Vogtle PEmails

From: Williams, Dana M. [DANAWILL@SOUTHERNCO.COM]
Sent: Thursday, April 17, 2008 5:05 PM
To: Christian Araguas; Jan Mazza; William Burton
Cc: Davis, James T.
Subject: SNC Letter AR-08-0615 transmitting Supplemental Info Regarding Request For Additional Info No. 2.5.2-3 and SER O/I No. 2.5-5
Attachments: AR-08-0615 Letter_FINAL.pdf

An electronic copy of Southern Nuclear's letter, AR-08-0615, dated April 17, 2008 is attached. In addition, a hard copy has been transmitted to the NRC Document Control desk via FedEx.

<<AR-08-0615 Letter_FINAL.pdf>>

Thank you,

Dana Williams
Southern Nuclear Operating Company
Nuclear Development
P 205.992.5934
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Hearing Identifier: Vogtle_Public_EX
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From: Williams, Dana M.

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Tracking Status: None
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Recipients Received:

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APR 17 2008

Docket No.: 52-011

AR-08-0615

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

Southern Nuclear Operating Company
Vogtle Early Site Permit Application
Supplemental Information Regarding Request For Additional Information No. 2.5.2-3
and Safety Evaluation Report Open Item No. 2.5-5

Ladies and Gentlemen:

In Revision 4 to the Vogtle Early Site Permit (ESP) Application, Southern Nuclear Operating Company (SNC) changed the definition of the ground motion response spectrum (GMRS) from the top of the Blue Bluff Marl to the ground surface. This change in definition of the GMRS requires a revision to the supplemental response provided for U.S. Nuclear Regulatory Commission (NRC) request for additional information (RAI) No. 2.5.2-3 in letter AR-07-1162, dated June 14, 2007. Enclosure 1 to this letter provides SNC's revised supplemental response for RAI No. 2.5.2-3.

In addition, by letter dated in October 15, 2007, SNC provided the NRC with responses to open items (OIs) from the Vogtle ESP Application Safety Evaluation Report (SER). Included in these SER OI responses was a response to OI 2.5-5. Based on subsequent discussions with the NRC, SNC is supplementing its response to this SER OI in providing additional information in the form of a letter that documents a discussion with Stephen Obermeier, retired from the U.S. Geological Survey. This letter is provided in Enclosure 2 to this letter.

The SNC contact for this supplemental information letter is J. T. Davis at (205) 992-7692.

Mr. J. A. (Buzz) Miller states he is a Senior Vice President of Southern Nuclear Operating Company, is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

Joseph A. (Buzz) Miller

Sworn to and subscribed before me this 17th *day of* April, *2008*

Notary Public: Dana M. Williams

My commission expires: 12/29/2010

JAM/BJS/dmw

Enclosures:

1. Revised Supplemental Response For Vogtle ESP Application RAI No. 2.5.2-3
2. Supplemental Information For Vogtle ESP SER Open Item 2.5-5

cc: <u>Southern Nuclear Operating Company</u>
Mr. J. B. Beasley, Jr., President and CEO (w/o enclosures)
Mr. J. T. Gasser, Executive Vice President, Nuclear Operations (w/o enclosures)
Mr. T. E. Tynan, Vice President - Vogtle (w/o enclosures)
Mr. D. M. Lloyd, Vogtle Deployment Director (w/o enclosures)
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Mr. D. P. Moore, Engineering Programs Consulting Engineer
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<u>Tetra Tech NUS, Inc.</u>
Ms. K. K. Patterson, Project Manager (w/o enclosures)

Southern Nuclear Operating Company

AR-08-0615

Enclosure 1

Revised Supplemental Response

For

Vogtle ESP Application RAI No. 2.5.2-3

<u>**Note**</u>**:** This enclosure consists of a 23-page attachment.

SSAR Section 2.5.2 Vibratory Ground Motion

RAI 2.5.2-3 **In response to this RAI, soil hazard curves were provided at three annual exceedance frequencies (10^{-4}, 10^{-5}, and 10^{-6}). However, in order for the staff to verify the adequacy of the SSE, soil hazard curves are requested at additional annual exceedance frequencies (i.e. at values between 10^{-4}, 10^{-5}, and 10^{-6}).**

Supplemental Response:

At the time of the original response to RAI No. 2.5.2-3 (SNC letter AR-07-1162, dated June 14, 2007), the then current Vogtle ESP Application (Revision 2) defined the ground motion response spectrum (GMRS) at the top of the Blue Bluff marl. With the recent submittal of the ESP Application (Revision 4), the GMRS is now defined at the ground surface. The supplemental response to RAI No. 2.5.2-3, presented here, addresses the original RAI request to prepare soil hazard curves for the GMRS, now at ground surface [0-foot depth].

Spectral acceleration ground motion values are given in Table 2.5.2-21b of the ESP Application SSAR (Revision 4) for both hard rock and ground surface motions (i.e., GMRS). These values for the seven frequencies at which the probabilistic seismic hazard analysis (PSHA) was performed are listed below in Table 1 along with the Soil/Hard Rock spectral ratio for each of the three annual probability levels.

Table 1. Hard rock motions, ground surface motions, and resulting spectral ratio of resulting ground motion values.

	Hard Rock			Ground Surface Horizon			Spectral Ratio		
Freq. (Hz)	**SA (g) 10^{-4}**	**SA (g) 10^{-5}**	**SA (g) 10^{-6}**	**SA (g) 10^{-4}**	**SA (g) 10^{-5}**	**SA (g) 10^{-6}**	**Ratio 10^{-4}**	**Ratio 10^{-5}**	**Ratio 10^{-6}**
100	0.214	0.559	1.480	0.266	0.474	0.777	1.242	0.848	0.525
25	0.551	1.540	4.090	0.547	0.762	0.976	0.993	0.495	0.239
10	0.399	0.983	2.330	0.789	1.279	1.379	1.976	1.301	0.592
5	0.317	0.728	1.540	0.709	1.335	2.076	2.237	1.833	1.348
2.5	0.223	0.512	1.020	0.775	1.309	1.893	3.476	2.557	1.856
1	0.101	0.235	0.465	0.227	0.572	1.178	2.250	2.433	2.533
0.5	0.065	0.185	0.423	0.237	0.722	1.556	3.624	3.903	3.678

For each of the seven frequencies, a quadratic equation was fit to the log (base10) of the spectral ratios (AMP) as a function of the log (base10) of the annual exceedance probability (AEP). Mathematically, this functional model is given as,

$$\text{Log}_{10}(\text{AMP}) = C_1 + C_2 * \text{Log}_{10}(\text{AEP}) + C_3 * [\text{Log}_{10}(\text{AEP})]^2 \qquad (1)$$

The resulting fits to the three data points are shown in Figures 1a through 1g for each of the seven frequencies. The coefficients and equation are given at the top of each plot. Note that the red dashed line is a linear log-log line between the three data points. In the cases where the red dashed line is not visible on Figures 1a through 1g, the quadratic equation line and the linear line for the given frequency are coincidental.

Figure 1a. Quadratic fit to the amplification values for 100 Hz (PGA).

Figure 1b. Quadratic fit to the amplification values for 25 Hz.

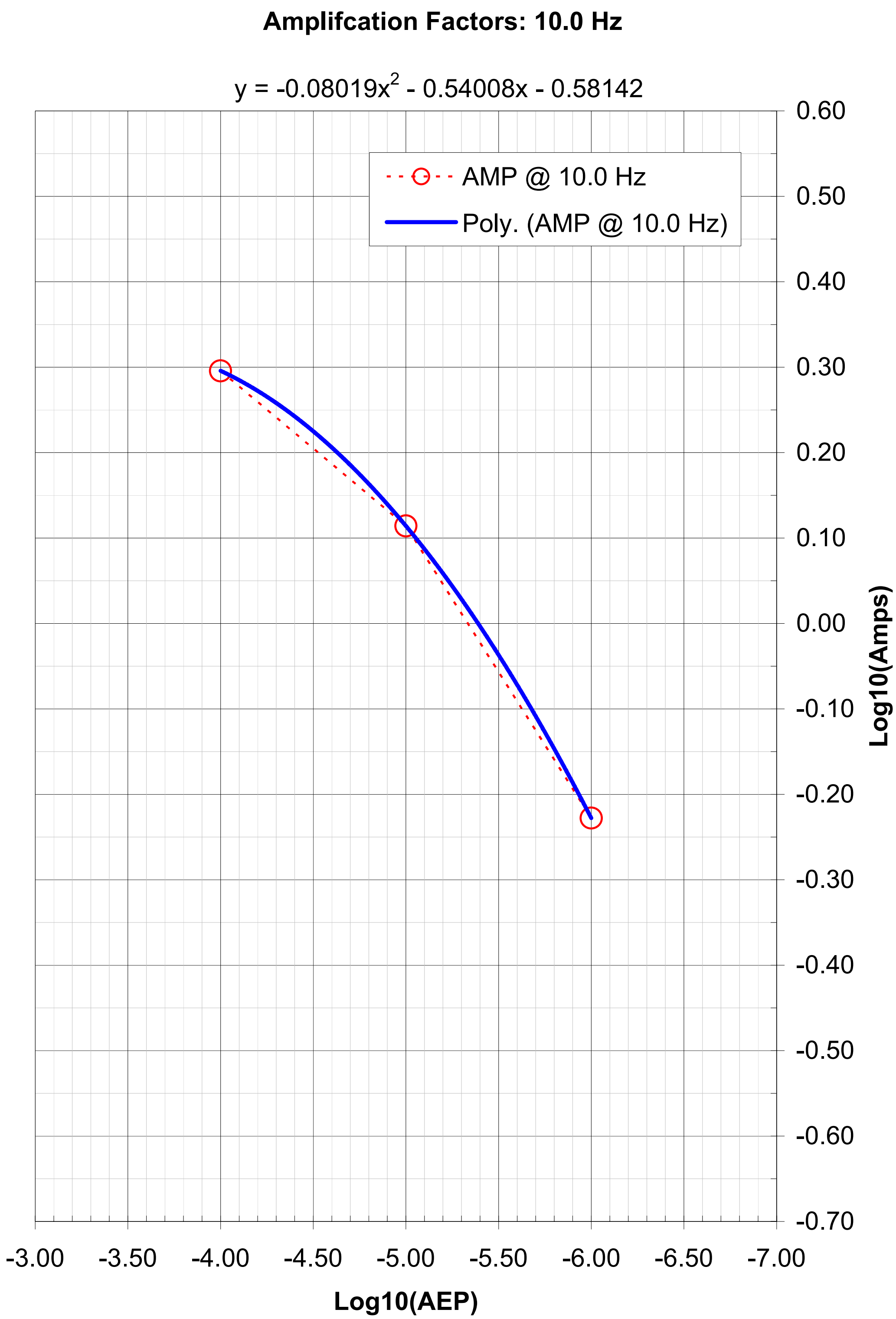

Figure 1c. Quadratic fit to the amplification values for 10 Hz.

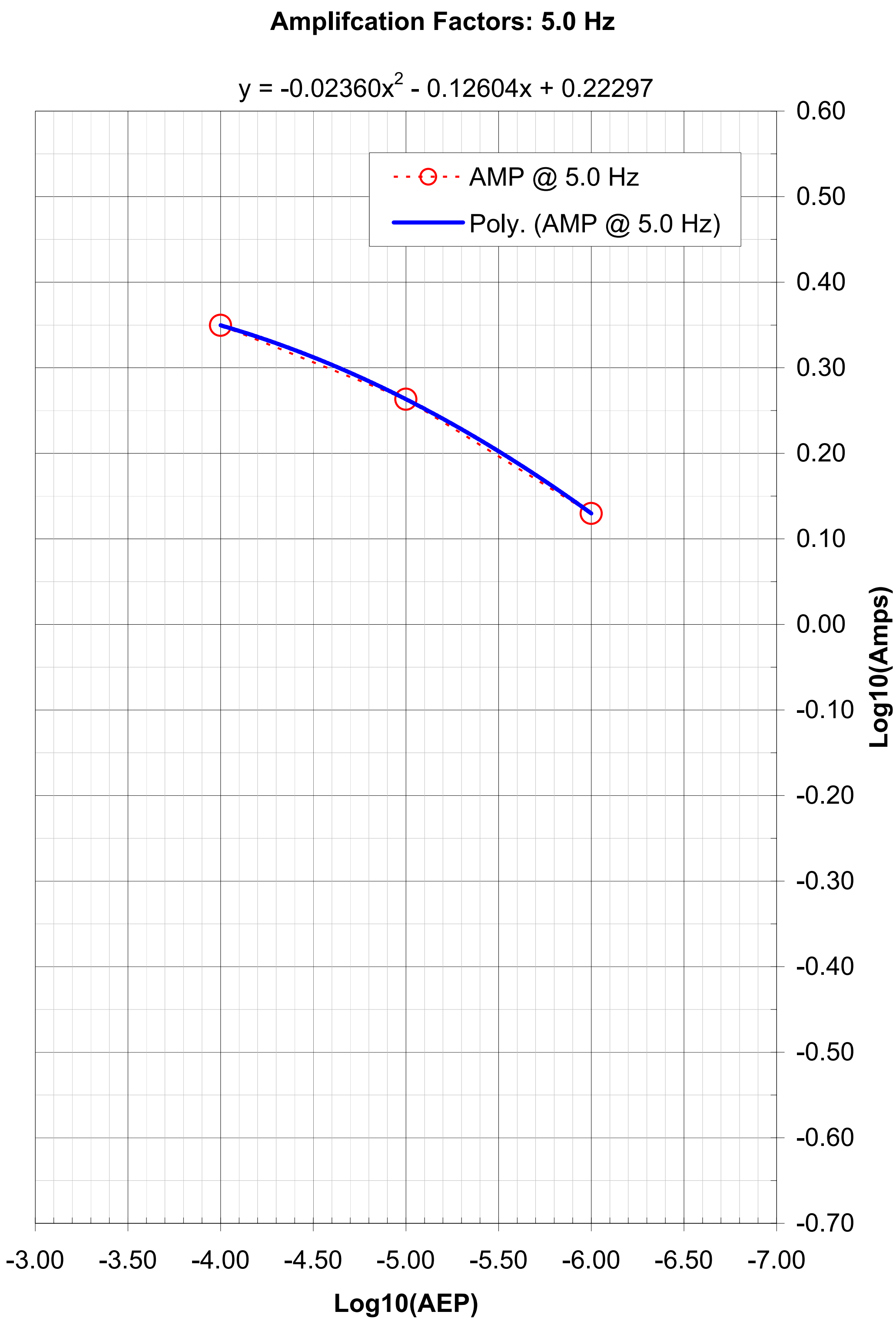

Figure 1d. Quadratic fit to the amplification values for 5 Hz.

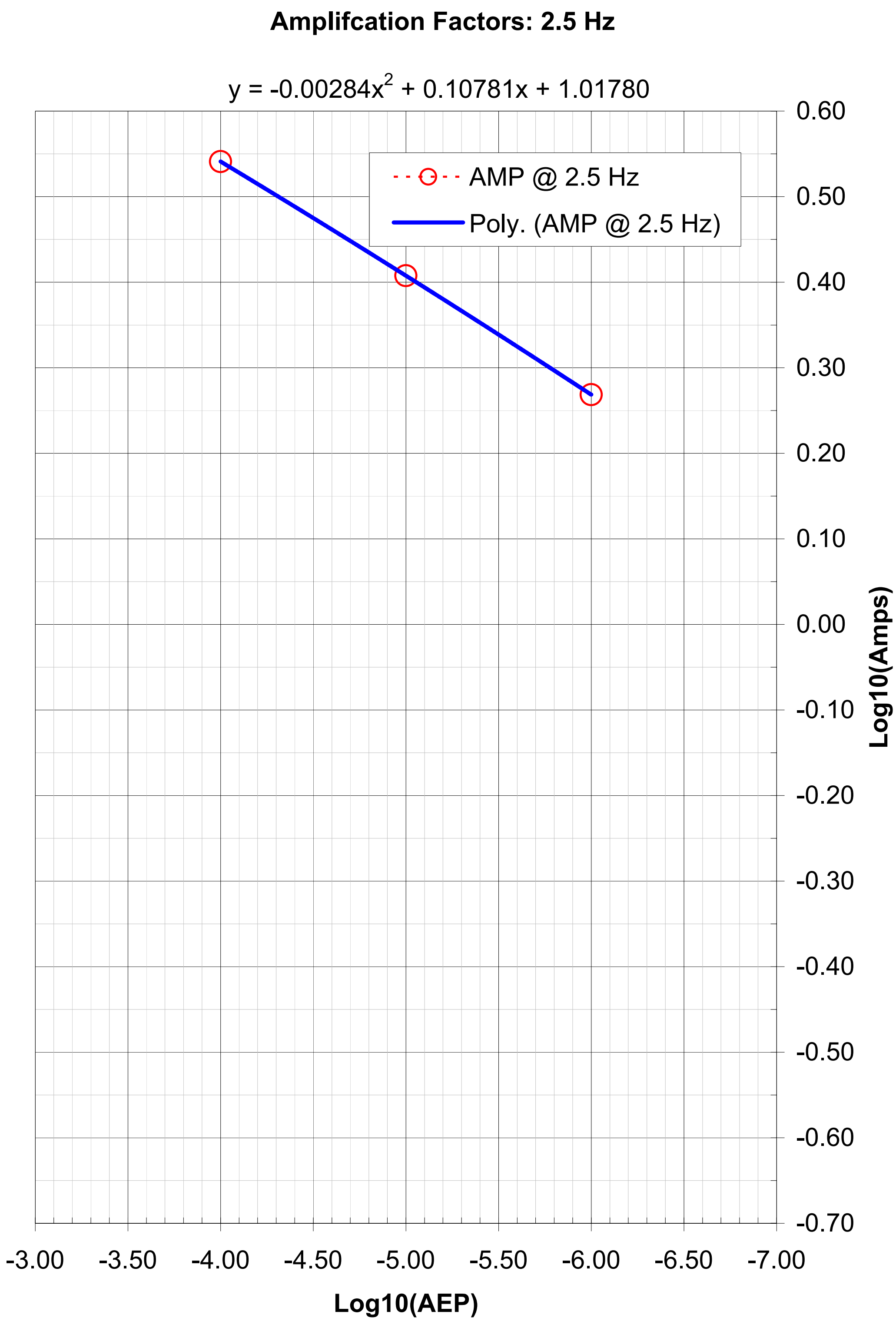

Figure 1e. Quadratic fit to the amplification values for 2.5 Hz.

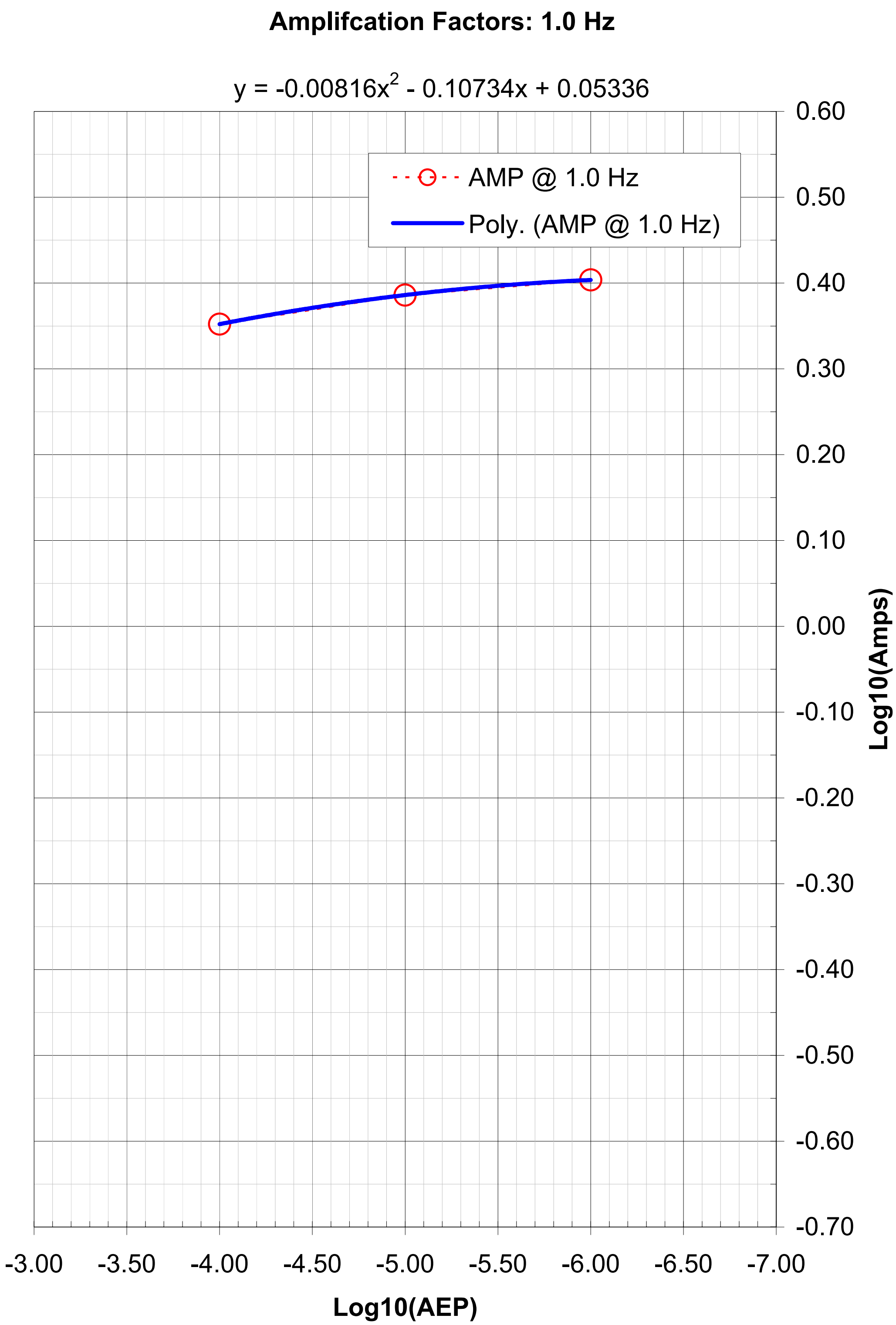

Figure 1f. Quadratic fit to the amplification values for 1 Hz.

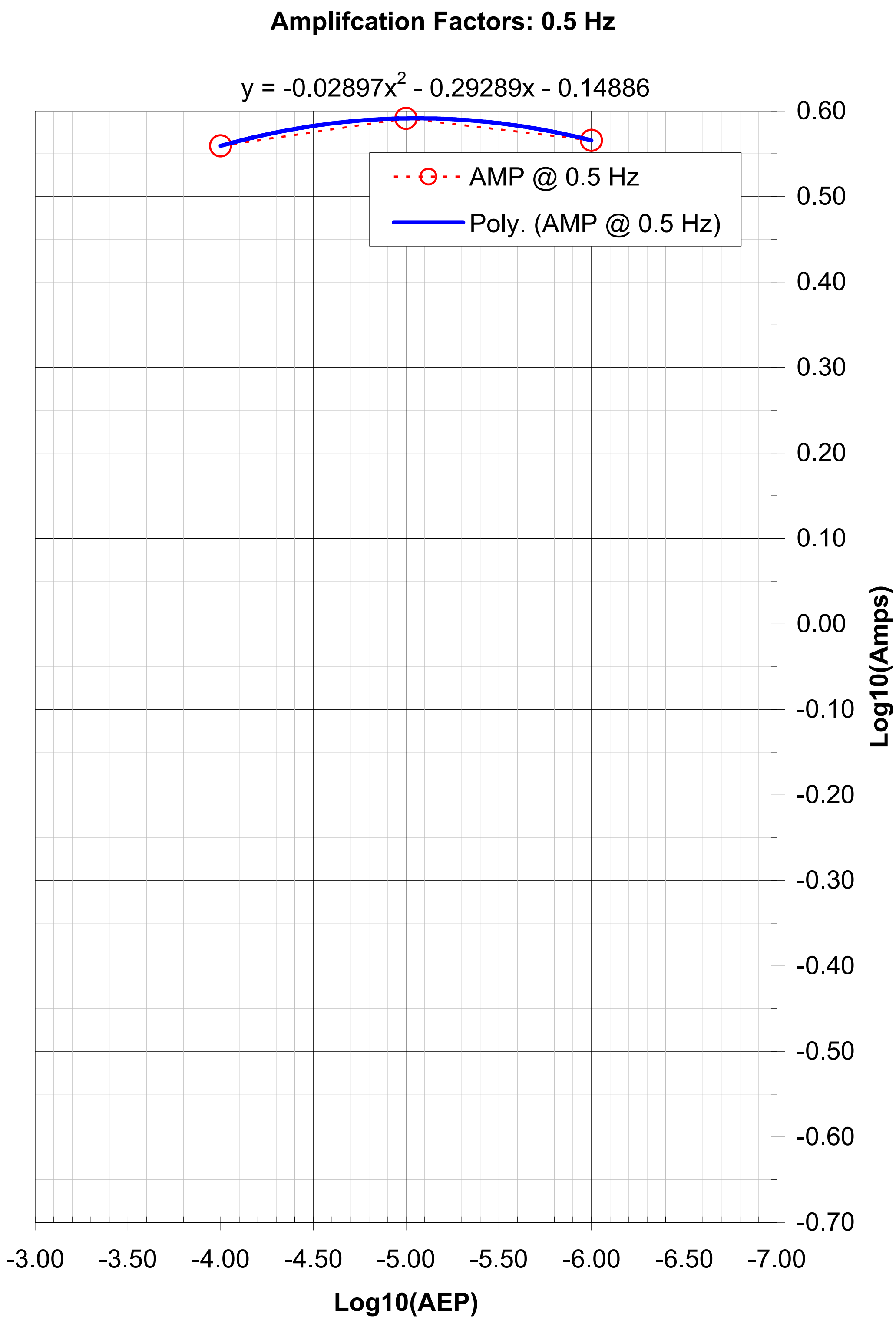

Figure 1g. Quadratic fit to the amplification values for 0.5 Hz.

Next, the hard rock hazard curves were scaled based on the functional amplification model for each frequency. The three hard rock ground motion values (see Table 1) corresponding to annual probability levels of 10^{-4}, 10^{-5}, and 10^{-6} were added to the original suite of 25 points that define the hard rock hazard curves **(Risk Engineering Inc., 0521-ACR-032, 2006)** prior to developing the ground surface horizon hazard curves. To fulfill the request for the ground surface hazard curves to span the range both above and below annual probability levels of 10^{-4} and 10^{-6}, the functional models given above were extrapolated based on the fit to the three data points. It should noted that extrapolated values must be used with caution as they lie outside the range in which the fitting function was developed. A constraint was placed on the resulting ground surface hazard curves such that the resulting hazard curve does not decrease in ground motion for decreasing annual probability of exceedance levels. In cases where this constraint is applicable, the resulting ground surface hazard curve is constrained to be vertical (i.e., same ground motion value for decreasing annual probability levels). This constraint precludes the "turning back" of the hazard curves to lower ground motions with decreasing hazard level, a result that cannot theoretically occur.

The hard rock seismic hazard curves, amplification factors, and corresponding ground surface seismic hazard curves are listed in Tables 2a through 2g for the seven frequencies. The three additional data points corresponding to probability levels of 10^{-4}, 10^{-5}, and 10^{-6} are indicated in bold. The hard rock (solid red line) and resulting ground surface seismic hazard curves are plotted in Figures 2a through 2g. As indicated on each figure, the dashed blue line is based on the extrapolation of the amplification function beyond the range 10^{-4} to 10^{-6} and the green solid line with green circles is based on the interpolation of the amplification function over the range 10^{-4} to 10^{-6}.

Table 2a. Hard rock and ground surface horizon seismic hazard curves for 100 Hz (PGA).

Hard Rock PGA (g)	**PGA AEP**	**AMPS**	**Soil PGA (g)**
1.000E-03	1.758E-02	2.0477	2.048E-03
1.500E-03	1.486E-02	2.0304	3.046E-03
2.000E-03	1.295E-02	2.0156	4.031E-03
3.000E-03	1.039E-02	1.9906	5.972E-03
5.000E-03	7.545E-03	1.9518	9.759E-03
7.000E-03	5.983E-03	1.9218	1.345E-02
1.000E-02	4.624E-03	1.8869	1.887E-02
1.500E-02	3.430E-03	1.8443	2.766E-02
2.000E-02	2.767E-03	1.8125	3.625E-02
3.000E-02	2.012E-03	1.7635	5.290E-02
5.000E-02	1.237E-03	1.6851	8.425E-02
7.000E-02	8.156E-04	1.6151	1.131E-01
1.000E-01	4.700E-04	1.5195	1.519E-01
1.500E-01	2.184E-04	1.3828	2.074E-01
2.000E-01	1.174E-04	1.2711	2.542E-01
0.214	**0.0001**	1.2423	2.658E-01
3.000E-01	4.547E-05	1.1022	3.307E-01
5.000E-01	1.310E-05	0.8915	4.457E-01
0.559	**0.00001**	0.8481	4.741E-01
7.000E-01	5.827E-06	0.7646	5.352E-01
1.000E+00	2.518E-06	0.6439	6.439E-01
1.48	**0.000001**	0.5250	7.770E-01
1.500E+00	9.738E-07	0.5218	7.827E-01
2.000E+00	4.866E-07	0.4429	8.857E-01
3.000E+00	1.723E-07	0.3407	1.022E+00
5.000E+00	4.047E-08	0.2286	1.143E+00
7.000E+00	1.406E-08	0.1667	1.167E+00
1.000E+01	4.162E-09	0.1130	1.167E+00

Table 2b. Hard rock and ground surface horizon seismic hazard curves for 25 Hz.

Hard Rock 25.0 Hz SA(g)	25.0 Hz AEP	AMPS	Soil 25.0 Hz SA(g)
1.000E-03	2.083E-02	4.3768	4.377E-03
1.500E-03	1.854E-02	4.2456	6.368E-03
2.000E-03	1.682E-02	4.1387	8.277E-03
3.000E-03	1.437E-02	3.9710	1.191E-02
5.000E-03	1.140E-02	3.7355	1.868E-02
7.000E-03	9.615E-03	3.5705	2.499E-02
1.000E-02	7.902E-03	3.3886	3.389E-02
1.500E-02	6.210E-03	3.1768	4.765E-02
2.000E-02	5.176E-03	3.0248	6.050E-02
3.000E-02	3.948E-03	2.8111	8.433E-02
5.000E-02	2.727E-03	2.5413	1.271E-01
7.000E-02	2.074E-03	2.3572	1.650E-01
1.000E-01	1.482E-03	2.1479	2.148E-01
1.500E-01	9.301E-04	1.8860	2.829E-01
2.000E-01	6.251E-04	1.6861	3.372E-01
3.000E-01	3.235E-04	1.3972	4.192E-01
5.000E-01	1.227E-04	1.0543	5.271E-01
0.551	**0.0001**	0.9927	5.470E-01
7.000E-01	6.043E-05	0.8550	5.985E-01
1.000E+00	2.718E-05	0.6724	6.724E-01
1.500E+00	1.058E-05	0.5037	7.556E-01
1.54	**0.00001**	0.4950	7.624E-01
2.000E+00	5.384E-06	0.4082	8.164E-01
3.000E+00	2.079E-06	0.3021	9.062E-01
4.09	**0.000001**	0.2387	9.762E-01
5.000E+00	6.228E-07	0.2046	1.023E+00
7.000E+00	2.751E-07	0.1563	1.094E+00
1.000E+01	1.109E-07	0.1152	1.152E+00

Table 2c. Hard rock and ground surface horizon seismic hazard curves for 10 Hz.

Hard Rock 10.0 Hz SA(g)	10.0 Hz AEP	AMPS	Soil 10.0 Hz SA(g)
1.000E-03	2.216E-02	1.2377	1.238E-03
1.500E-03	1.971E-02	1.2776	1.916E-03
2.000E-03	1.781E-02	1.3121	2.624E-03
3.000E-03	1.501E-02	1.3703	4.111E-03
5.000E-03	1.152E-02	1.4595	7.297E-03
7.000E-03	9.402E-03	1.5268	1.069E-02
1.000E-02	7.417E-03	1.6036	1.604E-02
1.500E-02	5.547E-03	1.6938	2.541E-02
2.000E-02	4.477E-03	1.7569	3.514E-02
3.000E-02	3.300E-03	1.8407	5.522E-02
5.000E-02	2.231E-03	1.9357	9.678E-02
7.000E-02	1.678E-03	1.9944	1.396E-01
1.000E-01	1.171E-03	2.0544	2.054E-01
1.500E-01	6.935E-04	2.1108	3.166E-01
2.000E-01	4.352E-04	2.1278	4.256E-01
3.000E-01	1.960E-04	2.0828	6.249E-01
0.399	**0.0001**	1.9763	7.886E-01
5.000E-01	5.879E-05	1.8543	9.272E-01
7.000E-01	2.462E-05	1.6010	1.121E+00
0.983	**0.00001**	1.3009	1.279E+00
1.000E+00	9.548E-06	1.2851	1.285E+00
1.500E+00	3.251E-06	0.9276	1.391E+00
2.000E+00	1.515E-06	0.7011	1.402E+00
2.33	**0.000001**	0.5919	1.402E+00
3.000E+00	5.063E-07	0.4369	1.402E+00
5.000E+00	1.162E-07	0.2030	1.402E+00
7.000E+00	4.054E-08	0.1069	1.402E+00
1.000E+01	1.217E-08	0.0468	1.402E+00

Table 2d. Hard rock and ground surface horizon seismic hazard curves for 5 Hz.

Hard Rock 5.0 Hz SA(g)	5.0 Hz AEP	AMPS	Soil 5.0 Hz SA(g)
1.000E-03	2.136E-02	2.3316	2.332E-03
1.500E-03	1.857E-02	2.3466	3.520E-03
2.000E-03	1.645E-02	2.3589	4.718E-03
3.000E-03	1.341E-02	2.3781	7.134E-03
5.000E-03	9.790E-03	2.4040	1.202E-02
7.000E-03	7.717E-03	2.4205	1.694E-02
1.000E-02	5.882E-03	2.4361	2.436E-02
1.500E-02	4.282E-03	2.4496	3.674E-02
2.000E-02	3.431E-03	2.4562	4.912E-02
3.000E-02	2.542E-03	2.4610	7.383E-02
5.000E-02	1.731E-03	2.4607	1.230E-01
7.000E-02	1.287E-03	2.4553	1.719E-01
1.000E-01	8.666E-04	2.4414	2.441E-01
1.500E-01	4.795E-04	2.4061	3.609E-01
2.000E-01	2.832E-04	2.3609	4.722E-01
3.000E-01	1.157E-04	2.2564	6.769E-01
0.317	**0.0001**	2.2363	7.089E-01
5.000E-01	3.009E-05	2.0435	1.022E+00
7.000E-01	1.127E-05	1.8570	1.300E+00
0.728	**0.00001**	1.8330	1.334E+00
1.000E+00	3.804E-06	1.6325	1.633E+00
1.500E+00	1.085E-06	1.3650	2.048E+00
1.54	**0.000001**	1.3478	2.076E+00
2.000E+00	4.433E-07	1.1780	2.356E+00
3.000E+00	1.227E-07	0.9264	2.779E+00
5.000E+00	2.225E-08	0.6389	3.194E+00
7.000E+00	6.650E-09	0.4738	3.316E+00
1.000E+01	1.697E-09	0.3259	3.316E+00

Table 2e. Hard rock and ground surface horizon seismic hazard curves for 2.5 Hz.

Hard Rock 2.5 Hz SA(g)	2.5 Hz AEP	AMPS	Soil 2.5 Hz SA(g)
1.000E-03	1.725E-02	6.5899	6.590E-03
1.500E-03	1.405E-02	6.4322	9.648E-03
2.000E-03	1.184E-02	6.3030	1.261E-02
3.000E-03	8.995E-03	6.1000	1.830E-02
5.000E-03	6.095E-03	5.8219	2.911E-02
7.000E-03	4.668E-03	5.6374	3.946E-02
1.000E-02	3.551E-03	5.4533	5.453E-02
1.500E-02	2.673E-03	5.2675	7.901E-02
2.000E-02	2.222E-03	5.1494	1.030E-01
3.000E-02	1.715E-03	4.9877	1.496E-01
5.000E-02	1.152E-03	4.7476	2.374E-01
7.000E-02	8.075E-04	4.5414	3.179E-01
1.000E-01	4.949E-04	4.2698	4.270E-01
1.500E-01	2.417E-04	3.8970	5.846E-01
2.000E-01	1.308E-04	3.6000	7.200E-01
0.223	**0.0001**	3.4763	7.752E-01
3.000E-01	4.770E-05	3.1540	9.462E-01
5.000E-01	1.082E-05	2.5847	1.292E+00
0.512	**0.00001**	2.5571	1.309E+00
7.000E-01	3.643E-06	2.2257	1.558E+00
1.000E+00	1.066E-06	1.8734	1.873E+00
1.02	**0.000001**	1.8565	1.894E+00
1.500E+00	2.466E-07	1.5184	2.278E+00
2.000E+00	8.504E-08	1.2989	2.598E+00
3.000E+00	1.860E-08	1.0343	3.103E+00
5.000E+00	2.641E-09	0.7656	3.828E+00
7.000E+00	7.020E-10	0.6208	4.346E+00
1.000E+01	1.637E-10	0.4907	4.907E+00

Table 2f. Hard rock and ground surface horizon seismic hazard curves for 1 Hz.

Hard Rock 1.0 Hz SA(g)	1.0 Hz AEP	AMPS	Soil 1.0 Hz SA(g)
5.000E-04	1.288E-02	1.6869	8.435E-04
7.000E-04	1.042E-02	1.7142	1.200E-03
1.000E-03	8.110E-03	1.7463	1.746E-03
1.500E-03	5.981E-03	1.7851	2.678E-03
2.000E-03	4.803E-03	1.8129	3.626E-03
3.000E-03	3.572E-03	1.8500	5.550E-03
5.000E-03	2.577E-03	1.8904	9.452E-03
7.000E-03	2.141E-03	1.9131	1.339E-02
1.000E-02	1.775E-03	1.9359	1.936E-02
1.500E-02	1.399E-03	1.9645	2.947E-02
2.000E-02	1.135E-03	1.9893	3.979E-02
3.000E-02	7.713E-04	2.0343	6.103E-02
5.000E-02	3.898E-04	2.1109	1.055E-01
7.000E-02	2.167E-04	2.1733	1.521E-01
1.000E-01	1.026E-04	2.2475	2.247E-01
0.101	**0.0001**	2.2499	2.272E-01
1.500E-01	3.752E-05	2.3366	3.505E-01
2.000E-01	1.667E-05	2.3985	4.797E-01
0.235	**0.00001**	2.4325	5.716E-01
3.000E-01	4.667E-06	2.4756	7.427E-01
0.465	**0.000001**	2.5330	1.178E+00
5.000E-01	7.767E-07	2.5385	1.269E+00
7.000E-01	2.178E-07	2.5486	1.784E+00
1.000E+00	5.407E-08	2.5262	2.526E+00
1.500E+00	1.099E-08	2.4591	3.689E+00
2.000E+00	3.602E-09	2.3875	4.775E+00
3.000E+00	7.659E-10	2.2582	6.775E+00
5.000E+00	1.076E-10	2.0537	1.027E+01

Table 2g. Hard rock and ground surface horizon seismic hazard curves for 0.5 Hz.

Hard Rock 0.5 Hz SA(g)	0.5 Hz AEP	AMPS	Soil 0.5 Hz SA(g)
5.000E-04	6.644E-03	2.2468	1.123E-03
7.000E-04	5.226E-03	2.3368	1.636E-03
1.000E-03	4.074E-03	2.4303	2.430E-03
1.500E-03	3.131E-03	2.5290	3.793E-03
2.000E-03	2.644E-03	2.5920	5.184E-03
3.000E-03	2.131E-03	2.6719	8.016E-03
5.000E-03	1.642E-03	2.7675	1.384E-02
7.000E-03	1.359E-03	2.8360	1.985E-02
1.000E-02	1.073E-03	2.9202	2.920E-02
1.500E-02	7.691E-04	3.0358	4.554E-02
2.000E-02	5.762E-04	3.1328	6.266E-02
3.000E-02	3.521E-04	3.2893	9.868E-02
5.000E-02	1.620E-04	3.5083	1.754E-01
0.0653	**0.0001**	3.6239	2.366E-01
7.000E-02	8.812E-05	3.6513	2.556E-01
1.000E-01	4.254E-05	3.7834	3.783E-01
1.500E-01	1.687E-05	3.8826	5.824E-01
0.185	**0.00001**	3.9025	7.220E-01
2.000E-01	8.249E-06	3.9031	7.806E-01
3.000E-01	2.773E-06	3.8382	1.151E+00
0.423	**0.000001**	3.6776	1.556E+00
5.000E-01	6.103E-07	3.5685	1.784E+00
7.000E-01	2.058E-07	3.2683	2.288E+00
1.000E+00	6.005E-08	2.8540	2.854E+00
1.500E+00	1.348E-08	2.3005	3.451E+00
2.000E+00	4.435E-09	1.8894	3.779E+00
3.000E+00	8.831E-10	1.3432	4.030E+00
5.000E+00	1.142E-10	0.7934	4.030E+00

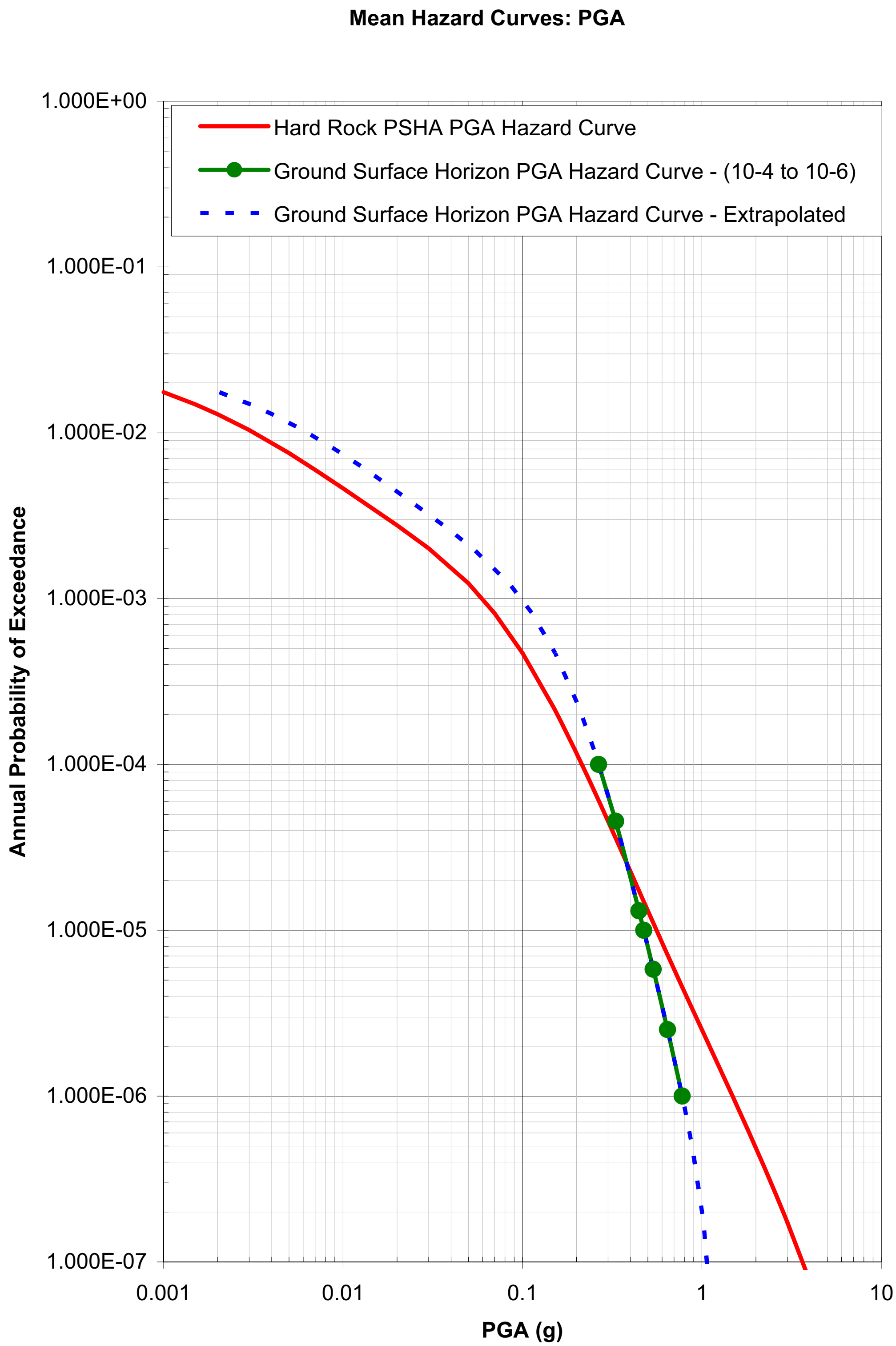

Figure 2a. Hard rock (solid red line) and ground surface horizon (dashed blue and solid green line) seismic hazard curves for 100 Hz (PGA).

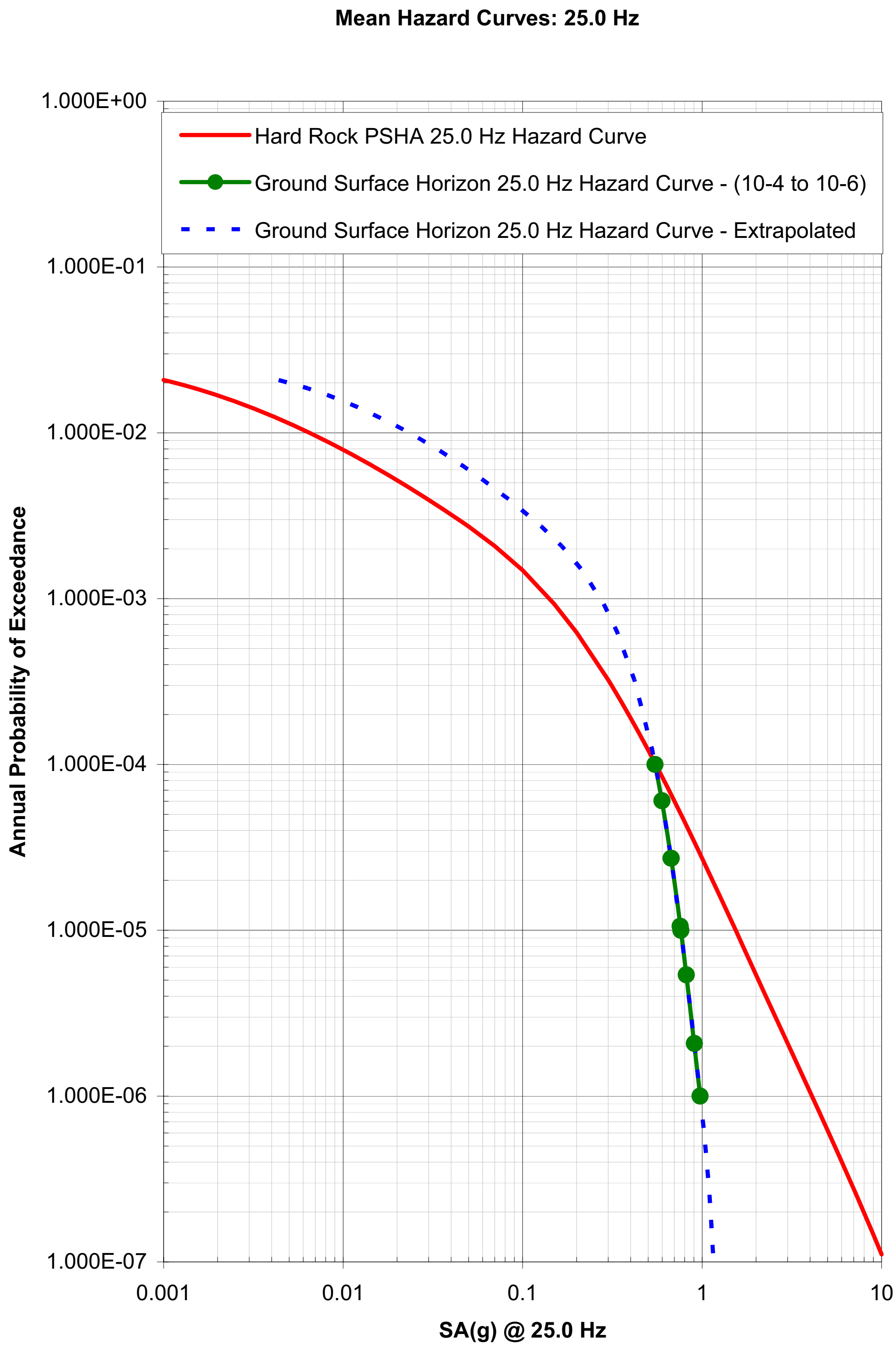

Figure 2b. Hard rock (solid red line) and ground surface horizon (dashed blue and solid green line) seismic hazard curves for 25 Hz.

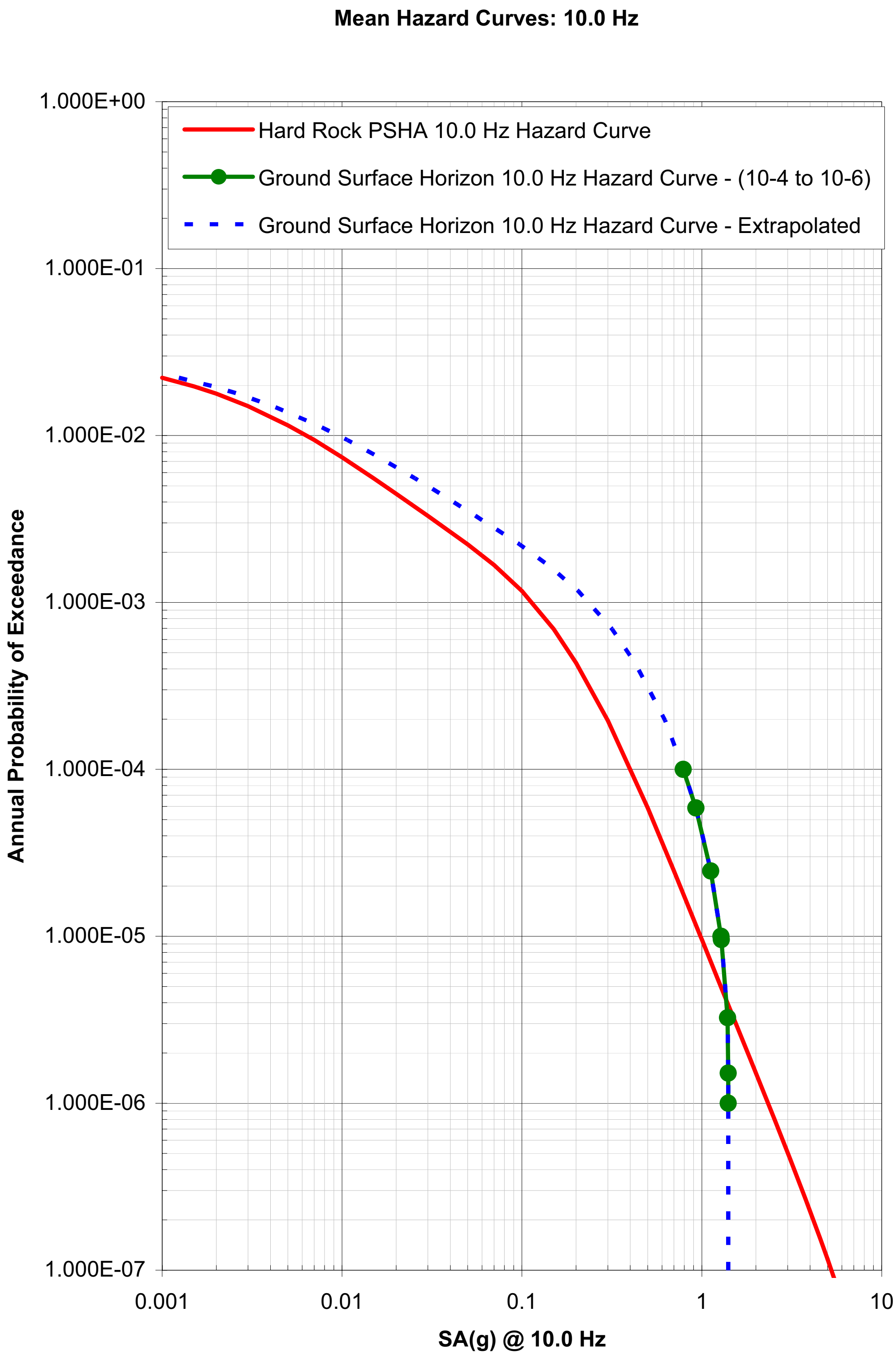

Figure 2c. Hard rock (solid red line) and ground surface horizon (dashed blue and solid green line) seismic hazard curves for 10 Hz.

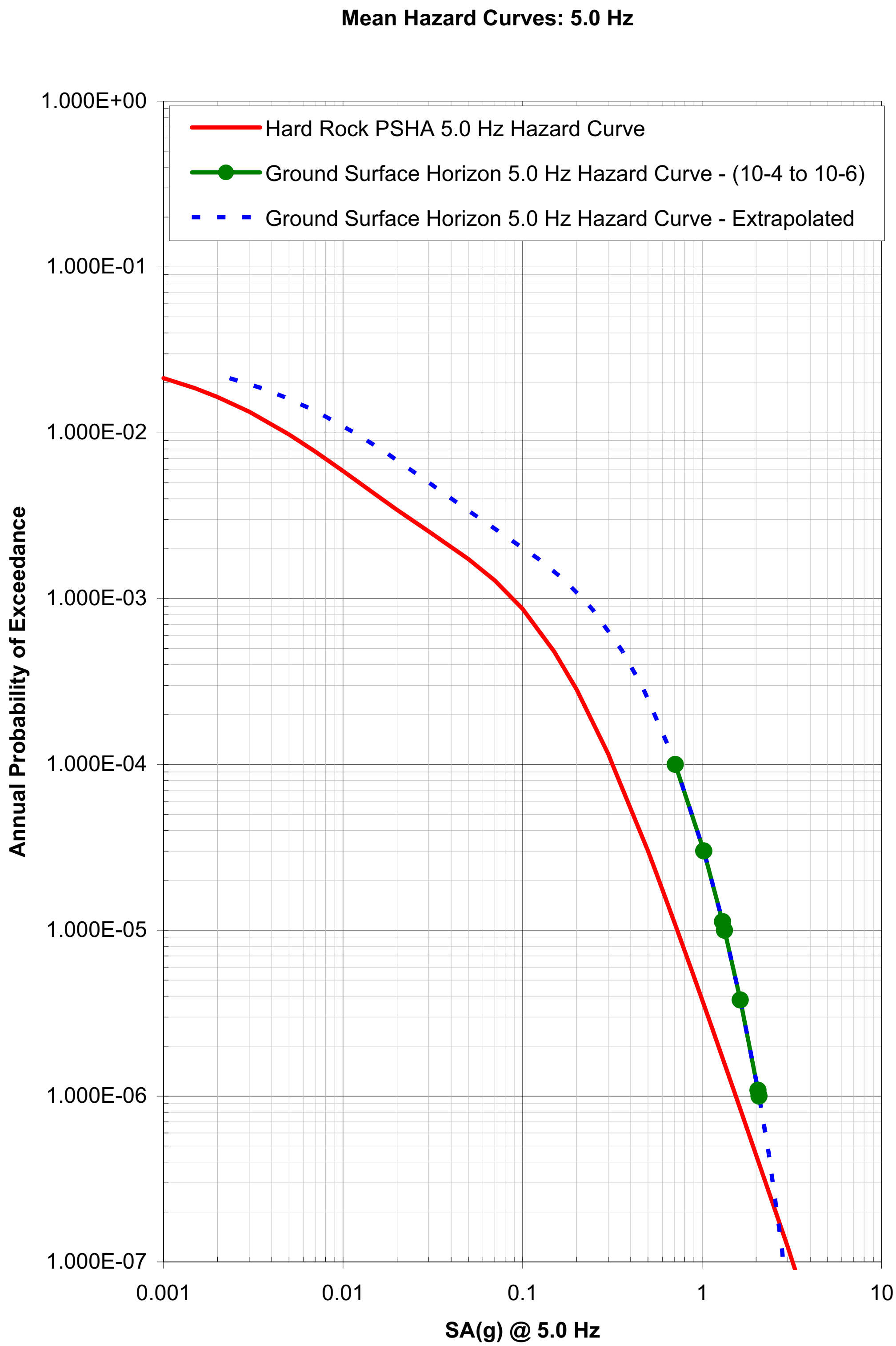

Figure 2d. Hard rock (solid red line) and ground surface horizon (dashed blue and solid green line) seismic hazard curves for 5 Hz.

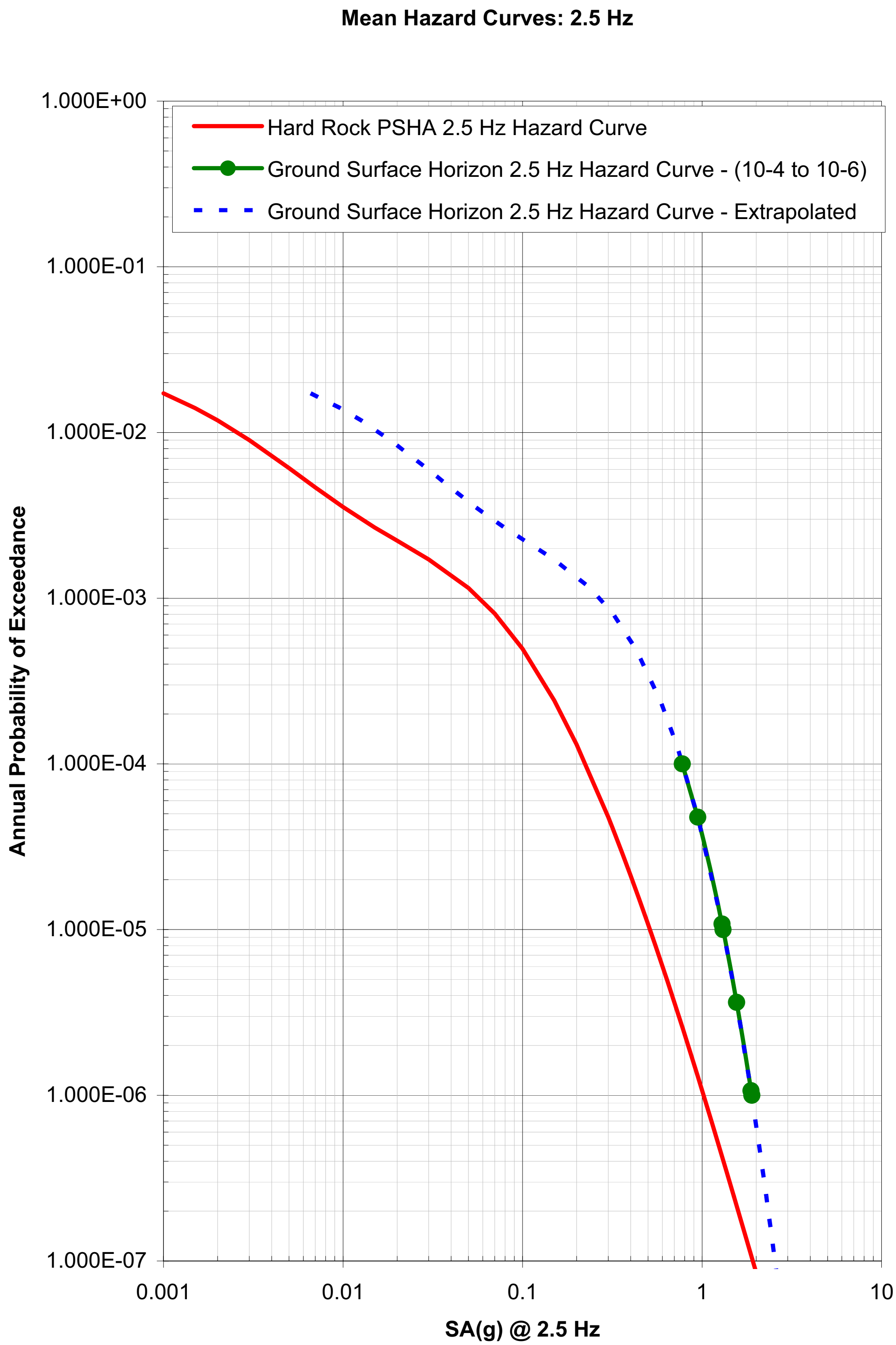

Figure 2e. Hard rock (solid red line) and ground surface horizon (dashed blue and solid green line) seismic hazard curves for 2.5 Hz.

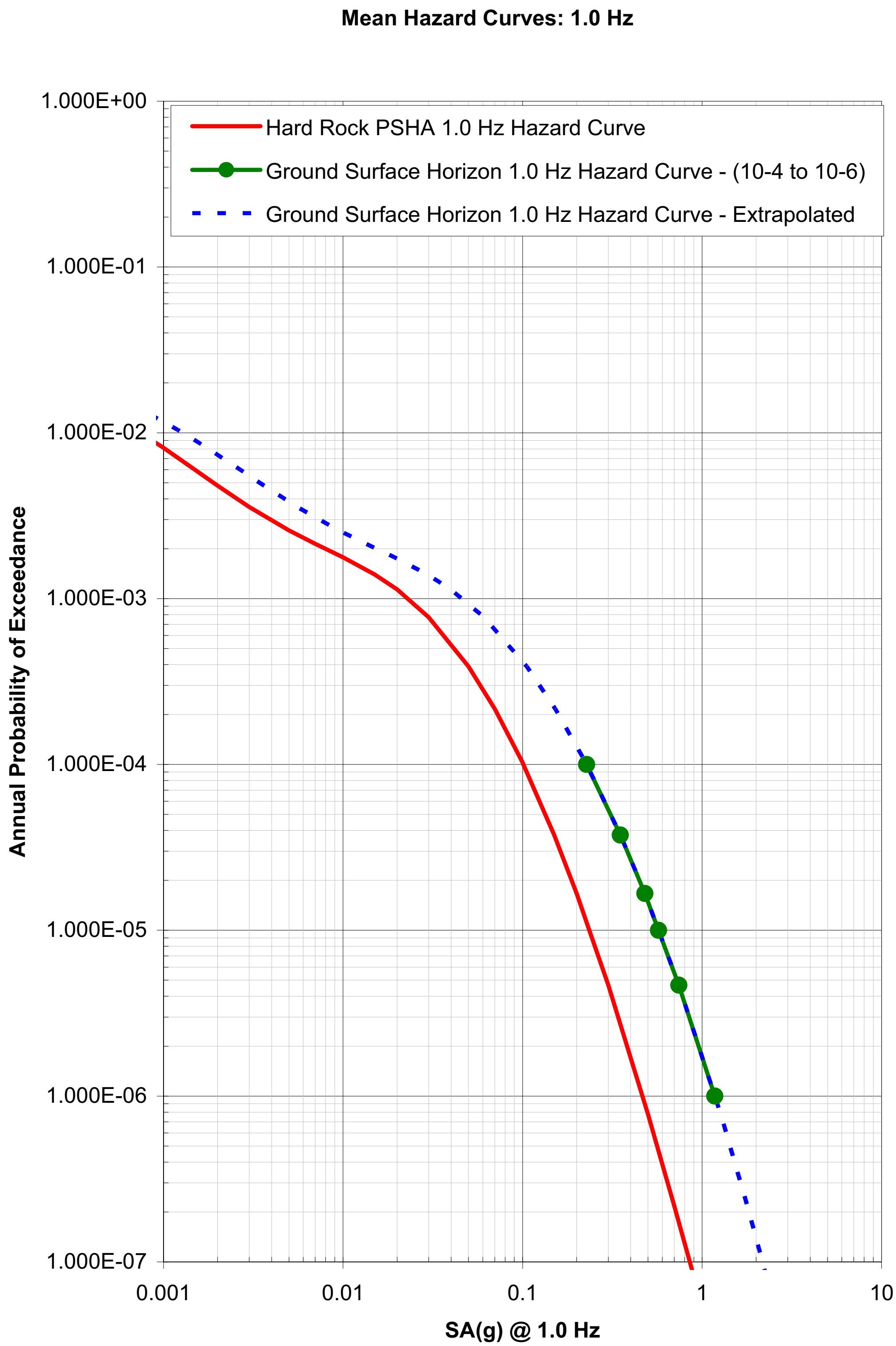

Figure 2f. Hard rock (solid red line) and ground surface horizon (dashed blue and solid green line) seismic hazard curves for 1 Hz.

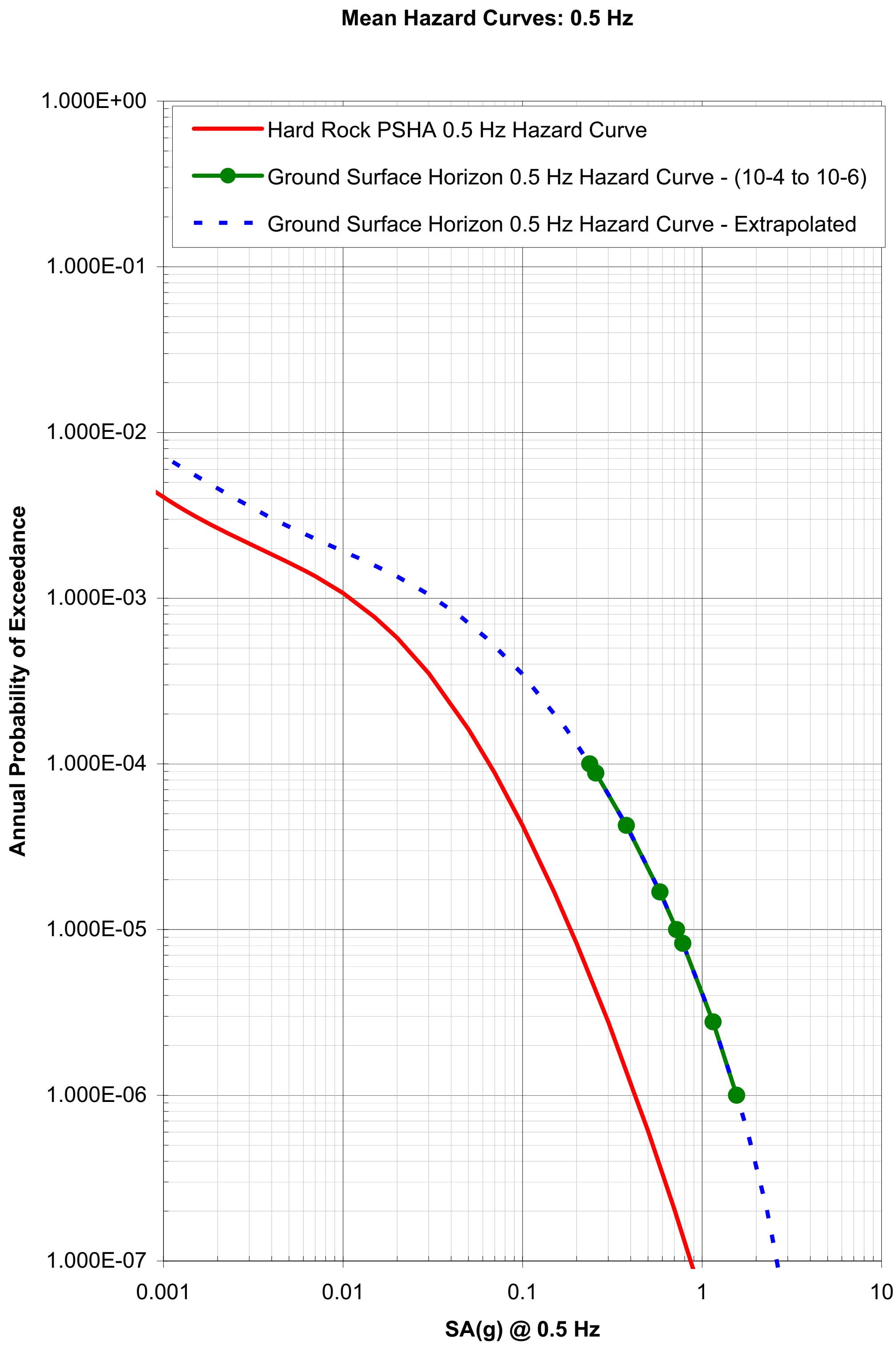

Figure 2g. Hard rock (solid red line) and ground surface horizon (dashed blue and solid green line) seismic hazard curves for 0.5 Hz.

Southern Nuclear Operating Company

AR-08-0615

Enclosure 2

Supplemental Information

For

Vogtle ESP SER Open Item 2.5-5

Note: This enclosure consists of a 2-page attachment.

WLA
WILLIAM LETTIS & ASSOCIATES, INC.
27220 Turnberry Lane, Suite 110, Valencia, California 91355
tel (661) 775-4990 fax (661) 775-4993

April 10, 2008

Mr. Jim Davis
Southern Nuclear
PO Box 1295, BIN B056
Birmingham, AL 35201

Letter to Provide Additional Documentation in Support of Vogtle Early Site Permit Application Safety Evaluation Report Open Item 2.5-5

Dear Mr. Davis:

By letter dated October 15, 2007, Southern Nuclear Operating Company (SNC) provided the U.S. Nuclear Regulatory Commission (NRC) with responses to twenty-seven Open Items related to the Vogtle Early Site Permit Application. The purpose of this letter is to provide additional documentation and clarification regarding the response to Open Item 2.5-5, as requested verbally by Rus Wheeler (U.S. Geological Survey).

As originally provided by the NRC in a letter dated August 30, 2007, the text of Open Item 2.5-5 is as follows: *Provide supporting evidence to rule out the occurrence of large inland earthquakes.* Liquefaction and paleoliquefaction data are the primary data bearing on this issue. As such, the additional information provided herein is based on a telephone conversation on February 13, 2008 with Stephen Obermeier (U.S. Geological Survey, retired), an expert in eastern U.S. liquefaction and paleoliquefaction. The information in this letter complements the information provided in the original Open Item response. In summary, Obermeier indicated that South Carolina liquefaction data do not preclude the potential for an inland source of large earthquakes, but the liquefaction data are consistent with a source of repeated, large-magnitude earthquakes located in coastal South Carolina.

Obermeier discussed the areas reconnoitered as part of his and others' research into South Carolina coastal plain liquefaction sites. There are no published maps that show in detail those areas studied but in which no liquefaction features were recognized. According to Obermeier, Figure 7.6 from Obermeier (1996) represents the best published approximation of the areas of investigation. This figure indicates that, with the exception of the Edisto River, the search for liquefaction features extended roughly 12 to 30 mi (20 to 50 km) inland throughout South Carolina. Reconnaissance along the Edisto River extended to roughly 70 mi (45 km) from the coast and represents the inland-most extent of the search for liquefaction features. Reconnaissance was conducted inland along the Edisto River in part because the banks of this river and its associated drainage ditches, more so than most in South Carolina, provide relatively good geologic exposure in which liquefaction features may be recognized.

Obermeier also discussed the four inland-most liquefaction sites on the Edisto River (shown on Obermeier's [1996] Figure 7.6; also listed as sites 117, 119, 120, and 121 from Amick et al.'s [1990] Table 1). Liquefaction features preserved at the two inland-most Edisto River sites are generally larger than those preserved at downstream Edisto River sites.

The inverse relationship between Edisto River liquefaction feature size and distance from Charleston is consistent with a seismic source located at Charleston. This observation does not preclude the possibility of large inland earthquakes, but is consistent with the preponderance of evidence that suggests Charleston-type earthquakes (i.e., large-magnitude events combined with a recurrence on the order of 500 years) are restricted to the South Carolina coastal zone.

The information provided in this letter is intended to satisfy Rus Wheeler's request for additional documentation regarding the original response to Open Item 2.5-5. If you have further questions regarding this letter, please contact me at 661-219-7101 or at hartleb@lettis.com.

Sincerely,

Ross D. Hartleb

Ross Hartleb, Ph.D.
Senior Geologist

cc: Don Moore, Southern Company

References cited in this letter

Amick, D., Maurath, G., and Gelinas, R., *Characteristics of Seismically Induced Liquefaction Sites and Features Located In the Vicinity of the 1886 Charleston, South Carolina Earthquake*: Seismological Research Letters, v. 61, no. 2, p. 117-130, 1990.

Obermeier, S., *Liquefaction-Induced Features*: in Paleoseismology, J. McCalpin (ed.), Academic Press, San Diego, p. 331-396, 1996.