APPENDIX B

MAJOR COMMENTS AND DOE RESPONSES

Seventeen letters were received commenting on the draft version of the EIS. These comment letters and DOE responses to the comments are given in this appendix. In many cases, revisions were also made in the text of the EIS.

The following letters were received.

Letter Designation	Individual or Organization	Date Rec'd
A	Department of Health, Education, and Welfare	9/12/78
B	Abel Wolman (Johns Hopkins University)	10/2/78
C	Rustum Roy (Pennsylvania State University)	10/6/78
D	National Science Foundation	10/23/78
E	Duke Power Company	10/18/78
F	W. P. Bebbington	10/24/78
G	U.S. Nuclear Regulatory Commission	11/1/78
H	Environmentalists, Inc., Columbia, SC	10/30/78
I	Ruth S. Thomas	10/30/78
J	Ohio Environmental Protection Agency	11/1/78
K	Georgia Conservancy	11/1/78
L	U.S. Environmental Protection Agency	11/16/78
M	W. A. Lochstet (Pennsylvania State University)	11/13/78
N	Congressman Leo J. Ryan	10/12/78
O	U.S. Department of the Interior	10/20/78
P	Office of the Governor of Georgia	1/8/79
Q	Bennie Ricardo Brown, III (Simon's Rock Early College)	6/3/79

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
FOOD AND DRUG ADMINISTRATION
ROCKVILLE, MARYLAND 20857

SEP 12 1978

Mr. W. H. Pennington, Director
Division of Program Review
and Coordination
Office of NEPA Affairs, EV
Department of Energy
Washington, D.C. 20545

RESPONSES

Dear Mr. Pennington:

A-1 The Department of Health, Education, and Welfare has reviewed the health aspects of the Draft Environmental Impact Statement, DOE/EIS-0023-D, Long-Term Management of Defense High-Level Radioactive Waste, Savannah River Plant, Aiken, South Carolina, and have the following comments to offer.

Chapert V. The discussion of potential environmental effects has adequately addressed the issues that impact on public health and safety. It is noted that the occupational exposure of workers and the offsite population exposures are within the current radiation protection guidelines. However, in Table 10 "Typical State and Federal Air and Water Quality Standards," it cites the PHS, Drinking Water Standard, U.S. Department of Health, Education, and Welfare, 1962 as the Federal Drinking Water Standard. The proper reference should be the EPA's National Interim-Drinking Water Regulations, EPS-570/9-76-003. In the preference it states that these regulations will replace the PHS Drinking Water Standards of 1962.

The requested reference has been added to Table 10.

A-2 Chapter XII. The discussions of cost/risk benefit is most helpful in assessing the future environmental and public health impacts from the Savannah River Plant Operations. Moreoever, the recognition of the need to adequately plan for corrective actions that can be taken to reduce population dose in the event of an unplanned release is significant.

No response required.

Continued normal operations at the SRP can be expected to result in minimal environmental impact and to provide adequate protection of the public health and safety.

Sincerely yours,

Charles L. Weaver
Consultant
Bureau of Radiological Health

ABEL WOLMAN
THE JOHNS HOPKINS UNIVERSITY
BALTIMORE, MARYLAND 21218

2 OCTOBER 1978

Mr. W. H. Pennington, Director
Division of Program Review and Coordination
Office of NEPA Affairs, EV
Department of Energy
Washington, D.C. 20545

My dear Mr. Pennington:

B-1 Your letter and enclosure of August 3, 1978, have been received. The Report covers an Environmental Impact Statement on high level radioactive wastes at the Savannah River Plant, at Aiken, South Carolina.

The document impressed me as an excellent review of the long term history of examination of this provocative problem. Some reference should be made, as well, to the fact that AEC laboratories began work on containment of these wastes more than 20 years ago. This would round out the complete record of attention over at least a quarter of a century.

Reference to previous work on long-term waste management has been added in Section II-G, History of Review of the Long-Range Waste Management Program at SRP.

B-2 The alternatives considered and quantified appear reasonable, even though many of the attributes are essentially qualitatively assessed.

No response required.

B-3 One must inevitably be concerned about the fact that nearly ten years have passed since recommendations for critical exploration of bed-rock possibilities had been generally agreed upon by competent students of the problem. The abrupt closure by AEC in 1972 of these proposals should be clarified to the extent that the decision was non-technical and more a reflection of political threats by South Carolina representatives.

In any event, the present document, it is hoped, will move the exploration off of dead center.

The concluding paragraph of Section II has been modified to respond to this comment.

Very truly yours,

Abel Wolman
AW:eh

THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PENNSYLVANIA 16802
Telephone (814) 865-3421
October 6, 1978

W. H. Pennington
Mail Station E-201
GTN
Department of Energy
Washington, D.C. 20545

Dear Mr. Pennington:

Enclosed herewith some comments on the SRP EIS as requested in your letter.

Sincerely,

Rustum Roy
Director, Materials Research Laboratory
and
Chairman, Science, Technology and Society Program

COMMENTS ON DRAFT EIS
Savannah River Plant

General Comments

C-1 The document is a well-reasoned presentation of the probable environmental impact of the three waste disposal scenarios. I believe that a convincing case has been made that solidification itself would not be a highly impacting step.

This comment requires no response.

A very fine part of the statement is the well-written summary which allows a reader to get a good perspective of the whole operation.

C-2 General Critique

1. Although it is alleged that these main scenarios have been treated as alternatives, in fact the entire document is focused on the glass alternative, and the three sub-cases thereof. This is not so serious a defect for the purpose of the EIS, however, it clearly leaves completely open the most important choice which DOE will have to make: which system?

The purpose of the document is to explore the environmental implications of proceeding with an R&D program and the environmental impacts of alternatives thereto. Any later proposals to take action of potentially significant impact, such as the construction of a major waste treatment facility on the construction of a permanent waste repository, will be covered in subsequent project-specific environmental reviews.

2. The document does not specify the choice sufficiently to be meaningful. i.e. Unless the total system is described, how can the risks and costs be quantified. e.g.:

a) Offsite shipment to where? Transportation accidents are function of distance.

A detailed explanation of the assumptions used in the risk assessment are included in ERDA 77-42. For conservatism, shipment was assumed over 3000 miles (probably the maximum distance a repository would be from SRP).

b) What geological host rock? This will determine design of temperature of container, which in turn will determine concentration of waste in glass. At 35% (p.IV-12) what would be the temperature at the surface of the container? P.IV-12 states that once emplaced the integrity of glass and container no longer matter, i.e. the release of the radionuclides is expected. (Probably correct evaluation.) THIS MEANS THAT UNLESS THE ROCK FORMATION OR

HYDRO-GEOLOGY CAN BE GUARANTEED SOMEWHERE OFFSITE, THE OPTION IS NOT VIABLE. Until this part of the system is readied, can one proceed with this option.

The specific disposal method on host media has not been selected. The proposed R&D program is flexible enough that it does not foreclose any of the geologic disposal options now under consideration. The summary has been modified to reflect this. It is emphasized that the Savannah River wastes produce very little heat. Even if canisters of glass containing five-year-old waste were emplaced in a salt cavern and the cavern were immediately backfilled and sealed, and the waste canisters were assumed to immediately disappear, the interface temperature between glass and salt would be about 150°C. In actual practice, four canisters of five-year-old waste would be produced compared with the number of canisters containing the very much older waste now on hand. The five-year-old canisters would be widely spaced among the cool canisters, even if they were actually placed in the repository immediately after production. The repository would remain open, dry, and cooled many years after waste production at Savannah River closed. The outer canister containing the glass would be specially chosen to give a long lifetime in whatever host medium the waste were emplaced, and the vicinity near each container would be backfilled with material having desirable chemical properties relative to the container and desirable retention properties relative to any waste that could escape. Taking all these factors into account means that the glass would never experience an interface temperature greater than 80-100°C, and it would be surrounded by a compatible host medium. There is abundant experimental evidence that glass is a high integrity waste from under these conditions.

C-3 3. The document is most baffling in what it omits. Surely both Alternative 1 and 3 were straw-men and should have had subcases which are the REAL COMPETITORS FOR THE GLASS OFFSITE SCENARIO. For example, why were these not considered.

With regard to Alternative 1b, scoping estimates have been made in the past for various means of in-tank solidification. When safety, occupational exposure requirements, and assurance of product quality and uniformity are provided for, these options cost about the same as removal from tanks and conversion to a high integrity form, and they provide an inferior disposal system.

Thus Alternative 1b: Dewater and add carefully tailored additions and concrete to solidify in tanks. Entomb with reinforced concrete, and grout under tanks with tailored supergrout.

Alternative 3b: Instead of the ludicrous straw man of pumping raw liquid or slurry into bedrock, employ well established (and improved by "super-grouting") Oak Ridge technology to solidify wastes in absorptive concrete. In my view the most probably real choices will be between Alt. 1b and 3b mentioned above. The technology of 3b is FAR ADVANCED OVER ANY GLASS TECHNOLOGY, with over 10 years experience in the U.S. Why was it ignored?

Alternative 3b could be employed if a decision were made to dispose of the waste in a bedrock cavern at Savannah River. The Oak Ridge technology is not applicable at Savannah River, since Oak Ridge uses fractured shale in thin sheets for disposal, and no such geology is available at Savannah River. The reference document, ERDA-77-42, discussed several low-integrity waste forms emplaced in bedrock under Savannah River. As discussed in Section IV-D, hot-pressed concrete as an alternative waste form is being investigated at DOE laboratories and will be considered as a possibility for the SRP wastes.

C-4 4. Budgetary costs. These are so dependent on specific technical choices (such as density of loading in canisters, and canister transportation and emplacement) that it borders on the meaningless unless the TOTAL SYSTEM COST IS SPECIFIED.

Total system costs are discussed and estimated in Sections X and XI. A large portion of the cost of the waste management program for the Savannah River defense waste will be for construction of the large shielded building for carrying out operations on the waste, and for removal of the waste from existing tanks and processing the waste so that it is ready for incorporation into some high integrity form. Total system costs are therefore not very sensitive to credible variations in present estimates of loading density, transportation, or emplacement. ERDA 77-42, Section IX, contains the detailed assumptions for cost estimating purposes.

C-5 Specific Critiques

p.II-1 (Para. 2, end) It is implied that grouting into bedrock would require "extensive R&D." This implies that such R&D would be more extensive than for the glass option. The exact opposite is true by one to two orders of magnitude. So far the U.S. glass R&D has not resulted in firming up (a) Composition and (b) Melter design, leave alone any actual technical problems such as electrode compositions, lifetime tests of refractories, etc. Compare this with Oak Ridge grouting technology - 10 years in situ experience. Which needs more R&D??

The sentence referred to in the comment addresses liquid waste (Alternative 3), not concrete grout. Most of the R&D required would be for the bedrock cavern itself and determination of its likely integrity, not for the waste form. As stated in Response C-3, the Oak Ridge technology is not applicable to the rocks underlying the Savannah River site, and also the Oak Ridge system is used for intermediate level wastes rather than high-level waste.

C-6 p.II-9. The candid if incomplete reports of the NAS *Committee and GAO reports leave me with the puzzle* - WHY DIDN'T SRP do R&D on the alternatives?

As stated in the Atomic Energy Commission press release *November 17, 1972, on postponing development of the bedrock* project at the Savannah River Plant, the Commission will place priority on research and development on other disposal methods. Consistent with the recommendations of the Interagency Review Group on Nuclear Waste Management (TID-29442), the Department of Energy is proposing to continue national research and development program on immobilization of the radioactive high-level waste for subsequent disposal. This program is described in Section IV-D.

C-7 p.II-9. Contd 4.3). This single statement is cited over and over again, as though it were the last word from the State government. It is a mild statement. Since then optistic estimates of other sites have changed. MOREOVER I BELIEVE THAT THE E.I.S. TOTALLY UNREALISTIC IN ITS"SOCIO-POLITICAL E.I.S." SURELY THE STATE OF S. CAROLINA SHOULD BE PAID SUMS IN THE ORDER OF HUNDREDS OF MILLIONS OF DOLLARS AS PAID FOR FEDERALLY-IMPACTED AREA WHILE EMPLACEMENT PROCEEDS. I believe the S. C. Legislature would have a very different attitude with a reasonable offer like that.

Selection of radioactive waste repository sites will be in compliance with the applicable regulations/guidelines. Socioeconomic issues will be addressed in project-specific environmental reviews.

C-8 p.II-11 (Para. 1). Very muddled or deliberately misleading. Why did AEC really stop work on bedrock storage in 1972? What was the total $ investment in this study? What was the "technology already in hand?" Glass? If it is not in hand now, how come it was in hand then?

The concluding paragraph of Section II has been modified to respond to this comment. Approximately $3-5M was spent on bedrock disposal studies. The technology in hand was that of retrievable surface storage as opposed to geologic storage.

C-9 p.IV-18 (Para.). The entire tone of the document suggests some urgency to get on with it. Why? "10 year development" of bedrock storage technology (already a high estimate) is unacceptable, as though it was expected that WIPP, and a final storage facility will be in operation in 10 years. Does some one believe that? If no, why the hurry? Will the public be very impressed by some tanks of hot glass? They have had themn at Harwell for 15 years and it hasn't convinced the public.

The decision addressed by this EIS is whether or not DOE should continue an R&D program. Any decision on implementation of an alternative will be addressed in project-specific environmental reviews.

C-10 Final Comment

The urgent, polemic tone advocating a particular solution is distressing. There is so little understanding of the total national picture, the total RWM system, the explosion of new science and technologies. THERE ARE VASTLY BETTER PRODUCTS THAN THE PROPOSED GLASS. VIZ ARTIFICAL MINERALS. THERE ARE VASTLY BETTER PROCESSES - OAK RIDGE GROUTING. UNLESS THESE ARE COMPARED AND A REASON GIVEN FOR CHOOSING GLASS, THE EIS IS INCOMPLETE.

Section IV-D has been included to discuss alternative waste forms, the national and foreign programs for their development, and the reasons for choosing glass as the reference waste form for the research and development, design, and testing program covered in this Programmatic EIS for the Savannah River Waste. The selection of a waste form for implementation in a project will be addressed in a project-specific environmental review.

It is not the intent of the document to imply a sense of urgency. Rather, this document analyzes the impacts of an orderly program for R&D to permit immobilization of the defense waste on a timely schedule, as recommended by the President's Interagency Review Group for nuclear waste management. It should be noted that if the program discussed in this EIS is followed by authorization in 1981, startup would not begin until 1988, and waste processing would work down the old inventory and become current with waste production in about the year 2000. It is also pointed out that the impact of further delay in the program would be continued storage of wastes in tanks, requirements to build more new tanks, and increased costs.

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

October 23, 1978

OFFICE OF THE ASSISTANT DIRECTOR
FOR ASTRONOMICAL, ATMOSPHERIC,
EARTH, AND OCEAN SCIENCES

Mr. W. H. Pennington, Director
Division of Program Review
and Coordination
Office of NEPA Affairs, EV
Department of Energy
Washington, DC 20545

Dear Mr. Pennington:

Your letter of 31 July 1978 transmitted to the National Science Foundation (NSF) for review the Department of Energy's draft Environmental Impact Statement, DOE/EIS-0023-D, Long Term Management of Defense High-Level Radioactive Wastes, Savannah River Plant (SRP), Aiken, South Carolina.

The draft statement has been reviewed by appropriate NSF staff. The following comments are offered:

D-1 To date, the SRP has an excellent safety record. The local populace is accustomed to the close proximity of that facility. A significant portion of local employment is SRP derived or related. Given the continuation of current trends these factors are unlikely to change significantly.

This DEIS appears to be well prepared and quite complete, with one exception noted. The energy requirement, which will be a high cost factor for each alternative, should be evaluated and considered in the decision process.

Requirements for the principal sources of energy for each alternative are estimated in Table VII-1. Costs for this energy are included in cost estimates discussed in Section XI-C.

D-2 Considering the local geology and hydrology, the size of the reserve wastes, and shortcomings inherent in long distance transportation, alternative (2), subcase (c), seems preferable (process to glass, disposal in bedrock cavern at SRP).

The proposed waste form technology development program does not foreclose any of the repository options being considered. However, selection of the type of geologic formation and the specific sites for repositories will be addressed in separate EIS's.

D-3 The draft statement indicates that certain research and development efforts are yet to be undertaken. When the results of these efforts are known, decisions on the alternatives may be made more adequately. Since the DEIS presents planning data in terms of a 300 year period, alternative (1) could be favored over the other two (continued storage in tanks). This would allow time for more advanced methods of treatment and storage to be developed that may be superior to those of alternatives (2) and (3). Alternative (3) appears to be the least desirable in view of possible problems in the future involving inaccessibility of the wastes.

Sincerely yours,

Daniel Hunt
Deputy Assistant Director

The Report to the President by the Interagency Review Group on Nuclear Waste Management, March 1979 (TID-29442) recommends that immobilization of the waste should begin as soon as practicable. As stated in the Foreword and discussed further in Section IV-D, a large R&D program is being conducted on alternative waste forms. This is in parallel to the development of the reference waste form, borosilicate glass monoliths. The proposed R&D program is aimed at permitting a decision on an SRP immobilization plant in 1982, and on a waste form in 1984.

DUKE POWER COMPANY
ELECTRIC CENTER, BOX 33189, CHARLOTTE, N. C. 28242

(704) 973-4226

E. B. HAGER
CHIEF ENGINEER
ENVIRONMENTAL DIVISION

October 18, 1978

Department of Energy
Washington, D. C. 20545

Attention: Mr. W. H. Pennington, Director
Division of Program Review
and Coordination
Office of NEPA Affairs, EV

Gentlemen:

Re: Long-Term Management of Defense
High-Level Radioactive Wastes,
Savannah River Plant, Aiken, S. C.
DOE/EIS-0023-D
File Nos. GS-N-9, GS-N-9.9, GS-S-64

E-1 We appreciate the opportunity to comment on the subject environmental impact statement. Radioactive waste disposal, whether it be from the national defense program or from the nuclear electric energy program, is a most important unanswered question. While we recognize that the wastes from nuclear electric generating facilities and those from potential reprocessing facilities are different from the wastes generated at the Savannah River Plant, we believe that much important technology can be gained from the permanent disposal of the Savannah River Plant wastes.

The results of the study presented in the subject report justify a permanent disposal option. The costs are presented for continuation of storage and deferment of permanent disposal are unacceptably high from an environmental standpoint. We urge the Department of Energy to take a lead in demonstrating and licensing permanent radioactive waste disposal. We believe that dealing with waste disposal now will save many dollars, resources, and population exposures, expecially since ultimate disposal must be dealt with.

Yours very truly,

S. B. Hager
SBH/DBB:sd

The Federal government recognizes its responsibility in the proper management and disposal of nuclear waste. On March 13, 1978, President Carter established the Interagency Review Group on Nuclear Waste Management (IRG) to formulate recommendations for establishment of an administration policy with respect to long-term management of nuclear wastes and supporting programs to implement this policy. The draft IRG report was published in October 1978 and received extensive public inputs. The final IRG report (TID-29442) was published in March 1979 and forms the basis for planning by Federal agencies. The Department of Energy proposes to continue its research and development program to immobilize and dispose of the radioactive waste.

W. P. BEBBINGTON
905 WHITNEY DRIVE
AIKEN, SOUTH CAROLINA 29801

October 24, 1978

W. H. Pennington, Director
Division of Program Review and Coordination
Office of NEPA Affairs, EV
Department of Energy
Washington, DC 20545

Dear Dr. Pennington,

Thank you for the opportunity to comment on DOE/EIS-0023-D, "Draft Environmental Statement - Long-Term Management of Defense High-Level Wastes - Savannah River Plant." The Statement presents the dilemma of having to choose among alternatives that entail extremely high costs to achieve extremely low calculated risks and those that entail moderate costs with very low associated risks, one of the latter being the "do nothing" option of continuing forever the present waste-management practices.

F-1 Although no conclusions are presented in the Statement, it is evident from the summaries of "Research and Development Needed" in Section IV that only Alternative 2, Subcase 1, "Process to Glass and Ship to a Federal Repository," is under active consideration. This alternative is estimated to cost $1.7 billion, six times as much as continuing operation of tank storage (Alternative 1), and would achieve only a 36 per cent reduction in risk. Both of these alternatives have, I believe, important "difficult-to-quantify" factors that are not evaluated in Table I-2.

It is correct that Alternative 2-1, "Immobilize and Ship to Federal Repository," is receiving the major attention in the R&D design and testing program. However, decisions regarding the specific waste form or the ultimate disposition of the waste form have yet to be made. The planned R&D programs will provide the technical bases for these decisions. The needed R&D programs are discussed in Section IV-B and Section IV-D, which was added to describe planned work on alternative waste forms. The choice between Alternative 1 and the various options of Alternative 2 must be made considering both cost and the perceived values of the added safety and avoidance of the need for future action.

F-2 Alternative 2, Subcase 1 is so very high in cost that there is a high risk that the funding of it will be indefinitely delayed, thus continuing Alternative 1 by default. Alternative 2-1 would also certainly rate very low in "Conformance with Policies of Governments of States other than S. C. and Ga." Since the citizens of the states where the Federal repository would be located and across which the wastes would be shipped would have derived no economic benefits from the oeprations at Savannah River that created the wastes, their governments would be understandably reluctant to accept responsibility for disposal.

Included in Alternative 2 are three options for the ultimate disposal of the wastes: (1) Disposal in a Federal Repository, (2) Storage in Surface Facility at SRP, and (3) Disposal in a Bedrock Cavern at SRP. Each of these has its own merits and faults which change depending on the viewpoint of the evaluation. Eventually, a consensus decision must be reached that balances both local and national considerations of risk and benefits, both past and present. This statement considers the environmental risks and benefits and demonstrates that the impact is small from any of the alternatives. Other factors, including cost, are evaluated to the extent possible.

F-3 Another "difficult-to-quantify" factor for Alternative 1 is the risk that neither adequate funds nor adequately competent staff will be provided for centuries. Although the estimated cost of this alternative includes the endowment of funds for the future, the actual expenditures will presumably have to be authorized in annual Federal budgets. Attracting high-grade technical staff to the dead storage of old wastes will certainly be difficult.

The requirements for indefinite tank storage are given in Sections IV-B and XI. DOE recognizes the uncertainties in projecting the behavior of cognizant officials in the distant future.

F-4 Alternative 3, "Liquid in SRP Bedrock," deserves further consideration since it holds the promise of being achievable at reasonable cost and in reasonable times. As presented in the Statement, its only "quantifiable" shortcoming is its relatively high calculated "Offsite Population Dose Risk." This risk, according to Table XII-10, would be less than 0.1 per cent of either the natural dose or the average medical dose to the pertinent population, but is high relative to those calculated for the other alternatives. Virtually all of the risk calculated for Alternative 3 is associated with the period of about a year during which the waste would be transferred to the bedrock cavern; the risk once the waste was in the cavern would be very low.

Comment noted; no response required.

F-5 The vulnerability during the period of transfer was envisioned as being to sabotage or earthquake damage. The assumptions upon which these risks were calculated are not given in the statement.

The assumptions upon which the earthquake risks are based are in ERDA 77-42, p. V-42. The scenario assumes that 25% of the wastes are in the cavern at the time of earthquake, the earthquake frequency which would result in a pathway from the cavern to the aquifer would be 3.3×10^{-5}/yr., 5000 gallons of waste would be transferred to the aquifer every year for three years, 50,000 people move onto the plant site and use the water under the site 100 years after the earthquake. ERDA 77-42 also explains that the detailed scenarios considered for sabotage are not given for reasons of security but are given in a classified appendix to the document.

F-6 The second full paragraph on page XII-12 states qualitatively some extreme risks of failure during transfer in a manner that is quite different from the quantitative assessments made elsewhere in the Statement. Most certainly people would not be permitted to drink water from the Tuscaloosa aquifer if it had been so contaminated that it would give them lethal radiation doses!

The referenced paragraph is a summary of the quantitative results presented in Section V. It is customary to state consequences of possible accidents without corrective actions in Environmental Impact Statements. It is probably true that few people would actually receive large exposures before consumption of the water would cease, even by an uninformed group of users. Corrective actions are discussed for this scenario in Section XII-D.

F-7 In view of the potentially great advantages of Alternative 3 over the others, the Final Statement should present much more detailed explanations and analyses of the risks of sabotage and earthquakes, including the measures assumed to forestall their effects. The costs of additional measures to reduce the current estimates of risk by factors of 10 and 100 should be estimated. During the period of waste transfer, sabotage could be deterred by redundant technical surveillance and security techniques supplemented by onsite military forces. The vulnerability of the fill line between ground surface and the tunnel bulkhead could be greatly reduced by application of the sorts of safeguards that are applied to nuclear reactors - basically these would be automatic closures, top and bottom, actuated by seismic sensors. Again, redundancy of systems should greatly decrease risk.

The tradeoff between cost and risk is treated in Section XI. Optimization of the design to reduce radiation risks is treated by applying the NRC and OMB cost-benefit relationship $1000/man-rem. The analysis in Section XI is intended to allow risk-benefit considerations to be treated on a consistent basis for all of the alternatives by presenting the incremental cost-risk relationship for each alternative.

F-8 Table V-4, page V-11, "Manpower and Time Requirements for Operational Modules," should include data for transfer of liquid waste to a bedrock cavern.

The manpower and time required for removal of wastes from old tanks and transfer to either new tanks or to bedrock cavern were assumed to be the same.

On page IV-19 it is stated "...research and development efforts for..alternative (3) would be directed toward ensuring the integrity of the bedrock..This work is not underway and is not currently proposed for funding." In view of the potential of Alternative 3 and of the findings of the review panels (pages II-6 through II-10), this position should be reconsidered.

Sincerely,

W. B. Bebbington

CC: N. Stetson, SRO

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555
Nov 1, 1978

Mr. W. H. Pennington, Director
Office of NEPA Coordination
U. S. Department of Energy
Washington, D. C. 20545

Dear Mr. Pennington:

Subject: Draft Environmental Impact Statement, Long-Term Management of Defense High-Level Radioactive Wastes, Savannah River Plant, Aiken, South Carolina, DOE/EIS-0023-D

This office has reviewed the Draft Environmental Impact Statement for the Long-Term Management of Defense High-Level Radioactive Wastes, Savannah River Plant, Aiken, South Carolina (DOE/EIS-0023-D) as requested in your letter of July 31, 1978. In consideration of this draft environmental impact statement, our comments on DOE/EIS-0023-D are enclosed for your use.

Sincerely,

Voss A. Moore, Assistant Director
for Environmental Projects
Division of Site Safety and
Environmental Analysis

Enclosure:
Comments on DOE/EIS-0023-D

cc: Mr. Thomas Sheckells (5)
Environmental Protection Agency
Room 537, West Tower
401 M Street, S. W.
Washington, D. C. 20460

NRC COMMENTS ON DRAFT EIS,
LONG-TERM MANAGEMENT OF DEFENSE HIGH-LEVEL RADIOACTIVE WASTES,
SAVANNAH RIVER PLANT, AIKEN, SOUTH CAROLINA

General Comments

G-1 1. The document assesses the environmental impacts associated with the three identified alternatives; however the comparison between the alternatives does not include a recommendation on the preferred option.

The preferred alternative for this programmatic EIS is the continuation of an R&D program aimed at immobilization of the SRP liquid high-level waste for disposal and is identified in the Foreword and Summary. Detailed technical descriptions will be included in subsequent project-specific environmental documents.

2. Since no detailed technical descriptions have been provided in the subject document for any of the proposed high level waste management alternatives, the NRC is unable to provide comments related to maintaining releases to the environment to "as low as is reasonably achievable" (ALARA) levels.

G-2 3. The SRP onsite and offsite radiological environmental monitoring program and the operational monitoring results should be referenced. The existing SRP radiological monitoring program should be generally described and any changes to the existing monitoring program needed for each of the different waste alternatives should be discussed.

The Savannah River Plant has had an extensive onsite and offsite environmental monitoring program since 1951 (before plant startup). The monitoring program measures direct radiation, breathing air, deposited radioactivity and radioactivity in consumed materials including water, milk, fruit, vegetables, grain, fish, fowl, etc. A description of the monitoring program and results are given in the major reference document, ERDA-1537, Appendix E, and the results are also published annually for public distribution (Environmental Monitoring in the Vicinity of the Savannah River Plant - Annual Report). Due to the programmatic nature of this EIS, a description of the environmental monitoring program has been omitted. The monitoring program, together with any changes necessitated by the implementation of the waste management alternative, will be presented in project-specific environmental documentation.

These comments were submitted on the draft of ERDA-1537 and were responded to on pages K-25 through K-29 of the final document.

G-3 Specific Comments

Page	Comment
II-9	The design of the Activity Collection (confinement) System does not incorporate a means to control the humidity of the exhaust air in the event of an accident before the air is passed through the HEPA filter-charcoal adsorber system. An engineered safety feature (ESF) filter system should consist of heaters, demisters, prefilters, HEPA filters, charcoal adsorbers, and after filters.
II-11	Consideration should be given to replacing the portable demineralizers in the Fuel and Target Storage Basin cleanup system with a permanent system. Also, the handling of demineralizer regenerant solutions is not described. Systems should be provided to maintain discharges of regenerant wastes to ALARA levels.

G-3 contd Specific Comments

Page	Comment
II-16	The report states that leakage in the process heat exchangers represents approximately one-fourth of the total releases from the reactor area. However, no mention is made of measures taken to isolate the leaking heat exchanger or to otherwise control releases. The capability of the systems to maintain releases ALARA in the event of process heat exchanger leakage should be described in the DES.
II-18	In order to achieve optimum control of releases and to maintain releases of radioactive materials in liquid effluents ALARA, releases should be collected in monitor tanks and each batch sampled before discharge. Releases should be monitored continuously and if activity levels exceed predetermined limits, the capability should exist to further process these effluents.
II-28	In order to maintain releases of radioactive iodine as low as is reasonably achievable, consideration should be given to adding iodine absorbers after the sand filters used to process effluents from the canyon processing areas and process vessel vents.
II-120	There appears to be an inconsistency in the methods for handling of drummed solid waste (20 year retrievable storage) versus bulky solid waste and contaminated equipment (buried directly in earthen trenches). The latter method could lead to migration of activity into the groundwater with eventual release to the environment. The environmental statement does not provide the details necessary to show that radioactive materials contained in these wastes will not migrate.
III-82	In order to prevent overflow from tank risers and vents, level controllers and alarms that will automatically terminate transfer of waste into the tank should be installed in all tanks.

G-4	Page	Comment	
	V-7	The monitoring method used to determine doses given in Table V-1 and V-1A should be discussed. It is not clear whether the average employee exposure from Table V-1 or V-1A was used for Table V-2. The discussion on fuel reprocessing inferred occupational exposure would be similar to waste processing considered in Table V-2.	The monitoring methods used to determine the exposures given in Tables V-1 and V-1A are included in the reference ERDA-1537, Appendix E. Also see response to comment G-2. As stated in the text of Section V-B.1, average SRP experience for 1965-1975 (Table V-1) was used to construct Table V-2 because there would be many people involved that are not subjected to radiation potential as high as with current reprocessing operations only. However, as stated in the text, there is little difference in the average exposures of the two different groups of workers.
G-5	Page	Comment	
	V-11	There is no obvious correlation between this table and the use of its data in Tables V-2 and V-3 for verification of dose calculations. The campaign times for each alternative should be clarified.	The correlation between the basic exposure data and estimated manpower requirements to construct Tables V-2 and V-3 is itemized in Section V-B.1, including components of campaign times.
G-6	Page	Comment	
	V-12	The pathways, age group, and compass direction of the site boundary location used in calculating the maximum individual dose (based on normal operations) should be identified in this statement, as well as in the referenced statement (p. V-17). What are the controlling radionuclides for airborne and liquid releases, based on SRP normal waste handling and processing operations?	The analyses indicate that tritium will be the most important radionuclide released to the environment from normal operations. Immersion/inhalation of atmospheric tritium at the site boundary, the milk pathway offsite, and human consumption of Savannah River water downstream will be the critical pathways. Dose calculations are for 70-year dose commitments. Detailed descriptions of the dose calculation methodologies are given in Appendices F and G of ERDA-1537.
G-7	Page	Comment	
	V-27	Why is the probability for an airplane crash for Alternative 1 (1.0×10^{-5} events/year) different from the value presented for each subcase of Alternative 2 (7.0×10^{-8} events/year)?	Details of derivation of probabilities are given in the reference document ERDA-77-42, as stated in the introduction in Section V-C. In the specific case mentioned in the comment, the lower probability results from an overlay of the probability of the airplane crashing into the building with the probability of hitting one of several smaller areas within the building.
G-8	Page	Comment	
	V-28	The maximum individual dose given for a spill (2.0×10^{-2} rem) differs from the value listed in Tables V-14, 15, and 16 (2.9×10^{-2} rem). Please explain this discrepancy.	The value of 2.0×10^{-2} rem is a typographical error, and has been changed to 2.9×10^{-2} rem.

G-9	Page	Comment	
	V-28	Sabotage events should also be considered for transportation and storage in the exposure risk analysis of Alternative 2, Subcase 1.	Sabotage has been considered for this alternative. The analyses show sabotage to result in negligible impacts. Discussion of sabotage for this alternative can be found on page VI-15 of ERDA 77-42.
G-10	Page	Comment	
	V-30	Sabotage events should also be considered for storage in the exposure risk analysis of Alternative 2, Subcase 3.	See the response to G-9.
G-11	Page	Comment	
	V-34	Offsite land contamination may also result from sabotage during transportation for Alternative 2, Subcase 1, and during storage for all the alternatives.	Land contamination beyond the immediate vicinity is estimated to be negligible for the transportation activity, as discussed in the reference ERDA-77-42. Sabotage during storage is also explicitly covered in that reference. Assumes high integrity shipping cask and waste form which would not result in significant land contamination due to sabotage.
G-12	Page	Comment	
	VI-2	It should be noted that Table VI-1 references Table VIII-1 which does not exist.	The table has been corrected.
G-13	Page	Comment	
	IX-2	It is not clear why the long-term man-rem doses for Alternative 1 and 3 are greater than those for Alternative 2 in Table IX-1. The differences in tabulated man-rem between alternatives for both short-term and long-term operations should be discussed.	The detailed components of risk that make up the summary of Table IX-1 are given in Tables V-12 through V-16 and Table V-2, so that each reader can examine the different sources of risk. These components were used to construct Table IX-1 as explained in Section IX-B.2.
G-14	Page	Comment	
	XII-6	The basis for using a lower population dose due to routine waste processing releases in Tables XII-6, 7 and 8 rather than the dose given on page XII-6 (22 man-rem/yr) for processing operations is not clear.	The dose given on page XII-6 is incorrect, and has been changed to be consistent with the tables.
G-15	Page	Comment	
	XII-7 thru XII-11	The resolution of the comments on Tables V-12 thru 16 should be incorporated into the summaries of costs exposure risks presented in Tables XII-5 thru 9.	The tables are consistent with each other, and have been changed to include risk integration to 10,000 years and updated costs.

	Page	Comment	
G-16	XIII-2	The offsite population dose risks presented in Table XIII-1 do not correlate with the information given in Table XII-10 page XII-13, particularly for Alternative 2, Subcase 3. Please clarify.	Table XII-10 gives average dose risk on an annual basis (man-rem/year), whereas Table XIII-1 gives time-integrated risk (man-rem). The two differ by an integration over time, taking into account radionuclide decay and population growth.
G-17		The radiation exposures listed in Table VI-1, page VI-2, should be included as additional quantifiable environmental impacts.	The radiation exposures given in Table XIII-1, Quantifiable Environmental Impacts, already include the exposures given in Table VI-1.
G-18		The derivation of the offsite population dose from natural radiation is not presented in the text of the document, and it is not clear how the value of 2.3×10^8 man-rem is obtained.	The offsite population dose from natural radiation is calculated by integrating the individual dose over the population within 150 km of the SRP site, with an allowance for population growth as explained in the text, and over the time period of interest.
G-19		The amount of accidental offsite land contamination should be revised, as appropriate, after consideration of the various comments on the topic of sabotage.	See Responses G-9 and G-11.

ENVIRONMENTALISTS, INC.
Founded 1972

October 30, 1979

Mr. W. H. Pennington
Mail Station E-201, GTN
Department of Energy
Washington, D. C. 20545

Dear Mr. Pennington:

SUBJECT: "Draft Environmental Impact Statement Long-Term Management of Defense High-Level Radioactive Wastes

Savannah River Plant, Aiken, South Carolina

July 1978 DOE/EIS-0025D"

H-1 General Comments:

The EIS purportedly "provides environmental input for decisions on whether Savannah River high-level radioactive wastes should be processed and solidified" in accordance with our national goals, or whether the wastes should be kept in storage tanks until such time as our priorities, technology, and regulations permit disposal in bedrock beneath the SRP site. "(S)ome future generation may make a decision that some other disposal method would be more desirable."

The EIS supports those who allege that there is no federal committment to solving our high-level radioactive waste management problems.

Three critical issues are ignored in the EIS: the problem of accumulated high-level radioactive wastes (HLRW); the fact that this country is seriously contemplating the generation of similar commercial nuclear energy wastes; the fact that this country is seriously considering accepting foreign waste fuel on a large scale.

Although the EIS gives lip service to the goal of solidification of waste and subsequent storage at a federal repository, the goal is not supported in the report. Clearly and consistently, remarks and judgments are introduced which are biased in favor of tank storage for an indefinite period of time, perhaps culminating in bedrock storage.

The purpose of this EIS is to analyze the environmental implications of a large Federal research and development program to develop methods for long-term management of the high-level wastes at the Savannah River Plant. The EIS analyzes the environmental impacts which would result from adoption and implementation of the developed technology. The preferred alternative is to conduct an R&D program aimed at immobilization for subsequent disposal. The purpose and preferred alternative have been clarified in the Foreword.

H-1 contd This narrow-minded attitude in favor of no action is unfortunate because the SRP waste management program could provide important leadership to assist this country toward a solution of its commercial nuclear waste problem.

This lack of dedication is outrageous because - for reasons of health and safety and acceptable economics - commercially-generated HLRW must be treated in a far more responsible manner. I enclose the Code of Federal Regulation to remind us all that commercial HLRW cannot be stored for more than five years. After that period of time they must be converted to dry solids and placed in sealed containers for shipment to a federal repository. Military HLRW have characteristics which require that they be isolated for similar periods of time and in a similar manner.

It is stated in the Report to the President by the Interagency Review Group on Nuclear Waste Management, March 1979 (TID-29442) that "since final processing of defense waste has been deferred for three decades, remedial action, including immobilization of the wastes, should begin as soon as practicable." DOE intends to act in accordance with the IRG recommendations after appropriate NEPA review.

H-2 Specific Comments:

Page I-2 mentions storage "for several decades". This period of time is not justified in relationship to the consideration of surface tank storage for 100 years (pg XI-4 and elsewhere). Cavern storage protection is noted for 300 years (pages XII-12 and elsewhere). Each of these time frames is unjustified when compared to the NAS/NRC recommendation of isolation for 1000 years (page II-9).

This confusion regarding the appropriate period of isolation of wastes is particularly important because of the EIS interest in continuing the present inaction by storing the wastes in surface tanks for 100 more years. This allegedly cheap option would clearly not be cheap if the wastes must be maintained for 1000 years. Furthermore, this option is not cheap if "some future generation" is forced to take action because our generation lacked the leadership to take decisive action.

The purpose of this EIS is to assess the environmental implications of continuing an R&D program which could lead to removal of SRP high-level waste from tanks, concentrating them into a high-activity fraction, and immobilizing the radioactive nuclides in a high-integrity form for subsequent disposal. This is the preferred action. However, other alternatives were considered to provide a range for comparison of potential environmental impacts.

The EIS has been modified to add integration of risks to 10,000 years. These changes are included in Sections V-C.3, Tables XII-5 through XII-9, and in the Summary. The costs for alternative 1 are independent of the length of time the tank farm remains in operation since, as described on p. X-I, a trust fund would be established which is adequate to replace tanks every 50 years.

H-3 Pg XII-20 clearly states that the Tuscaloosa and McBean aquifers are not interconnected. To my knowledge, this issue is still debatable. In the event of earthquake, accidents, technical complications, or some other factual misunderstanding, this uncertainty could clearly expand the area of catastrophe associated with bedrock or cavern storage.

As shown in Figure III-4, the McBean-Congaree aquifer is separated from the base of the Tuscaloosa aquifer by about 600 feet. Within this section are several beds of clay that would impede any upward movement of contamination that had found its way into the base of the Tuscaloosa. In addition, there appear to be no vertical gradients within the Tuscaloosa formation that would cause upward water movement from its base to its upper boundary. The difference in hydraulic heads shown on Figure III-4 indicates that there is not a direct connection between the Ellenton and Congaree formations. These two formations are separated by a clay that appears to be continuous over a large part of the southeastern U.S.

H-4 Pg III-9 The alternative of tank surface storage ignores the close proximity of the water table.

Of the three potential release paths for radioactive liquid wastes at SRP (into the ground, over the surface of the ground, and into the atmosphere), the most significant paths from the point of view of safety are surface spills and atmospheric releases. For radionuclides released into the clayey soil around the waste tanks, the time to migrate to groundwater and thence to surface streams is so long that the radionuclides will almost completely decay before reaching the streams. The relative immobility of radionuclides released to the ground at SRP is discussed in Section V and Appendices A and B of the backup document, ERDA-77-42, and in Section III of ERDA-1537.

H-5 Pg III-11 A major earthquake is regarded as improbable, despite (1) the area is a Class III earthquake zone; (2) major cavern excavation and refilling is proposed; (3) past experience with the refilling of caverns has resulted in earthquakes.

(1) SRP is in Zone II but near the boundary of Zones II and III as shown on the risk map of the U.S. (Algermission 1969); however, this page-sized map of the entire U.S. is only a generalized guide to earthquake risk. Facility design is based on sesmic risk factors developed from more specific information than location on a generalized map.

(2) & (3) Earthquakes have been induced by filling surface reservoirs where a new hydraulic pressure is imposed in the area. Earthquakes have also been induced by high pressure injection of fluid into wells. However, no data is known to DOE that indicate that earthquakes have been induced where the new hydraulic pressure is less than the original hydrostatic pressure.

H-6 Pg IV-11 & 12, Tank storage of HLRW at SRP:
How many HLRW tanks are now being used which are leaking?
How many HLRW tanks are now being used which are not leaking?
How many HLRW tanks are now under construction?
How many HLRW tanks will be constructed within the next five years?
Which if any, of the above HLRW tanks are stainless steel?
If the above tanks are used for long-term storage, how many will be required and how long will it be until the tanks can be covered and abandoned?

Answers to the first two parts of this comment require clarification of the term "leaking" as applied to waste tanks. The SRP high-level waste tanks provide three distinct barriers between the stored waste and the surrounding ground: (a) the steel "primary" tank, (b) the steel "secondary" tank under and around the primary, and (c) the water-tight reinforced concrete vault completely surrounding the two steel vessels. Nine primary tanks have developed cracks which allowed small quantities to seep into the secondary tanks, where it has been completely contained in all cases but one. There is no evidence that any of the secondary tanks have leaked (i.e. through fissures or flows in the walls or bottom); however, the steel secondary vessels of the 16 oldest tanks are only five feet high, and there has been one incident, in 1960, in which sufficient waste leaked from the primary to exceed the height of the short secondary pan. Almost all of the excess was contained by the concrete outer tank, but a few tens of gallons of waste escaped (presumably through an imperfectly-sealed construction joint) into the surrounding ground, where its radioactive components have been absorbed and have remained close to the tank for the past 19 years. From an environmental impact standpoint, only

H-6
contd

this one SRP waste tank has leaked. This tank has been permanently retired from service; as of October 1979, all of the liquid waste and over 98% of the sludge have been removed from the tank, and further cleaning of the tank are in progress. Seven of the other eight tanks in which some waste has leaked into the secondary vessels are currently in dormant service holding aged waste, although most of the liquid has been removed from two of these waste. One of the eight is in active service, with the liquid level restricted to below the elevation of the single known crack. The eight will be emptied, cleaned, and retired within the next few years as new tanks are completed.

In addition to the above eight tanks, 16 other tanks with double steel vessels, are currently in service (including three essentially empty tanks designated as emergency spares). Seven of these are of older (Type I) design and are scheduled for removal of their waste by 1984. Also, eight uncooled waste tanks having a single steel vessel inside a concrete shell are in low-heat waste service; all but one of these will be emptied (including sludge and salt cake) by the middle of 1983. One uncooled (Type IV) tank will remain in service as a cesium removal column feed tank, receiving off-specification overheads from the 242-H evaporator and low radioactivity waste from the Resin Regeneration Facility (Bldgs. 244-H and 245-H). The remaining nine existing tanks are of the current (Type III) design with stress-relieved primary vessels and secondary steel vessels the full height of the primaries. Four Type III tanks have been completed recently and will be placed in service late in 1979 or early in 1980, and 14 others are in various stages of construction, with scheduled completion dates of April 1980 (4), August 1980 (6), and March 1981 (4). All of the above tanks are of carbon steel.

Quantitative answers to the last part of the question depend on several factors yet to be resolved. Current forecasts predict high-level waste production at SRP averaging 1,600,000 gallons per year over the next decade. After aging, this can be reduced to salt cake and sludge occupying 30 to 35% of the original volume, i.e., about 500,000 gal./year. Thus, an average of four new tanks per decade would be needed to maintain the present mode of operation indefinitely, not counting replacements for tanks reaching the end of their useful lifetimes.

Under current criteria, tanks containing aged high-level waste will never be "covered and abandoned". If tank storage were continued indefinitely; the tanks would be replaced periodically as they deteriorated with time, moving the waste to newly constructed tanks, and thoroughly decontaminating the old tanks before abandonment. The expected high-integrity lifetime of stress-relieved tanks of current design is conjectural, but should average at least 50 years; this would require an additional six tanks per decade beginning about 2020 and gradually increasing thereafter.

H-7 Pg IV-17 refers to a "previous" cavern study which "concluded that a cavern 1500 feet below the surface in Triassic formation would be best" for cavern storage. This was an Idaho study. The studies of bedrock storage at SRP have been inconclusive. The EIS conslusion appears to be unsound.

The reference given in the draft EIS is incorrect. The intended reference is Technical Assessment of Bedrock Wash Storage at the Savannah River Plant, ERDA Report DP-1438, (1976) as shown on page IV-18 of this document.

H-8 Leaching problems and potentials are not addressed in the EIS.

Leaching from glass monoliths in abandoned surface vaults and bedrock caverns is discussed in Section V of the backup document (ERDA 77-42) and is shown to result in no significant population exposure. For conservatism, leach rates from small samples were used in the analysis to account for possible cracking of the monolith and no credit was taken for protection by the canister.

H-9 Pg V-5 reference to the sales tax and income tax revenues associated with HLRW construction ignores the attendant social costs of schools, roads, police, etc.

The existence and importance of socioeconomic aspects of constructing and operating the waste management facilities are recognized and will be addressed in detail in the project-specific environmental impact statement.

H-10 Over a year ago the group I represent commented on the SRP DWD:

"The goal of the waste management plan to be adopted at SRP should be to comply with the five-year solidification regulation now imposed upon proposed similar commercial facilities. The Number One priority of the SRP waste management plan should be the construction of a solidification facility for defense wastes, so that high-level wastes can be removed from the SRP site. Further consideration of already-discarded waste management techniques should be regarded as not only an unnecessary duplication of effort, but also as a lack of committment to the finding of solutions to the difficult problems at hand.

"Years ago guarantees were given that South Carolina would not be used for permanent storage of high-level radioactive wastes, particularly because of the unsuitable seismology and hydrology of the area. Federally-commissioned studies indicate that safety questions exist in the use of SRP bedrock for the storage of high-level wastes. An NAS/NOR study[2] concluded that it is doubtful that safety could be established for the proposed bedrock storage system for high-level liquid or soluble wastes; it was suggested that the plan be abandoned.....

"On the other hand, a prototype for reducing the wastes to a glass form has been operated.[4] We believe that with the committment on the part of the SRP staff, the technique could be made operational within the least time and with the least environmental effect."

The Interagency Review Group on Nuclear Waste Management (IRG) has recommended that DOE accelerate its R&D activities oriented toward improving immobilization and waste forms and review its current immobilization programs in the light of the latest views of the scientific and technical community. Since final processing of defense waste has been deferred for three decades, the IRG also recommends that remedial action, including immobilization of the waste, should begin as soon as practicable. The preferred alternative is consistent with the IRG recommendations.

For more than two years, while assigned with a responsibility for assessing the problems and seeking solutions, the responsible decision makers have fooled around with paper shuffling. Responsible regulations have been ignored. Health and safety is being compromised in the interest of expediency and buck-passing. The public is the victim of a monstrous shell game.

Sincerely,

Suzanne Rhodes
President of Environmentalists, Inc.

Enclosure: ORR

COMMENTS ON
DRAFT ENVIRONMENTAL IMPACT STATEMENT
LONG-TERM MANAGEMENT OF DEFENSE HIGH-LEVEL RADIOACTIVE WASTES
SAVANNAH RIVER PLANT, AIKEN, S. C. (DOE/EIS-0023-D)
July 1978 U. S. Department of Energy

Submitted by Ruth S. Thomas
1339 Sinkler Road
Columbia, S. C. 29026
tel. 803-782-3000

General Comments:

The Report ("Draft Environmental Impact Statement, Long-Term Management of Defense High-level Radioactive Wastes- Savannah River Plant, Aiken, South Carolina"), contains numerous examples of overlooking evidence and factual data related to potential and existing health hazards and environmental degradation. This, together with the Report's failure to give proper emphasis to previous studies, contributes to the false conclusion that:

"There are no substantial environmental impacts arising from nuclear radiation for any of the three alternatives"proposed for Savannah River Plant (SRP) wastes. (page 1-3 of the Report)

Specific Comments:

The Report has too many failures, omissions and misstatements to comment on all of them:

I-1 1. Failure to include accurate information, including such subjects as monitoring. These ommissions lead to the mistaken impression that the dangers associated with radioactive wastes are quite easily controlled.

According to the Department of Interior, "it must be remembered that the data obtained from the monitoring will not *necessarily prove that radionuclides are not migrating from* the site.[1]

In a review of the Barnwell Nuclear Fuel Plant site, geologists and hydrologists with the Department of the Interior warn that the consequences of undetected radionuclides moving *into the environment can be so serious that taking effective* corrective action may be impossible or impracticable.[1]

The risk analyses do not take credit for the potential reduction of consequences which may be afforded by corrective actions.

I-2	2. Failure to give proper emphasis to the data contained in previous studies, including all of the fourteen references I have listed, a majority of the Report's references and numerous other documents and studies.	This question is answered by virture of the response to the other related questions specific to the fourteen references.
I-3	3. Failure to give proper emphasis to the recommendations of advisory groups such as the Committee on Geologic Aspects of Radioactive Waste Disposal of the National Academy of Sciences (NAS) of 1966.[3]	In preparing this EIS, DOE has considered the 1966 NAS report as well as more recent studies.
I-4	4. Failure to provide data obtained from the tests and studies which the NAS-1966 Committee requested if the advice to halt investigation of bedrock cavern storage of SRP wastes was not followed.[3]	The current report is based primarily upon studies and data more recent than given in the 1966 study.
I-5	5. Ommission of evidence about the losses and damages which have occurred as a result of radioactive wastes at the SRP and at other sites.[8,9,12]	The radioactive waste storage experience at SRP is referred to in the summary and described in detail in ERDA-1537, a reference to this EIS.
I-6	6. Misleading statements made about radioactive wastes and effects of the SRP. The Report indicates that the withdrawal of over six million gallons of water per day from the Tuscaloosa formation "has had no discernible effect on the water levels in the past 22 years." (page V-3 of the Report-DOE/EIS-0023-D)	The statement is correct and not misleading. It has nothing to do with radioactive wastes.
I-7	7. Failure to include information about problems which have been experienced in the operations to remove radioactive wastes from tanks, although the records on such operations must have been kept by the SRP and the Hanford plant.	See response to comment K-18.
I-8	8. Failure to use the data, evidence and findings contained in the Report's references, or explain the contradictions between the report's views on SRP waste plans and the information in such references. For example, on page IV-3 of "Alternatives for Long-Term Management of Defense High-Level Radioactive Wastes-SRP" this statement appears: "If liquid is stored in a cavern, a severe earthquake or major sabotage during the one-year filling period could contaminate the Tuscaloosa aquifer. Large individual radiation does would result if people drank this contaminated water."[13] Further on in this report (page X-39) the subject of contamination is discussed. The document states that the "detrimental outcomes of the Tuscaloosa acquifer becoming contaminated are significant, including residents and industries being required to use another water supply."[13]	Large individual radiation doses could result if people drank the contaminated water. However, the low probability of an earthquake or sabotage event occurring which could contaminate the aquifer result in low population exposures when integrated over time.

I-9 9. Failure to give proper emphasis to earthquake data, as well as a failure to recognize the significance of the SRP being in a high earthquake zone.

See response to comment H-5.

I-10 10. Failure to connect the text of the Report to the listed references. Quotations from references are not used and the material to support the text are not documented by particular reference and page number.

Where appropriate, summaries of the references have been incorporated in the text and in these comments.

I-11 11. The failure to properly identify support information and the use of some references which are difficult to obtain make the task of discovering the reasons for the choice of SRP waste plans in Report DOE/EIS-0023-D arduous.

In addition to the extensive information in the report, adequate support information is listed in the references, which are all publicly available.

I-12 12. Failure to stress that:

"Responsible authorities in the United States and abroad generally agree that the best management approach (for high-level radioactive wastes) involves converting the wastes to inert, refractory solids before storage."

" Waste Solidification Program Summary Report, Vol. 11 Evaluation of WSEP High Level Waste Solidification Process", Battelle Pacific Northwest laboratories July 1972, (page 1.1)

The DOE Report lacks information about solidification, its present stage of development, the work now being done on solidification, the size of the experiments being conducted and the amount of effort needed to apply the present solidification technology to the SRP wastes.

Developing technology for removing the wastes from the tanks and immobilizing the radionuclides in a solid form is the preferred alternative in the EIS. DOE has a large research and development program for immobilizing radioactive waste. A description of this program has been added as Section IV-D.

I-13 13. Lack of information regarding the plans for a federal repository.

As stated in the Foreword and Summary, the purpose of this document is to explore the environmental implications of a large research and development program aimed at providing the information required to replace interim tank storage of the wastes with immobilization for long-term management. The method for disposal subsequent to immobilization has not yet been chosen. Specific plans for a Federal repository for the wastes are beyond the scope of this document and will be addressed in subsequent environmental reviews.

I-14 14. Failure to use Nuclear Fuel Services' reports to the Nuclear Regulatory Commission on operating experience, abnormal occurrances and unusual events (Docket No. 50-201 and Docket No. 70-952) as a basis for making predictions about the likelihood of human errors, equipments failures, design miscalculations, etc. to cause accidents, health hazards, exposures of workers and the public and environmental degradation.

The twenty-five years of safe operating experience at the Savannah River Plant is more appropriate and therefore is used as a basis for predicting factors identified in the question and in preparing safety analyses of similar current operations.

I-15	15. Failure to give proper emphasis to the problem of sabotage and terrorism and the studies which have been done on these subjects.[13]	Sabotage has been analyzed in the technical backup document for the EIS, ERDA 77-42, and the potential environmental impacts of sabotage have been summarized and presented in Tables V-12 through V-16 and Section V.C.4 of this EIS.
I-16	16. Failure to use recently discovered data, including information which makes existing plans for decontamination and decommissioning out-of-date.[14]	Decontamination of reactors with neutron-activated trace elements within the structural steel requires different decontamination techniques than the surface contamination which would be present at waste management facilities.
I-17	17. Failure to give proper emphasis to studies which present data on the capabilities of radioactive materials to cause cancer, leukemia and birth defects, including studies of Hiroshima and Magasaki victims, studies of uranium miners, and those related to x-ray exposure of animals and human beings.	Comparative risks of hazards of low-level radiation are discussed in the responses for questions M-1 and M-3.
I-18	18. Designation of a 300 year period for estimating radiation exposures related to proposals for SRP wastes when these wastes contain radioactive materials which remain toxic for hundreds of thousands of years.	See response to comment L-10.
I-19	19. Overlooking the concerns of the authorities and officals of South Carolina and Georgia and the people they represent-farmers, residents, property owners and businessmen.[7,10]	The concerns of the States are noted in the Summary.
I-20	20. Failure to estimate the loss of such natural resources as the Tuscaloosa aquifer and failure to include such costs in making comparisions between different plans for SRP wastes.	The environmental impacts resulting from contamination of the Tuscaloosa aquifer are included in Table V-16.
I-21	21. Basing the selection of SRP waste proposals on economic informtion which is incomplete and therefore faulty.	The economic information is complete to the best of our knowledge.
I-22	22. Failure to consider that the people of the 3.1 area would be receiving no compensating benefit to offset the detrimental effects of having radioactive wastes kept in South Carolina.	The compensating benefits are addressed in ERDA-1537, p. IX-2, and include increased employment for the area.

I-23 23. Failure to use the scientific method in addressing the problem of having radioactive waste materials in an area where contamination of ground water and drinking water supplies is possible and where conditions related to the presence of radioavtive wastes are unfavorable.[1,2,3,4,5,6,8]

Ground water movement depends upon local conditions. The Savannah River Plant has an extensive program to determine ground water movement patterns and to formulate predictive models. Other ongoing studies are examining the potential for contamination of ground water by buried waste. Although these methods involve a certain amount of uncertainty, we are utilizing the best technology available.

I-24 24. Failure to comply with the DOE's stated policy- "to isolate the waste from the environment for long enough or in a secure enough manner that it will pose negligible risk to human welfare." (page II-2 of the Report - DOE/EIS-0023-D.

Preparation of this EIS is not inconsistent with DOE's policy.

I-25 25. Failure to comply with other stated goals for radioactive wastes.[8,13]

See response to I-24.

I-26 26. Failure to give proper emphasis to previous studies which support the conclusion that SRP wastes need to be removed from South Carolina.[1,3,6,7]

The Atomic Energy Commission postponed indefinitely the SRP bedrock exploration program at the Savannah River Plant in 1972. The bedrock alternative was considered in this EIS to provide a range of alternatives for comparing potential environmental impacts. The preferred alternative for the management of SRP high-level liquid radioactive waste is to continue R&D directed toward immobilization for disposal. The method for disposal has not been chosen but options would include disposal outside of South Carolina.

Conclusion:

The Report points out that -"Successful demonstration of long-term management of defense waste could have an imporatnt sociopolitical bearing on the acceptability of nuclear power generation by a significant portion of the public." (page V-47 of the report) I agree, as I'm sure, do many men and women throughout the nation and the world.

Of all the nuclear energy problems, the one of greatest concern is the question of what to do with radioactive wastes. For this reason, it is imperative that decisions on SRP wastes and on other radioactive waste materials be based on as complete and accurate a collection of factual data and evidence as possible. Instead, Report- DOE/EIS-0023-D uses incomplete, misleading and faulty information.

Promoting and developing radioactive waste plans which ignore facts, which ignore the advice of earth scientists and which ignore recommendations of authorities and officals of South Carolina and Georgia would further add to the existing distrust which many people have of nuclear proposals, including the building and operation of nuclear power plants.

Submitted by Ruth J. Thomas on October 30, 1978

REFERENCES

1. Safety Evaluation-Barnwell Nuclear Fuel Plant (Docket 50-332), Division of Materials Licensing, U.S. Atomic Energy Commission, Appendix B, Comments of the Department of Interior, page 113 -(September 18, 1970)

2. G. E. Siple, Geology and Ground Water at the Savannah River Plant and Vicinity of South Carolina, USGS Water Supply Paper 1841 (1967)

3. Report from Committee on Geologic Aspects of Radioactive Wastes Disposal, NAS- ( ) to Division of Water Development and Technology (May 1966)

4. Operations Concerning the Management of High-Level Radioactive Waste Material. Report from the Comptroller General to the Joint Congressional Committee on Atomic Energy (May 1968)

5. Proposals and Problems for Managing High-Level Radioactive Wastes. Report from the Comptroller General to the Joint Congressional Committee on Atomic Energy, (November 1970)

Conclusions: These are the writer's opinions and the response given previously to the 26 questions respond to the specific points upon which the conclusion is apparently based.

6. Frank T. Garuccio, An Appraisal of the Location of the Barnwell Fuel Reprocessing Plant from Hydro-Geologic Considerations, Report to the Committee to Study the Establishment of Plants or Facilities for the Recovery of Nuclear Fuel and the Storage of Waste Nuclear Materials, (1972)

7. Report of the Committee to Study the Establishment of Plants or Facilities for the Recovery of Nuclear Fuel and the Storage of Waste Nuclear Materials. Report from the Committee of the South Carolina General Assembly to the Governor and General Assemly (1972)

8. Draft Environmental Statement, Waste Management Operations Savannah River Plant, Aiken, South Carolina. Report ERDA-1537, Energy Research and Development Administration (October 1976)

9. Letter C. L. Wakamo to Mrs. James T. Mills, Answers to questions, which includes the answer that the EPA and officals of Georgia were told "that all effort had been abandoned and that it was not a part of the Waste Management Program EIS consideration." (March 5, 1975) -On Bedrock disposal of radioactive wastes-

10. Letter David Domick to Senator Ernest F. Hollings, Answers to Questions by EPA (Ocober 26, 1971)

11. Preliminary Safety Analysis Report of the Barnwell Nuclear Fuel Plant, Allied-Gulf Nuclear Services, December 1970, pages dated 3/21/69, III.3-2B

12. Preliminary Data on the Occurrence of transuranium Nuclides in the Environment at the Radioactive Waste Burial Site, Maxey Flats, Kentucky, G. Lewis Meyer presentation at / International Symposium on Transuranium Nuclides in Environment, San Fransisco, Cal. (November17-21, 1975)

13. Alternatives for Long-Term Management of Defense High-Level Radioactive Wastes (HLW), Erda 77-44 (May 1977)

14. John J. Stephens, Jr. and Robert O. Fohl, Trace Elements in Reactor Steels: Application for Decommissioning, Report #2882 (August 1977)

State of Ohio Environmental Protection Agency
Box 1049, 361 E. Broad St.,
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James A. Rhodes, Governor
Ned E. Williams, P.E. Director

Re: Long-Term Management of Defense High-Level Radioactive Wastes, Savannah River Plant, Aiken, South Carolina

W. H. Pennington
Office of NEPA Coordination
U.S. Dept. of Energy
Washington, D.C. 20545

November 1, 1978

Dear Mr. Pennington:

The Ohio Environmental Protection Agency, acting as lead agency and review coordinator for Federal Environmental Impact Statements has received a copy of the above referenced document. The Director of OEPA has transmitted the document to me for comments, which follow.

J-1 General

Inasmuch as the operations described in the subject document are out of the jurisdiction of the State of Ohio, we have no immediate concern with the subject EIS. However, since Ohio has a well-established ongoing interest in fuel cycle and radioactive wate disposal matters, we have examined the document with considerable interest and would like to make the following comments.

At present Ohio has an active commercial reactor building program; one unit is operational, three are under construction, one has been decommissioned, and four more are in the planning stage. If the spent fuel from these reactors must ultimately be stored at a Federal Repository, such a program would be more easily established if the management of defense wastes were fully in harmony with and supplemental to the commercial waste program.

It is also becoming increasingly apparent that the radioactive waste disposal is beset with a number of (non-technical) institutional, political and social barriers which are more evident in the case of commercial reactor spent fuel elements than for defense related wastes. The subject EIS does not apparently take these into account.

The existence of institutional, political, and social factors are recognized in this EIS and summarized in Section XII.

J-2 Concerning the specific alternatives which are presented there are several comments which we trust you will find pertinent.

1) Alternative 1 - Continue Storge in Tanks. While this "No Action" alternative might be cheapest, environmentally benign and backed by the greatest experience, it also has the disadvantages of contributing nothing new or progressive to the state of the art of radioactive waste management. It also might add to a public perception of DOEs inability or indecision to dispose successfully of defense wastes.

2) Alternative 2 - Process to Glass and Ship to a Federal Repository. We realize that this alternative may be the most difficult to implement inasmuch as it requires the timely existence of both a Federal Repository and a radioactive waste shipping network. Nevertheless both the shipping and repository facilities will ultimately be necessary for both the civilian and military nuclear program.

Alternative 2 - Subcase 2 - Process to Glass and Store in Surface Facility at SRP. The construction of a surface facility for storage of high-level, non-reprocessable waste appears to represent an unnecessary expense. It has the added disadvantage of providing an alternative to a Federal *Repository. Such a "Temporary" facility might well deflect* the program for a Federal Repository and thus run the danger of becoming de facto permanent.

Alternative 2 - Subcase 3 - Process to Glass and Dispose of in an SRP Bedrock Cavern. This would demonstrate a waste disposal procedure which possibly could be applicable to the handling of commercial waste and thus add importantly to our knowledge in this area.

3) Alternative 3 - Dispose of Liquid Waste in an SRP Bedrock Cavern. The construction of an eight mile double walled pipeline raises serious questions of risk and expense. Furthermore storage of liquid wastes is at odds with the multiple barrier concept embodied in corrosion resistant containers and glassification of the waste and thus would appear to be a step backward in the state of the art. Also this method of disposal is inapplicable to commercial waste.

The alternatives considered in this EIS were selected to provide a range for comparison of potential environmental impacts. The preferred alternative is to conduct a research and development program aimed at immobilization for subsequent disposal. These comments appear to support the preferred alternative.

J-3 The report is generally well organized and written and comparatively free of technical errors. In Fig. IV-1, p. IV-5 the decay line for 95 Zr is not identified. It appears to be the line immediately to the right of the 91 Y decay line.

The appropriate label for ^{95}Zr was added.

We appreciate the opportunity to comment on this Draft EIS and hope that these remarks will be helpful.

Sincerely,

Harold W. Kohn
Power Siting Coordinator
Ohio Environmental Protection Agency

HWK/caj

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November 1, 1978

Mr. W. H. Pennington
Mail Station E-201
GIN
Department of Energy
Washington, D.C. 20545

Re: Draft EIS
Long-Term Management of
Defense High-level Radioactive Wastes
Savannah River Plant
DOE/EIS-0023-D

Dear Mr. Pennington:

We have reviewed the referenced report, and we have specific concerns and questions for which we request response in the final Environmental Impact Statement. As expressed in previous letters, we consider this matter to be of great importance to the health and safety of Georgians and protection of our state's resources.

We would like to express our appreciation to the Department of Energy for the early announcement of this document, making it more convenient for review.

The report concludes that there are "no substantial environmental risks" associated with any of the alternatives listed. Such a conclusion is extremely premature in view of the serious environmental concerns which remain unanswered, some of which are addressed in our following comments:

The Summary has been modified to reflect the uncertainty in the environmental analyses.

K-1 1) We continue to oppose management alternatives for long-term storage or disposal of nuclear waste at the Savannah River Plant (SRP) site, either on the surface or subsurface.

The alternatives considered in this EIS were selected to provide a range for comparison of potential environmental impacts. The preferred alternative is to conduct a research and development program aimed at immobilization for disposal. Decisions to immobilize in a specific waste form and the method for disposal subsequent to immobilization will be the subject of future environmental reviews.

Surface storage poses too great a threat to Georgians from accidental releases in various possible incidents, including earthquakes, tornadoes, sabotage, aircraft crashes, spills, and errors in emissions control. Subsurface storage poses similar threats as well as an increased possibility for groundwater contamination, particularly in the Tuscaloosa aquifer which lies beneath the site and extends into Georgia.

Item 2 on page XII-14 describes the consequences of aquifer contamination as "quite high", but then attempts to explain them away due to "promising possibilities" and because the alternative is "the least expensive". We are not reassured by such comments.

K-2 2) Only one alternative was listed for storage off the SRP site; an off-site federal repository. However, since this alternative was not addressed on a site specific basis, we must conclude that an acceptable waste management plan has not yet been presented. We, therefore, await further information on off-site alternatives available. In this regard, we question any off-site use of bedrock or geologic storage which has potential for contact with groundwater or aquifers. Furthermore, any off-site subsurface storage studies should include test drilling and construction of exploratory shafts and tunnels to determine the characteristics of possible storage caverns and their surroundings.

Details of the environmental impacts of an offsite geologic repository would be covered in a site-specific EIS for that facility. However, bounding estimates can be made at the present time to determine whether shipment to such a repository is a feasible alternative for the SRP wastes, and such estimates are included in this Programmatic EIS.

K-3 3) We question whether the alternative of disposal off the SRP site is being given full consideration. It is our understanding that studies on a federal waste repository have been largely limited to applications to commercial nuclear waste. Please advise us further as to specific work underway toward development of a defense waste repository other than the SRP site. We feel this must receive priority in view of the unacceptability of the SRP site.

The site exploration, technology development, and repository engineering studies underway in the National Waste Terminal Storage (NWTS) program encompass the alternatives of spent reactor fuel and solidified waste from reprocessing. Solidified defense HLW will differ from possible commercial solidified HLW only in the lower heat density for defense waste resulting from different operating conditions for defense material production reactors). The lower heat density means that disposal of all defense HLW will require less than four percent of the repository space needed for either HLW or spent fuel from commercial nuclear energy through the year 2000. Therefore, the geologic repositories under the NWTS program are being designed to accept high-level wastes both from the commercial sector and from defense programs.

K-4 4) The question remains on the ultimate relationship between disposal of defense wastes and commercial wastes. This question was partially addressed in Appendix A, but joint disposal was not ruled out. Our specific concern is that if commercial waste is being considered for disposal at the SRP site, it must be addressed as an added environmental impact in this Environmental Impact Statement.

See response to comment K-3 above, "No work..."

K-5 5) We agree that exploratory tunnels would be an essential step in determining the characteristics of possible storage caverns below the SRP site. However, we do not advocate the development of a tunnelling project because the SRP site is already considered unacceptable on the basis of the problems listed in comment 2 above.

No work is proposed for tunneling related to an SRP bedrock repository.

K-6 6) We do not support the assumption that the radioactivity from the waste will be negligible after 300 years. There is much evidence that even very low levels of radiation can cause cancer and genetic defects. Furthermore, plutonium has a half-life of 24,000 years and can cause lung cancer from minute doses.

The health effects of exposure to low levels of radiation continue to be examined and are cause for some uncertainty. Also see response to comment M-3. Time integration of the risks over 10,000 years has been added to the data in this EIS to indicate the longer term risks.

K-7 7) The consequences of future unintentional human disturbance of the stored waste should be addressed in detail. Since the waste will remain harmful for thousands of years, it is very possible that it will out-live human institutions existing today, and the records on its location may not be available to future generations doing exploratory drilling or subsurface excavation.

The consequences of human disturbance of the stored waste are bounded by the pessimistic assumptions used in Section V regarding sabotage, abandonment, airplane crash, etc. Any smaller scale disturbance would have smaller consequences, and they would be limited to fewer individuals.

K-8 8) Please indicate the pages of the report which address the possible natural forces acting on the waste over future years and their possible consequences in releasing the waste materials to the biosphere. Section V.C. on abnormal events begins to address this, as does page XII-14, but both references are far from complete.

Details of the consequences of natural events, beyond those included in Sections V and XI, are included in the reference documents ERDA-1537 and ERDA 77-42. In ERDA-1537, see pages III-100 to III-120. In ERDA 77-42, see pages V-8 to V-10, V-25, and V-42 to V-44.

K-9 9) Clarification is needed on the physical condition of the waste at the time it would be encased in molton glass. What percent water would remain in the sludge and ion exchange product? Has the powder form been decided upon as that described on page IV-15? What will the waste particle size be? Will encasement preclude the dissolving of the waste particles in water in the event that cracks developed in the glass?

Determination of the detailed waste composition is part of the proposed ongoing research and development and testing program. These characteristics are used in an upper bounding manner for purposes of this EIS, and are given in the reference document ERDA-77-42. Encasement of the waste glass will undoubtedly provide extra time before the glass could be contacted by water and leaching could begin. The analyses given here, however, take no credit for protection by the canister. The leaching estimates assume the glass is in small pieces, and take no credit for the glass as a large monolith.

K-10 10) We question the statement of page v-24 that "no large individual doses can occur" from liquid releases. It appears that with a sufficiently large release, large individual doses would indeed occur. To deny that this is even possible requires further explanation.

Studies at the SRP have identified no mechanism for a large, short duration release directly to drinking water users. Liquid releases would be absorbed in the soil or diluted many orders of magnitude by the onsite creeks and swamps and the Savannah River before reaching drinking water users. This is explained further in Section V and in ERDA 77-42, p. VIII-7 through VIII-15.

K-11 11) Each alternative considered should account for the added danger that come with transport of the wastes from site to site. Adequate containment must be provided to avoid accidental releases during transport. As a minimum, the containment of this material should meet the same requirements as those set forth for the transport of spent fuel from commercial nuclear reactors.

Transport routes should avoid population centers as much as possible and provide maximum security against unauthorized access to the waste.

Transportation risks are included in the offsite radiation risks developed in Section V.

K-12 We agree with the decision that any selected management alternative will allow for future retrieval and monitoring of the waste rather than merely disposal and abandonment. Too many questions remain unanswered on the future state of the waste, and the only way to know that it is adequately managed is to be able to verify its containment on a periodic basis.

The immobilized waste form will be of a high-integrity nature and its disposal will be in compliance with all applicable regulatory requirements including retrievability.

K-13 13) The option of reducing the amount of defense radioactive waste being generated should be addressed. This should include the recycling of Plutonium from obsolete or phased out weapons to reduce the amount of new inventories produced with the resulting reduction of waste materials. If a certain amount of fresh Plutonium is needed due to decay of existing inventories, this should be explained.

Alternatives for reducing the amount of defense waste generated are beyond the scope of this EIS. However, process development to reduce the volume of the waste is a continuous activity to support the SRP operations. Utilizing such process modifications as additional evaporation, condensate recycle, chemistry refinements, etc., the volume of waste generated has been continually reduced at SRP.

K-14 14) Other means of reducing total waste volume should be addressed, such as processing methods that use less water and generally methods to reduce the total amount of wasted material.

See response on K-13.

K-15 The population doses for various scenarios in the report do not include certain radionuclide vectors which are present in the fresh waste. Among those excluded are 89Sr and 134Cs, which have a high level of activity in the first 20 years or more after production. All radioactive substances present should be included in the dose analysis regardless of ther dose contribution.

The risk estimates for this EIS were developed using only the radioisotopes that make a major contribution to the risk. Inclusion of all radioactive subtances present regardless of their dose contribution is judged to add nothing to the process of disclosing environmental impacts.

K-16 16) In consideration of storage tanks used prior to long-term storage, acid storage in tanks of stainless steel or with stainless steel lining should be further addressed. Stainless steel would appear to provide a long tank life with less chance of leakage. In addition, there are indications that the acid waste would be easier to convert to glass after cooling and involves less waste volume than alkaline waste.

Storage of high-level liquid waste as acid solutions in stainless steel tanks was considered in the "Final Environmental Report - Waste Management Operations, Savannah River Plant," (ERDA-1537), September 1977. This option was rejected because studies made on the conversion of SRP wastes to acid form showed that operation of a dual acid and alkaline storage system would be required and could not be economically justified (page V-10 and 11 of ERDA-1537).

K-17 17) The integrity of existing tanks should also be addressed further in considering storage of the fresh waste prior to long-term disposal. Existing waste should be transferreed to adequate containment as soon as possible in those cases where leakage is occurring of where stress corrosion cracking is evident.

Relocation of existing wastes from cracked tanks to tanks of unquestionable integrity is already in progress and will be continued over the next several years as new stress-relieved (Type III) tanks are completed. All liquid waste and over 98% of the sludge has already been removed from Tank 16 (the only SRP tank from which stored waste has leaked past all barriers and into the ground), and work to remove the remaining sludge and surface contamination is continuing currently (October 1979). Similar waste removal and decontamination are in progress on schedule for all of the older (non-stress-relieved) high-level waste tanks at SRP, with priority going to those tanks which have developed stress corrosion cracks. Currently, most of the liquid waste has been removed from

K-17
contd

two cracked tanks (in addition to Tank 16), and salt removal is in progress in two tanks. Salt and/or liquid are scheduled for removal from all non-stress-relieved tanks (except evaporator feed Tank 13) by the end of 1982, but sludge removal will not be completed until 1984 because more elaborate equipment is required.

K-18 18) We are concerned whether the waste can be effectively removed from the existing tanks without serious environmental risks. The EIS assumes that the waste will be in new tanks when solidification processes begin, but does not address the essential step in the long range planning of getting it there.

It appears that reliquifying the salt cake in order to remove it would result in significant leaks; on the other hand, physical mining of the waste from the tanks poses problems of worker exposure or remote control work. It appears that a containment structure over the tanks would be necessary for the latter method.

Transfer of liquid waste from one tank to another and to the tank farm evaporators has been routinely practiced at SRP for nearly 20 years, and safe and effective techniques are well established. Most of the sludge (80-95%) was removed from seven tanks in 1966-69 by hydraulic "mining" (i.e., slurrying) using once-through high pressure water as the slurrying medium. More thorough sludge removal was not attained because of limited capacity to store the added water. Subsequently, a technique has been developed using recirculated waste supernate pressurized by long-shaft pumps submerged in the tanks, which eliminates the restriction on operating time imposed by the fresh-water method. The recirculated supernate technique has already removed 98% of the sludge from Tank 16, and a scheduled repeat of the operation is expected to remove almost all of the remainder. Although Tank 16 has more cracks than all other SRP tanks combined, self-sealing of the cracks with salt and/or sludge is so effective that little or no liquid seeped through the cracks during sludge removal. If leakage through the cracks in the primary tank had occurred, the liquid would have been retained by the secondary pan and transferred by an installed steam jet back into the primary tank; the same precautions will be applied in all future sludge and/or salt removal operations in other tanks.

Removal of most of the salt cake from a concentrate tank by dissolving in water or unsaturated waste supernate has been demonstrated in one tank in 1971-72, and further demonstrations are currently in progress in two other tanks. The recirculation of liquid necessary to continuously bring unsaturated liquid into contact with the salt surface can be accomplished by density-driven convection and/or mechanical agitation; both techniques are under development.

No need is envisioned or work is planned at SRP to remove salt or sludge from waste tanks by physical or mechanical (i.e. non-hydraulic) mining methods.

K-19 *Sabotage of the waste facilities is still assigned an extremely low probability. This can be compared to the surge in commercial aircraft hijacking in recent years. A few years ago, the calculated risk of such acts would have been very small, since few had occurred, whereas the risk today is quite significant.*

It would seem more realistic to admit the uncertainty of this occurrence and consequently assume a high likelihood to assure adequate protection. Safeguards and security measures *should be increased accordingly. However, we are concerned* that civil liberties of citizens be protected at the same time.

This comment expresses an opinion and requires no response. However, the structure of the data used in the sabotage analysis is available in the EIS and its references, so that the reader can apply his own estimate of probabilities if he so desires. Also, sensitivity of the results is discussed in Section XII-C.

K-20 20) *Corrective action for River Water Exposure (p. XII-19)* assumes that a liquid waste spill would be discovered with adequate time to shut down the Savannah area drinking water intake. We are not confident that human error can be avoided completely in such a case. There is also the question of who decides on behalf of the Savannah area people if a certain leak is serious enough to shut down their water supply. Similar concerns are raised under Corrective Action for Atmospheric Exposure (p. XII-17) where 95% of the populace are expected to respond to an alarm sounded after discovery of a release all within as little as one hour.

Corrective actions are presented to demonstrate that were they taken, a reduction of the estimated impacts could result by the indicated amount. For the purpose of calculating impacts which would result from implementing an alternative, the effect of possible corrective actions was not included. *Consequently, even if the assumptions are considered optimistic,* it would not affect the results in the document.

K-21 21) The cost calculation for Alternative Plan I includes costs for tank replacement only once during the 300 year projected management period. In actuality, a total of 5 sets of replacement tanks would need to be built at 50 years intervals in the 300 year period.

The proposed trust fund to finance these funds assumes unsupportable trends in inflation and materials production costs. It would, therefore, be appropriate to include the total cost of all tanks in the original cost estimate.

More realistic surveillance costs should also be used for this alternative.

With the above modifications in the cost estimate, we see alternative Plant I being much more expensive than presented, and possibly higher than some other alternatives analyzed.

Table XIII-3 has been modified to include undiscounted costs in 1980 dollars for tank replacement over periods of both 300 years and 10,000 years.

K-22 Short-term cost should not be the deciding factor in comparing alternatives. The unavoidable high cost of managing this waste should be borne now to assure adequate safeguards rather than deferring the cost of future generations with unacceptable risks of environmental contamination in the meantime.

This comment expresses an opinion and requires no response.

K-23 23) We must object to the ommission of certain important issues from Appendix A, "Summary of Substantive Issues Covered in Comment letters." In our comment letter of August 1, 1977 we addressed the following issues, which we believe are very substantive and should have been included in the summary:

a) The need to address impacts of transportation from site to site in each of the alternatives considered. (Our August 1, comment No. 3).

Transportation risks are included for all alternatives that involve offsite transportation in Section V, and the basis of these estimates is discussed in the major supporting reference, ERDA-77-42.

K-24 b) The option of reducing the amount of defense radioactive waste being generated. (Our August 1, comment No. 6).

Response to this comment was given earlier (K-13 and K-14).

K-25 c) Concern about the integrity of existing waste tanks and the methods to be used for storage prior to long-term storage. (Our prior August 1, comments Nos. 9 and 10.

Integrity of the underground double-shell high-level liquid waste storage tanks at the Savannah River Plant was discussed in the following documents:

1. "Final Environmental Impact Statement - Waste Management Operations, Savannah River Plant," (ERDA-1537, September 1977).

2. "Environmental Statement - Additional High-Level Waste Facilities, Savannah River Plant," WASH-1530, August 1974.

3. "Environmental Statement - Future High-Level Waste Facilities, Savannah River Plant," WASH-1528, April 1973.

Currently, DOE is preparing a supplement to ERDA-1537 to address certain specific design and safety features of these tanks. Preparation of this supplemental EIS is directed by the United States Court of Appeals for the District of Columbia Court (NRDC vs. Administrator, ERDA/DOE).

K-26 In conclusion, we believe that many technological questions involved in management of this waste have yet to be answered. In addition, the social issues and public acceptance questions must be resolved before an acceptable waste management alternative can be selected. As a part of this process, we recommend that the public hearing by the National Academy of Sciences (NAS) be utilized in preparing the Final EIS. The results of the present NAS study should also be accounted for. In addition, public comment to the Interagency Review Group on Nuclear Waste Management should recieve full consideration.

The national nuclear waste management strategy is being developed based on the recommendations of the Interagency Review Group on Nuclear Waste Management (TID-29442). The IRG report, as well as the public comments included with it, has received full consideration in the preparation of this document. Socioeconomic as well as institutional issues will be addressed in greater detail in project-specific environmental reviews. Although unavailable for this document, the results of reviews by the National Academy of Sciences will be addressed in Savannah River waste management programs and will be considered in preparing future environmental documentation.

K-26 contd We appreciate the opportunity to comment, and we ask that our comments be given full consideration in preparation of the Final Environmenta lmpact Statement.

Sincerely,

Bob Kerr
Executive Director

BK/ea

CC: President Jimmy Carter
Governor George Busbee
Mr. James Setzer, Georgia Environmental Protection Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF THE
ADMINISTRATOR

16 NOV 1978

Mr. W. H. Pennington, Director
Division of Review and Coordination
Office of NEPA Affairs
Department of Energy
Washington, D.C. 20545

Dear Mr. Pennington:

The Environmental Protection Agency (EPA) has reviewed the Department of Energy's draft Environmental Impact Statement (EIS) for "Long-Term Management of Defense High-Level Radioactive Wastes" for the Savannah River Plant, Aiken, South Carolina (DOE/EIS-0023-D). Our detailed comments are enclosed.

L-1 EPA is concerned over the absence of any clear statement by DOE identifying the action on which the draft EIS has been prepared. In one instance, DOE states that the EIS is to provide "environmental input for decisions on whether Savannah River high-level wastes should be processed and solidified" (See Foreword). However, DOE also states on page I-1 (Summary that the EIS is intended to "provide for appropriate consideration of environmental values in planning for either permanent disposal or for storage over a period that could extend to several decades." EPA believes the purpose of this EIS should be clearly identified early in the document.

The purpose of the EIS is to analyze the environmental implications of a large research and development program to develop methods for long-term management of the high-level wastes at the Savannah River Plant. The EIS analyzes the environmental impacts which would result from adoption and implementation of the developed technology. The Foreword and Summary have been modified to respond to this comment.

L-2 As a Presidential Interagency Review Group (IRG) is currently recommending radioactive waste management policy, we question why the Department of Energy (DOE) is proceeding with the unilateral policy planning evidenced in this draft EIS. Additionally, EPA is in the process of developing environmental criteria for radioactive waste management. These criteria will address the objectives of waste management and the procedures necessary to provide public health and environmental protection. EPA is also developing environmental standards for high-level radioactive waste management which will be applicable to any disposal option used for the Savannah River Plant's (SRP) high-level wastes. Until such time as EPA's criteria and standards and the IRG policies are issued in final form, it is premature in our opinion for DOE to make firm decisions regarding the final disposition of any high-level waste.

The DOE defense waste management program is consistent with the recommendations of the Interagency Review Group on Nuclear Waste Management (TID-29442):

> "The IRG recommends the DOE accelerate its R&D activities oriented toward improving immobilization and waste forms and review its current immobilization programs in the light of the latest views of the scientific and technical community. Since final processing of defense waste has been deferred for three decades the IRG also recommends that remedial action, including immobilization of the waste, should begin as soon as practicable."

Decisions on whether to immobilize and on ultimate disposal of the waste will be made based on subsequent environmental reviews. The proposed R&D program is sufficiently flexible so as not to foreclose any of the reasonable alternative waste forms under consideration prior to a project-specific environmental review. The proposed R&D effort will factor applicable Environmental Protection Agency criteria into consideration as they become available.

L-3 EPA also has significant concern over specific storage options being considered for SRP waste. We are concerned that alternatives, such as storage or disposal of waste (in bedrock) beneath the Savannah River Plant, are still considered possible options by DOE. We believe that such alternatives are environmentally unacceptable and have so stated in our past reviews of waste management options (both EIS and technology assessment) for the Savannah River Plant. As noted in this EIS, as well as in past Energy Research and Development Administration's reports, bedrock storage or disposal presents a high potential for contaminating the Tuscaloosa aquifer. EPA strongly recommends that other more environmentally satisfactory alternatives be pursued, unless detailed studies (water movement, geological movement) can be provided with information to the contrary.

In accordance with the Council on Environmental Quality guidelines, this EIS analyzes the range of reasonable alternatives to the proposed continuation of an R&D program directed at immobilization. Our analysis does not show a high potential of damaging the aquifer from any of the alternatives; however, EPA's opinion is noted in the body of the EIS.

L-4 In revising the draft EIS, the Department of Energy staff should focus on the different methods of processing high-level waste into other waste forms. Since the final recommendations of the Interagency Review Group will concern ultimate disposal, information on the types of waste forms may be more beneficial than the current limited analysis to a final decision on the Savannah River Plant. Most importantly, until the purpose of the EIS is clarified and coordinated with the recommendations of the IRG, the environmental impact of each SRP alternative cannot be fully discussed.

The purpose of the EIS has been clarified in the Foreword and Summary. A section on alternative waste forms has been added as Section IV-D.

L-5 On the basis of the above concerns we have rated the draft EIS 3 (Inadequate). Further, on the basis of information already available to EPA as well as that provided in the draft EIS, we have categorized any bedrock disposal option at the Savannah River Plant as EU (Environmentally Unsatisfactory). We urge DOE to modify the EIS for the Savannah River Plant to reflect these concerns.

A meeting was held with EPA on January 15, 1979 to discuss the basis for rating the EIS inadequate. It was determined that EPA had considered the document as a Project-Specific EIS instead of a Programmatic EIS and that the analysis was adequate for a Programmatic EIS. The EIS has been revised to clarify that it is a Programmatic EIS. In addition, other EPA comments have been reviewed in detail and the EIS has been modified accordingly.

Should you or your staff have any questions, or wish to discuss our comments, please contact Florence Munter of my staff (755-0770).

Sincerely yours,

William D. Dickerson
for
Peter L. Cook
Acting Director
Office of Federal Activities (A-104)

Enclosure

REVIEW COMMENTS PREPARED BY
UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

ON

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
LONG-TERM MANAGEMENT OF DEFENSE HIGH-LEVEL
RADIOACTIVE WASTES AT SAVANNAH RIVER PLANT
AIKEN, SOUTH CAROLINA (DOE/EIS-0023-D)

General Comments

L-6 It is not clear for what action the draft EIS has been prepared. In the Foreword, DOE states that the EIS provides environmental input for decisions on whether Savannah River Plant (SRP) high-level wastes should be processed and solidified. However, in the Summary (p. I-1), DOE indicates that "the statement is intended to provide for appropriate consideration of environmental values in planning for either the permanent disposal of the waste or, if needed, for storage over a period that could extend to several decades." There is a clear difference in these statements regarding the purpose of the draft EIS. The draft EIS was obviously written for the latter purpose. However, given the current status of the radioactive waste program for selecting repository sites and EPA's many previously recorded objections to the use of bedrock disposal at SRP, we believe the draft EIS should be substantially revised to address in a more effective manner the processing and solidification options for storage and eventual disposal of SRP high-level radioactive waste.

This comment has been addressed above. The Foreword and Summary have been clarified accordingly.

L-7 The alternatives or options for high-level waste processing into suitable forms for long term storage or disposal received inadequate consideration in the draft EIS. Only two waste forms were considered, glass and the existing slurry/sludge combination. This limitation falls far short of achieving the purpose of the draft EIS as expressed in the Foreword. The discussion of solidification options in Chapter X provides very limited information for options that are only modifications of the vitrification option. No discussion is included for any of the solidification options that potentially offer a more effective barrier to migration of the waste. These options include such methods as metallic matrices, ceramics and others.

Section IV-D has been added to discuss alternative waste immobilization forms.

L-8 More consideration should be given to combinations of alternatives, such as surface storage followed by disposal in a deep geologic repository. According to the IRG's report, mined repositories might not be available until the year 2000. (Site availability is dependent upon a number of technical criteria and research, much of which is not available at this time.) In this case, storage of waste at facilities such as Savannah is an integral part of the overall national waste management strategy.

Alternative 2, Subcase 2 (convert the waste to glass and store on the surface at SRP) is intended to give the environmental impact of leaving the waste at SRP for a long period in lieu of immediate shipment to an offsite repository. Costs and risks are given in modular form to enable the reader to construct reasonably accurate cases for variations that may be of interest.

L-9 We have identified several problems concerning the length of time during which institutional control can be relied upon and the length of time for assessing the environmental impact of waste storage. EPA currently believes that reliance on institutional controls should be limited to about 100 years. This institutional control limit would drastically alter the two alternatives which involve surface storage of the high-level waste (Alternative 1 and Alternative 2 - subcase 2). The revised draft should consider EPA's forthcoming proposed institutional control limit of 100 years. (Federal Radiation Guidance on Waste Management). The 100 year institutional control limit also raises serious questions concerning the adequacy of the risk analysis in Chapter V. For example, in Alternative 2 - subcase 1, Glass Stored in Offsite Geological Storage, the exposure risk from the storage event is listed as negligible. We believe an abandonment scenario should be included for this event or activity. Preliminary findings in EPA's waste disposal risk assessment indicate that the loss of institutional control (abandonment) at a repository leads to potentially significant risks. In fact, the expected risk (time-integrated risk) for the abandonment scenario at a repository is greater than that presented in Table V-13 for the total risk.

The risk analysis has been modified at the request of EPA to reflect abandonment of the tanks after 100 years for Alternative 1 - Continued Tank Farm Operation. As stated in the text and the backup reference ERDA-77-42, consequences of abandonment of the air-cooled vault in Alternative 2 - Subcase 2 are negligible. Any geologic disposal system implies eventual abandonment, but population exposures received from long-term migration of such isotopes as I-129 and Tc-99 to the biosphere are negligible compared to exposures from natural radiation. Tables V-17 and V-17A are included as estimates of the risks that might be incurred by individuals intruding into an abandoned generic repository.

L-10 Another major problem with the risk analysis in Chapter V is the arbitrary cutoff of the impact assessment at 300 years. The potential hazards of the waste beyond 300 years are much too great for such an arbitrary decision. Risk assessment for waste management and disposal should be carried out for a much longer period. In addition, the consequences of risk assessments should be presented in health effects, as is common practice with risk assessments, rather than population doses as presented in the draft EIS. EPA believes the risk analysis presented in the draft EIS is inadequate and should be significantly modified before issuance of a final EIS.

The integration of risks for 300 years is not arbitrary, but is based on the fact that after that time exposures that could be received by average individuals in the nearby population from any of the unusual events could be only small fractions of the exposures normally received by those individuals from natural background radiation. This topic is discussed in Sections V-C.3 and XI-B.2.

The EIS has been modified to add integration of risks through 10,000 years, and a discussion of possible health effects has been added. These changes are included in Sections V-C.3, XI-B.2, Tables XI-5 through XI-9 in Section XIII, and in the Summary.

L-11 Given the limitations on information presented in this EIS, EPA questions the usefulness of the cost comparisons provided. Inclusion of all costs and sensitivity analysis of assumptions could significantly change relative costs of the alternatives. Thus, to avoid misinterpretations of the calculated cost estimates, an explanation of the limitations of the EIS should be presented. There are three types of limitations on the cost information presented:

1. Only certain types of costs are considered: budgetary costs for the storage systems, radiation risk to the public, and land contamination. Environmental costs, social costs and monetary costs other than engineering costs, are not considered.

2. The costs that are presented are calculated only for certain assumptions, e.g. budgetary costs and radiation risk are calculated for a limited area, and for a limited time.

3. Methodology and assumptions used in calculating budgetary costs are not fully explained.

EPA submitted similar cost comments regarding ERDA 77-42, but there has been no improvement in the cost comparison methodology in this draft EIS.

Comment No. 1 is incorrect regarding budgetary costs. The EIS includes monetary costs not only for the storage systems but also for all other parts of the long-term waste management activities, starting with removal of waste from tanks through processing the waste, transportation, and finally through ultimate disposal, where applicable to the particular alternative. DOE is unaware of any methodology for placing a monetary value on what the comment refers to as "environmental costs" and "social costs." There is, in fact, considerable controversy over whether it is useful to attempt to place a monetary valuation on radiation population risk, as one of the examples in this EIS does.

The assumptions regarding cost calculations are the best that can be made at this time; however, they do include a broad enough area and time span that any additional coverage would be insignificant.

The comparisons in the document are given primarily as examples of how a decision process might take the different aspects of the alternatives into account. The basic data for each alternative are available in the document, so that any reader who so desires can make his own evaluation. Sensitivity analysis of the important factors is covered in Section XI-C. The accuracy of different components of monetary cost is discussed in Section X-A.

L-12 Geological Comments

EPA strongly objects to the storage or disposal of radioactive waste in the bedrock beneath the Savannah River Plant. In EPA's opinion, the alternatives involving storage or disposal beneath the SRP are not viable and we have opposed alternatives that involve bedrock disposal beneath SRP since 1972. (See EPA's enclosed comments on "Final Environmental Impact Statement, Waste Management Operations, Savannah River Plant," (ERDA-1537) and "Alternatives for Long-Term Management of Defense High-Level Radioactive Waste - Savannah River Plant," (ERDA-77-42).

The rationale for including disposal of waste in the bedrock beneath SRP in the alternatives covered is discussed in Sections I, II-A, and Appendix A. It is noted in Section I, SUMMARY, that EPA has disapproved of this alternative disposal mode. No work is under way, and none is proposed, on the bedrock disposal concept at SRP.

L-13 The basement rock beneath the Savannah River Plant is described in the draft EIS as crystalline metamorphic rock grading into Dunbarton Triassic Basin rock to the southeast. A vertical geologic cross section to a 2,000 foot depth is depicted in Figure 1 and shows approximately 1000 feet of unconsolidated sedimentary rocks overlying older crystalline metamorphic and Triassic sedimentary basement rock. The contact between the older crystalline metamorphic rock and younger sedimentary Triassic basement rock is a normal fault and predates the Triassic deposition. The presence of

As stated, mylonites and cataclastic textures are common in the metamorphic rocks of the Piedmont province and are also indicated in the metamorphic rock beneath SRP. The origin of these features, however, is quite ancient and is probably related to the orogenies of the Paleozoic. There is no reason to believe these ancient features are related to the current fractures in the basement rock or to modern seismicity in the region.

L-13 contd mylonite zones in the crystalline metamorphic rock has been reported by Christl (1964) and Diment et al. (1965). In addition, this rock type is indicative of major fault zones which parallel the Appalachian system as described in graphic detail by Higgins (1971) and Hatcher (1972).

Diment, et al. (1965), reporting on the basement rock beneath the Savannah River Plant, states: "Mylonite occurs in localized, intensely sheared zones of the basement rock, and elsewhere flaser textures are widespread as a result of mechanical granulation." The major fault zones which parallel the southern Appalachian Mountains also contain mylonite and cataclastic rocks and are a result of intense faulting. Mylonite zones along these faults are commonly one half mile wide and these grade into cataclastic rock zones up to 3 miles wide (Higgins, 1971); these rock assemblages characterize the fault zone. The widespread occurrence of mylonite and cataclastic rock (flaser texture) in the basement rock beneath the Savannah River Plant, in addition to the multiple complex fracture systems warrants careful DOE consideration. These occurrences will affect the integrity of the crystalline rocks as a repository for high-level waste. While preliminary data suggest that the Triassic sedimentary rocks are not as extensively fractured, the proximity of the basement rock and local inter-mixing of water from the basement rock with the overlying aquifer are factors of important significance in any bedrock disposal plan.

L-14 The 500 foot thick Tuscaloosa aquifer overlying the basement rock is one of the most important aquifers in the southeastern United States (See Figure 1). A saprolite clay of an average of 70 feet in thickness separates the basement rock from the aquifer, but locally this clay is absent. The investigative report of the National Academy of Sciences (1972) assumes that water from the basement rock is being transmitted upward into the Tuscaloosa aquifer at a rate of 0.002 gpd/ft^2 where clay is present, but at 0.0035gpd/ft^2 wherever the clay may be absent. To date, no absolute hydraulic separation of the basement rock from the Tuscaloosa aquifer has been proven by the chemical evidence available and it may be presumed that movement of waters between the basement rock and the aquifer occurs in accord with existing permeabilities and hydraulic gradients. The possibility of aquifer and basement water mixing, involving potential high-level nuclear waste, presents a potential risk of contamination in the Tuscaloosa aquifer and the biosphere.

The gross separation of the waters of the coastal plain aquifers and those of the bedrock are shown by: (1) the abrupt discontinuity in their chemistries TDS $\simeq$ 30 mg/l at the base of the coastal plain aquifer and 6000 mg/l in the crystalline metamorphic rock; (2) pumping about 1500 gpm in each of two plant areas continuously for 27 years has not caused a decline in hydraulic pressure in the crystalline rock; (3) a year-long pumping test in the crystalline rock showed no indication of leakage through the safrolite; (4) a large amount of helium has accumulated in the waters of the crystalline rock which could not have accumulated if there were even minor leakage from the metamorphic rock. Therefore, although it has not been conclusively demonstrated, the water mixing potential is considered to be extremely low. Migration of radionuclides from the cavern was considered in the preparation of the EIS and the potential environmental impact was determined to be insignificant.

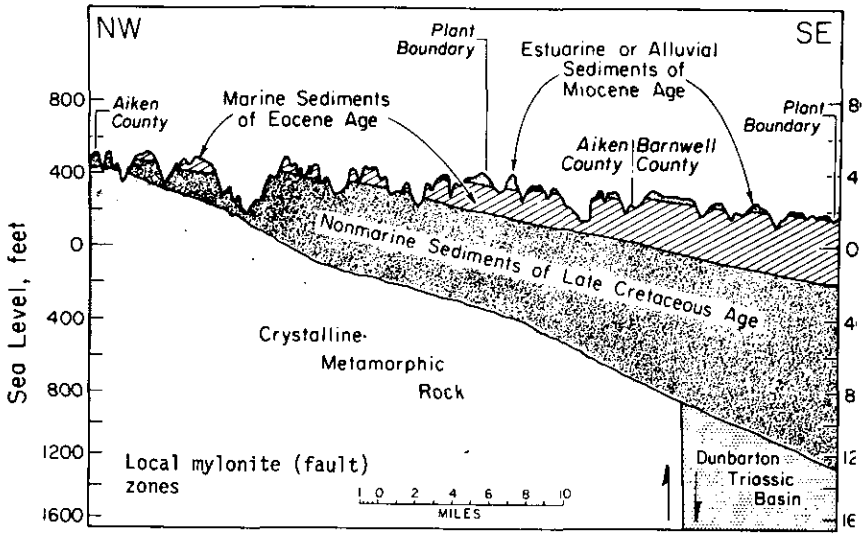

Figure 1: EPA has revised Figure III-3 (page III-5) from the source document to show the local mylonite zones and the fault between the Triassic sedimentary rock and the Metamorphic basement rock. The Tuscaloosa Aquifer is in the formation labeled as "Nonmarine Sediments of Late Cretaceous Age."

L-15 A map of earthquake hazard developed by Algermissen and Perkins, 1977, is depicted in Figure 2. Although the hazard in the East is lowered by the relative infrequency of large earthquakes, the total time in the last 250 years is actually greater than that in the West. As shown in Figure 2, the highest number in the East centers around Charleston, S.C., which in 1886 was the site of an earthquake of Intensity X on the Modified Mercalli Scale. While the cause of this severe earthquake is speculative as to origin, the earthquake epicenter lies but a few miles from the Savannah River Plant site.

The fact that the metamorphic bedrock is locally faulted and fractured makes bedrock disposal, even in the Triassic sedimentary rock, and unviable option at SRP. At a minimum, these geological problems should be discussed more adequately in the final EIS.

As stated on page III-11 of DOE-EIS-0023, the epicenter of the Charleston Earthquake of 1886 was about 90 miles from SRP. All investigations of known faults in the metamorphic bedrock have shown that they are noncapable faults. The options for storage of waste in bedrock assume that the cavern would be constructed in nonfaulted bedrock. Extensive field study would be required to determine whether disposal in a nonfaulted area is in fact feasible but studies to date do not preclude this possibility.

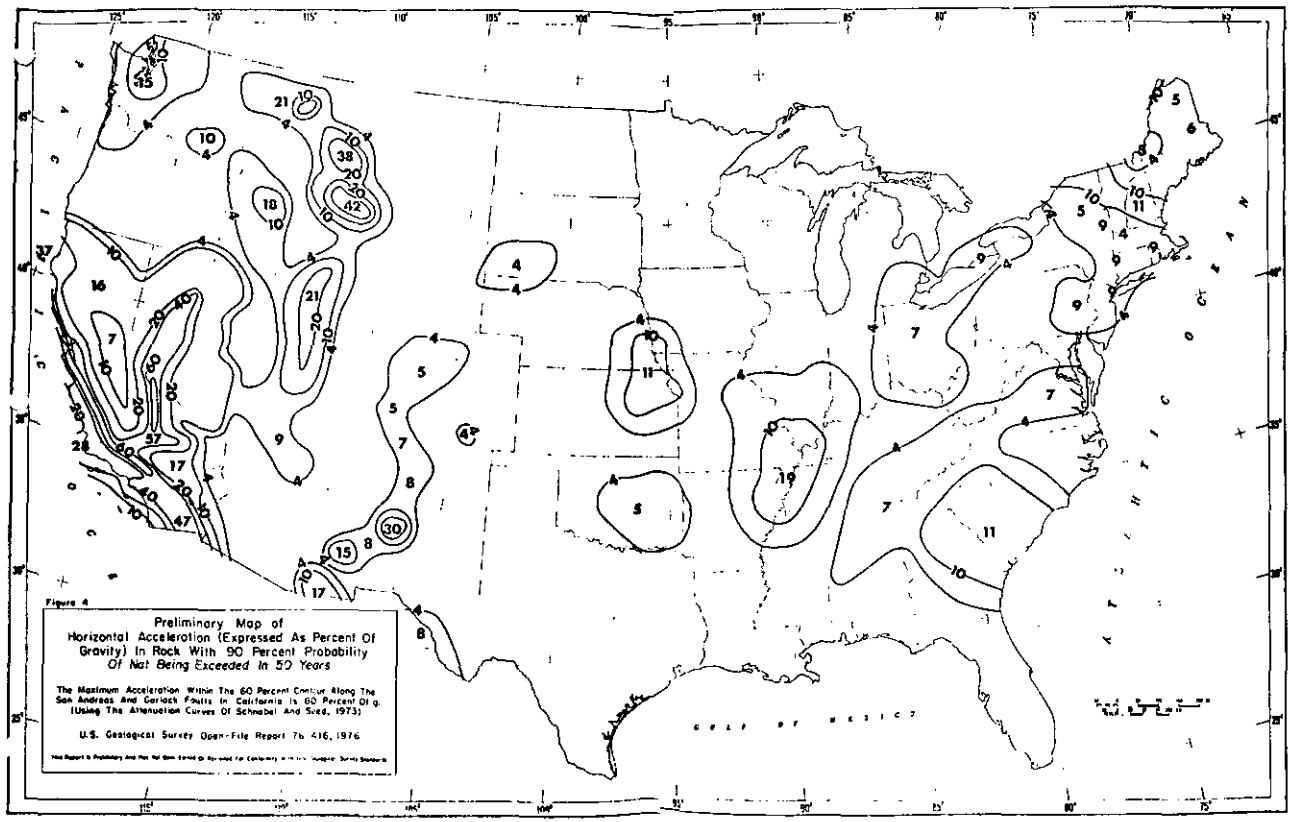

Figure 2: Earthquake Hazard Map of the United States developed by Algermissen and Perkins (1977). The numbered contours are the horizontal acceleration in hard rock as a percentage of g - the Earth's gravity. The numbers within each contour are the maximum expected accelerations at a constant-probability that the numbers will not be exceeded in 50 years. In other words there is a 10 percent probability that the acceleration values will be exceeded in 50 years. (From Algermissen and Perkins, 1977).