November 7, 2003

Dr. Kevin Crowley, Director
Board on Radioactive Waste Management
The National Academy of Science
500 Fifth Street NW, 6th Floor
Washington, DC 20001

RE: NMED COMMENTS ON TECHNICAL PAPERS SUBMITTED BY DOE TO NAS WIPP
COMMITTEE “OPTIMIZING THE CHARACTERIZATION AND TRANSPORTATION OF
TRANSURANIC WASTE DESTINED FOR THE WASTE ISOLATION PILOT PLANT”
PROJECT IDENTIFICATION NUMBER: BRWM-U-02-01-A

Dear Dr. Crowley:

On September 8, 2003, the US Department of Energy (DOE) submitted the following technical reports to the National Academy of Sciences (NAS) committee evaluating proposals to optimize the characterization of waste destined for the Waste Isolation Pilot Plant (WIPP):

- Analysis of Volatile Organic Compound Levels in the Transuranic Waste Inventory
- Statistical Analysis of Volatile Organic Compound Levels in Transuranic Waste
- Technical Evaluation Report for WIPP Room-Based VOC Monitoring
- An Analysis of TRU Waste Characterization Accuracy
- Statutory, Regulatory and Guidance Justification for Changing Mixed Waste Analysis Requirements at the Waste Isolation Pilot Plant

The New Mexico Environment Department (NMED) obtained copies of these technical reports from Barbara Pastina of your staff on September 22, 2003 in order to review and submit comments to the committee. NMED understands the committee met on September 8, 2003 to discuss final edits and consensus issues regarding the final report scheduled to be issued within the next two or three months. Therefore, NMED acknowledges that while these comments may
arrive too late for the committee to act upon, we believe it is important that these concerns and questions be submitted for the record.

NMED appreciates the fact that DOE has developed and submitted these technical reports reflecting a more quantitative approach to supporting their proposals to reduce waste characterization requirements for transuranic (TRU) waste destined for WIPP. NMED is the regulator of TRU mixed waste activities at WIPP through the Hazardous Waste Facility Permit (Permit) issued by our agency in 1999. NMED presented information at the January 28, 2003 NAS meeting in Santa Fe pointing out the discrepancies between the anticipated concentrations of volatile organic compounds (VOCs) provided in the original WIPP permit application versus the measured concentrations of VOCs in the emplaced WIPP inventory. Several of the technical reports submitted by DOE to the committee appear to address this issue in greater detail.

NMED has reviewed these technical reports and offers our comments in the attachment to this letter. NMED also provides the following general observations on these reports:

1. NMED believes DOE has not demonstrated in any of their submittals a correlation between the characterization issues associated with waste emplaced to date and the remaining inventory projected for disposal. Nearly 90% of the waste emplaced so far originated at one production facility (Rocky Flats), and DOE has not provided any compelling arguments how waste characterization experience obtained from this waste (particularly in the realm of acceptable knowledge documentation) is transferable to waste yet to be characterized. This situation is analogous to the standard investment disclaimer that “past performance is not necessarily indicative of future results.” The conclusions reached in the report analyzing waste characterization accuracy to date do little to address the uncertainties associated with older, poorly documented waste streams generated fifteen to thirty years ago that have yet to be characterized, considering the waste emplaced to date reflects newer, better documented waste streams.

2. For similar reasons, NMED believes DOE’s analysis of VOC levels in the emplaced TRU waste inventory at WIPP does little more than validate the characteristics of that waste already emplaced. Again, there is no demonstrated correlation between the VOC characteristics of waste emplaced and future waste yet to be identified and characterized. NMED eagerly awaits not only the release of the “Transuranic Waste Inventory Update Report, 2003”, but also DOE’s critical comparison of the revised inventory estimate against the original inventory published over seven years ago. Only then might DOE be able to extrapolate VOC data associated with emplaced waste to the remaining TRU waste inventory across the DOE complex.

3. NMED believes DOE has not demonstrated that complete elimination of chemical sampling and analysis will still satisfy the regulatory requirement of 40 CFR §264.13(a)(1) to “obtain a detailed chemical and physical analysis of a representative sample of the wastes” before such waste is accepted for disposal. Radiography can estimate the presence of certain hazardous metals such as lead, but the program as
proposed by DOE dismisses the value of any chemical sampling such as headspace gas as having no value. By taking this position, DOE has neglected to contemplate a revised characterization program in which headspace gas sampling would be performed on a statistically representative population of each waste stream, similar to what NMED approved for specific categories of waste in response to a permit modification request submitted in April 2000.

NMED appreciates the NAS committee’s consideration of our comments. If I can be of further assistance, please contact me at (505) 428-2521 or Steve Zappe of my staff at (505) 428-2517.

Sincerely,

Sandra Y. Martin
Acting Bureau Chief
Hazardous Waste Bureau

SYM/soz

Attachments

cc: Charles Lundstrom, NMED WWMD
    John Kieling, NMED HWB
    Steve Zappe, NMED HWB
    Tracy Hughes, NMED OGC
    Chuck Noble, NMED OGC
    Laurie King, EPA Region 6
    Betsy Forinash, EPA ORIA
    Connie Walker, Trinity Engineering
    File: Red WIPP ‘03
Attachments
NMED Comments Regarding
“Analysis of Volatile Organic Compound Levels in the Transuranic Waste Inventory”
By William H. McCulla and Gregory D. Van Soest
September 4, 2003

1. The executive summary concludes (p. 2) that the information presented therein for solidified organic headspace gas data “only represents the FWF [final waste form] VOC levels for that [RFETS] facility. This assessment, then, may not accurately represent the average VOC levels for solidified organic FWFs for the Department of Energy (DOE) Complex.” The authors go on to state that RFETS organics are the worst-case scenario with respect to organic content, but supporting AK, sampling, and other information is not provided or referenced. Do these statements take into account the continually evolving waste inventory estimates for WIPP, including solidified material in high level tanks, alpha low-level mixed waste and whatever else may be contemplated for disposal at WIPP? When will the 2003 TRU Waste Inventory Update Report be available for examination?

2. The authors provide statements regarding AK information for LANL and Hanford (p. 15) without referencing the AK summaries, waste stream profile forms, or any other sources of information supporting the statements. The authors also generally conclude that “only four sites” contain a “bulk of the problem” (with respect to solidified organics, presumably). Generally, the references cited do not indicate what the source of this information might be. What is the specific RFETS waste stream in question? What data was used to conclude that this waste stream is not present at other facilities? What supporting documentation was used to conclude that LANL minimizes solvent usage? What is the source of the statement that there are only a few cubic meters of solidified organics in storage at Hanford that “do not appear” to have high VOCs? Also, why is it “reasonable to presume” that sites will manage newly generated solidified waste to reduce organics; wouldn’t the incentive to minimize organic content be eliminated if actual chemical analysis of these wastes were also eliminated? The only basis for overestimation of WIPP source term is the assumption that RFETS is conservative, but without the 2003 Inventory Report to review, this assumption is not supported.

3. The report states (p. 16), “Even conservative acceptance of current data as representative of all solidified organic FWFs for the DOE Complex creates no threat of exceeding ... either room-based limits or WIPP emission limits for an open room.” However, information supporting this anticipated volume of waste was not provided, and comparison of the 1996 Baseline Inventory Report and the limited 2003 Inventory Report contained in the authors’ reports suggests that the inventory may be ever changing, depending upon disposal options for other wastes, legislation, political climate, etc.

4. What is the source of information supporting the statement (p. 16) that “worst case is that only one percent of the total anticipated WIPP volume presently represented by the solidified organics FWF may contain any VOC at average levels greater than 1,000 ppmv”? If all chemical analysis is eliminated as proposed by DOE, what “further analysis” will be performed to “confirm... source terms for the solidified organics”?

5. Based upon statements in the report that VOC concentrations in the 930-drum data set decreased significantly as a result of the data screening (p. 7), it appears that the screening process tended to remove drums with higher concentrations. Could DOE document the VOC concentrations of the
excluded drums along with the reason for exclusion, and assess any correlation between the failure to meet screening criteria and the VOC concentration of the test drum? Publishing the concentrations of excluded drums along with the screening criterion that led to the exclusion would allow a reviewer to verify that there is no correlation or bias in the screening process to artificially eliminate higher VOC concentration drums.

6. Did the authors take into account that the DOE has not employed random waste loading, or equal distribution of waste amongst panels and rooms? Does a concentrated rather than dispersed occurrence affect the conclusions, and if so, how? If not, why not?

7. On Table 6, “Weighted Average for 28 VOCs”, has the physical emplacement of containers within the WIPP repository really been random as was originally assumed? Because of site-specific and WIPP operational considerations, wastes from a specific FWF could well be sent to the WIPP on a consistent basis and often within a short period of time. Therefore, any statements that there is no probability that a single room at WIPP could contain a concentrated population of organic solids waste containers needs to be demonstrated, showing that WIPP waste loading schemes would ensure this random distribution in the future. Have any calculations been performed to determine if the worst-case scenario occurs where a higher proportion of the solidified organic waste with the highest concentrations of 1,1,1-trichloroethane and carbon tetrachloride in the headspace gas are contained within one room if the WIPP emission standards can be exceeded – for an open room and for a closed room?

8. Evaluation of Table 4 of the report indicates that solidified organics and solidified inorganics were the two FWFs that had the largest percentage exclusion rates. These two FWFs accounted for approximately 40% of the weighted concentration prior to screening and only 18% after screening. Also, the total population of containers appears to be heavily weighted toward debris and non-hazardous debris waste. Therefore, the profile of the screened data is significantly different than that of the original data. Could DOE discuss the positive correlation of excluded drums as it relates to the solidified organics and solidified inorganics FWFs? Similarly, the authors appeared to remove many drums with elevated VOC and hydrogen levels from the 930-drum population as part of their re-evaluation of the predicted room based VOC concentrations. However, it is unclear what FWF these drums were associated with and what the associated VOC concentration was for drums that were excluded due to elevated VOC and hydrogen levels. Could DOE clarify what specific impact removal of these drums from the study population has on the revised VOC concentrations?

9. The report indicates that drums exceeding hydrogen limits are not eligible for transport to WIPP due to transportation requirements. However, the ultimate disposition of these waste containers is unclear. Presumably, these drums will be repackaged or reconfigured in some way to make them eligible for disposal. Could DOE clarify how drums with elevated hydrogen levels are dispositioned and explain how actual disposition procedures are consistent with the Screening assumption made in this study?

10. Assuming that the 1995 test study referred to in the paper is Appendix C2 of the 1995 RCRA Part B Permit Application, it is difficult to independently determine if the data from the study is truly comparable to the current HSG data for containers emplaced in the WIPP. Resolution of the
following questions would be helpful in demonstrating comparability of the 1995 data set to the current waste container inventory:

- The report states that the drum age for all drums in the 1995 study was 30 days. However, the report does not indicate the packaging configurations of the drums that were included in the test population. The permit has a variety of packaging configuration based drum age criteria that can vary significantly depending upon the actual waste configuration. Could DOE clarify the packaging configurations of the waste containers used in the 1995 study in order to establish that the 30 day holding time was adequate to reach the 90% steady state equilibrium in the containers?

- The report did not document the FWF and VOC concentrations of the drums that were removed because they have not met the 30-day drum age criteria. Additionally, the packaging configuration of these drums were not documented. As previously stated, there are a variety of available drum age criteria in the permit based upon the packaging configuration. In some instances, the required drum age for packaging configurations are significantly less than 30 days. Could DOE document the packaging configurations of drums that were removed because the 30 day screening criteria were not met; and assess whether the 30 day drum age screening criteria is consistent with the current drum age criteria in the permit?
NMED Comments Regarding
By Jeffrey C. Myers
August 22, 2003

General Comments

1. In order to carry out a statistically valid comparison between the 1995 (930-drum) data set and the 2003 (WIPP Plus) data set, the data sets should (at a minimum) be weighted to reflect the proportions of the drums from each final waste form (FWF) relative to the proportions of each FWF in the existing WIPP inventory. For example, the unweighted and weighted average values per drum for 28 VOCs in the WIPP Plus data set were listed in Tables 5 and 6 of McCulla and Van Soest (2003). Table 2 of the current report also lists the average ppm per drum of the 28 VOCs. However, comparison of Table 2 in the present report with both Tables 5 and 6 of McCulla and Van Soest indicates that the data in Table 2 do not match either the weighted or unweighted data in the McCulla and Van Soest report. For example, the present report indicates an average carbon tetrachloride concentration of 51.1 ppmv per drum of combustible waste; the corresponding numbers in the McCulla and Van Soest report for the unweighted data (61.0 ppmv) and weighted data (3.23 ppmv) differ from this value. The author should indicate whether the 930-drum and WIPP Plus data sets were weighted to account for different proportions of the FWFs in the data sets and in the existing WIPP inventory. If the data were not weighted to account for the differences between the proportions of the different FWFs in the two data sets and the existing WIPP inventory, the author should explain why this statistical analysis has any relevance to the WIPP, because the data sets are not at all representative of the existing WIPP inventory.

2. A meaningful statistical analysis can only be carried out if the data are representative of the population being studied. It is not clear what efforts were made to weight headspace VOC concentrations in the data sets by FWF. In addition, even if the data were weighted to reflect the proportions of each FWF in the existing WIPP inventory, no information has been presented to demonstrate that the HSG data adequately represent the projected waste inventory within each FWF. Evidence that indicates the “WIPP Plus” data set is not representative of the projected waste inventory includes:

- Early waste shipments to WIPP often did not contain hazardous VOCs or contained relatively low concentrations; consequently, higher average concentrations of VOCs could be encountered in future shipments.
- Waste has not been shipped to WIPP in a random manner, but has been shipped as the result of “campaigns” at the different generator sites. This data set is heavily weighted towards RFETS waste, but the possible effects of including mostly RFETS waste in the data set are not thoroughly evaluated. Two waste forms (solidified organics and soils) did not have any associated waste streams emplaced at WIPP by May 2003 (Table 8).
• McCulla and Van Soest provided the data set for this statistical analysis, but they state that headspace gas data for solidified organics (identified as the principal FWF contributing VOCs to the waste inventory) in their survey was obtained only from RFETS waste, and their assessment “may not accurately represent the average VOC levels for solidified organic FWFs for the Department of Energy (DOE) complex.” Although McCulla and Van Soest assert that solidified organic wastes from LANL and Hanford should have lower VOC concentrations based on process knowledge, no gas headspace data have been collected from this waste to confirm this assessment.

Are the results of this study likely to accurately predict future WIPP inventory if the data set used in this study is not representative of all WIPP wastes?

3. The nature and relevance of the data from the IT Hydrogen Getters study and the IDC003 INEEL transportation flammability study was unclear. For practical purposes in the preponderance of scientific studies, data used from other studies are of no value to limited value unless the parameters under which the data were generated and reported are consistent with the primary study. For example, different drum waste compositions, test conditions, analytical requirements, or reporting requirements are all factors that could render data from other studies useless for this report. For example, DOT flammability tests may have different analytical detection limit requirements than those required to establish headspace gas characterization data under the permit. In order to understand the context under which these data from alternate data sources are used in this report, DOE could provide additional information on the following elements of the IT Hydrogen Getters Study:

• What types of wastes were studied (FWF and hazardous constituents) and how did they compare to the wastes used in the 1995 test data set as well as the current existing WIPP inventory?
• What were the conditions under which samples were collected, such as drum age criteria, packaging configurations, use of sealed inner bags, and storage temperatures?
• What were the analytical methods used, including method detection limits, analytes quantitated, TIC criteria, quality control requirements, and calibration requirements?
• What were the criteria used to validate and assess the usability of the IT study data?

DOE could also provide additional information on the following elements of the IDC003 INEEL Flammability Study:

• What were the conditions under which samples were collected, such as drum age criteria, packaging configurations, use of sealed inner bags, and storage temperatures?
NMED Comments

4. A main premise in the author’s argument (Section III, VOC Prevalence and Totals, p. 3) is that VOC concentrations in headspace are directly related to the mass of VOCs in the waste, as demonstrated by the description of how the WIPP VOC Mass Inventory results in Table 1 were obtained. However, DOE has not demonstrated a quantitative relationship between headspace gas concentrations and the total VOC mass inventories in the waste drums; therefore, how can Tables 1 through 4 represent total WIPP VOC mass inventories when the total amounts of VOCs in the drums are unknown? In fact, sites have always been given the option of demonstrating a waste concentration in headspace gas so that certain concentration-based codes need not be added, and no site to date, to our knowledge, has attempted this calculation.

Specific Comments

1. The assertion in the Executive Summary (p. 1) that “AK combined with existing data will supply conservative and protective estimates of the total future VOC load” is not clearly supported by this report. The primary rationale for this assertion is that the current VOC inventory is less than the original estimates from the 1995 test data and therefore, the 1995 data “overestimates” the actual VOC content of the waste. However, the report does not adequately detail the composition and relevant AK information of the predominant waste streams in the WIPP Plus inventory or explain the nature of the wastes that are yet to be characterized. DOE should provide answers to the following specific questions:

- Do all sites have the extensive process-based descriptions of waste generating activities that document each waste generating action and waste management requirement as is available at RFETS for most of their retrievably stored and newly generated decontamination and decommissioning waste?
- Has comprehensive AK been assembled and assessed for all waste at all generating sites? If this has not occurred, then how can one be assured that the current estimates are “conservative and protective”? Note that the 2003 Transuranic Waste Inventory Update Report has not been provided for review, and the origin of the information in this update is not known (if it was assembled in a similar manner to the 1996 TRU Waste Baseline Inventory Report (TWBIR), then sites provided information but were not required to follow the rigorous AK process outlined in the permit to assemble AK information). It also appears, based on the limited information available, that many changes were noted between the TWBIR 1996 inventory and the inventory in the yet-to-be-provided 2003 update; will there be more inventory changes between the 2003 inventory and the next inventory that will be taken in the future? What would happen if future inventory
changes or additional AK showed that the above assumptions were not as conservative as the author believes?

- Can it be demonstrated that the same level of detailed information would be available at all generator sites? Is that the reason why the author seeks to remove chemical characterization requirements – because AK is presumed to be satisfactory?
- Even if the same AK data collection process is implemented at each site, will the results – adequate AK – always be assembled? What will be done if AK is inadequate? What and who determines if AK is inadequate?

2. The author states in the Executive Summary (p. 1) that one of the two “most significant findings” is “Headspace gas sampling and analysis (HSGSA) places an enormous financial burden on the U.S. Department of Energy complex, yet, any value derived appears to be completely absent.” Has the author provided any cost-benefit analysis to support this conclusion? What constitutes “an enormous financial burden”? Haven’t DOE’s previous estimates of the cost of characterizing TRU waste (e.g., “White Paper, Improvements in the RCRA Waste Characterization Program”, J. Winston Porter, January 10, 2003, Introduction and Summary, page 3 – “These waste characterization requirements have proven to be very costly, on the order of $10,000 to $20,000 per container of waste material.”) considerably overstated the cost presented in the June 10, 2003 DOE report entitled “WIPP TRU Characterization Cost Analysis” (Executive Summary – “Based on the projected characterization needs of the containers to be shipped to WIPP from fiscal year 2004 onward, the average cost of characterization is $3,900 per container.”). Isn’t this latest cost estimate very close to Dr. Triay’s original cost of characterization goal of $3,000 per container of CH TRU waste (WIPP web site, “Big Picture” articles, “Where we are going: 17S-3K-5K”, April 25, 2001, attached)? Has the author evaluated the relative cost savings of representative headspace gas sampling versus the current permit requirements?

3. The author states (p. 3) that the “Data sets were screened as reported in McCulla and Van Soest”; however, the report subsequently refers to these data as the “930-drum data set”, sometimes not clarifying whether this was the screened or unscreened set. The screened 1995 data set consisted of 800 drums, i.e., 930 drums minus the 130 removed based on the screening process (page 7, McCulla and Van Soest). Based on this discrepancy (800-drum data set versus 930-drum data set), it is unclear what version of the 1995 data set was used in the data analysis; this information should be clarified.

4. In Section II – Database (p. 3), the author indicated that due to the bimodality of the data, typical normality-based statistical parameters were not calculated, such as the 95% upper confidence limit of the mean, which would more completely represent uncertainty associated with these data than do the average values. However, the author did not indicate if the applicability of other data transformations was evaluated or if the data should have been evaluated as separate data sets. Clearly the nature of the VOCs in the waste will dictate that several of the target VOCs will rarely be
detected in some FWFs (salts and graphites) and a few will be detected often and at variable concentrations in some FWFs (solidified organics, combustibles, and non thermally treated solidified inorganics). Could the author clarify whether the applicability of data transformations was explored and if so, the results of those data transformation tests? Did the author explore the possibility of treating the populations as non-parametric data sets? Did the author explore the feasibility of identifying the cause of the bimodality (e.g., mixed vs. non-mixed, etc.) and constructing data sets that would allow calculation of statistical parameters?

5. It appears that evaluating each FWF individually in the WIPP Plus dataset in comparison to the 1995 data set would be more appropriate, given the disparity in FWF distribution between the two data sets. In a sense, each of the FWFs could be thought of as different strata of data as is often done for contaminated site investigations under RCRA and CERCLA. Could the author clarify why each FWF was not evaluated separately to provide a more accurate correlation between the WIPP Plus dataset and the 1995 test dataset?

6. The concentrations that were used to calculate the results in Table 1 were the headspace gas concentrations. DOE has not demonstrated a quantitative relationship between headspace gas concentrations and total VOC mass inventories in the waste drums; therefore, how can Tables 1 through 4 represent total WIPP VOC mass inventories when the total amounts of VOCs in the drums are unknown?

7. This report identifies carbon tetrachloride and 1,1,1-tetrachloroethane as the major contributors to the VOC load in the WIPP, with significant contributions from methanol, acetone, and other VOCs. Is this conclusion consistent with what is known about future WIPP wastes from AK and other sources of information?

8. How does comparing the WIPP Plus data set to the data set from the original 930 drums (Section IV) demonstrate that the WIPP Plus data set is a more accurate estimate of the VOC loads that will be placed in the repository in the future? Because the waste streams will change over time as cleanup progresses and as the inventory changes due to mission, economic/political considerations (e.g., inclusion of alpha LLW in overpacks was never considered in 1995, but DOE is now disposing of it in WIPP, etc.), isn’t it likely that both data sets may be inaccurate representations of the total waste that will be placed in WIPP?

9. There was a significant decrease in the contribution of methylene chloride in the WIPP Plus data in comparison to the 1995 Test data. In McCulla and Van Soest, this decrease in methylene chloride contribution was attributed to removing drums from the dataset that exceeded the flammability limits in TRAMPAC Revision 19. However, this screening method is likely to have artificially lowered the VOC concentrations in the data set. In actual practice, if a drum has HSG concentrations that exceed the flammability limits, the drum lid is removed and the drum is allowed to partially degas. The drum is then resealed and sampled again after the appropriate
waiting period specified by the drum age criteria. The VOC concentrations in such a partially degassed drum will eventually pass the flammability limits for shipment, but are likely to be relatively high. By completely removing these drums from the data set, isn’t the data likely to be biased toward low VOC concentrations?

10. In Table 6, some of the data are listed as “NA” because of the use of chemical synonyms; couldn’t the data sets be corrected by substituting the appropriate synonyms?

11. The scatter plot illustrated in Figure 1 compares the percentage of total mass of VOCs represented by the original 930-drum data set and the WIPP Plus data set. The author should answer the following questions about Figure 1:

   • Because the values in this scatter plot were derived from headspace gas concentrations that have not been related to total VOC mass in the drums, how can these data represent total masses of VOCs in the repository?
   • Why would the regression line in Figure 1 be used to determine the mass of the VOC that has actually been accepted into WIPP? Shouldn’t the values in Table 2 (Average VOC Concentrations by Analyte and FWF) be used to calculate the mass of VOCs accepted into WIPP to date? Wouldn’t it be even more accurate to use the actual HSG data in the WWIS to calculate the VOCs instead of average values?
   • The report indicates that regression analysis produced a correlation coefficient of 0.81, with an $r^2$ value of 0.65 when comparing the two datasets and concludes that this was proof of agreement between the datasets. The entire conclusion of this paper that HSG sampling is not relevant and that AK alone is adequate for waste characterization is based upon an assertion that these values show sufficient agreement between the data sets to make such conclusions. Could the author cite and provide literature that illustrates agreement in the environmental statistics community that these values represent an adequate degree of correlation, given the nature of the conclusions made by the author?
   • How does the correlation (or rather obvious lack of correlation at higher values) between the two data sets “confirm that using the 930-drum data set is a conservative way to predict future VOC loads on the repository”?

12. On page 10 of the report, the author states that there is a good correlation between the predicted (930-drum data set) and “actual” (WIPP Plus) data set. How is this consistent with the statement on page 9 that “the first 45,000 drums disposed (approximately) contain far less VOC load than would have been predicted using the 930-drum data set?”

13. The discussion of Safety Factors (p.12) left several issues unanswered that warrant discussion. These issues include:
NMED Comments

- In the absence of evidence that the new waste will be the same as the already-received waste, how can the safety factors calculated in this report be meaningful?
- What OSHA or NIOSH guidance are the safety factors based on for demonstrating safe concentrations for human health?
- Are the toxicity, mutagenic, or carcinogenic dose curves for all of these VOCs linear as well to correspond to the linearity of these safety factors?
- Did research indicate that any adverse health effects exist upon application of these safety factors either on an acute or chronic basis?
- Given the critical nature of the safety factors in the author’s arguments, it seems appropriate that a qualified toxicologist should have prepared and/or evaluated this section of the report. Was the discussion and evaluation of safety factors developed by a qualified toxicologist?

14. The Discomfort Factors as described in Table 7 (Section V) appear to artificially lower the relevance of the solidified organic waste stream. The discomfort factor is created by multiplying the weighted average concentration by the percentage of the FWF. The weighted average concentration is a much clearer indication of the relative “discomfort” of each FWF to the inventory. Could the author provide evidence indicating why it is reasonable to believe a hazardous waste is unimportant because it is a relatively small volume of waste at the site? Could the author cite and provide literature that indicates that the Discomfort Factor is a recognized measure of risk for this application? Could the author also justify why this approach is a better indicator of the relative risk than Table 4 that indicates that 68% of the VOCs in the WIPP Plus data set come from solidified organics?

15. Other questions must be addressed relative to the Discomfort Factors (pp. 13-14) including:

- Is the discomfort factor’s utility limited to situations where placement of waste in the WIPP is completely random? Isn’t there evidence that waste placement carried out in WIPP has not been random?
- How is the proposed discomfort factor relevant for situations where a group of waste drums with higher headspace gas VOC concentrations (e.g., solidified organics) is placed in a single room because these wastes were shipped to WIPP during the same time period?
- Does Table 7 actually illustrate that the discomfort factor is an inappropriate screening tool for addressing gas headspace VOC concentrations, because the FWF most likely to pose a significant risk (solidified organics) received a discomfort factor that is very low?

16. Table 8 lists the number of waste streams for each final waste form in the data set; what is the total number of waste streams that are anticipated for each final waste form that will be placed in WIPP (as opposed to the waste that has been received so far)? Table 8 actually illustrates that the data collected so far do not adequately represent the various waste streams that will eventually be shipped to WIPP.
17. Based on the text in Section VII (p. 15), it is not clear if the author is suggesting that methylene chloride should no longer be included in underground monitoring for VOCs. Because the HSG data collected to date are not representative of the total inventory of waste that will be shipped to the WIPP site and because estimated methylene chloride concentrations apparently decreased mainly because of differences in data set screening methods, the author would be justified in recommending that DOE discontinue monitoring for methylene chloride only if it can be demonstrated that the screening method did not inappropriately reduce the potential risks from methylene chloride.

18. Because of the significant issues associated with the data set and statistical analysis used in this report, the conclusions in Section VIII (pp. 15-16) are not adequately supported. Problems with the conclusions include:

- Conclusion 1 states “estimated proportions and actual proportions match closely.” How is this statement consistent with the poor agreement between the calculated proportions for methylene chloride and carbon tetrachloride? Because neither the 930-drum data set nor the WIPP Plus data set have been shown to accurately represent all WIPP waste, how can either database be used to predict the proportion that a particular VOC will contribute to the total VOC load?

- Conclusion 2 indicates that the total anticipated VOC load on the repository is overestimated, based on comparisons between the 930-drum study and the WIPP Plus data set. Because neither data set has been shown to represent waste that will be accepted at WIPP in the future, how can the total VOC load be predicted?

- In Conclusion 3, the risks posed by VOCs are predicted to remain acceptable based on comparisons between the WIPP Plus data set and the 930-drum study. Isn’t the appropriate conclusion that the risks currently posed by VOCs are acceptable, based on the WIPP Plus data set, but that the future risks have not been definitively established because the data sets may underestimate HSG concentrations in waste shipped to WIPP in the future?

- Doesn’t Conclusion 4, which states that potential problem waste streams can be identified by use of the discomfort factor, contradict the data in Table 7? In this table, the solidified organics FWF has a relatively low discomfort factor, but this waste form apparently has the highest HSG concentrations and would be most likely to require the type of “special procedures” suggested in conclusion 4.

- The comparisons in this report have been between measured HSG concentrations in the 930-drum data set and the WIPP Plus data set, neither of which relied on AK. How has AK been shown in this report to be adequate for characterizing drum contents, as stated in conclusion 5? This entire report is based on HSG concentrations, so how can it be stated that HSG sampling to date has not contributed to a greater understanding of VOCs in WIPP waste?

- As stated in Conclusion 6, how do the similarities in proportions and masses of VOCs calculated with the two data sets examined in this report indicate anything about the reliability of AK for estimating HSG concentrations? The author should
provide information on what would be expected in the wastes based on AK and compare this information to the results of HSG measurements.

19. Because of the problems associated with the data set and statistical analysis, the following questions regarding the discussion in Section VIII must be addressed by the author:

- How has this report demonstrated that the waste shipments accepted through May 2003 completely represent all waste that will be shipped to WIPP? Because the waste shipments accepted through May 2003 might underestimate HSG concentrations in future waste shipments, are any of the conclusions regarding risk estimation adequately supported?

- This report states “it is not possible to place waste containers in a configuration where catastrophic events such as a roof fall could produce either a short-term risk to workers or a long-term risk to boundary residents” (p. 16). What would happen to the predicted risks if a roof fall occurred in an area of WIPP that has a high proportion of drums with higher VOC concentrations, such as the solidified organics? Has this scenario been quantitatively evaluated?

- Has a quantitative analysis been carried out to demonstrate the assertion (p. 17) that VOCs will not be a health or safety risk in any circumstance, unless the VOC concentrations in the containers exceed levels allowed by the transportation restrictions? The analysis in the McCulla and Van Soest report appears to be qualitative in nature and does not present any calculations regarding what could happen if a cluster of high-VOC drums is present in either an open or closed room in which a roof fall occurs (page 16 of McCulla and Van Soest).
Where we are going: 17S-3K-5K

Welcome to my first WIPP Home Page column. Through one-on-one discussions, group meetings, electronic conversations, and surveys, I have come to recognize a common denominator among project participants: the desire for a continuous dialogue concerning the project’s big picture.

In an ideal world, I would sit down with each employee to discuss where we are now and where we need to be in the future. Because this is not possible, I will use this as one of many ways to carry on this essential exchange.

To be successful, we must share a crystal clear vision of where we are going. I recently thought, "With a project this large and complex, is it possible to distill our vast number of aims, goals, objectives, plans, and intentions into a simple, concrete vision that we can all get our arms around?" Fortunately, the answer is yes. Simply put, our common vision should be 17S-3K-5K:

- 17 shipments processed safely each week (17S)
- $3,000 per contacted-handled (CH) waste drum for characterization (3K)
- $5,000 per remote-handled (RH) waste drum for characterization (5K)

Implied in this vision is an in-place and operating RH System. As an employee, you might be asking yourself, "Well, how do I fit into this vision? I'm in human resources or program management or communications." The fact is that we all can and must contribute to make 17S-3K-5K a reality. Our human resources professionals can expedite recruitment of key scientific and technical talent. Our program management professionals can implement new ways of budgeting, so project managers can spend more time managing. Our communications professionals can help influence key stakeholders in supporting our common vision. The fact is we can all contribute to making 17S-3K-5K a reality.

Where are we right now? 6S-10K-20K. Obviously, we have our work cut out for us, but I am convinced that this team can get us there. How do we get to 17S-3K-5K? The things we need to do to reach our common vision will be the subject of future columns, some by me and some by guest columnists such as John Lee, Ned Elkins, Paul Shoemaker, and Vernon Daub. These columns will include discussions about our roles and responsibilities, as well as our project culture and the need to operate WIPP like a business.

Let's dedicate ourselves now to achieving 17S-3K-5K. Together, we can help meet the challenges the DOE complex faces. Achievement of this vision will provide us with opportunities for growth and advancement. These are exciting times. We will continue our string of project successes and "firsts" by focusing on 17S-3K-5K.
General Comments

1. Although the proposed open-room and closed-room monitoring approaches are described in general terms within this report, the author does not provide information that is sufficient detailed for a RCRA permit modification. For example, construction design documentation is not provided and other details are also lacking. Additional information would need to be provided before the safety and efficacy of this proposed modification could be fully evaluated.

2. In the scenario in which monitoring of a closed room indicates that room-based VOC limits have been exceeded, the author proposes abandoning the adjacent open room and therefore not filling it to its design capacity. Abandoning rooms because room-based limits are exceeded potentially could result in an inadequate amount of space at WIPP for the waste that is scheduled for disposal. Doesn’t the current permit use the results of headspace gas (HSG) to allow the facility to effectively manage emplacement of waste to ensure this scenario is unlikely (Permit Condition IV.D)? No analysis has been presented to indicate the relative costs of prematurely abandoning rooms compared to the costs of tracking HSG monitoring results when placing waste in each room at WIPP, especially if HSG sampling and analysis requirements are reduced to a representative sample of containers in each waste stream. Such an evaluation should be performed to fully evaluate the proposed change to the VOC monitoring approach.

3. The author compares the HSG VOC concentrations in a 1995 data set of 930 drums to a new data set composed of the 1995 data set, WWIS data from March 1999 to May 2003, HSG data from drums from a hydrogen-getters poisoning study, and HSG data from 103 drums of waste at INEEL that have been analyzed for shipment to WIPP. Comparison of the two data sets by the author indicated that the new data set had lower average HSG VOC concentrations than the 1995 data set, from which the author concluded that VOC concentrations in WIPP waste would be lower than previously projected. Where is the evidence necessary to demonstrate that the data in the more recent data set are representative of all WIPP waste that will be received during the lifetime of the repository?

4. Although the HSG concentration data in the new data set were weighted to account for different final waste forms (FWFs), were the data within each FWF evaluated to determine whether they are representative of all waste that will be included in those FWFs? Reference #9 (Myers, 2003) points out that two of the waste streams (soils and solidified organics) have not been included in wastes emplaced in WIPP as of May 2003, so how can the representativeness of the data for those FWFs be demonstrated? Is there any information regarding whether the waste streams contributing to the other FWFs as of May 2003 are truly representative of all waste streams that will be accepted at WIPP? Evidence suggests that the waste initially
shipped to WIPP may have lower-than-expected HSG VOC concentrations because DOE Carlsbad directed sites in an October 14, 1997 memorandum (before WIPP opened) to “take immediate action to concentrate efforts on segregating, certifying and preparing non-mixed defense TRU waste for disposal at WIPP” (See attached memo from George Dials to three generator/storage sites). This action may have skewed the overall VOC concentrations lower for the period considered in this paper. As cleanup progresses and the generator sites ship more challenging waste streams, isn’t it possible or even likely that average VOC concentrations might rather increase, possibly to the levels that were initially predicted or even to higher levels? Also, refer to NMED’s comments specific to the report entitled “Analysis of Volatile Organic Compound Levels in the Transuranic Waste Inventory” for more questions regarding this inventory analysis.

Specific Comments

5. This report (Section 3.1, last paragraph) indicates that analytical data were eliminated from the supporting data sets if the corresponding blanks were contaminated. However, if a VOC is a common laboratory contaminant it does not necessarily follow that this constituent will not be present in significant concentrations in WIPP wastes. Could discarding all of the samples with associated blank contamination have caused potentially important VOCs to be eliminated from the analysis? What VOC concentrations were observed in the samples and in the blanks? Were any criteria applied when discarding the data with corresponding blank contamination (e.g., discarding only those samples with concentrations less than five or 10 times the concentrations in the blanks)?

6. In Section 3.1.2, the report states that solidified organics from INEEL and RFETS represent an upper bound on HSG concentrations from VOCs. However, no HSG measurements have been carried out on waste drums containing solidified organics from Hanford, LANL, or other generator sites. Is there any evidence to confirm that the HSG concentrations of VOCs in drums from other sites will be lower than in the RFETS drums? Shouldn’t HSG measurements be performed to provide evidence regarding the VOC concentrations in drums containing solidified organics from other sites?

7. In the third paragraph of Section 3.1.3, the author states “...the room-based limit can not be reached even if all the problem VOC waste from solidified organics were to be emplaced in a single room (Ref #9-Statistical Analysis of VOC Levels in the TRU Waste Inventory).” NMED’s review of reference #9 (page 16) failed to identify a specific analysis that was carried out to substantiate this assertion. Has a quantitative evaluation been carried out to substantiate this claim? If such an evaluation has been performed, information regarding the methods and results of this investigation should be provided.

8. Section 4.3 describes the proposed action levels for the closed-room monitoring system. Because monitoring results obtained in Room 7 of Panel 1 are being used to
establish action levels and response time, has an analysis been performed to demonstrate that the waste in this room adequately represents all wastes that will be placed in WIPP in light of the October 17, 1997 DOE memorandum mentioned above? Is it possible that VOC concentrations will rise more rapidly in a room with a higher proportion of high-VOC waste (such as solidified organics) or in rooms with other types of waste? An analysis should be performed to demonstrate that these action levels and response times would be adequate under all possible circumstances.
October 14, 1997

CAO: NTP: MRB 97-2219 UFC 5822

TRU Waste, Mixed TRU Waste Segregation

John Wilczynski, ID
Tom Baca, LANL
Jessie Roberson, RFFO

The Waste Isolation Pilot Plant is on schedule to open in May; however, it now appears that the RCRA Part B permit from the State of New Mexico will be delayed. The State of New Mexico has publicly stated that it has no objection to the transportation and disposal of non-mixed TRU waste prior to issuance of the RCRA Part B Permit.

Consequently, your support is needed in identifying, segregating, certifying, and preparing for shipment non-mixed defense TRU waste. For planning purposes, a firm estimate of how much non-mixed defense TRU waste can be shipped to the WIPP in the FY98 and FY99 time period is required by October 22, 1997, given the planned opening date of May 30, 1998. If necessary, members of my staff and their support contractors will be available to assist your site. For the purpose of performing a National TRU Waste Program impact analysis, we also require information specific to your site regarding ALARA consequences, safety considerations, cost impacts, and potential impacts on State agreements.

Your site should take immediate action to concentrate efforts on segregating, certifying and preparing non-mixed defense TRU waste for disposal at WIPP.

If you have any questions regarding this request, please contact Kent Hunter of my staff at 505-234-7456.

Thank you for your support.

George E. Dias
Manager
NMED Comments Regarding
"An Analysis of TRU Waste Characterization Accuracy"
By Bob Kehrman and Wille Most
September 3, 2003

1. While the information provided appears to reflect great detail and broad applicability, NMED notes that nearly 90% of the waste emplaced at WIPP (based upon WWIS data through May 23, 2003) to which this acceptable knowledge (AK) accuracy analysis applies was generated at a single site – Rocky Flats Environmental Technology Site (RFETS). The paper only briefly addressed AK accuracy data from the few other sites shipping waste, and did not address the underlying assumption that must be questioned: is AK accuracy observed for RFETS waste applicable to the approximately 700,000 additional containers (if 55-gallon drums) destined for WIPP from other sites? Was the waste generating process at RFETS so similar to the processes at other sites that AK accuracy will be similarly comparable? Did other sites assemble AK waste information using WSRIC [Waste Stream and Residue Identification and Characterization] books and other systems like those at RFETS that apparently successfully characterized waste using AK? If all chemical analysis were eliminated, what specifically would sites do to obtain missing information when AK is not complete?

2. What was the initial purpose of performing AK accuracy calculations with respect to the permit? Is the AK accuracy calculation rigorous and well enough defined to draw the specific conclusions presented in this technical paper? Do all sites calculate AK accuracy in the same manner using the same reporting frequencies, report formats, report contents, etc.? Are there any “loopholes” that allow sites to segregate or otherwise exclude materials from inclusion in the AK accuracy “reports”? Attached is a blank AK accuracy report excerpted from the procedure used by the Permittees’ Centralized Characterization Project (CCP) [Procedure CCP-TP-005, CCP Acceptable Knowledge Documentation, Attachment 11]; is the information required on this form by this procedure rigorous enough to support all conclusions presented in this position paper? Because the NAS committee is being asked to endorse complete elimination of all chemical sampling, additional questions pertaining to the origin and content of AK accuracy calculations need be asked, as well as specifics as to how the AK accuracy reports were written and additional information necessary to completely evaluate this issue. Provision of the actual AK accuracy reports used to prepare this paper is warranted.

3. Direct observation of the AK accuracy calculation process by NMED during site audits has shown that it is not a comprehensive measure of AK accuracy, particularly if its intended purpose here is to validate elimination of all chemical waste characterization. For example, observation during audits of site implementation and development of AK accuracy reports shows that sites sometimes use a small population of containers to identify an issue (e.g., reassignment of a container to a new waste stream) and this might be reflected in a given AK accuracy report, but the
next AK accuracy report will not show this “change” as an inaccuracy because the whole waste stream was reassigned. Also, sites do not always calculate a “rolling average” AK accuracy, so the reports would be a time or waste stream “snap shot”. In short, while it is good that the authors are attempting to evaluate the AK accuracy data, the generation, origin, and limitations of this information must also be presented. Also, all AK accuracy reports should be assessed, not just the most recent ones.

4. The AK accuracy values cited require additional explanation. How was the composite AK accuracy of 98.5% determined? Was this weighted with respect to the bulk of the wastes obtained to date (i.e., RFETS origin)? Are there any problematic wastes or waste types for which accuracy was less? The “high accuracies” appears to be based on 28 of the estimated 400 plus waste streams destined for WIPP, with the bulk of these wastes from a single production facility (remembering that waste shipped from INEEL originated at RFETS).

5. The statement “there are no reported instances...[when chemical analyses] resulted in different handling or disposal requirements” requires clarification. For example, NMED’s direct audit observation of the INEEL 3100 m³ program revealed that site personnel clearly selected only those containers that could be successfully characterized and shipped, leaving other containers to be dealt with by the next contractor in line to take over the project. These containers were segregated, and therefore “different handling or disposal requirements” likely remains to be seen, depending upon what the current contractor determines about this waste.

6. Alternate conclusions can be reached from this report based solely on the data presented therein. For example, information presented in this report implies that AK did not identify all hazardous wastes in about 33% of the waste streams identified (assuming that 10 waste streams required reassignment and that the total number of waste streams in this determination was 28, although these numbers are of question since over 40 waste streams from five generator sites had been emplaced by May 23, 2003, and not all are presented individually). Therefore, wouldn’t these data then suggest that HSG sampling has some merit with respect to ensuring that a fundamental requirement of waste management – adequate identification of waste streams – is achieved? Is there a demonstrated usefulness for this technique, accepted by the community and stakeholders, to characterize the hundreds of waste streams destined for WIPP for which no AK has been assembled?

7. The authors make several sweeping statements and conclusions that require additional explanation:

- The authors state that “all of the HWNs [hazardous waste numbers] added [by HSG] were allowed by the HWFP” (pp. 3, 16), but this is not surprising considering the permit has been modified three times in the last two years to add
33 new hazardous waste codes that were not identified via AK in the original permit application.

- It is also not surprising that the addition of HWNs did “not change the sampling and analysis” (pp. 3, 16) because the permit does not mandate additional sampling and analysis if the new hazardous waste codes are discovered based on HSG.

- It is also not surprising that the addition of HWNs did not change “the way in which the waste stream was handled” (pp. 3, 16), as the WIPP facility Contingency Plan, Procedures to Prevent Hazards, etc., should reflect any considerations with respect to the new HWNs assigned.

- The authors state that “the number of unexpected prohibited items in the waste is insignificant” (p. 20), but this statement is somewhat misleading. It implies that there should be no “unknown” prohibited items, when in fact many sites routinely screen and segregate containers specifically for prohibited items using radiography, such that the actual number of prohibited items in a waste stream can be very significant.

8. The statement that “there were no recorded instances where the results of HSGSA [headspace gas sampling and analysis] or SS [solid sampling] resulted in the removal of a container from the generator sites’ transuranic (TRU) waste inventory because it was determined to be unsuitable for disposal at WIPP” (pp. 4, 16) requires additional explanation. Direct observation during audits has shown that actions are typically taken at sites to ensure that containers are ultimately suitable. For example, HWNs are requested for addition to the permit, troublesome waste containers are often segregated for later disposition, and waste containers are re-assigned to streams that contain the HWNs. Actions may not result in removal from the TRU inventory because the waste is still TRU, but obviously actions have been taken to remedy the identification of HWNs via headspace gas sampling that had not been assigned by AK, such that these actions may not “show up” in AK accuracy calculations.

9. Caution must be exercised when examining Table 1, because the source of information in this executive summary table is not explained or described. For example, the number and ways sites may segregate, remove, or otherwise assign containers based on HWNs, physical description or prohibited item contents, etc., and which are not reflected in the AK accuracy reports, has not been presented. This information must be clearly and precisely shown to give a balanced vision of how waste is actually managed and dispositioned at generator sites. AK accuracy tells only a small portion of the “story”, and the full story should be presented.

10. The authors provide ten “metrics” for evaluating AK accuracy, but do AK accuracy reports generally include these metrics? Do statements in the metrics discussions (Section 1, p. 5+), implying how each is accounted for in AK accuracy, take into account instances where, for example, Waste Matrix Code problems are identified for a waste stream during initial examinations, but the whole waste stream is not “counted against” AK accuracy because it is reassigned before full characterization occurs? Isn’t it true that the permit includes chemical similarity as a requirement for
waste streams (Permit Attachment B, page B-2), but the metric implies that only the physical characteristic of the waste stream is important (metric 2, page 8)? Direct observation of AK Audits has shown that it is not necessarily true that “each time a container is assigned to a different waste stream it is counted against AK accuracy” (p. 8). Also, containers found to be “problematic” are sometimes segregated for later dispensation (e.g., 3100 m$^3$ project at INEEL), or are reassigned without reporting in AK accuracy because of the characterization methodology (e.g., radiography “quick scan” to identify prohibited items under the guise of collecting supplemental AK information).

11. A number of detailed questions arise pertaining to the Tables, including inconsistencies, comparability problems between tables, unexplained values, unclear intents/purpose, etc. For example, the origin of Table 7 (page 15) requires clarification. As written, the authors imply that “subsequent AK” improved the original AK for various waste streams. What is the origin of this subsequent AK? This is a critical and important matter, as comparison of Table 3 and Table 7 show the same “values”. Is it related to the fact that HSG/SS information obtained by Bechtel under the 3100 m$^3$ program at INEEL was “rolled into” the next contractor’s (BNFL’s) characterization program as AK information? While the practice itself is not necessarily objectionable, it appears that the authors are using this table to support their desire to eliminate chemical sampling by showing that “subsequent AK” provides an abundance of data. However, the actual source of the data in the table could be related to HSG and Solid Sampling performed under the WIPP WAP by a previous contractor. Clarify the source of the “subsequent AK” data.

12. On page 18, the authors state that relatively few containers changed HWNs due to visual examination/radiography, but is this really surprising since the only HWNs consistently identified by these methods is lead? How, then, can radiography of a few containers confirm HWNs, when this method can only identify with certainty one of the dozens of hazardous waste codes in the Permit? Also, aren’t the relatively few reassignments at RFETS/INEEL with respect to waste matrix codes (WMCs) actually expected, since RFETS originally packaged its waste by physical forms compatible/comparable to WMCs?

13. Table 11, presents “Instances When Prohibited Items Were Found During Radiography or Visual Examination.” However, isn’t this table misleading, as the authors later say that it “must be used carefully since many sites do not report the number of containers that are rejected by the radiography or VE in lieu of radiography processes”? NMED audit observers have noted that hundreds of containers (if not more) are probably rejected by RTR/VE due to the presence of prohibited items, but this generally does not “show up” in AK accuracy reports due to how and when these items can be rejected. To really understand how often prohibited items are present, the authors should go to sites and ask for the number of containers segregated/rejected due to the presence of prohibited items.
14. The authors acknowledge on page 23 that data reported "to date" indicated good AK accuracy, and that "concerns regarding waste characterization accuracy generally and AK accuracy specifically, are, for the most part, unfounded." [emphasis added] However, the authors admit that AK information is not perfect. The authors state that sites can "no longer accept waste into the WIPP characterization program if AK information indicates the possibility of prohibited items similar to the waste stream characterized from ANL-E." Where is this requirement contained? Since ANL-E waste was characterized by the CCP and many sites are not, if the requirement is CCP-specific, how is this to be enforced complex-wide? Note that the authors allude to the "quick screen" method used at SRS, by which containers are quickly examined by RTR (not following the requirements of the permit) to identify prohibited items prior to full examination of the waste following permit requirements. Clearly, this method uses RTR to beneficially pre-screen wastes, but is this requirement to be mandated complex-wide?

15. A very important element of this report is the statement on page 23 that "if HWNs are unknown effort will be necessary to make reasonable assignments to assure there is not compatibility issues associated with the waste." What does this mean? What will this entail - select sampling and analysis? Does this satisfy the requirement to obtain a detailed chemical and physical analysis of a representative portion of the waste, as required under RCRA? How can this determination be checked for adequacy – by whom and when? The authors also state that the success of their proposed program to eliminate all chemical characterization "depends on the construction of an adequate waste examination sampling plan." Presumably, the authors intend for this to be a plan for statistically selecting containers for radiography, but how will this tie into the "efforts" made when AK is poor? What will be the AK triggers to determine when sampling and analysis are required? Who will decide when efforts – including sampling—are necessary? What do the authors mean by the statement, "examination of data collected to date indicates that a statistical sampling approach could be used to identify the number of containers that should be radiographed… to confirm the waste stream characterization results with a high degree of confidence." How will you confirm assignment of HWNs for anything other than lead using radiography? How can this "indirectly confirm" the chemical/hazardous properties of the waste when, for example, a container is filled with sludges? The authors seem to have qualified their bold conclusions in the report by recognizing that future situations may differ from that currently dominated by RFETS waste characterization, and that alternative waste characterization approaches could be required. Since this would appear to be a very important element of the authors' proposal, why does it have the least amount of explanation involved?
CCP-TP-005
Revision 12
CCP
Acceptable Knowledge Documentation

EFFECTIVE DATE: 03/26/2003

David H. Haar
APPROVED FOR USE
### 4.6 Determining AK Documentation Accuracy

**NOTE**
The quality assurance objectives (QAOs) and their applicability to AK are discussed in the QAPJP. Calculation of the accuracy of AK documentation is required and is performed as follows.

**SPQAO**

4.6.1 Obtain the completed Attachment 10, Acceptable Knowledge Confirmation Checklist, and any AK Re-evaluating Checklists (Attachment 12) applicable to the waste stream or waste stream lot, and any necessary supporting documentation from the SPM, or the CCP Records Custodian.

**NOTE**
The AK Accuracy report is used to determine the number of containers reassigned to a new waste matrix code, designated with a hazardous waste number assignment different from AK, or inconsistent with anticipated radionuclide composition determined from AK.

4.6.2 Complete an Acceptable Knowledge Accuracy Report (Attachment 11) after AK confirmation has been completed for the subject waste stream or waste stream lot.

4.6.3 Review, sign, and submit the Acceptable Knowledge Accuracy Report (Attachment 11) to the SPM.

**SPM**

4.6.4 Review, sign, and submit the Acceptable Knowledge Accuracy Report (Attachment 11) to the CCP Records Custodian.
Attachment 10 - Acceptable Knowledge Confirmation Checklist

<table>
<thead>
<tr>
<th>Acceptable Knowledge Information or other data points</th>
<th>Confirmed? Yes/No</th>
<th>Acceptable Knowledge Re-evaluation Required? Yes/No</th>
<th>Comments</th>
</tr>
</thead>
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<td>Physical waste form/description</td>
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<tr>
<td>Waste material parameters present</td>
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<tr>
<td>Waste percent volume consistent with nondestructive examination or visual examination data and audio/video tapes or equivalent media</td>
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<tr>
<td>Summary category group assignment</td>
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<tr>
<td>Waste matrix code assignment</td>
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<tr>
<td>Absence of prohibited items</td>
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<tr>
<td>Hazardous waste constituents present</td>
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<td></td>
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<tr>
<td>Tentatively identified compounds</td>
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<tr>
<td>EPA Hazardous Waste Code assignment</td>
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<td>Toxicity characteristic code assignment</td>
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<td>UCL_{90} &gt; PRQL?</td>
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Attachment 10 - Acceptable Knowledge Confirmation Checklist (continued)

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<table>
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<tr>
<th>Acceptable Knowledge Information or other data points</th>
<th>Confirmed? Yes/No</th>
<th>Acceptable Knowledge Re-evaluation Required? Yes/No</th>
<th>Comments</th>
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<tbody>
<tr>
<td>VOCs from packaging materials or radiolysis present</td>
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<tr>
<td>State Hazardous Waste Code assignment</td>
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<tr>
<td>Radionuclides present</td>
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<tr>
<td>Other radiological parameters: (specify)</td>
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</table>

Additional Comments:

- Identified in the AK Summary Report or included in the in-process record documentation (e.g., BDR's)
- Use the Acceptable Knowledge and Waste Characterization Data Cross-Reference (Attachment 9) to identify applicable testing, sampling, and analysis information to compare to the acceptable knowledge information.
- Identify the source of the waste characterization information (e.g., batch data report).
- Ensure that, if a toxicity characteristic contaminant is identified, it is not included as a listed waste, and if analytical data regarding the concentration are not available, the corresponding EPA Hazardous Waste Code is applied.
- Tentatively Identified Compounds identified in the Headspace Gas Summary Report were identified on the Hazardous Constituent List, Attachment 5

Site Project Manager:

<table>
<thead>
<tr>
<th>Print</th>
<th>Sign</th>
<th>Date:</th>
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</table>

Acceptable Knowledge Expert:

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Page of
Attachment 11 - Acceptable Knowledge Accuracy Report

Site(s): ___________________________________________ 

Waste Stream Number(s): _____________________________________ 

Waste Stream Description: _____________________________________ 

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</table>

Total containers in this report: ____________
Total containers consistent with AK: ____________
Percent containers consistent with AK: ____________

SPQAO:

/ ____________________________ Date: ____________
Print Sign

Site Project Manager:

/ ____________________________ Date: ____________
Print Sign
**Attachment 12 - Acceptable Knowledge Re-evaluation Checklist**

**Site(s):**

**Waste Stream Number(s):**

**Waste Stream Description:**

**NCR numbers(s) if applicable:**

**Inconsistency between waste characterization and acceptable knowledge information (describe):**

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<th>Requirements</th>
<th>Completed?</th>
<th>Supporting Documentation</th>
</tr>
</thead>
<tbody>
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<td>Review existing AK information and document state and EPA Hazardous Waste Code differences with characterization results.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassess original AK and document AK associated with new state and EPA Hazardous Waste Code assignment and new waste stream designation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reassess and document AK associated with new waste material parameter determinations and new waste stream designation.</td>
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<tr>
<td>Verify and document that new waste material parameter determinations (or those associated with a new waste matrix code) are consistent with the waste material parameters identified during nondestructive examination or visual examination.</td>
<td></td>
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<tr>
<td>Reassess original AK and document AK associated with new summary category assignment and new waste stream designation.</td>
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<tr>
<td>Verify and document that the new waste matrix code group wastes were generated within the AK specified time period, area, buildings, and waste generating processes.</td>
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<tr>
<td>Reassess and document AK associated with new radionuclide content determination and new waste stream designation.</td>
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<tr>
<td>Report nonconformance, document segregation of container, and define corrective action for full characterization if AK discrepancies for new assignment(s) exist.</td>
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</table>

**a.** Cite the source document, nonconformance report number, attachment, or other documentation used to support a change or no change.

**b.** Ensure that, if a toxicity characteristic contaminant is identified, is not included as a listed waste, and analytical data regarding the concentration are not available, the corresponding EPA Hazardous Waste Code is applied.

---

**Acceptable Knowledge Expert:**

Print ______________________ /

Sign ______________________

Date: __________

**Site Project Manager:**

Print ______________________ /

Sign ______________________

Date: __________
1. The above referenced DOE position paper references the Joint NRC/EPA Guidance on Testing Requirements for Mixed Radioactive and Hazardous Waste, 62 FR 62081, November 1997 to support the author's contention that acceptable knowledge (AK) alone can be used to characterize waste. The DOE states that the guidance emphasizes the use of process knowledge alone. However, the guidance document also states in a disclaimer that "The policies discussed in this document are not final Agency actions, but are intended solely as guidance. They are not intended, nor can they be relied upon, to create any rights enforceable by any party... The [EPA and NRC] may follow the guidance, or act at variance with the guidance, based on analysis of site circumstances." In short, the authors of the guidance clearly recognized that variance from the guidance will occur. Also, the guidance document states, on page 62083, "It is recognized that certain mixed waste streams, such as waste from remediation activities or waste produced many years ago, may have to be identified using laboratory analysis, because of a lack of waste process information on these streams." The guidance document goes on to indicate that "hazardous waste determinations based on generator knowledge can be used to reduce the sampling of mixed waste..." and this is then followed by methods by which this sampling can take place. The guidance document also discusses redundancies with respect to sampling at the waste disposal sites (i.e., eliminating the need to sample "each waste movement" as done at some RCRA sites, etc.), but DOE never implemented verification sampling at the WIPP, which is typically performed at RCRA facilities. Finally, the guidance document concludes by stating, "EPA and NRC believe that a combination of common sense, modified sampling procedures, and cooperation between State and Federal regulatory agencies will minimize any hazards associated with sampling and testing mixed waste." NMED questions whether this cooperative approach been sought by the DOE via a technically defensible permit modification request to reduce sampling and analysis requirements at the WIPP.

2. The genesis and application of this joint guidance also needs elucidation. For example, is it true that this guidance document was primarily written for commercial mixed low-level waste generators (p. 62080)? Is it true that because these commercial mixed low-level waste generators are active operating facilities, it would be much simpler to use process knowledge to determine the type of waste generated? In addition, didn't the guidance document explicitly state that there might be cases where waste generated "many years ago" may not have adequate process information (p. 62083)? Isn't it likely that the DOE legacy wastes generated prior to active implementation of RCRA might have less than adequate waste characterization by AK and therefore were not characterized in accordance with specifications currently
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in-place at “typical” regulated commercial mixed low-level waste generators, such as the generators impacted by the November 20, 1997 joint guidance?

3. It appears that the process in developing the joint EPA/NRC guidance did not include input from State regulatory agencies responsible for mixed waste regulation, even though there are currently at least thirty-nine states and one territory that have been delegated authority by EPA to regulate mixed waste. Has any new guidance been issued since this document was published that either integrates lessons learned by the States or takes into account State requirements or considerations? Has any more guidance been issued at all from EPA or States regarding regulation of mixed waste and, specifically, characterization of these wastes?

4. Wasn’t this guidance document drafted specifically to address the characterization of non-transuranic, mixed low-level waste from commercial facilities (page 62080)? As such, sampling and analysis considerations examined by those writing the guidance document would probably have taken into account the nature and type of waste generated (e.g., newly generated waste at commercial facilities), who would know the physical characteristics of waste as it was being generated, and who would also likely record hazardous constituent input to the waste from which the hazardous wastes could be defined. Did the authors of the joint guidance take into account the specific needs of legacy waste, wherein the physical and chemical characteristics of waste may not be well defined?

5. The DOE position paper on page 3, paragraph 1, indicates that there is no statutory or regulatory basis for requiring the examination, sampling and analysis of 100% of containers in every waste stream. NMED does not dispute this statement. Based on NMED’s experience observing site audits, examining available AK information, and assessing AK accuracy through comparison of headspace gas and nondestructive examination, there may be waste in the DOE inventory with sufficient AK to allow, for example, a statistical sampling approach to chemical and physical characterization. In fact, when presented with technically defensible permit modification requests seeking reduced headspace gas sampling requirements for specific waste types in April 2000, NMED approved them with no reservations. However, where is the specific evidence to support the conclusion in this paper that chemical sampling is unnecessary for any waste intended for disposal at WIPP? Wouldn’t it be more technically and regulatorily defensible to consider the nature of the AK available (as suggested in the joint guidance) before unilaterally determining it unnecessary to chemically sample and analyze the wastes? Also, shouldn’t this characterization include both physical and chemical verification (e.g., both HSG and VE/RTR)?

6. The DOE position paper indicates (on Page 4 under the “Discussion” title, paragraph 1) “the waste delivered to WIPP originates within the DOE complex and is typically well pedigreed and subject to strict quality assurance requirements.” However, direct observation at audits by NMED has shown that sites have explicitly selected waste
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that can demonstrate immediate success (e.g., 3100 m³ project at INEEL), with almost all site personnel indicating that there are wastes at these sites (e.g., Hanford, INEEL) for which the adequacy of AK remains to be demonstrated. Also, DOE has, unfortunately, brought to question the adequacy of its own AK in very public forums. For example, at the public hearing for the WIPP permit on February 24, 1999 (Hearing Transcript, pp 470-474, attached, cross examination of Mr. Kent Hunter, DOE technical witness, by Kevin Ward), DOE presented an RTR tape for a container that clearly contained debris waste. However, AK data provided by the Permittees to stakeholders identified this container as being in a homogenous solid waste category. The public witnessed this apparent misclassification, and it does bring to question whether site assignments of waste containers to a waste stream can be considered adequate without some measure of chemical and physical verification.

7. On page 10, the position paper references EPA guidance document “Waste Analysis at Facilities that Generate, Treat, Store and Dispose of Hazardous Waste - A Guidance Manual”, 1994 [OSWER 9938.4.03, April 1994]. This document presents general guidance for preparation of waste analysis plans at RCRA facilities, which are typically facilities that actively generate waste (i.e., do not have legacy waste), and for which the waste generating processes may be more simplistic than the complex waste generating processes that could occur at some WIPP waste generating sites (e.g., Oak Ridge, etc.). The WIPP disposal site is not a “typical” RCRA facility because DOE sites have waste streams that have not been characterized according to present standards, and DOE sites also have “legacy” wastes that are waste that has been stored at DOE sites for in some cases as long as 30 years in various burial grounds, bunkers or waste pits. Information regarding these wastes is often indeterminate, since sites have, in many instances, not yet begun to assemble and assess information for these more difficult to characterize wastes. While it is understandable that DOE wishes to reference this document, it must be understood that the intent for the EPA guidance was for operating RCRA facilities that normally generate and store known hazardous waste. In addition, if there is a question regarding an operating RCRA facility’s waste, it is more appropriate to characterize the waste by simple chemical analysis. This is not the case with the DOE wastes destined for disposal at WIPP.

8. The EPA waste analysis guidance clarifies the use of AK and sampling/analysis on page 1-12, “For example if you are the owner/operator of a TSDF [treatment, storage, or disposal facility], accept waste from an off-site facility, and rely on the information provided by the generator or TSDF sending you waste, your facility is still responsible for accurately identifying/classifying the waste.” The guidance document further states, “Therefore, to ensure compliance within RCRA you should conduct a full scale, and under certain circumstances an abbreviated scale, sampling, and laboratory testing program for all wastes prior to managing the wastes.” Isn’t it true that the WIPP site as a disposal facility conducts no sampling or analysis of waste on-site? Therefore, since the WIPP TSDF does not conduct verification sampling, doesn’t it seem logical that additional verification and characterization of the waste
should be done at the generator sites? Typical RCRA TSDFs perform certain verification analysis at the site to ensure that the waste being shipped from the generators is the same waste as is specified on the manifest papers. WIPP has no on-site process to verify this information since no waste characterization occurs on site like other RCRA sites. Therefore might it be in the best interest of the citizens of New Mexico to ensure that an appropriate verification process occurs at the generator sites?

9. The position paper does not address the additional regulations contained in 40 CFR 264.13(c) which requires screening and analysis procedures for off-site TSDFs that help minimize the potential for facilities to accept incorrectly identified or unacceptable waste shipments. In the EPA waste analysis guidance document cited by the DOE, Section 2.6.1, page 2-45, indicates that an off-site facility should, at a minimum, visually inspect and compare the contents of each shipment, ... to identify the wastes. The guidance document then states, “The shipment received on site should be sampled and analyzed to the extent necessary to verify that it meets permit specifications and regulatory requirements.” Since the WIPP site does not perform visual inspection or any type of waste verification that normally occurs at “typical” RCRA disposal sites, shouldn’t the waste stream verification/characterization be performed at the DOE generator site to ensure the wastes are properly identified? The guidance on page 2-44 indicate that “most facilities that receive wastes from off site sample a percentage of the waste when they are received, and check each waste container for ‘selected fingerprint analysis parameters’.” The WIPP site conducts no such sampling like typical RCRA sites. On page 2-47, the same EPA guidance indicates that “...EPA will generally measure compliance in enforcement actions based on a comprehensive analysis of hazardous constituents and properties associated with a particular waste.” If the WIPP site does not conduct analysis and DOE wishes not to have the generator conduct analysis, and for safety reasons NMED can not conduct enforcement verification sampling of the waste, then how are the enforcement agencies going to determine if the waste being sent to WIPP are compliant, as is possible with typical RCRA site? The system of checks at the generator sites for the waste heading to WIPP was included in the permit for these reasons. Based on the above, is verification of the waste without analytical capabilities at the generator and disposal sites a prudent course of action?

10. The EPA waste analysis guidance document on page 1-12, section 1.5.1 also states, “... if you own/operate a TSDF, accept waste from an off-site facility, and rely on the information provided by the generator or TSDF sending you waste, your facility is still responsible for accurately identifying/classifying the waste.” However, once again, at the WIPP site it is not possible for the site or NMED to verify if a waste has been properly analyzed unless such detailed information is obtained and verified at the generator site.
STATE OF NEW MEXICO
BEFORE THE SECRETARY OF THE ENVIRONMENT

IN THE MATTER OF THE FINAL PERMIT
ISSUED TO THE UNITED STATES
DEPARTMENT OF ENERGY (DOE)
AND WESTINGHOUSE ELECTRIC COMPANY WASTE ISOLATION DIVISION (WID) FOR
THE WASTE ISOLATION PILOT PLANT (WIPP); USEPA NO. NM 4890139088

REPORTER'S TRANSCRIPT OF PROCEEDINGS
TECHNICAL TESTIMONY
VOLUME III
February 23, 1999
9:02 a.m.
Santa Fe, New Mexico

BEFORE: JEFFREY S. GULIN, Hearing Officer

On February 23, 1999, at approximately 9:02 a.m., this matter came on for hearing before Hearing Officer Jeffrey S. Gulin at the PERA Building, Santa Fe, New Mexico.

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*   *   *
of quality control at the Los Alamos National Laboratory.
That's used as part of the process.

Q. So, obviously, the personnel of the permittees had knowledge of what was in the drum before the videograph was taken?
A. That's correct.

Q. But that's not the usual circumstance?
A. I'm sorry. I don't understand your question.
Q. When the permittees proposed to do radiography as a part of their confirmation process, will the radiographer typically know what is in the drum before he undertakes the radiography?
A. Typically the radiographer should have a very good idea of what to expect because of the acceptable knowledge that has been done previously.
Q. But he would not have opened the drum? He would not have visually inspected the contents?
A. No, he would not have visually inspected the contents.

Q. Now, the second video that you showed us was for wastes from Los Alamos National Laboratory, correct?
A. All three -- I didn't show the second segment, but all three segments were from Los Alamos National Laboratory, yes, sir.
Q. Now, the -- and I believe that -- that second
1 drum was S816697?

2 A. I don't recall the number.

3 Q. You don't recall. Is there an easy way for you to tell us whether that was the drum number without us pulling out the television screen and the video?

4 A. No, sir, I couldn't do that. I don't believe we have that information.

5 Q. Let me have handed to you a copy of a letter.

6 I only --

7 HEARING OFFICER GULIN: Counsel, do you have that information?

8 MR. KRISTL: We do have the information and that is the number that is on the outside of the tape that we filed, yes.

9 MR. WARD: So we have a stipulation that the drum referenced in the second video was S816697.

10 MR. KRISTL: I don't know if it constitutes a stipulation, but we certainly would agree to that fact.

11 Q. (BY MR. WARD) Now, the waste that was depicted in that video, would that be fairly characterized as debris waste?

12 A. On all three videos, yes.

13 Q. That was not homogeneous waste?

14 A. That's correct.
Q. It was not solidified waste?
A. No, it was not.

Q. Let me show you a document that's in the record, and we'll have copies distributed.

MR. WARD: Excuse me. That's the wrong document.

HEARING OFFICER GULIN: Shall we hold on to it, Mr. Ward?

MR. WARD: No, we're not going to need that.

HEARING OFFICER GULIN: Okay.

Q. (BY MR. WARD) I will now hand to you another document. Now, what I've handed you is a document that's entitled "Los Alamos National Laboratory Transuranic Waste Characterization Sampling Plan," dated April 8, 1997, correct?

A. That is the title and the date, yes, sir.

Q. Are you familiar with this document?
A. No, I'm not.

MR. KRISTL: Your Honor, for the record, I would like to indicate that this is not the entire document. It appears to be a cover page and some other selected pages out of the document, and the record should reflect that fact.

MR. WARD: That is correct.
Q. (BY MR. WARD) Now, would this document have been reviewed by the permittees as part of their auditing or quality assurance, quality control program?
A. It's likely. I could not testify that it was looked at during our program.

Q. Let's look at the second page of this document, which is actually page 335 of Appendix D, and this is entitled "Waste Stream TA-55-38, Cemented Inorganics and Spent Samples," correct?
A. This is a waste description?
Q. Right. The very top of the second page of the document.
A. Oh, the title? Yes.
Q. Okay. And then if you go down further into the waste description, it reads, "Solidified inorganic process solids generated from facility and equipment operations and maintenance," correct?
A. Yes.
Q. "This waste includes process leached solids, ash, filter cakes, salts, metal oxides, fines, or evaporator bottoms stabilized in Portland or gypsum cement," correct?
A. That's correct.
Q. And if you go on to the next page, which is the third page of the exhibit, but page 343 of Appendix D of
the document, if you'll look down on the package ID
column, you see drum S816697, correct?
   A. Yes.
   Q. Now, the drum that we saw labeled S816697 did
not contain leached solids, ash, filter cakes, salts,
metal oxides, fines, or evaporator bottoms stabilized in
Portland or gypsum cement, correct?
   A. It did not appear to.
   Q. Now, let's talk about visual examination.
Visual examination will not occur on all drums, correct?
   A. That's correct.
   Q. It will only occur on a portion of the drums?
   A. Yes, sir.
   Q. And I believe one of the reasons you gave was
for the limit -- limiting visual examination was because
of concerns of worker safety?
   A. That's correct.
   Q. Have the permittees collected any data
regarding worker exposure as a result of visual
examination of drums?
   A. To my knowledge, their hasn't been any data
collected specific to that activity.
   Q. Let's now move to the topic of corrosivity.
Some of the wastes that are proposed to be disposed of at
WIPP will come from Los Alamos National Laboratory?