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560 Golden Ridge Road, Suite 130
Golden, CO 80401
(303) 763-7188
(303) 763-8889 FAX
www.techlawinc.com

May 1, 2006

Mr. David Cobrain
State of New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building One
Santa Fe, New Mexico 87505-6303

Reference: Work Assignment No. 06110.310.0002; State of New Mexico Environment Department, Santa Fe, New Mexico; Sandia National Laboratories; Public Comments on the *Probabilistic Performance-Assessment Modeling of the Mixed Waste Landfill at Sandia National Laboratories*, presented in Appendix E of the Sandia National Laboratories (SNL) *Mixed Waste Landfill Corrective Measures Implementation Plan*, dated November 2005; Task 2 Deliverable.

Dear Mr. Cobrain:

Enclosed please find the deliverable for the above-referenced work assignment. The deliverable consists of compiled and summarized public comments on the *Probabilistic Performance-Assessment Modeling of the Mixed Waste Landfill at Sandia National Laboratories*, presented in Appendix E of the Sandia National Laboratories (SNL) *Mixed Waste Landfill Corrective Measures Implementation Plan* (the CMI plan), dated November 2005, and provided by Mr. Will Moats of NMED on March 3, 2006.

The public comments cover a wide range of concerns. Some of the main concerns and objections are summarized in condensed form below:

- The fate and transport model is not comprehensive, and does not consider biological intrusion and resulting transport of contaminants; radiolysis and degradation of contaminants such as perchloroethylene; and radionuclide decay cascades and potential surface exposures.

- The fate and transport model used data that are more than 10 years old, and does not accurately reflect current conditions at the landfill.

- Wastes buried in unlined pits and trenches should be excavated and transferred to more secure facilities.

- The maintenance and long-term monitoring plan should be included and made available for public review and comment.

- A public technical discussion group should be convened to provide a more thorough evaluation of the fate and transport model and the CMI plan.

Index of Comments Received by NMED on the *Probabilistic Performance-Assessment Modeling of the Mixed Waste Landfill at Sandia National Laboratories* (SNL), Presented in Appendix E of the SNL *Mixed Waste Landfill Corrective Measures Implementation Plan* (the CMI plan), Dated November 2005

Commenter ID	Comment Number	Date of Letter or e-mail	Commenter - Association	Subject: Issue or Comment	Response
A	1	1/25/06 (rec'd 1/27/06)	Citizen, Donna Detweiler	The commenter was concerned regarding possible contamination of groundwater resulting from releases from the mixed waste landfill, particularly contamination of the Burton Well serving the Kirtland Addition neighborhood. Commenter stated that the fate and transport model indicates contamination may reach groundwater in as little as 50 years.	None of the modeled radionuclides and heavy metals was simulated to reach groundwater during the 1,000-year performance period or the extended 10,000-year period. However, the model indicates that aquifer concentrations of perchloroethene (PCE) will peak in less than 50 years for the majority of the model runs. Only 1 of 100 model runs indicates that PCE concentrations will exceed the regulatory maximum contaminant level (MCL) of 5 µg/L (approximately 5 parts per billion). The fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater, but is not designed to address groundwater plume movement. NMED will consider this comment further, including the potential need for a groundwater plume model.
A	2	1/25/06 (rec'd 1/27/06)	Citizen, Donna Detweiler	The commenter believes there is "much good housing stock here," an apparent reference to the Kirtland Addition neighborhood, and expresses concern that it will be condemned as unlivable in the future.	NMED understands the issue addressed by the commenter; however, this comment addresses a subject area that is beyond the scope of the review of the fate and transport model.
A	3	1/25/06 (rec'd 1/27/06)	Citizen, Donna Detweiler	The commenter would like to see the waste removed and disposed elsewhere away from a large population area.	NMED understands the issue addressed by the commenter and will consider the comment further. The NMED, however, previously held a public comment period and public hearing regarding the corrective measures study (CMS) conducted for the mixed waste landfill. The NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy for the

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					mixed waste landfill. This selection was based on the administrative record and the Hearing Officer's report. The corrective measures implementation (CMI) plan, which includes the fate and transport model, was developed as a result of the remedy selection.
B	4	1/28/06 (rec'd 1/31/06)	Citizen, Floy J. Barrett	The commenter is concerned that Sandia's fate and transport model is not comprehensive and does not consider biological transport of contaminants.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of biological transport of contaminants is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
B	5	1/28/06 (rec'd 1/31/06)	Citizen, Floy J. Barrett	The comment is concerned that Sandia's fate and transport model is not comprehensive and does not consider human intrusion.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of human intrusion into the landfill is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
B	6	1/28/06 (rec'd 1/31/06)	Citizen, Floy J. Barrett	The commenter is concerned that Sandia's fate and transport model is not comprehensive and does not consider beryllium and metallic sodium as potential contaminants of concern.	Concentrations of contaminants of concern (COCs) in the groundwater are considered by the fate and transport model. Beryllium and metallic sodium are not among the compounds qualified as COCs and considered within the current scope of the model. NMED will consider this comment further as the model results are reviewed.
B	7	1/28/06 (rec'd 1/31/06)	Citizen, Floy J. Barrett	The commenter is concerned that Sandia's fate and transport model is not comprehensive and does not consider animals, plants, and humans as "triggers."	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Concentrations of COCs in the groundwater are considered by the model. Consideration of other triggers is beyond the current scope of the

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					model. NMED will consider this comment further in association with biological transport of contaminants.
B	8	1/28/06 (rec'd 1/31/06)	Citizen, Floy J. Barrett	The commenter is concerned that Sandia's fate and transport model is not comprehensive and does not consider appropriate "trigger levels" for all contaminants in the known inventory.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Concentrations of COCs in the groundwater are considered by the model. Consideration of other triggers is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
B	9	1/28/06 (rec'd 1/31/06)	Citizen, Floy J. Barrett	The commenter is concerned that Sandia's fate and transport model is not comprehensive and does not consider conducting a risk assessment for the fate and transport model that includes all waste types buried at the landfill, not just the risk posed by tritium as currently considered by the assessment.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Concentrations of COCs in the groundwater are considered by the model. The current scope of the model does not require a risk assessment for all wastes disposed in the landfill. NMED will consider this comment further as the model results are reviewed.
B	10	1/28/06 (rec'd 1/31/06)	Citizen, Floy J. Barrett	The commenter is concerned that Sandia's fate and transport model is not comprehensive and uses data that are outdated. Commenter believes new data should be gathered to verify the validity of the modeling.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
B	11	1/28/06 (rec'd 1/31/06)	Citizen, Floy J. Barrett	The commenter stated that the people of New Mexico deserve to have the laboratories of this state (apparently a reference to Sandia National Laboratories and Los Alamos National Laboratory) comply with every possible safety procedure. The commenter believes the mixed waste landfill model for containment does not insure long-term safety of groundwater and soil.	NMED understands the issue addressed by the commenter, however, the fate and transport model does not address safety procedures. The model addresses the probability of contaminant transport from the landfill through the vadose zone to groundwater. NMED will consider this comment further as the model results are reviewed.
B	12	1/28/06 (rec'd	Citizen, Floy J. Barrett	The commenter stated there is still time to continue to study and reassess the issues noted by the	NMED understands the issue addressed by the commenter and will consider the comment

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		1/31/06)		commenter. The commenter also stated NMED has an obligation to require that Sandia National Laboratories complete reassessments.	further as the model results are reviewed.
B	13	1/28/06 (rec'd 1/31/06)	Citizen, Floy J. Barrett	The commenter expects NMED to respond to each of his concerns.	NMED has responded to each of the commenter's concerns and noted that each will be considered further as the model results are reviewed.
C	14	1/28/06 (rec'd 1/31/06)	Citizen, David M. Brugge	The commenter reviewed the fate and transport model for the Sandia mixed waste landfill and states, "I am in agreement with all contained therein...." However, based on the remainder of the commenter's letter, a number of technical comments on the model are presented.	NMED understands the issue addressed by the commenter and specifically addresses all of the technical comments presented in the commenter's letter.
C	15	1/28/06 (rec'd 1/31/06)	Citizen, David M. Brugge	The commenter states that biological transport of contaminants is not limited to reptiles, mammals, birds, and amphibians. The commenter believes that invertebrates, surface and subsurface flora, fungi, molds, bacteria, and other species should be considered. The commenter suggests that the model should address soil bacteria and possibly viruses that become airborne during windy drought conditions at the landfill area. The commenter also suggested that the agent responsible for valley fever may mutate in the landfill area.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of biological transport of contaminants is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
C	16	1/28/06 (rec'd 1/31/06)	Citizen, David M. Brugge	The commenter believes that human intrusion into the landfill is a serious issue requiring further consideration. The commenter suggested there is potential for terrorist explosion in or adjacent to the landfill, which would effectively create a "dirty bomb."	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of human intrusion into the landfill is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
C	17	1/28/06 (rec'd 1/31/06)	Citizen, David M. Brugge	The commenter acknowledges New Mexico's oversight is limited to the effects that are predictable during the next 30 years. The commenter suggests that the State should review the threat of adverse impacts on water, air, and safety within the Mesa del	NMED understands the issue addressed by the commenter; however, this comment addresses a subject area that is beyond the current scope of the review of the fate and transport model.

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				Sol development area and possibly impacts to land values, even though the critical stages of these threats are beyond the 30-year oversight period. The commenter suggests that impacts to land values will prevent the University of New Mexico from receiving the full benefit of the Mesa del Sol development. The commenter suggests that the university and the State may have potential liability for any damages.	
D	18	1/28/06 (rec'd 1/31/06)	Citizen, Maurice Weisberg, MD	The commenter stated that the protection of the integrity of our aquifers is a matter of urgent national security for public health and economic stability. The commenter referenced the National Academy of Science, which reported in 2000 that most of the nuclear bomb sites will never be cleaned up enough to allow public access to the land and the plan for guarding these sites cannot guarantee the safety of the public.	NMED understands the issue addressed by the commenter; however, this comment addresses a subject area that is beyond the current scope of the review of the fate and transport model.
D	19	Not dated (rec'd 2/05/06)	Citizen, Maurice Weisberg, MD	The commenter stated that biotransport of radioactive contaminants is likely to occur over time and increasingly over the long term.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of biological transport of contaminants is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
D	20	Not dated (rec'd 2/05/06)	Citizen, Maurice Weisberg, MD	The commenter referenced Dr. Peter Montague, director of Rachel's Environment and Health Weekly, who indicated 5 or 6 reasons why dirt caps and vegetative covers fail. Among the problems are deep root systems extending as much as 20-30 feet below the surface, burrowing rodents and insects, erosion, and cave-ins due to collapsing wastes, drums, and debris.	NMED understands the issue addressed by the commenter and will consider the comment further, but this comment is beyond the scope of the review of the fate and transport model. The NMED, however, previously held a public comment period and public hearing regarding the CMS conducted for the mixed waste landfill. The NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy for the mixed waste landfill. This selection was based on the administrative record and the

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					Hearing Officer's report. The CMI plan, which includes the fate and transport model, was developed as a result of the remedy selection.
D	21	Not dated (rec'd 2/05/06)	Citizen, Maurice Weisberg, MD	The commenter supports the excavation of all mixed wastes buried in unlined, unregulated, and unpermitted pits and trenches and their transfer for storage in hardened facilities above ground.	NMED understands the issue addressed by the commenter and will consider the comment further, but this comment is beyond the scope of the review of the fate and transport model. The NMED, however, previously held a public comment period and public hearing regarding the CMS conducted for the mixed waste landfill. The NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy for the mixed waste landfill. This selection was based on the administrative record and the Hearing Officer's report. The CMI plan, which includes the fate and transport model, was developed as a result of the remedy selection.
D	22	Not dated (rec'd 2/05/06)	Citizen, Maurice Weisberg, MD	The commenter is concerned about the leaching of radioactive materials from the landfill and their transport through the vadose zone to groundwater. The commenter references the SNL Chemical Waste Landfill and the Liquid Waste Disposal Area as sources of groundwater contamination through a similar pathway.	As part of the CMI plan, the fate and transport model addresses the probability that radioactive contaminants will move from the landfill through the vadose zone to groundwater. None of the modeled radionuclides were simulated to reach groundwater during the 1,000-year performance period or the extended 10,000-year period.
D	23	Not dated (rec'd 2/05/06)	Citizen, Maurice Weisberg, MD	The commenter is concerned that liquid waste was disposed in the landfill prior to 1972 and that it has leached from the landfill to groundwater.	None of the modeled radionuclides and heavy metals was simulated to reach groundwater during the 1,000-year performance period or the extended 10,000-year period. However, the model indicates that aquifer concentrations of perchloroethene (PCE) will peak in less than 50 years for the majority of the model runs. Only 1 of 100 model runs indicates that PCE concentrations will exceed the regulatory maximum contaminant level (MCL) of 5 µg/L (approximately 5 parts per billion). The fate and transport model addresses the probability

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					that contaminants will move from the landfill through the vadose zone to groundwater, but is not designed to address groundwater plume movement. NMED will consider this comment further, including the potential need for a groundwater plume model.
D	24	Not dated (rec'd 2/05/06)	Citizen, Maurice Weisberg, MD	The commenter referenced Dr. Arjun Makhijani, of the Institute of Energy and Environmental Research (IEER), who supports excavating buried nuclear waste sites as a priority for shipment to a repository.	NMED understands the issue addressed by the commenter and will consider the comment further, but this comment is beyond the current scope of the review of the fate and transport model. The NMED, however, previously held a public comment period and public hearing regarding the CMS conducted for the mixed waste landfill. The NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy for the mixed waste landfill. This selection was based on the administrative record and the Hearing Officer's report. The CMI plan, which includes the fate and transport model, was developed as a result of the remedy selection.
E	25	Not dated (rec'd 2/06/06)	Albuquerque Center for Peace and Justice and Citizens for Alternatives to Radioactive Dumping, Dorelen Bunting and Janet Greenwald	The commenter supports the comments submitted by Citizen Action concerning the Mixed Waste Landfill at Sandia National Laboratories and specifically the Fate and Transport model.	NMED received comments from Citizen Action, which are addressed in another portion of this comment response table.
E	26	Not dated (rec'd 2/06/06)	Albuquerque Center for Peace and Justice and Citizens for Alternatives to Radioactive Dumping, Dorelen	The commenter is concerned regarding the proposed "triggers" for releases from the landfill. The commenter believes that plants and animals, if found to be contaminated, should be considered a trigger. The comment also supports consideration of all the contaminants for trigger levels. In addition, the commenter believes that contaminants in the vadose	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Concentrations of COCs in the groundwater are considered by the model. Consideration of other triggers is beyond the current scope of the

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			Bunting and Janet Greenwald	zone should be a trigger.	model. NMED will consider this comment further as the model results are reviewed, particularly the possibility of establishing trigger levels in the vadose zone.
E	27	Not dated (rec'd 2/06/06)	Albuquerque Center for Peace and Justice and Citizens for Alternatives to Radioactive Dumping, Dorelen Bunting and Janet Greenwald	The commenter requests consideration of all contaminants in the landfill when calculating the risk to the surrounding community.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
F	28	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model concluded that contaminants from the mixed waste landfill will reach Albuquerque's sole-source aquifer within 50 years. The commenter considers the seriousness of potentially contaminated drinking water and states that the fate and transport model and the Corrective Measure Implementation Plan are dangerously inadequate.	None of the modeled radionuclides and heavy metals was simulated to reach groundwater during the 1,000-year performance period or the extended 10,000-year period. However, the model indicates that aquifer concentrations of perchloroethene (PCE) will peak in less than 50 years for the majority of the model runs. Only 1 of 100 model runs indicates that PCE concentrations will exceed the regulatory maximum contaminant level (MCL) of 5 µg/L (approximately 5 parts per billion). The fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater, but is not designed to address groundwater plume movement. NMED will consider this comment further, including the potential need for a groundwater plume model.
F	29	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model needs to be revised to consider possible transport of contaminants through animals and plants.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of biological transport of contaminants is beyond the current scope of the

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					model. NMED will consider this comment further as the model results are reviewed.
F	30	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model needs to be revised to consider the ineffectiveness of a rock bio-intrusion barrier.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Evaluation of the effectiveness of the bio-intrusion barrier is beyond the scope of the model. The NMED, however, previously held a public comment period and public hearing regarding the CMS conducted for the mixed waste landfill. The NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy for the mixed waste landfill. This selection was based on the administrative record and the Hearing Officer's report. The CMI plan, which includes the fate and transport model, was developed as a result of the remedy selection.
F	31	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model needs to be revised to consider the comprehensive modeling of institutional controls against human intrusion.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of institutional controls to prevent human intrusion is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
F	32	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model needs to be revised to consider the comprehensive analysis of potential human intrusion.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of human intrusion is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
F	33	2/06/06	Loretto	The commenter states the fate and transport model	As part of the CMI plan, the fate and transport

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		(rec'd 2/06/06)	Community of Catholic Sisters and Co-members, Penelope McMullen	needs to be revised to consider the modeling of all hazardous chemicals and volatile organic compounds known or suspected to be in the mixed waste landfill.	model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. The current scope of the model considers COCs selected from the wastes disposed in the landfill. NMED will consider this comment further as the model results are reviewed.
F	34	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model needs to be revised to consider the modeling of all potential new compounds which could be formed as a result of mixing radionuclides with non- radioactive materials.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. The current scope of the model considers COCs selected from the wastes disposed in the landfill. NMED will consider this comment further as the model results are reviewed.
F	35	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model needs to be revised to consider a plan for monitoring, testing and dealing with contaminants that may show up in the future.	NMED understands the issue addressed by the commenter; however, this comment addresses a subject area that is beyond the current scope of the fate and transport model. NMED will consider this comment further.
F	36	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model needs to be revised to consider performing a risk assessment for all waste types buried in the mixed waste landfill.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Concentrations of COCs in the groundwater are considered by the model. The current scope of the model does not require a risk assessment for all wastes disposed in the landfill. NMED will consider this comment further as the model results are reviewed.
F	37	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model needs to be revised to consider recent data to verify the validity of the fate and transport model, since the data used are outdated by at least 10 years.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.

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F	38	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the fate and transport model needs to be revised to consider the analysis of possible deterioration of each type of "container" for each type of waste buried in the MWL.	NMED understands the issue addressed by the commenter; however, this comment addresses a subject area that is beyond the current scope of the fate and transport model. NMED will consider this comment further.
F	39	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the CMI plan should be revised to include all of the analysis of the revised fate and transport model.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
F	40	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the CMI plan should be revised to include full long-term monitoring and maintenance program for public review and comment.	NMED understands the issue addressed by the commenter; however, this comment addresses a subject area that is beyond the current scope of the fate and transport model. NMED will consider this comment further.
F	41	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter states the CMI plan should be revised to include a demonstration showing how the proposed monitoring system will detect migration of contaminants.	NMED understands the issue addressed by the commenter; however, this comment addresses a subject area that is beyond the current scope of the fate and transport model. NMED will consider this comment further.
F	42	2/06/06 (rec'd 2/06/06)	Loretto Community of Catholic Sisters and Co-members, Penelope McMullen	The commenter supports the excavation of the mixed waste landfill and development of a comprehensive clean up plan to contain the waste in a safer area.	NMED understands the issue addressed by the commenter and will consider the comment further. The NMED, however, previously held a public comment period and public hearing regarding the corrective measures study (CMS) conducted for the mixed waste landfill. The NMED selected a vegetative soil cover with a bio-intrusion barrier as the remedy for the mixed waste landfill. This selection was based on the administrative record and the Hearing Officer's report. The corrective measures implementation (CMI) plan, which includes the fate and transport model, was developed as a

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					result of the remedy selection.
G	43	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter stated that the general approach taken by the fate and transport model is proper and commendable. The commenter stated the model is aimed at identifying appropriate locations and properties or constituents for long-term monitoring, and that the stochastic (probabilistic) modeling provides information for performing a sensitivity analysis, which in turn informs the monitoring program. The commenter believes this is an example of appropriate application of stochastic modeling, but also noted that several technical flaws (presented below) bring the overall results into question.	NMED understands the issue addressed by the commenter and specifically addresses all of the technical comments presented in the commenter's letter.
G	44	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter states that the uncertainty distribution for the inventory of radionuclides in the MWL is undefended, applying a uniform distribution with a minimum at the values reported in SNL (1993) (from the document references) and a maximum of only twice the minimum. Commenter notes that no justification for this distribution is provided in the document, and believes the distribution is narrow based on the uncertainties regarding the inventory that are apparent in the source document. The commenter believes it is highly unlikely that all inventory constituents share the exact same uncertainty distribution, so the uniform (x,2x) distribution seems *ad hoc*. The commenter notes that inventory uncertainty is often the greatest source of modeling uncertainty at other DOE sites and suggests that a more thorough analysis of these distributions should be performed.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
G	45	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter believes that the most significant oversight in the contaminant transport modeling of the mixed waste landfill is the lack of any contributions to transport by biotic activity. The commenter believes this should have been identified in the preliminary exercise of identifying significant	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of biological transport of contaminants is beyond the current scope of the

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				features, events, and processes affecting contaminant transport at the site. The commenter notes that recent work at other DOE sites (including Los Alamos National Laboratory and Nevada Test Site) has found that biotic activity in the form of plant uptake and redistribution of contaminants and animal translocation of bulk (contaminated) materials can be significant or even dominant modes of contaminant transport. The commenter states that in arid environments, plants tend to extend roots to significant depths in search of water, while ants have been found to construct nests to depths of several meters. The commenter believes that a cap thickness of a meter is ineffective at keeping these biota out of the waste in the mixed waste landfill.	model. NMED will consider this comment further as the model results are reviewed.
G	46	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter notes that the model document includes the development of a method for predicting the ground surface flux of radon-222 (^{222}Rn) above the MWL, as a linear function of the concentration of its parent, radium-226 (^{226}Ra), at depth in the landfill. The commenter believes this model is fine under the assumption that all the ^{226}Ra stays at depth, but notes that if biotically-induced transport of waste materials is included as a contaminant transport process, the ^{226}Ra parent material (as well as its parents, such as uranium-238 [^{238}U]) will move into the cap itself and onto the ground surface. The commenter notes that this does not fit the current radon diffusion model assumptions, and suggests that this modeling must employ more sophisticated techniques.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
G	47	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter states that decay cascades can produce significant doses, and should not be neglected in the dose assessment process. The commenter notes that when coupled with biotic processes in the cap, there is a possibility of bringing radionuclides to the surface.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
G	48	2/07/06	Citizen, John	The commenter notes that external exposures from	NMED understands the issue addressed by the

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		(rec'd 2/07/06)	Tauxe, Ph.D., PE	radionuclides in the ground surface and near surface was overlooked in the model and that this is a potentially significant exposure pathway. The commenter believes this exposure should be included with inhalation of gases and particulates and incidental ingestion of soils by potential future receptors who would have access to the site.	commenter and will consider the comment further as the model results are reviewed.
G	49	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter believes that a reasonable potential future receptor scenario includes a residence built directly on top of the mixed waste landfill. The commenter notes that with ongoing development in the Albuquerque area and a precedent of residential construction on landfills (e.g., Love Canal, New York), this would trigger the analysis of additional exposure pathways as well, such as exposure to indoor air with its elevated concentrations of gaseous radionuclides and volatile organic carbon (VOC) compounds.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
G	50	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter notes that the period of performance for the model is 1,000 years, but suggests that modeling for peak dose analysis can still be useful in providing perspective on the long-term significance of waste disposal.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
G	51	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter believes that transport and fate of tetrachloroethylene (or perchloroethylene, PCE) is modeled reasonably, including decay from biotic degradation, but notes that future releases of PCE from as-yet unbreached containers was not performed. The commenter notes that PCE decay products are not modeled and yet can be significant sources of cancer risk. The commenter states that some of these decay products have higher hazard indices than that of PCE, and cancer risk from them should be included in the model, as well as consideration of variable biodegradation rates, which will vary with location in the model.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
G	52	2/07/06	Citizen, John	The commenter notes that the model indicates it is	NMED understands the issue addressed by the

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		(rec'd 2/07/06)	Tauxe, Ph.D., PE	conservative in its assumptions, but this philosophy was applied inconsistently between groundwater infiltration and surface water runoff pathways. When one is modeled conservatively, the other is not conservative, if the pathways are linked to the same conditions. The commenter recommends abandoning the attempt to be "conservative" in favor of trying to be realistic in all assumptions.	commenter and will consider the comment further as the model results are reviewed.
G	53	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter notes that the model document proposes monitoring of tritium and radon at the site boundary. The commenter, however, suggests that more valuable and interesting data will be obtained by monitoring these constituents on the landfill as they emanate from the cap. The commenter believes monitoring on the landfill cap will provide a more immediate and sensitive indication of gas emanation than can be provided by monitoring at the boundary.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
G	54	2/07/06 (rec'd 2/07/06)	Citizen, John Tauxe, Ph.D., PE	The commenter notes that the sensitivity analysis performed for the fate and transport model attempts to identify those model parameters and processes that most influence the results and recommends them for future monitoring. The commenter believes, however, that the sensitivity analysis is *ad hoc*, rather than comprehensive. The commenter recommends performance of a comprehensive sensitivity analysis and that the inventory distributions should be revisited, or if this was done, that sufficient details be provided for the reader to understand the method.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
H	55	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information	The commenter requests that NMED convene a "technical discussion group" to serve as a public meeting to provide a forum for interested stakeholders regarding the adequacy of the fate and transport model and the CMI plan. The commenter recommends that this technical discussion group include representatives of the permittee, the NMED, and members of the public who have expressed an interest in the studies conducted by Sandia and/or	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed. NMED will convene a public meeting in late May 2006.

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			Center)	submitted comments to the NMED on the CMI plan and/or the fate and transport model. The commenter also recommends convening this technical discussion group prior to determining that the CMI plan and the fate and transport model are either "comprehensive" or complete" with respect to the technical requirements applicable to the wastes at the mixed waste landfill.	
H	56	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter stated that the fate and transport model is not comprehensive with respect to the volume of each individual waste product and physical state of containers for the full range of contaminants at the mixed waste landfill.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
H	57	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter stated that the fate and transport model is not comprehensive with respect to the potential for releases including vadose zone and groundwater contamination due to transport not considered in the model, including mechanisms such as biological transport of contaminants through the ground surface, human intrusion, and movement of contaminants by wind/air.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of biological transport of contaminants, human intrusion, and airborne movement of contaminants is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
H	58	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information	The commenter stated that the fate and transport model is not comprehensive with respect to the modeling for the complete suite of radionuclides and daughter products, metals, and volatile and semi-volatile organic compounds in the known inventory of the MWL.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. The current scope of the model considers COCs selected from the wastes disposed in the landfill. NMED will consider this comment further as the model results are reviewed.

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			Center)		
H	59	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter stated that the fate and transport model does not address biological transport of contaminants resulting from plant and animal uptake of contaminants and subsequent dispersion of soil, plant and animal material by wind. The commenter believes this information is required for a comprehensive model.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of biological transport of contaminants is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
H	60	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter stated that the fate and transport model does not address transport of contaminants resulting from human intrusion associated with accidental events and the eventual failure of the land use restriction portions of the institutional controls proposed by Sandia for the landfill. The commenter believes this information is required for a comprehensive model.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of human intrusion into the landfill and institutional controls is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
H	61	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter stated that the fate and transport model does not provide a comprehensive fate and transport analysis as it does not include calibrated model "realizations" for the full range of radioactive and hazardous constituents identified at the mixed waste landfill, including a wide range of radionuclides, a wide range of metals and inorganic compounds including beryllium, nickel, chromium, sodium, lithium, and the range of volatile organic compounds (VOCs) present at the landfill. The commenter believes this information is required for a comprehensive model.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. The current scope of the model considers COCs selected from the wastes disposed in the landfill. NMED will consider this comment further as the model results are reviewed.
H	62	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments	The commenter stated that the model does not identify or address fate and transport dynamics associated with the potential for formation of mobile, potential hazardous compounds by radiolysis - the	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. The

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			compiled by Paul Robinson, Southwest Research and Information Center)	process by which radionuclides can mix with non-radioactive constituents and form new compounds. The commenter believes this information is required for a comprehensive model.	current scope of the model considers COCs selected from the wastes disposed in the landfill. NMED will consider this comment further as the model results are reviewed.
H	63	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter stated that the "triggers" identified in the model do not include monitoring mechanisms to reflect either human intrusion, biological transport, or the waste constituents identified at the MWL. The commenter believes this information is required for a comprehensive model.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of biological transport of contaminants and human intrusion is beyond the current scope of the model. The current scope of the model considers COCs selected from the wastes disposed in the landfill. NMED will consider this comment further as the model results are reviewed.
H	64	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter stated that the fate and transport model does not identify means to monitor, model and assure the effectiveness of institutional controls or the consequences of the failure of such passive site protection measures. The commenter believes this information is required for a comprehensive model.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Consideration of institutional controls is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed.
H	65	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter stated that the fate and transport model does not provide a risk assessment/performance assessment analysis in its evaluation of the potential for release of contaminants from the landfill. The commenter believes this information is required for a comprehensive model.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.

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H	66	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter states that the model relies on data regarding releases of radionuclides, heavy metals, and volatile organic compounds from the Phase 1 and Phase 2 RCRA Feasibility Investigation (RFI) gathered in 1993 – 1995. The commenter states that no new data gathering was conducted or proposed to calibrate or verify the modeling.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
H	67	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter states that the model does not appear to identify or consider either the mechanisms for deterioration of waste containers or the consequences of the deterioration of waste containers during development of the input parameters and assumptions for its VOC, heavy metal and radionuclide models, with the exception of the radon model runs in which radium-226 containers were determined to deteriorate in 1,000 years.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
H	68	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter states the model concludes that PCE, the only organic compound modeled, would reach groundwater for all 100 model runs ("realizations") with the majority of the model runs showing PCE reaching groundwater within 50 years. The commenter states that the model also does not identify or present model realizations for the decay products of PCE and the other VOCs and semi-volatile compounds (SVOCs) that were known to have escaped the landfill in 1993. The commenter requests that NMED consider requiring improvements in the Corrective Measure proposed for the landfill to prevent future releases of VOCs and SVOCs.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
H	69	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton	The commenter states that the model identifies a 1995 Argonne National Laboratory report [cited as Johnson 1995 in the FTM] at p. 16 that showed that	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.

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			(Comments compiled by Paul Robinson, Southwest Research and Information Center)	VOCs released from the landfill could reach the water approximately 250 years from the time of disposal. This study was not provided to NMED as part of the CMS, CMI plan, or the references for either of those reports. The commenter states that NMED should require Sandia to provide the agency with copies of the 1995 Argonne Study, review the Study, and consider its relevance regarding the adequacy of the Corrective Measure identified in the Permit Modification since Sandia did not present the Study to NMED or the public or consider it during the development of the CMS. The commenter requests that NMED review the Corrective Measure approved in the Permit Modification as the conclusions of the 1995 Argonne Report are contrary to the conclusions presented in the CMS and Sandia's landfill hearing, i.e., that contaminants such as VOCs could not reach groundwater at the landfill site.	
H	70	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter states that the "trigger levels" identified in the model do not provide for early detection and early response to releases prior to the exceedance of health–based standards. The commenter states that the proposed trigger levels do not provide either early detection or early response as they are set at values at or near regulatory standards, rather than at levels that would demonstrate the "edge of the plume." The commenter suggests trigger levels that provide "detection of contamination," which would be established at a level 25–50% above initial concentrations for contaminants of concern.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
H	71	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson,	The commenter states that the model does not identify trigger levels for waste constituents that apply at the edge of the landfill or in the vadose zone below the site, but above the water table.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Concentrations of COCs in the groundwater are considered by the model. Consideration of

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			Southwest Research and Information Center)		other triggers is beyond the current scope of the model. NMED will consider this comment further as the model results are reviewed, particularly the possibility of establishing trigger levels in the vadose zone.
H	72	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter states that the model discussion of "Trigger Levels"' does not address the degree to which monitoring for moisture content changes would reflect vapor phase movement of VOCs. The commenter requests that the model identify technologies that could be used to monitor moisture content.	As part of the CMI plan, the fate and transport model addresses the probability that contaminants will move from the landfill through the vadose zone to groundwater. Concentrations of COCs in the groundwater are considered by the model. NMED will consider this comment further as the model results are reviewed, particularly the possibility of monitoring moisture content in association with vapor phase movement of VOCs. Identification of moisture content technologies is beyond the current scope of the fate and transport model.
H	73	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter states that a broad range of sources of uncertainty in the model were identified by the model's lead author Dr. Clifford Ho in a PowerPoint presentation at a DOE-sponsored public meeting on the model in January 2006. The "uncertainty variables" identified by Dr. Ho included: waste inventory and size; thickness of cover and vadose zone; and transport parameters including: infiltration, adsorption coefficient, saturated conductivity, moisture content; tortuosity coefficients, and boundary-layer thickness. The commenter suggests that the model should be revised to identify the full range of uncertainty variables associated with each of the constituents addressed in the FTM, as well as to identify the range of values used in model realizations to account for the uncertainty associated with each variable.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
H	74	2/07/06 (rec'd	Citizen Action New Mexico,	The commenter states that the CMI plan does not effectively incorporate the content and findings of the	NMED understands the issue addressed by the commenter and will consider the comment

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		2/07/06)	Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	model in either the evaluation or design of the Corrective Measure proposed for the landfill. The commenter requests revision of the CMI plan to incorporate the analyses and findings in the model when it is determined to be comprehensive and meet the requirements of the permit modification and associated guidelines and regulations by NMED.	further as the model results are reviewed.
H	75	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter is concerned that the CMI plan does not provide a comprehensive or detailed long-term operation and maintenance plan for public comment or review. The commenter requests that the CMI plan include a long-term monitoring and maintenance program that addresses: all parameters to be monitored, all media – including air, soil, vadose zone, groundwater and biota (plants and animals); recommended limits of detection for analytic equipment to be used; frequency of sampling and analysis; quality control and quality assurance measures; monitoring and maintenance cost estimates; landfill cover inspections and maintenance activities; and measures to verify that all institutional control aspects of the proposed corrective measure are in place and enforced for the full closure and post-closure period at the landfill.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
H	76	2/07/06 (rec'd 2/07/06)	Citizen Action New Mexico, Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	The commenter states that the CMI plan proposes only three vadose zone monitoring boreholes and does not provide a demonstration that this number of instruments will provide comprehensive vadose zone monitoring.	NMED understands the issue addressed by the commenter and will consider the comment further as the model results are reviewed.
H	77	2/07/06 (rec'd	Citizen Action New Mexico,	The commenter states that the CMI plan does not address the technical literature related to bio-	NMED understands the issue addressed by the commenter and will consider the comment

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		2/07/06)	Susan Dayton (Comments compiled by Paul Robinson, Southwest Research and Information Center)	intrusion barriers or identify monitoring systems appropriate for detection of releases associated with bio-intrusion into the landfill. The commenter requests revision of the CMI plan to include a thorough investigation and re-sampling of the soil at the landfill to identify bio-intrusion mechanisms and biological transport of contaminants, and consider the applicability of findings of such investigations to the Corrective Measure for the landfill.	further as the model results are reviewed.