

**ENVIRONMENTAL EVALUATION GROUP**

AN EQUAL OPPORTUNITY / AFFIRMATIVE ACTION EMPLOYER

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June 29, 2001

Mr. Steve Zappe  
Hazardous & Radioactive Waste Bureau  
New Mexico Environment Department  
P.O. Box 26110  
Santa Fe, NM 87502

Dear Mr. Zappe:

Attached are the EEG's comments on the Class 2 Modification Request that was submitted by the WIPP Permittees on April 27, 2001. As noted in the summary comments we are primarily concerned about the rigid liner lid diameter and sampling through unvented rigid liner issues. Possible remedies to these deficiencies are suggested.

Sincerely,

Matthew K. Silva  
Director

MKS:JKC:BAW:js  
Enclosures (2)

cc w/enclosures: Dr. Inés Triay, CBFO  
Robert St. John, WTS  
Robert Kehrman, WTS  
Jody Plum, CBFO

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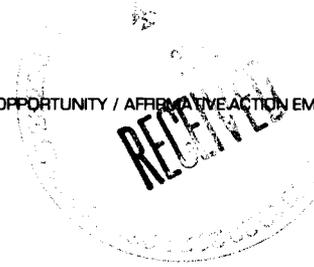




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**EEG Summary Comments**  
**Class 2 Modification Request (DAC)**  
**June 29, 2001**

There are several significant changes in this proposed modification compared to the one submitted on December 7, 2000, although the DAC values themselves are unchanged. EEG had five summary comments on the previous submittal. Two of these (agreement that the conceptual approach is reasonable and that the calculations should be checked by NMED) are still applicable. The other three comments dealt with specific concerns. EEG's conclusions on whether the April 27, 2001 modification resolved these concerns are summarized below.

Handling of Different Filter Diffusivity Values. The previous modification did not specify how the DAC tables would be applied to intermediate filter diffusivity values. The current modification adds a footnote to Tables B1-7, B1-9, and B1-10 to require that for intermediate values the next lowest diffusivity value in the tables is to be used. This solution is conservative and satisfies EEG's concerns about this issue.

Diameter of the Opening in the Rigid Liner Lid. EEG was concerned about the uncertainty in the value of this critical parameter and the fact that nothing was being proposed to verify the accuracy of the acceptable knowledge being used. The current modification adds a footnote to B1-7, B1-9, and B1-10 that is similar to the footnote on diffusivity; i.e. for intermediate diameters the lesser diameter in the tables should be used. This is an improvement. However, nothing in the April 27 modification appears to recognize there may be uncertainty in this value or to address how Acceptable Knowledge may be verified. The change in the B-3c paragraph relative to RTR and VE seems to apply only to determining the number of inner bags and containers.

EEG considers the current wording to still be deficient. One change that may be adequate would be to add a footnote to these tables, similar to the following: "the value of lid opening diameters needs to be confirmed in some manner that is approved by the audit process. If the value cannot be confirmed a minimum diameter shall be assumed." This puts a burden on the audit process to approve the details but is not dissimilar to the approach used for other waste characterization processes.

Number of Inner Bags. The current modification adds a footnote to Table B1-8 saying that the most conservative packaging configuration must be used if a specific packaging configuration cannot be assigned. Also, the use of RTR/VE to verify packaging configurations is now recognized in paragraph B-3c. EEG considers this issue to have been adequately addressed.

An additional issue is the proposal to permit head space gas sampling through the unvented rigid liner. We are not aware that a fully developed methodology currently exists to do this. In addition, there are concerns about the advisability of taking off drum lids. Perhaps these problems can be resolved in the future via auditing of procedures. As noted below, this is a gas sampling issue and not a DAC issue and need not have been included.

**EEG Detailed Comments**  
**Class 2 Modification Request (Drum Age Criteria)**

1. Comments attached to the NMED's March 26, 2001 "Final Determination" letter for the previously submitted Class 2 modification on Drum Age Criteria discuss the changes in the calculations and assumptions since the original DAC was reviewed and accepted as a part of the HWFP. These comments state (p. 3 of the attachment):

While the mathematics appears generally appropriate, NMED has a number of questions concerning assumptions, applicability, etc., which remain unanswered because NMED did not have access to the authors nor have an opportunity to interact with the Permittees after the modification was submitted. This is primarily due to the nature of the Class 2 permit modification process, which does not provide for supplementing the administrative record with information obtained from a request for supplemental information (**RSI**) or a notice of deficiency (**NOD**).  
[emphasis in the original]

The same conditions that led to this comment would appear to be unchanged with the submission of this new Class 2 modification request.

The letter itself stated (p. 2):

Due to its complex technical nature and in consideration of the NMED's and the public's comments, the Permittees may wish to resubmit this permit modification request as a Class 3 modification under 20.4.1.900 (incorporating 40 §270.42(c)) and 20.4.1.908.B(5) NMAC...If the Permittees continue to submit technically complex changes as Class 2 modifications, they run the risk of having technically deficient requests denied on the same basis as this DAC modification request.

The new modification request appears to be at least as complex as was the modification request that was rejected in the letter, and contains proposed additions to the HWFP which appear to contain deficiencies in information related to technical matters. While none of these deficiencies appear to be such as to cause rejection of the concepts behind the proposed modifications, information not included as a part of this modification request appears to be necessary before the request can be approved.

2. The modification request as submitted would institute alterations of the HWFP other than DAC changes. The request clearly notes one of these changes (clarification interpretation that drum liners are not to be considered greater-than-four-liter sealed containers); this would seem to be a separate item that should have been proposed independently, so that its approval would not be contingent on approval of the DAC changes.

3. The request also proposes an alteration to HWFP Attachment B1-1a to allow sampling of drums with unvented rigid 90-mil liners by using a needle that penetrates the liner. The statement in the "Basis" section of the proposed modification states (p. A-3):

The Permit also contains language in Section B1-1a that states that a representative sample cannot be collected until the rigid poly liner has been vented to the drum. This is only applicable to samples that are taken between the drum lid and the unvented poly liner. Samples that are taken from within the rigid drum liner or through the pipe component vent hole are representative if the appropriate DAC has been met. Therefore, the language in this section has been modified to clarify this point and to ensure such sampling obtains a representative sample.

Rather than a "clarification", this is an alteration to a practice considered unacceptable in the current HWFP, and represents a deviation from WIPP headspace gas sampling requirements that have been in effect since at least 1995<sup>1</sup>. HWFP sections B1-1a(3)(i), B1-1a(3)(ii), and B1-1a(3)(iii) all contain the following statements:

The lid of the drum's 90-mil poly liner shall contain a hole for venting to the container. A representative sample cannot be collected until the poly liner has been vented. If headspace-gas samples are collected prior to venting the 90-mil poly liner, the sample is not acceptable and a nonconformance report shall be prepared, submitted, and resolved.

Change to this requirement is not a change in drum age criteria. The DAC in the proposed change would remain the same, but it is a change to sample collection methodology that should have been proposed independent of the DAC modification proposal. A separate item would have allowed approval of the DAC changes without including endorsement of unvented drum liner sampling process.

The modification request does not contain or cite any data that demonstrate that a representative sample can be taken through an unvented rigid liner. The DOE should demonstrate that a representative sample can be obtained by the method proposed.

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<sup>1</sup>The Transuranic Waste Quality Assurance Program Plan (CAO-94-1010, Revision 0, November, 1995), Section 7.2.3, required that, "A sample of the headspace gas directly under the drum lid must be collected from within each drum", and also states that, "The lid of the drum's 90 mil polyethylene liner must contain a hole for venting to the drum. If headspace gas samples are collected prior to venting the 90 mil liner, a nonconformance report must be prepared, submitted, and resolved." This document was the principal source of WIPP waste characterization requirements from its promulgation until it was canceled at the time the HWFP went into effect.

4. The BWXT 1999<sup>2</sup> report included in Appendix B to the modification request states (p. 1):

For waste in a 55-gallon drum, the most dramatic improvement in DACs would result from the elimination of the rigid drum liner, from the removal of the rigid drum liner lid, or from an increase in the size of the hole in the drum liner.

The tables in the proposed modification readily support this conclusion--the rigid drum liner is the primary factor in determining time extensions to the DAC. When rigid liners are present, the size of the opening in the drum liner lid is therefore an important consideration.

The modeling for diffusion through liner lid openings is based on an equation that uses an estimated value for the VOC diffusivity in air at low pressures (see Equations 6 and 7, p. 14, of BWXT (2000)<sup>3</sup>). The EEG's comments on the previous DAC Class 2 modification<sup>4</sup> noted that the difference between the two smallest opening sizes listed in the tables would result in a 36-day change to the DAC for one packaging configuration, even though the size difference "...would not be obvious even in a visual examination without a measuring device" (p. 2). The difference in the size of the two smallest openings listed in the modification request (0.375-in and 0.30-in) would be less than 2 mm in diameter.

This difference would, of course, be less obvious using real time radiography (RTR), where determining the size of the opening would be much more difficult than in visual examination. Since the most commonly used RTR equipment views drums from a side angle, the presence of an opening can currently be established; accurately measuring the size of the opening, even to distinguish between a 0.75-inch diameter and a 1.0-inch diameter, may require modification of RTR equipment so that a vertical view of the drum may be necessary.

A measuring system for verification of hole size for either VE or RTR is not discussed in the proposed modification, nor is training of RTR and VE personnel to performing the additional operations that would be necessary included in the modification request. Thus, the proposed modification does not provide for verification of acceptable knowledge of rigid liner lid openings, or establishment of the value in cases where AK does not provide

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<sup>2</sup>Liekhus, K.J., *et al*, Determination of Transuranic Waste Container Drum Age Criteria and Prediction Factors Based on Packaging Configurations (INEEL/EXT-99-01010), November 1999.

<sup>3</sup>Liekhus, K.J., *et al*, Determination of Transuranic Waste Container Drum Age Criteria and Prediction Factors Based on Packaging Configurations (INEEL/EXT-200-01207), October 2000.

<sup>4</sup>Attachment to February 9, 2001 Silva-to-Zappe letter.

it. These processes should be included in the modification before it is approved. The NMED should also consider whether RTR personnel should be periodically tested on their ability to determine liner lid opening sizes accurately, as is done for their ability to discern other specific objects in waste containers..

5. A second potential issue related to liner lid opening size is that the BWXT (2000) document states (p. 1):

The current limits for DACs (Connolly et al., 1998) are categorized based on the waste form and packaging as follows:

Waste Types I and IV, Solidified Inorganics and Solidified Organics.

These wastes were assumed to be packaged in two drum liner bags, in a rigid drum liner with a 0.375-inch diameter hole...

Attached is page F-1 of Connolly *et al.*, 1998<sup>5</sup>, which shows that the drum liners for sludge drums (Types I and IV) in the steady-state model were assumed to have a 5.1 cm<sup>2</sup> area. This would be the equivalent of a 1.0-inch diameter opening, rather than the 0.375-inch diameter hole cited in BWXT (2000). If the assumption that the original model used a 0.375-inch diameter opening was carried through to the conclusions of the BWXT (2000) report then the DACs for S3000/S4000 containers in both the BWXT (2000) report and the proposed modification could need to be adjusted. While it appears that the quotation above was likely an erroneous entry in the document which was not carried into the modeling, there is a need to conclusively establish its impact.

6. The Discussion section of the modification request describes the testing performed on the model used to establish the current HWFP DAC, then states (p. A-4):

Additional testing is not necessary because the actual waste drum testing demonstrated that the parameters effectively describe the interactions of the VOC gas with the polyethylene used in the packaging and can be scaled to the size of the polyethylene bags and rigid liners used in [the] actual system being modeled using the thickness and surface area.

Thus, the testing values that were good for two values of 225 days for solidified wastes and 142 days for debris waste in the HWFP are now considered able to cover the 120 different container age values represented in Tables B1-6 through B1-10. Several of these 120 values are for only 4 days, a considerable drop from the bounding values currently in the HWFP.

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<sup>5</sup>Connolly, M.J. *et al.*, Position for Determining Gas Phase Volatile Organic Compound Concentrations in Transuranic Waste Containers, INEL-95-0109, Revision 2, June, 1998.

The Discussion section statements on testing only references the Lockheed (1995) document. This document (Revision 1 of the Connolly, *et al.* document cited previously) contains brief descriptions of the tests used to build and verify the model. These were perhaps sufficient for establishing the bounding DAC values currently in the HWFP. However, these descriptions do not show that the model used to derive the proposed new DAC values was tested against actual values for the parameters that are in the proposed Tables of new DAC values. The number of containers used in the experiments that were used to build the models is not even given, nor is it clear that drums used to verify the model included ones with no rigid liner, no liner lid, variations in the liner lid hole size when present, or the variety of confinement layers present. These and other important test data would seem to be in the documents referenced by Lockheed (1995); these are the four Liekhus, *et al.* references listed in the References section (p. 7-1) of Lockheed (1995). The Permittees should provide these documents to NMED so that NMED can determine if the testing was sufficient to justify the range of values submitted.

7. The testing itself did not initially completely match the model. Connolly *et al.*, 1998, Appendix D, which discusses the establishment of the model, states (p. D-2):

A comparison of model and experimental concentration ratios in the lab scale waste drum showed good agreement except in the cases of toluene and cyclohexane. Initial model estimates of the time required for toluene to reach near steady-state conditions (90 percent of steady state ratio) was much less (37 days) than was observed (>86 days). Since the model estimate of the toluene steady-state concentration ratio was similar to actual ratio observed, it was concluded that toluene permeability used in model calculations was correct. The discrepancy between model and actual concentration ratio was attributed to Henry's constant used in original calculations...

Since the exact variation of VOC equilibrium concentration in the drum liner with VOC mole fraction in the gas phase could not be defined without additional data, the Henry's constants for toluene and cyclohexane used in the model calculations were adjusted until time to reach near steady-state conditions more closely approximated the experimental results.

The magnitude of the change in Henry's constant in order for the model to meet experimental data is not given, nor is the source of the initial value for the constant provided. Since the Henry's constant resulted in good agreement for 27 of the 29 VOCs studied, altering it to make the model fit the data for the other two may have been a questionable enterprise. Toluene was used as the primary indicator VOC in the sensitivity study (see BWXT (1999), Tables II through IV, pp. B-5 to B-7), and the

modification request (p. A-2 and A-4) states that toluene was the VOC used to establish the bounding DAC values currently in the HWFP. This material should be reviewed by a qualified chemist.

8. The modification request states (p. A-7):

If additional packaging configurations are identified at a later date, CBFO will submit modifications to specify appropriate DAC based on the methodology in the BWXT (2000) report. Sites are being encouraged to use packaging configurations that have a DAC established whenever possible.

A companion Class 2 modification request was submitted on the same date as this DAC modification request in order to increase the WIPP hazardous waste storage volume specifically for ten drum overpack (TDOP) containers. It would seem as if there is at least one additional packaging configurations that should have been included in this modification request. Other containers currently acceptable under the HWFP may need specific DACs also; many 55-gallon drums are currently overpacked in 85-gallon drums, 100-gallon drums may be used for overpacking of "several compacted containers", and both 85-gallon and 100-gallon drums may be directly loaded with waste.<sup>6</sup> The NMED should consider whether or not DAC values should be established for these containers, in their various configurations, before approving this modification request.

The December, 2000 Revision 2 of the National TRU Waste Management Plan (DOE/NTP-96-1204) states concerning newly generated wastes (Section 2.3.1.6, p. 21):

Generators should use the largest container possible when generating waste for disposal (e.g., standard waste boxes or ten drum overpack containers) because of relative characterization costs.

Until a DAC (or DACs) for TDOPs is established sites are apparently being encouraged to use a packaging configuration for which headspace gas sampling protocols have yet to be established.

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<sup>6</sup>The Class 1 modification of 07-20-00 allowing direct loading of 85-gallon, and all uses of 100-gallon drums, have yet to be incorporated into the HWFP on the NMED's web site. These changes are not clearly in the Class 1 classifications listed in 40 CFR 270.42 Appendix I, and may therefore eventually be excluded from the HWFP.

It may be that the DACs for 55-gallon drums also apply to 85-gallon and 100-gallon drums. However, there is no evidence presented that these containers were considered either in the BWXT (2000) document, or by the Permittees in submitting this modification request.

9. As currently configured, the process for establishing the DAC requires a complex analysis, revised equipment needs, additional training, and records keeping that not all sites and programs will need or want to implement. This modification request would have been enhanced by inclusion of a statement allowing use of a bounding DAC condition, which if applied site-wide would allow the site to continue current practices for DACs rather than expending unnecessary resources to meet the requirements inherent in the proposed change to the HWFP. In using this option, the site would then only need additional documentation of the decision to use the bounding condition. While this is not an action that the NMED can force on to the Permittees, the current concern with reducing the costs involved in waste characterization indicate that the Permittees may want to include this concept in the modification request.

### **Comments on Proposed Text Revisions**

Comments will use the same alpha-numeric numbering system as are found in the modification request (i.e., a.1, a.2, b.1, etc). When multiple comments relate to a single modification, an additional number will be added (a.1-1, a.1-2, etc).

- b.2-1 HWFP Section B1-1a is altered to create separate Summary Category Group (SCG) S5000 (debris) waste and SCG S3000/4000 (homogeneous solids and soil/gravel) waste discussions of nearly half a page each. These are added using a format (indentation of the text) that is not in conformance with the rest of the formatting of the Waste Analysis Plan, and this could create the impression that the paragraphs following these two SCG descriptions applies to the latter SCG only. The discussions in these two additions are also identical, except for references to the appropriate Tables for Scenario 3 DACs. These two discussions should be unified into a single description, either referencing "the appropriate Tables" or ending in a single sentence stating which tables to use for the different Summary Category Groups, and both the separate titles and the indentation formatting should be dropped.
- b.2-2 Text is added to HWFP Section B1-1a which states (p. A-18):

The DAC for Scenario 2 containers that contain filters or liner vent holes other than those listed in Table B1-7 shall be determined using footnotes "a" and "b" in Table B1-7.

The footnote lettering for Table B1-7 might change in the future, and the text should state the policy clearly--that in the absence of an exact match to criteria from Table B1-7, the next more conservative value should be used (i.e., the filter diffusivity that is close to, but smaller than, the one in question, or the next smaller liner lid opening size).

b.2-3 Text is added to HWFP Section B1-1a which states (p. A-18):

If a container is designated as packaging configuration group 4 (i.e., a pipe component), the headspace gas sample must be taken from the pipe component headspace.

This could be considered a change to the headspace gas sampling method, rather than to the DAC, and if so should have been a separate item in the modification request.

The HWFP currently specifies headspace gas sampling for “drums”, an apparent misnomer meaning “container”,<sup>7</sup> but also implying the outermost container that meets Type A requirements (currently, headspace of drums, SWBs, or TDOPs). A method for performing headspace gas sampling on overpack containers is not currently specified in the HWFP, and a more generic statement which covers not only pipe components but also such practices as the LANL system of placing drums on which headspace gas sampling has taken place into SWBs could be added to the HWFP (LANL set the precedent by shipping these SWBs before the HWFP was promulgated, but has recently resumed shipping headspaced drums in SWBs). If this proposed modification is added to the HWFP, the analogous situation of the LANL SWBs could be considered a violation of HWFP requirements that are currently more open to interpretation. The NMED should consider whether or not the statement should be added or not, and also consider whether a more generic concept should be added instead.

b.2-3 Text is added to HWFP Section B1-1a which states (p. A-19):

Generator/storage sites are to use acceptable knowledge (procedural controls, etc.) as specified in Permit attachment B4 and may use radiography and/or visual examination as specified in Permit Attachment B1 to make the determination of the appropriate sampling scenario and packaging configuration.

However, requirements for AK and RTR/VE to record their findings have not been included in the modification request (though the same paragraph requires documentation associated with headspace gas sampling). The NMED should consider whether or not AK documentation should now be required to provide information on packaging configurations as well as waste generating processes, and RTR/VE should document rigid liner lid opening sizes as well as waste matrix codes and parameter category weights.

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<sup>7</sup>The EEG pointed out in comment 4 of the attachment to the February 9, 2000 Neill-to-Zappe letter that the WAP portion of the HWFP contains several instances where the term “drum” has been used where “container” was apparently meant. Courtesy copies of the letter and attached comments--the attachment was titled WIPP WAP Inconsistencies and Editorial Errors--were provided to the Permittees also. The EEG has never received a response to the comments, and the inconsistencies and errors noted are still in the HWFP.

b.2-4 Text is added to HWFP Section B1-1a which states (p. A-19):

When sampling the rigid drum liner under Scenario 1, the sampling device must form an airtight seal with the rigid poly drum liner to ensure that a representative sample is collected (using a sampling needle connected to the sampling head to pierce the rigid liner satisfies this requirement).

This process would seem to require removing the drum lid. Since drum liner lids are not meant to establish a seal--though they may do so-- so that removal of the drum lid, attaching the sampling device, and forcing the needle through the liner may produce "breathing" from the inside of the liner. Such breathing would affect the representativeness of the sample. The uncertainty as to whether or not this process occurs is part of the reason that sampling through the liner has not been used in the past. The NMED should require evidence to be presented that sampling by this method will consistently produce representative concentrations of VOC samples.

- b.11. Sub-scenarios B1 and B2 require sampling through unvented rigid liners. As noted in a comment above, this is a sampling methodology that has yet to be approved, and should be considered as a change to sampling methods rather than a change to criteria as to when to sample.
- b.14. The added Table B1-8, Scenario 3 Packaging Configurations, states for Packaging Configuration 1 that covered packaging configurations contain a "filtered inner lid". This would seem to mean a drum liner lid (SRS has liners with drum filters in them, according to Section 5.0 of the Connolly *et al.* (1998) document), but the terminology is not completely clear. NMED should ascertain whether or not this language required clarification.
- b.15 Tables B1-9, Scenario 3 Drum Age Criteria (in days) Matrix for S5000 Waste By Packaging Configuration Group, and Table B1-10, a similar table for S3000/S4000 waste, have identical DACs for all entries under Packaging Configuration 1 (no confinement layers, "filtered inner lid"). In contrast to this equivalency, the current HWFP contains DAC values for S3000/S4000 wastes (solidified material and soil/gravel) that are 50% greater than those for S5000 wastes (debris) even when there are more confinement layers for the S5000 waste (five layers instead of two). The same is true for proposed Packaging Configurations 2 and 3--the solidified and soil/gravel wastes have much longer DAC than does debris wastes. As solidified and soil/gravel wastes would seem to have less surface area to diffuse from as well as a denser matrix to diffuse through, the values in the current HWFP and in Packaging Configurations 2 and 3 appear to be a more logical presentation than those in the proposed tables for Packaging Configuration 1.

The model is said to have been the same for both the current HWFP and the proposed modification DAC values. The difference noted is an indication that one of the tables in the modification request may have incorrect values for Configuration 1 DACs, even though the values in both proposed tables were accurately copied from the BWXT (2000) document. The NMED should verify that the model's output values for Packaging Configuration 1 were accurately placed in to the BWXT (2000) document.

The same equivalency of solidified wastes and soil gravel with debris waste DAC values is also found for Packaging Configurations 4, 5 and 6, which are for pipe components (4) and SWBs (5 and 6). The same concern may apply to these configurations also. However, pipe components have a much smaller volume of waste to diffuse from, a smaller space to reach 90% of steady state concentration in, and a long DAC value (152 days) to reach the steady state condition in. This appears to simply be a bounding value. SWBs have a greater surface area for diffusion from the waste, and again the values appear to be bounding cases.