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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

March 21, 2003

OFFICE OF
AIR AND RADIATION

Dr. Inés R. Triay, Manager
Carlsbad Field Office
U.S. Department of Energy
P.O. Box 3090
Carlsbad, NM 88221

Dear Dr. Triay: [Environmental Protection Agency (EPA) preliminary review of information for the Advanced Mixed Waste Treatment Project (AMWTP)] 10/21/03 R

Thank you for the submission regarding the Advanced Mixed Waste Treatment Project (AMWTP) in your letter dated December 10, 2002. The Environmental Protection Agency (EPA) has completed its preliminary review of the information you provided. It is our understanding that you would like to dispose of uncompacted non-debris and super compacted debris wastes in the Waste Isolation Pilot Plant (WIPP) that will be generated by the AMWTP. The December 10 letter acknowledges, and we concur, that requirements related to demonstration of waste characterization under 40 CFR § 194.8 must be addressed prior to emplacement of AMWTP waste in the WIPP. There are also a number of other significant questions and concerns related to your submission that are not fully addressed by the December 10 letter. At this time we can not agree with you that there will be "no adverse impacts from AMWTP wastes on conceptual models and long-term performance." We require additional information in order to adequately assess the effects of AMWTP waste and determine whether to allow its disposal in the WIPP. Before the Department of Energy (DOE) can emplace any AMWTP waste in the WIPP, EPA must issue both a general approval, under 40 CFR §194.4, for its disposal, and a site-specific approval for the Idaho National Environmental and Engineering Laboratory (INEEL), based on an inspection under 40 CFR §194.8. General issues are discussed below and our detailed questions and comments are enclosed.

First, the report on the "Assessment of Impacts on Long-Term Performance From Super Compacted Wastes Produced by the Advanced Mixed Waste Treatment Project" provides information that suggests that the waste from the AMWTP deviates from the waste envelope that was used in the original performance assessment and approved for the certification. For example, the cellulose, plastics and rubbers inventory appears to be in addition to that used in the certification baseline inventory. This is important because these inventory items can contribute to increased gas pressures in the repository. Also, the baseline inventory report estimates may need to be updated to account for AMWTP wastes. In addition, there is limited

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information on the expected characteristics of the waste. It is possible that the waste characteristics of the super compacted wastes produced from the AMWTP change the conceptualization (e.g., creep closure behavior) of the repository and therefore may affect the expected long-term performance of the repository.

Second, the report relies primarily on logical arguments with only limited analysis. Based on the limited information provided, and the calculations presented, some of which are clearly based on other calculations performed on computer systems and with computer codes that have not been accepted by EPA (as required by 40 CFR § 194.23(a)), it is not possible to determine the expected long-term performance of the WIPP with AMWTP wastes emplaced therein.

If possible, the Carlsbad Field Office (CBFO) needs to clearly demonstrate that the new AMWTP waste is equivalent to the existing waste inventory in that the quantities of the inventory and the properties of the inventory are equivalent. The present submission does not demonstrate equivalency and can even be interpreted to suggest that the AMWTP wastes are very different from current wastes. Another approach would be for CBFO to demonstrate, through a more representative analysis, that the new waste form resulting from the AMWTP, if somewhat different from the assumed waste characteristics, nevertheless does not impact compliance with the Agency's disposal regulations. The arguments and information you have provided thus far are inadequate to support such claims. With information you provided in the AMWTP documentation, it appears to us that, in order to resolve these issues, you may need to conduct performance assessment calculations that investigate the effects on releases due to the changes in waste characteristics, and the potential change in inventory of radionuclides, cellulose, plastics and rubbers (CPR) resulting from the super-compaction process.

We suggest that you conduct separate analyses for uncompacted and super-compacted waste from the AMWTP. In this way, the Agency can make separate determinations on these wastes. For example, we might be able to more quickly approve the uncompacted waste if you can provide sufficient additional information to verify that this waste has equivalent characteristics to the waste included in the original certification performance assessment and contains less than the inventory values (of radionuclides and CPR) used in those calculations. With respect to the super compacted waste, however, we are concerned that the waste characteristics could challenge some fundamental assumptions concerning the predicted future performance of the WIPP. The effects on homogeneous waste assumptions, possible changes in local chemistry, creep closure assumptions, and the possible impact from future drilling events, need to be thoroughly examined before the Agency can approve the shipment of this new waste type to WIPP. This may require experiments and modeling.

Before the Agency can make any decision on the acceptability of this waste for the WIPP waste inventory, these issues must be resolved. The EPA will evaluate additional information submitted by DOE to determine whether the waste characteristics and behavior entailed by AMWTP waste constitute a significant departure from the information upon which EPA's certification is based. Until EPA completes this evaluation and a site-specific inspection for the

AMWTP under 40 CFR § 194.8 (and issues decisions on both), DOE is not to dispose of AMWTP wastes in the WIPP. Furthermore, DOE is to develop and adhere to a waste loading scheme that incorporates the placement of the AMWTP in addition to the other wastes being emplaced.

If you have any questions, please contact Betsy Forinash at (202) 564-9310.

Sincerely,



Frank Marcinowski, Director
Radiation Protection Division

Enclosure

cc: Nick Stone, EPA Region VI
Russ Patterson, DOE/CBFO
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Enclosure

AMWTP Concerns and Questions

- The review of features events and process may be incomplete in both reports that accompany the December 10, 2002 letter. For example, because of the structural integrity of the 100 gallon containers filled with super compacted waste, the creep closure assumptions used in the original certification may be altered.
- Enclosure 2, pages 6 and 7, lists assumptions used in this analysis. Because of the different nature of the AMWTP super compacted waste when compared to the various waste assumptions, such as homogeneity, the assumption of random emplacement must be strongly enforced and a waste loading scheme must be used in the future. The statement that the contents of three 100 gallon containers physically replace seven 55 gallon drum is not the salient point. The radiological characteristics, waste characteristics and inventory of cellulose, plastics, and rubbers are the most important elements.
- Enclosure 2 does not appear to verify that super compacted waste is actually equivalent to existing waste assumptions in the original certification (See attached Table One). It appears, for the super compacted waste, that the density of cellulose, plastics, and rubbers is almost ten times those assumed in the original certification. This alone appears to alter the assumption of waste homogeneity in the original certification.
- There needs to be a thorough analysis that demonstrates that the radionuclides released from a borehole intrusion would be unchanged when one compares the supercompact waste and the original waste.
- It appears, from Table 4 on page 8, that the AMWTP waste inventory, both uncompact and super compacted debris waste, is being substituted for the original assumed waste from INEEL in the original certification. If this is the case, it seems incorrect. INEEL waste has already been placed into the WIPP and more is coming from other sources at INEEL, therefore it seems that the AMWTP waste inventory should be additive. What is the true total inventory from INEEL and what will be its impact on the total inventory expected to be delivered to WIPP?
- From the analysis done in Enclosure 2, Section 2.4, super compacted waste could locally significantly increase the density of cellulose, plastics, and rubbers. This would appear to change the repository behavior in fundamental ways, such as more frequent cases of high gas pressure, since these items are important to gas generation. Therefore mere logical arguments that the new AMWTP waste is equivalent to original certification assumptions are insufficient to determine whether this is a significant departure from the original WIPP certification.
- Enclosure 2, page 13, states that generated gas will flow freely between panels for the Performance Assessment Verification Test (PAVT). This statement is no longer true because of the Option D condition in the WIPP certification decision and all performance assessments must include Option D panel closures. Therefore, analysis must include recent changes to the performance assessment, such as the inclusion of Option D, a new spillings model, etc.

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- Enclosure 2, page 14, references a performance assessment analysis done to support the DOE panel closure submission. This performance assessment was done using unqualified computer codes and an unapproved parameter database system which cannot be accepted by the EPA for compliance determinations.
- It is unclear from the discussion if the super compacted waste will have porosity and permeability characteristics that may influence the "stuck pipe" and "gas erosion" mechanisms considered in the original certification. Your analysis should clearly demonstrate that, if true, this new waste form does not affect such assumptions in the original certification.
- The waste was modeled in the Compliance Certification Application (CCA) as an average mixture of metals, cellulose, sorbents, rubber, plastic and sludges. In other words, all the components are approximately equal in proportion (Enclosure 2). Because compacted and non compacted materials are not in similar proportion, it is not clear whether that conclusion is still applicable, or whether it needs to be modified for the AMWTP waste. A more thorough discussion is necessary.
- It is proposed in the AMWTP submission that the waste density, waste shear strength, waste permeability and the waste porosity from AMWTP will not be different from the CCA and will not affect the creep closure process. This statement needs to be thoroughly justified.
- Based on the rock mechanics and surrogate experimentation work in the CCA, Sandia National Laboratories (SNL) came to the conclusion that "degraded waste tensile strength can vary significantly." SNL decided to take an empirical approach to reduce uncertainty. Enclosure 2 concludes that "the range of final compacted waste volume from the AMWTP and in situ room closure process are similar." It is not clear what state of the compacted material is considered to be "final." According to Callahan and De Vries, 1994, during first 50 years the closure process is rapid and then proceeds at an appreciably slower rate. The closure process continues for several decades. SNL assumes that the gas pressure can increase significantly when the compacted material thickness is less than 2m. Super compacted waste can influence the natural creep closure process. A thorough analysis needs to be done to evaluate the effect of emplacing super compacted waste.
- A permeability value of $1.7 \times 10^{-13} \text{ m}^2$ was used in the CCA calculations and increased for the PAVT. Butcher in SAND97 -0794 mentions that "It should also be noted that the permeability value used represents the lowest value considered likely (no gas generation), and is associated with the maximum possible compaction of the waste. If gas generation limits waste compaction, making the waste even more porous, then it could be even more permeable." It is not clear how the permeability considerations in the AMWTP report compare with the original certification assumptions. A more complete comparison of AMWTP super compacted waste and creep closed waste is required.

- Enclosure 2 states: "The ranges for final waste density and for waste porosity are expected to be similar between the PAVT and the repository with AMWTP waste." However, the "Spalling Release Position Paper, 1997" states that "Tensile strength is thought to be the most significant with respect to failure and possible transport during a spall event." The study concludes that there are significant variations in the value of the strength at partially and fully degraded surrogate materials and dry and saturated conditions, stating "Testing is being conducted to quantify the conditions that capture the "low end" of possible mechanical strength created as a result of extensive degradation. These mechanical data are being used to calculate possible spall volumes when gas pressure are sufficiently high."
- In order to concur with CBFO's findings in the AMWTP submission and accept the assumptions and predictions for the AMWTP wastes, we need a detailed explanation of the issues related to tensile and mechanical strength. Also, in the AMWTP report it is proposed that the properties of wastes compacted by the natural process (creep closure) and the mechanical means (AMWTP) are the same. However, one is time dependent and the other is not.

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