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UniStar
NUCLEAR ENERGY

10 CFR 50.4
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October 12, 2009

UN#09-419

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Response to Request for Additional Information for the
Calvert Cliffs Nuclear Power Plant, Unit 3,
RAI No. 144, Other Seismic Category I Structures
RAI No. 145, Foundations

Reference: UniStar Nuclear Energy Letter UN#09-390, from Greg Gibson to Document Control Desk, U.S. NRC, Response to RAI No. 144, Other Seismic Category I Structures, and RAI No. 145, Foundations, dated September 28, 2009

The purpose of this letter is to provide updated schedule information for the responses to Requests for Additional Information (RAI) No. 144 and RAI No. 145. The questions associated with RAI No. 144 address Other Seismic Category I Structures, as discussed in Section 3.8.4 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 6. The questions associated with RAI No. 145 address Foundations, as discussed in Section 3.8.5 of the FSAR.

The referenced letter stated that a response schedule would be provided by October 13, 2009. The response schedule for RAI No. 144 and RAI No. 145 is provided in the enclosure.

There are no regulatory commitments identified in this letter. This letter does not contain any proprietary or sensitive information.

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NRO

If there are any questions regarding this transmittal, please contact me at (410) 470-4205, or Mr. Michael J. Yox at (410) 495-2436.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 12, 2009

Greg Gibson

Enclosure: Response Summary for Requests for Additional Information, RAI No. 144, Other Seismic Category I Structures; and RAI No. 145, Foundations; Calvert Cliffs Nuclear Power Plant Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Loren Plisco, Deputy Regional Administrator, NRC Region II (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2
U.S. NRC Region I Office

GTG/TD/jmm

Enclosure

Response Summary for Requests for Additional Information
RAI No. 144, Other Seismic Category I Structures; and RAI No. 145, Foundations
Calvert Cliffs Nuclear Power Plant Unit 3

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-1	CCNPP Unit 3 FSAR 3.8.4.1 provided information to address the second COL item but not the first. The applicant is requested to address the first COL item as well, or state in the FSAR (as was done for the other items) that "No departures or supplements" apply.	December 4, 2009
	Identify whether the structural features listed below (obtained from Figure 9.2-4) are considered as Seismic Category I, and if not, explain why. a. Existing Bulkhead b. New Sheet Pile Bulkhead c. New Channel Wall d. New Dredged Intake Channel Identify where all of these items are listed in FSAR Table 3.2-1. If these items are considered as Seismic Category I or II, identify where the design and analysis descriptions are provided.	December 4, 2009
	FSAR Figure 9.2-4 shows that the CW Intake Structure is quite close to the UHS Makeup Water Intake Structure. According to FSAR Table 3.2-1, the CW Intake Structure is classified as Seismic Category "CS" which means Conventional Seismic. Explain why this structure isn't classified as Seismic Category II since it appears that consideration of potential seismic interaction effects with the adjacent UHS Makeup Water Intake Structure is needed.	December 4, 2009
	The EPR FSAR and the CCNPP Unit 3 FSAR do not provide a description of the analysis and design results for the radwaste structures consisting of the Nuclear Auxiliary Building (NAB) and the Radioactive Waste Processing Building (RWPB). Explain where this information is located. Similarly, where is the description of the analysis and design results for Seismic Category II structures?	December 4, 2009
03.08.04-2	Section 3.8.4.3.1 identifies the Severe Environmental Loads for the Standard Project Hurricane (SPH) and Extreme Environmental Loads for the Probable Maximum Hurricane (PMH). Provide the location in the FSAR where all of the specific quantitative data for these loads are developed. Describe how the hurricane parameters given in this section are used to calculate the pressures to be applied to the structures. Since the information provided in Section 3.8.4.3.1 only appears to be fluid pressure loads, explain what quantitative wind load is used in conjunction with the SPH and PMH for the site-specific structures and identify where this information is presented in the FSAR. Also, explain what wind loading identified as W is used for the other load combinations included in U.S. EPR FSAR Section 3.8.4.3.2 that do not include PMH and SPH.	December 29, 2009

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-2 (continued)	Section 3.8.4.3.1 states that "the UHS Makeup Water Intake Structure (MWIS) and UHS Electrical Building are designed to withstand a peak positive overpressure (due to postulated explosions) of at least 1 psi without loss of function." Provide the basis for selection of this quantitative overpressure loading and explain how this criterion is used to demonstrate that an explosion on transportation routes (e.g., railway, highway, or navigable waterway) is not likely to have an adverse effect on plant operation or to prevent a safe shutdown of the plant. Confirm whether the evaluation for explosions is performed in accordance with NRC Regulatory Guide 1.91, Rev. 1, "Evaluations of Explosions Postulated to Occur on Transportation Routes near Nuclear Power Plants."	Submitted UN#09-390, dated September 28, 2009
	For the site-specific structures, some information is provided for hurricane loads and pressure loads due to explosions. For the site-specific structures provide a description of all the other applicable loads or explain whether the identical description and quantitative data presented in the EPR FSAR are utilized for the CCNPP Unit 3 structures as well.	November 2, 2009
03.08.04-3	Calvert Cliffs Unit 3 FSAR Sections 3.8.4.3.1, 3.8.5.5.2, and 3.8.5.5.3 identify that the EPR certified design groundwater level is exceeded in 2 instances, based on site-specific groundwater analyses. From information provided in the License Renewal application for Units 1 and 2, the staff is aware that there is an underground drain system for Units 1 and 2, whose purpose is to maintain the groundwater at a level lower than would naturally occur. The staff requests the applicant to provide the following information for Unit 3: 1. Will this existing drain system be relied on to maintain the Unit 3 groundwater at a level lower than would naturally occur? If so, describe quantitatively the estimated effect on the level of the groundwater; describe the operating experience and current condition of the drain system; describe any repairs/upgrades that will be implemented; and describe the maintenance program that will be relied on to ensure continued functioning of the existing drain system throughout the Unit 3 operating life. 2. Will a new underground drain system be installed for Unit 3, to maintain the Unit 3 groundwater at a level lower than would naturally occur? If so, describe quantitatively the estimated effect on the level of the groundwater; and describe the maintenance program that will be relied on to ensure continued functioning of the new drain system throughout the Unit 3 operating life. 3. If either existing or new underground drain system(s) are relied upon, then explain why the system(s) are not identified as safety related systems.	December 16, 2009
03.08.04-4	Describe in detail, the waterproofing system that is used for all below grade concrete structures including the buried electrical duct banks and buried piping. The description should include the type of waterproofing membrane, material composition, thickness, type of joints for the membrane, and installation process. For the installation process, explain how it is assured that the waterproofing membrane will not be damaged in any manner.	December 4, 2009

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-4 (continued)	Sections 3.8.4.6.1 and 3.8.5.6.1 indicate that the waterproofing system in combination with improved concrete mix design will adequately protect the below-grade foundations (walls and basemats) and buried duct banks. Reference is also made to ACI 201.2R-01 (Guide to Durable Concrete) and ACI 515.1R-79 (Guide to the Use of Waterproofing, Damp Proofing, Protective, and Decorative Barrier Systems for Concrete) (ACI, 1985). Provide more details on the specific measures that are being specified to ensure that no degradation of the concrete foundations and buried duct banks will occur over the potential 60 year design life of the plant. This should include a quantitative discussion of the aggressiveness of the soil/groundwater, the specific concrete mix design to be specified, which recommendations of ACI 201.2R and ACI 515.1R will be specified, and the construction procedures that will be followed to ensure durable and dense concrete. Will rubber water stops be utilized at all construction joints that may occur up to grade elevation? Additional questions related to the use of improved concrete mix design are contained in RAI 3.8-11(Internal).	December 29, 2009
	Describe the operating experience for other below grade reinforced concrete structures that currently exist at the site which contain similar waterproofing membranes and are also exposed to comparable aggressive groundwater over long periods of time.	December 29, 2009
	Provide vendor test data or other operating experience which demonstrates that the type of waterproofing membrane to be used has adequate water-retarding properties under aggressive saturated soil conditions for long periods of time without degrading.	December 4, 2009

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-5	Calvert Cliffs Unit 3 FSAR Section 3.8.4.3.2 presents two additional load combinations for the UHS MWIS and UHS Electrical Building to address the hurricane loadings SPH and PMH. The Severe Environment SPH load combination appears to correspond to one of the Service Load Combinations presented in the EPR FSAR and ACI 349, when the wind load W is replaced by the hurricane load SPH. The Extreme Environment PMH appears to correspond to one of the Factored Load Combinations that are presented in the EPR FSAR and ACI 349, when the tornado load Wt is replaced by the hurricane load PMH. Address the following items related to these load combinations: 1. Explain why these two load combinations are only applicable to the UHS MWIS and UHS Electrical Building, and not to the other Seismic Category I structures as well. 2. The load combination U = (0.75)(1.4D + 1.4F + 1.7L + 1.7H + 1.7W + 1.7To +1.7Ro) appears in the EPR FSAR and ACI 349. Explain why a load combination corresponding to U = (0.75)(1.4D + 1.4F + 1.7L + 1.7H + 1.7SPH (replacing W) + 1.7To +1.7Ro) is not considered. 3. In order to be consistent with the Factored Load Combinations in the EPR FSAR and ACI 349 that contain Wt (tornado wind), explain why the load To was omitted in the "Extreme Environment PMH" load combination presented in Section 3.8.4.3.2 of the CCNPP Unit 3 FSAR.	Submitted UN#09-390, dated September 28, 2009
03.08.04-6	Calvert Cliffs Unit 3 FSAR Section 3.8.4.4.5 provides a limited description of the analysis and design procedures for buried electrical duct banks and buried Essential Service Water pipes. The first COL Item listed in Section 3.8.4.4.5 indicates that a COL applicant will describe the design and analysis procedures for the conduit and buried pipe. Section 3.8.4.4.5 refers to Section 3.7.3 for the seismic design of buried duct banks and buried pipe. Information for the analysis and design procedures for all of the other loads is lacking. Therefore, provide a description of the analysis and design procedures for all of the other loads imposed on all the buried duct banks and buried pipes. This description should include the procedures for analysis and design under vertical earth loads, permanent surface loads, surface live loads, internal pressure (for pipe), fluid transients (if applicable), buoyancy, thermal expansion (if applicable), and frost effects (e.g., heave for pipes placed above the frost line). This description should also clearly state (1) whether the approach follows the analysis and design procedures presented in EPR FSAR Section 3.8.4.4.5, including the AREVA report entitled U.S. Piping Analysis and Pipe Support Design Topical Report (Reference 37 of the EPR FSAR) for buried piping and (2) the extent to which the procedures in EPR FSAR Section 3.8.4.4.5 and EPR Reference 37 are used for buried electrical duct banks. If a different approach is used for either buried duct banks or buried pipe, provide a detailed description of the approach used. Since the ground water table is probably above the buried electrical duct banks, explain what types of joints are used and what provisions are made to prevent water intrusion.	December 4, 2009

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-7	Calvert Cliffs Unit 3 FSAR Sections 3.8.4.4.6 (Other Seismic Category I Structures – Design Report) and 3.8.5.4.5 (Foundations - Design Report), state "No departures or supplements." Since there are three site-specific Seismic Category I structures defined in the FSAR, a Design Report is required for each of these structures. Therefore, provide a Design Report for the UHS Makeup Water Intake Structure, UHS Electrical Building, and the buried electrical duct banks and buried piping. The Design Reports should be prepared in accordance with the guideline described in NRC SRP 3.8.4, Appendix C. The Design Reports could be separate documents referenced by the FSAR or included as part of the FSAR as an Appendix. If Appendix 3E.4 is used for the purpose of the Design Reports, then it would need to be expanded to include the other information described in SRP 3.8.4, Appendix C.	December 4, 2009

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-8	1. For the UHS Makeup Water Intake Structure: a. For determining member forces in the structure for design purposes, provide more detailed information on the finite element model (FEM) and analysis than that described in Section 3.8.4, 3.8.5, and Appendix 3E. This should include information on: (1) soil representation used in the FEM (e.g., why pinned supports rather than soil springs), (2) how equivalent static loads are determined and then applied, (3) consideration of any local dynamic amplification for slabs and walls for seismic loading, (4) seismic load application (were loads applied simultaneously in three directions or applied separately? If separately, how are the responses combined? Due to non-symmetry conditions are seismic loads considered to act in plus and minus horizontal directions?), (5) representation of water within the structure and outside the structure. b. If the same model and approach described in FSAR Section 3.7.2 is used for representation of water, simply stating that it was done in accordance with ACI 350.3-06 and Army Corps of Engineers Manual EM-1110-2-6051 is not acceptable. These standards have not been previously reviewed and endorsed by the NRC and many elements of these standards are not applicable to nuclear power plants. Provide a description of how the water contained within the structure and outside the structure was considered in the model for developing member forces. c. Explain why the concrete shear keys below the basemat are not included in the FEM and why the sloped concrete walls on the North-West side of the UHS Makeup Water Intake Structure, shown on Figure 3E.4-2, are not also sloped in the FEM on Figure 3.8-5. d. Provide a description of how all the loads were determined and applied to this model. This should include soil loads from dead weight, live load, surcharge, seismic, and soil passive pressure (if relied upon for stability evaluation); water pressure within and outside the building; and the hurricane induced loadings (pressure loadings from wind, storm surge and wave run-up). e. Section 3.8.4.4.7 states that the "results from the GT STRUDL static analysis are used to design reinforced concrete shear walls and slabs according to provisions of ACI 349-01 (ACI, 2001a) (with supplemental guidance of Regulatory Guide 1.142 (NRC, 2001)), ACI 350-06 (ACI, 2006a) and ACI 350.3-06 (ACI, 2006b)." These ACI standards have not been previously reviewed and generically endorsed by the NRC and some elements of these standards are not applicable to nuclear power plants. Furthermore, the referenced Regulatory Guide 1.142 endorses ACI 349-97, not ACI 349-01. Therefore, specifically identify which sections/provisions in the three ACI referenced standards are used for design and describe how they compare to ACI 349-97, supplemented by Regulatory Guide 1.142. Note that this item, related to the appropriate ACI Standard(s), is also applicable to the UHS Electrical Building and to the buried electrical conduit duct banks.	December 4, 2009

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-8 (continued)	2. For the UHS Electrical Building: Section 3.8.4.4.7 states "Due to its relative simplicity and treatment as a soil inclusion, the design of the embedded UHS Electrical Building is performed by manual calculations. Reinforced concrete shear walls and slabs are designed in accordance with ACI 349-01 (ACI, 2001a) (with supplemental guidance of Regulatory Guide 1.142 (NRC, 2001)), ACI 350-06 (ACI, 2006a) and ACI 350.3-06 (ACI, 2006b)." a. Explain what is meant by the phrase "soil inclusion." b. Since Section 3.8.4.4 is supposed to present the design and analysis procedures, provide a description of how the manual calculations were performed for the various loads. Address the same question raised under Item 1.e above, regarding the use of the three ACI standards, as it applies to the UHS Electrical Building.	December 4, 2009
03.08.04-9	Calvert Cliffs Unit 3 FSAR Section 3.8.4.5 indicates that Section 3E.4 of Appendix 3E provides the details for the design of the basemat and typical wall for the UHS Makeup Water Intake Structure and the UHS Electrical Building. What is the technical basis for only selecting a typical wall for each structure? Explain why other concrete walls and slabs were not considered. Since the buried electrical duct banks and buried piping are also site-specific Seismic Category I structures, provide corresponding analysis and design information for critical sections of electrical duct banks and buried piping to represent this group of structures/components.	December 4, 2009

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-10	Calvert Cliffs Unit 3 FSAR Sections 3.8.4.6.1 and 3.8.5.6.1 refer to "the use of dense concrete with a low water cement ratio and improved concrete mixture design." According to Section 3.8.5.6.1, the compressive strength of the concrete for the foundation of the UHS Makeup Water Intake Structure and UHS Electrical Building is f'c = 5,000 psi. Provide information to address the following related items: 1. FSAR Sections 3.8.1 through 3.8.5 should identify any specific water cement ratios needed for the concrete mix for all Seismic Category I structures. The tables in Part 10, Section 2.4 (ITAAC) specify that the acceptance criterion is a maximum water cement ratio of 0.45 for all below grade concrete sections. Explain how this value was selected considering that usually a lower value of the water cement ratio, high compressive strength f'c, and large concrete cover over steel reinforcement are recommended for aggressive concrete surface conditions. As an example, ACI 350-01 recommends a water cement ratio of 0.40 and f'c = 5,000 psi for severe aggressive conditions. Also, clarify where in the FSAR the water cement ratios for Seismic Category II and II-SSE structures are specified. 2. In view of the aggressiveness of the soil conditions at CCNPP Unit 3, explain why the concrete compressive strength for most of the other Seismic Category I structures is less than 5,000 psi, which is the value used for the UHS Makeup Water Intake Structure and UHS Electrical Building. EPR FSAR Sections 3.8.4.6.1 and 3.8.5.6.1 indicate that 4,000 psi is specified for the foundations of Seismic Category I structures including the buried electrical duct banks. Also clarify where in the FSAR the compressive strength for the Seismic Category II and II-SSE structures is specified and address this issue for these structures as well.	December 4, 2009
03.08.04-11	U.S. EPR FSAR Sections 3.8.4.6.1 and 3.8.5.6.1 require a COL applicant that references the U.S. EPR design certification to evaluate the use of waterproofing membranes and epoxy coated rebar based on site-specific groundwater conditions. Describe the evaluation performed to determine whether epoxy coated rebar is needed in accordance with the referenced COL item.	December 4, 2009
03.08.04-12	The staff notes that the approach to limit the in-service inspection program to examination of exposed portions of below-grade concrete for signs of degradation when adjacent soil is excavated for any reason has been used and accepted at sites where the soil is not aggressive. Therefore, provide more details about this program and why is it considered adequate for below grade concrete foundations when subjected to aggressive soil conditions. The description should include a discussion of the scope, locations, schedule, parameters inspected, inspection methods, and acceptance criteria. Also provide the technical basis for assuming that the presence of a waterproof membrane is sufficient justification to follow an in-service inspection program normally used where the soil is not aggressive.	December 29, 2009

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-12 (continued)	Explain why the description in the FSAR refers to this as a periodic surveillance program while in a later discussion it indicates that the inspection is limited to examination of the surfaces when the adjacent soil is excavated for any reason. Provide the basis for why examination of exposed portions of below-grade concrete, when adjacent soil is excavated for any reason, is considered adequate rather than supplementing this requirement with a specified maximum time period.	December 29, 2009
	Explain why the FSAR does not state that such a program is also applicable to buried piping considering the aggressive soil conditions present at the site.	December 29, 2009
	For the waterproofing membrane beneath the foundation basemats and on the below grade walls, explain what type of inspection is to be specified to ensure that the waterproofing membrane has not been damaged or shows sign of degradation. Explain whether this inspection will be performed prior to the placement of soil backfill and during the periodic below-grade concrete degradation program.	December 29, 2009
	Explain whether the monitoring and maintenance of all Seismic Category I, II, and II-SSE structures, including the site-specific structures, will be performed in accordance with the requirements of 10 CFR 50.65, supplemented with the guidance in Regulatory Guide 1.160. For the UHS Makeup Water Intake Structure and CW Intake Structure explain whether the inspections will also be performed in accordance with NRC Regulatory Guide 1.127, Rev. 1, "Inspection of Water-Control Structures Associated with Nuclear Power Plants."	December 29, 2009

Response Summary for Request for Additional Information

RAI 144 Question	Description of RAI Item	Response Date
03.08.04-13	Calvert Cliffs Unit 3 FSAR Table 3E.4-1 presents the governing design load combinations for the UHS Makeup Water Intake Structure and UHS Electrical Building. Provide the following information related to the load definition and load combinations for these site-specific structures: 1. Confirm that all of the load definitions for these site-specific structures are the same as those defined in the US EPR FSAR. 2. Confirm that the methods utilized to determine the individual loads are consistent with the approach used in the US EPR FSAR and provide the magnitude of the live load and snow load for these site-specific structures. 3. Explain why the load combinations in Table 3E.4-1 are considered to bound all of the other load combinations tabulated in the US EPR FSAR. 4. Confirm that for every load combination, where any load reduces the effects of other loads, a load factor of zero is applied/considered for that load. 5. For the stability evaluation load combinations 6 through 8, confirm that the effects due to the buoyancy force based on the maximum groundwater elevation and permanent surcharge loads (of adjacent structure(s)) are also considered.	December 4, 2009
03.08.04-14	Calvert Cliffs Unit 3 FSAR Section 3E.4 provides a description of the analysis and design of the UHS Makeup Water Intake Structure and UHS Electrical Building and some limited information about the results in terms of demand member forces for several critical sections (basemats and walls). For the most critical concrete members in the basemat and walls for the UHS Makeup Water Intake Structure and the UHS Electrical Building, provide the resulting member forces (membrane forces, shears, and moments) and comparisons to the section strengths, at least for the most critical governing load combination(s). This information would show the level of margin existing in the design. To facilitate the review, such information is usually presented in tables. Include in these tables the steel areas provided which correspond to the tabulated section strengths.	December 29, 2009

Response Summary for Request for Additional Information

RAI 145 Question	Description of RAI Item	Response Date
03.08.05-1	Section 3.8.5.5 lists three bulleted items that participate in resisting sliding of the Emergency Power Generating Buildings (EPGBs) and the Essential Service Water Buildings (ESWBs). Explain why these items were listed only for the EPGBs and the ESWBs and not for the Nuclear Island (NI), or for Seismic Category II and II-SSE structures. Is the methodology used for the EPGBs and ESWBs different than that used for the NI? Explain why the list of three bulleted items does not include: (1) the resistance to sliding between the mud mat and waterproofing membrane, and (2) shear resistance within the soil.	December 29, 2009
	In order to achieve a coefficient of friction between the basemat and the mud mat of 0.7 will the concrete surface of the mud mat be required to be intentionally roughened in accordance with ACI 349-97 Section 11.7? If not, then demonstrate that the coefficient of friction between the basemat and the mud mat is equal to at least 0.7.	December 29, 2009
	Section 3.8.5.6.1 of the EPR FSAR indicates that the textured waterproofing membrane in the mud mat beneath the basemat will have a coefficient of friction of at least 0.7 and that this will be demonstrated by vendor testing. Where is this requirement stated in the Calvert Cliffs Unit 3 FSAR, and where are the vendor test data results presented?	December 29, 2009
	Section 3.8.5.5 of the Calvert Cliffs FSAR indicates that a coefficient of friction of 0.70 at the soil-soil interface beneath the EPGB and ESWB basemats cannot be achieved for the existing underlying soils. Therefore, during excavation of the soil at the site, additional soil material will be removed below the structures and structural backfill material will be placed. Section 3.8.5.5 further states that the coefficient of friction for the actual structural backfill material will be confirmed to meet the EPR FSAR requirement of 0.70 prior to placement of the structural backfill. Based on the information in Sections 3.8.5.5, 2.5.4.5.2 and Figures 2.5-130 through 2.5-134, there appears to be only 4 feet of structural backfill material that will be used under several of the structures (e.g., Reactor Containment Building, Safeguards Building, and Fuel Building). Explain how this depth is determined and why is this considered to be sufficient to preclude sliding/soil failure beneath the 4 foot structural backfill layer. Explain how it will be determined that the required coefficient of friction is met for the critical soil layer prior to placement of the structural backfill. What type of testing will be performed to determine the coefficient of friction at both the soil-soil and soil-concrete interfaces? When will this be performed? Also, the ITAAC in Application Part 10, Table 2.4-1, related to demonstrating the coefficient of friction for the various structures do not clearly state that the coefficient of friction of 0.70 will be demonstrated for the soil-soil and soil-concrete interfaces.	December 29, 2009
	The last paragraph of Section 3.8.5.5 states "Coefficients of friction at the soil-soil and soil-concrete interfaces are consistent with the values in Section 2.5.4.10.2, including Table 2.5-36." Explain the meaning of this sentence. Are there test data at this time which demonstrate that the coefficients of friction at the soil-soil and soil-concrete interfaces will be at least 0.70 as required? Why is Section 2.5.4.10.2 referenced since it addresses settlement with no discussion about coefficients of friction? Although Table 2.5-36 provides coefficients of sliding, the coefficients correspond to values far below the requirement of 0.70.	December 29, 2009

Response Summary for Request for Additional Information

RAI 145 Question	Description of RAI Item	Response Date
03.08.05-2	Calvert Cliffs Unit 3 FSAR Section 3.8.5.5.1 states that the site-specific differential settlements of the NI foundation basemat are expected to be up to 1 inch in 50 feet. This exceeds the ½ inch in 50 feet considered in the standard design for the EPR. Some limited information was provided on the evaluation for the higher site-specific differential settlements; however, a more detailed description is needed. Provide the information requested below: 1. Identify and describe the specific structural model(s) used for the NI settlement analysis. 2. Explain how the site-specific differential settlement of 1 inch in 50 feet was applied to or considered in the model. How does the approach used relate to the statement in FSAR Section 3.8.5.5.1 which states that the "NI is subjected to structural eccentricities associated with a 7 inch basemat differential displacement representing a settlement value of 1 inch in 50 feet." 3. Explain whether the differential settlement values were included in both N-S and E-W directions simultaneously. 4. Was a purely linear displacement distribution assumed and applied to the model? 5. FSAR Section 3.8.5.5.1 states "The evaluation assumed no changes in the soil stiffness or increased flexure due to differential settlement consistent with the design analysis for the standard U.S. EPR Design." Explain why the evaluation did not include the potential increase in flexure due to differential settlement. If no increase in flexure is assumed then how can the effect of differential settlement on member forces be determined? What considerations were given to the effects of horizontal variations in soil properties that could lead to increased loadings (flexure and shear) on the structures?	December 29, 2009

Response Summary for Request for Additional Information

RAI 145 Question	Description of RAI Item	Response Date
03.08.05-3	Calvert Cliffs Unit 3 FSAR Table 3.8-1 provides a summary table for evaluation of the UHS Makeup Water Intake Structure basemat for soil bearing pressure and stability evaluation (sliding and overturning). Provide the information requested below related to this table. 1. Define the various load combinations applicable to all of the entries in FSAR Table 3.8-1. How do these load combinations compare with those in NRC SRP 3.8.5? 2. For the site-specific UHS Makeup Water Intake Structure, provide a description and the results of the evaluation performed to demonstrate that the sliding, overturning, and flotation load combinations meet the acceptance criteria presented in NRC SRP 3.8.5. Include an explanation of how the demand (applied) SSE loading was developed for horizontal shear force and overturning moment, how the resisting forces for shear and overturning were determined, whether two sets of two-dimensional (2-D) calculations were performed (i.e., evaluations performed for NS and vertical, and then EW and vertical), whether upward vertical SSE force was assumed to reduce dead weight, and whether buoyancy was considered. 3. What was the governing coefficient of friction that was used in these stability evaluations (basemat to mud mat, mud mat to waterproofing membrane, mud mat to soil, or soil to soil (which could vary from 0.35 to 0.7 depending on whether the soil is existing soil from the site or structural backfill)). 4. Section 3.8.5.5 indicates that passive earth pressure and shear keys are utilized to transfer shear into the soil. To develop the passive earth pressure of the soil, the foundation would need to displace sufficiently to mobilize the soil passive resistance. Thus, the dynamic coefficient of friction would be more appropriate than the static coefficient of friction (which would have a smaller value). Explain whether a dynamic coefficient of friction is utilized and the magnitude of the governing dynamic coefficient of friction, or provide the technical basis for using the static coefficient of friction. 5. Provide a complete description and results of the stability evaluation for the UHS Electrical Building. Also, provide the soil bearing, settlement, and stability evaluations for the Seismic Category II and II-SSE site-specific structures.	December 29, 2009

Response Summary for Request for Additional Information

RAI 145 Question	Description of RAI Item	Response Date
03.08.05-4	Calvert Cliffs Unit 3 FSAR Section 3.8.5.5.1 for the NI, 3.8.5.5.2 for the EPGBs, and Section 3.8.5.5.3 for the ESWBs acknowledge that there are some differences from the U.S. EPR standard plant in the soil bearing pressures, stresses in the base mat, and stability evaluations due to site-specific settlements and groundwater conditions. The extent of these differences is sometimes identified as negligible, within allowable values, or less than the corresponding section capacity. For each of these structures, quantify the specific differences from the U.S. EPR standard plant discussed in FSAR Sections 3.8.5.5.1, 3.8.5.5.2 and 3.8.5.5.3 rather than using qualitative terms. FSAR Section 3.8.5.5.2 for the EPGBs includes a statement that the "Factors of safety against sliding and overturning remain within allowable values" and Section 3.8.5.5.3 for the ESWBs has a similar statement which indicates that the effects are "negligible." No such discussion is given for the NI. Due to the increased site-specific settlements and higher groundwater elevations, and changes in soil bearing pressures, coefficient of frictions, and soil properties from the values specified in the EPR FSAR, provide a description and the results of the stability evaluations for the NI, EPGBs, and ESWBs. If the differences in the responses of the structures from the U.S. EPR standard plant are truly negligible eliminating the need for any of the specific stability evaluations, provide the technical justification including the quantitative data to support the conclusion. How has the potential effect of saturated soils from groundwater been considered in (1) the calculation of the subgrade modulus/soil spring stiffness used in the various analyses, (2) all seismic soil structure interaction (SSI) analyses for development of building loads and displacements, (3) calculations for soil bearing pressure demand, (4) stability evaluations (including coefficient of friction and passive pressure), and (5) design of the basemat foundation and walls?	December 29, 2009
03.08.05-5	For the UHS Makeup Water Intake Structure finite element model, Calvert Cliffs Unit 3 FSAR Section 3E.4.1 states that "Pinned supports are placed at all nodes of the base mat. During detailed engineering, and upon completion of the Final Geotechnical Site Investigation, it will be confirmed that the use of soil springs (in lieu of pinned supports) does not adversely affect the design results." This type of statement, which relies on future geotechnical site investigations, appears in several other locations in Section 3.8 of the FSAR (e.g., Sections 3.8.4.3, 3.8.4.4.5, 3.8.4.5, 3.8.5.5.4). Explain why such assumptions are necessary rather than utilizing bounding/conservative assumptions. When would these future geotechnical site investigations be performed?	December 29, 2009

Response Summary for Request for Additional Information

RAI 145 Question	Description of RAI Item	Response Date
03.08.05-6	Calvert Cliffs Unit 3 FSAR Section 3E.4.1 – Base Mat of the UHS Makeup Water Intake Structure, under the heading Results of Critical Section Design, states that: "The mat dimensions used in the seismic analysis are based on the building periphery and not the extended base mat. Thus, the maximum difference between the base mat dimension in soil contact and the corresponding mat dimension used in the dynamic analysis is 8 ft (2.4 m), or approximately 15 percent of the overall mat dimension. During detailed engineering, it will be confirmed that the mat extensions do not adversely impact the accelerations and in-structure response spectra generated via the seismic analysis." This statement indicates that the analysis and design of the site-specific structures presented in the FSAR do not correspond to the actual configuration that will be constructed. Therefore, include in the FSAR the description and results of the analysis and design of the site-specific structures that match the actual configurations that will be constructed. If this is not done, then provide a sufficient technical basis supported by quantitative data to demonstrate the adequacy of the existing analysis and design.	November 2, 2009