June 25, 2009

Mr. Scott Head, Manager
Regulatory Affairs
STP Nuclear Operating Company
P. O. Box 289
Wadsworth, TX 77483

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 130 RELATED TO SRP SECTION 02.05.04 FOR THE SOUTH TEXAS PROJECT COMBINED LICENSE APPLICATION

Dear Mr. Head

By letter dated September 20, 2007, STP Nuclear Operating Company (STP) submitted for approval a combined license application pursuant to 10 CFR Part 52. The U. S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed application.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

To support the review schedule, you are requested to respond within **45** days of the date of this letter. If changes are needed to the safety analysis report, the staff requests that the RAI response include the proposed wording changes.

If you have any questions or comments concerning this matter, I can be reached at 301-415-6197 or by e-mail at Tekia.Govan@nrc.gov or you may contact George Wunder at 301-415-1494 or George.Wunder@nrc.gov.

Sincerely,

/RA/

Tekia V. Govan, Project Manager
ABWR Projects Branch
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-012
52-013

eRAI Tracking No. 2498, 2696, 2922

Enclosure:
Request for Additional Information

cc: William Mookhoek
Richard Bense

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OFFICE	RGS1/TR	RGS1/BC	NGE2/PM	OGC	NGE2/L-PM
NAME	WBieganousky	CMunson	TGovan	SBrock	GWunder
DATE	05/21/2009	06/02/2009	06/25/2009	06/12/2009	06/13/2009

*Approval captured electronically in the electronic RAI system.

OFFICIAL RECORD COPY

Request for Additional Information No. 2498 Revision 2
South Texas Project Units 3 and 4
South Texas Project Nuclear Operating Co.
Docket No. 52-012 and 52-013
SRP Section: 02.05.04 - Stability of Subsurface Materials and Foundations
Application Section: 2.5.4

QUESTIONS for Geosciences and Geotechnical Engineering Branch 1 (RGS1)

02.05.04-24

In the response to RAI 2.5.4-2 regarding the design of the temporary slopes, you performed stability analyses for the temporary excavation and obtained acceptable factors of safety for the shear strength parameters used, phi = 25 to 28 degrees and cohesion = 300 psf. It is stated in the slope stability write-up that more information is being sought and that the shear strength parameters will be verified. Case histories document that permanent cut slopes in stiff fissured clays suffer strength loss over time, and it is generally recommended that the cohesion component of strength be set to zero for conservatism for permanent cut slopes. Given the temporary nature of the slopes, some cohesion may be operative for the duration of the open excavation. However, your write up does not address the potential for progressive failure or potential strength degradation and the staff would like you to discuss whether or not it was considered.

Please provide a discussion of your evaluation of the operational shear strength of the stiff fissured Beaumont clay for the open excavation duration. How does the duration of the open excavation for Units 1 and 2 compare with the projected construction schedule of Units 3 and 4? Are there any other long term deep excavations in the Beaumont clay that would substantiate your assumptions?

02.05.04-25

FSAR Section 2.5S.4.2.1.1 "Stratum A" makes a statement following Equation 2.5S.4-4B that "Equation 2.5S.4-4B is indicated by Reference 2.5S.4-55 for use if the plasticity index is less than 30 or for silty or sandy clay. Strata J Clay, K Clay, L and N Clay are considered to be somewhat more sandy clays and will be characterized by Equation 2.5S.4-4B even though they have average plasticity index values greater than 30." A quick check of these soil layers in the summary tables, seems to indicate low sand percentages, typically less than 25 percent. No results were provided for layer L Clay.

Please provide additional data to support your assumption of sand-like behavior and the use of the higher value of elastic modulus applicable for cohesive soils with PI less than 30.

02.05.04-26

Equations 2.5S.4-4A and 4B relating the elastic modulus to shear strength and OCR were obtained from Reference 2.5S.4-55. The equations offer a range of values of multipliers to be applied to the shear strength to compute the Es. From this range you selected mid-range values. The same reference also indicates that for overconsolidated soils that are excavated and may heave due to the reduction in overburden stress, the resulting Es is smaller, and perhaps very much smaller. You stated that heave on the order of 4 inches to 5 inches will occur during excavation of the overburden. The heave is expected to recompress with reloading. The staff has the following questions regarding settlement predictions based on estimated Es and the recommendations of Reference 2.5S.4-55.

How is the reduction in Es due to heave accounted for in the settlement predictions?

Enclosure

Request for Additional Information No. 2696 Revision 2

South Texas Project Units 3 and 4
South Texas Project Nuclear Operating Co.
Docket No. 52-012 and 52-013
SRP Section: 02.05.04 - Stability of Subsurface Materials and Foundations
Application Section: 2.5.4

QUESTIONS for Geosciences and Geotechnical Engineering Branch 1 (RGS1)

02.05.04-27

FSAR Table 3.0-11 of Part 9: ITAAC, "ITAAC For Backfill Under Category I Structures," (1) does not specify the inspections, tests, or analyses that will be used to ensure that the properties of the selected backfill meet the ABWR design control document (DCD) Tier I requirements, (2) only commits to meeting minimum density values, and (3) does not provide specific acceptance criteria. The10 CFR 100.23 (d) (4) requires that "Each applicant shall evaluate all siting factors and potential causes of failure, such as the physical properties of the materials underlying the site …," and Regulatory Guide 1.206 section C.I.2.5.4.5, "Excavations and Backfill" states that the applicant should discuss "sources and quantities of backfill and borrow, including a description of exploration and laboratory studies and the static and dynamic engineering properties of these materials."

Please describe how you will ensure that (1) the field backfill meets the requirement of ABWR DCD on minimum shear wave velocity of 1000 fps as listed in the Tier I criteria, and (2) meets or exceeds the engineering properties and strength parameters assumed for the backfill in stability analyses (bearing capacity, settlement, and lateral earth pressure, liquefaction etc.).

Request for Additional Information No. 2922 Revision 2

South Texas Project Units 3 and 4
South Texas Project Nuclear Operating Co.
Docket No. 52-012 and 52-013
SRP Section: 02.05.04 - Stability of Subsurface Materials and Foundations
Application Section: 2.5.4

QUESTIONS for Geosciences and Geotechnical Engineering Branch 1 (RGS1)

02.05.04-28

In FSAR 2.5.4.8 "Liquefaction", the results of liquefaction analyses based on STP N-values, CPT tip resistance and shear wave velocities were presented in some detail for factors of safety less than or equal to 1.1. In view of the small number of data points having factors of safety of less than 1.1 that will remain after construction, you concluded that liquefaction potential was nil. In response to RAI 2.5.4-5, you stated that graphic presentation of liquefiable zones below power block safety related structures was not possible because there are no liquefaction zones. Regulatory Guide 1.198, Section 3.2, "Factor of Safety Against Liquefaction", recommends that for factors of safety less than 1.1 and factors of safety between 1.1 and 1.4, that stability and deformation analyses should be performed with assigned strength values commensurate with the amount of pore water pressure generation. Your presentation in the FSAR does not address strength degradation for factors of safety between 1.1 and 1.4. Without a detailed explanation of those results, the liquefaction and/or strength degradation issue is not fully addressed. The staff needs the following information and data to close out this issue.

a. Discussion of pore-water generation and post-earthquake strength for soils that have factors of safety less than 1.4.

b. Discussion of post-earthquake stability of safety-related structures and/or potential interaction with adjacent non-safety related structures as a result of either liquefaction or strength loss.

c. Factor of safety statistics in the form of a histogram for the results for each of the three methods used to compute liquefaction potential site-wide and structure specific.

In addition, the staff requests that you provide all the data required to perform SPT, CPT and shear wave velocity liquefaction analyses in electronic format in order for the staff to perform confirmatory analyses. The data needed to perform these independent liquefaction assessments is as follows:

SPT, N_{60} values (varying with depth, for all borings used for testing)
CPT, tip resistance (q_c) and sleeve resistance (f_s) (varying with depth, for all borings used for testing)
Shear Wave Velocity (Vs) (varying with depth, for all borings used for testing)

This data has already been provided but they are in non-searchable pdf documents. It is requested that the data be provided in electronic format (for instance, on an Excel spreadsheet), to ensure the accuracy of the assessment.