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TABLE 2-1

SUMMARY OF OCTOBER 1998 GEOSYNTEC FIELD INVESTIGATION PROGRAM

Boring No.	Drilling				Sampling				Instrumentation and Additional Testing	
	Location (Figure 2-1)	Total Depth	Method	Terminate	Approximate Sequence	No. Shelby Tubes	No. Pitcher Barrel	No. SPT Tests	Piezometers	D-hole Shear Wave
G-1A	Dam centerline (offset 10 ft from G-1B)	60 ft	8" bent. mud rotary	Within dam fill	None	0	0	0	1 in. PVC casing (2 installed)	
G-1B	Dam centerline	114 ft	8" bent. mud rotary	At bedrock surface	SPT - 5' intervals Tubes - 20' intervals	4-shell	1-shell 1-core	12-shell 2-core 1-saprolite	4 in. PVC casing (1 installed)	Within 4 in PVC casing
G-2	Dam centerline	68 ft	8" rotary	At bedrock surface	SPT - 5' intervals Tubes - 20' intervals	2-shell	3-shell	4-shell 1-saprolite	1 in. PVC casing (3 installed)	
G-3	115 ft west of dam centerline, above valley bottom	47 ft	HSA - 4.25" ID	Within dam fill	SPT - 5' intervals Tubes - 15' intervals	5-shell	0	6-shell	1 in. PVC casing (1 installed)	
G-4	235 ft west of dam centerline, above right abutment	55 ft	HSA - 4.25" ID (upper 30 ft) and 4" bent. mud rotary (lower 25 ft)	Within natural soil below dam fill	SPT - 5' intervals Tubes - 15' intervals	2-shell	3-shell	6-shell		
G-5	200 ft east of dam centerline, above left abutment	67 ft	8" bent. mud rotary	Within dam fill	SPT - 5' intervals Tubes - 15' intervals	5-core	1-core	2-shell 7-core		Within 4 in PVC casing

HSA = hollow stem auger, bent. = bentonite, PVC =polyvinyl chloride

TABLE 2-2

SUMMARY OF SPT N-VALUE CORRELATION TO EFFECTIVE STRESS FRICTION ANGLE

Material	ϕ' from N - Kulhaway and Mayne, 1990				ϕ' from $(N_1)_{60}$ - Hatanaka and Uchida, 1996			
Boring	no. tests	minimum	average.	st. deviation	No. tests	minimum	average.	st. deviation
Shell								
G-1B	14	38	41	1	14	38	41	2
G-2	2	36	39	3	2	37	39	3
G-3	5	38	42	3	7	37	40	2
G-4	5	37	40	3	7	35	38	2
G-5	-	-	-	-	1	43	43	-
	total	weighted	weighted	range	total	weighted	weighted	range
	26	avg. 37.7	avg. 40.8	1 to 3	31	avg. 37.2	avg. 40.0	2 to 3
Core								
G-1B	4	34	35	1	4	35	36	1
G-5	14	29	34	3	14	31	35	2
	total	weighted	weighted	range	total	weighted	weighted	range
	18	avg. 30.1	avg. 34.2	1 to 3	18	avg. 31.9	avg. 35.2	1 to 2
Saprolite								
G1-B	2	44	42	0	2	44	44	0

TABLE 3-1

LABORATORY TESTING RESULTS

SPECIMEN IDENTIFICATION				TRIAXIAL SHEAR TESTING							INDEX PROPERTY TESTING						
				Specimen Initial Conditions			Peak Strength Condition		Ultimate Strength Condition		Atterberg Limits		Grain Size Analysis (percent)				USCS Class.
Test No.	Boring No.	Sample Depth (ft)	Core or Shell Material	Water Content (%)	Dry Unit Weight (pcf)	Effective Consolidation Stress[1] (psi)	Deviator Stress[2] (psi)	Pore Pressure[3] (psi)	Deviator Stress[2] (psi)	Pore Pressure[3] (psi)	Liquid Limit	Plasticity Index	gravel	sand	silt	clay	
A	G-4	47-50	shell	25.9	103.1	41.5	79.0	17.5	113.1	1.6	NP	NP	12	58	23	7	SM
B	G-4	15-16	shell	17.7	97.9	13.6	78.0[4]	-4.0	81.3[4]	-7.3							
C	G-4	30-32	shell	27.8	97.2	27.2	55.0	14.0	101.2	-8.6							
D	G-1B	20-22	shell	19.1	103.5	18.3	34.5	8.5	48.6	0.3							
E	G-1B	38-40	shell	19.8	104.8	25.7	51.0	10.5	88.3	-7.5	33	3	7	49	41	3	SM
F	G-1B	80-81.5	shell	16.5	108.1	56.5	112.0	24.5	162.6	-7.1	NP	NP	3	61	34	2	SM
G	G-1B	105-107	core	20.7	109.3	68.9	104.0	39.5	165.3	4.0	41	9	4	44	42	10	ML
H	G-5	27-30	core	17.5	114.4	21.0	40.0	10.5	84.8	-8.1	33	9	6	42	35	17	ML
I	G-5	13-15	shell	24.2	105.1	12.9	30.5	4.5	63.6	-9.0							
J	G-5	60-62	core	22.0	104.8	40.9	64.5	24.0	97.8	6.5	45	15	2	40	40	18	ML
K	G-3	15-17	shell	22.5	107.4	13.7	28.0	60.0	63.3	-7.9							
L	G-3	28-30	shell	24.1	98.5	19.8	35.5	10.5	60.7	-0.6							
M	G-2	18-20	shell	23.8	98.3	10.4	26.0	3.5	55.3	-8.1							
N	G-2	38-40	shell	18.7	106.5	27.3	47.0	15.5	81.7	-1.1							
O	G-2	58-60	shell	21.6	106.0	42.6	58.0	25.5	84.7	11.4							
P	G-1B	20-22	shell	16.9[5]	102.8[5]	18.3[6]	49.0	5.0	87.7	-12.7							

Notes:
(1) Effective consolidation stress was achieved using back pressures ranging from 49 to 79 psi.
(2) Deviator stress is equal to the vertical stress applied to the specimen during shearing.
(3) Reported pore pressure is the change in pore water pressure during shearing.
(4) During this test excess friction developed in the loading system and reported deviator stresses are believed to be larger than actual values.
(5) Test performed on recompacted material.
(6) Test specimen initially consolidated to an effective stress of 23.8 psi, then overconsolidated to an effective stress of 18.3 psi.

TABLE 4-1

SUMMARY OF STANDPIPE PIEZOMETER DATA (LAW, INSTALLED 1972)

Piezometer No.	6 Oct 97	13 Oct 97	29 Oct 97	30 Oct 98
L3	1614.01	1613.91	(1613.31)	(1613.31)
L4	1593.02	1593.02	(1593.02)	(1593.02)
L5	1581.89[(1)]	1573.99	1580.89	1574.45

Note: [(1)] Elevated level likely resulted from poor surface seal.
(1613.31) indicates base of piezometers, piezometer noted to be dry.

TABLE 4-2

SUMMARY OF VIBRATING WIRE PIEZOMETER DATA
(Installed 1997, 1998)

Piezometer No	Water Elevation (ft)																	
	10/17/97	1/14/98	3/19/98	4/20/98	5/19/98	6/12/98	6/19/98	6/26/98	7/2/98	7/10/98	7/16/98	7/24/98	8/21/98	8/28/98	9/4/98	9/11/98	9/18/98	10/23/98
P2-A	4.5	4.0	4.9	3.8	4.0	3.0	2.9	2.8	2.6	2.4	2.4	2.2	2.0	1.9	1.8	1.8	1.8	1.7
P2-B	26.3	25.7	26.7	26.4	26.6	25.6	25.5	25.5	25.2	25.1	24.9	24.9	24.5	24.4	24.2	24.1	24.1	23.8
P2-C	40.1	39.0	40.0	39.7	39.9	39.6	39.7	39.5	39.3	39.1	39.0	38.9	38.4	38.2	38.2	38.2	38.0	37.9
P4-A	4.7	9.1	11.2	11.6	10.4	7.9	7.4	6.9	6.5	6.0	5.6	5.3	4.1	3.7	3.3	3.3	3.0	2.4
P4-B	16.3	19.2	21.5	21.0	20.5	18.7	18.2	17.9	17.7	17.5	17.1	16.7	15.8	15.8	15.4	15.4	15.1	14.5
P4-C	35.6	36.5	38.7	38.0	38.3	37.0	36.7	36.5	36.2	35.9	35.7		34.8	34.8	34.6	34.4	34.4	34.2
P6-A					8.7	8.0	7.5	7.4	7.4	7.0	6.8	6.9	7.4	6.6	6.3	6.3	6.0	6.1
P6-B					16.6	16.6	16.4	16.4	16.3	16.3	16.3	16.0	16.1	16.1	16.0	16.0	15.9	15.8
P6-C					17.3	16.7	16.2	16.0	15.8	15.6	15.4	15.4	15.6	15.0	14.7	14.6	14.3	14.5
P7-A					6.9	6.7	6.3	6.2	6.0	5.8	5.6	5.5	6.7	6.2	5.9	5.8	5.2	5.8
P7-B					12.9	12.2	12.1	12.0	12.0	11.8	11.8	11.8	12.0	11.7	11.6	11.7	11.5	11.9
P7-C					8.8	8.2	7.9	7.8	7.5	7.3	7.2	7.0	7.9	8.0	7.8	7.7	7.8	8.1

TABLE 4-3

SUMMARY OF STANDPIPE PIEZOMETER DATA (GEOSYNTEC, INSTALLED 1998)

Piezometer No.	Elevation			
	10/22/98	10/23/98	10/26/98	10/29/98
G-1A Shallow	1593.68	1593.43	1593.42	1593.67
G-1A Deep	1577.07	1576.93	1576.51	1576.92
G-1B	1580.87[(1)]	1583.84	1583.85	1583.89
G-2 Shallow	1566.23	1566.12	1566.06	1566.07
G-2 Intermediate	1558.90	1558.68	1558.81	1559.00
G-2 Deep	1553.41	1553.71	1553.52	1553.75
G-3	1531.94	1531.93	1531.92	1531.95

Note: [(1)] This reading may not be representative due to unstabilized conditions.

TABLE 4-4

SUMMARY OF PIEZOMETER ELEVATION VARIATIONS AFTER INITIAL STABILIZATION

Piezometer No.	Water Elevation Variation (ft)																	
	10/17/97	1/14/98	3/19/98	4/20/98	5/19/98	6/12/98	6/19/98	6/26/98	7/2/98	7/10/98	7/16/98	7/24/98	8/21/98	8/28/98	9/4/98	9/11/98	9/18/98	10/23/98
P2-A	0.0	-0.5	0.4	-0.7	-0.5	-1.5	-1.6	-1.7	-1.9	-2.1	-2.1	-2.3	-2.5	-2.6	-2.7	-2.7	-2.7	-2.8
P2-B	0.0	-0.6	0.4	0.1	0.3	-0.7	-0.8	-0.8	-1.1	-1.2	-1.4	-1.4	-1.8	-1.9	-2.1	-2.2	-2.2	-2.5
P2-C	0.0	-1.1	-0.1	-0.4	-0.2	-0.5	-0.4	-0.6	-0.8	-1.0	-1.1	-1.2	-1.7	-1.9	-1.9	-1.9	-2.1	-2.2
P4-A	0.0	4.4	6.5	6.9	5.7	3.2	2.7	2.2	1.8	1.3	0.9	0.6	-0.6	-1.0	-1.4	-1.4	-1.7	-2.3
P4-B	0.0	2.9	5.2	4.7	4.2	2.4	1.9	1.6	1.4	1.2	0.8	0.4	-0.5	-0.5	-0.9	-0.9	-1.2	-1.8
P4-C	0.0	0.9	3.1	2.4	2.7	1.4	1.1	0.9	0.6	0.3	0.1		-0.8	-0.8	-1.0	-1.2	-1.2	-1.4
P6-A					0.0	-0.7	-1.2	-1.3	-1.3	-1.7	-1.9	-1.8	-1.3	-2.1	-2.4	-2.4	-2.7	-2.6
P6-B					0.0	0.0	-0.2	-0.2	-0.3	-0.3	-0.3	-0.6	-0.5	-0.5	-0.6	-0.6	-0.7	-0.8
P6-C					0.0	-0.6	-1.1	-1.3	-1.5	-1.7	-1.9	-1.9	-1.7	-2.3	-2.6	-2.7	-3.0	-2.8
P7-A					0.0	-0.2	-0.6	-0.7	-0.9	-1.1	-1.3	-1.4	-0.2	-0.7	-1.0	-1.1	-1.7	-1.1
P7-B					0.0	-0.7	-0.8	-0.9	-0.9	-1.1	-1.1	-1.1	-0.9	-1.2	-1.3	-1.2	-1.4	-1.0
P7-C					0.0	-0.6	-0.9	-1.0	-1.3	-1.5	-1.6	-1.8	-0.9	-0.8	-1.0	-1.1	-1.0	-0.7

TABLE 6-1

SUMMARY OF MODEL PARAMETERS FOR SEEP/W ANALYSES

Material Type	Vertical Permeability (ft/s)	Ratio of Horizontal to Vertical Permeability
Shell	3.3×10^{-6}	1, 5, 10
Core	3.3×10^{-8}, 3.3×10^{-7}, 1.6×10^{-6}, 3.3×10^{-6}	1, 5, 10
Upstream Saprolite	3.3×10^{-9}	1
Downstream Saprolite	1.6×10^{-6}	1
Bedrock	3.3×10^{-9}	1
Ball Field Soils	1.6×10^{-6}	1
Internal Drain: Total Head = 1525 ft, 1530 ft, 1535 ft		

TABLE 6-2

SUMMARY OF BEST-FIT MATERIAL PARAMETERS

SEEP/W Analyses of 23 October 1998 and EML Scenarios

Material Type	Vertical Permeability (ft/s)	Ratio of Horizontal to Vertical Permeability
Shell	3.3×10^{-6}	10
Core	1.6×10^{-6}	10
Internal Drain: Total Head = 1535 ft		

TABLE 6-3

COMPARISON OF MEASURED AND COMPUTED POREWATER PRESSURE HEADS

23 October 1998 Scenario

Piezometer Designation	Computed Pressure Head (ft)	Measured Pressure Head (ft)	Residual Pressure Head (ft)[(1)]
P7A	6.4	5.8	-0.6
P7C	14.9	8.1	-6.8
P7B	23.0	11.9	-11.1
P6A	2.3	6.1	3.8
P6C	7.9	14.5	6.6
P6B	16.9	15.8	-1.1
G2A	3.6	1.0	-2.6
G2B	25.2	29.2	4.0
G2C	34.2	37.3	3.1
P4A	3.0	2.4	-0.6
P4B	19.8	14.5	-5.3
P4C	34.5	34.2	-.3
G1A	3.9	0.3	-3.6
G2B	22.2	10.3	-11.9
G1C	61.8	62.5	0.7
P2A	0.6	1.7	1.1
P2B	19.3	23.8	4.5
P2C	39.8	37.9	-1.9
		Average Residual Pressure Head	**-1.22**

Note: (1) Residual Pressure Head = Measured Pressure Head – Computed Pressure Head
A negative residual pressure head value indicates an overprediction when compared to measured values.

TABLE 6-4

Comparison of Measured and Computed Porewater Pressure Heads

EML Scenario

Piezometer Designation	Computed Pressure Head (ft)	Measured Pressure Head (ft)	Residual Pressure Head (ft)[(1)]
P7A	7.5	6.9	-0.6
P7C	15.8	8.8	-7.0
P7B	23.9	12.9	-11.0
P6A	8.7	8.7	0.0
P6C	11.3	17.3	6.0
P6B	18.6	16.4	-2.2
G2A	8.5	0.0	-8.5
G2B	28.1	31.9	3.8
G2C	36.3	38.3	2.0
P4A	11.6	11.6	0.0
P4B	25.0	21.5	-3.5
P4C	38.6	38.7	0.1
G1A	4.0	0.0	-4.0
G2B	27.3	19.3	-8.0
G1C	65.5	63.5	-2.0
P2A	4.9	4.9	0.0
P2B	23.5	26.7	3.2
P2C	43.5	40.0	-3.5
		Average Residual Pressure Head	**-1.96**

Note: (1) Residual Pressure Head = Measured Pressure Head – Computed Pressure Head
A negative residual pressure head value indicates an overprediction when compared to measured values.

TABLE 7-1

MATERIAL PROPERTIES FOR SLOPE STABILITY ANALYSES

Material	Unit Weight		Strength Parameters			
			Drained		Undrained	
	γ_{moist} (lb/ft^3)	γ_{sat} (lb/ft^3)	ϕ' (deg)	c' (lb/ft^2)	ϕ (deg)	c (lb/ft^2)
Shell	125	125	34	0	(1)(2)	(1)(2)
Core	130	130	32	0	(1)	(1)
Saprolite	125	125	35	0	35	0
Rock	150	150	45	10,000	45	10,000

Note: (1) Undrained shear strength parameters are described in Section 5. The parameters used for the analysis reflect a strength envelope with a slope of 0.58 and an intercept of 7 psi on a plot of vertical effective stress versus undrained shear strength.

(2) The parameters used for surficial stability analysis were taken as equal to the drained strength parameters, as discussed in Section 5.2.1.

TABLE 7-2

SLOPE STABILITY ANALYSES RESULTS
MINIMUM CALCULATED FACTORS OF SAFTEY
DOWNSTREAM EMBANKMENT STABILITY

Loading Condition	Porewater Pressure Scenario	
	EML	Post-Rehabilitation
Steady-State	1.52	1.74
Seismic	1.46	Not calculated[1]

cannot believe this

Note: [1] The minimum calculated factor of safety for the seismic loading condition with the post-rehabilitation porewater pressure scenario would, if calculated, exceed the value of 1.46 obtained for the EML porewater pressure scenario.

TABLE 8-1

SUMMARY OF PRIMARY EVALUATION
PRIMARY EVALUATION CRITERIA

Rehabilitation Measure	Improvement to Minimum F.S.	Constructibility	Schedule	Ability to Monitor Effectiveness	Capital Cost	O&M Cost	Total Score	Comments
Drainage								
Toe Drains	1	2	5	4	4	4	20	Reject
Buttress Drains	1	4	5	4	4	3	21	Retain
Pressure Relief Wells	3	4	4	4	3	1	19	Reject
Trench Drains	4	4	4	4	4	4	24	Retain
Horizontal Wells	3	3	3	3	3	3	18	Reject
Top Buttress								
Earth Fill	5	4	1	4	2	4	20	Retain for Comparison
Reinforced Soil or Rock	5	3	2	4	2	3	19	Reject
Retaining Wall and Backfill	3	3	3	4	1	4	18	Reject

TABLE 8-1 (continued)

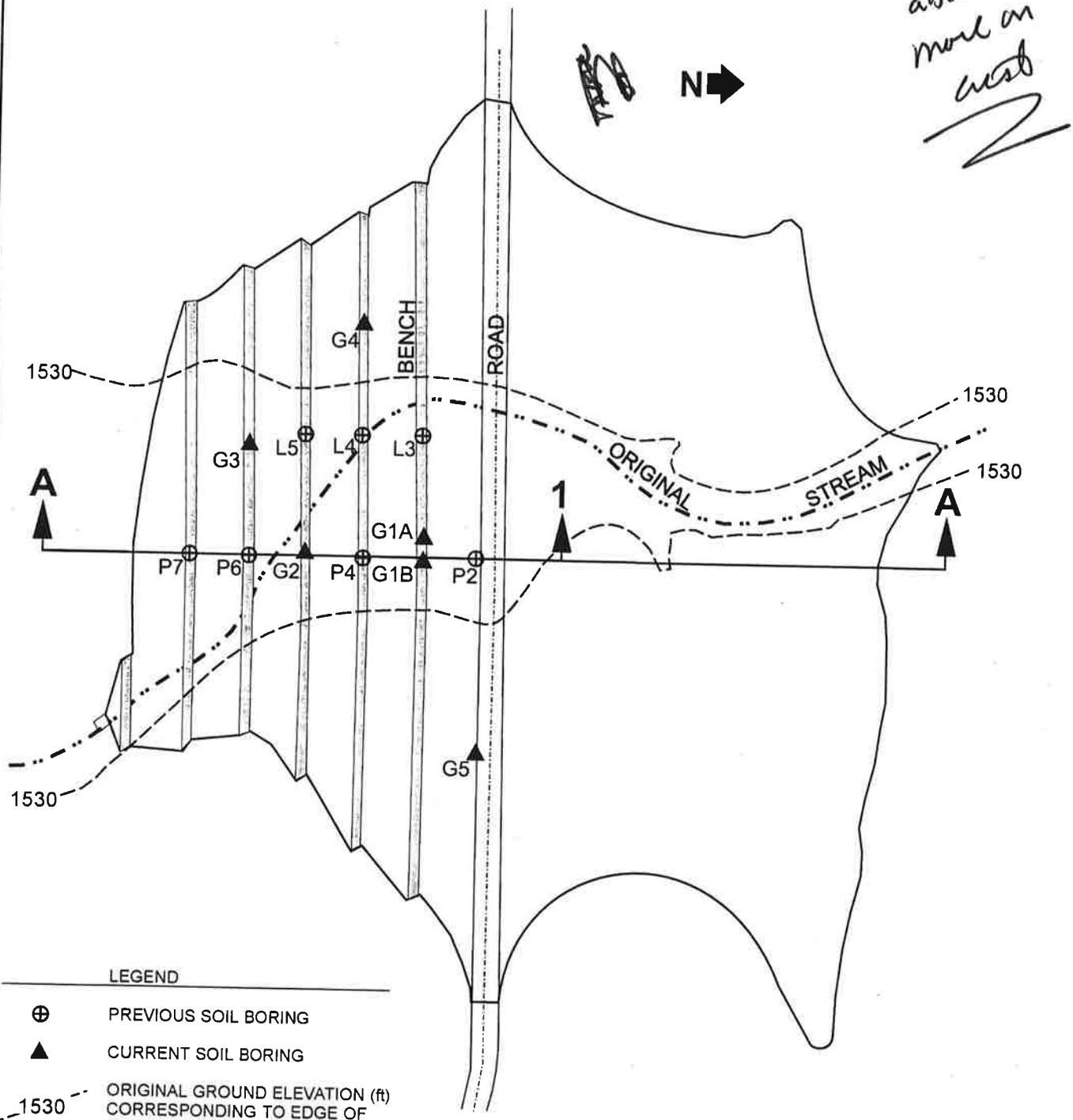
SUMMARY OF PRIMARY EVALUATION
PRIMARY EVALUATION CRITERIA

Rehabilitation Measure	Improvement to Minimum F.S.	Constructibility	Schedule	Ability to Monitor Effectiveness	Capital Cost	O&M Cost	Total Score	Comments
Seepage Cutoff								
Grouting	1	2	2	3	2	3	13	Reject
Subsurface Barrier	4	2	1	4	1	4	16	Reject
Upgradient Impermeable Barrier	2	1	2	4	2	2	13	Reject
Infiltration Control								
Impermeable Membrane (entire slope)	2	4	4	3	2	3	18	Reject
Surface Water Drainage	1	5	5	3	4	5	23	Retain
Paved Benches	2 [(1)]	5	5	3	3	5	23	Retain

Notes: [(1)] Significant depth required to provide required factors of safety.

PETIT COVE DAM
PLAN VIEW

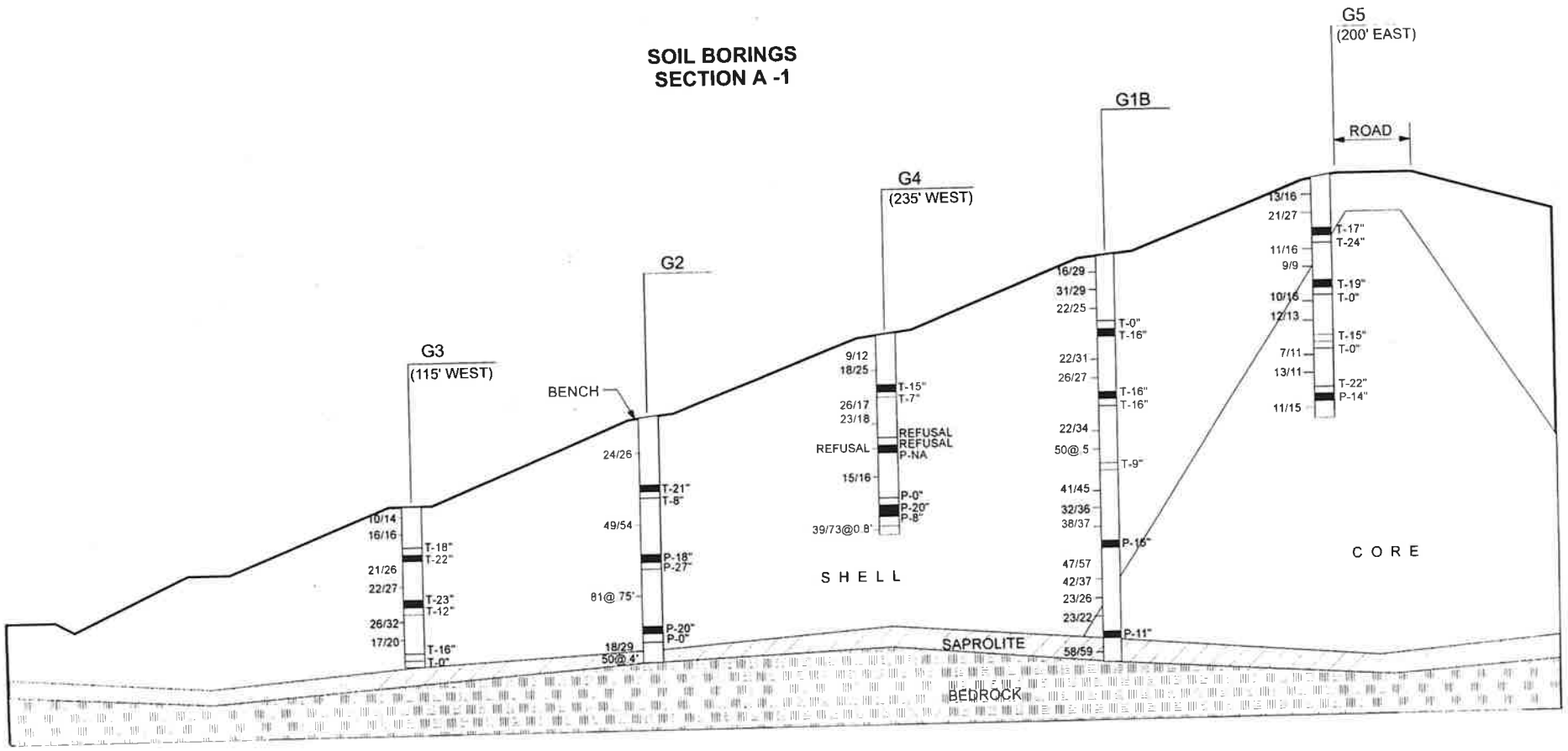
Look @ abutments more on east



GeoSyntec Consultants
ATLANTA, GEORGIA

FIGURE NO.	2-1
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	Plan.cdr

SOIL BORINGS
SECTION A -1



LEGEND

10/14	10 = SUM OF 2ND AND 3RD SPT* BLOWCOUNTS 14 = SUM OF 3RD AND 4TH SPT* BLOWCOUNTS
T-18" P-18"	T = SHELBY TUBE SAMPLE P = PITCHER BARREL SAMPLE 18" = SAMPLE RECOVERY
NA	NOT AVAILABLE
■	SAMPLE USED FOR LABORATORY TRIAXIAL SHEAR TESTING

*STANDARD PENETRATION TEST

NOTE:
BORINGS SHOWN FROM GEOSYNTEC
FIELD INVESTIGATION PROGRAM, OCTOBER1998

GeoSyntec Consultants
ATLANTA, GEORGIA

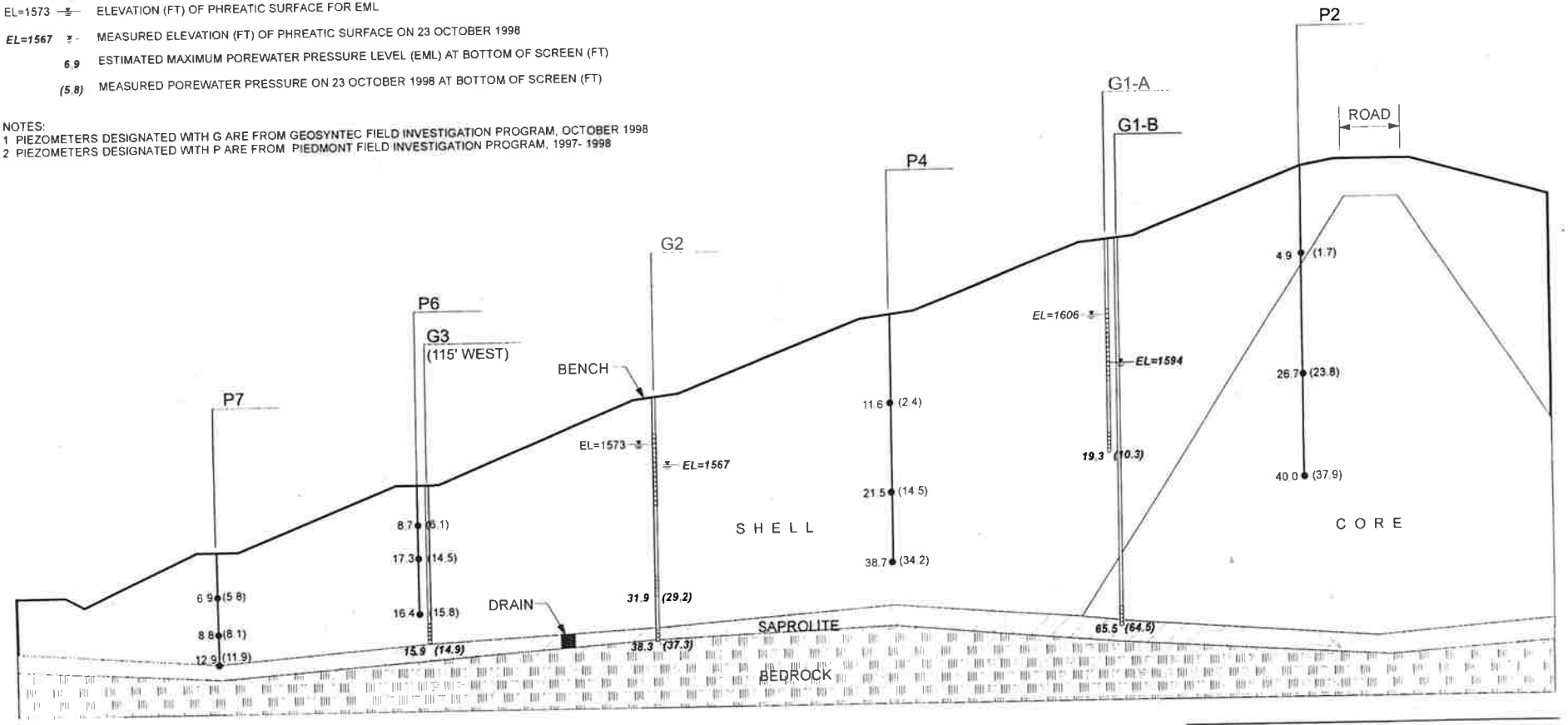
PROJECT NO.	GL0625-15	FIGURE NO.	2-2
DOCUMENT NO.	GA981181	FILE NO.	SEC-A.CDR

PIEZOMETER LOCATIONS AND MEASUREMENTS
SECTION A - 1

LEGEND

- ● VIBRATING WIRE PIEZOMETER
- 6.9 ESTIMATED MAXIMUM POREWATER PRESSURE LEVEL (EML) (FT)
- (5.8) MEASURED POREWATER PRESSURE ON 23 OCTOBER 1998 (FT)
- ╫ SCREEN INTERVAL FOR STANDPIPE PIEZOMETER
- EL=1573 ⏚ ELEVATION (FT) OF PHREATIC SURFACE FOR EML
- *EL=1567* ⏚ MEASURED ELEVATION (FT) OF PHREATIC SURFACE ON 23 OCTOBER 1998
- *6.9* ESTIMATED MAXIMUM POREWATER PRESSURE LEVEL (EML) AT BOTTOM OF SCREEN (FT)
- *(5.8)* MEASURED POREWATER PRESSURE ON 23 OCTOBER 1998 AT BOTTOM OF SCREEN (FT)

NOTES:
1 PIEZOMETERS DESIGNATED WITH G ARE FROM GEOSYNTEC FIELD INVESTIGATION PROGRAM, OCTOBER 1998
2 PIEZOMETERS DESIGNATED WITH P ARE FROM PIEDMONT FIELD INVESTIGATION PROGRAM, 1997- 1998



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PROJECT NO.	GL0625-15	FIGURE NO.	2-3
DOCUMENT NO.	GA981181	FILE NO.	SEC-A3.CDR

SHEAR WAVE VELOCITY PROFILES

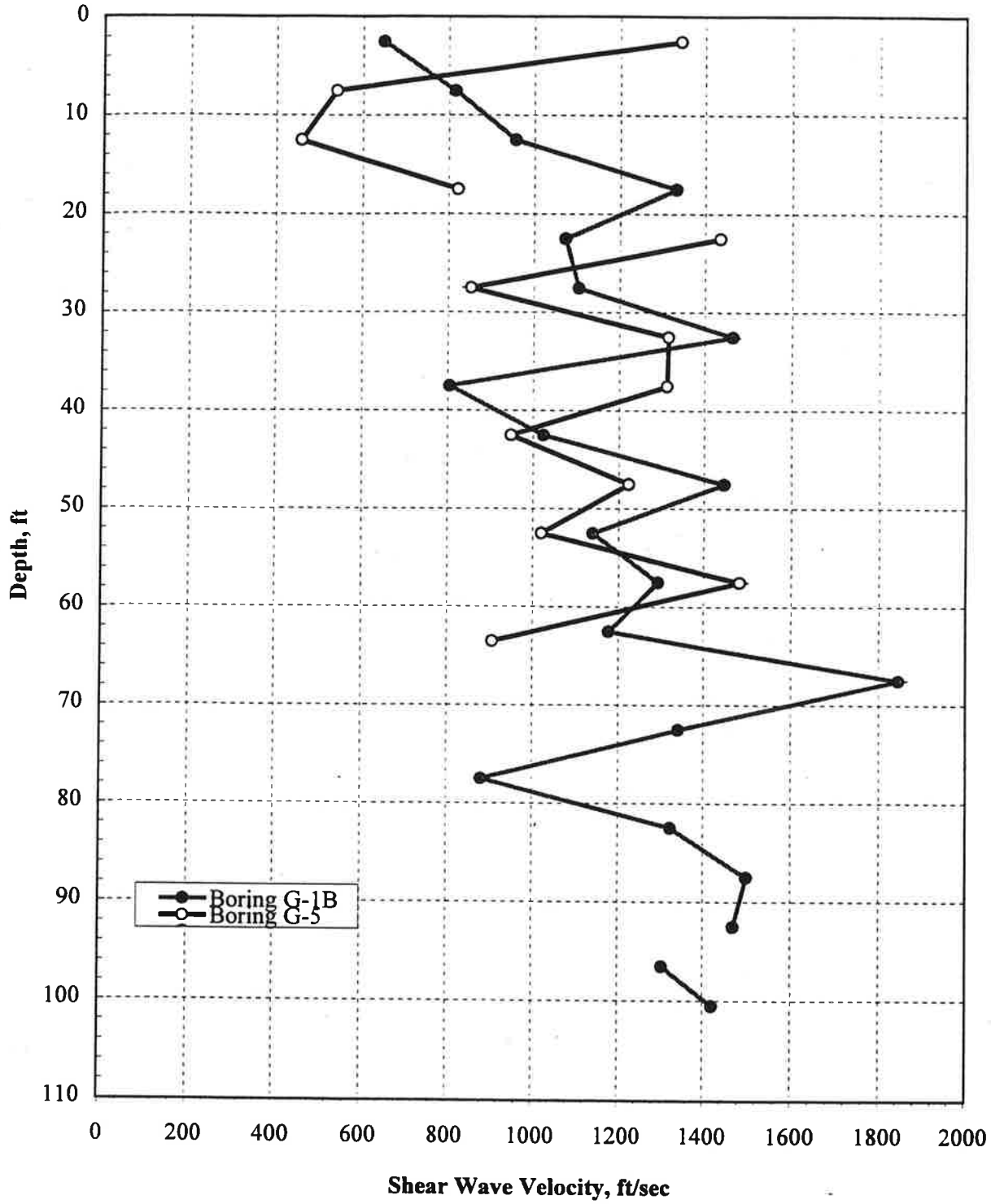

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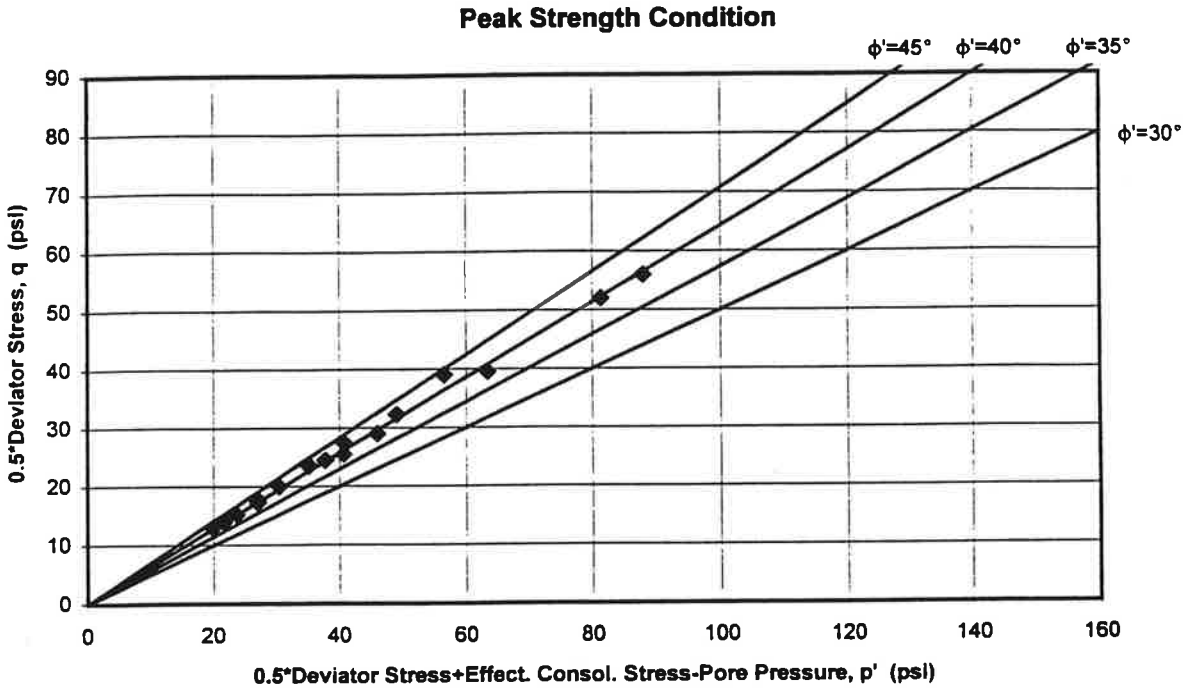
FIGURE NO.	2-4
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FIGS.cdr/df

TRIAXIAL SHEAR TESTING RESULTS
EFFECTIVE STRESS SHEAR STRENGTH PARAMETERS



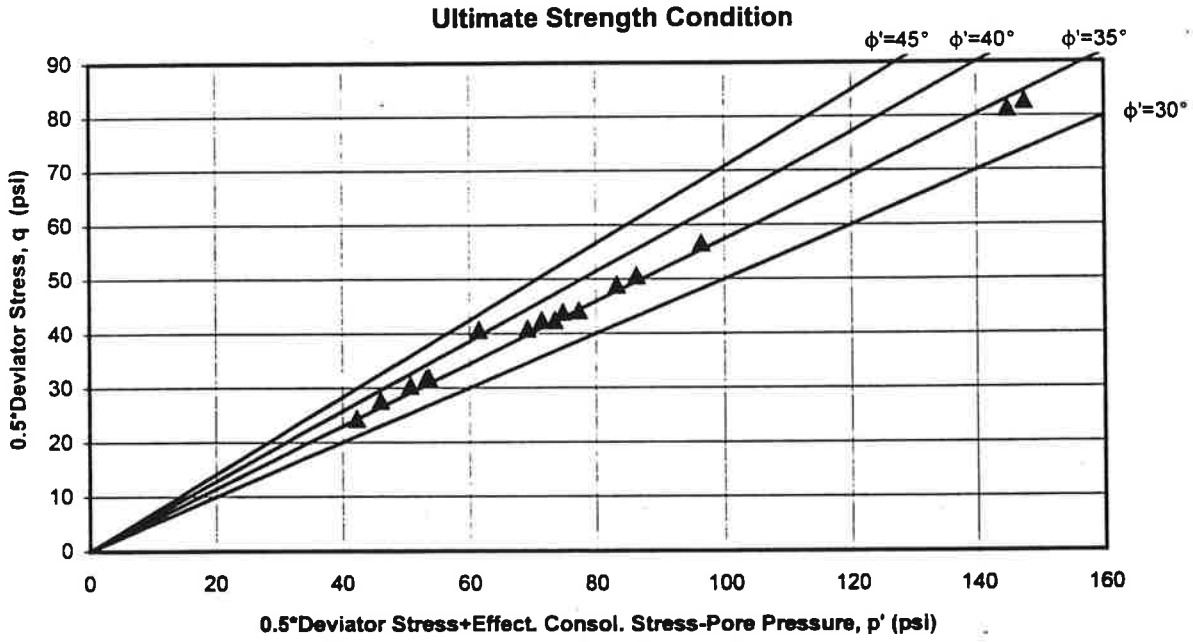


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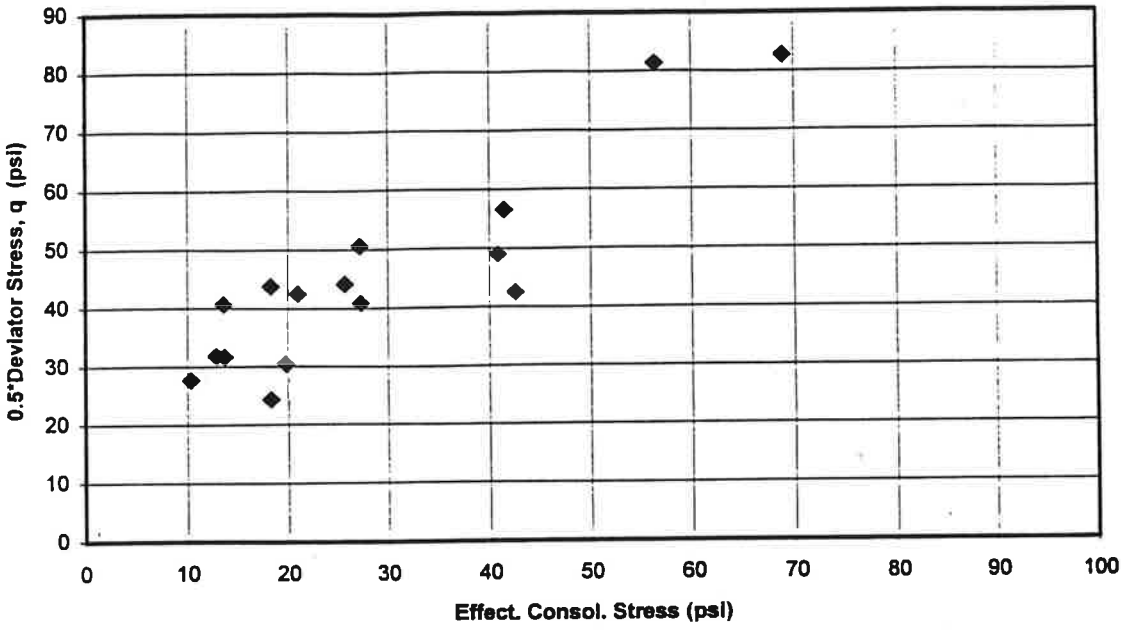
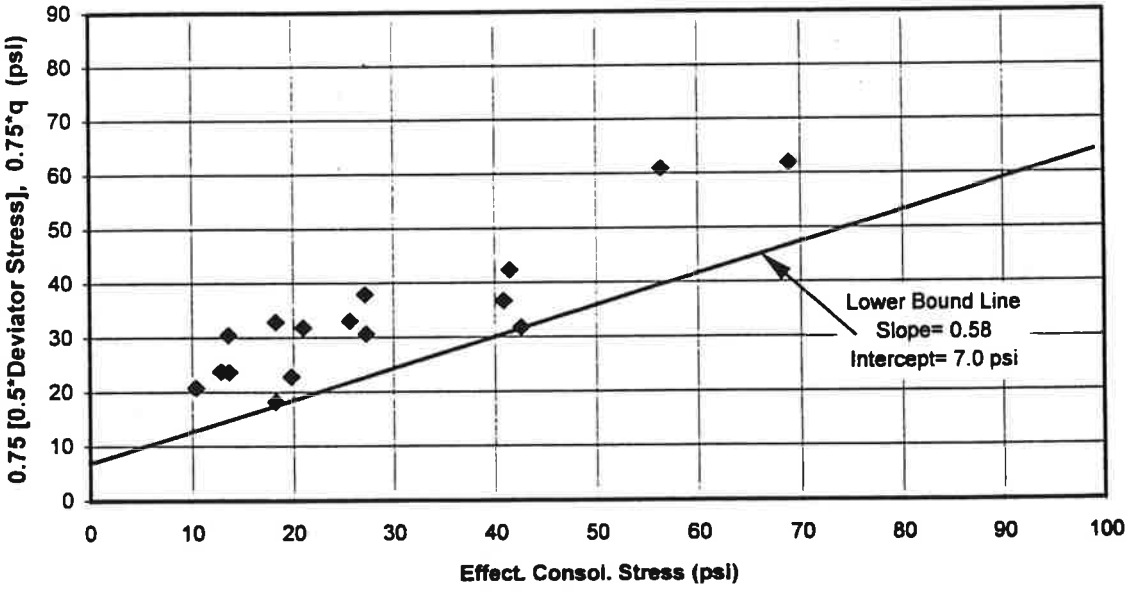
FIGURE NO.	3-1
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FIGS.cdr/df

TRIAXIAL SHEAR TESTING RESULTS
TOTAL STRESS SHEAR STRENGTH PARAMETERS

Ultimate Strength Condition



Ultimate Strength Condition with 25% Strength Reduction



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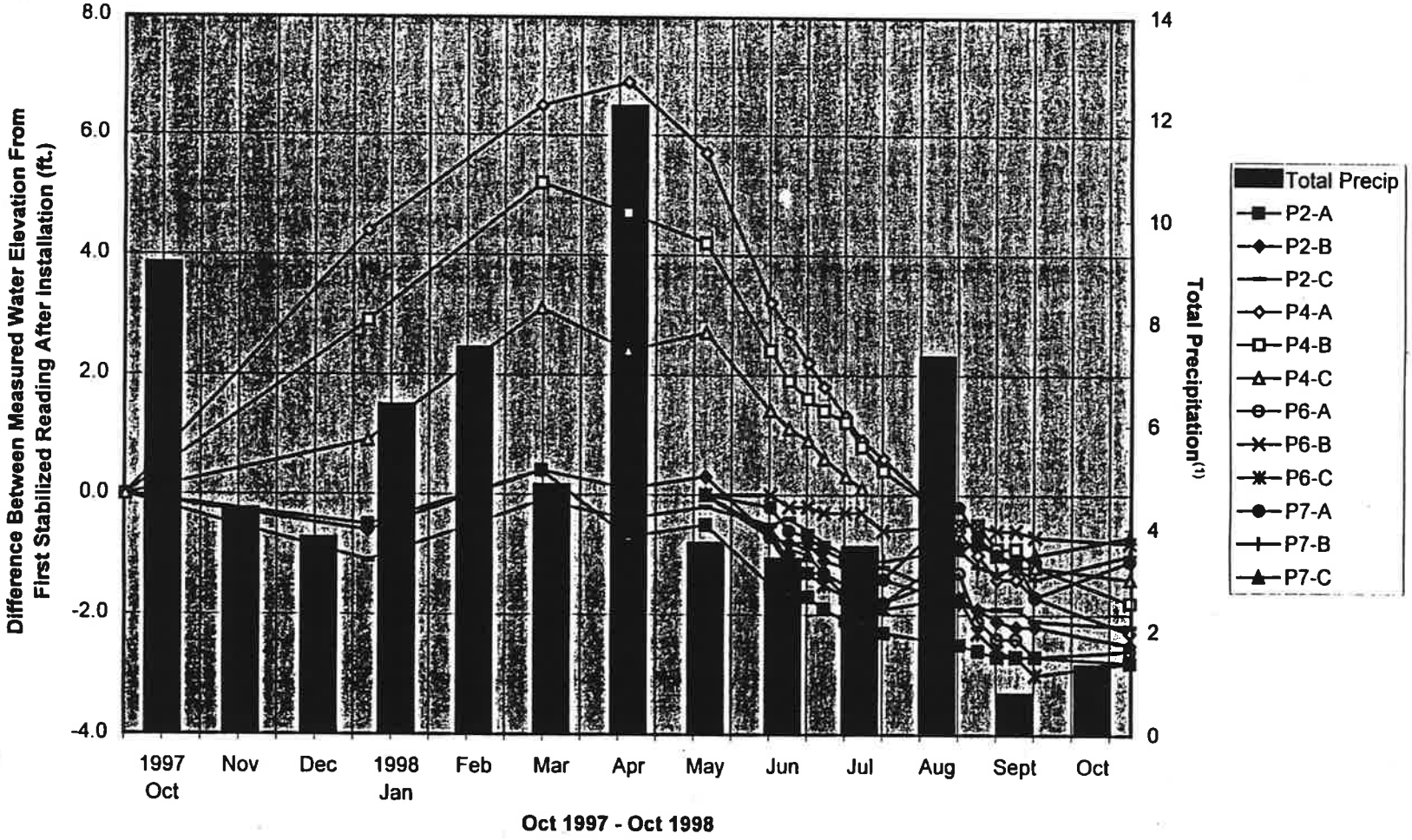
ATLANTA, GEORGIA

FIGURE NO.	3-2
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FIGS.cdr/df

COMPARISON OF PIEZOMETRIC ELEVATION VARIATIONS AND PRECIPITATION DATA



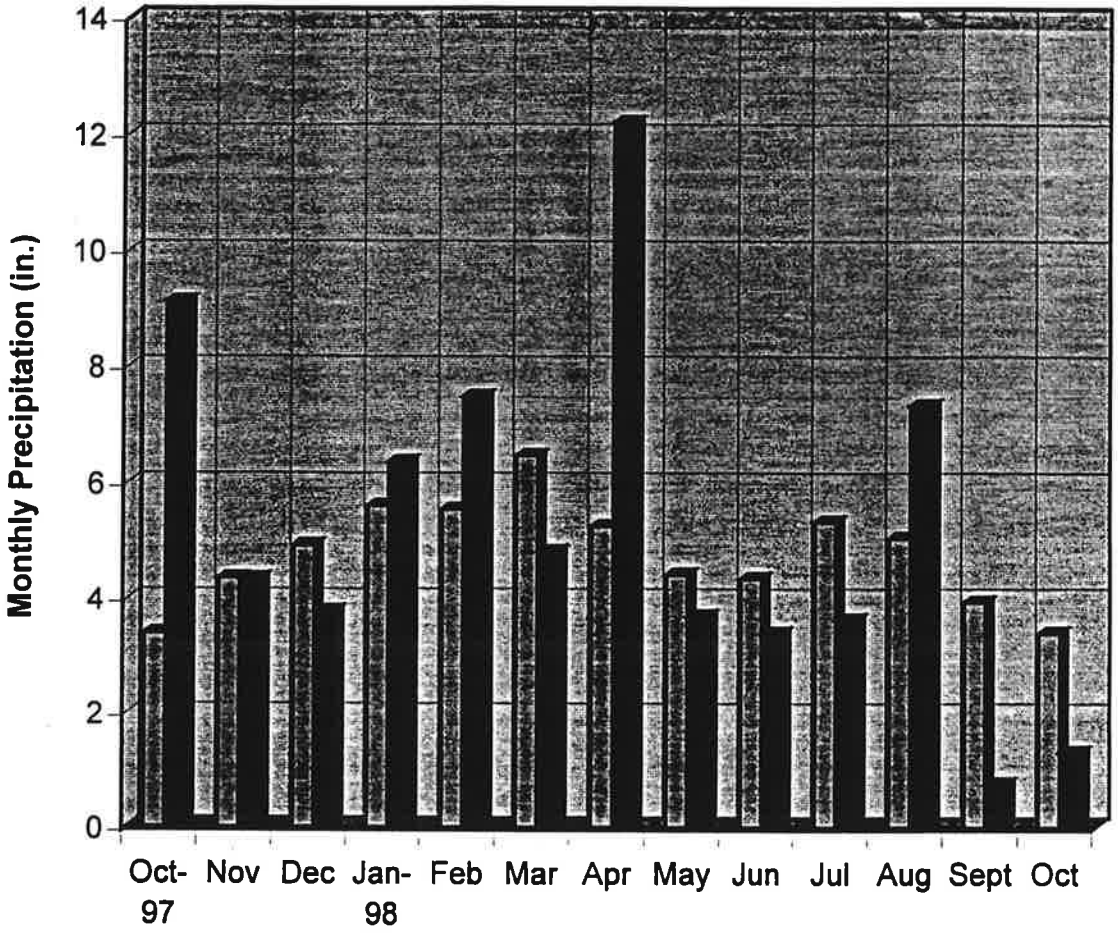
Notes

(1) Monthly precipitation based on precipitatioin data from Jasper, Georgia

GeoSyntec Consultants
Atlanta, Georgia

FIGURE NO.	4-1
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FIGS.cdr/df

SUMMARY OF MONTHLY PRECIPITATION DATA
JASPER, GEORGIA



Notes

Precipitation data obtained from the National Climatic Data Center and the South East Regional Climatic Center

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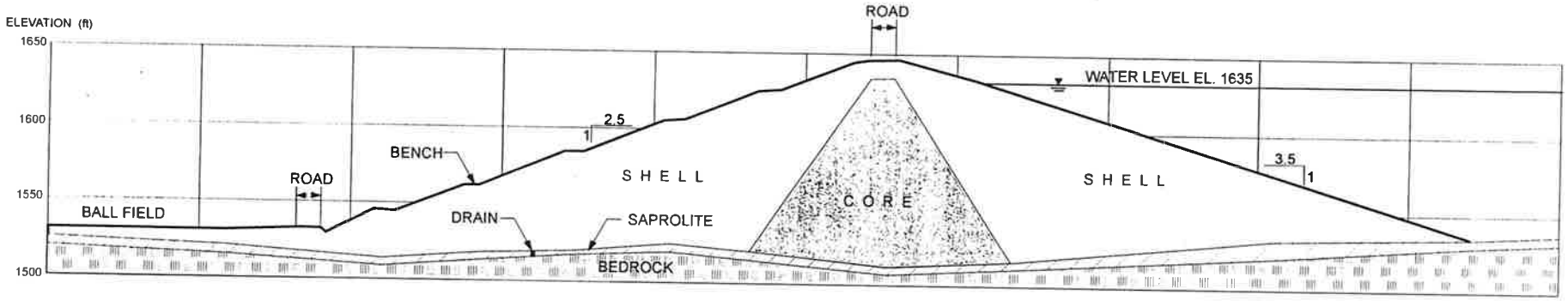
FIGURE NO.	4-2
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FIGS.cdr/df

SITE PHYSICAL CONDITIONS MODEL
SECTION A - A



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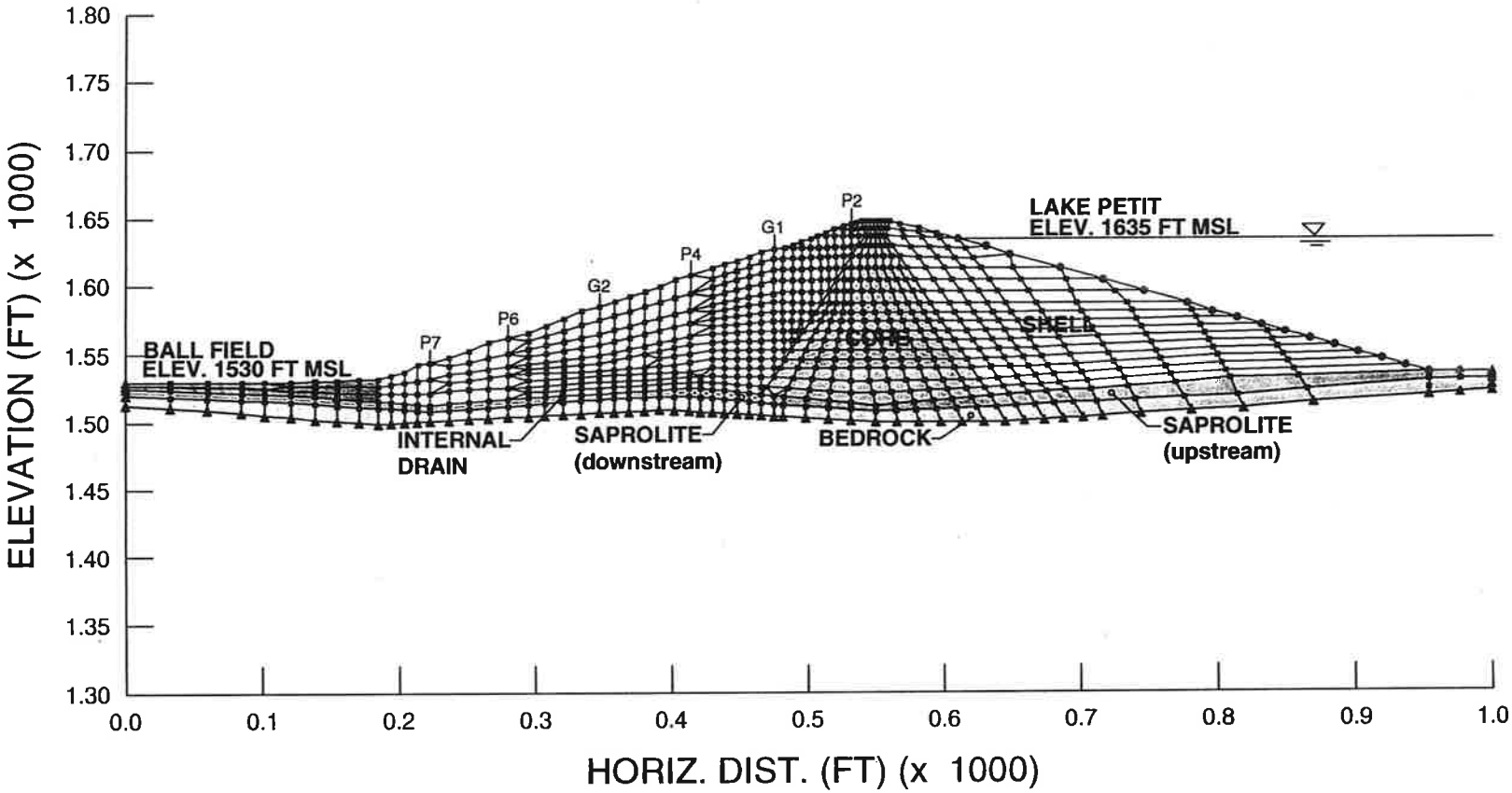
PROJECT NO.	GL0625-15	FIGURE NO.	5-1
DOCUMENT NO.	GA981181	FILE NO.	SEC-A.CDR

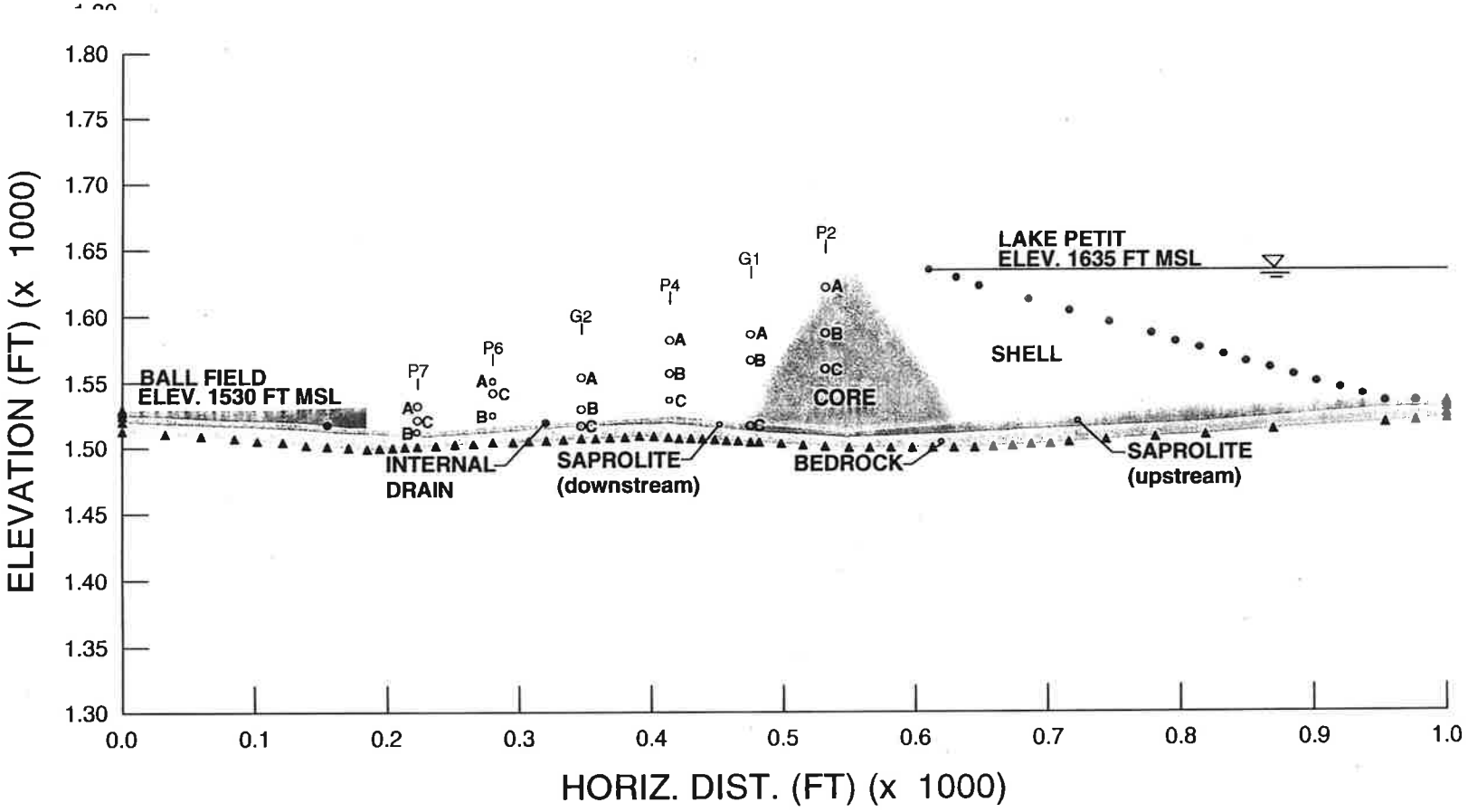
FINITE ELEMENT MESH FOR SEEP/W ANALYSES



GeoSyntec Consultants
ATLANTA, GEORGIA

FIGURE NO.	6-1
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FINITE.cdr/df

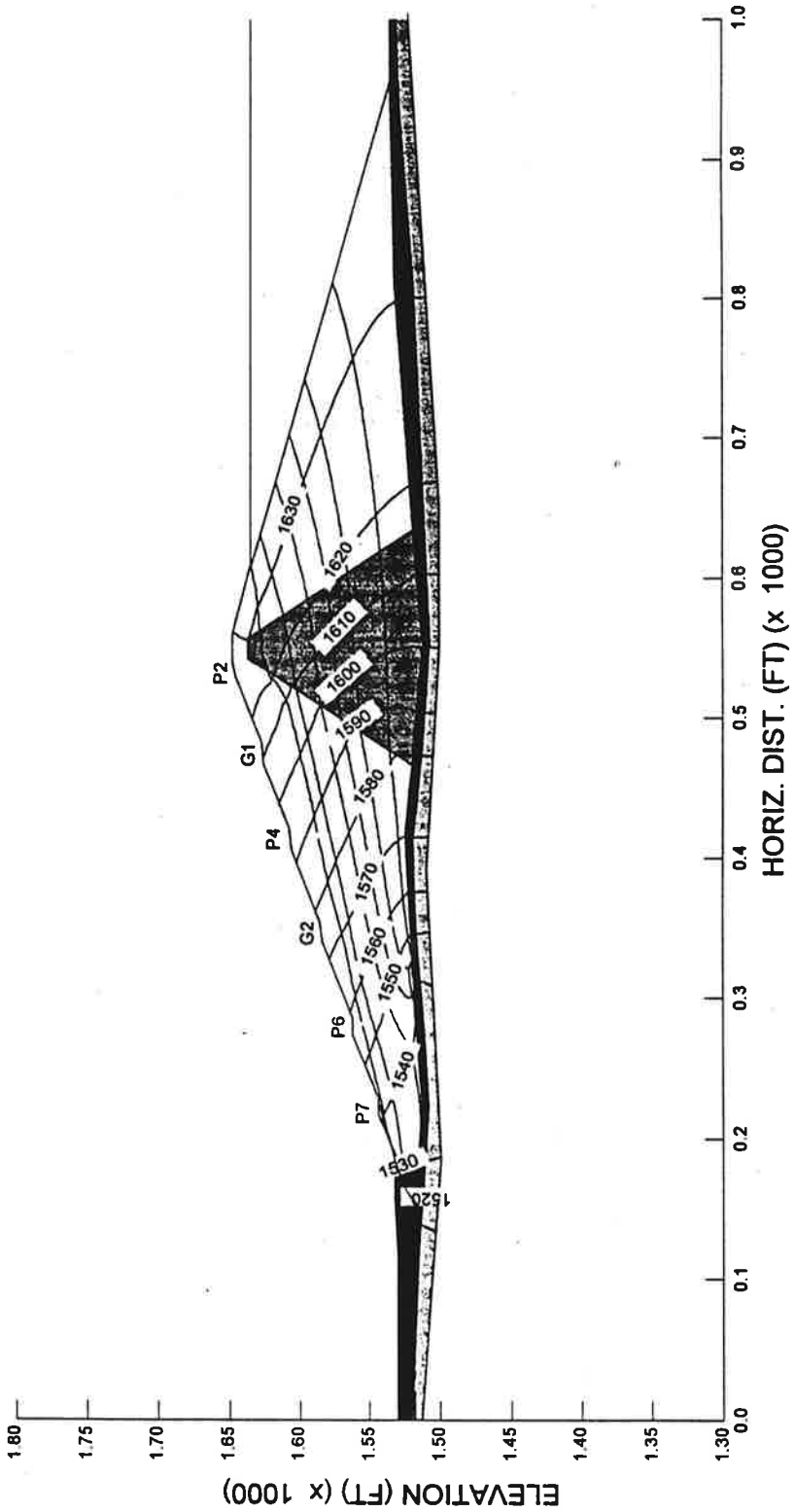
PIEZOMETER LOCATIONS



GeoSyntec Consultants
ATLANTA, GEORGIA

FIGURE NO.	6-2
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FINITE.cdr/df

EQUIPOTENTIAL LINES AND FLOW PATHS
23 OCTOBER 1998 SCENARIO

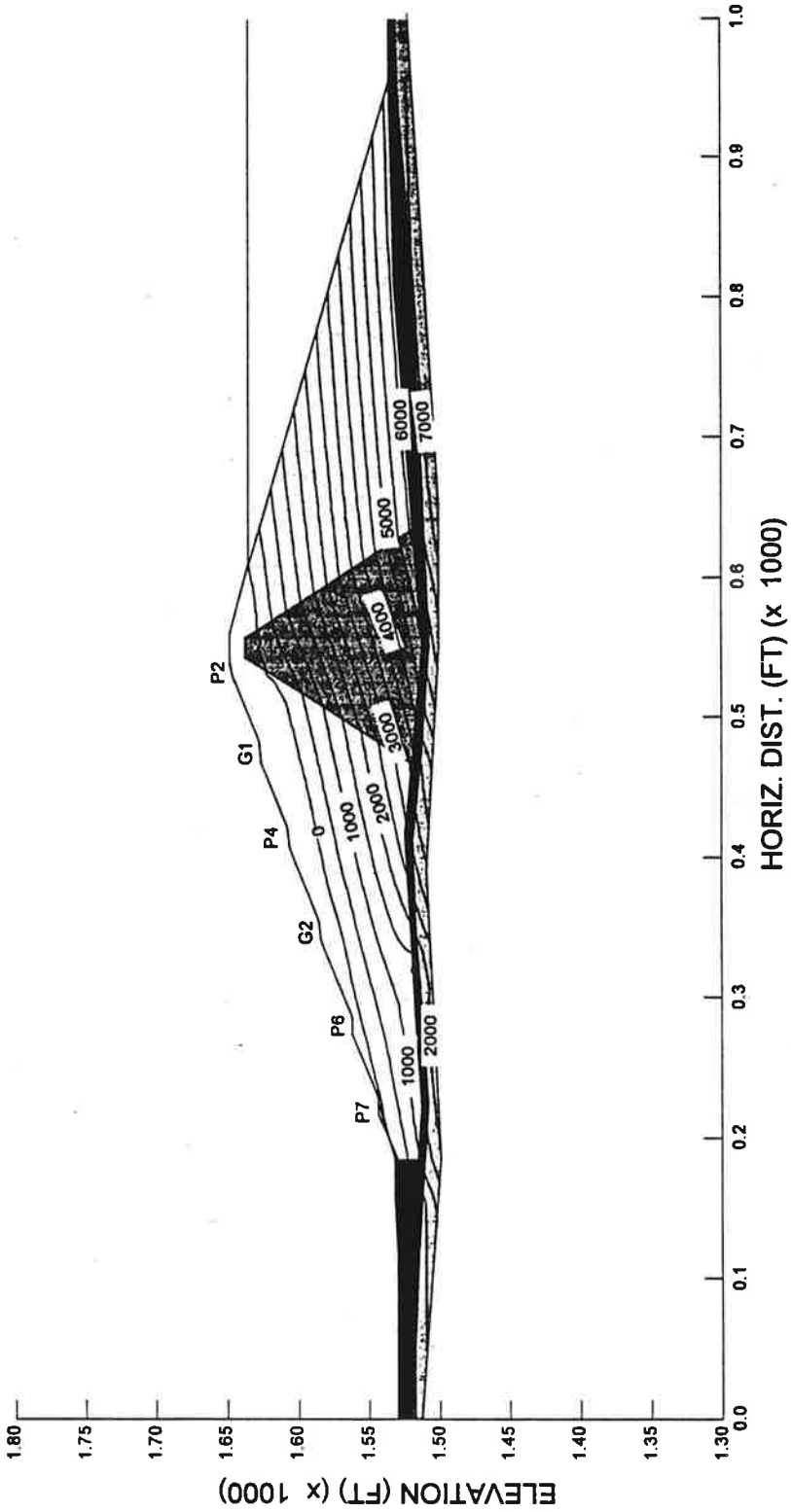


GeoSyntec Consultants

ATLANTA, GEORGIA

FIGURE NO.	6-3
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FINITE.cdr/df

POREWATER PRESSURE DISTRIBUTION
23 OCTOBER 1998 SCENARIO

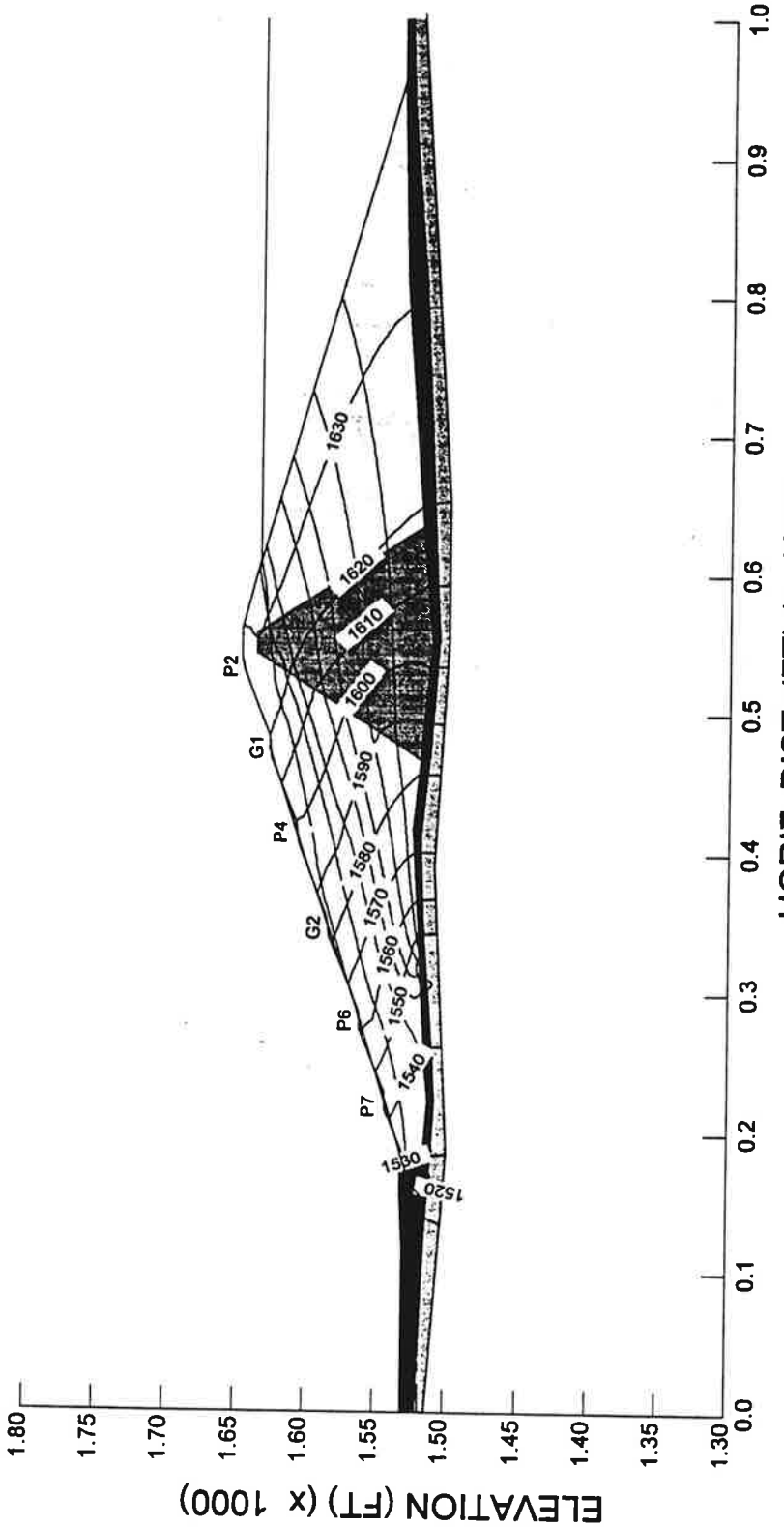


GeoSyntec Consultants

ATLANTA, GEORGIA

FIGURE NO.	6-4
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FINITE.cdr/df

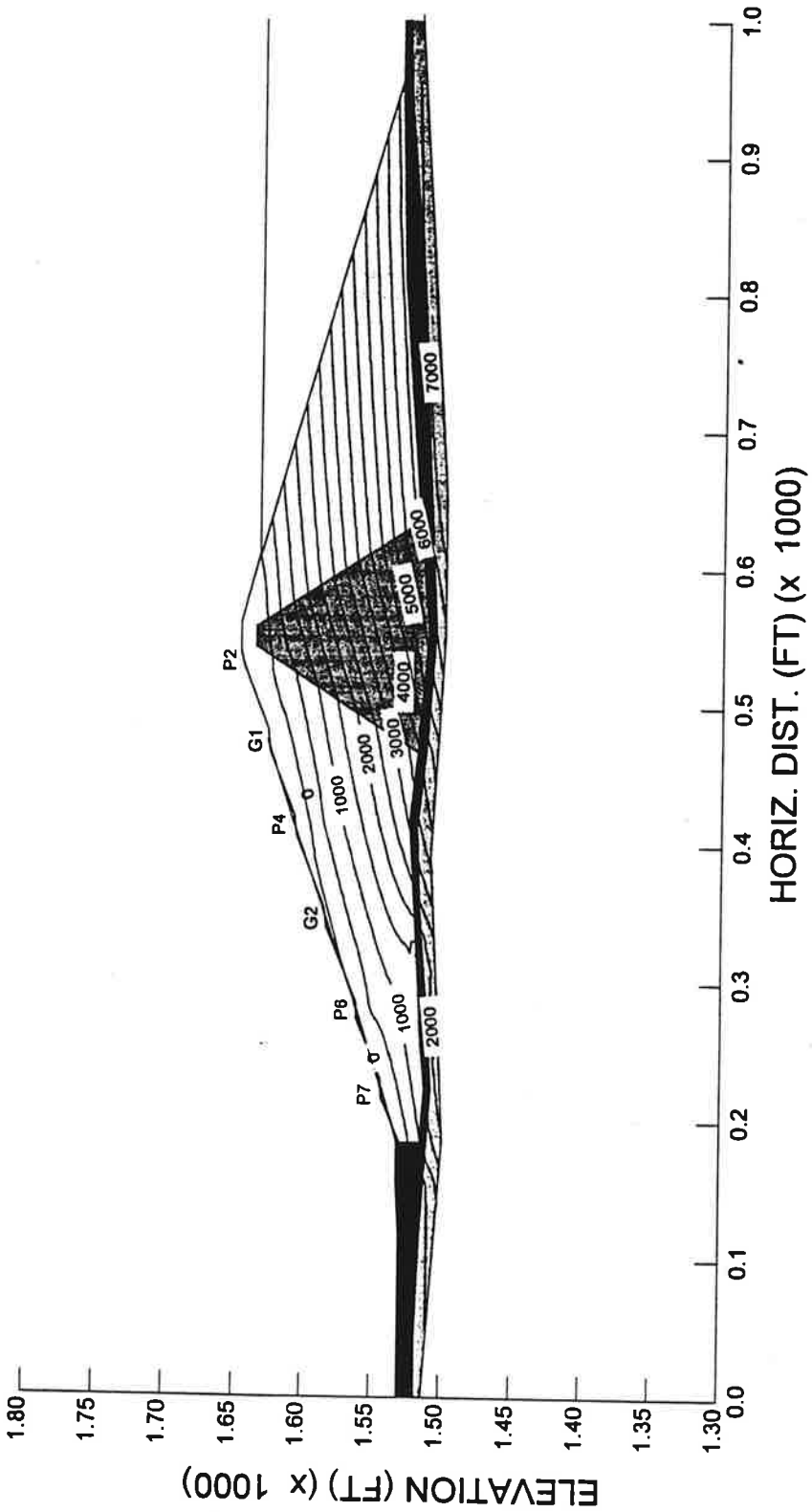
EQUIPOTENTIAL LINES AND FLOW PATHS
EML SCENARIO



GeoSyntec Consultants
ATLANTA, GEORGIA

FIGURE NO.	6-5
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FINITE.cdr/df

POREWATER PRESSURE DISTRIBUTION
EML SCENARIO



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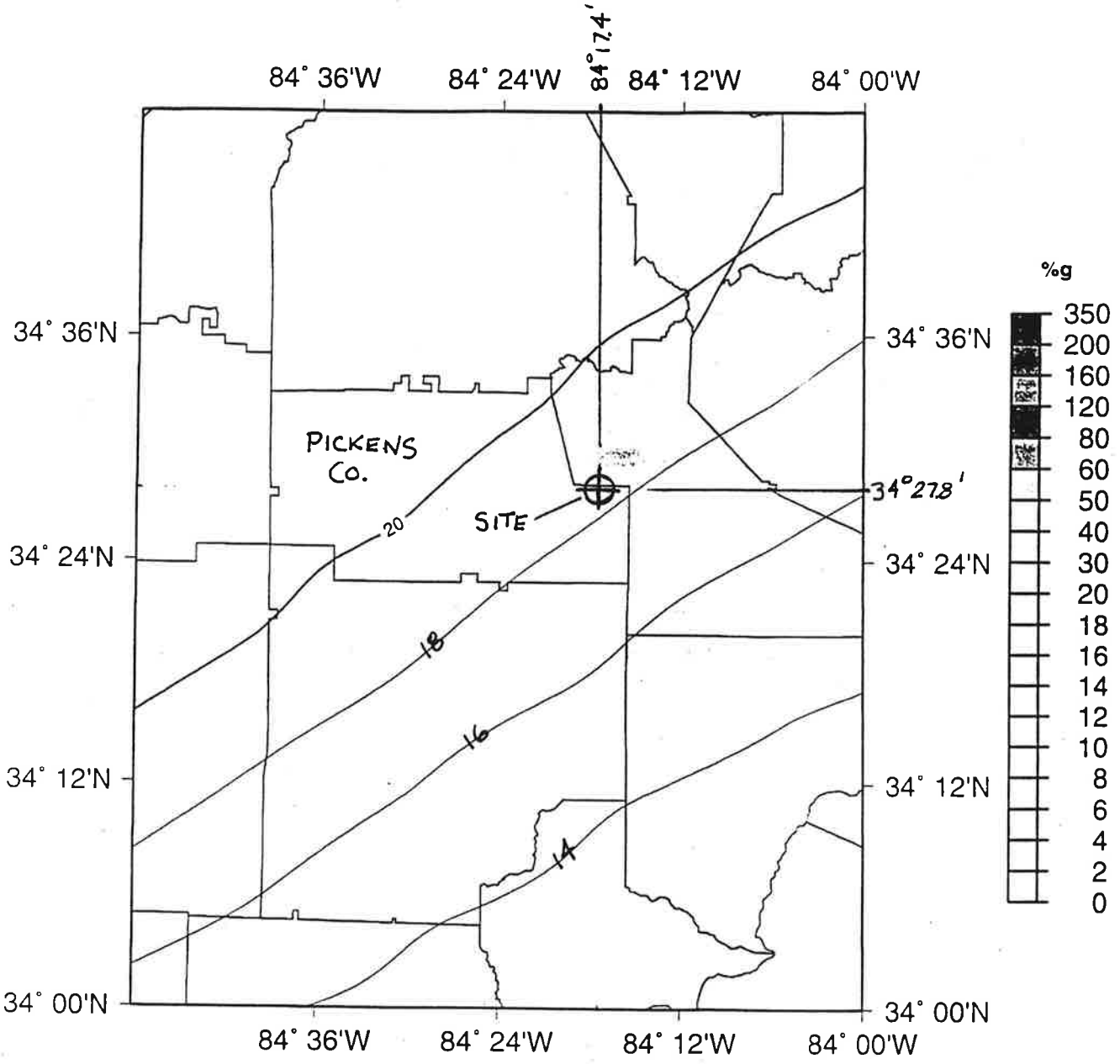
ATLANTA, GEORGIA

FIGURE NO.	6-6
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FINITE.cdr/df

PEAK ACCELERATION MAP



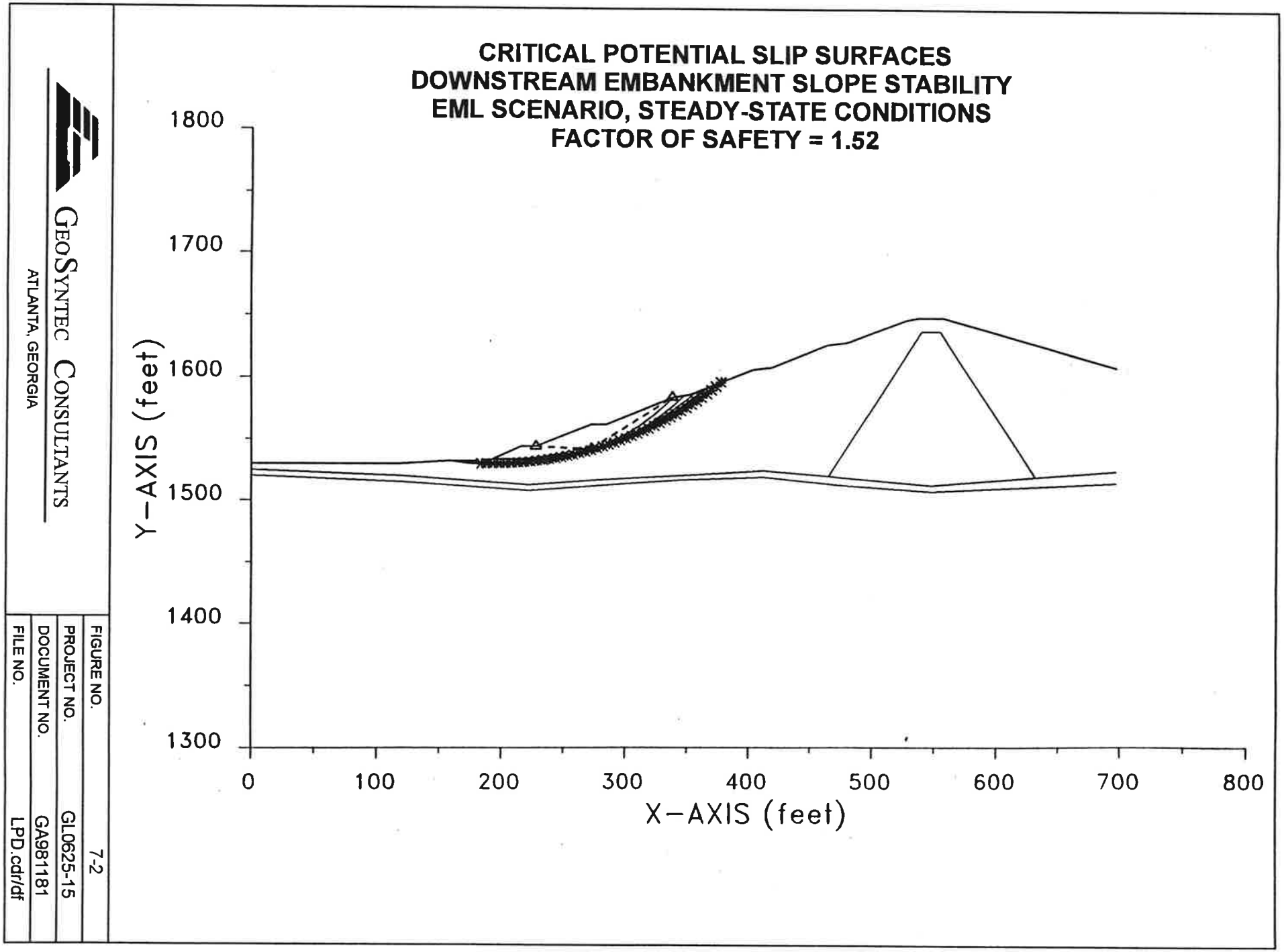
Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary

U.S. Geological Survey
National Seismic Hazard Mapping Project

Albers Conic Equal-Area Projection
Standard Parallels: 29.5 and 45.5 degrees

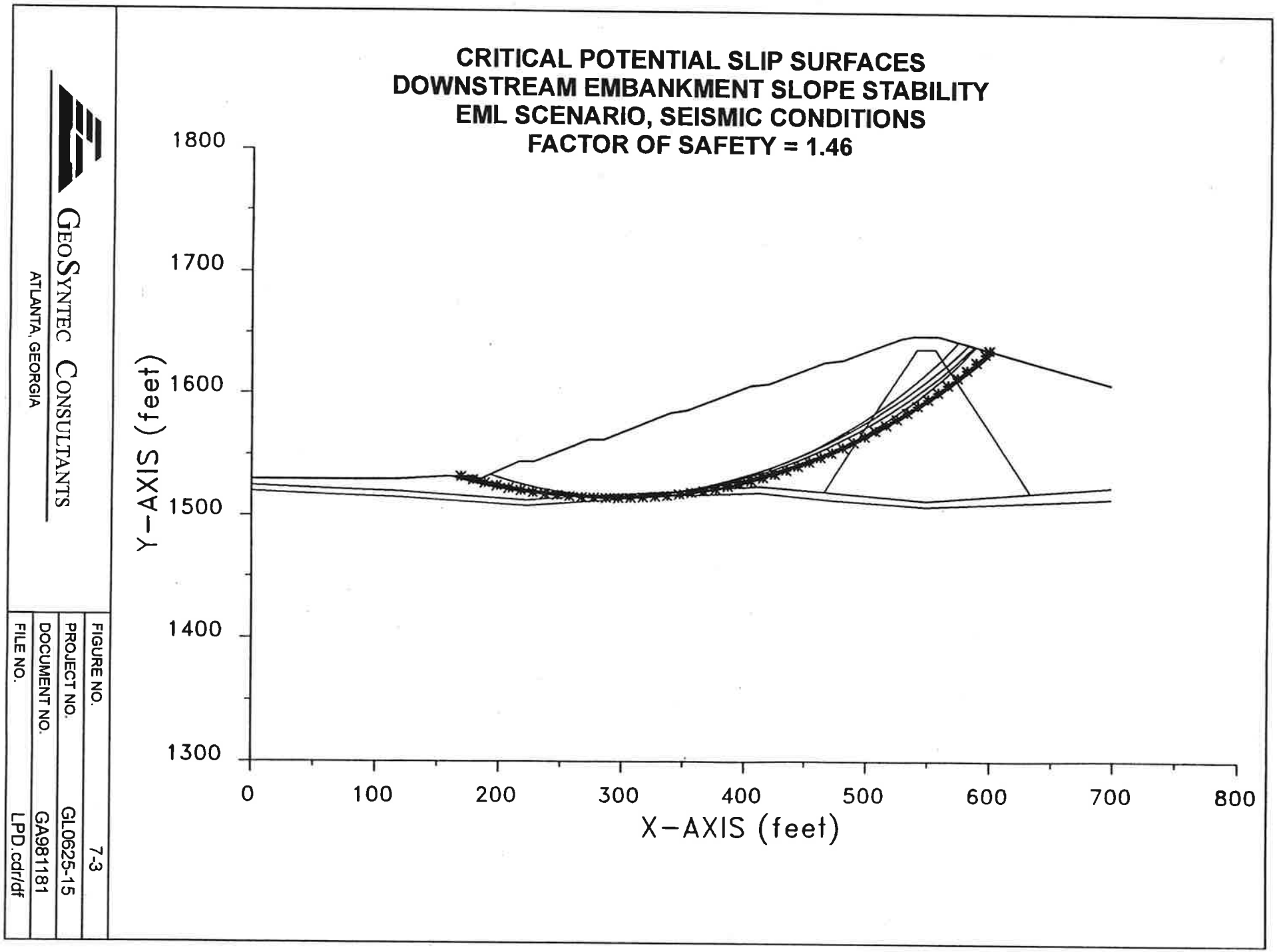
GeoSyntec Consultants
ATLANTA, GEORGIA

FIGURE NO.	7-1
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FIGS.cdr/df



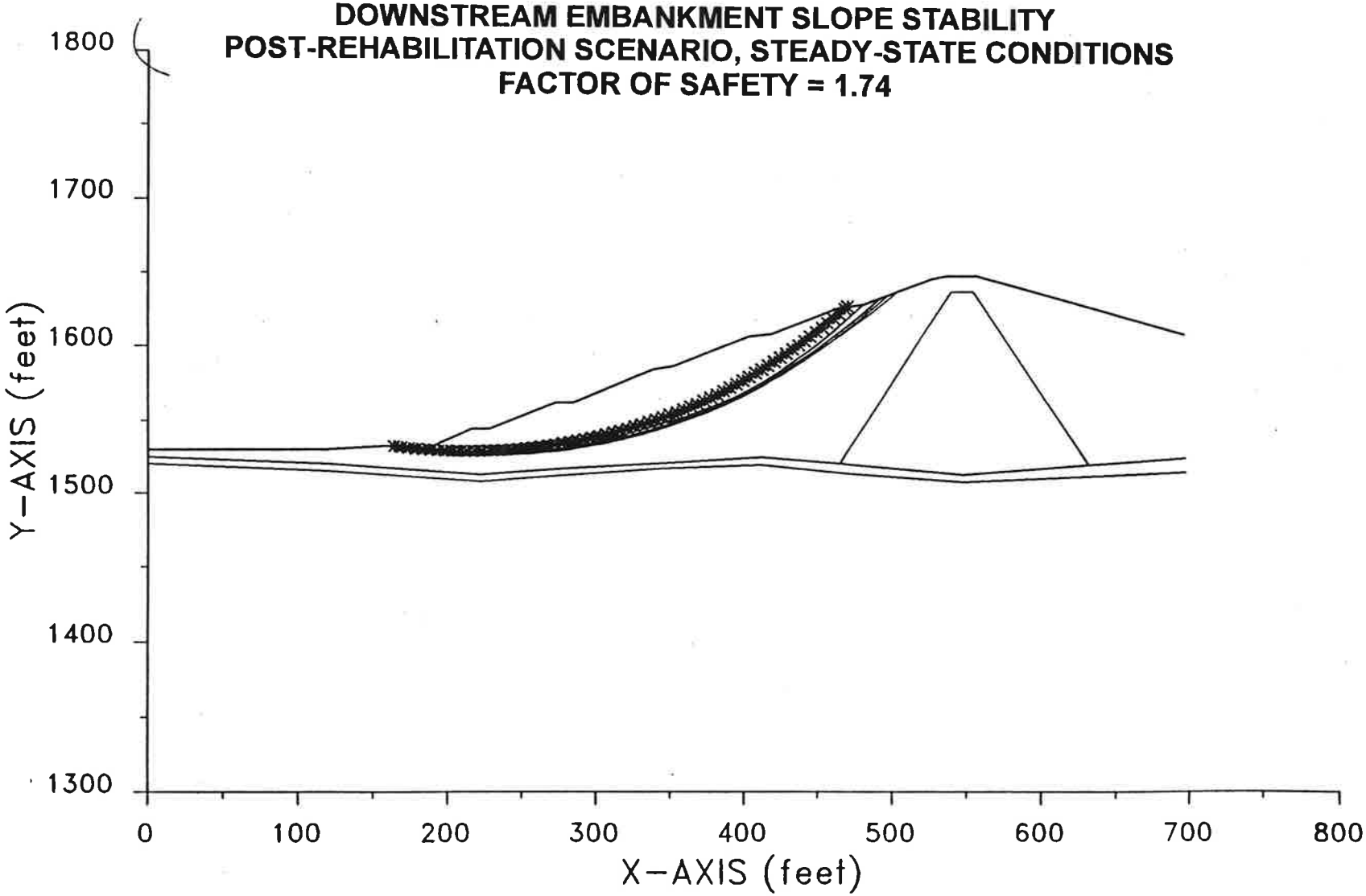
GeoSyntec Consultants
ATLANTA, GEORGIA

FIGURE NO.	7-2
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	LPD.cdr/df



GeoSyntec Consultants
ATLANTA, GEORGIA

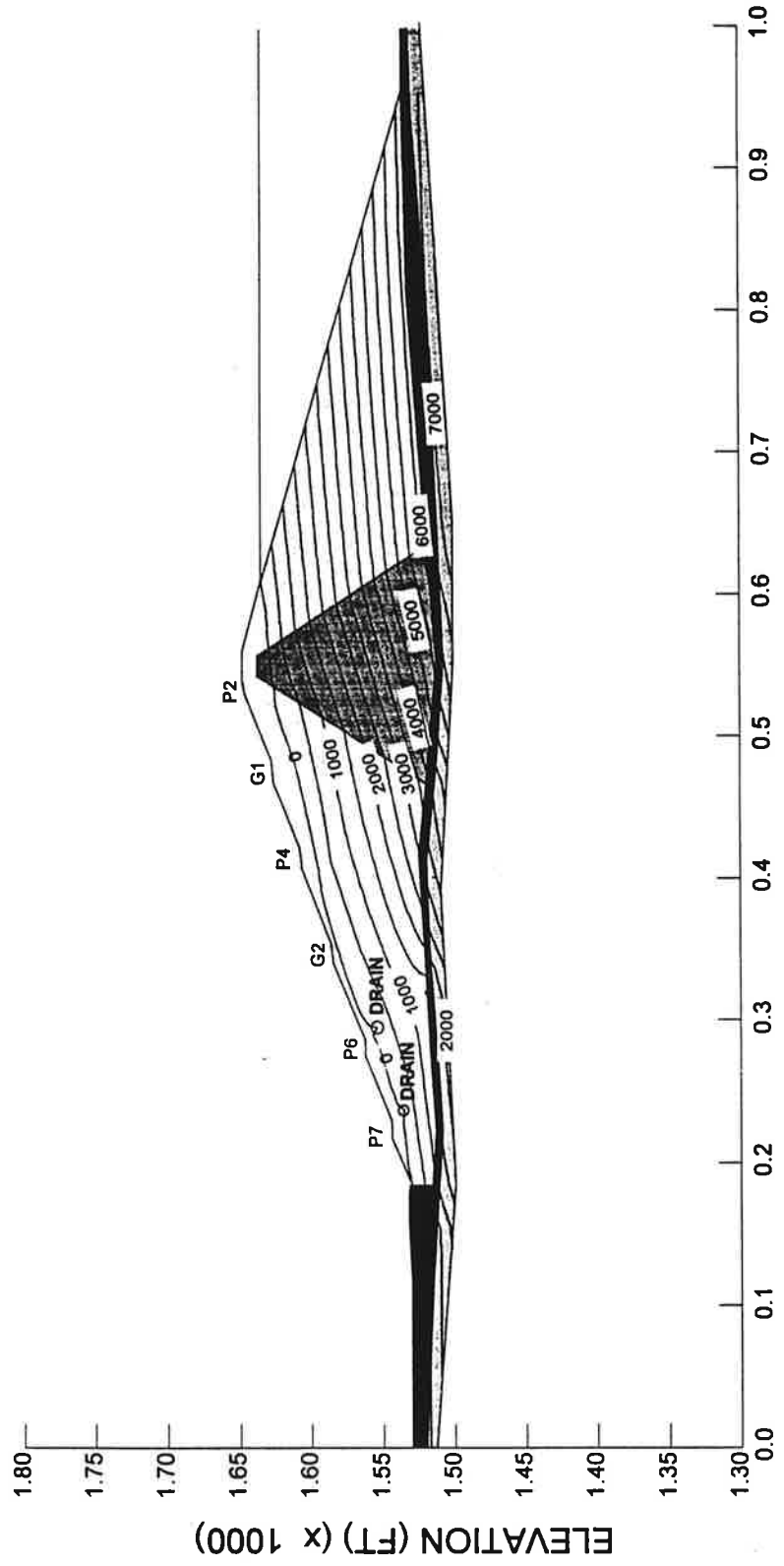
FIGURE NO.	7-3
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	LPD.cdr/df



GeoSyntec Consultants
ATLANTA, GEORGIA

FIGURE NO.	7-4
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	LPD.cdr/df

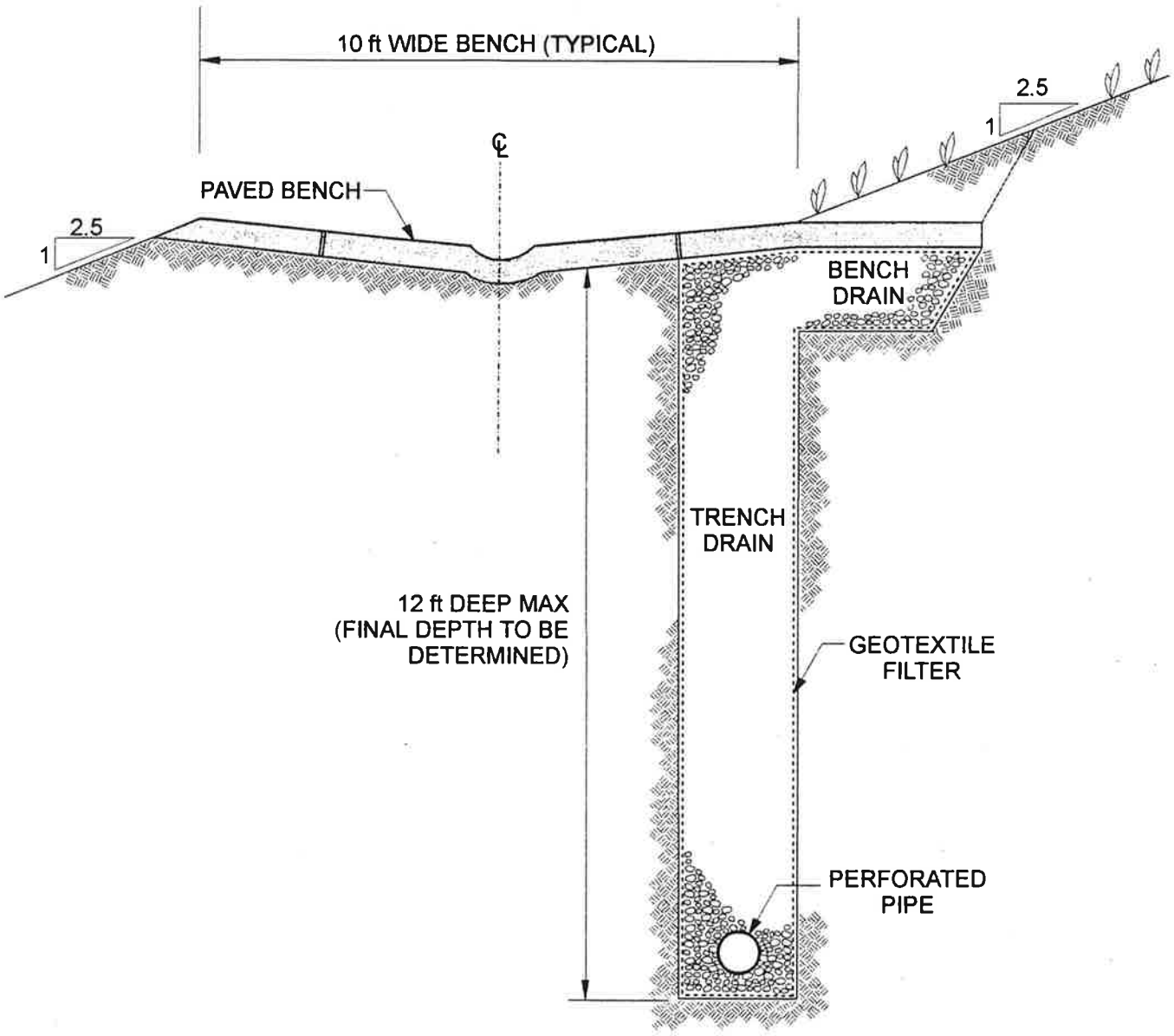
INFLUENCE OF TRENCH DRAIN ON POREWATER PRESSURE DISTRIBUTION



GeoSyntec Consultants
ATLANTA, GEORGIA

FIGURE NO.	8-1
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FINITE.cdr/df

TYPICAL DETAIL OF PAVED BENCH AND DRAINAGE SYSTEMS

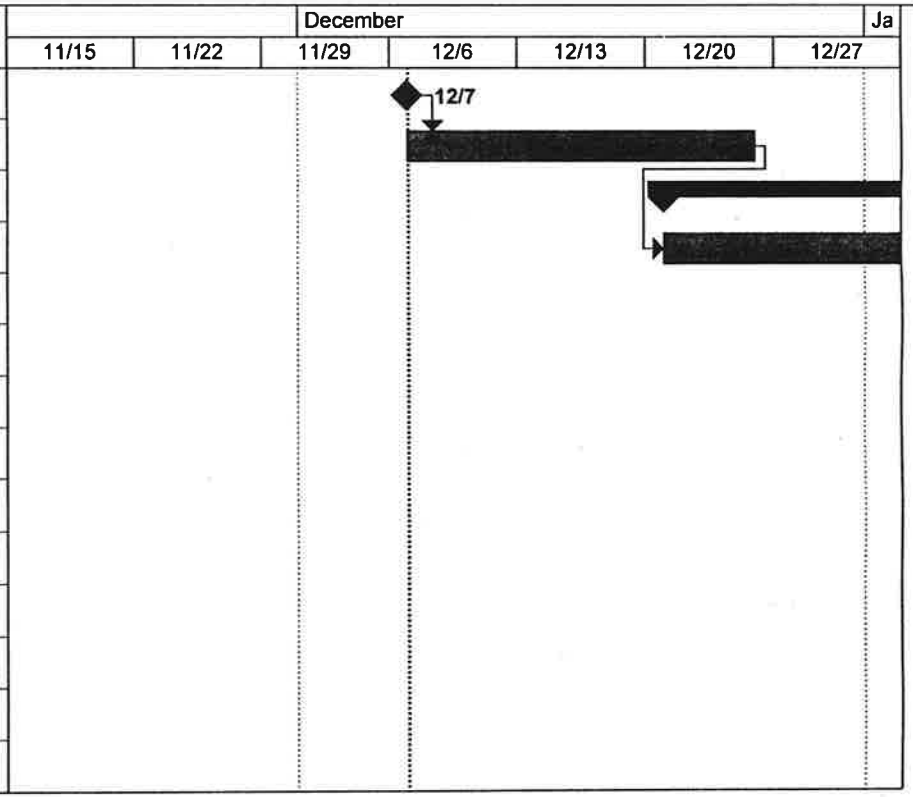


GeoSyntec Consultants
ATLANTA, GEORGIA

FIGURE NO.	8 - 2
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	FIG-8-2.cdr

Figure 8-3
Proposed Schedule
Implementation Of Rehabilitation Measures, Lake Petit Dam

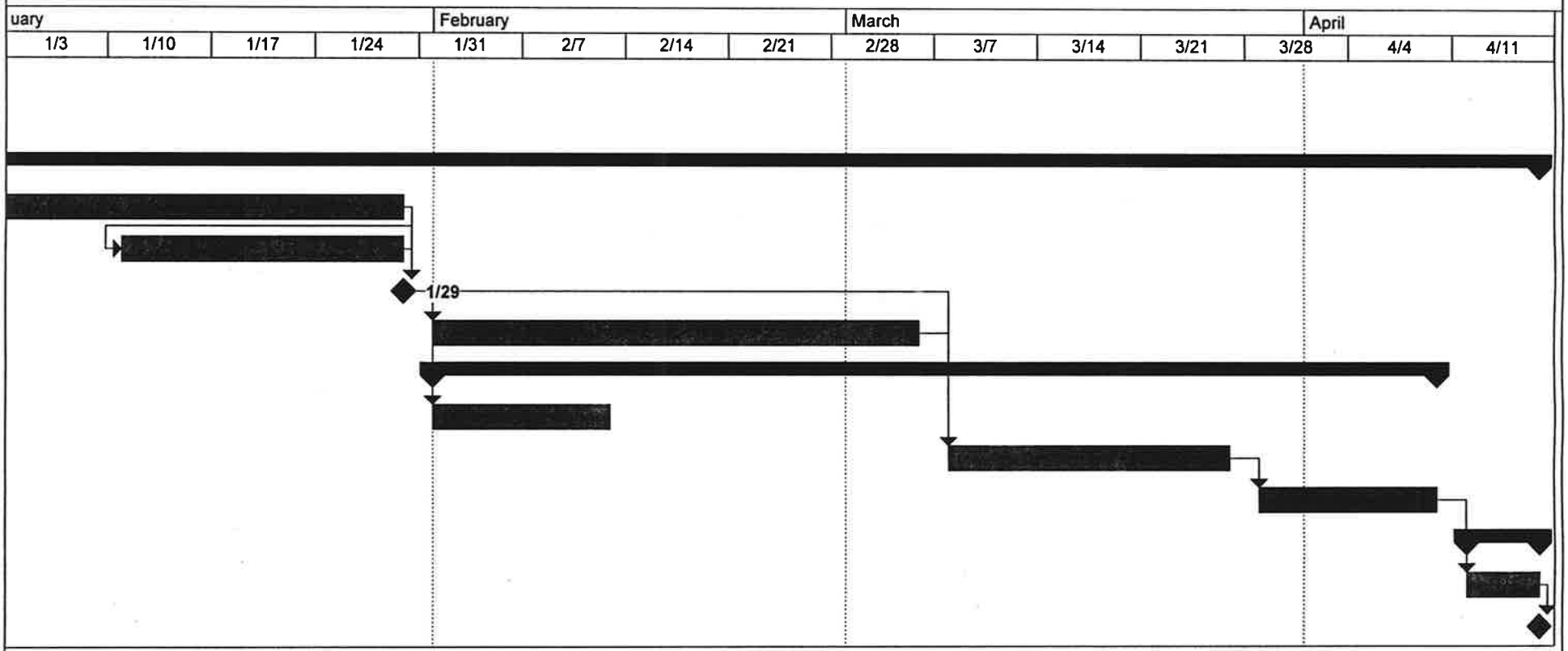
ID	Task Name	Duration	Start
1	***Submit Technical Memorandum to GaEPD***	0 days	Mon 12/7/98
2	GaEPD Review	15 days	Mon 12/7/98
3	**Detailed Design**	**85 days**	**Mon 12/21/98**
4	Plans and Specifications	6 wks	Mon 12/21/98
5	Final Analyses	3 wks	Mon 1/11/99
6	Submit Final Plans, Specs, and Analyses to GaEPD	0 days	Fri 1/29/99
7	GaEPD Review and Approval	5 wks	Mon 2/1/99
8	**Pre-Construction Activities**	**50 days**	**Mon 2/1/99**
9	Secure Funding	2 wks	Mon 2/1/99
10	Bid Period	3 wks	Mon 3/8/99
11	Bid Review and Contract Award	2 wks	Mon 3/29/99
12	**Construction**	**5 days**	**Mon 4/12/99**
13	Mobilization	1 wk	Mon 4/12/99
14	**Start Construction (Target Date - April 1999)**	0 days	Fri 4/16/99



Project: Tech Memorandum Schedule
Date: Mon 12/7/98

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary

Figure 8-3
Proposed Schedule
Implementation Of Rehabilitation Measures, Lake Petit Dam



Project: Tech Memorandum Schedule
Date: Mon 12/7/98

Task		Summary		Rolled Up Progress	
Split		Rolled Up Task		External Tasks	
Progress		Rolled Up Split		Project Summary	
Milestone		Rolled Up Milestone			

APPENDIX A

BORING LOGS AND PIEZOMETER CONSTRUCTION LOGS

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**		BORING ID: **G-1B**
LOCATION: **G-1**	N:	E:	GROUND ELEV.: **1627.0**
DRILLING CO.: **AT&E**	RIG: **CME 750**		DRILLER: **P. Bergman**
METHOD & DIAMETER: **Mud Rotary (8-in.)**			LOGGED BY: **J.Titus**
DATE: STARTED- **6 Oct 98**	COMPLETED- **12 Oct 98**		CHECKED BY: **G. Schmertmann**

L:\LPD\LOGS\G1.Pt.3 JDT-1 11-24-98

ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	SYMBOL	WELL DIAGRAM	Blows/ 6 in. (0 10 20 30 40)	DRILLING LOG
1627	0					Begin Boring at 09:50hrs.
		SILT, micaceous, with coarse gravel, trace fine grained sand. Color: yellowish red (5YR4/6)			6, 8, 8 — 21	
1622	5					
		SILT and fine to medium sand, some clay @ 9.75 -10 feet. Weathered gneiss fragments sampled as fine grained sand.			10, 16, 15 — 14	
1617	10					
		SILT, micaceous, trace very fine sand. Color yellowish red (5YR5/8) Some coarse gravel (gneiss fragments) and trace organics (root) encountered @ 14-15 feet			4, 11, 11 — 14	
1612	15					
						Attempt shelby tube. Would not push (rock)
1607	20					Push shelby tube, 16" recovery
1602	25					
		SILT and very fine grained sand, micaceous. Color: dark reddish brown to very dark gray.			8, 8, 14 — 17	
1597	30					
		SILT, trace very fine sand, occassional lenses of weathered gneiss sampling as medium sand, trace organic material (bark/root)			8, 12, 14 — 13	
1592	35					
1587	40					Push shelby tube, 16" recovery

REMARKS:

3-WELL PIEZOMETER CLUSTER CONSTRUCTED AS FOLLOWS:
SHALLOW - 1-INCH PVC CASING SCREENED @ 20-40
MIDDLE - 1-INCH PVC CASING SCREENED @ 55-60
DEEP - 4-IN. PVC CASING SCREENED @ 105.5-110.5

SEE ATTACHED FIGURE FOR CONSTRUCTION DETAILS

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**	BORING ID: **G-1B**
LOCATION: **G-1**	N: E:	GROUND ELEV.: **1627.0**
DRILLING CO.: **AT&E**	RIG: **CME 750**	DRILLER: **P. Bergman**
METHOD & DIAMETER: **Mud Rotary (8-in.)**		LOGGED BY: **J.Titus**
DATE: STARTED- **6 Oct 98**	COMPLETED- **12 Oct 98**	CHECKED BY: **G. Schmertmann**

L:\LPD\LOGSIG1.PL3 JDT-1 11-24-98

ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	SYMBOL	WELL DIAGRAM	Blows/ 6 in.	DRILLING LOG
1587	40					Push shelby tube, 16" recovery.
1582	45					
		SILT, trace very fine sand, micaceous (muscovite). Color: red (2.5YR4/8) and very dark gray (10YR3/1)			5 8 14 20	
1577	50					Hard drilling @ 51-52 feet.
		SILT, some very fine sand, some medium to coarse gravel (weathered gneiss and schist fragments).			14	Split spoon bouncing on wood
1572	55				50/5	
						Hard drilling (rock) @ 57.5-58 feet
						Push shelby tube, 16" recovery
1567	60					
1562	65	SILT, some very fine sand, some medium to coarse gravel (weathered gneiss and schist). Increasing size and number with depth in the spoon.			12 21 20 25	
1557	70				14 14 18 18	
1552	75	SAND, very fine to fine grained, and silt, some fine to medium gravel (weathered gneiss and schist fragments). Silty clay in end of spoon.			14 19 19 18	
1547	80					

REMARKS:

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**	BORING ID: **G-1B**
LOCATION: **G-1**	N: E:	GROUND ELEV.: **1627.0**
DRILLING CO.: **AT&E**	RIG: **CME 750**	DRILLER: **P. Bergman**
METHOD & DIAMETER: **Mud Rotary (8-in.)**		LOGGED BY: **J.Titus**
DATE: STARTED- **6 Oct 98**	COMPLETED- **12 Oct 98**	CHECKED BY: **G. Schmertmann**

L:\LPDILOGS\G1.Pt.3 JDT-1 11-24-98

ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	SYMBOL	WELL DIAGRAM	Blows/ 6 in.	DRILLING LOG
1547	80					Pitcher barrel sample, 16" recovery.
1542	85	SILT, some very fine sand, micaceous. Trace gneiss gravel in end of spoon.			15 19 28 29	
1537	90	SILT and very fine sand, some weathered schist and gneiss fragments (1/2-1 inch. diam). Lower 5 inches of spoon has strong banding of mafics, quartz, and feldspars. Extensively weathered.			21 23 19 18	
1532	95	SILT, trace clay, micaceous. Mottled slightly. Color: dark red (2.5YR3/6) and yellowish brown (10YR5/8).			0 12 11 16	Drop by weight of rods Drilling becoming much harder
1527	100	SILT, some clay, micaceous. Color is very dark grayish brown (10YR3/2) @ 100-101 feet and red (2.5YR4/8) @ 101-102 feet.			10 11 12 10	Hit rock while drilling past 102.5. Wood fragment came out of hole while drilling past 103 feet.
1522	105					Pitcher barrel sample, 11" recovery.
		Saprolite				
1517	110				12 28 30 29	
		Boring terminated at 114.00 feet				
1512	115					
1507	120					

REMARKS:

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**		BORING ID: **G-2**
LOCATION: **G-2**	N:	E:	GROUND ELEV.: **1584.8**
DRILLING CO.: **AT&E**	RIG: **CME 750**		DRILLER: **P. Bergman**
METHOD & DIAMETER: **Mud Rotary (8-in.)**			LOGGED BY: **J.Titus**
DATE: STARTED- **14 Oct 98**	COMPLETED- **15 Oct 98**		CHECKED BY: **G. Schmertmann**

L:\LPD\LOGS\G2.PL3 JDT--1 11-24-98

ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	SYMBOL	WELL DIAGRAM	Blows/ 6 in.	DRILLING LOG
1585	0					Begin Drilling 14 Oct 98 16:00 hrs.
1580	5					
1575	10	SILT and fine grained sand, some coarse grained sand lenses. Color: banded red (10R4/8) and gray (2.5YR5/0). Weathered gneiss fragments in end of spoon.			10 14 10 15	
						Hitting rock while drilling
1570	15					Hitting rock while drilling
						Pushed shelby tube, 21" recovery
1565	20					Pushed shelby tube, 8" push/recovery. Switch to pitcher barrel for sampling
1560	25					
1555	30	SILT, micaceous with fine grained sand, some coarse grained sand, some clay lenses (1 cm thick), trace coarse gravel (gneiss)			8 10 15 39	
1550	35					
1545	40					Pitcher barrel, 18" recovery

REMARKS:

3-WELL PIEZOMETER CLUSTER CONSTRUCTED AS FOLLOWS:
SHALLOW - 1-IN. PVC CASING SCREENED @ 10-30
MIDDLE - 1-IN. PVC CASING SCREENED @ 50-55
DEEP - 1-IN. PVC CASING SCREENED @ 65.5-68.5

SEE ATTACHED FIGURE FOR CONSTRUCTION DETAILS

GeoSyntec Consultants

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**	BORING ID: **G-2**
LOCATION: **G-2**	N: E:	GROUND ELEV.: **1584.8**
DRILLING CO.: **AT&E**	RIG: **CME 750**	DRILLER: **P. Bergman**
METHOD & DIAMETER: **Mud Rotary (8-in.)**		LOGGED BY: **J.Titus**
DATE: STARTED- **14 Oct 98**	COMPLETED- **15 Oct 98**	CHECKED BY: **G. Schmertmann**

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ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	SYMBOL	WELL DIAGRAM	Blows/ 6 in. 0 10 20 30 40 50	DRILLING LOG
1545	40					Pitcher barrel, 27" recovery (1.5 foot push)
1540	45	SILT and fine to medium sand, some coarse gravel.				
1535	50				30 31 50/3	
1530	55					
1525	60					Pitcher barrel, 20" recovery Pitcher barrel, no recovery
1520	65	SILT and fine to medium sand, some coarse gravel. Color: reddish brown SILT and fine to medium sand. Color: olive brown			5 7 11 18	Drill bit chattering @65-68 feet Wood fragments washing up out of borehole.
		Saprolite			50/3	
1515	70	Bedrock, boring terminated at 69.50 feet				
1510	75					
1505	80					

REMARKS:

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**		BORING ID: **G-3**
LOCATION: **G-3**	N:	E:	GROUND ELEV.: **1564.03**
DRILLING CO.: **AT&E**	RIG: **CME 750**		DRILLER: **P. Bergman**
METHOD & DIAMETER: **4-1/4 ID HSA**			LOGGED BY: **J.Titus**
DATE: STARTED- **13 Oct 98**	COMPLETED- **13 Oct 98**		CHECKED BY: **G. Schmertmann**

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ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	SYMBOL	WELL DIAGRAM	Blows/ 6 in.	DRILLING LOG
1564	0					Begin drilling 13 Oct 98: 1545 hrs.
		SILT, micaceous, trace very fine sand, trace coarse gravel (gneiss). Color: yellowish brown (10YR5/4). Gneiss weathers to fine sand. Color is banded gray and white.			7 4 6 8	
1559	5					
		Occasional lenses of silty clay. Color red (2.5YR5/8)			4 8 8 8	
1554	10					Hit water while drilling
						Pushed shelby tube, 18" recovery
1549	15					Pushed shelby tube, 22" recovery
		Becoming more banded in texture. Gneiss weathers to fine to medium sand.			6 11 10 15	
1544	20					
		SILT and coarse gravel (quartz and gneiss)			5 10 12 15	
1539	25					
						Pushed shelby tube, 23" recovery
1534	30					Pushed shelby tube, 12" recovery
		SILT, micaceous, trace medium sand (quartz), trace very fine sand. Coarse gravel (gneiss) in end of spoon.			4 10 18 15	
1529	35					
					5 8 9 11	
1524	40					
						Pushed shelby tube, 16" recovery
1519	45					Attempted shelby tube, would not push.
		Boring terminated at 47.00 feet				
1514	50					

REMARKS:
SHALLOW PIEZOMETER SCREENED IN FILL MATERIAL

CONTRUCTION: 1-INCH ID PVC PIPE WITH 5-FEET OF 0.010-INCH SLOTTED SCREEN.

GeoSyntec Consultants

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**	BORING ID: **G-4**
LOCATION: **G-4**	N: E:	GROUND ELEV.: **1605.8**
DRILLING CO.: **AT&E**	RIG: **CME 750**	DRILLER: **P. Bergman**
METHOD & DIAMETER: **HSA/4" Mud Rotary**		LOGGED BY: **GS / JDT**
DATE: STARTED- **2 Oct 98**	COMPLETED- **5 Oct 98**	CHECKED BY: **G. Schmertmann**

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ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	SYMBOL	WELL DIAGRAM	Blows/ 6 in.	DRILLING LOG
1606	0					2OCT98 Beging drilling using 4-1/4 ID HSA
		SILT, some sand. Color: brown			3 4 5 7	
1601	5					
		SILT, some sand, some medium gravel, micaceous, dry			6 9 9 15	
1596	10					
						Push shelby tube, 15" recovery
1591	15					Push shelby tube, 7" recovery
		SILT, some sand, some gravel. Medium gravel (weathered gneiss and schist) concentrated in upper 6" spoon, more silt in lower 9". dry. Color: dark brown.			17 18 8 9	
1586	20					
					4 13 10 8	
1581	25					
						Attempted shelby tube, would not push
1576	30					Attempted shelby tube, would not push
						Resume drilling on 5OCT98 at 10:45 hrs using 4-3/4 OD mud rotary. Boring has been offset by 5 feet from original location.
						30-32 ft. - Pitcher barrel sample
1571	35					
		SILT, some sand. Trace gravel in upper 3" of spoon. micacoeus, dark brown.			7 7 8 8	
1566	40					

REMARKS:

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**		BORING ID: **G-4**
LOCATION: **G-4**	N:	E:	GROUND ELEV.: **1605.8**
DRILLING CO.: **AT&E**	RIG: **CME 750**		DRILLER: **P. Bergman**
METHOD & DIAMETER: **HSA/4" Mud Rotary**			LOGGED BY: **GS / JDT**
DATE: STARTED- **2 Oct 98**	COMPLETED- **5 Oct 98**		CHECKED BY: **G. Schmertmann**

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ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	SYMBOL	WELL DIAGRAM	Blows/ 6 In.	DRILLING LOG
1566	40				8	Push shelby tube, 5" recovery.
1561	45	SILT, some sand, some fine to meduim gravel, micaceous				Push shelby tube, no recovery
						Pitcher barrel sample, 20" recovery
1556	50					Pitcher barrel sample, 8" recovery
		SILT, some sand, trace gravel (FILL)				
		Saprolite			10 15 25	
1551	55	Boring terminated at 55.00 feet			50/4	
1546	60					
1541	65					
1536	70					
1531	75					
1526	80					

REMARKS:

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**	BORING ID: **G-5**
LOCATION: **G-5**	N: E:	GROUND ELEV.: **1646.72**
DRILLING CO.: **AT&E**	RIG: **CME 750**	DRILLER: **P. Bergman**
METHOD & DIAMETER: **Mud Rotary (8-in.)**		LOGGED BY: **J.Titus**
DATE: STARTED- **12 Oct 98**	COMPLETED- **14 Oct 98**	CHECKED BY: **G. Schmertmann**

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ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	Blows/ 6 in.	DRILLING LOG
1647	0	SILT some fine to medium sand, some fine to medium gravel. Dry, Color: brown (7.5YR4/4)	4 6 7 8	Begin drilling on 12OCT98: 13:50 hrs.
1642	5			
1637	10	SILT, some very fine to fine sand, micaceous. Color: banded strong brown (7.5YR5/6) and dark gray (7.5YR4/0).	8 9 12 16	Push shelby tube, 17" recovery
1632	15	SILT, trace very fine sand. Color: dark gray to very dark gray (10YR4/1 - 3/1)	4 4 7 8	Pushed shelby tube 1 foot, 24" recovery (wash out)
1627	20	SILT, trace clay, micaceous, Color: red (10R4/8) Extremely weathered schist (to silt) in end of spoon.	5 5 4 5	
1622	25	SILT, some very fine sand, micaceous. Trace clay in lower 6" of spoon.		Push shelby tube, 19" recovery
1617	30			Push shelby tube, no recovery
1612	35	SILT, some fine to medium quartz sand, trace clay, micaceous. Color: red (2.5YR4/8).	2 4 6 10	
1607	40	SILT and sand (weathered gneiss) SILT, and clay. Wood fragments at 29 feet.	5 6 6 9	

REMARKS:
Blank casing installed (no screen) for downhole geophysics applications.

TEST BORING RECORD

PROJECT NAME: **Lake Petit Dam**	PROJECT NO.: **GL0625**	BORING ID: **G-5**
LOCATION: **G-5**	N: E:	GROUND ELEV.: **1646.72**
DRILLING CO.: **AT&E**	RIG: **CME 750**	DRILLER: **P. Bergman**
METHOD & DIAMETER: **Mud Rotary (8-in.)**		LOGGED BY: **J.Titus**
DATE: STARTED- **12 Oct 98**	COMPLETED- **14 Oct 98**	CHECKED BY: **G. Schmertmann**

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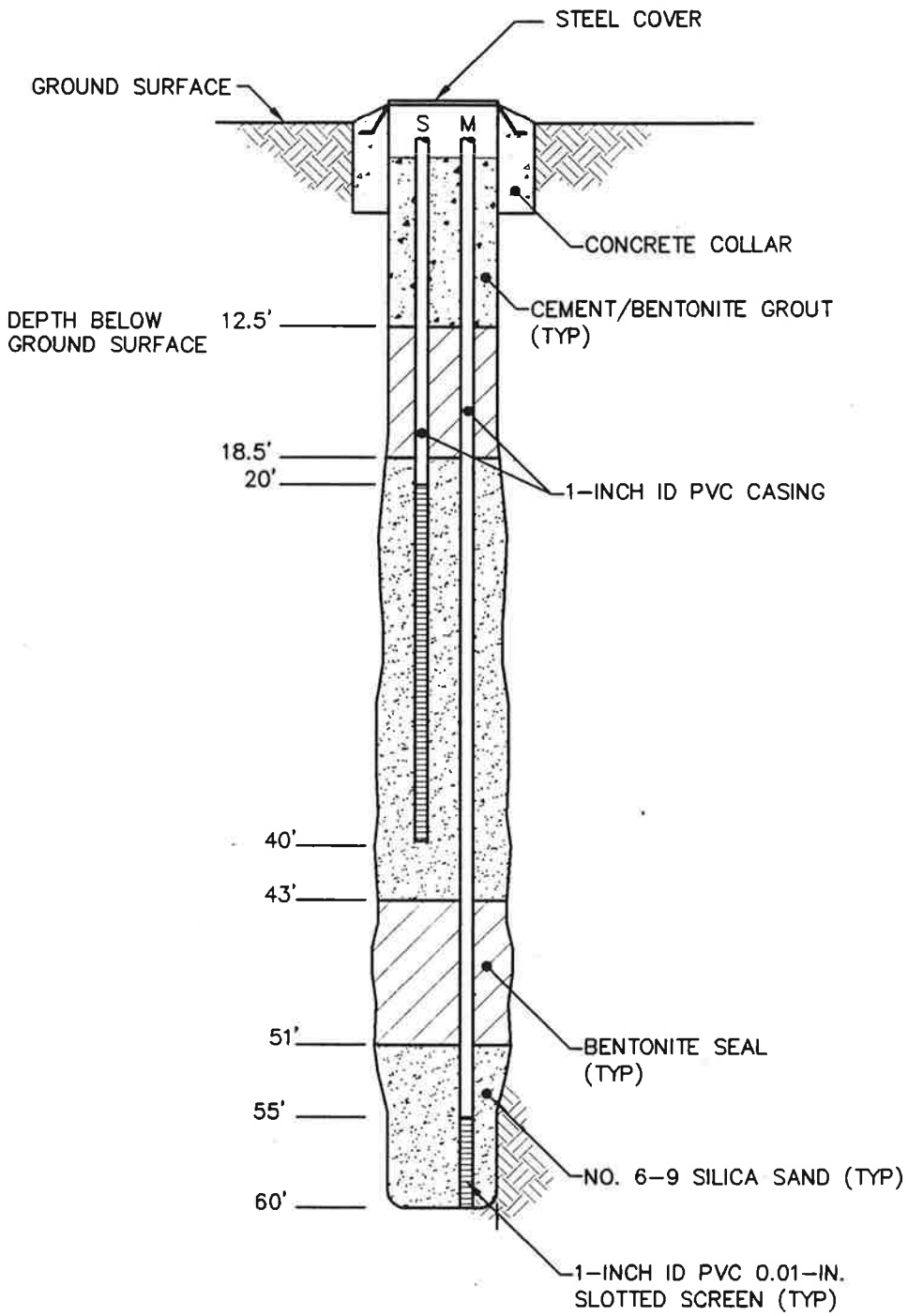
ELEVATION (FEET)	DEPTH (FEET)	DESCRIPTION	SYMBOL	WELL DIAGRAM	Blows/ 6 in.	DRILLING LOG
1607	40				7	Wood debris washing up out of borehole
						Push shelby tube, 15" recovery
1602	45					Pushed shelby tube 6". No recovery. wood debris in end of tube
		SILT, micaceous, trace clay, trace very fine sand, trace wood/roots. Color: red (10R4/8)			2 3 4 7	
1597	50					
		Increasing wood fragments up to 1" diam.			4 8 5 6	
1592	55					
						Push shelby tube, 22" recovery
1587	60					Push shelby tube, 14" recovery
		SILT, some clay, trace very fine sand. Color: @ 63-64.5 - red (10R4/8) @ 64.5-65 - dark gray (5YR4/1)			4 5 6 8	
1582	65					
		Boring terminated at 67.00 feet				
1577	70					
1572	75					
1567	80					

REMARKS:

G-1A PIEZOMETER CLUSTER CONSTRUCTION DETAIL



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ATLANTA, GEORGIA

FIGURE NO.	A-1
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	0625F003.DWG

G-1B PIEZOMETER CONSTRUCTION DETAIL

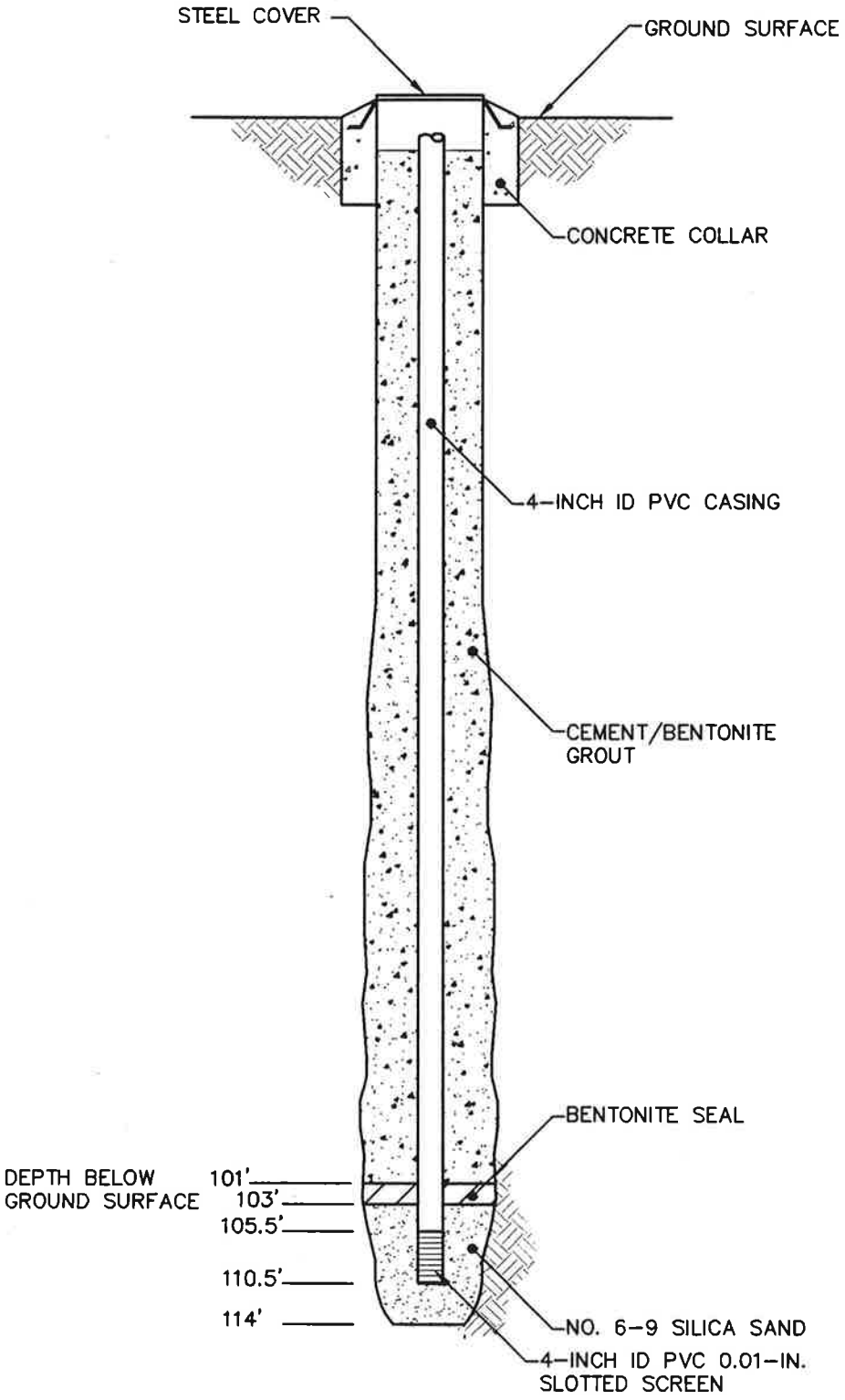

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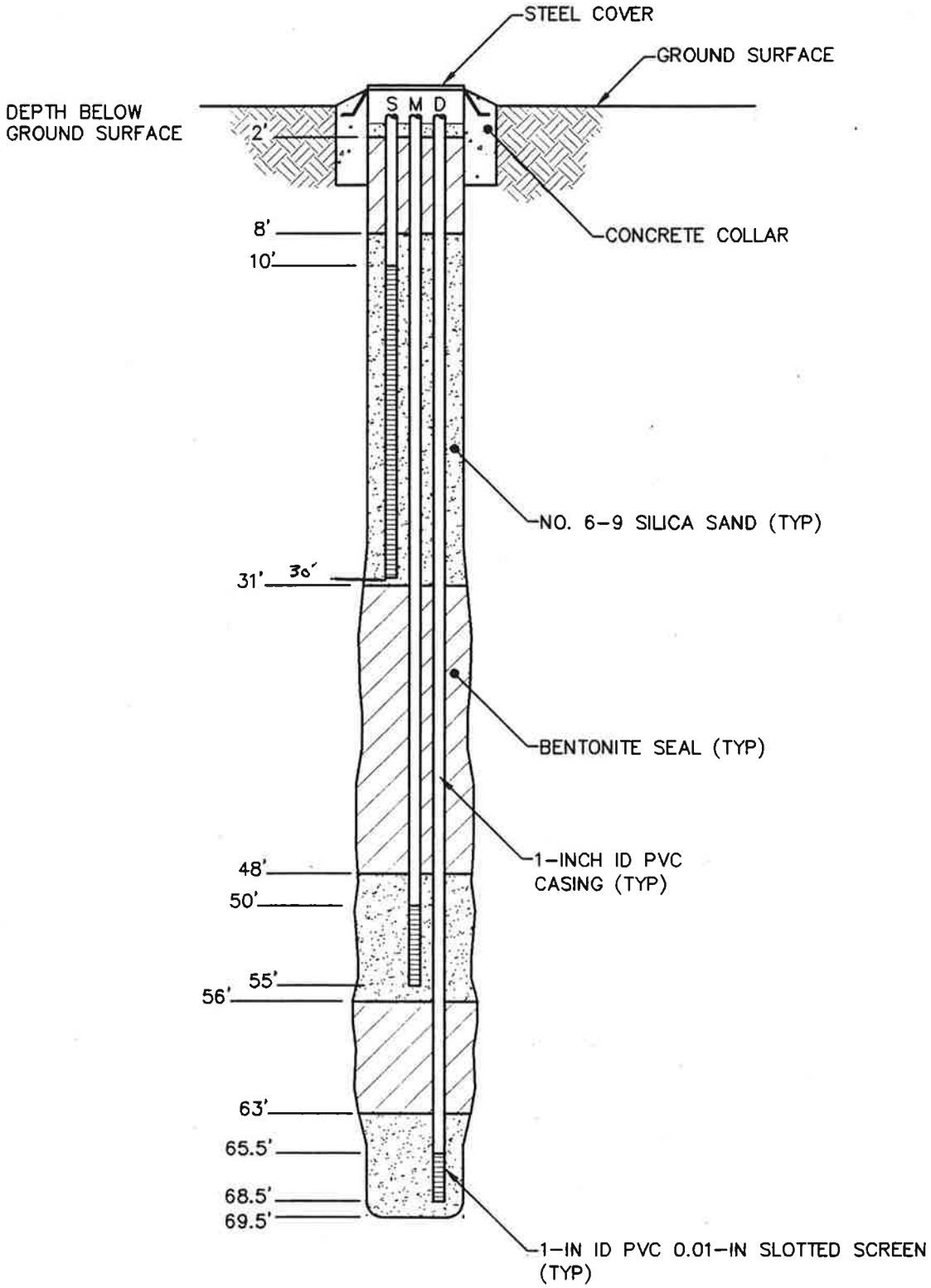
FIGURE NO.	A-2
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	0625F002.DWG

G-2 PIEZOMETER CLUSTER CONSTRUCTION DETAIL



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ATLANTA, GEORGIA

FIGURE NO.	A-3
PROJECT NO.	GL0625-15
DOCUMENT NO.	GA981181
FILE NO.	0625F001.DWG

TABLE

ELEVATIONS FOR STANDPIPE PIEZOMETERS (GEOSYNTEC, INSTALLED 1998)

Piezometer ID	Top of Casing Elevation [1] (feet above MSL)	Ground Elevation [1] (feet above MSL)
G-1As	1626.70	1626.8
G-1Ad	1626.81	1626.9
G-1B	1626.84	1626.9
G-2s	1584.7	1584.8
G-2m	1584.7	1584.8
G-2d	1584.7	1584.8
G-3	1563.84	1564.0

Note: **(1)** Elevations from GPS survey performed by GeoSyntec on 15 October 1998.
MSL - Mean Sea Level

APPENDIX B

SEISMIC DOWNHOLE TESTING REPORT

LAW

LAWGIBB Group Member

October 21, 1998

John M. Callaham
Geosyntec Consultants
1100 Lake Hern Drive NE, Suite 200
Atlanta, Georgia 30342-1523

Subject: **Report of Seismic Downhole Testing**
Lake Petit Dam
Big Canoe, Georgia
Law Project No. 12000-8-0078 Phase 02

Dear Mr. Callaham:

Seismic downhole testing was conducted at the Lake Petit dam in the Big Canoe private community in northern Georgia. The work in this report was outlined in Law Engineering and Environmental Services (LAW) Proposal Number 12050-8-9000 Task 18. The purpose of the seismic downhole testing was to gather compression and shear wave velocities of the in situ materials to enable earthquake response analysis of the dam.

Field Investigation

The field investigation consisted of seismic downhole tests to measure seismic velocities. The field work was conducted by John Chulick and Brian Black of Law on October 8, 1998. Seismic downhole tests were performed in two borings (G-1A and G-5). Each boring had been drilled and 4-inch PVC casing had been installed and grouted in place in preparation for the seismic downhole testing.

Boring G-1A was located on the downstream slope of the dam about one-fifth of the distance below the crest. Drilling records provided by Geosyntec showed that the boring was terminated about 114 feet in depth and was completed as a monitoring well with a final depth of 110 feet. At the time of the seismic downhole testing, G-1A had water at 27 feet and the borehole geophones could not be lowered below 103 feet.

LAW Engineering and Environmental Services, Inc.
112 TownPark Drive • Kennesaw, GA 30144
770-421-3400 • Fax: 770-421-3486

Boring G-5 was located on the crest of the dam at the downstream edge of the road that crosses the dam. Drilling records provided by Geosyntec show that the boring was drilled to 67 feet and had PVC casing installed with a final depth of 66.5 feet.

The test equipment consisted of a Geometrics Strataview digital seismograph, three triaxial borehole geophones, and surface energy sources. In a given test measurement, the three triaxial geophones were separated by five feet and temporarily fixed to the borehole casing using bladders inflated by nitrogen. Recordings were made with all three geophones for each measurement setup in the boring. The geophone cables were marked at even increments to allow accurate positioning of the geophones. Recordings were made at ten-foot intervals, giving complete coverage of the boring and providing repeated data every ten feet.

Three recordings were made at each test depth. One recording was optimized for compression waves and two recordings were optimized for shear waves at each test depth. The recorded signals were stored digitally for later processing and analysis. The compression wave source consisted of a vertical hammer blow on a metal plate placed ten feet from the boring. The shear wave source consisted of horizontal hammer blows made from each end of an eight-foot wooden beam placed about ten feet from the boring and fixed in place by the weight of a vehicle.

Seismic Data Analysis

The seismic downhole data were analyzed by viewing each recording on a computer and identifying the first arrival time of the compression and shear waves at each geophone component. Nine channels of data (one for each component of three triaxial geophones) were examined for each recording and the arrival times of the compression and shear waves were identified. Then, the arrival times were used with the source to receiver distances to compute seismic wave velocities at various depths.

Seismic velocities were computed using five and ten foot intervals between geophones. Compression and shear wave velocities were computed by dividing by the differences in the arrival times at two geophones by the differences in the distances between the geophones and the source. Because of the relatively short time intervals between compression wave arrivals, it was sometimes necessary to compute velocities from recordings taken at larger differential depths. Direct source-geophone velocities were computed near the surface. Poisson's Ratio can be calculated for each depth interval where both compression and shear wave velocities have been computed. The dimensionless value of Poisson's Ratio (μ) is given by the following relationship:

$$\mu = \frac{1 - 1/2\left(\frac{V_p}{V_s}\right)^2}{1 - \left(\frac{V_p}{V_s}\right)^2}$$

where V_p is the compression wave velocity and V_S is the shear wave velocity. For ideal elastic materials, Poisson's Ratio ranges from 0 to 0.5. Values are frequently near 0.5 in saturated unconsolidated soils. Rock often has Poisson's Ratio values near the middle part of the range (0.2 to 0.3), although a value in this range does not necessarily denote rock. Very low (and negative) values may be due to the seismic wave velocities not measuring the same materials, i.e., rock on one side of the boring and soil on the other at the same depths.

Seismic Downhole Test Results

The compression and shear wave velocities and the Poisson's ratios at borings G-1A and G-5 are presented on Tables 1 and 2. Figures 1 and 2 show the compression and shear wave velocities plotted versus depth. Compression wave velocities ranged from 1,212 to 6,142 feet per second (ft/s).

Shear wave velocities ranged from 457 to 1,846 ft/s. Shallow soils generally yield lower velocities; however, slightly higher velocities were observed at the top of G-5 probably due to the road and roadbed. Shear wave velocities exceeding 2,500 ft/s are generally considered to represent sound rock, which was not encountered with the seismic downhole testing.

It has been our pleasure to provide our services to Geosyntec Consultants in the preparation of this report. If you have any questions concerning this report, or when we may be of further service, we hope that you will contact us at your convenience.

Sincerely,

John A. Chulick, P.G.
Senior Geophysicist

Joseph R. Wilson, Ph.D., P.G.
Principal

Table 1: Seismic Velocities at G-1A

Depth Range	Midpoint (ft)	Vp (ft/s)	Vs (ft/s)	Poisson's Ratio
0-5	2.5	1212	648	0.30
5-10	7.5	1889	816	0.39
10-15	12.5	1317	957	-0.06
15-20	17.5	1693	1333	-0.32
20-25	22.5	1976	1074	0.29
25-30	27.5	1725	1105	0.15
30-35	32.5	4049	1466	0.42
35-40	37.5	1455	805	0.28
40-45	42.5	1737	1025	0.23
45-50	47.5	3262	1447	0.38
50-55	52.5	1589	1140	-0.03
55-60	57.5	1924	1293	0.09
60-65	62.5	1849	1178	0.16
65-70	67.5	2123	1846	-1.05
70-75	72.5	2566	1342	0.31
75-80	77.5	3042	882	0.45
80-85	82.5	4206	1324	0.45
85-90	87.5	3600	1501	0.39
90-95	92.5	1890	1471	-0.27
95-98	96.5	1990	1305	0.12
98-103	100.5	6142	1422	0.47

Table 2: Seismic Velocities at G-5

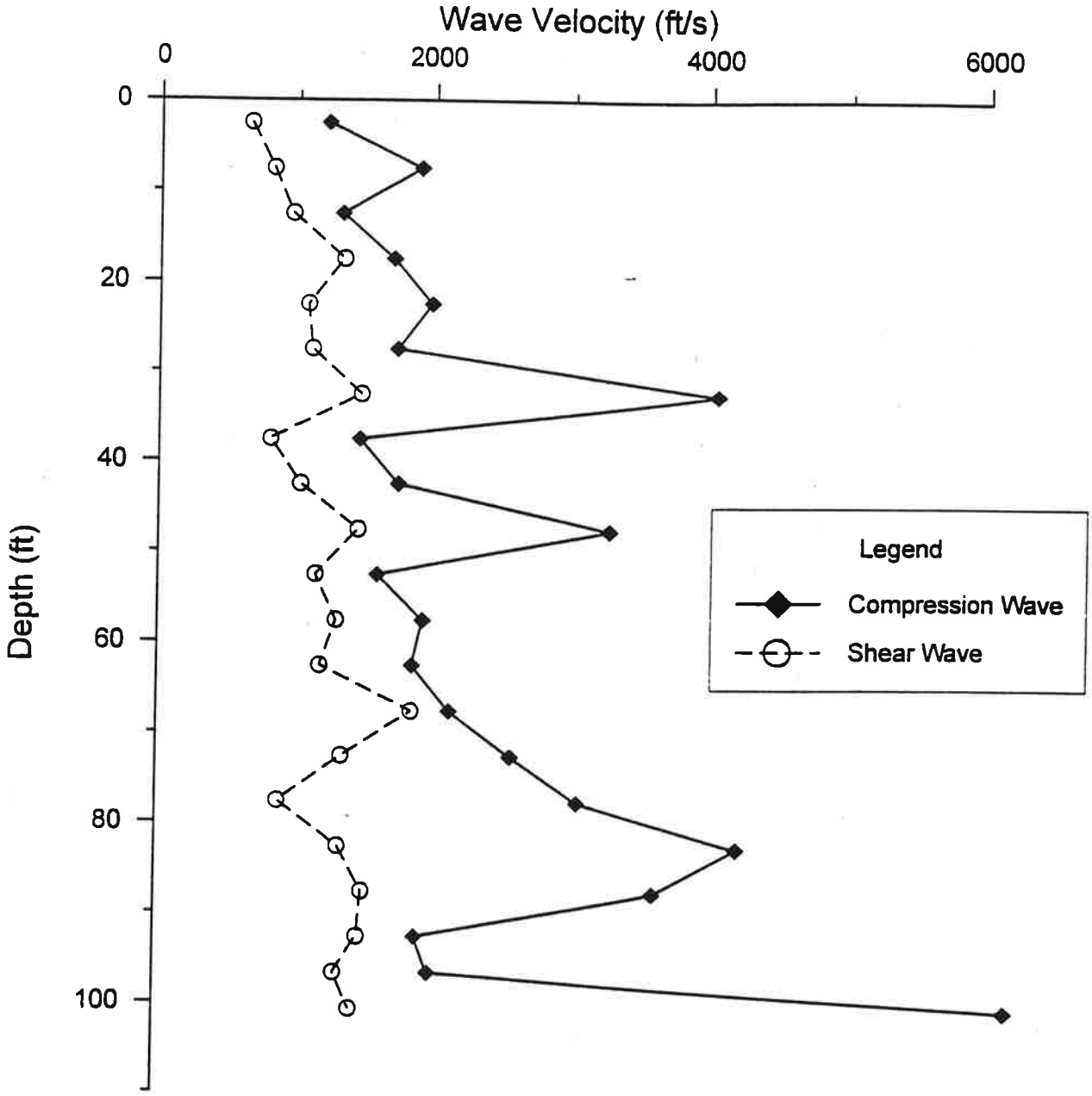
Depth Range	Midpoint (ft)	Vp (ft/s)	Vs (ft/s)	Poisson's Ratio
0-5	2.5	2055	1344	0.13
5-10	7.5	2055	539	0.46
10-15	12.5	1554	457	0.45
15-20	17.5	1444	822	0.26
20-25	22.5	2216	1436	0.14
25-30	27.5	2421	854	0.43
30-35	32.5	1958	1316	0.09
35-40	37.5	4557	1313	0.45
40-45	42.5	1415	949	0.09
45-50	47.5	2375	1223	0.32
50-55	52.5	1965	1021	0.32
55-60	57.5	4398	1484	0.44
61-66	63.5	5254	908	0.48

Table 1: Seismic Velocities at G-1A

Depth Range	Midpoint (ft)	Vp (ft/s)	Vs (ft/s)	Poisson's Ratio
0-5	2.5	1212	648	0.30
5-10	7.5	1889	816	0.39
10-15	12.5	1317	957	-0.06
15-20	17.5	1693	1333	-0.32
20-25	22.5	1976	1074	0.29
25-30	27.5	1725	1105	0.15
30-35	32.5	4049	1466	0.42
35-40	37.5	1455	805	0.28
40-45	42.5	1737	1025	0.23
45-50	47.5	3262	1447	0.38
50-55	52.5	1589	1140	-0.03
55-60	57.5	1924	1293	0.09
60-65	62.5	1849	1178	0.16
65-70	67.5	2123	1846	-1.05
70-75	72.5	2566	1342	0.31
75-80	77.5	3042	882	0.45
80-85	82.5	4206	1324	0.45
85-90	87.5	3600	1501	0.39
90-95	92.5	1890	1471	-0.27
95-98	96.5	1990	1305	0.12
98-103	100.5	6142	1422	0.47

Table 2: Seismic Velocities at G-5

Depth Range	Midpoint (ft)	Vp (ft/s)	Vs (ft/s)	Poisson's Ratio
0-5	2.5	2055	1344	0.13
5-10	7.5	2055	539	0.46
10-15	12.5	1554	457	0.45
15-20	17.5	1444	822	0.26
20-25	22.5	2216	1436	0.14
25-30	27.5	2421	854	0.43
30-35	32.5	1958	1316	0.09
35-40	37.5	4557	1313	0.45
40-45	42.5	1415	949	0.09
45-50	47.5	2375	1223	0.32
50-55	52.5	1965	1021	0.32
55-60	57.5	4398	1484	0.44
61-66	63.5	5254	908	0.48



GEOSYNTEC CONSULTANTS
BIG CANOE, GEORGIA

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G-1A
SEISMIC VELOCITIES

Job No. 12000-8-0078 Figure 1