UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of:	)	Docket No. 72-22-ISFSI
PRIVATE FUEL STORAGE, LLC (Independent Spent Fuel Storage Installation)	)	ASLBP No. 97-732-02-ISFSI
	)	January 31, 2000

STATE OF UTAH'S OBJECTIONS AND RESPONSE TO APPLICANT'S FIFTH SET OF DISCOVERY REQUESTS TO INTERVENORS STATE OF UTAH AND CONFEDERATED TRIBES

The State responds to Applicant's January 19, 2000 Fifth Set of Discovery Requests, which relate to Utah Contentions E (Financial Assurance) and L (Geotechnical). The State and the Applicant have agreed that the party responding to Requests for Admissions and Interrogatories, during the formal discovery period, may have eight working days in which to timely file a response.

GENERAL OBJECTIONS

These objections apply to the State of Utah's responses to all of the Applicant's Fifth Set of Discovery Requests.

1. The State of Utah objects to the Applicant's instructions and definitions on the grounds and to the extent that they request or purport to impose upon the State any obligation to respond in manner or scope beyond the requirements set forth in 10 CFR §§ 2.740, 2.741 and 2.742.

2. The State of Utah objects to Applicant's Request for Production of

Documents to the extent that it requests discovery of information or documents protected under the attorney-client privilege, the attorney work-product doctrine and limitations on discovery of trial preparation materials and experts' knowledge or opinions set forth in 10 CFR § 2.740 or other protection provided by law. The State has provided PFS with a Privilege Log which identifies all documents subject to these privileges and protections and which the State reserves the right to supplement.

I. GENERAL INTERROGATORIES

General Interrogatory No. 1. State the name, business address, and job title of each person who was consulted and/or who supplied information for responding to interrogatories, requests for admissions and requests for the production of documents. Specifically note for which interrogatories, requests for admissions and requests for production each such person was consulted and/or supplied information.

If the information or opinions of anyone who was consulted in connection with your response to an interrogatory or request for admission differs from your written answer to the discovery request, please describe in detail the differing information or opinions, and indicate why such differing information or opinions are not your official position as expressed in your written answer to the request.

RESPONSE TO GENERAL INTERROGATORY NO. 1: The persons listed below were consulted and/or supplied information in responding to the discovery requests for Applicant's Fifth Set of Requests. Declarations for Drs. Sheehan, Allison, and Bartlett, and Denise Chancellor, Esq. supporting State's responses to this set of discovery requests cover State's Responses to Applicant's Fourth Set of Discovery as well, and are attached to State's Responses to Applicant's Fourth Set, also filed January 31, 2000 as Exhibit 1. Declarations for Drs. Arabasz and Pechmann are attached hereto as Exhibit 1.

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Economist and Financial Expert, Osterberg & Sheehan
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Utah Contentions L
Walter Arabasz, Ph.D. (limited to Responses to Interrogatory 1, Part B, Interrogatory 2, Admission Request Nos. 1-5 and 17)
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Director, University of Utah Seismograph Stations
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James C. Pechmann, PhD (limited to Responses to Interrogatory 1, Part B, Interrogatory 2, Admission Request Nos. 1-5 and 17)
Research Associate Professor
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M. Lee Allison, Ph.D. (limited to Interrogatory No. 1, Part A, Admission Request Nos. 16, 18 through 38)
State Geologist and Director
Kansas Geological Survey
1930 Constant Ave.
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Steven F. Bartlett, Ph.D. (limited to Interrogatory No. 1, Part C and Admission Requests Nos. 6 through 15, and 39 through 44)
Research Project Manager, Research Division
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General Discovery Requests
Denise Chancellor, Esq.
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In response to whether the information or opinions of anyone who was consulted in connection with the State's response to an interrogatory or request for admission differs from the State's written answer to the discovery request, the State is unaware of any such difference among those consulted.

II. BOARD CONTENTION 3 (UTAH E) FINANCIAL ASSURANCE

A. Requests for Admission – Utah E

1. Do you admit that there is reasonable assurance that a PFS customer that was a nuclear reactor licensee under 10 C.F.R. Part 50 would make the payments due PFS?

RESPONSE TO ADMISSION REQUEST NO. 1 - UTAH E. Denied.

2. Do you admit that, for a customer from whom PFS had taken no spent fuel, if PFS refused to take any fuel from the customer because it had missed a payment to PFS, that there would be no potential for PFS to suffer harm from the customer failing to make that payment?

RESPONSE TO ADMISSION REQUEST NO. 2 - UTAH E. Denied.

3. Do you admit that periodically examining PFS's customers' financial health would reduce the risk to PFS arising out of the potential for the customer to fail to make a payment due PFS?

RESPONSE TO ADMISSION REQUEST NO. 3 - UTAH E. Denied.

4. Do you admit that requiring PFS's customers to meet creditworthiness standards would reduce the risk to PFS arising out of the potential for the customer to fail to make a payment due PFS?

RESPONSE TO ADMISSION REQUEST NO. 4 - UTAH E. Denied on the

grounds that there is insufficient information as to what standards would apply, when the standards would be applied, and what would happen if subsequently the customers encountered financial problems.

5. Do you admit that if a PFS customer paid all its fees due PFS in advance that there would be no potential for PFS to suffer harm from the customer failing to make a payment?

RESPONSE TO ADMISSION REQUEST NO. 5 - UTAH E. Denied.

6. Do you admit that requiring a customer to obtain a letter of credit to cover the amount the customer owed PFS in spent fuel storage fees would reduce the risk to PFS arising out of the potential for the customer to fail to make a payment due PFS?

RESPONSE TO ADMISSION REQUEST NO. 6 - UTAH E. Denied on the grounds that there is insufficient information as to what amount the customer owed PFS or what costs are included in PFS storage fees.

7. Do you admit that requiring a third-party guarantee from a customer to cover the amount the customer owed PFS in spent fuel storage fees would reduce the risk to PFS arising out of the potential for the customer to fail to make a payment due PFS?

RESPONSE TO ADMISSION REQUEST NO. 7 - UTAH E. Denied on the grounds that there is insufficient information as to the financial condition of the customer. *See also* Response to Admission No. 6.

8. Do you admit that requiring a customer to post a bond to cover the amount the customer owed PFS in spent fuel storage fees would reduce the risk to PFS arising out of the potential for the customer to fail to make a payment due PFS?

RESPONSE TO ADMISSION REQUEST NO. 8 - UTAH E. Denied on the grounds that there is insufficient information to ascertain the form of the bond, what costs a bond may cover, and when a bond would be posted.

III. BOARD CONTENTION 8 (UTAH L) GEOTECHNICAL

A. Requests for Admission – Utah L

1. Do you admit that probabilistic seismic hazards assessments are, in general, an industry-accepted method for determining the design basis earthquake?

RESPONSE TO ADMISSION REQUEST NO. 1 - UTAH L. Denied. The request is ill-posed. Whether or not probabilistic seismic hazard assessments are "an industry-accepted method for determining the design basis earthquake" can only be answered conditional upon the specific application and upon any regulatory rules that apply. In a circumstance, for example, in which regulatory governance prescribes the design-basis earthquake to be determined by a deterministic approach, it becomes irrelevant whether a probabilistic methodology exists or is "industry-accepted." In cases where the rules prescribe or allow a probabilistic approach, standards and guidelines—at least for probabilistic hazard analysis for vibratory ground motion—have been promulgated by national entities such as the National Research Council, the U.S. National Regulatory Commission, the U.S. Department of Energy, and the Electric Power Research Institute.

2. Do you admit that the State of Utah has approved the design of buildings and structures whose design basis earthquake was determined through a probabilistic seismic hazards assessment?

RESPONSE TO ADMISSION REQUEST NO. 2 - UTAH L. The State objects to this request as irrelevant in that the standards are not determined by the State of Utah but the U.S. Nuclear Regulatory Commission. Notwithstanding this objection this

request is admitted in part. It is correct that the "State of Utah"—in the broad sense defined here by the Applicant—has approved the design of some "buildings and structures whose design basis earthquake was determined through a probabilistic seismic hazards assessment." *See* "Response to Admission Request No. 3—Utah L" below. It is equally correct that the State of Utah requires a deterministic approach for determining the design basis earthquake for some structures, for example for dams where a fault-specific source controls the ground-shaking hazard.

3. Do you admit that the State of Utah has approved the design of interstate highway bridges whose design basis earthquake was determined through a probabilistic seismic hazards assessment?

RESPONSE TO ADMISSION REQUEST NO. 3 - UTAH L. The State objects to this request as irrelevant in that the standards are not determined by the State of Utah but the U.S. Nuclear Regulatory Commission. Notwithstanding this objection this request is admitted. Under earlier informal discovery, the State provided the Applicant with a copy of a 1996 report entitled, "Final Report, Seismic Hazard Analysis of the I-15 Corridor." A probabilistic seismic hazard analysis summarized in this report was the underlying basis used by the Utah Department of Transportation to develop seismic design spectra for new highway bridges along interstate highway I-15 in the Salt Lake Valley.

4. Do you admit that the probabilistic seismic hazards assessment performed by Geomatrix consultants for PFS meets industry standards?

RESPONSE TO ADMISSION REQUEST NO. 4 - UTAH L. Denied. The "probabilistic seismic hazards assessment performed by Geomatrix consultants" involved

probabilistic analyses both of vibratory ground-motion hazard and fault-displacement hazard. The State is not aware of any "industry standards" yet established for a probabilistic analysis of fault-displacement hazard. Regarding a probabilistic analysis of vibratory ground-motion hazard, the State recently become aware in reading the NRC Staff's Safety Evaluation Report (SER), released in December 1999, that an independent analysis and review of seismic hazards at the PFS site had been performed for the Staff by the Center for Nuclear Waste Regulatory Analysis (CNWRA). The State is attempting to secure a copy of this information from the Staff through discovery and withholds further judgment on the probabilistic hazards assessment performed by Geomatrix until it can scrutinize the independent analysis and review performed for the Staff by the CNWRA.

5. Do you admit that the probabilistic seismic hazards assessment performed by Geomatrix consultants for PFS meets the State of Utah's standards?

RESPONSE TO ADMISSION REQUEST NO. 5 - UTAH L. The State objects to this request as irrelevant because the standards are not determined by the State of Utah but the U.S. Nuclear Regulatory Commission. Notwithstanding this objection this request is denied. The Applicant has here defined the "State of Utah' to be so broad that no uniform "standards" can be said to exist. It is assumed that any entity of the State of Utah seeking appropriate standards would refer to national standards such as those referred to above in "Response to Admission Request No. 1—Utah L."

6. Do you admit that the upper few feet of the PFS site consists of eolian silty soil deposits?

RESPONSE TO ADMISSION REQUEST NO. 6 - UTAH L. Admitted

7. Do you admit that a silty clay/clayey silt layer underlies the eolian silty soil layer?

RESPONSE TO ADMISSION REQUEST NO. 7 - UTAH L. Denied. The CPT data suggest that there is more than one layer below the eolian silt and the denser sediments at thirty feet.

8. Do you admit that the underlying silty clay/clayey silt layer is competent for supporting the storage pads and cask transportation over the adjacent driveways?

RESPONSE TO ADMISSION REQUEST NO. 8 - UTAH L. Denied. *See* Response to Interrogatory No. 1, 4th Set.

9. Do you admit that the "competent soil layer" referred to by the State in Contention L, Request for Admission No. 1 of "State of Utah's Sixth Set of Discovery Requests," dated December 20, 1999, is the underlying silty clay/clayey silt layer?

RESPONSE TO ADMISSION REQUEST NO. 9 - UTAH L. Denied. The "competent soil layer" refers to denser soils below the silty clay/clayey silt layer.

10. Do you admit that PFS will replace the upper few feet of eolian silty soil deposits underlying the storage pads and adjacent driveways with a soil-cement mixture?

RESPONSE TO ADMISSION REQUEST NO. 10 - UTAH L. Admitted

11. Do you admit that this soil-cement mixture will be stronger than the underlying silty clay/clayey silt layer?

RESPONSE TO ADMISSION REQUEST NO. 11. - UTAH L. The State objects to the term "this soil-cement mixture" because PFS has not provided details about the mixture. The State also objects to the term "stronger" as non-technical and vague. Notwithstanding these objections, the admission is denied.

12. Do you admit that the soil-cement mixture will be competent for supporting the storage pads and cask transportation over the adjacent driveways?

RESPONSE TO ADMISSION REQUEST NO. 12 - UTAH L. Denied. PFS has not demonstrated competency of the soil-cement mixture at the site. In addition, PFS has not shown an adequate factor of safety against sliding during a seismic event.

13. Do you admit that the eolian silty soil layer will be removed before the construction of the foundations of the Canister Transfer Building?

RESPONSE TO ADMISSION REQUEST NO. 13 - UTAH L. Admit that this is PFS's intent.

14. Do you admit that the foundations of the Canister Transfer Building will rest on the silty clay/clayey silt layer?

RESPONSE TO ADMISSION REQUEST NO. 14 - UTAH L. Denied. *See* Response to Request for Admission No. 7.

15. Do you admit that the silty clay/clayey silt layer is competent for supporting the foundations of the Canister Transfer Building?

RESPONSE TO ADMISSION REQUEST NO. 15 - UTAH L. Denied. PFS has not demonstrated the competency of foundation soils.

16. Do you admit that impinging seismic waves will not approach the foundation at an angle significantly different from vertical?

RESPONSE TO ADMISSION REQUEST NO. 16 - UTAH L. Denied. The current characterization of capable faults in Skull Valley is inadequate to know where the source of earthquakes might occur. Seismic waves may also impinge the foundation from outside Skull Valley. In either case, the seismic waves may come from a distance far

enough away from the foundation that they would impinge at an angle significantly different from vertical.

17. Do you admit that the controlling seismic source for the ground motion hazard at the PFS site is the Stansbury fault?

RESPONSE TO ADMISSION REQUEST NO. 17 - UTAH L. The State objects on the grounds the term "controlling seismic source" is vague. NRC Regulatory Guide 1.165, Appendix A, gives the following definition for controlling earthquakes: "Controlling earthquakes are the earthquakes used to determine spectral shapes or to estimate ground motions at the site. There may be several controlling earthquakes for a site..." Therefore, the controlling earthquake(s) and the source(s) they occur on depend on unspecified factors such as the period and component of the ground motion, the type of seismic hazard analysis being performed (deterministic or probabilistic), and, for probabilistic analyses, the return period of interest.

Notwithstanding this objection, the request is denied because the Applicant's own studies show that the Stansbury fault is not always the controlling seismic source for ground motion hazard at the PFS site. Specifically, the Geomatrix report entitled "Update of Deterministic Ground Motion Assessments", submitted by PFS to the NRC on April 8, 1999, concludes that the East fault is the controlling fault for a deterministic seismic hazard analysis. *See* at 3 and Figure 1. The other seismic sources considered in this report are the Stansbury, West, and East Cedar Mountains faults. Note that combined ruptures of the East fault and the West and/or Springline fault are not considered in this

updated deterministic analysis, even though such sources are included in the PSHA in the February 1999 Geomatrix report entitled "Fault Evaluation Study and Seismic Hazard Assessment." *See* at 66-68 and Figures 6-5 and 6-6. Also not considered in the deterministic analysis is a possible combined rupture of the East fault and the Stansbury fault. Rupture of the East fault in combination with one or more other faults would produce larger ground motions than rupture of the East fault alone, making this combined source the controlling source.

18. Do you admit that the State of Utah has additional seismic reflection lines for Skull Valley beyond those utilized by PFS from the Geomatrix study?

RESPONSE TO ADMISSION REQUEST NO. 18 - UTAH L. Denied.

19. Do you admit that the State of Utah has not identified any faults, in addition to those faults identified by Geomatrix Consultants, that would cause the ground motion for a 2,000-year return period earthquake, as determined using a probabilistic seismic hazards assessment, to exceed the design basis ground motion of 0.53g?

RESPONSE TO ADMISSION REQUEST NO. 19 - UTAH L. Denied. The State recognizes more and possibly larger faults on the seismic reflection lines produced by PFS than does PFS and its contractors. Based on the data provided to the State, PFS has not collected sufficient or qualified data to fully and adequately characterize faults on their seismic lines and maps. The geology of Skull Valley and its environs is strongly indicative of the potential presence of other, large capable faults. The State also recognizes geologic conditions are suggestive of additional faults bounding and intersecting Hickman Knolls and other bedrock blocks that could extend under or adjacent to the PFS site.

PFS has the obligation to fully characterize the seismo-tectonic environment and demonstrate the lack of such faulting. The State of Utah intends to review the adequacy, completeness, and quality of the data and interpretations that PFS makes regarding seismic capabilities.

20. Do you admit that the faults identified by the State of Utah would not cause the ground motion for a 2,000-year return period earthquake, as determined using a probabilistic seismic hazards assessment, to exceed 0.67g?

RESPONSE TO ADMISSION REQUEST NO. 20 - UTAH L. Denied. Some of the faults identified by the State are based on Bay Geophysical and Geosphere Midwest seismic reflection lines. These lines have no shallow geologic reflectors. The hazard associated with the faults cannot be evaluated without evidence of their horizontal extent and vertical offsets, for capability and age determination, respectively. Moreover, it cannot be determined if additional faults are extant because of the lack of shallow data or because of the masking of data by coherent noise.

Some of the faults identified by the State are from poor geologic exposures (such as the East Cedar Mountain fault) or are inferred from outcrop geology (such as the uplifted mid-valley horst blocks including Hickman Knolls). Additional information is needed to quantify the nature, history, and capabilities of these faults.

21. Do you admit that the State of Utah has not identified any faults improperly correlated by Geomatrix Consultants that would cause the ground motion for a 2,000-year return period earthquake, as determined using a probabilistic seismic hazards assessment, to exceed the design basis ground motion of 0.53g?

RESPONSE TO ADMISSION REQUEST NO. 21 - UTAH L. Denied. The

faults identified by Geomatrix are based on interpretations of coherent seismic noise rather than on geologic seismic reflectors. Inasmuch as Geomatrix and Bay Geophysical correlated noise events, their interpretations have no geologic basis. Evaluation of the Bay Geophysical processing of the seismic lines revealed that the noise on the lines is so great that fault offsets of up to 60 feet could exist and be masked by the noise.

22. Do you admit that the State of Utah has not identified any faults improperly correlated by Geomatrix Consultants that would cause the ground motion for a 2,000-year return period earthquake, as determined using a probabilistic seismic hazards assessment, to exceed the design basis ground motion of 0.67g?

RESPONSE TO ADMISSION REQUEST NO. 22 - UTAH L. Denied. As described in Response to Admission Request No. 21 above, large, extensive faults could be present in the subsurface and be masked by coherent noise events on the seismic lines from less than optimum data acquisition and undocumented and non-replicable processing of the data.

23. Do you admit that the "smoothing" is an accepted industry practice for the analysis of seismic data?

RESPONSE TO ADMISSION REQUEST NO. 23 - UTAH L. The State objects on the grounds that this request is vague in that the terms "smoothing" and "industry practice" are not defined. The specific operations that are being referred to as "smoothing" need to be identified and described. Notwithstanding this objection, Admission Request No. 23 is denied to the extent that "industry practice" relates to that used on shallow reflection data for engineering applications as with the PFS data. "Smoothing" is used in the petroleum industry to enhance the coherency of conventional

seismic data. "Smoothing" is not a standard practice used on shallow reflection data for engineering applications. "Smoothing" has a tendency to artificially flatten shallow reflection data and de-emphasize irregularities such as fault offsets. Near-surface reflection data acquired and processed for engineering and ground water applications possess a unique set of constraints and limitations as they relate to use of conventional petroleum seismic techniques. Depending on the specific parameters used, "smoothing" can sacrifice the accuracy of near-surface data in order to enhance more dominant deep data or if not used with extreme care, enhance groundroll noise. An important purpose of the PFS seismic line acquisition was to evaluate shallow (*i.e.*, geologically young) faulting and folding. Without severe constraints, the practice of "smoothing" will diminish the ability to detect and analyze shallow data.

24. Do you admit that "smoothing" does not change the underlying data?

RESPONSE TO ADMISSION REQUEST NO. 24 - UTAH L. The State objects on the grounds that this request is vague in that the term "smoothing" is not defined. The specific operations that are being referred to as "smoothing" need to be listed and described. Notwithstanding this objection, the Admission Request is denied. "Smoothing" is often used in petroleum exploration to enhance deeper reflectors where the interpreter is not particularly interested in shallow data. The purpose of "smoothing" is to flatten or smooth reflectors to compensate for near-surface static and waveform irregularities. However, shallow faults will also appear to "smoothing" operations as a static or waveform irregularity. Irregularities such as fault offsets can easily be

eliminated completely through smoothing techniques.

It is assumed that the underlying data referred to here are the processed sections. Any processes that enhance coherency by altering the time location or data attributes of the displayed section will alter the underlying data. In that regard, "smoothing" does change the underlying data by enhancing coherency through attempting to align apparent reflections at the expense of the accuracy of the shallow reflection data.

25. Do you admit that the State of Utah has not identified any examples where "smoothing" of the seismic data resulted in the incorrect recognition of geological features?

RESPONSE TO ADMISSION REQUEST NO. 25 - UTAH L. Denied. The State reprocessed some of the Bay Geophysical seismic data and discovered that it is contaminated and dominated by noise. Because most of the stacked coherent, shallow seismic events are noise, there are no recognizable geologic features where a direct comparison can be made. When a "smoothing" function is applied to noise and not to geologic reflectors as is the case with these data, resulting stacked sections have absolutely no basis of geologic fact. "Smoothing" enhanced the coherency of the noise so they appear as continuous seismic events on stacked sections. In that regard, "smoothing" contributed to the incorrect recognition of geologic features.

26. Do you admit that the "trimming" is an accepted industry practice for the analysis of seismic data?

RESPONSE TO ADMISSION REQUEST NO. 26 - UTAH L. The State objects on the grounds this request is vague in that "trimming" is not defined. It is unknown

whether "trimming" refers to residual statics operations applied before stack, after stack, or to window specific time adjustment using correlation routines. Notwithstanding this objection the request is admitted in part and denied in part. "Trimming" is an accepted petroleum industry practice just as amputation is an accepted medical practice. However, even in the petroleum industry where they have extremely high signal-to-noise, and a large optimum time and offset window where high quality reflection are present, it must be used judiciously. "Trimming" is a highly subjective practice that should be used only where there is adequate knowledge of, and compensation for the velocity structure and where a large number of reflections are present across the entire expanse of the profile. Without such velocity knowledge and data characteristics, "trimming" is just as likely to incorrectly alter valid data as it is to appropriately compensate for static irregularities. The Applicant did not produce any detailed processing history, exact flow, parameters used when applying the various operations, and intermediate data, so the effects of each operation could not be appraised.[1] Without this information all operations and processed data must be considered invalid. There is also no documentation on what or how trimming was applied. *See* footnote no. 1.

27. Do you admit that the State has not identified any examples where "trimming" of the seismic data has resulted in the incorrect analysis of seismic data?

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[1]The Applicant stated that "no such documents exist" in response to a request for "[a]ll documents relating to the rationale for the use and application of static and trim processing and smoothing the data." Applicant's Objections and Non-proprietary Responses to State's First Request for Discovery (April 21, 1999) at 45.

RESPONSE TO ADMISSION REQUEST NO. 27 - UTAH L. Denied. The effects of any single operation when discussed in the context of a completely processed seismic section is not possible. Complete and detailed documentation of the acquisition and processing parameters Bay Geophysical applied to the stacked seismic sections are necessary for this evaluation. The State could not replicate Bay Geophysical's stacked data, interpretations, or conclusions. Moreover, the State could not sort out from the immense amounts of missing information how the "trimming" was applied or its direct result. However, as stated above, noise dominates the seismic sections. There was little or no valid reflection data for trimming to be used appropriately. Recognizing the groundroll and refractions to be noise, "trimming" very likely contributed to the poor signal-to-noise ratio of the stacked seismic data that in turn resulted in incorrect analysis.

28. Do you admit that a fault displacement of less than 0.1cm is minor?

RESPONSE TO ADMISSION REQUEST NO. 28 - UTAH L. Denied. First, it is important to note that fault displacement is only part of the concern. Most of the damage from an earthquake is due to ground shaking. Fault offset at a specific location may not be indicative of the amount of ground shaking or energy release from the earthquake. Fault displacement needs to be considered in context of its location along a fault, position within the tectonic framework, and relation to the local geology. A fault displacement, even of less than 0.1 cm, at the surface still indicates a surface-rupturing earthquake with a likely magnitude of at least 6.0 and more likely 6.5 or greater. In the Loma Prieta, California earthquake of 1989, no surface faulting displacement was found, yet the

earthquake caused tens of billions of dollars damage and killed scores of people.

Displacement along a fault, especially a normal or thrust fault, often varies. It can be hundreds or thousands of feet at its maximum but die out to zero at the fault segment boundary or terminus. In addition, fault segment boundaries or termini (with apparently 'minor' offsets) may be stress concentrators and preferentially rupture in future earthquakes. In these cases, "minor" fault displacements may be indicative of high seismic hazard because of their position at a stress concentration node on faults with overall larger fault displacements.

29. Do you admit that structures can be designed to accommodate minor fault displacements?

RESPONSE TO ADMISSION REQUEST NO. 29 - UTAH L. The State objects on the ground this request is vague in that "accommodate" is not defined. To accommodate life safety is different than to accommodate the integrity or operation of the structure. Notwithstanding this objection, Admission Request No. 29 is admitted. However it should be noted that building codes in general are written to avoid complete collapse in order to protect life safety. A structure damaged in an earthquake might allow the inhabitants to survive but be non-functional and non-operational. Also, note that in recent large California earthquakes, approximately 86% of the damage was caused by ground shaking, not directly by fault offsets.

30. Do you admit that faults underlie Salt Lake City?

RESPONSE TO ADMISSION REQUEST NO. 30 - UTAH L. Admitted.

31. Do you admit that at least one of the faults underlying Salt Lake City could result in a displacement greater than 0.1cm?

RESPONSE TO ADMISSION REQUEST NO. 31 - UTAH L. Admitted.

32. Do you admit that the new Salt Palace Convention Center in Salt Lake City is being built directly over a fault?

RESPONSE TO ADMISSION REQUEST NO. 32 - UTAH L. The State objects to this request as irrelevant and immaterial to licensing an NRC Part 72 facility. Notwithstanding this objection, Admission Request No. 32 cannot be admitted or denied. The extension of the Salt Palace Convention Center is being constructed over an *en echelon* system of grabens. It is debatable whether the grabens are near-surface features that terminate at a relatively shallow layer as a result of liquefaction, slumping, or other land failure, or whether they are deeper-seated tectonic features.

33. Do you admit that the new Salt Palace Convention Center in Salt Lake City is being expand directly over displaced sediments?

RESPONSE TO ADMISSION REQUEST NO. 33 - UTAH L. *See* State's objections to Admission Request No. 32 above. In addition, the State objects on the grounds that this request is vague and unclear. Notwithstanding these objections, to the extent the request is whether the new Salt Palace Convention Center is being expanded directly over displaced sediments, the State admits Admission Request No. 33.

34. Do you admit that the State of Utah approves of the expansion of Salt Palace Convention Center in Salt Lake City?

RESPONSE TO ADMISSION REQUEST NO. 34 - UTAH L. *See* State's objections to Admission Request No. 32 above. In addition, the State objects on the

grounds this request is irrelevant in that any decision to approve the PFS facility will be made by the U.S. Nuclear Regulatory Commission, not the State of Utah. Prior decisions by the State are irrelevant. Notwithstanding this objection the request is denied. The Salt Palace Convention Center is a Salt Lake County project. Building permits and approvals are the jurisdiction of Salt Lake City.

35. Do you admit that the State of Utah has no data to indicate that the offset on each fault in the PFS site area could represent an individual earthquake resulting in a large displacement rather than multiple events resulting in smaller displacements on one or more faults?

RESPONSE TO ADMISSION REQUEST NO. 35 - UTAH L. The State objects on the grounds this request is vague and unclear. Notwithstanding this objection, Admission Request No. 35 is denied. The State of Utah has examples from within the state demonstrating that large, surface-rupturing earthquakes occur on separate fault traces within a fault system. This is well documented, for example, on the Wasatch Fault in southeastern Salt Lake County. This phenomenon is also common on other fault systems, including the San Andreas Fault in California. This is sufficient to question whether a similar situation exists at the PFS site. PFS's ad hoc claim that earthquakes reoccur repeatedly on the same fault traces is made with no evidence to support it.

Within the engineering geology profession, the conservative approach would be to assume that each fault offset is the result of a single earthquake unless proven otherwise. PFS thus far has not provided interpretable seismic reflection data in Skull Valley. PFS's original 1996 lines lacked any data in the upper (young) part of the section. In addition,

PFS's 1998 seismic lines are dominated and contaminated by noise, so that again, the upper part of the section has no recognizable data present. PFS's claims on fault displacement are based on artifacts of processing, not on geologic reflectors. The recurrence claims have no basis.

36. Do you admit that the State of Utah has not identified any active or capable faults under the most recent channel and fan deposits in the area southwest of shotpoint 1000 on seismic reflection line PFSF-98-B?

RESPONSE TO ADMISSION REQUEST NO. 36 - UTAH L. Admitted. However, Geomatrix characterized the data southwest of shotpoint 1000 on seismic reflection line PFSF-98-B as "poor quality." Subsequent reprocessing of the line PFSF-98-A by the State demonstrated that the seismic reflection data are dominated by noise, rather than by seismic signals reflecting geologic data. The seismic reflection lines cannot be reliably interpreted due to the poor quality of the data. The noise mistakenly interpreted by Bay Geophysical and Geomatrix as geologic reflectors can in fact mask faults with offsets as great as 60 feet.

37. Do you admit that the depth to bedrock at the PFS site has been established?

RESPONSE TO ADMISSION REQUEST NO. 37 - UTAH L. Denied. PFS has provided no credible data on which to establish depth to bedrock.

38. Do you admit that coring of the bedrock at the PFS site is not necessary to determine the site's seismic properties?

RESPONSE TO ADMISSION REQUEST NO. 38 - UTAH L. Denied.

39. Do you admit that coring of the bedrock at the PFS site is not necessary to

determine the competency of the overlying soils?

RESPONSE TO ADMISSION REQUEST NO. 39 - UTAH L. The State objects to the term "competency of the overlying soils" as vague. Notwithstanding this objection, the request is denied in part and admitted in part. Denied as to competency for seismic modeling. Admitted as to competency for shallow static bearing capacity and consolidation settlement.

40. Do you admit that the State of Utah has conducted Split Spoon sampling to estimate dynamic settling?

RESPONSE TO ADMISSION REQUEST NO. 40 - UTAH L. Admitted.

41. Do you admit that PFS has conducted additional undisturbed sampling of the site?

RESPONSE TO ADMISSION REQUEST NO. 41 - UTAH L. The State objects to the form of the question, which requires a comparison but does not disclose what the "additional sampling" is to be compared to. Notwithstanding this objection, this Request is admitted as compared with the PFS original application submitted to the NRC.

42. Do you admit that the values for soil parameters used in PFS's geotechnical calculations were more conservative than the corresponding average values determined from the geotechnical investigations?

RESPONSE TO ADMISSION REQUEST NO. 42 - UTAH L. Denied. *See* State's Response to Applicant's Fourth Set of Discovery Requests Directed to the State... (January 31, 2000) (hereinafter, "State's Response 4th Set"), Interrogatory No. 1.

43. Do you admit that PFS has conducted additional cone penetration tests at the PFS ISFSI site?

RESPONSE TO ADMISSION REQUEST NO. 43 - UTAH L. The State objects to the form of the question, which requires a comparison but does not disclose what the "additional cone penetration tests" are to be compared to. Notwithstanding this objection, this Request is admitted as compared with the PFS original application submitted to the NRC.

44. Do you admit that cone penetration testing is an accepted industry method for determining soil parameters?

RESPONSE TO ADMISSION REQUEST NO. 44 - UTAH L. The State objects to this Request as vague. The term "soil parameters" is vague. The term "soil properties" is generally used to refer to cone penetration testing. Notwithstanding this objection, the Request is denied. Soil properties are not determined from cone penetration tests. Because no samples are taken, soil properties must be inferred from statistical correlations.

B. Interrogatories – Utah L

1. Identify and fully explain in each and every respect all the public health and safety effects that the State claims would occur due to the alleged inadequacy of the site and subsurface investigations at the PFSF ISFSI, and the bases therefor.

RESPONSE TO INTERROGATORY NO 1 - UTAH L. The State objects to this Request as over broad and burdensome. Notwithstanding these objections, the State responds as follows:

A. Capable Faults. PFS's seismic reflection data does not adequately characterize faulting in the immediate vicinity of the PFS site (*e.g*, presence, size,

location, history, capability, recurrence interval, displacement, extent, and structural-tectonic relationships of the faults). As a consequence, insufficient information is available about where earthquakes may occur, how large they will be, how often they can reoccur, or where surface rupture will be expected to occur. Without adequate information, the PFS site, transportation facilities, and other bases may be subject to greater ground shaking, surface rupture, horizontal and vertical acceleration, and soil collapse (including liquefaction, slumping, and settling) from earthquakes than designed for.

Greater-than-expected earthquake effects could directly topple spent fuel canisters, disable communications and access (preventing timely notification and emergency response), knock out power and power backup facilities, derail trains, buckle and block roads, disable operational equipment and facilities, and injure or kill workers.

Under the above conditions, canisters knocked on their sides may not be righted in time to forestall overheating, leading to system failure. Thus, the operational integrity of the entire spent fuel system may be jeopardized.

B. Probabilistic Hazard Analysis and Ground Motion: PFS has requested an exemption from the current seismic design requirements for independent spent fuel storage installations (ISFSIs): 10 CFR 72.102(f)(1). This exemption would allow PFS to design the facility for probabilistic vibratory ground motions with an average return period of 2,000 years instead of the maximum vibratory ground motions found by a deterministic seismic hazard analysis.

PFS has no plans to anchor the spent fuel storage casks to the concrete pad to prevent them from tipping over during an earthquake. To justify this plan, Chapter 8 of the SAR presents cask stability analyses for two sets of vibratory ground motion time histories: one for PFS's original, and now obsolete, deterministic design earthquake (0.67 g horizontal, 0.69 g vertical) and one for their probabilistic design basis ground motions (2,000 year return period, 0.53 g horizontal and 0.53 g vertical). PFS's conclusion is that the casks would rock and slide somewhat if subjected to the ground motions analyzed, but would not break, tip over, collide, or slide off the concrete storage pads. SAR, Rev. 5 at 8.2-3 to 8.2-8. However, it is possible for the storage casks to be subject to larger ground motions than those for which the cask stability analyses were made. For reference, the 84th percentile peak ground accelerations determined for the PFS site in the Geomatrix updated deterministic analysis (submitted to the NRC on April 8, 1999) are 0.72 g and 0.80 g in the horizontal and vertical directions, respectively. The 95th percentile ground motions would be higher, perhaps by a tenth of a g or more. Therefore, the possibility of cask tipovers during a large earthquake cannot be precluded.

Consequently, cask tipovers are a threat to public health and safety because any casks which tip over must be uprighted within 30 hours to restore natural convection cooling before temperatures exceed design criteria. PFS letter, Donnell to U.S. NRC, Commitment Resolution Letter #14, dated August 6, 1999, at 3. If an earthquake tips over a large number of the casks stored on site (up to 4,000), then it might be difficult or impossible for PFS staff to upright all of them within 30 hours. This scenario is of

particular concern because PFS is apparently not planning to store a crane on site capable of uprighting any toppled storage casks. Instead, PFS plans to temporarily procure a crane for this purpose from an unspecified source if and when the need arises. Emergency Plan, Rev. 1 at 3-4.

The State believes that it is very risky to count on procuring a crane from an unknown source within less than 30 hours after a cask tipover resulting from a natural disaster such as an earthquake. An earthquake large enough to tip over storage casks at the PFS facility might also cause significant damage to buildings, bridges, and other facilities in nearby urban areas of the Wasatch Front region. If this were the case, then it might be difficult for PFS to procure a suitable crane and transport it to the Skull Valley facility within 30 hours because of (a) high demand for cranes for search and rescue purposes, and/or (b) the disruption of transportation and communication systems in the surrounding region.

C. Soils and Foundation Loading: *See* Response to Interrogatory No. 1, State's Response 4th Set. In addition, PFS has conducted no investigations for the collapsibility of soils since the State's response to the 2nd and 3rd Set of Discovery, thus, the State's responses to the 2nd and 3rd Set are still applicable. *See* State of Utah's Objections and Response to Applicant's Second Set of Discovery Requests with Respect to Groups II and III Contentions, June 28, 1999, Response to 7 at 49-51.

2. Identify and fully explain in each and every respect any deficiencies claimed by the State in the probabilistic seismic hazards assessment for a 2,000-year return period earthquake conducted for the PFS facility by Geomatrix Consultants,

including any deficiencies in the determination of horizontal and vertical ground acceleration, and ground displacement, and the bases therefor.

RESPONSE TO INTERROGATORY NO. 2 - UTAH L. The State objects to this Interrogatory because the question incorrectly assumes that a 2,000-year return period is the appropriate regulatory standard against which PFS must conduct its seismic hazards assessment. Under current regulations, the Applicant must conduct a deterministic analysis. 10 CFR 72.102(f)(1). Further, the State challenges the basis for consideration of a probabilistic assessment with a 2,000-year return period. *See* "State of Utah's Request for Admission of Late-filed Modification to Basis 2 of Utah Contention L" dated January 26, 2000. Notwithstanding these objections, the State provides the following response.

First, as noted in "Response to Admission Request No. 4 – Utah L" above, (1) the State of Utah recently became aware that an independent analysis and review of seismic hazards at the the PFS site had been performed for the NRC Staff by the Center for Nuclear Waste Regulatory Analysis and (2) the State is attempting to secure a copy of this information from the Staff through discovery. Accordingly, until the State can scrutinize this information, it wishes to retain the right to identify any deficiencies in the probabilistic seismic hazard assessment performed by Geomatrix Consultants, Inc.

Second, in a supplemental response to an earlier discovery request by the Applicant, the State noted the following, which remains relevant to this interrogatory regarding the probabilistic assessment conducted by Geomatrix Consultants, Inc.:

> The Geomatrix seismic hazard analyses do not appear to include the possibility of synchronous coseismic rupture of the Stansbury fault with the East and/or West faults, a scenario that could lead to larger ground motions than for independent rupture of the individual faults. Fault rupture during the magnitude (M_W) 7.3 Hebgen Lake, Montana, earthquake of 1959 provides a relevant precedent for this scenario. *See* D.I. Doser, 1985, "Source parameters and faulting process of the 1959 Hebgen Lake, Montana, earthquake sequence": *Journal of Geophysical Research, vol. 90, pp. 4537-4555.*

State of Utah's Supplemental Response to Applicant's Second Discovery Request (Contention L), August 31, 1999, at 3.

Third, the State repeats the following response to a very similarly-worded interrogatory posed in the Applicant's "Second Set of Discovery Requests with Respect to Groups II and III Contentions":

> Documentation in Appendix F of the Geomatrix Consultants, Inc., 1999a, Fault evaluation study and seismic hazard assessment, Private Fuel Storage Facility, Skull Valley, Utah: report prepared for Stone & Webster Engineering Corporation, February, 3 vols, is incomplete, at least in the following respects:
>
> > 1. The velocity-damping models used in the Skull Valley site response evaluations are not clearly and completely described in Appendix F (Geomatrix 1999a, pp. F-8 to F-9). The models used appear to be combinations of (1) one of the "crustal profiles" listed in Table F-5 and (2) either the "soil profile" shown in Figure F-4 or a modified version of this profile. This point should be clarified, and the different soil profiles used should be tabulated in the same manner as the crustal profiles in Table F-5.
> >
> > 2. Appendix F does not include a reference list... [Note: This deficiency was addressed in the Applicant's "Errata for Geomatrix Fault Evaluation Study and Seismic Hazard Assessment," August 10, 1999.]

3. In the main body of the report on p. 8 of Vol I, Section 1.18, the text states: "The analysis of the earthquake catalog is provided in Appendix F." Neither Appendix F nor any other appendix provides such an analysis of the earthquake catalog. Appendix F deals with attenuation relationships and ground-motion modeling.

State of Utah's Objections and Response to Applicant's Second Set of Discovery Requests with Respect to Groups II and III Contentions, July 28, 1999, at 32-33. This incomplete documentation diminishes the ability to fully understand and track what the seismic analyst(s) did, and it diminishes meeting what the Applicant refers to as "industry standards" (see, for example, "Request for Admission No. 4 – Utah L," above).

DATED this 31st day of January, 2000.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that a copy of STATE OF UTAH'S OBJECTIONS AND RESPONSE TO APPLICANT'S FIFTH SET OF DISCOVERY REQUESTS TO INTERVENORS STATE OF UTAH AND CONFEDERATED TRIBES was served on the persons listed below by electronic mail (unless otherwise noted) with conforming copies by United States mail first class, this 31st day of January, 2000:

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