

16 TERRESTRIAL ECOLOGY

16.1 ARID RECOVERY

Issue:

It was suggested that the proposed buffer distance of 500 m between the rock storage facility (RSF) and Arid Recovery was inadequate as shading may affect the vegetation and ecology of the area under normal operating conditions or if the RSF encroached on this 500 m buffer because of instability.

Submission: 118

Response:

The RSF would be located south of Arid Recovery. In summer, the sun crosses the sky directly overhead, while in winter it has a more northerly trajectory. Therefore, the RSF would not shade Arid Recovery.

The RSF would be designed and constructed so that the outer walls would be built by truck-dumped material. The angle of the RSF slopes formed when this material comes to rest (the angle of repose), would be about 37 degrees (refer Draft EIS, Section 5.2 for details). This method results in a stable structure (see Section 5.2 of the Supplementary EIS for further details on the stability of the RSF). In addition, based on a face height of 75 m, a maximum height of 150 m, an angle of repose of 37 degrees and a bench width of 300–400 m, it is estimated that the highest point of the RSF would be more than 1,200 m from the Arid Recovery boundary.

Issue:

It was suggested that feral cats began to pose a serious threat to native fauna in the region only after the township of Roxby Downs was established. Also, a question was raised regarding the number of feral cats removed from Arid Recovery since its inception.

Submission: 302

Response:

Feral cats are believed to have been present in the Roxby Downs area since European settlement (Moseby 2003). Since this time, they have posed a major threat to native fauna in the region, preying on small mammals, reptiles and ground-dwelling birds (refer Section 15.5.11 of the Draft EIS for details). BHP Billiton is committed to implementing management actions and control measures to mitigate the impact of vertebrate pests in the Olympic Dam region, including providing ongoing support to Arid Recovery. Section 15.3.10 of the Draft EIS described Arid Recovery as an ecosystem restoration zone established to provide an area free of feral animals, and where locally extinct species are reintroduced. Species population numbers then expand to the point that the species can be released outside Arid Recovery. Staff at Arid Recovery estimate that since 1997, between 70 and 100 cats have been removed from the 60 km² 'exclusion' zone or fenced area that was cleared of all feral cats when it was first enclosed.

16.2 EMISSIONS AND FLORA/FAUNA INTERACTIONS

Issue:

Further information was sought about the management measures that were proposed to mitigate any impacts of light and noise emissions on fauna. A more detailed definition was also requested of the 'area of management focus' referred to in the chapter on Noise and Vibration (Chapter 14 of the Draft EIS).

Submission: 15

Response:

The effect of light and noise emissions on fauna was discussed in Section 15.5.9 of the Draft EIS. It was acknowledged that emissions of light and noise may reduce habitat value in the southern areas of Arid Recovery. However, mitigation measures designed to minimise these impacts would be implemented wherever practicable, and similar habitats near the affected areas would be protected to compensate, to some extent, for the reduced habitat value.

Light spill

Many groups of insects may be attracted to lights used during night operations, which may in turn encourage visitation by insectivorous bats, some birds, and ground-dwelling fauna to forage at, and near, the source of light emissions (refer Section 15.5.9 of the Draft EIS). Section 15.5.10 of the Draft EIS noted that light emissions might alter the behaviour of fauna in affected areas, including listed species in southern parts of Arid Recovery. Light spillage would be mitigated to some degree by the use of directional lighting and screens to concentrate light on operations and to block spillage as far as possible. The use of lamps that are less attractive to insects than conventional lights could also be investigated.

Noise emissions

Noise effects would be limited to within the Special Mining Lease (SML) and the southern part of Arid Recovery, and would rapidly reduce to 40–65 dbA within 2 km of the noise source, such as a road or railway (i.e. the effect would be similar to the background, daytime noise levels measured in a remote rural location near to Woomera – refer Chapter 14 and Appendix N12 of the Draft EIS for details). As noted in Section 15.4.2 of the Draft EIS, siting project infrastructure and modifying designs to minimise disturbance footprints provides the greatest opportunity to lessen potential impacts on terrestrial ecology. One strategy to minimise the impact of noise on terrestrial fauna in the vicinity of new infrastructure was to locate the water supply pipeline, transmission line, gas supply pipeline and rail line adjacent to existing infrastructure, thereby confining the noise impact to an area where, to some extent, fauna have already become accustomed to periods of increased noise.

Section 15.5.9 and Section N12.5 of Appendix N of the Draft EIS also noted that noise is likely to have an impact on some species of conservation significance (i.e. Thick-billed Grasswren, Greater Stick-nest Rat, Greater Bilby, Western Barred Bandicoot and Burrowing Bettong) in the vicinity of the SML and southern areas of Arid Recovery. Section 15.5.9 of the Draft EIS categorised noise impacts on these species as a high residual impact, representing a long-term impact to a sensitive receiver. It was also noted that 'this would remain an area of management focus for the proposed expansion', which means that ongoing support would be provided for Arid Recovery (in order to maintain alternative habitats in northern areas of the conservation area), and would remain a high priority for the expanded operation. Another mitigation measure discussed in the Draft EIS was setting aside suitable habitat areas for conservation purposes elsewhere in the region, as part of the significant environmental benefit (SEB) offset strategy.

Issue:

Concern was raised regarding the predicted impact of increased dust and sulphur dioxide on vegetation in the expanded Special Mining Lease (SML), particularly vegetation on the outer edge of the rock storage facility (RSF) and the southern areas of Arid Recovery.

Submissions: 71, 72 and 168

Response:

Section 15.5.9 of the Draft EIS categorised the likely impact of air emissions on vegetation on the outer edges of the RSF and the southern areas of Arid Recovery as 'moderate'. As per the criteria used throughout the Draft EIS, this impact level reflects a long-term impact to a common receiver (refer Section 1.6.2 of the Draft EIS for details of the impact level criteria). The vegetation communities in these areas were categorised as 'common' because they are widespread in the arid regions of South Australia, and the area of potential impact represents a small proportion (less than 5.6%) of these communities in the EIS Study Area (refer Table 15.5 of the Draft EIS for details) and they are not afforded additional protection under Australian or South Australian legislation.

Section 15.9.5 of the Draft EIS also noted that extrapolations for measurable effects on plants from gaseous emissions are not definitive as vegetation loss depends on the interaction of a number of variables including the age of vegetation, the duration and frequency of exposure, rainfall intensity, and rainfall frequency. Some minor but measurable effects on vegetation in the expanded SML and the southern areas of Arid Recovery are expected. However, it is unlikely that this would result in a loss of vegetation in these areas. The Draft EIS acknowledged that the impact of air emissions on vegetation in these areas might reduce the habitat value of ecosystems for some animals. These impacts would be compensated, to some degree, by setting aside 126,650 ha of land in the South Australian Arid Lands Natural Resource Management region as part of the significant environmental benefit (SEB) offset strategy (outlined in Section 15.5.1 of the Draft EIS), which would result in a moderate residual benefit (i.e. a long-term benefit to a common receiver).

BHP Billiton currently conducts an environmental monitoring program for the purpose of quantifying the extent and significance of the operation's impacts on flora. Following project approval, the monitoring program would be updated to include the expanded operation. Established indicator species would be regularly inspected for symptoms of damage that may be attributable to increased emissions from the expansion. If unacceptable adverse effects on vegetation were detected during monitoring, a review of control measures designed to limit the impact of gaseous emissions would be undertaken. The results of the monitoring and management activities that are implemented would be publicly reported in the Annual Environmental Management and Monitoring Report.

Issue:

Concern was raised about the potential impacts on fauna from dust exposure and accidental spills at the proposed Outer Harbor sulphur terminal. Dolphins and migratory birds protected under international treaties were identified as species of particular concern.

Submissions: 22 and 66

Response:

Section 5.9.5 of the Draft EIS described the new sulphur handling and storage facility proposed at Outer Harbor, including a summary of design features that would be installed to minimise the risk of dusting of sulphur during transport, handling and storage. These features included:

- the use of fully enclosed spoon chutes during loading and unloading from ships
- dust curtains at entry and exit points
- using suppression mist sprays along the full width of conveyed material.

It is also noted that elemental sulphur imported via Outer Harbor would be transported in the form of prill, which is a solid 'pellet' form that is far less likely to spill or dust than other forms of sulphur. BHP Billiton has been transporting and handling elemental sulphur for the Olympic Dam operation for more than 20 years. The company understands that sulphur prill may break down through abrasion or crushing during transport and handling and is very experienced in successfully applying the mitigation measures identified above.

Section 7.16 of Appendix C to the Draft EIS described the risk assessment undertaken to identify and assess risks associated with constructing and operating the proposed sulphur handling and storage facility at Outer Harbor. The residual risk of detriment to fauna was assessed as 'low', after applying the mitigation measures mentioned above and further described in Section 5.7.1 of the Draft EIS.

The residual impacts on the Port River estuary associated with shipping operations were categorised as 'negligible', representing no detectable effect (refer Section 16.6.13 of the Draft EIS). Dolphins, in particular, do not seem to be averse to marine vessel traffic in the area. Despite hundreds of shipping movements to and from Port Adelaide each year, dolphins are frequently sighted in the vicinity of the Port River and Outer Harbor area of operations. Daily excursions to observe dolphins have been run by tour operators in the region for many years, indicating that dolphins inhabit the area regardless of busy port activity.

16.3 MANAGEMENT OF WEEDS AND ABUNDANT SPECIES

Issue:

Concern was expressed about the risk of propagating pest plants in areas that are currently free of invasive weeds. It was suggested that the greatest risk of introducing weeds such as Buffel Grass to areas where BHP Billiton is operating is by transmission of contaminants on vehicles and machinery bringing materials north to site from southern areas where weeds are prevalent. Several requests were made in relation to these concerns, including assurance that BHP Billiton would:

- make an explicit commitment to work with relevant Natural Resources Management (NRM) Boards to address vertebrate pests and declared weeds in all areas of operation
- comply with provisions of the Natural Resources Management Act as directed by the Northern and Yorke, and Eyre Peninsula NRM Boards
- initiate consultation and engagement with relevant NRM Boards early in the project planning phase.

Submissions: 2, 62, 63, 71 and 136

Response:

Section 15.5.11 of the Draft EIS acknowledged the environmental risks associated with propagation of pest species and committed to minimising the spread of weeds and feral animals through collaboration with the relevant NRM Boards. This section of the Draft EIS also outlined a series of management measures proposed to mitigate the spread of weeds and vertebrate animal pests, including:

- liaising with relevant NRM Boards to develop targeted weed management strategies including coordinated efforts to control high-priority species
- continuing the existing feral animal monitoring and control programs in the Olympic Dam region
- collaborating with the Roxby Downs Council to better manage cats and dogs in the township
- ensuring that plant, equipment and vehicles were cleaned diligently before construction work began and after they left areas infested by declared weeds
- identifying areas where weed hygiene measure would be implemented by undertaking searches for declared weeds during the field surveys for the final infrastructure locations
- minimising the disturbance caused by construction and operational activities wherever possible
- ensuring that vehicles remained on designated tracks to minimise disturbance and weed spread
- conducting follow-up surveys 12 months after construction and/or after significant rains to determine the need for weed control
- undertaking control activities for declared and environmental species where they occur on lands owned by BHP Billiton.

Section 15.5.11 of the Draft EIS also noted the collaborative effort between BHP Billiton, Arid Recovery, the Roxby Downs Council and the Andamooka Progress and Opal Miners Association to develop a weed management strategy for the Olympic Dam region in 2004. This strategy assigns responsibility to each agency for controlling pest plants in designated areas. The strategy would be updated to include new components of the project (e.g. the water supply pipeline from Point Lowly, the desalination plant at Point Lowly and the gas supply pipeline from Moomba) before construction of the proposed expansion began.

BHP Billiton also currently conducts an environmental monitoring program to quantify any change in the extent and significance of the operation's impacts, including impacts on flora. Following project approval, the monitoring plan would be extended to include areas of new infrastructure. The distribution of extreme- and high-risk weed species would be mapped as part of this program and the information used to determine the need for amendments to the weed management plan, control activities or management measures. The results of monitoring and management activities implemented would be publicly reported in the annual Environmental Management and Monitoring Report.

Issue:

It was suggested that uncontrolled kangaroo grazing is likely to result in land degradation on the SML, and details of a proposed kangaroo management strategy were requested. It was also suggested that a kangaroo management plan be developed after project approval.

Submission: 2**Response:**

Chapter 24 of the Draft EIS provided an outline of the current Olympic Dam Environmental Management (EM) Program FY08–FY10 that details site objectives (and targets), current controls and mitigation measures to protect environmental values, and environmental action plans to address issues of high environmental risk, including kangaroo abundance. The need to monitor and control kangaroo numbers is acknowledged in the Fauna Monitoring Program FY08. Section 2.4 of the monitoring program relating to Feral and Abundant Species notes that kangaroo numbers directly affect the condition of vegetation on the mine and municipal leases, and also the success of rehabilitation measures and amenity plantings in these areas. For this reason, kangaroo numbers are monitored regularly (every three months) and controlled when necessary.

Section 24.4.6 of the Draft EIS stated that the current EM Program (FY08–FY10) would be combined with the Draft EM Program if the proposed expansion was approved and kangaroo management and monitoring would continue under the updated EM Program. Results of fauna management and monitoring activities would continue to be publicly reported in the Annual Environmental Management and Monitoring Report.

16.4 LISTED SPECIES

Issue:

Concern was raised that the Draft EIS did not address potential impacts on the Orange-bellied Parrot. The submission noted that this species has feeding grounds in the Winninowie Conservation Park, which is approximately 15 km from the proposed landing facility.

Submission: 84**Response:**

The Orange-bellied Parrot is not a species known to utilise habitats in the area investigated for the proposed expansion of Olympic Dam and would not be affected by the expansion project.

Although the parrot's range is considered to include the eastern side of Upper Spencer Gulf (Australian Department of Environment, Water and Heritage (DEWHA) 2010, see Figure 16.1 of the Supplementary EIS), the Winninowie Conservation Park (WCP) is not considered to be a critical feeding habitat for the species. As shown in Figure 16.1, its core range is presently restricted to coastal regions of the far south-east of South Australia, southern Victoria and western Tasmania (DEWHA 2010; Birds Australia 2008; Parrot Society 1997).

The record of the Orange-bellied Parrot at Chinaman's Creek in the WCP refers to an observation of a single bird in 1992. The park's management plan notes it as 'a species not previously recorded for the region' (DEH 2000), and includes no specific management measures for the species. It has been suggested that the individual sighted at Chinaman's Creek may have been associated with migrating Blue-winged Parrots (Klau and Langdon 1994, cited in DEWHA 2010).

The breeding range of the species is limited to south-west Tasmania (see Figure 16.1 of the Supplementary EIS), where individuals return to breed in summer after visiting their winter feeding grounds (DEWHA 2010; Orange-bellied Parrot Recovery Team (OBPRT) 2006). The species is 'rarely recorded from west of the Murray River in South Australia' (OBPRT 1998). As shown in Figure 16.1, the eastern side of Spencer Gulf is classified as 'infrequent non-breeding range', and the western side of the gulf, including the proposed locations for the landing facility and the desalination plant, is not included in the range of this species.

In South Australia, the preferred habitat of the Orange-bellied Parrot is within 3 km of the coast (DEWHA 2010), where it prefers beaches, coastal dune systems, salt marshes, lagoons and open pastures (DEWHA 2010; Birds Australia 2010; Ehmke 2009). The species feeds on seeds, favouring plants such as the Bidgee-widgee (*Acaena novaezelandiae*) and Sea Rocket (*Cakile maritima*) (DEWHA 2010; Birds Australia 2010; Ehmke 2009; OBPRT 2006). As shown in Figure 16.2 of the Supplementary EIS, although *Cakile* is recorded in Upper Spencer Gulf, *Acaena* is much more prevalent in the southern parts of South Australia, and on the Eyre and Yorke Peninsulas is recorded only on the southern tips (State Herbarium of SA 2010). Neither species has been recorded in the proposed locations of the landing facility or the desalination plant, as detailed in Appendix N, Table N.3.1 of the Draft EIS.

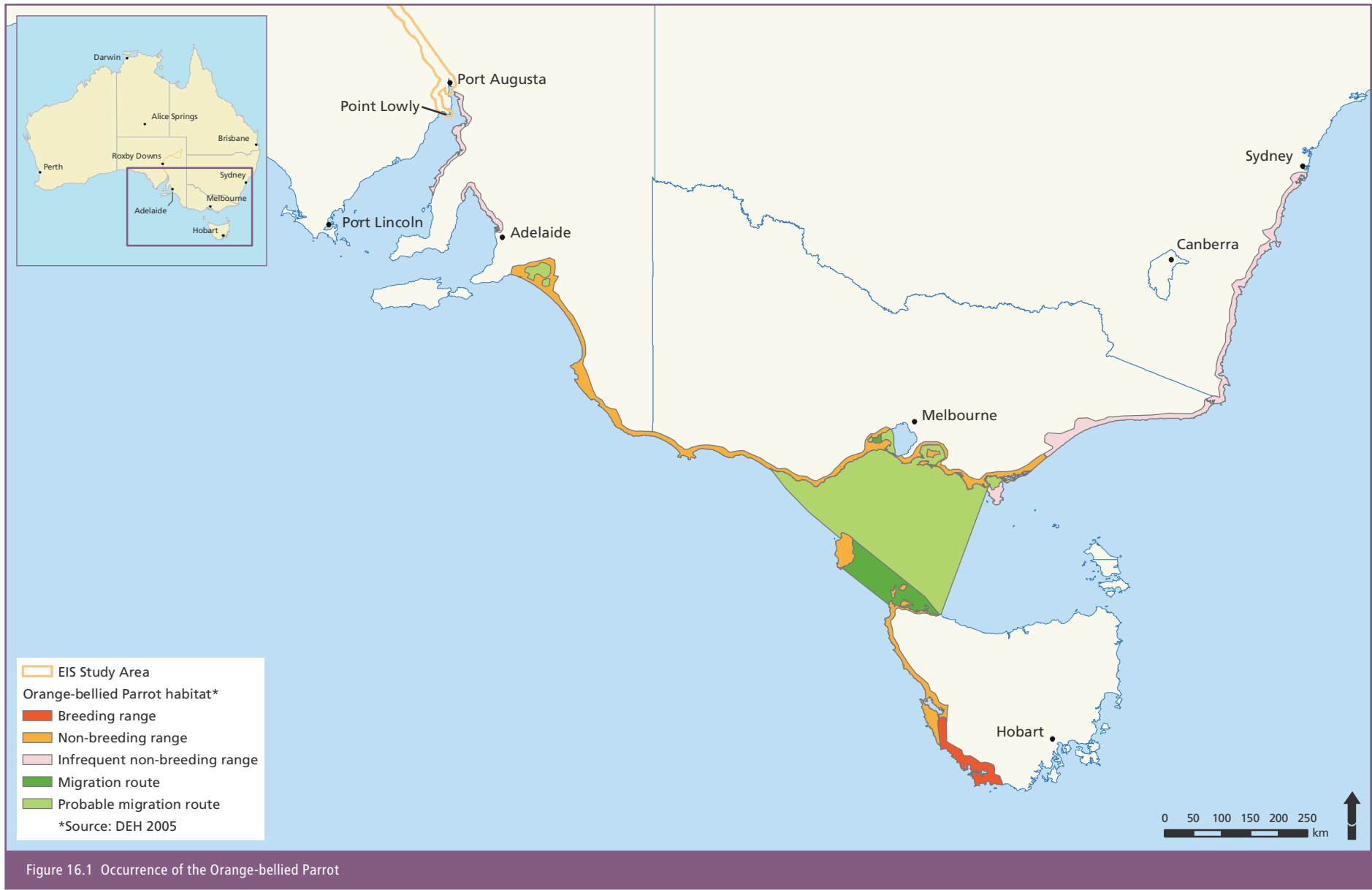


Figure 16.1 Occurrence of the Orange-bellied Parrot

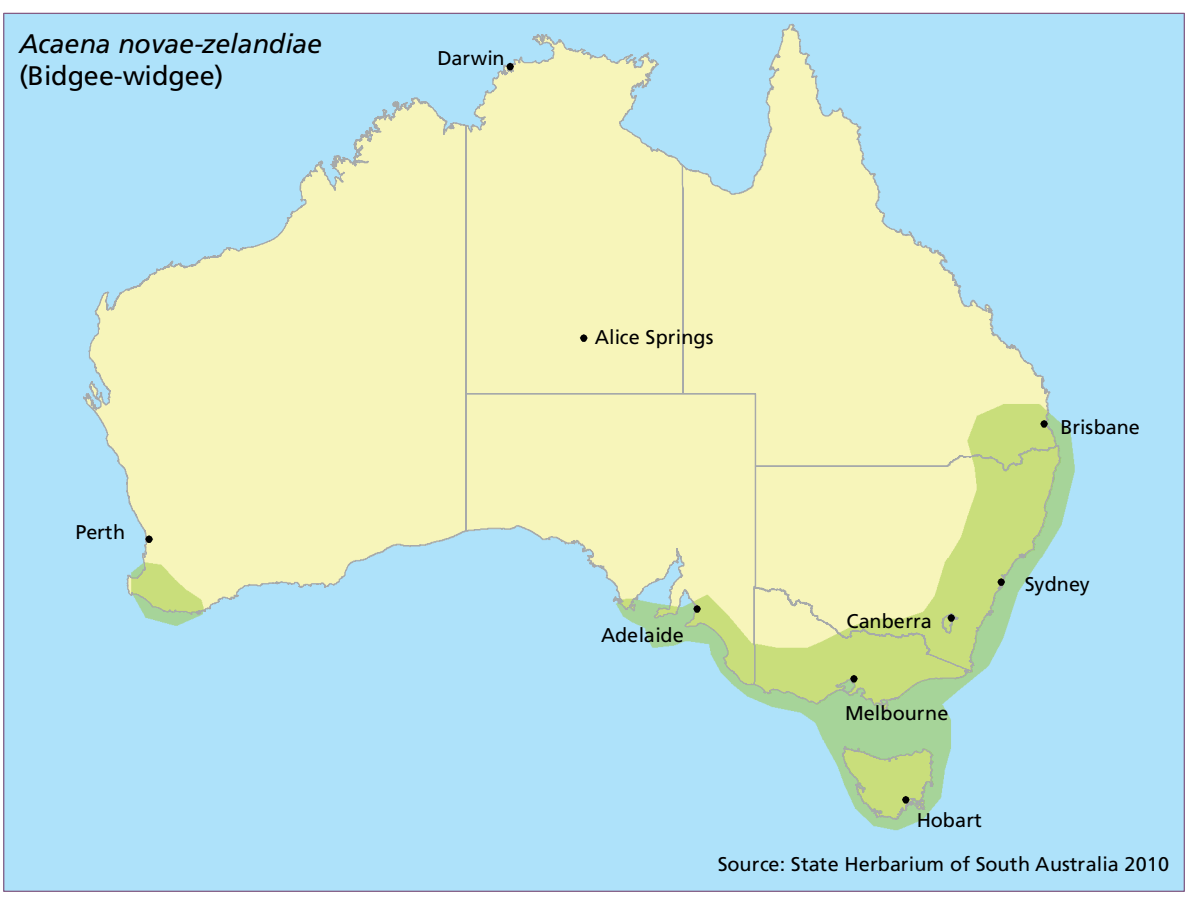


Figure 16.2 Indicative distribution of the plants *Acaena novaezelandiae* and *Cakile maritima*

Issue:

A more detailed definition was sought of the area of habitat suitable for colonisation by populations of Plains Rat displaced during the mine expansion.

Submission: 15**Response:**

Section 15.3.2 of the Draft EIS identified areas of low chenopod shrubland and cracking clay plains considered typical habitat for *Pseudomys australis* (Plains Rat) to the north, south, east and west of the Special Mining Lease (SML). These areas favoured by the Plains Rat in the Olympic Dam region were identified on Figure 15.3 of the Draft EIS, using numbers to demarcate chenopod shrubland. This is reproduced in Figure 16.3 of the Supplementary EIS. Areas of habitat suitable for the Plains Rat in the vicinity of the infrastructure corridor (northern sections) were clearly marked on Figures N1.4a to N1.4c of Appendix N of the Draft EIS, and these areas have been reproduced in Figure 16.4 of the Supplementary EIS.

Section 15.5.5 of the Draft EIS acknowledged that some populations of the Plains Rat in the vicinity of the expanded mine would be displaced by construction activities. However, it was noted that the Plains Rat is a mobile species, regional populations tend to fluctuate in number and are unlikely to establish regular patches of habitat or refugia: therefore it is expected that displaced populations would easily colonise adjacent areas of suitable habitat (as marked on Figures 16.3 and 16.4). It was further noted in Section 15.5.5 of the Draft EIS that the Plains Rat population density fluctuates greatly depending on climatic conditions, erupting into plague proportions during periods of peak abundance. This indicates that displaced populations would assimilate with resident groups if adjacent areas of suitable habitat were already colonised.

The residual impact on the Plains Rat was categorised as 'moderate', reflecting a short-term impact to a sensitive receiver.

Issue:

Clarification was sought in relation to findings presented in the Draft EIS that the microbial mats that are the precursors of stromatolites and fossilised stromatolites found at Yarra Wurta Springs are not considered to be of significant scientific interest.

Submission: 1**Response:**

Section 15.3.9 of the Draft EIS described the environmental values of Yarra Wurta Springs including microbial mats and rock formations found to be precursors of stromatolites and fossilised stromatolites. In the following sub-section entitled Stromatolites, it was explained that although the microbial mats and rock formations in Yarra Wurta Spring were found to be precursors of stromatolites, and fossilised stromatolites; samples of these were analysed by stromatolite experts who determined that they were similar to others that occur in springs throughout the world and therefore, are not scientifically significant. More detailed information regarding the scientific process used to analyse the algal mats and rock samples taken from Yarra Wurta Spring was provided in Appendix N to the Draft EIS in Section 8.4.3.

16.5 TAILINGS RETENTION SYSTEM AND WILDLIFE

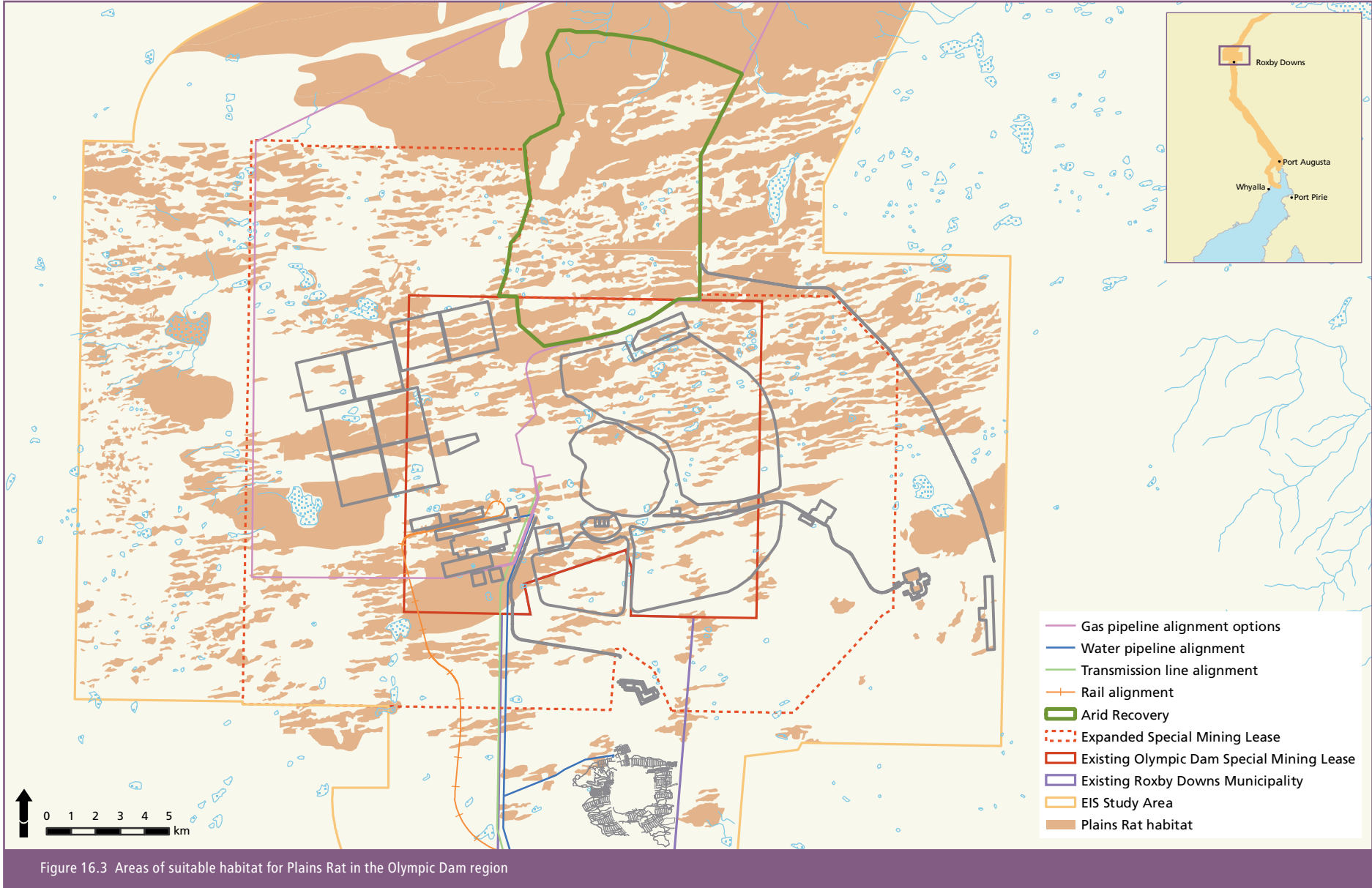
Issue:

Additional information was requested about how the proposed tailings storage method compares to alternatives when it comes to reducing or avoiding bird deaths. Specific issues raised in the submissions included the alternatives of neutralising the tailings, storing them underground, providing more cells that could be more easily monitored and covering the entire tailings retention system to exclude birds.

Submissions: 2, 12, 13, 15, 17, 18, 19, 24, 35, 40, 44, 62, 71, 88, 92, 136, 162, 168, 185, 204, 245, 301, 306, 313, 315, 331, 339, 382 and 391**Response:**

The proposed tailings storage method compares very favourably to feasible alternatives for tailings storage when it comes to reducing or avoiding bird deaths.

Section 4.7 of the Draft EIS discussed the alternative tailings storage methods and outlined the reasons for selecting the preferred method and rejecting alternatives. Section 4.2.1 of the Supplementary EIS presents further information that justifies the reasons for rejecting alternatives, including the neutralisation of tailings. As the neutralisation of tailings is not a practical option for Olympic Dam, it has not been considered further below.



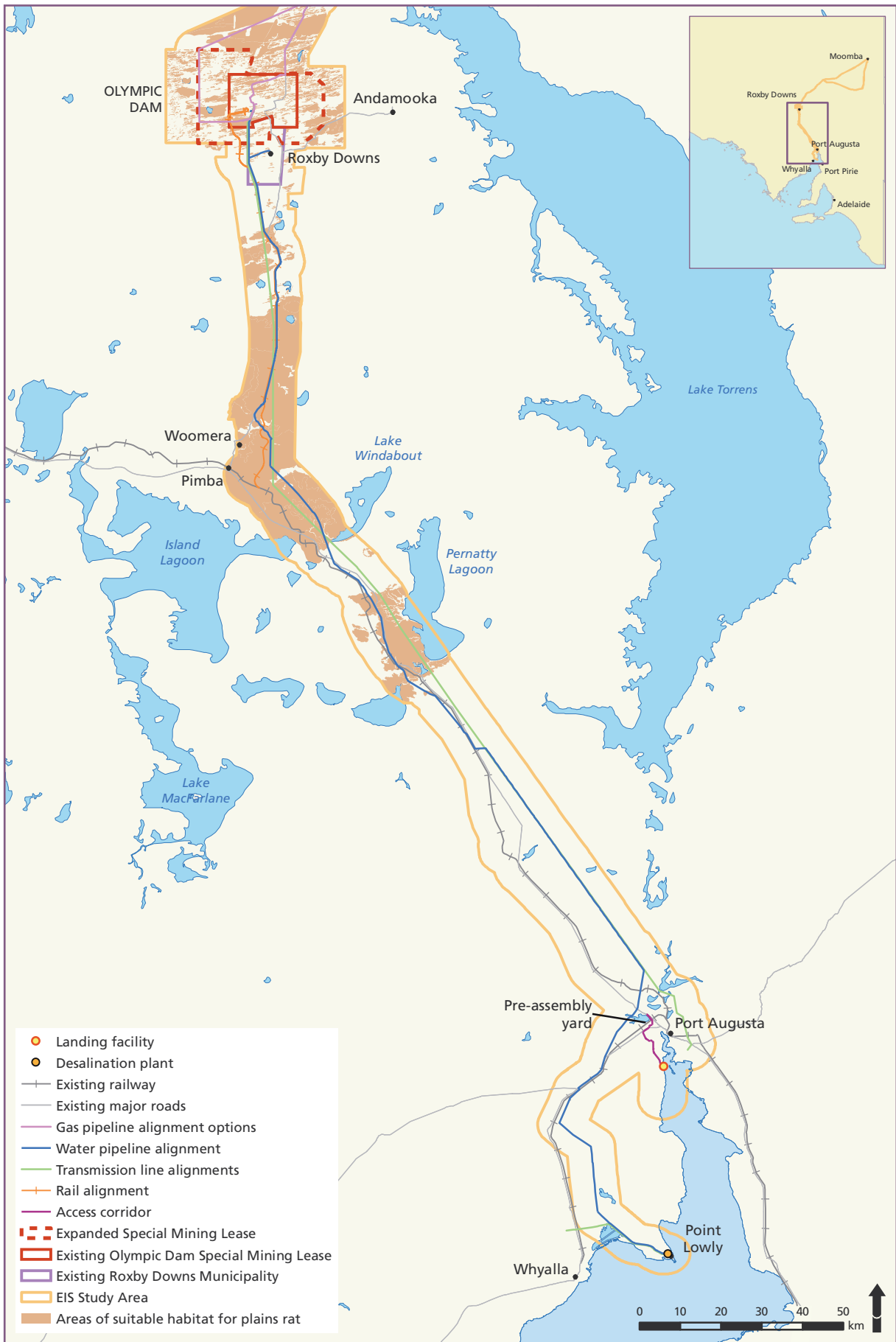


Figure 16.4 Areas of suitable habitat for Plains Rat in the southern infrastructure corridor

Storing the tailings liquor underground

The method of storing tailings liquor underground could be achieved with the addition of preferential flow paths beneath the tailings to more quickly direct tailings liquor from the surface to the groundwater. Removing the liner in tailings storage cells would also accelerate seepage rates.

These methods:

- would still result in some surface ponding, but potentially this could be less than the proposed tailings storage design
- would result in either the same risk to birds attracted to ponded areas or a reduced risk if the ponded area was smaller
- would not reduce the area of vegetation clearance, nor the risk to birds that inhabit beach-like areas.
- However, accelerating the seepage of acidic tailings liquor to the groundwater is inconsistent with the current South Australian Government regulatory regime.

Providing more cells that could be more easily monitored

Monitoring birds on the tailings cells more extensively would not reduce the impact to birds interacting with tailings.

The key consideration for minimising bird interaction with the tailings storage facility is to minimise, or restrict access to, ponded liquor. This is achieved by maximising the evaporation of liquor through the provision of tailings cells with large surface areas. The selected option provides a balance between large surface areas and a smaller ponded area that is confined to a central decant pond allowing the free liquor to be netted or similar measures to be used to restrict bird access.

The alternative of more, smaller cells would require a greater disturbance footprint to maintain the same surface area and accommodate the extra tailings cell walls. For example, cell walls are approximately 30 m wide. For the purpose of comparison, for an alternative that provided twice as many cells at half the size of those proposed, an additional disturbance area of at least 48 ha would be required to accommodate the cell walls. This is calculated by adding one cell wall of 2 km in length in each of the existing eight cells to effectively halve the cell (refer Figures 5.22 and 5.23 of the Draft EIS for details). The additional area would be 48 ha (i.e. eight cell walls 30 m wide and 2 km long for each of the additional eight cells).

Therefore, as noted above, this option may improve the ability to monitor birds in the centre of a cell, but it would require an additional 48 ha to be cleared and would not reduce the impact to birds interacting with tailings. As such, this alternative is not preferable to the proposed tailings storage method.

Covering the entire tailings retention system to exclude birds

This alternative presents two challenges.

First, to minimise seepage of tailings to the groundwater it is necessary to maximise evaporation, and this requires exposing the tailings to the environment, not covering them. The process of consolidating the tailings to ensure geotechnical stability also requires a drying cycle between deposition layers. It is for these reasons that netting, rather than covering, has been proposed for the central decant ponds in the selected option.

Further, the area a cover would be required to span for each tailings cell is extensive. To provide context, the largest enclosed free-spanning roof area in the world is the Louisiana Superdome in the United States of America (SMG 2010). This superdome has a roof area of 3.9 ha. The total area of the eight proposed tailings cells is 3,200 ha, with each cell having an area of 400 ha, and even the central decant pond in each cell is 9 ha in area.

As a consequence, it is not practical, or perhaps even possible, to cover the entire tailings retention system.

Issue:

Further information was requested on several aspects of the interaction between the tailings storage facilities and birds, namely:

- confirmation of bird death numbers from the existing operation
- the outcomes of previous monitoring and how this monitoring has led to improvements in deterring birds from the tailings retention system (TRS)
- how future monitoring would occur given the large size of the tailings storage facility (TSF) cells
- the apparent separation between bird deaths for the existing and proposed expanded operation and BHP Billiton’s Sustainability Charter
- what offset is proposed to compensate for bird deaths
- whether the proposed expansion could also reduce bird deaths from the existing operation.

Submissions: 8, 12, 13, 15, 17, 18, 19, 24, 27, 35, 37, 40, 44, 57, 62, 88, 92, 136, 168, 185, 204, 206, 216, 245, 255, 295, 301, 302, 306, 313, 315, 331, 339, 363 and 382

Response:

Each of the issues raised is addressed separately below.

Confirmation of bird death numbers from the existing operation

Section 15.5.7 of the Draft EIS noted that the reporting of bird deaths at Olympic Dam commenced in 1996 and since that year 50 bird mortalities were recorded each year from 1996 to 2005, 895 mortalities in 2006, 311 in 2007 and 282 in 2008. The Draft EIS also acknowledged that these numbers are likely to present an underestimate of total mortalities as some carcasses are scavenged or sink prior to counting.

The results of bird mortalities have been publicly reported from Olympic Dam as part of the Environmental Management and Monitoring Report since 1996. The latest Olympic Dam annual report states that 222 bird mortalities were recorded in FY09 (BHP Billiton 2009).

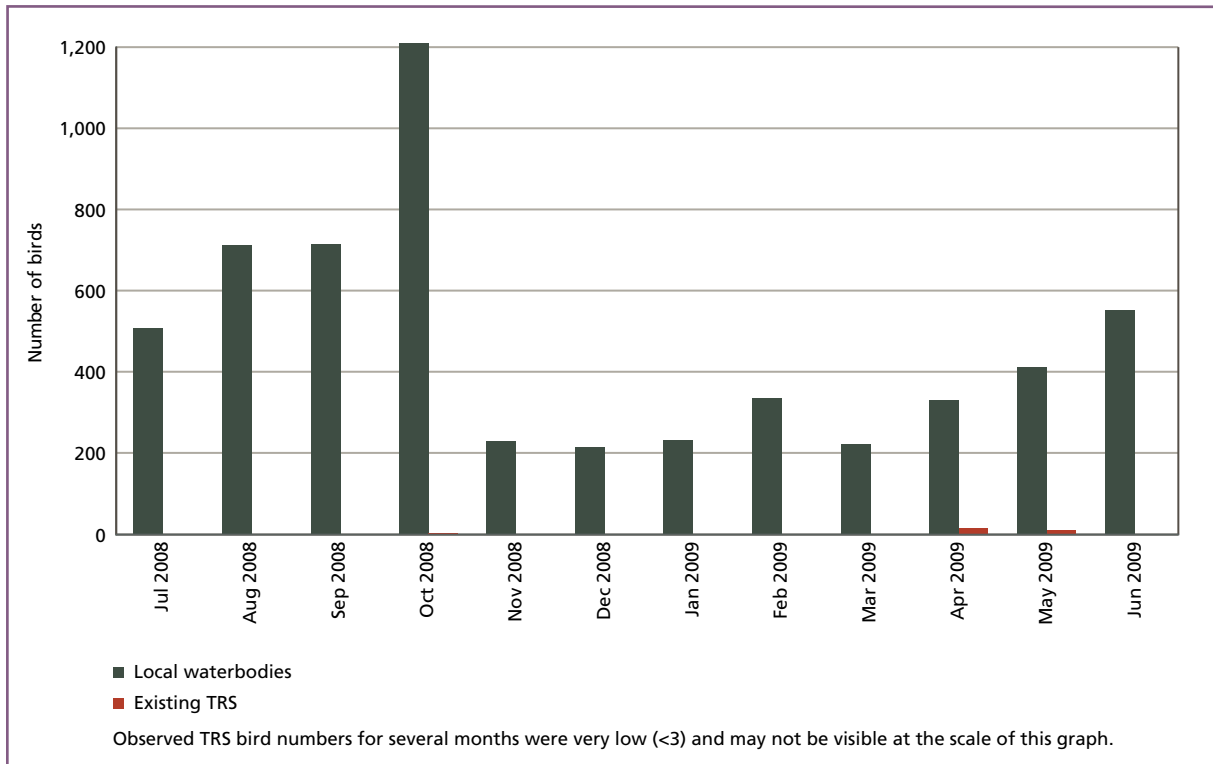


Figure 16.5 Monthly summary of number of waterbirds recorded at local non-toxic waterbodies compared to TRS in FY09

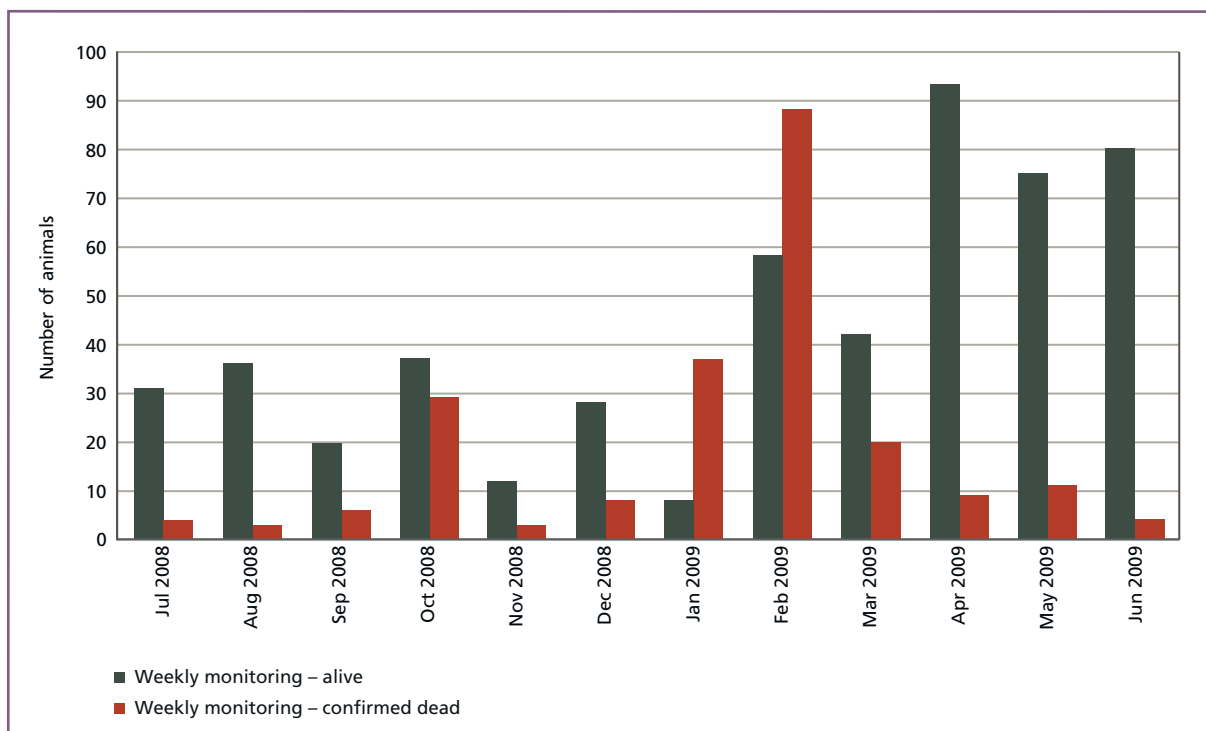


Figure 16.6 Monthly summary of weekly monitoring results for FY09 showing total number of animals recorded within the TRS

The outcomes of previous monitoring and how this monitoring has led to improvements in deterring birds from the TRS

As noted above, the outcomes of previous monitoring are publicly reported annually in the Olympic Dam Environmental Management and Monitoring Report (see BHP Billiton 2009 for the latest annual report).

It is important to note that BHP Billiton also undertakes monthly bird surveys at local freshwater bodies where waterbirds congregate (i.e. the ponds of the on-site desalination plant, sewage ponds and mine water ponds), not just on the tailings retention system (TRS). This monitoring allows the local population of waterbirds (especially transient species) to be determined and compared with those detected at the TRS.

The monitoring highlights three points:

- The large number of birds recorded at local non-toxic waterbodies continues to demonstrate the limited number of birds from local and nomadic bird populations that visit the TRS, as is shown in Figure 16.5 of the Draft EIS
- Not all birds that visit the TRS are recorded as mortalities, as is shown in Figure 16.6 of the Draft EIS
- Anecdotal evidence suggests that a considerable proportion of birds that do visit the TSF are able to leave. This is supported by very few observations of birds that show signs of having visited the tailings (e.g. staining of feathers) that are also sick.

Nevertheless, preventing and deterring visitations by large flocks of birds remains a focus of management efforts at the Olympic Dam TRS. Previous monitoring has led to improvements in deterring birds from the TRS. For example:

- The observation that open areas of free liquor, such as the evaporation ponds and decant ponds, attract a variety of bird species has prompted the commitment in the proposed expansion to remove the need for additional evaporation ponds and restrict access to the central decant pond. This would be achieved by several measures, as detailed in Section 5.5.6 of the Draft EIS, including enlarging the surface area of the tailings cells to maximise evaporation and thus reduce the ponding of liquor, increasing the recycling of liquor back to the metallurgical plant, and providing smaller, covered balance ponds to manage excess liquor that may pond on the tailings cells following a one-in-100-year rainfall event.
- The observation that preventing access to free tailings liquor would significantly reduce the number of species impacted by the storage of tailings has prompted several design modifications for the proposed expansion, as described in Sections 5.5.6 and 15.4.2 of the Draft EIS, including collecting supernatant liquor that has not been evaporated from the tailings beaches in a central decant pond, covering the decant pond with netting or a similar barrier, and covering the stormwater balance ponds with netting or a similar barrier.

In addition to adopting design modifications for the proposed expansion as a result of lessons learnt, research into other bird deterrents continues. Some of these studies include:

- investigations into a new, more advanced marine radar triggered deterrent system for potential use at the TRS (BHP Billiton 2009)
- trials of sound identification software to determine its efficacy at identifying waterbird species and its potential use as part of an on-demand deterrent system (BHP Billiton 2009)
- a \$5 million, four-year collaborative research effort between BHP Billiton Olympic Dam, Deakin University and the Department for Environment and Heritage, which commenced in 2009–2010. The research focuses on two areas:
 - using captive birds to determine the most effective light wavelengths and flicker rates to try to deter birds more effectively
 - better understanding bird movements between regional waterbodies and the factors that affect these movements (e.g. night-time light levels and weather patterns in different regions).

How future monitoring would occur, given the large size of the TSF cells

The proposed tailings cells would be constructed with a perimeter wall and a central decant pond, as was shown on Figure 5.22 of the Draft EIS (reproduced here as Figure 16.7). As shown on this figure, an access embankment would be constructed from the perimeter of each tailings cell to an inner perimeter wall that forms the central decant pond. As shown on the figure, the maximum distance between an accessible embankment would be 850 m, with access from both embankments, and the maximum distance over which birds could be viewed would be 425 m.

Monitoring of birds on the existing tailings cells occurs, with the use of 8 x magnification binoculars and a 20–60 x magnification telescope. The maximum distance for bird viewing is on Cell 4, and is 350 m.

While the total size of each proposed tailings cell would be larger than the existing cells, the inclusion of an accessible embankment to an accessible central decant pond wall would marginally increase the viewing distance. However, the perimeter wall around the central decant pond would increase the effectiveness of the monitoring of open liquor areas to which most bird species are preferentially attracted.

The apparent separation between bird deaths for the existing and proposed expanded operation and BHP Billiton's Sustainability Charter

BHP Billiton maintains a Charter and a Sustainable Development Policy, both of which were provided in Appendix E5 of the Draft EIS. The proposed expansion of Olympic Dam is consistent with both the Charter and the Sustainable Development Policy.

The Charter confirms that BHP Billiton values safety and the environment and provides an overriding commitment to health, safety, environmental responsibility and sustainable development. The Sustainable Development Policy states, 'Whenever we operate we will develop, implement and maintain management systems for sustainable development that drive continual improvement and ensure we enhance biodiversity protection by assessing and considering ecological values and land-use aspects in investment, operational and closure activities.'

Throughout the development of Olympic Dam, and as reported in the 1982, 1997 and current 2009 Draft EIS and the annual environmental reporting undertaken since 1996, BHP Billiton has demonstrated a commitment to environmental responsibility, to continual improvement, to enhancing biodiversity protection and to assessing and considering ecological values in its investment and operational activities and closure planning.

Examples of this with specific relevance to reducing bird interactions with tailings include:

- a suite of bird deterrent trials over the past 20 years, including hazing, laser lights, gas guns and radar systems
- continuing to research bird deterrents as per the research projects noted above for a more advanced marine radar system, the collaborative research project to determine the most effective light wavelengths and flicker rates to try to develop a more effective deterrent, and sound identification software to better establish bird species visiting the tailings in real time for potential use in an on-demand deterrent system
- modifying the TSF design for the proposed expansion as part of continual improvement and enhancing biodiversity protection by:
 - maximising recycling of free liquor from the tailings cells back to the metallurgical plant, thus reducing the attractant for birds
 - not building additional evaporation ponds, again reducing the attractant for birds
 - increasing the rate of liquor loss via evaporation by constructing larger TSF cells, again reducing the attractant for birds
 - restricting access by fauna to free liquor by collecting supernatant liquor that has not evaporated from beaches in a central decant pond, and covering the decant pond with netting or similar

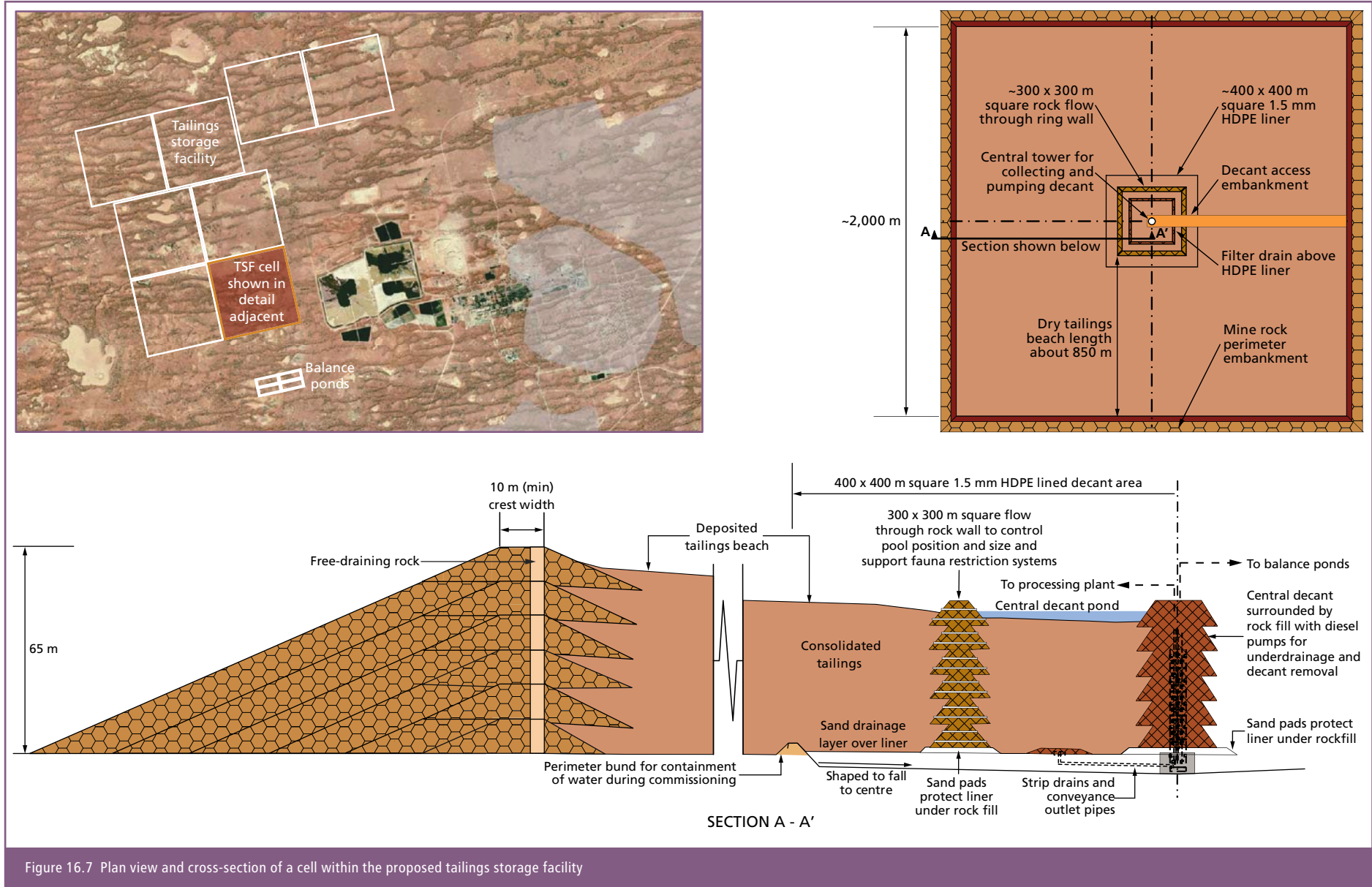


Figure 16.7 Plan view and cross-section of a cell within the proposed tailings storage facility

- restricting access by fauna to free liquor by covering the 60 ha stormwater/tailings water balance ponds with netting or similar
- creating the opportunity to reduce the amount of free liquor on the existing tailings cells by providing sufficient capacity in the newly proposed cells to recycle free liquor from the existing evaporation ponds and tailings cells over the larger beaches of the new TSF cells.

What offset is proposed to compensate for bird deaths

There remains uncertainty over the advantages and disadvantages of providing an offset to compensate for bird deaths. For example, providing large non-toxic waterbodies in the area in an attempt to attract wader birds away from the TSF may in fact increase the number of birds visiting Olympic Dam. Data as shown in Figure 16.5 of the Supplementary EIS demonstrates that a significantly larger number of birds visit the non-toxic waterbodies than the tailings. Providing more non-toxic waterbodies may therefore increase the total number of birds attracted to the region and potentially increase the number of birds landing on the tailings.

Monetary compensation is provided in the form of continuing research into deterrents. The most recent initiative is the \$5 million collaborative research effort between BHP Billiton Olympic Dam, Deakin University and The Department for Environment and Heritage (DEH) as discussed above.

Whether the proposed expansion could also reduce bird deaths from the existing operation

As discussed in Section 15.4.2 of the Draft EIS, the proposed expansion certainly provides the opportunity to reduce bird deaths from the existing operation. In particular, depending on the water balance of the expanded operation, there may be capacity in the expanded TSF to recycle free liquor from the existing evaporation ponds and tailings cells over the larger beaches and eighth contingency cell of the new TSF, which may substantially reduce or even eliminate over time the area of free liquor currently accessible to birds.

Issue:

Clarification was sought about the netting proposed to prevent birds from accessing the free liquor of the expanded tailings storage facilities. In particular, submissions have asked for further details on:

- the material to be used and how this would perform in the acidic environment
- how the challenges of installing and maintaining the nets would be overcome given the large distances to span the central decant ponds, jarosite build-up on the nets and birds becoming entangled in the nets
- any evidence of long-term performance of such nets demonstrated through trials
- contingency plans if the nets proved to be ineffective
- why BHP Billiton has not implemented netting on the much smaller TRS at the current operation

Submissions: 2, 13, 15, 18, 24, 40, 44, 57, 168, 295, 301, 302, 306, 315, 339 and 382

Response:

Each of the issues raised is addressed separately below.

The material to be used and how this would perform in the acidic environment

BHP Billiton has long been involved in a program of research to identify ways in which to minimise the impact of wildlife interaction with the TRS; netting the central decant ponds is only one alternative currently under consideration. Other options being investigated are described in other sections of this report. The new cells would be netted if this was identified as the preferred option for preventing wildlife access to tailings liquor, after all of the alternatives had been assessed.

In this case, the proposed netting material is high-density polyethylene (HDPE). This material is currently used for the liner at the base of the evaporation ponds and the decant pond of existing tailings Cell 4 and tailings pipelines installed to transport tailings from the metallurgical plant and reticulate tailings liquor in the TSF. As such, this is a proven product in this acidic environment.

How the challenges of installing and maintaining the nets would be overcome given the large distances to span the central decant ponds, jarosite build-up on the nets and birds becoming entangled in the nets

Similar netting proposed for the central decant ponds is used to span large distances in several industries, including aviation, agriculture and mining. It is acknowledged that the situation at Olympic Dam is challenging. The deposition of tailings to the multiple tailings cells would occur on a rotational basis, whereby one cell would be inactive at any given time to allow the cell wall to be raised. The walls of each TSF cell would be raised by about 10 m on each occasion, and this would occur on average every seven years.

The nets would be required to span a maximum distance of 150 m.

Trials currently underway at Olympic Dam confirm that jarosite builds up on the nets if they are too close to the acidic tailings. However, it appears that it may be possible to overcome this by slightly increasing the height above the tailings liquor. To date, trials have shown that maintaining the nets about 2 m above the tailings is sufficient to avoid jarosite build-up.

With regard to the potential entanglement of birds in the nets, the use of similar netting at Parafield Airport in South Australia for more than seven years has demonstrated that entanglement can be avoided through appropriate design. In particular, a combination of small hole size (i.e. an aperture of 15–17 mm), construction method and net tension has been shown to avoid bird entanglements (S Hilder, BHP Billiton Sustainability Adviser 2009, pers. comm.).

Any evidence of long-term performance of such nets demonstrated through trials

As noted above, trials of the proposed netting are occurring at present at Olympic Dam. Similar nets have been used to successfully restrict bird access at Parafield Airport in South Australia for seven years, and the ability of HDPE to persist in the acidic environment of the Olympic Dam tailings has been proven over the past 20 years of operation.

Contingency plans if the nets proved to be ineffective

Contingency planning to avoid and/or reduce impacts of bird interactions with tailings has been part of the continuous improvement program at Olympic Dam for many years, and alternative bird deterrent systems continue to be investigated and trialled. These include the use of 100 mm high-density polyethylene balls, the collaborative research project to determine the most effective light wavelengths and flicker rates to try to develop a more effective deterrent, and the sound identification software to better establish which bird species visit the tailings in real time for potential use in an on-demand deterrent system.

Why BHP Billiton has not implemented netting on the much smaller TRS at the current operation

The use of the proposed netting is made possible by the newly proposed central decant ponds in each tailings cell (see Figure 16.7 of the Supplementary EIS for details). These ponds provide a perimeter wall in the centre of each cell, and thus a foundation to secure poles to which the nets can be attached. The existing tailings cells have no such central structure, and would be required to span more than 500 m to fasten to the perimeter walls, whereas the proposed nets in the new cells would span a maximum distance of 150 m.

The primary objective of the new facility design is to achieve and maintain a water balance that reduces the total area of acidic liquor. However, trials to determine the feasibility of netting the existing evaporation ponds are currently being undertaken; it is possible that the proposed nets could be fitted to the existing, smaller evaporation ponds to restrict bird access and this will be investigated further.

16.6 VEGETATION CLEARANCE/SIGNIFICANT ENVIRONMENTAL BENEFIT

Issue:

Clarification was sought on a number of points in relation to the calculation of the significant environmental benefit (SEB) outlined in the Draft EIS, namely:

- whether areas outside the rock storage facility (RSF) that may be inundated by stormwater run-off, or areas near the open pit likely to be significantly affected by dust and/or sulphur dioxide, have been included in the disturbance footprint for SEB calculations
- a request for comparative analysis of proposed Arid Lands set-aside areas with the main areas of vegetation to be cleared, including reference to biodiversity values, the occurrence of threatened species in the areas to be set aside, and the displacement of fauna species
- a description of the management strategy proposed for the set-aside areas to clarify how SEB would be achieved via these offsets, particularly in Wimbrina East, Gosse and Emerald Springs regions, and any offsets proposed for Upper Spencer Gulf
- details of the operational budget, perpetual financing vehicles and works priorities allocated by BHP Billiton to ensure that the proposed set-aside areas would leave a legacy of significant environmental benefits.

Submissions: 1, 2, 12, 15, 17, 18, 24, 40, 44, 57, 63, 71, 92, 106, 141, 301, 313, 331, 341, 346 and 347

Response:

Each of the above issues is addressed separately below.

Inclusion of airborne emissions and stormwater run-off in SEB calculations

As noted in Section 15.5.1 of the Draft EIS, the calculation of the SEB offset does not include the indirect impacts associated with dust deposition, stormwater run-off or sulphur dioxide emissions. Section 15.5.9 of the Draft EIS stated that the indirect effect of dust deposition on vegetation is predicted to be negligible because the areas of highest deposition are in the ultimate disturbance footprints for the proposed open pit, rock storage facility (RSF), tailings storage facility (TSF) and metallurgical facilities (an area totalling 13,108 ha), and therefore have been included in the direct footprint areas used for the SEB calculations.

Outside these ultimate disturbance footprints, dust deposition may occur at low concentrations (e.g. less than 0.15 g/m²/month, as was presented in Section 15.5.9 of the Draft EIS). The potential for such concentrations to result in the loss of vegetation, however, is unlikely because it is influenced by many factors, such as the age of the vegetation, the duration and frequency of exposure, and rainfall intensity and frequency.

Similarly, the impact of increased sulphur dioxide emissions on vegetation would be buffered by the ultimate disturbance footprint created by components of the proposed expansion described above. Section 15.5.9 of the Draft EIS noted that the process of predicting the impacts of increased sulphur dioxide emissions on plants at Olympic Dam was undertaken primarily by comparison with other operations that emit sulphur dioxide. Comparisons suggest that the proposed mine expansion has the potential to increase the area where the detectable effects on vegetation are discernible. However, even though the effects of sulphur dioxide on vegetation may be detectable at low concentrations, this does not necessarily equate to damage to vegetation in the expanded area of impact. For this reason, the vegetation likely to experience elevated gaseous emissions has not been included in SEB calculations.

Section 11.6 of the Draft EIS categorised the effect of stormwater run-off from the RSF, TSF and metallurgical plant on vegetation as a negligible impact. Stormwater run-off from the metallurgical plant would be directed to retention ponds, the disturbance footprint of which was included in SEB calculations. Section 11.6 of the Draft EIS noted also that any incident rainfall on the TSF would flow into the central decant pond. The size of the RSF dictates that very little stormwater would run-off this facility (see Section 11.2.1 of the Supplementary EIS for details), and this run-off would pond in the nearby claypans until it infiltrated to groundwater or evaporated, as occurs under normal storm conditions at present. Therefore, it is not predicted that any vegetation would be lost to inundation by stormwater run-off outside the direct disturbance footprint. The potential for contaminants in the stormwater run-off from the RSF to impact biota is discussed in Section 11.3.1 of the Supplementary EIS.

A request for comparative analysis of proposed arid lands set-aside areas with the main areas of vegetation to be cleared

The proposed set-aside areas compare well with the areas of vegetation proposed to be cleared. These areas were identified in accordance with the selection criteria developed by the International Council for Mining and Metallurgy (ICMM) Good Practice principles for achieving an SEB. The assessment undertaken against these selection criteria for each proposed set-aside option was summarised in Table N9.8 of Appendix N of the Draft EIS and is reproduced in the Supplementary EIS as Table 16.1.

Table 16.1 Summary of assessment against selection criteria for each set-aside option

	Selection criteria ¹							
	Tourism interest	Adjacent to conservation area	Listed preset	Unique habitat/terrain types	Quantifiable area – km ²	In same NRM region as vegetation loss	In same land system as veg. loss	Habitat similar to disturbed areas
Set-aside options	b	b	c	c	c	e	f	g
Gosse/Emerald springs	✓	✓	✓	✓	453	✓		
Wimbrina East		✓	✓	✓	191	✓		✓
McCormack Reserve					27	✓	✓	✓
Wood Duck and Black Swan			✓	✓	1,590	✓		✓
Kookaburra					304	✓	✓	✓

¹ Set-aside principles identified by ICMM (2005) and ten Kate et al. (2004) listed in section N9.5.1 above.

In accordance with ICCM principles, all proposed set-aside areas are situated in the same NRM region where clearance would occur. These areas exhibit vegetation associations and fauna communities similar to those in proposed clearance areas, and have been subject to limited grazing or other disturbances. The preservation of areas of minimal disturbance would ensure that areas of high biodiversity value were protected in the long term.

Table 16.1 indicates whether proposed set-aside areas are located adjacent to existing conservation areas, including areas in the Arid Lands Naturelinks corridor. It also indicates that there are listed species of flora and/or fauna in the majority of proposed set-aside areas. Listed species include those that are classified as 'rare', 'vulnerable', 'endangered' and 'critically endangered'. In addition to identifying listed species in proposed set-aside areas, Table 16.1 also sets out other attributes of these areas that would further promote positive biodiversity outcomes in the region, such as whether the area was located adjacent to conservation areas or the presence of unique habitat/terrain types.

In addition to protection of proposed set-aside areas listed in Table 16.1, BHP Billiton has proposed a suite of management actions described in Chapter 15 of the Draft EIS that are designed to further contribute to the achievement of net gain for biodiversity over time.

These include:

- implementing feral animal monitoring and control programs in the Olympic Dam region
- collaborating with the Roxby Downs Council to reduce the impact of increased human activity on native flora and fauna in the region
- developing targeted weed management strategies, including control of declared and environmental species, in consultation with relevant Natural Resources Management Boards.

With regard to the potential displacement of fauna species, Section 15.3.6 of the Draft EIS noted that surveys of terrestrial fauna have indicated that most are either highly mobile species that easily adjust to habitat disruption, and/or are widely distributed across large areas, mitigating the impact of individual loss of sedentary species (such as the Trilling Frog) during clearance.

The population density of mobile species such as birds, lizards and mammals fluctuates greatly in response to abundance of food, predation, bushfire and flood, indicating that displaced individuals or populations are likely to both colonise similar habitat adjacent to areas where clearing is proposed, and also return to areas following revegetation.

A description of the management strategy proposed for the set-aside areas to clarify how SEB would be achieved via these offsets

Section N9.1 of Appendix N to the Draft EIS noted that following approval of the proposed expansion, BHP Billiton would prepare a native vegetation management plan for submission to the Native Vegetation Council (NVC), describing how the significant environmental benefit (SEB) would be achieved. NVC approval initiates a legal requirement to preserve nominated set-aside areas in perpetuity, ensuring ongoing environmental benefit to the region. The management strategy proposed for the Wimbrina East, Gosse and Emerald Springs regions would be similar to other plans approved by the NVC, including the recently approved Gosse Springs native vegetation management plan.

With regard to offsets for Upper Spencer Gulf, Section N9.5 of Appendix N to the Draft EIS detailed BHP Billiton's SEB proposal in each of the areas proposed for clearance, including the Northern and Yorke, and Eyre Peninsula NRM regions, where the proposed desalination plant and infrastructure corridors would be located. Section N9.5.2 noted that to offset the proposed clearance of 165 ha and 100 ha in the Northern and Yorke, and Eyre Peninsula NRM regions respectively, BHP Billiton proposes to retain the services of a third party to facilitate the required set-asides and achieve the SEB in consultation with the NVC, and in accordance with the *Native Vegetation Act*. The location of these set-aside areas is likely to be in the Northern and Yorke, and Eyre Peninsula NRM regions, or an equivalent area with comparable environmental values, as agreed with the NVC and relevant stakeholders.

Details of operational budget, perpetual financing vehicles and works priorities allocated by BHP Billiton to ensure that the proposed set-aside areas will produce significant environmental benefits in perpetuity

BHP Billiton would make sufficient financial provision in the annual operational budget to fund the management actions required to effect significant environmental benefit for the operational life of the mine. Cost provisioning for ongoing environmental management actions following closure would be detailed in the Rehabilitation and Closure Plan. Closure planning was outlined in the Executive Summary and further detailed in Chapter 23 of the Draft EIS. Any perpetual management obligations would be considered at the time of closure and would include a covenant or a similar mechanism to ensure the ongoing management of the SEB post-closure.

Issue:

It was suggested that when considering the environmental impact of any project in Australia, any adverse effects on the Echidna should be the top priority. The rationale is that the Echidna controls ant populations and so is essential to maintaining Australia's economic well-being.

It was also noted that, as the proposed Olympic Dam expansion would have a negative effect on Echidna habitat, the project should be rejected for this reason alone.

Submission: 98**Response:**

At present, the Echidna is not given additional or special protection under South Australian, Northern Territory or Australian threatened species legislation or associated regulations. It is also classed as a species of 'least concern' by the International Union for Conservation of Nature (IUCN 2008), indicating it is 'widespread and abundant'. This status is somewhat confirmed as the Echidna has been recorded in the Olympic Dam Special Mining Lease and all of the corridors for the proposed linear infrastructure (refer Draft EIS, Appendix N5).

Importantly, an Echidna's home range is more than 20 ha, so it forages over considerable areas. It is possible that individual Echidnas may be displaced in areas requiring larger-scale vegetation clearance (e.g. for the open pit, rock storage facility (RSF) and expanded tailings storage facility (TSF)). However, it is unlikely that individuals would be displaced in the areas of linear infrastructure corridors, where cleared easements averaging 20 m in width would then be rehabilitated. Consequently, the proposed expansion of Olympic Dam is not anticipated to have a significant impact on the Echidna. Interestingly, the reintroduction of the similarly myrmecophagic (ant-eating) Numbat *Myrmecobius fasciatus* to Arid Recovery is likely to contribute to the ant population control.

Issue:

It was suggested that endemic vegetation species should be planted in the workforce accommodation villages.

Submission: 9**Response:**

The Roxby Downs Draft Master Plan provided as Appendix F4 to the Draft EIS was developed using local ecological information and it is specifically stated that local native species would be used in revegetation programs and planting of open space in the township. The Design section of Appendix G1 of the Draft EIS (Table G1.1) also noted that the proposed Hiltaba Village would incorporate similar strategic features (to those included in the Roxby Downs Draft Master Plan) in the concept development design to enhance the sustainability, accessibility and liveability of the built areas associated with contractor accommodation.

Issue:

It was suggested that further information relating to the calculation of significant environmental benefit (SEB) in all proposed SEB areas should be provided to an equivalent level of detail to that presented in the BHP Billiton Gosse Springs Management Plan.

Submission: 2**Response:**

Appendix N of the Draft EIS outlined the method applied to the calculation of the SEB for the proposed expansion, including details of the areas in each vegetation community to be cleared and the reasoning behind the 8:1 offset ratio based on vegetation condition. Section N9.1 of Appendix N noted that following approval of the proposed expansion, BHP Billiton would prepare a native vegetation management plan for submission to the Native Vegetation Council (NVC) describing how the SEB would be achieved. At this stage, further details of the calculations for the SEB would also be provided to the level consistent with the Gosse Springs Management Plan. For this reason, specific details of the management strategy planned for the proposed set-aside areas would only be available after NVC permission to clear areas of native vegetation and following approval of the proposed expansion.

Section 9.5.1 of Appendix N of the Draft EIS contained a detailed description of each of the areas that BHP Billiton has identified as suitable to be set aside, using selection criteria developed on the basis of International Council for Mining and Metallurgy (ICCM)

Good Practice principles for achieving an SEB. A summary of assessment undertaken against these selection criteria for each proposed set-aside option was presented in Table N9.8 of Appendix N and is reproduced in the Supplementary EIS as Table 16.1.

The proposed set-aside areas compare well with the proposed areas of vegetation clearance. In accordance with ICCM principles, all proposed set-aside areas are situated in the same NRM region where clearance would occur. These areas have vegetation associations and fauna communities similar to those in proposed clearance areas, and have been subject to limited grazing or other disturbance.

Issue:

Clarification was sought on the approach to minimising the clearance of vegetation, particularly the strategy employed for infrastructure corridor route selection to demonstrate avoidance of River Red Gum *Eucalyptus camaldulensis* communities. Clarification was also sought for the reduced SEB ratio in infrastructure corridors, and specific plans to rehabilitate these areas post-construction.

Submissions: 2, 26 and 348

Response:

Minimum environmental impact imperative

Section 1.2.4 of the Draft EIS stated that a key BHP Billiton objective for the proposed expansion is to 'design, construct, operate and decommission an expanded operation that minimises the impact on, and maximises the benefits to, the environment and community'.

This objective informs each element of the project and underpins the process of project design, options analysis and formulation of management and mitigation measures designed to ensure that impact on the environment is minimised.

Also, when choosing the final pipeline alignment, BHP Billiton would not cross lake beds, would avoid creek crossings where possible and where unavoidable would cross at right-angles. Significant native vegetation would be avoided as would homesteads and pastoral infrastructure.

Minimising vegetation clearance associated with linear infrastructure

As noted in Section 15.4.2 of the Draft EIS, siting project infrastructure and modifying designs to minimise disturbance footprints provides the greatest opportunity to lessen potential impacts on terrestrial ecology. One initiative specifically designed to minimise vegetation clearance associated with construction of new project infrastructure is the adoption of a 5 m-wide clearance corridor for the transmission line (in addition to 100 square metre tower footprints), rather than a 20–30 m-wide corridor, thereby minimising the disturbance footprint.

Another strategy to minimise the clearance of vegetation, minimise edge effects and reduce habitat fragmentation is to locate the water supply pipeline, transmission line, gas supply pipeline and rail line adjacent to existing infrastructure corridors.

Avoiding River Red Gums

River Red Gum *Eucalyptus camaldulensis* is restricted to major drainage lines in northern South Australia and there are few recorded in the project area. The presence of River Red Gum communities along creeks and drainage lines was identified during the vegetation sampling and mapping studies undertaken for the Draft EIS (distribution of River Red Gums in the vicinity of the EIS study area has been provided at Figure 16.8 in the Supplementary EIS). Nevertheless, as noted in Section N1.8.6 of Appendix N of the Draft EIS, BHP Billiton recognise the importance of preserving communities of *E. camaldulensis*, as they provide significant habitat for many vertebrates, including key breeding sites for raptors and other avian and bat species – habitat that is often not present in surrounding areas dominated by low shrublands or grasslands.

Throughout the Draft EIS, and with respect to the linear infrastructure corridors, a 10 km-wide corridor was assessed. In that corridor, an indicative centreline for the 5–30 m-wide linear infrastructure easement was identified. Section 15.5.4 of the Draft EIS noted that further field surveys would be undertaken before the linear infrastructure easements were finalised, and areas of particular importance to listed flora species would be marked as no-go areas on construction design drawings and fenced off in the field to avoid loss. Similar surveys, refinement of easement alignments and no-go marking would also occur for significant individuals and communities of River Red Gum.

Additional management measures to avoid or minimise the clearance of River Red Gums may include:

- crossing creeks as near as possible at right-angles to minimise the clearance of vegetation, including River Red Gums
- identifying large River Red Gums on or close to the final alignment and flagging these for preservation



Figure 16.8 Occurrence of *Eucalyptus camaldulensis* in the vicinity of the EIS Study Area

- identifying River Red Gums that support active nests and flagging these for preservation
- where feasible, narrowing the corridor at creek crossings to avoid or minimise clearance of riparian vegetation, including River Red Gums
- where realignment of the easement is not feasible, leaving the River Red Gums on the easement right of way where this is practicable
- trimming boughs to avoid the need to clear a River Red Gum.

Significant environmental benefit ratios for infrastructure corridors

Mining, petroleum and geothermal activities in South Australia that would involve clearance of native vegetation requires a native vegetation management plan. The plan describes how significant environmental benefit (SEB) would be achieved, and must be submitted to Government for approval, before any clearance takes place. The goal of a SEB is to achieve a net gain that contributes to improving the condition of the environment and biodiversity of the region, rather than simply replacing the immediate environmental values lost through clearing.

As described in Appendix N9 of the Draft EIS, a SEB can take the form of a payment to the Native Vegetation Fund or setting aside land for conservation. A SEB ratio is used to determine the size of the SEB payment or set-aside area; the ratio used depends on a number of factors that result in a ratio of between 1:1 and 10:1. The initial ratio is determined on the basis of type and condition of vegetation to be cleared, and may then be adjusted to reflect the extent to which SEB areas would be restored (e.g. if the SEB area is to be restored to better than previous condition the ratio would be reduced), and whether additional mitigation measures were proposed.

The NVC is not prescriptive regarding the application of SEB ratios, responsibility rests with the proponent to justify the SEB proposal (NVC 2005). However, some general guidelines are available to help proponents such as BHP Billiton determine the form of SEB to be offered and the ratio to use for calculating the set-aside area or payment amount. SEB obligations would be calculated in accordance with the *"Guidelines for native vegetation significant environmental benefit policy for the clearance of native vegetation associated with the minerals and petroleum industry"* dated September 2005.

The SEB proposal for the project expansion was detailed in Section N9 of Appendix N. Specifically, an SEB ratio of 8:1 was deemed appropriate in the areas proposed for clearing on the grounds that:

- vegetation in these areas is generally in good condition, showing few signs of disturbance
- the characteristics of the vegetation communities present in the linear infrastructure corridors and the techniques proposed for clearance suggest that regeneration would occur in a short time, such as one to two years. As such, 75% of the cleared infrastructure easement would be revegetated reasonably quickly and therefore a reduction from the maximum 10:1 ratio is appropriate (note that the sections of the easement immediately above buried infrastructure would be rehabilitated to support shallow-rooted vegetation such as grasses only, rather than the original vegetation community).

Issue:

Clarification was sought on the predicted impact of habitat fragmentation on terrestrial ecology. It was also suggested that quantified estimates of species populations, particularly those species with limited dispersal, that may be directly lost or affected by fragmentation (including creation of the open pit and formation of a pit lake) be provided.

Submissions: 24, 56, 92 and 306

Response:

Section 15.5 of the Draft EIS presented the assessment of impacts on terrestrial flora and fauna associated with the proposed expansion, taking into account project design modifications applied to reduce impacts. Section 15.5.2 of the Draft EIS specifically addressed the issue of habitat fragmentation, noting that this is a relatively minor issue in the context of the proposed expansion because the vegetation of the EIS Study Area is typically sparse but widespread in the region, and the linear infrastructure corridors would be rehabilitated following the short-term clearance of easements (see Plates 16.1 to 16.10 of the Draft EIS). The resulting level of impact for the linear infrastructure corridors was categorised as negligible, representing no detectable impact.

Section 15.5.2 of the Draft EIS noted that the construction and operation of the open pit could fragment some habitats, and the residual impact of these activities was categorised as low, due to the large expanse of similar habitat available for colonisation in adjacent areas. It is recognised that some individuals are sedentary or may not disperse ahead of the proposed clearing (e.g. the Trilling Frog), and as such the loss of some individuals is expected. However, these species are also widely distributed in the Olympic Dam region and are not at risk of local extinction.



Plate 16.1 Provisionally threatened Mulga *Acacia aneura* woodland



Plate 16.5 Cypress Pine *Callitris glaucophylla* woodland

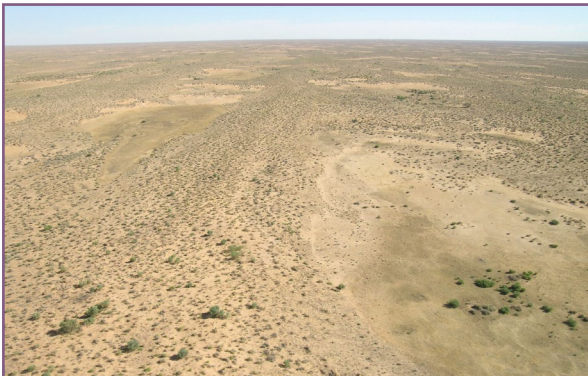


Plate 16.2 Sparse Sandhill Wattle *Acacia ligulata* shrubland and Sandhill Canegrass *Zygochloa paradoxa* hummock grassland



Plate 16.6 Canegrass *Eragrostis australasica* grassland



Plate 16.3 Cottonbush *Maireana aphylla* shrubland



Plate 16.7 Coolibah *Eucalyptus coolabah* woodland in a larger watercourse on the gas pipeline corridor



Plate 16.4 Chenopod *Atriplex vesicaria* shrubland on gibber



Plate 16.8 Myall *Acacia papyrocarpa* woodland with understorey of chenopod shrubland



Plate 16.9 Nitre-bush *Nitraria billardieri* shrubland



Plate 16.10 Barley Mitchell-grass *Astrebla pectinata* grassland

Appendix N5 of the Draft EIS listed the fauna species recorded during the surveys undertaken for the Draft EIS and Tables N5.1, N5.2 and N5.3 listed each species and their presence in the investigated project areas. While this does not provide quantified estimates of species population numbers, it does provide an indication of the widespread nature of most fauna species recorded. For example, of the 184 bird, 29 mammal, 47 reptile and one amphibian species recorded in the Special Mining Lease and Roxby Downs Municipality, only 12 bird, two mammal and three reptiles species were recorded from the SML and Roxby Downs Municipality and not from the other surveyed areas (refer Tables N5.1 to N5.3 of the Draft EIS for details). Of these species, all of the 12 bird species and the two mammals (Yellow-bellied Sheath-tail Bat and Spinifex Hopping Mouse) are mobile species and would not be significantly affected by habitat fragmentation. The three reptile species (Common Desert Ctenotus, Great Desert Slider and Narrow-banded Snake) are distributed throughout semi-arid central Australia.

With respect to the potential for habitat fragmentation associated with temporary trenches required for the water and gas supply pipelines, considerable effort would be made to collect and safely remove individuals that fell into the open trenches during the construction phase. Management measures to reduce these impacts were described in Section 15.5.11 of the Draft EIS and will be further detailed in the Trench Management Plan as described in Appendix U of the Draft EIS (refer ID 1.1 Land Disturbance in particular).

The proposal to preserve 126,650 ha of comparable habitat in areas earmarked to be set aside as part of the significant environmental benefit (SEB) proposal outlined in Section 15.5.1 and further described in Appendix N9.5 of the Draft EIS is an additional management action that would contribute to low residual impact on terrestrial ecology. This area would provide a long-term offset in the South Australian Arid Lands NRM region to compensate for the proposed clearance of about 17,000 ha required for the proposed expansion in this region.

With respect to the pit lake post-closure, and as discussed in the Draft EIS, this lake is not expected to form until about 100 years after operations ended (refer Section 11.5.4 of the Draft EIS for details), and wildlife (particularly birds) are not expected to be attracted in large numbers because the temperature in the pit would be high (up to 10°C above ambient), and the pit lake would be unlikely to support aquatic food. Nevertheless, although the quality of the pit water would be relatively poor (i.e. saline to eventually hyper-saline), the water quality modelling undertaken for the Draft EIS indicated that it would have neutral to near-neutral pH and would not be toxic to fauna (refer Appendix J2 of the Draft EIS).

Issue:

It was suggested that the predicted biomass loss of flora and fauna due to the total clearance of some 18,000 ha of native vegetation should be calculated and reported.

Submission: 331

Response:

A prediction of the biomass loss of flora and fauna due to the proposed vegetation clearance is not required to gain an understanding of the potential impacts and benefits of the proposed expansion. A comprehensive review of the statutory requirements, requisite permits and licences, codes of practice and guidelines applicable to the proposed Olympic Dam expansion that was undertaken as part of the process for preparing the Draft EIS (a synopsis of which was presented in Chapter 6, Legislative Framework) confirms this is not required.

The biomass loss of vegetation that would be cleared for infrastructure associated with the expansion was calculated as part of greenhouse gas emissions predictions presented in Section L1.5.3 of Appendix L to the Draft EIS. The results of these calculations have been presented as tonnes of CO₂ associated with carbon loss from vegetation clearing, and removal of debris and soil.

Section 15.5 of Chapter 15 (Terrestrial Ecology) in the Draft EIS presented the assessment of predicted impacts on terrestrial flora and fauna associated with the proposed expansion, taking into account project design modifications applied to reduce impacts. Section 15.5.1 clearly detailed the extent and impact of vegetation clearance. Table 15.5 (reproduced in the Supplementary EIS as Table 16.2) listed the predicted areas of each vegetation community to be cleared and the percentage that the proposed clearance represented of the total area of each community in the EIS study area (which established a total of 17,249 ha to be cleared, representing an average of 1.3% of the vegetation communities present in the study area). Section 15.5.1 also discussed establishing set-aside areas designed to create significant environmental benefits and create positive biodiversity outcomes in the Olympic Dam region.

Table 16.2 Predicted vegetation clearance for each vegetation association

Vegetation associations	Area (ha)	Area of association within EIS Study Area (ha)	Percentage (%)
<i>Acacia aneura</i> woodland (1–4)	319.4	70,235.7	0.5
<i>Acacia papyrocarpa</i> woodland (9, 10, 63)	438.7	96,213.5	0.5
Acacia shrubland (5–7, 11–15, 40, 77)	8142.9	144,586.0	5.6
<i>Astrebla pectinata</i> grassland (70)	0.3	30.0	1.0
<i>Avicennia marina</i> forest (31)	408.4	152,764.2	0.3
<i>Amphibolis antarctica</i>	0.1	856.0	0.0
<i>Beyeria lechenaultii</i> / <i>Westringia rigida</i> low shrubland (32)	0.0	30.3	0.0
<i>Callitris glaucophylla</i> woodland (33–34)	671.1	26,010.0	2.6
<i>Casuarina pauper</i> woodland (36–37)	7.5	10,521.8	0.1
Chenopod shrubland (17–30, 38, 42, 50–59, 72)	5997.2	422,688.9	1.4
Clay pan – ephemerals (39)	209.8	15,987.2	1.3
<i>Cyperus</i> spp. low sedgeland (71)	0.0	322.6	0.0
<i>Eragrotis australasica</i> grassland (41)	58.4	4,787.7	1.2
Eucalypt woodland (43–45, 76)	105.7	33,378.2	0.3
<i>Geijera linearifolia</i> shrubland – <i>Casuarina pauper</i> woodland (46)	5.1	199.1	2.6
<i>Maireana aphylla</i> shrubland (49)	40.2	14,297.7	0.3
Melaleuca shrubland (60)	0.0	234.7	0.0
<i>Melaleuca xerophila</i> woodland (61)	0.9	371.4	0.2
<i>Muehlenbeckia florulenta</i> +/- <i>Maireana aphylla</i> shrubland (62)	7.8	4,783.9	0.2
<i>Myoporum platycarpum</i> woodland (64)	2.6	352.2	0.7
<i>Nitraria billardieri</i> open shrubland (73)	232.0	79,070.3	0.3
<i>Olearia axillaris</i> / <i>Scaevola crassifolia</i> shrubland (65)	1.7	84.1	2.0
<i>Posidonia</i> spp.	2.4	1,250.0	0.2
Samphire shrubland (48, 74)	18.2	8,425.4	0.2
<i>Sclerolaena</i> spp. low shrubland (66–68, 78)	443.8	65,877.7	0.7
Senna shrubland (69)	1.1	1,505.8	0.1
<i>Zostera</i> spp.	0.3	25.0	1.2
<i>Zygochloa paradoxa</i> grassland (75)	134.2	203,854.0	0.1
Total	17,249¹	1,358,743	1.3

¹ Total does not include miscellaneous clearance of 20 ha from Table 15.4 (vegetation types are unknown) or previously cleared areas; assumes longest gas pipeline route.