August 16, 2001

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)	)	

NRC STAFF'S RESPONSE TO APPLICANT'S MOTION FOR SUMMARY DISPOSITION OF UTAH CONTENTION W

INTRODUCTION

Pursuant to 10 C.F.R. § 2.749, the NRC Staff ("Staff") hereby responds to the "Applicant's Motion For Summary Disposition of Utah Contention W" ("Motion") filed by Private Fuel Storage, L.L.C. ("PFS" or "Applicant") on July 27, 2001. For the reasons set forth below and in the attached affidavit,[1] the Staff submits that the issues pertaining to Contention Utah W have been resolved and there does not exist a genuine dispute of material fact with respect to these matters. Accordingly, the Staff submits that the Applicant is entitled to a decision in its favor as a matter of law, and its Motion should be granted.

BACKGROUND

In June 1997, the Applicant filed a license application for its proposed independent spent fuel storage installation ("ISFSI"), to be located on the Reservation of the Skull Valley Band of Goshute Indians ("Skull Valley Band"). The application consisted of several documents including, as pertinent here, an Environmental Report ("ER"), which addressed the environmental impacts

---

[1] *See* "Joint Affidavit of NRC Staff Concerning Contention Utah W," submitted by Terry J. Blasing, Richard H. Ketelle, Henry W. Lee, Makuteswara Srinivasan, John Stamatakos, Michael D. Waters, and Gregory P. Zimmerman ("Joint Affidavit"), attached hereto.

of the Applicant's proposed facility. The application included a proposal by PFS to transport shipping casks containing spent nuclear fuel ("SNF") by rail to an intermodal transfer facility ("ITF") to be built at Rowley Junction (a highway interchange at the intersection of Skull Valley Road and Interstate 80, near Timpie, UT), where the casks would be offloaded from rail cars onto heavy haul tractor/trailers for transport down Skull Valley Road to the PFS Facility ("PFSF").

In November, 1997, the State of Utah ("State") filed a number of safety and environmental contentions relating to the PFS application.[2] On April 22, 1998, the Atomic Safety and Licensing Board issued LBP-98-7, in which it ruled on the State's standing to intervene and the admissibility of its contentions, including Contention Utah W.[3] Therein, the Board admitted one portion of Contention Utah W, concerning the impact of flooding on the intermodal transfer point ("ITP") which PFS had originally proposed to construct at Rowley Junction, UT. As admitted by the Board, Contention Utah W states as follows:

> **Utah W -- Other Impacts Not Considered**
>
> CONTENTION: The Environmental Report does not adequately consider the adverse impacts of the proposed ISFSI and thus does not comply with NEPA or 10 C.F.R. § 51.45(b) in that the Applicant has not considered the impact of flooding on the intermodal transfer point.

LBP-98-7, 47 NRC at 256.

In August 1998, PFS filed an amendment to its application, relocating the beginning of its proposed rail spur to a point near Low, UT (17 miles west of its original planned location at Rowley Junction), and relocating its intermodal transfer point to a site 1.8 miles west of its original planned location at Rowley Junction. *See Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage

---

[2] "State of Utah Contentions Regarding the Materials License Application Of Private Fuel Storage In An Independent Spent Fuel Storage Installation," dated November 23, 1997 ("Utah Contentions").

[3] *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-98-7, 47 NRC 142, 201-02 (1998).

Installation), LBP-98-29, 48 NRC 286, 289 (1998).[4] Therein, PFS identified the rail spur as its preferred option, but nonetheless retained an option of constructing and operating the ITP for rail-to-truck transfer of spent fuel to the PFS Facility ("PFSF"). *See id.* at 289. In April 2000, PFS amended its application to address the potential for flooding at the relocated ITP. *See* ER § 4.3.4 (Rev. 7), at 4.3.9.

In June 2000, the Staff published its "Draft Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Installation on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility in Tooele County, Utah," NUREG-1714 ("DEIS"). Therein, the Staff, *inter alia*, addressed the potential environmental impacts of the proposed PFSF and related transportation facilities -- and specifically considered the potential for flooding at the revised ITP site, 1.8 miles west of Timpie. *See* DEIS §§ 2.2.4.2 (Local Transportation Options (in Skull Valley)"), 3.2.1.2 ("Flooding"), 5.2.1.2 ("Potential Impacts of Flooding"), 5.2.1.3 ("Water Use"), and 5.2.2.2 ("Potential Impacts of Flooding"). Further, the Staff evaluated the potential environmental impacts of SNF transportation to and from the PFS Facility, both along transportation routes and at the ITP (*see* DEIS Ch. 5, and Appendices C and D), including an evaluation of potential radiological and non-radiological human health impacts under both incident-free and accident conditions (*Id.*, § 5.7).

On July 27, 2001, PFS filed the instant Motion, in which it asserts that there does not exist a genuine dispute of material fact with respect to the matters raised in Contention Utah W. PFS contends that this issue has been adequately addressed in its (revised) ER and in the Staff's DEIS; that the flooding events postulated by the State are extremely improbable, and in any event would

---

[4] *Cf. Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-98-10, 47 NRC 288, 293-94 (1998) (declining to reconsider the exclusion of other portions of Contention Utah W); *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-99-39, 50 NRC 232, 236 (1999) (declining to dismiss the environmental impact issue related to ITP flooding, raised in this contention).

not lead to the submersion of the SNF shipping casks; and that, even if the casks were submerged, no adverse consequences would result (Motion at 2). Additionally, PFS asserts that the State has not been able "to formulate a credible factual scenario that would lead to flooding of the ITP, let alone the occurrence of radiological or other environmental impacts from such flooding" (*Id.* at 3). PFS therefore concludes that summary disposition of Contention Utah W is warranted.

As set forth below and in the Joint Affidavit attached hereto, the Staff has reviewed the Applicant's Motion and Statement of Material Facts, and is satisfied that each of the statements of fact contained therein are correct, subject to the modifications contained in the attached affidavit (none of which affect the Staff's determination that there does not exist any genuine dispute of material fact with respect to Contention Utah W). Accordingly, the Staff submits that summary disposition of Contention Utah W is appropriate at this time.

DISCUSSION

A. Legal Standards Governing Motions for Summary Disposition.

Pursuant to 10 C.F.R. § 2.749(a), "[a]ny party to a proceeding may move, with or without supporting affidavits, for a decision by the presiding officer in that party's favor as to all or any part of the matters involved in the proceeding. The moving party shall annex to the motion a separate, short, and concise statement of the material facts as to which the moving party contends that there is no genuine issue to be heard." In accordance with 10 C.F.R. § 2.749(b), when a properly supported motion for summary disposition is made, "a party opposing the motion may not rest upon the mere allegations or denials of his answer; his answer by affidavits or as otherwise provided in this section must set forth specific facts showing that there is a genuine issue of fact." In addition, an opposing party must annex to its answer a short and concise statement of material facts as to which it contends there exists a genuine issue to be heard. 10 C.F.R. § 2.749(a). All material facts set forth in the moving party's statement will be deemed to be admitted unless controverted in the

opposing party's statement. *Id.*[5] Pursuant to 10 C.F.R. § 2.749(d), "[t]he presiding officer shall render the decision sought if the filings in the proceeding, depositions, answers to interrogatories, and admissions on file, together with the statements of the parties and the affidavit, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a decision as a matter of law."[6]

The Licensing Board has previously ruled upon various motions for summary disposition filed by PFS, in accordance with these principles. In doing so, the Board succinctly summarized the standards for granting summary disposition, as follows:

> Under 10 C.F.R. § 2.749(a), (d), summary disposition may be entered with respect to any matter (or all of the matters) in a proceeding if the motion, along with any appropriate supporting material, shows that there is "no genuine issue as to any material fact and that the moving party is entitled to a decision as a matter of law." The movant bears the initial burden of making the requisite showing that there is no genuine issue as to any material fact, which it attempts to do by means of a required statement of material facts not at issue and any supporting materials (including affidavits, discovery responses, and documents) that accompany its dispositive motion. An opposing party must counter each adequately supported material fact with its own statement of material facts in dispute and supporting materials, or the movant's facts will be deemed admitted. See Advanced Medical Systems, Inc. (One Factory Row, Geneva, Ohio 44041), CLI-93-22, 38 NRC 98, 102-03 (1993).

---

[5] *Accord, Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Units 1 and 2), ALAB-841, 24 NRC 64, 93 (1986). General denials and bare assertions are not sufficient to preclude summary disposition when the proponent of the motion has met its burden. *Advanced Medical Systems, Inc.* (One Factory Row, Geneva, Ohio 44041), CLI-93-22, 38 NRC 98, 102 (1993) ("AMS"). Although the opposing party does not need to demonstrate that it will succeed on the issues, it must at least demonstrate that a genuine issue of fact exists to be tried. *Id.; Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), CLI-92-8, 35 NRC 145, 154 (1992) (to avoid summary disposition, the opposing party had to present contrary evidence that was so significantly probative as to create a material issue of fact).

[6] The Commission's summary disposition procedures have been analogized to Rule 56 of the Federal Rules of Civil Procedure. *See, e.g., Cleveland Electric Illuminating Co.* (Perry Nuclear Power Plant, Units 1 and 2), ALAB-443, 6 NRC 741, 753-54 (1977); *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation) LBP-99-32, 50 NRC 155, 158 (1999).

Private Fuel Storage, L.L.C. (Independent Spent Fuel Storage Installation), LBP-01-19, 53 NRC 416, 421-22 (2001) (summary disposition of Contention Utah K), *citing PFS*, LBP-99-23, 49 NRC 485, 491 (1999) (Contention Utah C).[7]

The Commission has encouraged the use of summary disposition procedures "on issues where there is no genuine issue of material fact so that evidentiary hearing time is not unnecessarily devoted to such issues." *Statement of Policy on Conduct of Licensing Proceedings*, CLI-81-8, 13 NRC 452, 457 (1981).[8] Likewise, the Appeal Board has recognized that summary disposition provides "an efficacious means of avoiding unnecessary and possibly time-consuming hearings on demonstrably insubstantial issues." *Wisconsin Electric Power* Co. (Point Beach Nuclear Plant, Unit 1), ALAB-696, 16 NRC 1245, 1263 (1982); *Houston Lighting and Power Co.* (Allens Creek Nuclear Generating Station, Unit 1), ALAB-590, 11 NRC 542, 550 (1980).[9]

Finally, if a contention challenges an applicant's environmental report, the contention may be viewed as a challenge to the Staff's EIS. Accordingly, where a contention asserts that the ER failed to consider some matter, those assertions may be deemed to apply to the Staff's EIS as well, and may be resolved by a showing that the EIS addressed the alleged omission. *See, e.g.,*

---

[7] *Accord, Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-01-23, 54 NRC __, slip op. at 5 (Aug. 1, 2001) (Utah Z); LBP-01-22, 54 NRC __, slip op. at 5 (Aug. 1, 2001) (Utah V); LBP-00-06, 51 NRC 101, 112 (2000) (Utah E); LBP-99-42, 50 NRC 295, 301 (1999) (Utah H); LBP-99-36, 50 NRC 202, 207 (1999) (Utah R); LBP-99-35, 50 NRC 180, 184 (1999) (Utah K); LBP-99-34, 50 NRC 168, 173-74 (1999) (Utah B); LBP-99-33, 50 NRC 161, 164-65 (1999) (Utah M); LBP-99-32, 50 NRC 155, 158 (1999) (Utah G); LBP-99-31, 50 NRC 147, 152 (1999) (Security-A, B, and C).

[8] The Commission subsequently endorsed this policy statement, but indicated that "Boards should forego the use of motions for summary disposition except upon a written finding that such a motion will likely substantially reduce the number of issues to be decided, or otherwise expedite the proceeding." *Statement of Policy on Conduct of Adjudicatory Proceedings*, CLI-98-12, 48 NRC 18, 20-21 (1998). The Staff submits that summary disposition of this contention will reduce the number of issues to be decided and will serve to expedite the proceeding.

[9] It is well settled that an agency may ordinarily dispense with an evidentiary hearing where no genuine issue of material fact exists. *Veg-Mix, Inc.* v. *U.S. Dep't of Agriculture*, 832 F.2d 601, 607-08 (D.C. Cir. 1987).

Louisiana Energy Services, L.P. (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 84 (1998); *Duke Power Co.* (Catawba Nuclear Station, Units 1 and 2), CLI-83-19, 17 NRC 1041, 1049 (1983); *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-01-22, 54 NRC __, slip op. at 8-9 (Aug. 1, 2001) (granting summary disposition of Contention Utah V).

As more fully set forth below, the Staff submits that summary disposition of Contention Utah W is appropriate in accordance with these established standards, in that a genuine dispute of material fact no longer exists with respect to any of the specific matters alleged in the contention.

B. Summary Disposition Is Appropriate In That Contention Utah W Is Now Moot.

In Contention Utah W, the State asserts that the Applicant's ER does not "adequately consider the adverse impacts of the proposed ISFSI and thus does not comply with NEPA or 10 C.F.R. § 51.45(b) in that the Applicant has not considered the impact of flooding on the intermodal transfer point." LBP-98-7, 47 NRC at 256. However, as the Board noted, this contention concerned the potential for flooding at "the Rowley Junction ITP" (*Id.* at 202) -- a site which PFS abandoned in its license application amendment in August 1998, when it relocated its proposed ITP to a site 1.8 miles west of the Rowley Junction site. *See Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-98-29, 48 NRC 286, 289 (1998). Significantly, while the State filed two new contentions and sought to modify an existing contention to address the August 1998 amendment (*see id.* at 290), it never sought to modify Contention Utah W to address the potential for flooding at the new ITP location, nor did it assert that flooding at the new ITP location constituted a reasonably foreseeable event that required consideration under the National Environmental Policy Act of 1969, 42 U.S.C. § 4321, *et seq.* ("NEPA").

Further, PFS subsequently filed an amendment to its application, in which it addressed the potential for flooding at the relocated ITP. *See* ER § 4.3.4, at 4.3.9 (ER Rev. 7, April 14, 2000). As set forth in the ER, the relocated ITP site has an elevation of 4220 ft. to 4225 ft.; the historic flood level of the Great Salt Lake is 4211.85 ft.; and in January 1999, the State of Utah's

Department of Natural Resources issued a document designating the flood plain of the lake for planning purposes as 4212 ft., and "the extent of the lake's flood plain" as 4217 ft. Accordingly, PFS concluded that the ITP "is not expected to be affected by flooding," and "there are no design provisions necessary at the ITP to prevent flooding."

Similarly, the Staff addressed the potential for flooding at the proposed ITP site in its DEIS. *See* DEIS § 3.2.1.2 ("Flooding"), at 3-11; § 5.2.1.2 ("Potential Impacts of Flooding"), at 5-7; and § 5.2.2.2 ("Potential Impacts of Flooding"), at 5-10. Therein, considering the elevation of the proposed ITP, the historic flood level of the Great Salt Lake, and the State's January 1999 designation of the lake's flood plain and the extent thereof, the Staff concluded that "there is no potential for flooding at the ITF location near Timpie." *Id.* at 3-11.[10] In addition, the Staff evaluated the potential environmental impacts of SNF transportation to and from the PFS Facility, both along transportation routes and at the ITP, including an evaluation of radiological and non-radiological human health impacts under both incident-free and accident conditions (*Id.*, Ch. 5, and § 5.7).[11]

In light of the discussion of flooding contained in the Applicant's revised ER and the Staff's DEIS, "whatever the situation" may have been with respect to the Applicant's original application, there is no question now -- following the Applicant's relocation of the ITP and the issuance of the

---

[10] In addition, the Staff determined that "[i]ntense precipitation events could result in increased stormwater runoff at the ITP construction site," which "could result in excessive waterborne erosion of spoil piles or piles of construction aggregate." DEIS at 5-7. The Staff further noted, however, that the stormwater "would be controlled under a general permit with the State of Utah," and that any other "potential flood-relate[d] impacts during construction of the ITF would be small because the facility would be constructed in an area with little to no flooding potential." *Id.*

[11] While the Applicant asserts that Table S-4 accounts for all environmental impacts of spent fuel transportation, and that any challenge to Table S-4 is impermissible (Motion, at 4), the Staff does not rely upon Table S-4 in this response. Rather, to the extent that transportation impacts are raised by Contention Utah W, the Staff relies upon the PFS-specific transportation analysis set forth in the DEIS. *See Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), LBP-01-22, 54 NRC ___, slip op. at 8 -9 (Aug 1, 2001) (granting summary disposition of Contention Utah V, on the grounds that the transportation analysis presented in the Staff's DEIS rendered moot the State's contention challenging the lack of any such analysis in the Applicant's ER, and the State had not amended its contention to challenge the adequacy of the DEIS analysis).

revised ER and the Staff's DEIS -- that these subsequent events render the State's contention moot. *See PFS*, LBP-01-22, slip op. at 8-9. Further, if the State disagreed with the conclusions stated in the revised ER or the DEIS, its concerns over the potential for flooding at the ITP "should have been channeled into a new contention (or perhaps an amended version" of Contention Utah W -- an action which the State failed to take (*see Id.* at 8). The time for filing or amending contentions to address these matters "appears to have long since passed" (*Id.* at 9), and in light of the revised ER and the Staff's June 2000 DEIS, summary disposition of Contention Utah W is appropriate, in that this contention "is now moot" (*see Id.*).[12]

C. Summary Disposition Is Appropriate In That No Adverse Environmental Impacts Are Likely to Result Even If Flooding Occurs At The ITP Site.

In its Motion, PFS addresses various phenomena postulated by the State (a rise of the level of the Great Salt Lake, wind-generated waves, earthquake-induced seiches, and subsidence from a seismic event near the ITP), which the State alleged could lead to flooding at the ITP site. Based upon its analyses, PFS concludes that these events are extremely improbable and in any event would not lead to submersion of the HI-STAR 100 transportation casks present at the ITP site; and, further, that even if the casks are submerged in a flooding event at the ITP site, no adverse environmental consequences would result. *See* Motion at 2 and 5-10. These matters are

---

[12] The Staff's DEIS evaluated the environmental and human health impacts of accidents during transportation; the DEIS did not address specifically the environmental impacts of flooding at the ITP. However, the Staff notes that the DEIS was not required to address specifically the environmental impacts of flooding at the ITP site, in light of the Staff's determination in the DEIS that "there is no potential for flooding at the ITF location near Timpie." *See* DEIS at 3-11. Thus, under NEPA, an agency's consideration of the potential environmental impacts of a requested federal action is subject to a "rule of reason." An agency is required to take a "hard look" at environmental factors and to make a reasoned decision, considering all "reasonably foreseeable" environmental impacts of the requested action; there is no requirement that it consider "remote and speculative possibilities." *See, e.g., Robertson v. Methow Valley Citizens Council,* 490 U.S. 332, 348-50 (1989); *Vermont Yankee Nuclear Power Corp. v. National Resources Defense Council,* 435 U.S. 519, 551 (1978), *quoting NRDC v. Morton,* 458 F.2d 827, 837-38 (D.C. Cir. 1972); *Limerick Ecology Action v. NRC,* 869 F.2d 719, 739 (3rd Cir. 1989); *Louisiana Energy Services, L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 87-88 (1998).

addressed in detail in the Applicant's Statement of Material Facts and the various Declarations filed in support of the Applicant's Motion.

As set forth in the Joint Affidavit attached hereto, the Staff has reviewed the Applicant's Statement of Material Facts and has determined that each of the statements contained therein are correct, except to the extent modified in the Staff's Joint Affidavit -- none of which modifications affects the Staff's determination that summary disposition of these issues is appropriate. *See* Joint Affidavit, ¶¶ 4-6. Further, the Staff agrees with the Applicant's view that flooding is not likely at the ITP; and that even in the event that flooding occurs at the ITP, any such flooding or flood-related events at the ITP (including submersion and/or a flood-related drop of the HI-STAR 100 transportation casks from their transport vehicles) would not result in adverse environmental impacts. *Id.*, ¶ 5. Accordingly, the Staff has concluded that no genuine dispute of material fact exists with respect to the issues raised in Contention Utah W, and summary disposition of this contention is appropriate.

CONCLUSION

As set forth above, the Applicant's relocation of its ITP, and the discussion presented in the Applicant's revised ER and the Staff's DEIS, render this contention moot. Further, for the reasons set forth above and in the Joint Affidavit attached hereto, the Staff submits that there does not exist any genuine dispute of material fact with respect to Contention Utah W, and the Applicant is entitled to a decision in its favor on this contention as a matter of law.

Respectfully submitted,

Sherwin E. Turk

Sherwin E. Turk
Counsel for NRC Staff

Dated at Rockville, Maryland
this 16th day of August 2001

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)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S RESPONSE TO APPLICANT'S MOTION FOR SUMMARY DISPOSITION OF UTAH CONTENTION W" in the above captioned proceeding have been served on the following through deposit in the NRC's internal mail system, with copies by electronic mail, as indicated by an asterisk, or by deposit in the U.S. Postal Service, as indicated by double asterisk, with copies by electronic mail this 16th day of August, 2001:

G. Paul Bollwerk, III, Chairman*
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555
(E-mail copy to GPB@NRC.GOV)

Dr. Jerry R. Kline*
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555
(E-mail copy to JRK2@NRC.GOV)

Dr. Peter S. Lam*
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555
(E-mail copy to PSL@NRC.GOV)

Atomic Safety and Licensing Board
Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Office of the Secretary*
ATTN: Rulemakings and Adjudications
Staff
U.S. Nuclear Regulatory Commission
Washington, DC 20555
(E-mail copies to SECY@NRC.GOV
and HEARINGDOCKET@NRC.GOV)

Office of the Commission Appellate
Adjudication
Mail Stop: 16-C-1 OWFN
U.S. Nuclear Regulatory Commission
Washington, DC 20555

James M. Cutchin, V*
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555
(E-mail to JMC3@NRC.GOV)

Jay E. Silberg, Esq.**
Ernest Blake, Esq.
Paul A. Gaukler, Esq.
Sean Barnett, Esq.
Shaw Pittman
2300 N Street, N.W
Washington, DC 20037-8007
(E-mail copy to jay_silberg, paul_gaukler, sean_barnett, and ernest_blake@shawpittman.com)

Tim Vollmann, Esq.**
3301-R Coors Road N.W.
Suite 302
Albuquerque, NM 87120
(E-mail copy to tvollmann@hotmail.com)

Denise Chancellor, Esq.**
Fred G. Nelson, Esq.
Laura Lockhart, Esq.
Utah Attorney General's Office
160 East 300 South, 5th Floor
P.O. Box 140873
Salt Lake City, UT 84114-0873
(E-mail copy to dchancel@State.UT.US) and jbraxton@email.usertrust.com

Connie Nakahara, Esq.**
Utah Dep't of Environmental Quality
168 North 1950 West
P. O. Box 144810
Salt Lake City, UT 84114-4810
(E-mail copy to cnakahar@state.UT.US)

Diane Curran, Esq.**
Harmon, Curran, Spielberg & Eisenberg
1726 M Street, N.W., Suite 600
Washington, D.C. 20036
(E-mail copy to dcurran@harmoncurran.com)

John Paul Kennedy, Sr., Esq.**
David W. Tufts, Esq.
Durham, Jones & Pinegar
111 East Broadway, Suite 900
Salt Lake City, UT 84105
(E-mail copy to dtufts@djplaw.com)

Joro Walker, Esq.**
Land and Water Fund of the Rockies
1473 South 1100 East, Suite F
Salt Lake City, UT 84105
(E-mail copy to lawfund@inconnect.com)

Land and Water Fund of the Rockies**
2260 Baseline Road, Suite 200
Boulder, CO 80302

Paul C. EchoHawk, Esq.
EchoHawk PLLC
P.O. Box 6119
Pocatello, Idaho 83205-6119
E-mail copy to:
pechohawk@hollandhart.com

Sherwin E. Turk

Sherwin E. Turk
Counsel for NRC Staff

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)	)	

JOINT AFFIDAVIT OF NRC STAFF
CONCERNING CONTENTION UTAH W

Terence J. Blasing ("TJB"), Richard H. Ketelle ("RHK"), Henry W. Lee ("HWL"), Makuteswara Srinivasan ("MS"), John Stamatakos, Michael D. Waters ("MDW"), and Gregory P. Zimmerman ("GPZ"), being duly sworn, do hereby state as follows:[1]

1(a). (TJB) My name is Terence J. Blasing. I am employed as member of the research staff in the Environmental Sciences Division at Oak Ridge National Laboratory ("ORNL") in Oak Ridge, Tennessee. I am providing this affidavit under a technical assistance contract between the NRC Staff ("Staff") and ORNL. A statement of my professional qualifications is attached hereto as Attachment 1.

1(b). (RHK) 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 ORNL. A statement of my professional qualifications is attached hereto as Attachment 2.

1(c). (HWL) My name is Henry W. Lee. I am employed as a Senior Structural Engineer in the Spent Fuel Project Office ("SFPO"), Office of Nuclear Material Safety and Safeguards

[1] Each individual paragraph as to which an affiant is attesting herein is identified by parenthetically listing the affiant's initials after the paragraph number. For paragraphs attributed to all of the affiants, no designation of the affiants' initials appears.

("NMSS"), U.S. Nuclear Regulatory Commission ("NRC"), in Washington, D.C. A statement of my professional qualifications is attached hereto as Attachment 3.

1(d). (MS) My name is Makuteswara Srinivasan. I am employed as a Metallurgical Engineer/Scientist, in the Spent Fuel Project Office ("SFPO"), Office of Nuclear Material Safety and Safeguards ("NMSS"), U.S. Nuclear Regulatory Commission ("NRC"), in Washington, D.C. A statement of my professional qualifications is attached hereto as Attachment 4.

1(e). (JS) My name is John Stamatakos. I am employed as a Senior Research Scientist at the Center for Nuclear Waste Regulatory Analysis ("CNWRA"), which is division of the Southwest Research Institute ("SwRI"), in San Antonio, Texas. I am providing this affidavit under a technical assistance contract between the NRC Staff and SwRI. A statement of my professional qualifications is attached hereto as Attachment 5.

1(f). (MDW) My name is Michael D. Waters. I am employed as a Project Engineer in the Spent Fuel Project Office ("SFPO"), Office of Nuclear Material Safety and Safeguards ("NMSS"), U.S. Nuclear Regulatory Commission ("NRC"), in Washington, D.C. A statement of my professional qualifications is attached hereto as Attachment 6.

1(g). (GPZ) My name is Gregory P. Zimmerman. I am employed as Leader of the Environmental Impact Analysis Program, in the Center for Energy and Environmental Analysis, at Oak Ridge National Laboratory ("ORNL") in Oak Ridge, Tennessee. I am providing this affidavit under a technical assistance contract between the NRC Staff and ORNL. A statement of my professional qualifications is attached hereto as Attachment 7.

2. This Affidavit is prepared in response to the "Applicant's Motion for Summary Disposition of Utah Contention W" ("Motion"), filed on July 27, 2001, by Private Fuel Storage L.L.C. ("Applicant" or "PFS"), and the "Statement of Material Facts on Which No Genuine Dispute Exists" ("Statement of Material Facts") attached thereto.

3. As part of our official responsibilities, we reviewed the Applicant's Motion and the Statement of Material Facts attached thereto, in which PFS seeks summary disposition of Contention Utah W. Our review included the Declarations of Donald W. Lewis, Kevin Coppersmith, George H. C. Liang, and Krishna Singh, and the depositions of David B. Cole and Barry J. Solomon, which were attached to the Applicant's Motion. Specifically, we reviewed the Applicant's Motion and Statement of Material Facts to the extent pertinent to our respective areas of expertise and work which we have done or are doing in evaluating the safety and/or environmental impacts of the PFS Facility and/or the intermodal transfer point ("ITP") which PFS proposes to construct and operate near Timpie, UT. With respect to the matters described in the Applicant's Motion and Statement of Material Facts concerning Contention Utah W, this review was conducted as follows: Statement Nos. 28-33 (Terence J. Blasing); Statement Nos. 21-27, and 56 (Richard H. Ketelle); Statement Nos. 13-20, 51-56, 63-64, and 68-69 (Henry W. Lee); Statement Nos. 60-63 (Makuteswara Srinivasan); Statement Nos. 34-48 (John Stamatakos); Statement Nos. 11, 49-50, and 57-59 (Michael D. Waters); and Statement Nos. 7-10, 12, and 65-68 (Gregory P. Zimmerman).

4. On the basis of our specific reviews, we are satisfied that the Statement of Material Facts attached to the Applicant's Motion is correct, except that we believe certain statements of fact should clarified or corrected as set forth in Paragraph 6 below.[2]

5. Notwithstanding the modifications set forth in Paragraph 6 below, based on our specific reviews and respective areas of expertise, we agree with the Applicant's view that flooding is not likely at the ITP; and that even in the event that flooding occurs at the ITP, flooding and flood-related events at the ITP (including submersion and/or a flood-related drop of HI-STAR 100 transportation casks that are present at the ITP) would not result in adverse environmental impacts.

---

[2] In the following discussion, proposed changes to the Applicant's Statement of Material Facts are indicated by underlining (insertions) or underlining and strikeout (deletions). The proponent of each proposed change is indicated by the affiant's initials.

Accordingly, we believe that no genuine dispute of material fact exists with respect to Contention Utah W.

6. As indicated in Paragraph 4 above, based upon and within the scope of our specific reviews, we believe the Applicant's Statement of Material Facts should be modified as follows:

(GPZ) 7. The location of the Applicant's proposed ITP changed after the State filed Contention Utah W, to a site 1.8 miles west of Timpie, UT, as is reflected in the DEIS. The ITP site is located at a greater distance from the Great Salt Lake than the original ITP site. PFS states that the ITP will be built at an elevation of 4221 ft. Declaration of Donald Wayne Lewis ("Lewis Dec.") ¶7.

(GPZ) 9. PFS states that the ITP can handle a maximum of three casks per single purpose train and there may be two trains at the facility at the same time, so there will be no more than six transportation casks present at the ITP at any point in time. Id. ¶11.

(MDW) 11. PFS states that it will be capable of contacting the loaded single purpose train at all times and will be able to contact the train in an emergency to divert it from the ITP site, if such action became necessary. Id. ¶13.

(HWL) 13. The HI-STAR 100 shipping or transportation cask used to ship spent fuel from the originating power plants to the PFSF is designed and manufactured in compliance with 10 CFR Part 71 and consists of the same welded sealed metal canister as used in the storage system, which is confined within the shipping cask with impact limiters mounted on either end of the shipping cask. Id. ¶15.

(HWL) 14. The HI-STAR 100 shipping cask is transported in a horizontal position, secured on a shipping cradle that in turn is secured to the rail car or heavy-haul trailer. The shipping cradle consists of a metal frame that is designed to securely hold the shipping cask under dynamic loads received during transport. The shipping cask with a canister loaded with spent nuclear fuel, impact limiters, and the shipping cradle weighs approximately 142 tons. Id. ¶¶15-16.

(HWL) 15. The HI-STAR 100 shipping cask has an overall diameter of 8 ft. The shipping cradle supports the centerline of the shipping cask approximately 6 ft above the vehicle deck. The deck height of the vehicles is typically 28" to 48", which raises the centerline of the shipping cask to at least slightly more than 8 ft above the ground. Id. ¶17.

(HWL) 16. In order for a HI-STAR 100 shipping cask to become fully submerged, it would have to be lying in ~~covered by~~ at least eight feet of water (without limiters) or at least 9 feet of water (with limiters). Id. ¶18; Declaration of Krishna P. Singh ("Singh Dec.") ¶9.

(HWL) 17. The HI-STAR 100 shipping cask is secured to the shipping cradle with tie-down straps, which consist of heavy steel bands that wrap around the cask and are bolted to the shipping cradle. The shipping cradle is to be secured to the transport vehicle with attachment connections in the form of heavy steel pins that can be removed to allow the shipping assembly to be removed from the transport vehicle. PFS states that both the tie-down straps and attachment pins will be designed to exceed the dynamic loads that are imposed on the vehicle during transport. Lewis Dec. ¶19.

(HWL) 18. Considering the HI-STAR 100 shipping assembly weight and securing measures proposed by PFS, ~~measures~~; it would take a significant force to dislodge the cask from the transport vehicle. Id.

(HWL) 19. Since the HI-STAR 100 transportation casks are lying on their sides, approximately four feet off the ground, while at the ITP, the biggest drop from a transport vehicle that they can experience in the event of an earthquake is approximately four feet. Singh Dec. ¶10.

(HWL) 20. ~~A four foot drop of a~~ A drop of approximately four feet of a HI-STAR 100 transportation cask would have no safety significance, since in accordance with NRC regulations (10 CFR 71.73(c)(1)) the transportation ~~casks have~~ cask design has been demonstrated through testing and analysis to be able to safely withstand a drop of thirty (30) feet ~~without damage~~ on an unyielding surface in accordance with the requirements in 10 C.F.R. Part 71. See Id.

(RHK) 26. It is possible to build dikes to protect the ITP, as was proposed in the mid-1980s for the protection of shore areas around the Great Salt Lake, at the time the Great Salt Lake last reached its historic high level. Id.

(TJB) 29. The increase in a lake's water level at the shore due to wind effects is the sum of the maximum seiche level and the maximum wave height at the shore. Id. ¶12.

(TJB) 31. A study done for the State concluded that, assuming the Great Salt Lake is at its maximum historical elevation of 4212 ft. and further assuming a 2 ft. seiche and a 2 ft. wave height, the maximum elevation at which flooding would be expected to occur would be 4216 ft. Id. ¶12; Cole Dep. at 53.

(TJB) 32. Making, as the State did in Utah W, the extremely conservative assumption that the wave height at the shore was the same as the maximum wave height would result in a total wave height of 9 ft. and (assuming a historical high lake level) would result in the lake water reaching an elevation of 4221 ft. Id. ¶13.

(TJB) 33. The HI-STAR 100 spent fuel transportation casks at the ITP will not be subject to flooding due to wind induced seiches, since they will ~~always~~ be above the predicted maximum water level at the ITP. Id. ¶14.

(JS) 35. The size of an earthquake-induced seiche is dependent upon many factors, including the shape of the basin and depth of the body of water. The Great Salt Lake is a shallow lake, with a maximum depth of 35 feet. This shallow depth makes the occurrence of a 12 foot seiche, such as the one postulated by the State in Utah W, extremely unlikely. Id. ¶17.

(JS) 38. The 4220 ft. elevation represents a ~~very~~ conservative high upper bound to the level of a seiche that can be anticipated to occur near the ITP if the Great Salt Lake is at its maximum historic elevation when the earthquake takes place. Id.

(JS) 47. If a maximum magnitude earthquake occurred on the Stansbury fault, the amount of tectonic subsidence at the ITP site is not likely to exceed 2 meters (less than 7 ft.) ~~and most likely will be substantially less~~. Id. ¶10.

(MDW) 49. The HI-STAR 100 spent fuel transportation casks that would be used to move spent fuel to and from the ITP are designed not to leak or disperse any of their radioactive contents under normal and accident test conditions as specified ~~to be radiologically leak-tight in accordance with stringent NRC requirements~~ in 10 C.F.R. Part 71. *See* Singh Dec. ¶6.

(MDW) 50. Unless flooding or a flooding-related event causes a breach of the integrity of the HI-STAR 100 shipping casks (*i.e.*, a breach of both the overpack and the canister containment boundaries), no ~~radioactivity~~ radioactive materials will escape from ~~them~~ inside the casks even if the casks become submerged. Id.

(HWL) 52. Lying on its side, the HI-STAR 100 transportation cask has a height of 8 feet (without impact limiters); therefore, in order for the cask to become fully submerged, it would have to be sitting in at least eight feet of water. Id.

(HWL) 53. The conditions of service for which the HI-STAR 100 transportation cask is engineered are established by 10 CFR Part 71 to be more severe than the flooding or drop conditions that are likely to occur at the ITP. ~~those that may be encountered by the cask in its actual service (namely, transport of spent nuclear fuel on railroads adjacent to population centers in the forty-eight contiguous states).~~ Id.

(HWL) 55. Submergence of a HI-STAR 100 transportation cask in 200 meters (656 ft) of water would create an external pressure load equal to 284 psi, which is less than the design pressure limit of 300 psi. Id.

(HWL/RHK) 56. No credible flooding mechanism at the ITP would result in submergence of the HI-STAR 100 transportation cask in over 200 meters of water. Id. Therefore, the structural consequences to the transportation cask of any conceivable Great Salt Lake flooding event at the ITP are bounded by the design basis for the transportation cask. Id.

(MDW) 57. The rate of heat transfer in water is ~~approximately 200 times that~~ substantially greater than the heat transfer rate in air. Id. ¶13.

(MDW) 58. The increased rate of heat transfer would keep a submerged HI-STAR 100 transportation cask even cooler than that in the air environment, thus water submergence can be characterized as a beneficial thermal event for the transportation casks (providing an enhanced rate of dissipation of the heat generated by the spent nuclear fuel), rather than a detriment. Id.

(MDW) 59. The thermal effects of submergence of a HI-STAR 100 transportation cask in the water of the Great Salt Lake are bound by the thermal design basis for the transportation cask. Id. ¶¶13-14.

(MS) 60. Potential corrosion of submerged HI-STAR 100 transportation casks due to exposure to salt water, is expected to be minimal even under prolonged exposure conditions. Id. ¶15.

(MS) 61. HI-STAR 100 transportation casks are designed for submersion in spent fuel pools of nuclear power plants containing boric acid in concentrations exceeding 0.2%, and are coated with an effective coating material, carboline 890. Id.

(MS) 62. In order for corrosion to degrade a submerged HI-STAR 100 transportation cask, so as to cause a leak of radioactive materials, the corrosion process would have to ~~remove the carboline 890 coating and "eat through" six (6) inches of steel, which would take centuries~~ penetrate both the steel overpack and the steel canister within the overpack, which would take many years (decades) of continued contact between the cask and the flood water, if it occurred at all. Id. ¶16.

(HWL/MS) 63. There are no physical or chemical mechanisms through which the physical integrity of a HI-STAR 100 spent fuel transportation cask could be expected to be compromised as a result of any postulated flooding event at the ITP. Id.

(HWL) 64. The water submergence scenarios addressed in the HI-STAR 100 transportation cask FSAR (*i.e.*, submergence in 200 meters (656 ft) of water) are far more severe than any flood event that may be postulated for the ITP. Since the HI-STAR 100 transportation cask ~~overpack~~ has been demonstrated to be capable of withstanding the FSAR scenarios without adverse safety consequences, it would also be able to withstand the effects of a postulated flooding at the ITP without adverse safety consequences. Id. ¶17.

(GPZ) 65. The potential non-radiological environmental impacts of flooding the ITP site would generally be limited to disruptions of the water supply and the sanitary waste disposal arrangements. However, drinking water is expected to be provided by bottled water or some other offsite source, and no wells or other water sources at the site will be utilized. Sanitary waste water generated by

ITP operation will be either collected in portable toilets and properly disposed of offsite, or will be routed to a small septic tank/leach field nearby. Lewis Dec. ¶20.

(GPZ) 67. PFS has indicated that the foundations of the pre-engineered metal building used to house the gantry crane at the ITP will be designed so as to prevent their corrosion from salty soils or water. Id. ¶9. Accordingly, any such foundation damage would have insignificant impact on the environment. Id. ¶21.

(HWL/GPZ) 68. A maximum of six HI-STAR 100 transportation casks ~~tasks~~ could be present at the ITP in the event of a postulated sudden flood at the ITP site. Assuming these casks were left isolated by the flood, there would be no adverse environmental consequences from this situation because the casks are designed to withstand any potential natural phenomena that may occur at the ITP site, including floods and would remain in a safe condition, even if submerged. Id.

(HWL) 69. The HI-STAR 100 transportation casks would not be adversely affected by flooding at the ITP site; therefore, if such flooding occurs, there would be no immediate need to remove the casks from a flooded ITP facility or perform any operations on them. Id.

7. (TJB) I hereby certify that the foregoing statements in paragraphs 1(a) and 2-6 above are true and correct to the best of my knowledge, information, and belief.

Terence J. Blasing

Sworn to before me this
13th day of August 2001

Claire M. Cotwood
Notary Public

My commission expires: 6/30/2004

8. (RHK) I hereby certify that the foregoing statements in paragraphs 1(b) and 2-6 above are true and correct to the best of my knowledge, information, and belief.

Richard H. Ketelle

Richard H. Ketelle

Sworn to before me this
14 th day of August 2001

Claire M. Chadwood
Notary Public

My commission expires: 6/30/2004

9. (HWL) I hereby certify that the foregoing statements in paragraphs 1(c) and 2-6 above are true and correct to the best of my knowledge, information, and belief.

Henry W. Lee

Sworn to before me this
16 th day of August 2001

Notary Public

ELVA BOWDEN BERRY
NOTARY PUBLIC STATE OF MARYLAND
My Commission Expires December 1, 2003

My commission expires: _____

10. (MS) I hereby certify that the foregoing statements in paragraphs 1(d) and 2-6 above are true and correct to the best of my knowledge, information, and belief.

Makuteswara Srinivasan

Makuteswara Srinivasan

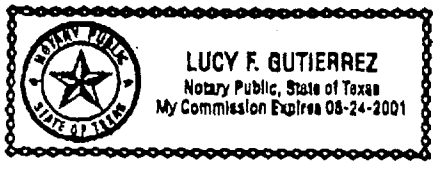
Notary Public for:
State of Maryland, Montgomery County.

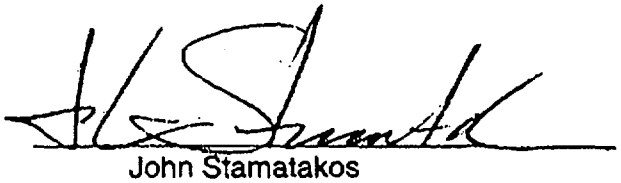
Sworn to before me this
16 th day of August 2001

Notary Public

My commission expires: Commission Expires July 1, 2002

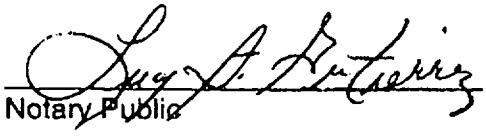
11. (JS) I hereby certify that the foregoing statements in paragraphs 1(e) and 2-6 above are true and correct to the best of my knowledge, information, and belief.





John Stamatakos

Sworn to before me this
16 th day of August 2001



Notary Public

My commission expires: August 24, 2001

12. (MDW) I hereby certify that the foregoing statements in paragraphs 1(f) and 2-6 above are true and correct to the best of my knowledge, information, and belief.

Michael D. Waters

Michael D. Waters

Sworn to before me this
13 th day of August 2001

CIRCE E. MARTIN
NOTARY PUBLIC
MONTGOMERY CO., MD.

Circe Ellen Martin

Notary Public

My commission expires: March 1, 2003

CIRCE E. MARTIN
NOTARY PUBLIC STATE OF MARYLAND
My Commission Expires March 1, 2003

13. (GPZ) I hereby certify that the foregoing statements in paragraphs 1(g) and 2-6 above are true and correct to the best of my knowledge, information, and belief.

Gregory P. Zimmerman

Sworn to before me this
13th th day of August 2001

Claire M. Chitwood
Notary Public

My commission expires: 6/30/2004

ATTACHMENTS 1-7

TO

JOINT AFFIDAVIT OF NRC STAFF
CONCERNING CONTENTION UTAH W

(PROFESSIONAL QUALIFICATIONS)

Attachment 1

Terence J. Blasing

EDUCATION

Ph.D in Meteorology, University of Wisconsin, Madison, WI, June 1975.
M.S. in Meteorology. University of Wisconsin, Madison, WI, June 1968.
B.S. in Meteorology. University of Wisconsin, Madison, WI, June 1966.

EXPERIENCE

Research Staff Member **January 2001 - present**
CARBON DIOXIDE INFORMATION ANALYSIS CENTER
ENVIRONMENTAL SCIENCES DIVISION
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE TN

Performs research in the general area of analyzing changes in the atmospheric concentrations of radiatively active (greenhouse) gases. Provides up-to-date information on the concentrations of these gases, and on the ways in which these gases enter and leave the atmosphere.

Adjunct Assistant/Associate Professor of Geography **1982-present**
THE UNIVERSITY OF TENNESSEE - KNOXVILLE
KNOXVILLE, TN

Duties include teaching courses in meteorology and climatology, presenting seminars, supervising graduate students, and occasionally advising students on careers in meteorology.

Research Staff Member **January 1990 - December 2000**
ENERGY DIVISION
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE TN

Performed air dispersion modeling, noise, and visibility assessments for National Environmental Policy Act (NEPA) Documents. Published reports and papers on air pollution and climate change, safety analysis, and related topics. Prepared written material for several Environmental Assessments and Environmental Impact Statements for the Nuclear Regulatory Commission and for the Department of the Army program to destroy unitary chemical warfare agent (Program Manager for Chemical Demilitarization).

Research Associate/Research Staff Member **September 1977 - January 1990**
ENVIRONMENTAL SCIENCES DIVISION
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE TN

Conducted research in climate change and bioclimatology, especially in areas related to atmospheric concentrations of carbon dioxide. Published several papers in refereed professional journals.

Research Associate **September 1971-September 1977**
LABORATORY OF TREE-RING RESEARCH
UNIVERSITY OF ARIZONA
TUCSON AZ.

Conducted research on the use of tree-ring data to reconstruct past climate. Published several papers in refereed professional journals. Supervised graduate students and presented several seminars on the general subject of climate change.

BIOGRAPHICAL LISTINGS

American Men and Women of Science

Who's Who in Technology

SELECTED PUBLICATIONS (other than NEPA documents)

Miller, R. M. and T.J. Blasing. 2001. *Results of Modeling a Proposed CFB Combustor Project at an Existing Power Plant.* Air and Waste Management Association 94th Annual Conference and Exhibition, Orlando FL, June 25-29.

Blasing, T.J. 2001. Climatological Paradox. *Bulletin of the American Meteorological Society 82*(1) Page 7.

Blasing, T.J., G.F. Cada, C.E. Easterly, L.N. McCold, and G.P. Zimmerman, 1998: *Environmental Assessment Renewal of Materials Licenses for ALARON Corp. Northeast Regional Service Facility, Wampum, Pennsylvania,* NUREG/CR-5549, U.S. Nuclear Regulatory Commission.

Blasing, T.J., Wang. J.L., and Lombardi, D.A., 1998: *Temperature Inversions in the Vicinity of Oak Ridge, Tennessee, as Characterized by Tethersonde Data*, ORNL/TM-13357, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Blasing, T.J., R.L. Miller, and L.N. McCold, 1996: Potential Consequences of the Clean Coal Program for Air and Waste Issues. *J. Air Waste Manage. Assoc.*, **46,** 517-529.

Terry, J.W., T.J. Blasing, and 7 others, 1995: *Disposal of Chemical Agents and Munitions Stored at Pueblo Depot Activity, Colorado: Final Phase I Environmental Report*, ORNL/TM-11210, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Socolof, M.L., M.S. Salk, A.H. Curtis, L.K. Mann, V.R. Tolbert, and T.J. Blasing 1995: *Environmental Data and Analysis for the Proposed Management of Spent Nuclear Fuel on the DOE Oak Ridge Reservation*, ORNL/TM-13065, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Lombardi, D.A., T.J. Blasing, C.E. Easterly, and C.B. Hamilton, 1995: *Environmental Resources of Selected Areas of Hawaii: Climate, Ambient Air Quality, and Noise*, ORNL/TM-12861, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

McCold, L.N., G.K. Eddlemon, and T.J. Blasing, 1995: *Environmental Effects of the U.S. Antarctic Program's Use of Balloons in Antarctica*, ORNL/TM-13032, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Ensminger, J.T., and T.J. Blasing, 1995: *The Use of Explosives by the U.S. Antarctic Program*, ORNL/TM-13031, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

SELECTED PUBLICATIONS (NEPA Documentation)

For the U.S. Nuclear Regulatory Commission

Final Environmental Impact Statement to Construct and Operate a Facility to Receive, Store, and Dispose of 11e.(2) Byproduct Material near Clive, Utah, NUREG-1476, (Docket No. 40-8989, Envirocare of Utah, Inc.), U.S. Nuclear Regulatory Commission, Washington, D.C., August 1993.

Draft Environmental Impact Statement: Decommissioning of the Shieldalloy Metallurgical Corporation Cambridge, Ohio, Facility, Docket No. 040-8948, License No. SMB-1507, NUREG 1543, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, July, 1996.

Draft Environmental Impact Statement: Decommissioning of Babcock and Wilcox's Shallow Land Disposal Area in Parks Township, Pennsylvania, Docket No. 070-3085, License No. SNM-2001, NUREG-1613 prepared for the U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Rockville, Maryland, by Oak Ridge National Laboratory, Oak Ridge, Tennessee, August, 1997.

Final Environmental Impact Statement Related to Reclamation of the Uranium Mill Tailings at the Atlas Site, Moab, Utah, NUREG-1531, Source Material License No. SUA 917, Docket No. 40-3453, Atlas Corporation, prepared for the U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, March 1999.

For the U.S. Department of Energy (Oak Ridge National Laboratory Facilities)

Environmental Assessment: Construction and Operation of Retrievable Transuranic and Transuranic Mixed Waste Storage Facilities at Oak Ridge National Laboratory, in Oak Ridge, Tennessee. DOE/EA-0349, U.S. Department of Energy, Washington, D.C., January, 1993.

Environmental Assessment: Construction and Operation of Class III/IV Solid Low-Level Waste Storage Facilities at Solid Waste Storage Area 7, Oak Ridge National Laboratory, Oak Ridge, Tennessee. DOE EA/1043, U.S. Department of Energy, Oak Ridge Operations, November 1995.

Environmental Assessment: Lease of Parcel ED-1 of the Oak Ridge Reservation by the East Tennessee Economic Council, DOE/EA-1113, U.S. Department of Energy, Oak Ridge Operations, Oak Ridge, Tennessee, April, 1996.

Final Environmental Assessment: Lease of Land and Facilities Within the East Tennessee Technology Park, Oak Ridge, Tennessee, U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN November 1997.

Attachment 2

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 Melton Valley 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.

Attachment 3

Henry W. Lee
Senior Structural Engineer
Spent Fuel Project Office
Office of Nuclear Materials Safety and Safeguards (NMSS)
U.S. Nuclear Regulatory Commission

B.S. in Hydraulics Engineering, Cheng Kung University, 1963
M.S. in Civil Engineering, University of Missouri at Rolla, 1966
Ph.D. in Civil Engineering, University of Maryland at College Park, 1970

Dr. Lee has more than thirty years of experience in Structural Engineering. He is a registered professional engineer and he is skilled in structural analysis, computer modeling, and finite element analysis.

Dr. Lee is currently performing structural evaluations for the licensing of spent nuclear fuel transportation and storage casks. His work includes the evaluation of the structural integrity of casks under the combined loadings of normal, off-normal, postulated design basis accident and extreme natural phenomena events, which include cask stability analysis under design basis seismic events. He has provided input for the preparation of NUREG-1567, Standard Review Plan for Spent Fuel Dry Storage Facilities; NUREG-1536, Standard Review Plan for Dry Cask Storage Systems; NUREG-1617, Standard Review Plan for Transportation Packages for Spent Nuclear Fuel. He has reviewed both the HI-STAR 100 Cask Storage application and the HI-STAR 100 Transportation Package application. He has also prepared many Safety Evaluation Reports for licensing actions involving the storage and transportation of spent nuclear fuel.

PROFESSIONAL CHRONOLOGY: Bridge Design Engineer, State of Illinois, 1966-1967; Research Assistant, University of Maryland, 1967-1970; Senior Structural Engineer, Ewell, Bombhardt Associates Inc., 1970-1972; Assistant Professor, South Dakota State University, 1972-1973; Research Engineer, Gilbert Associates Inc., 1973-1978; Structural Engineer, Structural Engineering Branch, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, 1978-1980; Structural Engineer, Transportation Certification Branch, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, 1980-1989; Senior Structural Engineer, Transportation Certification Branch, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, 1989-1995; Senior Structural Engineer, Spent Fuel Project Office, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, 1995-Present.

Attachment 4

MAKUTASWARA SRINIVASAN

Education:

Ph.D. Metallurgical Engineering, University of Washington, 1972.
M.S. Metallurgical Engineering, University of Washington, 1969.
B.E. (Dist) Metallurgy, Indian Institute of Science, 1967.
B.Sc. Chemistry, University of Madras, 1964.

Experience:

October 2000 - Present — **Metallurgical Engineer/Scientist, Technical Review Section, Technical Review Directorate, Spent Fuel Project Office, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission (NRC), Washington, D.C.**

Provided materials expertise related to safe design and use of commercial transportation and storage casks by reviewing safety analysis reports (SAR) of cask applications; identified and addressed issues related to performance- and life-limiting factors due to corrosion, oxidation, creep, vibrations, and fatigue, based on materials properties and design and operational parameters; generated requests for additional information (RAI) based on 10 CFR Part 71 and 10 CFR Part 72.

Monitored and executed a contract with Pacific Northwest National Laboratory on the creep of Zircaloy cladding, as applied to storage and transportation of spent fuel; directed the contractor effort to focus on developing information specific to creep life of cladding during transportation and dry storage of casks.

Examined industry initiatives to address handling of spent nuclear fuel with high burnup and identified critical issues related to fracture mechanics, corrosion mechanisms, creep deformation and residual ductility of zircaloy cladding.

Monitored and executed a contract concerning an evaluation of neutron shielding material supporting an allegation effort, and contributed to writing allegation close-up information.

May - September 2000 — **Systems Analyst. Program Management, Policy Development and Analysis, Office of Nuclear Material Safety and Safeguards, NRC.**

Designed and developed a new contract financial management system for the office, and coordinated this effort with other NRC Offices.

July 1997 – April 2000 — **Metallurgical Engineer/Scientist, TWRS Section, Special Projects Branch, Office of Nuclear Material Safety and Safeguards, NRC.**

Reviewed licensee submittals and evaluated the metallurgical, ceramic and related materials engineering aspects of components and structures needed for safe operation of radioactive

waste processing and storage facilities. Engineering reviews included conditions arising from normal operations, postulated accidents, natural phenomena, and construction and surveillance.

Performed studies and analyses of materials related technical projects by managing contract with the Center for Nuclear Waste Regulatory Analysis (CNWRA), San Antonio, TX.

Reviewed technical submittals in accordance with the Standard Review Plan (SRP) (Draft NUREG-1702) and Draft Revisions to 10 CFR Part 70, including Integrated Safety Analysis and 10 CFR Part 20. Review included various topical areas such as Materials and Processes, Plant Engineering, and Chemical Safety.

Co-authored a paper on chemical safety issues and a paper on issues concerning materials related to a waste treatment plant at Hanford, WA, identifying structures, systems, and components that are safety-related and important to safety with respect to the performance of their intended functions under normal, off-normal, and natural phenomenon conditions.

Contributed to Standard Review Plan development for TWRS-P Project and MOX projects in NRC sections dealing with integrated safety analysis, chemical safety, and plant systems.

1990 – 1997 **Co-owner/Founder, PC Skills, Inc., Amherst, NY.**

Developed and installed computer solutions for office management; developed course materials and trained PC users in the use of numerous computer software applications. Developed custom software application solutions for information management of small-to-medium size companies.

1989 - 1997 **Founder, Materials Solutions International, Inc., Grand Island, NY.**

Provided consulting and contract services in materials performance analysis, quality assurance, and product development. Expertise in engineered materials, process analysis and product improvement. Projects included ceramic materials and coatings, silicon carbide fibers, hard chrome plating replacement, and temperature sensor assemblies used in turbine engines and nuclear power reactors.

1978 - 1989 **The Carborundum Company, Division of BP America Inc., Niagara Falls, NY.**

Conducted research and development concerning the risk of rupture of ceramic materials based on probabilistic (Weibull) brittle material design concepts; established life-time prediction methodologies based on fracture mechanics – crack growth behavior phenomenological models. Contributed to the creation of nondestructive evaluation and quality assurance methods (including in-service real-time observations and monitoring) in order to reduce the risk of brittle ceramic material application in engineered products. Contributed to improved reliability of materials and components in engineered applications.

Conducted research and development projects related to thermal shock and temperature and fatigue effects, corrosion, erosion, and other in-service environmental degradation and their effects on the use of aged and degraded materials in extended service.

Designed, coordinated, and conducted customer-oriented seminar series in the design and application of brittle ceramic materials. Teamed with plant engineers to implement in-process quality controls to manufacture flaw-free advanced ceramics.

Directed the technical work of 21 staff professionals. Developed and executed numerous process- and product-oriented research projects. Managed analytical laboratory with for characterization of materials, in-process products, and finished products by nondestructive and destructive analyses. Supervised component design and product performance analysis tasks. Contributed to failure analysis, fracture mechanics, erosion, corrosion and wear of industrial components.

Professional Activities

Elected Fellow of the American Ceramic Society (1987), based on work involving the choice and use of technical ceramics for engineered applications.

Recipient of Superior Services Award, Contract Services Category, CERAMIC INDUSTRY.

Published over 60 technical journal articles and contributed book chapters in various ceramic handbooks. Delivered over 50 presentations to professional group meetings, seminars and conventions. Delivered, by invitation, presentations in Germany and Japan.

Served in American Society for Testing Materials (ASTM) subcommittees concerned with establishing test procedures for fracture toughness testing, particularly, single-edge notched beam testing, chevron-notched beam testing, and fracture toughness determination through intrinsic flaw fractography.

Served as a member of American Society for Nondestructive Testing (ASNT). Involved in addressing the implications of fracture mechanics on what was being measured quantitatively and interpreted statistically.

Served as a Member on the Editorial Committee of "Advanced Materials and Processes."

1974 - 1978 **Staff Scientist, Union Carbide Corporation, Parma, Ohio.**

Created and executed critical industrial graphite electrode development projects to improve fracture resistance to thermal shock. Conducted research on fracture mechanics of complex graphitic materials. Conducted failure analysis of graphites. Conducted in-situ crack-growth studies using scanning electron microscopy. Conducted studies to advance the state-of-the-art of fracture mechanics of composite materials. Developed theory and modeled the performance of graphites and computer-coded predictive behavior to compare actual performance.

1972 - 1974 **Research Assistant Professor, University of Washington, Seattle, WA.**

Conducted research, under National Institute of Health (NIH) sponsorship, on the development and characterization of thermoluminescent dosimeter materials for health and safety.

Instructed students in the areas of Physical Metallurgy and computer programming.

JOHN STAMATAKOS

Senior Research Scientist
Center for Nuclear Waste Regulatory Analyses
Southwest Research Institute

B.S., Geology, Franklin and Marshall College, Lancaster, Pennsylvania, 1981
M.S., Geology, Lehigh University, Bethlehem, Pennsylvania, 1988
Ph.D., Geology, Lehigh University, Bethlehem, Pennsylvania, 1990

Dr. Stamatakos is a structural geologist and geophysicist with international research experience in regional and global tectonics. Dr. Stamatakos has conducted research on a range of topics including paleomagnetism, neotectonics, kinematics of fault block rotations in strike-slip, normal, and thrust fault systems, effects of internal strain on the magnetic properties of deformed rocks, evolution of curvature in arcuate mountain belts, and age and sequence of deformation in folded and faulted mountain belts. This research has focused on the northern and central Appalachians in the eastern United States and Canada, the Hercynian mountains in Germany and northern Spain, the Rocky Mountains and Basin and Range in the western United States, and the northern Cordilleran Mountains in Alaska. Other strengths include numerical modeling of deformation, magnetostratigraphy, rock magnetism, and exploration geophysics.

As a Research Scientist in the Center for Nuclear Waste Regulatory Analyses, Dr. Stamatakos is a Principal Investigator for structural deformation and seismicity, including tectonics and neotectonics research. Tectonics research at CNWRA currently includes compiling a tectonics Geographic Information System (GIS) database, field analyses of the structural and tectonic elements of the Basin and Range province in southwestern United States, evaluation of seismic and faulting hazards at nuclear facilities, and the development of tectonic models for the region surrounding the proposed high-level nuclear waste repository at Yucca Mountain, Nevada. These investigations, sponsored by the U.S. Nuclear Regulatory Commission, currently support development of the tectonic framework for evaluation of risk of earthquakes and volcanic activity, and the effects of structures and tectonic processes on groundwater flow in the region surrounding Yucca Mountain.

Prior to coming to CNWRA, Dr. Stamatakos held positions as a visiting faculty at the University of Michigan and as a postdoctoral fellow at the Eidgenössische Technische Hochschule (ETH) in Zurich, Switzerland. At the University of Michigan, Dr. Stamatakos taught courses in field mapping, structural geology, geophysics, and tectonics.

Dr. Stamatakos has written or collaborated on nearly 50 papers and reports on structural geology, tectonics, and geophysics. He has made presentations at international conferences in the U.S., Canada, and Europe and has won an outstanding paper award from the American Geophysical Union.
Dr. Stamatakos is associate editor of the Geological Society of America Bulletin, GP Editor for EOS of the American Geophysical Union, and is a regular reviewer of papers for the Journal of Geophysical Research, Earth and Planetary Science Letters, Reviews of Geophysics, Journal of Structural Geology, Physics of the Earth and Planetary Sciences, and Geophysical Research Letters as well as grant proposals for the National Science Foundation.

Professional Chronology: Petroleum Geologist, Analex Geosciences, 1981–1983; Research and Teaching Assistant, Lehigh University, 1984–1990; Research Fellow, Eidgenössische Technische Hochschule, Switzerland, 1990–1992, Visiting Assistant Professor, University of Michigan, 1992–1995, Research Scientist, Southwest Research Institute, Center for Nuclear Waste Regulatory Analyses, 1995–Present.

Memberships: Geological Society of America, American Geophysical Union, Sigma Xi.

Michael D. Waters

EDUCATION

M.S. Nuclear Engineering Sciences, University of Florida, 1995
B.S. Nuclear Engineering, University of Florida, 1993

WORK EXPERIENCE

U.S. NUCLEAR REGULATORY COMMISSION

May 1996 to Present Project Engineer, NMSS, Spent Fuel Project Office (SFPO)

Project Manager: Schedule, coordinate, and prepare licenses, amendments, and approval certificates for several spent fuel storage installations, spent fuel storage and transportation cask designs, and transportation package designs. Coordinate multi-disciplined technical review teams to make regulatory findings on the adequacy of proposed designs. Develop NRC policy on assigned technical and licensing issues.

Technical Reviewer: Reviewed the adequacy of several spent fuel storage cask, storage facility, and transportation package designs primarily in the major technical disciplines of shielding, criticality, containment, radiological protection, and operating and maintenance procedures. Performed detailed technical reviews and conducted independent confirmatory analyses with state-of-the-art methods to determine compliance of proposed designs with 10 federal safety requirements in 10 CFR Parts 20, 71, and/or 72. Prepared written safety evaluations reports, federal rulemakings, and environmental assessments for assigned projects.

Major NRC Casework and Publications:

Project manager of the Fort St. Vrain independent spent fuel storage installation (ISFSI), Three-Mile Island, Unit 2 ISFSI, SPEC-300 transportation package, and MOX fresh fuel package.

Primary shielding and radiological safety reviewer of the HI-STAR 100 transportation cask design (Part 71), HI-STAR 100 storage cask design (Part 72), and HI-STORM 100 storage cask design (Part 72). Primary shielding, radiological safety, criticality, and/or containment reviewer of multiple other storage and transportation cask designs (Part 71 and 72).

Co-author of NUREG-1571, *"Information Handbook on Independent Spent Fuel Storage Installations,"* December 1996. Primary author of *"Reconsideration of Dose Assessments for Future Independent Spent Fuel Storage Installation Multi-Row Cask Arrays,"* Sixth International Conference on Nuclear Engineering.

UNIVERSITY OF FLORIDA

Jan 1993 - April 1996 Research Assistant/Graduate Student, Department of Nuclear Engineering Sciences

Responsibilities: Developed computer codes to analyze and evaluate the characteristics of industrial fuel designs and performed cost-benefit analyses to determine optimum fuel designs. Investigated the University's hazardous mixed waste problem, interviewed research laboratory personnel, identified root causes of waste generation, and determined inexpensive methods to mitigate waste.

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 1993 - August 1993 Professional Intern, Oak Ridge National Laboratory
May 1992 - August 1992

Responsibilities: Performed various studies with the RELAP-5 thermal hydraulic code and commercial plotting software. Developed experiments and standard procedures, as part of a program to confirm criticality design features of the reactor spent fuel storage racks.

Gregory P. Zimmerman

Leader of the Environmental Impact Analysis Program, Center for Energy and Environmental Analysis, Oak Ridge National Laboratory, Oak Ridge, TN.

Education:

M.S. Degree, Mechanical Engineering, University of Tennessee, Knoxville, 1977.
B.S. Degree, Mechanical Engineering, University of Tennessee, Knoxville, 1975.

Qualifications:

Mr. Zimmerman has over 20 years' experience at ORNL in risk and safety analyses, radioactive waste management, and environmental impact assessment. In 1988, he participated in the preparation of a Programmatic Environmental Impact Statement (EIS) for the U.S. Army's proposal to destroy the national stockpile of lethal chemical weapons, and in 1989, he assumed program management responsibility at ORNL for the preparation of eight site-specific EISs related to that U.S. Army program.

Mr. Zimmerman has provided assistance to the Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) in the completion of environmental impact assessments. In his involvement with those programs, Mr. Zimmerman has conducted accident analyses, exposure assessments, and dose analyses for facilities handling radioactive materials and wastes under the jurisdiction of both the DOE and the NRC.

In addition to his technical interests in risk assessment and accident analysis, Mr. Zimmerman has also developed a mathematical technique for blending census of population data with information about atmospherically dispersed pollutants in order to quantify the spatial distribution of potential human health impacts. This analytical technique has been successfully applied to the siting of hazardous facilities and has potential application to the investigation of issues related to environmental justice or environmental equity.

Employment History and Selected Projects:

January 1977 to Present — OAK RIDGE NATIONAL LABORATORY, Oak Ridge, TN.

In his program manager duties, Mr. Zimmerman is responsible for coordinating and supervising the technical progress of a multidisciplinary team of individuals who conduct environmental impact analyses and assessments for a variety of federal agencies. The program specializes in the preparation of environmental impact statements and assessments. His managerial responsibilities include the development of schedules, budgets, and work assignments, as well as technical oversight, quality control, preparation, and assembly of final project deliverables and documents.

In 1993, Mr. Zimmerman lead the ORNL effort to assist NRC with its review of the license application of Envirocare of Utah for an 11e.(2) byproduct disposal facility near Clive, Utah. He provided technical assistance to NRC and coordinated the preparation of the NRC's final EIS as part of this effort. In 1995, Mr. Zimmerman conducted a radiological and chemical accident analyses for NRC's relicensing of Nuclear Metals, Inc., in Concord, Mass. In 1994 to 1996, he served as the ORNL Core Team leader for Performance Evaluations of fifteen potential DOE mixed, low-level (radioactive) waste disposal sites. This project was a coordinated effort between ORNL and Sandia National Laboratories.

Mr. Zimmerman is presently assisting the NRC with its environmental review of a license application for a commercial spent nuclear fuel storage facility proposed for Skull Valley, Utah.

September 1975 to December 1976 — UNIVERSITY OF TENNESSEE, Dept. of Mechanical Engineering, Knoxville, TN.

Under a graduate research assistantship, Mr. Zimmerman participated in nuclear safety studies involving heat and mass transfer in nuclear reactors cooled by liquid metals.

March 1971 to June 1974 — NASA (GEORGE C. MARSHALL SPACE FLIGHT CENTER), Huntsville, AL.

As part of his cooperative education experience, Mr. Zimmerman assisted with mission planning aspects of the U.S. Space Shuttle program, including payload packaging and scheduling, as well as in-flight operations and orbital mechanics & maneuvering.

Technical Specialties:

Project and Program Management
Risk and Accident Analyses
Heat Transfer and Thermodynamics
Scientific Programming (Computers)
Environmental Impact Analyses
Nuclear Waste Management
Nuclear Weapons Effects

Professional/Academic Awards and Honors:

Member of Tau Beta Pi, the engineering honorary society.
Joel F. Bailey Award for academic achievement among engineering students (University of Tennessee), 1975
Martin Marietta Energy Systems, Inc., *Significant Event Award*, July 1991.
UT-Battelle, *Significant Event Award*, October 2000.

Selected Publications:

K.S. Gant and G.P. Zimmerman, *Tooele Chemical Agent Disposal Facility: Review and Evaluation of Information for Updating the 1989 Final Environmental Impact Statement*, ORNL/TM-13542, Oak Ridge National Laboratory, Oak Ridge, Tenn., July 1999.

R.M. Reed and G.P. Zimmerman, "Analyses of Environmental Justice Concerns for the U.S. Army's Chemical Stockpile Disposal Program," proceedings of *Environmental Forum VII*, Denver, Colo., April 28 and 29, 1999, sponsored by the Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Md.

(Among preparers for) U.S. Department of the Army, *Final Environmental Impact Statement for Pilot Testing of Neutralization/Supercritical Water Oxidation of VX Agent at Newport Chemical Activity, Indiana*, Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Md., December 1998.

Blasing, T.J., G.F. Cada, C.E. Easterly, L.N. McCold, G.P. Zimmerman, *Environmental Assessment: Renewal of Materials Licenses for ALARON Corp. Northeast Regional Service Facility, Wampum, Pennsylvania*, NUREG/CR-5549, prepared by the Oak Ridge National Laboratory, Oak Ridge, Tenn., for the Office of Nuclear Material Safety and Safeguards, Nuclear Regulatory Commission, Washington, D.C., December 1998.

(Project leader for) U.S. Department of the Army, *Final Environmental Impact Statement for Pilot Testing of Neutralization/Biotreatment of Mustard Agent at Aberdeen Proving Ground, Maryland,* Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Md., July 1998.

(Among preparers for) U.S. Department of the Army, *Revised Final Environmental Impact Statement for Disposal of Chemical Agents and Munitions Stored at Pine Bluff Arsenal, Arkansas*, Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Md., April 1997.

G.P. Zimmerman, *Review and Evaluation of Updated Numerical Input Values for Determining Risks to Threatened and Endangered Species near the Umatilla Chemical Depot, Oregon*, prepared for the Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Md., by the Oak Ridge National Laboratory, Oak Ridge, Tenn., April 1997.

R.L. Miller, C.E. Easterly, D.A. Lombardi, I.E. Treitler, R.T. Wimbrow, and G.P. Zimmerman, *Environmental Assessment for Proposed License Renewal of Nuclear Materials, Inc., Concord, Massachusetts*, NUREG/CR-6528, prepared by Oak Ridge National Laboratory, Oak Ridge, Tenn., for U.S. Nuclear Regulatory Commission, Office of Nuclear Materials Safety and Safeguards, Washington, D.C., February 1997.

(Project leader for) U.S. Department of the Army, *Revised Final Environmental Impact Statement for Disposal of Chemical Agents and Munitions Stored at Umatilla Depot Activity, Oregon*, Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, Md., November 1996.

(Technical Core Team Leader for) U.S. Department of Energy, *Performance Evaluation of the Technical Capabilities of DOE Sites for Disposal of Mixed Low-Level Waste*, DOE/ID-10521 (Vols. 1, 2, and 3) and SAND96-0721 (Vols. 1, 2, and 3), prepared by Sandia National Laboratories, Albuquerque, New Mexico, March 1996.

J.D. Tauxe, D.W. Lee, J.C. Wang, and G.P. Zimmerman, "A Comparative Subsurface Transport Analysis for Radioactive Waste Disposal at Various DOE Sites," P95-79881, *Proceedings of the 1995 Fall Meeting of the American Geophysical Union*, San Francisco, Calif., December 11-15, 1995.

National Research Council, *Recommendations for the Disposal of Chemical Agents and Munitions*, National Academy Press, Washington, D.C., 1994. [G.P. Zimmerman provided the text and Figure 4-3 on the comparative risk of destroying the U.S. stockpile of chemical weapons versus continuing to store the stockpile.]

G.P. Zimmerman, *The National Environmental Policy Act (NEPA): A Training Session on Its Requirements and Its Implementation*, presented at the request of the NEPA Office of the U.S. Army Chemical Materiel Destruction Agency, Aberdeen, Maryland, February 15, 1994.

(Project leader for) U.S. Nuclear Regulatory Commission, *Final Environmental Impact Statement to Construct and Operate a Facility to Receive, Store, and Dispose of 11e.(2) Byproduct Material Near Clive, Utah*, NUREG-1476, U.S. Nuclear Regulatory Commission, Office of Nuclear Materials Safety and Safeguards, Washington, DC, August 1993.

(Among preparers for) *Chemical Stockpile Disposal Program Final Programmatic Environmental Impact Statement*, Vols. 1, 2, and 3, Program Executive Officer–Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, MD, January 1988.

G.P. Zimmerman, *Better Understanding of Bubble Behavior in Liquid Environments: The Rise and Collapse of Large Vapor Bubbles*, Master's Thesis, University of Tennessee, Department of Mechanical Engineering, 1977.