EEG-41
DOE/AL/10752-41

REVIEW OF THE DRAFT SUPPLEMENT ENVIRONMENTAL IMPACT STATEMENT, DOE/EIS-0026-DS, VOLUMES I AND II, DOE WASTE ISOLATION PILOT PLANT, APRIL 1989

Environmental Evaluation Group
7007 Wyoming Boulevard NE, Suite F-2
Albuquerque, New Mexico 87109

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FOREWORD

The purpose of the Environmental Evaluation Group (EEG) is to conduct an independent technical evaluation of the Waste Isolation Pilot Plant (WIPP) Project to ensure protection of the public health and safety and the environment. The WIPP Project, located in southeastern New Mexico, is being constructed as a repository for permanent disposal of transuranic (TRU) radioactive wastes generated by the national defense programs. The EEG was established in 1978 with funds provided by the U. S. Department of Energy (DOE) to the State of New Mexico. Public Law 100-456, the National Defense Authorization Act, Fiscal Year 1989, Section 1433, assigned EEG to the New Mexico Institute of Mining and Technology and provided for continued funding from DOE through Contract DE-AC04-79AL10752.

EEG performs independent technical analyses of the suitability of the proposed site; the design of the repository, its planned operation, and its long-term integrity; suitability and safety of the transportation systems; suitability of the Waste Acceptance Criteria and the generator sites' compliance with them; and related subjects. These analyses include assessments of reports issued by the DOE and its contractors, other federal agencies and organizations, as they relate to the potential health, safety and environmental impacts from WIPP. EEG also performs environmental monitoring for background radioactivity in air, water, and soil, both on-site and in surrounding communities.

Robert H. Neill
Director

STAFF

Sally C. Ballard, Environmental Technician
William T. Bartlett, Ph.D., Health Physicist
James K. Channell, Ph.D., P.E., CHP, Sr. Environmental Engineer
Lokesh Chaturvedi, Ph.D., Deputy Director & Engineering Geologist
Laura H. Connolly, M.A., Librarian/Editor
Anthony F. Gallegos, Ph.D., Sr. Performance Assessment Specialist
Jim W. Kenney, M.S., Environmental Scientist
C. Robert McFarland, B.S., Sr. Quality Assurance Engineer
Robert H. Neill, M.S., Director
Delo J. Reed, Secretary
Kevin J. Shenk, M.S., Health Physicist
Mary Stetten, B.A., Administrative Secretary
Susan C. Stokum, Administrative Secretary
Georgina M. Temple, Secretary
Brenda J. West, B.A., Administrative Officer

SUMMARY

The Draft Supplement Environmental Impact Statement (SEIS) for WIPP does not provide adequate justification to support the proposed action of shipping up to 620,000 cubic feet of transuranic (TRU) waste to WIPP before demonstrating compliance with the Environmental Protection Agency's (EPA) Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes (40 CFR 191). The "alternative action" of shipping no waste to WIPP prior to demonstrating compliance with the EPA Standards has been dismissed without sufficient discussion and justification. The document contains mistakes in calculations, reflects an erroneous knowledge of the history of the project, presents tables without units, and displays an indifference to the statistical precision of predictions. It also does not adequately address the environmental impacts of the potential failure to complete the demonstration of compliance with the EPA Standards by October 1993. By comparison, DOE plans to complete the demonstration of compliance with the same standards before starting construction of the high-level waste repository in Nevada. These two diametrically opposed approaches by DOE, for WIPP and for the Yucca Mountain repository, need to be addressed.

There is insufficient time for EEG to check all the calculations and to evaluate the public health and safety implications of the errors found in the calculations. EEG will pursue these when time permits, since they may be substantial. The following is a summary of our main concerns with the document.

1. <u>Lack of Compliance with EPA Standards</u>

The SEIS is silent on the observed lack of progress by DOE in demonstrating compliance with the Standards for safe disposal of transuranic waste which were promulgated by EPA in September 1985, and had been circulated in draft for several years prior to that.

New Mexico's position on the Standards was expressed as early as January 15, 1979, in a letter from the Secretaries of the New Mexico Health and Environment Department and the Energy and Natural Resources Department, to the U.S. Department of Energy:

> "We feel that DOE should clearly state that EPA Standards will take precedence over any interim standards established by DOE."

Unfortunately, DOE still has not published any probabilistic risk assessment studies as required by EPA, and DOE continues to issue deterministic analyses of the type used in the 1980 Final Environmental Impact Statement (FEIS) for WIPP.

The NM Secretaries' letter further stated:

> "Also, the DOE should state that they will move quickly to come into conformity with any EPA Standards developed for nuclear wastes." "...we feel that a permanent TRU repository should be conceived and designed to allow for timely compliance with new standards developed in the future." - January 15, 1979

The work has not moved quickly nor has the DOE committed to timely compliance.

Preliminary calculations of performance assessment by the DOE's scientists since 1987 have indicated that the repository may not meet the EPA Standards under human intrusion scenarios. This issue must be addressed by the SEIS directly and explicitly, and its impact on the proposed action should be evaluated.

2. Incomplete NEPA Documentation

The October 1980 FEIS stated that the necessary National Environmental Policy Act (NEPA) documentation had been completed for two of the ten waste generating sites. The April 1989 SEIS states that the necessary NEPA documentation has been completed for two more sites in the intervening 8.5 years. The SEIS states that DOE may propose that TRU wastes generated at six other facilities be shipped to WIPP, and appropriate site-specific NEPA documentation would be prepared for such a proposal. Why hasn't site-specific NEPA documentation been completed for the other six sites? An explanation of the lack of progress of documentation for each of these six sites and the proposed schedule for compliance should be included.

3. Incomplete Information

While the SEIS does address bounding calculations for the environmental impact of 10% of the waste (83,000 drum-equivalents), it does not identify the quantities of CH-TRU waste associated with the various alternatives. Since the amounts of waste are an intrinsic component of any evaluation, the document neither provides nor permits a meaningful comparison of the alternatives. The reader must rely on other documents to obtain estimates of the quantities of TRU waste. They include the April Draft Test Phase for Performance Assessment and Operational Demonstration, the June 6, 1989 Addendum to the Test Phase, and the June 7, 1989 Draft Test Phase for the Bin and Alcove Experiments, all of which contain conflicting and inconsistent information.

4. Unexplained Changes in Radioactive Inventories

While estimates of the expected amounts of waste to be produced are continuously changing, we are concerned with the very wide differences from those shown in the FEIS. For example, the amounts of remote handled transuranic (RH-TRU) waste have changed from 250,000 cubic feet to 93,000 cubic feet. The estimated actual radioactivity in each canister dropped from 510 curies in the 1980 FEIS, to 47 curies (adjusted for daughter radionuclides) in the 1989 draft Final SAR, and has now increased to 177 curies in the 1989 draft SEIS. The total amount of RH-TRU radioactivity has been reduced from 5.1 million curies to 0.51 million curies, a ten-fold reduction without any explanation.

5. Uncertainty Estimates

EEG recommended in September 1979 (EEG-3) that DOE include estimates of the uncertainty associated with the radionuclide inventories. This has not yet been done. Instead, the document shows seven-place accuracy in the projections in which two-thirds of the CH-TRU waste has yet to be generated.

6. Incorrect Dosage Estimates

The calculations of human exposure from the stock water well to beef pathway are incorrect. The correct dose to an individual would be over two orders of magnitude greater than reported. The corrected doses (15.7 rem committed effective dose equivalent in the Case IIC scenario) are very significant and will most likely violate the EPA Standards when probabilities are assigned.

7. U.S. Department of Transportation Preferred Routes

While there is agreement in the routes to be followed in New Mexico for the 34,000 truck shipments to WIPP, they are not "Preferred Routes" in the context of regulations issued by the U.S. Department of Transportation (49 CFR 171 and 173) and it is misleading to imply that they fulfill the DOT requirements.

8. Shortcomings in the FEIS

Of fundamental concern is whether DOE will properly and adequately address concerns expressed in this review of the SEIS. The following issues identified by EEG in January 1981 (EEG-10) in our review of the 1980 Final Environmental Impact Statement (FEIS) were then rejected by DOE (WIPP-DOE 81 and 81A). Subsequently, all the following problems identified in EEG-10 have been encountered or have yet to be resolved.

A. We recommended that DOE evaluate a scenario of a connection between the WIPP, a high-pressure brine reservoir and the surface (EEG-10, pages 20, 23). DOE refused to do so, stating it appears extremely unlikely and the only pressurized brine pocket in a deep drill hole in the Delaware Basin away from the Capitan Reef was associated with an anticlinal structure. EEG then published two scenarios (EEG-11, EEG-15). After a brine reservoir estimated to be 17 million barrels was encountered 1,000 feet from the then proposed waste location, DOE finally published an analysis and has now updated it for the SEIS.

B. In EEG-10, we repeated our August 1979 recommendation on the DEIS review (EEG-3) that a scenario evaluating the effects of high pressure gas formation, generated by organic decomposition of the waste, acts as a driving mechanism in bringing wastes to the surface.

DOE rejected the hypothesis and did not consider the effects of human intrusion. EEG raised the issue of the retardation on room closure at a meeting with the NAS WIPP Panel in January 1988, and presented an extensive discussion in a paper at the waste management conference in March 1988. While the 1989 SEIS does not address this issue, gas generation has been recognized as a major problem associated with a human intrusion scenario.

C. EEG questioned why there was no consideration of gas generated from CH-TRU waste decomposition.

DOE stated that it would not be expected to be released to the atmosphere because of the overburden and slow rate of gas production. Today, gas is recognized as a major problem.

D. EEG raised the concern whether the CH-TRU waste drums could contain explosive gas mixtures at the time of retrieval, if retrieval proved necessary.

DOE responded "The amount of time between waste emplacement and retrieval is expected to be too short to allow significant generation of gas in the CH-TRU waste containers ("Gas Generation from Radiolytic Attack of TRU-Contaminated Hydrogenous Waste," LA-7674-MS, Los Alamos Scientific Laboratory, 1979)."

The amount of time between waste emplacement and retrieval could be 10 years. We now know that hydrogen gas generation can be a problem in the transportation of CH-TRU wastes which involves a period of only several months (EEG-24).

E. EEG recommended that the FEIS provide an estimate of the total radioactivity expected to be emplaced in WIPP.

DOE did not do so and part of the confusion that exists today on the proper source term to be used in dosage estimates stems from that fact.

F. We recommended that an effective control period of 400 years be established.

No further progress has been reported by DOE on this request.

G. EEG stated that the information was not adequate on large brine reservoirs.

DOE stated that the information was adequate for an assessment of the WIPP site. A large reservoir was subsequently encountered at WIPP-12 on November 22, 1981.

H. EEG recommended that estimates of the uncertainties of waste quantities be included.

DOE ignored the recommendation and it has been ignored in the SEIS.

I. EEG asked what would be the ultimate disposal site if wastes had to be retrieved.

DOE responded that the specific site has yet to be determined. Today, that is still true.

J. EEG expressed concern that DOE did not incorporate an analysis of ingesting contaminated food after a transportation accident. The SEIS still does not address this concern.

K. DOE stated that "the SPDV program has been planned to confirm the geologic adequacy of the site..."

We did not agree. DOE's response was to insist that it was adequate and subsequent events have confirmed that the SPDV program was not adequate.

L. EEG stated (EEG-10, p. 39) that WIPP-12 was at the edge of an anticlinal structure in the Castile, and was also at the southern edge of one of the zones of anomalous seismic reflection.

The response of DOE was to ignore the comment. Later, brine was encountered when the hole was deepened in November 1981.

SPECIFIC COMMENTS ON SEIS SUMMARY CHAPTER

1. Page S-2, Changes in Waste Package. The TRUPACT-I design was not a Type A package. It was a single-contained, vented, Type B package that could not have met NRC requirements for shipments of plutonium in excess of 20 curies.

2. Page S-2, Implementation of a Test Phase. The Test Phase, which is part of the proposed plan, is not presented with any detail in the Draft SEIS nor has it yet been evaluated in detail by the National Academy of Sciences (NAS) WIPP Panel, or the Environmental Evaluation Group (EEG). Nonetheless, reviewers of the SEIS are asked to accept the proposed plan rather than the Alternative Plan or the No Action Plan without being able to evaluate the efficacy of the proposed Test Plan.

3. Page S-3, New Information. The following should be included in the section titled "New Information":

A. State that there is much better understanding of the Rustler Formation hydrology, including higher transmissivities in the central and southeastern part of the site, geochemical zonations, sorption, and salt dissolution.

B. Add to the last item (salt creep), "and fracturing would make it difficult to retrieve the waste after five years, without rock-bolting in the roof of the waste rooms." Add "3 times faster."

C. Also add, "It is now assumed that a large quantity of pressurized brine exists in the upper part of the Castile Formation, approximately 800 feet below the repository."

4. Page S-5, First Sentence. It is stated that all TRU waste emplacement would be conducted so as to maintain retrievability for a reasonable time period. This statement is not definitive enough and should discuss more specifically the effect of room closure, fracturing and other anticipated problems on the ability to retrieve and the amount of time to emplace and retrieve.

5. Page S-7, No Action Alternative. This alternative is given very little attention in the Draft SEIS and the reason(s) given for not accepting it are not persuasive. The section on Pages 5-168 to 176 does give estimated doses to persons on and off-site from very low probability events. The consequences of those events are similar to those postulated for WIPP during the transportation and operation phase and it is not known how the degree of conservation or the probability of occurrence would compare. However, there are <u>expected</u> consequences from the WIPP Project which are delineated in the Draft SEIS (e.g., 8.3 traffic fatalities, 106 injured in traffic, about 1.1 Latent Cancer Fatalities from transportation and operation radiation exposure to workers and the public) and none are mentioned for the No Action Alternative. There is one good reason for not choosing the No Action Alternative, but it is not invoked in the SEIS. Congress has passed laws to dispose of TRU and high-level radioactive wastes in geologic repositories and, thus, ruled against reliance on long-term storage. It appears that the Draft SEIS was written with a predetermined conclusion to accept the proposed plan and that alternatives were not seriously considered.

6. Pages S-8 to S-13, Summary Table. The inclusion of a summary table is an effective way to give the reviewer a

quick overview of projected environmental consequences. Most entries in the table will be discussed elsewhere in our comments, but the following comments are offered here:

A. The expected number of fatalities and injuries from transportation accidents are the greatest projected impacts of the project. Yet the Draft SEIS says very little about this impact and does not even attempt to explain why the plans are to ship all (or virtually all) wastes by truck and incur 5.3 (179%) more fatalities and 72 (212%) more injuries than by train. The failure to thoroughly evaluate the transportation mode is a major shortcoming in the Draft SEIS.

B. Since several effects are not listed in the table or in the SEIS, the document fails to fully reflect the consequences of WIPP. For example:

(1) The irreversible and irretrievable commitment of resources (said to be similar to the FEIS in Chapter 9, but fails to list any numbers);

(2) The numbers of deaths and injuries expected from industrial accidents, both at WIPP and the generating/storage sites;

(3) Any updating of the quantity and value of mineral resources located in the proposed 16-square-mile withdrawn area since 1980 and their impact on national markets.

C. Table 5.1 uses both per year and per project lifetime health effects and the footnotes do not always reflect the correct units. This is confusing and should be clarified and made consistent.

7. Page S-14, Alternatives Considered but Rejected. It is not clear what synergistic mechanisms would require radioactive waste emplacement at WIPP, given the time frame of the experiments, and why these experiments cannot be performed at the generator sites. More documentation is needed to evaluate the "unreasonableness" of this alternative than has been presented.

It is stated that another alternative to conduct performance assessment without collecting any data was rejected for reasons related to the rejection of using non-radioactive simulated wastes. Why is it necessary to obtain additional data? Has performance assessment with existing data shown non-compliance? If so, then this information should be made available to evaluate the need for additional data.

8. Page S-14, Existing Environment. The Draft SEIS should explain why DOE determined that Zone IV was unnecessary (the change is mentioned on Page 2-1).

9. Page S-15, Transportation. The calculation of 34,144 truck shipments of TRU waste or 18,467 rail shipments is one that affects most calculations pertaining to transportation doses throughout this document. Unfortunately, those numbers are based on an incorrect assumption of the volumes of waste coming to WIPP.

Waste volumes listed in the Integrated Data Base (IDB) represent total volumes of various containers instead of the actual volume of waste contents. The IDB for 1987 (Table

3.9, Page 110) and the IDB for 1988 (Table 3.10, Page 97) indicates that the projected volume accumulation to move to WIPP through the year 2013 is 156,613 m^3 (5.53 x 10^6 ft^3). This is comparable to the total in SEIS Table 3.1, (5.60 x 10^6 ft^3) compiled from Tables 3.5 and 3.16 in the IDB of 1987.

The 6.2 x 10^6 ft^3 design capacity of WIPP is based upon the total volume of emplaced containers and not their contents. Attachment 1 to this review provides an informal analysis of WIPP capacity for CH and RH wastes. If the projected mix (per DOE/WIPP 88-005) of 65% by volume in drums and 35% by volume in Standard Waste Boxes (SWB) is used, and if the SWBs are emplaced three tiers high, 6.16 x 10^6 ft^3 can be accommodated. Scaling up slightly to 6.20 x 10^6 ft^3, this corresponds to 843,537 drum equivalents. Each drum represents a value of 208 L (0.21 m^3). The SEIS makes a fundamental error that permeates the entire document. The SEIS takes the 6.2 x 10^6 ft^3 waste capacity at face value, assumes this represents the volume of container <u>contents</u>, and generates a fictitious number of drums that cannot fit into the WIPP. They assume the average drum is 80% full, round off the total drum volume to 0.2 m^3, and obtain 6.2 x $10^6/(0.2 \times 0.8 \times 35.31) = 1.10 \times 10^6$ drums (where 35.31 is ft^3/m^3). This is 256,463 drums <u>more</u> than the capacity of WIPP! For the 10% of waste capacity assumed for the Test Phase, the SEIS correctly uses 6.2 x 10^5 ft^3, but because of the interpretation error, uses 110,000 drums and 22,000 drums per year instead of 84,354 and 16,870 drums per year, respectively. For the Disposal Phase, they use 990,000 drums and 49,500 drums per year instead of 759,183 drums and 37,959 drums per year. The effects of using the 0.8 "fullness" factor on results are as follows:

A. The number of required shipments are overstated by

23%.

B. The number of transportation accidents are overstated by 23%.

C. The radioactive control per shipment should also be affected. However, it does not appear to be, since Table D.3.3 (average curies per shipment) values don't agree with the total inventory (Table B.2.1) either with or without the 0.8 factor.

D. The chemical content per shipment and for the total campaign are not affected, since these calculations are done on a per drum basis, not a total inventory.

These calculated transportation consequences affect several portions of the SEIS and it is disturbing that more care was not taken in setting basic parameters at the outset.

10. Page S-15, Transportation. EEG comments on Incident-Free Conditions and Accident Conditions are included under Chapter 5 and Appendix D. We concluded that the population doses (person-rem) calculated for both routine transportation and accidental releases were conservative. However, the maximum exposures to a member of the public from routine operation and the bounding accident were non-conservative by at least an order of magnitude.

11. Page S-17, Long Term Performance. It should clearly be stated at the beginning of this section that these calculations neither provide a basis for assessment of compliance with the long-term performance part of the EPA Standards (40 CFR 191), nor do they substitute for those

calculations. The failure to include any work to date in showing compliance with these 4-year-old standards is distressing.

12. The reference to "usual guidelines" in the last paragraph on Page S-17 is sloppy. State the guidelines that apply to WIPP - EPA Standards, DOE Orders, etc. - and judge compliance with them.

13. Page S-18, Last Paragraph. The statement, "Nevertheless, the results suggest that appropriate Performance Assessment methods and likely values of parameters would show that the WIPP would comply with the Standard. They also indicate the efficiency of potential engineering modifications..." is without basis and should be deleted. The official position of DOE is that compliance with standards for safe disposal cannot be shown until October 1993. Hence, conjecture such as "likely values would show that WIPP would comply" is misleading.

14. Page S-20, Mitigation Measures. EEG believes the presentation of mitigation measures in the Draft SEIS is incomplete and preliminary and is a major shortcoming. Some of these measures will be required by the project, and the Draft SEIS implies that those that are needed will be used and they will automatically work in a satisfactory manner.

Much more careful thought and consideration needs to be given to these measures than is contained in the SEIS or other documents published by the project. Too many decisions regarding mitigation measures are yet to be made, yet credit already appears to have been taken for several of these measures.

15. Both the Proposed Action and Alternative Action reveal a

serious shortcoming concerning waste treatment mitigation measures. They indicate that construction of waste treatment facilities will be in abeyance until after the Test Phase and pursued only if a determination is made that noncompliance with EPA regulations would result if additional treatment is not done. If the Test Phase must be followed by a study of options, design facilities, a budget cycle, construction, and tests prior to start of waste shipment to WIPP, a delay of many years will be introduced. DOE may argue that commencing such work now would be interpreted that treatment must be done, while tests may indicate it is not needed. The risk is that there can be a serious interruption of WIPP operations if waste treatment is required. A counter argument may be that selected stored waste, plus certain newly-generated wastes, may be "complying" and can be shipped during the interim while facilities are constructed. If DOE had vigorously pursued waste processing as recommended by EEG, oversight committees and other organizations, instead of following a stated minimal processing policy, much of the current debate over gas generation and brine inflow may have been resolved. An up-to-date discussion of the impact on the program of possible waste processing needs should be provided in the Final SEIS.

SECTION 1

1. Page 1-1, First Paragraph. It is not correct to say that "most of the underground experimentation rooms and waste rooms for initial waste emplacement have been excavated." Excavation for the alcoves began in late June, 1989.

2. The Salado Formation is 1700 to 2000 feet thick. What is a "3000-foot-thick bedded salt and anhydrite formation?"

3. "The volumes and characteristics of TRU wastes are discussed in Subsection 2.4..." Should this be Subsection 2.3?

4. Page 1-1, Third Paragraph. There is no Subsection 10.3.1 in the Draft SEIS. Subsection 10.2.5 appears to be the appropriate reference.

5. The SEIS fails to identify the role of EEG, created in 1978, as the <u>only</u> full-time, external, review agency on WIPP subsequently mandated by Congress in the National Defense Authorization Act, Public Law 100-456, September 29, 1988, Section 1433 (a).

6. Page 1-1, Last Full Paragraph. In the list of items requiring completion prior to testing, add "an EPA Permit to receive mixed wastes at WIPP."

7. Page 1-2, First Paragraph: It is stated that, "In addition, the delay of the WIPP Project holds the potential to adversely affect the nation's production of nuclear weapons." This sentence should be amplified to explain the delay of any progress in demonstrating compliance with the EPA Standards for disposal of TRU waste, which were

promulgated by EPA almost four years ago in September 1985. The lack of progress toward showing compliance and the resulting delay is the factor that may well impact on weapons production.

8. Page 1-2, Last Paragraph. DOE's Record of Decision of January 28, 1981 was challenged in a court by the NM State Attorney General. Describe that challenge and the resulting "Stipulated Agreement" between DOE and the state here.

9. Page 1-4, NEPA Documentation Since the FEIS. In 1980, DOE completed NEPA documentation for shipment of waste from INEL and RFP. Since that time, DOE has completed NEPA documentation for transportation of radioactive wastes from only Hanford and SRP. Why? Section 1.2.2 does not contain any information on NEPA documentation since the FEIS.

10. The discussion of the 1982 cost-reduction measures that were subsequently reinstated is not included. For example, DOE maintained that the deletion of the fourth shaft would not pose problems for air circulation. In 1988, DOE acknowledged that the fourth shaft was required for adequate air circulation underground.

11. Page 1-4, Purpose and Need for Supplement. The statement that DOE may be proposing disposal of wastes from six additional facilities is puzzling since DOE has publicly acknowledged that the mission of WIPP is to include wastes from LANL and five other facilities.

12. Page 1-4, "The analysis in the 1980 FEIS considered only TRU wastes from INEL and Rocky Flats Plant".

The FEIS never explained why the transportation of wastes from all other sites was included in the 1979 Draft

EIS and deleted in the Final EIS. Please explain, including the impact of hydrogen gas generation from radiolysis on the unvented TRUPACT-I.

13. Page 1-4, Fourth Paragraph. Also state EEG's response to DOE (1983) and the recommendations that were accepted by DOE and implemented during 1984-89 period.

14. Page 1-5, Changes in the TRU Waste Inventory. Provide an explanation for the 10-fold reduction of RH TRU from 5.1×10^6 curies to 0.51×10^6 curies.

15. Page 1-5. In the list of new data and significant geotechnical information, include the presence of a brine reservoir in the uppermost anhydrite of the Castile Formation below the proposed repository. The significant change in the withdrawal area of the WIPP site should also be an important reason for a SEIS, as is compliance with 40 CFR 191.

16. Page 1-5. The text states that experiments would be conducted to reduce uncertainties associated with the prediction of several natural processes (e.g., gas generation, brine inflow, and salt deformation).

There are no experiments requiring the use of waste to measure brine inflow. There are no experiments requiring waste to measure salt deformation since they are mutually independent events. Gas generation is the <u>only</u> parameter proposed to be measured that requires waste.

17. Page 1-5, Proposed Action. It is stated that operations are needed to "show the ability of the TRU-waste management system to safely and efficiently certify, package, transport, and emplace waste in the WIPP." This claim is misleading for the following reasons:

A. The certification of waste for WIPP is independent of operational demonstration and is currently underway at the generating and storage sites.

B. The packaging of waste has been studied and perfected since 1970 and is independent of any operational demonstrations.

C. The transportation of these wastes has been demonstrated in the past with packages other than TRUPACT-II and experience with TRUPACT-II could be obtained (once it is certified by NRC) by shipments from RFP to INEL and from LLNL to NTS.

D. No justification has been provided for the emplacement of 83,000 drums (up to 10% of the WIPP capacity). Emplacement is occurring today at INEL.

18. Page 1-6, Line 9. It is stated that, "At the conclusion of the Test Phase, the DOE would decide...whether WIPP would comply with EPA disposal standards." No mention is made of receiving input or requiring concurrence by other organizations. Does DOE plan to make this determination unilaterally?

19. Page 1-6, Line 14. "If there is a determination of non-compliance, a number of options would be considered (e.g. waste treatment) and the required NEPA documentation would be prepared." We believe it would be prudent for DOE to begin evaluating options at this time and not rely completely on the hope that the Proposed Action will be found to be satisfactory. It is irresponsible to plan on deferring action on a potential problem for 4 years and then say that the required NEPA paperwork would deal with it.

20. Page 1-6, Alternatives Considered in the SEIS. The SEIS is not able to adequately justify the alternative chosen

because of the lack of a detailed, DOE-approved, Five-Year Test Plan to review.

21. Page 1-6, Content of the SEIS. "...it is not the purpose of this SEIS...to demonstrate compliance with regulatory requirements." Unfortunately, it is also not the purpose of the Final Safety Analysis Report to do so either, nor has any other document been prepared by DOE to demonstrate regulatory compliance. By comparison, DOE will provide that documentation in the FSAR in Nevada. Why the difference?

22. Page 1-6, Section 1.5. The first paragraph of this section gives the impression that assessment of compliance with 40 CFR 191 was not done because the Standards were vacated. This is not true and is misleading.

23. Page 1-7, Footnote. The SEIS uses numerical values and projections made in the December 1988 draft of the FSAR. EEG has extensively reviewed the Draft FSAR and believes many of these calculations are flawed (see EEG-40, May 1989).

24. Page 1-17 & 18, References. The reference list does not include the following documents referred to in the text:

A. 1978 Contract establishing EEG
B. Public Law establishing EEG
C. C&C Agreement
D. Five-Year Test Plan

SECTION 2

1. Page 2-1, Location, Fourth Paragraph. Provide the reference for the justification for DOE eliminating "the requirement to control the land identified as Zone IV in the FEIS"? This is a significant change that should be explained.

2. It is misleading to merely state the percent reduction (from the FEIS) of desirable mineral resources resulting from the reduced site area since this does not mention that the amount of these resources is so significant. For example, the FEIS stated that the (old) WIPP site contained 20.2% of the free world's langbeinite resources and reserves. If 35% of this is still within the present WIPP site boundaries, this would still be 7.1% of the free world total. The resource issue needs to be addressed directly, not by reference to the FEIS.

3. Describe the status of private leases being held.

4. Page 2-3, Exclusive Use Area. The location of the Exclusive Use Area and the proposed expanded area should be shown in Figure 2.2 or elsewhere. Also, the rationale for choosing a 640-acre or a 1,454-acre exclusive use area should be explained.

5. Page 2-5, Figure 2.3. Buildings numbered 364 and 365 are missing from this figure and from the listing of building names on the next page. These buildings are significant since they house Station A and Station B of the Effluent Monitoring System.

6. Page 2-7. Although the definition of TRU wastes

excludes actinides with half-lives less than 20 years, DOE has committed to including Cm-244, with a half-life of 18 years, and Cf-252, with a half-life of 2.6 years, in the TRU wastes coming to WIPP. DOE has also committed to include U-233 with a half-life of 150,000 years which does not have an atomic number greater than 92. This commitment by DOE to include these three radionuclides should be shown in conjunction with the definition.

7. Page 2-7, "Wastes with TRU concentrations between 10 and 100 nCi/g are expected to be reclassified as low-level wastes which would not be sent to the WIPP."

They are classified as low-level wastes. Our understanding is that waste with TRU concentrations between 10 and 100 nCi/g <u>will</u> (not may) be classified as low level wastes and not be sent to WIPP. This is an important distinction. What are the plans?

8. Page 2-9, "CH-TRU waste is packaged in sealed steel drums and boxes."

They are not and must be vented to avoid the generation of mixtures of flammable gases during shipment.

9. Page 2-9, "Approximately 3% by volume of defense TRU waste is RH TRU waste,..."

It is about 5.3% by curies (a more meaningful measure than volume) and 1.6% by volume (see Appendix B-2 and 3). The text should be specific about the volume percentage that is being quoted and should also give the radioactivity percentage. Also, the maximum dose rate limits for RH-TRU should be listed.

10. Page 2-9. The use of units of volume to characterize transuranic waste is misleading. The discussion should describe typical concentration in nanocuries/gram for both weapons grade plutonium and heat source plutonium.

11. Page 2-9, Waste Acceptance Criteria. The statement, "The DOE established the WAC in consideration of DOT and NRC regulations" is incorrect. The purpose of the WAC was to delineate the criteria that waste packages must meet in order to permit safe handling and disposal at WIPP.

12. Page 2-9, "The NRC will be asked to issue a certificate of compliance for the TRUPACT-II shipping container...".

Add "... and the yet to be built RH-TRU waste shipping cask."

13. The SEIS does not discuss the two sets of additional criteria that must be met in transporting and disposing of wastes at WIPP, including:

A. Those issued by the NRC as a condition for licensing the use of TRUPACT-II for CH-TRU waste.

B. Those issued by EPA to meet the requirements of 40 CFR 261 and 262 for hazardous waste.

The SEIS should explain how these criteria differ, how each is implemented, and if there are potential conflicts in meeting all three sets of criteria simultaneously.

14. Page 2-9, Section 2.3.1 (WAC). Although Revision 3 of the "TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant," January 1989 (WAC), reflected many improvements over Revision 2, it still contains certain serious deficiencies, some of which EEG had called to the attention of the WIPP Project Office following publication of Revision

2. (See letter to Mr. W. R. Cooper, WIPP Project Manager, from R. H. Neill, Director, EEG, January 15, 1986.) These and other comments are addressed below:

A. Does the gas generation criterion allow the waste generators to make a decision on the need for venting? There is no definition of what is considered an "overpressure," nor an "explosive mixture." The criterion also specifies that the "TRU waste shipper" must provide data on the total alpha activity, waste form, and organic content, but this language appears redundant, since such information is already required by the Data Package Certification criterion. If it is to be provided in two separate places, it should be clarified and justified. The provision of such information does not preclude the possibility of judgmental or careless errors on venting due to lack of sufficiently definitive criteria.

   Also, the technical justification for the gas criteria has not been updated and fails to recognize current data on gas permeabilities and gas generation levels of concern now being expressed by Sandia. The gas criteria needs to be completely reevaluated and rewritten.

B. The immobilization criterion fails to recognize the potential for increases in particulates with time due to breakdown of cellulosic material. Packages containing such material should be subject to a lower limit.

C. The criterion applicable to radioactive mixed waste mandates that hazardous waste as defined in 40 CFR 261 be included only as co-contaminants with transurancis (and presumably fission products). The last line of the criterion as stated in Revision 3 indicates that such hazardous materials "are to be reported," however, no further details are indicated on such reporting. It is not clear whether such reporting is in reference to the Data Certification information, or whether it is an additional reporting pursuant to 40 CFR 262. This latter RCRA regulation requires reporting to EPA and also requires that the waste shipment be accompanied by a detailed manifest on a specific EPA form. This manifest requirement is not mentioned in the WAC, Revision 3, and should be added. The entire subject of the RCRA regulations is treated in excellent detail in "Radioactive Mixed Waste Compliance Manual," 1989, WP-02-07, and could be included in the WAC by reference.

D. The EEG has been objecting to the use of a maximum Plutonium-Equivalent Curie (PE-Ci) limit of 1,000 since November, 1985, and considers it to be unacceptable. For our latest comments on the PE-Ci limit, see EEG-40 (May, 1989).

15. Page 2-10, "The WAC do not require detailed characterization of chemical constituents because waste sampling and analysis would result in increased radiological exposure of personnel."

The WAC does not and was never intended to specify how a waste generator demonstrated compliance, and suggests a lack of familiarity by the author with the intent of those criteria. By that rationale, the WAC would never have required characterization of radiological constituents.

16. References should include the review by Marshall S. Little, "Evaluation of the Safety Analysis Report for the Waste Isolation Pilot Plant Project," May 1985, EEG-29.

17. Page 2-10. In the discussion of "plutonium-239 equivalent activity," , mention should be made of the long-standing disagreement by EEG of the 1,000 PE-Ci limit chosen by DOE.

18. Page 2-12, "Gas generation considerations for transportation have resulted in the introduction of vented waste packages at some generation facilities."

The WAC needs to be modified to require filters in all packages prior to shipment.

19. Various DOE documents describe the fraction of stored mixed waste as 60% (SEIS) to 90%. Is 60% the agreed upon value?

20. Page 2-14. Clearly state that it is planned to emplace waste during the first five years without backfill, and that backfill will be added later by moving the waste to new rooms. Also, state the reasons for not backfilling during the test phase.

21. Page 2-14. The decision on retrieval fails to specifically describe what DOE would do with 83,000 drums if it were necessary to retrieve them. This is different from DOE's commitment in Nevada to include a detailed discussion in the Final SAR. (See DOE planned Table of Contents for the HLW repository, 10 CFR 60.21, SAR Content.)

22. Page 2-15. The reasons cited for possibly not returning wastes to the generating sites due to "costs of double

handling and transportation impacts" should be addressed in evaluating the alternative of showing WIPP can meet the safety standards first.

23. Page 2-15, Third Paragraph. Serious consideration to the feasibility and problems of various engineered modifications should be given now rather than postpone it for several years. The problems are fairly well defined already.

24. Page 2-15, Fourth Paragraph. Where will the waste be shipped if the drums are to be compacted, incinerated, etc.?

Too many DOE documents have claimed the possibility of in-place installation of backfill without describing and demonstrating the process. "It could possibly be installed" is not good enough for making decisions.

This section (2.5) should also describe the changes (roof rock-bolting, for example) that have been introduced in the design due to fracturing observed in the SPDV rooms, and analyze the effect of these design changes on the assurance of retrievability and long-term performance.

26. Page 2-20, Section 2-9. This section does not describe any of the independent environmental surveillance conducted by EEG. It is suggested that this section be changed to read as follows:

> "Since 1985, DOE has funded independent environmental and effluent studies at WIPP which are conducted by the Environmental Evaluation Group. Measurements of radioactivity include atmospheric, terrestrial, hydrologic and biotic baselines. EEG will also conduct radiological analyses of particulate samples from the effluent air exhaust system which serves the underground portion of the facility."

SECTION 3

1. Page 3-1. The SEIS identifies the Proposed Action of bringing 83,000 drums (10% WIPP capacity) to WIPP prior to demonstrating compliance with the EPA Standards on the basis that it is needed to demonstrate compliance with those Standards. The authors appear unfamiliar that the quantity of wastes identified by DOE in providing information useful to assess compliance with those Standards amounts to 4,500 drums (650 for bin and 3,850 for alcove tests as described in M. Molecke test plans.) The discussion in comparing alternatives without any reference to the amounts involved is meaningless.

2. Page 3-2. Why has DOE completed the necessary NEPA documentation for only two additional sites since 1980? The SEIS should specify the status of such documentation for six other facilities, including the expected dates of completion.

3. Page 3-2, Paragraph Three. Stating that "DOE may propose that TRU waste stored and/or generated by six additional facilities should be transferred to the WIPP for permanent emplacement" after the expenditure of 3/4 billion dollars is not only surprising, but, if true, illustrates that DOE has not made any plans for alternative disposal.

4. Page 3-2. For the past 11 years, DOE has repeatedly issued estimates of RH-TRU waste of about 250,000 cubic feet at 5.1 million curies. This document shows a ten-fold reduction to 0.51 million curies. Why? What is the explanation?

In 1984, the DOE Inspector General recommended (DOE/IG-0207) that there was insufficient justification to build a hot-cell at WIPP for RH-TRU waste only, and those unwanted residuals should be sent to the HLW repository. The reduction of RH-TRU from 36% of the WIPP radioactive inventory to 5.3% suggests that the recommendation of the IG had merit.

5. Page 3-2. The text suggests that the purpose of WIPP can be modified to accommodate up to 1.65 million cubic feet of TRU waste from new facilities ($6.45 \times 10^6 - 5.8 \times 10^6$). Is this correct? Is DOE suggesting that buried TRU wastes or unidentified stored TRU wastes could be brought to make up the difference? Also, what information is available on the Special Isotope Separation Facility?

6. Page 3-4, Table 3.2, RH-TRU Quantities. These values are reported in Chapter 3 and Appendix B. Both the expected volume and curies of RH-TRU waste continue to change drastically as shown in the following table:

	FEIS(1)	FSAR(2)	SEIS
Ci/canister	510	47(3)	177(4)
Volume, $feet^3$	250,000	88,285 - 176,570	93,000
Total, Curies	5.1×10^6	$5 \times 10^4 - 1 \times 10^6$	$.52 \times 10^6$

1 Expected Average Conditions
2 Representative Radionuclide Content (see EEG-40, p. 19)
3 Includes Daughter Radionuclides
4 Equals the Ratio of Total Curies/ft^3 x 31.8 ft^3/canister.

There is no documentation or justification for these changes. How certain are these estimates in which half the RH-TRU has yet to be generated (Table B.2.3)? Provide an explanation for these substantive differences. Also, there are internal inconsistencies within Appendix B; the average curies per trailer load in Table B.2.7 is not consistent with that calculated from Tables B.2.1 and B.2.3.

7. Page 3-3. Only 1/3 of the total TRU waste to be shipped to WIPP now exists with 2/3 yet to be produced. Table 3.3 shows seven-place accuracy in the estimates of future waste ($1 \div 5,598,397 = 10^{-7}$). Either DOE can make astonishingly accurate predictions, or the authors are unaware of the statistical limitations of future projections. The same comment applies to Table 3.2 on Page 3-4.

8. EEG requested a discussion of uncertainties in the RH-TRU inventory in our review of the FSAR and has not had a reply. We suspect there is still considerable uncertainty in volumes, curies, and distribution of radionuclides in RH-TRU waste. We are aware that a questionnaire is now being conducted by the WPO on RH-TRU inventories, and have heard that there are wastes that are high in activation products that may have a problem meeting the 1,000 rem/hour surface dose rate limit. Although calculations in the FEIS, FSAR, and SEIS indicate that RH-TRU wastes should be less of a problem than CH-TRU wastes, we cannot conclude this because of the apparently greater uncertainty in the data base.

9. Page 3-5. "The design of the CH-TRU waste package has been changed from a Type A (TRUPACT-I) container in 1980 to Type B..."

While EEG has called the original design a lot of things, we never called it a Type A container. Change it to Type B. Also, the decision to abandon the rectangular TRUPACT-II design in favor of a right circular cylinder TRUPACT-II design was not made in 1980, but in 1987.

10. Page 3-5, Brine Inflow Studies. Although there are

plans to measure brine inflow in a cylindrical room to be mined in the WIPP repository, the study will not involve the use of radioactive waste. Hence, the statement inferring that radioactive TRU waste is needed during the Test Phase to reduce uncertainties associated with brine inflow is incorrect and should be changed.

11. Page 3-6, Last Paragraph. This paragraph states that the average Pu-238 activity content has increased from 1.2% in the FEIS (correct) to 17%. This does not agree with the tabulation in Table B.2.13, Page B-19, in Volume 2, which indicates that 42% of the total radioactivity and 81% of the alpha-emitting transuranic radioactivity is Pu-238.

12. Page 3-7, Table 3.3. Change "Curies" to "Radioactivity" to be consistent with the other entries and list all units (including curies) in the table.

The table should indicate maximum values. For example, the maximum surface dose rate of RH-TRU is 1,000,000 mrem/hour. The failure to provide units results in this confusion.

Fill in the blanks in the table on RH-TRU waste characteristics. Since the Final Safety Analysis Report (FSAR) has not been published, include the information in both documents.

13. Page 3-10, Table 3.4. EEG has expressed concern previously (see EEG-40) about the extent that concentrations of hazardous chemicals at RFP could be considered as conservative for all other sites. There is now an additional uncertainty with the RFP wastes since we understand that the FBI and EPA are currently investigating the RFP characterization of mixed wastes. Thus, it is possible that

the RFP waste constituent data are flawed.

14. Page 3-16, Transportation Modes. It is stated that the requirements of the trucking contract in all these areas are highly specific and demanding with respect to the transport of TRU waste to WIPP. Does the contract include alternate route restrictions to safeguard against arbitrary selection by the driver/company? If so, then it should be documented in the text.

15. Page 3-19, Transportation Routes. DOT regulations contained in 49 CFR, Parts 171, 174, and 177, are characterized as requiring that the interstate highway system be used whenever possible to transport highway route controlled quantities of radioactive materials to WIPP and that appropriate state agencies can require other routes if less risk can be demonstrated.

This analysis of 49 CFR, Parts 171, 174, and 177, is misleading and inaccurate. The requirements of 49 CFR, Part 177.825, are that highway route controlled quantities of radioactive materials can be transported over "preferred routes" which are selected by a state routing agency when an interstate highway system or bypass is not available. As of this date, there have been no "preferred routes" designated by the State of New Mexico as required by the DOT regulations in 49 CFR 177.825 dated May 8, 1988.

16. Page 3-25, Integrated Operations Demonstration. The emplacement of TRU waste at WIPP for operational demonstration purposes is being proposed before compliance with 40 CFR, Part 191, Subpart B. What is the advantage of initiating such a demonstration before compliance with the Standard where the possibility exists that the waste may have to be removed, treated, etc.? What are the disadvantages of

delaying this activity until compliance is demonstrated? If the reasons are political, economic, training, etc., then a justification for overriding a health and safety standard should be incorporated into the SEIS. Also, why is it not possible for some operational demonstrations external to WIPP to be conducted without actual transport and emplacement of waste at WIPP prior to compliance?

17. Page 3-26, Performance Assessment. DOE and the State did not agree to proceed with performance assessment planning as if the Standards were in effect. We agreed to proceed with the documentation. Unfortunately, nothing except a schedule has been published by DOE since those Standards were promulgated in September 1985.

18. Page 3-26, Performance Assessment. It is stated that the SEIS describes the proposed Test Phase activities that will enable DOE to ascertain whether the repository can meet the Standards (Subpart B). An alternative to the Test Phase is to proceed with performance assessment without gathering any more data (Page 3-32). It is stated that under these circumstances DOE would not have "sufficient" data for conducting a performance assesssment that would provide a basis for determining compliance with Subpart B. Yet it may be possible to perform an assessment with the available data that would be bounding, and could be compared with the Standard to justify additional data gathering in critical areas of uncertainty and sensitivity. If such assessments have already been performed, then they should be incorporated into the SEIS.

19. Page 3-27, Bin-Scale Tests. Because the bin-scale tests would involve the emplacement of TRU wastes at WIPP before compliance with Subpart B of 40 CFR, Part 191, then a justification for such action should be stated. Other

locations for these tests have been presented as an alternative with little impact on the health and safety of the public or on the environment. The preference to conduct these experiments at WIPP are guided by economics and delays expected due to permitting at other facilities. But these economics have not been demonstrated, nor has it been explained why permitting would be much easier at WIPP. In fact, due to the expected delay in obtaining a permit for mixed wastes, the date to begin starting bin-scale experiments at WIPP may be considerably delayed.

20. Page 3-28, Second Paragraph. Why are treated wastes such as incinerated, cemented, charred, asphalted, etc., not part of the experimental design since some of the alternatives to retrieval (under non-compliance) involve treatment of wastes? If treatment of some or all wastes is found to be necessary, the lack of experiments now may result in considerable delay.

21. Page 3-28, Room-Scale Tests. Room or alcove experiments are designed without consideration of possible future waste forms. Also, it is stated that four room-scale tests will be performed; whereas, the Test Plan lists six rooms for these experiments. Which plan is correct? Finally, what is the effect of the short time frame in which to conduct these experiments on the value of the results?

22. Page 3-30, Alternative Action. The discussion on waiting until DOE demonstrates compliance with the EPA Standards does not address a number of facts that should be included:

A. DOE has not objected to the NRC requirement to demonstrate compliance in Nevada before beginning construction of the repository, and DOE has published plans to do so. Why does DOE object at

WIPP?

B. DOE sees no merit in conducting an operational test phase in Nevada prior to meeting standards and has no plans to do so.

C. Unlike the Nevada repository, which has NRC licensing, DOE has been given the authority by Congress to self-determine compliance with the EPA Standards at WIPP. These Standards state in the 1985 preamble that compliance should be completed <u>during the design phase</u>. Why does the SEIS ignore that statement and present an analysis to bring up to 83,000 drums (10% of design volume) to WIPP first? This is particularly relevant since DOE has not published any progress (except a schedule) in compliance with those Standards.

D. The text invokes the mantle of performance assessment (for which DOE only identifies a need of 4,500 drums) in discussions which variously require 83,000 drums, 36,000 drums or 18,400 drums.

E. The text does not acknowledge that representative mixtures of waste may not be available for shipment until March 1990 at the earliest (projected date for EPA authorization for mixed waste). Therefore, meaningful bin experiments at the site may not begin for a year.

F. Additionally, there is no discussion of why gas measurements have not been made at the generator sites since 1985. If the measurements are useful, discuss this as well as the impact of a year's delay in starting to get data.

G. The text also does not address limits in gas pressurization in the alcoves (e.g., 1 psi extrapolated to 2,100 psi, absence of repository conditions of backfill, engineered fixes, leakages of gas from instrumentation connections).

H. Standards issued by NRC and EPA do not <u>require</u> tests. Explain why they must be done and do not imply that such tests are obligatory. The text should describe how the information derived may be useful or helpful in long-term risk assessment analyses.

SECTION 4

1. Page 4-2, Socioeconomic Environment. The nearest community to the WIPP site is Loving, whose population "decreased from an estimated 1,600 in 1980 to 1,450 in 1986..." While the presence of the proposed repository probably did not cause a negative economic impact on the community, it obviously did not result in any positive economic impact. Discuss the absence of this despite the proximity to the site, high unemployment rate, availabiity of local manpower, the railroad track to WIPP passing through the community, and the presumed naturally occurring breach surfacing at Malaga Bend in the Pecos River at Loving. Identify the number of workers from Loving of the 640 employed for WIPP.

2. Page 4-3, First Paragraph. The text should provide the distance and direction of the three ranches and three mining operations located near the site or locate them on a suitable map.

3. Page 4-3, Land Use. The SEIS should provide (either here or in Chapter 2) a summary of the natural resources, estimated to be present, beneath the 16-section WIPP site, and the extent of private mining leases still being held within the site boundaries.

4. The information contained in the last sentence of Section 4.1.4 should explain what is meant by "restricted" mining and drilling within the WIPP site. How does DOE plan to implement these "restrictions" and for how long? If the DOE obtains control in perpetuity of this real estate, currently managed by the Department of Interior, how will mining be prevented? Will DOE delegate those

responsibilities back to the Department of Interior, Bureau of Land Management?

5. Page 4-4, Background Radiation. EEG's preoperational environmental radiation surveillance program should be referenced here (as well as in Chapter 2).

6. Page 4-4. Reference EEG's work in the preoperational environmental radiation surveillance.

7. Page 4-7, Last Sentence. The sentence should be expanded to, "The WIPP horizon is in a 26-foot-thick section bounded by Marker Beds 138 and 139, that consists mostly of halite with a few thin interbeds of anhydrite, clay, and polyhalite. Detailed stratigraphy of this section between the two marker beds and the location of WIPP excavations is shown in Figure _____." (Add a figure.)

8. Page 4-13, Hydrology and Water Quality. Add "Dewey Lake Redbeds" among the geologic units of hydrologic interest of WIPP.

9. Page 4-13, Section 4.3.1.1, Third Paragraph. "Deposits" is not a synonym for brine "reservoirs."

10. Page 4-14, Brine Inflow. The stated in-flow rate of 1.6 L/day/m^2 would completely fill an empty 4 x 10^3 m^3 room with brine in three years! With waste, it would be filled to the ceiling in less than a year! The correct value from the Nowak and McTigue report is 1.6 mL/day/m^2.

11. The development of the concept of Salado salt as a saturated medium should be described and the work of Bredehoeft (1988) should be cited.

12. Page 4-18. Reference the required tests that DOE conducted for the Stipulated Agreement to the lawsuit by the New Mexico Attorney General. Ignoring those required tests ignores the true history.

13. Page 4-22, Table 4.2. The work of Stormont et al, 1987, is cited on Pages 4-22 through 4-25, but not referenced at the end of the chapter.

14. Page 4-20. The discussion of gas permeability should include estimates of the expected amounts of gas and the pressure to be reached. If a modification to the waste form is required to reduce the amount of gas produced, the environmental impacts should be discussed.

15. Page 4-25, Section 4.3.2.4. "Underground experience at the WIPP indicates that these fractures open locally in response to excavation" does not adequately describe the extensive continuous fractures up to four inches thick that have been observed in the SPDV rooms.

16. Section 4.3.2.4. This section should describe extensive fracturing observed in the roofs of the SPDV rooms that will also provide potential pathways for gas or brine migration.

17. Page 4-33, Last Sentence. Arguments counter to the hypothesis advanced by Lambert and Harvey (1987) should also be provided here. See, for example, Chapman, 1986 (EEG-35).

18. Page 4-55, Section 4.3.3.4. This section should also refer to Chapman, 1988 (EEG-39) and Ramey, 1985 (EEG-31) to describe the geochemistry of the Rustler Formation, especially since Siegel et al, 1988, has not yet been published.

19. Page 4-58, Figure 4-20. The "Disturbed Zone" boundaries have become enlarged with each new encounter of a Castile brine reservoir. There is no rational basis for the delineation of these zones and they should be abandoned.

20. Page 4-60, Last Full Paragraph. The request to relocate the repository and the report by Channell should both be attributed to the New Mexico Environmental Evaluation Group.

21. Channell's calculations (in EEG-11, 1982) were made with a lesser waste inventory and likelihood of occurrence of a brine reservoir and did not address compliance with the EPA Standards, which were not promulgated until 1985. Therefore the report <u>cannot</u> be used to conclude that the presence of an underlying brine reservoir would not result in exceeding the EPA Standards.

22. Page 4-60, Paragraph Beginning at Bottom of Page. "The presence of Castile brine beneath the repository is of concern <u>only</u> in the event of human intrusion." (Emphasis added.) Gas pressures exceeding lithostatic in the repository could cause fracturing to ERDA-9 and then to the upper anhydrite layer of the Castile where brine is located.

SECTION 5

1. Page 5-2, Biology. It is stated that the salt levels do not appear to inhibit plant species diversity or abundance. This statement should be clarified to say that "current" accumulations do not have an effect, unless soil salt concentrations are not expected to increase in the future as a result of operations. Also, the phrase "do not appear" suggests that a detailed study has not been performed. Has it?

2. Page 5-3, Last Sentence of Paragraph Two. Delete the words "modifications of."

3. Page 5-6, Land Use. A justification should be provided for the choice of the WIPP site boundaries and various control zones that have changed since the FEIS (See Chapter 2 comments).

4. Page 5-6, Air Quality. The occurrences where state and federal air quality standards have been exceeded are not adequately explained in this paragraph. For example, the text states:

> "The WIPP has not been determined to be responsible for the elevated sulfur dioxide levels."

How was this determined? Similarly, the cause of high ozone levels "has not been identified," but WIPP has been exonerated.

With respect to dust loadings exceeding the air quality standards, it is stated that the cause is attributed to heavy use of a dirt road near the air sampler. Has this cause been verified by moving the sampler to another location, or from analysis of deposits on the filter?

There are possible explanations for the high values. They could be due to sampling or analytical errors, or could cover a wider area than the WIPP site, or could be due to WIPP-related traffic. But no explanations have been justified here. We must conclude from this paragraph that the WIPP site has not been shown to have a negligible effect on air quality standards.

5. Page 5-22, Transportation. EEG has thoroughly evaluated the calculations presented in Appendix D for transportation and our detailed comments are included in that section. Our findings on the evaluation are summarized here.

A. The methodology and assumptions used to calculate population doses to workers and the public from routine transportation were appropriate and conservative.

B. The estimated dose to the maximally exposed members of the public (1.6 mrem during 25 years) is unrealistically low by one to two orders of magnitude.

C. Assumptions used for the Total Respirable Release Fraction from the different Severity Category Accidents are more conservative than those used by EEG in EEG-33 for a doubly-contained, non-vented TRUPACT. Thus, the total radiological impact projected for transportation accidents is conservative.

D. The probabilistic method of presenting accident results completely hides the effect of accidents, especially the more severe ones, from all except the technical reviewer who digs them out of the tables himself. For example, the total number of accidents and the number of accidents leading to a release are not presented anywhere. Neither are any route specific total accident and release values provided. If the SEIS is going to use these numbers, it should summarize them in a way that is understandable.

E. The Bounding Accident is very non-conservative because it uses the average PE-Ci trailer-load from the Rocky Flats Plant. The average PE-Ci value for the entire system is 6.5 times the RFP value and the average SRP trailer is 64 times as great.

F. EEG believes the appropriate Bounding Accident (with SRP wastes) would result in 35,800 person-rem. This would be about ten Latent Cancer Fatalities (LCF).

G. The probability of a bounding accident is not "extremely low" as stated on Page 5-24. From the tables and assumptions in Appendix D, one can calculate a probability of about 0.6% that an accident involving >0.75 LCF will occur during the WIPP operational period.

6. Page 5-24 to 5-28, Human Health Consequences of Transportation Releases. We believe the LCF/rem factors used are appropriate, and, since we judge the total doses received from transportation to be conservative, the total LCF are considered conservative. EEG has the following observations about transportation health effects:

A. Transportation causes the majority of the radiological health effects of the entire project.

B. The expected effects are about 0.96 LCF for 100% truck shipments and 0.31 LCF for maximum rail shipments.

C. Consideration should be given to maximizing rail shipments and other ALARA practices to reduce the total health effects.

7. Page 5-29, Transportation Accidents. Although the statement that the bounding accident assumes that all drums are breached is incorrect, we agree with the assumption that all headspace gas is released in an accident.

8. Page 5-29, Trichloroethylene. We agree with the inclusion of this VOC in the waste inventory because it was commonly used prior to and during the 1970's. This point had been raised to DOE by our consultant, Dr. William Lappenbusch, some months ago, and we are pleased that it has been accepted.

9. Page 5-30, Quantities of Chemicals Released. We agree that 100% of Volatile Organic Compound (VOC) gases present in the headspace should be assumed to be released in a transportation accident. However, we also believe that a fraction of the total VOCs in the waste matrix should be assumed to be released in an accident. The SEIS assumes that .02% (2E-4) of all TRU radionuclides in a TRUPACT are released in the most severe accident. There are experimental data to support releases of this order for TRU radionuclides, which are typically in a non-mobile, non-volatile form. We believe a factor of 2E-4 would be appropriate for the VOC fraction in the waste matrix. This will increase the source term by 29% to 630%. For carbon tetrachloride, which has the most hazardous headspace gas concentration (40 times TWA-TLV), the increase would be 86%. Note also that there would still be the non-conservative assumptions of assuming average values for headspace gas concentration and concentrations in the waste.

10. Page 5-30 to 5-32, Quantities of Lead Released. The release values are unrealistically low. Starting from an

average amount of lead in an average drum of wastes of 60.3 kg, the released amount is only 0.46 mg. So the total release fraction is 7.6E-9! Again, we compare this to the average value of plutonium in these wastes of 2E-4. We don't believe plutonium is 26,000 times as mobile as lead.

The very low value resulted from the DOE assumption that no lead could possibly be released from any waste form other than sludges, which have only 10 mg/kg of lead. EEG rejects this assumption and believes the appropriate source term should be 507 grams per trailer.

11. Page 5-31, Paragraph Three. These two sentences have fires lasting for 2.0 hours and 1.5 hours.

12. Page 5-31, Paragraph Five. Why is the maximally exposed individual at 30m here and at 50m in paragraph seven?

13. Page 5-32, Second Paragraph. What is the origin of the 1300°K temperature in the bounding case accident? Assumed temperatures for the hypothetical test accident are somewhat lower (800°C or 1073°K).

14. Page 5-33, Table 5.10. It is not clear how the values in this table were calculated. Is g/m^3 the correct unit? Why would the concentration (g/m_3) in six TRUPACTs be twice as great as in three TRUPACTs? Using carbon tetrachloride as an example, the average headspace gas concentration in Table 5.26 and the average emission rate in Table 5.28, we can also calculate a concentration. There are 1.9 g/m^3 in the headspace gas. If this were also diluted in the TRUPACT cavity outside the drums (2.45 m^3), the average concentration in the entire TRUPACT void volume would be 0.87 g/m^3. This value is 50 times that reported in Table 5-10 for three TRUPACTs. The emission rate for carbon tetrachloride would

add another 0.12 g in 100 hours. Thus, we believe the amount of carbon tetrachloride in the TRUPACT void space should be assumed to be 2.0 g or 0.82 g/m^3. This value is 27 times the TWA-TLV. The 1,1,1-Trichloroethane and trichloroethylene values are 3.2 and 1.2 times TWA-TLV values.

15. Page 5-34, Table 5.11. For the quantity of lead available for release, the fraction received by the maximum receptor is very high. The intake for an individual amounts to 8.5E-5 of that released. The radiological bounding accident had only 3.1E-8 fractional intake, and EEG-33 had 5.5E-8. Should the concentration be micrograms/m^3?

This very low dilution offsets a good bit of our objection to the very low release fraction. We believe the quantity released from a CH-TRU trailer should be about 5E+5 mg, and the fraction inhaled by the maximum individual about 5E-8 for an intake of 2.5 x 10^{-2} mg. The air concentration ($\tilde{}$42 μg/m^3) would be about 28 times the Clean Air Act Standard for 90 days but for a time weighted average would be well below any of the limits shown on Page G-15.

16. Summary Comment on Section 5.2.2.2. EEG has significant reservations about the quality of the data, some of the assumptions, and calculation inconsistencies in this section. Because of these concerns, we cannot yet conclude that reported concentrations, which are low compared to TLV-based limits, indicate that hazardous chemical releases from transportation accidents are negligible.

17. Section 5.2.2.3, Non-Radiological, Non-Chemical Transportation Requests. Comments on this subject are also included in comments on the Summary Chapter and Appendix D. The only additional observations are that:

A. Expected LCF from vehicle emissions are less than 20% of the LCF from radiation for truck shipments, and less than 30% for rail shipments.

B. Expected deaths from accidents are much greater than from radiation, 8.6 times for truck shipments, and 6.6 times for rail shipments.

C. Since rail transportation is predicted to be safer than truck transportation in all areas (radiation, accidents, vehicle emission), consideration should be given to maximizing rail shipments.

18. Page 5-39, Assumptions and Considerations of Uncertainty. As mentioned previously, the use of a "fullness factor" of 0.80 is incorrect and will influence many of the calculations that follow.

19. Page 5-44, Waste Retrieval. Our general comments on waste retrieval also apply to comments on Pages 5-46 and 5-49, and Table 5.18. It is difficult to believe that routine exposures from retrieval would be the same per shift as emplacement (but twice as much per drum, because of greater handling time) or that surface contamination would be present on only one-half (5%) of the drums that were brought underground contaminated (10%). Table 5.18 assumes that the 5% of drums that are contaminated can be retrieved and repackaged with a dose of only 1.7 mrem per drum. This is unrealistic. If retrieval is believed to be no more hazardous, why are there plans to HEPA filter area exhausts during retrieval, but not during emplacement?

19. Page 5-45, Routine Radiological Releases. Two fundamental errors were made in calculating releases of radionuclides to the environment in Table 5.15. First, the

number of drums was overestimated by the erroneous use of the 0.8 fullness factor. This results in increasing the annual drum equivalents handled. The values should be about 17,000 and 38,000 drums per year in the test phase and disposal phase, respectively. Secondly, the use of the 1E-5/m resuspension factor to calculate amount removed in a year is incorrect, because this factor includes amounts that settle out as well as those carried away. This error also occurred in the December 1988 Draft FSAR. In fact, the amount of alpha curies shown in Table 5.15 to be released in a year is 1.55E-3 Ci/year. The curies of alpha radiation included on all drums brought in during a year (with 10% contamination at 50 pCi/100 cm^2) is only 5E-5 Ci/year! The SEIS claims to carry off 31 times the amount of radioactivity brought in!

Both of the errors give conservative predictions, that is, they predict greater releases to the environment. However, such significant errors cause real doubts about the thoroughness and accuracy of subsequent calculations.

20. Page 5-47, Table 5.15. It is noted that the radionuclide releases in this table are about 35% higher than those in Chapter 6 of the Draft FSAR. The ratio on a per drum basis would be about 58% higher. However, the values in both tables need to be recalculated.

21. Page 5-48, Table 5.16. The values of annual radiation exposure in this table are apparently scaled up (by a factor of about 1.33) from the Draft FSAR. As stated above, we believe the source term (Table 5.15) is incorrect. Our comments on the environmental pathway analysis are substantive and are included under Appendix F.

22. Page 5-48, Table 5.17. These occupational radiation doses are apparently scaled up from the Draft FSAR. EEG

conclusions on the FSAR numbers were that the direct radiation dose was reasonable, but the inhalation dose was not reproducible from assumptions listed and was probably low. The same conclusions apply here.

23. Page 5-49, Section 5.2.3.4, Accidental Radiological Releases and Exposures. The accident scenario assumptions, releases, and doses are identical to those in the Draft FSAR. EEG's principal conclusions are summarized below. A more detailed explanation of these conclusions is included in EEG-40, Pages 50 to 52.

A. The C-8 (hoist drop) accident is not incredible and should be included in dose calculations.

B. The use of a 1,000 PE-Ci upper limit for individual waste containers is unacceptable to EEG.

C. The potential doses to radiation workers from accidents are unreasonably low, because of the assumption that all accidents occur with an average PE-Ci drum.

D. The C-2 (forklift) accident doses are unreasonably low, because the forklift operator is assumed to receive no dose.

24. Page 5-54, Table 5.2.1. The Draft FSAR calculated doses to a member of the public at the maximum location in the WIPP site where public access is allowed. The doses are 60% higher than at Mills Ranch and would be more appropriate to use.

25. Page 5-55, Third Paragraph. There are three errors in this paragraph relative to Table 5.22, and the table is correct in each case. The excess fatal cancers are per year

and not during the entire operation. The fatal cancers per year in the population from facility operations should be 7.6E-6, during the Test Phase, and 2.5E-5, during the Disposal Phase, as shown in Table 5.22. They are incorrectly described in the text on Page 5-55 as 8.4×10^{-6} and 2.7×10^{-5}, respectively.

26. Page 5-57, Table 5.23. The values given for risk of latent cancer fatalities from accidents are correct for the doses presented in this section. However, if the maximum exposed worker (in the C-6 accident) had been handling a 1,000 PE-Ci drum, the dose would have been 713 rem. This would lead to a 0.20 probability of a LCF. EEG has estimated that the dose to the C-2 forklift operator with a 1,000 PE-Ci drum would be about 2,900 rem.

27. Page 5-61, Heavy Metal Releases. The statement that WAC certification assures no radioactive contamination exists on the surface of containers is incorrect. A limited amount of radioactive contamination is allowed (50 pCi/100 cm^2 for alpha emitters and 450 pCi/100 cm^2 for beta-gamma emitters) and some containers are expected to contain measurable contamination between zero and the limit. Also, the "elaborate HEPA filtration system" will not normally be operating to filter underground exhaust, and, thus, cannot be categorized as routinely filtering exhaust air.

28. Page 5-64, Line 4. The statement that use of average concentrations represent a bounding case is misleading. In any scenario where only a few drums are involved (e.g., when unloading a TRUPACT), a conservative assumption would be at least as great as the average concentration for the maximum class of waste. This is especially pertinent because the original TRUPACT certification is not expected to permit mixing of waste types. For example, carbon tetrachloride

Waste Category 2 (cemented and uncemented organic sludges) are 10.5% of all wastes and have a concentration of 50,000 mg/kg, 9.3 times the average.

29. As mentioned in the Chapter 3 comments, EEG is not yet confident that the hazardous chemical inventory is accurate, including RFP.

30. Page 5-64, Last Paragraph. The statement that 10% of the 6.2 million cubic feet of total repository capacity is 110,000 drum-equivalents is incorrect. The 6.2 million cubic feet is based on the total volume within the containers, not the estimated volume of waste within the container. A 55-gallon drum holds about 7.34 cubic feet. There would then be 845,000 drum-equivalents in 6.2 million cubic feet.

31. Page 5-67, Table 5.28. The 1,1,1-trichloroethane emission rate (9.3E-9) is inconsistent with the other values and the assumption that the diffusion coefficient is related to the square root of the molecular weight ratios. A consistent value would be 1.7E-7, which was used in the December 1988 Draft FSAR, and is 19 times greater. Also, the value in Table 5.31 uses the higher emission value.

32. Page 5-68, Assumptions of Operational Exposure. We believe the assumptions listed on this page are all reasonable and slightly conservative.

33. Page 5-70, Air Dispersion Modeling. The EPA Industrial Source Complex (ISC) dispersion is used to predict off-site concentrations of VOC's. Is it being assumed in these analyses that hazardous wastes are not adsorbed onto particulates in the exhaust? If true, then documentation for this assumption is required in the SEIS for proper justification; otherwise, it should be considered in the

assessment.

34. Page 5-71, Exposures from Above Ground Operations. The statement is made that releases from waste containers into the TRUPACT-II <u>may</u> occur during transport. We believe they will surely occur. Your assumptions of average emission rates in Table 5.28 would lead to significant gas concentrations in a TRUPACT-II while it was sealed during shipment. In 100 hours, the predicted concentration would be 1.6 times the TWA-TLV for carbon tetrachloride in an average load. In a maximum load, the concentration would be 15 times the TWA-TLV for carbon tetrachloride and 1.8 times for 1,1,1-trichloroethane. It is apparent that sampling must be done before opening the TRUPACT-II units at WIPP, and that precautions may have to be taken to insure safety of those most involved in waste handling with the TRUPACT.

35. Page 5-71, Exposures from Underground Operations. The assumption of an air velocity of 3m/s is non-conservative by a factor of at least two. This assumption requires a flow rate of 120 m^3/s in either one storage room or in the panel exit drift. The total flow rate for a panel is about 58 m^3/s and for an individual room would be only a fraction of this. This discrepancy was pointed out in our Draft FSAR comments and acknowledged by Westinghouse. The values in Tables 5.31 and 5.32 check for the assumptions used.

36. Table 5.31 and 5.32, Exposures from Underground Operations. From the assumptions stated on Page 5-68, the above ground worker should be exposed to the emissions from an average of 66,000 drums during the first five years, and 6,000 drums thereafter. The estimated daily intakes in Table 5.32 reflect this 11 to 1 ratio. Also, the concentration for an above ground worker in the 20-year period is consistent. But the above ground worker concentrations for five years are

too low by a factor of about three. The effective X/Q value for the 20-years concentration is about 1.5 x 10^{-6}. It is about a factor of ten low compared to Table H-49 of the FEIS, but without knowing stack height assumptions we can't comment on its validity.

37. Page 5-78, Table 5.34. Units of micrograms/m^3 are missing.

38. Page 5-82, Table 5.36. Footnote "a" is missing.

39. Page 5-100, Non-radiological Risks. The LCF for CH-TRU shipping by rail would be 0.088 (See Table D.4.9).

40. Page 5-109, Third Bullet. Although the assumption used in the FEIS that TRU waste in the repository dissolves at the same rate as salt is called unrealistic, it led, because of other assumptions, to a concentration that was less than 4E-6 Molar.

41. Page 5-110, Last Sentence. Since concentrations of VOC's in some waste forms average as high as 150,000 mg/kg (see Table B.3.2), it is imprudent to call this limited or minor.

42. Page 5-111, Fourth Paragraph. The statement implies there is a definite plan and commitment to using a backfill containing bentonite. We are unaware of any such commitment, and the text should not take credit for it.

43. Page 5-113, Fourth Paragraph. EEG has been assured in the past that there was not enough brine in the Salado to fill a room before closure. We believe the current hypothesis is more reasonable.

44. Page 5-114, Third Paragraph. Although a human intrusion drill hole may be considered unlikely by the SEIS writers, its evaluation is required by 40 CFR 191.

45. Page 5-114, Last Paragraph. EEG has been told that blowout preventers do not activate unless pressures are quite high and might not be activiated by a brine reservoir. Also, since the WIPP-12 brine reservoir unavoidably permitted 27,000 barrels of brine to flow to the surface before it could be shut in for pressure testing (see Page H-9 of TME 3153), how can the claim be made that little or no brine would reach the surface?

46. Page 5-115, First Paragraph. What assurance is there that standard borehole plugs would be installed? Who inspects these?

47. Page 5-117, Cases IIC and IID. We agree with plutonium and americium solubility values of 1E-6M for average and 1E-4M for degraded conditions. An order of magnitude increase in the solubility for uranium might be more appropriate.

48. Page 5-119, Third Paragraph. Again, credit is taken for bentonite in the backfill.

49. Page 5-125, Last Paragraph. It is not obvious that gas generation by radiolysis is negligible. Waste inventories have become more concentrated and more work has been done on gas generation since 1980. The average concentration in an equivalent drum in the repository will be about 6.16 alpha curies. The Safety Analysis Report for Packaging (SARP) for TRUPACT-II uses G factors (net gas) that range from 0.6 - 8.4 atoms of gas per 100 electric volts of absorbed alpha energy for five of the six waste forms considered. A G factor of 1.0 would generate 0.64 moles/year/drum. Even though G

factors are usually assumed to decrease, in a poorly defined manner, with time it does not seem conservative to ignore radiolysis. Besides, the only reason to use real waste for experiments is the contributor by radiolysis. Neither bacterial decay nor chemical reactions require waste.

50. Page 5-129, Last Paragraph. The flow would be around as well as through the seal in MB139.

51. Page 5-135, Table 5.52. The large retardation factors, for 100% of the wastes, assumed in the Culebra should guarantee that you will have no problems, regardless of other assumptions. Since there are so many complexities to this waste and large quantities of material that are potential chelating materials, we believe that a small percentage (perhaps in the 1 - 10% range) of waste should be assumed to move with no retardation.

52. Page 5-137, Fifth Paragraph. It is stated that 12 liters of brine with a radionuclide solubility of 1E-4 molar would carry 1% of a drum's radionuclides. Our calulations show that this volume of brine at 1E-4 molar would contain about 0.288 grams each of plutonium and americium and about 0.281 grams of uranium. These quantities would be 3.2%, 100%, and 24% of the average grams in a drum (See Table B.2.14.).

53. Page 5-138, Table 5.54. We agree with the calculated dose for the assumptions used. For the average LANL wastes, which has an Am-241 concentration 7.3 times the WIPP average, the dose would be 0.6 mrem. This is still a low value.

It should be recognized that taking a cuttings sample from RH-TRU wastes could conceivably result in somewhat higher doses. For example, if an RH-TRU cylinder contained an average of 10 Ci/L of Cs-137 at time of emplacement (this would meet the requirements of the State of New Mexico for a total concentration of less than 23 Ci/L), this would still be 1.0 Ci at 100 years. A 526 cm^3 cutting would have a dose rate at 1 meter of 175 mrem/hour, even if no compaction of the waste were assumed.

54. Section 5.4.2.6, Analysis of Scenarios: Cases IIA, IIB, IIC, and IID. EEG has not had the time to check all of the calculations in this section, so we are unable to provide a comprehensive assessment of the analysis. Most of the checking we have done is discussed in Appendix I. There was one significant finding.

The calculations of human exposure from the stock-well-beef pathway are calculated incorrectly and understate the doses that should have been calculated from the assumptions by over two orders of magnitude. The problem was caused by calculating the intake of radionuclides by the steer for <u>only one day</u>. Two hundred days of intake is typically considered to be a reasonable assumption. The 200-day feeding assumption would increase the concentration in the nuclides of interest by factors of 100 to 200, depending on the effective half-life of the specific nuclide. When calculated correctly, the 129 mrem dose in Case IIC becomes 15.7 rem Committed Effective Dose Equivalent per year of beef consumption.

This dose (using the SEIS assumptions) is significant, about two orders of magnitude above natural background doses. A great deal of explanation is needed to explain why this type of dose is acceptable, even for an event with a probability somewhat less than 1.0.

The fact that Uranium-233 turns out to be the dominant radionuclide in a well scenario is not suprising to EEG. We came to the same conclusion in EEG-9, published in September 1981.

EEG has long maintained that a well scenario with humans drinking treated water directly is reasonable to consider. The technology to reduce high solids water is available today (with reverse osmosis being perhaps the most practical method), and is used some in water-short areas that do not have access to better quality water. The well water in Case IIC, if treated to remove 90% of the solids, and, incidentally, remove 90% of the radionuclides, would result in a dose of about 33 rem/year (CEDE). Even if 99% of the radionuclides were released, the CEDE would still be 3.5 rem/year.

SECTION 6

1. Page 6-2, Introduction. The text states, "If, for example, it were determined through the Test Phase experimentation that gas-generation is a long-term repository problem, then gas-getter materials could be selected as a mitigative measure."

Current DOE estimates clearly show that gas generation is a long-term repository problem. For gas not to be a problem, measurements would have to show a 25-fold reduction in the amounts expected of 2.4 moles/y-drum to 0.1 moles/y-drum, a most unlikely situation.

The text states that the solution is to use gas-getters. If this is the case, why do the experiments? The text further states, "Other experimental results could identify the need for other treatments." What are the kinds of results that could prompt other treatments?

2. Page 6-2. The text states, "The requirements of the Occupational Safety and Health Administration (OSHA) and Mining Safety and Health Administration (MSHA) have been closely followed." Include a discussion of violations and citations identified by those federal agencies since the FEIS was issued and how these have been corrected.

3. Page 6-2, Existing Facilities. The reader is led to believe that HEPA filters are continuously filtering underground exhaust air during normal operations. This is not the case, and the wording should be changed to indicate that air is normally discharged without passing through the HEPA filters.

4. Page 6-2. It is inferred that the remainder of the

repository has not been excavated because of premature closure due to salt creep. It should be added that those rooms which have been excavated require rock bolting and wire-mesh surfacing to insure worker safety due to fracturing in the ceiling of the drifts and rooms along with salt creep during the short term.

5. Page 6-2, Socioeconomics. The release of land in Control Zone IV for unconditional use for economic reasons, as opposed to the FEIS which did not allow this option, impacts on both health and safety, and on ecological preservation. Presumably, these were the original reasons for control of this zone. What has changed since the FEIS to account for this release? How does this release impact on slant drilling under the site for mineral exploration and extraction which is not currently permitted?

6. Page 6-5, Emplacement of Backfill. It is stated that the FEIS considered only crushed salt as a backfill for waste containers, and that various types of backfill developed since that time may speed the entombment process and the attainment of final porosities within the waste areas. A 70:30 crushed salt-bentonite mixture with yet unidentified gas getter(s) is the only option discussed in the SEIS as bulk backfill. Is the only option a selection of getters? What other backfill materials, including getters, are being considered?

7. Page 6-5. "The reason for backfilling WIPP disposal rooms and access tunnel systems...would be to shorten the estimated 'time for closure' of the disposal room." That is not the sole reason. Getters, such as bentonite, are used to retard radionuclide movement after a hydrologic breach. Additionally, EPA requires engineered barriers. Since the WIPP waste is soluble, respirable, and housed in a carbon

steel oil drum, backfill at the present time is the only engineered barrier at the WIPP.

The text states that compaction of backfill <u>in situ</u> would be costly and require manual labor. Thus, a loosely placed backfill is seemingly being proposed, and faster emtombment using backfill compaction is not being considered. Because brine sorption and minimized gas production through the use of getters are now being completed since the FEIS was written, what is the mechanism for more rapid entombment of waste exclusive of these two processes? It appears from this analysis that the SEIS authors favor getters rather than bulk backfill material.

8. Page 6-8, Figure 6.1, Tentative Location of Panel Seals. The impact on workers' safety after the first panel is sealed, becomes pressurized with hydrogen and other gases, and potentially blows out the bulkhead prior to closing the mine 25 years later, is not discussed in the SEIS. Estimates of the potential pressures should be included.

9. Page 6-10-19, Mitigation by Waste Treatment. The discussion of waste treatment in the SEIS appears to favor postponing any decision on waste processing on the basis that knowledge acquired during or after the Test Phase may modify the approach to take, yet all evidence points to a need for immediate consideration with respect to potential gas generation problems, brine influx, and hazardous waste components. Neither immobilization treatment nor incineration are included in the experiments. The investigation of incinerated wastes and/or immobilization may be more important because of their potential in reducing the problems and hazards associated with gas-generation and hazardous wastes, in addition to ameliorating the consequences of transportation accidents, and enhancing WAC

certification. Why aren't these treatments being considered in the Test Phase? The lack of experience with incinerators is not the problem, as about 80 incinerators have been operated for this purpose internationally (Page 6-16), and immobilization has been employed at nine commercial reactors (Page 6-13). This experience may be compared to compactor utilization at 74 commercial power reactors (Page 6-17).

10. Page 6-17, Effects of Waste Treatment. It is stated that it is not currently possible to qualitatively estimate any long term benefit from waste treatment. How about the indirect benefits of diffusing objections, meeting Performance Assessment requirements (if otherwise not met), and, in short, allowing disposal to proceed?

SECTION 7

1. Page 7-1, Section 7.1.1. Why is DOE proposing to increase the fenced area at WIPP from 250 acres to 1,454 acres? No explanation is provided.

2. The 1980 FEIS stated, "The waste that is emplaced underground is not expected to release any radioactivity; it will, therefore, produce no long-term radiological impact." The 1989 SEIS repeated this statement that the wastes "would not be expected to release any radioactivity..." Statements like these without documentation of probabilities are inconsistent with the stated DOE position that it will be October 1993 before the DOE can complete the demonstration that the facility can meet the Standards for safe disposal issued by EPA.

3. Page 7-2, Cost Reduction Program. A discussion of the decision under the Cost Reduction Program in 1982 to eliminate the fourth shaft should be included, since subsequent events led the DOE to eventually build the fourth shaft. A number of issues were raised on the Cost Reduction Program by EEG in November 1982 (see EEG-19), and the economic and environmental impacts should be discussed.

4. Page 7-4. DOE concludes that delaying the receipt of TRU waste until compliance with the Standards (Alternative Action) would not result in any difference in unavoidable adverse impacts when compared to the alternative of bringing waste now. In that case, why not commit to full compliance first?

5. Page 7-4. The conclusion that the emplacement of 65,000 drums in WIPP before meeting the Standards would not have any

differences in potential impacts with the option of completing compliance first has not been thought through. If wastes had to be retrieved, the costs of retrieval, transportation risks, and operational risks would be substantially different for both cases. A detailed benefit/risk analysis should be included.

SECTION 8

1. The text discusses slant drilling to permit the extraction of hydrocarbon resources under the WIPP site. This is counter to previous DOE commitments to prevent the extraction of those resources.

2. In addition to the bin tests, discuss alcove tests at sites other than WIPP, since EPA indicated that the earliest date for shipment of RCRA wastes, which are representative of the various waste streams, may be March 1990.

SECTION 9

1. The discussion of conducting bin-scale tests at WIPP versus generating sites should address the potential of a one-year delay for authorization to ship RCRA type waste, which would substantially delay the availability of experimental results.

2. Page 9-4. Add the appropriate references to the list. Only one is shown.

3. The discussion on bin tests should be extended to include alcove tests and room tests.

Was there a commitment by DOE not to allow drilling in Zone IV?

SECTION 10

1. Page 10-6, "Complete waste characterization data for waste expected to be shipped to WIPP is not yet available." Reference whatever data is available.

2. The status of the variance request for a no migration petition should be updated, including an estimate on the earliest date mixed waste could be shipped to WIPP.

3. Add a commitment to the list of regulations for safe transportation to those issued by the U.S. Department of Transportation, 49 CFR, Parts 171 through 178.

4. Add a commitment in Table 10.1 to have the CH-TRU and RH-TRU shipping container certified by NRC.

5. Page 10-13. The text cites the Second Modification of Agreement 4, 1987, to the New Mexico Department of Energy C&C Agreement as the earliest date to meet NRC transportation regulations. Actually, DOE agreed to do this in the October 1980 FEIS, Page 6-1, which states, "The transportation of radioactive waste to the WIPP will comply with the regulations of the U.S. Department of Transportation (DOT) and the corresponding regulations of the U.S. Nuclear Regulatory Commission (NRC)." Unfortunately, DOE would not honor their 1980 FEIS commitment until 1987. This is discussed in EEG-33, "Adequacy of TRUPACT-I Design for Transporting Contact-Handled Transuranic Wastes to WIPP, June 1986," and should be discussed here.

6. Page 10-13. Although there are 8000 shipments of RH-TRU waste identified in the SEIS, the document is silent on the status of that shipping container. Include a drawing of the

shipping cask, the expected date of construction, schedule for testing and planned submittal of documentation to NRC and the expected date of certification.

Include an explanation on the absence of progress in this area since shipments of RH-TRU waste were planned ten years ago.

APPENDIX A

1. Page A-4, Table A.1.1. Table A.1.1 does not show a limit on the amount of RH-TRU waste that can have a maximum surface dose rate of 1,000 rem/hour. It should be 5% of the expected 93,000 cubic feet of RH-TRU or 4,650 cubic feet as agreed in the C&C Agreement as modified. The remainder has a maximum surface dose rate of 100 rem/hour.

2. Page A-5. Change the text to require all CH-TRU waste containers to have a venting feature.

APPENDIX B

1. Page B-2, Inventory. Some explanation should be provided for the enormous changes in waste concentrations and amounts shown in the SEIS in comparison to the FEIS.

2. Page B-3, Table B.2.1. The term "Newly-generated" is used to describe waste that has yet to be produced. A better term might be "to be produced."

3. Page B-4, Table B.2.2. Table B.2.2 lacks units and contains seven-place accuracy for two-thirds of waste yet to be produced.

4. Page B-5, Table B.2.3. Table B.2.3 lack units.

5. Page B-6, Table B.2.4. What is a "volume scale-up?"

6. Page B-7. EEG does not agree with the 1,000 PE-Ci limit per package established by DOE.

7. Page B-7. Additional information on the radioactive waste inventory has been drafted in a report, DOE/WIPP-88-049 (WIPP, 1989), and "constitutes the fundamental basis for analysis reported in the SEIS and in the WIPP FSAR." Since DOE has not provided the report to EEG, no conclusions can be drawn as to its value.

8. Page B-8. Table B.2.5 lacks units.

9. Page B-8, Table B.2.5. Table B.2.5 lacks units. Fill in the blanks in the table which shows major changes from the FEIS.

10. Page B-11, Paragraph Three. The equation includes the 0.80 "fullness" factor. This generates more drums than WIPP can hold and results in 23% more shipments than expected.

11. Page B-12, Table B.2.8. The table indicates 6.26×10^4 m^3 of newly-generated CH waste for Rocky Flats, and 1.29×10^5 containers. This implies a container volume of 0.485 m^3 that does not match either a drum (.208 m^3) or a SWB (1.798 m^3). The value for newly-generated waste in the table (6.24×10^4 m^3) is <u>greater</u> <u>than</u> the value of 5.66×10^4 m^3 (2.0×10^6 ft^3) given in Table B.2.4 (Page B-6) for <u>both</u> stored <u>and</u> new waste at Rocky Flats.

12. The equation in Table B.2.8 includes a factor of 3 m^3/TRUPACT. It is actually 2.9 m^3/TRUPACT for drums, and 3.6 m^3/TRUPACT for SWBs.

13. Page B-13, Table B.2.9. Total RH volume 1.98×10^4 probably should be 1.98×10^1, which would then be consistent with 2.20×10^1 containers. The 19.8 m^3 stored + 5.4 m^3 newly-generated waste (Page B-12) totals 25.2 m^3, somewhat less than the $1.2 \times 10^3 \times .02832 = 34.0$ m^3 indicated by Table B.2.4 (Page B-6).

14. Page B-15, Paragraph One. What is the citation for "updated by WIPP, 1989?" Is it DOE/WIPP 88-005? The citation should be given.

15. Page B-15, Paragraph Two and Table B.2.14 on Page B-20. The process used to obtain the modified inventory for long-term performance analysis, although not cited, was found in SAND 89-0462, pages 4-23 to 4-26. The "modified inventory" shown in Table B.2.14 shows a 22% increase of Am-241 adjusted for decay and ingrowth from Pu-241, whereas, all of the latter is not present in the inventory. Also, there is no

change in the Pu-238 inventory over the time period, nor does Np-237 appear to reflect its production from Am-241. Is the decay time allowed 100 years? What is the justification for this inventory?

16. Page B-15, Section B.2.2.2, Operational Analysis. The draft FSAR is referenced for operational impacts of waste handling and storage at WIPP. It should be noted in the SEIS that reference is being made to a draft, and that changes may have to be reflected in the SEIS. Only a brief mention of "updating" the SEIS for this purpose is mentioned in a footnote.

17. Section B.2.2.3, Long Term Performance Assessment. It is stated that emplacement procedures at WIPP of RH-waste will minimize degradation. In light of brine seepage, how is corrosion of canisters minimized? Also, how does the uncertainty of RH-inventory justify excluding this type of waste in performance assessment? These terms need clarification.

18. Pages B-22 and 23, CH-TRU Mixed Waste. It is not clear how RFP wastes represent a conservative upper bound for potential risks rather than just a representative sample for risk assessment involving hazardous wastes. Are all identified hazardous waste quantities in RFP waste in higher concentrations than that generated at other locations? Is there any quantitative reasoning behind this assumption?

19. Page B-15, High Curie Waste. It is gratifying to note the correction in the SEIS in identifying the heat source Pu-238 contribution is 17% of the inventory, in comparison to the 1.2% used in the FEIS. However, it is not reassuring to realize that the FEIS calculations were predicted on the more dilute weapons grade waste streams and ignored the heat

source Pu-238 wastes.

20. Page B-16, Table B.2.10. An explanation should be provided for the increases in the activities represented in the SEIS from the FSAR.

	Factor Of
Pu-238 increased	260
Pu-239 increased	2
Pu-240 increased	1.7
Pu-241 increased	2.4
Am-241 increased	300
TOTAL	6.2

21. Page B-17, Table B.2.11. Table B.2.11 describes waste in a Standard Waste Box. Hence, mass and activity should not be shown as "grams per drum" and "Ci per drum." They should be "g/box" and "Ci/box."

22. Page B-18, Table B.2.12. While the table is technically correct in telling the reader that daughter products are not included in reporting 260 Ci/container of RH-TRU waste, it is deliberately misleading to delete the contribution of Y-90 of 250 Ci and report only half of the actual radioactivity present in the container, which is 510 Ci. Besides, the Y-90 was included in the FEIS Volume II, Page E-4, which shows 5.1×10^2 Ci/canister. The deletion masks the 12-fold reduction of radioactivity in each container. Please explain the difference.

23. Page B-19, Table B.2.13. The table lists the initial CH-TRU inventory. A similar table should be provided with the initial inventory for RH-TRU, which would include fission products and activation products.

APPENDIX C

EEG has had a number of critical comments on the adequacy of the emergency response program and has transmitted these concerns to DOE in a June 21, 1989, letter from the Director of EEG to the WIPP Project Manager. Hence, those concerns will not be duplicated here with the expectation that they will be addressed in the Final SEIS.

1. Page C-7, Emergency Response Scenario. There are a number of unrealistic conditions portrayed in the emergency response scenario. It is unlikely that any state's police officer would have the expertise to verify that radiation levels were at normal background levels even if he did have the correct instrumentation. Radiochemical analyses of soil samples would be required if the goal was to return the accident area to background levels as is inferred.

APPENDIX D

1. Page D-10 and 11. The text indicates that all applicable U.S. DOT regulations, with respect to "preferred routes," have been implemented. They have not.

The definition of preferred route in the context of U.S. Department of Transportation regulations is incorrect and fails to acknowledge the May 8, 1988, revision of the U.S. Department of Transportation regulations, 49 CFR 177.825, requiring a state to formally notify DOT when it has completed the procedures. Such notification has not occurred and the text should make this clear.

The first 42 pages of this appendix cover routes to WIPP in considerable detail. This is useful information, and only a few minor discrepancies were noted.

<u>Incident Free Transportation</u>

1. Page D-47, Table D.3.2. Footnote B shows that the 0.80 factor, erroneously used throughout the SEIS, is used in calculating the number of shipments. See our comments in the Summary Chapter. However, we believe it would be appropriate to use a factor to allow for the likelihood that TRUPACT shipments from some generators will be weight-limited. For example, they will not be able to carry 14 drums and stay within permitted trailer weight limits. This is because the average payload of the three TRUPACTS on a trailer is now down to about 5,300 pounds per TRUPACT (380 pounds per drum), and there have been predictions that RFP wastes will average about 600 pounds/drum after the supercompactor is operational in 1990.

2. Page D-48, Table D.3.3. This table is very useful

because it gives the average radionuclide distribution and concentration for each generator. It also points out that any use of RFP wastes as a typical or average waste is incorrect and misleading. The SEIS uses an average RFP trailer-load for the "bounding" transportation accident. The average trailer-load is 183 PE-Ci, 6.5 times the RFP average. The SRP wastes, which comprise 11.9% of all shipments, average 1,787 PE-Ci, 63.8 times the RFP average. It is noted that the values in this table should be calculable from Tables 13.2.1, D.3.1, and D.3.2, but they are not consistent even with the 0.8 factor.

3. Page D-53, Table D.3.7. The stop time (hr/km) for trucks seems unreasonably high. For example, on the LANL to WIPP route, the vehicle would have 7.02 hours of driving time and 6.07 hours of stops.

4. Pages D-50 to D-57, Tables D.3.5 to D.3.10. We have spot-checked the dose values presented in Tables D.3.8 - D.3.10 by non-RADTRAN methodology and believe they are reasonable. See additional comments on Chapter 5 in the significance of these doses. However, in Table D.3.10, we note that the differences between the proposed action and alternative action apparently do not assume RFP waste will be transported to INEL with the alternative action scenario. If they were, the approximately 1,270 (or 1,590 with 0.8 factor) shipments during five years would result in about 100 - 130 additional person-rem, compared to direct shipment.

5. Page D-57 and Table D.3.14. The claim that the "...hypothetical maximum exposure to an individual from incident-free transportation during Test Phase and Disposal Phase is only 1.6 millirems over 25 years..." is unreasonably low. This value would be approximately correct for a resident at a 100-foot distance from a roadway where trucks

were stopped for 30 seconds each. However, there are locations along the route where residences are within 50 feet of the roadway, and this would lead to doses of about 6 mrem.

But the above assumptions are not reasonable for the maximum exposed individual. For example:

A. A person in the adjoining traffic lane for one 30-minute period during the entire lifetime of WIPP would receive a dose of 2.6 mrem from an average ORNL CH-TRU load and 3.1 mrem from a Hanford RH-TRU shipment.

B. An employee at a restaurant who is exposed to 10% of all trucks stopped for 45 minutes each from a distance of 100 feet would receive about 14 mrem. If this person were exposed to 5% of trucks at a distance of 50 feet, the 25-year dose would be about 26 mrem.

C. A service station attendant who refuels 10% of all trucks and spends two minutes each time at a distance of 10 feet from the center of the truck would receive almost 110 mrem over the 25 years.

D. A guard at the entry to the WIPP site (who is not a "member of the public") who observed one-half of all shipments being checked for contamination (the present procedure takes over 15 minutes) at a distance of 25 feet would receive about 450 mrem.

None of the above assumptions are incredible or bounding. They are likely to happen. The SEIS should not try to trivialize the maximum individual doses by presenting non-conservative dose estimates.

Transportation Accidents

1. Page D-57, Severity Categories. The claim that 99.5% of truck and 99.6% of rail accidents are less severe than regulatory criteria is not consistent with other statements and the calculations presented in this section. For example, the statement is made on Page D-68 that Severity Category III slightly exceeds the regulatory limits and Tables D.3.15 and D.3.16 (which are used in the calculations) show that 9% of truck and 20% of rail accidents are Category III or higher.

2. Page D-73, Table D.3.19. EEG believes the Total Respirable Release Fraction (TRRF) values given for the various Severity Categories are conservative. In fact, they are more conservative than the values used in EEG-33 for a doubly contained, non-vented TRUPACT, except for the Category VIII accident.

3. Page D-79, Resuspension. We do not agree with the assumption that governmental authorities will impound foodstuffs and clean up contaminated land to the level necessary to result in zero dose from ingestion. The RADTRAN III model can calculate ingestion doses, and it should be used here.

4. Pages D-79 to D-86, Accidental Risk Results. We have checked portions of the risk results and believe that the total values are reasonable and conservative. Also, we agree that the probabilistic method of calculating the "expected" radiation doses from accidents is appropriate. However, presenting the results only in a probabilistic manner hides much of the impact from a non-technical or casual technical reader.

For example, the total number of accidents expected was not found in either Volume 1 or 2. One can calculate a value of 78 accidents with wastes and an equal number without wastes. Also, one can calculate a prediction of 7.0 accidents where radioactive material is released, and 4.8 of these would be in urban or suburban areas.

Route specific totals could also be calculated. For example, LANL shipments would lead to 1.64 accidents, 0.19 deaths, and 1.19 injuries. The expected number of release accidents would be 0.15, and about 40% of these would be in suburban areas. If 40% of the suburban accidents occurred in Santa Fe, there would be about a 2.3% probability of a release occurring.

Accident results should be presented in a form where laymen can get a feel for the number and severity of release accidents that may occur along routes where they live. Another statistic that would be informative to laymen is that in the section of the route between Vaughn and Carlsbad (which carries about 91% of all WIPP vehicles) on Highway 285, there would be about a 3.4% probability of an accident occurring along each mile of roadway. There would be about 0.3% probability of a release accident per mile.

Bounding Transportation Accident

EEG does not believe the "bounding case" transportation accident is bounding. Our reason is principally due to the choice of a typical RFP waste trailer load. The average RFP trailer would carry only 28 Plutonium Equivalent Curies (PE-Ci). The averages, concentrations, and percentages of shipments from major generating sites are:

SITE	AVERAGE TRAILER (PE-Ci)	PERCENTAGE OF CH-TRU SHIPMENTS
RFP	28.	32.8

SRP	1787.	11.9
LANL	583.	10.3
LLNL	231.	4.2
Hanford	67.	13.0
INEL	61.	23.5
ORNL	338.	1.1
CH-TRU Average	183.	100

We believe that a "bounding case" should include the average SRP waste, which comprises about 12% of the total CH-TRU shipments.

Otherwise, the values assumed for parameters are conservative. The 2E-4 fractional release rate is twice that used by EEG for a Severity Category VII accident.

Consequently, the "EEG Bounding Accident" would be a release fraction of 0.5 times the SEIS release value, and a PE-Ci load of 63.8 times. This would result in a population dose of 35,800 person-rem. The estimated latent cancer fatalities (LCF) would be 10.0.

The probability of the "EEG Bounding Accident" can be calculated from data in Appendix D. The probability is about 0.1% (1E-3), certainly not incredible.

There are other probabilities that can be determined from those data and assumptions. The total probability of having an accident that leads to greater than 1.0 LCF (>3,570 person-rem) is 2.5×10^{-3} from the SRP, LANL, LLNL, and ORNL routes. The total probability of having an accident that leads to 0.75 - 1.0 LCF is 3.7×10^{-3} from the Hanford, INEL, and ORNL (suburban) routes.

The SEIS should clearly present some of these doses and probabilities so that the reviewer understands you are predicting a fairly high possibility of accidents leading to latent cancer fatalities.

Nonradiological and Nonchemical Consequences

There is only one basic comment on this section (and related portions of Volume 1). The differences in projected deaths from shipments by truck (8.3) vis a vis rail (3.0) is significant. Likewise, the expected injuries are 106 by truck and 34 by rail. These are the most significant health and safety impacts predicted anywhere in the SEIS. Yet, there is no discussion of why the truck mode is being chosen and why this difference of 5.3 deaths and 72 injuries is considered negligible. Also, if all RFP wastes for the first five years were shipped to INEL for storage (and then to WIPP later), this would be expected to add about 0.3 - 0.4 accidental deaths by truck (compared to the proposed plan). Yet, Table D.4.8 shows 0.11 less deaths for the alternative plan (RFP + INEL shipments) than the compared plan values in Table D.4.6. Why?

APPENDIX E

1. Page E-5. Appendix D should read "E".

2. Page E-18, Hole NG252. It is stated that hole NG252 appears to be an anomaly because of its substantially higher rate of brine flow than other comparable holes distant and nearby. How can a real observation and measurement be considered an anomaly?

3. Page E-49 to 54, WIPP Brine Flow Model. References are made to a significant number of citations ...36, 37, 25, 40, Figure 1, Appendix A, Sec 4.3.4 which are either not identified in the SEIS, or are not referred to in the discussion. This information should be included in the SEIS.

4. Page E-55 and 59, WIPP Moisture Release Data. References are made to citations, 30, 25, 26, 29, Table 1, Table 2, Figure 2, which are also not identified in the SEIS as they should be. It appears that the brine flow and moisture release information in the SEIS were taken from another publication(s) where the citations appeared. The references for these documents should also be included in the SEIS if they were not referenced in the missing citations.

5. Page E-57, Equation(8). Shouldn't the parameter listed as 10E14 be listed as 10E-14?

APPENDIX F

1. Page F-2, Stack Effluent Modeling. It should be explained how a stack which exhausts gases and particulates at an acute angle to the horizontal and shrouded to force exit in one direction can be made to fit Rupp's Equation for estimating effective stack height. The resulting effective stack height from the use of this equation is probably not valid. Since it probably affects the shape of the exhaust plume as well, the use of the equation without modification should be verified in the SEIS.

2. Page F-2, Dispersion Modeling. The use of a constant scavenging coefficient is probably not conservative. Precipitation scavenging is about 10 times more efficient than dry deposition mechanisms in removing particulates from the atmosphere and varies with the amount of precipitation. Scavenging should be coupled to precipitation pattern at the site with other parameters such as wind direction and velocity. Precipitation varies both temporally and in amount throughout the year at WIPP with most of the precipitation occurring during the growing season. Where precipitation is more evenly distributed and in larger amounts than occur at WIPP, the assumption may have more validity. If this assumption is to be used for performance assessment, then it should be verified with models which take the stochastic and temporal characteristics of precipitation events at the site into consideration. It does not appear to be a valid assumption at WIPP.

In the case of accidental releases, the occurrence of an accident during an intense precipitation event (or scavenging) should not be discounted as indicated in the SEIS. In fact the probablity of a serious accident is increased by bad weather conditions which limit visibility and affect road conditions. A scenario of this type should be included in the SEIS as a credible event.

3. Page F-2, Terrestrial Modeling. What is the scientific basis for using 12.5 years (one-half the repository life) as the period of long-term buildup of radioactivity on the soil surface. How does the life of the facility enter into the determination of this process. Why isn't the build-up process modeled?

4. Page F-3, Dose Modeling. The terms "exponential transfer" and "decaying exponential functions" are not used properly when modeling ingestion. The transfer is governed by exponential functions, not exponential transport. Retention of nuclides in organs is represented by exponential functions with negative exponents, not decaying exponential functions.

5. Page F-4, Table F.1, Meteorological Data. It is not clear from the footnote "Categories A-D are not utilized in AIRDOS-EPA Code" how the frequencies for the individual stability classes are adjusted for in the model, unless one stability class is being used in the simulation. The adjustment of frequencies other than A-D should be explained in the SEIS.

6. Page F-8, Table F.5, Stack Information. Are the reported values actual stack heights? If so, then "effective stack heights" should also be included in the Table as estimated from the use of the Rupp equation. How is the correction made for the angular and directional release of the exhaust stack from the repository? Is it valid to apply Rupp's equation to stack(s) in question? If so, please document how this adjustment is made.

7. Page F-9, Table F.6, Terrestrial Modeling Assumptions. How was the build-up time of 4,562.5 days for surface deposition obtained? What is the scientific basis for this determination? Why is the resuspension rate of particulate matter from both soils and plants not taken into account in the model? Also, why have potential contamination pathways involving erosion events (saltation-creep, rainsplash) been ignored in the model since they are important processes in arid sites? Why is it that physical removal of particulates (weathering) from plant surfaces was considered without including these other important processes?

Were the reported biomass densities of forage crops fresh weight or dry weight? In either case, the reported value appears high by a factor of 2-3 above the forage biomass values existing at the site. These larger biomass densities would tend to decrease radionuclide intakes because of tissue dilution of surficial contamination and lower resuspension rates with increasing biomass density and crown cover.

Why is a value of 15.6 kg/day utilized as a consumption rate in lieu of the NRC-reported value of 12.5 kg/day for cattle? A lag period from slaughter of beef to consumption of meat by humans (20 days) is used in the model although it is not that important for transuranics. However, it is not clear whether a similar and more important lag between grazing and slaughter has been incorporated in the model. The build-up of radionuclides in beef tissue during this period is significant, and it is not clear whether this period of radionuclide ingrowth in these tissues has been taken into consideration in making dose calculations. If not, then the total amount of radioactivity ingested by humans from this pathway would be underestimated and incorrect. More documentation of this process is required in the SEIS.

8. Page F-19, C2: Drum Drop From a Forklift. The use of the average radionuclide content of a drum (12.9 PE-Ci) is not conservative, even though other parameters may have been conservatively assumed. The maximum allowed content (1000 PE-Ci) would have been the most conservative approach, while a value at the 99% c.l. of the activity distribution would have been more realistic in bounding the release. Also, reference is made to the draft FSAR for more specific information concerning this scenario, yet the description is identical to the SEIS; hence no new needed information for evaluation of this scenario is available. Also, the time of exposure of the worker that is 20 feet away is not included in the SEIS (or FSAR) which does not allow straightforward verification of dose calculations in this case. It is not clear what type of exposure would be received by the forklift operator if he became immersed in the cloud. Furthermore, if the operator removed the forklift from the punctured drum before he left the scene, then the activity from the punctured drum would probably reach him before he could shut down the forklift and take flight. This scenario is not conceptually well established as it now stands and needs more study. Finally, what is the scientific basis for the contamination dispersal rate used in these calculations?

9. Page F-22, Hoist Cage Drop. The annual probability of a catastrophic accident is given as 1.7×10^{-8} and concludes that such an accident is not credible. Over a 30-year operational life of WIPP, that becomes 0.51×10^{-6}. EEG has never agreed with the assumptions and calculations used by DOE and still believes such an accident is sufficiently credible to warrant the calculation of the consequences which would require a higher QA classification system than the one used in the hoist system.

The assumption by DOE that faulty maintenance would be negligible as a contributing factor to a potential accident was found to be incorrect when workmen installed a valve backwards in the waste hoist system. Similarly, excluding human error as a contributing factor to a potential accident was found incorrect when the wrong valve was purchased and installed. The assumption that a poor design could not contribute may now be considered unreasonable based on the recent defects found in one of the three main bearings on the hoist shaft. Our position has been expressed in letters to the WIPP Project Manager dated May 15, 1985, October 8, 1985 and April 8, 1986.

EEG is aware that our request in 1980 to address the consequences of a fire in the mine was rejected by DOE on the basis that it was an incredible event. Earlier this month, there was a fire in an instrumentation panel in the mine.

10. Page F-23, Fire Within A Drum Underground. What criteria were used in estimating that 80% of the heated aerosol was deposited on the walls of the repository before leaving in the exhaust stream?

11. Page F-24, R5: Hoist Drop With a Canister of RH Waste. The premise for not including this scenario as a credible accident is the same as C8, and is submitted without proof or evidence in support of the assumption. This information should be provided in the SEIS.

APPENDIX G

1. Page G-4, Summary. The formula for methylene chloride is CH_2Cl_2, not Ch_2Cl_2.

2. Page G-4, 5, Fate and Transport. Reference is made to biodegradation of CH_2Cl_2 occurring both aerobically and anaerobically. A reference or documentation to this effect should be included in the SEIS.

3. Page G-8, Health Effects. Reference is made to an LC50 for rats of 14,000 mg/kg. It appears that LC50 has been confused with an oral LD50; otherwise what do the units refer to in terms of concentration?

4. Page G-24, Long Term Risk Estimation for Non-Carcinogens, Routine Operations. The basis for excluding non-carcinogens if they are present in amounts less than 1% by weight is not clear. Since the reference cited is not readily available (Rockwell, 1985), a summary or explanation of its contents should be included in the SEIS. Also, in equation G-4, the term "Ri" and RLi" appear to reference the same variable. What is the correct usage? If Li is a variable, then it should be defined in the SEIS.

5. Page G-24, 25, Risks Associated With Accident Scenarios. What does the phrase "...to the only occupational population" mean? Also, what is the meaning of "residential exposure," and how does the assumption of filtration validate that the latter are assumed to be excluded from exposure? Does the filtration system also "filter" out VOC's? How does dilution exclude persons from exposure?

APPENDIX H

1. Page H-6. In the section on EEG, add the sentence "EEG has published 40 major reports on their investigation and analyses." That is far more significant than the number of quarterly meetings between DOE and EEG, which appears to trivialize the 11 years of work.

APPENDIX I

In general the SEIS provides information in the form of Tables and Figures which are quite useful for verification purposes. However, in many cases involving dose calculations, some of the assumed parameters are either not present in the SEIS, or must be searched for in an unspecified location in the two volumes. Furthermore, there usually isn't any citation as to where these parameters may be located. This makes it difficult, if not impossible, to verify some of the SEIS dose estimates for a reader that is not familiar with secondary sources which provide this information. This has lead to the use of more than one value in the SEIS for a given parameter and to units for these parameters which give incorrect dimensional analysis in the document itself. Therefore, it is imperative that the assumed values for parameters be presented in the SEIS at each location where doses are being estimated. In addition, many of the parameter estimates are "assumed values" and are presented without any validation of their worth to the reader. All assumed values should be more fully justified in the SEIS to give them more credibility.

Several other problems arise with respect to pathway analyses notwithstanding those already discussed. A major problem is the reliance on established source codes to the extent that flexibility or site-specific alternative pathways or processes of importance to the WIPP site may be excluded. The rationale given in some instances is that many of these processes are not significant and, therefore, are not worthy of analysis. However, the analysis upon which these conclusions are based may be flawed, and have not been validated or proved. Investigators who utilize established codes are not exempt from using realistic input parameters and from incorporating site-specific information if necessary. An example is the use of the Rupp equation for determining effective stack heights of the two underground exhaust stacks at WIPP: the existing configuration is probably not amenable to this type of analysis, yet it is still utilized in the SEIS for this purpose. Another example concerns the climatology of the WIPP environment: erosion events which may significantly contribute to the atmospheric transport of contaminants to man are ignored because they are not readily incorporated into the codes being used in the analyses. The SEIS is silent on these issues.

There also appears to be a generalized carelessness with respect to the assemblage of transport pathways of contaminants, particularly those involving the food chain. Some of the large discrepancies in dose estimates have been caused by the failure of the SEIS to properly estimate steady-state concentrations of contaminants in soils as a result of air deposition events, and by not accounting for ingrowth of contaminant concentrations in beef tissue beyond one day. These oversights should be addressed in the SEIS.

SPECIFIC COMMENTS

1. Page I-5, top. Arrival times at points of interest for cases 1A and 1B "were determined by the times at which the discharge rates rose to 10^{-18} Ci/day." This extremely low activity represents material discharged per day having an activity of only about <u>one</u> disintegration per <u>year</u>! This represents the extreme leading edge of a distributed nuclide and <u>effective</u> arrival times are <u>longer</u> than stated.

2. Page I-7, The Swift II Groundwater Transport Code, Influence Functions. Figure 1.1.2.1 referred to in the text

is missing, it should be Figure 1.1.1.

3. Page I-13, Table 1.1.3.1, Maximum Dose Received by a Member of the Drilling Crew. Plutonium-239 is cited twice in the Table. Does the first citation refer to Pu-238?

4. Page I-14, Table 1.1.3.2, Radionuclide Concentrations in Dried Mud Pit. Not enough information was presented in the SEIS to reproduce the values in this Table. They were reproduced by using the assumptions presented in SAND 89-0462 (p. 5-9) which was not cited for this purpose. The use of "drum equivalents" for TRU activities is nowhere mentioned in this section (we could not find it in the entire SEIS), yet it is not possible to estimate the values without it. Also, other assumptions: percent solid in mud(50%), density of dried mud (1.4 g/cc) were also found in SAND 89-0462. Curiously, the density of the mud for plume dispersion is given as 2.0 g/cc which is inconsistent. The SEIS should settle on one value for both calculations and "stick" to it.

5. Page I-15, Table 1.1.3.3, Air Concentrations And Deposition Fluxes. The values of Ci/M3 in this Table appear to be about 20+% too low based on eq.(I-37) unless drum equivalent activities are being used. Our calculation is summarized below.

Assumptions:

Mud Density = 2.0 g/cc (p)
Wind Velocity = 3.7 m/s (U)
Resuspension Rate = 5.065E-12 (1/s)
Distance Downwind = 500 M (d)
Plume Vertical Standard Deviation = 40.92 m (Tz)
Plume Lateral Standard Deviation = 57.68 m (Ty)
Depth of Resuspension Layer = 1 cm (do)
Area of Mud Surface = 46.45 m2 (A)
  (taken from Pb plume, Page I-29)
Mud Activity = 1.54E-8 Ci/g (CS) for Pu-239
Source Strength = 1e04*p*do*A*K*CS, Ci/s (Q)
Air Concentration = 2*Q/2.51*3*Ty*Tz*U

```
              = (2*2*1*46.45*5.065E-12*1.54E8*1e04)/
                (2.51*3*57.68*40.92*3.7)
              = 2.2E-18 Ci/m3 (X)
                (reported value = 1.68E-18 Ci/m3)
```

Assuming a density of 1.4 g/cc yields X = 1.54 E-18 Ci/m3 for this parameter, however, recalculation of Ty and Tz:

Ty = 0.11*d/(1+1E-4*d)1/2 = 53.67 m,
Tz = 0.08*d/(1+2E-4*d)1/2 = 36.36 m, which yields a value of:
X = 1.86E-18 Ci/m3.

The FEIS reports a pit area of 66.9 m2 for resuspension of radionuclides and 46.45 m2 is reported for resuspension of Pb from the same mud pit in the SEIS, a factor of 1.4 difference for these estimates. Why do the areas vary? Which one was used in obtaining the reported values? If the higher value was used, then greater disagreement in estimates arises.

6. Page I-16, Table 1.1.3.4, Steady State Soil Concentrations. The steady state soil concentrations as reported in Table I.1.3.4 appear to be very low estimates based on steady state approximation. Our calculation used the following assumptions from SAND89-0462, Page 7-9:

```
Plow Layer Thickness = 0.2 m (plt)
Soil Density = 1.4e03 Kg/m3  (p)
Sink Loss Rate = 1.1E-4 /d  (lr)
Deposition Rate = 1.68E-20 Ci/m2-s
                = 1.452E-15 Ci/m2-day (I)
Soil Radionuclide Buildup as a Function of Time, Days, QA(t),
  Ci/m2 = (I/lr)*(1-exp(-lr*t), for t=100 years and negligible
    radioactive decay.
  = (1.45E-15/1.1E-4)*(1-exp(-1.1E-4*100*365))
  = (1.32E-11)*(1-.018)
  = 1.3E-11 Ci/m2
Mass of Soil = plt*1*p
             = 0.2*1*1.4e03
             = 280kg/m2
Pu-239 Concentration, Ci/kg Soil = 1.3E-11/280
                                 = 4.64E-14 Ci/kg
```

The reported value = 5.17E-18 Ci/kg, is a factor of 8,975 too low. The details of how this estimate was derived is not included in the SEIS, therefore, it is not possible to compare analytical strategies. Since the relationship between soil concentrations and rem doses is linear, then those contributed from beef, milk, vegetables, and root crops are also underestimated by almost four orders of magnitude. However, other factors also contribute further in underestimating these pathways.

7. Page I-18, Exposure From Stock Well Water. A reference to Table 5.7 should be to Table 5.59. The former refers to annual cumulative exposures from RH-TRU waste, whereas, the latter refers to stock well water concentrations at 1,000 years.

8. Page I-19 to 21, Soil-Plant-Beef Pathway Analysis Using Pu-239 as an Example. The following assumptions were used:

Soil Specific Activity = 5.18E-18 Ci/kg (CPu)
Soil-Plant Transfer Factor = 1.4E-2 Kg-p/Kg-s (SPF)
Forage-Meat Transfer Factor = 1.0E-6 d/Kg-meat (FMF)
Forage Consumption Rate = 15 Kg-p/d (FCR)
Feeding Period to Slaughter = 200 days (FP)
Biological Half-Life = 64000 days (TB)

The concentration in beef after 1 day of feeding ,uCi/Kg-meat, (CBD) is estimated as:

CBD = CPu*SPF*FMF*FCR*1e06 uCi/Ci
= 1.0857E-18 uci/Kg-meat

The concentration in beef after 200 days, uCi/Kg-meat, (CB200D) is estimated as:

CB200D = (CBD/(.693/TB)*(1 - exp(-(.693/TB)*FP))

= (1.0E-13)*(.0022)
= 2.2E-16 uCi/Kg at

If one uses the concentration in beef after one day of feeding, then the committed dose after one-year consumption is estimated as 1.95E-15 mrem/50 year integration. The reported value (1.98E-15) agrees with this estimate quite well, however, it is a factor of 199 too low if the beef concentration at slaughter time (200 days) is used in the estimate, providing all other assumptions are correct. Previously it was determined that soil concentrations were a factor of 8,975 too low, hence an underestimate of as much as 1.82E6 are reported, and the rem dose would be 3.7E-09 mrem/50 year integration. Similarly, the dose contribution from milk, vegetables, and root crops would be a factor of 8,975 too low because of the higher soil radioactivity. The corresponding corrected values for milk, vegetables, and root crops would be 2.8E-13, 3.4E-8, and 1.4E-7 mrems/50 year integration period, respectively. These pathways would yield a total of 1.8E-7 mrems/50 years, whereas the reported dose total equals 1.96E-11 for this radionuclide or a factor of 9,183 too low. Assuming that this underestimate applies to all radionuclides, then the reported dose for these pathways (4.87E-10 mrem/50yr) would be increased to about 4.5E-07 mrem/50 years. Throughout this analysis it has been assumed that a 20cm plow layer has been used for beef cattle grazing such as on winter wheat. If cattle are grazing on open range, then the thickness of the radionuclides deposit is closer to 2cm or the Pu-239 concentration is a factor of ten higher than the corrected value or 4.64E-13 Ci/Kg. Assuming that cattle at the WIPP site consume one pound of soil/day from foraging in an arid environment, then the daily intake would be 2.1E-13 Ci/day from this source. The dose from this pathway alone would be 1.68E-8 mrem/50 year integration period or about 1.3E-8 mrem/50 year when adjusted for that present on vegetation surfaces.

Inclusion of this pathway in the total analysis would increase the dose to 4.6E-07 mrem/50 yr. These values are admittedly small when compared to doses resulting from inhalation, but are not as small as that reported. As commented earlier, the method of estimating deposition using a constant value may yield lower soil activity values than one which employs stochastic methods involving precipitation pattern and precipitation amounts. Also, the contribution of beef cow radionuclide uptake from inhalation and translocation to internal organs and tissues has been ignored in these calculations.

9. Page I-19 to 21, Inhalation Pathway for Humans. The reported dose from this pathway (5.4E-2 mrem/50 yr) compares well with our estimate (5.44E-2 mrem/50 yr).

10. Page I-20, 21, Stock Well Pathway Using Pu-239 as an Example and Case IIB. The values reported for Np-237, Pb-210, Pu-239, and Pu-240 are 1.0E06 too low (column 5); all other values for the rest of this column and for other columns are correct according to the assumptions used. The confusion comes from the use of the relationship presented in the footnote; Column H = FxGx365(days) where F is given in Ci/d, and G is given in rem/uCi, that is H must be multiplied by 1.0E06 to make the conversion to uCi/d before the terms can be multiplied. The conversions were made for all calculations except those noted.

Assumptions for Beef Cows:

Water Consumption Rate = 49 Kg/d (WCR)
Pu-239 Activity in Water = 6.66E-8 Ci/Kg (CWpu)
Water-Meat Conversion Factor = 5.0E-7 d/Kg (WMF)
Feeding Period to Slaughter = 200 days (FP)
Biological Half-Life = 64000 days (TB)

The concentration in beef after one day of drinking water, Ci/Kg-meat, (CBD) is estimated as:

CBD = CWPu*WCR*WMF*1.0e06 uCi/Ci
= 1.66E-6 uCi/Kg

The concentration in beef after 200 days, uCi/Kg-meat, (CB200D) is estimated as :

CB200D = (CBD/(.693/TB))*(1-exp(-(.693/TB)*FP))
= (1.53E-1)*(.0022)
= 3.4E-4 uCi/Kg-meat

The dose obtained when using the Pu-239 concentration in beef after one day of drinking water uptake agrees quite well with that reported (.224 mrem/50yr vs .225 mrem/50yr), however, the concentration after 200 days water consumption is 199 times greater. Therefore, the 50-year committed dose would be 46 mrem/50 yrs on this basis which alone exceeds the EPA Standard. Assuming that this analysis applies to all radionuclides in the water, then the following doses would be projected:

Case IA:	reported = 2.09E-4	corrected = .0425 mrem/50y
Case IIB:	= 72	= 14630
Case IIC:	= 129	= 26213
Case IID:	= .915	= 186

With the exception of Case IA, all cases exceed the standard on this basis.

11. Page I-22, Calculation For Chemical Exposure Pathways. It is not entirely clear why lead is selected as a representative toxic metal in lieu of others, such as cadmium, which may be more toxic, other than it is present in the

highest concentration. Some further explanation of other wastes, including organics, should be included in the SEIS to document or justify this "lead bounding" assumption further.

12. Page I-23, Modeling Assumptions For Calculating Lead Solubility in Culebra Groundwater. Why hasn't the possibility of chelation of metallic ions by organic compounds been considered in these calculations? Some of the compounds used for decontamination purposes are of this type.

13. Page I-27, Health Effects Associated With Stable Lead From Wind Dispersion. Because cattle consume significant quantities of soil, which is present on plant surfaces as a result of erosion processes (lbs/day), it may not be advisable to ignore lead consumption by animals through this pathway. Do any of the models employed incorporate this pathway? Also, why wasn't inhalation of lead contaminants taken into consideration from both ambient and resuspension pathways for these animals?

14. Page I-28, Calculation of Inhalation of Pb Containing Particulates. The variable (RV) is given in units mg/m3/day and m3/day. Dimensional analysis indicates that the latter set of units is applicable. Also, the conversion factor should probably be in mg/g rather than ug/mg for the same reason (although they are equivalent). Finally, the equation incorporating these variables should be:

$$Ir = (Cai)*(RV)*(Tai)*(A)/Wa$$

To obtain the correct units for Ir:

$$(g/m3)(m3/day)(mg/g)(1/kg) = mg/kg/day$$

The reported equation has the variable (A) incorrectly in the denominator. Were the calculations in the SEIS made with the reported equation?

15. Page I-29, Table 1.1.4.5, Calculation of the Ambient Lead Concentration at Receptor Site. The equation used for these calculations shows 2*pi rather than the square root of 2*pi as required (see equation I-37, Page I-14). However, the actual estimate does use the square root value in arriving at the average concentration estimate. This equation should be corrected.

16. Page I-32, Intake by Beef Cattle. The parameter "49.21" is assumed to be the variable (Qw) referenced in Table 1.1.4.5, however, the value reported is 49.0 l/day. Is there any significance to this inconsistency?

17. Page I-35, Waste Porosity. The void ratio, e = Vv/Vrs, is not clear. Is the term "Vrs" actually "Vs" defined as the solid volume? If not, then what is "rs"? Should not the equation be e = Vv/Vs?

18. Page I-25 to 33, Lead Pathway Analysis. The reported value for the concentration of Pb in the drilling mud (3.6E-5 g-Pb/g-mud) agrees with our estimate (3.602E-5 g/g) assuming a mud density (2g/cc), 22,000 gal (1.665E8 g), and 6 Kg of Pb in the mud overall. Two values of air concentration at the designated distance downwind (500 m) are obtained depending on the values of Ty and Tz. Using the reported values (Ty = 57.68 m, Tz = 40.92 m), a value of 5.15E-15 g/m3 is obtained which compares with the reported value (5.16E-15 g/m3) quite well. The value obtained when using the recalculated values of these parameters under the conditions specified (Ty = 53.67 m, Tz = 36.36 m) yields a slightly higher estimate (6.23E-15 g/g). The SEIS text is inaccurate because it confuses g/m3 with ug/m3 in several locations (Page I-27). Also, when radionuclides were being considered, a steady-state concentration of radionuclide

soil concentrations was used as a result of deposition at the receptor site (100 years). Why was only one year of Pb deposition utilized in these analyses assuming parallel exposure scenarios? The reported air deposition at the site after one year (1.63E-9 g/m2) compared with our estimate (1.62E-9 g/m2). However, assuming steady-state accumulation and a Pb loss rate from the plow layer equal to 1.1E-4, then a concentration of 1.45E-5 g/m2 results over a 100-year period as described earlier for radionuclides. Estimation of Pb concentration uptakes in mg/kg/day for beef cattle via this pathway is based on the following assumptions:

Soil Pb Concentration = 1.45E-5(g-Pb/m2)/280(Kg-s/m2)
= 5.2E-8 g/Kg (CPb)
Soil-Plant Transfer Factor = 0.1 Kg-p/Kg-s (SPF)
Forage-Meat Transfer Factor = 3.0E-4 d/Kg-meat (FMF)
Forage Consumption Rate = 15 Kg-p/d (FCR)
Feeding Period to Slaughter = 200 d (FP)
Biological Half-Time = 1460 d (TB)

The concentration in beef after one day of feeding, g/Kg-meat, CBD is estimated as:

CBD = CPb*SFP*FMF*FCR

CBD = CPb*SPF*FMF*FCR
= 2.3E-11 g/Kg-meat

The concentration in beef after 200 days, g/Kg-meat (CB200D) is estimated as:

CB200D = (CBD/(.693/TB)*(1 - exp(-(.693/TB)*FP))
= (4.85E-8)*(.091)
= 4.4E-09 g/Kg-meat

This analysis agrees with the statement in the SEIS that this pathway contributes an insignificant Pb burden to humans.

Pathway analysis on plant food consumption yields comparably low values as well, even after steady-state soil concentrations are reached.

The calculation involving the inhalation of Pb by humans is flawed in the following ways:

A. The relationship used is in error. The relationship requires the conversion factor 1000 mg/g to be in the numerator:

Ir = Ca(g/m3)*RV(m3/d)*Ta1*A(mg/g)/Wa(Kg)
= mg/Kg/day

B. The concentration employed is 5.16E-9 g/m3 which is 5.16E-9 ug/m3; thus, the value 5.16E-15 g/m3 is correct.

The calculation yields, (5.16E-15)(20)(.35)(1000)/70 = 5.16E-13, which yields the reported value by coincidence. In addition, there are two sets of units for RV.

19. Page I-30, Transport of Pb From Stock Water to Beef Cows. The reported concentration of Pb in stock well water (2.31 mg/l) was obtained from a 10 mg/l prediction of SWIFT-II allowing for lateral dispersion of 4.2 which gives an estimate of 2.38 mg/l from the ratio 10/4.2. The correction for dispersion was not mentioned in connection with radionuclide concentrations, and the SEIS should document that SWIFT-II does not make this correction in its operation. The following assumptions were used to predict the transport of Pb from well water to beef cattle:

Concentration of Pb in Well Water = 2.31 mg/l (CPbW)
Water Consumption Rate = 49 Kg/d (WCR)
Water-Meat Conversion Factor = 3.0E-4 d/Kg (WMF)
Feeding Period to Slaughter = 200 d (FP)

Biological Half-Life = 1460d (TB)

The concentration of Pb in beef after 1 day of drinking water, mg/Kg-meat (CBD) is estimated as:

CBD = CPbW*WCR*WMF
    = 0.034 mg/Kg-meat

The concentration in beef after 200 days, mg/Kg-meat (CB200D) is estimated as:

CB200D = (CBD/(.693/TB))*(1 - exp(-(.693/TB)*FP))
       = (71.6)*(0.091)
       = 6.48 mg/Kg-meat

The reported concentration is equal to that estimated using one day of drinking water. However, the concentration after 200 days of drinking is 191 times higher than that reported. Therefore, the daily intake of Pb by humans is 2.79E-3 mg/Kg/day instead of the reported value (1.46E-5 mg/Kg/day). The corrected hazard index (HI) is equal to 6.4 which indicates that the EPA Standard is exceeded in this scenario by this amount.

ATTACHMENT 1

Informal Analysis of WIPP Capacity for CH and RH Wastes
S. E. Logan, May 1989

Reference volumes used in calculations are as follows:

	m^3	ft^3	Drum Equivalents
55 Gallon Drum	0.208	7.35	1
Standard Waste Box	1.798	63.51	8.64
RH Canister	0.850	30.02	

WIPP "Capacity":

CH TRU	6.2E6
RH TRU	2.5E5

CH Waste

The capacity of a room is generally stated to be 6,000 drums. A review of the CH Criticality Safety Analysis report, shows that 6,750 drums can ideally be accommodated in a room if the slip sheet alignment tabs are oriented lengthwise in the room with alternate seven-packs staggered for close packing. This is essentially 15 drums wide, 150 drums long, and three tiers high. Allowing for some over packed drums and emplacement anomalies, the 6,000 value appears to be a reasonable average.

An array of Standard Waste Boxes (SWB) six boxes wide, average of 55 boxes long, and three tiers high, representing a total of 990 boxes, can be accomplished if half of the boxes are placed lengthwise and half are placed crosswise across the room width. However, if seven boxes are placed with the small dimension across the room by 50 boxes long, 1,050 boxes can be placed in a room using three tiers (700 boxes with two tiers). But, the CH Criticality Analysis is ambiguous about whether two tiers or three tiers will be used.

The capacity of a room becomes:

	Drums	Boxes	Drum Equivalents
Drums, maximal	6,750		
nominal	6,000		6,000
SWB, 3 tiers		1,050	9,072
2 tiers		700	6,048

The CH waste storage areas are calculated to be as follows:

	m^2
One room	920
One panel	11,664
Total, 8 panels	93,308
Central zone	20,382
Total	113,690

These areas include the effect of area loss to isolation plugs, except no isolation plugs are included for division of the central zone into two halves (division is indicated in the SEIS).

The multiplier for total capacity as compared to the capacity of one room is:

$$113,690/920 = 123.6$$

This assumes that the areal efficiency is the same throughout the CH storage area, although it has not been shown that drifts as narrow as 14 feet can accommodate seven-packs and SWB's with the same packing efficiency as in the 33 foot-wide rooms. Using the above multiplier, the WIPP capacity becomes:

	Number	Drum Equivalents	ft^3
<u>All</u> as drums	741,600	741,600	5.45E6
<u>All</u> as SWB, 2 tiers	86,520	747,533	5.49E6
3 tiers	129,780	1,121,299	8.24E6

The draft source term document (DOE, 1988) indicates that the projected division by volume between drums and the SWB is 65% in drums and 35% in the SWB (number of containers 94.2% and 5.8%, respectively).

Some calculations are needed at this point.

Let
D = number of drums
D_T = total number if <u>all</u> drums (741,600)
B = number of boxes
B_T = total number if <u>all</u> boxes (129,780 in 3 tiers, 86,520 in 2 tiers)
V_d = volume of drum, ft^3 (7.35)
V_b = volume of box, ft_3 (63.51)
C = total waste volume capacity of WIPP, ft^3

Then, for 65% by volume in drums, and 35% by volume in boxes:

$$DV_d = 0.65\ C \qquad (1)$$

$$BV_b = 0.35\ C \qquad (2)$$

$$DV_d + BV_d = C \qquad (3)$$

$$D/D_T + B/B_T = 1 \qquad (4)$$

Solving equations 1 through 4 for D, B, and C, the following results are obtained for numbers of drums and boxes, and WIPP waste volume capacity:

	Number	Drum Equivalents	ft^3
Drums	546,951	546,951	4.020E6
3 Tiers of Boxes	34,076	294,417	2.164E6
Total	581,027	841,368	6.184E6
Drums	483,741	483,741	3.555E6
2 Tiers of Boxes	30,115	260,194	1.912E6
Total	513,856	743,935	5.468E6

Note that here waste volume is taken to be container volume. On this basis, the WIPP has a capacity approximately equal to the generally stated 6.2E6 ft^3, providing at least 5.8% of the containers (35% of the volume) is emplaced in SWB's, and that all SWB's are placed three tiers high. If only two tiers of SWB's are used, the WIPP capacity is less than 5.5E6 ft^3 regardless of the drum/SWB mix. Adding isolation plugs in the central zone reduces storage area by approximately 600 m^2 or 0.5% of the total. This eliminates about 3,900 drum equivalents of storage space. This decreases the drum/3-tiers-of-SWB total from 841,368 drum equivalents by 3,900 to 837,468 drum equivalents (6.155×10^6 ft^3).

If we adjust the total waste volume slightly from 6.155×10^6 ft^3 to the "design" 6.2×10^6 ft^3 (a factor of 1.0073), it corresponds to adjusting the calculation basis of 6,000 drums/room up to 6,044 drums/room. The net WIPP capacity then becomes as follows:

	Number	Drum Equivalents	ft^3
Drums	548,361	548,361	4.03E6
3 Tiers of Boxes	34,164	295,176	2.17E6
Total	582,525	843,537	6.20E6

Recently, major DOE documents have emerged, notably the SEIS, that erroneously interpret the 6.2E6 ft^3 "waste capacity" of WIPP to be the volume of settled contents of containers instead of the volume of the containers themselves. Using an average "fullness" of 80%, this leads the SEIS to increase the number of drums by a factor of 1/0.80 = 1.25, which would increase the actual capacity of 843,537 drum equivalents (with 3-tier SWB component) to a fictitious 1.05 million drums (the SEIS uses 1.10 million). There simply is no space for the "extra" 256,463 drums!

RH Waste

The WIPP capacities for RH waste are generally stated as 250,000 ft^3 or 6,000 canisters. At 30 ft^3 per canister, the two values are not consistent. 250,000 ft^3 represents 8,300 canisters, and 6,000 canisters represents 180,000 ft^3. The planned nominal spacing is eight feet along CH storage walls. The total CH storage perimeter has been calculated to be 26,000 m, including the central zone between the two sets of panels. This would indicate a maximum number of horizontal RH storage holes, on 8-foot centers, of 10,663. Subtracting 672 to avoid interference at 336 corners and 100 for possible isolation plugs added in the central zone leaves a capacity, with full wall utilization, of 9,890, though some reports indicate the total requirement is for about 4,800. Looking at this another way, utilizing 8,300/9,890 = 84% of the available wall for RH would provide for 250,000 ft^3, 61% of the wall would provide for 6,000 canisters, and 49% of the wall would provide for an expected 4,800 canisters. If the central zone is not available for RH emplacement (can the hole boring and emplacement equipment operate in a 14-foot-wide drift?), the wall perimeter is reduced 29% to 18,439 m and the corresponding number of emplacement holes is limited to 7,562 - 416 = 7,146. This would accommodate 2.15E5 ft^3 of RH waste (will not accommodate 2.5E5 ft^3). Some of this potential RH storage wall perimeter may not be accessible after experimental emplacement of CH waste. If longer holes are bored to accept two or more RH canisters, additional wall perimeter becomes unavailable to avoid interference, but a net increase in emplacement can be obtained.

References

(DOE, 1988) "Radionuclide Source Terms for the Waste Isolation Pilot Plant," working draft report.

(DOE, 1989) "Draft Supplement Environmental Impact Statement," SEIS.