ENVIRONMENTAL IMPACT OF THE RANGER URANIUM MINE, ALLIGATOR RIVERS REGION, NORTHERN TERRITORY, AUSTRALIA

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For almost twenty years, uranium has been mined and milled at the Ranger Mine within an area that is surrounded by Kakadu National Park. The national and international importance of Kakadu has been recognised by its inclusion on the Register of the National Estate and its inscription on the World Heritage List. The flood plain areas within Kakadu are recognised as one of Australia's Wetlands of International Importance listed under the Convention on Wetlands of International Importance. Much of the land in the region, including the land on which the Ranger deposits were found, has been recognised as part of the traditional estate of the Aboriginal people of the region. For these reasons, operation of the mine has been subject to a rigorous system of regulation and supervision, a system that is unequalled anywhere in Australia and probably anywhere else in the world.

Environmental management of the region is achieved through the work of federal and state agencies. The Park is managed through a Commonwealth agency, Parks Australia, by a Board of Management on which the traditional Aboriginal owners of the land in the Park form a clear majority. The Ranger Mine is regulated by an agency of the Northern Territory Government, the Department of Mines and Energy. The Commonwealth Government, however, has stipulated a number of Environmental Requirements which govern the activities of the Northern Territory in its day-to-day regulation of the mine. The Supervising Scientist, a statutory officer of the Commonwealth, is responsible for assessing the adequacy with which regulation of the mine complies with the Environmental Requirements and, through research on the effects of uranium mining, for developing standards, practices and procedures that will ensure the continuing protection of the environment.

The adequacy with which this regime has protected the people and landscapes of Kakadu National Park has been assessed by extensive chemical, biological and radiological monitoring programs which have been continually upgraded to take into account the results of new scientific research. The chemical monitoring program has shown that, in the receiving waters of Kakadu National Park, the concentrations of all chemical constituents have, throughout the entire period of mining, remained below the standards recommended by the Supervising Scientist and have been significantly below the concentrations predicted by the Ranger Uranium Environmental Inquiry. The biological monitoring program has shown that operation of the mine has had no detectable impact on a range of sensitive indicators of ecological health including the survival of larval fish, the reproduction of freshwater snails, the migration patterns of fish, and the community structure of fish and macroinvertebrates. The radiological monitoring program has shown that the radiation exposure of people living in the vicinity of the mine, either through consumption of foods collected from downstream waters or through radon dispersed from the mine site, has always been significantly lower than the internationally recommended limit on radiation exposure of members of the public.

The operation of a mine cannot be conducted without there being limited spatial and temporal impact on the environment. The environment on the mine lease itself is certainly disturbed but the objective of any environmental protection regime is that there be minimal impact off-site and that this impact is within standards that are set to ensure a high level of environmental protection. Over one hundred specific incidents have occurred at the Ranger Mine. The environmental protection regime at Ranger

requires the operator to report all such incidents to the supervising authorities and the Supervising Scientist must report on, and assess the significance of, these incidents in his Annual Report to the Australian Parliament. Over the life of the Ranger Mine, only two such incidents were considered by the Supervising Scientist to be of significance and neither of these had any lasting impact on the people, biodiversity or landscapes of Kakadu National Park.

The paper describes the techniques used to ??? environmental impact at Ranger. Many of these have been developed specifically for application at Ranger, but there is substantial potential for them to be applied at other sites. The results of over 20 years of monitoring are presented and analysed.

The overwhelming conclusion that can be drawn from the extensive chemical, biological and radiological monitoring programs in place at Ranger is that mining and milling operations have been conducted in a manner that has enabled a very high standard of environmental protection to be achieved for the cultural landscape of Kakadu National Park. With respect to the likelihood of future environmental impact, it has been concluded that the short and the long-term impact of seepage from tailings repositories at Ranger and the long-term impact arising from dispersal of tailings are not likely to be of radiological or ecological significance.