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AT KEARNEY

November 6, 1995

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Mr. Benito Garcia
State of New Mexico Environment Department
Hazardous and Radioactive Material Bureau
P.O. Box 26110
2044 Galisteo
Santa Fe, New Mexico 87502

Reference: Work Assignment No. G969; State of New Mexico Environment Department, Santa Fe, New Mexico; WIPP Disposal Phase Part B Permit Application Review; Deliverable, Review of Chapters D, E, and I

Dear Mr. Garcia:

Enclosed please find a copy of the review deliverable for Chapters D, E, and I of the WIPP Part B Permit Application, Revision 5.0. Checklists identifying where in the permit application specific issues are discussed are being finalized and will be faxed as soon as possible. We will provide the A.T. Kearney Part B checklist for a portion of Chapter D and for Chapter I, but have used the NMED checklist for the miscellaneous unit portion of Chapter D (slightly revised for use in technical adequacy assessments, rather than completeness determinations). All deliverables, including the checklists, are provided on disk in WordPerfect 5.1 and hard copy.

In general, Chapters D and I of the permit application lack necessary and important detailed information. In particular Chapter D of the permit application was seriously lacking in necessary detail concerning: the design and operation of the Waste Handling Building (WHB) Hazardous Waste Management Unit (HWMU); the design and operation of the Underground HWMU(s); the design and operation of the ground (roof) control program and geomechanical monitoring programs for the Underground HWMUs; and the assumptions and risk assessment calculations used to demonstrate compliance with the 20 NMAC 4.1, Subpart V, § 264.601, miscellaneous unit environmental performance standards. Chapter I of the permit application was seriously lacking in detail concerning the design and construction of the repository panel seals and the repository shaft seals. Chapter I also did not address many of the 20 NMAC 4.1, Subpart V, § 264, Subpart G requirements for closure of HWMUs.

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Our concerns relative to Chapters D, E, and I are articulated in both General and Specific Comments.

A.T. Kearney performed a thorough technical review of the permit application and identified numerous technical issues that should be addressed by the applicant. Rather than make a determination regarding what NMED might consider important or unimportant, we chose to focus on providing NMED with a comprehensive review which presents concerns that are both technically and regulatorily valid. A.T. Kearney conducted the review in the same manner we conduct reviews for other regulated facilities to ensure consistency (e.g., no "special requirements" for this applicant). However, we also took into account our extensive understanding of the WIPP to craft our comments in such a fashion that the applicant can readily respond to the issues; that is, we attempted to fashion our comments with an understanding of the information available to the applicant, and how a satisfactory response to the comment could be provided by the applicant.

A.T. Kearney has attempted to evaluate the appropriateness of the proposed point of compliance (the four-mile square facility boundary as defined in the Land Withdrawal Act) as part of the review of the Chapter D environmental performance standard information. However, due to the complete lack of appropriate references and/or back-up data concerning calculations of exposure point concentrations and health risk-based concentrations, we were unable to evaluate the appropriateness of the proposed point of compliance. We have included comments requesting the information required to evaluate the point of compliance. We anticipate that DOE's response to our comments will provide (or reference) information from the No Migration Variance Petition (NMVP) prepared for the U.S. Office of Solid Waste. As a result, A.T. Kearney has conducted a brief review of the NMVP and provided comments concerning major deficiencies as they pertain to Part B permit application requirements. However, our review of the NMVP was not extensive, and the intent of our comments concerning the NMVP was to allow NMED to inform the permittee that NMED has some concerns about the probable source of the data DOE used to attempt compliance demonstration with the miscellaneous unit's environmental performance standards. That is, NMED may wish to indicate to the permittee that a significant quantity of supporting information must be provided by the applicant relative to the Subpart X performance standards, but that the probable source of this information (the NMVP) is also questionable. Our comments are crafted so that NMED may provide the Part B concern and/or pertinent commentary on the NMVP.

A.T. Kearney has not provided comments concerning the appropriateness of the language in the Introduction to Chapter D on page D-1 (lines 21-30) concerning

certification of plans and drawings. NMED indicated that they would review the following statement for consistency with State of New Mexico requirements: "Certain technical data, such as design drawings and specifications and engineering studies for newly designed facility features (e.g., panel 2 design) will be certified by a registered professional engineer (in accordance with 20 NMAC 4.1, Subpart X, § 270.14[a]). Other drawings provided in this permit application are "as-built" drawings. "As-built" drawings are not design drawings and specifications, or engineering studies and therefore are not subject to the requirements of 20 NMAC 4.1, Subpart X, § 270.14(a)."

Our review of the design and operation of the WHB was based on the assumption that the containers to be managed in the WHB hazardous waste management unit (HWMU) will be considered to contain free liquids. If NMED determines that the WIPP WAC restriction of free liquids to less than 1% of the volume of a container will satisfy the 20 NMAC 4.1, Subpart V, § 264.175(c) for a container storage area that does not manage free liquids, the WHB will not have to be equipped with a containment system and General Comment No. 3 can be removed from the deliverable.

Our review of the WHB design and operation information provided in the permit application has been based on the assumption that the WHB will be permitted as a container storage hazardous waste management unit. If NMED determines that the WHB will be permitted as a Miscellaneous Unit (as requested by DOE in the current permit application), all of our technical comments concerning the WHB will still apply since under 264.601, the design and operation of the WHB would still have to meet the § 264 Subpart I requirements for the use and management of containers since they are the most appropriate technical standards. In addition, additional comments will be required since DOE did not address the groundwater and surface water environmental performance standard information for the WHB within the current application.

Since the WHB will be permitted as a container storage area, the miscellaneous unit environmental performance standards for air emissions will not apply to the WHB. As a result, we have included a comment requesting that DOE remove information concerning the assessment of potential for risk due to air emissions from the WHB.

In Chapter E, E-3, General Hydrogeologic Information, Pages E-4 through E-6, the permit application indicates that detailed information on site hydrogeology is presented in Appendix E1. Therefore, Section E-3 of the permit application was not reviewed, with the emphasis of our review on E1. NMED should make it clear to the applicant that the lack of comments on sections pertaining to geology and hydrology in Chapter E and Appendix E1 does not mean consistence with information presented in Section E-3

of the permit application, as comments were directed to the referenced appendix that contained the more detailed information.

In contrast to our comments on Chapters A, B, and C, comments on Chapters D, E and I are general rather than specific in nature. As such, we believe that review of the general comments with DOE alone will be sufficient to communicate overall inadequacies of the permit application. It might be helpful, however, to ensure that one-line synopsis of our general concerns are included in the meeting agenda provided to DOE. We can generate this listing during our meeting with you the day before the DOE meeting.

As indicated above, we performed a thorough review of Chapters D, E, and I. Due to magnitude of the deficiencies noted in Chapter D of the permit application, A.T. Kearney has generated mostly General Comments that request wholesale revisions to the application or incorporation of detailed design information. Due to the large amount of information that has been requested, another round of detailed technical review may be required to evaluate the information that DOE provides in response to the information request.

The A.T. Kearney review focused on technical and regulatory issues. As such, we did not point out typographical and format errors, unless the errors seriously change the intent of the sentence.

Please feel free to contact me or Dave Walker (Chapters D and I) at 303-572-6175, should you have any questions or require additional information.

Sincerely,

Connie Walker
Program Manager

cc: B. Hoditschek, NMED
S. Zappe, NMED
L. Knapp, ATK
J. Darabaris, ATK
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J. Wanslow, ICF

WIPP PART B PERMIT APPLICATION REVIEW
FACILITY AND PROCESS INFORMATION

CHAPTER D

GENERAL COMMENTS

1. The permit application does not provide a consistent or adequate description of the size of the Waste Handling Building (WHB) Hazardous Waste Management Unit (HWMU) as required by 20 NMAC 4.1, Subpart IX, § 270.14(b)(1) and (19). Revise the permit application to address the following:

   A. Page D-4 (lines 8 and 9) of the permit application states that the surface HWMU will consist of the portion of the WHB where contact-handled (CH) and remote-handled (RH) TRU mixed waste containers will be routinely handled prior to emplacement, and references Figure D-2 to show the WHB HWMU. However, the boundary of the WHB HWMU shown on Figure D-2 does not encompass a number of WHB waste container handling areas that are discussed in lines 11 through 26 of page D-4, such as the Overpack and Repair Room and CH Overpack enclosure, which will be used to overpack damaged or contaminated containers, and the "other areas" of the WHB (Shielded Room, etc.) that will be available, should off-normal events occur that interrupt the timely movement of TRU mixed waste into the underground. Revise Figure D-2 to include all areas of the WHB that will be used for management or storage of TRU mixed waste containers, except for short-term accumulation or storage for derived waste generated at the WIPP, within the shaded boundaries of the WHB HWMU.

   B. The boundary of the WHB HWMU shown on Figure D-2 does not encompass the entire floor area of the CH Bay and the RH Bay. However, the text of the permit application does not provide the rationale or justification for not including all of the floor area of the CH Bay and RH Bay within the HWMU. Revise the permit application to provide the justification for not including the entire floor area of the CH Bay and the RH Bay within the WHB HWMU. In addition, if the entire floor area of the CH Bay and RH Bay will not be used for the management of TRU mixed waste, then provide a description of the engineering controls (curbs, walls, fencing, painted lines etc.) and/or procedural controls that will be used to prevent waste management activities from occurring throughout the CH and RH Bays.

2. The permit application does not provide an adequate description of the maximum number of containers and the maximum volume of waste that will be managed in the WHB HWMU as required by 20 NMAC 4.1, Subpart V, § 264, Subpart I. Revise

the permit application to describe the maximum number of each type of CH and RH TRU mixed waste containers, and the maximum volume of waste, that will be managed in each part of the WHB HWMU at any one time (including contingency storage requirements). Also provide a scale drawing that shows the maximum number of containers can be stored in the WHB while maintaining appropriate aisle space.

3. The permit application does not provide adequate information to demonstrate that all of the requirements of 20 NMAC 4.1, Subpart V, § 264 Subpart I, for the use and management of containers, will be met. As noted in comments concerning Chapter A, the WHB HWMU will be permitted as a container storage area rather than a miscellaneous unit. ~~However, even if the WHB HWMU were to be permitted as a miscellaneous unit, the design and operation of the WHB would still have to meet the § 264 Subpart I requirements, since they are the most appropriate technical standards.~~ Neither Section D-9a(3)(b) nor the referenced Appendix D3 drawings (41-F-087-014, 41-E-003-014, 41-E-005-14) provide adequate information to demonstrate that the WHB HWMU is equipped with a secondary containment system in accordance with 20 NMAC 4.1, Subpart V, § 264.175 (b)(2), (3), and (5). Revise the permit application to provide the following information:

   A. Information which demonstrates that the various rooms and areas of the WHB that will be used to manage CH and RH waste (the CH Bay, overpack and repair room, CH overpack enclosure, conveyance loading room, RH Bay, cask unloading room, Hot Cell, canister transfer cell, and the facility cask loading room) will provide a containment system whose base (both the floor and containment trenches) is sloped or otherwise designed and operated to drain and remove liquids resulting from leaks or spills [20 NMAC 4.1, Subpart V, § 264.175(b)(2)]. Alternatively, demonstrate that the containers will be elevated or protected from contact with the spilled material.

   B. Information (including plan and cross sectional drawings) which demonstrate that the containment system for all of the rooms and areas of the WHB that will manage CH and RH waste has sufficient capacity to contain 10% of the maximum volume of waste to be stored in a room, or the volume of the largest container, whichever is greater [20 NMAC 4.1, Subpart V, § 264.175 (b)(3)].

   C. Information which demonstrates that spills or leaks will be removed from the sump or collection area of the secondary containment system in a timely manner to prevent overflow [20 NMAC 4.1, Subpart V, § 264.175 (b)(5)].

4. The permit application does not provide an adequate description of the procedures that will be used to determine whether releases of hazardous constituents have occurred from the waste containers in the WHB, the procedures that will be used to decontaminate containers, equipment and/or structures or the procedures that will be

State codetection is insufficient to detect release

used to demonstrate that decontamination is complete. The use of contamination surveys and possible decontamination of TRUPACT II's, road casks and railroad casks, waste containers, and canisters is discussed on pages D-14 (lines 35-43), D-15 (lines 6-11), D-17 (lines 3-7 and 16-24). However, the permit application does not provide detailed information concerning how contamination surveys and decontamination will be conducted, or an adequate reference to where the information is located within the permit application. Revise the permit application, or identify the appropriate reference, to provide the following information:

A. A general sampling plan that describes the types of samples, number of samples per unit area, and analytical parameters that will be determined during the initial contamination surveys of waste containers and canisters.

B. A description of the criteria that will be used to determine whether decontamination of a container, equipment, or structure will be required, and a detailed description of the procedures to be used to decontaminate containers equipment and structures.

C. A general sampling plan that describes the types of samples, number of samples per unit area, and analytical parameters that will be determined to demonstrate the effectiveness of decontamination and the criteria to be used to determine when the decontamination is complete.

5. Neither Section D-9a(2)(b) (pages D-17 and D-18) nor Section D-9a(3)(b) of the permit application provide an adequate description of the configuration of the WHB RH Bay, as required by 20 NMAC 4.1, Subpart IX, § 270.14(b)(1) and (19). From Figure D-16 and Drawing No. 41-E-005-014, it appears that the Hot Cell is located above the cask unloading room and that the canister transfer room is below the floor level of the cask loading room. However, this is not completely clear from the text, figures or drawings included in the permit application. Revise the permit application to provide figures or drawings that show cross-sectional views of the RH side of the WHB. At a minimum, include both north-south oriented and east-west oriented cross-sections that show the entire RH Bay through both the cask unloading room and the facility cask loading room.

6. Neither Section D-9a(2)(b) or Section D-9a(3)(f) of the permit application provide an adequate description of the procedures to be used to emplace the CH and RH TRU mixed waste in the underground disposal rooms. In accordance with 20 NMAC 4.1, Subpart IX, § 270.23(a) and Subpart V, § 264.601, revise either or both sections of the permit application to provide the following information:

A. The order and direction that disposal rooms and disposal room access drifts within a panel will be filled with RH waste canisters and CH waste containers.

B. An estimate of the amount of time it will take to complete waste emplacement within a panel.

C. The spacing between CH waste containers and the initial minimum spacing between the CH waste containers and the walls and roof of the disposal rooms and disposal room access drifts.

D. A description of the amount of aisle space (if any) that will be maintained within the disposal rooms and/or disposal room access drifts after waste emplacement to allow for access to the emplaced waste containers and/or access to inspect, monitor and maintain the roof support system.

E. The initial diameter of the boreholes used for disposal of RH waste canisters to demonstrate that the boreholes have adequate diameter to accommodate the overpack RH canister.

F. The amount of air movement that will be allowed into disposal rooms and disposal room access drifts that are full of waste.

G. A statement concerning whether backfill materials will be placed around the emplaced CH waste containers. If backfill materials will be used, provide a detailed description of the material to be used and the procedures and equipment to be used to place the backfill.

H. Waste loading considerations relative to waste form groups.

7. Sections D-9a (page D-5) and D-9a(2)(b) (page D-18) of the permit application state that a shield plug will be installed after an RH canister has been inserted into a borehole to provide radiation shielding. However, neither Section D-9a(2)(b) or Section D-9a(3)(f) provide an adequate description of the design of the shield plug, or of the anticipated performance of the shield plug in response to salt creep and brine inflow. In accordance with 20 NMAC 4.1, Subpart IX, § 270.23(a) and Subpart V, § 264.601, revise the permit application to provide the following information:

A. A description of the design of the shield plug, and the procedures that will be used to install the plug. Also include design drawings of the shield plug.

B. An assessment of the amount of time it will take for salt creep to breach the RH canister. If it is anticipated that salt creep will result in a canister breach occurring prior to completing disposal operations within a panel and placing of the panel seal, then provide design information which demonstrates that the shield plug is capable of withstanding the pressure buildup due to compression of the air and waste within a canister without failing. Alternatively, provide information that demonstrates that a breach of one or more canisters will not

result in a release of hazardous constituents at concentrations that will exceed the miscellaneous unit environmental performance standards.

C. An assessment of the potential for hydrogen gas generation via shield plug corrosion, and the impact this may have on facility performance, or a reference where, this information is discussed within the permit application.

8. Section D-9a(2)(b) (page D-18, lines 5-15) of the permit application indicates that RH wastes will be disposed of in boreholes that are drilled into the walls of the waste disposal rooms and disposal room access drifts, and that the a nominal spacing of 8 feet between centers of the boreholes is planned. However, the permit application does not provide any information concerning the potential adverse impact on the stability of the disposal rooms that could result from borehole emplacement. From the mine design information provided in the text and appendices to the permit application, it does not appear that the presence of the boreholes in the walls of the disposal rooms has been taken into account during modeling of the closure of the disposal rooms due to salt creep. In accordance with 20 NMAC 4.1, Subpart IX, § 270.23(a) and Subpart V, § 264.601, revise the permit application to provide:

A. An assessment of the effect that the boreholes drilled into the walls of the disposal rooms and disposal room access drifts will have on room closure rates and the room closure process, the stability of the roof and walls of the disposal rooms, and the anticipated life of the disposal rooms.

B. A description of the distance that will be maintained between the first boreholes in a disposal room and the intersection of the disposal room and the disposal room access drift (the point of maximum stress in the pillar), and the justification for choosing the distance.

C. An assessment of the effect that the potential increase in temperature of the salt surrounding the RH canisters will have on the stability of the disposal room walls and roof.

9. The permit application does not provide an adequate description of the ground control program to be conducted in the underground HWMUs. Section D-9a(3)(f) states that DOE will ensure that any room in which waste will be placed will be sufficiently supported to assure compliance with the applicable portions of the LWA. Section D-9e(1) of the permit application indicates that a very comprehensive ground control monitoring and support system has been implemented, identifies the types of support systems that are available, and describes the support systems that have been used in the disposal rooms in panel 1. However, the permit application does not describe the support system that will be used in the disposal rooms and disposal room access drifts in the remaining underground disposal panels. In accordance with 20 NMAC 4.1, Subpart IX, § 270.23(a) and Subpart V, § 264.601, revise the permit application to

include the following information within the text of the permit application or within appendices:

A. Detailed design information for the initial roof support system that will used in all of the disposal rooms and disposal room access drifts in underground HWMU panels 2-8. Include a description of, and justification for choosing, the types of rock bolts to be used, the number of rock bolts per unit area, and the anchoring horizon.

B. Detailed support system installation plans, including the quality assurance/ quality control program, that will be used for installing the initial roof support system in HWMU panels 2-8.

C. A detailed description of the types of supplementary support systems that may be used in the disposal rooms and disposal room access drifts if the geomechanical monitoring data indicate that the initial roof support system is not capable of maintaining the stability of the disposal rooms or disposal room access drifts until emplacement of the panel seal.

D. The name of the person or organization that is responsible for conducting the ground control program and determining the level and types of ground control and maintenance activities that will be required in the disposal rooms and disposal room access drifts.

10. The permit application does not provide adequate information to demonstrate that the implementation of the ground control program and the geomechanical monitoring program will ensure that the stability of the roofs in the disposal rooms and disposal room access drifts will be maintained throughout disposal activities in a panel. The discussion of the of the protection of groundwater (Section D-9d(1), page D-39, lines 8-9) and surface water (Section D-9d(2), page D-39, line 27) indicate that all TRU mixed waste will be in unopened (uncrushed) containers throughout the Disposal Phase. In addition, the discussion of the potential for health risks due to release of hazardous constituents to the air (Section D-9d(3), page D-41, lines 11-31) indicates that the health risks to WIPP workers and the hypothetical member of the public residing at the unit boundary have been projected based on the emission of VOC headspace gases via diffusion through the HEPA grade filters (i.e., the health risk calculations have been based on the assumption that the CH and RH TRU mixed waste containers will remain intact during the disposal period). As a result, maintaining the roof stability within a disposal panel, so that the roof will not fall and breach waste container(s), is apparently crucial to ensuring that the miscellaneous unit environmental performance standards will be met. In accordance with 20 NMAC 4.1, Subpart IX, § 270.23(a) and Subpart V, § 264.601, revise the permit application to address the following issues:

A. The permit application (Page D-19, line 15) states that "ground control will be maintained as long as access to the affected area is maintained." This implies that the ground control program and geomechanical monitoring program will be discontinued within a disposal room or portion of a disposal room after waste has been emplaced, but the actual length of time that the ground control program and the geomechanical monitoring program will be continued is not described. Revise the permit application to explicitly identify the point in time when the ground control program and the geomechanical monitoring program will cease in those areas of the disposal panels where waste has been emplaced. If the programs will continue in those areas where waste has been emplaced, then describe how personnel and equipment access will be accomplished without disturbing the emplaced waste containers.

B. The permit application does not provide an estimate of the length of time the roofs in the panel 2-8 disposal rooms and disposal room access drifts will remain stable (no roof falls) after they have been excavated and equipped with an initial rock bolt system. Although page D-43, lines 15 and 16, of the permit application states that the consensus of an expert review panel was that a life of 7 to 11 years could be expected from room 1, panel 1, with limited maintenance, it is not clear that this estimate can also be used for other rooms in the remaining panels. In addition, the estimate for room 1, panel 1 assumed that an initial rock bolt system was in place and that the support system would be continually monitored and maintained. Revise the permit application to provide an estimate of the length of time that the roofs of the panel 2-8 disposal rooms and disposal room access drifts will remain stable after excavation and installation of an initial rock bolt system. Since it is unlikely that the geomechanical monitoring and the ground control programs can be continued once waste has been emplaced in a room, ensure that the all time estimates account for the cessation of the ground control program. Including potential degradation of the support system due to salt creep.

C. Provide a comparison of the length of time that the roofs of the panel 2-8 disposal rooms and disposal room access drifts will remain stable to the length of time that will be required to complete waste emplacement in a panel and construct the panel seal. If it is determined that length of time that a roof will remain stable is less than the amount of time it will take to complete panel closure, provide a description of the activities that will be conducted to ensure that a roof fall will not occur. Alternatively, provide information that demonstrates that the design and construction of the containers is adequate to withstand a roof fall event without breaching. A second alternative would be to revise all of the risk assessment calculations used to calculate the health and environmental risks resulting from exposure to air emissions from the WIPP facility during disposal operations so that the projected emissions are based on

waste concentrations in breached containers, rather than headspace gases diffusing through HEPA grade filters.

D. Provide a comparison of the length of time that the roofs of the panel 1-8 disposal rooms and disposal room access drifts will remain stable to the length of time that will be required to complete waste disposal in the entire underground repository (emplacing waste and constructing panel seals in all panels). If it is determined that length of time that a roof will remain stable is less than the amount of time it will take to complete the filling and sealing of all waste panels, the revise all of the risk assessment calculations used to calculate the health and environmental risks resulting from exposure to air emissions from the WIPP facility during disposal operations and facility closure [Section D-9d(3)] so that the projected emissions are based on waste concentrations in breached containers, rather than headspace gases diffusing through HEPA grade filters. Alternatively, provide information that demonstrates that the design and construction of the containers is adequate to withstand a roof fall events without breaching.

11. The permit application (page D-43, lines 5-9) indicates that one of the key elements incorporated into the ground control program approach is that salt moves or creeps and that ground-support systems cannot resist salt creep. However, the permit application does not discuss the expected magnitude or rate of vertical and horizontal creep closure in the disposal rooms or the disposal room access drifts, or the measures that will be taken to ensure that room closure due to salt creep will not result in a breach of the CH waste containers while waste disposal activities are still occurring in a panel. In accordance with 20 NMAC 4.1, Subpart IX, § 270.23(a) and Subpart V, § 264.601, revise Chapter D of the permit application to:

A. Describe the anticipated rate of horizontal and vertical room closure due to salt creep and how the estimate was made.

B. Provide an assessment of the potential for salt creep closure to crush or breach some of the first CH waste containers placed in a panel prior to completion of the panel seal. The assessment should include a comparison of the anticipated rate of salt creep closure over time, the initial size of the disposal room openings, the initial spacing between the waste containers and the walls and roof of the disposal rooms and disposal room access drift, and the maximum anticipated length of time it will take to completely fill and seal a disposal panel. If the assessment indicates that salt creep is likely to result in CH containers being crushed prior to construction of the panel seal, then describe the engineering or procedural controls that will be instituted to prevent the breach of the containers. Alternatively, provide information that demonstrates that a breach of one or more containers will not result in a release of

hazardous constituents at concentrations that will exceed the miscellaneous unit environmental performance standards.

12. The permit application does not provide an adequate description of geomechanical monitoring program to be conducted in the underground HWMUs. In accordance with 20 NMAC 4.1, Subpart IX, § 270.23(a) and Subpart V, § 264.601, revise the permit application to provide a detailed description of the geomechanical monitoring system, including:

    A. A description of the type and number of monitoring instruments and/or monitoring points that will be used to monitor each HWMU disposal panel.

    B. A description of the potential problems that are looked for during visual inspections and how the results of the visual inspections are recorded.

    C. A figure showing the location of the monitoring instruments and/or monitoring points that will be used to monitor each HWMU disposal panel.

    D. A description of the frequency that measurements and observations will be made.

13. The permit application does not provide an adequate description of the organization responsible for conducting the geomechanical monitoring program or evaluating the data obtained from this program. Section D-9a(3), page D-19 of the permit application indicates that data collected from geomechanical monitoring of the HWMUs during the Disposal Phase will be evaluated periodically. The permit application indicates that any ground conditions exceeding established criteria will be evaluated for immediate and longer-range safety. Waste emplacement in a room may be terminated depending on the results of the evaluation, and if a roof fall is imminent, appropriate action will be taken to protect human health and the environment. However, neither Section D-9a(3) or D-9e(1) of the permit application provides any details concerning who will evaluate the data and how the data will be used. In accordance with 20 NMAC 4.1, Subpart IX, § 270.23(a) and Subpart V, § 264.601, revise the permit application to include:

    A. A description of the organizational structure (with job titles) responsible for the geomechanical monitoring program.

    B. A description of the frequency that the data from the geomechanical monitoring program will be evaluated.

    C. A step by step description of the procedures in place to review, reduce, interpret, and act upon the geomechanical data collected in a timely manner to

ensure that maintenance or corrective measures will be performed to maintain the stability of the disposal panels.

D. A description of established criteria for determining when unstable ground conditions are occurring (or will occur) and identification of the person responsible for deciding whether waste disposal operations must be terminated.

E. A description of the potential corrective measures that will be considered in the event that unstable ground conditions are identified.

F. A description of when and how NMED will be notified that the established criteria for determining when unstable ground conditions exist in the disposal panel HWMUs have been exceeded.

14. The permit application does not provide adequate information to demonstrate that the equipment that will be used to manage CH and RH TRU mixed waste containers will have adequate design capacity to handle the maximum anticipated loads without failure. In accordance with 20 NMAC 4.1, Subpart V, § 264.173 and § 264.601, revise Sections D-9a(3)(c), D-9a(3)(d) and D-9a(3)(g) to provide the following information:

A. The design capacity of the CH Bay overhead bridge crane, the CH Bay forklifts, the conveyance loading car, the underground waste transporter, the underground forklift, the RH Bay overhead bridge crane, the road-cask transfer car, the facility-cask transfer car, the facility-cask rotation fixture, and the grapple hoist.

B. The maximum gross weight of the following containers or groups of containers: the seven-pack of 55-gallon drums, the four-pack of 83-gallon drums, the ten-drum overpack, the standard waste box, and the RH canister.

C. The maximum net weight of the following equipment: the empty TRUPACT-II Type B shipping container, the center-of- gravity lift fixture, the empty facility pallet, the empty RH-72B shielded road cask, and the empty facility cask.

15. The permit application does not specifically address each of the 20 NMAC 4.1, Subpart V, § 264.601(a)(1)-(9) and § 264.601(b)(1)-(9) requirements to demonstrate that the design and operation of the WIPP underground HWMU will prevent releases that may have an adverse effect on human health and the environment due to migration of constituents in groundwater and the subsurface environment and in surface water, or wetlands, or on the soil surface. Revise Sections D-9d(1) and D-9d(2) of the permit application to specifically address each of the § 264.601(a) and (b) requirements. Include a synopsis of the information required to meet each requirement, and specific references (including Appendix Number and/or Report title,

and specific chapter or section where the information is located) to the location of the detailed information that demonstrate that each requirement has been thoroughly addressed. Relative to those performance standards pertinent to groundwater, ensure that each of the standards is addressed in sufficient and appropriate detail, taking into account comments on Chapters E, Appendix E1, and Appendix D6.

16. The information provided in Section D-9d(3) of the permit application does not adequately address each of the 20 NMAC 4.1, Subpart V, § 264.601(c)(1)-(7) requirements to demonstrate that the design and operation of the WIPP underground HWMUs will prevent releases that may have adverse effects on human health and the environment due to migration of waste constituents in the air. Revise Section D-9d(3) and the appropriate tables and appendices to address the following issues:

    A. The permit application does not provide an adequate description of the physical and chemical characteristics of the waste managed in the WIPP, as required by § 264.601(c)(1). The discussion of the potential for health risks on page D-41 (lines 11-16) and Table D-3 indicates that the health risks to WIPP workers and the public have been calculated based on emission of VOC headspace gases from waste containers. However, the permit application does not describe or properly reference the source of the headspace gas emission data. Revise the text of the permit application and Table D-3 to appropriately reference Appendix C2 as the source of the weighted average drum headspace concentrations that have been use to calculate the air emissions exposure risk.

    In addition, Appendix C2 indicates that the weighted average concentrations of headspace gases provided in Table C2-1 and Table D-3 were calculated based on analyses from only 700 containers from only two generator sites. Revise the permit application to provide a discussion of the appropriateness of calculating the health and environmental risks due to air emissions from the WIPP based on headspace gas data from only 700 containers from only two generator sites, rather than representative samples of the spectrum of wastes from all of the potential generator sites.

    B. The permit application does not provide an adequate description of the effectiveness and reliability of systems and structures to reduce or prevent emissions of hazardous constituents to air, as required by § 264.601(2). The discussion of the potential for health risks due to release of hazardous constituents to the air on page D-41 (lines 11-31) indicates that the health risks to WIPP workers and the hypothetical member of the public residing at the unit boundary have been projected based on the emission of VOC headspace gases via diffusion through the HEPA grade filters (i.e., the health risk calculations have been based on the assumption that the CH and RH TRU mixed waste containers will remain intact). The text further states that the greatest potential exposure to a member of the public would occur when the

last panel is open and being filled and when minute emissions contributions from all closed panels (via design basis diffusion rates) through the closure system are occurring. The calculations of the emission contributions from the closed panels also appear to have been based on the drums remaining intact. Since it is not likely that waste containers within a closed panel will remain intact throughout the entire Disposal Phase due to potential roof failures and the effects of salt creep, revise the permit application to discuss the appropriateness of basing the concentrations of VOCs in air emissions from closed panels on the assumption that the containers will remain intact. Revise the calculations of health and environmental risks from the air emissions accordingly.

In addition, the permit application does not does not provide adequate or consistent information concerning how the emissions contributions from the closed disposal panels were calculated. Page D-41 (lines 25-26) indicates that the minute emissions contributions from all closed panels are calculated by factoring in the design basis diffusion rates, which is assumed to mean diffusion through the panel seals. However, review of the calculations provided in Appendix D9, Table D9-3, indicates that it does not appear that diffusion through the panel seals has been included in the calculation of single closed panel emissions. Revise the text of the permit application and Appendix D9 to clearly state whether the calculation of emissions from closed panels has included a factor for diffusion through the panel seals. In addition, provide a complete description of the design basis diffusion rate for the panel seals and how the rate was calculated.

C. The permit application does not provide an adequate description of the operating characteristics of the unit which impact VOC distribution, as required by § 264.601(3). The calculations of potential health and environmental risks resulting from exposure to air emissions from the WIPP facility have been based on weighted average drum headspace concentrations of VOCs. As a result, it will be very important to control the placement of containers within a disposal panel to ensure that the mix of waste placed in a panel is similar to the mix of waste used to calculate the average headspace concentrations. Revise the permit application to describe the procedural controls that will be used to ensure that the volume and concentration of VOC containing waste placed in a particular disposal panel is similar to composition of the waste used to calculate the average headspace concentrations of VOCs (i.e., waste loading considerations).

D. The permit application does not provide adequate information to demonstrate that the calculations performed to assess the potential for health risks caused by human exposure to waste constituents have been properly conducted, as required by § 264.601(6). Page D-40 (lines 41-42) indicates that the risk to

the nearest resident is based on calculations dictated by DOE Orders and is documented in the Final Safety and Analysis Report. Table D-3 indicates that the Public Exposure Health-Based Levels are based on risk assessment information explained in the WIPP No-Migration Variance Petition. Revise the permit application to provide complete copies of all of the risk assessment assumptions and calculations used to assess the potential for health risks resulting from exposure to air emissions from the WIPP facility as an attachment or appendix to the permit application. Also provide a justification for conducting risk assessment calculations for only nine VOCs, when Appendix C2, Table C2-1 indicates that 32 volatile organic constituents were detected during the headspace gas analysis of the 700 drums.

E. The permit application provides an assessment of the potential health risks due to exposure to air emissions from waste in the underground repository for WIPP workers in an open panel underground and for a member of the public residing at the Land Withdrawal Act boundary. However, the permit application does not provide an assessment of the potential health risks due to exposure to air emissions to WIPP support personnel who work above ground (but are not directly involved in waste management activities) during the closure and post-closure time period. It is presumed that the exposure concentration for these personnel will be higher than the exposure concentrations to the general public at the Land Withdrawal Act Boundary, but that these personnel may not be directly covered under OSHA occupational exposure requirements. Revise the permit application to provide an assessment of the potential health risks to WIPP support personnel working in the surface facilities during the operational, closure, and post-closure care periods.

F. The permit application does not provide an assessment of the potential for damage to domestic animals, wildlife, crops, and vegetation caused by exposure to waste constituents in the air emissions from the WIPP. In accordance with § 264.601(7), revise Section D-9d(3) to specifically address this requirement.

17. The permit application does not provide an adequate description of the air dispersion model and modeling utilized to estimate the VOC concentrations at the unit boundary. Further, the permit application does not provide adequate information relating to the required input parameter data sets. Tables D-3 and D9-3 (Appendix D9), which calculate the maximum public exposure concentrations, are based upon the use of an air dispersion factor (ADF), which is a calculated output from the air dispersion modeling. However, the text does not address air dispersion modeling. Revise the permit application to provide the following information:

A. A description of the air dispersion model chosen for the WIPP site.

B. A detailed description of the specific input model parameters necessary for the dispersion modeling, including the control data sets, the source data set, the receptor data set and the meteorological data set.

C. A detailed analysis and justification of all assumptions made for the modeling.

D. A summary of the modeling results.

Note that while the permit application does not provide the air dispersion modeling used in estimating VOC concentrations at the facility, it appears that the required information may be within the No Migration Variance Petition since it discusses the air dispersion model ISC2 in Chapter 5 (Environmental Impact Analysis). As of September of this year, EPA mandated the model ISC3 as the legal air dispersion model to be used in risk assessment. ISC3 is the refined version of the 1994 model ISCST2-DFT. Ensure that the discussion of air dispersion modeling provided in the permit application explains if ISC2 was chosen as the preferred model because at the time ISCST2-DFT was still in draft form and ISC2 was the "latest" EPA approved model at the time the NMVP was written and states whether the permit application will be revised using the ISC3 model.

18. The permit application provides assessments of the potential for health risks due to exposure to air emissions from the WHB for both WIPP Workers and a member of the public residing at the Land Withdrawal Act boundary. However, the since the WHB will be permitted as a container storage area, the miscellaneous unit environmental performance standards for air emissions will not apply to the WHB. Revise the permit application to remove information concerning the assessment of potential for risk due to air emissions from the WHB.

19. The permit application does not specifically address 20 NMAC 4.1, Subpart V, § 264.603 requirement that the environmental performance standards required under § 264.601 must also be met during the post-closure care period. Revise Section D-9d of the permit application to provide information that demonstrates that the environmental performance standards will also be met during the post-closure care period. Specifically, the permit application must reference in Section D-9d where post-closure information is included, or provide this information. See General Comment No. 5, Chapter I, and Chapter E comments for additional guidance.

20. ? The Note that while the permit application does not provide adequate information to demonstrate that monitoring for volatile organic constituents in the emissions from the underground HWMUs during the Disposal Phase and the post-closure care period is not required. Since the projections of volatile organic constituent concentrations at the facility boundary (as defined in the Land Withdrawal Act) due to emissions from

the underground HWMUs were based strictly on limited waste analysis and on theoretical predictions of the waste container headspace gas concentrations that are highly questionable (refer to General Comment No. 16 above), it will be very important to conduct volatile organic constituent air monitoring of the actual emissions from the underground HWMUs to verify the predicted emission rates. Revise the permit application to provide a plan for monitoring the volatile organic hazardous constituent emissions from the underground HWMUs during the Disposal Phase.

21. A number of pages in Chapter D contain reference notes in parenthesis. These include the following: (DOE/WIPP 91-057) on page D-43 (line 16); (DOE 1992a) on page D-45 (line 27) and page D-48 (line 27); (DOE 1992b) on page D-46 (line 30) and page D-47 (line 13); (Westinghouse, 1991) on page D-47 (line 6); (DOE 1994) on page D-49 (line 15) and (DOE/CAO-95-2043, 1995) on Table D-3, page D-54. The use of reference notes in Chapter D is inappropriate since Chapter D does not include a reference list. Revise the permit application to include a reference list, or to provide complete references within the text of the Chapter.

WIPP PART B PERMIT APPLICATION REVIEW
FACILITY AND PROCESS INFORMATION

CHAPTER D

SPECIFIC COMMENTS

1. Chapter D, Introduction, Page D-1, Lines 32-35.

The permit application states that "The Disposal Phase will consist of receiving both contact-handled (CH) and remote-handled (RH) TRU mixed waste shipping containers, unloading and transporting the waste containers to the underground HWMUs, emplacing the waste in the HWMUs, and subsequently achieving disposal by closing the HWMUs in compliance with applicable state and federal regulations." The last part of the sentence implies that the emplacement of waste in the underground HWMUs will not be considered disposal until the HWMU (panel) is closed. However, 20 NMAC 4.1, Subpart I, § 260.10 states that disposal means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged to any waters, including groundwater. As a result, the emplacement of waste within the disposal rooms and disposal room access drifts will constitute disposal of waste. Revise the permit application to add the words "and disposing of waste by" between the words "underground HWMUs," and the words "emplacing the waste" on line 34 of page D-1. Also delete the words "subsequently achieving disposal by" from lines 34 and 35 of page D-1.

Note that if for some reason, the emplacement of waste within the disposal rooms was not considered disposal until panel closure was complete, then the emplacement of waste in a panel would then be classified as waste storage. In that case, the 20 NMAC 4.1, Subpart V, §264 Subpart I requirements for use and management of containers would be the most appropriate standards to apply to the management of waste in the underground HWMUs. This would require that DOE maintain appropriate aisle space, secondary containment, container inspections, etc.

2. Chapter D, Section D-9, Miscellaneous Unit, Page D-3, Lines 19-20.

The permit application states that the HWMU ~~that will be~~ located on the surface in the WHB is also eligible for permitting as a miscellaneous unit under 20 NMAC 4.1, Subpart V, Miscellaneous Unit, Subpart X. As noted in comments concerning Chapter A, there is no basis for permitting the WHB as a miscellaneous unit since appropriate standards for the use and management of containers already exist under 20 NMAC 4.1, Subpart V, § 264 Subpart I. Revise all of the appropriate portions of the

permit application to address the above ground HWMU as a permitted hazardous waste container storage area.

3. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a, Description of the Miscellaneous Unit, Page D-4, Lines 37-43.**

The permit application provides a description of how the various CH waste containers will be stacked in the disposal rooms and disposal room access drifts and references Figure D-3 to show the stacking configuration. However, neither the text or Figure D-3 provides information concerning the maximum dimensions of the waste container stacking configurations (height and width) to show how much space will be left between containers and between the containers and the walls and roof of a disposal room. In accordance with 20 NMAC 4.1, Subpart V, § 264.601, revise the text of this Section of the permit application to describe the distance between each type of container in a disposal room, and the minimum distance between waste containers and the walls and floors of a disposal room. In addition, provide two cross-sectional drawings (to scale) of a disposal room at the point where seven packs of drums will emplaced and at the point where standard waste boxes will be emplaced.

4. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(1)(c), Groundwater Hydrology, Page D-10, Lines 1-8.**

The permit application provides a description of the horizontal hydraulic gradient and very generalized transmissivities within the Culebra, but does not describe the groundwater flow direction specifically in the vicinity of the WIPP. In accordance with 20 NMAC 4.1, Subpart V, § 264.601, revise the text of the permit application to describe the direction of groundwater flow within the Culebra, or specifically reference where this information is included.

5. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(1)(c), Groundwater Hydrology, Page D-10, Lines 10-15.**

The permit application indicates that the nearest use of groundwater within the Culebra is approximately seven miles southwest of the WIPP site and refers to Figure D-9 to show the location of the well with respect to the WIPP site. However, the text of the permit application does not provide the name of well(s) used for watering livestock so that they can be clearly identified on Figure D-9. In accordance with 20 NMAC 4.1, Subpart V, § 264.601, revise the permit application to clearly denote the Culebra wells that are used for water livestock.

6. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(2)(b), TRU Mixed Waste Management Operations, Page D-14, Lines 1-10.**

The permit application states that derived waste will be considered acceptable for management at the WIPP facility, because any TRU mixed waste shipped to the facility will have already been determined to be acceptable and because no new constituents will be added. However, the permit application does not identify the types of solvents or decontamination materials that will be used during decontamination activities to demonstrate that no new constituents will be added. Revise the permit application to identify all of the potential cleaning solvents that will be used to decontaminate equipment and cleanup spills. Also identify the specific hazardous constituents present in each of the cleaning solvents. (Also refer to Chapter C comments pertaining to use of these solvents).

7. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(2)(b), TRU Mixed Waste Management Operations, CH TRU Mixed Waste Handling, Page D-15, Lines 6-11.**

The permit application states that all contamination surveys at the WIPP facility are based on the concept of co-detection. Due to the heterogeneity of the waste managed at the WIPP there may be instances when a release of hazardous constituents occurs without a concurrent release of radioactive waste. As a result, the use of only the co-detection principle to determine whether a release of hazardous waste or hazardous constituents has occurred from a container, or to verify spill cleanup, may be inadequate. Revise the permit application to state that all surface sampling radiation surveys conducted at WIPP to verify spill cleanup, or determine whether a release has occurred, will be confirmed by collecting samples for hazardous constituent analysis. Alternatively, revise the permit application to include a complete and comprehensive justification for this approach.

8. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(2)(b), TRU Mixed Waste Management Operations, CH TRU Mixed Waste Handling, Page D-16, Lines 29-30.**

The permit application does not identify the location within the repository that the underground forklifts will remove the waste containers from the facility pallet. In accordance with 20 NMAC 4.1, Subpart V, § 264.601, revise the permit application to provide this information.

9. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(2)(b), TRU Mixed Waste Management Operations, CH TRU Mixed Waste Handling, Page D-16, Lines 34-35.**

There is a typographical error on line 35 in an important reference. Revise the permit application to indicate that Section D-9a(3)(f) provides the further discussion of the repository container management rather than Section D-9a(3)(g).

10. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(3), Facility Design and Construction, page D-19, Line 15.**

The footnote to the sentence on this line refers the reader to Appendix D3, Drawing 54-W-009-W presumably for additional information concerning the ground control program. However, a review of the referenced drawing indicates that the drawing does not contain any information about the ground control program. Revise the permit application to remove the reference to the drawing, reference the appropriate drawing, or to clarify why the drawing was referenced.

11. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(3)(e), Shafts and Subsurface Facilities, page D-32, Lines 8-11.**

The permit application indicates that the shafts (with the exception of the salt handling shaft) are equipped with three water collection rings to collect any water that may seep into the shaft through the shaft liner. However, the permit application doe not provide a discussion of the disposition of the water once it has been collected. Revise the permit application to describe how any water that is collected in the collection rings is managed and disposed to prevent run-on to the underground HWMUs. Alternatively, reference where in the permit application this information is presented.

12. **Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(3)(f), Subsurface Structures, Underground Ventilation Modes of Operation, page D-35, Lines 25-32.**

The permit application indicates that the filtration mode is activated manually or automatically if the radiation monitoring system detects abnormally high concentrations of airborne radioactive particulates, or if an alarm is received from one continuous air monitor at Station A. According to the co-detection concept proposed by DOE, if releases of radioactive particulates or radiation occur, it means that releases of hazardous constituents has also occurred. Since the HEPA filters are not designed to remove volatile organic hazardous constituents from the exhaust air, the released hazardous constituents may be released directly to the environment. Revise this Section of the permit application, and Section D-9e(1), Volatile Organic Compound Monitoring (page D-49) to state that in addition to the routine VOC air monitoring program (General Comment No. 19), the exhaust air from the Exhaust

Filter Building will be monitored for releases of volatile organic constituents any time the filtration mode of the ventilation system is activated.

13. Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(3)(f), Underground Ventilation System Description, Page D-34, Lines 25-32.

Ventilation rates in waste-filled rooms and panel entry drifts are not explicitly provided in the text. However, a footnote to Table D9-1 states that the panel ventilation rate includes 2,000 cfm for each of 6 filled rooms (while the last room is being filled). The ventilation rate in waste-filled rooms is an important factor in preventing accumulate flammable or explosive gas mixtures or VOC vapor concentrations in excess of those in Table D-3. In accordance with 20 NMAC 4.1, Subpart V, § 264.601, revise the text to explain whether 2,000 cfm ventilation will be maintained in each waste-filled room until the panel closure seals are installed. (If not, revise Table D9-1.) Include a description of the means to be used to ensure that this flow rate is maintained in each waste-filled room. Also include a separate description of the means for maintaining and ensuring similar ventilation of the filled portions of the main access drift disposal zone(s).

14. Chapter D, Section D-9, Miscellaneous Unit, Section D-9a(3)(g), Containers, pages D-36 through D-38.

The permit application does not provide the dimensions of all of the CH waste containers so that the maximum waste stacking height can be verified. In accordance with 20 NMAC 4.1, Subpart V, § 264.601, revise the permit application to provide the dimensions of a 55-gallon drum, the standard waste box, and the 83-gallon overpack drum.

15. Chapter D, Section D-9, Miscellaneous Unit, Section D-9b, Waste Characterization, page D-38, lines 24-26.

This section of the permit application defers to Chapter C of the permit application for information concerning TRU mixed waste characterization. While reference to Chapter C for detailed waste identification and characterization information is acceptable, this section of Chapter D must provide a synopsis of the waste characterization data as it relates to the safe operation of the miscellaneous unit. In accordance with 20 NMAC 4.1, Subpart V, § 264.601, revise this section of the permit application to provide:

- A brief discussion of the compatibility of the waste types with all of the container types to be used to dispose of waste to ensure that breaches of the containers due to corrosion and will not occur prior to placement of panel seals;

- A brief description of the potential for breaching of containers due to the build-up of internal pressure as a result of gas and/or heat generation due to reactions of the waste within a container

16. Chapter D, Section D-9, Miscellaneous Unit, Section D-9e(1), Monitoring, Panel 1 Ground Control Activities, Page D-43, Lines 5-9.

The permit application states that "Ground-support systems cannot resist salt creep, so in order to provide long-term support, the ground-control system must be able to accommodate the continuous creep of salt and to restrain broken and or fractured rock in the roof." In accordance with 20 NMAC 4.1, Subpart V, § 264.601, revise the permit application to describe how the ground-control system that is in place in panel 1 and the ground-control system that will be used in panels 2-8 has been designed to accommodate salt creep while continuing to restrain broken and fractured rock. Include an evaluation of the adequacy of the design to accommodate salt creep once waste has been emplaced in a disposal room or disposal room access drift and access to the ground-control system for maintenance purposes is no longer possible.

17. Chapter D, Section D-9, Miscellaneous Unit, Section D-9e(1), Monitoring, Panel 1 Ground Control Activities, Page D-43, Lines 15-27.

The permit application states that the consensus of the expert review panel was that a life of 7 to 11 years could be expected from room 1, panel 1, with limited maintenance. However, the permit application does not clearly state that the expert panels 7-11 year room life estimate was from the time of initial excavation and that the panel was assuming that the initial rock bolt system was in place. Revise the permit application to clearly state the assumptions on which the conclusions of the expert panel were based.

18. Chapter D, Section D-9, Miscellaneous Unit, Section D-9e(1), Monitoring, Panel 1 Ground Control Activities, Page D-43, Lines 28-33.

The permit application identifies ground-support needs for panel 1 and describes the supplemental roof support systems installed in Rooms 1 and 2, but does not describe whether supplemental roof support systems will be required to maintain roof stability during the disposal phase. Since the youngest panel 1 disposal room, room 7, was excavated in 1988, the panel 1 disposal rooms will be approaching end of the 7-11 year life estimated by the expert panel. As a result, it is likely that a supplemental roof support system will be required for panel 1 disposal rooms 3-7 to ensure that the roofs will remain stable during the disposal phase. Revise the permit application to provide an evaluation of the remaining active life of disposal rooms 3-7 and the disposal room access drifts in panel 1 compared to the length of time that will be required to fill and seal panel 1. Provide detailed design and installation information

describing any supplementary support systems that may be required to extend the active life of the remaining panel 1 rooms.

19. Chapter D, Section D-9, Miscellaneous Unit, Section D-9e(1), Monitoring, Air Monitoring, Page D-45, Lines 17-23.

The permit application indicates that the requirements and results of air monitoring conducted to comply with DOE Orders are fully discussed in the NESHAPs data package that was prepared and submitted to the EPA. In accordance with 20 NMAC 4.1, Subpart V, § 264.601(c)(5), provide a brief synopsis of the data package and a complete reference for this document.

COMMENTS: TABLES AND FIGURES

1. **Chapter D, Figure D-21, RH-72B Shielded Road Cask for RH Transuranic Mixed Waste and Figure D-22, Road Cask Transfer Car.**

   The information provided in Figure D-22 is not consistent with Figure D-21. A dashed line provided on Figure D-22 shows the position of the Shielded Road Cask mounted vertically on the Road Cask Transfer Car. However, the Shielded Road Cask center pivot support trunnions (which presumably fit into the support saddle on the Road Cask Transfer Car) are shown on Figure D-21 as being mounted on the center axis of the Shielded Road Cask, while on Figure D-22, the center pivot support trunnions are shown as being very close to one end of the Shielded Road Cask. Revise the appropriate Figure to correct this discrepancy.

APPENDIX D9

1. **Chapter D, Appendix D9, Table D9-1, Maximum Occupational Exposure From Underground Waste Emissions, Page D9-1.**

Table D9-1 contains VOC emission rates in column 3, labelled Carbon Composite Filter Diffusion (mole/s/molefrac), which is abbreviated as DF in the formulas below this table. The source of these values is not referenced. Revise the permit application to provide the source of the DF values used in Table D9-1. Include a description of the test equipment, methods, procedures and data used to calculate the DF values.

The source of the DF values appears to be Appendix DIF of the No Migration Variance Petition (NMVP) that was submitted to the U.S. EPA office of solid waste. If the NMVP was the source of the DF values, then DOE should be aware that discrepancies have been found between the information provided in the permit application and the information provided in the NMVP. For instance, the drum filter emission rates and "headspace" mole fraction values reported in the No Migration Variance Petition, Appendix DIF (Transport Characteristics Across Drum Filter Vents and Polymer Bags, K. J. Liekhus, August 1994, EGG-WM-11454) do not agree with the DF values in Table D9-1. For example, Appendix DIF provides the following values:

VOC	Diffusion Characteristic (mol s^{-1} X 10^7) for NFT-013 filter	Air Concentration in Test Vessel (ppmv)
Carbon Tet.	10.6	301
M. Chloride	17.7	1010
Toluene	13.2	398

These are the only VOCs in Appendix DIF which are also in Table D9-1. To compare these values with DF values in Table D9-1, the Diffusion Characteristic must be divided by the mole fraction (Air Concentration divided by one million). The results are compared below:

VOC	DF from Table D9-1 (moles/s/molefrac)	DF from Appendix DIF (same units)
Carbon Tet.	1.21×10^{-6}	3.52×10^{-3}
M. Chloride	1.48×10^{-6}	1.75×10^{-3}
Toluene	1.20×10^{-6}	3.32×10^{-3}

There appear to be major discrepancies between the permit application and the NMVP. In particular, Appendix DIF does not establish the linear dependence of rate of diffusion across a filter on the concentration of VOC vapor inside the test vessel (or a drum). Although this concept is logical, the tests reported in Appendix DIF used only two mixtures of different VOC vapors, not different concentrations of the same VOCs. These discrepancies should be resolved if the NMVP information is to be used in the permit application.

2. **Chapter D, Appendix D9, Table D9-1, Maximum Occupational Exposure From Underground Waste Emissions, Page D9-1.**

Column 4 of Table D9-1 contains the weighted average drum headspace concentrations (ppmv). However, the source for these concentrations is not referenced. Revise the permit application to provide the source of the weighted headspace concentrations for both the carcinogenic and noncarcinogenic chemicals used in Table D9-1; include descriptions of the methods, calculations and data used to calculate the concentrations. Also, discuss the screening methodology used to determine the selected VOCs.

The source of the drum headspace concentrations appears to be Appendix VOC of the NMVP. If the source of the drum headspace concentrations is the NMVP, the DOE should be aware that discrepancies have been found between the NMVP and the permit application. For instance, the weighted average headspace concentrations for both carcinogens and noncarcinogens reported in the NMVP, Appendix VOC (VOC Screening Methodology) do not agree with the weighted average headspace concentrations for the noncarcinogenic chemicals in Table D9-1.

For example, Appendix VOC of the NMVP calculates the conversion from headspace concentrations in micrograms per cubic meter to parts per million per volume for noncarcinogenic chemicals using the following formula:

where:

$$HS_{(ppmv)} = \frac{HS_{n(mg/m^3)} x 24.45}{MW}$$

HS = weighted average headspace concentration, ppmv
HS_n = weighted average headspace concentration, mg/m^3
MW = molecular weight, chemical specific

However, Table VOC-2 (Results of the VOC Screening Using Headspace Concentrations) in Appendix VOC lists the headspace concentrations for noncarcinogens in the bottom half of column 5 in units of $\mu g/m^3$. Sample calculations performed using the values presented in Table VOC-2, indicate that the above formula was used using the headspace concentrations in micrograms per cubic meter. Therefore, it is not clear whether the values for the headspace concentrations were labeled incorrectly in Table VOC-2 or if the calculations were performed incorrectly.

Further, the weighted average drum headspace concentration for toluene was reported as 16.69 ppmv in Table VOC-2 and as 18.89 ppmv in Table D9-1. Upon application of the above formula, it appears as if the values reported in Table VOC-2 are correct.

There appear to be major discrepancies between the permit application and the NMVP. In particular, Appendix VOC provides the methodology used in performing the screening analysis to determine the VOCs to be selected for the risk analysis. However, the methodology appears to be unsubstantiated, particularly if this logic is to be applied to the Part B permit application. For example, several chemicals were screened out on the basis that the chemical was either site specific or not listed as both an Appendix VIII and as a QAPP identified chemical. Since the WIPP permit application appears to rely on the NMVP for the determination of the selected VOCs, the screening methodology should be carefully evaluated in order to demonstrate compliance with the § 264.601 environmental performance standards.

3. **Chapter D, Appendix D9, Table D9-3, Maximum Public Exposure Concentration at the LWB From Underground Waste Emissions, Pages D9-3 and D9-4.**

The 35-year health-based limits for the selected VOCs are listed in column 4 of Table D9-3. However, the source of these values is not referenced. Revise the permit application to include all appropriate references for the determination of the 35-year health-based limits as presented in Table D9-3. Also, provide the equations and methodologies used in these references.

The No Migration Variance Petition, Chapter 5 (Environmental Impact Analysis) appears to be the reference for the health-based limits. However, the methodologies for determining the health-based limits as discussed in Chapter 5 of the NMVP contain several discrepancies that should be addressed prior to submittal within the permit application.

For example, the formula used to calculate the health-based limits for carcinogens contains an absorption factor in the denominator of the equation. However, an absorption factor is applied to determining limits in relation to soil ingestion and dermal exposure, not to direct inhalation scenarios. Also, when calculating a health-based limit due to inhalation, an exposure time is factored into the equation, which was not included.

Further, in calculating the health-based levels for noncarcinogens, exposure time, exposure frequency and exposure duration terms were added unnecessarily to the equation. (Although these terms were set so that they cancelled each other out.) The hazard quotient, which should be revised to be the hazard index, was assumed to be one (which is correct, since a single exposure pathway was considered). Although EPA has in the past said a hazard index with a value of one or less is assumed to mean no significant adverse health effects would be expected, recent EPA guidance

has stated that an assumption that 75% of the hazard index is reserved for exposure to background constituents, and therefore a hazard index of 0.25 should be the ceiling value. DOE should consider this when conducting risk assessment calculations for noncarcinogens.

4. Chapter D, Appendix D9, Calculation Briefs for Environmental Performance Standards, Table D9-3.

Appendix D9, Table D9-3 provides the maximum public exposure concentration at the Land Withdrawal Act Boundary from underground waste emissions of various constituents. Revise the permit application to address the following concerns that were noted relative to the information provided in the Table, pertinent to the example calculations that were used to obtain the exposure concentrations:

A. Column 9 of Table D9-3 contains the calculated excess cancer risk to the public. The related footnote states that this is based upon EPA Risk Assessment/Guidance for Superfund Sites and RCRA Proposed Subpart S methodology, as explained in the WIPP No-Migration Variance Petition (NMVP). However, the NMVP does not explain the excess risk calculation. Although EPA guidance for risk assessment does provide methods for determining excess risk, these methodologies do not coincide with the formula presented on page D9-4 of the permit application. Revise the permit application to discuss on what the formula for excess risk was based on to include proper references for this calculation. Also include discussion on parameters assumptions.

B. The calculation for the single closed panel emissions does not appear to include a source term such as the average drum emission rate. It is not clear whether this is a typographical error, or whether the constituent emission rate has been factored into the equation in some other manner. Revise the permit application to clearly state how the source term has been incorporated into single closed panel emissions calculation. If the lack of a source term in the example calculation on Table D9-3 is a simple typographical error, then revise the example calculation to show the source term component. If the source term component has been factored into the equation in some other manner, then revise the example calculation to clearly show how the source term has been incorporated. If an error has been made in the emissions calculations by not including a source term component, then revise all of the emissions calculations to obtain the correct emissions rates.

C. The calculation for the single closed panel emissions includes an average gas generation rate, and an equivalent gas generation rate due to panel volumetric reduction (creep). However, the permit application does not describe why the gas generation factors were included in the calculations or how the factors

were calculated. Revise the permit application to describe why the average gas generation rate and equivalent gas generation rate factors were included in the calculations and to include a detailed description of how the factors are calculated.

D. In comparing the selected VOCs, as listed in Table D-3, to the list of detected compounds in Table C2-1, a discrepancy with carbon disulfide occurs. Although Table D-3 lists carbon disulfide as a selected VOC, Table C2-1 does not list carbon disulfide as a detected component of the TRU mixed waste. The permit application does not address why carbon disulfide was chosen as a selected VOC in determining risk to both occupational workers and the public, when this compound was not detected in analyses of the waste. Revise the permit application to include a justification of the selected VOCs for the risk assessment.

E. Also, Table D-3 lists 1,1-Dichloroethene, while Table C2-1 lists this compound as 1,1-Dichloroethylene. Although these names apply to the same compound, it is confusing. Modify for consistency.

WIPP PART B PERMIT APPLICATION REVIEW
GROUNDWATER MONITORING

CHAPTER E

GENERAL COMMENTS

1. The permit application states on page D-39 that the "exposure of humans or the environmental receptors to hazardous waste or hazardous constitutions via the groundwater or subsurface environment will be unlikely," but provides only two paragraphs of information supporting this assertion. The section also references Section E for contaminant migration pathway discussion. However, neither Chapter D or E specifically address the environmental performance standards that must be met to ensure protection of human health and the environment. The permit application must be revised to address the specific elements which prevent releases of potential contaminants, that may have adverse effects on human health and the environment due to migration of waste constituents in ground water, as presented in 20 NMAC 4.1 § 264.601(a)(1)-(9). (See General Comment No. 15, Chapter D.) Revise the permit application to include this information within Chapter D of the permit application.

   Although some of the necessary supporting documentation is included in Appendices E1 and D6, the permit application does not correlate this information with the environmental performance standards that must be addressed, at least in a preliminary fashion, in accordance with 20 NMAC 2.1 Section V, § 264.600-603. When revising Chapter D to incorporate performance standard requirements, ensure that all supporting Appendices are referenced in detail (reference the specific location within the Appendix that addresses the standard of interest). Also, revise the permit application to discuss the environmental performance standards for the operational and post closure periods separately, unless the applicant can justify why, in the permit application, conditions during both time periods will be identical.

2. Chapter E does not provide any references for the assertions presented in the section, particularly those included in Section E-1c. Refer to the Specific Comments below, which require justification of specific statements/numbers or assumptions, or appropriate referencing of supporting material.

3. DOE does not discuss any groundwater modeling currently being used and created by Sandia National Laboratories as applied to the WIPP. This information provides the most up-to-date understanding of groundwater flow in and around the WIPP, and is important to understanding the impact of gas generation on facility closure and groundwater transport, particularly during the near- term post-closure period. Revise the permit application to include this information. The groundwater modeling that has been employed at Sandia

National Laboratories, such as the program BRAGFLO, should be used to discuss the possibility of contaminants migrating up the shaft and into (and through) the Culebra, as well as lateral contaminant migration through Salado marker beds.

WIPP PART B PERMIT APPLICATION REVIEW
GROUNDWATER MONITORING

CHAPTER E

SPECIFIC COMMENTS

1. **Chapter E, E-1 Compliance with Groundwater Protection Requirements, Page E-1, lines 4-11 and 13-23.**

   The permit application states that groundwater monitoring of the uppermost aquifer below the facility is not proposed because this water-bearing unit is not considered a credible pathway for release from the repository. Yet, the section does not provide a reference for this assertion, and appendices referenced in other portions of the section do not specifically address this claim. Revise the permit application to include information regarding this assertion, and appropriately reference this information within the body of the text.

   Additionally, lines 12-18 begin with discussion of contaminant transport to the Culebra (above the facility), but then reiterates the assertion made in the previous paragraph regarding the uppermost aquifer below the facility, which is confusing. Revise the permit application to clarify this discussion, perhaps by moving the discussion in lines 15-18 to the discussion pertaining to the underlying aquifer in the previous paragraph.

   Lines 19 - 23 state Appendix E1 demonstrates that groundwater monitoring at the WIPP is not required to ensure the protection of human health and the environment, and that migration of contaminants from the repository via the groundwater pathway is unlikely. As shown in specific comments pertaining to Appendix E1 (see attached), this assertion is not adequately demonstrated, particularly relative to environmental performance standards and contaminant transport during the closure and post-closure periods. Revise the permit application to address the concerns expressed in Appendix E1 comments, as well as General Comments Nos. 1 and 3, above.

2. **Chapter E, E-1 Compliance with Groundwater Protection Requirements, Page E-1, Lines 24 - 28.**

   The permit application states that it would be beneficial to continue the Culebra groundwater monitoring program. However, in lines 26 - 28, the applicant asks the EPA Regional VI Administrator to find that there is no potential for migration of liquid (groundwater or brine) to the "uppermost and other aquifers during the active life of the facility, including the post-closure care period." This statement is

contradictory; revise the permit application to clarify whether DOE intends to continue the Culebra groundwater monitoring program, and under what venue.

Additionally, groundwater modeling, including the programs BRAGFLO, the SECO codes, VAST and NUTS, has demonstrated that it is possible that contaminated groundwater or brine could flow from the repository into the Culebra, if specific assumptions regarding seal design, unit permeability, etc. are not met. Any discussion or wholesale statements regarding the confinement capabilities of the WIPP should be tempered with an understanding of the assumptions associated with this statement, and the application must be revised to discuss the appropriateness of these assumptions more thoroughly (Refer to General Comment No. 3, above).

Also, revise the permit application to explain why the Region VI Administrator, rather than the NMED, is to provide the ruling on whether or not DOE must maintain a Culebra monitoring program, given that this application has been submitted to the NMED and NMED has authorization over groundwater monitoring programs associated with the Part B permit application.

3. **Chapter E, Section E-1c, No Migration, Pages E-2 through E-3.**

This section of the permit application was apparently written to support the requirement presented in 20 NMAC Section 4.1, § 264.90 (a)(4), which indicates that if the NMED finds that there is no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit (including the closure/post closure period), then a groundwater monitoring waiver can be acquired. The application is signed by a certified/qualified geologist, as required by the regulation, but the permit application does not address other critical elements of this demonstration. As stated in the above regulatory citation, the permit application must "provide an adequate margin of safety in the prediction of potential migration of liquid....(basing) any predictions made ...on assumptions that maximize the rate of liquid migration". The permit application does not address this assumption. Revise the permit application to include a detailed discussion of those elements which maximize the rate of fluid migration, including but not limited to: seal permeability, gas generation effects, contaminant source term, etc. Provide a detailed, comprehensive discussion, including groundwater modeling, which assumes parameters and conditions that maximize fluid flow, as required by the regulations.

4. **Chapter E, Section E-1c, No Migration, Pages E-2 through E-3.**

The permit application presents, in this section, a discussion that the applicant believes that migration of hazardous constituents from the WIPP facility through groundwater is unlikely. However, the discussion is not "balanced", and claims

presented in the section are sometimes unsubstantiated and are based upon confusing logic and unsubstantiated conclusions. That is, the application makes blanket statements regarding facility characteristics, when alternative interpretations or additional information are available that bring to questions the presented interpretation. The following issues arise from review of this section that illustrate these concerns, which the permit application must be revised to address:

- While the Salado may be of low permeability, considerable attention has been paid to the potential for fluid flow and, hence, contaminant transport, through marker beds, which are not discussed or introduced in this section. No references are included which site where this information is presented.
  cite

- The permit application states that measured inflow of brine is minimal, but does not indicate whether this inflow rate is significantly impacted by mine ventilation, and what effect dissipation of this ventilation will have on brine inflow. Brine inflow rate relative to creep closure is also not discussed or referenced.

- In lines 29 - 41, the applicant assumes that the shaft seals will be emplaced perfectly, preventing any migration of brine from the repository to any water-bearing units via the shaft. However, the application does not provide any justification that this is indeed true, and only includes conceptual designs for the shaft seals. The application includes no discussion of groundwater modeling, gas generation and pressure buildup which would either support of negate the above conclusion.

- The permit application states, on lines 1 and 2, page E-3, that there must be a driving force for constituents to migrate from the repository to water-bearing units. However, the subsequent paragraph does not discuss the effects of gas generation and subsequent pressure buildup with time, which could serve as a significant driving force. Additionally, discussion pertaining to contaminant transport models is lacking, which include some consideration for gas generation and fracture opening scenarios.

- Lines 5 and 6 state that the Mescalero Caliche will prevent surface water from reaching groundwater, and visa versa. However, the permit application does not demonstrate that the Mescalero Caliche is a consistent unit through out the WIPP area, including suspected areas of recharge (see Comment No. 6, Appendix D6). Also, the lack of near surface water bearing features could mean the opposite of what is inferred in this section (e.g. karst terrain). Additionally, there is no discussion, within the application, regarding the "regional water table", nor is pertinent supporting information in associated appendices even referenced.

- Lines 9 - 12 mention several studies which demonstrate that recharge to the Rustler units is not occurring at or near the WIPP facility. However, references for these studies and synopses of the studies that resulted in these conclusions were not provided.

- Information presented in Appendix E1 and D6 include only scant discussion of vertical gradients, of which the text of the application relies heavily upon to demonstrate that natural fluid flow is "toward" the repository. Additional detailed discussion of vertical gradients is required to support this blanket statement (See General Comment No. 3, Appendix D6). Further, the blanket statement that there is "no potential for migration of liquid from the underground hazardous waste management units" (lines 29-31) conflicts with the previous statement on page E-2, lines 9-10 that "the migration of hazardous waste or hazardous constituents form the WIPP facility... through groundwater is unlikely".

- The statement, in lines 20-22, that no migration pathways or hydraulic gradients exist during the disposal phase is unsubstantiated. Refer to the bulleted comment, above. Additionally, the request for the exemption (lines 32-24) does not include the requisite demonstration, in 20 NMAC 4.1, § 264.90(a)(4) (Refer to Specific Comment No. 3, above).

- The permit application should include a synopsis of existing groundwater quality information that could serve as "background" information. Alternatively, reference where, in the Appendices, this information is included.

5. **Chapter E, Sections E-6, General Monitoring Program Requirements, and Section E-7, Detection Monitoring Program, Page E-7.**

As presented in General Comment No. 1, above, the permit application does not adequately discuss whether the performance standards for Subpart X units have been met, nor does it demonstrate that the specific waiver requirements of § 264.90(a)(4) have been met. Revise the permit application to include a detection monitoring program. Alternatively, revise the permit application to sufficiently demonstrate that environmental performance standards of 20 NMAC 4.1, Subpart V, § 264.601 have been met.

relationship of detection monitoring, plume, + compliance monitoring

APPENDIX E1

GENERAL COMMENTS

1. The permit application provides generalized site characterization information in support of the applicant's groundwater monitoring variance request. However, this information must be presented to demonstrate compliance with performance standards (see General comment No.1, Chapter E), and should also, in the appropriate location, differentiate between operational/closure, and post-closure demonstrations, as per 20 NMAC Subpart 4.1, § 264.601 and 603, respectively. Revise the permit application to address these concerns, in the manner described in General Comment No. 1, Chapter E.

2. The permit application includes information relative to groundwater in Sections E, Appendix E1, and Appendix D6. However, information presented within these sections is sometimes inconsistent, too generally referenced, or contains confusing references (e.g., references to "Chapters" 5.0, 6.0 and 7.0, in Appendix E1, Section E1-2, Page E1-3, when this appendix includes no such specific chapters). Revise the permit application to ensure consistency and clarity. Additionally, provision of "arguments" and supporting information in two separate appendices is confusing, as this requires continual cross referencing to ensure that the "fact" presented in one is indeed supported by data within the other. Revise the permit application to combine Appendices E1 and D6 so that one appendix is created that presents both the arguments and supporting data.

3. This appendix does not sufficiently reference where in the permit application supporting information regarding conclusions and assertions are provided. For example, on Page E1-4, the permit application discusses the facility location relative to population centers, land use, water quality, hydraulic interconnection, and water supply wells, without indicating specifically where, in the permit application, supporting information is presented. Revise the permit application to include this information or specifically reference where, in the permit application, this information is included. Alternatively, refer to General Comment No. 2, above.

APPENDIX E-1

SPECIFIC COMMENTS

1. **Appendix E1, Section E1-1, Introduction, Page E1-1, Lines 21-26.**

   The permit application states that groundwater monitoring in accordance with 20 NMAC Subpart V, § 264.90 - 264.101 applies only if said monitoring is necessary to demonstrate compliance with Subpart X performance standards. However, the 1987 preamble to Subpart X regulations clearly indicates that groundwater monitoring needs for Subpart X units are to be flexible, and does not mandate that any monitoring strictly adhere to § 264.90-101 requirements. The applicant may wish to consider this when addressing comments pertaining to groundwater monitoring, Chapter E, and Appendices E1 and D6.

2. **Appendix E1, Section E1-1, Introduction, Page E1-1, Lines 36-38.**

   The permit application states that Appendix E1 is included to demonstrate compliance with 20 NMAC 4.1 Subpart V, § 264.601(a) and § 264.602. However, the information does not focus on the operational period. Revise this statement in the permit application to indicate that this information is (more) pertinent to the post-closure period. ?

3. **Appendix E1, Section E1-1, Introduction, Page E1-2, Lines 1-21.**

   Revise this section of the permit application to clarify, specifically, the formation/unit that the applicant believes to be the uppermost aquifer. 20 NMAC Section 4.1, Subpart F specifies that the uppermost aquifer be monitored. This is assuming, however, that the HWMU(s) to be monitored is at land surface, and the uppermost aquifer is the first contaminant transport pathway that releases from the unit could encounter. In the case of WIPP, the uppermost unit of concern may not be the same as that if WIPP were at land surface. Revise the permit application to specify the aquifer in consideration, and to justify, as necessary, this designation. Also, this evaluation should include, initially, all of the performance standards presented in 20 NMAC, Section 4.1, § 264.601(a)(b) in a preliminary fashion; if this appendix is intended to provide more detailed information regarding specific performance standards, it should so specify. Revise the permit application accordingly.

4. **Appendix E1, Section E1-2, Groundwater Protection Summary, Page E1-3, Lines 8-19.**

   The permit application states that information presented in Appendix D6 includes information obtained up to 1987, yet this appendix includes some - but not all -

information acquired after this date. Revise Appendix D6 of the permit application to include more recent information. Also refer to General Comment 3, Chapter D, for statements in lines 15-17 regarding the adequacy of information presented in Chapter D.

Page E1-3

5. **Appendix E1, Section E1-2, Groundwater Protection Summary, Lines 20-25.**

The permit application states that "groundwater will not come in contact with the waste" and "there is no potential for <u>any</u> (emphasis added) possible contaminated groundwater to migrate from the disposal horizon to the accessible environment due to ...natural hydraulic gradients." These statements are not necessarily true for the following reasons:

- The permit application does not sufficiently demonstrate or discuss the containment capacity of seals (see Specific Comment No. 4, Chapter E).

- The permit application does not adequately discuss the potential for brine inflow and the total impact of said brine on containment capacity of the facility, particularly during the post-closure (post room closure) period (see Specific Comment No.4, Chapter E).

- The permit application does not adequately discuss hydraulic gradients (See General Comment No 3, Appendix D6).

6. **Appendix E1-2, Section E1-2, Groundwater Protection Summary, Page E1-3, Lines 27-32.**

The permit application implies that distance from land surface impacts the determination of the most likely contaminant transport pathway. However, the most likely contaminant transport pathway is a result of stratigraphic position of the facility, rather than depth. Revise the permit application to address this.

7. **Appendix E1-2, Section E1-2, Groundwater Protection Summary, Pages E1-3 - E1-4, Lines 40, and Lines 1-5, respectively.**

The permit application states that shaft design will mitigate inflow of water from overlying units, but does not reference where, in the application, the supporting information relative to this assertion is included. Also, the permit application indicates that shaft seals will mitigate fluid movement, but does not provide (or reference) specific information pertaining to seal design (e.g., permeability) to support this assertion. Revise the permit application to include this information, or specifically reference where it is included.

8. **Appendix E1, Section E1-2, Groundwater Protection Summary, Page E1-4, Lines 29 - 40.**

The permit application states that there is no transport medium, pathway, or driving force to move contaminants from the repository. However, the permit application does not differentiate between the operational and post-closure periods relative to application of performance standards, nor does it include or reference any discussion of seal design, brine inflow, and gas generation, all of which could seriously impact containment capacity of the WIPP. Further, statements regarding pathway feasibility, gradients, etc. are unsubstantiated and unreferenced. Revise the permit application to address these concerns.

9. **Appendix E1, Section E1-3, Geographical Setting and Land Use, Page E1-5, Line 9.**

The permit application indicates that Appendix D6 includes more detailed information regarding geographical setting, but comparable information is not included in Appendix D6. Revise the permit application to include this information, or to reference where, in the permit application, this information is presented.

10. **Appendix E1, Section E1-3, Geographical Setting and Land Use, Section E1-3a, Geographical Setting, Page E1-5, Lines 32-34.**

Revise the permit application to include the origin of dissolution associated with the San Simon Sink, or to reference where, in the permit application, this information is presented. Additionally, this section should be revised to reference specific figures that present the features discussed in this section of Appendix E1.

11. **Appendix E1, Section E1-3, Geographical Setting and Land Use, Section E1-3b, Land Use, Page E1-6, Lines 10-32.**

Revise the permit application to reference figures that present the features discussed in this subsection. Alternatively, revise the permit application to provide these figures, if not already included.

12. **Appendix E1, Section E1-4, Geology, Pages E1-6 - E1-10.**

Because this section relies heavily upon Appendix D6 for supporting information, Appendix D6 was reviewed relative to information included in this section to avoid duplication of comments. Revise this section of Appendix E1 to reflect commentary on Appendix D6, as applicable.

13. **Appendix E1, Section E1-5, Climatology and Water Balance, Section E1-56, Local Water Balance, Pages E1-10 - E1-11.**

The permit application includes discussions pertaining to a regional water balance study and a"recent hydrogeologic study," but more detailed information regarding these studies is required to substantiate conclusions presented in this section, including conclusions presented in lines 20-22, page E1-11. Revise the permit application to include this information.

14. **Appendix E1, Section E1-5, Climatology and Water Balance, Section E1-56, Local Water Balance, Page E1-11, Lines 23-27.**

Revise the permit application to include a more detailed discussion regarding conclusions drawn in these lines regarding infiltration/recharge and contaminant migration. These statements are vague and unsubstantiated as presented in the permit application.

15. **Appendix E1, Section E1-6, Site Hydrology and Water Quality, Pages E1-11 E-17.**

The permit application does not adequately reference figures presenting discussed features, nor does it adequately reference where, in Appendix D6, supporting information is included. Revise Appendix E1 to address these concerns.

16. **Appendix E1, Section E1-6, Site Hydrology and Water Quality, Section E1-6b, Subsurface Hydrology, Page E1-12, Lines 10 and 11.**

In these lines, the permit application states that brine and gas occurrences are "described," but does not indicate where. Revise the permit application to adequately reference the descriptions of brine and gas occurrences.

17. **Appendix E1, Section E1-6, Site Hydrology and Water Quality, Section E1-6b, Subsurface Hydrology.**

Because this section relies heavily upon Appendix D6 for supporting information, refer to comments on D6 regarding deficiencies in this section, and revise the permit application accordingly.

18. **Appendix E1, Section E1-6, Site Hydrology and Water Quality, Section E1-6b, Subsurface Hydrology, Section E1-6b(2), Hydrology of the Salado Formation, Pages E1-13 - E1-14.**

Revise the permit application to address the following:

- It is not clear that the specific conclusions drawn in this section are supported by specific information presented in Appendix D6. Further, information presented in Appendix D6 is not substantiated, nor is a concise and balanced discussion of brine inflow information presented in this section or Appendix D6.

- The discussion pertaining to marker beds in the Salado is incomplete, as it does not consider gas generation effects on these marker beds, particularly during the post closure period.

- The blanket statement, on page E1-14, lines 1 and 2 that "migration to overlying or underlying water-bearing units will not occur", is unsubstantiated, as the permit application does not discuss the specific cumulative impact that gas generation, room closure, brine inflow, and seal design, will have on containment capabilities of the facility. Revise the permit application to present this information. Include any modeling that simulates these events during the post-closure period.

19. **Appendix E1, Section E1-6, Site Hydrology and Water Quality, Section E1-6b, Subsurface Hydrology, Section E1-6b(2), Hydrology of the Salado Formation, Page E1-14, Lines 6 - 31.**

Information and conclusions presented in this section are not fully substantiated by Appendix D6. Specifically, discussion pertaining to brine inflow relative to ventilation, brine origin, age, composition, are incomplete. Revise the permit application to address these concerns.

20. **Appendix E1, Section E1-7, WIPP Facility Design, Section E1-7a, Shaft Designs, Page E1-18, Lines 12 - 42.**

Revise the permit application to include figures presenting the shaft design features which are intended to inhibit groundwater flow into the shafts from overlying water-bearing units. Include the design life of the seals, any malfunctions of the seals noted to date, and estimated groundwater inflow to the seal collection devices. Alternatively, reference where in the permit application this information is included.

21. **Appendix E1, Section E1-7, WIPP Facility Design, Section E1-7b, Repository Seals, Pages E1-18 - E1-19.**

The permit application does not include, or reference, sufficiently detailed seal design information to ensure brine containment. The application admits brine inflow will occur, but fails to demonstrate how shaft seals will ensure containment when taken in concert with brine inflow, gas generation, and room/panel closure situations. Revise the permit application to include this information, including any modeling done

relative to this; ensure that sufficient model documentation is included or referenced with the application to allow for substantive review of this information.

22. **Appendix E1-8, Waste Containment, Page E1-19, Lines 15 - 31.**

The permit application indicates that waste containers "isolate the waste during waste emplacement operations and remain effective until after panel closure and sealing." However, the permit application includes no information to support this assertion, as well as any claims relative to panel/salt creep closure vs. drum effectiveness. The shaft seal statement (lines 21 and 22) is unsubstantiated (see Comment No. E1-20, above). Further, the issues of gas generation and waste loading relative to hydrogen/methane and VOCs is not sufficiently addressed in the application, and the potential occurrence of incompatible waste requires additional clarification (refer to comments pertaining to appendix C1).

23. **Appendix E1-9, Summary and Conclusions, Pages E1-19 - E1-20.**

The permit application does not conclusively demonstrate the containment capability of WIPP relative to groundwater, particularly during the post closure period. In light of the above comments, revise section E1-9 of Appendix E1 accordingly.

APPENDIX D6

GENERAL COMMENTS

1. Appendix D6 of the permit application includes information regarding the results of studies, some of which provide differing interpretations of the same physical conditions. Additionally, the significance of some studies relative to site containment capabilities is not clear. For example, significance of void-filling salts/anhydrite within the Culebra is not explicitly discussed relative to groundwater flow, nor does the applicant take a position relative to the various Salado marker bed textures (e.g.primary/synsedimentary vs. secondary/recrystallization features). Revise Appendix D6, where necessary, to include these sorts of explanations and interpretations. This is important because while those very familiar with the WIPP can attempt to "fill in the blanks" the unindoctrinated reader is sometimes left wondering about the significance of a particular study, condition, etc.

2. Appendix D6 does not include a discussion regarding modeling efforts that are ongoing relative to fluid flow within the Salado and Culebra, although the Appendix infers that data presented therein is to support modeling efforts. Revise Appendix D6 to include this information, including but not limited to summary discussions of models being used, assumptions and limitations of these models [e.g. significance of Culebra thickness variations cited in section D6-1c(5)(b)], and modeling results relative to groundwater flow and potential contaminant transport, with an emphasis on the operational and post closure period.

3. Appendix D6 includes discussion of site groundwater hydrology, but should include a specific subsection that discusses the head potential within the Bell Canyon, Castile, Salado, Culebra (and each Rustler unit), Dewey Lake, and Santa Rosa Formations to support the applicant's assertions in Appendix E1 that head differentials would preclude contaminant migration from the Salado to the Rustler or underlying units. Include freshwater head corrections.

APPENDIX D-6

SPECIFIC COMMENTS

1. **Appendix D6, Introduction, page D6-1, Lines 24-28.**

   Revise the permit application to specify the geophysical techniques discussed in this section, or to reference where, in the permit application, these activities are discussed more thoroughly.

2. **Appendix D6, Introduction, Page D6-2, Lines 4-10.**

   The permit application states that the formation in which WIPP has been constructed is deep enough to reduce the potential for dissolution and is without complicated structure. However, information presented in other portions of this section and other geologic documentation pertaining to WIPP indicate that deep-seated dissolution has been a concern to some, and structure within the Castile, that often translates to the Salado, occurs within the region. Revise the permit application to specify that the depth relationship is specific to potential dissolution from ground surface, and that the uncomplicated structure is a local feature. Also revise the permit application to include the specific site-selection criteria cited in this section.

3. **Appendix D6, Section D6-1 Geology, Section D6-1a Data Sources, page D6-3, lines 9-10.**

   The permit application does not include the well installation, construction, and geologic log information for newly constructed wells (WQSP wells). Revise the permit application to include this information.

4. **Appendix D6, Section D6-1 Geology, Section D6-1c, Stratigraphy and Lithology in the Vicinity of the WIPP Site, Section, D6-1c(5)(b), The Culebra Member, pages D6-13 through D6-14.**

   The permit application does not include a discussion regarding secondary porosity occurrence and development within the Culebra relative to the nature, distribution, and origin of fracturing. Revise the permit application to include this information or to reference where, in the permit application, this information is discussed in more detail.

5. **Appendix D6, Section D6-1 Geology, Section D6-1c, Stratigraphy and Lithology in the Vicinity of the WIPP Site, Section, D6-1c(6), The Dewey Lake, Page D6-17, lines 11-19.**

Revise the permit application to discuss the differences between isotope ratios of the Dewey Lake and Rustler in more detail, including the specific unit within the Rustler the data were obtained from.

6. **Appendix D6, Section D6-1 Geology, Section D6-1c, Stratigraphy and Lithology in the Vicinity of the WIPP Site, Section, D6-1c(9), The Mescalero Caliche, Page D6-19, Line 1 and Lines 19-23.**

The permit application states that the Mescalero Caliche is expected to be continuous over large areas, but should also discuss any data to the contrary. Stakeholders have questioned the continuity of this feature, and additional information regarding its occurrence is warranted. Additionally, the permit application should provide additional detail regarding why the Mescalero Caliche is an indicator of surface stability. Revise the permit application accordingly.

7. **Appendix D6, Section D6-1 Geology, Section D6-1c, Stratigraphy and Lithology in the Vicinity of the WIPP Site, Section, D6-1d(2), Site Physiography and Geomorphology, page D6-21, Lines 30-37.**

Revise the permit application to include a figure presenting the San Simon Swale, or to include a reference to a figure already presented in the application which shows this feature.

8. **Appendix D6, Section D6-1, Geology, Section D6-1e(2), Faulting, Page D6-23, Lines 32-37.**

The permit application discusses the potential for fault occurrence, citing that inferred connections with underlying Bell Canyon or deeper units is unlikely "given the Castile geology within boreholes WIPP 13 and DOE-2". Revise the permit application to include a more detailed discussion of the geologic information from these wells, and how it supports the assertion of "no interconnection" between the Castile and underlying formations.

9. **Appendix D6, Section D6-2, Surface Water and Groundwater Hydrology, Page D6-40, Lines 15-23.**

The permit application indicates that the disposal medium is essentially devoid of groundwater, the effects of groundwater circulation ar minimal and predictable, and groundwater use in the area is "virtually nonexistent". These statements are to the extreme in that while the Salado exhibits low permeability and porosity, it is 100%

saturated with brine; groundwater circulation within the Culebra relative to the occurrence of fractures, effect of loading, localized dissolution are not well understood (or at least not well described); and there are a few local groundwater wells. Revise the language in the permit application to be more accurate.

10. **Appendix D6, Section D6-2, Surface Water and Groundwater Hydrology, Section D6-2a(3), Hydrology of the Salado and Castile Formations, Page D6-45, Lines 1-3.**

The permit application states that the clay seams within the Salado are the most likely source of brine, predicting that "brine flow ceases after structural creep in the formation ceases". DOE has presented numerous theories regarding the origin of brines, however, and this theory has been shown to be questionable relative to brine chemistry, fluid flow assumptions, etc.(in DOE's most recent technical exchange meeting on the topic). Further, the statement that structural creep will cease brine inflow needs additional clarification regarding when final creep closure is anticipated to occur. Revise the permit application to include all possible origins of brine within the WIPP, detailed chemistry data pertaining to the WIPP brines, and thorough justification of the assertion that clay seams are the origin of brine. Also include when final creep closure of each room is anticipated to occur and rate of brine inflow to this time, or to reference where, in the permit application, this information is presented.

11. **Appendix D6, Section D6-4, Seismicity, Page D6-66, Lines 13-15.**

The permit application states that there is some uncertainty regarding the origin of earthquakes associated with the Central Basin Platform. Revise the permit application to discuss the location of the Central Basin Platform relative to WIPP, and the impact that this level of uncertainty could have on WIPP site stability.

12. **Figures D6-10, D6-11, D6-13, D6-14, D6-22 through D6-26.**

These figures show the regional area surrounding the WIPP and are useful in that they provide a general understanding of structure and isopachous variations in the region surrounding the WIPP. However, additional detail in the specific WIPP area would also be helpful to understand variations in this site, as the contour intervals on the provided map are too large to show any features that may be present at WIPP. Revise the permit application to provide additional maps that show more detail in the WIPP area.

13. **Figure D6-27.**

The Capitan Reef is typically shown in cross section only to the western margin of the WIPP, although geologic maps show the feature to "ring" the WIPP. Revise this

figure to include a location map relative to the plan map that presents the horizontal location of the Capitan Reef.

WIPP PART B PERMIT APPLICATION REVIEW
CLOSURE AND POST-CLOSURE PLAN

CHAPTER I

GENERAL COMMENTS

1. The Closure Plan does not address closure of disposal zones in the main access drifts, which are outside the eight HWMU panels. Chapter B (page B-10, line 40), Chapter I (Appendix I1), and previous WIPP documents indicate that this area will be used for disposal, but it is not identified as a unit or units in the Part A or elsewhere in the application. This deficiency may require overall revision of the application. If this area will not be used for disposal, then Appendix I1 contains major conceptual errors. Revise the permit application as appropriate to address this. Refer to Specific Comments 1, 3, 6, 7, 9 and 10.

2. The Closure Plan text contradicts the conclusions in Appendix I1, in stating that panel seals are necessary to restrict emissions of volatile organic waste constituents in order to meet health-based limits at the facility boundary. In addition to this inconsistency, the text of the application fails to mention the more important function of panel seals, that is, to contain methane fires or explosions (as explained in some detail in Appendix I1). Revise the permit application as appropriate to address this. Refer to Specific Comments 2, 14 and 16.

3. Both the partial closure (panel seal) and final closure (repository seal) design discussions (Appendices I1 and I2) are indefinite, and do not provide implementable construction details or demonstrations that the seals will meet the performance standards in 20 NMAC 4.1, Subpart V, § 264.111 and 264.601. The application must provide definite, detailed designs and engineering reports for panel and repository seals. Revise the permit application as appropriate to address this. Refer to Specific Comments 6, 9, 15, 16, 17 and 19.

4. The Closure Plan does not provide monitoring and management procedures for preventing ignition of gas accumulations, particularly methane. This issue may be of major concern, especially during the end of the operational period and final closure of the facility. The gas generation rate used in the application (Appendix I1) is apparently not based on testing or observation of wastes. If microbial gas generation rates are appreciably higher than currently assumed, this will be a major concern throughout the operational period. Revise the permit application as appropriate to address this. Refer to Specific Comments 13, 15, 16 and 21.

5. The permit application does not provide a post-closure plan. Post-closure compliance criteria apply to partial closures (sealed waste panels) during continuing operation of

the facility, as well as the entire facility after final closure. The post-closure plan must be submitted with the permit application, as specified in 20 NMAC 4.1, Subpart V, § 264.118 and Subpart IX, § 270.14(b)(13). Revise the permit application to address this. Refer to Specific Comments 20 and 21.

6. Appendix I1 (Conceptual Design for Panel Closures) makes several general assumptions which are not adequately supported. In particular, gas generation (especially methane and hydrogen production rates), waste container headspace VOC concentrations, panel seal and grouted DRZ permeability, and panel seal monitoring and maintenance measures are not adequately addressed. The application must provide information to fully describe the proposed panel seal function, design and construction methods, and demonstrate that the seals will meet the performance standards of 20 NMAC 4.1, Subpart V § 264.111 and 264.601. References to other documents or limited summaries of other documents not provided in the application are generally not adequate for these purposes. Specific and detailed information is necessary to support the application; revise the permit application to include this information. Refer to Comments 1, 2, and 3, Appendix I1.

WIPP PART B PERMIT APPLICATION REVIEW
CLOSURE AND POST-CLOSURE PLAN

CHAPTER I

SPECIFIC COMMENTS

1. **Chapter I, Introduction, Page I-1, Lines 6-9.**

The permit application does not clearly identify the units to be closed. The four main access drifts (between the eight waste panels) are implied to be filled with waste after panels 1-8 are closed, according to Appendix I1, Section 4.2. Previous DOE documents (e.g., the 1994 Waste Backfill Engineering Analysis) are much more explicit in describing the main access drift disposal zone. However, this disposal zone is not described in the Closure Plan or other parts of the hazardous waste permit application. These access drifts (W-170, W-30, E-140 and E-300; and cross-drifts) will apparently contain about as much waste as two panels. Revise the permit application to provide a detailed description of the access drift disposal zone and to clarify whether this area is considered a single unit or multiple units. If these drifts are not to be used for disposal, Appendix I1 and Chapter B (page B-10, line 40) must be revised. Also revise all appropriate portions of the permit application to include these access drifts (e.g., Part A, Chapter D), if the drifts are to be used for waste disposal.

2. **Chapter I, I-1 Closure Requirements, Section I-1a, Closure Performance Standard, Page I-2, Lines 19-22.**

The text indicates that the partial closure system is designed to prevent migration of hazardous constituents above health-based levels at the facility boundary. However, Section I-1e(1), page I-7, lines 13-21, and the supporting documentation in Appendix I1 (Conceptual Design for Panel Closure Systems, Section 4.2) state that annual average health-based levels will not be exceeded at the facility boundary (with a safety factor of two orders of magnitude), even if gas flow from all of the waste disposal panels and access drifts (10 "panel equivalents") is completely unrestricted. In addition, Section I-1a does not mention the apparently much more important function of the panel seals in containing potential methane fires and explosions. (See Appendix I1, Section 4.3.) Revise this section of the permit application to provide a discussion of the partial closure system which is consistent with the actual design assumptions and functional criteria for the panel seals.

3. **Chapter I, I-1 Closure Requirements, Section I-1b, Closure Requirements, Page I-3, Line 24.**

This section does not include the main access drifts (W-170, W-30, E-140 and E-300; and cross-drifts) in the discussion of partial closure. These drifts are assumed to be filled with waste and isolated with typical panel-type seals, but these seals are not mentioned in the Closure Plan. Revise the permit application to provide discussion of the timing of main access drift seal construction in relation to final closure of the facility.

4. **Chapter I, I-1 Closure Requirements, Section I-1b, Closure Requirements, Page I-3, Lines 26-28.**

The regulations governing closure do not require NMED approval at the time of final or partial closure of a permitted facility, unless significant changes are proposed. If changes are proposed, a permit modification request must be submitted in accordance with 20 NMAC 4.1, Subpart V, § 264.112(c). If the (partial) closure is to be performed according to the Closure Plan in the facility permit, only notification is necessary, pursuant to 20 NMAC 4.1, Subpart V, § 264.112(d). Revise this section of the permit application to correct the statement regarding approvals.

5. **Chapter I, I-1 Closure Requirements, Section I-1b, Closure Requirements, Page I-3, Line 28.**

The text states that the WHB will be closed concurrently with final closure. This statement is not in agreement with the Final Closure Schedule in Figure I-1, page I-19. Closure of the WHB as a HWMU should be completed when decontamination is complete, 16 months after notification to NMED. Final closure activities will begin after WHB closure is complete, and continue for more than 6 years after this point. Revise this section of the permit application to clarify the sequence of closure activities.

6. **Chapter I, I-1 Closure Requirements, Section I-1c, Maximum Waste Inventory, Page I-4, Lines 17-18.**

Discussion of the maximum extent of operations is unclear. Revise the permit application to explain in detail what "...portions of the access drifts" outside of the panels will be used for disposal of wastes. Include in this revision the planned placement of RH waste canisters (if any) in these access drifts, and specify the locations of seals for the access drifts.

7. **Chapter I, I-1 Closure Requirements, Section I-1c, Maximum Waste Inventory, Page I-4, Lines 17-18.**

The maximum volumes of CH and RH wastes are not mentioned in this section. Page B-11, lines 4-5, states that up to 23,000 cubic feet of RH waste may be placed in panels. Page I-4, lines 14-15, states panel capacity as 81,000 drum equivalents, which equals 594,793 cubic feet, assuming 7.34 cubic feet per drum (apparently including RH waste). This volume is not equal to the panel CH capacity of 612,795 cubic feet as stated on page B-10, line 40. Appendix I1, page 4-18 states the volume to be placed in each panel as 600,000 cubic feet (RH is not mentioned). Revise the permit application to provide estimates of the total volumes of both RH and CH wastes to be placed in each panel and other disposal units (access drifts). Include explanation of the assumptions on which the estimates are based.

8. **Chapter I, I-1 Closure Requirements, Section I-1d, Schedule for Closure, Page I-4, Lines 36-38.**

The text states that up to 10 years may be needed for decontamination and final closure. However, the final closure schedule in Figure I-1, page I-19, provides for a maximum closure period of only 92 months after notification to NMED. Revise the text of the permit application or Figure I-1 to provide consistent time frames.

9. **Chapter I, I-1 Closure Requirements, Section I-1d, Schedule for Closure, Page I-5, Line 22.**

The schedules referenced in this line are incomplete; no schedule is provided which explicitly lists each hazardous waste management unit. Various interpretations of the timing of closure activities are possible, given the vagueness of the information in the current schedules. Revise the permit application to provide an expanded overall closure schedule which shows the expected timing of closure for each and every panel, access drift disposal unit(s), the WHB unit, and construction of the shaft seals.

10. **Chapter I, I-1 Closure Requirements, Section I-1d, Schedule for Closure, Page I-5, Line 25.**

The preceding final closure schedule discussion in the text, and the time lines in Figure I-1 are not consistent with the statement in this line, regarding "partial" closure of the last disposal panel. The ("clean") closure of the WHB will be completed before closure of the last subsurface unit is started. Therefore, the WHB closure will be the last "partial closure" at the facility, in accordance with the definition in 20 NMAC 4.1, Subpart I, Section 101, § 260.10. Revise the statement on page I-5, line 25 of the permit application to reflect this closure sequence.

Also revise the statement on page I-5, line 25 to state that the closure of the last subsurface unit (which is apparently an access drift, not a panel) and final closure of the facility will begin with the start of construction of the unit seal(s), but will not be complete until the shaft seals are finished. Revise Figure I-1 to reflect this corrected terminology (delete or replace "Partial" and "Panel" in the phrase "Partial Closure of Final HWMU Panel").

11. **Chapter I, I-1 Closure Requirements, Section I-1d(1), Extension for Closure Time, Page I-5, Lines 28-34.**

Discussion of the time needed for closure activities is incomplete and confused. Requests are not provided for extension of the 90-day limit for final disposal of wastes as required in 20 NMAC 4.1, Subpart V, § 264.113(a), or for extension of the 180-day limit for completion of closure activities [20 NMAC 4.1, Subpart V, § 264.113(b)]. The text promises to apply for an extension beyond the 180-day limit in the future, if needed. However, the schedule in Figure I-2 indicates that extensions beyond the 180-day limit (a total of 7 months or 210 days) will be needed for every panel closure. The schedule in Figure I-1 indicates that closure of the WHB unit will not begin for 8 months, and will not be complete until 16 months, after receipt of the final volume of waste. Final closure (of the last subsurface unit and the facility) will not begin until 16 months after the final volume of waste is received. Revise the text of the permit application to request extensions beyond both the 90- and 180-day time limits.

12. **Chapter I, I-1 Closure Requirements, Section I-1d(1), Extension for Closure Time, Page I-5, Lines 28-33.**

Requests for extension of time limits for final disposal of wastes and completion of final closure activities must provide demonstrations that the activities will, of necessity, take longer than 90 and 180 days to complete, and that all steps necessary to prevent threats to human health and the environment will be taken. The application provides general descriptions of decontamination and decommissioning requirements for DOE facilities, in Sections I-1d and I-1e(2), but the descriptions are broad, and do not include time requirements for D&D or panel closure activities. Revise the permit application to provide detailed descriptions of DOE orders or other requirements, including time needed to comply with each of those requirements, to support closure time extension requests.

13. **Chapter I, I-1 Closure Requirements, Section I-1d(1), Extension for Closure Time, Page I-5, Lines 28-33.**

A. This section of the Closure Plan does not provide references to, or discussion of, steps to prevent threats to human health and the environment during the proposed closure time extensions, as required by 20 NMAC 4.1, Subpart V, §

264.113(a)(2) and (b)(2). According to Appendix I1, Section 4.3, methane fires or explosions are not expected to be a major concern during the time period before each panel seal is completed. However, the microbial gas (methane) generation assumptions in Appendix I1 are based on theoretical conclusions in a memorandum and a position paper [Brush (1993 and 1994)] which are not included in the application. The Closure Plan and Appendix I1 provide no gas generation data from testing or observation of wastes. In addition, neither Chapter F (Procedures to Prevent Hazards), the Closure Plan, nor Appendix I1, provide any description of measures to detect and mitigate flammable or explosive gas concentrations. Revise the permit application to provide detailed summaries of or references to actual TRU-mixed waste gas generation data (including test or observation conditions) if available, and proposed explosive gas monitoring and response plans for each waste-filled panel both before and after installation of the panel seals.

B. Conditions most favorable to accumulation of large volumes of flammable or explosive gas mixtures will occur at the end of the operational life of the facility, when gas seepage from all eight panels will be combined with "new" gases generated in the unventilated main access drift disposal zone(s). This disposal zone will be left open for a much longer time period than any of the panels (for 16 months after final receipt of wastes from off-site, according to Figure I-1) before final seal construction is started. According to Appendix I1 (Figures 4-3, 4-6 and 4-7, and relevant text on pages 4-12 and 4-13), at the time construction of the last "panel-type" seal is started, explosive (or perhaps much higher) concentrations of methane are expected to be emitted from the first waste-filled panels, at rates approaching unrestricted flow rates. This may lead to threats to human health outside the panels, which must be adequately addressed, as specified in the following paragraph.

Based on information presented in the permit application, after 25 years of operation, Panels 1, 2 and 3 are expected to be emitting a combined total of roughly 1 cubic meter of methane per day (mixed with many other gases and vapors) through the panel seals and/or surrounding DRZ. An approximately equal volume of methane will be emitted from the 5 more recently filled panels. During the last few months of active operation, and the following 16 months while the facility will be undergoing decontamination prior to construction of the last access drift seals, these gases will be combined with another 700 liters of methane generated daily from the wastes (two "panel equivalents") in the main access drifts, assuming gas generation rates presented in the permit application. Assuming homogeneous mixing of all methane emissions at 5% concentration, this could result in a total volume of about 54 cubic meters of explosive gas per day. Revise the permit application to specifically address provisions for monitoring and managing potential explosive gas hazards during final closure of the facility. Include information adequate

to demonstrate compliance with the requirements of 20 NMAC 4.1, Subpart V § 264.15, 264.17 and 264.601(c) and Subpart IX § 270.14(b)(9) and § 270.23(a)(2).

14. **Chapter I, I-1 Closure Requirements, Section I-1e(1), Panel Closure, Page I-7, Lines 15-17.**

The text references average hazardous waste constituent concentrations in waste container headspace gas, in Appendix I1 (Table 4-3). These concentrations are not the same as the weighted average headspace concentrations in Table C2-1 (page C2-2 of the application). Table 4-3 concentrations are consistently higher than those in Table C2-1 (after conversion to similar units). Table 4-3 also includes carbon disulfide, which is not in Table C2-1. Revise the permit application to provide an explanation of how the two tables are related, or rectify inappropriate differences and recalculate values, as appropriate.

15. **Chapter I, I-1 Closure Requirements, Section I-1e(1), Panel Closure, Page I-7, Lines 6-9.**

The text references Appendix I1 for the panel closure system design details and states that the design accounts for (among other things) structural load-bearing capacity. However, the brief discussions of structural concerns in Appendix I1 are focused on panel entry seals and creep closure rates. Neither the text in this section nor Appendix I1 discuss the predicted stability of waste disposal rooms. The structural stability of disposal rooms and drifts is a very important factor in determining necessary maintenance, monitoring and closure activities, especially the time period during which the roof or back can be confidently predicted to be stable, and not collapse on the emplaced wastes. Roof collapse or loss of structural integrity are included as possible reasons to implement the facility Contingency Plan (pages G-19 and G-20), abandon and initiate closure of a partially-filled active disposal panel. However, adequate discussion of roof stability is not provided in the Closure Plan or elsewhere in the application. Revise the permit application to provide detailed discussion of the structural stability of disposal rooms and drifts, including WIPP testing and monitoring data, roof bolting, the effects of heat generation in RH containers, and any other factors which affect stability, to support the best estimate of the minimum time period that the back is expected to remain stable after termination of maintenance, i.e., <u>after waste emplacement is initiated</u> in a panel.

16. **Chapter I, I-1 Closure Requirements, Section I-1e(1), Panel Closure, Page I-7, Lines 22-25.**

The text states that the panel closure design is necessary to meet 20 NMAC 4.1, Subpart VIII, § 268.6 requirements. This statement immediately follows, and contradicts, an accurate summary of the conclusions from Appendix I1, i.e., that <u>no</u>

restrictions of vapor emissions are needed to meet the requirements of § 268.6. In addition, the text fails to mention the necessary function of the panel seals in containing potential methane fires and explosions, as detailed in Appendix I1, Section 4.3. Revise the permit application to reflect the actual design assumptions and functional criteria for the panel seals.

17. **Chapter I, I-1 Closure Requirements, Section I-1e(1), Panel Closure, Page I-7, Lines 26-27.**

Panel seal design information presented in Appendix I1 is only "conceptual," and does not provide the number, locations, dimensions or materials and methods of construction of the panel and drift seals. Final designs may be quite different from the alternatives and indefinite details described (in Sections 5.2-5.5 of Appendix I1), but the application provides no commitment to submit final design information. Four sets of panel seals (to close eight entry drifts) are expected to be constructed during the anticipated 10-year term of the initial hazardous waste facility permit. Revise the permit application to provide detailed design drawings and an engineering report describing how the panel seals will be constructed, as required by 20 NMAC 4.1, Subpart V § 264.112(b)(1) and Subpart IX § 270.23(a)(2).

18. **Chapter I, I-1 Closure Requirements, Section I-1e(2), Decontamination and Decommissioning, Pages I-7 through I-12.**

The descriptions of activities to be performed during final closure are very general. Time frames and a sequential schedule are not provided for the activities described. The Final Closure Schedule in Figure I-1 is not referenced in this section, and the activities discussed do not correlate with the items listed in the Schedule. References to specific DOE Orders or other D&D requirements are not provided. Revise this section of the permit application to provide detailed descriptions of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components. Specifically discuss the expected use of the "Co-Detection" principle during final closure. Explain why the contamination surveys of the facility (including sample analyses) are expected to take 22 months to perform (according to Figure I-1). Include a listing and discussion of DOE Orders and other requirements to demonstrate why final closure activities will, of necessity, take more than 180 days to complete.

19. **Chapter I, I-1 Closure Requirements, Section I-1e(2), Decontamination and Decommissioning, Page I-12, Lines 1-20.**

A. The text of Section I-1e(2) and the referenced conceptual design in Appendix I2 do not provide detailed descriptions of the functional criteria, design details, or the materials and methods of construction of the proposed repository seals. In addition, Appendix I2 does not include several aspects of the final closure

program which are shown in Appendix I1, page 3-2, Figure 3-1. Figure 3-1 shows Repository Boundary Seals, special tunnel backfill, and Tunnel Bulkheads. These components are barely mentioned in the text of Appendix I1, and are not included at all in Appendix I2. Data from laboratory and intermediate-scale tests of seal material properties are apparently available (Appendix I2, page 32, lines 2-3), but are not provided or summarized. The Appendices are theoretical discussions which do not provide definite plans for closure.

B. 20 NMAC 4.1, Subpart V, § 264.112 requires the closure plan to identify the steps necessary to perform partial and/or final closure of the facility at any point during its active life. The plan must contain a detailed description of the activities necessary during closure to ensure that all partial closures and final closure satisfy the closure performance standards. Revise the permit application to provide definite, detailed design drawings and specifications for closure.

20. **Chapter I, I-1 Closure Requirements, Section I-1e(4), Closure of Disposal Units, Page I-15, Lines 9-12.**

The text states that a post-closure plan will be submitted, but does not propose a submittal date. The regulation cited in the text and 20 NMAC 4.1, Subpart IX § 270.14(b)(13), requires the post-closure plan to be submitted as part of the permit application for the facility. Revise the permit application to provide the post-closure plan.

21. **Chapter I, I-2 Post-Closure Plan/Contingent Post-Closure, Page I-15 and I-16.**

The discussion of post-closure activities includes several potential monitoring programs which are under evaluation for possible implementation after final closure of the facility, and mentions an "Access Controls" document, which is not included in the permit application. Post-closure requirements for closed panels or panel seals are not mentioned. Revise the permit application to provide the post-closure plan, including details of proposed monitoring, maintenance and other activities for closed waste disposal panels, as well as the entire facility after final closure, as required by 20 NMAC 4.1, Subpart V, § 264.118, and Subpart IX § 270.14(b)(13). Post-closure requirements for closed panels could be included in Chapter D or F, if preferred, with references in Chapter I.

22. **Chapter I, I-3 Notices Required For Disposal Facilities, Section I-3b, Survey Plat, Page I-16, Line 23.**

In accordance with 20 NMAC 4.1, Subpart V, § 264.116, the survey plat must be submitted to the local zoning or land use authority (expected to be the County

government), in addition to the Secretary of NMED. Revise Section I-3b of the permit application to include this requirement.

23. **Chapter I, I-3 Notices Required For Disposal Facilities, Section I-3d, Post-Closure Notices, Page I-16, Lines 44-47.**

The text claims an exemption from the deed notation requirement in 20 NMAC 4.1, Subpart V, § 264.119. The regulation does not provide for an exemption from this requirement, regardless of the ownership status of a facility. Revise the permit application to provide a commitment to submit the deed notation, or provide a demonstration that the information cannot be provided, to support a request for a variance per 20 NMAC 4.1, Subpart IX, § 270.14(a).

APPENDIX I1

1. **Chapter I, Appendix I1 Conceptual Design For Operational Phase Closure Systems, Section 3.1.2.4, Recently Revised Panel Seal Conceptual Designs, Page 3-17.**

   The text states that "...confidence for sealing during the operational period can be bolstered by remedial maintenance, ventilation, and monitoring measures at the access drift adjacent to the near-end bulkhead." However, there is no further mention of such measures in either Appendix I1 or the text of the Closure Plan (Chapter I in the permit application). The above monitoring and maintenance provisions are precisely the type of plans which must be included in the Post-Closure Plan for the disposal panel units. They must also be included (or referenced) in the Procedures to Prevent Hazards (Chapter F of the application) unless a demonstration that no hazards will develop is provided. Revise the permit application to provide detailed plans for remedial maintenance, ventilation and monitoring measures at the access drift adjacent to the near-end bulkhead of panel seals.

2. **Chapter I, Appendix I1 Conceptual Design For Operational Phase Closure Systems, Section 4.1.1, Gas Generation, Pages 4-2 to 4-5.**

   The Appendix cites three documents by L.H. Brush to support assumed gas generation rates. The documents are not provided, quoted or summarized in any detail. Relevant and detailed information is available to DOE from historical research at the WIPP, and recent and ongoing studies of waste behavior, but that information is not provided to support these gas generation assumptions. On the basis of the information provided in Appendix I1, it is not possible to determine whether the "best estimates" in Table 4-1 are based on extensive and highly reliable data, or if they are mainly theoretical, with little or no empirical support. For example, the estimate of hydrogen production (zero) is based on the assumption that no significant quantities of brine will accumulate in disposal panels, but the data from brine inflow studies is not provided or even referenced. This assertion is based only on the observation that brine weeps cease to form after a few years (page 4-3), without discussion of measured inflow rates or the differences between previous brine inflow observation stations and future disposal panels. Existing excavated areas have been open for up to 10 years or more, subject to high ventilation (and resulting evaporation) rates for that time period. Future disposal panels will be only partially ventilated, at relatively low rates, for only two or three years after excavation before seals are installed. Therefore, brine accumulation in disposal panels, or at least temporary development of 100% relative humidity, appears to be possible. Revise the permit application to provide detailed information, including summaries of and references to all DOE research on brine inflow, hydrogen, methane, and other gas generation, to support the gas generation rates used in evaluating the closure system design.

3. **Chapter I, Appendix I1 Conceptual Design For Operational Phase Closure Systems, Section 4.2, Model for Unrestricted Flow of VOCs, Pages 4-6 to 4-7.**

The text states that gas generation is assumed to be 0.1 moles per year per drum. However, the annual gas production per panel is stated on page 4-7, page 6-2, and elsewhere as 8,200 moles per year. Since 81,000 drum equivalents are assumed to be in each panel, this implies a per drum generation rate of 0.101235 moles per year. Revise the permit application to explain the discrepancy between the stated per drum and total panel gas generation rates.

4. **Chapter I, Appendix I1 Conceptual Design For Operational Phase Closure Systems, Section 4.4, Restricting Flow of Gases Out of a Panel, Pages 4-16 to 4-22.**

This section provides the theoretical requirements for limiting gas flow out of a panel, and assumes that the required effective low permeability is "...achievable by treating the DRZ and interface zone through the design and construction of a bulkhead and grout curtain..." However, the Appendix fails to explain why such restriction is necessary, provides no data to demonstrate that the required permeability is actually achievable, and suggests several possible approaches (in Section 5) for constructing the panel seals and performing grouting. This type of a report is not a closure plan, as required to be submitted as part of the permit application. Revise the permit application to provide consistent explanation of the required functions of the panel/ drift seals, data from testing of grouted DRZ to support the proposed design permeability, and a complete set of definite design details and construction procedures for actually installing the panel seals.

COMPLETENESS/TECHNICAL EVALUATION CHECKLIST

		Complete (Y/N)	Technically Adequate (Y/N)	See Attached Comment	See Attached Exhibit	Location of Information
D. PROCESS INFORMATION						
D-1	Containers		N	Sec. D Gen. Com. 1-5		Secs. D-9a(2)(b); D-9a(3)(b),(c),(d),(g); D-9d
D-1a	Containers with free liquids		---			Secs. D-9a(2)(b); D-9a(3)(b),(c),(d),(g); D-9d
D-1a(1)	Description of containers practices		N	Sec. D Gen. Com. 2-3		Sec. D-9a(3)(c)(pp. D-27 - D-29), and Sec. D-9a(3)(g)(pp. D-36 - D-38)
D-1a(2)	Container management practices		N	Sec. D5 Gen. Com. 4, 5, 14 Spec. Com. 7		Sec. D-9a(2)(b)(pp. D-13 - D-18) Sec. D-9a(3)(b)(pp. D-20 - D-26) Sec. D-9a(3)(c)(pp. D-27 - D-29) Sec. D-9a(3)(d)(pp. D-29 - D-31) Sec. D-9a(3)(g)(pp. D-36 - D-38)
D-1a(3)	Secondary containment system design and operation		N	Sec. D Gen. Com. 3		Sec. D-9a(3)(b)(pp. D-19, D-20), App. D8
D-1a(3)(a)	Requirement for the base or liner to contain liquids		Y	N/A		
D-1a(3)(b)	Containment system drainage		N	Sec. D Gen. Com. 3		
D-1a(3)(c)	Containment system capacity		N	Sec. D Gen. Com. 3		
D-1a(3)(d)	Control of run-on		Y	N/A		Sec. D-9d(1)(p. D-39); App. D3, DWG. 24-C-028-W1 App. D7
D-1a(3)(e)	Removal of liquids from containment system		N	Sec. D Gen. Com. 3		Not provided
D-1b	Containers without free liquids		N/A			
D-1b(1)	Test for free liquids					
D-1b(2)	Description of containers					
D-1b(3)	Container management practices					

COMPLETENESS/TECHNICAL EVALUATION CHECKLIST

		Complete (Y/N)	Technically Adequate (Y/N)	See Attached Comment	See Attached Exhibit	Location of Information
D-1b(4)	Container storage area drainage		N/A			
D-2	Tank systems		N/A			
D-2a	Tank systems description					
D-2a(1)	Dimensions and capacity of each tank					
D-2a(2)	Description of feed systems, safety cutoff, bypass systems, and pressure controls					
D-2a(3)	Diagram of piping, instrumentation and process-flow					
D-2a(4)	Ignitable, reactive and incompatible wastes					
D-2b	Existing tank system					
D-2b(1)	Assessment of existing tank system's integrity					
D-2c	New tank systems					
D-2c(1)	Assessment of new tank system's integrity					
D-2c(2)	Description of tank system installation and testing plans and procedures					
D-2d	Containment and detection of releases					
D-2d(1)	Plans and description of the design, construction, and operation of the secondary containment system					
D-2d(1)(a)	Tank age determination					

COMPLETENESS/TECHNICAL EVALUATION CHECKLIST

		Complete (Y/N)	Technically Adequate (Y/N)	See Attached Comment	See Attached Exhibit	Location of Information
E. GROUNDWATER MONITORING						
E-1	Exemption from groundwater protection requirements		N	Gen. Com. 1, Spec. Com. 1, 3		Chap. E, Sec. E-1
E-1a	Waste piles		NA			
E-1b	Landfill		NA			
E-1c	No migration			Spec. Com. 3		Chap. E, Sec. E-1c
E-2	Interim status groundwater monitoring data		NA			
E-2a	Description of wells					
E-2b	Description of sampling/ analysis procedures					
E-2c	Monitoring data					
E-2d	Statistical procedures					
E-2e	Groundwater assessment plan					
E-3	General hydrogeologic information		N	Chap. E Com. App. D1, D6		Chap. E, App. E1 and D6
E-4	Topographic map requirements		Y			Chap. A and B
E-5	Contaminant plume description		NA			
E-6	General monitoring program requirements		N			
E-6a	Description of wells			App. D6 Spec. Com. 3		---

COMPLETENESS/TECHNICAL EVALUATION CHECKLIST

		Complete (Y/N)	Technically Adequate (Y/N)	See Attached Comment	See Attached Exhibit	Location of Information
E-6b	Description of sampling/ analysis procedures	____	____	Chap. E, Spec. Com. 7	____	---
E-6c	Procedures for establishing background quality	____	____	____	____	____
E-6d	Statistical procedures	____	____	____	____	____
E-6d(1)	Parametric analysis of variance (ANOVA)	____	____	____	____	____
	(based on ranks)	____	____	____	____	____
E-6d(3)	Tolerance or prediction interval procedure	____	____	____	____	____
E-6d(4)	Control chart approach	____	____	____	____	____
E-6d(5)	Alternative approach	____	____	____	____	____
E-7	Detection monitoring program	____	____	____	____	____
E-7a	Indicator parameters, waste constituents, reaction products to be monitored	____	____	____	____	____
E-7b	Groundwater monitoring system	____	____	____	____	____
E-7c	Background groundwater concentration values for proposed parameters	____	____	____	____	____
E-7d	Proposed sampling and analysis procedures	____	____	____	____	____
E-7e	Statistically significant increase in any constituent or parameter identified at any compliance point monitoring well	____	____	____	____	____

COMPLETENESS/TECHNICAL EVALUATION CHECKLIST

		Complete (Y/N)	Technically Adequate (Y/N)	See Attached Comment	See Attached Exhibit	Location of Information
E-8	Compliance monitoring program	____	____	N/A	____	_____
E-8a	Description of the monitoring program	____	____	____	____	_____
E-8a(1)	Waste description	____	____	____	____	_____
E-8a(2)	Characterization of contaminated groundwater	____	____	____	____	_____
E-8a(3)	Hazardous constituents to be monitored in compliance program	____	____	____	____	_____
E-8a(4)	Concentration limits	____	____	____	____	_____
E-8a(5)	Alternate concentration limits	____	____	____	____	_____
E-8a(5)(i)	Adverse effects on groundwater quality	____	____	____	____	_____
E-8a(5)(ii)	Potential adverse effects	____	____	____	____	_____
E-8a(6)	Engineering report describing groundwater monitoring system	____	____	____	____	_____
E-8a(7)	Proposed sampling and statistical analysis procedures for groundwater data	____	____	____	____	_____
E-8a(8)	Groundwater protection standard exceeded at compliance point monitoring well	____	____	____	____	_____
E-9	Corrective action program	____	____	____	____	_____
E-9a	Characterization of contaminated groundwater	____	____	____	____	_____
E-9b	Concentration limits	____	____	____	____	_____
E-9c	Alternate concentration limits	____	____	____	____	_____
E-9c(1)	Adverse effects on groundwater quality	____	____	____	____	_____

COMPLETENESS/TECHNICAL EVALUATION CHECKLIST

		Complete (Y/N)	Technically Adequate (Y/N)	See Attached Comment	See Attached Exhibit	Location of Information
E-9c(2)	Potential adverse effects	____	____	N/A	____	____
E-9d	Corrective action plan	____	____	____	____	____
E-9d(1)	Location	____	____	____	____	____
E-9d(2)	Construction detail	____	____	____	____	____
E-9d(3)	Plans for removing wastes	____	____	____	____	____
E-9d(4)	Treatment technologies	____	____	____	____	____
E-9d(5)	Effectiveness of correction program	____	____	____	____	____
E-9d(6)	Reinjection system	____	____	____	____	____
E-9d(7)	Additional hydrogeologic data	____	____	____	____	____
E-9d(8)	Operation and maintenance	____	____	____	____	____
E-9d(9)	Closure and post-closure plans	____	____	____	____	____
E-9e	Groundwater monitoring program	____	____	____	____	____
E-9e(1)	Description of monitoring system	____	____	____	____	____
E-9e(2)	Description of sampling and analysis procedures	____	____	____	____	____
E-9e(3)	Monitoring data and statistical analysis procedures	____	____	____	____	____
E-9e(4)	Reporting requirements	____	____	____	____	____
F. PROCEDURES TO PREVENT HAZARDS						
F-1	Security	____	____	____	____	____
F-1a	Security procedures and equipment	____	____	____	____	____
F-1a(1)	24-hour surveillance system	____	____	____	____	____
F-1a(2)(a)	Barrier	____	____	____	____	____
F-1a(2)(b)	Means to control entry	____	____	____	____	____

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
40 CFR § 264.601	Subpart X requirement for incorporation of 40 CFR § 264 Subparts I through O.	N	Sec. D-9a (pp. D-3 to D-38)	Gen. Com. Nos. 6, 7, 8, 9, 10, 11, 12, 13, 14; and Spec. Com. Nos. 1, 3, 6, 7, 8, 11, 14, 15
§ 264.601(a)	Prevention of release of contaminates/constituents to ground water.	N	Sec. D-9d (1)	Sec. D, Gen. Com. No. 15 and Sec. E Com.
§ 264.601(a)(1)	Volume and potential for migration through the soil.	N	Sec. D-9b Sec. C, App. C1	Sec. D, Gen. Com. No. 15 and Sec. E Com.
§ 264.601(a)(2)	Hydro/Geologic characteristics of the unit and surrounding area.	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15; Spec. Com. Nos. 4, 5, and Sec. E Com.
§ 264.601(a)(3)	Existing quality of ground water including the sources of contamination and their cumulative impact on ground water.	N	Sec. D-9a (1)and(2) App. D4 D5, D6, Sec. E	Sec. D, Gen. Com. No. 15 and Sec. E Com.

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
§ 264.601(a)(4) § 264.601(b)(5)	Quantity and direction of ground water flow.	N	Sec. D-9a (1)and(2) App. D4 D5, D6, Sec. E	Sec. D, Gen. Com. No. 15, and Sec. E Com.
§ 264.601(a)(5)	Proximity and withdrawal rates of current and potential ground water users.	N	Sec. D-9a (1)and(2) App. D4 D5, D6, Sec. E	Sec. D, Gen. Com. No. 15, and Sec. E Com.
§ 264.601(a)(6) § 264.601(b)(9)	Patterns of land use	N	Sec. D-9a (1)and(2) App. D4 D5, D6, Sec. E	Sec. D, Gen. Com. No. 15, and Sec. E Com.
§ 264.601(a)(7)	Potential for disposition and migration of waste and/or constituents to:	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15, and Sec. E Com.
	subsurface physical structures	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15, and Sec. E Com.

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
	root zone	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15, and Sec. E Com.
	food chain crops	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15, and Sec. E Com.
	other vegetation	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15, and Sec. E Com.
§ 264.601(a)(8) § 264.601(b)(10) § 264.601(c)(6)	Potential for health risks caused by human exposure to waste constituents.	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. Nos. 7, 8, 9, 10, 11, 12, 13, and Spec. Com. Nos. 7, 13, 16, 17, 18,
§ 264.601(a)(9) § 264.601(b)(11)	Potential for damage to: domestic animals.	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
	wildlife	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15
	crops	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15
	vegetation	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15
	physical structure	N	Sec. D-9a (1)and(2) App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
§ 264.601(b)	Prevention of release that may have adverse effects on human health and the environment due to migration in surface water, wetlands, or soil surface.	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. Nos. 7, 8, 9, 10, 11, 12, 13, 15
§ 264.601(b)(2)	Effectiveness and reliability of:			
	containment	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15
	confinement	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15
	collection system structure	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. 7, 8, 9, 10 11, 12, 13, 14, 15, and Spec. Com. No. 11

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
§ 264.601(b)(3)	Hydrologic characteristics unit	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15
	surrounding area	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15
	topography of land around the unit	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, Sec. E	Sec. D, Gen. Com. No. 15
§ 264.601(b)(4)	Precipitation patterns in the region	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, D7, Sec. E	Sec. D, Gen. Com. No. 15

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
§ 264.601(b)(6)	Proximity to surface water	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, D7, Sec. E	Sec. D, Gen. Com. No. 15
§ 264.601(b)(7)	Current and potential uses of nearby surface water and water quality standards for these waters.	N	Sec. D-9d (2), Sec. D-9a (1)and(2), App. D4, D5, D6, D7, Sec. E	Sec. D, Gen. Com. No. 15
§ 264.601(b)(8)	Existing quality of surface water in the area including all of the sources for contamination and the cumulative effect on surface water.	N	Sec. D-9a (1), App. D4, D5, D6	Sec. D, Gen. Com. No. 15
§ 264.601(c)	Prevention of any release that may have adverse effects on human health and the environment.	N	Sec. D-9a Sec. D-9d (3), Table D-3, App. D3, D4, D9	Sec. D, Gen. Com. Nos. 7, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19, 20, and Spec. Com. Nos. 7, 12, 13, 16

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
§ 264.601(b)(1) § 264.601(c)(1)	Volume and chemical characteristics of waste including emissions and dispersal.			
	off gases	N	Sec. D-9a (1), App. D4, D5, D6	Sec. D, Gen. Com. No. 15, and Spec. Com. No. 15
	aerosols	N	Sec. D-9a (1), App. D4, D5, D6	Sec. D, Gen. Com. No. 15, and Spec. Com. No. 15
	particulates	N	Sec. D-9a (1), App. D4, D5, D6	Sec. D, Gen. Com. No. 15, and Spec. Com. No. 15
§ 264.601(c)(2)	Effectiveness and reliability of systems to eliminate/reduce/prevent emissions of hazardous waste to the air.	N	Sec. D-9a (1), App. D4, D5, D6	Sec. D, Gen. Com. No. 15
§ 264.601(c)(3)	Operational characteristics of the unit.	N	Sec. D-9a D-9d	Sec. D, Gen. Com. Nos. 6-15
§ 264.601(c)(4)	Characteristics of the unit and the surrounding area:			
	atmospheric	Y	Sec. D-9a Sec. D-9d (3), Table D-3, App. D3, D4, D9	None

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
	meteorologic	Y	Sec. D-9a Sec. D-9d (3), Table D-3, App. D3, D4, D9	None
	topographic	Y	Sec. D-9a Sec. D-9d (3), Table D-3, App. D3, D4, D9	None
§ 264.601(c)(5)	Existing quality of the air including the sources of contaminates and the cumulative impact on the air.	Y	Sec. D-9a Sec. D-9d (3), Table D-3, App. D3, D4, D9	None
§ 264.602	Monitoring:			
	air	N	Sec. D-9e	Sec. D, Gen. Com. No. 20, and Spec. Com. No. 12
	surface water	Y	Sec. D-9e	---
	ground water	Y	Sec. D-9e	---
	soils	Y	Sec. D-9e	---
	Testing	Y	Sec. D-9e	---

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
	Analytical Data	N	Sec. D-9e	Sec. D, Gen. Com. No. 20
	Response	N	Sec. D-9e	Sec. D, Gen. Com. No. 20
	Reporting Procedures	N	Sec. D-9e	Sec. D, Gen. Com. No. 20
	Reporting Frequencies	N	Sec. D-9e	Sec. D, Gen. Com. No. 20
§ 264.602	Requires the compliance with the following sections.			
	§ 264.15 General Inspection Requirements			
	§ 264.33 Testing and Maintenance of Equipment			
	§ 264.75 Biennial Report			
	§ 264.76 Unmanifested Waste Report			
	§ 264.77 Additional Reports			
§ 264.602	Requires the compliance with the following sections.			
	§ 264.101 Corrective action for solid waste management units			
§ 264.602	Other requirements set by the Secretary to protect human health and the environment specified in this permit.			

REGULATORY CITATION(S):	REQUIREMENT:	ADEQUATE: Yes/No/NA	WHERE TOPIC IS/SHOULD BE ADDRESSED	COMMENTS:
§ 264.603	Unit will be maintained under 264.601 during post closure care under 264.118 and the closure/post closure care plan must specify compliance with 264.601.	N	NA	Sec. D, Gen. Com. No. 19

COMMENTS: