UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
PRIVATE FUEL STORAGE, L.L.C.	)	Docket No. 72-22-ISFSI
	)	
(Independent Spent Fuel Storage Installation)	)	
	)	

AFFIDAVIT OF RICHARD H. KETELLE CONCERNING UTAH CONTENTION O -- HYDROLOGY

Richard H. Ketelle, being duly sworn, does hereby state as follows:

1. My name is Richard H. Ketelle. I am employed as a subsurface contamination specialist, with the Bechtel-Jacobs Corporation in Oak Ridge, Tennessee. I am providing this affidavit under a technical assistance contract between the NRC Staff and Oak Ridge National Laboratory ("ORNL"). A statement of my professional qualifications is attached hereto as Attachment 1.

2. This Affidavit is prepared in support of the "NRC Staff's Response To Applicant's Motion For Summary Disposition of Utah Contention O - Hydrology" ("Staff Response") filed herewith, concerning the "Applicant's Motion for Summary Disposition of Utah Contention O - Hydrology" ("Motion") and the "Statement of Material Facts on Which No Genuine Dispute Exists" ("Statement of Material Facts") attached thereto, filed by Private Fuel Storage, L.L.C. ("PFS" or "Applicant") on June 29, 2001.

3. As part of my official responsibilities, I assisted the NRC Staff in its evaluation of the potential environmental impacts related to the Applicant's proposed construction and operation of an independent spent fuel storage installation ("ISFSI") on the Reservation of the Skull Valley Band

of Goshutes ("Reservation") located in Skull Valley, Utah. Further, I assisted in the preparation of the Staff's "Draft Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Facility on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility in Tooele County, Utah," NUREG-1714, issued in June 2000 ("DEIS"), and am currently assisting in the preparation of the NRC Staff's Final EIS ("FEIS") related to this proposed facility.

4. As part of my official responsibilities, I reviewed the Applicant's Motion and the Statement of Material Facts attached thereto, in which PFS seeks summary disposition of Utah Contention O. My review included the Declarations of George H. C. Liang and Donald Wayne Lewis, which were attached to the Applicant's Motion.

5. On the basis of my review of the Applicant's Environmental Report (ER), the Applicant's Motion, the Declarations of Dr. Liang and Mr. Lewis, and the DEIS, I am satisfied that the Statement of Material Facts attached to the Applicant's Motion is correct, except that I believe that Material Facts Nos. 9, 12, 21, 35, 46, 49, 50, 52, 53, 55, 56, 59, and 66 should be clarified or corrected in minor respects, as set forth in paragraphs 6 through 19 below:[1]

6. Material Fact No. 9 should be modified to read:

> 9. There are no perennial watercourses within 5 miles downslope of the PFSF, including lakes, ponds, drinking water storage areas and streams. The nearest intermittent stream channel is approximately 1,500 feet northeast of the PFSF site. Decl. ¶ 18, ER § 2.5.1, DEIS § 3.2.1.1, Ostler Dep. pp 43-44.

7. Material Fact No. 12 should be modified to read:

> 12. Assuming that the Applicant's proposed ~~The~~ erosion control plan and best management practices are implemented during construction, those measures, in combination with the absence of nearby ~~lack of~~ receiving surface water bodies, typically low

[1] In the following discussion, proposed changes to the Applicant's Statement of Material Facts are indicated by underlining (insertions) or underlining and strikeout (deletions).

precipitation, and ~~lack of~~ the weak hydrological link between the land surface and groundwater at the PFS site, ~~will ensure~~ render it very unlikely that construction activities will ~~not lead to~~ lead to contamination of surface or groundwater. Decl., ¶ 32.

8. Material Fact No. 21 should be modified to read:

21. PFS has indicated that all ~~All~~ of these protective measures ~~; which~~ will be implemented as part of PFSF's "Start Clean – Stay Clean" operating philosophy. If these measures are implemented, radiological contamination is unlikely to ~~from~~ will occurr~~ing~~ at the PFSF site. Id. ¶ 33.

9. Material Fact No. 35 should be modified to read:

35. Physical separation of (the wastewater treatment system) from the areas where contamination could occur, PFS's commitment to ~~the~~ requirement ~~for~~ the use of protective clothing; and PFS's commitment to adopt facility procedures to prevent introduction of contaminants into wastewater drains, render it very unlikely ~~will preclude the possibility~~ that radiological contamination will be introduced into the sewer/wastewater system, in the unlikely event such contamination should occur. Id. ¶ 47.

10. Material Fact No. 46 should be modified to read:

46. The potential for non-radiological contamination of the water in the detention pond is ~~limited and effectively precluded~~ minimized by:

(a) The PFS commitment to implement operating procedures that contain ~~The absence of~~ any significant sources of non-radiological contamination (Id. ¶¶ 42, 49),

(b) The PFS commitment to implement~~ation of~~ procedures to ensure compliance with all regulations related to handling and storage of hazardous materials (Id. ¶ 42), and

(c) Engineered containment features (e.g., the drainage ditches that run alongside the north and south sides of the railroad tracks) that will contain other potential non-radiological contaminates such as diesel fuel. These drainage ditches will include weirs to prevent any accidental spills of diesel fuel from running into the detention pond. Id. ¶ 54.

11. Material Fact No. 49 should be modified to read:

49. For contamination to be carried to the groundwater, it must first be present. As discussed in paragraphs 13 through 21 and 22 through 26, above, there is a low likelihood of ~~no credible source for~~ either radiological or non-radiological contamination entering the detention basin.

12. Material Fact No. 50 should be modified to read:

50. The ~~lack of a~~ weak hydrological connection between the surface and groundwater at the PFSF site ~~precludes~~ reduces the likelihood of surface contamination from reaching the groundwater. Decl. ¶ 59.

13. Material Fact No. 52 should be modified to read:

52. As stated in paragraph 9, above, there are no perennial surface water sources within 5 miles downslope of the PFS site, including lakes, ponds, drinking water storage areas, and streams. The nearest intermittent stream is approximately 1,500 feet northeast of the site. As stated in paragraph 10, above, average annual precipitation in the vicinity of the PFSF site is 7 – 12 inches.

14. Material Fact No. 53 should be modified to read:

53. As discussed in paragraphs 12, 13 through 21, 22 through 27, 32 through 35, 38, 46, and 47 ~~and 51~~, above, the likelihood of any release of contamination from the PFSF is very low. ~~there are no credible sources or pathways of radiological or non-radiological contamination at the PFSF.~~

15. Material Fact No. 55 should be modified to read:

55. As discussed in paragraph 3, above, there is ~~no direct~~ only a weak hydrological link between the surface and groundwater at the PFS site.

16. Material Fact No. 56 should be modified to read:

56. As discussed in paragraphs 12, 13 through 21, 22 through 27, 32 through 35, 38, 46, and 47 ~~and 51~~ , above, the likelihood of any release of contamination from the PFSF is very low. ~~there are no credible sources or pathways of radiological or non-radiological contamination at the PFSF.~~

17. Material Fact No. 59 should be modified to read:

> 59. The closest downgradient, off-reservation well to the PFSF site is approximately 9,500 feet away. Decl. ¶ 64.

18. Material Fact No. 62 should be modified to read:

> 62. PFS estimates that water requirements over the 42-year construction/operation period ~~to~~ will average 2.3 acre-feet per year. Id. ¶ 29. An independent analysis by the Staff results in an estimate of an average withdrawal of approximately 4.4 acre-feet per year. Either number (i.e., 2.3 or 4.4 acre-feet) constitutes only a very small portion of the water available in the aquifer. Id. ¶ 66.

19. Material Fact No. 66 should be modified to read:

> 66. ~~The lack of any credible sources of groundwater contamination and pathways for such contamination to reach downgradient users precludes any impact of potential contamination from the PFSF on downgradient users.~~ The combination of PFS's commitments to facility design elements and operating procedures that limit the potential for contaminant release, the absence of nearby downslope surface water bodies, and the weak hydrologic connection between the land surface and the aquifer beneath the site, make the likelihood of contamination reaching downgradient water users very low. Decl. ¶ 67-68.

20. Notwithstanding the modifications and corrections set forth in paragraphs 6 through 19 above, I agree with the Applicant's view that the concerns raised by the State in Utah Contention O regarding potential hydrological impacts associated with the construction, operation and decommissioning of the PFSF have been addressed satisfactorily, and no genuine dispute of material fact exists with respect to these matters.

21. Further, I have reviewed the commitments regarding facility design features, construction practices, and operating procedures contained in the Applicant's Statement of Material Facts. Assuming that these commitments are implemented, I believe that the conclusions stated in the Applicant's Statement of Material Facts, as modified herein, are correct.

22. I hereby certify that the foregoing statements are true and correct to the best of my knowledge, information, and belief.

Richard H. Ketelle

Sworn to before me this
19th day of July 2001

Claire M. Cutwood
Notary Public

My commission expires: 6/30/2004

Richard H. Ketelle

EDUCATION

M.S. in Geology, University of Tennessee, Knoxville, 1977. Thesis Title: Characterization of the Mineral and Metal Content of Suspended Sediment, New River Basin, Tennessee.

B.S. in Geology, University of Tennessee, Knoxville, 1973.

EXPERIENCE

Engineering Specialist **March 2000 to Present**
Bechtel-Jacobs Corporation
Oak Ridge, Tennessee

Responsible for Water Quality Program at the Oak Ridge National Laboratory ("ORNL") site including planning and overseeing surface water and groundwater monitoring for the Environmental Monitoring ("EM") Program at ORNL. Provides technical support to remediation projects and procurement teams for the ORNL site. Provides technical assistance to ORNL Research Reactors Division on release of tritium contaminated process wastewater to groundwater at the High Flux Isotope Reactor site.

Research Staff **1979-March 2000**
Oak Ridge National Laboratory
Oak Ridge, Tennessee

Groundwater Manager
Oak Ridge National Laboratory (1996-2000)

Provided oversight of groundwater monitoring activities for ORNL. Assigned as technical lead for the Remedial Investigation Report preparation for the Melton Valley Watershed and participated in preparation of the MeltonValley Proposed Plan and Record of Decision. Also participated in public interactions of the End Use Working Group and the Stewardship Working Group sponsored by the Oak Ridge Reservation Site Specific Advisory Board.

Group Leader, Applied Geology Group
Oak Ridge National Laboratory (1995-1996)

Led technical activities in groundwater investigations for the ORNL Environmental Restoration Program. Groundwater Coordinator for ORNL site.

Research Staff Member
Oak Ridge National Laboratory (1993 - 1994)

Technical Lead for groundwater activities for ORNL Environmental Restoration. Lead hydrogeologic analyses for several remedial action projects at ORNL which culminated in construction of groundwater collection and treatment facilities. Contributed to use of advanced groundwater models in risk assessment analyses for site remediation at ORNL.

Research Associate, Applied Physical Sciences Group
Oak Ridge National Laboratory (1990-1992)

Directed activities of Applied Physical Sciences Group geologists in preparing report sections for the Gaseous Diffusion Plant Safety Analysis Report Upgrade Program. Participated in groundwater modeling task supporting the Performance Assessment for operating low-level waste disposal facilities in Solid Waste Storage Area 6 at ORNL. Directed site monitoring activities for the proposed future low-level waste sites at Oak Ridge. Advised ORNL Environmental Restoration staff on geologic and hydrogeologic considerations in risk assessment of ORNL facilities.

Research Associate
Oak Ridge National Laboratory (1979-1989)

1985-1989: Responsible for geologic and hydrogeologic site characterization studies in DOE's Low-Level Waste Disposal Development and Demonstration Program and the ORNL Remedial Action Program Remedial Action Feasibility Study. Activities included characterization program task planning and performance using both subcontract personnel and ORNL staff. Planned and supervised construction of piezometers and water quality monitoring wells at the ORNL facilities for the purpose of basic site characterization, sampling of selected wells in a contaminant scoping survey, and performance of hydraulic testing in core holes to develop a large-scale understanding of the groundwater flow system at ORNL. Responsible for the performance of the first regional inventory of karst subsidence in East Tennessee.

1982-1985: Performed site characterization of two proposed low-level radioactive waste disposal sites and participated in pathways analyses for both sites. Work at the West Chestnut Ridge Site at Oak Ridge included characterization of thick residual soils, bedrock, and groundwater flow in the karst aquifer. Work at the Ohio site involved characterization of soil and bedrock conditions as well as performance of aquifer tests and participation in the site pathways analysis. Pathways analyses for both of these sites included groundwater contaminant transport analyses and estimation of potential radiological dose to. Participated in preparation of documents pertaining to appropriate techniques for shallow land burial of low level radioactive waste and remedial measures to stabilize shallow land burial facilities. Applied electromagnetic survey techniques to groundwater studies at several sites.

1979-1982: Performed analyses of potential impacts of large-scale synthetic fuel plant construction and operation and participated in preparation of NEPA documents for other DOE sponsored projects.

Hensley-Schmidt Consultants, Inc. **1977-1979**
Chattanooga, Tennessee

As a geologic consultant, performed coal exploration and reserve estimation on properties in Alabama, Kentucky, Tennessee, and West Virginia. Performed foundation and settlement investigations at several large construction sites.

Field Assistant **1977**
U.S. Geological Survey
Reston, Virginia

Participated in field geologic mapping and sampling for mineral resource assessment at areas proposed for designation as National Wilderness Areas in East Tennessee. Gained experience in geologic mapping in the metamorphic rock setting of the Blue Ridge Province of East Tennessee.

REGISTRATION

Registered Professional Geologist in the State of Tennessee No. 555

OTHER TRAINING

2000	Multi-Agency Radiation Survey and Site Investigation Manual training, Washington, D.C.
1993	Dynamic Graphics, Earthvision training course.
1990	Applied Groundwater Modeling, International Groundwater Modeling Center, Butler University, Indianapolis, Indiana.
1984	Geotechnical Applications of Borehole Geophysics, by Jeffrey Daniels.
1984	Project Management, Oak Ridge National Laboratory.
1983	Geotechnical Engineering for Waste Disposal Projects, University of Texas Short Course.
1981	Introductory Soil Mechanics, The University of Tennessee, One Quarter.
1978	Fundamentals of Grouting, University of Missouri Short Course.

PUBLICATIONS

R.H. Ketelle and G.J. Davies, Hydrogeochemical Responses of Knox Group Springs to Precipitation at Oak Ridge Tennessee. GSA Abstracts with Programs Vo. 31 No. 7 p. 331 October 1999.

J. C. Wang, D. W. Lee, R. H. Ketelle, R. R. Lee, D. C. Kocher, Determining the Operating Limits for Radionuclides for a Proposed Landfill at Paducah Gaseous Diffusion Plant. in Transactions of the American Nuclear Society Vol. 71, 1994.

D. A. Wolf, M. F. Tardiff, R. H. Ketelle, Characterizing Groundwater at Oak Ride National Laboratory Hazardous Waste Sites. in Proceedings of American Statistical Association for Section on Statistics and the Environment

R. R. Lee, R. H. Ketelle, J. M. Bownds, T. A. Rizk, Aquifer Analysis and Modeling in a Fractured, Heterogeneous Medium. Ground Water Vol. 30, Number 4. 1992.

R. H. Ketelle, R. R. Lee, J. M. Bownds, T. A. Rizk, Model Validation Lessons Learned: A Case Study at Oak Ridge National Laboratory, published in Proceedings of the Eleventh Annual DOE Low-Level Waste Management Conference by National Low Level Waste Management Program, Conf-890854-Vol. 1, p. PA26-PA39, November 1989.

R. R. Lee, R. H. Ketelle, J. M. Bownds, T. A. Rizk, Calibration of a Groundwater Flow and Contaminant Transport Computer Model: Progress Toward Model Validation. ORNL/TM-11294. September, 1989.

D. M. Borders, C. B. Sherwood, J. A. Watts, R. H. Ketelle, Hydrologic Data Summary for the White Oak Creek Watershed May 1987 - April 1988, ORNL/TM-10959, September 1989.

D. A. Lietzke, R. H. Ketelle, R. R. Lee, Soils and Geomorphology of the East Chestnut Ridge Site, ORNL/TM-11364. October 1989.

D. A. Lietzke, R. H. Ketelle, R. R. Lee, Synthesis of Bedrock Geology, Saprolite Weathering and Soil Genesis in Soil and Geologic Mapping, American Society of Agronomy Annual Meeting, Las Vegas, Nevada, October 15-20, 1989.

J. M. Bownds, R. H. Ketelle, R. R. Lee, T. A. Rizk, Advances in Groundwater Modeling at Oak Ridge National Laboratory, in proceeding of the Ninth Oak Ridge National Laboratory Life Sciences Symposium: The Scientific Challenges of NEPA, Knoxville, Tn.. October 24-27, 1989.

R. R. Lee, R. H. Ketelle, J. M. Bownds, T. A. Rizk, Modeling Groundwater Flow and Contaminant Transport at Oak ridge National Laboratory, in proceeding of the Ninth Oak Ridge National Laboratory Life Sciences Symposium: The Scientific Challenges of NEPA, Knoxville, Tn.. October 24-27, 1989.

E. C. Drumm, W. F. Kane, R. H. Ketelle, J. Ben-Hassine, J. A. Scarborough, Subsidence of Residual Soils in a Karst Terrain, ORNL.TM-11525, June 1990.

D. W. Lee, J. S. Baldwin, D. C. Kocher, J. M. Bownds, R. H. Ketelle, R. J. Luxmoore, J. M. Begovich, H. W. Godbee, J. L. Kasten, C. W. Nestor, Review Draft of Performance Assessment for SWSA 6, June 1990.

R. H. Ketelle, R. R. Lee, M. W. Yambert, H. K. Hardee, Supplemental Hydrologic Data Collected at Central Waste Management Division Sites; 9/1/89 - 3/31/90. K/WM-3, June 1990.

R. H. Ketelle, J. G. Newton, and J. M. Tanner, Karst Subsidence in East Tennessee. In Proceedings of the Second Conference on Environmental Problems in Karst Terranes and their Solutions. Sponsored by NWWA, Nashville, Tennessee, November 17-18, 1988.

B. A. Walker et al., Data Package for the Low Level Waste Disposal Development and Demonstration Program Environmental Impact Statement. ORNL/TM-10939, September 1988.

R. R. Lee and R. H. Ketelle, Contaminant Transport Model Validation: The Oak Ridge Reservation, Oak Ridge, Tennessee. ORNL/TM-10972, September 1988.

R. R. Lee and R. H. Ketelle, Subsurface Geology of the Chickamauga Group at Oak Ridge National Laboratory, ORNL/TM-10749, May 1988.

S. H. Stow, D. D. Huff, C. S. Haase, and R. H. Ketelle, Hydrogeologic Characterization Activities on the Oak Ridge Reservation (Tennessee, USA) in support of waste management studies in a humid environment, in Hydrogeology and Safety of Radioactive and Industrial Hazardous Waste Disposal, International Association of Hydrogeologists. BRGM Editions, Orleans, France, 1988.

S. Y. Lee et al., Soil and Surficial Geology Guidebook to the Oak Ridge Reservation, Oak Ridge, Tennessee. ORNL/TM-10803, June 1988.

R. H. Ketelle and D. W. Lee, Identification of Sites for the Low-Level Waste Disposal Development and Demonstration Program. ORNL/TM-10221, 1988.

R. R. Lee and R. H. Ketelle, Stratabound Pathways of Preferred Groundwater Flow: an Example from the Copper Ridge Dolomite in East Tennessee. In Proceedings: "Focus: Conference on Eastern Regional Groundwater Issues." Sponsored by National Water Well Association (NWWA), Burlington, Vermont, July 14-16, 1987.

E. C. Drumm, R. H. Ketelle, W. E. Manrod, and J. Ben-Hassine, Analysis of Plastic Soil in Contact with Cavitose Bedrock. Published in "Proceedings of ASCE Specialty Conference on Geotechnical Practice for Waste Disposal, 1987." Geotechnical Specialty Publication No. 13. June 15-17, 1987, Ann Arbor, Michigan.

R. H. Ketelle and J. G. Newton, Inventory of Karst Subsidence in the Valley and Ridge Province of East Tennessee. In "Karst Hydrogeology: Engineering and Environmental Applications." Proceedings of the Second Multidisciplinary Conference on Sinkholes and the Environmental Impacts of Karst, Orlando, Florida, February 9-11, 1987.

R. H. Ketelle, W. E. Manrod, E. C. Drumm, and J. Ben-Hassine, Soil Mechanics Analysis of Plastic Soil Deformation Over a Bedrock Cavity. In "Karst Hydrogeology: Engineering and Environmental Applications," Proceedings of the Second Multidisciplinary Conference on Sinkholes and the Environmental Impacts of Karst, Orlando, Florida, February 9-11, 1987.

R. H. Ketelle, J. T. Kitchings, R. K. Owenby, and J. E. Caton, Results of Reconnaissance Evaluation of Hazardous Chemical Migration in Ground Water in the Vicinity of Two Low-Level Radioactive Waste Disposal Sites. In "Non-Radiological Groundwater Quality at Low-Level Radioactive Waste Disposal Sites," NUREG-1183, April 1986.

R. H. Ketelle, Results of September 1985 Ground Water Sampling and Analyses Sheffield, Illinois. In "Non-Radiological Groundwater Quality at Low-Level Radioactive Waste Disposal Sites," NUREG 1183, April 1986.

J. B. Cannon, D. G. Jacobs, D. W. Lee, C. C. Gilmore, R. H. Ketelle, F. C. Kornegay, R. D. Roop, W. P. Staub, L. E. Stratton, R. E. Thoma, and J. W. VanDyke, "Shallow Land Burial of Low-Level Radioactive Waste," ORNL/TM-9496, February 1986.

R. H. Ketelle, R. D. Sharp, J. T. Kitchings, and D. W. Parsons, Uranium Mill Tailings Pond Chemical Characterization, Petrotomics Uranium Mill, Shirley Basin, Wyoming. Subcontractors report submitted to U.S. NRC, Denver, Colorado, February 1985.

R. H. Ketelle, F. G. Pin, and C. D. Shackelford, Electromagnetic Exploration of Shallow Subsurface Hydrology at the Petrotomics Uranium Mill Site, Wyoming. Subcontractors report submitted to U.S. NRC, Denver, Colorado, November 1985.

R. H. Ketelle, F. G. Pin, P. T. Singley, and C. D. Shackelford, Evaluation of Shallow Subsurface Seepage at Pathfinder Luck Mc Uranium Mill by Electromagnetic Terrain Conductivity Mapping. Subcontractors report submitted to U.S. NRC, Denver, Colorado, November 1985.

F. G. Pin, J. P. Witherspoon, D. W. Lee, J. B. Cannon, and R. H. Ketelle, Radio nuclide Migration Pathways Analysis for the Oak Ridge, Central Waste Disposal facility on the West Chestnut Ridge Site, ORAL/TM-9231, October 1984.

R. H. Ketelle and D. D. Huff, Site Characterization of the West Chestnut Ridge Site, ORNL/TM-9229, September 1984.

D. W. Lee and R. H. Ketelle, A Methodology for Selecting Low-Level Radioactive Waste Disposal Sites with Application to the Oak Ridge Reservation, A Case Study. Facility Siting and Routing '84: Energy and Environment. Meeting Sponsored by Environment Canada, Banff, Alberta, April 15-18, 1984.

R. D. Roop, W. P. Staub, D. B. Hunsaker, R. H. Ketelle, D. W. Lee, F. G. Pin, and A. J. Witten, Corrective Measures to Stabilize Trench Subsidence in Low-Level Waste Trenches. In Proceedings of the Sixth Annual Symposium on Management of Uranium Mill Tailings, Low-Level Waste and Hazardous Waste, Colorado State University, Ft. Collins, Colorado, February 1-3, 1984.

R. H. Ketelle and F. G. Pin, "Mapping Liquid Hazardous Waste Migration in Ground Water with Electromagnetic Terrain Conductivity Measurements," Presentation at Sixth Annual Symposium on Management of Uranium Mill Tailings, Low-Level Waste and Hazardous Waste, February 1-3, 1984, Fort Collins, Colorado. Published in Proceedings.

F. G. Pin and R. H. Ketelle, "Mapping Subsurface Flow Pathways for Contaminant Migration at a Proposed Low-Level Waste Disposal Site Using Electromagnetic Methods," Presentation at Sixth Annual Symposium on Management of Uranium Mill Tailings, Low-Level Waste and Hazardous Waste, February 1-3, 1984, Fort Collins, Colorado. Published in Proceedings.

R. H. Ketelle and F. G. Pin, "Application of Electromagnetic Terrain Conductivity Measurement Techniques to Contaminant Plume Mapping and Site Characterization," Presented at UCC-ND/Gat Environmental Protection Seminar, December 6-7, 1983. Published in Proceedings of the Seminar.

D. W. Lee, R. H. Ketelle, and L. H. Stinton, "Use of DOE Site Selection Criteria for Screening LLW Disposal Sites on the Oak Ridge Reservation," ORNL/TM-3717, 1983.

R. H. Ketelle and F. G. Pin, "Use of Electromagnetic Terrain Conductivity Measurements to Map Liquid Hazardous Waste Migration in Groundwater," ORNL/TM-8865, November 1983.

F. G. Pin and R. H. Ketelle, "Conductivity Mapping of Underground Flow Channels and Moisture Anomalies in Carbonate Terrain Using Electromagnetic Methods," ORNL/TM-8866, November 1983.

D. W. Lee, R. H. Ketelle, F. G. Pin, and G. S. Hill, "Environmental Pathways Analysis for Evaluation of a Low-Level Waste Disposal Site," IAES International Conference on Radioactive Waste Management, Seattle, Washington, May 16-20, 1983.

R. D. Roop, W. P. Staub, D. B. Hunsaker, Jr., R. H. Ketelle, D. W. Lee, F. G. Pin, and A. J. Witten, "A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches," ORNL/TM-8715, May 1983.

"Environmental Analysis of the Operation of Oak Ridge National Laboratory (X-10 Site)," ORNL/5870 (contributor) November 1983.

R. Blumberg, J. B. Cannon, G. S. Hill, R. H. Ketelle, D. W. Lee, and F. G. Pin, ""GCEP Waste Pathways Analysis Study," K/D-5375, Jannuary 1983.

R. H. Ketelle, "Report on Preliminary Site Characterization of the West Chestnut Ride Site," ORNL/NFW-82/21, October 1982.

"Chattanooga Shale: An Assessment of the Resource and Technology for the Recovery of Hydrocarbons and Minerals," ORNL/TM-7920 (contributor) 1982.

Environmental Assessment Aquifer Thermal Energy Storage Program, DOE/EA-0131 (contributor) 1981.

CONOCO Pipeline Gas Demonstration Project (Environmental Impact Statement), contributed sections on Geology, Soils, and Groundwater Hydrology and Quality, 1981.

Memphis Industrial Fuel Gas Demonstration Plant (Environmental Impact Statement) contributed sections on Geology, Soils, Groundwater Hydrology and Quality, and Surface Water Hydrology, 1981.

"Solvent Refined Coal-I Demonstration Facility at Newman, Kentucky, 1981," (Environmental Impact Statement) contributed sections on Geology, Soils, Groundwater Hydrology and Quality, and Surface Water Hydrology, 1981.

R. H. Ketelle and E. K. Triegel, "Interpreting the Factors Related to Groundwater Impact Assessment of Coal Conversion Solid Waste," in *Proceedings of the Third Annual Madison Conference of Applied Research and Practice on Municipal and Industrial Waste*, September 10-12, 1980, Madison, Wisconsin.

R. H. Ketelle, W. R. Wilson, and R. E. Bergenbach, "Stratigraphic Framework and Depositional Environment, Lower Pennsylvanian Rocks, Doran Cave Area, Jackson County, Alabama," *Journal of the Tennessee Academy of Sciences*, 1979.