Chapter 1
Introduction

Most Australians benefit either directly or indirectly from the medical, industrial and scientific use of radioactive materials. But this use generates a small amount of radioactive waste including lightly contaminated soil, plastic, paper, laboratory equipment, smoke detectors, exit signs and gauges.

Australia's radioactive waste is temporarily stored at more than 100 urban and rural locations around Australia, much of it in buildings that were not designed for the long-term storage of radioactive material and that are nearing or have reached capacity. Storage locations include hospitals, research institutions, industry and government stores. Storing waste in many locations in non-purpose built facilities potentially poses greater risk to the environment and people than disposing of the material in a national, purpose-built repository where the material can be safely managed and monitored.

It is internationally accepted practice that low level and short-lived intermediate level radioactive waste be disposed of in near-surface repositories, and more than 100 repositories for this type of waste are either operating or are in the process of being established in over 30 countries.

In 1985, the Commonwealth/State Consultative Committee on Radioactive Waste Management recommended a national program to identify potentially suitable sites for a national near-surface radioactive waste repository for Australia's low level and short-lived intermediate level radioactive waste. The committee's decision recognised that, for the small amount of radioactive waste that Australia has, it would be technically and economically inefficient for each jurisdiction to establish its own disposal facility.

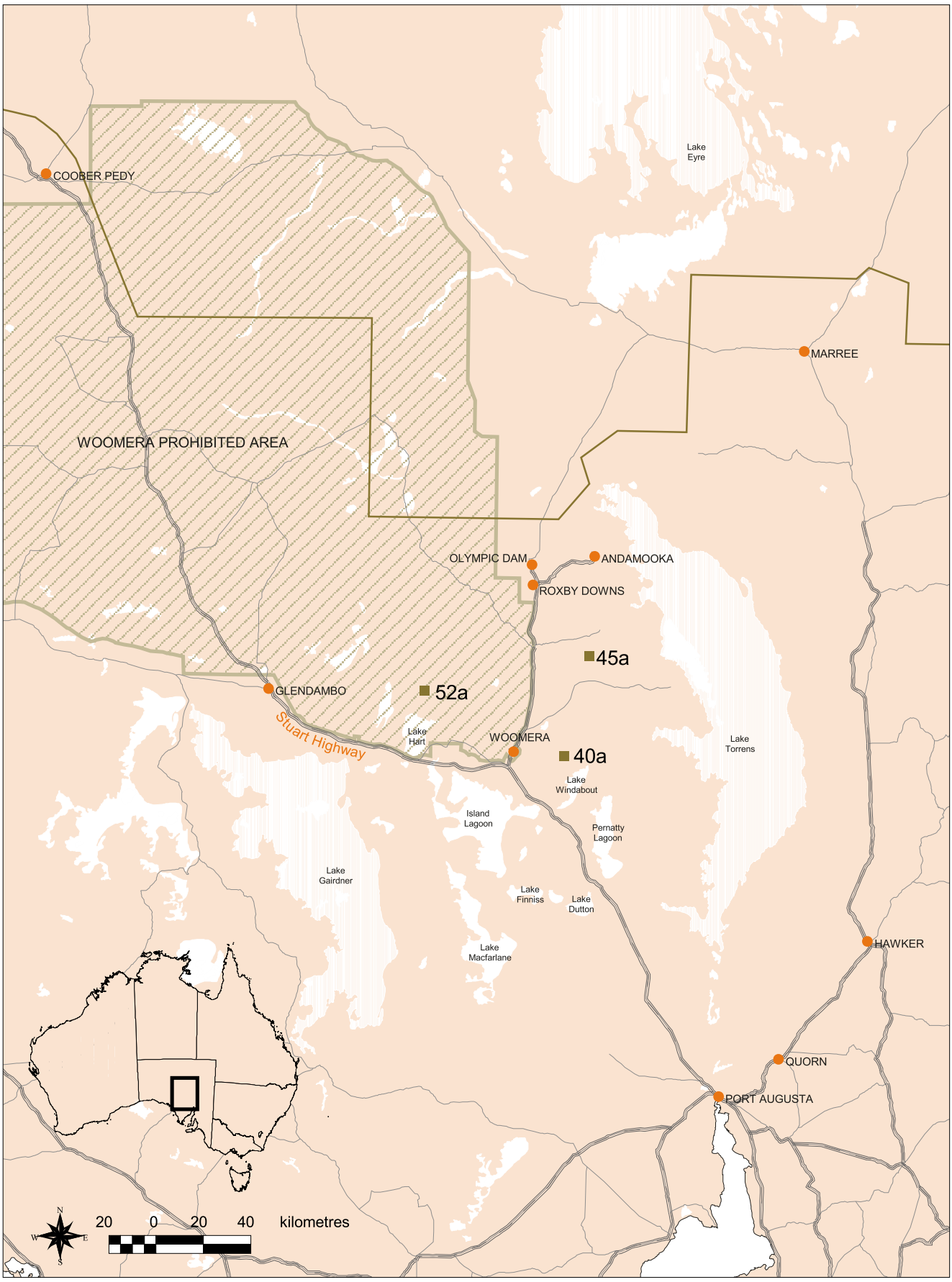
The committee reported that most of Australia's radioactive waste is suitable for near-surface disposal at a specially selected site. In 1992, the Commonwealth Government, supported by the states and territories, began an Australia-wide search for a suitable site for the disposal of Australia's low level and short-lived intermediate level radioactive waste. In January 2001, following extensive scientific investigation and community consultation, the then Minister for Industry, Science and Resources, Senator Nick Minchin, announced a preferred site and two alternatives for the national repository in central–north South Australia.

The location of the preferred site, 52a, and the two alternative sites, 40a and 45a, is shown in Figure 1.1.

The proposal to establish the national repository was referred to the then Minister for the Environment and Heritage, Senator Robert Hill, under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), who stipulated that an environmental impact statement (EIS) should be prepared on the proposal for assessment under the EPBC Act.

The Department of the Environment and Heritage (Environment Australia) subsequently developed the guidelines (or terms of reference) for preparing the EIS, after taking public comment into consideration. The final guidelines were released on 26 June 2001.

The Commonwealth, through the Department of Education, Science and Training (DEST), is the proponent under the EPBC Act for the proposal to construct and operate a national repository for Australia's low level and short-lived intermediate level radioactive waste. The department is responsible for preparing the EIS in line with the guidelines, to provide the Minister for the Environment and Heritage with the basis for making a decision on the proposal. In July 2001 the Commonwealth, through the former Department of Industry, Science and Resources (DISR), appointed PPK Environment & Infrastructure (PPK) in association with Halliburton KBR to prepare the EIS. After the 2001 federal election, responsibility for the national repository project was transferred to DEST.



Potential repository sites
Towns
Dog fence
Roads
Woomera prohibited area
Salt lakes
Sealed roads

FIGURE 1.1
Study area and site locations, central-north South Australia

1.1 Objectives of the Proposal

The objectives of the national radioactive waste repository project are to:

- strengthen Australia's radioactive waste management arrangements by promoting the safe and environmentally sound management of Australian low level and short-lived intermediate level radioactive waste by establishing a purpose built, near-surface repository
- provide safe containment of radioactive wastes until the radioactivity has decayed to background levels.

To meet these objectives, it is proposed to construct a near-surface repository at the preferred site, or at one of the two alternatives, in central–north South Australia, for the disposal of Australian low level and short-lived intermediate level waste generated from the medical, research and industrial uses of radioactive materials.

The repository would be constructed and operated in accordance with Commonwealth regulations by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), and in a manner that meets all health, safety, environmental and quality standards. The construction and operation would also be consistent with the National Health and Medical Research Council (NHMRC) 1992 *Code of practice for the near-surface disposal of radioactive waste in Australia* (NHMRC 1992 Code), other relevant codes, legislation and guidelines, and accepted international practice (including International Atomic Energy Agency (IAEA) Safety Standards Series *Near surface disposal of radioactive waste*, WS-R-1 (1999) and *Safety assessment for near surface disposal of radioactive waste*, WS-G-1.1 (1998) and the IAEA Safety Series *Siting of near surface disposal facilities 111-G-3.1* (1994)).

The facility is not intended for the disposal of naturally occurring radioactive waste from mining or mineral processing. Radioactive waste from the mining and processing of uranium ores and heavy mineral sands is disposed of in accordance with the national *Code of practice on the management of radioactive wastes from the mining and milling of radioactive ores* (Department of the Arts, Sport, the Environment, Tourism and Territories 1982) or as is otherwise provided for in the legislation of individual jurisdictions. This type of waste is usually generated in bulk quantities and is disposed of at or near the relevant mine or processing site.

A national store for long-lived intermediate level waste will not be co-located with the national repository. A separate nationwide search, announced by the Minister for Industry, Science and Resources in August 2000 and February 2001, has begun to identify a site on Commonwealth land for a national store for long-lived intermediate level waste produced by Commonwealth agencies. The Minister ruled out co-location of the store for intermediate level waste on the same site as the repository for low level waste in South Australia, to avoid any suggestion that the two processes are not completely separate.

Australia does not produce high level radioactive waste and will not accept the nuclear wastes of other countries for storage or disposal in Australia. The Government's position is based on the principle that countries deriving benefits from nuclear applications should expect to make their own arrangements to safely dispose of their nuclear waste. This has been the policy of successive Australian governments.

1.2 Environmental Assessment under the EPBC Act

1.2.1 Application of the Act

The EPBC Act, which came into force on 16 July 2000, has the object to ensure that matters potentially significantly affecting the environment are fully examined and taken into account in decisions by the Commonwealth Government.

The term 'environment' refers to all aspects of the surroundings of human beings, whether they affect human beings as individuals or in social groupings. The term includes the natural environment, the built environment and social aspects of our surroundings. The definition covers such factors as air, water, soils, flora, fauna, buildings, roads, hazards and risks, and human safety.

Under the EPBC Act an action will require approval from the Minister for the Environment and Heritage if the action has, will have or is likely to have a significant impact on a matter of national environmental significance. Matters of national environmental significance are defined by the Act as:

- World Heritage properties
- Ramsar wetlands of international importance
- listed threatened species and communities
- migratory species protected under international agreements
- nuclear actions
- the Commonwealth marine environment.

The criteria for determining whether or not the proposed action is of national environmental significance are listed below.

Extinct in the Wild Species Criteria

An action has, will have or is likely to have a significant impact on extinct in the wild species if it does, will or is likely to:

- adversely affect a captive or propagated population or one recently introduced/ reintroduced to the wild, or
- interfere with the recovery of the species or its reintroduction to the wild.

Critically Endangered and Endangered Species Criteria

An action has, will have or is likely to have a significant impact on a critically endangered or endangered species if it does, will or is likely to:

- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of the species, or
- fragment an existing population into two or more populations, or
- adversely affect habitat critical to the survival of the species, or
- disrupt the breeding cycle of a population, or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat, or
- interfere with the recovery of the species.

Vulnerable Species Criteria

An action has, will have or is likely to have a significant impact on a vulnerable species if it does, will or is likely to:

- lead to a long-term decrease in the size of an important population of a species, or
- reduce the area of occupancy of an important population, or
- fragment an existing important population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an important population, or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or
- interfere substantially with the recovery of the species.

An important population is one that is necessary for a species' long-term survival and recovery, and may include populations that are:

- key sources either for breeding or dispersal, and/or
- necessary for maintaining genetic diversity, and/or
- near the limit of the species range.

Critically Endangered and Endangered Ecological Communities Criteria

An action has, will have or is likely to have a significant impact on a critically endangered or endangered ecological community if it does, will or is likely to:

- lead to a long-term adverse affect on an ecological community, or
- reduce the extent of a community, or
- fragment an occurrence of the community, or
- adversely affect habitat critical to the survival of an ecological community, or
- modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for the community's survival, or
- result in invasive species that are harmful to the critically endangered or endangered community becoming established in an occurrence of the community, or
- interfere with the recovery of an ecological community.

Nuclear Actions Criteria

All nuclear actions, as detailed in section 22 of the EPBC Act, should be referred to the Commonwealth Environment Minister for a decision on whether approval is required. These actions are:

- establishing or significantly modifying a nuclear installation or a facility for storing spent nuclear fuel, or
- transporting spent nuclear fuel or radioactive waste products arising from reprocessing, or
- mining or milling uranium ore, or
- establishing or significantly modifying a large-scale disposal facility for radioactive waste, or
- decommissioning or rehabilitating any facility or area in which an activity described above has been undertaken, or
- any other action prescribed by the regulations.

In addition to actions having a significant impact on a matter of national environmental significance, the EPBC Act provides that certain actions taken by the Commonwealth and actions affecting Commonwealth land also require approval under the Act. See Section 1.6.2 for further discussion on the objects of the EPBC Act, and the principles of ecologically sustainable development (ESD) as identified by the EPBC Act.

An overview of the EPBC Act referral, assessment and approval process is provided in Figure 1.2.

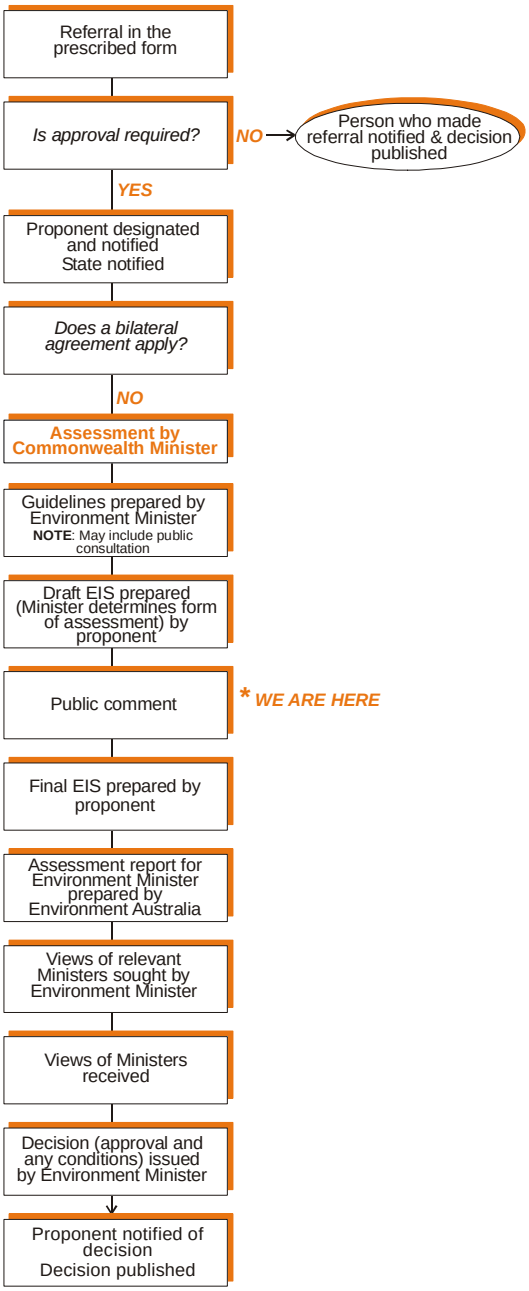


FIGURE 1.2
An overview of the referral, assessment and approval process

1.2.2 EIS Progress to Date

In January 2001, the selection of and proposed use of either the preferred site or one of the two alternatives for the national repository project was referred to the Minister for the Environment and Heritage under the EPBC Act because the action was being undertaken by the Commonwealth, and because the proposal was relevant to the matter of national environmental significance relating to nuclear actions.

The project was declared a controlled action, which is an action of national significance for which ministerial approval is required, under three provisions of the EPBC Act:

- listed threatened species and communities
- nuclear actions
- the Commonwealth is the proponent.

This Draft EIS is the means by which the Minister for the Environment and Heritage is informed of all aspects of the repository proposal. The requirements for the EIS are clearly defined in guidelines prepared by Environment Australia (see Appendix A).

1.2.3 Role and Purpose of the EIS

This environmental impact assessment is required to adequately define those elements of the environment that may be affected by a proposed development, and identify the significance, risks and consequences of the potential impacts of the proposal at a local, regional and national level.

As such the EIS will be the primary source of information upon which the environmental impacts of the proposal will be assessed, and will be the basis for an informed decision by the Minister for the Environment and Heritage. The EIS used as the basis for the decision by the Minister will comprise this Draft EIS, the Supplement and the Commonwealth's Assessment Report.

This Draft EIS describes the existing environment in the area and the proposed operations involved in the activity. It evaluates the environmental impacts and proposes measures to avoid or minimise the expected or likely impacts. The aims of the Draft EIS and the associated public review process are to provide:

- a source of information so that interested individuals and groups may gain an understanding of the proposal, the need for the proposal, the alternatives, the environment that it would affect, the impacts that may occur (including those on the community and its safety) and the measures to be taken to minimise these impacts
- a forum for public consultation and informed comment on the proposal
- a framework in which decision makers may consider the environmental aspects of the proposal in parallel with economic, technical and other factors.

The guidelines also state that the EIS will demonstrate compliance with the goals, objectives and guiding principles of ESD as set out in the *National strategy for ecologically sustainable development* (Environment Australia 1992) and the EPBC Act.

1.3 Structure of this Document

The Draft EIS is structured to provide a logical progression of the issues and to be consistent with the general content, form and style specified in the guidelines. The key considerations that have shaped the structure of this Draft EIS are the need to:

- present background information on the need for the proposal, work undertaken to date, definitions and information on types of radioactive waste, and the legislative framework for the management of waste in Australia (Part A)
- present information on the design and characteristics of the repository (Part B)
- undertake a detailed assessment of the potential effects of the proposal on the environment and identify strategies to mitigate potential effects (Part C)
- summarise the commitments on environmental management and monitoring (Part D)
- summarise the conclusions of the Draft EIS (Part E).

The Draft EIS has been printed as two volumes. Volume One provides the background information and the main results of the environmental assessment. Volume Two provides more detailed information in appendices as follows:

- Appendix A — EIS guidelines
- Appendix B — Radioactive waste inventory
- Appendix C — Physical environment
- Appendix D — Biological environment
- Appendix E — Radiation
- Appendix F — Assessment of climatic change at Woomera
- Appendix G — Organisations consulted
- Appendix H — Study team.

1.4 Study Area and Regional Setting

The study area is located in northern South Australia in a region known as central–north South Australia (formerly referred to as Billa Kalina) (Figure 1.3). The region is located approximately 400 km north of Adelaide, in stony desert country with sparse saltbush. A preferred site and two alternative sites have been selected, all of which are located in the area between the townships of Woomera and Roxby Downs.

The lack of obvious and easily accessible water sources, limited transport and urban infrastructure, and the open desert environment has significantly limited post-European human activity in the region. The activity since European settlement has generally been confined to:

- mining (Mount Gunson, Olympic Dam, and the Andamooka and Coober Pedy opal fields)
- pastoral activities (primarily sheep and cattle grazing south of the dog fence, and cattle grazing north of the dog fence; the dog fence, which is to the north of the preferred and two alternative sites, excludes dingoes and wild dogs from the southern pastoral areas)
- remote area tourism and research activity
- some high technology research and business activity (primarily weapons, communications and satellite industries).

The preferred site (Site 52a) is located on state pastoral lease within the Woomera Prohibited Area (WPA), an area of 127,800 km^2 on the western side of the Woomera–Roxby Downs Road. Two alternative sites, Sites 45a and 40a are located on state pastoral leases on the eastern side of the Woomera–Roxby Downs Road.

The sites are covered by three overlapping native title claims, Barngarla (SC 96/004), Kokatha (SC 99/002), and Kujani (SC00/003) (see Chapter 11).

It is intended that the Commonwealth would acquire the final site once the Minister for the Environment and Heritage makes a decision on the repository proposal. The acquisition would be undertaken under the *Lands Acquisition Act 1989* (Cwlth).

1.5 Previous Study Phases

1.5.1 Site Selection

The site selection process has been undertaken in three phases, each outlined below.

Phase 1 of the national radioactive waste repository project began in 1992 with the development of the methodology for siting a national repository. The method used a computer-based geographic information system, A System for Selecting Suitable Sites (ASSESS), to apply internationally accepted site selection criteria adapted for Australia on a nationwide basis.

Geographic information relevant to radioactive waste disposal, such as groundwater quality, earthquake risk and geology, was collated for all of Australia. ASSESS compared this information to the 13 site selection criteria set out in the NHMRC 1992 Code. These criteria included natural physical characteristics relating to geology, groundwater and surface water, and socio-economic, ecological and land use factors (see Section 5.1).

A public discussion paper, *A radioactive waste repository for Australia: Methods for choosing the right site* (National Resource Information Centre), was released for public comment in 1992. In response, 124 submissions about the repository concept, methodology, disposal and site selection processes were received from the public. In 1993, a response paper, *National radioactive waste repository: Site selection study — Phase 1: A report on public comment* (Department of Primary Industries and Energy), was released, which commented on the issues raised in public submissions.

In Phase 2 of the investigation, which began in 1994, the site selection methodology developed in Phase 1 was applied (after taking into consideration public comment) to identify eight broad regions of Australia likely to contain suitable sites (Figure 1.3): three in South Australia, one across the South Australia–New South Wales border, two in the Northern Territory, one in Western Australia and one in Queensland. The Great Artesian Basin and the Murray–Darling Basin, being major water resources, were excluded from the search areas.

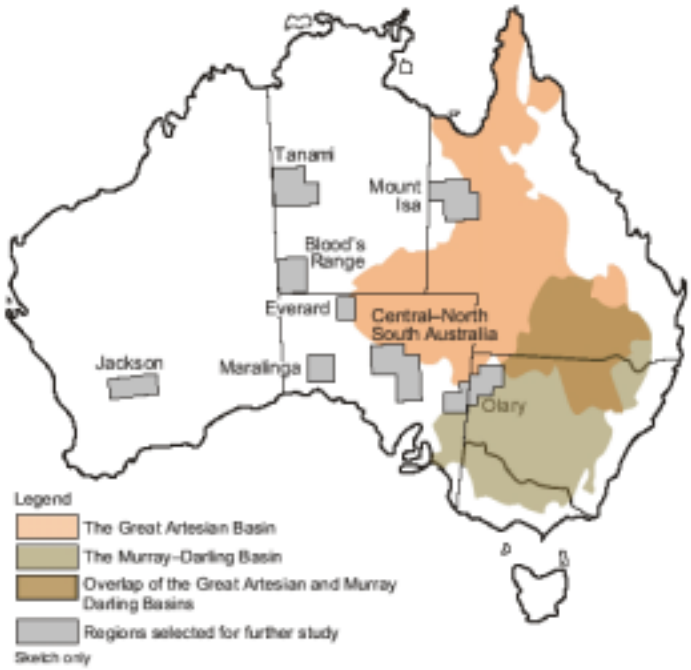


FIGURE 3.1
Regions of Australia likely to contain suitable sites

The results of the Phase 2 investigation were published in the 1994 public discussion paper, *A radioactive waste repository for Australia: Site selection study — Phase 2* (National Resource Information Centre 1994). In response to the paper, 45 submissions were received which raised issues such as the siting and consultation process, and safety issues. In 1995, a paper responding to the public comment, *National radioactive waste repository: Site selection study — Phase 2: A report on public comment*, was published (Department of Primary Industries and Energy 1995).

Phase 3 of the study began in 1998, with the selection of central–north South Australia, as the preferred area for more detailed investigation. The region, which covers approximately 67,000 km^2, contained the largest area potentially suitable for siting the repository, based on

the available data. Following the release of the public discussion paper, *A radioactive waste repository for Australia: Site selection study — Phase 3: Regional assessment* (Bureau of Resource Sciences 1997), 69 submissions were received from 84 respondents. Issues raised included the siting process and particularly the selection of the region, and the possible impact on the region from the siting of the repository. These issues were responded to in the 1999 paper, *National radioactive waste repository: Site selection study — Phase 3: A report on public comment* (Department of Industry, Science and Resources).

1.5.2 Drilling Investigations — Selection of the Preferred Site

An expert advisory committee, the National Repository Advisory Committee, advised DISR on the siting process. The committee was chaired by the Bureau of Resource Sciences, and had members from ARPANSA, and the Australian Nuclear Science and Technology Organisation (ANSTO). Technical assessment was undertaken and coordinated by the Technical Assessment Group, with members from the Bureau of Resource Sciences, ANSTO, and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

After the selection of central–north South Australia, the selection criteria were applied on a local scale within the area. Desktop studies and community consultation identified 1.5 x 1.5 km sites within the region that would be suitable for further investigation. The sites were all located on raised, stony desert plateaux.

In Stage 1 of the drilling program, in 1999, 11 sites were drilled. In 2000, Stage 2 of the program involved more extensive drilling of five sites, and three sites were further investigated in Stage 3. The scientific investigations described and assessed the:

- rock types and their structures
- potential for mineral deposits
- the depth, quality, quantity, age and movement of groundwater
- surface drainage characteristics.

The local community and relevant interest groups were extensively consulted throughout the siting investigations and their input had an effect on the sites investigated.

In January 2001 the former Minister for Industry, Science and Resources announced the selection of the preferred site at Evetts Field West (Site 52a) and two alternative sites (Sites 45a and 40a) in the central–north region of SA (Figure 1.3), based on advice from technical experts in the Technical Assessment Group and the National Repository Advisory Committee, for further investigation in an environmental assessment process.

Site 52a at Evetts Field West was selected as the preferred site as it performed best against the selection criteria, particularly with respect to geology, groundwater, transport and security. Two alternative sites, Site 45a and Site 40a, were also found to be highly suitable for the siting of the national repository.

In particular, Site 52a was preferred because:

- the surrounding landforms near the site indicated that there was little run-on of water onto the site, providing a highly favourable environment for the construction and maintenance of the disposal trenches
- the rock formation that would host the disposal trenches and its groundwater features meant that the water drainage characteristics could be modelled more easily for this site than the others
- this rock formation consisted of materials resistant to groundwater flow, which would therefore provide a highly effective natural barrier for the waste
- the well-formed road to the site provided superior transport access
- the site's location in the WPA, which has restricted public access, gave excellent prospects for long-term control and security.

In addition, groundwater beneath Site 52a and the two alternatives was highly saline and therefore unsuitable for human, agricultural or industrial use, and water movement in the saturated zones and potential extraction rates was low.

Logging of samples from the drilling program at each of the three sites showed that there was no significant mineralisation down to depths of 100 m. Other available geological and geophysical information suggests that there is no significant mineral potential at greater depths below the three sites. Thus there appears to be no significant mineral potential at the three sites that would interfere with the proposal for a radioactive waste repository.

Isotopic studies of groundwater at the three sites indicated that it takes thousands of years for surface water to move downwards to the watertable or groundwater level, and then further thousands of years for the water at the watertable to move to an area of discharge, such as a salt lake.

There is no known hydrological link between groundwater at the three sites and the Great Artesian Basin (Bureau of Resource Sciences 1997). Hydrogeological information collected during the drilling program is summarised in Chapter 8 of this document.

Further details on the site selection studies are given in Section 5.2.

1.5.3 Consultation

The extensive public consultation throughout the site selection process included the national release of public discussion papers and the establishment of a toll-free information line and internet site to consult with regional stakeholders. Consultation activities in central–north South Australia included information days, the establishment of a regional information office, the distribution of a newsletter, and the formation of a Regional Consultative Committee (RCC), with members from soil conservation boards, Aboriginal groups, local industry, and local and State government.

Issues raised during consultations have been addressed in publications, letters and at meetings, are further addressed in this EIS, and have been taken into account during the siting process.

The key elements of the public consultation process undertaken so far are outlined below. Specific issues are addressed in the sections of the EIS indicated in brackets.

Public Discussion Papers

At the start of Phases 1, 2, and 3 of the project, in 1992, 1994 and 1998 respectively, public discussion papers were released and distributed throughout Australia to those who expressed an interest in the proposal. The availability of these documents for public comment was advertised in major national and regional papers.

More than 1300, 1850 and 2400 copies of the Phase 1, 2 and 3 discussion papers respectively, were distributed around the time of the releases. In addition, an information kit with 12 fact sheets detailing the siting process, the reason for the selection of the region, and information about radioactivity and radioactive waste, transport of radioactive waste and other relevant issues, was distributed with the Phase 3 discussion paper (Bureau of Resource Sciences 1997).

Broadly similar issues were raised in response to the Phase 1 and 2 discussion papers, including:

- the need for a national repository and alternatives to the proposal (Section 1.6)
- the siting process (Section 5.1)
- suggested regions or sites (Sections 5.1 and 5.2)
- the consultation process (Section 1.5.3)

- the type of waste to be disposed of in the facility (Section 4.1)
- transport of waste to the facility (Chapter 7)
- safety of the environment and people (Chapters 8–12)
- design of the facility (Chapter 6).

After the selection of the central–north region of South Australia for further siting studies, public comments became more focused on the specific region. Issues raised included:

- why the central–north region of South Australia had been chosen
- the environmental impact of siting the repository
- the socio-economic impact of siting the repository.

The issue of whether the store for long-lived intermediate level waste would be co-located with the repository was also raised (Section 1.1). Some submissions also raised the issue of whether the national repository would accept international nuclear waste (Section 1.1).

The issues were addressed in papers responding to public comment (Department of Primary Industries and Energy 1993, 1995; Department of Industry, Science and Resources 1999).

Regional Consultation, 1998

Once the central–north region of South Australia had been selected, significant effort was put into consulting with people in the region to inform them about the proposal and to listen to their views about the repository and possible siting options. The company Halliburton KBR (formerly Kinhill) was engaged by DISR to assist with the public consultation process until the preferred site for the national repository was identified.

Key elements of the community consultation process included the operation of a temporary regional information office, community information days, establishment of a toll-free information line, an internet website, meetings with community and stakeholder groups, briefing of regional media, and the establishment of the RCC.

The Phase 3 discussion paper (Bureau of Resources Sciences 1997) and a comprehensive information kit were distributed widely in the region to key stakeholders, and to council offices and libraries. Community-based meetings were held with the following groups in the week following their release:

- Andamooka Progress and Opal Miners Association
- District Council of Coober Pedy
- Northern Region Development Board
- Roxby Downs Administrator
- Corporation of the City of Port Augusta
- *Coober Pedy Times*
- WMC (Olympic Dam Corporation) Pty Ltd
- Woomera Administrator and Board.

These meetings provided an opportunity to identify other key groups in the community who should be consulted and to discuss the most appropriate mechanisms for promoting and conducting community information days. Interviews were held with the media to inform the public about the project, including the *Coober Pedy Times*, the *Port Augusta Transcontinental* newspapers, the regional ABC radio stations in Port Augusta and Port Pirie, and Channel 9 television in Adelaide. Pastoral lessees in the region were consulted on the proposal and the views of pastoralists were also sought on possible sites.

The regional information office was established in the main street of Port Augusta from 24 February until 17 March 1998. The office was equipped with visual display material, information brochures, the ASSESS system on laptop computer, and people from the project team were on hand to discuss the project and answer questions. Approximately 20 people visited the office.

Information Days

Community information days were widely advertised through letters sent to groups in the region, leaflets distributed to people living and working in the region, and advertisements in regional newspapers.

A total of 275 people attended the information days held at five locations in the region (Table 1.1).

TABLE 1.1 Information days and attendance, 1998

Date	Town	Number of attendees
18 March 1998	Roxby Downs	90, including school students
19 March 1998	Woomera	40
20 March 1998	Andamooka	13
24 March 1998	Coober Pedy	115
26 March 1998	Port Augusta	17

In conjunction with the information days, meetings were held with the following community groups in the region:

- Andamooka Land Council
- Andamooka Progress and Opal Miners Association
- Country Women's Association via School of the Air
- District Council of Coober Pedy
- Kupa Piti Kungka Tjuta Aboriginal Corporation
- Nullakarinku Wanga Association
- Port Augusta Native Title Working Group (the group no longer exists but comprised members from Barngarla, Kokotha and Kujani claimants)
- Regional Coober Pedy School.

The Spencer Gulf Alliance Group was also invited to meet with Commonwealth officers. The group declined the invitation but members did attend the community information day held at Port Augusta.

The consultation process was very effective in hearing the views of a wide cross-section of the population. The personalised, one-on-one nature of the process also provided the opportunity of explaining the proposal in more detail, answering specific questions and clarifying misunderstandings about the impact of the proposal. The success of this process led to additional direct consultation with stakeholder groups and information days as the project progressed.

The diverse opinions expressed at the information days ranged from those who felt quite comfortable with the repository being located in South Australia's central–north region through to those who strongly opposed the proposal. Those who were in agreement understood and accepted the need for improved, more responsible management of Australia's radioactive waste. They expressed confidence in the government's decision-making processes given the stringent criteria to be applied in selecting and managing the repository. A few people expressed an interest in opportunities for involvement in the construction or ongoing management of the repository.

Others accepted the need for one national radioactive waste repository and acknowledged that the proposed region met all the criteria, but still had concerns about the repository being located there. Some thought the central–north region already had its fair share of radioactive waste with the current activities at Olympic Dam and previous activities at nearby Maralinga. Others thought that the case for locating the repository in central–north South Australia had not been sufficiently proven.

Some considered that waste should be stored at the point where it is generated. Those most strongly opposed to the proposal also had broader concerns about mining uranium, the use of nuclear energy and contribution to nuclear waste internationally. The issues were responded to by the project officers at the information days and are addressed in this EIS.

Regional Consultative Committee

Shortly after the announcement of the selection of the central–north region for siting studies, the RCC was established by the Commonwealth to facilitate information exchange between the Commonwealth and stakeholders in the region. The RCC is not a decision-making body: it was established to ensure that stakeholder views are taken into account in decision making. The RCC currently includes representatives from:

- Andamooka Land Council Association
- Andamooka Progress and Opal Miners Association
- Andamooka Country Women's Association
- Antakirinja Land Management Aboriginal Corporation
- Arid Areas Catchment Water Management Board
- Barngarla Native Title Claimants
- Corporation of the City of Port Augusta
- Defence Estate Organisation
- Defence Support Centre (Woomera)
- District Council of Coober Pedy
- Northern Regional Development Board
- Flinders Ranges and Outback Tourism Board
- Kingoonya District Soil Board
- Kokatha Native Title Claimants
- Kujani Native Title Claimants
- Marree Soil Conservation Board
- Marla–Oodnadatta Soil Conservation Board
- Municipal Council of Roxby Downs
- Office of the SA Minister for Environment and Heritage
- Outback Areas Community Development Trust
- SA Department for Environment and Heritage
- SA Department of the Premier and Cabinet
- SA Health Commission
- SA Tourism Commission
- WMC (Olympic Dam Corporation) Pty Ltd
- Woomera Board.

Guests invited to meetings of the RCC are:

- the Member for Grey (Commonwealth Parliament)
- the Member for Giles (SA Parliament).

The RCC has met at both the beginning and end of each phase of the project. To the end of 2001, the committee had met on eight occasions, mostly at Roxby Downs or Woomera.

A range of issues has been discussed at the meetings, with a particular focus on the progress and results of the siting investigations. In addition, presentations have been given to the committee by representatives of ARPANSA and Environment Australia on various aspects of the review and approval processes, and by ARPANSA on the nature of radioactive materials and their safe management. At the July 2001 meeting in Roxby Downs, the consultants for this EIS, PPK and Halliburton KBR, described the EIS process and the scope and conduct of the study.

The views of regional stakeholders have been taken into consideration in selecting sites for investigation. Pastoralists, members of the RCC, and Aboriginal groups (further detail on the discussion with Aboriginal groups is given in Chapter 11) were extensively consulted on the

heritage value of potential sites. As a result, new sites were selected for investigation and work did not proceed on others.

Consultation from 1999 Onwards

A newsletter, *The Monitor*, was distributed to all addresses in the region. To the end of 2001, five issues of the newsletter had been published and distributed. Articles in various issues described the status and next phases of the project, and provided information on various issues raised during public consultation such as the safety of the proposed facility, transport of waste, and the Government's refusal to accept radioactive waste from overseas. Community participation was encouraged throughout the project public consultation process.

In 2000, an informal consultative group was established with pastoralists in the region. Meetings with the group took place the day before the RCC, and provided a framework for discussion of the siting process with those who had potential sites located on their pastoral leases or on adjacent properties. The EIS consultants described the EIS process and scope and conduct of the study to a meeting of the group in Roxby Downs in July 2001.

In July 2000, a scientific liaison officer, Dr Keith Lokan, was appointed to talk to community groups and the media about the national repository proposal and, in particular, to respond to scientific and technical questions. Dr Lokan, the former head of the Australian Radiation Laboratory, is both nationally and internationally recognised as an expert in radiation-related matters, and currently serves on the SA Radiation Protection Committee, a statutory committee formed under the *Radiation Protection and Control Act 1982* (SA).

Dr Lokan has addressed the RCC and pastoralist group, and has accompanied media representatives on visits to the preferred sites and alternatives. He has addressed the South Australian Science Teachers Association and the Australian New Zealand Association for the Advancement of Science, and other meetings organised by local government in the region and by various political parties. He has also interacted with a number of environmental groups.

Information Days

With the start of the EIS process, information days were held in the region in July 2001, and an up-to-date information kit with 10 fact sheets was prepared for distribution. The aim was to provide the regional community in particular with further information on the project and the review and approval process, and to give the community an opportunity to ask questions about the proposal. Gutteridge, Haskins and Davey Pty Ltd, appointed as project manager for the Repository Project in April 2001, assisted with the information days.

The dates and venues for information days were advertised in *The Monitor* newsletter, with the exception of the Glendambo Field Day, which was a privately organised event. Fliers were sent to council offices and local libraries. Local papers, such as the *Woomera Gibber Gabber*, also advertised the relevant information.

A total of 247 people visited the five information sessions (Table 1.2).

TABLE 1.2 Information days and attendance, July 2001

Date	Town	Number of attendees
6 July	Woomera	21 (all visitors)
7 July	Andamooka	43 (41 locals)
8 July	Roxby Downs	24 (22 locals)
17 July	Port Augusta	104 (about 97 locals)
18 July	Glendambo	55 (all visitors)

Both locals and visitors to the district attended the information days. Project officers and representatives from ARPANSA answered questions about the project, and provided information about the proposal and radioactive materials.

Issues raised and views expressed were similar to those expressed during the 1998 information days.

Some supported the national repository project, saying that the waste had to go somewhere and that it made sense to get it out of universities, hospitals and industry stores and put it in a purpose-built facility.

Some raised questions about the design of the repository, and the safety of the environment near the facility (Chapters 8 and 9). Others asked whether the national store for intermediate level waste would be co-located with the repository, and others were concerned that the repository might take international nuclear waste (Section 1.1). Some asked questions about the transport of waste to the facility (Chapter 7) and the regulation of the facility (Chapter 3).

Some raised the issue of why alternative sites had not been selected: in particular, Maralinga, Radium Hill and Olympic Dam Mine (see Section 1.7.2). Others opposed the concept of radioactive waste disposal as part of a general opposition to the nuclear fuel cycle.

Consultation with the SA Government

There has been extensive consultation with the South Australian Government both before and after the central–north region was selected for siting studies. To facilitate consultation between the SA Government and the Commonwealth, a South Australian/Commonwealth Government Consultative Committee was established. This committee meets directly before the RCC meetings and includes officials from the following SA Government agencies:

- Department of the Premier and Cabinet
- Department for Environment and Heritage
- Department of State Aboriginal Affairs
- Department of Human Services
- Department of Primary Industries and Resources
- Department for Transport, Urban Planning and the Arts
- Department of Industry and Trade.

Some of the SA Government officials that attend the SA/Commonwealth Consultative Committee also attend RCC meetings.

The EIS consultants made a presentation to the SA/Commonwealth Consultative Committee on the timetable, scope and conduct of the EIS at a meeting in Adelaide in July 2001.

Other Consultative Committees

Consultation with other Commonwealth Government agencies has been provided through an interdepartmental consultative committee, which generally meets about the same time as the RCC and the SA/Commonwealth Consultative Committee, at the start or conclusion of each phase of the project. The EIS consultants met with the interdepartmental committee in Canberra in August 2001, and described the timetable, scope and conduct of the EIS.

In addition, the Commonwealth/State Consultative Committee on Radioactive Waste Management, with members from departments and agencies with the responsibility for managing radioactive waste in the various jurisdictions, is regularly briefed on progress of the project.

After the conclusion of the environmental assessment process, when a final site is decided, a local consultative committee of stakeholders with a direct interest in the site will be established.

1.6 Project Need and Justification

At present, low level and short-lived intermediate level waste is stored at over 100 locations around Australia, in rural locations and highly populated urban centres. Generally speaking, waste producers have the responsibility of looking after the radioactive waste in circumstances that, although safe, are not ideal and cannot be guaranteed continuity of arrangements.

In many cases storage space is limited, and the storage is in facilities that were not purpose-built. Where radioactive waste is stored by waste producers the potential exists for incidents in which employees or even members of the general public are needlessly exposed to radiation, through lack of security or lack of willingness on the part of waste producers to take responsibility for the waste.

The establishment of a national repository for Australian low level and short-lived intermediate level radioactive waste will ensure that the waste is disposed of in a purpose-built facility where it can be managed in a safe and responsible manner. The community and environment would benefit from the establishment of such a facility by ensuring that the waste is isolated, as much as possible, from the environment and people, and responsibly monitored and managed until its radioactivity decays to background levels.

In developing the project a range of alternatives has been considered, including the 'no project' alternative, alternative locations, alternative disposal methods and alternative technologies. The advantages and disadvantages of these options are further discussed in the following sections, particularly as they relate to the identified national environmental significance criteria and the EPBC Act (Section 1.2.1), ESD principles (1.6.2), local and international strategies and accepted international practice.

1.6.1 The Need for a National Near-Surface Radioactive Waste Repository

Why a Repository?

Australia has generated a relatively small amount of low level and short-lived intermediate level waste. Recent estimates indicate that about 3700 m^3 (about the volume of eight average houses) has been generated from medical, industrial and research use of radioisotopes over the last century. Over half of this waste consists of 2010 m^3 of lightly contaminated soil, a result of experimentation into radioactive ores by CSIRO in the 1950s and 1960s, which has been stored in the WPA since 1994–95.

The balance of the existing waste consists of materials such as paper, plastics, glassware and protective clothing, luminous watches, compasses, gauges and exit signs, and radioactive materials used in a variety of medical and industrial equipment. Much of the waste is a legacy of the past use of radioactive materials in medicine, industry and research.

Most Australians benefit from the medical, research and industrial uses of radioactivity. For instance, in 1997–98 alone, some 347,000 patient doses of radiopharmaceuticals were produced by the Lucas Heights research reactor for medical procedures such as cancer diagnosis and treatment (PPK Environment & Infrastructure 1998). Also, ANSTO estimates (pers. comm. to DEST 2002) that in 2000–2001 about 525,000 people in Australia underwent a nuclear medicine procedure for the treatment or diagnosis of medical conditions such as cancer.

With the benefits of the medical, industrial and research use of radioactivity comes the responsibility for the safe management and disposal of radioactive waste. Radioactive wastes will continue to be produced and will therefore need to be disposed of in a manner that reduces potential risks to the environment, society and the economy. Disposal of radioactive waste is the end point in the responsible cycle of use and management of radioactive material.

The more than 100 locations around Australia that currently store low level and short-lived radioactive waste include hospitals, research institutions, and industry and government stores. The waste is largely stored in buildings that were not designed for the long-term storage of radioactive material. Space at many of these storage sites is nearing or has reached capacity. The risk to the environment and people is greater when material is stored in many locations in non-purpose built facilities, than when it is disposed of in a national, purpose-built repository.

The following two examples illustrate the potential for accidental exposure. A few years ago, when an Australian hospital was being demolished, two demolition contractors took a safe from a basement, unaware that it contained radioactive sources that had not been used for years. They used a blowtorch to cut the safe open in a domestic back yard but, luckily, no one was exposed to radiation in the incident. In the other example, a basement used to store radioactive material in an Australian university was flooded. Although there was no leakage of radioactive material, the incident demonstrates the difficulties of storing radioactive waste in facilities that are not purpose built.

Concerns about the possibility of acts of terrorism involving nuclear and radioactive materials have assumed greater international prominence in the wake of the events of 11 September 2001 in New York City and Washington DC.

While it would be very difficult for terrorists to develop effective nuclear weapons, a radiological weapon could be within their capabilities. This could involve, for example, the use of explosives with radioactive materials to spread radioactive contamination (what some term a ‘dirty bomb’). It is unlikely that the low level radioactive materials might be sought for such purposes. However, there is a possibility, and thus an even stronger reason than before to establish a national process for the orderly collection and safekeeping of these types of materials.

To minimise the risk of radioactive materials falling into the wrong hands, the IAEA — of which Australia is a prominent and respected member — has placed a high priority on strengthening security arrangements for radioactive materials. Under its nuclear safeguards agreement with the IAEA, and as a signatory to several IAEA conventions governing the safety and security of radioactive materials and nuclear facilities, the Australian Government is obliged to use its best efforts to ensure that such materials are used, stored and transported in accordance with the highest international standards.

Without a national repository for low level and short-lived intermediate level radioactive wastes, disposal of radioactive sources used in medical, industrial and scientific fields is not an option for most Australian users when the sources reach the end of their life. Sources that cannot be recycled must be stored.

This current practice of having hazardous radioactive materials stored in many locations nationwide is clearly unsatisfactory in the long-term from the perspective of public health and safety. It is also strongly in the interests of public security both in Australia and internationally to secure radioactive materials from possible theft or misuse by terrorists, through collecting and disposing of them at a facility specifically designed for this purpose.

The objects of the EPBC Act, and the principles of ESD as identified by the Act, are highlighted in Section 1.6.2, and the application of the EPBC Act is described in Section 1.2.1. The current storage situation can be considered unsustainable and not consistent with the objectives of the EPBC Act or the principles of ESD, because of the risks associated with multiple-storage locations, in non-purpose designed facilities.

In particular, the present ad hoc approach is not considered to be in compliance with several objectives of the EPBC Act, including providing protection for the environment (object (a) of the Act), providing a cooperative approach to protection and management of the environment (object (d)) and not conforming with international safety and guidelines for the disposal of the wastes (object (e)).

The present arrangements do not fully address the following principles of ESD as described in Section 1.6.2, including that of inter-generational equity as the current arrangements place the burden of disposal of waste on future generations.

Why a National Repository?

In 1985, the Commonwealth/State Consultative Committee on Radioactive Waste Management recommended a national program to identify potentially suitable sites for a national near-surface radioactive waste repository. This decision recognised that, for the small amount of radioactive waste that Australia has, it would be technically and economically inefficient for all jurisdictions to establish their own disposal facilities.

A national repository for low level and short-lived intermediate level waste will ensure that waste currently largely stored in facilities which are not purpose built is disposed of in a purpose-built repository where it can be safely monitored and isolated, as much as possible, from the environment and people.

The committee reported that most of Australia's radioactive waste is suitable for near-surface disposal at specially selected sites. Studies were undertaken by state and territory authorities to identify potentially suitable regions using international guidelines.

Although all governments supported the concept of a national repository, states and territories were reluctant to volunteer to host the facility. This resulted in the siting study by the Commonwealth, begun in 1992, with the support of state and territory governments. The previous study phases are described in detail in Section 1.5.

Why a Near-Surface Repository?

It is internationally accepted practice that low level and short-lived intermediate level radioactive waste is disposed of in near-surface repositories. There are more than 100 repositories for low level and short-lived intermediate level waste either operating, or in the process of being established, in over 30 countries including the United States of America (USA), England, France, South Africa and Spain (Section 2.5.2).

Shallow near-surface disposal has been practised successfully in other countries for decades. The environment in the central–north region of South Australia is broadly similar to the arid environments in the USA and South Africa where near-surface disposal of low level and short-lived intermediate level waste has been successfully practised in trenches with very little engineering. In Australia, near-surface disposal of hazardous and radioactive wastes has been successfully undertaken at Mount Walton East in Western Australia. There is also a purpose-built storage facility at Esk, Queensland. Further information on near-surface repositories operating in Australia and overseas can be found in Sections 2.4 and 2.5 of this document.

A national near-surface repository for the disposal of Australian low level and short-lived intermediate level waste would reduce the cumulative risks of managing numerous waste storage areas. It represents the safest and most effective option for Australia to manage our low level and short-lived intermediate radioactive waste.

The Commonwealth government considers that the establishment of a national repository represents the safest and most effective option for Australia to manage this type of waste, particularly as the ongoing generation of waste is expected to be relatively small, and therefore technically and economically does not justify the establishment of separate facilities on a state-by-state basis.

As noted previously, the exercise for determining a location for a national store for long-lived intermediate waste produced by Commonwealth agencies is being undertaken separately from the process to site a national repository for low level and short-lived intermediate level waste. It is not proposed that the store would be co-located with the repository on the same site in SA.

1.6.2 The Benefits of a National Near-Surface Radioactive Waste Repository

The continued production of radioactive wastes in Australia through the medical, industrial and research use of radioactivity, will exacerbate the pressure on the current storage arrangements. Disposal of this waste in a national repository would allow many of the existing temporary storage facilities to be closed. The community expects that the Government will act responsibly to ensure minimal risks to the environment and society. A national near-surface repository will ensure that any potential risks are properly managed in accordance with the NHMRC 1992 Code. In addition to this code, the IAEA guidelines — Safety Standards Series (*Near surface disposal of radioactive waste*, WS-R-1 (1999) and *Safety assessment for near surface disposal*, WS-G-1.1(1998)) and Safety Series *Siting of near surface disposal facilities 111-G-3.1* (1994) — will be referred to.

There will be an overall benefit to the Australian community by disposing of national low level and short-lived intermediate level radioactive waste in the optimal region for hosting the repository.

Disposal of waste in a suitable, purpose-built repository is in keeping with the guiding principles outlined for the management of radioactive waste (International Atomic Energy Agency 1995), detailed in Section 3.1. Waste classifications and international practice are discussed in Sections 2.3 and 2.5.

The expected community, regional, state or national benefits can be considered in terms of:

- facility management benefits
- socio-economic benefits
- regulatory benefits.

Facility Management Benefits

Much of the existing radioactive waste is stored in highly populated urban environments largely in buildings that were neither designed nor located for the long-term storage of radioactive material. Waste producers have the burden of managing this material under circumstances that were not designed for its long-term management.

A purpose built national near-surface repository, which is managed and maintained in compliance with government legislation and regulations, and which is in accordance with the NHMRC 1992 Code, would ensure that Australian low level and short-lived intermediate level radioactive waste is managed safely until it decays to background levels and no longer poses a potential danger to people or the environment. It would also, indirectly (through the removal of potential hazards), provide benefits to the environment and also to the population in the vicinity of many current storage locations.

Socio-Economic Benefits

Some employment and economic benefits have been generated by the national repository project. The siting phase has employed contractors for drilling, scientific analysis of data, and environmental assessment. Aboriginal groups have been remunerated for undertaking heritage clearances of sites.

As Australia only holds and generates a small amount of radioactive waste, the national repository will be a small operation, with infrequent disposal activities. There will be some opportunities for contractors to become involved in the operation and construction of the

facility. Some upgrading of existing infrastructure may be required depending on the location of the final repository site.

Regulatory Benefits

The regulatory benefits of the proposal are evident by considering the objects and principles of the EPBC Act and ESD. The objects of the EPBC Act are to:

(a) provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance
(b) promote ESD through the conservation and ecologically sustainable use of natural resources
(c) promote the conservation of biodiversity
(d) promote a cooperative approach to the protection and management of the environment involving governments, the community, landholders and indigenous peoples
(e) assist in the cooperative implementation of Australia's international environmental responsibilities
(f) recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity
(g) promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge.

The EPBC Act identifies the following principles of ESD:

1. Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.

2. If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

3. The principle of inter-generational equity — the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

4. The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making.

5. Improved valuation, pricing and incentive mechanisms should be promoted.

The purpose of this EIS is to enable formal assessment of whether the proposed national repository addresses the objects of the EPBC Act. It aims to show that the disposal of radioactive waste in a purpose-built facility addresses the objects of the EPBC Act better than the current ad hoc arrangements. It also aims to show that disposal of radioactive waste in a safely monitored and managed facility would provide better protection for the environment (object (a)), and the establishment of a national facility would provide a cooperative approach (object (d)) to radioactive waste management, and assist in the cooperative implementation of Australia's international environmental responsibilities.

The establishment of a purpose-built facility for the safe disposal of low level and short-lived radioactive waste will address protection of the environment in a manner consistent with the objects of the EPBC Act and the principles of ESD. Managing waste by disposal in a purpose-built facility will better address these objects and principles of protection of the environment and people, than the current ad hoc arrangements.

Issues relating to biodiversity, the protection and management of the repository site, the consideration of long-term and short-term economic, social and equitable considerations are addressed in this EIS.

Under current arrangements various state, territory and Commonwealth Acts and Regulations govern the management of radioactive waste. The states and territories are responsible for monitoring the use, transport and disposal of radioactive materials in their jurisdictions, and the Commonwealth Government is responsible for managing radioactive materials in organisations under its control, including government departments and agencies.

The recently created ARPANSA, which reports to the Minister for Health and Ageing, is responsible for regulating all Commonwealth departments, agencies and bodies corporate (including contractors to these organisations) involved in radiation or nuclear activities or dealings (through the ARPANSA regulatory branch). Other branches of ARPANSA are responsible for:

- promoting uniformity of radiation protection and nuclear safety policy and practices across jurisdictions of the Commonwealth, the states and territories
- providing advice to government and the community on radiation protection and nuclear safety
- undertaking research and providing services on radiation protection, nuclear safety and medical exposures to radiation.

As a Commonwealth facility, the national radioactive waste repository would be regulated by ARPANSA, which would assist in facilitating a more coordinated approach to radioactive waste management in Australia.

1.6.3 Implications of Not Establishing a National Near-Surface Radioactive Waste Repository

The implications of not establishing a national near-surface radioactive waste repository are summarised as follows:

- Australia has about 3700 m^3 of low level and short-lived intermediate level waste currently being stored in over 100 locations around the country. Many of these temporary stores are nearing capacity. Australia currently produces about 40 m^3 of this type of waste annually. Without a national repository, each state and territory may have to site, design and operate its own near-surface radioactive waste repository in the future, which would be an inefficient and unnecessary use of resources.
- Of the over 100 locations around Australia used for the storage of radioactive waste, many are in urban environments in buildings that were neither designed nor located for the long-term storage of radioactive material. Some of the packaging and containment of these wastes is deteriorating, and security cannot be guaranteed. Not proceeding with the national repository would mean that waste would continue to be stored largely in non-ideal circumstances, with the potential for future loss of control or accidental exposure of people or the environment to radiation.
- If the proposal for a national repository did not go ahead, the storage of radioactive waste in non-ideal arrangements will continue to be an issue. Community concern may focus on these numerous storage locations and their perceived risk of accidental exposure and possible terrorism activity.

1.7 Alternatives to the Proposal

An extensive process of scientific assessment and community consultation has selected the preferred site and the preferred method of disposal. This section briefly discusses alternatives to the proposal presented in this EIS.

There are no feasible alternatives to the storage and disposal of low level and short-lived intermediate level radioactive waste.

1.7.1 The No Repository Option (Maintaining the Status Quo)

Previous sections have discussed the overall need for a national near-surface repository for low level and short-lived intermediate level waste and described a number of the benefits of such a facility. This section outlines some of the advantages and disadvantages of maintaining the current waste management practice of indefinite storage of radioactive waste.

Maintaining the status quo does not provide best long-term protection to the environment. It also does not address the objects of the EPBC Act nor ESD principles (Section 1.6.2). Indefinite storage in non-purpose-built facilities poses a potential threat to both present and future generations, thereby contradicting the principle of inter-generational equity.

In addition, storage represents an interim stage in the management of waste, and disposal is the final step. Disposal of low level and short-lived intermediate level radioactive waste as proposed by the Commonwealth is an internationally accepted method for the management of this type of waste.

The advantages and disadvantages of maintaining current storage arrangements can be considered in terms of:

- impacts on the environment and society
- continuity of arrangements
- potential contamination risks.

Impacts on the Environment and Society

If the proposed national repository were not constructed, there would be no disruption or alteration to the local physical and biological environments at the preferred site, or potentially one of the two alternatives, in the central–north region of South Australia during construction, operation and decommissioning. Nor would there be any impacts on proposed transport routes. There would be no disruption to the communities living in the vicinity of the proposed development sites. There would also be no visual impact of development or operation. Therefore there are benefits to the local environment at the proposed site in maintaining the status quo.

However, low level and short-lived intermediate level radioactive waste would continue to be stored on the WPA near Woomera as well as at over 100 other locations around Australia, in non-purpose-built accommodation, which poses the ongoing risk of radiation environmental impact and, in any event, given the ongoing accumulation of waste material, is not a sustainable arrangement.

Continuity of Arrangements

Under the present arrangements medical, industrial and research organisations (public and private) producing radioactive waste are responsible for managing it. Although strict Commonwealth, state and territory legislation governs the storage of radioactive wastes, current arrangements are not ideal, generally, because they cannot be guaranteed in the long term.

Maintaining the status quo may result in Australia not meeting its long-term responsibilities in terms of managing and disposing of radioactive waste.

Potential Contamination Risks

Without a national repository, low level and short-lived intermediate level radioactive wastes would continue to be stored in over 100 locations around Australia, largely in facilities which were neither designed nor located for the long-term storage of radioactive material, and which are reaching, or have already reached, their storage capacity. In the medium to long term there is potential for future loss of control or accidental exposure of people or the

environment to radiation. In addition, there are considerations of excessive cost in maintaining an adequate level of safety and security of the numerous storage facilities over the long term.

Disposal in Facilities of Different Designs to the Proposed National Repository

Accepted international practice (International Atomic Energy Agency 1995) is that low level and short-lived intermediate level radioactive waste is suitable for disposal in near-surface repositories. The disposal structures may either be below-ground trenches or disposal units above the ground surface. Facilities built above the ground surface are intended to be mounded-over during closure to create an artificial hill. Some nations also dispose of low level and short-lived intermediate level waste in rock caverns.

The choice of repository design takes into account the groundwater, climatic conditions and rock type as well as the type and volume of waste to be disposed of. What is a suitable design for one environment or situation is not necessarily suitable for another.

The proposed design for Australia's national repository takes into account the arid environment, and the type and volume of radioactive waste that Australia currently has, along with that which will be generated in the foreseeable future.

Some countries dispose of low level and short-lived intermediate level radioactive waste in bedrock of up to approximately 100 m below the ground surface, but these facilities are not the usual method of disposal of this type of waste. They are used in some countries that have large quantities of short-lived intermediate level waste, or where climatic conditions are extreme, or in countries that are actively advancing the consideration of models for geologic disposal facilities (e.g. Sweden) because of the large quantities of high level and long-lived intermediate level waste they produce from nuclear power programs.

Alternative Locations

An extensive site selection process has been undertaken and is described in more detail in Sections 1.5 and 5.2 of this document. The site selection process considered a number of locations, both across the country and within central–north South Australia. The preferred site and two proposed alternatives have been selected on the basis that they best met the internationally accepted selection criteria adapted for Australia on a nationwide basis.

Potential Longer-Term Use of the Proposed National Repository

Presently, it is suggested that the disposal operations would continue for 50 years with a period of review after this to consider the possibility of continued disposal. An option to continue the life of the national repository would provide the following benefits:

- It would avoid potentially returning to the current ad hoc storage arrangements with the potential for loss of control of radioactive waste, and accidental exposure of people and the environment to radiation.
- The need to find a new site for a disposal facility would be postponed.

1.7.2 Alternative Disposal Methods

There are a number of alternative disposal options for low level and short-lived intermediate level radioactive waste. These include:

- disposal in disused or used mine sites
- geological disposal
- ocean disposal.

Disused or Operating Mine Sites

The Commonwealth Government has considered the option of siting a national radioactive waste repository in a disused or operating mine. The use of a disused or operating mine site would need to be assessed against the technical selection criteria, and the proposed method of disposal, regulation and monitoring would need to meet the regulator's requirements. In addition, ore deposits may occur in areas of fractured rock, and the behaviour of radioactive substances in such an environment is hard to predict.

During public consultation, disposal of waste in either the operating Olympic Dam Mine or at the disused Radium Hill mine was suggested.

Disposal of radioactive waste in an operating mine such as Olympic Dam would pose operational difficulties in several respects. These include the inclusion of a Commonwealth facility within a privately run mine, security issues, interference with the separate logistics for the operations, the potential interference of regulatory monitoring requirements for the two operations, and the potential compromising of future mining operations.

At Radium Hill, there are high levels of radon gas in the mine and reopening it for the disposal of radioactive waste would be difficult and potentially hazardous. An above-ground area within a stockpile of sand at Radium Hill has been used by the SA Government for the disposal of small quantities of mining ore samples. This arrangement has the potential for destabilisation by erosion and is at potential risk of intrusion by people and animals. This option is not suitable for many of the wastes destined for the national repository.

Geological Disposal

Geological disposal involves disposing of radioactive waste packages in a stable geological formation at, typically, several hundred metres below the surface. Engineered barriers are constructed around and/or between the waste packages and the surrounding rock.

Geological disposal is considered to be a technically excessive and unnecessarily expensive approach for disposal of the type of waste to be disposed of in the national repository. Internationally accepted practice is that geological disposal is only required for long-lived intermediate level radioactive waste or high level waste.

Ocean Disposal

Australia is party to both the *United Nations Convention on the Law of the Sea 1994* (UNCLOS), which it ratified in 1994, and the *United Nations Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972* (London Convention), to which it acceded in 1984. The Commonwealth regulates the dumping of wastes into the sea, and fulfils Australia's obligations under these international conventions (Australian and New Zealand Environment and Conservation Council 1998). The dumping of radioactive wastes at sea is prohibited under these conventions and regulations.

Therefore, to adopt this option for the disposal of low level and short-lived intermediate level radioactive waste would contravene both international conventions on protection of the marine environment and Australian legislation.

1.7.3 Alternative Technologies

Alternative technologies have been suggested for disposal of long-lived intermediate level and high level waste rather than for radioactive waste that is suitable for near-surface disposal. The suggested alternative technologies include:

- transmutation
- space disposal
- Synroc.

Transmutation involves the conversion of long-lived radionuclides into shorter-lived or even stable nuclides by bombardment either with neutrons in a nuclear reactor or with protons in high-powered linear accelerators. This technique is not considered feasible or commercially viable in the near future (Miller et al.1994) for low level radioactive waste.

Disposal in space has been considered as, if successfully achieved, it provides the greatest degree of isolation from man's environment (Rice and Priest 1981; Coopersmith 1999), but its practicality, cost, technological complexity and potential risks all argue against it.

The use of a material such as Synroc to encapsulate radioactive waste does not provide an alternative to storage and disposal. Synroc can be used, instead of cement or glass, to act as binding material to encapsulate long-lived (or high level) radioactive waste. The resulting material still needs to be disposed of in a repository appropriate to this class of waste. It is not cost effective to use a material such as Synroc for the encapsulation of low level or short-lived intermediate level radioactive waste.