CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

This chapter describes the alternatives for amending NRC's regulations to include criteria for controlling the disposition of solid materials that originate in restricted or impacted areas of NRC/Agreement State licensed facilities. These materials have no, or very small amounts of, radioactivity resulting from licensed operations and are referred to in this Draft Generic Environmental Impact Statement (Draft GEIS) as "solid materials." The alternatives studied in detail are No Action, Unrestricted Release, Environmental Protection Agency (EPA)/State-Regulated Disposal, Low-Level Waste (LLW) Disposal (Prohibition), and Limited Dispositions. In addition, one alternative and two options are presented which were considered but not studied in detail.

2.1 PROPOSED ACTION

The Proposed Action being considered in this Draft GEIS is to promulgate an NRC regulation that would include criteria for disposition of solid materials from NRC licensed facilities. The Proposed Action would improve the efficiency and effectiveness of the NRC regulatory process for disposing of solid materials. The NRC is guided by the goals of the NRC Strategic Plan (NRC, 2004d), of which the primary goal is ensuring protection of public health and safety. The proposed rulemaking would result in related rulemakings in the Agreement States.

2.2 SOLID MATERIALS CONSIDERED UNDER THIS RULEMAKING

Nuclear facilities routinely use different types of materials in support of various activities, including operations, production, research and development, maintenance, facility refurbishment, and ultimately decommissioning. In support of these activities, materials and items are introduced in areas that contain radioactivity. Areas that contain radioactivity include systems that process radioactive process fluid or gas streams, and waste storage and processing areas. Areas where radioactive materials are present are collectively referred to as "radiologically controlled" or "radiologically restricted" areas. Once materials or items are no longer needed or otherwise need to be removed, a licensee must decide how to disposition this material. For equipment and items such as tools, vehicles, and test equipment, the items could be considered for recycle or reuse rather than disposed of in LLW facilities because of their usefulness and value. Materials and equipment are surveyed before being taken out of restricted areas. The results of the surveys are used to determine the final disposition of materials or items. Based on the survey results, licensees determine whether it is worthwhile to decontaminate the materials or items or simply dispose of them as LLW. Materials considered by this rulemaking are described below. Descriptions of licensees and inventories of materials are discussed in Appendix F.

Concrete - Concrete is expected to be generated mostly during the decommissioning phase of facilities, although smaller amounts of concrete could be generated during facility or system modifications or refurbishment while still in operation. Larger amounts of concrete are expected to come from structural concrete, with and without steel reinforcement bars (rebars). Other origins of concrete may vary, ranging from sidewalks or equipment pedestals to building foundations.

Metals - For ferrous metals, this grouping includes carbon steel, stainless steel, forged steel, galvanized steel, cast iron, etc. with no specific distinctions being made as to their relative amounts. For the sake of inclusiveness, copper and aluminum were added to this category. In origin, ferrous metal and aluminum are expected to come from process system components, structural support, system piping and tanks, pumps, heat exchangers, valves, pipe hangers, motors, ventilation ductwork, etc. Copper is expected to come from cabling and wiring, electric motors, power distribution panels, etc.

Trash - The composition of trash is expected to vary widely depending on the type of facility and operations. Generally, trash consists of plastics, paper, cloth, rubber, absorbent materials, wood, glass, filters, and metals (such as cans, wiring, etc.), and non-compactible waste (such as rubble, bricks, etc.).

Soils - Soils are generated during facility operations and remediation activities. Most of the soil volumes are expected to be associated with decommissioning activities at the time of license termination. In broad terms, soils include natural soils, engineered backfill, and process related materials that may be present by themselves or commingled with natural soils. Backfills may consist of a mixture of rocks, gravel, and sand, with some being native to the site or imported from offsite locations. Some process materials that are soil-like materials include sediments, sands, filter cake, sludge, and crushed slag, with all excess water drained. These materials are characterized by a water content and other physical properties that are similar to that of natural soils (NRC 2005b). Soils are not within the scope of this Draft GEIS because they were not analyzed as part of this effort (see Section 2.4.5).

Tools and Equipment - Tools and equipment include a variety of items used during facility operations, maintenance, and routine support activities. Tools may include hand tools and power tools. Equipment may include electronic test equipment, welding equipment and test instrumentation. Similarly, heavy equipment may include forklifts, trucks, backhoes, and cranes. Equipment also includes items used in offices, such as desks, file cabinets, chairs, computers, printers, phones, and copy and fax machines.

Treated process materials, which are materials whose properties have been modified or are unique to the process from which they originate, include spent ion-exchange resins, sludge from spent ion-exchange process systems, microspheres, oily sludge and sediments, spent filters and filter sludge, spent charcoal beds, and incinerator ashes. They also include materials that have been solidified or stabilized, contain chelating agents, pathogenic or infectious biotic agents, and pyrophoric or explosive chemicals. These materials are not within the scope of this Draft GEIS and they were not analyzed as part of this effort. Moreover, radioactive materials present as sealed sources, as sources within devices and equipment, and bulk or discrete amounts of radioactive materials (in any form) are excluded from the provisions of this rule.

2.3 PROCESS USED TO FORMULATE ALTERNATIVES

A set of preliminary alternatives for controlling the disposition of solid materials was first described in an NRC Issues Paper published for public comment in the Federal Register on June 30, 1999 (64 FR 35090) (NRC 1999a). Public comments were received on the alternatives at

public workshops and in written comments during the comment period (NUREG/CR-6682 (NRC, 2000b) and SECY-00-0070 (NRC 2000a)).

In March 2002, a report issued by the National Academies (National Research Council 2002) provided additional discussion concerning the advantages and disadvantages of various alternatives. The report found that NRC's current approach for controlling the disposition of solid materials "is sufficiently protective of public health that it does not need immediate revamping." However, the National Academies report also states that NRC's current approach is incomplete and inconsistent and concludes that NRC should therefore undertake a process to evaluate a broad range of alternatives to provide clear risk-informed direction on controlling the disposition of solid materials.

Based on these efforts, the Commission decided in October 2002 to proceed with a rulemaking for controlling the disposition of solid material. The Commission published a request for comments on the scope of the proposed rulemaking and notice of a workshop in the Federal Register on February 28, 2003 (68 FR 9595) (NRC 2003a). NRC held a public workshop on May 21-22, 2003 to solicit additional input on the alternatives being considered. This workshop was attended by a range of stakeholder groups who provided a diverse set of comments on the alternatives. In addition, more than 2,600 letters and e-mails were submitted to the NRC in response to the February 28, 2003 Federal Register notice, also from various stakeholders. A more complete description of the details of the entire scoping process for this Draft GEIS (including a summary of the public comments) is provided in Section 1.3 and the Scoping Summary Report in Appendix A.

NRC has explored the range of all reasonable alternatives suggested during the scoping process and by the National Academies. After considering input from this scoping process, NRC determined the following reasonable range of alternatives for detailed study in this Draft GEIS. The order of the alternatives follows the order in which the alternatives were formulated and analyzed.

- No Action
- Unrestricted Release
- EPA/State-Regulated Disposal
- LLW Disposal (Prohibition) (hereinafter referred to as LLW Disposal)
- Limited Dispositions

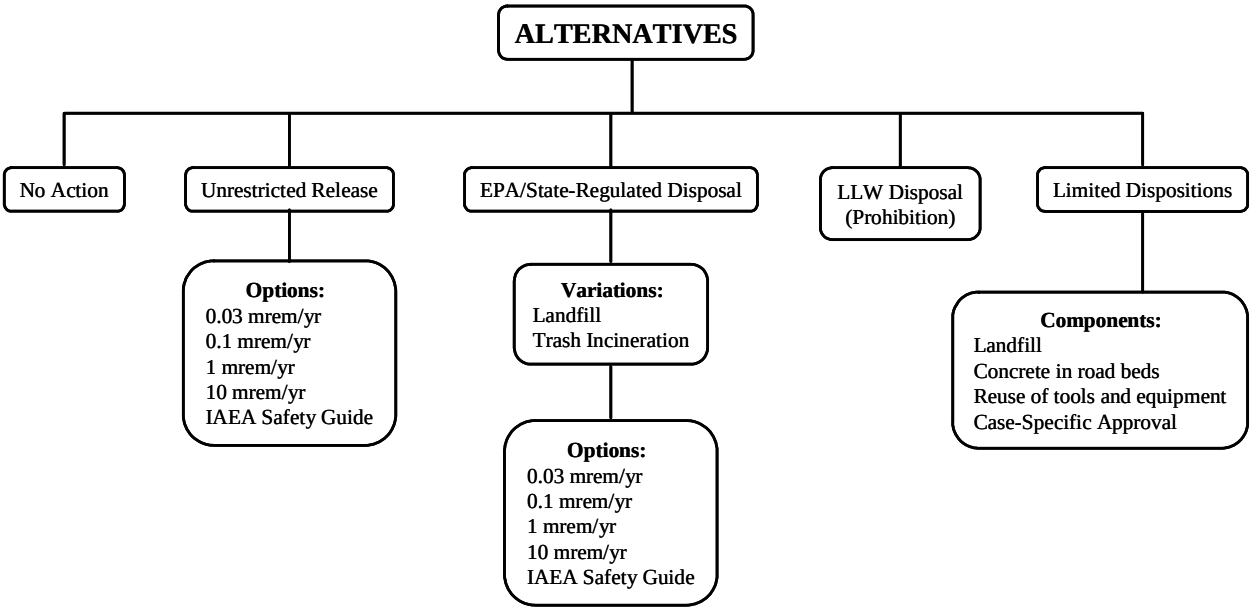
Two dose-based standards were considered and then eliminated from detailed study. These standards, which are described in Section 2.5, are the American National Standards Institute (ANSI)/Health Physics Society (HPS) Standard ANSI/HPS N13.12-1999 and the European Commission (EC) Radiation Protection Reports Nos. 89 and 122 (European Commission 2000a; European Commission 2000b).

2.4 ALTERNATIVES STUDIED IN DETAIL

Regulatory alternatives for controlling the disposition of solid material analyzed in this Draft GEIS are shown in Figure 2-1 and described in detail in this section. The Unrestricted Release

and EPA/State-Regulated Disposal Alternatives have dose options, which are sensitivity studies for those alternatives. The order of the description of the alternatives in this section follows the order in which the alternatives were analyzed. The Limited Dispositions Alternative evolved from the study of the other alternatives.

Figure 2-1 Alternatives



2.4.1 No Action

National Environmental Policy Act (NEPA) regulations (40 CFR 1502.14) require the analysis of a No Action Alternative to provide the decisionmaker with a basis for comparison to reasonable alternatives. In this case, under the No Action Alternative, NRC would continue to apply its current approach to determining the eligibility of solid material for unrestricted release in general commerce or disposal. The NRC's current approach is one that employs measurement-based guidelines to determine if solid materials can be released for any use or disposal. License conditions and facility-specific procedures require that solid materials that have been used in controlled or restricted areas are surveyed for the presence of radioactivity before being taken out of radiologically controlled areas. Solid materials can currently be released for any unrestricted use or disposal if the survey indicates that existing guidelines are met. Although NRC does not track release quantities if the materials meet the criteria, NRC inspectors routinely inspect a licensee's radiation protection programs and implementing procedures, which includes the survey records for compliance with Part 20 and license conditions.

However, 10 CFR Part 20 does not currently specify a numerical level (e.g., dose or concentration limits) below which the material can be released. Decisions on disposition of solid materials are currently made using levels contained in a set of existing guidelines that are based primarily on the ability of survey techniques to measure the radioactivity level on, or in, the solid material. Solid material releases have been evaluated at many sites during decommissioning.

Under the current case-by-case approach, NRC considers the volumes of material, exposure pathways, doses to individuals, environmental impacts, stakeholder concerns, and ALARA issues in evaluating licensee requests. Additional details on NRC's current approach to determining the eligibility of solid material for unrestricted release in general commerce can be found in Appendix B.

Under the No Action Alternative, solid material released (at or below guideline levels) for unrestricted release may be recycled and reused in a variety of end products, or it may be sent for disposal. Disposal may take place in an EPA/State-regulated landfill or LLW disposal facility. The potential exposures and the groups of individuals subject to exposures from released materials are dependent on their final dispositions.

Disadvantages of the current case-by-case approach are (1) the lack of a consistent criterion for controlling solid materials can result in inconsistent release levels, (2) there is no guidance for volumetrically contaminated materials, (3) there have been some inconsistencies when other types of detectors with different sensitivities are used and still lower levels of radioactivity are detected in previously released materials, and (4) additional time and resources are required to evaluate and implement an approach that can vary with each case.

2.4.2 Unrestricted Release

The Unrestricted Release Alternative would allow solid materials to be released for any use in general commerce (recycling and/or reuse into consumer products and industrial and construction uses) or for disposal, if they are below a dose-based criterion. Under the Unrestricted Release Alternative, all materials to be released would undergo a radiation survey and the measured level of radiation would be compared against the criterion for release for unrestricted release.[1] Solid materials with measured radiation levels below the established criterion would be released from licensed control, while solid materials with radiation levels above the criterion would be sent to a LLW disposal site. The proposed rulemaking would include a table of radionuclide concentrations (or clearance levels) corresponding to the selected dose-based criterion. In implementation, survey results would be compared to the clearance level of each radionuclide or mixture of radionuclides in demonstrating compliance with the rule. Compliance would be demonstrated when the survey results are less than the applicable clearance levels.

Under the Unrestricted Release Alternative, solid material released for unrestricted use may follow any disposition path – it may be recycled and reused in a variety of end products, or it may be sent for disposal. Disposal may take place in an EPA/State-regulated landfill or LLW disposal facility. The potential radionuclide exposures and the groups of individuals subject to exposures from released materials are dependent on their final dispositions.

This Draft GEIS considers a range of dose level options for the release of solid materials. The dose level that NRC selects would directly impact the amount of solid material released for use

[1] The term "clearance" is also used by various organizations and in various documents to mean removal from licensed control of material that meets certain release criteria.

in general commerce, with the amount of material released decreasing as the allowable dose criterion decreases. These dose options are:

- 0.03 mrem/yr[2]
- 0.1 mrem/yr
- 1 mrem/yr
- 10 mrem/yr
- International Atomic Energy Agency (IAEA) Safety Guide No. RS-G-1.7 (1 mrem/yr) (IAEA 2004)

For the first four dose options, NRC has independently assessed potential doses to individuals that could result from release of solid materials (NUREG-1640 (NRC 2003c)). This independent analysis is discussed in Chapter 3 of this Draft GEIS.

For the fifth dose option, IAEA Safety Guide No. RS-G-1.7 (IAEA 2004) was assessed. Appendix E compares RS-G-1.7, which is based on 1 mrem/yr, with a 1 mrem/yr dose criterion based on NUREG-1640 (NRC 2003c). The IAEA safety guide was considered because its use would provide more consistency with international numeric standards. Although both dose options (RS-G-1.7 and NUREG-1640) are based on a dose limit of 1 mrem/yr, their associated radionuclide concentration levels differ due to differences in dose modeling assumptions.

Under each of the dose options, solid materials to be released would have their level of radioactivity measured on-site by licensed facility workers (survey workers) prior to release. Those materials whose level of activity are found to be below the applicable clearance levels would be cleared for unrestricted release, including disposal in a landfill. Materials that do not meet clearance levels would be disposed of in a licensed LLW facility.

2.4.3 EPA/State-Regulated Disposal

Under this alternative, all potentially clearable solid material below a dose-based criterion would be released to EPA/State-regulated landfills and would be prohibited from general commerce (recycling into consumer products and industrial and construction uses). A base case and one variation of this alternative are being considered, specifically:

- EPA/State-Regulated Landfill (base case) – All released solid materials (including tools and equipment) would be disposed of in EPA/State-regulated Resource Conservation and Recovery Act (RCRA) Subtitle D landfills. Solid materials above the dose-based criterion would be sent to a LLW disposal facility.

- EPA/State-Regulated Trash Incineration (variation) – Trash would be incinerated at EPA/State-regulated incinerators and the ash disposed of in EPA/State-Regulated landfills. All non-trash solid materials (concrete, ferrous metal, etc.) would not be incinerated, but

[2] A realistic lower-bound dose limit of 0.03 mrem/yr was chosen because it is a small value at, or marginally above, detectable levels.

would be disposed of in EPA/State-regulated landfills. Solid materials above the dose-based criterion would be sent to a LLW disposal facility.

Under both the base case and the incinerator variations of this alternative, the following four dose options are being considered.

- 0.03 mrem/yr
- 0.1 mrem/yr
- 1 mrem/yr
- 10 mrem/yr

The four dose options are based on NRC's independent analysis in NUREG-1640 (NRC 2003c). Because allowing only landfill disposal would limit the public's exposure to potentially clearable material, this alternative results in higher radionuclide concentration limits. Thus a greater amount of activity could be released to landfills than the amount that could be released to general commerce under the Unrestricted Release Alternative because persons are exposed in a more limited manner.

EPA regulates municipal and industrial solid waste under RCRA. Under RCRA Subtitle D, the solid waste program encourages States to develop comprehensive plans for managing non-hazardous industrial solid waste and municipal solid waste and also sets criteria for municipal solid waste landfills and other solid waste disposal facilities. Further discussion of RCRA facilities is contained in Appendix J.

Under RCRA Subtitle C, the hazardous waste program establishes a system for controlling hazardous waste from the time it is generated until its disposal. Because hazardous materials are typically disposed of in Subtitle C facilities, this alternative considers only RCRA D facilities. However, it is useful to discuss the status of EPA efforts on RCRA Subtitle C facilities. EPA is considering a rulemaking that could permit disposal of certain NRC-regulated material in a RCRA Subtitle C facility subject to, if necessary, an appropriate NRC approval process (e.g., a site-specific or general license, or exemption). EPA published an Advanced Notice of Proposed Rulemaking (ANPR) in the Federal Register (68 FR 65119, November 18, 2003) (EPA 2003a) to solicit stakeholder input on a potential regulatory framework to permit disposal of low-activity radioactive waste, including mixed waste and other low-level waste, in RCRA Subtitle C disposal facilities. EPA is considering a wide range of allowable dose limits for materials being disposed, most of which are higher than the 1 mrem/yr dose limit. EPA is coordinating with NRC on the ANPR. If EPA decides to move foreward with a rulemaking for RCRA Subtitle C facilities, NRC would need to take conforming regulatory action in a separate rulemaking. That effort would be different from the proposed action discussed in this GEIS and would take place at a later time once EPA decides if it is moving forward with a rulemaking.

2.4.4 LLW Disposal (Prohibition)

Under the other alternatives, solid materials in excess of the release criteria would be sent to licensed LLW disposal facilities. However, under this alternative, also known as Prohibition, all potentially clearable solid material would be prohibited from general commerce and EPA/State-

regulated landfill disposal. All solid material in restricted or impacted areas (including tools and equipment) would be classified as LLW and required to be disposed of under NRC's existing regulations. The requirements of 10 CFR Part 61 address the siting, operation, and closure of LLW disposal facilities. Requirements in Appendix G to 10 CFR Part 20 focus on licensees (as waste generators) and provide procedures to ship LLW to such disposal sites.

There are currently three LLW disposal sites operating in the country that could accept solid material under this alternative. These facilities are:

- Envirocare - Clive, UT
- Barnwell Disposal Facility - Barnwell, SC
- Hanford Off-Site LLW Disposal Facility - Hanford, WA

The Barnwell Disposal Facility will only accept non-regional waste until 2008, at which time it will accept waste only from the Atlantic Compact States of South Carolina, New Jersey, and Connecticut, which is a relatively small subset of the total population of licensed facilities. The Hanford Off-Site LLW Disposal Facility accepts waste only from the Northwest and Rocky Mountain Compact States, which are: Washington, Oregon, Idaho, Montana, Utah, Wyoming, Nevada, Colorado, New Mexico, Alaska, and Hawaii. Because it is assumed that very little of the solid material would be eligible for disposal at the Barnwell and Hanford facilities, this alternative assumes that in the future all solid material would be sent to the Envirocare site for disposal. Information on the remaining available capacity of the existing LLW disposal facilities is presented in Section 3.7.

2.4.5 Limited Dispositions

In this alternative, solid material would be released, but NRC would allow only certain authorized dispositions to limit the potential for public exposure. All materials to be released would undergo a radiation survey and the measured level of radiation would be compared against the criterion for release for limited dispositions. Solid materials with measured radiation levels below the established criterion would be released for pre-approved limited dispositions, while solid materials with radiation levels above those radionuclide concentrations would be sent to a LLW disposal facility. Any requests to release material other than to these limited end uses or at higher radionuclide concentrations would require case-specific approval from NRC. NRC regulations in 10 CFR Part 20 would be amended to add a dose-based regulation for limited dispositions.

For the pre-approved dispositions, the radionuclide concentrations were chosen based on a dose limit of 1 mrem/yr using the IAEA Safety Guide No. RS-G-1.7 (IAEA 2004). A dose limit of 1 mrem/yr was chosen because it is a small fraction of the public dose limit and it is based on the NCRP and the National Academies recommendations. The table of radionuclide concentrations accompanying the IAEA Safety Guide is based on unrestricted release. This is a reasonably conservative approach because, for the same 1 mrem/yr dose criterion, an unrestricted release is generally associated with lower (more restrictive) nuclide concentrations than a limited path release, for which persons are exposed in a more limited manner. Thus, it can be assured that even in the unlikely event that all materials released in a year from a licensee were inadvertently

diverted for unrestricted release (despite the requirements of the proposed rule directing it to a limited use or disposal), a 1 mrem/yr dose would not be exceeded, and it could also be assured that an isolated unrestricted release would result in doses well below 1 mrem/yr. The materials that could be released under the Limited Dispositions Alternative are concrete, metals, and trash. The disposition of soils is excluded from this Alternative based on the analyses considering potential uses of released soil under varying scenarios. The results indicate that under some conditions, soils initially intended for burial in landfills could be diverted, at a point beyond the licensee's control, and used in other purposes given that there is a demand for "clean fill" that can be used as backfill. The staff analysis revealed that there is not enough information to characterize how soils might be used locally. Thus, the disposition of soils would be considered under the case-specific component of the rule, as is done under current practices. This aspect is discussed in more detail in the section addressing "case-specific approvals."

The radionuclide tables in RS-G-1.7 are expressed in terms of the quantity of the nuclides contained within the volume of the solid material. However, in many situations, surface concentrations will need to be measured or be more readily measurable. In fact, NRC's current approach in Regulatory Guide 1.86 includes a table of acceptable surface concentration levels. Since IAEA has not developed such information on surface concentrations at this time, NRC developed a table of surface concentrations by converting the volume concentrations of RS-G-1.7 to surface concentrations using information in NUREG-1640 (NRC 2003c) and by considering the values in the Department of Transportation transport requirements in 49 CFR Part 173. These surface concentrations are described in the NRC guidance document (NRC 2005a) that is being issued with this rule.

NRC considered whether solid material could be released if its further use would be restricted to only certain uses with limited potential for public exposure, such as use in a controlled environment. Examples include industrial uses such as metals in bridges or sewer lines, concrete use in road fill, and reuse of tools and equipment for their original purposes. Based on public comments during the scoping period, some of the possible recycling uses were not considered as pre-approved dispositions. Also, the marketplace is likely to limit the range of end-uses for the disposition of solid materials. For example, the recycling industry indicated it would be difficult to find scrap metal brokers and steels mills willing to accept and process the released materials. Although recycling of scrap metal was not considered as a pre-approved disposition, metal recycling could be considered as a case-specific application.

Based on public comments during the scoping period and on the analyses for the Unrestricted Release and EPA/State-Regulated Disposal Alternatives in Chapter 3, the only limited dispositions considered under this alternative are disposal in a RCRA Subtitle D landfill, concrete use in roadbeds, and reuse of tools and equipment for their original purpose. Licensees would need to demonstrate that material proposed for release is less than the radionuclide concentrations in the proposed rule. Any requests to release material other than these limited end uses would require case-specific approval (including the disposition of soils).

To ensure that the material releases are occurring to the pre-approved dispositions, there will be licensee recordkeeping and these activities would be evaluated periodically during routine staff

inspections at licensed facilities. Also, enforcement action would be taken if necessary, according to NRC regulations in 10 CFR Part 2.

The following are the components of this alternative.

Landfills. For landfill disposal under this alternative, the released solid materials (concrete, metal or trash) at or below the 1 mrem/yr criterion using the RS-G-1.7 standard could be disposed of in RCRA Subtitle D landfills. At this risk level, the controls associated with disposal of solid materials at RCRA Subtitle D landfills are sufficient to provide reasonable assurance that doses are maintained well below levels established to ensure adequate protection of public health and safety and the environment. Solid materials above the 1 mrem/yr criterion would be sent to a LLW disposal facility. As explained in Section 2.4.3 (EPA/State-Regulated Disposal Alternative), this proposed rulemaking considers only RCRA Subtitle D facilities because EPA is currently evaluating the possibility of higher dose limits at RCRA Subtitle C facilities. At this time, because NRC does not want to prejudge eventual EPA decisions regarding RCRA Subtitle C landfills, a licensee request to dispose of solid material in a RCRA Subtitle C landfill could be addressed under existing provisions in 10 CFR 20.2002.

Although NRC would authorize, by rule, disposal in a RCRA Subtitle D facility, the municipal solid waste operators and the regulator of each RCRA facility (EPA and the States) have the discretion of allowing or refusing disposals in Subtitle D facilities. Even if allowed, EPA and the State agencies might impose additional constraints on such disposal. Accordingly, the implementation of the rule would have to consider EPA and State agency requirements. It is envisioned that some landfill operators and EPA and State agencies might not want to receive such materials, but others would, considering economic factors. At this time, however, it is not possible to determine readily which landfill operators and State agencies might find the NRC rule an effective option.

Concrete in Roadbeds. Released concrete at or below the 1 mrem/yr criterion using the RS-G-1.7 standard could be recycled into roadbed material. Licensees who could demonstrate that concrete would be recycled into roadbed material could proceed with that release of material without NRC approval, but subject to NRC inspections in demonstrating compliance with the provisions of the rule.

Reuse of Tools and Equipment for their Original Purpose. A separate provision of the rule would address the reuse of equipment, such as tools and vehicles, for their original purposes. Tools and equipment that meet the 1 mrem/yr dose criterion could be reused. Equipment at a licensed facility includes scaffolds, cranes, trucks and office furniture. Smaller pieces of equipment and tools are used by workers and may be transported in and out of restricted/impacted areas as part of the routine conduct of work in those areas.

Case-specific approvals. Any request to release solid material other than to these limited dispositions or releases at higher radionuclide concentration levels would require case-specific approval from NRC. For these requests, NRC would codify the process and the criteria for licensees to seek case-specific approvals under a license amendment request. The licensee would also be required to submit an environmental report on the proposed action. The proposed rule

would identify the requirements that licensees need to observe in preparing and submitting such requests. It is expected that such applications would address end-uses for limited types and amounts of materials. For example, some types of structural steel could be reused for the construction of a framework for warehouses. For soils, materials may be used as backfill or as bedding in pipe trenches. For soil-like materials with cementitious properties, materials may be used as an additive to concrete in industrial settings, such as building footings and foundations or equipment pedestals. A licensee seeking a limited release for some restricted end use of material would be required to request an exemption based on pathways, worker protection, future uses, etc. A licensee could have to provide reasonable assurance that such materials are kept out of disposition paths that are not allowed and could have to submit a dose assessment to NRC for a case-specific disposition application.

The decision to include the disposal of soil under the case-specific component of the Alternative reflects the results of analyses considering potential uses of released soil under varying scenarios. The results indicate that under some conditions, soils initially intended for burial in a RCRA D landfill could be diverted, at a point beyond the licensee's control, and used in other purposes given that there is a demand for "clean fill" for use as backfill. The staff analysis revealed that, at this time, there is not enough information to characterize how soils might be used locally. For example, the analysis presented in NUREG-1725 (Human Interaction with Reused Soil: An Information Search) and evaluation conducted in support of this GEIS, indicates that there is much uncertainty in the potential volumes and types of soils that might be released and how soils might be used once released. For instance, is the amount of soil a decisive factor in dictating whether it would be used or disposed of locally? do USDA and State regulations and restrictions impose limitations on the movement and use of soils? are there shipping cost constraints that would favor disposal over use? are there factors that would lead licensees to leave soil onsite instead of shipping it for disposal? Moreover, the engineering properties of soils are expected to dictate where and under what conditions soils might be reused. For example, the relative proportions of soil, gravel, sand, and other materials (e.g., concrete and asphalt rubble) might restrict the use to very limited applications or dictate disposal. These considerations could not be fully addressed in the staff analysis because of the lack of supporting information. Given these uncertainties, the staff deemed it prudent to address the disposition of soils on a case-specific basis, as is done under current practices.

Recordkeeping. As part of its proposed rule, the NRC would include a requirement for records maintenance. These records would aid in allowing verification that the criterion has been met and provide reasonable assurance that the material was delivered to one of the allowed destinations. This recordkeeping could also provide the means to assess the effectiveness of this rule by confirming material released and estimated doses that have occurred as a result. Licensees would be required to maintain records indicating the nature of the material released (i.e., type and quantity of solid material, and nuclides present and their concentrations) and its destination (i.e., the landfill or specific end use shipped to, etc.).

Monitoring. All radioactive materials used, possessed, or stored onsite are required to be periodically monitored and inventoried. The monitoring includes the conduct of external radiation and surface contamination surveys. The inventory addresses quantities of radioactive materials as to their physical and chemical forms, uses, and dispositions, including radioactive

decay. These requirements are stated in 10 CFR Part 20 and as license conditions stipulated in each license. Accordingly, the radiological status and locations of materials, before being designated for release, fall under the full control of the radiation safety program of each licensee. As a result no additional mitigation measures are anticipated as a result of implementing any of the alternatives. The implementation of the rule will be monitored through inspections, similar to those for releases to sewers.

In summary, the limited dispositions for each material are as follows:

- Concrete could be disposed in a RCRA Subtitle D landfill or recycled into roadbed material.
- Metals could be disposed in a RCRA Subtitle D landfill.
- Tools and equipment could be reused or disposed in a RCRA Subtitle D landfill.
- Trash could be disposed in a RCRA Subtitle D landfill.
- Disposition of soils, soil-like materials, or process materials would be case-specific.
- Any other disposition of these materials or disposition at higher radionuclide concentrations would require case-specific approval by NRC.

2.5 ALTERNATIVES AND OPTIONS CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

One alternative (conditional use) and two dose options (both clearance standards) were considered by NRC and eliminated from detailed study. These options are therefore not analyzed in detail in this Draft GEIS. The following sections describe the reasons why they have been eliminated from consideration.

2.5.1 Conditional Use

In this alternative, solid material would be released, but its further use would be restricted to only certain authorized uses with limited potential for public exposure, such as use in controlled environments. Examples might include industrial uses such as metals in bridges, sewer lines, or industrial components, or concrete use in road fill. NRC regulations in 10 CFR Part 20 would be amended to add a dose-based regulation for conditional use. The Conditional Use Alternative would allow a greater amount of activity to be released than the amount that would be released under the Limited Dispositions Alternative because the latter uses unrestricted release radionuclide concentrations to establish the 1 mrem/yr dose limit and these are more conservative.

Material from these authorized uses may ultimately be reused or recycled into products not authorized under the Conditional Use Alternative. For this reason, the Conditional Use Alternative was replaced with the more restrictive Limited Dispositions Alternative, which uses radionuclide concentrations based on unrestricted release.

2.5.2 American National Standards Institute/Health Physics Society Standard N13.12-1999

In addition to the dose options being analyzed under the Unrestricted Release Alternative, the 1999 American National Standards Institute (ANSI)/Health Physics Society (HPS) Standard N13.12 was also considered. The National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law 104-113, requires all Federal agencies and departments to use technical standards developed or adopted by voluntary consensus standards bodies as a means to carry out policy objectives or activities determined by the agencies and departments, except when utilization of such standards "is inconsistent with applicable law or otherwise impractical."

The ANSI standard presents screening clearance criteria for unrestricted release (clearance) of solid materials based on an annual dose limit of 1 mrem. When justified on a case-by-case basis, clearance could be permitted at higher dose levels when it can be assured that exposures to multiple sources (including those that are beyond the scope of this standard) will be maintained ALARA (as low as reasonably achievable) and will provide an adequate margin of safety below the public dose limit of 1 mSv/yr (100 mrem/yr) TEDE. The standard excludes the release of land and soils intended for agricultural purposes.

As identified by the National Academies, one problem with the standard is that the bases for the screening clearance levels have not been fully documented. Moreover, the National Academies note that the approach used in deriving the volumetric screening levels is based on a room modeling scenario involving exposures only to external radiation, inhalation, and incidental ingestion of dust containing radioactivity. The total duration of the exposures is assumed to be only 500 hours, occurring over a brief time period. In evaluating case-specific applications, the NRC would consider exposure scenarios and pathways that were not addressed by the standard. Such differences make the use of the ANSI standard difficult to justify. Finally, the standard is due for its first 5-year review cycle in 2004 and ANSI may decide to revise it in accommodating comments from the National Academies and others. For these reasons, NRC believes that use of the ANSI standard is impractical, and the ANSI standard was not included in the detailed analysis.

2.5.3 European Commission Standard - Reports Nos. 89 and 122

An additional international standard considered by NRC as an option under the Unrestricted Release Alternative was the European Commission's (EC's) clearance levels as described in Radiation Protection Reports Nos. 89 and 122 (EC 2000a and 2000b). In these documents, there are a range of assumptions used for converting the actual measured concentrations at the release point to the dose received by various receptors. Appendix E provides a comparison between NRC's independent dose analysis (NUREG-1640), IAEA Safety Guide RS-G-1.7, and the EC clearance levels. Using the more recently adopted IAEA safety guide instead of the EC clearance levels would provide more consistency in international standards.

2.6 SUMMARY COMPARISON OF PREDICTED ENVIRONMENTAL IMPACTS

NEPA regulations require a comparison of the environmental impacts of all of the alternatives, in order to define the issues and provide a clear basis for choice among the various options. This section presents a brief comparison of the environmental impacts of the alternatives, which are compared in greater detail in Section 3.12. Table 2-1 provides a summary of the impacts.

Nuclear power plants would be disposing of material over the next 50 years. However, the time period over which impacts are considered includes (1) the operational phase of reactors during which some materials are expected to be released, (2) the post-shutdown and decommissioning phase of reactors during which materials will be released as well, (3) and the post-decommissioning time period after which materials that have been released are presumed to have some long-term impacts on the public. The operational phase of reactors takes into account the currently operating and shutdown reactors over the next 50 years. The post-decommissioning phase considers impacts over the next 200 years, while the analysis notes that doses beyond 200 years and out to 1,000 years become vanishingly small and contribute very little to the total of collective doses.

As discussed in Section 1.3, some environmental issues are not analyzed in detail in this Draft GEIS because NRC does not anticipate impacts to these environmental resources. These environmental resources and issues include soils, noise, ecological resources, socioeconomics, historic and cultural resources, environmental justice, visual and scenic resources, and land use (Table 2-1).

The impacts shown in Table 2-1 are defined in 10 CFR Part 51, Appendix B.

- "Small Impact" is defined as: "For the issue, environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small as the term is used in this table." In addition, those environmental resources or issues where there is no potential to cause impact are included under the term "small impact."

- "Moderate Impact" is defined as: "For the issue, environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource."

- "Large Impact" is defined as: "For the issue, environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource."

As described in Chapter 3, the following impacts were studied in detail: water quality, transportation, air quality, waste management, and public and worker health and safety. The impacts on water quality, air quality and public and worker health and safety would be small for all alternatives. The transportation effects (which are based on statistical information on non-radiological fatal traffic accidents) are highest for the LLW Disposal Alternative, because

transport distances associated with this alternative are significantly higher for truck transport, resulting in higher estimated fatal traffic accidents. The effects on waste management associated with the LLW Disposal Alternative are considered large (more than four times the existing LLW capacity at the Envirocare site under its current State licenses and permits). Under the other alternatives, the amount of solid material that would be sent to a LLW facility is less than the existing LLW disposal capacity.

Table 2-1 Comparison of Alternatives and Associated Impacts[3]

	Alternatives				
	No Action	**Unrestricted Release**	**EPA/State-Regulated Disposal**	**LLW Disposal (Prohibition)**	**Limited Dispositions**
Soils	❍	❍	❍	❍	❍
Noise	❍	❍	❍	❍	❍
Ecological Resources	❍	❍	❍	❍	❍
Socioeconomics	❍	❍	❍	❍	❍
Historic and Cultural Resources	❍	❍	❍	❍	❍
Environmental Justice	❍	❍	❍	❍	❍
Visual and Scenic Resources	❍	❍	❍	❍	❍
Land Use	❍	❍	❍	❍	❍
Water Quality	❍	❍	❍	❍	❍
Transportation	❍	❍	❍	❍ to ◗	❍
Air Quality	❍	❍	❍	❍	❍
Waste Management	◗	❍	❍	●	❍
Public and Worker Health and Safety	❍	❍	❍	❍	❍
Benefit or (Cost)	0	247	181	(1,404)	257

❍ Small Impact ◗ Moderate Impact ● Large Impact

In analyzing the monetary costs and benefits associated with the alternatives, the No Action Alternative is the baseline against which the other alternatives are compared. There are no incremental costs or benefits for the No Action Alternative. For the Unrestricted Release and EPA/State-Regulated Disposal Alternatives, the incremental costs and benefits are dependent on the dose option selected. For both alternatives, benefits are associated with the 1 mrem/yr and 10 mrem/yr dose options, but costs are associated with the 0.03 mrem/yr and 0.1 mrem/yr dose options. These costs are due to the fact that under these lower dose options, smaller amounts of solid material are released, and larger amounts must be transported and disposed of in LLW disposal sites. In Table 2-1, the benefit shown for these alternatives is for a dose limit of 1 mrem/yr. The highest incremental costs are associated with the LLW Disposal Alternative and

[3] The terms "small," "moderate" and "large" impacts are discussed in Section 2.6.

are estimated to exceed $1.4 billion, primarily from transportation and disposal operations. For Limited Dispositions, with a dose criterion of 1 mrem/yr based on the IAEA standard, the benefit would be $257 million.

2.7 PRELIMINARY RECOMMENDATIONS REGARDING THE PROPOSED ACTION

The comparison of the alternatives is presented briefly in Section 2.6 and in detail in Section 3.12. After weighing the costs and benefits and comparing the impacts of the alternatives, the NRC staff, in accordance with 10 CFR 51.71(e), sets forth their preliminary National Environmental Policy Act (NEPA) recommendation regarding the proposed action. The NRC staff recommends that the staff promulgate a regulation for limited dispositions. As discussed in Section 2.4.5, solid material would be released, but NRC would allow only certain authorized dispositions to limit the potential for public exposure. The only pre-authorized limited dispositions considered under this alternative would be disposal of concrete, metal or trash in a RCRA Subtitle D landfill, concrete use in road fill, and reuse of tools and equipment for its original purpose. Licensees would need to demonstrate that releases would be below Part 20 radionuclide concentrations derived for a dose limit of 1 mrem/yr using the IAEA Safety Guide RS-G-1.7 for unrestricted release. Any requests to release material other than to these limited end uses or disposition at higher radionuclide concentrations would require case-specific approval from NRC.

The NRC staff preliminarily concluded the overall benefits of the proposed rulemaking outweigh the disadvantages based on consideration of the following:

- provide a risk-informed consistent criterion for controlling the disposition of solid materials,
- allow for a predictable regulatory process that is efficient and effective,
- set a dose criterion well below levels established to ensure adequate protection of public and safety and the environment,
- be consistent with international numeric guidelines,
- provide limited potential for public exposure,
- address public concerns with unrestricted release of solid materials into general commerce,
- address concerns from the steel and concrete industries that consumers could choose not to purchase items made from materials recycled from licensed facilities,
- provide guidance on materials with surficial and volumetric residual radioactivity, and
- ensure less time and resources would be expended on case-specific applications.