OLYMPIC DAM EXPANSION

DRAFT ENVIRONMENTAL IMPACT STATEMENT 2009

APPENDIX U
DRAFT ENVIRONMENTAL MANAGEMENT PROGRAM

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resourcing the future

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APPENDIX U

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAM

U1 DRAFT ENVIRONMENTAL MANAGEMENT PROGRAM

U1.1 ENVIRONMENTAL MANAGEMENT PROGRAM STRUCTURE

This Draft EM Program would continue to develop and would ultimately be consistent with the existing EM Program implemented for the Olympic Dam operation. It would continue to function as a three-year program for the protection, management and rehabilitation of the environment for the activities outlined in the Draft EIS for the proposed expansion.

The current Olympic Dam EM Program (FY08–FY10) has been used as the model for this document. It incorporates the objectives, assessment criteria, commitments, standard measures and monitoring requirements identified during the environmental impact assessment process. The EM Program would also integrate key risk items identified for the expansion and include, where appropriate, contingency measures to manage those risks.

The EM Program refers to the specific management and monitoring plans identified in the Draft EIS and provides environmental objectives and assessment criteria.

It is also anticipated that this Draft EM Program would be subject to the existing regulatory regime of review and approval (currently occurring for the EM Program (FY08–FY10) for the Olympic Dam operation) throughout the execution and progression of the proposed expansion project.

As the expansion progressed, and as the various components associated with the expansion neared construction phase, further detail would be incorporated into the EM Program.

The Draft EM Program for the proposed expansion currently incorporates the following:

Scope

The Scope provides the context in which the particular program has been written. The Scope aims to provide an overview of the key issues related to the aspect that requires specific management.

Legal and other guidance

Provides an outline of the key legislation (Commonwealth, South Australian and Northern Territory) and/or guidance reference, such as a Code of Practice or industry guideline, as it relates to the scope of the particular program.

Values

Values of the environment that are considered to be the most important and/or unique to the proposed expansion are identified here. These values provide the basis for which management and mitigation measures and monitoring programs are developed. The proposed expansion aims, via the EM Program, to enhance, protect and/or conserve these identified values.

Objectives

Specific objectives have been developed and presented within the EM Program for the proposed expansion. Objectives have been developed using the following criteria:

- based on the values that are required to be enhanced, protected and/or conserved for the project
- are to be the major environmental outcomes that BHP Billiton aims to achieve for the proposed expansion
- are measurable.

Objectives of the EM Program therefore address issues considered to have a residual impact or risk, are measurable and communicate the major environmental issues BHP Billiton would manage. Issues would be managed with the implementation of management plans, controls, contingency measures and continuous improvement.

Assessment Criteria

Assessment criteria have been proposed for each objective in the EM Program and would be used by management to assess and demonstrate progress towards meeting objectives. Assessment criteria have been derived from a number of sources including regulatory criteria (where applicable), applicable industry standards and Codes of Practice and from baseline surveys/assessments undertaken (and planned to be undertaken) for the proposed expansion.

The assessment criteria would inform the development of monitoring programs and the application of ‘lead’ and ‘lag’ indicators, as required.

As the project progressed, with various project components constructed and commissioned, further refinement of assessment criteria through ongoing environmental assessments and monitoring would occur as part of the adaptive management of the expansion project.

Management Plans

Management Plans are developed as separate documents and typically function as technical (operational and adaptive) documents informing the EM Program and the measures and actions put in place for achieving the objectives. Management Plans provide background information commensurate to the Plan's application, compiled from various sources such as published literature, studies/surveys undertaken and Codes of Practice and guideline documents.

Controls/Management Actions

Controls and management actions that have been identified as part of the impact assessment process are provided here. These controls and management actions would be used to perpetuate the culture of continuous improvement.

These controls and measures may, in appropriate circumstances, be modified or replaced with other appropriate measures during the course of the detailed design, construction, execution and decommissioning of the project.

Monitoring Programs

Monitoring Programs (MPs) have been (or would be) developed, as separate documents, for the proposed expansion. MPs are developed from the assessment criteria and therefore may include 'lead' and 'lag' indicators (where relevant) to trigger necessary management action or response.

MPs would state the assessment criteria to be measured and the methodology to be used, including, for example, details of responsibilities, adopted protocols, frequency, control and monitoring locations, instrumentation, data assessment (including quality assurance, quality control, accuracy of data) and reporting procedures. These would be relevant and organic documents that would be reviewed regularly as the project proceeded.

It is critical that the MPs be routinely revised to match the project and advances in legislative and environmental practices.

MPs would assess environmental performance relative to specific assessment criteria (and the associated objectives), as well as the performance of control measures and management actions implemented.

Contingency Options for Risk Items

Contingency measures for key project risks would be determined during the subsequent stages of the expansion project. The EIS risk assessment process has identified a comprehensive register of risks associated with the proposed expansion, and these have been fed into the BHP Billiton expansion project risk management system. The EIS risk process resulted in immediate control measures being applied to any risks identified as 'intolerable' to reduce the specific risk to a tolerable level.

Depending on the magnitude of risk, contingency measures for the identified tolerable risks would be developed using the principles of risk management. This is an iterative approach, which aims to eliminate or reduce the likelihood and/or consequence of incidents to a level considered to be as low as reasonably achievable or as low as reasonably practicable.

BHP Billiton applies risk reduction measures and controls in the stages where there is sufficient detail available to maximise the effectiveness of the controls. As a result, only some contingency options are identified in this Draft EM Program.

BHP Billiton Responsible Person

The BHP Billiton site personnel responsible for managing, implementing and maintaining particular components of the EM Program would be identified. This person/s would be familiar with the requirements of the EM Program and have a working relationship with key contacts within the government agencies (and other industry networking groups/agencies) relevant to that component of the EM Program.

Key Government Departments

This section lists the government department primarily responsible for administering any legislative Acts and Regulations related to the scope of the program.

U1.2 DRAFT ENVIRONMENTAL MANAGEMENT PROGRAM

The current EM Program (FY08–FY10) has been used as the model for the development of a Draft EM Program for the proposed expansion, incorporating the commitments, mitigation measures, standard controls, contingency measures and monitoring requirements identified during the EIS process. Table U1.1 illustrates how the current EM Program (FY08–FY10) has been considered during the development of the proposed expansion Draft EM Program. Each of the proposed expansion Draft EM Programs is provided.

Table U1.1 Proposed expansion Draft EM Program

PROPOSED EXPANSION DRAFT EM PROGRAM	CURRENT OD EM PROGRAM (FY08 – FY10)
ID 1 USE OF NATURAL RESOURCES	
ID 1.1 Land Disturbance	ID 5.3 Land Disturbance
ID 1.2 Marine Disturbance	
ID 1.3 Spread of Pest Plants and Animals	ID 5.1 Presence of Pest Plants and Animals
ID 1.4 Aquifer Level Drawdown	ID 2.1 Artesian Pressure Reduction
	ID 2.2 Water Efficiency of the Operation
ID 2 STORAGE, TRANSPORT AND HANDLING OF HAZARDOUS MATERIAL	
ID 2.1 Chemical/Hydrocarbon Spillage	ID 4.1 Hydrocarbon Spillage
ID 2.2 Radioactive Process Material Spillage	ID 4.2 Radioactive Process Material Spillage
ID 2.3 Transport of Radioactive Material	
ID 3 OPERATION OF INDUSTRIAL SYSTEMS	
ID 3.1 Fugitive Particulate Emissions	ID 3.3 Particulate Emissions
ID 3.2 Noise Emissions	
ID 3.3 Point-Source Emissions	ID 3.2 Sulphur Dioxide Emissions
ID 3.4 Saline Aerosol Emissions	ID 3.1 Saline Aerosol Emissions
ID 3.5 Radioactive Emissions	
ID 3.6 Greenhouse Gas Emissions	ID 3.4 Greenhouse Gas Emissions
	ID 1.1 Energy Efficiency of the Operation
ID 4 GENERATION OF INDUSTRIAL WASTES	
ID 4.1 Marine Discharge	
ID 4.2 Containment of Tailings and Waste Rock	ID 6.1 Tailings Storage Facility Embankment Stability
ID 4.3 Major Storage Seepage	ID 2.3 Tailings Retention System (TRS) Seepage
	ID 2.4 Processing Dams Seepage
ID 4.4 Stormwater Discharge	
ID 4.5 Fauna Interaction with Operations	ID 5.2 Fauna Interaction with Tailings Retention System
ID 4.6 Waste Disposal	ID 6.2 Waste Generation
ID 4.7 Radioactive Waste	
ID 5 EMPLOYMENT AND ACCOMMODATION OF PEOPLE	
ID 5.1 Community Interactions	
ID 5.2 Workplace Interactions	

ID 1	USE OF NATURAL RESOURCES
ID 1.1	**Land Disturbance**

Scope

Land disturbance, which includes disturbance to areas of native vegetation, is required for the proposed expansion, particularly for access to the ore body and for the construction of the processing plant, tailings storage facility (TSF), accommodation, transport, and supply services infrastructure.

The *Native Vegetation Act 1991* regulates the clearance of native vegetation in South Australia and clearance must be minimised within the area approved for disturbance and be off-set by a Significant Environmental Benefit (SEB) (or set-aside area). The proposed expansion would result in the clearance of approximately 16,926–17,269 ha of native vegetation, mostly associated with the TSF and rock storage facility (RSF), and to lesser extent infrastructure corridors.

Removal of native vegetation can fragment habitats, which in turn can introduce weeds and pose a barrier to the movement of fauna. The areas in which clearing is proposed for the expansion are included within the Arid Lands, Eyre Peninsula, and Northern and Yorke Peninsula NRM regions.

Project development works requiring clearance of the surface with heavy earth-moving machinery may also have the potential to impact heritage sites, particularly archaeological sites which are at, or near, the ground surface. Appropriate management of such events is required.

Port of Darwin facilities would be built on reclaimed land and not on natural topography or soils. However, with disturbance of the reclaimed land during the construction of the proposed facilities, some issues may arise in relation to erosion and sedimentation off-site into stormwater drains and/or directly into the marine environment. Depending on where the reclaim materials have been obtained, there might also be issues in relation to acid sulfate soils, contaminated soils, unearthing of foreign anthropogenic materials and/or unearthing of artefacts or items of archaeological significance.

Legal and Other Guidance

- *Roxby Downs (Indenture Ratification) Act 1982* (SA)
- *Natural Resources and Management Act 2004* (SA)
- *Native Vegetation Act 1991* (SA)
- *National Parks and Wildlife Act 1972* (SA)
- *Aboriginal Heritage Act 1988* (SA)
- *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
- Use of environmental offsets under the EPBC Act 1999 – Draft policy (Commonwealth)
- Guidelines for a Native Vegetation Significant Environmental Benefit Policy for the clearance of native vegetation associated with the minerals and petroleum industry, 2005
- *Heritage Conservation Act, Northern Territory Aboriginal Sacred Sites Act* (NT)
- *Soil Conservation and Land Utilization Act* (NT)
- Northern Territory Erosion and Sediment Control guidelines

Values

- Arid Recovery
- Listed threatened flora and fauna
- Special landscape features of value to the region
- Significant Aboriginal and non-Aboriginal sites
- Coastal and surrounding marine environmental values (NT)

Objective(s)

1. No significant adverse impacts to listed threatened species (South Australian, Northern Territory, Commonwealth) populations in the expansion project area as a result of BHP Billiton's construction activities

Assessment Criteria

1a. No significant adverse impact on the Ampurta as a result of BHP Billiton activities

1b. No significant adverse impact on an important population of the Pernatty Knob-tailed Gecko, Dusky Hopping-mouse or Plains Rat as a result of BHP Billiton activities

ID 1	USE OF NATURAL RESOURCES
ID 1.1	Land Disturbance

Management Plans

Vegetation Management Plan (new)

- BHP Billiton has prepared an offset strategy to facilitate a net benefit for the clearance of native vegetation required for the proposed expansion

Heritage Management Protocol (new)

- A Heritage Management Protocol has been developed as part of the proposed expansion for managing heritage sites of Aboriginal heritage value (17.5.2)
- If it is necessary to disturb archaeological or ethnographic sites (with relevant approvals), a site disturbance mitigation plan would be developed in consultation with the appropriate Aboriginal groups (17.3.3)

Environmental/Indigenous Heritage Clearance Permit (EIHCP)(OD Doc. 512)

- The EIHCP procedure would be reviewed to include expansion areas, such as infrastructure corridors from Moomba to Pt Lowly, and the Port of Darwin (10.5.1)

Acid Sulfate Soil Management Plan (new)

- For areas below 5 m AHD at the Port of Darwin, Point Lowly, landing facility and the infrastructure corridor (in particular Yorkey's Crossing and Lake Windabout), where ground disturbance is to occur, further investigations would be carried out and an ASS management plan prepared prior to disturbance detailing required soil handling methods and lime dosing rates if the sample analysis was found to exceed the applicable criteria (10.5.2)

Erosion and Sediment Control Plan (new)

- Erosion and sediment control plans (ESCP) would be prepared for the construction disturbance in coastal areas (e.g. Port of Darwin, the landing facility and desalination plant), and areas of high and very high soil erosion risk (e.g. gas pipeline corridor). Plans would include marked-up design drawings that show the location, extent and type of erosion control measures proposed, and monitoring programs to ensure erosion and sediment control measures were inspected and maintained (10.5.1)
- The ESCP for the proposed gas pipeline corridor would specifically address dunefield areas associated with the Strzelecki, Collina and Hope land systems, undulating downs and rolling hills within the Mumpie soil unit, and the bed, banks and overflow channel areas of the main watercourses (10.5.1)

Trench Management Plan (new)

- A trench management plan would be implemented to minimise fauna mortalities associated with the open trench during the construction of the water supply and gas supply pipelines (15.5.11)

Topsoil Management Plan (new)

- A management plan would be prepared to guide the reuse of topsoil (including sand) and cleared vegetation at sites where revegetation is an appropriate rehabilitation objective (23.9.1)

Rehabilitation and Closure Plan (new)

- The following outlines the monitoring and research areas that would occur during the operation phase of the expanded mine and provide additional information to help refine the rehabilitation and closure plan:
  - pit water quality and quantity (23.12.1; 23.8.1)
  - RSF and TSF rehabilitation trials (23.12.2)
  - characterisation of the mine rock (23.9.1)
  - optimising revegetation and rehabilitation (23.12.3)
  - metal uptake by vegetation (23.12.4)
  - rehabilitation success (23.12.5)

ID 1	USE OF NATURAL RESOURCES
ID 1.1	**Land Disturbance**

Controls/Management Actions

- A Significant Environmental Benefits (SEB) offset strategy would be implemented. This could be achieved by setting aside 126,650 ha of land in the South Australian Arid Lands NRM region or alternative arrangements as agreed with the South Australian Government (15.5.1)

Arid Recovery

- The expanded mining and processing operations would not encroach on the existing footprint of Arid Recovery and, as such, there is no change to land use (9.7.2)
- Arid Recovery would continue to be supported through:
  - ongoing financial support
  - maintaining a distance of 500 m between the RSF and Arid Recovery
  - scientific, managerial and professional support by BHP Billiton (15.3.10)

Desalination Plant

- On land, the intake and outfall pipes would be aligned in trenches through land that is either currently vacant or alongside the existing road corridor. The pipes would then either be trenched into the seabed or laid on the seabed and covered with rock. A fenced compound would be installed around the intake sump on currently vacant land (5.7.4; 9.7.3)
- In the event that the ultimate pipeline alignment requires blasting to be within 100 m of the Point Lowly Lighthouse, the charge size of blasts in the area would be adjusted to ensure compliance with recommended building damage criteria for sensitive sites, based on Australian and international standards (18.5.1)
- Management measures to further reduce potential impacts on the Point Lowly Lighthouse Complex would include:
  - minimising the construction period and disturbance footprint of the outfall pipe within the heritage complex
  - providing prior notice of construction works to the South Australian DEH and prospective tourists to the lighthouse
  - consultation with the South Australian DEH to establish acceptable design and construction criteria for the pipeline and other requirements during the construction phase
  - undertaking pre- and post-blasting building conditions surveys at the Point Lowly Lighthouse, if required
  - monitoring blast patterns to ensure compliance with the appropriate airblast and vibration criteria
  - keeping accurate records describing the location of each blast and all blastholes, the design of the blast in terms of explosives and initiating system usage, and ground vibration and airblast measurement data (18.5.1)

Linear Infrastructure

- The gas and water supply pipelines would be buried for the majority of their length to enable current land use in the pipeline corridor to continue (9.6). Small sections of the water supply pipeline, particularly those sections of the line that intersect watercourses such as the inlets to Lake Windabout and Pernatty Lagoon, would remain above ground (about 1.5 km in total) supported on pre-cast concrete plinths or culverts (5.7.5)
- Continued consultation with landowners directly affected in relation to infrastructure easements, including land access, fencing along access tracks, crossing points for pastoral activities, and strategies for dealing with potential incidents during construction and operation (19.5.6)

ID 1	USE OF NATURAL RESOURCES
ID 1.1	**Land Disturbance**

- Suitable erosion protection measures (e.g. silt fences) would be installed on the downstream side of the disturbance areas for the transmission line towers where soils of high erosion risk have been identified and in areas within 50 m of a drainage channel or watercourse (10.5.1)
- Erosion protection measures would be implemented to limit the disturbance to protective gibber surfaces (such as those within the Arcoona land system between Woomera and Roxby Downs) and salt crusts (e.g. at Lake Windabout and Pernatty Lagoon). Where possible, ancillary infrastructure would be located outside these areas. Site clean-up in these areas would also avoid grading or shallow ripping of traffic compacted areas to retain the integrity of the compacted surface (10.5.1)
- The final alignment of linear infrastructure would be selected to avoid surface water features of particular significance (e.g. Reedy Springs and Saint Mary Pool on the gas pipeline corridors) (11.5.1)
- The proposed expansion has adopted a five metre wide clearance corridor for infrastructure for the transmission line (in addition to 100 m^2 powerline tower footprints) (15.4.2)
- Linear infrastructure [water, power, rail and gas] would be located where possible adjacent to existing infrastructure corridors to reduce habitat fragmentation (15.5.2)
- Locating the water supply pipeline, transmission line, rail line adjacent to existing infrastructure corridors (15.4.2; 20.1)
- The Pernatty Knob-tailed Gecko has been identified as a species requiring special attention during construction of the water supply pipeline and powerline (between kp 158 and kp 212) and a specific management plan would be developed to minimise impacts on this species. The plan would cover:
  - pre-construction surveys
  - leaving the trench open for as little time as possible from kp 158–212
  - placing a water-soaked, sawdust-filled hessian bag in the trench every 100 m from kp 158–212 to provide shade
  - qualified personnel monitoring the open trench every morning and releasing trapped geckos (15.5.5)

Flora and Fauna (general)

- Implementation of the SEB offset strategy to mitigate residual impacts of clearing vegetation (15.4.2)
- Management measures aimed at detecting and avoiding potential impacts on threatened flora include:
  - further field surveys of the disturbance footprints of the linear infrastructure once the final alignment has been finalised
  - before disturbance, 'no go' areas would be identified (15.5.4)
- BHP Billiton would work closely with suitable contractors to establish a seed collection, treatment and storage program to support rehabilitation initiatives at Olympic Dam (23.9.2)

Aboriginal and non-Aboriginal Heritage

- A procedure for identifying and treating fossils, should they be found during ground disturbance work, would be developed for the project components requiring excavation in the Bulldog Shale areas (10.5.5)
- Separate consultation with the Nukunu, Arabunna, Dieri and Adnyamathanha groups has continued as required and BHP Billiton would consult with Aboriginal groups claiming an interest in any area where land disturbance would occur during the expansion (17.2.2)
- Where it has not already done so, BHP Billiton would conduct ethnographic surveys over areas where proposed infrastructure for the expanded project may be located (17.5.3)
- The Kokatha, Barngarla and Kuyani groups have agreed to a salvage program, which would involve archaeological field trainees nominated by those Aboriginal groups (17.5.3)
- If new or potential non-Aboriginal heritage sites were identified during the project definition or construction phases, the sites would be managed according to the *Heritage Places Act 1993* (SA) (18.5.4)

Port of Darwin

- The infrastructure would be located on existing cleared land or on Darwin Port Corporation reclaimed land to avoid impacts on mangrove and other marine communities at the Port of Darwin (16.5.2)
- Erosion protection measures would be implemented to limit sediment transport from the construction area into watercourses and coastal areas (E4.8.3)
- For areas below 5 m AHD at the Port of Darwin, where ground disturbance is to occur, further investigations would be carried out and an ASS management plan would be prepared if the sample analysis was found to exceed the applicable criteria (E4.8.3)
- In the event that a site or relic of non-Aboriginal heritage value was found during construction or operation of the proposed facility at East Arm in the Northern Territory, the relic would be managed in accordance with the *Heritage Conservation Act* (18.5.4)

Other

- No further expansion of Olympic Village outside the area assessed and approved under the 1997 EIS would be undertaken for the proposed expansion (5.10.2)

ID 1	USE OF NATURAL RESOURCES
ID 1.1	**Land Disturbance**

Monitoring Program(s)

Fauna (OD Doc. 2663)

- The existing Fauna Monitoring Program would be reviewed to ensure the expanded operations were incorporated

Flora (OD Doc. 2664)

- The existing Flora Monitoring Program would be reviewed to ensure the expanded operations were incorporated

Risk Items

- Construction workforce impacts GAB springs due to failure to manage construction workers and camp sites
- Destruction of mound springs and/or surrounding areas during gas pipeline construction due to inadvertent clearing of ground in the area of mound springs
- Indiscriminate off-road driving in vicinity of Hiltaba Village and Roxby Downs due to inadequate resident awareness, inadequate education and training for workers, and/or failure to provide adequate alternative activities; failure of management systems
- Indiscriminate off-road driving in vicinity of linear infrastructure leading to damage of Aboriginal heritage sites due to inadequate education and training for workers; failure of management systems

Contingency Options

- To be developed as required

BHPB Responsible Officer

- tba

Key Government Department(s)

- Department of Water, Land and Biodiversity Conservation (SA)
- Department for Environment and Heritage (SA)
- Department of Environment, Water, Heritage and the Arts (Commonwealth)
- Department of Natural Resources, Environment, The Arts and Sport (NT)
- Minister for Indigenous Policy and (Heritage Advisory Council) (NT)

ID 1	USE OF NATURAL RESOURCES
ID 1.2	**Marine Disturbance**

Scope

The construction of the desalination plant (and associated infrastructure) and landing facility would result in some physical disturbance to the marine environment. For example, such activities would include laying water intake and return water pipework for the desalination plant, and construction of footings (or similar) for the landing facility.

Operation and maintenance of the above facilities would also result in some marine activities. For example, cleaning intake and outfall structures and the extraction of raw feed water from the Spencer Gulf, in the case of the desalination plant; and operation of barges in the case of the landing facility.

Further discussion of the management of marine discharges and fauna interaction with marine operations are provided in ID 4.1 and ID 4.5 respectively.

Legal and Other Guidance

- *Environment Protection Act 1993*
- Environment Protection (Water Quality) Policy 2003
- *National Parks and Wildlife Act 1972*
- *Marine Parks Act 2007*
- *Historic Shipwrecks Act 1981*
- Living Coast Strategy 2004

Values

- Australian Giant Cuttlefish breeding aggregation
- Recreational fishing resource
- Aquaculture (Fitzgerald Bay facilities) industry
- Commercial fishing resources
- Heritage values within the marine environment

Objective(s)

1. No significant adverse impacts to specified marine environmental values of the Upper Spencer Gulf from constructing the desalination plant (at Point Lowly) or the landing facility (southwest of Port Augusta)

Assessment Criteria

1. No long term adverse impacts on the breeding success of Australian Giant Cuttlefish caused by the construction of the desalination plant

Management Plans

Silt and Sediment Management Plan – Marine (new)

- BHP Billiton would prepare a silt and sediment management plan to minimise turbidity and silt deposition arising from the installation of intake and outfall pipes for the desalination plant (16.6.11)

Blasting Management Plan – Marine (new)

- A blasting management plan would be prepared for the installation of desalination plant intake and outfall pipes to minimise the concussive effects of blasting and the potential for sediment mobilisation (16.6.11)

Controls/Management Actions

Desalination plant

- To mitigate potential impacts during the breeding period of the Australian Giant Cuttlefish, the installation of the intake and outfall pipes would only occur between 1 November and 1 May (16.5.2; 16.6.11)
- Areas of disturbed Australian Giant Cuttlefish breeding habitat would be reinstated once the intake and outfall pipes had been installed (16.6.11)
- Consideration would also be given to creating additional breeding habitat for cuttlefish adjacent to existing habitat with excess rock from the pipe trench, in consultation with relevant stakeholders (16.6.11)
- When selecting outfall pipe location, consideration would be given to minimising impacts on a sponge community (16.6.6)
- Final location of the desalination plant outfall would be confirmed by more detailed modelling of dispersion of the return water plume (16.5.2)
- The outfall pipes would be buried completely, limiting potential impacts on the visual appeal of the lighthouse to the construction phase only (18.5.1)
- If the remnants or relics of historic shipwrecks were located, the SA DEH would be contacted and remnants managed according to the *Historic Shipwrecks Act 1981* (18.5.4)

ID 1	USE OF NATURAL RESOURCES
ID 1.2	**Marine Disturbance**

- Installing the intake and outfall pipes through rocky reef areas may require the use of underwater blasting to fracture the rock prior to excavation. The explosive charges would be placed in holes drilled into the seabed, which would dampen the concussive effect of the blasting. The concussive effects would be further mitigated by using numerous small charges rather than fewer, large charges. Marine blasting would not occur during the cuttlefish breeding season, or if whales or dolphins were observed in the area. Prior to each blast, a 600 m exclusion zone would be established and monitored to minimise the risk of marine mammals or listed marine species entering the blast zone (16.6.11)

Landing facility

- The landing facility would be constructed as a piered jetty rather than a causeway to minimise impacts on coastal processes and seagrass communities (16.5.2; 16.6.12)
- BHP Billiton has undertaken testwork at the site of the proposed landing facility and the results indicate that there would be no need for any dredging in the Upper Spencer Gulf (16.6.13)

Outer Harbor, Port of Adelaide

- Existing berths would be used [for importing and exporting of materials] at Outer Harbor, and no dredging would be required (16.6.13)

Monitoring Program(s)

General

- Before the desalination plant commenced operation, a monitoring program incorporating the following would be established:
  - seasonal surveys describing the composition of benthic communities at permanent underwater monitoring sites
  - a seawater program to provide comprehensive water quality data (including salinity and dissolved oxygen) for Point Lowly. Salinity/temperature meters and data loggers would be used to monitor salinity at critical sites
  - a sediment sampling program at Point Lowly to provide comprehensive sediment quality information, including organic and inorganic pollutants and sediment oxygen demand (16.6.5; 16.6.9)

Marine Flora and Fauna Program (new)

- A monitoring program would be developed for flora and fauna monitoring for marine activities associated with the desalination plant. The program would be developed to monitor the effectiveness of controls, management and mitigation measures put in place to meet the objectives set for marine disturbance
- A monitoring program would be established to:
  - monitor Australian Giant Cuttlefish populations at Point Lowly before and after the desalination plant began to operate
  - monitor salinity within the Point Lowly cuttlefish habitat before and after the desalination plant began to operate (16.6.7)

Marine Water Quality Monitoring Program (new)

- During the first year of operation of the desalination plant, salinity and dissolved oxygen would be monitored intensively within 1–2 km of the outfall, under a variety of tide and wind conditions, to validate the hydrodynamic model predictions of dispersion and dilution of the return water, and to determine if stratification and subsequent low dissolved oxygen occurs on the seafloor. Rhodamine WT dye would be added to the return water on several occasions (including during dodge tide and no wind conditions) to provide a direct measure of return water dilution and dispersion within several kilometres of the outfall. If the model predictions were confirmed, the monitoring program would be reviewed and revised appropriately (16.6.5; 16.6.9)

Risk Items

- Excessive silt plume during construction of inlet and discharge pipes due to actual silt behaviour differing from modelling results or excessive sediment generation

Contingency Options

- To be developed as required

BHPB Responsible Officer

- tba

Key Government Department(s)

- Environment Protection Authority (SA)
- Department for Environment and Heritage (SA)

ID 1	USE OF NATURAL RESOURCES
ID 1.3	Spread of Pest Plants and Animals

Scope

Pest plant and animal species cause a range of environmental and economic impacts throughout Australia and across a spectrum of industries. While many pest species were present in the area prior to the development of Olympic Dam and associated infrastructure, people living and working in the vicinity of the operation can potentially increase the abundance and type of pest plant and animal species that occur.

Ground disturbance during construction, movement of vehicles, the operation of waste facilities and the provision of water, shelter, or other resources can potentially cause an increase in the abundance of pest species. The level of control required for a particular species is dependant on the risk that the species may cause environmental or economic harm and an assessment of the likelihood that control options would be effective.

The existing operations implement and maintain a Weed Management Plan. This strategy identifies agreed priority pest plant species, monitoring commitments, control actions and responsibility. The plan was prepared in conjunction with the SA Arid Lands Natural Resources Management Board, Roxby Downs Council, the Andamooka Progress Association, and in accordance with the *Natural Resources Management Act 2004* and would be expanded and implemented for the expansion.

The construction activities and the movement of materials into and out of the Port of Darwin have the potential to introduce weed species and/or pest or feral animals. Of particular concern are mosquito breeding and biting insects which, in the Northern Territory, cause concerns for human health.

Legal and Other Guidance

- *Natural Resource Management Act 2004* (SA)
- The Australian Weeds Strategy (2007) (SA)
- South Australian Arid Lands NRM Weed Plan
- *Weeds Management Act 2001* (NT)
- *Territory Parks and Wildlife Conservation Act* (NT)
- *Public Health Act* and Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations (NT)
- Construction Practice Near Tidal Areas of the Northern Territory – Guidelines to Prevent Mosquito Breeding, Department of Health and Community Services, June 1988 (NT)

Values

- Listed threatened flora and fauna
- Native flora and fauna, and biodiversity
- Public health

Objective(s)

1. No material increase in the abundance or area of infestation of pest species as a result of BHP Billiton's expansion activities in the expansion project area (as defined)

Assessment Criteria

1a. No material increase in abundance of existing declared pest species

1b. No introduction of new self-sustaining declared pest populations

Management Plans

Weed Management Plan

- The existing plan would be reviewed and expanded following a re-assessment of risk (Weed Risk Assessment (2007)) to incorporate the expansion, particularly new infrastructure components, new geographical areas which would form part of the operation and the risks associated with construction works
- Prior to the construction phase, BHP Billiton would develop appropriate weed control strategies for the Eyre Peninsula and Northern and Yorke NRM regions in consultation with the respective boards (15.5.11)

Landfill Management Plan (new)

- A landfill management plan would be developed for the new facilities to be built as part of the expansion and would incorporate strategies and controls for pest plants/animals

Mosquito Management Plan (new)

- Developed prior to construction by appropriately qualified personnel in accordance with the Guidelines to Prevent Mosquito Breeding. Issues to be considered would be pond depth, angle of bund sides, material used in bunds, control of aquatic and semi-aquatic vegetation, and the discharge sites for overflow water

Ballast Water Management Plan (new)

- BHP Billiton would develop and implement a Ballast Water Management Plan for the management of barge and ship ballast water for the protection of marine environmental values

ID 1	USE OF NATURAL RESOURCES
ID 1.3	**Spread of Pest Plants and Animals**

Controls/Management Actions

- BHP Billiton would consider supporting Roxby Downs Council to:
  - fence landfill sites to minimise access by feral animals including cats and foxes
  - improve the management of landfill sites to ensure that non-recycled organic rubbish is buried as quickly as possible (15.5.11)
- BHP Billiton would support DEH efforts in prevention of gull predation on banded stilt eggs (15.5.7)

Port of Darwin

- Any receptacles or depressions with the potential to store water for more than 3 days would be avoided, and stormwater drains would be kept clear of vegetation and be free-draining to avoid formation of mosquito breeding habitat (E4.8.5)
- Consultation with personnel with ecological expertise during the design and construction of the port facilities, including the Medical Entomology Branch of the NT Department of Health and Families (E4.8.5)
- Discharge of ballast water would be managed in accordance with the requirements of Darwin Port Corporation and national ballast water management standards (currently being developed) (E4.8.4)

Monitoring Program(s)

Fauna (OD Doc. 2663)

- The existing Fauna Monitoring Program would be reviewed to incorporate the expanded operations
- BHP Billiton would monitor gull populations at Olympic Dam and communicate the results to DEH to assist its programs (15.5.11)
- Routine feral animal monitoring and control programs that BHP Billiton currently undertakes in the Olympic Dam region would continue (15.5.11)

Flora (OD Doc. 2664)

- The existing Flora Monitoring Program would be reviewed to ensure the expanded operations were incorporated

Risk Items

- Weed infestation (marine and terrestrial) at the desalination plant due to failure of decontamination procedures
- Weed infestation along linear infrastructure and at Roxby Downs due to failure of decontamination procedures

Contingency Options

- To be developed as required

BHPB Responsible Officer

- tba

Key Government Department(s)

- Department of Water, Land and Biodiversity Conservation (SA)
- Department of Natural Resources, Environment, The Arts and Sport (NT)
- Department of Health and Families (NT)

ID 1	USE OF NATURAL RESOURCES
ID 1.4	**Aquifer Level Drawdown**

Scope

The primary water supply for the proposed expansion is a desalination plant located at Point Lowly. No additional water would be obtained from the Great Artesian Basin (GAB) beyond sustainable yields and that which is available under approvals from the South Australian Government. A supplementary water supply, primarily for dust suppression, would be sourced from saline aquifers close to the current operation.

Saline water for dust suppression and other low-quality uses would be sourced from a primary saline wellfield (Motherwell) in the Andamooka Limestone, around 30 km north of Olympic Dam, and from various satellite wellfields within and close to the SML. Water recovered from depressurisation activities would also be recycled and reused. Total groundwater extraction would be around 12 ML/d from the Tent Hill aquifer and around 28 ML/d from the Andamooka Limestone aquifer.

Temporary water supply wells may be required about every 10–20 km along the linear infrastructure corridors, but these would be located so that they had minimal impact on third-party users.

Groundwater modelling undertaken for the proposed expansion shows that dewatering and depressurisation of the open pit and extraction of groundwater for water supply would result in an overall loss of groundwater from the system and drawdown in the Andamooka Limestone and Tent Hill aquifers.

The effects of changes in groundwater levels are most prominent south of Olympic Dam because groundwater flowing from the Arckaringa Basin (across the northern part of the Stuart Shelf) acts as a buffer between Olympic Dam and groundwater systems to the north. Groundwater drawdown would not affect the northern boundary of the Stuart Shelf and there would be no impact on the artesian aquifers of the GAB and the corresponding springs.

No residual impact to third-party groundwater users is expected.

Legal and Other Guidance

- *Roxby Downs (Indenture Ratification) Act 1982*

Values

- Water resources of the GAB and Stuart Shelf
- Lake Torrens saline springs (e.g. Yarra Wurta)
- Ecological communities within springs associated with the GAB

Objective(s)

1. No significant adverse impacts to the availability and quality of groundwater to existing third party users as a result of groundwater drawdown associated with BHP Billiton's expansion activities
2. No significant adverse impacts to groundwater dependant ecosystems as a result of groundwater drawdown associated with BHP Billiton's expansion activities

Assessment Criteria

1. No material change in the availability and quality of groundwater at existing groundwater bores operated by third-party users
2. No significant decline in groundwater flow rate to Yarra Wurta springs

Management Plans

Water Management Plan

- Existing water management plan would be revised for the expansion

Controls/Management Actions

- No additional water for the proposed expansion would be obtained from the GAB beyond sustainable yields and that which is available under approvals from the South Australian Government (2.10.3; 12.1)
- A supplementary low quality water supply, primarily for dust suppression, would be sourced from saline aquifers close to the current operation (12.1)
- No water would be extracted from GAB springs or groundwater wells within 20 km of the springs during gas pipeline construction (15.5.3)
- The new open pit would require dewatering and depressurisation to control potential inflows of groundwater to the pit and to reduce residual pore pressures behind the pit walls (5.4.3; 12.4.2)

ID 1	USE OF NATURAL RESOURCES
ID 1.4	**Aquifer Level Drawdown**

Monitoring Program(s)

Groundwater Monitoring Program (OD Doc. 2791)

- The existing Groundwater Monitoring Program would be reviewed to incorporate expansion requirements for regulatory review and approval prior to implementation and would include provision for:
  - monitoring the groundwater levels in wells in the Olympic Dam region to confirm and validate the groundwater model (12.6.3)
  - ongoing monitoring of groundwater levels and spring flow at Yarra Wurta springs (12.6.4)
- A monitoring program using piezometer monitoring bores would be established to review the depressurisation system and optimise its performance (5.4.3)

Great Artesian Basin (OD Doc. 2789)

- The Monitoring Program would be reviewed to ensure expansion requirements were incorporated

Fauna (OD Doc. 2663)

- The existing Fauna Monitoring Program would be reviewed to ensure groundwater communities/ecology (such as the Yarra Wurta Spring) relevant to monitoring the expanded operations were incorporated

Risk Items

- Potential impacts to third parties from excessive drawdown of potentiometric heads due to actual drawdown differing from results of modelling, or inter-aquifer contamination (change of pressure between aquifers and water flows in different directions)
- Excessive drawdown of potentiometric heads (saline aquifer) due to incorrect modelling of the impact of drawing water from aquifer
- Routine mining operations (open pit and RSF) change groundwater levels due to aquifer drawdown

Contingency Options

- If monitoring showed that drawdown was affecting current third-party users, alternative water supply options would be investigated. These may include relocating or deepening existing groundwater wells, or providing an alternative water supply. Options would be considered in consultation with the third-party user (12.6.3)

BHPB Responsible Officer

- tba

Key Government Department(s)

- Department of Water, Land and Biodiversity Conservation (SA)

ID 2	STORAGE, TRANSPORT AND HANDLING OF HAZARDOUS MATERIAL
ID 2.1	Chemical/Hydrocarbon Spillage

Scope

As with any mining and industrial operation, a large variety of diesel, sulphur, hydrocarbons, reagents and other chemicals are transported, handled, stored and used throughout the operation. This is also the case for the construction phase. Spillage of chemicals and/or hydrocarbons can cause environmental harm and possible impact to human health.

Primary (tanks), secondary (bunds) and tertiary (on-site drainage collection ponds) containment systems exist to minimise the risk of spills entering the environment beyond the boundaries of the specific operating areas, and procedures are in place to ensure proper storage, handling and use of chemicals/hydrocarbons are exercised.

Legal and Other Guidance

- *Dangerous Substances Act 1979* and Dangerous Substances Regulations 2002 and Road Transport Reform (Dangerous Goods) Regulations 1997 (Commonwealth) (as amended by Dangerous Substances Regulations 2002) (SA)
- *Environment Protection Act 1993* (SA)
- Environment Protection (Water Quality) Policy 2003 (SA)
- *Petroleum Products Act 2000* (SA)
- Petroleum Products Regulations 1995 (SA)
- AS1940 Storage and Handling of Flammable and Combustible Materials (2004)
- EPA Bunding and Spill Management Guidelines (SA)
- Olympic Dam Spill Reporting Procedure (OD Doc. 50648)
- *Dangerous Goods Act* and Dangerous Goods Regulations (NT)
- *Dangerous Goods (Road and Rail Transport) Act 2003* and Dangerous Goods (Road and Rail Transport) Regulations (NT)

Values

- Clean and safe workplace
- Existing quality of local soil and water resources (both surface and groundwater)

Objective(s)

1. No significant contamination to soils, surface water or groundwater as a result of the storage, transport or handling of hazardous materials by BHP Billiton during expansion activities

Assessment Criteria

1. No lasting significant contamination arising from uncontrolled loss of chemicals to the natural environment (area to be defined)

Management Plans

Emergency Response Plan (OD Doc. 3788)

- The Emergency Response Plan would be updated to ensure any additional requirements of the expansion were incorporated, particularly for accidental spills associated with possible derailment, truck accident or vandalism

Management of Hazardous Materials (OD Doc. 4217)

- The existing procedure for the management of hazardous materials would be updated to include the expansion
- For identified [sensitive] areas (the western edge of Lake Windabout, Upper Spencer Gulf, and Darwin Harbour), specific spill management procedures would be expanded and developed. The procedures would ensure that spills were controlled at source, contained on-site and cleaned up according to the requirements of the MSDS. Spill containment and clean-up equipment would be available on-site at all times and personnel would be trained in the appropriate use of this equipment (11.5.2)

Other Operational HSEC Plans (eg. OD Doc. 67957 (Security), OD Doc.48958 (Incident Management Team Plan) and OD Doc. 60140 (Confirmed Fire, Surface))

- Security operations, crisis management, fire control and other existing operational risk management plans would be reviewed to ensure requirements for the expansion were incorporated

ID 2	STORAGE, TRANSPORT AND HANDLING OF HAZARDOUS MATERIAL
ID 2.1	Chemical/Hydrocarbon Spillage

Controls/Management Actions

- The current operation's spill management and reporting procedures would be extended to the expanded operation (10.6)
- As a minimum, the South Australian Environmental Protection Authority (SA EPA) standards would be used for storage of hazardous liquids, which require bund sizes and volumes to be 120% of the net capacity of the largest tank and 133% for flammable material (11.5.2; 12.6.2; 22.6.8)

Port of Darwin

- Fuel storages and other hazardous materials would be appropriately bunded in accordance with Northern Territory and Australian statutes (E4.8.3)
- Temporary bunds and spill kits would be stored on-site for use by trained personnel in the event of a spill (E4.8.3)
- All chemicals would be managed through a central store area, material safety data sheets provided, and appropriate training given to personnel in the safe use and handling of chemicals or hazardous materials (E4.10.1)

Monitoring Program(s)

Groundwater (OD Doc. 2791)

- The groundwater monitoring program would be updated to incorporate the expansion

Risk Items

- Spill of fuel or chemicals into Spencer Gulf due to equipment failure and/or operator error
- Chemical and/or fuel spillage at desalination plant site due to lack of care during plant removal phase or loss of containment
- Chemical and/or fuel spillage at metallurgical plant due to lack of care during plant removal or loss of containment
- Spillage of toxic or flammable material during rail transport between Port Adelaide and Olympic Dam due to failure of ISO transport containers and/or excessive impact due to heavy shunting
- Spillage of sulphur during rail transport between Port Adelaide and Olympic Dam due to bottom dumping wagons failure or leak
- Commodity loss in rural or agricultural area from rail transport between Olympic Dam and Port Adelaide due to failure of commodity containment systems
- Spillage of molten sulphur in corridor between greenfield and brownfield sites due to failure of material transfer systems (pipes)
- Loss of containment of acid between new acid plant and existing facilities due to failure of acid pipelines
- Spillage of sulphur during wharf activities due to overfill of rail wagon
- Fuel/oil/chemical spills during construction and decommissioning due to loss of containment or operator error
- Fuel or chemical spill into Darwin Harbour due to equipment failure and/or operator error during construction
- Fuel leak or spill due to failure of containment systems and/or inadequate bunding at Port of Darwin

Contingency Options

- To be developed as required

BHPB Responsible Officer

- tba

Key Government Department(s)

- Environment Protection Authority (SA)
- Department of Primary Industries and Resources (SA)
- Safework SA (Department of the Premier and Cabinet)
- NT WorkSafe (Department of Justice) (NT)

ID 2	STORAGE, TRANSPORT AND HANDLING OF HAZARDOUS MATERIAL
ID 2.2	Radioactive Process Material Spillage

Scope

Olympic Dam handles radioactive process materials that, if released to the environment, could contaminate the air, soil and water (surface and groundwater) if appropriate management strategies are not in place.

Primary (tanks), secondary (bunds) and tertiary (on-site drainage collection ponds) containment systems are in place to minimise the risk of spills entering the environment beyond the boundaries of the processing plant. Tailings pipelines are also located within a secondary containment system.

The radiation protection principle of ALARA (As Low As Reasonably Achievable) is applied to radiation management at Olympic Dam. Strict controls and procedures are in place as part of meeting HSEC standards for the management of radioactive materials for the mining, transfer, storage and disposal of such materials. The expansion would result in added controls/procedures for the open pit mining activities, RSF and TSF.

Legal and Other Guidance

- *Australian Radiation Protection and Nuclear Safety Act 1998 (Commonwealth)*
- *Environment Protection Act 1993 (SA)*
- *Dangerous Substances Act 1979* and Dangerous Substances Regulations 2002 and Road Transport Reform (Dangerous Goods) Regulations 1997 (Commonwealth) (as amended by Dangerous Substances Regulations 2002) (SA)
- EPA Bunding and Spill Management Guidelines (SA)
- Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005)
- Criteria and Procedures for Recording and Reporting Incidents at SA Uranium Mines (PIRSA publication)

Values

- Clean and safe workplace and healthy community
- Existing quality of soil, air and water resources (both surface and groundwater)

Objective(s)

1. No adverse impacts to health of employees or the public from exposure to radiation as a result of BHP Billiton's expansion

Assessment Criteria

1. Radiation doses to the public less than 1 mSv/y above natural background and 20 mSv/y above natural background for designated workers

Management Plans

Emergency Response Plan (OD Doc. 3788)

- The Emergency Response Plan would be updated to ensure any additional requirements of the expansion were incorporated, particularly for accidental spills

Management of Hazardous Materials (OD Doc. 4217)

- The existing procedure for the management of hazardous materials would be reviewed to ensure the expansion requirements were incorporated

Other Operational HSEC Plans (eg. OD Doc. 67957 (Security), OD Doc.48958 (Incident Management Team Plan) and OD Doc. 60140 (Confirmed Fire, Surface))

- Security operations, crisis management, fire control and other existing operational risk management plans would incorporate requirements for the expansion

Radioactive Waste Management Plan

- There are specific requirements under the Mining Code and these are currently incorporated within the EMS. These requirements are being reviewed and updated to incorporate any additional requirements of the expansion. It is intended that the current RWMP would be updated to encompass the expanded activities

Radiation Management Plan (new)

- As required under the Mining Code, a Radiation Management Plan would be developed. The Plan would be closely related to the RWMP but concentrate on occupational exposure control

Controls/Management Actions

- The current operations spill management and reporting procedures would be extended to the expanded operation (22.4.5)
- As a minimum, the South Australian Environmental Protection Authority (SA EPA) standards would be used for storage of hazardous liquids, which recommend bund sizes and volumes to be 120% of the contained volume of material and 133% for flammable material (12.6.2)
- The tailings pipelines lie within a bunded corridor for the entire length. Traverse bunds would be constructed at intervals to ensure that any spillages were contained within a discrete section of the pipeline corridor (22.6.3)

ID 2	STORAGE, TRANSPORT AND HANDLING OF HAZARDOUS MATERIAL
ID 2.2	**Radioactive Process Material Spillage**
Monitoring Program(s)	
Waste (OD Doc. 2792)	
• The existing Waste Monitoring Program would be expanded and updated to ensure the requirements for the expanded operations were incorporated	
Risk Items	
• Spillage of concentrate in corridor between greenfield and brownfield sites due to failure of material transfer systems (pipes)	
Contingency Options	
• To be developed as required	
BHPB Responsible Officer	
• Statutory Radiation Safety Officer	
Key Government Department(s)	
• Environment Protection Authority (SA)	
• Department of Primary Industries and Resources (SA)	
• Emergency Services – SA	
• Australian Safeguards and Non-Proliferation Office (ASNO) (Commonwealth)	
• Australian Maritime Safety Authority (Commonwealth)	

ID 2	STORAGE TRANSPORT AND HANDLING OF HAZARDOUS MATERIAL
ID 2.3	Transport of Radioactive Material

Scope

Olympic Dam has been producing, transporting and exporting uranium oxide since 1988 under strictly controlled conditions. A large amount of expertise has been accumulated resulting in an ongoing, safe and environmentally competent operation. In addition to this, samples of radioactive materials are routinely sent to and from various laboratories and institutions for test work. Internal management systems are externally audited and comply with all relevant requirements ensuring that the transport of radioactive material from Olympic Dam is well controlled. All off-site transport of radioactive material is conducted to conform with National and International Codes of Practice on safe transport of radioactive materials. These systems would extend to the transport, storage and export of additional uranium oxide and concentrate at the Port of Darwin.

For the expanded operation, it is expected that bulk quantities of concentrate (containing up to 2,000 ppm uranium) would be shipped to international customers via rail, road and ship. The levels of uranium in these products exceed the IAEA definition of a radioactive material (>1 Bq/g) and therefore the concentrate would be shipped as a 'low specific activity – 1 (LSA-1)' radioactive material.

Legal and Other Guidance

- *Australian Radiation Protection and Nuclear Safety Act 1998* (Commonwealth)
- *Customs Act 1901* (Customs (Prohibited Exports) Regulations 1958) (Commonwealth)
- *Radiation Protection and Control Act 1982* (Transport of Radioactive Substances Regulations 2003) (SA)
- *Environment Protection Act 1993 (SA)*
- Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005)
- Code of Practice for the Safe Transport of Radioactive Materials (2008) (Note that this code has been released by ARPANSA, but yet to be adopted by SA into legislation)
- IAEA, 1996, International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources
- *Darwin Port Corporation Act,* Port By-Laws and Darwin Port (Handling and Transport of Dangerous Cargoes) By-Laws (NT)
- *Radioactive Ores and Concentrates (Packaging and Transport) Act* (NT)
- *Radiation (Safety Control) Act* (NT)
- *Radiation Protection Act 2004* (due to commence in 2009) (NT)

Values

- Security of potentially hazardous material
- Clean, safe workplace and community

Objective(s)

1. No adverse impacts to health of employees or the public from exposure to radiation as a result of BHP Billiton's expansion activities

Assessment Criteria

1. Radiation doses to the public less than 1 mSv/y above natural background and 20 mSv/y above natural background for designated workers

Management Plans

Transport Plan for uranium oxide from Olympic Dam to Australian shipping ports (OD doc 43773)

- The transport plan describes the procedures and processes for safely storing and transporting uranium oxide, from packaging and delivery, including the emergency response to potential incidents along the routes. It also describes the roles and responsibilities of the various organisations involved. The plan is externally audited

Transport Plan for Concentrate (new)

- A transport plan is being developed in consultation with the appropriate authorities for the transport of concentrate. The plan outlines the key information for shippers, including material hazardousness, stowage information, transport precautions, environmental considerations and emergency procedures

Olympic Dam Emergency Response Plan (OD doc 3788)

- A formal site-wide emergency response plan exists which incorporates processes for the response to material spillages. Appropriate clean up equipment is in place

Uranium and Olympic Dam Development Crisis and Emergency Management Team Plan (OD doc 48958)

- This customer group plan has been established to manage issues that may have group wide consequences

Radiation Management Plan (new)

- As required under the Mining Code, a Radiation Management Plan would be developed. The Plan would be closely related to the RWMP but concentrates on occupational exposure control

ID 2	STORAGE TRANSPORT AND HANDLING OF HAZARDOUS MATERIAL
ID 2.3	Transport of Radioactive Material

Controls/Management Actions

- A 'closed system' would be used to transport, store and convey concentrate from Olympic Dam to the ship's hold at the Port of Darwin. Specifically:
  - appropriate dedicated equipment would be constructed and used
  - rail wagons would be effectively sealed with suitable covers and fitted in such a manner that concentrate would not escape during transport
  - the water used to wash the outside of the rail wagons would be collected and reused. Solids that settle from this water would be placed on the concentrate stockpile and when required, water would be returned to Olympic Dam for disposal
  - the concentrate storage system and conveying system would have a negatively pressured extraction ventilation system with automatic unloading and rail wagon wash systems (5.9.5; 11.4.2; 13.3.4; 22.6.10)
- Compliance with appropriate transport requirements as detailed in the Australian Code of Practice for the Safe Transport of Radioactive Material (2008) would be required (22.6.10)
- The water used to wash the rail wagons would be collected and treated to recover concentrate particles that may have attached to the wagon during unloading (i.e. tippling). The treated water would be contained in on-site storage tanks for reuse in subsequent wash cycles, while any collected solids would be placed on the copper concentrate stockpile for export, resulting in a zero discharge decontamination system (5.9.5)
- From time to time (preliminary estimates suggest about every four to six months) a proportion of the wash down water would be removed from the system and the system would be 'topped up' with replacement water. The removed water would be discharged into a holding tank or similar unit and railed back to Olympic Dam to be disposed of within the Olympic Dam TSF (5.9.5)
- All conveyor transfer points at Olympic Dam and East Arm would contain fully enclosed spoon chutes, with dust curtains at entry and exit points. Dust suppression mist sprays would be located within the skirts after the loading point and could cover the full width of the conveyed material (5.9.5; 13.3.4)
- BHP Billiton would collaborate with the Darwin Port Corporation and relevant regulatory authorities and agencies to develop and implement a site specific security management plan (5.9.5; E4.2.3)
- Uranium oxide would continue to be sealed in 200 L drums and placed in sealed shipping containers for transport to the nominated export port (5.9.5; E4.2.2)

Monitoring Program(s)

Radiation Dose to Members of the Public (OD 2790)

- Potential doses to members of the public from the transport of radioactive material would be assessed as necessary

Risk Items

- Spread of concentrate along rail line due to failure of washing and monitoring
- Spillage of concentrate into Darwin Harbour during ship loading due to failure of materials handling systems or dust control systems
- Spillage of concentrate during movement of material to and from stockpile at Port of Darwin due to failure of conveyor system and/or product enclosure system
- Loss of integrity of concentrate storage during cyclonic rain storm at Port of Darwin

Contingency Options

- To be developed as required

BHPB Responsible Officer

- Statutory Radiation Officer

Key Government Department(s)

- Australian Maritime Safety Authority (Commonwealth)
- Australian Safeguards and Non-Proliferation Office (ASNO) (Commonwealth)
- Environment Protection Authority (SA)
- Emergency Services – SA Police, Fire Fighting Service, SA Ambulance (SA)
- NT WorkSafe (Department of Justice) (NT)
- Department of Health and Families (NT)
- NT and Darwin Emergency Services (NT)

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.1	**Fugitive Particulate Emissions**

Scope

The Olympic Dam expansion project is expected to handle 350-390 Mtpa of mine rock as part of the open pit mining operations. Loading, transport and unloading of this material would generate fugitive particulate emissions, primarily consisting of dust. Fugitive particulate emissions would also be generated during construction works for other infrastructure associated with the expansion, including linear and transport infrastructure, the landing facility, the desalination plant, Hiltaba Village, the airport, the Port of Darwin facilities and works associated with expanding Roxby Downs.

Sensitive dust receptors include residents in Roxby Downs, Hiltaba Village, Olympic Village (during initial development phase) and to a lesser extent communities living near service infrastructure and associated corridors during the construction period. Dust modelling assessment suggests that dust criteria would be met under most circumstances at key receptors. Two possible exceptions include Roxby Downs and Hiltaba Village during adverse wind and temperature inversion conditions. Modelling suggests operational activities can be modified during these periods to ensure dust criteria can be met at the sensitive receptors identified.

At the Port of Darwin, fugitive particulate emissions would be generated during construction works and appropriate dust suppression and control measures would be implemented to reduce dust generation. The engineered systems for product transport, storage and transfer are closed systems, thus fugitive particulate emissions as a result of materials handling would not be an issue for operations.

Legal and Other Guidance

- *Environment Protection Act 1993 (SA)*
- SA EPA Air Quality Impact Assessment Guideline (EPA 2006)
- National Environment Protection (Ambient Air Quality) Measure (2003)
- *Waste Management and Pollution Control Act* and Waste Management and Pollution Control (Administration) Regulations (NT)
- *Workplace Health and Safety Act 2007* and Workplace Health and Safety Regulations (NT)

Values

- Ambient air quality in a remote rural community
- Clean, safe workplace and community

Objective(s)

1. No adverse impacts to public health as a result of fugitive particulate emissions from BHP Billiton's expansion activities at Olympic Dam

Assessment Criteria

1. Annual average operational contributed PM_{10} concentration of less than 30 µg/m³ and 24 hour average of less than 50 µg/m³ at sensitive receivers

Management Plans

Dust Management Plant (new)

- A dust management plan would be developed to record and monitor the following process of applying operational control:
  - a network of real-time dust monitors, which may include TSP, PM_{10} and $PM_{2.5}$ monitors, around the mining operation, at the sensitive receivers, and at intervals between these receivers and the mining operation. These would be integrated within the mining process control system as an early warning of rising particulate concentrations at the sensitive receivers
  - a real-time meteorological system, integrated with the real-time dust monitors, which would permit mining operations to be planned and adjusted to ensure the particulate criteria would not be exceeded at the sensitive receivers
  - additional monitoring sites would be placed north, east and west of the operation to determine the concentration of particulates contributed by the expanded operation (13.3.5)

Controls/Management Actions

Mining activities

- The National Environment Protection (Ambient Air Quality) Measure (NEPM) ground level dust concentration and SA EPA air quality guidelines for airborne particulates would be met through design and operational management controls of mining operations at Olympic Dam (13.3.2)
- Good quality haul roads would be installed and maintained with regular application of saline water and/or the application of suitable dust suppressants (5.5.4; 13.4.2)
- A real-time dust and meteorological monitoring system would be installed at Olympic Dam to predict dust concentrations which would provide information for operational control of dust (13.3.5)
- The provision of a 500 m separation between the RSF and Arid Recovery to minimise direct impacts from particulate matter (13.3.4)
- The borrow pits excavated to provide material for the construction of the additional road and rail infrastructure would use water carts and mobile sprinklers to suppress dust during operations and prevent adverse impacts on the sensitive receivers. After excavation of the pit was finished, the pits would be ripped and left to revegetate (13.3.5)
- Areas disturbed during construction of off-site infrastructure but no longer required would be rehabilitated in order to minimise ongoing dust impacts (13.3.5)

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.1	**Fugitive Particulate Emissions**

- All conveyor transfer points at Olympic Dam (and East Arm) would contain fully enclosed spoon chutes, with dust curtains at entry and exit points. Dust suppression mist sprays would be located within the skirts after the loading point and could cover the full width of the conveyed material (5.9.5)
- Dry materials would be transferred using covered or otherwise enclosed conveyor systems, with baghouses at transfer points, and intermediate storage bins to minimise dust emissions. Differential pressure indicators would be fitted to alert operations personnel to a potential bag failure (13.3.4)
- Dust suppression capabilities would be installed on the ore conveyor stacker to control dust (26.3.2)
- BHP Billiton would meet regulatory dust limits at Roxby Downs and Hiltaba Village through operational controls and would conduct monitoring of dust levels to confirm this

Port of Darwin

- The concentrate handling facility at the Port of Darwin would be a closed system. This would include an enclosed concentrate storage and handling facility with a suitable ventilation system (13.3.5). Additional systems for spillage control that aim to control spills at source, contain them on-site and provide for clean-up equipment and procedures would be implemented (5.9.5; 11.5.2; E4.2.3; E4.8.1; E4.13)
- Enclosed conveyors and transfer points for the transfer of concentrate from the concentrate shed to the ship's hold (5.9.5; 13.3.4; E4.2.3; E4.8.1)
- The facilities would be completely on hardstand and hence fugitive dust from trafficked areas is likely to be minimal. However, controls such as regular street sweeping would be implemented to ensure dust is minimised for the operation

Monitoring Program(s)

Dust (new)

- A real-time response system would be used to monitor the weather and fugitive particulates around the mine and towards sensitive receptors such as Roxby Downs and Hiltaba Village, identify impending exceedances and direct remedial action at specific dust sources (13.4.2)
- Establish a particulate monitoring station at Port of Darwin, at a suitable location, prior to the commencement of construction to determine baseline ambient air quality. Monitoring would continue through construction and operation of the port facility (E4.8.1)

Fauna (OD Doc. 2663)

- The existing Fauna Monitoring Program would be reviewed to incorporate the expanded operations

Flora (OD Doc. 2664)

- The existing Flora Monitoring Program would be reviewed to ensure the expanded operations were incorporated

Risk Items

- Excess dust from routine mining blasting operations due to failure of dust control mechanisms or inappropriate blast design
- Excessive dust generation from ore stockpile due to ore being too dry, resulting in dusting
- Excessive dust from crushing operations due to failure of ventilation and dust control systems
- Excessive dust from operations on RSF due to failure of dust control mechanisms
- Excessive dust from ore handling and ore processing operation due to failure of ventilation and dust control systems
- Excessive dust in Roxby Downs from mining operations due to change in meteorological conditions including wind, or to inaccurate modelling
- Uncontrolled release from smelter dust recycle system due to failure of control systems
- Uncontrolled release of dust and gases from anode furnace and slag furnace due to failure of gas control systems
- Spillage during movement of material to and from stockpile at Port of Darwin due to failure of conveyor system and/or product enclosure system
- High dusting of concentrate in the concentrate shed due to loss of moisture in concentrate stockpile

Contingency Options

- Should ambient dust concentrations rise to a point where the ambient air quality goals are likely to be exceeded, the management response may include:
  - relocating some or all blasting/loading or unloading activities to more favourable areas of the mining operation
  - redirecting mine rock haulage activities
  - modifying planned blasting activities
  - increasing the frequency of dust suppression activities on haul roads
  - cessation of operations (13.3.5)

BHPB Responsible Officer

- tba

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.1	**Fugitive Particulate Emissions**

Key Government Department(s)

- Environment Protection Authority (SA)
- SafeWork SA (Department of the Premier and Cabinet)
- Department of Natural Resources, Environment, The Arts and Sport (NT)
- NT WorkSafe (Department of Justice) (NT)

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.2	**Noise (and Vibration) Emissions**

Scope

The existing Olympic Dam operation has been operating within existing noise criteria for 20 years. With the proposed expansion, a range of additional noise (and vibration) sources will exist, including open pit mining, storage of mine rock, processing plant/equipment, a desalination plant at Point Lowly, a rail line, a new airport and a considerably larger accommodation village (Hiltaba Village). There will also be an increase in the use of existing transport infrastructure and the access corridor (between the landing facility and the Port Augusta pre-assembly yard).

Sensitive receptors include residents within Roxby Downs and adjacent to transport corridors, coastal homes at Upper Spencer Gulf, Hiltaba Village and Olympic Village (during initial development phase).

Noise (and vibration) will be generated during construction activities at the Port of Darwin with the operation of large equipment and the building of major infrastructure.

Noise modelling assessment suggests that noise criteria would be met under most circumstances at key receptors. Two possible exceptions include Roxby Downs and Hiltaba Village during adverse wind and temperature inversion conditions. Haul truck operation and associated air horn, reversing beeper, and mechanical noises are the most significant contributors to the noise levels at these receivers, particularly during the pre-mine period when the pit is shallow and the rock storage facility (RSF) is not sufficiently developed to act as a noise barrier.

Modelling of the ground vibration and air blast associated with open pit blasting activities indicates compliance with the vibration criteria at Roxby Downs and Hiltaba Village under all conditions.

Legal and Other Guidance

- *Environment Protection Act 1993 (SA)*
- Environment Protection (Noise) Policy 2007 (SA)
- World Health Organisation Guidelines for Community Noise 1999
- Australian Standard AS2021:2000 (Acoustics – Aircraft Noise Intrusion – Building, Siting and Construction)
- *Waste Management and Pollution Control Act* and Waste Management and Pollution Control (Administration) Regulations (NT)
- *Workplace Health and Safety Act 2007* and Workplace Health and Safety Regulations (NT)

Values

- Ambient noise levels experienced in a remote rural community

Objective(s)

1. No adverse impacts to public health as a result of noise emissions from BHP Billiton's expanded operations

Assessment Criteria

1. Maintain noise from the expanded operations at Olympic Dam, desalination plant and landing facility to less than 30 dBL_{Aeq} (24 hour) within residential dwellings

Management Plans

Noise Management Plan (new)

- BHP Billiton has extensive experience in open pit mining operations and managing noise emissions within compliance limits. To achieve compliance from the Olympic Dam open pit during the worst-case weather conditions (i.e. during night-time temperature inversions), operational response plans would be developed for noise generation from mining activities (14.6)
- Existing operational management plans would be updated to confirm the findings of the noise modelling, including:
  - development of a refined and validated acoustic model based on the as-built mining and metallurgical operations
  - installing a meteorological system that incorporates climatic conditions such as wind speed and direction into the acoustic model so that noise levels contributed during operations at Roxby Downs and Hiltaba Village could be predicted
  - monitoring of sound at key receptor locations to assess compliance with the adopted criteria and to ensure the reliability of the acoustic model
  - implementing an operating response plan for situations where noise levels were predicted to exceed the compliance criteria (14.5.2)

Controls/Management Actions

Mining activities

- Noise levels at the existing heavy industrial area at Olympic Dam Village would comply with the industrial requirements. When necessary, or the area is needed for the RSF, the facilities would be relocated

Landing facility and access corridor

- The access corridor would be screened by tree-planting. An environmental management plan for the construction and operation of the access corridor and landing facility would be communicated to residents (19.5.6)
- Locate the proposed landing facility to minimise the number of properties that could be affected, and limiting operations to daylight hours, typically 7 am to 7 pm, to minimise nuisance noise to nearby residents (14.4.2)

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.2	**Noise (and Vibration) Emissions**
Desalination plant • Enclose the reverse osmosis section of the coastal desalination plant and the seawater intake pumping station (14.4.2) *Port of Darwin* • Excessive noise generating activities from the operation of the concentrate handling facility (such as train shunting and unloading) would be undertaken within buildings and enclosures (E4.8.2)	
Monitoring Program(s) *Noise (new)* • Noise monitoring would be undertaken at key receptor locations to assess compliance with the adopted criteria (14.5.2) • Monitoring would be undertaken to confirm that noise and vibration levels and equipment productivity parameters are within predictions (5.4.3) • Laser-based ground movement monitors would be used to measure the effects of blast vibration on the stability of the pit walls and underground mine. Real time geotechnical monitoring equipment for ground movement and slope stability would be installed to monitor ground conditions in the underground mine and open pit and for wall movement in the open pit (22.6.2)	
Risk Items • No key project risks identified for noise (and vibration) emissions	
Contingency Options • BHP Billiton would implement one or more of the following strategies to achieve compliance at sensitive receptors during temperature inversions: - fitting acoustic shielding to attenuate sound on mobile equipment - modifying design and restricting use of surface equipment air horns and reversing alarms - relocating mobile noise sources (such as haul trucks) to areas further away from sensitive receivers (14.5.2)	
BHPB Responsible Officer • tba	
Key Government Department(s) • Environmental Protection Authority (SA) • SafeWork SA (Department of the Premier and Cabinet) • Department of Natural Resources, Environment, The Arts and Sport (NT) • NT WorkSafe (Department of Justice) (NT)	

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.3	**Point-Source Emissions**

Scope

The existing Olympic Dam operation has been operating for 20 years and has extensive experience in managing point-source emissions. Processing plant and equipment are point-sources for emissions of particulates (dust) and gases, such as SO_2 and NO_X. Plant and equipment have been designed to incorporate appropriate controls for preventing and/or minimising emissions.

Ongoing monitoring of emissions provides information for checking that the incorporated controls and systems are functioning effectively and efficiently, and for continuously improving what is in place to reduce emission levels.

Legal and Other Guidance

- *Environment Protection Act 1993 (SA)*
- Environment Protection (Air Quality) Policy 1994 (SA)
- National Environment Protection (Ambient Air Quality) Measure 2003
- National Environment Protection (Air Toxics) Measure

Values

- Ambient air quality in a remote rural community
- Aesthetic values associated with 'clean' emissions

Objective(s)

1. No adverse impacts to public health as a result of point-source emissions from BHP Billiton's expanded operations at Olympic Dam

Assessment Criteria

1a. Annual average SO_2 concentration of less than 57 µg/m³, 24 hour average of less than 228 µg/m³ and 1 hour average of less than 450 µg/m³ at sensitive receivers

1b. Annual average operational contributed PM_{10} concentration of less than 30 µg/m³ and 24 hour average of less than 50 µg/m³ at sensitive receivers

Management Plans

- No specific management plans are currently required

Controls/Management Actions

- The four new sulphur burning acid plants would have exhaust stacks at least 50 m high and would operate to at least the same efficiency as the existing acid plant (13.3.4)
- The proposed gas-fired power station would have a stack at least 35 m high (13.3.4)
- The proposed additional calcining furnace would have a gas cleaning system installed that would treat the calciner off-gas to comply with the criteria (13.3.4)
- The additional smelter anode furnace would have a similar gas cleaning system to that currently installed for the existing anode furnaces (13.3.4)
- The gas cleaning systems in all smelter-based furnaces would be bypassed in the event of abnormal or emergency conditions. These bypass stacks would be interlocked to the process (13.3.5)
- The storage facility for elemental sulphur would be enclosed within concrete barriers and wind-disruptive fencing similar to the existing sulphur storage area (5.5.4)
- One additional metallurgical gas acid plant (double contact, double absorption) would be constructed. These typically capture around 99% of the sulphur (5.5.4)
- The stack height for the anode furnaces would be determined during detailed design; it must be sufficiently tall to ensure ground level concentrations of emissions are acceptable and avoid the potential for ventilation gases to re-enter the smelting building. For the purposes of the Draft EIS a height of 35 m has been used (5.5.4; 13.3.4)

Monitoring Program(s)

Airborne Emissions (OD Doc. 2788)

- The existing Airborne Emissions Monitoring Program would be reviewed to ensure the expansion was incorporated
- Real-time monitoring of sulphur dioxide in the smelter would be used to assess the continuing adequacy and effectiveness of the ventilation system (22.6.3)
- The effect of emissions on vegetation would continue to be monitored (15.5.9)

Flora (OD Doc. 2664)

- The existing Flora Monitoring Program would be reviewed to ensure the expanded operations were incorporated

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.3	**Point-Source Emissions**

Risk Items

- Excessive exhaust dust from uranium calcination and packing due to failure of off-gas cleaning equipment
- Excessive dust from ore handling and ore processing operation due to failure of ventilation and dust control systems
- Release of concentrate in the feed preparation area of the smelter due to failure of the concentrate pneumatic system
- Emissions from CCGT power station exceeding expectations due to failure of emission control systems
- Routine operation of sludge and evaporation basins at desalination plant lead to development of anaerobic conditions
- Emissions of gases and dusts from refinery slimes treatment due to operator error or failure of ventilation system
- Emissions of dust from uranium calciner due to failure of dust cleaning and control systems
- High concentration SO_2 gas emission from smelter due to leak or failure in gas handling system
- Uncontrolled release of dust and gases from anode furnace and slag furnace due to failure of gas control system

Contingency Options

- To be developed as required

BHPB Responsible Officer

- tba

Key Government Department(s)

- Environmental Protection Authority (SA)

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.4	**Saline Aerosol Emissions (Relevant to Existing Operations only)**
Saline Aerosol Emissions is an item not relevant to the expansion but it is relevant to existing Olympic Dam underground operations. However, this item would be included when the Draft EM Program for the expansion was managed in conjunction with the EM Program for the existing operations.	

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.5	**Radioactive Emissions**

Scope

Olympic Dam has an established record of controlling radioactive emissions. This has resulted in environmental and community exposures well below national and international standards. Radioactive emissions from the operations at Olympic Dam arise primarily through airborne pathways, including radon (and its decay products) and radioactive dusts. Gamma radiation is also a form of radioactive emission however its pathway to the environment is very short and its impact is negligible beyond the plant boundary. In the existing operations, radon and dusts are emitted from the underground ventilation system, processing plant stacks, the tailings system, materials stockpiles and the processing of ore. For the expanded operation, additional sources of radioactive emissions would include the open pit and the rock storage facility (RSF).

The existing licence to mine (LM1) under the *Radiation Protection and Control Act 1982* requires compliance with the Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005) (referred to as the 'Mining Code') and requires the development of a Radioactive Waste Management Plan which forms part of this and other EM Programs.

The existing Olympic Dam operation holds a licence under the *Radioactive Ores and Concentrates (Packaging and Transport) Act* for the transport of uranium oxide to the Port of Darwin. The proposed expansion would transport, store and handle additional uranium oxide and the new concentrate product.

Olympic Dam has controlled radioactive emissions from the operation to below occupational and member of the public dose limits as per national and international standards since the commencement of operations in 1988.

Radiation protection for employees is managed under the operations health and safety systems. This EM Program is limited to the environmental systems for ensuring the radiation protection of the environment and local communities from radioactive emissions.

Legal and Other Guidance

- *Roxby Downs (Indenture Ratification) Act 1982* (requires compliance with the most stringent international radiological protection standards)
- *Radiation Protection and Control Act 1982* (Radiation Protection and Control (Ionising Radiation) Regulations 2000) (SA)
- *Environment Protection Act 1993 (SA)*
- Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005)
- Recommendations of the International Commission on Radiological Protection (ICRP) (various publications)
- IAEA, 1996, International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources
- *Workplace Health and Safety Act 2007* and Workplace Health and Safety Regulations (NT)
- *Radioactive Ores and Concentrates (Packaging and Transport) Act* (NT)
- *Radiation (Safety Control) Act* (NT)
- *Radiation Protection Act 2004* (due to commence in 2009) (NT)

Values

- Natural radiation levels in the environment
- Clean, safe workplace and community

Objective(s)

1. No adverse impacts to health of employees or members of the public from exposure to radiation from BHP Billiton's expansion activities

Assessment Criteria

1. Radiation doses to members of the public less than 1 mSv/y above natural background and 20 mSv/y above natural background for designated workers

Management Plans

Radioactive Waste Management Plan

- There are specific requirements under the Mining Code and these are currently incorporated within the EMS. These requirements are being reviewed and updated to incorporate any additional requirements of the expansion. It is intended that the current RWMP would be updated to encompass the expanded activities

Dust Management Plan (new)

- A dust management plan would be developed to record and monitor operational control (see ID 3.1 for details)

Incident Response Plan (OD Doc. 48958 Part 2)

- The existing Olympic Dam Corporation Incident Response Plan would be modified to address aspects of the transport of concentrate (22.6.10)

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.5	**Radioactive Emissions**

Controls/Management Actions

- BHP Billiton would comply with internationally accepted radiation limits for workers and the public and would set a goal of maintaining doses at less than 50% of the internationally acceptable limits (22.6.5; E4.13)
- Radiation levels at the existing heavy industrial area at Olympic Dam Village would comply with the industrial requirements. As the open pit develops, it is expected that these facilities would be relocated
- A closed transportation system would be implemented from Olympic Dam to the ship hold to effectively contain radioactive material and the potential for radiation exposure (5.9.5; E4.10.2)
- Further reduce the potential for radiation exposure through an 'optimisation program' based on the ALARA principle (22.6.5; E4.10.2)

Monitoring Program(s)

Radiation Dose to Members of the Public (OD doc 2790)

- A requirement of the Mining Code is to assess the radiation dose to members of the public. A process to do this has been developed and approved by regulators (see document 2790)
- This process is complemented by a wider environmental radiological monitoring program which assesses environmental radon decay product concentrations and radionuclide levels in dust at dedicated environmental radiation monitoring sites around the existing operation. This network of monitors would be reviewed to incorporate requirements of an expanded operation

Airborne Emissions (OD Doc. 2788)

- The existing Airborne Emissions Monitoring Program currently includes a regime for radionuclides. The Program would incorporate the expanded operations

Dust (new)

- A real-time response system which would be used to monitor the weather and fugitive particulates around the mine and towards sensitive receptors such as Roxby Downs and Hiltaba Village, identify impending exceedances and direct remedial action at specific dust sources (13.4.2)

Flora (OD Doc. 2664)

- The existing Flora Monitoring Program would be reviewed to ensure the expanded operations were incorporated

Risk Items

- Increased radiation levels in Roxby Downs and environment due to change in meteorological conditions including wind
- Increased ionising radiation levels in Roxby Downs due to actual dust and radon patterns differing from modelling results leading to increased intensity and area of exposure
- Increased radiation levels at Port of Darwin and rail corridor due to inaccurate modelling of dust and radon patterns leading to increased area of influence

Contingency Options

- To be developed as required

BHPB Responsible Officer

- Statutory Radiation Safety Officer

Key Government Department(s)

- Environment Protection Authority (SA)
- NT WorkSafe (Department of Justice) (NT)
- Department of Health and Families (NT)

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.6	**Greenhouse Gas Emissions**

Scope

The current operations and the expansion would consume fossil fuels directly and indirectly as part of its activities. Major greenhouse generating sources include the use of electricity and/or gas as major energy sources, combustion of LPG and/or natural gas, diesel, fuel oil, petrol, use of coke, soda ash and soderberg paste within metallurgical plant and through the use of ANFO and other explosives. The consumption of acid in the process plant, neutralisation of acidic liquor within the tailings storage facility (TSF) and chemical reactions within the rock storage facility (RSF) also generate carbon dioxide.

The *Energy Efficiency Opportunities Act 2006* aims to improve identification and evaluation of energy efficiency opportunities by large energy using businesses and, as a result, to encourage implementation of cost effective energy efficiency opportunities. The Act requires organisations to submit five-year plans that set out proposals for assessing their energy usage and to identify efficiency projects.

The South Australian *Climate Change and Greenhouse Emissions Reductions Act 2007* aims to promote action within South Australia by developing specific targets for various sectors of the state's economy, and developing policies and programs to reduce greenhouse gas emissions. BHP Billiton is currently negotiating a voluntary Sector Agreement with the South Australian Government, specifically for the Olympic Dam expansion.

BHP Billiton's Climate Change Position is a multifaceted approach to tackling climate change. The Olympic Dam expansion is implementing the BHP Billiton-wide position goals as part of its Greenhouse Gas and Energy Management Plan.

Legal and Other Guidance

- *National Greenhouse and Energy Reporting Act 2007* (Commonwealth)
- *Energy Efficiency Opportunities Act 2006* (Commonwealth)
- *Climate Change and Greenhouse Emissions Reduction Act 2007* (SA)
- BHP Billiton Climate Change Position
- NT Environmental Impact Assessment Guide: Greenhouse Gas Emissions and Climate Change

Values

- Global atmospheric greenhouse concentrations

Objective(s)

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

Assessment Criteria

1. Apply a management goal of reducing greenhouse gas emissions (reportable under the National Greenhouse and Energy Reporting (Measurement) Determination 2008) to an amount equivalent to at least a 60% reduction (to an amount equal to or less than 40%) of 1990 emissions, by 2050

Management Plans

Greenhouse Gas and Energy Management Plan

- A Greenhouse Gas and Energy Management Plan would be developed for the proposed expansion. The Plan would:
  - establish modelling to project the likely emissions from the expanded Olympic Dam operation from commencement to 2050
  - establish targets and timelines for greenhouse gas reduction
  - identify greenhouse gas reduction strategies and projects (13.2.5)
- The Greenhouse Gas and Energy Management Plan would be reviewed annually

Controls/Management Actions

- Greenhouse gas emissions would be addressed by:
  - applying a goal of reducing greenhouse gas emissions (reportable under the National Greenhouse and Energy Reporting (Measurement) Determination 2008) to an amount equivalent to at least a 60% reduction (to an amount equal to or less than 40%) of 1990 emissions, by 2050
  - constructing an on-site cogeneration power station (250 MW capacity) for recovering waste heat
  - sourcing renewable energy (35 MW capacity) via the national electricity market for the seawater desalination plant
  - producing an annual 'road map' that quantifies emission reduction opportunities and achievements (13.2.2)
- The BHP Billiton Group Climate Change Position aims to:
  - understand emissions from the full life cycle of the products the BHP Billiton Group produces
  - improve the management of energy and greenhouse gas emissions across the BHP Billiton Group's businesses
  - commit US$300m over five years to support the development of low emissions technology, energy excellence projects within the company and encourage emissions abatement by employees and local communities
  - use technical capacity and experience of the BHP Billiton Group to assist governments and other stakeholders to design effective and equitable climate change policies, including market-based mechanisms such as emissions trading (13.2.2)

ID 3	OPERATION OF INDUSTRIAL SYSTEMS
ID 3.6	**Greenhouse Gas Emissions**
• BHP Billiton would implement energy saving strategies including; solar hot water services for permanently occupied accommodation buildings in Hiltaba Village and solar energy at the new airport (5.8.8; 5.9.6)	
Monitoring Program(s) *Greenhouse Gas Monitoring Program (existing)* • The existing Greenhouse Gas Monitoring Program would be reviewed to incorporate the expanded operations	
Risk Items • No key project risks identified for greenhouse gas emissions	
Contingency Options • To be developed as required	
BHPB Responsible Officer • tba	
Key Government Department(s) • Department of the Premier and Cabinet (Sustainability and Climate Change Agency) (SA) • Department for Transport, Energy and Infrastructure (Energy Division) (SA) • Department of Natural Resources, Environment, The Arts and Sport (NT)	

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.1	**Marine Discharge**

Scope

Marine discharges are likely to occur from the landing facility as treated stormwater run-off and at the desalination plant at Point Lowly with return water (which would also contain trace amounts of water treatment chemicals) discharged to the marine environment as a result of the reverse osmosis process.

Marine discharges would be managed and monitored, not only for their water quality, but also in terms of the volume and velocities, to ensure protection and conservation of marine values, including commercial marine values, of the Upper Spencer Gulf.

Legal and Other Guidance

- *Environment Protection Act 1993 (SA)*
- Environment Protection (Water Quality) Policy 2003 (SA)
- *Marine Parks Act 2007* (assented to 12 February 2008 but not yet commenced) (SA)
- Living Coast Strategy 2004

Values

- Australian Giant Cuttlefish breeding aggregation
- Recreational fishing resource
- Aquaculture (Fitzgerald Bay facilities) industry
- Commercial fishing resources
- Heritage values within the marine environment

Objective(s)

1. No significant adverse impacts on the specified marine environmental values of the Upper Spencer Gulf as a result of discharges from the desalination plant (at Point Lowly)

Assessment Criteria

1a. Maintain return water dilution at aquaculture leases greater than the species protection level identified by ecotoxicology tests

1b. No long-term adverse impacts on the breeding success of Australian Giant Cuttlefish as a result of construction or operation of the desalination plant

Management Plans

Erosion and Sediment Control Plan (new)

- Erosion and sediment control plans (ESCP) would be prepared for the construction disturbance in coastal areas (e.g. Port of Darwin, the landing facility and desalination plant). Plans would include marked-up design drawings that show the location, extent and type of erosion control measures proposed, and monitoring programs to ensure erosion and sediment control measures were inspected and maintained (10.5.1)

Ballast Water Management Plan (new)

- BHP Billiton would develop and implement a Ballast Water Management Plan for the management of barge and ship ballast water for the protection of marine environmental values identified above. The plan would be consistent with international, Australian and local (Flinders Ports and Darwin Ports Corporation) requirements (16.6.13)

Controls/Management Actions

- The return water diffuser would be designed and operated to deliver, as a minimum, the dilution predicted at 100 m from the diffuser and the dilution required to mitigate significant impacts at the nearest cuttlefish breeding habitat (5.7.4; 16.5.2)
- BHP Billiton would undertake appropriate monitoring (during the operation of the desalination plant) to identify significant changes to marine flora and fauna communities, and water quality (16.6.5)
- Potential impacts on the Upper Spencer Gulf marine environment would be minimised by establishing a system whereby ballast water would be discharged to on-shore tanks at the landing facility. The same water would be used to re-ballast vessels (16.6.13)
- Chlorine dosing would occur intermittently to prevent marine growth and residual chlorine in discharge water would be neutralised using sodium metabisulphite before seawater was desalinated (5.7.4; 16.4.1)
- Backwash solids and associated coagulating and flocculating agents would be settled in ponds or filtered centrifugally prior to the residual liquid being discharged to sea. The solids would be dried in evaporation ponds and periodically removed for off-site land disposal at an appropriate licensed facility (5.7.4; 13.3.5; 16.4.1)
- Pre-filtration particulates and associated residual chemicals would be disposed of on land, and the use and discharge of process chemicals minimised (16.5.2)
- The membranes used in reverse osmosis would be cleaned every few months using agents such as acids, bases and surfactants, and the wastewater collected would be disposed of on land in a managed pond, where the water would evaporate and the solids would be collected and disposed of to a licensed landfill (5.7.4; 16.4.1)
- Should different antiscalants or other pre-treatment chemicals be used, then additional ecotoxicity test work would be carried out (16.2.3)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.1	**Marine Discharge**

Monitoring Program(s)

General

- Before the desalination plant commenced operation, a monitoring program incorporating the following would be established:
  - seasonal surveys describing the composition of benthic communities at permanent underwater monitoring sites
  - a seawater program to provide comprehensive water quality data (including salinity and dissolved oxygen) for Point Lowly. Salinity/temperature meters and data loggers would be used to monitor salinity at critical sites
  - a sediment sampling program at Point Lowly to provide comprehensive sediment quality information, including organic and inorganic pollutants and sediment oxygen demand (16.6.5; 16.6.9)

Marine Flora and Fauna Program (new)

- A monitoring program would be developed for flora and fauna monitoring for marine activities associated with the desalination plant. The program would be developed to monitor the effectiveness of controls, management and mitigation measures put in place to meet the objectives set for marine discharges
- A monitoring program would be established to:
  - monitor Australian Giant Cuttlefish populations at Point Lowly before and after the desalination plant began to operate
  - monitor salinity within the Point Lowly cuttlefish habitat before and after the desalination plant began to operate (16.6.7)

Marine Water Quality Monitoring Program (new)

- During the first year of operation of the desalination plant, salinity and dissolved oxygen would be monitored intensively within 1–2 km of the outfall, under a variety of tide and wind conditions, to validate the hydrodynamic model predictions of dispersion and dilution of the return water, and to determine if stratification and subsequent low dissolved oxygen occurs on the seafloor. Rhodamine WT dye would be added to the return water on several occasions (including during dodge tide and no wind conditions) to provide a direct measure of return water dilution and dispersion within several kilometres of the outfall. If the model predictions were confirmed, the monitoring program would be reviewed and revised appropriately (16.6.5; 16.6.9)

Risk Items

- Return water discharge does not meet parameters derived from modelling due to actual dilution outcomes differing from modelling results
- Increase in salinity levels in shallow water due to significant failure of pipe near water line (in shallow water)
- Excessive silt plume during construction of inlet and discharge pipes due to actual silt behaviour differing from modelling results or excessive sediment generation

Contingency Options

- To be developed as required

BHPB Responsible Officer

- tba

Key Government Department(s)

- Environment Protection Authority (SA)
- Department for Environment and Heritage (SA)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.2	**Containment of Tailings and Mine Rock**

Scope

As part of the expansion, a new tailings storage facility (TSF) and rock storage facility (RSF) would be built to handle the increased processing of ore and volume of overburden.

For the expanded operation, it is expected that the only new waste stream would be the open cut mine rock. It is intended that this material be securely buried within the wider RSF.

The RSF incorporates design features to prevent exposure of higher grade materials to rainfall and oxygen, and hence minimising leaching of the more reactive materials.

Several waste streams are generated from the operations at Olympic Dam and arise from both the mining and processing operations. In the metallurgical plant, the primary form of radioactive waste is tailings. The tailings contain up to 85% of the original radioactivity of the ore and are disposed in secure surface tailings retention ponds. Other waste streams from the metallurgical processing plant are combined with the tailings for disposal.

Additional tailings storage systems would be constructed as required. The TSF has design features incorporated into it for both seepage control and containment of materials to effectively prevent and minimise potential environmental impacts. The TSF also has been designed to reduce the potential impacts associated with seepage to groundwater and access by birds.

Legal and Other Guidance

- *Environment Protection Act 1993 (SA)*
- Environment Protection (Water Quality) Policy 2003 (SA)
- Code of Practice and Safety Guide for Radioactive Waste Management in Mining and Mineral Processing (2005)
- Guidelines on Tailings Dam Design, Construction and Operation (ANCOLD 1999)
- State Government (PIRSA) Draft Tailings guidelines
- Strategic Framework for Tailings Management (Ministerial Council on Mineral and Petroleum Resources)

Values

- Existing water (surface and groundwater) and soil quality

Objective(s)

1. Maintain structural integrity of the RSF and expanded TSF

Assessment Criteria

1. No unplanned structural failures to the TSF or RSF

Management Plans

TSF Management Manual

- The existing operating manual for the TSF would be reviewed to incorporate expansion requirements

RSF Management Manual (new)

- An operating manual for the RSF would be developed to include controls and contingencies as per this Plan

Radioactive Waste Management Plan

- There are specific requirements under the Mining Code and these are currently incorporated within the EMS. These requirements are being reviewed and updated to incorporate any additional requirements of the expansion. It is intended that the current RWMP would be updated to encompass the expanded activities

Rehabilitation and Closure Plan

- The existing Rehabilitation and Closure Plan would be reviewed to incorporate expansion requirements (23.1)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.2	**Containment of Tailings and Mine Rock**

Controls/Management Actions

RSF

- Potentially reactive mine rock would be enclosed within the RSF (12.5.2)
- There is no specific geotechnical limit to the height of the RSF, and the final height would be determined through an economic assessment of the costs associated with hauling mine rock material either vertically or horizontally. For the purpose of the Draft EIS, the final height of the RSF would be 150 m above ground level (5.4.6)
- The use of mine rock would be investigated in greater detail during the definition phase of the project, with the aim of minimising disturbance and maximising beneficial reuse while ensuring adequate material was available throughout the life-of-mine to enclose the class A and B materials within the RSF. Non-reactive rock would be used for the outermost walls of the RSF and no reactive material would be placed under outer slopes (5.4.7; 23.8.2)
- RSF design controls to minimise seepage would include:
  - traffic compaction on all surfaces (except the ultimate inner and outer RSF slopes) to minimise rainfall infiltration (12.5.2)
  - each haul truck load would be categorised into one of the classes of rock, and would be tracked, enabling the material to be selectively placed to surround all reactive rock in the RSF with benign and/or neutralising material (5.4.6)
  - placing a layer of benign and/or neutralising material (overburden) at the base of the RSF to increase the potential for neutralisation and natural attenuation of seepage fluid (12.5.2; 12.6.2; 5.4.6)
- The RSF would be operated and closed [at the end of mine life] to minimise infiltration of rainwater into zones containing potentially reactive material, minimising seepage from these areas (12.6.2)

TSF

- Tailings cells would be capped when they reached their target design height, and when it was safe for vehicles to access the TSF surface (23.8.4)
- Radon emanation from the TSF would be minimised by capping the surface with sufficiently thick benign material (nominally 0.5 to 1.5 m, depending on the type of material) (23.8.4)
- The most suitable cover would be defined by future testwork (23.8.4)

Rehabilitation of RSF and TSF

- The rehabilitation plans for the RSF and TSF would be updated as more information about the characteristics of the mine rock was gathered during the operation phase of the mine (23.9.1)

Monitoring Program(s)

Waste (OD Doc. 2792)

- The existing Waste Monitoring Program would be expanded and updated to ensure the expanded operations were incorporated

Groundwater (OD Doc. 2791)

- The Monitoring Program would be reviewed to ensure that the expansion requirements were incorporated

Risk Items

- Water infiltration into TSF due to failure to rehabilitate the TSF successfully

Contingency Options

- To be developed as required

BHPB Responsible Officer

- tba

Key Government Department(s)

- Department of Primary Industries and Resources (SA)
- Environment Protection Authority (SA)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.3	**Major Storage Seepage**

Scope

Various solid and liquid materials would be sent to storage as part of the mine operations with the major storage being the TSF and the RSF. Both facilities either contain water during operations or accumulate water during their life, thus some seepage is expected to occur from these facilities.

Geochemical studies have indicated that seepage of acidic tailings liquor from the existing operations is effectively attenuated in the soils below the TSF. Recharge of the Andamooka Limestone aquifer beneath the TSF with neutralised tailings liquor reduces the salinity of the groundwater and is extracted by the current operations as a useful addition to the site water supply. The TSF for the expanded operation would follow a design similar to the existing facility with some additional controls included.

The RSF has been designed to minimise erosion, ensure short and long-term stability and manage the potential for acid generation and metals leaching.

Ongoing monitoring of these major storage facilities would be necessary to ensure the controls are functioning properly and that the environment was not at risk.

Legal and Other Guidance

- *Environment Protection Act 1993 (SA)*
- Environment Protection (Water Quality) Policy 2003 (SA)
- Guidelines on Tailings Dam Design, Construction and Operation (ANCOLD 1999)
- State Government (PIRSA) Draft Tailings guidelines
- Strategic Framework for Tailings Management (Ministerial Council on Mineral and Petroleum Resources)

Values

- Existing water (surface and groundwater) and soil quality within the SML

Objective(s)

1. No significant adverse impacts to ecological communities as a result of seepage from the RSF and expanded TSF

Assessment Criteria

1. No loss of native vegetation outside bunded TSF area as a result of seepage to groundwater from the TSF

Management Plans

TSF Management Manual

- The existing operating manual for the TSF would be reviewed to ensure that expansion requirements were incorporated

RSF Management Manual (new)

- An operating manual for the RSF would be developed to include controls and contingencies as per this Plan

Controls/Management Actions

- The design of the TSF incorporates controls to minimise seepage including:
  - increasing the volume of liquor recycled from the TSF
  - constructing larger cells with greater evaporation capacity
  - collecting liquor through a central decant arrangement
  - installing a liner beneath the central decant systems
  - recycling water from the mound beneath the TSF (5.5.6)
- BHP Billiton would, in order to meet the requirements of the Environment Protection (Water Quality) Policy 2003, either apply for an exemption or seek a variation to the groundwater quality criteria for the local groundwater system (12.6.2)

Monitoring Program(s)

Groundwater (OD Doc. 2791)

- The Groundwater Monitoring Program would be reviewed to incorporate the expansion and, in particular, requirements for major storage areas
- The existing groundwater monitoring program would continue and be expanded to monitor effects on groundwater quality from seepage and would be compared against predicted solute movement (12.6.2)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.3	**Major Storage Seepage**

Risk Items

- Decrease in vertical permeabiity of Arcoona quartzite increases lateral flow due to chemical reaction from seepage changing hydro-geological characteristics of shallow aquifer
- Increased lateral penetrability through Andamooka limestone due to chemical reaction from seepage changing hydro-geological characteristics
- Increased seepage from balancing pond due to failure of base system
- Acid seepage through base of tailings due to failure to neutralise the seepage water through the ground
- Increased seepage from TSF due to excessively high rainfall leading to failure to manage water balance
- Seepage from existing evaporation ponds due to excessively high rainfall leading to failure to manage water balance
- Seepage of pregnant liquor from storage ponds (associated with metallurgical plant) due to failure of containment systems
- Uncontrolled release from TSF, balancing ponds or existing evaporation ponds due to failure of containment systems and/or liquor transfer pipelines
- Seepage from sludge/evaporation basins at desalination plant

Contingency Options

- If rates of seepage transported away from the TSF or RSF were higher than predicted, risks would be reviewed and remedial actions investigated (12.6.2)

BHPB Responsible Officer

- tba

Key Government Department(s)

- Environment Protection Authority (SA)
- Department of Primary Industries and Resources (SA)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.4	**Stormwater Discharge**

Scope

The Olympic Dam mine currently operates on the basis of zero discharge of surface water from a defined management area, including both high and low quality waters. Run-off from operational areas is directed to various storage areas, including evaporation ponds, TSF, stormwater retention ponds, tertiary containment ponds and other minor storages across the site.

Storage areas are not covered and are therefore influenced by rainfall and evaporation. This is of most importance for the operation's water balance in the larger storages such as the TSF and evaporation ponds. Stormwater is opportunistically pumped from containment ponds for use in the operation.

The expansion requires the construction of new infrastructure facilities, including a desalination plant, access corridor and landing facility. This infrastructure requires significant ground disturbance over a range of different soils and terrain types. Some of these are also located adjacent to coastal areas.

The Port of Darwin facilities require the construction of new infrastructure on newly reclaimed land and would involve construction and operation activities adjacent to the marine environment. Management of stormwater and the prevention of stormwater pollution are necessary for both construction and operation so as to not impact the nearby marine environment.

Legal and Other Guidance

- *Environment Protection Act 1993* (SA)
- Environment Protection (Water Quality) Policy (2003) (SA)
- Guidelines on Tailings Dam Design, Construction and Operation (1999), ANCOLD
- *Waste Management and Pollution Control Act* and Waste Management and Pollution Control (Administration) Regulations (NT)
- *Water Act* (NT)
- Port of Darwin Draft Stormwater Management Plan

Values

- Existing surface water quality
- Marine environmental values of the Port of Darwin and Upper Spencer Gulf, including Australian Giant Cuttlefish community, fishing, recreational (shack communities) and aquaculture (Fitzgerald Bay facilities) industry values

Objective(s)

1. No significant adverse impacts to environmental receptors as a result of stormwater discharges to soil, surface water (freshwater and marine) or groundwater associated with BHP Billiton's expansion activities

Assessment Criteria

1. All contact stormwater maintained within designated stormwater management areas

Management Plans

Stormwater Management Plan (new)

- Stormwater Management Plans would be developed for the construction and operation of the proposed expansion (mining, processing, desalination plant, infrastructure corridors, Roxby Downs and Hiltaba Village) and would incorporate relevant controls, monitoring requirements and mitigation measures (11.5.1; 11.5.3)
- A Stormwater Management Plan would be developed for the NT Transport Option and would incorporate relevant controls, monitoring requirements and mitigation measures (11.5.1)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.4	**Stormwater Discharge**

Controls/Management Actions

Mining activities

- Stormwater in the vicinity of the pit rim would be diverted to natural depressions of the dune-swale landscape (e.g. clay pans) by a pit-rim bund and elevated haul roads. This would ensure containment of run-off from the low-grade ore stockpile within a defined management area (11.5.1)
- The new entry road to the mine site would be constructed as a levee to contain a 1-in-100 year flood. There would be no discharge of stormwater from the SML. Stormwater from the metallurgical plant and hardstand areas would be directed to tertiary containment ponds and reused wherever possible (11.4.2; 11.5.1; 11.5.2)
- The TSF and stormwater retention ponds would be designed to have sufficient capacity (freeboard) to accommodate protracted and heavy rainfall. Additional freeboard of 0.5 m has been incorporated into the TSF design to account for possible changes due to global climate change (11.4.2)

Accommodation developments

- Stormwater from Hiltaba and Roxby Downs would be reused where practicable, dependent upon its beneficial use (11.5.1)

Desalination plant and landing facility

- The stormwater drainage system for the desalination plant and landing facility would be designed so that:
  - rainfall on disturbed areas of the site would be collected, treated and channelled to an on-site detention basin sized to accommodate a 100-year ARI event
  - discharge from the on-site detention basin should match pre-development flows
  - rainfall landing above disturbed areas would be diverted around the site and discharged downstream of the detention basin (11.5.1)

Port of Darwin

- A 'closed system' would be used to transport, store and convey concentrate from Olympic Dam to the ship's hold at the Port of Darwin (5.9.5) (see ID 2.3 for details)
- First flush stormwater run-off from the site would be directed to on-site detention basin(s) for settling of sediments prior to discharge to the established Port of Darwin stormwater detention system (as per the Port of Darwin's Draft Stormwater Management Plan) (11.5.1; 6.6.13)
- No wagon wash-down water would be discharged to the natural environment, rather washing would occur in an enclosed building, with the water collected, reused and ultimately transported back to Olympic Dam in a rail wagon (11.5.1)
- The water used to wash the outside surfaces of the rail wagons would be collected and treated to recover concentrate particles that may have attached to the wagon during unloading (i.e. tippling). The treated water would be contained in on-site storage tanks for reuse in subsequent wash cycles, while any collected solids would be placed on the concentrate stockpile for export, resulting in a zero discharge decontamination system (5.9.5; E4.2.3; E4.13)
- From time to time (preliminary estimates suggest about every four to six months), a proportion of the wash-down water would be removed from the system and the system would be 'topped up' with replacement water. The removed water would be discharged into a holding tank or similar unit and railed back to Olympic Dam to be disposed of within the Olympic Dam tailings storage facility (5.9.5; E4.2.3; E4.8.3; E4.13)

Monitoring Program(s)

Stormwater Monitoring Program (new)

- As part of the Stormwater Management Plan, a Stormwater Monitoring Program would be developed for the expansion to monitor controls and performance

Risk Items

- Stormwater comes into contact with concentrate due to failure to exclude stormwater from concentrate shed at Port of Darwin

Contingency Options

- To be developed as required

BHPB Responsible Officer

- tba

Key Government Department(s)

- Environment Protection Authority (SA)
- Department of Natural Resources, Environment, The Arts and Sport (NT)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.5	**Fauna Interaction with Operations**

Scope

Open water bodies, including sewerage ponds, process water storage, acidic liquor ponds and wet tailings beach environments at the existing operations attract fauna, particularly water birds. Large numbers of these species are regularly recorded utilising good quality water storages, such as process water and sewage ponds in the vicinity of the operations.

Acidic liquor ponds and wet tailings beach environments within the TSF offer poor quality habitat for fauna, but a number of animals still attempt to utilise the facilities as they are attracted to the prospect of good habitat. Numerous mitigation measures and deterrent devices have been trialled and implemented at the existing Olympic Dam operations to reduce its attractiveness to birds. These measures have met with varying success, but the proposed expansion offers an opportunity to reduce the area of open liquor ponds by improved design.

Other activities, such as construction activities, use of resources, land clearing and operation of vehicles, also result in fauna interactions which may result in fauna losses.

Ongoing monitoring, assessment and management of fauna interactions are necessary to ensure appropriate management strategies and controls are implemented and maintained for minimising the loss of fauna on-site.

Legal and Other Guidance

- *National Parks and Wildlife Act 1972 (SA)*
- *Environment Protection Act 1993 (SA)*
- *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

Values

- Arid Recovery
- Listed threatened flora and fauna

Objective(s)

1. No significant adverse impacts to listed fauna (South Australian, Commonwealth) as a result of BHP Billiton's expanded operations

Assessment Criteria

1a. No significant adverse impact to listed migratory species

1b. No significant adverse impact on an important population of the Banded Stilt

Management Plans

TSF Management Manual

- The existing operating manual for the TSF would be reviewed to ensure expansion requirements were incorporated

Blasting Management Plan – Marine (new)

- A blasting management plan would be prepared for the installation of desalination plant intake and outfall pipes to minimise the concussive effects of blasting and the potential for sediment mobilisation (16.6.11)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.5	**Fauna Interaction with Operations**

Controls/Management Actions

- Arid Recovery would continue to be supported through:
  - maintaining a distance of 500 m between the RSF and Arid Recovery
  - ongoing financial support
  - scientific, managerial and professional support by BHP Billiton (15.3.10)
- The proposed expansion of the TSF would minimise impacts on birds, by:
  - not building additional evaporation ponds
  - netting (or similar) the central decant pond of each expansion TSF cell
  - covering the balancing ponds with netting (or similar) (15.3.10)
- The risk [of birds flying into transmission lines] would be further reduced by attaching highly visible markers to the conductors at regular intervals on the sections of transmission line within one to two kilometres of ephemeral lakes (15.5.11)
- Light spillage would be mitigated to some degree by using screens and directional lighting where appropriate. Impacts on insects may be mitigated to some degree by the use of appropriate lamps, which are less attractive to insects (15.5.9)
- BHP Billiton is committed to continue investigating wildlife deterrent devices and to regular monitoring of wildlife mortalities associated with the TSF (15.5.7)

Desalination Plant

- The intake pipe and intake sump have been designed to allow gravity feed to the sump and promote the minimum practicable intake velocity (5.7.4; 16.5.2)
- The shape, configuration and orientation of the intake structure would be designed to minimise impingement and entrainment of marine biota (16.5.2)
- The intake structure would be regularly cleaned to ensure that fouling does not increase intake velocities (16.6.10)
- Installing the intake and outfall pipes through rocky reef areas may require the use of underwater blasting to fracture the rock prior to excavation. The explosive charges would be placed in holes drilled into the seabed, which would dampen the concussive effect of the blasting. The concussive effects would be further mitigated by using numerous small charges rather than fewer, large charges. Marine blasting would not occur during the cuttlefish breeding season, or if whales or dolphins are observed in the area. Prior to each blast, a 600 m exclusion zone would be established and monitored to minimise the risk of marine mammals or listed marine species entering the blast zone (16.6.11)

Monitoring Program(s)

Fauna (OD Doc.2663)

- The existing Fauna Monitoring Program would be reviewed to ensure the expanded operations were incorporated

Flora (OD Doc. 2664)

- The existing Flora Monitoring Program would be reviewed to ensure the expanded operations were incorporated

Risk Items

- Excessive numbers of wading birds visiting beach and liquor area of TSF due to pond area growing due to an imbalance in process or design
- Large flock of wading birds is affected by TSF liquor due to large flock of wading birds visiting liquor ponds
- Increased visitation by fauna to TSF and balancing pond due to failure to limit fauna access to acidic liquor ponds

Contingency Options

- To be developed as required

BHPB Responsible Officer

- tba

Key Government Department(s)

- Department for Environment and Heritage (SA)
- Department of Water, Land and Biodiversity Conservation (SA)
- Department of Environment, Water, Heritage and the Arts (Commonwealth)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.6	**General Waste Disposal**

Scope

The management of waste materials generated on-site from the mining and processing operations would largely follow the existing site practices.

The scale of the expansion would result in an increase in waste generated and thus the volumes available for reuse and recycling. This would require the construction of a new waste management facility, incorporating a new waste transfer station, a new landfill site and new areas for storing materials that are to be reused or recycled. Some of the materials that may be reused or recycled include plastic, cardboard and paper, steel, wooden pallets and rubber. For those wastes that are not recovered, a landfill facility would be operated to ensure containment and isolation of waste from the environment.

Wastes would also be generated by the construction and operation of other components of the expansion such as the desalination plant, the landing facility and the facilities at the Port of Darwin. Appropriate systems would be put in place to ensure the hierarchy of eliminate, reduce, reuse, recycle were adopted and that wastes were managed in accordance with regulatory requirements.

Legal and Other Guidance

- *Environment Protection Act 1993 (SA)*
- EPA Guidelines, Environmental management of landfill facilities (municipal solid waste and commercial and industrial waste), January 2007 (SA)
- Code of Practice and Safety Guide for Radioactive Waste Management in Mining and Mineral Processing (2005)
- NEPM(s) Movement of Controlled Waste, Used Packaging; Materials, and Assessment of Site Contamination
- National Waste Minimisation and Recycling Strategy
- *Waste Management and Pollution Control Act* and Waste Management and Pollution Control (Administration) Regulations (NT)
- Code of Practice and Safety Guide for Radioactive Waste Management in Mining and Mineral Processing (2005) (NT)

Values

- Clean, safe workplace and community
- Existing quality of soil, air and water resources (both surface and groundwater)
- Listed threatened flora and fauna

Objective(s)

1. Minimise general waste generated by BHP Billiton's expansion activities and maximise the reuse of general waste, where practicable

Assessment Criteria

1. Increase the proportion of general waste reuse/recycling

Management Plans

Landfill Management Plan (new)

- The existing waste management plan would be reviewed and would incorporate plans for management of the landfill and the various waste types generated during operation of the expansion, and would incorporate controls, monitoring requirements and contingency measures

Used Tyre Management Plan (new)

- With the large volume of waste tyres to be generated by operations, a specific Used Tyre Management Plan would be developed for investigations into technology options for strategic use of used tyres

Radioactive Waste Management Plan

- There are specific requirements under the Mining Code and these are currently incorporated within the OD EMS. These requirements are being reviewed and updated to incorporate any additional requirements of the expansion. It is intended that the current RWMP would be updated to encompass the expanded activities

Rehabilitation and Closure Plan

- The existing Rehabilitation and Closure Plan would be reviewed to ensure expansion requirements were incorporated

Controls/Management Actions

- Cover to the landfill facility would be provided on a daily basis with construction of the waste cells in accordance with EPA guidelines (5.6.2)
- BHP Billiton would continue to investigate options for recycling acid plant catalyst containing vanadium pentoxide (5.6.6)
- General office waste and putrescible wastes generated at Port of Darwin facilities would be disposed of to local waste management facilities by licensed contractors (E4.8.8)
- The backwash solids (from the desalination plant) would be periodically removed from the lagoons and disposed of at a licensed landfill facility to minimise the potential for odour (13.3.5)

ID 4	GENERATION OF INDUSTRIAL WASTES
ID 4.6	**General Waste Disposal**

Monitoring Program(s)

Waste (OD Doc. 2791)

- The existing Waste Monitoring Program would incorporate the expansion activities

Risk Items

- Inadequate waste management practices at Hiltaba Village and Roxby Downs due to lack of procedures, proper facilities or waste management initiatives
- Unwanted release of wastewater from water treatment facilities during operation of CCGT power station due to failure of containment systems
- Inadequate waste management practices due to failure to contain construction wastes at Port of Darwin
- Loss of control of inert or recyclable waste during decommissioning of CCGT power station due to failure of contractor management systems

Contingency Options

- Several options for managing used tyres are currently being investigated. The hierarchy of preferred practice adopted for the expanded operation is to:
  - reduce the volume of tyres requiring management by implementing programs to increase the life of tyres
  - retread or repair, where possible
  - use waste tyres for industrial purposes such as berms, road demarcation and fencing
  - treatment of waste tyres using energy recovery technologies such as incineration, co-combustion, tyre-derived fuel, pyrolysis, gasification, shredding and granulation
  - disposal in RSF in a documented location (5.6.3)

BHPB Responsible Officer

- tba

Key Government Department(s)

- Environment Protection Authority (SA)
- Department of Natural Resources, Environment, The Arts and Sport (NT)

ID 4	GENERATION OF INDUSTRIAL WASTE
ID 4.7	**Radioactive Waste**

Scope

Olympic Dam has an established record of managing radioactive wastes. This has resulted in environmental and community exposures well below national and international standards.

Any wastes with residual radioactivity above the definition of radioactive substances generated within a designated area of the mine and plant are deemed to be 'low level radioactive wastes' and are disposed of in a specially designated area of the main site solid waste disposal area in accordance with regulatory requirements. All equipment and material that leaves the site undergoes a 'radiation clearance' check to ensure compliance with relevant requirements.

All radioactive waste disposal is undertaken in accordance with regulatory approvals.

The existing licence to mine (LM1) under the Radiation Protection and Control Act requires compliance with the Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005) (referred to as the 'Mining Code') and requires the development of a Radioactive Waste Management Plan which forms part of this and other EM Programs.

Mine rock and tailings are dealt with separately in ID 4.2 and ID 4.3.

Radiation protection for employees is managed under the operations' occupational health and safety systems. This EM Program is limited to the environmental systems for ensuring the radiation protection of the environment and local communities from radioactive waste generation.

Legal and Other Guidance

- *Radiation Protection and Control Act 1982* (Radiation Protection and Control (Ionising Radiation) Regulations 2000) (SA)
- *Environment Protection Act 1993 (SA)*
- *Roxby Downs (Indenture Ratification) Act 1982* (requires compliance with the most stringent international radiological protection standards) (SA)
- Mining Code (Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005))
- Recommendations of the International Commission on Radiological Protection (ICRP) (various publications)
- IAEI, 1996, International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources

Values

- Natural radiation levels in the environment
- Clean, safe workplace and community

Objective(s)

1. No adverse impacts to health of employees or the public from exposure to radiation from BHP Billiton's expansion activities

Assessment Criteria

1. Radiation doses to the public less than 1 mSv/y above natural background and 20 mSv/y above natural background for designated workers

Management Plans

Radioactive Waste Management Plan

- There are specific requirements under the Mining Code and these are currently incorporated within the EMS. These requirements are being reviewed and updated to incorporate any additional requirements of the expansion. It is intended that the current RWMP would be updated to encompass the expanded activities

Controls/Management Actions

- Low-level radioactive waste would be disposed of in the TSF (as per the existing operation) in accordance with relevant codes and legislation (5.6.5)
- No wagon wash-down water would be discharged to the natural environment, rather washing would occur in an enclosed building, with the water collected, reused and ultimately transported back to Olympic Dam in a rail wagon to be disposed of within the Olympic Dam tailings storage facility (11.5.1)

Monitoring Program(s)

Radiation Dose to Members of the Public (OD Doc. 2790)

- As part of the Radioactive Waste Management Plan, a program – Radiation Dose to Members of the Public – for monitoring radon decay products and radionuclide in dust and in total suspended particulate matter, with environmental radiation monitoring sites set up for the existing operation, is implemented and would be reviewed to ensure the expansion was incorporated

Risk Items

- No key project risks identified for radioactive waste

Contingency Options

- To be developed as required

BHPB Responsible Officer

- Statutory Radiation Safety Officer

Key Government Department(s)

- Environment Protection Authority (SA)

ID 5 EMPLOYMENT AND ACCOMMODATION OF PEOPLE

ID 5.1 Community Interactions

Scope

Recognising that the workforce and the community are an important part of the operation, consideration and management of social interactions are necessary for a safe, content community and workforce.

The scale of the expansion is likely to increase pressure on workforce resources, labour supply and demand, availability of skilled personnel, along with ensuring there are adequate services, housing, recreational opportunities, further education and training opportunities, cultural needs and support for an increased population (and potentially an increased diversity in cultural background) during construction and operation.

It is important that issues are understood and appropriate strategies are implemented to assist in meeting the needs of the community and workforce, where BHP Billiton has the authority and capacity to do so.

Legal and Other Guidance

- BHP Billiton Standard - Community

Values

- Acceptable living conditions, working conditions and a desired lifestyle
- Safe and content community and workforce
- Recreational amenity of coastal homes' communities at Point Lowly and Upper Spencer Gulf

Objective(s)

1. Communities in which BHP Billiton operates value our citizenship

Assessment Criteria

1. Community concerns are tracked and all reasonable complaints are addressed

Management Plans

Traffic Management Plan (new)

- BHP Billiton would implement a Traffic Management Plan for the safe and efficient transport of large loads and over-dimension loads between Port Augusta and Olympic Dam (19.5.6). Inconvenience to the general public would be limited through the following measures:
  - obtaining approval for movement of materials from the appropriate authorities (22.6.9)
  - notification of road usage and interruptions through regular community announcements (19.5.6; 22.6.9)
  - aiming to transport loads at times that are out of peak period (19.5.6)
  - installing sufficient passing bays along the route to limit disruptions to road users (5.9.4)

Security Management/Operations Plan (new)

- BHP Billiton would develop and implement a security management plan for the Port of Darwin operations (E4.2.3)

Risk Management and Cyclone Response Plan (new) (for Port of Darwin)

- BHP Billiton would develop and implement a risk management and cyclone response plan for their operations at the Port of Darwin

Aboriginal Engagement Plan (new)

- BHP Billiton would develop an Aboriginal Engagement Plan including:
  - details of commitments under the Olympic Dam Agreement
  - outline of persons within the organisation who have responsibility for Aboriginal engagement and delivery of the commitments
  - cross-cultural training for all employees and contractors
  - plans for employment and training of local Aboriginal people and identification of potential positions for Aboriginal people including training programs and apprenticeships
  - identification of contracting or subcontracting opportunities that could be made available to local Aboriginal businesses
  - consideration of wider business or joint venturing opportunities with local Aboriginal businesses
  - support for local Aboriginal business development (19.5.1)

Industry Participation Plan (Port of Darwin)

- BHP Billiton would consult with the Larrakia Development Corporation to develop an Industry Participation Plan (17.3.1)

Social Management Plan (new)

- BHP Billiton would develop and implement, in collaboration with government and other stakeholders, a Social Management Plan. This plan would aim to monitor the impacts of the proposed expansion on Roxby Downs and relevant communities in the northern region and identify areas for action (19.5.7)

ID 5	EMPLOYMENT AND ACCOMMODATION OF PEOPLE
ID 5.1	Community Interactions

Controls/Management Actions

Community relations

- To reduce the likelihood of adverse impacts associated with the construction workforce, BHP Billiton plans to construct separate, high-quality accommodation (i.e. Hiltaba Village) with on-site entertainment, recreation and sports facilities (19.5.2)
- BHP Billiton would work collaboratively with the South Australian Government to develop and implement a strategy to provide an appropriate diversity of accommodation to meet the socio-economic requirements of the demographic mix of the Roxby Downs community as it expands (19.5.3)
- The existing accommodation area of Olympic Village would be relocated as part of the proposed expansion (5.10.2)
- Barge unloading at the landing facility would occur during daylight hours, typically between 7 am and 7 pm (5.9.5; 14.4.2; 19.5.6). Unloading of barges at the landing facility would not occur at night (19.5.6)
- BHP Billiton would continue to consult with landholders potentially affected by the proposed landing facility, access corridor and pre-assembly yard in Port Augusta (19.5.6)
- Pre-mining operations would be managed to comply with air quality criteria at the existing heavy industrial area at Olympic Dam Village. When necessary, or where the area is needed for the RSF, the facilities would be relocated (5.10.2; 13.3.4)
- BHP Billiton would continue discussions with directly affected landowners in relation to infrastructure easements, including land access, fencing along access tracks and the crossing points for pastoral activities and strategies for dealing with potential incidents during construction and operations phases (19.5.6)
- BHP Billiton would investigate the installation of a viewing platform to allow organised tour groups to safely view the open pit and mining operations (20.5.3)
- BHP Billiton commits to its obligations under the Olympic Dam Agreement, which includes:
  - establishing a trust to manage payments by BHP Billiton and to support community and business development initiatives for Aboriginal communities in northern South Australia (as defined in the Agreement)
  - implementing the Heritage Management Protocol to protect the Aboriginal ethnographic and archaeological values of the region (17.5.2)
- The Heritage Management Protocol includes the following:
  - proceed with the Olympic Dam Expansion in a manner that is respectful of the interests and concerns of the Native Title Parties
  - fund ethnographic mitigation measures
  - have areas surveyed for archaeological sites by an archaeologist using a scientifically valid predictive sampling model prior to significant ground disturbance
  - provide funding for one member from each of the Kokatha, Barngarla and Kuyani to be trained to a standard sufficient for them to be engaged as field assistants in the completion of field surveys
  - give Native Title parties copies of each archaeological report it commissions
  - undertake archaeological mitigation measures
  - take reasonable measures to safeguard culturally sensitive information in a manner identified by the Native Title Party that provided the information (17.5.2)

Crime and Anti-Social Behaviour

- BHP Billiton would implement a range of measures, in conjunction with local service providers, to address concerns relating to crime and anti-social behaviour resulting from the expansion, including:
  - initiating visitor management policies and procedures for Hiltaba Village and initiatives relating to crime and anti-social behaviour
  - developing a code of practice/behaviour for Hiltaba Village
  - providing for a proactive community-policing style of security and surveillance presence in Hiltaba Village to prevent and respond to incidents
  - developing, in collaboration with police, a strategy to ensure a rapid response to incidents
  - continuing to implement the 'Fit for Work' program, including routine drug and alcohol monitoring of workers
  - continuing to implement the workforce induction and education information strategies to communicate safety and security expectations
  - liaising with police management and providing updates of workforce schedules
  - working with council and police to develop safety awareness education and information programs
  - establishing a complaints procedure whereby any reported incidents of unacceptable behaviour would be investigated
  - provide internal security arrangements in accommodation village to manage inappropriate behaviour by workers and visitors
  - proactive discussion and engagement with the community and other stakeholders to establish a social management system to monitor and respond to issues, including the implementation of additional management strategies where necessary (19.5.2)
- BHP Billiton would progress the detailed design for the township and Hiltaba Village to further incorporate crime prevention principles (19.5.2)
- Sites for mobile work camps would be selected in consultation with landowners to avoid homesteads and sensitive areas, and implementing code of practice/behaviour among the construction workforce would minimise residual impacts (19.5.1; 19.5.6)

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ID 5.1	**Community Interactions**

Cultural awareness

- A program of ongoing archaeological investigations has been agreed to by the Kokatha, Barngarla and Kuyani groups (17.5.3)
- As part of the Olympic Dam Agreement, cross cultural training of staff is recognised as an important means to protect the Aboriginal cultural values of the region. Part of the induction program for all new employees and contractors at Olympic Dam would also include cultural awareness training (17.5.6)

Roxby Downs Master Plan

- Once finalised, BHP Billiton would facilitate the implementation of the Roxby Downs Master Plan, in collaboration with council, state government, developers and community organisations. BHP Billiton aims to:
  - provide for the timely and orderly release of serviced land to meet housing demand
  - utilise the Draft Master Plan and 'good residential design' published by Planning SA
  - develop residential areas to provide a leading example of environmentally sustainable urban development
  - seek a 5% vacancy rate in housing to encourage a stable housing market
  - provide for a range of allotment sizes based on demographics
  - provide the necessary infrastructure (including sewage treatment, reclaimed water irrigation, potable water, landfill, and power) and establish mandatory installation of AAA water saving appliances and fittings in each new household; provide for additional potable water storage and system; upgrade the existing waste water treatment system; construct a new landfill facility and transfer station; upgrade the power substation
  - provide a landscape plan for new residential areas
  - locate a new caravan park
  - facilitate ongoing consultation on the Draft Master Plan (19.4.2; 19.5.3; 5.10.2)
- Components of the township (e.g. residential, light industrial, recreational and educational areas) described in the Roxby Downs Master Plan would remain within existing or expanded land use precincts (9.6)
- BHP Billiton would manage land releases to accommodate supply and demand requirements to seek a goal of 5% vacancy rates in Roxby Downs, to address issues of housing supply and affordability (19.5.3)
- BHP Billiton would aim to develop Roxby Downs in accordance with the Roxby Downs Master Plan including the following measures to promote sustainability:
  - installing water saving appliances and fittings in all new households
  - establishing retention basins in parklands to enable harvesting and reclaiming stormwater for non-potable uses
  - applying the principles of water sensitive urban design
  - reclaiming treated effluent from the new wastewater treatment plant for beneficial reuse to reduce the demand on the potable water supply
  - in conjunction with state and local governments, investigating renewable energy sources for the town
  - all new buildings to comply with the energy limits imposed by the Building Code of Australia and requiring solar water heating for all new residential buildings
  - incorporating SA Department of Planning and Local Government's energy conservation measures into land and building layouts
  - incorporating an understanding of shading and solar orientation into building design
  - targeting urban development to choose areas identified as having lower ecological significance (5.10.2)
- In order to investigate and deliver appropriate social services and infrastructure, BHP Billiton would:
  - actively participate in the development of a plan by State Government to address social services and infrastructure prior to the expansion proceeding
  - arrange for a recreation officer/events coordinator to organise a range of recreational, cultural, social and sporting activities for the construction workforce
  - work in partnership with the State Government and non-government agencies to support and contribute to the provision of essential services in Roxby Downs (19.5.4)
- BHP Billiton would collaborate with government and non-government organisations to maintain a reasonable standard of health care in Roxby Downs (19.5.4)

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ID 5.1	**Community Interactions**

- BHP Billiton would also promote safe sex messages and drug and alcohol awareness programs in Hiltaba Village and the workplace to minimise potential impacts on community health (19.5.4)
- BHP Billiton would promote community identity and cohesion in Roxby Downs by:
  - providing accommodation for the permanent LDC workforce in Roxby Downs, as outlined in the Roxby Downs Draft Master Plan, to support the development of ongoing relationships between residential and non-residential workers
  - implement education programs promoting responsible social and environmental behaviours and ethics (15.5.11)
  - hold regular community forums on the expansion project in Roxby Downs and Andamooka
  - work with the council to provide an ongoing and proactive new residents' program and community-building activities to facilitate positive cultural and social interaction (19.5.5)

Community education

- BHP Billiton would implement a management plan to minimise the environmental impact of recreational activities around Roxby Downs (15.5.11)
- BHP Billiton would support Roxby Downs Council's proposed by-laws to manage cats and dogs more effectively in Roxby Downs by:
  - informing new residents about the ecological impacts associated with cats
  - subsidise a de-sexing program for cats
  - subsidise the installation of cat enclosures (runs) in backyards
  - investigate the possible establishment of an RSPCA branch in the township (15.5.11)
- To assist in fostering a greater understanding of impacts of particulates on community amenity and health, BHP Billiton would provide information to residents of Roxby Downs and Hiltaba Village on dust and dust emissions through:
  - information packs for all new and existing residents
  - a web-based system that enables the community to have access to dust monitoring results
  - feedback to the community about on-site and off-site environmental performance through the Annual Environmental Management and Monitoring Report (13.3.5)
- BHP Billiton would provide information to employees, and make available information to all new and existing residents of Roxby Downs and Hiltaba Village on:
  - dust
  - radiation
  - feral animals control
  - weed control
  - care for the environment
  - cultural diversity within the workforce and community
  - other social considerations as appropriate (19.5.5)
- BHP Billiton would develop and implement an education program providing details of the minimal impact of the proposed transport of uranium oxide and concentrate along the Adelaide to Darwin rail line (E4.10.5)

Employment and training

- BHP Billiton would continue to review and implement targeted programs for overseas employees (19.5.1)
- To address community perceptions about the safety and security of transporting concentrate and uranium oxide, BHP Billiton would launch an education program providing details of the minimal impact of the product prior to the increased transport (E4.10.5)
- BHP Billiton would address the skills shortage by supporting a number of Australian and South Australian governments' new employment and training initiatives. In addition, BHP Billiton would undertake a number of specific measures, including:
  - initiatives targeting employment and skills formation for Aboriginal people
  - expanding its traineeship, apprenticeship and new graduate intakes
  - providing bursaries for two students per year to study mining engineering for four years at Adelaide University
  - supporting TAFE SA programs in Roxby Downs
  - supporting a Careers Expo in Roxby Downs
  - working with governments, university, TAFE colleges and high schools to encourage the development of curricula that are relevant to the mining industry

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ID 5.1	Community Interactions

- targeting high schools and universities to attract new employees
- proactively working with government, regional development boards, TAFE and other training and education providers to build the capacity of South Australian businesses and to meet skills requirements (19.5.1)

• BHP Billiton would address potential skills shortages and labour impacts by participating in government and industry groups by considering:

- recommendations raised in recent reports by the National Institute of Labour Studies
- the extent and composition of labour force requirements and demand/supply issues
- vocational education and training requirements for both new and older workers, including pre-vocational training, traineeships and apprenticeships, on-the-job training, retraining and multiskilling
- more flexible and 'family friendly' work environments
- the location, training and other issues associated with the potential use of labour from industry sectors in decline (such as manufacturing) (19.5.1)

Economic Development

• BHP Billiton would work through regional economic development boards and the Industry Capability Network of South Australia to maximise opportunities for South Australian and Aboriginal businesses by:

- establishing a data base of SA businesses with an interest in the project
- facilitating the pre-qualification of SA businesses
- providing information about current and future opportunities and tendering processes
- supporting business training, development and diversification
- linking existing or potential suppliers to improve local competitiveness (19.5.1)

Traffic and Transport

• BHP Billiton would provide for the safe and efficient movement of materials and goods in and out of Olympic Dam through:

- installation of a rail/road intermodal facility at Pimba and the construction of a rail line between Pimba and Olympic Dam (5.9.3)
- installation of a landing facility south of Port Augusta to handle pre-assemblies
- construction of a road-over-rail overpass on Olympic Way (5.9.2)
- installation of up to 15 passing bays along the Stuart Highway and Olympic Way that would enable traffic to pass safely (5.9.2, 22.6.9)

• To provide for the safe movement of traffic between, and within, Roxby Downs, Hiltaba Village and Olympic Dam, BHP Billiton would:

- install a dual carriageway from the intersection of Olympic Way and the Roxby Downs heavy vehicle bypass road to the mine site (19.5.6)
- install new roads, intersections and engineered traffic controls such as roundabouts in Roxby Downs (5.9.4)
- install traffic calming measures to maintain speed control in Roxby Downs
- provide a fleet of buses for travel between the construction site and accommodation areas (19.5.6; 22.6.9)

• Inconvenience to the general public and the safe and efficient transport of large loads and pre-assemblies between Port Augusta and Olympic Dam would be managed by:

- notification of road usage and interruptions through regular community announcements
- aiming to transport loads at times that are out of peak periods
- apply a goal of ensuring that the maximum time that the general public may be disrupted by individual road closure events is 45 minutes (19.5.6)

• Railway crossings with appropriate signage would be provided where the rail line crosses minor roads and access tracks to pastoral stations (5.9.2)

• An expansion of the existing long distance commuter workforce bus service between Roxby Downs and Port Augusta would be provided if there was sufficient demand (5.10.2; 19.5.4)

• Final decommissioning of the metallurgical plant and associated infrastructure would use rail to transport the material away from Olympic Dam rather than road to minimise truck movements (26)

Desalination Plant

• Should blasting be required for installation of intake and outfall pipes, it would be likely to involve approximately 15 land-based blasts every two to three days over a period of 40–60 days and approximately 25 underwater blasts every two days over a period of approximately 50 days. A maximum charge size of 10 kg would be used, and would involve sequential detonations to minimise potential airblast, overpressure and vibration impacts. Blasting would only occur during daylight hours, and would not occur on a Sunday or a public holiday (19.5.6)

ID 5	EMPLOYMENT AND ACCOMMODATION OF PEOPLE
ID 5.1	Community Interactions

- During blasting activities, appropriate exclusion zones would be established to ensure public safety for people on land, and on or in the water. Estimated safety limits for land-based blasts would be approximately 300 m for people (where the maximum charge size would be 10 kg) and 100 m for unoccupied residences (or less, where the charge size would be adjusted to comply with noise and vibration limits). The safety exclusion zone for underwater blasting would be 1,350 m for people in the water and 70 m for a boat or other ship or vessel on the water (19.5.6)
- In order to further reduce the impact of blasting on people and buildings at Point Lowly, BHP Billion would:
  - provide advance notice of the blasting schedule to people in the Point Lowly area
  - place prominent signs on blasting days at the boat ramps at Point Lowly and Whyalla, and at the two dive shops in Whyalla
  - undertake surveillance of the blast area two hours prior to a blast, intensify water surveillance during blasting, and patrol upstream of the blast area to safeguard drift divers
  - monitor blast patterns to ensure compliance with the appropriate airblast and vibration criteria
  - keep accurate records describing the location of each blast and blastholes, the design of the blast in terms of explosives and initiating system usage, and ground vibration and airblast measurement data (19.5.6)

Visual Amenity

- Visual impacts of desalination plant minimised by selecting appropriate building colours and landscaping appropriately to screen the plant and associated infrastructure (20.5.2)
- When siting Roxby Downs expansion area, some of the natural dunes and vegetation would be retained to minimise the potential impacts on visual amenity. The potential visual impact of the proposed RSF and TSF would be further minimised by creating suitable conditions for vegetation growth around the lower slopes and base of the RSF and TSF (20.5.2)

Port of Darwin

- BHP Billiton would collaborate with the Darwin Port Corporation and relevant regulatory authorities and agencies to develop and implement a site specific security management plan (5.9.5)
- Member of the public radiation dose would be maintained below applicable limits (E4.10.2)

Other

- The open pit mine would commence as soon as possible after all necessary approvals had been received and a decision by the BHP Billiton Group Board to proceed (5.4.1)
- Prior to mining operation commencing, the existing site desalination plant would be relocated. It would be decommissioned after the new desalination plant was operational, and the existing infrastructure relocated and reused to provide the additional on-site capacity as required (5.4.3)

Monitoring Program(s)

Radiation Dose to Members of the Public (OD Doc. 2790)

- The Radiation Dose to Members of the Public Monitoring Program would be reviewed and updated to include expansion requirements, if any

Noise (new)

- Noise monitoring would be undertaken at key receptor locations to assess compliance with the adopted criteria (14.5.2)

Risk Items

- Indiscriminate off-road driving at Hiltaba Village and Roxby Downs due to inadequate resident awareness, inadequate education and training of workers and/or failure to provide adequate alternatives activities; failure of management systems
- Collecting and fossicking of fossils due to inadequate resident awareness and/or failure to provide adequate alternative recreational activities at Hiltaba Village and Roxby Downs
- Indiscriminate off-road driving along linear infrastructure leading to damage of Aboriginal heritage sites due to inadequate education and training of workers; failure of management systems
- Delays to public road users on public highway due to transport of over dimension loads along public highway
- Concern of local residents due to construction noise at landing facility and access road exceeding expected levels
- Public concern due to expansion of Roxby Downs and Hiltaba Village
- Public outcry over rail transport of uranium oxide and concentrate due to public failure to understand actual risks of such transport
- Collision between Olympic Dam supply train and a vehicle driven by a member of the public due to inadequate warning of oncoming train or inattention
- Vehicle accidents due to increase in number of contractor vehicles during construction and failure of road safety systems

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ID 5.1	**Community Interactions**
Contingency Options	
• To be developed as required	
BHPB Responsible Officer	
• tba	
Key Government Department(s)	
• Department of Families and Communities (SA)	
• Department of Education and Children's Services (SA)	
• Department of Further Education, Employment, Science and Technology (SA)	
• Department of Health (SA)	
• Department of the Premier and Cabinet (SA)	
• Department of Health and Families (NT)	

ID 5	EMPLOYMENT AND ACCOMMODATION OF PEOPLE
ID 5.2	**Workplace Interactions**

Scope

Social well-being of employees and contractors is incorporated into the BHP Billiton HSEC standards, which are incorporated into site operational systems at Olympic Dam. The expansion would result in increased workforce numbers, increased career changes within the organisation and added pressure on the associated community to provide support.

It is important that issues are recognised and that appropriate strategies are implemented to assist in meeting the needs of the community and workforce to maintain a healthy workplace and lifestyle, where BHP Billiton has the authority and capacity to do so.

Legal and Other Guidance

- *Occupational Health, Safety and Welfare Act 1986* and Occupational Health, Safety and Welfare Regulations 1986 (SA)
- *Workplace Health and Safety Act 2007* and Workplace Health and Safety Regulations (NT)

Values

- Expectations of the workforce and community

Objective(s)

1. Olympic Dam is a safe and valued place of employment

Assessment Criteria

1. Health, Safety, Environment and Community Incidents are tracked and significant incidents are addressed

Management Plans

Other Operational HSEC Plans (eg. OD Doc. 67957 (Security), OD Doc.48958 (Incident Management Team Plan) and OD Doc. 60140 (Confirmed Fire, Surface))

- Security operations, emergency response, crisis management, fire control and other existing operational risk management plans would be updated to incorporate the expansion

HSEC Management Plans

- BHP Billiton would develop a comprehensive set of health, safety, environment and community (HSEC) design criteria documents for the project definition stage. These documents would collate details of design leading practice and specific requirements and outcome requirements that are to be used by the design, development and review teams (22.5.2)

Traffic Management Plan (new)

- A traffic management plan would be implemented to control risks from light vehicles and surface mobile equipment in the mine (22.6.2)

Controls/Management Actions

Community Health and Safety

- The existing heavy industrial area at Olympic Dam Village would be relocated as part of the proposed expansion (5.10.2)
- To respond to medical incidents at Hiltaba Village, a qualified paramedic would be available 24 hours, seven days a week, with only serious medical emergencies expected to be referred to Roxby Downs Health Service or other medical services. The facilities manager at Hiltaba Village would also provide a first response to all medical and fire emergencies. In addition, the induction of workers would cover emergency response and evacuation procedures and a monitored fire alarm system would be incorporated into the village's central control system (19.5.4)
- The workforce currently accommodated at Olympic Village would be relocated to Hiltaba Village and/or accommodation at Roxby Village during the pre-mine phase (5.10.2)
- BHP Billiton proposes management initiatives in relation to workplace and living conditions including:
  - offering competitive remuneration and rewards
  - providing attractive and flexible career prospects
  - providing employee development opportunities, such as study cost reimbursement, conference attendance and in-house training
  - providing high quality living environments and workplace conditions
  - working with the community and government to improve amenities and facilities in Roxby Downs (19.5.1)

ID 5	EMPLOYMENT AND ACCOMMODATION OF PEOPLE
ID 5.2	**Workplace Interactions**

Workplace Health and Safety

- BHP Billiton would comply with internationally accepted radiation limits for workers and the public and would set a goal of maintaining doses at less than 50% of the internationally acceptable limits (22.6.5)
- A 'safety case' for the current operation is being conducted and would incorporate all components of the proposed expansion. This includes:
  - identifying the hazards and risks of the proposed expansion
  - describing how the risks are to be controlled
  - outlining the safety management system and its implementation
  - monitoring and review of effectiveness (22.5.3)
- A study would be undertaken to minimise impacts of fly-rock and to determine optimum distances for the characteristics of the mine rock (22.6.2)
- All people entering the open pit would be required to have a proper induction, comply with internal and external regulations and wear appropriate high visibility PPE. Those on foot in the pit would be required to wear appropriate high visibility PPE and comply with communications protocols (22.6.2)
- BHP Billiton to provide buses for travel between the construction site and accommodation areas and all work vehicles would conform with the relevant BHP Billiton vehicle standards, including the Fatal Risk Control Protocols (22.6.1)
- Bulk storage facilities for hazardous materials would be designed and constructed according to applicable standards and legislation (22.6.8)
- All contractors would be required to comply with standard procedures for hazardous substances to ensure that any construction material that arrived on the site was obtained, stored, used and disposed of in a safe and responsible manner (22.6.8)
- Additional smelter ventilation would be installed to manage the gases generated through tapping the new blister tapholes on the eastern end of the furnaces (5.5.4; 26.3.2)
- The gas cleaning systems in all smelter-based furnaces would be bypassed in the event of abnormal or emergency conditions that may adversely affect the health and safety of personnel (13.3.5)
- In the brownfields expansion work, exclusion zones would be established and effective barriers would be installed to control risk from work at heights (26.3.2)
- Install barrier along tailings cells and balance ponds' access roads to prevent vehicles from accidentally leaving the road. Provide tether points and harnesses for use by all operators in tailings cells and balance ponds areas (26.3.2)
- Geotechnical studies would be conducted during the latter stages of operation to determine the potential for surface subsidence around the perimeter of the open pit and to identify a safety exclusion zone (23.8.1)
- All workers would be trained in radiation protection measures and a site-wide safety culture promoted (22.6.5; E4.10.2)

Monitoring Program(s)

Airborne Emissions (OD Doc. 2788)

- The existing Airborne Emissions Monitoring Program would be reviewed to ensure expanded operations were incorporated

Risk Items

- Release of toxic materials during road or rail transport due to failure of containment systems or vehicle accident
- Diver or maintenance crew impacted during cleaning and maintenance of intake/outfall structure due to blockage during intake/outfall cleaning process
- Chlorine gas leak due to rupture or equipment failure at desalination plant
- Drowning of diver due to diver error or systems failure
- Incidents involving lifting equipment (collapse, overload, contact with overhead services) during greenfield site construction due to failure to follow safe work procedures
- Aircraft accident due to systems failure
- Unauthorised entry by construction workers into operations area due to failure of management and control procedures

ID 5	EMPLOYMENT AND ACCOMMODATION OF PEOPLE
ID 5.2	**Workplace Interactions**
• Vehicle accidents due to increase in number of vehicles for residents and workers in Roxby Downs and/or failure to follow road safety rules • Hazardous materials interactions due to failure to identify susceptible worker and/or undesired exposures to hazardous substances • Electrocution due to live wire, operator error or systems failure • Explosion in smelter leading to fatality due to hydrocarbon leak in vicinity of oxygen production area • Asphyxiation due to major leak of nitrogen in confined space in vicinity of oxygen production area in smelter • Violent acts in Hiltaba Village and/or Roxby Downs due to anti-social behaviour or pre-mediated behaviour of transient workforce (due to alcohol or drugs) • Increased fugitive emissions into smelter building due to failure of gas handling systems to control emissions from increased smelter throughput • Operator falls into acidic tailings liquor due to failure of barriers and failure of safe work procedures • Accidents during open pit blasting due to uncontrolled detonation of a loaded blast pattern, misfire, personnel inside blast perimeter, flyrock beyond safe zone or explosion at batch plant or magazine • Failure of pit walls due to incorrect design • Mining vehicle accidents due to failure of traffic management plan • Gas leak leading to fire or explosion due to gas leak in plant • Vehicle accidents due to increase in number of contractor vehicles during construction and failure of road safety systems • Accidents involving surface mobile equipment (including collisions, run over and rollover) due to increased number of vehicles being used for all phases of the project • Trench collapse during excavation due to inappropriate trench shoring or benching or ineffective construction management controls • Interaction between construction and operations work areas resulting in such events as falling objects due to construction workers working in vicinity of operations personnel with different safety systems • Accident to technicians while monitoring radioactivity levels of rail wagons at Port of Darwin due to failure of safety systems and operating procedures • Accident during rail wagon lid fitting or removal due to failure to follow procedures or inadequate design • Interaction between rail wagon tippler and worker during loading or unloading due to operator failure to follow procedures or unauthorised entry • Contact or collision between operator and reclaimer in concentrate shed due unauthorised entry or failure to follow procedures • Operator engulfed in concentrate due to slumping of stockpile • Entrapment in moving machinery (i.e. conveyors) due to failure to follow procedures or inadequate design • Ship collision or grounding due to loss of control of vessel or operator error	
Contingency Options	
• To be developed as required	
BHPB Responsible Officer	
• tba	
Key Government Department(s)	
• Department of Health (SA) • Safe Work SA (Department of the Premier and Cabinet) • NT WorkSafe (Department of Justice) (NT)	