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February 17, 1998

Mr. Charles Haughney, Acting Director
Spent Fuel Project Office, Mailstop O6F18
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

Mr. Haughney:

Enclosed please find a copy of a letter that I recently sent to Connie Nakahara at the Office of High-Level Waste Opposition. The letter describes my concerns about the proposed Temporary High-Level Nuclear Waste Repository in Skull Valley, Utah from the perspective of earthquake hazards potentially generated on the Stansbury fault. If you have any questions regarding this letter or my research on the Stansbury fault, please feel free to call me.

Sincerely,

Jennifer M. Helm
Geologist

c/o AGRA Earth & Environmental, Inc.
4137 South 500 West
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February 13, 1998

Connie Nakahara, Director
Office of High-Level Waste Opposition
Dept. of Environmental Quality
Box 144880
Salt Lake City, Utah 84114-4880

Ms. Nakahara:

I wish to express my concerns regarding the "Temporary" High-Level Nuclear Waste Repository proposed to be constructed on the Goshute Indian Reservation in Skull Valley, Tooele County, Utah. My position regarding the facility is neither as an advocate for its construction nor as an opponent against it. However, I have studied the geology of the area and would like to bring a few matters to the attention of your group and others involved with the hearing and permitting processes and potential construction of the proposed facility.

My background is as follows: Between 1991 and 1994 I was a graduate student at the University of Utah in the Department of Geology and Geophysics. I studied under Dr. Ronald Bruhn and obtained my M.S. Geology degree in 1994. My thesis project focused on faulting along the Stansbury fault, which borders the east side of Skull Valley. During the summers of 1992 and 1993 I conducted detailed geologic fieldwork in the Stansbury Range and eastern Skull Valley to study the characteristics of the Stansbury fault, and completed the most thorough investigation of that fault to date. Currently I am a staff geologist with AGRA Earth & Environmental, Inc. in Salt Lake City, where for the past 2.5 years I have participated in and/or managed a variety of engineering geology and related projects, including fault hazards investigations. I represent myself, and my views are not necessarily those of my employer nor of the university.

The Nuclear Regulatory Commission (NRC) considers a fault to be "capable" of producing an earthquake in the relatively near future if it 1) has ruptured within the past 35,000 years; 2) has a recurrence interval of less than 500,000 years; 3) shows evidence of macroseismicity; and/or 4) is linked to a capable fault (Kramer, 1996). My research of the Stansbury fault suggests very strongly that the fault is "capable." My investigation led me to the following conclusions regarding the fault (Helm, 1994 and 1995):

- The Stansbury fault offsets alluvial fans of Quaternary age (mid-Pleistocene?, or about 800,000 years, to Holocene, <10,000 years).

- The Stansbury fault is approximately 45 km (28 mi) in length and has two structural segments which probably are rupture segments. The segment boundary occurs at Pass Canyon near the center of the range.

- The average vertical separation rate since mid-Miocene time (about 15 million years ago) is estimated to be 0.07 mm/yr (0.003 in/yr) for the north fault segment. No rate has been determined for the south segment, but some evidence suggests it may be slightly higher.

- The north segment has not ruptured since the time of the Lake Bonneville high stand 14,500 ^{14}C yr B.P. (approx. 15,000 to 18,000 years ago). No definitive evidence constrains the timing of the most recent event on the south segment, but some evidence suggests it may have ruptured more recently than the north segment.

- Assuming strain has accumulated at a constant rate for 18,000 years, the next surface rupture event is anticipated to produce a scarp at least 1.25 m (4.1 ft) high, correlating with a magnitude M_S = 6.8 to 6.9 earthquake.

Although my investigation yielded no maximum constraining date for the most recent faulting event on the Stansbury fault, some evidence suggests the south segment ruptured about the time of the Bonneville high stand. I suspect that the most recent event on the north segment occurred on the order of 20,000 to 30,000 years ago. Additional studies could constrain the timing of the most recent event(s) better, if necessary.

If faulting has indeed occurred within the time-frame I propose, the fault is, by definition #1, "capable." In any event, the recurrence interval on the Stansbury fault is very much less than 500,000 years: The alluvial fans cut by the fault are on the order of 500,000 years old, and fault scarps cutting these fans are tens of meters high indicating numerous surface-rupture events have occurred within 500,000 years. Thus, definition #2 is satisfied. Lastly, although both macro- and microseismicity are limited in the area, the largest earthquake on historic record within about 50 km (30 mi) of the Stansbury fault, an M_L 4.3 in 1915, may have occurred on the Stansbury fault itself (Arabasz et al., 1989), suggesting definition #3 may be satisfied. All in all, the Stansbury fault adequately fits the NRC's definition of a "capable" fault, and my master's thesis work indicates the fault could generate a minimum M_S 6.8 to 6.9 earthquake.

Specific hazards related to a large seismic event on the Stansbury fault, which could strongly affect facilities within Skull Valley, include the following:

- surface fault rupture and associated displacements
- horizontal and vertical ground accelerations
- liquefaction
- tectonic subsidence and/or uplift
- slope failures such as landsliding

In addition, other geologic hazards should also be assessed prior to the proposed facility being permitted, including but not limited to debris flows, debris floods, rock fall, expansive soils and groundwater recharge.

It may be possible for the proposed "Temporary" High-Level Nuclear Waste Repository to be constructed to avoid and/or withstand these hazards. However, if the facility is built it is imperative that it be constructed adequately to survive fault-related and other potential geologic hazards.

I do know that the geology of the Skull Valley site has been considered to some degree by Private Fuel Storage, L.L.C., the consortium interested in storing nuclear waste there. I understand that a firm called Stone and Webster has conducted a geologic investigation of the site with respect to the proposed facility. One of their geologists contacted me in December 1996 to ask about my geological understanding of the vicinity. Dr. Don Currey of the University of Utah Geography department mentioned that he also was contacted. However, I am unaware of the extent of the geologic investigation conducted by Stone and Webster.

If I can provide additional information, please feel free to contact me.

Respectfully,

Jennifer M. Helm
Geologist

cc:
Mr. Lee Allison, State Geologist and Director, Utah Geological Survey
Dr. Walter Arabasz, Director, Univ. of Utah Seismograph Stations
Mr. Leon Bear, Tribal Chairman, Skull Valley Band of Goshutes
Dr. Ron Bruhn, Professor, Univ. of Utah Dept. of Geology and Geophysics
Mr. Charles Haughney, Acting Director, Spent Fuel Project Office, NRC
Mr. John D. Parkyn, Chairman of the Board, Private Fuel Storage, L.L.C.

REFERENCES

Arabasz, W.J., Pechmann, J.C., and Brown, E.D., 1989, Evaluation of seismicity relevant to the proposed siting of a superconducting supercollider (SSC) in Tooele County, Utah: Utah Geological and Mineral Survey Miscellaneous Publication 89-1, Figures 3.6 and 3.7.

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