



## Department of Energy

Idaho Operations Office  
1955 Fremont Avenue  
Idaho Falls, ID 83415  
December 21, 2007

Mr. J. K. Fortenberry  
Defense Nuclear Facilities Safety Board  
625 Indiana Avenue, NW, Suite 700  
Washington, D.C. 20005-2901

**SUBJECT:** The Department of Energy, Idaho Operations Office Sodium Bearing Waste Treatment Project Summary of Actions to the Defense Nuclear Facilities Safety Board Statements Regarding the Geotechnical and Seismic Investigations Associated with the Integrated Waste Treatment Unit Facility Design (FMDP-MTPP-07-017)

**Reference:** 1) The Department of Energy, Idaho Operations Office Sodium Bearing Waste Treatment Project Response to the Defense Nuclear Facilities Safety Board Questions Regarding the Geotechnical and Seismic Investigations Associated with the Integrated Waste Treatment Unit Facility Design (FMDP-MTPP-07-015), Memorandum from Elizabeth D. Sellers, Manager, Idaho Operations Office to Mr. J. K. Fortenberry, Defense Nuclear Facilities Safety Board, dated October 1, 2007

2) Integrated Waste Treatment Unit (IWTU) Idaho National Laboratory, Kleinfelder Report, Project No 76388, Revision 0, June 5, 2007

Dear Mr. Fortenberry:

This letter provides the summary of actions taken and responses to the three remaining questions regarding the geotechnical and seismic investigations for the Integrated Waste Treatment Unit (IWTU) facility design. The scope and schedule to address these three questions was provided in reference 1. Implementation of this work has entailed ongoing dialogue between your staff and the IWTU project staff. The confirmation analyses that have been performed, based on the results *of* these actions, demonstrate that the facility design (with minor modifications) meets the requirements of the applicable consensus codes and DOE standards. Demand to capacity ratios for the structural elements are less than 1.0 when the appropriate factors ( $SF$ ,  $F_m$ ) per DOE-STD-1020 are applied. The results of the Soil Structure Interaction (SSI) analysis that incorporated the three actions were discussed between DOE, CH2M♦WG Idaho, LLC (CWI) and Simpson Gumpertz & Heger (SGH) staff and your staff on December 12, 2007.

The results of our actions to address the three DNFSB staff statements are summarized below:

1. The design basis earthquake response spectra are artificially low due to use of the mean from the site specific soils spectra data.

Action Taken: The Project developed the broadened horizontal and vertical 84th percentile spectra with 5% damping using the randomized soil column profiles based on the site specific geotechnical studies, reference 2. This action increased the target 5% damped spectra from the peak horizontal acceleration of 1.1 g recommended by the IWTU Blue Ribbon Panel (BRP) to about 1.25 g, which was then used as the basis for the following two actions.

2. The geotechnical input for the engineered fill using the technical approach relying on a thesis paper was not justified.

Action Taken: Members of the IWTU Blue Ribbon Panel (BRP) and DOE technical experts met on October 3 and 4, 2007 to discuss the DNFSB staff's issues. Regarding the modeling of the soil and its properties, the BRP recommended: 1) that minor changes be made to the finite element model in the area of the base slab, using brick rather than plate elements, and 2) an approach that bounded the site-specific data by establishing four soil property cases (lower bound (LB), best estimate (BE), upper bound (UB), and high bound (HB)) that were deemed to adequately bounded the expected range of soil and engineered fill response. The modeling and changes to the LB, BE, and UB cases had no appreciable impact to the design, as determined in comparisons of the base shear for the various cases that have been run throughout the design effort. The HB case increased the base shear in the walls by 15% to 25%, which the confirmation analysis demonstrated could be accommodated with adequate margin.

3. The time histories used in the SSI analysis should be evaluated matching both the 5% damped and 13% damped values, appropriately broadened horizontal and vertical IWTU PC3 soil design basis earthquake response spectra from item 1.

Action Taken: The SSI analysis responses used in the original design represented the highest SSI system mode damping of 13%. The December 2007 confirmation analyses, using the IWTU BRP recommended four soil profiles, produced SSI responses yielding a highest SSI system damping of 14%. Therefore, the Project matched the time histories to 5% and 14% damped spectra for the SSI analyses. The Project also confirmed that the time histories matched or exceeded the 84th percentile spectra at 5% damped value proposed by the IWTU BRP at the surface of the IWTU project. The modification to the time histories had the single largest effect on the analytical results. The base shear in the final analysis was 33% to 45% higher than that of the original analysis. The results of the final analysis were also compared to a new SSI run using the final model and soil properties and the time histories from the original analyses. The final model and matched time histories resulted in base shear that was 65% higher than those calculated using the final model and original time history.

Global (or integrated load) checks as well as element by element reviews of the analytical results using these more conservative inputs indicate that the demand to capacity ratios (D/C) for the IWTU structural design are still less than 1.0 when the appropriate factors from DOE-STD-1020 and consensus codes are taken into consideration. Because the D/C is less than 1.0 the design meets all applicable criteria. Also as discussed at the December 12, 2007 meeting, the project will review the final results with Dr. Carl Constantino and other members of the IWTU BRP. An additional meeting, per your staff request, is also planned with your staff the first week of January 2008 to review the details of the structural design, particularly those associated with the process cell walls.

We consider that the actions to address the three outstanding issues are complete. Concrete placement of the process cells walls will proceed, as scheduled, in mid-January.

If you or your staff has any question regarding this path forward please contact me at 208-526-5665 or Mr. Guy Girard, the SBW Treatment Project Federal Project Director, at 208-520-0524.



Elizabeth D. Sellers  
Manager

cc:

D. Chung, EM-60

K. Picha, EM-60

M. Whitaker, HS-1.1

Attachment