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Date: 9/27/2007 9:54:06 AM
Subject: Draft RAIs on the Review of the SNC LWA Supplement - Sections 2.5.4 and 3.8.5
cc: "James George" <JXG7@nrc.gov>,"Thomas Cheng" <TMC@nrc.gov>,"Rebecca Karas" <RLK@nrc.gov>,"Yong Li" <YXL1@nrc.gov>

Jim,

Attached are draft RAIs pertaining to the staff's review of the LWA supplement Sections 2.5.4 and 3.8.5. Please take a look and let me know if you would like to have a conference call for the staff to further clarify these draft RAIs. Thanks.

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Draft Requests for Additional Information on the LWA-2 Supplement to the Vogtle ESP Application

1.1-1 The second to last paragraph on Page 1-2 (Section 1.1) states that SNC requested an LWA-2 under 10 CFR 50.10(e)(3) for some safety-related construction activities. These activities include placement of engineered backfill including retaining walls and preparation of the nuclear island foundation including installation of mudmats, water proofing, formwork (retaining walls), rebar, and foundation embedments necessary to prepare the foundation for placement of concrete subsequent to the issuance of the COL. In order for the staff to understand how these LWA-2 activities are to be implemented, SNC is requested to provide a detailed description (including sketches) of the above listed works (mudmats, water proofing, formwork, rebar, and foundation embedments) in the application.

2.5.4-1 Section 2.5.4, page 1, indicates that 174 borings have been taken at the site along with other types of penetrations (presumably CPTs, Suspension and down-hole velocity loggers, etc.). In reading through the other descriptions provided along with the MACTEC Appendices, it is not clear how the total of 174 was reached. SNC is requested to explain how to get a detailed accounting of these penetrations and how many will not be usable for the site specific analyses since they were taken through the material that is scheduled to be excavated.

2.5.4-2 In its previous reviews conducted for the ESP application, the staff was concerned with the number of borings that penetrated significantly into the Blue Bluff Marl (BBM), the layer offering primary support to the Nuclear Island (NI). Since the staff needs to have a clear understanding of the depths and numbers of all these penetrations to ensure that the mean properties of site stratigraphy are adequately being modeled and enough properties were determined to be able to adequately determine material property variability, SNC is requested to provide a description of those borings that penetrated into and through the BBM and how many samples and types of samples were taken of this material as well as material below the BBM.

2.5.4-3 Since the BBM material is important to the foundation support and site response, SNC is requested to demonstrate the ability to understand how samples of the BBM were obtained and how the degree of disturbance of this material was evaluated during the testing program.

2.5.4-4 Section 2.5.4.2.2.1 indicates that no new strength (and presumably stiffness) testing is to be performed for the Upper Sand Strata since this material is being excavated from beneath the Category I structures. Since the staff needs additional information and basis for its conclusion on the effect of the two-dimensional velocity configuration of the excavated zone on site response and SSI effects, SNC is requested to provide the assessment of the in-situ velocity profile through the Upper Sand Strata for the staff to complete its evaluation.

2.5.4-5 Section 2.5.4.2.2.2 presents a general description of the Blue Bluff Marl. The staff's previous review of the ESP application found that some samples below the BBM had extremely low blow count that led to questions on the potential adequacy of this soil material for settlement and bearing capacity. In the LWA application, the staff could not find any significant discussion of this issue. During the September 5-6, 2007 LWA site visit, SNC indicated that these results were anomalies. The staff requests SNC to provide a basis for making these conclusions.

2.5.4-6 On page 2.5.4-7 of the application, mention is made of a design value for cohesion of the BBM of 10,000 psf. This concern was identified during the ESP review and was also discussed during the September 5-6, 2007, LWA site visit. It is important for the staff to understand the basis for this evaluation and if any laboratory test data are available to support this design value. Of equal importance, the staff needs to understand where in the facility evaluation this parameter is to be used. SNC is requested to provide a basis for the determination of this design value and how this value is to be used.

2.5.4-7 Subsections 2.5.4.5.2 and 2.5.4.5.3 discuss excavation and backfill issues. However, there is no discussion related to the required shear wave velocity conditions that need to be met to ensure that the backfill soil will satisfy the analysis criteria used for the SSI calculations of the AP1000 standard plant design. The staff's concerns refer to both minimum shear wave velocity values as well as consideration of acceptable variability of the measured velocity over the footprint of the NI. SNC is requested to provide additional information to address these issues.

2.5.4-8 In Subsection 2.5.4.5.3 of the application, SNC stated that the backfill soil was classified into two categories. Seismic Category 1 backfill will be compacted to an average of 97 percent and a minimum of 93 percent, with no more than 10 percent of field compaction below 95 percent of the maximum dry density; and seismic Category 2 backfill will be compacted to an average of 95 percent and a minimum of 93 percent, with no more than 10 percent of field compaction tests less than 95 percent of the maximum dry density. In order to assist the staff to reach a review conclusion on the compaction criteria described above, SNC is requested to provide the following:

(a) A correlation between density and velocity to ensure that the site characteristic requirements (e.g., shear wave velocity) of the backfill are being met.

(b) A justification (or analyses) to ensure that use of the 93% minimum under Category 1 structures will not adversely impact soil density to the point that the minimum measured shear wave velocity falls below the minimum velocity requirement.

(c) Justification for Category 2 backfill to ensure that if the average dry density will meet the 95 percent compaction requirement that no more than 10 percent will fall below 95 percent.

2.5.4-9 As stated in Subsection 2.5.4.5.3, the two backfills are to be compacted to given Proctor density requirements based on field density measurements of one density test per 10,000 square feet of lift. SNC is requested to provide the basis of this testing density and how this number of density tests will provide assurance of adequate uniformity of shear wave velocity as used in the SSI analyses of the AP1000 standard design.

2.5.4-10 Section 2.5.4.5.3 states that approximately 3.9M cubic yards of material will be excavated for the power block area and that approximately 3.6M cubic yards will be required as structural backfill. Only about 30% of the excavated material will be suitable for reuse as structural backfill. An additional 2.5M cubic yards will be required and this material has been identified as being available in the switchyard area north of the power block; however, it is not clear that suitable material exists in this area in the quantities required. SNC should consider performing additional investigations and testing, using horizontal and vertical intervals sufficient to determine material variability, to ensure that structural backfill material exists in the switchyard or other borrow areas in the quantities required for the project.

2.5.4-11 In Subsection 2.5.4.5.3, there is no discussion regarding the number of grain size tests to be made to control the uniformity of the backfill. It is the staff's expectation that the maximum dry density and optimum water content for fill placement will be related to the grain size distribution of the backfill. In order to ensure that the backfill both under and to the side of the NI satisfies the AP1000 SSI analysis criteria, SNC is requested to provide, in the application, a description regarding the program needed to assure that the correlation of the grain size distribution of the borrow material, the corresponding maximum dry density and associated shear wave velocity is defined.

2.5.4-12 In Subsection 2.5.4.5.3, SNC indicated that a flowable fill may be used in place of the compacted backfill. During the September 5-6, 2007, LWA site visit, SNC stated that the extent to which this material will be used is to be very limited. SNC is requested to specify in the application: (1) what are the target properties of this material, (2) the required uniformity of these properties, (3) how should it relate to the remainder of the compacted backfill, and (4) the description of the potential extent of its usage.

2.5.4-13 In Subsection 2.5.4.5.5, SNC indicated that an MSE wall will be constructed and will be used as a form against which the nuclear island (NI) structures will be poured. It is not obvious that the backfill placed immediately behind the MSE wall will be able to be compacted to the same density criteria as the remainder of the fill without disturbing the MSE wall (e.g., deflection toward to the NI structures due to backfill compaction). Based on the staff's previous review experience, the individual sections of the MSE wall cannot be expected to sustain significant lateral deflections during compaction without causing problems for placement of waterproofing. If the density of the backfill soil immediately adjacent to the wall is less compact, this material may have velocity properties different from that of the rest of the backfill. SNC is requested to provide, in the application, the procedures for compaction of the backfill immediately adjacent to the wall.

2.5.4-14 SNC is requested to provide, in the application, a discussion of how velocity testing of the compacted backfill will be performed and how assurance will be provided that the resulted velocities will meet target velocity requirements in the completed condition.

2.5.4-15 In Subsection 2.5.4.5.3.2, SNC discussed the ITAAC for the backfill soil. SNC is requested to address the following issues identified by the staff:

(a) The “Design Requirement” column should also include the requirement of minimum shear wave velocity of 1,000 ft/sec.

(b) In the “Inspection and tests” column, SNC stated that testing will be performed during the placement of the backfill materials. A detailed description of the testing program should be provided in the application.

(c) The “Acceptance Criteria” states that “a report exists …” A detailed description of this report should be provided in the application.

(d) The “Acceptance Criteria” should also include the criterion of minimum shear wave velocity of 1,000 ft/sec.

2.5.4-16 In Subsection 2.5.4.7.1, SNC discussed the shear wave velocity profile to characterize the site, but the discussion did not cover the backfill material. In Subsection 2.5.4.7.2, SNC mentioned EPRI93 soil degradation models as well as SRS models. However, no significant discussion is presented of how these two models compare, which is more appropriate to use for Vogtle site response analyses, and how significant the models are to both site response and SSI analyses. SNC is requested to address these two issues.

2.5.4-17 The MACTEC report (attachments to the application) discusses the use of the REMI method for site geophysical testing. It is the staff’s understanding that this method is generally considered more problematic in determining S- and P-wave velocity profiles. SNC is requested to provide a description of how this method was applied and a justification to demonstrate the adequacy of using these data in determining site properties and its impact on response analyses.

2.5.4-18 Section 5 of the MACTEC report indicates that Dr. K. H. Stokoe will be used to review the RCTS data generated on the program. One of the issues with RCTS testing is the quality and experience of the laboratory personnel performing the tests to allow use of the data generated. SNC is requested to provide a description of the details of the depth and completeness of Dr. Stokoe’s review to ensure that the quality of the data generated is appropriate for use in the site evaluations.

3.8.5-1 In the one page description of Section 3.8.5, SNC did not provide any information on how the quality of the backfill (grain size, compaction,

uniformity, etc.) is going to be used to ensure the adequacy of the foundation design. SNC needs to address this issue.

3.8.5-2 Regarding the dynamic stability of the NI structures sited at the Vogtle ESP site, SNC is requested to provide additional information to demonstrate how the sliding criteria assumed during the AP1000 SSI analyses (sliding friction value of 0.7) are in fact to be attained from the backfill soil-mudmat-water proofing system at the ESP site.