National Radioactive Waste Repository

Site Selection Study - Phase 2

A Report on Public Comment
November 1995

Australian Government Publishing Service
Canberra

ISBN 0 644 35929 3

Contents

Comments of Technical Aspects of the Site Selection Process

- The process
- Site selection issues
  - *General*
  - *Ecological significance*
  - *Ground water*
  - *Rainfall*
  - G*eology*
  - *Aboriginal interests*
  - *Population density*
  - *Potential land use*
  - *Who will make the decision on a preferred region?*
  - *Alternative potentially suitable areas*

Public Comments on Regions Identified in Phase 2

- General
- Olary
- Billa Kalina
- Mount Isa
- Jackson
- Maralinga
- Everard
- Tanami
- Bloods Range

Site Selection Study Phase 3

Glossary of Terms

Glossary of Abbreviations

Annex A

Annex B

Annex C

Background

Australia's Commonwealth, State and Territory governments are responsible for the management of radioactive wastes produced within their jurisdictions.

There is a long history of extensive consultation between the Commonwealth and State/Territory Governments regarding the management of radioactive waste in Australia. In 1980 a Commonwealth/State Consultative Committee (C/SCC) was established to develop co-ordinated policies for managing Australia's radioactive waste. The Committee was specifically required to look at management of radioactive waste from the medical, industrial and research use of radionuclides. The Committee found that most of the radioactive waste generated in Australia is suitable for near-surface disposal at specially selected sites, but noted that near-surface disposal facilities had yet to be developed.

In 1985 the C/SCC recommended that a national program be initiated to identify potentially suitable sites for a near-surface radioactive waste repository. An initial desktop review to identify potentially suitable regions was undertaken by State and Territory authorities using International Atomic Energy Agency (IAEA) guidelines, and the results were collated by the C/SCC.

In 1986 the Committee reported that a number of regions were likely to contain suitable repository sites and recommended that:

> *'prospective host Governments advise the Commonwealth on what basis they would proceed to detailed investigation of possible locations, and that appropriate arrangements be made to enable at least one of those Governments to proceed.'*

In March 1986 the Minister for Resources and Energy wrote to State/Northern Territory (NT) contact Ministers seeking interest in hosting a repository. All Governments supported the concept of a national repository, but only the NT Government expressed interest in hosting a repository. After lengthy consideration of its position, in April 1988 the NT Government was granted $100 000 from the Commonwealth for a feasibility study of a repository in the Northern Territory.

The Australian Nuclear Science and Technology Organisation (ANSTO) was contracted by the NT Government to carry out the study, which was completed in March 1989. It provided information on how the establishment of a repository in the NT might proceed. The NT Government advised the Commonwealth in May 1991 that it no longer wished to proceed with the repository proposal. Political rather than technical considerations seem to have caused the failure of the Commonwealth/State consultative process for siting the facility.

Agreement was reached in principle between the State/Territory and the Commonwealth Governments that a suitable site for a repository must be found. State and Territory agencies have assisted in Phase 1 and Phase 2 of the current siting study, and their co-operation will be sought in subsequent phases.

Introduction

There has been increasing objection by local communities to long term *ad hoc* storage arrangements for radioactive waste in their vicinity. For example, the Sutherland Shire Council has objected to storage of lightly contaminated soil from the CSIRO Fishermans Bend site in Victoria at ANSTO's Lucas Heights Research Laboratories and there have been objections by local residents to storage of Department of Defence radioactive waste at the Australian Defence Industries' (ADI) St Marys site in NSW.

On 1 June 1992 the then Minister for Primary Industries and Energy, the Hon Simon Crean, reiterated the Commonwealth's commitment to establishing a national radioactive waste repository and announced the commencement of an Australia-wide site selection study to identify a suitable repository site. This commitment is supported by State and Territory Governments and is embraced in the *National Strategy for Ecologically Sustainable Development, December 1992*, under Objective 19.2:

> *'Governments will: undertake a siting study to identify a short list of suitable sites for a repository for low level and short-lived intermediate level radioactive waste.'*

On 7 October 1992 the Discussion Paper *A Radioactive Waste Repository for Australia: Methods for Choosing the Right Site*, resulting from the first phase of the site selection study, was released for public comment. The Discussion Paper provided background information on radioactive waste management in Australia and demonstrated a methodology for identifying regions that may have potentially suitable repository sites, as a basis for public discussion and refining the site selection criteria. A report summarising and

responding to public comment was finalised in August 1993 and sent to all who expressed an interest in the Phase 1 Discussion Paper.

On 18 July 1994 the Minister for Primary Industries and Energy, the Hon Bob Collins, released for public comment the Discussion Paper *A Radioactive Waste Repository for Australia: Site Selection Study - Phase 2*, resulting from the second phase of the site selection study. The Discussion Paper described the application of the site selection methodology developed in Phase 1, taking into account public comment, to identify eight broad regions in Australia most likely to contain suitable repository sites. The national repository will be for disposal of low level and short-lived intermediate level radioactive wastes stemming from the medical, research and industrial use of radioisotopes in Australia.

The closing date for submissions on the Discussion Paper was 30 September 1994. However, the study group decided to accept and respond to several submissions received after this date.

Purpose of this Report

The purpose of this report is to summarise and respond in general terms to comment received on the Discussion Paper on Phase 2 of the study. Copies of this report are being sent to all groups, organisations and individuals who provided comment on the Phase 2 Discussion Paper and who have expressed an interest in the site selection study to date.

Discussion Paper

The Phase 2 Discussion Paper was advertised in major Australian newspapers, the major rural press and in regional papers in the vicinity of regions identified in the Discussion Paper. A copy of the advertisement and a list of the papers in which the advertisement appeared are included inAnnex A.

More than 1850 copies of the Discussion Paper were circulated for comment to members of the public; to Government departments, agencies and organisations; to Commonwealth/State/Territory members of Parliament; to the press; to key environmental and industry groups; to people who provided comment on the Phase 1 Discussion Paper; to people who requested copies of the Phase 1 Discussion Paper; and to local councils in the vicinity of regions identified in the Phase 2 Discussion Paper. Approximately 800 of these were sent to individuals, groups, organisations, government agencies and members of government who had shown an interest in the site selection study to date.

Figure 1 shows the total number of Phase 2 Discussion Papers distributed to Members of Parliament and the press, in the Commonwealth, in individual States and Territories, and overseas. Figure 2 shows the number of submissions received from each of these sources. The number of Discussion Papers distributed and the number of submissions received provide some indication of the level of interest in the national repository within individual States and Territories and Commonwealth agencies. Most papers were distributed in New South Wales (NSW) and Western Australia (WA), followed by Commonwealth and Parliament, then Victoria (Vic), South Australia (SA) and Queensland (Qld). Most submissions received were from NSW, SA and WA.

Fig 1: Number of Discussion Papers Distributed

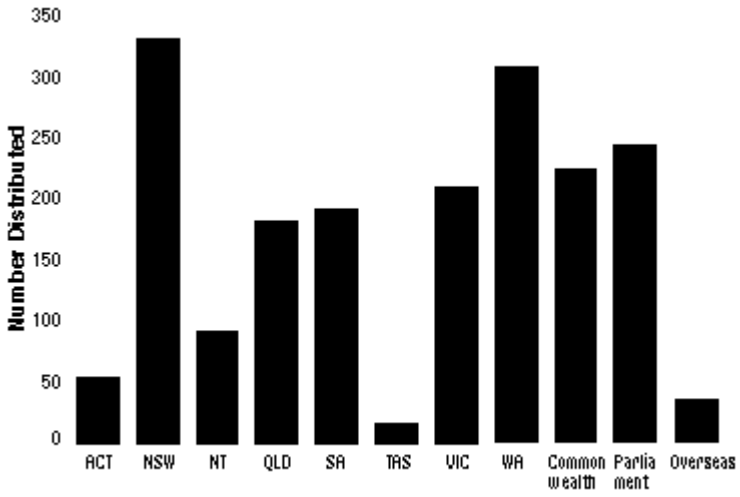
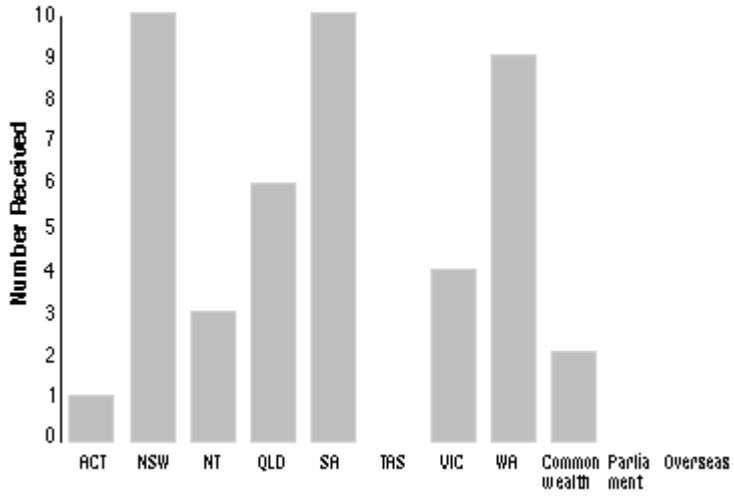


Fig 2: Number of Submissions Received



Summary of Public Comment

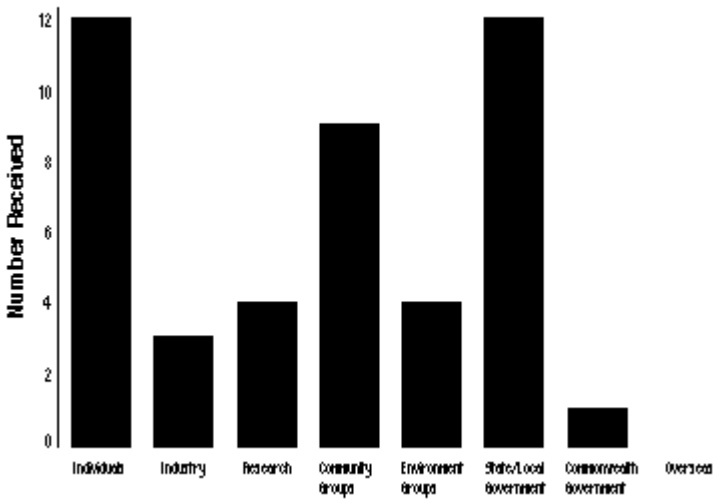
Forty five submissions were received. Of these:

- 18 supported the Phase 2 study approach and the concept of a national repository;
- 13 did not state a clear position but either requested more information or provided constructive comment on the siting process;
- 7 supported the site selection approach and the repository concept but suggested that the repository should not be sited in a particular area;
- 3 opposed the siting of the repository in their vicinity but not necessarily the repository concept and site selection approach;
- 4 opposed the concept of a national repository.

This compares with 124 submissions on Phase 1 of the study, of which 57 opposed the national repository concept (52 of these were form letters elicited by Greenpeace) and 48 supported the establishment of a national repository and the site selection approach proposed.

Figure 3 shows the number of submissions received in response to the Discussion Paper from government, research organisations, industry, environmental and community groups and individuals.

FIG 3: Number of Submissions Received from Various Interest Groups



Support

Most submissions supported the repository concept and the site selection study approach. Seven submissions supported the process but suggested certain areas within the regions identified were inappropriate for siting a national repository, either for social or technical reasons or because they did not support its establishment in their vicinity. Particular issues that attracted attention included:

- public consultation process;
- repository design issues;
- possible suitable sites;
- management of the facility;
- transport issues;
- waste minimisation;
- alternative repository concepts;
- suitability/unsuitability of particular areas within identified regions; and
- site selection methodology.

No position stated/more information requested or constructive comment provided

Authors of submissions that stated neither clear objection to, nor support for the project, either requested more information or offered constructive comment on the process. Questions were raised and/or comments offered on the following aspects:

- environmental and safety risks associated with disposal of radioactive wastes;
- transport routes/risks;
- future use of the repository;
- radioactive waste storage;
- Aboriginal interests;
- mineral potential;
- ecological significance;
- access;
- waste minimisation/prevention;
- parties who should be consulted;
- future technology for handling radioactive waste;
- alternatives to near-surface disposal; and
- suitability/unsuitability of particular areas.

One submission (Amtrust Pty Ltd) indicated that a new technology could be used for radioactive waste disposal but did not provide any details.

Objection

Objection was based principally on the following:

- transport risks;
- disposal is not ’environmental best practice’;
- disposal does not encourage waste minimisation; and
- ’not in my backyard’.

Comments on Matters Raised

In the following sections of this report comments from public submissions are summarised in italics, followed by the study group's response.

General

Two submissions, being those from National Geographic Information Systems (NGIS) and Maleny Wastebusters Co-operative (MWC), congratulated the study group on the site selection process adopted. Five submissions, from MWC, Country Women's Association of South Australia (CWASA), NSW Minister for the Environment, NT Department of Health and Community Services (NT DHCS) and Roger Alsop Consulting (RAC), acknowledged the need for the establishment of a national repository for Australia's radioactive wastes. ANSTO was 'pleased to see progress in the consultative process for the establishment of a national radioactive waste repository and the nomination of a number of regions for further investigation'.

The Commonwealth Government agrees that a suitable site needs to be located for disposal of Australia's low level and short-lived intermediate level radioactive wastes and that management of these wastes should not be left to future generations.

RAC summed up its support for the repository as follows: 'as these materials [radionuclides] exist, and are beneficial to mankind, it is better to know where they are, and that they are safe and isolated from the biosphere, rather than located in a haphazard series of storage places throughout the country with no real alternative for the user to be assured of ultimate safety for materials which are now of no further use to him ... only with a National Repository can Australians be assured that there is a proper and responsible way to dispose of used Australian radioactive materials with the appropriate disposal/safety regulations being in a position whereby a responsible procedure for disposal can be enforced.'

Opposition to siting repository in local areas

The City of Kalgoorlie-Boulder opposed the establishment of a national radioactive waste repository within the City or within adjoining municipalities and a petition containing 700 signatures of local residents opposing the repository was submitted in support of the City Council's resolution. The City of Port Augusta objected to the establishment of a national radioactive waste repository on Commonwealth -owned land near Woomera, SA.

The objective of Phase 2 was to reapply the site selection methodology outlined in the Phase 1 Discussion Paper to continental-scale information, to identify regions in which large areas satisfy the selection criteria, and to assemble more detailed, regional-scale information to characterise the site suitability within each of these regions. The purpose of the Phase 2 Discussion Paper was to facilitate public discussion and elicit advice on this process and the results.

The third and final phase of the siting study will involve identification of a region, and selection of a suitable site within that region to host a national repository. A high priority will be placed on consultation with State representatives and experts in relevant fields at a regional and local level during this process. Compulsory acquisition of a site would be a last resort. The Commonwealth will negotiate use of the preferred site with interested parties.

In parallel with the systematic search for a national repository site, the Commonwealth will consider potentially suitable areas volunteered by State Governments and local communities (see also comments below underComments on technical aspects of the site selection process - alternative potentially suitable areas).

Each State should be responsible for its own radioactive waste

Five submissions, including Country Women's Association of WA (CWA WA) and Yilgarn Shire Council, considered that each State should be responsible for the disposal of its own wastes and/or waste should be disposed of close to the site of its origin, which would minimise the risks associated with transport (including avoiding inter-state haulage) and transport costs. One individual considered that the States should follow Western Australia's example and take responsibility for the final disposal of their own radioactive wastes.

In 1986 the C/SCC reported on the management of radioactive waste arising from the medical, industrial and research use of radionuclides in Australia. The Committee agreed to investigate a national system of radioactive waste disposal on the basis that it could be wasteful of resources to establish repositories in each State and Territory and that the total amount of waste is so small as to justify only one or two facilities. Western Australia has since developed its own facility for disposal of radioactive waste at Mount Walton East.

Specific considerations in opting for a national repository rather than individual State/Territory repositories include:

- siting a radioactive waste repository is a difficult process, given that it is publicly and politically contentious. Finding a site that meets site selection criteria and that is acceptable to local communities within each State/Territory would be much more difficult than locating a single suitable national repository site. All State/Territory Governments support the concept of a national radioactive waste repository even though they have been reluctant to host such a facility.
- siting and construction of a repository is an expensive undertaking and to recoup initial establishment costs the charges for disposing of waste at small State facilities would be very high in comparison to disposal charges at a national facility. Unreasonably high disposal costs may result in the continued storage of radioactive waste in less than ideal conditions, with the attendant risk of abandonment or illegal dumping of waste. Even in countries where large quantities of radioactive waste are generated, such as the USA, France, Germany and Sweden, only one or a few waste disposal facilities have needed to be established to manage radioactive wastes.
- management of one national repository is preferable to establishing seven sites with an institutional control period of 100 to 200 years, taking account of the costs in maintaining security and loss of use of that land for the specified institutional control period.
- management of radioactive waste disposal activities, including record keeping and monitoring, at a central national facility would be more easily effected than if waste disposal were carried out at individual State/Territory facilities.

Suggested alternatives to near-surface disposal

Storage

Three submissions, being those from MWC, Queensland Greens (Qld Greens) and Communities Against Radio-active Dumps (CARD), commented that radioactive waste should be stored at an above-ground dry repository to allow for monitoring and retrieval of waste, on the grounds that some of the waste will emit radiation for 'thousands of years', making above-ground storage safer than near-surface disposal. Two submissions, including those of Greenpeace and the Spencer Gulf Environmental Alliance (SGEA), called for all radioactive waste to be stored at above-ground dry stores at the site of origin. The Women's International League for Peace and Freedom (WILPF) recommended above-ground dry storage for long-lived radioactive wastes.

The waste proposed for disposal in a national near-surface repository arises from the medical, industrial and research use of radionuclides and is generally referred to as low level and short-lived intermediate level radioactive waste. The *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (1992) defines the type of waste acceptable for near-surface disposal more precisely in terms of concentration limits for radionuclides. The waste material consists of lightly contaminated paper, plastics, glassware and protective clothing, dried residues, metal scraps, industrial gauges, luminous discs, electron tubes and lightly contaminated soil and is currently stored at temporary storage facilities throughout Australia. This waste is recognised as suitable for near-surface disposal under international guidelines, in particular those prepared by the IAEA, the international organisation responsible, among other things, for developing standards and guidelines to ensure safe management of radioactive waste.

The isolation period required for low level and short-lived intermediate level radioactive waste is relatively short (hundreds, not thousands of years) and within the period over which it is reasonable to expect that institutional control can be maintained for a near-surface repository.

Above-ground dry storage of radioactive waste at the site of origin is an approach to management of **high level** radioactive waste generated from the nuclear power and reprocessing industries in other countries, pending its ultimate disposal in deep geological repositories. Unlike the type of waste proposed for disposal in a national near-surface repository (which is of relatively low radiotoxicity), high level radioactive waste is highly radioactive, heat generating and includes significant concentrations of long-lived radionuclides. The low radiotoxicity of Australia's waste regarded as suitable for near-surface disposal does not warrant deep geological disposal. There is no technical requirement for **permanent** above-ground storage of this material, and international consensus is that there is no need to delay disposal of low level wastes. Above-ground dry

storage is an option where no disposal route is available. It is more costly than near-surface disposal in the long term and does not isolate the waste from the biosphere to the same extent.

Permanent storage of radioactive waste at the 'site of origin' does not address the community concerns that would arise from unnecessary long term storage of radioactive waste at the multitude of sites within our cities where radioactive materials are used, or the attendant possibility of their abandonment by irresponsible individuals. It is unreasonable to expect each user of radioactive materials to develop a permanent facility for storage of radioactive waste when this waste can be safely disposed of at a single purpose-built facility. In addition, that view takes no account of the fact that generators of radioactive waste, such as ANSTO, are not the only beneficiaries. Most Australians benefit either directly or indirectly from the use of radionuclides, particularly from their medical and manufacturing applications.

Internationally accepted criteria developed by the IAEA for optimal siting of radioactive waste repositories preclude the siting of a repository within highly populated areas, and suggest that indefinite storage at the site of origin is technically less than ideal. Pressure from urban communities clearly indicates that present arrangements for storage of radioactive wastes within our cities is not publicly acceptable.

Disposal of carefully packaged radioactive waste in a near-surface repository is preferable to above-ground storage, as the substrate provides an additional natural barrier to radioactivity and greatly reduces any risk of inadvertent human intrusion, vandalism and removal of radioactive material.

Current interim storage arrangements are safe, but in many cases not ideal. A national repository will remove the need for long term storage of most radioactive waste and will facilitate its controlled and co-ordinated management. Central **interim** stores will still be required for storage of radioactive waste prior to transfer to the national repository, and the establishment of interim storage facilities is the responsibility of the relevant State/Territory.

A small quantity of radioactive waste not suitable for near-surface disposal will be held in interim storage pending establishment of a final disposal facility (see response underCategory S wastesbelow).

Why not deep underground disposal?

Two submissions suggested deep underground disposal of radioactive waste. One individual suggested disposal 'deep in the rock of a mountain where there is minimum variation in temperature, water effect etc.' The other suggested disposal of radioactive waste 'in deep bores in uninhabited offshore islands'.

The waste to be disposed of in the national repository is solid low level and short-lived intermediate level radioactive waste generated from the medical, research and industrial use of radioisotopes in Australia, not long-lived intermediate level waste such as that contained in spent fuel produced from the operation of Australia's major research reactor, ANSTO's High Flux Australian Reactor (HIFAR), nor Category S wastes such as Department of Defence wastes currently stored at Woomera. Near-surface disposal is recognised as a suitable method of management for this type of waste by international guidelines and has been practised safely in a number of countries for over 30 years. The rationale behind near-surface disposal is that the isolation period required for this type of waste to decay to harmless levels is relatively short and within the period over which it is reasonable to expect that institutional control can be maintained.

Deep underground disposal is relevant only to long-lived intermediate level and high level radioactive waste. It would be a technically excessive and unnecessarily expensive approach for disposal of the solid, low level and short-lived intermediate level radioactive waste produced in Australia.

Abandoned mine site

Two individuals suggested radioactive waste could be disposed of in worked-out uranium mines or other disused mines.

This option has been noted, and will be considered if an appropriate site becomes available.

Future technologies

Two submissions, including that from Friends of the Earth (FoE), believed that waste should continue to be stored to give future generations wider management options, including allowing future advances in technology to develop which could enable utilisation of waste products. Amtrust Pty Ltd indicated that it knows of a technology currently being developed to effectively control any level of radioactive waste for disposal, involving its neutralisation, purification and conversion into a by-

product for use in applications such as road based materials or building bricks. CWA WA felt that more research needs to be undertaken into alternative methods of disposal.

The national repository will be used for disposal of Australia's current inventory of low level and short-lived intermediate level radioactive waste and estimated annual arisings for about 50 years from the date of its commissioning.

Future research may produce viable alternative disposal/recycling methods for radioactive waste. A national near-surface repository does not preclude the application of these technologies to future waste arisings, but continuing to store radioactive waste at interim storage sites around the country with an expectation that future technologies will provide alternative solutions is not acceptable, as it leaves responsibility for the management of our radioactive waste to future generations. Near-surface disposal is an internationally practised and accepted option that can be exercised now.

Waste recycling/minimisation/elimination

Ten submissions, including those of MWC, Greenpeace, FoE, SGEA, Qld Greens, CARD, WILPF and CWA WA, commented on the need for radioactive waste minimisation/recycling, radioactive waste elimination and/or phasing out the use of radionuclides altogether in preference to alternative means. One individual suggested that the waste should not exist as it should all be recyclable. WILPF considered that resources allocated for the repository would be better used to fund research and development into non- radioactive alternative technologies.

Alternatives to the creation of radioactive waste should be encouraged, and there should be strong economic incentives for industry to minimise radioactive waste production. The National Health and Medical Research Council (NHMRC) is looking at methods to encourage waste minimisation, such as the introduction of a tax to cover disposal of certain radionuclide sources. It is intended that a national repository will operate on the basis of full cost recovery. A fee can be calculated that reflects the true cost of disposal operations and encourage waste minimisation.

Recycling of radioactive wastes such as radioactive sources in gauges is encouraged by State and Commonwealth Governments, but much residual radioactive material cannot be recycled as it comprises materials lightly contaminated with radioactivity; for example, contaminated soils, plastics, paper, clothing and laboratory equipment. Many users of radiation sources have agreements providing for return of spent sources to the supplier, which may reuse components of that source.

Much of the waste currently held in storage is a legacy from past medical, research and industrial use of radionuclides. Several categories of waste are either no longer generated or the quantities produced have been reduced as a result of technological advances. Until effective alternatives are found, small amounts of radioactive waste will continue to be produced in Australia from the unavoidable use of radionuclides.

FoE rejected the assertion that there are currently no alternatives to many uses of radionuclides.

There are currently no feasible alternatives to many uses of radionuclides in medicine, industry and research. Here are some examples of the uses of radioisotopes in these fields.

- **Medicine:** the use of radiation in the form of radiopharmaceuticals enables a quick and accurate diagnosis for a wide range of conditions and diseases at any age. The injection of a radioactive tracer or radiopharmaceutical into a vein of a patient is followed by gamma ray camera or PET imaging or scanning. The use of nuclear medicine is the only way to examine whether some tissues are functioning properly. Radioactive material can also be used for therapy as well as diagnosis and can be used to treat certain conditions, particularly cancer and tumours.
- **Industry:** industry uses radiation and radionuclides in a variety of ways to improve productivity and safety and to obtain information that could not be obtained in other ways. Sealed radioactive sources are used in industrial radiography, gauging applications, civil engineering and mineral analysis. Short-lived radioisotopes are used in flow tracing and mixing measurements. Accelerators are used as sources of radiation for curing plastics, sterilising instruments, radiography and many other applications.
- **Agricultural and environmental research:** tritium and other radionuclides can be used to study important aspects of water and solute movement in the soil zone and in ground water. The studies tend to be particularly valuable in the arid zone. Radiation techniques are used in studies and control of agricultural insect pests. For instance the Sterile Insect Technique (SIT) has been used to eradicate or dramatically control fruit fly and screwworm fly populations in various countries. With SIT, male flies sterilised by irradiation are released into a population. They mate with female flies that then produce sterile eggs, breaking the life cycle of the pest.

Radioisotopes such as tritium, phosporus-32, technetium-99m and gold-198 are useful tools in studying physical, chemical and biological aspects of ecosystems. Radioisotopes such as those mentioned above are also used as tracers to measure and map effluent discharges and pollution plumes from factories and sewage plants, sand movement around harbours, rivers, bays and estuaries, termite activities and so on. Multi-element analysis, by Neutron Activation Analysis (NAA) is being increasingly used for environmental monitoring programs and is widely used for mineral sample investigations by the mining industry.

Qld Greens recommended the phasing out of ionising smoke detectors and supported the manufacture of non-ionising smoke detectors. MWC was concerned that the NHMRC's recommendations regarding the disposal of ionising smoke detectors are not being implemented.

Modern smoke detectors contain considerably less radioactivity than older types. The NHMRC considers that the benefits of using domestic smoke detectors containing radioactive elements considerably outweigh the risks of radiation exposure that may result from their use, misuse and disposal. The national repository will provide for suitable disposal of stocks of used smoke detectors.

Queensland Conservation Council (QCC) recognised the need for final disposal, stating that 'all responsible waste management strategies today are employing the "cradle to grave " concept, taking responsibility from ... generation [to] disposal', but considered that more should be done to prevent waste generation.

Category S wastes

The Central Land Council (CLC) noted that the National Radioactive Waste Repository Site Selection Study Phase 1 - Report on Public Comment 1993 stated that the repository ,could also provide interim on-site surface storage facilities for category S wastes, those not considered suitable for shallow burial...'. CLC suggested that this seemed to raise a range of safety issues that are not particularly well addressed in the study group's response.

Category S waste may be broadly described as long-lived, intermediate level radioactive waste unsuitable for near-surface disposal. The amount of Category S waste in Australia is very small, and consists mainly of scaled radium sources. These wastes will be kept in storage until a deep disposal facility is established.

In its Phase 1 Discussion Paper *A Radioactive Waste Repository for Australia: Methods for Choosing the Right Site*, the study group indicated that a national near-surface repository could provide interim on-site surface storage facilities for wastes not considered suitable for near-surface disposal. The appropriateness of storage of Category S waste at a near-surface disposal facility will depend on the site selected; in particular, site security.

As mentioned in the project study group's *Report on Public Comment on Phase 1*, the small quantity of Category S waste in existence does not justify the construction of a deep disposal facility at present. Deep underground co-disposal of radioactive waste of low radiotoxicity and Category S would be expensive unless an existing facility and infrastructure, such as an abandoned mine site, could be used.

The *Code of Practice for the Safe Transport of Radioactive Substances* (1990) specifies arrangements for the safe transport of Category S waste.

Wastes from mining of radioactive ores

One individual suggested that mining of uranium ores should be phased out. Another individual suggested that the solution to the radioactive waste problem was to stop uranium mining. FoE considered that uranium mining and milling operators must take responsibility for the management of the wastes they generate. Qld Greens and CARD considered that uranium mining should be abolished given the longevity of wastes in tailing ponds.

The wastes intended for disposal in a national repository are low level and short-lived intermediate level radioactive wastes arising from the use of radioisotopes in medicine, research and industry. Uranium mining and milling operatorsdotake responsibility for the radioactive wastes they generate, which are managed and disposed of near the site of origin at the expense of the mine operator in accordance with requirements of the *Code of Practice on the Management of Radioactive Waste from the Mining and Milling of Radioactive Ores* (1982) and its guidelines, and relevant State legislation.

Radioactive waste such as thorium hydroxide residues from the processing of radioactive monazite heavy mineral sands for recovery of rare earth minerals, could be disposed of at a national repository where the reprocessing plant was within an acceptable distance from the repository and no other suitable disposal site

was available closer to the processing plant. To date there has been no requirement for a national repository to cater for this type of waste.

Nature of the wastes for disposal

Greenpeace asked the study group to explain why some radioactive wastes referred to under Categories A-C of Phase 1 Discussion Paper are not mentioned in Phase 2.

The Category descriptions provided in Phase 1 are intended to present examples of the types of waste that may fall within each category, and are derived from the NHMRC *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (1992). Appendix 1 of the Phase 2 Discussion Paper provided a general description of the kind of waste intended for disposal at the proposed national repository. Neither list is intended to be comprehensive, but indicates the nature of wastes that may be disposed of in a near-surface disposal facility. There is no significance in the fact that these lists are not identical.

Radiation protection standards

Greenpeace was critical of the NHMRC Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia (1992), claiming the radiation protection standards used in the Code are weaker than those used by other countries. It asked why the NHMRC did not use a radiation dose limit of 0.5 mSv, recommended by the UK National Radiological Protection Board (UKNRPB) fora single installation.

The Government's approach to the dose limits has been explained in detail in response to Parliamentary questions in 1992 and in the report *National Radioactive Waste Repository Site Selection Study -A Report on Public Comment* (1993). Unlike Australia, countries such as the UK have highly developed nuclear power industries, and dose constraints for a single facility are established on the premise that a member of the public may be exposed to more than one source.

Rather than set an arbitrary limit to the radiological dose or risk resulting from a repository, the NHMRC Working Party responsible for developing the *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (1992) was concerned to ensure that the **total dose** to the public from manufactured sources, including the repository but excluding medical and natural background exposure, does not exceed the 1 millisievert (mSv) limit recommended by the International Commission on Radiological Protection (ICRP) and the NHMRC.

The*Code*introduces the concept of a dose constraint, which requires regulators to take account of sources of exposure other than the repository. In practice, this could result in a reduction in the activity concentration limits for waste to be disposed of at a specific facility, to take account of other potential sources of radiological exposure. The choice of the value for the dose constraint will be the responsibility of regulatory authorities.

To put the recommended dose limit into context, the estimated average annual exposure for an individual in Australia from natural sources of radioactivity is about 2 mSv. Of this amount, external irradiation from cosmic rays and terrestrial gamma ray sources accounts for about 55% while internal irradiation, from decay in the lungs of inhaled radon/thoron gas and from dietary intake, accounts for about 30% and 15% respectively.

Typical radiation doses for medical procedures such as conventional X-rays range per procedure from 0.02 mSv for a foot X-ray to about 3 mSv for an intestine X-ray. Radiation doses for various computerised tomography X-ray procedures range from about 2 to 7 mSv. Air travel contributes about 1.5 µSv per hour to external radiation doses and fallout from past atmospheric nuclear testing contributes an estimated 0.003 mSv per annum.

The NHMRC *Code* requires the repository operator to prepare a Radiation Management Plan (RMP) to address operational aspects of radiation safety at the facility. The RMP must meet the requirements of and be approved by the appropriate authority, and address operational aspects of radiation safety such as personnel training, personnel monitoring, record maintenance, monitoring within the operational area of the facility, designation of potentially hazardous areas, emergency preparedness, contamination control, and protective clothing and apparatus. The operator must review the RMP about every three years, and make the report available to the public and to the appropriate authority.

Environmental, human health and safety risks

Two submissions (Qld Greens and CARD) commented that the best technologies and working practices for reducing doses to the lowest level technically achievable should be enforced, in order to minimise the hazards to workers, the public and the environment. One individual asked whether there is any level at which an enclosed system of radioisotopes could be regarded as stable. FoE expressed opposition to near-surface disposal on grounds that there are some risks associated with it, such as decay of packages and possible ground water migration. NTDHCS considered that greater emphasis should be placed on human health and environmental aspects of the proposal in an open process of public consultation.

The NHMRC *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (1992) provides a basis for near-surface disposal of solid radioactive waste in a way that ensures that any risk to humans, other biota or the environment is kept to a minimum, and that future risks will not exceed those currently accepted. Waste must also be disposed of in a solid form and meet activity concentration limits and packaging requirements described in the*Code*. To be suitable for near-surface disposal of radioactive waste, the site chosen for the facility shall have characteristics that facilitate its long term stability and isolate the wastes from the environment. The selected site will also have a limit on total radioactivity, which will be determined on the basis of a safety assessment of the site. It must include a buffer zone in which environmental monitoring will be conducted to verify that there is no unacceptable movement of contaminants from the site.

The IAEA has provided detailed guidance in all areas of radioactive waste management for member states that have sought international guidance and co-ordination in the field of radioactive waste management. Development and promulgation of the Radioactive Waste Safety Standards (RADWASS) is a key activity of the Agency. The program requires development of 55 documents by the year 2001 including Safety Fundamentals, Safety Standards, Safety Guides and Safety Practices documents. Australia participates directly in the development of the RADWASS series of documents and development of the IAEA Convention on the Safety of Radioactive Waste Management, currently in early stages of development and to which Australia will become a party.

Transport of radioactive waste to the facility will proceed in accordance with the *Code of Practice for the Safe Transport of Radioactive Substances* (1990) and State regulations (see comments underTransportbelow).

SGEA considered it paradoxical that 'authorities claim there is no risk, yet very expensive transportation and storage facilities are pushed to get it out of sight and especially out of certain electorates.'

The establishment of a national near-surface repository consistent with the guidelines set out in the NHMRC*Code*is the preferred waste disposal method, and will reduce to a minimum any risks associated with wastes disposed of at the facility (see comments underSuggested alternatives to disposal - Storageabove). The cost of establishing the repository and operating costs will be recovered through a user-pays system for disposal, which will also encourage waste minimisation practices among waste producers.

Phase 2 of the study identified **regions** and made no attempt to identify individual **sites**; claims that 'certain electorates' had been excluded from the process are therefore spurious.

SGEA considered that there is no safe level of radiation.

This statement does not take cognisance of the fact that radiation, both ionising and non-ionising, is and always will be a natural part of the environment and that all creatures on this planet live essentially in a sea of radiation. All humans are subjected to ionising radiation in the form of cosmic radiation from outer space, and those people who live in locations above sea level are subjected to higher levels of cosmic radiation. The annual dose from cosmic radiation increases at the rate of 0.2 mSv per 1000 metres rise in altitude above sea level. We all receive a radiation dose from naturally occurring radionuclides in the food we eat, the water we drink, the air we breath and even the materials from which our homes are constructed. Furthermore we all receive an external radiation dose from naturally occurring radionuclides present in all soil and rock on which we stand.

The average annual effective dose from the naturally occurring ionising radiation sources mentioned above is about 2 mSv. Artificial sources of ionising radiation such as nuclear power plants and radioactive waste disposal sites are regulated to ensure that any doses to the general public are only a fraction of the dose that people normally receive from naturally occurring sources.

Any risks associated with the medical, industrial and research use of radiation are balanced by the benefits these uses confer on society (see alsoWaste recycling/minimisation eliminationabove).

Five submissions, from WILPF, CWAWA, Greenpeace, CARD and MWC, considered there to be risks associated with the waste to be disposed of at the national repository remaining radioactive for 'thousands of years'. WILPF commented that secure containment over long periods cannot be guaranteed without careful monitoring. Qld Greens considered it would not be possible to ensure the site would not be interfered with by humans or by natural forces.

These concerns are based on the incorrect notion that the category of radioactive waste to be disposed of in a national repository will be potentially hazardous for thousands of years. The radioactive waste proposed for disposal in a near-surface repository is low level and short-lived intermediate level waste arising from the medical, industrial and research use of radionuclides; its radioactivity will decay to safe levels within 200-300 years - the institutional control period of the repository. It should not be confused with the high level, long-lived radioactive waste produced in other countries' nuclear power programs (see response above underSuggested alternatives to disposal -Storage).

Radioactive waste presented for disposal must comply with the activity concentration limits established by the NHMRC *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (1992). Activity concentration limits may vary depending on the institutional period chosen by the appropriate authority. The*Code*requires that the institutional control period should be 'not less than 100 years' (Section 2.6.2). These limits will ensure only waste with very low concentrations of long-lived radionuclides will be accepted for disposal. At the end of the institutional control period no further control of the repository site will be necessary, as radioactivity will have decayed to acceptable levels. Human intrusion after this period would be unlikely, and in any case would not result in significant environmental impact or human exposure over the prescribed radiological dose limits.

Repository management

CWAWA commented that radioactive waste must be identified, and guidelines put in place for the long term management of the repository site, including time limits.

The Commonwealth Government is responsible for the effective management of Australia's radioactive waste in accordance with international guidelines, particularly those prepared by the IAEA. This responsibility is realised through Codes of Practice that cover the management of radioactive waste in Australia. The NHMRC *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (1992) was developed to provide a national standard, based on internationally accepted standards, for the management of near-surface radioactive waste disposal in Australia.

Four submissions (NT DHCS, CLC, NSW Minister for the Environment and MWC) commented on the importance of an integrated waste management approach between State and Federal authorities for the effective management of radioactive waste and for the siting of a repository. CLC commented that regulation and implementation of the NHMRC Near-Surface Disposal Code by a Commonwealth authority was required to ensure its principles were adhered to. CWAWA commented that a local 'watchdog' committee needs to be established to monitor all aspects of the repository process, and to report at given intervals to the relevant State Parliament. The NSW Minister for the Environment commented that if a site were chosen in NSW, the proposal should be subject to NSW legislation and overseen by relevant NSW agencies. MWC (referring to the Mount Isa region) considered the repository should be solely managed by the Federal Government, with adequate resources and trained staff.

Co-operation between the Commonwealth and States on radioactive waste management has taken place through the Commonwealth/State Consultative Committee (C/SCC) to develop co-ordinated policies for radioactive waste management. In 1985 the C/SCC recommended that a national program be initiated to identify potentially suitable sites for a national near-surface radioactive waste repository (see comments underBackgroundandEach State should he responsible for its own radioactive waste). The NHMRC *Code* was developed in association with and endorsed by State authorities. Arrangements for regulatory oversight of a national repository will depend on whether the repository is sited on State or Commonwealth land. Should it be on Commonwealth land, it is expected that the repository will be regulated by the Australian Institute for Radiation Protection - a statutory authority proposed to regulate radiation-related activities within Commonwealth jurisdiction.

Phase 3 of the study will involve identifying a preferred region for more detailed field investigation to select a suitable site for a repository. All affected parties, including State and local governments and communities, will be closely consulted during the site selection process.

A draft Environmental Management Plan (EMP) will be released for public comment once a site has been selected. A review of the EMP will be carried out at intervals of about three years, as required by the *Code of*

Practice for the Near-Surface Disposal of Radioactive Waste in Australia (1992). The *Code* also requires the operator to prepare a Radiation Management Plan (RMP) and contingency plans to address possible emergencies. Reports on reviews of the EMP and RMP will be made available to the public and relevant State authorities.

CWASA considered that very stringent regulations are needed for the storage of radioactive waste.

Radioactive waste storage

The study group agrees that improved storage (as well as disposal) arrangements are required for Australia's inventory of radioactive waste. The establishment of a national repository will negate the need for States and Territories (with the exception of WA, which has already established a repository at Mount Walton East for disposal of its low level radioactive wastes) to build their own repositories for the final disposal of their radioactive wastes. It will also greatly reduce the number of interim stores that currently exist, as the radioactive wastes stored at these sites will be disposed of at the national repository. Central interim storage facilities will still be required for storage of States' radioactive wastes prior to their transfer to the national repository. Establishment of these central stores will be the responsibility of the States and Territories (see also comments under Suggested alternatives to disposal -Storage above).

Worker safety

CWAWA expressed concern for the safety of the workforce at the repository site.

Guidelines for the protection of workers and the environment during operation of the repository will be followed as outlined in the NHMRC *Code of Practice for the Near-Surface Disposal of Radioactive Waste In Australia*(1992); these are based on internationally accepted standards.

Spent fuel management

One individual noted that the report of the Research Reactor Review recommended beginning work immediately to identify and establish a high level waste repository, and asked why only a repository for low level and short-lived intermediate level waste was being considered. He also raised issues regarding the management of spent fuel rods from the operation of ANSTO's research reactor.

Spent nuclear fuel from ANSTO's HIFAR research reactor is stored at the Lucas Heights site under IAEA safeguards pending decisions on its disposal. Arrangements for disposal are being considered in the context of international developments in management of spent research reactor fuel.

Options for management of this material include return of the United States origin material to the US for disposal, and reprocessing of United Kingdom origin material in the UK. Future arrangements for this material will be clearer following completion of a review by the US of its policy on return of foreign research reactor spent fuel. In 1993 the US resolved to prepare an Environmental Impact Statement (EIS) on a new proposal to accept over 15 years up to 22 000 spent fuel elements containing high enriched uranium exported from the US. A decision on the EIS is scheduled for December 1995 with implementation of the policy commencing early in 1996. If HIFAR spent fuel is reprocessed in the UK, the wastes will be returned to Australia in the form of conditioned long-lived intermediate level wastes after 25 years.

Importation of radioactive waste

Three submissions, including the City of Port Augusta and CWA WA, expressed concern that the repository could be used to dispose of radioactive waste from other countries. The City of Port Augusta was concerned that the establishment of a repository for low level radioactive waste could eventually lead to the establishment of a repository for higher level radioactive and toxic wastes from Australia and overseas.

The proposed national repository would only accept radioactive waste suitable for near-surface disposal that is produced in Australia. Most countries have made, or are making, their own arrangements for dealing with this type of waste. The proposed national repository would only be for Australia's current inventory of waste and estimated annual arisings for about 50 years from its commissioning. Long-lived intermediate level waste from the operation of ANSTO's HIFAR research reactor is not suitable for disposal in a near-surface repository (see comments underSpent fuel managementabove) Commonwealth Government policy prohibits the importation of other countries' radioactive wastes.

Future use of the facility

Four submissions, including those of CLC, Goldfields Against Serious Pollution (GASP) and the City of Port Augusta, made comments on possible future uses of the repository. CLC expressed concern regarding the type of waste to be disposed of highlighting that in its 1993 report DPIE stated the proposed future use of the repository site and its surrounding area, including co-disposal with other types of waste, will be a matter for consideration by the owners, the community and relevant Governments involved. GASP and one individual commented on the possible expansion of the facility to accept high level waste, including waste from overseas, and HIFAR spent fuel and decommissioning wastes.

The near-surface repository will only be suitable for the disposal of low level and short-lived intermediate level radioactive wastes. Co-disposal of low level and Category S waste in a specially constructed deep geologic facility is not economically justifiable at the moment, as Australia's inventory of Category S waste is very small.

HIFAR spent fuel will not be disposed of at the repository, nor will any wastes from overseas. Australian Government policy prohibits the importation of radioactive waste from other countries.

Any proposed future use of the repository site and its surrounding area, including co-disposal with other types of waste, will be a matter for consideration by the site owner(s), the community and relevant Governments involved.

Development of a deep repository for any high level radioactive waste that may arise in Australia in the future is beyond the scope of the present site selection process. The siting criteria for a HLW geologic repository are different to those for the near-surface repository.

Use of radioisotopes - food irradiation

One individual asked a series of questions about the use of radioisotopes in food preservation.

All foods contain some natural radiation, and some contain larger amounts than others; for example, coffee beans and brazil nuts have natural levels that would cause them to be classified as low level radioactive waste if they were in a nuclear power station. Food irradiation increases the safety and quality of certain food by destroying certain food-borne pathogens, making food safer and prolonging shelf-life by killing pests and bacteria. It does not, however, disguise out-of-date food, as deterioration would already have taken place. Research and experience have shown that foods such as fruits, vegetables, seafood, meats and grains are suitable for radiation processing, but that other foods such as dairy products are not.

Foods processed using ionising radiation are not rendered radioactive by the process. Food irradiation should not be confused with foods contaminated by radionuclides; those foods are rendered radioactive. The energies from the radiation sources (gamma rays from cobalt-60 or caesium- 137 sources, X-rays or electrons) used in the irradiation processing of food are too low to induce radioactivity in any material, including food, exposed to them.

Consumer non-acceptance, based on misunderstanding of what the food irradiation process entails, is one of the main drawbacks of the process. For this reason IAEA and other organisations have developed and continue to refine standards to ensure that post-treatment of irradiated food is based on documented procedures, including adequate labelling to indicate that the product has been irradiated and for what purpose.

In Australia, food irradiation has been the subject of a moratorium since December 1989. Australia commissioned the World Health Organisation (WHO) to prepare a report on the *Safety and Nutritional Adequacy of Irradiated Foods*. The conclusions of WHO's 1994 report reconfirm the international scientific consensus that food irradiation is an acceptable and safe food preservation technology. Its adoption in Australia would first require the development of a standard for irradiation of foods for inclusion in the *Australian Food Standards Code*.

User disposal of radioisotopes

One individual asked about disposal of radioisotopes in sewerage systems.

Some types of radioactive waste generated through the medical, research and industrial uses of radionuclides contain very low levels of radioactivity, or small quantities of radionuclides of short half life. They are considered safe to dispose of in conventional ways, such as at designated municipal tips or in

sewerage systems (for very low level liquid wastes). State and Territory Governments are responsible for managing radioisotopes produced within their jurisdictions, and regulations vary between and within States and Territories.

The NHMRC has developed a *Code of Practice for the Disposal of Radioactive Wastes by the User* (1985), which sets out guidelines and safe practices for the disposal of such low level wastes. This *Code* supplements existing State/Territory radiation control legislation implemented by appropriate State/Territory authorities. State/Territory regulations usually contain requirements additional to this *Code*, with which users are required to comply.

Transport

Thirteen submissions, including those from Qld Greens, CLC, CARD, SGEA, GASP, CWAWA, CWASA, Blacktown City Council, City of Port Augusta, the Country Regional Councils Association of WA (CRCAWA) and the Municipality of Peterborough SA, raised issues relating to the transport of radioactive waste from interim storage sites to the national repository. These covered safety procedures such as vehicle markings, accident risks, procedures to deal with spillages, prior notification of consignments, and safe transport routes; for example, whether vehicles will pass through populated areas, travel on sealed or unsealed roads, and so on.

Radioactive waste will be transferred to the national repository infrequently to limit transport costs and to minimise handling of waste. Only solid waste will be transported for disposal; this will be packaged, handled and transported in accordance with the *Code of Practice for the Safe Transport of Radioactive Substances* (1990) to assure public and worker safety. The transport Code sets maximum external radiation levels and specifies the types of containers to be used for radioactive waste transported in Australia. Environmental impact or damage is very unlikely during the transportation of radioactive waste, given the solid (and treated) form of the wastes and the stringent packaging requirements. The risks involved in transport are considerably lower than those associated with routine carriage of flammable cargoes on Australia's roads.

Transport infrastructure and ease of access are important factors that will be considered in the selection of a suitable site.

Emergency plans

CWAWA commented that emergency plans must be prepared for evacuation and other situations.

Contingency plans will be developed as required under the *Code of Practice for the Near- Surface Disposal of Radioactive Waste in Australia* (1992: Section 3.2.6) to address potential releases from the repository as a result of fires, operational incidents and other possible events. The probability of a release is low and the consequences would be minor, given the low radiotoxicity of most of the waste involved.

It should be noted that society accepts the operation of facilities potentially far more hazardous than the proposed waste repository, without requirements for contingency plans to address unlikely events such as earthquakes and fractures. Many of these facilities, holding flammable and toxic chemicals, are located in cities where the consequences of such an event would be far greater than in remote areas.

Climate change

Three submissions, including those from NT DHCS and SGEA, commented that the Discussion Paper did not mention the possible effects of climate change on the long term suitability of a repository site. NT DHCS considered that due to uncertainties associated with the Greenhouse effect, it would be safer to confine the facility to an area already constrained by existing radiation levels.

The repository will be designed and sited to isolate the waste from the surface environment for an institutional control period of at least 100 years. By the end of the institutional control period the radioactivity of the waste will have decayed to levels at which there will be no need for further institutional control.

Breach of the repository structure by climate change or unforeseen events, either natural or induced, is most unlikely in this time frame. Even in the event of a breach, impact upon the environment would be unlikely because of restrictions on the type of wastes accepted for disposal, packaging requirements, and the fact that the repository is likely to be situated in an arid environment. Many other factors need to be considered in assessing a site's suitability: above-average background radiation levels would be advantageous but not strictly necessary.

Quality of waste for disposal

NT DHCS commented that the Phase 2 Discussion Paper gives little indication of the quantity and deposition rates of the wastes.

Details of the quantity of State and Commonwealth radioactive waste in storage pending its disposal in a near-surface repository were provided in the Phase 1 Discussion Paper, which noted that there are around 3 300 cubic metres of waste from more than 40 years of medical, research and industrial use of radionuclides, with annual arisings of less than 60 cubic metres.

Repository design

Five submissions, those from CLC, MWC, NT DHCS, ANST0 and the Australian Nuclear Association (ANA), commented on issues relating to repository design. CLC considered the repository design parameters are not well defined (for example, the institutional control period, annual waste arisings, future use of the site). ANSTO noted that 'natural properties of a selected or volunteered site that do not meet recommended criteria can be addressed through the use of appropriate engineered design and manufactured materials. Allowing more freedom for engineers to develop various engineered repository design options during Phase 3 could increase the probability of a repository being sited closer to the required infrastructure. This in turn could provide more flexibility in the operation of the facility, and lead to more input, acceptability and support from the host community. 'ANA suggested that if outline designs are included in future reports, they should be described as illustrative only.

The final repository design, including the nature of barriers used, will be determined by the characteristics of the selected site. Once a site has been selected, the design concept will be developed and made available for public comment. The use of manufactured engineered materials such as geofabrics will be considered, depending to a considerable extent on the location and ultimate design chosen for the repository.

The NHMRC *Code of Practice on the Near-Surface Disposal of Radioactive Waste in Australia* (1992) provides information and guidelines on repository design parameters, including information on institutional control period and future land use.

MWC considered that the engineered trench structure will be insufficient to safeguard waste for thousands of years.

The waste will not remain potentially hazardous for thousands of years (see response underEnvironmental, human health and safety risks). The radioactivity of materials disposed of in a near-surface repository will decay to within safe levels within the institutional control period, which is required to be at least 100 years. The repository site and its design, involving multiple engineered and natural barriers, will provide for adequate containment of radionuclides within the repository during its operational period and well into the future.

Size of repository site

NT DHCS commented that the Phase 2 Discussion Paper provided no indication of the likely area of the repository (including buffer) and land requirements.

Page 2 of the Phase 2 Discussion Paper indicates that the study aims to locate regions most likely to contain suitable sites with areas of approximately 225 hectares. One repository site of approximately 225 hectares, which includes a buffer zone, is required to dispose of Australia's entire inventory of low level and short-lived intermediate level radioactive waste and up to 50 years of future annual arisings. The actual repository would occupy an area about the size of a football field.

SYNROC

MWC asked whether SYNROC would be used to treat wastes intended for the repository.

SYNROC will not be used for the treatment of wastes to be disposed of at the national repository. The SYNROC process was developed for the long-term immobilisation of radionuclides in high level radioactive waste from the reprocessing of spent fuel from nuclear power stations and for the remediation of defence wastes. These wastes do not exist in Australia.

Not a dump/out of sight out of mind

Three submissions, including Greenpeace, suggested that wastes would be 'dumped' at a repository site. SGEA expressed concern that outback areas are being seen as a convenient place to 'dump' all kinds of waste, including radioactive waste.

Radioactive waste will not be 'dumped' at a national repository. It will be appropriately packaged and placed in a secure, purpose-built structure, designed and managed to contain the waste material. The design, operation and monitoring of the facility will be in accordance with strict requirements under the NHMRC*Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia*(1992).

Sites versus regions

A number of submissions confused the terms 'site' and 'region'.

The **regions** are large, varying in size from 11 000 square kilometres (Everard) to 67 000 square kilometres (Billa Kalina). A repository **site** will only be approximately 225 hectares in size including the buffer zone.

The Consultation Process

FoE considered that the study does not adequately involve the public in the decision making process nor address issues such as public accountability and access to data input, and that it is not enough only to negotiate use of a site with State and local governments. In particular, FoE raised issues concerning consultation in relation to the decision to transfer wastes to Woomera for interim storage.

During Phase 3 of the site selection study use of a preferred site will be negotiated with all interested parties, including affected landholders and community groups (including Aboriginal groups), and State and local governments. One of the objectives of Phase 3 will be to raise public understanding of the proposal, to involve interested parties, and to discuss issues as they arise.

The transfer of wastes to Woomera for interim storage is a separate undertaking from the national repository, and is the responsibility of the Minister for Industry, Science and Technology.

One individual noted that regional consultation would be the most sensitive and difficult part of the Phase 3 process, requiring careful planning and management, particularly in the handling of the media.

The project study group recognises the need for a sensitive, well planned approach to community consultation during Phase 3. An outline of the proposed Phase 3 consultation strategy is given on p14 of the Phase 2 Discussion Paper.

SGEA asked why no consultation had been done with people on the ground in selected areas, in particular with Aboriginal people and people living in outback places and along proposed routes. CLC commented that the effectiveness of advertising the study in Central Australia was limited, that issues such as the nature of radiation were not well understood by the general public, in particular in a cross-cultural situation, and that more effective communication and awareness programs should be initiated.

The availability of the Phase 2 Discussion Paper was advertised in major metropolitan newspapers and in local newspapers in the identified regions (Annex A). Copies of the Discussion Paper were also sent to Aboriginal councils in the vicinity of the Tanami and Woods Range regions, and to Maralinga Tjarutja. Phase 3 will involve detailed consultation with local communities once a region has been identified.

The objective of Phase 2 was to identify *broad regions* of Australia that contain potentially suitable sites. Consultation involving individual communities in these areas was beyond the scope of the Phase 2 study, due to the vast areas involved. Detailed consultation with people on the ground will take place during Phase 3 once an area has been identified. As part of the Phase 3 consultation strategy, information leaflets, reports and a video on the proposal will be made available to the public, and media will be used to discuss all aspects of the proposal.

MWC suggested that once a site has been chosen, public consultation meetings involving representatives from the study group, the community and the conservation movement should take place throughout the area, and recommended that funding be made available for an independent assessment of the proposed site and repository design. The South Australian Environment Protection Authority (SA EPA) commented that should the selected region fall within South Australia, SA EPA and the South Australian community must be involved in the consultative process. NT DHCS commented that investigations and negotiations between the Commonwealth and the relevant State Government would be necessary past Phase 3 when a suitable site had been chosen, and considered that greater emphasis should be placed on human health and environmental aspects of the proposal in the context of an open process of public consultation.

Once a region has been identified the study group will establish an information service at a centre in the region to provide information to the public on all aspects of the proposal and record community views and concerns. The consultative and investigative process will also involve relevant State and local government agencies.

The site selection study to date has involved an open process of public consultation through the release of public Discussion Papers inviting public comment. Public comment and relevant expert advice will continue to be taken into consideration at all stages of the process -the eventual selection of a preferred region and site will primarily be based on technical suitability as well as social acceptability. Once a preferred site has been identified, the proposal will be considered in accordance with provisions of the *Environment Protection (Impact of Proposals) Act 1974*.

The NHMRC *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia* (1992) also requires the appropriate authority to prepare an Environmental Management Plan (EMP), which will be made available for review by State and community organisations. The EMP will establish performance indicators and outline monitoring procedures for acquiring data necessary to:

- assess any impact of site operations on members of the public and on the environment;
- enable early detection of any inadvertent releases of radionuclides, allowing corrective action to prevent harmful impact upon site personnel, the public and the environment; and
- project long term behaviour of the waste in the repository following closure of the facility.

Three submissions (QCC, Qld Greens and CARD) congratulated the study group on the process of public consultation for Phase 2. ANA expressed its strong support for the consultation strategy, and considered that to optimise Phase 3 activities and to minimise costs it is essential for the study group to determine at an early stage State and local acceptance of a preferred site. MWC commented it was glad that the community has the opportunity to participate in the decision-making process. RAC commended the study group on aspects of its public education strategy.

ANA welcomed and supported the statement on 18 July 1994 by the Minister for Primary Industries and Energy, the Hon Bob Collins, that in parallel with the systematic search for a national repository site, the Commonwealth would consider potentially suitable areas volunteered by State governments and local communities.

The project study group recognises the need for a sensitive, well planned approach to community consultation and has proposed a detailed consultation program. Comments on this process are sought and may be sent in writing to:

The Information Officer
National Near-Surface Radioactive Waste Repository Project
Coal and Minerals Division
Department of Primary Industries and Energy
GPO Box 858
CANBERRA ACT 2601
Telephone (02) 6272 4378
Facsimile (02) 6272 4178

Ecologically sustainable development (ESD)

QCC noted that the precautionary principle is a fundamental component of ESD and trusted that the repository would be considered within an ESD framework. GASP considered that where there is a threat of 'serious or irreversible damage,... lack of full scientific certainty should not permit measures which may damage the environment from going ahead, particularly when there are alternatives' such as disposal at Maralinga which, GASP noted, is already radioactively contaminated.

For comments on Maralinga see comments underPublic comments on regions identified in Phase 2 - MaralingaandSite selection issues - Aboriginal Interestsbelow.

The philosophy and methodology being applied to the identification and selection of a national repository is consistent with ESD principles. The site selection process has involved matching information at a national level to a series of criteria important to radiation and environmental protection, covering requirements such as low rainfall, stable geomorphology and distance from water table, among others, and to non-radiological factors such as reasonable access, potential for agriculture or outdoor recreational use. Eight regions containing potentially suitable sites have been identified via this filtering process. Once a preferred site has been identified in one of these regions, the proposal will be considered in accordance with the provisions of the *Environment Protection (Impact of Proposals) Act 1974.*

Comments on Technical Aspects of the Site Selection Process

The process

Eight submissions, including those from QCC, Qld Greens, CARD, ANSTO, RAC, Office of the Supervising Scientist (OSS) and Moree Plains Shire Council, approved of the site selection methodology. RAC considered that Phase 2 of the site selection study indicated 'a rational pathway to an ultimate national radioactive waste repository' ' One individual particularly approved of the multistage approach, the mode of analysis of criteria, issues and themes and the narrowing field of focus. Qld Greens and CARD congratulated the study group on its 'thoroughness in choosing the site selection criteria'. QCC considered that the attention to detail in the process was totally justified, and perhaps was not detailed enough, and that 'figure 2 using all themes is the most significant as none of the 13 stipulated [criteria] is extraneous'.

The versatility of the ASSESS (A System for Selecting Suitable Sites) enabled the study group to investigate the spatial consequences of removing themes that address individual criteria, providing an insight into the degree of suitability. The consideration of all criteria is the study group's objective.

Two submissions (CLC and ANA) commented that suitable areas additional to those identified should be investigated. CLC commented that the site selection process excluded too many suitable areas and has perhaps identified areas as suitable which, when looked at in more detail (particularly against social and economic criteria), may not be suitable.

The study group acknowledges that some potentially suitable areas will have been excluded and that some unsuitable areas may have been retained within the boundaries of the regions identified. This is a consequence of the extent of information available to the study group. The method anticipates this and it relies upon subsequent and more detailed field investigation.

One individual cautioned against focusing too much on a search for a highly suitable repository site, considering that a suitable site is sufficient, particularly if it is preferred for reasons not outlined in the site selection criteria.

Indications of suitability are relative, so an orientation towards 'highly' suitable areas is being used to maximise the likelihood of locating a suitable repository site.

ANA commented that the descriptions in the text of the Discussion Paper are useful but do not always adequately correlate with the information in the maps.

The study group acknowledges that more comprehensive textual descriptions of the regions as they relate to the figures could have been provided in the Phase 2 Discussion Paper.

GASP considered the ASSESS system to be a default system which selects the least bad site within limited parameters, and that what it considers to be uncertainties associated with WA's Mount Walton East repository site are reflective of potential problems with preferred ASSESS sites.

It is inappropriate to make a direct comparison and an assessment of equivalent suitability between the Mount Walton East repository and the other regions identified as being potentially suitable. It is likely that areas within some regions will share similarities with Mount Walton East, but there will be many differences also. The suitability of areas within the preferred region will be assessed in detail.

WILPF commented that the study group moved on to Phase 2 without having produced an interim report or 'a reconsideration of the wisdom of the desire for waste burial'.

An interim report on comments made by the public on Phase 1 of the site selection study, *National Radioactive Waste Repository Site Selection Study Phase 1 A Report on Public Comment,* was published in August 1993. This report included responses to questions and concerns raised in public submissions to Phase 1. This public participation process negates the suggestion that the study group moved inexorably to Phase 2.

Two submissions (CWAWA and ANSTO) agreed with site selection being made on the balance of advantages and disadvantages associated with each region according to various site criteria. Two submissions (CWA WA and OSS) commented that all of the identified regions contain suitable sites. ANSTO commented that the survey results presented in the Discussion Paper showed that a major portion of the continent contains potentially suitable locations, and commented that of the regions identified some were obviously more suitable than others.

The study group concurs.

ANSTO agreed with the biophysical themes and associated classes used by the study. ANSTO commented that some of the suitability classes used seemed arbitrary for assessing site suitability, but this has not prevented the identification of regions that contain sites suitable for an engineered trench facility if biophysical criteria are given main consideration.

Rather than 'arbitrary', the suitability classes provide a 'relative' indication. However, the classes can be redefined if a rationale for doing so can be provided.

NT DHCS commented that studying in-depth only one region during Phase 3 due to financial constraints may encourage acceptance of a site even if a suitable site is not found in the preferred region.

Australia's natural and socioeconomic situation makes it extremely unlikely that a suitable repository site cannot be located within an identified region. If, however, this did occur, then a more highly engineered structure could be used to account for site deficiencies. It should be remembered that, based on international standards and practice, Australia has adopted a very conservative approach to identify a suitable repository site.

ANSTO noted that some of the themes and suitability classes used implied a level of hazard out of proportion to the actual hazard of low level and short-lived intermediate level radioactive waste. ANSTO considered that the sheer remoteness of sites within some of the regions may lead to the misconception that the waste to be disposed of is highly hazardous: ANSTO highlighted the actual very small scale of the operation, with the disposal area to occupy about one hectare and the whole site, including the buffer zone, about one square kilometre.

The approach used is aimed at maximising the likelihood of locating a suitable site, and the conservative or severe categories relating to closeness to populated places reflect that approach. The system is capable of reviewing the outcome with a less conservative treatment. Misconceptions regarding the low-hazard nature of the waste are an unfortunate consequence of this.

ANA commented that the Phase 2 study should not have assumed that suitable areas other than Jackson do not exist in Western Australia.

It was considered unreasonable to consider other regions in WA given the prior existence of the Mount Walton East facility and the improbability of establishing two repositories in the same State.

OSS expressed concern at the degree to which site selection based on political or sociological factors may override choices made on environmental grounds. It encouraged the continuation of consultation between DPIE and the Environment Protection Agency (EPA) to ensure that environmental issues continue to be addressed.

The study group concurs.

SA EPA commented that both the radiological and non radiological criteria used in the study were appropriate.

Site selection issues

General

ANSTO commented that the remoteness of some regions (Tanami, Bloods Range and Everard) means that factors associated with accessibility, ease of construction, site security and monitoring could present practical problems and unnecessarily raise disposal costs. NGIS commented that a criterion covering the distance of the repository from temporary storage sites should be included, as accidents are most likely to occur during transportation.

These views are encompassed by the requirements of site selection criterion**i**: that the site should have reasonable access for the transport of materials and equipment during construction and operation, and for the transport of waste to the site.

One individual suggested weighting be given to a site selection criterion reflecting 'the likelihood of a relatively easy and non-controversial consultation leading to approval agreement'.

A criterion that covers the ease with which consultation would lead to agreement on a site would be very difficult to quantify and would be based on subjective judgements. Once the Government has identified a preferred region, consultation will take place with all affected parties. It is at this stage of the siting process that the relative ease with which consultation will proceed can be determined. Technical criteria will appropriately remain a prime consideration in selecting a suitable site.

One individual suggested that local knowledge of the inhabitants and customary usage of land should be added as selection criteria.

This is implicit in the broader interpretation of criteria **k** and **m**.

Information on these types of site specific issues will be gathered by the study group through community consultation within the region identified by the Government as preferred for further field investigation. Local advice will be taken into account in identifying a suitable repository site.

NT DHCS commented that it could reasonably be argued that the repository site should be confined to an area such as Maralinga where existing long term radiation will constrain land use for periods in excess of those required to allow radioactivity in the repository to decay to safe levels.

The study group agrees that a site possessing this characteristic would be desirable , providing it satisfied the other site selection criteria. For comments on Maralinga, see responses under Public comments on regions identified in Phase 2-Maralinga and Site selection issues Aboriginal interests below.

Two submissions (SGEA and QCC) commented on the wording of some of the criteria. SGEA considered that use of 'known habitat of rare fauna and flora' in criterion* j *is simplistic considering Australia's vastness and the relatively little known about the environment. SGEA also noted ~ apart from rare fauna and flora the criteria only deal with human-induced activities. QCC considered that use of the words 'unlikely' and 'should' in the criteria implies a less stringent attitude than is required.

The study group agrees that few data are available on many aspects of the arid environment, particularly flora and fauna, and that it is appropriate to review these environmental attributes during detailed field assessments. Concerns such as these will also need to be addressed when the proposal is considered in relation to the *Environment Protection (Impact of Proposal) Act 1974.*

NGIS commented that one criterion not considered in the report is the distance between sites where radioactive material is stored temporarily and the final repository. NGIS noted that accidents are most likely to occur during transportation, so it is essential to minimise transportation distances. NGIS suggested GIS is a suitable tool for calculating travel distances and recommended that this be added as a site selection criterion.

If no site has been chosen, it is not possible to include a distance criterion: that could only happen after possible sites have been selected. Also, a greater number of transport links/shorter distance from existing storage would indicate a repository site closer to population centres, which could contravene criterion **e** (see response underComments on matters raised - Transport above).

ANA commented that the maps (Figures 10-17) were very useful, but criticised the lack of scale on the maps and considered the presentation of colour and superimposed text on them made readability difficult.

There were some publication technical difficulties that reduced the clarity of Figures 10-17. The point about indicated scale is well made.

Ecological significance

Two submissions, including that from SGEA, raised concerns about the ecological significance of potential sites. One individual asked how the ecological significance of an area is to be assessed. SGEA noted that the Discussion Paper made no mention of what vegetation and fauna studies have been done within the identified regions and asked why only rare flora and fauna are being considered.

The assessment of ecological significance of a potential repository site will be undertaken by agencies with appropriate knowledge and expertise in ecological surveying.

One individual argued that because the ecological significance of areas is likely to change through time, a longer term perspective is needed when mapping these areas. It noted that scientists in the US recognised the need for a long term record of climate and ground water to be kept to assist in identifying suitable sites, achieved by environmental reconstruction from evidence preserved in pack rat nests.

Studies carried out in the US on pack rat nests were to obtain information about the long term environmental stability of proposed deep geological repositories for high level nuclear waste rather than for near-surface disposal of low level and short-lived intermediate level radioactive wastes. The institutional control period of the near-surface repository proposed for Australia is required to be at least 100 years, by the end of which the wastes will have decayed to levels that do not require institutional control. This is a relatively short time period compared with that for which high level waste repositories must function (see response underComments on matters raised-Climate change above).

Ground water

Four submissions, including those from QCC, CARD and CWASA, raised concerns relating to ground water characteristics, including the risk involved with regions located in the proximity of the Great Artesian and Murray-Darling Basins. QCC commented that the Mount Isa, Olary, Billa Kalina and Everard regions have been included even though they partly overlie the Great Artesian and/or Murray-Darling Basins, and that the resulting risk to ground water is unacceptably high compared with other regions. CWASA stated that such sites should be excluded from consideration.

The Phase 2 Discussion Paper specifically excludes from consideration any regions within the Great Artesian and Murray-Darling Basins. Some of the regions appear to overlap with small segments of the Great Artesian and Murray-Darling Basins (see Figure 9 in the Phase 2 Discussion Paper). This is because the region boundaries were based on standard map sheet boundaries. These overlapping portions will not be considered as part of the regions.

Areas within or immediately adjacent to the catchments of the Great Artesian or the Murray-Darling Basins will be automatically excluded. This is to minimise the possibility of contaminating potable ground water. Impact on ground water resources is a key consideration for site appraisal and a site will be regarded favourably where ground water conditions can be modelled effectively. There are areas in all the regions that satisfy this requirement.

Rainfall

CWASA considered that criterion a should be modified to account for the type of rainfall in each region; Mount Isa and Tanami are both subject to extremes of drought/flooding, which could be difficult to control and predict.

Rainfall type is an important consideration in flood prediction. Large areas of northern Australia, for example, experience monsoonal rainfall patterns, and for this reason an area with more predictable rainfall will be favoured unless topography negates flooding as an issue.

Geology

CWASA suggested that 'a site where old basement rocks outcrop' would be preferable as 'deep layers of sediments can obscure mineral deposits'.

Mineral resource potential will be assessed within the selected region. Techniques such as radiometric, gravimetric and magnetic surveys may be used to augment assessments where there is a sedimentary or other masking surficial layer.

Aboriginal interests

Four submissions, from QCC, MWC, Greenpeace and CLC, commented on the importance of consultation with Aboriginal groups in siting a repository. Four submissions WC, Q1d Greens, CARD and MWC) commented that Aboriginal sites of significance should be assessed and excluded from consideration. QCC considered that in relation to criterion* k*, sites adjacent to such areas should also be excluded. Greenpeace noted that the Discussion Paper did not take into account Aboriginal ownership of identified regions and NTDHCS noted it did not take into account sacred sites. NTDHCS stated that sacred site clearance would be essential before further detailed site investigations could take place in the NT. Greenpeace and SGEA commented that the Discussion Paper did not take account of the possibility of land being reclaimed (under the Native Title Act) by its original owners. CLC noted that Tanami and Bloods Range are wholly within Aboriginal land and stressed the importance of effective consultation with Aboriginal people.

Broad*regions,*not*sites,*have been identified by the study group. Aboriginal people and private land owners who may be affected will be consulted during detailed field investigations within the preferred region identified by the Government in Phase 3. At this stage, no communities have been excluded from the site selection process. The use of the most potentially suitable sites will be negotiated with interested parties including the local communities, and to exclude Aboriginal land from the process at this stage could be regarded as presumptuous.

Each area needs to be considered on a case by case basis. Site selection criterion **m** states that the site should not be 'located in an area where land ownership rights or control could compromise retention of long term control over the facility'. A site would not be selected where there is uncertainty regarding its long term security; that would include lands potentially subject to claims under the *Native Title Act 1993.*

There are likely to be Aboriginal and private landholder interests in each of the eight regions identified. The Phase 2 Discussion Paper provided an initial opportunity for groups and individuals within the identified regions to express their views. There will, however, be further opportunities for affected interest groups to express their views during the Phase 3 consultation process.

Greenpeace asked whether the traditional owners in the Tanami, Bloods Range and Maralinga regions had been consulted.

Copies of the discussion paper were sent to Aboriginal community councils in the vicinity of the Tanami and Bloods Range regions and to the Administrator of the Maralinga Tjarutja. Copies of the paper were also provided to local councils within the regions identified, advertised in local papers and rural papers as well as major metropolitan and national papers.

WILPF compared the proposed repository with the former nuclear test site at Maralinga as being a 'violation' of the indigenous environment which will be given back to Aboriginal people some time in the future with the advice that it is uninhabitable.

The former British nuclear testing program at Maralinga cannot be compared to the establishment of a near-surface radioactive waste repository. The WILPF statement is based on the unwarranted assumptions that: the proposed national repository will automatically be located on Aboriginal land; the site will be abandoned in a hazardous condition; the site will be rendered uninhabitable; and the site will be uncontrolled. Site selection criterion **m** requires that the site should not be located in an area where land ownership rights could compromise the long term retention of control over the facility. Unlike the Maralinga test site, the repository site (which will be vastly smaller in area than Maralinga Range) will be selected only after extensive consultation with all affected parties.

At Maralinga, radioactive contaminants including 22 kilograms of plutonium were spread haphazardly over the ground in a series of hundreds of 'minor' nuclear warhead development trials. Seven 'major' atmospheric tests resulted in widespread atmospheric dispersion of contaminants. Wastes destined for the national repository will be appropriately packaged and placed in a secure, purpose-built repository structure, specifically designed and managed to contain the waste material. The design, operation and monitoring of the facility will be in accordance with requirements of the NHMRC *Code of Practice on the Near-Surface Disposal of Radioactive Waste in Australia*(1992).

Maralinga will **not** be handed back to its traditional owners with the advice that it is uninhabitable. Maralinga has been the subject of extensive technical and scientific investigations following the 1985 Royal Commission

into British Nuclear Tests in Australia to determine feasible options for its rehabilitation, and the objective of the Maralinga rehabilitation program is to clean up the former test site to a standard acceptable to its traditional owners, Maralinga Tjarutja. Maralinga Tjarutja has been closely involved in the process through a Consultative Group, and has formally endorsed the rehabilitation option chosen. The Maralinga Tjarutja people have also been compensated for their loss of use of the test site land.

In terms of the national repository, the NHMRC *Code* requires that an institutional control period be chosen to permit unrestricted future use of the site, by which time most of the radioactivity will have decayed to safe levels. Such disposal principles and regulations also apply to disposal methods employed for hazardous non-radioactive wastes.

Population density

SGEA asked if it were acceptable for 'a few Aborigines to be near radioactive waste but not for the populations of Canberra or Sydney', and CLC commented that while sedentary populations in the Tanami and Bloods Range regions are currently low, future development and utilisation of the areas are likely to accelerate through factors such as improved roads, greater access to vehicles and improved telecommunications.

A requirement for low population density at a site in which the projected population growth or prospects for future development are also low is one of the criteria (criterion **e**) used to assess suitable regions. It is not desirable for the national repository to be located in an area of current or projected high population density (consistent with IAEA standards), for reasons of minimising risk associated with human intrusion and to minimise the likelihood that the site will limit other land uses. The siting of a repository in a suitable arid region, which would also have desirable characteristics such as low rainfall and a deep water table, would not by default mean the repository would be in the vicinity of an Aboriginal community. Such issues will be discussed and negotiated with all affected parties during the Phase 3 consultation process.

Criteria for siting a near-surface radioactive waste repository are outlined in the NHMRC *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia (1992),*and are derived from internationally accepted criteria developed by the IAEA.

Potential land use

CWASA commented that criterion* h ['the site for the facility should be located in a region that has no known significant natural resources, including potentially valuable mineral deposits, and which has little or no potential for agriculture or outdoor recreational uses'] *should exclude the Mount Isa, Everard, Billa Kalina, Jackson and Tanami regions.

Detailed investigations of the chosen region will establish its status with respect to potential land use.

Who will make the decision on a preferred region?

One individual asked who will make the judgement on a preferred region.

The project study group will make recommendations to the Commonwealth Government on a preferred region for further detailed field investigation, based on a careful assessment of technical and public comment considerations. Reconnaissance surveys will also be undertaken by the study group to gather further information to help assess the suitability of areas in relation to the site selection criteria. The Commonwealth Government will make the final decision on a preferred region.

Alternative potentially suitable areas

One individual proposed an alternative semi-arid area in the Northern Territory which, he considered, meets the site selection criteria and could contain suitable repository sites.

The identification of broad regions in Australia most likely to contain suitable repository sites in the Phase 2 Discussion Paper does not exclude the possibility of there being other, potentially suitable, areas outside these regions.

The project study group has considered areas suggested by the public as well as the regions identified in the Phase*2* Discussion Paper in its overall assessment of region suitability. The ideal would be for a local landholder, community or State Government to volunteer a technically suitable site for the national repository.

The purpose of the Discussion Paper was to facilitate discussion and to obtain advice regarding potentially suitable sites. However, acceptance of an offered site will still be based on its suitability in terms of meeting the established site selection criteria.

Although not provided as a submission, the study group has noted recent comments made to the media by Western Mining Corporation's (WMC) Managing Director, Hugh Morgan, suggesting the Olympic Dam underground mine as a possible disposal site for a large part of Australia's inventory of radioactive waste.

Were the Olympic Dam mine to be offered as a national repository site it could offer a technically superior alternative to a near-surface facility. Waste could be disposed of in mined-out stopes within the mine. Olympic Dam is likely to exceed the technical requirements for disposal of low level and short-lived intermediate level radioactive wastes. Category S waste could also be disposed of in a purpose-designed part of such a facility subject to appropriate conditioning and emplacement of the waste.

Public Comments on Regions Identified in Phase 2

General

The NSW Minister for the Environment commented that NSW should not be expected to host a repository because of [controversial] steps NSW had previously taken to host an incinerator for disposal of intractable wastes. One individual was opposed to the repository being sited anywhere, but particularly in South Australia on Aboriginal land.

Noted.

QCC rejected the Discussion Paper's assertion that all the regions are likely to contain suitable sites, considering that the regions differ in their relative suitability. It suggested that resources allocated for Phase 3 be limited to the four eastern regions which it considered have a lower level of risk associated with them.

'Highly suitable' is a relative designation. The study group will decide on the relative merits of each region when choosing the preferred one.

CLC commented on the cultural significance of the NT regions*[Tanami and Bloods Range]*to Aboriginal people, as they contain numerous sacred sites and support a rich traditional Aboriginal culture.

The CLC's concerns with regard to the cultural significance of the Tanami and Bloods Range regions to Aboriginal people are taken into account under site selection criterion**k**, which states that the repository site should not be located in an area of special cultural or historical significance.

Eighteen submissions supported the Phase 2 study approach and the concept of a national repository*[seeSummary of public comment].*The Moree Plains Shire Council stated that it does not have any objection to a repository being established in any of the eight identified regions. OSS and ANSTO considered that all identified regions appear to have the potential to contain suitable repository sites.

Most of the public comments summarised in this section allude to issues that are best addressed by detailed survey

Olary

Council of the Shire of Cobar opposed location of a radioactive waste repository site anywhere within the western division of NSW. QCC noted the 'significant drainage systems within the Bulloo-Bancannia and lake Eyre Drainage Divisions' and highlighted the study group's assessment that 'ground water supply rates may limit the region's suitability'.

The repository site will not be located within any part of the Great Artesian or Murray-Darling Basins.

The NSW Department of Water Resources registered its interest in the project and offered any support in data gathering that it could provide in relation to water resources in the Olary Region.

The study group thanks the Department for its offer of support.

The NSW Minister for the Environment considered Olary to be unsuitable because it contains a large population centre (Broken Hill), contrary to the requirements of one of the selection criteria. The Minister also commented that contrary to the claims of the Discussion Paper, the Olary region has promising mineral exploration potential, noting that the NSW and SA governments have recently commenced a major program of geological and geophysical investigations to promote exploration activity in the region. CWASA also commented that the Olary region is mineral rich.

Parts of the Olary region have low population density; the city of Broken Hill occupies a relatively small area just inside this region. Mineral deposits do occur in parts of the region, but a repository site would be located to avoid impact on potential mineral resources.

RAC commented that from his examination of the topographical and superficial geomorphology of Australia, together with broad association of waste generation sites (generally the larger centres) and the ease of access to transport, areas that could be most suitable would be those to the west or north of Broken Hill, or to the north or west of Port Augusta, (that is, in or near to two regions identified through ASSESS), while noting that many other factors would influence the first choice.

Both the Olary and Billa Kalina regions contain large, relatively suitable areas. Other factors will be considered during assessment of the chosen region.

Billa Kalina

***One individual was concerned about Woomera being identified as a possible site, as the area is susceptible to flooding and there is potential for ground water*contamination.**

The Phase 2 Discussion Paper identifieseight broad regionsof Australia likely to contain potentially suitable repository sites. One of these regions is Billa Kalina (with an area of 67 000 square kilometres, the largest region identified), which encompasses Woomera, Andamooka and Olympic Dam Village. The region is named 'Billa Kalina' after the standard 1:250 000 Billa Kalina map sheet covering the northwestern part of this region. The project study group does not specifically advocate disposing of low level and short-lived intermediate level radioactive wastes at Woomera. Press reports naming 'Woomera' as the selected region are inaccurate. A site susceptible to flooding and where there is a risk of ground water contamination will not be selected.

QCC highlighted the study group's assessment that 'the*[many]*drainage systems (Western Plateau and SA Gulf Drainage Division) and ground water characteristics limit the suitability of parts of the region'.

Some areas within the Billa Kalina region are likely to be unsuitable due to their susceptibility to flooding. However, there are many other areas within this region that are not flood-prone and that are very likely to contain potentially suitable repository sites.

The Phase 2 Discussion Paper specifically excludes the Great Artesian Basin from consideration. Any possibility of potable artesian/ground water contamination is a key concern for site appraisal, and a site will be regarded as unsuitable if there is potential for contamination of water resources. For some parts of the Billa Kalina region the standing ground water level is deeper than 75 metres, the water supply rate is low (at most 0.1 litres per second) and water quality poor (total dissolved solids of greater than 14 000 parts per million-too salty for livestock).

The study group's principal aim is to identify a site for the repository that minimises potential impact on the environment and to human health and safety.

CWASA commented that much of the Billa Kalina region 'exhibits doline or sink hole type solution features that are very undesirable'.

Doline style features are more characteristic of the Maralinga region than the Billa Kalinaregion. Areas within the Billa Kalina region displaying these features would be avoided. Billa Kalina is a large area and contains many potentially suitable locations that do not possess these undesirable characteristics.

One individual suggested work could focus on the Mount Isa region where there is interest in hosting the repository, and that repository design and construction could be used to overcome any shortcomings in site suitability.

Public acceptance of the proposed repository will be an important factor in selecting a suitable site. Any natural deficiencies of a preferred site could be compensated for through the use of engineered structures (see also response underComments on matters raised - Repository designabove).

Mount Isa

QCC considered that ground water quality may limit Mount Isa's suitability, noting the 'abundance of massive drainage systems of the Gulf of Carpentaria and Lake Eyre Drainage Divisions'. QCC considered that, based on Figure 2 in the Discussion Paper, the Mount Isa region does not reveal itself as worthy of further investigation.

The repository will not be located in an area where it could contaminate ground water resources. The Mount Isa region identified covers an area of 55 000 square kilometres and the repository site, including its buffer zone, will cover an area of only 225 hectares. It would be most unlikely that a site satisfying the selection criteria could not be located in the Mount Isa region.

Two submissions (QCC and MWC) raised concerns about a repository in Queensland in conjunction with the Esk interim storage facility. MWC considered that Queensland does not need two facilities; if Mount Isa was chosen, then Esk should be closed.

Esk is, and is expected to remain, an interim storage facility, not a final repository site for radioactive waste; the two facilities serve different purposes. Even after a national repository has been established, each State and Territory will need central collection points, such as the Esk facility, before wastes are transported to the national repository for final disposal. Such regulated central stores are preferable to the current situation whereby radioactive waste is stored at a numerous sites all over the country.

States and Territories are responsible for the management of their own radioactive waste. If the national repository were to be located in the Mount Isa region the future of the Esk facility would be a matter for the Queensland Government.

MWC asked whether the proposed national repository will be near the former Mary Kathleen uranium mine, and if not, why not.

A preferred region for further investigation during Phase 3 has not yet been identified. If Mount Isa were chosen as the preferred region it is possible that a site near Mary Kathleen could be suitable; however, many other factors would need to be considered in the assessment, not just proximity to the old mine.

CWASA commented that the Mount Isa region is a prospective for gold and base metals, and noted that there are new mining developments and exploration in the region.

Mineral deposits are widespread in the Mount Isa region. A repository site will be situated so as to avoid affecting potential mineral resources.

Jackson

Five submissions, those from the Shire of Coolgardie, Yilgarn Shire Council, CWAWA, GASP and CWASA, considered that the Jackson region is unsuitable for hosting a national repository for these reasons: ground instability and seismic factors, the region's good mining prospects, endangered species, risk of ground water **contamination, Aboriginal** ***significance, future uses of saline ground water, opposition from local population(s), risk of spills during transport, and*** **contamination of** ***WA's wheat belt from radioactive emissions from the repository.***

All the issues for concern identified by these submissions are legitimate, but to contend that all parts of the Jackson region are unsuitable in these regards is inaccurate. The study group considers that all the identified regions contain potentially suitable repository sites: the matters raised by these submissions as they relate to Jackson were covered in the site selection criteria used to identify the eight regions in Phase 2. After a preferred region has been identified it will be the subject of detailed field investigations during Phase 3 of the siting study, during which the selection criteria will be further refined and applied to identify a suitable local site. The existing Mount Walton East site has many characteristics that would make it suitable for possible adaptation to a national repository.

CWAWA commented that the Mount Walton **[East]** ***site has well connected transport links - waste could be shipped from any point in Australia to Esperance, loaded onto rail trucks bringing ore from Koolyanobbing, then off-loaded and trucked to the site by road (alternatively, the rail line could be extended to the site).***

Noted.

One individual commented that the Mount Walton site is unsuitable due to ground instability and its Aboriginal significance.

WA's existing radioactive waste repository site is at Mount Walton East, not Mount Walton which is a significant aboriginal site. Mount Walton East was chosen as the preferred site for the integrated waste disposal facility after a series of detailed site investigations. A primary criterion for the shallow ground burial of radioactive waste is that the proposed disposal site must be stable geologically, and Mount Walton East meets this criterion.

A primary criterion that the IAEA specifies for suitability of a site for radioactive waste disposal is that it must be geologically stable.

Maralinga

Four submissions, including those from GASP and CWAWA, considered that the former test site area at Maralinga would be a suitable site for a repository, as it remains a prohibited Commonwealth site and is already contaminated from its past use as a nuclear test site. One individual suggested that the Commonwealth should retain a small portion of contaminated Section 400 land for the repository and pass the rest to Maralinga Tjarutja. One individual considered it would be politically and socially insensitive to choose a site in the Maralinga region, and SA EPA considered that the Maralinga region should not be studied further as under present arrangements the former test sites are to be rehabilitated and handed back to Maralinga Tjarutja. Greenpeace criticised the study group for not taking into account the views of traditional owners before suggesting Maralinga as a prospective region.

The Section 400 area in the Maralinga region has some characteristics relevant to siting a repository, but such a use would be contrary to the wishes of the Maralinga Tjarutja Aborigines. Maralinga Tjarutja considers that bringing more radioactive material to the sites would be inconsistent with the Government's objective of rehabilitating the test site area as far as practicable so that it may become available for use by semitraditional Aboriginal people. A copy of the Phase 2 Discussion Paper was provided to the Administrator of Maralinga Tjarutja.

Many other considerations are necessary to assess a site's suitability apart from the presence of naturally occurring radioactivity or an area's prior use for waste disposal (see also response underSite selection criteria - Aboriginal interestsabove).

Everard

QCC commented that the Everard region constitutes part of the Lake Eyre Drainage Division, and agreed with the study group's assessment that ground water depth and quality may be a limiting factor.

Any areas that overlap with, or are immediately adjacent to, the Great Artesian Basin will be excluded from consideration.

CWASA commented that Everard should not be considered because of large coal deposits at Arckareinga, Wintinna and Lake Phillipson, and opal fields at Mintabie.

Some of the places mentioned fall outside the Everard region. The presence of coal deposits does not exclude the 11 000 square kilometres Everard region from containing potentially suitable sites. The repository will occupy a small area and it would be placed to avoid impact on mineral or coal deposits.

Tanami

CWASA commented that the Tanami region is mineral rich. CLC provided detailed and informed comments on why it considers the Tanami region to be unsuitable to host a national radioactive waste repository. CLC's main points are:

- ***the criterion of good surface drainage is not met in the Tanami, where creeks or well developed watercourses are lacking, with most runoff occurring as sheet flow and ponding occurring in lower areas. This hydrogeological pattern leads to significant fluctuations in the depth of the water table;***
- ***Tanami is subject to seasonal monsoonal events;***

- ***significant diurnal temperature fluctuations in the region result in significant expansion and contraction of the regolith, which has an impact on the geomorphological stability of areas. This effect is compounded after major rainfall events, with soil saturation and expansion followed by desiccation and contraction;***
- ***ground water supports all human occupation in the Tanami (mining and Aboriginal outstations), and any risk of contamination to ground water is of major concern to CLC;***
- ***the population of the region is growing with the development of new outstations and mining operations;***
- ***Tanami is a major gold province, with excellent exploration potential;***
- ***Tanami is a region of significant biodiversity, with several rare and endangered species, such as the Mala or Rufous Hare Wallaby;***
- ***the Tanami highway is a public road crossing Aboriginal land, it is unsealed, sustains heavy use and is often impassable after heavy rains. Accidents involving road trains have occurred.***

CLC's submission demonstrated a high level of technical knowledge of local issues, forwhich the study group is grateful. These comments will be used in the selection of a preferred site should the investigation of the Tanami region proceed. It is agreed that remoteness and the nature of Tanami's rainfall pattern are two of the region's main shortcomings.

Two key factors that must be kept in perspective, however, are the relatively small area that the repository sitewill require; and the existence of practical solutions to some of the problems identified by CLC. For example, it is noted that many areas in the Tanami region have low relief, where sheet flow and ponding occur. A repository site can be situated on higher ground to avoid this problem. In addition, the repository will be sited to avoid affecting mineral resources. Expansion and contraction on a low relief terrain are not primary concerns, and engineered structures can be incorporated in the repository design to account for such factors.

ANA commented that only a relatively small part of the map for the Tanami region appears to be suitable, and that Tanami may be too remote for convenient transport.

The size and remoteness of potentially suitable areas in the Tanami and Bloods Range regions may be reviewed if the region is selected for more detailed study.

Bloods Range

CLC made the following comments regarding the suitability of the Bloods Range Region:

- ***there is less information on ground water in the Bloods Range region than in the Tanami region, but local outstations rely on water from bores there;***
- ***Bloods Range contains more than 10 Aboriginal outstations whose populations are mobile and vary during the year, and there is a Large Aboriginal community at Docker River that serves the outstations;***
- ***Aboriginal people in the region are involved in tourist ventures;***
- ***there is considerable mining exploration interest in the region, which remains largely unexplored;***
- ***the region is ecologically important and contains the last known population of the Common Brushtail Possum in central Australia;***
- ***the road between Uluru and Docker River is not public, but is being increasingly used for tourist transfers; there is significant use by local communities.***

As stated for Tanami**,** the study group considers CLC's submission demonstrated a high level of technical knowledge of local issues, for which the study group is grateful. CLC's comments will be taken into account in assessing the suitability of the Bloods Range and Tanami regions.

ANA commented that in relation to Bloods Range only a small area appears to be suitable in the centre of the region and transport access may be a problem.

The size and remoteness of potentially suitable areas in the Tanami and Bloods Range regions may be reviewed if the region is selected for more detailed study.

Site Selection Study Phase 3

During Phase 3 of the site selection study a preferred region will be identified for more detailed field investigation. The site selection criteria will be further refined and applied to select a potentially suitable repository site within the preferred region. All affected parties, including State and local governments and communities, will be closely consulted during the site selection process. As part of the Phase 3 consultation strategy, information leaflets, reports and a video on the proposal will be made available to the public, and media will be used to discuss all aspects of the proposal.

On 9 March 1995 the Commonwealth Parliament passed a motion to establish a 'Senate Select Committee on the Dangers of Radioactive Waste' to inquire into radioactive waste management issues in Australia. The Committee is expected to report before the end of November 1995. The Minister for Primary Industries and Energy, the Hon Bob Collins, has suspended Phase 3 of the site selection study until after the Committee has completed its inquiry, so that the study can take full account of its findings.

The National Radioactive Waste Repository Project study group is available to answer questions relating to the project throughout its duration. Questions should be sent in writing to:

The Information Officer
National Radioactive Waste Repository Project
Coal and Minerals Division
Department of Primary Industries and Energy
GPO Box 858
CANBERRA ACT 2601

Telephone: (02) 6272 4378
Facsimile: (02) 6272 4178

Glossary of Terms

activity concentration
The concentration of a radioactive substance in any particular material expressed in terms of the activity of the radionuclide in becquerels (Bq) per kilogram of the material.

buffer zone
A zone of restricted access, which is controlled by the operator, between the operational site boundary and any structure within the facility to ensure that there is a sufficient distance between the facility and any area accessible to members of the public.

Category A waste
Category A covers solid waste with radioactive constituents, mainly beta- or gamma-emitting radionuclides, whose half-lives are considerably shorter than the institutional control period. The radioactivity will decay substantially during this period. Long-lived alpha-emitting radionuclides should only be present at very low concentrations. This category of waste will comprise, predominantly, lightly contaminated or activated items such as paper, cardboard, plastics, rags, protective clothing, glassware, laboratory trash or equipment, certain consumer products and industrial tools or equipment. It may also comprise lightly contaminated bulk waste from mineral processing or lightly contaminated soils.

Category B waste
Category B covers solid waste and shielded sources with considerably higher activities of beta- or gamma-emitting radionuclides than Category A waste. Long-lived alpha-emitting radionuclides should be at relatively low levels. This category of waste will comprise, typically: gauges and sealed sources used in industry; medical diagnostic and therapeutic sources or devices; and small items of contaminated equipment.

Category C waste
Category C covers solid waste containing alpha-, beta- or gamma-emitting radionuclides with activity concentrations similar to those for Category B. However, this waste typically will comprise bulk materials, such as those arising from downstream processing of radioactive minerals, significantly contaminated soils, or large individual items of contaminated plant or equipment for which conditioning would prove to be impractical.

Category S waste
Category S covers waste that does not meet the specifications of Categories A, B or C. Typically this category will comprise sealed sources, gauges or bulk waste which contains radionuclides at higher concentrations than are allowable under Categories A, B or C.

disposal
Placement of radioactive waste in a purpose-built facility in a manner such that there is no intention of retrieval.

disposal site
That area of land used for the disposal of the waste, consisting of a disposal facility and a surrounding buffer zone.

disposal structure
A trench, bore hole or other form of excavation which is designed to contain the radioactive waste; it may be constructed from natural as well as manufactured materials.

engineered barrier
A feature made or altered by humans which delays or prevents radionuclide migration from the waste or the disposal structure into its surroundings; it may be part of the waste package or part of the disposal structure.

environmental management plan
A document which sets out a system of management based on social, economic and environmental aims within which the decision-making process takes place.

geographic information system (GIS)
A geographic information system is a computer-based suite of software and hardware used to organise and manage spatial information.

high-level waste (HLW)
Waste containing high levels of beta and gamma emitters and significant levels of alpha emitters. It typically arises from the reprocessing of spent fuel elements from nuclear power reactors. Such wastes require

careful handling, substantial shielding, provision for dissipation of heat generated by the decay of fission products, and long-term immobilisation and isolation from the biosphere. HLW is not generated in Australia.

IAEA
The International Atomic Energy Agency, an autonomous intergovernmental organisation founded in 1957 in accordance with a decision of the General Assembly of the United Nations. Its statutory mandate is 'to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world and to ensure, so far is as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose'. Its activities include harmonisation of principles and standards for the safe management and disposal of radioactive waste, advisory services, assistance missions to Member States and the coordination of research and development and special projects that have regional or global interest.

institutional control
The control of a former waste disposal site by the appropriate authority in order to restrict access to, and use of, the site and to ensure an ongoing knowledge that the site has been used for the disposal of radioactive waste.

interim storage
Storage of radioactive materials such that: (1) isolation, monitoring, environmental protection and human control are provided; and (2) subsequent action involving treatment, transport and disposal or reprocessing (fuel) is expected.

intermediate-level waste (ILW) / medium-levelwaste (MLW)
Waste containing significant levels of beta- and gamma-emitting radionuclides that could also contain significant levels of alpha emitters. It consists of chemical process residues, decayed sealed sources and industrial gauges, reactor components, irradiated fuel cladding, ion exchange resins and filters (e.g. as a result of reactor operation). This waste requires special shielding during handling and transport. Disposal options for short-lived ILW are similar to those for low-level waste.

intrusion
The process, accidental or intentional, by which living organisms, including humans, may come in contact with disposed or stored waste.

long-lived waste
Waste that will not decay to an acceptable level in a period of time during which administrative controls can be expected to last (see short-lived waste).

low-level waste (LLW)
Waste containing low levels of beta and gamma emitting radionuclides and normally very low levels of alpha-emitting radionuclides. Special shielding is not normally required for its handling and transport.

It includes items such as wrapping material and discarded protective clothing and laboratory plant and equipment. Disposal in near-surface structures is commonly practised overseas. In some cases, the level of radioactivity is below the limit which regulations set as radioactive material. Indeed some of the LLW arising at ANSTO and elsewhere in Australia is suitable for disposal at authorised municipal landfill sites under the NHMRC *Code of Practice for the Disposal of Radioactive Waste by the User (1985).*

monitoring
The methodology and practice of measuring levels of radioactivity either in environmental samples or *en route* to the environment. Examples include ground water monitoring and personnel monitoring.

NHMRC
The National Health and Medical Research Council. Its principal function is to advise the Australian community on matters relating to the achievement and maintenance of high standards of individual and public health through appropriate legislation, administration and practices, and to encourage health and medical research to achieve those standards.

near-surface disposal (as defined in this paper)
Disposal of radioactive waste, with or without engineered barriers, below the ground surface, where the final protective covering is of the order of a few metres thick. It is usually restricted to disposal down to a depth of about 30 metres from the ground surface.

radioactive waste
Waste materials which contain radioactive substances for which no further use is envisaged.

radioactive waste management
All activities, administrative and operational, that are involved in the handling, treatment, conditioning, transportation, storage and disposal of waste.

radionuclide/radioisotope
An isotope which is radioactive. Most natural isotopes lighter than lead are not radioactive. Two important natural radioisotopes are carbon-14 and potassium-40.

reprocessing, fuel
Recovery of fissile and fertile material from irradiated nuclear fuel by chemical separation from fission products and other radionuclides; selected fission products may also be recovered.

risk
For the purpose of radiation protection, the probability that a given individual will incur any given deleterious stochastic effect as a result of radiation exposure.

short-lived waste
Waste which will decay to a level which is considered to be insignificant from a radiological point of view, in a time period during which administrative controls can be expected to last. Radiological assessment of the chosen disposal system can determine whether such waste is short-lived.

short-lived nuclide
For wage management purposes, a radioactive isotope with a half-life shorter than about 30 years, e.g. 137Cs, 90Sr, 85Kr, 3H.

sievert, Sv
The unit of dose equivalent (1 Sv = 100 rem).

spent fuel
Irradiated fuel units not intended for further reactor service.

stochastic
Random events leading to effects whose probability of occurrence in an exposed population (rather than severity in an affected individual) is a direct function of dose. These effects are commonly regarded as having no threshold. Hereditary effects are regarded as being stochastic. Some somatic effects, especially carcinogenesis, are regarded as being stochastic.

storage
The emplacement of waste in a facility with the intent and in such a manner that it can be retrieved at a later time.

waste conditioning
The process which converts the waste into an acceptable concentration and stable form for packaging, transport and disposal. The process may involve solidification of the waste and/or encapsulation in a stable matrix such as concrete.

waste minimisation
The establishment of practices in all stages of the production, processing and use of radioactive materials to minimise the quantity of waste generated, including its radioactivity.

waste packaging
The processes that are carried out to change the characteristics of the waste to produce a safe and convenient form of storage or disposal. This may involve operations such as solidification, incineration or compaction to minimise the waste volume.

Glossary of Abbreviations

ADI	Australian Defence Industries
ANSTO	Australian Nuclear Science and Technology Organisation
ANA	Australian Nuclear Association Inc.
ASSESS	A System for Selecting Suitable Sites
CARD	Communities Against Radio-active Dumps
CLC	Central Land Council, Northern Territory
CRCAWA	Country Regional Councils Association of Western Australia
C/SCC	Commonwealth/State Consultative Committee
CWASA	Country Women's Association South Australia
CWAWA	Country Women's Association Western Australia
DPIE	Department of Primary Industries and Energy
EIS	Environmental Impact Statement
EMP	Environment Management Plan
EPA	Environment Protection Agency (Commonwealth)
ESD	Ecologically Sustainable Development
FoE	Friends of the Earth
GASP	Goldfields Against Serious Pollution
GIS	Geographic Information Systems
Greenpeace	Greenpeace Australia Ltd
HEU	High Enriched Uranium
HIFAR	High Flux Australian Reactor
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
MWC	Maleny Wastebusters Cooperative
NGIS	National Geographic Information Systems (Aust) Pty Ltd
NHMRC	National Health and Medical Research Council
NT DHCS	Northern Territory Department of Health and Community Services
OSS	Office of the Supervising Scientist (EPA)
QCC	Queensland Conservation Council
Qld Greens	Queensland Greens
RAC	Roger Alsop Consulting
RMP	Radiation Management Plan
SA EPA	South Australian Environment Protection Authority
SGEA	Spencer Gulf Environmental Alliance Inc
UKNRPB	UK National Radiological Protection Board
WHO	World Health Organisation
WILPF	Women's International League for Peace and Freedom
WMC	Western Mining Corporation

Annex A

National Resource Information Centre

A Radioactive Waste Repository for Australia: Site Selection Study — Phase 2

A discussion paper on phase 2 of a project to identify a suitable site for a national near-surface repository for Australia's low level and short-lived intermediate level radioactive wastes is available for public comment.

The paper entitled *'A Radioactive Waste Repository for Australia: Site Selection Study — Phase 2'* has been prepared by the National Resource Information Centre, Bureau of Resource Sciences. It describes the methodology used to select regions that are the most likely to contain suitable repository sites for more detailed field investigation.

Persons or organisations wishing to comment on the paper are invited to make written submissions by 30 September 1994 to:

The Information Officer
National Near-Surface Radioactive Waste Repository Project
Department of Primary Industries and Energy
GPO Box 858
CANBERRA ACT 2601
Telephone (06) 272 4378
Facsimile (06) 272 4178

Copies of the paper can be obtained from the Information Officer.

Metropolitan, national and regional newspapers in which the Discussion Paper was advertised

Barrier Daily Truth
Countryman
Eyre Peninsula Tribune
Flinders News
Forbes Advocate
Katherine Times
Northern Territory News
Parkes Champion Post
Queensland Country Life
Stock Journal
Sunraysia Daily
Tennant & District Times
The Adelaide Advertiser
The Age
The Australian/Financial Review
The Ballarat Courier
The Bendigo Advertiser
The Canberra Times
The Centralian Advocate
The Courier Mail
The Kalgoorlie Miner
The Land
The Longreach Leader
The Mercury
The Northern Miner
The North West Star
The Sydney Morning Herald
The Transcontinental
The Weekend Australian
The West Australian
The Western Herald
Weekly Times (Victoria)
West Coast Sentinel
Whyalla News

Annex B

List of Respondents to Phase 2 Discussion Paper

Arson, R, Roger Alsop Consulting, Vic
Amtrust Pty Ltd, Qld
Australian Nuclear Science and Technology Organisation (ANSTO)
Australian Nuclear Association Inc, NSW
Blacktown City Council, NSW
Campbell, M, Holland Park, Qld
Central Land Council, Alice Springs, NT
Council of the Shire of Cobar, Cobar, NSW
Country Regional Councils Association of WA
Country Women's Association of SA, Kent Town, SA
Country Women's Association of WA, West Perth, WA
City of Kalgoorlie-Boulder, WA
City of Port Augusta, SA
Communities Against Radioactive Dumps (CARD), Esk, Qld
Ellington, A, Research Institute, Rutherglen, SA
Environment Protection Agency, Commonwealth
Fitzgerald, Dr J, Coromandel Valley, SA
Fraser, J, Eltham North, Vic
Friends of the Earth, Fitzroy, Vic
Goldfields Against Serious Pollution, Boulder, WA
Grant, M, Faulconbridge, NSW
Green, D, North Adelaide. SA
Greenpeace Australia National Office, Surry Hills, NSW
Hartcher, C, NSW Minister for Environment
Hornsby, JR, East Warburton, Vic
Kaye, G, Killarney Heights, NSW
Kilgariff, B, OAM JP, Erldunda Station, NT
Maleny Wastebusters Cooperative, Maleny, Qld
Manno, G, Adelaide, SA
McCusker, J, Adelaide, SA
Moree Plains Shire Council, Moree, NSW
Municipality of Peterborough, Peterborough, SA
National Geographic Information Systems (Aust) Pty Ltd, Mount Pleasant, WA
NT Department of Health & Community Services, Casuarina, NT
Pearson, S, University of NSW, Sydney, NSW
Queensland Conservation Council, Brisbane, Qld
Queensland Greens, Esk, Qld
SA Department of Environment and Natural Resources, Adelaide, SA
Shire of Coolgardie, Coolgardie, WA
Smith, S, Boulder, WA
Spencer Gulf Environmental Alliance Inc, Port Augusta, SA
Water Resources of NSW, Dubbo, NSW
Wilkins, S, Kondinin, WA
Women's International League for Peace and Freedom, Deakin, ACT
Yilgarn Shire Council, Southern Cross, WA

Annex C

Status of Low and Intermediate Level Radioactive Waste Disposal Facilities in Various Countries in 1994		
Country (open-closed)	**Repository / site name**	**Repository concept**
In site selection process		
Australia		Engineered near surface facility
Belgium		Engineered near surface facility
Bulgaria		Engineered near surface facility
Canada (historic LLW)		---
China (East)		Engineered near surface facility
Romania		Engineered near surface facility
USA (Illinois)		Engineered near surface facility
(Pennsylvania)		
Site selected		
Brazil	Abasia de Goias	Engineered near surface facility
China	Gobi, Gansu	Engineered near surface facility
	Chanwan Bay, Guandong	Engineered near surface facility
Egypt	Inshas	Mined cavity
Korea, Rep. of	Kurop-do	Engineered near surface facility
Mexico	Laguna Verde	Mined cavity
Norway	Himdfalen	Mined cavity
Switzerland	Wellenberg	Mined cavity
UK	Near Sellafield (Nirex)	Geological repository
Under licensing		
Canada	Chalk River	Engineered near surface facility
Germany	Konrad	Mined cavity
USA	Boyd County, Nebraska	Engineered near surface facility
	Fackin Ranch, Texas	Engineered near surface facility
	Ward Valley, California	Engineered near surface facility
Under construction		
Finland	Loviisa	Mined cavity
In operation		
Argentina	Ezeiza	Engineered near surface facility
Bulgaria	Novi Han	Engineered near surface facility
Czech Republic	Richard (1964-)	Mined cavity
	Dukovany (1994-)	Engineered near surface facility
Finland	Olkiluoto (1992-)	Mined cavity
France	Centre de L'Aube (1992-)	Engineered near surface facility
Germany	Morsleben (1981-)	Mined cavity
Hungary	RHFT Puspokszilagy	Engineered near surface facility
India	Trombay (1954-)	Engineered near surface facility
	Tarapur (1968-)	Engineered near surface facility
	Rajasthan (1972-)	Engineered near surface facility
	Kalpakkam (1974-)	Engineered near surface facility
	Narora (1991-)	Engineered near surface facility
	Nakrapar (1992-)	Engineered near surface facility
Japan	Rokkasho-mura (1992-)	Engineered near surface facility
Norway	Kjeller (1970-)	Engineered near surface facility
Pakistan	Kanupp (1971-)	Simple near surface facility
	Pinstech	Simple near surface facility
Poland	Rozan	Engineered near surface facility
Romania	Baita-Stei	Geological repository
Russian Federation	Sergiev Posad	Engineered near surface facility
South Africa	Vaalputs (1986-)	Simple near surface facility

Spain	El Cabril (1992-)	Engineered near surface facility
Sweden	Forsmark (1988-)	Mined cavity
UK	Drigg (1959-)	Simple & engineered near surface facilities
USA	Barnwell, South Carolina(1971-)	Simple near surface facility
	Hanford,Washington (1965-)	Simple near surface facility
Vietnam	Dalat	Engineered near surface facility
Under closure		
France	Centre de la Manche (1969-1994)	Engineered near surface facility
Closed		
Czech Republic	Alcazar, Hostin (1953-1965)	Mined cavity
USA	Beatty, Nevada (1962-1992)	Engineered near surface facility

Source: 'Table I. Status of Low and Intermediate Level Waste Disposal Facilities in Various Countries in 1994',*Nuclear Power, Nuclear Fuel Cycle and Waste Management: Status and Trends 1995 (Part C of the IAEA Yearbook 1995).*