

**Response to Comments
On the
Draft Independent Peer Review
Of the U.S. Department of Energy
Sandia National Laboratories
Mixed Waste Landfill
July 9, 2001**

Responses to comments received on the Draft report are attached. Each response was prepared and agreed upon by the peer panel and is numbered for each set of comments. The responses are written in Aerial font and indented to set off the response from the comment. Comments are sequenced by date in the order that they were received. Comments were received via postal mail, e-mail, and at the public hearing on August 16, 2001. In most cases the comments were received in an electronic version and could be inserted directly into this document. Some, however, were hand written and were thus typed into this document. In a few cases, the comments had to be modified by change of font or reformatted to be included. Precautions were used to insure that no alteration of the texts occurred including grammar and spelling errors. The period of time made available for input to the final report was approximately five weeks and all comments were considered in the finalization of the report issued August 31, 2001.

**Comments on the Draft Independent Peer Review of the U.S. Department of Energy
Sandia National Laboratories' Mixed-Waste Landfill
Performed by WERC**

Ruth F. Weiner, Ph. D. (Chemistry)
7336 Lew Wallace NE
Albuquerque, NM 87109
July 23, 2001

Commenter's Qualifications:

Ph. D., Chemistry, The Johns Hopkins University, 1962 (B.S., M.S. Physics)
Atomic Energy Commission Postdoctoral Fellow
40 years teaching experience, teaching physics, physical chemistry, environmental
chemistry
Former chemistry department chair (Florida International University)
Former Dean of Environmental Studies (Western Washington University)
Retired from Sandia National Laboratories
Author of four environmental engineering textbooks and 105 technical publications

General Comments:

1. Citation of references in the document is uneven, and mostly inadequate. Section 6 is the closest to adequate in this respect, citing specific references to support contentions in several places. In several sections there are no references at all. If the review panel reviewed Sandia's documentation, reference should be made in each case to the particular document. In addition, information taken from elsewhere must always be referenced.

Response 1: The panel members have reviewed their references and consider the references as currently cited to be adequate for the purpose of locating documents necessary to support their statements. The panel members have made strong effort to cite references for all information taken from other sources. Many of the references were copied directly from other documents and were kept in the format as noted in the document from which the particular reference was identified. The comment above is so general that the panel members are unable to identify what additional references or what changes in references are requested. The general nature of the comment makes it difficult for the panel members to take additional action.

2. Apparently no attempt was made to look for experts beyond the faculty of either the University of New Mexico or New Mexico State University. A health physicist, or someone with similar expertise in dosimetry and dose reconstruction, should have been on the panel. The report demonstrates that such expertise was missing. If the

panel needed health expertise, a health physicist would have been at least as appropriate as a toxicologist, and might have given an accurate review of the occupational health concerns. Specific comments on this question, and on the apparent preconceived bias in some of the panel's comments are given in the more detailed sections that follow.

Response 2: No response necessary as this is a general comment with specifics provided elsewhere in the reviewer's comments.

3. One reviewer, the author of Section 5, did not appear to perform a review of Sandia's monitoring data – at least that's not what Section 5 indicates. The section does not reflect its title, because it does not discuss how well the landfill has prevented dispersal of its contents – the "performance" of the landfill. The reviewer's criticisms of Sandia and the mixed waste landfill go far beyond the stated purpose of the peer review: "to assess the historic performance of the Mixed-Waste Landfill (MWL) and its safety." The section contains unsupported, unjustified and misleading statements, and causes me to question this reviewer's (and thereby the panel's) objectivity. The agreement or disagreement of other panel members with this point of view is also not clear. Detailed critique is given below.

Response 3: No response necessary as this is a general comment with specifics provided elsewhere in the reviewer's comments.

4. Verbal assurance was given at at least one of the public meetings that the panel would not generate new data. However, modeling was done by the panel, and new data developed, and there is clearly not time in the arbitrary 30-day comment period for a commenter to obtain the model from Golder Associates and review the modeling. The modeling was well done; I know Mr. Bruce Baker and I am confident that he did a good job. My concern is that the model is not made available to commenters (as models used in DOE EISs are) and sufficient time is not allowed to obtain and review the modeling.

Response 4: The modeling process did not generate new data but rather it was used to evaluate existing data. For specific calculations made by the panel, WERC can make available this information upon request.

5. The panel does not correctly state the relationship between modeling and experimental data. A detailed comment to this effect is given below.

Response 5: No response necessary as this is a general comment with specifics provided elsewhere in the reviewer's comments.

6. The statements made about confirming Sandia's data indicate that the panel never consulted Sandia's internal quality assurance (QA) procedures. The QA procedures are not cited in the references. The panel's comments suggest complete ignorance of quality assurance. Confirmation by sending "round-robin" samples to several independent laboratories is often part of QA. The statements about confirmation would be valid only after the relevant QA plan and program had been found to be inadequate. Specific comments to this effect may be found below.

Response 6: Questions on QA were addressed by Sandia representatives during presentations at the March and May public meetings. The recommendation for a second laboratory to perform uranium isotopic activity ratios is reflective of the fact that only one sample round was performed using mass spectrometry.

7. The document should be signed by those who consent to its conclusions. If a reviewer disagrees, he or she should issue a signed minority report. The statements throughout that "one reviewer disagreed..." leave the reader confused as to whether this was always the same person or whether different people disagreed with different conclusions. There is no way of evaluating what the consensus is.

Response 7: The final report does contain an Agreement of Report Contents and is signed by all peer panel members. Additionally, the panel has spent considerable amount of effort in reconciling their interpretations of the information. A main change to the report is a rewording of Conclusion 6 in the Executive Summary that now reads:
... "The hazardous/radioactive waste should ultimately be excavated and stored in a licensed repository if human exposure and/or significant environmental damage become imminent. The panel recommends that retrieval and disposal of the contaminants must be evaluated as part of a comprehensive alternatives evaluation report."

The panel further makes the recommendation that ... "Sandia National Laboratories should proceed with a comprehensive report that evaluates the options of excavating the MWL in the near future, placing a cover on the MWL with retrieval at some future time, a permanent cover with no retrieval, maintaining current conditions, and possibly other alternatives. This study should clearly articulate the risks, costs, and impacts associated with the different alternatives and the different points in time that actions may take place."

8. I found the tone of the review somewhat grudging and mean-spirited. (e.g., page 55: "the assumption presented by the Baskaran report...although not unreasonable, is questionable.")

Response 8: No disrespect was intended. Throughout the peer review process, the panel conducted itself in a professional manner.

9. Perhaps because service on the panel was part of the panel members' faculty service, public meetings **with the panel** were held **only** during the normal working day (see Appendix C), making it impossible for someone who works during the day to attend. I did not fail to attend the panel's meetings out of lack of interest, but because I could not afford either the loss of workday time or the pay loss. At least one meeting should have been held in the evening or on a weekend day. Sandia and DOE routinely do this, and the Sandians and DOE staff who attend such meetings sometimes get compensatory time but sometimes do so on their own time.

Response 9: All meetings were advertised several weeks in advance of the actual meetings. No requests were received to change the meeting times. Of the four meetings held, two were scheduled in the evening, while two were held during the daytime.

Specific comments: only paragraphs on which I have comments are cited here, and only critical comments are given. Citations from the report are in regular type. My comments are in italics.

In its review of MWL information and in its deliberations during March and May 2001 the peer panel identified that much of the information presented was of high quality and the general approach taken by Sandia National Laboratories to evaluate the performance of the MWL is valid with conclusions drawn being reasonable.

What does "much" mean here? Either say it was of high quality with the exception of the following parts, or identify what was high quality. This is what I mean by "mean-spirited."

Response 10: The above comment refers to the summary part of the panel report. As part of this summary, the panel members were complimenting the Sandia National Laboratory on the fact that much of the information and the general approach were of high quality. To go into a detailed discussion of what parts were of high quality and what were the exceptions, would destroy the purpose of a summary. Additional comments in each of the sections clearly identify any exceptions and clearly note the high quality parts of the Sandia work. The panel sees little reason to add additional details into the summary sections of the report. However for clarification, the statement was changed as follows:

... "In its review of MWL information and in its deliberations during March and May 2001 the peer panel identified that the information presented was consistently of high quality and the general approach taken by Sandia

National Laboratories to evaluate the performance of the MWL is valid with conclusions drawn being reasonable.”

Although there appears to be anecdotal information that implies that excavation of the MWL at this time would be too dangerous for worker safety, there is no documentation on actual risks, costs, or impacts to support this assumption.

This statement is not only mean-spirited, but egregious. It displays ignorance of basic health physics, as-low-as-reasonably-achievable (ALARA) occupational health practice, Sandia's own occupational health and safety practices, and the use of dose calculations. Since the activity of what is in the landfill is documented, external dose rate (rem/hr) to any worker can readily be calculated. Moreover, the workers who landfilled the material wore dosimeters, so that the relationship between dose and curies landfilled was doubtless established. Even if this were not the case, the relationship between exposure and dose is the same for workers as for anyone else exposed, and it is this (linearly extrapolated) relationship that has led to the activist outcry about adverse public health effects for exposures that are orders of magnitude smaller than the relevant occupational exposures. In other words, if the panel takes the activists' concern about very brief exposure to nanocurie quantities seriously, they must take the much longer exposure to curie quantities seriously also.

Response 11: No disrespect was intended by this statement. DOE and Sandia specifically stated that no risk assessment had been performed for a retrieval scenario. Additionally, no comprehensive cost/risk/impact evaluation had been performed for any set of alternatives including ones that would protect worker safety during excavation. Those that would excavate the MWL would be radiation workers who are permitted a prescribed maximum annual radiation dose. On the other hand, ALARA is intended for the general population or in cases not covered by radiation worker definitions thus is not appropriately applied to the potential excavation of the MWL.

Additionally, there is no documentation as to when in the future such excavation might be appropriate.

Since Sandia had not envisioned future excavation, why should such documentation have existed? This statement reveals a preconceived bias of the panel.

Response 12: The peer panel considers it reasonable that DOE should evaluate alternatives in its decision making process and clearly points out the need for a comprehensive study to determine when to excavate if that is the final conclusion of the study.

The data pertaining to fate and transport of tritium from the MWL presented and reviewed in this report (specifically, the spatial and temporal distribution of sampled tritium activities), appear to be consistent with those expected given the inventory, regional meteorology, subsurface soil conditions, and hydrologic parameters.

Why hedge? Is it or isn't it consistent? What does "appear to be" mean?

Response 13: Based on the information presented, the word "appear" is a perfectly acceptable scientific word that expresses that there is not 100 percent certainty.

Future concentrations of tritium are not expected to increase but rather are expected to decrease over the next 10 years based on the natural decay of the tritium radionuclide. The MWL, to the knowledge of the reviewers, neither resulted in human exposure to contaminants nor has there been any significant environmental damage to date.

This is the panel's most significant and important conclusion.

Response 14: The panel agrees that these are important findings and, as such, included them in both the Executive Summary and Section 8.0 Summary Findings and Recommendations.

The peer panel believes that future retrieval of the contaminants must be evaluated to determine if it is the most appropriate risk-based decision.

"Must" requires justification, and none is presented.

Response 15: Evaluation of alternatives is a fundamental process for environmental decision-making.

One reviewer disagrees, and states that the hazardous/radioactive waste will (not may) ultimately need to be excavated and stored offsite at a licensed facility because of the potential for human exposure and significant environmental damage is certainly present and will persist into the foreseeable future.

I could not find any justification for this statement in the report. Since the half-life and emissions of tritium (the only nuclide that seems to have moved off-site) are well-known, the radioactive contents of the landfill are well known, the half-lives and dose conversion factors for these are documented in Federal Regulatory Guides 11 and 12, and presumably the panel, with the guidance of the Health Physics Handbook can make dose calculations, this statement strikes me as unsupportable. At the very least, the panel member in question should supply a dose calculation to support it, such as is required of every single Department of Energy risk assessment.

Response 16: The panel has spent considerable amount of effort in reconciling their interpretations of the information and are in agreement with the report's findings. As noted in an earlier response, a main change to the report is a rewording of Conclusion 6 in the Executive Summary that now reads:

. . . "The hazardous/radioactive waste should ultimately be excavated and stored in a licensed repository if human exposure and/or significant environmental damage become imminent. The panel recommends that retrieval and disposal of the contaminants must be evaluated as part of a comprehensive alternatives evaluation report." This site is not only regulated by DOE's internal orders but also by federal and State of New Mexico regulations under the Resource Conservation and Recovery Act (RCRA) with goals of providing long-term protection of human health and the environment. As such, an evaluation of alternatives, one of which would be retrieval, is appropriate.

Recommendations

Why are the Section 6 recommendations concerning risk assessment not included?

Response 17: The major conclusions and recommendations associated with the risk assessment evaluation are included in the Executive Summary and Section 8.0 Summary Findings and Recommendations. Minor comments are included in the body of the report that are important for DOE to also consider. This is true for all sections of the report.

Sandia National Laboratories should proceed with a comprehensive report that evaluates the options of excavating the MWL in the near future, placing a cap on the MWL with retrieval at some future time, a permanent cap with no retrieval, maintaining current conditions, and possibly other alternatives. This study should clearly articulate the risks, costs, and impacts associated with the different alternatives and the different points in time that actions may take place.

This recommendation is gratuitous. This is something Sandia is doing anyway – why not acknowledge it? Moreover, the charge to the panel did not include telling Sandia how to write its reports or what to put in them. The panel was charged with reviewing Sandia's data.

Response 18: This recommendation is made because this type of evaluation was not performed and no plans were identified by either DOE or Sandia National Laboratories to perform this type of evaluation.

Since tritium is the one contaminant detected in soil sampling that clearly originated from

the landfill, some additional explanation of the assumptions used in the risk assessment is needed for clarity, such as: For an industrial worker or for a resident, how much soil is estimated to be ingested? How much inhalation occurs? It would also be useful to include a table that lists exposure levels (i.e. soil ingestion, inhalation, dermal exposure, and plant uptake).

Apparently, excessively “conservative” though this recommendation is, it’s something Sandia is doing anyway. See preceding comment, please.

Response 19: A charge to the panel was to determine whether the risk assessments were written in a manner that was understandable. The final report requests that the ingestion values be incorporated into the risk assessment document for clarification.

Given the interest and concern of the public in Albuquerque and throughout New Mexico regarding the contaminants present in the MWL, Sandia National Laboratories risk assessments should be highly explanatory documents that outline how the human health and ecological risk assessments are conducted and what fundamental assumptions are used.

This assessment of “public concern” may be the result of the inability of working people to attend the panel’s public meetings. Did the panel poll the public to find out independently if this is a public concern? Or did the panel just take Citizen Action’s word for it? If the panel thought such claptrap would not offend anyone, let me assure you that it offends me. Please, it is not “the public” although that may be the term Sandia is forced to use. Citizen Action does not now and never has represented “the public”. If this panel is as unbiased as it claims to be, it should identify activist groups as activist groups. For myself, I very much resent being lumped with Citizen Action as someone with this kind of spurious trumped-up concern. On the other hand, I resent even more the implication that as a scientist I am somehow not a member of the public.

I would delete this entire recommendation. It goes well beyond the charge to the panel. Moreover, if the panel were going to comment on this, they should also have commented on the extensive public information and public participation effort that Sandia and DOE have carried out, with respect to the mixed waste landfill, during the past three years. Not a word is said about this effort. Considering the panel’s apparent ignorance of Sandia’s outreach effort, the panel has no business making this recommendation.

Response 20: The term “public” used in the original text was not intended to imply a Citizen Action group. As stated above, the charge to the panel and specifically to Dr. Walker, was to review the most recent risk assessment documents that were available to the public, determine whether the risk assessments were conducted properly, and whether the documents were written in a manner that was understandable. It was not the charge of the panel to review Sandia’s previous public information efforts. As stated above, Dr. Walker concluded that the risk assessments

were conducted properly; however, the risk assessment documents standing alone, although available to the public, would not be interpretable by them. Given that the risk assessment documents are an official part of the public record, those interested citizens that lack adequate scientific technical understanding should be provided the opportunity to read a summary of the risk assessments as concluded by Sandia National Laboratories at a level that they can understand. Dr. Walker has a degree in science journalism and expertise in technical writing and concluded that these documents could be written in a manner more understandable to the public.

To clarify this recommendation (Recommendation C), it has been rewritten as follows:

. . . “To provide adequate communication to the public, Sandia National Laboratories should provide an explanatory executive summary for the human health risk assessment and the environmental risk assessment documents. This information should describe the basic risk assessment processes that were used, the identified contaminants of concern, the uncertainties associated with them, and the basic conclusions reached from these processes. This information may already exist in the public information efforts previously conducted by Sandia; however, it is lacking from the risk assessment documents made available to the public.”

These documents should be written in manner to present the information to the lay public.

This recommendation may have struck the panel as “motherhood and apple pie” and therefore inoffensive. I find it offensive. The panel was not charged with reviewing Sandia’s or DOE’s public information efforts or editorial and publishing policy, is clearly ignorant of these efforts and policies, does not include an expert in technical writing, and has no business making this recommendation. Delete it.

Response 21: See Response 20 to the previous comment.

Although a recent round of analytical testing using mass spectrometry strongly suggests that the uranium level are those of the natural abundance of the element, a different laboratory should confirm this finding using similar analytical methods on a future round of groundwater sampling/testing.

Do you mean “the uranium level is...?”

Response 22: To be consistent in the report this has been changed to read . . . “ the uranium isotopic activity ratios . . . ”

*This recommendation indicates that the panel never bothered to acquaint itself with the quality assurance (QA) procedures and plan used by Sandia, or with the results of any QA audits. Proper QA, for which the auditing is done by an outside agency, makes this kind of endless confirmation unnecessary. Confirmation would be needed **only** after Sandia's QA plan and procedures would have been found wanting or inadequate, or after it had been determined that Sandia did not use good laboratory practice, or after an audit had uncovered the need for corrective action but no corrective action had been taken. The purpose of QA is to provide a consistent regular method of ensuring data quality. If the panel had wanted to perform such an audit, a trained QA auditor should have been included. (A note to the panel: I have served as a technical specialist on a number of QA audits of laboratories.)*

Response 23: After reviewing the information provided by DOE and Sandia National Laboratories on the uranium isotopic activity ratios and information provided in the Baskaran report, the panel suggested in March 2001 that a round of sampling scheduled to take place in April 2001 be analyzed by a more precise means using mass spectrometry. DOE and Sandia considered this to be a good approach to resolving this issue and performed the analysis by this means. The results strongly indicate that the uranium isotopes do reflect a natural abundance and that the MWL is not leaching uranium into the groundwater. The panel believes it is appropriate to perform the next scheduled sampling campaign using the mass spectrometry methodology by a different laboratory to validate this conclusion.

The Baskaran study is cited with respect to this recommendation, but Sandia's response to the Baskaran report is not cited. This is a serious oversight. The panel's report gives no indication at all that Sandia ever responded to the Baskaran report. The panel, if it is indeed unbiased, should give at least equal time and weight to Sandia's responses to Baskaran as to the Baskaran report.

Response 24: The panel had the opportunity to review over a 100 documents as part of this peer review process and it was not necessary to reference each one. While Sandia's response to the Baskaran report provided some clarification on the issue, it did not provide a strong argument. For this reason, the panel suggested a more precise means of analyzing the uranium isotopic activity ratios to support Sandia's conclusion. Sandia agreed.

Section 2.0

This entire section needs references to the specific Sandia documents cited, so that a reader can check and see if the documents are cited correctly. Such citation is standard

procedure in peer-reviewed publication, and was certainly standard procedure for National Research Council reports when I was on an NRC panel. In this respect, the panel has not followed good academic practice. The material in this section is largely a condensation and repetition of Appendix B. The Section should contain a more succinct summary and a reference to Appendix B.

Response 25: See Response 1.

Classified wastes are materials that are considered to have national security value and are not subject to public disclosure and are disposed in Pits 1 through 37, Pits SP-1 through SP-5.

Do you mean “national security?” Do you mean “disposed of?”

Response 26: Change has been made for . . . “national security”. The use of the word “of” is unnecessary.

Section 3.0

To evaluate each of these factors the following six criteria were used:

- 1) Validity of assumptions
- 2) Alternative interpretations
- 3) Uncertainty of results and consequences if wrong

What does “if wrong” mean? If the error band is incorrect? Uncertainty is uncertainty.

Response 27: The evaluation criterion “uncertainty of results and consequence if wrong” was used as a measure of understanding the uncertainty of conclusions drawn from analysis, modeling, etc., and the impact of those conclusions if the interpretation is wrong.

- 4) Appropriateness and limitations of methodology and procedures

Of course you mean “method” and not “methodology.”

Response 28: Methodology is intended.

- 5) Accuracy of calculations
- 6) Validity of calculations

The intent of the peer review was to assess the validity of the assumptions that were used by DOE to evaluate historic performance of the MWL and its safety. As stated earlier, an

engineering evaluation of the cap design itself was not a part of this peer review. Additionally, the peer review was not to assess the appropriateness of DOE's historic or existing waste disposal practices, nor future missions or uses at Sandia National Laboratories. The review conducted was a high-level analysis, focused on determining the reasonableness of conclusions reached by DOE. The intent of the review was not to reproduce the calculations and results of the reports used to evaluate the MWL.

How can you assess the accuracy and validity of calculations without reproducing at least some of them (which is actually what was done)? These statement should be edited to remove internal contradictions.

Are Sandia and DOE being referred to interchangeably in the entire report? Sandia works under contract to DOE. Either the landfill is constructed and managed by Sandia, or it is said to be constructed and managed by DOE. These references should be clear and consistent.

Response 29: Calculations were checked and in some cases simplified modeling was performed to check the information provided. The panel did not reproduce the extensive calculations, modeling, or quality assurance validation that was outside the scope of work for this peer panel. The peer panel's responsibility was to review the information available and determine if the work was professionally performed and conclusions drawn were reasonable.

DOE is the responsible agency for the Sandia site. Regardless of who operates the site, DOE is the owner, provides the funding, and has ultimate liability for work performed at the site. Therefore, it is correct to use DOE in this context throughout the report.

Section 4.0

Furthermore, tritium can be used to develop a simplified model of transport to support or dispute the sampled spatial distribution of contaminants with time based on its high mobility and pervasiveness in many forms (liquid and vapor phases).

*This statement is wrong. A model is **never** used to "support or dispute" experimental data; if the model's answers are different from the empirically obtained data, it's the model that's wrong, not the data. In science, confirmation is the other way round: experimental data confirms or invalidates models (e.g.: when Ernest Rutherford showed experimentally that alpha particles are deflected by the nucleus, his colleagues didn't say "your results are wrong" but changed the atomic model to the one we know today). Models are built from empirical data, not data from models. If the GoldSim model output is consistent with Sandia's data, that means it's a good model; if the output were inconsistent, it would mean that something about the model is wrong, not that the data are wrong.*

In fact, the discussion of discrepancies between model and measured results makes precisely this point (page 28, second paragraph) – that a discrepancy indicates that the model didn't take some transport mechanisms into account. In general, the discussion of Section 4 is very good.

Response 30: This sentence has been change to read . . . “Furthermore, tritium can be used to develop a simplified model of transport to explain the sampled spatial distribution of contaminants with time based on its high mobility and pervasiveness in many forms (liquid and vapor phases).”

Models are developed and validated with data; the most important use of any model is to predict as well as explain problems that parallel those used in validation. In this case, GoldSim®, a well-documented and validated model was used to explain the nature of tritium transport at the MWL. This is a perfectly good example of the usefulness of a model.

Tritium was used as the representative contaminant to model transport from the sources within the classified area pits (where most of the tritium was buried). The fate and transport of other radionuclides and nonradiological soil/water contaminants have not been considered in this analysis.

The last sentence contradicts the sentence that precedes it. In what sense is tritium representative of any other radionuclide in the landfill? Tritium is present either as a gas or most likely as tritiated water, and moves through the subsurface environment as water (liquid or vapor).

Response 31: Tritium does not represent other radionuclides; it was selected because it is the most mobile and is the only contaminant that was found outside the MWL. This is a common approach to sampling and modeling in the environmental sciences; e.g., *E-coli* is an indicator organism for many pathogens because of its abundance in fecal matter. Modeling a non-mobile contaminant does not make sense. The model indeed did not take certain transport mechanisms into account. This is explained in detailed in the review with reference to soil characteristics.

Section 5.0

*Despite its title, this section does **not** address the historical performance of the mixed waste landfill. “Performance” means how well the landfill has prevented dispersion of its contents in the environment. Performance is judged by monitoring records and their interpretation, which are barely mentioned in the section and not discussed. There is a lot of speculation about future events, a lot of discussion of the landfill's contents, a non-analytical discussion of waste removal and “storage,” but no analysis or discussion of*

the performance beyond what appears in other sections of the report (and not much of that).

Response 32: The panel agrees and has stated that historical information indicates that neither human exposure to contaminants nor any significant environmental damage has resulted from the MWL. Section 5.0 primarily focused on the future performance of the MWL.

However, given the highly hazardous nature of the inventory, the potential for human exposure and significant environmental damage is certainly present and will persist into the foreseeable future; therefore, the hazardous/radioactive waste will ultimately need to be excavated and stored offsite at a licensed facility.

There is no support for this statement anywhere in the section. A petroleum storage tank has a hazardous inventory (and by the way, “highly” is a completely unnecessary modifier here), as do a large bottle of aspirin, a fire extinguisher, a freezer full of dry ice, and a gallon bottle of bleach, just to name a few common examples.

*Justification for this statement might have been found in modeling the decay, chemical reactions, leaching, and transport of the materials in the landfill. The GoldSim model and an experienced modeler were apparently available to the panel, but were not used for this purpose. Without any evidence or information about **environmental transport**, stating that excavation is needed because the contents are hazardous is a non-sequitur.*

“Stored offsite in a licensed facility” begs the question. Why “offsite,” especially if the reviewer is so concerned that only a single fence separates the landfill from the rest of Kirtland AFB (“At this time, it is protected with a modest fence and very limited warning signs.”)? Where should this “offsite facility” be located? “Licensed” for what and by whom? How should the excavated material be transported, and by whom?

Any municipal waste landfill contains hazardous materials in considerably larger quantities than Sandia’s mixed waste landfill. Is the author of this section seriously suggesting excavating any landfill that contains hazardous materials? And what do you do with the stuff then?

The need for excavation and offsite storage is based on the reviewer’s current understanding of toxicology, environmental impact, and waste management technology.

I have no idea what the reviewer knows or doesn’t know. “The reviewer’s current understanding” hardly qualifies as a valid citation. Couldn’t “the reviewer’s current understanding” simply be the reviewer’s current biases?

Should these knowledge-base factors change dramatically, a different disposal solution may result.

*What does this mean? What are “knowledge-base factors?” Does it mean “should the reviewer change his mind and decide that he was mistaken after all” or something similar? Moreover, I certainly hope that the “disposal solution” (which was **not** part of the charge to the panel) doesn’t depend solely on this or any particular reviewer changing his mind. Maybe he means “should these knowledge-base factors change dramatically, I would recommend a different disposal solution” but he’s writing this, not me..*

The MWL is unlined and has no engineered protection at this time from water intrusion.

That’s what the monitoring is for, as the reviewer well knows – to determine if or if not more protection is needed. In fact, I would be happy to donate the heavy-gauge black plastic I just took up from my front yard as an infiltration barrier. This plastic was exceedingly effective in preventing any infiltration for 17 years, even though it had holes in it where we wanted the water to infiltrate. Maybe it’s different where the reviewer lives, but in Northeast Albuquerque where I live I work very hard to get water pouring out of a garden hose to infiltrate to a depth of 20 feet.

At this time, it is protected with a modest fence and very limited warning signs.

As the reviewer knows perfectly well, the landfill is inside the boundary of Kirtland Air Force Base, a well-fenced area whose access is completely protected by guard gates. This statement is deliberately misleading

The nature and amounts of hazardous and radioactive materials stored at the MWL site plus the location of the site next to a major, growing metropolitan city represents a long-term potential hazard to both humans and the environment.

And it’s been there for more than a quarter-century. Any noticeable effects from this “long-term” exposure to a “long-term potential hazard?” This is yet another gratuitous and unnecessary statement.

Both the chemical and most of the radionuclides have very long half-lives, thus unless excavated, this site will be a permanent legacy issue to DOE.

This supposedly expert reviewer ought to know that specific radioactivity is inversely proportional to half-life. U-238 has a half-life of 4.9 billion years and is ubiquitous; does that make it a “DOE legacy issue?” His statement, moreover, is another non-sequitur. Excavation neither shortens the half-life nor addresses any putative legacy issue.

The question of when this excavation and offsite storage should take place is beyond the scope of this report. As a first step in DOE’s development of its long-term stewardship plan, DOE should initiate a comprehensive study to investigate how best to excavate, when it is appropriate to excavate, and how to store the radioactive and hazardous waste from the MWL site.

*The reviewer apparently hopes that by repeating “offsite storage” often enough he will convince the reader that it is necessary. No justification is given for excavation, and **absolutely** no hint of justification for offsite storage is presented.*

The panel was not charged with addressing DOE’s stewardship plans. Had the panel chosen to do so, the entire panel should have addressed the stewardship issue, and should supply adequate referencing for their critiques. This kind of off-the-cuff dragging in of an extraneous issue is misleading. Moreover, it is uncomfortably reminiscent of standard anti-DOE mantras.

Response 33: The above comments concern a single paragraph in Section 5.0. The peer panel has reviewed this section and has spent considerable amount of effort in reconciling their interpretations of the information and is in agreement with its findings. The paragraph has been rewritten to reflect the agreement of the panel as follows:

“The MWL, to the knowledge of the panel, neither resulted in human exposure to contaminants nor resulted in any significant environmental damage. Continuation of monitoring at the site will be essential to determine if there is a potential for change in this status. The MWL is unlined and has no engineered protection at this time from water intrusion. Although located within a secure federally operated site, the actual MWL is protected with a modest fence and very limited warning signs. The nature and amounts of wastes stored at the MWL site plus the location of the site next to a major growing metropolitan city represents a potential hazard to both humans and the environment. If human exposure and/or environmental damage become imminent based on monitoring data, the hazardous/radioactive waste should ultimately be excavated and stored in a licensed repository. It is important to document the economic and environmental impacts associated with how best to excavate, when it is appropriate to excavate, and how to store the radioactive and hazardous waste from the MWL site if required at some future date.”

The cleanup experience at the DOE Hanford, Washington site has shown that such information is invaluable and will save significant future costs and efforts.

I am quite familiar with the Hanford waste sites. I took students on tours of Hanford from 1976 until 1993. If there is any documentation for the fact that compiling “relevant information” has saved Hanford money, I am not aware of it, and it is not presented here. The mixed waste landfill bears the same relationship to the Hanford waste sites that my kitchen trash can and its contents bear to the multi-state hazardous waste disposal site at Arlington, Oregon. This is another extraneous issue, meaningless in this report, that appears to be brought in only to activate an anti-DOE “hot button.”

Response 34: It is not the intent to indicate that Sandia's MWL is on the same scale as the DOE Hanford site problems. The intent is to indicate that a well-maintained and indexed library of documents is essential to the community and regulators to understand a site's problems and possible solutions. Providing a public repository for information does save time and money by providing a relatively simple process for people to review important documents. Section 8.0 further states that . . . "Much of this information is currently available in two public reading rooms in Albuquerque that are maintained by Sandia National Laboratories. The first is located at the University of New Mexico, Zimmerman Library, Government Information Department; and the second location is in an office building at 8338 B Comanche Road NE."

5.2 Performance Review

This portion of the WERC review addresses the short- and long-term performance of Sandia National Laboratories MWL. Sources of input include oral presentations on March 22-23 and May 11, 2001 by representatives from Sandia National Laboratories, DOE, New Mexico Environment Department, and Albuquerque Health Department, plus over a hundred documents provided to WERC. The comments are based on the reviewers' unbiased professional judgment

If I were this reviewer, I would delete the word "unbiased". Methinks the reviewer doth protest too much.

Response 35: To the best of the panel's abilities, the peer review was performed in an unbiased professional manner.

Section 5.3.1 to 5.3.8

An interesting point is that the MWL waste in general appears to meet the criteria for disposal at the WIPP site... though there may be some exceptions.

So what? What does the statement mean anyway? Where is the citation of WIPP criteria? In fact, the WIPP disposal criteria (from 40 CFR Part 194 and the WIPP Land Withdrawal Act) are (1) that it be transuranic waste – waste containing 100 nanocuries per gram (100 microcuries per kg) of elements heavier than uranium, (2) that it be defense waste, (3) that contact-handled waste have no more than 200 mrem/hr external surface dose, (that no more than 5% be remote-handled waste, which is very similar to high-level waste). The only criterion that the contents meet is (2) – it is "defense waste." One cannot apply Criterion (1) because the weight of transuranic-contaminated material in the landfill is not provided. However, the curie amount of transuranic elements shown in Table 1 for 1999 is 3.5 millicuries (3500 microcuries), and I am fairly sure the landfill

contains more than 35 kg of material ($3500\mu\text{Ci}/100\mu\text{Ci}/\text{kg} = 35 \text{ kg}$), so the material probably wouldn't meet Criterion (1).

The $3.5 \text{ mCi} = 1.1 \text{ mCi Pu-238} + 1.2 \text{ mCi Am-241} + 1.2 \text{ mCi Pu-239}$. U-238 and Th-232 are not transuranic isotopes.

Why make this vague and inaccurate statement? Why mislead the reader by bringing up the WIPP?

Most of the text of these subsections simply repeats what is in other parts of the report. The reviewer's putative points are unclear, as is whatever the reader is supposed to make of this repetition. As noted before, the Baskaran report is cited without any reference to Sandia's response to that report. This omission implies that Sandia made no response; certainly I would not know from this panel's review that a Sandia response existed. Such a skewed citation casts doubt on the panel's objectivity.

Response 36: Personal contacts with WIPP representatives indicated that a significant portion of the waste at the MWL would meet the WIPP disposal criteria.

The panel had the opportunity to review over 100 documents as part of this peer review process and it was not necessary to reference each one.

Section 5.9

The reviewer's calculations (or at least sample calculations) should be appended to the report.

Response 37: The panel provided calculations within the report where it was considered important.

Section 6.0

This is a well-written section. It is the best-referenced section of the report. The suggestions to Sandia are generally well-founded. Some specific comments:

- 1. When nothing is detected because the amount or concentration is below a detection limit, that does **not** mean that the value of the detection limit (or any fraction thereof) should be taken as the amount or concentration. A sample that is at or below the detection limit should be reported that way; i.e. "below detection" or "at or below the detection limit of the instrumentation," or words to that effect, and should **not** be included in any quantitative calculation of amount or concentration. "Below detection" is exactly that.*

Response 38: Commonly the detection limit value is used as the “actual” contaminant concentration when taking a conservative approach in risk assessment. According to the human risk assessment document for the MWL, “the 95th UCL of the mean concentration for 1,1,2,2-tetrachloroethane” was used to calculate excess cancer risk; however “out of 96 samples, only 1 had a positive detection of 1,1,2,2-tetrachloroethane.” If only one sample had a positive detection value, then how can a mean and 95th UCL be calculated? I assume that the detection limit was used as the contaminant concentration for the other 96 samples, but this requires clarification as requested in the final report.

2. *The TEDE limits are not set by Sandia.*

Response 39: The report is not asking who sets the limits, but requesting a clarification as to why the limits for occupational and residential exposure differ.

3. “Thus, as an outside scientific reviewer without knowledge of this previous process, there are minor items in this report that require classification ...” *Do you mean “clarification?”*

Response 40: The text has been changed to “clarification.”

4. *On page 51, it is sufficient to cite references that do not support the assumption of the equivalence of toxicological sensitivity in species of different size. Describing the examples, especially the thalidomide example, which is really not relevant, looks suspiciously like activation of more anti-DOE sentiment (another “hot button”).*

Response 41: Thalidomide was used as an example of differences in species sensitivity with which most people would be familiar.

Section 7.0

This section is also generally well written and pretty well referenced, although specific references to laboratory reports that are cited should be added. The absence of reference to Sandia QA and to the Sandia response to the Baskaran report have already been noted.

This section mentions that other sources of hazardous (non-radioactive) chemicals exist in addition to the mixed waste landfill. However, there is no mention of atmospheric fallout as a source of tritium. What is the panel’s assessment of the landfill v. fallout as a tritium source, and what is the basis for that assessment?

Response 42: The panel does not consider fallout as a source of tritium and thus would not be a factor in the tritium inventory at the MWL.

My Summary Comment

The purpose of this peer review is to assess the historic performance of the Mixed-Waste Landfill (MWL) and its safety.

*Where the panel did not deviate from this purpose, it has produced a generally acceptable report, with the exceptions already noted – Section 5 in particular. Unfortunately, the panel did deviate from this purpose in a number of instances and, as a result, indulged in some unfounded speculation. My summary recommendation, in addition to the specific recommendations made, is that the panel review the report carefully and retain only that content that speaks directly to the stated purpose. In addition, don't **claim** to be objective and unbiased, but **demonstrate** your objectivity in your writing.*

Response 43: No response necessary.

Comments on “Draft: Independent Peer Review of the U.S. Department of Energy Sandia National Laboratories’ Mixed-Waste Landfill”

Thomas P. Swiler
3006 Colorado St. NE
Albuquerque, NM 87110

Comments on Specific Text

Executive Summary

DOE’s preferred solution is to not excavate and treat the buried waste because of the significant concern for worker safety, but rather to place a four-foot thick native soil and vegetative cap on the top of the landfill. The performance characteristics of the cap are predicted by Sandia to achieve the regulatory goals of providing long-term protection of human health and the environment. ...

If my memory on this issue serves me correctly, Sandia’s preferred solution, based on a risk assessment of the MWL, was to do not put a cover on the MWL. The cover solution was proposed by NMED and was accepted by Sandia to provide an extra measure of safety at the MWL. The proper credit for this solution should be given so as to make it clear that it was the consensus solution of those knowledgeable about the MWL and accountable to the public, not solely to an entity that, as the critics contend, is simply trying to shirk its responsibility to ensure the safety of the public. In my personal opinion, keeping a fence around the MWL and keeping it off limits to trespassers is still the best solution because it endangers no one in its current state, it minimizes the impact on the environment, it avoids exposing new areas of bare soil that could erode, and it avoids adding an extra 5 feet of soil that one must dig through if one is to ever excavate.

Response 1: Attribution of the recommendation to add a cover to the MWL to provide an extra layer of protection is given in Section 1.0 to the New Mexico Environment Department. These comments are likely a correct historical perspective and the proposed solution of “keeping it off limits to trespassers is still the best solution” is one of numerous scenarios that should be addressed in the recommended study of alternatives (see Recommendation A in the Final Report).

General Conclusions

The MWL, to the knowledge of the reviewers, neither resulted in human exposure to contaminants nor has there been any significant environmental damage to date.

Grammatically, both causes should share the same noun, the MWL, but they don't. How about: "To the knowledge of the reviewers, up to this date, there has been neither human exposure to contaminants nor significant environmental damage resulting from the existence of the MWL." (This same paragraph occurs three times in the report).

Response 2: Conclusion 5 has been rewritten as follows . . . "The MWL, to the knowledge of the reviewers, neither resulted in human exposure to contaminants nor resulted in any significant environmental damage to date. Continuation of monitoring at the site will be essential to determine if there is a potential for change in this status."

... One reviewer disagrees, and states that the hazardous/radioactive waste will (not may) ultimately need to be excavated and stored offsite at a licensed facility because of the potential for human exposure and significant environmental damage is certainly present and will persist into the foreseeable future.

Should be: "One reviewer disagrees, and states that the hazardous/radioactive waste will (not may) ultimately need to be excavated and stored offsite at a licensed facility because the potential for human exposure and significant environmental damage is certainly present and will persist into the foreseeable future." (Remove the "of").

Response 3: This paragraph has been rewritten and no longer contains the reference to a dissenting position.

Recommendations

Sandia National Laboratories should proceed with a comprehensive report that evaluates the options of excavating the MWL in the near future, placing a cap on the MWL with retrieval at some future time, a permanent cap with no retrieval, maintaining current conditions, and possibly other alternatives. This study should clearly articulate the risks, costs, and impacts associated with the different alternatives and the different points in time that actions may take place.

Why should Sandia prepare one more report that will support the conclusions of its previous reports.

Response 4: An alternatives evaluation report is recommended because the risks, costs, and impacts of not retrieving the materials at the MWL have not been evaluated alongside potential alternatives that do use retrieval.

Since tritium is the one contaminant detected in soil sampling that clearly originated from the landfill, some additional explanation of the assumptions used in the risk assessment is needed for clarity, such as: For an industrial worker or for a resident, how much soil is estimated to be ingested? How much inhalation occurs? It would also be useful to include a table that lists exposure levels (i.e. soil ingestion, inhalation, dermal exposure, and plant uptake).

I believe that soil ingestion values are already available. Sally Hoier at Sandia would be more than happy to anyone about the assumptions made in the risk assessment.

Response 5: A charge to the panel was to determine whether the risk assessments were written in a manner that was understandable. The final report requests that the ingestion values be incorporated into the risk assessment document for clarification.

Given the interest and concern of the public in Albuquerque and throughout New Mexico regarding the contaminants present in the MWL, Sandia National Laboratories risk assessments should be highly explanatory documents that outline how the human health and ecological risk assessments are conducted and what fundamental assumptions are used. These documents should be written in manner to present the information to the lay public.

The public, as represented in the former Citizen's Advisory Board, have time and again looked at the risks presented by the MWL and have approved Sandia's plan for the MWL. To adequately understand the risks posed by the MWL requires a significant investment of time that can not be avoided by simply writing a risk assessment report in a language that can be understood by lay persons. Any simplified report that says that the MWL is either safe or dangerous would gloss over too many issues to be taken seriously by its critics.

Response 6: The charge to the panel and specifically to Dr. Walker, was to review the most recent risk assessment documents that were available to the public, determine whether the risk assessments were conducted properly, and whether the documents were written in a manner that was understandable. It was not the charge of the panel to review any statements or conclusions of the Citizen's Advisory Board. Dr. Walker concluded that the risk assessments were conducted properly; however, a number of details explaining certain assumptions were not included which needed to be added to the documents. These are detailed in section 6.0 of the report. In addition, the risk assessment documents, although

available to the public, would not be easily interpretable by them. We agree that oversimplification of the risk assessments would not be beneficial to the process, however, we disagree that they can not be explained in a manner that the public would understand.

Although a recent round of analytical testing using mass spectrometry strongly suggests that the uranium level are those of the natural abundance of the element, a different laboratory should confirm this finding using similar analytical methods on a future round of groundwater sampling/testing.

As a member of the CAB, I suggested that as the technology of analyzing test samples changes, that those technologies providing higher accuracy at a similar price be selected over technologies providing the same or lesser accuracy at a lesser price. That is, a policy of continuous improvement should be adopted. It is unfortunate that so much energy has been devoted to having to explain away a few bad data points, and better quality measurements, where available, should minimize these problems in the future.

Response 7: The panel agrees.

It is recommended that Sandia National Laboratories compile all of the relevant information related to the MWL in one document series and make it accessible to the public. ...

I agree with this. I believe that all the data should be available on compact disc in a PDF format. I believe that the CD should also be updated regularly with new data. I acknowledge the difficulty of including older documents that are known to contain errors. If possible, the reports should be revised, with incorrect information struck out but still legible and corrected information either inserted or available as a hyperlink from the incorrect text.

Response 8: No response necessary.

2.0 Background on the Mixed-Waste Landfill

2.2 MWL Inventory of Disposal Materials

Wrong word on p 6.: "...have natural security ..." should be "... have national security ...".

3.0 Peer Review Process

On p 21, why not paste the spreadsheet directly into the document instead of a scanned-in image of the spreadsheet.

4.0 Fate and Transport

4.3.2 Modeling Assumptions

On p 25, “inbetween” should be “in between”.

Response 9: All three changes were made.

While the approach in computing the tritium concentrations around the MWL over time seems good, the implementation seems to have some problems. A finite difference calculation of the spread of tritium with simultaneous decay is a justifiable method to determine realistic concentration tritium profiles around the MWL. However, I am concerned by the jaggedness in the concentration profiles determined here – it could be that the F-D time step may be too long, so the solution is numerically unstable. Concentration profiles should be smooth in both spatial and temporal spaces, but they are not here. Even the curve showing the remaining tritium over time, Figure 15, is rough, but a simple exponential decay curve should be completely smooth.

Also, the author states that “It is shown that by considering both diffusion and natural decay of tritium, the concentrations are currently diminishing and should continue to diminish for the next 10 years.” This is not strictly true. It can be theoretically shown that for a point removed from the source, the concentration of a decaying specie due to the source will increase over a certain length of time to a maximum, then will decrease. However, that length of time can be arbitrarily long because it depends on the distance from the source. In reality, this is of little consequence because the maximum concentration at a point well removed from the source may be immeasurably small even at its maximum value. Thus, for practical purposes, what the author says is true.

Because of these irregularities, I have some doubts about the accuracy of this model, although I agree with its end result – that the tritium is not going to get anywhere of consequence. I would have preferred some mention of rules of thumb – for me this would be “Given that tritium has gone 100 ft. in 20 years, it should take 80 years to go 200 feet, in which time, its concentration will have essentially decayed to background.” I believe that the distance matter is transported by diffusion is typically proportional to the square root of time.

Finally, the graphics are a little hard to understand. Although the authors criticize Sandia for not having a report of the MWL understandable by lay persons, this section of the report is no more lucid than any of the Sandia documents.

Response 10: The jaggedness of the concentration profiles is an artifact of the manner in which container “packets” of tritium were released into the environment. One percent of the total inventory was released over a prescribed time period. Had 0.05 % been released over the same time period, the oscillations would have been smoothed.

5.0 Short-term and Long-term Performance

5.1 Summary of Short-term and Long-term Performance

On p 39, the reviewer makes many unsubstantiated statements.

Response 11: No specifics are given; therefore, a response to this comment cannot be made.

5.3.3 Issue 3: Episodic Influx of Water – Thunderstorms, Desert Floods, Etc.

On p 41, the reviewer makes several analogies to the behavior of landfills at other sites without justification or providing specific details.

Response 12: DOE's most recent experience is with the uranium mill tailings program for repository design that has had numerous problems with cover design at many of the 24 sites and is referred to in this section of the report.

On p 43, the reviewer states, "There is a concern however, by this reviewer, with a solution that caps the MWL and monitors it for many decades. During this time it is possible that the contamination could spread and make the restoration more costly." The reviewer has no justification for this statement. The point of all the studies performed to date are to answer the question, "Will the MWL leak contaminants of consequence from its boundaries?" and the overwhelming conclusion of all these studies performed by Sandia and reviewed by NMED is "No." How can this reviewer, who was asked to sit on the review board because of his scientific background, be justified in challenging these conclusions without scientific basis? The reviewer offers no plausible alternative to the science that was performed that shows that the MWL is safe, and justifies his opinions on anecdotal evidence – comparisons to uranium mill tailing containment cells – that can not be assessed for validity.

Response 13: Based on DOE's experience with waste disposed in drums, wooden boxes, and plastic containers/bags at other sites, there will be deterioration of the containers over time resulting in the release of their contents to the environment. Current sampling data clearly shows the release of tritium. It is probable that other contaminants could also be released and migrate including the oxidized DU and Pb. This is not to say that it will impact human health, but rather if the decision to excavate in

the future is made it may require more excavation than if it were performed today.

6.0 Evaluation of Human Health and Ecological Risk Screening Assessments

6.2 Summary of Evaluation of Ecological Risk Screening Assessment

On p 50, "... the general confusion ..." should be "... the general conclusion ..."

Some of the statements in the executive summary come from this section, and now have more relevance.

Response 14: This change has been made.

7.2 The U-238/U-235 Ratio Issue

On p 61, "The accepted isotopic ratio, U-238/&-235, for the naturally occurring abundance ..." should be "The accepted isotopic activity ratio, U-238/U-235, for the naturally occurring abundance ..."

Response 15: This change has been made throughout the report.

7.4 Validity of Uranium Measurements Made in the Year 2001

On p 63, the statement is made "It should be noted that this decision is only valid if the error in discriminating between the isotopes for the 'disintegration counting' method are negligible and the error of assigning disintegration rates for the individual isotopes in the mass spectrometry method are negligible." This assumes that the established activity ratio is only based on disintegration counting. As a former member of the CAB, I was very interested in this issue. It appears that the disintegration energies for the different isotopes overlap, and depending on the resolution of the alpha spectrometer, disintegrations could be assigned to the wrong isotope. This might particularly be an issue if the spectrometer was being used to measure several isotopes simultaneously instead of being tuned to measure just the energy of the uranium isotopes. I am not an expert in this area, so this is just conjecture, and I have not found anyone who could confirm or deny this idea. Still, if the errors in the measurements of the two isotopes are correlated (i.e., a disintegration for U-238 was counted as a U-235 disintegration), this could explain why the error in the ratio is larger than that expected by combining the errors of the individual measurements assuming uncorrelated errors as was done by Baskaran.

Perhaps it should be stated that mass spectroscopy is more accurate because it can measure all atoms of an isotope that are present and not just those that are disintegrating during a measurement. This make mass spectroscopy vastly more accurate for long-lived isotopes that have a low rate of disintegration.

Figures 24 and 25 should be labeled U-238/U-235 Activity Ratios.

Response 16: The panel agrees that your explanation of how the error occurred is plausible. The panel felt it was necessary only to identify that the mass spectrometry approach was an improvement over measuring the very slow disintegration rates for the isotopes. The correct titles for Figures 24 and 25 should include the term "Activity"; unfortunately, this change was missed in the Final Report editing.

General Comments

I believe that the statements made in Section 5 that are unsupported should be stricken from the report.

It would appear that there is not complete consensus on the board from the statement,

The peer panel believes that future retrieval of the contaminants must be evaluated to determine if it is the most appropriate risk-based decision. One reviewer disagrees, and states that the hazardous/radioactive waste will (not may) ultimately need to be excavated and stored offsite at a licensed facility because of the potential for human exposure and significant environmental damage is certainly present and will persist into the foreseeable future.

I would like to know more about the nature of this disagreement. I would like to know if the reviewer who made this recommendation is also the same one who made other unsupported statements in this report.

Response 17: The panel has spent considerable amount of effort in reconciling their interpretations of the information. A main change to the report is a rewording of Conclusion 6 in the Executive Summary and a similar change to Section 5 that now reads:
. . . "The hazardous/radioactive waste should ultimately be excavated and stored in a licensed repository if human exposure and/or significant environmental damage become imminent. The panel recommends that retrieval and disposal of the contaminants must be evaluated as part of a comprehensive alternatives evaluation report."

The board should take a stronger stance on the issue. Regardless of the absolute amount of risk posed would be workers excavating the MWL, the board should have some idea as to whether the task is worthwhile now – or ever. To say that even though the investigation by Sandia was fairly well performed, their conclusions still require further review after they have already been reviewed by NMED is a cop out. As a scientist who was also a member of the Sandia Citizen’s Advisory Board, I found that none of the “evidence” indicating that the MWL was not performing well could be supported. Thus, I concluded that there is no scientific justification for excavating the MWL now or ever if it is continually monitored and is deemed to be performing well. The results presented in this report have not presented any new evidence nor have they changed my conclusions about the MWL.

In the future, there may be political reasons or societal values, other than near-term risk minimization, that may make the eventual excavation of the MWL preferable to leaving it lie. It is too bad that the report didn’t discuss these issues in a neutral way, which I find to be far more vexing than the scientific issues.

Response 18: The principal problem that the panel encountered with the information provided by DOE and Sandia National Laboratories is that there was a fundamental lack of information concerning the risk associated with excavation. Some anecdotal information was given, but there was no risk assessment, no alternative evaluation that described worker protection measures and their costs, and no environmental impacts of excavation. Standard engineering practice as well as environmental regulations and guidelines require an evaluation of alternatives.

The panel agrees that there are political and social issues that often influence decisions. The panel first recommendation is that . . . “Sandia National Laboratories should proceed with a comprehensive report that evaluates the options of excavating the MWL in the near future, placing a cover on the MWL with retrieval at some future time, a permanent cover with no retrieval, maintaining current conditions, and possibly other alternatives. This study should clearly articulate the risks, costs, and impacts associated with the different alternatives and the different points in time that actions may take place.” If this study is performed, the decision makers will have a much clearer understanding of the impacts (environmental, economic, social, and political) of their decision.

**COMMENTS ON THE WERC “INDEPENDENT PEER REVIEW”
OF THE MIXED WASTE LANDFILL**

Comments submitted by Steven Dapra, P O Box 80078, Albuquerque, NM 87198, 8/4/01

The WERC review solicits comments on the Review. Where are these comments to be sent? Neither the front matter, the Executive Summary, nor the Introduction and Purpose have a mailing address for comments.

Page two (General conclusions)

line two: change the word “identified” to “found.”

line five: change “that implies” to “suggesting.”

line seven: change “on” to “of.”

line 15 and 16: re-write as follows: “To the knowledge of the reviewers, the MWL has not led to human exposure to contaminants, nor has there been any significant environmental damage to date.”

line 20: omit the word “of.”

line 25: omit “that” and replace with “the level.”

line 27: omit “remain” and replace with “persist.”

line 29: omit “were” and replace with “have been.”

line 30: omit “based on inventory.”

Page three (Recommendations)

third bullet: omit “be highly explanatory documents that outline” and replace with “explain in detail.”

Page five (Landfill Setting)

line 4: omit the commas after the words “filled” and “feet,” and omit the word “up.”

line 8: the word used to describe the size of the sand is spelled “coarse” (not “course”).

Page 39 (Summary of Short-term and Long-term Performance)

Re-write the first sentence as follows: “To the knowledge of the reviewer, Sandia National Laboratories’ Mixed-Waste Landfill (MWL) has neither resulted. . .”

Response 1: The aforementioned items are all grammatical or word preference comments. Grammatical changes have been made and, where appropriate word changes have also been made.

The second sentence refers to the “highly hazardous nature” of the MWL. “[H]ighly hazardous” is a judgement call and will vary depending upon who is asked to assess the MWL. Some people do not consider the contents to be hazardous. Even if the contents are “highly hazardous,” there is a decided difference between hazard and risk.

This sentence also says that the waste “will” ultimately need to be excavated and stored elsewhere. I question the prudence of using the imperative “will.” Furthermore, how much waste is included in this assessment? Does it include the tritium-contaminated soil? Is Professor Eric Nuttall (who wrote this section) suggesting that all this soil also be excavated and hauled away? Since the tritium has spread to at least 120 feet below grade, this would require digging a hole in the ground at least 120 feet deep and hauling away all the soil that comes out of it. This would be tantamount to opening a small open pit mine on the site of the MWL.

The sentence in lines 13 – 15 begins: “Both the chemical [wastes] and most of the radionuclides have very long half-lives . . .” The chemical wastes have infinite half-lives. That is very long indeed. For the radionuclides, what constitutes a “very long” half-life? The only really dangerous radionuclide is cobalt 60, which has a half-life of 5.26 y. In less than 50 years from today (2001) it will have decayed away to a stable element, thus making its excavation unnecessary. The depleted uranium (DU) has a very long half-life (millions of years), but for all practical purposes it poses no radiological threat. DU poses a greater chemical threat than it does a radiological threat, and that is only if it is ingested. There is no need to dig these wastes up and haul them away.

Response 2: The above comments concern a single paragraph in Section 5.0. The peer panel has reviewed this section and has spent considerable amount of effort in reconciling their interpretations of the information and is in agreement with its findings. The paragraph has been rewritten to reflect the agreement of the panel as follows:

“The MWL, to the knowledge of the panel, neither resulted in human exposure to contaminants nor resulted in any significant environmental damage. Continuation of monitoring at the site will be essential to determine if there is a potential for change in this status. The MWL is unlined and has no engineered protection at this time from water intrusion. Although located within a secure federally operated site, the actual MWL

is protected with a modest fence and very limited warning signs. The nature and amounts of wastes stored at the MWL site plus the location of the site next to a major growing metropolitan city represents a potential hazard to both humans and the environment. If human exposure and/or environmental damage become imminent based on monitoring data, the hazardous/radioactive waste should ultimately be excavated and stored in a licensed repository. It is important to document the economic and environmental impacts associated with how best to excavate, when it is appropriate to excavate, and how to store the radioactive and hazardous waste from the MWL site if required at some future date.”

Page 40 (Issue 1: Source concerns – Accelerated Release in the Future)

Dr. Nuttall invokes “DOE’s Hanford experience” which has shown that waste can migrate far from its original place of disposal. I suspect that the Hanford geology is quite different from that of the MWL, and if it is, the invocation of the “Hanford experience” has no merit. Has the “Hanford experience” found that DU and metallic lead migrate great distance from their place of disposal? If not, the invocation of this experience is doubly lacking in merit.

Response 3: Hanford’s experience has shown that contaminants have migrated great distances from the original source. The intent of this section was to illustrate that information collected over time will become invaluable in future understanding of issues associated with waste inventory and site operations.

Page 41 (Issue 3: Episodic Influx in Water . . .)

Thunderstorms and desert floods are not going to carry the MWL contents to the water table some 500 feet below grade. Neither are rodent tunnels and ponding. Sandia staff connected with the MWL have pointed out that precipitation in the Albuquerque area penetrates the ground to a depth of approximately two feet (or less) at which depth it is pulled out of the ground by evaporation and transportation.

Response 4: Migration pathways such as rodent tunnels and ponding are important considerations in the design of an engineered cover, even in desert environments. The panel is simply stating that this issue should be addressed during design.

Page 41 (Issue 4: Intrusion . . .)

Re-write the first sentence as follows: “At this time the MWL is unlined, has no engineered protection . . .”.

Response 5: This is an editorial preference. No change was made.

It is true that the MWL is unlined. This proved nothing. Several of the landfills owned by the City of Albuquerque are also unlined. Although I consider it to be unnecessary, the MWL can easily have an engineered cap installed for protection from water intrusion. The current lack of a cap is a non-issue. The fence around the MWL is not “modest” – I have seen it – and in any event it can easily be strengthened. (Why would anyone want to invade the MWL anyway?) The “very limited warning signs” can also be improved. This is a notably feeble objection.

Response 6: No response is necessary.

The final sentence of the section refers to “solubilized” depleted uranium and lead. What is “solubilized”? It probably means dissolved DU and lead. How are the DU and lead going to be dissolved (or “solubilized”)? As noted above, precipitation only gets about two feet below grade, and I suspect that the DU and lead are well below this level. An engineered cap would be at least three feet thick, so precipitation would not penetrate to the level of the surrounding grade, let alone to the DU and lead.

Page 42 (Issue 6: Large Quantities . . .)

line 4: “solubilization” appears again. Perhaps this sentence should be re-written to read, “DU and lead can be dissolved in water and are subject to oxidation.”

Response 7: An engineered cover must consider many factors, one of which is water infiltration. DOE’s extensive experience with uranium mill tailings under the UMTRA program has shown that, even in a desert environment, repository caps have developed pathways for water intrusion. If this would occur, then the metals may become oxidized and solubilized (dissolved in the water media) with the water then acting as the transport agent to underlying strata. The term “solubilized” is used correctly within this paragraph.

Page 42 (Issue 7: Many Radionuclides . . .)

This section claims that Co-60 decays to Ni-63. I suspect this is incorrect.

Response 8: Ni-60 is correct and the change has been made.

Page 43 (last paragraph: “These comments . . .”)

The reviewer objects to the solution of capping and monitoring the MWL, saying that during this time “it is possible that the contamination could spread and make the restoration more costly.” Yes, it’s possible. How probable is it though? It might be well to consider the probability, and not merely the possibility.

Response 9: This point is well taken and is one of the reasons that the panel made the recommendation to evaluate alternatives to determine their costs, risks, and impacts (see Recommendation A). Only in this way, will DOE be able to answer this question.

Page 44-45 (Issue 9: Reactor Coolant Water Discharge)

This water was discharged into Trench D at the Mixed Waste Landfill. The reviewer estimates that this trench had an area of 1200 square feet. According to page 39 of Sandia’s Technical Response to the Baskaran report, Trench D has an area of 5400 square feet.

Response 10: Noting that Trench D was partially backfilled during this period, the panel member did a separate calculation on the depth of possible water migration. This work supports Sandia’s conclusions.

The reviewer also invokes Mr. Doug Earp’s claims about chlorides, nitrates, and conductivity of certain groundwater. How does this have any bearing on whether or not the reactor coolant water has reached groundwater? Mr. Earp analyzed chloride, nitrate, sulfate, TDS, and specific conductance in MWL groundwater. In a memorandum dated Dec. 14, 2000, Tim Goering and Jerry Peace of Sandia National Labs showed that his analysis had no merit. Their memorandum does not appear to be listed in Appendix D (the bibliography) of the WERC Draft review of the Mixed Waste Landfill. I request that it be included in the bibliography.

Response 11: The panel had the opportunity to review over 100 documents as part of this peer review process. The panel also received information during the public meetings.

The documentation received by the panel by Sandia on the chloride and nitrate issue was from presentations made at the March 22 and 23, 2001 public meeting. The panel concluded from these presentations that . . . “Sandia has provided plausible explanations for the chloride, nitrate, and conductivity data.”

On page 44, paragraph three, Doug Earp is referred to as “Dr.” Earp. I do not believe he has a doctorate.

Response 12: This change has been made.

Page 50 (third bullet: “A statement . . .”)

This bullet has an incomplete sentence. Along with being explained, the RESRAD acronym should be written out in full.

Response 13: The acronym was added.

Page 51 (second checkmark: “Similarly, . . .”)

It is necessary to point out that thalidomide was once used to treat nausea? The last sentence begins with the word “and”. This “and” should be omitted, and the sentence should specify what humans are more sensitive to.

Response 14: No, it is not necessary. This sentence was changed to read . . . “An example of this is the responsiveness of different mammalian species to the limb teratogenicity of thalidomide.”

Page 52 (first bullet)

The sentence in lines seven and eight begins: “This is in contrast to the human health risk assessment where Sandia discusses their uncertainty assessment . . .” This sentence is ambiguous. Does it mean that Sandia is discussing its own “uncertainty assessment”? If so, it should read “Sandia discusses its uncertainty assessment”. The sentence needs to be re-written in a manner that explicitly states what it is that Sandia is discussing.

Response 15: This sentence has been changed to read . . . “This is in contrast to the human health risk assessment where Sandia discusses its uncertainty assessment . . .”

Page 52 (third bullet)

In line two, omit the word “addressed,” and replace it with “conducted.”

Page 55

In line six, omit the comma after “interpretation.”

Page 63

Re-write the first sentence of section 8.2 as follows: “To the knowledge of the reviewers, the MWL has not led to human exposure to contaminants, nor has there been any significant environmental damage to date.”

Response 16: Some of these editorial changes have been made.

The second sentence of section 8.2 refers to the “highly hazardous nature” of the MWL. “[H]ighly hazardous” is a judgement call and will vary depending upon who is asked to assess the MWL. Some people do not consider the contents to be hazardous. Even if the contents are “highly hazardous,” there is a decided difference between hazard and risk.

This sentence also says that the waste “will” ultimately need to be excavated and stored elsewhere. I question the prudence of using the imperative “will”. Furthermore, how much waste is included in this assessment? Does it include the tritium-contaminated soil? Are the reviewers suggesting that all this soil also be excavated and hauled away? Since the tritium has spread to at least 120 feet below grade, this would require digging a hole in the ground at least 120 feet deep and hauling away all the soil that comes out of it. This would be tantamount to opening a small open pit mine on the site of the MWL.

Page 63

The sentence in lines two and three begins: “Both the chemical [wastes] and most of the radionuclides have very long half-lives . . .” The chemical wastes have infinite half-lives. That is very long indeed. For the radionuclides, what constitutes a “very long” half-life? The only really dangerous radionuclide is cobalt 60, which has a half-life of 5.26 y. In less than 50 years from today (2001) it will have decayed away to a stable element, thus making its excavation unnecessary. The depleted uranium (DU) has a very long half-life (millions of years), but for all practical purposes it poses no radiological threat. DU poses a greater chemical threat than it does a radiological threat, and that is only if it is ingested. I doubt that anyone is going to be eating the DU that is buried in the Mixed Waste Landfill. There is no need to dig these wastes up and haul them away.

Response 17: This paragraph has been rewritten as follows:

“The MWL is unlined and has no engineered protection at this time from water intrusion. Although located within a secure federally operated site, the actual MWL is protected with a modest fence and very limited warning signs. The nature and amounts of wastes stored at the MWL site plus the location of the site next to a major growing metropolitan city represents a potential hazard to both humans and the environment. Based on the review of information on the MWL, however, the panel concluded that the landfill has neither resulted in human exposure to contaminants nor resulted in any significant environmental damage to date. Continuation of monitoring at the site will be essential to determine if there is a potential

for change in this status. If human exposure and/or environmental damage become imminent based on monitoring data, the hazardous/radioactive waste should ultimately be excavated and stored in a licensed repository. It is important to document the economic and environmental impacts associated with how best to excavate, when it is appropriate to excavate, and how to store the radioactive and hazardous waste from the MWL site if required at some future date.”

Page 67

In the last sentence of Dr. Catherine Aimone-Martin’s biography, Governor Johnson’s first name should be included.

Dr. Michael Campana’s biography says he is a “Fullbright” Scholar. The correct spelling is “Fulbright” (one “l”).

This biography also refers to a University College of “Blize.” Is this word spelled correctly? Should this be “Belize” – the country in Central America?

Page 69

Lines ten and eleven should read “fluidized bed combustion” (not “bad).

In line thirteen, “Diplomat” should be spelled “Diplomate.”

Page 105 (Appendix E)

The RESRAD acronym should be written out, not merely explained.

The WERC acronym should be written out.

-----END-----

Response 18: Where appropriate, these changes were made.

Miles Nelson, M.D.
PO Box 1133
Sandia Park, NM 87047
505-280-996
mnelson@swep.com
CITIZEN ACTION

8/7/01

Abbas Ghassemi, Ph.D.
Catherine Aimone-Martin, Ph.D.
Michael Campana, Ph.D.
Antonio Lara, Ph.D.
Eric Nuttall, Ph.D.
Mary Wilson, Ph.D.

Dear Members of the WERC Mixed Waste Landfill study;

Please accept the comments below concerning your draft study. Appendix A is a list of documents used in support of these comments. Appendix B consists of the actual documents for your review. The majority of these documents were recently obtained by Citizen Action under the Freedom of Information Act. In the interest of time and space I am providing only representative documents. We have evaluated over 2000 pages in the past several weeks and they support the conclusions below.

SNL/DOE, through their representatives Dick Fate, John Gould and Jerry Peace, have for the past two years consistently maintained the following concerning the Mixed Waste Landfill:

- 1) No water was allowed in or near the dump except for 271,500 gal of reactor coolant water disposed of in trench D in 1967.
- 2) No solvents were disposed of at the dump except for very small amounts, which were first always solidified in some manner.
- 3) An “excellent” inventory of the landfill exists.

It is my belief that these statements are made to reassure a skeptical public as well as to placate the regulator under which their RCRA permit is administered. The documents I have provided to you prove that each of these assertions is false. Therefore all assumptions concerning this dump, which are in any way based on these assertions must be reconsidered.

Response 1: The receipt of these documents at this late date (August 16, 2001) could not allow the panel to complete the Final Peer review report by the delivery date of August 31, 2001. This information has value and should be made available to the New Mexico Environment Department.

The panel recognizes that it is important to evaluate alternatives as to their risks, costs, and impacts (see recommendation A) and this information that Citizen Action is providing will be important.

Also included is a report commissioned by Citizen Action from Dr. Marvin Resnikoff of Radioactive Waste Management Associates critiquing SNL's risk assessment of the landfill. This document will serve as my main comment concerning risk assessment, although I will make a few brief observations of my own.

First let me praise the generally independent thought of the peer panel. I must express concern however of the scope of work of this panel. Congresswoman Heather Wilson promised funds for an independent study of the landfill and for new soil samples.¹ This appropriation was made due to intense public interest in the dump. However, only selected old data have been evaluated here. While certainly WERC can not be faulted for this as \$25,000 could in no way generate adequate new soil samples, it is my contention that these funds were misappropriated and that the WERC study is therefore founded on a false promise.

Response 2: WERC cannot address any comments related to appropriation of funds by Congress. WERC was not involved in this part. WERC had proposed a work scope to the Department of Energy as follows:

“WERC will serve as the facilitator for the study and use its national network of experts to conduct the peer review of declassified relevant technical information, as well as the existing data from all sources. This peer review will examine the data focusing on technical aspects of the mixed waste landfill. WERC will evaluate the assumptions, quality and appropriateness of data collected, QA/QC for data collection, and relevant technical conclusions made. WERC will not evaluate classified documents. WERC will use the following steps to complete this task.”

The scope of work as noted in the statement of objectives relative to the award from DOE had the following statement:

“WERC will develop a panel of experts to review the technical data and receive oral briefings. The panel will meet in three public forums and issue a final report with the results of their evaluation. Funds are to be used to defray labor and other expenses incurred by panel members.”

Based on the above, WERC and the panel have carried out the scope exactly as proposed and approved.

Let me initially make some general comments, supported by the provided documents, about the inventory of the landfill and the dumping practices of SNL/DOE. I will then comment on specific points of the draft study.

GENERAL COMMENTS:

In order to fully characterize the risk posed to the community by this, or any, dump the contents must be known. This is not the case with the Mixed Waste Landfill. Almost all early disposal records were destroyed as part of a records purge.^{2, 3 (pg 11), 4} To compensate for this SNL conducted interviews with past employees to access their memories of specific contaminants disposed of. As can be imagined the inventory pieced together in this manner is woefully incomplete. These were often elderly men with imperfect memories.⁵ While in the process of characterizing this dump Sandia's internal memos and notes reflect uncertainty with respect to the contents of casks and drums.^{6 (pg 8), 7, 8 (pg 2)} Our own review of actual waste disposal records reveals a single major category of waste type disposed: miscellaneous.⁹ To suggest that the inventory of this dump is even adequate, let alone "excellent" is at best disingenuous.

SNL/DOE have maintained that free liquids were not disposed of in the landfill except for 271,500 gallons of reactor coolant water in 1967. This is important as free liquids would aid in the migration of contaminants and pose a risk to the groundwater. In fact, much more water was disposed of in and about the MWL than is claimed. Certainly these open pits and trenches collected water during the monsoon season. If you assume that the entire 2.6 acre site acted as a collecting pond (admittedly this is a very conservative assumption, likely only the open pits and trenches collected water but the rest of the site may have drained into these pits and trenches), and given that the dump was active from 1959 to 1988 (a period of 29 years), and assuming an annual average rainfall of 8.5 inches then the site would have collected 53 acre feet of water, or 17,791,488 gallons.

The effect of the monsoons were keenly felt by those who excavated the pits and trenches as they were, in at least one instance, forced to pump 5 feet of standing water from a trench being excavated into the adjacent existing trench. This was not done in the early years when ignorance of contaminant transport might be forgiven, but was apparently done in 1985.¹⁰ Additionally, one document refers to the ongoing dumping of reactor coolant water in two drainfields "near the MWL" from 1963 through 1971. Apparently 19,414,470 gallons total containing an estimated 35 curies of activity (including the 271,500) were disposed of at or near the MWL.¹¹ The effect of this water must be considered with respect to potential contaminant transport and risk to the aquifer. This information was withheld from Dr. Baskaran during this study of the landfill.

SNL/DOE has claimed to the public and the regulator (The New Mexico Environment Department) that only minute amounts of solvents were allowed into the MWL, and then only after stabilization and solidification. This is false. Organic hazardous wastes were disposed of in the MWL from 1959 through 1962 when the Chemical Waste Landfill (CWL) was opened and began to accept such waste. These wastes consisted of TCE, carbon tetrachloride, organic acids and toluene based scintillation cocktails. Un-solidified

radioactively contaminated organics continued to be dumped in the landfill through 1975, only then were these hazardous materials required to be solidified.^{12, 13, 14, 15, 6 (pgs3&5), 16}

The reader is certainly aware that SNL has just finished excavation of the CWL due to groundwater contamination from that site. This contamination occurred due to migration of contaminants through the vadose zone in a manner previously unrecognized by SNL/DOE. No water was needed to aide this transport. The documents referenced above indicate the MWL was the de-facto CWL in the early years. Why should we expect the MWL to behave differently with respect to contaminate migration and ultimate groundwater contamination?

Allow me finally to provide two examples of inconsistencies with regard to the published inventory of the MWL. One document refers to plutonium deposited in trench D. However, Pu does not appear in the published inventory for this trench.¹⁷ This type of omission can adversely affect proper oversight of the dump by the regulator. Finally, I am quite concerned that the regulator may be prepared to render a decision concerning this dump based on inaccurate information. Certainly all of the previous references support this contention, but one example is truly illustrative. In correspondence between NMED and SNL/DOE, NMED specifically asks about a contaminated trailer buried in the landfill. In its response SNL/DOE reassure the regulator that the trailer is a “carriage or cradle” type without contents, not a box type with doors. SNL/DOE even provide a photo of such a trailer.¹⁸ In fact, as a document obtained under the FOIA clearly shows, the trailer is a box type with doors, the contents of which are unknown or undocumented.¹⁹

The examples above prove that the inventory for the landfill is poor, that vast amounts of water was allowed to be deposited in and near the landfill, that free solvents, volatile organic compounds and semi-volatile organic compounds were disposed of at the site and that the permitting of this dump under the Resource Conservation and Recovery Act is based on faulty and misleading claims. Please consider this data in your final report.

Response 3: This information is important, but neither could it be used by the panel at this late date nor could the panel pass judgment on its validity. It is appropriate for it to be made available to the New Mexico Environment Department. In accordance with the project scope, the panel reviewed all information provided by all concerned parties during the term of the contract study.

SPECIFIC COMMENTS OF THE DRAFT REPORT:

- Concerning 2.1, Landfill Setting.
Winds in the area are reported in averages. What are the magnitude of gusts in this area and what effect might they play in contaminant transport and soil disruption/dispersion?

Response 4: The intent of this section was to provide a summary of the MWL background and is intended to provide the reader with a general

understanding of the physical setting and history of the site. A sentence was added to clarify this point. Details on specifics of the site, such as maximum wind velocity, are available in DOE documents.

- Concerning 2.2, Inventory of Disposal Material.
Please note my comments above.

Response 5: The panel has direct knowledge of inventories at other DOE sites and at other hazardous waste sites. The inventory for the MWL is considered to one of the most complete and comprehensive ones that exist. This does not mean that it is absolutely perfect; it is not. However, there exists no site of this age that has an absolute knowledge of its contents.

- Concerning 4.0, Fate and Transport.
The author does not consider radionuclides and nonradiological soil/water contaminants, but seems to only concern herself with tritium. This is a serious oversight and does little to further understanding of this site. The community would be better served with a more comprehensive review, particularly in light of the insights gleaned from the documents referenced above.

Response 6: Tritium was selected as it is the one and only contaminant that has traveled away from the site. To model radionuclides and other contaminants that have not migrated off site would not be appropriate and there is not rationale to justify this.

- Concerning 5.0, Short-term and Long-term Performance.
The author stated that the MWL has “neither resulted in human exposure to contaminants nor has there been any significant environmental damage.” This can not be supported as no study of worker health has ever been conducted and environmental monitoring of the site is and has not been comprehensive. A SNL/DOE document obtained under the FOIA states that the potential for release of “hazardous vapors” from the dump is “high.”²⁰ Also The RCRA phase 2 report shows that between 1992 and 1993 there was an increase in measured tritium out-gassing from the landfill by 2 orders of magnitude, yet all monitoring ceased after this spike was detected. Given the paucity of monitoring at this site risk to human health and the environment cannot be determined.

The author references SNL’s contention that clean-up of this site would expose waste to the wind and the air. SNL/DOE has used this silly argument in the past to frighten the public and convince them that this waste is best left undisturbed. I am aware of a radium clean-up in London where the public was protected from airborne contamination by erecting a sprung structure over the site. Of course SNL/DOE can keep airborne emissions under control during a clean-up if they chose to. The Author appropriately

debunks SNL/DOE's argument that the cobalt-60 is preventing clean-up at this time. SNL/DOE is referenced as stating that waiting until 2040 before considering clean-up is the proper course of action. This argument is disingenuous and immoral. While we may be facing a temporary slow down in the nation economy we have never been so prosperous as now. We are each receiving a tax rebate and we continue to fund at extraordinary levels the very activities that lead to the waste we are considering here. Dr. Nuttall suggests that the waste could be excavated now if the will existed. If we do not address this problem now while we have the resources and the scrutiny then we are sentencing future generations the task of addressing a problem that we created. This is wrong. In terms of clean-up and safeguarding future generations, if not us then who, and if not now then when? To abdicate our responsibilities in this matter is weak and immoral.

The author recommends that the DOE commission a study to address the costs and benefits of near and long-term excavation of this site. While I agree that the DOE should find such a study I do not believe that the DOE is sufficiently reliable to conduct an unbiased review. This should be undertaken by a totally independent entity with citizen input and oversight.

The author refers to 204,000 gallons of water being dumped into the MWL. Please see my comments above for a more accurate measurement.

Response 7: The panel understands the concerns that are being expressed, however, these concerns are beyond the scope of the work authorized. The primary issue that keeps cropping up is "what is an appropriate action that will protect human health and the environment?" To answer this question and to provide decision makers the necessary information to make an informed decision, the panel has made the following recommendation:

"Sandia National Laboratories should proceed with a comprehensive report that evaluates the options of excavating the MWL in the near future, placing a cover on the MWL with retrieval at some future time, a permanent cover with no retrieval, maintaining current conditions, and possibly other alternatives. This study should clearly articulate the risks, costs, and impacts associated with the different alternatives and the different points in time that actions may take place."

- Concerning 6.0, Evaluation of Human Health and Ecological Risk. Please accept the provided Resnikoff report.²¹

Response 8: The late receipt of this information did not allow time for the panel to use this information. It is appropriate for it to be made available to the New Mexico Environment Department. In accordance with the project

scope, the panel reviewed all information provided by all concerned parties during the term of the contract study.

Sandia's Risk Assessment, Attachment 9, sites the incremental excess cancer risk due to tritium, a class A carcinogen, as 2.4E-6. NMED guidelines for excess cancer risk are 1E-6 for class A and B carcinogens, and 1E-5 for a class C carcinogen. SNL has ignored this and instead elected to risk stratify tritium due to its radionuclide features using the less stringent EPA guidelines.²² Please comment.

Response 9: Risk stratification of tritium and use of the EPA guidelines are appropriate at this site, specifically because of the radionuclide features of tritium. The excess cancer risk is based on lifetime exposure to a non-changing level of a carcinogen. However, tritium has a radioactive decay half-life of approximately 12.5 years. This means that the amount of tritium will be reduced to 50% of its original activity in 12.5 years, to 25% of its original activity in 24 years, to 12.5% of its original activity in 36.5 years, etc. Thus, the exposure level will decline over an individual's lifetime. Due to this fact, risk stratification of tritium is acceptable.

The author does not consider contaminants within the landfill, but concentrates primarily on those COC addressed already by SNL/DOE. This is a serious oversight and does little to address the concerns of the community. Clearly the hazardous constituents within this dump will breach their containment at some point in the future and pose a risk to human health and the environment.

Response 10: The charge of the panel was to review the risk assessments conducted based on those contaminants that have been detected in the soil and groundwater surrounding the landfill. It was not the charge of the panel to conduct an independent risk assessment based on the landfill constituents that remain contained in the landfill.

The author recommends the SNL conduct a risk assessment of this dump based on various excavation scenarios. I agree that such a review would be valuable but strongly disagree that the work should be done by SNL. RCRA is a risk-based driver. It is inappropriate that the polluter perform their own risk assessment as the result may force clean-up which SNL/DOE are strenuously resisting. The potential for intrinsic standardized bias is too high, and the consequences of an inaccurate risk assessment are too great.

Response 11: The panel's scope does not authorize suggesting who does the work.

- Concerning 7.0, Analytical/Radiochemistry and Measurement Errors.

I see that the author agrees with Dr. Baskaran that the precision of analysis conducted by SNL/DOE has been “extremely poor.” The author also notes that SNL/DOE have used more precision with the current round of sampling, as suggested by Dr. Baskaran. I am disappointed, however, that the author does not credit Dr. Baskaran for these observations.

Response 12: The panel made every effort to provide an un-biased report. As such, it was inappropriate to degrade or praise individual authors.

Dr. Baskaran also cited plutonium contamination in the air, soil and groundwater. This contamination seems plausible given the vast quantities of water deposited in and near the landfill. Could the author please address this?

Response 13: To confirm migration of anthropogenic contaminants, the uranium isotopic activity ratios were evaluated based on higher quality mass spectrometry analysis. Based on the results of this work, it could be determined that the uranium present in the samples was natural background. Thus, one can conclude due to the close association between uranium and plutonium that if uranium has not migrated from the MWL, then plutonium would not have migrated either.

Thank you for allowing me the opportunity to comment. I look forward to your final report.

Sincerely,

[original signed]

Miles Nelson, M.D.
CITIZEN ACTION

August 9, 2001
Lance Voss (505) 845-5825

Review comments on WERC, Mixed Waste Landfill Peer Review, July 9, 2001 draft report.

- 1) Executive Summary, page 1, paragraph two. Suggest deleting this paragraph or moving the information toward the end of the section. If retained the material should be revised to summarize the history of the MWL and what DOE proposes to do, not what they propose not propose to do. Also suggest revising the second half of the paragraph to more clearly present a summary of proposed stewardship, monitoring and periodic re-evaluation.

Response 1: The panel felt that no major changes to this paragraph were necessary.

- 2) Executive Summary, page 1, paragraph five. This information should have been presented as a footnote or editors note. Delete from final.

Response 2: This paragraph was updated to reflect activities that occurred from the time of the release of the Draft Report.

- 3) General Conclusions, page 2, bullet two. An evaluation of risk, or cost/benefit analysis of MWL excavation appears to be outside of the stated purpose of this peer review. Also the reported activity of gamma emitters in the MWL should not be characterized as “anecdotal”. Suggest deleting these statements from the General Conclusions sections.

Response 3: The panel’s judgment is that it is only reasonable that alternatives are evaluated including those that would protect workers during excavation.

- 4) General Conclusions, page 2, bullet five. Suggest revising this statement for accuracy. The highly conservative data presented by SNL does not indicate that no human exposure as occurred, it does indicate that no unacceptable risk is predicted or present. Similarly environmental risk not “environmental damage” has been assessed. Also suggest replacing “to the knowledge of the reviewers” with “the review indicates”.

Response 4: The panel’s judgment is that the language is accurate. No information was provided to the panel that suggested that there has been any exposure once the MWL was closed to operation. “Environmental damage” is used correctly in the paragraph; e.g., if groundwater had been

impacted with contaminants, damage would have occurred but environmental risk would not have because there are no receptors or pathways.

- 5) General Conclusions, page 2, bullet six. This statement should be presented as a recommendation not a conclusion.

Response 5: This paragraph has been rewritten as follows:

“The hazardous/radioactive waste should ultimately be excavated and stored in a licensed repository if human exposure and/or significant environmental damage become imminent. The panel recommends that retrieval and disposal of the contaminants must be evaluated as part of a comprehensive alternatives evaluation report (please see Recommendation A).”

- 6) General Conclusions, page 2, bullet seven. The peer review panel must reconcile the conclusions stated in bullet seven with those of bullets two, five, and six above.

Response 6: There are no conflicts between these conclusions.

- 7) General Conclusions, page 2, bullet eight. The report should be revised to clarify all discussion of “poor” data precision relative to isotopic ratio calculations. Was the precision poor relative to the expected method performance, or simply too low or unacceptable for use in isotopic ratio analysis. Was isotopic ratio analysis the intended use for the data?? If not, this may be a Data Quality Objective/Data Quality Assessment problem. Please discuss.

Response 7: The ultimate intended use of uranium analysis information was to determine isotopic activity ratios. First, the “poor” data precision reflects on, and is a consequence of alpha spectrometry (Baskaran’s terminology). The error bars (overall) are large for the alpha spectrometry method, especially if compared to the later mass spectrometry analyses. As a consequence, the activity ratio error bars are also large and statistically overlap with 95% confidence. Propagation of error calculations was done using 2 sigma values (2 standard deviations).

- 8) Recommendations, page 3, bullet four. There appears to be no regulatory or decision need basis for this recommendation. It appears to advocate the collection of non-essential data.

Response 8: Future rounds of sampling are regulatory requirements for monitoring the MWL. The recommendation is to use a more precise analytical methodology to validate previous work and conclusions.

- 9) Recommendations, page 3, bullet five. This recommendation should be revised. It is a requirement that all relevant information be accessible to the public in designated reading rooms. If the current information on file is incomplete, appropriate comment and recommendations should be made.

Response 9: It was the panel's understanding that not all materials are available at the public reading rooms and that they could be made more accessible.

- 10) Section 1.0 Introduction and Purpose, page 4, paragraph two. Suggest deleting this paragraph or revise (see comment 1 above) and move to Section 2.0.

Response 10: The panel felt that no major changes to this paragraph were necessary.

- 11) Section 1.0 Introduction and Purpose, page 4, paragraph three. Suggest moving this discussion of this review up in the section. Also, the peer panel should expand the discussion, specifically stating how safety and performance of the landfill will be assessed. Identify all evaluation criteria.

Response 11: The panel felt that no major changes to this paragraph were necessary.

- 12) Section 2.1 Landfill Setting, page 5, paragraph one. Change to, "...up to a depth of ...".

Response 12: This change was made.

- 13) Section 2.2 MWL Inventory of Disposed Materials, page 7, paragraph two. Edit "...HEPA filters, prefilters,..." and "...and **expended** or obsolete...".

Response 13: This change was made.

- 14) Section 3.0 Peer Review Process, page 19, paragraph two (with three subsections). Suggest editing, expanding and moving this information to a more

appropriate section such as Section 2.0. Edits should include but not be limited to:

- a. Delete “at least for the next several decades”, this implies that DOE believes that the MWL will become a threat in the future.
- b. The proposed cap would also provide further waste isolation and protection from intrusion.
- c. Expand the discussion of site monitoring and stewardship planning to include ground water monitoring, site inspection, surface and shallow subsurface vadose zone moisture monitoring.
- d. Edit item 3). Suggest, “At periodic future dates the decision process should be reopened to evaluate the landfill and cap performance and identify a final remedy.”

Response 14: The panel felt it was appropriate to use the language DOE expressed at the public meetings; therefore, only minor changes were made based on input from DOE.

- 15) Section 3.0 Peer Review Process, page 20. Edit, “To **evaluate** each...”

Response 15: A change was made and was intended to be . . . “The evaluation of each of these factors . . .” unfortunately, it ended up . . . “To evaluation each of these factors . . .”

- 16) Section 4.1 Introduction, page 22, paragraph two. It is stated that tritium was used as the representative contaminant to model transport. Is tritium physically and chemically representative of the COCs associated with the landfill?? How does this fate and transport evaluation predict or relate to the fate and transport potential of the other inventory based COCs in the landfill? Would the fate and transport of tritium be representative of that of the mass of refined metals and/or organics identified in the inventory?? What are the fate and transport characteristics of these other COCs in the MWL setting. Reviewer should address the fate and transport of these materials at some (commensurate) level.

Response 16: Tritium is used in the modeling because of its high mobility and pervasiveness in the MWL. This is a common approach to sampling and modeling in the environmental sciences. Tritium is also the only COC that is detected at any depth under the MWL and therefore the modeling of tritium provides a conservative estimate of potential future migration of other contaminants.

- 17) Section 5.0 Short-term and long-term Performance. The reviewer does not address the subject of short-term or long-term performance in this section. There is no structured review based on the six criteria identified in Section 3.0. Nothing

in the section appears to address either short or long-term performance. The entire section should be revised to address the stated purpose of the report.

Response 17: The short or long-term performance of the MWL were evaluated through the nine issues that were discussed. Since one of the key documents that cast doubt on Sandia's information was the Baskaran report, these nine issues related to short and long-term performance were addressed.

- 18) Section 7.1 Summary, page 55, paragraph one. This paragraph contains the statement that, "the precision is extremely poor". As a controversial and public issue this evaluation must be clear and precise. Specifically, was the precision "poor" relative to the expected method performance or was the method precision unacceptable for use in isotopic ratio determination. Was isotopic ratio analysis the intended use for the data or was this an inappropriate use of the data?? The reviewer should be careful in their choice of words.

Response 18: See Response 7.

- 19) Section 7.4, page 57, paragraph three. The author states that mass spectrometry measurements by a different independent laboratory are needed to validate this conclusion. Is the validation of this conclusion a critical data or decision need for the landfill?? If not, this recommendation should not be made. There appears to be adequate data to determine the nature and extent of contamination associated with the landfill.

Response 19: The validation is needed to provide support to the conclusions drawn from one round of analysis using mass spectrometry.

- 20) Section 7.6 Hazardous Wastes – Minor Concerns, page 58, paragraph 1. As a public document, this discussion needs to be expanded or an alternative conceptual model based argument should be proposed. The general public is not sufficiently aware of phthalates in the environment to appreciate or accept this argument at this time.

Response 20: The recommendation is that phthalates are ubiquitous and often show up in samples and, when detected, Sandia should note this as a common sampling problem and not an indicator of contamination.

- 21) Section 7.6 Hazardous Wastes – Minor Concerns, page 58, paragraph 2. Edit or be more specific, i.e., toluene is not a polychlorinated short chain hydrocarbon.

Response 21: This change was made.

From: RuthWeiner@aol.com [mailto:RuthWeiner@aol.com]
Sent: Thursday, August 09, 2001 6:50 PM
To: aghassem@nmsu.edu
Cc: clint.williamson@mail.house.gov
Subject: Fwd: Additional comments on the Mixed Waste Landfill panel report

Hello Abbas,

I am sorry I missed your call. The attached are additional comments that I have sent to the panel.

The more I reread the report, the more I question both the panel's objectivity and its expertise.

Ruth Weiner, Ph. D.
ruthweiner@aol.com
From: <RuthWeiner@aol.com>
To: <werc@nmsu.edu>,
<aghassemi@nmsu.edu>
Cc: <hjoy@swcp.com>,
<mmiller@sandia.gov>,
<sjd@swcp.com>
Subject: Additional comments on the Mixed Waste Landfill panel report
Date: Thu, 9 Aug 2001 08:24:45 -0600
Message-ID: <9b.19282487.28a3f72d@aol.com>
MIME-Version: 1.0
Content-Type: multipart/alternative;
boundary="-----_NextPart_000_00B4_01C123D5.4B41BC50"
X-Mailer: AOL 6.0 for Windows US sub 10527
X-MimeOLE: Produced By Microsoft MimeOLE V5.50.4807.1700

Please consider these additional comments (my comments are italicized):

Section 5.3.7:

"...Cobalt-60 has decayed to harmless non-radioactive Ni-63."

This is incorrect. The beta decay of Co-60 can be described in the equation Co-60 = beta(-) + gamma + Ni-60, since Co is atomic number 27 and Ni is atomic number 28 and beta decay is essentially conversion of a neutron in the nucleus to a proton by emission of an electron, with no significant change in atomic mass. Ni-60 is indeed not radioactive.

Were the document as a whole, and especially this section, less prone to cheap shots at DOE and Sandia, I would be generous and suggest that "Ni-63" is another typographical error, speaking more to lousy proofreading than to substantive error.

Response 1: This has been corrected to Ni-60.

Section 5.3.8:

First bullet: "beryllium" is misspelled.

Second bullet: The bulleted statement is "Large radioactive lithium quantities are located in seven or more different pits or trenches."

It is impossible to know what the basis for this statement is. Lithium is not listed in the isotope inventory (Table 1, page 21). Now, I am a chemist, not a nuclear engineer, so I looked this up in the 1996 edition of the Chart of the Nuclides (GE Nuclear Energy and Lockheed-Martin) as well as in Lederer, Hollander, and Perlman TABLE OF THE ISOTOPES (Wiley, New York, 1967). According to the Chart of the Nuclides, there are four radioactive isotopes of lithium with the following half-lives:

Li-5 -- 0.000000000000000000003 sec (0.0000003 femtoseconds)

Li-8 -- 0.840 sec

Li-9 -- 178.3 milliseconds

Li-10 --0.0000004 femtoseconds

Li-8 and 9 are beta emitters. According to Lederer, et al (1967) they are produced by bombardment of Li-7 and Be-9, respectively, with protons or deuterons in an accelerator. The Chart of the Nuclides shows that Li-9 decays to stable Be-9 and that Li-8 decays through a series of radionuclides with half-lives of milliseconds or seconds, eventually to stable He-4. None of the radioactive isotopes of lithium could be present in the landfill, let alone in "large quantities," nor could "large quantities" ever have been present.

Li-6 and Li-7 are not radioactive. Maybe the word "radioactive" could be written off as another typographical error by someone more forgiving than I. Maybe stable lithium is present in "large quantities" (whatever those are), if so, it would be in the form of a lithium salt (e.g., LiCl), because metallic lithium would oxidize immediately on contact with air or water and is never stored in contact with air.

Third and fourth bullets: These statements are excellent reasons for leaving the contents of the mixed waste landfill exactly where they are.

Response 2: Spelling of "beryllium" has been corrected. The section on lithium is taken directly from correspondence with Sandia representatives, and the intent of this section was not to alter their language. However, to clarify the concern about lithium being radioactive the paragraph was changed to read:

"Large quantities of lithium targets are located in 4 or more different pits or trenches. While the lithium itself is not radioactive, the targets do contain tritium and other radioactive nuclides."

Ruth Weiner, Ph. D.
ruthweiner@aol.com

COMMENTS RECEIVED AT THE PUBLIC MEETING – AUGUST 16, 2001

**FROM:
HUBERT JOY
P.O. BOX 93337
ALBUQUERQUE, NM 87199-3337**

The tone of section 5 leads one to suspect that it had been written (ghost written) by Citizen Action. Some of the supposed statements of fact are not correct, e.g. the statement about “large radioactive lithium quantities...” (page 42). There is no mention of lithium in the table on page 21.

Response: Members of the peer panel, none of whom have an affiliation with Citizen Action, wrote the peer review report.

The section on lithium is taken directly from correspondence with Sandia representatives, and the intent of this section was not to alter their language. However, to clarify the concern about lithium being radioactive the paragraph was changed to read:

“Large quantities of lithium targets are located in 4 or more different pits or trenches. While the lithium itself is not radioactive, the targets do contain tritium and other radioactive nuclides.”

Because lithium has extremely short half-life (less than a second), it would not show up in Table 1.

COMMENTS RECEIVED AT THE PUBLIC MEETING – AUGUST 16, 2001

**FROM:
STEVEN DAPRA
P.O. BOX 80078
ALBUQUERQUE, NM 87198**

The WERC review of the Mixed Waste Landfill frequently invokes Dr. Mark Baskaran's report on the Landfill. SNL prepared a detailed reply to Dr. Baskaran's report, but the WERC review appears to have ignored the SNL reply. It is inconceivable to me that the WERC panel is unaware of the SNL reply – in fact it is listed in the bibliography. I would like to know why the WERC panel treated the SNL reply as though it does not exist.

The WERC panel also alluded to Mr. Doug Earp's claims about chloride and nitrates in the water under the Landfill. SNL prepared a detailed assessment of these claims showing that they had no merit. This reply appears to not be listed in the bibliography. Why not?

I am not asking the review panel to re-write its report taking into consideration the SNL reply to Dr. Baskaran's report. I do think these two omissions I have cited constitute serious shortcomings in the WERC review, and I believe we are entitled to an explanation for them.

The WERC review has many other errors in it, but I have addressed these in my earlier written comments.

Response: The panel had the opportunity to review over 100 documents as part of this peer review process and it was not necessary to reference each one. Sandia's response was certainly valuable; however, the Baskaran report brought up significant issues, such as the uranium isotopic activity ratios calculated from existing analytical data, that the peer panel evaluated using its own expertise.

The documentation received by the panel by Sandia on the chloride and nitrate issue was from presentations made at the March 22 and 23, 2001 public meeting. The panel concluded from these presentations that . . . "Sandia has provided plausible explanations for the chloride, nitrate, and conductivity data."

COMMENTS RECEIVED AT THE PUBLIC MEETING – AUGUST 16, 2001
FROM:
RIMA PETROSSIAN
CONCERNED CITIZEN
P.O. BOX 12254
AUSTIN, TX 78711

Recommendation B – Why is the risk assessment including resident’s scenarios? Are there residents living at the landfill? If this property is considered part of the U. S. Government, then can’t the land be considered to never have resident’s living here and therefore there would be no risk to residents?

Recommendation C – There are very few people here. I see very little concern from the public.

General Conclusion 6 – If the contaminants are already in a Mixed Waste Landfill, why should the U. S. Government, and therefore, the public, pay for retrieval and re-disposal of the contaminants which assures human exposure rather than leaving it in the ground. In addition, retrieval and re-disposal could cause significant environmental damage at an additional location. This would start another potential location that would need study and assessment, costing the tax-payers additional expenses.

Response: There are not currently residents living in close proximity to the landfill. However, the land may not remain as U.S. government land forever. Air Force bases have been closed across the country and the possibility that this land could become residential in the future is not out of the realm of possibilities. In addition, the human health risk assessment clearly demonstrates that even if the site does become residential, the landfill would not pose a risk as long as current landfill conditions do not change.

Not all concerns are expressed at public meetings, nor does a small turnout indicate a lack of concern.

The question of . . . “why should the U.S. government . . . pay for retrieval . . . rather than leaving it in the ground?” is an excellent question. Unless there is a study of alternatives, their costs, their risks, and their impacts, this question cannot be answered. This is the reason that the panel has recommended this activity take place (see Recommendation A).

X-Server-Uuid: 19a8503c-ef97-11d3-b9f4-0008c7e636c7
From: "Bourne, David O." <dbourne@doeal.gov>
To: "Perez, Carolyn" <werc@nmsu.edu>
cc: "Themelis, John" <jthemelis@doeal.gov>,
"Gardipe, Mike" <mgardipe@doeal.gov>, "Rael, George" <grael@doeal.gov>,
"Gould, John" <jgould@doeal.gov>
Subject: FW: Response for WERC comment on MWL risk assessment:
Date: Fri, 17 Aug 2001 16:35:25 -0600
X-MS-TNEF-Correlator:
<9093ED78575DD311B5A50008C791E51702A05436@al_exch1.al.gov>
X-Mailer: Internet Mail Service (5.5.2650.21)
X-WSS-ID: 176343A5119077-01-01

Carolyn,

Here is an additional comment on the WERC report. Thanks for your consideration.

Dave Bourne,
DOE

In paragraph 8.2, the WERC report states that the MWL is unlined and has no engineered protection at this time from water intrusion. The report does not acknowledge or appear to take into consideration in concluding the landfill must be excavated the engineered cover that is proposed and give any credit for the protection that the cover will afford. Also, the report states that the site will be a permanent legacy issue for DOE. DOE acknowledges the situation regarding the contents of the landfill and consequently DOE is designing a long term environmental stewardship program specifically to address DOE's responsibilities for this legacy issue.

Submitted by John Themelis, Acting Assistant Manager, Office of Environmental Operations and Services, DOE, Albuquerque Operations Office

Response: As stated in the Section 1 of the report . . . "An engineering evaluation of the cover design itself is not a part of the peer review." We are aware of DOE's long term stewardship plan for Sandia; however, the evaluation of it was also beyond the scope of the peer review.

August 17, 2001

COMMENTS ON THE WERC STUDY
Mixed Waste Landfill (MWL)

by Sue Dayton, Citizen Action

Preface:

Citizen Action was formed by four, former members of the Sandia Labs' Citizens Advisory Board (CAB) in an effort to further investigate the Mixed Waste Landfill. After thorough review of the MWL our position is it must be cleaned up in order to protect human health and the environment. This position is based on long-lived radioactive waste buried in the MWL that will be essentially hazardous forever; proximity of MWL to Albuquerque and neighboring communities; continued protection of precious and declining ground water; future development issues; land values; and risks posed by the MWL to human health and the environment.

Citizen Action has grown into a 14-member coalition comprised of political, environmental, and neighborhood organizations: Southwest Research and Information Center; Southwest Organizing Project; Peace Action New Mexico; Citizens for Alternatives to Radioactive Dumping, Mountain View Neighborhood Association; Bernalillo County Green Party; Green Party of New Mexico; Center for Action and Contemplation; Progressive Albuquerque Network; Native Forest Network; Forest Guardians; Data Analysis Services; International Depleted Uranium Study Team; and First Nations North and South.

In order to understand why this issue has been so controversial it is important to understand the past events surrounding the MWL:

1. One of the suggested guidelines for the report examining potential RAD contamination at the MWL was the selection of an "independent" consultant. Before Dr. Baskaran was selected by CAB members to review the RAD data efforts were made by SNL to persuade CAB members to hire a DOE contractor.
2. When Dr. Mark Baskaran presented his final report at a public meeting he was humiliated by a SNL/Weston employee who bet a \$100 bill Dr. Baskaran couldn't get his report published in a peer-reviewed journal. He went on to call Dr. Baskaran's report a sham. Representatives of DOE have called Dr. Baskaran "immoral" because he concluded SNL's data was poor. This behavior on the part of our government agencies is not only unprofessional and juvenile, it is disrespectful. SNL/DOE has never apologized to Dr. Baskaran for these statements.
3. Citing small amounts of potential Pu contamination in soil samples to 460 ft., Dr. Baskaran recommended SNL resample the soil in an attempt to settle the question of Pu contamination. Representatives from *Citizen Action* called for reanalysis of the soil core samples by an independent lab, but were told by SNL the cores had

been thrown away. This was disconcerting news, particularly when SNL/DOE refused to re-core citing it was too expensive (cost of 4 core samples = one-half million each).

4. Congressional money was allocated for “resampling and reanalysis of the soil” by an “independent” group. However, the money fell far short of what would be needed to conduct new soil sampling. The money was then given to the WERC to review the existing MWL data. Generally an organization that receives millions in research funds from the DOE, whose board members consist of representatives from the Labs, is not be considered to be “independent.” A counter proposal for a joint research project was submitted by *Citizen Action* and the Southwest Research and Information Center, a public interest research group, that would examine alternatives to capping the MWL. The project was not considered.
5. At a ‘stewardship’ meeting a SNL spokesperson told members of the community the MWL was not going to be cleaned up, and the meeting was about “stewardship.” If members of the public had come to talk about clean up “this was not the place to do it.” Many people from the South Valley, including members from *Citizen Action* who attended the meeting, became outraged and refused to participate in DOE’s ‘stewardship’ task groups.
6. Today, a few former members of the CAB and representatives from the NMED participate in DOE’s “stewardship task groups.” These groups receive funding to promote DOE’s “stewardship” program. We believe that SNL/DOE has used these groups as an example to illustrate that the public is actively involved in “stewardship.” This, however, is not the case. Most people in Albuquerque don’t have a clue what “stewardship” is, while many others boycott these meetings.

The following are recommendations for further actions:

- Independent resampling/reanalysis. Resampling of the air, water and soil be conducted at the MWL for a suite of RAD and non-RAD contaminants. Analyses of these samples should be conducted by an independent lab to assure the public no contamination has occurred.
- Additional monitoring wells. Additional studies are needed to determine if elevated levels of chloride found under Trench ‘D’ are naturally occurring or a pathway for contamination.
- Characterization. It is clear after review of FOIA documents that the inventory of the MWL is poor, a full characterization of waste buried in the landfill has not been completed, and liquids were dumped in the landfill from 1959-1975. Characterization of much of this waste could be attained from review of invoices from other DOE facilities that shipped waste items to SNL for burial at the MWL. An examination of alternate methods of investigation is in order to characterize additional waste not yet fully characterized.
- Alternatives to capping/in-situ/stewardship. Alternatives to capping have not been studied. We recommend a full range of options be studied with participation from members of communities. Verbal assurance from SNL/DOE that in 2040 they will

conduct a second study or “revisit the MWL again” is not enough. A study that explores alternatives to capping should include members of communities, particularly those who live in the South Valley, and Citizen Action coalition members. These differences of opinions are necessary to represent a full range of opinions and an unbiased outcome. It is our belief that communities have a right in decision-making that can affect their health and the health of their children. A study that explores financial assurance for on-going monitoring and potential clean up these sites is crucial. However, we have been told by a key DOE spokesperson that one of the main reasons DOE does not want to clean up the MWL is that it would result in a setting a “precedent” for clean up.

- Risk Assessment. Traditional risk assessments conducted by industry representatives are problematic. First, risk assessments are conducted to determine risks to MEMBERS OF COMMUNITIES, for communities. However, member of communities can neither read standard industry risk assessments nor are they invited to participate in such studies. Secondly, industry-based risk assessments are based solely on numbers, and ignore public values and opinions. Third, risk assessments based on calculations and models may be viewed as cutting edge science; however, it must be remembered that numbers can be manipulated, and conceptual models are no good if data is flawed to begin with. Fourth, the risk assessment conducted by SNL is poor, and contains serious flaws. Risk is based solely on tritium, and does not consider other hazardous and radiological waste products buried in the landfill. It does not consider, among other things, decay products, risk to women and children, future land use scenarios, and potential pathways for contamination to occur. Fifth, any study that attempts to assess risk to **public health** should **not** be conducted by the agency responsible for creating the problem. This rule is essential to safeguard against potential bias and conflicts of interest. A study that strives to be independent, one that involves the public in the risk process and in the selection of a third party to conduct the risk study is in order. Such a project has been conducted by Dr. John Till of Risk Assessment Corporation who conducted a risk assessment with communities at the Hanford facility.
- Health Study of Former Lab Workers. It is not known whether the MWL has harmed anyone as there have been no studies of worker health or of populations located downwind of the landfill. Many of the workers who dumped waste into the landfill through the years were unprotected, and many were exposed to radioactive and chemical waste. A health study is in order to assess the health of former workers and downwind populations.

Given the past events and current circumstances surrounding this issue we feel these recommendations are both valid and reasonable. These recommendations, if implemented, will help make amends and assure a skeptical public, especially in light of new FOIA information on the MWL, that SNL/DOE is making a sincere attempt to acknowledge and consider public concern and opinion. I would also like to commend the WERC panel members for taking on this issue in the midst of a great deal of public controversy and upheaval. Citizen Action has gone on record as not supporting the

WERC study due to the circumstances surrounding it. However, I wish to personally apologize to the WERC panel members for a statement that appeared in the Albuquerque Tribune regarding this study. The reporter misquoted me as calling the WERC study “rigged.” I did not say at any time the WERC study was “rigged;” I said it was “potentially biased.” However, it appears the panel members have worked hard to remain independent in producing their report. Thank you.

Sue Dayton

Citizen Action

PO BOX 1133
Sandia Park, NM 87047
(505) 280-1844

Response: The panel thanks Citizen Action for their input, the material does not ask for any action by the panel. No response is necessary.

Comments received from DOE and Sandia National Laboratories on August 17, 2001.

General Comments

On the subject of cover design, the draft report states several times that the proposed cover has a thickness of four feet. Sandia's proposal is actually a 3-foot-thick cover with up to 40 inches of sub-grade for purposes of leveling the site and improving the cover's long-term performance.

Please note for the last paragraph of page seven that there are currently seven monitoring wells at the MWL, rather than five. (Two new wells were installed last year.) An additional 18 bore-holes were drilled around the perimeter of the MWL during the Phase 1 RCRA Facility Investigation, conducted in 1989 and 1990.

Response 1: These changes have been made.

5.0 Short-term and Long-term Performance

In this chapter, we would prefer the author use specific rather than general terms. One example is in Section 5.3.1, with the statement, "Migration of tritium has occurred outside of the current boundaries by hundreds of feet and to depths of at least 100 ft." Figure 4.4-3, 1993 Tritium Surface Soil Sampling results from the Phase 2 RCRA Facility Investigation, September 1996, is the only known source of information on this migration. It shows horizontal distribution of tritium no more than 100 feet from the site boundary. Another example is in Section 5.3.8 where "large lithium quantities are located in four or more different pits or trenches." A quick review of the four pits and trenches shows a total of 50 kilograms of lithium compounds. This figure would seem more appropriate than "large quantities."

Response 2: Tritium moves by diffusion through the soil, therefore if detected at 100 feet in high concentrations it is reasonable that the extent of migration is beyond that distance. This is especially true for the horizontal component of migration.

The section on lithium is taken directly from correspondence with Sandia representatives, and the intent of this section was not to alter their language.

We also believe that, in the discussion of Sections 5.3.2 through 5.3.6, some elaboration is needed to make clearer the hazards discussed. In the discussion of the concept of container deterioration (Section 5.3.2), for example, it appears that an explanation of the rate of deterioration with the variables of container material, soil moisture content and the mechanisms for corrosion is needed. In this way, it may become clearer whether the threat of deterioration is a contemporary problem or one on a geologic time scale. In the discussions (Section 5.3.4 and 5.3.6) of the concept of solubilized depleted uranium and

lead, more information and explanation is needed on the K_{sp} values for these metals. In the Sandia analysis of this issue, the only credible pathway for lead and uranium hazards would seem to be a scenario in which they become aerosolized for inhalation by receptors. An explanation of this scenario would bolster the author's designation of this as an issue.

In Section 5.3.5, the concept of tritium "retardation" should be explained in some detail for clarity.

Response 3: The panel agrees that this analysis is important and should be conducted as indicated in the Recommendation A

The premise in Section 5.3.7 needs some additional effort. "The high radioactivity of Cobalt-60 is assumed by some to be a problem limiting the near-term excavation of the MWL due to work(er) exposures. This is not likely to be the case." In fact, it is considered by Sandia ER investigators to be the limiting problem. This is not because of cobalt-60 sources, encapsulated in lead shielding, however. The inventory indicates a number of items with cobalt-60 activation products and virtually no shielding against gamma radiation. In the case of items like these, the short half-life of this radionuclide makes the argument that proceeding cautiously and monitoring carefully for a few additional half-lives is a prudent approach. The radiation protection philosophy of ALARA (As Low As Reasonably Achievable) dictates that a substantive reason needs to exist to justify excavating these sources early when waiting to allow them to decay is the wisest approach. No substantive reason has yet been suggested.

Response 4: The panel agrees that this analysis is important and should be conducted as indicated in the Recommendation A

Finally, the chapter calls for a better explanation of the "unusual water level/table," particularly at MW-4. Water levels in MW-4, MW-5, and MW-6 are lower than water levels in MW-1, MW-2, MW-3, and BW-1 because of the downward vertical gradient in the regional aquifer. More recent information on these differences has been collected and we would be pleased to share these data with the WERC panel.

Response 5: This section has been rewritten as follows:

... "Sandia has provided plausible explanations for the chloride, nitrate, and conductivity data. The variable water level is believed to be caused by the fact that MW-4 taps a different level in the aquifer. Additional explanation of this water level phenomenon would be useful to understand better the nature of the groundwater regime under the MWL." This additional information will be helpful.

6.0 Evaluation of Human Health and Ecological Risk Screening Assessments

The WERC comments will be valuable to the Sandia risk assessment team for updating the MWL risk assessment. The original MWL risk assessment package was prepared as part of the formal response (01/28/1999) to NMED comments (9/11/1997) on the “MWL Phase 2 RCRA Facility Investigation”.

Formatted

The risk assessment process at Sandia was established in association with NMED regulators and toxicologists during many sessions from May to December of 1997. In these sessions, relevant parameters and assumptions were negotiated with respect to New Mexico habitat, based on the USEPA Superfund Guidance¹ for human health and other EPA guidance for ecological risk assessment.

An updated risk assessment will make use of data collected since 1999 and new guidance will be included. Sandia will take advantage of the opportunity to incorporate suggestions from the WERC report, including the addition of more explanation about the risk assessment methodologies and toxicological profiles for the contaminants of concern.

Response 6: No response necessary.

6.1.1. Minor Issues Requiring Clarification on Human Health Screening Assessments

WERC Draft Report Comment:

Since tritium is the one contaminant detected in soil sampling that clearly originated from the landfill, some additional explanation of the assumptions used for RESRAD would be useful, such as: For an industrial worker or for a resident, how much soil is estimated to be ingested? How much inhalation occurs? It would also be useful to include a table that lists how much exposure (i.e. millirem/year (mrem/yr)) is estimated to occur from each of the exposure pathways (i.e. soil ingestion, inhalation, and plant uptake).

[DOE Response]

RESRAD does not assume any partitioning between volatile and bound tritium. In general, RESRAD assumes that tritium is transferred in environmental media through its association with water as tritiated water (HTO). To estimate tritium concentration in air, water, and food, the tritium concentration in soil water in the contaminated zone is first estimated from the soil properties, tritium concentration in soil, and the tritium retardation factor. It is assumed that the relationship of tritium in air versus tritium in the ground would be analogous to that of stable hydrogen in these media. Appendix L of the RESRAD user's manual discusses the tritium model in detail. Specific questions about the model can be addressed to Dr. Charley Yu of Argonne National Laboratory.

For the MWL, the estimated annual dose from tritium is 0.2 mrem/year, compared to the 360 mrem/year the average person receives from natural background radiation. In fact, the RESRAD output outlines the specific pathway that contributes to the estimated dose

on a per-radionuclide basis. In this instance, 99.8% of the radiation dose from tritium is determined by RESRAD to come from inhalation. RESRAD input parameter R018 gives the soil ingestion rate of 36.5 g/y.

WERC Draft Report Comment:

Why is the dermal pathway for tritium considered insignificant?

[DOE Response]

Dermal absorption typically assumes immersion by bathing or showering. This pathway is not considered significant, because no well water from the site is utilized. It is possible for gaseous tritium to be absorbed through the skin; however, at the very low concentrations encountered at the MWL, this pathway of exposure is considered trivial and not analyzed further.

WERC Draft Report Comment:

For all these routes of exposure was the highest detected tritium concentration used? If so, the Uncertainty Discussion (pages 38-40, SWMU 76) should address this.

[DOE Response]

In all ER screening risk assessments, the highest observed COC concentration is used in the risk screening. If the screening result suggests a potential problem, the risk assessment is repeated with more appropriate site-specific input parameters. This clarification will be added to the uncertainty discussion section of the report.

WERC Draft Report Comment:

A statement describing RESRAD would be useful. Such as “RESRAD is a computer model developed at Argonne National Laboratory for the U. S. Department of Energy to calculate site-specific radiation doses and cancer risk to chronically exposed on-site receptors.”

[DOE Response]

RESRAD is the only code designated by DOE for the evaluation of radioactively contaminated sites. NRC has approved the use of RESRAD for dose evaluation by licensees involved in decommissioning, NRC staff evaluation of waste disposal requests and dose evaluation of sites being reviewed by NRC staff. RESRAD has been applied to more than 300 sites in the U.S. and other countries. The EPA Science Advisory Board reviewed the RESRAD model. EPA used RESRAD in their rulemaking on radiation site cleanup regulations. The RESRAD code has been verified and has undergone several benchmarking analyses, and has been included in IAEA projects to compare environmental transport models. RESRAD training workshops have been held at DOE, NRC, and EPA headquarters and Regional offices. Some 800 people have been trained at these workshops.

WERC Draft Report Comment:

Why is the incremental TEDE (total effective dose equivalent) set at 15 mrem/yr for the industrial scenario and 75 mrem/yr for the residential scenario? What is the basis for this difference?

[DOE Response]

These target values are an artifact of the original negotiations with the NMED to establish acceptable thresholds for risk screening assessments. The 15 mrem/year TEDE came from the EPA’s guidance on most likely future use scenarios of the site. The 75 mrem/year TEDE also came from EPA’s guidance regarding the unlikely situation in which the anticipated future use of the site is not realized (loss of institutional control). The EPA acknowledged the low probability of the loss of institutional control situation by allowing the higher 75 mrem/year TEDE.

Response 7: These clarifications are helpful and the information will help improve Sandia’s risk assessment documents.

6.2.2. Minor Issues Requiring Clarification on Ecological Risk Screening Assessments

WERC Draft Report Comment:

It was never mentioned whether burrowing owls are resident at Kirtland Air Force Base. Given that the burrowing owl has been designated as a species of management concern by the U.S. Fish and Wildlife Service in Region 2, it would be nice to know if any censuses have been conducted and what the status of burrowing owl population is on the base.

[DOE Response]

The burrowing owl has been observed and surveyed at Kirtland Air Force Base (KAFB). In fact, the base is believed to be one of the largest owl nesting sites in the state. Surveys have been conducted by both Sandia and KAFB during the past five years. Surveys involve marking and checking the survival rate of nesting pairs to determine the population size. Information is provided to the KAFB Installation Restoration Project from its contractor, Hawks Aloft, in the form of an annual report. The base environmental group has also issued a draft Natural Resources Management Plan with information on the owl population.

Deleted: ¶

¹ U.S. Environmental Protection Agency (EPA), 1989. “Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual,” EPA/540-1089/002, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1991. “Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B),” Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

Response 8: These clarifications are helpful and the information will help improve Sandia’s risk assessment documents.