

REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 182-8160
SRP Section: 03.07.01 – Seismic Design Parameters
Application Section: 3.7.1
Date of RAI Issue: 08/31/2015

Question No. 03.07.01-4

10 CFR 50 Appendix S requires that the safety functions of structures, systems, and components (SSCs) must be assured during and after the vibratory ground motion associated with the safe shutdown earthquake (SSE) ground motion through design, testing, or qualification methods. DCD Section 3.7.1.3, Appendix 3.7A, and APR1400-E-S-NR-14001-P, Rev. 0, "Seismic Design Bases," provides information related to the DCD generic soil profiles, which were used in the various soil structure interaction (SSI) analyses of the APR1400 Seismic Category I structures. In accordance with 10 CFR 50 Appendix S, the staff reviewed this information related to the supporting media and determined that the following additional information should be provided to assist the staff's evaluation

a) Strain compatible (not low strain) soil profiles should be used for DC/COL soil profile comparison

Since magnitude/distance properties are not appropriate to be specified in the DCD, the ranges of soil profiles in the standard design are typically considered as strain-iterated. In the end, the combined license application (COLA) will need to compare their appropriate strain compatible properties (based on site-specific data and ground motion parameters) when developing ground motion response spectra (GMRS) with the range of profiles considered in the DCD.

Furthermore, COLA profiles cannot easily be defined as "bounded" by the profiles used for the DCD. Since both low strain soil profiles and strain iterated soil profiles are provided in DCD Section 3.7.1.3, DCD Appendix 3.7A, and APR1400-E-S-NR-14001-P, Rev. 0, the applicant is requested to clearly indicate in these documents that the COLA strain iterated soil profiles should be compared to the strain iterated generic soil profiles. It is understood that COLA comparison of soil profiles is addressed separately in Section 2.5. Therefore, any revision of SRP 3.7.1 related information should be performed in connection with any required revision of DCD Section 2.5 including COL information items.

b) Treatment of DCD soil degradation models

It is not clear what is the purpose of specifying the modulus reduction and damping curves in the DCD as described in Section 3.7.1.2 because the SSI analyses in the DC stage only requires a range of generic soil profiles typically considered as strain iterated. Three soil degradation models are used in Section 5.1 of APR1400-E-S-NR-14001-P, Rev. 0: (1) curves for sand from EPRI TR-102293, (2) soft rock from Silva's report, and (3) rock from SHAKE. These curves do not always exhibit a clear trend (as evidenced in Figures 5-11, 5-12, and 5-13) to be consistent with the expected behavior of sand, soft rock and rock. As discussed in the above RAI question, consideration of soil/rock degradation is not necessary in the DCD because the SSI analyses in the DCD start typically with postulated range of strain iterated soil profiles. As such, the three degradation models should be treated as part of a demonstration of the DCD method and how the DCD demands and ISRS were reached. Accordingly, the applicant is requested to include a COL information item for the COLA to use methods/models/data suitable for its site and any use of these three DCD soil degradation models must be justified to be appropriate for the site in COLA.

c) Strain compatible P-wave velocities

DCD Section 3.7A.2.2 indicates that separate horizontal and vertical site response analyses were performed to get the strain compatible properties for the nine low-strain soil profiles, which are then used as equivalent linear properties in the SSI analyses. The strain compatible properties for the two horizontal directions were averaged to obtain a single set of strain compatible properties for the two horizontal directions. Tables 3.7A-1 through 3.7A-9 show both the low strain and strain compatible soil profiles. On the other hand, Section 2.2 of the HRHF technical report, "Site Response Analysis," indicated that the horizontal site response analyses considered soil degradation but the vertical site response analyses uses the low-strain compression wave velocities. It appears that strain compatible P-wave velocities were used for the CSDRS related analyses but the low strain P-wave velocities were used for the HRHF site response analysis.

The applicant is requested to identify what P-wave velocities were used in the SSI analysis for the HRHF related evaluation, and provide the basis for the inconsistent application of the P-wave velocities in the site response analyses and/or SSI analyses for CSDRS and HRHF evaluations.

Previous recommendations for site-specific SSI analyses indicated use of strain compatible properties for S-wave velocities and corresponding low strain velocities for P-wave velocities. However, that approach has recently been modified (ASCE Standard 4 for example) since these differences can lead to stability problems in SSI analyses. For example, Section C5.2 of the draft ASCE 4 (July 3, 2013) states that "Poisson's ratios at low strain levels should be maintained for strain-compatible soil properties, except for saturated soils for which the minimum P-wave velocity of saturated soil should be maintained." The DCD and APR1400-E-S-NR-14001-P, Rev. 0 present different Poisson's ratios for the low strain soil profiles and the strain compatible soil profiles. Therefore, the applicant is requested to:

- (1) Explain the method used to develop the strain compatible P-wave velocities

- (2) Explain how that method used in the DCD compares to the currently recommended approach (i.e., maintaining the low strain Poisson's ratio as described in the draft ASCE 4).

Response

- a) The COLA should compare their appropriate strain compatible soil properties to the strain compatible generic soil profiles of the APR1400. To avoid confusion and improve clarity in the DC/COL soil profile comparison, DCD Tier 2 will be revised to not use the terms "low-strain" and "strain-compatible", and only use the term "generic" when describing soil profiles. Also, the description of site response analysis and degradation models in the context of DCD Tier 2 will be removed. Tier 2 of the DCD will provide only generic soil profiles which are used in the SSI analyses. The last paragraph of Subsection 5.2 in technical report APR1400-E-S-NR-14001-P, Rev. 0 specifies the generic soil profiles used in the SSI analyses for the certified seismic design response spectra (CSDRS) seismic input motion. The soil profile used in the SSI analysis for hard rock high frequency (HRHF) seismic input motion will be added to DCD Tier 2, Appendix 3.7B and the technical report APR1400-E-S-NR-14004-P, Rev. 1. The ~~use of strain compatible soil profiles for~~ DC/COL soil profile comparison will be clearly specified in DCD Tier 2, ~~Table 1.8-2, Subsection 3.7.1.3 and 3.7.5~~ as COL 3.7(4213). To incorporate the aforementioned changes, DCD Tier 2, Table 1.8-2, Subsections 2.5.2.6, 2.5.6, 3.7.1.2, 3.7.1.3, 3.7.5, 3.7.6, Figure 3.7-23, Appendices 3.7A, 3.7B, and technical reports APR1400-E-S-NR-14001-P, Rev. 0, APR1400-E-S-NR-14003-P, Rev. 0, APR1400-E-S-NR-14004-P, Rev. 1, APR1400-E-S-NR-14005-P, Rev. 0, and APR1400-E-S-NR-14006-P, Rev. 1 will be revised, as indicated in the attachment associated with this response.
- b) The three soil degradation models in the DCD are used in site response analyses of the APR1400 standard design. These soil degradation models are provided for a description of site response analysis procedure performed in APR1400 seismic analysis. ~~The soil degradation models in the DCD will be removed, as discussed in item a) of this response.~~ The COLA can determine the soil degradation models from dynamic laboratory testing of the site materials, information obtained from published literature, or both as specified in SRP 3.7.2, Rev.4. The suitability of soil degradation models for a COL site should be reviewed in the COL stage. The application of site-specific soil degradation models will be clearly specified in DCD Tier 2, Table 1.8-2, Subsection 3.7.1.2, and ~~Subsection 3.7.5~~ as COL 3.7(4412).
- c) The SSI analyses for CSDRS and HRHF response spectra do not use strain compatible P-wave velocities, but use low strain P-wave velocities of generic soil profiles.

The approach recommended in Section C5.2 of the draft ASCE 4 (July 3, 2013), which states that "Poisson's ratios at low strain levels should be maintained for strain-compatible soil properties except for saturated soils for which the minimum P-wave velocity of saturated soil should be maintained," implies that the strain-compatible P-wave velocity degrades with the ground-motion-induced compression strain level in the

same way as the strain-compatible S-wave velocity degrades with the ground-motion-induced shear strain level.

In principle, the dynamic Poisson's ratios of soils at the low strain level are derived quantities based on measured P- and S-wave velocities at the low strain level. At the higher shear strain level, it is known that the shear-strain-compatible S-wave velocity degrades with the shear strain level induced by the ground motion. However, at the higher shear strain level, whether the compression-strain-compatible P-wave velocity will degrade with the compression strain level induced by the ground motion in the same manner as the S-wave velocity degrades with the shear strain level induced is yet to be validated.

For saturated soils, the P-wave velocity at all compression strain levels is maintained at a value not less than the P-wave velocity of water, which is approximately 4800 to 5000 ft/sec, depending on temperature. This, coupled with the shear-strain-compatible degraded S-wave velocity, will cause the dynamic Poisson's ratios of saturated soils to increase from the dynamic Poisson's ratios measured at the low strain level. Thus, maintaining the dynamic Poisson's ratios at the low-strain level for the higher strain levels is no longer valid.

Another approach for soil-structure interaction (SSI) analysis is to use the strain-compatible S-wave velocities coupled with the low-strain P-wave velocities measured at the low strain levels to perform the seismic SSI analysis. This approach results in increase of dynamic Poisson's ratios for soils at higher shear strain levels. As a result, the strain-compatible Poisson's ratios could approach a high value (close to the limiting value of 0.5 for an incompressible solid), which may cause numerical stability for the finite elements used to model the soils. To maintain numerical stability, the strain-compatible dynamic Poisson's ratios are usually limited to a value of 0.48. When the limiting value of 0.48 is reached for the dynamic Poisson's ratios, the P-wave velocities of soils that are computed from the strain-compatible S-wave velocities and the limiting Poisson's ratio value of 0.48 will decrease from their low-strain P-wave velocity values. This approach is the approach used for the seismic SSI analysis for CSDRS and HRHF DRS of the APR1400.

Impact on DCD

DCD Tier 2, Table 1.8-2, Subsections [2.5.2.6](#), [2.5.6](#), [3.7.1.2](#), [3.7.1.3](#), ~~and 3.7.5~~, [3.7.6](#), [Figure 3.7-23](#), [Appendices 3.7A and 3.7B](#) will be revised, as indicated in the attachment associated with this response.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

~~There is no impact on any Technical, Topical, or Environmental Report~~ Technical reports APR1400-E-S-NR-14001-P/NP, APR1400-E-S-NR-14003-P/NP, APR1400-E-S-NR-14004-P/NP, APR1400-E-S-NR-14005-P/NP, and APR1400-E-S-NR-14006-P/NP will be revised, as indicated in the attachment associated with this response.

DRAFT

APR1400 DCD TIER 2

Table 1.8-2 (2 of 29)

RAI 366-8406 Question 02.05.02-5

Item No.	Description
COL 2.5(1)	The COL applicant is to provide the site-specific information on geology, seismology, and geotechnical engineering as required in NRC RG 1.206.
COL 2.5(2)	The COL applicant is to confirm that the foundation input response spectra (FIRS) of the nuclear island are completely enveloped by the CSDRS-compatible free-field response motions at the bottom elevation of the nuclear island for a site with the low-strain shear wave velocity greater than 304.8 m/s (1,000 ft/s) at the finished grade in the free field. Alternately, the COL applicant is to confirm that FIRS of the nuclear island are completely
COL 2.5(3)	The COL applicant is to confirm that the site-specific profile for a HRHF site is consistent with generic soil profile S9 and the site-specific GMRS determined at the finished grade are completely enveloped by the APR1400 HRHF response spectra. In addition, the COL applicant is to confirm that the FIRS of the seismic Category I structures are completely enveloped by the HRHF-compatible free-field response motions at the bottom elevation of each seismic Category I structure.
COL 2.5(4)	The COL applicant is to confirm that the site-specific GMRS determined at the finished grade are completely enveloped by the hard rock high frequency (HRHF) response spectra for a site with a low strain shear wave velocity of supporting medium for the nuclear island higher than 1,494 m/s (4,900 ft/s) overlaying a hard rock with a low strain shear wave velocity greater than 2,804 m/s (9,200 ft/s). the soil profile provided in Table 3.7B-3
COL 2.5(5)	The COL applicant is to perform a site-specific seismic analysis to generate in-structure response spectra at key locations using the procedure described in Appendix 3.7A if COL 2.5(2) and COL 2.5(3) above are not met. In addition, the COL applicant is to confirm that the site-specific in-structure response spectra so generated are enveloped by the corresponding in-structure response spectra provided in Appendix 3.7A.
COL 2.5(6)	The COL applicant is to perform a site-specific seismic response analysis using the procedure described in Appendix 3.7B and the EPRI White Paper, "Seismic Screening of Components Sensitive to High Frequency Vibratory Motions," if COL 2.5(4) is not met.
COL 2.5(7)	The COL applicant is to perform an evaluation of the subsurface conditions within the standard plant structure footprint based on the geologic investigation in accordance with NRC RG 1.132.
COL 2.5(8)	The COL applicant is to confirm that the dynamic properties of structural fill granular to be used in construction of the APR1400 seismic Category I structures satisfy the requirements of structural fill granular provided in Table 2.0-1.
COL 3.2(1)	The COL applicant is to identify the seismic classification of site-specific SSCs that should be designed to withstand the effects of the SSE.
COL 3.2(2)	The COL applicant is to identify the quality group classification of site-specific systems and components and their applicable codes and standards.
COL 3.3(1)	The COL applicant is to demonstrate that the site-specific design wind speed is bounded by the design wind speed of 64.8 m/s (145 mph).
COL 3.3(2)	The COL applicant is to demonstrate that the site-specific seismic Category II structures adjacent to the seismic Category I structures are designed to meet the provisions described in Subsection 3.3.1.2.
COL 3.3(3)	The COL applicant is to provide reasonable assurance that site-specific structures and components not designed for the extreme wind loads do not impact either the function or integrity of adjacent seismic Category I SSCs.

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Table 1.8-2 (4 of 29)

RAI 4-7830 Question 03.07.04-2

Item No.	Description
COL 3.7(3)	The COL applicant is to provide the seismic design of the seismic Category I SSCs that are not part of the APR1400 standard plant design. The seismic Category I structures are as follows: <ul style="list-style-type: none"> a. Seismic Category I essential service water building b. Seismic Category I component cooling water heat exchanger building
COL 3.7(4)	The COL applicant is to confirm that the any site-specific non-seismic Category I SSCs are designed not to degrade the function of a seismic Category I SSC to an unacceptable safety level due to their structural failure or interaction.
COL 3.7(5)	The COL applicant is to perform any site-specific seismic design for dams that is required.
COL 3.7(6)	The COL applicant is to perform seismic analysis of buried seismic Category I piping, conduits, and tunnels.
COL 3.7(7)	The COL applicant is to perform seismic analysis for the seismic Category I above-ground tanks.
COL 3.7(8)	The COL applicant that references the APR1400 design certification will determine whether essentially the same seismic response from a given earthquake is expected at each unit in a multi-unit site or each unit is to be provided with a separate set of seismic instruments.
COL 3.7(9)	The COL applicant is to confirm details of the locations of the triaxial time-history accelerograph.
COL 3.7(10)	The COL applicant is to identify the implementation milestones for the seismic instrumentation implementation program based on the discussion in Subsections 3.7.4.1 through 3.7.4.5.
COL 3.7B(1)	The COL applicant is to evaluate the HRHF response spectra.
COL 3.7B(2)	The COL applicant is to evaluate the representative items listed in Table 3.7B-2.
COL 3.8(1)	The COL applicant is to provide the design of site-specific seismic Category I structures such as the essential service water supply structure and the component cooling water heat exchanger building.
COL 3.8(2)	The COL applicant is to identify any applicable site-specific loads such as site proximity explosions and missiles, potential aircraft crashes, and the effects of seiches, surges, waves, and tsunamis.
COL 3.8(3)	The COL applicant is to determine the environmental condition associated with the durability of concrete structures and provide the concrete mix design that prevents concrete degradation including the reactions of sulfate and other chemicals, corrosion of reinforcing bars, and influence of reactive aggregates.
COL 3.8(4)	The COL applicant is to determine construction techniques to minimize the effects of thermal expansion and contraction due to hydration heat, which could result in cracking.
COL 3.8(5)	The COL applicant is to monitor the safety and serviceability of seismic Category I structures during the operation of the plant and provide the appropriate maintenance.
COL 3.8(6)	The COL applicant is to provide reasonable assurance that the design criteria listed in Table 2.0-1 are met or exceeded.

COL 3.7(11) The COL applicant is to prepare a procedure for the post shutdown inspection and plant restart in accordance with the guidance of NRC RG 1.167.

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RAI 366-8406 Question 02.05.02-5

than 304.8 m/s (1,000 ft/s), the submaterials are completely excavated to expose competent material with a low-strain shear wave velocity equal to or greater than 304.8 m/s (1,000 ft/s), and the GMRS are defined as a free-field motion on the hypothetical outcrop after the excavation. For a site where the nuclear island is located on hard rock with a shear wave velocity greater than 2,804 m/s (9,200 ft/s), the site-specific GMRS can be defined at the foundation level. For this case, GMRS could be referred to as foundation input response spectra (FIRS) for the seismic Category I structures. The site-specific GMRS need to be transferred to the foundation elevations of each seismic Category I structure to obtain FIRS of each seismic Category I structure. The COL applicant is to confirm that the site meets the following requirements:

- a. For a site with a low-strain shear wave velocity greater than 304.8 m/s (1,000 ft/s) at the finished grade in the free field, the site-specific GMRS at the finished grade are completely enveloped by the APR1400 CSDRS shown in Figures 3.7-1 and 3.7-2. In addition, according to the NRC DC/COL-ISG-017 (Reference 5), the FIRS of the nuclear island are completely enveloped by the CSDRS-compatible free-field response motions at the bottom elevation of the nuclear island shown in Figures 3.7A-12 through 3.7A-14 (COL 2.5(2)).
- b. For hard rock sites with a low-strain shear wave velocity of supporting medium for the nuclear island greater than 2,804 m/sec (9,200 ft/s), FIRS of the nuclear island are completely enveloped by the CSDRS (COL 2.5(2)).
- c. For soil sites, the lower bound of the site-specific strain-compatible soil profile is greater than the lower bound of the generic strain-compatible soil profiles used in the APR1400 seismic analyses shown in Tables 3.7A-1 through 3.7A-9 and Figures 3.7A-3 through 3.7A-11 (COL 2.5(3)).
- d. ~~For a site with a low strain shear wave velocity of supporting medium for the nuclear island higher than 1,494 m/s (4,900 ft/s) overlaying a hard rock with a low strain shear wave velocity greater than 2,804 m/s (9,200 ft/s), the site specific GMRS determined at the finished grade are completely enveloped by the APR1400 HRHF response spectra shown in Figures 3.7-12 and 3.7-13 (COL 2.5(4)).~~
- e. If the requirements a, b, and c listed above are not satisfied, a site-specific seismic

the soil profile provided in Table 3.7B-3

For a HRHF site, the site-specific profile needs to be consistent with generic soil profile S9. The site-specific GMRS determined at the finished grade are completely enveloped by the APR1400 HRHF response spectra shown in Figures 3.7-12 and 3.7-13 (COL 2.5(4)). In addition, according to the NRC DC/COL-ISG-017 (Reference 5), the FIRS of the seismic Category I structures are completely enveloped by the HRHF-compatible free-field response motions at the bottom elevation of each seismic Category I structure.

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RAI 366-8406 Question 02.05.02-5

2.5.4.12 Techniques to Improve Subsurface Conditions

If necessary to improve subsurface conditions, the plans, summaries of specifications, and methods of quality control are described in the site-specific information.

2.5.5 Stability of Slopes

No assumptions in regard to slope stability are used in the evaluation of the APR1400 standard design.

The stability of all natural and manmade slopes, including embankments and dams, that are vital to the safety of APR1400, is included in site-specific information.

2.5.6 Combined License Information

COL 2.5(1) The COL applicant is to provide the site-specific information on geology, seismology, and geotechnical engineering as required in NRC RG 1.206 (Reference 1).

COL 2.5(2) The COL applicant is to confirm that the FIRS of the nuclear island are completely enveloped by the CSDRS-compatible free-field response motions at the bottom elevation of the nuclear island for a site with the low-strain shear wave velocity greater than 304.8 m/s (1,000 ft/s) at the finished grade in the free field. Alternately, the COL applicant is to

the soil profile provided in Table 3.7B-3

The COL applicant is to confirm that the site-specific profile for a HRHF site is consistent with generic soil profile S9 and the site-specific GMRS determined at the finished grade are completely enveloped by the APR1400 HRHF response spectra shown in Figures 3.7-12 and 3.7-13. In addition, the COL applicant is to confirm that the FIRS of the seismic Category I structures are completely enveloped by the HRHF-compatible free-field response motions at the bottom elevation of each seismic Category I structure.

COL 2.5(3) The COL applicant is to confirm that the lower bound of the site-specific strain-compatible soil profile for a soil site is greater than the lower bound of the generic strain-compatible soil profiles used in the APR1400 seismic analyses.

COL 2.5(4) ~~The COL applicant is to confirm that the site-specific GMRS determined at the finished grade are completely enveloped by the HRHF response spectra for a site with a low-strain shear wave velocity of supporting medium for the nuclear island higher than 1,494 m/s (4,900 ft/s) overlaying hard rock with a low-strain shear wave velocity greater than 2,804 m/s (9,200 ft/s).~~

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provided in Table 3.7A-1 through 3.7A-9

analysis are ~~obtained from generic modulus reduction and hysteretic damping curves recommended by EPRI TR-102293 (Reference 11) based on site response analysis of soil columns for the standard plant profiles considering shear strains compatibility.~~

← Insert "B" from page 4.

3.7.1.3 Supporting Media for Seismic Category I Structures

Seismic Category I structures are founded directly on rock or competent soil. The nuclear island and emergency diesel generator building correspond to the seismic Category I structures of the APR1400 standard plant design. The nuclear island consists of the following seismic Category I structures, the reactor containment building and the auxiliary building, which are founded on a common basemat. The emergency diesel generator building and a diesel fuel oil storage tank room are also seismic Category I structures. The foundation embedment depth, foundation size, and total height of the seismic Category I structures are presented in Table 3.7-8.

For the design of seismic Category I structures, nine soil profiles and one fixed-base condition are established with various shear wave velocities compared with soil depth.

The supporting media for the generic site are described in Appendix 3.7A about soil properties, layering characteristics, shear wave velocity, shear modulus, and density. ~~Basically, soil structure interaction analyses on soil sites for the APR1400 use the soil degradation curves recommended by EPRI TR-102293. The curves are used to generate the strain-compatible soil properties.~~

Insert "B" from page 7.

Insert "C" from page 4.

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These nine profiles are considered representative to envelop sites where competent soil is defined by the shear wave velocity of the supporting medium at the foundation level exceeding 304.8 m/sec (1,000 ft/sec). The shear wave velocity profiles of the nine sites considered are shown in Figure 3.7-23. The nine soil profiles, S1 through S9, are developed as combinations of six soil layering categories, which are designated as 55, 100, 200, 500, 1,000 ft, and half-space, and five average-shear-wave-velocity categories, namely, 1,200, 2,000, 4,000, 6,000, and 9,200 ft/sec. The generic site soil profiles are described further in Technical Report, APR1400-E-S-NR-14001-P (Reference 9).

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RAI 4-7830 Question 03.07.04-2

- COL 3.7(6) The COL applicant is to perform seismic analysis of buried seismic Category I piping, conduits, and tunnels.
- COL 3.7(7) The COL applicant is to perform seismic analysis for the seismic Category I above-ground tanks.
- COL 3.7(8) The COL applicant that references the APR1400 design certification will determine whether essentially the same seismic response from a given earthquake is expected at each unit in a multi-unit site or each unit is to be provided with a separate set of seismic instruments.
- COL 3.7(9) The COL applicant is to confirm details of the locations of the triaxial time-history accelerographs.
- COL 3.7(10) The COL applicant is to identify the implementation milestones for the seismic instrumentation implementation program based on the discussion in Subsections 3.7.4.1 through 3.7.4.5.

Insert "D" from page 4.

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3.7.6 References

1. 10 CFR Part 50, Appendix A, General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," U.S. Nuclear Regulatory Commission.
2. 10 CFR Part 50, Appendix S, "Earthquake Engineering Criteria for Nuclear Power Plants," U.S. Nuclear Regulatory Commission.
3. Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," Rev. 2, U.S. Nuclear Regulatory Commission, July 2014.
4. Regulatory Guide 1.208, "A Performance-based Approach to Define the Site-specific Earthquake Ground Motion," Rev. 4, U.S. Nuclear Regulatory Commission, March 2007.
5. NUREG-0800, Standard Review Plan, Section 3.7.1, "Seismic Design Parameters," Draft Rev. 4, U.S. Nuclear Regulatory Commission, December 2012.

COL 3.7(11) The COL applicant is to prepare a procedure for the post shutdown inspection and plant restart in accordance with the guidance of NRC RG 1.167.

"A"

COL 3.7(12)	The COL applicant is to demonstrate the applicability of soil degradation models used in site-specific site response analysis for the site conditions.
COL 3.7(13)	The COL applicant is to compare the site-specific strain-compatible soil properties with strain-compatible generic soil properties in order to confirm that the site meets the generic soil profile used in the standard design.

"B"

The site-specific soil degradation models can be determined from dynamic laboratory testing of the site materials or from the published literature. The COL applicant is to demonstrate the applicability of soil degradation models used in site-specific site response analysis for the site conditions (COL 3.7(12)).

"C"

The COL applicant is to compare the site-specific strain-compatible soil properties with ~~strain-compatible~~ generic soil properties in order to confirm that the site meets the generic soil profile used in the standard design (COL 3.7(13)).

"D"

COL 3.7(12) The COL applicant is to demonstrate the applicability of soil degradation models used in site-specific site response analysis for the site conditions.

COL 3.7(13) The COL applicant is to compare the site-specific strain-compatible soil properties with ~~strain-compatible~~ generic soil properties in order to confirm that the site meets the generic soil profile used in the standard design.

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6. NUREG-0003, "Statistical Studies of Vertical and Horizontal Earthquake Spectra," U.S. Nuclear Regulatory Commission, January 1976.
7. NUREG/CR-6728, "Technical Basis for Revision of Regulatory Guidance on Design Ground Motions: Hazard- and Risk-consistent Ground Motion Spectra Guidelines," U.S. Nuclear Regulatory Commission, October 2001.
8. NUREG/CR-5347, "Recommendations for Resolutions of Public Comments on USIA-40, 'Seismic Design Criteria'," U.S. Nuclear Regulatory Commission, June 1989.
9. APR1400-E-S-NR-14001-P, "Seismic Design Bases," Rev. 0, KHNP, November 2014.
10. Regulatory Guide 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," Rev. 1, U.S. Nuclear Regulatory Commission, March 2007.
11. ~~EPRI TR-102293, "Guidelines for Determining Design Basis Ground Motions," Electric Power Research Institute, November 1993.~~ Deleted
12. ASCE 4-98, "Seismic Analysis of Safety Related Nuclear Structures and Commentary," American Society of Civil Engineers, January 2000.
13. An Advanced Computational Software for 3D Dynamic Analysis Including Soil-Structure Interactim, ACS SASSI NQA Version 2.3.0 Including Options A and FS and User Manual Rev. 5, Ghiocel Predicttrue Technologies, Inc., January 2012.
14. ANSYS, Advanced Analysis Techniques Guide, Release 14.0, ANSYS Inc., November 2011.
15. Analysis GTSTRUDL User Guide, Rev.7, GTSTRUDL Version 31, Georgia Institute of Technology, August 2010.
16. NUREG-0800, Standard Review Plan, Section 3.7.2, "Seismic System Analysis," Rev. 4, U.S. Nuclear Regulatory Commission, September 2013.
17. APR1400-E-S-NR-14002-P, "Finite Element Seismic Models for SSI Analyses of the NI Buildings," Rev. 0, KHNP, November 2014.

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Replace with Figure in next page.

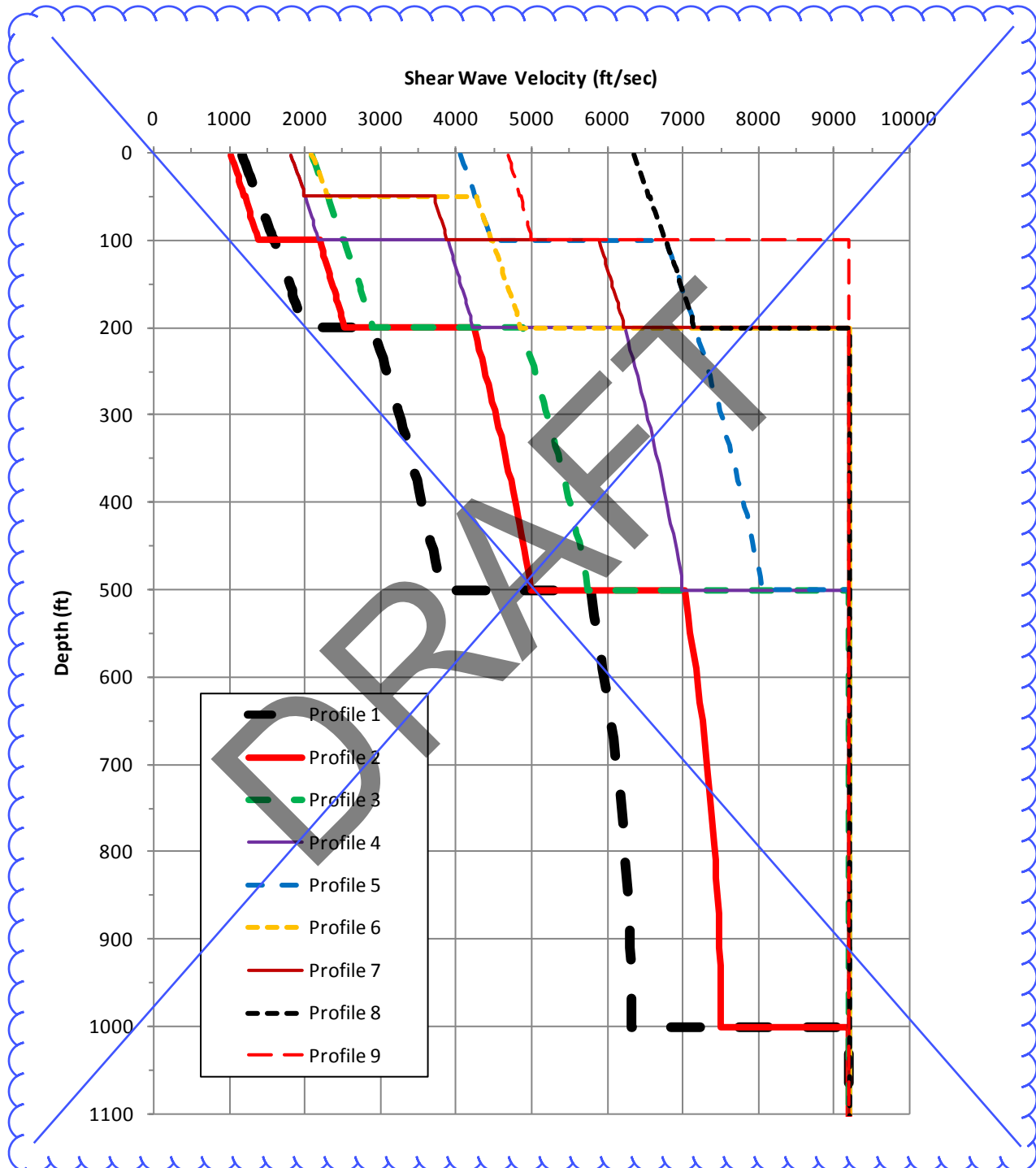


Figure 3.7-23 Generic Soil Profiles Proposed for APR1400 Standard Design

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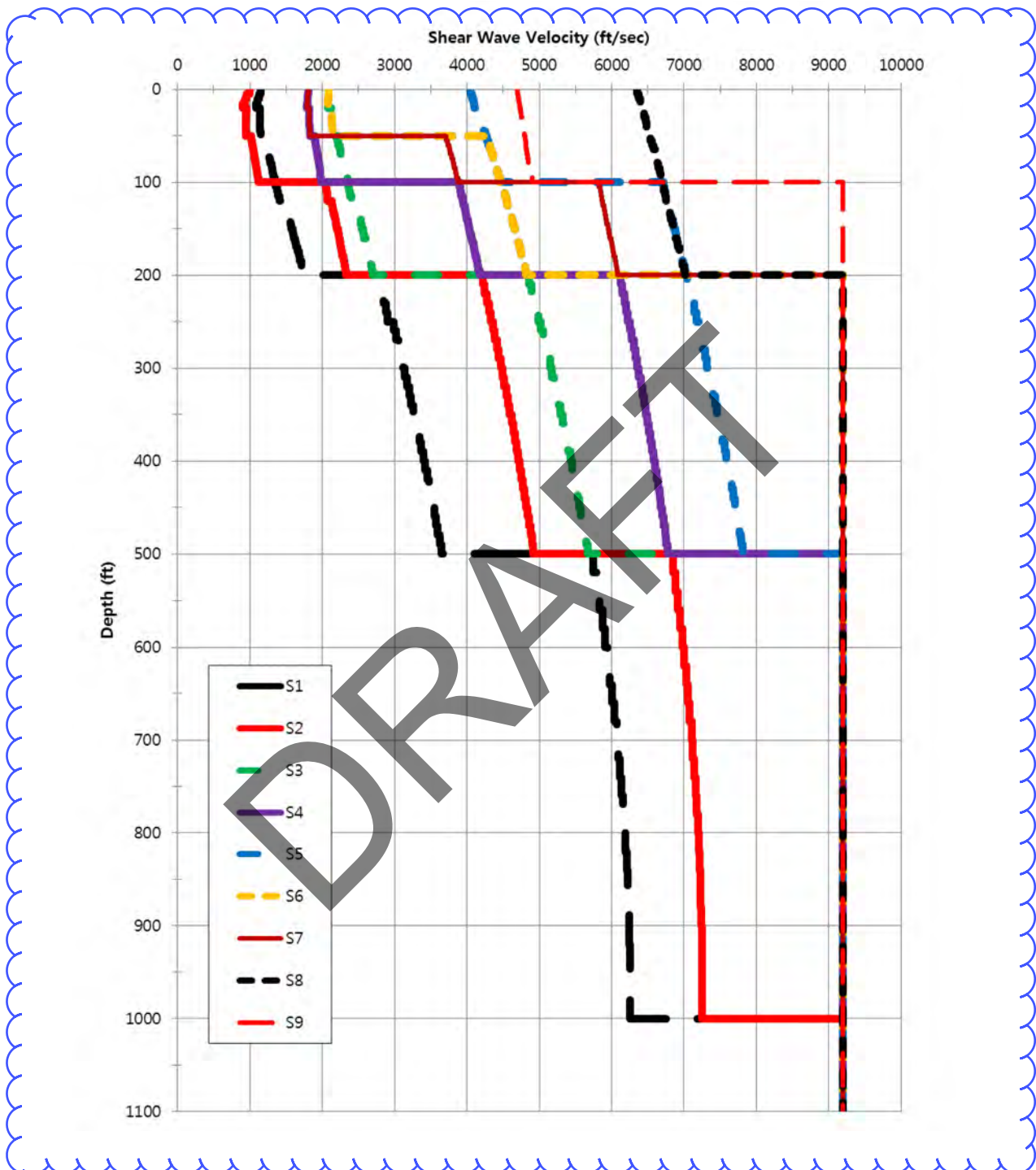


Figure 3.7-23 Generic Soil Profiles Proposed for APR1400 Standard Design

APR1400 DCD TIER 2**APPENDIX 3.7A – SOIL-STRUCTURE INTERACTION ANALYSIS
METHODOLOGY AND RESULTS****TABLE OF CONTENTS**

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Free-field Seismic Response Motions

APR1400 DCD TIER 2**3.7A.2 Site Response Analysis****3.7A.2.1 Soil Column Model**

The soil column models that are used in the site response analysis for the APR1400 are developed as shown in Tables 3.7A-1 through 3.7A-9.

The variation of shear modulus with shear strain and the variation of damping in the soil with shear strain are shown in Figures 3.7A-1 and 3.7A-2, respectively. The variations are based on the curves that are recommended in EPRI TR-102293 (Reference 2).

3.7A.2.2 Strain-compatible Soil Properties

The horizontal and vertical site response analyses are performed separately for the above nine low strain soil properties. The seismic input motions for the horizontal site response analysis are the horizontal components of the SSE. The seismic input motion for the vertical site response analysis is the vertical component of the SSE. The seismic input motions used in the analyses are defined as outcrop motions at the site grade elevation, El. 98 ft 8 in, where the shear wave velocity is greater than 304.8 m/sec (1,000 ft/sec). The site response analyses use the SHAKE computer program (Reference 3).

In the horizontal site response analyses, the strain-compatible soil/rock properties resulting from the east-west (E-W) and north-south (N-S) components of the seismic input motions differ slightly from each other because of the different time history input motions. To obtain a common set of strain-compatible soil properties for the SSI analysis, the strain-compatible soil properties resulting from the E-W and N-S input motions for each case are averaged. The average sets of strain-compatible properties for the nine soil profiles are shown in Tables 3.7A-1 through 3.7A-9. The strain-compatible soil properties are the equivalent linear properties used in the SSI analysis of seismic Category I structures.

Strain-compatible soil damping values greater than 15 percent are not used in accordance with NRC Standard Review Plan (SRP) 3.7.2 (Reference 4).

3.7A.2.3 Strain-compatible Free-field Seismic Response Motions

Free-field response motions at the foundation base elevation that are consistent with the strain-compatible equivalent linear soil properties are also obtained from the site response analyses. The soil models using the average strain-compatible soil/rock properties as

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shown in Tables 3.7A-1 through 3.7A-9 are then subjected to the control motion input defined as outcrop motion at the site grade elevation.

Figures 3.7A-12 through 3.7A-14 show the comparison of 5 percent damped response spectra between the seismic input motion at the free-field site grade elevation and the seismic response outcrop motions enveloped for all site soil column models at the seismic Category I structures foundation base elevation. The peak ground accelerations of the horizontal site response motions at the seismic Category I structures foundation base elevation are greater than 0.1g.

3.7A.3 SSI Analysis

Because the analyses are performed in the frequency domain, the transfer functions are generated up to a maximum cut-off frequency. Cut-off frequencies are the maximum frequencies that the soil media can transmit without loss of accuracy in the solution. In the present analyses, cut-off frequencies are computed based on the dimensions of the soil discretization. The maximum frequency that a soil layer can transmit corresponds to a wavelength equal to 5h, where h is the layer thickness. Cut-off frequencies vary according to the soil profiles used in the analyses. Table 3.7A-10 lists the cut-off frequencies for nine soil profiles.

3.7A.3.1 SSI Analysis Cases

A summary of the SSI analysis cases is presented in Table 3.7A-10. Nine SSI analyses are performed using all generic soil profiles described in Subsection 3.7.1.3.

All analyses are three-dimensional with input excitation provided in three directions. The generic soil sites differ from each other with respect to soil properties and depth of soil over bedrock. The embedment depth of the nuclear island is approximately 16.4 m (53 ft 8 in) in all cases.

The soil layers used in the SSI models and their associated ~~strain-compatible~~ soil/rock properties are shown in Tables 3.7A-1 to 3.7A-9 for all soil cases.

generic

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2. ~~EPRI TR-102293, "Guidelines for Determining Design Basis Ground Motions," Electric Power Research Institute, November 1993.~~ Deleted
3. ~~User's Manual for SHAKE91, University of California, Davis, November 1992.~~ Deleted
4. ~~NUREG-0800, Standard Review Plan, Section 3.7.2, "Seismic System Analysis," Rev. 4, U.S. Nuclear Regulatory Commission, September 2013.~~ Deleted
5. Regulatory Guide 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor-Supported Equipment or Components," Rev. 1, U.S. Nuclear Regulatory Commission, February 1978.

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Table 3.7A-1 (1 of 4)

Soil Layers and Properties (S1) [Replace with Table in next page.](#)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand	1	5	0.125	1,173	2,873	0.40	0.020	1,155	4,800	0.47
	2	5	0.125	1,196	2,929	0.40	0.031	1,132	4,800	0.47
	3	5	0.125	1,219	2,985	0.40	0.041	1,102	4,800	0.47
	4	5	0.125	1,241	3,040	0.40	0.048	1,087	4,800	0.47
	5	5	0.125	1,264	3,095	0.40	0.037	1,142	4,800	0.47
	6	5	0.125	1,286	3,150	0.40	0.042	1,138	4,800	0.47
	7	5	0.125	1,308	3,204	0.40	0.046	1,138	4,800	0.47
	8	5	0.125	1,330	3,259	0.40	0.050	1,141	4,800	0.47
	9	5	0.125	1,352	3,313	0.40	0.053	1,144	4,800	0.47
	10	5	0.125	1,374	3,366	0.40	0.056	1,149	4,800	0.47
	11	5	0.125	1,396	3,420	0.40	0.043	1,224	4,800	0.47
	12	5	0.125	1,418	3,473	0.40	0.044	1,234	4,800	0.46
	13	5	0.125	1,439	3,526	0.40	0.046	1,246	4,800	0.46
	14	5	0.125	1,461	3,578	0.40	0.047	1,257	4,800	0.46
	15	5	0.125	1,482	3,630	0.40	0.047	1,271	4,800	0.46
	16	5	0.125	1,503	3,682	0.40	0.048	1,285	4,800	0.46
	17	5	0.125	1,524	3,734	0.40	0.048	1,299	4,800	0.46
	18	5	0.125	1,545	3,785	0.40	0.049	1,314	4,800	0.46
	19	5	0.125	1,566	3,837	0.40	0.050	1,328	4,800	0.46
	20	5	0.125	1,587	3,887	0.40	0.050	1,342	4,800	0.46
	21	5	0.125	1,608	3,938	0.40	0.050	1,357	4,800	0.46
	22	5	0.125	1,628	3,988	0.40	0.051	1,373	4,800	0.46
	23	5	0.125	1,649	4,038	0.40	0.051	1,389	4,800	0.45
	24	5	0.125	1,669	4,088	0.40	0.051	1,406	4,800	0.45
	25	5	0.125	1,689	4,137	0.40	0.039	1,489	4,800	0.45
	26	5	0.125	1,709	4,187	0.40	0.039	1,506	4,800	0.45

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Table 3.7A-1 (1 of 4)

Soil Layers and Properties (S1)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.125	0.020	1,155	4,800	0.47
	2	5	0.125	0.031	1,132	4,800	0.47
	3	5	0.125	0.041	1,102	4,800	0.47
	4	5	0.125	0.048	1,087	4,800	0.47
	5	5	0.125	0.037	1,142	4,800	0.47
	6	5	0.125	0.042	1,138	4,800	0.47
	7	5	0.125	0.046	1,138	4,800	0.47
	8	5	0.125	0.050	1,141	4,800	0.47
	9	5	0.125	0.053	1,144	4,800	0.47
	10	5	0.125	0.056	1,149	4,800	0.47
	11	5	0.125	0.043	1,224	4,800	0.47
	12	5	0.125	0.044	1,234	4,800	0.46
	13	5	0.125	0.046	1,246	4,800	0.46
	14	5	0.125	0.047	1,257	4,800	0.46
	15	5	0.125	0.047	1,271	4,800	0.46
	16	5	0.125	0.048	1,285	4,800	0.46
	17	5	0.125	0.048	1,299	4,800	0.46
	18	5	0.125	0.049	1,314	4,800	0.46
	19	5	0.125	0.050	1,328	4,800	0.46
	20	5	0.125	0.050	1,342	4,800	0.46
	21	5	0.125	0.050	1,357	4,800	0.46
	22	5	0.125	0.051	1,373	4,800	0.46
	23	5	0.125	0.051	1,389	4,800	0.45
	24	5	0.125	0.051	1,406	4,800	0.45
	25	5	0.125	0.039	1,489	4,800	0.45
	26	5	0.125	0.039	1,506	4,800	0.45

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Table 3.7A-1 (2 of 4)

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Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand (cont.)	27	5	0.125	1,729	4,235	0.40	0.039	1,523	4,800	0.44
	28	5	0.125	1,749	4,284	0.40	0.039	1,540	4,800	0.44
	29	5	0.125	1,769	4,332	0.40	0.039	1,556	4,800	0.44
	30	5	0.125	1,788	4,380	0.40	0.039	1,573	4,800	0.44
	31	5	0.125	1,808	4,428	0.40	0.039	1,590	4,800	0.44
	32	5	0.125	1,827	4,476	0.40	0.039	1,608	4,800	0.44
	33	5	0.125	1,846	4,523	0.40	0.039	1,625	4,800	0.44
	34	5	0.125	1,866	4,570	0.40	0.039	1,642	4,800	0.43
	35	5	0.125	1,885	4,616	0.40	0.039	1,659	4,800	0.43
	36	5	0.125	1,904	4,663	0.40	0.039	1,676	4,800	0.43
	37	5	0.125	1,922	4,709	0.40	0.039	1,692	4,800	0.43
	38	5	0.125	1,941	4,754	0.40	0.039	1,709	4,800	0.43
	39	5	0.125	1,960	4,800	0.40	0.039	1,725	4,800	0.43
	40	5	0.125	1,978	4,845	0.40	0.039	1,742	4,845	0.43
	41	10	0.13	2,926	6,650	0.38	0.022	2,780	6,650	0.39
	42	10	0.13	2,962	6,732	0.38	0.022	2,814	6,732	0.39
	43	10	0.13	2,998	6,813	0.38	0.022	2,845	6,813	0.39
	44	10	0.13	3,033	6,894	0.38	0.023	2,876	6,894	0.39
	45	10	0.13	3,068	6,973	0.38	0.023	2,907	6,973	0.39
	46	10	0.13	3,102	7,051	0.38	0.018	2,992	7,051	0.39
	47	10	0.13	3,136	7,128	0.38	0.019	3,022	7,128	0.39
	48	10	0.13	3,169	7,204	0.38	0.019	3,053	7,204	0.39
	49	10	0.13	3,202	7,279	0.38	0.019	3,083	7,279	0.39
	50	10	0.13	3,235	7,353	0.38	0.019	3,113	7,353	0.39
	51	10	0.13	3,267	7,426	0.38	0.019	3,142	7,426	0.39
	52	10	0.13	3,299	7,498	0.38	0.019	3,172	7,498	0.39

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Table 3.7A-1 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand (cont.)	27	5	0.125	0.039	1,523	4,800	0.44
	28	5	0.125	0.039	1,540	4,800	0.44
	29	5	0.125	0.039	1,556	4,800	0.44
	30	5	0.125	0.039	1,573	4,800	0.44
	31	5	0.125	0.039	1,590	4,800	0.44
	32	5	0.125	0.039	1,608	4,800	0.44
	33	5	0.125	0.039	1,625	4,800	0.44
	34	5	0.125	0.039	1,642	4,800	0.43
	35	5	0.125	0.039	1,659	4,800	0.43
	36	5	0.125	0.039	1,676	4,800	0.43
	37	5	0.125	0.039	1,692	4,800	0.43
	38	5	0.125	0.039	1,709	4,800	0.43
	39	5	0.125	0.039	1,725	4,800	0.43
	40	5	0.125	0.039	1,742	4,845	0.43
	41	10	0.13	0.022	2,780	6,650	0.39
	42	10	0.13	0.022	2,814	6,732	0.39
	43	10	0.13	0.022	2,845	6,813	0.39
	44	10	0.13	0.023	2,876	6,894	0.39
	45	10	0.13	0.023	2,907	6,973	0.39
	46	10	0.13	0.018	2,992	7,051	0.39
	47	10	0.13	0.019	3,022	7,128	0.39
	48	10	0.13	0.019	3,053	7,204	0.39
	49	10	0.13	0.019	3,083	7,279	0.39
	50	10	0.13	0.019	3,113	7,353	0.39
	51	10	0.13	0.019	3,142	7,426	0.39
	52	10	0.13	0.019	3,172	7,498	0.39

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Table 3.7A-1 (3 of 4)

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Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand (cont.)	53	10	0.130	3,330	7,569	0.38	0.019	3,200	7,569	0.39
	54	10	0.130	3,361	7,639	0.38	0.019	3,229	7,639	0.39
	55	10	0.130	3,391	7,707	0.38	0.019	3,258	7,707	0.39
	56	10	0.130	3,421	7,775	0.38	0.019	3,286	7,775	0.39
	57	10	0.130	3,450	7,842	0.38	0.019	3,314	7,842	0.39
	58	10	0.130	3,479	7,907	0.38	0.019	3,342	7,907	0.39
	59	10	0.130	3,507	7,972	0.38	0.019	3,369	7,972	0.39
	60	10	0.130	3,535	8,035	0.38	0.019	3,396	8,035	0.39
	61	10	0.130	3,563	8,098	0.38	0.019	3,423	8,098	0.39
	62	10	0.130	3,590	8,159	0.38	0.019	3,449	8,159	0.39
	63	10	0.130	3,616	8,220	0.38	0.019	3,475	8,220	0.39
	64	10	0.130	3,642	8,279	0.38	0.019	3,501	8,279	0.39
	65	10	0.130	3,668	8,337	0.38	0.019	3,526	8,337	0.39
	66	10	0.130	3,693	8,395	0.38	0.019	3,550	8,395	0.39
	67	10	0.130	3,718	8,451	0.38	0.019	3,574	8,451	0.39
	68	10	0.130	3,742	8,506	0.38	0.019	3,598	8,506	0.39
	69	10	0.130	3,766	8,560	0.38	0.019	3,621	8,560	0.39
	70	10	0.130	3,789	8,613	0.38	0.019	3,644	8,613	0.39
Soft Rock	71	20	0.135	5,778	12,029	0.35	0.035	5,748	12,029	0.35
	72	20	0.135	5,822	12,120	0.35	0.035	5,792	12,120	0.35
	73	20	0.135	5,864	12,208	0.35	0.035	5,833	12,208	0.35
	74	20	0.135	5,905	12,292	0.35	0.035	5,872	12,292	0.35
	75	20	0.135	5,943	12,372	0.35	0.035	5,909	12,372	0.35
	76	20	0.135	5,980	12,448	0.35	0.035	5,944	12,448	0.35
	77	20	0.135	6,014	12,520	0.35	0.035	5,978	12,520	0.35
	78	20	0.135	6,047	12,588	0.35	0.035	6,009	12,588	0.35

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Table 3.7A-1 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand (cont.)	53	10	0.130	0.019	3,200	7,569	0.39
	54	10	0.130	0.019	3,229	7,639	0.39
	55	10	0.130	0.019	3,258	7,707	0.39
	56	10	0.130	0.019	3,286	7,775	0.39
	57	10	0.130	0.019	3,314	7,842	0.39
	58	10	0.130	0.019	3,342	7,907	0.39
	59	10	0.130	0.019	3,369	7,972	0.39
	60	10	0.130	0.019	3,396	8,035	0.39
	61	10	0.130	0.019	3,423	8,098	0.39
	62	10	0.130	0.019	3,449	8,159	0.39
	63	10	0.130	0.019	3,475	8,220	0.39
	64	10	0.130	0.019	3,501	8,279	0.39
	65	10	0.130	0.019	3,526	8,337	0.39
	66	10	0.130	0.019	3,550	8,395	0.39
	67	10	0.130	0.019	3,574	8,451	0.39
	68	10	0.130	0.019	3,598	8,506	0.39
	69	10	0.130	0.019	3,621	8,560	0.39
	70	10	0.130	0.019	3,644	8,613	0.39
Soft Rock	71	20	0.135	0.035	5,748	12,029	0.35
	72	20	0.135	0.035	5,792	12,120	0.35
	73	20	0.135	0.035	5,833	12,208	0.35
	74	20	0.135	0.035	5,872	12,292	0.35
	75	20	0.135	0.035	5,909	12,372	0.35
	76	20	0.135	0.035	5,944	12,448	0.35
	77	20	0.135	0.035	5,978	12,520	0.35
	78	20	0.135	0.035	6,009	12,588	0.35

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Table 3.7A-1 (4 of 4)

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Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Soft Rock (cont.)	79	20	0.135	6,078	12,653	0.35	0.035	6,038	12,653	0.35
	80	20	0.135	6,108	12,714	0.35	0.035	6,066	12,714	0.35
	81	20	0.135	6,135	12,771	0.35	0.035	6,092	12,771	0.35
	82	20	0.135	6,160	12,824	0.35	0.035	6,115	12,824	0.35
	83	20	0.135	6,184	12,873	0.35	0.035	6,136	12,873	0.35
	84	20	0.135	6,206	12,919	0.35	0.036	6,157	12,919	0.35
	85	20	0.135	6,226	12,960	0.35	0.036	6,175	12,960	0.35
	86	20	0.135	6,244	12,998	0.35	0.036	6,191	12,998	0.35
	87	20	0.135	6,261	13,032	0.35	0.036	6,206	13,032	0.35
	88	20	0.135	6,275	13,062	0.35	0.036	6,218	13,062	0.35
	89	20	0.135	6,288	13,089	0.35	0.036	6,229	13,089	0.35
	90	20	0.135	6,298	13,111	0.35	0.036	6,238	13,111	0.35
	91	20	0.135	6,307	13,130	0.35	0.036	6,245	13,130	0.35
	92	20	0.135	6,315	13,145	0.35	0.036	6,251	13,145	0.35
	93	20	0.135	6,320	13,156	0.35	0.036	6,254	13,156	0.35
	94	20	0.135	6,323	13,163	0.35	0.036	6,256	13,163	0.35
	95	20	0.135	6,325	13,166	0.35	0.037	6,255	13,166	0.35
Rock	96	—	0.155	9,200	18,264	0.33	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) The values of compression wave velocity, Vp, are for unsaturated soil. If the soil is saturated, a minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used.

(3) Poisson's Ratio

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Table 3.7A-1 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	79	20	0.135	0.035	6,038	12,653	0.35
	80	20	0.135	0.035	6,066	12,714	0.35
	81	20	0.135	0.035	6,092	12,771	0.35
	82	20	0.135	0.035	6,115	12,824	0.35
	83	20	0.135	0.035	6,136	12,873	0.35
	84	20	0.135	0.036	6,157	12,919	0.35
	85	20	0.135	0.036	6,175	12,960	0.35
	86	20	0.135	0.036	6,191	12,998	0.35
	87	20	0.135	0.036	6,206	13,032	0.35
	88	20	0.135	0.036	6,218	13,062	0.35
	89	20	0.135	0.036	6,229	13,089	0.35
	90	20	0.135	0.036	6,238	13,111	0.35
	91	20	0.135	0.036	6,245	13,130	0.35
	92	20	0.135	0.036	6,251	13,145	0.35
	93	20	0.135	0.036	6,254	13,156	0.35
	94	20	0.135	0.036	6,256	13,163	0.35
	95	20	0.135	0.037	6,255	13,166	0.35
Rock	96	—	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

APR1400 DCD TIER 2

Table 3.7A-2 (1 of 4)

Soil Layers and Properties (S2)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand	1	5	0.125	1,020	2,498	0.40	0.022	996	4,800	0.48
	2	5	0.125	1,040	2,547	0.40	0.037	958	4,800	0.48
	3	5	0.125	1,060	2,595	0.40	0.048	930	4,800	0.48
	4	5	0.125	1,079	2,644	0.40	0.059	902	4,800	0.48
	5	5	0.125	1,099	2,691	0.40	0.047	954	4,800	0.48
	6	5	0.125	1,118	2,739	0.40	0.052	950	4,800	0.48
	7	5	0.125	1,138	2,786	0.40	0.056	948	4,800	0.48
	8	5	0.125	1,157	2,834	0.40	0.061	947	4,800	0.48
	9	5	0.125	1,176	2,881	0.40	0.064	948	4,800	0.48
	10	5	0.125	1,195	2,927	0.40	0.067	950	4,800	0.48
	11	5	0.125	1,214	2,974	0.40	0.051	1,025	4,800	0.48
	12	5	0.125	1,233	3,020	0.40	0.052	1,034	4,800	0.48
	13	5	0.125	1,252	3,066	0.40	0.053	1,044	4,800	0.48
	14	5	0.125	1,270	3,111	0.40	0.054	1,054	4,800	0.47
	15	5	0.125	1,289	3,157	0.40	0.055	1,065	4,800	0.47
	16	5	0.125	1,307	3,202	0.40	0.056	1,075	4,800	0.47
	17	5	0.125	1,326	3,247	0.40	0.057	1,086	4,800	0.47
	18	5	0.125	1,344	3,292	0.40	0.057	1,098	4,800	0.47
	19	5	0.125	1,362	3,336	0.40	0.058	1,110	4,800	0.47
	20	5	0.125	1,380	3,380	0.40	0.059	1,123	4,800	0.47
	21	5	0.130	2,198	4,996	0.38	0.029	2,044	4,996	0.40
	22	5	0.130	2,216	5,037	0.38	0.03	2,055	5,037	0.40
	23	5	0.130	2,234	5,077	0.38	0.031	2,065	5,077	0.40
	24	5	0.130	2,251	5,117	0.38	0.031	2,074	5,117	0.40
	25	5	0.130	2,269	5,157	0.38	0.024	2,134	5,157	0.40

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Table 3.7A-2 (1 of 4)

Soil Layers and Properties (S2)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.125	0.022	996	4,800	0.48
	2	5	0.125	0.037	958	4,800	0.48
	3	5	0.125	0.048	930	4,800	0.48
	4	5	0.125	0.059	902	4,800	0.48
	5	5	0.125	0.047	954	4,800	0.48
	6	5	0.125	0.052	950	4,800	0.48
	7	5	0.125	0.056	948	4,800	0.48
	8	5	0.125	0.061	947	4,800	0.48
	9	5	0.125	0.064	948	4,800	0.48
	10	5	0.125	0.067	950	4,800	0.48
	11	5	0.125	0.051	1,025	4,800	0.48
	12	5	0.125	0.052	1,034	4,800	0.48
	13	5	0.125	0.053	1,044	4,800	0.48
	14	5	0.125	0.054	1,054	4,800	0.47
	15	5	0.125	0.055	1,065	4,800	0.47
	16	5	0.125	0.056	1,075	4,800	0.47
	17	5	0.125	0.057	1,086	4,800	0.47
	18	5	0.125	0.057	1,098	4,800	0.47
	19	5	0.125	0.058	1,110	4,800	0.47
	20	5	0.125	0.059	1,123	4,800	0.47
	21	5	0.130	0.029	2,044	4,996	0.40
	22	5	0.130	0.03	2,055	5,037	0.40
	23	5	0.130	0.031	2,065	5,077	0.40
	24	5	0.130	0.031	2,074	5,117	0.40
	25	5	0.130	0.024	2,134	5,157	0.40

APR1400 DCD TIER 2

Table 3.7A-2 (2 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand (cont.)	26	5	0.130	2,286	5,197	0.38	0.025	2,147	5,197	0.40
	27	5	0.130	2,304	5,236	0.38	0.025	2,160	5,236	0.40
	28	5	0.130	2,321	5,275	0.38	0.025	2,174	5,275	0.40
	29	5	0.130	2,338	5,314	0.38	0.026	2,188	5,314	0.40
	30	5	0.130	2,355	5,353	0.38	0.026	2,202	5,353	0.40
	31	5	0.130	2,372	5,392	0.38	0.026	2,216	5,392	0.40
	32	5	0.130	2,389	5,430	0.38	0.026	2,229	5,430	0.40
	33	5	0.130	2,406	5,468	0.38	0.027	2,242	5,468	0.40
	34	5	0.130	2,422	5,506	0.38	0.027	2,255	5,506	0.40
	35	5	0.130	2,439	5,543	0.38	0.027	2,267	5,543	0.40
	36	5	0.130	2,455	5,581	0.38	0.027	2,280	5,581	0.40
	37	5	0.130	2,472	5,618	0.38	0.027	2,293	5,618	0.40
	38	5	0.130	2,488	5,655	0.38	0.028	2,306	5,655	0.40
	39	5	0.130	2,504	5,692	0.38	0.028	2,319	5,692	0.40
	40	5	0.130	2,520	5,728	0.38	0.028	2,332	5,728	0.40
Soft Rock	41	10	0.135	4,244	8,834	0.35	0.035	4,219	8,834	0.35
	42	10	0.135	4,275	8,900	0.35	0.035	4,248	8,900	0.35
	43	10	0.135	4,307	8,965	0.35	0.035	4,277	8,965	0.35
	44	10	0.135	4,337	9,029	0.35	0.035	4,305	9,029	0.35
	45	10	0.135	4,368	9,092	0.35	0.036	4,333	9,092	0.35
	46	10	0.135	4,397	9,154	0.35	0.036	4,361	9,154	0.35
	47	10	0.135	4,427	9,215	0.35	0.036	4,387	9,215	0.35
	48	10	0.135	4,456	9,276	0.35	0.036	4,413	9,276	0.35
	49	10	0.135	4,485	9,336	0.35	0.036	4,440	9,336	0.35
	50	10	0.135	4,513	9,395	0.35	0.036	4,466	9,395	0.35
	51	10	0.135	4,541	9,453	0.35	0.036	4,492	9,453	0.35

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Table 3.7A-2 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand (cont.)	26	5	0.130	0.025	2,147	5,197	0.40
	27	5	0.130	0.025	2,160	5,236	0.40
	28	5	0.130	0.025	2,174	5,275	0.40
	29	5	0.130	0.026	2,188	5,314	0.40
	30	5	0.130	0.026	2,202	5,353	0.40
	31	5	0.130	0.026	2,216	5,392	0.40
	32	5	0.130	0.026	2,229	5,430	0.40
	33	5	0.130	0.027	2,242	5,468	0.40
	34	5	0.130	0.027	2,255	5,506	0.40
	35	5	0.130	0.027	2,267	5,543	0.40
	36	5	0.130	0.027	2,280	5,581	0.40
	37	5	0.130	0.027	2,293	5,618	0.40
	38	5	0.130	0.028	2,306	5,655	0.40
	39	5	0.130	0.028	2,319	5,692	0.40
	40	5	0.130	0.028	2,332	5,728	0.40
Soft Rock	41	10	0.135	0.035	4,219	8,834	0.35
	42	10	0.135	0.035	4,248	8,900	0.35
	43	10	0.135	0.035	4,277	8,965	0.35
	44	10	0.135	0.035	4,305	9,029	0.35
	45	10	0.135	0.036	4,333	9,092	0.35
	46	10	0.135	0.036	4,361	9,154	0.35
	47	10	0.135	0.036	4,387	9,215	0.35
	48	10	0.135	0.036	4,413	9,276	0.35
	49	10	0.135	0.036	4,440	9,336	0.35
	50	10	0.135	0.036	4,466	9,395	0.35
	51	10	0.135	0.036	4,492	9,453	0.35

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Table 3.7A-2 (3 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Soft Rock (cont.)	52	10	0.135	4,568	9,510	0.35	0.037	4,517	9,510	0.35
	53	10	0.135	4,596	9,566	0.35	0.037	4,542	9,566	0.35
	54	10	0.135	4,622	9,622	0.35	0.037	4,567	9,622	0.35
	55	10	0.135	4,649	9,677	0.35	0.037	4,592	9,677	0.35
	56	10	0.135	4,674	9,731	0.35	0.037	4,616	9,731	0.35
	57	10	0.135	4,700	9,784	0.35	0.037	4,639	9,784	0.35
	58	10	0.135	4,725	9,836	0.35	0.037	4,663	9,836	0.36
	59	10	0.135	4,750	9,887	0.35	0.037	4,686	9,887	0.36
	60	10	0.135	4,774	9,938	0.35	0.037	4,709	9,938	0.36
	61	10	0.135	4,798	9,988	0.35	0.037	4,732	9,988	0.36
	62	10	0.135	4,821	10,037	0.35	0.038	4,754	10,037	0.36
	63	10	0.135	4,845	10,085	0.35	0.038	4,776	10,085	0.36
	64	10	0.135	4,867	10,132	0.35	0.038	4,797	10,132	0.36
	65	10	0.135	4,890	10,178	0.35	0.038	4,819	10,178	0.36
	66	10	0.135	4,911	10,224	0.35	0.038	4,839	10,224	0.36
	67	10	0.135	4,933	10,269	0.35	0.038	4,859	10,269	0.36
	68	10	0.135	4,954	10,313	0.35	0.038	4,879	10,313	0.36
	69	10	0.135	4,975	10,356	0.35	0.038	4,898	10,356	0.36
	70	10	0.135	4,995	10,398	0.35	0.038	4,918	10,398	0.36
Rock	71	20	0.145	7,025	13,946	0.33	0.012	6,847	13,946	0.34
	72	20	0.145	7,063	14,022	0.33	0.012	6,881	14,022	0.34
	73	20	0.145	7,100	14,094	0.33	0.012	6,914	14,094	0.34
	74	20	0.145	7,135	14,164	0.33	0.012	6,945	14,164	0.34
	75	20	0.145	7,168	14,230	0.33	0.012	6,976	14,230	0.34
	76	20	0.145	7,200	14,293	0.33	0.012	7,004	14,293	0.34
	77	20	0.145	7,230	14,353	0.33	0.012	7,032	14,353	0.34

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Table 3.7A-2 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	52	10	0.135	0.037	4,517	9,510	0.35
	53	10	0.135	0.037	4,542	9,566	0.35
	54	10	0.135	0.037	4,567	9,622	0.35
	55	10	0.135	0.037	4,592	9,677	0.35
	56	10	0.135	0.037	4,616	9,731	0.35
	57	10	0.135	0.037	4,639	9,784	0.35
	58	10	0.135	0.037	4,663	9,836	0.36
	59	10	0.135	0.037	4,686	9,887	0.36
	60	10	0.135	0.037	4,709	9,938	0.36
	61	10	0.135	0.037	4,732	9,988	0.36
	62	10	0.135	0.038	4,754	10,037	0.36
	63	10	0.135	0.038	4,776	10,085	0.36
	64	10	0.135	0.038	4,797	10,132	0.36
	65	10	0.135	0.038	4,819	10,178	0.36
	66	10	0.135	0.038	4,839	10,224	0.36
	67	10	0.135	0.038	4,859	10,269	0.36
	68	10	0.135	0.038	4,879	10,313	0.36
	69	10	0.135	0.038	4,898	10,356	0.36
	70	10	0.135	0.038	4,918	10,398	0.36
Rock	71	20	0.145	0.012	6,847	13,946	0.34
	72	20	0.145	0.012	6,881	14,022	0.34
	73	20	0.145	0.012	6,914	14,094	0.34
	74	20	0.145	0.012	6,945	14,164	0.34
	75	20	0.145	0.012	6,976	14,230	0.34
	76	20	0.145	0.012	7,004	14,293	0.34
	77	20	0.145	0.012	7,032	14,353	0.34

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Table 3.7A-2 (4 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	78	20	0.145	7,259	14,410	0.33	0.012	7,057	14,410	0.34
	79	20	0.145	7,286	14,463	0.33	0.012	7,081	14,463	0.34
	80	20	0.145	7,311	14,514	0.33	0.012	7,103	14,514	0.34
	81	20	0.145	7,335	14,561	0.33	0.012	7,124	14,561	0.34
	82	20	0.145	7,357	14,605	0.33	0.012	7,143	14,605	0.34
	83	20	0.145	7,378	14,646	0.33	0.012	7,162	14,646	0.34
	84	20	0.145	7,397	14,684	0.33	0.012	7,178	14,684	0.34
	85	20	0.145	7,414	14,718	0.33	0.012	7,191	14,718	0.34
	86	20	0.145	7,430	14,750	0.33	0.012	7,203	14,750	0.34
	87	20	0.145	7,444	14,778	0.33	0.013	7,214	14,778	0.34
	88	20	0.145	7,457	14,803	0.33	0.013	7,223	14,803	0.34
	89	20	0.145	7,468	14,825	0.33	0.013	7,232	14,825	0.34
	90	20	0.145	7,477	14,843	0.33	0.013	7,238	14,843	0.34
	91	20	0.145	7,485	14,859	0.33	0.013	7,244	14,859	0.34
	92	20	0.145	7,491	14,871	0.33	0.013	7,247	14,871	0.34
	93	20	0.145	7,496	14,880	0.33	0.013	7,250	14,880	0.34
	94	20	0.145	7,499	14,886	0.33	0.013	7,250	14,886	0.34
	95	20	0.145	7,500	14,889	0.33	0.013	7,249	14,889	0.34
	96	—	0.155	9,200	18,264	0.33	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) The values of compression wave velocity, Vp, are for unsaturated soil. If the soil is saturated, a minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used.

(3) Poisson's Ratio

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Table 3.7A-2 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	78	20	0.145	0.012	7,057	14,410	0.34
	79	20	0.145	0.012	7,081	14,463	0.34
	80	20	0.145	0.012	7,103	14,514	0.34
	81	20	0.145	0.012	7,124	14,561	0.34
	82	20	0.145	0.012	7,143	14,605	0.34
	83	20	0.145	0.012	7,162	14,646	0.34
	84	20	0.145	0.012	7,178	14,684	0.34
	85	20	0.145	0.012	7,191	14,718	0.34
	86	20	0.145	0.012	7,203	14,750	0.34
	87	20	0.145	0.013	7,214	14,778	0.34
	88	20	0.145	0.013	7,223	14,803	0.34
	89	20	0.145	0.013	7,232	14,825	0.34
	90	20	0.145	0.013	7,238	14,843	0.34
	91	20	0.145	0.013	7,244	14,859	0.34
	92	20	0.145	0.013	7,247	14,871	0.34
	93	20	0.145	0.013	7,250	14,880	0.34
	94	20	0.145	0.013	7,250	14,886	0.34
	95	20	0.145	0.013	7,249	14,889	0.34
	96	—	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

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Table 3.7A-3 (1 of 4)

Soil Layers and Properties (S3)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand	1	5	0.130	2,090	4,800	0.38	0.015	2,090	4,800	0.38
	2	5	0.130	2,090	4,809	0.38	0.019	2,090	4,809	0.38
	3	5	0.130	2,081	4,861	0.38	0.023	2,081	4,861	0.39
	4	5	0.130	2,082	4,912	0.38	0.026	2,082	4,912	0.39
	5	5	0.130	2,126	4,963	0.38	0.021	2,126	4,963	0.39
	6	5	0.130	2,129	5,014	0.38	0.023	2,129	5,014	0.39
	7	5	0.130	2,130	5,065	0.38	0.025	2,130	5,065	0.39
	8	5	0.130	2,134	5,115	0.38	0.027	2,134	5,115	0.39
	9	5	0.130	2,140	5,165	0.38	0.028	2,140	5,165	0.40
	10	5	0.130	2,148	5,215	0.38	0.030	2,148	5,215	0.40
	11	5	0.130	2,213	5,264	0.38	0.024	2,213	5,264	0.39
	12	5	0.130	2,226	5,314	0.38	0.024	2,226	5,314	0.39
	13	5	0.130	2,241	5,363	0.38	0.025	2,241	5,363	0.39
	14	5	0.130	2,255	5,412	0.38	0.025	2,255	5,412	0.39
	15	5	0.130	2,270	5,460	0.38	0.026	2,270	5,460	0.40
	16	5	0.130	2,285	5,508	0.38	0.026	2,285	5,508	0.40
	17	5	0.130	2,300	5,556	0.38	0.026	2,300	5,556	0.40
	18	5	0.130	2,315	5,604	0.38	0.027	2,315	5,604	0.40
	19	5	0.130	2,331	5,651	0.38	0.027	2,331	5,651	0.40
	20	5	0.130	2,345	5,699	0.38	0.028	2,345	5,699	0.40
	21	5	0.130	2,358	5,745	0.38	0.029	2,358	5,745	0.40
	22	5	0.130	2,372	5,792	0.38	0.029	2,372	5,792	0.40
	23	5	0.130	2,386	5,839	0.38	0.029	2,386	5,839	0.40
	24	5	0.130	2,400	5,885	0.38	0.030	2,400	5,885	0.40
	25	5	0.130	2,466	5,931	0.38	0.023	2,466	5,931	0.40
	26	5	0.130	2,482	5,976	0.38	0.024	2,482	5,976	0.40

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Table 3.7A-3 (1 of 4)

Soil Layers and Properties (S3)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.130	0.015	2,090	4,800	0.38
	2	5	0.130	0.019	2,090	4,809	0.38
	3	5	0.130	0.023	2,081	4,861	0.39
	4	5	0.130	0.026	2,082	4,912	0.39
	5	5	0.130	0.021	2,126	4,963	0.39
	6	5	0.130	0.023	2,129	5,014	0.39
	7	5	0.130	0.025	2,130	5,065	0.39
	8	5	0.130	0.027	2,134	5,115	0.39
	9	5	0.130	0.028	2,140	5,165	0.40
	10	5	0.130	0.030	2,148	5,215	0.40
	11	5	0.130	0.024	2,213	5,264	0.39
	12	5	0.130	0.024	2,226	5,314	0.39
	13	5	0.130	0.025	2,241	5,363	0.39
	14	5	0.130	0.025	2,255	5,412	0.39
	15	5	0.130	0.026	2,270	5,460	0.40
	16	5	0.130	0.026	2,285	5,508	0.40
	17	5	0.130	0.026	2,300	5,556	0.40
	18	5	0.130	0.027	2,315	5,604	0.40
	19	5	0.130	0.027	2,331	5,651	0.40
	20	5	0.130	0.028	2,345	5,699	0.40
	21	5	0.130	0.029	2,358	5,745	0.40
	22	5	0.130	0.029	2,372	5,792	0.40
	23	5	0.130	0.029	2,386	5,839	0.40
	24	5	0.130	0.030	2,400	5,885	0.40
	25	5	0.130	0.023	2,466	5,931	0.40
	26	5	0.130	0.024	2,482	5,976	0.40

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Table 3.7A-3 (2 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand (cont.)	27	5	0.130	2,498	6,021	0.38	0.024	2,498	6,021	0.40
	28	5	0.130	2,514	6,067	0.38	0.024	2,514	6,067	0.40
	29	5	0.130	2,530	6,111	0.38	0.024	2,530	6,111	0.40
	30	5	0.130	2,546	6,156	0.38	0.025	2,546	6,156	0.40
	31	5	0.130	2,562	6,200	0.38	0.025	2,562	6,200	0.40
	32	5	0.130	2,578	6,244	0.38	0.025	2,578	6,244	0.40
	33	5	0.130	2,594	6,288	0.38	0.025	2,594	6,288	0.40
	34	5	0.130	2,609	6,332	0.38	0.025	2,609	6,332	0.40
	35	5	0.130	2,624	6,375	0.38	0.026	2,624	6,375	0.40
	36	5	0.130	2,640	6,418	0.38	0.026	2,640	6,418	0.40
	37	5	0.130	2,655	6,461	0.38	0.026	2,655	6,461	0.40
	38	5	0.130	2,670	6,503	0.38	0.026	2,670	6,503	0.40
	39	5	0.130	2,685	6,545	0.38	0.026	2,685	6,545	0.40
	40	5	0.130	2,700	6,587	0.38	0.026	2,700	6,587	0.40
Soft Rock	41	10	0.135	4,860	10,160	0.38	0.034	4,860	10,160	0.35
	42	10	0.135	4,893	10,235	0.38	0.034	4,893	10,235	0.35
	43	10	0.135	4,926	10,309	0.38	0.034	4,926	10,309	0.35
	44	10	0.135	4,959	10,383	0.38	0.035	4,959	10,383	0.35
	45	10	0.135	4,991	10,455	0.38	0.035	4,991	10,455	0.35
	46	10	0.135	5,023	10,527	0.38	0.035	5,023	10,527	0.35
	47	10	0.135	5,055	10,598	0.38	0.035	5,055	10,598	0.35
	48	10	0.135	5,087	10,667	0.38	0.035	5,087	10,667	0.35
	49	10	0.135	5,117	10,736	0.38	0.035	5,117	10,736	0.35
	50	10	0.135	5,147	10,804	0.38	0.035	5,147	10,804	0.35
	51	10	0.135	5,178	10,871	0.38	0.036	5,178	10,871	0.35
	52	10	0.135	5,207	10,936	0.38	0.036	5,207	10,936	0.35

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Table 3.7A-3 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand (cont.)	27	5	0.130	0.024	2,498	6,021	0.40
	28	5	0.130	0.024	2,514	6,067	0.40
	29	5	0.130	0.024	2,530	6,111	0.40
	30	5	0.130	0.025	2,546	6,156	0.40
	31	5	0.130	0.025	2,562	6,200	0.40
	32	5	0.130	0.025	2,578	6,244	0.40
	33	5	0.130	0.025	2,594	6,288	0.40
	34	5	0.130	0.025	2,609	6,332	0.40
	35	5	0.130	0.026	2,624	6,375	0.40
	36	5	0.130	0.026	2,640	6,418	0.40
	37	5	0.130	0.026	2,655	6,461	0.40
	38	5	0.130	0.026	2,670	6,503	0.40
	39	5	0.130	0.026	2,685	6,545	0.40
	40	5	0.130	0.026	2,700	6,587	0.40
Soft Rock	41	10	0.135	0.034	4,860	10,160	0.35
	42	10	0.135	0.034	4,893	10,235	0.35
	43	10	0.135	0.034	4,926	10,309	0.35
	44	10	0.135	0.035	4,959	10,383	0.35
	45	10	0.135	0.035	4,991	10,455	0.35
	46	10	0.135	0.035	5,023	10,527	0.35
	47	10	0.135	0.035	5,055	10,598	0.35
	48	10	0.135	0.035	5,087	10,667	0.35
	49	10	0.135	0.035	5,117	10,736	0.35
	50	10	0.135	0.035	5,147	10,804	0.35
	51	10	0.135	0.036	5,178	10,871	0.35
	52	10	0.135	0.036	5,207	10,936	0.35

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Table 3.7A-3 (3 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Soft Rock (cont.)	53	10	0.135	5,322	11,190	0.38	0.036	5,237	11,001	0.35
	54	10	0.135	5,349	11,251	0.38	0.036	5,266	11,065	0.35
	55	10	0.135	5,377	11,311	0.38	0.036	5,294	11,128	0.35
	56	10	0.135	5,403	11,370	0.38	0.036	5,322	11,190	0.35
	57	10	0.135	5,430	11,429	0.38	0.036	5,349	11,251	0.35
	58	10	0.135	5,456	11,486	0.38	0.036	5,377	11,311	0.35
	59	10	0.135	5,481	11,542	0.38	0.036	5,403	11,370	0.35
	60	10	0.135	5,506	11,597	0.38	0.036	5,430	11,429	0.35
	61	10	0.135	5,530	11,652	0.38	0.036	5,456	11,486	0.35
	62	10	0.135	5,554	11,705	0.38	0.036	5,481	11,542	0.35
	63	10	0.135	5,577	11,757	0.38	0.037	5,506	11,597	0.35
	64	10	0.135	5,601	11,809	0.38	0.037	5,530	11,652	0.35
	65	10	0.135	5,624	11,859	0.38	0.037	5,554	11,705	0.35
	66	10	0.135	5,646	11,909	0.38	0.037	5,577	11,757	0.35
	67	10	0.135	5,668	11,958	0.38	0.037	5,601	11,809	0.35
	68	10	0.135	9,200	18,264	0.38	0.037	5,624	11,859	0.35
	69	10	0.135	9,200	18,264	0.38	0.037	5,646	11,909	0.36
	70	10	0.135	9,200	18,264	0.38	0.037	5,668	11,958	0.36
Rock	71	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33
	72	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33
	73	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33
	74	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33
	75	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33
	76	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33
	77	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33
	78	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33

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Table 3.7A-3 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	53	10	0.135	0.036	5,237	11,001	0.35
	54	10	0.135	0.036	5,266	11,065	0.35
	55	10	0.135	0.036	5,294	11,128	0.35
	56	10	0.135	0.036	5,322	11,190	0.35
	57	10	0.135	0.036	5,349	11,251	0.35
	58	10	0.135	0.036	5,377	11,311	0.35
	59	10	0.135	0.036	5,403	11,370	0.35
	60	10	0.135	0.036	5,430	11,429	0.35
	61	10	0.135	0.036	5,456	11,486	0.35
	62	10	0.135	0.036	5,481	11,542	0.35
	63	10	0.135	0.037	5,506	11,597	0.35
	64	10	0.135	0.037	5,530	11,652	0.35
	65	10	0.135	0.037	5,554	11,705	0.35
	66	10	0.135	0.037	5,577	11,757	0.35
	67	10	0.135	0.037	5,601	11,809	0.35
	68	10	0.135	0.037	5,624	11,859	0.35
	69	10	0.135	0.037	5,646	11,909	0.36
	70	10	0.135	0.037	5,668	11,958	0.36
Rock	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33

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Table 3.7A-3 (4 of 4)

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Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	79	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33
	80	20	0.155	9,200	18,264	0.38	0.010	9,200	18,264	0.33
	81	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	82	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	83	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	84	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	85	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	86	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	87	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	88	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	89	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	90	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	91	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	92	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	93	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	94	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	95	20	0.155	9,200	18,264	0.35	0.010	9,200	18,264	0.33
	96	—	0.155	9,200	18,264	0.35	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) The values of compression wave velocity, Vp, are for unsaturated soil. If the soil is saturated, a minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used.

(3) Poisson's Ratio

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Table 3.7A-3 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33
	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	—	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

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Table 3.7A-4 (1 of 4)

Soil Layers and Properties (S4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand	1	5	0.130	1,820	4,137	0.38	0.016	1,813	4,800	0.42
	2	5	0.130	1,840	4,182	0.38	0.021	1,802	4,800	0.42
	3	5	0.130	1,860	4,227	0.38	0.026	1,794	4,800	0.42
	4	5	0.130	1,879	4,272	0.38	0.029	1,790	4,800	0.42
	5	5	0.130	1,899	4,316	0.38	0.025	1,820	4,800	0.42
	6	5	0.130	1,918	4,360	0.38	0.027	1,817	4,800	0.42
	7	5	0.130	1,938	4,404	0.38	0.029	1,818	4,800	0.42
	8	5	0.130	1,957	4,448	0.38	0.031	1,820	4,800	0.42
	9	5	0.130	1,976	4,491	0.38	0.033	1,826	4,800	0.42
	10	5	0.130	1,995	4,535	0.38	0.034	1,832	4,800	0.41
	11	5	0.130	2,014	4,578	0.38	0.026	1,898	4,800	0.41
	12	5	0.130	2,033	4,621	0.38	0.027	1,909	4,800	0.41
	13	5	0.130	2,052	4,663	0.38	0.027	1,921	4,800	0.40
	14	5	0.130	2,070	4,706	0.38	0.029	1,930	4,800	0.40
	15	5	0.130	2,089	4,748	0.38	0.029	1,939	4,800	0.40
	16	5	0.130	2,107	4,790	0.38	0.030	1,949	4,800	0.40
	17	5	0.130	2,126	4,831	0.38	0.032	1,958	4,831	0.40
	18	5	0.130	2,144	4,873	0.38	0.033	1,967	4,873	0.40
	19	5	0.130	2,162	4,914	0.38	0.033	1,975	4,914	0.40
	20	5	0.130	2,180	4,955	0.38	0.034	1,984	4,955	0.40
Soft Rock	21	5	0.135	3,898	8,114	0.35	0.033	3,892	8,114	0.35
	22	5	0.135	3,916	8,151	0.35	0.034	3,908	8,151	0.35
	23	5	0.135	3,934	8,188	0.35	0.034	3,922	8,188	0.35
	24	5	0.135	3,951	8,225	0.35	0.034	3,937	8,225	0.35
	25	5	0.135	3,969	8,262	0.35	0.034	3,953	8,262	0.35
	26	5	0.135	3,986	8,298	0.35	0.035	3,968	8,298	0.35

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Table 3.7A-4 (1 of 4)

Soil Layers and Properties (S4)

Soil Type	Layer No.	Thick .(ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.130	0.016	1,813	4,800	0.42
	2	5	0.130	0.021	1,802	4,800	0.42
	3	5	0.130	0.026	1,794	4,800	0.42
	4	5	0.130	0.029	1,790	4,800	0.42
	5	5	0.130	0.025	1,820	4,800	0.42
	6	5	0.130	0.027	1,817	4,800	0.42
	7	5	0.130	0.029	1,818	4,800	0.42
	8	5	0.130	0.031	1,820	4,800	0.42
	9	5	0.130	0.033	1,826	4,800	0.42
	10	5	0.130	0.034	1,832	4,800	0.41
	11	5	0.130	0.026	1,898	4,800	0.41
	12	5	0.130	0.027	1,909	4,800	0.41
	13	5	0.130	0.027	1,921	4,800	0.40
	14	5	0.130	0.029	1,930	4,800	0.40
	15	5	0.130	0.029	1,939	4,800	0.40
	16	5	0.130	0.030	1,949	4,800	0.40
	17	5	0.130	0.032	1,958	4,831	0.40
	18	5	0.130	0.033	1,967	4,873	0.40
	19	5	0.130	0.033	1,975	4,914	0.40
	20	5	0.130	0.034	1,984	4,955	0.40
Soft Rock	21	5	0.135	0.033	3,892	8,114	0.35
	22	5	0.135	0.034	3,908	8,151	0.35
	23	5	0.135	0.034	3,922	8,188	0.35
	24	5	0.135	0.034	3,937	8,225	0.35
	25	5	0.135	0.034	3,953	8,262	0.35
	26	5	0.135	0.035	3,968	8,298	0.35

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Table 3.7A-4 (2 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Soft Rock (cont.)	27	5	0.135	4,004	8,334	0.35	0.035	3,983	8,334	0.35
	28	5	0.135	4,021	8,370	0.35	0.035	3,998	8,370	0.35
	29	5	0.135	4,038	8,406	0.35	0.035	4,013	8,406	0.35
	30	5	0.135	4,055	8,441	0.35	0.035	4,027	8,441	0.35
	31	5	0.135	4,072	8,476	0.35	0.035	4,042	8,476	0.35
	32	5	0.135	4,089	8,512	0.35	0.036	4,057	8,512	0.35
	33	5	0.135	4,106	8,546	0.35	0.036	4,072	8,546	0.35
	34	5	0.135	4,122	8,581	0.35	0.036	4,087	8,581	0.35
	35	5	0.135	4,139	8,616	0.35	0.036	4,102	8,616	0.35
	36	5	0.135	4,155	8,650	0.35	0.036	4,116	8,650	0.35
	37	5	0.135	4,172	8,684	0.35	0.036	4,131	8,684	0.35
	38	5	0.135	4,188	8,718	0.35	0.036	4,145	8,718	0.35
	39	5	0.135	4,204	8,751	0.35	0.036	4,160	8,751	0.35
	40	5	0.135	4,220	8,785	0.35	0.037	4,175	8,785	0.35
Rock	41	10	0.145	6,244	12,396	0.33	0.011	6,120	12,396	0.34
	42	10	0.145	6,275	12,458	0.33	0.011	6,147	12,458	0.34
	43	10	0.145	6,307	12,520	0.33	0.011	6,173	12,520	0.34
	44	10	0.145	6,337	12,581	0.33	0.011	6,200	12,581	0.34
	45	10	0.145	6,368	12,641	0.33	0.011	6,225	12,641	0.34
	46	10	0.145	6,397	12,700	0.33	0.011	6,252	12,700	0.34
	47	10	0.145	6,427	12,759	0.33	0.011	6,278	12,759	0.34
	48	10	0.145	6,456	12,817	0.33	0.011	6,303	12,817	0.34
	49	10	0.145	6,485	12,874	0.33	0.011	6,328	12,874	0.34
	50	10	0.145	6,513	12,930	0.33	0.011	6,353	12,930	0.34
	51	10	0.145	6,541	12,985	0.33	0.012	6,378	12,985	0.34
	52	10	0.145	6,568	13,040	0.33	0.012	6,401	13,040	0.34

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Table 3.7A-4 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	27	5	0.135	0.035	3,983	8,334	0.35
	28	5	0.135	0.035	3,998	8,370	0.35
	29	5	0.135	0.035	4,013	8,406	0.35
	30	5	0.135	0.035	4,027	8,441	0.35
	31	5	0.135	0.035	4,042	8,476	0.35
	32	5	0.135	0.036	4,057	8,512	0.35
	33	5	0.135	0.036	4,072	8,546	0.35
	34	5	0.135	0.036	4,087	8,581	0.35
	35	5	0.135	0.036	4,102	8,616	0.35
	36	5	0.135	0.036	4,116	8,650	0.35
	37	5	0.135	0.036	4,131	8,684	0.35
	38	5	0.135	0.036	4,145	8,718	0.35
	39	5	0.135	0.036	4,160	8,751	0.35
	40	5	0.135	0.037	4,175	8,785	0.35
Rock	41	10	0.145	0.011	6,120	12,396	0.34
	42	10	0.145	0.011	6,147	12,458	0.34
	43	10	0.145	0.011	6,173	12,520	0.34
	44	10	0.145	0.011	6,200	12,581	0.34
	45	10	0.145	0.011	6,225	12,641	0.34
	46	10	0.145	0.011	6,252	12,700	0.34
	47	10	0.145	0.011	6,278	12,759	0.34
	48	10	0.145	0.011	6,303	12,817	0.34
	49	10	0.145	0.011	6,328	12,874	0.34
	50	10	0.145	0.011	6,353	12,930	0.34
	51	10	0.145	0.012	6,378	12,985	0.34
	52	10	0.145	0.012	6,401	13,040	0.34

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Table 3.7A-4 (3 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	53	10	0.145	6,596	13,094	0.33	0.012	6,425	13,094	0.34
	54	10	0.145	6,622	13,147	0.33	0.012	6,449	13,147	0.34
	55	10	0.145	6,649	13,199	0.33	0.012	6,472	13,199	0.34
	56	10	0.145	6,674	13,250	0.33	0.012	6,494	13,250	0.34
	57	10	0.145	6,700	13,301	0.33	0.012	6,516	13,301	0.34
	58	10	0.145	6,725	13,351	0.33	0.012	6,538	13,351	0.34
	59	10	0.145	6,750	13,400	0.33	0.012	6,559	13,400	0.34
	60	10	0.145	6,774	13,448	0.33	0.012	6,580	13,448	0.34
	61	10	0.145	6,798	13,495	0.33	0.012	6,601	13,495	0.34
	62	10	0.145	6,821	13,542	0.33	0.012	6,621	13,542	0.34
	63	10	0.145	6,845	13,588	0.33	0.012	6,641	13,588	0.34
	64	10	0.145	6,867	13,633	0.33	0.012	6,661	13,633	0.34
	65	10	0.145	6,890	13,677	0.33	0.012	6,681	13,677	0.34
	66	10	0.145	6,911	13,721	0.33	0.012	6,700	13,721	0.34
	67	10	0.145	6,933	13,763	0.33	0.012	6,719	13,763	0.34
	68	10	0.145	6,954	13,805	0.33	0.012	6,737	13,805	0.34
	69	10	0.145	6,975	13,846	0.33	0.012	6,755	13,846	0.34
	70	10	0.145	6,995	13,887	0.33	0.012	6,773	13,887	0.34
	71	20	0.155	9,200	18,264	0.33	0.01	9,200	18,264	0.33
	72	20	0.155	9,200	18,264	0.33	0.01	9,200	18,264	0.33
	73	20	0.155	9,200	18,264	0.33	0.01	9,200	18,264	0.33
	74	20	0.155	9,200	18,264	0.33	0.01	9,200	18,264	0.33
	75	20	0.155	9,200	18,264	0.33	0.01	9,200	18,264	0.33
	76	20	0.155	9,200	18,264	0.33	0.01	9,200	18,264	0.33
	77	20	0.155	9,200	18,264	0.33	0.01	9,200	18,264	0.33
	78	20	0.155	9,200	18,264	0.33	0.01	9,200	18,264	0.33

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Table 3.7A-4 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	53	10	0.145	0.012	6,425	13,094	0.34
	54	10	0.145	0.012	6,449	13,147	0.34
	55	10	0.145	0.012	6,472	13,199	0.34
	56	10	0.145	0.012	6,494	13,250	0.34
	57	10	0.145	0.012	6,516	13,301	0.34
	58	10	0.145	0.012	6,538	13,351	0.34
	59	10	0.145	0.012	6,559	13,400	0.34
	60	10	0.145	0.012	6,580	13,448	0.34
	61	10	0.145	0.012	6,601	13,495	0.34
	62	10	0.145	0.012	6,621	13,542	0.34
	63	10	0.145	0.012	6,641	13,588	0.34
	64	10	0.145	0.012	6,661	13,633	0.34
	65	10	0.145	0.012	6,681	13,677	0.34
	66	10	0.145	0.012	6,700	13,721	0.34
	67	10	0.145	0.012	6,719	13,763	0.34
	68	10	0.145	0.012	6,737	13,805	0.34
	69	10	0.145	0.012	6,755	13,846	0.34
	70	10	0.145	0.012	6,773	13,887	0.34
	71	20	0.155	0.01	9,200	18,264	0.33
	72	20	0.155	0.01	9,200	18,264	0.33
	73	20	0.155	0.01	9,200	18,264	0.33
	74	20	0.155	0.01	9,200	18,264	0.33
	75	20	0.155	0.01	9,200	18,264	0.33
	76	20	0.155	0.01	9,200	18,264	0.33
	77	20	0.155	0.01	9,200	18,264	0.33
	78	20	0.155	0.01	9,200	18,264	0.33

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Table 3.7A-4 (4 of 4)

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Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	79	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	80	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	81	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	82	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	83	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	84	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	85	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	86	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	87	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	88	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	89	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	90	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	91	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	92	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	93	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	94	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	95	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	96	—	0.155	9,200	18,264	0.33	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) The values of compression wave velocity, Vp, are for unsaturated soil. If the soil is saturated, a minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used.

(3) Poisson's Ratio

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Table 3.7A-4 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33
	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	—	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

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Table 3.7A-5 (1 of 4)

Soil Layers and Properties (S5) [Replace with Table in next page.](#)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Soft Rock	1	5	0.135	4,048	8,427	0.35	0.033	4,048	8,427	0.35
	2	5	0.135	4,071	8,474	0.35	0.033	4,071	8,474	0.35
	3	5	0.135	4,094	8,521	0.35	0.035	4,086	8,521	0.35
	4	5	0.135	4,116	8,568	0.35	0.036	4,103	8,568	0.35
	5	5	0.135	4,139	8,615	0.35	0.031	4,139	8,615	0.35
	6	5	0.135	4,161	8,662	0.35	0.031	4,161	8,662	0.35
	7	5	0.135	4,183	8,708	0.35	0.031	4,183	8,708	0.35
	8	5	0.135	4,205	8,754	0.35	0.031	4,205	8,754	0.35
	9	5	0.135	4,227	8,800	0.35	0.031	4,227	8,800	0.35
	10	5	0.135	4,249	8,846	0.35	0.032	4,249	8,846	0.35
	11	5	0.135	4,271	8,891	0.35	0.032	4,271	8,891	0.35
	12	5	0.135	4,293	8,936	0.35	0.032	4,293	8,936	0.35
	13	5	0.135	4,314	8,981	0.35	0.032	4,314	8,981	0.35
	14	5	0.135	4,336	9,026	0.35	0.032	4,336	9,026	0.35
	15	5	0.135	4,357	9,070	0.35	0.032	4,357	9,070	0.35
	16	5	0.135	4,378	9,114	0.35	0.032	4,378	9,114	0.35
	17	5	0.135	4,399	9,158	0.35	0.032	4,399	9,158	0.35
	18	5	0.135	4,420	9,202	0.35	0.032	4,420	9,202	0.35
	19	5	0.135	4,441	9,245	0.35	0.032	4,441	9,245	0.35
	20	5	0.135	4,462	9,288	0.35	0.032	4,462	9,288	0.35
Rock	21	5	0.145	6,783	13,465	0.33	0.009	6,719	13,465	0.33
	22	5	0.145	6,803	13,506	0.33	0.009	6,735	13,506	0.33
	23	5	0.145	6,824	13,546	0.33	0.009	6,751	13,546	0.33
	24	5	0.145	6,844	13,587	0.33	0.009	6,767	13,587	0.34
	25	5	0.145	6,864	13,627	0.33	0.009	6,783	13,627	0.34
	26	5	0.145	6,884	13,667	0.33	0.009	6,800	13,667	0.34

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Table 3.7A-5 (1 of 4)

Soil Layers and Properties (S5)

Soil Type	Layer No.	Thick .(ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Soft Rock	1	5	0.135	0.033	4,048	8,427	0.35
	2	5	0.135	0.033	4,071	8,474	0.35
	3	5	0.135	0.035	4,086	8,521	0.35
	4	5	0.135	0.036	4,103	8,568	0.35
	5	5	0.135	0.031	4,139	8,615	0.35
	6	5	0.135	0.031	4,161	8,662	0.35
	7	5	0.135	0.031	4,183	8,708	0.35
	8	5	0.135	0.031	4,205	8,754	0.35
	9	5	0.135	0.031	4,227	8,800	0.35
	10	5	0.135	0.032	4,249	8,846	0.35
	11	5	0.135	0.032	4,271	8,891	0.35
	12	5	0.135	0.032	4,293	8,936	0.35
	13	5	0.135	0.032	4,314	8,981	0.35
	14	5	0.135	0.032	4,336	9,026	0.35
	15	5	0.135	0.032	4,357	9,070	0.35
	16	5	0.135	0.032	4,378	9,114	0.35
	17	5	0.135	0.032	4,399	9,158	0.35
	18	5	0.135	0.032	4,420	9,202	0.35
	19	5	0.135	0.032	4,441	9,245	0.35
	20	5	0.135	0.032	4,462	9,288	0.35
Rock	21	5	0.145	0.009	6,719	13,465	0.33
	22	5	0.145	0.009	6,735	13,506	0.33
	23	5	0.145	0.009	6,751	13,546	0.33
	24	5	0.145	0.009	6,767	13,587	0.34
	25	5	0.145	0.009	6,783	13,627	0.34
	26	5	0.145	0.009	6,800	13,667	0.34

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Table 3.7A-5 (2 of 4)

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Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	27	5	0.145	6,904	13,706	0.33	0.009	6,816	13,706	0.34
	28	5	0.145	6,924	13,746	0.33	0.010	6,832	13,746	0.34
	29	5	0.145	6,944	13,785	0.33	0.010	6,848	13,785	0.34
	30	5	0.145	6,963	13,824	0.33	0.010	6,864	13,824	0.34
	31	5	0.145	6,983	13,862	0.33	0.010	6,880	13,862	0.34
	32	5	0.145	7,002	13,901	0.33	0.010	6,896	13,901	0.34
	33	5	0.145	7,021	13,939	0.33	0.010	6,913	13,939	0.34
	34	5	0.145	7,041	13,977	0.33	0.010	6,929	13,977	0.34
	35	5	0.145	7,060	14,015	0.33	0.010	6,945	14,015	0.34
	36	5	0.145	7,079	14,053	0.33	0.010	6,961	14,053	0.34
	37	5	0.145	7,097	14,090	0.33	0.010	6,977	14,090	0.34
	38	5	0.145	7,116	14,127	0.33	0.010	6,993	14,127	0.34
	39	5	0.145	7,135	14,164	0.33	0.010	7,009	14,164	0.34
	40	5	0.145	7,153	14,200	0.33	0.010	7,025	14,200	0.34
	41	10	0.145	7,181	14,255	0.33	0.011	7,048	14,255	0.34
	42	10	0.145	7,217	14,327	0.33	0.011	7,080	14,327	0.34
	43	10	0.145	7,253	14,398	0.33	0.011	7,110	14,398	0.34
	44	10	0.145	7,288	14,468	0.33	0.011	7,141	14,468	0.34
	45	10	0.145	7,323	14,537	0.33	0.011	7,172	14,537	0.34
	46	10	0.145	7,357	14,605	0.33	0.011	7,202	14,605	0.34
	47	10	0.145	7,391	14,673	0.33	0.011	7,232	14,673	0.34
	48	10	0.145	7,424	14,739	0.33	0.011	7,261	14,739	0.34
	49	10	0.145	7,457	14,805	0.33	0.011	7,291	14,805	0.34
	50	10	0.145	7,490	14,869	0.33	0.011	7,319	14,869	0.34
	51	10	0.145	7,522	14,933	0.33	0.011	7,347	14,933	0.34
	52	10	0.145	7,554	14,996	0.33	0.012	7,375	14,996	0.34

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Table 3.7A-5 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	27	5	0.145	0.009	6,816	13,706	0.34
	28	5	0.145	0.010	6,832	13,746	0.34
	29	5	0.145	0.010	6,848	13,785	0.34
	30	5	0.145	0.010	6,864	13,824	0.34
	31	5	0.145	0.010	6,880	13,862	0.34
	32	5	0.145	0.010	6,896	13,901	0.34
	33	5	0.145	0.010	6,913	13,939	0.34
	34	5	0.145	0.010	6,929	13,977	0.34
	35	5	0.145	0.010	6,945	14,015	0.34
	36	5	0.145	0.010	6,961	14,053	0.34
	37	5	0.145	0.010	6,977	14,090	0.34
	38	5	0.145	0.010	6,993	14,127	0.34
	39	5	0.145	0.010	7,009	14,164	0.34
	40	5	0.145	0.010	7,025	14,200	0.34
	41	10	0.145	0.011	7,048	14,255	0.34
	42	10	0.145	0.011	7,080	14,327	0.34
	43	10	0.145	0.011	7,110	14,398	0.34
	44	10	0.145	0.011	7,141	14,468	0.34
	45	10	0.145	0.011	7,172	14,537	0.34
	46	10	0.145	0.011	7,202	14,605	0.34
	47	10	0.145	0.011	7,232	14,673	0.34
	48	10	0.145	0.011	7,261	14,739	0.34
	49	10	0.145	0.011	7,291	14,805	0.34
	50	10	0.145	0.011	7,319	14,869	0.34
	51	10	0.145	0.011	7,347	14,933	0.34
	52	10	0.145	0.012	7,375	14,996	0.34

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Table 3.7A-5 (3 of 4)

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Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	53	10	0.145	7,585	15,058	0.33	0.012	7,402	15,058	0.34
	54	10	0.145	7,616	15,119	0.33	0.012	7,429	15,119	0.34
	55	10	0.145	7,646	15,179	0.33	0.012	7,456	15,179	0.34
	56	10	0.145	7,676	15,238	0.33	0.012	7,483	15,238	0.34
	57	10	0.145	7,705	15,296	0.33	0.012	7,508	15,296	0.34
	58	10	0.145	7,734	15,353	0.33	0.012	7,534	15,353	0.34
	59	10	0.145	7,762	15,410	0.33	0.012	7,559	15,410	0.34
	60	10	0.145	7,790	15,465	0.33	0.012	7,584	15,465	0.34
	61	10	0.145	7,818	15,520	0.33	0.012	7,608	15,520	0.34
	62	10	0.145	7,845	15,573	0.33	0.012	7,632	15,573	0.34
	63	10	0.145	7,871	15,626	0.33	0.012	7,656	15,626	0.34
	64	10	0.145	7,897	15,678	0.33	0.012	7,679	15,678	0.34
	65	10	0.145	7,923	15,729	0.33	0.012	7,702	15,729	0.34
	66	10	0.145	7,948	15,779	0.33	0.012	7,724	15,779	0.34
	67	10	0.145	7,973	15,828	0.33	0.012	7,746	15,828	0.34
	68	10	0.145	7,997	15,876	0.33	0.012	7,768	15,876	0.34
	69	10	0.145	8,021	15,923	0.33	0.012	7,789	15,923	0.34
	70	10	0.145	8,044	15,970	0.33	0.012	7,809	15,970	0.34
	71	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	72	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	73	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	74	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	75	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	76	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	77	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	78	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-5 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	53	10	0.145	0.012	7,402	15,058	0.34
	54	10	0.145	0.012	7,429	15,119	0.34
	55	10	0.145	0.012	7,456	15,179	0.34
	56	10	0.145	0.012	7,483	15,238	0.34
	57	10	0.145	0.012	7,508	15,296	0.34
	58	10	0.145	0.012	7,534	15,353	0.34
	59	10	0.145	0.012	7,559	15,410	0.34
	60	10	0.145	0.012	7,584	15,465	0.34
	61	10	0.145	0.012	7,608	15,520	0.34
	62	10	0.145	0.012	7,632	15,573	0.34
	63	10	0.145	0.012	7,656	15,626	0.34
	64	10	0.145	0.012	7,679	15,678	0.34
	65	10	0.145	0.012	7,702	15,729	0.34
	66	10	0.145	0.012	7,724	15,779	0.34
	67	10	0.145	0.012	7,746	15,828	0.34
	68	10	0.145	0.012	7,768	15,876	0.34
	69	10	0.145	0.012	7,789	15,923	0.34
	70	10	0.145	0.012	7,809	15,970	0.34
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33

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Table 3.7A-5 (4 of 4)

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Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	79	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	80	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	81	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	82	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	83	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	84	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	85	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	86	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	87	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	88	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	89	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	90	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	91	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	92	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	93	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	94	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	95	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	96	5	0.155	9,200	18,264	0.33	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) The values of compression wave velocity, Vp, are for unsaturated soil. If the soil is saturated, a minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used.

(3) Poisson's Ratio

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Table 3.7A-5 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33
	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	5	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

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Table 3.7A-6 (1 of 4)

Soil Layers and Properties (S6)[Replace with Table in next page.](#)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand	1	5	0.130	2,093	4,757	0.38	0.015	2,090	4,800	0.38
	2	5	0.130	2,116	4,809	0.38	0.019	2,090	4,809	0.38
	3	5	0.130	2,139	4,861	0.38	0.023	2,081	4,861	0.39
	4	5	0.130	2,161	4,912	0.38	0.026	2,082	4,912	0.39
	5	5	0.130	2,184	4,963	0.38	0.021	2,126	4,963	0.39
	6	5	0.130	2,206	5,014	0.38	0.023	2,129	5,014	0.39
	7	5	0.130	2,228	5,065	0.38	0.025	2,130	5,065	0.39
	8	5	0.130	2,250	5,115	0.38	0.027	2,134	5,115	0.39
	9	5	0.130	2,272	5,165	0.38	0.028	2,140	5,165	0.40
	10	5	0.130	2,294	5,215	0.38	0.030	2,148	5,215	0.40
Soft Rock	11	5	0.135	4,271	8,891	0.35	0.032	4,271	8,891	0.35
	12	5	0.135	4,293	8,936	0.35	0.032	4,293	8,936	0.35
	13	5	0.135	4,314	8,981	0.35	0.032	4,314	8,981	0.35
	14	5	0.135	4,336	9,026	0.35	0.032	4,336	9,026	0.35
	15	5	0.135	4,357	9,070	0.35	0.032	4,357	9,070	0.35
	16	5	0.135	4,378	9,114	0.35	0.032	4,378	9,114	0.35
	17	5	0.135	4,399	9,158	0.35	0.032	4,399	9,158	0.35
	18	5	0.135	4,420	9,202	0.35	0.032	4,420	9,202	0.35
	19	5	0.135	4,441	9,245	0.35	0.032	4,441	9,245	0.35
	20	5	0.135	4,462	9,288	0.35	0.032	4,462	9,288	0.35
	21	5	0.135	4,483	9,331	0.35	0.032	4,483	9,331	0.35
	22	5	0.135	4,503	9,374	0.35	0.032	4,503	9,374	0.35
	23	5	0.135	4,524	9,417	0.35	0.032	4,524	9,417	0.35
	24	5	0.135	4,544	9,459	0.35	0.033	4,543	9,459	0.35
	25	5	0.135	4,564	9,501	0.35	0.033	4,561	9,501	0.35
	26	5	0.135	4,584	9,543	0.35	0.033	4,580	9,543	0.35

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Table 3.7A-6 (1 of 4)

Soil Layers and Properties (S6)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.130	0.015	2,090	4,800	0.38
	2	5	0.130	0.019	2,090	4,809	0.38
	3	5	0.130	0.023	2,081	4,861	0.39
	4	5	0.130	0.026	2,082	4,912	0.39
	5	5	0.130	0.021	2,126	4,963	0.39
	6	5	0.130	0.023	2,129	5,014	0.39
	7	5	0.130	0.025	2,130	5,065	0.39
	8	5	0.130	0.027	2,134	5,115	0.39
	9	5	0.130	0.028	2,140	5,165	0.40
	10	5	0.130	0.030	2,148	5,215	0.40
Soft Rock	11	5	0.135	0.032	4,271	8,891	0.35
	12	5	0.135	0.032	4,293	8,936	0.35
	13	5	0.135	0.032	4,314	8,981	0.35
	14	5	0.135	0.032	4,336	9,026	0.35
	15	5	0.135	0.032	4,357	9,070	0.35
	16	5	0.135	0.032	4,378	9,114	0.35
	17	5	0.135	0.032	4,399	9,158	0.35
	18	5	0.135	0.032	4,420	9,202	0.35
	19	5	0.135	0.032	4,441	9,245	0.35
	20	5	0.135	0.032	4,462	9,288	0.35
	21	5	0.135	0.032	4,483	9,331	0.35
	22	5	0.135	0.032	4,503	9,374	0.35
	23	5	0.135	0.032	4,524	9,417	0.35
	24	5	0.135	0.033	4,543	9,459	0.35
	25	5	0.135	0.033	4,561	9,501	0.35
	26	5	0.135	0.033	4,580	9,543	0.35

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Table 3.7A-6 (2 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Soft Rock (cont.)	27	5	0.135	4,604	9,584	0.35	0.033	4,598	9,584	0.35
	28	5	0.135	4,624	9,626	0.35	0.033	4,617	9,626	0.35
	29	5	0.135	4,644	9,667	0.35	0.034	4,634	9,667	0.35
	30	5	0.135	4,663	9,707	0.35	0.034	4,651	9,707	0.35
	31	5	0.135	4,683	9,748	0.35	0.034	4,668	9,748	0.35
	32	5	0.135	4,702	9,788	0.35	0.034	4,685	9,788	0.35
	33	5	0.135	4,721	9,828	0.35	0.034	4,702	9,828	0.35
	34	5	0.135	4,741	9,868	0.35	0.034	4,719	9,868	0.35
	35	5	0.135	4,760	9,908	0.35	0.035	4,736	9,908	0.35
	36	5	0.135	4,779	9,947	0.35	0.035	4,753	9,947	0.35
	37	5	0.135	4,797	9,986	0.35	0.035	4,770	9,986	0.35
	38	5	0.135	4,816	10,025	0.35	0.035	4,786	10,025	0.35
	39	5	0.135	4,835	10,064	0.35	0.035	4,803	10,064	0.35
	40	5	0.135	4,853	10,102	0.35	0.035	4,820	10,102	0.35
Rock	41	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	42	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	43	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	44	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	45	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	46	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	47	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	48	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	49	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	50	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	51	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	52	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-6 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Soft Rock (cont.)	27	5	0.135	0.033	4,598	9,584	0.35
	28	5	0.135	0.033	4,617	9,626	0.35
	29	5	0.135	0.034	4,634	9,667	0.35
	30	5	0.135	0.034	4,651	9,707	0.35
	31	5	0.135	0.034	4,668	9,748	0.35
	32	5	0.135	0.034	4,685	9,788	0.35
	33	5	0.135	0.034	4,702	9,828	0.35
	34	5	0.135	0.034	4,719	9,868	0.35
	35	5	0.135	0.035	4,736	9,908	0.35
	36	5	0.135	0.035	4,753	9,947	0.35
	37	5	0.135	0.035	4,770	9,986	0.35
	38	5	0.135	0.035	4,786	10,025	0.35
	39	5	0.135	0.035	4,803	10,064	0.35
	40	5	0.135	0.035	4,820	10,102	0.35
Rock	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33

APR1400 DCD TIER 2

Table 3.7A-6 (3 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	53	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	54	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	55	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	56	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	57	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	58	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	59	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	60	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	61	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	62	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	63	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	64	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	65	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	66	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	67	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	68	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	69	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	70	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	71	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	72	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	73	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	74	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	75	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	76	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	77	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	78	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-6 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33
	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33

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Table 3.7A-6 (4 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	79	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	80	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	81	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	82	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	83	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	84	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	85	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	86	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	87	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	88	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	89	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	90	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	91	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	92	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	93	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	94	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	95	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	96	—	0.155	9,200	18,264	0.33	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) The values of compression wave velocity, Vp, are for unsaturated soil. If the soil is saturated, a minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used.

(3) Poisson's Ratio

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Table 3.7A-6 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33
	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	—	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

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Table 3.7A-7 (1 of 4)

Soil Layers and Properties (S7) [Replace with Table in next page.](#)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Sand	1	5	0.130	1,820	4,137	0.38	0.016	1,813	4,800	0.42
	2	5	0.130	1,840	4,182	0.38	0.021	1,802	4,800	0.42
	3	5	0.130	1,860	4,227	0.38	0.026	1,794	4,800	0.42
	4	5	0.130	1,879	4,272	0.38	0.029	1,790	4,800	0.42
	5	5	0.130	1,899	4,316	0.38	0.025	1,820	4,800	0.42
	6	5	0.130	1,918	4,360	0.38	0.027	1,817	4,800	0.42
	7	5	0.130	1,938	4,404	0.38	0.029	1,818	4,800	0.42
	8	5	0.130	1,957	4,448	0.38	0.031	1,820	4,800	0.42
	9	5	0.130	1,976	4,491	0.38	0.033	1,826	4,800	0.42
	10	5	0.130	1,995	4,535	0.38	0.034	1,832	4,800	0.41
Soft Rock	11	5	0.135	3,714	7,731	0.35	0.032	3,714	7,731	0.35
	12	5	0.135	3,733	7,770	0.35	0.032	3,733	7,770	0.35
	13	5	0.135	3,752	7,810	0.35	0.032	3,752	7,810	0.35
	14	5	0.135	3,770	7,848	0.35	0.032	3,770	7,848	0.35
	15	5	0.135	3,789	7,887	0.35	0.032	3,789	7,887	0.35
	16	5	0.135	3,807	7,925	0.35	0.032	3,807	7,925	0.35
	17	5	0.135	3,826	7,964	0.35	0.033	3,825	7,964	0.35
	18	5	0.135	3,844	8,002	0.35	0.033	3,841	8,002	0.35
	19	5	0.135	3,862	8,039	0.35	0.033	3,858	8,039	0.35
	20	5	0.135	3,880	8,077	0.35	0.033	3,874	8,077	0.35
Rock	21	5	0.145	5,898	11,709	0.33	0.009	5,826	11,709	0.34
	22	5	0.145	5,916	11,744	0.33	0.010	5,839	11,744	0.34
	23	5	0.145	5,934	11,780	0.33	0.010	5,853	11,780	0.34
	24	5	0.145	5,951	11,815	0.33	0.010	5,866	11,815	0.34
	25	5	0.145	5,969	11,849	0.33	0.010	5,880	11,849	0.34
	26	5	0.145	5,986	11,884	0.33	0.010	5,894	11,884	0.34

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Table 3.7A-7 (1 of 4)

Soil Layers and Properties (S7)

Soil Type	Layer No.	Thick .(ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Sand	1	5	0.130	0.016	1,813	4,800	0.42
	2	5	0.130	0.021	1,802	4,800	0.42
	3	5	0.130	0.026	1,794	4,800	0.42
	4	5	0.130	0.029	1,790	4,800	0.42
	5	5	0.130	0.025	1,820	4,800	0.42
	6	5	0.130	0.027	1,817	4,800	0.42
	7	5	0.130	0.029	1,818	4,800	0.42
	8	5	0.130	0.031	1,820	4,800	0.42
	9	5	0.130	0.033	1,826	4,800	0.42
	10	5	0.130	0.034	1,832	4,800	0.41
Soft Rock	11	5	0.135	0.032	3,714	7,731	0.35
	12	5	0.135	0.032	3,733	7,770	0.35
	13	5	0.135	0.032	3,752	7,810	0.35
	14	5	0.135	0.032	3,770	7,848	0.35
	15	5	0.135	0.032	3,789	7,887	0.35
	16	5	0.135	0.032	3,807	7,925	0.35
	17	5	0.135	0.033	3,825	7,964	0.35
	18	5	0.135	0.033	3,841	8,002	0.35
	19	5	0.135	0.033	3,858	8,039	0.35
	20	5	0.135	0.033	3,874	8,077	0.35
Rock	21	5	0.145	0.009	5,826	11,709	0.34
	22	5	0.145	0.010	5,839	11,744	0.34
	23	5	0.145	0.010	5,853	11,780	0.34
	24	5	0.145	0.010	5,866	11,815	0.34
	25	5	0.145	0.010	5,880	11,849	0.34
	26	5	0.145	0.010	5,894	11,884	0.34

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Table 3.7A-7 (2 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	27	5	0.145	6,004	11,919	0.33	0.010	5,907	11,919	0.34
	28	5	0.145	6,021	11,953	0.33	0.010	5,921	11,953	0.34
	29	5	0.145	6,038	11,987	0.33	0.010	5,935	11,987	0.34
	30	5	0.145	6,055	12,021	0.33	0.010	5,949	12,021	0.34
	31	5	0.145	6,072	12,054	0.33	0.010	5,962	12,054	0.34
	32	5	0.145	6,089	12,088	0.33	0.011	5,976	12,088	0.34
	33	5	0.145	6,106	12,121	0.33	0.011	5,990	12,121	0.34
	34	5	0.145	6,122	12,154	0.33	0.011	6,004	12,154	0.34
	35	5	0.145	6,139	12,187	0.33	0.011	6,018	12,187	0.34
	36	5	0.145	6,155	12,220	0.33	0.011	6,031	12,220	0.34
	37	5	0.145	6,172	12,252	0.33	0.011	6,045	12,252	0.34
	38	5	0.145	6,188	12,284	0.33	0.011	6,059	12,284	0.34
	39	5	0.145	6,204	12,316	0.33	0.011	6,073	12,316	0.34
	40	5	0.145	6,220	12,348	0.33	0.011	6,086	12,348	0.34
	41	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	42	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	43	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	44	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	45	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	46	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	47	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	48	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	49	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	50	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	51	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	52	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-7 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	27	5	0.145	0.010	5,907	11,919	0.34
	28	5	0.145	0.010	5,921	11,953	0.34
	29	5	0.145	0.010	5,935	11,987	0.34
	30	5	0.145	0.010	5,949	12,021	0.34
	31	5	0.145	0.010	5,962	12,054	0.34
	32	5	0.145	0.011	5,976	12,088	0.34
	33	5	0.145	0.011	5,990	12,121	0.34
	34	5	0.145	0.011	6,004	12,154	0.34
	35	5	0.145	0.011	6,018	12,187	0.34
	36	5	0.145	0.011	6,031	12,220	0.34
	37	5	0.145	0.011	6,045	12,252	0.34
	38	5	0.145	0.011	6,059	12,284	0.34
	39	5	0.145	0.011	6,073	12,316	0.34
	40	5	0.145	0.011	6,086	12,348	0.34
	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33

APR1400 DCD TIER 2

Table 3.7A-7 (3 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	53	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	54	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	55	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	56	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	57	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	58	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	59	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	60	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	61	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	62	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	63	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	64	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	65	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	66	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	67	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	68	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	69	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	70	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	71	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	72	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	73	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	74	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	75	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	76	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	77	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	78	20	0.155	9200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-7 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33
	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33

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Table 3.7A-7 (4 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	79	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	80	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	81	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	82	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	83	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	84	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	85	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	86	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	87	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	88	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	89	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	90	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	91	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	92	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	93	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	94	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	95	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	96	—	0.155	9,200	18,264	0.33	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) The values of compression wave velocity, Vp, are for unsaturated soil. If the soil is saturated, a minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used.

(3) Poisson's Ratio

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Table 3.7A-7 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33
	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	—	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

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Table 3.7A-8 (1 of 4)

Soil Layers and Properties (S8) Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock	1	5	0.145	6,348	12,602	0.33	0.002	6,348	12,602	0.33
	2	5	0.145	6,371	12,648	0.33	0.004	6,371	12,648	0.33
	3	5	0.145	6,394	12,693	0.33	0.005	6,394	12,693	0.33
	4	5	0.145	6,416	12,738	0.33	0.006	6,416	12,738	0.33
	5	5	0.145	6,439	12,782	0.33	0.006	6,435	12,782	0.33
	6	5	0.145	6,461	12,827	0.33	0.006	6,450	12,827	0.33
	7	5	0.145	6,483	12,871	0.33	0.007	6,467	12,871	0.33
	8	5	0.145	6,505	12,915	0.33	0.007	6,485	12,915	0.33
	9	5	0.145	6,527	12,958	0.33	0.007	6,503	12,958	0.33
	10	5	0.145	6,549	13,002	0.33	0.007	6,521	13,002	0.33
	11	5	0.145	6,571	13,045	0.33	0.008	6,540	13,045	0.33
	12	5	0.145	6,593	13,088	0.33	0.008	6,559	13,088	0.33
	13	5	0.145	6,614	13,131	0.33	0.008	6,578	13,131	0.33
	14	5	0.145	6,636	13,174	0.33	0.008	6,597	13,174	0.33
	15	5	0.145	6,657	13,216	0.33	0.008	6,616	13,216	0.33
	16	5	0.145	6,678	13,258	0.33	0.008	6,631	13,258	0.33
	17	5	0.145	6,699	13,300	0.33	0.008	6,646	13,300	0.33
	18	5	0.145	6,720	13,342	0.33	0.009	6,662	13,342	0.33
	19	5	0.145	6,741	13,383	0.33	0.009	6,677	13,383	0.33
	20	5	0.145	6,762	13,424	0.33	0.009	6,692	13,424	0.33
	21	5	0.145	6,783	13,465	0.33	0.009	6,708	13,465	0.33
	22	5	0.145	6,803	13,506	0.33	0.009	6,724	13,506	0.34
	23	5	0.145	6,824	13,546	0.33	0.009	6,740	13,546	0.34
	24	5	0.145	6,844	13,587	0.33	0.009	6,756	13,587	0.34
	25	5	0.145	6,864	13,627	0.33	0.009	6,773	13,627	0.34
	26	5	0.145	6,884	13,667	0.33	0.010	6,788	13,667	0.34

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Table 3.7A-8 (1 of 4)

Soil Layers and Properties (S8)

Soil Type	Layer No.	Thick .(ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock	1	5	0.145	0.002	6,348	12,602	0.33
	2	5	0.145	0.004	6,371	12,648	0.33
	3	5	0.145	0.005	6,394	12,693	0.33
	4	5	0.145	0.006	6,416	12,738	0.33
	5	5	0.145	0.006	6,435	12,782	0.33
	6	5	0.145	0.006	6,450	12,827	0.33
	7	5	0.145	0.007	6,467	12,871	0.33
	8	5	0.145	0.007	6,485	12,915	0.33
	9	5	0.145	0.007	6,503	12,958	0.33
	10	5	0.145	0.007	6,521	13,002	0.33
	11	5	0.145	0.008	6,540	13,045	0.33
	12	5	0.145	0.008	6,559	13,088	0.33
	13	5	0.145	0.008	6,578	13,131	0.33
	14	5	0.145	0.008	6,597	13,174	0.33
	15	5	0.145	0.008	6,616	13,216	0.33
	16	5	0.145	0.008	6,631	13,258	0.33
	17	5	0.145	0.008	6,646	13,300	0.33
	18	5	0.145	0.009	6,662	13,342	0.33
	19	5	0.145	0.009	6,677	13,383	0.33
	20	5	0.145	0.009	6,692	13,424	0.33
	21	5	0.145	0.009	6,708	13,465	0.33
	22	5	0.145	0.009	6,724	13,506	0.34
	23	5	0.145	0.009	6,740	13,546	0.34
	24	5	0.145	0.009	6,756	13,587	0.34
	25	5	0.145	0.009	6,773	13,627	0.34
	26	5	0.145	0.010	6,788	13,667	0.34

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Table 3.7A-8 (2 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	27	5	0.145	6,904	13,706	0.33	0.010	6,805	13,706	0.34
	28	5	0.145	6,924	13,746	0.33	0.010	6,821	13,746	0.34
	29	5	0.145	6,944	13,785	0.33	0.010	6,837	13,785	0.34
	30	5	0.145	6,963	13,824	0.33	0.010	6,854	13,824	0.34
	31	5	0.145	6,983	13,862	0.33	0.010	6,869	13,862	0.34
	32	5	0.145	7,002	13,901	0.33	0.010	6,886	13,901	0.34
	33	5	0.145	7,021	13,939	0.33	0.010	6,902	13,939	0.34
	34	5	0.145	7,041	13,977	0.33	0.010	6,918	13,977	0.34
	35	5	0.145	7,060	14,015	0.33	0.010	6,935	14,015	0.34
	36	5	0.145	7,079	14,053	0.33	0.010	6,951	14,053	0.34
	37	5	0.145	7,097	14,090	0.33	0.010	6,967	14,090	0.34
	38	5	0.145	7,116	14,127	0.33	0.010	6,983	14,127	0.34
	39	5	0.145	7,135	14,164	0.33	0.011	7,000	14,164	0.34
	40	5	0.145	7,153	14,200	0.33	0.011	7,015	14,200	0.34
	41	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	42	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	43	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	44	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	45	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	46	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	47	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	48	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	49	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	50	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	51	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	52	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-8 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	27	5	0.145	0.010	6,805	13,706	0.34
	28	5	0.145	0.010	6,821	13,746	0.34
	29	5	0.145	0.010	6,837	13,785	0.34
	30	5	0.145	0.010	6,854	13,824	0.34
	31	5	0.145	0.010	6,869	13,862	0.34
	32	5	0.145	0.010	6,886	13,901	0.34
	33	5	0.145	0.010	6,902	13,939	0.34
	34	5	0.145	0.010	6,918	13,977	0.34
	35	5	0.145	0.010	6,935	14,015	0.34
	36	5	0.145	0.010	6,951	14,053	0.34
	37	5	0.145	0.010	6,967	14,090	0.34
	38	5	0.145	0.010	6,983	14,127	0.34
	39	5	0.145	0.011	7,000	14,164	0.34
	40	5	0.145	0.011	7,015	14,200	0.34
	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33

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Table 3.7A-8 (3 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	53	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	54	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	55	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	56	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	57	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	58	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	59	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	60	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	61	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	62	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	63	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	64	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	65	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	66	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	67	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	68	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	69	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	70	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	71	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	72	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	73	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	74	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	75	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	76	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	77	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	78	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-8 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33
	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33

APR1400 DCD TIER 2

Table 3.7A-8 (4 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	79	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	80	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	81	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	82	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	83	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	84	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	85	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	86	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	87	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	88	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	89	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	90	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	91	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	92	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	93	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	94	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	95	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	96	20	0.155	9,200	18,264	0.33	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) The values of compression wave velocity, Vp, are for unsaturated soil. If the soil is saturated, a minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used.

(3) Poisson's Ratio

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Table 3.7A-8 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33
	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	20	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

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Table 3.7A-9 (1 of 4)

Soil Layers and Properties (S9) [Replace with Table in next page.](#)

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock	1	5	0.145	4,692	9,315	0.33	0.003	4,692	9,315	0.33
	2	5	0.145	4,709	9,348	0.33	0.005	4,709	9,348	0.33
	3	5	0.145	4,726	9,382	0.33	0.006	4,722	9,382	0.33
	4	5	0.145	4,742	9,415	0.33	0.007	4,730	9,415	0.33
	5	5	0.145	4,759	9,448	0.33	0.007	4,741	9,448	0.33
	6	5	0.145	4,776	9,481	0.33	0.008	4,753	9,481	0.33
	7	5	0.145	4,792	9,513	0.33	0.008	4,765	9,513	0.33
	8	5	0.145	4,808	9,546	0.33	0.008	4,778	9,546	0.33
	9	5	0.145	4,825	9,578	0.33	0.008	4,785	9,578	0.33
	10	5	0.145	4,841	9,610	0.33	0.009	4,793	9,610	0.33
	11	5	0.145	4,857	9,642	0.33	0.009	4,802	9,642	0.34
	12	5	0.145	4,873	9,674	0.33	0.009	4,811	9,674	0.34
	13	5	0.145	4,889	9,706	0.33	0.009	4,821	9,706	0.34
	14	5	0.145	4,905	9,737	0.33	0.010	4,832	9,737	0.34
	15	5	0.145	4,920	9,768	0.33	0.010	4,842	9,768	0.34
	16	5	0.145	4,936	9,799	0.33	0.010	4,853	9,799	0.34
	17	5	0.145	4,952	9,830	0.33	0.010	4,864	9,830	0.34
	18	5	0.145	4,967	9,861	0.33	0.010	4,875	9,861	0.34
	19	5	0.145	4,983	9,892	0.33	0.011	4,886	9,892	0.34
	20	5	0.145	4,998	9,922	0.33	0.011	4,897	9,922	0.34
	21	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	22	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	23	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	24	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	25	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	26	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-9 (1 of 4)

Soil Layers and Properties (S9)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock	1	5	0.145	0.003	4,692	9,315	0.33
	2	5	0.145	0.005	4,709	9,348	0.33
	3	5	0.145	0.006	4,722	9,382	0.33
	4	5	0.145	0.007	4,730	9,415	0.33
	5	5	0.145	0.007	4,741	9,448	0.33
	6	5	0.145	0.008	4,753	9,481	0.33
	7	5	0.145	0.008	4,765	9,513	0.33
	8	5	0.145	0.008	4,778	9,546	0.33
	9	5	0.145	0.008	4,785	9,578	0.33
	10	5	0.145	0.009	4,793	9,610	0.33
	11	5	0.145	0.009	4,802	9,642	0.34
	12	5	0.145	0.009	4,811	9,674	0.34
	13	5	0.145	0.009	4,821	9,706	0.34
	14	5	0.145	0.010	4,832	9,737	0.34
	15	5	0.145	0.010	4,842	9,768	0.34
	16	5	0.145	0.010	4,853	9,799	0.34
	17	5	0.145	0.010	4,864	9,830	0.34
	18	5	0.145	0.010	4,875	9,861	0.34
	19	5	0.145	0.011	4,886	9,892	0.34
	20	5	0.145	0.011	4,897	9,922	0.34
	21	5	0.155	0.010	9,200	18,264	0.33
	22	5	0.155	0.010	9,200	18,264	0.33
	23	5	0.155	0.010	9,200	18,264	0.33
	24	5	0.155	0.010	9,200	18,264	0.33
	25	5	0.155	0.010	9,200	18,264	0.33
	26	5	0.155	0.010	9,200	18,264	0.33

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Table 3.7A-9 (2 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	27	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	28	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	29	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	30	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	31	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	32	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	33	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	34	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	35	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	36	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	37	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	38	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	39	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	40	5	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	41	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	42	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	43	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	44	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	45	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	46	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	47	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	48	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	49	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	50	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	51	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	52	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-9 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	27	5	0.155	0.010	9,200	18,264	0.33
	28	5	0.155	0.010	9,200	18,264	0.33
	29	5	0.155	0.010	9,200	18,264	0.33
	30	5	0.155	0.010	9,200	18,264	0.33
	31	5	0.155	0.010	9,200	18,264	0.33
	32	5	0.155	0.010	9,200	18,264	0.33
	33	5	0.155	0.010	9,200	18,264	0.33
	34	5	0.155	0.010	9,200	18,264	0.33
	35	5	0.155	0.010	9,200	18,264	0.33
	36	5	0.155	0.010	9,200	18,264	0.33
	37	5	0.155	0.010	9,200	18,264	0.33
	38	5	0.155	0.010	9,200	18,264	0.33
	39	5	0.155	0.010	9,200	18,264	0.33
	40	5	0.155	0.010	9,200	18,264	0.33
	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33

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Table 3.7A-9 (3 of 4)

Replace with Table in next page.

Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	53	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	54	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	55	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	56	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	57	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	58	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	59	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	60	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	61	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	62	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	63	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	64	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	65	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	66	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	67	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	68	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	69	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	70	10	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	71	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	72	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	73	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	74	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	75	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	76	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	77	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	78	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33

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Table 3.7A-9 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33
	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33

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Table 3.7A-9 (4 of 4)

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Soil Type	Layer No.	Thick. (ft)	$\gamma^{(1)}$ (k/ft ³)	Low Strain			Strain Compatible			
				Vs (ft/s)	Vp ⁽²⁾ (ft/s)	$\rho^{(3)}$	Damp.	Avg. Vs (ft/s)	Vp (ft/s)	ρ
Rock (cont.)	79	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	80	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	81	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	82	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	83	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	84	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	85	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	86	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	87	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	88	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	89	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	90	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	91	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	92	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	93	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	94	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	95	20	0.155	9,200	18,264	0.33	0.010	9,200	18,264	0.33
	96	—	0.155	9,200	18,264	0.33	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) The values of compression wave velocity, Vp, are for unsaturated soil. If the soil is saturated, a minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used.

(3) Poisson's Ratio

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Table 3.7A-9 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	V _s (ft/s)	V _p ⁽²⁾ (ft/s)	$\rho^{(3)}$
Rock (cont.)	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33
	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	—	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) A minimum compression wave velocity of 1,463 m/sec (4,800 ft/sec) (speed of sound in water) is used to consider groundwater table.

(3) Poisson's Ratio

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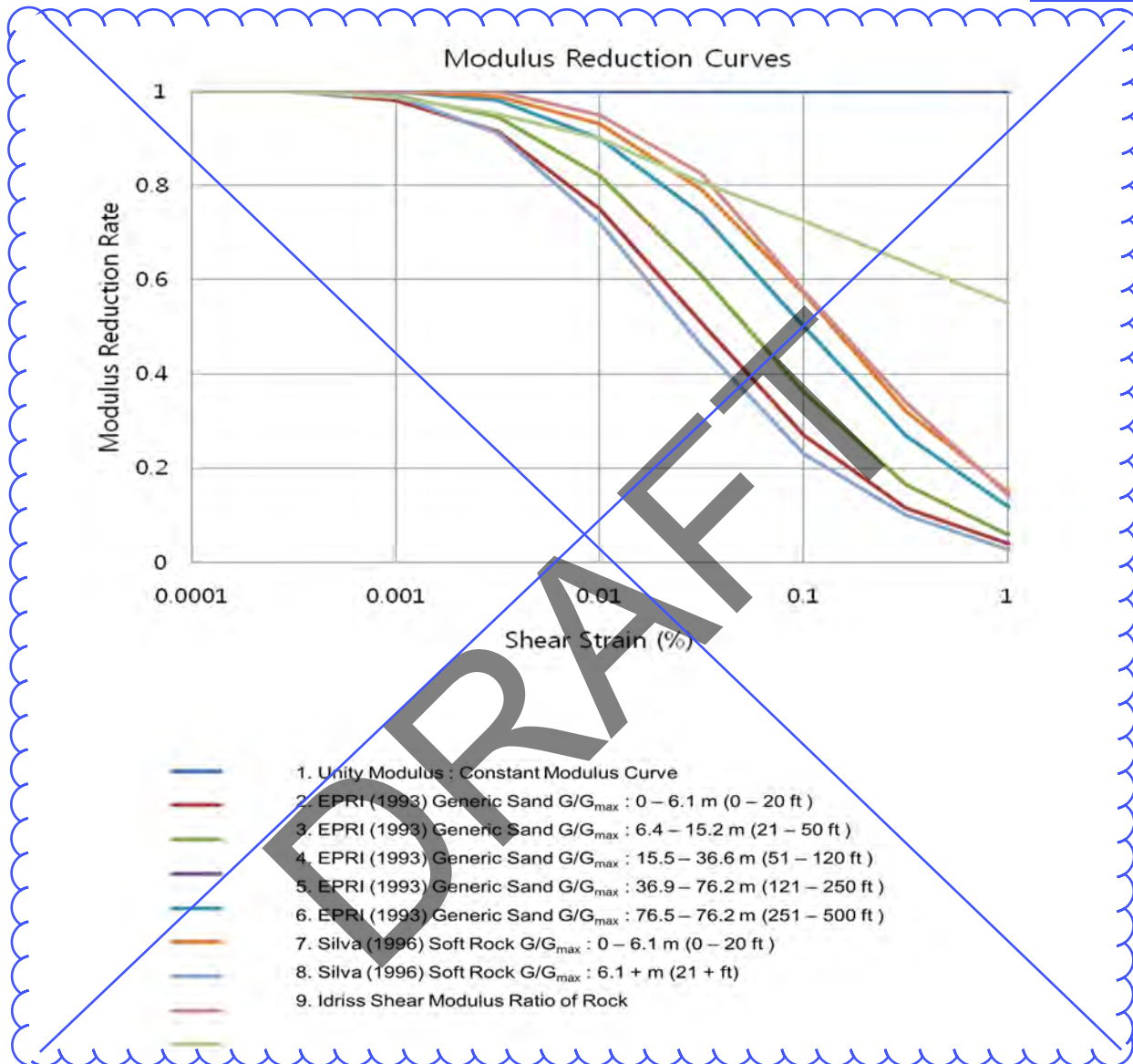


Figure 3.7A-1 Shear Modulus with Shear Strain

APR1400 DCD TIER 2

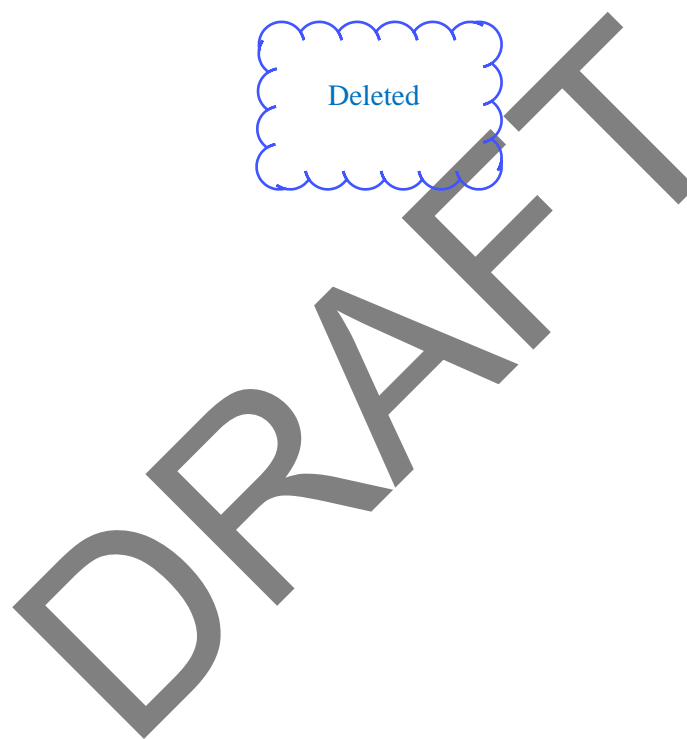


Figure 3.7A-1 Shear Modulus with Shear Strain

APR1400 DCD TIER 2

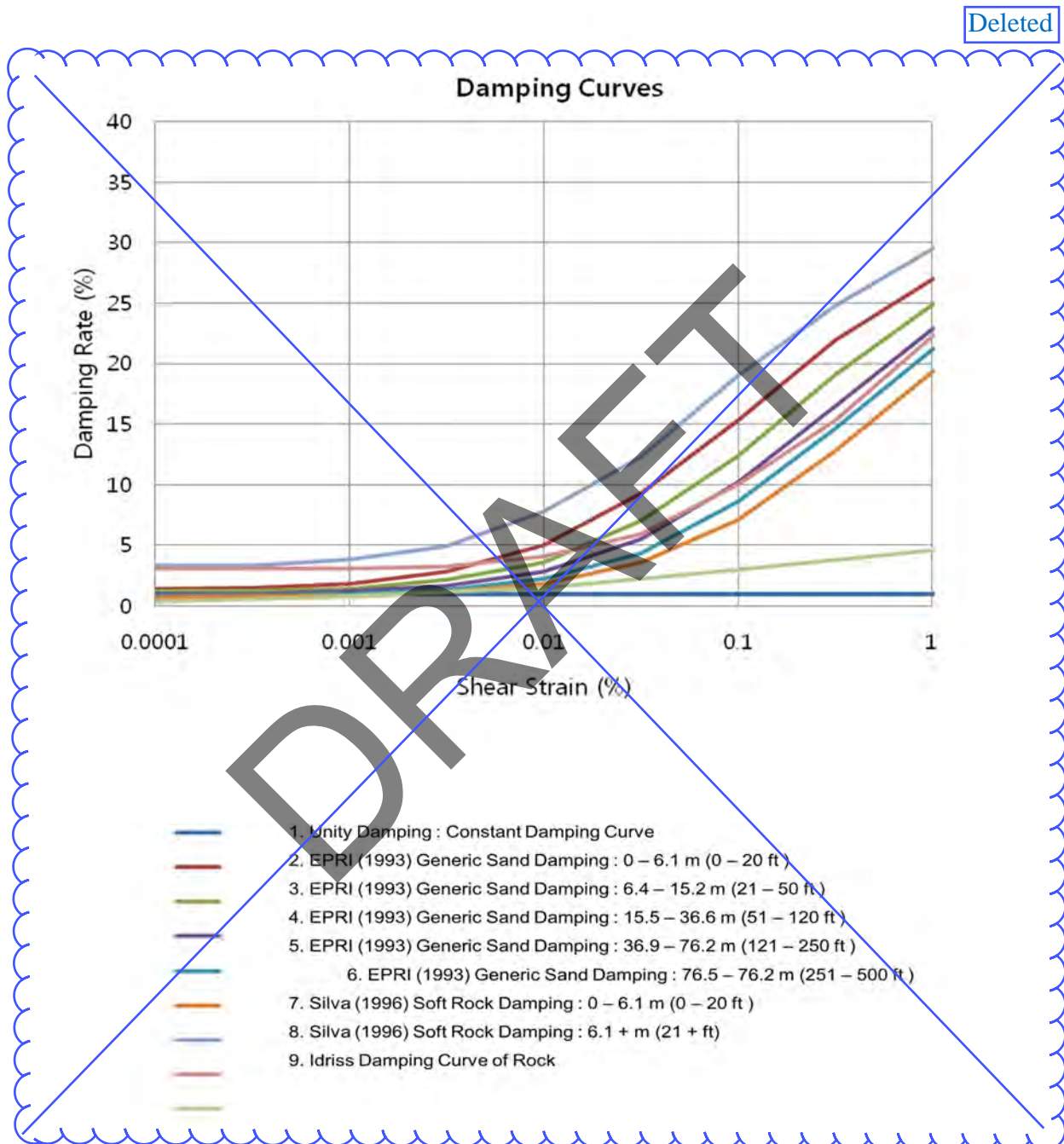


Figure 3.7A-2 Variation of Damping in Soil with Shear Strain

APR1400 DCD TIER 2

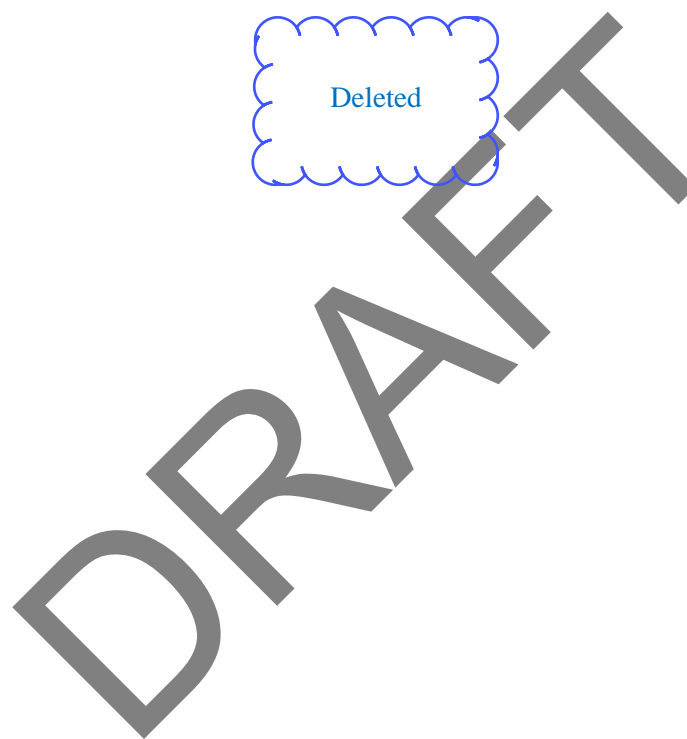


Figure 3.7A-2 Variation of Damping in Soil with Shear Strain

APR1400 DCD TIER 2

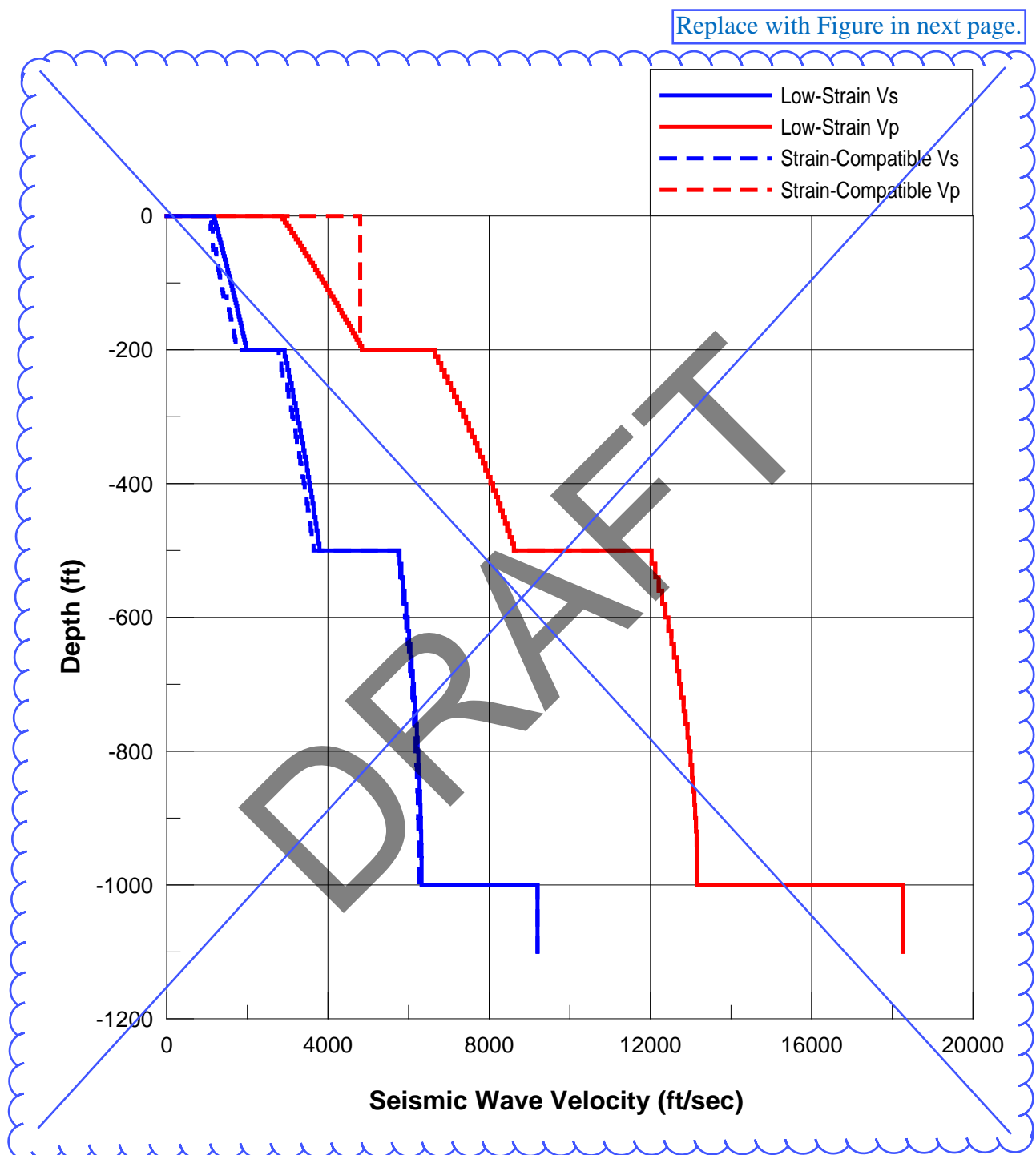


Figure 3.7A-3 Shear and Compression Wave Velocity Profiles for S1

APR1400 DCD TIER 2

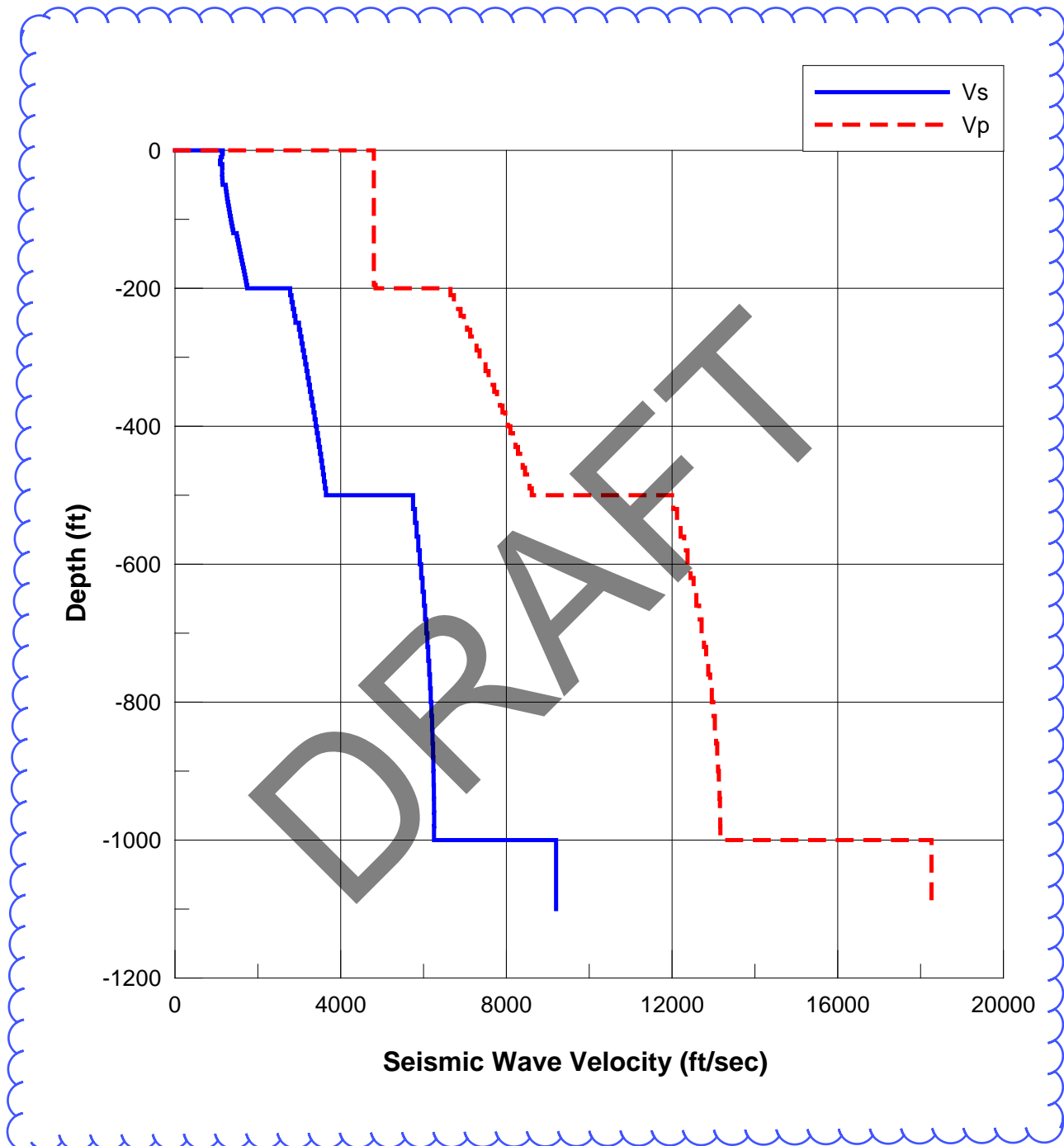


Figure 3.7A-3 Shear and Compression Wave Velocity Profiles for S1

APR1400 DCD TIER 2

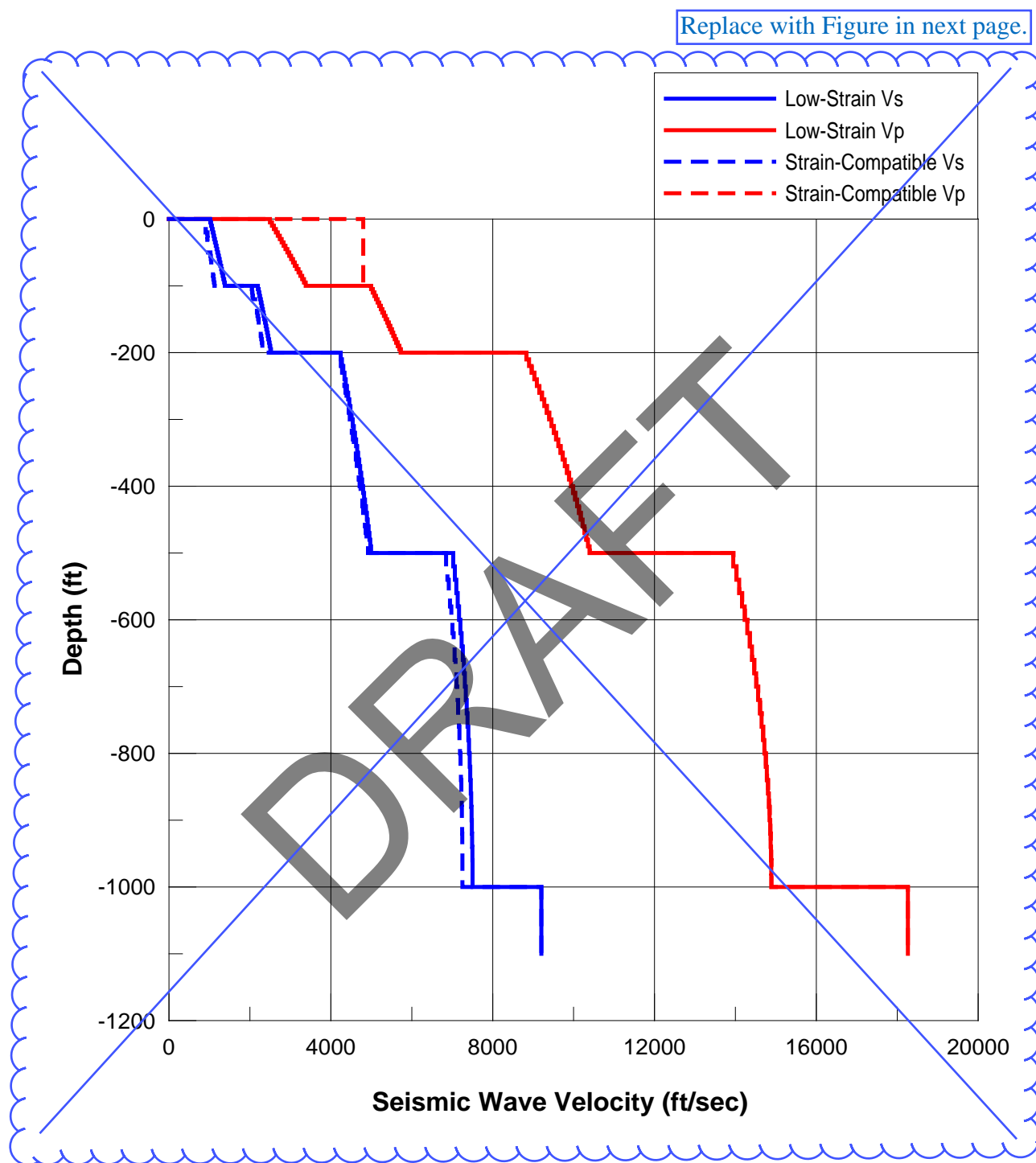


Figure 3.7A-4 Shear and Compression Wave Velocity Profiles for S2

The figure is a line graph showing seismic wave velocity (ft/sec) on the x-axis versus depth (ft) on the y-axis. The x-axis ranges from 0 to 20,000 ft/sec with major ticks every 4,000 units. The y-axis ranges from 0 to -1200 ft with major ticks every 200 units. Two data series are plotted: Vs (Shear Wave Velocity) as a solid blue line and Vp (P-wave Velocity) as a dashed red line. Both series show a step-wise increase in velocity with depth. A large 'DRAFT' watermark is overlaid on the plot.

Depth (ft)	Vs (ft/sec)	Vp (ft/sec)
0	0	0
100	1000	1000
200	2000	2000
1000	2000	2000
2000	3000	4000
3000	3000	4000
4000	3000	4000
5000	3000	4000
6000	3000	4000
7000	3000	4000
8000	3000	4000
9000	3000	4000
10000	3000	4000
11000	3000	4000
12000	3000	4000
13000	3000	4000
14000	3000	4000
15000	3000	4000
16000	3000	4000
17000	3000	4000
18000	3000	4000
19000	3000	4000
20000	3000	4000

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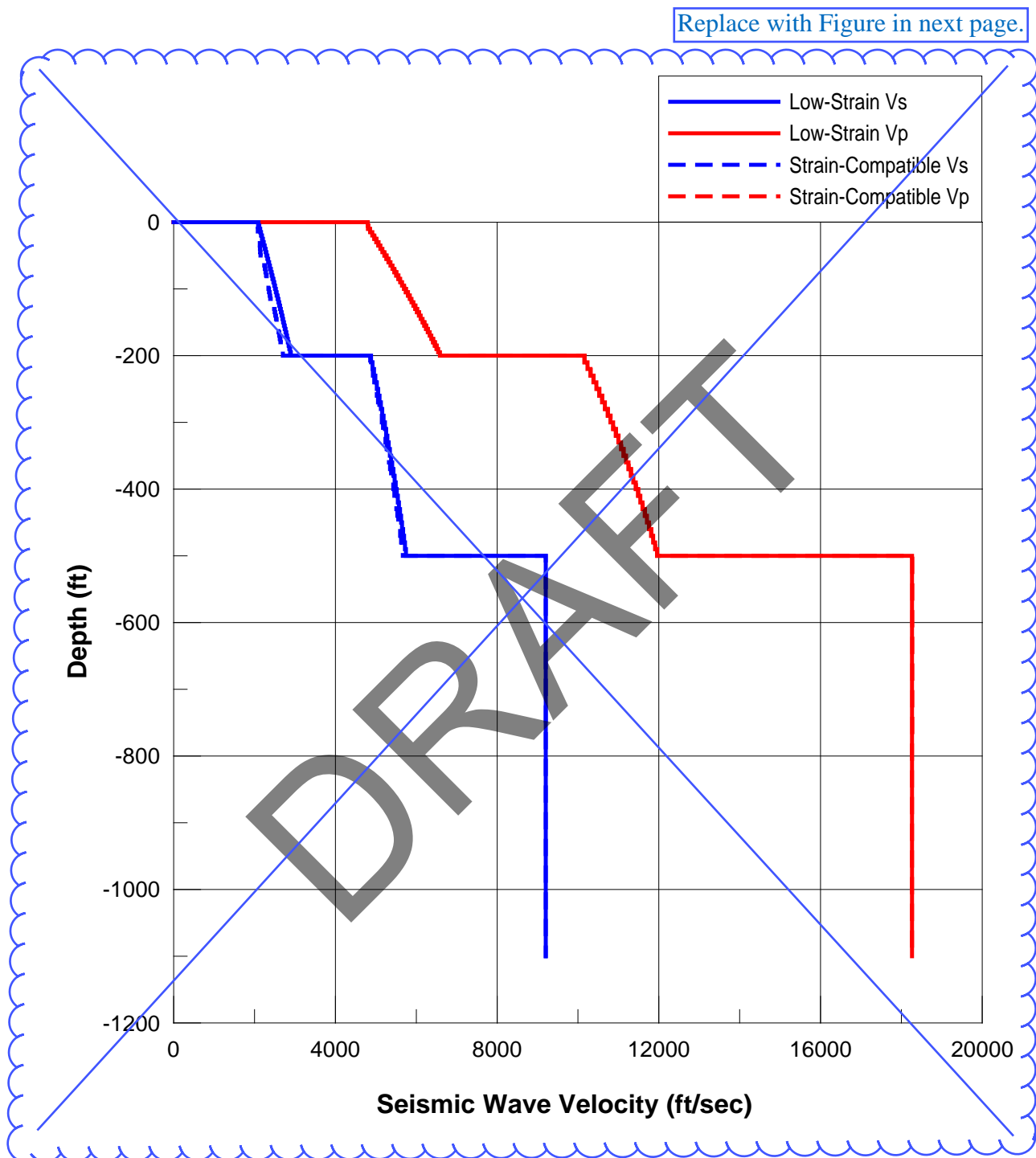


Figure 3.7A-5 Shear and Compression Wave Velocity Profiles for S3

APR1400 DCD TIER 2

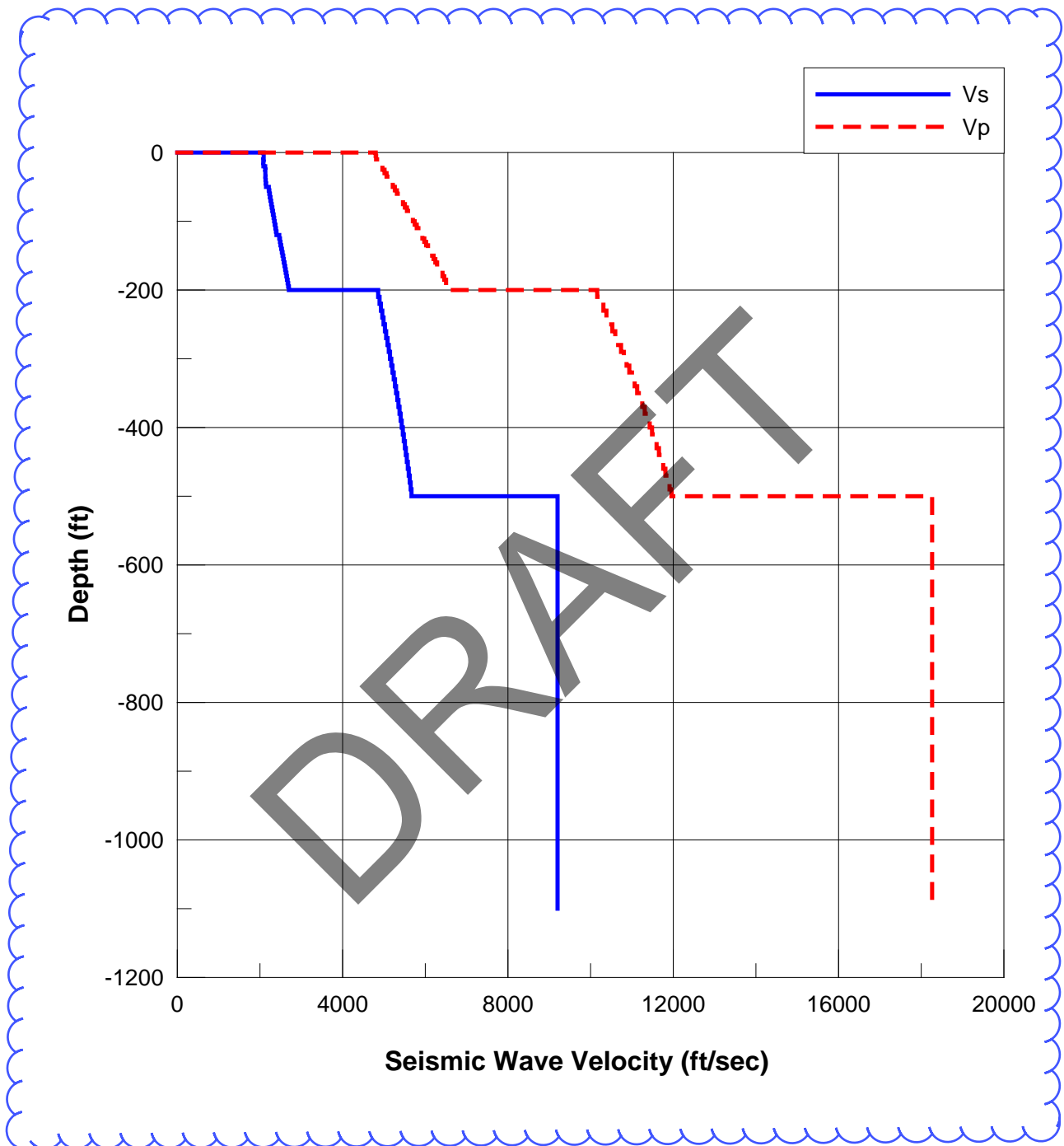


Figure 3.7A-5 Shear and Compression Wave Velocity Profiles for S3

APR1400 DCD TIER 2

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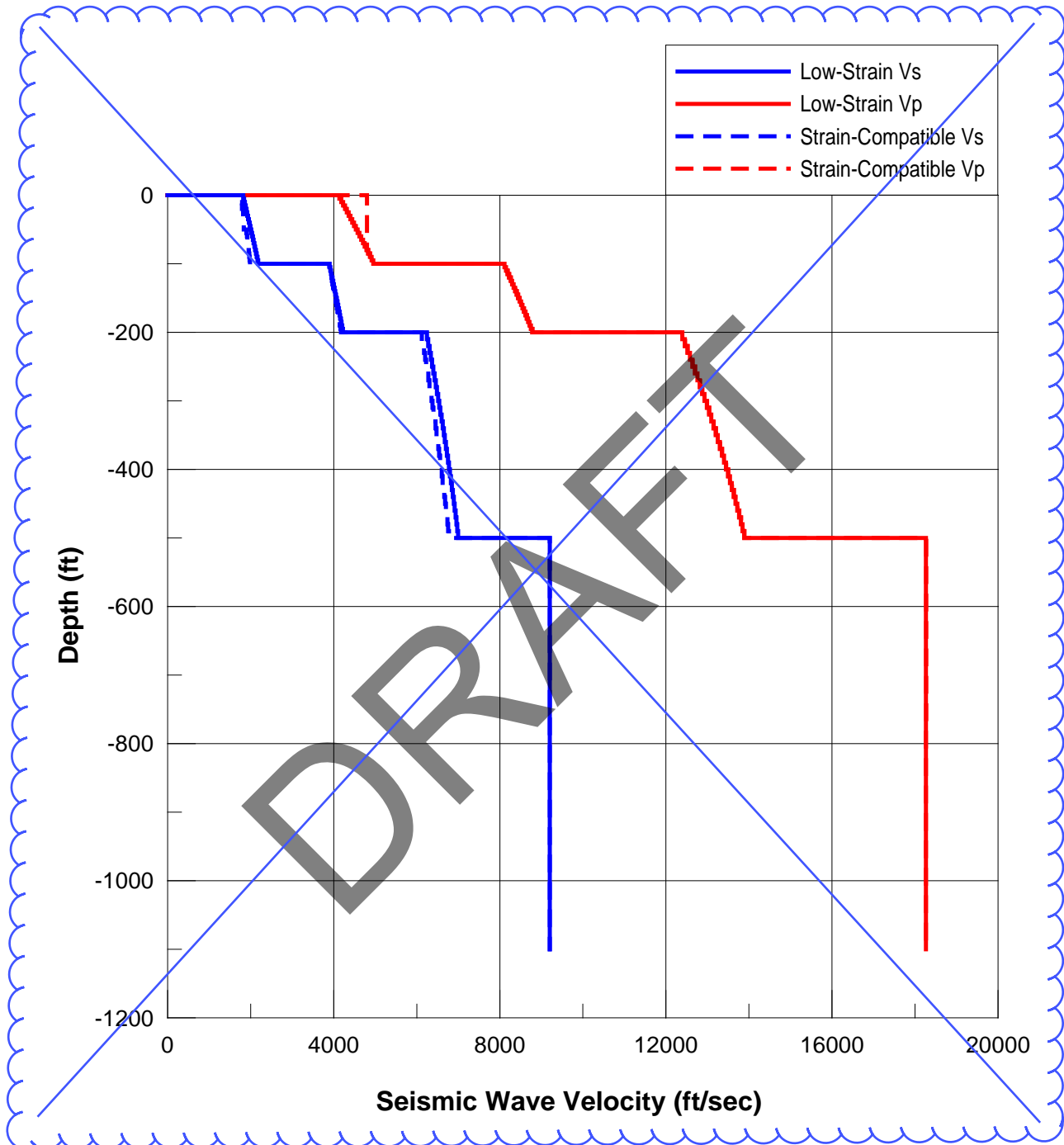
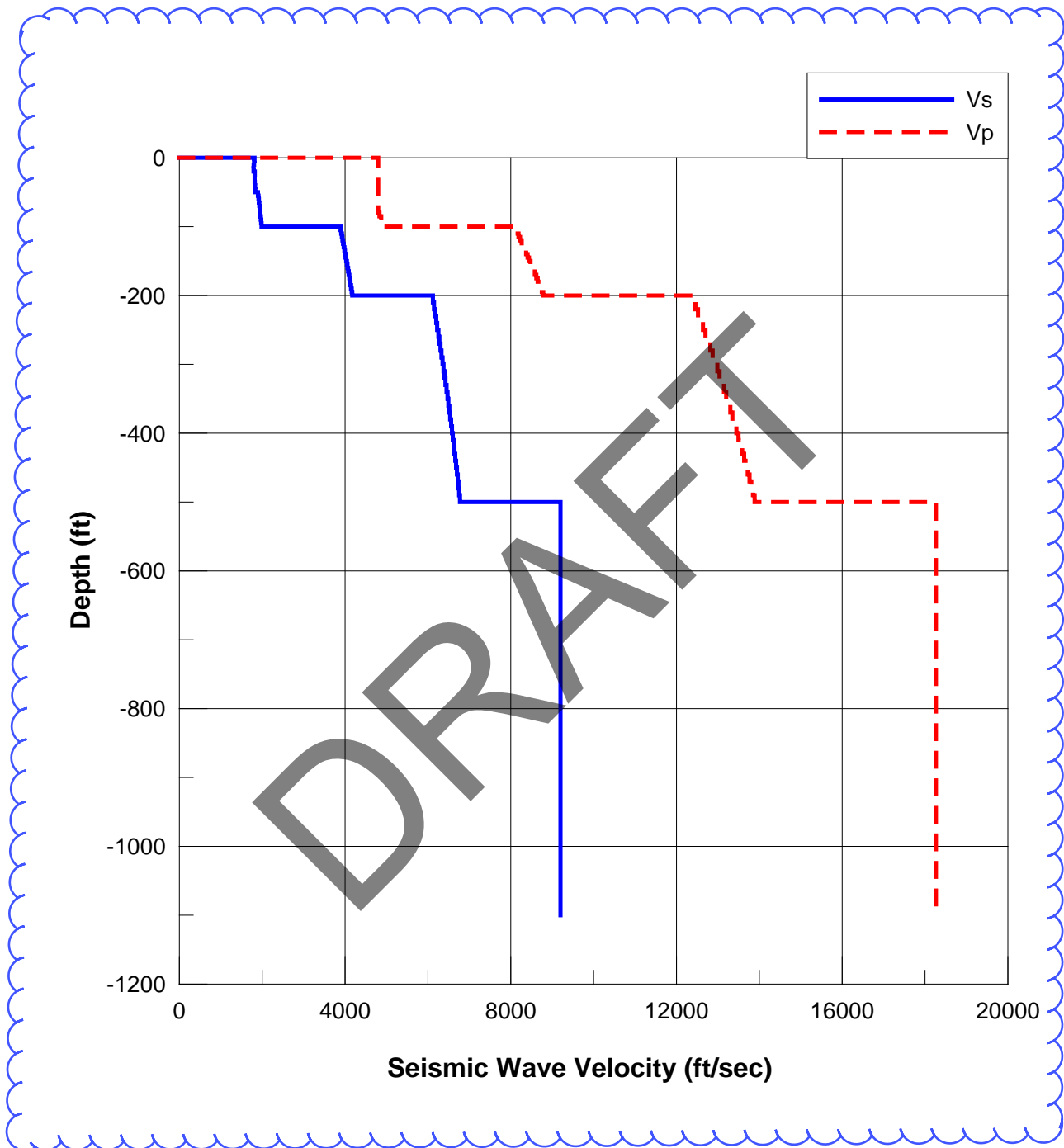


Figure 3.7A-6 Shear and Compression Wave Velocity Profiles for S4

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APR1400 DCD TIER 2

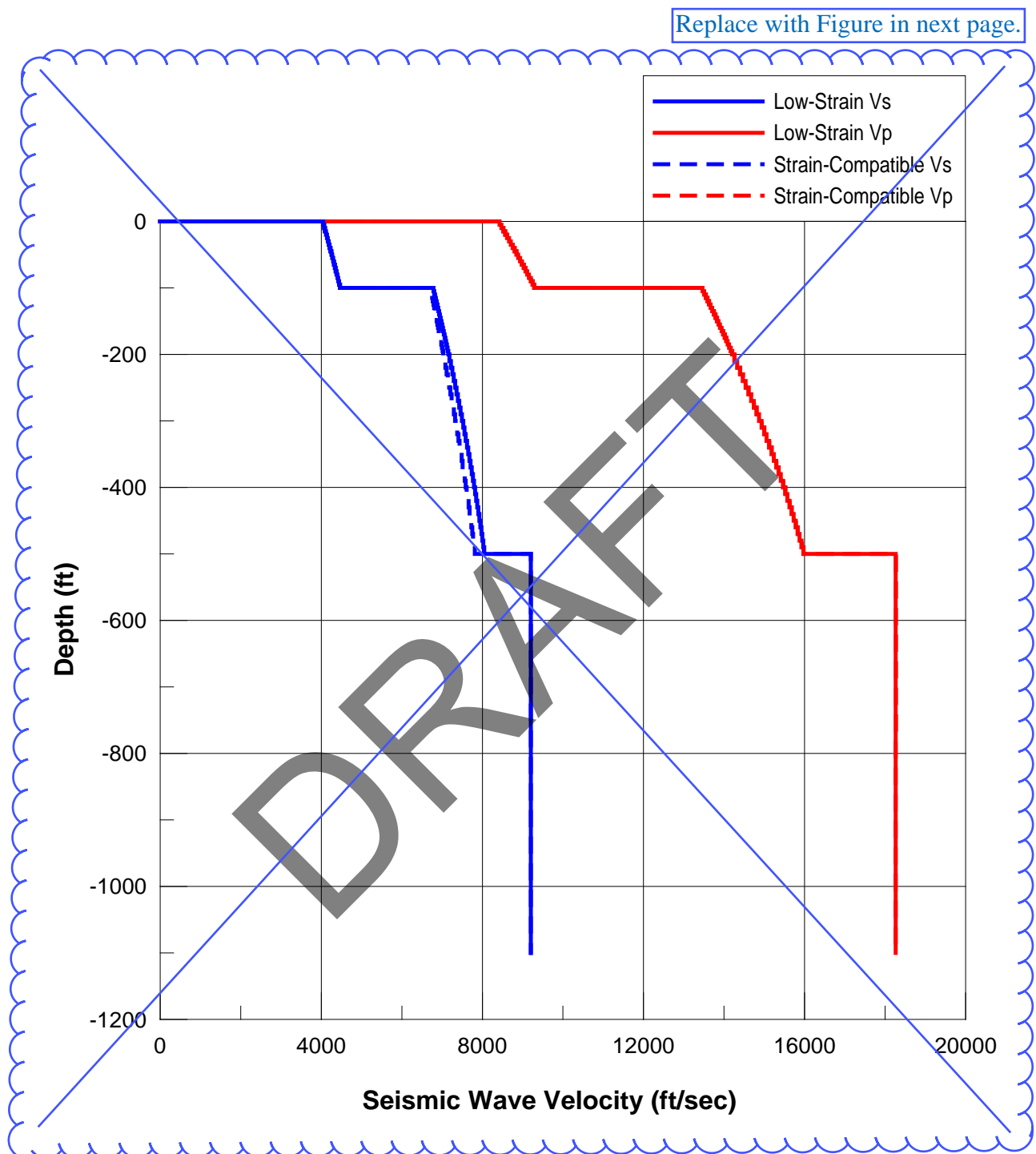


Figure 3.7A-7 Shear and Compression Wave Velocity Profiles for S5

APR1400 DCD TIER 2

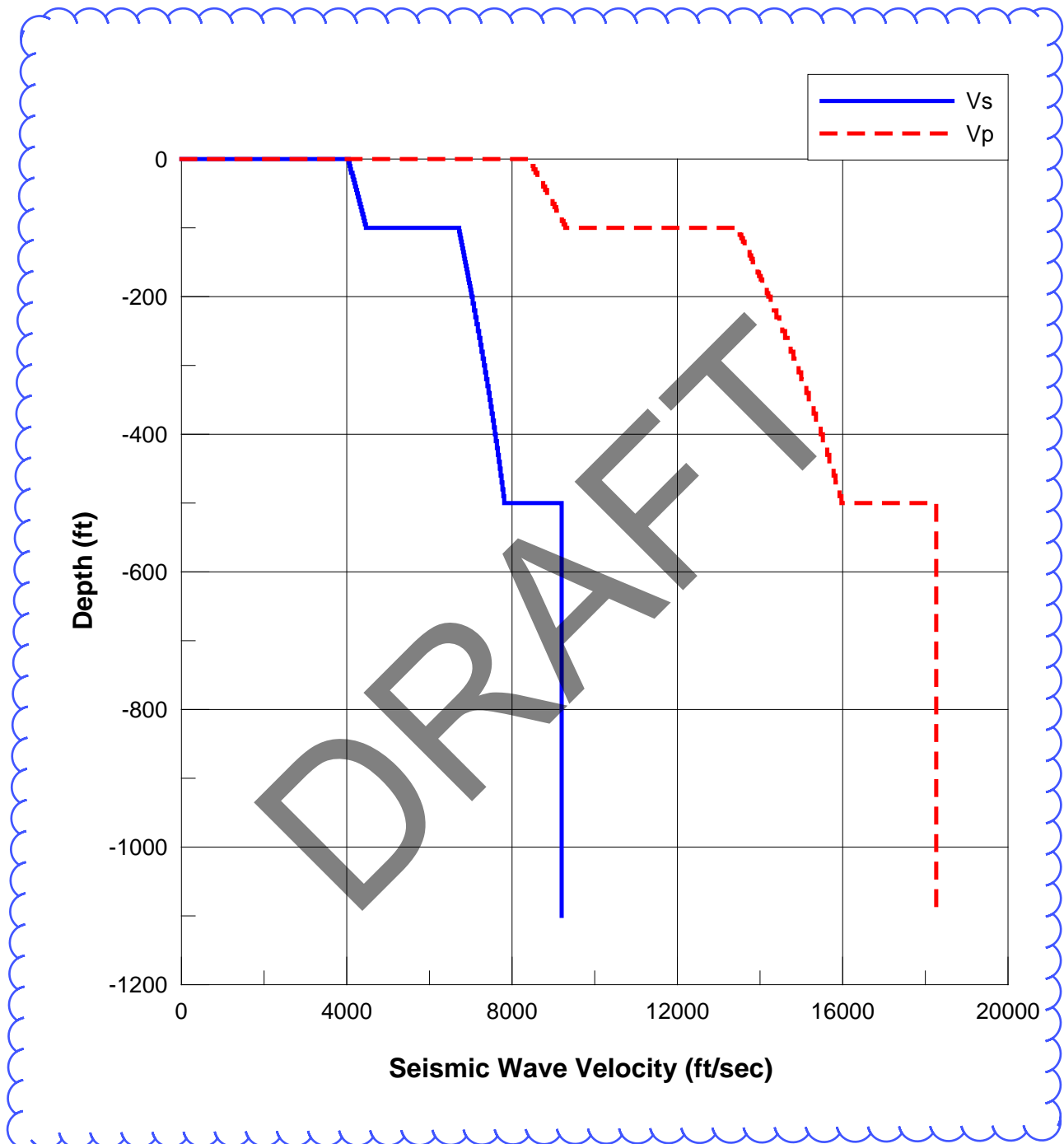


Figure 3.7A-7 Shear and Compression Wave Velocity Profiles for S5

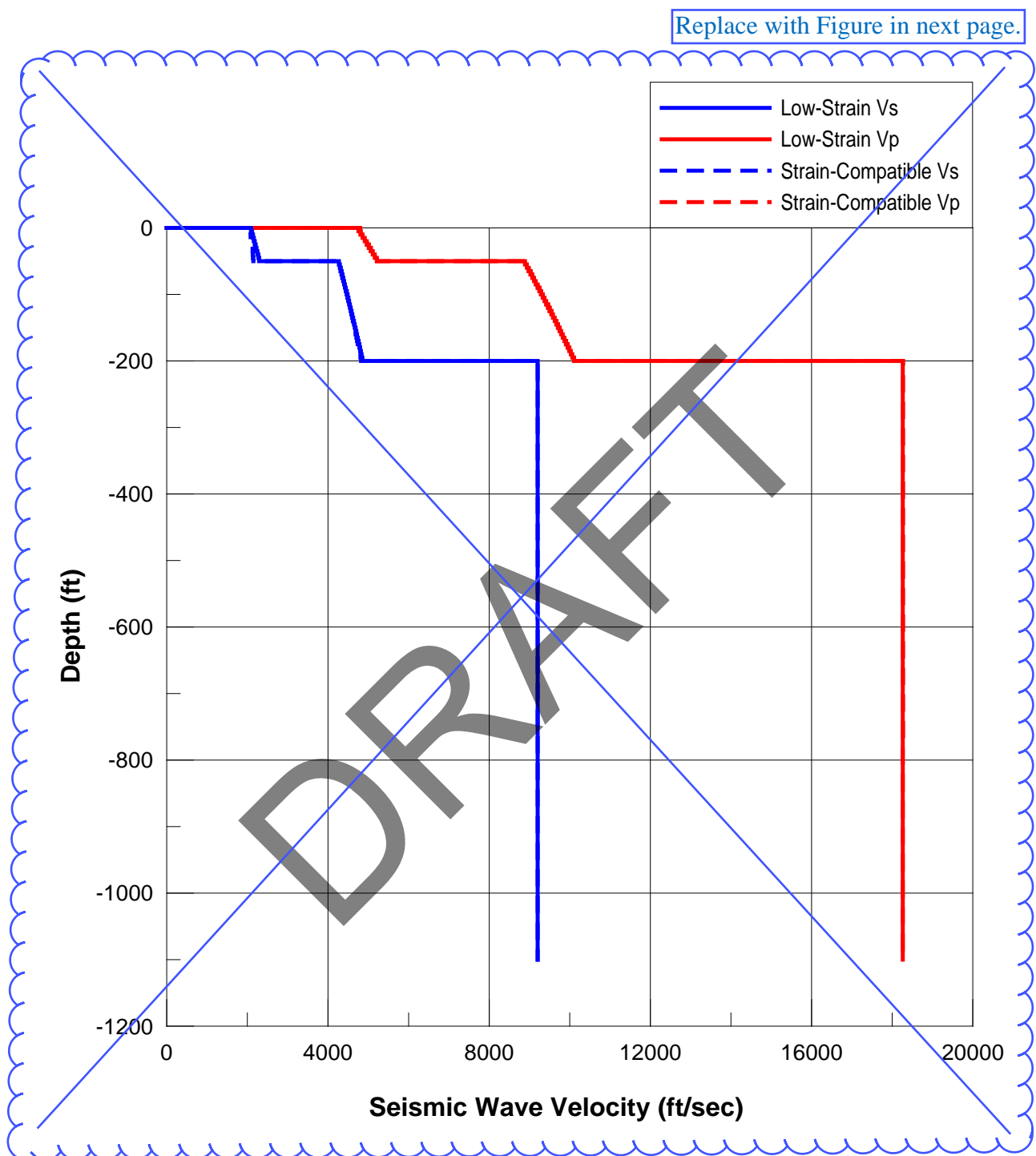
APR1400 DCD TIER 2

Figure 3.7A-8 Shear and Compression Wave Velocity Profiles for S6

APR1400 DCD TIER 2

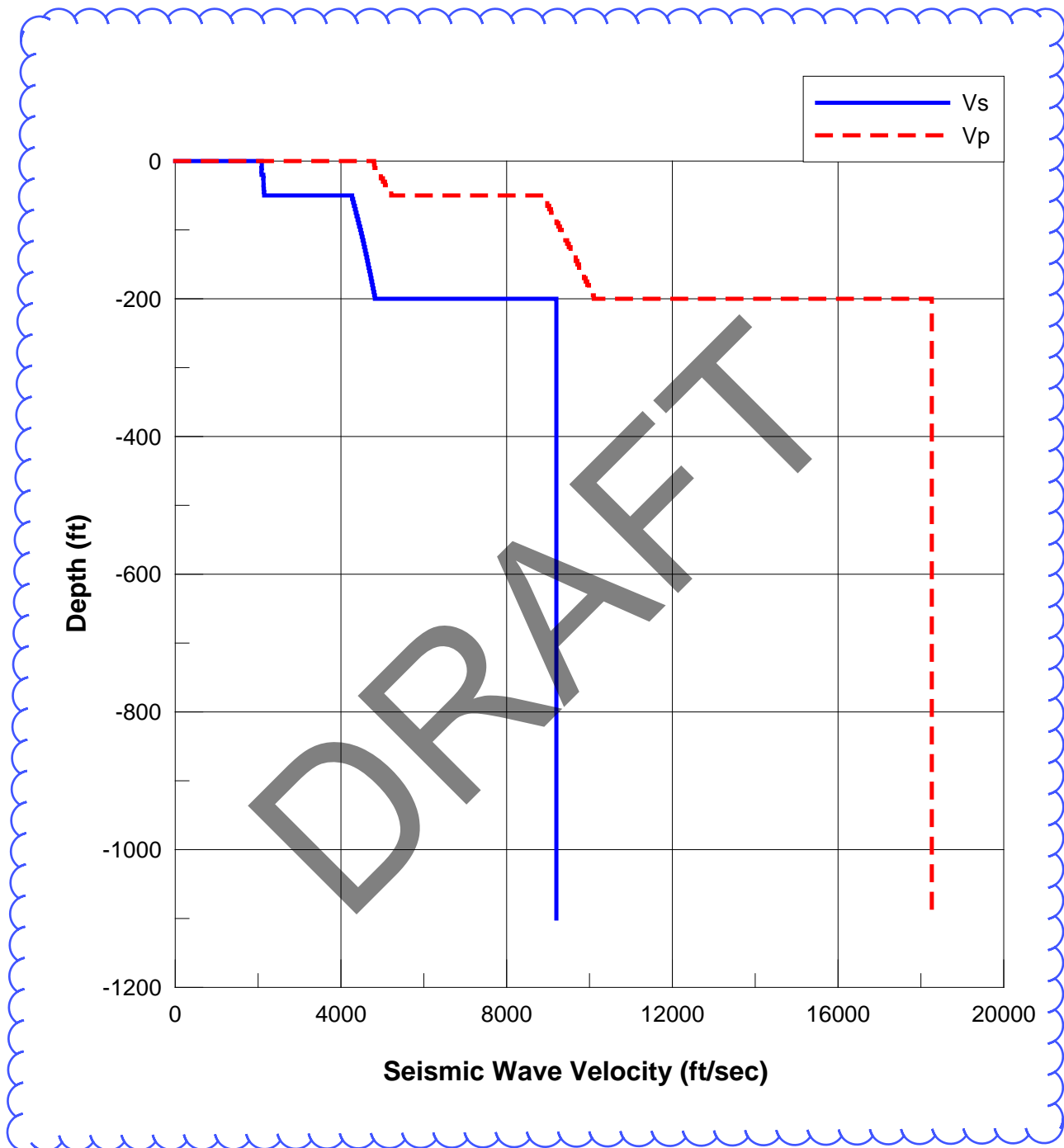


Figure 3.7A-8 Shear and Compression Wave Velocity Profiles for S6

APR1400 DCD TIER 2

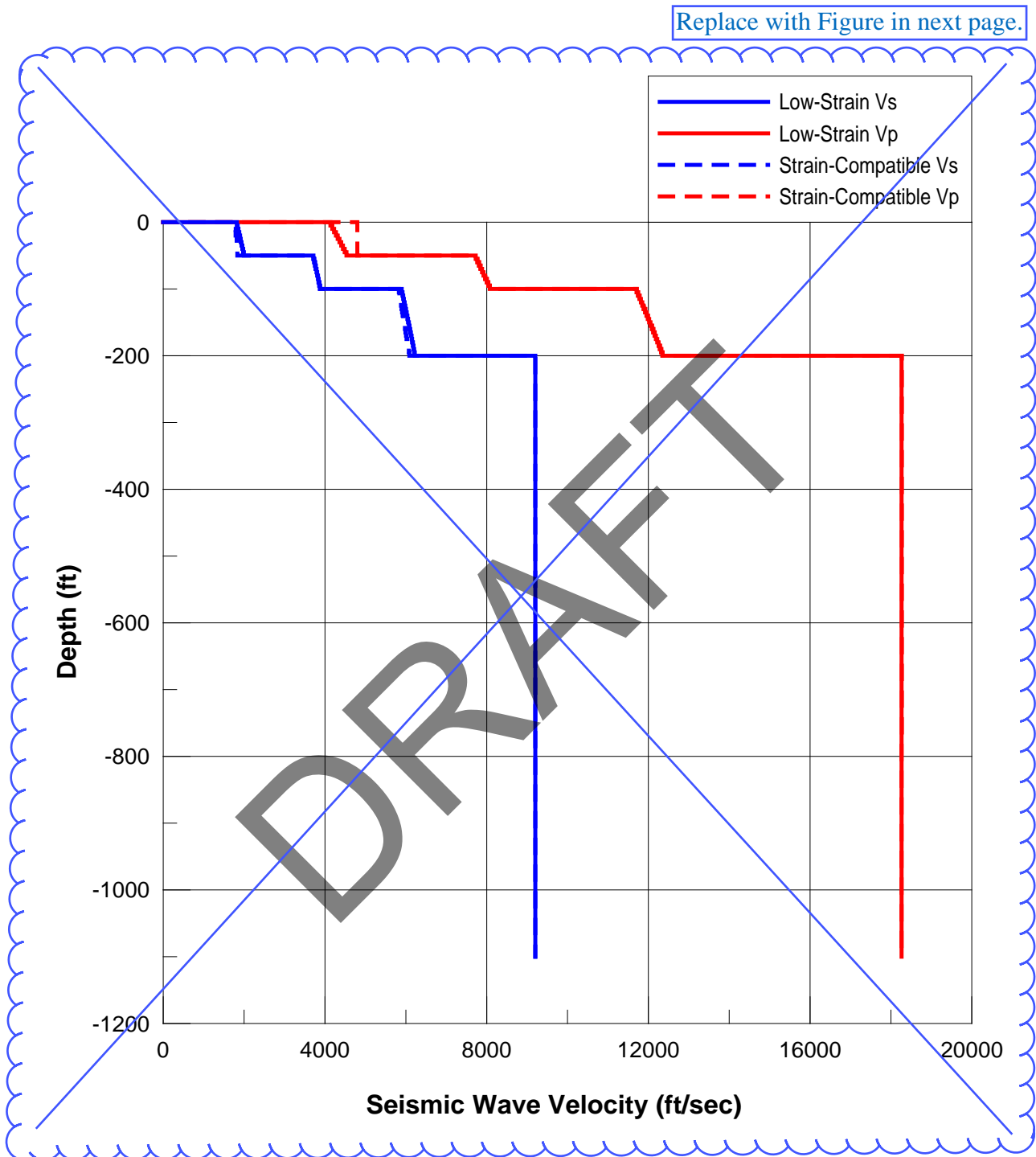


Figure 3.7A-9 Shear and Compression Wave Velocity Profiles for S7

APR1400 DCD TIER 2

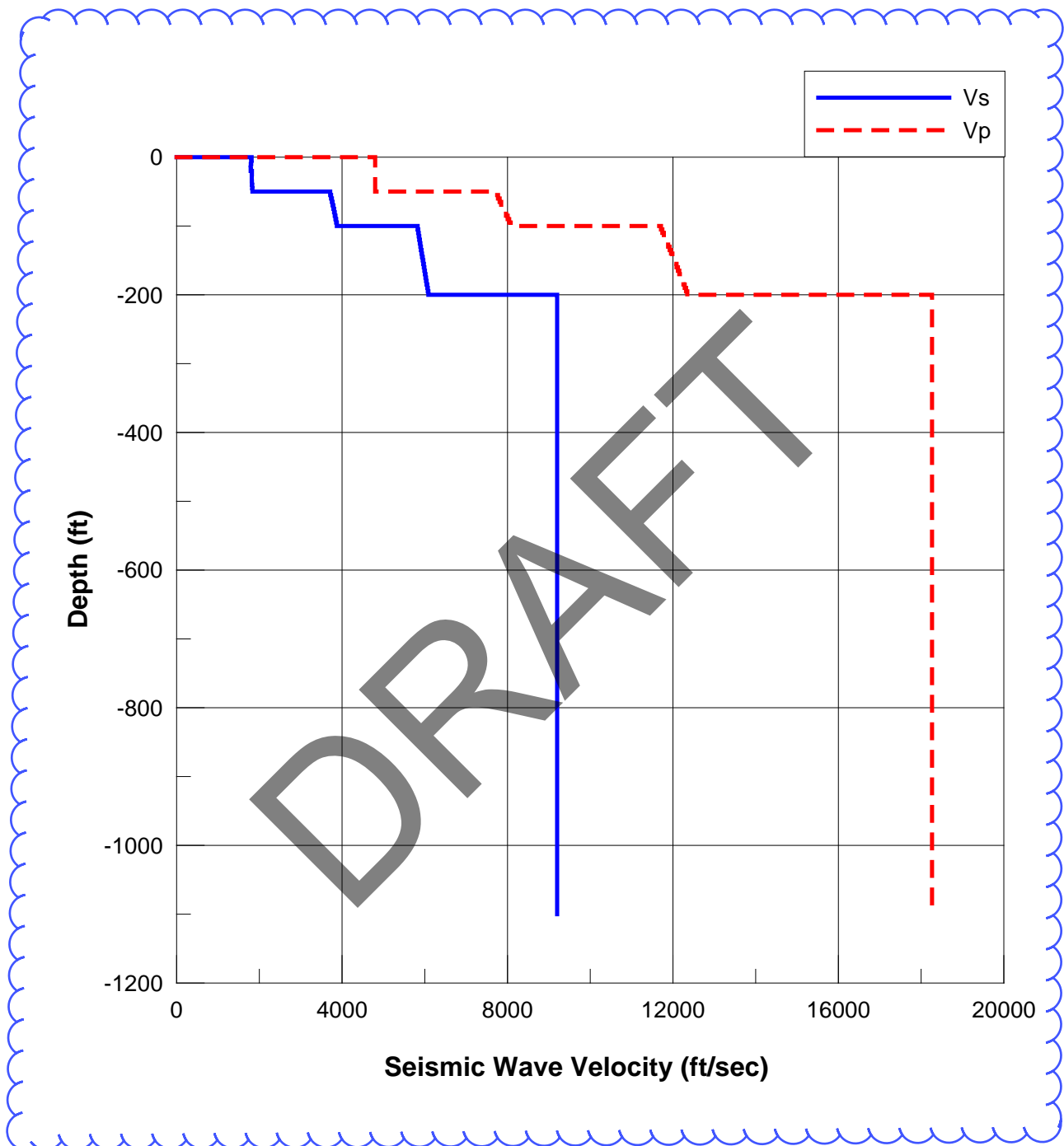


Figure 3.7A-9 Shear and Compression Wave Velocity Profiles for S7

APR1400 DCD TIER 2

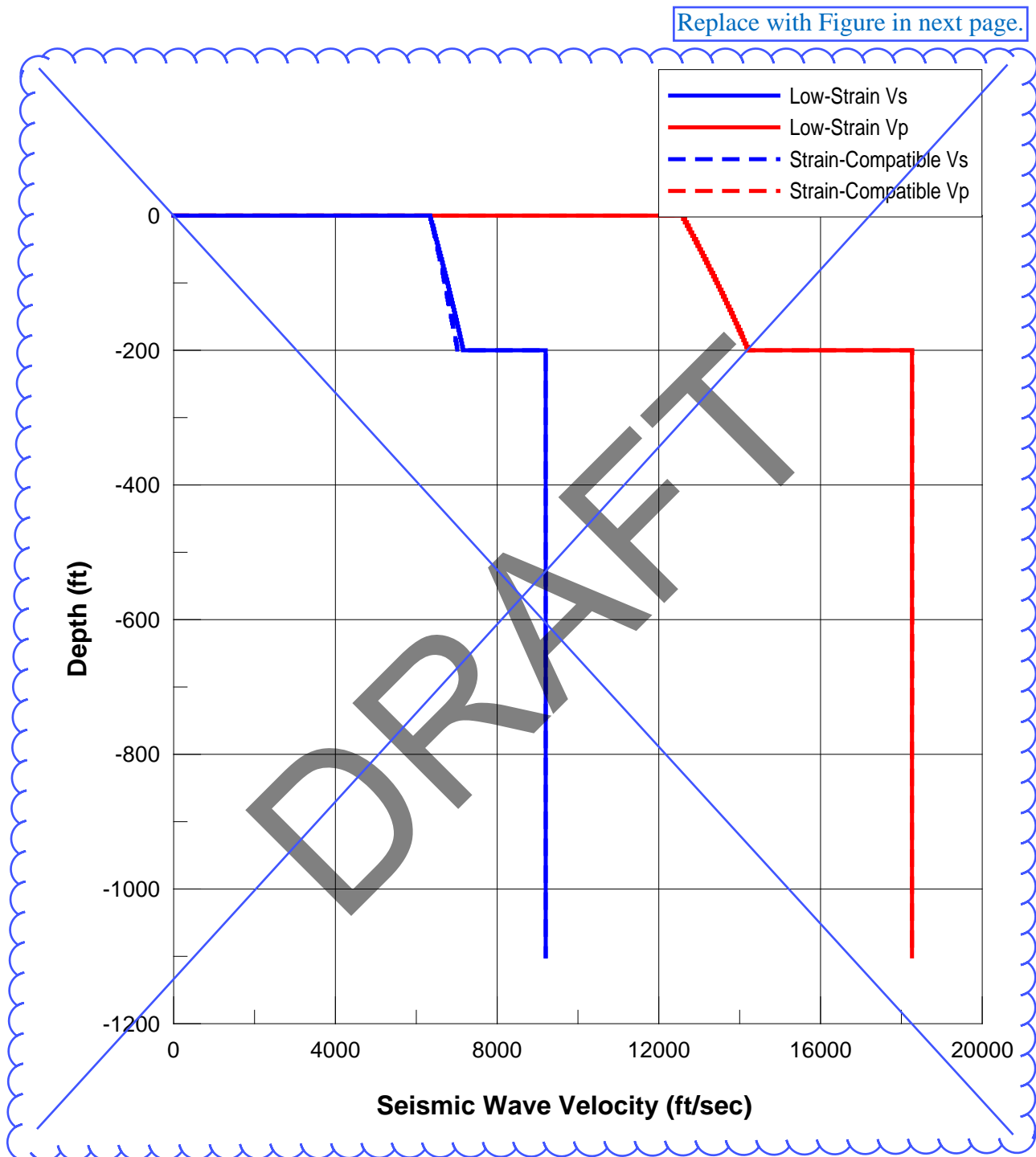


Figure 3.7A-10 Shear and Compression Wave Velocity Profiles for S8

APR1400 DCD TIER 2

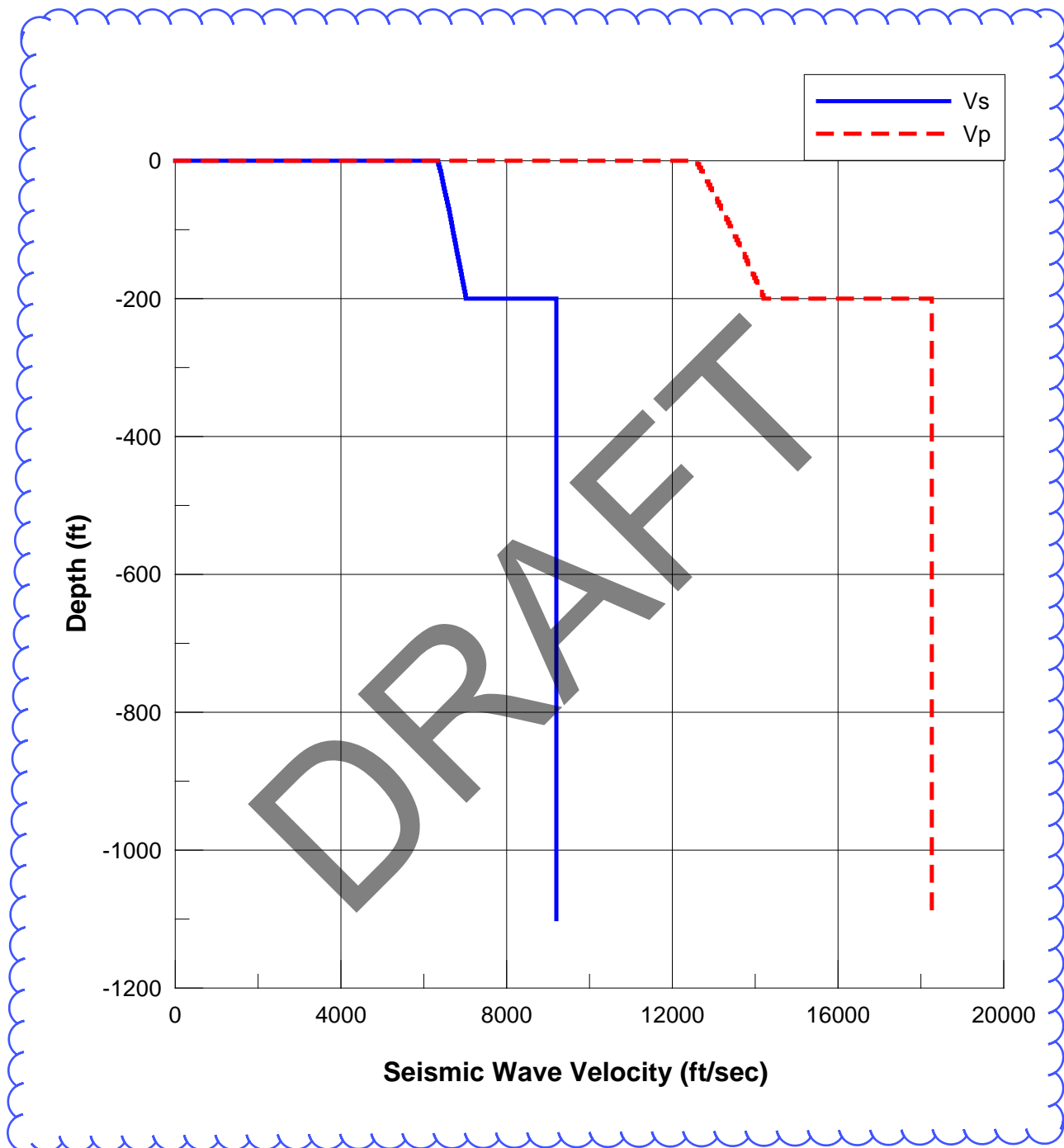


Figure 3.7A-10 Shear and Compression Wave Velocity Profiles for S8

APR1400 DCD TIER 2

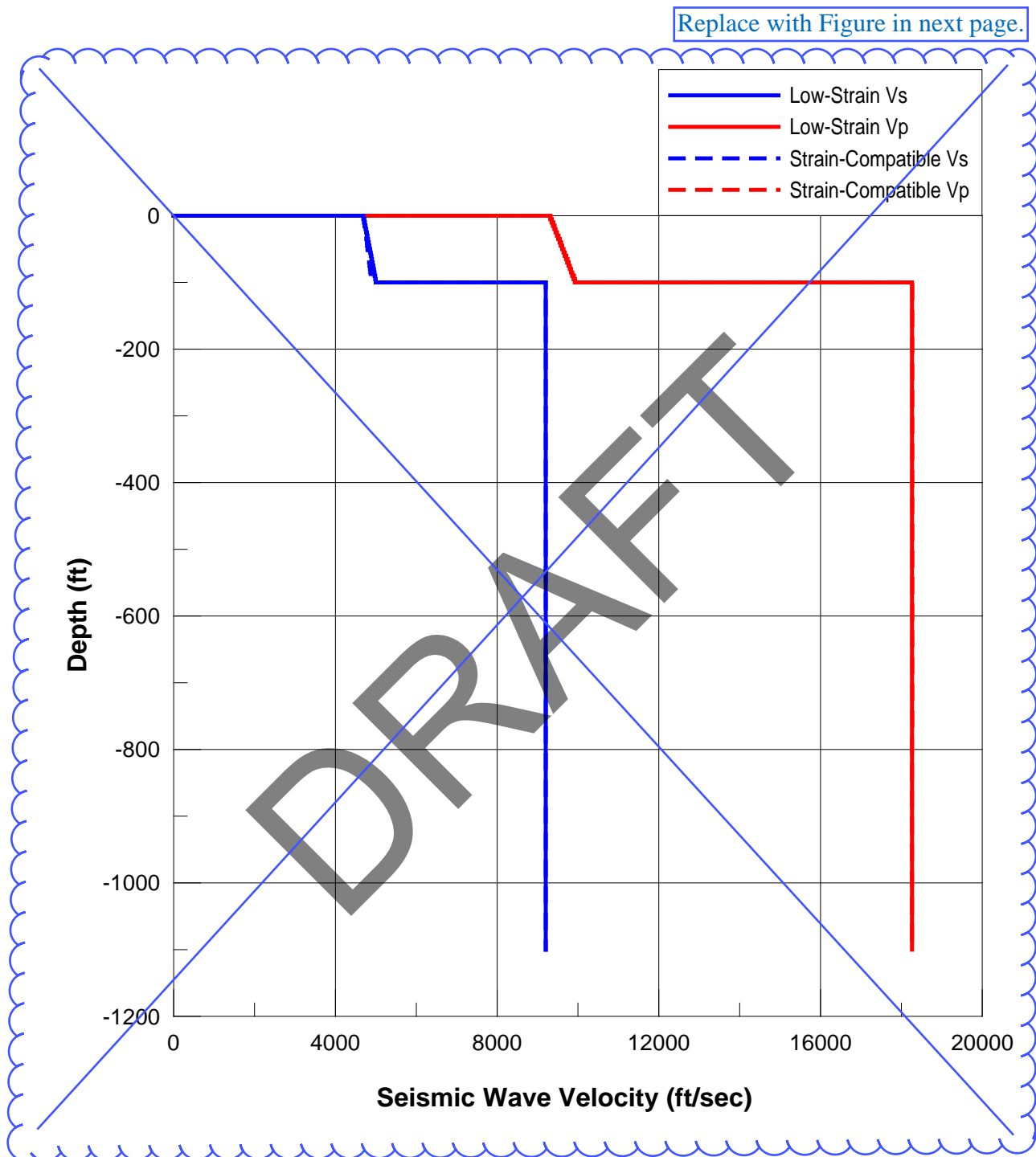


Figure 3.7A-11 Shear and Compression Wave Velocity Profiles for S9

APR1400 DCD TIER 2

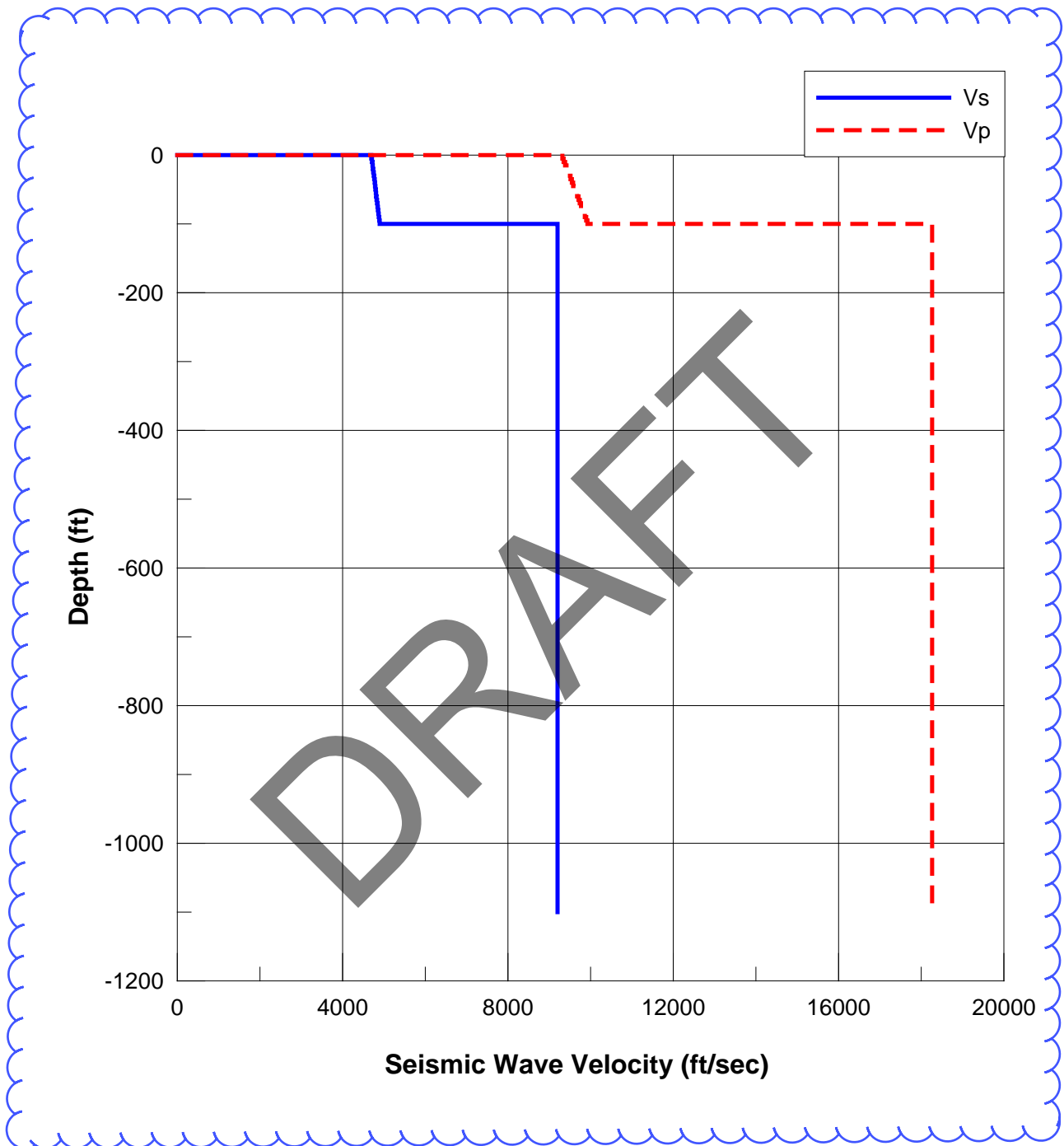


Figure 3.7A-11 Shear and Compression Wave Velocity Profiles for S9

APR1400 DCD TIER 2**LIST OF TABLES**

<u>NUMBER</u>	<u>TITLE</u>	<u>PAGE</u>
Table 3.7B-1	5%-Damped HRHF Horizontal Target Response Spectrum	3.7B-11
Table 3.7B-2	5%-Damped HRHF Vertical Target Response Spectrum.....	3.7B-12
Table 3.7B-3	Equipment List of Evaluation for High Frequency Seismic Input	3.7B-13
Table 3.7B-3	Soil Layers and Properties (S9 for HRHF Seismic Input Motions)	

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The HRHF vertical target response spectra for the 2, 3, 4, 7, and 10 percent damping ratios were generated by multiplying the V/H ratios for the CEUS rock site conditions by the corresponding HRHF horizontal target response spectra.

The generated HRHF horizontal and vertical target response spectra for the 2, 3, 4, 5, 7, and 10 percent damping ratios are shown in Chapter 3, Figures 3.7-12 and 3.7-13, respectively. The guidelines and criteria described in NRC SRP Section 3.7.1, Rev. 4, for Option 1 Approach 1 (Reference 6), were used for generating a set of three-component acceleration time histories compatible with HRHF target response spectra. The generated HRHF horizontal and vertical acceleration time histories, named H1H and H2H for both horizontal directions and VTH for vertical direction, are plotted along with the integrated velocity and displacement time histories that are presented in Chapter 3, Figures 3.7-14, 3.7-15, and 3.7-16, respectively. The comparisons of the time history response spectra with the corresponding HRHF horizontal and vertical target response spectra for each damping value are shown in Chapter 3, Figures 3.7-17, 3.7-18, and 3.7-19.

3.7B.3 High Frequency Site Profiles

Among the nine generic site-shear-wave-velocity profiles (site profiles S1 through S9) developed for the APR1400 standard plant design, the site profiles that could be classified as hard-rock sites are S8 and S9. For site profile S8, the depth of bedrock where the rock shear-wave velocity (V_s) is equal to 2,804 m/sec (9,200 ft/sec) is 61 m (200 ft). For site profile S9, the depth of bedrock where the V_s is equal to 2,804 m/sec (9,200 ft/sec) is 30.5 m (100 ft).

Site profile S9 was determined to be more critical when subjected to the HRHF horizontal seismic input motion than site profile S8, based on a comparison of the horizontal site response amplification transfer functions from the bedrock where V_s is equal to 2,084 m/sec (9,200 ft/sec) for site profiles S8 and S9. Therefore, the soil-structure interaction (SSI) analysis using the HRHF seismic input motion was performed for site profile S9.

3.7B.4 Soil-Structure Interaction Model

For the evaluation of the impact of HRHF seismic input motion on the APR1400 standard plant design, the nuclear island SSI model described in Subsection 3.7.2 was analyzed using the ACS SASSI computer program. Acceleration time histories compatible with the HRHF target response spectra are applied at the finished grade.

The soil layers, and their associated properties, used in the SSI model for HRHF seismic input motions are shown in Table 3.7B-3.

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In the APR1400 plant, the design acceptance criteria are applied to the piping design area. The combined license (COL) applicant is to evaluate the HRHF response spectra (COL 3.7B(1)).

3.7B.7.4 Safety-Related Electrical Equipment

Safety-related electrical equipment was evaluated for the effect of high frequency input motion for safety of the plant. Representative items were selected for the evaluation because they are susceptible to high frequency seismic inputs. Susceptibility to excitation caused by high frequency input depends on the presence of the following factors:

- a. The local HRHF ISRS exceed the APR1400 CSDRS ISRS in the high frequency range.
- b. Safety-related equipment has modes or natural frequencies in the high frequency range.
- c. Safety-related components have potential failure modes involving a change of state, chatter, signal change/drift, and/or connection problems.

Equipment with modes in the range of the high frequency response excitation is expected to experience higher loads and amplifications than equipment with modes outside a high frequency range. To support this expectation and determine the effect of high frequency seismic motion on the APR1400 safety-related electrical equipment, the equipment configuration, location, stress analysis methodology, and equipment qualification testing procedures were reviewed.

The COL applicant is to evaluate the representative items listed in Table 3.7B-3 (COL 3.7B(2)).

3.7B.8 Combined License Information

COL 3.7B(1) The COL applicant is to evaluate the HRHF response spectra.

COL 3.7B(2) The COL applicant is to evaluate the representative items listed in Table 3.7B-3.

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Table 3.7B-3 (1 of 4)

Soil Layers and Properties (S9 for HRHF Seismic Input Motions)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp (ft/s)	$\rho^{(2)}$
Rock	1	5	0.145	0.004	4,692	9,315	0.33
	2	5	0.145	0.006	4,707	9,348	0.33
	3	5	0.145	0.007	4,711	9,382	0.33
	4	5	0.145	0.008	4,720	9,415	0.33
	5	5	0.145	0.008	4,731	9,448	0.33
	6	5	0.145	0.008	4,737	9,481	0.33
	7	5	0.145	0.009	4,743	9,513	0.33
	8	5	0.145	0.009	4,750	9,546	0.34
	9	5	0.145	0.010	4,758	9,578	0.34
	10	5	0.145	0.010	4,767	9,610	0.34
	11	5	0.145	0.010	4,775	9,642	0.34
	12	5	0.145	0.010	4,785	9,674	0.34
	13	5	0.145	0.011	4,795	9,706	0.34
	14	5	0.145	0.011	4,807	9,737	0.34
	15	5	0.145	0.011	4,818	9,768	0.34
	16	5	0.145	0.011	4,830	9,799	0.34
	17	5	0.145	0.011	4,843	9,830	0.34
	18	5	0.145	0.011	4,855	9,861	0.34
	19	5	0.145	0.011	4,868	9,892	0.34
	20	5	0.145	0.011	4,882	9,922	0.34
	21	5	0.155	0.010	9,200	18,264	0.33
	22	5	0.155	0.010	9,200	18,264	0.33
	23	5	0.155	0.010	9,200	18,264	0.33
	24	5	0.155	0.010	9,200	18,264	0.33
	25	5	0.155	0.010	9,200	18,264	0.33
	26	5	0.155	0.010	9,200	18,264	0.33

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Table 3.7B-3 (2 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp (ft/s)	$\rho^{(2)}$
Rock (cont.)	27	5	0.155	0.010	9,200	18,264	0.33
	28	5	0.155	0.010	9,200	18,264	0.33
	29	5	0.155	0.010	9,200	18,264	0.33
	30	5	0.155	0.010	9,200	18,264	0.33
	31	5	0.155	0.010	9,200	18,264	0.33
	32	5	0.155	0.010	9,200	18,264	0.33
	33	5	0.155	0.010	9,200	18,264	0.33
	34	5	0.155	0.010	9,200	18,264	0.33
	35	5	0.155	0.010	9,200	18,264	0.33
	36	5	0.155	0.010	9,200	18,264	0.33
	37	5	0.155	0.010	9,200	18,264	0.33
	38	5	0.155	0.010	9,200	18,264	0.33
	39	5	0.155	0.010	9,200	18,264	0.33
	40	5	0.155	0.010	9,200	18,264	0.33
	41	10	0.155	0.010	9,200	18,264	0.33
	42	10	0.155	0.010	9,200	18,264	0.33
	43	10	0.155	0.010	9,200	18,264	0.33
	44	10	0.155	0.010	9,200	18,264	0.33
	45	10	0.155	0.010	9,200	18,264	0.33
	46	10	0.155	0.010	9,200	18,264	0.33
	47	10	0.155	0.010	9,200	18,264	0.33
	48	10	0.155	0.010	9,200	18,264	0.33
	49	10	0.155	0.010	9,200	18,264	0.33
	50	10	0.155	0.010	9,200	18,264	0.33
	51	10	0.155	0.010	9,200	18,264	0.33
	52	10	0.155	0.010	9,200	18,264	0.33

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Added

Table 3.7B-3 (3 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp (ft/s)	$\rho^{(2)}$
Rock (cont.)	53	10	0.155	0.010	9,200	18,264	0.33
	54	10	0.155	0.010	9,200	18,264	0.33
	55	10	0.155	0.010	9,200	18,264	0.33
	56	10	0.155	0.010	9,200	18,264	0.33
	57	10	0.155	0.010	9,200	18,264	0.33
	58	10	0.155	0.010	9,200	18,264	0.33
	59	10	0.155	0.010	9,200	18,264	0.33
	60	10	0.155	0.010	9,200	18,264	0.33
	61	10	0.155	0.010	9,200	18,264	0.33
	62	10	0.155	0.010	9,200	18,264	0.33
	63	10	0.155	0.010	9,200	18,264	0.33
	64	10	0.155	0.010	9,200	18,264	0.33
	65	10	0.155	0.010	9,200	18,264	0.33
	66	10	0.155	0.010	9,200	18,264	0.33
	67	10	0.155	0.010	9,200	18,264	0.33
	68	10	0.155	0.010	9,200	18,264	0.33
	69	10	0.155	0.010	9,200	18,264	0.33
	70	10	0.155	0.010	9,200	18,264	0.33
	71	20	0.155	0.010	9,200	18,264	0.33
	72	20	0.155	0.010	9,200	18,264	0.33
	73	20	0.155	0.010	9,200	18,264	0.33
	74	20	0.155	0.010	9,200	18,264	0.33
	75	20	0.155	0.010	9,200	18,264	0.33
	76	20	0.155	0.010	9,200	18,264	0.33
	77	20	0.155	0.010	9,200	18,264	0.33
	78	20	0.155	0.010	9,200	18,264	0.33

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Added

Table 3.7B-3 (4 of 4)

Soil Type	Layer No.	Thick (ft)	$\gamma^{(1)}$ (k/ft ³)	Damp.	Vs (ft/s)	Vp (ft/s)	$\rho^{(2)}$
Rock (cont.)	79	20	0.155	0.010	9,200	18,264	0.33
	80	20	0.155	0.010	9,200	18,264	0.33
	81	20	0.155	0.010	9,200	18,264	0.33
	82	20	0.155	0.010	9,200	18,264	0.33
	83	20	0.155	0.010	9,200	18,264	0.33
	84	20	0.155	0.010	9,200	18,264	0.33
	85	20	0.155	0.010	9,200	18,264	0.33
	86	20	0.155	0.010	9,200	18,264	0.33
	87	20	0.155	0.010	9,200	18,264	0.33
	88	20	0.155	0.010	9,200	18,264	0.33
	89	20	0.155	0.010	9,200	18,264	0.33
	90	20	0.155	0.010	9,200	18,264	0.33
	91	20	0.155	0.010	9,200	18,264	0.33
	92	20	0.155	0.010	9,200	18,264	0.33
	93	20	0.155	0.010	9,200	18,264	0.33
	94	20	0.155	0.010	9,200	18,264	0.33
	95	20	0.155	0.010	9,200	18,264	0.33
	96	—	0.155	0.004	9,200	18,264	0.33

(1) Unit weight density of soil/rock

(2) Poisson's Ratio

APR1400 DCD TIER 2




 Table 3.7B-4 (1 of 2)

Equipment List of Evaluation for High Frequency Seismic Input

Equipment	Description
125V DC 1E Battery	Battery
1E Battery Charger	Battery Charger
1E DC Control Center	Distribution Panels
Non-1E DC Control Center	
Ground Fault Monitoring Cabinet	
125V DC Distr. PNL	
480V 1E MCC	
1E Regulating TR.	Transformer
1E Inverter	Inverter
1E AB 4.16KV SWGR	Switchgear
Spent Fuel Pool Level	Level Switches and Transfer
Floor Drain Sump Flooding Level	
CCW Sump Flooding Level	
SI Pump Room Flooding Level	
SC Pump Room Flooding Level	
CS Pump Room Flooding Level	
BOP RMS Cabinet (SRDC)	Radiation Monitor
MMIS-BOP MCR Consoles	Main Control Room
MMIS-BOP ESF-CCS (LCC and GCC)	
MMIS-BOP QIAS-N	
Flexible Hose	Active Hose
Reactor Trip Switchgear	Switchgear
RCP Pump Speed	Speed Sensor
RCS Hot Leg Water Level	Transmitters
PZR Level	
PZR Wide Range Pressure	
PZR Narrow Range Pressure	

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Table 3.7B-3 (2 of 2)

Equipment	Description
POSRV Motor Operated Isolation Valve	Active Valves
Pilot Operated Safety Relief Valve	
SIT Discharge Isolation	
PZR Level Reference Leg Temperature	Resistance Temperature Detector
SIT N2 Vent	Non Active Valve
SCS Heat Exchanger	Heat Exchanger
Safety Injection Tank	Tank

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5. GENERIC SITE SOIL PROFILES

Support for various generic site profiles was considered in the APR1400 standard plant design. A total of nine (9) generic site profiles plus a 10th fixed-base support condition were developed. The nine generic site conditions considered are all horizontally layered sites with site shear wave velocities varying from soft to medium to firm soil sites and soft to medium to hard rock sites. For each of the nine generic site profiles considered, free-field site response analyses are performed to develop the free field site response strain-compatible soil/rock dynamic properties to be used as input for the seismic soil-structure interaction (SSI) analysis.

The nine generic site profiles considered and the free-field site response analyses performed are described in the following subsections.

5.1 Generic Site Profiles

The nine (9) generic site profiles considered for the APR1400 standard plant design consist of six (6) site-layering categories, labeled site-layering categories A through F with their site-layer thicknesses and depths from the ground surface as follows:

Site-Layering Category	Layer Thickness (ft)	Layer Depth Range (ft)
A	55	0 ~ 55
B	45	55 ~ 100
C	100	100 ~ 200
D	300	200 ~ 500
E	500	500 ~ 1000
F	Infinite	Halfspace > 1000

In addition to six (6) site-layering categories, five (5) average-shear-wave-velocity categories, labeled as P1 through P5, with their average shear-wave-velocity values as shown below are considered:

Average Shear-Wave Velocity Category	Average Shear-Wave Velocity (ft/sec)
P1	1,200
P2	2,000
P3	4,000
P4	6,000
P5	9,200

The site soil/rock material unit weight (weight density), Poisson's Ratio, and types of shear-strain-dependent modulus-degradation and damping value variation curves for the soil/rock material (sand, soft rock, and rock) considered for each of the categories P1 through P5 are shown in Table 5-1.

The nine (9) generic site profiles considered for design of the APR1400 standard plant, designated as S1 through S9, are developed with combinations of the site-layering categories A through F and the average shear-wave velocity categories P1 through P5, as shown in Table 5-2. Figure 5-1 shows the low-strain shear wave velocity profiles vs. depth for the nine generic site profiles considered.

The compression wave velocity profiles vs. depth for the nine generic site profiles considered are derived from the low-strain shear wave velocity profiles and their corresponding Poisson's ratios shown in Table 5-1 using the following formula:

$$V_p = \sqrt{\frac{2(1-\nu)}{1-2\nu}} V_s$$

Where

V_s = Shear wave velocity,

V_p = Compression wave velocity

ν = Poisson's Ratio.

The representative generic site profiles, S1 through S9, for the shear wave velocities and compression wave velocities used in the site response analysis for the APR1400 are shown in Tables 5-3 to 5-11 and Figures 5-2 to 5-10.

The shear-strain-dependent, soil/rock modulus degradation and damping value variation curves for the soil/rock materials (sand, soft rock, and rock) considered for the nine generic site profiles are shown in Figure 5-11 for sand, Figure 5-12 for soft rock, and Figure 5-13 for rock. The curves for sand considered, as shown in Figure 5-11, adopt the sand curves published in the Electric Power Research Institute (EPRI) TR-102293 (Reference 15). The curves for soft rock, as shown in Figure 5-12, adopt the curves for soft rock published in Silva's report (Reference 16). The curves for rock considered, as shown in Figure 5-13, adopt the curves for rock used in the SHAKE computer program (Reference 17, 18).

For the APR1400 standard plant design, the design groundwater table elevation is 2 ft below the ground surface at El. 96'-8", and the extreme groundwater table elevation considered in the design is at the ground surface at El. 98'-8" (Reference 3). If the compression wave velocity (V_p) of subgrade soil below the groundwater table computed from the low-strain shear wave velocity and Poisson's ratio has a value less than the V_p of water (4,800 ft/sec), the V_p value of the soil is taken to be not less than 4,800 ft/sec.

5.2 Strain-Compatible Soil Properties

Horizontal free-field site response analyses are carried out for the nine generic site profiles S1 through S9, subjected to the free-field seismic ground motion input at the ground surface at El. 98'-8". The free-field seismic ground motion input is the CSDRS-compatible acceleration time histories H1 and H2 applied in the plant E-W and N-S directions, respectively. For each generic site profile, the horizontal free-field site response analyses are performed separately for H1 (E-W) and H2 (N-S) time-history inputs using the SHAKE computer program (Reference 17, 18). The shear-strain-compatible shear wave velocity profiles obtained from the analyses using H1 and H2 inputs are then averaged to produce the averaged shear-strain-compatible shear wave velocity profile for each generic site profile considered. The averaged shear-strain-compatible shear wave velocity profiles so obtained for S1 through S9 are the free-field site profiles used in development of the seismic SSI analysis models.

For the free-field site response analysis for each generic site profile, a low-strain soil column model to be used in the SHAKE analysis is developed. The SHAKE soil column models are developed to pass vertically propagating plane seismic shear waves up to a cut-off frequency of at least 50 Hz. The SHAKE soil column models so developed for all nine generic site profiles considered are tabulated in Tables 5-3 through 5-11.

In the horizontal site response analyses, the strain-compatible soil/rock properties resulting from the E-W and N-S components of the seismic input motions differ slightly from each other because of the different time-history input motions. To obtain a common set of strain-compatible soil properties for the SSI analysis, the strain-compatible soil properties resulting from the E-W and N-S input motions for each case are averaged. The average sets of strain-compatible properties for nine soil profiles are shown in Tables 5-12 through 5-20. The strain-compatible soil properties shown in Tables 5-12 through 5-20 and Figures

Table 5-1

Low-strain

Generic Soil Profiles Dynamic Properties of Generic Soil/Rock Materials for Site Average Shear-Wave Velocity Categories P1 through P5

Average-Shear Wave-Velocity Category No.	Average-Shear Wave-Velocity (ft/sec)	Soil/Rock Unit Weight (lb/ft ³)	Poisson's Ratio (ν)	Degradation Curve Type (EPRI)
P1	1,200	125	0.40	Sand
P2	2,000	130	0.38	Sand
P3	4,000	135	0.35	Soft Rock
P4	6,000	145	0.33	Rock
P5	9,200	155	0.33	Rock

Table 5-2

Low-strain

Site Layering and Average Shear-Wave Velocity Categories Considered for the Nine Generic Site Profiles

Layer Site Category Depth from Ground Surface (ft)	Generic Soil Profile No.								
	S1	S2	S3	S4	S5	S6	S7	S8	S9
	Average Shear-Wave Velocity No.								
A 0 ~ 50 ft	P1	P1	P2	P2	P3	P2	P2	P4	P4
B 50 ~ 100 ft	P1	P1	P2	P2	P3	P3	P3	P4	P4
C 100 ~ 200 ft	P1	P2	P2	P3	P4	P3	P4	P4	P5
D 200 ~ 500 ft	P2	P3	P3	P4	P4	P5	P5	P5	P5
E 500 ~ 1,000 ft	P3	P4	P5	P5	P5	P5	P5	P5	P5
F > 1,000 ft	P5	P5	P5	P5	P5	P5	P5	P5	P5

Table 5-3 (1 of 4)

Low-strain

Soil Layers and Properties (Case S1)

Layer No.	Soil Type	Thickness (ft)	Depth Layer Top (ft)	Depth Layer Bottom (ft)	Weight Density (kcf)	Shear Wave Velocity V_s (fps)	Compression Wave Velocity $V_p^{1)}$ (fps)	Poisson's Ratio
1	Sand	5	0	5	0.125	1,173	2,873	0.40
2		5	5	10	0.125	1,196	2,929	0.40
3		5	10	15	0.125	1,219	2,985	0.40
4		5	15	20	0.125	1,241	3,040	0.40
5		5	20	25	0.125	1,264	3,095	0.40
6		5	25	30	0.125	1,286	3,150	0.40
7		5	30	35	0.125	1,308	3,204	0.40
8		5	35	40	0.125	1,330	3,259	0.40
9		5	40	45	0.125	1,352	3,313	0.40
10		5	45	50	0.125	1,374	3,366	0.40
11		5	50	55	0.125	1,396	3,420	0.40
12		5	55	60	0.125	1,418	3,473	0.40
13		5	60	65	0.125	1,439	3,526	0.40
14		5	65	70	0.125	1,461	3,578	0.40
15		5	70	75	0.125	1,482	3,630	0.40
16		5	75	80	0.125	1,503	3,682	0.40
17		5	80	85	0.125	1,524	3,734	0.40
18		5	85	90	0.125	1,545	3,785	0.40
19		5	90	95	0.125	1,566	3,837	0.40
20		5	95	100	0.125	1,587	3,887	0.40
21		5	100	105	0.125	1,608	3,938	0.40
22		5	105	110	0.125	1,628	3,988	0.40
23		5	110	115	0.125	1,649	4,038	0.40
24		5	115	120	0.125	1,669	4,088	0.40
25		5	120	125	0.125	1,689	4,137	0.40
26		5	125	130	0.125	1,709	4,187	0.40
27		5	130	135	0.125	1,729	4,235	0.40
28		5	135	140	0.125	1,749	4,284	0.40
29		5	140	145	0.125	1,769	4,332	0.40
30		5	145	150	0.125	1,788	4,380	0.40

Table 5-4 (1 of 4)

Low-strain

Soil Layers and Properties (Case S2)

Layer No.	Soil Type	Thickness (ft)	Depth Layer Top (ft)	Depth Layer Bottom (ft)	Weight Density (kcf)	Shear Wave Velocity Vs (fps)	Compression Wave Velocity Vp ¹⁾ (fps)	Poisson's Ratio
1	Sand	5	0	5	0.125	1,020	2,498	0.40
2		5	5	10	0.125	1,040	2,547	0.40
3		5	10	15	0.125	1,060	2,595	0.40
4		5	15	20	0.125	1,079	2,644	0.40
5		5	20	25	0.125	1,099	2,691	0.40
6		5	25	30	0.125	1,118	2,739	0.40
7		5	30	35	0.125	1,138	2,786	0.40
8		5	35	40	0.125	1,157	2,834	0.40
9		5	40	45	0.125	1,176	2,881	0.40
10		5	45	50	0.125	1,195	2,927	0.40
11		5	50	55	0.125	1,214	2,974	0.40
12		5	55	60	0.125	1,233	3,020	0.40
13		5	60	65	0.125	1,252	3,066	0.40
14		5	65	70	0.125	1,270	3,111	0.40
15		5	70	75	0.125	1,289	3,157	0.40
16		5	75	80	0.125	1,307	3,202	0.40
17		5	80	85	0.125	1,326	3,247	0.40
18		5	85	90	0.125	1,344	3,292	0.40
19		5	90	95	0.125	1,362	3,336	0.40
20		5	95	100	0.125	1,380	3,380	0.40
21		5	100	105	0.130	2,198	4,996	0.38
22		5	105	110	0.130	2,216	5,037	0.38
23		5	110	115	0.130	2,234	5,077	0.38
24		5	115	120	0.130	2,251	5,117	0.38
25		5	120	125	0.130	2,269	5,157	0.38
26		5	125	130	0.130	2,286	5,197	0.38
27		5	130	135	0.130	2,304	5,236	0.38
28		5	135	140	0.130	2,321	5,275	0.38
29		5	140	145	0.130	2,338	5,314	0.38
30		5	145	150	0.130	2,355	5,353	0.38

Table 5-5 (1 of 4)

Low-strain

Soil Layers and Properties (Case S3)

Layer No.	Soil Type	Thickness (ft)	Depth Layer Top (ft)	Depth Layer Bottom (ft)	Weight Density (kcf)	Shear Wave Velocity Vs (fps)	Compression Wave Velocity Vp ¹⁾ (fps)	Poisson's Ratio
1	Sand	5	0	5	0.130	2,090	4,800	0.38
2		5	5	10	0.130	2,090	4,809	0.38
3		5	10	15	0.130	2,081	4,861	0.38
4		5	15	20	0.130	2,082	4,912	0.38
5		5	20	25	0.130	2,126	4,963	0.38
6		5	25	30	0.130	2,129	5,014	0.38
7		5	30	35	0.130	2,130	5,065	0.38
8		5	35	40	0.130	2,134	5,115	0.38
9		5	40	45	0.130	2,140	5,165	0.38
10		5	45	50	0.130	2,148	5,215	0.38
11		5	50	55	0.130	2,213	5,264	0.38
12		5	55	60	0.130	2,226	5,314	0.38
13		5	60	65	0.130	2,241	5,363	0.38
14		5	65	70	0.130	2,255	5,412	0.38
15		5	70	75	0.130	2,270	5,460	0.38
16		5	75	80	0.130	2,285	5,508	0.38
17		5	80	85	0.130	2,300	5,556	0.38
18		5	85	90	0.130	2,315	5,604	0.38
19		5	90	95	0.130	2,331	5,651	0.38
20		5	95	100	0.130	2,345	5,699	0.38
21		5	100	105	0.130	2,358	5,745	0.38
22		5	105	110	0.130	2,372	5,792	0.38
23		5	110	115	0.130	2,386	5,839	0.38
24		5	115	120	0.130	2,400	5,885	0.38
25		5	120	125	0.130	2,466	5,931	0.38
26		5	125	130	0.130	2,482	5,976	0.38
27		5	130	135	0.130	2,498	6,021	0.38
28		5	135	140	0.130	2,514	6,067	0.38
29		5	140	145	0.130	2,530	6,111	0.38
30		5	145	150	0.130	2,546	6,156	0.38

Table 5-6 (1 of 4)

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Soil Layers and Properties (Case S4)

Layer No.	Soil Type	Thickness (ft)	Depth Layer Top (ft)	Depth Layer Bottom (ft)	Weight Density (kcf)	Shear Wave Velocity Vs (fps)	Compression Wave Velocity Vp ¹⁾ (fps)	Poisson's Ratio
1	Sand	5	0	5	0.130	1,820	4,137	0.38
2		5	5	10	0.130	1,840	4,182	0.38
3		5	10	15	0.130	1,860	4,227	0.38
4		5	15	20	0.130	1,879	4,272	0.38
5		5	20	25	0.130	1,899	4,316	0.38
6		5	25	30	0.130	1,918	4,360	0.38
7		5	30	35	0.130	1,938	4,404	0.38
8		5	35	40	0.130	1,957	4,448	0.38
9		5	40	45	0.130	1,976	4,491	0.38
10		5	45	50	0.130	1,995	4,535	0.38
11		5	50	55	0.130	2,014	4,578	0.38
12		5	55	60	0.130	2,033	4,621	0.38
13		5	60	65	0.130	2,052	4,663	0.38
14		5	65	70	0.130	2,070	4,706	0.38
15		5	70	75	0.130	2,089	4,748	0.38
16		5	75	80	0.130	2,107	4,790	0.38
17		5	80	85	0.130	2,126	4,831	0.38
18		5	85	90	0.130	2,144	4,873	0.38
19		5	90	95	0.130	2,162	4,914	0.38
20		5	95	100	0.130	2,180	4,955	0.38
21	Soft Rock	5	100	105	0.135	3,898	8,114	0.35
22		5	105	110	0.135	3,916	8,151	0.35
23		5	110	115	0.135	3,934	8,188	0.35
24		5	115	120	0.135	3,951	8,225	0.35
25		5	120	125	0.135	3,969	8,262	0.35
26		5	125	130	0.135	3,986	8,298	0.35
27		5	130	135	0.135	4,004	8,334	0.35
28		5	135	140	0.135	4,021	8,370	0.35
29		5	140	145	0.135	4,038	8,406	0.35
30		5	145	150	0.135	4,055	8,441	0.35

Table 5-7 (1 of 4)

Low-strain

Soil Layers and Properties (Case S5)

Layer No.	Soil Type	Thickness (ft)	Depth Layer Top (ft)	Depth Layer Bottom (ft)	Weight Density (kcf)	Shear Wave Velocity Vs (fps)	Compression Wave Velocity Vp ¹⁾ (fps)	Poisson's Ratio
1	Soft Rock	5	0	5	0.135	4,048	8,427	0.35
2		5	5	10	0.135	4,071	8,474	0.35
3		5	10	15	0.135	4,094	8,521	0.35
4		5	15	20	0.135	4,116	8,568	0.35
5		5	20	25	0.135	4,139	8,615	0.35
6		5	25	30	0.135	4,161	8,662	0.35
7		5	30	35	0.135	4,183	8,708	0.35
8		5	35	40	0.135	4,205	8,754	0.35
9		5	40	45	0.135	4,227	8,800	0.35
10		5	45	50	0.135	4,249	8,846	0.35
11		5	50	55	0.135	4,271	8,891	0.35
12		5	55	60	0.135	4,293	8,936	0.35
13		5	60	65	0.135	4,314	8,981	0.35
14		5	65	70	0.135	4,336	9,026	0.35
15		5	70	75	0.135	4,357	9,070	0.35
16		5	75	80	0.135	4,378	9,114	0.35
17		5	80	85	0.135	4,399	9,158	0.35
18		5	85	90	0.135	4,420	9,202	0.35
19		5	90	95	0.135	4,441	9,245	0.35
20		5	95	100	0.135	4,462	9,288	0.35
21	Rock	5	100	105	0.145	6,783	13,465	0.33
22		5	105	110	0.145	6,803	13,506	0.33
23		5	110	115	0.145	6,824	13,546	0.33
24		5	115	120	0.145	6,844	13,587	0.33
25		5	120	125	0.145	6,864	13,627	0.33
26		5	125	130	0.145	6,884	13,667	0.33
27		5	130	135	0.145	6,904	13,706	0.33
28		5	135	140	0.145	6,924	13,746	0.33
29		5	140	145	0.145	6,944	13,785	0.33
30		5	145	150	0.145	6,963	13,824	0.33

Table 5-8 (1 of 4)

Low-strain

Soil Layers and Properties (Case S6)

Layer No.	Soil Type	Thickness (ft)	Depth Layer Top (ft)	Depth Layer Bottom (ft)	Weight Density (kcf)	Shear Wave Velocity Vs (fps)	Compression Wave Velocity Vp ¹⁾ (fps)	Poisson's Ratio
1	Sand	5	0	5	0.130	2,093	4,757	0.38
2		5	5	10	0.130	2,116	4,809	0.38
3		5	10	15	0.130	2,139	4,861	0.38
4		5	15	20	0.130	2,161	4,912	0.38
5		5	20	25	0.130	2,184	4,963	0.38
6		5	25	30	0.130	2,206	5,014	0.38
7		5	30	35	0.130	2,228	5,065	0.38
8		5	35	40	0.130	2,250	5,115	0.38
9		5	40	45	0.130	2,272	5,165	0.38
10		5	45	50	0.130	2,294	5,215	0.38
11	Soft Rock	5	50	55	0.135	4,271	8,891	0.35
12		5	55	60	0.135	4,293	8,936	0.35
13		5	60	65	0.135	4,314	8,981	0.35
14		5	65	70	0.135	4,336	9,026	0.35
15		5	70	75	0.135	4,357	9,070	0.35
16		5	75	80	0.135	4,378	9,114	0.35
17		5	80	85	0.135	4,399	9,158	0.35
18		5	85	90	0.135	4,420	9,202	0.35
19		5	90	95	0.135	4,441	9,245	0.35
20		5	95	100	0.135	4,462	9,288	0.35
21		5	100	105	0.135	4,483	9,331	0.35
22		5	105	110	0.135	4,503	9,374	0.35
23		5	110	115	0.135	4,524	9,417	0.35
24		5	115	120	0.135	4,544	9,459	0.35
25		5	120	125	0.135	4,564	9,501	0.35
26		5	125	130	0.135	4,584	9,543	0.35
27		5	130	135	0.135	4,604	9,584	0.35
28		5	135	140	0.135	4,624	9,626	0.35
29		5	140	145	0.135	4,644	9,667	0.35
30		5	145	150	0.135	4,663	9,707	0.35

Table 5-9 (1 of 4)

Low-strain

Soil Layers and Properties (Case S7)

Layer No.	Soil Type	Thickness (ft)	Depth Layer Top (ft)	Depth Layer Bottom (ft)	Weight Density (kcf)	Shear Wave Velocity Vs (fps)	Compression Wave Velocity Vp ¹⁾ (fps)	Poisson's Ratio
1	Sand	5	0	5	0.130	1,820	4,137	0.38
2		5	5	10	0.130	1,840	4,182	0.38
3		5	10	15	0.130	1,860	4,227	0.38
4		5	15	20	0.130	1,879	4,272	0.38
5		5	20	25	0.130	1,899	4,316	0.38
6		5	25	30	0.130	1,918	4,360	0.38
7		5	30	35	0.130	1,938	4,404	0.38
8		5	35	40	0.130	1,957	4,448	0.38
9		5	40	45	0.130	1,976	4,491	0.38
10		5	45	50	0.130	1,995	4,535	0.38
11	Soft Rock	5	50	55	0.135	3,714	7,731	0.35
12		5	55	60	0.135	3,733	7,770	0.35
13		5	60	65	0.135	3,752	7,810	0.35
14		5	65	70	0.135	3,770	7,848	0.35
15		5	70	75	0.135	3,789	7,887	0.35
16		5	75	80	0.135	3,807	7,925	0.35
17		5	80	85	0.135	3,826	7,964	0.35
18		5	85	90	0.135	3,844	8,002	0.35
19		5	90	95	0.135	3,862	8,039	0.35
20		5	95	100	0.135	3,880	8,077	0.35
21	Rock	5	100	105	0.145	5,898	11,709	0.33
22		5	105	110	0.145	5,916	11,744	0.33
23		5	110	115	0.145	5,934	11,780	0.33
24		5	115	120	0.145	5,951	11,815	0.33
25		5	120	125	0.145	5,969	11,849	0.33
26		5	125	130	0.145	5,986	11,884	0.33
27		5	130	135	0.145	6,004	11,919	0.33
28		5	135	140	0.145	6,021	11,953	0.33
29		5	140	145	0.145	6,038	11,987	0.33
30		5	145	150	0.145	6,055	12,021	0.33

Table 5-10 (1 of 4)

Low-strain

Soil Layers and Properties (Case S8)

Layer No.	Soil Type	Thickness (ft)	Depth Layer Top (ft)	Depth Layer Bottom (ft)	Weight Density (kcf)	Shear Wave Velocity Vs (fps)	Compression Wave Velocity Vp ¹⁾ (fps)	Poisson's Ratio
1	Rock	5	0	5	0.145	6,348	12,602	0.33
2		5	5	10	0.145	6,371	12,648	0.33
3		5	10	15	0.145	6,394	12,693	0.33
4		5	15	20	0.145	6,416	12,738	0.33
5		5	20	25	0.145	6,439	12,782	0.33
6		5	25	30	0.145	6,461	12,827	0.33
7		5	30	35	0.145	6,483	12,871	0.33
8		5	35	40	0.145	6,505	12,915	0.33
9		5	40	45	0.145	6,527	12,958	0.33
10		5	45	50	0.145	6,549	13,002	0.33
11		5	50	55	0.145	6,571	13,045	0.33
12		5	55	60	0.145	6,593	13,088	0.33
13		5	60	65	0.145	6,614	13,131	0.33
14		5	65	70	0.145	6,636	13,174	0.33
15		5	70	75	0.145	6,657	13,216	0.33
16		5	75	80	0.145	6,678	13,258	0.33
17		5	80	85	0.145	6,699	13,300	0.33
18		5	85	90	0.145	6,720	13,342	0.33
19		5	90	95	0.145	6,741	13,383	0.33
20		5	95	100	0.145	6,762	13,424	0.33
21		5	100	105	0.145	6,783	13,465	0.33
22		5	105	110	0.145	6,803	13,506	0.33
23		5	110	115	0.145	6,824	13,546	0.33
24		5	115	120	0.145	6,844	13,587	0.33
25		5	120	125	0.145	6,864	13,627	0.33
26		5	125	130	0.145	6,884	13,667	0.33
27		5	130	135	0.145	6,904	13,706	0.33
28		5	135	140	0.145	6,924	13,746	0.33
29		5	140	145	0.145	6,944	13,785	0.33
30		5	145	150	0.145	6,963	13,824	0.33

Table 5-11 (1 of 4)

Low-strain

Soil Layers and Properties (Case S9)

Layer No.	Soil Type	Thickness (ft)	Depth Layer Top (ft)	Depth Layer Bottom (ft)	Weight Density (kcf)	Shear Wave Velocity Vs (fps)	Compression Wave Velocity Vp ¹⁾ (fps)	Poisson's Ratio
1	Rock	5	0	5	0.145	4,692	9,315	0.33
2		5	5	10	0.145	4,709	9,348	0.33
3		5	10	15	0.145	4,726	9,382	0.33
4		5	15	20	0.145	4,742	9,415	0.33
5		5	20	25	0.145	4,759	9,448	0.33
6		5	25	30	0.145	4,776	9,481	0.33
7		5	30	35	0.145	4,792	9,513	0.33
8		5	35	40	0.145	4,808	9,546	0.33
9		5	40	45	0.145	4,825	9,578	0.33
10		5	45	50	0.145	4,841	9,610	0.33
11		5	50	55	0.145	4,857	9,642	0.33
12		5	55	60	0.145	4,873	9,674	0.33
13		5	60	65	0.145	4,889	9,706	0.33
14		5	65	70	0.145	4,905	9,737	0.33
15		5	70	75	0.145	4,920	9,768	0.33
16		5	75	80	0.145	4,936	9,799	0.33
17		5	80	85	0.145	4,952	9,830	0.33
18		5	85	90	0.145	4,967	9,861	0.33
19		5	90	95	0.145	4,983	9,892	0.33
20		5	95	100	0.145	4,998	9,922	0.33
21		5	100	105	0.155	9,200	18,264	0.33
22		5	105	110	0.155	9,200	18,264	0.33
23		5	110	115	0.155	9,200	18,264	0.33
24		5	115	120	0.155	9,200	18,264	0.33
25		5	120	125	0.155	9,200	18,264	0.33
26		5	125	130	0.155	9,200	18,264	0.33
27		5	130	135	0.155	9,200	18,264	0.33
28		5	135	140	0.155	9,200	18,264	0.33
29		5	140	145	0.155	9,200	18,264	0.33
30		5	145	150	0.155	9,200	18,264	0.33

Table 5-12 (1 of 4)

Generic

Strain-Compatible Soil Properties (Case S1)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
1	Sand	5	0.125	0.020	1,155	4,800	0.47
2		5	0.125	0.031	1,132	4,800	0.47
3		5	0.125	0.041	1,102	4,800	0.47
4		5	0.125	0.048	1,087	4,800	0.47
5		5	0.125	0.037	1,142	4,800	0.47
6		5	0.125	0.042	1,138	4,800	0.47
7		5	0.125	0.046	1,138	4,800	0.47
8		5	0.125	0.050	1,141	4,800	0.47
9		5	0.125	0.053	1,144	4,800	0.47
10		5	0.125	0.056	1,149	4,800	0.47
11		5	0.125	0.043	1,224	4,800	0.47
12		5	0.125	0.044	1,234	4,800	0.46
13		5	0.125	0.046	1,246	4,800	0.46
14		5	0.125	0.047	1,257	4,800	0.46
15		5	0.125	0.047	1,271	4,800	0.46
16		5	0.125	0.048	1,285	4,800	0.46
17		5	0.125	0.048	1,299	4,800	0.46
18		5	0.125	0.049	1,314	4,800	0.46
19		5	0.125	0.050	1,328	4,800	0.46
20		5	0.125	0.050	1,342	4,800	0.46
21		5	0.125	0.050	1,357	4,800	0.46
22		5	0.125	0.051	1,373	4,800	0.46
23		5	0.125	0.051	1,389	4,800	0.45
24		5	0.125	0.051	1,406	4,800	0.45
25		5	0.125	0.039	1,489	4,800	0.45
26		5	0.125	0.039	1,506	4,800	0.45
27		5	0.125	0.039	1,523	4,800	0.44
28		5	0.125	0.039	1,540	4,800	0.44
29		5	0.125	0.039	1,556	4,800	0.44
30		5	0.125	0.039	1,573	4,800	0.44

Table 5-12 (2 of 4)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
31	Sand	5	0.125	0.039	1,590	4,800	0.44
32		5	0.125	0.039	1,608	4,800	0.44
33		5	0.125	0.039	1,625	4,800	0.44
34		5	0.125	0.039	1,642	4,800	0.43
35		5	0.125	0.039	1,659	4,800	0.43
36		5	0.125	0.039	1,676	4,800	0.43
37		5	0.125	0.039	1,692	4,800	0.43
38		5	0.125	0.039	1,709	4,800	0.43
39		5	0.125	0.039	1,725	4,800	0.43
40		5	0.125	0.039	1,742	4,845	0.43
41		10	0.130	0.022	2,780	6,650	0.39
42		10	0.130	0.022	2,814	6,732	0.39
43		10	0.130	0.022	2,845	6,813	0.39
44		10	0.130	0.023	2,876	6,894	0.39
45		10	0.130	0.023	2,907	6,973	0.39
46		10	0.130	0.018	2,992	7,051	0.39
47		10	0.130	0.019	3,022	7,128	0.39
48		10	0.130	0.019	3,053	7,204	0.39
49		10	0.130	0.019	3,083	7,279	0.39
50		10	0.130	0.019	3,113	7,353	0.39
51		10	0.130	0.019	3,142	7,426	0.39
52		10	0.130	0.019	3,172	7,498	0.39
53		10	0.130	0.019	3,200	7,569	0.39
54		10	0.130	0.019	3,229	7,639	0.39
55		10	0.130	0.019	3,258	7,707	0.39
56		10	0.130	0.019	3,286	7,775	0.39
57		10	0.130	0.019	3,314	7,842	0.39
58		10	0.130	0.019	3,342	7,907	0.39
59		10	0.130	0.019	3,369	7,972	0.39
60		10	0.130	0.019	3,396	8,035	0.39

Table 5-12 (3 of 4)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
61	Sand	10	0.130	0.019	3,423	8,098	0.39
62		10	0.130	0.019	3,449	8,159	0.39
63		10	0.130	0.019	3,475	8,220	0.39
64		10	0.130	0.019	3,501	8,279	0.39
65		10	0.130	0.019	3,526	8,337	0.39
66		10	0.130	0.019	3,550	8,395	0.39
67		10	0.130	0.019	3,574	8,451	0.39
68		10	0.130	0.019	3,598	8,506	0.39
69		10	0.130	0.019	3,621	8,560	0.39
70		10	0.130	0.019	3,644	8,613	0.39
71	Soft Rock	20	0.135	0.035	5,748	12,029	0.35
72		20	0.135	0.035	5,792	12,120	0.35
73		20	0.135	0.035	5,833	12,208	0.35
74		20	0.135	0.035	5,872	12,292	0.35
75		20	0.135	0.035	5,909	12,372	0.35
76		20	0.135	0.035	5,944	12,448	0.35
77		20	0.135	0.035	5,978	12,520	0.35
78		20	0.135	0.035	6,009	12,588	0.35
79		20	0.135	0.035	6,038	12,653	0.35
80		20	0.135	0.035	6,066	12,714	0.35
81		20	0.135	0.035	6,092	12,771	0.35
82		20	0.135	0.035	6,115	12,824	0.35
83		20	0.135	0.035	6,136	12,873	0.35
84		20	0.135	0.036	6,157	12,919	0.35
85		20	0.135	0.036	6,175	12,960	0.35
86		20	0.135	0.036	6,191	12,998	0.35
87		20	0.135	0.036	6,206	13,032	0.35
88		20	0.135	0.036	6,218	13,062	0.35
89		20	0.135	0.036	6,229	13,089	0.35
90		20	0.135	0.036	6,238	13,111	0.35

Table 5-12 (4 of 4)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
91	Soft Rock	20	0.135	0.036	6,245	13,130	0.35
92		20	0.135	0.036	6,251	13,145	0.35
93		20	0.135	0.036	6,254	13,156	0.35
94		20	0.135	0.036	6,256	13,163	0.35
95		20	0.135	0.037	6,255	13,166	0.35
96	Rock		0.155	0.004	9,200	18,264	0.33

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Table 5-13 (1 of 4)

Generic

Strain-Compatible Soil Properties (Case S2)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
1	Sand	5	0.125	0.022	996	4,800	0.48
2		5	0.125	0.037	958	4,800	0.48
3		5	0.125	0.048	930	4,800	0.48
4		5	0.125	0.059	902	4,800	0.48
5		5	0.125	0.047	954	4,800	0.48
6		5	0.125	0.052	950	4,800	0.48
7		5	0.125	0.056	948	4,800	0.48
8		5	0.125	0.061	947	4,800	0.48
9		5	0.125	0.064	948	4,800	0.48
10		5	0.125	0.067	950	4,800	0.48
11		5	0.125	0.051	1,025	4,800	0.48
12		5	0.125	0.052	1,034	4,800	0.48
13		5	0.125	0.053	1,044	4,800	0.48
14		5	0.125	0.054	1,054	4,800	0.47
15		5	0.125	0.055	1,065	4,800	0.47
16		5	0.125	0.056	1,075	4,800	0.47
17		5	0.125	0.057	1,086	4,800	0.47
18		5	0.125	0.057	1,098	4,800	0.47
19		5	0.125	0.058	1,110	4,800	0.47
20		5	0.125	0.059	1,123	4,800	0.47
21		5	0.125	0.029	2,044	4,996	0.40
22		5	0.125	0.030	2,055	5,037	0.40
23		5	0.125	0.031	2,065	5,077	0.40
24		5	0.125	0.031	2,074	5,117	0.40
25		5	0.125	0.024	2,134	5,157	0.40
26		5	0.125	0.025	2,147	5,197	0.40
27		5	0.125	0.025	2,160	5,236	0.40
28		5	0.125	0.025	2,174	5,275	0.40
29		5	0.125	0.026	2,188	5,314	0.40
30		5	0.125	0.026	2,202	5,353	0.40

Table 5-13 (2 of 4)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
31	Sand	5	0.125	0.026	2,216	5,392	0.4
32		5	0.125	0.026	2,229	5,430	0.4
33		5	0.125	0.027	2,242	5,468	0.4
34		5	0.125	0.027	2,255	5,506	0.4
35		5	0.125	0.027	2,267	5,543	0.4
36		5	0.125	0.027	2,280	5,581	0.4
37		5	0.125	0.027	2,293	5,618	0.4
38		5	0.125	0.028	2,306	5,655	0.4
39		5	0.125	0.028	2,319	5,692	0.4
40		5	0.125	0.028	2,332	5,728	0.4
41		10	0.130	0.035	4,219	8,834	0.35
42		10	0.130	0.035	4,248	8,900	0.35
43		10	0.130	0.035	4,277	8,965	0.35
44		10	0.130	0.035	4,305	9,029	0.35
45		10	0.130	0.036	4,333	9,092	0.35
46		10	0.130	0.036	4,361	9,154	0.35
47		10	0.130	0.036	4,387	9,215	0.35
48		10	0.130	0.036	4,413	9,276	0.35
49		10	0.130	0.036	4,440	9,336	0.35
50		10	0.130	0.036	4,466	9,395	0.35
51		10	0.130	0.036	4,492	9,453	0.35
52		10	0.130	0.037	4,517	9,510	0.35
53		10	0.130	0.037	4,542	9,566	0.35
54		10	0.130	0.037	4,567	9,622	0.35
55		10	0.130	0.037	4,592	9,677	0.35
56		10	0.130	0.037	4,616	9,731	0.35
57		10	0.130	0.037	4,639	9,784	0.35
58		10	0.130	0.037	4,663	9,836	0.36
59		10	0.130	0.037	4,686	9,887	0.36
60		10	0.130	0.037	4,709	9,938	0.36

Table 5-13 (3 of 4)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
61	sand	10	0.130	0.037	4,732	9,988	0.36
62		10	0.130	0.038	4,754	10,037	0.36
63		10	0.130	0.038	4,776	10,085	0.36
64		10	0.130	0.038	4,797	10,132	0.36
65		10	0.130	0.038	4,819	10,178	0.36
66		10	0.130	0.038	4,839	10,224	0.36
67		10	0.130	0.038	4,859	10,269	0.36
68		10	0.130	0.038	4,879	10,313	0.36
69		10	0.130	0.038	4,898	10,356	0.36
70		10	0.130	0.038	4,918	10,398	0.36
71	Soft Rock	20	0.135	0.012	6,847	13,946	0.34
72		20	0.135	0.012	6,881	14,022	0.34
73		20	0.135	0.012	6,914	14,094	0.34
74		20	0.135	0.012	6,945	14,164	0.34
75		20	0.135	0.012	6,976	14,230	0.34
76		20	0.135	0.012	7,004	14,293	0.34
77		20	0.135	0.012	7,032	14,353	0.34
78		20	0.135	0.012	7,057	14,410	0.34
79		20	0.135	0.012	7,081	14,463	0.34
80		20	0.135	0.012	7,103	14,514	0.34
81		20	0.135	0.012	7,124	14,561	0.34
82		20	0.135	0.012	7,143	14,605	0.34
83		20	0.135	0.012	7,162	14,646	0.34
84		20	0.135	0.012	7,178	14,684	0.34
85		20	0.135	0.012	7,191	14,718	0.34
86		20	0.135	0.012	7,203	14,750	0.34
87		20	0.135	0.013	7,214	14,778	0.34
88		20	0.135	0.013	7,223	14,803	0.34
89		20	0.135	0.013	7,232	14,825	0.34
90		20	0.135	0.013	7,238	14,843	0.34

Table 5-13 (4 of 4)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
91	Soft Rock	20	0.135	0.013	7,244	14,859	0.34
92		20	0.135	0.013	7,247	14,871	0.34
93		20	0.135	0.013	7,250	14,880	0.34
94		20	0.135	0.013	7,250	14,886	0.34
95		20	0.135	0.013	7,249	14,889	0.34
96	Rock		0.155	0.004	9,200	18,264	0.33

DRAFT

Table 5-14 (1 of 4)

Generic

Strain-Compatible Soil Properties (Case S3)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
1	Sand	5	0.130	0.015	2,090	4,800	0.38
2		5	0.130	0.019	2,090	4,809	0.38
3		5	0.130	0.023	2,081	4,861	0.39
4		5	0.130	0.026	2,082	4,912	0.39
5		5	0.130	0.021	2,126	4,963	0.39
6		5	0.130	0.023	2,129	5,014	0.39
7		5	0.130	0.025	2,130	5,065	0.39
8		5	0.130	0.027	2,134	5,115	0.39
9		5	0.130	0.028	2,140	5,165	0.40
10		5	0.130	0.030	2,148	5,215	0.40
11		5	0.130	0.024	2,213	5,264	0.39
12		5	0.130	0.024	2,226	5,314	0.39
13		5	0.130	0.025	2,241	5,363	0.39
14		5	0.130	0.025	2,255	5,412	0.39
15		5	0.130	0.026	2,270	5,460	0.40
16		5	0.130	0.026	2,285	5,508	0.40
17		5	0.130	0.026	2,300	5,556	0.40
18		5	0.130	0.027	2,315	5,604	0.40
19		5	0.130	0.027	2,331	5,651	0.40
20		5	0.130	0.028	2,345	5,699	0.40
21		5	0.130	0.029	2,358	5,745	0.40
22		5	0.130	0.029	2,372	5,792	0.40
23		5	0.130	0.029	2,386	5,839	0.40
24		5	0.130	0.030	2,400	5,885	0.40
25		5	0.130	0.023	2,466	5,931	0.40
26		5	0.130	0.024	2,482	5,976	0.40
27		5	0.130	0.024	2,498	6,021	0.40
28		5	0.130	0.024	2,514	6,067	0.40
29		5	0.130	0.024	2,530	6,111	0.40
30		5	0.130	0.025	2,546	6,156	0.40

Table 5-14 (2 of 4)

Layer No.	Soil Type	Thickness (ft)	Weight Density (kcf)	Damping	Avg Strain-Compatible Vs (fps)	Strain-Compatible Vp (fps)	Poisson's Ratio
31	Sand	5	0.130	0.025	2,562	6,200	0.40
32		5	0.130	0.025	2,578	6,244	0.40
33		5	0.130	0.025	2,594	6,288	0.40
34		5	0.130	0.025	2,609	6,332	0.40
35		5	0.130	0.026	2,624	6,375	0.40
36		5	0.130	0.026	2,640	6,418	0.40
37		5	0.130	0.026	2,655	6,461	0.40
38		5	0.130	0.026	2,670	6,503	0.40
39		5	0.130	0.026	2,685	6,545	0.40
40		5	0.130	0.026	2,700	6,587	0.40
41		10	0.135	0.034	4,860	10,160	0.35
42		10	0.135	0.034	4,893	10,235	0.35
43		10	0.135	0.034	4,926	10,309	0.35
44		10	0.135	0.035	4,959	10,383	0.35
45		10	0.135	0.035	4,991	10,455	0.35
46		10	0.135	0.035	5,023	10,527	0.35
47		10	0.135	0.035	5,055	10,598	0.35
48		10	0.135	0.035	5,087	10,667	0.35
49		10	0.135	0.035	5,117	10,736	0.35
50		10	0.135	0.035	5,147	10,804	0.35
51		10	0.135	0.036	5,178	10,871	0.35
52		10	0.135	0.036	5,207	10,936	0.35
53		10	0.135	0.036	5,237	11,001	0.35
54		10	0.135	0.036	5,266	11,065	0.35
55		10	0.135	0.036	5,294	11,128	0.35
56		10	0.135	0.036	5,322	11,190	0.35
57		10	0.135	0.036	5,349	11,251	0.35
58		10	0.135	0.036	5,377	11,311	0.35
59		10	0.135	0.036	5,403	11,370	0.35
60		10	0.135	0.036	5,430	11,429	0.35