

# Contents

<b>List of figures</b>	<b>iv</b>
<b>List of tables</b>	<b>v</b>
<b>Executive summary</b>	<b>vii</b>
<b>1 Introduction</b>	<b>1</b>
<b>2 Description of the leak</b>	<b>2</b>
2.1 Location	2
2.2 Duration	9
2.3 Water Volume	10
2.4 Identification of the leak	10
2.5 Cause of the leak	11
2.6 Additional sources of manganese	12
<b>3 Assessment of Environmental Impact</b>	<b>13</b>
3.1 Contaminant Transport Pathway	13
3.2. Ecological impact assessment based on monitoring	13
3.3 Ecological impact assessment based on modelling	20
3.3.1 Seepage into the Culvert	20
3.3.2 Sources of solutes in Corridor Creek	21
3.3.3 Dilution and attenuation of contaminants within the wetlands	21
3.3.4 Estimates of the concentration of contaminants in Magela Creek	22
3.3.5 Comparison with toxicological data	23
3.4 Radiological impact assessment	24
3.4.1 Calculation of the maximum dose which could have been received	24
3.4.2 Measurements of radionuclides in fish and mussels from Mudginberri billabong	25
<b>4 Review of the Tailings Dam Corridor</b>	<b>25</b>
4.1 Suitability of the design of the tailings dam corridor	26
4.2 Suitability of the operation and maintenance of the Tailings Dam Corridor	27

<b>5 Discussion on issues arising from the investigation</b>	<b>31</b>
5.1 Design and Maintenance of the Tailings Dam Corridor	31
5.2 ERA response to the incident	32
5.3 Breach of the Commonwealth’s Environmental Requirements	34
5.4 Statutory Environmental Monitoring Program	36
5.5 Inspection of the Ranger Uranium Mine	38
5.6 Environmental monitoring programs	40
5.7 Reporting of Incidents	40
<b>6 Conclusions</b>	<b>42</b>
6.1 Origin of the leak and adequacy of remediation measures	42
6.2 Impact on people and the environment	43
6.3 Compliance with reporting requirements	44
6.4 Other issues	45
<b>References</b>	<b>45</b>
<b>Appendices</b>	<b>47</b>
Appendix 1 Notification of the tailings water leak from ERA	
Appendix 2 Ranger Mine Incident Investigation: Second Report on Technical Issues prepared for Supervising Scientist by ERA of Australia Pty Ltd	
Appendix 3 ERA Internal Review Significant Incident Investigation Report Process Water Pipe Leak at ERA	
Appendix 4 ERA investigations into the Process Water Spill Incident: Letter from ERA	
Appendix 5 Ranger Mine Incident Investigation: Northern Territory Department of Mines and Energy	
<b>Figures</b>	
Figure 1 Photograph of the flange joint in the Tailings Water Return Pipeline that transports water from the tailings dam to the processing plant after it was repaired (photo P Waggitt)	3
Figure 2 End of the disused pipe segment after it was uncovered (photo P Waggitt)	3
Figure 3 Schematic representation of the pipelines in the Tailings Dam Corridor	4
Figure 4 Schematic representation of the Access Road Culvert showing the TWRP and the disused pipe segment	5

Figure 5 Schematic representation of the Tailings Dam Corridor at the VLGCR	6
Figure 6 Schematic representation of the Tailings Dam Corridor at the VLGCR (elevation through section C – D)	7
Figure 7 VLGCR looking south	8
Figure 8 VLGCR looking north	8
Figure 9 Potential transport pathway between the source of the leak and Kakadu National Park	14
Figure 10 Manganese concentrations at MG0009 (1980–2000)	15
Figure 11 Uranium concentrations at MG0009 (1980–2000)	15
Figure 12 Sulphate concentrations at MG0009 (1980–2000)	16
Figure 13 Magnesium concentrations at MG0009 (1980–2000)	16
Figure 14 Electrical conductivity at MG0009 (1980–2000)	17
Figure 15 Creekside monitoring results for A larval black-striped rainbowfish survival, and B freshwater snail egg production, for wet season 1992 to 2000.	19
Figure 16 Mean changes (March–April 2000) in the concentration of contaminants as a function of path length through the Corridor Creek wetlands (note the logarithmic scale)	22
Figure 17 Tailings Dam Corridor looking east before remedial works	28
Figure 18 VLGCR culvert after remedial works showing concrete pad	28
Figure 19 Tailings Dam Corridor pipelines before remedial works (looking west)	29
Figure 20 Tailings Dam Corridor pipelines after remedial works (looking west)	29
Figure 21 Schematic diagram illustrating the environment protection philosophy at Ranger	36

## Tables

Table 1 Summary of actions taken by ERA in the identification of the leak	11
Table 2 Summary statistics for the compositions of waters in Magela Creek upstream and downstream of Ranger	17
Table 3 Dates of creekside trials conducted in the 1999-2000 wet season	18
Table 4 Calculation of Tailings Water Load in the VLGCR	20
Table 5 The composition of waters entering the Corridor Creek wetlands	21

Table 6 Average predicted increases in concentration of dissolved contaminants at GS8210009 based upon scenarios of no chemical attenuation of contaminants and process water leaks of 85 m <sup>3</sup> and 2000 m <sup>3</sup> , compared to the historical mean during mining at Ranger (1980–1999)	23
Table 7 Results of the Preliminary Analysis of Fish taken from Mudginberri Billabong	25