Enclosure 1 of AET 06-0013

Report A1PH-9-K007-00001-1
Entitled *Final Report of Site-Specific Seismic Study - USEC American Centrifuge*
Dated January 2006

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FINAL REPORT OF SITE-SPECIFIC SEISMIC STUDY

USEC AMERICAN CENTRIFUGE
PIKETON, OHIO

Prepared For

FLUOR DANIEL

ECS

ECS
Geotechnical • Construction Materials • Environmental

January 31, 2006

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Reference: Final Report of Site-Specific Seismic Study
USEC American Centrifuge
Piketon, Ohio
ECS Project No. 14-3046
Fluor Document Number A1PH-9-K007-00001-1

Gentlemen:

As authorized, ECS performed a site-specific seismic study for the USEC American Centrifuge in Piketon, Ohio. The site specific seismic hazard (SSHA) was performed in general accordance with Specification No. 000210 02010 for the project dated August 23, 2005. The seismic design considerations for the project are attached to this letter. Subsurface soil and rock information used to perform the current study was contained in current borings and cone penetration tests (CPTs) performed by ECS. In addition, we reviewed the subsurface and laboratory information contained in a previous study for the site prepared by Law Engineering Testing Company entitled, "Final Report, Gas Centrifuge Enrichment Plant Geotechnical Investigation, Portsmouth, Ohio", dated April 28, 1978. This report shall supercede our previous report dated October 21, 2005.

SEISMIC CONSIDERATIONS

The seismic evaluation consisted of:

1. Evaluation of the site response spectrum using the probabilistic methods described in the IBC 2003 using the 1996 and 2002 USGS attenuation relationships;
2. Performing a probabilistic seismic hazard analysis (PSHA);
3. The PSHA included return periods (Probability of Exceedance) of 475 years (10% in 50 years), 975 years (5% in 50 years), 2,475 years (2% in 50 years), 9,975 years (0.5 % in 50 years), and 99,750 years (0.05% in 50 years); and
4. Using the results of the PSHA and the subsurface soil and rock properties to develop site-specific response spectra.

The 475-, 975-, 2,475-, 9,975- and 99,750-year return periods are referred to as the 500-, 1,000-, 2,500-, 10,000- and 100,000-year return periods, respectively, for the purpose of this report.

The IBC 2003 allows the use of site-specific procedures to determine ground motion accelerations. When site specific procedures are used to determine ground motions, the results have to be 90 percent or greater than the ground motions determined by the general spectral response acceleration determined by using Code Section 1615.1.4. The results of the above analyses are presented in more detail below.

INTERNATIONAL BUILDING CODE 2003

General

The Site Classification for seismic design was determined using Section 1615.1.5 of the IBC 2003. The Code allows the use of Standard Penetration Tests (SPT), undrained shear strength (Su), and Shear Wave Velocity (Vs), measurements to define the soil profile at the site. The purpose is to determine the short period acceleration values of the Site Coefficient (F_a) and the mid-period velocity Site Coefficient (F_v) presented in Tables 1615.1.2(1) and 1615.1.2(2), respectively.

The site coefficients were developed by a seismic group appointed by the Building Seismic Safety Council (BSSC) to more closely consider site soil effects that are known to have a large influence on seismic site response in recent Western U.S. earthquakes. The 1996 maps presented in the 2000 and 2003 editions of the IBC are based on attenuation relationships for a geologic site condition that corresponds to the National Earthquake Hazards Reduction Program (NEHRP) B-C boundary. The maps were based on data from earthquake ground motions recorded at typical rock sites in the Western U.S. and were developed for the Central and Eastern United States (CEUS). The earthquake input motion is for typical "soft" rock sites; hence care must be taken in evaluating the site class using a profile that has rock like materials (defined as shear wave velocities of 2,500 feet per second or greater) should this occur in the top 100 feet of the site profile. Such was the case at the project site where rock-like materials were encountered at depths ranging from about 20 to 35 feet.

For the USEC American Centrifuge site, shear wave velocity test results from the current ECS study and the previous from the Law Engineering Testing Company report were used to evaluate the seismic Site Class. Based on these test results, a seismic Site Class "C" was determined for the site.

The USGS and several working committees have assembled new paleoseismological data that indicates different return periods and maximum magnitudes for the CEUS seismic region. As a result of these studies, the 1996 maps were updated in the 2002 National Hazard Seismic Maps prepared by the USGS. The 2002 maps included changes in mean recurrence time, characteristic magnitude and sources for the New Madrid Seismic Zone (NMSZ) and Charleston source zones, and incorporated additional attenuation relationships. The 1996 USGS maps and the 2002 USGS maps were used in this study.

Figure 1 shows a map with the site location and the locations of the primary source zones affecting the site seismicity. The primary source zones are the New Madrid Source Zone (NMSZ) to the west and to a lesser extent the Charleston Fault Zone, the Anna Ohio area source and area sources to the north in Canada.

A seismic hazard deaggregation of the site is shown on Figure 2. Based on this figure, the primary contributions to the seismic hazard as the site are from a far-field high magnitude event along the NMSZ in combination with the smaller source events primarily located within 250 kilometers of the site. The Anna Ohio earthquakes are modeled in the PSHA and an overview of the seismicity of the state of Ohio as described by the USGS website abridged from *Earthquake Information Bulletin, Volume 8, Number 1, January - February 1976,* by Carl A. von Hakeis presented below:

An earthquake on June 18, 1875, caused damage in western Ohio, and affected a total area estimated at 104,000 square kilometers. Walls were cracked and chimneys thrown down (intensity VII) at Sidney and Urbana. The shock was felt sharply at Jeffersonville, Indiana; the affected area included parts of Illinois, Indiana, Kentucky, and Missouri.

Slight damage (intensity VI) was reported at Lima from a September 19, 1884, earthquake. At Columbus, chandeliers kept swinging for several minutes after the tremor. The shock was felt in Washington, D.C., by workmen on top of the then unfinished Washington Monument, about 500 feet above the ground. This earthquake was felt throughout a broad area, from Pennsylvania to Kentucky and West Virginia to Michigan (about 324,000 square kilometers).

Several towns in southeastern Ohio experienced moderate damage on November 5, 1926. Chimneys toppled at Keno and Pomeroy (intensity VI to VII); in addition, a stove was overturned at Pomeroy. The earthquake was also felt at Letart, West Virginia.

A brief but strong shock was felt over a wide area in western Ohio on September 30, 1930. The strongest intensity at Anna knocked down a chimney on the school and caused plaster to crack and fall (intensity VII). The tremor was accompanied by a rumbling noise. Less than one year later (September 20, 1931), another damaging earthquake occurred in the same area. At Anna, Houston, and Sidney cornices were thrown down from church buildings, several chimneys were toppled, and plaster fell from some walls (intensity VII). Intensity V to VI was experienced over an area of approximately 100,000 square kilometers, including most of western Ohio and parts of Indiana and Kentucky.

On March 2, 1937, much additional damage occurred at Anna. Plaster fell and walls cracked in a school house (intensity VII), which was later declared unsafe. Many chimneys were thrown down and other minor damage was inflicted at Anna, Sidney, and Wapokoneta; in Bellefontaine and Lima, alarm was general but damage was minor. Two to five shocks were felt in many places. The total felt area included approximately 181,000 square kilometers in Ohio, Indiana, and Michigan;

felt reports were also received from a few places in Illinois, Kentucky, West Virginia, and Wisconsin, and one place in Canada.

The next day, March 3, at 3:50 a.m., a moderate earthquake (intensity V) shook the same area. It awakened many persons, rattled windows, and shook some bricks from chimneys.

The strongest tremor of this series occurred at 11:45 p.m., March 8, 1937. At Anna, chimneys repaired after the March 2, 1937 earthquake were again thrown down, with scarcely a chimney undamaged (intensity VII to VIII). Organ pipes were twisted in one church and other church and school buildings were badly cracked. A few chimneys also fell at Sidney and there was damage to plaster. The affected area was much larger than that of the previous earthquake. The 388,000 square kilometer area covered all of Ohio and Indiana, parts of Illinois, Kentucky, Michigan, and a few places in Missouri, Pennsylvania, West Virginia, Wisconsin, and Ontario, Canada.

Outstanding phenomena common to both the March 2 and 8, 1937 earthquakes were the rotation of tombstones and subsurface changes revealed by the activities of wells. Marked changes in the behavior of wells were reported from Botkins, Huntsville, and New Knoxville.

On March 9, 1943, an earthquake centered east of Cleveland, was felt over a 100,000 square kilometer area, but only caused minor damage at points nearest the epicenter. Reports of cracked plaster and broken windows and dishes (intensity V) were received after the shock. It was noted over a large part of Ohio and in parts of Michigan, New York, and Pennsylvania, and Ontario, Canada.

On June 20, 1952, an early morning (3:38 a.m.) tremor awoke most of the people in the Zanesville area. An old chimney was toppled (intensity VI), doors were thrown open, pictures shook, and dished rattled. The earthquake was felt over about 26,000 square kilometers in southeastern Ohio.

<u>Site Specific Evaluation</u>

ECS used the computer program EZ-FRISK Version 7.14 written by Risk Engineering to evaluate the earthquake hazard at the site. The predominant earthquake sources that would affect the site were modeled, the characteristics of the earthquakes were inputted, and the ground motions that the earthquakes would generate were calculated. The site is located at 39.02 degrees north latitude and 83.00 degrees west longitude. A PSHA was performed using various ground motion attenuation relationships. Several attenuation relationships were chosen including Toro (1997), Mid-Continent USGS 2002, Somerville (2001) USGS 2002, Campbell (2003), USGS 2002, Frankel (1996) and Atkinson and Boore (1995) USGS. The analysis included the Charleston and New Madrid source zones and nearby Background Zones. The results of the EZ-FRISK Total Hazard Analysis (Figure 3) show the mean peak bedrock accelerations versus the annual frequency of exceedence.

The EZ-FRISK probabilistic analysis results are presented on the Total Hazard plot shown on Figure 3. The earthquake Hazard by Seismic Source is shown on Figure 4.

Of the sources listed in Figure 4, the CEUS gridded is the most significant, along with the Anna Ohio. This is consistent with the deaggregation figure in that the hazard is being controlled mainly by local seismicity as opposed to a larger magnitude event in the far field such as the New Madrid. In order of significant contribution the list would be:

1. CEUS Gridded Background Zone
2. Anna Ohio Area Source
3. Central New Madrid
4. Southeast New Madrid
5. Northwest New Madrid
6. Charleston Broad Zone
7. Charleston Narrow Zone

The USGS, CEUS 1996 and CEUS 2002 documentation was used as a basis for development of the tectonic environment. The USGS has a gridded seismicity hazard calculation for both high and low magnitude earthquakes on a 0.1 degree by 0.1 degree grid which is normalized by the counting window duration to get a seismicity rate in each grid cell in the CEUS. The radius of this background source was 1,000 kilometers. At the project site, the USGS counts all earthquakes with magnitudes greater than 3 since 1924, > 4 magnitudes since 1860 and >5 magnitudes since 1700. For magnitudes over 6, they used finite faults centered on each grid cell. The Central, NW and Southeast New Madrid fault zones were modeled with an upper bound magnitude of 7.297. The Anna Ohio was given a minimum magnitude of 5 and a maximum magnitude of 7. The Charleston Broad and Narrow zones are assigned an upper bound magnitude of 7.035.

The sources and the characteristics of the sources are consistent with the guidelines presented in DOE standard 1023-95 and with the results generally consistent with results obtained by previous studies at the site. For the analysis associated with the site-specific study the mean was used. Given the relative risk level associated with the various facilities that comprise the American Centrifuge Plant, use of a weighted mean or the 84th percentile estimate of ground motion for the seismic analysis is considered unnecessary. A weighted mean or 84th percentile estimate of ground motion is typically used for high risk facilities such as nuclear power reactors. It is our understanding that none of the American Centrifuge Plant facilities present that level of risk.

The EZ-FRISK Uniform Hazard Spectra shown on Figure 5 for the above specified 5 return periods show the spectral acceleration vs. period generated by EZ-FRISK. The frequency of exceedance vs. peak bedrock acceleration and the S_s and S_1 values are shown in Table 1.

TABLE 1
Annual Frequency of Exceedence vs. Peak Bedrock Acceleration (g) and S_s and S_1 Values

Return Period (Years)	Peak Bedrock Acceleration (g)	S_s (g)	S_1 (g)
500	0.05	0.09	0.03
1,000	0.07	0.13	0.04
2,500	0.09	0.20	0.07
10,000	0.20	0.37	0.12
100,000	0.70	1.00	0.26

The IBC response spectra were prepared for the 5 specified return periods using the general procedure presented in Section 1615.1.4. All of the results for this study are at 5% damping. The 1996 and the 2002 USGS map code spectra for Site Class C are shown on Figures 6 and 7, respectively. It is important to note that the Code has a 2/3 decrease for the 2,500 year return period. This factor was used on all of the Code spectra although this factor is not explicitly applied to other return periods in the code.

A SHAKE analysis was performed using Shake 91+. Several earthquakes were scaled to the target PSHA spectra. The earthquakes were then used as input motions in the Shake program at the base of the soil column. The soil profiles used in the Shake analysis are shown on Figure 8 (Profile 1) and Figure 9 (Profile 2). The soil test borings, cone penetration test soundings and laboratory test data are attached as Supplemental Data. It should be noted that the two profiles consider variability in the shear wave velocity of Soil Layer 4 ranging from 500 to 1,000 ft. per second which accounts for the variations in the consistency of the soil profile.

The results of the Shake analysis for the 2,500-year return period earthquake event is plotted on Figure 10. The 2,500 year return period plot is presented with the Code spectra. It should be noted that the Shake analysis appears to indicate a higher amplitude response in the high frequency range (>3Hz) than the code spectra. It should also be noted that the Shake analysis did include a 2/3 reduction smoothing between about 3½ and 6½ Hz for the 2,500 year return period. Section 1615.1.3 of the IBC 2003 (Equations 16-40 and 16-41) allows for a 2/3 reduction in the maximum considered earthquake spectral response for the short (0.2 second) and long (1.0 second) periods.

The 10,000 year return period broad-band response spectrum is shown on Figure 11. The curves for the softer soil Profile 1, and the stiffer Profile 2, are shown. As expected, the stiffer profile created a higher amplitude response in the short period range. Using Section 1615.1.3 of the IBC 2003 as a basis, a 2/3 reduction is typically used to smooth the high amplitude peaks that occur over very small frequency ranges in the spectrum. For this study, 80 percent of the Shake values between 2.5 to 3.3 Hz was used which did not have an affect on the structures for this study.

This resulted in the top of the curve being truncated at 0.85g. The broad-band response is shown on Figure 11. Based on the variation in the soil profile and the results of the Shake analysis, it is concluded that the broad-band response envelopes the potential earthquake ground motion for the 10,000 year return period event.

The input motions used to run the Shake analyses are scaled from actual earthquake records having a similar magnitude, distance and duration. The earthquakes chosen are those that reasonably match the probability densities shown in the deaggregation shown in Figure 2. In order to scale the actual earthquake records to match the target spectrum, a spectral matching program written by Abrahamson was used. The program code is embedded in the EZ-FRISK software. The results of the spectral matches for the earthquakes used in the 2,500 year return period analyses are shown on Figures 12, 13 and 14. The corresponding acceleration velocity and displacement time histories associated with those input motions are shown on Figures 15, 16 and 17. The results of the spectral matches for the earthquakes used in the 10,000 year return period analyses are shown on Figures 18, 19 and 20. The corresponding acceleration velocity and displacement time histories associated with those input motions are shown on Figures 21, 22 and 23. The amplification ratios for the 10,000 year return period are presented on Figures 24, 25 and 26 for the Shake Profile 1 and Figures 27, 28, and 29 for the Shake Profile 2. The amplification of the soil profile ranges from 1 to about 2.4. Using the highest amplification ratio, the response at the zero period was anchored at 0.48g as reflected in Figure 11.

A summary of the Shake and the Code S_{DS} and S_{D1} values are for the 2,500 year and the 10,000 year return period events are presented in Table 2.

TABLE 2
S_{DS} and S_{D1} Values

Return Period (years)	Parameter	PSHA Analysis (g)	1996 USGS IBC 2003 (g)	2002 USGS (g)
2,500	S_{DS}	0.30	0.16	0.14
2,500	S_{D1}	0.07	0.09	0.07
10,000	S_{DS}	0.43	0.32	0.29
10,000	S_{D1}	0.15	0.15	0.13

PSHA = Probabilistic Seismic Hazard Analysis.

The shear strain versus damping curves used in the Shake analysis is shown on Figure 30. The modulus reduction curves are shown on Figure 31.

Comparison of Results to License Application

The USEC license application utilized the Beavers (1995) report and extrapolated that data to the 10,000 year return period. In order to compare the results obtained for this analysis with the previous analysis prepared for the site by Beavers (1995), we ran an analysis for the 1,000 year return period event using the above described methodology. The result of our analysis was plotted with the Beavers result. The plots are shown on Figure 32. The results indicate that the current analysis closely matches the previous analysis for this return period event.

For the 1,000 year return period event, this site-specific study indicated a peak bedrock acceleration of 0.07g (Table 1) with a site amplification factor of approximately 2.0. Multiplying the peak bedrock acceleration by the site amplification factor yields a peak ground acceleration of 0.14g, which is slightly lower, but very close to the Beavers result of 0.15g.

Similarly for the 10,000-year return period event, the site-specific study indicated a peak bedrock acceleration of 0.20g (Table 1). The amplification factors observed for this return period typically ranged from 1.7 to 2.4, which would yield a peak ground acceleration ranging from 0.34g to 0.48g. The amplification factors are approximated from Figures 24 through 29. Using the highest amplification factor (2.4), the peak ground acceleration would be 0.48g, which exceeds the 0.32g peak ground acceleration identified in the USEC license application.

The 100,000 year return period spectral acceleration is shown on Figure 33. This spectrum was derived from using the 100,000 year return period Uniform Hazard and scaling using the F_a and F_v values presented in the IBC 2003.

CLOSURE

This report was prepared in accordance with generally accepted geotechnical engineering practice. No other warranty is expressed or implied. The analyses and recommendations presented in this report are based on the available project information, as well as on the results of limited field exploration. The results of this report should not be used for facilities outside the American Centrifuge Plant without the review and approval of ECS.

Thank you for the opportunity to provide geotechnical engineering services on this project and we look forward to our continued involvement during the construction phase. Should you have questions regarding our findings or need additional consultations, please do not hesitate to contact our office.

Respectfully,

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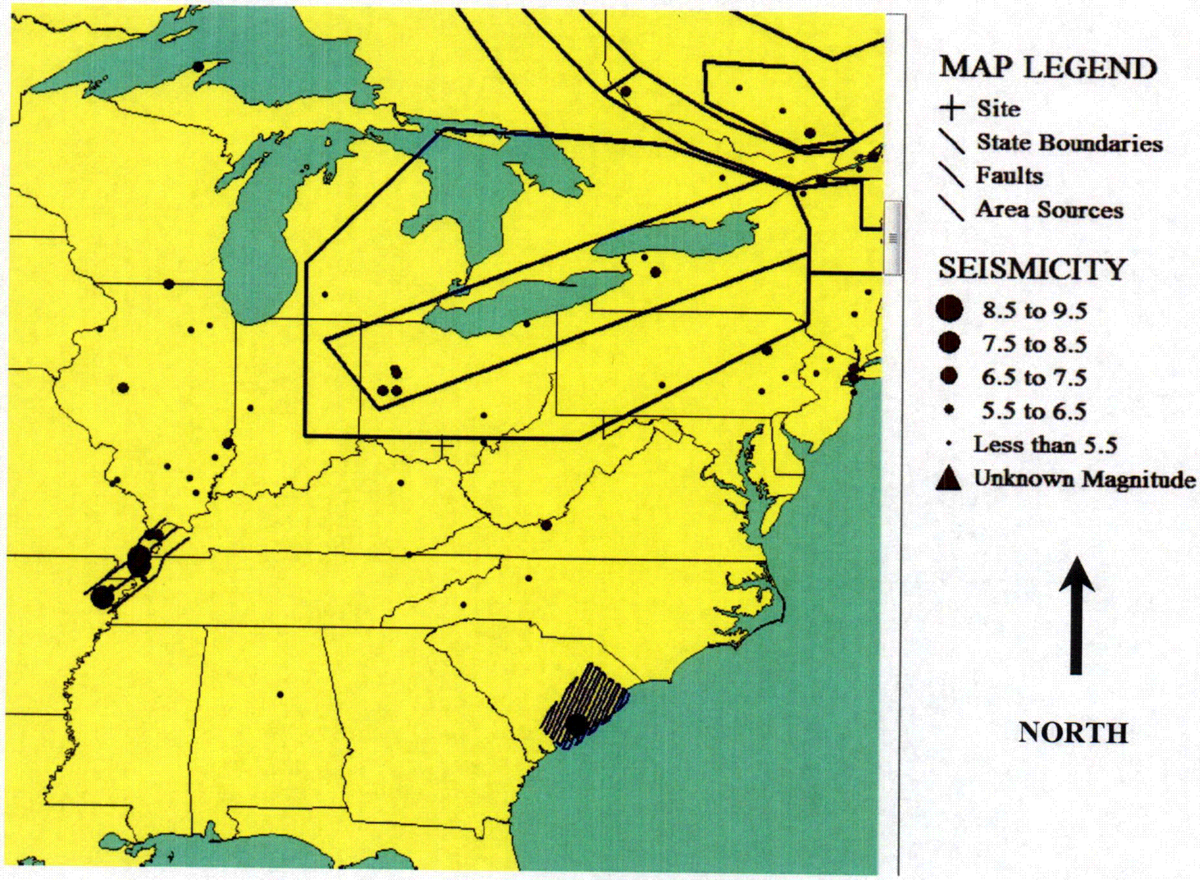
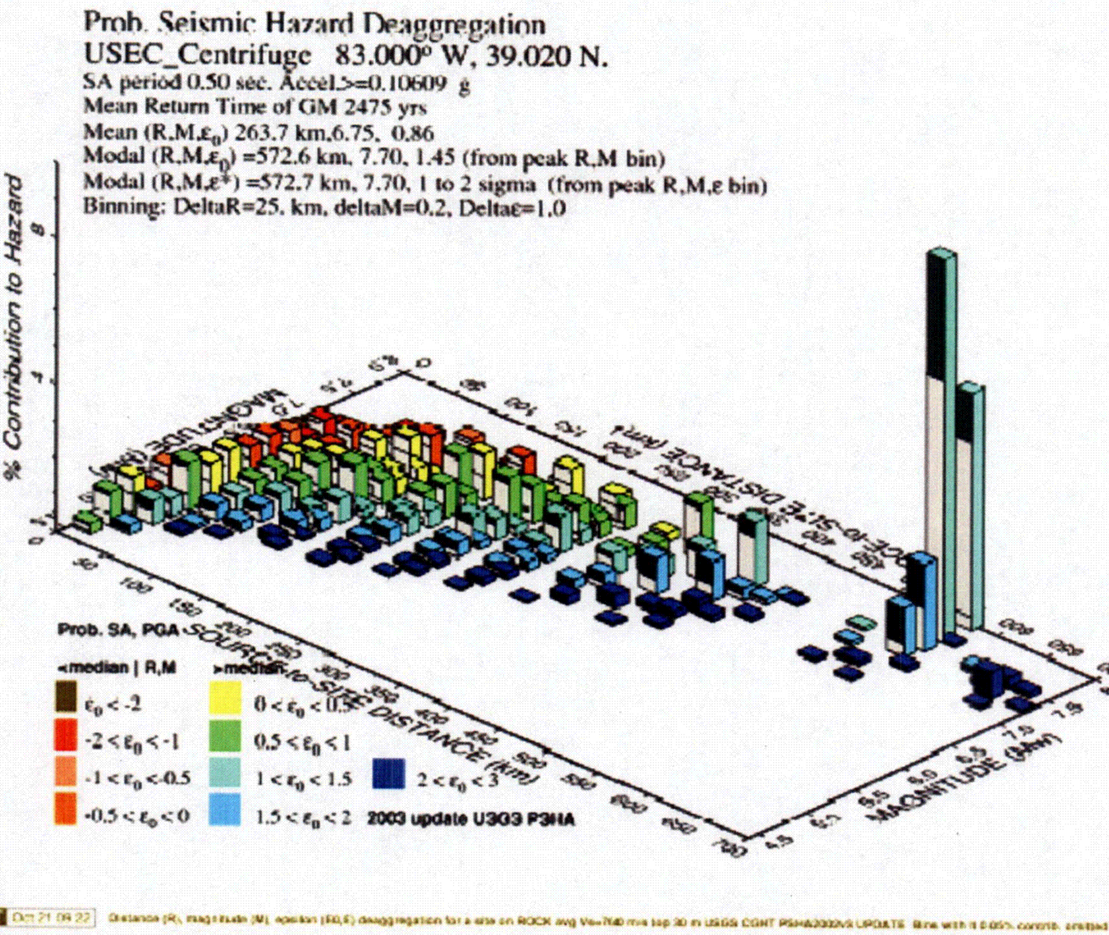


SOURCE MAP LEGEND

USEC American Centrifuge **Centrifuge Enrichment Plant** **Piketon, Ohio**	**Figure 1** **ECS Project No. 14-3046** **January 2006**

C01

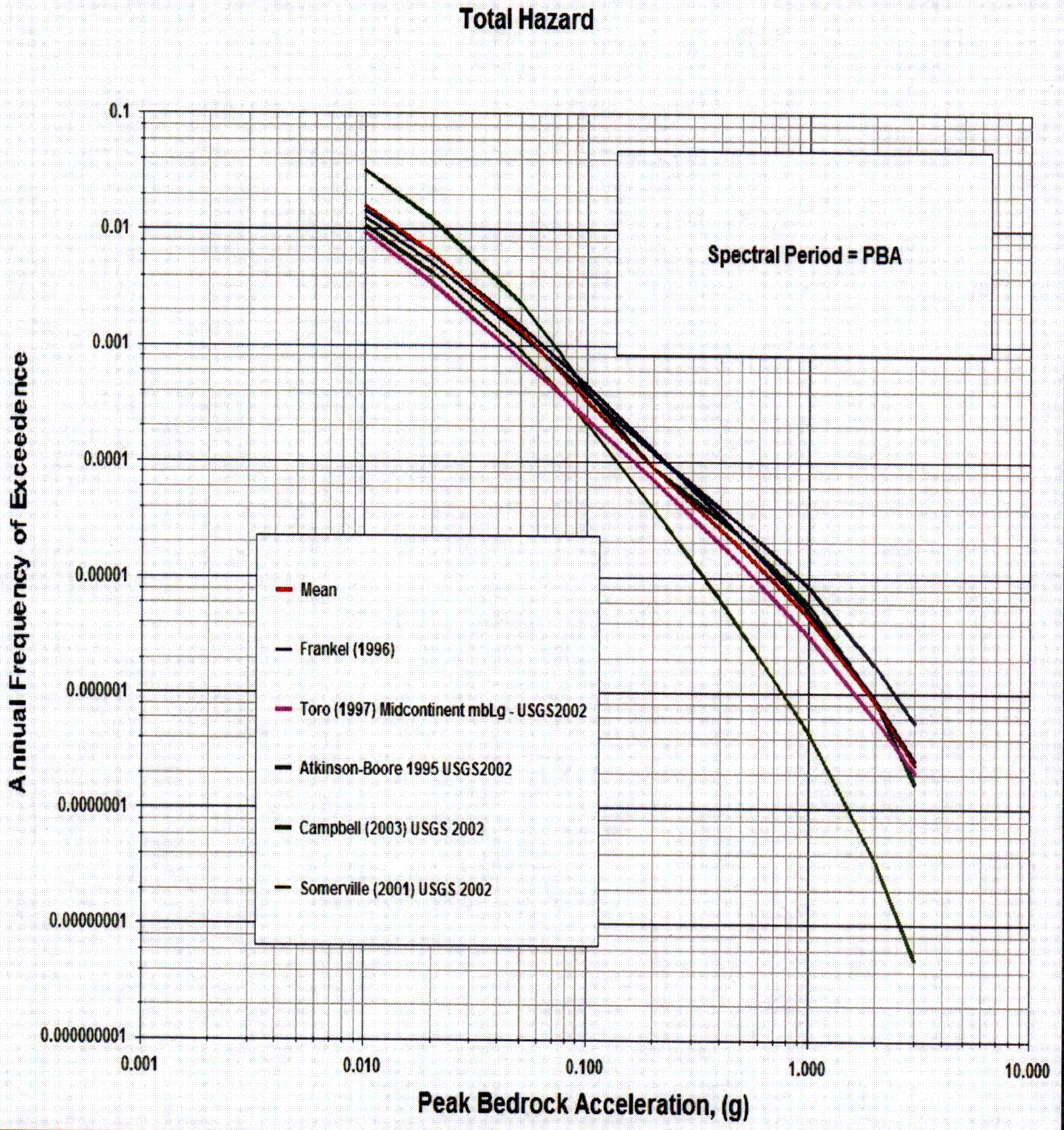


SEISMIC HAZARD DEAGGREGATION

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 2
ECS Project No. 14-3046
January 2006

C02

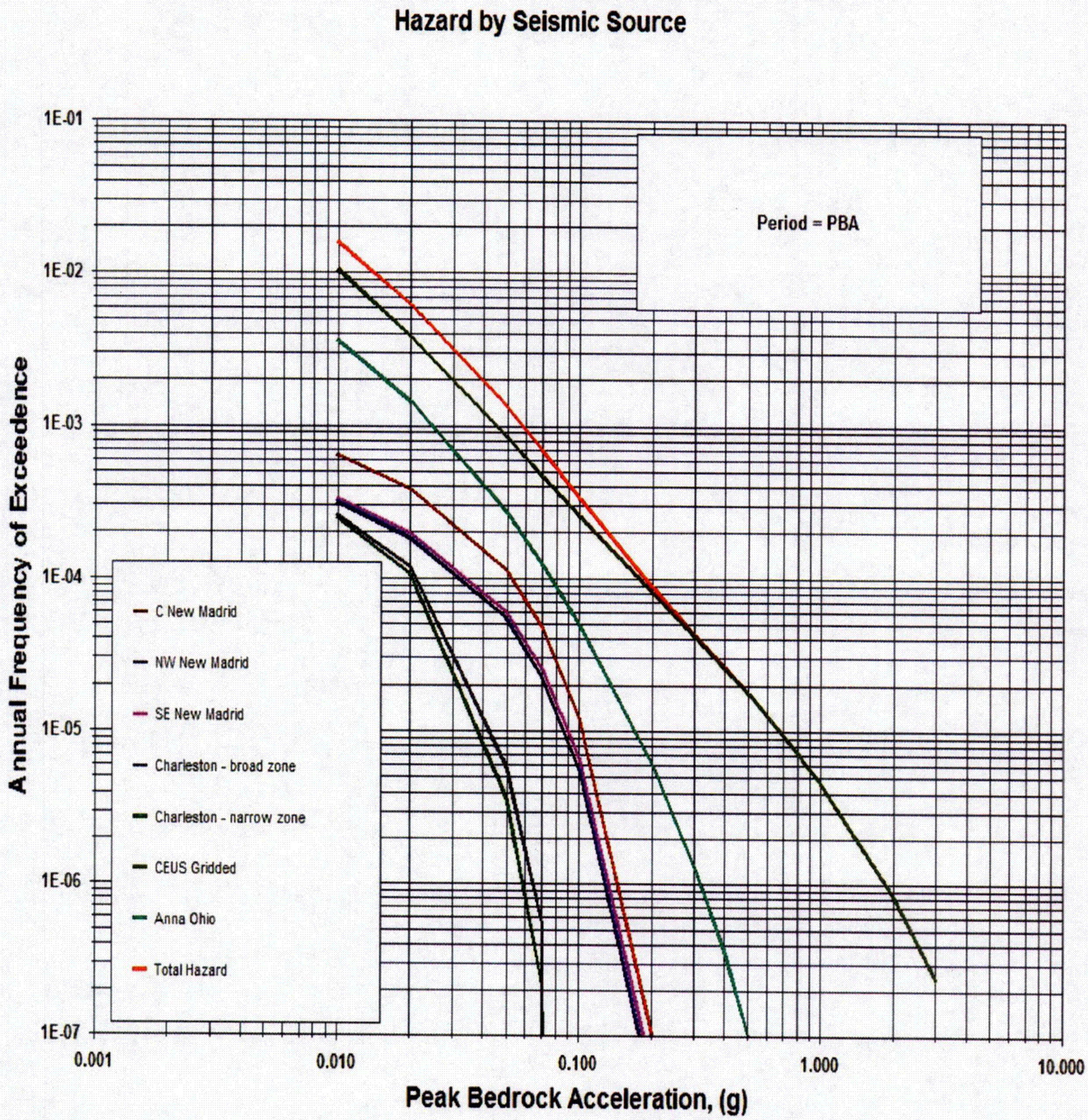


TOTAL HAZARD – PROBALISTIC ANALYSIS

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 3
ECS Project No. 14-3046
January 2006

C03

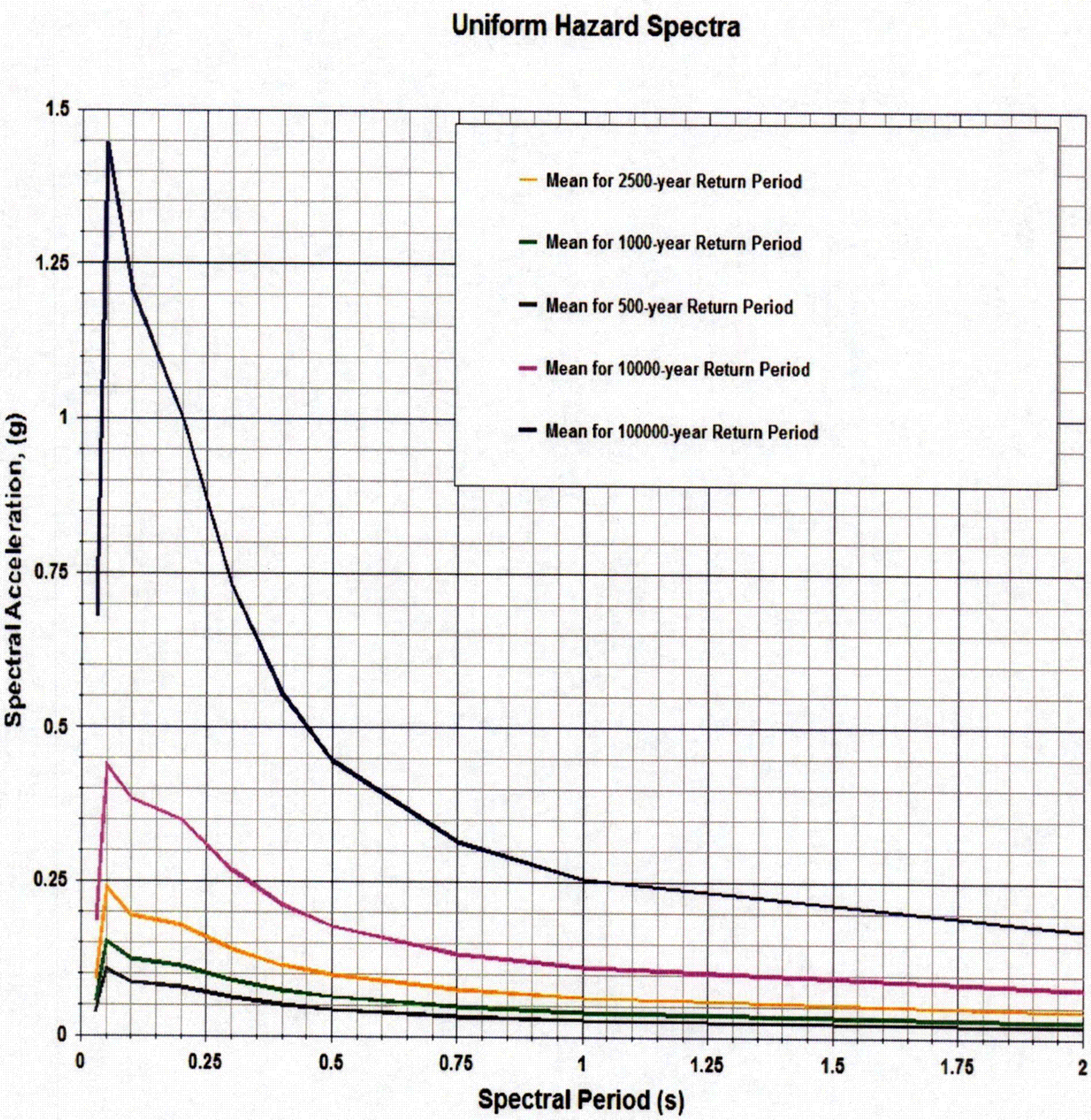


HAZARD BY SEISMIC SOURCE

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 4
ECS Project No. 14-3046
January 2006

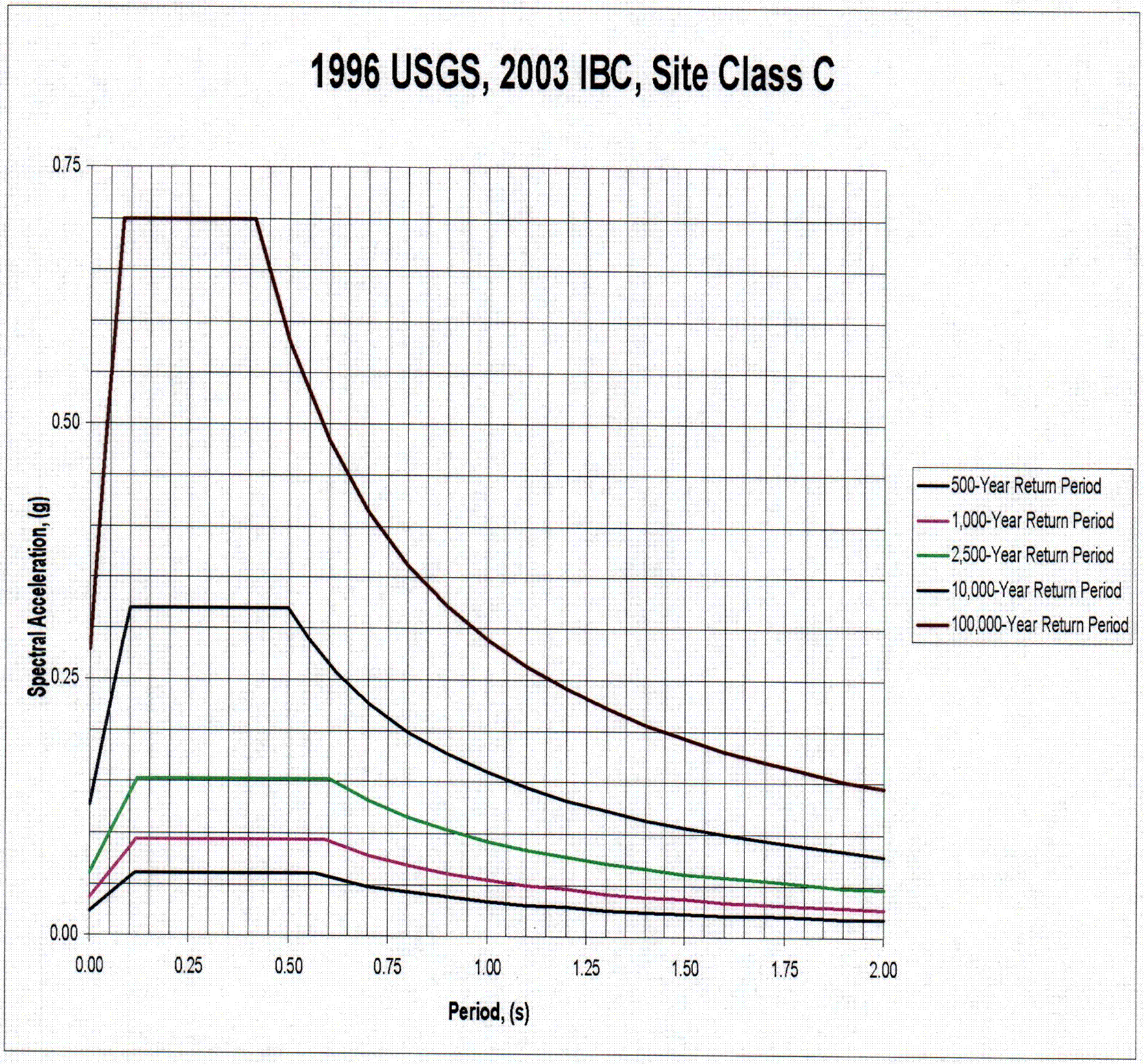
C04



UNIFORM HAZARD SPECTRA

USEC American Centrifuge Centrifuge Enrichment Plant Piketon, Ohio	ECS	Figure 5 ECS Project No. 14-3046 January 2006

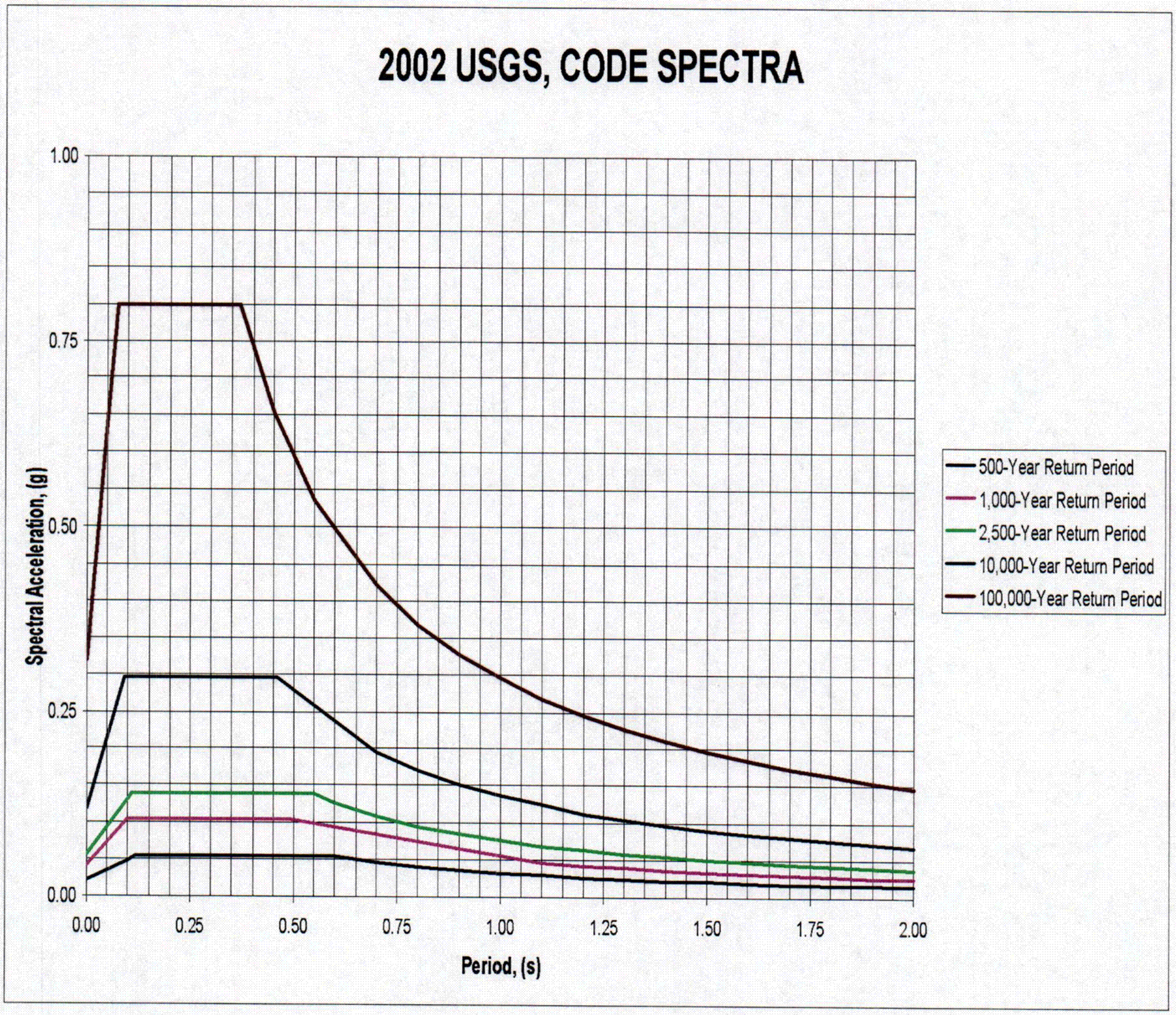
C05



CODE RESPONSE SPECTRA

USEC American Centrifuge **Centrifuge Enrichment Plant** **Piketon, Ohio**	**Figure 6** **ECS Project No. 14-3046** **January 2006**

C06



CODE RESPONSE SPECTRA

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

ECS

Figure 7
ECS Project No. 14-3046
January 2006

C07

Layer	Name	Thickness	Classification	P...	Modulus Reduction Curve	Damping Curve	Density	Max. Shear Wave Vel...	Max. Shear Modulus
1	Inorganic Clay with Low Plasticity	3.0 feet	USCS CL		Clay (Sun et al 1988) Plasticity Index 5-10	Clay (Sun et al 1988) Av...	120.0 ...	740.0 feet per second	2042.39 ksf
2	Inorganic Silts with Slight Plasticity	6.0 feet	USCS ML		Clay (Sun et al 1988) Plasticity Index 5-10	Clay (Sun et al 1988) Av...	120.0 ...	750.0 feet per second	2097.96 ksf
3	Inorganic Clay with Low Plasticity	13.0 feet	USCS CL		Clay (Sun et al 1988) Plasticity Index 10-20	Clay (Sun et al 1988) Av...	120.0 ...	850.0 feet per second	2694.72 ksf
4	Inorganic Silts with Slight Plasticity	5.0 feet	USCS ML		Clay (Sun et al 1988) Plasticity Index 5-10	Clay (Sun et al 1988) Av...	120.0 ...	500.0 feet per second	932.428 ksf
5	Silty Sand	5.0 feet	USCS SM		Sand (Seed & Idriss 1970) Average	Sand (Seed & Idriss 1970...	120.0 ...	1100.0 feet per second	4512.95 ksf
6	Silty Sand	5.0 feet	USCS SM		Sand (Seed & Idriss 1970) Average	Sand (Seed & Idriss 1970...	130.0 ...	1300.0 feet per second	13091.3 ksf

SOIL PROFILE FOR SHAKE ANALYSIS- PROFILE 1

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 8
ECS Project No. 14-3046
January 2006

C08

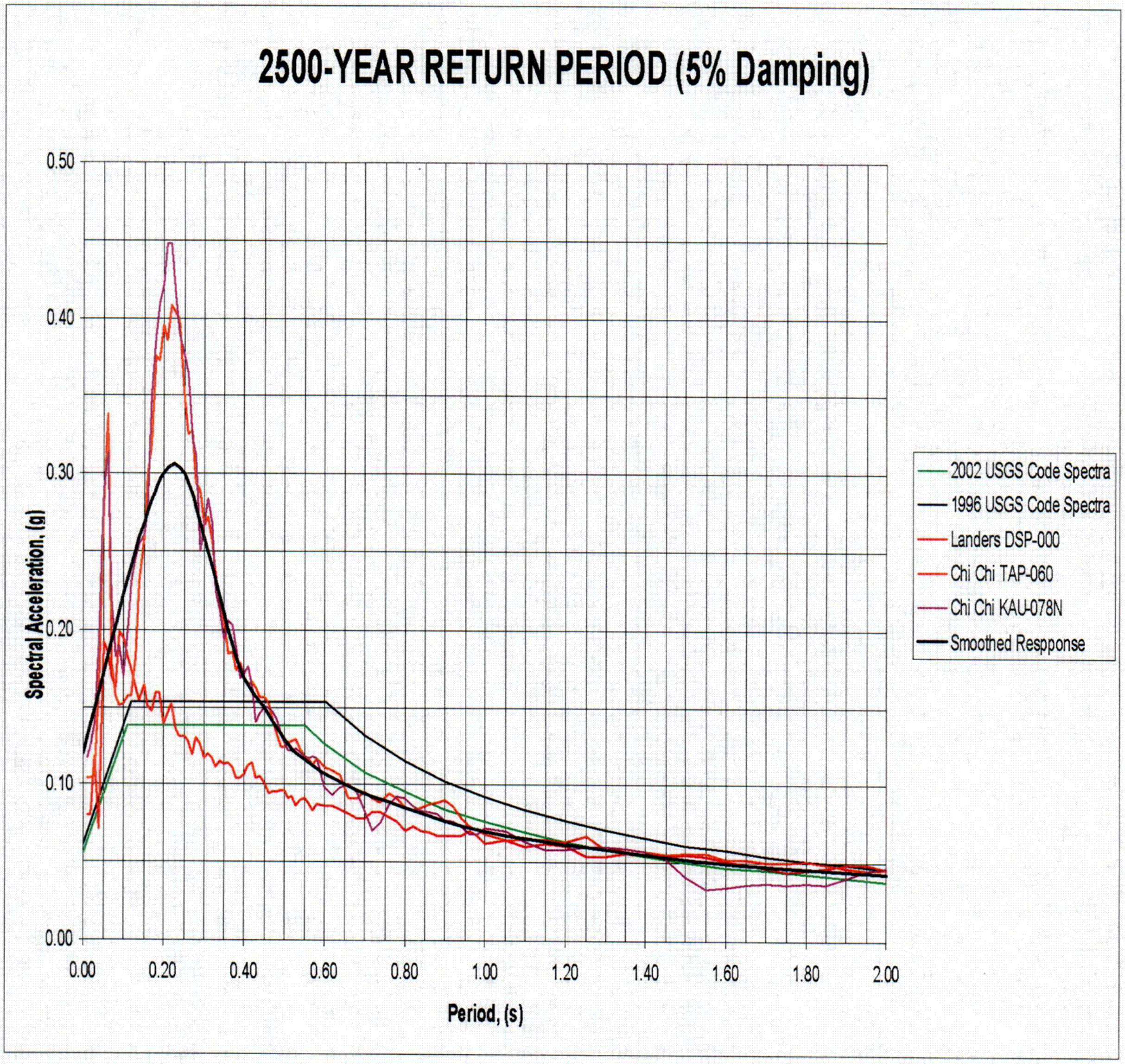
Layer	Name	Thickness	Classification	P...	Modulus Reduction Curve	Damping Curve	Density	Max. Shear Wave Vel...	Max. Shear Modulus
1	Inorganic Clay with Low Plasticity	3.0 feet	USCS CL		Clay (Sun et al 1988) Plasticity Index: 5-10	Clay (Sun et al. 1988) Av...	120.0...	740.0 feet per second	2042.39 ksf
2	Inorganic Silts with Slight Plasticity	6.0 feet	USCS ML		Clay (Sun et al 1988) Plasticity Index: 5-10	Clay (Sun et al. 1988) Av...	120.0...	750.0 feet per second	2097.36 ksf
3	Inorganic Clay with Low Plasticity	13.0 feet	USCS CL		Clay (Sun et al 1988) Plasticity Index: 10-20	Clay (Sun et al. 1988) Av...	120.0...	850.0 feet per second	2694.72 ksf
4	Inorganic Silts with Slight Plasticity	5.0 feet	USCS ML		Clay (Sun et al 1988) Plasticity Index: 5-10	Clay (Sun et al. 1988) Av...	120.0...	1000.0 feet per second	3729.71 ksf
5	Silty Sand	5.0 feet	USCS SM		Sand (Seed & Idriss 1970) Average	Sand (Seed & Idriss 1970...	120.0...	1100.0 feet per second	4512.35 ksf
6	Silty Sand	5.0 feet	USCS SM		Sand (Seed & Idriss 1970) Average	Sand (Seed & Idriss 1970...	130.0...	1600.0 feet per second	13091.3 ksf

SOIL PROFILE FOR SHAKE ANALYSIS- PROFILE 2

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

ECS

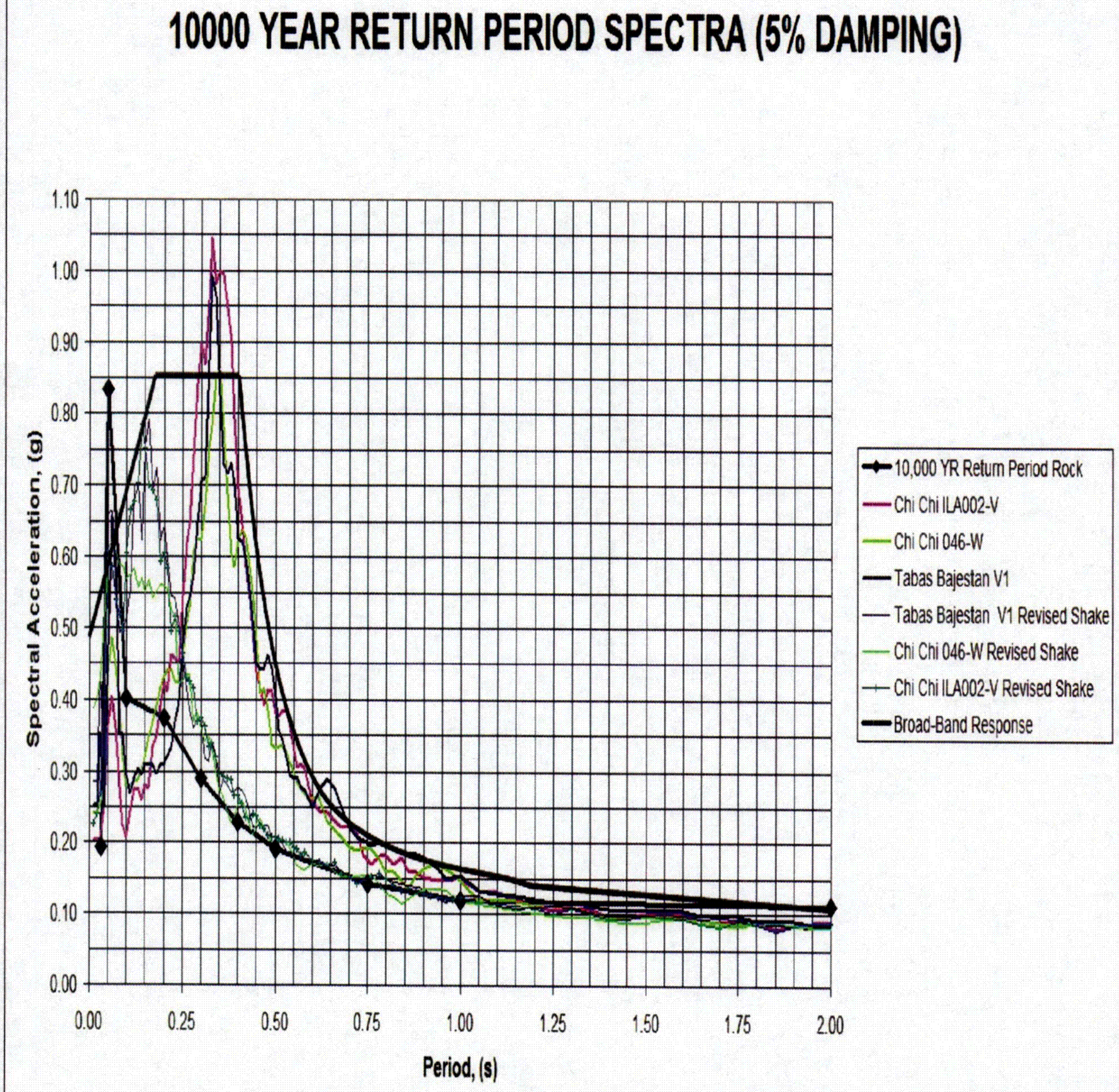
Figure 9
ECS Project No. 14-3046
January 2006



2,500 Yr RETURN PERIOD - SHAKE ANALYSIS

USEC American Centrifuge **Centrifuge Enrichment Plant** **Piketon, Ohio**	ECS	**Figure 10** **ECS Project No. 14-3046** **January 2006**

C10



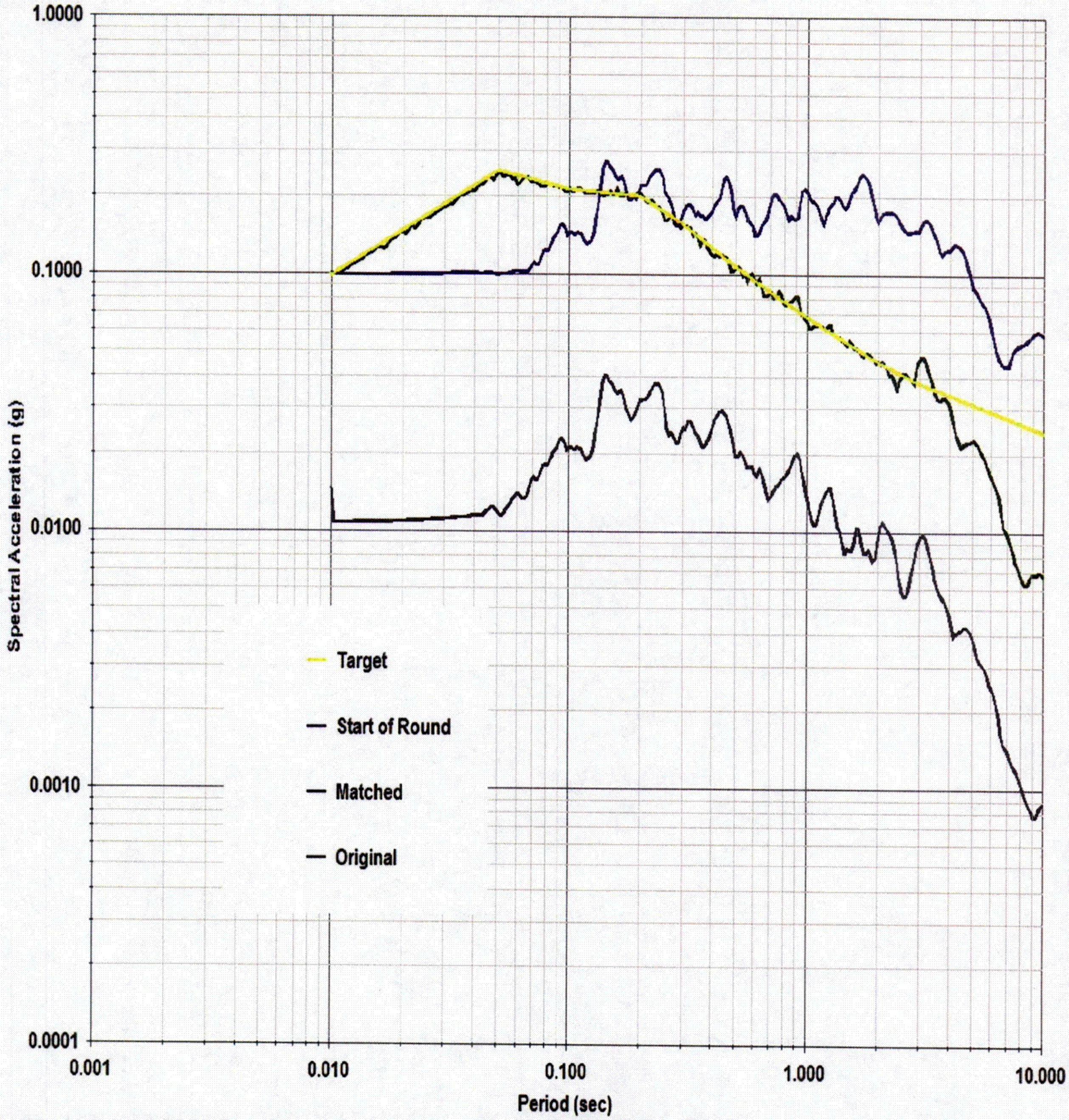
10,000 Yr RETURN PERIOD SPECTRA - SHAKE ANALYSIS

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

ECS

Figure 11
ECS Project No. 14-3046
January 2006

C11

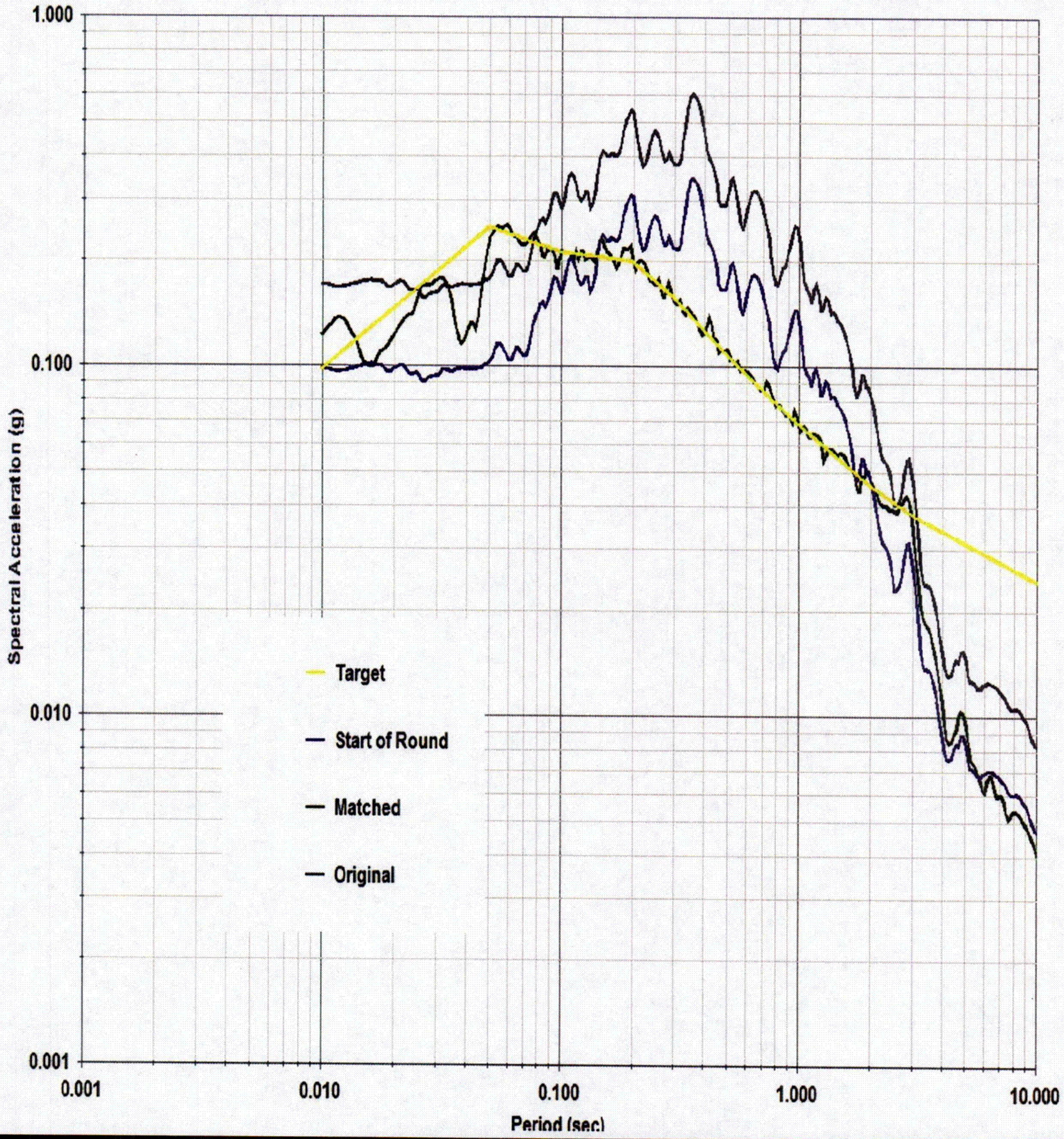


2,500 Yr TAP060 Spectral Match

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 12
ECS Project No. 14-3046
January 2006

C12

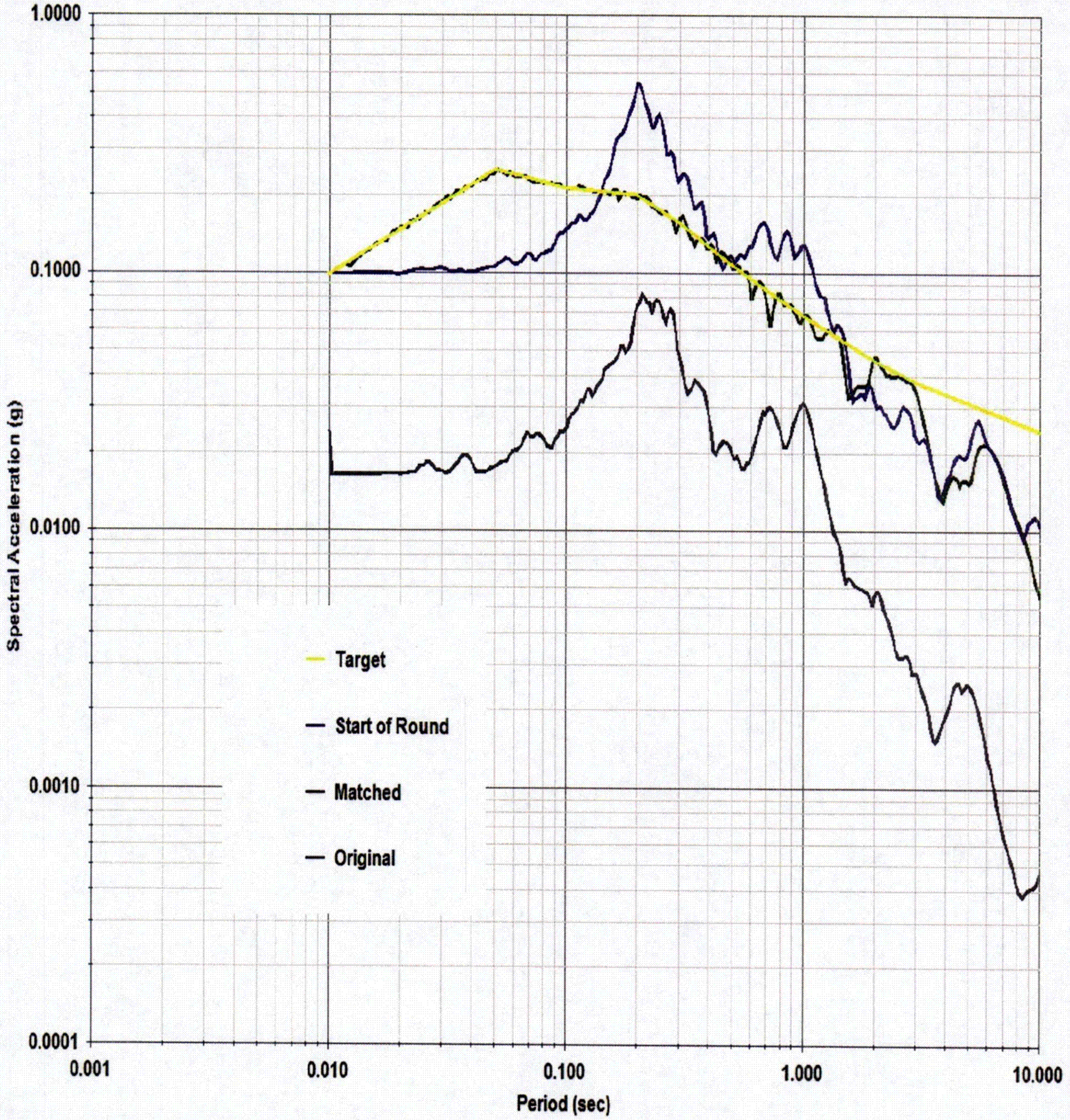


2,500 Yr Landers SIL Spectral Match

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 13
ECS Project No. 14-3046
January 2006

C13



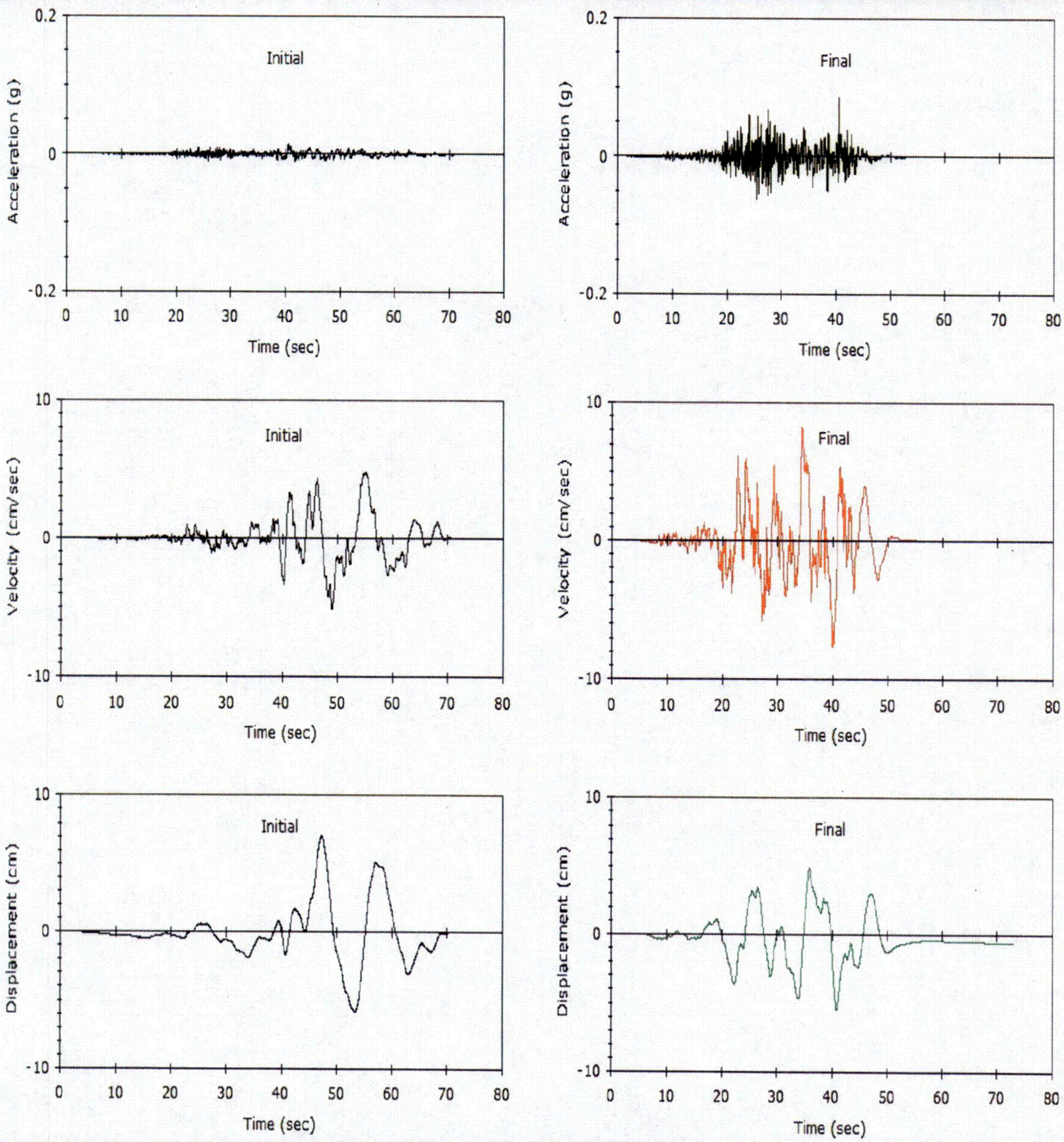
2,500 Yr Taiwan Chi Chi KAU-078N Spectral Match

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

ECS

Figure 14
ECS Project No. 14-3046
January 2006

C14

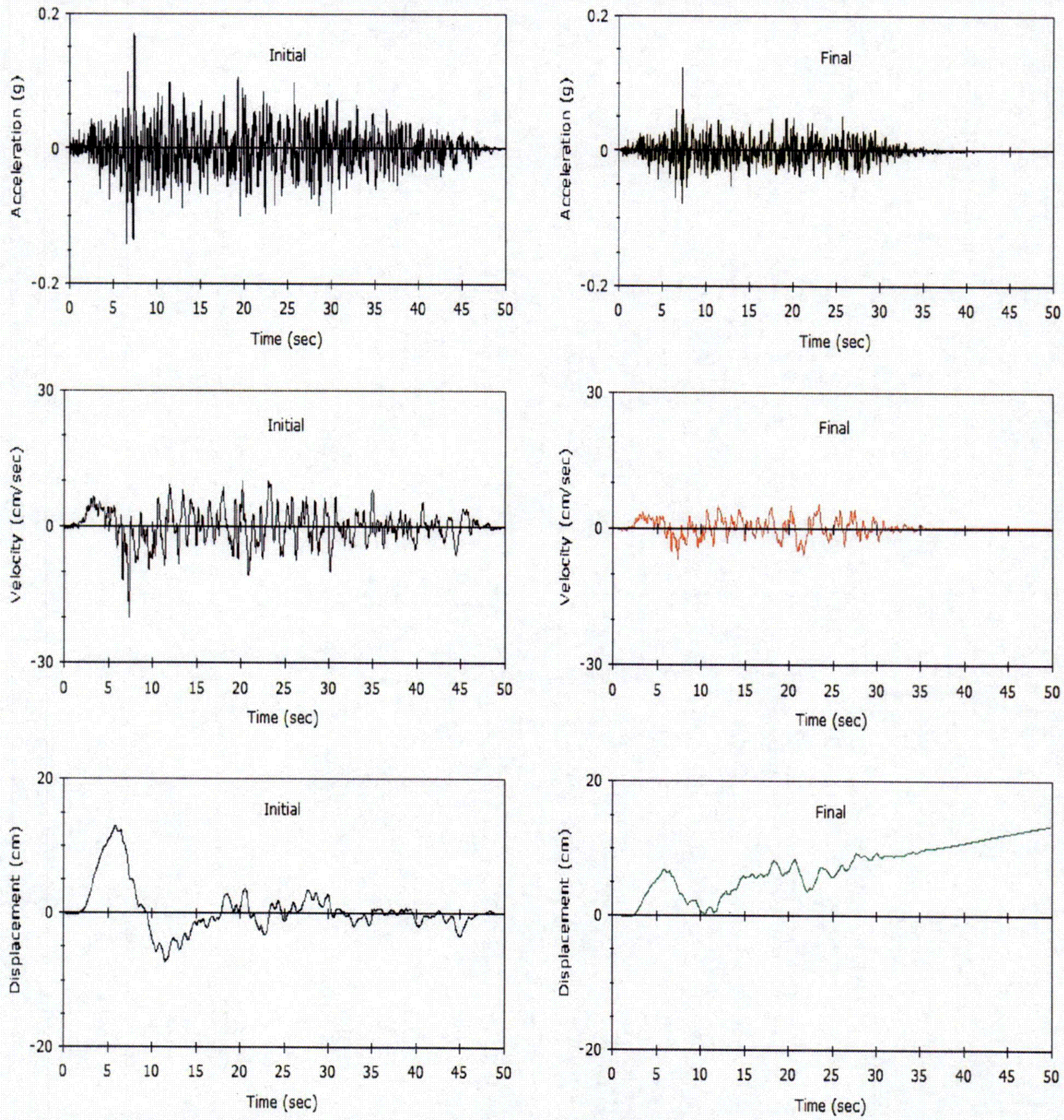


2,500 Yr TAP 060V Time History

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 15
ECS Project No. 14-3046
January 2006

C15

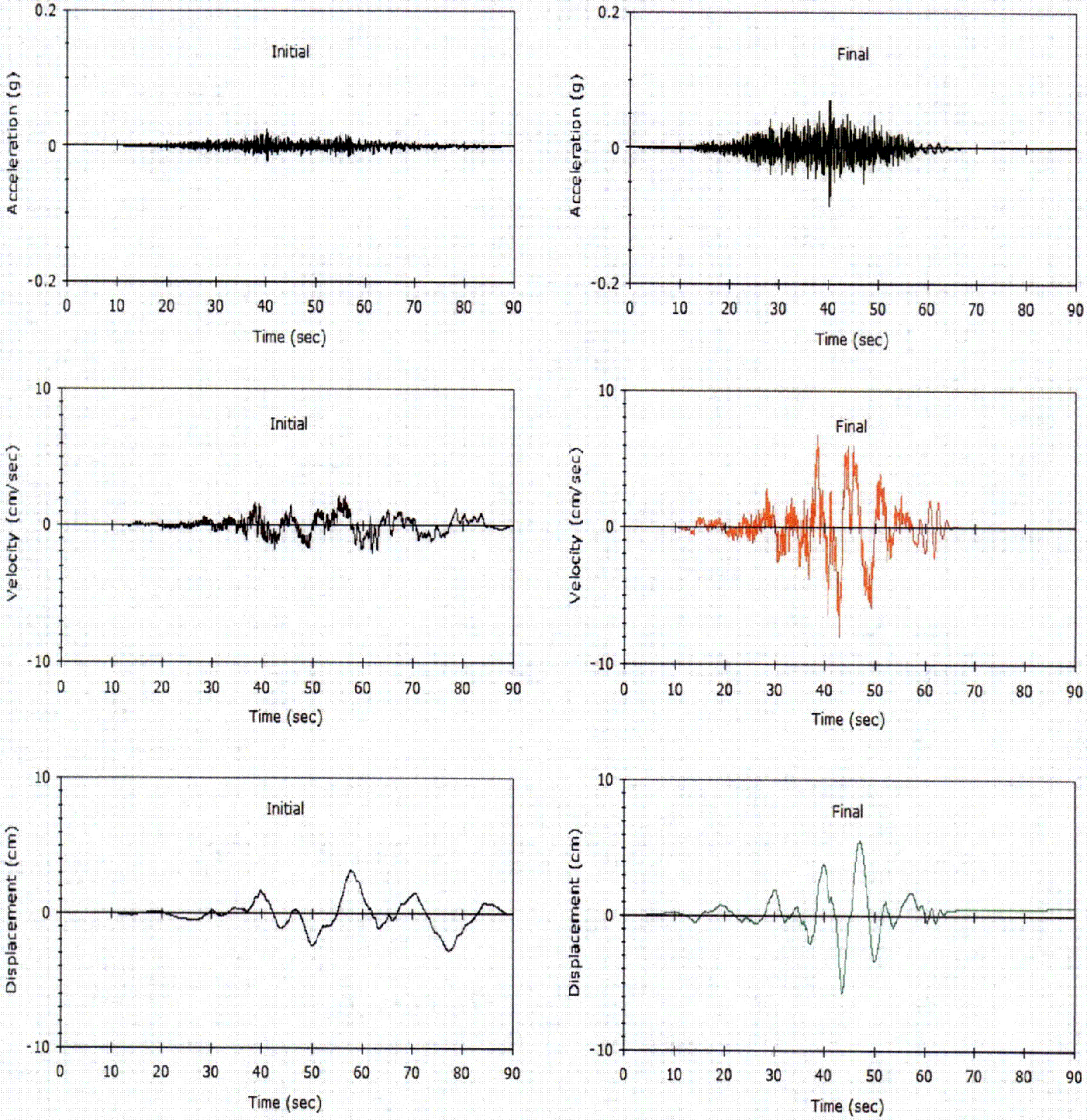


2,500 Yr Landers SIL Time History

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 16
ECS Project No. 14-3046
January 2006

C16

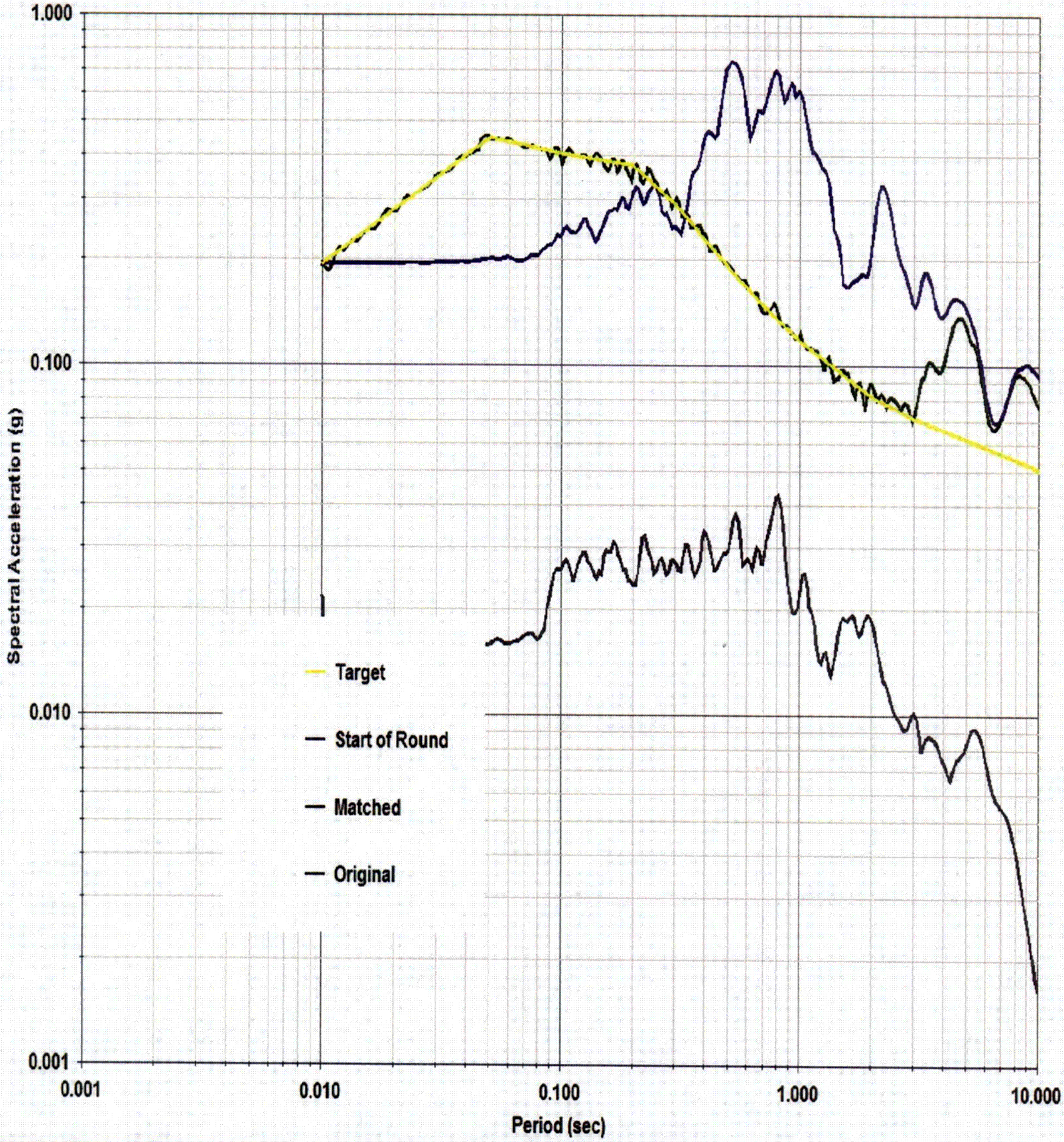


2,500 Yr Taiwan Chi Chi KAU078N Time History

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 17
ECS Project No. 14-3046
January 2006

C17

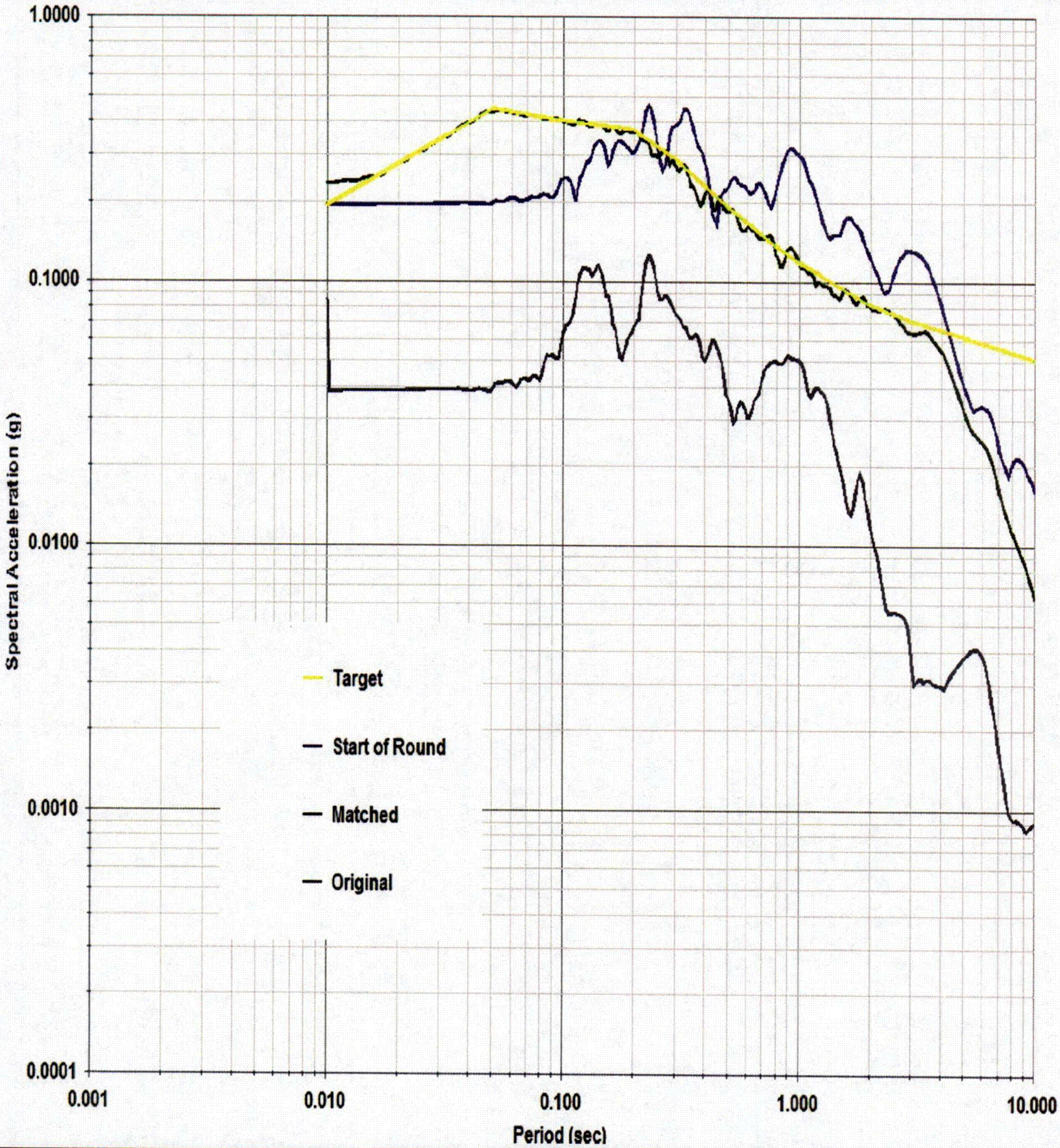


10,000 Yr Taiwan Chi Chi ILA002-V Spectral Match

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 18
ECS Project No. 14-3046
January 2006

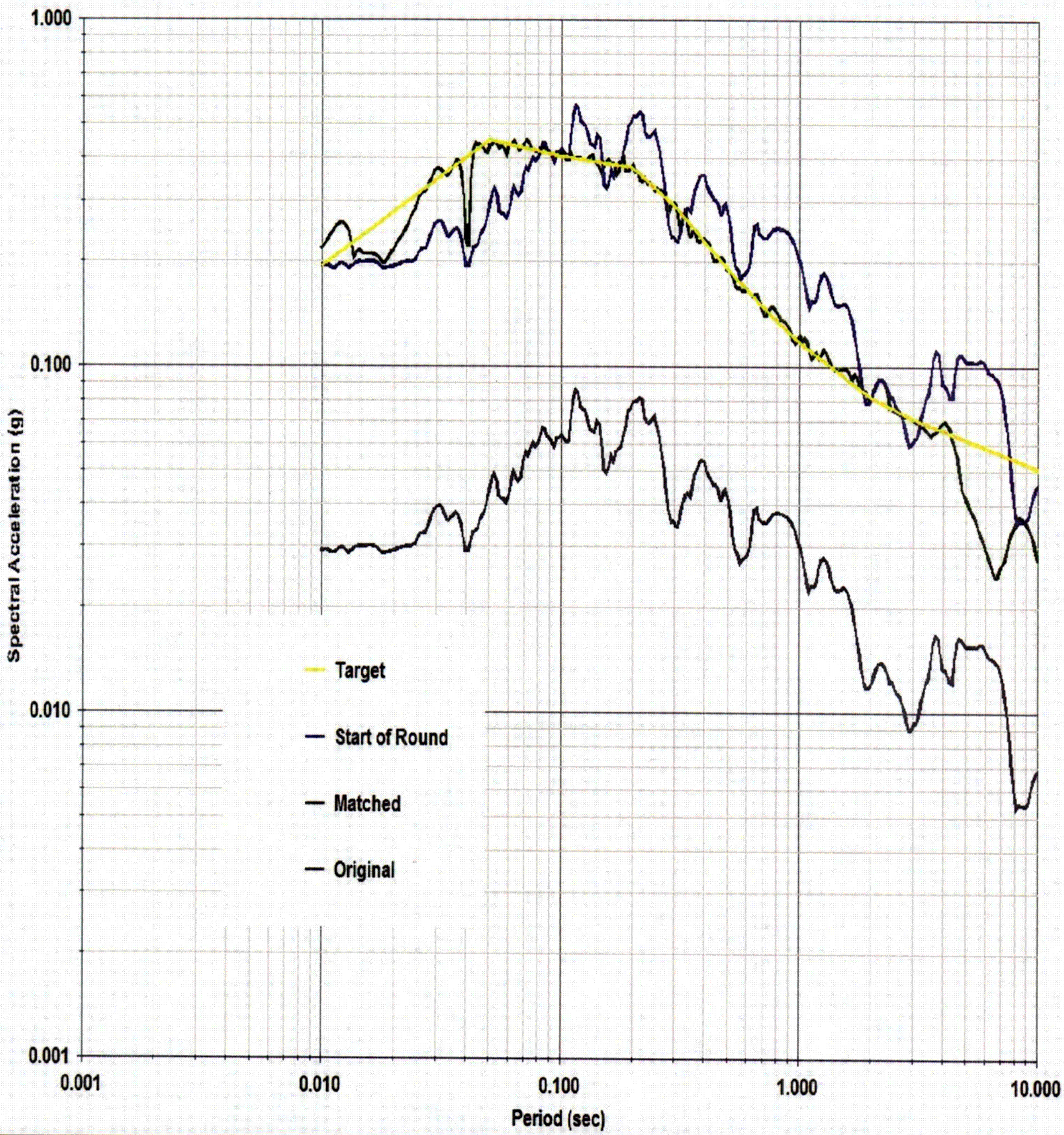
C18



10,000 Yr Taiwan Chi Chi 046-W Spectral Match

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 19
ECS Project No. 14-3046
January 2006



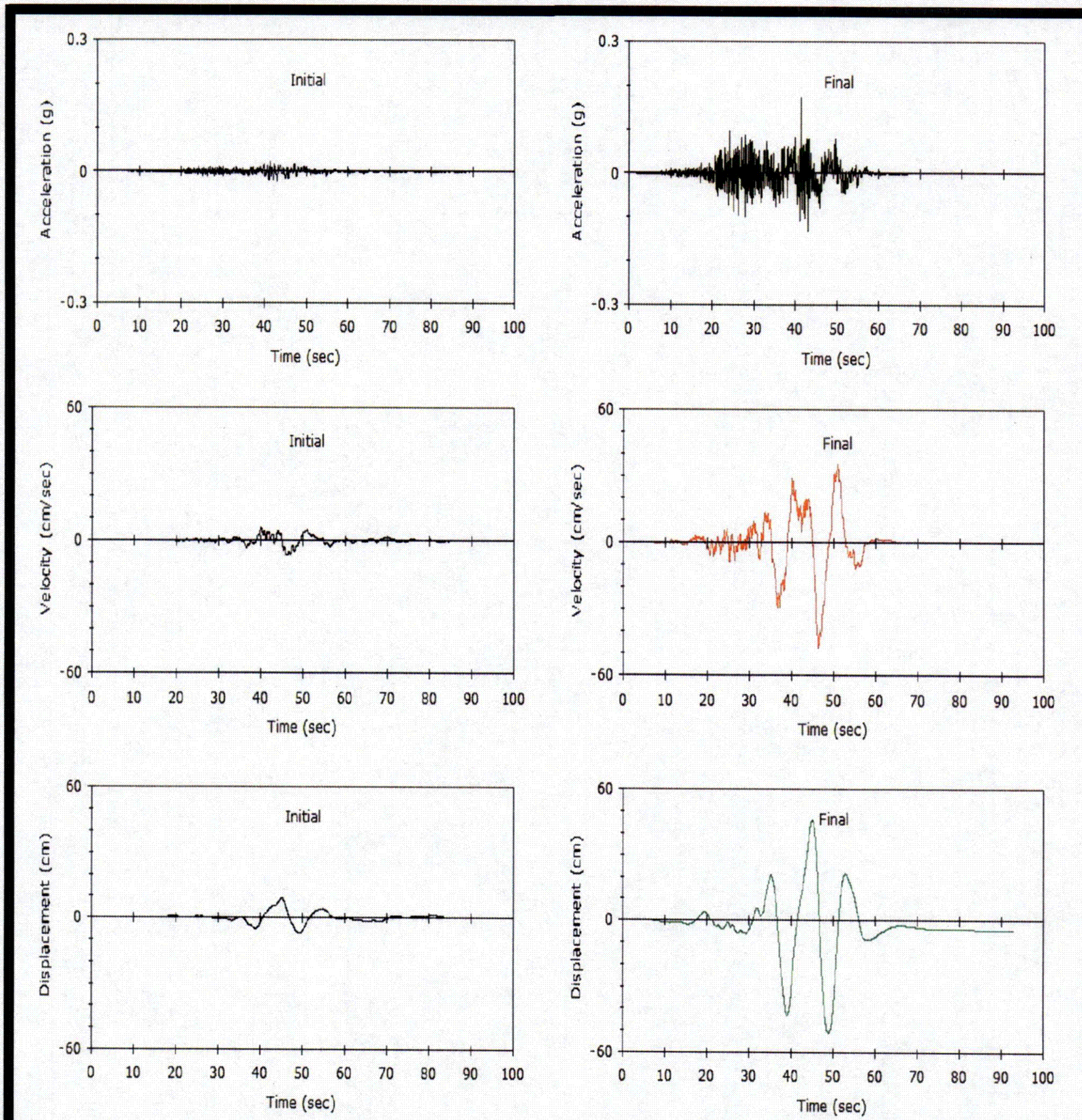
10,000 Yr Tabas Bajestan V1 Spectral Match

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

ECS

Figure 20
ECS Project No. 14-3046
January 2006

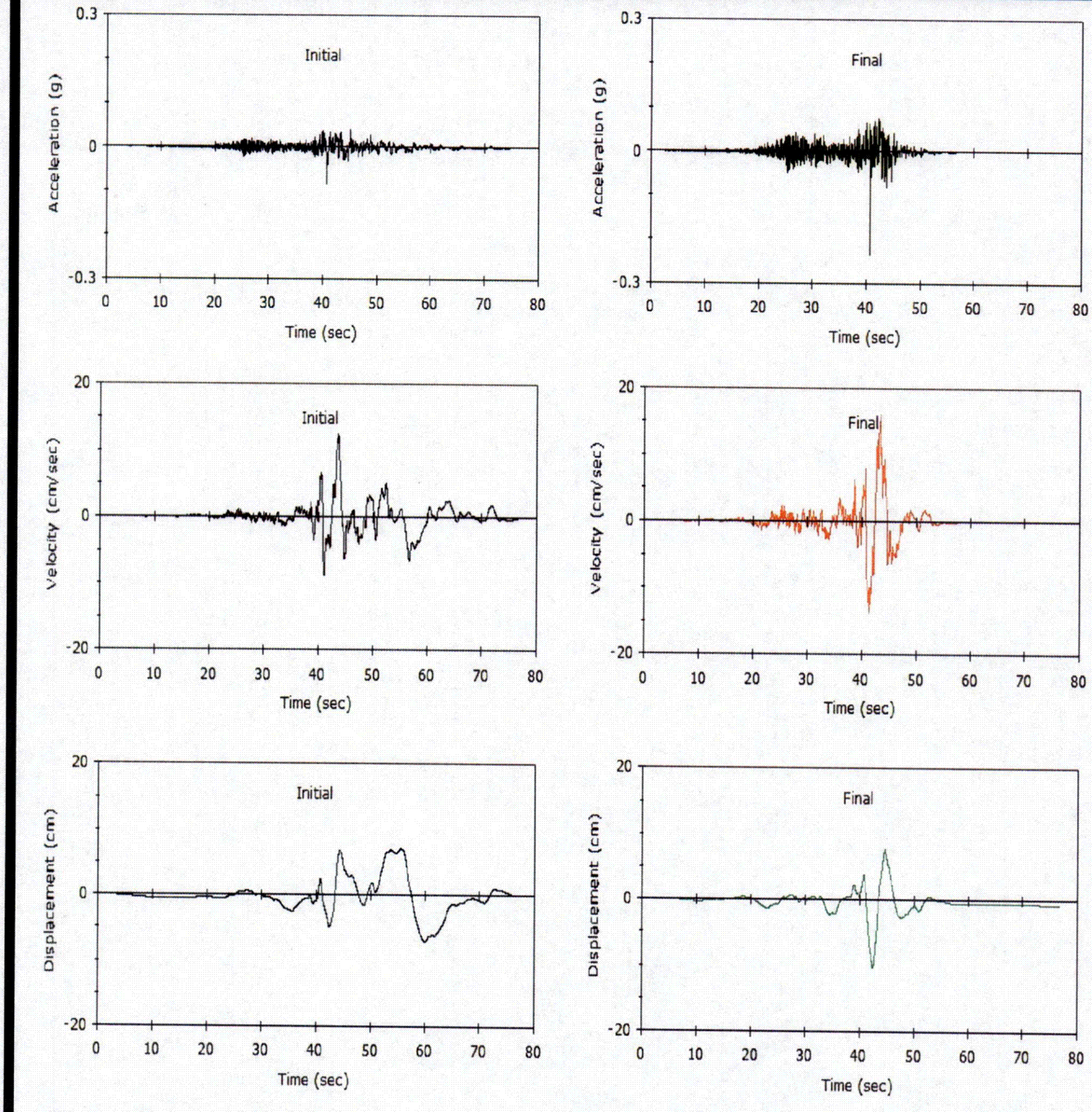
C20



10,000 Yr Taiwan Chi Chi ILA002-V Time History

USEC American Centrifuge **Centrifuge Enrichment Plant** **Piketon, Ohio**	ECS	**Figure 21** **ECS Project No. 14-3046** **January 2006**

C21

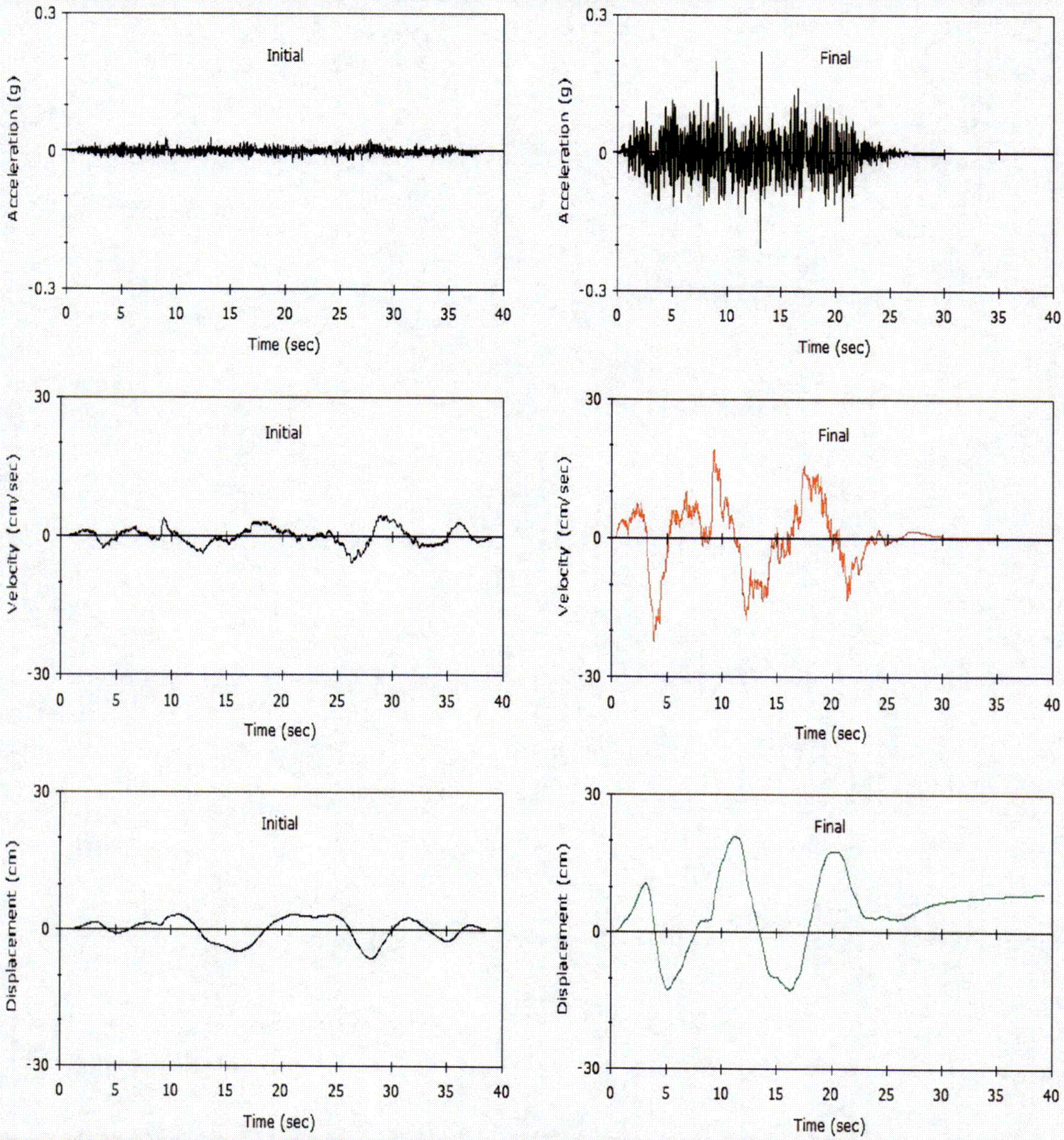


10,000 Yr Taiwan Chi Chi 046-W Time History

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 22
ECS Project No. 14-3046
January 2006

C22

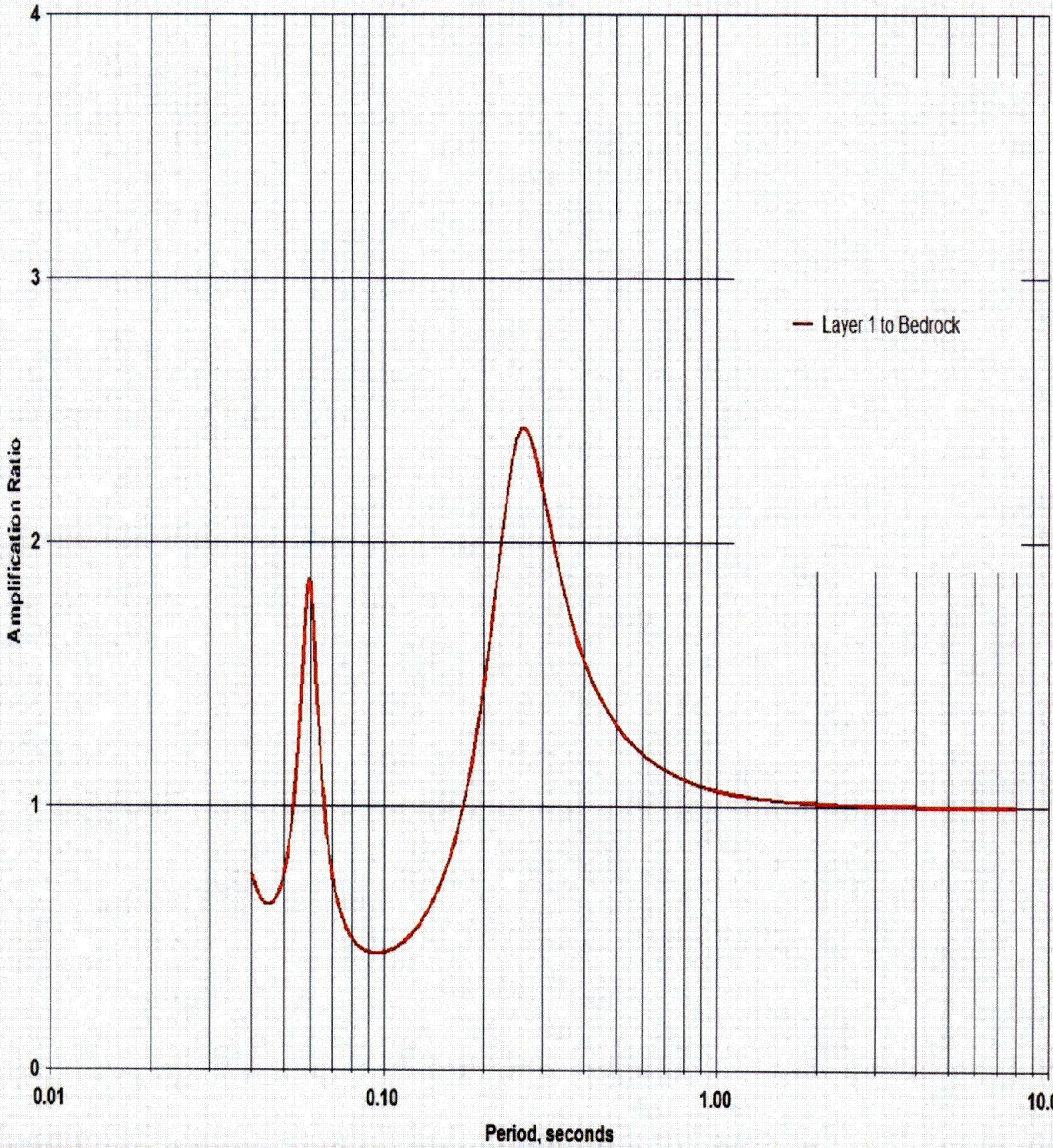


10,000 Yr Tabas Bajestan V1 Time History

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 23
ECS Project No. 14-3046
January 2006

C23

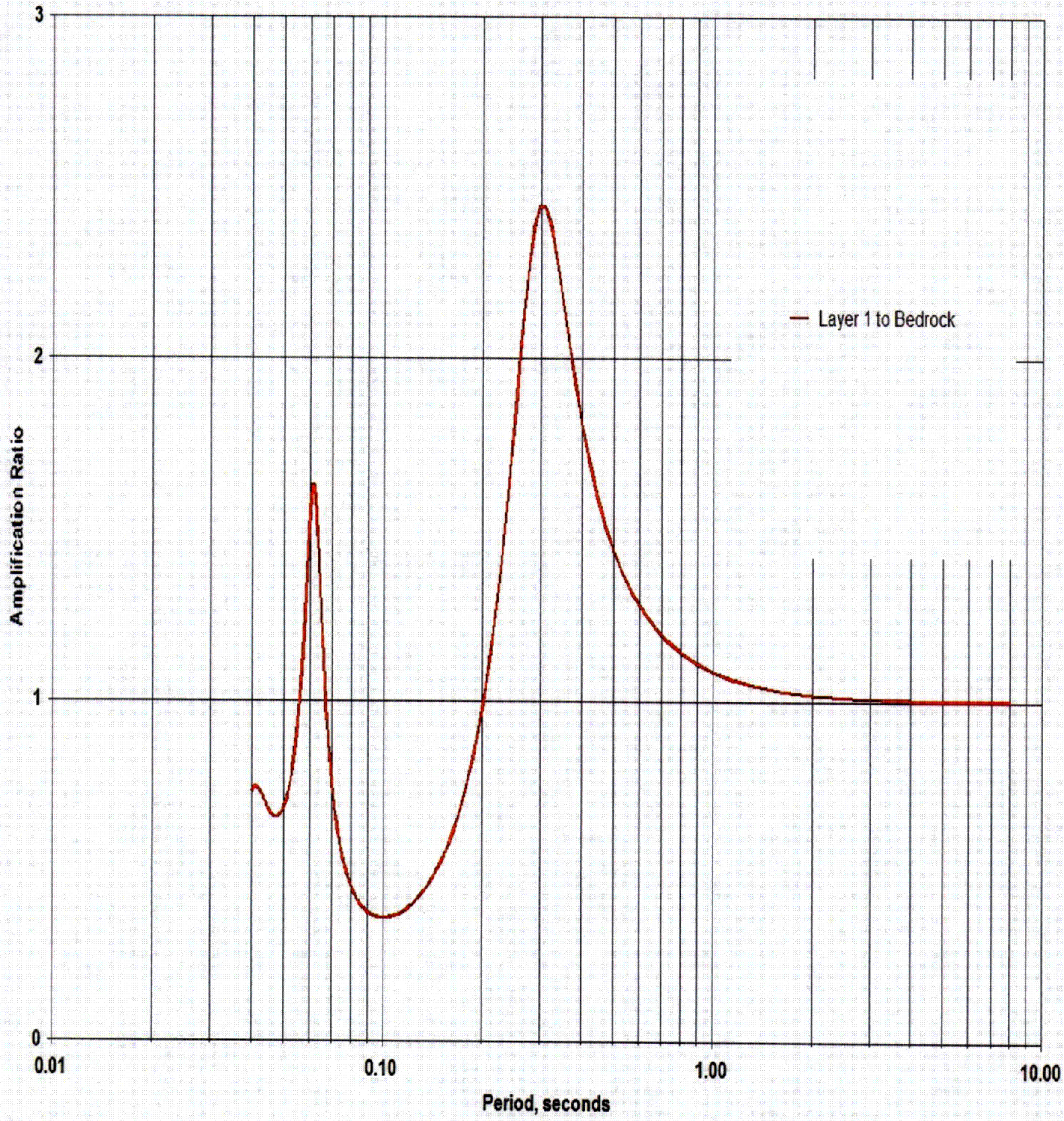


10,000 Yr Taiwan Chi Chi ILA002-V Amplification Ratio- Profile 1

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 24
ECS Project No. 14-3046
January 2006

C24

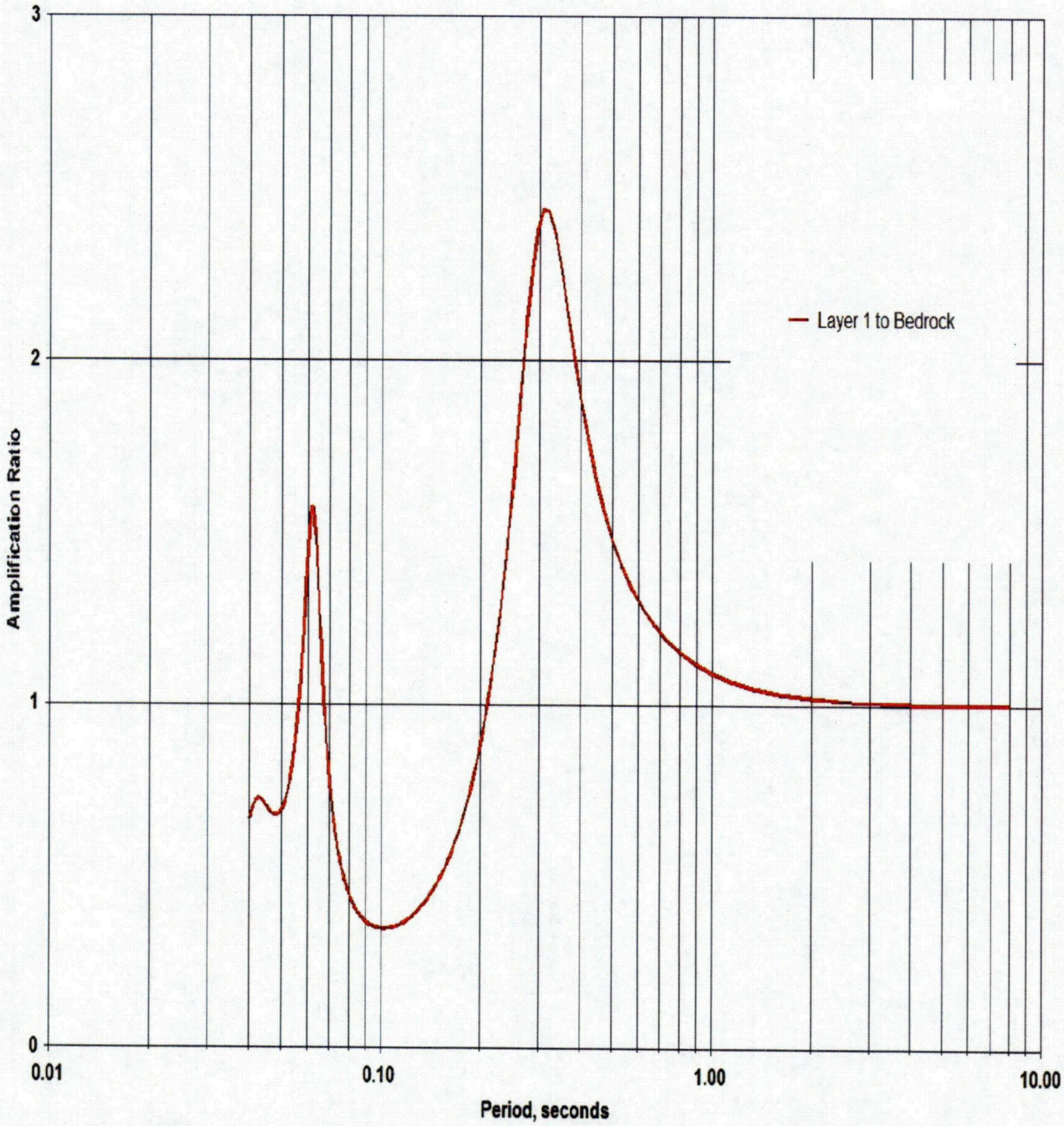


10,000 Yr Taiwan 046-W Amplification Ratio – Profile 1

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 25
ECS Project No. 14-3046
January 2006

C25



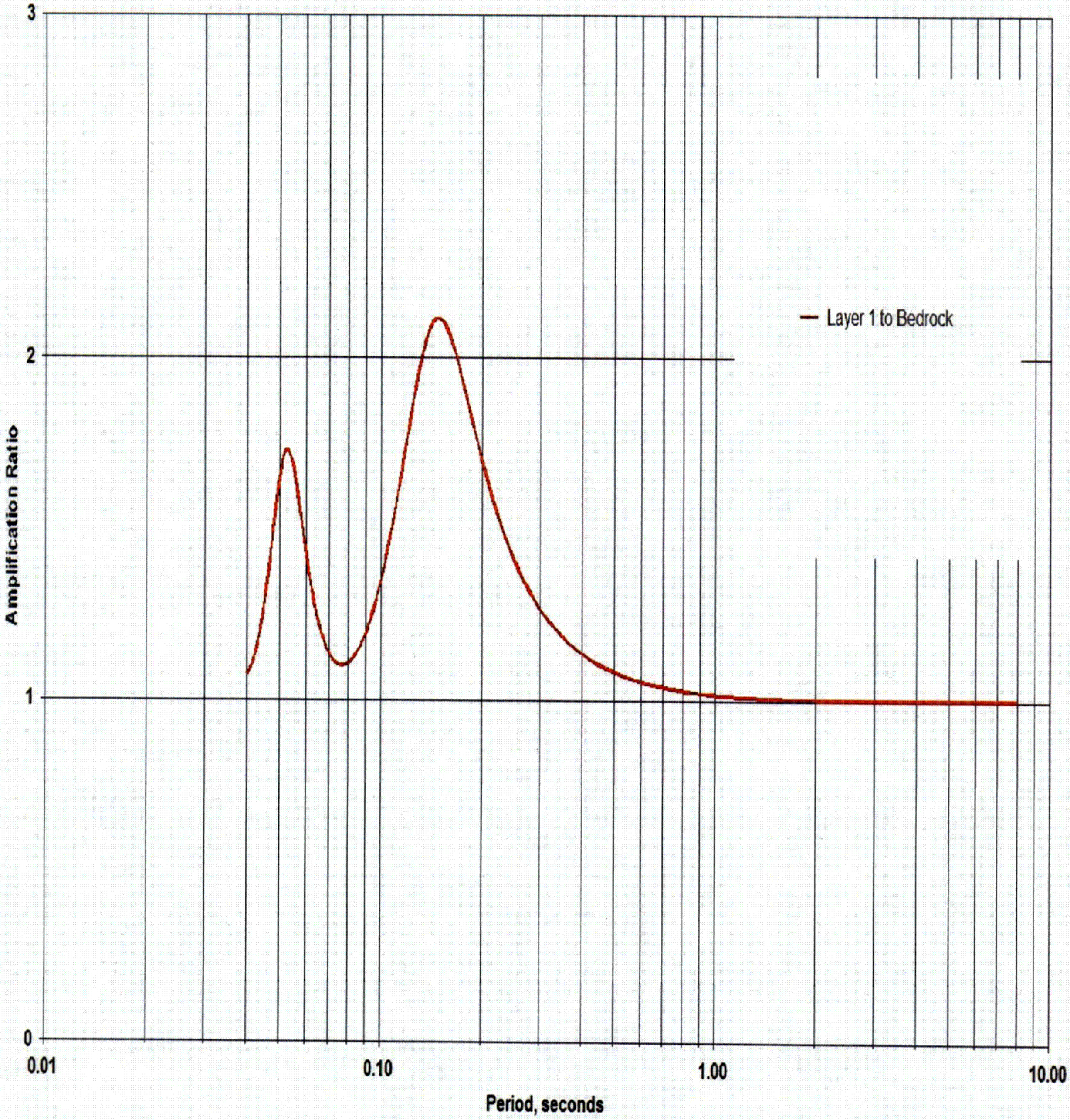
10,000 Yr Tabas Bajestan V1 Amplification Ratio – Profile 1

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

ECS

Figure 26
ECS Project No. 14-3046
January 2006

C26

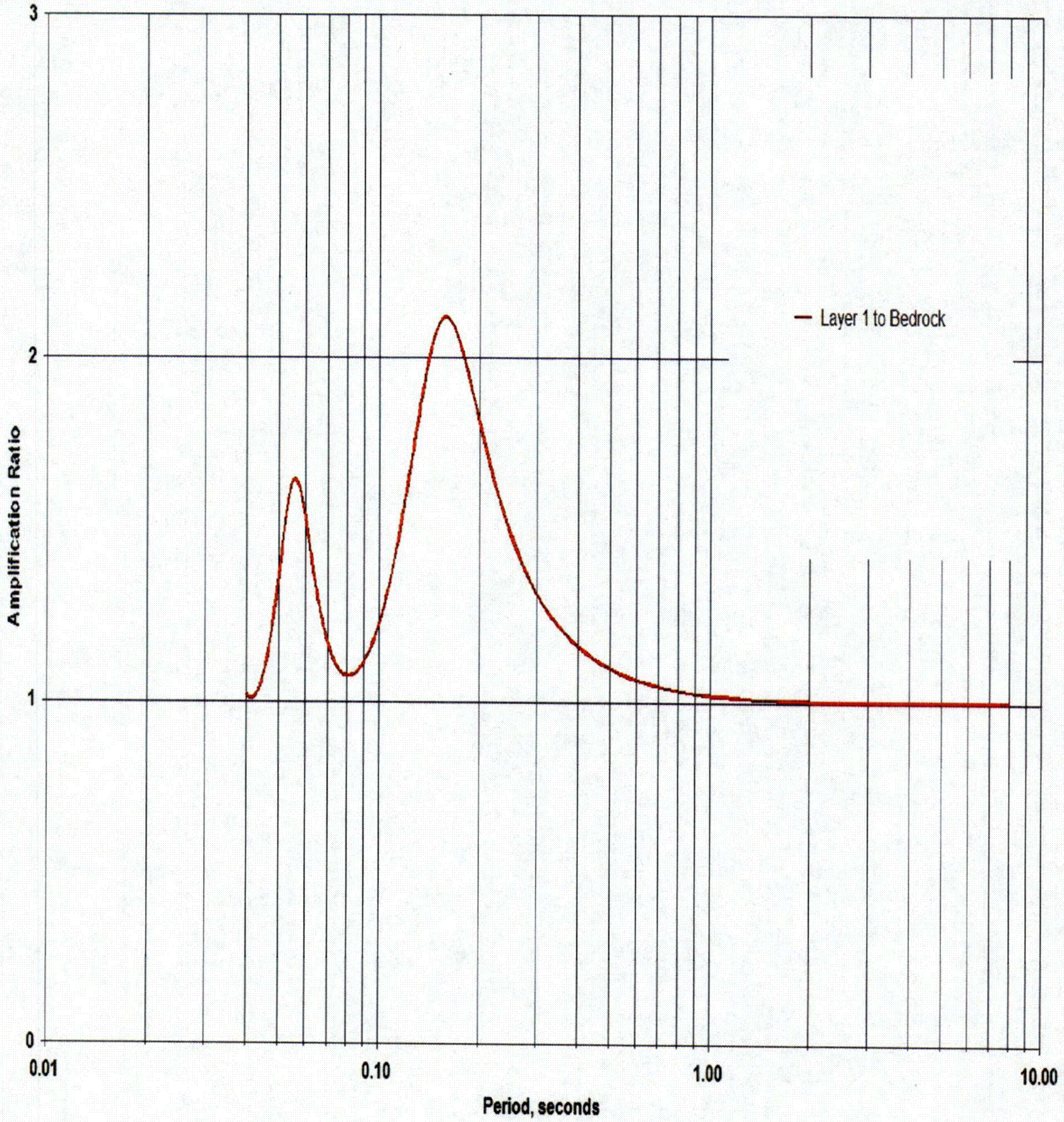


10,000 Yr Taiwan Chi Chi ILA002-V Amplification Ratio- Profile 2

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 27
ECS Project No. 14-3046
January 2006

C27



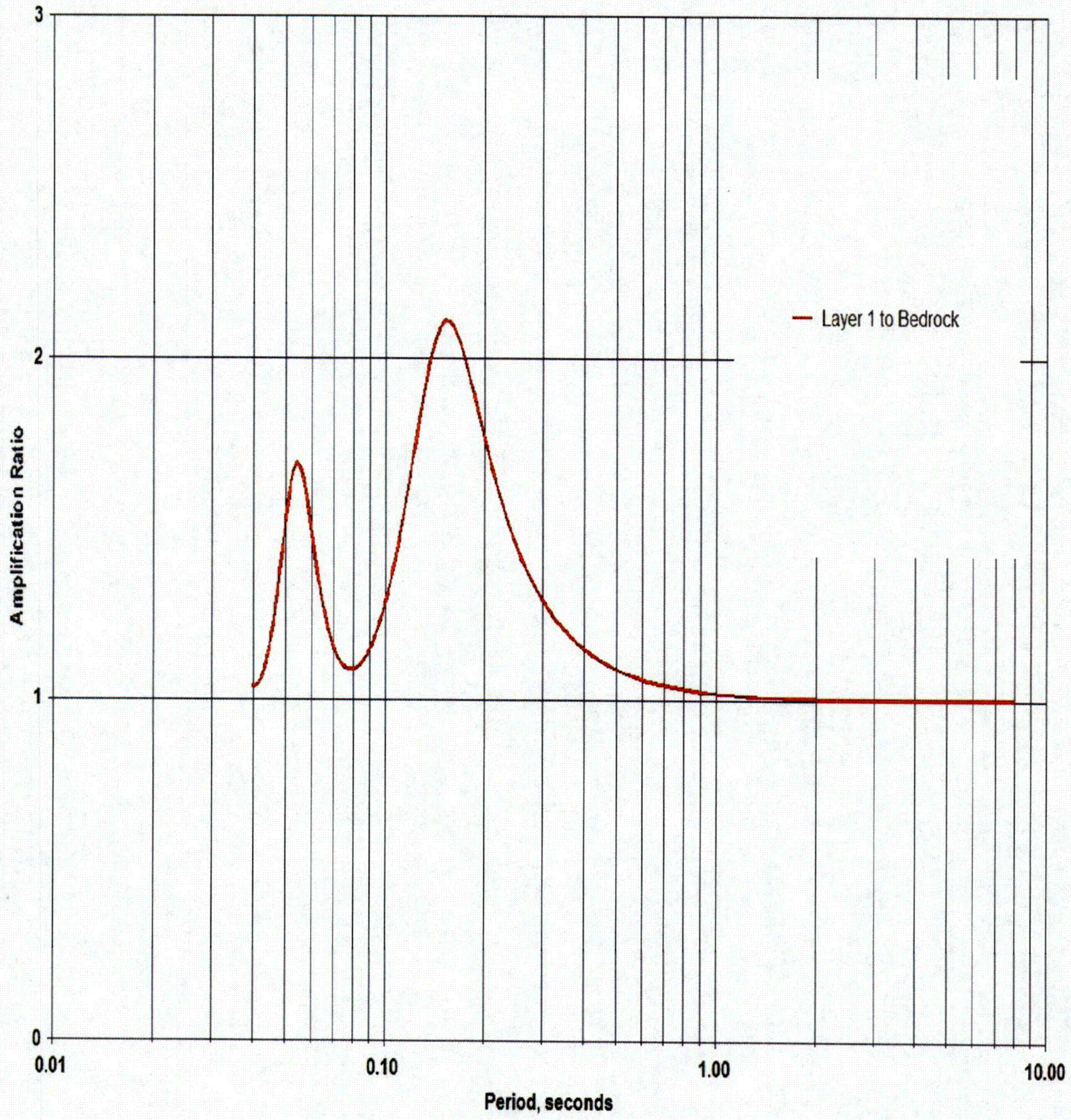
10,000 Yr Taiwan 046-W Amplification Ratio – Profile 2

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

ECS

Figure 28
ECS Project No. 14-3046
January 2006

C28



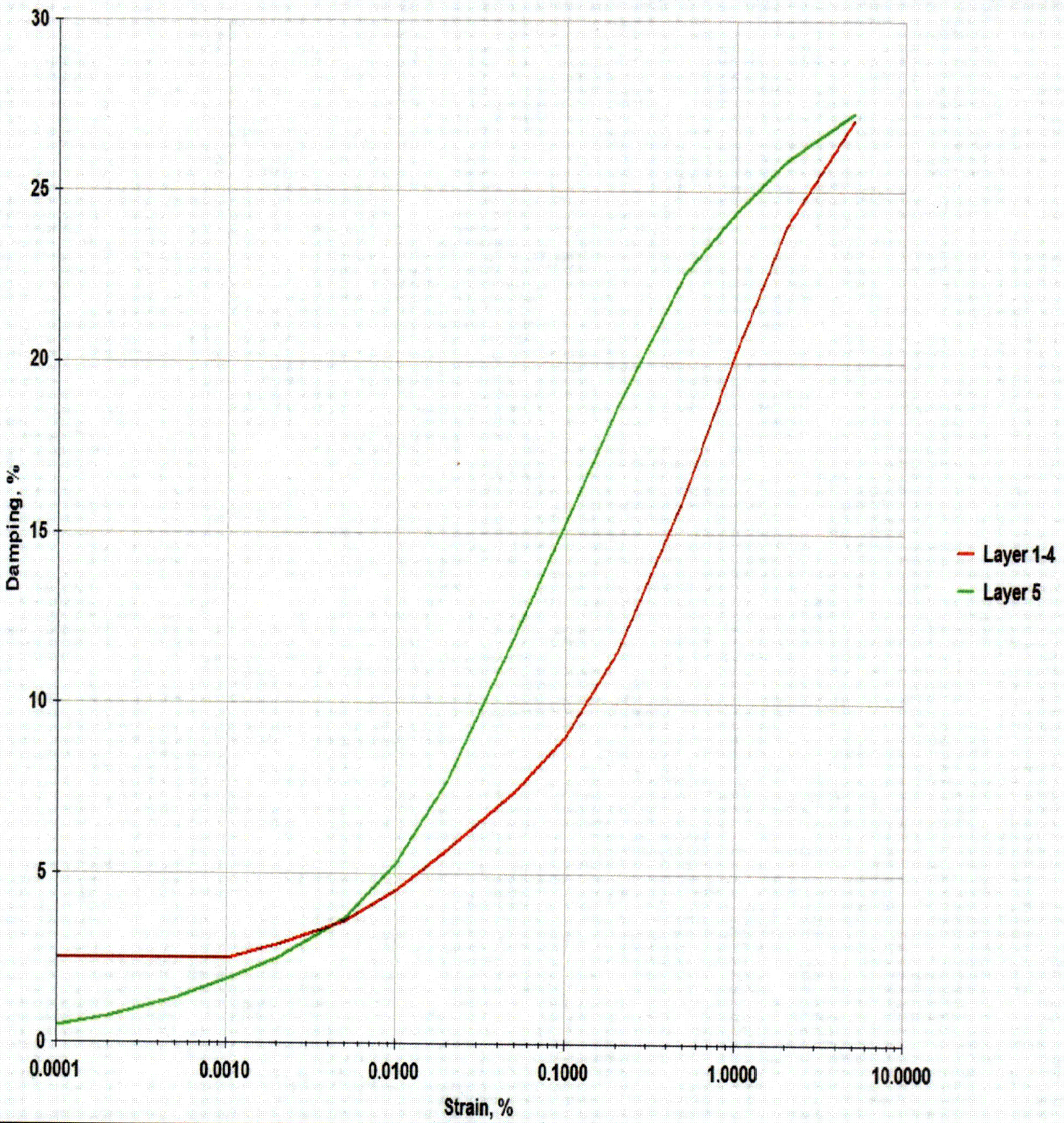
10,000 Yr Tabas Bajestan V1 Amplification Ratio – Profile 2

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

ECS

Figure 29
ECS Project No. 14-3046
January 2006

C29



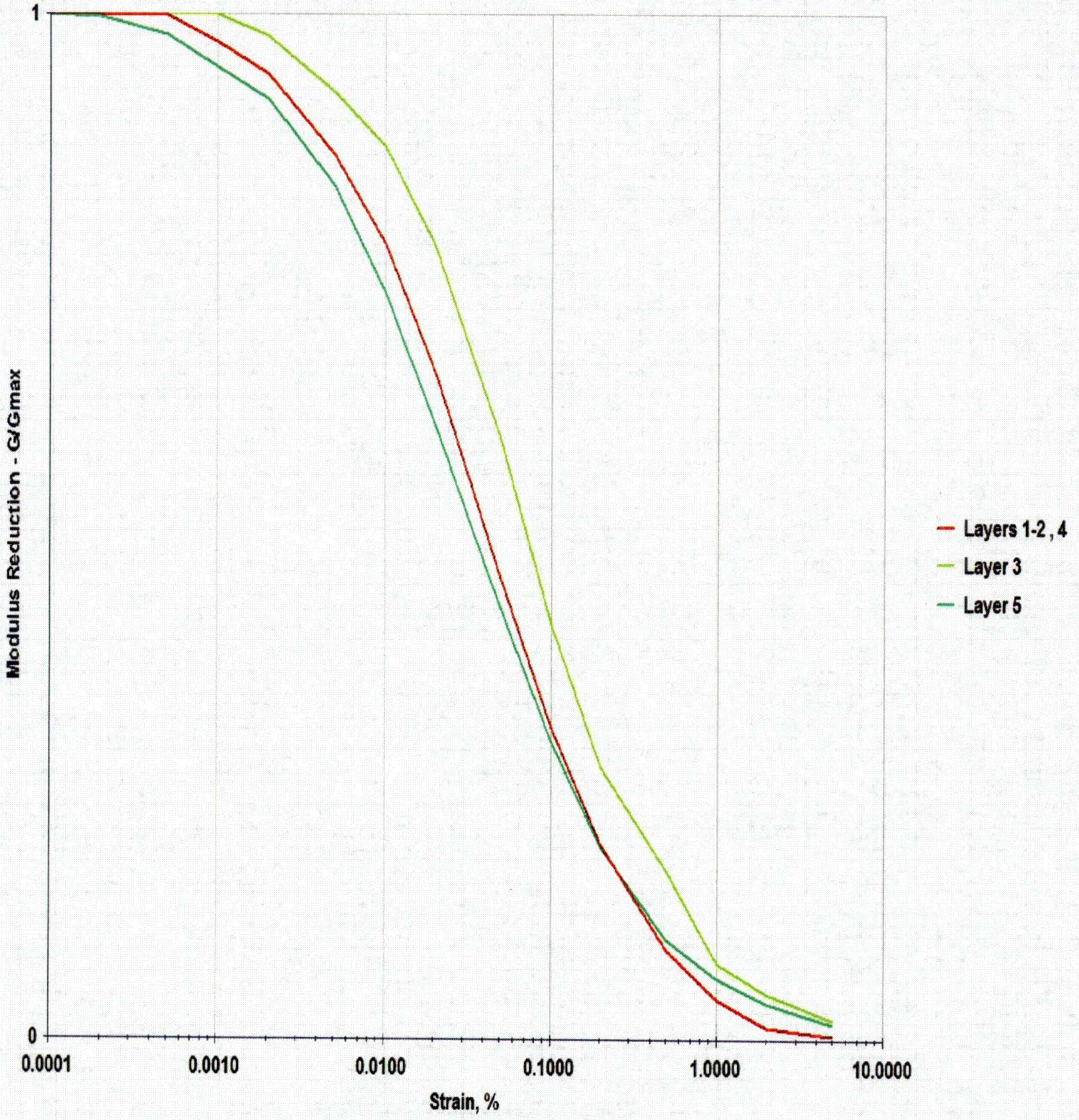
SHAKE ANALYSIS SHEAR STRAIN VS DAMPING

USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

ECS

Figure 30
ECS Project No. 14-3046
January 2006

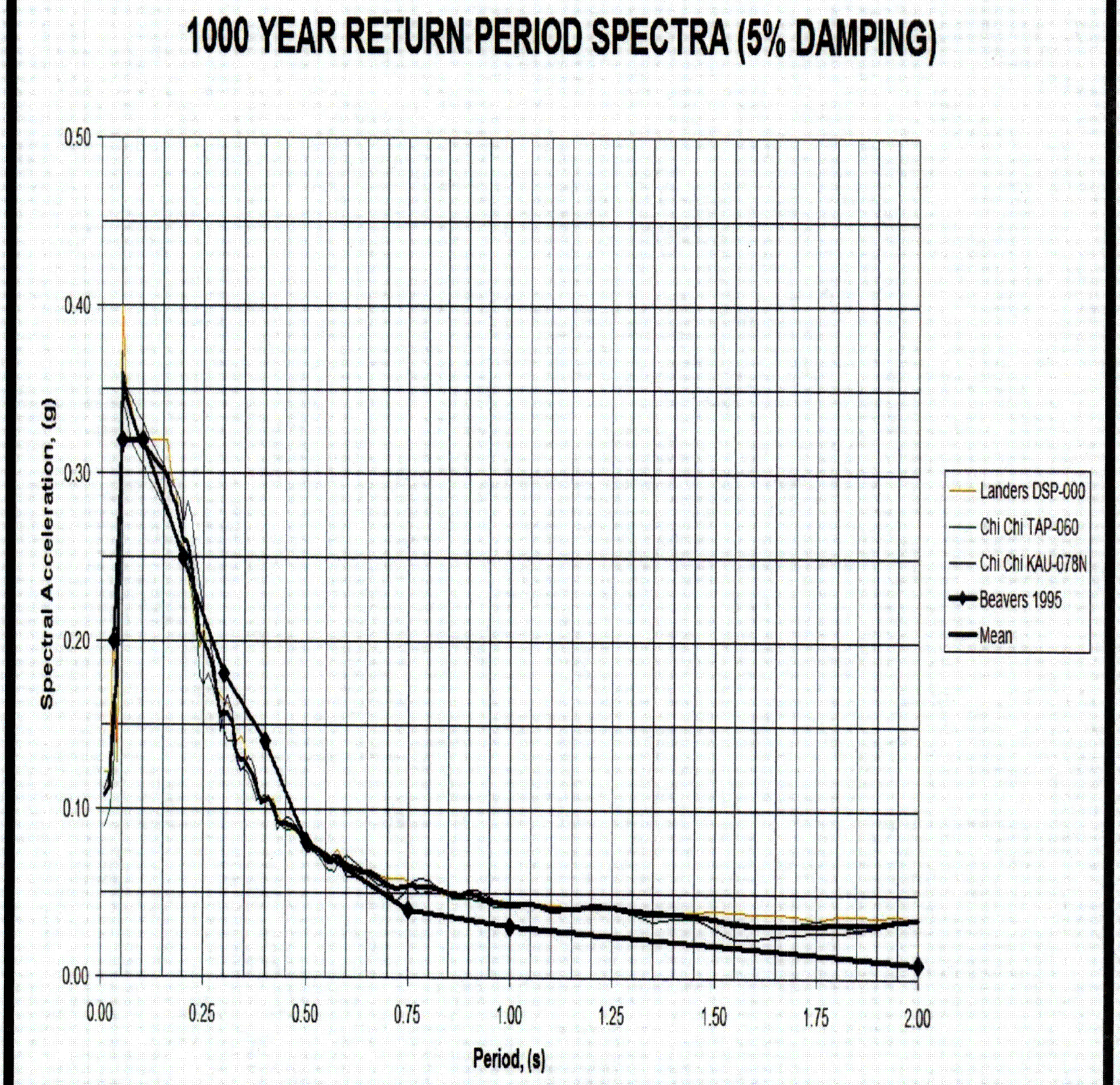
C30



SHAKE ANALYSIS MODULUS REDUCTION CURVES

USEC American Centrifuge Centrifuge Enrichment Plant Piketon, Ohio	ECS	Figure 31 ECS Project No. 14-3046 January 2006

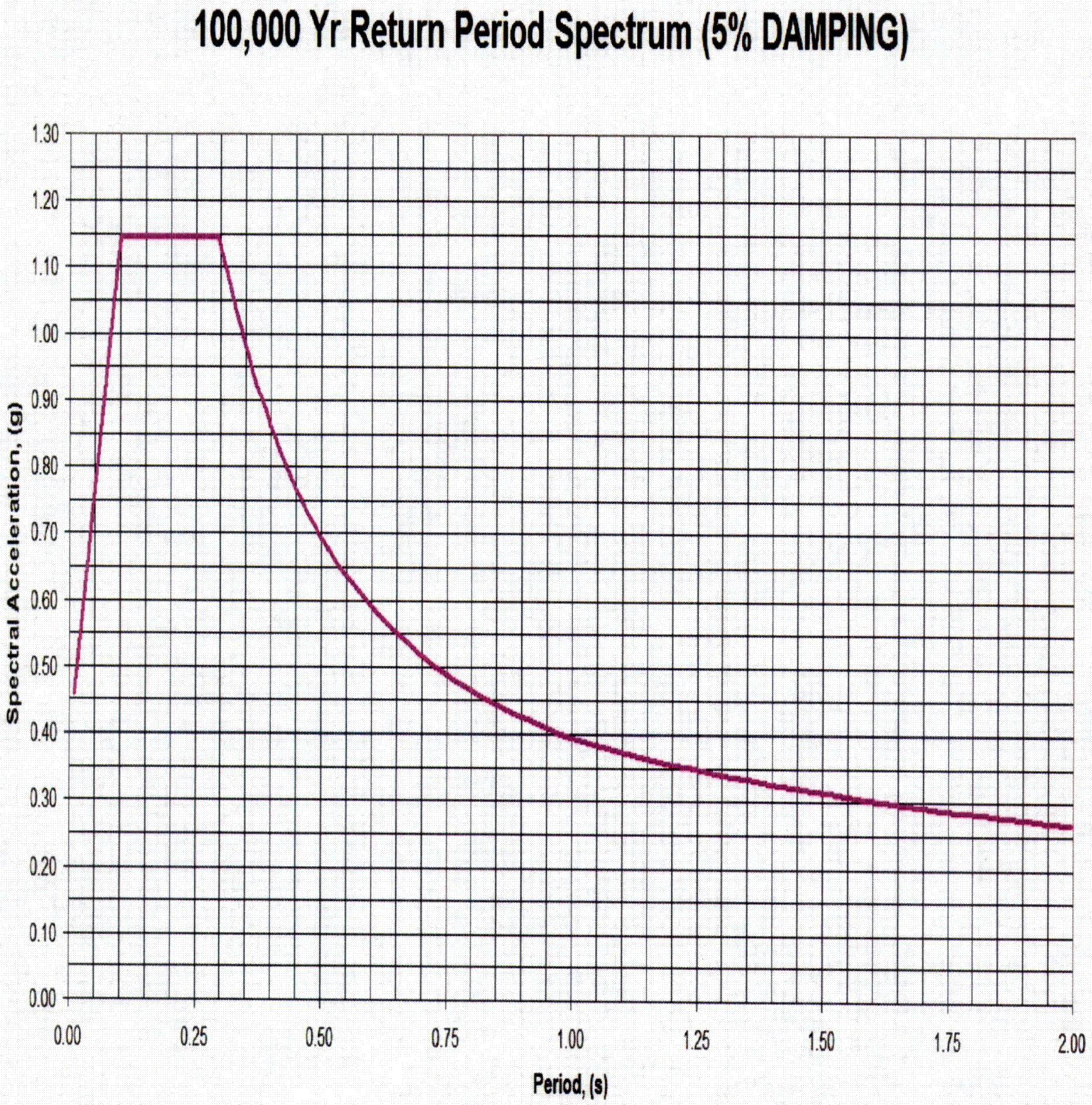
C31



1000 yr Return Period Spectra Comparison

USEC American Centrifuge **Centrifuge Enrichment Plant** **Piketon, Ohio**	**Figure 32** **ECS Project No. 14-3046** **January 2006**

C32



100,000 Yr Return Period Spectrum

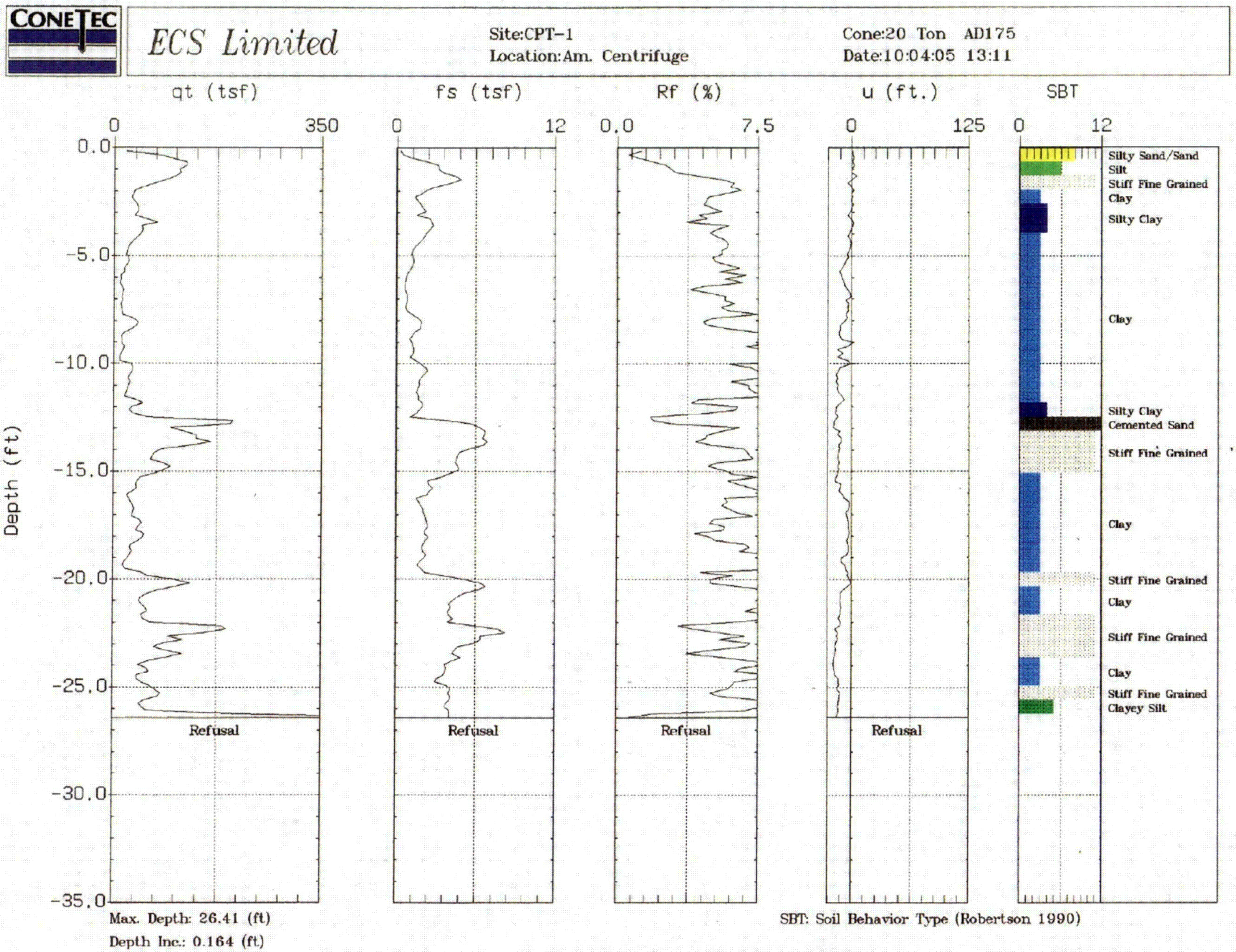
USEC American Centrifuge
Centrifuge Enrichment Plant
Piketon, Ohio

Figure 33
ECS Project No. 14-3046
January 2006

C33

Supplemental Data

Boring Location Diagram
Cone Penetration Test (CPT) Soundings Logs
Soil Test Borings Logs
Shear Wave Velocity Test Results
Summary of Shear Wave Velocity Testing from the 1977 LETCO Report
Laboratory Testing Summary


CONETEC
ECS Limited
Site:CPT-1
Location:Am. Centrifuge
Cone:20 Ton AD175
Date:10:04:05 13:11
qt (tsf)
0
350
fs (tsf)
0
12
Rf (%)
0.0
7.5
u (ft.)
0
125
SBT
0
12
Depth (ft)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
Silty Sand/Sand
Silt
Stiff Fine Grained
Clay
Silty Clay
Clay
Silty Clay
Cemented Sand
Stiff Fine Grained
Clay
Stiff Fine Grained
Clay
Stiff Fine Grained
Clay
Stiff Fine Grained
Clayey Silt
Refusal
Refusal
Refusal
Refusal
Max. Depth: 26.41 (ft)
Depth Inc.: 0.164 (ft)
SBT: Soil Behavior Type (Robertson 1990)

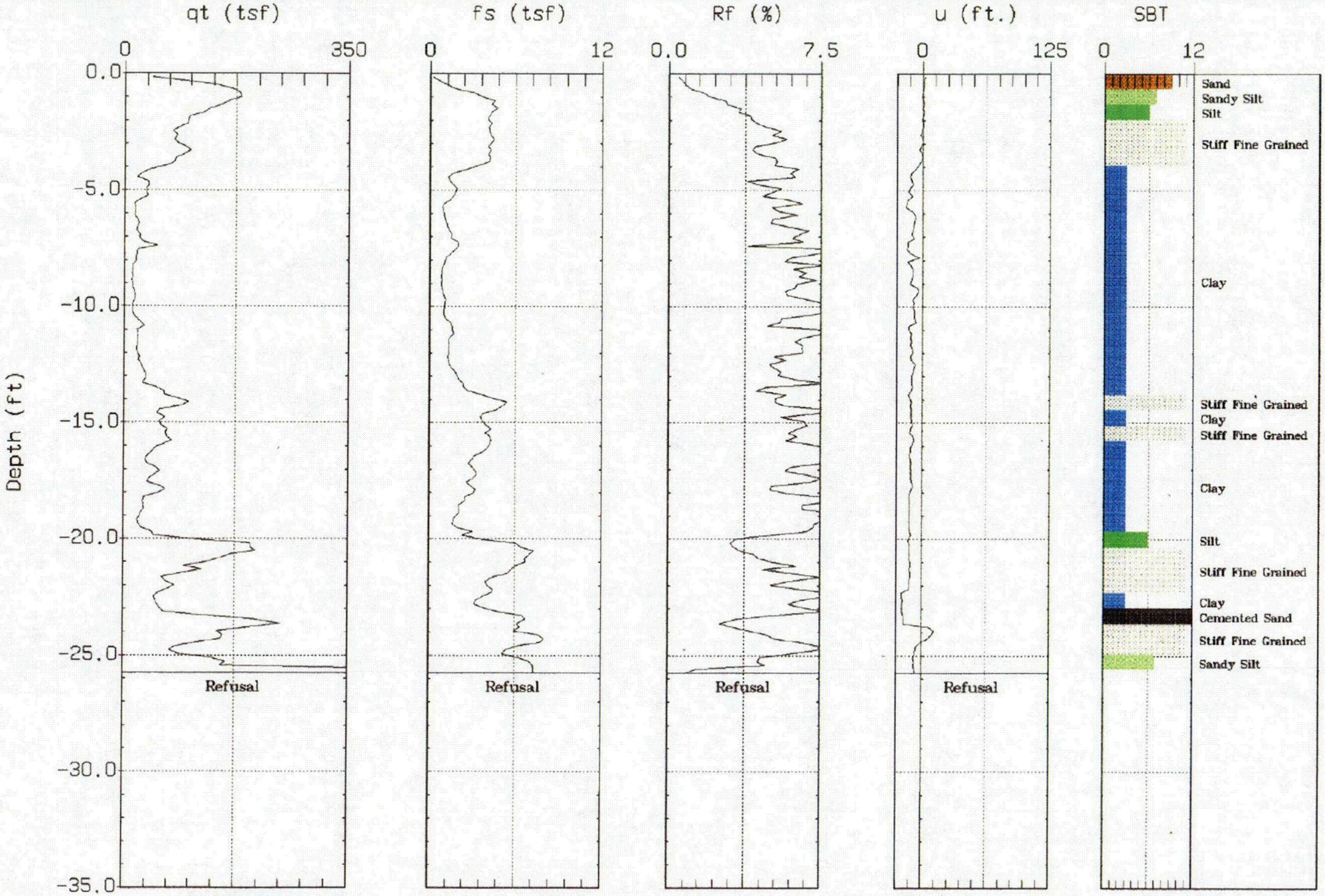
C34

CONETEC

ECS Limited

Site:CPT-3
Location:Am. Centrifuge

Cone:20 Ton AD175
Date:10:04:05 13:38



Max. Depth: 25.75 (ft)
Depth Inc.: 0.164 (ft)

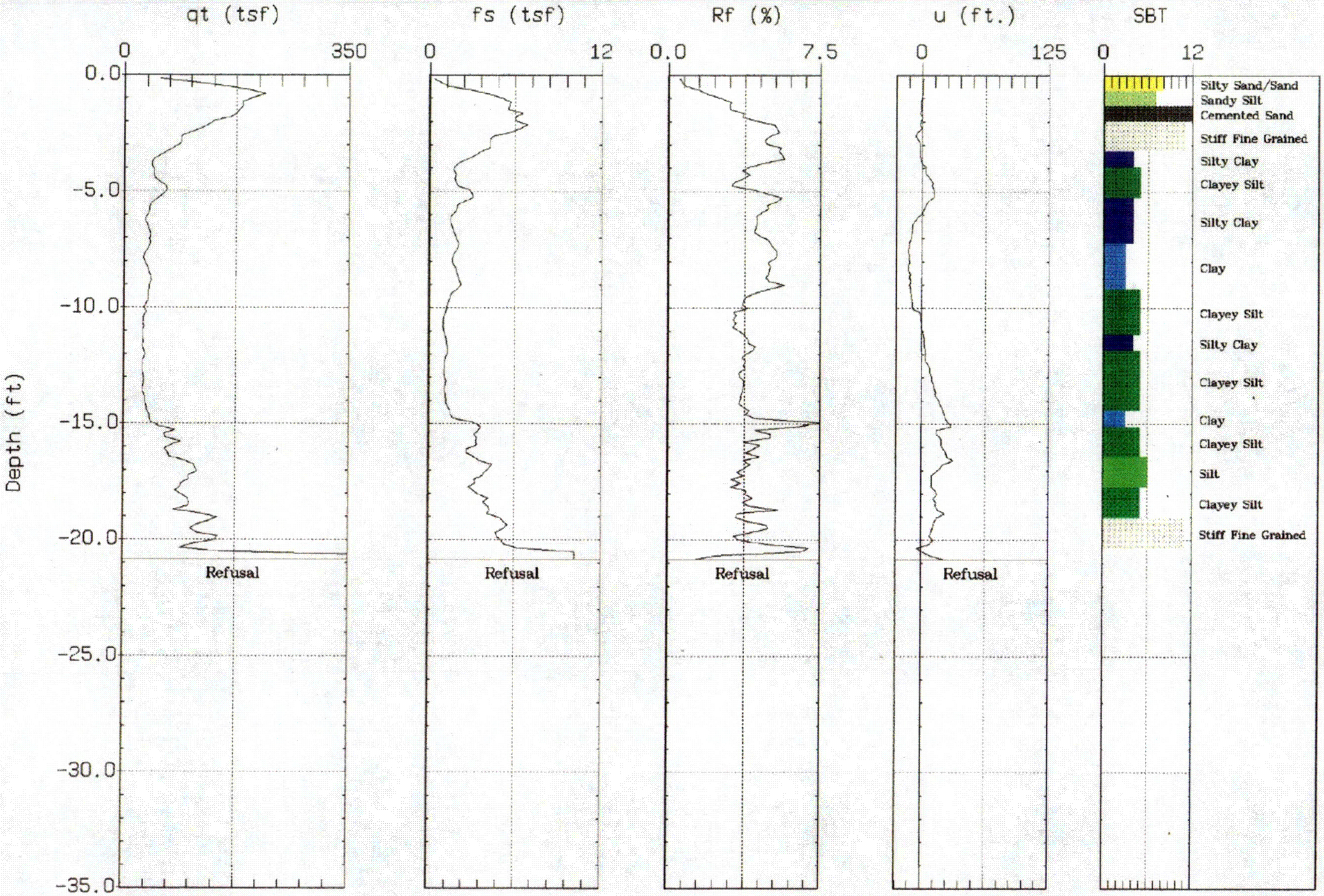
SBT: Soil Behavior Type (Robertson 1990)

C35

ECS Limited

Site:CPT-4
Location:Am. Centrifuge

Cone:20 Ton AD175
Date:10:04:05 12:40



Max. Depth: 20.83 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

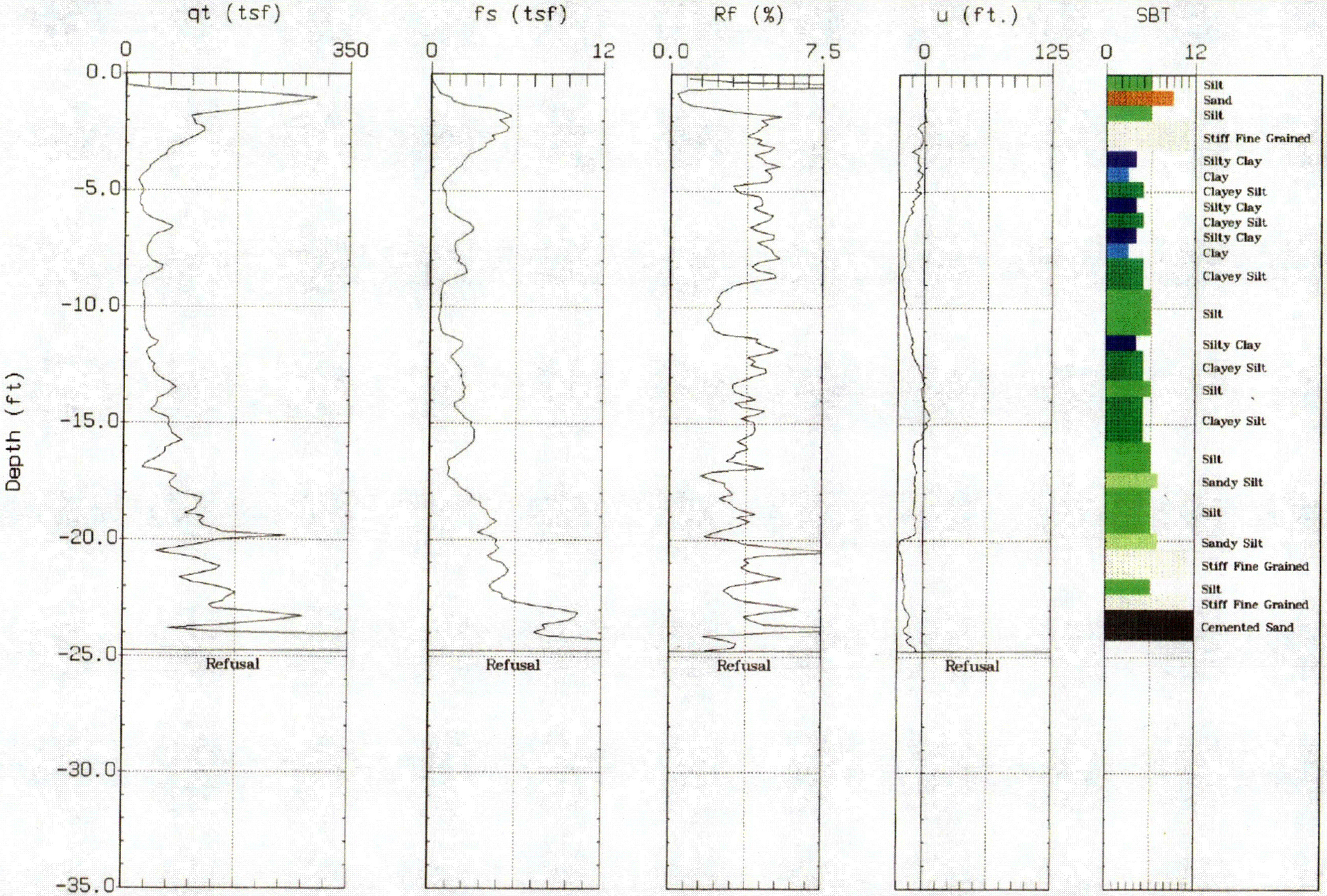
C36

CONETEC

ECS Limited

Site:CPT-5
Location:Am. Centrifuge

Cone:20 Ton AD175
Date:10:04:05 12:11



Max. Depth: 24.77 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

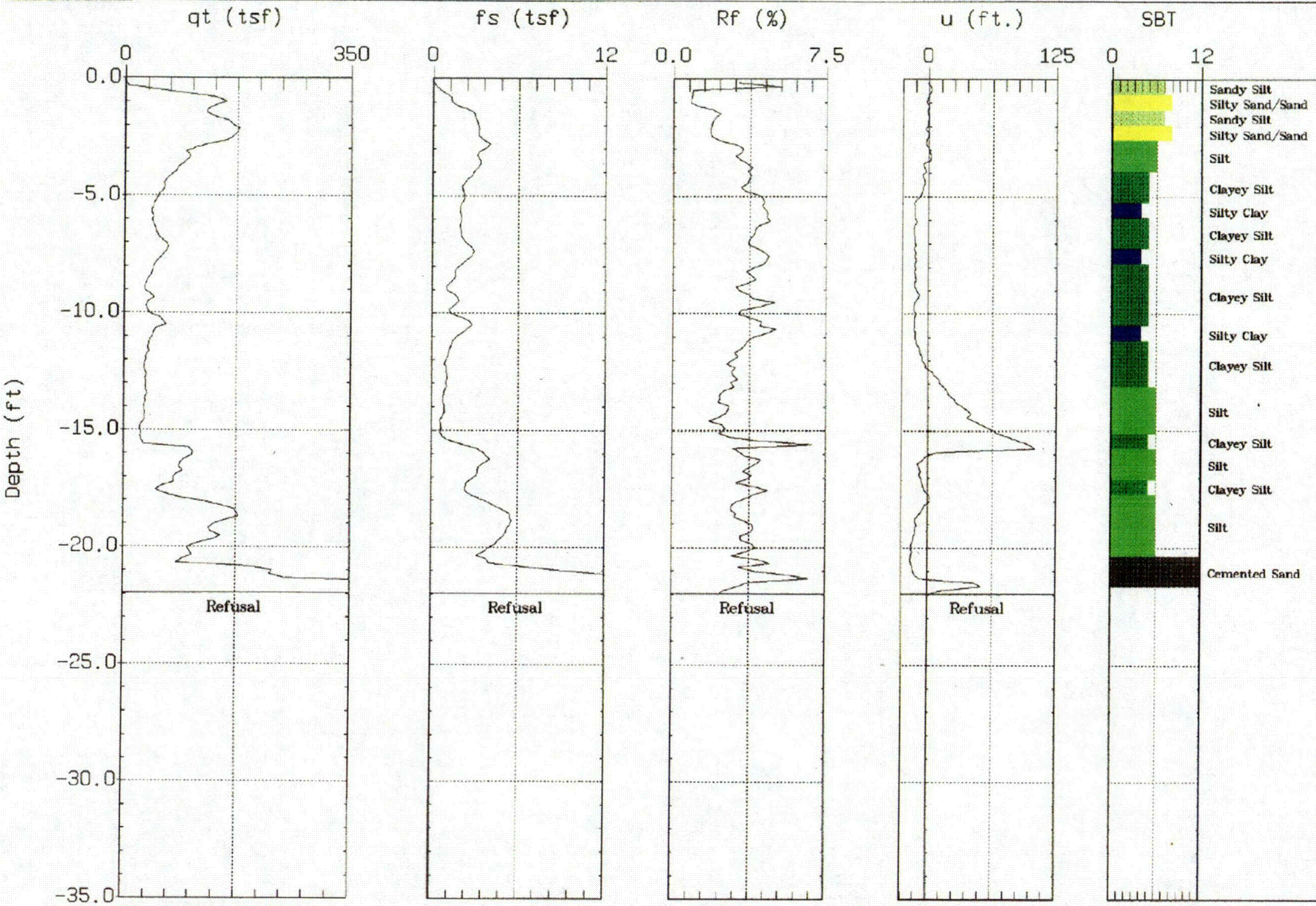
C37

CONETEC

ECS Limited

Site:CPT-7
Location:Am. Centrifuge

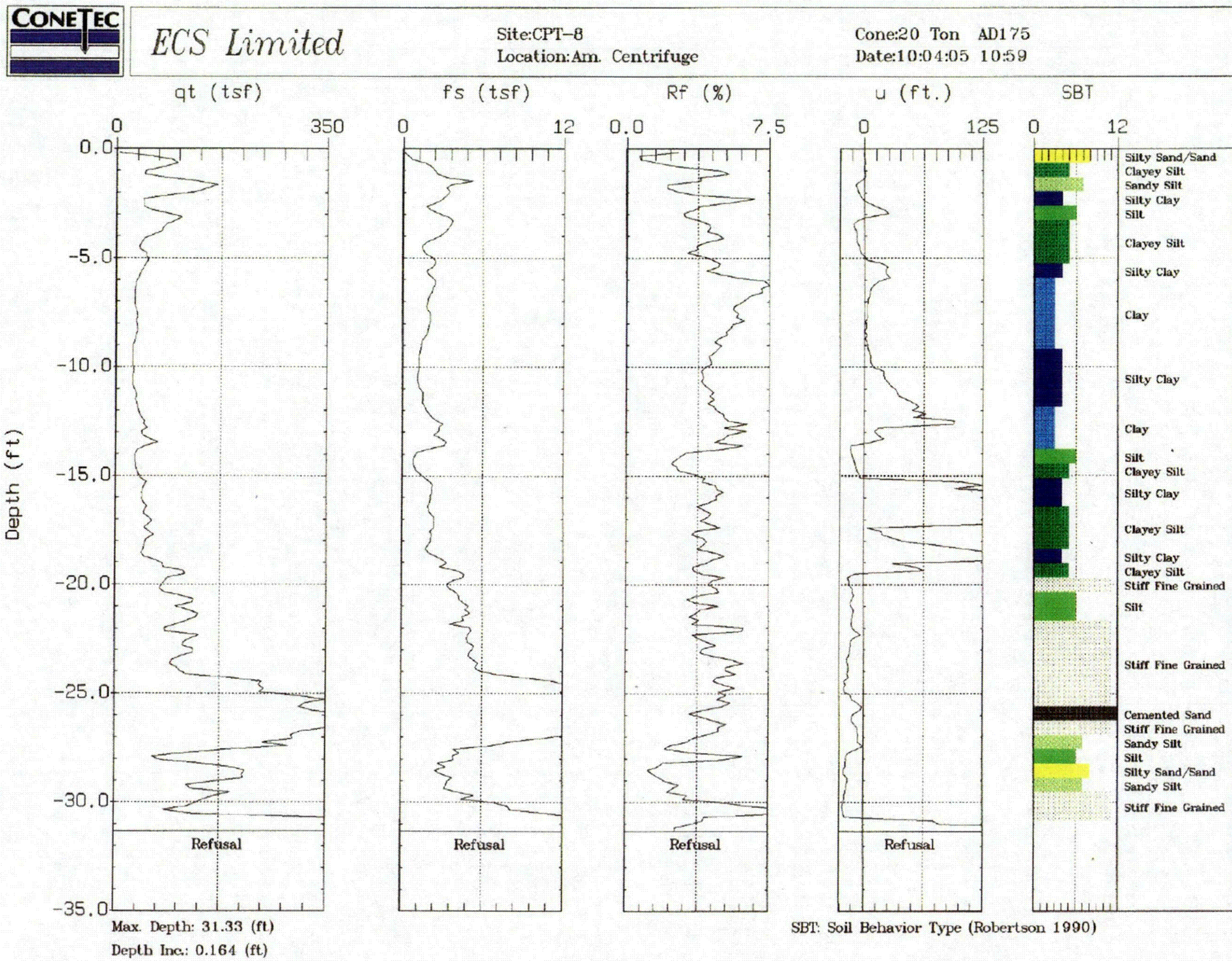
Cone:20 Ton AD175
Date:10:04:05 11:44



Max. Depth: 21.98 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

C38


CONETEC
ECS Limited
Site:CPT-8
Location:Am. Centrifuge
Cone:20 Ton AD175
Date:10:04:05 10:59
qt (tsf)
fs (tsf)
Rf (%)
u (ft.)
SBT
0
350
12
0.0
7.5
125
Depth (ft)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
Refusal
Silty Sand/Sand
Clayey Silt
Sandy Silt
Silty Clay
Silt
Clay
Stiff Fine Grained
Cemented Sand
Max. Depth: 31.33 (ft)
Depth Inc.: 0.164 (ft)
SBT: Soil Behavior Type (Robertson 1990)

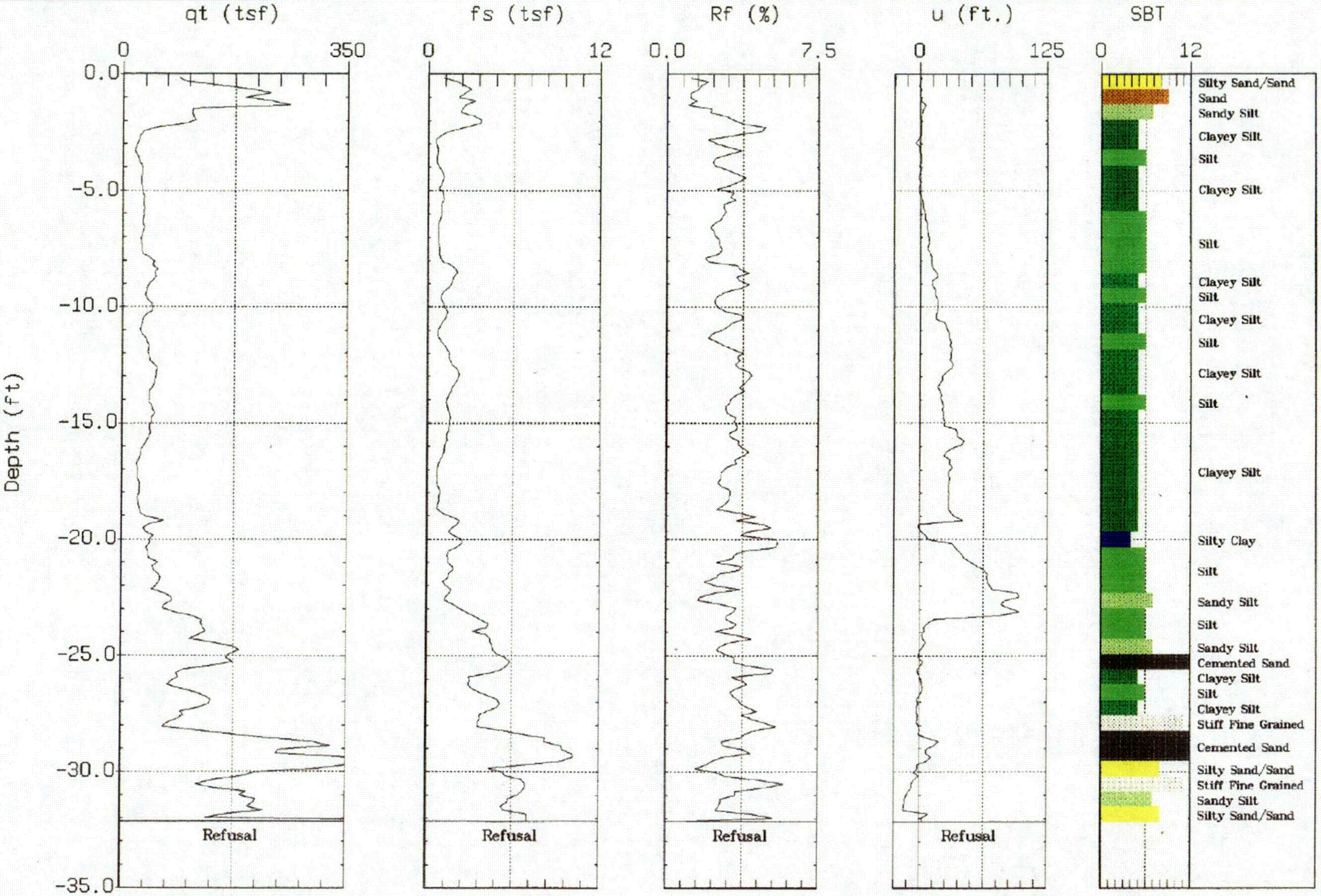
C39

CONETEC

ECS Limited

Site:CPT-11
Location: Am. Centrifuge

Cone:20 Ton AD175
Date:10:04:05 09:57



Max. Depth: 32.15 (ft)
Depth Inc.: 0.164 (ft)

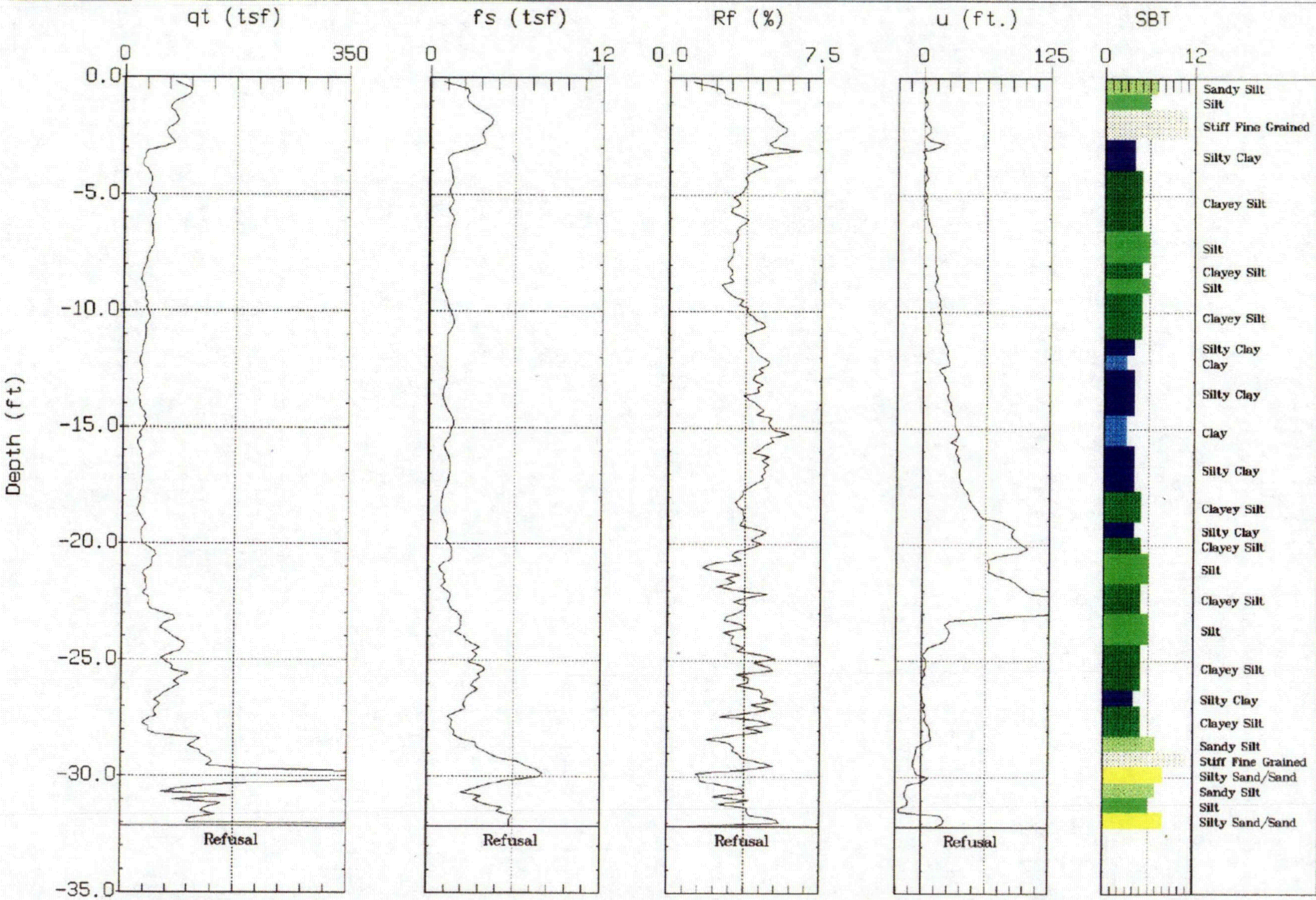
SBT: Soil Behavior Type (Robertson 1990)

C40

ECS Limited

Site:CPT-12
Location: Am. Centrifuge

Cone:20 Ton AD175
Date:10:04:05 14:20



Max. Depth: 32.15 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

C41

CLIENT	JOB #	BORING #	SHEET
FLUOR DANIEL	14-3046	B-2	1 OF 1

ECS LLP CAROLINAS

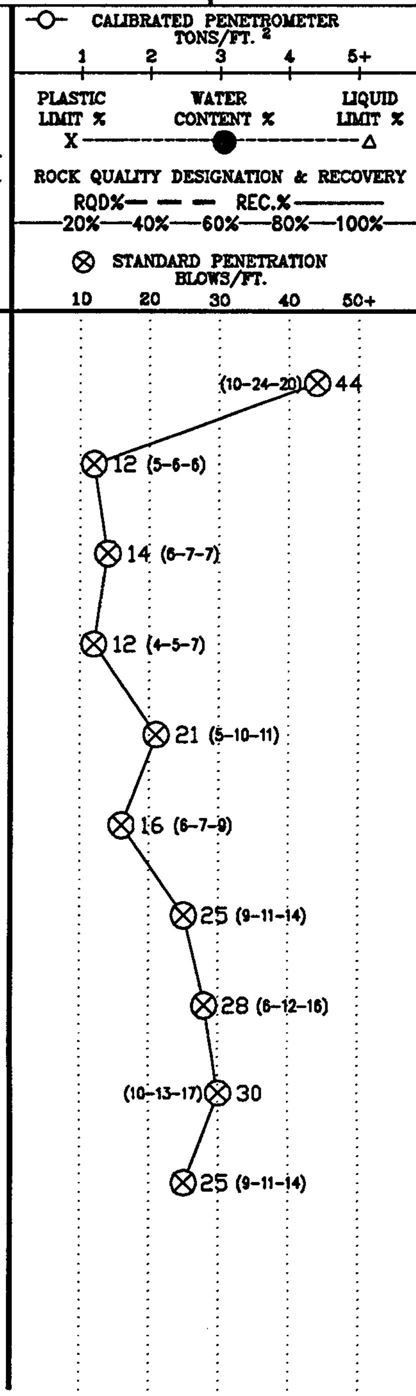
PROJECT NAME: USEC AMERICAN CENTRIFUGE

ARCHITECT-ENGINEER: FLUOR DANIEL

SITE LOCATION: PIKETON, OHIO

DESCRIPTION OF MATERIAL — ENGLISH UNITS — SURFACE ELEVATION

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	STANDARD PENETRATION BLOWS/FT.
0					TOPSOIL- DEPTH 3"	
	1	SS	18	18	FILL- Silty CLAY, Light Brown, Dry, Hard, (CL)	(10-24-20) 44
	2	SS	18	13	FILL- Silty CLAY, Trace Sand, Light Brown, Moist, Stiff, (CL)	12 (5-6-6)
5	3	SS	18	13	FILL - Silty CLAY, Light Brown, Moist, Stiff to Very Stiff, (CL)	14 (6-7-7)
	4	SS	18	6		12 (4-5-7)
10	5	SS	18	12		21 (5-10-11)
	6	SS	18	6		16 (6-7-9)
15	7	SS	18	14	Silty CLAY, Light Gray to Brown, Moist, Very Stiff, (CL)	25 (9-11-14)
	8	SS	18	13	Silty CLAY, Trace Fine Gravel, Light Brown and Gray, Moist, Very Stiff, (CL)	28 (6-12-16)
20	9	SS	18	15		(10-13-17) 30
	10	SS	18	13	Silty CLAY, Trace Gravel, Sand, and Shale Fragments, Light Brown and Gray, Moist, Very Stiff, (CL)	25 (9-11-14)
25						
30					AUGER REFUSAL @ 27.50'	



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 20.5	WS OR WD	BORING STARTED 10/4/05	
WL(AB)	WL(AC)	BORING COMPLETED 10/4/05	CAVE IN DEPTH
WL		RIG FOREMAN	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
FLUOR DANIEL	14-3046	B-6	1 OF 1

ECS LLP CAROLINAS

PROJECT NAME	ARCHITECT-ENGINEER
USEC AMERICAN CENTRIFUGE	FLUOR DANIEL

SITE LOCATION: PIKETON, OHIO

DESCRIPTION OF MATERIAL — ENGLISH UNITS

SURFACE ELEVATION

-O- CALIBRATED PENETROMETER TONS/FT.² (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% ——— (20% — 40% — 60% — 80% — 100%)

⊗ STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DEPTH (FT)	DESCRIPTION OF MATERIAL
0 – 3"	TOPSOIL- DEPTH 3"
to ~3.5	Silty CLAY, Light Gray and Light Brown, Dry, Hard, (CL)
~3.5 – 8	Silty CLAY, Light Brown, Moist, Very Stiff, (CL)
8 – 13	SILT, Light Brown, Damp, Very Stiff to Stiff, (ML)
13 – 15.5	Clayey SILT, Light Brown, Damp, Stiff, (ML)
15.5 – 20.5	SILT, Light Brown, Wet, Stiff to Verty Stiff, (ML)
20.5 – 23	Clayey SAND and Gravel, Light Brown, Saturated, Very Dense, (SC)
23 – 25.5	BLACK WEATHERED SHALE

AUGER REFUSAL @ 25.50'

SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	STANDARD PENETRATION BLOWS/FT.
1	SS	18	11	(12-20-28) 48
2	SS	18	18	24 (6-10-14)
3	SS	18	18	24 (7-10-14)
4	SS	18	18	18 (7-8-10)
5	SS	18	18	17 (4-8-9)
6	SS	18	18	15 (4-7-8)
7	SS	18	18	11 (4-5-6)
8	SS	18	18	16 (6-8-8)
9	SS	18	18	(40) 50/4
10	SS	18	0	50/0

Water level ∇ at approximately 11 ft.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

∇WL 11 WS OR WD	BORING STARTED 10/3/05	
∇WL(AB) ∇WL(AC)	BORING COMPLETED 10/3/05	CAVE IN DEPTH @
∇WL	RIG B-61 FOREMAN	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
FLUOR DANIEL	14-3046	B-9	1 OF 2

ECS LLP CAROLINAS

PROJECT NAME	ARCHITECT-ENGINEER
USEC AMERICAN CENTRIFUGE	FLUOR DANIEL

SITE LOCATION
PIKETON, OHIO

DESCRIPTION OF MATERIAL — ENGLISH UNITS

SURFACE ELEVATION

-O- CALIBRATED PENETROMETER TONS/FT.² 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% ——— 20%—40%—60%—80%—100%

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	STANDARD PENETRATION BLOWS/FT.
0	1	SS	18	13	FILL- Silty Fine to Coarse GRAVEL, Light Gray, Dry, Very Dense, (GM)		54 (40-37-17)
5	2	SS	18	15	Silty CLAY, Trace Fine SAND, Light Brown and Light Gray, Moist, Very Stiff, (CL)		19 (6-7-12)
	3	SS	18	18			26 (7-10-16)
10	4	SS	18	17			29 (6-13-16)
	5	SS	18	18	Silty CLAY, Light Brown and Brown, Moist, Very Stiff, (CL)		27 (6-11-16)
15	6	SS	18	18	Silty CLAY, Light Brown and Light Gray, Damp, Very Stiff, (CL)	▽	20 (6-8-12)
	7	SS	18	18	SILT, With Sand, Light Brown, Damp, Very Stiff, (ML)		16 (7-7-9)
20	8	SS	18	18	Fine Sandy SILT, With Sandy Clay Inclusions, Light Brown, Wet, Stiff, (ML)		15 (6-9-6)
25	9	SS	18	0	NO RECOVERY		25 (6-10-15)
30	10	SS	18	18	Clayey SILT, With Trace Gravel, Brown, Very Hard, (ML)		50/5 (22-46)

CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 13.6 WS OR WD	BORING STARTED 10/3/05	
▽WL(AB) ▽WL(AC)	BORING COMPLETED 10/3/05	CAVE IN DEPTH @
▽WL	RIG B-61 FOREMAN	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
FLUOR DANIEL	14-3046	B-9	2 OF 2

ECS LLP CAROLINAS

PROJECT NAME	ARCHITECT-ENGINEER
USEC AMERICAN CENTRIFUGE	FLUOR DANIEL

SITE LOCATION
PIKETON, OHIO

-O- CALIBRATED PENETROMETER TONS/FT.[2]
1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY
RQD% — — — REC.% ———
20% — 40% — 60% — 80% — 100%

⊗ STANDARD PENETRATION BLOWS/FT.
10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS; SURFACE ELEVATION)	WATER LEVELS	ELEVATION (FT)
30					Clayey SILT, With Trace Gravel, Brown, Very Hard, (ML)		
31					AUGER REFUSAL @ 31.00'		
35							
40							
45							
50							
55							
60							

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL 13.6 WS OR WD	BORING STARTED 10/3/05	
▽WL(AB) ▽WL(AC)	BORING COMPLETED 10/3/05	CAVE IN DEPTH @
▽WL	RIG B-61 FOREMAN	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
FLUOR DANIEL	14-3046	B-10	1 OF 2

ECS LLP CAROLINAS

PROJECT NAME	ARCHITECT-ENGINEER
USEC AMERICAN CENTRIFUGE	FLUOR DANIEL

SITE LOCATION: PIKETON, OHIO

DESCRIPTION OF MATERIAL — ENGLISH UNITS

SURFACE ELEVATION

-O- CALIBRATED PENETROMETER TONS/FT.² 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	STANDARD PENETRATION BLOWS/FT.
0	1	SS	18	12	SILT, Trace Sand, Brown, Moist, Very Stiff, (ML)	24 (7-15-9)
	2	SS	18	18	Silty CLAY, Brown, Wet, Stiff, (CL)	9 (3-4-5)
5	3	SS	18	18	Silty CLAY, Trace Sand, Light Brown, Moist, Very Stiff, (ML)	23 (6-10-13)
	4	SS	18	18	Silty CLAY, Light Brown and Gray, Moist, Very Stiff, (CL)	19 (5-9-10)
10	5	SS	18	18		19 (6-8-11)
	6	SS	18	18		19 (5-8-11)
15	7	SS	18	18		24 (7-10-14)
	8	SS	18	18	Silty CLAY, Light Brown and Gray, Moist, Very Stiff, (CL)	18 (5-7-11)
20					Clayey SILT, With Trace Coarse Sand, Light Brown, Very Stiff, (ML)	
	9	SS	18	18		22 (5-11-11)
25					Silty Fine SAND, Light Brown, Wet, Medium Dense, (SM)	
30	10	SS	18	18		18 (5-9-9)

CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL WS OR WD	BORING STARTED	10/3/05	
▽WL(AB) ▽WL(AC) 19.2	BORING COMPLETED	10/3/05	CAVE IN DEPTH @ 28.2
▽WL	RIG B-61	FOREMAN	DRILLING METHOD

CLIENT	JOB #	BORING #	SHEET
FLUOR DANIEL	14-3046	B-10	2 OF 2

ECS LLP CAROLINAS

PROJECT NAME	ARCHITECT-ENGINEER
USEC AMERICAN CENTRIFUGE	FLUOR DANIEL

SITE LOCATION
PIKETON, OHIO

-O- CALIBRATED PENETROMETER TONS/FT.² 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY
RQD% — — — REC.% ——
20% — 40% — 60% — 80% — 100%

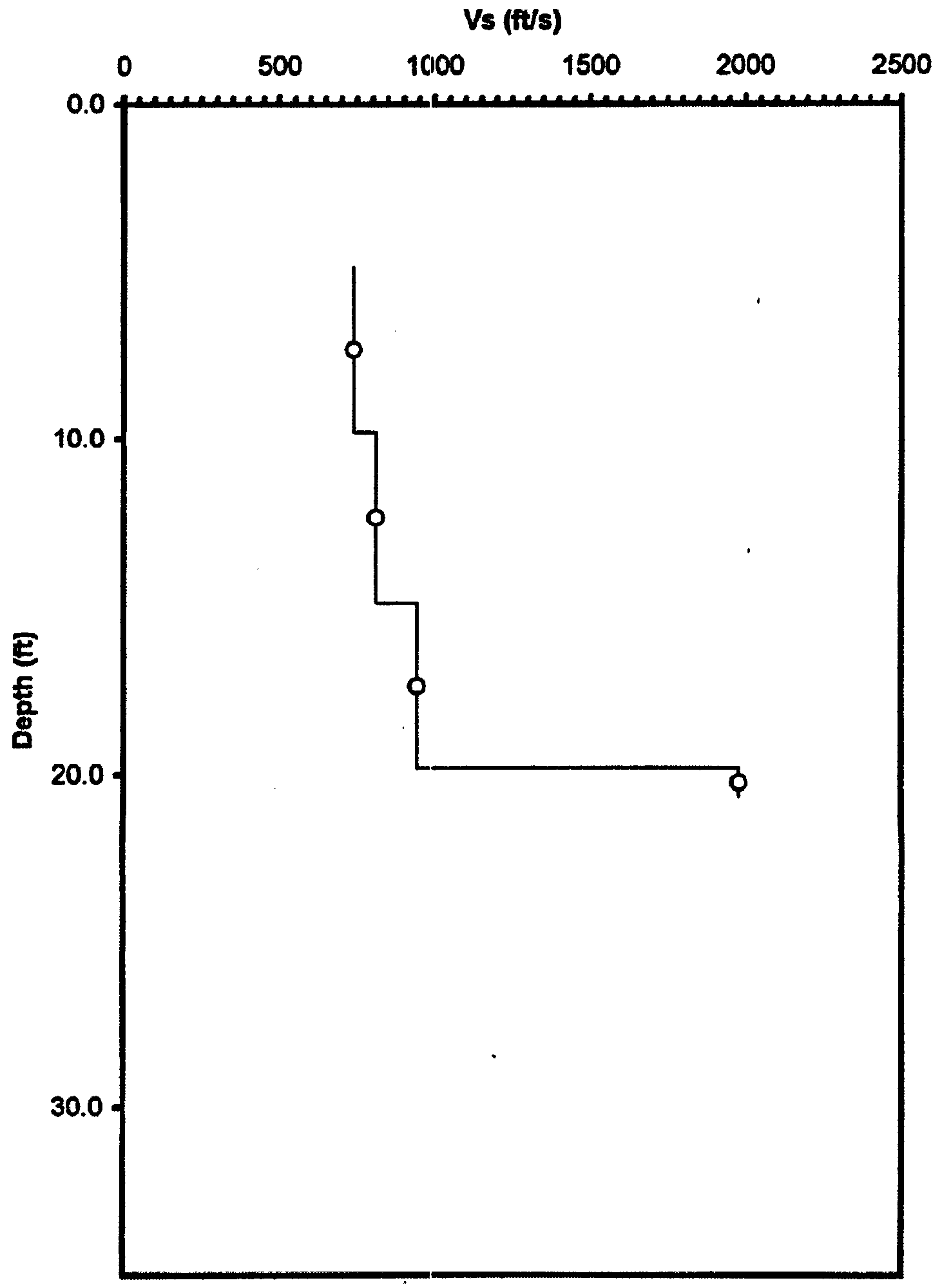
⊗ STANDARD PENETRATION BLOWS/FT.
10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL ENGLISH UNITS SURFACE ELEVATION	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
30					Silty Fine SAND, Light Brown, Wet, Medium Dense, (SM)			
	11	SS	18	11	Silty Fine SAND, With Gravel, Brown, Saturated, Very Dense, (SM)			(13) ⊗ 50/4
35								
					AUGER REFUSAL @ 36.00'			
40								
45								
50								
55								
60								

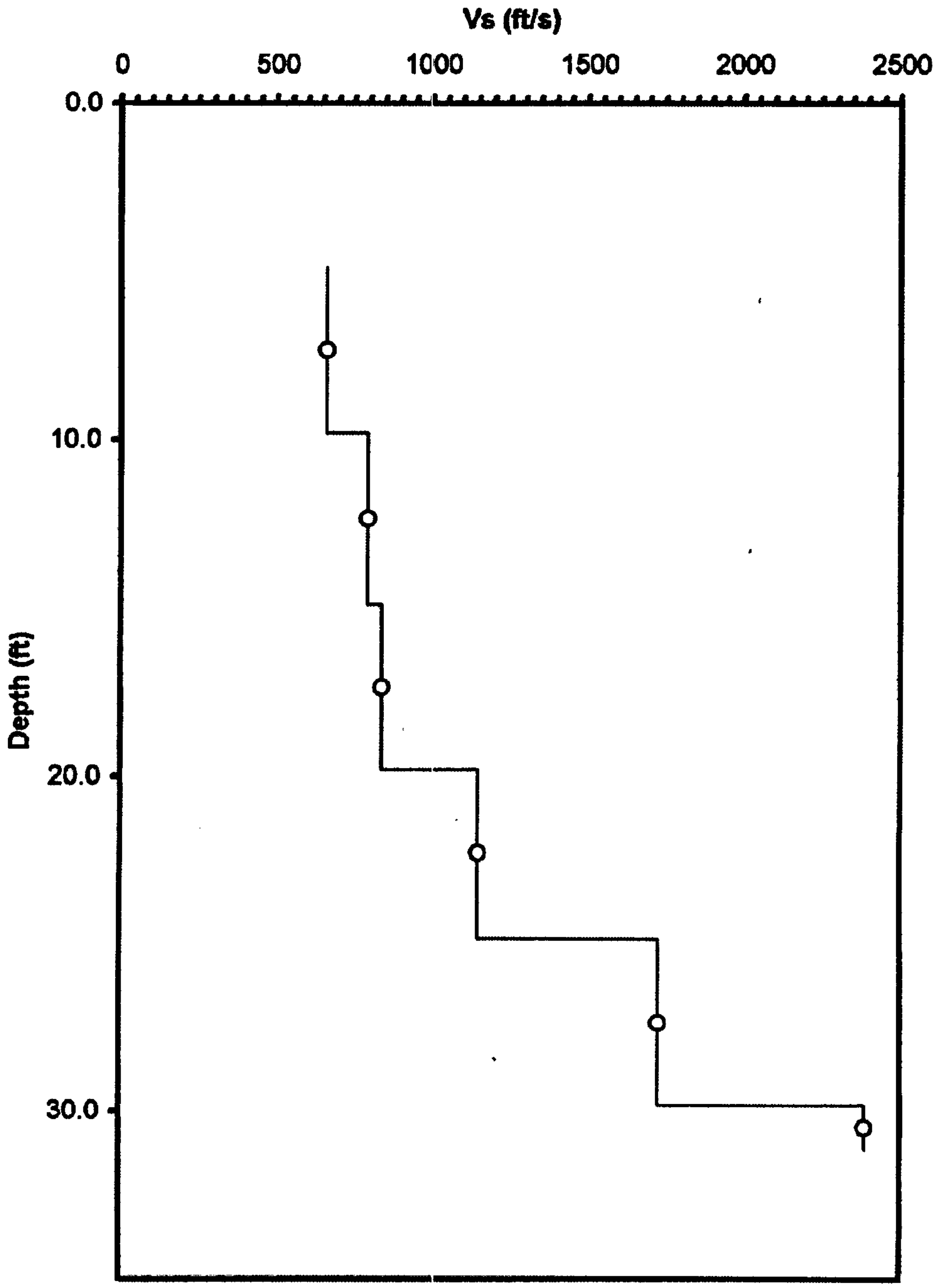
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

▽WL	WS OR WD	BORING STARTED 10/3/05	
▽WL(AB)	▽WL(AC) 19.2	BORING COMPLETED 10/3/05	CAVE IN DEPTH @ 28.2
▽WL		RIG B-61 FOREMAN	DRILLING METHOD

Client: ECS Limited
Location: ·American Centrifuge, Piketon, OH
Sounding: CPT-4
Sounding Date: October 4, 2005

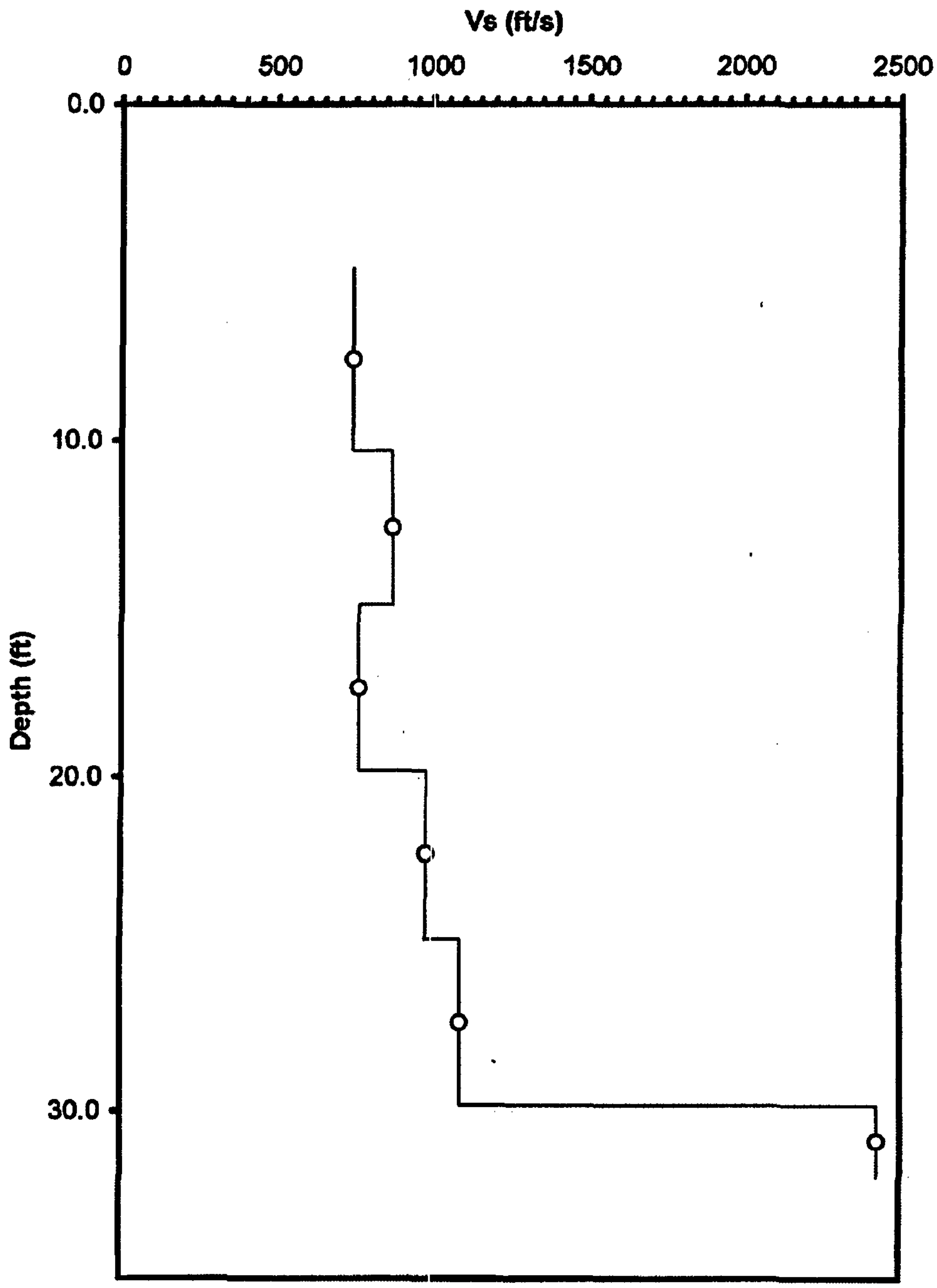


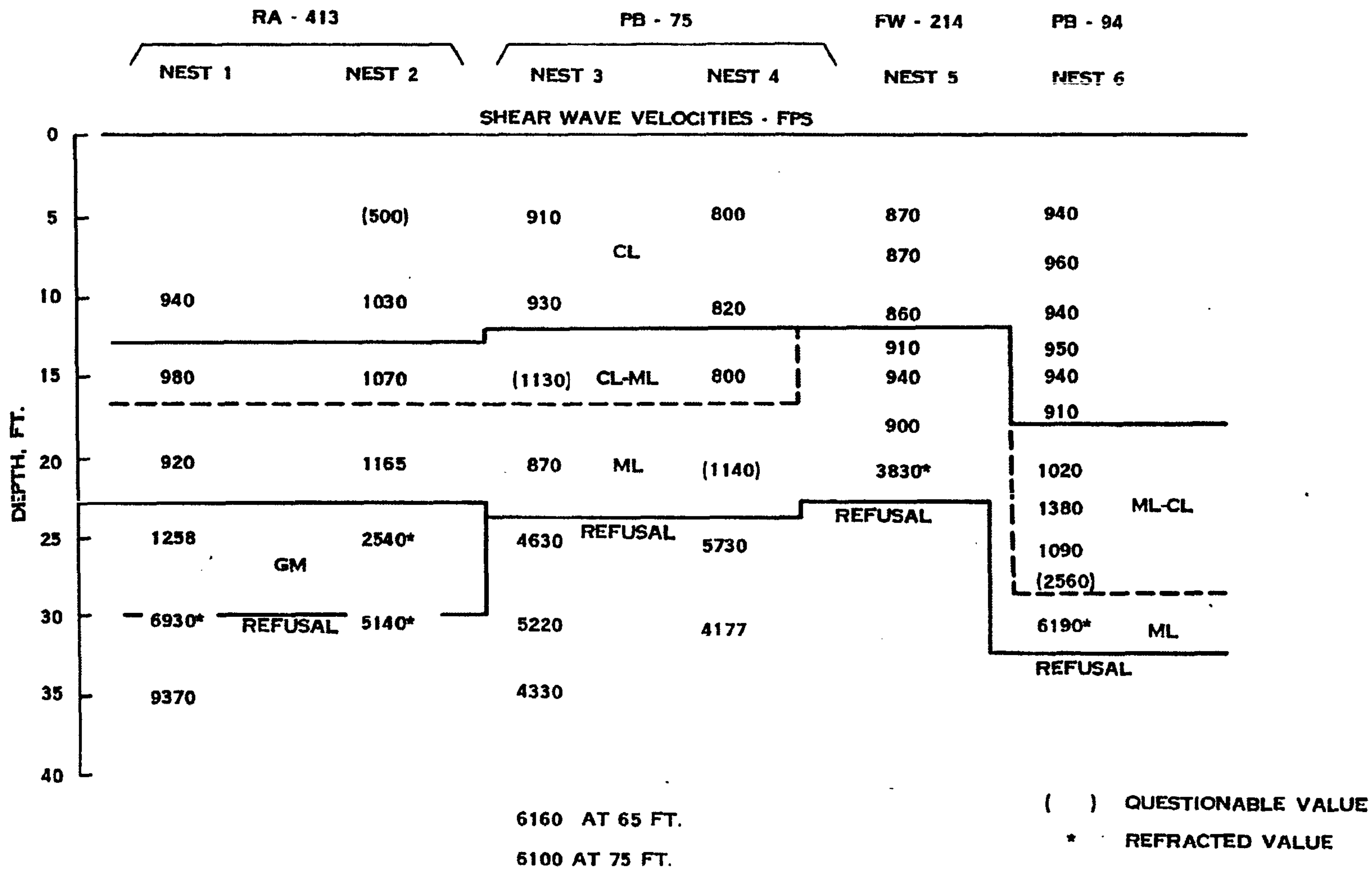
Client: ECS Limited
Location: American Centrifuge, Piketon, OH
Sounding: CPT-8
Sounding Date: October 4, 2005



CONETEC

Client: ECS Limited
Location: American Centrifuge, Piketon, OH
Sounding: CPT-11
Sounding Date: October 4, 2005





DEPARTMENT OF ENERGY

GAS CENTRIFUGE ENRICHMENT PLANT

MK 7502

LAW ENGINEERING TESTING COMPANY

MARIETTA, GEORGIA

SUMMARY OF CROSSHOLE SHEAR WAVE VELOCITIES

FIGURE 9-3

DWN BY: TJ CKD BY: SAC APPRVD BY: [illegible]

ECS
Greenville, South Carolina
Laboratory Testing Summary

Project Number: 3046 **Project Engineer:** DLA **Date:** 10/16/05

Project Name: USEC American Centrifuge **Principal Engineer:** SG **Summary By:** JAM

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
									Maximum Density (pcf)	Optimum Moisture (%)		
B-1	1	1-2.5	17.8									
B-2	Bulk	Bulk	17.3						111.0	15.5		
B-2	3	6-7.5	15.7	CL	35	23	12					
B-2	8	16-17.5	12.0	CL	29	19	10					
B-6	2	3.5-5	16.6	CL	33	22	11					
B-6	4	8.5-10	20.4	ML	29	27	2					
B-6	7	16-17.5	25.1	ML				92.9				
B-8	Bulk	Bulk	15.1						110.5	15.5		
B-9	2	3.5-5	20.3	CL	36	19	17					
B-9	7	13.5-15	19.4	CL	34	23	11					
B-9	9	18.5-20	26.3	ML				76.3				
B-10	2	3.5-5	25.4	CL	42	23	19					
B-10	3	6-7.5	19.8	CL	38	24	14					
B-10	5	11-12.5	20.2									
B-10	11	23.5-25	25.7									

Summary Key:

SA = See Attached
S = Standard Proctor
M= Modified Proctor
OC = Organic Content

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Staibilization