Vogtle PEmails

From: Davis, James T. [JTDAVIS@southernco.com]
Sent: Wednesday, June 04, 2008 11:45 AM
To: Christian Araguas
Cc: Pierce, Chuck R.; Moore, Don P.; McCallum, Thomas O.; Aughtman, Amy G.; Sparkman, Wesley A.
Subject: Slides from 5-29-08 Meeting
Attachments: NRC_Presentation_5_29_08 rev 3.ppt; NRC Meeting Westinghouse-5-29-08.ppt

Christian,

Attached files are the Westinghouse and Bechtel slides from our May 29th Seismic Meeting. Give me a call if you have any questions.

<<NRC_Presentation_5_29_08 rev 3.ppt>> <<NRC Meeting Westinghouse-5-29-08.ppt>>

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Hearing Identifier: Vogtle_Public_EX
Email Number: 61

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Subject: Slides from 5-29-08 Meeting
Sent Date: 6/4/2008 11:45:07 AM
Received Date: 6/4/2008 11:49:58 AM
From: Davis, James T.

Created By: JTDAVIS@southernco.com

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"Pierce, Chuck R." <CRPIERCE@southernco.com>
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"McCallum, Thomas O." <TOMCCALL@southernco.com>
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"Aughtman, Amy G." <AGAUGHTM@SOUTHERNCO.COM>
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Files	**Size**	**Date & Time**
MESSAGE	530	6/4/2008 11:49:58 AM
NRC_Presentation_5_29_08 rev 3.ppt	2921024	
NRC Meeting Westinghouse-5-29-08.ppt	874560	

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Priority: Standard
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Sensitivity: Normal
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Recipients Received:

NRC Meeting with
Southern Nuclear Operating Company

Vogtle ESP Ground Motion for SSI and SSI Analyses

May 29, 2008

Contents

- **GMRS and FIRS – ESP Data**
  - Site Response Analysis
  - Input for SSI Analysis
- **Sensitivity Study**
  - Site Response Analysis
  - Input For SSI Analysis
- **Comparison between ESP and Sensitivity Study-Site Response**
- **Backfill Geometry Effects on Site Response**

Development of GMRS and FIRS - ESP Data

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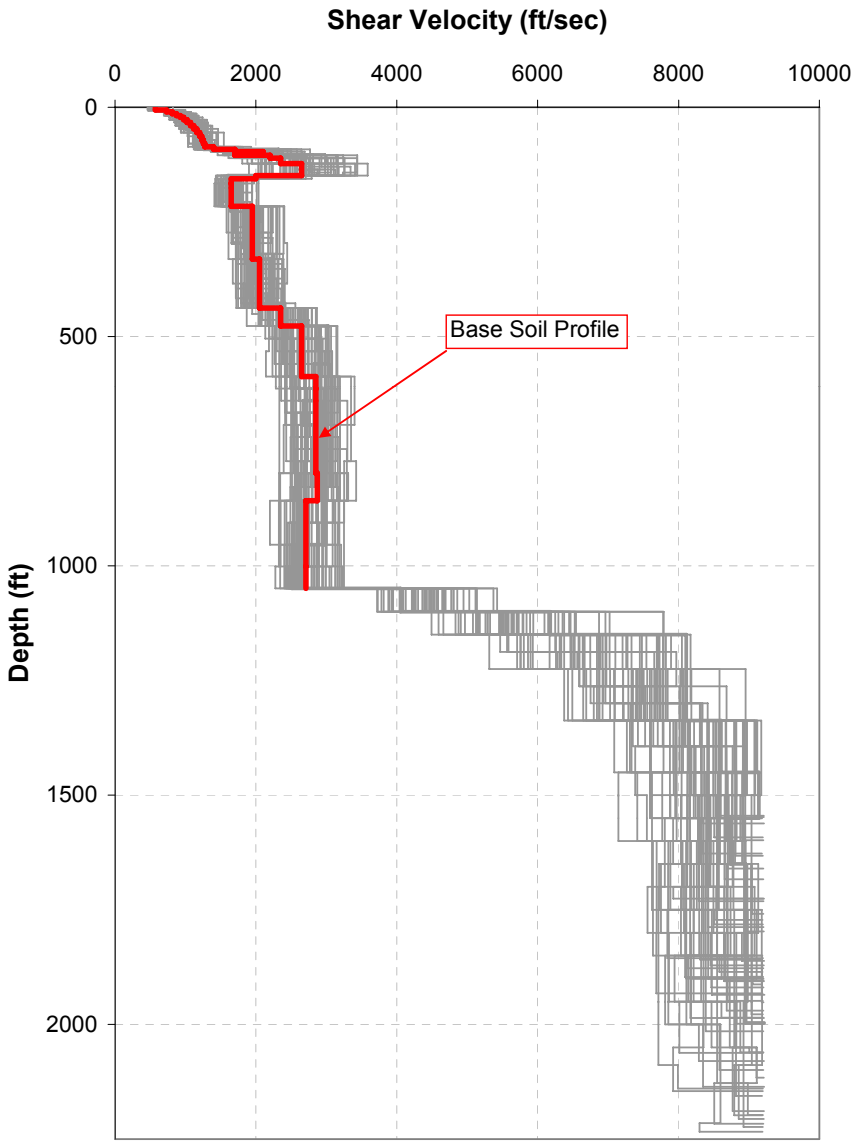
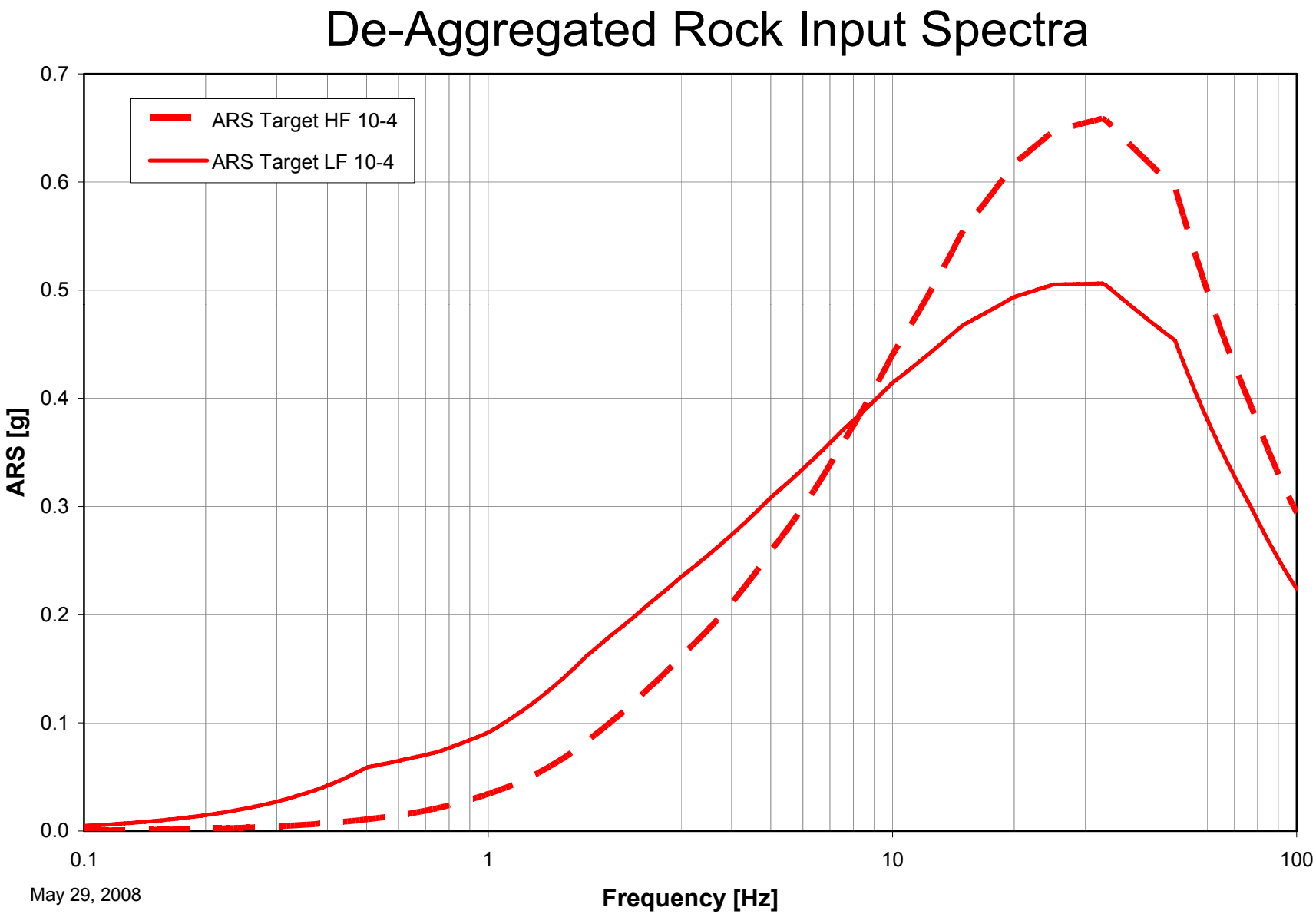
- The best estimate profile for the full soil column height was randomized
- 60 randomized profiles
- 60 randomized nonlinear soil curves for each formation (SRS and EPRI curves)
- Linear properties for rock
- HF, LF spectra at 10-4, 10-5 and 10-6 levels
- 30 time histories for each of the above 6 spectra

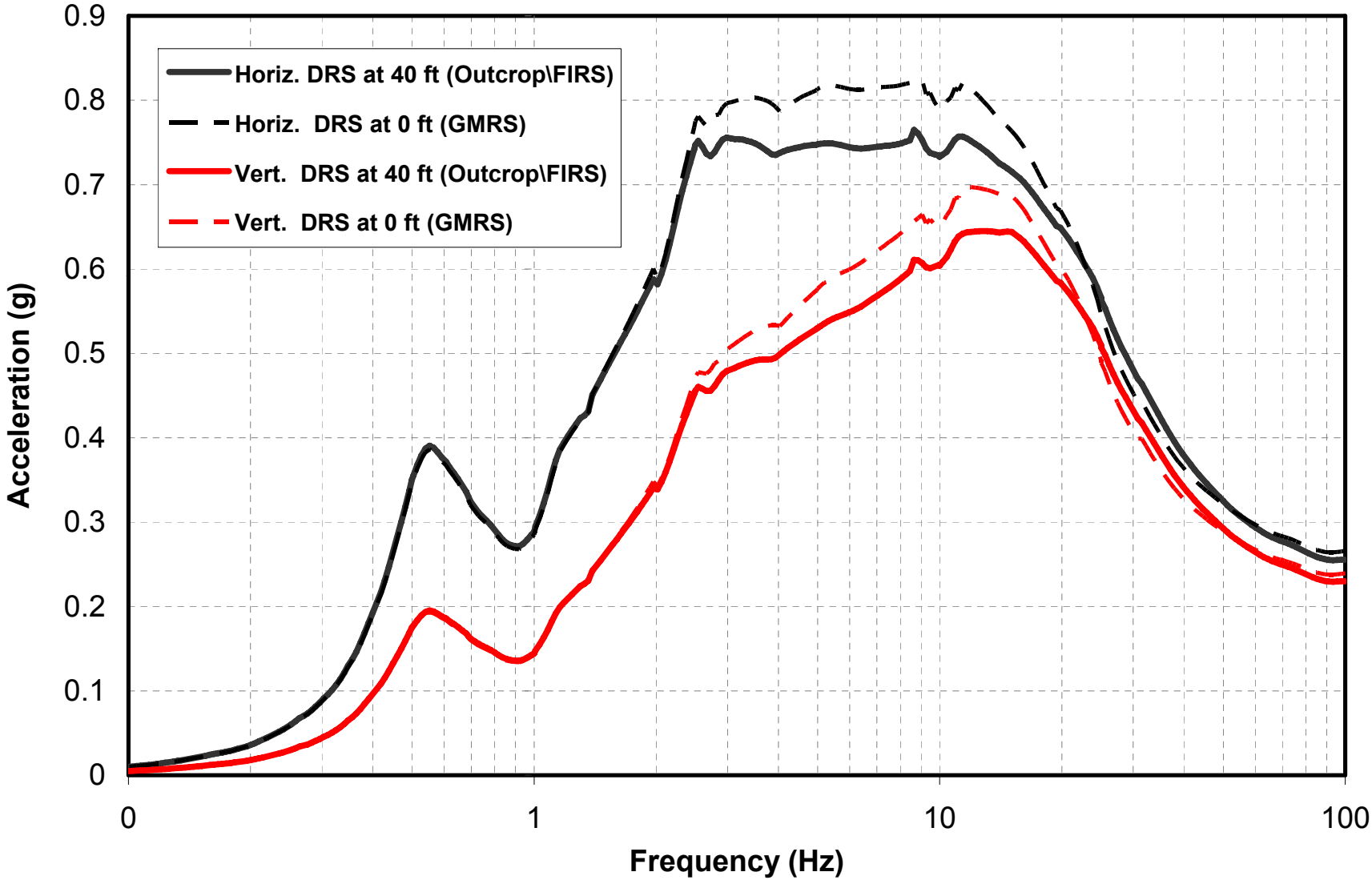
ESP - Low-Strain Vs



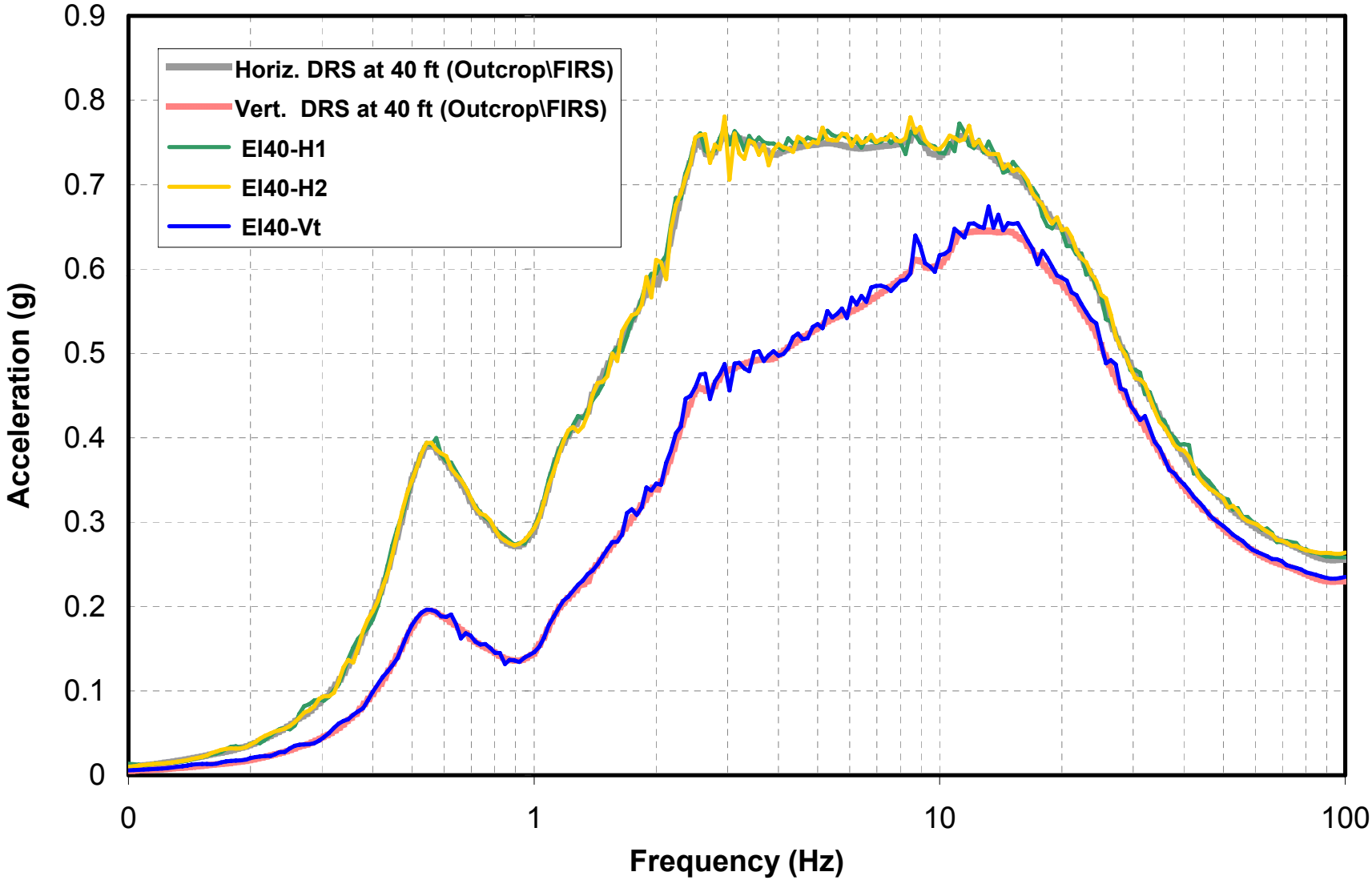
De-Aggregated Spectra (10-4 Hazard level)



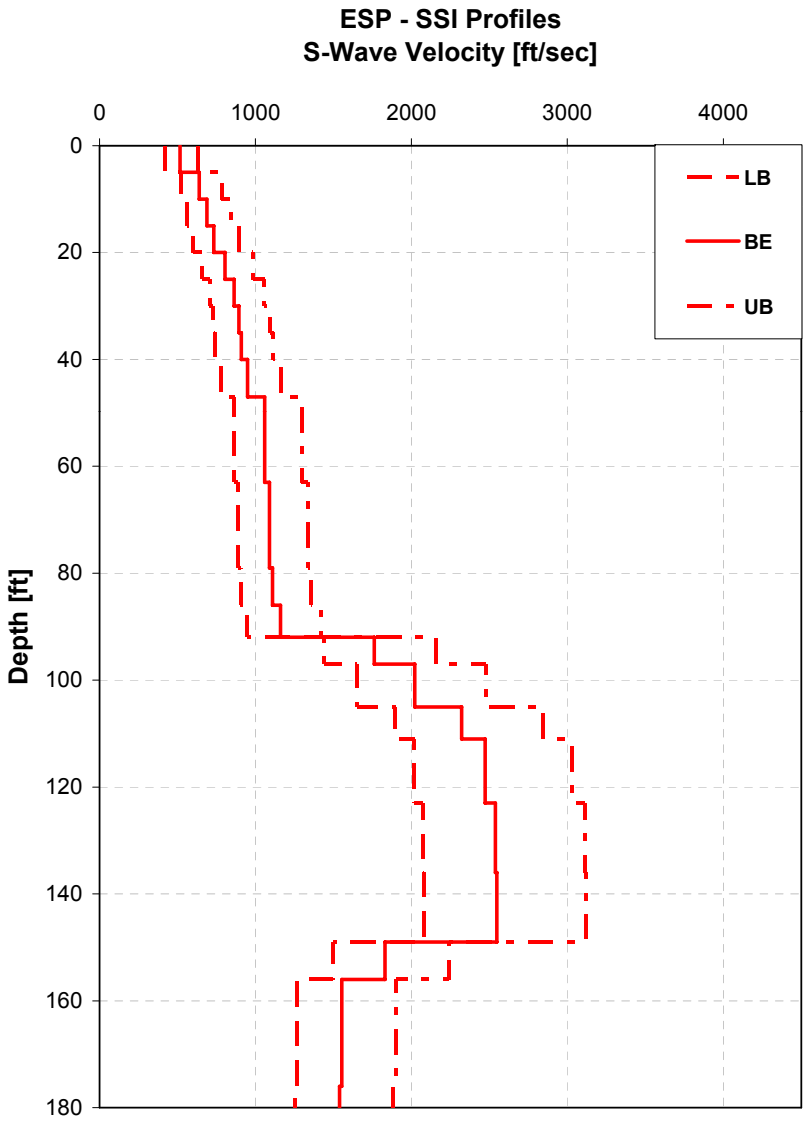
DRS for ESP - FIRS and GMRS

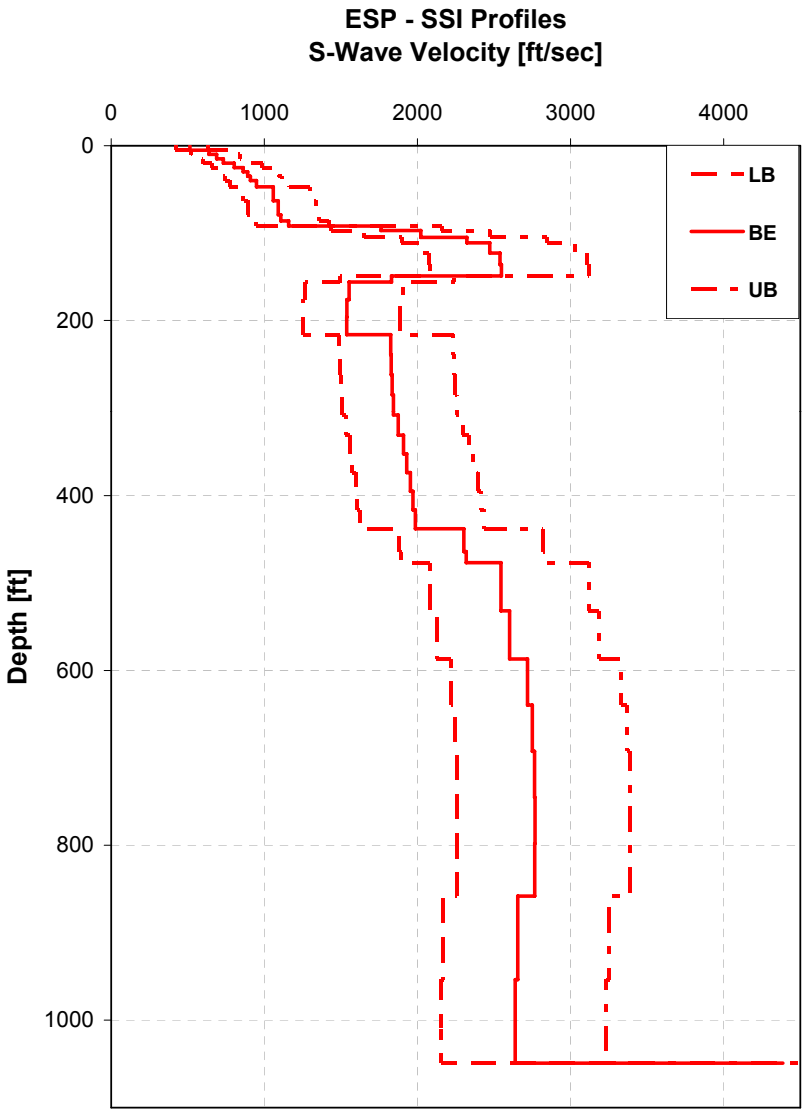


ESP - FIRS and GMRS (matched TH)

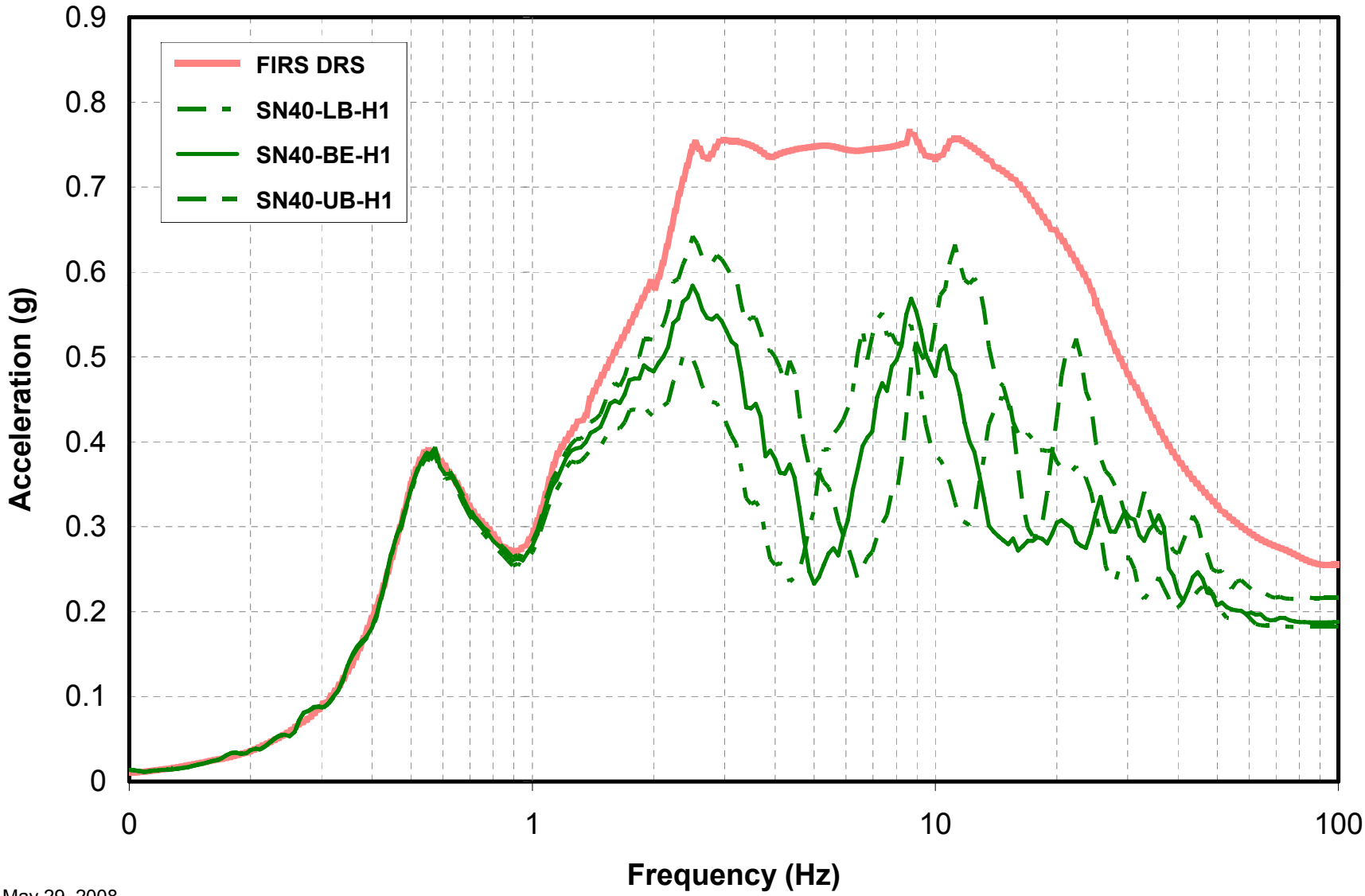


ESP - Strain-Compatible Vs for SSI

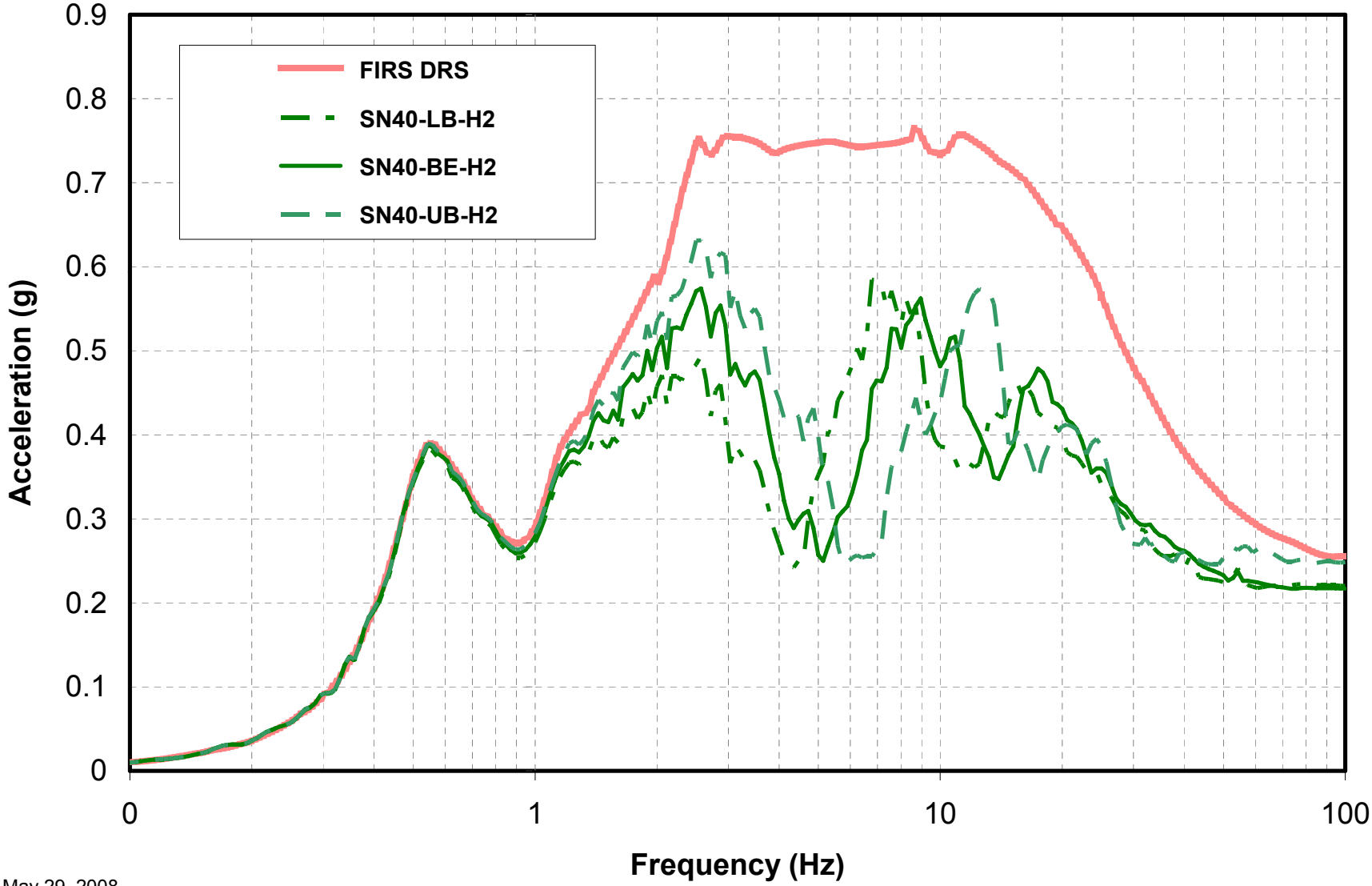




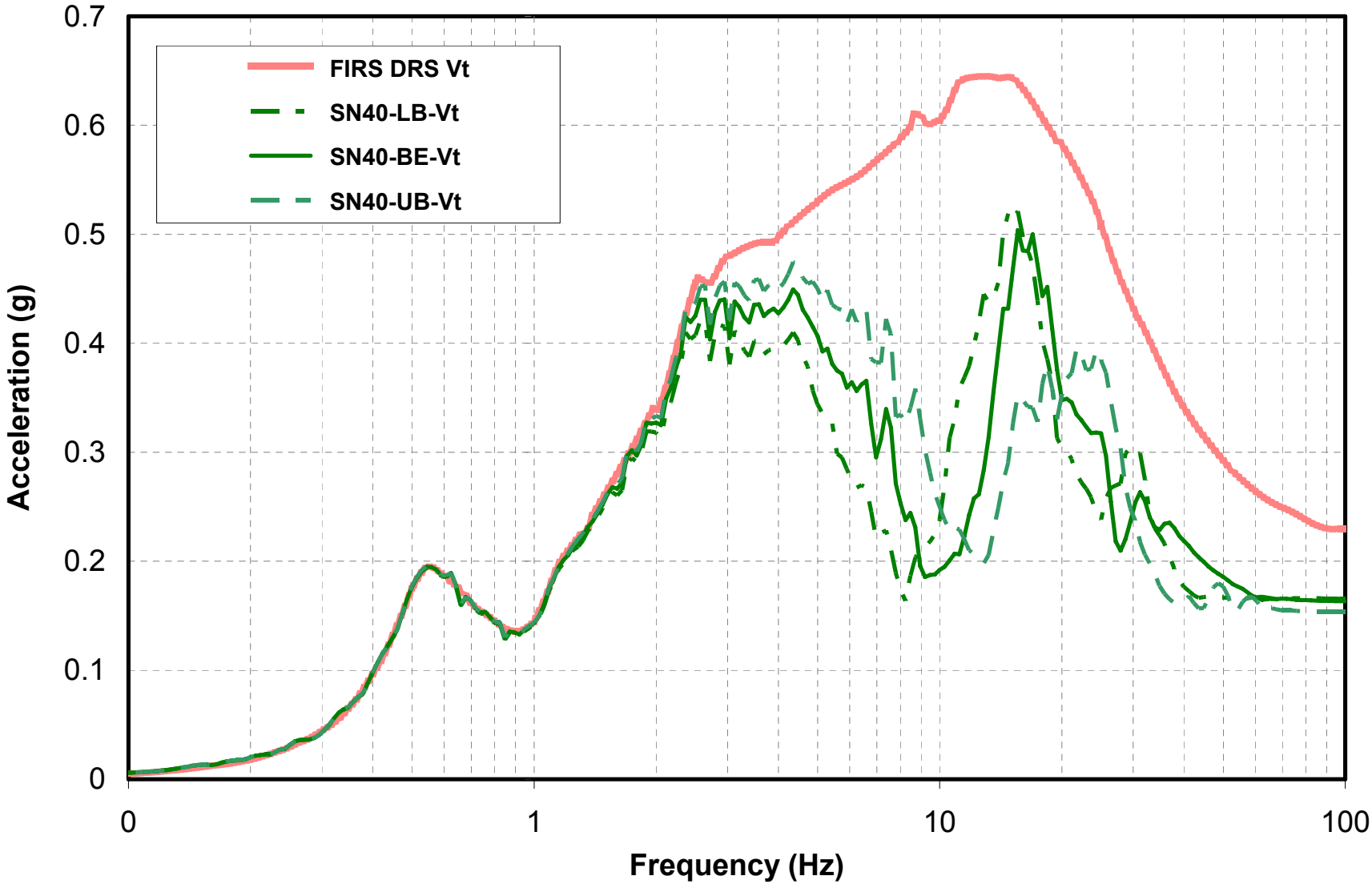
ESP - SSI Input Motion (H1)



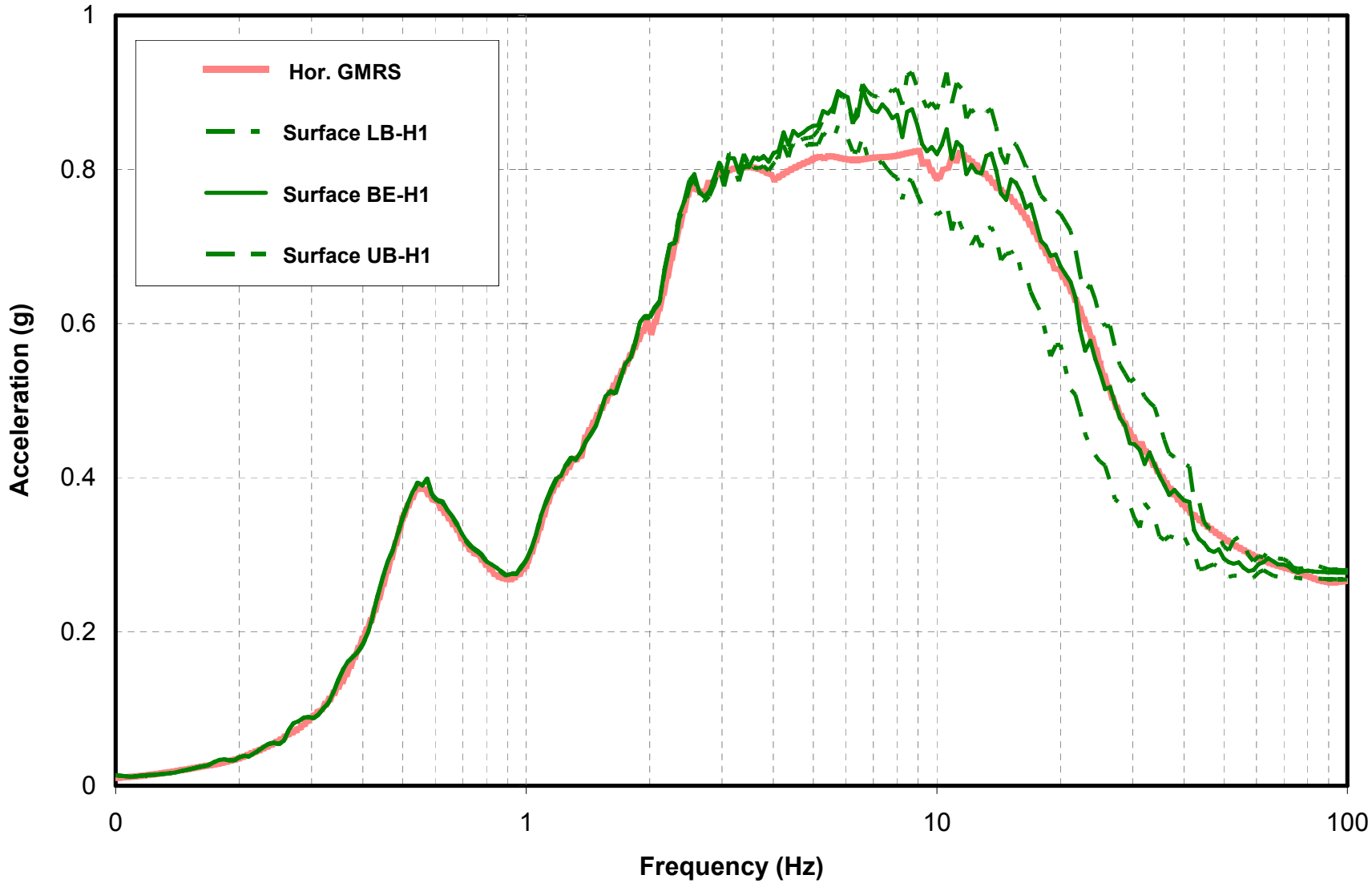
ESP - SSI Input Motion (H2)



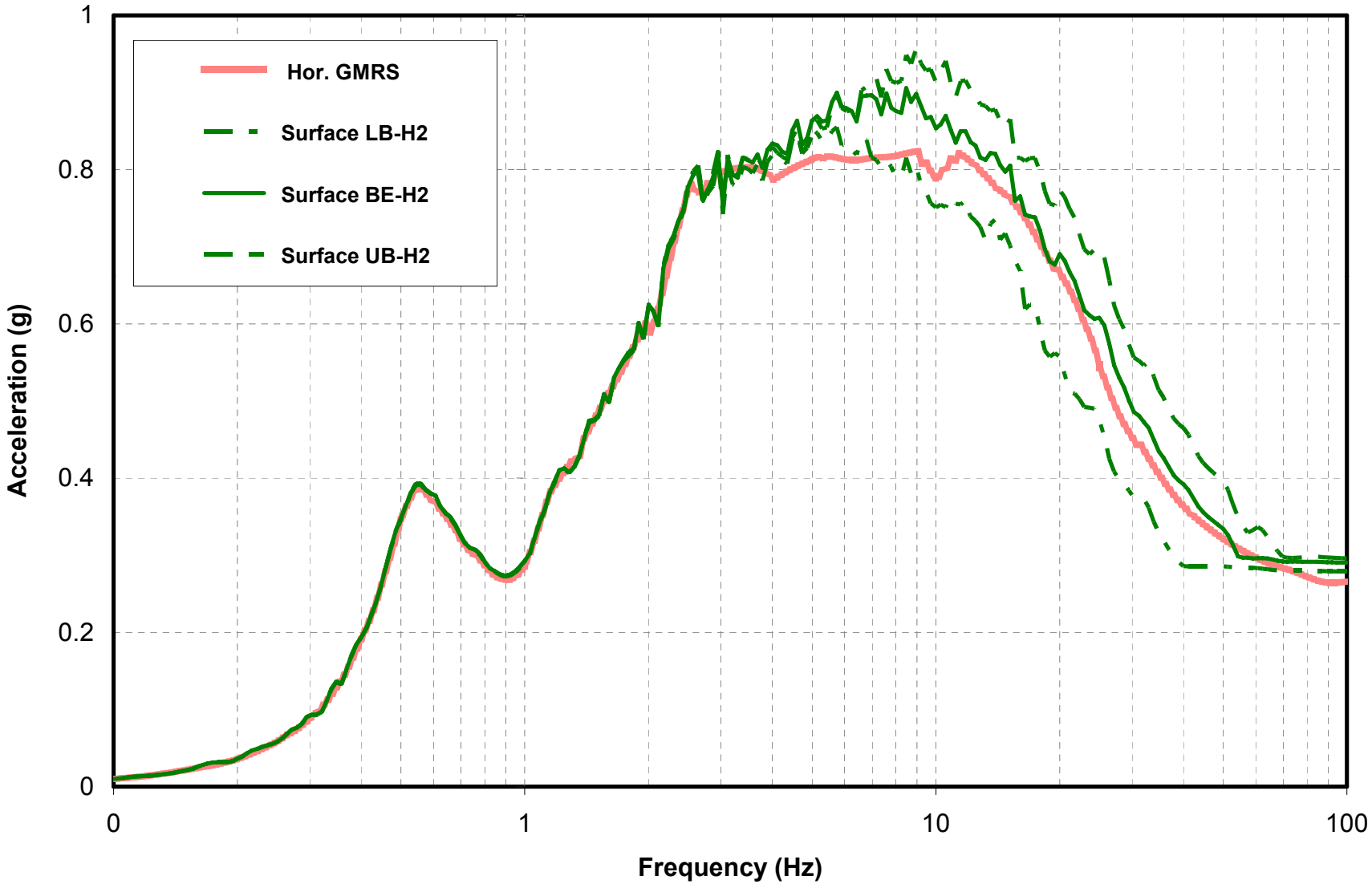
ESP - SSI Input Motion (Vt)



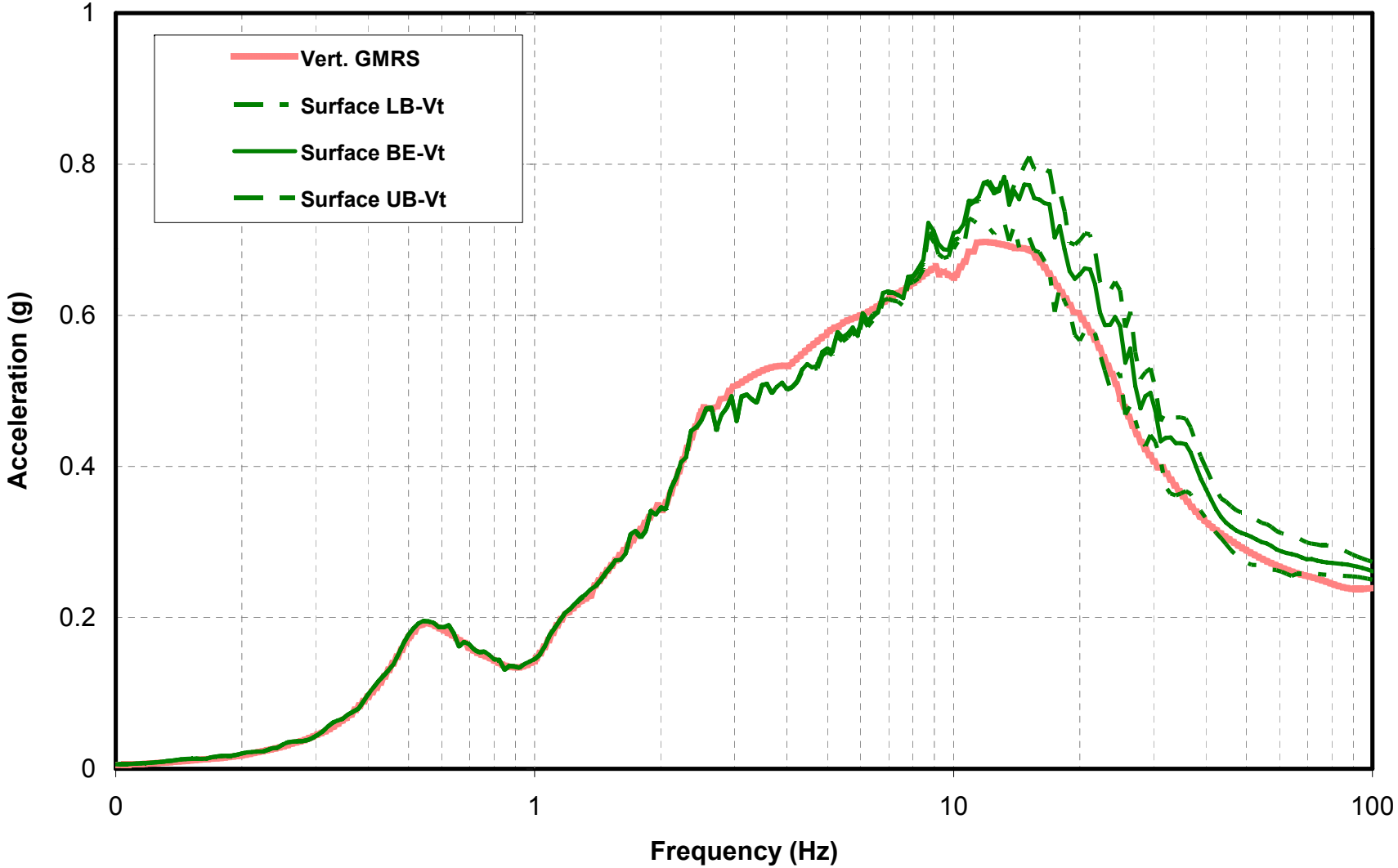
ESP-Horizontal GMRS versus H1 T.H. Convolved to Surface



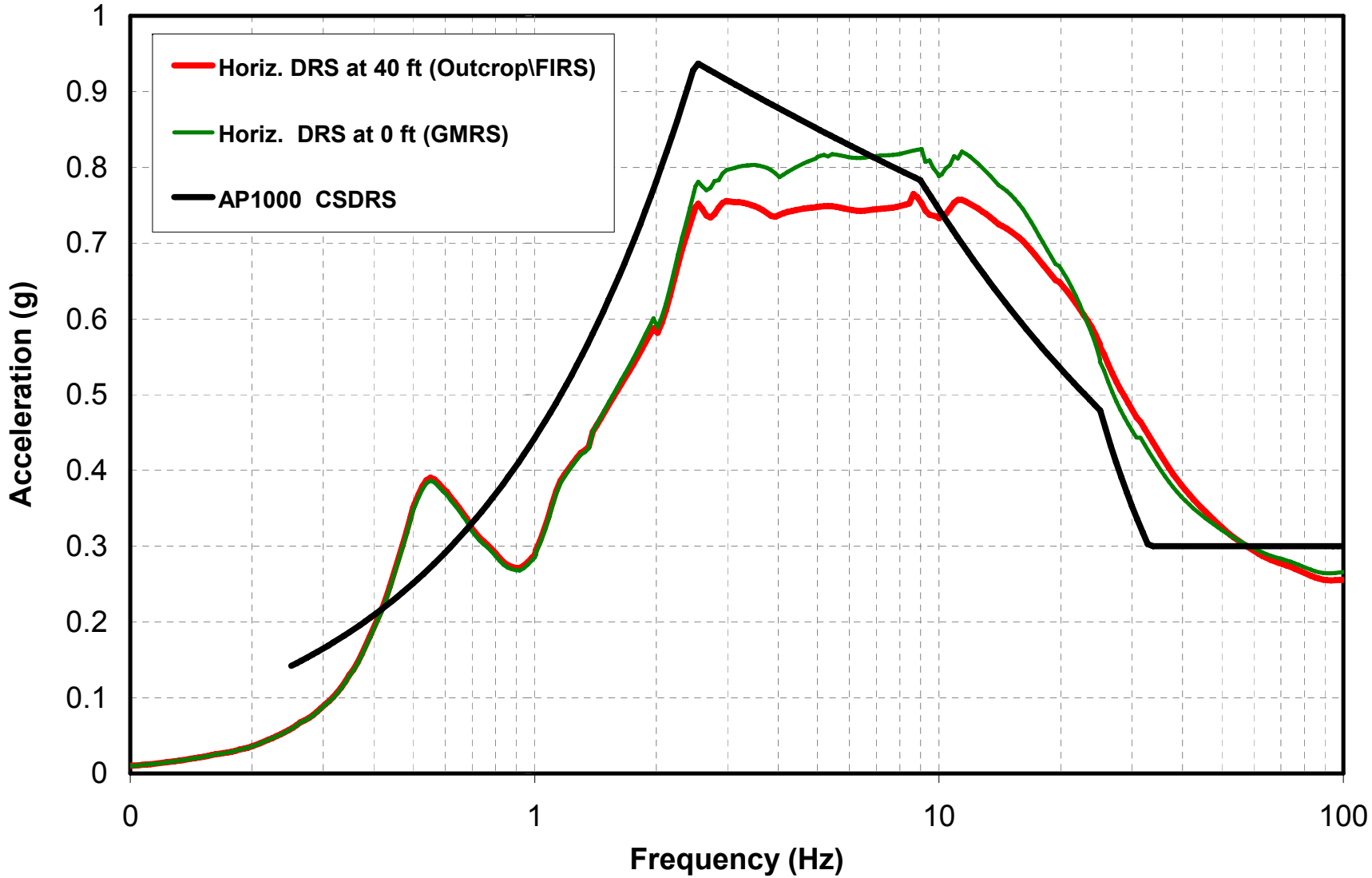
ESP-Horizontal GMRS versus H2 T.H. Convolved to Surface



ESP-Vertical GMRS versus Vertical T.H. Convolved to Surface



ESP – DRS and CSDRS



ESP – Input for SSI Analysis

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Energy to Serve Your World®

- The in-column time histories at the depth of 40 ft (H1, H2, Vt)
- The strain-compatible soil profiles (UB, BE, LB)

Development of Input Data for SSI-Sensitivity Study

SOUTHERN COMPANY
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- The best estimate profile for the full soil column height was randomized
- 60 randomized profiles
- 60 randomized nonlinear soil curves for each formation (SRS and EPRI curves)
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- 30 time histories for each of the above 6 spectra

ESP versus Sensitivity Study - Low Strain Vs

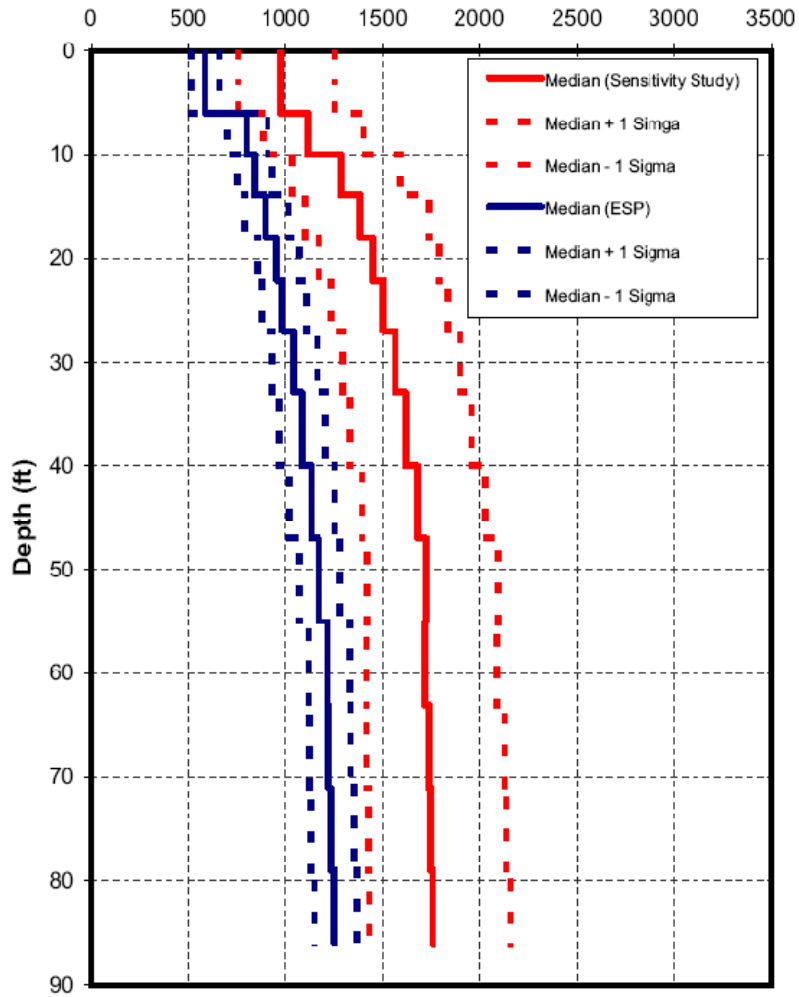
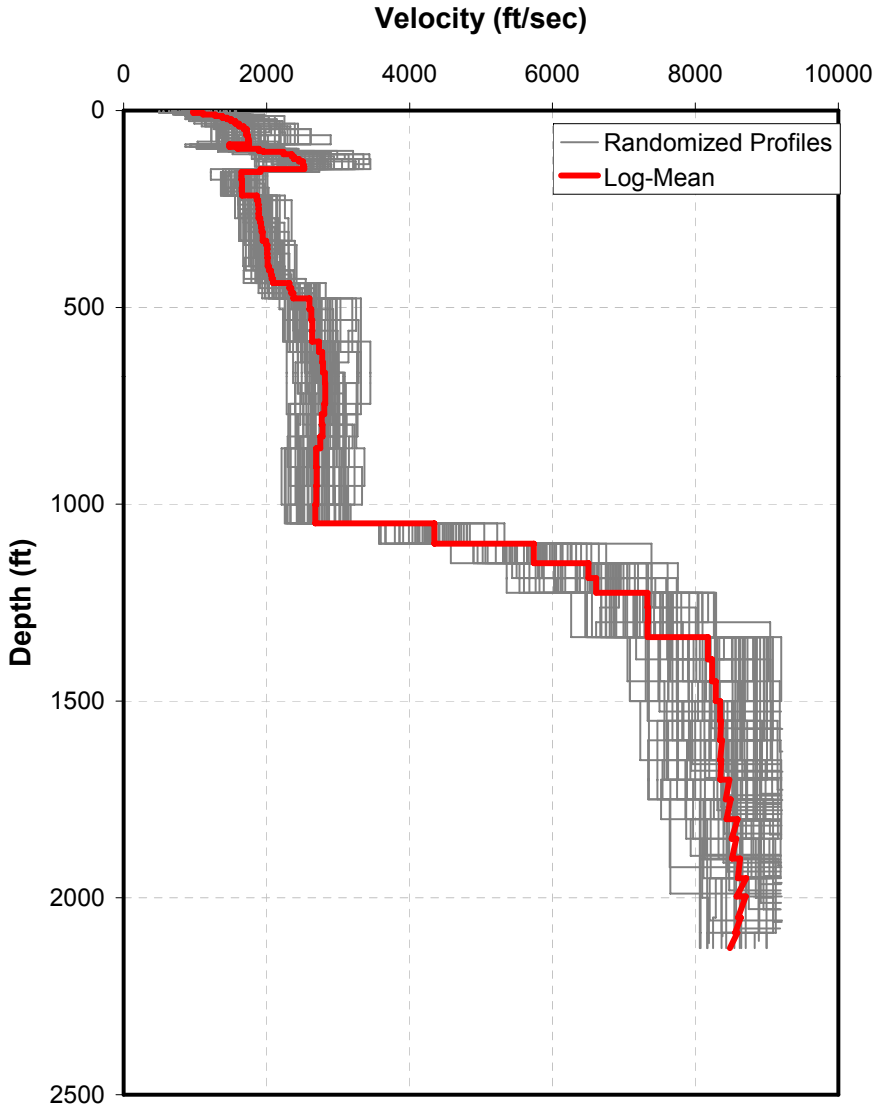
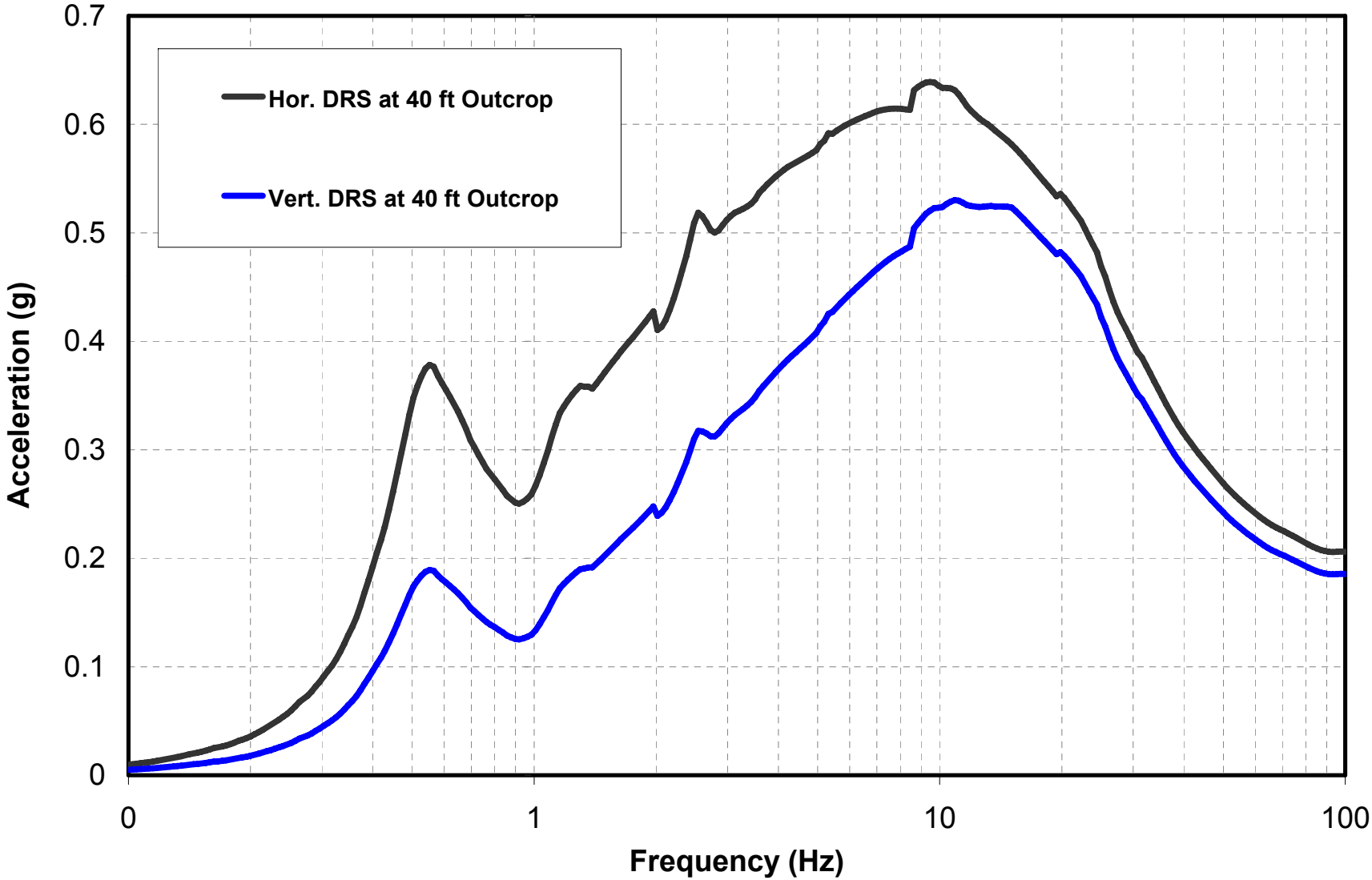


Figure 2.5.2-61 Low Strain Backfill Shear Wave Velocity (ft/sec)

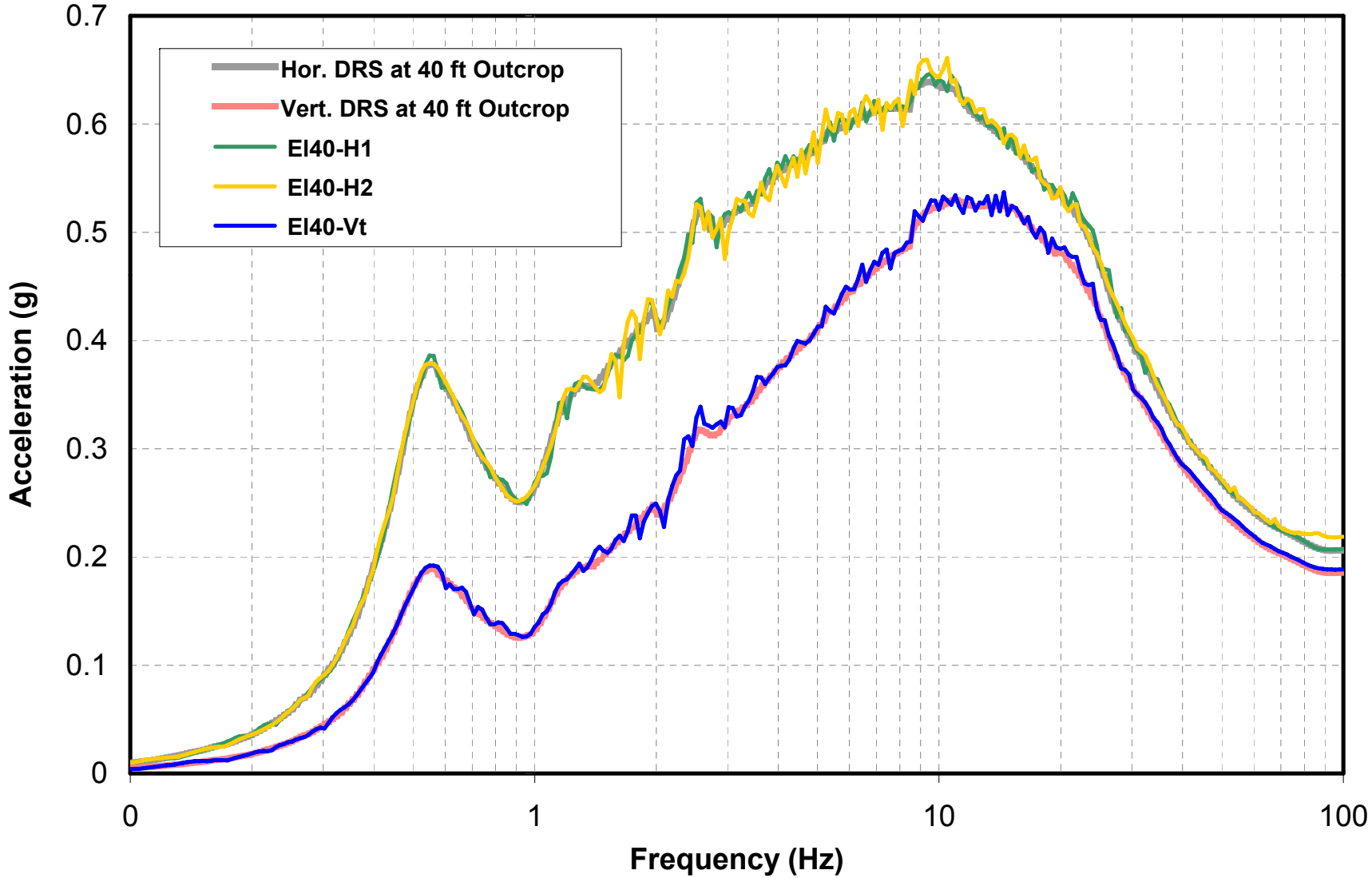
Sensitivity Study - Low-Strain Vs



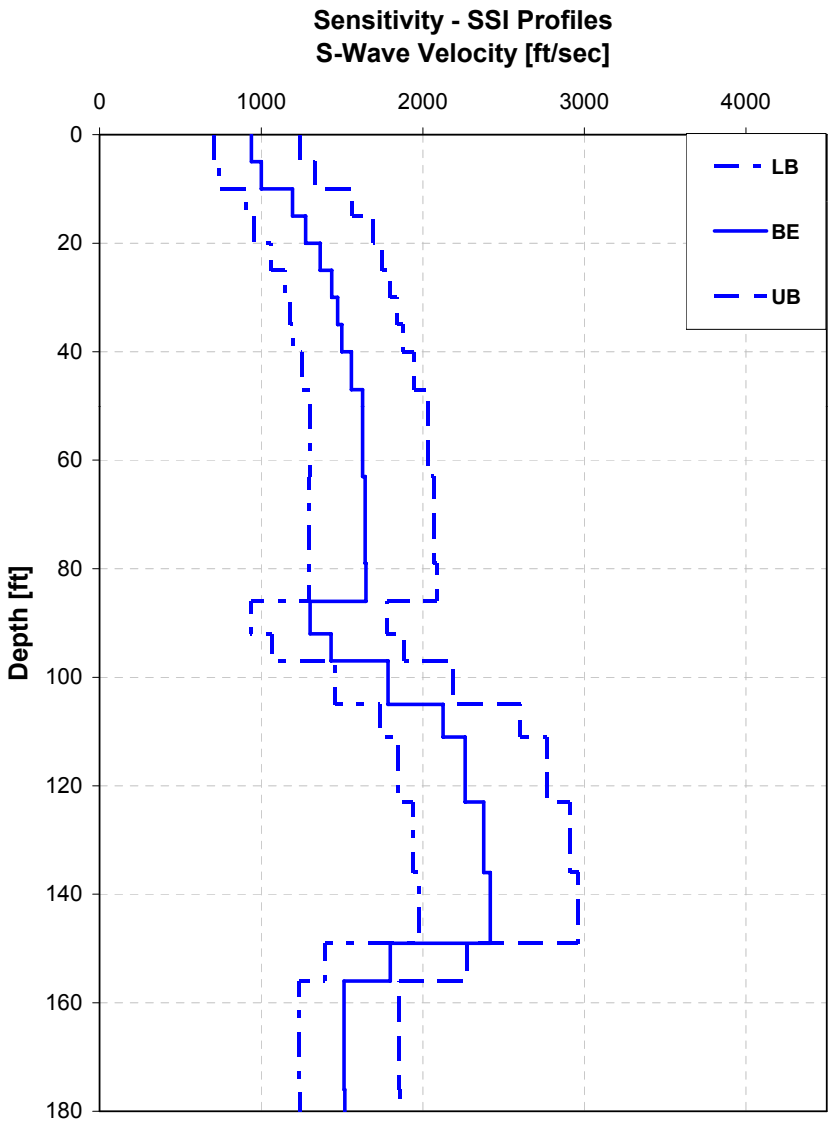
Sensitivity Study – DRS at 40 ft outcrop

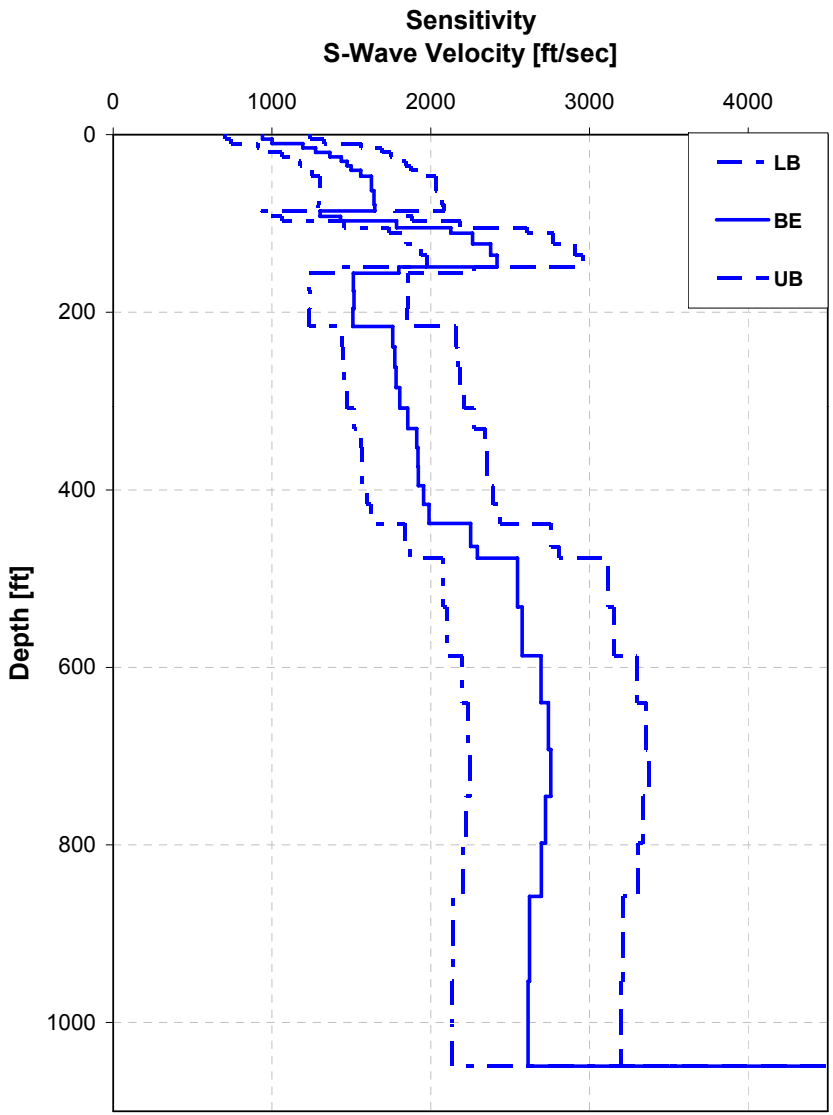


Sensitivity Study - 40 ft outcrop (matched TH)

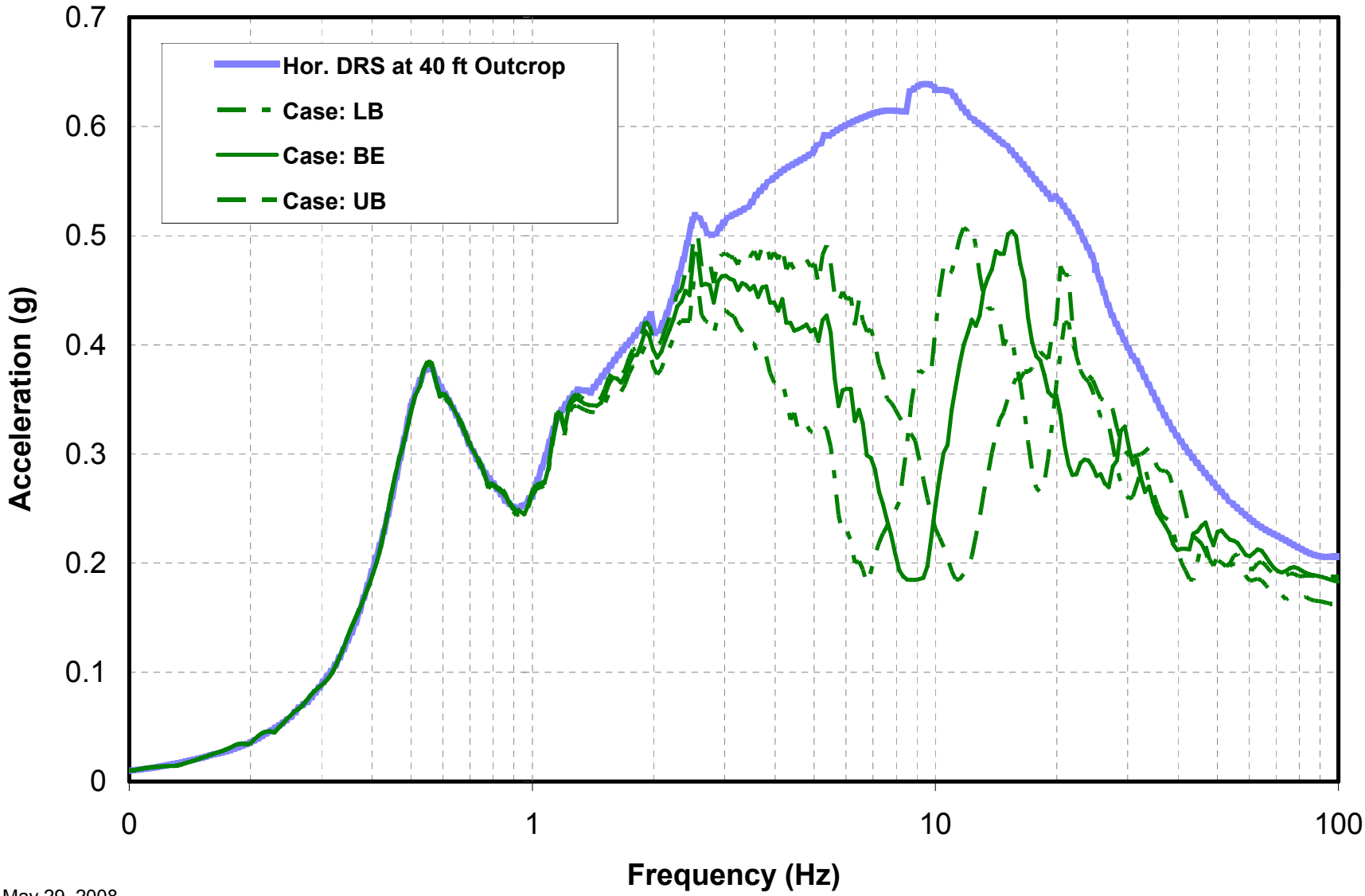


Strain-Compatible Vs for SSI-Sensitivity Study

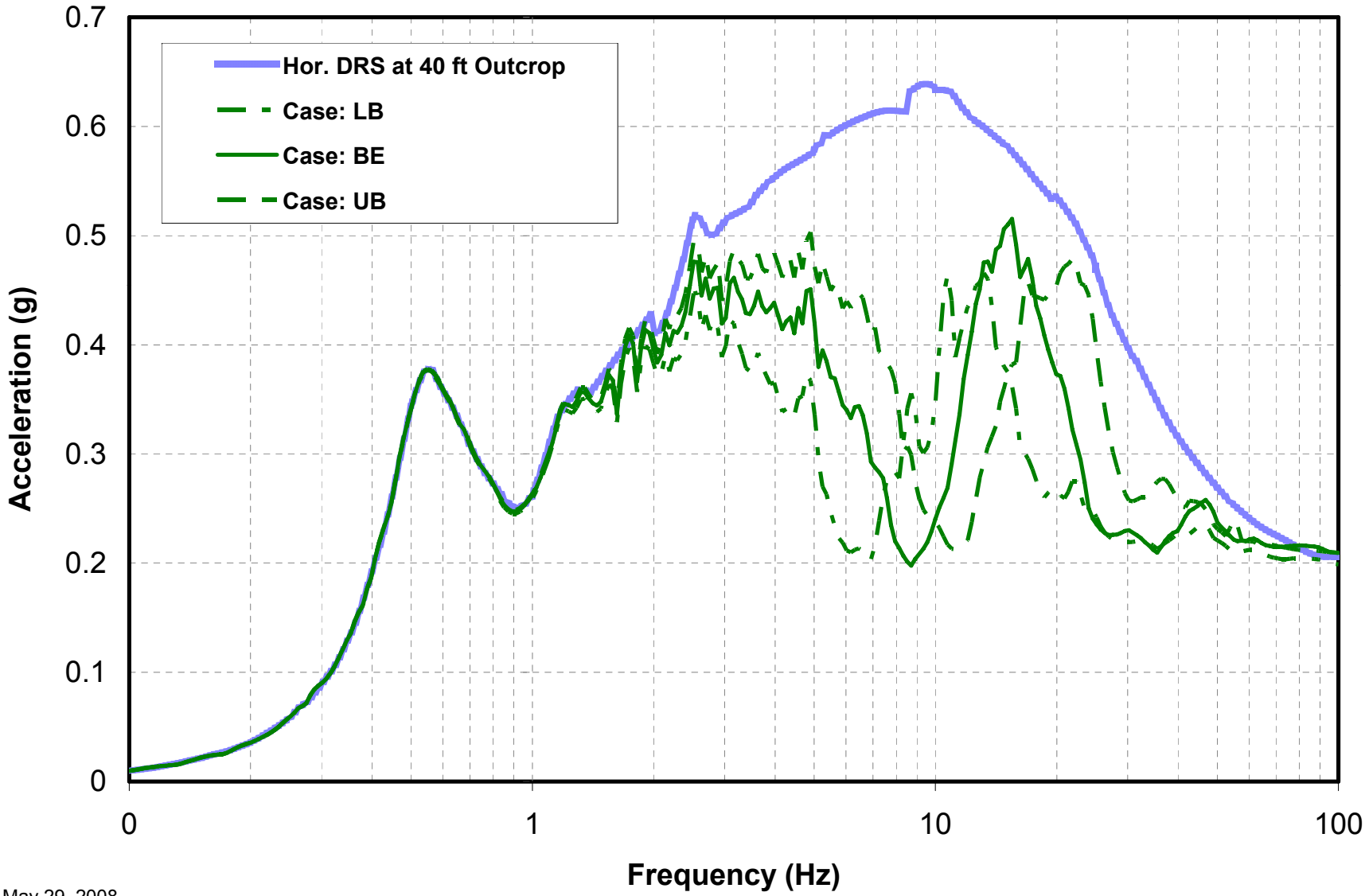




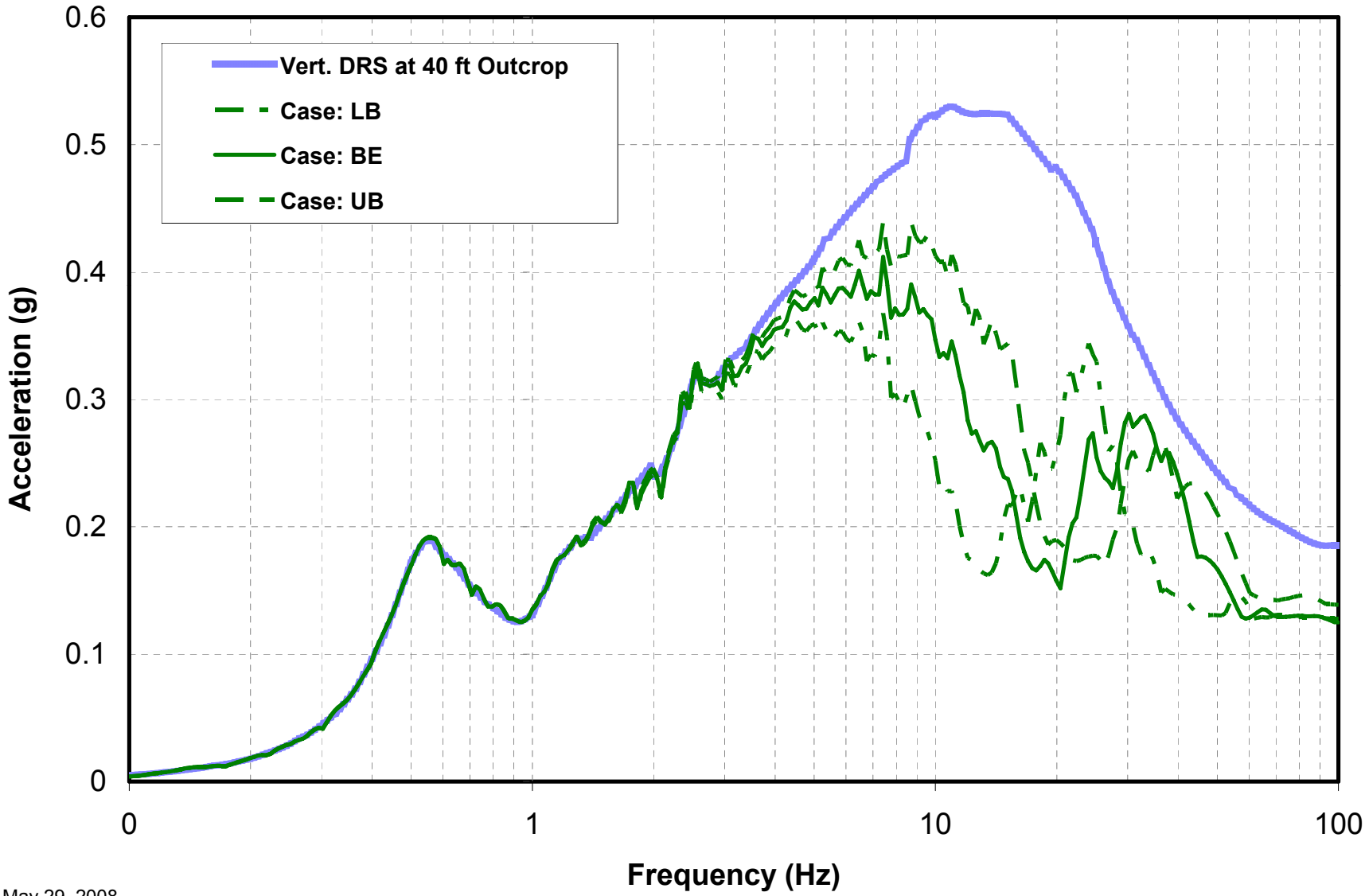
SSI Input Motion - Sensitivity Study (H1)



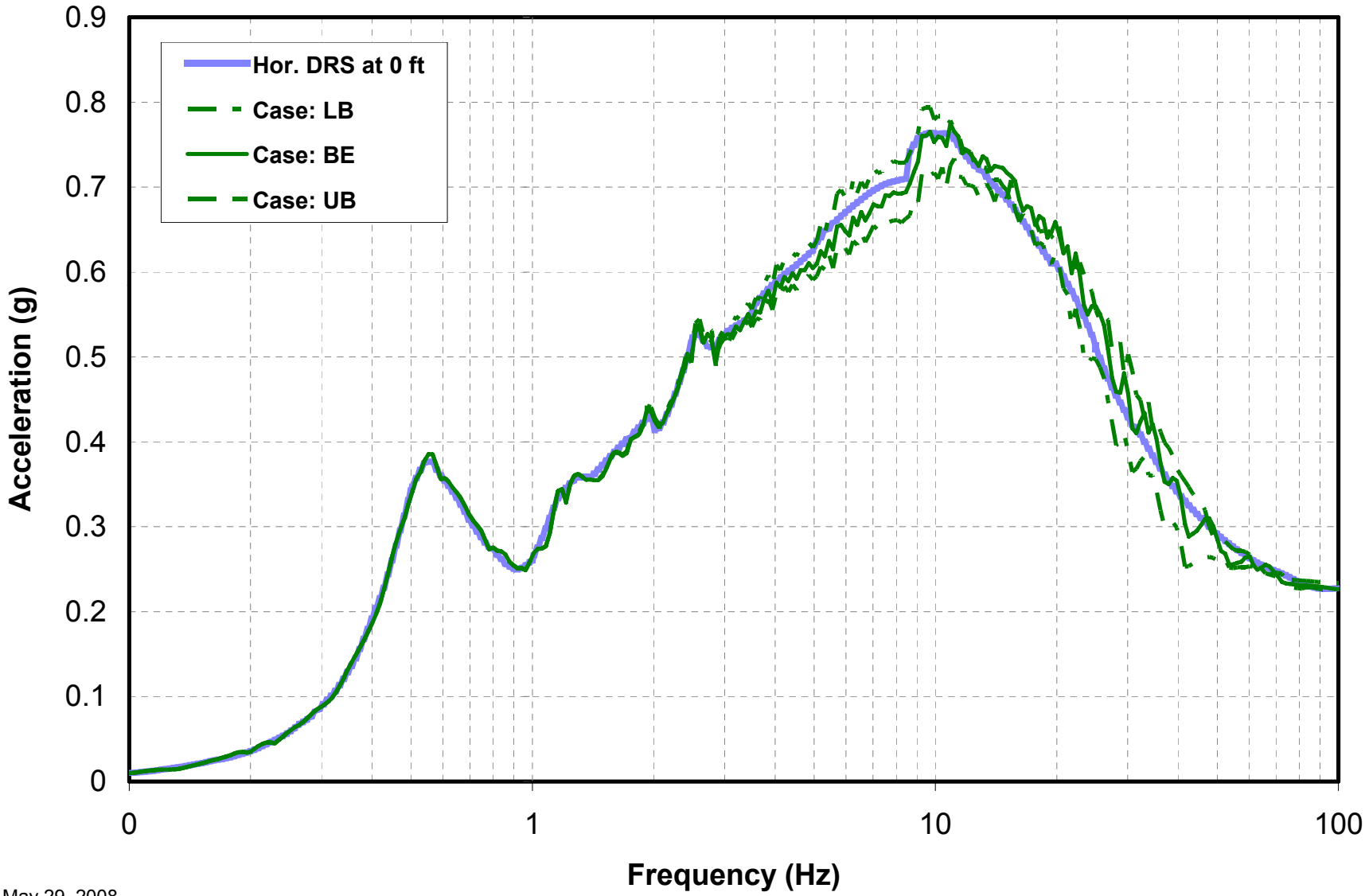
SSI Input Motion - Sensitivity Study (H2)



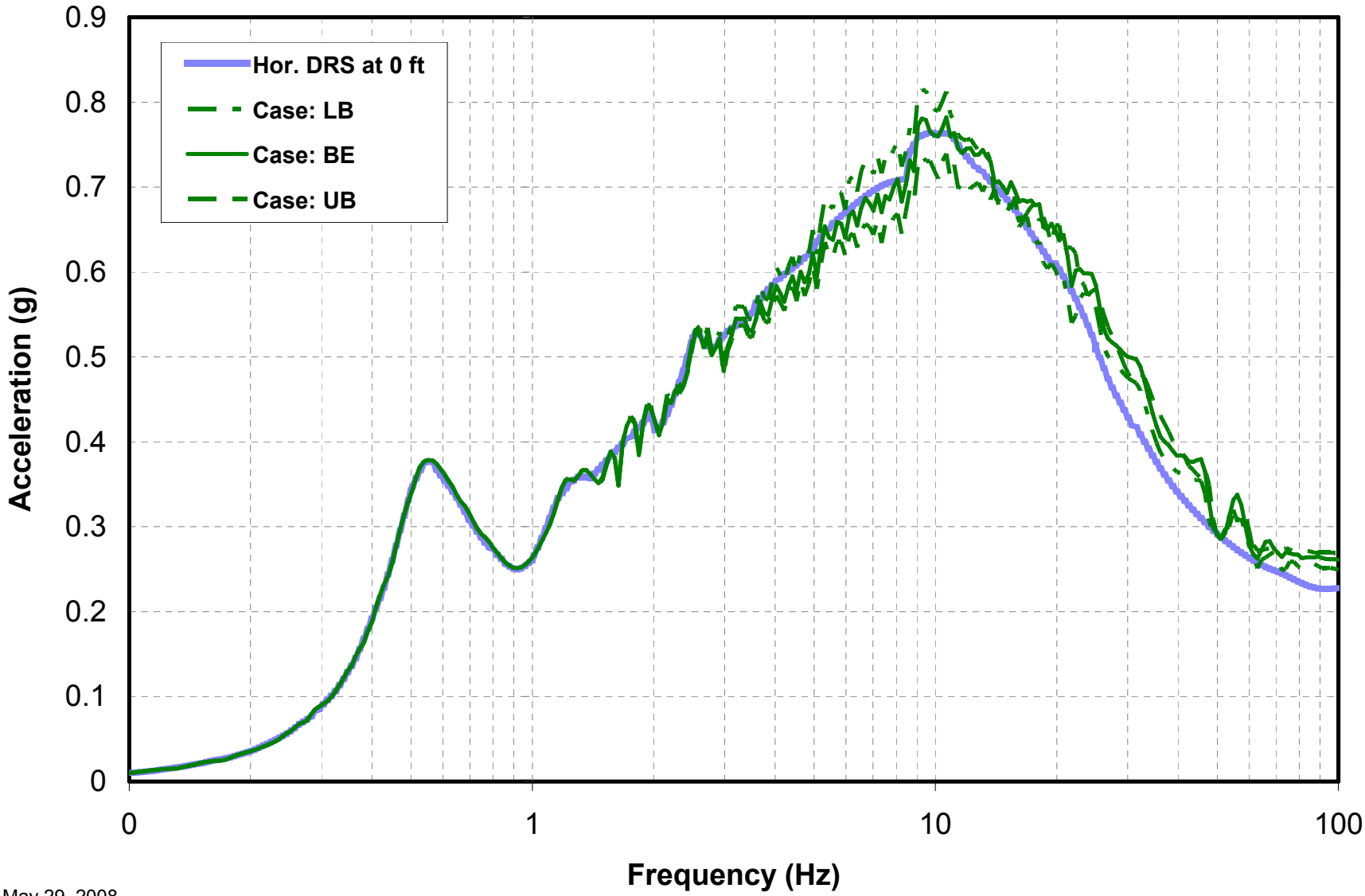
SSI Input Motion - Sensitivity Study (Vt)



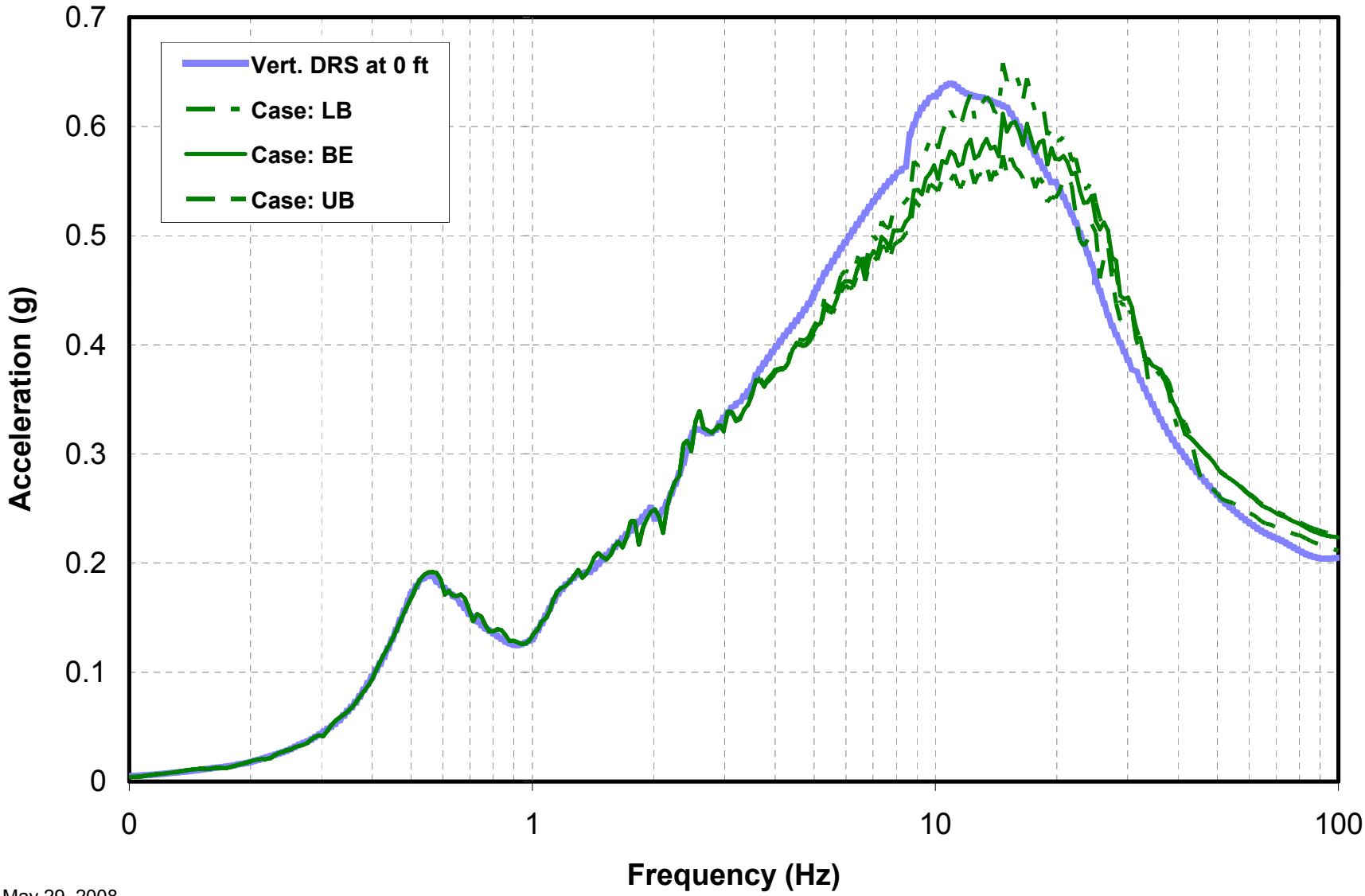
Ground Surface - Sensitivity Study (H1)



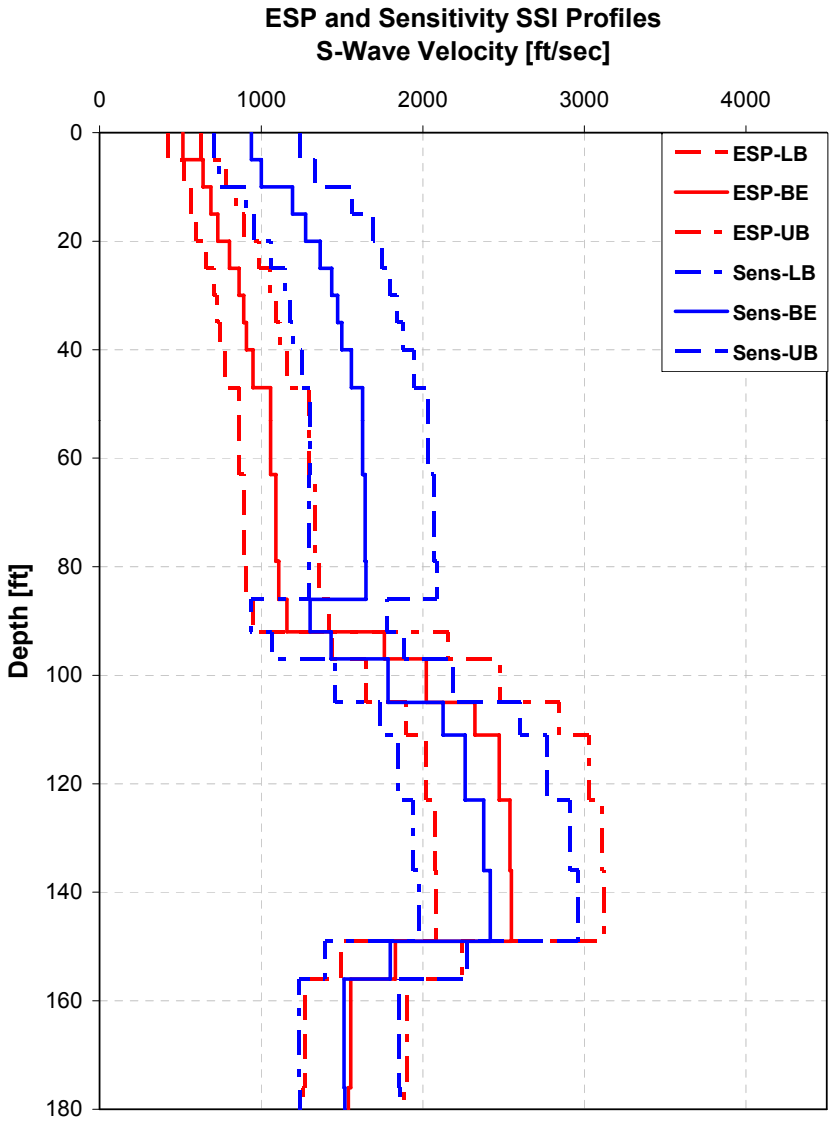
Ground Surface - Sensitivity Study (H2)

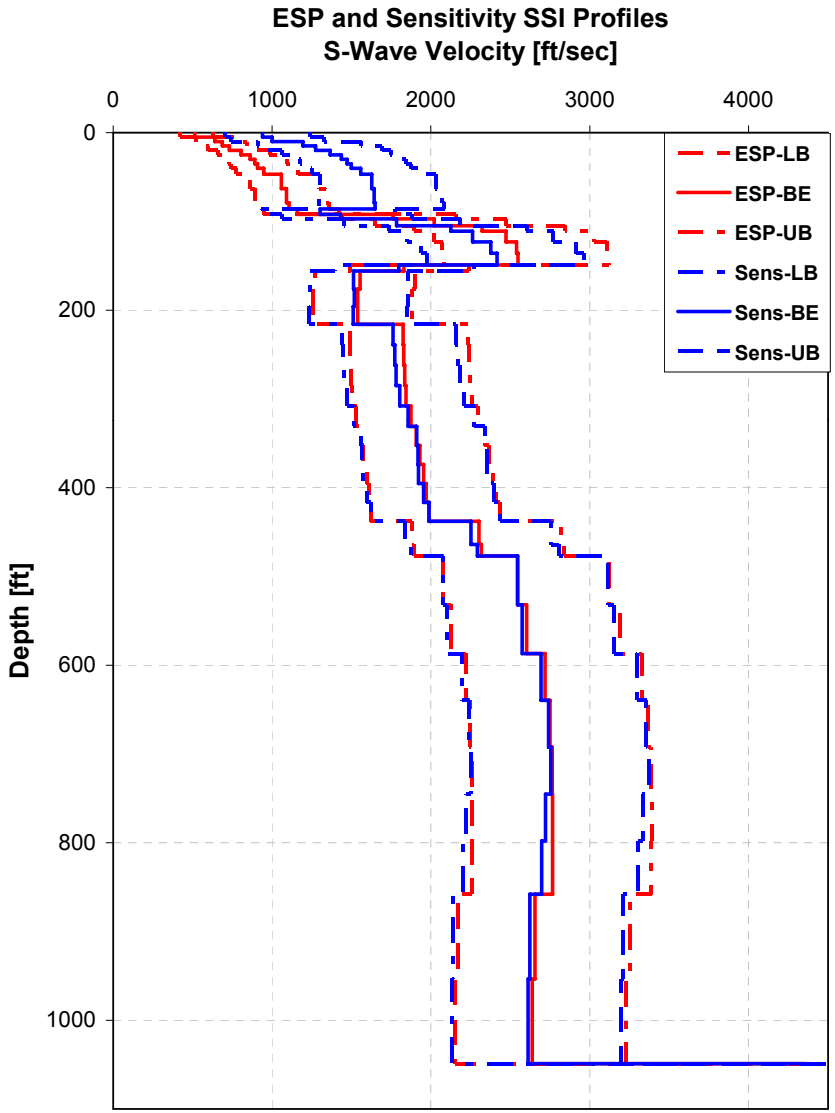


Ground Surface - Sensitivity Study (Vt)

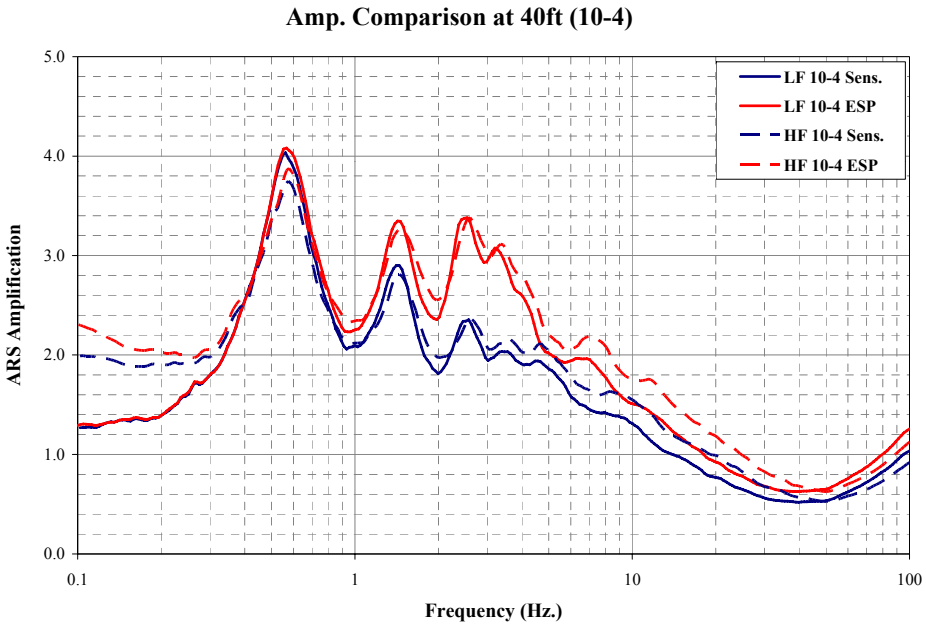


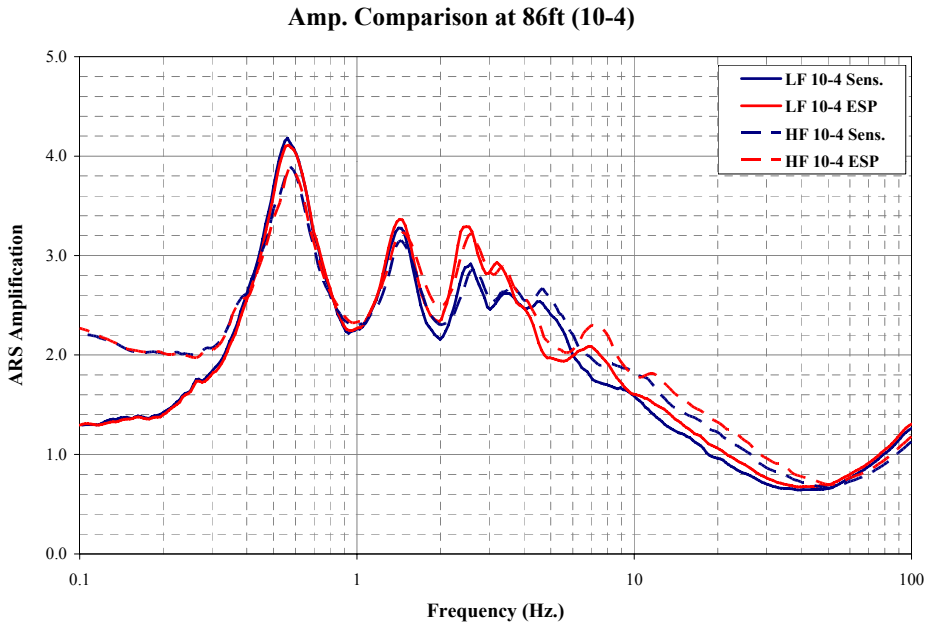
SSI Soil Properties - Comparison



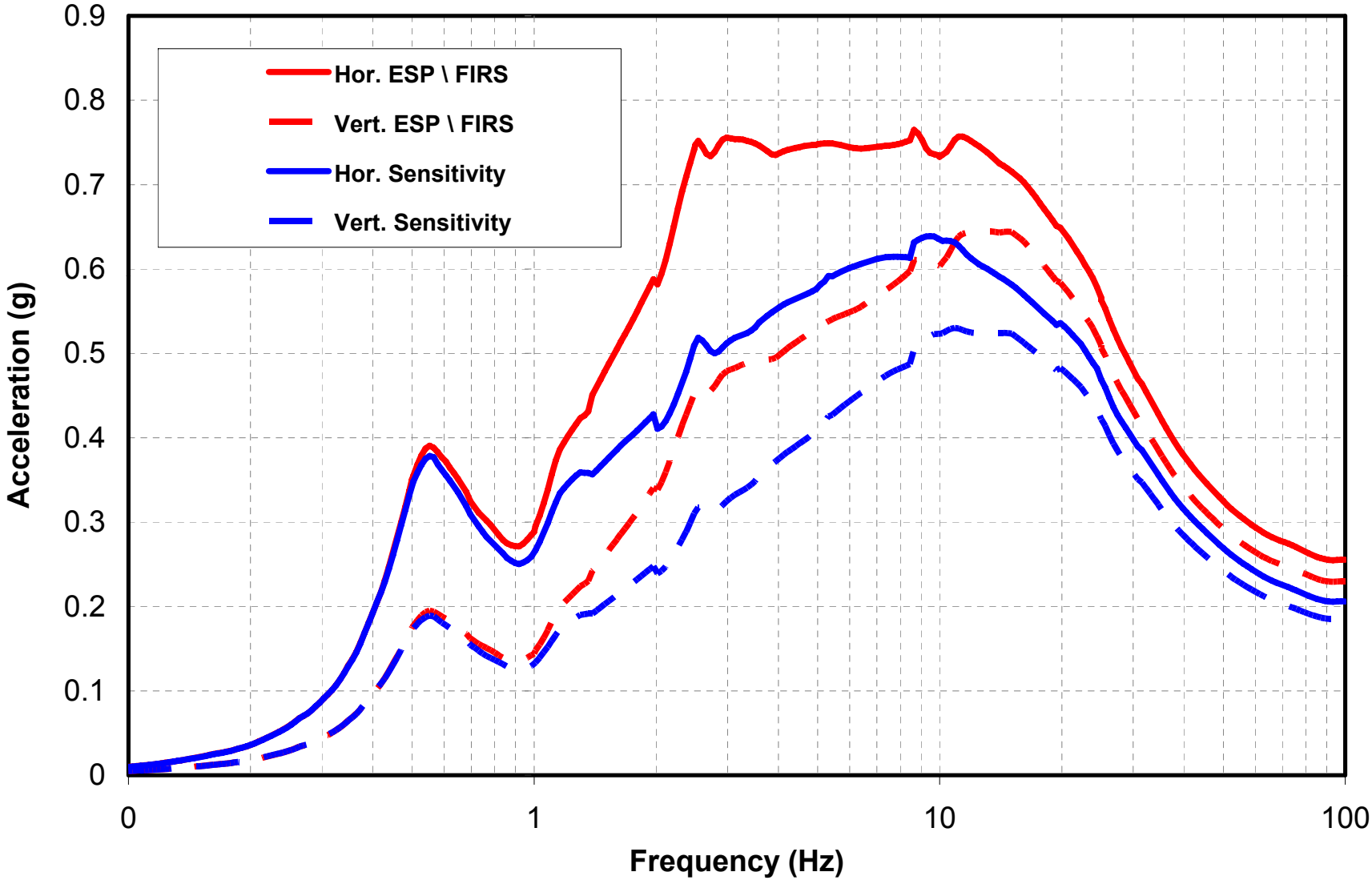


ESP versus Sensitivity Study at 40 ft and 86 ft outcrop

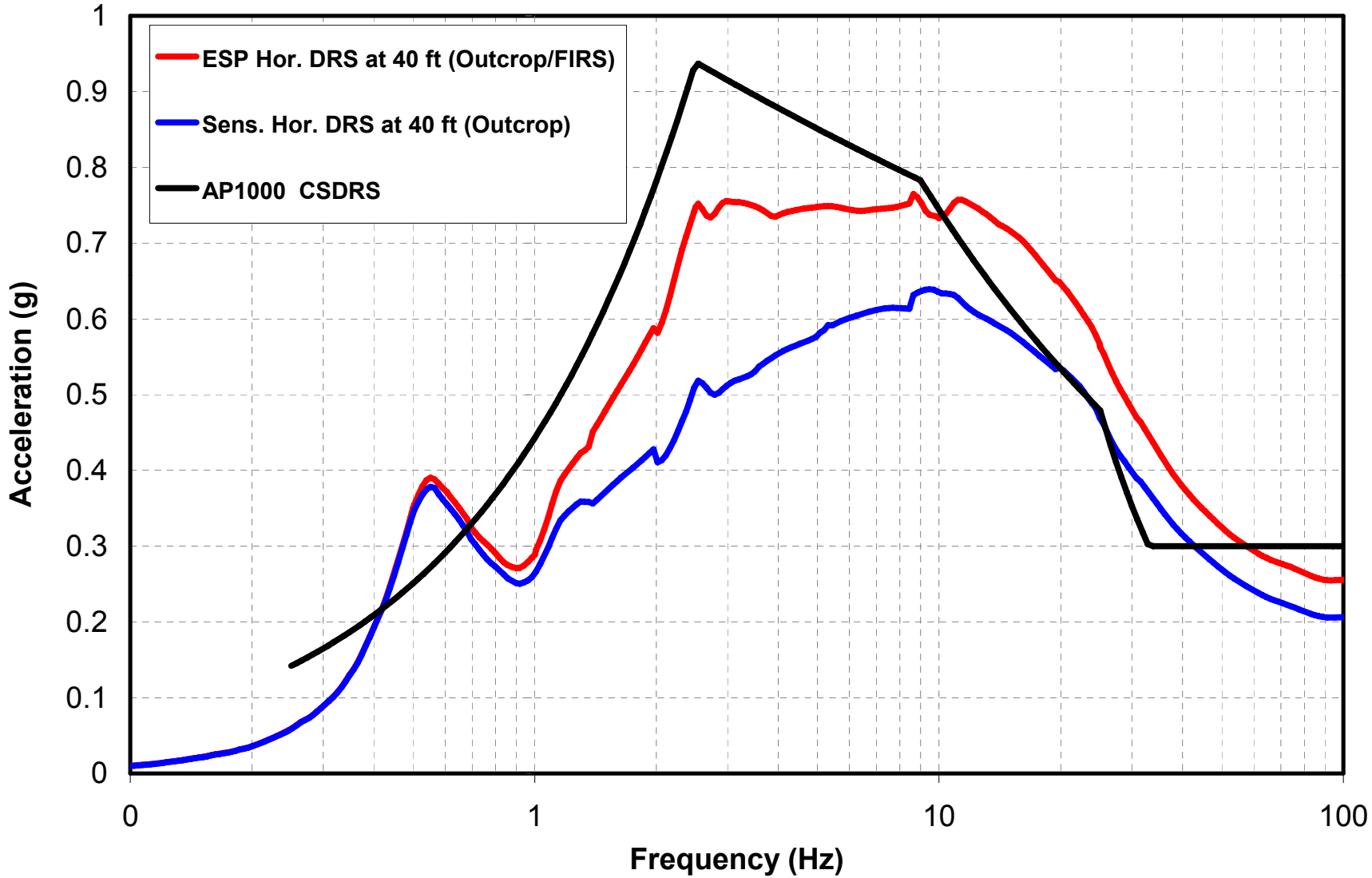




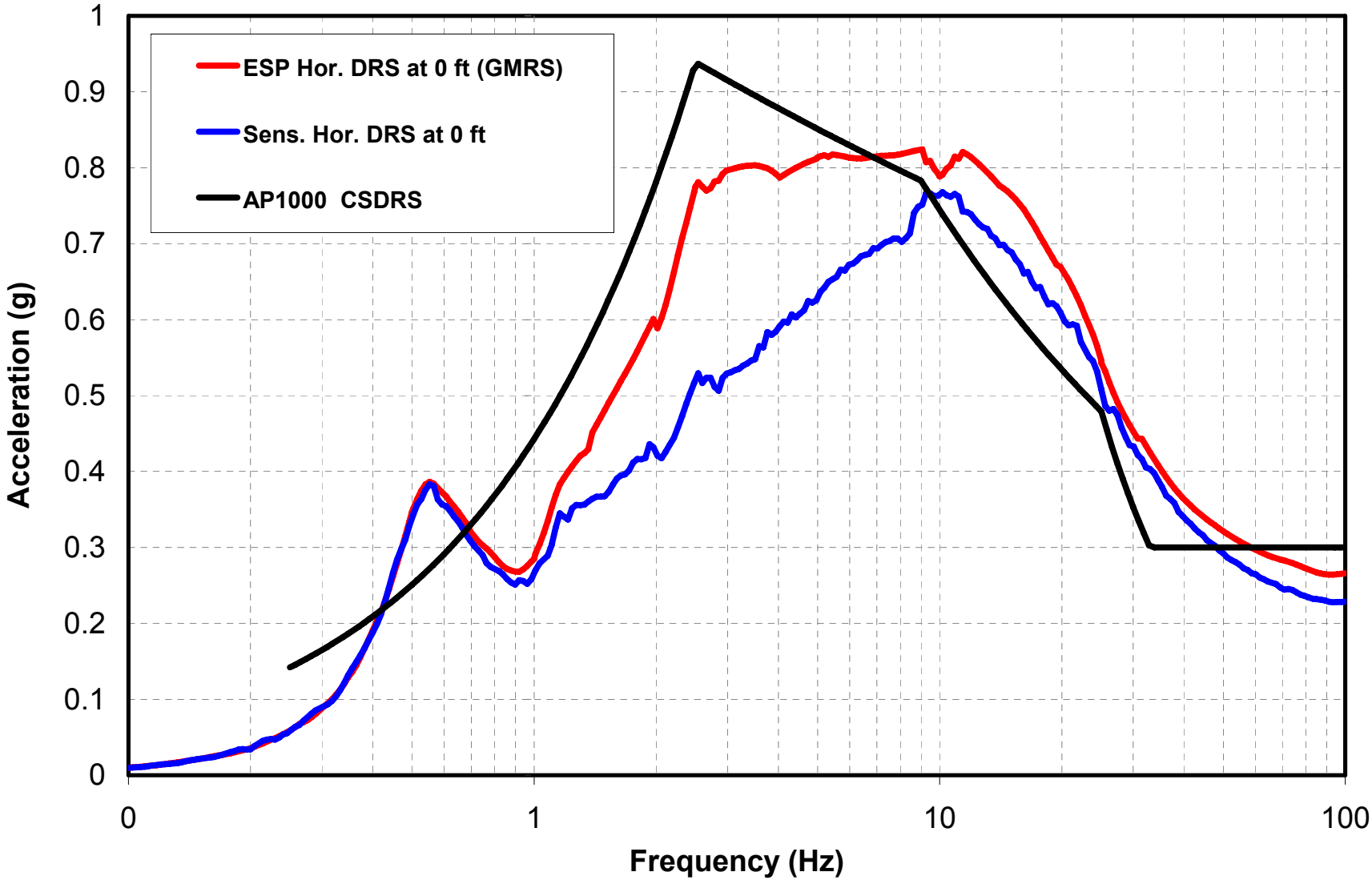
ESP FIRS versus Sensitivity Study at 40 ft outcrop



DRS Comparison at FIRS Horizon



DRS Comparison at GMRS Horizon



Sensitivity Study – Input for SSI Analysis

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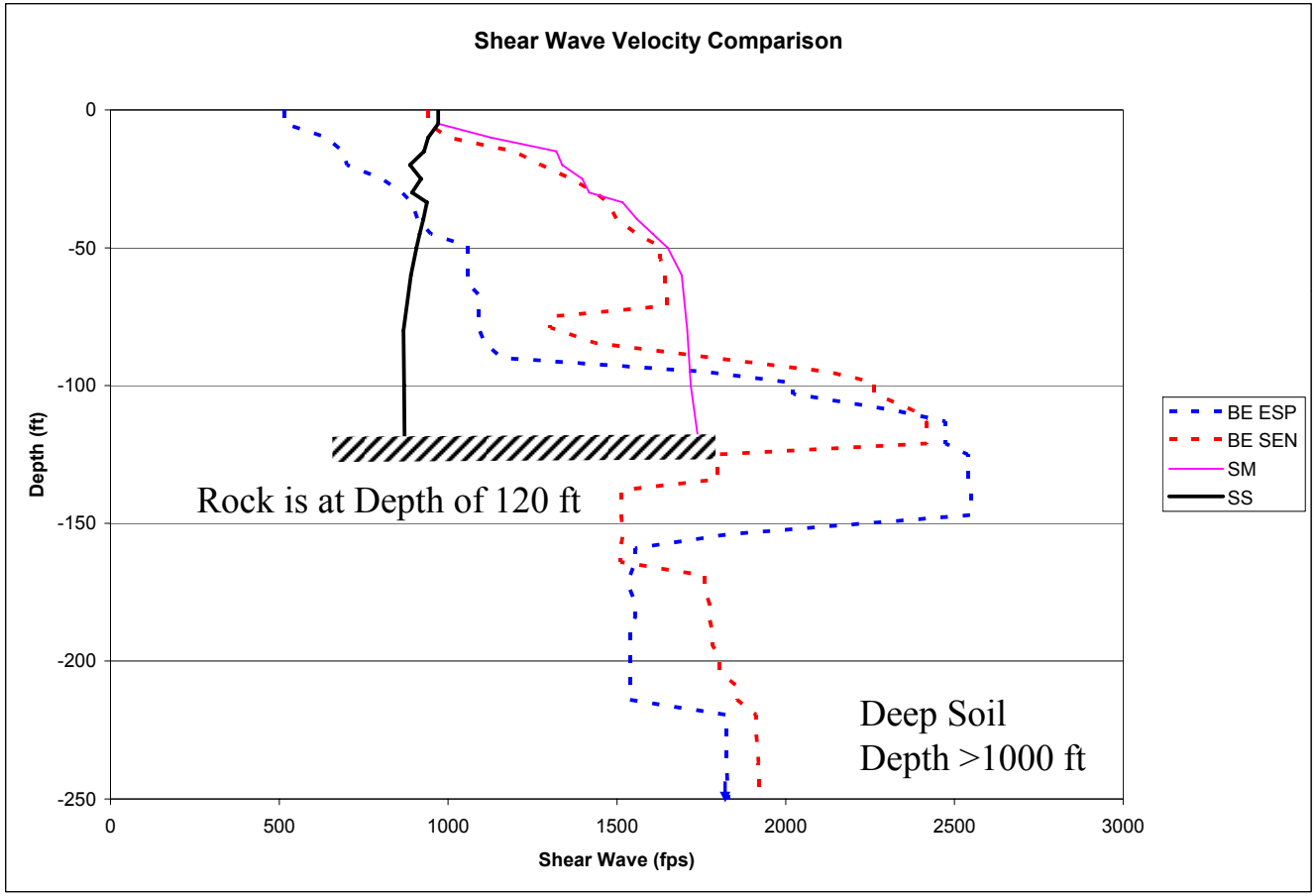
- The in-column time histories at the depth of 40 ft (H1, H2, Vt)
- The strain-compatible soil profiles (UB, BE, LB)

Differences between the Vogtle and Generic SSI analyses

Lee Tunon-Sanjur
AP1000 Layout and Structures
412-374-6475– tunonslj@westinghouse.com

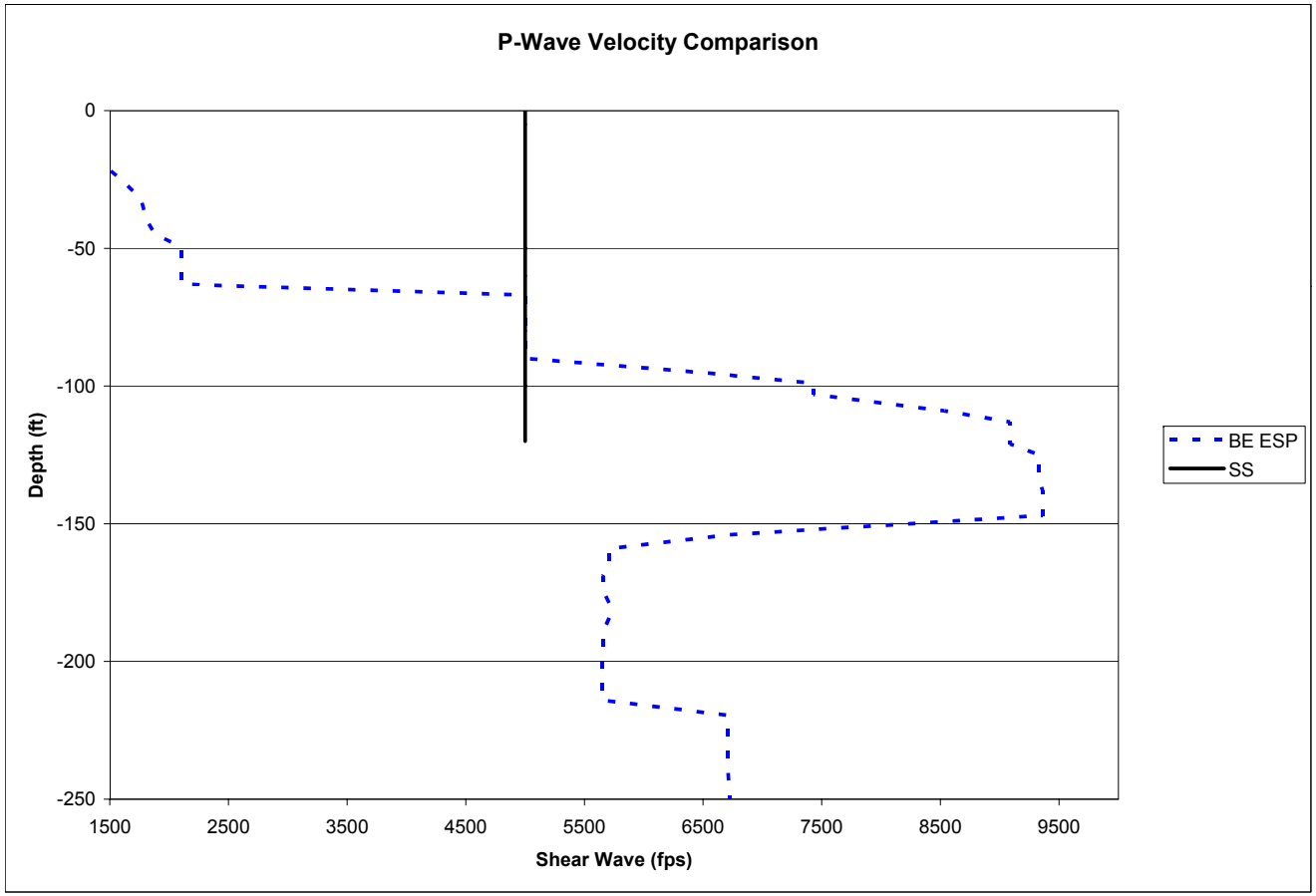
Shear Wave Profiles



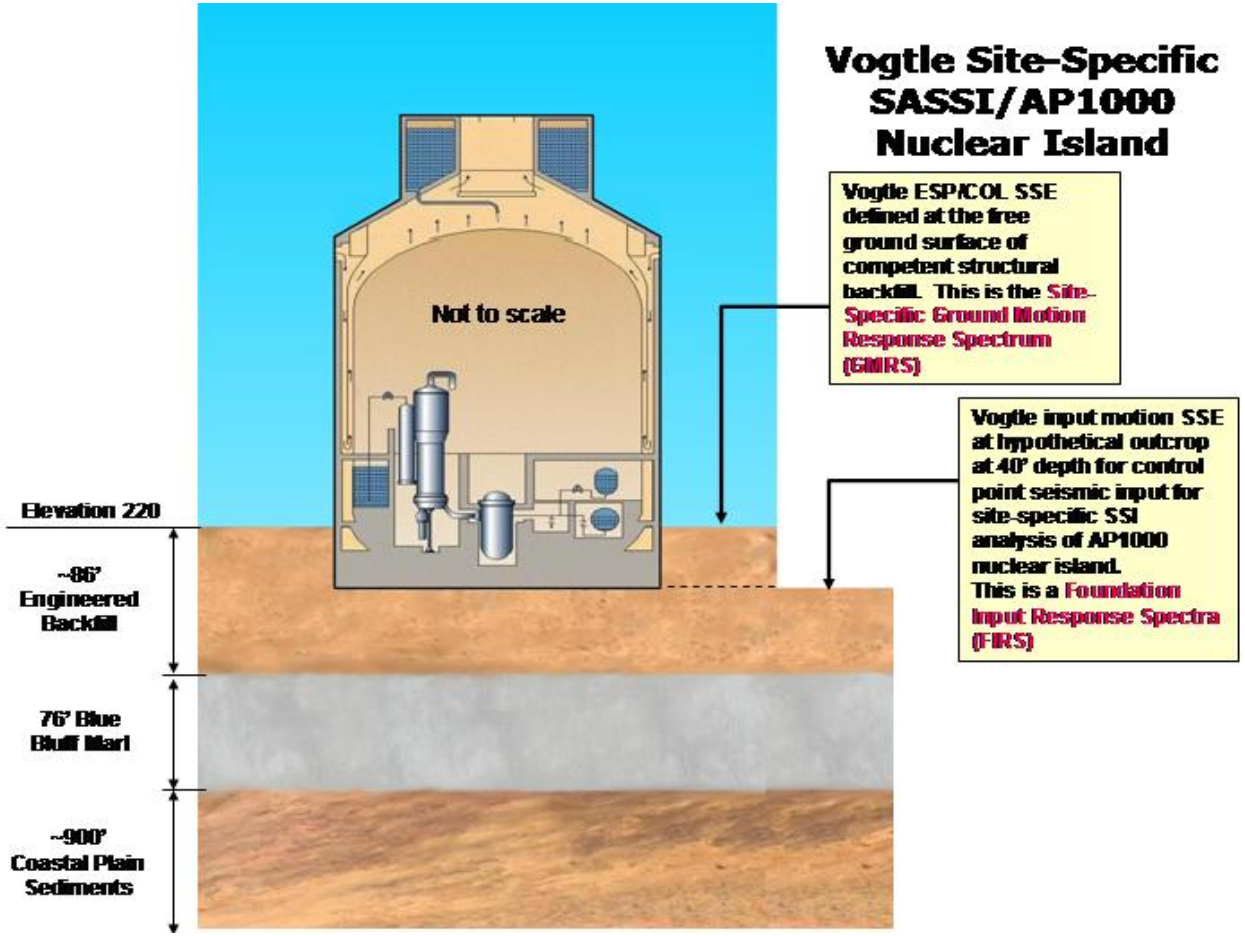
Vogtle BE ESP soil profile is closer to Generic Soft Soil

Vogtle BE SEN soil profile is closer to Generic Soft to Medium Soil

P-Wave Profiles

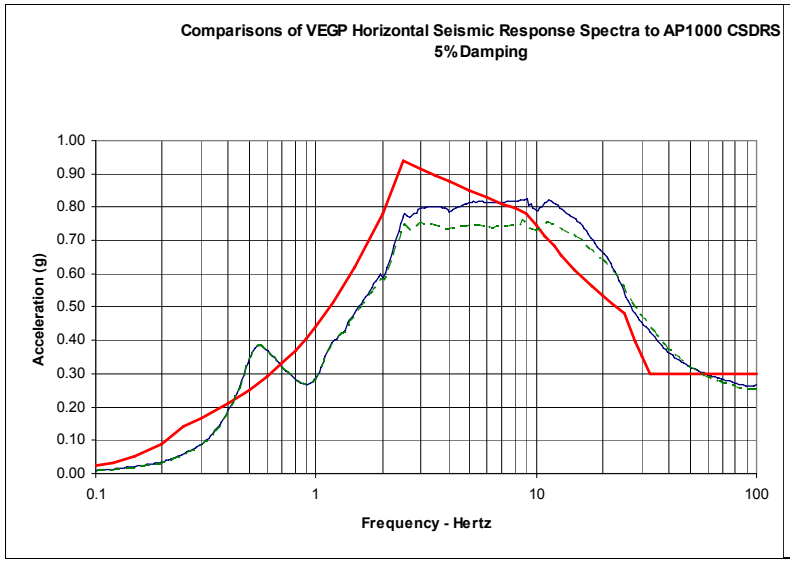


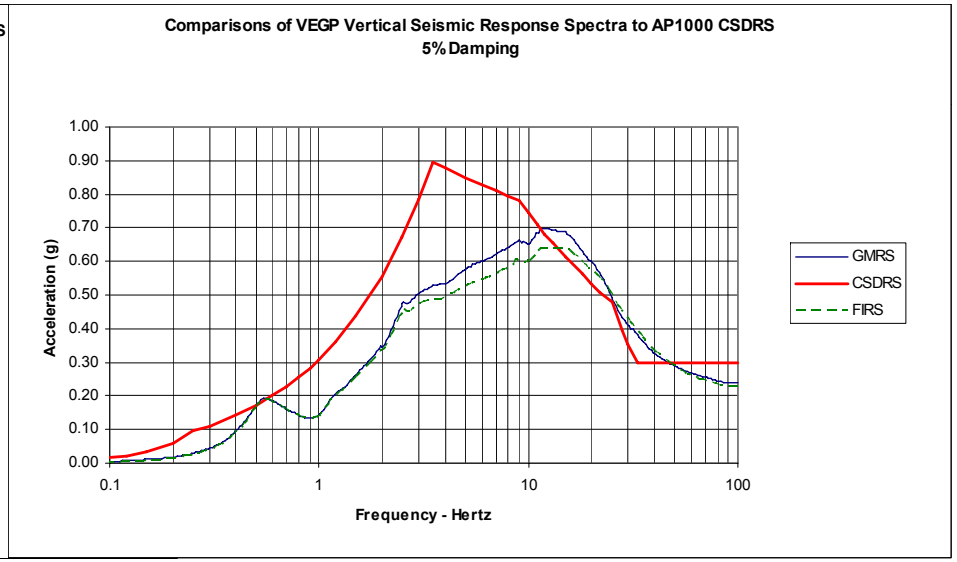
Seismic Analyses of an AP1000 at Vogtle



FIRS

Vogtle Seismic Input in the 1-10 Hz range is below the AP1000 Generic Analyses Seismic Input in both the Horizontal and Vertical direction

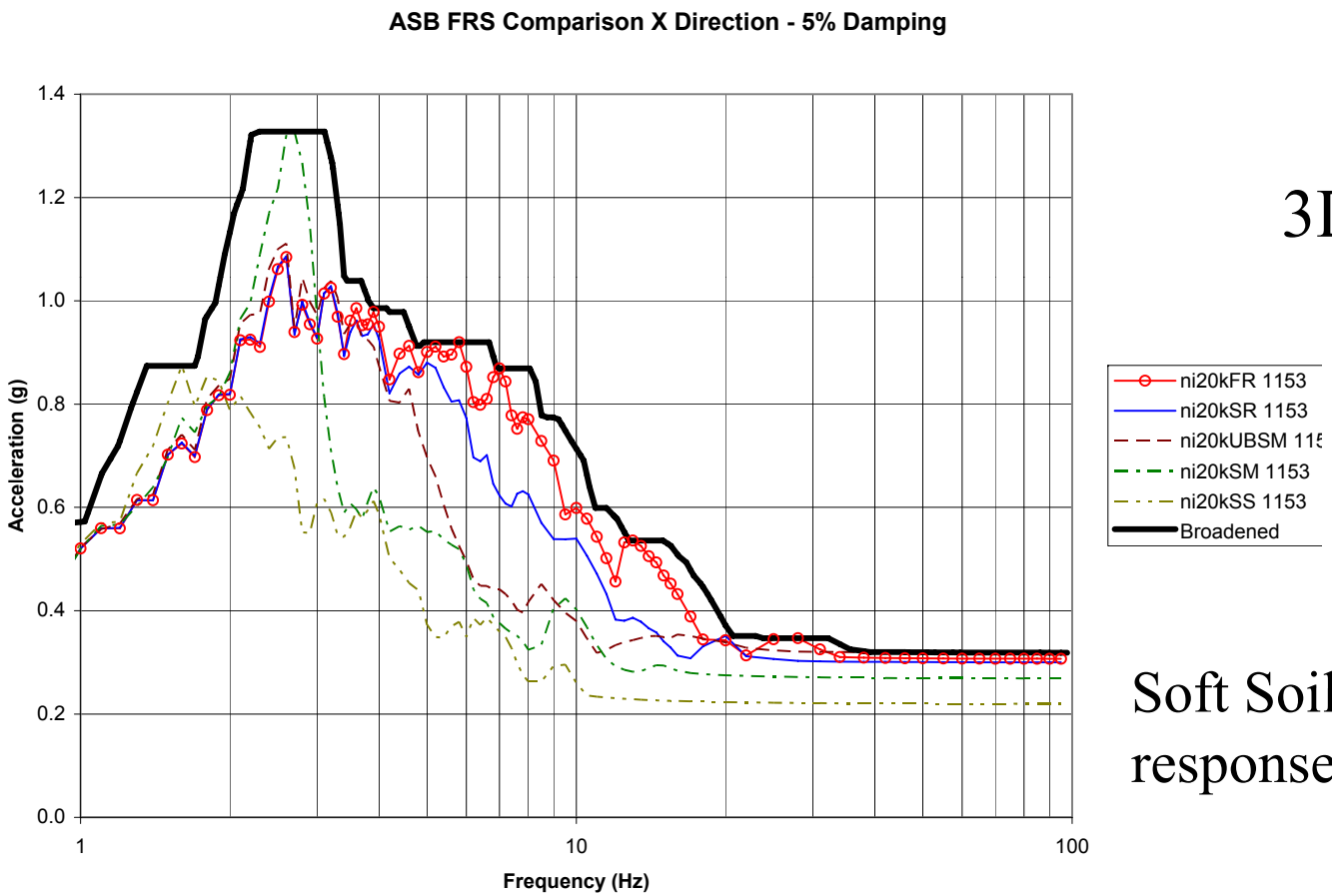




Horizontal

Vertical

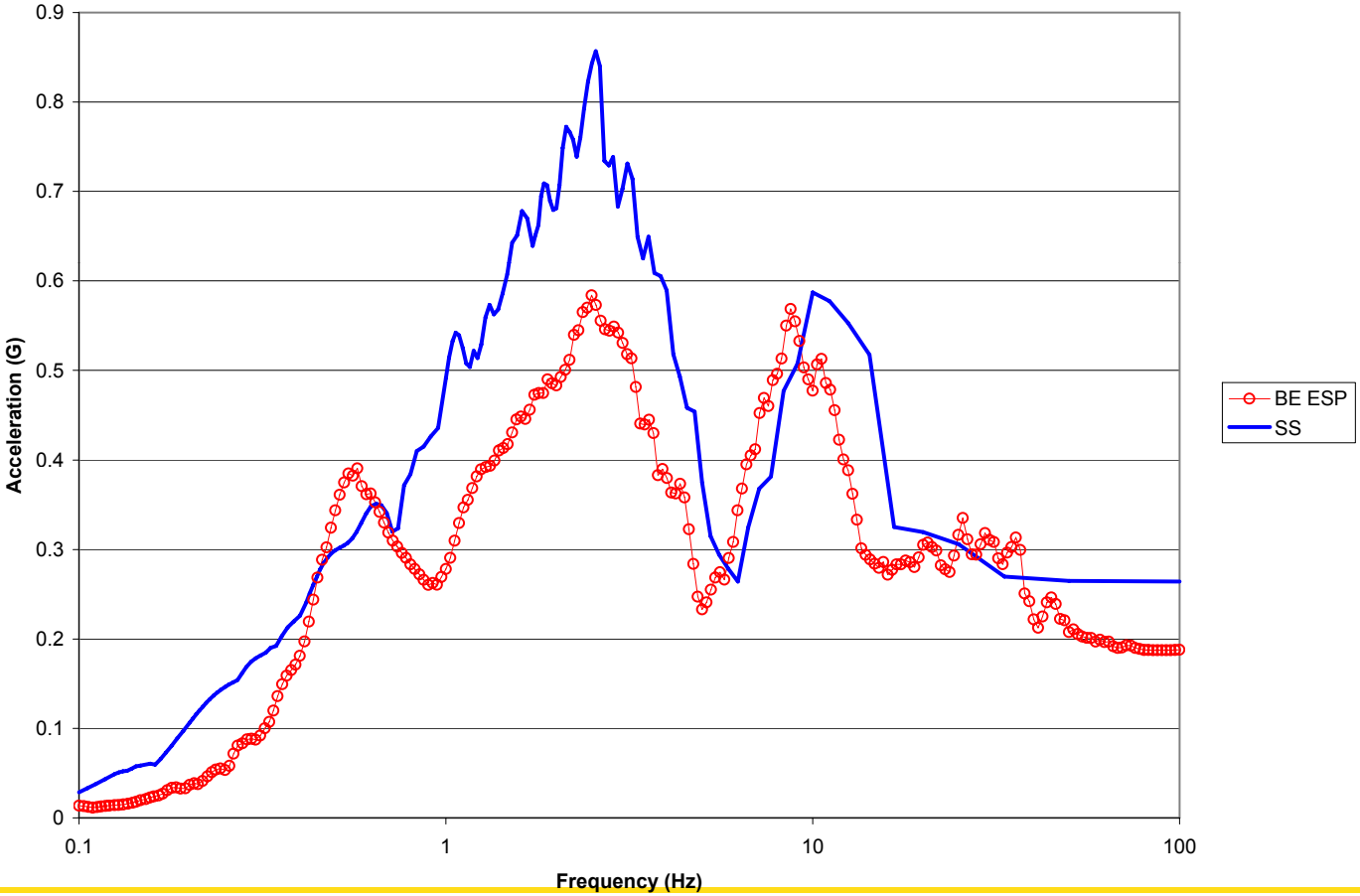
Generic Analyses FRS at Foundation Level



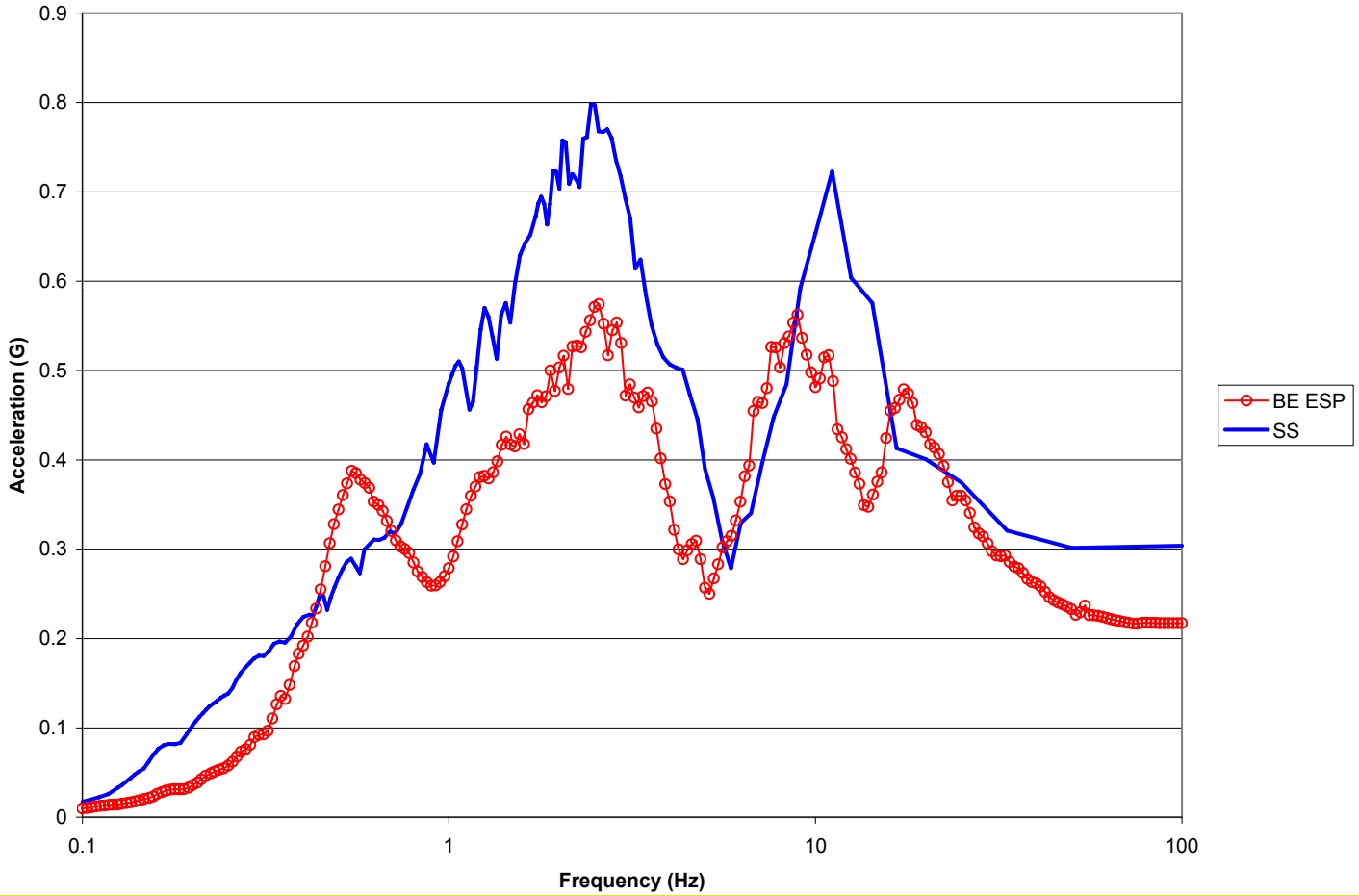
3D SASSI

Soft Soil gives the lowest response of all soil profiles

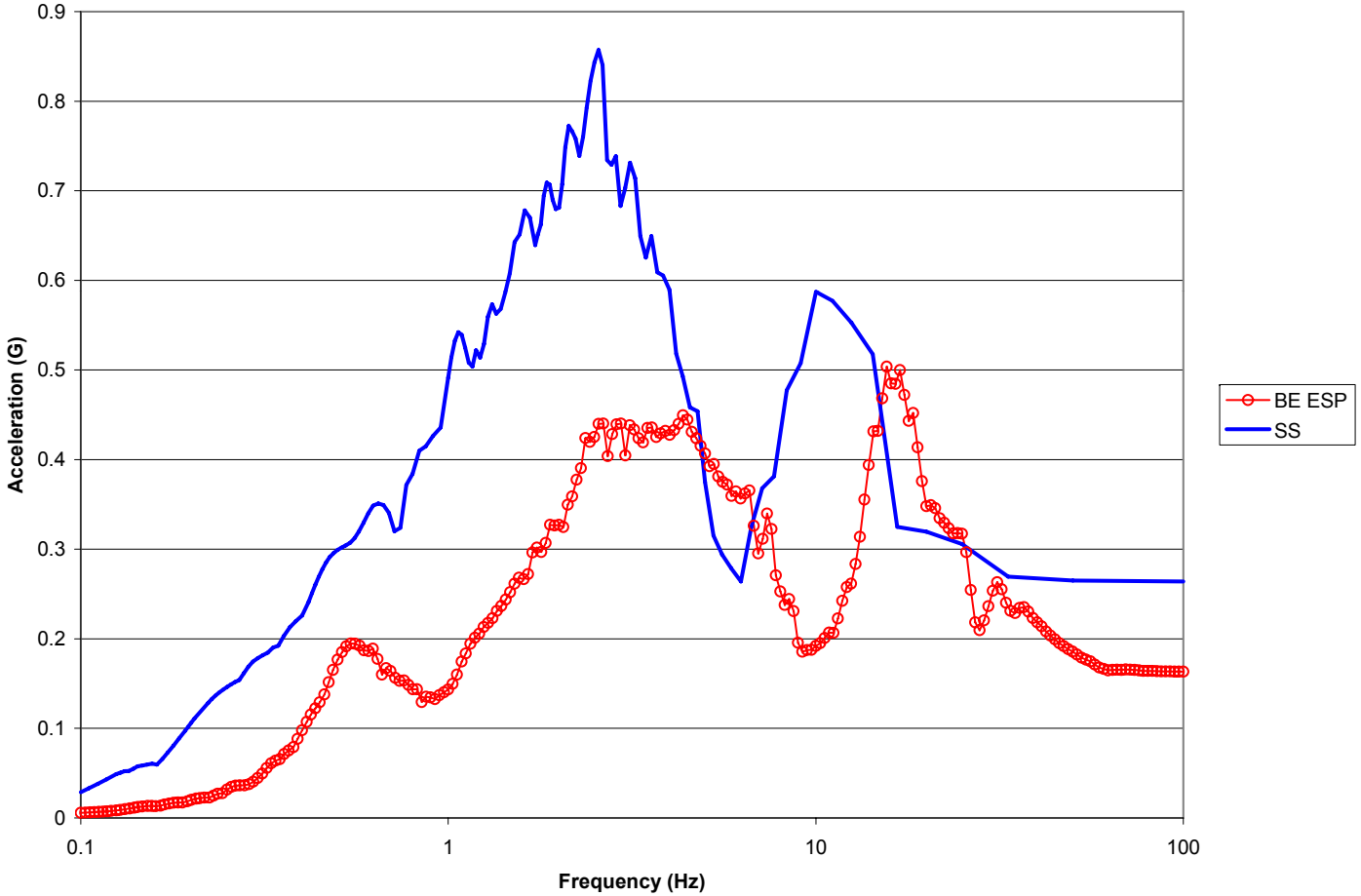
Seismic Input at Foundation Level – X Direction - ESP



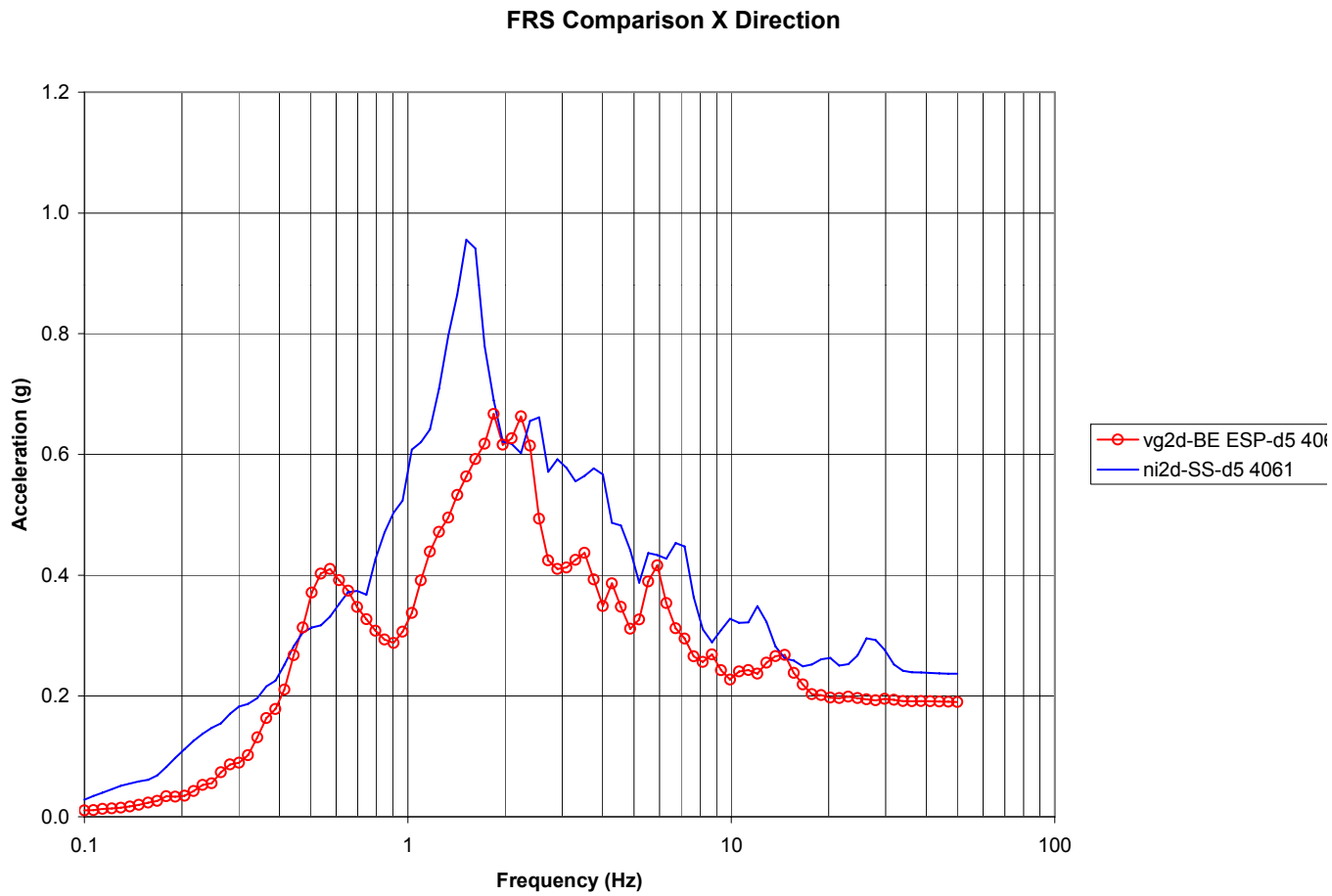
Seismic Input at Foundation Level – Y Direction - ESP



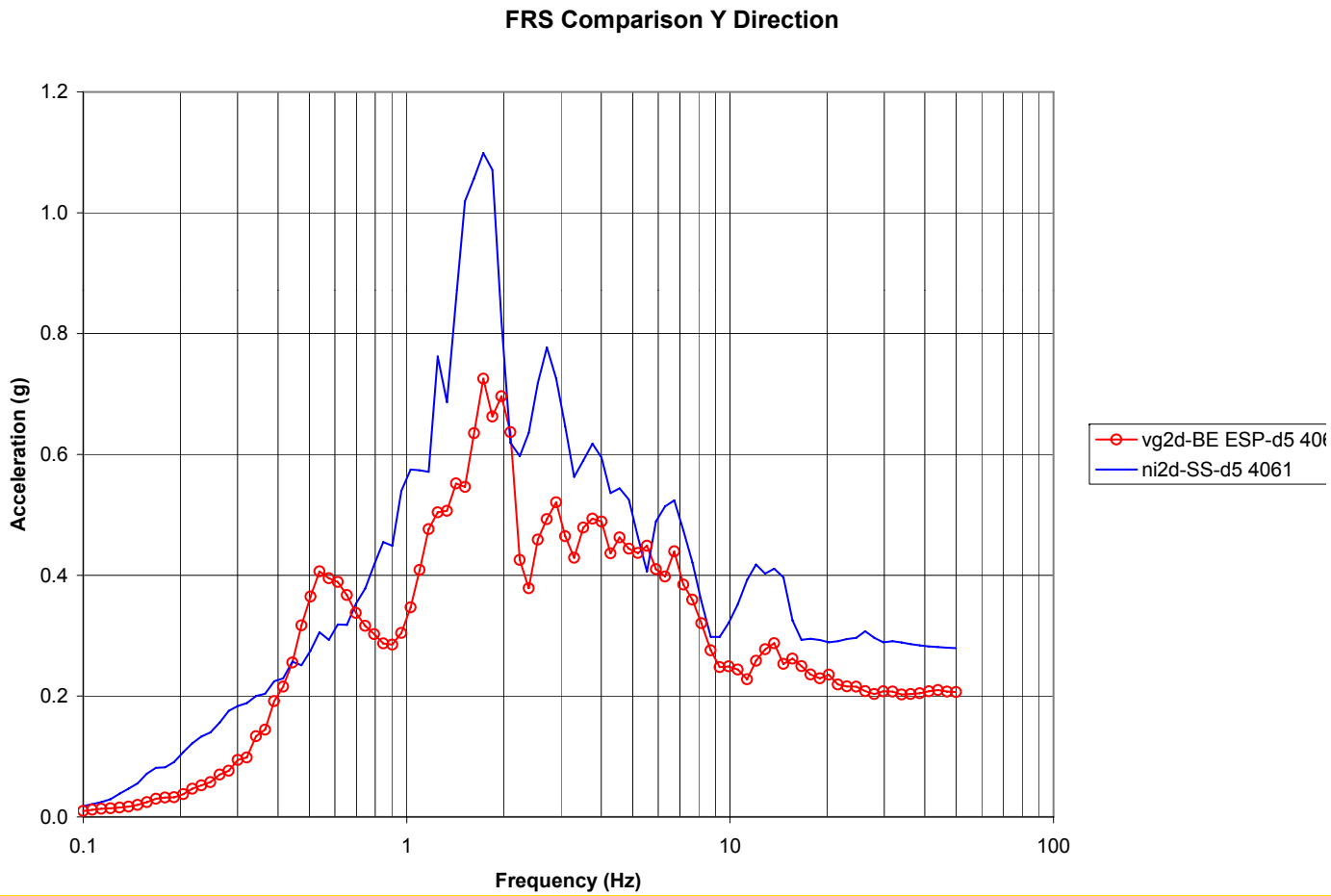
Seismic Input at Foundation Level – Z Direction - ESP



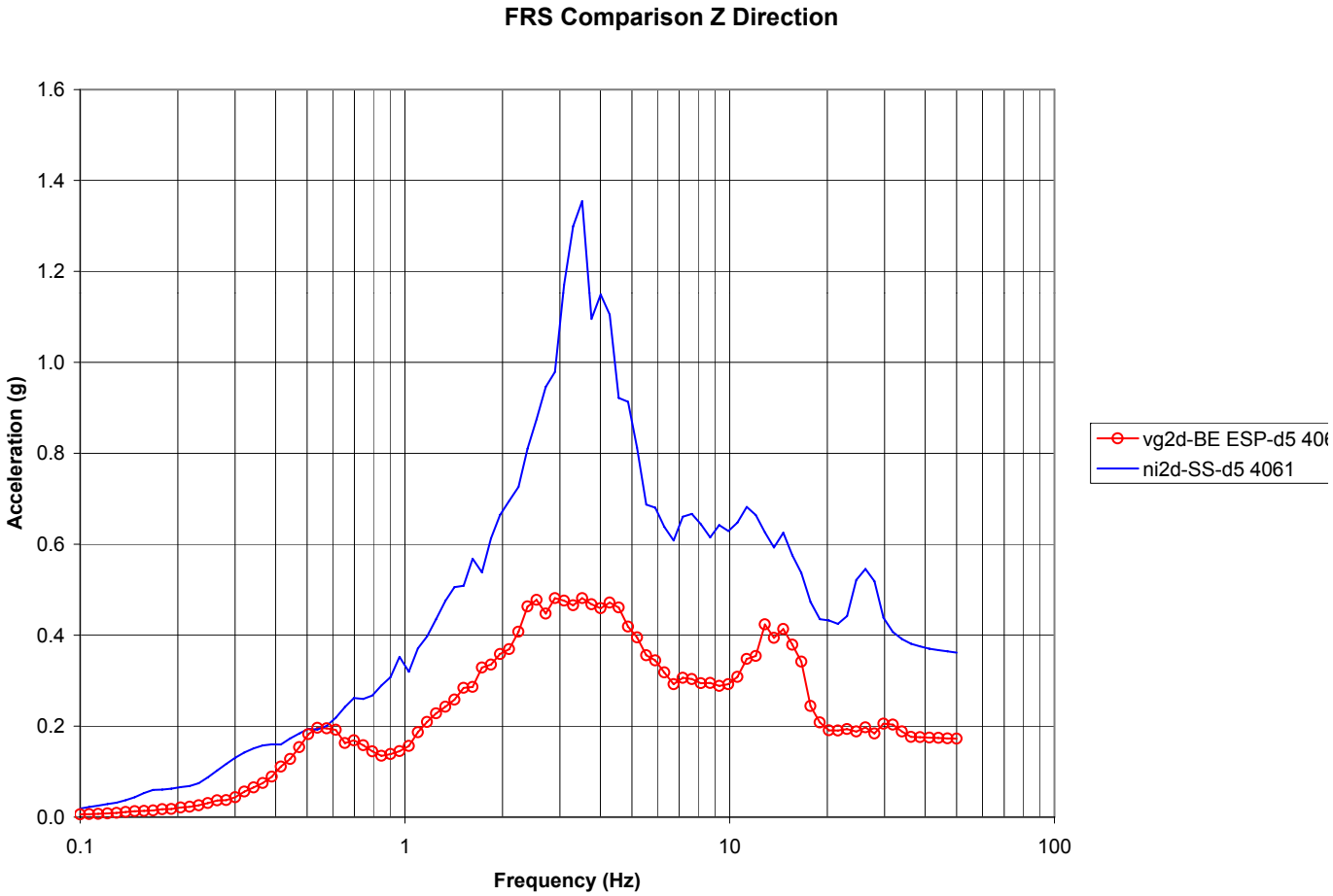
FRS Comparison at Control Room Level – X Direction



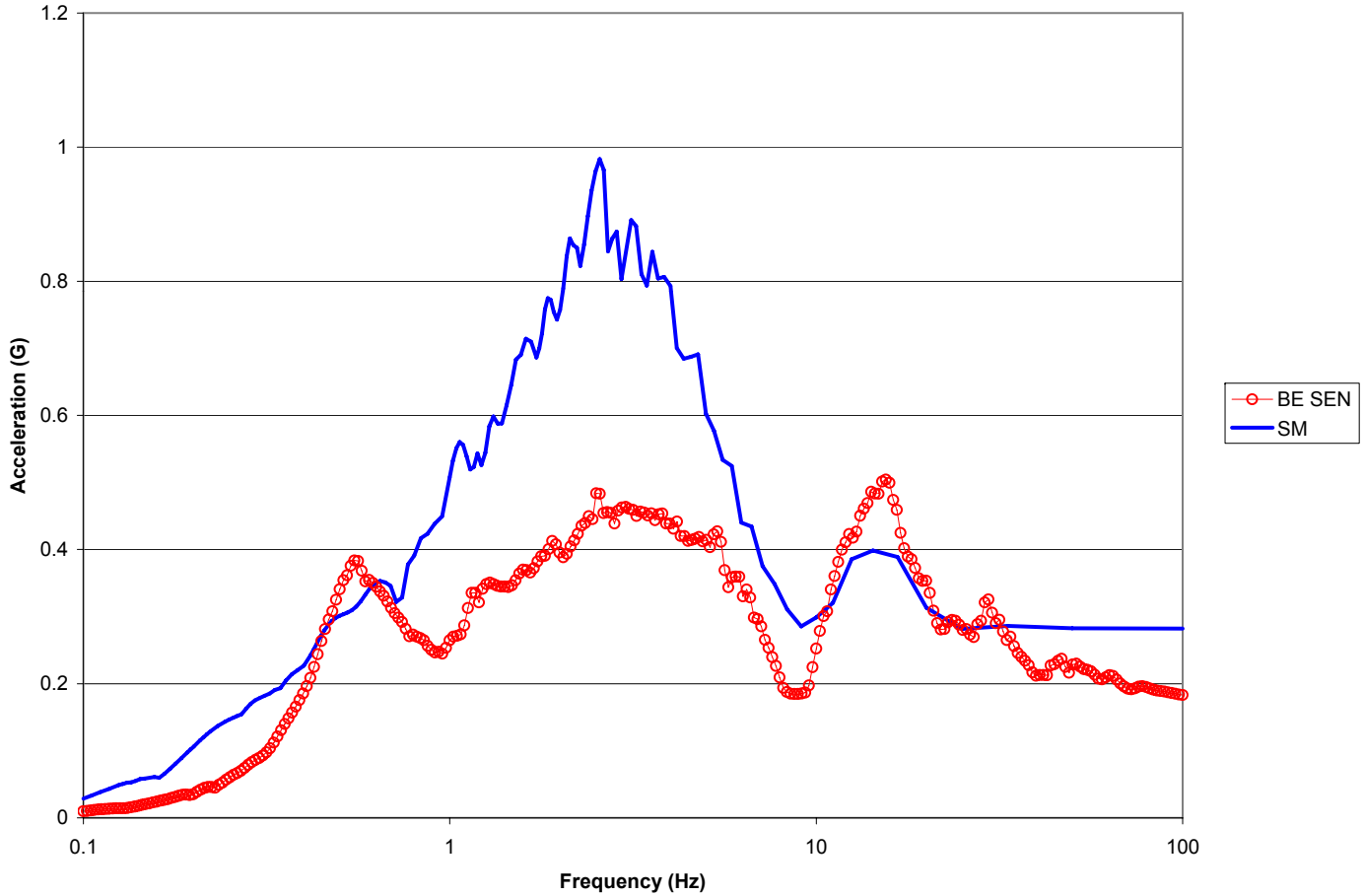
FRS Comparison at Control Room Level – Y Direction



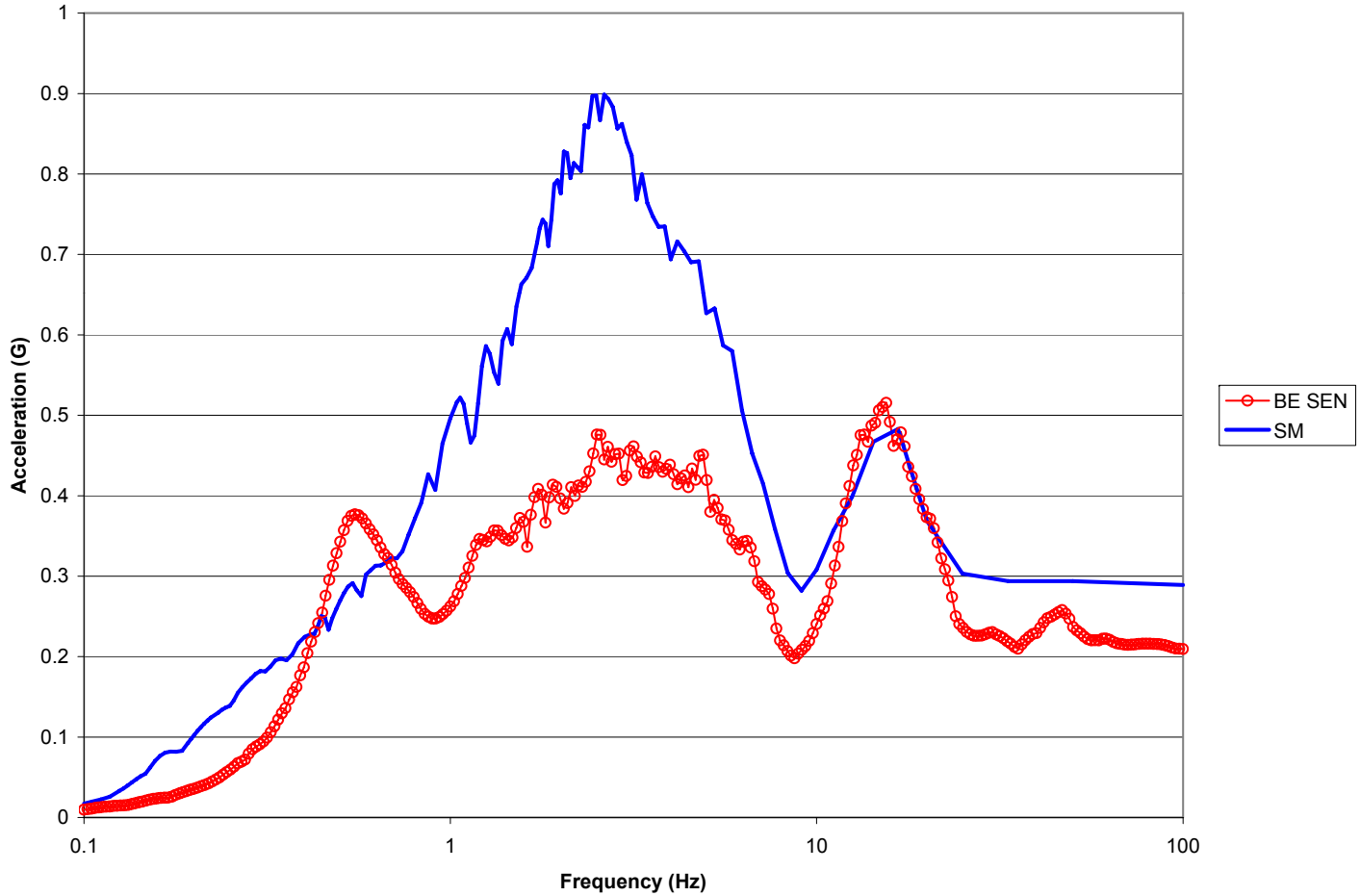
FRS Comparison at Control Room Level – Z Direction



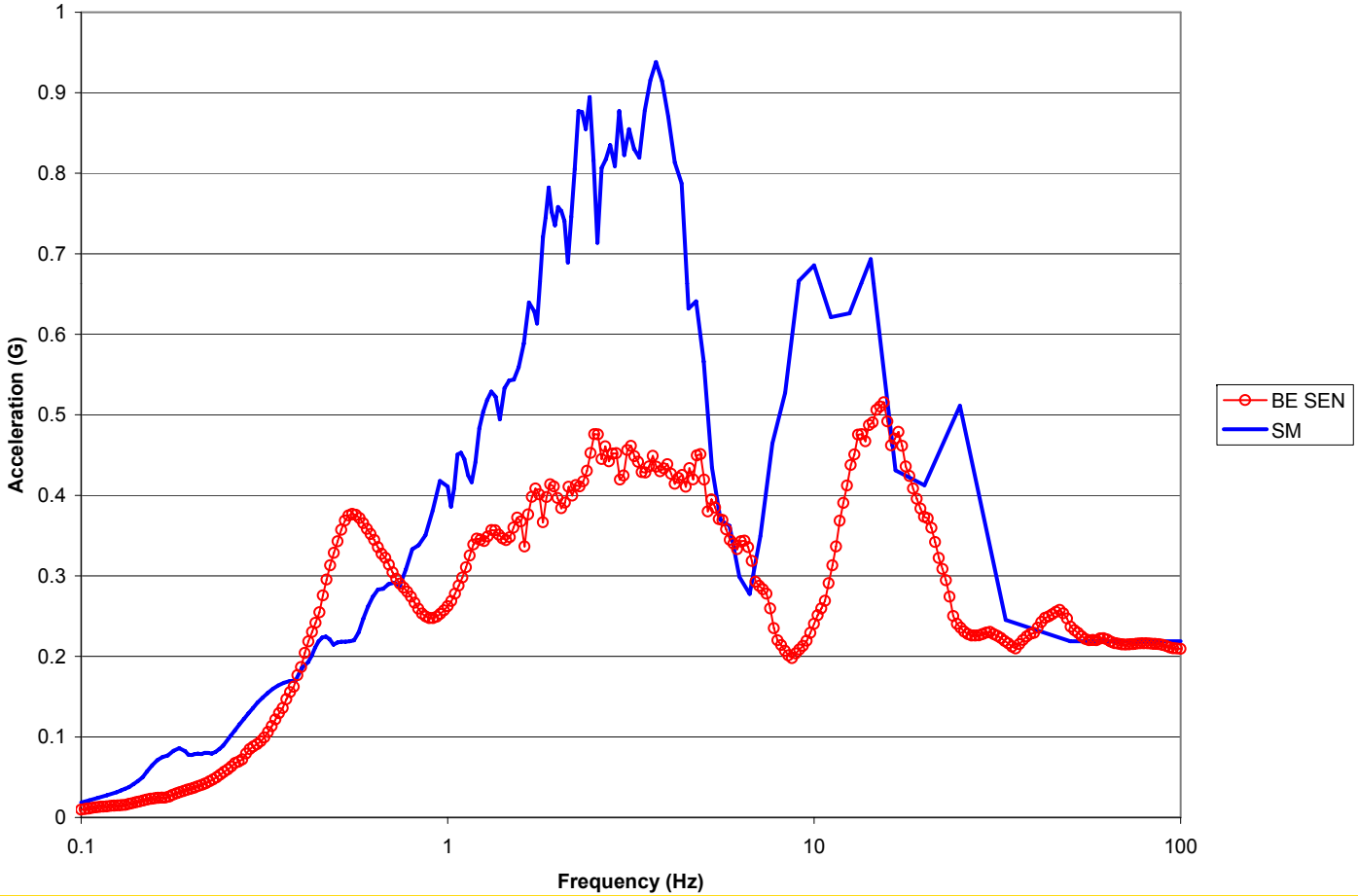
Seismic Input at Foundation Level – X Direction - SEN



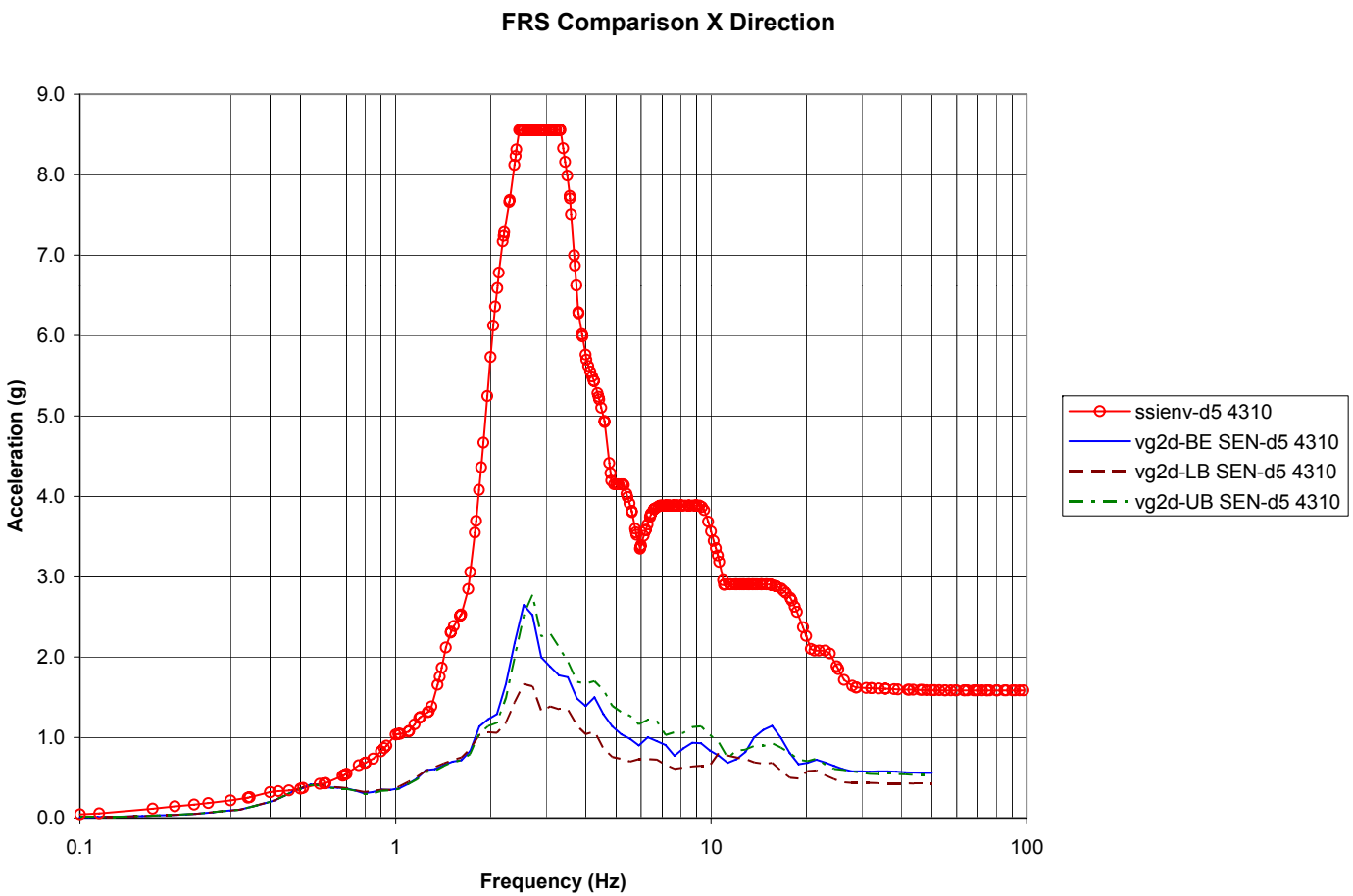
Seismic Input at Foundation Level – Y Direction - SEN



Seismic Input at Foundation Level – Z Direction - SEN



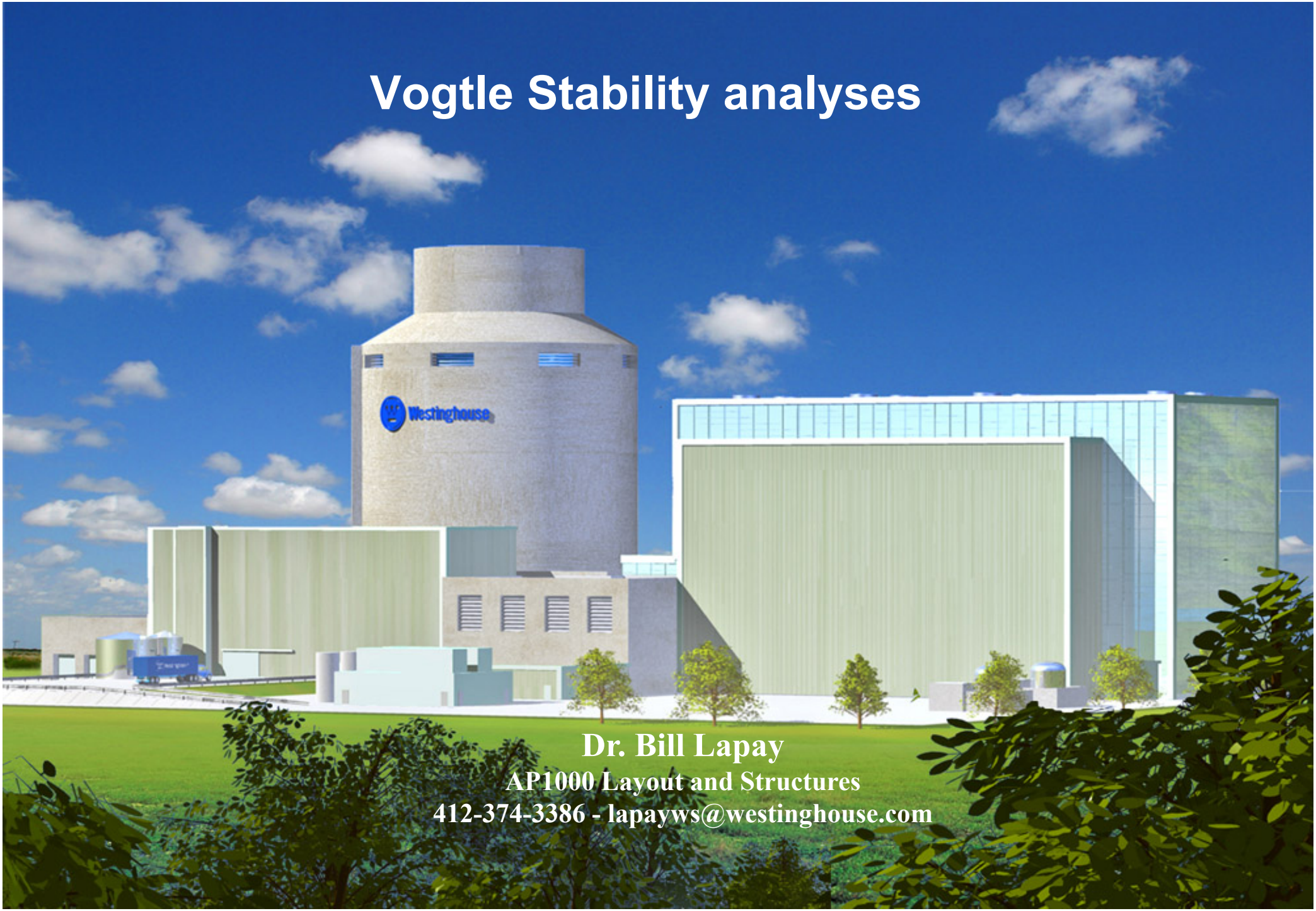
FRS Comparison at Shield Building Roof – X Direction



Conclusions

- Vogtle seismic input is lower than those of the AP1000 design cases, especially in the vertical direction.
- Vogtle soil profiles are for a deep soil site (depth >1000 ft) while the Generic Soil Profiles use a depth of 120 ft. Thus radiation damping is more in Vogtle.
- Vogtle P-wave velocities are less than 5000 fps (submerged site) used in the Generic Analyses, this would tend to lead to dampen the vertical motions more.

Vogtle Stability analyses



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Vogtle Site Specific
Seismic Stability Analysis
Sliding

Seismic Stability

AP1000

Generic Seismic Stability Analysis Performed for the AP1000 NI Considered 6 Site Profiles

- **Hard Rock**
- **Firm Rock**
- **Soft Rock**
- **Upper Bound Soft to Medium Soil**
- **Soft to Medium Soil**
- **Soft Soil**

Vogtle Site Stability Analysis

- Site Specific Analysis Performed using 2D Model
- Sliding Coefficient Friction Factor for the Vogtle Analysis uses a Smaller Coefficient of Friction than the AP1000 Generic Design (0.45 versus 0.7)
- Water Table below AP1000 Basemat

Sliding

$$FS = [F_f + F_p] / [F_{SSE} + F_{AO}]$$

F.S. = Factor of Safety against Sliding

F_f = Sliding resistance based coefficient of friction factor of 0.45

F_p = Passive soil pressure resistance

F_{AO} = Active soil pressure + Overburden

F_{SSE} = Seismic Shear

Stability Soil Cases

AP1000

Early Site Permit Soil Cases (ESP)

- Lower Bound
- Best Estimate
- Upper Bound

Sensitivity Soil Cases (SEN)

- Lower Bound
- Best Estimate
- Upper Bound

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Seismic Sliding Stability FS

AP1000

Seismic Stability Factors of Safety - SEN

Increased to 0.3g at 40 ft Outcrop

Stability Factors of Safety	AP1000 Generic Analyses	Vogtle Site Specific Lower Bound Estimate	Vogtle Site Specific Best Estimate	Vogtle Site Specific Upper Bound Estimate	Limit
Sliding NS earthquake	1.28	1.99	1.86	1.84	1.1
Sliding EW earthquake	1.33	2.06	2.00	1.91	1.1

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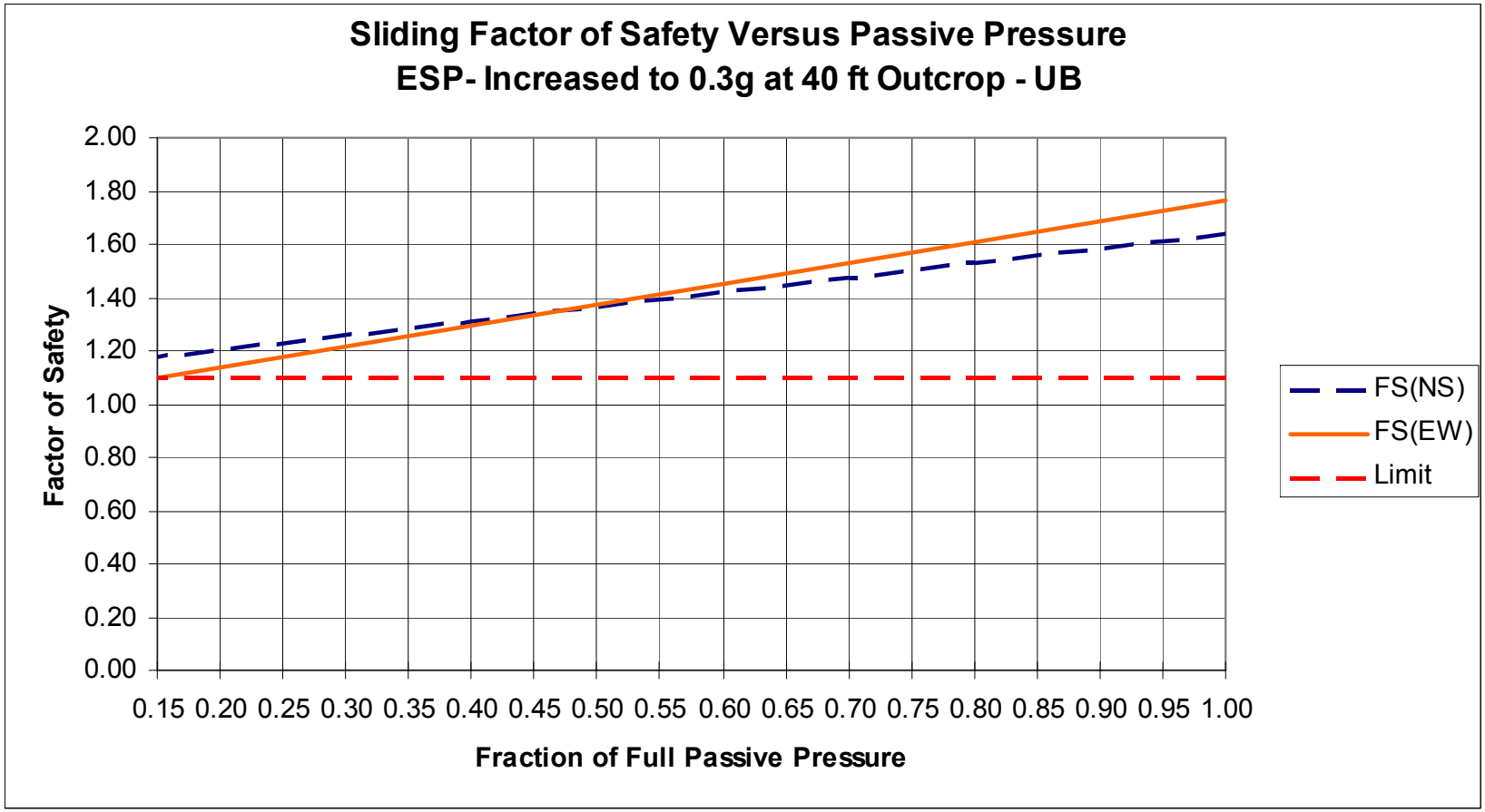
Seismic Stability FS

Seismic Stability Sliding Factors of Safety – ESP

Increased to 0.3g at 40 ft Outcrop

Stability Factors of Safety	AP1000 Generic Analyses	Vogtle Site Specific Lower Bound Estimate	Vogtle Site Specific Best Estimate	Vogtle Site Specific Upper Bound Estimate	Limit
Sliding NS earthquake	1.28	1.89	1.78	1.64	1.1
Sliding EW earthquake	1.33	1.92	1.89	1.77	1.1

Seismic Sliding Stability FS



Seismic Stability FS

AP1000

Conclusions

- Seismic Stability Factors of Safety for the Vogtle Site have Significant Margin
- The Vogtle Site Seismic Stability Factors of Safety have Significant Margin Above the AP1000 Generic Design
- The Seismic Stability Factors of Safety for Sliding have Significant Margin using a Sliding Coefficient of Friction of 0.45

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