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August 24, 2010

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

Subject: Duke Energy Carolinas, LLC
William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the
William States Lee III Nuclear Station Units 1 and 2
Response to Request for Additional Information
(RAI No. 2350)
Ltr# WLG2010.08-02

Reference: Letter from Brian Hughes (NRC) to Peter Hastings (Duke Energy), Request for Additional Information Letter No. 067 Related to SRP 03.07.01 - Seismic Design Parameters for the William States Lee III Units 1 and 2 Combined License Application, dated March 23, 2009 (ML090820071)

This letter provides the Duke Energy response to the Nuclear Regulatory Commission's request for additional information (RAI) included in the referenced letter.

The response to the NRC information request described in the referenced letter is addressed in a separate enclosure, which also identifies associated changes, when appropriate, that will be made in a future revision of the Final Safety Analysis Report for the Lee Nuclear Station.

If you have any questions or need any additional information, please contact Peter S. Hastings, Nuclear Plant Development Licensing Manager, at 980-373-7820.

Bryan J. Dolan
Vice President
Nuclear Plant Development

D093
NRO

Enclosure:

1) Duke Energy Response to Request for Additional Information Letter 067, RAI 03.07.01-004

AFFIDAVIT OF BRYAN J. DOLAN

Bryan J. Dolan, being duly sworn, states that he is Vice President, Nuclear Plant Development, Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this supplement to the combined license application for the William States Lee III Nuclear Station and that all the matter and facts set forth herein are true and correct to the best of his knowledge.

Bryan J. Dolan

Subscribed and sworn to me on August 24, 2010

Vickie M Prenatt
Notary Public

My commission expires: May 11, 2011

SEAL

VICKIE M PRENATT
NOTARY PUBLIC
Mecklenburg County
North Carolina
My Commission Expires May 11, 2011

xc (w/o enclosure):

Loren Plisco, Deputy Regional Administrator, Region II
Jeffrey Cruz, Branch Chief, DNRL

xc (w/ enclosure):

Brian Hughes, Senior Project Manager, DNRL

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter No. 067

NRC Technical Review Branch: **Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)**

Reference NRC RAI Number(s): **RAI 03.07.01-004**

NRC RAI:

This RAI is follow-up RAI related to 3.07.01-002

RAI 3.07.01-002 (eRAI system RAI 1003, Q3500) addresses the seismic analysis of the Annex Building. The AP1000 DCD, Section 3.7.2.8, states that the Annex Building is a Seismic Category II building that is analyzed/designed to Seismic Category I design criteria for a range of soil conditions as given in DCD Section 3.7.1.4. The FSAR states that the Annex Building will not fail/collapse onto NI structures. The RAI questioned whether the range of analyses referenced in DCD Section 3.7.1.4 properly envelopes the soil conditions at Lee Station.

The applicant responded to RAI 3.07.01-002 in a letter dated December 17, 2008 [ML083570396]. The applicant stated that significant margin exists between the site-specific FIRS and the CSDRS except in the high frequency range, which the Applicant states is of little significance since high frequency seismic motion is of limited, or negligible, structural damage potential.

The staff believes that the applicant's response does not address the concern that the range of soil conditions analyzed for the DCD envelope the soil conditions at Lee Station.

The concern is that the Annex Building is largely, possibly entirely, founded on artificial fill based on the review of FSAR Figures 2.5.4-233 through -239. The soil depths (soil column heights) vary between approximately 30 and 50 ft., which is significantly less than the soil depths studied in DCD Section 3.7.1.4. These relatively shallow soil columns under the Annex Building can amplify the seismic motion since they are stiffer than the deeper depth soil columns studied in the DCD. The soil properties of the artificial fill are also not known or specified. The overall concern is that actual seismic motion experienced by the Annex Building may be greater than what was studied in DCD Section 3.7.1.4.

While margin does indeed exist between the CSDRS and the GMRS itself, the actual seismic demand for the Annex Building may be greater than the CSDRS for Lee Station given (1) that the GMRS is defined at the NI foundation elevation and (2) the shallow soil conditions and fill soil properties.

The staff requests the applicant to clarify that the backfill soil amplification below the annex building is bounded by the analyses considered in the DCD and provide appropriate analytical data to support this conclusion.

Duke Energy Response:

As described in the Lee Nuclear Station (Lee) FSAR, the nuclear island structures are founded on hard rock. In Reference 1, Duke Energy described its decision to use granular fill material beside the nuclear island and beneath the structures adjacent to the nuclear island, including the

Annex Building and the Turbine Building. Revision 2 of the FSAR reflects these changes. FSAR Figures 2.5.4-245, 2.5.4-246, and 2.5.4-260 through 2.5.4-265 show the extent of this granular fill material. Since the source of this granular fill material has not yet been identified, a range of potential materials has been considered, corresponding to soil classifications GW, GP, and SW. The properties for this granular fill material are shown in FSAR Table 2.5.4-211 and FSAR Tables 2.5.4-224A through 2.5.4-224F. FSAR Subsection 2.5.4.5.3.5 describes the installation of this granular fill material to ensure that its properties are consistent with those assumed. The granular fill extent and required properties are well defined, and are consistent with the range of materials considered by Westinghouse in its standard AP1000 DCD hard rock design.

As described in the response to RAI 03.07.01-002 (Reference 2), much of the Seismic Category II portion of the Lee Unit 1 Annex Building (that portion adjacent to the nuclear island) is underlain by a legacy nuclear auxiliary building structural slab from the Cherokee construction era. This area is characterized by a structural basemat slab underlain by structural fill concrete resting on top of continuous rock, with the top of the structural slab at approximately elevation 545', only a few feet below the base of the nuclear island. Granular structural fill is used over this legacy structural slab to bring the soil to the elevation needed to support the Annex Building foundation. The support conditions in this area are very uniform, and are in fact similar to those described in the AP1000 DCD, except that the fill material supporting the Annex Building is a few feet thicker. In the northernmost end of the Unit 1 Annex Building (also a Seismic Category II portion), the top-of-continuous-rock slopes away, but the overall character of the building support remains quite uniform. This is illustrated in FSAR Figures 2.5.4-246, 2.5.4-260, and 2.5.4-264. Since the entire Seismic Category II portion of the Annex Building is on a common basemat and will behave as a unit, these localized differences in the support conditions will not significantly affect overall response of the Unit 1 Annex Building, or its potential for interaction with the nuclear island.

FSAR Figure 2.5.4-260 also illustrates the support conditions beneath the Unit 2 Annex Building. Though final excavation profiles to support construction of Unit 2 have not been established, the foundation support provided by the existing rock excavation provide uniform support at a depth about ten feet less than the configuration described in the AP1000 DCD.

The foundation conditions beneath the Seismic Category II portion of the Unit 1 and Unit 2 Turbine Buildings are also very uniform and are in fact similar to those described in the AP1000 DCD, except that the supporting rock or fill concrete will be a few feet above the level considered for the standard design.

In Reference 3, Westinghouse describes its standard evaluation of the requirements for adjacent structures. The AP1000 DCD hard rock configuration assumes the adjacent structures are supported by forty feet of fill material above the rock foundation of the nuclear island. Small variations in the depth to the rock surface from the ground surface are not expected to result in large differences in the resulting seismic accelerations calculated at the foundation of the surface-founded adjacent structures. It is therefore reasonable to expect that site-specific seismic criteria for the adjacent buildings founded on fill material consistent with the AP1000 DCD criteria, uniform support conditions generally similar to that evaluated in the AP1000 DCD, and with excitation less than the AP1000 DCD Hard Rock High Frequency (HRHF) would also be bounded by the AP1000 DCD design criteria for adjacent buildings.

As confirmation, Duke Energy has evaluated soil profiles at six locations that are representative of the support conditions for the adjacent structures. For each unit, the three locations below were considered:

- Beneath the Seismic Category II portion of the Annex Building
- Beneath the Seismic Category II portion (first bay) of the Turbine Building, and
- Beneath a general free-field location near the Non-Seismic portion of the Annex Building.

For each location, a soil profile was developed extending to the base of the foundation of the building at that location. For the Annex Building, this is five feet below the ground surface elevation of 589.5 ft MSL, and for the other locations, this is at the ground surface. Profiles were created for each of the three fill materials considered, and for three possible groundwater levels at each location, for a total of nine profiles at each location.

Figure 1 shows these six locations (A2, A3, A4, C1, C2, and C3). Figures 2, 3, and 4 illustrate representative geologic cross-sections, similar to those shown in the FSAR, as well as the location of the profiles selected. Figures 5, 6, 7, 8, 9, and 10 illustrate typical profiles at these six locations for one of the three fill granular materials considered, and for one of the three groundwater levels considered at each location.

Using these profiles, site response analyses were performed using the techniques described in Reference 4 (consistent with the development of the Unit 1 nuclear island Foundation Input Response Spectra (FIRS)). Equal weight was assigned to each candidate fill material. The different groundwater cases were weighted 60% to the best estimate groundwater level, and 20% each to high and low groundwater levels. This process resulted in one horizontal and one vertical spectrum representing each location.

Figure 11 (horizontal) and Figure 12 (vertical) illustrate the resulting foundation-level response spectra for the six locations, and compares these spectra to the site Ground Motion Response Spectra (GMRS), as well as to the generic AP1000 HRHF spectrum and the AP1000 Certified Seismic Design Response Spectra (CSDRS). As anticipated by the RAI, amplification is noted in some frequency ranges compared to the characteristic hard rock spectrum shape because of the soil column above the rock surface.

Location A3, associated with the Unit 1 Turbine Building first bay, and location C3, associated with a Unit 2 general free-field location, are most similar to the AP1000 DCD hard rock configuration that was evaluated for adjacent structures. These two locations have about forty feet of engineered fill below the ground surface, with hard rock (or legacy concrete with high shear wave velocity) below that depth.

Other Unit 1 spectra (locations A2 and A4) are associated with profiles with approximately seven to ten feet more engineered fill over hard rock or legacy concrete. Profiles at location A4 also include the effect of a layer of partially weathered rock beneath the non-seismic portion of the Annex Building. These other Unit 1 profiles result in similar or lower foundation-level accelerations compared to locations A3 and C3.

Unit 2 profiles at locations C1 and C2 are associated with thinner layers of engineered fill (approximately 30'), and result in higher foundation-level accelerations between 5 Hz and 30 Hz. Since the fill properties investigated are consistent between the different locations, this difference in response is attributed to the thinner layers of engineered fill beneath the adjacent structures at those locations.

In Reference 3, Westinghouse considered three Hard Rock High Frequency Plant Grade (HRHF-PG) soil surface spectra corresponding to three soil types characterized by shear wave velocities of 500 fps, 750 fps, and 1000 fps. These three HRHF-PG spectra represent one idealized profile with the three different fill materials. The differences between the spectra reflect the effect on the soil-surface spectra of the three fill materials considered. The three HRHF-PG spectra were the input to SASSI analyses developing base input spectra for the Seismic Category II adjacent buildings. These results were then combined with the results of analyses of other soil site configurations and seismic inputs (e.g. soil sites and CSDRS) to result in an envelope base response spectra to be used for design of adjacent Seismic Category II buildings.

In contrast, the six Lee spectra each include consideration of the effects of three candidate fill materials, and three different groundwater levels for six locations. The appropriate comparison to be made between the generic HRHF-PG soil surface spectra and the Lee site-specific foundation-level spectra is whether the site-specific demand for each of the Lee locations lies below the (upper) envelope of the inputs considered for hard rock sites in the AP1000 DCD analyses.

Figure 13 (horizontal) and Figure 14 (vertical) compare the Lee site-specific foundation-level spectra to the envelope of the generic HRHF-PG soil surface spectra used by Westinghouse in Reference 3.

For frequencies above about 2.5 Hz, it is clear that the generic spectra lie above the Lee site-specific demand. Locations A3 and C3, which are closest to the AP1000 DCD HRHF configuration considered, show significant margin between the site demand and the envelope of the HRHF-PG spectra. Other Unit 1 locations A2 and A4, which exhibit larger thicknesses of fill material and greater depths to hard rock, show spectra that are consistent with, or lower than, those for A3 and C3. Consistent with the expectation in the RAI, the Unit 2 profiles at locations C1 and C2, with higher rock surface and corresponding thinner layers of fill material, exhibit more amplification between 5 Hz and 30 Hz. Nevertheless, the spectra for locations C1 and C2 also exhibit significant margin between the Lee site-specific demand and the HRHF-PG spectra considered in setting the design criteria for Seismic Category II adjacent buildings.

For frequencies below 2.5 Hz, the foundation-level spectra for almost all the Lee site-specific locations exhibit minor exceedances above the HRHF-PG spectra. In this frequency range, the HRHF-PG and Lee site-specific demands are dwarfed by the requirement to also design adjacent structures for the CSDRS. This is illustrated in Figures RAI-SRP3.7.1-SEB1-15-23 through RAI-SRP3.7.1-SEB1-15-26 of Reference 3, where the relative contribution of HRHF-PG inputs and that of other design conditions can be seen in terms of their effect on the envelope design criteria for the adjacent buildings.

In Reference 3, Westinghouse has also compared the demand on the adjacent buildings that result from the HRHF-PG inputs and from the CSDRS inputs. For the Seismic Category II structures, the only performance requirement is to remain intact and avoid adverse interaction with the nuclear island. An appropriate measure of the overall demand on the structure is a comparison of the total base moments, shears, and axial forces resulting from the two different seismic inputs. Reference 3 demonstrates that the structural demands on adjacent structures resulting from the CSDRS cases are significantly higher than those resulting from the HRHF-PG cases. Therefore, the minor exceedances of the Lee site-specific soil surface spectra compared to the HRHF-PG below 2.5 Hz are of no consequence to establishing the design criteria for adjacent buildings.

To ensure that the support conditions at the northernmost end of the Unit 1 Annex Building (Northwest Corner) do not result in unacceptable amplification of motions in that area, Duke Energy has also evaluated several profiles in that area. Figure 15 shows the location of these profiles, and Figure 16 illustrates the associated geologic cross-section, similar to that shown in FSAR Figure 2.5.4-245, and the location of the profiles. Profiles at locations B3-7, B3-8, and B3-9 are representative of the northern portion of the Unit 1 Annex Building support zone. These profiles are characterized by thicker layers of granular fill material than those investigated above, ranging from fifty to seventy feet thick. Figures 17, 18, and 19 illustrate typical profiles at these locations for one of the three granular fill materials considered and for one of the three groundwater levels considered at each location. Other profiles include features such as saprolite fill and Group I fill that are not characteristic of the material supporting the Annex Building.

Similar to the six other locations described above (A2, A3, A4, C1, C2, and C3), site response analyses were conducted at these three Northwest Corner locations. The analyses used the same techniques and weighting schemes in developing one horizontal and one vertical spectrum representing each profile location. Figure 20 (horizontal) and Figure 21 (vertical) illustrate the resulting foundation-level response spectra for the three Northwest Corner locations, and compare them to the CSDRS, HRHF, and the Lee GMRS. Similar to other profiles investigated, amplification is noted in some frequency ranges compared to the characteristic hard rock spectrum shape because of the soil column above the rock surface. In particular, Figure 21 shows somewhat more vertical amplification at higher frequencies, between 25 Hz and 40 Hz, than was observed with other profiles (Figure 12). Because of the particular combinations of fill material properties and thickness, these higher-frequency vertical accelerations are comparable in magnitude to those expected for the Unit 2 conditions with rock closer to the surface than considered in the standard AP1000 DCD configuration.

Figure 22 (horizontal) and Figure 23 (vertical) compare the calculated Unit 1 Northwest Corner foundation-level spectra to the HRHF-PG spectra considered in Reference 3. The comparison for the Northwest Corner locations is similar to that described for the initial six locations, except that there is less margin in the vertical direction at around 30 Hz. Figure 24 (horizontal) and Figure 25 (vertical) summarize the spectrum results for the nine locations described and permit direct comparison of the results for the various locations.

As described above, the Lee foundation-level spectra used in this comparison were developed assigning equal weight (equal likelihood) to each of the three candidate granular fill materials (GW, GP, and SW). As such, they should not be interpreted to be the envelope of the spectra that would result from evaluating the three candidate fill materials independently. Nevertheless, the comparisons presented in this RAI response demonstrate that the Lee site-specific demand is significantly less than the AP1000 DCD design capacity.

In Reference 3, Westinghouse has provided a new AP1000 DCD Subsection 3.7.2.8.4, describing the Seismic Modeling and Analysis of Seismic Category II Building Structures. In that section, Westinghouse has established screening criteria to be used by the COL applicant to confirm that the standard AP1000 DCD evaluations of adjacent structures is applicable to their site. If these criteria are not met, site-specific analyses can demonstrate that the site-specific Seismic Category II foundation seismic response spectra are less than the AP1000 Annex Building and Turbine Building first bay generic design envelope foundation spectra. For a hard rock site such as Lee Nuclear Station, these screening criteria are shown below:

- The Bearing Capacity with appropriate factor of safety is greater than or equal to the Bearing Demand;

- For hard rock high frequency sites, the site GMRS is enveloped by the AP1000 HRHF response spectra with a minimum backfill surface shear wave velocity of 500 fps, and a minimum lateral extent of the backfill corresponding to a line extending down from the surface at a one horizontal to one vertical (1H:1V) slope from the outside footprint limit of the Seismic Category II structure; and
- The site meets Section 2.5.4.5 AP1000 DCD soil uniformity requirements.

In Reference 3, Table RAI-SRP3.7.1-SEB1-15-3 shows the maximum bearing demand beneath the Annex Building to be between 4.5 ksf and 4.78 ksf, depending on the type of fill material beneath the building. The table also shows the maximum bearing demand beneath the first bay of the Turbine Building to be between 5.79 ksf and 11.98 ksf, depending on the type of fill material. FSAR Table 2.5.4-228 shows the allowable bearing pressure based on strength of the fill material. Beneath the Annex Building this is shown to be between approximately 26 ksf and 30 ksf, depending on the type of granular fill material selected, and between 40 ksf and approximately 47 ksf for the Turbine Building. (It should be noted that comparison to FSAR Table 2.5.4-229 is not appropriate, since the maximum pressures reported in Reference 3 include seismic loading, while Table 2.5.4-229 is based on long-term settlement criteria.) There is significant site-specific bearing capacity margin compared to the AP1000 bearing demand.

As demonstrated in FSAR 3.7.1.1.1, the Lee site GMRS (and Unit 1 FIRS) are enveloped by the AP1000 HRHF spectra. FSAR Tables 2.5.4-224A through 2.5.4-244C demonstrate that each of the candidate granular fill materials satisfy the required shear wave velocity. FSAR Subsection 2.5.4.3.6 confirms that the granular fill material extends 100 feet from the nuclear island, or six feet beyond the edge of the adjacent buildings, whichever is greater. The associated FSAR Figures 2.5.4-245, 2.5.4-246, and 2.5.4-260 through 2.5.4-265 illustrate that near the Seismic Category II buildings, the granular fill slope is also gentler than required.

As described above, the support conditions for the Seismic Category II buildings are very uniform, and are in fact similar to those described in the AP1000 DCD. The fill material supporting the Unit 1 Annex Building is a few feet thicker than considered in the AP1000 DCD. In the northernmost end of the Unit 1 Annex Building, the top-of-continuous-rock slopes away, but the overall character of the building support remains quite uniform. Though final excavation profiles for Unit 2 have not been established, the foundation support for the Annex Building provided by the existing rock excavation provides uniform support at a depth about ten feet less than the configuration described in the AP1000 DCD.

These site-specific differences in support conditions have been considered, and the effect of those changes on potential amplification of ground motions has been evaluated by a series of site-specific site response analyses to determine the resulting near-surface response spectra. In each case, significant margin exists between the site-specific demand and the standard input considered in developing the AP1000 Annex Building and Turbine Building first bay generic design envelope foundation spectra.

This site-specific analysis considers the soil amplification below the Seismic Category II adjacent buildings, and confirms that the site-specific demand for the Lee Nuclear Station is less than the demand considered in the standard design of Seismic Category II adjacent buildings. FSAR Subsection 3.7.2.8.4 is revised to reflect this site-specific analysis as shown in Attachment 26 to this enclosure, and will be incorporated into a future revision of the Final Safety Analysis Report.

References:

1. Letter from Bryan J. Dolan (Duke Energy) to Document Control Desk, U.S. Nuclear Regulatory Commission, Supplemental Response to Request for Additional Information (RAI Nos. 1874, 1881, and 2098), Ltr# WLG2009.10-02, dated October 30, 2009 (ML093080101)
2. Letter from Bryan J. Dolan (Duke Energy) to Document Control Desk, U.S. Nuclear Regulatory Commission, Response to Request for Additional Information (RAI Nos. 1003 and 1004), Ltr# WLG2008.12-25, dated December 17, 2008 (ML083570396)
3. Letter from Robert Sisk (Westinghouse Electric Company) to Document Control Desk, U.S. Nuclear Regulatory Commission, AP1000 Response to Request for Additional Information (SRP 3), dated July 28, 2010 (Letter DCP_NRC_002981, ML102160322)
4. Letter from Bryan J. Dolan (Duke Energy) to Document Control Desk, U.S. Nuclear Regulatory Commission, Transmittal of Unit 1 Foundation Input Response Spectra (FIRS) Horizontal and Vertical Component Analysis, Ltr# WLG2010.02-01, dated February 22, 2010 (ML100550350)

Associated Revision to the Lee Nuclear Station Final Safety Analysis Report:

Revised FSAR Subsection 3.7.2.8.4

Attachments:

1) Figure 1 - Base Case Dynamic Profile Location Map
2) Figure 2 - Planned Excavation Profile Geologic Cross Section B-B'
3) Figure 3 - Planned Excavation Profile Geologic Cross Section E-E'
4) Figure 4 - Planned Excavation Profile Geologic Cross Section F-F'
5) Figure 5 - Dynamic Profile Lee Unit 1 - Base Case Profile A2-2 (GP-B)
6) Figure 6 - Dynamic Profile Lee Unit 1 - Base Case Profile A3-2 (GP-B)
7) Figure 7 - Dynamic Profile Lee Unit 1 - Base Case Profile A4-2 (GP)
8) Figure 8 - Dynamic Profile Lee Unit 2 - Base Case Profile C1-2 (GP-B)
9) Figure 9 - Dynamic Profile Lee Unit 2 - Base Case Profile C2-2 (GP-B)
10) Figure 10 - Dynamic Profile Lee Unit 2 - Base Case Profile C3-2 (GP)
11) Figure 11 - Horizontal Foundation-Level Spectra for SC-II Buildings
12) Figure 12 - Vertical Foundation-Level Spectra for SC-II Buildings
13) Figure 13 - Horizontal Foundation-Level Spectra for SC-II Buildings Compared to Reference 3
14) Figure 14 - Vertical Foundation-Level Spectra for SC-II Buildings Compared to Reference 3
15) Figure 15 - Lee Unit 1 - Northwest Corner Dynamic Profile Location Map

16) Figure 16 - Lee Unit 1 - Northwest Corner Geologic Cross-Section U-U'
17) Figure 17 - Lee Unit 1 - Northwest Corner Dynamic Profile B3-7 (GP-M)
18) Figure 18 - Lee Unit 1 - Northwest Corner Dynamic Profile B3-8 (GP-M)
19) Figure 19 - Lee Unit 1 - Northwest Corner Dynamic Profile B3-9 (GP-M)
20) Figure 20 - Lee Unit 1 - Northwest Corner Horizontal Foundation-Level Spectra
21) Figure 21 - Lee Unit 1 - Northwest Corner Vertical Foundation-Level Spectra
22) Figure 22 - Lee Unit 1 - Northwest Corner Horizontal Foundation-Level Spectra Compared to Reference 3
23) Figure 23 - Lee Unit 1 - Northwest Corner Vertical Foundation-Level Spectra Compared to Reference 3
24) Figure 24 - Summary of All Horizontal Foundation-Level Spectra for SC-II Buildings
25) Figure 25 - Summary of All Vertical Foundation-Level Spectra for SC-II Buildings
26) Mark-up of FSAR Subsection 3.7.2.8.4

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 1 to RAI 03.07.01-004

Figure 1 - Base Case Dynamic Profile Location Map

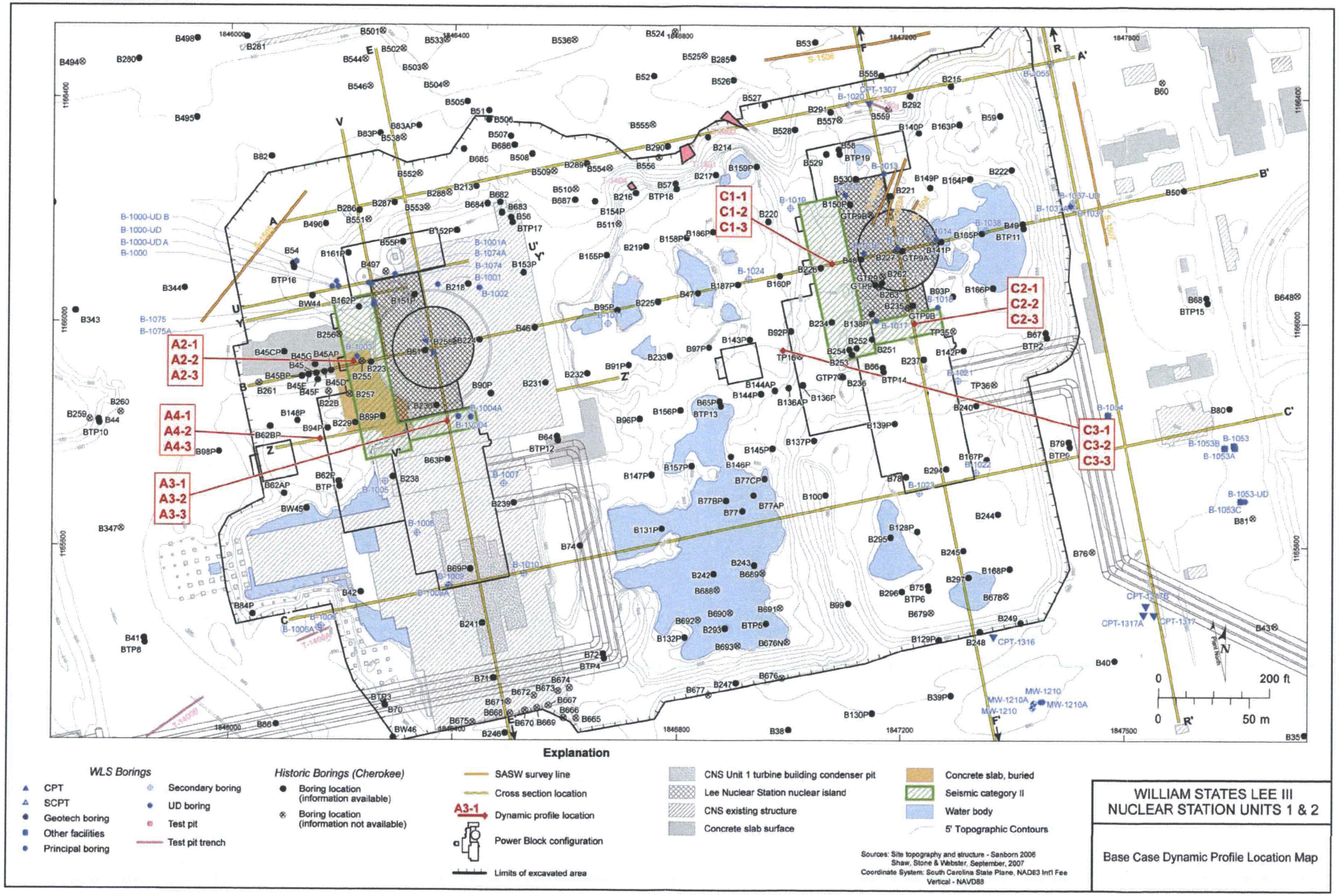

Figure 1 - Base Case Dynamic Profile Location Map

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 2 to RAI 03.07.01-004

Figure 2 - Planned Excavation Profile Geologic Cross Section B-B'

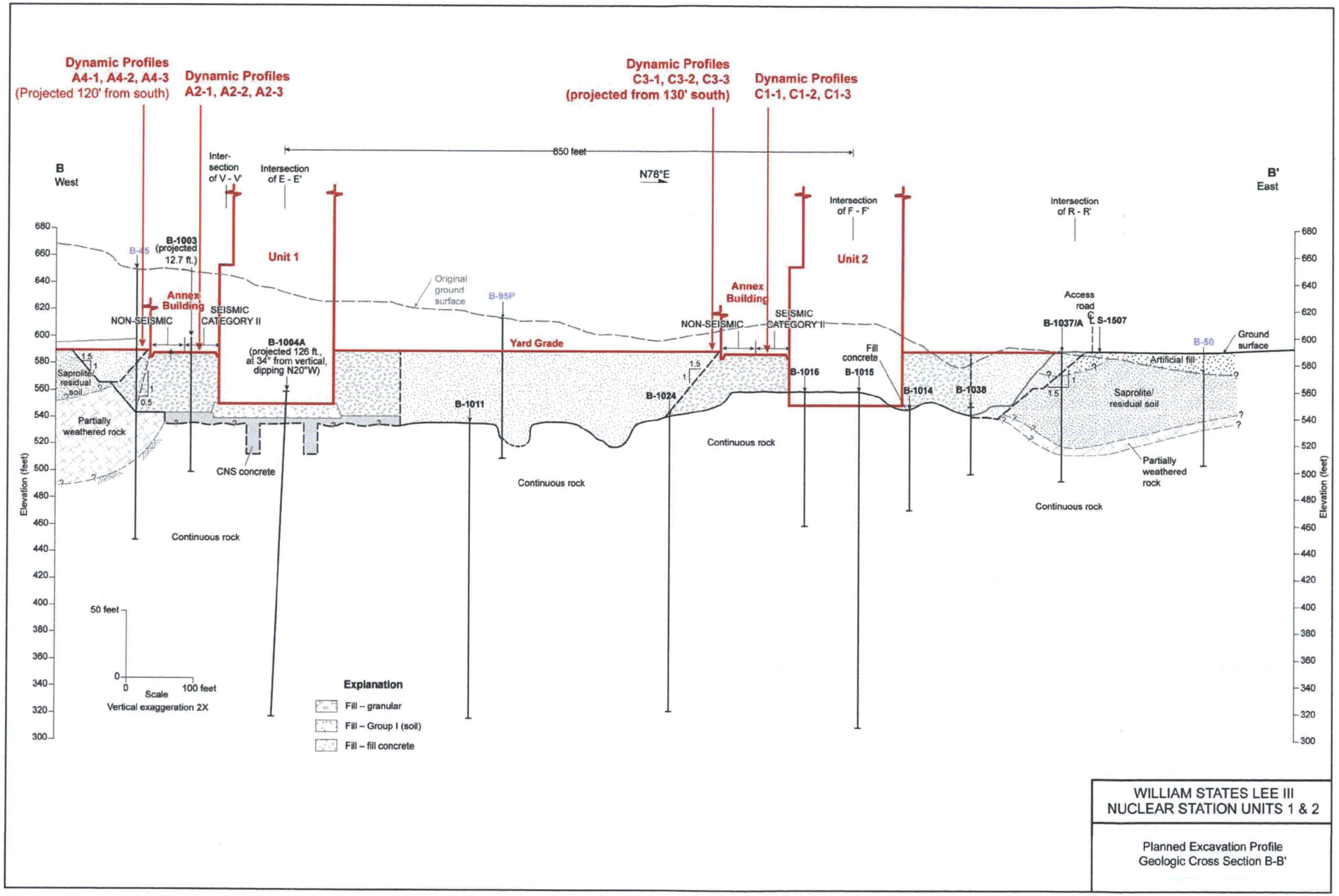

Figure 2 - Planned Excavation Profile Geologic Cross Section B-B'

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 3 to RAI 03.07.01-004

Figure 3 - Planned Excavation Profile Geologic Cross Section E-E'

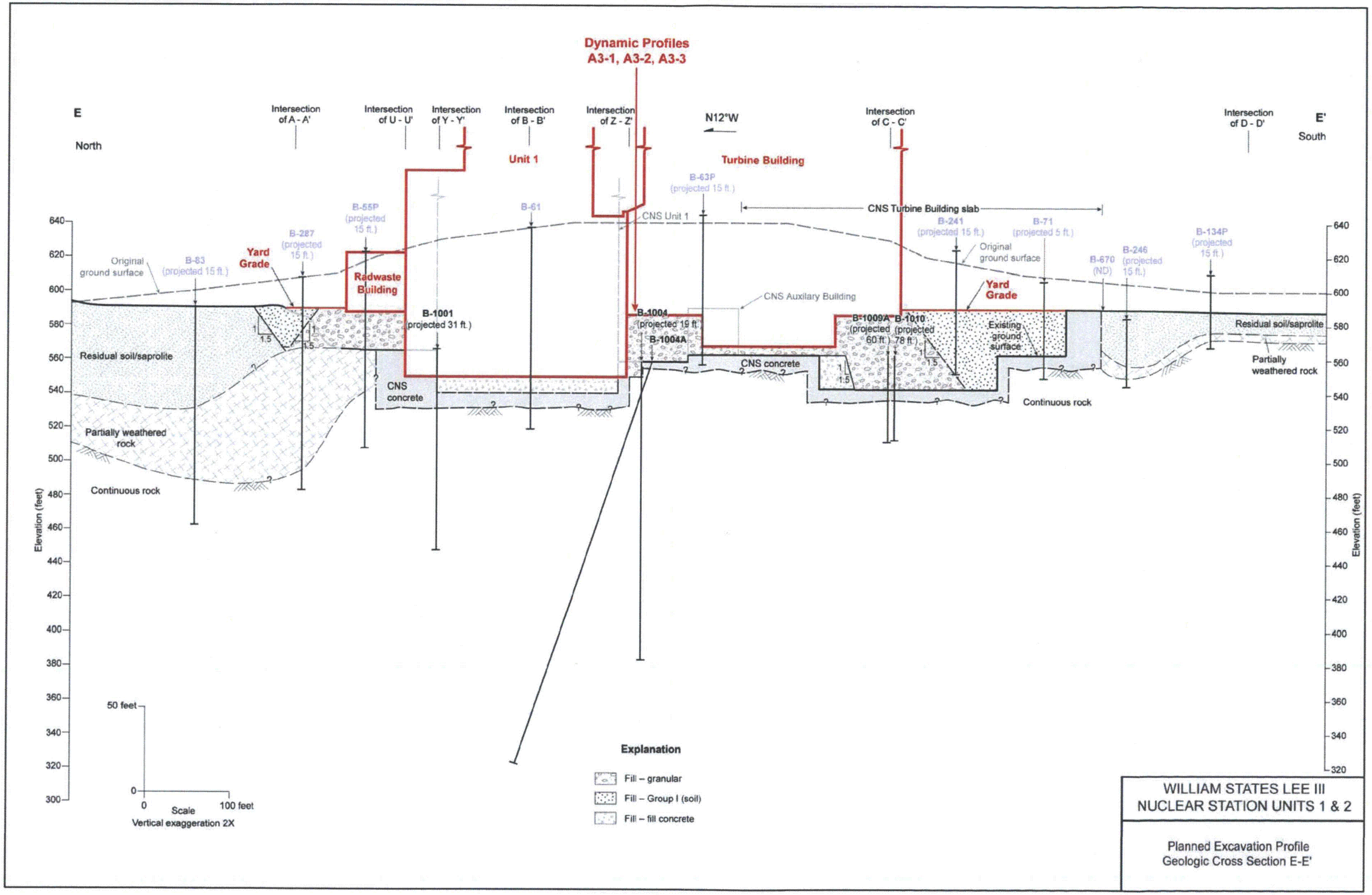

Figure 3 - Planned Excavation Profile Geologic Cross Section E-E'

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 4 to RAI 03.07.01-004

Figure 4 - Planned Excavation Profile Geologic Cross Section F-F'

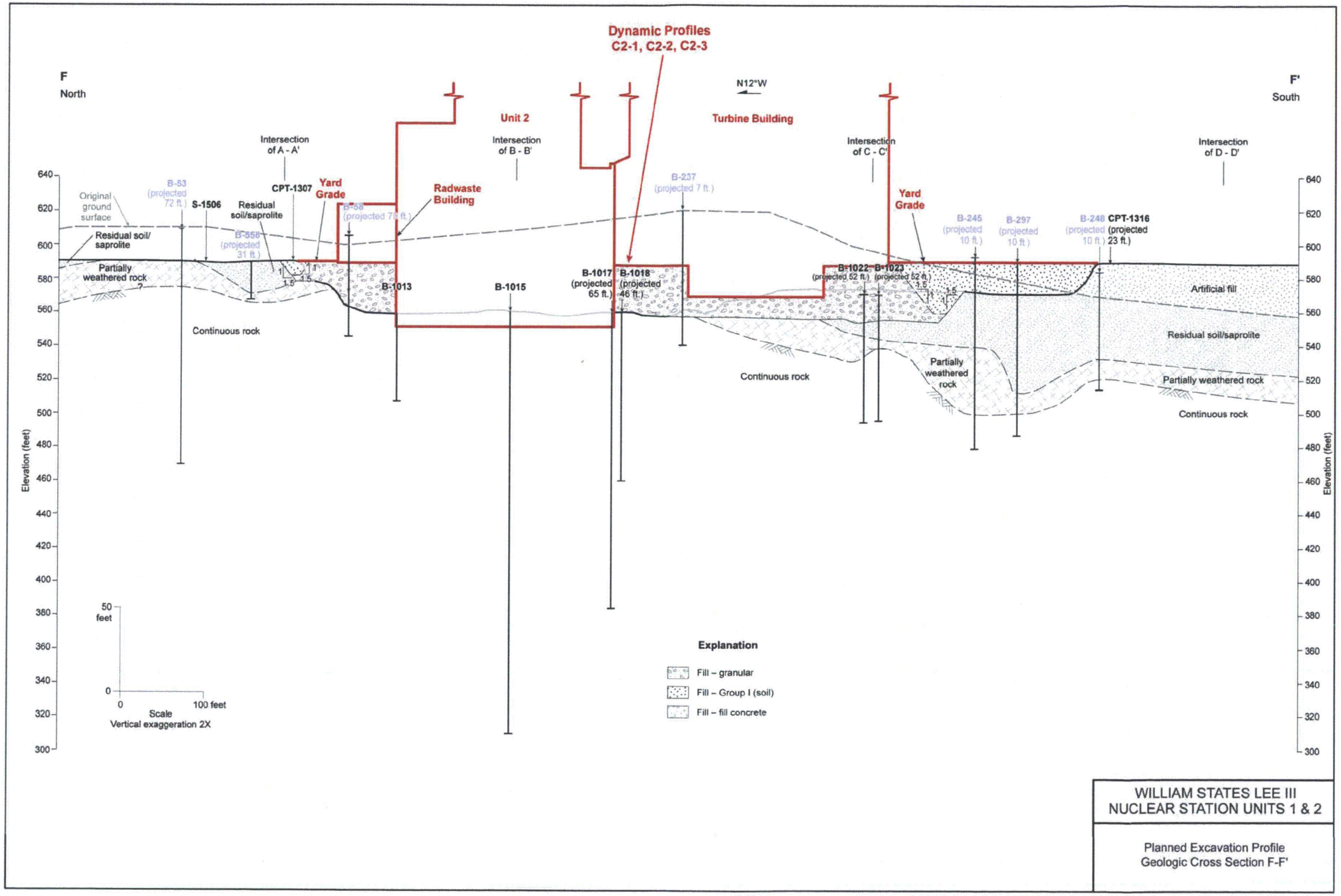

Figure 4 - Planned Excavation Profile Geologic Cross Section F-F'

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 5 to RAI 03.07.01-004

Figure 5 - Dynamic Profile Lee Unit 1 - Base Case Profile A2-2 (GP-B)

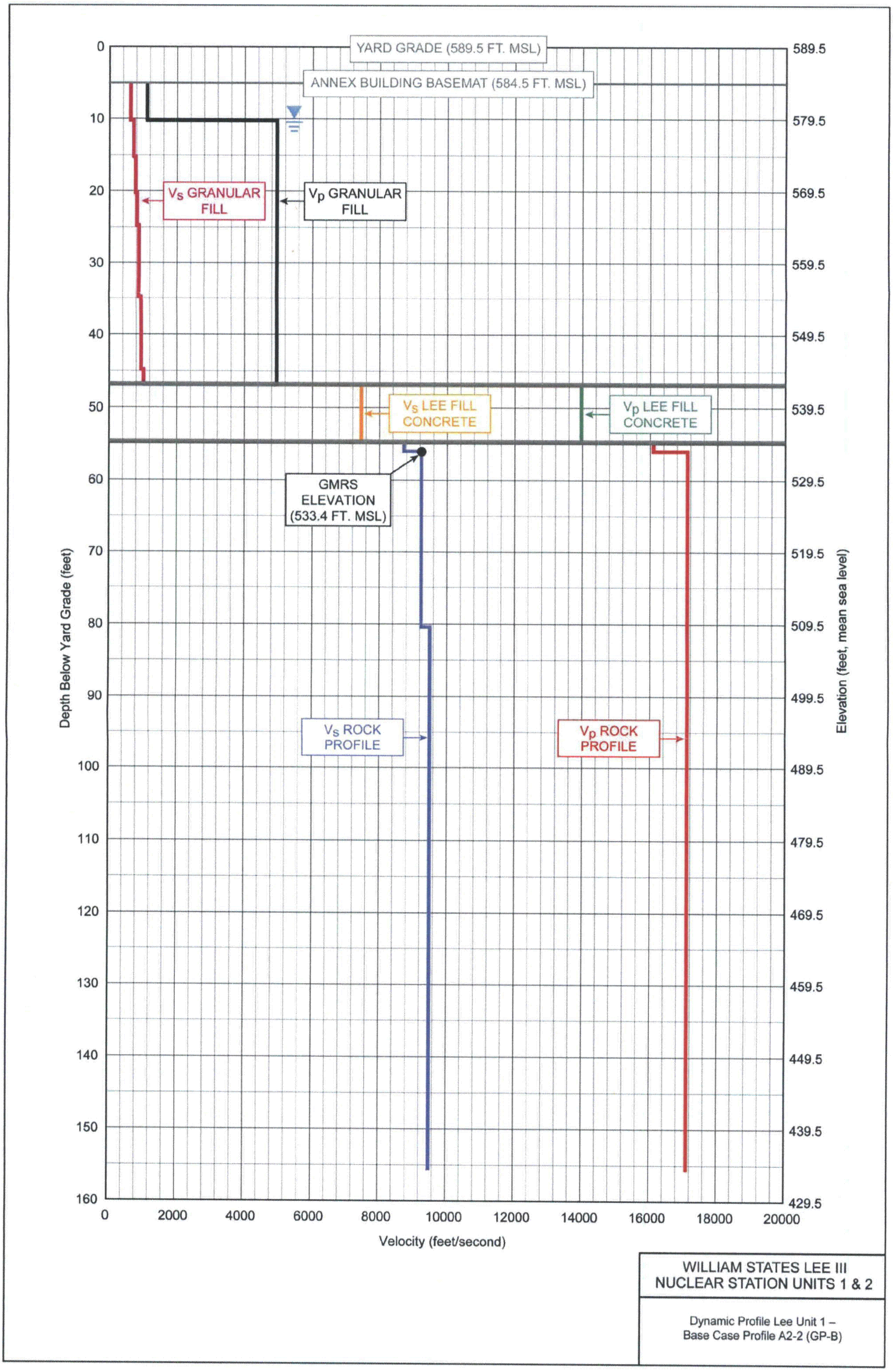

Figure 5 - Dynamic Profile Lee Unit 1 - Base Case Profile A2-2 (GP-B)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 6 to RAI 03.07.01-004

Figure 6 - Dynamic Profile Lee Unit 1 - Base Case Profile A3-2 (GP-B)

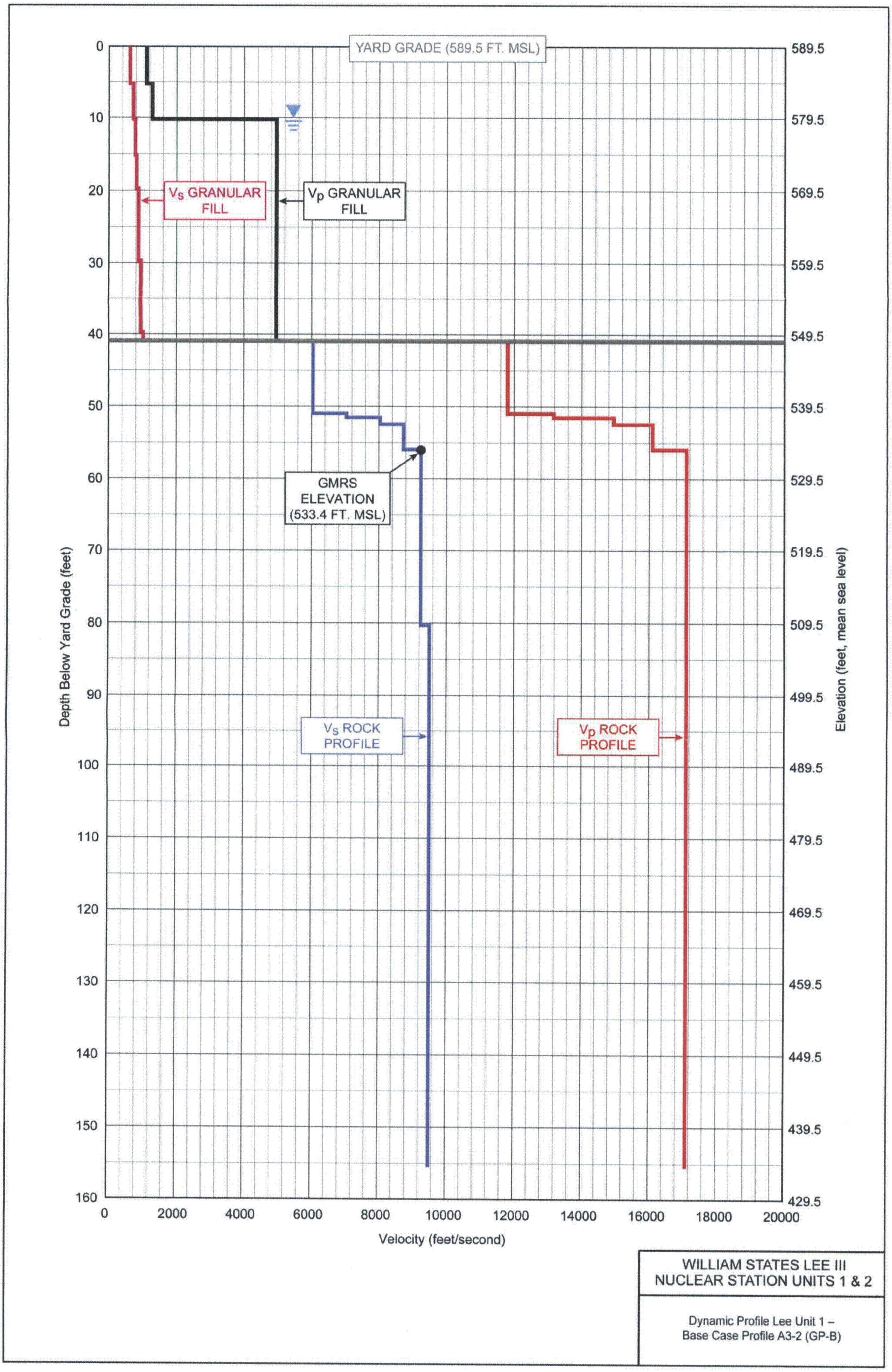

Figure 6 - Dynamic Profile Lee Unit 1 - Base Case Profile A3-2 (GP-B)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 7 to RAI 03.07.01-004

Figure 7 - Dynamic Profile Lee Unit 1 - Base Case Profile A4-2 (GP)

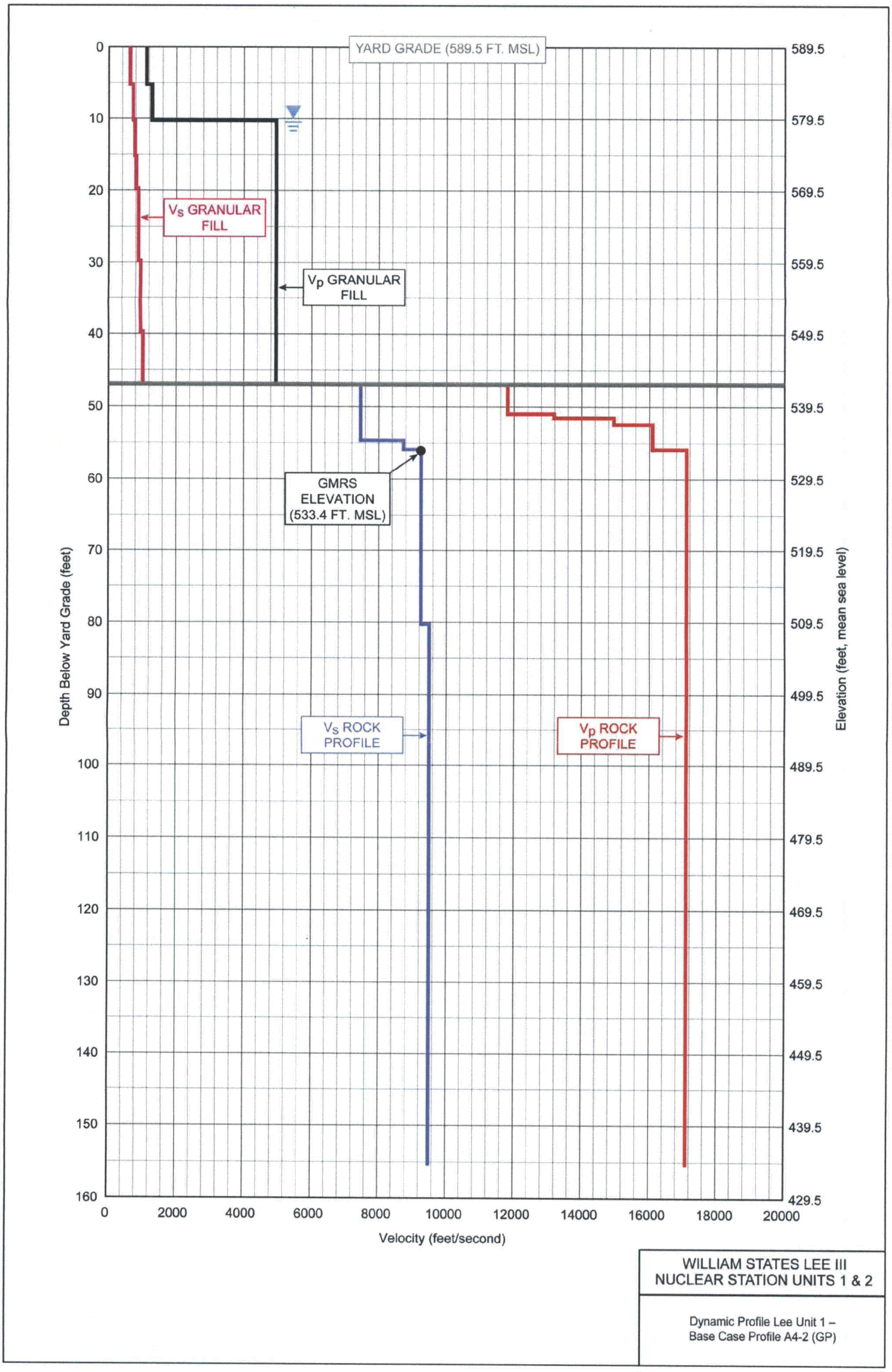

Figure 7 - Dynamic Profile Lee Unit 1 - Base Case Profile A4-2 (GP)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 8 to RAI 03.07.01-004

Figure 8 - Dynamic Profile Lee Unit 2 - Base Case Profile C1-2 (GP-B)

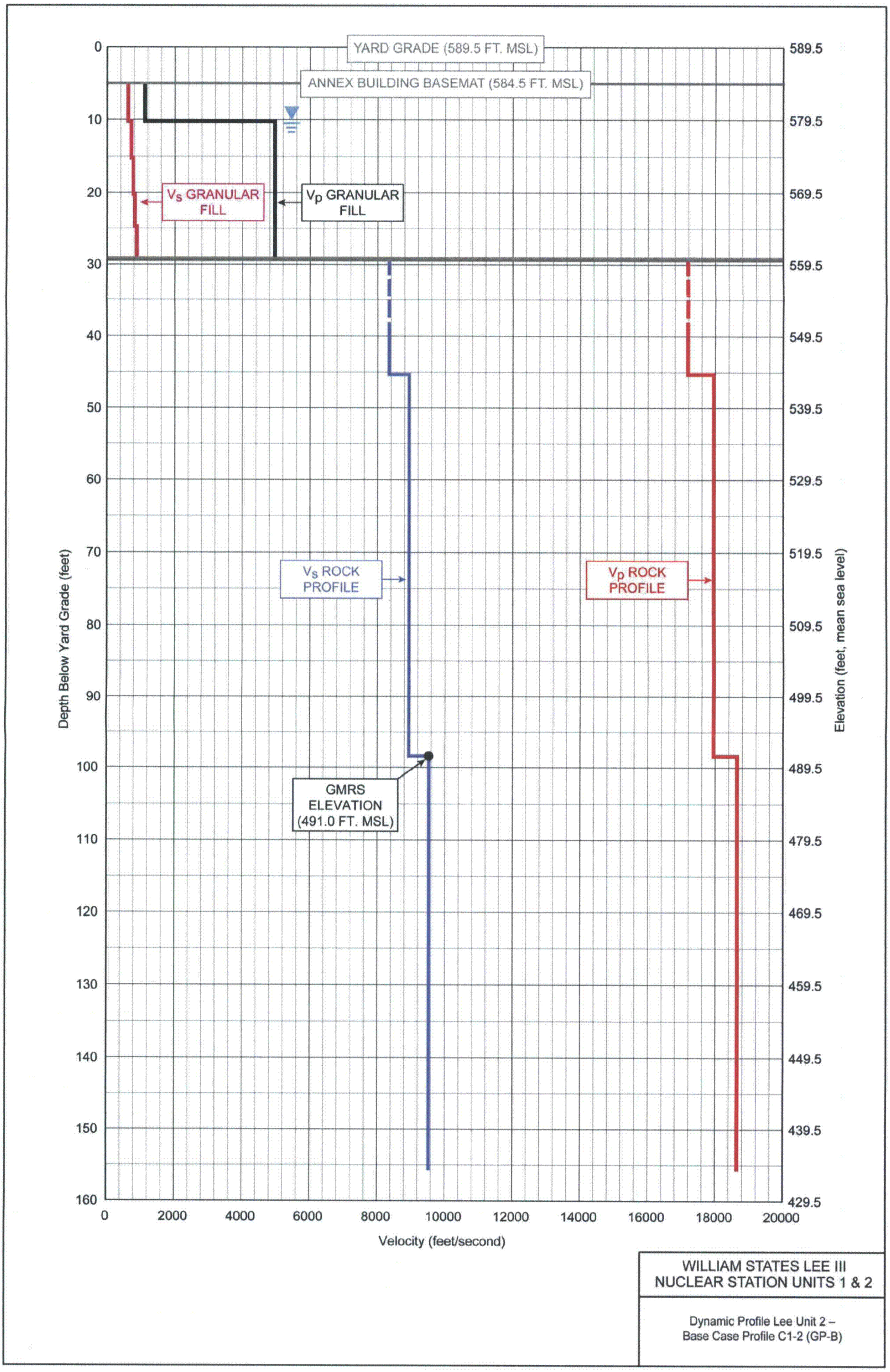

Figure 8 - Dynamic Profile Lee Unit 2 - Base Case Profile C1-2 (GP-B)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 9 to RAI 03.07.01-004

Figure 9 - Dynamic Profile Lee Unit 2 - Base Case Profile C2-2 (GP-B)

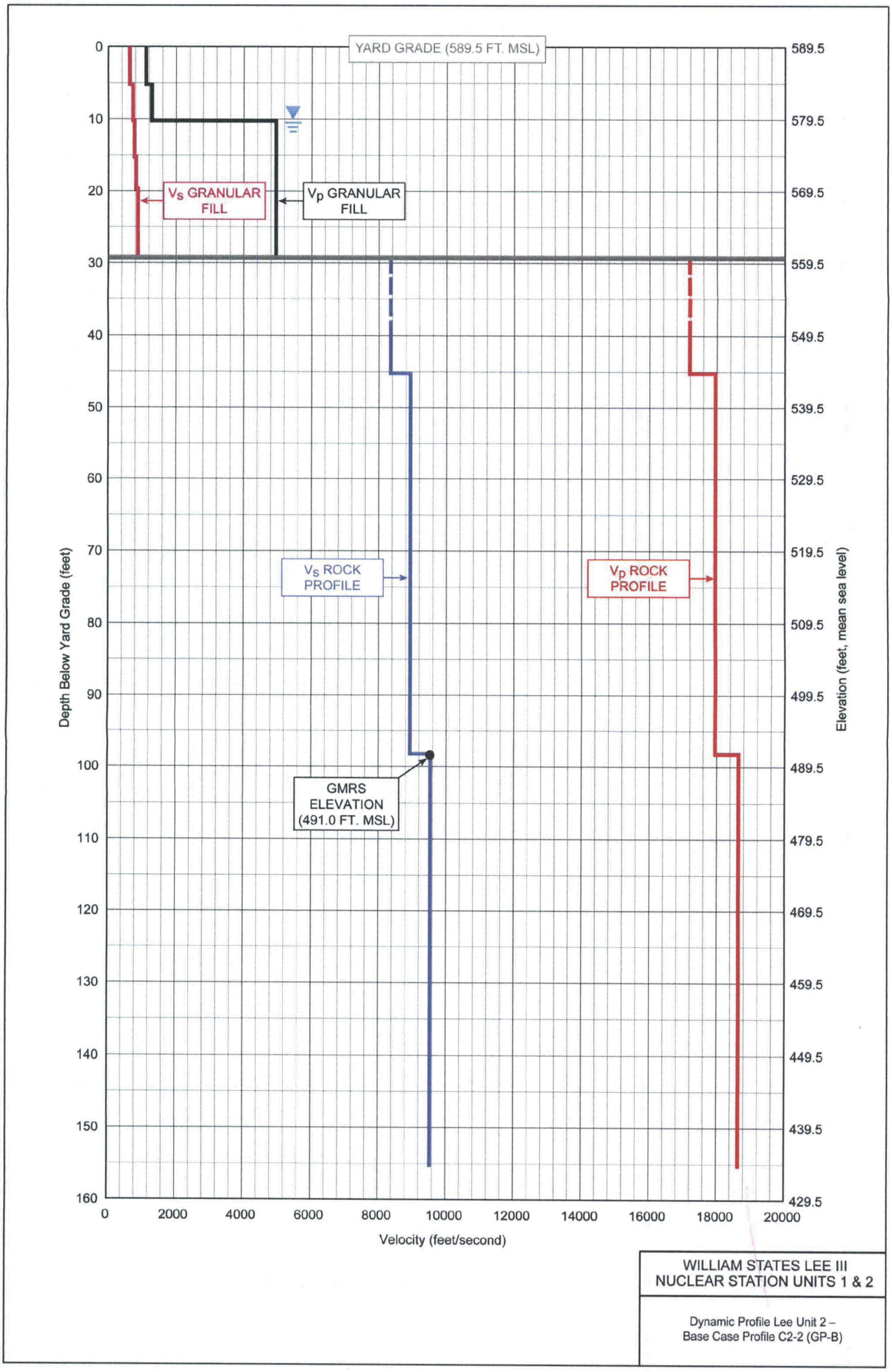

Figure 9 - Dynamic Profile Lee Unit 2 - Base Case Profile C2-2 (GP-B)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 10 to RAI 03.07.01-004

Figure 10 - Dynamic Profile Lee Unit 2 - Base Case Profile C3-2 (GP)

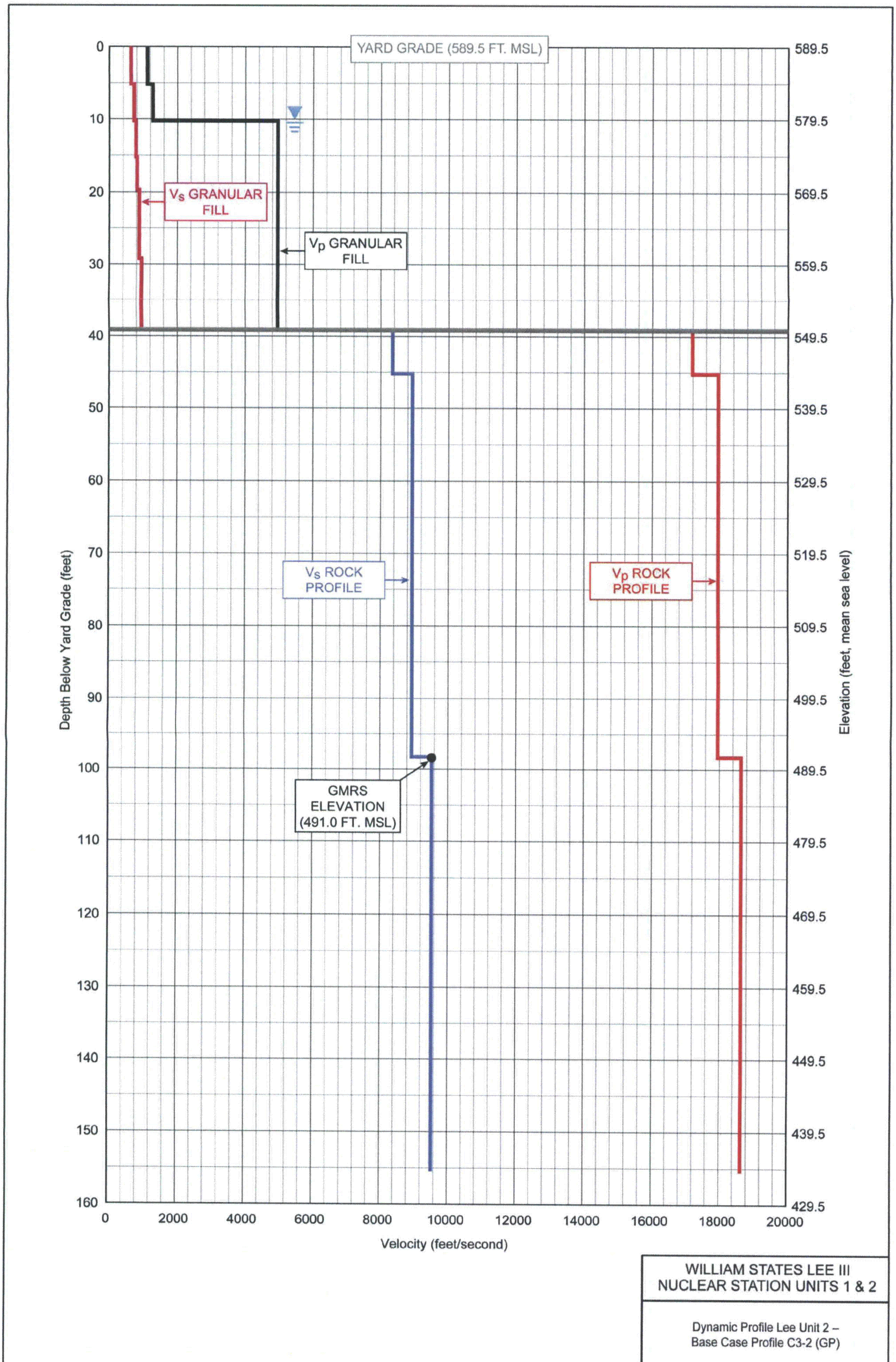

Figure 10 - Dynamic Profile Lee Unit 2 - Base Case Profile C3-2 (GP)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 11 to RAI 03.07.01-004

Figure 11 - Horizontal Foundation-Level Spectra for SC-II Buildings

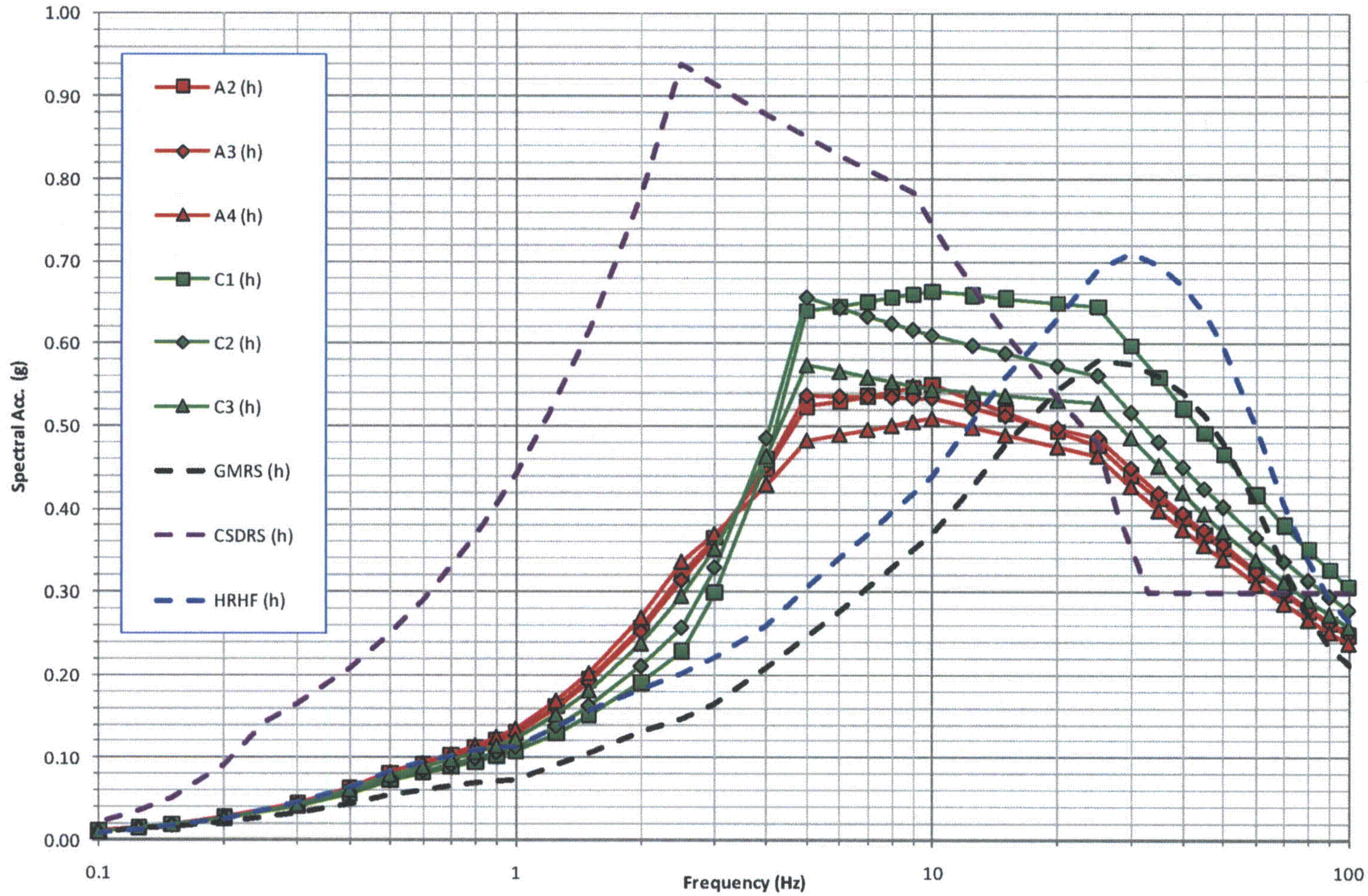

Figure 11 - Horizontal Foundation-Level Spectra for SC-II Buildings

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 12 to RAI 03.07.01-004

Figure 12 - Vertical Foundation-Level Spectra for SC-II Buildings

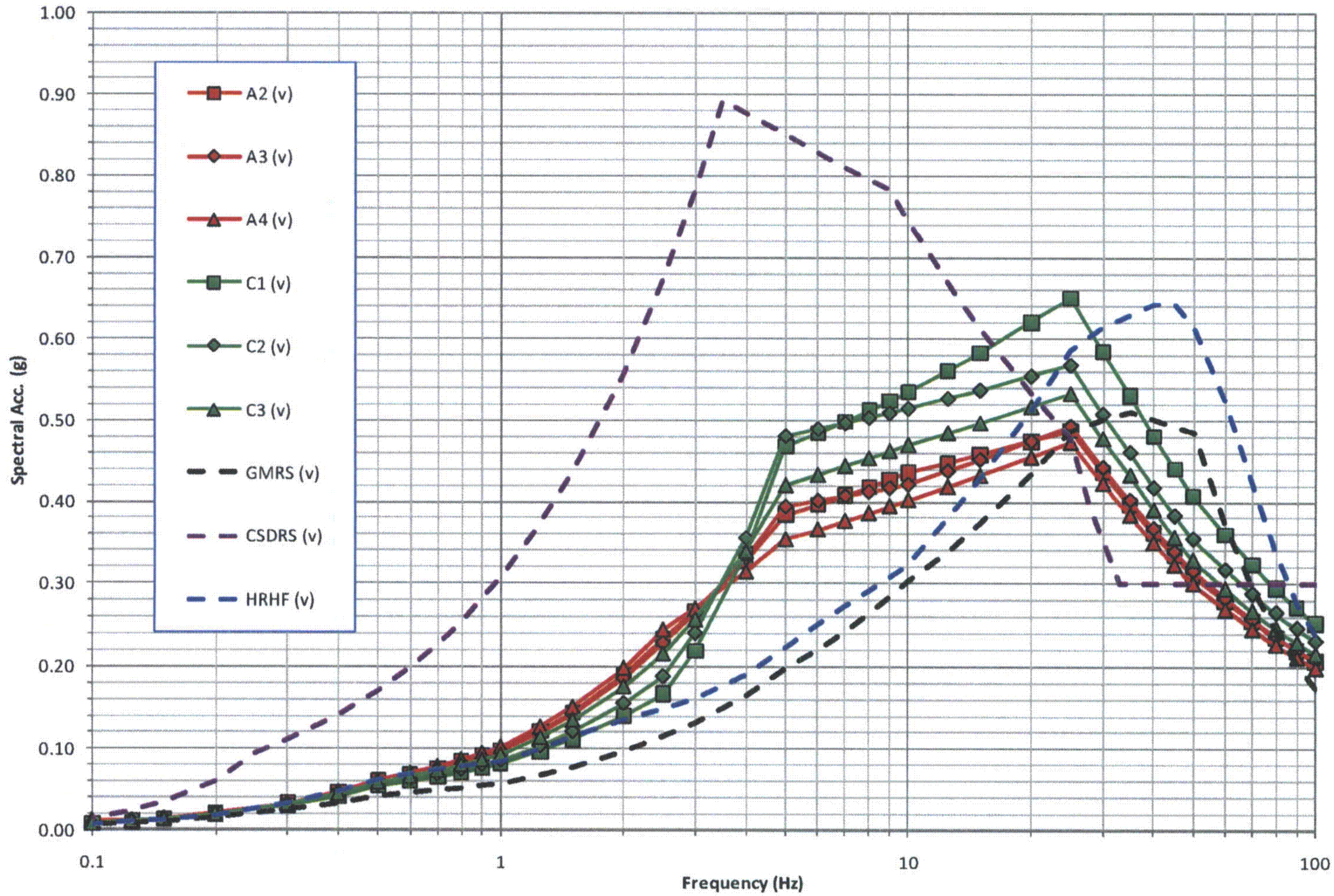

Figure 12 - Vertical Foundation-Level Spectra for SC-II Buildings

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 13 to RAI 03.07.01-004

Figure 13 - Horizontal Foundation-Level Spectra for SC-II Buildings Compared to Reference 3

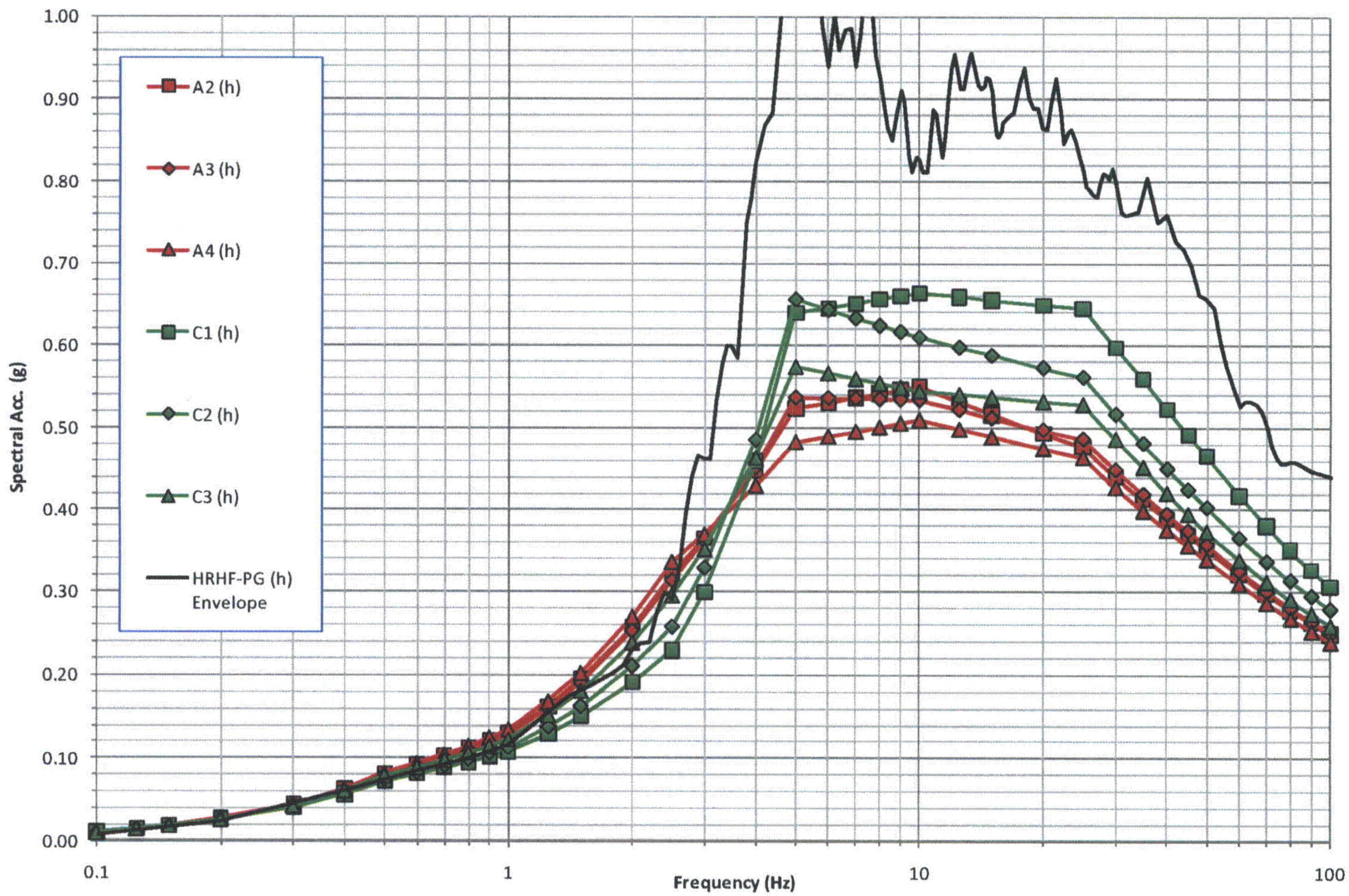

Figure 13 - Horizontal Foundation-Level Spectra for SC-II Buildings Compared to Reference 3

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 14 to RAI 03.07.01-004

Figure 14 - Vertical Foundation-Level Spectra for SC-II Buildings Compared to Reference 3

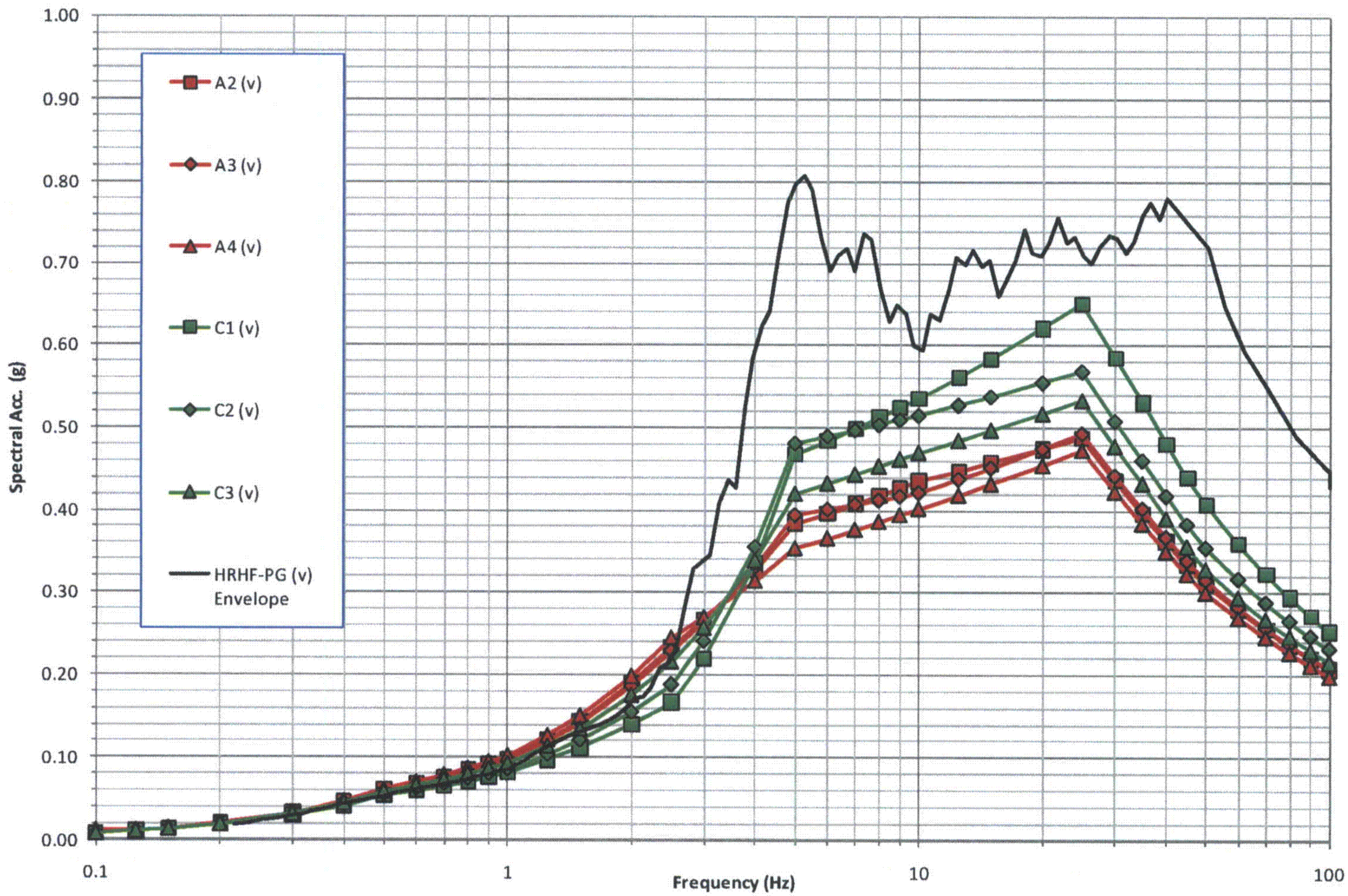

Figure 14 - Vertical Foundation-Level Spectra for SC-II Buildings Compared to Reference 3

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 15 to RAI 03.07.01-004

Figure 15 - Lee Unit 1 - Northwest Corner Dynamic Profile Location Map

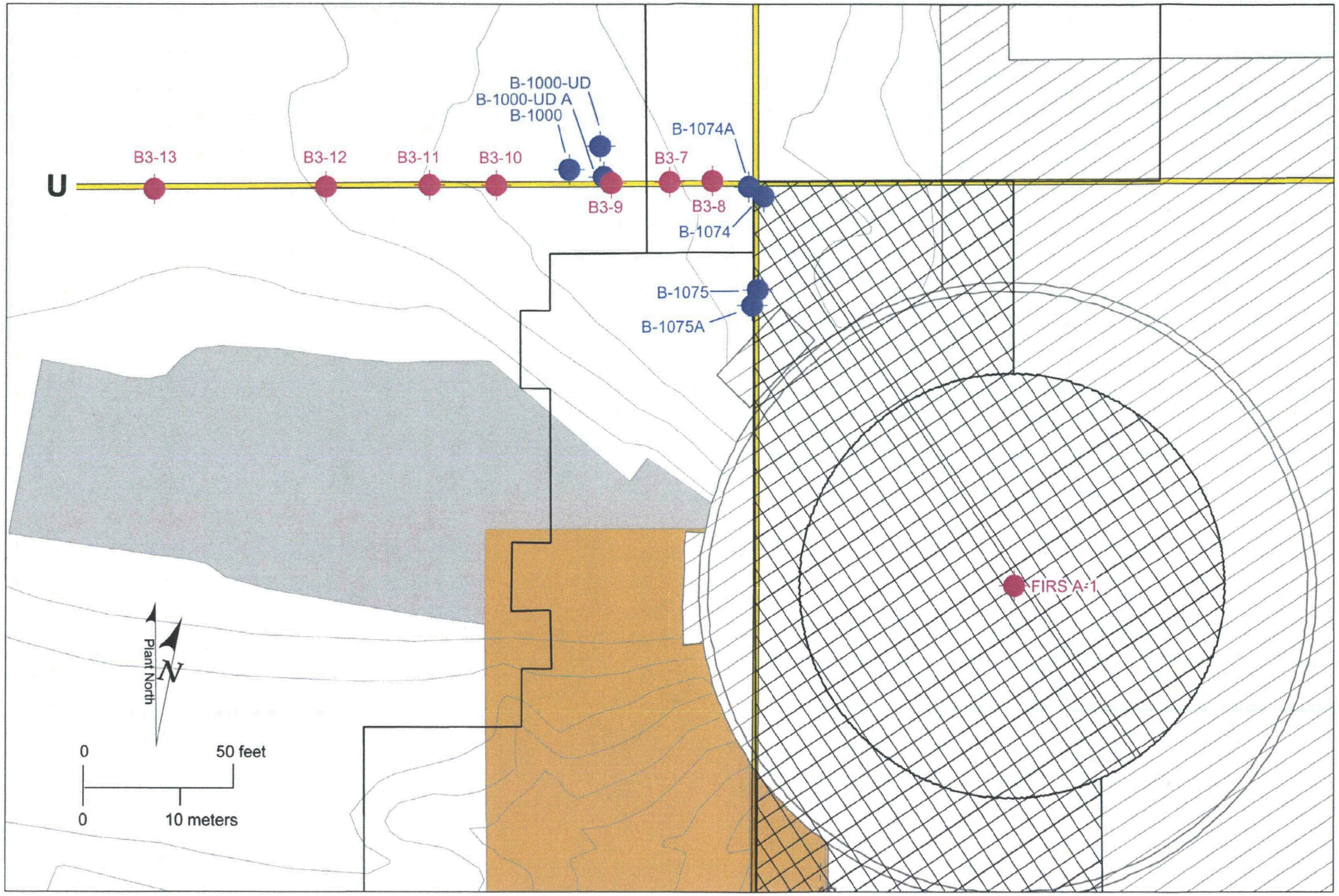

Figure 15 - Lee Unit 1 - Northwest Corner Dynamic Profile Location Map

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 16 to RAI 03.07.01-004

Figure 16 - Lee Unit 1 - Northwest Corner Geologic Cross-Section U-U'

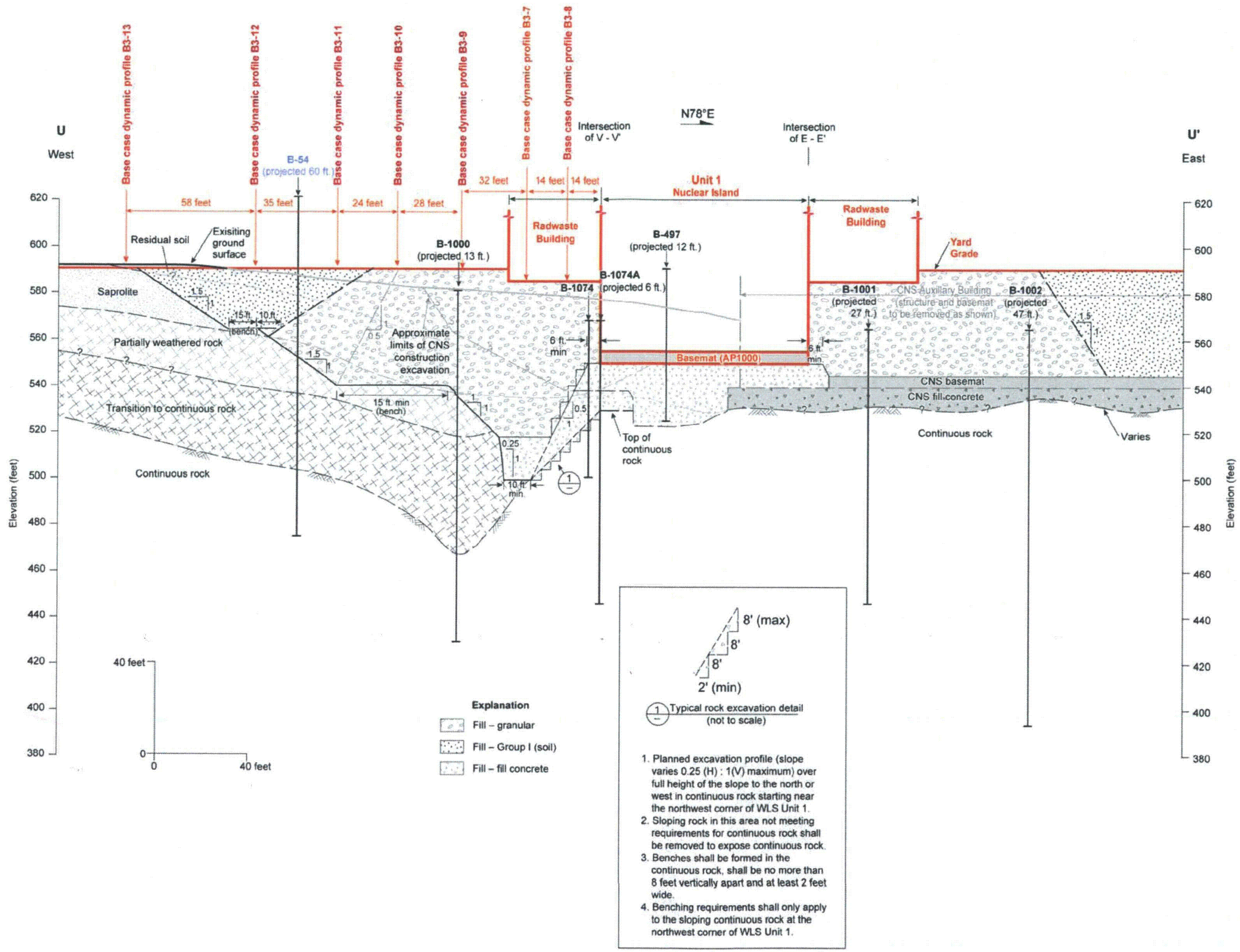

Figure 16 - Lee Unit 1 - Northwest Corner Geologic Cross-Section U-U'

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 17 to RAI 03.07.01-004

Figure 17 - Lee Unit 1 - Northwest Corner Dynamic Profile B3-7 (GP-M)

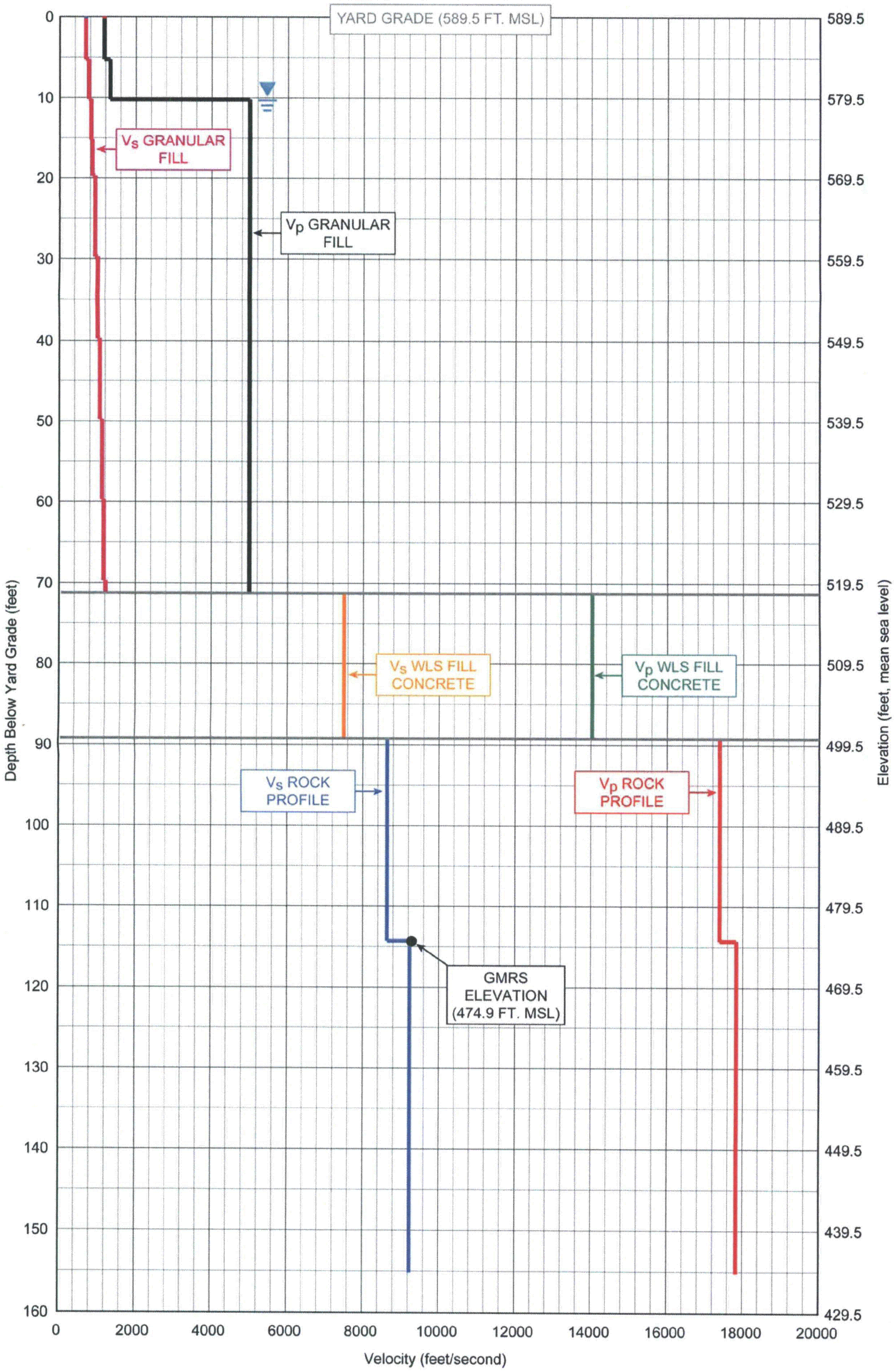

Figure 17 - Lee Unit 1 - Northwest Corner Dynamic Profile B3-7 (GP-M)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 18 to RAI 03.07.01-004

Figure 18 - Lee Unit 1 - Northwest Corner Dynamic Profile B3-8 (GP-M)

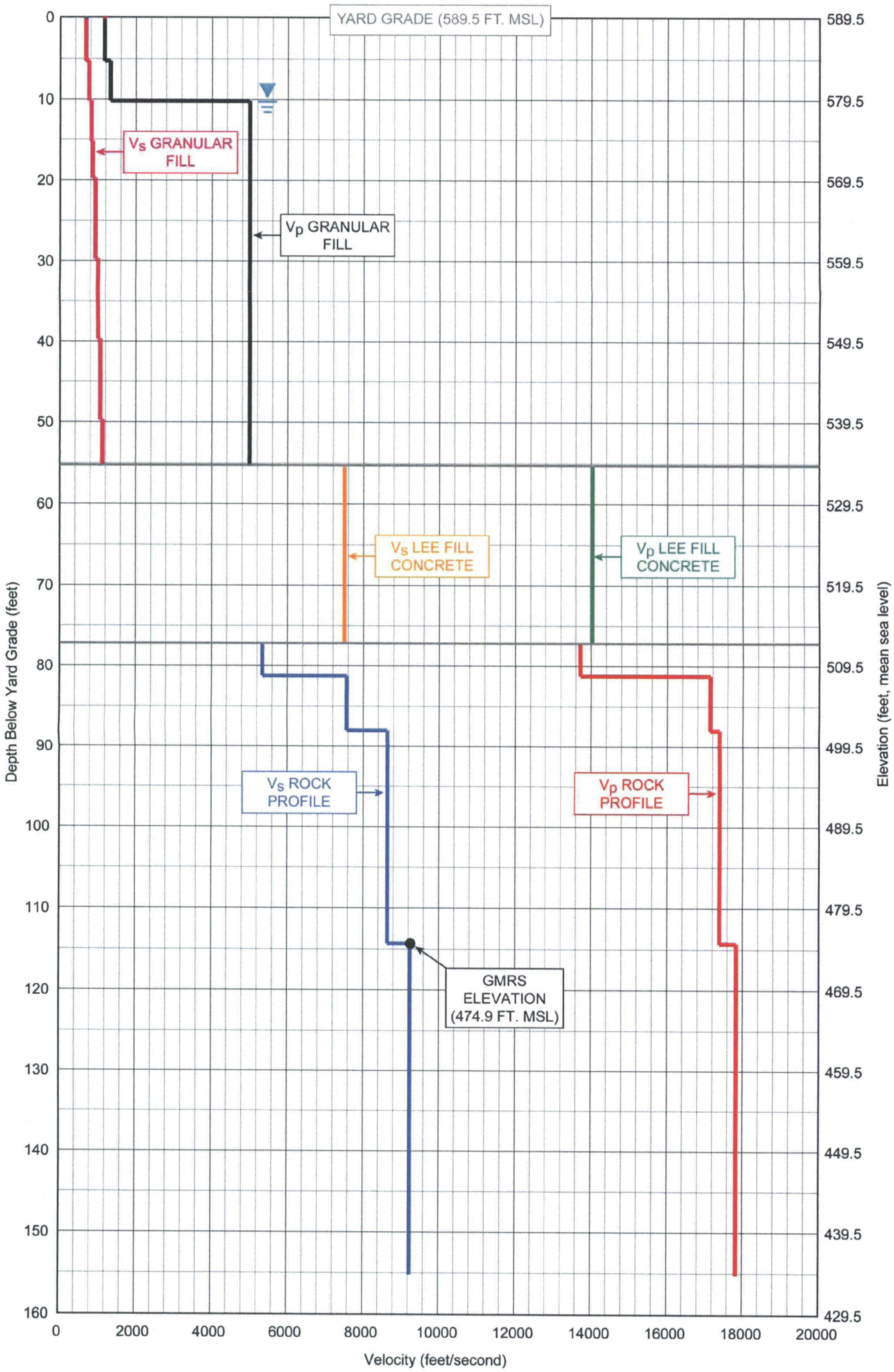

Figure 18 - Lee Unit 1 - Northwest Corner Dynamic Profile B3-8 (GP-M)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 19 to RAI 03.07.01-004

Figure 19 - Lee Unit 1 - Northwest Corner Dynamic Profile B3-9 (GP-M)

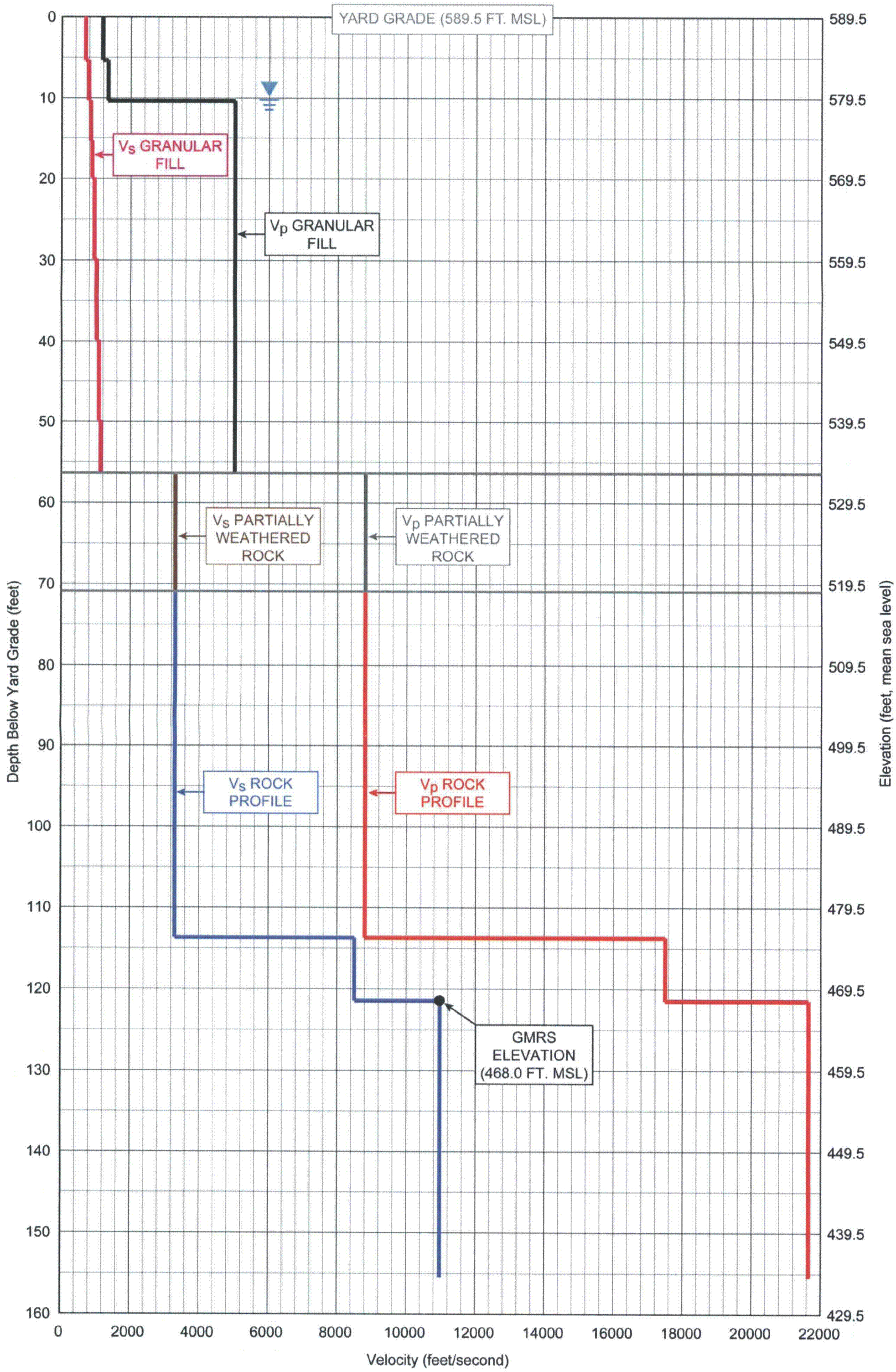

Figure 19 - Lee Unit 1 - Northwest Corner Dynamic Profile B3-9 (GP-M)

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 20 to RAI 03.07.01-004

Figure 20 - Lee Unit 1 - Northwest Corner Horizontal Foundation-Level Spectra

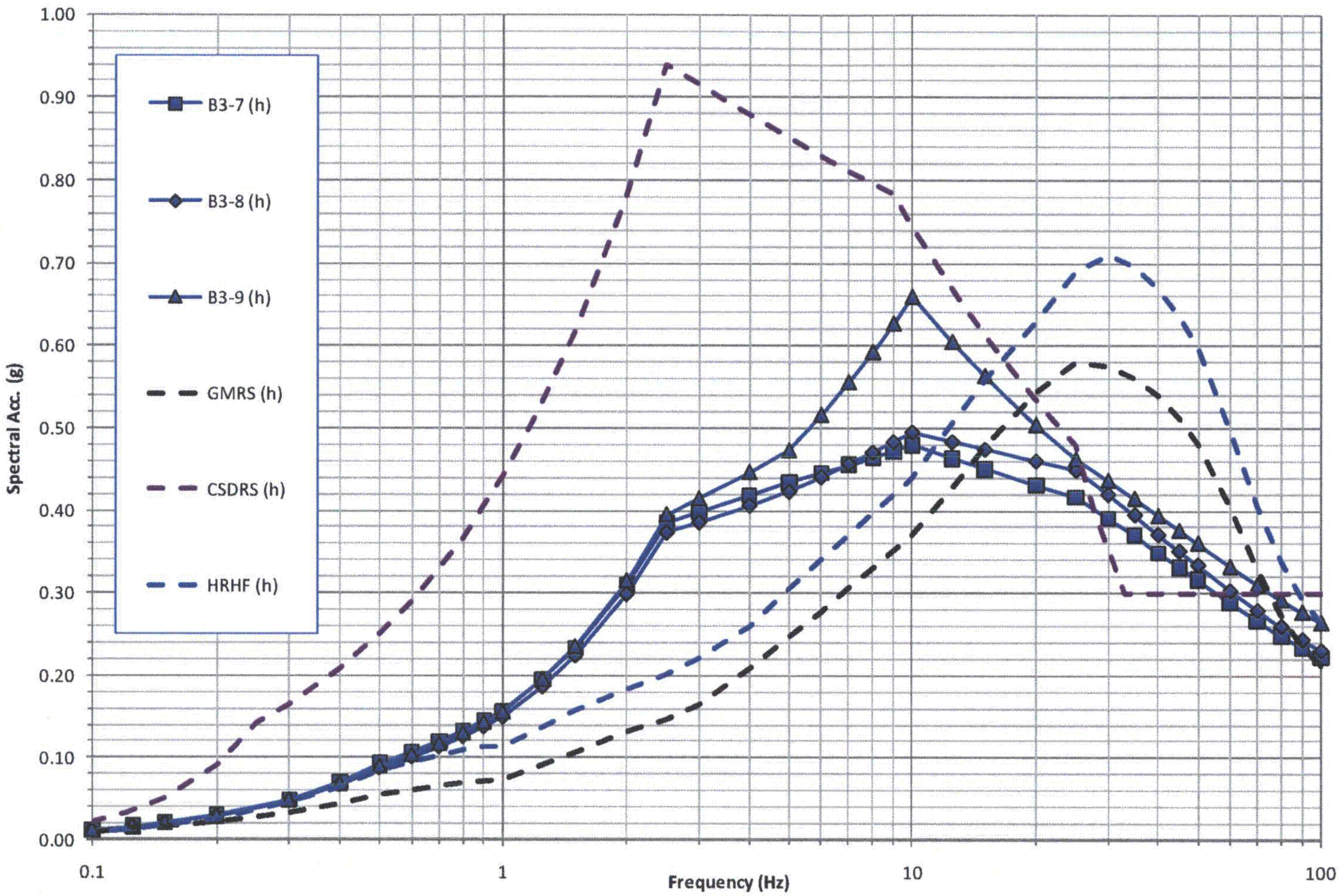

Figure 20 - Lee Unit 1 - Northwest Corner Horizontal Foundation-Level Spectra

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 21 to RAI 03.07.01-004

Figure 21 - Lee Unit 1 - Northwest Corner Vertical Foundation-Level Spectra

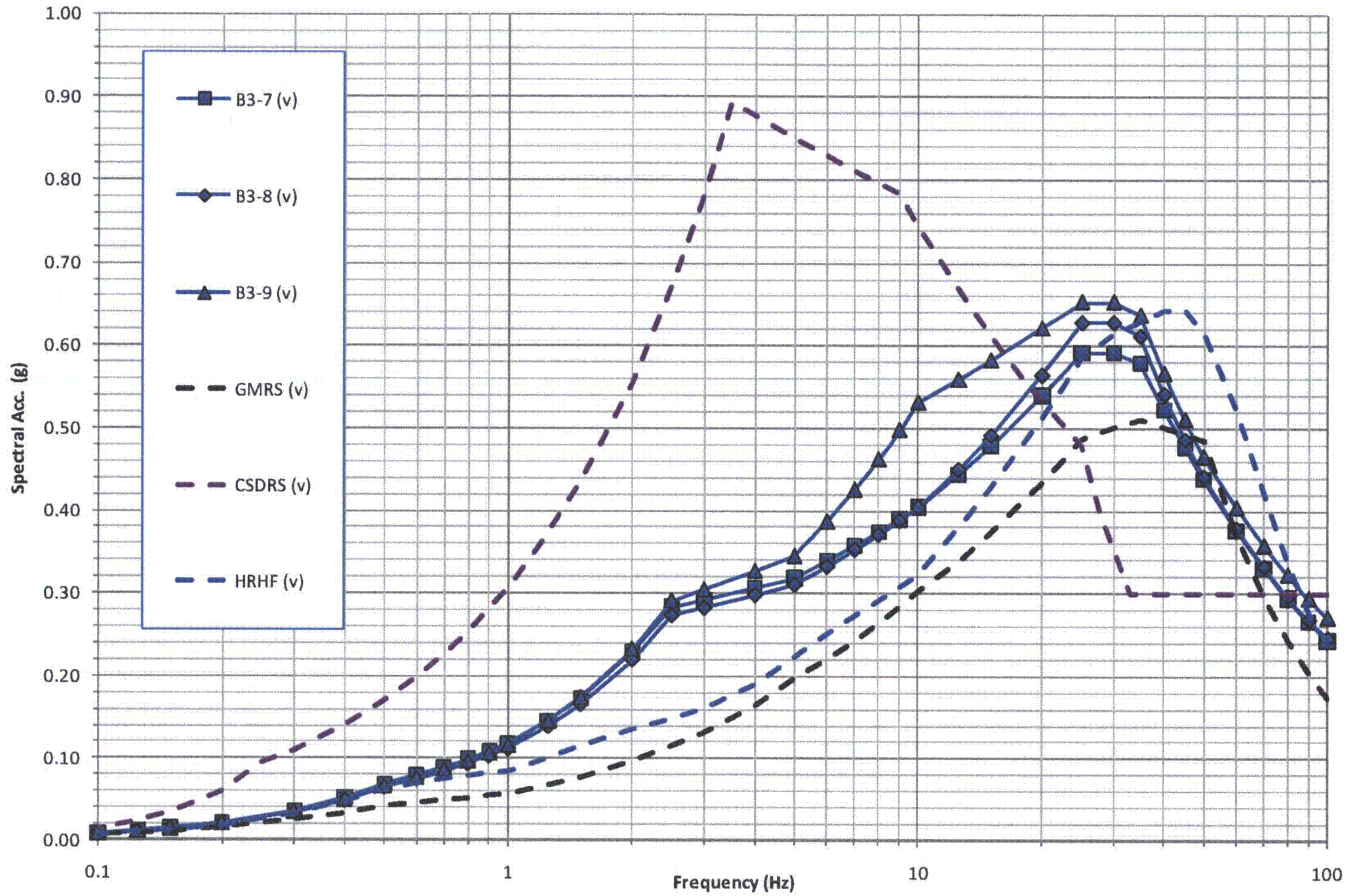

Figure 21 - Lee Unit 1 - Northwest Corner Vertical Foundation-Level Spectra

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 22 to RAI 03.07.01-004

Figure 22 - Lee Unit 1 - Northwest Corner Horizontal Foundation-Level Spectra Compared to Reference 3

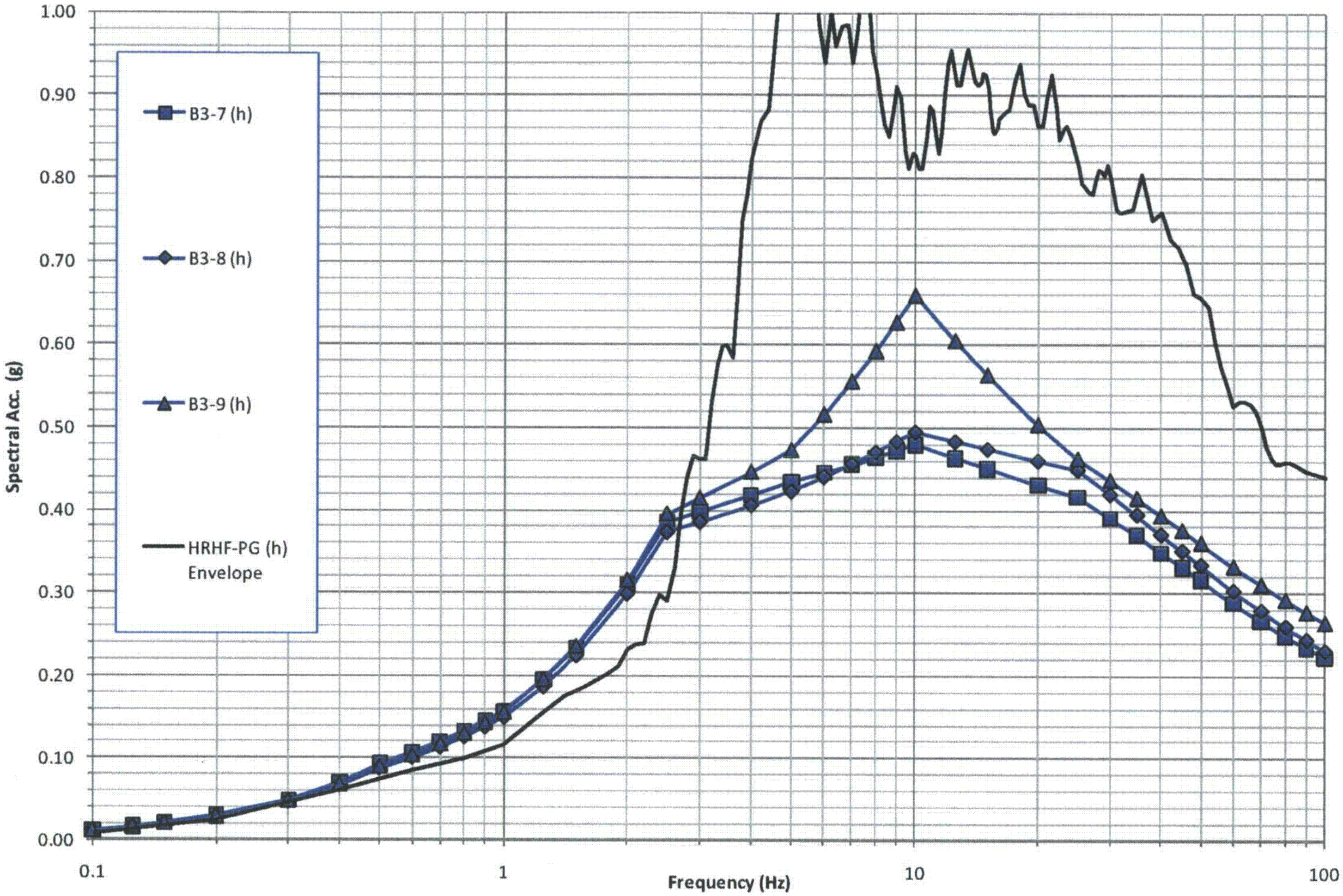

Figure 22 - Lee Unit 1 - Northwest Corner Horizontal Foundation-Level Spectra Compared to Reference 3

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 23 to RAI 03.07.01-004

Figure 23 - Lee Unit 1 - Northwest Corner Vertical Foundation-Level Spectra Compared to Reference 3

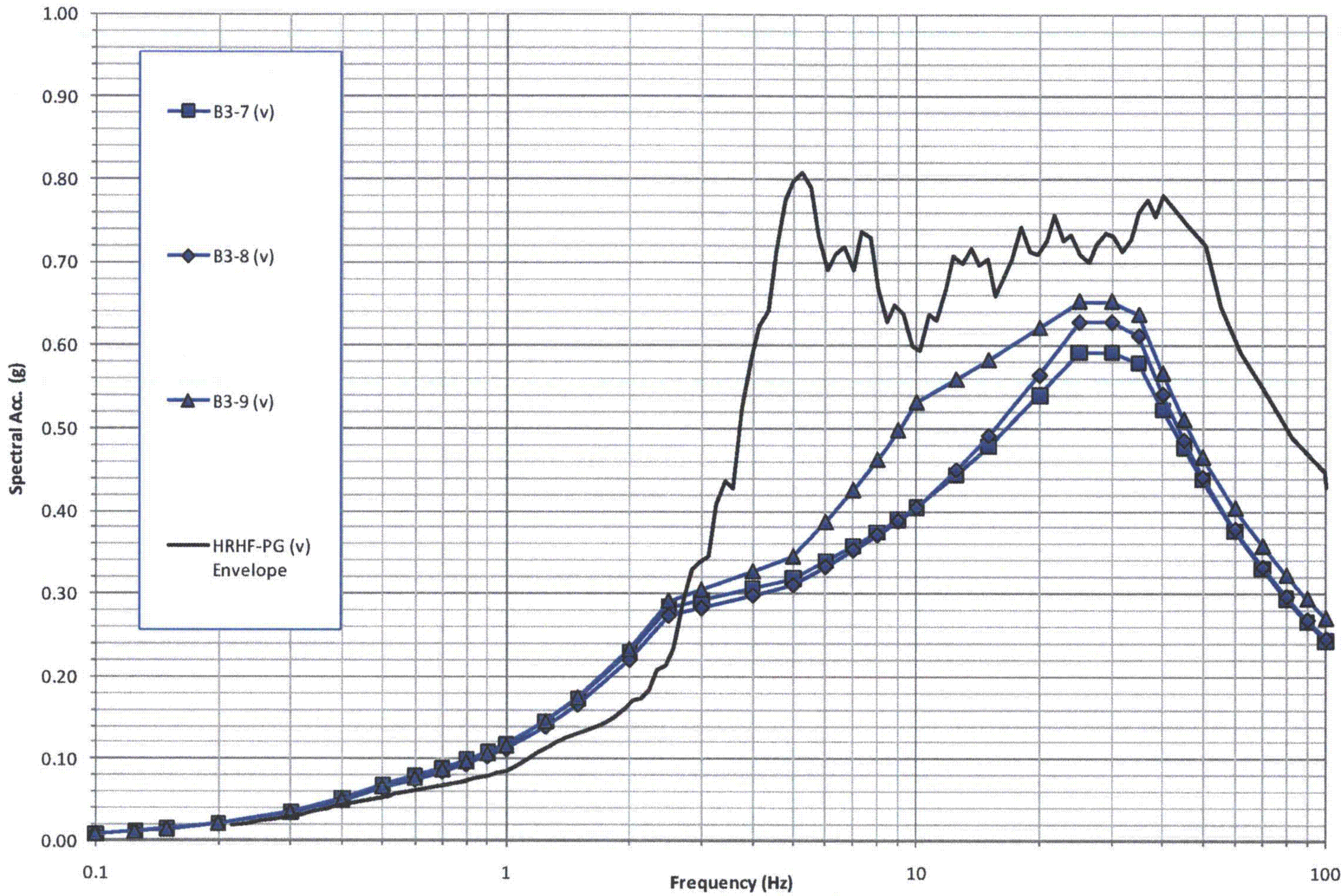

Figure 23 - Lee Unit 1 - Northwest Corner Vertical Foundation-Level Spectra Compared to Reference 3

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 24 to RAI 03.07.01-004

Figure 24 - Summary of All Horizontal Foundation-Level Spectra for SC-II Buildings

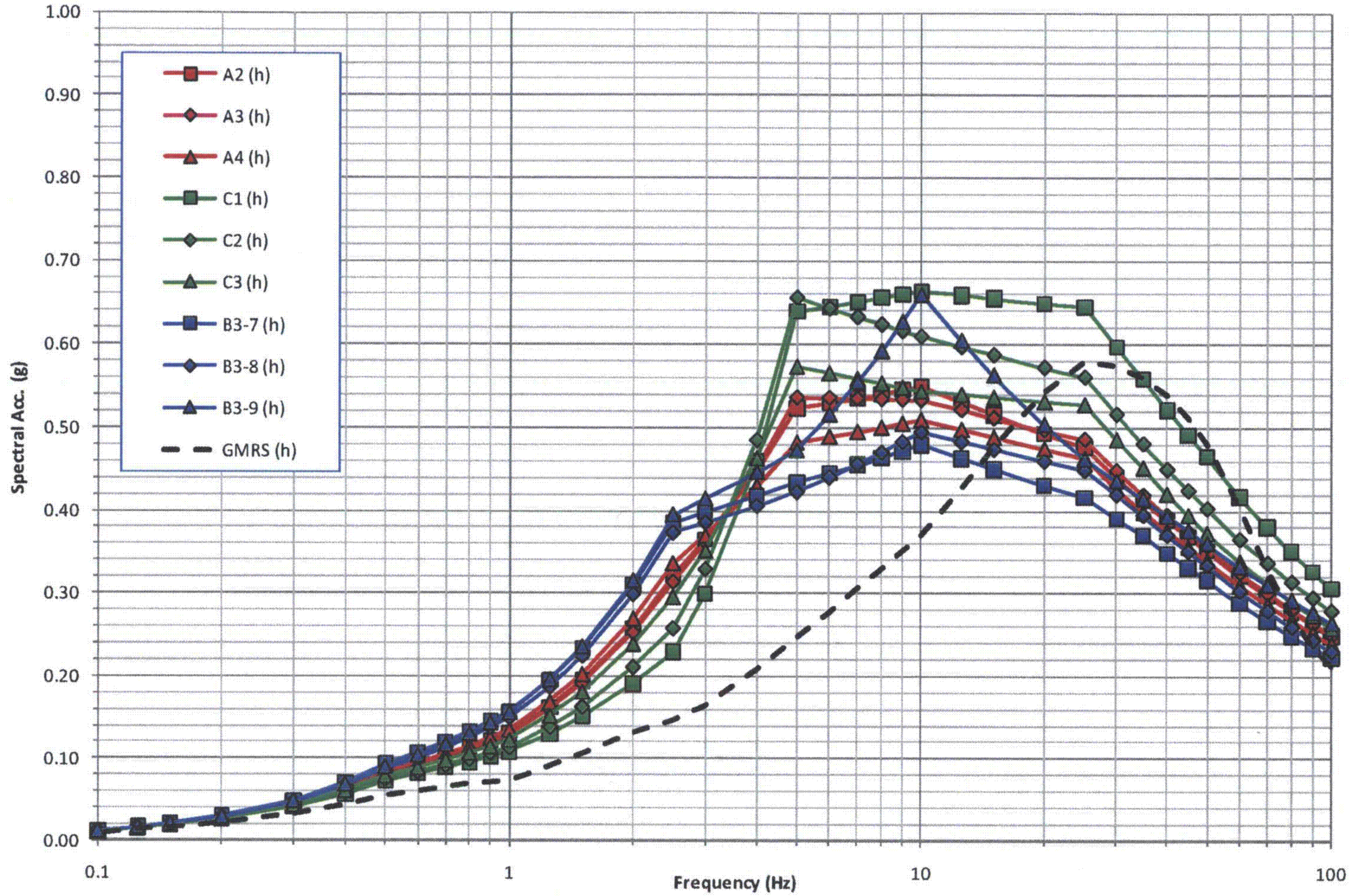

Figure 24 - Summary of All Horizontal Foundation-Level Spectra for SC-II Buildings

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 25 to RAI 03.07.01-004

Figure 25 - Summary of All Vertical Foundation-Level Spectra for SC-II Buildings

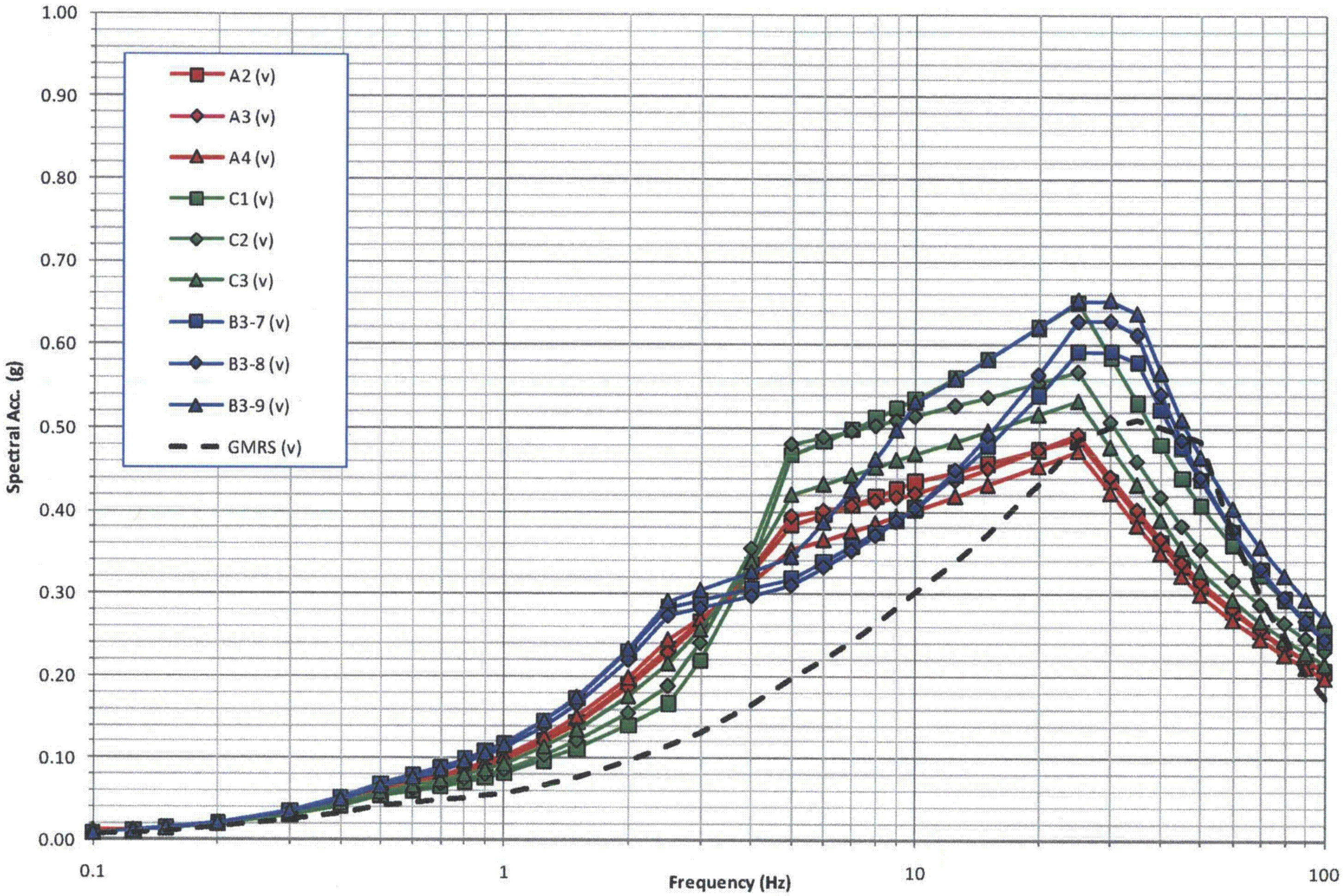

Figure 25 - Summary of All Vertical Foundation-Level Spectra for SC-II Buildings

Lee Nuclear Station Response to Request for Additional Information (RAI)

Attachment 26 to RAI 03.07.01-004

Mark-up of FSAR Subsection 3.7.2.8.4

In Reference 3, Westinghouse committed to add a new AP1000 DCD Tier 2 Subsection 3.7.2.8.4 in response to RAI-SRP3.7.1-SEB1-15. In response to this change to AP1000 DCD Tier 2, COLA Part 2, FSAR, Chapter 2, Subsection 3.7.2.8.4, is revised to add the following supplemental text:

3.7.2.8.4 Seismic Modeling and Analysis of Seismic Category II Building Structures

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Add the following information to the end of DCD Subsection 3.7.2.8.4:

WLS SUP 3.7-4 The foundation conditions beneath most of the Unit 1 Annex Building are very uniform, and are in fact similar to those described in the AP1000 DCD, except that the fill material supporting the Annex Building is a few feet thicker. In the northernmost end of the Unit 1 Annex Building, the top-of-continuous-rock slopes away, but the overall character of the building support remains quite uniform. This is illustrated in FSAR Figures 2.5.4-246, 2.5.4-260, and 2.5.4-264. Since the entire Seismic Category II portion of the Annex Building is on a common base mat and will behave as a unit, these localized differences in the support conditions will not significantly affect overall response of the Unit 1 Annex Building, or the potential for interaction with the nuclear island.

FSAR Figure 2.5.4-260 also illustrates the support conditions beneath the Unit 2 Annex Building. Though final excavation profiles to support construction of Unit 2 have not been established, the foundation support provided by the existing rock excavation provide uniform support at a depth about ten feet less than the configuration described in the AP1000 DCD.

The foundation conditions beneath the Seismic Category II portion of the Unit 1 and Unit 2 Turbine Buildings are also very uniform and are in fact similar to those described in the AP1000 DCD, except that the supporting rock or fill concrete will be a few feet above the level considered for the standard design.

As shown in FSAR Subsection 3.7.1.1.1, the Lee GMRS and Unit 1 FIRS are enveloped by the AP1000 HRHF response spectrum. The properties of the granular fill material that will be placed above continuous rock, presented in FSAR Table 2.5.4-211 and FSAR Tables 2.5.4-224A through 2.5.4-224F, are consistent with those used by Westinghouse in developing design criteria for adjacent Seismic Category II structures and include having a shear wave velocity greater than 500 fps.

Lee site-specific spectra at the foundation levels of the adjacent Seismic Category II buildings have been developed, considering the effects of the different thicknesses of granular fill material beneath the adjacent buildings. For frequencies above 2.5 Hz, these site-specific spectra are lower than the AP1000 generic plant-grade spectra for a Hard Rock High Frequency site that were considered in developing design criteria for the Seismic Category II buildings. For frequencies below 2.5 Hz, the design of Seismic Category II structures is governed by the CSDRS.

The Lee site-specific bearing capacity for the granular fill material supporting the Seismic Category II structures (shown in FSAR Table 2.5.4-228) is greater than the generic AP1000 bearing demand for these structures.

The Lee site provides uniform support for the Seismic Category II buildings; site-specific fill material is consistent with that considered in establishing generic AP1000 design criteria for these buildings; and the site-specific seismic demands on the Seismic Category II buildings are less than those considered in the AP1000 standard design.
