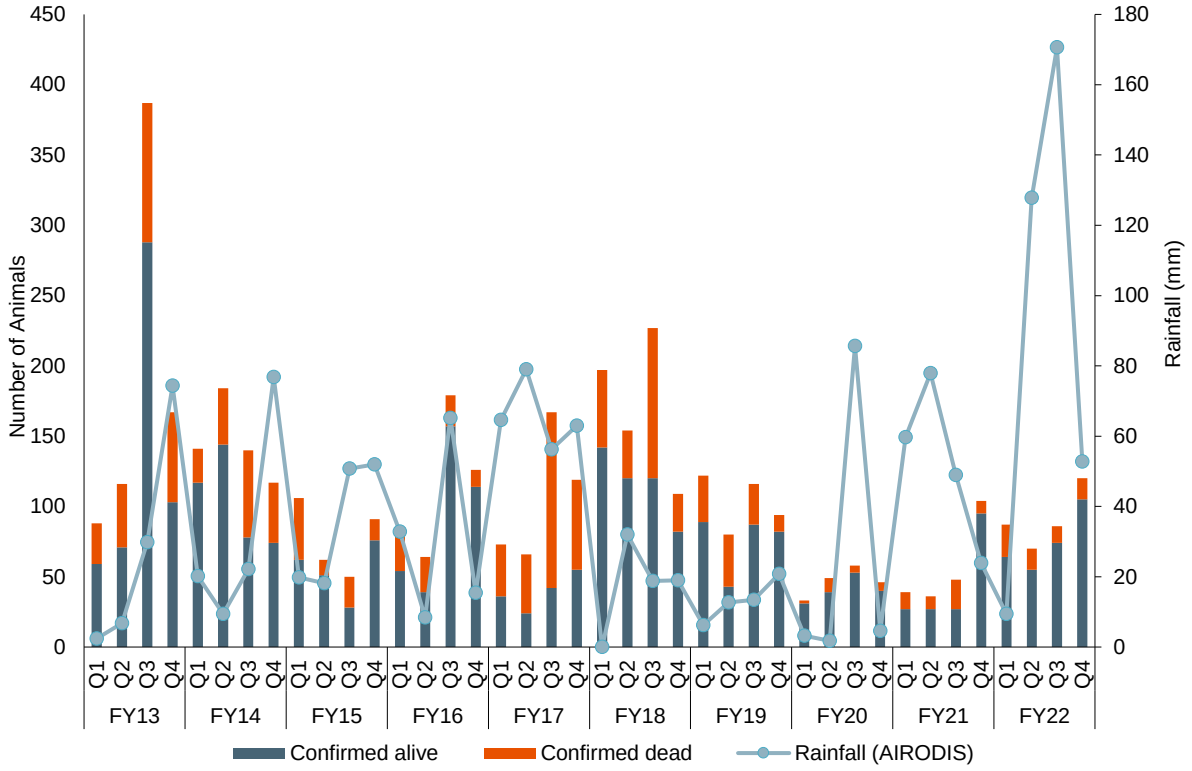


Figure 75: Quarterly summary of all weekly monitoring since FY13, showing total number of animals recorded as alive, and confirmed as dead within the TRS. Rainfall data presented are collected from the Roxby Downs weather station.

All fauna observed opportunistically (i.e., outside formal monitoring sessions) during FY22 are summarised in Figure 76. Opportunistic observations bias towards live animals, especially large flocks, hence more live animals than dead animals are usually observed.

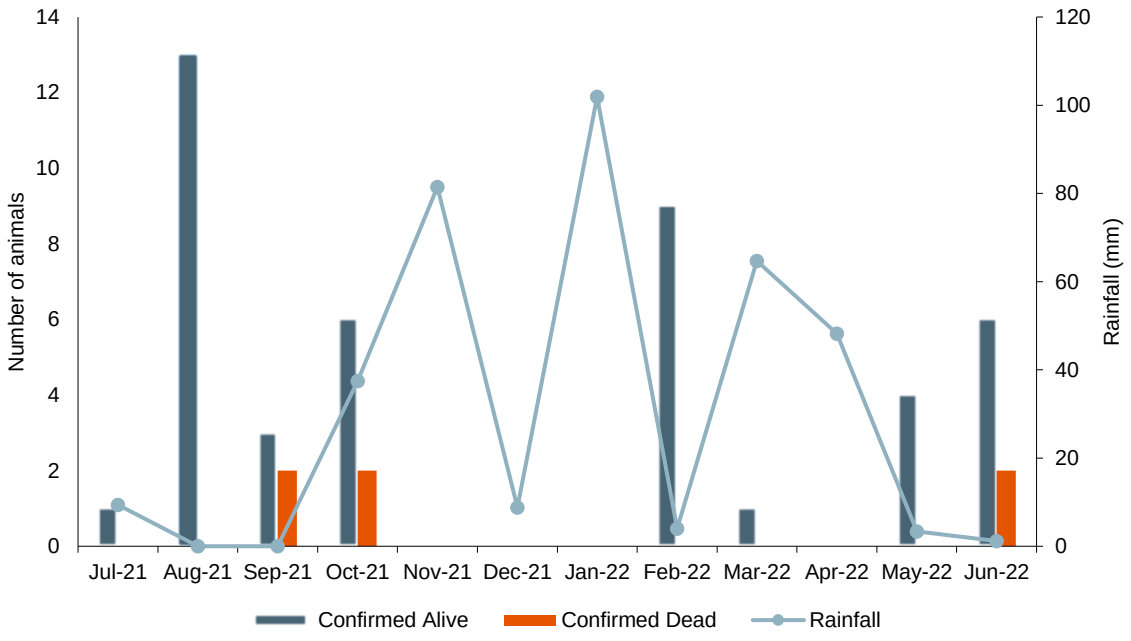


Figure 76: Monthly summary of opportunistic observations for FY22, showing total number of animals recorded within the TRS. Rainfall data presented is collected from the Roxby Downs weather station.

The data presented indicate the number of fauna counted and do not represent total numbers; they are presented as an index only. A number of factors are considered when interpreting and refining the monitoring and data analyses, these include:

- Birds may be seen and recorded as alive on one day and subsequently may be observed as dead. The total includes both observations, leading to a possible overestimate;
- Scavenging by birds of prey and corvids means that some carcasses may be removed from the system prior to an observation being made;
- Carcasses floating in the liquor may sink and disappear before being recorded; and,
- Some fauna species may leave the system and die elsewhere.

The number of birds recorded as dead at the TRS may represent a small proportion of those that visited. Preventing and deterring visitations by large flocks of birds, particularly Banded Stilts, remains a focus of management efforts at the TRS.

4.3.5 Targets FY22

None applicable.

4.3.6 Actions FY22

Continue investigating and trialling alternative deterrent technologies when they become available.

A summary of deterrents trialled to-date was compiled in FY21, and the process derived a short-list of potential deterrent and offset options to be further explored based on their high feasibility, low cost and unknown effectiveness (e.g., most deterrent options only had anecdotal evidence available). As a result of this process, ODC has identified the wetland wailer, an audio-based deterrent as a feasible option to investigate. Field trials of the wetland wailer commenced in October of FY22.

The wetland wailer combines natural bird vocalisations and electronic sounds to create a 350m radius that is uncomfortable for birds to remain in. The use of natural and electronic sounds, in combination with multiple speakers, changes in duration and strobe lighting prevents birds from habituating to the patterns of the deterrent.

In October 2021, two deterrents were deployed on the northern and southern cell roadways of Evaporation Pond 3 (EP3). Our target fauna is wading bird species that find the liquor attractive. The wailer utilises vocalisations of wading bird species in distress or calls of their predators. To remove the noise from the effectiveness of the wetland wailer, small bird species that are residential at EP3 but have not been observed interacting with the liquor have been removed from the analysis. Zebra finches, swallows (welcome, white-backed, black-faced) and willy-wagtails have habituated to the area and perch on pump equipment and have not been observed interacting with the liquor during the period October 2020-June 2022 at EP3 (non-target species). Therefore, they have been removed from the analysis. The remaining bird species may not have been observed interacting with the liquor but are known from historic data to interact with the liquor. No State or Federally listed species were observed at EP3 during the monitoring period. The most abundant species observed as both alive and dead was the silver gull. There was no significant difference in both alive and dead observations at EP3 over the monitored period (Alive: $F_{1,20} = 0.02$ $p = 0.060$; $R^2 = 0.0008$; Dead: $F_{1,20} = 0.10$ $p = 0.122$, $R^2 = 0.0054$; Figure 77). BHP is committed to continuing using the wetland wailer throughout FY23, particularly to capture more seasonal data and investigating alternative bird deterrent technologies when they become available.

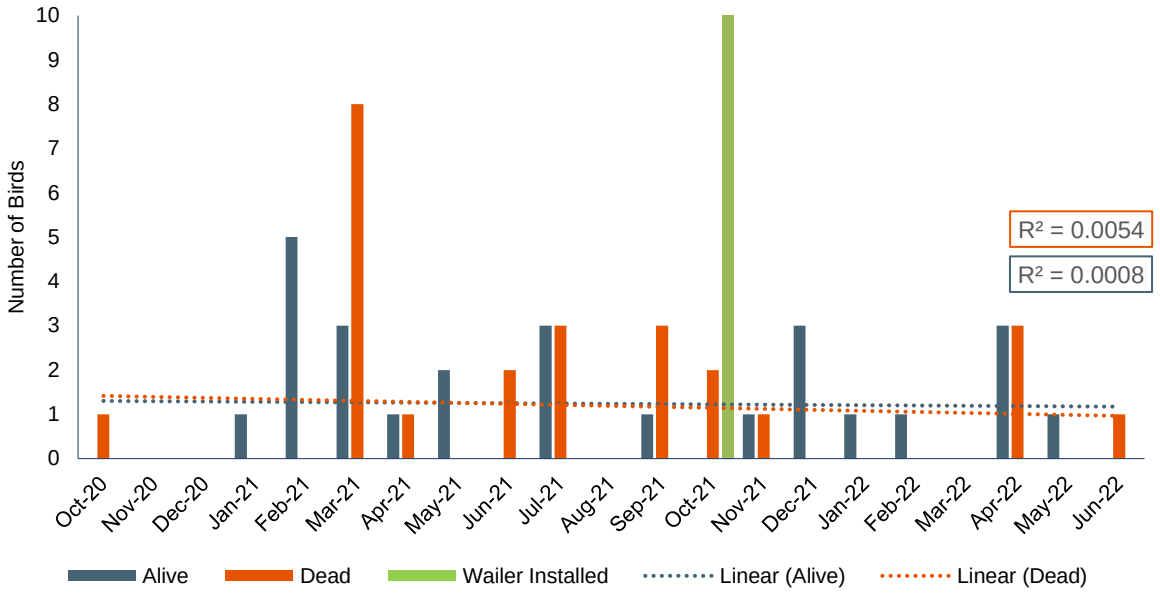


Figure 77: Monthly summary of weekly monitoring from October 2020 to June 2022, showing the number of birds recorded at EP3 as either alive or dead. Dashed lines represent linear trends.

4.4 Solid waste disposal

4.4.1 Environmental Outcome

No significant adverse impacts as a result of management of solid waste.

The Resource Recovery Centre (RRC) effectively manages solid waste as per the EPA approved Landfill Environmental Management Plan 2021 (LEMP). No evidence of material environmental harm was identified through routine auditing or reporting of materials disposed of to the landfill. Therefore, it can be concluded that no significant adverse impacts resulted from the management of solid waste at Olympic Dam during FY22.

In FY22 the RRC experienced three small landfill fires and one timber fire while loading a truck for transport to Adelaide. The fires were extinguished quickly. Although the root cause of the landfill fires could not be determined. Previous fires were the result of incorrect segregation of batteries from general waste, and likely to be the cause of FY22 fires. The root cause for the timber fire was found to be potential contamination caused by chemical agents that were ignited by a static discharge between the trailer and loading grapple.

To improve waste segregation onsite, ODC has revised the waste training module on BHP's Learning Management System (LMS) to include pass/fail questions on battery disposal and introduced the waste training module as a pre-requisite for gaining a site access card.

4.4.2 Compliance criteria

No site contamination leading to material environmental harm arising from the operation of the Resource Recovery Centre.

Solid wastes which cannot be reused or recycled by the RRC and have not been contaminated by processing chemical wastes are disposed of into the general waste landfill facility. The RRC effectively manages solid waste as per the approved EPA Landfill Environmental Management Plan

(LEMP) so that no actual or potential material environmental harm is caused by the storage of non-chemical waste materials.

Waste is minimised, stored, transported and disposed of in a manner that controls the potential risk of adverse impacts to the environment and communities through implementation and maintenance of the LEMP. No evidence of site contamination leading to material environmental harm arising from the operation of the Resource Recovery Centre was identified based on routine auditing and reporting conducted during FY22.

4.4.3 Leading Indicators

None applicable.

4.4.4 Deliverables (WA 2.5)

Records of quantities of general and industrial waste disposed of to landfill.

Records of all waste delivered to the Resource Recovery Centre (RRC) were maintained by the waste management contractor during FY22. The total amount of waste and recycling materials delivered to the RRC for further management and disposal in FY22 was 9,945t (Table 29). Of this, 4,328t was disposed of directly to the permanent landfill. A total of 5,617t was sent to recycling stockpiles within the RRC in FY22, prior to recovery or recycling off-site.

Table 29: Quantities of materials delivered to the RRC for either permanent disposal or recovering/recycling in FY21 and FY22.

	FY21 (t)	FY22 (t)
Disposed to permanent landfill	9,519	4,328
Delivered to recoverable and recycling stockpiles	3,964	5,617
Total entering RRC	**13,483**	**9,945**

Historical waste volumes of waste disposed to the landfill and recyclable/recoverable materials sent offsite to a licenced facility between FY2003 and FY2022 are shown in

Table 30. In FY22, 28,853m^3 of waste was permanently disposed to the landfill and 12,111t of recycling or recoverable materials were sent off-site to a licenced facility. FY22 delivered a site wide clean-up project and RRC initiatives to remove waste stockpiled onsite for recycling, steel being the main waste stream recycled. The project delivered value across the RRC with a significant volume of waste diverted from Landfill.

Table 30: Historical total waste received at the Resource Recovery Centre (FY2003-FY2022).

Year	Landfill Disposal (m^3)	Estimated Landfill Disposal via conversion (t)	Total Recycled Materials (t)
2003	30, 622	4, 593	193
2004	27, 348	4, 102	617
2005	14, 578	2, 187	510
2006	45, 361	6, 804	347
2007	47, 964	7, 195	685
2008	52, 171	7, 826	673
2009	40, 898	6, 135	936
2010	32, 980	4, 947	1, 890
2011	37, 511	5, 627	1, 735
2012	36, 291	5, 444	2, 644
2013	17, 739	2, 661	1, 248
2014	31, 433	4, 715	1, 232
2015	34, 939	5, 241	3, 073
2016	27, 355	4, 103	2, 651
2017	30, 081	4, 512	1, 957
2018	55, 254	8, 288	1, 513
2019	59, 608	8, 941	3, 145
2020	60, 469	9, 304	3, 409
2021	64, 055	9, 519	3, 568
2022	28, 853	4, 328	12,111

Figure 78 shows the estimated tonnage of waste disposed of to the landfill on an annual basis from FY2003 to FY2022. An overview of waste quantities and historical trends is displayed in Table 30 and Figure 78 as an overall percentage of total volumes.

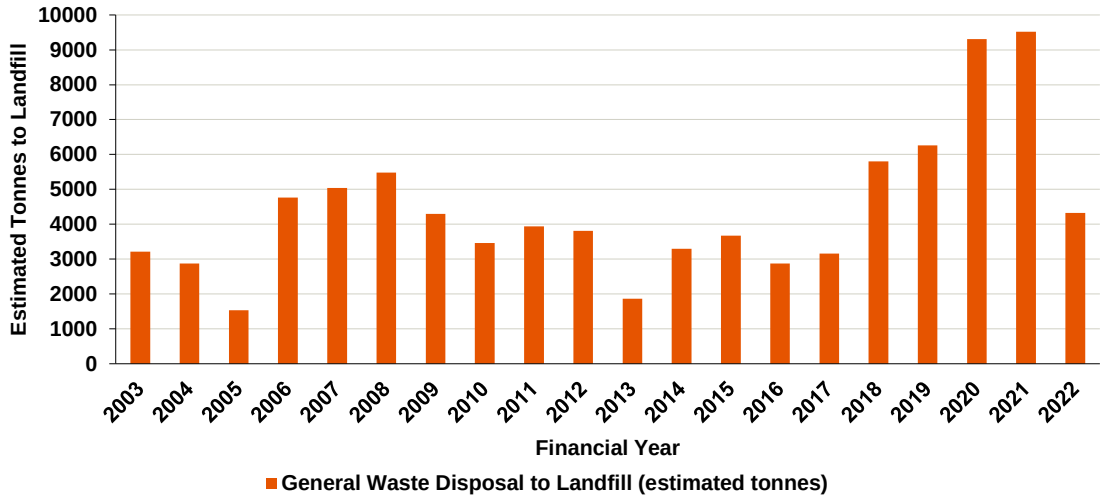


Figure 78: Historical overview of general waste quantities to landfill disposal FY2003-FY2022.

**Note from 2003 to 2021 estimated tonnes is based on recorded cubic meters and then applying volume to weight conversion factors. These conversion factors are updated in line with the EPA guidelines at the time; therefore, fluctuations in estimated tonnes to landfill may be the result of changing conversion factors as opposed to raw increase in waste entering the landfill. From FY2022 waste data is captured through weighbridge data, with tonnes converted to a volume using the mixed waste conversion factor (150kg / m3).*

Records of quantities of material recovered for reuse and recycling.

Records maintained by the RRC waste management contractor show the total recyclable material transported off-site in FY22 equalled 12,111t, an increase of 109% on the previous year, and marks the highest volume of recycled material removed from Olympic Dam since commencement of operations. This is largely due to the sitewide clean-up taking place, and RRC initiatives to remove stockpiled waste for recycling offsite.

Table 31 provides an overview of the recyclable materials captured and the quantity of each material removed from site during FY22 to licenced facilities for recycling.

Table 31: Recyclable material transported off-site for recycling in FY22.

Recycling removed from site	Quantity (t)
Batteries	37.5
Copper Cable	306.24
Hazardous Materials	26
Tyres	503.8
IBC's	79.4
Poly Pipe/HDPE	15
Scrap Steel	10,039
Timber	1,104
*Total	12,111

**Note: Total may not equal sum of numbers due to rounding.*

Figure 79 provides an overview of the historical off-site recycling trends to appropriately licenced facilities (FY2003-FY2022 inclusive).

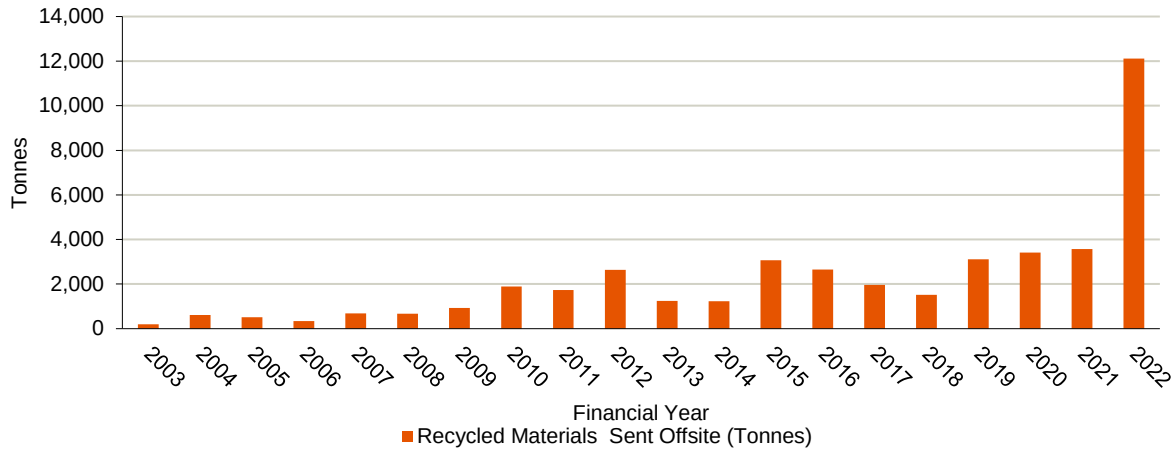


Figure 79: Recyclable materials transported offsite to suitably licenced facilities for re-processing FY2003-FY2022.

4.4.5 Deliverables (WA 2.6)

Records of categories, quantities and location of hazardous waste materials disposed of within the SML.

Depending on the type of hazardous or contaminated material, quantities are measured in cubic metres (m3) or tonnes (t). Records of hazardous waste disposed of within the SML are shown in Table 4, whilst records of hazardous waste disposed offsite are shown in Table 5.

Contaminated waste disposed within the SML is discussed within the Radioactive waste section of this report (Chapter 4.5), whilst disposal of hazardous waste is to the Tailings Storage Facility (TSF). Risk assessments of materials being disposed of to the TSF ensure that TSF integrity is not compromised.

Where possible, process waste is disposed of via bunded areas and directed to tails disposal. This reduces the amount of waste disposed of at the tailings waste finger.

Records to provide evidence that listed waste is appropriately managed, specifically:

- **that listed waste is stored, contained and treated in a manner that does not cause environmental harm or nuisance or present risks to human health and safety;**
- **that all listed waste storage containers are of a suitable strength and durability, are clearly marked and contain appropriate safety warnings;**
- **that all listed wastes do not contact soils or stormwater, and that measures to prevent and recover spillages are implemented as necessary.**

The waste management contractor is responsible for maintaining all hazardous waste management records at the RRC. The location, type and quantity of hazardous waste is recorded in an electronic register, as per all relevant regulations and site procedures. The transport of hazardous waste off-site is documented through the EPA waste transport and tracking system, providing assurance that wastes are managed appropriately so as not to cause environmental harm or present a risk to human health and safety. Table 32 provides an overview of waste management streams which are approved under the Tailings Retention System Waste Management Plan for disposal to the TRS.

Table 32: Hazardous wastes disposed of within the SML's Tailings Retention System FY22.

Source of waste	Quantity of Waste (t)
Acid Plant Catalyst	284.2
Electro Winning and Gold Room	200
Miscellaneous Waste cleared for TRS	818.3
Onsite laboratory	30.4
Process waste	513.7
Refinery	816
Smelter	25.3
SX Area	256.35
*Total	2,944.2

** Total may not equal sum of numbers due to rounding.*

Other hazardous waste removed from site for disposal at licenced facilities consists of hydrocarbon waste such as oily rags, oily filters and waste acid as shown in Table 33.

ODC complies with the requirements of EPA Licence 1301 pertaining to listed and controlled waste by adhering to the approved Landfill Environmental Management Plan (LEMP). Spill kits are available at all collection and loading points for listed waste (e.g. Waste Oil Facility and Distribution Centre).

Table 33: Records of hazardous waste collected and removed off-site for further treatment during FY22.

Type of waste	Quantity of Waste (t)
Waste Oil/Water	42.5
Tyres	503.8
Batteries	37.5

**Note: Contaminated soil refers to soil with chemical contamination, this does not include radiation contamination.*

4.4.6 Targets FY22

Increase at source waste segregation to reduce waste to landfill

All recycling stations across site have colour coded skip bins to assist with segregation at source. This has assisted in achieving a recycling rate of 56% for all waste entering the RRC during FY22. This improvement at the source has led to a reduction in second-hand sorting once received at the RRC sorting pad. Additional skip bins will be provided at specific locations to facilitate at source segregation in FY23, including temporary areas such as Projects.

4.4.7 Actions FY22

Continue to monitor and store LV/HV tyres in line with accepted guidelines

ODC will continue to store tyres in accordance with the recommend guidelines including the South Australian Environment Protection Agency Guideline – Waste Tyres. The Waste to Resources Policy (2010) formally bans the disposal of whole tyres to landfill. Until tyres can be recycled they must be stored in a manner that minimises their negative effects on the environment.

In accordance with EPA requirements, tyres should be stored on a level site away from surface watercourses, flood zones and groundwater recharge points. The site should be securely fenced and have access gates wide enough to allow the entry of emergency vehicles. Flammable or combustible

liquids, hazardous wastes or other ignitable materials should not be stored close to tyre stockpiles. Stored tyres should comply with the General Guidelines for the Outdoor Storage of Used Tyres issued by the South Australian Fire Service Fire Safety Department

Improve paper and cardboard recycling awareness and on ground participation

The waste working group is working on several initiatives to be developed into waste improvement projects. Some of these are likely to include improved source segregation at waste disposal locations and responsible waste management information sessions for employees.

4.5 Radioactive waste

4.5.1 Environmental Outcome

No adverse impacts to public health as a result of radioactive waste from ODC's activities.

ODC has consistently operated in a manner that limits radiation dose to members of the public from radioactive waste, to less than a small fraction of the International Commission on Radiological Protection (ICRP) 1 mSv/y limit. As a result, there were no adverse radiation exposure impacts to the public from activities undertaken at Olympic Dam in the reporting period.

No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive waste from ODC's activities.

During the reporting period there were no significant adverse impacts to populations of listed species or ecological communities as a result of ODC's activities. Monitoring of radiation doses to the public and the deposition of ^{238}U at non-human biota assessment sites is used as an indicator of the potential exposure of listed species to radioactive waste.

Deposition of ^{238}U at non-human biota assessment sites during the reporting period was at a level which poses no significant adverse impacts to non-human biota (refer to Chapter 3.4).

4.5.2 Compliance criteria

Radiation doses to members of the public less than 1mSv/y above natural background.

The total estimated dose (during FY22) to members of the public at the Roxby Downs Monitoring Site (RDMS) and the Olympic Village Monitoring Site (OVMS) that was contributed by ODC operations was 0.053 mSv and 0.053 mSv respectively.

Deposition of project originated ^{238}U less than 25 Bq/m^2/y at the non-human biota assessment sites.

The average deposition of ^{238}U, calculated as an average of results at the four monitoring sites was determined to be 0.6 Bq/m/y, well below the 25 Bq/m^2/y compliance criteria.

4.5.3 Leading Indicators

Indications that a dose constraint of 0.3 mSv/y to members of the public above natural background will be exceeded.

Indications that a reference level of 10 µGy/h for impact on non-human biota above natural background will be exceeded.

Note: The reference level for non-human biota is set as an interim criterion until such time as an agreed national approach is determined

The two leading indicators were not triggered during the reporting period. Doses to members of the public are below OD's internal dose constraint of 0.3 mSv/yr during the reporting period. Similarly, the

reference level of 10 uGy/h for impacts on non-human biota was not triggered during the reporting period. For more information see section 3.4

4.5.4 Deliverables (WA 2.7)

Records of the categories, quantities and location of LLRW and contaminated material disposed of within the SML.

A waste management register is maintained by site staff and the waste management contractor to track origins of the structural waste, waste categories, quantities, radiation testing results, and final disposal or storage locations.

Contaminated waste is defined as structural waste from within the operational mining and processing areas which after surface cleaning retains a surface area activity of greater than 3,700 Bq/m^2 and an average activity concentration level below 1 Bq/g. Any structural waste which returns a surface area activity reading below 3,700 Bq/m^2 can be safely recycled and any cleaned materials which remain above the surface area activity threshold of 3,700 Bq/m^2 must remain onsite or undergo further cleaning.

Table 34 shows the total tonnage of structural waste (2017-2022 inclusive) which once cleaned has remained above 3,700 Bq/m^2 and below an average activity concentration level of 1 Bq/g and therefore has been placed into a purpose-built Contaminated Waste Disposal Facility (CWDF).

Table 34: Permanent Contaminated Waste Disposal Facility (CWDF).

CWDF Storage Location	Type of waste	FY	Quantity of Waste (t)
Cell 1 Stage 1	Contaminated structural equipment	2017	3,304
Cell 1 Stage 1 Cell 1 Stage 2	Contaminated structural equipment	2018	2,088
Cell 1 Stage 2	Contaminated structural equipment	2019	2,042
Cell 1 Stage 2	Contaminated structural equipment	2020	1,566
Cell 1 Stage 2	Contaminated structural equipment	2021	738
Cell 1 Stage 2	Contaminated structural equipment	2022	693
Total in storage end FY22			**10,431**

The use and closure of each CWDF Cell stage is implemented through the requirements of the approved CWMP. CWDF Cell 1 Stage 1 was approved and constructed adjacent to the Resource Recovery Centre (RRC) during FY17 and was backfilled in FY18 once capacity was achieved. CWDF Cell 1 Stage 2 (Lift 1), directly above Stage 1, was constructed in FY18 and currently remains in operation.

The regulatory framework for a CWDF is contained within the current licence conditions for the Olympic Dam Licence to Mine (LM1), which requires ODC to comply with the Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005).ODC is required to seek regulatory authorisation for various stages of the CWDF facility/cells and to have a Radioactive Waste Management Plan (RWMP) developed and maintained. Figure 80 provides an overview of the tonnages sent for disposal to each respective CWDF cell stage.

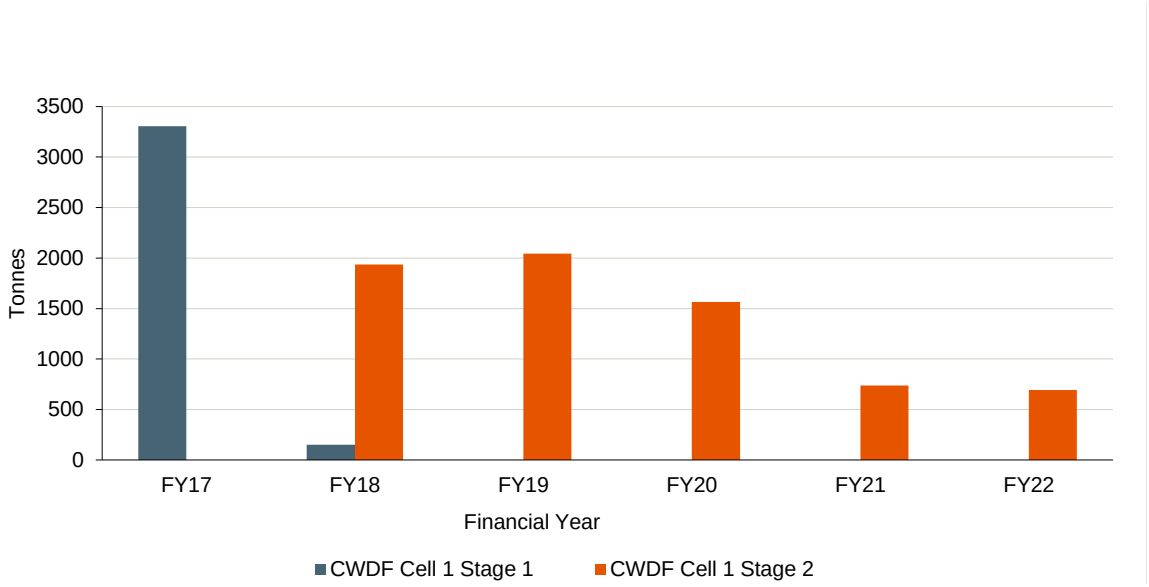


Figure 80: Overview of structural waste tonnage received at each of the CWDF cells currently utilised at OD from FY17-FY22.

Some structural waste materials return surface area activity readings above 3,700 Bq/m^2 and activity concentration readings above 1 Bq/g after cleaning and decontamination processes have been implemented. These materials are classified as Low Level Radioactive Waste (LLRW) and are therefore segregated away from other structural contaminated waste materials. Table 35 summarises the quantity of LLRW stored in accordance with the approved CWMP.

Table 35: Low Level Radioactive Waste currently in storage

Storage Location	FY	Quantity of waste stored (t)
LLRW Area	FY18	115
LLRW Area	FY19	44
LLRW Area	FY20	173
LLRW Area	FY21	545**
LLRW Area	FY22	1.5*
Total in storage end FY22		**878.5**

**A small volume of LLRW was disposed to the LLRW facility during FY22. Due to SCM21, the volume of LLRW waste streams were reduced significantly. This was further supported by improvements for cleaning structural waste.*

***During FY21 operational maintenance requirements an estimated a total of 540 t of clarifier overflow bricks had to be sent to the LLRW holding area. All other waste sent to the LLRW came to a total of 5 t.*

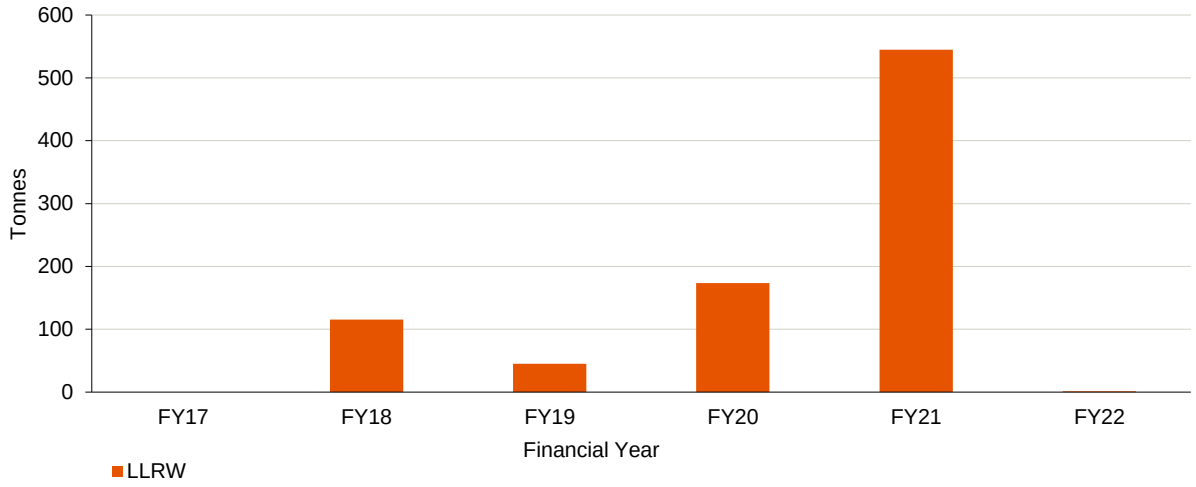


Figure 81: Overview of structural waste tonnage received at the LLRW Pre-Disposal holding area from FY17-FY22.

The cleaning of structural materials from processing and mining areas of the mine has continued in FY22, and proved to be a successful method for reducing the radiation levels, with the overall volumes of contaminated waste required to stay on site in a CDWF Cell or the LLRW holding area greatly reduced, shown in Figure 81. The testing program has enabled OD to safely recycle a large quantity of metal waste.

4.5.5 Targets FY22

Maintain radiation doses as low as reasonably achievable, as assessed through the annual Radiation Management Plan Review.

Quarterly ODC radiation monitoring results, radiation dose calculations and occupational hygiene results are presented to the regulatory authorities for review. In addition, an annual adequacy and effectiveness review is completed each year confirming that doses are as low as reasonably achievable.

4.5.6 Actions FY22

None applicable.

5 Interaction with communities

5.1 Community interaction

5.1.1 Environmental Outcome

Residents in Roxby Downs, Andamooka and Woomera have a favourable view of ODC.

The 2022 Community Perception Survey (undertaken by Ipsos, April-June 2022) indicated that ODC is viewed favourably (trusted) by 30% of respondents in its local communities.

5.1.2 Compliance criteria

Community concerns are tracked and all reasonable complaints are addressed where reasonably practical.

ODC has a process to receive and track community enquiries, concerns, complaints and grievances through the company's complaints procedure and stakeholder engagement management plan. ODC received 8 community complaints in FY22. Complaints primarily related to the cancellation of community accessible flights and changes to the flight schedule. There were 7 community concerns raised (with potential to escalate into complaints if not resolved) regarding primarily these related to community members being unable to access BHP supplied Rapid Antigen Tests (RAT) and the same flight concerns which featured in the aforementioned complaints. The remaining concerns related to various one off incidents, including a hit and run incident with a parked car by a BHP branded vehicle. These concerns were managed with the community members/stakeholders involved.

5.1.3 Leading Indicators

None applicable.

5.1.4 Deliverables (SE 3.1)

A description of the extent to which residents in Roxby Downs, Andamooka and Woomera trust ODC to act in their best interest (calculated triennially).

A decision was made in 2021 to align all of the community research undertaken by BHP, so that every BHP host community across the globe was assessed in a uniform manner. This has resulted in some changes to the data collection mechanisms. The quarterly (Local Voices) survey has ceased. To compensate for this, the frequency of the Community Perceptions Survey has increased to biennially and additional questions were asked in the 2022 data collection which give a snapshot of community sentiment and wellbeing.

A description of the extent to which residents in Roxby Downs, Andamooka and Woomera trust ODC (calculated biennially by the Community Perception Survey) is provided below:

The 2022 Community Perception Survey showed that ODC is viewed favourably (trusted) by 31% of respondents in its local communities, this was a decrease from 50% in 2020. A decrease in trust was recorded across all BHP assets and coincides with a fall in trust recorded against other resource companies included as comparators. This survey also marks the first time that trust has been measured since BHP took the decision not to proceed with the expansion of the Olympic Dam mine in 2020, a decision which was not received favourably by the local community. The survey also showed an opportunity to establish greater trust with community, with trust among stakeholders (interviewees

who have a direct relationship with ODC and who undertook a more thorough survey) increasing from 40% in 2020 to 50% in 2022. This was underpinned by an appreciation of BHP's visibility in the local community and the consultative and practical ways in which ODC supports the local community, but coupled with concerns about communication of decisions to the community and unmet expectations of consistent behaviour and communications.

The Community Perception Survey indicated that BHP's strength was its contribution to local community, which was well recognised and demonstrated through employment and community investment. BHP's response to COVID-19 was again highlighted by respondents as an example of BHP's commitment to their community and awareness of the impact the company on local communities.

The survey also highlighted community and stakeholders' high expectations of BHP, especially when it came to communications and engagement. Respondents expect BHP to take an active role in the community that extends beyond contribution, with positive relationships a key driver of BHP's reputation.

Figure 82 shows the key unprompted concerns of community members relative to the concerns raised when the survey was conducted in 2020.

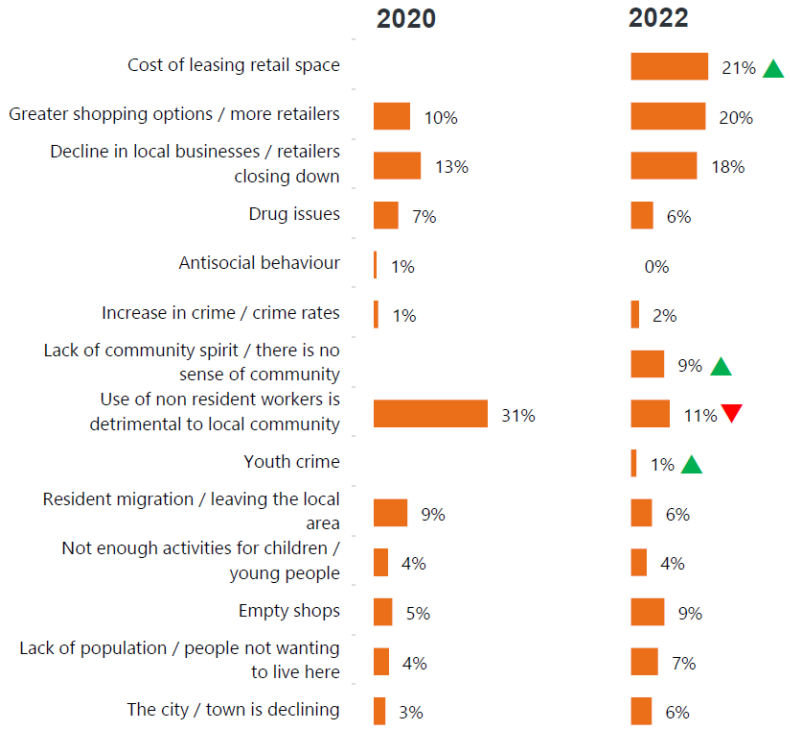


Figure 82: Community Perception Survey local concerns 2022.

5.1.5 Deliverables (SE 3.2)

A description of residents' perceptions about quality of life services and facilities, safety and social fabric in Roxby Downs, Andamooka and Woomera (reported triennially).

The survey which previously collected some of this data is no longer undertaken. However, this was replaced by an increase in frequency of the Community Perceptions Survey which, while not directly comparable, does provide an assessment of community perceptions of wellbeing indicators.

Almost half (49%) of those living in Roxby Downs, Andamooka and Woomera felt that their community is headed in the wrong direction. The communities were significantly less concerned about the health and economic impacts of COVID-19, compared to 2020. Levels of concern about the sustainability of local businesses (80% to 69%), job creation in the community (47% to 43%), and the

impact of FIFO (67% to 55%) have also decreased since 2020. Areas which were of greater concern were access to high quality health services (49% to 57%), and access to high quality education (50% to 52%).

As highlighted in Figure 83, when asked without prompt, statistically significant increases were seen in the level of concern around antisocial behaviour, crime and a lack of community spirit or sense of community. Conversely, a statistically significant shift was recorded in relation to the perception that non-resident workers were a detriment to the community.

When prompted, a significant upward shift was recorded in the percentage of the community who were concerned about the ability to access high quality health services. With all other statistically significant shifts recording reductions in concern, specifically in relation to the impacts of COVID on the town (both economically and in relation to health) and the impact of FIFO on the local town.

Prompted concerns

How concerned are you about each of the following issues in your community? (%)

'Very' + 'Extremely' concerned

	2020	2022
Sustainability of local businesses	**80%**	**70%**
Access to high quality health services	**49%**	**68%↑**
Job creation in the OD communities	**47%**	**51%**
Access to high quality education	50%	44%
Social, mental and emotional wellbeing impacts of COVID-19 on the community	40%	38%
Impact of FIFO on the local community	67%	**37%↓**
Economic impacts of COVID-19 on the community	47%	**30%↓**
Climate change	23%	29%
Fair access to water resources	36%	28%
Health impacts of COVID-19 on the community	38%	**23%↓**
Wellbeing of Indigenous Australians	24%	22%
Impacts of mining (e.g. dust, air quality)	18%	19%

Figure 83: Community Perception Survey prompted concerns 2022.

5.1.6 Targets FY22

None applicable.

5.1.7 Actions FY22

Complete and implement Olympic Dam Social Value Plan for the FY21-25 period.

Social Value Is the positive contribution BHP makes to the community, environment and society – its workforce, partners, customers, economies and communities. BHP believes we will have successfully contributed to social value when those around us feel they are better off from our presence.

Social Value is a company-wide, whole of business approach that BHP is hardwiring into its culture, decisions and actions at every level, and now forms one of the five themes of BHP's strategic framework designed to operationalise the company's new strategy.

The first Olympic Dam Social Value Plan was developed for the FY21-25 period and a full review and realignment was undertaken at the end of FY22 with an amended plan rolled out for the FY23-27 period following analysis of the most recent data assessing the needs and perceptions of primary stakeholders against the operational priorities of both Olympic Dam and BHP.

In FY22, Olympic Dam's social value priorities included focus on proactive community and stakeholder engagement, relationship building with Aboriginal Traditional Owners, progress on water stewardship and Pathway to Net Zero initiatives, strong investment in local business through BHP's Local Buy Program, and progress in supporting Aboriginal businesses.

Undertake the triennial Community Perception Survey (2020) to monitor local community perceptions of ODC, and of local services and facilities.

The biennial Community Perception Survey was undertaken between April and June 2022 to monitor local community perceptions of ODC and of local services and facilities.

Continue to undertake the CSIRO Local Voices monthly 'pulse' survey's to compare against anchor survey (from mid- 2019) to monitor local community perceptions of ODC.

With the alignment of research across BHP globally, the CSIRO Local Voices pulse surveys are no longer occurring, however the company has increased the frequency of the Community Perceptions Survey to compensate. In addition, ODC will establish (in FY23) a formal community engagement mechanism which will provide regular engagement with community representatives and the provision of measurable shifts in community sentiment

Review and update local procurement plans with targets to maximise the participation of local, regional and State businesses and employment in supplying goods and services to Olympic Dam

BHP is committed to investing with local, regional and South Australian businesses. In FY22, ODC's total spend in South Australia was $591.1M, with $238.3M spent with regional suppliers in the Roxby Downs and Upper Spencer Gulf regions (a $60.8M increase from FY21).

BHP's partnership with C-Res delivers the Local Buy Program in its key communities across Australia, which supports small businesses to secure work packages and develop relationships with BHP. In FY22, $23.97M was spent through the Local Buy Program in South Australia, exceeding the set target of $4.24M for the year.

Continue to explore opportunities to build involvement of Aboriginal people and businesses to participate and benefit from Olympic Dam.

Throughout FY22, ODC continued to explore and support opportunities to increase involvement of Aboriginal businesses with the operation.

ODC's standard operations, combined with a major smelter maintenance campaign in FY22, saw more than $20M of procurement from Aboriginal businesses.

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7 Glossary

ADU	Ammonium diuranate, commonly referred to as Yellowcake
AE	Monitoring Program – Airborne Emissions
AHD	Australian Height Datum, a measure of elevation referenced from approximate sea level
ANCOLD	Australian National Committee on Large Dams
ANZECC	Australian and New Zealand Environment and Conservation Council.
Aquifer	Porous water bearing formation of permeable rock, sand, or gravel capable of yielding significant quantities of water.
APTS	Acid Plant Tails Stack
AQMS	Air Quality Monitoring System
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
BaU	Business as Usual
Bq	Becquerel, a unit of radioactive decay
Bq/g	Becquerel per gram
$Bq/m^2/y$	Becquerels per square metre per year
Ca	Calcium
CCTV	Closed-circuit television
CAF	Cemented aggregate fill
Closure	Permanent cessation of operations at a mine or mineral processing site after completion of the decommissioning process, signified by tenement relinquishment
CO_2-e	Carbon dioxide equivalent
Cu	Copper
CMP	Calibrated Maintenance Plan
CPTu	Cone penetrometer test – undrained
CWDF	Contaminated Waste Disposal Facility
CWMP	Contaminated Waste Management Plan
DEM	Department for Energy and Mining
Domestic Water Use	Water used in the town of Roxby Downs or Olympic Dam Village

ER	Monitoring Program – Environmental Radiation
EG	Monitoring Program – Energy Use and Greenhouse Gas (GHG) Emissions
EIS	Environmental Impact Statement
EMM	Environmental Management Manual
EM Program	Environmental Management Program
EMS	Environment Management System. The part of an organisation's management system used to develop and implement its environmental policy and manage its environmental aspects (Standards Australia / Standards New Zealand 2004). Note: A management system is a set of interrelated elements used to establish policy and objectives and to achieve those objectives. A management system includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources.
Environmental Aspect	An element of the organisation's activities or products or services that can interact with the environment (Standards Australia / Standards New Zealand 2004).
Environmental Impact	Any change to the environment, whether adverse or beneficial wholly or partially resulting from an organisation's environmental aspects (Standards Australia / Standards New Zealand 2004).
EoR	Engineer of Record.
EPA	Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth).
EPMP	Environmental Protection and Management Program. Describes the environmental management and monitoring activities undertaken by BHP Olympic Dam for the purpose of quantifying any change in the extent or significance of its impacts, assessing the performance of control measures employed to limit impacts, and/or to meet legal and other obligations.
EPP 2015	Environment Protection (Water Quality) Policy 2015
EP	Evaporation Pond. A containment pond to hold liquid wastes to assist with disposal of liquor via evaporation.
FA	Monitoring Program - Fauna
FL	Monitoring Program - Flora
FRP	Fibreglass reinforced plastic – a casing material used in bore construction
FoS	Factors of Safety
FY	Financial Year
GA	Monitoring Program – Great Artesian Basin

GAB	Great Artesian Basin
GEMS	Global Event Management Solution
GIS	Geographical Information System
GHG	Greenhouse Gas
GLC	Ground Level Concentration
GW	Monitoring Program – Groundwater
g/m^3	Grams per cubic metre – a measure of dust concentration in air
Gy/h	Grays per hour – a measure of absorbed radiation dose
ha	Hectare
ICRP	International Commission on Radiological Protection
ID	EMP chapter identification
Industrial Water use	Water used in mining or mineral processing operations and excluding domestic water use
kg CO_2-e	Kilograms of carbon dioxide equivalence – a standard measure of greenhouse gas emissions
kg CO_2-e/t	Kilograms of carbon dioxide equivalence per tonne of material milled – a measure of greenhouse gas emission intensity of ODC
kL/t	Kilolitres per tonne
kt	Kilotonne
Listed Species	Those species or communities that are listed as threatened or migratory under Commonwealth and/or relevant State or Territory legislation
LEMP	Landfill Environmental Management Plan
LNAPL	Light Non-Aqueous Phase Liquid
LLRW	Low level radioactive waste
LM1	Licence to Mine
LUP	Land Use Permit
mAHD	Elevation in metres with respect to the Australian Height Datum
mg/Nm^3	Milligrams per normal cubic metre
ML	Megalitres
ML/d	Megalitres per day

MP	Monitoring Program. A document which describes the environmental monitoring activities undertaken by ODC for the purpose of quantifying any change in the extent or significance of its impacts, assessing the performance of the control measures employed to limit its impacts, and/or to meet its legal and other obligations.
Mt	Million tonnes
MSS	Main Smelter Stack
mSv	Millisieverts, a measure of equivalent radiation dose
mSv/y	Millisieverts per year, a measure of equivalent radiation dose per year
MWDP	Mine water disposal pond
NaCl	Sodium chloride (salt)
N/D	Not Determined
NEPM 2011	National Environment Protection Measure. NEPM investigation levels (Health Investigation Level Scenario D: Industrial/Commercial land use; Schedule B1 - National Environmental Protection (2011)
NGER	National Greenhouse and Energy Reporting. Federal government reporting of greenhouse gas emissions and energy use and production
NHB	Non-human biota
Nm^3	Normal metres cubed, referring to volume at standard temperature and pressure
NO_x	Oxides of nitrogen
NPW Act	National Parks and Wildlife Act 1972 (SA)
NVMP	Native Vegetation Management Program
ODC	BHP Olympic Dam Corporation Pty. Ltd. On 7 May 2021 BHP Billiton Olympic Dam Corporation Pty Ltd changed its name to **BHP Olympic Dam Corporation Pty Ltd**. The change was a name change only.
OV	Olympic Village, the accommodation camp located at Olympic Dam township
OVMS	Olympic Village Monitoring Site
Pb	Lead
^{210}Pb	A naturally occurring isotope of lead, having atomic number 82, atomic mass 210 and half-life 22.3 years
PFFF	Prohibited firefighting foam
pH	A measure of acidity and alkalinity
PM_{10}	Particulate matter with an effective aerodynamic diameter less than or equal to 10 µm

$PM_{2.5}$	Particulate matter with an effective aerodynamic diameter less than or equal to 2.5 µm
Po	Polonium
^{210}Po	A naturally occurring isotope of polonium, having atomic number 84, atomic mass 210 and half-life 138.38 day
ppm	Parts per million
P2NZ	Pathways to Net Zero, P2NZ is BHP's project to achieve and maintain net zero operational emissions by 2050.
Ra	Radium
^{226}Ra	A naturally occurring isotope of radium, having atomic number 88, atomic mass 226 and half-life 1599 years
RDMS	Roxby Downs Monitoring Site
Rehabilitation	The reclamation or repair, as far as practicable, of a facility to an appropriate or agreed state as required by law, or company self-regulation
RHDV	Rabbit Haemorrhagic Disease virus
Rn	Radon. Chemically inert radioactive gaseous element formed from the decay of ^{226}Ra as part of the ^{238}U decay chain
^{222}Rn	A naturally occurring isotope of radon, having atomic number of 86, atomic mass of 22 and half-life 3.8235 days
RRC	Resource Recovery Centre
RWMP	Radioactive Waste Management Plan
SAALLB	South Australia Arid Lands Landscape Board
SAP	Systems Applications Products
SE	Monitoring Program – Social Effects
SEB	Significant Environmental Benefit
Significant aspect	An environmental aspect that has or can have a significant environmental impact. Significance is determined by risk assessment.
Significant Impact Guidelines	Australian Government, 2013, 'Matters of National Environmental Significance: Significant impact guidelines 1.1, *Environment Protection and Biodiversity Conservation Act 1999*.
SML	Special Mining Lease
SO_2	Sulphur dioxide
SO_4	Sulphate
SW	Monitoring Program – Surface Water
SX	Solvent Extraction

t	Tonnes
TDS	Total dissolved solids
TEC	Threatened Ecological Community
TRS	Tailings Retention System. Incorporates all elements of the tailings delivery, deposition and storage system and elements associated with the collection and disposal or return of tailings liquor. The TRS includes the Tailings Storage Facilities (TSFs), Evaporation Ponds and pipe corridors including tailings delivery pipelines and liquor pipelines.
TSF	Tailings Storage Facility. Incorporates the tailings deposition and storage system, which currently comprises six storage cells.
Th	Thorium
^{230}Th	An isotope of thorium, having mass number 90 and half-life 7.54×10^4 years.
U	Uranium
USX	Uranium Solvent Extraction
^{238}U	The most common isotope of uranium, having atomic number 92, atomic mass 238 and half-life 4.46×10^9 years
µGy/h	Micro gray per hour
VWP	Vibrating Wire Piezometers. Used to measure pore water pressure.
WA	Monitoring Program – Waste
WoNS	Weeds of National Significance
WWTP	Waste Water Treatment Plant
WQ	Water Quality