DUKE COGEMA
STONE & WEBSTER

NRC Technical Exchange
Geology, Seismology and Geotechnical Engineering

City of Aiken Municipal Building Conference Center
19-20 September 2001

Objectives

DUKE COGEMA
STONE & WEBSTER

- Inform NRC staff about development of SRS seismic criteria
  - Regional geology and seismology
  - Site-Specific Probabilistic Seismic Hazard Assessment
  - SRS Design Criteria
- Demonstrate that these criteria are also applicable to the MFFF site
- Describe selection of MFFF Design Basis
- Present results of geotechnical engineering evaluations
- Receive NRC feedback and questions

DUKE COGEMA
STONE & WEBSTER

Agenda Day One

	TOPICS	
8:00 - 8:15	Welcome	Persinko
8:15 - 8:30	Introduction	McConaghy
8:30 - 8:45	Overview	Salomone
8:45 - 9:15	SRS Geology	Wyatt
9:15 - 9:45	SRS Seismology	Lee
	SRS Site-Specific PSHA	
10:00 - 10:30	Bedrock Spectra	Kimball
10:30-11:30	Soil Surface Spectra	Lee
11:30-12:00	SRS Design Spectra	Gutierrez
12:00 - 13:00	Lunch Break	
13:00 - 14:00	Confirmation of Inputs for MFFF Site	Lewis
14:00 - 15:30	Selection of MFFF Design Basis	McConaghy
15:30 - 16:00	Questions	Persinko
16:00 - 16:30	Summary, Action Items	McConaghy

Agenda Day Two

DUKE COGEMA
STONE & WEBSTER

TOPICS

8:00 - 8:10	Introduction	McConaghy
8:10 - 8:30	Site Investigations and Testing	Meisenheimer
8:30 - 9:00	Subsurface Profiles and Soft Zones	Meisenheimer
9:00 - 9:30	Engineering Properties	Meisenheimer
9:30 - 10:00	Bearing Capacity and Settlements	Meisenheimer
10:00 - 10:30	Foundation Design and Performance	Meisenheimer
10:30 - 11:15	Dynamic and Liquefaction Evaluations	Meisenheimer
11:15 - 12:00	Post-Earthquake Settlements	Meisenheimer
12:00 - 12:30	Questions	Persinko
12:30 - 13:00	Summary, Action Items	McConaghy
13:00	Adjourn	Persinko

DUKE COGEMA
STONE & WEBSTER

Introduction

- NRC staff questions during presentations are encouraged.
- Outstanding issues will be recorded and discussed in daily summary.
- Action items will be recorded at close of each day.

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

Available F-Area Geotechnical Programs

- **(WSRC 1996) "F-Area Geotechnical Characterization Report"**
- **(Geomatrix 1998) "Final Geotechnical Study Report-Antinide Packaging and Storage Facility, Savannah River Site"**
- **(WSRC 1998a) "APSF Confirmatory Drilling Program Results"**
- **(WSRC 1999a) "F-Area Northeast Expansion Report"**
- **(WSRC 1999b) "Significance of Soft Zone Sediments at the Savannah River Site-Historical Significant Investigations and Current Understanding of Soft Zone Origin, Extent and Stability"**
- **(WSRC 2000a) "Natural Phenomena Hazards (NPH) and Design Criteria and Other Characterization Information for the Mixed Oxide (MOX) Fuel Fabrication Facility at Savannah River Site"**

Revised 19 September 2001

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

PURPOSE AND SCOPE

- **Define geologic stratigraphy and compare to stratigraphic units defined across the F-Area.**

- **Define the index properties of each stratigraphic layer and make a comparison to geotechnical properties determined for the F-Area.**

- **Evaluate the subsurface conditions to define relative geotechnical conditions and suitability to support the proposed MFFF critical structures.**

- **Define any subsurface conditions that may be detrimental to support the proposed MFFF critical structures.**

- **Define geotechnical design criteria for the MFFF site.**

- **Determine critical structure performance.**

Revised 19 September 2001

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

DEVELOPMENT OF GEOTECHNCIAL PROGRAM

- Primary exploration method cone penetration testing (CPT).
- Exploration borings to:
  Obtain representative soil samples testing;
  Establish elevation of Congree Formation across site;
  Provide correlation of SPT with CPT values.
- Space exploration holes to define presence of any significant soft zone locations.
- Perform additional exploration, as required, to define limits of any significant soft zones identified.
- Define subsurface conditions adequately to determine suitability of site to support critical structures.

Revised 19 September 2001

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

SITE INVESTIGATIONS

- **Original site investigation conducted May - July 2000.**

- **63 Cone Penetration Tests (CPT) Soundings include 14 seismic cones.**
  All CPTs measure tip resistance, pore water pressure, and sleeve resistance.
  Depths range from 64 to 140 feet.
  All CPTs pushed to refusal (approx. 600 tsf tip resistance).

- **13 Exploration Borings with Standard Penetration Tests (SPT).**
  All borings extended into Congree Formation.
  Depths range from 131 to 181 feet.

Revised 19 September 2001

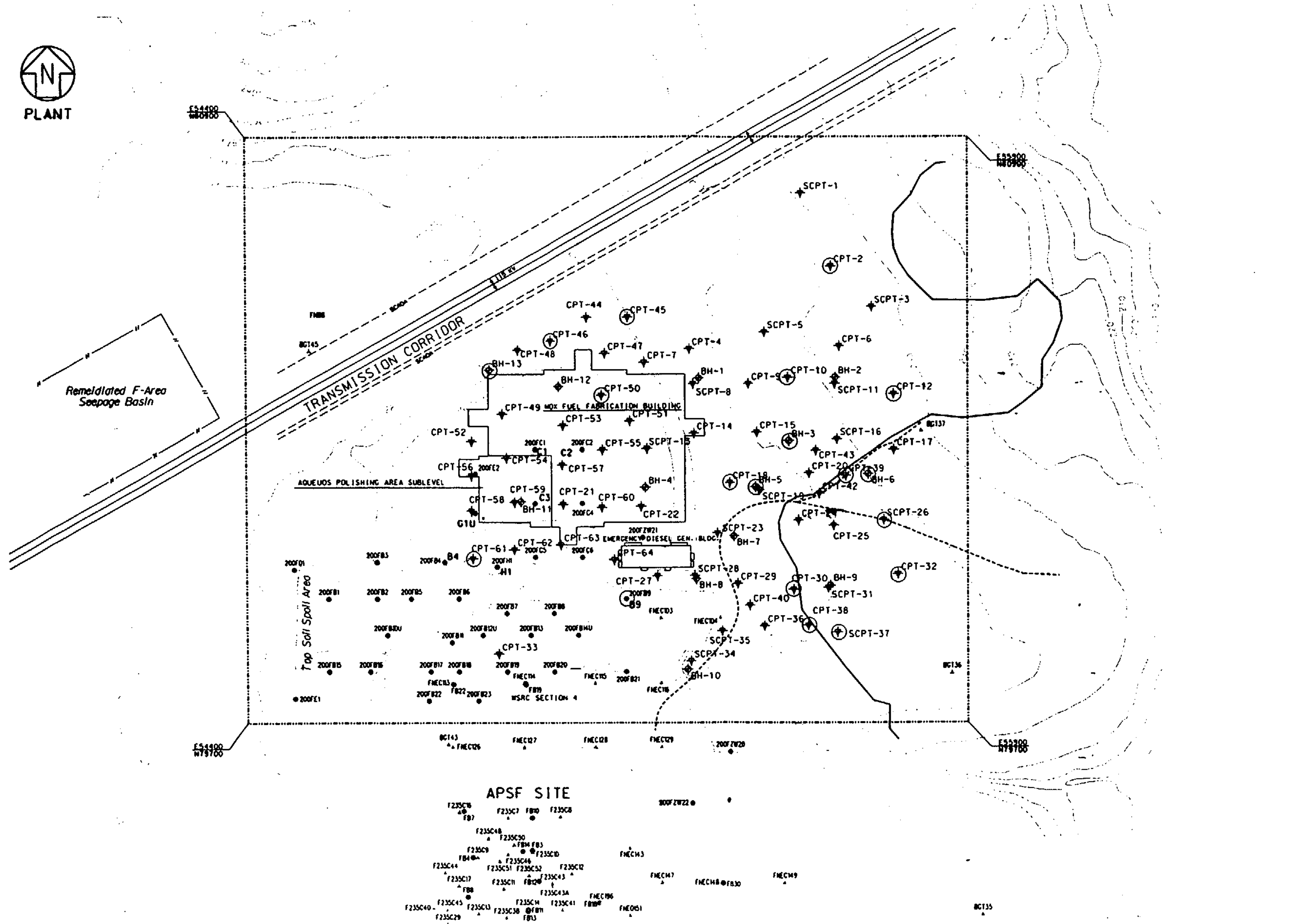
SITE INVESTIGATIONS (Cont.)

- Soil sampling with standard thin wall Shelby tubes and CPT thin wall sampler to obtain representative samples for static and dynamic testing.

- 10 dilatometer test holes (DMT) adjacent to CPT soundings.

- Downhole seismic testing performed in three cased borings. (Borings BH-2, BH-5 and BH-10)

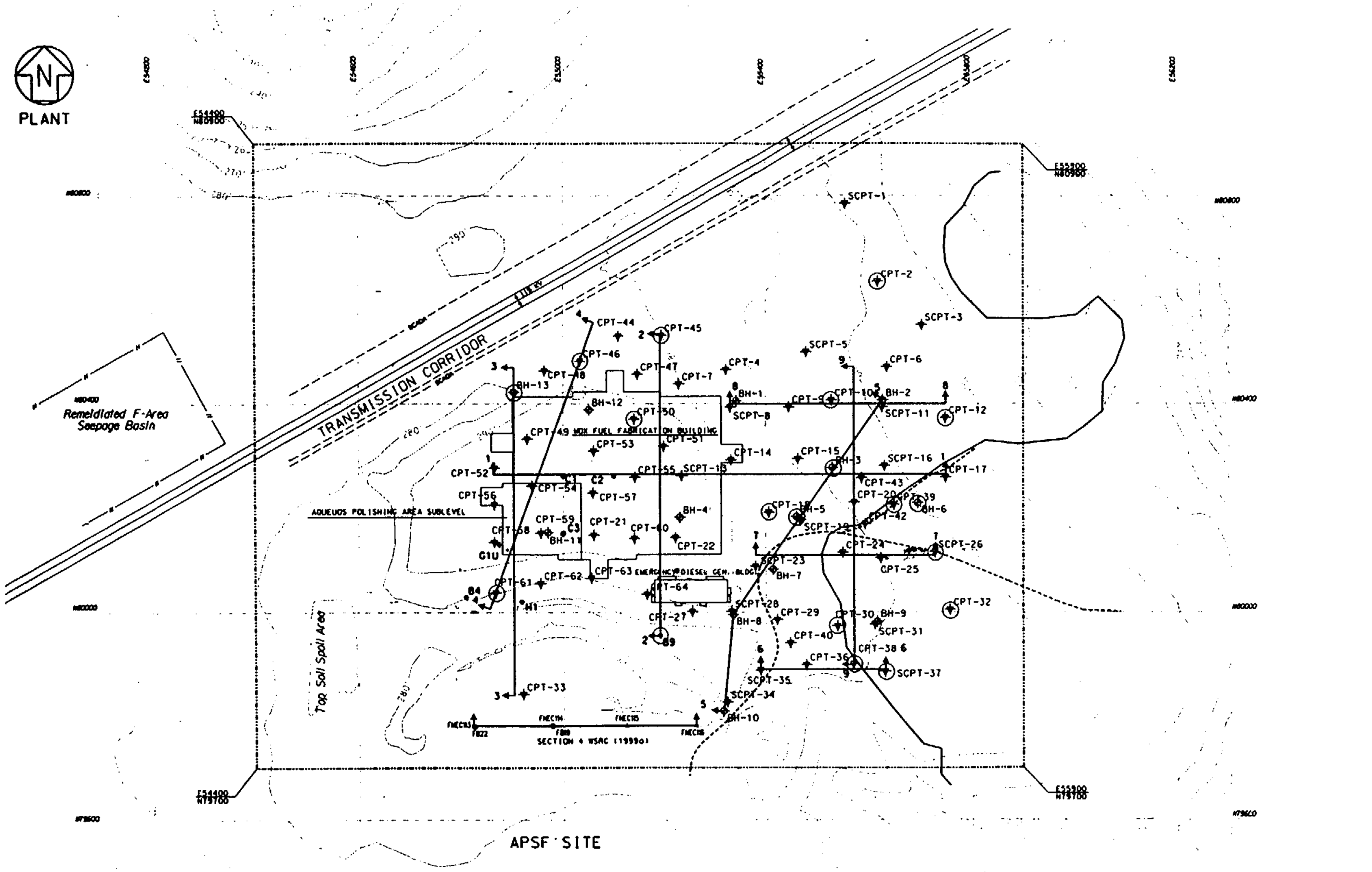
  - Refer to Figures 4-1 and 5-1



LEGEND:

- FNECXX — WSRC F-AREA EXPANSION REPORT CPT'S
- FBXX — WSRC F-AREA EXPANSION REPORT BORINGS
- BX, CX, GXU — 1973 MUESER, RUTLEDGE SERIES BORINGS
- CPT-XX, SCPT-XX — CONE PENETROMETER LOCATION (2000) (SCPT is a Seismic CPT)
- BH-XX — BOREHOLE LOCATION (2000)
- SOFT ZONE LOCATION
- MOX SITE BOUNDARY
- ARCHEOLOGICAL BOUNDARY (APPROXIMATE)
- EXISTING ROAD
- TOPOGRAPHY (2000)
- OVERHEAD ELECTRICAL LINE
- UNDERGROUND ELECTRICAL LINE
- ABOVE GROUND COMM./SIGNAL LINES

MFFF SITE GEOTECHNICAL REF
DCS01-WRS-DS-NTE-0005-E
EXPLORATION PROGRAMS
AT THE MFFF SITE
FIGURE 4-1



LEGEND:

- CPT-XX / SCPT-XX — CONE PENETROMETER LOCATION (2000) (SCPT is a Seismic CPT)
- BH-XX — BOREHOLE LOCATION (2000)
- SOFT ZONE LOCATION
- MOX SITE BOUNDARY
- ARCHEOLOGICAL BOUNDARY (APPROXIMATE)
- EXISTING ROAD
- TOPOGRAPHY (2000)
- OVERHEAD ELECTRICAL LINE
- UNDERGROUND ELECTRICAL LINE
- ABOVE GROUND COMM./SIGNAL LINES

MFFF SITE GEOTECHNICAL REPORT
DCS01-WRS-DS-NTE-0005-B
EXPLORATION PROGRAMS AT THE MFFF SITE
FIGURE 5-1

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

LABORATORY TESTING PROGRAM

- **Testing performed to determine index properties and engineering properties**
- **Samples selected for testing to obtain results for representative soil units**
- **Test results correlated with published laboratory test data from the APSF, the F-Area Northeast Expansion and F-Area geotechnical programs**
- **Soil properties tested included:**
  - **Moisture content**
  - **Wet and dry density**
  - **Particle size**
  - **Plasticity**
  - **Consolidation characteristics**
  - **Shear strength parameters**
  - **Dynamic behavior (shear modulus reduction and damping)**

SUBSURFACE PROFILE

- **Near surface subsurface conditions were characterized based on field exploration and laboratory index test results.**

- **The CPT measurements prove to be the best method to define engineering units and their respective stratigraphic layer.**

- **Engineering unit definitions and alphanumeric system used at the MFFF site are the same as used for the F-Area subsurface engineering units. (Refer to Table 5-1)**

- **MFFF subsurface characterization was compared with published subsurface data from APSF, F-Area Northeast Expansion and F-Area geotechnical investigations. (Refer to Table 5-2)**

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

TABLE 5-1

CORRELATION OF ENGINEERING AND GEOLOGIC STRATIGRAPHY UNITS FOR MFFF SITE

Engineering Unit	Geologic Unit
TR1 and TR1A	"Upland Unit" Formation
TR2A and TR2B	Tobacco Road Formation
TR3/4 and DB1/3	Dry Branch Formation
DB4/5. ST1 and ST2	Tinker/Santee Formation
GC Layer	Warley Hill Formation
CG Layer	Congaree Formation

Revised 19 September 2001

TABLE 5-2
AVERAGE SOIL INDEX PROPERTIES FOR MFFF, APSF, AND F-AREA NORTHEAST EXPANSION

	ENGR UNIT	AVE. THICK.[1] (ft)	AVE TOP EL.[1] (MSL)	AVE SPT N VALUE	AVE q_{cor} (tsf)	AVE PI (%)	LIQUID LIMIT (%)	MOISTURE CONTENT (%)	AVE - NO. 200 (%)
F-Area	TR1 [2]	25		25	91	17	38	15	33
NE Exp.		13	291	31	95	23	48	18	34
APSF		16	289	33	142	11	30	16	25
MOX FFF		9	276	17	92				
F-Area	TR1A [2]	19	278	25	120	14	36	19	30
NE Exp.		16.0	278	31	103	20	35	19	30
APSF		14	273	27	68	22	46	20	37
MOX FFF		12	267	18	103	16	39	14	30
F-Area	TR2A	25	261	28	147	10	33	17	17
NE Exp.		26	262	37	146	9	28	17	14
APSF		27	260	34	136	10	33	21	16
MOX FFF		20	255	22	129	25	50	16	17
F-Area	TR2B	19	233	36	201	18	41	22	19
NE Exp.		23	236	39	164	12	24	18	10
APSF		22	233	38	154	NP	NP	24	11
MOX FFF		23	235	28	140			16	10
F-Area	TR3/4	10	213	18	55	58	96	51	64
NE Exp.		7	213	27	73	19	54	34	36
APSF		8	211	19	37	19	54	42	34
MOX FFF		7	212	18	41	47	82	35	37
F-Area	DB1/3	28	204	33	172	19	44	27	14
NE Exp.		28	206	37	194	16	11	25	11
APSF		28	203	50	166	NP	NP	27	9
MOX FFF		22	205	30	120	39	69	29	14
F-Area	DB4/5	7	175	28	61	15	48	39	22
NE Exp.		6	178	29	67	11	45	36	20
APSF		7	175	21	52	11	45	38	21
MOX FFF		9	183	19	35	35	67	37	26
F-Area	ST1	19	167	47	131	18	40	29	29
NE Exp.		20	172	43	138	14	23	30	19
APSF			168	46	137	25	49	30	18
MOX FFF		17	174	47	200			26	9
F-Area	ST2								
NE Exp.		11	152						
APSF									
MOX FFF		11	157	20	44	27	53	33	32
F-Area	GC	7	138	21	58	47	83	32	39
NE Exp.		7	141	39	97	27	42	32	33
APSF		9	143	49	79	30	57	28	52
MOX FFF		5	146	32	63	30	55	29	47
F-Area	CG								
NE Exp.			134						
APSF			134						
MOX FFF			141	89	213	27	50	24	14

[1] NE expansion values include APSF data.
[2] Surface effects have not been accounted for.

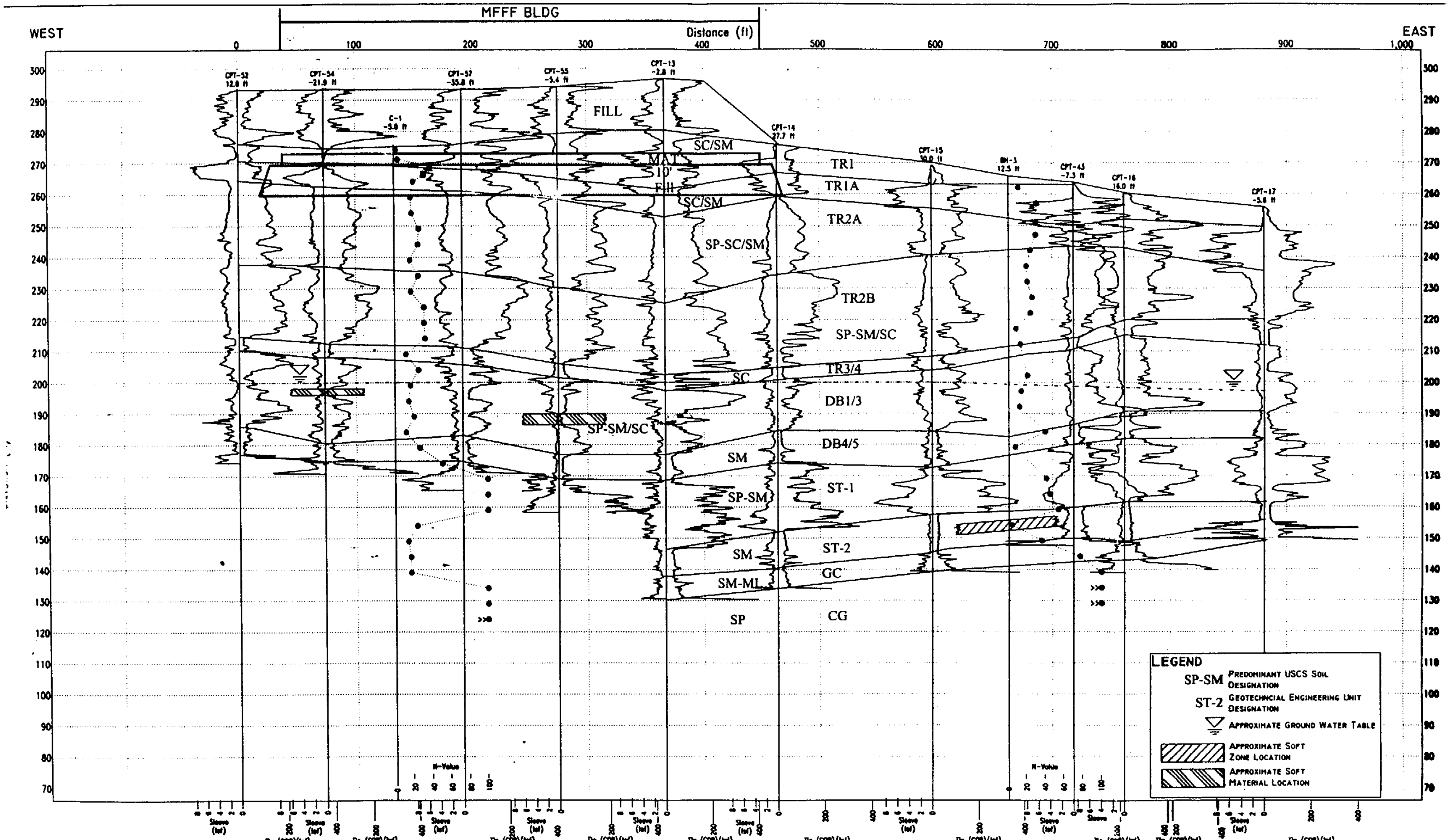
SUBSURFACE PROFILE (Cont.)

- **The average material strength and index properties for each of the engineering units correlate well with averages found for the APSF and F-Area Northeast geotechnical investigations.**

- **No anomalous subsurface conditions were found at the critical structure locations. (Figures 5-1 through 5-5)**

- **Measured piezometric levels in CPTs are consistent with observed groundwater levels measured in MFFF site vicinity. (Figures 5-1 through 5-5)**

- **Detailed subsurface geotechnical cross sections through the MFFF site demonstrate consistency with previous F-Area subsurface conditions. Figure 5-11)**



DUKE COGEMA STONE & WEBSTER

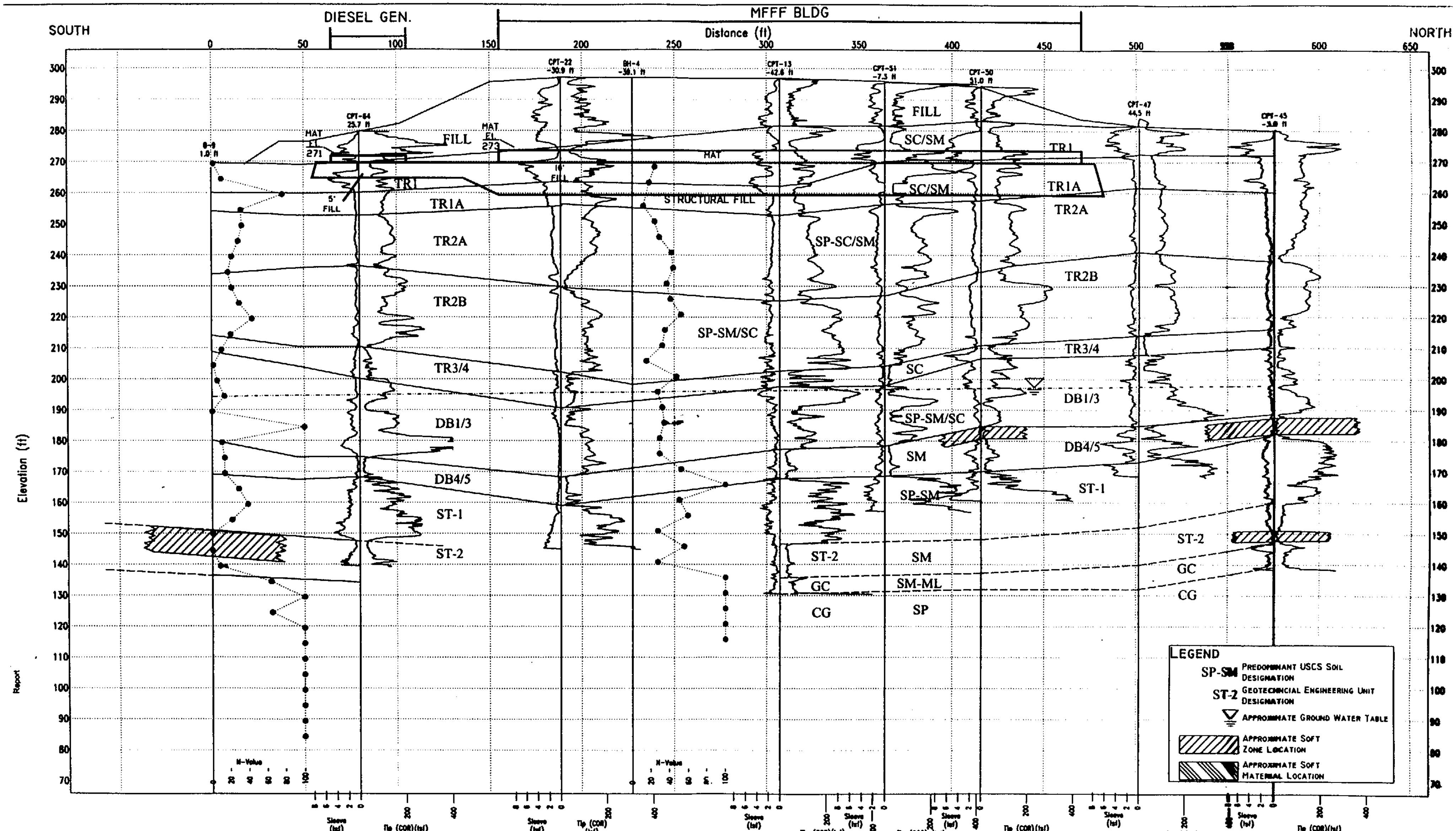
MOX Fuel Fabrication Facility
DOE Savannah River Site
Job # 08716

NOTES:
1. Subsurface stratigraphy shown represents a reasonable judgement of the conditions expected based on the data shown. Some variation from these conditions must be expected.
2. The water table elevation shown represents approximate conditions at the time of the site investigation (June/July, 2000).
3. Some borings and CPT soundings used to develop this cross section are not shown to maintain clarity.
4. "B- and C-" series borings from 1973 Foundation Investigation for Delta Program, Mueser, Rutledge Consulting Engineers.

GEOTECHNICAL CROSS SECTION I

NOT TO SCALE

FIGURE 5-2



DUKE COGEMA STONE & WEBSTER

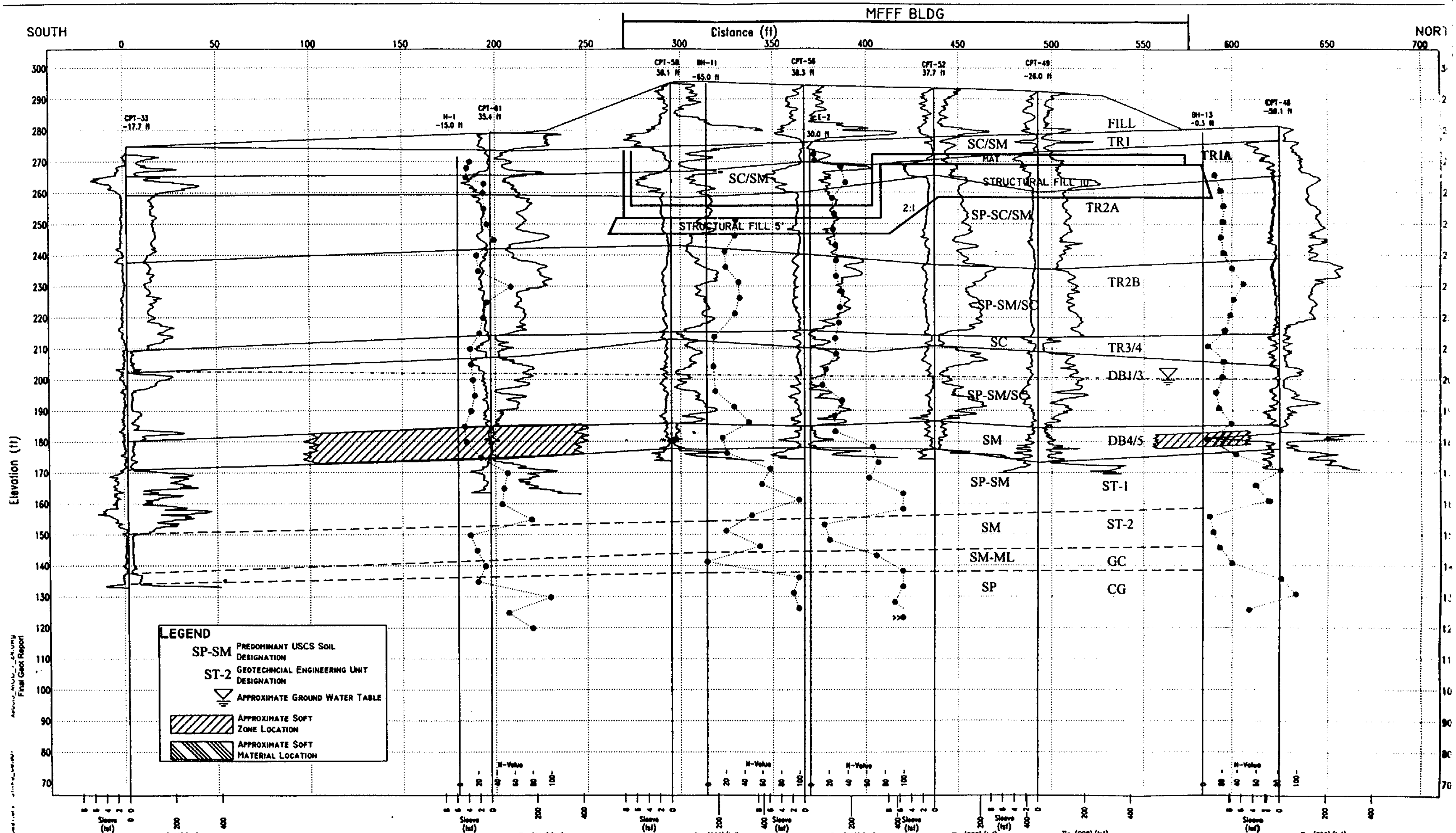
MOX Fuel Fabrication Facility
DOE Savannah River Site
Job # 08716

NOTES:
1. Subsurface stratigraphy shown represents a reasonable judgement of the conditions expected based on the data shown. Some variation from these conditions must be expected.
2. The water table elevation shown represents approximate conditions at the time of the site investigation (June/July 2000).
3. Some borings and CPT soundings used to develop this cross section are not shown to maintain clarity.
4. "B- and C-" series borings from 1973 Foundation Investigation for Delta Program, Mueser, Rutledge Consulting Engineers.

GEOTECHNICAL CROSS SECTION 2

NOT TO SCALE

FIGURE 5-3



DUKE COGEMA STONE & WEBSTER

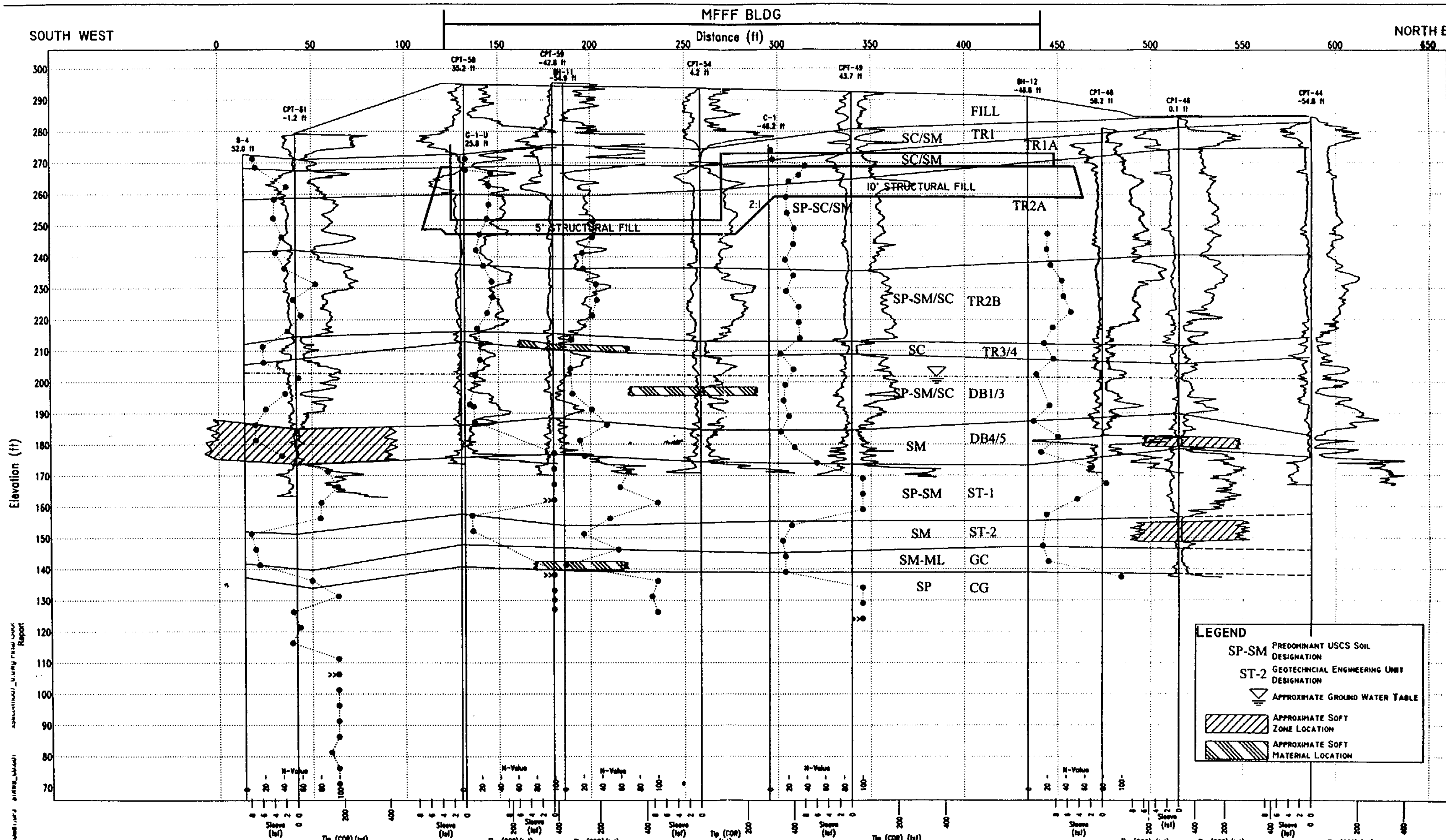
MOX FUEL FABRICATION FACILITY
DOE SAVANNAH RIVER SITE
JOB # 08716

NOTES:
1. Subsurface stratigraphy shown represents a reasonable judgement of the conditions expected based on the data shown. Some variation from these conditions must be expected.
2. The water table elevation shown represents approximate conditions at the time of the site investigation (June/July 2000).
3. Some borings and CPT soundings used to develop this cross section are not shown to maintain clarity.
4. "B- and C-" series borings from 1973 Foundation Investigation for Delta Program, Mueser, Rutledge Consulting Engineers.

GEOTECHNICAL CROSS SECTION

NOT TO SCALE

FIGURE 5-4



DUKE COGEMA STONE & WEBSTER

MOX FUEL FABRICATION FACILITY
DOE SAVANNAH RIVER SITE
JOB # 08716

NOTES:
1. Subsurface stratigraphy shown represents a reasonable judgement of the conditions expected based on the data shown. Some variation from these conditions must be expected.
2. The water table elevation shown represents approximate conditions at the time of the site investigation (June/July 2000).
3. Some borings and CPT soundings used to develop this cross section are not shown to maintain clarity.
4. "B- and C-" series borings from 1973 Foundation Investigation for Delta Program, Mueser, Rutledge Consulting Engineers.

GEOTECHNICAL CROSS SECTION

NOT TO SCALE

FIGURE 5-5

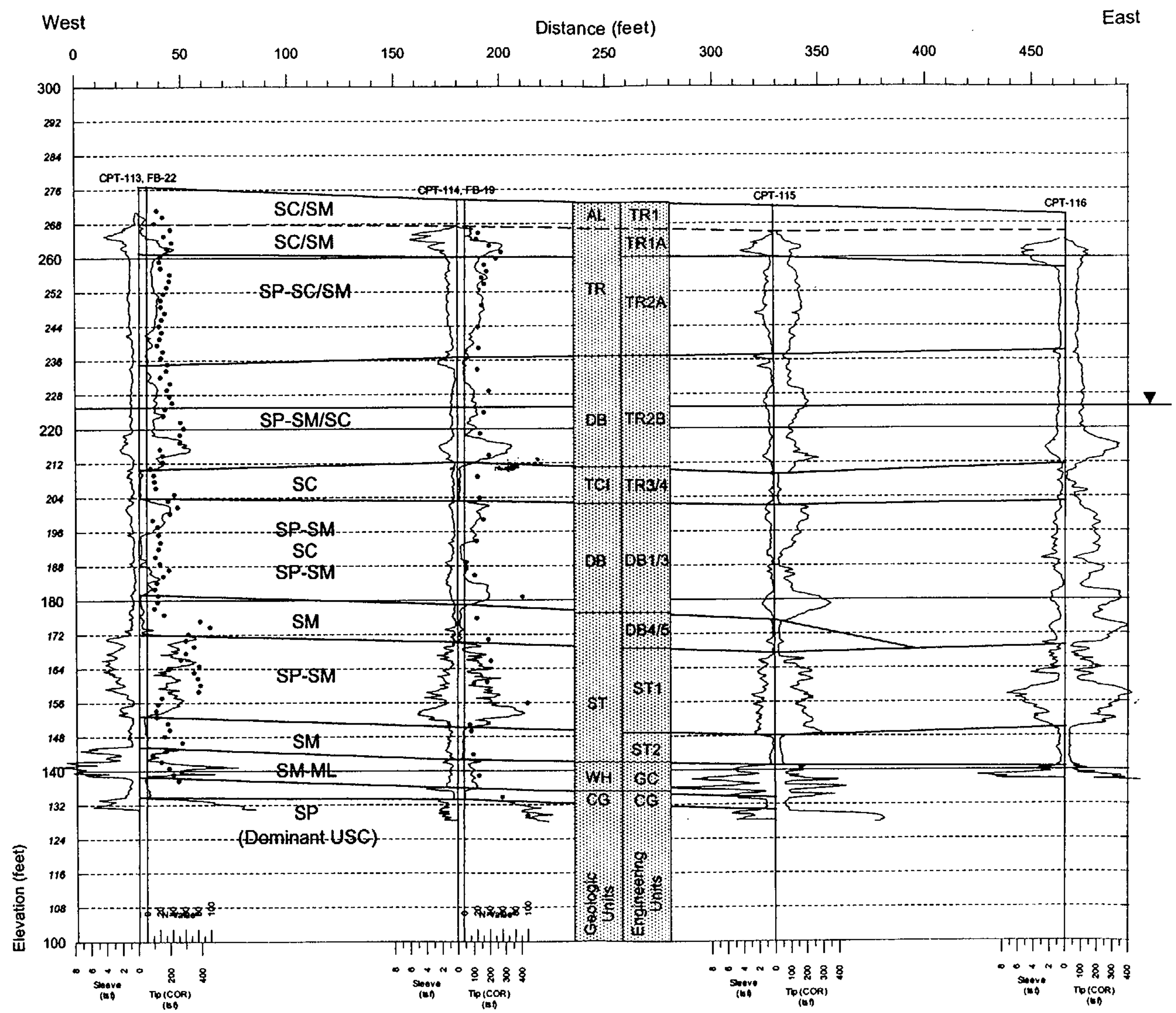


Figure 5-11. Geologic Cross Section 4 (WSRC 1999a)

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

SOFT ZONES

- Soft zones at MFFF site defined by criteria similar to that used for the APSF site and F-Area Northeast Expansion geotechnical programs.
    - Corrected CPT tip stress of less that 15 tsf for at least two feet.
    - SPT N-Value of 5 or less for at least two feet.
    - Soft zones are found within the lower Santee/Tinker (ST2) or Lower Dry Branch (DB4/5) Formations.

- All soft zones found at on the MFFF site are consistent with soft zone conditions and properties described in previous SRS geotechnical reports.

- No unusual soft zone conditions were identified at the MFFF site and no voids were encountered.

SOFT ZONES (Cont.)

- The soft zones are at depths of about 90 feet or more at the critical structure locations.
- Identified soft zones are isolated and have limited lateral and vertical extent, based on the overall spacing and layout for borings and CPTs.
- The lateral extent of soft zones and soft materials found on the geotechnical cross sections is conservatively shown.
- Soft zones and soft materials at and near critical structure locations are presented on Figures 5-1 through 5-5.
- Soft material locations shown on the geotechnical cross sections were defined by the same criteria used for soft zones.

TABLE 5-3
SOFT ZONE SUMMARY

CPT No.	Top Elev.	Bottom Elev.	Approx. Thick. (ft)
2	166.3	158.0	8.3
10	147.3	145.1	2.2
12	185.5	181.2	4.3
18	174.0	171.6	2.3
26	156.9	147.9	9.0
30	152.7	148.4	4.3
32	184.4	179.5	4.9
37	157.5	144.6	12.9
	180.7	177.7	2.9
38	182.2	177.3	4.9
39	158.8	152.8	6.0
	151.3	146.8	4.6
45	187.2	182.1	5.1
	151.0	147.6	3.4
46	182.8	179.7	3.1
	155.9	149.2	6.7
50	184.6	180.9	3.8
55	190.1	186.3	3.8
61	185.3	173.9	11.3
Boring No.	Top Elev.	Bottom Elev.	Approx. Thick. (ft)
BH-3	156	153.5	2.5
BH-5	193	191	2
	183	181	2
BH-6	184	182	2
	161	157	4
BH-13	182	180	2

1. In CPT soundings, a soft zone is defined as a zone with a CPT corrected tip stress of less than 15 tsf over a continuous interval of at least two feet.
2. In boreholes, a soft zone is defined as a zone with SPT N-value of 5 or less over a continuous interval of at least two feet.
3. If two or more soft zones are separated by less than one foot of firmer material, they are treated as one layer.
4. Soft Zones fall within the lower Santee/Tinker (ST2) or lower Dry Branch (DB4/5) formations.

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

STATIC ENGINEERING PROPERTIES

- CPT and SPT test results are summarized by engineering unit.
- SPT N-Values corrected for effective stress conditions.
- CPT tip resistance corrected using net area concept.
- Shear wave velocities were determined for each engineering unit based on CPT downhole seismic testing.
- CPT and SPT results correlate well to F-Area geotechnical investigations. (Table 6-1)
- Results of classification and physical test results presented Table 6-2 indicate that liquid limit (LL) and plasticity index (PI) are slightly higher than observed in other F-Area geotechnical results.

Revised 19 September 2001

TABLE 6-1
AVERAGE CPT AND SPT TEST RESULTS

	ENGR UNIT	AVE TOP EL.[1] (MSL)	AVE SPT N VALUE	AVE q_{cor}/N VALUE	AVE f_s (tsf)	AVE q_{cor} (tsf)	AVE R_f [2] (%)	AVE Pore Press. (tsf)	SHEAR WAVE VELOCITY (ft/sec)
F-Area	TR1 [3]		25	3.6		91			
NE Exp.		291	31	3.1		95	3.0		1544
APSF		289	33	4.3		142	2.0		1637
MOX FFF		276	17	5.4	1.6	92	1.6	0.39	1541
F-Area	TR1A [3]	278	25	4.8		120			
NE Exp.		278	31	3.3		103	3.0		1454
APSF		273	27	2.5		68	4.0		1464
MOX FFF		267	18	5.7	2.4	103	2.5	0.64	1476
F-Area	TR2A	261	28	5.3		147			
NE Exp.		262	37	3.9		146	1.0		1257
APSF		260	34	4.0		136	1.0		1284
MOX FFF		255	22	5.9	1.3	129	1.1	0.09	1324
F-Area	TR2B	233	36	5.6		201			
NE Exp.		236	39	4.2		164	1.0		1165
APSF		233	38	4.1		154	1.0		1215
MOX FFF		235	28	5.0	1.1	140	0.9	0.10	1253
F-Area	TR3/4	213	18	3.1		55			
NE Exp.		213	27	2.7		73	2.0		1056
APSF		211	19	1.9		37	2.0		1020
MOX FFF		212	18	2.4	1.0	41	3.0	3.08	1016
F-Area	DB1/3	204	33	5.2		172			
NE Exp.		206	37	5.2		194	1.0		1176
APSF		203	50	3.3		166	1.0		1197
MOX FFF		205	30	4.0	0.9	120	1.1	0.36	1126
F-Area	DB4/5	175	28	2.2		61			
NE Exp.		178	29	2.3		67	2.0		1180
APSF		175	21	2.5		52	2.0		1231
MOX FFF		183	19	1.8	1.4	35	2.5	5.25	1104
F-Area	ST1[4]	167	47	2.8		131			
NE Exp.		172	43	3.2		138	1.0		1273
APSF		168	46	3.0		137	1.0		1223
MOX FFF		174	47	4.2	2.0	200	1.2	1.39	1129
F-Area	ST2[4]								
NE Exp.		152							
APSF									
MOX FFF		157	20	2.2	0.8	44	2.0	9.18	1068
F-Area	GC	138	21	2.8		58			
NE Exp.		141	39	2.5		97	2.0		1319
APSF		143	49	1.6		79	2.0		1160
MOX FFF		146	32	2.0	1.3	63	2.1	14.21	1217
F-Area	CG								
NE Exp.		134							
APSF		134							
MOX FFF		141	89	2.4	2.0	213	1.5	6.65	

[1] NE Expansion values include APSF data.
[2] Friction Ratio = sleeve(f_s)/q_{COR} ratio.
[3] Surface effects have not been accounted for.
[4] The Northeast Expansion report does not separate ST1 and ST2.

TABLE 6-2
AVERAGE CLASSIFICATION AND PHYSICAL TEST RESULTS

	ENGR UNIT	AVE. THICK.[1] (ft)	AVE PI (%)	LIQUID LIMIT (%)	FINES CLASS.	MOISTURE CONTENT (%)	AVE % SAND (%)	AVE - NO. 200 (%)	AVE % SILT (%)	AVE % CLAY (%)	D_{50} Mean Grain Size (mm)	WET DENSITY (pcf)	DRY DENSITY (pcf)
F-Area	TR1 [2]	25	17	38		15	67	33		18.3	0.23	122	106
NE Exp.		13	23	48		18	66	34					
APSF		16	11	30		16	75	25					
MOX FFF		9									-		
F-Area	TR1A [2]	19	14	36		19	70	30		32.5	0.12	114	96
NE Exp.		16.0	20	35		19	70	30					
APSF		14	22	46		20	63	37				123	101
MOX FFF		12	16	39	CL	14	70	30	17.9	23.0	0.15		
F-Area	TR2A	25	10	33		17	83	17		10.1	0.27	122	101
NE Exp.		26	9	28		17	86	14					
APSF		27	10	33		21	84	16					
MOX FFF		20	25	50	CL-CH	16	83	17	3.9	14.4	0.33	120	100
F-Area	TR2B	19	18	41		22	81	19		8.3	0.36	123	99
NE Exp.		23	12	24		18	90	10					
APSF		22	NP	NP		24	89	11				124	102
MOX FFF		23				16	90	10			0.37	118	103
F-Area	TR3/4	10	58	96		51	36	64		39.6		108	76
NE Exp.		7	19	54		34	64	36					
APSF		8	19	54		42	66	34				115	89
MOX FFF		7	47	82	CH	35	63	37	8.6	28.7	0.23	115	89
F-Area	DB1/3	28	19	44		27	86	14		12.1	0.34	124	99
NE Exp.		28	16	11		25	89	11					
APSF		28	NP	NP		27	91	9				122	98
MOX FFF		22	39	69	CH	29	86	14	5	15.6	0.37	119	95
F-Area	DB4/5	7	15	48		39	78	22		20.1	0.29	118	86
NE Exp.		6	11	45		36	80	20					
APSF		7	11	45		38	79	21				115	87
MOX FFF		9	35	67	CH	37	74	26	6.6	19.4	0.23	108	78
F-Area	ST1[3]	19	18	40		29	71	29		23.9	0.22	116	87
NE Exp.		20	14	23		30	81	19					
APSF			25	49		30	82	18					
MOX FFF		17				26	90	9	4.9	13.6	0.21	113	83
F-Area	ST2[3]												
NE Exp.		11											
APSF													
MOX FFF		11	27	53	CH	33	68	32	15.2	18.7	0.14	113	85
F-Area	GC	7	47	83		32	61	39		2.8	0.11	121	92
NE Exp.		7	27	42		32	67	33					
APSF		9	30	57		28	48	52					
MOX FFF		5	30	55	CH	29	53	47	28.5	24.6	0.08	114	91
F-Area	CG												
NE Exp.													
APSF													
MOX FFF			27	50	CH	24	85	14			0.35		

[1] NE Expansion values include APSF data.
[2] Surface effects have not been accounted for.
[3] The Northeast Expansion report does not separate ST1 and ST2.

STATIC ENGINEERING PROPERTIES (Cont.)

- **Percent sand content is generally greater than 60%, which is consistent with low friction ratio (f_s) observed in CPTs.**
- **Fines content for each engineering unit generally classifies as a CL or CH.**
- **Representative strength properties for engineering units are best estimated from CPT tip resistance. Sandy nature of units makes it difficult to obtain undisturbed samples for laboratory testing.**
- **Consolidation test results present on Table 6-4 are consistent with previous F-Area investigations and are considered conservative due to limited sampling in primarily sandy engineering units.**

TABLE 6-4
AVERAGE CONSOLIDATION TEST RESULTS

	ENGR UNIT	AVE. THICK.[1] (ft)	AVE TOP EL.[1] (MSL)	VOID RATIO	C_c	C_r	P_c (ksf)
F-Area	TR1 [2]	25		0.68	0.12	0.011	6.2
NE Exp.		13	291				
APSF		16	289				
MOX FFF		9	276				
F-Area	TR1A [2]	19	278	0.74	0.08	0.009	6.3
NE Exp.		16.0	278				
APSF		14	273	0.66	0.12	0.100	
MOX FFF		12	267				
F-Area	TR2A	25	261	0.69	0.07	0.011	5.0
NE Exp.		26	262				
APSF		27	260				
MOX FFF		20	255	0.65	0.12	0.011	8.0
F-Area	TR2B	19	233	0.80	0.05		12.0
NE Exp.		23	236				
APSF		22	233				
MOX FFF		23	235	0.64			
F-Area	TR3/4	10	213	1.39	0.85	0.138	14.8
NE Exp.		7	213				
APSF		8	211	0.89	0.28	0.16	
MOX FFF		7	212	0.94	0.21	0.021	5.8
F-Area	DB1/3	28	204	0.75	0.27	0.109	13.9
NE Exp.		28	206				
APSF		28	203				
MOX FFF		22	205	0.83	0.10	0.011	4.0
F-Area	DB4/5	7	175	1.04	0.55	0.053	10.7
NE Exp.		6	178				
APSF		7	175	1.03	0.25	0.009	
MOX FFF		9	183	1.19	0.45	0.035	7.9
F-Area	ST1[3]	19	167	0.98	0.31	0.042	14.8
NE Exp.		20	172				
APSF			168				
MOX FFF		17	174	0.96	0.15	0.017	9.1
F-Area	ST2[3]						
NE Exp.		11	152				
APSF							
MOX FFF		11	157	0.99	0.28	0.024	8.4
F-Area	GC	7	138	0.83	0.31	0.035	11.5
NE Exp.		7	141				
APSF		9	143				
MOX FFF		5	146	0.87	0.21	0.045	9.6
F-Area	CG						
NE Exp.			134				
APSF			134				
MOX FFF			141				

[1] NE Expansion values include APSF data.
[2] Surface effects have not been accounted for.
[3] The Northeast Expansion report does not separate ST1 and ST2.

STATIC ENGINEERING PROPERTIES (Cont.)

- Obtaining soft zone samples is difficult at SRS. Limited samples obtained are consistent with results presented in WSRC 1999b soft zone report.
- Recommended soft zone properties presented in WSRC soft zone report were used for analysis for soft zones and soft materials.
- Engineering properties for engineered structural fill is based on properties of a well compacted, well-graded, durable crushed rock material.
- Engineering properties used for the MFFF site are consistent with those recommended in previous F-Area geotechnical investigations.

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

FOUNDATION DESIGN AND PERFORMANCE

- **Foundation performance is based on foundation design criteria, Table 7-1, and engineering properties of subsurface engineering units.**

- **Foundation preparation assumes engineered structural fill as indicated on Table 7-1.**

- **The engineered structural fill and underlying stiff to hard soil layers provide more than adequate bearing capacity.**

- **Bearing capacity was determined using standard bearing capacity equations and factor of safety for all load cases is much greater than three (3).**

Revised 19 September 2001

TABLE 7 – 1

FOUNDATION DESIGN CRITERIA

MOX AND EMERGENCY DIESEL GENERATOR BUILDINGS

ITEM	MFFF Building Main Level	Aqueous Polishing Sublevel	Emergency Diesel Generator Bldg
1. Mat thickness (FT)	4	4	2
2. Top of Mat EL. (FT)	273	255.5	271
3. Bottom of Mat EL (FT)	269	251.5	269
4. Minimum Structural Fill Thickness (FT)	10	5	5
5. Approximate Bottom Fill EL. (FT)	259	246.5	264
6. Static Design Load (PL + LL) Max. Edge Bearing Pressure (PSF)	7,200	7,800	3,600
Avg. Bearing Pressure	4,600	6,100	2,000
7. Dynamic Design Load (Seismic) Max. Edge Bearing Pressure (PSF)	10,900	13,200	6,900
Ave. Bearing Pressure	6,800	9,100	3,100

FOUNDATION DESIGN AND PERFORMANCE (Cont.)

- A conventional settlement analysis was performed using C_r values to define settlement magnitudes for the MOX building center and edge for typical geotechnical cross section 1.
- Results indicate settlement at edge of mat at 1.4 inches and center at 2.5 inches.
- A settlement analysis using FLAC was performed to define the settlement profile beneath critical structures.

The subsurface engineering units and soft zones shown on Figures 5-2, 5-3 and 5-5 were modeled in FLAC to the detail shown on these figures.

FOUNDATION DESIGN AND PERFORMANCE (Cont.)

- **Shear modulus (G) used for the FLAC analysis was assumed to be 0.15% of G_{max} to conservative adjust for settlement strain rate and to approximate results from conventional settlement analysis.**

- **FLAC settlement results for Best Estimate values are presented on Tables 7-4, 7-5 and 7-6.**

- **Typical FLAC settlement profiles and displacement contours are presented on Figures 7-1, 7-2, 7-7, and 7-8.**

- **Settlement results from conventional settlement and FLAC analyses are considered to be conservative based on settlement analysis for SRS facilities and monitored settlement histories.**

Table 7-4. Settlement Results for the MOX Building at Geotechnical Cross-Section 1

Case Analyzed	Figure No.	Total Settlement Right Edge (in)	Total Settlement Centerline (in)	Total Settlement Left Edge (in)	Max Differential Settlement MOX From CL to Edge (in)	Max Total Settlement Values from FLAC Model (in)
Best Estimate	7-1, 7-2	1.5	2.1	1.1	0.9	2.1
Lower Bound	7-1, 7-3	2.1	2.8	1.5	1.3	2.9

Table 7-5. Settlement Results for the MOX and Emergency Diesel Generator Buildings at Geotechnical Cross-Section 2

Case Analyzed	Figure No.	Total Settlement Right Edge MOX (in)	Total Settlement Centerline MOX (in)	Total Settlement Left Edge MOX (in)	Max Differential Settlement CL to edge MOX (in)	Total Settlement Centerline EDG (in)	Max Differential Settlement EDG (in)	Max Total Settlement Values from FLAC Model (in)
Best Estimate	7-4, 7-5	1.4	2.0	1.2	0.8	0.8	0.1	2.0
Lower Bound	7-4, 7-6	1.5	2.1	1.3	0.8	0.9	0.1	2.2

Table 7-6. Settlement Results for the MOX Building at Geotechnical Cross-Section 4

Case Analyzed	Figure No.	Total Settlement Right Edge MOX (in)	Total Settlement Centerline MOX (in)	Total Settlement Left Edge MOX (in)	Max Differential Settlement CL to Edge MOX (in)	Total Settlement Centerline of Sublevel (in)	Max Differential Settlement Sublevel (in)	Max Total Settlement Values from FLAC Model (in)
Best Estimate	7-7, 7-8	1.4	2.2	1.5	0.7	0.6	0.9	2.2
Lower Bound	7-7, 7-9	1.9	2.9	1.9	1.0	0.7	1.2	2.9

NOTES FOR TABLES:
1. Analysis assumes 10 ft of structural fill beneath main MOX building.
2. Analysis assumed 5 ft of structural fill beneath the Aqueous Polishing Area (sublevel) of the MOX building and beneath the Emergency Diesel Generator (EDG) building.

Figure 7-1. MFFF Site - Section 1 Difference Between Load and No Load Cases

FLAC (Version 4.00)

LEGEND

11-Jul-01 8:34
step 10
-1.506E+01 <x< 2.861E+02
-1.001E+02 <y< 2.011E+02

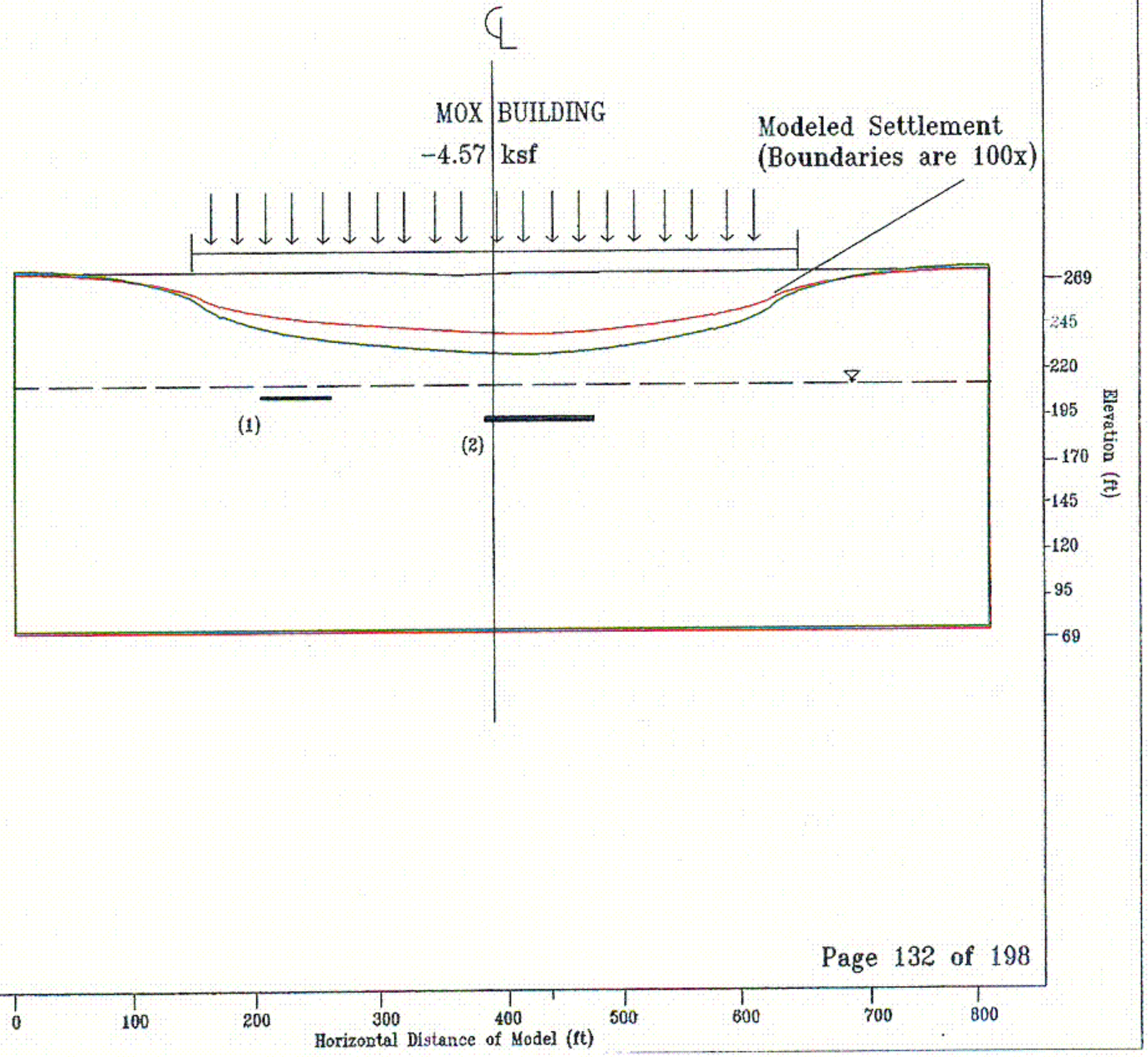
NO LOAD CASE - 10' STRUCTURAL FILL

Exaggerated Boundary Disp.
Magnification = 100 Times
Max Disp = 0.1785 ft (2.14")
BEST ESTIMATE PROPERTIES

Exaggerated Boundary Disp.
Magnification = 100 Times
Max Disp = 0.2411 ft (2.89")
LOWER BOUND PROPERTIES

Soft Material Location
Water Table at El. 210'

Duke Cogema Stone & Webster
FILENAME:
figure7-1.dwg



C01

Figure 7-2. MFFF Site - Section 1 Settlement Analysis BEST ESTIMATE VALUES, 10' Structural Fill

FLAC (Version 4.00)

LEGEND

12-Jul-01 7:21
step 10
-1.506E+01 <x< 2.861E+02
-1.001E+02 <y< 2.011E+02

Y-displacement contours (ft)
-1.75E-01
-1.50E-01
-1.25E-01
-1.00E-01
-7.50E-02
-5.00E-02
-2.50E-02
0.00E+00

Contour interval= 2.50E-02 (ft)

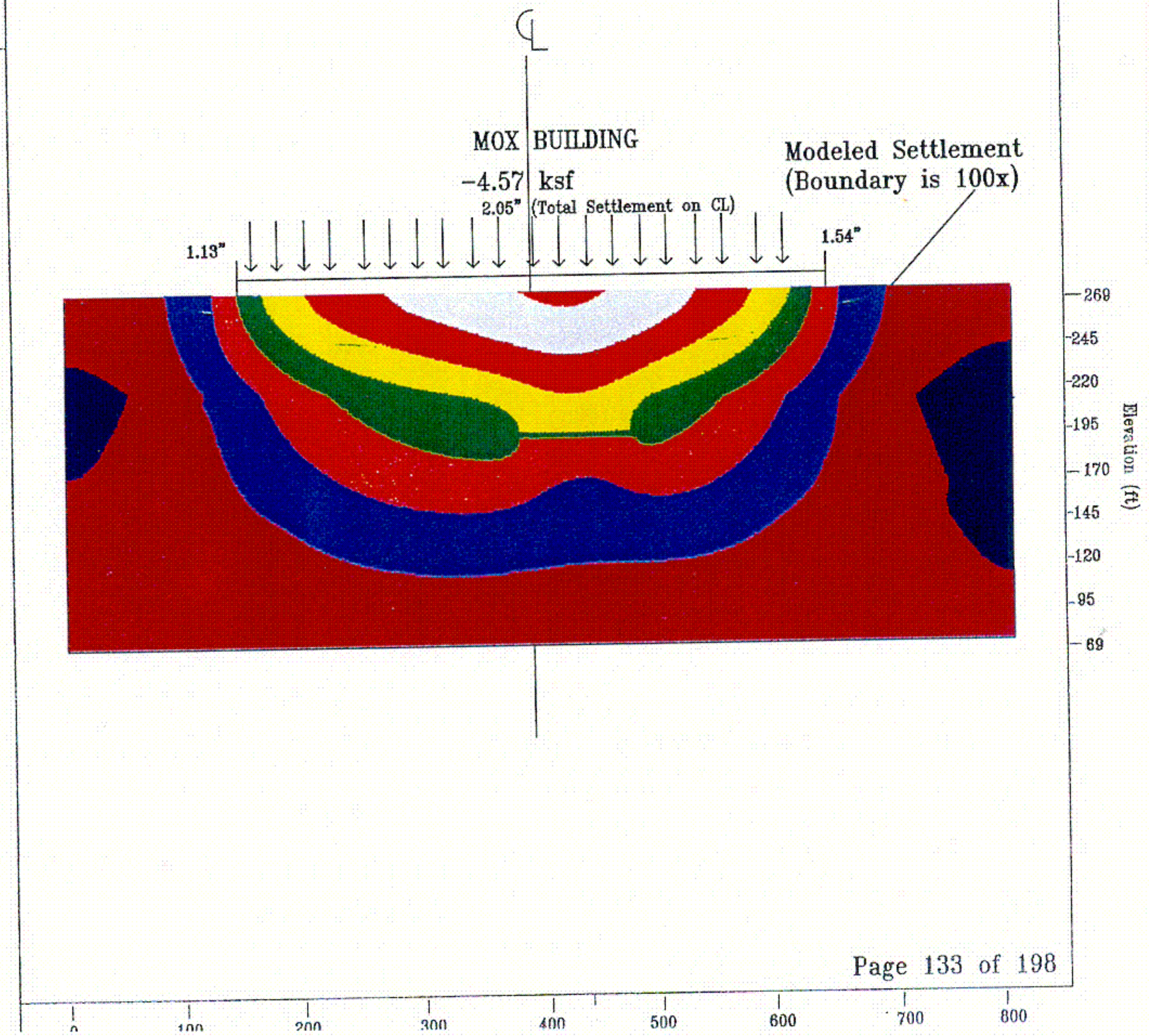
Exaggerated Boundary Disp.
Magnification = 100 Times
Max Disp = 0.1785 ft (2.14")

Soft Material Location

Water Table at El. 210'

Duke Cogema Stone & Webster

FILENAME:



C02

Figure 7-7. MFFF Site - Section 4 Difference Between Load and No Load Cases

FLAC (Version 4.00)

LEGEND

20-Jul-01 18:20
step 46
-1.394E+01 <x< 2.649E+02
-8.896E+01 <y< 1.899E+02

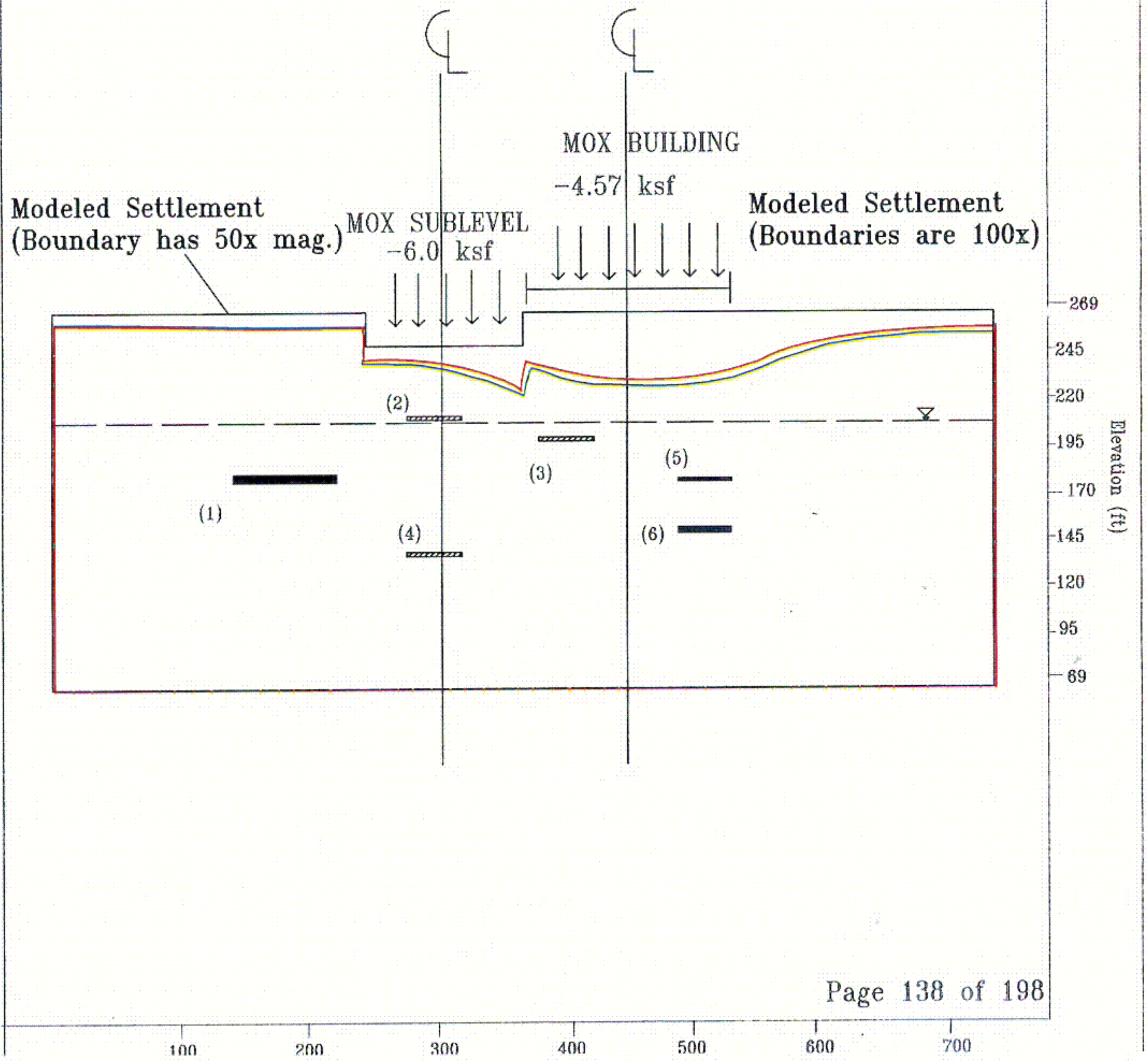
NO LOAD - 10' STRUCTURAL FILL

Exaggerated Boundary Disp.
Magnification = 100 Times
Max Disp = 0.1794 ft (2.15")
BEST ESTIMATE VALUES

Exaggerated Boundary Disp.
Magnification = 100 Times
Max Disp = 0.2442 ft (2.93")
LOWER BOUND VALUES

Water Table at El. 210'
Softzone Location
Soft Material Location

Duke Cogema Stone & Webster
FILENAME:



C03

Figure 7-8. MFFF Site - Section 4 Settlement Analysis BEST ESTIMATE VALUES, 10' Structural Fill

FLAC (Version 4.00)

LEGEND

11-Jul-01 15:26
step 40
-1.394E+01 <x< 2.649E+02
-8.896E+01 <y< 1.899E+02

Y-displacement contours (ft)
-1.75E-01
-1.50E-01
-1.25E-01
-1.00E-01
-7.50E-02
-5.00E-02
-2.50E-02
0.00E+00

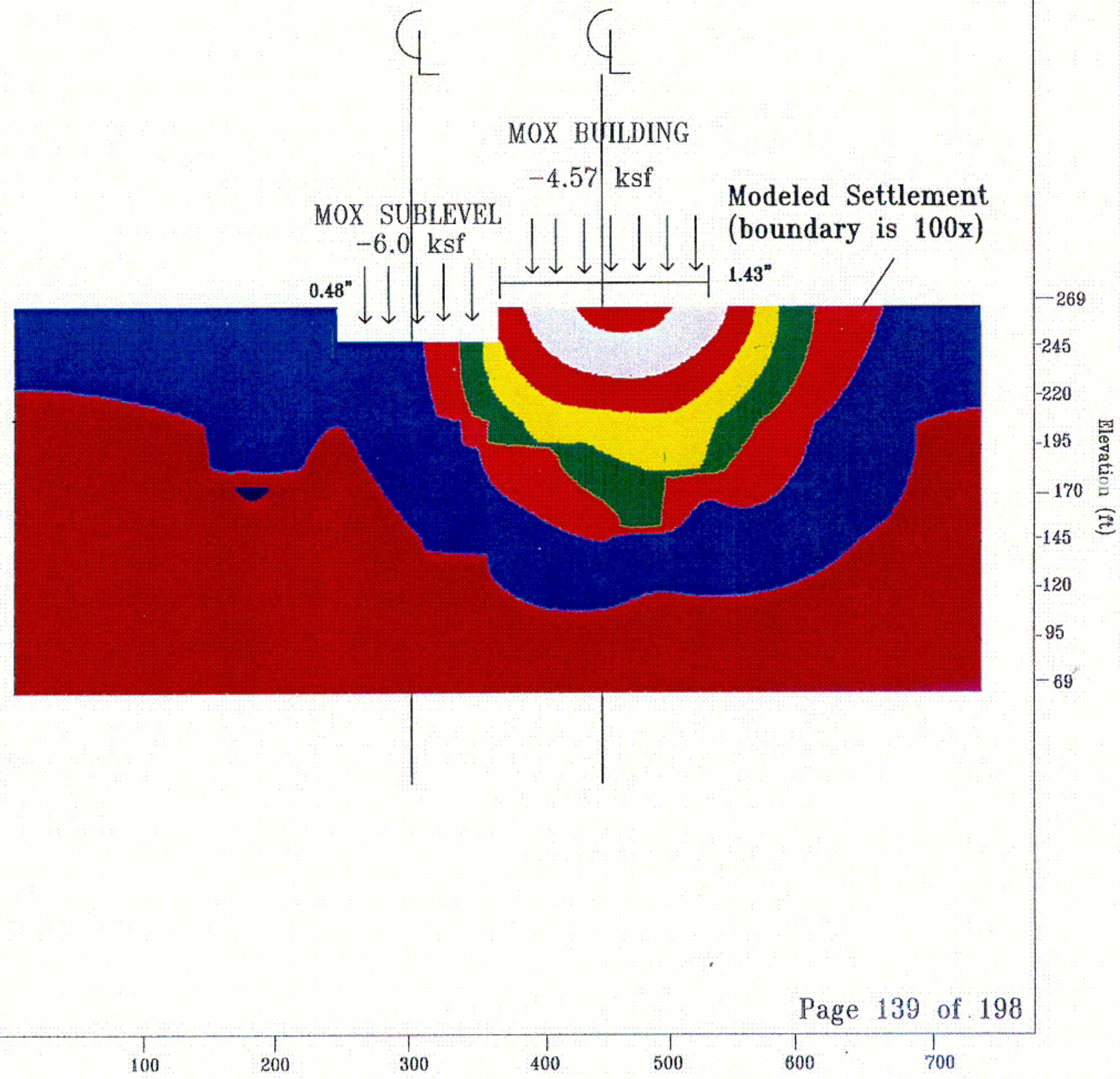
Contour interval= 2.50E-02 (ft)

Exaggerated Boundary Disp.
Magnification = 100 Times
Max Disp = 0.1794 ft (2.15")

Water Table at El. 210'
Softzone Location
Soft Material Location

Duke Cogema Stone & Webster

FILENAME:



Page 139 of 198

C04

DYNAMIC ENGINEERING PROPERTIES

- **The 15 CPT field measurements of insitu shear wave velocities were used to develop an idealized profile of low-strain shear wave velocity, based on shear wave velocities determined for each engineering unit above the Congaree (CG). (Tables 6-1 and 6-6)**

- **Shear wave velocities for soil units from the Congaree and below were derived from previous F-Area dynamic studies and analysis.**

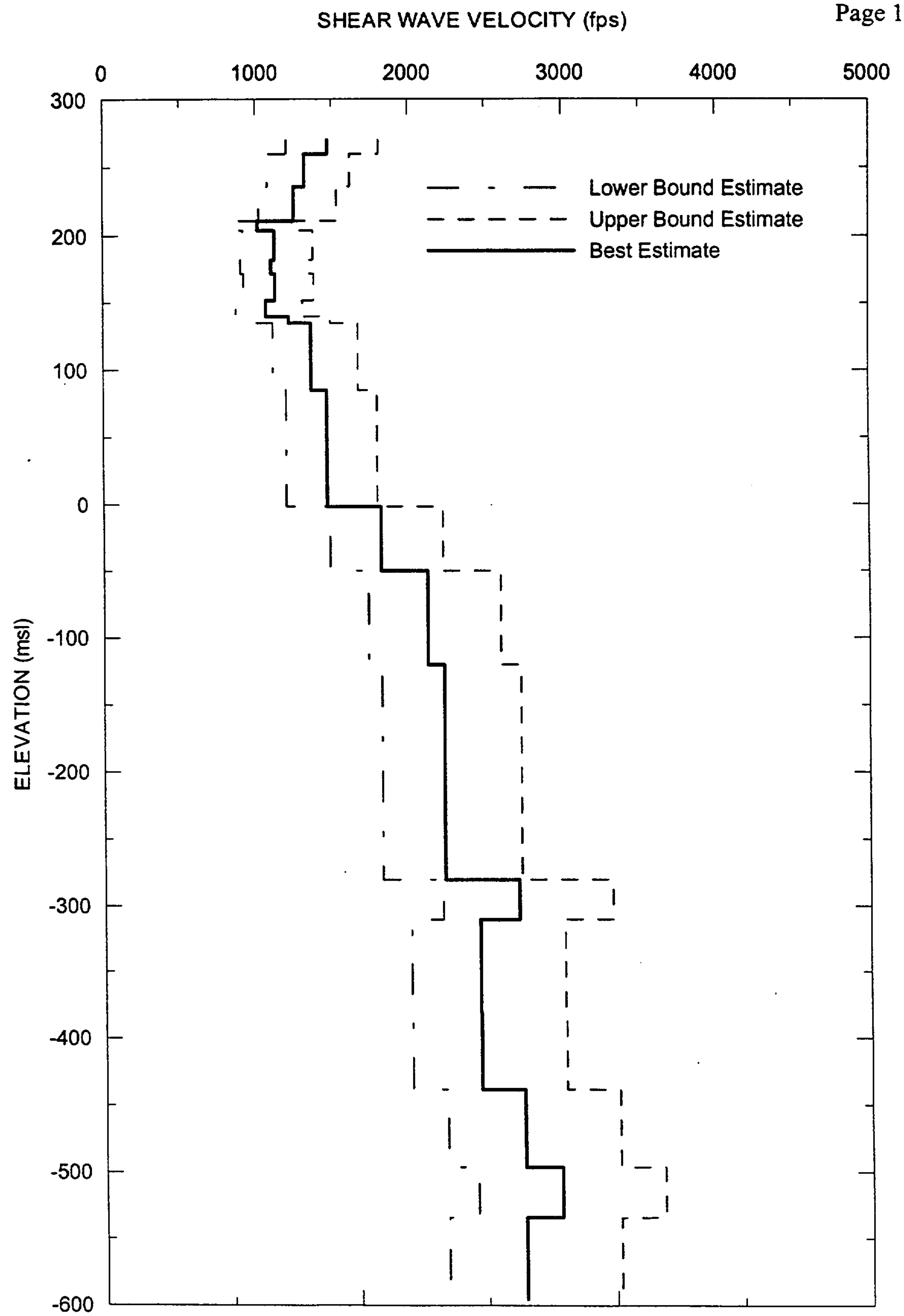
- **Bedrock at the MFFF site area is at approximately El. -595 feet (865 feet deep) and is crystalline in nature.**

- **The idealized low strain shear wave velocity profiles are shown on Figures 6-2 and 6-3.**

TABLE 6-6

STATISTICAL SUMMARY OF S-CPT SHEAR WAVE VELOCITY DATA

Soil Type	Average Vs (fps)	No. of Data Points	Min	Max	Median	Std Dev	Ave. + 1 Std Dev	Ave. - 1 Std Dev
TR1	1541	3	1312	1672	1641	199	1741	1342
TR1A	1476	10	1107	2019	1460	285	1761	1191
TR2A	1324	44	1053	1896	1263	187	1511	1137
TR2B	1253	65	911	3489	1209	333	1586	921
TR3/4	1016	19	857	1375	988	132	1148	883
DB1/3	1126	63	848	1941	1109	164	1290	963
DB4/5	1104	19	890	1309	1095	120	1225	984
ST1	1129	44	927	1406	1118	125	1254	1005
ST2	1068	25	775	1438	1043	175	1243	893
GC	1217	6	927	1471	1279	216	1433	1001
CG	no data							



Note: Bedrock velocity (11,000 fps) not shown

Fig 6-1-B.grf w/Shear_Wave_Values.xls by RCC [8/8/01]

DUKE COGEMA STONE & WEBSTER	MOX Fuel Fabrication Facility **US Department of Energy CH** J.O. 08716	Idealized Profile of Low-Strain Shear Wave Velocity at MFFF Site	Figure 6-2

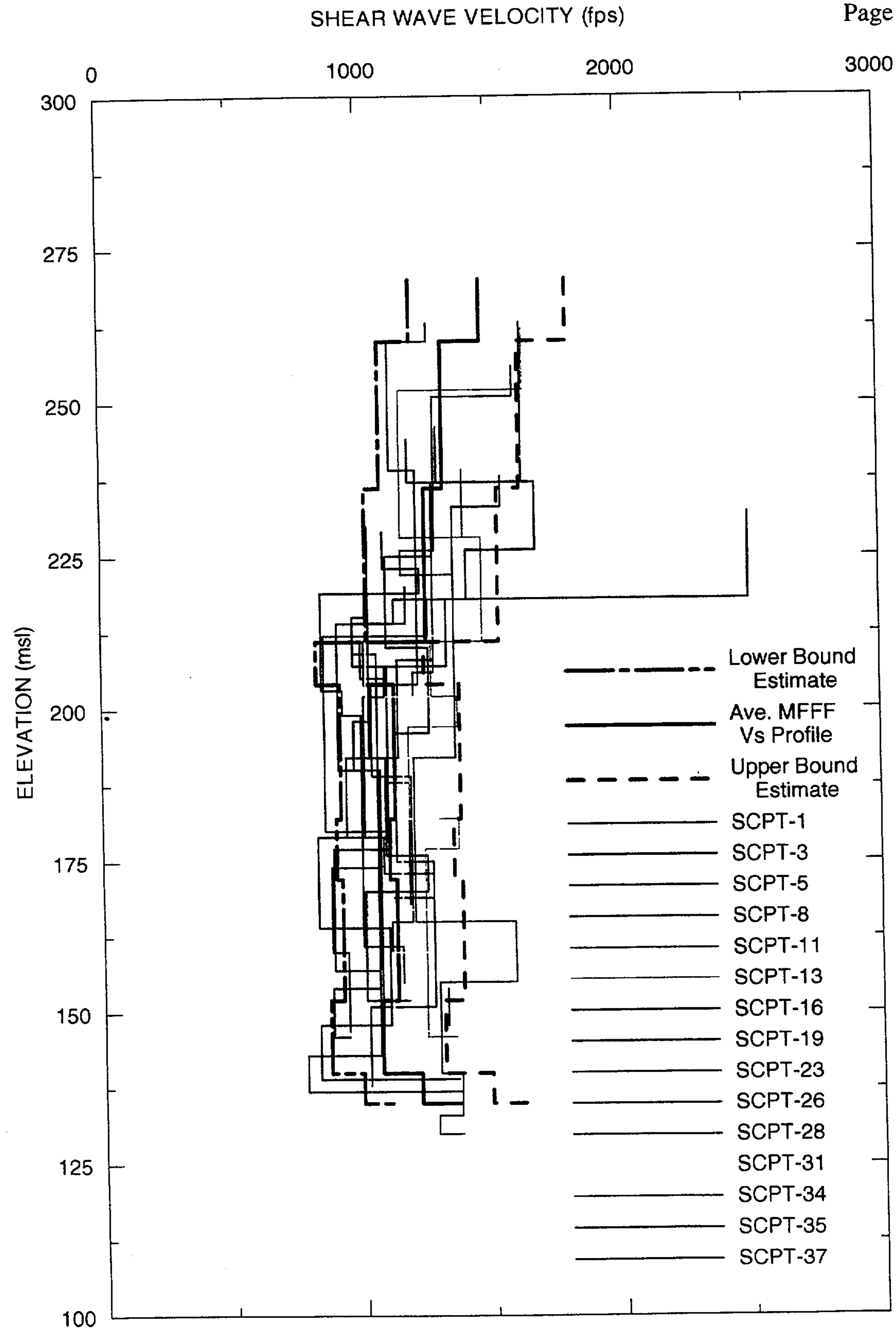


Fig 6-2-B.grf w/Shear_Wave_Values.xls 8/8/01

DUKE COGEMA STONE & WEBSTER	MOX Fuel Fabrication Facility **US Department of Energy CH** J.O. 08716	Low Strain Shear Wave Velocity by SCPT	Figure 6-3

DYNAMIC ENGINEERING PROPERTIES (Cont.)

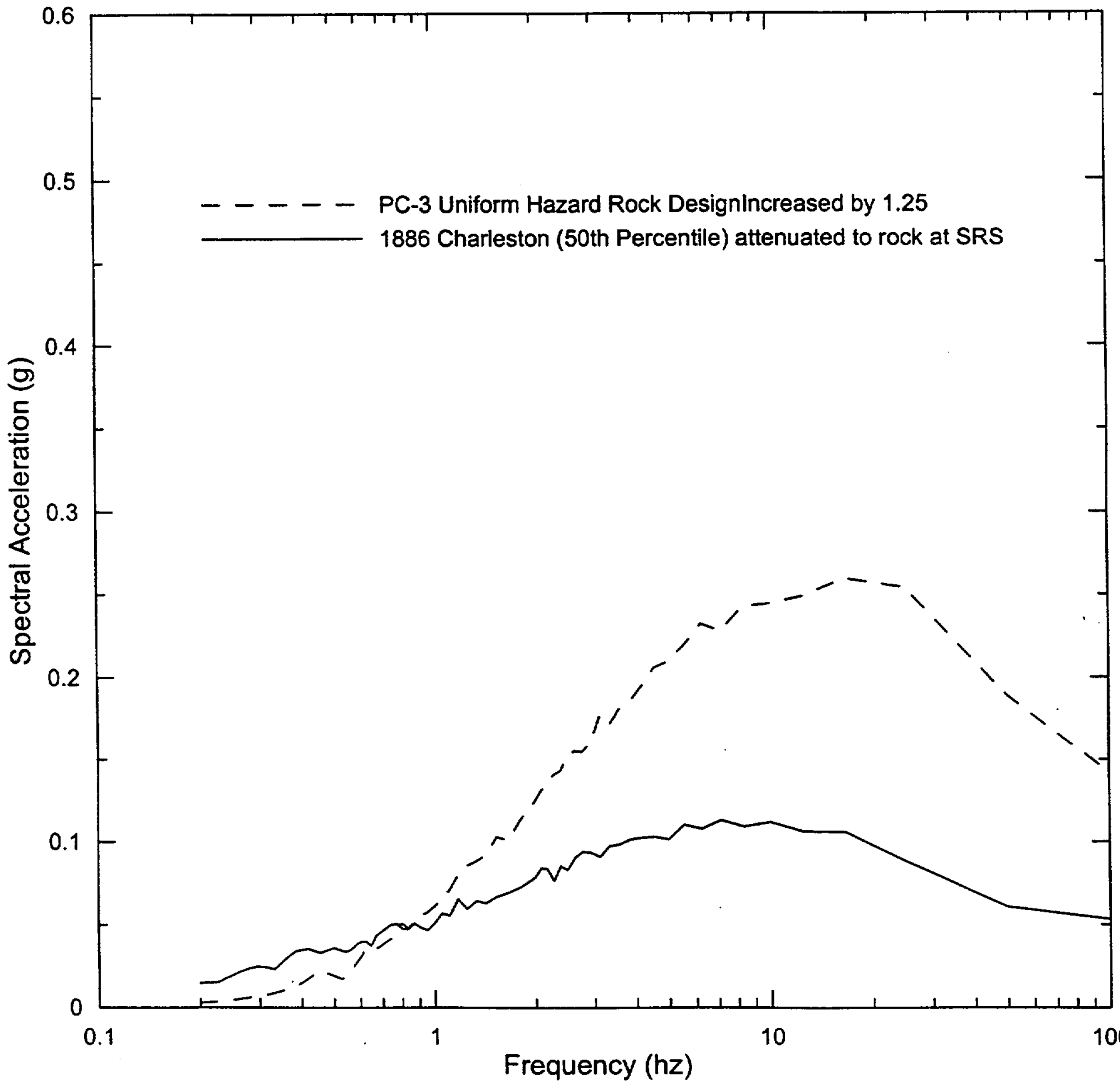
- **The upper and lower bound shear wave velocities were determined in accordance with ASCE 4-98.**

- **Cyclic triaxial and resonant column testing were used to confirm that the results of the WSRC 1996a "Investigation of Non-linear Dynamic Soil Properties at the Savannah River Site" are applicable to the MFFF site.**

- **The results presented have been used to define dynamic soil properties used in dynamic analyses.**

CONTROL GROUND MOTION

- **The SRS PC-3 uniform hazard rock design response spectrum was used to establish the bedrock motion required to achieve the design PGA of 0.20g.**
- **The PC-3 was required to be increased by a factor of 1.25 to yield a PGA of 0.20g.**
- **The second control ground motion is the 1886 Charleston earthquake (50th).**
- **The MFFF site was analyzed for the 1886 Charleston earthquake to evaluate liquefaction from a large distance earthquake.**
- **Figure 6-10 presents the two bedrock response spectra used for the MFFF site response analyses.**



DUKE COGEMA STONE & WEBSTER	MOX Fuel Fabrication Facility **US Department of Energy CH** J.O. 08716	Response Spectra (Damped 5%) used in MFFF Site Response Analyses	Figure 6-10

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

SITE RESPONSE ANALYSES

One-dimensional free-field site response analyses were performed to estimate response characteristics for the soil column from small to moderate cyclic strains generated during the design level earthquakes.

Three sets of analysis were performed:

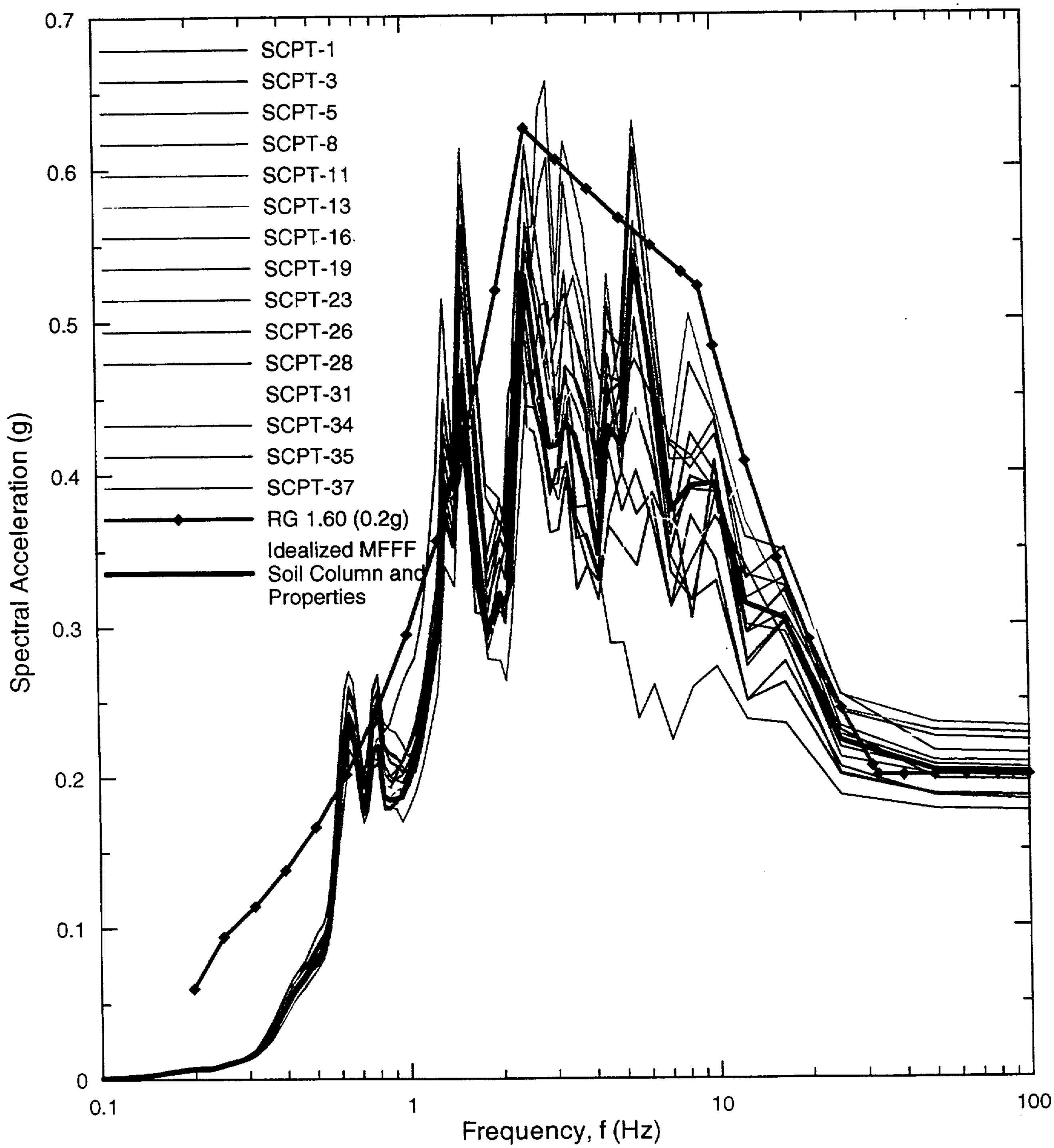
- **The idealized soil column and associated material properties were analyzed using a modified PC-3 time history.**
- **An analysis was performed for each of the 15 S-CPTs using the modified PC-3 time history.**
- **The 1886 Charleston earthquake was analyzed for each of the 15 S-CPTs.**

Revised 19 September 2001

SITE RESPONSE ANALYSES (Cont.)

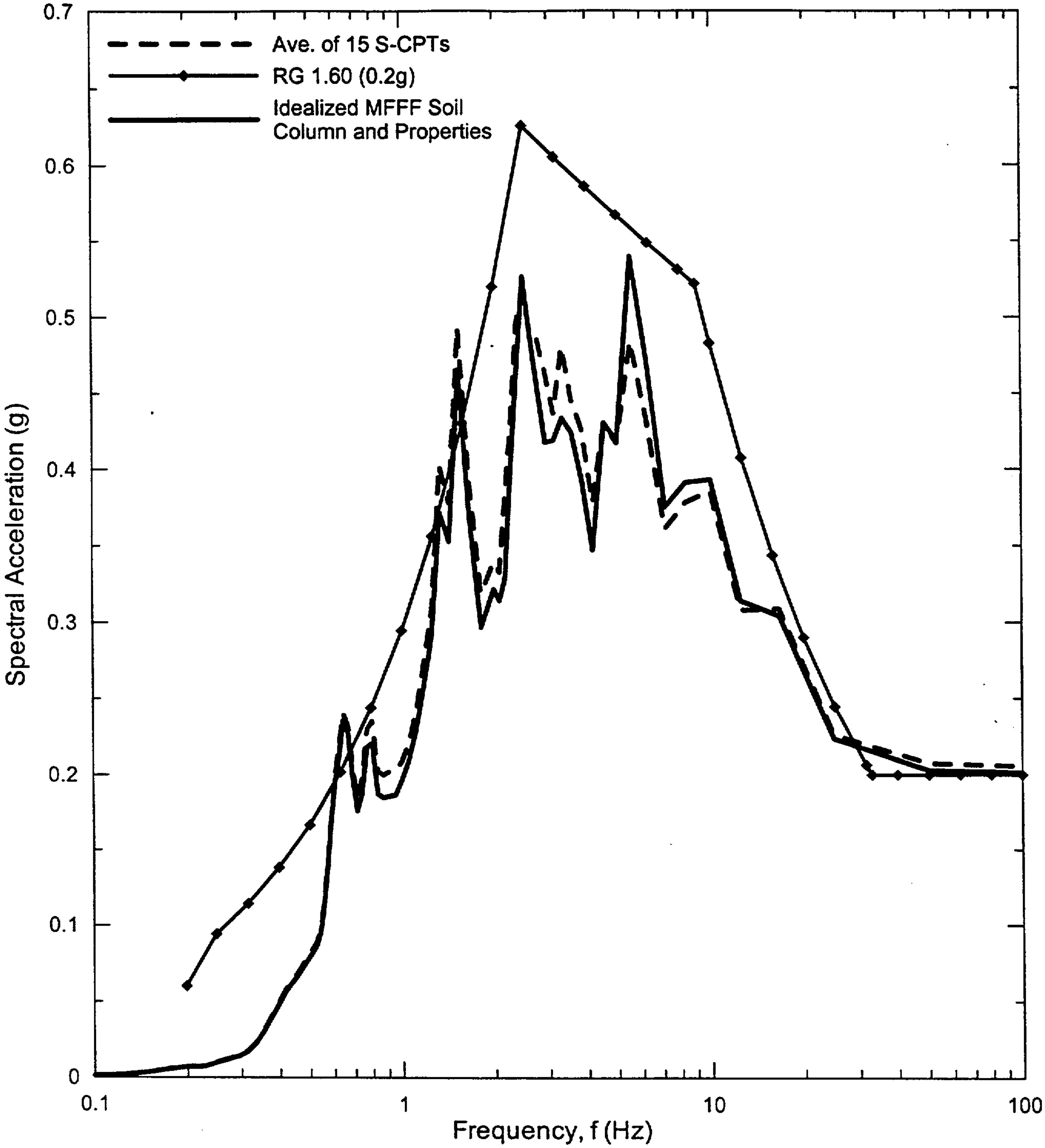
- **The variability of the individual S-CPTs to the composite site response using the idealized soil column and material properties are presented on Figures 6-11 through 6-14.**

- **The cyclic stress ratio vs. depth for both earthquakes is presented on Figures 6-17 and 6-18.**



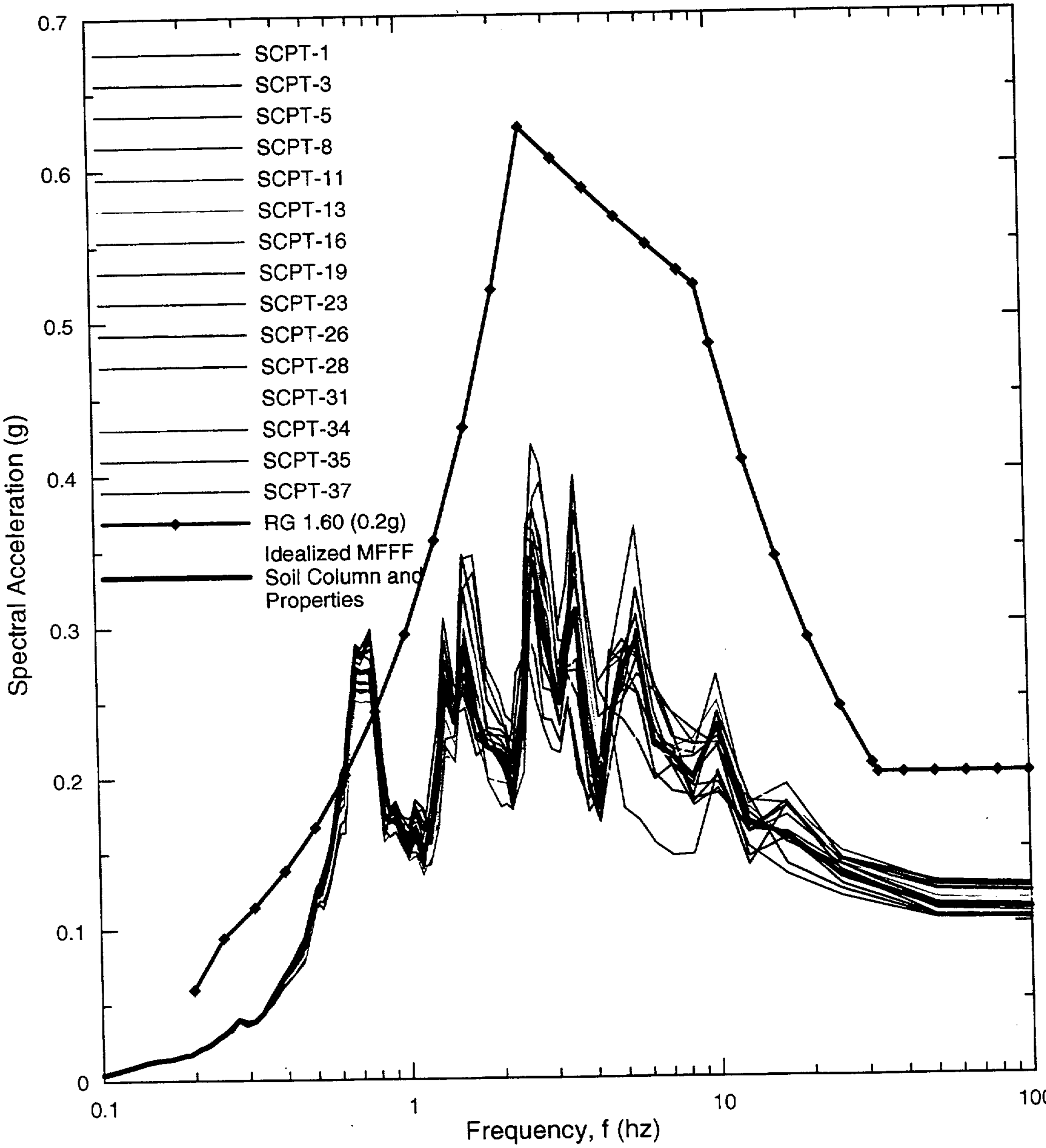
SAvT_comp-1-P.GRF w/PC3ALL.xls by JJT [08/08/01]

DUKE COGEMA STONE & WEBSTER	MOX Fuel Fabrication Facility **US Department of Energy CH** J.O. 08716	Comparison of Surface Response Spectra (5% Damped) for 15 SCPTs PC-3 Motion Scaled up 1.25	Figure 6-11



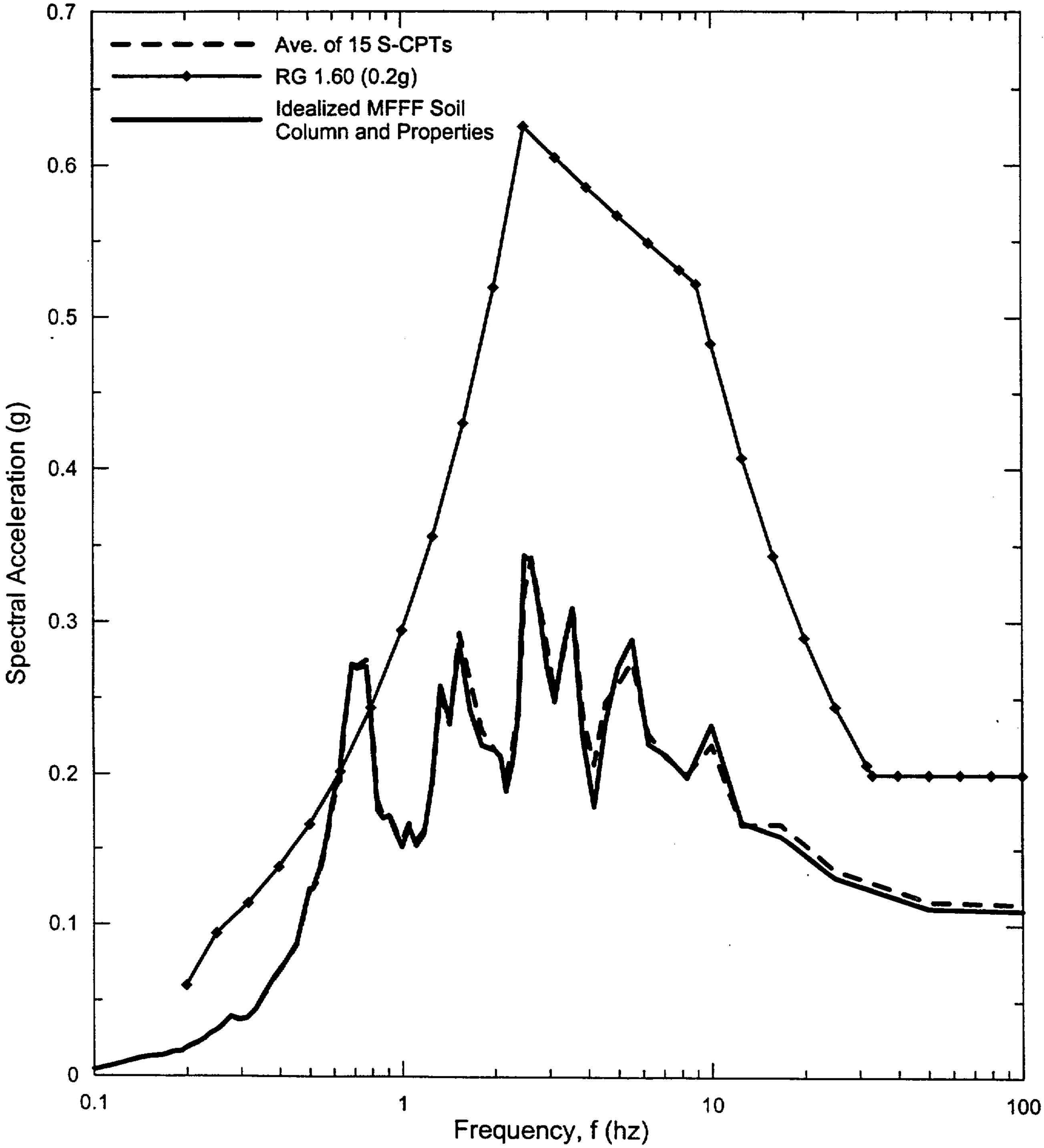
SAvT_comp-2-P.GRF w/PC3ALL.xls by JJT [08/08/01]

DUKE COGEMA STONE & WEBSTER	MOX Fuel Fabrication Facility **US Department of Energy CH** J.O. 08716	Comparison of Surface Response Spectra (5% Damped) for Ave. of 15 SCPTs PC-3 Motion Scaled up 1.25	Figure 6-12



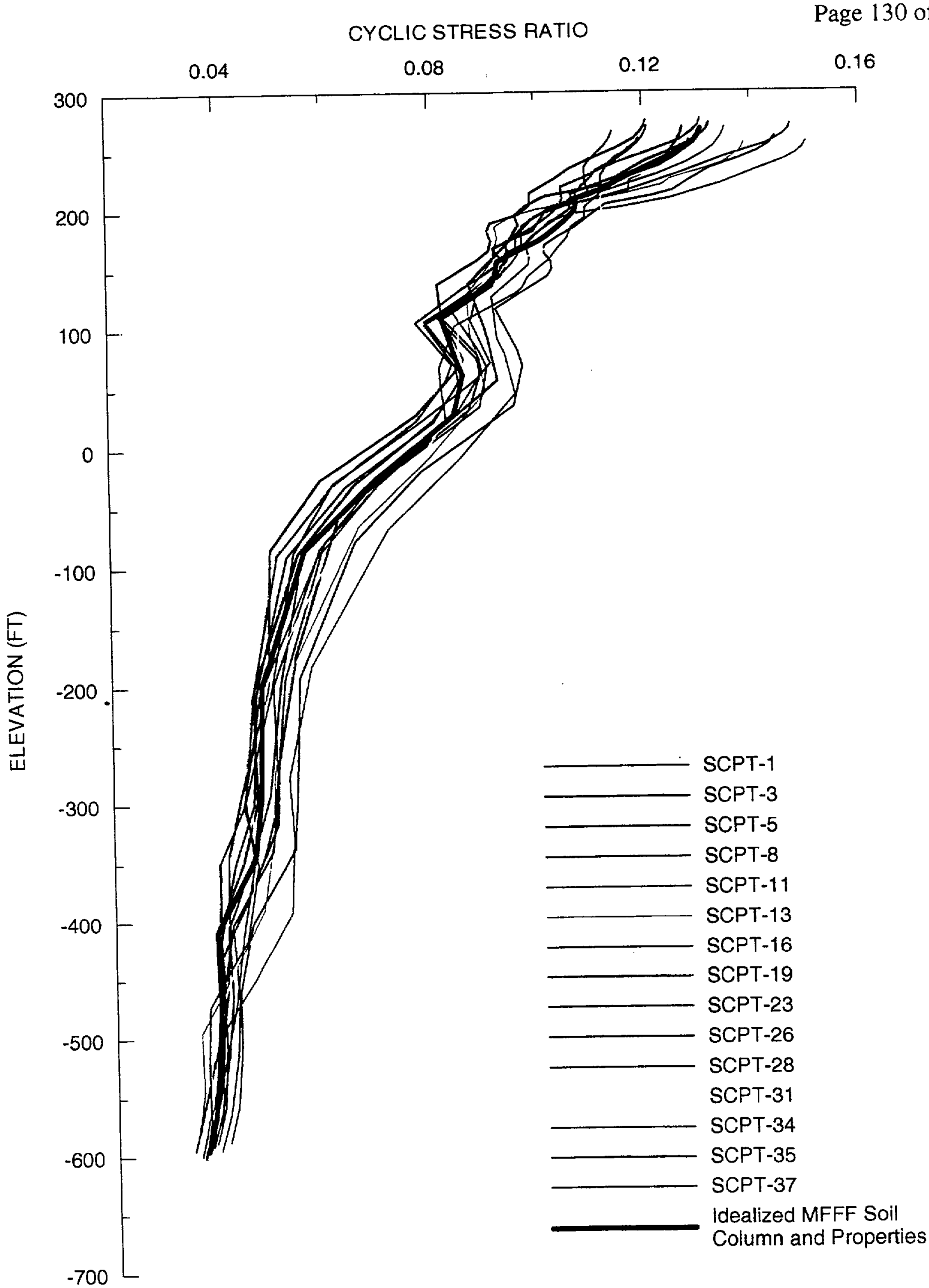
SAvT_comp-1C.GRF w/CHASC-ALL .xls by FJW [08/08/01]

DUKE COGEMA STONE & WEBSTER	MOX Fuel Fabrication Facility **US Department of Energy CH** J.O. 08716	Comparison of Surface Response Spectra (5% Damped) for 15 SCPTs 1886 Charleston 50th Percentile Motion	Figure 6-13



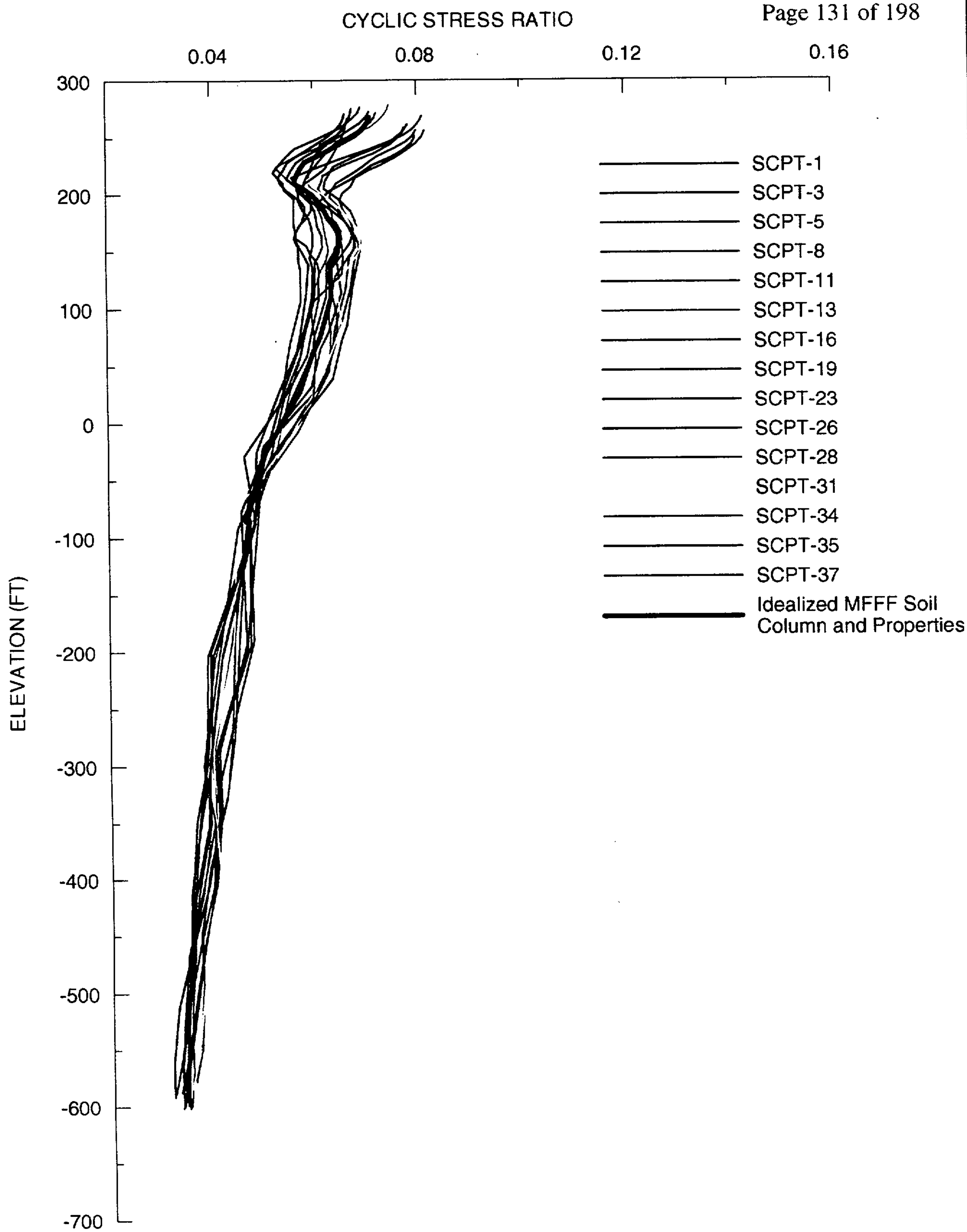
SAvT_comp-2-C.GRF w/CHASC-ALL .xls by FJW [08/08/01]

DUKE COGEMA STONE & WEBSTER	MOX Fuel Fabrication Facility **US Department of Energy CH** J.O. 08716	Comparison of Surface Response Spectra (5% Damped) for Ave. of 15 SCPTs 1886 Charleston 50th Percentile Motion	Figure 6-14



CSRvDpt-P.grf w\PC3-ALL.xls by RCC 8/8/01

DUKE COGEMA STONE & WEBSTER	MOX Fuel Fabrication Facility **US Department of Energy CH** J.O. 08716	Cyclic Stress Ratio vs Depth for 15 SCPTs PC-3 Rock Motion Scaled Up By 1.25	Figure 6-17



DUKE COGEMA STONE & WEBSTER	MOX Fuel Fabrication Facility **US Department of Energy CH**	Cyclic Stress Ratio vs Depth for 15 SCPTs 1886 Charleston 50th Percentile	Figure 6-18
	J.O. 08716		

MFFF Seismology and Geotechnical Engineering Site Visit and Public Meeting
18-20 September 2001

LIQUEFACTION EVALUATION

- **Liquefaction potential was evaluated using the Cyclic Stress Approach as defined in the Proceedings of the NCEER Workshop 1997.**

- **Factor of safety against liquefaction is considered to be greater than 1.1.**

- **Factors of safety between 1.1 to 1.4 may result in soil settlement.**

- **Liquefaction potential of fine grained soils:**
  - **Cohesive soils having a fines content (-No. 200 material) greater than 30 percent and fines that either classify as clays or have a Plasticity Index greater than 30 percent are not generally considered liquefiable; and**
  - **Soils with a clay content greater than 15 percent and a liquid limit greater than 35 percent, occurring at a natural water content lower than 90 percent of the Liquid Limit are considered non-liquefiable.**

Revised 19 September 2001

LIQUEFACTION EVALUATION (Cont.)

- **Results of liquefaction analyses indicate that the liquefaction potential of the MFFF site is quite low.**
- **The 1886 Charleston earthquake will control liquefaction potential.**
- **All liquefaction potential that was observed occurred in isolated zones at depth and is surrounded by non-liquefiable materials.**
- **Liquefaction will not have any adverse affect to the proposed MFFF critical structures.**

POST EARTHQUAKE SETTLEMENT

- **Post earthquake settlement estimated was using the Ishirara/Yoshimine method.**
- **This method assumes that some settlement may occur up to a factor of safety against liquefaction of 2.0.**
- **Since CPT and SPT N-Values are used to determine post earthquake settlement, identified low strength zones are included in this analysis.**
- **The results of the post earthquake settlement analyses are presented in Tables 8-2, 8-3 and 8-4 and Figure 8-58.**

TABLE 8-2
SUMMARY OF ESTIMATED POST-EARTHQUAKE SETTLEMENT FOR PC3+ BASED CONTROL MOTION AND CHARLESTON CONTROL MOTION (CSRs FROM MFFF IDEALIZED SOIL COLUMN)

CPT/Boring No.	Total Depth (ft)	PC3+ Settlement (in)	Charleston Settlement (in)
BH-1	150	0.2	0.4
BH-4	181	0.0	0.0
BH-8	153	0.0	0.0
BH-11	170	0.6	1.6
BH-12	154	0.1	0.1
BH-13	155	0.6	1.8
CPT-7	114	0.6*	1.1*
CPT-8	140	0.4	1.1
CPT-13	167	0.4*	1.1*
CPT-14	142	0.5	1.3
CPT-21	139	0.7*	1.4*
CPT-22	153	0.7*	1.6*
CPT-27	129	0.8*	1.4*
CPT-28	150	0.3	0.9
CPT-47	116	0.4*	0.8*
CPT-48	111	0.6*	1.0*
CPT-49	123	0.4*	0.9*
CPT-50	134	0.5*	1.0*
CPT-51	139	0.7*	1.3*
CPT-52	120	0.5*	1.0*
CPT-53	125	0.5*	1.1*
CPT-54	123	0.6*	1.2*
CPT-55	137	0.7*	1.4*
CPT-56	120	0.4*	0.9*
CPT-57	129	0.5*	1.1*
CPT-58	122	0.4*	0.9*
CPT-59	126	0.6*	1.2*
CPT-60	141	0.7*	1.4*
CPT-63	119	0.5*	1.1*
CPT-64	141	0.4	1.0
Average	**137**	**0.5**	**1.0**

*CPT sounding refusal in ST-1/ST-2 Units. Average site Unit thickness of ST1 and ST2 was used to compute remainder of settlement in these layers.

TABLE 8-3
SUMMARY OF ESTIMATED POST EARTHQUAKE SETTLEMENT
(CSRs BY INDIVIDUAL S-CPTs)

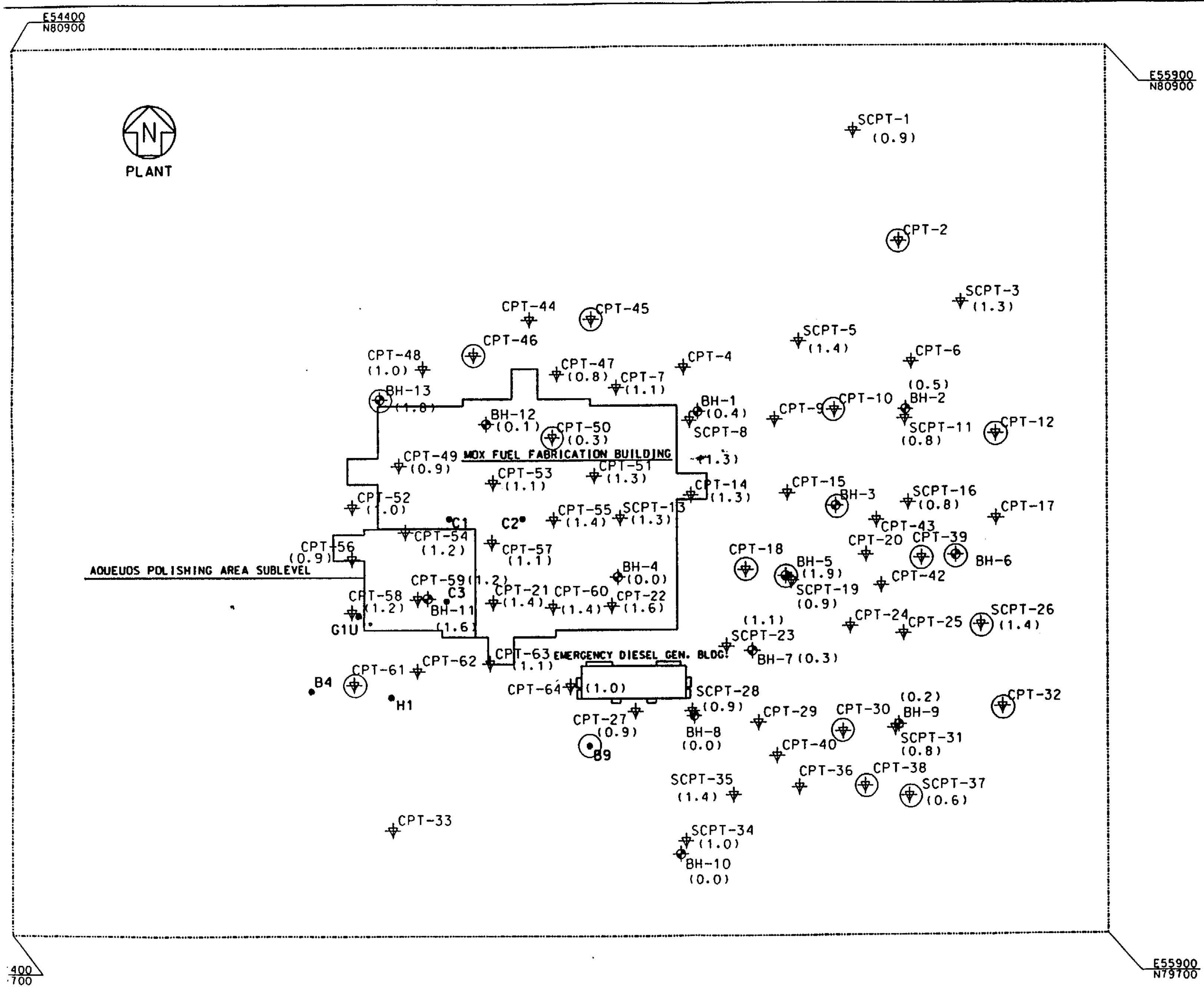
CPT/Boring No.	Total Depth (ft)	PC3+ Settlement (in)	Charleston Settlement (in)
BH-1	150	0.1	0.4
BH-2	138	0.3	0.5
BH-5	158	1.7	1.9
BH-7	153	0.1	0.3
BH-8	153	0.0	0.0
BH-9	138	0.0	0.2
BH-10	153	0.0	0.0
CPT-1	104	0.2	0.9
CPT-3	109	0.4	1.3
CPT-5	125	0.7	1.4
CPT-8	140	0.6	1.3
CPT-11	106	0.2	0.8
CPT-13	157	0.7*	1.3*
CPT-16	122	0.4	0.8
CPT-19	117	0.5*	0.9*
CPT-23	123	0.5*	1.1*
CPT-26	127	0.3	1.4
CPT-28	150	0.4	0.7
CPT-31	126	0.3	0.8
CPT-34	146	0.5	1.0
CPT-35	144	0.6*	1.4*
CPT-37	135	0.3	0.6
Average	**135**	**0.4**	**0.9**

*CPT sounding refusal in ST-1/ST-2 Units. Average site Unit thickness of ST-1 and ST-2 was used to compute remainder of settlement in these layers.

TABLE 8-4
COMPARISON OF ESTIMATED POST EARTHQUAKE SETTLEMENTS FROM CSRs BETWEEN CPTs/BORINGS OF MFFF IDEALIZED SOIL COLUMN AND INDIVIDUAL SCPTs/BORINGS

		MFFF Idealized Soil Column		Individual Seismic-CPTs	
CPT/Boring No.	Total Depth (ft)	PC3+ Settlement (in)	Charleston Settlement (in)	PC3+ Settlement (in)	Charleston Settlement (in)
BH-1	150	0.2	0.4	0.1	0.4
BH-8	153	0.0	0.0	0.0	0.0
CPT-8	140	0.4	1.1	0.6	1.3
CPT-13*	167	0.4	1.1	0.7	1.3
CPT-28	150	0.3	0.9	0.4	0.7

*CPT sounding refusal in ST-1/ST-2 Units. Average site Unit thickness of ST-1 and ST-2 was used to compute remainder of settlement.



LEGEND:

(0.6) Estimated Post-Earthquake Settlement (inches) From 1886 Charleston based motion (Used highest values from Tables 8-2 and 8-3)

CPT-XX / SCPT-XX — CONE PENETROMETER LOCATION (2000) (SCPT is a Seismic CPT)

BH-XX — BOREHOLE LOCATION (2000)

○ SOFT ZONE LOCATION

- MOX SITE BOUNDARY
- ARCHEOLOGICAL BOUNDARY (APPROXIMATE)
- EXISTING ROAD
- TOPOGRAPHY (2000)
- OVERHEAD ELECTRICAL LINE
- UNDERGROUND ELECTRICAL LINE
- ABOVE GROUND COMM./SIGNAL LINES

MFFF SITE GEOTECHNICAL REPORT
DCS01-WRS-DS-NTE-G-0005-B
POST-EARTHOUAKE SETTLEMENT ESTIMATE AT DEPTH
FIGURE 8-58
(1886 CHARLESTON EARTHOUAKE)

plantest8p.dgn Final Geot. Re

POST EARTHQUAKE SETTLEMENT (Cont.)

- The Charleston earthquake is the controlling event for post earthquake settlement.
- Significant stiff soil layers (over 40 feet thick) are located between the deep potentially liquefiable zone the mat foundations for critical structures.
- The stiff soil layers will successfully redistribute these estimated post earthquake settlements such that no abrupt differential settlement will occur at the foundation base.