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See 72 Rpts 2 Vols.

SUBJECT: Forwards Vols I & II to Rev 1 to Rept 05996.02-G(P030), Presentation of Cone Penetration Testing Results of Soils at Private Fuel Storage Facility Skull Valley,UT."

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Private Fuel Storage, L.L.C.

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John L. Donnell, P.E., Project Director

May 28, 1999

Mr. Mark Delligatti
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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBMITTAL OF COMMITMENT RESOLUTION #4 INFORMATION
DOCKET NO. 72-22 / TAC NO. L22462
PRIVATE FUEL STORAGE FACILITY
PRIVATE FUEL STORAGE L.L.C.

Reference:
1. PFS Letter, Parkyn to Director, Office of Material Safety and Safeguards, Responses to Request for Additional Information, dated February 10, 1999
2. PFS Letter, Donnell to Delligatti, Submittal of Commitment Resolution Information, dated March 24, 1999
3. PFS Letter, Donnell to Delligatti, Submittal of Commitment Resolution Information, dated March 31, 1999
4. PFS Letter, Donnell to Delligatti, Commitment Resolution Letter #4, dated April 14, 1999

NF06

In reference 4 PFS committed to perform additional field work at the PFSF site in order to provide resolution to NRC/CNWRA comments regarding recent PFS Safety RAI responses (Reference 1) and additional comment resolution responses (Reference 2 and 3). Cone Penetrometer Testing and Dilatometer Testing have been performed at the site in order to develop profiles of strength and compressibility of the in situ soils over the entire cask storage pad emplacement area.

The results of this testing program are enclosed. If you have any questions regarding this response, please contact me at 303-741-7009.

John L. Donnell
Project Director
Private Fuel Storage L.L.C.

	Ltr	Encl
Change PM	1	0
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ENCLOSURE

SUMMARY OF STRENGTH AND COMPRESSIBILITY PROFILES INCLUDED IN "CONE PENETRATION TESTING REPORT", PREPARED BY CONETEC, SALT LAKE CITY, UT, MAY 1999

PFS performed additional field work to expand the amount of subsurface data available for the site. The primary goal of this investigation was to develop profiles of strength and compressibility of the soils within the depth interval of 10 ft to ~25 ft in the pad emplacement area. This program included performing cone penetration tests (CPT) to develop continuous profiles of the strength of the soils in the upper layer (from the surface down to ~ 25 ft) within the pad emplacement area. It also included performing dilatometer tests (DMT) to develop profiles of the compressibility of the in situ soils. These were located, primarily, in areas where the preliminary tip resistance profiles from the CPT tests indicated that the in situ soils had the lowest strengths and the highest compressibilities. The locations of these CPTs and DMTs are shown in Stone & Webster Sketch 05996.02-GSK-B-37-1, which is included in Appendix J of the attached "Cone Penetration Testing Report" (ConeTec, 1999).

Phase 1 of this program included performing 36 CPTs, located on a grid pattern of ~300 ft within the entire emplacement area. This layout provided nine CPTs in each of the four quadrants of the pad emplacement area. Several of these CPTs were located in close proximity to the borings that were drilled previously at the site, permitting correlations between the previous boring and laboratory data to be utilized in the interpretation of the CPT and DMT data. Additional CPTs and DMTs were performed in the vicinity of Borings CTB-4, CTB-5(OW), and C-1, to obtain data for correlating the CPT data with the laboratory testing that was performed on samples from these borings, as well.

The results of the Phase 1 CPTs included measuring continuous profiles of tip resistance and sleeve friction stress, which were used to identify the extent and thickness of the lower blow count soils within the upper layer. The plots of corrected tip resistance, Qt, vs depth, presented in Appendix E of the attached report by ConeTec (1999), document the strength and compressibility of the soils within the profile. The results are consistent with the results of the borings that were drilled previously at the site; i.e., Qt increases from grade to a depth of about 15 to 17 ft. Below this depth, it drops slightly or remains constant with depth, down to a depth of about 23 ft, at which point it increases markedly, as did the Standard Penetration Test blow counts in most of the borings in the pad emplacement area.

These data were interpreted to provide profiles of strength, which are plotted in Appendix D and listed in tabular form in Appendix F of the attached report by ConeTec (1999). A review of the plots of the undrained shear strength, s_u, vs depth indicates that s_u measured in the CPTs increases with depth, and it generally exceeds 1 tsf. Note, this value corresponds with the lower bound of the values of s_u measured in the CU and UU tests. These plots indicate that s_u remains fairly constant in the depth range from ~15 ft to ~23 ft, and normally exceeds 2 tsf. Therefore, the lower blow count zone at approximately 20 ft has undrained shear strengths that are at least twice those used in the analyses of the stability of the cask storage pads.

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In Phase 2, dilatometer tests were performed to measure, in situ, the compressibility of the soils vs depth at the locations identified in Phase 1 where the softer soils exist. The compressibility is reported as the constrained modulus, M, in the plots and tables included in Appendices G and H of the attached report by ConeTec (1999).

The plots of M vs depth in Appendix G show that M generally is lowest near the surface of the site, increases with increasing depth to about 4 to 5m (13 to 16 ft), at which point it decreases, generally remaining fairly constant at a value that is equal to or greater than that near the top of the profile. This trend is evident on the plots of DMT-1, 2, 3, 4, 8, 9 (excluding the high modulus values above 2.5m), 11, 12, 14, 15, 16, 17, and 18. Although DMT-6 found a slight decrease in M from ~5.5m to 7m, the resulting values were higher than in the other DMTs in this depth range. DMT-5, 7, and 13 show only slight increases in M with depth to ~ 4 to 5m, followed by slight drop in modulus to ~7.5 to 8m.

In general, DMT-10 has the lowest compressibility for the entire profile. DMT-10 is anomalous in that M remains fairly constant throughout the entire depth range of ~2m to 7.8m, with a minimum value of 130 bars (135.7 tsf). This DMT was located about half-way between Borings B-1 and C-1 at the northern edge of the pad emplacement area. Note, the consolidation tests reported in the SAR were obtained at a depth of 10 ft in Boring C-1 and C-2, which were near this location.

Conservatively assuming that this value of M is applicable for the entire upper layer of the profile, the estimated settlement of the cask storage pads would be calculated as follows. Note, M equals $\Delta\sigma_v / \varepsilon_v$, the change in vertical stress divided by the vertical strain. Settlement equals the thickness of the layer multiplied by the average vertical strain. Based on Table 3, "Calculation of Settlements Beneath Center of Storage Pad", in Calculation 05996.01-G(B)-03, Rev 2, $\Delta\sigma_v$ is ~1.5 ksf for the upper layer, which is ~25 ft thick. For the M value of 130 bars (135 tsf), this works out to be a settlement of :

25 ft x 12 inches/ft x 1.5 ksf / (135 tsf x 2 ksf/tsf), or 1.67 inches.

Note, this is less than the elastic plus primary consolidation settlement estimated in Table 3 of Calculation 05996.01-G(B)-03, Rev 2. Therefore, even using the lowest compressibility profile determined in the recent field testing program, the estimated settlements of the cask storage pads are less than those that were reported based on the consolidation tests that were performed at a depth of ~10 to 12 ft.

CONCLUSIONS:

The recent cone penetration testing program provides additional subsurface information to enhance the available data for substantiating the site is suitable for proposed Private Fuel Storage Facility. This program obtained additional subsurface data in the form of continuous profiles of tip resistance and sleeve friction resistance in a grid pattern of ~300 ft, substantially supplementing the available database of subsurface information. As discussed above, the profiles of strength and compressibility included in the report of the cone penetration testing (ConeTec, 1999) demonstrate that the underlying soils are stronger and less compressible than those at the shallower depth. Therefore, the analyses of the stability and settlements of the cask storage pads based on the results of laboratory tests that were performed at depths of ~10 to 12 ft are conservative.

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