

Investigation of tailings water leak at the Ranger uranium mine

1 Introduction

During the 1999–2000 Wet season, a leak occurred in the tailings water return pipe at the Ranger uranium mine in the Alligator Rivers Region of the Northern Territory. The first indication to the authorities that a leak had occurred was in a facsimile message from Energy Resources of Australia (ERA), the mine operator, to the Office of the Supervising Scientist (OSS) on the afternoon of Friday 28 April 2000. This message advised that approximately 2000 cubic metres of tailings water (process water) had leaked from a pipe in the Tailings Dam Corridor of the Ranger site between late December 1999 and 5 April 2000. The facsimile message was also sent by ERA to the Northern Territory Department of Mines and Energy (NTDME), Northern Land Council (NLC) and the Department of Industry, Science and Resources (DISR).

Water in the tailings dam at Ranger is pumped from the dam back to the mill through the Tailings Water Return Pipeline for use in the process plant. The primary containment system is the pipeline itself. A secondary containment system is in place to protect the environment from any adverse effects arising from a failure anywhere along the pipeline. This secondary containment system consists of a bunded roadway that collects any spilled water and directs it to a sump, the Tailings Dam Corridor Sump. Water that is collected in this sump is returned to the mill water management system. Should both the primary and secondary containment systems fail, a third barrier for the protection of the environment is in place in the form of constructed wetland filters which are designed to partially remove contaminants from the water as it passes through the filter system.

Although a leak had been reported, no indication was given that the secondary containment system may have been breached. Indeed, the report stated that no infringement of the Ranger General Authorisation had occurred. On receipt of the facsimile, the OSS contacted ERA to clarify the circumstances surrounding the incident. The Department of Industry Science and Resources also sought advice from ERA on the nature and the timing of the leak. During telephone conversations between OSS and ERA staff, information on water quality at a number of sites was provided which indicated that a proportion of the process water had entered the Very Low Grade Corridor Road Culvert (VLGCRC) built under the Tailings Dam Corridor, and hence had escaped the secondary containment system consisting of bunds and a sump, designed to collect any spillages from the pipes in the tailings corridor.

Based on this information the Supervising Scientist concluded that a breach of the Environmental Requirements had occurred and immediately notified the office of the Minister for the Environment and Heritage. On Sunday 30 April, the Supervising Scientist provided a formal brief to the Minister on the incident. Following receipt of this brief, the Minister requested that the Supervising Scientist investigate the incident and provide a report to him. A similar request was received from the Minister for Industry, Science and Resources who is responsible for the administration of the *Atomic Energy Act 1953* under which approval has been given for ERA to operate the Ranger Mine. This report is in response to these requests.

In preparing this report, the Supervising Scientist has consulted all the major stakeholders including ERA, NTDME, NLC and the Gundjehmi Aboriginal Corporation. On technical aspects of the assessment, a report was prepared by ERA in close cooperation and

consultation with staff of the Supervising Scientist and the NTDME. In addition ERA commissioned a report from a specialist pipeline inspection company, Intico, on the condition of pipes in the Tailings Corridor and the Supervising Scientist commissioned a review from Sinclair Knight Merz on the adequacy of the design, operation and maintenance of the tailings corridor system. NTDME also prepared a report on the incident.

This report describes the outcomes of the investigation and makes recommendations to address deficiencies identified in the environmental management systems at Ranger and in the supervisory and regulatory regimes applied to Ranger by the Supervising Scientist and NTDME. The ERA and NTDME reports are at Appendices 2 and 5 of this report. The SKM report is available on request from the Supervising Scientist.

2 Description of the leak

2.1 Location

The leak occurred at a flange joint in the 250 mm diameter Tailings Water Return Pipeline which transports water from the tailings dam to the processing plant at Ranger. Figure 1 is a photograph of the flange joint after it was repaired. The Tailings Water Return Pipeline (TWRP) is approximately 2.5 km long and runs alongside the Tailings Dam Corridor road within a bunded area on the Ranger site (the Tailings Dam Corridor) designed to collect and contain any spillages that occur. The Tailings Dam Corridor drains to a sump near Pit 1 (the Tailings Dam Corridor Sump). Water collected in this sump is pumped, as required depending on rainfall, to a retention pond on the Ranger site.

Also located in the Tailings Dam Corridor are other pipes for the transport of tailings and tailings water (process water) between the tailings dam, Pit 1 and the process plant. Figure 3 is a schematic representation of the pipelines in the Tailings Dam Corridor.

Between the process plant and a point some 120 m from the tailings dam, the TWRP consists of a steel pipe with a diameter of approximately 250 mm. At this point, the steel pipe joins a steel reinforced flexible 'plastic' pipe to accommodate an upward bend in the TWRP, and the pipeline passes under a road culvert (the Access Road Culvert). The flexible section then connects to 250 mm steel pipe which completes the pipeline between the tailings dam and the process plant. It was the flange joint at the eastern end of the flexible section of the TWRP, which was just to the west of the Access Road Culvert under which the TWRP passes, that leaked. At the time, this flange joint was buried at a depth of approximately 50 cm due to silt build-up in the culvert under the road.

Buried by silt near the leaking flange joint, and also passing under the Access Road Culvert, was a disused pipe segment approximately 10 m long. One end of the disused pipe segment was located within one or two metres of the leaking flange. The top of the other end of the disused pipe segment abutted the surface within the Tailings Dam Corridor on the eastern side of the Access Road Culvert. A photograph of this end of the disused pipe segment after it was uncovered is shown in Figure 2. Figure 4 is a schematic representation of the Access Road Culvert showing the TWRP and the disused pipe segment.

Tailings water which escaped from the leaking flange traveled underground for one or two metres, entered one end of the disused pipe segment flowing within it to emerge at the opposite end before upwelling to the surface. Once on the surface, the tailings water joined the surface flow of rainfall runoff within the Tailings Dam Corridor. Surface water within the Tailings Dam Corridor flows to the Tailings Dam Corridor Sump. It has now been established