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1 INTRODUCTION

Throughout the **Environmental Protection and Management Program (EPMP)** documentation, cross-references to certain commitments and government conditions have been included, appearing as a prefix with numbers following (e.g. (MC xx)). See section 1.4.2 for more details.

1.1 Scope

BHP Billiton Olympic Dam Corporation Pty Ltd (ODC) conducts underground mining activities on the **Special Mining Lease (SML)** and associated treatment, transport and infrastructure related activities to the north, south and east of Roxby Downs (ODC's Olympic Dam operations).

ODC produces refined copper cathode plus associated products of uranium oxide, gold and silver.

The scope of the EPMP (and the Environmental Management System) covers the environmental aspects of ODC within the SML and associated wellfields A and B.

1.2 Glossary and defined terms

Throughout the EPMP some terms are taken to have specific meaning. These are indicated in bold text in the documentation and are defined in the glossary in section 5. Defined terms have the same meaning wherever they appear in bold text. Some other terms and acronyms are also defined in the glossary, but do not appear in bold text.

1.3 Purpose

The EPMP comprises the following documents:

Environmental Management Manual (EMM);

Environmental Management Program (EM Program), a document that is organised and presented in distinct categories or 'EM Program IDs', each relating to different **environmental aspects** of ODC's Olympic Dam operations;

Environmental Management Program Targets, Actions and Major Changes (Annual Actions and Targets (AAT));

Monitoring Programs (MPs); and

Closure Management and Rehabilitation Plan.

The EMM provides background information, explains the environmental management system used to manage environmental risks and obligations in relation to ODC's Olympic Dam operations and explains the regulatory framework for the EPMP and how the EPMP operates (including the enforcement regime). The regulatory framework applicable to the EPMP is outlined in section 2.1.

The EM Program sets out potential significant **environmental aspects and impacts** and the processes, systems and actions used to manage them. The MPs set out how requirements of the EM Program are measured. The Closure Management and Rehabilitation Plan sets out a plan for the closure and rehabilitation of the mine.

The EPMP serves (and has been prepared and submitted for) the purposes set out in section 1.3 as follows.

1.3.1 Indenture Clause 11 Program

Clause 11 of the **Indenture** requires the submission of a programme for the protection, management and rehabilitation (if appropriate) of the environment (**Clause 11 Program**). The Environmental Management Program – document No. 49329, along with the relevant parts of the EMM, is submitted for that purpose.

1.3.2 Indenture Clause 13 Monitoring Program

Clause 13 of the Indenture requires the collection of data from a monitoring system approved by the State for collection of adequate data for the management of the use of underground water resources. Monitoring Program – Great Artesian Basin (GAB) - Document No. 2789, included in the EPMP (along with any relevant parts of this EMM) is submitted for that purpose.

1.3.3 Mining Code

Licence LM1, the **Radiation Protection and Control Act (1982)** and Clause 10 of the Indenture require compliance with the **Mining Code**. Clause 2.8 of the **Mining Code** requires that a Radioactive Waste Management Plan (RWMP) be presented for approval before commencement of any stage of an operation. The RWMP must undergo regular review and re-approval from time to time. The EPMP incorporates the RWMP and therefore there is no standalone RWMP. The RWMP comprises only the provisions of the EPMP that are identified in Table 7.1 (along with any relevant parts of this EMM) (MC 2.3.1, 2.3.4, 2.8.1).

1.3.4 Other information

The EPMP also serves the following purposes:

- To consolidate the requirements of various other licences, approvals and obligations (including, for example, requirements of EPA South Australian (SA) Licences), and ODC internal requirements.
- To describe how the environmental requirements of BHP's Health, Safety, and Environment (HSE) Management System (including the Environmental Management System) apply and are incorporated into ODC's operations at Olympic Dam.
- To serve as a site standard that contributes to ODC's minimum commitment to environmental management in accordance with AS/NZS ISO 14001:2015 Environmental Management Systems – requirements with guidance for use (Standards Australia 2015) (including, for example, the information contained in sections 3.5 and 4 and Appendices E and F of the EMM).

This information is included in the EPMP for information purposes only and can change from time to time without notice. The information does not form part of the plans and programs referred to in sections 1.3 and 1.4.1.

1.3.5 Term

The EPMP has no set term or expiry date.

1.4 How to use the EPMP

1.4.1 EPMP structure

The EPMP consists of a number of documents which form a portion of the **Environmental Management System (EMS)** requirements. The EMS is described in further detail in section 4 below. A brief summary of each document within the EPMP, and reference to further information, is shown in Table 1.1.

Table 1.1: EPMP structure

Document	Content summary	Further information
EMM	<ul style="list-style-type: none"> • 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. 	This document
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 the prioritised aspects and impacts.	<ul style="list-style-type: none"> • section 3.5.2 • section 4.3.4 • EM Program
Annual Actions and Targets (AAT)	Provides annual targets and actions for the EM Program, and outlines significant changes to the previous version of the EPMP	<ul style="list-style-type: none"> • EM Program • AAT

Document	Content summary	Further information
MP(s)	Address assessment and performance of the EM Program's outcomes, compliance criteria, control mechanisms and legal and other requirements.	<ul style="list-style-type: none"> section 3.5.2 section 4.5.1 MP(s)
Closure Management 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.	MCRP

1.4.2 Referencing of conditions, commitments and management measures

Cross-referencing has been provided throughout the EPMP to identify where it addresses:

The requirements of the **Mining Code**; and

The requirements of Environment Protection Authority (SA) Licences and Exemptions.

Where a section of the EPMP addresses a relevant obligation, a cross-reference appears in the form shown in Table 1.2. The cross-reference table provided in Appendix A of this document provides a guide to the section of the EPMP where a specific condition is addressed. Any other content not specified in Appendix A (and the EPMP) as relating to a legal obligation does not form part of the program submitted for the purpose of satisfying those obligations.

Table 1.2: Conditions cross-reference types

Cross-reference	Reference type	Reference table
(MC xx) e.g. (MC 2.8.1)	Requirement of the nominated section of the Mining Code	Appendix A, Table 7.1
(DEIS xx) e.g. (DEIS 17.5.3)	Commitment made in the nominated section of the 2009 Draft Environmental Impact Statement	NA
(SEIS xx) e.g. (SEIS 18.2)	Commitment made in the nominated section of the 2011 Supplementary Environmental Impact Statement	NA
(EPA xxxxx.xxx-xxx) e.g. (EPA 1301.330-168)	Conditions in the specified EPA Licence or Exemption clause	Appendix B, Table 8.1

2 REGULATORY FRAMEWORK

2.1 Key legal requirements

The EPMP has been prepared within the regulatory framework and to comply with certain key legal requirements, as described below in this section 2.1. EMS key legal requirements and other obligations are described in further detail in section 4.3.2 below.

2.1.1 Indenture

2.1.1.1 Background

The **Indenture** applies to and governs ODCs operations. The **Indenture** was ratified and approved, and its implementation by the State authorised, by the **Ratification Act**. The **Indenture** has been amended several times since it was originally signed in 1982.

2.1.1.2 Ratification Act

The **Ratification Act** authorises the implementation of the **Indenture** (including the requirement that a **Clause 11 Program** approved pursuant to clause 11 of the **Indenture** be implemented), and the State and its authorities must do all things necessary to give full effect to the **Indenture**.

The **Ratification Act** also modifies State laws to the extent required to give effect to the **Indenture**. If there is any inconsistency between the **Indenture** and other State laws, including the **Mining Act 1971** (SA), the provisions of the **Indenture** prevail to the extent of the inconsistency.

2.1.1.3 Indenture provisions

The following provisions of the **Indenture** are relevant to this EMM (and the EPMP):

- Clause 10 of the **Indenture**. This clause requires compliance with the various Codes of Practice in relation to radiation protection, which have been issued by the appropriate Commonwealth Government department (now ARPANSA). Additionally, Codes of Practice, as issued by the IAEA and the published recommendations of the ICRP are to be complied with.

One of those codes, the **Mining Code**, outlines specific requirements for environmental radiation and radioactive waste management, which have been incorporated into the wider EPMP. Appendix A contains a cross-reference of the requirements in the **Mining Code** and the section of ODC's environmental management documentation where those requirements are addressed.

- Clause 11 of the **Indenture**. This clause requires ODC to prepare and implement a program for the protection, management and rehabilitation (if appropriate) of the environment (**Clause 11 Program**) in respect of the Initial Project and Subsequent Projects (as those terms are defined in the Indenture), including arrangements with respect to monitoring and the study of sample areas to ascertain the effectiveness of the program.

The EPMP includes a program prepared to comply with clause 11. The **Clause 11 Program** must be submitted to the Indenture Minister for approval. The Indenture Minister may approve, approve with conditions, vary as considered reasonable, or refuse to approve the program.

ODC must also prepare an annual EPMP report to show compliance with the **Clause 11 Program**.

The procedures for review, amendment and enforcement set out in sections 2.3 and 2.5 below apply in connection with the Clause 11 Program in this EPMP.

- Clause 13 of the Indenture. This clause sets out a regime to meet the water requirements for ODC. The Indenture gives ODC the right to explore for underground water and, if a source is located, apply for a Special Water Licence to take water from that source. The State has granted two Special Water Licences to ODC under these provisions (SWL and SWL No. 2, related to Wellfields B and A, respectively), pursuant to which ODC extracts water from the Great Artesian Basin (GAB).

Clause 13 requires ODC to design, install and maintain an appropriate monitoring system approved by the State to collect data for the management of the use of underground water resources, including collecting data in relation to total abstraction on an individual well and wellfield basis, water pressures and levels in all wells and at the boundary of the wellfields designated areas and water qualities. ODC must submit to the State an annual report, prepared by a competent hydrologist or hydrogeologist, about the use of aquifers, aquifer response and future water exploration, development, production and management.

2.1.2 Conditions of radiation licence

(MC 2.8.1, 2.9.1, 2.9.2, 2.9.3, 2.9.4, 2.9.5, 2.9.6, 2.10.1(c), 2.10.1(e), 2.10.1(g))

ODC has been granted Licence LM1 under the Radiation Protection and Control Act (1982) (Radiation Licence). Compliance with the Mining Code is a condition of the Radiation Licence.

Under the Mining Code, ODC is required to seek formal authorisations for specific stages of the operation (i.e. construction, operation and closure), based on a regularly reviewed and approved RWMP which (as noted in section 1.3.3) is integrated into the overall EPMP. ODC is also required to ensure that the appropriate authority be kept informed of proposed changes to the operation to which the Mining Code applies, and seek approval and authorisation for changes.

2.2 Compliance with routine reporting obligations

Certain reporting obligations (outlined in section 2.1) under the **Indenture**, the Licence LM1 and EPA licences are fulfilled by ODC preparing and submitting the documents in Table 2.1.

Table 2.1: Routine reporting obligations

Document	Document component	Key legal requirement satisfied
Annual EPMP Report	Stand alone	<ul style="list-style-type: none"> • Indenture (clause 11(6))

Document	Document component	Key legal requirement satisfied
Great Artesian Basin Wellfields Report (submitted annually)	Stand alone	<ul style="list-style-type: none"> • Indenture (clause 13)
LM1 Annual Report (in part)	Stand alone	<ul style="list-style-type: none"> • Licence LM1 reporting requirements.
Quarterly notification of emission events EPA smelter report	Stand alone	<ul style="list-style-type: none"> • EPA Licence No. 1301

2.3 Amendments to the EPMP

ODC is able to amend the provisions of this EPMP submitted for the purposes specified in sections 1.3.1, 1.3.2 and 1.3.3 at any time by submission to the Indenture Minister of an application to amend the EPMP together with all monitoring data required to enable the Indenture Minister to make a decision on the application. Following approval by the Indenture Minister, the EPMP provisions shall be amended as approved.

The Indenture Minister provides a blanket approval in accordance with recommendations made by the Department for Energy and Mining (DEM) (Ref 98/24441, April 2002) of any amendments to **Clause 11 Programs** that do not diminish the effectiveness of the program and which are set out in an application made by ODC to, and approved by the Chief Inspector of Mines – DEM. Following approval of the amendments by the Chief Inspector of Mines, the EPMP provisions shall be amended as approved. In the event that no approval is received within two months of such an application, ODC may make an application in respect of the same subject matter to the Indenture Minister.

2.4 Environmental outcomes and criteria

2.4.1 Basis of environmental outcomes and criteria for measurement

ODC has included a number of **environmental outcomes** and **compliance criteria** in the EPMP. The purpose of including **compliance criteria** is to assist ODC to demonstrate, to government departments and the Indenture Minister, compliance with the **environmental outcomes** specified in the EPMP.

The **environmental outcomes** and **compliance criteria** in the EPMP were developed for the key **environmental aspects and impacts** which were prioritised during the environmental risk assessment process (see section 4.3.1). In preparing the **environmental outcomes** and **compliance criteria** ODC considered the Olympic Dam environment policy, legal and other requirements (including the Guidelines for miners: preparation of a mining lease proposal or mining and rehabilitation program (MARP) in South Australia published by DMITRE 2009), significant **environmental aspects**, technological options, financial, operational and business requirements, past environmental performance and the views of interested stakeholders.

Risks which had a very low probability, or were trivial in consequence without the use of specialised control measures, were not designated a specific **environmental outcome** or **compliance criteria**.

A comprehensive review of the **environmental outcomes** and **compliance criteria** is conducted during the triennial review of the EPMP. Minor reviews are conducted annually and, where necessary, an amendment application is submitted in accordance with the process outlined above.

Environmental outcomes represent a commitment on the extent to which the operation will seek to limit **environmental impact** (natural, social and economic). The **environmental outcomes** are intended to be reasonable and realistically achievable, acceptable to affected parties and to meet other applicable legislative requirements. **Environmental outcomes** are accompanied by **compliance criteria**. The criteria are described in terms that are specific, measurable and clearly enable confirmation that the **environmental outcomes** have been achieved.

It is intended that the compliance by ODC with the regulatory framework set out above be assessed according to the **compliance criteria**. Details on how **compliance criteria** are measured (such as location, frequency and methodology) is included in the MPs.

The **environmental outcomes** and **compliance criteria** for Olympic Dam are provided in Appendix C.

2.4.2 Leading indicator and target criteria

Leading indicator and **target criteria** are provided, where appropriate, to support the **environmental outcomes** and **compliance criteria**.

2.4.2.1 Leading indicator criteria

Where advance warning is required that a management control may be failing and there is a subsequent risk that a **compliance criteria** may not be met, **leading indicator** criteria are given. **Leading indicators** are not required for all **environmental outcomes** and **compliance criteria**, but are provided in circumstances where early warning is necessary and possible.

2.4.2.2 Target criteria

The EPMP identifies **target criteria** which reflect a level of **environmental impact** that is as low as reasonably achievable. In addition to those **target criteria**, the EPMP also includes targets to indicate a long-term aspirational goal, or an interim target leading to a long-term goal.

2.5 Enforcement process (Indenture and Mining Code)

The process set out in this section applies to the provisions of this EPMP submitted for the purposes specified in sections 1.3.1, 1.3.2 and 1.3.3.

In the event of a sudden and unexpected material detriment to the environment occurring as a result of ODC's operations under the **Indenture**; ODC is required under clause 11(7) of the **Indenture** to, as soon as reasonably practicable, prepare a programme for the mitigation of such detriment.

The **Mitigation Plan** must be submitted to the Indenture Minister for approval and clauses 11(2) to 11(5) of the Indenture will apply to the plan (with any necessary modifications).

2.6 ALARA and best practicable technology

(MC 2.10.1(b))

The OD HSE philosophy of 'zero harm' is consistent with the broad concepts of **BPT** and **ALARA**.

BPT usually refers to technology which minimises risks to people and the environment, now and in the future, which can reasonably be implemented taking social and economic factors into account.

ODC utilises leading design, engineering and construction techniques to ensure that operations and facilities are designed and built to appropriate standards. In this regard, ODC undertakes regular reviews of the available and emerging technology and, where appropriate, implements that technology.

The **ALARA** principle is more specific, applying to radiation protection. It is one part of the International Commission on Radiological Protection (ICRP) system of dose limitation, which in turn forms the basis of ODC's approach to radiation protection. Radiation exposures to workers, the public and the environment are maintained 'as low as reasonably achievable', with social and economic factors taken into account.

ODC is developing processes to ensure that **ALARA** studies (also known as optimisation studies) are conducted on new projects.

3 GENERAL BACKGROUND INFORMATION

3.1 History

WMC Resources Limited began exploring South Australia for copper deposits in 1961. In 1972, a review of historical geological data combined with various geological models led WMC geologists to focus on the region west of Lake Torrens. This led to the discovery of a prospective ore deposit in 1977.

Because of the likely cost of developing that deposit, WMC Resources Limited entered into a joint venture with the BP Group in July 1979. Production at Olympic Dam commenced in 1988 at a rate of 45,000 tonnes per annum (tpa) of refined copper plus associated products.

In 1993, WMC (Olympic Dam Corporation) Pty Ltd acquired the interest held by the BP Group. In June 2005 BHP acquired WMC Resources and WMC (Olympic Dam Corporation) Pty Ltd became BHP Billiton Olympic Dam Corporation Pty Ltd.

In 1997, after the release of an Environmental Impact Statement, government approval was obtained to increase copper production at Olympic Dam to up to 350,000 tpa.

Approval was obtained from the South Australian and Commonwealth governments in October 2011 to further expand the mine to up to 750,000 tpa through the construction of an open pit mine, additional processing facilities and associated infrastructure.

In August 2012 BHP announced that it would investigate an alternative less capital intensive design of the Olympic Dam open-pit expansion, involving new technologies, to substantially improve the economics of the project.

3.2 Location

Olympic Dam is located approximately 560 kilometres (km) north-north-west of Adelaide (Figure 3-1) and 16 km north of the Roxby Downs township in the far north of South Australia.



Figure 3-1: Olympic Dam location

3.3 Olympic Dam region operating environment

(MC 2.8.2(b))

3.3.1 Climate

The climate is arid, with median annual rainfall of 160 millimetres (mm) and mean annual evaporation of 2,800 mm. The temperature ranges from cool winters, with mean minima and maxima of 5 °C and 19 °C respectively, to hot summers with mean minima and maxima of 20 °C and 35 °C respectively.

3.3.2 Vegetation

The vegetation in the region is determined by the terrain structure and climate. The terrain consists of low parallel dunes with an east-west orientation. The dunes may be close together or separated by swales which vary in width, the narrowest in the southern parts of the Roxby Downs Municipality and the broadest north of the mine.

Vegetation on the dunes consists of low woodlands or tall shrublands of Northern Cypress Pine (***Callitris glaucophylla***), Horse Mulga (***Acacia ramulosa***), Narrow Leaved Hopbush (***Dodonaea viscosa***) and Sandhill Wattle (***Acacia ligulata***). The understorey consists mainly of grasses and ephemeral herbs. The pines are most common in the vicinity of Roxby Downs, becoming less common north of Olympic Village.

Swale vegetation is dominated by chenopod shrublands of Bladder Saltbush (***Atriplex vesicaria***) and Low Bluebush (***Maireana astrotricha***), with associated short-lived chenopods, grasses and ephemeral herbs. Some swales also contain low woodlands of Western Myall (***Acacia papyrocarpa***), with either a chenopod or grass understorey. Mulga (***Acacia aneura***) is common at the base of dunes and also on low sand rises, usually with a grassy or herbaceous understorey.

The broad swales north of the mine are dominated by Bladder Saltbush, Glasswort (***Sclerostegia tenuis***) and Bristly Sea-heath (***Frankenia serpyllifolia***) with an understorey of grasses and ephemeral herbs.

3.3.3 Fauna

The mosaic of dunes and interdunal swales, woodland, shrubland, grassland and bare ground habitats in the Olympic Dam region supports a diverse fauna community.

Over 220 bird species have been recorded within the Olympic Dam region. No resident species are considered to be of major conservation significance. Many of the vagrant and migratory species, which have been classified by ODC as at-risk, have been recorded in the region. These include the Plains-wanderer (***Pedionomus torquatus***), Australian Bustard (***Ardeotis australis***), Flock Bronzewing (***Phaps histrionica***), Freckled Duck (***Stictonetta naevosa***) and Major Mitchell Cockatoo (***Cacatua leadbeateri***).

The local reptile community is diverse by world standards, although the regional pool of 47 species is less than that found in some other Australian arid zone habitats. Several large reptile species, including three venomous elapid snakes, are conspicuous elements of the local fauna.

By contrast, most of the 29 native mammal species recorded in the region are small and nocturnal and hence rarely seen. The Desert Mouse (***Pseudomys desertor***), which has been trapped on the SML, was once thought to be rare in South Australia but recent studies suggest that the rodent is widespread and secure. Notably, the Plains Rat (***Pseudomys australis***) and the Hopping Mouse (***Notomys alexis***) were recorded within the SML for the first time in 1998. Red Kangaroos (***Macropus rufus***) are common throughout the region. Rabbits (***Oryctolagus cuniculus***), cats (***Felis catus***) and foxes (***Vulpes vulpes***) are also common, and all have a significant adverse impact on the local ecosystem.

Trilling Frogs (***Neobatrachus centralis***) are the most common local vertebrate, but only surface following heavy rains.

3.3.4 Hydrogeology

There are two important groundwater systems in the Stuart Shelf: the Andamooka Limestone aquifer and the Tent Hill aquifer. These form the overlying cover sequence at Olympic Dam and consist of Cambrian shales and limestones and Late Proterozoic quartzite, sandstone and shale members, mostly of very low permeability.

The upper Andamooka Limestone is the shallowest of the aquifers in the Stuart Shelf and forms the regional 'water table' aquifer north of Olympic Dam. The water table typically occurs about 50 metres

(m) below ground (i.e. 50 m Australian Height Datum (mAHD)), with groundwater in the aquifer moving from west of the Stuart Shelf to the northern end of Lake Torrens, where the water table typically occurs less than 10 m below ground. Groundwater salinity is typically in the range of 20,000 to 60,000 milligrams per litre (mg/L) on the SML, increasing to as much as 200,000 mg/L closer to Lake Torrens. For comparison, seawater salinity is generally around 35,000 mg/L.

The Tent Hill aquifer is extensive and forms the most important aquifer over the southern portion of the Stuart Shelf, where the Andamooka Limestone aquifer is either very thin or absent. It includes the lower parts of the Arcoona Quartzite and the Corraberra Sandstone units of the Tent Hill Formation and is therefore sometimes referred to as the Arcoona Quartzite aquifer or the Corraberra Sandstone aquifer. The aquifer occurrences reduce north of the SML due to a deepening of the unit and reduction in permeability.

At Olympic Dam, this aquifer typically occurs 160 to 200 m below ground level (about -60 mAHD to -100 mAHD). The depth increases moderately to the north, west and south, with the base of the unit occurring around 225m below ground level (-125 mAHD) near the existing underground mine and more than 400 m below ground level (-300 mAHD) north of Olympic Dam.

Groundwater salinity in the Tent Hill aquifer is generally higher than in the Andamooka Limestone, with reported concentrations ranging from about 35,000 to more than 100,000 mg/L in the vicinity of Olympic Dam, and ranging to around 200,000 mg/L closer to Lake Torrens.

The upper section of the Arcoona Quartzite unit forms an aquitard. This is a low-permeability layer that acts to restrict the movement of groundwater between the Andamooka Limestone aquifer and the Tent Hill aquifer.

3.3.5 Radiological environment

(MC 2.8.2(b))

Radionuclides occur naturally in the environment and have been extensively monitored in the Olympic Dam region since commencement of operations in the early 1980s.

To date, a significant quantity of data and information on environmental radiation has been collected and reported for ODC. Much of the data is summarised in the Olympic Dam Expansion Draft Environmental Impact Statement 2009 (DEIS) and Olympic Dam Expansion Supplementary Environmental Impact Statement 2011 (SEIS) for the Olympic Dam Expansion, with other routine results reported to government in annual Environmental Management and Monitoring Reports and the Radiation Protection and Control Act Licence Annual Report.

Overall, radon and radionuclide concentrations have increased above natural background levels close to the operation, and the impact of those increases has been shown to be negligible.

A summary of the DEIS and SEIS information is provided below.

3.3.5.1 Radon in air

Results of routine monitoring indicate that environmental radon concentrations, on average, range from a few becquerel's per cubic metre (Bq/m³) to 55 Bq/m³ (for passive monitors) and 30 Bq/m³ (for active monitors). An extensive regional study using passive monitors, conducted in 2009 and 2010 for the SEIS, showed that radon concentrations at locations very close to the existing operations were elevated, falling to regional background levels (approximately 25 Bq/m³) at distances beyond 4 km from the operations.

3.3.5.2 Radionuclides in airborne dust

Pre-operational annual dust mass concentrations (in µg/m³) and ²³⁸U and ²²⁶Ra concentrations (in micro Becquerel per cubic metre (µBq/m³)) (for the years 1982 and 1983), were measured by high-volume dust samplers. These results are the most representative of pre-existing background levels.

More recent high-volume samples from Roxby Downs and Olympic Village show that the concentration of dust and radionuclides have remained consistent with the earlier sampling results. Dust concentrations are 25 to 70 µg/m³, with ²³⁸U and ²²⁶Ra concentrations of 1 to 4 and 1 to 7.5 µBq/m³ respectively.

3.3.5.3 Radionuclides in flora

Background concentrations from pre-operational monitoring showed that there was a measurable difference between the radionuclide concentrations in species growing in sand compared to those

growing on swales for ^{238}U , ^{230}Th and ^{226}Ra . In addition, concentrations of ^{210}Pb were elevated compared to the other long lived radionuclides in flora.

The most recent radionuclide sampling in flora was conducted in 2009. Mulga (*Acacia aneura*) was selected as the most representative species. The analysis showed no significant differences in radionuclide concentration in Mulga with direction from Olympic Dam and that radionuclide concentrations in vegetation are not elevated at distances greater than 5 km from the operation. There are no detectable impacts from the elevated radionuclide concentrations on the representative species found close to the operations.

3.3.5.4 Radionuclides in fauna

Fauna monitoring was initially conducted with the intent of assessing potential **members of the public** doses from consumption of animals. Subsequent assessment has determined that this human exposure pathway is negligible and therefore monitoring for this purpose was discontinued.

In 2006, ODC undertook a fauna sampling survey, specifically examining radionuclide concentrations in kangaroos from within the SML and at a distance from the operation. Overall, the study showed no statistical difference in radionuclide concentrations between the two groups of animals tested.

ODC has moved to assessing impacts to fauna (and flora) as recommended by the ICRP (ICRP2008) through the ERICA assessment system (ERICA Program 2007).

3.3.5.5 Radionuclides in soils

Early pre-operational data reported radionuclide concentrations for different soil types and showed that levels were generally higher in clayey materials (such as in swales and claypans), and were consistent with world averages (UNSCEAR 2000). The results also showed no significant difference between surface and sub-surface soils.

Later studies enabled comparisons between soils close to the mine and at distance and showed that over time, radionuclide levels in soils have not changed markedly. Generally, radionuclide levels in soils close to the operation (i.e. within the SML) are higher than the levels outside the SML, although the increases are not uniform and in some cases the levels are higher in samples from outside the SML. Additionally, there does not appear to be a trend of increasing concentration levels over time, compared to the earlier results.

3.3.5.6 Radionuclides in groundwater

Background radionuclide concentrations of groundwater in the two local aquifers are variable by up to an order of magnitude. It should be noted that the depth (>50 m) and high salinity (>25,000 mg/L TDS) of the local groundwater prevent it from being consumed, thus not posing a health hazard to people or fauna. There are no third party groundwater bores within 45 km of the operation.

Monitoring associated with seepage from the base of the existing TSF and recent analysis shows that the contaminants (the radionuclides and the metals in the seepage) are precipitated within a few metres of the base. This is due to the neutralising effect of the underlying sediments on the acid seepage.

In 2016, the range and average radionuclide concentrations in monitored groundwater were:

^{238}U 0.28 to 6.2 (average 1.09) Bq/l;

^{226}Ra 0.18 to 3.4 (average 1.4) Bq/l.

3.3.5.7 Radionuclides in surface water

There is no naturally occurring permanent free standing surface water in the region of Olympic Dam, however, after rainfall, claypans hold runoff water and are sampled opportunistically. Results from these samples have been highly variable.

3.4 Process overview

(MC 2.8.2(a))

The operations at Olympic Dam comprise an underground mine, surface quarrying, a mineral processing plant and associated infrastructure located within the SML area of approximately 180 square kilometres (km²).

Personnel access to the underground mine is through inclined service tunnels (declines).

The ore minerals consist mainly of fine-grained copper sulphide, uranium, gold, silver and rare earths, hosted in a haematite-rich breccia complex, located beneath about 350 m of unmineralised sedimentary rocks. The primary extraction method is a variant of sublevel (underground) open stoping, in which blocks of mineralised ore are systematically blasted and the ore recovered for crushing below ground. The crushed ore is then hoisted up the Clark shaft (one of three at site) or hauled up one of the declines to the surface stockpile.

Following extraction, stopes are backfilled with a cemented aggregate of crushed mullock (waste rock) or crushed dolomite/limestone sourced from a surface backfill quarry (and potentially from open-pit operations), deslimed process tailings, cement and pulverised fuel ash from the Port Augusta Power Station. Over 30 raise bores are used to ventilate the underground workings.

The surface backfill quarry operation, within the Backfill Quarry Reserve (334.53 ha), was redesigned in March 2011 to include a sump, a 500 m blasting offset distance to the TSF and a revised staged approach to quarrying. The revised approach increases the tonnages quarried to 103 million tonnes of limestone over the remaining four stages.

Above ground, the processing facilities (collectively referred to as the metallurgical plant) comprise a copper concentrator (including grinding mills), hydrometallurgical plant, uranium calciners, a copper smelter, sulphuric acid plant, copper refinery, and gold and silver refinery. A simplified ore processing flow diagram for current operations is provided in Figure 3-2.

Copper is recovered primarily by flotation of copper sulphide from a slurry of finely crushed ore, after which the copper concentrate is smelted to produce blister copper, and is converted by electrorefining to high-purity copper. Wastes generated during electrorefining are treated to recover gold and silver. After treatment by flotation, the flotation tails are leached with sulphuric acid to dissolve the uranium and any remaining copper. The leach liquor is then processed in the solvent extraction plant to separate the residual copper and uranium streams. This residual copper is recovered by electrowinning, and the uranium is converted to ammonium diuranate (yellowcake), which is calcined to produce a uranium oxide concentrate (UOC).

The mining and processing operations produce a series of waste streams, which are managed in separate dedicated facilities. These include a storage facility for the tailings solids, evaporation ponds for tailings liquor, a disposal pond for mine drainage water, a recycling centre and solids landfill, and sewage treatment facilities. A contaminated waste disposal facility exists for equipment that is unable to be disposed of in existing on-site waste storage facilities or cleaned for offsite recycling. The plant also includes comprehensive air pollution control equipment. Airborne emissions are monitored and managed with the aim of keeping them within statutory limits, and minimising **environmental impact**.

The operation currently produces approximately 10 Mtpa of tailings containing low levels of radioactivity which is disposed of in the existing tailings storage facility (TSF) cells.

A small amount of **low-level radioactive waste** is produced by the on-site analytical laboratory and the uranium product packaging area (<10 cubic metres per year (m³/y)) and this currently has approval to be disposed of in the TSF.

Spillages of radioactive process material are generally reclaimed and recycled through the processing circuit. Where this is not possible, the spilt material is disposed of in the TSF.

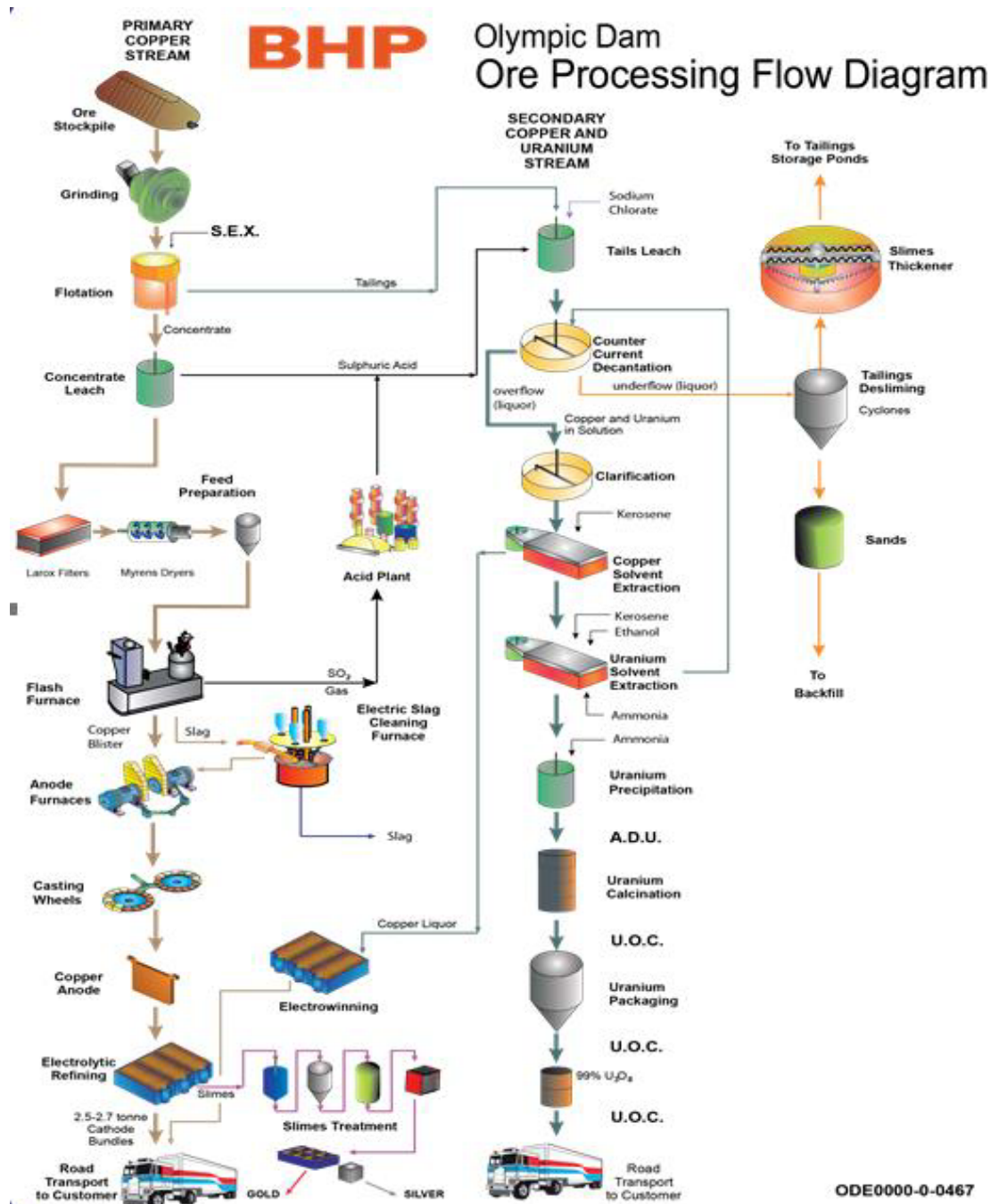


Figure 3-2: Simplified Ore Processing Flow Diagram for the Existing Operation

3.5 Environmental management system overview

3.5.1 ODC Environmental Management System

The overall structure of the ODC EMS and hierarchy of documents is illustrated in Figure 3-3. The scope of the EPMP is defined within the central, orange portion of the diagram.

Within BHP, the management of environment and community is guided by the **BHP Charter** and Group Level 'Our Requirements' Documents. The 'Our Requirements' Documents cover the entire lifecycle of operations, from exploration and planning through to operation and closure (decommissioning, remediation and rehabilitation).

The relevant objectives of 'Our Requirements' are to:

1. Support the implementation of the Charter and the Guide to Business Conduct across BHP;
2. Provide a risk-based environment and community (EC) management system framework, consistent with:

- international policies, standards and management practices to which BHP has committed, including the:
 - United Nations Global Compact;
 - United Nations Universal Declaration of Human Rights;
 - International Council on Mining and Metals (ICMM) Sustainable Development Framework;
 - World Bank Operational Directive on Involuntary Resettlement;
 - US-UK Voluntary Principles on Security and Human Rights;
 - recommendations of the International Commission on Radiological Protection (specifically the system of dose limitation);
 - negotiated agreements with local communities; and
 - other regional commitments;

Set out and formalise the expectations for progressive development and implementation of more specific and detailed EC management systems at all levels of BHP;

Provide auditable criteria, against which EC management systems across BHP can be measured; and

Drive continual improvement towards leading industry practice.

Guided by the Charter and 'Our Requirements' Documents, the EMS (and EPMP) at Olympic Dam are implemented through a four-tiered approach. These consist of an overarching policy (in the form of the environment policy), followed by the standards and procedures (the EMM, EM Program and MPs) that together make up the EPMP. Further information about specific elements of the EMS is given in section 3.5.2.



Figure 3-3: EMS and hierarchy of documents

3.5.2 ISO 14001 - Environmental Management System

This EMM provides an overview of the EMS at Olympic Dam and provides guidance and reference to the specific components of the EMS required to be followed and implemented.

The EMS structure consists of 17 elements, which are utilised as headings within this document to describe the activities and processes which Olympic Dam implements to meet the requirements of ISO 14001:2015. Appendix D illustrates ISO 14001 elements and corresponding key Olympic Dam documentation.

Figure 3-4 summarises the process by which the EM Program, MPs and Environmental Improvement Plans (EIPs) are developed. Where appropriate, these activities illustrate the corresponding ISO 14001:2015 element numbers.

The Interested Parties and Obligations Registers are maintained and used as input to the Environmental Risk Register (**aspects and impacts**). This is then used to focus on those **environmental aspects** which have the greatest risk of causing **environmental impact**, through a process of risk assessment and prioritisation of environmental issues. The Environmental Risk Register also documents the controls that have been implemented against the mitigation hierarchy (avoid, minimise and rehabilitate environmental impacts, prior to applying compensatory actions) to manage impacts to land and biodiversity.

The assessment of risk is standardised in accordance with the BHP Risk Management standard, using a risk rating methodology. The methodology is a structured and consistent approach to risk management, aligning strategy, processes, people, technology and knowledge for the purpose of evaluating and managing the uncertainties faced in creating shareholder value.

The process of producing a prioritised list of **environmental risks (aspects and impacts)** is carried out annually, and is followed by the development or review of outcomes, criteria and targets (see section 2.4), and the EM Program (see section 4.3.4). The prioritised list is used to establish the scope of the EM Program and to ensure there is a documented process for managing the prioritised risks. Other identified but un-prioritised risks can be managed by standard systems.

Where significant **aspects and impacts** are deemed to have inadequate operational or management control, or where controls are being implemented over longer timeframes, continuous improvement and development opportunities and one-year action plans and **improvement targets** are identified and detailed within the AAT. The detailed resources, timeframes and responsibilities for each of the items in the action plan are incorporated into area Environmental Improvement Plans (EIPs) (see section 4.5.2). These EIPs are site-based documents.

MPs (see section 4.5.1) relevant to assessing the performance of the EM Programs, control mechanisms and legal and other requirements are also reviewed annually. Other monitoring procedures are reviewed as required by the site's document management system.

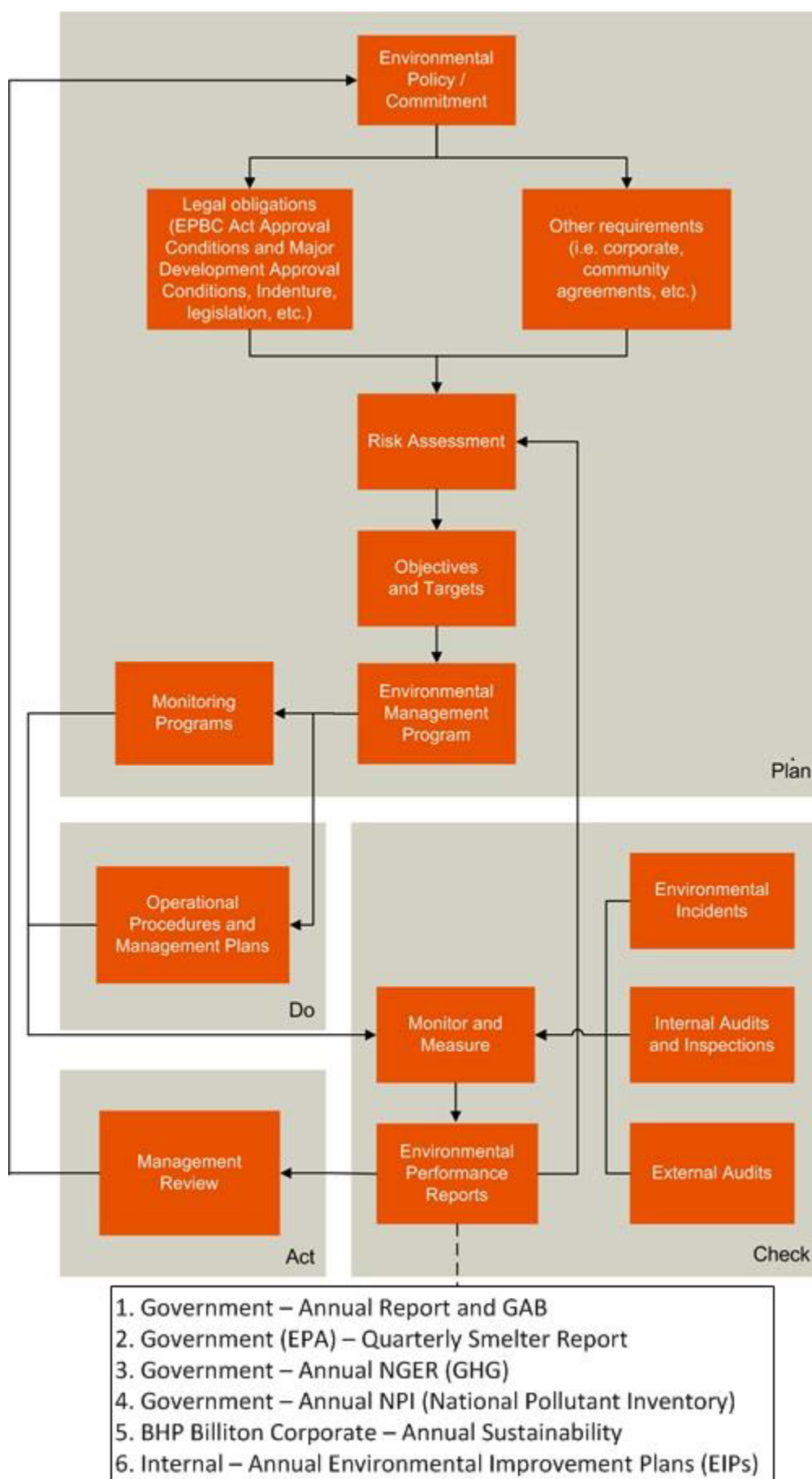


Figure 3-4: Olympic Dam EMS Model

4 ENVIRONMENTAL MANAGEMENT SYSTEM REQUIREMENTS

4.1 General requirements

Elements of the Olympic Dam EMS are described in the following sections.

4.2 Policy

Olympic Dam has a site environment policy, which reinforces management's commitment to the environment. This commitment is displayed at key locations and is accessible to all employees via the intranet. The policy signed by the Asset President is available at Appendix F.

4.3 Planning

4.3.1 Environmental aspects and impacts

ODC has a procedure for the identification and prioritisation of **environmental risks (aspects and impacts)** related to its activities (refer to Identification and Prioritisation of Environmental Risks – Document No. 2763). The significant **environmental risks (aspects and impacts)** are recorded in the Olympic Dam Environmental Risk Register. As a part of this process controls are identified and documented using the mitigation hierarchy (avoid, minimise and rehabilitate environmental impacts, prior to applying compensatory actions). These controls are then used to manage impacts to land and biodiversity. In consideration of the life cycle perspective, all ODC products are supplied with a materials safety data sheet (MSDS) that provides guidance on their safe and environmentally responsible use and disposal.

Major reviews of the Environmental Risk Register are carried out prior to major review of the EPMP. Other reviews of the register are undertaken outside this schedule to identify changes in risk that may have occurred (typically annually). Annual reviews take into account such changes as new plant and equipment, monitoring results and the performance of controls (environmental performance). If changes are required they are incorporated into the reviewed EPMP document and submitted for approval through an amendment application to government.

Identification, management and communication with contractors that undertake on-site activities that may pose an HSE risk are managed in accordance with BHP processes and procedures.

4.3.2 Legal and other obligations

Legal and other obligations are taken into consideration when identifying and prioritising significant **environmental aspects and impacts**, preceding the development of the EPMP (described in section 2). Non-compliances are recorded, addressed and managed through a corporate incident tracking system (ITS). Where incidents that may potentially be required to be reported externally occur, they are managed in accordance with a site procedure (External Reporting of Environmental Incidents – Document No. 3913) and HSE 'Our Requirements' Documents.

4.3.3 Site environmental outcomes and targets

A comprehensive review of site **environmental outcomes** and targets is conducted during the review of the EPMP and minor reviews are conducted annually. Outcomes and **compliance criteria** are set as described in section 2.4 of this manual. Targets are formulated for departments/functions appropriate to the significant aspect and included in the AAT, with performance reported in the annual EPMP report.

The EPMP is distributed internally to those levels and functions within the site that are responsible for the outcomes, targets, management controls, continuous improvement opportunities and action plans.

4.3.4 EM Program and EM Program IDs

Significant **environmental impacts** that have been identified through the Environmental Risk Register, or through legal requirements, are addressed by the EM Program and its EM Program IDs. Continuous improvement opportunities are identified in the EM Program and are progressed during the period to which the EM Program ID relates.

The EM Program documents the processes, systems and actions used to manage prioritised **aspects and impacts**, including the incorporation of:

- The **environmental values** that may be impacted, and the key risks to those **values**;
- The **environmental outcomes** that ODC aims to achieve;

- 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 (aspects and impacts)**, including any regulatory conditions;
- Contingency options to be used in the event that identified risks are realised;
- Continuous improvement opportunities and development opportunities identified that can assist in meeting **compliance criteria** and **environmental outcomes**; and

The AAT documents the environmental **improvement targets** and the action plan to achieve such targets. The actions stem from continuous improvement and development opportunities identified in the EM Program.

4.4 Implementation and operation

(MC 2.10.1(d), 2.10.1(f), 2.10.1(l), 2.10.1(m))

4.4.1 Structure and responsibility

ODC commits to providing resources that are specifically required to fulfil the commitments in the EPMP.

The Head of HSE and the Superintendent Environment Analysis and Improvement Approval are appropriately qualified and resourced and are the management representatives responsible for ensuring that the EMS requirements are established, implemented and maintained in accordance with ISO 14001:2015 and the BHP HSE 'Our Requirements' Documents.

The Superintendent Environment Analysis and Improvement Approval is responsible for reporting on the performance of the EMS to the OD Leadership Team at the Management Review.

4.4.1.1 Organisational structure

The organisational structure for ODC, including the Environment Section, is detailed in organisation charts which are available via the BHP intranet.

Responsibilities and authorities for elements of the site EMS, as defined in this document, are detailed in Appendix E.

4.4.1.2 Responsibility for all employees

It is the responsibility of all employees to comply with the BHP HSE 'Our Requirements' Documents and the site EMS.

All employees must ensure that ODC's environmental obligations in relation to Olympic Dam are met by:

- Understanding the **environmental risks** and obligations associated with all work to be undertaken;
- Understanding and applying the relevant standards, procedures, work instructions, safeguards and controls needed to meet environmental obligations and workplace control;
- Reporting actual and potential environmental incidents; and
- Understanding, promoting and helping to implement the Olympic Dam environment policy.

4.4.1.3 Responsibility for supervisors

Supervisors will enable Olympic Dam to meet all relevant environmental obligations by ensuring that:

- Employees understand the environmental hazards and obligations associated with the work they undertake;
- Standards, procedures, work instructions, safeguards and other controls relating to **environmental aspects** are understood by employees and are actively applied;
- Environmental incidents are reported and investigated; and

- Employees have HSE objectives, and their performance against these objectives are assessed.

Supervisors also need to ensure that all activities within their area of responsibility comply with all relevant:

- Legal obligations (including legislation and licence conditions);
- BHP 'Our Requirements' Documents; and
- Procedures and work instructions.

Where a non-conformance is found, supervisors are required to take appropriate corrective action.

4.4.1.4 Responsibilities for Olympic Dam Leadership Team

The Asset President, Head of Departments and General Managers are responsible for:

- Development and review of the Olympic Dam environment policy;
- Provision of adequate human and financial resources to implement the site EMS, as outlined in this document, and implement continuous improvement opportunities, as detailed in the EM Program;
- Provision of resources to implement actions from the environmental improvement plans (EIPs);
- Ensuring line management is responsible and accountable for environmental performance within their respective areas of responsibility;
- Reviewing performance of the site EMS through the annual environmental management review process; and
- Development of annual HSE performance targets for the site.

4.4.2 Training, awareness and competence

Environmental training is managed via Olympic Dam's sitewide Training Management System (TMS).

4.4.3 Communication

4.4.3.1 Internal communication

Internal communication on environmental matters occurs through:

- Inductions (site and area-specific);
- Internal newsletters and bulletins;
- Environmental reports/updates;
- Intranet webpage;
- Site safety meetings;
- Management meetings;
- Monthly, quarterly and annual reporting; and
- General daily communications.

The EPA specifies in relation to Licences and Exemptions the requirements for correct display of the Licences and Exemptions, and where copies are to be made available at the site. It is also a condition of the Licences and Exemptions that employees, agents or contractors responsible for carrying out tasks are advised as to the requirements of the applicable Licence or Exemption, and the general environment duty under section 25 of the **Environment Protection Act**. The relevant conditions of the EPA Licences and Exemptions to this effect are:

- **EPA 1301**, A-1
- EPA 31543, 500-5 and 500-437
- EPA 3054, 400-339 and 400-215

4.4.3.2 External communication

A site procedure (External Reporting of Environmental Incidents – Document No. 3913) details Olympic Dam's external environmental performance reporting requirements.

External communication on environmental matters may take the following forms:

- Written (letters, memos, faxes, reports, meeting minutes, media statements);
- Electronic (email, internet, video); or
- Verbal (either direct through meetings, presentations and media interviews, or by telephone).

All official correspondence relating to environmental management to and from regulatory agencies etc. is filed electronically in the Correspondence Register Database.

It is the responsibility of line management to ensure that copies of outgoing correspondence regarding environmental issues are forwarded to the Administrator Environment and Community for filing.

Environmental complaints are received and entered into the ITS in accordance with the Olympic Dam Community Complaints and Enquires Procedure– Document No. 117490.

4.4.3.3 Interested parties register

All external enquiries from interested third parties regarding environmental issues at Olympic Dam must be directed initially to the Community Section.

A stakeholder register of interested parties is maintained for those individuals or groups that have demonstrated an interest in the environmental performance of Olympic Dam. The concerns of interested parties are considered in the risk assessment process.

ODC reviews communication strategies regularly.

4.4.4 Environmental Management System documentation

All Olympic Dam documents can be accessed through the Quality System on the intranet.

The EPMP forms a portion of the EMS documentation, as described in section 3.5.1 above. The EPMP consists of a number of documents. A brief summary of each document, and reference to further information, is detailed in Table 1.1 in section 1.4.1 above.

4.4.5 Document control

The document control requirements of ISO 14001:2015 are met by the Quality System at Olympic Dam. Application of a procedure entitled Document Management Process – Document No. 1 ensures that documents are controlled and that the following occurs:

- A master list is used to identify the current version of documents;
- Documents are reviewed for adequacy by authorised personnel at the required frequency prior to use;
- Current issues of documents are available at locations required and are also available on the intranet;
- Obsolete documents are removed from all points of issue or use, and those retained for legal knowledge preservation purposes are suitably identified as such;
- Changes to documents are reviewed and approved by authorised personnel only.

4.4.6 Operational control

ODC identifies activities and services for Olympic Dam which are associated with significant **environmental risks (aspects and impacts)**. These activities are controlled by engineering control mechanisms (e.g. baghouses), or by the development of procedures that stipulate operating criteria. Engineering controls and operating procedures relevant to the control of significant **environmental risks** are listed in the EM Program and EM Program IDs. The performance of engineering control measures is maintained through regular preventive maintenance programs.

The development and implementation of control measures is an ongoing process and is part of the continuous improvement in environmental management of the operation.

4.4.6.1 Contractor management

Environmental responsibilities and requirements are communicated to contractors working at Olympic Dam via the site Induction Process. In addition, depending on their proposed work areas, area-specific inductions also need to be attended, which include area-specific environmental responsibilities and requirements.

Contractor requests, contract specification, classification, tender process and evaluation processes are detailed in the Site Specific Information & Conditions for Contractors – Document No. 53074.

Contractors that have significant HSE risk are required to submit an HSE Management Plan for ODC approval. Upon approval, this plan is to be implemented and maintained.

Meetings are held with new contractors before any work begins. The Olympic Dam Contract Manager is responsible for arranging and chairing these meetings. Contractors are made aware of relevant site procedures at the meetings in addition to how to report incidents/hazards etc.

Day-to-day management of the contractor and monitoring of HSE performance are the responsibility of the Olympic Dam Contract Manager.

4.4.6.2 Purchasing / Supply

ODC implements a Material Master Data Cataloguing Request (MM06) – Document No. 104257 for Olympic Dam, with clearances required by site personnel for dangerous/hazardous goods.

4.4.6.3 Change management

The purpose of the document, Management of Change Process – Document No. 3287 is to:

- Define the process and responsibilities associated with the management of change as applied to plant, equipment, processes, services and materials;
- Ensure that changes are implemented in a systematic and traceable manner;
- Ensure change does not compromise the safety and health of the personnel, the environment, production and the operation of the plant.

Roles and responsibilities are defined for personnel within each department within their Position Descriptions.

Change management also encapsulates certain conditions within the various EPA Licences and Exemptions associated with change as applied to plant, equipment, processes, services and materials. Change management also captures process issues associated with the Licences and Exemptions such as the annual return process, the renewal of licences and exemptions, and the ability of the EPA to impose or vary conditions during the life of the licence or exemption in question. The following table summarises the Licence and Exemption and the relevant conditions as they apply to these change management facets.

Table 4.1: EPA Licence or Exemption change management

EPA Licence or Exemption	Condition number					
	Annual return process	Change to process emissions or waste	Alterations to plant and equipment	Imposing or varying of conditions	Renewal	Change of Licensee details
EPA 1301	A-4	A-6	A-5		320-38, A-2	A-3
EPA 3054	400-78	400-347	400-348	400-201	400-79	400-338
EPA 31543	500-103	500-438	500-439	500-6	500-99	500-2

4.4.6.4 Emergency preparedness and response

The Olympic Dam Incident Management Team Plan details the process to be followed in a site emergency. An Emergency Services Group is maintained to support the Olympic Dam operation. An experienced, professional team of Emergency Services Officers trained in all aspects of emergency response, including environmental incidents, provides coverage 24 hours a day. This group is supported by an Emergency Response Team comprising other employees and contractors trained in emergency response and first aid.

All incidents relating to the environment are reported through the ITS and related records are maintained.

4.5 Checking and corrective action

(MC 2.10.1(i), 2.10.1(j))

4.5.1 Monitoring and measurement

MPs are implemented to assess performance against the EM Program IDs' outcomes, **compliance criteria** and targets, control mechanisms and legal and other requirements. The results are compiled and inform submissions to government, predominantly in the following reports:

- Quarterly EPA Smelter Report;
- Annual EPMP report; and
- Annual Great Artesian Basin (GAB) Wellfields Report.

Key deliverables are managed through the BHP SAP work management system to ensure timely submissions.

There are nine MPs referenced in the EM Programs and forming part of the EPMP. These are:

- Monitoring Program – Airborne Emissions – Document No. 2788;
- Monitoring Program – Energy Use and Greenhouse Gas Emissions – Document No. 67616;
- Monitoring Program – Environmental Radiation – Document No. 2790;
- Monitoring Program – Fauna – Document No. 2663;
- Monitoring Program – Flora – Document No. 2664;
- Monitoring Program – Great Artesian Basin (GAB) – Document No. 2789;
- Monitoring Program – Groundwater – Document No. 2791;
- Monitoring Program – Social Effects – Document No. 110687;
- Monitoring Program – Waste – Document No. 2792.

Additional monitoring procedures and work instructions are available on the Olympic Dam Document Management System (DMS). Records are filed and/or data is entered into a database(s), as directed by the associated documentation.

ODC calibrates and maintains monitoring equipment for OD as required, and records of this process are retained.

Where monitoring indicates a significant potential impact or significant actual impact, an incident notification is raised in the ITS. The incident is assessed to determine the ODC level of significance and the requirements for reporting to regulators and other stakeholders. This information is also considered in the annual review of **environmental aspects and impacts**.

Implementation, data analysis and reporting of data relating to MPs, procedures and work instructions are a mechanism for the periodic evaluation of compliance with relevant environmental legislation and regulations.

4.5.2 Area environment improvement plans

Environmental Improvement Plans (EIPs) are developed by Environment Section and Operations personnel for each area to evaluate performance of ODC against outcomes, **compliance criteria** and targets. They are also used to set action plans that designate actions, responsibilities and timeframes to achieve the **environmental outcomes** and targets. These EIPs are revised regularly to reflect changes in organisational objectives and operational targets.

4.5.3 Non-conformance and corrective and preventative action

(MC 2.10.1(h))

Incidents are managed in accordance with the procedure External Reporting of Environmental Incidents – Document No. 3913. All incidents are recorded in the ITS.

Documented procedures exist covering non-conformances with standards or systems and legislation, licences or commitments (refer to procedures listed in Appendices B and C). Corrective and preventative actions taken are appropriate to the magnitude and risk of the actual or potential problem.

Where any corrective and preventative action results in changes to how an activity is performed, appropriate changes are made to existing documented procedures or work instructions.

Non-conformance with the EMS (based on ISO 14001:2015) identified by audits (termed critical actions) and the associated corrective and preventative actions, as well as non-compliance with environmental legislation, licences and/or obligations are entered into the ITS.

Environmental reports and updates are generated by Environment Section personnel and circulated to relevant site personnel. Relevant information on incidents, non-conformances and corrective and preventative action is also included in these reports and is submitted for management review of the EMS.

4.5.4 Records

(MC 2.10.1(n))

Identification, maintenance and disposal of records are consistent with procedures established for both the Quality and the Environmental Management Systems. Environmental records management is described by the Olympic Dam Event Report and Investigation Procedure – Document No. 51350.

Retention periods are in accordance with records management procedures and will vary according to customer, statutory and Olympic Dam requirements.

All archived records are required to be clear and legible and maintained in an environment suitable for long-term storage without degradation and in a manner that allows for ready retrieval and use.

4.5.5 Environmental audit(s)

The timing and frequency of audits at Olympic Dam are identified and managed by site. The results of audits are recorded and brought to the attention of personnel directly responsible for the area being audited.

Integration of auditing across the site is required to enhance efficiencies. A dedicated Internal Auditor at Olympic Dam facilitates and investigates opportunities to integrate Quality, Environment and Safety Management System audits. HSE Group Level Documents and associated Standards are organised through Olympic Dam's Head of HSE.

Other audits that may be performed on a less frequent basis include:

- Environmental compliance audits (i.e. internal or external audit focusing on legal/regulatory matters);
- ISO 14001 / ISO 9001 verification and surveillance audits; and
- Radiation protection audits (i.e. internal or external audits as determined by the regulator) (MC 2.10.1(k)).

The Superintendent Environment Analysis and Improvement Approvals provides an annual update to the Olympic Dam Leadership Team for the purposes of Management Review, detailing audits completed, non-conformances and audit recommendations identified, and progress against non-conformances and audit recommendations from previous audits.

4.6 Management review

ODC's Leadership Team reviews the EMS at defined intervals to ensure its continuing suitability, adequacy and effectiveness. The management review of the **Environmental Management System** ensures that these objectives are achieved. The document provided to management for review includes ISO 14001 and 9001 requirements.

Each year, ODC undertakes an 'adequacy and effectiveness' review of radiation protection mechanisms (MC 2.8.2(i)) which is reported in the annual LM1 Report.

A record of all management reviews is maintained.

5 GLOSSARY

Term	Definition
Annual Targets and Actions	Annual update of targets and actions against the EM Program. These targets and actions are reported against as a part of the Annual EPMP Report.
Arid Recovery	A joint conservation initiative between ODC, the local community, the South Australian Department for Environment & Water and The University of Adelaide. Based at Roxby Downs, the initiative aims to develop and implement methods for broad-scale restoration of arid lands.
Aspects and Impacts	ODC's procedure for the identification and prioritisation of environmental risks.
Best Practicable Technology	<p>The use of that technology which produces the maximum environmental benefit that can be reasonably achieved having regard to all matters including:</p> <ul style="list-style-type: none"> the environmental standards achieved by uranium operations elsewhere in the world and the extent to which environmental degradation is prevented; the level of environmental protection to be achieved by the application or adoption of the technology and the resources required to apply or adopt the technology so as to achieve the maximum environmental benefit from the available resources; the cost of the technology; evidence of detriment, or lack of detriment, to the environment; the physical location of the Olympic Dam Mine; the age of equipment and facilities in use at Olympic Dam Mine and their relative effectiveness in reducing environmental pollution and degradation; the extent to which the technology provides for continuous improvement; social factors including the views of the regional community, and; possible adverse effects of introducing alternative technology.
Clause 11 Program	Three year program for the protection, management and rehabilitation (if appropriate) of the environment, submitted to and approved by, the Minister in accordance with Clause 11 of the Indenture (as amended from time to time).
Community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	Refers to the community of plants and animals reliant on the natural discharge of groundwater from Great Artesian Basin springs as defined by the EPBC Act 1999.
Compliance Criteria	Measurable standards or specifications of parameters to demonstrate achievement of a required outcome.
Designated Area	The area designated in respect of a Special Water Licence in accordance with clause 13(8) of the Indenture.
Dose Constraint	Given meaning from the Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005, ARPANSA, or as amended).
Environment	Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.
Environmental Aspect	Element of the organization's activities, products or services that can interact with the environment.
Environmental Impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.
Environmental Management Manual	Document that describes the scope of the Environmental Management System, its main elements and their interaction, and reference to related documents.
Environmental Protection and Management Program	The compilation of documents including the Environmental Management Manual, Environmental Management Program, Monitoring Programs and Closure Management and Rehabilitation Plan.
Environmental Management System	<p>Part of ODC's management systems used to develop and implement its environmental policy and manage its environmental aspects. The core elements of the EMS are described in the Environmental Management Manual.</p> <p>Note 1: A management system is a set of interrelated elements used to establish policy and objectives and to achieve those objectives.</p> <p>Note 2: A management system includes organizational structure, planning activities, responsibilities, practices, procedures, processes and resources.</p>

Term	Definition
Environmental Outcome	Overall environmental goal, consistent with the environmental policy that an organisation sets itself to achieve. Is an outcome based commitment on the extent to which the operation will seek to limit impacts on the environment (natural, social and economic). These are intended to be reasonable and realistically achievable, acceptable to affected parties and meet other applicable legislative requirements. Outcomes are accompanied by compliance criteria, which represent confirmation that the outcome has been achieved (defined further in section 2.4 of the Environmental Management Manual).
Environment Protection Act	Environment Protection Act 1993 (SA).
Environmental Risk	The chance of something happening that will have an impact on environmental outcomes.
Environmental Values	Physical characteristics and qualities of the environment that contribute to biodiversity conservation, and the social, spiritual and economic health of individuals and society.
EPA Licence 1301	EPA Licence 1301, under the Environment Protection Act, governs permissible procedures and protocols, emission or concentration levels, as well as operation and/or maintenance standards of plant and equipment by ODC at Olympic Dam.
Expansion	Expansion of the Olympic Dam Mine as described in the DEIS and SEIS.
Indenture	The Indenture scheduled to the Ratification Act (as amended from time to time).
Important Biodiversity and Ecosystems	Species and ecological communities listed under international, national and state conservation listings. It also includes species of regional and local significance subject to ODC's impacts.
Important population of a species	A population that is necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans as key source populations, either for breeding or dispersal, populations that are necessary for maintaining genetic diversity and/or populations that are near the limit of the species range.
Improvement Target	Target applied to the planned delivery of continual improvement opportunities.
Leading Indicator (Criteria)	Measurable standards or specifications of parameters that give an early warning that a control measure is failing and a required outcome is potentially at risk of not being achieved.
Licence LM1	Licence granted on 28 September 1988 under the <i>Radiation Protection and Control Act 1982</i> (SA) to mine and treat uranium bearing ores at Olympic Dam.
Listed Species or Ecological Communities	Those species or communities that are listed as threatened or migratory under Commonwealth and/or relevant State or Territory legislation.
Low-Level Radioactive Waste	Waste that is above exemption levels, but with limited amounts of long-lived radionuclides.
Management Plan	A document that either contains or provides references to information that is required to manage an <i>environmental aspect</i> . It may cover multiple aspects, multiple entities or be contained within a broader business plan. These documents may not be approved or regulated by Government.
Material environmental harm	Major impact/s (<5 years) to land, biodiversity, ecosystem services, water resources or air.
Members of the Public	Meaning given in IAEA Safety Glossary – Terminology used in nuclear safety and radiation protection (international Atomic Energy Agency 2007, or as amended).
Mining Code	Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005, ARPANSA).
Mitigation Plan	A plan to manage or mitigate an adverse environmental impact or detriment and, where applicable, for a return to compliance with the relevant provision of the EPMP (including where appropriate, timeframes, monitoring and reporting).
Monitoring Program	A program, identified in an EM Program and forming part of the EPMP, that documents the process to collect and interpret data used to assess the performance of the EM Program IDs' outcomes, criteria, controls, management actions, legal obligations and other requirements. The results from these MPs are compiled and inform submissions to Government in various reports.
Non-human biota	Plants and animals (other than humans).
Olympic Dam Agreement	An agreement dated 15 January 2008 between ODC and key traditional owner groups affected by the Olympic Dam mine and its expansion. Those groups include the Kokatha people, the Barngarla people, and the Kuyani people.
Organisation	Company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration.
Policy/Commitment	Direction of ODC related to its performance in Health, Safety, and Environment (HSE). It provides a framework for action and for the setting of environmental outcomes and targets.

Term	Definition
Radioactive	A material defined as a radioactive ore or radioactive substance in the Radiation Protection and Control Act 1982 (SA).
Reference plants and animals	Plants and animals defined by the ICRP for the purposes of non-human biota dose assessment.
Ratification Act	Roxby Downs (Indenture Ratification) Act 1982 (SA).
Significant adverse impact to populations	An impact to a population that results in impairing the ability of populations to recover and/or replace themselves.
Significant impact	Represents an environmental aspect with a potential to cause environmental impact, as determined by a risk assessment.
Significant Impact Guidelines	EPBC Act Policy Statement 1.1, Significant Impact Guidelines – Matters of National Environmental Significance (Department of the Environment, Water, Heritage and the Arts 2009).
Special Mining Lease	Special Mining Lease granted under the Indenture and held by ODC.
Special Water Licence	A Special Water Licence granted under the Indenture. (Two have been issued to ODC for extraction of water from the Great Artesian Basin (GAB)).
Substantial Commencement	The stripping of topsoil from the open pit site and commencement of removal of overburden.
Target	Targets reflect long-term aspirational goals that ODC expects to achieve, an interim target leading to a long-term goal, or shorter term performance targets.
Target Criteria	For the Clause 11 Program : <ul style="list-style-type: none"> Reflecting a level of impact that is as low as reasonably achievable.
Value	Description of specific environmental values that a particular EM Program ID is aiming to protect.

5.1 Acronyms

Term	Definition
ALARA	As Low As Reasonably Achievable
AHD	Australian Height Datum
AAT	Environmental Management Program Targets, Actions and Major Changes (Annual Targets and Actions)
BPT	Best Practicable Technology
CMRP	Closure Management and Rehabilitation Plan
DEIS	Olympic Dam Expansion Draft Environmental Impact Statement 2009
DEM	Department for Energy and Mining (South Australia)
DMS	Olympic Dam Document Management System
EIS	Final Environmental Impact Statement, incorporating the Draft Environmental Impact Statement 2009 and the Supplementary Environmental Impact Statement 2011
EMM	Environmental Management Manual
EM Program	Environmental Management Program
EMS	Environmental Management System
EPA	Environment Protection Authority (South Australia)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EPMP	Environmental Protection and Management Program
EPP	EPP (2015) – Environment Protection (Water Quality) Policy 2015
GGEMP	Greenhouse Gas and Energy Management Plan
HIA	Heavy Industrial Estate or Heavy Industrial Area
HSE	Health, Safety and Environment
LLRW	Low-Level Radioactive Waste
MC	Mining Code
MP	Monitoring Program
NEPM	NEPM (1999) - National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council, December 1999
NGER	National Greenhouse and Energy Reporting
NR SAAL	Natural Resources SA Arid Lands Region
OD	Olympic Dam
ODC	BHP Billiton Olympic Dam Corporation Pty Ltd
ODV1	Olympic Village
RWMP	Radioactive Waste Management Plan
SAP / 1SAP	Systems, Applications & Products in Data Processing enterprise software
SEIS	Olympic Dam Expansion Supplementary Environmental Impact Statement 2011
SML	Special Mining Lease held by ODC
SMP	Social Management Plan
TRS	Tailings Retention System
TSF	Tailings Storage Facility

6 REFERENCES

ARPANSA 2005, Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005).

BHP Billiton 2009, Olympic Dam Expansion Draft Environmental Impact Statement 2009, Main Report, Volumes 1 and 2, BHP Billiton, Adelaide.

BHP Billiton, 2011, Olympic Dam Expansion Supplementary Environmental Impact Statement 2011, Volumes 1 and 2, BHP Billiton, Adelaide.

Environmental Protection Authority, South Australia 2012, Bunding and spill management, Liquid storage Guidelines.

Government of South Australia, PIRSA, Minerals Regulatory Guidelines MG2, Guidelines for miners: preparation of a mining lease proposal or mining and rehabilitation program (MARF) in South Australia, Version 4.9, February 2009.

Standards Australia, 2004, AS/NZS ISO14001:2015: Environmental Management Systems – Requirements with guidance for use.

Standards Australia, 2004, AS/NZS ISO14001:2015: Environmental Management Systems – Guidelines on principles, systems and support techniques.

7 APPENDIX A: MINING CODE REQUIREMENTS

ODC maintains an integrated EMS that describes the approach and systems for management of all **environmental aspects** associated with the operation, including radiological impacts to **members of the public**, the environment and non-human biota.

There is a requirement in South Australia under the Radiation Protection and Control Act for the operation to hold a Licence to Mine and Mill Radioactive Ores. As part of this licence, ODC must comply with the Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (also known as the **Mining Code**).

Given the extent of the broader environmental requirements at Olympic Dam, and the fact that radiological parameters are usually considered with other non-radiological parameters, the specifics of the **Mining Code** requirements have been incorporated into the site-wide Environmental Protection Management Program (EPMP).

Table 7.1 cross-references the specific requirements of the **Mining Code** to where they are addressed in the broader EPMP.

Table 7.1: Mining Code and EPMP cross-references

Mining Code clause number	Information Only	Environmental Management Manual	Monitoring programs																						
			ID 1.1 Land disturbance and rehabilitation	ID 1.2 Aquifer level drawdown	ID 2.1 Chemical/Hydrocarbon spills	ID 2.2 Radioactive process material spills	ID 3.1 Particulate emissions	ID 3.2 Sulphur dioxide emissions	ID 3.3 Saline aerosol emissions	ID 3.4 Radioactive emissions	ID 3.5 Greenhouse gas emissions	ID 4.1 Embankment Stability of TSF	ID 4.2 Tailings seepage	ID 4.3 Fauna interaction	ID 4.4 Solid waste disposal	ID 4.5 Radioactive waste	ID 5.1 Community interactions	Fauna	Flora	Great Artesian Basin	Groundwater	Airborne emissions	Environmental radiation	Energy use and GHG emissions	Waste
1.1	X																								
1.2	X																								
1.3	X																								
1.4	X																								
2.1	X																								
2.2	X																								
2.3.1		1.2.3																							
2.3.2	X																								

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Mining Code clause number	Information Only	Monitoring programs																								
		Environmental Management Manual	ID 1.1 Land disturbance and rehabilitation	ID 1.2 Aquifer level drawdown	ID 2.1 Chemical/Hydrocarbon spills	ID 2.2 Radioactive process material spills	ID 3.1 Particulate emissions	ID 3.2 Sulphur dioxide emissions	ID 3.3 Saline aerosol emissions	ID 3.4 Radioactive emissions	ID 3.5 Greenhouse gas emissions	ID 4.1 Embankment Stability of TSF	ID 4.2 Tailings seepage	ID 4.3 Fauna interaction	ID 4.4 Solid waste disposal	ID 4.5 Radioactive waste	ID 5.1 Community interactions	Fauna	Flora	Great Artesian Basin	Groundwater	Airborne emissions	Environmental radiation	Energy use and GHG emissions	Waste	Social
2.9.3		2.1.3																								
2.9.4		2.1.3																								
2.9.5		2.1.3																								
2.9.6		2.1.3																								
2.9.7	X																									
2.10.1(a)	RMP																									
2.10.1(b)		2.6																								
2.10.1(c)		2.1.3																								
2.10.1(d)		4.4																				1.1	1.1		1.1	
2.10.1(e)		2.1.3																								
2.10.1(f)		4.4																				1.1	1.1		1.1	
2.10.1(g)		2.1.3																								
2.10.1(h)		4.5.3				2.2.4 2.2.12																				
2.10.1(i)		4.5				2.2.12																				
2.10.1(j)		4.5																								
2.10.1(k)		4.5.5																								
2.10.1(l)		4.4																								
2.10.1(m)		4.4.																								
2.10.1(n)		4.5.4																								
2.10.1(o)	RMP																									
2.10.1(p)	RMP																									

Mining Code clause number	Information Only	Environmental Management Manual	Monitoring programs																								
			ID 1.1 Land disturbance and rehabilitation	ID 1.2 Aquifer level drawdown	ID 2.1 Chemical/Hydrocarbon spills	ID 2.2 Radioactive process material spills	ID 3.1 Particulate emissions	ID 3.2 Sulphur dioxide emissions	ID 3.3 Saline aerosol emissions	ID 3.4 Radioactive emissions	ID 3.5 Greenhouse gas emissions	ID 4.1 Embankment Stability of TSF	ID 4.2 Tailings seepage	ID 4.3 Fauna interaction	ID 4.4 Solid waste disposal	ID 4.5 Radioactive waste	ID 5.1 Community interactions	Fauna	Flora	Great Artesian Basin	Groundwater	Airborne emissions	Environmental radiation	Energy use and GHG emissions	Waste	Social	
2.10.2	RMP																										
Total		28	0	0	0	4	0	0	0	1	0	3	4	0	0	4	0	0	0	0	2	5	6	0	3	0	

RMP: Radiation Management Plan, outside scope of EPMP

CMRP: Closure Management and Rehabilitation Plan

8 APPENDIX B: EPA (SA) LICENCE AND EXEMPTION CROSS-REFERENCES

Table 8.1: EPA Licence and Exemption cross-references

EPA Licence/Exemption (Condition)	Environmental Management Manual	Environmental Management Program								Monitoring Programs		
		ID 2.1 Chemical/Hydrocarbon spills	ID 3.1 Particulate emissions	ID 3.2 Sulphur dioxide emissions	ID 4.1 Embankment Stability of TSF	ID 4.2 Tailings seepage	ID 4.3 Fauna interaction	ID 4.4 Solid waste disposal	ID 5.1 Community interaction	Groundwater	Airborne emissions	Waste
EPA 1301 – Licence												
(305-137)				3.2.3							2.1.4	
(305-138)				3.2.3							2.1.4	
(305-139)				3.2.3 3.2.8							2.1.4 2.4.1 2.4.4	
(305-140)				3.2.3 3.2.8							2.1.4 2.4.1 2.4.4	
(305-141)				3.2.3 3.2.8							2.1.4 2.4.1 2.4.4	
(305-142)				3.2.12								
(37-43)			3.1.12	3.2.12							2.1.4	
(34 – 39)	2.1.12											
(S-166)								4.4.12				
(S-60)			3.1.12									
(S-61)			3.1.12									
(S-5)	2.1.3							4.4.13				
	2.1.12							4.4.12				
(34-39)	2.1.12											
(S-27)								4.4.12				
(S-28)								4.4.12				
(S-22)	2.1.12											
(S-1)								5.1.12				
(S-2)			3.1.12	3.2.12								
(S -89)			3.1.12									
(S – 90)			3.1.12									
(S-122)								4.4.12				
(S-143)								4.4.12				
(S -163)								4.4.12				

[illegible]

EPA Licence/Exemption (Condition)	Environmental Management Manual	Environmental Management Program								Monitoring Programs		
		ID 2.1 Chemical/Hydrocarbon spills	ID 3.1 Particulate emissions	ID 3.2 Sulphur dioxide emissions	ID 4.1 Embankment Stability of TSF	ID 4.2 Tailings seepage	ID 4.3 Fauna interaction	ID 4.4 Solid waste disposal	ID 5.1 Community interaction	Groundwater	Airborne emissions	Waste
EPA 31543 – Exemption												
(U – 535)					4.1.12	4.2.3						2.1.3
						4.2.12	4.3.12					2.1.4
(U-536)						4.2.12						
(U-518)						4.2.11				2.1.4		2.1.3
						4.2.12						2.1.4
(U – 519)						4.2.11						
(500-407)						4.2.13						
(500-5)	4.4.3.1											
(500-437)	4.4.3.1											
(500-2)	4.4.6.3											
(500-6)	4.4.6.3											
(500-103)	4.4.6.3											
(500-438)	4.4.6.3											
(500-439)	4.4.6.3											
(500-99)	4.4.6.3											

The following EPA conditions have been omitted from Table 8.1 as they are out of scope of the EPMP:
1301.S-130, 1301.A-3

Only EPMP documents relevant to EPA Licence and Exemptions are included in Table 8.1.

9 APPENDIX C: EM PROGRAM ID, ENVIRONMENTAL OUTCOMES, COMPLIANCE CRITERIA AND LEADING INDICATORS

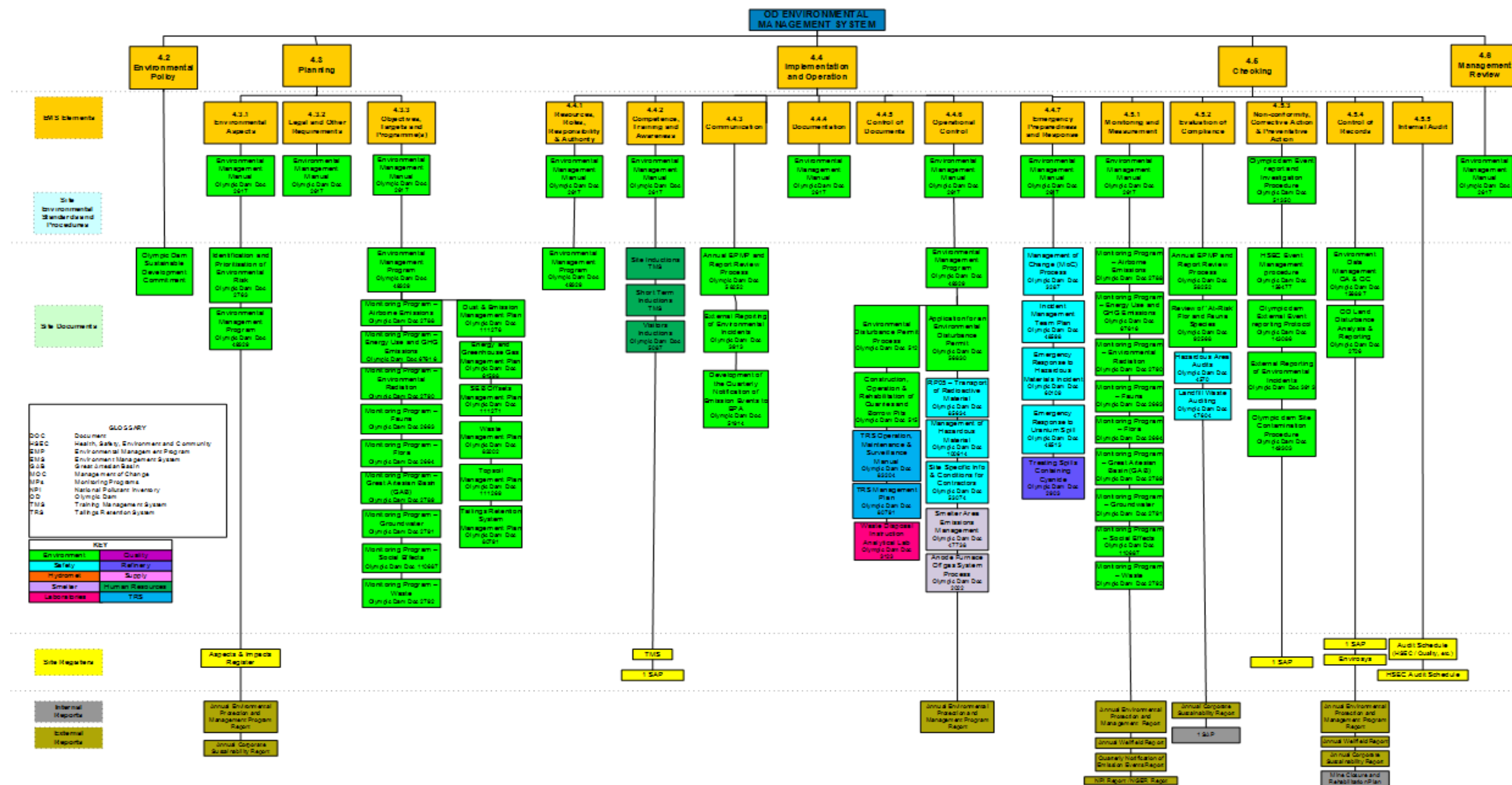
Cross-references to sections of the monitoring programs are provided (e.g. FA 2.6) to show where monitoring for each criteria or target is described within the respective monitoring programs.

Individual monitoring programs are referred to in this table 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 GHG Emissions – EG; Waste – WA; Social Effects – SE. Targets are listed in the Environmental Management Program Targets, Actions and Major Changes document.

ID	EM Program	Environmental outcome	Compliance criteria	Leading indicators
ID 1 Use of natural resources				
1.1	Land disturbance and rehabilitation	<ul style="list-style-type: none"> No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of the construction, operation and closure of Olympic Dam. 	<ul style="list-style-type: none"> 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 <i>Eriocaulon carsonii</i>. <p><i>Note: Significant impact is as defined in the Significant Impact Guidelines and greater than predicted in the EIS.</i></p> <ul style="list-style-type: none"> No loss of an important population of Plains Rat (<i>Pseudomys australis</i>). 	<ul style="list-style-type: none"> None applicable
1.2	Aquifer level drawdown	<ul style="list-style-type: none"> 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 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 impact on groundwater-dependent listed species or ecological communities as a result of groundwater drawdown associated with ODC activities. 	<ul style="list-style-type: none"> 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 (GA 2.2, GA 2.3). 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 (GA 2.2, GA 2.3). 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 km² (GA 2.2, GA 2.3). No material change in the availability and quality of groundwater at existing bores in the Stuart Shelf area operated by third-party users (GW 2.2, GW 2.3). 	<ul style="list-style-type: none"> A drawdown trend at monitoring bore S1 that may exceed 4.5 m in the next 12 months (GA 2.2). A drawdown footprint for Wellfield B, measured as the area contained within the 10 m drawdown contour, that is greater than 4,000 km² (GA 2.2). 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 A combination of the following factors that can be attributed to water extraction from Wellfields A and B: <ul style="list-style-type: none"> 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. Evidence of water quality change (measured as pH or conductivity) at GAB springs (GA 2.1, GA 2.3). A continuing drawdown trend at GAB pastoral bores that may exceed the predictions of the Olympic Dam Environmental Impact Statement of 1997 (GA 2.2). A drawdown trend or changes in groundwater quality in the Stuart Shelf area that may impact on existing third-party users (GW 2.2, GW 2.3).
ID 2 Storage, transport and handling of hazardous materials				
2.1	Chemical/Hydrocarbon spills	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> No site contamination leading to material environmental harm arising from hydrocarbon/chemicals spills within the SML and Wellfields Designated Areas. <p><i>Note: Measurement and monitoring is carried out in response to a specific event and in accordance with the NEPM 1999 or EPP 2015, as appropriate.</i></p>	<ul style="list-style-type: none"> None applicable
2.2	Radioactive process material spills	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> A dose limit for radiation doses to members of the public of 1 mSv/y above natural background (ER 2.2). No significant radioactive contamination arising from uncontrolled loss of radioactive material to the natural environment (ER 2.4). <p><i>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 is carried out in response to a specific event.</i></p>	<ul style="list-style-type: none"> None applicable
ID 3 Operation of industrial systems				
3.1	Particulate emissions	<ul style="list-style-type: none"> No adverse impacts to public health as a result of particulate emissions from ODC's activities. 	<ul style="list-style-type: none"> Ground level PM₁₀ 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 50 µg.m³ (AE 2.7) 	<ul style="list-style-type: none"> None applicable
3.2	Sulphur dioxide emissions	<ul style="list-style-type: none"> No adverse impacts to public health as a result of sulphur dioxide emissions from ODC's activities. 	<ul style="list-style-type: none"> Annual average SO₂ concentration of less than 0.02 ppm at sensitive receivers, Olympic Village and Roxby Downs (AE 2.1, AE 2.4). 24 hour average SO₂ concentration of less than 0.08 ppm at sensitive receivers, Olympic Village and Roxby Downs (AE 2.1, AE 2.4). 	<ul style="list-style-type: none"> None applicable

ID	EM Program	Environmental outcome	Compliance criteria	Leading indicators
			<ul style="list-style-type: none"> One hour average SO₂ concentration of less than 0.2 ppm at sensitive receivers, Olympic Village and Roxby Downs (AE 2.1, AE 2.4). 	
3.3	Saline aerosol emissions	<ul style="list-style-type: none"> No significant adverse impacts to populations of listed species (South Australian, Commonwealth) as a result of ODC's activities. 	<ul style="list-style-type: none"> No loss of an important population of Plains Rat (<i>Pseudomys australis</i>) due to habitat loss (AE 2.6). 	<ul style="list-style-type: none"> None applicable
3.4	Radioactive emissions	<ul style="list-style-type: none"> No adverse impacts to public health as a result of radioactive emissions from ODC's activities. No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive emissions from ODC's activities. 	<ul style="list-style-type: none"> Radiation doses to members of the public less than 1mSv/y above natural background (Aus 5d, 6, 13; State 34) (ER 2.2). Deposition of project originated ²³⁸U less than 25 Bq/m²/y at the non-human biota assessment sites (ER 2.3). 	<ul style="list-style-type: none"> Indications that a dose constraint of 0.3 mSv/y to members of the public above natural background will be exceeded (Aus 5f, 6, 14; State 34) (ER 2.2). Indications that a reference level of 10 µGy/h for impacts on non-human biota above natural background will be exceeded (Aus 5f, 6, 14; State 34) (ER 2.3). <p><i>Note: The reference level for non-human biota is set as an interim criteria until such time as an agreed national approach is determined.</i></p>
3.5	Greenhouse gas emissions	<ul style="list-style-type: none"> Contribute to stabilising global atmospheric greenhouse gas concentrations to minimise environmental impacts associated with climate change. 	<ul style="list-style-type: none"> 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, reported annually. (EG 2.2). 	<ul style="list-style-type: none"> None applicable
ID 4 Generation of industrial wastes				
4.1	Embankment stability of TSF	<ul style="list-style-type: none"> No significant TSF embankment failure. 	<ul style="list-style-type: none"> No significant radioactive contamination arising from uncontrolled loss of radioactive material as a result of an embankment failure to the natural environment (ER 2.4, WA 2.1). <p><i>Note: 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.</i></p>	<ul style="list-style-type: none"> Rate of rise of tailings at an average of 2 m per annum or less; The rate of rise of pore pressures within or adjacent to the TSF embankment is less than or equal to the rate of rise of tailings. and; The maximum supernatant pond area of individual TSF cells does not exceed 15ha for TSF1, 23ha for TSF2/3, 90ha for TSF4 and 135ha for TSF5. <p>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 operational processes should be reviewed.</p>
4.2	Tailings seepage	<ul style="list-style-type: none"> No significant adverse impact on vegetation as a result of seepage from the TSF. 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 the environmental values of groundwater outside the SML as a result of seepage from the TSF. 	<ul style="list-style-type: none"> 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) (GW 2.2). All TSF seepage attenuated within the SML, as demonstrated by a numerical geochemical model. confirmed by monitoring (GW 2.3) 	<ul style="list-style-type: none"> 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. A numerical geochemical model trend that indicates that all TSF seepage may not be attenuated within the SML should the trend continue (GW 2.3).
4.3	Fauna interaction with Tailings Retention System	<ul style="list-style-type: none"> No significant adverse impacts to listed species (South Australian, Commonwealth) as a result of interactions with the Olympic Dam TRS. 	<ul style="list-style-type: none"> No significant adverse impact on the size of an important population of Banded Stilt (<i>Cladorhynchus leucocephalus</i>) as a result of interactions with the Olympic Dam TRS. (FA 2.7). <p><i>Note: Significant impact is as defined in the Significant Impact Guidelines and greater than predicted in the EIS.</i></p>	<ul style="list-style-type: none"> None applicable
4.4	Solid waste disposal	<ul style="list-style-type: none"> No significant adverse impacts as a result of management of solid waste. 	<ul style="list-style-type: none"> No site contamination leading to material environmental harm arising from the operation of the Resource Recovery Centre (GW 2.3, WA 2.5). 	<ul style="list-style-type: none"> None applicable
4.5	Radioactive waste	<ul style="list-style-type: none"> No adverse impacts to public health as a result of radioactive waste from ODC's activities. No significant adverse impacts to populations of listed species or ecological communities as a result of radioactive waste from ODC's activities. 	<ul style="list-style-type: none"> Radiation doses to members of the public less than 1mSv/y above natural background (ER 2.2). Deposition of project originated ²³⁸U less than 25 Bq/m²/y at the non-human biota assessment sites (ER 2.3) 	<ul style="list-style-type: none"> Indications that a dose constraint of 0.3 mSv/y to members of the public above natural background will be exceeded (Aus 5f, 6, 14; State 34) (ER 2.2). Indications that a reference level of 10 uGy/h for impacts on non-human biota above natural background will be exceeded (Aus 5f, 6, 14; State 34) (ER 2.3). <p><i>Note: The reference level for non-human biota is set as an interim criteria until such time as an agreed national approach is determined.</i></p>
ID 5 Interaction with communities				
5.1	Community interaction	<ul style="list-style-type: none"> Residents in Roxby Downs, Andamooka and Woomera have a favourable view of ODC. 	<ul style="list-style-type: none"> Community concerns are tracked and all legitimate complaints are addressed where reasonably practicable (SE 2.1). 	<ul style="list-style-type: none"> None applicable

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11 APPENDIX E: EMS RESPONSIBILITY MATRIX

ISO 14001:2015 requirement	EMS Elements	Asset President	General Managers and Managers	Head of HSE	Senior Manager Group Legal	Superintendent Environment Analysis and Improvement Approvals	Superintendent Environment, Radiation, Health and Hygiene Business Partners	Manager Radiation, Health and Hygiene Analysis and Improvement	Principal Occupational Hygiene	Specialist Radiation	Specialist Environment Analysis and Improvement	Engineer Integrated Planning	Analyst HSE Reporting/ Document Controller	Superintendent Emergency Services & Security	Manager Training and Development	Manager Supply	Quality Systems Coordinator	Senior Internal Auditor	Supervisors	All Employees	Contract Owners (BHP)	Contractors Managers	Contractors employees
4.1 General requirements																							
Establish and document an environmental management system	EPMP documentation																						
4.2 Environmental Policy		R/A	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Define an environmental policy	Olympic Dam environment policy	R/A		R	R	R	R	R					R					R					
4.3 Planning																							
4.3.1 Environmental aspects																							
Identify environmental aspects of activities, products and services and determine significant environmental aspects.	Establishment and maintenance of environmental aspects and impacts register					R/A	R			R	R												
Document the information and keep it up to date	Annual and triennial (exhaustive) reviews of environmental aspects and impacts					R/A	R			R	R												
Ensure significant environmental aspects are taken into account in EMS	Annual and triennial reviews and update of EM Programs		R			R/A	R			R	R	R	R						R				
4.3.2 Legal and other requirements																							
Procedure(s) to identify applicable legal and other requirements.	Conduct annual internal environmental legal compliance review			R/A		R	R	R			R												
Determine how requirements apply to environmental aspects.	Conduct triennial external environmental legal compliance review			R/A		R	R	R			R												
Ensure legal and other requirements are taken into account in EMS	Conduct annual review and update of Olympic Dam's Environmental Obligations Register			R/A		R	R	R			R												
4.3.3 Objectives, targets and programme(s)																							
Establish and maintain environmental objectives and targets	Annual and triennial (exhaustive) reviews of objectives and targets within the EM Programs and the AAT					R/A	R				R								R				
	Development of annual environmental performance targets		R			R	R			R	R	R							R		R		
Objectives and targets to be measurable, consistent with environmental policy, legal and other requirements	Annual and triennial reviews and update of EM Programs		R			R/A	R			R	R	R	R						R				
Program to achieve objectives and targets.	Annual update of Action Plan to achieve environmental objectives and targets		R			R	R			R	R	R							R		R		
4.4 Implementation and operation																							
4.4.1 Resources, roles, responsibility and authority																							

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Provision of resources for implementation of the EMS	EMM Appendix E (this table)			R/A		R/A																	
Roles and responsibilities to be defined and documented				R/A		R/A																	
Management representatives for implementing EMS				R/A		R/A	R																
Management review of EMS		R	R			R	R											R					
4.4.2 Competence, training and awareness																							
Ensure competency, identify training needs, provide training and maintain records.	Identification of environmental training needs (triennial)			R		R/A	R			RS	R		R					R		R	R		
	Development and implementation of environmental training materials			R		R/A	R			R	R		R					R		R	R		
	Collation of all records on TMS					R/A	R								R					R/A			
Establish procedures for awareness of requirements	Management of Contractor, Site and Area Inductions and Section Overviews									R					R/A								
4.4.3 Communication																							
Establish procedure for internal communication and recording external communication.	Site environment internal communications					R/A	R			R	R	R/A											
	Forward correspondence on environmental issues to Environment Section	R	R	R	R	R/A		R										R	R	R	R	R	
	Maintain correspondence register.	R	R	R	R	R/A	R	R										R	R	R	R	R	
Establish method for external communication of significant environmental aspects.	Submission of reports to regulators regarding environmental performance					R/A	R			R													
4.4.4 Documentation																							
EMS documentation to include certain components.	Regular Maintenance of EMS documentation (i.e. environmental policy, EMM, EM Program, MPs, other procedures of the EMS according to OD Document No.3785 <i>Environmental Management System Index</i> and any documents including records, necessary to ensure the effectiveness of the EMS).						R/A	R			R	R					R	E					
4.4.5 Control of documents																							
Establish, implement and maintain procedure(s) to control the EMS documents (Quality Docs System)	Implementation of Document Management Process, OD Document No.1						R/A	R					R				R	R					
4.4.6 Operational control																							
Identify and plan operations associated with significant environmental aspects.	Development, maintenance and implementation of standards, procedures, work instructions and safeguards	R	R/A															R/A	R		R/A	R	

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	Ensure that an MSDS is received for any hazardous material prior to its arrival at site		R/A						R/A										R/A	R		R/A	R
	Implementation of Material Master Maintenance Process								R/A							R/A							
	Development of standards, tools and processes for evaluating material source, identification and rating of aspects and impacts associated with products, communication with suppliers etc.					R										R/A							
4.4.7 Emergency preparedness and response																							
Establish procedures to identify potential emergency situations and response.	Provide the resources to ensure that Olympic Dam has a functional: Emergency Response Plan Crisis Management and Recovery Plan Fire Protection Plan			R/A		R/A	R	R	R					R									
Respond to emergency situations and accidents and review procedures.	Ensure that there are adequate numbers of emergency response personnel to deal with the identified events scenarios			R/A		R/A	R	R	R					R									
	Establish mutual aid arrangements to deal with any prolonged emergency response			R/A		R/A	R	R	R					R					R				
Test emergency response procedures	Ensure that there is an adequate program of exercises to test the above plans			R/A		R/A	R	R	R					R									
4.5 Checking																							
4.5.1 Monitoring and Measurement																							
Establish procedures to monitor and measure operations with potential significant environmental aspects.	Develop and implement monitoring programs to assess performance of the EMP, objectives and targets, control mechanisms, legal and other requirements					R/A	R			R	R								R	R	R	R	R
	Compile, analyse and report results from monitoring to appropriate stakeholders	R		R		R/A	R			R	R	R							R	R	R	R	R
	Incident notification					R/A	R	R		R	R	R							R	R		R	R
Use calibrated equipment and maintain records.	Calibration of environmental section monitoring equipment					R/A	R			R	R	R											
	Calibration of operational environmental monitoring equipment		R/A			R	R			R	R	R							R	R		R	R
4.5.2 Evaluation of compliance																							
Establish procedures to evaluate compliance and maintain records.	Undertake annual review of obligations within Obligations Register to assess compliance			R/A		R	R				R	R											

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	Records keeping and management of results from periodic evaluations of compliance with legal and other requirements			R/A		R	R				R	R											
	Reporting of progress e.g. Annual Environmental Management and Monitoring Report	R/A		R/A		R/A	R	R			R	R											
	Reporting actual and potential environmental incidents	R	R	R		R/A	R	R		R	R	R							R	R	R	R	R
	Monitor contractor performance		R	R		R	R	R		R	R	R							R		R/A		
4.5.3 Nonconformity, corrective action and preventive action																							
Establish procedures for identifying and dealing with nonconformities.	Raise non-conformances with EMS					R												R/A	R				
	Raise an incident notification for non-compliances with legislation, licences and/or obligations	R	R	R/A		R	R		R	R	R	R	R					R/A	R	R	R/A	R/A	R
Make any necessary changes to EMS	Annual and triennial reviews and update of EM Programs		R			R/A	R			R	R	R	R						R				
4.5.4 Control of records																							
Establish and maintain records to demonstrate conformity, and implementation of procedures for same.	File monitoring data, reports, correspondence, licences etc within the Environment Sections Library and electronic file structure as defined in Document No. 2697					R/A	R				R								R	R			
	Filing of environmental correspondence and records (refer to Document No. 2697)					R/A	R				R	R											
	Maintain log of external correspondence					R/A	R													R			
4.5.5 Internal audit																							
Conduct internal audits of the EMS, and establish audit programs and procedures. Ensure objective and impartial auditing.	Develop annual program for internal EMS and other audits	R/A	R	R		R/A	R	R		R	R	R						R/A	R		R/A	R	
	Schedule, implementation, filing of environmental audits, raising of critical actions and tracking of progress					R/A	R	R										R/A				R/A	
	Develop program of external environmental audits for the EMS cycle period					R	R										R	R/A					
	Scheduling and implementation of internal EMS audits	R/A	R	R		R	R	R									R	R/A					
	Major and minor non-conformances and observations arising from EMS audits issued and tracked	R/A	R	R		R	R	R									R	R/A					

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		Scheduling and organisation of external EMS Audits				R	R/A																	R				
		4.6 Management review																										
		Management to review EMS at planned intervals	Provision of environmental information for the environmental section of the integrated EMS and Quality Management System Management Review					R/A	R			R	R	R														
			Raise and monitor corrective actions arising from the Management Review					R/A	R																			
			Implementation of Continuous Improvement Opportunities		R																				R		R	R
			Log and file record of meeting minutes					R/A	R	R																		

R = Responsibility
A = Authorisation



Olympic Dam Integrated Management System (IMS) Policy

The BHP Charter Values unite our purpose, strategy, values and measures of success. The first value is Sustainability – put health and safety first, be environmentally responsible and support our communities. Sound principles that govern health and safety, process safety, business conduct, social, quality, environmental and economic activities, are integral to the way we do business.

Olympic Dam (OD) will develop, implement and maintain an Integrated Management System (IMS) to work safely, reliably and sustainably. Operating discipline underpins the effectiveness of the IMS and together with the BHP Operating System, will drive continual improvement and fulfil all legal and compliance obligations. We will make sure we:

- systematically identify hazards, assess and manage risks
- do not compromise our values
- develop and review policies and procedures, have measurable objectives and targets to promote continual improvement in health, safety, environment, process safety and quality system performance
- provide training to make sure that all people are competent, appropriately trained and inducted into the business, including identified personnel with safety critical roles
- comprehensively investigate all events and use the learnings to continuously improve the identification of hazards and management of risks
- communicate this policy to all persons working for, or on behalf of Olympic Dam and make it available to all relevant stakeholders

Our IMS framework specifically ensures our commitment to:

Health & Safety:

- provide safe, healthy and inclusive working conditions for the prevention of work-related illness and injury
- consultation and participation of all members of the workforce, taking their views and concerns into account in decision-making

Environment:

- protection of the environment, including the prevention of pollution, through the implementation of the *Environmental Protection and Management Program* (EPMP) that meets ISO 14001 Management System Certification and focuses on embedding environmental management practices into site activities. Through continued execution of the EPMP, Olympic Dam will strive to achieve measurable outcomes by managing the impacts associated with:
 - the use of natural resources
 - storage, transport & handling of hazardous materials
 - operation of industrial systems and generation of waste
 - generation of industrial wastes
 - interaction with communities

Process Safety:

- embed a process safety culture
- make sure effective controls are in place to prevent and mitigate the effects of process safety events, particularly those with low probability but of high consequence
- undertake regular analysis of process safety risks that exist with the operation

Quality:

- provide product that meet or exceed regulatory requirements and expectations of customers through ISO9001 certification

This Policy will be reviewed as part of the annual Management Review by Senior Leaders to ensure it remains relevant and appropriate to organisational needs. It is available on the OD digital home page and via the IMS Contractor Management login.



Laura Tyler
Asset President
June 2019