



## 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

# memorandum

Idaho Operations Office

Date: October 1, 2007

Subject: 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)

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

This letter defines the actions the Sodium Bearing Waste (SBW) Treatment Project has taken in response to your staff's remaining questions regarding the geotechnical and seismic investigations associated with the Integrated Waste Treatment Unit (IWTU) facility design. Your staff communicated these issues to the Federal Project Director on September 7, 2007 and they were subsequently discussed with the SBW Project staff on September 13, 2007. Based upon the September 13, 2007 meeting, three remaining issues require resolution to demonstrate adequate design margin for the process and packaging cell facility structure. These issues and our actions to address these items are outlined below.

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

Proposed Action: The project proposes to develop appropriately broadened horizontal and vertical IWTU Performance Category (PC) 3 soil design basis earthquake response spectra at 5% damping using the 84th percentile spectra from the soil surface spectra data.

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

Proposed Action: The project will revise the geotechnical input to the Soil Structure Interaction (SSI) analysis for both the natural soils, using the results from item 1, and the engineered fill, to address the compacted nature of the backfill. Justification of the use of the approach described in the thesis paper, as reported in the project geotechnical report, will be provided as part of this analysis to address the over-compacted nature of the backfill.

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

Proposed Action: The project intends to perform the analysis as noted.

Your staff recommended that the results from the above three items be evaluated by rerunning the SSI analysis to fully understand the impact, if any, on the design. These items need to be completed prior to placement of the process cell walls concrete as these walls are more sensitive to changes in the seismic loads, than is the basemat. Consensus has been reached with your staff that placement can proceed for the facility process and packaging cell base slab.

We have initiated work to address these three remaining issues. Initial data representing the 84<sup>th</sup> percent spectra was provided to your staff on September 17, 2007. The IWTU Geotechnical Blue Ribbon Panel (BRP) has undertaken actions to address items 2 and 3, as directed by CH2M-Hill Washington, Inc. I have directed my staff and the contractor to target addressing these items by November 1, 2007 and completing the SSI analysis by December 3, 2007. A one-line schedule for completing these actions is provided in the attachment.

We will continue to work with your staff during this period to ensure our actions are adequately addressing these issues. I request that you acknowledge the successful completion of these activities, should they provide the expected degree of design margin, will resolve the issues identified in your September 7, 2007 communication.

My staff has worked closely with the Office of Safety Management and Operations on this approach and schedule to resolve this issue. If you or your staff has any question regarding this path forward please contact me at 208-526-5665 or Mr. Joel Case, the SBW Treatment Project Federal Project Director, at 208-526-6795.



Elizabeth D. Sellers  
Manager

cc:

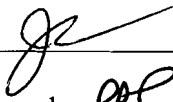

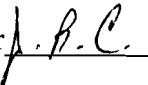
I. Triay, EM-3  
D. Chung, EM-60  
M. Whitaker, HS-1.1

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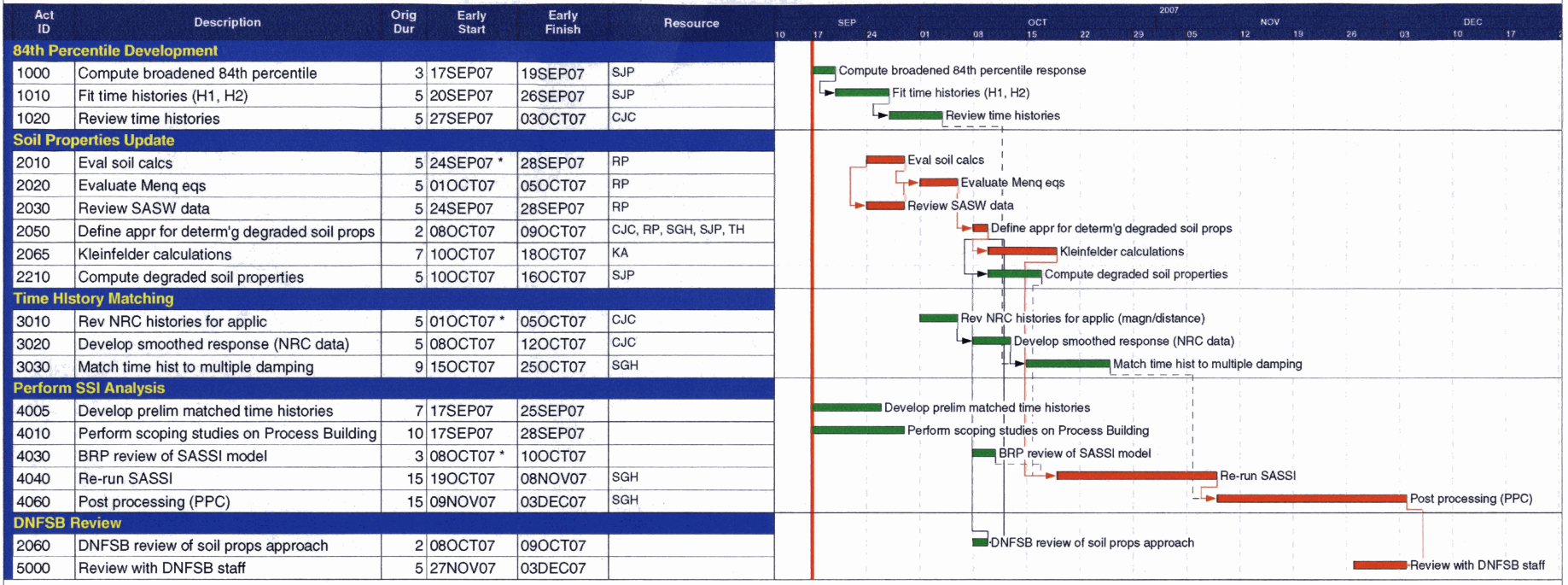
Dae Chung via email

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RECORD NOTES:

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
2. Joel Case prepared this memo.
3. This memo closes Pegasus number N/A
4. The attached correspondence has no relation to the Naval Nuclear Propulsion Program.

## Response to DNFSB on IWTU Seismic



Date	Revision	Checked	Approved
24SEP07	B		
25SEP07	C		
26SEP07	D		
27SEP07	E		