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

MAY 17 1996

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Mr. George E. Dials, Manager
Carlsbad Area Office
Department of Energy
P.O. Box 3090
Carlsbad, NM 88221

Dear Mr. Dials:

Please find enclosed the Office of Solid Waste's (OSW's) final comments on the Preliminary Draft No-Migration Variance Petition (NMVP) submitted to OSW on May 26, 1995. This submittal addresses the Department of Energy's (DOE's) compliance with the EPA's Land Disposal Restrictions during the operational time frame of the WIPP facility.

This final version of OSW's comments now includes our response to those issues raised by DOE in the introductory section of the draft petition, specifically the WIPP unit boundary, definition of disposal, and human intrusion.

As mentioned in our January submission, these comments are advisory in nature, and not regulatory requirements. When the final petition is submitted, EPA will evaluate its merits from a regulatory standpoint.

As we also mentioned in our earlier draft submission, we expect that the application in June will attempt to demonstrate no migration for disposal operations and the post-closure phase.

Please direct your comments and questions, as well as requests for any meeting you wish to have regarding these comments, to Chris Rhyne of my staff at 703-308-8658.

Sincerely,

Matthew Hale

Matthew Hale, Director
Office of Solid Waste

Enclosure

[redacted]

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cc w/ enclosure:
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CHAPTER 1.0: INTRODUCTION

WIPP Unit Boundary

In the May 31, 1995 draft no-migration variance petition submission, DOE suggested that the unit boundary be moved to the surface land withdrawal area during the operational phase of the underground facility. DOE mentioned in that submission that jurisdiction over the surface land withdrawal area has been granted to the department by the Land Withdrawal Act of 1992 (Public Law 102-579).

This is a different approach than was taken by DOE and EPA in the previously approved no-migration determination (November 14, 1990, 55 FR 47700). (The unit boundary defined by the 1990 no-migration decision was limited to the Salado formation.) While the Agency agrees that the no-migration standard should not apply within the operational portion of the unit itself (i.e., within the mine) or within the unrealistic confines of the exhaust shaft, the no-migration standard, in our view does apply to workers at the surface and the public who may be near the exhaust shaft or in the surface facility's vicinity.

We believe, consequently, that the appropriate point of compliance to demonstrate no-migration via the air pathway is on the surface and at any location where a worker or other person might stand. Under this approach DOE would show compliance at a point adjacent to the shaft, and at surface points beyond. We understand that from your air modeling, you have concluded that the area of highest potential VOC concentrations at the ground surface lies outside the fence immediately surrounding the WIPP plant but well within the Land Withdrawal Act area. If this proves to be the case, then for all practical purposes this is the area where you should focus your demonstration of compliance. To demonstrate compliance consistent with this approach, DOE should perform a risk assessment on human receptors on or near the aboveground facility, demonstrating that the annual average risk to humans will not exceed health-based levels.

In performing this assessment, DOE may wish to take a conservative screening approach and consider the impact on a theoretical human receptor of hazardous constituents at the point where any discharge plume from the mine exhaust shaft would experience the highest average annual concentration. Under this approach, DOE would also calculate the receptor's risk based on an exposure time equal to the operational phase of the WIPP. In addition, the Agency is also interested in the results of a conventional human health risk assessment at this facility, based on realistic conservative exposure assumptions.

This approach to determining migration is consistent with EPA's recent no-migration decision for the Exxon Corporation's New South Land Treatment Unit located in Billings, Montana (58 FR 40134, July 27, 1993). At the Exxon land treatment facility the point of compliance was determined just outside the outer edge of the facility berm (not the edge of waste placement), the nearest point at which human activity could reasonably be expected. In addition, consideration was given at the Billings facility to the effects of migration at points away from the unit boundary.

Definition of Disposal

For the purposes of the no-migration variance petition, DOE has adopted the AEA definition of disposal, which defines disposal as occurring at the time of isolation with no intent to recover (i.e., when the individual room seals are in place). For the purpose of the land disposal restrictions, RCRA defines "disposal" as placement in a "land disposal unit," which explicitly includes salt bed formations (section 3004(k)). The RCRA definition of land disposal does not include the temporary placement of containerized waste that may occur during the transportation, loading, or staging of drums in preparation for disposal. However when drums are placed in a land disposal unit (including salt bed formations), then land disposal has occurred. Our immediate reaction to DOE's approach is negative.

Human Intrusion

The Agency believes that DOE has taken a reasonable position on human intrusion, fully consistent with EPA's approach to human intrusion in no-migration determinations issued under the Underground Injection Control Program (40 CFR 146).

CHAPTER 2.0: SITE CHARACTERIZATION

This chapter presents an overview of site characterization issues and conclusions, but leaves many topics unaddressed and many citations unreferenced. For example, the discussion pertaining to soil development at WIPP (Pages 2-54 to 2-55) contains few references, and soil maps depicting the surficial distribution of soils should be included. Also, on Page 2-82, the climatic information discussed is not adequately referenced. Additionally, the document presents various geologic theories regarding sedimentary history of some formations, etc., but in almost all instances, does not offer an opinion regarding the most scientifically acceptable theory.

The text presents various theories (e.g., Holt and Powers theories regarding syndepositional dissolution within the Salado), but "why" these theories are posed relative to NMVP requirements is not presented. Further, topics are discussed without benefit of figures, which makes the discussions somewhat confusing and unclear (e.g., faulting discussion, Page 2-62). Revise the NMVP to address these concerns.

Many of the figures included within the text are sufficient, although revision of some could be enhanced to improve the quality and readability of the document. For example, Figure 2-2, borehole location, presents only select boreholes surrounding the WIPP, giving the false impression that the area around WIPP has not been drilled. This is not the case: hundreds of boreholes are present or are proposed within the area presented on Figure 2-2, including oil and gas exploration/production wells. Also, relative to Figure 2-4, the addition of informal nomenclature designations would enhance the figure, since the text discusses these issues. For example, revision of the column(s) to include the A1-A3 designations within the Castile, etc. would enhance readability of the document. Also, Figure 2-10 shows little about the site-specific variations in Rustler thickness. This map should be revised to include a much larger scale map that details Rustler thickness below the WIPP.

Page 2-13, Figure 2-2 DOE should ensure that any maps and data pertaining to each borehole located in, or adjacent to, the WIPP site are current and complete. This would include the current status of each borehole (e.g., plugged and abandoned, casing problems, included in a water sampling program, etc.), the borehole's current completion (e.g., plugback depth, packer setting depth, perforated intervals, etc.), and the results of any groundwater level and analytical data. Data concerning the locations, past/current status, and completion of boreholes related to oil and gas activities may be required. Sufficient current and comprehensive data should be included to allow verification of site characterization data.

Page 2-109, Lines 27-40; Page 2-110, Lines 1-26:

DOE states that groundwater levels have been measured continuously in some units in the vicinity of the WIPP. The groundwater data indicates that there is a trend of rising water-level elevations within the Culebra Dolomite, which overlies the WIPP repository horizon. From 1988 through December 1991, the water level in Well P-18, completed in the Culebra, increased a total of approximately 103 feet. DOE justifies these significant water level rises by stating that the groundwater is trending toward an equilibrium state.

On June 13, 1995, Region 6 staff attended a technical workshop in Albuquerque, New Mexico, sponsored by the Environmental Evaluation Group (EEG). This workshop was entitled, "The Potential Effects of Oil and Gas Activities on the Future Performance of the Waste Isolation Pilot Plant." The following discussions, presented at the workshop, directly pertain to WIPP site characteristics; specifically, the hydrologic regime. This summary, along with the pertinent regulatory and guidance document citations, are included as justification for our comments concerning DOE's characterization of WIPP's hydrologic regime.

A presenter from Sandia National Laboratories (SNL) stated that the rise in Culebra water level south of the WIPP site at the H-9b well was probably "human-induced" and could have been caused by a brine disposal well. No explanation was given for the water level rises in wells CB-1, D-268, DOE-1, H-4b, H-7b1, H-10b, H-11b2, H-12, H-15, H-14, H-17, P-15, and P-17. The presenter also stated that the shafts at the WIPP site have caused a cone of depression in the Culebra. The water level in several wells (ERDA-9, H-1, H-2b2, H-3b2, possibly H-18, WIPP-12, WIPP-18, WIPP-19, WIPP-21, and WIPP-22) responded to activities conducted during the drilling of the air intake shaft (AIS), such as, drilling of the AIS pilot hole, upreaming, lining, and grouting behind the AIS liner. The presenter attributed the water level rise in P-14, WIPP-25, WIPP-26, WIPP-27, and WIPP-30 to the discharge of potash mill effluent into Nash Draw.

A consulting geologist stated that during the drilling of the Hartman-Bates 2, located in a back-reef environment several miles from the WIPP site, large volumes of high pressurized brine were encountered, possibly flowing from Marker Beds 140-142 of the Salado Formation. The well could not be shut-in due to concerns of fluid migration to other strata; consequently, a pipeline was constructed to recover the large volumes of brine and the well was subsequently plugged. The presenter also stated that a possible source of the brine could have been the Rose-Yates Waterflood Unit located two miles away and raised the question of mine safety and what distances from oil/gas wells mines should be allowed to exist.

RCRA regulations codified at §268.6(a)(3) specify that a no-migration demonstration must include "a comprehensive characterization of the disposal unit site...." Regulations codified at §268.6(b)(5) specify that an analysis must be performed to identify and quantify any aspects of the demonstration that contribute significantly to uncertainty.

EPA's NMVP Guidance Document states that the site's hydrology must be described in sufficient detail to permit assessment of the degree of waste isolation achievable. It adds that locational factors, external to the unit, may have significant bearing on the probability of migration from the unit; and therefore, vulnerable site characteristics must be identified. Likely human-induced events which may affect the isolation capability of the unit, such as disturbance of the hydrologic regime, should be considered.

DOE has not adequately explained the significant water level rises observed in several Culebra Dolomite water wells (including P-18), and the possibility exists that waterflooding activities may have caused this anomaly at H-9. The high-pressurized brines encountered in the Hartman-Bates 2, within the Salado Formation (repository horizon), may have originated from a waterflood project where the injection point was located several miles away.

Given the characteristics of the Salado Formation (e.g., marker beds as fluid migration pathways and the high dissolution potential of the salt formation) and the proximity of the oil and gas industry to the WIPP site, the possibility of a Hartman-Bates 2 scenario at WIPP should not be completely ruled out. The information presented at the workshop, although available to DOE and relevant to the site's characterization, was omitted from the O/C Phase NMVP.

The hydrologic regime must be thoroughly understood and human-induced factors external to the geological repository and host formation must be addressed in order to determine its isolation capability. Therefore, DOE should investigate all causes for significant water level rises, including but not limited to, past and present brine disposal and waterflooding activities adjacent to the WIPP site. DOE should consider the sources and the direct/indirect effects of these water level increases on the short- (O/C Phase) and long-term (PC Phase) performance of the repository. In addition, DOE should include current groundwater level data in a NMVP and should identify all anomalies based on this information.

Our comments are consistent with a memorandum from the NMED, DOE Oversight Bureau, to DOE's Carlsbad Area Office (June 20, 1995; Keith E. Mckamey, Geologist III, to Kent Hunter, Team Leader). This memorandum suggests that DOE consider further the possible effects of the oil and gas industry on WIPP, and illustrates several scenarios whereby injected fluids from waterflooding activities could reach the repository horizon.

Page 2-20, Section 2.1.3.2 - The Bell Canyon Formation. The text discusses the Bell Canyon Formation relative to depositional environment, occurrence, etc. However, inclusion of a figure presenting an isopach of the Bell Canyon in the WIPP area would be useful, as it would show the occurrence and trends of sandstone units underlying WIPP that have been posed, by some, to be potential conduits for fresh water that could dissolve the Castile. Also, expand Figure 2-5 to show the members of the Salado, as well as the informal units within the Castile.

Page 2-29, Section 2.1.3.4, Salado Formation. Include or reference an isopach map of the Salado, as the thickness of the Salado is continually discussed within this section, without benefit of an isopach map.

Page 2-30, Section 2.1.3.4, Salado Formation. The NMVP provides sample dates for the Salado salt based upon K-Ar and Rb-Sr isotope information. However, the location(s) where these samples were collected is not included. This is important because if these samples were collected at depth, shallower (or deeper) samples could reveal different dissolution dates. A process that acts on the upper contact could significantly differ from solution processes at depth. Also, the text (lines 19-26) should include references for the K-Ar and Rb-Sr age inferences discussed within this section.

Page 2-31, Section 2.1.3.4, Salado Formation. Discussion regarding the "brine aquifer" is somewhat confusing. Upon first reading, it appears that there is no brine aquifer, as evidenced by information presented by Holt and Powers (1984); but then it is implied that this zone exists, but is limited to areas west of the WIPP.

Page 2-32, Section 2.1.3.5, Rustler Formation. The NMVP presents two models regarding salt distribution within the Rustler: post depositional dissolution, and (near) syndepositional dissolution/resedimentation. Although the NMVP indicates that salt distribution (presumably salt within the Rustler) is considered a long-term performance issue, the final NMVP should indicate and/or advocate a specific salt occurrence scenario, describing pros/cons of the scenario and including supporting data.

Page 2-39, Section 2.1.3.5.1, Unnamed Lower Member. The NMVP states that cross sections based upon geophysical log interpretations show the relationship between the thickness of the unit and the presence of halite, but the text should be clarified/revised to discuss this relationship more thoroughly.

Page 2-39, Section 2.1.3.5.2, The Culebra Dolomite Member. The NMVP states that the "regulatory period of concern is short enough and the boundaries close enough that these differences (regarding how the Rustler hydrologic system developed) are not important to disposal system performance." This statement is unsubstantiated; dissolution rates/origin of dissolution is critical to understanding the performance of the system. Revise the NMVP to substantiate this statement.

Page 2-48, Section 2.1.3.8, the Gatuna Formation. DOE indicates that the Gatuna was "deposited in part over areas actively subsiding in response to dissolution." An isopach map of the Gatuna over the WIPP site should be included, and the NMVP should discuss how the Gatuna thickness corresponds to areas of potential dissolution in underlying units.

Page 2-53, Section 2.1.3.8, the Gatuna Formation. DOE indicates that age dating of volcanic ash from the Gatuna ranges in age from .6 to 13 million years. This is quite a broad range, and would imply that the Gatuna is Tertiary rather than Pleistocene in age (if the older age is accurate). Revise the NMVP to discuss the relative accuracy of these dates and whether they were obtained from the same horizon.

Page 2-53, Section 2.1.3.9, Mescalero Caliche. The NMVP states that "it is clear that the Mescalero is expected to be continuous over large areas." However, this is not necessarily the case at WIPP, as other workers have implied evidence to the contrary. The NMVP should be revised to more accurately reflect the known lateral occurrence of the Mescalero Caliche in the WIPP area.

Page 2-56, Section 2.1.4.2, Site Physiography and Geomorphology. The NMVP indicates that a solution-subsidence feature is presented about two miles north of the center of the site, but does not reference or include a figure presenting the location of this feature.

Page 2-62, Section 2.1.5.2, Faulting. This section indicates that potential faults have been identified within the evaporite section at WIPP, but does not offer any figures (e.g., cross sections, etc.) illustrating these features. Further, the discussion pertaining to the fault occurrence is not clear and should provide more detail relative to the apparent argument that site geology does not support the occurrence of these faults. The significance of the statement "drilling for hydrocarbon exploration has been extensive around the north and west boundaries of the site since the mid-1980s" is not clear - is this included to imply that these wells did not encounter a fault?

Page 2-65, Section 2.1.5.4, Loading and Unloading. It is not clear how Figure 2-18 indicates a current state of loading for the Culebra. The features presented in this illustration could represent variations due to underlying dissolution of the Salado, regional dip, etc, but how this relates to loading (i.e., sedimentation upon) the Culebra is not immediately apparent from the figure.

Page 2-73, Section 2.1.6.2.2, Extent of Dissolution. It is unclear, from this discussion, specifically which "margin" is being called the edge of dissolution in the upper Salado based upon information presented in Figures 2-19 through 21.

Page 2-74, Section 2.1.6.2.3, Timing of Dissolution. In Lines 29-36, the NMVP indicates that it is not appropriate to extrapolate data applicable to dissolution that occurred 500,000 years ago to a shorter time frame, or to the geologic future. However, the NMVP must provide greater detail regarding dissolution rate estimates for the immediate future and up to 10,000 years in the future, and the only real source for this information is the historical record. Periodicity of climatic change relative to precipitation/temperature as it relates to potential dissolution should be discussed, both for the Culebra and Salado. While groundwater flow within the Culebra is not directly relevant to the No Migration Determination, should hydrologic conditions within the Culebra change, this could impact the underlying Salado which contains the WIPP repository. The impact that said changes could have on the WIPP within the 10,000-year time frame must also be addressed.

Page 2-74, Section 2.1.6.2.3, Timing of Dissolution. The NMVP states that Bachman's rates (of dissolution) were "too high," but it is unclear specifically why the initial estimates were considered as such. This paragraph states that Bachman provided initial estimates of dissolution based "on a reconstruction of Nash Draw relationships," but specifically what these relationships are and how this affects the later "reconsider(ation) (of) the Nash Draw relationships" and ultimate dissolution rate conclusions are unclear.

Page 2-81, Section 2.1.6.2.3, Timing of Dissolution. The NMVP states that "there is no indication that the rates of dissolution in the Delaware Basin are sufficient to affect the ability of the WIPP to isolate TRU waste." However, the NMVP does not differentiate between dissolution associated with the Rustler and Salado; this is important because dissolution mechanisms and impacts associated with each could be different and could thus affect WIPP stability in a different fashion.

Page 2-81, Section 2.1.5.6.2.4, Features Related to Dissolution. The NMVP states that there are no known surficial features within the site boundaries that can be attributed to dissolution or karst. However, some subsurface features can be attributed to dissolution activities (e.g., high porosity "finger" in the Culebra in the southern portion of the site). Revise the NMVP to address this situation.

Page 2-81, Section 2.2., Surface Water and Groundwater Hydrology. This section cites six "ways" DOE accomplished the goal of selecting a site with minimal impacts from fluid flow and potential contaminant transport. However, these statements are very broad, and raise a number of questions. First, the disposal medium, while of extremely low porosity and permeability, is presumed to be saturated, and brine inflow from the formation to the repository is a key concern relative to gas generation. Also, while it is possible that the observed effects of ground-water "circulation" could be minimal, additional work is currently being performed to evaluate this; also, ground-water flow--particularly within the Salado--is hardly predictable. Further, the NMVP has not adequately discussed or demonstrated that climatic considerations will not be of concern during the 10,000-year period.

Page 2-82, Section 2.2, Surface Water and Groundwater Hydrology. It is not clear whether the impact of injection well activities is included in the relevant factors that have been evaluated relative to groundwater. Revise the NMVP to address this concern.

Page 2-87, Section 2.2.1, Groundwater Hydrology. The NMVP does not indicate in this section why the Santa Rosa is hydrologically important to the WIPP. Also, Table 2-3 should include references for these data; Sections 2.2.1.1 to 2.2.1.3 should include references, as well. Revise the NMVP to address these concerns.

Figure 2-26. Revise this figure to indicate that the green shaded area is the area of the Capitan Aquifer.

Pages 2-96 through 2-97, Section 2.2.1.3.1, Salado Hydrology. This portion of the NMVP does not present a thorough discussion regarding the far-field vs. near-field origin of brine within the Salado, nor does it discuss alternative theories regarding origin of brines (e.g., clay seams), including brine geochemistry. Revise the NMVP to address these concerns.

Page 2-97, Section 2.2.1.3.2, Castile Hydrology. This portion of the NMVP does not thoroughly address the origin of brine in the Castile relative to specific age dates and study results. It does not discuss the age of the Castile brines relative to that of the structures that they are found in, nor does it detail the referenced geochemical evidence.

Page 2-97, Section 2.2.1.4, Hydrology of the Rustler-Salado Contact Zone. While it is agreed that dissolution in Nash Draw occurred after deposition of the Rustler, the NMVP should substantiate this statement with supporting information, as well as additional references. Additionally, a map presenting the lateral extension/occurrence of the "brine aquifer" should be included to facilitate the discussion.

Page 2-98, Section 2.2.1.4, Hydrology of the Rustler-Salado Contact Zone. The NMVP indicates that the "brine aquifer" occurs only in the area adjacent to Nash Draw, and does not extend to the WIPP site (see Line 31, Page 2-97). However, the text in this section implies that this unit is present below the WIPP (see Lines 25-27).

Page 2-101, Section 2.2.1.4, Hydrology of the Rustler-Salado Contact Zone. The longer water is in contact with soluble materials, the greater the concentration of these cations/anions will be in the water. The NMVP, however, does not explain why this (alone) allows for a "very slow" groundwater movement designation for the WIPP site and surrounding areas. Also, the NMVP should include, within the text, a map presenting groundwater chemistry information so that the distributions discussed within the text can be more readily visualized and understood.

Figure 2-28. Revise the figure to indicate that these transmissivities apply to the Culebra.

Page 2-102, Section 2.2.1.5.2, The Culebra Member of the Rustler Formation. Explain why data are insufficient to map the spatial variability of the Culebra porosity; it is assumed that well logs were run at each of these wells that could be used to infer porosity. Additionally, while exact location of enhanced porosity due to fracturing cannot be determined across the WIPP site, those areas with known fracture porosity should be identified.

Page 2-105, Section 2.2.1.5.2, The Culebra Member of the Rustler Formation. Clarify whether conceptual or calculated paleoflow to the east will be discussed; also, inclusion of a figure to illustrate geochemical facies variation, isotope distribution information, etc. would be helpful. Also, this section (starting with Line 16) presents the concept of geochemical facies, but does not discuss this thoroughly in this or previous portions of the section. The NMVP should include maps and/or figures presenting the location of these facies, as well as presentations showing flow rate variation, etc. Also, this section raises a number of issues that could provide critical information regarding flow within the Culebra, but the NMVP does not indicate whether these issues will be resolved. While a comprehensive characterization of groundwater flow in the Culebra is not directly required in the NMVP because the Culebra is above the unit boundary, an accurate general description of flow in this unit--particularly vertical fluid transport that could impact the Salado--should be provided.

The discussion concerning Culebra hydrology is generally unsubstantial and does not discuss or present groundwater flow (direction) information (although this information is available). Further, the section does not discuss the origin of transmissivity variations in the unit, and how the processes that formed these variations could impact the Salado/WIPP. It is assumed that the referenced "computer models" which present flow rates will be included in the revised NMVP.

Page 2-106, Section 2.2.1.6, Hydrology of the Supra-Rustler Rocks (the Dewey Lake and the Santa Rosa). This portion of the NMVP states that the Dewey Lake may retard downward percolation of surface waters, although the average hydraulic conductivity is equivalent to that of a silt or fine-grained sandstone, which would not necessarily retard downward infiltration of water. Further, the next paragraph in the following subsection indicates that fractures are present within the Dewey Lake, which could serve as direct conduits for surface water infiltration. Additional justification for the claim of infiltration retardation is warranted.

Page 2-109, Section 2.2.1.7, Groundwater Elevation Measurements in 1991. The NMVP states that water level measurements from Wells CB-1 and P-18 indicate water levels in the Culebra are decreasing and increasing, respectively. However, the NMVP offers no explanation for the dramatic increase in water levels in Well P-18. Borehole data indicate that well P-18 was drilled into the Salado (TD 1998 ft bgs), was plugged back to 1125 feet, and was completed as an observation well in the Rustler (which occurs from 626 to 1088 ft bgs). Screen length, etc. were not provided, so it is not clear which interval the groundwater originates from within the Rustler; in short, well construction information does not help determine the origin of water rise at well P-18. The potential source of this increase in water level must be investigated and understood, particularly if there are nearby injection or water flood wells, regardless of what horizon these wells inject into. Such significant changes in water level could impact hydrologic conditions within the Rustler, which could conceivably impact the Salado. Although it is possible that some water level increase, such as that of the Magenta, could be in response to "rebound" following aquifer pumping of the early 1980s as argued in the NMVP, more information should be presented to support this assertion.

Pages 2-110 through 2-112, Section 2.2.2, Surface-Water Hydrology. This section does not sufficiently reference information presented in the text. Revise the NMVP to address this concern.

Page 2-112, Section 2.2.3, Groundwater Discharge and Recharge. The NMVP does not reference (or include) a map which presents the discussed recharge/discharge locations; additionally, the formation from which groundwater discharges is not completely discussed (only the origin of Surprise Springs water is presented).

Page 2-115, Section 2.2.3, Groundwater Discharge and Recharge. The NMVP states that Figure 2-27 indicates some inflow north of WIPP; revise the NMVP to clarify whether the relatively higher water level at WIPP-28 is meant to infer this inflow.

Page 2-122, Section 2.3.2.2, Land Use. This section states that land use is expected to change little in the future near WIPP, but does not cite the source of this information.

Pages 2-132 through 2-133, Section 2.4.2.1, Groundwater Quality. The discussion pertaining to the Culebra groundwater quality zones is incomplete, as a map presenting these zonations is not included, nor is a reason for the zonation provided. (While providing "reasons" for ground-water classifications are not mandated, it would make sense to include this information because if water quality changes are noted in the future, an understanding of mechanisms controlling groundwater quality will help determine why said changes occurred.) This discussion can be tied in with discussion of Culebra groundwater quality presented in previous sections. Further, while water within the Salado is not potable, discussion of background groundwater quality is important, particularly when contaminant transport mechanisms are to be considered.

Page 2-134, Section 2.4.3, Air Quality. The WIPP has been required to conduct shaft and downhole air quality monitoring as part of the conditional No Migration Variance granted for the Test Phase. This information is available, and should be synopsized within this section of the NMVP.

Page 2-135, Section 2.5.2, Historic Climatic Conditions. The NMVP should include a more thorough discussion of the six climatic cycles noted in the Blackwater Draw area. Further, the conclusion drawn on Page 2-137 that future climate extremes are unlikely to exceed those of the later Pleistocene needs further substantiation, as does the statement that return to full glacial conditions is unlikely within the next 10,000 years.

Pages 2-139 to 2-140, Section 2.6.1, Seismic History. The NMVP should include a synopsis of the more recent earthquake events, specifically the earthquakes which occurred in the region during the early to mid 1990's. Include origin, epicenter locations, and impact that these events had on the WIPP.

Page 2-164, Section 2.6.2.1, Acceleration Attenuation. The statement that the coefficients b1, b2, and b3 were selected as "the best ones" requires additional discussion. Further, the adoption and modification of the attenuation law requires additional discussion and justification.

Page 2-164, and Figure 2-44, Section 2.6.2.2, Seismic Source Zones. Clarify why a source zone was not selected around WIPP, since it appears a small cluster of epicenters occurs relatively near the facility (e.g., superimposing subregions on the map from which the zones were determined would be useful in showing this decision). Additionally, Figures 2-44 and 2-45 require the addition of the source zone to the map key. Also, justification for the selected focal depths should be included.

Pages 2-169 to 2-170, Section 2.6.2.4, Design Basis Earthquake. It is unclear why this discussion is included, as it is not apparent how this information relates to No Migration if it only applies to surface structures.

Pages 2-170 to 2-173, Section 2.7, Rock Geochemistry. It is unclear why this information is included at the back of this section as it would fit better with discussions of formation hydrogeology. Additionally, geochemistry of all horizons - not just the Salado - should be included.

CHAPTER 3.0: FACILITY DESCRIPTION

Page 3-16, Section 3.2.3, CH TRU Waste Handling Operations. Revise the NMVP to discuss why additional filtration beyond that offered by HEPAs are not necessary.

Page 3-50, Section 3.4.1, CH TRU and RH TRU Waste Disposal Operations. The NMVP does not indicate whether any load sequence or waste placement strategies in terms of waste disposal have been evaluated. It would appear that examination of waste loading/disposal organization could be important to meeting both no migration and radioactive waste disposal criteria.

Page 3-53, Section 3.6.1.2, Underground Facilities Ventilation System. Clarify whether underground ventilation requirements/needs vary as rooms are open and closed, and how this might factor into the ventilation system design/ model. Also, provide the sequence of panel construction and discuss how panels will be excavated--machinery type, etc., including how long a given panel will be open.

Pages 3-66 and 3-67, Section 3.7.1, Engineered Barriers Disturbed Rock Zone. No detail has been provided on excavation techniques, backfill techniques, as well as the predicted rock mechanics and geotechnical design assumptions. Also, no information was presented relative to the tunnel design criteria and the tunnel system design elements. For example, the projected standup time for the rooms is not discussed. Also, ceiling support systems (i.e., rock bolt patterns, rock bolt types, temporary shielding) are not discussed.

Page 3-68, Section 3.7.2, Operational Period Panel Closure System. Additional information should be provided regarding the "potentially explosive mixture" which could emerge after 20 years of operation. Specifically, the NMVP should provide the "analysis" that was performed that showed generation of the explosive mixture and closure designs which explicitly demonstrate that an explosion of the magnitude shown in the analysis will not result in migration of hazardous constituents beyond the unit boundary (e.g., top of the Salado). Also revise the NMVP to include details on repository/panel design criteria including calculations supporting the contention that the panel seals can withstand potential detonations based on gas buildup that are projected to occur at the end of the 20-year disposal timeframe.

CHAPTER 4.0: WASTE DESCRIPTION

Section 4.1 Waste Inventory, Page 4-2, Lines 25-36; Pages 4-87 and 4-95, Table 4-7 and 4-8 respectively, Footnote A; See also Section 4.3.4.5 Process Knowledge; Page 4-105, Lines 15-38; Page 4-106, Lines 1-37; Page 4-107, Lines 1-7:

DOE is predominantly relying on the use of process knowledge in its demonstration of compliance with the no-migration standards of §268.6. Therefore, DOE should provide documentation in the final NMVP supporting the use of process knowledge for the characterization of transuranic (TRU) mixed wastes destined for disposal at WIPP.

Process knowledge documentation may include: pertinent records, waste stream process manuals, operating procedures, sampling and analytical data, process flow diagrams, the time period which the waste was generated, and documented procedures and other administrative controls. Documentation should consider the unique nature of the specific the generator/storage sites whose wastes are destined for disposal at WIPP. The documentation should be sufficient to allow EPA to verify the applicability of process knowledge in characterizing the wastes destined for disposal at WIPP.

There is an inherent level of uncertainty in the ability to predict the nature of waste produced by future decontamination and decommissioning (D&D) and environmental restoration (ER) activities. DOE should either establish acceptance criteria or demonstrate how the waste inventory in the BIR reflects future volumes and types of TRU mixed wastes from such activities. DOE should consider current ER projects in this demonstration.

APPENDIX WAP - WASTE ANALYSIS PLAN

Introduction; Page C-2, Lines 34-36; Page C-3, Lines 1-3, Lines 14-20; Page C-17; Lines 31-34:

We agree that some debris waste forms such as personal protective equipment and leaded rubber gloves cannot be representatively sampled. However, DOE should describe in detail how the use of process knowledge is used for the characterization of stored debris wastes, particularly in light of the heterogenous nature of site-specific wastes. In addition, we are assuming that a large portion of the newly-generated debris waste inventory is associated with D&D and ER activities. There is currently uncertainty in the types and volumes of these wastes.

A waste stream is material generated from similar processes or activities. The use of process knowledge for waste characterization will require that waste stream variations are identified across all generator/storage sites. Therefore, DOE should demonstrate how future generated debris wastes can reasonably be identified by process knowledge, and the subsequent categorization by Waste Matrix Code Group (WMCG), given the uncertainty in the types and volumes of these wastes across generator/storage sites.

Section C-1b Identification of TRU Mixed Waste Managed at the WIPP Facility; Page C-13, Lines 28-37; Page C-14, Lines 1-7; Appendix C1 Chemical Compatibility Analysis of Waste Forms and Container Materials; Page C1-5, Lines 15-18, Lines 24-26; Pages C1-97 thru C1-110; See also Section 4.3.3.2 Chemical Compatibility, Page 4-101, of the O/C Phase NMVP:

The compatibility demonstration provided by DOE in the O/C Phase NMVP only includes wastes from RFETS and INEL. DOE should verify that this demonstration is valid for each of the generator/storage sites anticipating disposal of TRU mixed wastes at the WIPP site. In addition, DOE should clarify which test program is being referenced in Pages C1-97 thru C1-110 to resolve incompatibilities.

Section C-3 Characterization Procedures and Frequency; Page C-19, Lines 18-23:

DOE should justify the "25 percent" criteria for the addition of tentatively identified compounds (TICs) to the target analyte list.

Section C-4 Laboratory Selection and Analytical Methods; Page C-25, Lines 19-20; Table C-4 Summary of Parameters, Characterization Methods, and Rationale for CH Transuranic Mixed Waste (Stored Waste), Page C-76; Table C-6 Headspace Target Analyte List and Methods, Page C-82:

We agree that VOC headspace gas sampling and analysis would support a demonstration of no-migration during the O/C Phase. This sampling and analytical program should include all of the VOCs screened by the concentration-toxicity screening technique. DOE should explain why Carbon Disulfide and 1,1,2,2-Tetrachloroethane were omitted from Table C-6, although identified as indicator VOCs in the O/C Phase NMVP.

40 CFR §268.6(a)(1) requires DOE to identify the specific wastes for which the no migration demonstration will be made.

Table C-1, "TRU Mixed Waste Characterization Information," (V.7, pages C-33 through C-72) provided waste stream descriptions; EPA Hazardous Waste Codes; and waste stream names, unique identifiers, and Final Waste Form Groups by Summary Category Groups. An evaluation of the information presented in Table C-1 and subsequent comparison with the information on waste classification and generation rates presented in Table 4-7, "Identification/Classification of CH TRU Waste Streams to be Disposed of at the WIPP Facility," (V.1, pages 4-15 through 4-87) and Table 4-8, "Identification/Classification of RH TRU Waste Streams to be Disposed of at the WIPP Facility," (V.1, pages 4-88 through 4-95) revealed numerous inconsistencies and discrepancies. The following questions are examples of incomplete or misleading information presented in Tables C-1, 4-7, and 4-8.

Table C-1 does not provide waste descriptions for the following waste streams identified on Table 4-7:

- AE-W038 - Solidified Inorganics
- AE-W039 - Solidified Organics
- AE-W040 - Solidified Inorganic
- AE-W041 - Lead/Cadmium Metal Waste
- AE-W042 - Lead/Cadmium Metal Waste
- MU-W002 - Heterogeneous Waste

Waste descriptions (along with the other information listed in Table C-1) should be provided for these waste streams.

Table C-1 indicates that waste stream KA-W016 has not yet been generated; however, Table 4-8 reports that 11 cubic meters are currently stored.

Table C-1 lists waste stream IN-W157 as a Solidified Process Residue within the Solidified Inorganics Final Waste Form Group under the Homogeneous Solids - S3000 Summary Category Group Description. The waste description is as follows:

> "This waste comes from the Rocky Flats Plant (RFP). It contains alcohols and organic acids such as ethylene diamine tetra acetic acid (Versenes) set in Portland and magnesia cements."

(1) Based on this description, the waste does not appear to be an "inorganic" waste.

(2) Based on the "Basis for Classification" presented for this wastes in Table 4-7, the description in Table C-1 appears to be incomplete as Table 4-7 indicates that trichloroethylene, carbon tetrachloride, 1,1,1-trichloroethane, methylene chloride, methanol, xylene, and 1,1,2-trichloro-1,2,2-trifluoroethane are also present.

(3) The detail of this waste description (and for that matter, the detail of all the other waste descriptions listed in Table C-1) is not sufficient to determine (1) whether the wastes results from a consistent process or batch process, (2) the specific process/operation that the waste resulted, and (3) what raw materials or chemical inputs were present.

Waste stream IN-W177 is listed as a Solidified Inorganic on page C-33 of Table C-1, yet in Table 4-7, page 4-21, this waste stream is listed as a Solidified Organic.

Table C-1 provides the following waste description for waste stream IN-W188, a Solidified Process Residues within the Solidified Inorganics Final Waste Form Group:

> "This waste is from RFP. The waste consists of sludge from floor drains in a Pu process facility that have been cemented in Portland cement; described as poor grade."

In addition, based on Table 4-7, this waste has beryllium, cadmium, chromium, lead, mercury, chloroform, 1,2-dichloroethane, trichloroethylene, tetrachloroethylene, 1,1,2-trichloro-1,2,2-trifluoroethane, carbon tetrachloride, 1,1,1-trichloroethane, methylene chloride, methanol, n-butyl alcohol, and xylenes. The waste description given in Table C-1 does not adequately describe this waste stream as this material does not appear to be an "inorganic waste."

Neither Table C-1 nor Tables 4-7/8 listed relevant drum numbers; therefore, we were unable to match headspace gas sampling results with specific waste streams to see if there were any correlations between VOC concentrations and waste classification/type.

Waste stream IN-W220 is described as Solidified Process Residues within the Solidified Inorganics Final Waste Form Group under the Homogeneous Summary Category. The waste description provided in Table C-1 is as follows:

> "This waste stream includes waste generated at Argonne National Laboratory-East (ANL-E) and solid wet sludge from RFP. The ANL-E waste is derived from research activities performed in a laboratory environment. The waste includes concrete and laboratory apparatus. The RFP solid wet sludge is cemented or dewatered sludge precipitated from aqueous waste treatment processes. Soils that are not contaminated with or by chemicals are also included."

(1) How did DOE decide to classify this waste stream as a homogeneous mixture when it includes laboratory wastes, debris, and soil from two different DOE sites?

(2) Although this material was classified as an inorganic, Table 4-7 list 11 organic constituents as the basis for classification.

Waste stream IN-W228 is described as Solidified Wastewater Treatment Sludges within the Solidified Inorganics Final Waste Form Group under the Homogeneous Summary Category. The waste description provided in Table C-1 is as follows:

> "This waste stream, generated at RFP, consists of wet sludge from treatment of all other plant radioactive and/or chemical contaminated wastes and further treatment of the first stage effluent. Some pre-1973 wastes may include non-sludge wastes such as electrical motors, mercury and lithium batteries, bottles of liquid chemicals, and small amounts of mercury in pint bottles. Portland cement was added to absorb the residual liquids."

(1) How did DOE decide to classify this waste stream as a homogeneous mixture when it is derived from the treatment of "all other plant radioactive and/or contaminated wastes," and contains motors, bottles, batteries, and soil?

(2) Although this material was classified as an inorganic, Table 4-7 list 11 organic constituents as the basis for classification.

(3) How was the Portland cement added to the bottles in the drums, or were the bottles emptied into the drums and then the Portland cement was added?

Waste stream LL-W019 is described as Solidified Waste within the Solidified Inorganics Final Waste Form Group under the Homogeneous Summary Category. The waste description provided in Table C-1 is as follows:

> "50 to 90 percent of this waste matrix consists of liquids solidified in 1- to 5-gallon plastic containers using Portland cement or Aquaset for the water-based liquids and Envirostone or Petroset for the oil-based liquids. The remainder consists of glove box waste."

(1) Table 4-7 indicates that the basis for classification of this waste is D040 and F002 (trichloroethylene and

spent halogenated solvents, respectively). Why was this waste stream classified as a Solidified Inorganic?

(2) Based on the waste description, the waste stream appears to be a mixture of water-based liquids, oil-based liquids, and glove box materials. Why is this waste stream placed under the Homogeneous Summary Category?

Other examples of insufficient waste descriptions include the description given for waste stream OR-W042, named Inactive Storage Tank Contents-MTRU Sludge, under the Solidified Inorganics Final Waste Form Group within the Homogeneous Summary Category:

> "This waste stream is comprised of MTRU sludge that has settled and separated from wastewater that has been stored in large underground storage tanks. The waste is a product of past operations at ORNL involving various nuclear research and radioisotope fabrication processes. Note: This stream may contain TSCA waste at unknown levels."

(1) Table 4-7 indicates that the basis for classification of this waste is cadmium, chromium, lead, and mercury. How can DOE use the above process description to determine that there are no other RCRA contaminants (organic or inorganic) present in this waste stream?

(2) DOE has stated that waste with equal to or more than 50 ppm polychlorinated biphenyls (PCBs) will not be accepted for disposal at the WIPP (V.7, page C-11). However, based on the petition, only solidified organic sludges will be sampled for PCBs (V.7, Table C-7, page C-84). Assuming that the statement referring to TSCA waste includes PCBs, how will DOE determine whether this waste stream contains less than 50 ppm PCBs (i.e., DOE stated that it will only analyze solidified organics for PCBs)?

Waste stream RF-W040 is described as Incinerator Ash/TRM within the Solidified Inorganics Final Waste Form Group under the Homogeneous Summary Category. The waste description provided in

Table C-1 is as follows:

> "This waste stream was previously named "fluidized bed incinerator ash (TRU)-mixed." Ash is generated from operation of a fluidized bed incinerator in Building 776 or an incinerator in RFP Building 771. The incinerator was used to burn office trash, combustible waste generated in process areas, combustible oils from refrigeration units, diesel fuel, and crank case oils. The oil had been accumulated as a low-level mixed waste. Fluid bed incinerator ash was packaged in 55-gal drums lined with a rigid polyethylene liner and one bag liner. It is a portion of the waste stream entitled "fluidized bed incinerator ash/LLW mixed" in the inventory report. The ash normally assays as low-level waste (LLW) but this portion was found to be TRU."

(1) Table 4-7 indicates that the basis for classification of this waste is the eight TC metals, 1,1,1-trichloroethane, carbon tetrachloride, methylene chloride, 1,1,2-trichloro-1,2,2-trifluoroethane, and methyl ethyl ketone. Why would incinerator ash generated from the destruction of office wastes and various oils would contain the five volatile organic constituents listed above?

(2) What does the abbreviation "TRM" stand for?

(3) Has DOE considered the potential for other non-volatile constituents such as particles of incomplete combustion (PICs) or dioxins (particularly if DOE is incinerating chlorinated organics) to be present in thermal treatment residues? Are there any sampling data?

(4) There are several other examples of thermal residues listed in Table C-1 (e.g., RF-M001 and SR-W053) that also contain numerous volatile organic constituents (some of which are chlorinated). Does this mean that DOE should rethink its statement made on V.7, page C-4, that for RH TRU waste forms, which are primarily thermally treated wastes, there are some CH TRU waste

sampling activities that would not be appropriate (e.g., headspace-gas sampling)? This statement implies that there may not be any volatile organic constituents present in the waste.

Waste stream RL-M017 is described as TRU Mixed Organic Labpacks within the Solidified Organics Final Waste Form Group under the Homogeneous Summary Category. The waste description provided in Table C-1 is as follows:

> "This waste stream consists primarily of organic labpacks. Some of the containers contain inorganic debris (metals organic debris (plastic and cellulosics)."

(1) Although the waste description indicates that this waste stream has inorganics, Tables C-1 and 4-7 show this waste stream as only being listed as F003; no inorganic contaminants (including lead) are listed on either table.

(2) How did DOE decide to classify this waste stream as a homogeneous mixture when it is derived from laboratory labpacks with organics, metals, plastic, and cellulosics. Would drums of organic labpacks, combustible waste, and debris be considered homogeneous?

Again, the question regarding the adequacy of the waste descriptions in Table C-1 arises when looking at the waste descriptions provided for waste streams IN-W311, IN-W312, and IN-W314:

- IN-W311 - "This waste was generated at the RFP." Waste codes D028 and F001.
- IN-W312 - "Pyrochemical salt consists of used chloride salts from pyrochemical processes such as electrorefining, molten salt extraction, or direct oxide reduction." No waste codes.
- IN-W314 - "This waste, generated at the RFP, consists of chunks of salt and ceramic." Waste code F001.

Are these really three different types of wastes or does this exemplify the variation in either process knowledge/waste descriptions or individuals who were responsible for developing waste descriptions.

Waste streams IN-W252 and IN-W254 have the same waste description:

> "This waste comes from RFP. It consists of leaded rubber gloves, and aprons. A limited amount of unleaded gloves, lead bricks, and lead sheeting may also be present."

However, IN-W252 has D008, D022, D028, D029, F001-3, and F005, while IN-254 has D008, F001, and F002. They also share TRUCON Code ID 223A. Based on the waste description, it appears as though both wastes streams should contain the same materials, yet DOE determined that one of the waste streams had more constituents than the other waste stream. How did DOE do this?

Waste stream IN-W330 is listed as Plastic/Rubber Debris under the Combustible Final Waste Form Group within the Debris Waste Summary Category. The waste description listed in Table C-1 states that "...One drum contains liquid mercury." However, neither Table C-7 nor 4-7 list mercury as a basis for classification or EPA Hazardous Waste Code. We would suggest that DOE segregate the one drum of liquid mercury from this waste stream, solidify it, and group it with the other solidified inorganics waste streams.

The methodology for determining final waste form groups is unclear. For example, waste stream IN-W169 is listed as Predominantly Combustible Debris under the Heterogeneous Final Waste Form Group within the Debris Waste Summary Category Group. The waste description is as follows:

> "The waste stream is from RFP and primarily consists of line- and non-line generated dry combustible materials such as paper, rags, plastics, surgical gloves, cloth overalls and booties, cardboard, wood, wood filter frames, and laundry lint. Some combustibles may be damp or moist. Limited amounts of non-combustibles

such as glass, concrete, cement, lead, glove box gloves, batteries, and metal scrap may also be present."

Yet, waste stream IN-W336 is listed as Combustible Debris under the Combustible Final Waste Form Group within the Debris Waste Summary Category Group. The waste description is as follows:

> "This waste stream, generated at Battlle Columbus Laboratories, contains such combustibles items as wood, plastic suits, nylon reinforced plastic tent structures, shoe covers, rubber gloves, and air hoses. The waste is from decontamination and deactivation of the Pu laboratory."

Why is one waste stream classified as a Heterogeneous, Predominantly Combustible Debris while the other waste stream is classified as Combustible, Combustible Debris when both waste descriptions are similar?

Waste stream IN-W259 is listed as Heterogeneous Debris under the Heterogeneous Final Waste Form Group within the Debris Waste Summary Category. The waste description listed in Table C-1 states that:

> "This waste stream, generated at ANL-E, contains alpha hot cell waste. Non-combustible and combustible waste are segregated. Combustible wastes include: paper, plastic and PVC containers, rubber O-rings and gloves, rags, and Q-tips. Noncombustible wastes include: laboratory equipment, tools, fixtures, glassware, pipe, tubing, fitting, fasteners, firebrick, ferrous and nonferrous metal scraps and parts, and small electric motors. Sodium in the waste is reacted with ethyl alcohol mixed with pelletized clay, and dried. Nitrates and oxidizing agents are neutralized or reduced, mixed with pelletized clay."

Why are these two different types of wastes kept within the same waste stream? The description states that they are segregated; therefore, the wastes should be separated into two waste streams - Combustible Debris within the Combustible Final Waste Form Group under the Debris Summary Category and Heterogeneous Debris under the Heterogeneous Final Waste Form Group within the Debris Waste Summary Category, respectively.

Waste stream NT-W001 is listed as Heterogeneous Debris, Uncategorized under the Heterogeneous Final Waste Form Group within the Debris Waste Summary Category. The waste description listed in Table C-1 states that:

> "This waste stream consists of glovebox parts, ...Most of the waste is contact handled (CH) TRU waste; one and 3 drums are remotely handled (RH). The waste stream was generated at Lawrence Livermore National Laboratory..."

(1) What does the statement "...one and 3 drums are remotely handled (RH)..." mean?

(2) Table C-1 for RH wastes does not appear to identify (track) the RH component of this waste stream; the RH portion of this waste stream may not be accounted for.

Waste stream OR-W045 is listed as CH TRU Uncategorized under the Heterogeneous Final Waste Form Group within the Debris Waste Summary Category. The waste description listed in Table C-1 states that:

> "This stream consists of CH TRU waste which is not classified. The physical form is either solid, liquid, mixed (both solidified and liquid) or unknown. Note this stream may contain TSCA waste at unknown levels."

Based on the description of this waste it could contain anything and, therefore, should be classified as Unknown, Summary Category 8000.

Waste stream IN-W247 is listed as Uncategorized Unknown under the Inorganic Nonmetal Final Waste Form Group within the Debris Waste Summary Category. The waste description listed in Table C-1 states that:

> "This waste stream, generated at the RFP, consists of boronated glass rings used to minimize neutron multiplication in liquid storage tanks. Unleached rashig rings was unused from 1971-79 as a separate stream and then combined leached rashig rings. The rings are about 1.75 in. high and 1.5 in. in diameter, with a 0.25 in. wall thickness. The rings are heat and chemical resistant borosilicate glass. Some of the rings, which had above-discard amounts of Pu, were leached with nitric acid to recover the Pu and then rinsed with water and dried. Some of the rings may be contaminated with small amounts of oil."

Why is this waste stream, which has a very detailed description, and several EPA Codes, classified as Uncategorized Unknown?

The waste description for waste stream RF-W041 states that the waste stream is currently characterized by process knowledge and sample analysis using the Extraction Procedure (EP) Toxicity Test. Future characterization for this waste stream needs to conform to the Toxicity Characteristic Leaching Procedure (TCLP).

Table 4-7 appears to be incomplete as many of the wastes do not have waste matrix codes and/or EPA Hazardous Waste Codes. For example, most of the RL-M series wastes do not have waste matrix codes, while waste streams IN-174 and IN-177 do not have EPA Hazardous Waste Codes. In addition, some wastes like LA-W001 and LA-W002 do not have a waste matrix code, EPA Hazardous Waste Code, or Basis for Classification.

Table 4-7 incorrectly lists waste stream IN-W197 as IN-W917.

Table 4-7 lists waste stream IN-W221 as Solidified Inorganics, yet the basis for classification indicates only xylenes and n-butyl alcohol - no inorganics.

In several cases, Table 4-7 list waste volumes as 0 stored and 0 future: RF-W063, RF-W065, RF-W076, IN-M001, and IN-M002. Why are these wastes included if they are not going to be generated?

In addition, in the cases of RF-W065 and RF-W076, Table C-1 stated that (1) as of 11/89 several hundred bottles and tanks of liquid were generated, and (2) that the waste is in 55-gallon drums, respectively.

The NMVP indicates that soils are going to be managed at the WIPP. DOE has not discussed the gas generation potential of soils containing organic material.

Footnote a of Table 4-7 states: "...Note: in the BIR, some of the waste streams carry EPA hazardous waste codes which are not included in the RCRA Part A Permit Application. These wastes will have to be treated and/or repackaged prior to shipment to the WIPP."

> Treatment or repackaging of the waste will not change the EPA waste codes for listed wastes.

A comparison of the waste generation estimates for CH-TRU waste reported in Table 3-5 of the WIPP Transuranic Waste Baseline Inventory Report (WTWBIR), text in the draft petition (V.1, page 4-12), and Table 4-7 (V.1, pages 4-15 through 4-87) revealed the following inconsistencies that should be reconciled.

- According to Table 3-5 of the WTWBIR, the current DOE inventory of CH-TRU waste is 73,000 cubic meters and the projected inventory of CH-TRU waste is approximately 51,000 cubic meters.
- Text from the draft petition indicates that the current DOE inventory of CH-TRU waste is 73,300 cubic meters and the projected inventory of CH-TRU waste is approximately 54,300 cubic meters.
- Table 4-7 of the draft petition reports the current DOE inventory of CH-TRU wastes as 70,000 cubic meters and the projected inventory of CH-TRU wastes as 57,000 cubic meters. Additionally, the current and future estimates of contact-handled TRU wastes at four sites differ as shown in Table 1.

A comparison of the total current and future waste quantities reported in Table 4-7 and the quantities provided in Table 3-5 of the WTWBIR also revealed the following site-level discrepancies that should be reconciled:

Sites	Current Inventory CH		Difference *	Future Inventory CH		Difference *
	Petition	WTWBIR		Petition	WTWBIR	
Hanford	8.1E+3	9.3E+3	1.2E+3	3.1E+4	2.1E+4	9.8E+3
INEL	3.9E+4	3.5E+4	4.0E+3	NA	NA	NA
RFETS	NA	NA	NA	4.0E+3	5.9E+3	1.9E+3
SRS	9.4E+3	1.5E+4	5.6E+3	1.3E+4	1.5E+4	1.6E+3

* Some differences may be attributed to rounding errors.

40 CFR §268.6(a)(2) requires waste analysis to describe fully the chemical and physical characteristics of the subject wastes. DOE stated that the following analytes were selected as parameters of interest (V.7, page C-16):

- Toxicity characteristic contaminants listed in 20 New Mexico Administrative Code 4.1, Subpart II, §261.24, Table 1, excluding pesticides.

- F-listed solvents (F001-F005) found in 20 NMAC 4.1, Subpart I, §261.31, and known to be used at DOE sites.

- Hazardous constituents included in 20 NMAC 4.1, Subpart II, §261 Appendix VIII, and reported by DOE TRU waste generator/storage sites.

DOE also provided Table C-2 (V.7, pages C-73 and C-74) which listed the 33 organic (when counting xylenes and cresols as one each) and nine inorganic parameters of interest. DOE did not provide any other additional information to support why these constituents were selected (and other Appendix VIII constituents were not selected) as parameters of interest.

(1) As it is often possible to say with reasonable certainty that a particular constituent was used, can DOE also say with reasonable certainty that a particular constituent was never used at a particular site?

(2) If the selection of a particular constituent was based on whether it had ever been reported by a DOE TRU waste generator/storage site, did the generator/storage site do a complete scan for all Appendix VIII constituents or did they have a standard list of analytes (i.e., were they looking for all possible constituents)?

(3) Has DOE considered the potential for other non-volatile constituents such as particles of incomplete combustion (PICs) or dioxins (particularly if DOE is incinerating chlorinated organics) to be present in thermal treatment residues?

DOE stated on V.7, page C-17 that:

> "For wastes that can be representatively sampled (Homogeneous Solids and Soil/Gravel Wastes), the total concentrations of PCBs, VOCs, semivolatile organic compounds (SVOCs), and metals will be determined analytically. Homogeneous Solid Waste in a salt matrix cannot readily be representatively sampled. For this waste, knowledge of the electrorefining processes that generate the waste indicates the use of high-temperature molten salt extraction methods is adequate to demonstrate that organic constituents are not present in the salt waste. This waste form is exempted from the requirement to determine VOC and SVOC concentrations. Transformer oils containing PCBs have been identified in a limited number of waste streams included in the final waste form of organic sludges. These will also be examined for PCBs."

(1) Table C-4 (V.7, pages C-76 through C-79) and text on page 4-107 (V.1) specifically state that salts will be sampled. Please clarify whether salt wastes will be sampled and analyzed for VOCs, SVOCs, and inorganics (or is it only going to be sampled for inorganics).

(2) There are several examples of thermal residues listed in Table C-1 (e.g., RF-M001 and SR-W053) that contain numerous volatile organic constituents (some of which are chlorinated). Explain DOE's rationale for not sampling and analyzing salt wastes and RH TRU waste forms, treated to remove VOCs and SVOCs.

(3) DOE stated that only solidified organic sludges will be sampled for PCBs (V.7, Table C-7, page C-84). However, based on the waste descriptions provided in Table C-1, it appears possible that solidified inorganics may also contain PCBs. DOE should also analyze solidified inorganics for PCBs.

As noted above, DOE listed the 33 organic (when counting xylenes and cresols as one each) and nine inorganic parameters of interest in Table C-2 (V.7, pages C-73 and C-74).

(1) Table C-5 (V.7, pages C-81 and C-81) presents a summary of hazardous waste characterization requirements for TRU mixed waste. Under the heading of Headspace Gases, DOE has listed 14 flammable VOCs and seven non-flammable VOCs (a total of 21 constituents). DOE should explain why methylene chloride, trichloroethene, and 1,1,1-trichloroethane (listed as combustible liquids by NIOSH) are listed as non-flammable VOCs. In addition, DOE should explain why 12 of the 33 VOC and SVOCs listed on Table C-2 as being parameters of interest were omitted from the Headspace Gases category (i.e., explain why headspace gas samples will not be analyzed for all the VOC/SVOCs listed on Table C-2).

(2) Table C-5 (V.7, pages C-81 and C-81) presents a summary of hazardous waste characterization requirements for TRU mixed waste. Under the heading of Total Volatile Organic Compounds, DOE has listed 25 VOAs and five SVOCs. DOE should explain why isobutanol, 1,1,2-trichloroethane, and trichlorofluoromethane are listed on Table C-2 as being parameters of interest were omitted from the Total Volatile Organic Compounds category.

(3) Table C-6 (V.7, page C-82) presents the headspace target analyte list and methods. This table only contains 20 of the 28 VOAs and none of the SVOCS listed on Table C-2. In addition, Table C-6 is missing trichlorofluoromethane which is listed on Table C-5 as an analyte under flammable VOAs under the Headspace Gases category. DOE should explain why the missing constituents were omitted from Table C-6.

(4) Tables C6-4 and C6-5 (Gas Volatile Organic Compound Target Analyte List and Quality Assurance Objectives and Total Volatile Organic Compounds Target Analyte List and Quality Assurance Objectives, respectively) also do not contain all of the constituents listed on Table C-2 as being parameters of interest. These Tables also contain a slightly different list of

constituents than the corresponding sections of Tables C-5 and C-6.

DOE should clarify whether the statement "Statistically select waste containers from waste streams in the homogeneous solids and soil/gravel matrix parameter categories..." is on a waste category basis or on a facility-waste category basis (i.e., a sampler per waste category at each facility).

DOE should provide the specific RH-waste analysis methods when they become available.

On page C-18 of V.7, DOE stated that:

> "Newly generated waste streams of homogeneous solids and soils/gravel wastes will be randomly sampled once per year or once per process batch. Sampling frequency of once per year is only allowed if a process has operated within established bounds. Otherwise, the waste must be considered as process batches."

(1) DOE should provide information to demonstrate that one sample per year or per process batch is sufficient to representatively capture the variability in constituent concentrations.

(2) How will DOE determine what "established bounds" are?

On page C-19 of V.7, DOE stated that:

> "A statistically selected portion of homogeneous solids and soil/gravel wastes will be sampled for hazardous waste constituents and toxicity characteristic..."

(1) The petition does not provide a description of the statistical procedure used to determine which drums/bins are going to be sampled. Instead, the reader is referred to the QAPP which was not attached to the petition. DOE should provide a description of this procedure for inclusion into the petition.

(2) In light of the lack of a waste acceptance criteria (WIPP WAC) or long-term performance modeling, how will DOE establish the necessary sampling frequencies (i.e., how will DOE define the levels of accuracy and precision needed in subsequent waste characterization) when a performance envelope (i.e., range of acceptable concentrations) has not been calculated. Specifically, if the characterization data are close to the upper bound of the performance envelope, DOE would need to collect a larger number of samples (by waste type and generator) than if the characterization data are not close to the upper bound of the performance envelope. DOE will need to justify why one sample per waste stream is sufficient.

(3) Based on a review of the waste generation data provided in Table 4-3 (V.1, page 4-5), it appears as though DOE will be relying on process knowledge to characterize nearly 80 percent of all the wastes placed in the WIPP (i.e., DOE will only sample and analyze solidified inorganics, solidified organics, and soils). Will DOE be using process knowledge to estimate total constituent concentrations for all of the parameters of concern?

CHAPTER 5.0: ENVIRONMENTAL IMPACT ANALYSES

Section 5.1.1 Migration Pathway; Page 5-1

EPA concluded, in the Final No-Migration Determination (NMD) for the Test Phase, that the air pathway was the only plausible migration pathway. Hazardous constituents were not expected to be released during this phase due to the nature of the tests and the containment of the waste for the duration of this phase.

During the O/C Phase, hazardous constituents will be released into a closed panel environment due to "creep closure" of the salt formation and the subsequent crushing of the waste containers. Detonations, due to the buildup of explosive gases, could also cause releases of hazardous constituents into the waste panel environment. VOCs will also be released into an open panel environment due to the diffusion of vapors through the carbon composite filters. Therefore, it is appropriate that DOE consider migration for the air pathway.

Based on the characteristics of the Salado Formation and the horizontal and vertical distance of the repository horizon to the unit boundary, it is highly unlikely that migration will occur during the O/C Phase to the unit boundary through the soil, surface water, or ground water media. However, DOE did not provide quantifiable data in this NMVP to demonstrate that hazardous constituents will not migrate to the unit boundary through these pathways. At a minimum, DOE should provide "simplified" worst-case migration calculations estimating the length of time required for hazardous constituents to reach the unit boundary, if ever. These calculations would provide a basis for defending conclusions that there will be no-migration through these media to the unit boundary during the O/C Phase.

Page 5-2, Table 5-1, Section 5.1.2, Contaminant Screening. Revise the NMVP to clarify why the five constituents listed within the conditional variance were not considered under this screening assessment, regardless of the results of the screening activities.

Section 5.2.2 Estimation of the Concentrations of Hazardous Constituents at the WIPP Unit Boundary; Page 5-12, Lines 9-33; Page 5-15, Lines 12-13; See also Section 4.3.3.3 Waste

Transformation Mechanisms; Page 4-101, Lines 17-30; Page 4-102, Lines 1-35; Page 4-103, Lines 1-30; See also Section 4.3.6 Waste Characterization Information Summary; Page 4-108, Lines 24-36:

Inundated conditions are not expected in waste panel environments during the O/C Phase. Only gas production under humid conditions should be evaluated. It is our understanding that the calculations in Appendix GAS were obtained from studies conducted for projects other than WIPP; although according to SNL, site-specific experiments were currently being conducted. Since site-specific data are not available, DOE should consider utilizing the maximum estimates of gas generation rates, presented in Appendix GAS, from each of the chemical reactions that could possibly occur in a closed panel environment.

Page 5-13, Section 5.2.2, Estimation of the Concentration of Hazardous Constituents at the WIPP Unit Boundary. The effective gas generation rate of 0.5 moles per drum per year is not substantiated or adequately discussed. Also, whether the gas generation calculations assume complete gas leakage from the panel, since, on Page 5-12, the NMVP indicates that the demonstration considers migration only from closed panels should be clarified.

Page 5-19, Section 5.3, Prediction and Assessment of Infrequent Events. It is assumed that this assessment considers the likelihood and consequences of these events during the operational period only. Therefore, this section should be significantly modified for the disposal phase. Also, shouldn't there be a statistical analyses done of these events rather than just a cursory discussion?

Page 5-22, Section 5.3.2.2, Chemical Effects. On Page 3-68 of the NMVP, DOE indicates that potentially explosive conditions could be generated within the WIPP within 20 years of initial waste emplacement, which appears to be in contradiction with the statement in this section that "chemical effects are not expected to adversely impact the facility during this (operational) time frame."

CHAPTER 6.0: MONITORING

Page 6-4, Section 6.2, Volatile Organic Compound Monitoring. DOE proposes to discontinue the current VOC monitoring program at the shafts during the operational phases, claiming that releases will be at least two orders of magnitude below HBL's (as cited in Chapter 5). The NMVP should clarify which HBL's the discussion is referring to (OSHA vs. RCRA). Furthermore, it would be inappropriate to remove a monitoring requirement based on theoretical projections in a situation where confirmatory data has not been accumulated.

DOE should assess migration of VOCs through the air pathway from both closed and open waste panels in its demonstration of compliance with §268.6. DOE should propose a VOC monitoring plan, for the O/C Phase, designed to detect migration of hazardous constituents through the air pathway at the earliest practicable time. This plan should include the specific information listed in §§268.6(c)(1)-(5). The data, obtained as a result of this monitoring program, should then be utilized in verifying the concentrations of VOCs at the unit boundary. DOE should consider background levels of constituents in determining compliance with the no-migration standards of §268.6.

Section 6.3 Long-Term Monitoring; Page 6-5. EPA will review, upon submittal by DOE, the adequacy of indirect indicators of repository performance in a demonstration of compliance with §268.6. However, DOE should also consider technologies that would more directly detect migration of hazardous constituents at the earliest practicable time. We are not implying that intrusive methods must be used, but rather that all possible technologies should be investigated. Methods developed by the mining industry could possibly identify technologies for consideration in a demonstration of compliance with the long-term monitoring requirements of §268.6.

CHAPTER 7.0: QUALITY ASSURANCE

Page 7-9, Section 7.6.1, Qualification of Existing Data. The discussion pertaining to qualification of existing data is vague, and needs additional detail. For example, the definition of "adequate (QA) program" is unclear. The specific process for qualifying this information should be discussed in more detail, as should the alternative methods for qualifying data. Revise the NMVP to address these concerns.

CHAPTER 9.0: REGULATORY COMPLIANCE ASSESSMENT

Section 9.5 Waste Acceptance/Waste Compliance; Page 9-4. DOE should submit the available QAPjPs for review by EPA. This would allow EPA to determine consistency between generator/storage sites in complying with the requirements of the TRU Waste Characterization Quality Assurance Program Plan (Revision 0; April 30, 1995).

SPECIFIC COMMENTS: CLOSURE PLAN-RELATED APPENDICES

Chapter I - Closure Plans, Post-Closure Plans, and Financial Requirements for the Part B Permit Application Revision 5

Page I-7. Clarify under what circumstances partial closure will occur.

Appendix I1 - Conceptual Design for Operational Phase Panel Closure Systems (Appears to be part of Chapter I, Closure Plans, Post-Closure Plans and Financial Requirements Presented in the Part B Permit Application, Revision 5)

Page ES-iii. The petitioner states that future detailed design studies will be available and that the studies will provide more detailed structural analysis and air flow analysis of contaminant migration. Clarify why this level of detail was not available for this submission of the NMVP.

Page 3-18. Have any of the design concepts presented in Figure 3-9 been field tested? If so, present results. Why has no definitive design been agreed upon?

Pages 3-21 and 3-22. Have any of the design concepts presented in Figure 3-10 and 3-11 been field tested? If so, present the results.

Page 4-11. Table 4-3 presents closed Panel Release Rates for VOCs based on a February 1995 Westinghouse Electric Corp. report entitled, "Underground Hazardous Waste Management Unit Closure Criteria for the Waste Isolation Pilot Plant Operational Phase, Predecisional Draft." WID/WIPP-DRAFT-2033. Provide this report for Agency examination.

Page 5-8. The statement, "deficiencies exist in assessing the long-term performance of sealing components and in the placement of components in a high-temperature environment" emphasizes the importance of presenting well-defined and field-proven sealing technologies.

VOLUME II

Appendix BAD - WIPP VOC Monitoring Program Data

Specific Comments:

1. Discuss the high incidence of analytes detected in blanks. Examples are listed below:

Station VOC-1	
Trichlorofluoroethane	09/06/91 - 12/27/91
	07/16/92 - 08/14/92
Trichloroethane	03/04/92 - 08/27/92
Methylene Chloride	05/12/93 - 08/13/93
	09/23/93 - 10/21/93
	12/10/93 - 01/19/94
Station VOC-8	
Trichloro-trifluoroethane	09/06/91 - 08/05/92
Methylene Chloride	11/23/93 - 02/01/94
Station VOC-9	
Trichloro-trifluoroethane	09/06/91 - 12/31/91

2. Explain the reason for high trichloroethane concentrations detected at Monitoring Station VOC-1 and VOC-8 (e.g., VOC-1: 10/01-91 - 95 ppm; 10/10/91 - 48 ppm; 10/26/91 - 110 ppm; 04/29/92 - 670 ppm; 09/04/82 - 280 ppm; 10/08/92 - 130 ppm; 12/02/92 - 100 ppm; 05/12/93 - 320 ppm; and at VOC-8: Trichloroethane - 8/5/92 - 3800 ppm).

3. Data presented in this appendix requires additional discussion and clarification. As indicated in Comment No. 1 above, the presence of contaminants in blanks should be discussed in terms of potential origin of contaminants, the type of blank that was contaminated, and remedies for mitigating blank contamination. Additionally, potential laboratory contaminants should be discussed more thoroughly. Further, as indicated in Comment No. 2 above, the specific origin of TCA within samples

should be discussed; this contaminant is important because the concentrations detected continually exceed the no-migration standard for this compound as identified in the Conditional Variance (@19 ppm). Also discuss how the concentrations detected at VOC-1 reflect potential ventilation dispersion/dilution.

VOLUME III

Appendix CLP - Appendix A
Derivation of Relationships for the Gas Model

General Comment:

1. Provide a table that presents pressure development with time at various parts in the repository (i.e., behind closed panels, at the shafts, etc.)

VOLUME III

Appendix CLP - Appendix B
Calculations in Support of Panel Gas Pressurization
Due to Creep Closure

Specific Comments:

1. Sec. B2.2, p. B-4 Explain the basis for the stated closure rate. Present field or laboratory data and analyses that support these estimates.

VOLUME III

Appendix CLP - Appendix C
Standard Design Calculations

Specific Comments:

1. Sec. C1.0, p. C-2 Why are shear stresses at the interface zone not taken into account?

2. Sec. C2.0, p. C-6 Provide more detail regarding the basis for the uniform shear stress (2 MPa), uniform compression (5 MPa), and approximate shear strength (418 psi) that is expected to develop at the time of a methane explosion.

3. What happens if the plug is not in place or is degraded at the time of methane explosion? Will plugs be inspected during the operational phase and will stresses be monitored?

VOLUME III

Appendix CLP - Appendix I2
Repository Seals Program Baseline Position Paper from "Systems Prioritization Method
Iteration 2 Baseline Position Paper: Repository Seals Program, Sandia National Laboratory, March 17, 1965

Specific Comments:

1. Sec. 3.0, p. 6 Provide a discussion relative to corrosion/degradation versus time for the various seal components. The discussion should be developed to support the 100-year PA boundary between short- and long-term timeframes.

2. Sec. 4.1, p. 18-20 Explain the inconsistencies in the table between permeability values used in the 1992 PA, and Recent Seal Design Calculations versus those in SPM calculations (example Lower Shaft Seal Element 8 is 10^{-19} to 10^{-16} m2 in the 1992 PA; 7.9 x 10^{-18} m2 in the Recent Seal Design Calculations; and 10^{-12} m2 to 10^{-19} m2 for SPM calculations.) What impact do the enhanced permeability values have on overall performance? Do recent large-scale tests confirm the more permeable values?

3. Sec. 4.2.2, p. 25 "Operational panel seals may be necessary for ventilation and worker safety, but these issues are not addressed here." Identify where these issues are addressed, and discuss the impact on operations.

4. Sec. 4.3, p. 32 "A search for (large-scale, salt-based seal) analogs in the mining industry and the oil and gas storage operations has been started, but the seals program does not have a quantified data base for larger seals." Discuss what progress has been made since March 1995.

5. Sec. 4.3, p. 32&33 "To prevent brine from filling the shaft, a permeability of about 10^{-16} m2 is needed. (See where this value plots on Figure 4-6.) If gas is a concern during the short term, the lower shaft short-term component would need to have a permeability of about 10^{-18} m2 to mitigate gas flow up the shaft." How does the applicant reconcile this statement relative to design criteria with the trends presented in Table 4-1 of more

permeable shaft seal sampling values (also presented in p. 33 and 35), and also with the concern for concrete degradation stated on p. 32 ("larger volumes of any material, but particularly concrete, increase the establishment of inherent imperfections, such as cracks")?

VOLUME III

Appendix CLP - Appendix I2
Repository Seals Program Baseline Position Paper from "Systems Prioritization Method
Iteration 2 Baseline Position Paper: Repository Seals Program, Sandia National Laboratory, March 17, 1965

General Comments:

1. What are the structural design criteria for the shaft seals?

2. Is the discussion in this Appendix current, given the recent modification of shaft material design composition?

3. Provide a timeline to indicate the degradation expected with time (if any) and when each seal is expected to reach its maximum design capability.