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OLYMPIC DAM EXPANSION EIS

MINING AND PROCESSING

Mineral processing at Olympic Dam began in 1988, initially producing 45,000 tonnes per annum (tpa) of copper plus associated products of uranium oxide, gold and silver. Between 1997 and 1999 there was a major expansion of the mine and minerals processing plant and in recent years annual copper production has averaged about 180,000 tonnes, with 4,000 tonnes of uranium oxide, 80,000 ounces of gold and 800,000 ounces of silver.

Copper produced at Olympic Dam is sold to global and domestic markets. The uranium oxide is sent to converters overseas for further processing into fuel used in nuclear power reactors in Asia, Europe and North America. All of the gold and silver is sent to the Australian Mint in Perth.

The proposed expansion is centred on the creation of a new open pit mine that would operate simultaneously with the existing underground mine and lift ore production six-fold to the levels shown below.

Production measure	Existing operation[1]	Proposed expansion	Combined operations
Quantity of ore recovered (million tonnes per annum)	12	60	72
Copper concentrate (tonnes per annum)	600,000	1,800,000	2,400,000
Refined copper (tonnes per annum)	235,000	515,000[2]	750,000[2]
Uranium oxide (tonnes per annum)	4,500	14,500[2]	19,000[2]
Gold bullion (ounces per annum)	100,000	700,000[2]	800,000[2]
Silver bullion (ounces per annum)	800,000	2,100,000[2]	2,900,000[2]

[1] Nameplate design capacity. (Nameplate capacity refers to the maximum continuous capacity of the Olympic Dam operation within specific ore grade and composition parameters, measured in tonnes of refined product.)

[2] Includes on-site and overseas production.

Existing Olympic Dam hydrometallurgical plant

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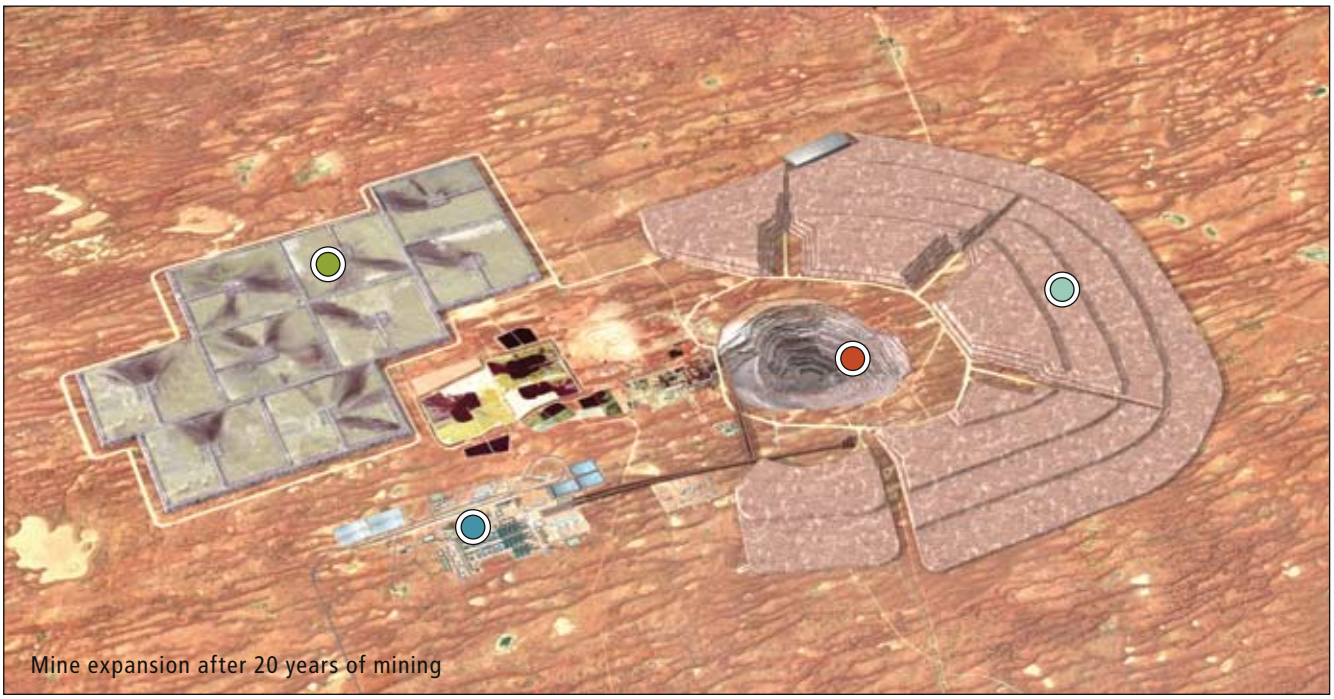

Mine expansion after 20 years of mining

Uranium Oxide

Open pit

Drilling of the ore body undertaken by BHP Billiton since 2005 has more than doubled the resource estimate from 3.98 billion tonnes of total mineral resource to 8.34 billion tonnes. At the same time, the expected long-term demand means underground mining is no longer optimal for such a large ore body. Consequently, open pit mining has become the most feasible option for mining more of the resource.

The open pit mine would operate simultaneously with the existing underground mine. Over 40 years, the size of the pit would grow to be 4.1 km long, 3.5 km wide and 1 km deep. By 2050, it would be larger in area than any other Australian mine except the Morwell open cut coal mine in the Latrobe Valley of Victoria, and it would be more than three times as deep. Eventually, mining the open pit would produce 60 Mtpa of ore, equivalent to an annual rate of refined copper production of 515,000 tonnes.

When viewed from above, the Olympic Dam ore body is shaped like a frying pan. The proposed open pit would mine the 'pan' and the underground operation would continue to take ore from the 'handle'.

Open pit mining

The open pit operation would include:

- dewatering of local aquifers to control inflows of highly saline groundwater into the pit and maintain the stability of the pit wall. Water recovered would be used for dust suppression and construction
- drilling and blasting to yield the optimal fragmentation of rock for ease of loading and haulage and to minimise dust and vibration
- loading the fragmented rock by electric shovels into haul trucks (see below) that would take the ore to a stockpile adjacent to the pit rim, ready for crushing and conveying to the metallurgical plant, and the mine rock (i.e. overburden and low-grade mineralised material) to the rock storage facility for long-term storage or to the tailings storage facility to be used to build perimeter walls.

Electric shovel and haul truck

Rock storage facility

It would take about five years of mining to remove the 350 m thick layer of overburden and expose the upper surface of the ore body. During this time, about 410 million tonnes per annum (Mtpa) of material would be moved from the open pit to the rock storage facility. The ultimate footprint of the rock storage facility would cover approximately 6,720 hectares, and it would eventually be about 150 m high.

Processing


Existing Olympic Dam ore grinding mill

Processing for the expanded mine would build on the 20 years experience gained by operating the existing Olympic Dam processing plant.

Very few operations mine, concentrate and smelt ore to final product at the same site. This is because it is difficult to match the operating parameters of an on-site smelter with the changing mineralogy, grade and volumes of ore being extracted from the mine. Smelters generally blend ore from multiple mines to optimise operating efficiency. Creating the ability to choose the volume and grade of concentrate sent to the on-site smelter and exporting the excess would provide Olympic Dam with greater operating efficiency.


Olympic Dam gold bullion

The expansion would require the following additional ore processing facilities:

- a new concentrator, built in stages, to grind the ore, then extract the minerals by flotation to produce:
  - a copper-rich concentrate containing recoverable quantities of uranium oxide, gold and silver
  - a uranium-rich tailings, which contains the majority of the uranium and the remainder of the copper, gold and silver
- a new hydrometallurgical plant to extract the uranium from the concentrator tailings
- upgrades to the existing electro-refinery and smelter, which would continue processing ore from either the existing underground operation or the open pit
- the proven metallurgical processes used in the existing plant would continue to be used for the expansion. The proposed expansion does, however, add the sale of copper concentrate (containing some uranium, gold and silver) to the existing suite of refined metal products.


Olympic Dam silver bullion

Tailings storage facility

The expansion would generate approximately 58 Mtpa of tailings at full production, and would require up to nine storage cells in addition to the four existing storage cells that receive approximately 10 Mtpa of tailings.

The tailings would be deposited into the storage cells from a pipeline that would circle the walls of each cell. Each section would be allowed to dry and consolidate before receiving more tailings. The perimeter wall would be progressively raised as each cell filled with tailings. Process fluids would be recovered and recycled for use in the process plant.


Copper cathodes

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Radiation safety officer servicing monitoring equipment

Exposure to dust emissions

The primary potential source of dust for the proposed expansion would be from the open pit operation, where drilling, blasting, excavating and transporting and unloading rock and ore generates dust.

The exposure of workers to dust is controlled by reducing the amount of dust generated and minimising the dust that enters the workplace through effective ventilation controls such as extraction systems, enclosure systems (i.e. enclosed conveyors) or dust suppression (i.e. saline water sprays). Procedural controls, including the mandatory wearing of personal protective equipment (PPE) would also be used to reduce exposures. Dust exposure would be controlled in the mine by using saline water sprays to suppress dust and engineering controls such as air-conditioned cabs on vehicles.

With respect to impacts on people at Roxby Downs and the proposed Hiltaba Village, air quality modelling shows that under adverse weather conditions (e.g. winds blowing directly towards Roxby Downs or Hiltaba Village) all compliance levels for dust emissions would be met except for small dust particles averaged over a 24-hour period. An analysis of daily weather data collected at Olympic Dam over the past 12 years suggests that such weather conditions may occur up to 10 days per year.

In response to this finding, BHP Billiton would establish a real-time monitoring and response system at Roxby Downs and the site of Hiltaba Village. Dust control measures could be pre-emptive and integrated into normal operations (e.g. by scheduling specific activities when unfavourable weather was forecast). However, there may be occasions when there would be no alternative but to shut down certain activities until the weather changed.

Exposure to radiation

Radiation exposure to employees and members of the public is expected to remain low in the expanded operation consistent with exposure levels experienced today from the existing plant and mine. Assessments show that exposures to miners in the new open pit should be similar to current levels. Member of the public exposures at Roxby Downs would increase slightly compared to current levels, but would remain less than one seventh of the legislated limit.

Radiation safety will comply with the requirements of leading international practice, ensuring that doses remain as low as reasonably achievable.


Example of dust suppression

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