PMSTPCOL PEmails

From: Elton, Loree [leelton@STPEGS.COM]
Sent: Thursday, January 21, 2010 12:39 PM
To: Muniz, Adrian; Dyer, Linda; Wunder, George; Tonacci, Mark; Eudy, Michael; Plisco, Loren; Anand, Raj; Foster, Rocky; Joseph, Stacy; Govan, Tekia; Tai, Tom
Subject: Transmittal of Letter U7-C-STP-NRC-100012
Attachments: U7-C-STP-NRC-100012.pdf

Please find attached a courtesy copy of letter number U7-C-STP-NRC-100012, which contains a supplemental response to the response to RAI question 02.05.02-19 and the response to the NRC staff question 02.05.04-33 in RAI letter 304, related to COLA Part 2, Tier 2, Section 2.5S.4, "Stability of Subsurface Materials and Foundations."

The official version of this correspondence will be placed in today's mail. Please call Dick Bense at 215-353-8857 if you have any questions concerning this letter.

Loree Elton
Licensing, STP 3 & 4
leelton@stpegs.com
361-972-4644

Hearing Identifier: SouthTexas34Public_EX
Email Number: 2019

Mail Envelope Properties (C7F098E3C31A0141A02043F0B8E656EE25771A073D)

Subject: Transmittal of Letter U7-C-STP-NRC-100012
Sent Date: 1/21/2010 12:38:39 PM
Received Date: 1/21/2010 12:39:47 PM
From: Elton, Loree

Created By: leelton@STPEGS.COM

Recipients:
"Muniz, Adrian" <Adrian.Muniz@nrc.gov>
Tracking Status: None
"Dyer, Linda" <lcdyer@STPEGS.COM>
Tracking Status: None
"Wunder, George" <George.Wunder@nrc.gov>
Tracking Status: None
"Tonacci, Mark" <Mark.Tonacci@nrc.gov>
Tracking Status: None
"Eudy, Michael" <Michael.Eudy@nrc.gov>
Tracking Status: None
"Plisco, Loren" <Loren.Plisco@nrc.gov>
Tracking Status: None
"Anand, Raj" <Raj.Anand@nrc.gov>
Tracking Status: None
"Foster, Rocky" <Rocky.Foster@nrc.gov>
Tracking Status: None
"Joseph, Stacy" <Stacy.Joseph@nrc.gov>
Tracking Status: None
"Govan, Tekia" <Tekia.Govan@nrc.gov>
Tracking Status: None
"Tai, Tom" <Tom.Tai@nrc.gov>
Tracking Status: None

Post Office: exgmb1.CORP.STPEGS.NET

Files	**Size**	**Date & Time**
MESSAGE	635	1/21/2010 12:39:47 PM
U7-C-STP-NRC-100012.pdf	1128588	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

January 21, 2010
U7-C-STP-NRC-100012

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
<u>Supplemental Response to Request for Additional Information</u>

References: 1. Letter, Mark McBurnett to Document Control Desk, "Response to Request for Additional Information," U7-C-STP-NRC-090072, dated July 20, 2009 (ML092030132)

2. Letter, Scott Head to Document Control Desk, "Response to Request for Additional Information," U7-C-STP-NRC-090090 dated August 10, 2009 (ML092250658)

Reference 1 provided the response to Request for Additional Information (RAI) question 02.05.02-19 and reference 2 provided a supplement to that response. During a telephone conference with the NRC Staff on November 12, 2009, STPNOC agreed to provide additional clarification for the response to RAI 02.05.02-19. These clarifications are attached as RAI 02.05.02-19, Supplement 2. Also attached is the response to the NRC staff question 02.05.04-33 in RAI letter 304, related to COLA Part 2, Tier 2, Section 2.5S.4, "Stability of Subsurface Materials and Foundations." This letter provides the complete response to RAI letter 304.

Attachments to this letter provide the following RAI responses:

02.05.02-19, Supplement 2 02.05.04-33

There are no commitments in this letter.

Where there are COLA markups, they will be made at the first routine COLA update following NRC acceptance of the RAI response.

If you have any questions regarding these responses, please contact me at (361) 972-7206, or Bill Mookhoek at (361) 972-7274.

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

Executed on 1/21/2010 MAMcBurnett

Mark McBurnett
Vice-President, Oversight and Regulatory Affairs
South Texas Project Units 3 & 4

rhb

Attachments:
1. RAI 02.05.02-19, Supplement 2
2. RAI 02.05.04-33

cc: w/o attachments and enclosure except*
(paper copy)

Director, Office of New Reactors
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-8064

Kathy C. Perkins, RN, MBA
Assistant Commissioner
Division for Regulatory Services
Texas Department of State Health Services
P. O. Box 149347
Austin, Texas 78714-9347

Alice Hamilton Rogers, P.E.
Inspection Unit Manager
Texas Department of State Health Services
P. O. Box 149347
Austin, Texas 78714-9347

C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

*Steven P. Frantz, Esquire
A. H. Gutterman, Esquire
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Ave. NW
Washington D.C. 20004

*George F. Wunder
*Tekia Govan
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852

(electronic copy)

*George F. Wunder
*Tekia Govan
Loren R. Plisco
U. S. Nuclear Regulatory Commission

Steve Winn
Joseph Kiwak
Eli Smith
Nuclear Innovation North America

Jon C. Wood, Esquire
Cox Smith Matthews

J. J. Nesrsta
Kevin Pollo
L. D. Blaylock
CPS Energy

RAI 02.05.02-19, Supplement 2:

SUPPLEMENTAL QUESTION:

During a telephone conference with the NRC Staff on November 12, 2009, STPNOC agreed to provide supplemental information to clarify the changes to FSAR Tables 2.5S.2-18 and 2.5S.2-19 provided in STP COLA Revision 3 and to explain the differences between these tables and Figures 2.5S.2-39, 2.5S.2-41, 2.5S.2-43, 2.5S.2-45 and 2.5S.2-49a. These Tables and Figures were shown as replaced in their entirety in Supplement 1 to the response to RAI 02.05.02-19 (STP Letter U7-C-STP-NRC-090090 (ML 092250658) dated August 10, 2009). Revision 3 of the FSAR incorporated the changes submitted in RAI 02.05.02-19.

RESPONSE, SUPPLEMENT 2:

Changes to the Uniform Hazard Response Spectra (UHRS) values in FSAR Tables 2.5S.2-18, "Horizontal 10-4 Rock and Site Specific UHRS (in g)," and 2.5S.2-19, "Horizontal 10-5 Rock and Site Specific UHRS (in g)," provided in RAI 02.05.02-19, Supplement 1, and incorporated into Revision 3 of the FSAR are explained below:

1) There are nine columns in both Table 2.5S.2-18 and Table 2.5S.2-19:

Column 1: Frequency
Column 2: LF [low frequency] rock UHRS
Column 3: HF [high frequency] rock UHRS
Column 4: LF amplification factors [Transfer Function]
Column 5: HF amplification factors [Transfer Function]
Column 6: LF Surface UHRS
Column 7: HF Surface UHRS
Column 8: Raw Site-Specific UHRS [envelope of columns 6 and 7]
Column 9: Smoothed Site-Specific UHRS

Column 1
The 38 frequency values in Column 1 are unchanged between Revision 2 and Revision 3 of the FSAR.

Columns 2 and 3
The seven Probabilistic Seismic Hazard Analysis (PSHA) rock spectral values for both 10^{-4} and 10^{-5} – at frequencies 100, 25, 10, 5, 2.5, 1, and 0.5 Hz – are unchanged between Revision 2 and Revision 3 of the FSAR – see FSAR Tables 2.5S.2-18 and 2.5S.2-19. What did change, however, was the high frequency and low frequency deaggregation of the rock ground motion hazard, the degree of which can be seen in comparing FSAR Tables 2.5S.2-17 from the two revisions. In the earlier determination of the controlling distances, *linear* distances were used, while for Revision 3 of the FSAR *logarithmic* distances were used. While linear distances and numerous distance bins are used by the USGS in their National Hazard Mapping Project in assessing mean distance for their deaggregation plots, many fewer distance bins [7] with

logarithmic distances are presented in Reg. Guide 1.208. Use of logarithmic distances notably decreases controlling distances, especially for distant sources of large magnitude earthquakes.

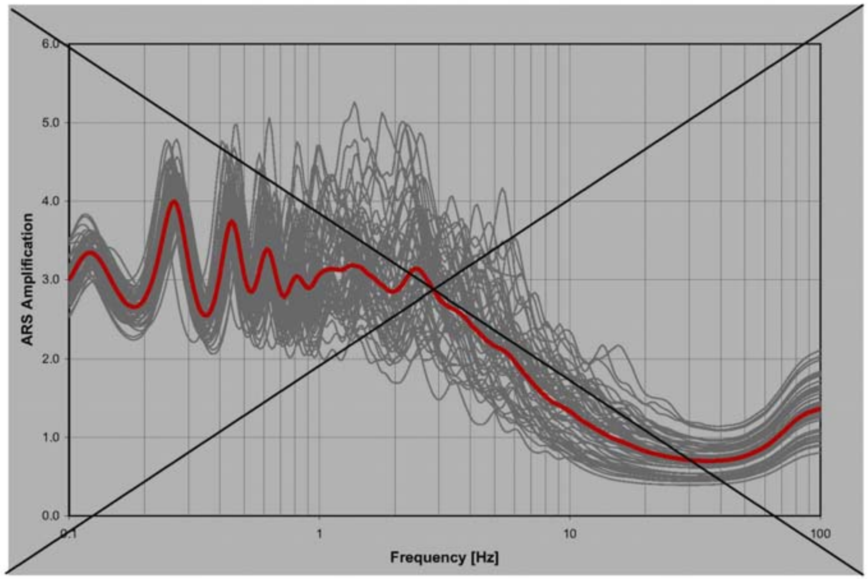
As discussed in the FSAR text, the controlling magnitudes and distances were used to develop the Central and Eastern United States (CEUS) rock response spectral shapes, as recommended in NUREG/CR-6728, for each 10^{-4} and 10^{-5}, HF and LF rock response spectra. These shapes were then constrained to go through all seven of, or a subset of, the given 10^{-4} or 10^{-5} PSHA rock ground motion response spectral accelerations to give the corresponding broadband HF and LF rock response spectra in columns 2 and 3 in the two tables. With these constraints, the high and low frequency rock spectra in columns 2 and 3 are little changed between constrained points for the two revisions. The greatest differences between the revisions occur where the spectral shapes are not constrained: for frequencies less than 5 Hz for the HF response spectra; and for frequencies less than 0.5 Hz for the LF response spectra; and where the different NUREG/CR-6728 spectral shapes are retained explicitly for the lower frequencies.

<u>Columns 4 through 9</u>
In addition to the changes in the HF and LF rock spectra (Columns 2 and 3) between Revisions 2 and 3 of the COLA, the site response analysis was re-run using a new set of modified randomized soil profiles that resulted in additional changes in columns 4 through 9 of the tables. As documented in FSAR Section 2.5S.2.5, the modified profiles in Revision 3 reflected the following:

- a- new material parameters from newly available Resonant Shear Column Torsional (RCTS) test data;
- b- deep sonic log data that resulted in changes in deep velocity profile; and
- c- a truncation study that resulted in the soil column model being extended deeper.

2) During this review, STPNOC identified that FSAR Figures 2.5S.2-39, 2.5S.2-41, 2.5S.2-43, 2.5S.2-45 and 2.5S.2-49a should be revised to show the transfer functions consistent with the revised values in Tables 2.5S.2-18 and 2.5S.2-19.

FSAR Figures 2.5S.2-39, 2.5S.2-41, 2.5S.2-43, 2.5S.2-45 and 2.5S.2-49a will be replaced as shown on the following pages:



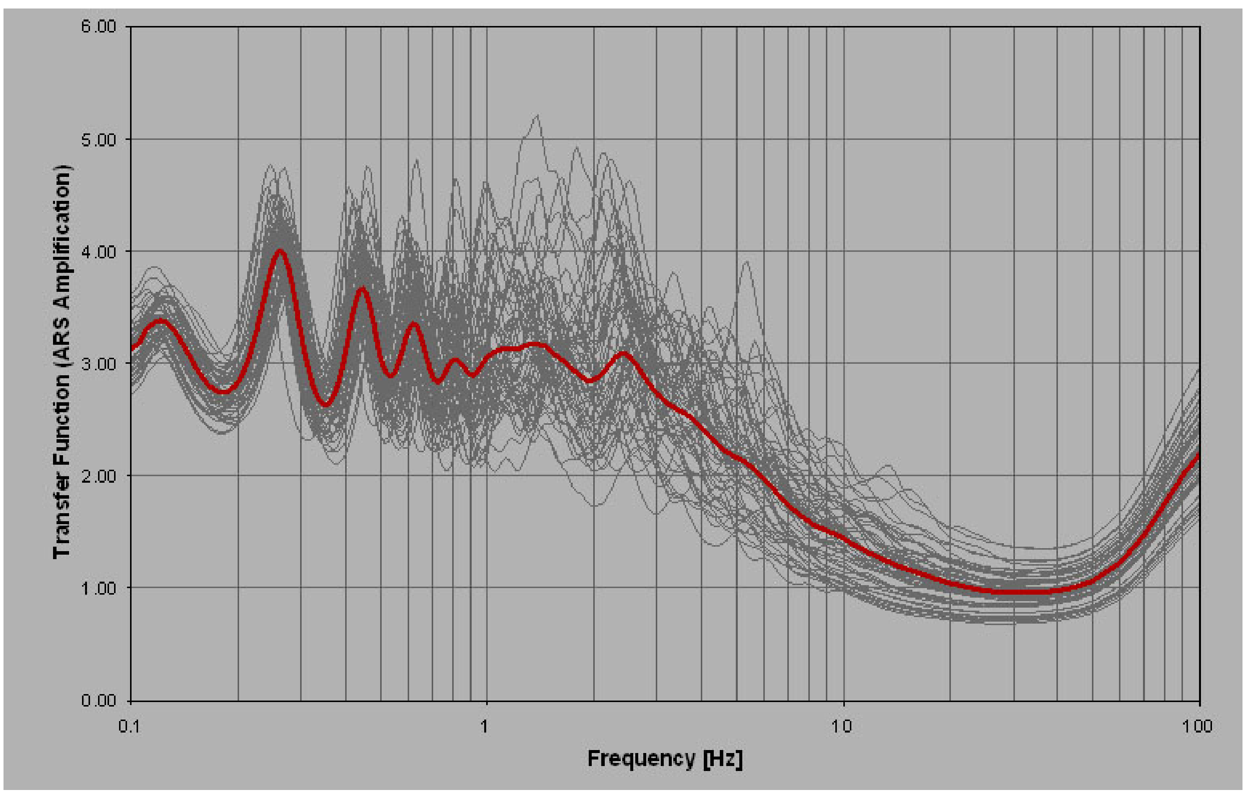
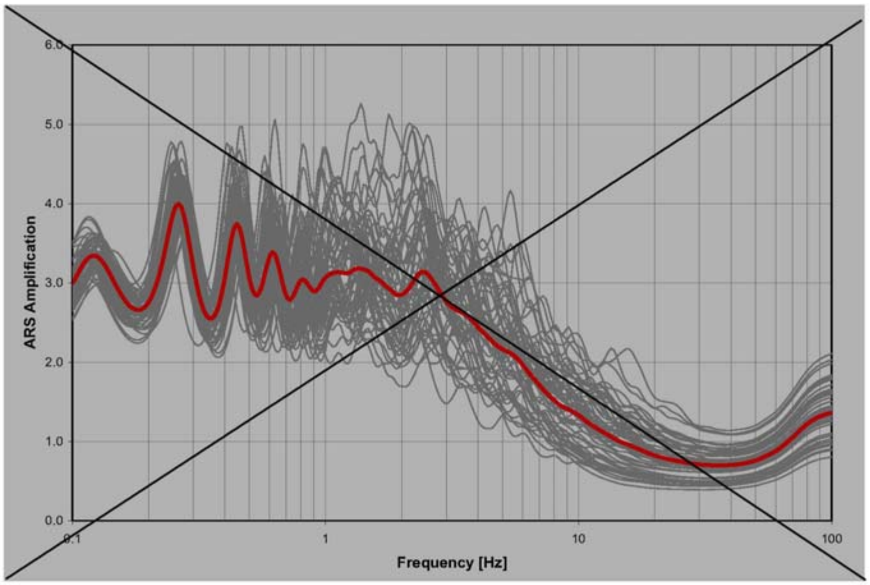


Figure 2.5S.2-39 Logarithmic Mean ~~and Standard Deviation~~ of Site ~~Amplification Factors~~ Transfer Functions (Amplification Factors) at Ground Surface from Analysis of the 60 Modified Random Profiles with the 10^{-4} LF Input Motion



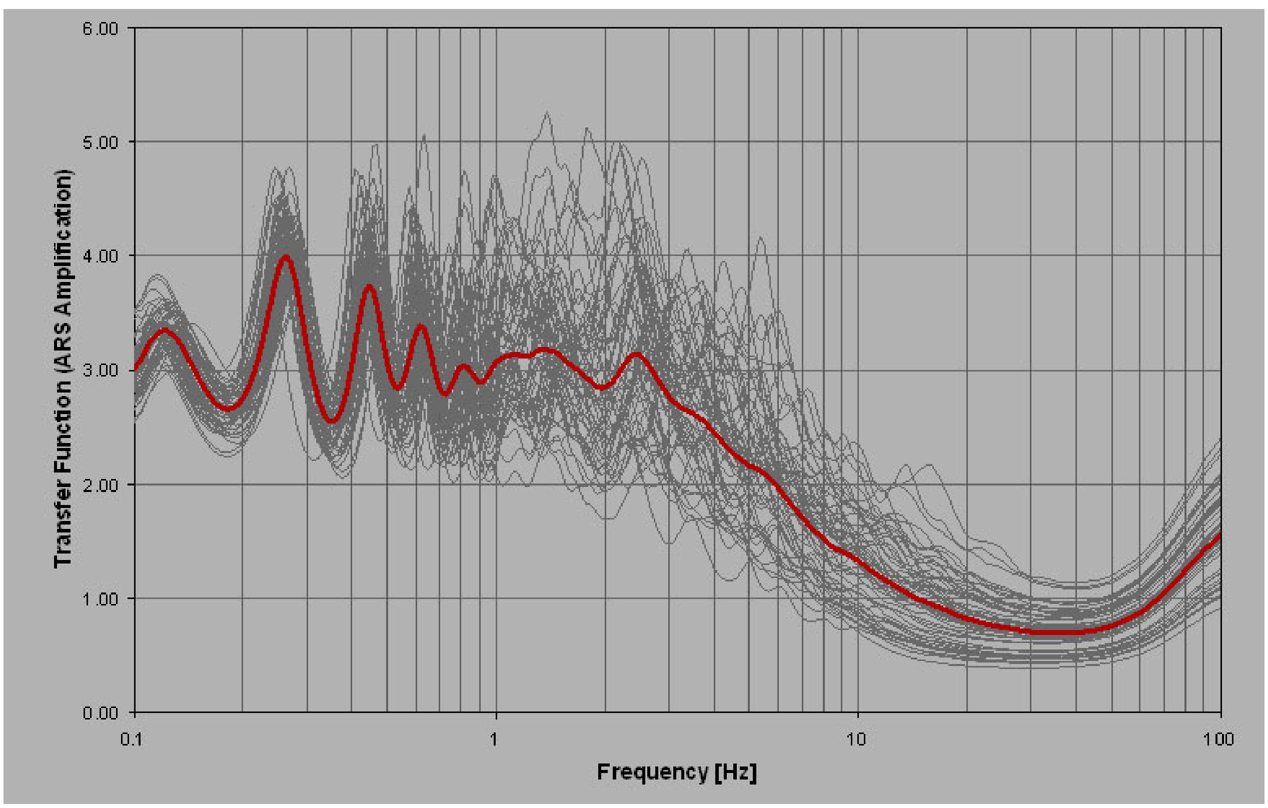
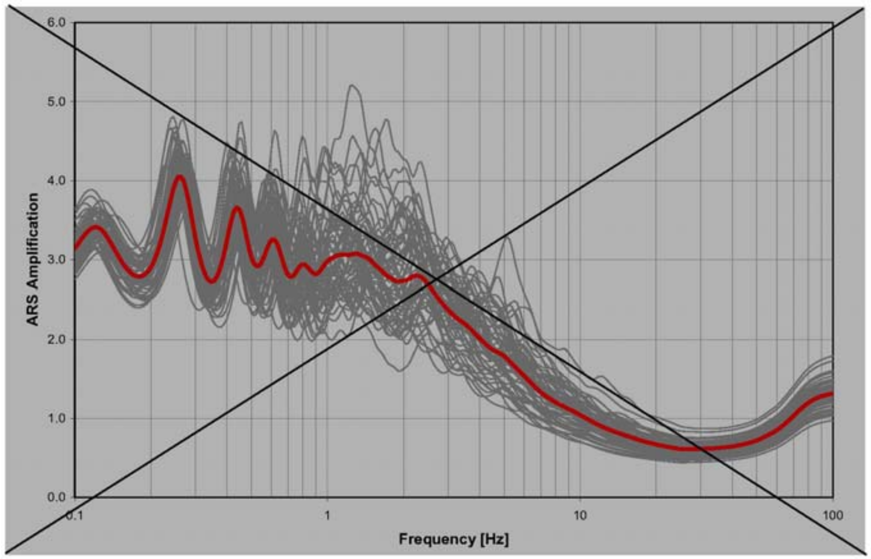


Figure 2.5S.2-41 Logarithmic Mean of Site ~~Amplification Factors~~ Transfer Functions (Amplification Factors) at Ground Surface from Analysis of the 60 Modified Random Profiles with the 10^{-4} HF Input Motion



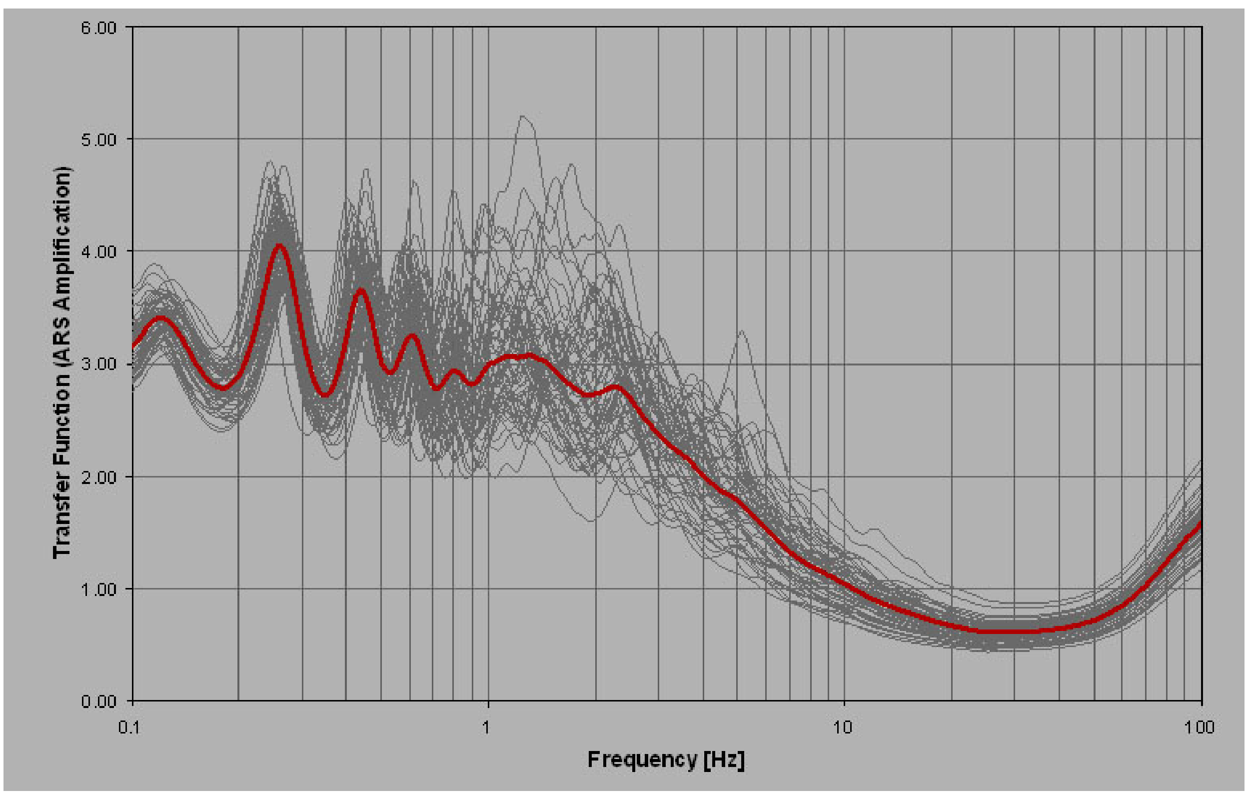
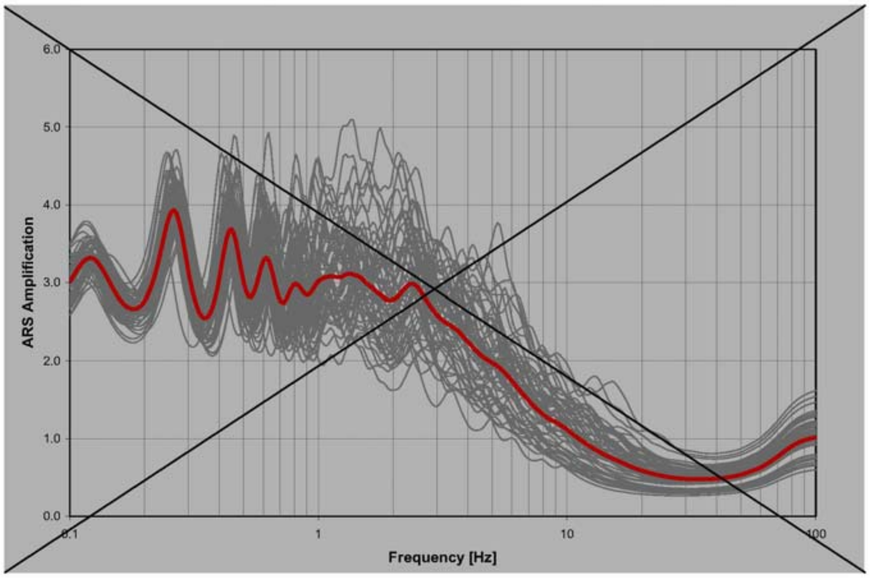


Figure 2.5S.2-43 Logarithmic Mean of Site ~~Amplification Factors~~ Transfer Functions (Amplification Factors) at Ground Surface from Analysis of the 60 Modified Random Profiles with the 10^{-5} LF Input Motion



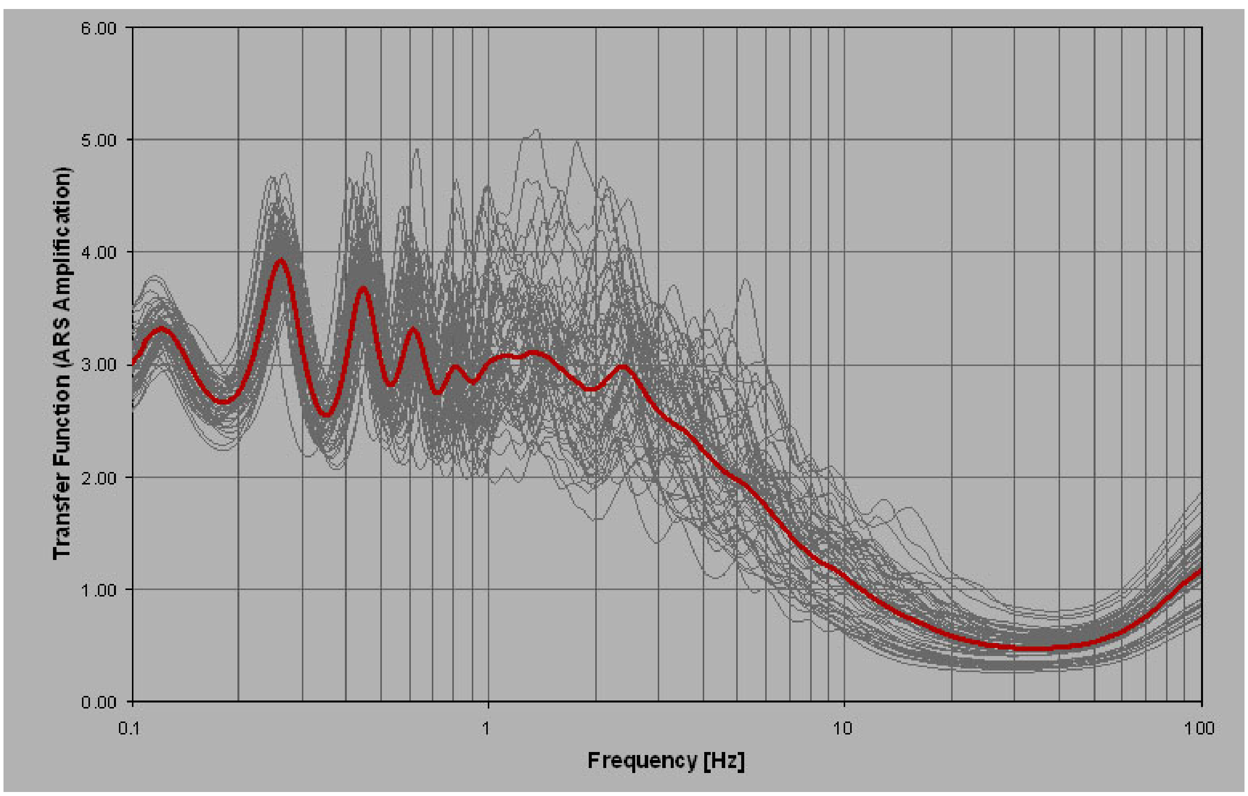
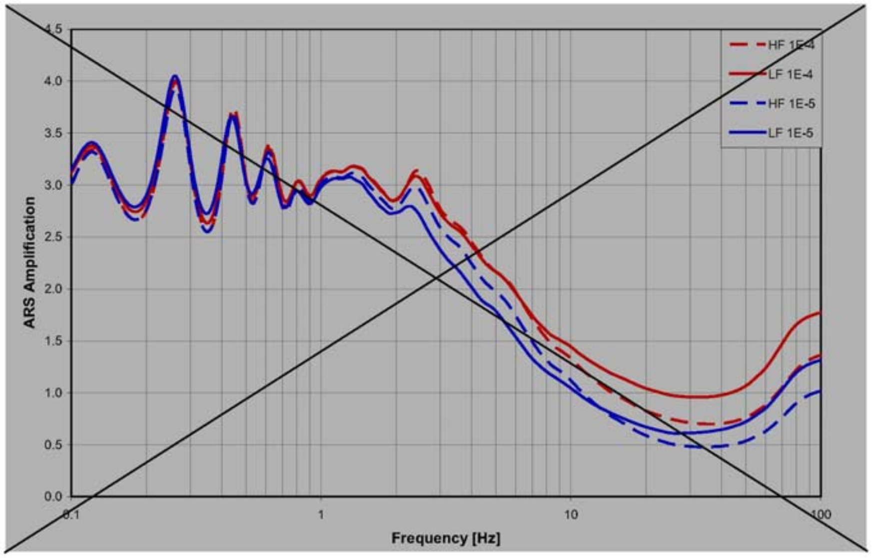


Figure 2.5S.2-45 Logarithmic Mean of Site ~~Amplification Factors~~ Transfer Functions (Amplification Factors) at Ground Surface from Analysis of the 60 Modified Random Profiles with the 10^{-5} HF Input Motion



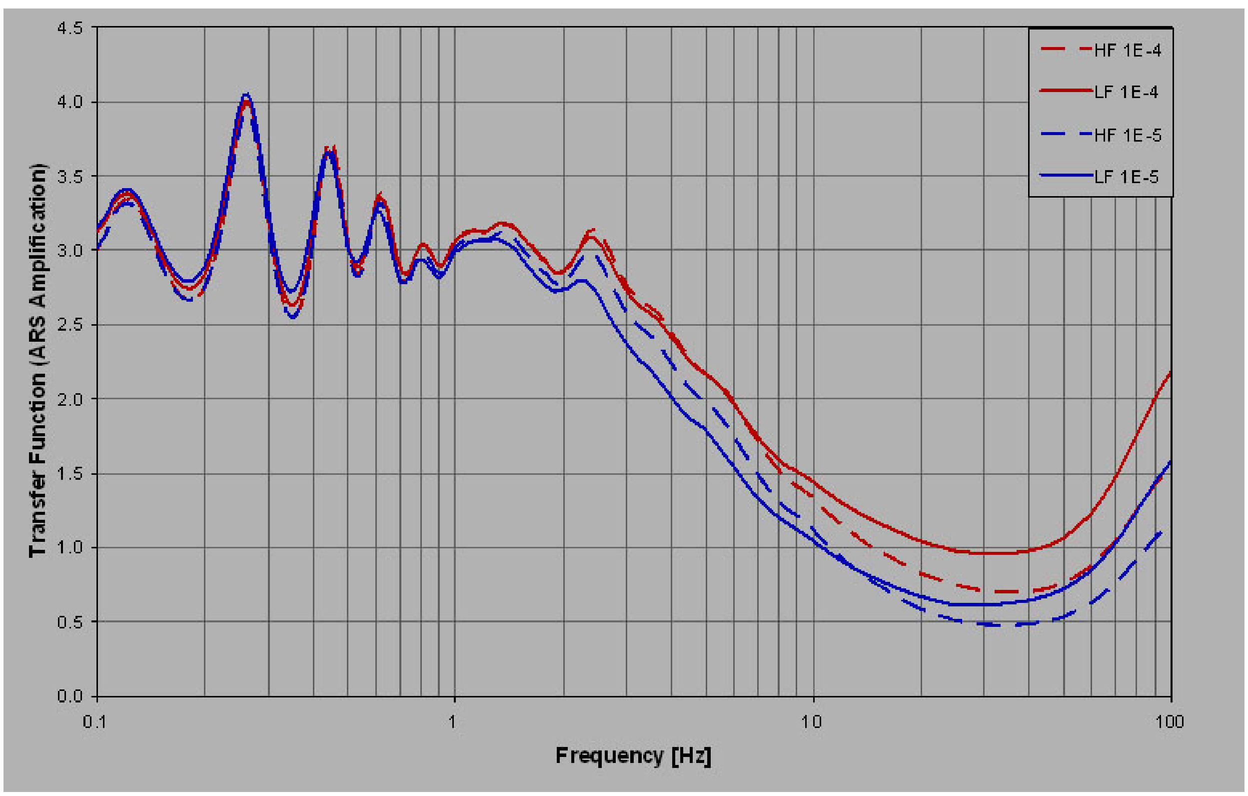


Figure 2.5S.2-49a Comparison of Log-Mean Soil ~~amplification Factors~~ Transfer Functions (Amplification Factors) at the Ground Surface Level for LF and HF 10^{-4} and 10^{-5} Input Motions

RAI 02.05.04-33

<u>QUESTION</u>:

In response to RAI 2.5.4-31 you indicate that you will determine static and dynamic engineering properties for the backfill materials, but you do not specify types or quantity of tests to be performed. As some of your Category 1 structures will be founded on structural backfill, the critical soil parameters (strength, compressibility, shear modulus degradation and damping ratio) need to be defined for the range of backfill types that will be encountered in the placement of 2.2 million cubic yards of backfill. Please provide additional information for the FSAR that specifies types of tests, frequency of testing and how your quality control program will ensure that assumed soil parameters used in design are bounded by as-built backfill soil parameters.

<u>RESPONSE</u>:

The response to RAI 14.03.02-6 (STPNOC letter U7-C-STP-NRC-090150, dated September 21, 2009, (ML092660093)) provided the revised ITAAC for backfill and provided references listing COLA sections where the technical basis for verifying adequacy and acceptability of the backfill material and placement is discussed. Additionally, as stated in the response to RAI 02.05.04-31, (STPNOC letter U7-C-STP-NRC-090170, dated October 12, 2009, (ML092890084)) when the source of backfill material to be placed under Seismic Category I structures is identified, testing will be conducted to ensure that the backfill properties are consistent with design inputs used in the analysis of these structures.

Prior to the delivery of the material to the project site, each off-site source for backfill will be sampled at the source and tested for compliance with the specifications. Tests will include grain size (ASTM D6913), organic matter (ASTM D2488) and compaction tests (ASTM D1557). Testing of backfill materials sampled at the source will also include consolidation (ASTM D2435), triaxial shear (USACE Procedure) and Resonant Column Torsional Shear (RCTS) (University of Texas procedure PBRCTS-1). Specific types and frequency of tests that will be performed are contained in the revised COLA Part 2 (Tier 2) Table 2.5S.4.3-1 included in this response.

In order to ensure that the assumed soil parameters used in the design are bounded by the as-built backfill soil parameters, the results of the consolidation and triaxial shear tests will be evaluated to determine that the compressibility and strength of the material will be at least as good as the values used in the engineering analyses of lateral earth pressure, settlement and bearing capacity and design. The results of the RCTS tests will also be evaluated to determine that the low strain shear wave velocity of the material, when placed and compacted, will lie within the range used in the soil-structure interaction (SSI) analysis and that the modulus and damping variations with shear strain are within the range used for the SSI analysis.

Once brought to the site, the materials from each source will be stockpiled separately to permit sampling and verification of the material properties before placement. These tests will include grain size (ASTM D6913) and organic matter (ASTM D2488). Additional compaction tests

(ASTM D1557) at the site will be performed on samples obtained from the backfill material as it is placed for compaction.

Prior to constructing backfill in the excavation for the plant structure, a test fill pad will be constructed on-site using the equipment and granular fill materials to be used in the backfill. The test pad will allow for verifying the size of compaction equipment, number of passes, lift thickness and other relevant data for achieving the specified compaction. The low strain shear wave velocity achieved in the test pad will be measured in-situ using surface wave and downhole methods.

Prior to placing the imported materials as backfill, an engineering report will be prepared to confirm that the materials, construction equipment and methods used to construct the test pad are capable of producing acceptable and consistent results.

COLA Part 2 (Tier 2) Section 2.5S.4.5.3 and Table 2.5S.4.5.3-1 are being revised to include these requirements for accepting materials for backfill, the types of tests, and the procedure for ensuring the backfill soil parameters used in design are bounded by the as-built backfill soil parameters. It should be noted that the criteria for minimum unit weight and angle of internal friction are based on values for earth pressure characterization and differ from those indicated as being used in the analysis of bearing capacity for structures supported on structural backfill in COLA Part 2. The affected structures (Reactor Service Water Piping Tunnels and Diesel Generator Fuel Oil Storage Vaults) all have high factors of safety greater than or equal to 71 based on the parameters ($\gamma = 134$ lb/ft^3 , $\varphi = 36^{o}$) used in the FSAR as shown in FSAR Table 2.5S.4-41B. Considering the high factors of safety, it is not anticipated that the change in the minimum unit weight and angle of internal friction will result in safety factors lower than the criterion of 3.0.

Revisions will be incorporated into the STP Units 3 and 4 COLA Part 2 (Tier 2), Section 2.5S.4.5.3, as indicated in the markup on the following pages:

2.5S.4.5.3 Compaction Specifications

Once structural fill sources are identified, as discussed in Subsection 2.5S.4.5.1, several samples of materials are obtained and tested for index properties and for engineering properties, including grain size and plasticity characteristics, moisture-density relationships, and dynamic properties. For foundation support and for backfill against walls, structural fill ~~needs are~~ is compacted to a minimum of 95% of its maximum dry density and within + or -3% of its optimum moisture content, as determined based on the modified Proctor compaction test procedure (Reference 2.5S.4-42).

A trial fill program is normally conducted for the purposes of determining the optimum number of compactor coverages (passes), the maximum loose lift thickness, and other relevant data for optimum achievement of the specified moisture-density (compaction) criteria.

Quality control for structural fill placement includes observation of borrow area excavation, moisture conditioning, and compaction. Representative samples of the structural fill material are selected and tested to verify that material classification and compaction characteristics are within range of the materials specified and used for design. ~~It is anticipated that the bulk of the structural fill will come from off-site sources.~~ Prior to the delivery of the material to the project site, each off-site source will be sampled at the source and tested for compliance with the specifications. Tests will include grain size (ASTM D6913), organic matter (ASTM D2488) and compaction tests (ASTM D-1557). Testing of materials sampled at the source will also include consolidation (ASTM D2435), triaxial shear (USACE Procedure) and Resonant Column Torsional Shear (RCTS) (University of Texas procedure PBRCTS-1).

The results of the consolidation and triaxial shear tests will be evaluated to determine that the compressibility and strength of the material will be at least as good as the values used in the engineering analyses of lateral earth pressure, settlement and bearing capacity.

The results of the RCTS tests will be evaluated to determine that the low strain shear wave velocity of the material, when placed and compacted, will lie within the range used in the analysis for site response to earthquakes and that the modulus and damping variations with shear strain are within the range used for site response.

The materials from each source will be stockpiled separately to permit sampling and verification of the material properties before placement. These tests will include grain size (ASTM D6913) and organic matter (ASTM D2488). Additional compaction tests (ASTM D1557) at the site will be performed on samples obtained from the backfill material as it is placed for compaction.

Prior to constructing backfill in the excavation for the plant structure, a test fill pad will be constructed on-site using the equipment and granular fill materials to be used in the backfill. The test pad will allow for verifying the size of compaction equipment, number of passes, lift thickness and other relevant data for achieving the specified compaction. The low strain shear wave velocity achieved in the test pad will be measured in-situ using surface wave and downhole methods.

Prior to placing the materials as backfill, an engineering report will be prepared to confirm that the materials, construction equipment and methods used to construct the test pad are capable of producing acceptable and consistent results.

Depending on the on-site handling of the imported material, moisture content adjustment may be necessary to achieve proper compaction. If water is added, it is uniformly applied and thoroughly mixed into the soil by discing. Testing of the backfill material during construction is required to verify that the engineering properties are compatible with the pre-construction qualification testing. Periodic density testing is performed on compacted fill as the material is placed. A quality control sampling and testing program inclusive of the items provided by Table 2.5S.4.5.3-1 is implemented during placement of the structural fill. This quality control sampling and testing program verifies that the structural fill is placed in accordance with the design parameters described in this Subsection.

Table 2.5S.4.5.3-1 Quality Control Recommendations for Structural Fill

Material	**Test**	**Minimum Sampling and Testing Frequency**
Structural Fill	Field Density	Minimum 1 sample per 500 cubic yards placed, sample taken at suspect areas, and at least one per every lift.
	Moisture	One test for each Field Density test
	Moisture-Density Relationship (Modified Proctor)	One test for every borrow area and material type and any time material type changes. Additional test for every 40 Field Density test (ASTM D1557)
	Gradation	One test for each Moisture-Density test. (ASTM D 6913)
	Atterburg Atterberg Limits	One test for each Moisture-Density test. (ASTM D 4318) for backfill types appropriate for this test.)
	Material Type	Soil must come from an approved borrow source. Other soil sources must be tested and approved.

The following laboratory tests will be performed on samples of the proposed granular fill materials before they are approved for use. An engineering report will be prepared to confirm that the granular fill material will produce a backfill having acceptable engineering properties.

Test	**Minimum No. of Tests**	**Criterion for Acceptance Unless Approved by Engineer of Record**
Grain Size ASTM D6913	1 per material type per source	Complies with Specifications
Organic Matter ASTM D2488	1 per material type per source	Complies with Specifications
Specific Gravity ASTM D854	1 per material type per source	Complies with Specifications
Modified Proctor ASTM D1557	1 per material type per source	Maximum Dry Density Will Result in a Saturated Total Unit Weight ≥ 120 lb/ft^3
Constant Head Permeability ASTM D2434	1 per material type per source	Complies with Specifications
pH ASTM G51	1 per material type per source	Complies with Specifications
Chloride Content EPA SW-846 9056/300.0	1 per material type per source	Complies with Specifications
Sulfate Content EPA SW-846 9056/300.0	1 per material type per source	Complies with Specifications
Resistivity ASTM G 57	1 per material type per source	Complies with Specifications
Consolidated Drained Triaxial Shear USACE EM-1110-2-1906 Appendix X (30 Nov. 70)	1 per material type per source	□’ ≥ 30˚
Consolidation ASTM D2435	1 per material type per source	Complies with Specifications
Resonant Column Torsional Shear University of Texas Procedure PBRCTS-1	1 per material type per source Test at 4 to 6 isotropic confining stress values	Maximum shear modulus, modulus ratio, and damping ratio consistent with upper range and lower range values used for soil-structure interaction analysis

The following criteria are required for structural fill placement around the STP Units 3 & 4 Seismic Category I Structures:

- The on-site equipment includes earthwork equipment for both drying and wetting of soils
- Materials selected for use as structural fill are free from roots and other organic matter, trash, debris, frozen soil, and stones larger than 6 inches in any dimension. The following soil types are considered unsuitable for use as structural fill: PT, OH, OL, MH, ML, CL, and CH (Referenced from Unified Soil Classification System).
- Suitable structural fill soils of the types ~~on-site~~ (SM, SC, SW and GW) are placed in accordance with specifications developed following testing. The soil is compacted by mechanical means such as steel drum, tamping, or rubber-tired rollers.
- Structural fill is compacted to at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) to within 3 percent of the optimum moisture content.

Lateral pressures applied against the below grade Nuclear Island walls are evaluated and discussed in Subsection 2.5S.4.10.3. Evaluation and discussion of liquefaction issues related to the structural fill materials is provided in Subsection 2.5S.4.8.