

14th ARRTC Meeting

13-15 September 2004

Summary Record

Members Present

Prof Barry Hart (Chair)

Mr Ray Evans – Independent Member

Mrs Jill Fitch – Independent Member

Mr Mark Foy – Northern Land Council

Dr Carl Grant – Independent Member

Dr Terry Hillman – Independent Member

Dr Arthur Johnston – Supervising Scientist

Mr Tony McGill - Department of Business, Industry and Resource Development

Dr Tony Milnes – Energy Resources of Australia Ltd.

Prof Gerald Nanson – Independent Member

Dr Jenny Stauber - Independent Member

Apologies

Mr Mark Foy – Northern Land Council (for Tuesday and Wednesday)

Dr Arthur Johnston – Supervising Scientist (for Monday)

Mr Shane Maraldo – Queensland Mines Pty Ltd.

Mr Peter Wellings – Parks Australia

Observers & Advisors Present (for all or part of the meeting)

Mr Julian Barry – Parks Australia

Dr Peter Bayliss - Environmental Research Institute of the Supervising Scientist

Dr Andreas Bollhofer - Environmental Research Institute of the Supervising Scientist

Dr Ken Evans - Office of the Supervising Scientist

Dr Max Finlayson - Environmental Research Institute of the Supervising Scientist

Ms Elaine Glen – Northern Land Council

Mr Alan Hughes - Department of Business, Industry and Resource Development

Dr Chris Humphrey - Environmental Research Institute of the Supervising Scientist

Ms Michelle Iles - Office of the Supervising Scientist

Dr David Jones - Earth Water Life Sciences Pty Ltd.

Dr Rod Kennett – Parks Australia North

Dr David Klessa - Earth Water Life Sciences Pty Ltd.

Mr Ian Loftus – Office of the Supervising Scientist

Mr Richard McAllister – Office of the Supervising Scientist
Mr Dene Moliere - Environmental Research Institute of the Supervising Scientist
Mr Alan Puhavolich - Earth Water Life Sciences Pty Ltd.
Mr Mike Saynor - Environmental Research Institute of the Supervising Scientist
Dr Rick van Dam - Environmental Research Institute of the Supervising Scientist
Mr Mark Walker – Northern Land Council
Ms Claire Watt – Office of the Supervising Scientist

1 Introductory Session

1.1 Welcome and Overview

1.1.1 The meeting opened at 9.00am on Monday 13 September 2004 with Barry Hart welcoming members, observers and advisors.

1.1.2 Barry Hart welcomed Dr Jenny Stauber, recently appointed by the Minister for the Environment and Heritage to fill the vacancy resulting from the resignation of Dr Doug Holdway. Jenny Stauber then introduced herself to the meeting.

1.1.3 Barry Hart then noted the need to rearrange parts of the agenda to accommodate Arthur Johnston's absence on the Monday due to his attendance at an audit at Ranger.

1.2 Apologies and Observers

1.2.1 Barry Hart noted the apologies received from Shane Maraldo and Peter Wellings for the whole meeting, and from Arthur Johnston for Monday and from Mark Foy for Tuesday and Wednesday. Barry Hart also noted that a range of observers and advisors would be present for all or part of the meeting.

1.3 Declarations of any conflicts of interest with Agenda items

1.3.1 No conflicts of interest with any agenda items were declared by members.

2 Draft Summary Record of 13th Meeting - March 2004

2.1 Discussion of the Draft Summary Record of the 13th Meeting

2.1.1 Jill Fitch asked for a minor amendment to paragraph 3.1.18 be made, replacing "authored by only ARRTC members" to "authored by only two ARRTC members".

2.1.2 Jill Fitch asked for a minor amendment to paragraph 3.1.42, replacing "effect the milling of rock as the ore" with "affect the milling of mineralised material".

2.1.3 Jill Fitch asked for a minor amendment to paragraph 4.2.13, replacing "doses appeared to be as low as reasonably achievable" with "doses were demonstrated to be as low as reasonably achievable".

Action/Outcome No 2A:

ARRTC endorsed the draft summary record of the 13th Meeting of ARRTC, held in March 2004, subject to the changes described in paragraphs 2.1.1 to 2.1.3 of this summary record.

2.2 Business Arising

2.2.1 Barry Hart then went through the Actions/Outcomes list appended to the Summary Record of the 13th Meeting, held in Darwin in March 2004.

Action Outcome 2A

2.2.2 Barry Hart noted that a briefing on the rehabilitation bond process would be provided by the Department of Business, Industry and Resource Development.

Action/Outcome 3A

2.2.3 Barry Hart noted that the Key Knowledge Needs documents had been finalised out of session, and that the documents were subsequently tabled in the Senate in response to a question from Senator Crossin at Senate Budget Estimates in May 2004.

2.2.4 Tony Milnes noted no requests from ARRTC for any Jabiluka long term care and maintenance documents had been made. He added that EWLS is working with Ray Evans on Jabiluka issues.

2.2.5 Barry Hart noted that no work had been done in relation to future scenarios. Tony McGill then noted that the spot price for uranium was getting close to US\$20/pound and that the rising price means that future scenarios are likely to change and are therefore important. He added that uranium in the waste rock dumps at Ranger and low grade orebodies and stockpiles are likely to be milled as they become more economic because of rising price. Barry Hart also noted that extreme events would be discussed at this ARRTC meeting.

Action/Outcome 3D

2.2.6 Barry Hart noted that a paper on the ISP landscape project had been prepared for discussion.

Action Outcome 3F

2.2.7 Barry Hart noted that a paper on Nabarlek and Ranger rehabilitation had been prepared for discussion.

Action/Outcome 3G

2.2.8 Barry Hart noted that a paper on hydrological data requirements had been prepared for discussion.

Action/Outcome 3H

2.2.9 Tony Milnes tabled an e-mail from Ian Hollingsworth. The text of the e-mail is: "Reclassification of the plant community data from our detailed survey of the Georgetown analogue area is part of the proposed work, as yet not funded by ERA, to develop closure and ecosystem design criteria. Reclassification of the plant community data from our large area reconnaissance survey to identify environmental gradients would not be very productive. The abundance data from this survey is qualitative. The reconnaissance survey design and analysis followed guidelines for cost effective survey and data analysis (Margules and Austin 1991. Nature conservation cost effective biological surveys and data analysis. CSIRO Australia). The results produced a reasonable stratification for designing the detailed, replicated plot vegetation survey in the analogue area to account for range in habitat. Further analysis of the plot study results will incorporate species abundance in the classification of plant community types for revegetation."

2.2.10 Carl Grant noted that this ARRTC request had not been followed through with action. Ray Evans then noted that the role of ARRTC is to produce strategic advice to the Minister for the Environment and Heritage, not to be an operational board of management. He then

queried what happens in relation to ARRTC actions/recommendations that do not get followed up, and whether ARRTC should pursue these scenarios with the Minister. Tony Milnes noted that both sides fail to follow up with actions arising from ARRTC meetings.

2.2.11 Gerald Nanson noted that all stakeholders had very busy lives and that there may be better ways of getting things done (such as workshops) rather than more meetings. He noted the March 2004 Ranger incident as something that had impacted upon the ability of stakeholders to follow-up actions from the previous ARRTC meeting.

2.2.12 Barry Hart noted that some ARRTC members had come to Darwin to participate in workshops on various issues. Carl Grant agreed that there needs to be more use of out-of-session work to build links between the various players.

2.2.13 Gerald Nanson observed that it could be a bit blunt to tell the Minister about ARRTC's views on progress in relation to issues. He noted that it may be appropriate to change the way that the Committee operates and make the processes less adversarial. He expressed the view that a more integrated approach could be useful, with more time being spent on specific areas.

2.2.14 Tony Milnes then noted the need for breakout sessions, away from the formal meeting process. He added that there is a need to resolve agreement on the scientific issues, and noted that ERA funding is a recurrent issue in relation to EWLS work.

2.2.15 Carl Grant expressed the view that any gaps between ARRTC expectations and actual activity should be raised in the Chair's letter to the Minister. Barry Hart advised that he had raised gaps with the Minister in earlier letters.

2.2.16 Terry Hillman then noted the absence of a strategic plan to track progress against actions. Max Finlayson responded, noting that the prioritised Key Knowledge Needs document is a useful document and needs to be further developed. For example, which "A" actions are higher than others and what areas need more intense investigations.

Action/Outcome 3I

2.2.17 Barry hart noted that an update from Tony Milnes had been provided on landform/revegetation. Carl Grant asked whether that was the actual paper requested, and Tony Milnes responded, noting that the revegetation project has not yet reached its next phase.

Action/Outcome 4C

2.2.18 Jill Fitch advised that this been deferred. Tony Milnes added that the Ranger incident had occurred and that this had interrupted ERA's implementation of ARRTC actions. He added that Alex Zapantis is now working for ERA and will be looking after radiation issues at Ranger.

Action/Outcome 5A

2.2.19 Barry Hart sought clarification on what the original request actually meant. Ray Evans noted that he had provided feedback to Michelle Iles on upstream versus downstream issues. He noted that more work is needed in this area and that the conceptual model is not robust. He queried whether any alternative conceptual models were available.

Action/Outcome 5B

2.2.20 Ray Evans asked about Jabiluka Land Application Area issues, and what actions were likely (for example, scraping soil). Tony Milnes noted that ERA has not yet completed work on this subject and that a close-out report is still underway.

Action/Outcome 6A

2.2.21 Barry Hart noted that information from Parks Australia North had been provided.

Action/Outcome 6B

2.2.22 Barry Hart noted that a paper on Arthur Johnston's attendance at a conference in Stockholm had been provided out of session.

Action/Outcome 7A

2.2.23 Barry Hart noted that Dr Jenny Stauber had now been appointed to fill the vacancy resulting from Dr Doug Holdway's resignation.

Action/Outcome 7B

2.2.24 Barry Hart advised that he had not yet written the letter to the Minister but that he would write to the incoming Minister shortly after the 9 October Federal election.

Action/Outcome No 2B:

ARRTC asked Ian Loftus to clarify the *Action/Outcome* list from each meeting with members prior to the distribution of the draft Summary Record of each ARRTC meeting.

3 Research Activities and Key Knowledge Needs

3.1 Key Knowledge Needs

3.1.1 The meeting discussed the final *Key Knowledge Needs* document and final *Prioritised Key Knowledge Needs* (prioritised) document which were both endorsed by ARRTC following the March 2004 ARRTC meeting. Comments were sought from members on issues arising from individual components of the Key Knowledge Needs. Members then discussed specific issues arising from the Key Knowledge Needs documents.

3.1.2 In relation to point 2.1 in the *Prioritised Key Knowledge Needs* document, it was suggested that "Geomorphic behaviour and evolution of the landform" be changed to "Geomorphic and geochemical behaviour and evolution of the landform".

3.1.3 In relation to Key Knowledge Need 1.1, under *Atmospheric transport of radionuclides*, Jill Fitch suggested that "dose rates" be replaced with "doses".

3.1.4 In relation to Key Knowledge Need number 1.2 under *Ecological risks via the surface water pathway*, it was requested that the words "transport/exposure" should be replaced with "transport/exposure/effects".

3.1.5 Also in relation to Key Knowledge Need 1.2, under *Wetland filters*, there was then some discussion, with queries raised in relation to migratory bird species eating food plants from wetland filters. Max Finlayson noted that this issue was raised in relation to biophysical pathways. Rod Kennett then noted that this topic was of interest to Traditional Owners. There was then some discussion on different *eleocharis* species. Terry Hillman then noted that different species absorb metals at different rates.

3.1.6 In relation to Key Knowledge Needs 2.1 under *Radiological characteristics of the final landform*, it was noted that "also be assessed so that" should be replaced with "also be reviewed so that". Also under Key Knowledge Need 2.1, under *Establishment and*

sustainability of ecosystems on mine landform, the words “the exclusion of weeds” should be replaced with “the control and exclusion of weeds”.

3.1.7 There was then some discussion on weeds. It was noted that the exclusion of weeds is often impractical, and that the focus should be on weed control rather than exclusion. Max Finlayson sought clarification in relation to the responsibility for control of weeds in the rehabilitation context, particularly in relation to responsibility for post-rehabilitation weed management. Carl Grant noted that ERA is currently looking at weed management onsite, and that the whole weed issue is far from simple.

3.1.8 In relation to Key Knowledge Need number 2.4, under *Active treatment technologies for specific mine waters*, it was suggested that the words “include treatment technologies” should be replaced with “include developing new treatment technologies”.

3.1.9 There was then some discussion in relation to uncertainty analysis and risk. It was noted that Cameco was alleged to have made a statement at Oenpelli that there would be “no risk” in exploration and mining was raised. Members sought views on risk factors in relation to mining. Tony McGill then noted that everything has some level of risk, and that Cameco has generally high standards. He added that he would be curious as to what Cameco actually meant, noting that he felt that that had probably implied that any risk was minor and manageable. There was then some further discussion on risk, with Barry Hart noting that ARRTC used risk-based assumptions and Mark Foy noting that the NLC has maintained that there is always an element of risk in any activity.

3.1.10 In relation to Key Knowledge Need number 6.2, under *Uncertainty analysis of data and communication* it was noted that “high risk” and “great risk” should be replaced with “higher risk” and “greater risk”.

3.1.11 Barry Hart then asked Jenny Stauber about her impressions of the Key Knowledge Needs. Jenny Stauber responded noting some issues in relation to ecotoxicity. There was then some discussion on toxicity and risk pathways, with Rick van Dam noting the need to emphasise pathways and exposure issues in work undertaken.

3.1.12 Rod Kennett then asked to make a comment on the Key Knowledge Needs. He noted that the title itself was appropriate but needs to be more specific to uranium mining. He suggested that the title include words linking the Key Knowledge Needs to uranium mining in the Alligator Rivers Region.

3.1.13 Rod Kennett then offered some comments on the Key Knowledge Needs documents. Rod Kennett then noted that a Parks Australia North project involves looking at old pre-mining aerial photos to consider the changes to the landscape resulting from mining.

3.1.14 There was then some general discussion on the inclusion of Nabarlek in the Key Knowledge Needs, with some members noting that additional context needed to be provided around references to Nabarlek.

3.1.15 Jill Fitch then noted the document itself did not have a date or version number. Barry Hart then suggested that the Key Knowledge Needs documents amended in accordance with suggestions made at this meeting should be dated 15 September 2004, and then sought the meeting’s views on a possible periodic review process.

3.1.16 Carl Grant then sought the views of Max Finlayson and Tony Milnes on potential review mechanisms and processes, particularly in relation to frequency of review. Ray Evans suggested that discussion of Key Knowledge Needs in meetings would be around the highest

priority projects and that the Key Knowledge Needs themselves would give structure to the discussions.

3.1.17 Max Finlayson noted that ERISS is required to have a work program in place by 1 July each year. He then noted the need for further information to guide the work planning process. Tony Milnes then noted the six month gap between ERISS and EWLS project planning processes as ERISS operates on a July-June (financial) year and EWLS operates on a January-December (calendar) year.

3.1.18 Barry Hart then asked why there is a need to change the Key Knowledge Needs document each year. He noted that ARRTC is supposed to be strategic rather than operational and that a two-yearly revision cycle would be more appropriate.

3.1.19 Carl Grant then noted that lots of discussion in relation to the Key Knowledge Needs had occurred at the March 2004 meeting, and that Arthur Johnston and Tony Milnes had subsequently put in significant effort in getting the document finalised. Carl Grant, and other members, noted satisfaction with the quality of the documents.

3.1.20 Ray Evans then asked what would occur with the priority list, and Barry Hart advised that priorities would be included in his letter to the Minister. Ray Evans then noted the need to look at the priority list in greater detail, and to identify which activities requiring an ongoing focus and which require a watching brief.

3.1.21 Terry Hillman then expressed a view that Barry Hart's letter to the Minister should include a review of this meeting, and should draw the Minister's attention to important issues, and not to interfere with workplans.

Action/Outcome No 3A:

ARRTC:

- Thanked Arthur Johnston and Tony Milnes for the out-of-session work undertaken to achieve finalisation of the Key Knowledge Needs documents;
- Agreed that the Key Knowledge Needs documents would, following incorporation of the amendments described in paragraphs 3.1.1 to 3.1.21 of this Summary Record, be referred to as the *Key Knowledge Needs 2004-2006*; and
- Agreed that the Key Knowledge Needs would reviewed on a two-yearly cycle.

3.2 ERISS Research

ERISS Thematic Workplans

3.2.1 Max Finlayson talked to the paper which detailed the ERISS thematic workplans. The themes in the workplan mirror the themes in the ARRTC Key Knowledge Needs. Max then noted the context of the plan, and that it exists with the Department's hierarchy of corporate documents. Max then referred to the audit of the Supervising Scientist Division, noting the views of the Department of the Environment and Heritage on how documentation in relation to planning processes should be structured.

3.2.2 Max Finlayson then noted that a number of staff changes had included at ERISS and OSS since the March 2004 ARRTC meeting. These changes included the loss of Peter Waggitt and Paul Martin to the International Atomic Energy Agency in Austria and Alex Zapantis to Energy Resources of Australia Ltd in Jabiru.

3.2.3 In relation to the first theme, *Rehabilitation*, Max noted that a meeting had been held with Carl Grant in Darwin.

3.2.4 Talking about the second theme, *Landscape Analysis of Impacts*, Max Finlayson noted that work in this area must occur within the next six months.

3.2.5 Max Finlayson then talked about ongoing discussions on the management of the Jabiru Field Station, and that current thinking is based on a separation of the operational and quality control processes. Max Finlayson then noted that ERISS is planning to publish a single annual snapshot of monitoring data.

3.2.6 Barry Hart then asked about quality assessment and control processes at the Jabiru Field Station, and sought Max Finlayson's advice as to where it appears in the ERISS Key Knowledge Needs paperwork. Max Finlayson advised that it appeared on page 10 under *Theme 5 Surface Water Monitoring*. Max Finlayson agreed to identify this topic as a separate project.

3.2.7 In relation to theme number six, *Radiological Risk*, Max Finlayson noted that Paul Martin was now working for the International Atomic Energy Agency in Austria. Members then queried the relationship between this theme and mine closure.

3.2.8 There was then some general discussion on food pathway issues. It was noted that, whilst this topic is essentially an assurance program for local Aboriginal people, there is a need to incorporate the views of local Aboriginal people on an ongoing basis. Jill Fitch asked if the diet used as the basis for these assumptions had been updated, and Max Finlayson noted that the current diet had not been updated since the 1980s despite substantial change to the diet used by Aboriginal people in the region since that time.

3.2.9 In relation to theme number seven, *Communications and Knowledge Management*, Max Finlayson noted that the Supervising Scientist's Jabiru-based Aboriginal liaison officer had resigned and that the position is in the process of being filled. Max then noted that uncertainty and risk issues were a key part of communications issue, and that embedding communications into the work programs of individual staff was an important ongoing task. He then noted that the external audit of the Supervising Scientist Division had recommended changes to internal communications and Knowledge Management and that some changes are currently being implemented.

3.2.10 Max Finlayson then added that some other important issues in relation to local communications involve the development of working relationships with both people and organisations. He then noted that indigenous employment and training activities, such as the use of Mirarr people in stream monitoring, have been working well for some years.

3.2.11 Max Finlayson then noted that the radiation exposure issues are a gap in the ERISS skill base at the moment, and that ways of overcoming this problem are currently under consideration. Jill Fitch expressed an interest in being kept informed, and advised that she can assist Max Finlayson in this area.

3.2.12 Terry Hillman then passed favourable comment on ERISS' institutional flexibility, noting that it is commendable to see what has been done in a relatively short period of time. He noted that the ERISS work allowed ARRTC to see the big picture.

3.2.13 Carl Grant noted the inclusion of "people weeks" in the ERISS documents, and asked whether there was sufficient flexibility to allow resources to be diverted in accordance with changing levels of priority. He also raised the issue of surface water monitoring, and whether

resources could be diverted in that area. Chris Humphrey noted that resources currently devoted to Jabiluka would be available soon for other activities.

3.2.14 Barry Hart then raised the subject of research versus monitoring. He noted that a good deal of ERISS could be regarded as monitoring rather than research. Carl Grant then noted that monitoring does appear in the Key Knowledge Needs – intended – person weeks for this to see how resources are being applied

3.2.15 Terry Hillman then noted that ARRTC is not a board of operational control and that the Committee needs to be careful not to get too involved in the micro-management of research and monitoring activities.

Action/Outcome No 3B:

ARRTC:

- Thanked Max Finlayson for the update on ERISS action in relation to the Key Knowledge Needs;
- Noted that quality assessment/control would be identified as a separate project in the ERISS Key Knowledge Needs documentation; and
- Asked Max Finlayson to include reference to the application of human resources (in person weeks) for past, current and future projects so that changes in priorities could be tracked.

ISP Landscape Paper

3.2.16 Peter Bayliss gave a presentation and talked to the paper *Review of the ISP Landscape Program (2003-2004) in the Alligator Rivers Region*. He noted that this issue has been on the ARRTC agenda for several meetings. He noted the links between the ISP issues and those addressed in the Key Knowledge Needs.

3.2.17 Tony McGill asked how weed species were spread, and Max responded, noting that weeds generally propagated through a vegetative method. He added that some of the weed grasses had been initially spread by aircraft in order to provide cattle feed.

3.2.18 Ray Evans then noted that the floodplain is key because of potential threats. He noted water pathways and then asked about the other pathways such as terrestrial. He believes that the ISP was interested in all vector pathways through the area.

3.2.19 Tony McGill then asked about cane toads as a potential threat to the aquatic and floodplain environments. Rod Kennett advised that cane toads had resulted in a ~60% decline in the number of goannas in some areas, and that there are currently no long term means to control toads. Rod noted that there is little that can be done at the landscape scale in relation to toads. Tony McGill then asked if cane toads could be ranked with other potential threats such as uranium mines as.

3.2.20 There was then some general discussion on landscape wide risk issues, with members also raising potential threats such as mimosa and salvinia. Barry Hart asked about the paper's recommendations, and Max explained that the concept of landscape should be regarded as broader than just the uranium mine.

3.2.21 Ray Evans then asked if the approach could be used for other risks, such as windblown radiation, magpie geese and sentinel wetlands. Ray then asked about the ways in

which Traditional Owners used land, and noted the ISP reference to social/human elements. He then raised the issue of humans as a potential pathway for containment transfer.

Action/Outcome No. 3C:

ARRTC:

- Expressed satisfaction with progress on the ISP landscape analysis process;
- Noted that the work is world's best practice; and
- Noted that a refocussing of some elements of work looking at the broader framework should be considered, with a focus on the communication of risk/communication issues.

Extreme Events in the Alligator Rivers Region

3.2.22 Mike Saynor talked to the paper *Extreme Events in the Alligator Rivers Region*.

3.2.23 Terry Hillman noted that the issue of extreme events appears to fit in several different places within the Key Knowledge Needs, and he noted the variety of approaches and models used in dealing with extreme events. Barry Hart advised that he felt comfortable with extreme events being included across the range of existing Key Knowledge Needs, and not within any specific Key Knowledge Need.

3.2.24 Gerald Nanson noted the uncertainty of extreme events, and that they are very difficult to predict and model. Gerald Nanson added that this uncertainty was also linked to the future of mining at Ranger. Ray Evans then noted his interest in the broader RLO issues, noting the increased potential to have an extreme event cause problems.

3.2.25 Max Finlayson then asked the meeting about the level of priority that extreme events should be given. Terry Hillman and other members advised that this topic is a high priority.

3.2.26 Gerald Nanson congratulated Mike Saynor on the quality of the paper. He then noted the possible problem of using the existing record as a basis for predicting the future. He expressed a belief that there is a need to look at the paleo record.

3.2.27 There was then some general discussion on the issues and other research/work already done in relation to extreme events. Mike Saynor then asked members whether they felt that Katherine Gorge could be a useful analogue for the Alligator Rivers Region, and Gerald Nanson responded, noting that it could be useful despite certain limitations.

3.2.28 Tony McGill then raised the example of a mine located close to the Northern Territory/Queensland border which was hit by several cyclones in a short period of time. He noted that this example has potential importance to other mines, including those beyond the Alligator Rivers Region. He noted deficiencies in the available data on this type of extreme event in relation to mines.

3.2.29 Gerald Nanson then advised that he wants extreme events included in the Key Knowledge Needs document, subject to a future review of the Key Knowledge Needs document.

3.2.30 Barry Hart noted that this issue is a key priority, as is revegetation. He also noted the issue of broader risk assessment, and that Max Finlayson will talk with Mike Saynor and other ERISS staff in relation to this topic.

Action Outcome No 3D:

ARRTC:

- Thanked Mike Saynor for his paper;
- Noted the importance and potential sensitivity of this work; and
- Noted that ERISS will include extreme events as an issue for discussion with a view to developing a paper for the next ARRTC meeting.

Revegetation Research for Nabarlek and Ranger Minesites

3.2.31 Peter Bayliss talked to the paper *Revegetation research for Nabarlek and Ranger minesites: Progress Report September 2004*. He noted that this is an update of the presentation given at the 13th ARRTC meeting held in March 2004.

3.2.32 Peter Bayliss talked about revegetation and the original revegetation aims, and responded to Jenny Staubers question on the revegetation criteria had changed.

3.2.33 Tony McGill then noted the subject of sovereign risk. In the Nabarlek context, he noted that the mining company did what the experts of the day put forward (under Government direction) and were now being asked to do more. He queried what the mining company would be required to do if the proposed revegetation initiatives did not work. He asked whether it would not be unreasonable for the Government to now assume some of the risk.

3.2.34 Jenny Stauber suggested that it would be useful to consider why revegetation at Nabarlek had not worked. Tony McGill noted that many of the current problems were known back in the 1980s and 1990s when the revegetation strategies were being drawn up. He noted that the experts of the 1980s and 1990s had come up with a solution that had not worked and that he believed that this now provided a “feeding frenzy for research”.

3.2.35 Carl Grant then asked what needed to be done to make revegetation at Nabarlek work successfully. Barry Hart asked the meeting whether this is ARRTC’s role. He noted that ARRTC had already commented on the science.

3.2.36 Carl Grant supported Peter Bayliss’ suggestion that a specific resource should be engaged to coordinate the revegetation process at Nabarlek.

3.2.37 Jenny Stauber asked about possible ramifications for Ranger revegetation. Tony Milnes then noted that the original Nabarlek strategy had been developed by a group of “experts” sitting around a table, and that things were now treated differently. He added that that many mines around the world were making the decision to not hand back land as that option was easier than testing the success of a mine closure plan.

3.2.38 Mark Foy then suggested that there is a need to do something positive at Nabarlek, and that plenty of data and other information is available. He noted that new revegetation practices and techniques should be applied to Nabarlek.

3.2.39 Barry Hart then noted that, using science based criteria, Nabarlek had been unsuccessful as a revegetation exercise. He noted that the revegetation was unsuccessful according to the criteria specified.

3.2.40 Carl Grant then noted the need to do planting, and noted that he saw the revegetation islands as very positive. Tony McGill noted that he saw one of the key problems as the lack of an overstorey layer.

3.2.41 Gerald Nanson then asked the meeting whether ARRTC members felt that Nabarlek could be rehabilitated if we started from scratch. He noted that agricultural scientists did field trials of the surface material to assess success and that such techniques could be used in minesite rehabilitation.

3.2.42 Barry Hart noted the involvement of Dr Sean Bellairs from the Charles Darwin University, and that this type of collaborative venture is positive and should be supported by ARRTC. He encouraged his involvement in the future, and supports linkages and collaborative ventures.

Action/Outcome No 3E:

ARRTC:

- Thanked Peter Bayliss for his paper and presentation;
- Expressed support for the Ranger revegetation strategy; and
- Expressed support for the consideration of indigenous cultural values in revegetation planning and implementation.

Review and Risk Assessment of Bioaccumulation and Trophic Transfer

3.2.43 Rick van Dam spoke to the paper *A review and risk assessment of bioaccumulation and trophic transfer of metals and radionuclides associated with mining in the Alligator Rivers Region*.

3.2.44 Tony McGill then asked about the wetland filters at Ranger, and whether they are practical accumulators. He noted interest in the data from the wetland filters that could assist in the study of trophic transfer.

3.2.45 Barry Hart then raised bioaccumulation in bushtucker as a possible issue for further consideration. There was then some general discussion on bioaccumulation issues with Barry Hart noting that the study had comprehensively considered effects but that more work was required on consequences. Chris Humphrey then noted that it is appropriate to use wetland filter data in view of the bioaccumulation work that has already been done. Rick van Dam then noted there are problems with some of the data.

3.2.46 Barry Hart noted the sporadic nature of the research, and suggested that the work needs to be pulled together.

Action/Outcome No 3F:

ARRTC:

- Thanked Rick van Dam for his paper; and
- Noted that a further paper would be prepared for the next ARRTC meeting.

Sediment Delivery Sensitivity

3.2.47 Ken Evans spoke to the paper *Sensitivity of methods used to monitor suspended sediment delivery from ARR mine sites to receiving (surface) waters*. This paper is a follow-up to issues raised in previous ARRTC meetings. He noted that the earlier work has now been refined

3.2.48 Barry Hart then asked Ken about the equation, and that Ken Evans and Dene Moliere explained the elements in the equation, noting that it is a power equation. Barry Hart then asked if the equation was based on loads for certain events or for a whole year, and Dene Moliere responded and advised that the equation was event based.

3.2.49 There was then some general discussion in relation to statistics and methodology, and on standard deviations. Chris Humphrey talked about the ability of the model to detect events, noting that the raw data alone would not identify change. He added that the model underestimates activity.

3.2.50 Barry Hart then asked where the meeting felt this issue should be taken. Ken Evans advised that he would prefer to have an additional year of data to provide a greater depth of background on assessing how the landform responds to rehabilitation. Chris Humphrey noted that this model can also be used to assess other variables.

3.2.51 Ray Evans then asked why this work should not be undertaken at Ranger rather than a Jabiluka, and why an additional year of Jabiluka data might be needed.

3.2.52 Ken Evans noted that he wants to validate the current model, and intends to do both Jabiluka and Ranger to see if the pulse returns to baseline and to see if the landform is stabilised.

3.2.53 Chris Humphrey added that the biological monitoring program is also being undertaken to detect possible mining-related impacts. Tony Milnes asked if the biological monitoring program showed any impacts, and Chris Humphrey advised that it did not. He added that the method is very sensitive in detecting mine-related impacts.

3.2.54 Max Finlayson then asked Carl Grant if he felt that another year of data would be warranted. Ray Evans noted that additional data would be useful if turbidity is used as a dose criteria. He added that there is a need to have quantitative data.

3.2.55 There was then some general discussion in relation to sensitivity and the ability of models to detect change. Barry Hart noted that the models appeared to be based on LOAD not on CONCENTRATION. He noted that the model could be altered to concentration.

3.2.56 Chris Humphrey then advised that he thought Jabiluka sampling should continue to give more data.

3.2.57 Ken Evans advised that he thought a pulse will occur when rehabilitation (and, therefore, disturbance) occurs. He noted that the model will be useful to see if the landform is returning to normal.

3.2.58 Ray Evans noted that, based on current assumptions, that some seven Wet seasons would occur prior to rehabilitation of the Ranger site, and that it would be prudent to start baseline sediment monitoring at Ranger sooner rather than later.

3.2.59 Ken Evans then noted that ERISS is looking at the feasibility of using the old Magela old gauging station) to do upstream versus downstream measurements.

3.2.60 Terry Hillman then noted a degree of scepticism in relation to macroinvertebrate sampling, and noted that he would prefer to see further chemical monitoring rather than biological monitoring. Gerald Nanson then queried what would happen if a further year of data gave the same results as this years data.

3.2.61 Ray Evans noted the need to integrate Ranger into Kakadu National Park as a monitoring issue for ERA and ERISS.

3.2.62 Gerald Nanson noted the data collection and suggested that it is possible to collect another year of data but that he can not see an urgent need at the moment. He suggested that it might be sensible to revisit this issue in several years.

3.2.63 Barry Hart noted that he felt that ARRTC was not convinced that this model is the best way to go in relation to monitoring at Ranger.

Action/Outcome No. 3G:

ARRTC:

- Thanked Ken Evans for his paper;
- Noted that ERISS is still waiting for Professor Fox to do further statistical analysis;
- Expressed the view that a convincing argument for continued sediment monitoring at Jabiluka had not been made, and that Ranger should be accorded a higher priority; and
- Expressed the view that the robustness of the ERISS model was not proven.

Hydrological Data Network

3.2.64 Richard McAllister talked to the paper *Hydrological Data Network*. He noted that out-of-session correspondence had taken place between Ray Evans and ERISS/OSS staff on this matter.

3.2.65 Ray Evans advised that he would be interested in Arthur Johnston's comments on the issue, but noted that Arthur was currently involved in a Ranger audit.

3.2.66 Mike Saynor noted that they could continue with existing stations, and that this would not be too expensive. Max Finlayson then noted that this type of work always had small costs but that this could become accumulative over the longer term.

Action/Outcome No 3H:

ARRTC:

- Thanked Richard McAllister for his paper; and
- Accepted the action list and recommendations in the paper.

3.3 ERA Research

3.3.1 Tony Milnes talked to the two papers provided to members. The first of the papers is a list of report titles for information. The second of the papers provides a high level overview of ERA's response to the prioritised Key Knowledge Needs document. He then provided an overview of the project funding proposals and expected timeframes.

3.3.2 Ray Evans asked whether the ERISS and ERA workplans were complementary, and meshed together with minimal duplication/overlap. Tony Milnes responded, noting that there are some areas of overlap, but that there is no unnecessary duplication.

3.3.3 Max Finlayson noted that some joint projects at lower levels do not appear in the high level overview documents.

3.3.4 Ray Evans advised that he would like to see more detail on some of the ERA projects listed in the documentation, particularly in relation to the approach/type of science being done. He noted that this would allow ARRTC to identify which ERA projects required scrutiny.

3.3.5 Barry Hart then asked what ARRTC's role should be. He noted that he feels that "appropriate science" has been addressed but that "quality of science" might need further consideration. Ray Evans then noted the original ISP request, and he feels that scrutiny of detail is required to fulfil ARRTC's remit.

3.3.6 Tony Milnes noted the MTC focus of their own research projects, whilst ERISS has a different focus due to its responsibility to the Minister for the Environment and Heritage. Barry Hart then noted that the public perception of ARRTC should be that of an independent body, and the its role is focussed on the quality of science rather than signing-off on issues.

3.3.7 Tony McGill noted that the Minesite Technical Committees were responsible to the Northern Territory Minister for Mines and Energy through the Department of Business, Industry and Resource Development. Ray Evans noted that ARRTC is not part of the approval process in relation to the MTCs; he noted that the term *appraisal* is more appropriate than *approval*. Terry Hillman added that ARRTC comments do not constitute part of the approval process. Barry Hart commented favourable on the approval versus appraisal dichotomy.

3.3.8 Tony Milnes then noted that ERA has been keeping ARRTC "key contacts" in the loop on important issues and developments as they occur. Ray Evans added that scientific deliberations by ARRTC should not constrain operational deliberations by other authorities.

3.3.9 Carl Grant advised that he prefers out of session work, as it allows feedback to be provided in a timely fashion. He noted that only the highest priority issues need to be flagged and that some more work is needed in relation to joint ERA/ERISS responsibilities.

3.3.10 Jill Fitch asked if the agendas for MTC meetings could be circulated to ARRTC members prior to each MTC meeting.

Action/Outcome No 3I:

ARRTC

- Thanked Tony Milnes for the ERA research information presented to the meeting; and
- Noted that Tony McGill would circulate MTC agendas to ARRTC members prior to each meeting of the MTC.

Magela Creek Study

3.3.11 David Klessa talked to the paper *Hydrological and mining influences on solute flux in creeks flowing within the Ranger Lease – Phase 1: Concentration variation and solute loads in Magela Creek*. He also described issues related to the Corridor Creek system which feeds into the Magela Creek system.

3.3.12 Barry Hart then asked if the three points of entry to the Magela system, and the relative percentage that each entry point contributed. David Klessa responded, advising that there is no definitive answer to that question at the moment but that this study hopes to give an idea of this.

3.3.13 Barry Hart asked how the three separate EC measures for the separate stream branches at 009 would be combined. David Klessa noted that this topic poses further questions. He added that the gauges were re-calibrated each year. Gerald Nanson then asked about manganese entering the Magela system, and about absorption. David Klessa noted that there is little dissolved manganese, and that groundwater is the main source manganese. David Jones then noted that manganese oxidises quickly and that this affects levels in downstream water loads; it is difficult to quantify manganese load levels.

3.3.14 Barry Hart then sought the views of ARRTC members on the recommendations presented in the paper.

3.3.15 Ray Evans advised that he found it difficult to comment on the paper and presentation as he was coming in cold to an area of which he had limited understanding. David Klessa then advised that it would be best to wait until the study had finished.

3.3.16 Barry Hart thanked David Klessa, and noted that he looks forward to seeing the completed work. Ray Evans then asked David Klessa to talk the meeting through the next steps in the process. David Klessa advised that he would be putting everything together and writing report now that the data has now been collected.

3.3.17 Arthur Johnston then asked David Klessa about the of origin of flow data, and the estimation of baseflow. David Klessa advised that the baseflow consists of three elements, which are shallow groundwater, seepage, and deep groundwater. He added that these elements vary during Wet seasons. Arthur Johnston then recalled the Chapman study, which suggested that Magela was feeding the aquifer. David Klessa then advised that he will look more closely at this aspect in the second phase of the study, and will also be considering other models.

3.3.18 Barry Hart then asked if there is anything special about the wet-dry tropics in relation to the use of other models. Ray Evans suggested that the conceptual approaches used in models are good and can be calibrated to suit specific conditions.

Outcome/Action No 3J:

ARRTC:

- Thanked David Klessa for his paper and presentation; and
- Expressed interest in being updated on progress at the next ARRTC meeting.

4 Monitoring

4.1 Supervising Scientist's Monitoring Program

4.1.1 Barry Hart asked Max Finlayson about possible changes to the monitoring regime currently in place at Jabiluka. Max Finlayson responded, and noted that monitoring will reduce in 2005-06, but could be reduced earlier if less is done in relation to sediment modelling.

4.1.2 Barry Hart then talked about assumptions used in setting the parameters for research, noting that the increasing price of uranium could affect priorities in relation to Jabiluka if mining proceeds at Jabiluka. Chris Humphrey then advised that he would feel more comfortable with an extra year of Jabiluka data as this provide a better baseline.

4.2 ERA Radiological Monitoring

4.2.1 Barry Hart noted that this topic had been on the agendas for the two previous ARRTC meetings. He then asked Tony Milnes for a progress/status report.

4.2.2 Tony Milnes then noted that the recent incidents at the Ranger mine had impacted upon ERA's ability to follow up on the actions of the March 2004 ARRTC meeting. Tony Milnes then advised that the recent appointment of Alex Zapantis to the position of Environment, Safety and Health Manager at Ranger would allow ERA to do further radiological monitoring work. Tony Milnes added that Alex Zapantis had planned to attend this ARRTC meeting but was required to attend the audit onsite today.

4.2.3 Jill Fitch noted that a consultant, Mark Sonter, had presented a paper to the March 2004 ARRTC meeting, and that this had been followed by a general presentation on issues including the rationale for monitoring. Jill noted that Mark Sonter and others would do more work and then would discuss further with Jill Fitch.

4.2.4 Jill Fitch advised that she was not clear of the scope of the Ranger audit conducted on Monday 13 September, and Arthur Johnston responded by giving a brief outline of the audit parameters.

4.2.5 Barry Hart noted the topic of Ranger radiological monitoring had been on several successive ARRTC agendas, and that he was concerned that it was not being addressed appropriately. Tony Milnes responded, and advised that things are currently occurring, but that current activities are being driven by the Commonwealth Minister for Industry, Tourism and Resources. Arthur Johnston then noted that significant additional human resources at Ranger for radiation protection were being put in place. These resources included Alex Zapantis as the new Environment, Safety and Health Manager, and an Assistant Radiation Safety Officer.

4.2.6 Ray Evans asked about Jabiluka monitoring and the reporting of monitoring data. He noted that there did not appear to be any assessment of reporting data with an extended assessment, and was interested in knowing whether there was another assessment mechanism. Ray then asked where the reports went, and whether there was further assessment or simply publication. He questioned whether there may be an ARRTC role in looking at monitoring reports. Tony McGill advised that he does not disagree with Ray Evans, and noted that reports are provided for each quarter, and that these reports are based on limits rather than loads. Arthur Johnston advised that his staff had commented to ERA on the lack of interpretation of monitoring data, and that this area needs further work.

4.2.7 Tony Milnes advised that the reports are a legislative requirement and that they are circulated to stakeholders for comment in the MTC forum. He feels that it is more appropriate to have ARRTC look at long-term (that is ~5 years) published data rather than short term operational data on an ongoing basis. Barry Hart then noted that ARRTC is interested in ensuring that the science is sound and that the monitoring regime is appropriate. Max Finlayson noted that ERISS is looking at publishing data on an annual basis with interpretations.

Action/Outcome No 4A:

ARRTC:

- Noted that the March 2004 incidents at the Ranger mine had drawn resources from ongoing tasks; and
- Noted that ERA will be applying additional resources to radiation issues at Ranger.

5 Operational Mining Issues

5.1 Applications

Ranger Water Treatment and RLO Applications

5.1.1 David Jones talked to the paper *Application to discharge treated water from the integrated pond and process water treatment plant at the Ranger Mine*.

5.1.2 Jill Fitch asked about the 20m of water over tailings in Pit #1, and whether this impacted upon seepage. David Jones responded, noting that the key issue is tailings consolidation and the need to have mass that can bear a capping load of rock.

5.1.3 Ray Evans asked what occurred when the three separate chemical cocktails were put into the tailings dam. David Jones responded, noting that ERA is looking at partitioning the tailings dam to separate the different types of sludge/water.

5.1.4 Ray Evans then asked where the magnesium sulfate would go. David Jones answered advising that it would end up with lime sludge, for pond water with brine stream.

5.1.5 Carl Grant then asked whether any lessons had been learned from the Jabiluka reverse osmosis experience. David Jones responded, advising that Jabiluka reverse osmosis had been an unfortunate experience due to bad products being used. He cited supplier failure as well as an also issue with algae in filters and an unanticipated algae bloom during the Wet season. He then noted that ERA has now partnered with international leaders in the reverse osmosis field, and that better products and process will be used at Ranger than were used at Jabiluka.

5.1.6 Jenny Stauber asked why iron flocculant would be used rather than other flocculants. David Jones advised that iron flocculation would be better able to absorb uranium, and would also allow the recovery of uranium from the sludge.

5.1.7 Gerald Nanson then asked about possible changes to the site hydrology, and whether the new water management plan accommodates safety margins. David Jones noted that the system still has the capacity to deal with a larger than normal Wet season and that Pit #3 can be used to store water if needed.

5.1.8 Arthur Johnston then asked about radon in the pond water, and noted that the level used to be 1Bq/L. David Jones noted that the level is ~2Bq/L at moment. Arthur Johnston then asked what the critical constituent in the water was, and whether it was uranium. David Jones noted that, initially, uranium would be important but that magnesium and SO₄ are also considered important.

5.1.9 Barry Hart asked about potential environmental stimulation resulting from the chemical composition of the water. David Jones advised that this is an important issue, and that research is focussing on activity in the wetland filters. He also noted that dilution is important.

5.1.10 Rick van Dam then asked about changes to hydrological requirements during the Wet season. David Jones noted that discharge rates are small in the context of overall Wet season flows. David Jones then noted that there are supplementary controls in place as well as a siphon to get rid of Retention Pond 1 water if needed. Tony McGill then noted that siphons/pumps would be unlikely to cope with large flood events. Tony Milnes then advised that the intent is to have water quality good enough to discharge to the environment within existing controls.

5.1.11 Tony McGill noted the potential problem of solute build-ups in Retention Pond 1 over time.

5.1.12 Mark Walker queried whether there would be any diurnal variation in water release. David Jones advised that this had not been specifically considered and that release would be based on rainfall events.

5.1.13 Chris Humphrey asked whether ammonia levels would be affected by weather conditions or at night. David Jones noted that the levels are not specifically dependent on light.

5.1.14 Ray Evans then asked about Dry season throughput in the Corridor Creek wetland filters, and whether it increases under the new water management proposals. David Jones advised that it what not.

5.1.15 Ray Evans asked about possible wetland seepage when the new system is operating, and whether any particular issues had been identified. Tony Milnes advised that there is likely to be some seepage but that several controls (such as clay lining) will be used to mitigate any impacts.

5.1.16 Barry Hart asked what contingency would be put in place in case the water treatment system failed, and David Jones responded, advising that the ultimate contingency is to suspend mining. He added that other contingency processes would be built into the processes.

5.1.17 Rod Kenett then raised the subject of phosphorus in the water system, and whether this had implications. David Jones noted that this issue was relevant in the context of stopping leaks to the system outside water system.

5.1.18 Rod Kennett queried whether phosphorus levels would impact upon aquatic plant growth. Ray Evans asked whether more phosphorus would make the wetlands lush and potentially attract more birds. David Jones noted that this topic not fully understood, but that filters were not always attractive to wetland birds.

5.1.19 Jill Fitch asked about the status of the application. Tony McGill then outlined the MTC processes, and advised that issues/changes may be raised in MTC discussions. David Jones advised that two separate issues existed: (1) approval to build/operate, and (2) environmental approval to discharge water.

5.1.20 Ray Evans asked if and when the Land Application Areas would be decommissioned if the new water treatment proposals go ahead. David Jones advised that the Land Application Areas will remain in operation, but that they will be receiving a lot less water than under current arrangements. Ray Evans then asked about the possibility of the surfaces of the Land Application Areas drying out, and whether this could contribute to things such as fire and erosion. David Jones noted that uranium concentration in sediments and in below-ground root mass might be an issue, and that some action could be required if, for example, fire occurred at a future time. He noted that this issue was closely linked to the future of Land Application Areas and their eventual decommissioning.

Action/Outcome No 5A:

ARRTC thanked David Jones for his paper and presentation.

Application to construct a seepage containment barrier in the Ranger #1 Pit

5.1.21 Alan Puhavalich talked to the paper *Application to construct a seepage containment barrier in the Ranger #1 Pit*.

5.1.22 Jill Fitch asked about the depth of the MBL aquifer, and whether it was less than RL0. Alan Puhavalich advised that it runs parallel to the pit but does not intersect the pit. He noted that it has a seepage zone into the pit.

5.1.23 Barry Hart asked how the faults had been mapped, and queried whether drilling had been the method used. Alan Puhavalich responded, advising that the fault was mapped in the 1980s and that mapping was based on geophysics and seepage, and that drilling was used.

5.1.24 Arthur Johnston then asked about the height of the edge of Pit 1 relative to RL0, and Alan Puhavalich advised that it was ~RL+20 metres at the lowest point of the edge of the pit.

5.1.25 David Jones noted that all parts of the wall of Pit 1 are permeable to some extent, and that the challenge is balancing the ratios of permeabilities and the areas of permeability.

5.1.26 Ray Evans noted that the major strategic issue is the longer-term management of tailings. Mark Walker then suggested that process water might be more of a problem than tailings. Barry Hart noted an interest in tailings modelling, and suggested that this is a high priority in ERA's planning processes.

5.1.27 Ray Evans asked Tony McGill whether there is a review process built into the MTC process. Tony McGill then noted that the stakeholders (the Supervising Scientist, the Department of Business, Industry and Resource Development, and the Northern Land Council) review and/or engage expertise to review applications made to the MTC.

5.1.28 Arthur Johnston then noted concern. His view is that the immediate need is for a barrier for water above RL0 and that the secondary issue is tailings. He noted that activities were staged in accordance with priorities. He then noted that tailings could be placed in Pit 3 as a final contingency.

5.1.29 Ray Evans then noted the urgency of the timing issues, noting that timing of the barrier has impacted upon processes. He suggested that the process had been somewhat rushed but that it was appropriate given the short time frames. Arthur Johnston advised that only a decision in relation to the barrier would be made at the MTC on 16 September.

5.1.30 Ray Evans concluded the discussion, noting that everything leaks to some extent in the longer term and that it is impossible to provide complete protection against seepage.

Action/Outcome No 5B:

ARRTC thanked Alan Puhavalich for his paper and presentation.

6 Member Reports and Updates

6.1 ERA (Ranger and Jabiluka)

6.1.1 No report provided.

6.2 Pioneer (Nabarlek)

6.2.1 No report provided.

6.3 Parks Australia

Parks Australia North Research

6.3.1 Rod Kennett talked to a paper on Parks Australia North research. Kakadu National Park does not have dedicated research staff, although some staff do some research work. The majority of research work in Kakadu is done by external organisations, often in partnership with Parks Australia North. Rod Kennett advised that the list of projects in his paper is based around a three to four year timeframe.

6.3.2 Rod Kennett then noted that cane toads will have a significant impact on Kakadu National Park and that there is likely to be the local extinction of quolls in the park. Tony McGill asked Rod if there is any information that cane toads have an impact upon the feral cats population and Rod responded, noting that there is no data. Rod Kennett also talked about rats, and the possible impact by cane toads on rat populations. Rod added that some radio tracking of goannas will be carried out to determine the extent to which goannas will survive cane toads. Goannas are a major foodstuff for Aboriginal people, and they have few other natural predators.

6.3.3 Barry Hart then thanked Rod Kennett for his presentation on Parks Australia North research and noted the strength of collaborative interaction between Parks Australia North. He particularly noted that the level of interaction appears to be improving.

Kakadu Landscape Change Project

6.3.4 Rod Kennett then talked to the draft paper on the *Kakadu Landscape Change Project*. He noted that the project was being funded via several external grants. The project is considering several issues: the savanna woodlands, boundaries (using old aerial photography to analyse changes in boundaries), tree dynamics (how forests operate), and riparian health (how riparian forests work).

6.3.5 Gerald Nanson then asked Rod Kennett if ERISS was involved in this project and Rod advised that ERISS was not involved. Rod then noted that the Charles Darwin University had put the proposal to Parks Australia North.

6.3.6 Arthur Johnston then asked whether the Charles Darwin University had spoken with ERISS first in relation to the project, and Max Finlayson advised that they had not. Arthur Johnston then expressed surprise that this issue had not been discussed with ERISS prior to the start of the project. Gerald Nanson noted that he expected better interaction with the Charles Darwin University now that Helen Garnett and Bob Wasson are now in senior management roles. Max Finlayson confirmed that there is now better interaction than there has been in previous years.

Other Tabled Documents

6.3.7 The meeting noted the papers provided by Peter Wellings in response to a request arising from the previous ARRTC meeting.

South Alligator Valley and Gunlom Issues

6.3.8 Julian Barry then provided an update on South Alligator Valley and Gunlom issues.

6.3.9 Jill Fitch asked if any issues had arisen in relation to the South Alligator Valley/Gunlom sites as part of the broader debate on the proposed national radioactive waste repositories. Julian Barry advised that none had, and that he feels fortunate that the process is tracking well. He noted that key stakeholders, such as the Environment Centre of the NT and local Aboriginal groups, had been kept in the loop. He added that stakeholders agreed that leaving the material close to its source is best outcome.

6.3.10 Ray Evans asked why check bores were required. Julian Barry responded, noting that Parks Australia North has asked for a technical paper on check monitoring pre-drilling in order to determine what underground water is doing.

6.3.11 Jill Fitch asked if the Australian Radiation Protection and Nuclear Safety Agency has given an indication of what is required for a containment site. Julian Barry noted the pre-1991 containment works, and advised that a risk assessment had been done and concrete monuments erected on containment sites at that time.

Action/Outcome No 6A:

ARRTC:

- Thanked Rod Kennett for his update on Parks Australia North research;
- Thanked Julian Barry for his update on South Alligator Valley and Gunlom issues; and
- Thanked Peter Wellings for the provision of information papers.

6.4 Department of Business, Industry and Resource Development

6.4.1 Tony McGill have an overview of the methodologies used in determining bonds under the Northern Territory *Mining Management Act 2001*.

6.4.2 Tony McGill noted that, under the *Mining Management Act*, the NT Government “may” not “must” request a bond. Tony McGill then added that this is at the discretion of the Minister.

6.4.3 Tony McGill then noted that Northern Territory legislation is different to legislation in place in other states in that bonds are reviewed and reassessed each year.

6.4.4 Tony McGill then explained that two different methods were used in determining bond levels, and that bonds can relate to more than just rehabilitation to the natural environment. He added that the value of each bond meets the needs of the NT Government, not just the estimated cost of rehabilitation.

6.4.5 The first method is based on activity-based costs estimates, for example using a quantity survey methodology. It is used mainly for small, uncomplicated mining operations. The second method uses risk-based estimates. Tony McGill then noted that the Nabarlek bond was assessed using a mixture of the two approaches.

6.4.6 Tony McGill then explained that close-out standards were not in prescribed in legislation, and that an individual mining company may negotiate agreed outcomes with the landholder and the NT Government. He added that a number of close-out certificates had

already been issued by the NT Government in relation to mining operations, and that the NT Government now has legal responsibility for those sites.

Action/Outcome No 6B:

ARRTC thanked Tony McGill for his presentation on the rehabilitation bond process.

6.5 Northern Land Council

6.5.1 Elaine Glen from the NLC introduced herself and then gave a presentation and talked to a paper on *Science, Traditional Knowledge and Mining in the Alligator Rivers Region*.

6.5.2 Elaine then noted ICSU (2002) definition that “Traditional knowledge is a cumulative body of knowledge, know-how, practices and representations maintained and developed by peoples with extended histories of interaction with the natural environment. These sophisticated sets of understanding, interpretations and meanings are part and parcel of a cultural complex that encompasses language, naming and classification systems, resource use practices, ritual, spirituality and worldview.”

6.5.3 Elaine Glen then posed questions on how traditional knowledge should be defined and what role it could play in the Alligator Rivers Region. She then sought the views of the meeting on possible future options.

6.5.4 In relation to the Key Knowledge Needs, Elaine noted that the documents refer to “knowledge” rather than “science”. She then queried ARRTC’s role.

6.5.5 Max Finlayson then advised that he felt that the paradigm has already shifted, and that the harder part is getting the traditional knowledge information rather than acknowledging its existence. Max Finlayson then noted that the NLC is represented on both ARRTC and the MTCs.

6.5.6 Arthur Johnston noted the Key Knowledge Needs closure criteria includes traditional knowledge. He noted that focus levels set for water quality were a function of Traditional Owner interaction with ERISS and other organisations.

6.5.7 Ray Evans advised that his initial reaction is defensive, and that he finds it hard to get past the “asking” stage. For example, how to get interaction between people happening rather than simply harvesting indigenous knowledge.

6.5.8 Mark Walker then noted that ARRTC has a scientific focus, and that other disciplines are (such as social and cultural) are absent. He noted that social and cultural issues are relative late-comers to the process. Terry Hillman then noted that ARRTC had been lobbying for social/cultural research for some time.

6.5.9 Arthur Johnston noted that ARRTC does not have a role in monitoring the social impact of mining, and added that Elaine Glen was talking about traditional knowledge not just social impact monitoring. Ray Evans then noted that this is a matter of more than just communications with Aboriginal people.

6.5.10 Gerald Nanson then noted that a form of traditional knowledge already exists in established science, for example the German versus United States interpretations of a landscape. He added that Australian geomorphologists have a different concept of time that geomorphologists from other countries. Tony McGill then noted the different world views

encapsulated in traditional knowledge and traditional science. He noted that it is difficult to communicate between these different world views.

6.5.11 Jenny Stauber then noted the challenge to get traditional knowledge into semi-quantitative ways to allow its use. Barry Hart then noted that Bayesian statistics can take into account different forms of knowledge, including traditional knowledge.

6.5.12 Ray Evans advised that he would like to have traditional knowledge addressed in work in the Alligator Rivers Region, and that he would like it to go beyond just communications. Barry Hart then asked the meeting if it would be beneficial to further modify the Key Knowledge Needs to take into account traditional knowledge. He suggested several approaches, such as either adding an additional dot point or making traditional knowledge more explicit in the Key Knowledge Needs documents.

6.5.13 Arthur Johnston then expressed the view that a re-examination of the Key Knowledge Needs to make traditional knowledge more explicit would be appropriate.

6.5.14 Terry Hillman then noted that key icon species could give Traditional Owners an important role in applying traditional knowledge to rehabilitation and revegetation efforts.

6.5.15 Arthur Johnston noted that traditional owners had expressed a view that they did not want a lake at Ranger following mine closure and that they had wanted the pit filled with a limit placed on the height of the waste rock dump.

6.5.16 Max Finlayson noted that this area represented an opportunity to assist the Batchelor Institute of Indigenous Tertiary Education with its progress in the area of traditional knowledge.

Action/Outcome No. 6C:

ARRTC:

- Thanked Elaine Glen for her paper and presentation;
- Endorsed the four points in the introduction to the ICSU document;
- Agreed to re-examine the Key Knowledge Needs to more explicitly incorporate traditional knowledge; and
- Noted that Max Finlayson would put together a paper on traditional knowledge for the next ARRTC meeting.

6.6 Supervising Scientist

6.6.1 Arthur Johnston gave an overview of his investigation into the recent incidents at the Ranger mine. He noted that both reports had been tabled in the Senate on 30 August 2004.

6.6.2 Jill Fitch asked Arthur Johnston what the 31 October and 31 December audit conditions were. Arthur Johnston noted that he was unsure if that information was public document. He added that ERA wrote back to Minister Macfarlane advising what they could do. Arthur Johnston noted the need for the Supervising Scientist to liaise with the Department of Business, Industry and Resource Development in relation to the October and December audits.

6.6.3 Tony McGill added a Northern Territory perspective noting that, under Northern Territory legislation, Mining Officers have a range of powers including the ability to shut

down a mining operation. He noted that the Northern Territory Department of Justice had been talking to Minister Vatskalis and the Department of Business, Industry and Resource Development in relation to possible legal action against ERA.

6.6.4 Tony McGill also advised that another occupational health and safety incident had occurred at Ranger, and that it resulted in serious injury to a worker. Tony McGill then noted that ERA had been warned in early March and had been threatened with shutdown at that time.

6.6.5 Gerald Nanson asked about the status Senate Inquiry recommendations, and Arthur Johnston advised that implementation of the recommendations would not have prevented the March 2004 incidents from happening.

Action/Outcome No 6D:

ARRTC thanked Arthur Johnston for his update on the investigation into the Ranger incidents.

7 Other Business

7.1.1 Barry Hart then discussed the content of his proposed letter to the Minister for the Environment and Heritage. Members made comments on the draft letter which will be sent to new Minister after the 9 October election.

8 Close

8.1 Next Meeting

8.1.1 Members discussed possible dates for the next ARRTC meeting. It was agreed that the meeting be held on Monday 28 February and Tuesday 1 March 2005 in Darwin.

8.1.2 Barry Hart then declared the 14th Meeting of ARRTC meeting closed at 5.10pm on Tuesday 14 September 2004.

Attachment A – Record of Break-out Sessions

Break-Out Sessions

Several break-out sessions were held on Wednesday 15 September. The table below records attendance at the different sessions.

<i>Theme</i>	<i>ARRTC</i>	<i>SSD</i>	<i>EWLS</i>
1. Model integration 2. Risk quantification	Barry Hart & Terry Hillman	Peter Bayliss & Rick van Dam	
3. Extreme events	Gerald Nanson	Mike Saynor	
4. Magela study 5. Minesite hydrogeology	Ray Evans & Gerald Nanson		David Klessa
6. Radiological issues	Jill Fitch		
7. Ecotoxicology	Jenny Stauber	Rick van Dam	
8. Hydrology	Ray Evans & Gerald Nanson	Ken Evans	
9. Research priorities	Barry Hart	Arthur Johnston & Max Finlayson	Tony Milnes

1 Model Integration & 2 Risk

Peter Bayliss reported back to the group on *model integration*.

Terry Hillman then posed several questions. He noted that there are lots of models (including spatial and temporal) and expressed interest in knowing how the models fitted together.

Peter Bayliss noted that *risk* and *models* mean different things to different people and that varieties of models (such as predictive, deterministic, and probabilistic) exist.

He then added that probabilistic models are seen as more appropriate as they allow different factors to be modelled.

Tony Milnes then noted that ERA is looking at natural systems models.

Barry Hart then suggest that a paper for the next ARRTC meeting is probably needed to allow this area to be progressed. He noted that this paper should consider linking models on both time and spatial scales.

3 Extreme Events

Ray Evans reported back to the group on the outcomes of the discussion on *extreme events*.

He noted several key tasks/issues that might form the basis for future papers. These are:

- Examination of the paleo-record, and consideration of what it could contribute to our understanding of extreme event impacts in the region not just at the catchment level;
- Reassessment of the north Australia extreme events record to determine the probability and frequency of extreme event recurrence; and
- Using models to predict flow impacts arising from extreme events scenarios, such as discharge events and size of rainfall events.

Ray Evans then noted that these points should inter-relate with other risk assessment models and other issues such as fire and drought. He did, however, note that he saw extreme events as being primarily a hydrological issue.

6 Radiological Issues

Jill Fitch reported back to the group on *radiological issues*. She noted that there had been staff turnover and incidents at Ranger.

Jill Fitch felt confident that Alex Zapantis would play a key role in implementing radiological monitoring reforms at Ranger, and expressed a view that ARRTC should have an idea of how things are progressing by March 2005.

Barry Hart then noted that ARRTC is still waiting for the radiological issue to be adequately address by ERA.

Jill Fitch noted the statutory monitoring and reporting requirements, and added that ARRTC could have an advisory role in relation to any new radiological monitoring program.

Jill Fitch noted that the current plan is adequate in the short term if correctly implemented, but that a better document will need in the longer (that is, 12+ months) term. Arthur Johnston noted that ERA is required to do significant work by 31 December 2004 to meet deadlines and requirements imposed recently by the Minister for Industry, Tourism and Resources.

Jill Fitch noted that the second issue, of environmental radiation monitoring, was currently being considered by Andreas Bollhofer of ERISS. She noted that work is focussing on a prioritisation of activities to determine which should be continued and which should cease.

7 Ecotoxicology

Jenny Stauber reported back to the group on *ecotoxicology* issues. She talked about current and future work programs.

She noted that ammonia is re-emerging as a potential issue in relation to the Ranger water treatment plans. She added that there is a need to revisit ammonia sensitivity, for example NOEC/triggers. She also noted possible impacts on wetlands, and that sensitivity is not fully understood.

Tony Milnes noted that wetland filters would only last as long as operations at mine last, and that they would be rehabilitated following cessation of operations.

Jenny Stauber then raised the issue of quality assurance, and that this could become a project. She noted its importance in the context of ERISS doing increased levels of commercial ecotoxicology work.

It was also noted that continuous exposure scenarios are more relevant than pulse exposure scenarios.

8 Hydrology

Ray Evans reported back to the group in *hydrology*. He noted four key issues that need to be addressed:

- Does ARRTC think that sediment transport monitoring is one of the required techniques to assess the closure criteria related to erosion at Ranger?
- Can ERISS proceed to establish the basic monitoring regime at Ranger?

- Is the method put forward by ERISS the most suitable?
- What are the priorities to achieve the best distribution of resources to achieve this?
- ERISS staff are concerned about the lack of confidence by ARRTC in the approach.

Ray Evans noted that he could not answer these questions now, but would write up to deal with out-of-session. Chris Humphrey noted interest in out-of-session involvement. Barry Hart then suggested a telephone hook-up rather than e-mail interaction as a better way of achieving progress. Ray Evans then added that he would like ERISS to talk to ARRTC in relation to the methods used.

Arthur Johnston then suggested that an ERISS paper should be completed on these issues and then provided to relevant ARRTC members for comment.

9 Research Priorities

Barry Hart reported back to the group on *research priorities*. He started by noting that discussions had only got through the “A1” list and that the group had not yet got to the “B1” list and that this also needs to be looked at. He added that a mini-workshop would be arranged for November 2004 to consider B1 priorities.

The table below shows outcomes of discussions on A1 priority topics:

Research Area (A1 Priorities)	Priority	Status (S=to start, C=continuing, Comp=almost complete)
Ecotoxicology (1.2)	Higher Lower	Magnesium Sulfate (Comp) Manganese (S)
Initial Landform Design (2.1)	Higher	Collaborative project underway/SIBERIA done (Comp) Stakeholders/redesign (C)
Containment of Tailings (2.3)	Higher	RL0 Issue (C)
Geochemical characterisation (2.3)	Lower	Yet to start (S)
Monitoring (3.1)	Lower Higher	Jabiluka sediment modelling/use of turbidity modelling Ranger
Revegetation Assessment (Nabarlek) (4.1)	Higher	Almost completed (comp)
Landscape Program (5.1)	Higher	Reassess – determine options/priorities for future
Integrated Knowledge (6.1)	Actually B1 priority	Just started – Communication aspects need to be integrated into ALL projects – depends on model integration

Barry Hart noted that monitoring appears to be the most controversial topic, particularly in relation to Ranger versus Jabiluka issues. He also noted that some monitoring decisions need to be made in relation to direction of program.

Barry Hart than noted that the biological monitoring protocols should be regarded as crucial but that they are not yet finalised. These will provide the quality assurance/quality control framework for monitoring and should be completed in time for the March 2005 ARRTC meeting.

Attachment B – List of Actions/Outcomes

<i>Recommendation</i>
<p><i>Action/Outcome No 2A:</i></p> <p>ARRTC endorsed the draft summary record of the 13th Meeting of ARRTC, held in March 2004, subject to the changes described in paragraphs 2.1.1 to 2.1.3 of this summary record.</p>
<p><i>Action/Outcome No 2B:</i></p> <p>ARRTC asked Ian Loftus to clarify the <i>Action/Outcome</i> list from each meeting with members prior to the distribution of the draft Summary Record of each ARRTC meeting.</p>
<p><i>Action/Outcome No 3A:</i></p> <p>ARRTC:</p> <ul style="list-style-type: none"> • Thanked Arthur Johnston and Tony Milnes for the out-of-session work undertaken to achieve finalisation of the Key Knowledge Needs documents; • Agreed that the Key Knowledge Needs documents would, following incorporation of the amendments described in paragraphs 3.1.1 to 3.1.21 of this Summary Record, be referred to as the <i>Key Knowledge Needs 2004-2006</i>; and • Agreed that the Key Knowledge Needs would reviewed on a two-yearly cycle.
<p><i>Action/Outcome No 3B:</i></p> <p>ARRTC:</p> <ul style="list-style-type: none"> • Thanked Max Finlayson for the update on ERISS action in relation to the Key Knowledge Needs; • Noted that quality assessment/control would be identified as a separate project in the ERISS Key Knowledge Needs documentation; and • Asked Max Finlayson to include reference to the application of human resources (in person weeks) for past, current and future projects so that changes in priorities could be tracked.
<p><i>Action/Outcome No. 3C:</i></p> <p>ARRTC:</p> <ul style="list-style-type: none"> • Expressed satisfaction with progress on the ISP landscape analysis process; • Noted that the work is world's best practice; and • Noted that a refocussing of some elements of work looking at the broader framework should be considered, with a focus on the communication of risk/communication issues.
<p><i>Action Outcome No 3D:</i></p> <p>ARRTC:</p> <ul style="list-style-type: none"> • Thanked Mike Saynor for his paper; • Noted the importance and potential sensitivity of this work; and • Noted that ERISS will include extreme events as an issue for discussion with a view to developing a paper for the next ARRTC meeting.
<p><i>Action/Outcome No 3E:</i></p> <p>ARRTC:</p> <ul style="list-style-type: none"> • Thanked Peter Bayliss for his paper and presentation; • Expressed support for the Ranger revegetation strategy; and

<ul style="list-style-type: none"> Expressed support for the consideration of indigenous cultural values in revegetation planning and implementation.
<ul style="list-style-type: none">
<p>Action/Outcome No. 3G:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> Thanked Ken Evans for his paper; Noted that ERISS is still waiting for Professor Fox to do further statistical analysis; Expressed the view that a convincing argument for continued sediment monitoring at Jabiluka had not been made, and that Ranger should be accorded a higher priority; and Expressed the view that the robustness of the ERISS model was not proven.
<p>Action/Outcome No 3H:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> Thanked Richard McAllister for his paper; and Accepted the action list and recommendations in the paper.
<p>Action/Outcome No 3I:</p> <p>ARRTC</p> <ul style="list-style-type: none"> Thanked Tony Milnes for the ERA research information presented to the meeting; and Noted that Tony McGill would circulate MTC agendas to ARRTC members prior to each meeting of the MTC.
<p>Outcome/Action No 3J:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> Thanked David Klessa for his paper and presentation; and Expressed interest in being updated on progress at the next ARRTC meeting.
<p>Action/Outcome No 4A:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> Noted that the March 2004 incidents at the Ranger mine had drawn resources from ongoing tasks; and Noted that ERA will be applying additional resources to radiation issues at Ranger.
<p>Action/Outcome No 5A:</p> <p>ARRTC thanked David Jones for his paper and presentation.</p>
<p>Action/Outcome No 6A:</p> <p>ARRTC:</p> <ul style="list-style-type: none"> Thanked Rod Kennett for his update on Parks Australia North research; Thanked Julian Barry for his update on South Alligator Valley and Gunlom issues; and Thanked Peter Wellings for the provision of information papers.
<p>Action/Outcome No 6B:</p> <p>ARRTC thanked Tony McGill for his presentation on the rehabilitation bond process.</p>

Action/Outcome No. 6C:

ARRTC:

- Thanked Elaine Glen for her paper and presentation;
- Endorsed the four points in the introduction to the ICSU document;
- Agreed to re-examine the Key Knowledge Needs to more explicitly incorporate traditional knowledge; and
- Noted that Max Finlayson would put together a paper on traditional knowledge for the next ARRTC meeting.

Action/Outcome No 6D:

ARRTC thanked Arthur Johnston for his update on the investigation into the Ranger incidents.