INFORMATION SHEET

OLYMPIC DAM EXPANSION EIS

URANIUM AND RADIATION

Uranium is a naturally occurring element. It is widespread in the earth's crust, and present in most soils and rocks. Where economic to do so, uranium is extracted from the earth's crust by physical and chemical processes. Uranium mined in Australia is used only in the civilian nuclear power industry to supply electricity for peaceful purposes.

Radiation exposure

Many of the concerns regarding the mining and processing of ores containing uranium stem from the fact that uranium is radioactive: that is, it emits radiation. Radiation is common in nature and everyone is exposed to natural radiation everyday of their life. This radiation comes from the rocks and soil of the earth, the air we breathe, water and food we consume, machinery and equipment we use and from space. These sources combine to give us our naturally occurring background radiation dose. In Australia the average background radiation dose per person is approximately 1.5 millisieverts (mSv) per year.

Some people are regularly exposed to radiation above the natural background levels. Additional exposure can occur in some occupations. The table below shows the average annual effective dose from a range of different occupations.

Source/practice	Global average annual effective dose (mSv)
Nuclear fuel cycle (including uranium mining)	1.8
Industrial uses of radiation	0.5
Medical uses of radiation	0.3
Air crew	3.0
Mining (other than coal)	2.7
Coal mining	0.7

Radiation is used extensively for diagnosis and treatment of disease. For example, a chest x-ray increases radiation exposure by between 0.5 to 1 mSv.

The effective dose limits recommended by the International Commission on Radiological Protection which are of most relevance in the mining and mineral processing industries are:

- Annual limit to a worker – 20 mSv
- Annual limit to a member of the public – 1 mSv.

Radiation management

Over its 20 years of operation, Olympic Dam has maintained a strong focus on protecting employees, contractors and members of the public from radiation using effective design and management practices. Radiation protection is designed to maintain doses to levels that are as low as reasonably achievable.

The measured average exposure for employees in defined radiation areas at Olympic Dam is about 5 mSv/yr. Many Olympic Dam employees get doses no higher than public limits (ie less than 1 mSv).

Gamma radiation exposure from ore stockpiles, tailings and other facilities are expected to be negligible outside the special mining lease area due to the distance to the public.

An expanded environmental radiation monitoring program (beyond the current extensive program) would be developed and implemented for the expanded operation. It would focus on monitoring airborne concentrations of dust and radon decay products, but would also include some monitoring of other parameters, including groundwater.

The estimated total dose to a member of the public living at either Roxby Downs or Hiltaba Village as a result of the expanded mine is 0.17 mSv/yr, significantly less than the 1 mSv limit.

Predicted exposures – mining

The proposed mining technique for the expansion is open pit mining, in contrast to the current underground mining operation. Miners in the new open pit would be expected to receive an annual dose of 3.5 mSv, which is the same as underground miners and less than one-sixth the international limit.

Predicted exposure – processing plant

The methods used in the proposed processing plant for the expanded mine would be similar to those used currently, so the exposure pathways would be similar, however the overall size of the facility would be greater. It is expected that doses

to workers in the expanded plant would be similar to those currently being received. Annual doses from the expanded concentrator, hydrometallurgical plant and refinery operations are expected to average 3 mSv/yr.

Predicted exposure – administration personnel

A number of people work in the administration area of the current operation, adjacent to the processing plant. Currently this group receives an average dose of approximately 0.5 mSv/yr. The expanded operation may increase dust and radon concentrations in the existing plant area, leading to possible increases in doses of about 0.7 mSv/yr and therefore the total dose is expected to be approximately 1.2 mSv/yr.

Predicted exposure - uranium product transport

In the current operation, uranium oxide is packed into drums, which are transported in standard sea-containers by road to Port Adelaide. The dose to drivers is estimated from measurements of dose rates made in the cabin before shipment. If a driver made 100 eight-hour trips (two trips per week) a year, the total dose is estimated to be about 0.8 mSv.

Some uranium oxide from the expanded operation would be railed from Olympic Dam to the Port of Darwin. Doses from the transport of uranium oxide from the proposed expansion are expected to be similar to those at present.

Predicted exposure - concentrate transport

It is proposed that up to 1.6 Mtpa of copper concentrate containing uranium, gold and silver (concentrate) produced from the expanded operation would be exported via the Port of Darwin. The concentrate is an odourless black powder, insoluble in water, with a uranium content of up to 2,000 parts per million (compared to 990,000 parts per million for the uranium oxide already shipped from the port). However, the uranium in the concentrate would still be sufficient for the product to be considered radioactive and therefore it would be transported according to the requirements of the Australian Radiation Protection and Nuclear Safety Agency's Code of Practice for the Safe Transport of Radioactive Material.

The low levels of uranium within the concentrate mean that the radiation level of the concentrate would not be detectable beyond 10 metres of the rail wagons transporting it from Olympic Dam to the Port of Darwin.

Safeguards and security

Australia's uranium is sold exclusively for use in the civilian nuclear power industry and there is a system of safeguards in place to ensure that it is not diverted for use in nuclear weapons.

Australia's safeguards are based on the system developed by the International Atomic Energy Agency (IAEA) under the Non-Proliferation Treaty. This system has three main elements:

- accounting for uranium as it moves through the fuel cycle
- physical security of nuclear material
- inspection to verify compliance.

Australia will sell uranium only to countries with which it has a bilateral safeguards agreement. These are formal agreements between the Australian Government and governments of customer countries that specify the details of how Australian-sourced uranium is to be used, handled, protected and accounted for. Australian uranium cannot be transferred to a third party without the specific agreement of the Australian Government.

Uranium stewardship

BHP Billiton is the driving force behind developing a global uranium stewardship program within the World Nuclear Association (WNA), which represents over 80% of the global nuclear industry.

Uranium Stewardship is a WNA programme of action seeking to define and achieve worldwide industry adherence to principles and practices designed to ensure that uranium and its by-products are managed in ways that are safe, environmentally responsible, and economically and socially acceptable. Through this programme WNA will engage all industry sectors involved with the uranium life cycle, as well as relevant stakeholders, with the objective of first encouraging best practice, then sustaining an ongoing industry effort to continually improve it.

In pursuing this objective WNA has identified key Principles of Uranium Stewardship and will aim to obtain from all relevant enterprises, formal commitment to a Code of Practice that translates these principles into worldwide industry performance.

Equipment used to monitor radiation levels