THE PARLIAMENT OF THE
COMMONWEALTH OF AUSTRALIA

RANGER URANIUM
WATER MANAGEMENT SYSTEM

Report of the House of Representatives
Standing Committee on Environment and Conservation

October 1986

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Terms of Reference of the Committee

That a Standing Committee be appointed to inquire into and report on:

(a) environmental aspects of legislative and administrative measures which ought to be taken in order to ensure the wise and effective management of the Australian environment and of Australia's natural resources; and

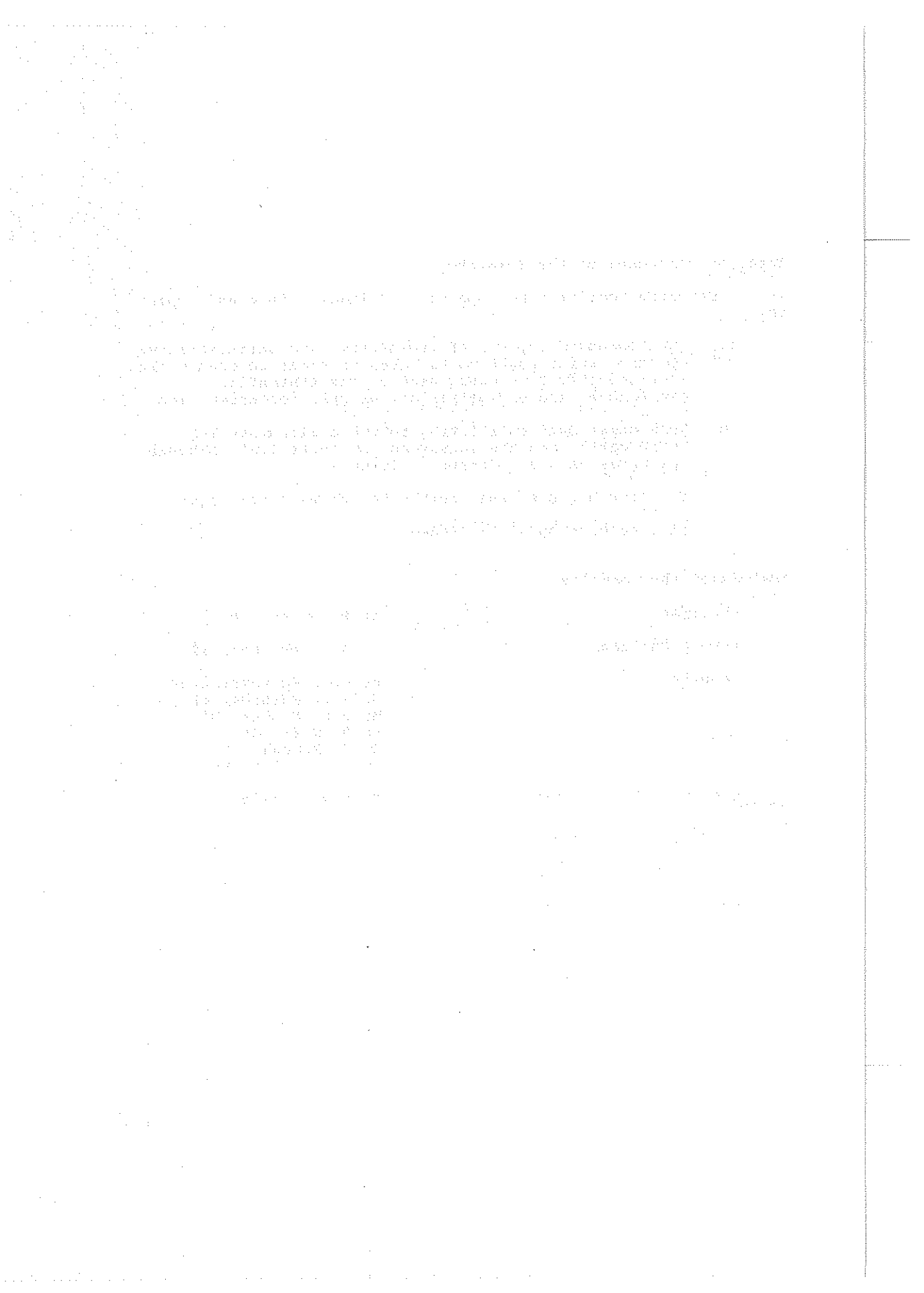
(b) such other matters relating to the environment and conservation and the management of Australia's natural resources as are referred to it by -

(i) the Minister responsible for those matters; or

(ii) resolution of the House.

Members of the Committee

Chairman	Mr P. Milton, MP
Deputy Chairman	Mr A.P. Webster, MP
Members	Mr R.L. Chynoweth, MP Mr R.F. Edwards, MP Mr P.S. Fisher, MP Mr G. Gear, MP Ms J. McHugh, MP Mr C.G. Miles, MP
Secretary to the Committee	Mr J.R. Cummins



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1. INTRODUCTION

Background

1. Uranium mining is a controversial issue. Accordingly the operations of the Ranger Uranium Project have generated a great deal of public interest since the first production of yellowcake in 1981. Energy Resources of Australia Ltd is the company having rights to the Ranger Project, and its mine operating company is Ranger Uranium Mines Pty Ltd. Press reports during 1985 alleged that the operations were defective and that proposals of the Company relating to water release were not in the best interests of the environment.

2. Various media reports referred to accidental spillages at the site and some implied that radioactive water had spilled into Kakadu National Park. Other reports implied that Ranger was seeking permission to release highly contaminated tailings dam water to the river system of the Region. The Committee was also aware of comments made by the Australian Conservation Foundation. Naturally in its role of monitoring environmental matters the Committee was concerned about allegations that the performance of mine management had been inadequate in respect of the Company's environment protection obligations and about possible threats to Kakadu National Park.

3. The Committee considered it appropriate to obtain briefings from the mining company, supervising authorities and organisations with an interest in the operations. During November 1985 the Committee was briefed by officers of the Department of Arts, Heritage and Environment, the Australian National Parks and Wildlife Service, the Office of the Supervising Scientist, the Department of Resources and Energy and representatives of Energy Resources of Australia Ltd. In February 1986 the Committee

visited the Northern Territory and held informal discussions with the Northern Land Council and the Northern Territory Environment Centre and visited the Ranger Uranium Project area and the Alligator Rivers Region Research Institute. Final discussions were held in Darwin in August 1986 when the Committee met with the Northern Territory Minister for Mines and Energy and officers of the Northern Territory Government.

Ranger Uranium Environmental Inquiry

4. The Ranger Uranium Environmental Inquiry (RUEI or Fox Inquiry) was established on 16 July 1975 under Sub-section 11(1) of the Environment Protection (Impact of Proposals) Act 1974 to conduct an inquiry into the proposal for the development of uranium deposits in the Alligator Rivers Region of the Northern Territory. The final report of the Inquiry was presented to the Minister for Environment, Housing and Community Development on 17 May 1977. The inquiry discussed all aspects of uranium mining but the Committee proposes to outline only those aspects which relate to water management.

5. The RUEI report noted that the uncertainties relating to the release of contaminated water included:

- the types of contaminants, the amounts and chemical forms;
- changes in the toxicity of contaminants with time as they move to different parts of the Magela system and their eventual destinations;
- the sensitivity of different organisms to toxic substances and the influence of factors such as temperature changes on the sensitivity; and
- the consequences to the whole Magela ecosystem in contrast to individual organisms of added contaminants and the extent of non-toxic effects.

6. The report concluded that ideally the system should be based on non-release of contaminants but that releases might have to be made at times even if all feasible alternatives were implemented. Accordingly the Inquiry concluded that the following broad principles be applied in the development of water release standards for the operation:

- the total amount of contaminants to be released from the operations should be minimised;

- deliberate releases only should be permitted under conditions of high flow in the Magela Creek and only when there is a continuous flow between Jabiru and the northern end of the Magela plains;

- that water release standards be developed; and

- that the approval of the supervising authorities be obtained before making any controlled release.

7. The Inquiry further concluded that the water management system should be established initially in a manner allowing no intentional releases to the environment and that this system be maintained until it is shown that releases of contaminated water would have to be made.

8. The RUEI also addressed the question of the use of Best Practicable Technology. The term Best Practicable Technology according to the RUEI does not refer to the level of pollution control technology representing the economic optimum between the cost of investment in equipment and the cost of environmental damage. The way in which accumulative and insidious environmental affects tend to be produced by successive minor increases in pollution makes it doubtful that such an economic optimum could be determined before major pollution actually occurs. Even then

it might not be possible to determine the cause of the observed environmental damage. By Best Practicable Technology the RUEI meant the best technology developed anywhere which can be applied to the uranium industry in Australia. In the case of the Ranger proposal where there is a combination of the prospects of a highly profitable venture, with an environment of great sensitivity and value, interpretation of the term should not be restricted to technology used in other industries in Australia or in the uranium industry in other parts of the world. In granting authority for the Company to mine, the Government re-defined Best Practicable Technology in the Environmental Requirements for Ranger. It gave a more precise but less restrictive definition than the RUEI and it is the Commonwealth's concept of Best Practicable Technology rather than the RUEI's that is binding on the Company and the regulating authorities (see para 32).

Legal frame work for uranium mining

9. With the granting of self-government to the Northern Territory in 1978 title to all minerals except uranium (and other 'prescribed substances') was ceded by the Commonwealth to the Northern Territory.

10. The Ranger project operates under an authority to mine issued under section 41 of the Commonwealth Atomic Energy Act 1953. Under an agreement between the Commonwealth and the Northern Territory Governments in 1978 uranium mining operations in the Alligator Rivers Region are regulated as far as possible under the laws of the Northern Territory.

11. The mine is on Aboriginal land and the terms of the Aboriginal Land Rights (Northern Territory) Act 1976 require that the miners negotiate an agreement with the Northern Land Council (representing the traditional owners) which must receive the approval of the Commonwealth Minister for Aboriginal Affairs. In the case of Ranger, where the mining was authorised to take place

on behalf of the Commonwealth, the initial agreement (since assigned to Energy Resources of Australia Ltd) was between the Commonwealth and the Northern Land Council.

12. The Environment Protection (Alligator Rivers Region) Act 1978 establishes the Commonwealth statutory office of Supervising Scientist, the Alligator Rivers Region Research Institute and the Co-ordinating Committee for the Alligator Rivers Region. Collectively, these comprise the Office of the Supervising Scientist. The Supervising Scientist has a supervisory, co-ordinating and research role in the protection of the environment in the Region from the effects of uranium mining. However he has no powers to license or regulate mining operations or to enforce the implementation of requirements and conditions.

13. The overall purpose of the Co-ordinating Committee for the Alligator Rivers Region is to facilitate the co-ordination of the work of the various parties involved in protecting the environment. In particular the Committee provides a forum and a mechanism for the organisations and authorities operating in the Region to communicate, consult, consider, review and reach understandings and agreements on the protection of the environment.

14. In order for it to control the environmental aspects of mining under the terms of its agreement with the Commonwealth, the Northern Territory enacted the Uranium Mining (Environmental Control) Act 1979 in which the Commonwealth's environmental requirements for Ranger (and Nabarlek) are incorporated. In exercising the powers and duties conferred on him under this Act, the relevant Minister (the Northern Territory Minister for Mines and Energy) must have primary regard to these environmental requirements. The Commonwealth and Northern Territory legislation relevant to protection of the environment of the Alligator Rivers Region is shown at Appendix 1.

Media reports

15. As outlined in the introductory paragraphs of this report the Committee's current interest in the water management system at Ranger arose from certain allegations in environment and conservation group publications and the metropolitan press. On the whole the reports provided a fair and accurate comment on the Company's operations particularly those reporting accidental spillages. However the Committee notes that some were misinformed, misleading or untrue. The articles occurred regularly during the past few years. The Committee cites a few of these by way of example.

16. Headlines such as "Ranger Crisis: Option to put Tailings into Creek" (Canberra Times, 6 November 1985) and comments such as "Ranger Uranium Mine is seeking permission to release contaminated water from their tailings dam into the Magela Creek system" (ACF Newsletter, December 1984) were just not true. According to the Office of the Supervising Scientist and Northern Territory supervising authorities, Ranger has never requested nor would approval ever be given for the release of tailings or tailings dam water. Headlines such as "Atom deluge threatens Park" (Australian, 4 November 1985) and "Nuclear leaks from Ranger" (Canberra Times, 12 February 1986) may attract readers' attention but do nothing to provide information to enable informed debate on the issue. Comments such as "...mussels aborted in huge numbers after that release" (Age, 3 February 1986) and "Last month a broken pipeline let contaminated water into the Park" (Australian, 29 October 1985) totally misrepresent the facts.

17. A number of press reports use statements by the Australian Conservation Foundation as the source of their articles. Accordingly the Committee considers it necessary to comment on a number of these.

18. The ACF Newsletter of May 1985 discussing a request by Ranger to release retention pond 2 (RP2) water to the Magela wrote

> "although approval had not been given by the (Co-ordinating Committee) for release Ranger constructed a pipeline from the retention pond to the Magela obviously hoping for approval at this last meeting...
>
> "this is a presumptive act. The Commonwealth and Northern Territory Governments must not bow to pressure from the Company".

19. To put these comments in context, in September 1984 Ranger sought approval to construct a pipeline from RP2 to Magela Creek. After discussions between the Office of the Supervising Scientist, the Northern Territory authorities, Australian National Parks and Wildlife Service and the Northern Land Council, the Northern Territory supervising authority gave approval for construction. The Department of Mines and Energy recommended the approval of the construction of the pipeline with the strict injunction that approval to build in no way implied permission to use. The implication of the article is that construction occurred without the approval of the supervising authorities. This was not the case. It should also be noted that no approval has been given for the release of RP2 water.

20. In the ACF Newsletter of August 1985 the proposal of Ranger to release RP2 water was criticised on a number of grounds. First the Newsletter comments that "this will cause serious long-term (tens of thousands of years) pollution and degradation of the Kakadu region". This comment is contradicted by the scientific evidence. The Office of the Supervising Scientist states that"... occasional controlled discharges of

Restricted Release Zone (RRZ see paragraph 27) water to the Magela could be made in such a way that there would be virtually no damage to the environment including no harm to people". Even those opposed to releases at this time, such as the Australian National Parks and Wildlife Service and scientific advisers to the NLC, whilst they advise of uncertainty and the need for caution, do not claim that such release will cause the damage suggested in the Newsletter.

21. Second, ACF claims that release "is a significant variation from the original agreement with Ranger and the basis on which permission to mine was given". This statement indicates a misunderstanding of the agreement. While the agreement to mine was that initially Ranger would operate its water management system on a no-release of contaminants basis the agreement states that 'no intentional releases to the environment' shall be maintained until such time as the Supervising Authority gives approval for the release of contaminated water. The agreement further states conditions under which release could be allowed to the Magela Creek.

22. Third, the Journal argues that release should not be allowed because "no supplementary EIS has been undertaken". Whilst this is correct it ignores the fact that the proposed operations of Ranger, which included a water management system in which occasional releases to Magela Creek were an integral part, were the subject of an extensive EIS and subsequent Inquiry, and remain subject to continuing environmental assessment and reporting.

23. Finally the article comments that "no reference has been made to the Australian Heritage Act". The Committee notes that the Australian Heritage Commission Act 1975 requires that there be an examination of a proposal and no authority to undertake that action should be given unless the Authority is satisifed that there is no feasible and prudent alternative and

all measures that can reasonably be taken to minimise adverse effects will be taken. The Committee understands that the provisions of the Act are being complied with under the regulatory and decision making process provided for in the Environment Protection (Alligator Rivers Region) Act 1978. In addition the Supervising Scientist reports regularly on his activities to the Director of the Australian Heritage Commission and has provided him with advice specifically on Ranger's water management problems.

24. The Committee understands the concern of the conservation movement in its opposition to uranium mining in general and specifically the operations of Ranger. The conservation movement has a vital responsibility in informing the community on matters relating to environmental protection but the Committee considers that more care should be taken to ensure that information provided is accurate. The media also has a responsibility in ensuring that its reporting accurately reflects the facts.

2. WATER MANAGEMENT SYSTEM

Existing system

25. In the initial stages of uranium mining little was known of the behaviour, susceptibility and resilience of the natural ecosystems or of the possible pathways by which contaminants might be transferred to people. Accordingly a conservative strategy of water containment was implemented with evaporation as the only means of removal while additional information that could lead to the safe controlled release of certain waters could be sought. The Ranger project water management system as it currently operates may be described as a no-release of contaminants system with provision for contingency release of specified water following unusual climatic conditions.

26. Ranger advised that objectives for the water management system are as follows:

- to provide the required supply of water for the mining, milling and infrastructure operations at the Ranger project site;
- to comply with the relevant authorisations designed to protect the environment during the production phase of the project; and
- to enable the safe and environmentally effective decommissioning and rehabilitation of the project site following completion of the production phase.

27. The two principal constraints on the system are that it must have primary regard for protection of the complex and valuable environment in which the project is located while

operating under the extremely variable tropical climatic conditions which exist in the region. The main features of the Ranger water management system are shown at Appendix 2. The catchments of the project have been divided into two separate basic zones, namely a restricted release zone (RRZ) and sediment control zones.

28. The RRZ includes all sub-catchments and storage units which are likely to generate or store contaminated run-off resulting from mine and process related activities. Run-off from the RRZ cannot be released to the environment without specific approval from the Northern Territory Supervising Authority and no releases of this water have been made to date. Included within the RRZ are the mine pit and its immediate surrounds, the haul road to the ore stock piles, the primary crusher area and high grade ore storage areas, the ore stock piles, the mill site, retention ponds 2 and 3 (RP2 and 3), the tailings dam, the tailings pipeline corridor and all pipelines which draw water from within the restricted release zone.

29. Sediment control zones are those zones in which the ground has been disturbed by mining operations or earth works. They provide an area in which settlement of sediments contained within run-off waters can occur prior to the waters entering the general environment.

30. While the waste rock dump and RP4 are specifically excluded from the RRZ, the water management system currently treats these areas in a similar fashion to the RRZ in that discharge is restricted. To date approval has been given for the release of water from RP4 on a number of occasions. These releases were conducted under strict water quality criteria with extensive supervision and monitoring control.

31. Prior to the 1985-86 wet season there was a growing Company concern about an excess of one million cubic metres of

water that had accumulated within the restricted release zone. Much of this had to be stored in the mine pit leading to interference with normal mining operations. This excess holding was the result of above average rainfall and the importation into the RRZ of about one million cubic metres of water in excess of requirements during 1982 when it was considered that there might be a shortage of water for continued operations. According to the Northern Territory Department of Mines and Energy the relatively low rainfall of the 1985-86 wet season and improved housekeeping of the water management system means that there is unlikely to be any excess water by the end of the 1986 dry season. In late 1985 the Company completed a report on Best Practicable Technology (BPT) for long term water management at Ranger.

Best Practicable Technology

32. The Office of the Supervising Scientist advised the Committee that the environmental goal to which the mining companies are required to work is not zero effect on the environment but the minimum detriment that can be achieved by the use of Best Practicable Technology. For Ranger operations Best Practicable Technology is designated as the technology from time to time relevant to the Ranger project which produces the minimum environmental pollution and degradation that can reasonably be achieved having regard to:

(a) the level of effluent control achieved and the extent to which environmental pollution and degradation are prevented in mining and milling operations in the uranium industry anywhere in the world;

(b) the total cost of the application or adoption of that technology relative to the environmental protection to be achieved by its application or adoption;

(c) evidence of detriment or of lack of detriment to the environment after the commencement of the Ranger project;

(d) the physical location of the Ranger project;

(e) the age of equipment and facilities in use on the Ranger project and their relative effectiveness in reducing environmental pollution and degradation, and

(f) social factors including possible adverse social effects of introducing new technology.

33. In developing its Best Practicable Technology for the water management system Ranger considered a number of options based on no-release, disposal within the Ranger project area, disposal beyond the Ranger project area, contaminant segregation and additional storage. A summary of the principal characteristics of the water management options is shown at Appendix 3.

34. Ranger saw BPT as a hierarchy of actions which are preferred in descending order but which are all necessary to the development of a system with sufficient flexibility for dealing with unpredictable and uncontrollable rainfall. The hierarchy and the necessary measures to permit its use were seen as:

- continuation of measures taken to reduce water accumulation within the RRZ;
- treated water disposed of by land application;
- treated water released to Magela Creek;
- untreated water disposed of by land application;
- untreated water released to Magela Creek;
- untreated water storage in tailings dam, and
- water stored in mine pit in extreme circumstances.

35. Ranger advised that the present water treatment plant has a nominal capacity of approximately 800 000 cubic metres per year which would handle the excess in two years out of three. In conditions exceeding these, disposal would be by land application of untreated water. The extent of the area approved for land application and the rate at which water has to be disposed of for operational reasons determines the need for release of untreated water. The BPT Report estimates that implementation of this hierarchy of measures would, under present conditions, enable direct release to be withheld for about 9 years out of 10.

36. Ranger concluded that if their BPT was accepted the obligation to protect the environment from contaminated water which is part of the implicit contract between Ranger, the Government and the Northern Land Council would be met. There would be no unnacceptable change to Aboriginal land or the Kakadu National Park and proper decommissioning and rehabilitation would be facilitated.

37. Since the publication of the BPT document there have been considerable discussions which have led to a revision of the details of the hierarchy approach. The Company is developing a five year operations and water management plan which would be reviewed every year. The plan will enable both long term and short term considerations to be addressed. Land application (on 33 hectares, at present) is likely to be the prime method of disposal. Occasional release of untreated water to the Magela system would remain a component of BPT. However each year water in the system would be assessed and as required the area of land application (and/or perhaps the rate of application) would be adjusted to reduce the need for direct release. Ranger hopes that given further favourable seasons the Company may be able to increase the capacity of part of its existing storages. The Committee was advised by officers of the Northern Territory Government that the probability of release under the developing regime may be reduced from one year in 10 as outlined in the BPT document to one year in 20.

Accidental spillages

38. As outlined in a previous section of this report the Committee was alarmed at media comments suggesting that there had been a large number of accidental spillages particularly from the pipeline and that some of these had leaked into Kakadu National Park. Both in discussions and from an examination of the annual reports of the Supervising Scientist the Committee was able to examine the number and nature of these accidental releases or, as described by the Supervising Scientist, "occurrences".

39. Since production commenced in 1981 there have been 24 occurrences involving the water management system which have given rise to regulatory concern, of which 16 related to failures in the tailings pipeline or tailings dam seepage collector lines. Eight of these failures occurred within the last financial year. The events of 1985 resulted in both Commonwealth and Territory Ministers criticising the Company. The Northern Territory Minister for Mines and Energy ordered the Company not to use its tailings pipeline until a replacement program had been completed.

40. The Northern Land Council and the Northern Territory Environment Centre in discussions with the Committee were critical of the number of tailings line failures. The NLC expressed concern about "gross carelessness in areas where the Company should be most careful". Both the NLC and the Environment Centre considered that the frequent spillages were in part due to Company attitudes and the lack of supervision and penalties. The Environment Centre argued that mine management has a poor attitude to environmental protection and continually seeks least cost solutions and that after two or three spillages Ranger should have been required to close its operations and replace the pipeline. According to the Environment Centre the argument used by mine management that spillages of this nature happen in all mines is an argument for closure of the mine because of its location in a world heritage area.

41. The Environment Centre concluded that even though Ranger is arguably the most highly regulated mine site in Australia with controls exercised by both Territory and Commonwealth authorities, and despite the millions of dollars spent by the supervising authorities and Ranger each year on environmental control, accidents and management problems continue to occur. The Environment Centre claims that while as isolated incidents these may not be of great importance, taken as an indication of the slackness of Ranger's "housekeeping" arrangements they are quite frightening.

42. The Centre and the NLC considered there was a conflict of interest concerning the supervising role of the Department of Mines and Energy which not only had a regulating role but was also responsible for the promotion of the use of uranium. Both argued for a greater supervisory role by the Office of the Supervising Scientist.

43. Ranger considered all the accidental releases to be minor and had caused no environmental damage. The Company advised that it had been quick to respond and none of the releases had reached Kakadu National Park and only a few had escaped from the restricted release zone. The Company stated that spillages of this nature happen in all mines and are only reported because of the unique regulatory regime established for the operations of the project.

44. The Supervising Scientist in his annual report for 1984-85 commented that no effects of the mining operations beyond the immediate mining site area at Ranger have been observable. The Report notes that there have been occurrences within the mine site over the years which have indicated some laxity in operational control and given rise to regulatory concern but most incidents have been minor and have not resulted in adverse impacts on humans or the environment beyond the mine site.

3. FUTURE WATER MANAGEMENT SYSTEM

Appraisal of BPT document

45. The Ranger report "Application of Best Practicable Technology to Water Management System" is under consideration by a Working Group of the Co-ordinating Committee for the Alligator Rivers Region comprising representatives of Ranger, the Office of the Supervising Scientist and the Department of Mines and Energy. The Working Group has agreed that given major changes in mine operations likely within the next few years - including the development of orebody No. 3 - it was reasonable at this time to consider water management BPT for a period of about 5 years. Longer term mine plans were considered to be too diffuse to allow definition of BPT beyond that period.

46. The Working Group reached substantive agreement on the options which should form part of BPT, namely, land application and occasional release to Magela Creek under certain circumstances and under a comprehensive regime of regulatory controls. The Committee has been advised that Ranger is at present preparing a 5 year water management plan for consideration by the Working Group. The Plan will be based on BPT and specify the probability of having to release to the Magela. This plan will be updated from year to year.

47. The basic ingredients of BPT for water management are dry season land application (spray irrigation) of water from RP2 and/or from the mine pit with release of such water to Magela Creek being allowed under controlled conditions when the climatic circumstances dictate that this course is desirable. The Territory Government advised that it is estimated that the probability of this latter being necessary will lie between 0.02 and 0.1.

Regulatory regime for release

48. After lengthy discussions between the Northern Territory Department of Mines and Energy, the Office of the Supervising Scientist and the Alligator Rivers Region Research Institute water release criteria have been established. The regulatory system has developed as follows:

- determination of receiving water quality criteria based on best available scientific data, that is, concentration limits and other chemical and physical parameters, which ensure that the stream remains safe for the ecosystem and for man;

- determination of maximum allowable additions of potential contaminants, either as concentrations or annual loads, which should ensure the receiving water quality criteria are not exceeded;

- establishment of appropriate physical criteria, for example, minimum flow rates in the stream, minimum dilution ratios, and stream flow continuity, so that the conditions for which the quality criteria were established should be adequately maintained;

- application of a discharge formula, using the concentrations of individual constituents obtained from analysis of the waste to be discharged and the stream flow rates, to determine a discharge flow rate which complies with all other requirements;

- pre-release biological testing using actual water to be released, diluted by actual receiving water, to establish a minimum dilution for release that will not produce observable effects on a selected range of known sensitive species;

- supervision of releases to ensure that authorised conditions are being observed;

- water quality monitoring of the receiving waters to verify adequacy of the discharge formula; and

- biological monitoring of the environment to establish that acute impacts have been avoided, plus longer term scientific observations of the biota and ecosystem to provide early warning of the possible presence of long term chronic effects.

49. The supervising authorities believe that Ranger should be able to meet all the requirements of the regulatory regime. The Office of the Supervising Scientist advised that it is not possible to state how much water could be released in any one year because the quality of the waters that might be considered for release (largely those in RP2 or the mine pit) will vary somewhat from time to time within a wet season, and from year to year, and because of the more widely varying climatic conditions and stream flows. Over a sequence of years however, and given average rainfall and stream flows, substantial volumes of water should be able to be released within the proposed limiting criteria.

50. Ranger would not need to treat existing RRZ water to obtain significant opportunities for release within the proposed standards and criteria. Treatment would however reduce both manganese and uranium content so that potentially larger amounts of water could be released before reaching the limits of concentration of those components. Water treatment is discussed later in the report.

Attitudes to release

51. The proposal to include releases of RRZ water in the water management regime has been criticised by the Northern Land Council, the conservation movement and the Australian National Parks and Wildlife Service.

52. ANPWS holds the view that the direct release of the RRZ water to the Magela should only be considered in the context of an examination of long term Best Practicable Technology options. It is ANPWS's view that the Company in its 1985 BPT document has not provided the information to enable this consideration to be undertaken. The Service believes that the document addresses short term BPT options only. ANPWS however would accept the discharge standards and general control regime should a need for release of RRZ waters arise.

53. ANPWS is unaware of the environmental impact of direct release but believes that there are still too many unknowns for assurances to be given that there would be no impact. The Service is not convinced that there will be no noticeable impact on the environment. Consequently ANPWS believes it must take a conservative view in relation to the issue. In summary the ANPWS position is that the direct release of RRZ water to the Magela may ultimately prove to be BPT but at present the case has not been argued adequately.

54. The Northern Land Council criticisms were made in the context of the Ranger BPT document and not the revised proposal currently being developed by Ranger. As the revised management scheme will still include the option for periodic release to the Magela the Committee assumes that the NLC concerns remain. The NLC comments that it was a clear understanding of the traditional owners that Ranger would develop a "no release of contaminants" water management system. The NLC advises that traditional owners have continued to voice this expectation and the failure to achieve this objective, as agreed later for other operational and planned mines in the Region, can only result in an unacceptable social impact. The NLC believes that Ranger's request for a series of one-off releases of water would result in annual releases becoming an integral part of their water management system. The Northern Land Council has no objection to the release

of RRZ water to Magela Creek if it is of equivalent quality to representative natural wet season water. RRZ water and the proposed standards for treated water do not approach this standard. Specifically the Council criticises the water release criteria on the following grounds:

- constituent elements and compounds are considered in isolation and not in combination;

- release criteria are based on limited biological tests; and

- a release of seemingly innocuous water from RP4 in 1985 produced adverse biological reactions in the mixing zone.

55. The NLC comments that in addition to the ecological objections the Aboriginal people in the area do not want the aquatic system of the Magela put at risk by the release of water which could have unknown and unpredictable consequences.

56. In spite of attempts by the NLC to allay the fears of the traditional owners about release of RP4 water early in 1985 this release coupled with continued speculation over release of RRZ water has caused considerable anxiety among the Aboriginal people of the region. The NLC has been informed that many of them have chosen not to eat aquatic bush foods from Magela Creek as a result of this release and speculation. They would prefer not to live with a contaminated water release system, even if properly monitored and controlled, because this in effect would cause further anxiety due to doubts about whether or not the controls were being properly implemented and whether deterioration in the Magela system was in progress or not.

57. The Northern Territory Environment Centre in discussions with the Committee concurred with all the views of the NLC and strongly opposes any release of contaminated water to

the Magela. The Centre advised that use of alternative water management systems, with all their problems associated with rehabilitation, is preferable to an approach which may pollute an aquatic system.

58. The Northern Territory supervising authorities strongly support periodic releases from RP2 as part of an overall water management system. In a technical paper presented to the Committee by the Territory Government it is argued that it is known that uranium mineralisation exists up-stream from Ranger in the Magela catchment and has for many thousands of years shed uranium into the system as have the Ranger ore bodies. Yet by the time the waters reach the Ranger deposit there is far less than the recognised world average amount remaining in solution in the natural environment. The paper argues that it is therefore reasonable to assume the direct discharges of RRZ water to the Creek are unlikely to cause any significant or lasting environmental detriment.

59. As outlined in the paper in an average year some 100 kg of uranium, between 100 and 400 kg of copper, lead or chromium and 3 to 4 tonnes of zinc and manganese will naturally flow down the Creek in solution. The amounts tumbling along in suspension and in the sediments are usually tens of thousands of times these quantities. The paper advises that the total uranium content of RP2 is less than 300 kg on average. Other metal loads include less than 10 kg copper, lead and chromium and 20 kg for zinc. From the entire restricted release zone some 300 hectares in area it is estimated that approximately 1000 tonnes of material would have been eroded from it under natural circumstances every year and that at least 250 kgs of this is uranium. The paper states that it is therefore possible to conclude that since the RRZ has been constructed it has prevented about 1.5 tonnes of uranium in small particles from being discharged to Magela Creek.

60. The Office of the Supervising Scientist view is that on technical grounds occasional controlled discharges of RRZ water

to the Magela could be made in such a way that there would be virtually no damage to the environment including no harm to people. The releases would need to be subject to strict regulatory control involving:

- compliance with authorised discharge standards plus a discharge formula;
- pre-release biological screening; and
- environmental and biological monitoring.

61. The Office of the Supervising Scientist agrees that if for social and/or political reasons water release is to be prohibited then alternative technologies may be able to be installed at Ranger which would lead to a stable water management system without reliance on release (except under very extreme climatic conditions). However such measures would be expensive and have associated with them their own environmental impact. On balance the OSS believes that water release to the Magela should be accepted as one of the water disposal components of long term BPT.

Land application

62. The prime method being considered by Ranger for the disposal of excess water is by land application (spray irrigation). In April 1986 the Department of Mines and Energy authorised Ranger to perform land application over a 33 hectare area during the 1986 dry season. This is currently operative and is being continually monitored.

63. Spray irrigation is a method of disposing of waste water by infiltration into the soil and by evapotranspiration. Heavy metal contaminants and radionuclides are substantially immobilized in the top few centremetres of soil while sulphate,

ammonia, nitrate and phosphate are absorbed, broken down or dissipated by various natural processes. Supervising authorities advise that one possible advantage of land irrigation as a method of water disposal is that residual contaminants are retained and confined in a known area. As a method of waste disposal it is therefore to some extent reversible. This is in contrast to release to a stream where environmental protection is achieved by dilution and dispersion. Another advantage is that it is carried out during the dry season and therefore adds flexibility to a waste management system. At the end of the dry season subject to satisfactory results from an appropriate monitoring program it may be acceptable to excise the irrigated land from the RRZ.

Attitudes to land application

64. The NLC comments that the disposal method least likely to have a direct impact on the environment is evaporation but since Ranger believe this to be impractical the NLC is willing to support spray irrigation of treated water. Land application, the NLC comments is clearly a far more convenient and simpler disposal system to monitor for impacts and contaminant export than an aquatic system. It is reasonable to expect that if the application rates are not excessive the land irrigation method will have sufficient capacity to absorb and attenuate the contaminants expected in the treated water as well as negate detectable impact and detriment to the stream system. The NLC believes that spray irrigation should be closely monitored to assess contaminant impact, retention and export from the site.

65. The Australian National Parks and Wildlife Service believes that land application as a method of disposal of RRZ waters should be thoroughly investigated. They believe the experimental application of untreated RRZ water should continue accompanied by an increased experimental and monitoring effort to determine the long term suitability of this method.

66. ANPWS is concerned at the potential long term effects that may arise from spray irrigation. These include future discharge in an uncontrolled way by natural causes of certain metals taken up temporarily in the soil from the irrigated water. Similarly the Service has concerns that some of these metals may be taken up in the food chain and recycled out of the irrigated area.

67. The Northern Territory supervising authorities strongly support closely monitored land application as the prime means of disposal of excess water. Northern Territory Government officers believe further detailed research into the impact of land application is unnecessary. They argue that the required answers can already be provided by those knowledgable in the World's scientific literature dealing with geo-chemical exploration. The Northern Territory Government considers that this generic literature is directly applicable to the Ranger site. No site specific research is necessary to assess the Ranger land application system because:

- the solutes involved are naturally occurring; and

- the geo-chemical processes involved are well known.

68. On the other hand the Office of the Supervising Scientist advises that the full impacts of land application over many years are not really known. Clearly the nature of the forest and its vegetation and probably fauna would change somewhat. It is not expected that the changes would be sudden or unacceptable. It could be many years however after the cessation of irrigation before the localised environment returned to the condition of unirrigated country.

69. The Alligator Rivers Region Research Institute holds the view that while the geo-chemical processes involved in the natural distribution of elements near the earth's surface are

likely to be relevant to land application at Ranger, this generalised geo-chemical information cannot be extrapolated to the specific circumstances at Ranger with the confidence required to ensure that the high levels of environmental protection being aimed at for the Region will be achieved for the life time of the mining operation. The environmental effects of spray irrigation are almost certainly long-term and can therefore only be satisfactorily determined by long-term monitoring.

70. The prediction however of the effects of spray irrigation could be possible by a research approach. The Office of the Supervising Scientist has sought approval for a research program which is divided into three phases extending over a three year period at a possible total cost of $400 000. OSS concludes that it is not likely that there would be serious irreversible impacts arising from the wider use of irrigation prior to the completion of the three year research program. Funds have been provided in the 1986-87 appropriations to commence this research which will be carried out as a collaborative program with CSIRO. There has been no commitment by the Government that funds will be provided in subsequent financial years.

Water treatment

71. Ranger has a water treatment plant on site capable of treating approximately 800 000 cubic metres per year. This plant has the capacity to reduce uranium, radium and manganese levels significantly but sulphate levels would be substantially unchanged and increases in the sodium and chloride content of the treated water would result. As indicated previously the NLC supports land application of <u>treated</u> water. The NLC argues that water should be treated to reduce uranium, radium and foreign organics to an acceptable level before discharge to the environment. The NLC argues that reduction of key chemical species in RRZ water besides satisfying a legal requirement is a hedge against possible short or long-term degradation of soil and

vegetation at terrestrial land application sites. If valid research and monitoring over the years can demonstrate that spray irrigation of untreated water will produce no harmful effects then relaxation of treatment requirements could be appropriate.

72. The Northern Territory supervising authorities believe that because of the low level of contaminants water treatment is totally unnecessary.

73. The Office of the Supervising Scientist advised that there are a number of factors which should be taken into account in including water treatment as part of BPT. OSS confirms that treatment may be unnecessary on the grounds that:

- the level of contaminants in RP2 water are low and consist of elements occurring naturally in the environment;
- the impacts will be continually monitored;
- while the impacts of untreated water may differ from treated water the effects are such that irreversible impacts are unlikely to occur before the results of the research program are known;
- depending on the treatment methods additional chemicals are likely to be added to the water and the impacts of these on the environment would have to be assessed; and
- treatment of water is likely to require the construction of an additional holding pond.

74. Both Ranger and the Supervising Scientist advised that the region is subject to contamination from sources other than the Ranger uranium mine such as run-off from roads, borrow pits in the Park and Jabiru township.

Additional storage

75. If the water management system of the Ranger Uranium Project was to operate on a no-release system additional storage capacity would be required. Energy Resources of Australia Ltd, at the request of the Committee, undertook a computer simulation of the appropriate parts of the water management system taking account of a number of variables. ERA advises that a pond would have to be built at least eight metres deep, and possibly considerably more, if it was not to overflow and the only mechanism for water removal was evaporation.

76. The Northern Territory Government advises that an adequate dam will result in the complete destruction for 30 years at least of more than 100 hectares of bush land (plus borrow areas) and would cost $8 to $10 million plus the cost of rehabilitation of the pond and the borrow areas after that 30 years at a cost of perhaps another several million dollars.

77. The Land Conservation Unit of the Northern Territory Conservation Commission is opposed to the construction of more ponds and to the detriment which will accrue from it. This detriment includes increased erosion rates and the consequent suspended sediment in Magela Creek, disruption to wildlife habitat and erosion for some years during rehabilitation.

78. The Northern Land Council accepts Ranger's view that a disposal method based purely on evaporation is impractical. The Council believes however that with the introduction of a land application system construction of an additional storage is required to ensure year round access to the mine pit. The storage must be of sufficient capacity to accommodate seasonal surges of contaminated water. The NLC suggests that a suitable storage pond need not be larger than 20 hectares in area.

79. The Office of the Supervising Scientist comments that if direct release of RRZ water to the Magela were prohibited and if there were requirements that:

- land application of water be confined to the dry season; and
- 800 000 cubic metres of the water must be treated each year before it is irrigated,

then additional water storage within the RRZ would be necessary to protect the environment and to provide reasonable assurance of continuity of mining operations. OSS argues that even if land application of untreated water at a higher rate over a larger land area is accepted it would appear necessary that some additional storage should be provided to ensure timely access to the mine pit each year. The OSS comments however that there are significant economic and environmental costs associated with building additional ponds for water storage. There is clearly a disturbance to additional land areas, not only during the operating period but during and possibly after rehabilitation.

80. As noted previously Ranger is investigating the possibility of increasing some existing storages which would not result in additional land being disturbed.

4. CONCLUSIONS

81. During the course of its investigations the Committee had the total co-operation of Energy Resources of Australia Ltd. The Company appeared voluntarily before the Committee in Canberra for informal discussions. During the inspections of the project area the Company was open and forthright in its discussions and allowed access to all areas within the project area including those areas where the Committee may have reached conclusions critical of the Company's operations.

82. The Committee believes that there are many areas of the Company's operations which warrant criticism. The Committee agrees with the Northern Land Council and the Northern Territory Environment Centre and others that the number of failures relating to the operation of the water management system is alarming. The Committee cannot accept that a Company which is located within an area of significant environmental value, claims to be as efficient as any operation in the world and claims to be one of the most regulated in the world, should have allowed the number of incidents to have occurred as have been reported in the annual reports of the Office of the Supervising Scientist. The Committee understands that the tailings pipeline has now been replaced. Should these regular accidental releases continue the Committee would support the temporary cessation of operations until such time as the system was rectified. Notwithstanding these comments the Committee accepts the Supervising Scientist assessment that there has been no discernible adverse impact on the environment from these occurrences.

83. Organisations have argued that Ranger has little regard for the environment and operates on a least cost basis. The Committee observed the state of the sulphur dump, exposed and decaying bags of chemicals at the water treatment plant and the trial dry tailings plot unfenced and with animal foot prints in

the tailings. The decision by mine management to import into the RRZ about one million cubic metres of water in excess of requirements during 1982 suggests a lack of concern about the longer term environmental consequences should rainfall return to normal in following seasons. The Committee also notes with concern claims by the Northern Land Council that Ranger has been slow to advise of occurrences at the mine. Traditional Aboriginal custodians should not have to rely on media reports which the Committee observes in some cases were misleading.

84. The Committee does not claim to be technically expert in the area of water management. It has however closely examined the assessments by others of the scientific data. The Committee notes that there is some doubt about the long term impact of spray irrigation, direct release and the construction of additional ponds. It also notes that the traditional Aboriginal custodians are opposed to direct release of water.

85. The views of the Supervising Scientist and the supervising authorities are that on technical grounds occasional controlled discharges of RRZ water to the Magela could be made in such a way that there would be virtually no damage to the environment including no harm to people. On the other hand conservationists and the Northern Land Council and the Australian National Parks and Wildlife Service believe that there are still too many unknown factors for assurances to be given that there will be no impact. The Committee recognises that special measures and standards of the highest order must be developed for an area with world heritage values. However the Committee notes that after years of careful research the Commonwealth and Territory supervising authorities have concluded that direct release under the developed conservative criteria will result in virtually no harm to humans or the environment. The Commitee further notes however that the supervising authorities were unable to give a 100 per cent assurance that there would be no detrimental environmental impacts.

86. The NLC and the conservation movement advised that the release of seemingly innocuous water from RP4 in 1984 produced adverse biological reactions in the mixing zone. This suggests to the Committee that the release of RP2 water may have even greater impacts. The Office of the Supervising Scientist advises however that the biological reaction observed (inhibition of reproductive behaviour in mussels) was temporary and normal behaviour returned soon after the release ceased. The reaction only occurred in mussles within the mixing zone where concentrations are higher near the discharge outlet. The OSS view is that such temporary impacts confined to such a restricted area are not significant. The post release ecological monitoring program will aim to detect any subtle significant affects beyond the mixing zone.

87. Approval has been given to Ranger to undertake land application trials on 33 hectares of land. Spray irrigation, at least on a trial basis, as a disposal method for excess water has the approval of all the organisations which spoke to the Committee. Both the ANPWS and the Office of the Supervising Scientist noted that land application is not without possible long term impacts. Both organisations believe that the trials should be accompanied by an increased experimental and monitoring effort. Territory authorities while supporting monitoring believe that further research is totally unnecessary. The Northern Land Council argues that the trial should be with treated water.

88. The Committee supports the land application trials and agrees that these should be subject to further research. Some months ago the Committee considered that these trials should be conducted with treated water. It appears now however that treatment is unnecessary.

89. The Committee believes that the construction of additional storage ponds should be avoided unless it is shown that the water management system cannot operate without frequent releases of RRZ water to the Magela system or that it is found that land application has unacceptable environmental impacts.

90. The Committee notes the concern of the traditional owners relating to the direct release to the environment. The Northern Land Council advised that it was the clear understanding of the traditional owners that Ranger would develop a no release of contaminants water management system. The Committee notes however that the agreements between the Commonwealth and the Northern Land Council and the Commonwealth and the Company do not specify that a no release system would operate. Some of this fear and uncertainty may be overcome by a sympathetic and continuing consultative process between the Company, supervising authorities, the Northern Land Council and the traditional owners. As noted previously Best Practicable Technology includes "social effects including possible adverse social effects of introducing new technology". This indicates that the views of the traditional owners must be respected in developing the water management system.

91. The Ranger Uranium Environmental Inquiry believed that ideally the water management system should be based on non-release of contaminants and that this system be maintained until it is shown that releases of contaminated water have to be made. The Committee considers that it has not been established that releases of RRZ water to the Magela need to be made.

PETER MILTON
Chairman

October 1986

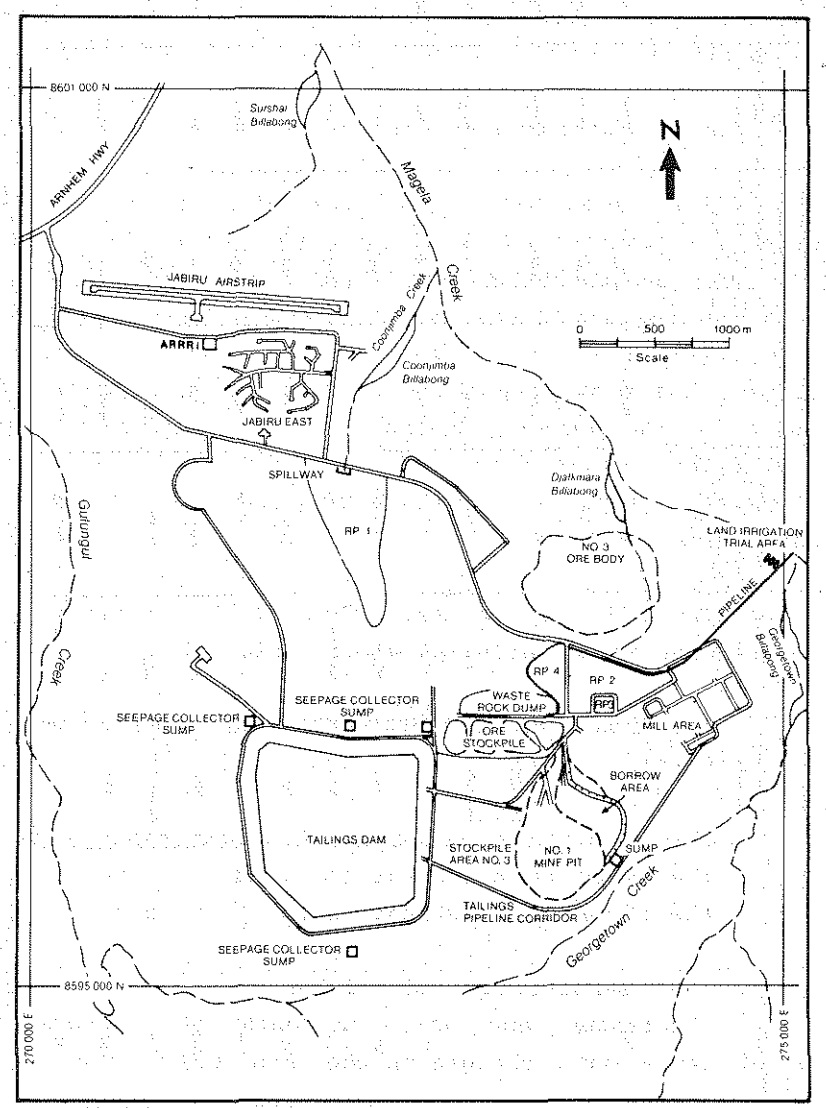
RELEVANT LEGISLATION BEING 'PRESCRIBED INSTRUMENTS' FOR THE PURPOSE OF THE ENVIRONMENT PROTECTION (ALLIGATOR RIVERS REGION) ACT 1978

Commonwealth Legislation as at 30 June 1985

1 Aboriginal Land Rights (Northern Territory) Act 1976
2 Atomic Energy Act 1953-1966
3 Australian Heritage Commission Act 1975
4 Environment Protection (Impact of Proposals) Act 1974
5 Environment Protection (Alligator Rivers Region) Act 1978; Reprinted 31 December 1984
6 Environment Protection (Northern Territory Supreme Court) Act 1978
7 *Environment Protection (Nuclear Codes) Act 1978*
8 Koongarra Project Area Act 1981
9 National Parks and Wildlife Conservation Act 1975
10 Northern Territory (Self-Government) Act 1978

Northern Territory Legislation as at 30 June 1985

1 Aboriginal Land Act: Reprint 1978-1979; amended by 54/1980
2 *Aboriginal Sacred Sites Act: Reprint 1978-80; amended by 57/1983*
3 Building Act 1983
4 Bushfires Act 1980; amended by 26/1982 and 32/1984
5 Conservation Commission Act 1980
6 Construction Safety Act: Reprint 1978-1983
7 *Control of Roads Act: Reprint 1953-1983*
8 Control of Waters Act: Reprint 1938-1979; amended by 69/1981
9 Dangerous Goods Act 1980; amended by 4/1981 and 1/1983
10 Darwin Port Authority Act 1983; amended by 27/1984
11 Environmental Assessment Act 1982
12 Fire Service Act 1983
13 Fish and Fisheries Act: Reprint 1980-1982; amended by 31/1984
14 Inspection of Machinery Act: Reprint 1941-1981; amended by 44/1982
15 Jabiru Town Development Act: Reprint 1979-1984
16 Litter Act: Reprint 1972-1978
17 Mines Safety Control Act: Reprint 1977-1981
18 Mining Act: Reprint 1982-83; amended by 45/1984
19 Native and Historical Objects and Areas Preservation Act: Reprint 1955-1978
20 Notifiable Diseases Act 1981
21 Place Names Act: Reprint 1967-80; amended by 55/1983
22 Plant Diseases Control Act 1979
23 Prevention of Pollution of Waters by Oil Act: Reprint 1962-1979
24 Public Health Act: Reprint 1952-1979; amended by 103/1981 and 6/1985
25 Radiation (Safety Control) Act 1978
26 Radioactive Ores and Concentrates (Packaging and Transport) Act 1980
27 Silicosis and Tuberculosis (Mine Workers and Prospectors) Act: Reprint 1966-1978
28 Soil Conservation and Land Utilization Act: Reprint 1970-1980
29 Territory Parks and Wildlife Conservation Act: Reprint 1977-1983
30 Uranium Mining (Environment Control) Act 1979; amended by 61/1981



General Layout of Ranger Operation

SUMMARY OF PRINCIPAL CHARACTERISTICS OF WATER MANAGEMENT OPTIONS

Significant Features and Performance Criteria / Water Management Options	Is the Option feasible based on existing knowledge and site data?	Is the option a genuine disposal technology?	In what repository are the contaminants largely retained?	Degree of limitation due to presently feasible rate of disposal	Volumes potentially manageable over time High>$1x10^6 m^3/yr$ Med $0.5-1x10^6$ Low $<0.5x10^6/yr$	Perceived Social Acceptability	Cost of implementation and operation Low <$1 million Med $1-5 million High >$5 million	Potential to reduce long-term environmental liability	Availability of Option under extreme wet weather conditions (e.g. cyclone activity)
Land application of treated water	Yes	Yes	RRZ & RPA	Medium	Medium	High	Medium	High	Annual Delayed
Land application of untreated water	Yes	Yes	RPA	Low	High	Medium	Low	Medium	Annual Delayed
Direct release of treated water	Yes	Yes	RRZ & beyond RPA	Low	Medium	Low	Low	High	Delayed to ensuing wet season
Direct release of untreated water	Yes	Yes	Beyond RPA	Low	High	Low	Low	High	Immediate
Evaporation Pond	No	Yes	RRZ	High	Medium	High	High	Low	Deferred
Enhanced evaporation	No	Yes	RRZ	High	Medium	High	High	Medium	Deferred
Additional storage within RRZ	Yes	No	N/A	Medium	Medium	High	High	Low	Deferred
Well injection	No	Yes	RPA	High	Low	Medium	Medium	Unknown	Deferred
Pit seepage interception	Yes	N/A	RRZ	N/A	Medium	High	High	High	N/A
RRZ area reduction	Yes	N/A	RRZ	N/A	Low	High	Low	High	N/A
Pipeline to coastal outlet	Yes	Yes	Beyond RPA	Low	High	Low	High	High	Immediate
Additional contaminant segregation	Yes	N/A	RRZ	N/A	N/A	High	Low	High	N/A
Storage in tailings dam	Yes	No	RRZ	Medium	Medium	High	High	Low	Deferred

N/A - Not Applicable