



ENVIRONMENTAL EVALUATION GROUP

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September 17, 1999

Dr. Inés Triay, Manager
Carlsbad Area Office
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Dear Dr. Triay:

EEG's preliminary comments on the *Fundamental Bases of the Characterization Requirements for Disposal of Transuranic Waste at the Waste Isolation Pilot Plant and Findings and Recommendations of the Transuranic Waste Characterization Task Force Final Report* (August 9, 1999) are attached.

Our comments are not a critique of the two reports but are limited to those recommendations where we have preliminary opinions. Silence on some recommendations does not imply either agreement or disagreement.

We believe that overall waste characterization requirements are excessive and the Task Force reports are a worthwhile effort at beginning to evaluate individual requirements. However, any proposed relaxation needs to be evaluated in sufficient detail to convince regulators, EEG, and stakeholders that the modification is justified.

Please call Dr. Jim Channell if there are questions.

Sincerely,

Rishi Chaturvedi
for Robert H. Neill
Director

RHN:JKC:js
Enclosure

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K. HUNTER

EEG Preliminary Comments on the Two Reports of the Transuranic Waste Characterization Task Force (TWCTF)

General Comments

There is a great deal of useful information as well as preliminary decisions in the two reports of the TWCTF: (1) Fundamental Bases of the Characterization Requirements for Disposal of Transuranic Waste at the Waste Isolation Pilot Plant, August 9, 1999; and (2) Findings and Recommendations of the Transuranic Waste Characterization Task Force, Final Report, August 9, 1999.

We are sympathetic to the purpose of the TWCTF (“...to focus on increasing the efficiency, effectiveness, and regulatory confidence of characterization operations while reducing costs.”). In general we consider the overall waste characterization requirements to be excessive and believe it should be possible to increase efficiency without any decrease in health and safety. But each proposed relaxation needs to be evaluated in enough detail to convince regulators, EEG, and stakeholders that the modification is justified.

EEG may undertake a review of the existing waste characterization requirements where we independently evaluate some waste characterization elements that appear excessive or without basis. We will also rigorously evaluate any DOE evaluations. The outcome of our individual evaluations cannot be predetermined; we could end up recommending that a requirement be increased, relaxed, deleted, or unchanged.

These comments on some of the recommendations in the second TWCTF report should be considered preliminary. They represent our current thinking on some of the recommendations but have not received enough evaluation to be considered final opinions. Our comments are not a critique of the reports themselves, but only of those recommendations where we have preliminary opinions. No assumptions should be made of implied agreement on discussions or recommendations we do not address. We believe it will be more useful to give you preliminary comments in a timely manner rather than delay until more thorough analyses can be made.

Fundamental Bases Report

This document was a useful resource to EEG and the effort required to produce it is appreciated. However, the compilation is not rigorous enough (we noted several errors) or detailed enough (it often references requirements rather than states them) to be a stand alone reference.

Findings and Recommendations Final Report

Chapter 1 describes the problem and approach used. The discussion recognizes that those requirements that have a legal or regulatory basis will be more difficult to change than one that



comes from only the WAC or QAPP. We agree but believe that any non legal or regulatory related changes should receive just as thorough a technical evaluation and justification.

Chapter 2

The use of only variable costs in the cost model appears reasonable as a way of comparing savings from reducing the frequency of the individual characterization activities in Table 3. If it were possible to completely eliminate one of the activities, fixed costs could be a factor. The assumption of 500 containers per waste stream is important because of the very expensive visual examination, coring, and solids analyses cost. We agree that (using the assumptions on pages 10-12) current variable cost of WIPP waste characterization would be about \$1.8 billion. It is noted that the 1997 WIPP Supplemental EIS (SEIS-II) estimated total (including facility and overhead) waste retrieval and characterization costs of \$3.9 billion.

Chapter 3

This chapter contains the activity by activity discussion and justification for the recommendation. We will respond individually to those items where we have preliminary opinions.

Chemical Compatibility

EEG agrees that this requirement should not be changed and has no recommendations at this time concerning the compliance method.

Explosive, Corrosives, Compressed Gases, and Pyrophorics

EEG agrees that these requirements should not be changed. We have no recommendations at this time concerning the compliance method.

External Dose Rate

The 200 mrem/hr contact dose rate limit is consistent with DOT regulations. Experience at DOE facilities indicates that occupational doses of persons handling these wastes are well below one rem/year. Therefore, we believe this is an appropriate limit and should not be changed.

Fissile Gram Equivalent

A limit of 200 Fissile Gram Equivalents for a drum and 325 FGE/for a standard waste box is specified in the TRUPACT-II Certificate of Compliance. We believe it is a reasonable limit and should not be changed.

Flammable Volatile Organic Compounds

The document states that no technical basis has been found for the specific limit of 500 ppm for VOCs. The history of the use of this limit in WIPP documents is summarized below. Use of the 500 ppm limit for flammable VOCs to mitigate flammability or explosion concerns is documented in the No Migration Variance Petition (U.S. Federal Register, vol. 55, no. 220, pp. 47709 and 47717). In addressing the issue of WIPP waste flammability, the DOE prepared a position paper that identifies how the 500 ppm VOC limit will mitigate flammability events. The DOE position states:

The safety concerns associated with the flammability of the waste seem to be well addressed by regulations from agencies such as the EPA and the NRC, by the waste acceptance criteria formulated by the DOE for both transportation and disposal, and by the operational procedures at individual sites. The regulations and the waste acceptance criteria are based on conservative analysis, and thus involve a margin of safety for preventing any potential flammability-related incidents. As an example, the total quantity of flammable VOCs in the headspace of a TRU waste drum is limited to 500 ppm. The fact that this imposed limit is extremely conservative, is clearly evident upon comparison with the lower explosive limits for some typical flammable VOCs. One such flammable VOC, xylene, which was actually involved in one of the incidents summarized in Section 4.0, has a lower explosive limit in air of 1.1 % (NFPA, 1986). Upon conversion of units, this value is equivalent to 11,000 ppm. Therefore a minimum of 11,000 ppm of xylene must be present in order to form a flammable mixture with air. By comparison, this is 22 times larger than the existing limit of 500 ppm of total amount of all flammable VOCs allowed per drum. (U.S. DOE, 1991).

The DOE is referring to the NRC requirements for transportation in the TRUPACT-II and the EPA No-Migration Determination for the WIPP.¹ In 1991, the DOE maintains that the 500 ppm limit on flammable VOCs was based on "conservative analysis." Unlike the NRC transportation limits, the EPA conditional determination did not restrict the concentration of flammable VOCs to 500 ppm. Rather, EPA used the 500 ppm to define a significant level of VOCs for the purpose of requiring DOE to "perform an explicit flame test to determine if a flammable mixture can be formed with air" (U.S. EPA, 1990, Section IV.B.7.a, p. 47709). EPA was concerned that the presence of significant levels of flammable VOCs would affect the LEL results calculated by the Le Chatelier formula for mixtures of hydrogen and methane.

The EPA technical justification for the 500 ppm level for flammable VOCs has merit. It inherently recognizes that the waste in a drum or standard waste box can be a complex mixture in

¹ The 1996 amendment to the WIPP Land Withdrawal Act deleted the need for EPA regulation on the migration of RCRA constituents.



which the flammability limits of hydrogen or methane can be lowered by the presence of a small amount of a flammable VOC.

Any proposal to change the VOC limit based on technical considerations must consider the potential need for a non-flammable VOC limit as well. For example, at least one non-flammable VOC found in the waste, trichloroethylene, is known to lower the flammability limits for methane and hydrogen. Jorissen and Meurwissen (1925) determined for "pure methane the explosion limits, which without addition of trichloroethylene vapor were 4.9% and 12.6%, were lowered to 3.3% and 9.6% by 5.8 percent of trichloroethylene vapor." In a study of hydrogen flammability, Jorissen and Ongkiehong (1925) showed the presence of trichloroethylene vapor also lowered the upper and lower explosive limits for mixtures of hydrogen and air.

The DOE recommended the 500 ppm VOC limit to the NRC ten years ago and again in August 1998 (see below). In addressing other issues, the DOE assured the NRC that the concentration of flammable VOC would be in the low ppm range. These other issues included pressure buildup and the impact of organic vapors on the efficacy of the O-rings for the certified TRUPACT-II and the proposed RH-TRU shipping cask. The TRUPACT-II SARP states that very few waste streams use flammable organic solvents at the sites, the permeabilities of the aromatic hydrocarbons through the plastic bags used as confinement layers are extremely high allowing these compounds to escape before being emplaced in the shipping container, analysis of the solidified aqueous inorganic materials with ppm levels of aromatic hydrocarbons in the waste did not have any detectable levels in the headspace above the waste (TRUPACT-II SARP, 2.10.10-3). These statements of low concentrations are not consistent with the Table C2-4 data mentioned below.

The flammable VOC requirement is a significant one. It is an expensive characterization cost. Also, some containers will not be shippable with the 500 ppmv limit or even a 5,000 ppmv limit. For example, the headspace gas data on 930 drums that is in Table C2-4 of DOE's RCRA application had over 11% of the drums with greater than 500 ppmv volatile VOCs and over 5% have greater than 5,000 ppmv volatile VOCs. Furthermore, six of the 11 Waste Matrix Code Groups (WMCs) sampled had at least one drum with a total VOC headspace gas concentration greater than 10,000 ppmv (1%). DOE has ignored the 1995 data from Table C2-4 in their latest submittal to NRC for the CH-TRAMPAC (8/98) and references 1989 or earlier data which concludes that only the solidified organic WMCs can have VOC concentrations greater than 1%.

The comment is made in Section 3.2.1 that a gross screening to determine if flammable VOCs total <500 ppm would be appropriate. We believe that a gross screening for total VOCs of <500 ppm would be appropriate because of the possible synergistic effect of nonflammable VOCs on the flammability limits. This <500 ppm total VOCs screening limit should also be acceptable for the VOCs that have room based concentration limits in the RCRA Permit. None of the 9 VOCs have room based concentration limits below 2400 ppmv and 7 of them are \geq 5490 ppmv. Those containers with <500 ppmv total VOCs will have no effect on showing compliance with the



room based limits. Any evaluation of raising the 500 ppm limit needs to consider the above history and also the effect on butyl O-rings in CH-TRU and RH-TRU shipping packages.

Free Liquids

We believe the free liquid requirement should remain unchanged. There are no recommendations at this time concerning the compliance method.

Decay Heat

EEG has been concerned about hydrogen gas generation of waste during shipment since 1983 when we published EEG-24. NRC had similar concerns that resulted in the limits specified in the TRUPACT-II Certificate of Compliance. We are also aware of the ongoing CAO effort to expand the envelope of gas generating wastes that can be shipped in TRUPACT-II (our most recent information came from Phil Gregory's July 26, 1999 presentation to the NAS WIPP Committee in Albuquerque).

We have the following comments on the gas generation issue:

The safety issue is real and the current requirements have significant characterization and shipping impacts.

An effort to try and justify some relaxation in the requirements is worthwhile if it does not adversely affect transportation safety.

It is unfortunate that so little progress has been made on this issue since the original TRUPACT-II Certificate of Compliance in 1989.

The CAO effort has the potential to significantly increase the number of containers that will be shippable but the problem is not likely to be completely solved without either treatment or repackaging of some containers.

EEG intends to closely follow the CAO effort and may perform an analysis of its own.

Waste Packaging - Confinement Layers

The number of confinement layers obviously affects hydrogen gas concentrations in the innermost bags and has an impact on the ability of a container to meet decay heat criteria and be shippable. Possibilities of reducing the number of layers in newly generated waste should be studied.



We offer one caveat. Layers of plastic bags have advantages in preventing contamination of workers that are removing wastes from glove boxes. Any evaluation aimed at minimizing the layers of bags used should have an overriding objective of minimizing possible contamination.

Plutonium Equivalent Curies

EEG was involved in the development of the PE-Ci concept back in 1982. We have reviewed and commented on a number of issues involving appropriate limits since that time. We have no additional comments at this time.

Waste Classification

This issue will be discussed further under the topic of radioassay. One observation is that a relaxation of the 95% confidence limit would reduce the amount of low level waste that would be acceptable at WIPP (wastes with mean concentrations greater than 60-80 nCi/g would usually be called TRU when 1.645σ is added). Also, see our comments under the 10-100 nCi/g low-level waste issue.

Matrix Parameter Category

EEG reached two conclusions in its review of the CCA that are relevant to the requirement for weights of cellulose, plastics, and rubber: (1) the determination of average concentration should be on a sub-repository basis (such as a panel) rather than on the full repository basis that is acceptable to EPA (see EEG-68, page 164); and (2) the calculation of Wang is not appropriate because it ignored density data that are reported in the Baseline Inventory Report which is the basis of the CCA inventory. Use of BIR data show that it is possible to exceed 2 times the inventory average concentration in a waste panel; and (3) neither DOE or EPA have responded to EEG's question about the accuracy of the cellulosic, plastic, and rubber determination which is important because of conclusion (2). EEG's justification for conclusions (2) and (3) are in an April 10, 1998 letter from R.H. Neill to Mary Kruger at EPA. EEG also expressed concern about the cellulosic content of the dunnage in drums containing RFETS pipe containers (in EEG's report of the September 1998 Salt Residues Audit).

Another consideration is that Sandia is evaluating the possibility of removing MgO backfill from the repository. So, the Task Force should be careful about assuming the existence of MgO backfill when justifying long-term recommendations.

We have no objection to estimating the quantities of cellulose, rubber, and plastic on a waste stream basis (as long as the waste stream is appropriately defined) because average concentrations for a panel appear to be adequate. However, the amount of uncertainty in the estimate is important in the present performance assessment models and we are not certain that the present system is accurate enough. Any proposal to decrease the amount of sampling (and thus increase uncertainty) needs to be carefully studied and justified.



Defense Waste

There would not be a technical basis for excluding non-defense waste from WIPP provided the amounts were small and there were not significant differences in waste streams. This is a public policy issue. It is spelled out in Public Law 96-164 (December 29, 1979), the Consultation and Cooperation Agreement between the State of New Mexico and DOE (June 30, 1981), and the WIPP Land Withdrawal Act of 1992 (PL 102-579). Because of this history, relief from this restriction should be sought from the Congress and the State of New Mexico.

Acceptable Knowledge

The desire to rely more on AK and back off from 100% head space gas sampling and analysis is understandable. It is true that approximate means and standard deviations of a waste group can be obtained by sampling less than 50% of containers. An examination of the Table C2-4 headspace gas data shows that only 2 minor waste matrix code groups (salt waste and soils) out of 11 have no containers with >500 ppm flammable VOCs and only 5 of 11 WMCGs have no containers over 5,000 ppm. Therefore in order to justify much sampling reduction it will be necessary to either get some relief from the NRC on the 500 ppm flammable VOC level and/or an understanding from NRC on the percentage of containers that are allowed to exceed the target level. Also, it will be necessary to do quite a bit of sampling within a waste stream to be sure of the distribution and thereby determine the sampling requirements.

Homogeneous Waste Sampling and Analysis

For the following reasons, EEG sees no scientific reason why it is necessary to analyze for metals at all:

DOE apparently did not feel that metals concentration data were important enough to include in the RCRA application. The State apparently concurred since they did not request that the data be include.

The required hazardous metals data are not to be used for any regulatory control under the Draft Permit.

Evaluations in EEG-72 concluded that human exposures to hazardous metals at WIPP would only occur from the same types of operational and human intrusion accidents that released radioactive materials. The calculated radionuclide risks (Excess Cancer Fatalities) were 2×10^6 times the hazardous metals release for operational accidents and 5×10^5 times for long term releases. Furthermore, methods used to clean up radionuclide contamination would also be effective in cleaning up hazardous metals.

EEG has no opinion at this time on sampling for VOCs and SVOCs in homogeneous wastes. The decision should be based on whether any useful information will be obtained

for VOC control under the RCRA Permit. We have no opinion at this time about use of the Toxicity Characteristic Leaching Procedure rather than total analysis.

Radioassay

The reason for removing NDA requirements from the QAPP and placing them in the WACC Revision 6 is not clear. Please explain.

For the four recommendations under Section 3.2.3 we have the following comments:

No comment on QAO's at this time.

Uneasy about removing limits on total bias. This needs to be explained and justified.

It has to be shown that the FGE limits and determination of >100 nCi/g TRU concentrations can be met on all containers with 90% sampling.

Clearly large container assay systems need to be developed. Progress has been slow and unless expedited will be a detriment to shipping flexibility.

Radiography and Visual Examination

These two requirements are combined here since they are inter-related and discussed together in Section 3.2.4.

The findings and recommendations address only the existing procedures for stored waste. It is unclear whether the Task Force has any reservations about plans to do 100% VE and 0% RTR for newly generated waste.

Claims are often made that VE is dangerous because of additional radiation exposures and possibility of contamination. EEG has discussed this issue with persons doing VE at INEEL, RFETS, and LANL and found they don't feel VE is dangerous and do not have data on incremental radiation exposures. More specific data and evaluations are needed if danger is to be used as an argument against VE. Also, the plan to use 100% VE for newly generated wastes appears to be inconsistent with expressed safety concerns.

EEG agrees with the generic policy that data that is not going to be used should not be collected. This includes data for all requirements, not just VE. However, it is necessary to do thorough evaluations to show that RTR and/or VE are not providing useful data in a waste stream. At the recent SRS audit, 15% of the first batch of drums were rejected by RTR.



Requirements - Minimizing, Making Consistent, Minimizing Changes

Minimizing Requirements. As mentioned throughout these comments we agree that waste characterization that is not used in some decision making process should be evaluated for elimination. This was our argument against metals analyses. The requirements dealing with operational and transportation safety (FGE, liquid, flammability, etc.) are related to decision making and obviously should not be eliminated.

The removal of WIPP from RCRA regulation is a political issue and we have no position on it. Our recent report (EEG-72) did conclude that the radiological risks from routine operations, operational accidents, and long-term releases were several orders of magnitudes greater than the risks from hazardous wastes.

Making Requirements Consistent. Some inconsistency in requirements is inevitable until the final RCRA Permit is issued. It seems to us that the timing of QAPP Revision 1 exacerbated this problem.

Minimizing Changes to Requirements. Coordination between CAO and the Sites is a common sense approach to minimizing the effect of changing requirements. Constant change is inevitable and we believe that any changes resulting from Task Force recommendations will occur over a period of several years rather than at one discrete time. An obsession with minimizing change would favor retention of the status quo which the Task Force believes is undesirable.

Data Management

We are not familiar with the RCRA/CERCLA system and cannot comment on it. Much of the criticism of redundancy is related to the QAPP and the stringency of the CAO audit process. We believe the audit process itself should not be relaxed because this would encourage sloppiness. It is preferable to try to reduce requirements that need to be audited while maintaining the current level of audit stringency.

Hanford stated that the number of data validations seemed excessive. Yet in the recent Hanford audit an EEG observer found numerical and calculation errors in one QAO document and one procedure. So, for whatever reason, the Hanford system is not effective enough to eliminate errors.

Performance Based Programs

We have concerns about the increased burden on the sites and CAO of implementing performance based programs and whether results would actually be as accurate. Would such programs put a greater (perhaps unrealistic) responsibility on the Performance Demonstration Program?



Pu-238 Transportation

Most of our thoughts on this issue are expressed under the decay heat requirement. One additional comment is relevant. We oppose use of the argument that only explosions that damage the transport container should be considered. This is a reduction in the factor of safety that would allow contamination of drums, boxes, and the interior of the TRUPACT-II.

Ten to 100 nCi/g Low-Level Waste

LANL suggested that the definition of TRU waste be lowered, perhaps all the way to 10 nCi/g. The motivation would be to help solve a mixed low-level waste problem, not a TRU waste problem. The claim under discussion of issues ("Reduced radioassay characterization costs would result from less effort expended to determine with existing uncertainties that the waste contains TRU nuclides in quantities greater than 100 nCi/g") makes sense only if there is to be no attempt to determine the lower value. We believe that the paper by Holman and Altomare (Assessing the Impacts of Lowering the Radioactivity Limit Definition of TRU waste from 100 nCi/g to 10 nCi/g, WM '99 conference) is a much better argument for not lowering the limit than any arguments in this report.

References

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- U.S. Environmental Protection Agency, 1990. Conditional no-migration determination for the U.S. Department of Energy Waste Isolation Pilot Plant. Federal Register, November 14, 1990, vol. 55, No. 220, p. 47700.

