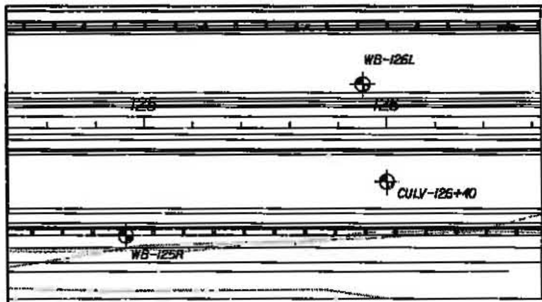
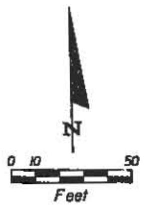


BORING LOCATION PLAN



NOTES:

1. LIMESTONE AND "ROCK LIKE" MATERIAL WAS ENCOUNTERED IN THE BORINGS PERFORMED. THE CONTRACTOR SHALL ANTICIPATE THE NEED FOR SPECIAL EQUIPMENT AND/OR PROCEDURES TO FACILITATE ROCK EXCAVATION.
2. THE DARK GRAY TO BLACK ORGANIC SILTY TO CLAYEY SAND (SM/SC) ENCOUNTERED WITHIN THE UPPER 3 TO 4 FEET OF SPT BORINGS SHALL BE REMOVED IN ACCORDANCE WITH INDEX 500 OF THE FDOT DESIGN STANDARDS.
3. BASED ON A REVIEW OF THE "POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER, WEST-CENTRAL FLORIDA" MAPS PUBLISHED BY THE USGS, THE POTENTIOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER AT THE PROJECT SITE RANGES FROM APPROXIMATELY +10 TO +20 FEET, NGVD 29. THE SPT BORINGS PERFORMED AT THE BRIDGE SITE DID NOT ENCOUNTER AN ARTESIAN FLOW CONDITION DURING THE FIELD EXPLORATION. HOWEVER, THE CONTRACTOR SHOULD BE PREPARED TO HANDLE THIS CONDITION, IF ENCOUNTERED.

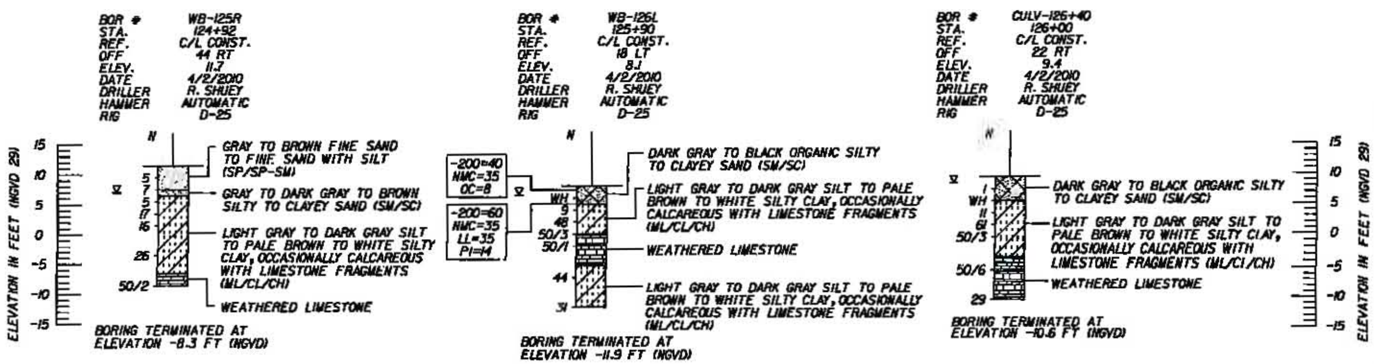
ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: MODERATELY AGGRESSIVE (RESISTIVITY=2,700 OHM-CM)
SUBSTRUCTURE STEEL: MODERATELY AGGRESSIVE (RESISTIVITY=2,700 OHM-CM)
SUPERSTRUCTURE SLIGHTLY AGGRESSIVE

SOIL TEST RESULTS:
RESISTIVITY 1,500 TO 2,700 OHM-CM
CHLORIDES 30 TO 60 PPM
SULFATES 105 TO 660 PPM
pH 7.6 TO 8.3

LEGEND

- LIGHT GRAY TO DARK GRAY SILT TO PALE BROWN TO WHITE SILTY CLAY, OCCASIONALLY CALCAREOUS WITH LIMESTONE FRAGMENTS (ML/CL/CH)
- DARK GRAY TO BLACK ORGANIC SILTY TO CLAYEY SAND (SM/SC)
- WEATHERED LIMESTONE
- GRAY TO BROWN FINE SAND TO FINE SAND WITH SILT (SP/SP-SM)
- GRAY TO DARK GRAY TO BROWN SILTY TO CLAYEY SAND (SM/SC)
- GRAY TO BLACK SAND TO SAND WITH SILT (SP/SP-SM)

SP UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING
N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4 NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD 29 NATIONAL GEODETIC VERTICAL DATUM OF 1929
APPROXIMATE SPT BORING LOCATION
GROUNDWATER TABLE



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	LESS THAN 4 4 to 10 10 to 30 30 to 50 GREATER THAN 50	LESS THAN 3 3 to 8 8 to 24 24 to 40 GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT SOFT FIRM STIFF VERY STIFF HARD	LESS THAN 2 2 to 4 4 to 8 8 to 15 15 to 30 GREATER THAN 30	LESS THAN 1 1 to 3 3 to 6 6 to 12 12 to 24 GREATER THAN 24

No.	REVISIONS	DATE	BY	SCALE AS NOTED DESIGNED BY JRA DRAWN BY BJS CHECKED BY EMF	E.O.R.: ERICK M. FREDERICK, P.E. P.E. LICENSE NUMBER 63920 TIERRA INC 7351 TEMPLE TERRACE HIGHWAY, TAMPA, FL. 33637 CERTIFICATE OF AUTHORIZATION: 6486	DATE 12/2/2010 PROJECT NO. 607060	MANATEE COUNTY PUBLIC WORKS	DESIGN ENGINEER ERICK M. FREDERICK FL LICENSE NO. 63920	REPORT OF CORE BORINGS	SHEET NO.

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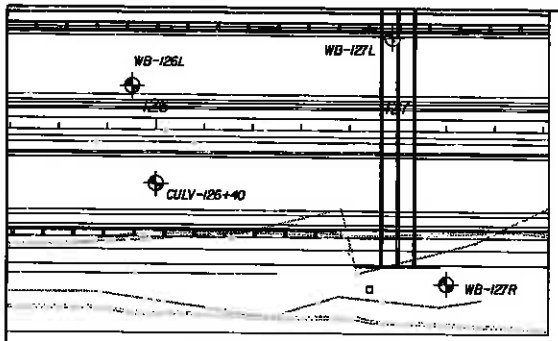
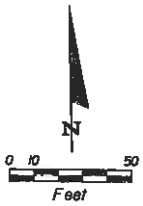


BORING LOCATION PLAN



NOTES:

1. LIMESTONE AND "ROCK LIKE" MATERIAL WAS ENCOUNTERED IN THE BORINGS PERFORMED. THE CONTRACTOR SHALL ANTICIPATE THE NEED FOR SPECIAL EQUIPMENT AND/OR PROCEDURES TO FACILITATE ROCK EXCAVATION.
2. THE DARK GRAY TO BLACK ORGANIC SILTY TO CLAYEY SAND (SM/SC) ENCOUNTERED WITHIN THE UPPER 3 TO 4 FEET OF SPT BORINGS SHALL BE REMOVED IN ACCORDANCE WITH INDEX 500 OF THE FDOT DESIGN STANDARDS.
3. BASED ON A REVIEW OF THE "POTENTIOMETRIC SURFACE OF THE UPPER FLORIDAN AQUIFER, WEST-CENTRAL FLORIDA" MAPS PUBLISHED BY THE USGS, THE POTENTIOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER AT THE PROJECT SITE RANGES FROM APPROXIMATELY +10 TO +20 FEET, NGVD 29. THE SPT BORINGS PERFORMED AT THE BRIDGE SITE DID NOT ENCOUNTER AN ARTESIAN FLOW CONDITION DURING THE FIELD EXPLORATION. HOWEVER, THE CONTRACTOR SHOULD BE PREPARED TO HANDLE THIS CONDITION, IF ENCOUNTERED.

LEGEND

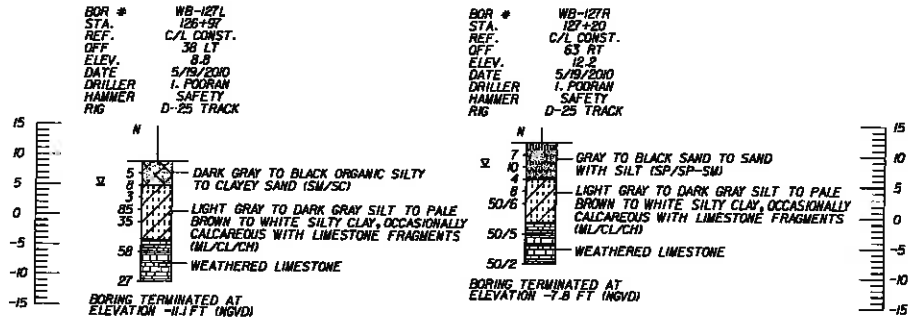
	LIGHT GRAY TO DARK GRAY SILT TO PALE BROWN TO WHITE SILTY CLAY, OCCASIONALLY CALCAREOUS WITH LIMESTONE FRAGMENTS (ML/CL/CH)
	DARK GRAY TO BLACK ORGANIC SILTY TO CLAYEY SAND (SM/SC)
	WEATHERED LIMESTONE
	GRAY TO BROWN FINE SAND TO FINE SAND WITH SILT (SP/SP-SM)
	GRAY TO DARK GRAY TO BROWN SILTY TO CLAYEY SAND (SM/SC)
	GRAY TO BLACK SAND TO SAND WITH SILT (SP/SP-SM)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING
N	NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCE
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD 29	NATIONAL GEODETIC VERTICAL DATUM OF 1929
	APPROXIMATE SPT BORING LOCATION
▽	GROUNDWATER TABLE

ENVIRONMENTAL CLASSIFICATION:

SUBSTRUCTURE	CONCRETE: MODERATELY AGGRESSIVE (RESISTIVITY=2,700 OHM-CM)
SUBSTRUCTURE	STEEL: MODERATELY AGGRESSIVE (RESISTIVITY=2,700 OHM-CM)
SUPERSTRUCTURE	SLIGHTLY AGGRESSIVE

SOIL TEST RESULTS:

RESISTIVITY	1,500 TO 2,700 OHM-CM
CHLORIDES	30 TO 60 PPM
SULFATES	105 TO 660 PPM
pH	7.6 TO 8.3



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS - RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	15 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

No.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: JRA
DRAWN BY: BJS
CHECKED BY: EMF

E.O.R.: ERICK M. FREDERICK, P.E.
P.E. LICENSE NUMBER 63920
TIERRA INC
7351 TEMPLE TERRACE HIGHWAY, TAMPA, FL. 33637
CERTIFICATE OF AUTHORIZATION: 6486

DATE: 12/2/2010
PROJECT NO.: 607160

MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS

SHEET NO.

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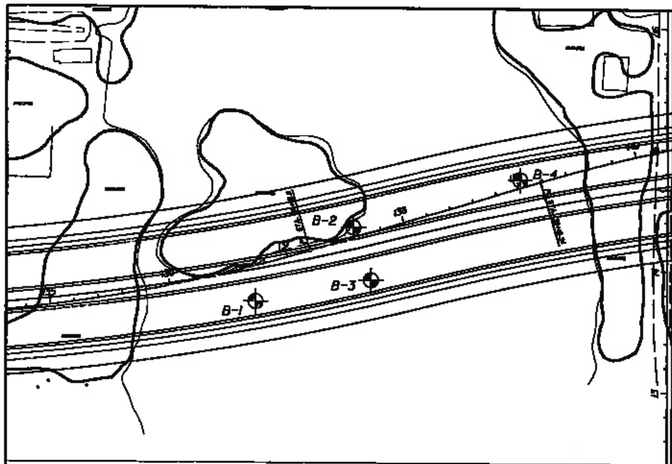


BORING LOCATION PLAN

N
0 20 100
Feet

ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: MODERATELY AGGRESSIVE (RESISTIVITY=2,200 OHM-CM)
SUBSTRUCTURE STEEL: MODERATELY AGGRESSIVE (RESISTIVITY=2,200 OHM-CM)

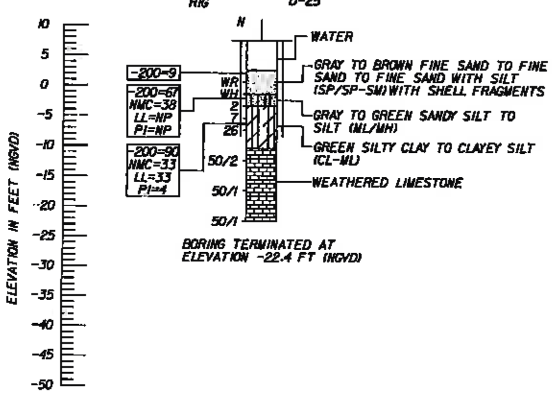
SOIL TEST RESULTS:
RESISTIVITY 6,500 OHM-CM
CHLORIDES 45 PPM
SULFATES 37.2 PPM
pH 8.2

WATER TEST RESULTS:
RESISTIVITY 2,200 OHM-CM
CHLORIDES 65 PPM
SULFATES 49.7 PPM
pH 7.8

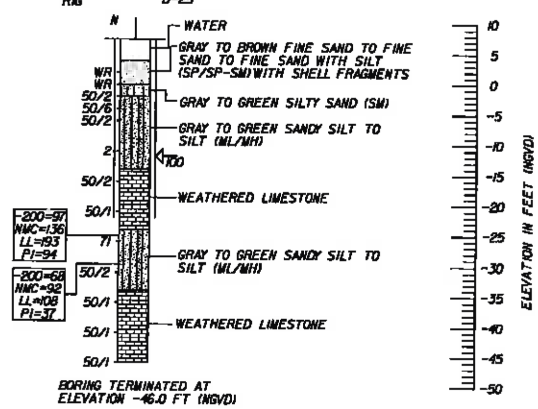
LEGEND

- GRAY TO BROWN FINE SAND TO FINE SAND TO FINE SAND WITH SILT (SP/SP-SM) WITH SHELL FRAGMENTS
- GRAY TO GREEN SILTY SAND (SM)
- GRAY TO GREEN SANDY SILT TO SILT (ML/MH)
- WEATHERED LIMESTONE
- GREEN SILTY CLAY TO CLAYEY SILT (CL-ML)
- APPROXIMATE SPT BORING LOCATION
- Ʃ GROUNDWATER TABLE
- 50/4 NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
- WH FELL UNDER WEIGHT OF ROD AND HAMMER
- WR FELL UNDER WEIGHT OF ROD
- N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
- NGVD NATIONAL GEODETIC VERTICAL DATUM OF 1929
- CASING
- 100 LOSS OF CIRCULATION OF DRILLING FLUID (%)
- -200 PERCENT PASSING #200 SIEVE
- NMC NATURAL MOISTURE CONTENT (%)
- LL LIQUID LIMIT (%)
- PI PLASTICITY INDEX (%)

BOR # B-1
STA. 136+67
OFF 27' RT
ELEV. 2.6 (MUDLINE ELEVATION)
DATE 7/30/2009
DRILLER A. TORRES
HAMMER SAFETY
RIG D-25



BOR # B-2
STA. 137+61
OFF 11' RT
ELEV. 4.0 (MUDLINE ELEVATION)
DATE 7/29/2009
DRILLER A. TORRES
HAMMER SAFETY
RIG D-25



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS-RELATIVE DENSITY	SPT (BLOWS/FT.)	SPT (BLOWS/FT.)
VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	LESS THAN 4 4 to 10 10 to 30 30 to 50 GREATER THAN 50	LESS THAN 3 3 to 8 8 to 24 24 to 40 GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT (BLOWS/FT.)	SPT (BLOWS/FT.)
VERY SOFT SOFT FIRM STIFF VERY STIFF HARD	LESS THAN 2 2 to 4 4 to 8 8 to 15 15 to 30 GREATER THAN 30	LESS THAN 1 1 to 3 3 to 6 6 to 12 12 to 24 GREATER THAN 24

NO.	REVISIONS	DATE	BY

SCALE: AS NOTED
DESIGNED BY: BJS
DRAWN BY: BJS
CHECKED BY: EMF

E.O.R.: ERICK M. FREDERICK, P.E.
P.E. LICENSE NUMBER 63920
TIERRA INC
7351 TEMPLE TERRACE HIGHWAY, TAMPA, FL. 33637
CERTIFICATE OF AUTHORIZATION: 6486

DATE: 12/2/2010
PROJECT NO.: 6071160

MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER: ERICK M. FREDERICK
FL. LICENSE NO.: 63920

REPORT OF CORE BORINGS (1)

SHEET NO.

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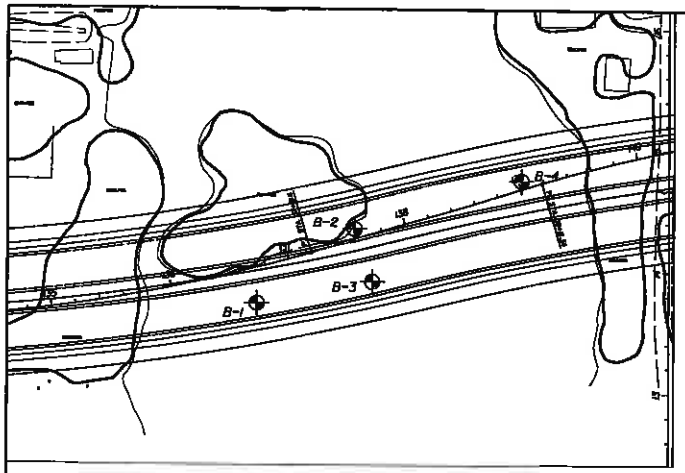
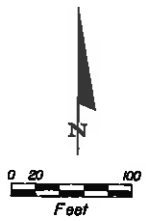




ENVIRONMENTAL CLASSIFICATION:
SUBSTRUCTURE CONCRETE: MODERATELY AGGRESSIVE (RESISTIVITY=2,200 OHM-CM)
SUBSTRUCTURE STEEL: MODERATELY AGGRESSIVE (RESISTIVITY=2,200 OHM-CM)

SOIL TEST RESULTS:

RESISTIVITY	6,500 OHM-CM
CHLORIDES	45 PPM
SULFATES	37.2 PPM
pH	8.2

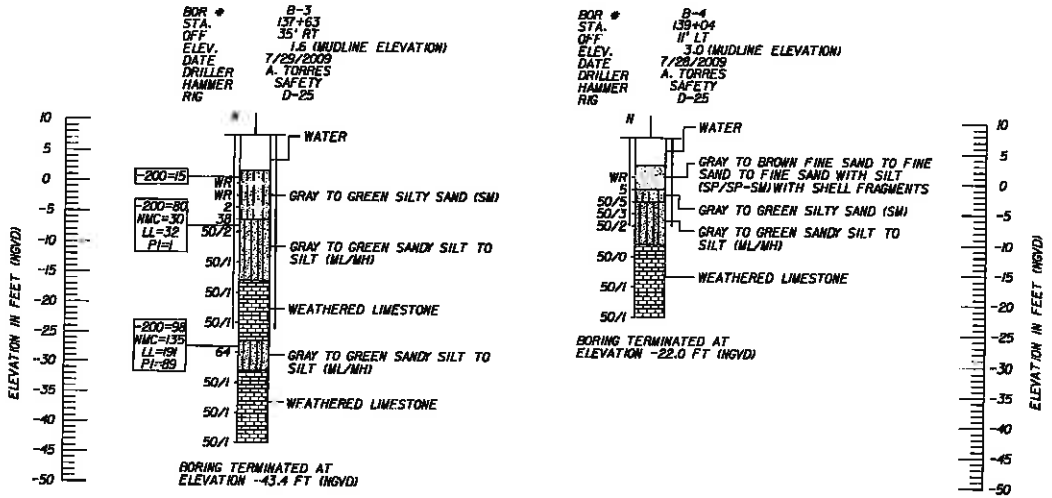
WATER TEST RESULTS:

RESISTIVITY	2,200 OHM-CM
CHLORIDES	65 PPM
SULFATES	49.7 PPM
pH	7.8

LEGEND

- GRAY TO BROWN FINE SAND TO FINE SAND TO FINE SAND WITH SILT (SP/SP-SM) WITH SHELL FRAGMENTS
- GRAY TO GREEN SILTY SAND (SM)
- GRAY TO GREEN SANDY SILT TO SILT (ML/MH)
- WEATHERED LIMESTONE
- GREEN SILTY CLAY TO CLAYEY SILT (CL-ML)
- APPROXIMATE SPT BORING LOCATION
- GROUNDWATER TABLE
- 50/4 NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
- WH FELL UNDER WEIGHT OF ROD AND HAMMER
- WR FELL UNDER WEIGHT OF ROD
- N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
- NGVD NATIONAL GEODETIC VERTICAL DATUM OF 1929
- CASING
- 100 LOSS OF CIRCULATION OF DRILLING FLUID (%)
- -200 PERCENT PASSING #200 SIEVE
- NMC NATURAL MOISTURE CONTENT (%)
- LL LIQUID LIMIT (%)
- PI PLASTICITY INDEX (%)

BORING LOCATION PLAN



	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT (BLOWS/FT.)	SPT (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT (BLOWS/FT.)	SPT (BLOWS/FT.)
VERY SOFT	LESS THAN 2	LESS THAN 1
SOFT	2 to 4	1 to 3
FIRM	4 to 8	3 to 6
STIFF	8 to 15	6 to 12
VERY STIFF	16 to 30	12 to 24
HARD	GREATER THAN 30	GREATER THAN 24

No.	REVISIONS	DATE	BY

SCALE AS NOTED
DESIGNED BY BJS
DRAWN BY BJS
CHECKED BY EMF

E.O.R.: ERICK W. FREDERICK, P.E.
P.E. LICENSE NUMBER 63920
TIERRA INC
7351 TEMPLE TERRACE HIGHWAY, TAMPA, FL. 33637
CERTIFICATE OF AUTHORIZATION: 6486

DATE 12/2/2010
PROJECT NO. 607IIGO

MANATEE COUNTY PUBLIC WORKS

DESIGN ENGINEER ERICK W. FREDERICK
FL. LICENSE NO. 63920

REPORT OF CORE BORINGS (2)

SHEET NO.

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APPENDIX B

SUMMARY OF USDA SOIL SURVEY OF MANATEE COUNTY, FLORIDA

44th Avenue East from 30th Street East to 45th Street East
Manatee County, Florida
County Project No. 6071160
Tierra Project No. 6511-09-089

USDA Map Symbol	USDA Soil Name	Depth (in)	Soil Classification Symbol		Saturated Hydraulic Conductivity (feet/day)	pH	Seasonal High Water Table	
			USCS	AASHTO			Depth (feet)	Months
5	Bradenton Fine Sand, Limestone Substratum	0-6	SP-SM	A-2-4, A-3	12-40	5.6-7.3	0-1	June- Dec.
		6-13	SM, SP-SM	A-2-4, A-3	12-40	5.6-7.3		
		13-47	SC, SC-SM, SM	A-2-4, A-2-6	2-4	6.6-7.8		
		47-51	Unweathered Bedrock[1]	Unweathered Bedrock[1]	4-40	—		
13	Chobee Loamy Fine Sand	0-8	SM, SP-SM	A-2-4	4-12	6.1-8.4	0-0.5	Jan-Dec.
		8-51	SC, SC-SM, SM	A-2-6, A-2-7, A-6, A-7	1-1	6.6-8.4		
		51-80	SC, SC-SM, SM, SP-SM	A-7, A-2-4, A-2-6, A-6	1-12	6.6-8.4		
16	Delray Complex	0-15	SC-SM, SM, SP-SM	A-2-4, A-3	12-40	5.6-7.3	0-0.5	Jan-Dec.
		15-55	SP-SM	A-2-4, A-3	12-40	5.6-7.3		
		55-80	SC, SC-SM, SM	A-2-4, A-2-6	2-12	6.6-7.8		
20	EauGallie Fine Sand, Non-Hydric	0-5	SP, SP-SM	A-3	12-40	4.5-6.0	0.5-1.5	June -Oct.
		5-28	SP, SP-SM	A-3	12-40	4.5-6.0		
		28-42	SM, SP-SM	A-2-4, A-3	2-12	4.5-6.0		
		42-50	SC, SC-SM, SM	A-2-4, A-2-6	1-4	5.6-7.8		
		50-65	SM, SP-SM	A-2-4, A-3	4-12	5.6-7.8		
	EauGallie Fine Sand, Hydric	0-5	SP, SP-SM	A-3	12-40	4.5-6.0	0-1.0	June-Oct.
		5-28	SP, SP-SM	A-3	12-40	4.5-6.0		
		28-42	SM, SP-SM	A-2-4, A-3	2-12	4.5-6.0		
		42-50	SC, SC-SM, SM	A-2-4, A-2-6	1-4	5.6-7.8		
		50-65	SM, SP-SM	A-2-4, A-3	4-12	5.6-7.8		
26	Floridan-Depressional	0-19	SM, SP-SM	A-2-4, A-3	12-40	5.6-7.8	0	Jan-Dec
		19-36	SP, SP-SM	A-3	12-40	5.6-738		
		36-63	SC, SC-SM	A-2-4, A-2-6	1-1	5.6-7.8		
		63-80	SM, SP-SM	A-2-4, A-3	12-40	5.6-7.8		
	Floridan-Immokalee	0-10	SP, SP-SM	A-3	12-40	4.5-5.5	0	Jan-Dec.
		10-34	SP, SP-SM	A-3	12-40	4.5-5.5		
		34-43	SM, SP-SM	A-2-4, A-3	2-4	4.5-5.5		
		43-80	SP, SP-SM	A-3	12-40	4.5-5.5		
	Floridan-Okeelanta	0-20	PT	A-8	12-40	5.6-8.4	0	June-Oct.
		20-54	SM, SP-SM	A-2-4, A-3	12-40	5.6-8.4		
35	Ona Fine Sand, Orstein Substrata, Non-Hydric	0-5	SP, SP-SM	A-3	12-40	4.5-6.0	0.5-1.5	June -Nov.
		5-16	SM, SP-SM	A-2-4, A-3	2-4	4.5-6.0		
		16-52	SP, SP-SM	A-3	12-40	4.5-6.0		
		52-68	SM, SP-SM	A-2-4	1-1	4.5-6.0		
		68-80	SM, SP-SM	A-2-4	1-2	4.5-6.0		
	Ona Fine Sand, Orstein Substrata, Hydric	0-5	SP, SP-SM	A-3	12-40	4.5-6.0	0-1.0	June-Nov.
		5-16	SM, SP-SM	A-2-4, A-3	2-4	4.5-6.0		
		16-52	SP, SP-SM	A-3	12-40	4.5-6.0		
		52-68	SM, SP-SM	A-2-4	1-1	4.5-6.0		
		68-80	SM, SP-SM	A-2-4	1-2	4.5-6.0		
38	Palmetto Sand	0-8	SP, SP-SM	A-2-4, A-3	12-40	3.5-5.5	0	June-Nov.
		8-25	SP, SP-SM	A-2-4, A-3	12-40	3.5-5.5		
		25-45	SP-SM	A-2-4, A-3	12-40	3.5-5.5		
		45-64	SC, SC-SM, SM	A-2-4, A-2-6	1-2	4.5-5.5		
		64-68	SM, SP-SM	A-2-4, A-3	4-12	4.5-5.5		
48	Wabasso Fine Sand, Non-Hydric	0-7	SP, SP-SM	A-3	12-40	4.5-7.3	0.5-1.5	June-Oct.
		7-21	SP, SP-SM	A-3	12-40	4.5-7.3		
		21-31	SM, SP-SM	A-2-4, A-3	2-12	4.5-7.3		
		31-37	SP, SP-SM	A-3	12-40	5.6-7.8		
		37-65	SC, SC-SM	A-2-4, A-2-6	1-1	5.6-7.8		
		65-80	SM, SP-SM	A-2-4,A-3	12-40	5.6-7.8		
	Wabasso Fine Sand, Hydric	0-7	SP, SP-SM	A-3	12-40	4.5-7.3	0-1.0	June-Oct.
		7-21	SP, SP-SM	A-3	12-40	4.5-7.3		
		21-31	SM, SP-SM	A-2-4, A-3	2-12	4.5-7.3		
		31-37	SP, SP-SM	A-3	12-40	5.6-7.8		
		37-65	SC, SC-SM	A-2-4, A-2-6	1-1	5.6-7.8		
		65-80	SM, SP-SM	A-2-4,A-3	12-40	5.6-7.8		

[1] USCS and AASHTO soil classification does not include a symbol for Unweathered Bedrock.

SUMMARY OF SEASONAL HIGH GROUNDWATER TABLE ESTIMATES (ROADWAY BORINGS)

44th Avenue East from 30th Street East to 45th Street East

Manatee County, Florida

County Project No. 6071160

Tierra Project No. 6511-09-089

Boring Name	Boring Location[1] (B/L Survey SR 55)		Boring Depth	Date Recorded	Approximate Ground Elevation[1]	Measured Groundwater Table		USDA Soil Survey Information		Estimated SHGWT[4]	
	Station (feet)	Offset (feet)	(feet)		(feet, NGVD)	Depth[2] (feet)	Elevation (feet, NGVD)	Map Symbol	Estimated SHGWT Depth[3] (feet)	Depth (feet)	Elevation (feet, NGVD)
Roadway Borings											
AB - 100R	100 + 46	25 RT	5.0	10/19/2009	30.9	3.5	27.4	20	0.0-1.5	1.5	29.4
AB - 105L	104 + 98	25 LT	5.0	10/19/2009	29.9	2.5	27.4	20	0.0-1.5	1.0	28.9
AB - 110R	110 + 01	22 RT	5.0	10/19/2009	28.6	2.5	26.1	35	0.0-1.5	1.0	27.6
AB - 115L	115 + 34	33 LT	5.0	10/19/2009	25.2	3.5	21.7	20	0.0-1.5	1.5	23.7
AB - 120R	119 + 95	27 RT	5.0	10/19/2009	18.1	GNA[5]	GNA[5]	20	0.0-1.5	0.0[6]	18.0[6]
AB - 125L	124 + 91	17 LT	4.0	10/29/2009	8.3	GNA[5]	GNA[5]	13	0.0-0.5	AGS[6]	AGS[6]
AB - 130R	130 + 06	34 RT	5.0	10/29/2009	11.8	3.5	8.3	5	0.0-1.0	1.0	10.8
AB - 135L	134 + 89	23 LT	5.0	10/29/2009	12.4	GNA[5]	GNA[5]	5	0.0-1.0	1.0	11.4
AB - 140R	140 + 03	32 RT	5.0	10/29/2009	14.4	GNA[5]	GNA[5]	16/48	0.0-1.5	1.5	12.9
AB - 145L	145 + 01	31 LT	5.0	10/29/2009	14.8	4.5	10.3	48	0.0-1.5	1.5	13.3
AB - 150R	149 + 99	18 RT	5.0	10/29/2009	15.8	3.0	12.8	20	0.0-1.5	1.5	14.3
AB - 155L	155 + 29	5 LT	5.0	10/29/2009	15.8	3.5	12.3	20	0.0-1.5	1.5	14.3
AB - 160R	159 + 95	41 RT	5.0	10/29/2009	15.7	3.5	12.2	20/48	0.0-1.5	1.5	14.2
AB - 165L	164 + 95	27 LT	5.0	10/29/2009	16.0	3.5	12.5	48/20	0.0-1.5	1.5	14.5

[1] Roadway boring locations and elevations were obtained from the Project Surveyor (McKim & Creed).

[2] Depth below existing grades at time of augering.

[3] Seasonal high groundwater table depth estimated based on the Manatee County, Florida USDA Soil Survey information

[4] Seasonal high groundwater table depth estimated based on soil stratigraphy, measured groundwater levels from the borings, the Manatee County, Florida USDA Soil Survey information and past experience with similar soil conditions.

[5] Groundwater table depth and elevation not apparent at the time of augering due to the presence of clayey soils.

[6] Seasonal High Groundwater Table at ground surface due to perched conditions atop clayey soils. Recommended that SHGWT can be evaluated by project biologist utilizing biological indicators.

APPENDIX C

SUMMARY OF SOIL CLASSIFICATION LABORATORY TEST RESULTS

44th Avenue East from 30th Street East to 45th Street East

Manatee County, Florida

County Project No. 6071160

Tierra Project No. 6511-09-089

Boring Name	Sample Depth (ft)	Stratum Number	AASHTO Symbol	Sieve Analysis								Atterberg Limits			Organic Content (%)	Natural Moisture Content (%)
				3/4"	3/8"	#4	#10	#40	#60	#100	#200	Liquid Limit	Plastic Limit	Plasticity Index		
Roadway																
AB-100R	3.0 - 3.5	1	A-3	—	—	—	100	92	76	42	4	—	—	—	—	—
AB-104R	0.0 2.0	1	A-3	—	—	100	100	93	78	45	4	—	—	—	—	—
AB-130 R	1.0 - 1.5	1	A-3	—	—	—	—	—	—	—	5	—	—	—	—	—
AB-144R	0.0 2.0	1	A-3	—	—	97	90	83	70	40	6	—	—	—	—	—
AB-145 L	2.5 - 3.0	1	A-3	—	—	—	—	—	—	—	5	—	—	—	—	—
AB-163L	0.0 2.0	1	A-3	—	—	97	92	87	70	34	3	—	—	—	—	—
AB-165 L	2.5 - 3.0	1	A-3	—	—	—	—	—	—	—	8	—	—	—	—	—
B-1	0.0 - 2.0	2	A-3	100	93	86	74	63	53	35	9	—	—	—	—	—
AB-160 R	1.0 - 2.0	2	A-1-b	76	68	62	54	48	39	21	4	—	—	—	—	—
AB-120R	4.5 - 5.0	3	A-2-6	—	—	—	100	89	79	59	33	34	19	15	—	32
AB-122R	3.0 - 4.5	3	A-2-4	—	—	—	—	—	—	—	16	—	—	—	—	18
AB-134R	3.5 - 5.0	3	A-2-4	—	—	—	—	—	—	—	31	20	14	6	—	18
AB-135 L	1.0 - 2.0	3	A-2-4	96	95	93	80	72	62	47	30	—	—	—	—	18
B-3	0.0 - 2.0	3	A-2-4	—	—	—	100	91	80	52	15	—	—	—	—	—
AB-153 L	2.0 - 3.0	3	A-2-4	—	—	—	—	—	—	—	19	—	—	—	—	—
AB-157 L	3.5 - 4.5	3	A-2-4	—	—	—	—	—	—	—	17	—	—	—	—	80
AB-165 L	3.5 - 4.0	3	A-2-4	—	—	—	—	—	—	—	19	24	17	7	—	21
AB-115L	0.0 - 0.5	4	A-7-6	—	—	—	100	92	82	65	46	45	22	23	—	35
AB-120R	0.0 - 0.5	4	A-7-6	—	—	—	100	89	80	61	44	46	23	23	—	25
WB - 126 L	2.0 - 4.0	4	A-6	—	—	—	—	—	—	—	60	35	21	14		35
AB-126R	1.0 - 2.0	4	A-6	—	—	—	—	—	—	—	81	32	23	9	2	35
B-1	4.0 - 6.0	4	A-4	—	—	—	—	—	—	—	67	NP	NP	NP	—	38
B-1	8.0 - 10.0	4	A-4	—	—	—	—	—	—	—	90	33	29	4	—	33
B-3	8.0 - 10.0	4	A-4	—	—	—	—	—	—	—	80	32	31	1	—	30
WB - 122 L	0.0 - 0.5	5	A-8	—	—	—	—	—	—	—	11	—	—	—	10	63
AB-125 L	0.0 - 0.5	5	A-8	—	—	—	—	—	—	—	13	—	—	—	12	67
AB-125 L	1.0 - 1.5	5	A-8	—	—	—	—	—	—	—	32	38	18	20	5	30
WB - 126 L	0.0 - 2.0	5	A-8	—	—	—	—	—	—	—	40	—	—	—	8	35
Culv-126+40	0.0 - 2.0	5	A-8	—	—	—	—	—	—	—	29	—	—	—	5	31
Culv-126+40	2.0 - 4.0	5	A-8	—	—	—	—	—	—	—	26	—	—	—	5	29
AB-126R	2.5 - 5.0	5	A-8	—	—	—	—	—	—	—	30	38	19	19	5	27
AB-127L	2.0 - 4.0	5	A-8	—	—	—	—	—	—	—	36	34	16	18	7	27

SUMMARY OF SOIL CLASSIFICATION LABORATORY TEST RESULTS

44th Avenue East from 30th Street East to 45th Street East

Manatee County, Florida

County Project No. 6071160

Tierra Project No. 6511-09-089

Boring Name	Sample Depth (ft)	Stratum Number	AASHTO Symbol	Sieve Analysis								Atterberg Limits			Organic Content (%)	Natural Moisture Content (%)
				3/4"	3/8"	#4	#10	#40	#60	#100	#200	Liquid Limit	Plastic Limit	Plasticity Index		
Ponds (provided to support the Roadway Soil Survey Sheet)																
AB - 5	1.5 - 2.0	1	A-3	—	—	—	—	—	—	—	9	—	—	—	2	23
AB - 14	0.0 - 2.0	1	A-3	—	—	—	—	—	—	—	2	—	—	—	—	—
AB - 17	1.0 - 2.0	1	A-2-4	—	—	—	—	—	—	—	10	—	—	—	—	—
PB - 4	4.0 - 6.0	1	A-3	100	99	98	92	79	65	37	5	—	—	—	—	—
PB - 5	0.5 - 1.0	1	A-3	—	—	—	—	—	—	—	10	—	—	—	2	22
PB - 5	2.5 - 3.0	1	A-3	—	—	—	—	—	—	—	8	—	—	—	—	—
PB - 12	2.0 - 4.0	1	A-3	—	—	—	—	—	—	—	4	—	—	—	—	—
PB - 12	8.0 - 10.0	1	A-3	—	—	—	100	87	72	39	3	—	—	—	—	—
PB - 14	6.0 - 8.0	1	A-3	—	—	—	—	—	—	—	3	—	—	—	—	—
AB - 1	2.0 - 4.0	2	A-1-b	76	63	58	52	43	36	25	15	—	—	—	—	—
AB - 18	1.0 - 2.0	2	A-1-b	100	94	80	58	49	39	22	7	—	—	—	—	—
PB - 6	4.0 - 6.0	2	A-3	100	98	92	77	56	46	27	5	—	—	—	—	—
AB - 2	3.0 - 3.5	3	A-2-4	—	—	—	100	87	73	46	16	—	—	—	—	—
AB - 14	2.0 - 4.0	3	A-2-4	—	—	—	—	—	—	—	19	NP	NP	NP	—	23
PB - 1	2.0 - 4.0	3	A-2-4	—	—	—	—	—	—	—	18				2	23
PB - 2	4.0 - 6.0	3	A-2-4	—	—	—	100	94	81	50	20	NP	NP	NP	—	27
PB - 14	2.0 - 4.0	3	A-2-4	—	—	—	—	—	—	—	15	NP	NP	NP	—	—
AB - 2	5.5 - 6.0	4	A-4	—	—	—	—	—	—	—	85	—	—	—	—	—
PB - 1	0.0 - 2.0	4	A-4	—	—	—	—	—	—	—	38	NP	NP	NP	—	17
PB - 3	4.0 - 6.0	4	A-4	—	—	—	—	—	—	—	50	23	15	8	—	24
PB - 12	13.0 - 15.0	4	A-4	—	—	—	—	—	—	—	87	NP	NP	NP	—	37

SUMMARY OF ENVIRONMENTAL CLASSIFICATION LABORATORY TEST RESULTS

40th Avenue East from 30th Street East to 45th Street East

Manatee County, Florida

County Project No. 6071160

Tierra Project No. 6511-09-089

Boring Name	Boring Location C/L Const. 44th Ave.		Sample Depth (ft)	Stratum Number	AASHTO Symbol	pH	Chlorides (ppm)	Sulfates (ppm)	Resistivity (ohm-cm)	Substructure Environmental Classifications[1] (Soil)		Substructure Environmental Classifications[1] (Water)	
	Station (feet)	Offset (feet)								Steel	Concrete	Steel	Concrete
Roadway													
AB-104R(LBR#01)	104 + 00	30 RT	0.0 - 2.0	1	A-3	6.4	30	<4.8	32,000	Moderately Aggressive	Slightly Aggressive	—	—
AB-144R(LBR#03)	144 + 00	30 RT	0.0 - 2.0	1	A-3	5.9	15	<4.8	62,000	Extremely Aggressive	Moderately Aggressive	—	—
AB-163L(LBR#04)	163 + 00	25 LT	0.0 - 2.0	1	A-3	6.9	15	<4.8	28,000	Moderately Aggressive	Slightly Aggressive	—	—
AB-125L(LBR#02)	124 + 91	17 LT	0.0 - 2.0	3	A-2-4	7.8	15	<4.8	49,000	Slightly Aggressive	Slightly Aggressive	—	—
B-3	137 + 63	35 RT	2.0 - 4.0	3	A-2-4/A-2-6	8.2	45	37	6,500	Slightly Aggressive	Slightly Aggressive	—	—
Culv-126+40	126 + 00	22 RT	6.0 - 10.0	4	A-4	7.6	30	660	1,500	Moderately Aggressive	Moderately Aggressive	—	—
WB-127R	127 20	63 RT	6.0 10.0	4	A-4/A-6/A-7-6	8.3	60	105	2,700	Moderately Aggressive	Moderately Aggressive	—	—
Water Sample	Seller's Pit		NA	NA	NA	7.8	65	50	2,200	NA	NA	Moderately Aggressive	Moderately Aggressive
Ponds													
PB-1	132 35	180 LT	4.0 - 6.0	2	A-1-b/A-3/A-2-4	8	30	101	3,200	Moderately Aggressive	Slightly Aggressive	—	—
PB-5	133 43	243 RT	6.0 - 8.0	2	A-1-b/A-3/A-2-4	7.7	30	288	2,700	Moderately Aggressive	Moderately Aggressive	—	—

[1] As per Table 1.1a "Criteria for Substructure Environmental Classifications" of the January 2009 FDOT Structures Manual Vol. 1 Structures Design Guidelines.

TIERRA INC.

RESULTS OF LIMEROCK BEARING RATIO TEST

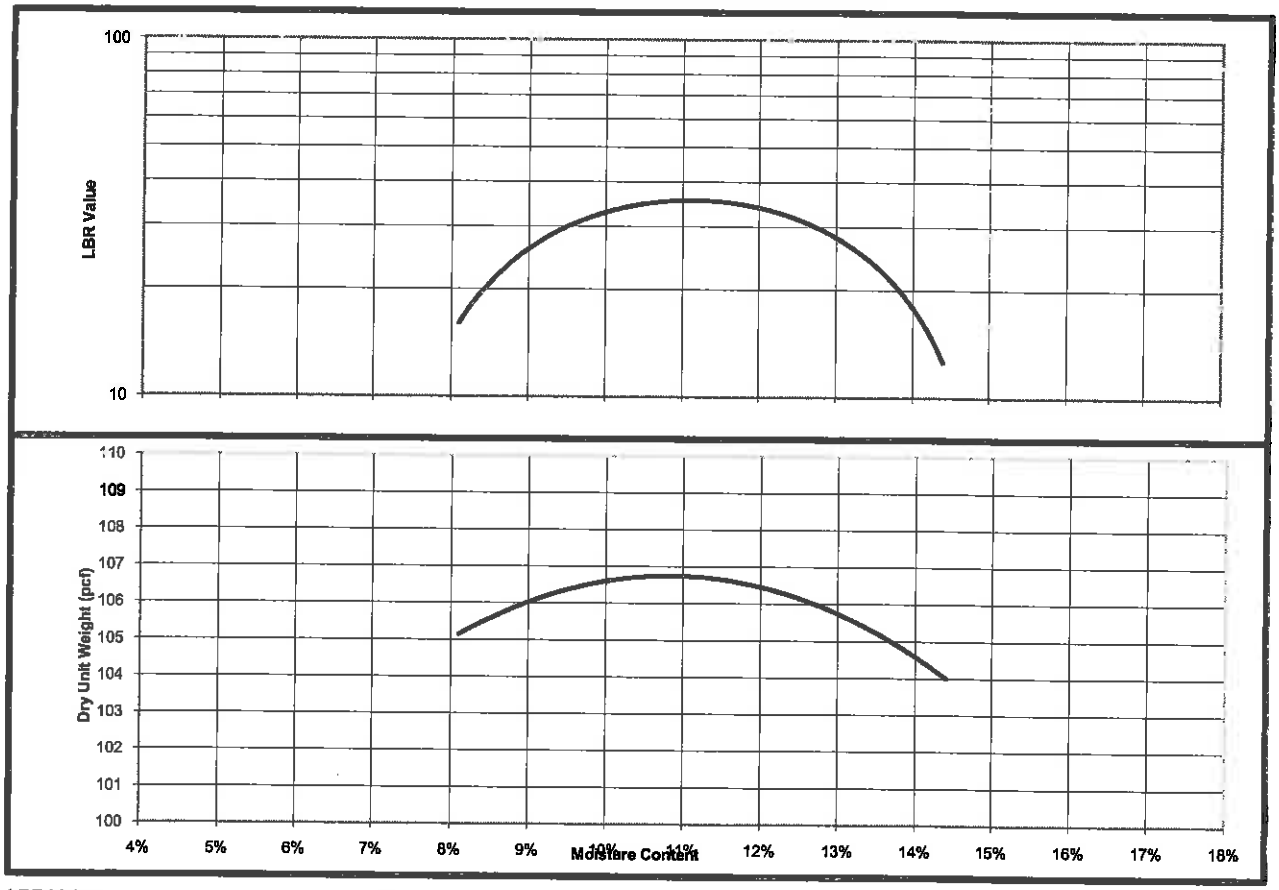
Tested For: HDR Engineering, Inc.

Project: 44th Ave. from 30th to 45th Street
Manatee County, FL

Date: 11/9/2009

Project No. 6511-09-089
Report No. LBR #01

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value	36
Maximum Density	107 pcf
Optimum Moisture	11 %
Test Method:	FSTM FM 5-515 (15 lb Surcharge)
Tested By:	C. Maikoski

Description:
Gray Fine Sand (A-3)

Sample Location:

Sample Depth:
0.0 - 2.0'

Corrosion Test Results	
pH	6.4
Resistivity (ohm-cm)	32,000
Chlorides (ppm)	30
Sulfates (ppm)	< 4.8
Slightly Aggressive	

Grain Size Distribution

Percent Passing Standard Sieve Sizes					
#4	#10	#40	#60	#100	#200
100	100	93	78	45	4.2

TIERRA INC.

RESULTS OF LIMEROCK BEARING RATIO TEST

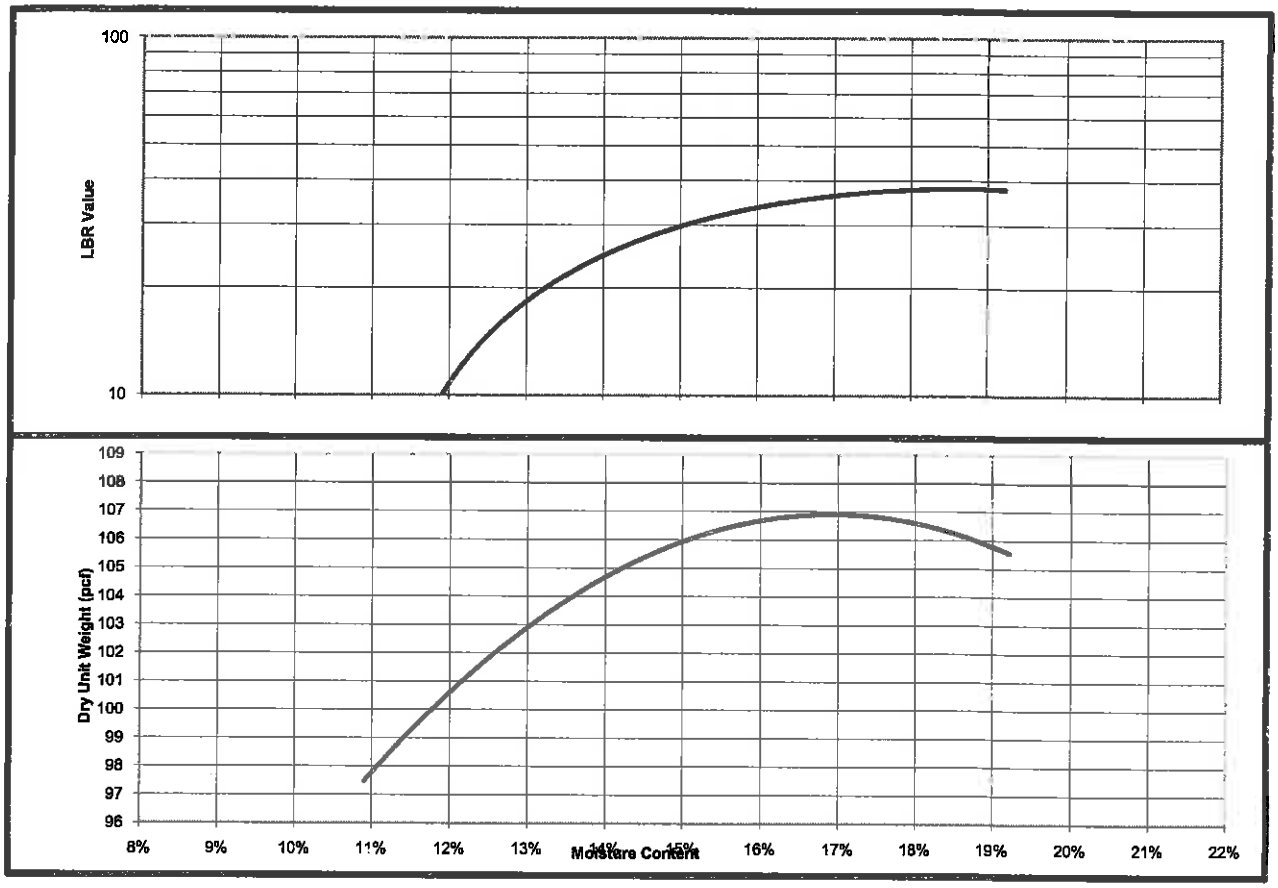
Tested For: HDR Engineering, Inc.

Project: 44th Ave. from 30th to 45th Street
Manatee County, FL

Date: 11/9/2009

Project No. 6511-09-089
Report No. LBR #02

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value	38
Maximum Density	107 pcf
Optimum Moisture	17 %
Test Method:	FSTM FM 5-515 (15 lb Surcharge)
Tested By:	C. Maikoski

Description:
Dark Brown Silty Fine Sand (A-2-4)
with Organic Material
Sample Location:

Sample Depth:
0.0 - 2.0'

Corrosion Test Results	
pH	7.8
Resistivity (ohm-cm)	49,000
Chlorides (ppm)	15
Sulfates (ppm)	< 4.8
Slightly Aggressive	

Grain Size Distribution

Percent Passing Standard Sieve Sizes

#4	#10	#40	#60	#100	#200
100	100	90	73	44	17.6

TIERRA INC.

RESULTS OF LIMEROCK BEARING RATIO TEST

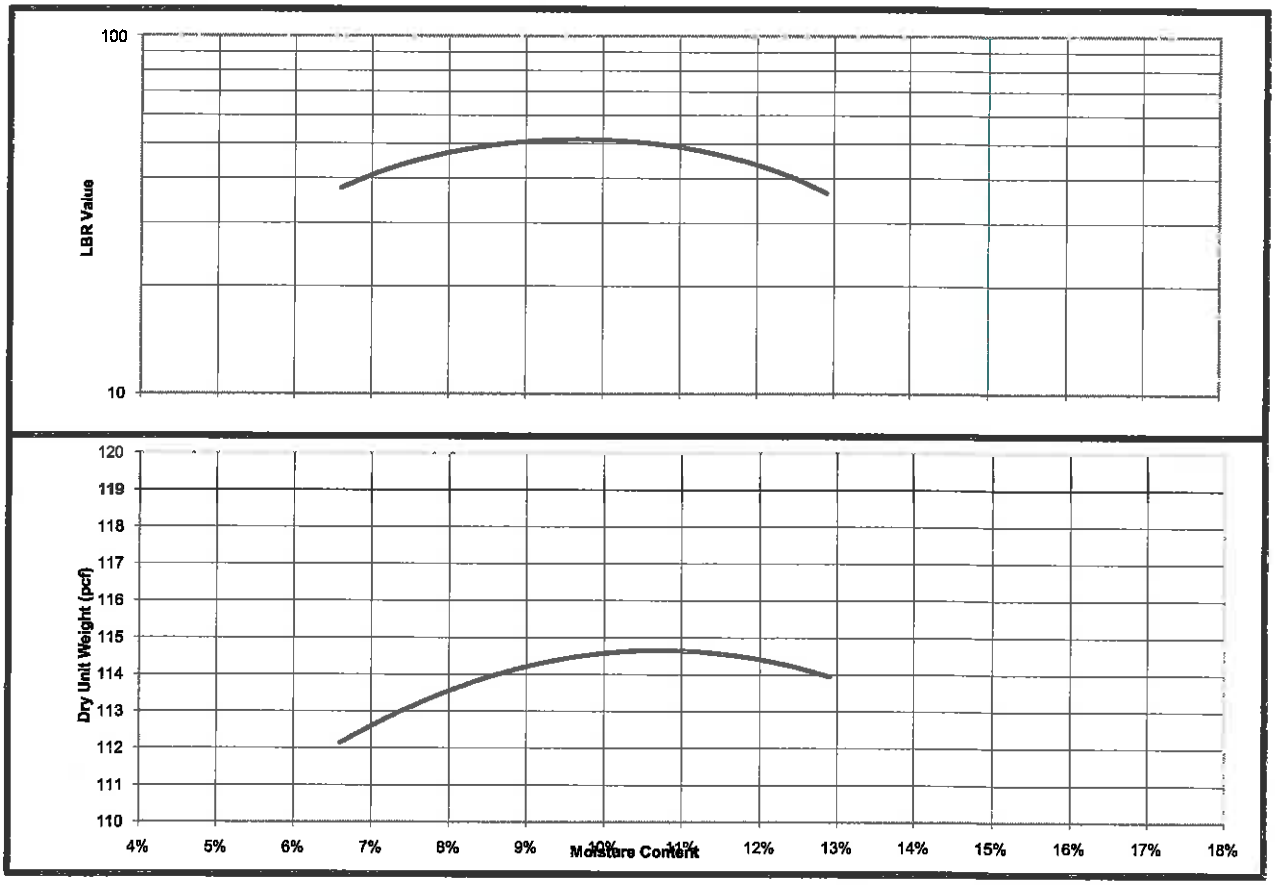
Tested For: HDR Engineering, Inc.

Project: 44th Ave. from 30th to 45th Street
Manatee County, FL

Date: 11/9/2009

Project No. 6511-09-089
Report No. LBR #03

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value	52
Maximum Density	115 pcf
Optimum Moisture	11 %
Test Method:	FSTM FM 5-515 (15 lb Surcharge)
Tested By:	C. Malkoski

Description:
Gray-Brown Slightly Silty Fine Sand (A-3)
with Shell Fragments
Sample Location:

Sample Depth:
0.0 - 2.0'

Corrosion Test Results	
pH	5.9
Resistivity (ohm-cm)	62,000
Chlorides (ppm)	15
Sulfates (ppm)	< 4.8
Moderately Aggressive	

Grain Size Distribution

Percent Passing Standard Sieve Sizes						
#4	#10	#40	#60	#100	#200
97	90	83	70	40	6.4

TIERRA INC.

RESULTS OF LIMEROCK BEARING RATIO TEST

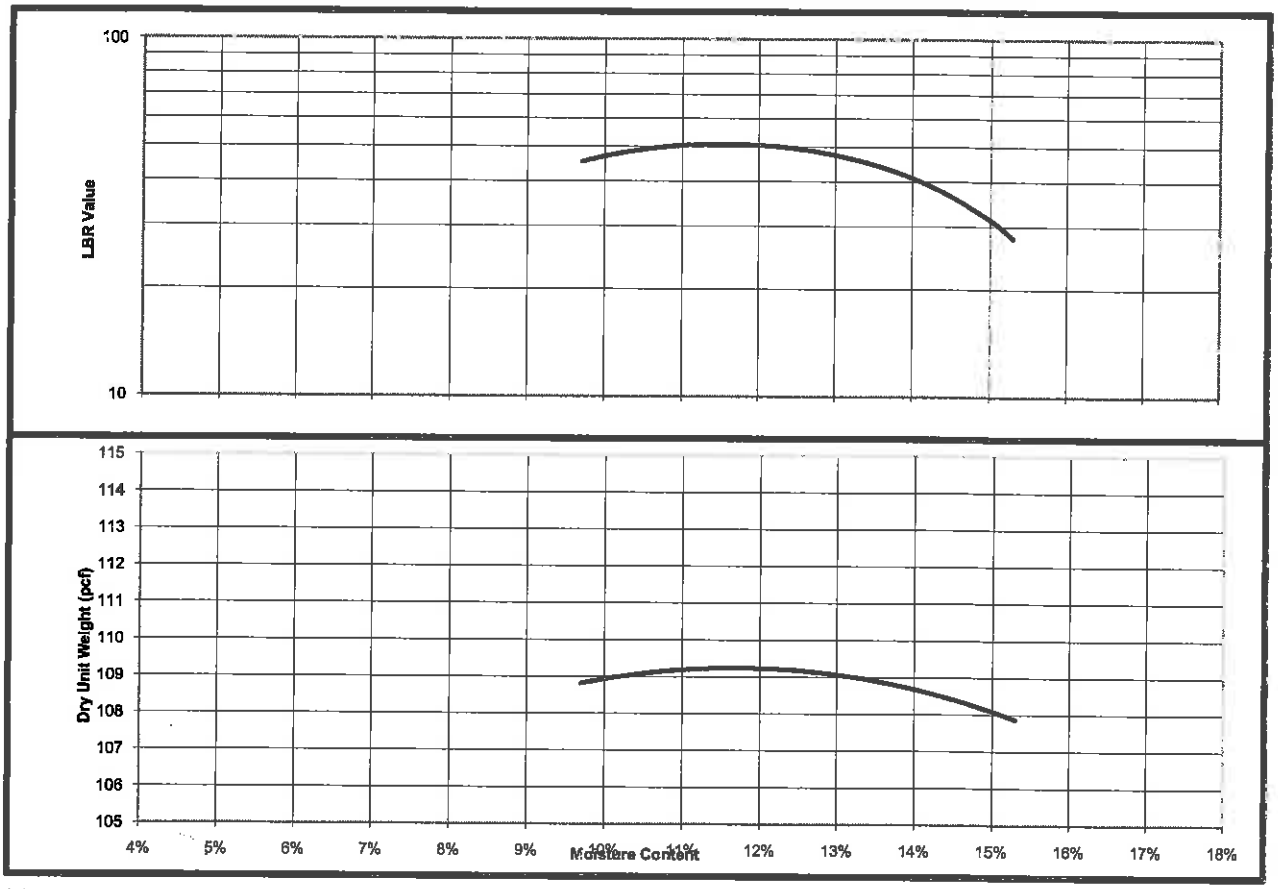
Tested For: HDR Engineering, Inc.

Project: 44th Ave. from 30th to 45th Street
Manatee County, FL

Date: 11/9/2009

Project No. 6511-09-089
Report No. LBR #04

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value	51
Maximum Density	109 pcf
Optimum Moisture	12 %
Test Method:	FSTM FM 5-515 (15 lb Surcharge)
Tested By:	C. Maikoski

Description:
Gray-Brown Slightly Silty Fine Sand (A-3) with Shell Fragments

Sample Location:

Sample Depth:
0.0 - 2.0'

Corrosion Test Results	
pH	6.9
Resistivity (ohm-cm)	28,000
Chlorides (ppm)	15
Sulfates (ppm)	< 4.8
Slightly Aggressive	

Grain Size Distribution						
Percent Passing Standard Sieve Sizes						
#4	#10	#40	#60	#100	#200	
97	92	87	70	34	3.1	

APPENDIX D

44th Ave Extension Causeway Option

PROJECT IDENTIFICATION

Title:	44th Ave Extension Causeway Option
Project Number:	Tierra Project No.:6511-09-089 -
Client:	HDR Engineering, Inc.
Designer:	Tierra, Inc. (JRA)
Station Number:	125+00

Description:
Settlement Analysis Using SPT Boring WB-125R

Company's information:

Name:	Tierra, Inc.
Street:	7351 Temple Terrace Highway Tampa, Fl 33637
Telephone #:	813-989-1354
Fax #:	
E-Mail:	

Original file path and name: J:\6511\20 ..... \6511-09-089 44th Ave\FoSSA\2D 125+00._WB-125R.2ST
Original date and time of creating this file: Wed Sep 09 11:02:25 2009

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 3 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	110.00	0.30	SP/SP-SM (Very Loose)
2	115.00	0.40	ML/CL/CH (Firm)
3	125.00	0.45	ML/CL/CH(Stiff to Very Stiff) / Refusal Limestone

INPUT DATA – EMBANKMENT LAYERS – 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	105.00	Fill Material

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	100.00	99.00

INPUT DATA FOR CONSOLIDATION — $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.15	0.01	1.40	0.2000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	100.00	0.00	1	216000	0.3000	0.0001	100.00	100.00	0.00
			2	720000	0.4000	0.0001			
			3	1152000	0.4500	0.0004			
2	113.33	0.00	1	216000	0.3000	0.0139	100.00	99.98	0.02
			2	720000	0.4000	0.0033			
			3	1152000	0.4500	0.0032			
3	126.67	0.00	1	216000	0.3000	0.0132	100.00	99.98	0.02
			2	720000	0.4000	0.0030			
			3	1152000	0.4500	0.0034			
4	140.00	0.00	1	216000	0.3000	0.0129	100.00	99.98	0.02
			2	720000	0.4000	0.0027			
			3	1152000	0.4500	0.0031			
5	153.33	0.00	1	216000	0.3000	0.0127	100.00	99.98	0.02
			2	720000	0.4000	0.0026			
			3	1152000	0.4500	0.0029			
6	166.67	0.00	1	216000	0.3000	0.0125	100.00	99.98	0.02
			2	720000	0.4000	0.0026			
			3	1152000	0.4500	0.0028			
7	180.00	0.00	1	216000	0.3000	0.0124	100.00	99.98	0.02
			2	720000	0.4000	0.0026			
			3	1152000	0.4500	0.0029			
8	193.33	0.00	1	216000	0.3000	0.0123	100.00	99.98	0.02
			2	720000	0.4000	0.0027			
			3	1152000	0.4500	0.0030			
9	206.67	0.00	1	216000	0.3000	0.0124	100.00	99.98	0.02
			2	720000	0.4000	0.0029			
			3	1152000	0.4500	0.0030			
10	220.00	0.00	1	216000	0.3000	0.0058	100.00	99.99	0.01
			2	720000	0.4000	0.0011			
			3	1152000	0.4500	0.0010			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	100.00	0.00	100.00	0.07	99.93
2	113.33	0.00	100.00	0.15	99.85
3	126.67	0.00	100.00	0.16	99.84
4	140.00	0.00	100.00	0.16	99.84
5	153.33	0.00	100.00	0.15	99.85
6	166.67	0.00	100.00	0.15	99.85
7	180.00	0.00	100.00	0.15	99.85
8	193.33	0.00	100.00	0.15	99.85
9	206.67	0.00	100.00	0.15	99.85
10	220.00	0.00	100.00	0.09	99.91

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	100.00	100.00	SP/SP-SM (Very Loose)
2	1	100.00	95.00	ML/CL/CH (Firm)
3	1	100.00	90.00	ML/CL/CH(Stiff to Very Stiff) / Refusal Limestone

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 100.00 [ft]	1	100.00	100.00	Fill Material
	X2 = 220.00 [ft]	2	100.00	105.00	
		3	106.00	109.00	
		4	220.00	108.00	
		5	220.00	103.00	

44th Ave Extension Causeway Option

PROJECT IDENTIFICATION

Title:	44th Ave Extension Causeway Option
Project Number:	Tierra Project No.:6511-09-089 -
Client:	HDR Engineering, Inc.
Designer:	Tierra, Inc. (JRA)
Station Number:	135+00

Description:
Settlement Analysis Using SPT Boring B-1

Company's information:

Name:	Tierra, Inc.
Street:	7351 Temple Terrace Highway Tampa, Fl 33637
Telephone #:	813-989-1354
Fax #:	
E-Mail:	

Original file path and name: J:\6511\20 ..... iles\6511-09-089 44th Ave\FoSSA\2D_135+00._B-1.2ST
Original date and time of creating this file: Wed Sep 09 11:02:25 2009

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 4 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	100.00	0.20	SP/SP-SM (Very Loose)
2	115.00	0.30	ML/MH (Firm)
3	125.00	0.45	CL-ML (Very Stiff)
4	135.00	0.50	Weathered Limestone (Hard)

INPUT DATA – EMBANKMENT LAYERS – 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	105.00	Fill Material

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	100.00	99.00

INPUT DATA FOR CONSOLIDATION — $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.21	0.02	1.10	0.2000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	100.00	0.00	1	216000	0.2000	0.0001	100.00	100.00	0.00
			2	720000	0.3000	0.0000			
			3	1152000	0.4500	-0.0000			
			4	2016000	0.5000	-0.0001			
2	112.78	0.00	1	216000	0.2000	0.0020	100.00	100.00	0.00
			2	720000	0.3000	0.0007			
			3	1152000	0.4500	0.0001			
			4	2016000	0.5000	0.0001			
3	125.56	0.00	1	216000	0.2000	0.0027	100.00	100.00	0.00
			2	720000	0.3000	0.0009			
			3	1152000	0.4500	0.0002			
			4	2016000	0.5000	0.0001			
4	138.33	0.00	1	216000	0.2000	0.0034	100.00	100.00	0.00
			2	720000	0.3000	0.0012			
			3	1152000	0.4500	0.0002			
			4	2016000	0.5000	0.0002			
5	151.11	0.00	1	216000	0.2000	0.0041	100.00	99.99	0.01
			2	720000	0.3000	0.0014			
			3	1152000	0.4500	0.0003			
			4	2016000	0.5000	0.0003			
6	163.89	0.00	1	216000	0.2000	0.0048	100.00	99.99	0.01
			2	720000	0.3000	0.0017			
			3	1152000	0.4500	0.0003			
			4	2016000	0.5000	0.0004			
7	176.67	0.00	1	216000	0.2000	0.0055	100.00	99.99	0.01
			2	720000	0.3000	0.0020			
			3	1152000	0.4500	0.0004			
			4	2016000	0.5000	0.0005			
8	189.44	0.00	1	216000	0.2000	0.0062	100.00	99.99	0.01
			2	720000	0.3000	0.0023			
			3	1152000	0.4500	0.0005			
			4	2016000	0.5000	0.0006			
9	202.22	0.00	1	216000	0.2000	0.0070	100.00	99.99	0.01
			2	720000	0.3000	0.0026			
			3	1152000	0.4500	0.0006			
			4	2016000	0.5000	0.0005			
10	215.00	0.00	1	216000	0.2000	0.0002	100.00	100.00	0.00
			2	720000	0.3000	0.0002			
			3	1152000	0.4500	0.0000			
			4	2016000	0.5000	0.0000			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	100.00	0.00	100.00	0.02	99.98
2	112.78	0.00	100.00	0.08	99.92
3	125.56	0.00	100.00	0.10	99.90
4	138.33	0.00	100.00	0.12	99.88
5	151.11	0.00	100.00	0.14	99.86
6	163.89	0.00	100.00	0.16	99.84
7	176.67	0.00	100.00	0.18	99.82
8	189.44	0.00	100.00	0.19	99.81
9	202.22	0.00	100.00	0.20	99.80
10	215.00	0.00	100.00	0.06	99.94

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	100.00	100.00	SP/SP-SM (Very Loose)
2	1	100.00	96.00	ML/MH (Firm)
3	1	100.00	90.00	CL-ML (Very Stiff)
4	1	100.00	87.00	Weathered Limestone (Hard)

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 100.00 [ft]	1	100.00	100.00	Fill Material
	X2 = 215.00 [ft]	2	106.00	101.00	
		3	206.00	104.50	
		4	215.00	100.00	

44th Ave Extension Causeway Option

PROJECT IDENTIFICATION

Title:	44th Ave Extension Causeway Option
Project Number:	Tierra Project No.:6511-09-089 -
Client:	HDR Engineering, Inc.
Designer:	Tierra, Inc. (JRA)
Station Number:	135+60

Description:
Settlement Analysis Using SPT Boring B-1

Company's information:

Name:	Tierra, Inc.
Street:	7351 Temple Terrace Highway Tampa, Fl 33637
Telephone #:	813-989-1354
Fax #:	
E-Mail:	

Original file path and name: J:\6511\20 ..... iles\6511-09-089 44th Ave\FoSSA\2D_135+60._B-1.2ST
Original date and time of creating this file: Wed Sep 09 11:02:25 2009

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 4 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	100.00	0.20	SP/SP-SM (Very Loose)
2	115.00	0.30	ML/MH (Firm)
3	125.00	0.45	CL-ML (Very Stiff)
4	135.00	0.50	Weathered Limestone (Hard)

INPUT DATA – EMBANKMENT LAYERS – 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	105.00	Fill Material

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	100.00	101.00

INPUT DATA FOR CONSOLIDATION — $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.21	0.02	1.10	0.2000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	100.00	0.00	1	216000	0.2000	0.0009	100.00	100.00	0.00
			2	720000	0.3000	0.0003			
			3	1152000	0.4500	-0.0001			
			4	2016000	0.5000	-0.0003			
2	117.56	0.00	1	216000	0.2000	0.0164	98.01	97.98	0.02
			2	720000	0.3000	0.0032			
			3	1152000	0.4500	0.0006			
			4	2016000	0.5000	0.0024			
3	135.11	0.00	1	216000	0.2000	0.0184	97.11	97.08	0.03
			2	720000	0.3000	0.0041			
			3	1152000	0.4500	0.0008			
			4	2016000	0.5000	0.0041			
4	152.67	0.00	1	216000	0.2000	0.0190	96.58	96.55	0.03
			2	720000	0.3000	0.0046			
			3	1152000	0.4500	0.0009			
			4	2016000	0.5000	0.0052			
5	170.22	0.00	1	216000	0.2000	0.0192	96.05	96.02	0.03
			2	720000	0.3000	0.0053			
			3	1152000	0.4500	0.0010			
			4	2016000	0.5000	0.0062			
6	187.78	0.00	1	216000	0.2000	0.0203	95.53	95.49	0.03
			2	720000	0.3000	0.0060			
			3	1152000	0.4500	0.0013			
			4	2016000	0.5000	0.0069			
7	205.33	0.00	1	216000	0.2000	0.0196	95.00	94.97	0.03
			2	720000	0.3000	0.0065			
			3	1152000	0.4500	0.0014			
			4	2016000	0.5000	0.0064			
8	222.89	0.00	1	216000	0.2000	0.0079	94.50	94.49	0.01
			2	720000	0.3000	0.0029			
			3	1152000	0.4500	0.0005			
			4	2016000	0.5000	0.0032			
9	240.44	0.00	1	216000	0.2000	0.0037	94.50	94.49	0.01
			2	720000	0.3000	0.0011			
			3	1152000	0.4500	0.0000			
			4	2016000	0.5000	0.0003			
10	258.00	0.00	1	216000	0.2000	0.0000	94.50	94.50	-0.00
			2	720000	0.3000	-0.0002			
			3	1152000	0.4500	-0.0002			
			4	2016000	0.5000	-0.0014			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	100.00	0.00	100.00	0.07	99.93
2	117.56	0.00	98.01	0.22	97.78
3	135.11	0.00	97.11	0.27	96.83
4	152.67	0.00	96.58	0.31	96.27
5	170.22	0.00	96.05	0.34	95.71
6	187.78	0.00	95.53	0.37	95.16
7	205.33	0.00	95.00	0.38	94.62
8	222.89	0.00	94.50	0.28	94.22
9	240.44	0.00	94.50	0.16	94.34
10	258.00	0.00	94.50	0.04	94.46

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	100.00	100.00	SP/SP-SM (Very Loose)
	2	122.00	97.50	
	3	222.00	94.50	
	4	258.00	94.50	
2	1	100.00	90.50	ML/MH (Firm)
3	1	100.00	84.50	CL-ML (Very Stiff)
4	1	100.00	81.50	Weathered Limestone (Hard)

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 100.00 [ft]	1	100.00	100.00	Fill Material
	X2 = 258.00 [ft]	2	107.00	103.50	
		3	208.00	106.50	
		4	222.00	99.50	
		5	258.00	94.50	

44th Ave Extension Causeway Option

PROJECT IDENTIFICATION

Title:	44th Ave Extension Causeway Option
Project Number:	Tierra Project No.:6511-09-089 -
Client:	HDR Engineering, Inc.
Designer:	Tierra, Inc. (JRA)
Station Number:	138+00

Description:
Settlement Analysis Using SPT Boring B-1

Company's information:

Name:	Tierra, Inc.
Street:	7351 Temple Terrace Highway Tampa, Fl 33637
Telephone #:	813-989-1354
Fax #:	
E-Mail:	

Original file path and name: J:\6511\20 ..... iles\6511-09-089 44th Ave\FoSSA\2D_138+00._B-1.2ST
Original date and time of creating this file: Wed Sep 09 11:02:25 2009

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 4 layers

	Wet Unit Weight, γ [lb/ft^3]	Poisson's Ratio μ	Description of Soil
1	100.00	0.20	SP/SP-SM (Very Loose)
2	115.00	0.30	ML/MH (Firm)
3	125.00	0.45	CL-ML (Very Stiff)
4	135.00	0.50	Weathered Limestone (Hard)

INPUT DATA – EMBANKMENT LAYERS – 1 layers

	Wet Unit Weight, γ [lb/ft^3]	Description of Soil
1	105.00	Fill Material

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	100.00	109.50

INPUT DATA FOR CONSOLIDATION — $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.21	0.02	1.10	0.2000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A
4	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	100.00	0.00	1	216000	0.2000	0.0000	100.00	100.00	-0.00
			2	720000	0.3000	-0.0002			
			3	1152000	0.4500	-0.0003			
			4	2016000	0.5000	-0.0027			
2	124.44	0.00	1	216000	0.2000	0.0064	100.00	99.99	0.01
			2	720000	0.3000	0.0020			
			3	1152000	0.4500	0.0002			
			4	2016000	0.5000	0.0002			
3	148.89	0.00	1	216000	0.2000	0.0132	100.00	99.98	0.02
			2	720000	0.3000	0.0046			
			3	1152000	0.4500	0.0008			
			4	2016000	0.5000	0.0051			
4	173.33	0.00	1	216000	0.2000	0.0219	100.00	99.96	0.04
			2	720000	0.3000	0.0078			
			3	1152000	0.4500	0.0015			
			4	2016000	0.5000	0.0091			
5	197.78	0.00	1	216000	0.2000	0.0218	100.00	99.96	0.04
			2	720000	0.3000	0.0075			
			3	1152000	0.4500	0.0013			
			4	2016000	0.5000	0.0094			
6	222.22	0.00	1	216000	0.2000	0.0218	100.00	99.96	0.04
			2	720000	0.3000	0.0075			
			3	1152000	0.4500	0.0013			
			4	2016000	0.5000	0.0094			
7	246.67	0.00	1	216000	0.2000	0.0219	100.00	99.96	0.04
			2	720000	0.3000	0.0077			
			3	1152000	0.4500	0.0015			
			4	2016000	0.5000	0.0092			
8	271.11	0.00	1	216000	0.2000	0.0148	100.00	99.97	0.03
			2	720000	0.3000	0.0052			
			3	1152000	0.4500	0.0009			
			4	2016000	0.5000	0.0055			
9	295.56	0.00	1	216000	0.2000	0.0067	100.00	99.99	0.01
			2	720000	0.3000	0.0021			
			3	1152000	0.4500	0.0002			
			4	2016000	0.5000	0.0004			
10	320.00	0.00	1	216000	0.2000	0.0000	100.00	100.00	-0.00
			2	720000	0.3000	-0.0002			
			3	1152000	0.4500	-0.0003			
			4	2016000	0.5000	-0.0027			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	100.00	0.00	100.00	0.03	99.97
2	124.44	0.00	100.00	0.23	99.77
3	148.89	0.00	100.00	0.37	99.63
4	173.33	0.00	100.00	0.46	99.54
5	197.78	0.00	100.00	0.46	99.54
6	222.22	0.00	100.00	0.46	99.54
7	246.67	0.00	100.00	0.46	99.54
8	271.11	0.00	100.00	0.38	99.62
9	295.56	0.00	100.00	0.24	99.76
10	320.00	0.00	100.00	0.03	99.97

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	100.00	100.00	SP/SP-SM (Very Loose)
2	1	100.00	96.00	ML/MH (Firm)
3	1	100.00	90.00	CL-ML (Very Stiff)
4	1	100.00	87.00	Weathered Limestone (Hard)

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 100.00 [ft]	1	100.00	100.00	Fill Material
	X2 = 320.00 [ft]	2	148.00	108.00	
		3	160.00	114.00	
		4	262.00	114.00	
		5	274.00	108.00	
		6	320.00	100.00	

44th Ave Extension Causeway Option

PROJECT IDENTIFICATION

Title:	44th Ave Extension Causeway Option
Project Number:	Tierra Project No.:6511-09-089 -
Client:	HDR Engineering, Inc.
Designer:	Tierra, Inc. (JRA)
Station Number:	138+00

Description:
Settlement Analysis Using SPT Boring B-2

Company's information:

Name:	Tierra, Inc.
Street:	7351 Temple Terrace Highway
	Tampa, Fl 33637
Telephone #:	813-989-1354
Fax #:	
E-Mail:	

Original file path and name: J:\6511\20 ..... iles\6511-09-089 44th Ave\FoSSA\2D_138+00._B-2.2ST
Original date and time of creating this file: Wed Sep 09 11:02:25 2009

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 4 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	100.00	0.20	SP/SP-SM to SM (Very Loose)
2	135.00	0.50	ML/MH (Hard)
3	105.00	0.25	ML/MH (Soft)
4	135.00	0.50	Weathered Limestone (Hard)

INPUT DATA – EMBANKMENT LAYERS – 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	105.00	Fill Material

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	109.50

INPUT DATA FOR CONSOLIDATION — $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A
3	Yes	1.00	0.21	0.02	0.90	0.2000	Top & Bot.
4	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	100.00	0.00	1	216000	0.2000	0.0000	100.00	100.00	-0.00
			2	2016000	0.5000	-0.0002			
			3	360000	0.2500	-0.0003			
			4	2016000	0.5000	-0.0023			
2	124.44	0.00	1	216000	0.2000	0.0093	100.00	99.98	0.02
			2	2016000	0.5000	0.0000			
			3	360000	0.2500	0.0060			
			4	2016000	0.5000	0.0003			
3	148.89	0.00	1	216000	0.2000	0.0195	100.00	99.96	0.04
			2	2016000	0.5000	0.0003			
			3	360000	0.2500	0.0151			
			4	2016000	0.5000	0.0047			
4	173.33	0.00	1	216000	0.2000	0.0322	100.00	99.94	0.06
			2	2016000	0.5000	0.0006			
			3	360000	0.2500	0.0237			
			4	2016000	0.5000	0.0082			
5	197.78	0.00	1	216000	0.2000	0.0320	100.00	99.94	0.06
			2	2016000	0.5000	0.0005			
			3	360000	0.2500	0.0236			
			4	2016000	0.5000	0.0086			
6	222.22	0.00	1	216000	0.2000	0.0320	100.00	99.94	0.06
			2	2016000	0.5000	0.0005			
			3	360000	0.2500	0.0236			
			4	2016000	0.5000	0.0086			
7	246.67	0.00	1	216000	0.2000	0.0322	100.00	99.94	0.06
			2	2016000	0.5000	0.0006			
			3	360000	0.2500	0.0237			
			4	2016000	0.5000	0.0083			
8	271.11	0.00	1	216000	0.2000	0.0217	100.00	99.96	0.04
			2	2016000	0.5000	0.0003			
			3	360000	0.2500	0.0163			
			4	2016000	0.5000	0.0051			
9	295.56	0.00	1	216000	0.2000	0.0097	100.00	99.98	0.02
			2	2016000	0.5000	0.0000			
			3	360000	0.2500	0.0063			
			4	2016000	0.5000	0.0004			
10	320.00	0.00	1	216000	0.2000	0.0000	100.00	100.00	-0.00
			2	2016000	0.5000	-0.0002			
			3	360000	0.2500	-0.0003			
			4	2016000	0.5000	-0.0023			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	100.00	0.00	100.00	0.04	99.96
2	124.44	0.00	100.00	0.19	99.81
3	148.89	0.00	100.00	0.33	99.67
4	173.33	0.00	100.00	0.43	99.57
5	197.78	0.00	100.00	0.44	99.56
6	222.22	0.00	100.00	0.44	99.56
7	246.67	0.00	100.00	0.43	99.57
8	271.11	0.00	100.00	0.35	99.65
9	295.56	0.00	100.00	0.20	99.80
10	320.00	0.00	100.00	0.04	99.96

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	100.00	100.00	SP/SP-SM to SM (Very Loose)
2	1	100.00	94.00	ML/MH (Hard)
3	1	100.00	90.00	ML/MH (Soft)
4	1	100.00	82.00	Weathered Limestone (Hard)

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 100.00 [ft]	1	100.00	100.00	Fill Material
	X2 = 320.00 [ft]	2	148.00	108.00	
		3	160.00	114.00	
		4	262.00	114.00	
		5	274.00	108.00	
		6	320.00	100.00	

44th Ave Extension Causeway Option

PROJECT IDENTIFICATION

Title:	44th Ave Extension Causeway Option
Project Number:	Tierra Project No.:6511-09-089 -
Client:	HDR Engineering, Inc.
Designer:	Tierra, Inc. (JRA)
Station Number:	138+00

Description:
Settlement Analysis Using SPT Boring B-3

Company's Information:

Name:	Tierra, Inc.
Street:	7351 Temple Terrace Highway Tampa, Fl 33637
Telephone #:	813-989-1354
Fax #:	
E-Mail:	

Original file path and name: J:\6511\20 ..... iles\6511-09-089 44th Ave\FoSSA\2D_138+00._B-3.2ST
Original date and time of creating this file: Wed Sep 09 11:02:25 2009

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 3 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	100.00	0.20	SM (Very Loose)
2	125.00	0.45	SM to ML/MH (Hard)
3	135.00	0.50	Weathered Limestone (Hard)

INPUT DATA – EMBANKMENT LAYERS – 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	105.00	Fill Material

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	100.00	109.50

INPUT DATA FOR CONSOLIDATION — $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	Yes	1.00	0.20	0.02	0.40	0.2000	Top & Bot.
3	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	100.00	0.00	1	216000	0.2000	0.0000	100.00	100.00	-0.00
			2	1152000	0.4500	-0.0003			
			3	2016000	0.5000	-0.0029			
2	124.44	0.00	1	216000	0.2000	0.0093	100.00	99.99	0.01
			2	1152000	0.4500	0.0003			
			3	2016000	0.5000	0.0002			
3	148.89	0.00	1	216000	0.2000	0.0195	100.00	99.97	0.03
			2	1152000	0.4500	0.0009			
			3	2016000	0.5000	0.0053			
4	173.33	0.00	1	216000	0.2000	0.0322	100.00	99.96	0.04
			2	1152000	0.4500	0.0017			
			3	2016000	0.5000	0.0096			
5	197.78	0.00	1	216000	0.2000	0.0320	100.00	99.96	0.04
			2	1152000	0.4500	0.0016			
			3	2016000	0.5000	0.0098			
6	222.22	0.00	1	216000	0.2000	0.0320	100.00	99.96	0.04
			2	1152000	0.4500	0.0015			
			3	2016000	0.5000	0.0098			
7	246.67	0.00	1	216000	0.2000	0.0322	100.00	99.96	0.04
			2	1152000	0.4500	0.0017			
			3	2016000	0.5000	0.0097			
8	271.11	0.00	1	216000	0.2000	0.0217	100.00	99.97	0.03
			2	1152000	0.4500	0.0010			
			3	2016000	0.5000	0.0058			
9	295.56	0.00	1	216000	0.2000	0.0097	100.00	99.99	0.01
			2	1152000	0.4500	0.0003			
			3	2016000	0.5000	0.0003			
10	320.00	0.00	1	216000	0.2000	0.0000	100.00	100.00	-0.00
			2	1152000	0.4500	-0.0003			
			3	2016000	0.5000	-0.0029			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	100.00	0.00	100.00	0.03	99.97
2	124.44	0.00	100.00	0.20	99.80
3	148.89	0.00	100.00	0.32	99.68
4	173.33	0.00	100.00	0.41	99.59
5	197.78	0.00	100.00	0.41	99.59
6	222.22	0.00	100.00	0.41	99.59
7	246.67	0.00	100.00	0.41	99.59
8	271.11	0.00	100.00	0.34	99.66
9	295.56	0.00	100.00	0.20	99.80
10	320.00	0.00	100.00	0.03	99.97

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	100.00	100.00	SM (Very Loose)
2	1	100.00	94.00	SM to ML/MH (Hard)
3	1	100.00	90.00	Weathered Limestone (Hard)

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 100.00 [ft]	1	100.00	100.00	Fill Material
	X2 = 320.00 [ft]	2	148.00	108.00	
		3	160.00	114.00	
		4	262.00	114.00	
		5	274.00	108.00	
		6	320.00	100.00	

44th Ave Extension Causeway Option

PROJECT IDENTIFICATION

Title:	44th Ave Extension Causeway Option
Project Number:	Tierra Project No.:6511-09-089 -
Client:	HDR Engineering, Inc.
Designer:	Tierra, Inc. (JRA)
Station Number:	138+00

Description:
Settlement Analysis Using SPT Boring B-4

Company's information:

Name:	Tierra, Inc.
Street:	7351 Temple Terrace Highway Tampa, Fl 33637
Telephone #:	813-989-1354
Fax #:	
E-Mail:	

Original file path and name: J:\6511\20 ..... iles\6511-09-089 44th Ave\FoSSA\2D_138+00._B-4.2ST
Original date and time of creating this file: Wed Sep 09 11:02:25 2009

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 2 layers

	Wet Unit Weight, γ [lb/ft³]	Poisson's Ratio μ	Description of Soil
1	100.00	0.20	SP/SP-SM to SM (Very Loose)
2	135.00	0.50	ML/MH to Weathered Limestone (Hard)

INPUT DATA – EMBANKMENT LAYERS – 1 layers

	Wet Unit Weight, γ [lb/ft³]	Description of Soil
1	105.00	Fill Material

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	109.50

INPUT DATA FOR CONSOLIDATION — $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	100.00	0.00	1	216000	0.2000	0.0000	100.00	100.00	-0.00
			2	2016000	0.5000	-0.0031			
2	124.44	0.00	1	216000	0.2000	0.0093	100.00	99.99	0.01
			2	2016000	0.5000	0.0002			
3	148.89	0.00	1	216000	0.2000	0.0195	100.00	99.97	0.03
			2	2016000	0.5000	0.0055			
4	173.33	0.00	1	216000	0.2000	0.0322	100.00	99.96	0.04
			2	2016000	0.5000	0.0103			
5	197.78	0.00	1	216000	0.2000	0.0320	100.00	99.96	0.04
			2	2016000	0.5000	0.0103			
6	222.22	0.00	1	216000	0.2000	0.0320	100.00	99.96	0.04
			2	2016000	0.5000	0.0103			
7	246.67	0.00	1	216000	0.2000	0.0322	100.00	99.96	0.04
			2	2016000	0.5000	0.0103			
8	271.11	0.00	1	216000	0.2000	0.0217	100.00	99.97	0.03
			2	2016000	0.5000	0.0061			
9	295.56	0.00	1	216000	0.2000	0.0097	100.00	99.99	0.01
			2	2016000	0.5000	0.0004			
10	320.00	0.00	1	216000	0.2000	0.0000	100.00	100.00	-0.00
			2	2016000	0.5000	-0.0031			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	100.00	0.00	100.00	0.00	100.00
2	124.44	0.00	100.00	0.00	100.00
3	148.89	0.00	100.00	0.00	100.00
4	173.33	0.00	100.00	0.00	100.00
5	197.78	0.00	100.00	0.00	100.00
6	222.22	0.00	100.00	0.00	100.00
7	246.67	0.00	100.00	0.00	100.00
8	271.11	0.00	100.00	0.00	100.00
9	295.56	0.00	100.00	0.00	100.00
10	320.00	0.00	100.00	0.00	100.00

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	100.00	100.00	SP/SP-SM to SM (Very Loose)
2	1	100.00	94.00	ML/MH to Weathered Limestone (Hard)

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 100.00 [ft]	1	100.00	100.00	Fill Material
	X2 = 320.00 [ft]	2	148.00	108.00	
		3	160.00	114.00	
		4	262.00	114.00	
		5	274.00	108.00	
		6	320.00	100.00	

44th Ave Extension Causeway Option

PROJECT IDENTIFICATION

Title:	44th Ave Extension Causeway Option
Project Number:	Tierra Project No.:6511-09-089 -
Client:	HDR Engineering, Inc.
Designer:	Tierra, Inc. (JRA)
Station Number:	139+80

Description:
Settlement Analysis Using SPT Boring B-4

Company's information:

Name:	Tierra, Inc.
Street:	7351 Temple Terrace Highway Tampa, Fl 33637
Telephone #:	813-989-1354
Fax #:	
E-Mail:	

Original file path and name: J:\6511\20 ..... iles\6511-09-089 44th Ave\FoSSA\2D_139+80._B-4.2ST
Original date and time of creating this file: Wed Sep 09 11:02:25 2009

GEOMETRY: Analysis of a 2D geometry

INPUT DATA – FOUNDATION LAYERS – 2 layers

	Wet Unit Weight, γ [lb/ft^3]	Poisson's Ratio μ	Description of Soil
1	100.00	0.20	SP/SP-SM to SM (Very Loose)
2	135.00	0.50	ML/MH to Weathered Limestone (Hard)

INPUT DATA – EMBANKMENT LAYERS – 1 layers

	Wet Unit Weight, γ [lb/ft^3]	Description of Soil
1	105.00	Fill Material

INPUT DATA OF WATER

Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]
1	0.00	101.50

INPUT DATA FOR CONSOLIDATION — $\alpha = 1/2$

Layer #	Underging Consolidation [Yes/No]	OCR = Pc / Po	Cc	Cr	e0	Cv [ft ²/day]	Drains at :
1	No	N/A	N/A	N/A	N/A	N/A	N/A
2	No	N/A	N/A	N/A	N/A	N/A	N/A

IMMEDIATE SETTLEMENT, Si

Node #	Settlement along section: X [ft.]	Y [ft.]	Layer (k)	Young's Modulus, E [lb/ft ²]	Poisson's Ratio, μ	Settlement of each layer, Si(k) [ft.]	Initial Z [ft.]	Final Z * [ft.]	Total Settlement Sum of Si(k), [ft.]
1	100.00	0.00	1	216000	0.2000	0.0007	100.00	100.00	0.00
			2	2016000	0.5000	0.0005			
2	112.89	0.00	1	216000	0.2000	0.0244	96.78	96.75	0.03
			2	2016000	0.5000	0.0061			
3	125.78	0.00	1	216000	0.2000	0.0223	95.51	95.48	0.03
			2	2016000	0.5000	0.0084			
4	138.67	0.00	1	216000	0.2000	0.0238	96.65	96.62	0.03
			2	2016000	0.5000	0.0077			
5	151.56	0.00	1	216000	0.2000	0.0230	97.79	97.76	0.03
			2	2016000	0.5000	0.0062			
6	164.44	0.00	1	216000	0.2000	0.0222	98.94	98.91	0.03
			2	2016000	0.5000	0.0047			
7	177.33	0.00	1	216000	0.2000	0.0193	100.08	100.05	0.02
			2	2016000	0.5000	0.0033			
8	190.22	0.00	1	216000	0.2000	0.0159	101.22	101.20	0.02
			2	2016000	0.5000	0.0018			
9	203.11	0.00	1	216000	0.2000	0.0108	102.36	102.35	0.01
			2	2016000	0.5000	0.0005			
10	216.00	0.00	1	216000	0.2000	0.0014	103.50	103.50	0.00
			2	2016000	0.5000	-0.0009			

*Note: Final Z is calculated assuming only 'Immediate Settlement' exists.

ULTIMATE SETTLEMENT, Sc

Node #	X [ft.]	Y [ft.]	Original Z [ft.]	Settlement Sc [ft.]	Final Z * [ft.]
1	100.00	0.00	100.00	0.00	100.00
2	112.89	0.00	96.78	0.00	96.78
3	125.78	0.00	95.51	0.00	95.51
4	138.67	0.00	96.65	0.00	96.65
5	151.56	0.00	97.79	0.00	97.79
6	164.44	0.00	98.94	0.00	98.94
7	177.33	0.00	100.08	0.00	100.08
8	190.22	0.00	101.22	0.00	101.22
9	203.11	0.00	102.36	0.00	102.36
10	216.00	0.00	103.50	0.00	103.50

*Note: Final Z is calculated assuming only 'Ultimate Settlement' exists.

TABULATED GEOMETRY: INPUT OF FOUNDATION SOILS

Found. Soil #	Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	1	100.00	100.00	SP/SP-SM to SM (Very Loose)
	2	120.00	95.00	
	3	216.00	103.50	
2	1	100.00	90.00	ML/MH to Weathered Limestone (Hard)

TABULATED GEOMETRY: INPUT OF EMBANKMENT SOILS

Embank. Soil #		Point #	Coordinates (X, Z) : (X) [ft.]	(Z) [ft.]	DESCRIPTION
1	X1 = 100.00 [ft]	1	100.00	100.00	Fill Material
	X2 = 216.00 [ft]	2	113.00	106.50	
		3	214.00	104.50	
		4	216.00	103.50	

APPENDIX E

** STABLPro V3.0**

Upgraded from
FHWA-PCSTABLE

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:
Time of Run:
Run By:
Input Data Filename:
Output Filename:
Plotted Output Filename:

PROBLEM DESCRIPTION Station 125+00 Slope Stability Analysis

BOUNDARY COORDINATES

4 Top Boundaries
4 Total Boundaries

Boundary No.	X-Left ft.	Y-Left ft.	X-Right ft.	Y-Right ft.	Soil Type Below Bnd
1	0.00	100.00	100.00	100.00	1
2	100.00	100.00	100.00	105.00	1
3	100.00	105.00	106.00	109.00	1
4	106.00	109.00	220.00	109.00	1

1

ISOTROPIC SOIL PARAMETERS

1 Type(s) of Soil

Soil Type No.	Total Unit Wt. pcf	Saturated Unit Wt. pcf	Cohesion Intercept psf	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant psf	Piez. Surface No.
1	120.0	120.0	0.0	32.0	0.00	0.0	0

1

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left ft.	X-Right ft.	Intensity psf	Deflection (deg)

1	110.00	216.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

1

Searching Routine Will Be Limited To An Area Defined By 1 Boundaries
Of Which The First 1 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left ft.	Y-Left ft.	X-Right ft.	Y-Right ft.
1	100.00	96.50	100.10	105.00

1

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Irregular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 50.00 ft.
and X = 90.00 ft.

Each Surface Terminates Between X = 108.00 ft.
and X = 150.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00 ft.

3.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -45.0
And 0.0 deg.

1

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Examined. They Are Ordered - Most Critical
First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	90.00	100.00

2	92.14	97.89
3	94.54	96.10
4	97.54	96.09
5	100.54	96.10
6	102.70	98.19
7	103.90	100.94
8	106.28	102.76
9	106.72	105.73
10	108.58	108.09
11	108.75	109.00

*** 1.566 ***

Individual data on the 12 slices

Slice No.	Width Ft	Weight Lbs	Water Force Top Lbs	Water Force Bot Lbs	Tie Force Norm Lbs	Tie Force Tan Lbs	Earthquake Force Hor Lbs	Earthquake Force Ver Lbs	Surcharge Load Lbs
1	2.1	0.27E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
2	2.4	0.87E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
3	3.0	0.14E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
4	2.5	0.12E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
5	0.5	0.59E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
6	2.2	0.23E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
7	1.2	0.11E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
8	2.1	0.17E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
9	0.3	0.21E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
10	0.4	0.25E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
11	1.9	0.47E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
12	0.2	0.95E+01	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	85.56	100.00
2	88.05	98.34
3	90.95	97.55
4	93.83	96.73
5	96.74	95.99
6	99.73	96.19
7	102.69	96.72
8	105.57	97.55
9	107.72	99.63
10	110.11	101.45
11	112.65	103.04
12	114.58	105.35
13	114.63	108.34
14	114.67	109.00

*** 1.732 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	85.56	100.00
2	87.70	97.91
3	90.54	96.91
4	93.51	96.49
5	96.50	96.35
6	99.49	96.13
7	102.48	95.89
8	105.36	96.73
9	107.41	98.92
10	109.46	101.12
11	111.53	103.28
12	113.65	105.41
13	113.85	108.40
14	113.89	109.00

*** 1.751 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	85.56	100.00
2	87.77	97.98
3	90.30	96.37
4	92.61	94.45
5	95.56	93.88
6	98.55	93.71
7	101.53	94.08
8	103.85	95.98
9	105.71	98.34
10	107.83	100.45
11	110.21	102.29
12	112.54	104.18
13	115.02	105.86
14	116.48	108.48
15	116.64	109.00

*** 1.772 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	85.56	100.00
2	88.28	98.75
3	91.04	97.58
4	94.01	97.15
5	96.92	96.39

6	99.78	95.52
7	102.78	95.38
8	105.75	95.79
9	108.59	96.76
10	111.26	98.13
11	113.18	100.44
12	114.96	102.85
13	117.00	105.06
14	119.21	107.08
15	121.14	109.00

*** 1.783 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	90.00	100.00
2	92.17	97.92
3	94.32	95.84
4	97.26	95.22
5	100.26	95.23
6	103.24	95.58
7	105.40	97.65
8	107.13	100.10
9	107.76	103.04
10	108.88	105.82
11	109.01	108.82
12	109.05	109.00

*** 1.808 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	81.11	100.00
2	83.83	98.73
3	86.67	97.78
4	89.55	96.92
5	92.39	95.97
6	95.25	95.05
7	98.14	94.24
8	101.14	94.40
9	104.08	94.99
10	106.00	97.30
11	107.85	99.65
12	108.60	102.56
13	110.20	105.10
14	112.40	107.13
15	113.07	109.00

*** 1.821 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	85.56	100.00
2	88.18	98.54
3	90.67	96.87
4	93.00	94.98
5	95.98	94.67
6	98.94	94.13
7	101.82	94.95
8	104.75	95.60
9	106.93	97.66
10	109.13	99.70
11	110.82	102.18
12	112.73	104.49
13	112.77	107.49
14	113.00	109.00

*** 1.870 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	90.00	100.00
2	92.34	98.13
3	94.91	96.57
4	97.65	95.36
5	100.47	94.32
6	103.42	93.82
7	106.25	94.83
8	107.59	97.52
9	108.92	100.21
10	110.25	102.89
11	110.91	105.82
12	111.43	108.77
13	111.47	109.00

*** 1.896 ***

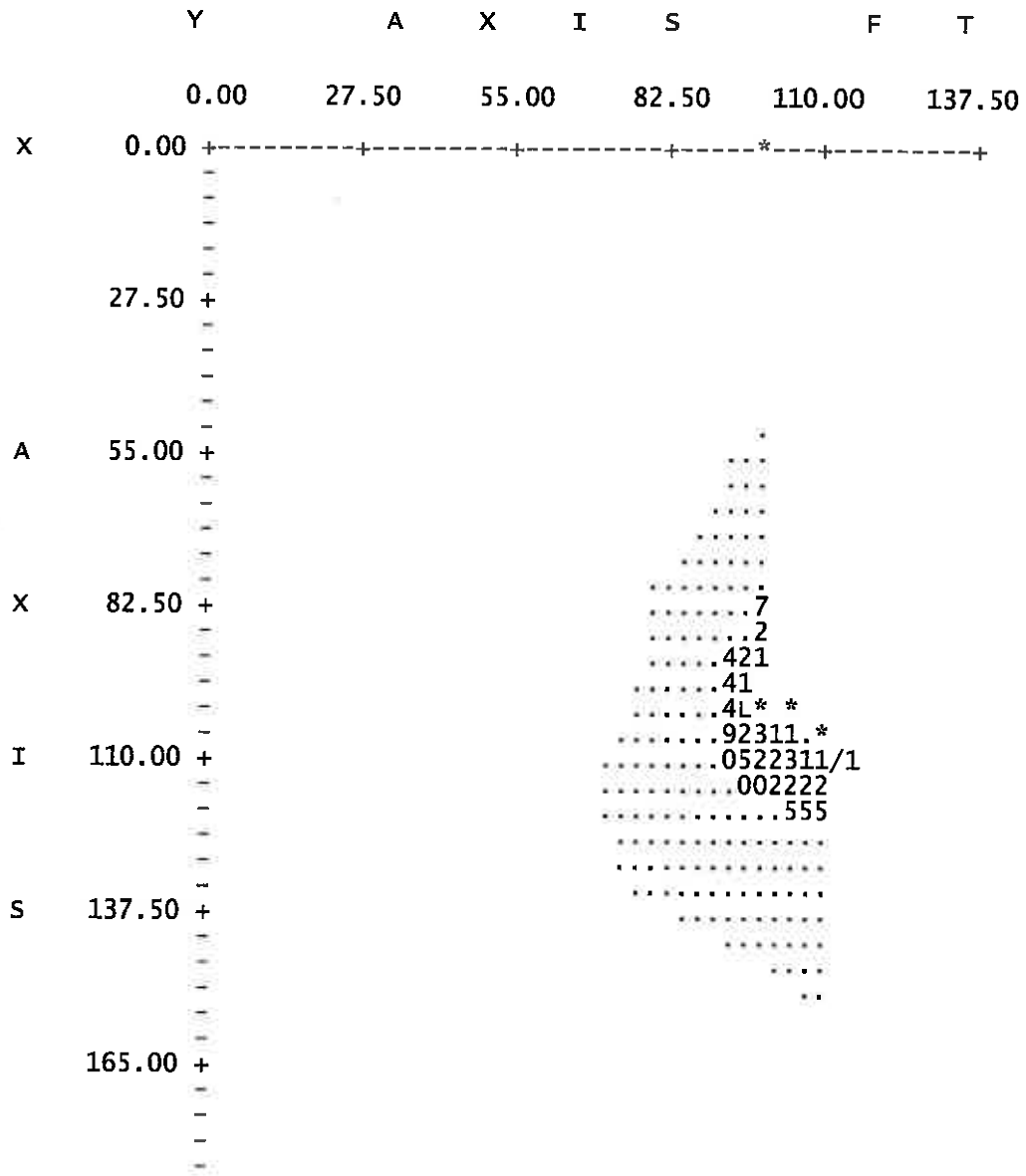
Failure Surface Specified By 15 Coordinate Points

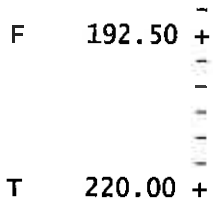
Point No.	X-Surf ft.	Y-Surf ft.
1	90.00	100.00
2	92.17	97.93
3	94.36	95.88
4	97.14	94.75

5	99.75	93.27
6	102.72	92.81
7	105.71	92.97
8	108.71	92.77
9	110.98	94.73
10	113.03	96.92
11	114.88	99.28
12	116.23	101.96
13	117.40	104.72
14	118.74	107.40
15	119.87	109.00

*** 2.113 ***

1





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*****************************************
******  EXECUTION OF STABL ABORTED  ******
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** STABLPro V3.0**

Upgraded from
FHWA-PCSTABLE

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:
Time of Run:
Run By:
Input Data Filename:
Output Filename:
Plotted Output Filename:

PROBLEM DESCRIPTION Slope Stability Analysis_Cross Section 1
38+00_SPT Boring B-1

BOUNDARY COORDINATES

4 Top Boundaries
8 Total Boundaries

Boundary No.	X-Left ft.	Y-Left ft.	X-Right ft.	Y-Right ft.	Soil Type Below Bnd
1	0.00	100.00	100.00	100.00	2
2	100.00	100.00	148.00	108.00	1
3	148.00	108.00	160.00	114.00	1
4	160.00	114.00	262.00	114.00	1
5	100.00	100.00	262.00	100.00	2
6	0.00	96.00	262.00	96.00	3
7	0.00	90.00	262.00	90.00	4
8	0.00	87.00	262.00	87.00	5

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. pcf	Saturated Unit Wt. pcf	Cohesion Intercept psf	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant psf	Piez. Surface No.
1	105.0	105.0	0.0	30.0	0.00	0.0	0
2	100.0	100.0	0.0	29.0	0.00	0.0	0
3	115.0	0.0	625.0	0.0	0.00	0.0	0
4	125.0	0.0	3250.0	0.0	0.00	0.0	0
5	135.0	0.0	12500.0	0.0	0.00	0.0	0

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.50 pcf

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water ft.	Y-Water ft.
1	0.00	109.50
2	320.00	109.50

1

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left ft.	X-Right ft.	Intensity psf	Deflection (deg)
1	161.00	260.00	250.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

1

Searching Routine Will Be Limited To An Area Defined By 2 Boundaries Of Which The First 2 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left ft.	Y-Left ft.	X-Right ft.	Y-Right ft.
1	100.00	100.00	148.00	108.00
2	148.00	108.00	160.00	114.00

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 5.00 ft.
and X = 95.00 ft.

Each Surface Terminates Between X = 161.00 ft.
and X = 250.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 50.00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	95.00	100.00
2	104.96	99.06
3	114.96	98.92
4	124.93	99.57
5	134.83	101.01
6	144.58	103.22
7	154.13	106.21
8	163.40	109.94
9	171.56	114.00

Circle Center At X = 111.8 ; Y = 224.9 and Radius, 126.0

*** 2.506 ***

Individual data on the 14 slices

Slice No.	Width Ft	Weight Lbs	Water Force Top Lbs	Water Force Bot Lbs	Tie Force Norm Lbs	Tie Force Tan Lbs	Earthquake Force Hor Lbs	Earthquake Force Ver Lbs	Surcharge Load Lbs
1	5.0	0.12E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
2	5.0	0.56E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
3	10.0	0.28E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
4	10.0	0.42E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
5	3.0	0.14E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
6	6.9	0.34E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
7	9.8	0.46E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
8	3.4	0.14E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
9	6.1	0.28E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
10	5.9	0.32E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
11	1.0	0.55E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	0.0
12	1.3	0.65E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	326.7
13	1.1	0.49E+03	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	274.1
14	8.2	0.17E+04	0.00E+00	0.00E+00	0.00E+00	0.0	0.0	0.0	2038.8

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	95.00	100.00
2	104.56	97.07
3	114.45	95.58
4	124.45	95.57
5	134.34	97.02
6	143.91	99.92
7	152.95	104.20
8	161.26	109.77
9	165.91	114.00

Circle Center At X = 119.6 ; Y = 163.1 and Radius, 67.7

*** 3.134 ***

1

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	85.00	100.00
2	94.14	95.95
3	103.75	93.17
4	113.64	91.71
5	123.64	91.60
6	133.56	92.85
7	143.23	95.42
8	152.46	99.27
9	161.08	104.33
10	168.94	110.52
11	172.31	114.00

Circle Center At X = 119.4 ; Y = 165.4 and Radius, 73.9

*** 3.213 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	85.00	100.00
2	94.66	97.40
3	104.51	95.68
4	114.47	94.83
5	124.47	94.86
6	134.43	95.78
7	144.26	97.59
8	153.90	100.25
9	163.27	103.76
10	172.28	108.09
11	180.88	113.19
12	182.00	114.00

Circle Center At X = 119.1 ; Y = 207.5 and Radius, 112.7

*** 3.268 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	65.00	100.00
2	74.80	98.01
3	84.71	96.68
4	94.69	96.02
5	104.69	96.01
6	114.67	96.68
7	124.58	98.01
8	134.38	99.99
9	144.03	102.62
10	153.48	105.89
11	162.69	109.78
12	171.08	114.00

Circle Center At X = 99.7 ; Y = 246.1 and Radius, 150.1

*** 3.278 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	95.00	100.00
2	104.88	98.46
3	114.83	97.44
4	124.82	96.94
5	134.82	96.96
6	144.80	97.50
7	154.75	98.56
8	164.62	100.13
9	174.40	102.22
10	184.06	104.81
11	193.57	107.90
12	202.91	111.48
13	208.57	114.00

Circle Center At X = 129.4 ; Y = 289.1 and Radius, 192.2

*** 3.567 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	75.00	100.00
2	84.51	96.92
3	94.27	94.73
4	104.19	93.44
5	114.18	93.07
6	124.17	93.62
7	134.06	95.08
8	143.77	97.45
9	153.23	100.70
10	162.35	104.81
11	171.05	109.74
12	177.18	114.00

Circle Center At X = 113.2 ; Y = 201.7 and Radius, 108.7

*** 3.621 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	65.00	100.00
2	74.37	96.50
3	83.99	93.78
4	93.80	91.86
5	103.74	90.77
6	113.74	90.49
7	123.73	91.05
8	133.63	92.42
9	143.39	94.61
10	152.93	97.60
11	162.19	101.37
12	171.11	105.89
13	179.63	111.13
14	183.54	114.00

Circle Center At X = 112.0 ; Y = 211.4 and Radius, 121.0

*** 3.627 ***

1

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf ft.	Y-Surf ft.
1	75.00	100.00
2	84.93	98.84
3	94.92	98.37
4	104.92	98.60
5	114.88	99.52
6	124.75	101.12
7	134.48	103.40

8	144.04	106.35
9	153.37	109.96
10	162.00	114.00

Circle Center At X = 96.7 ; Y = 242.8 and Radius, 144.4

*** 3.702 ***

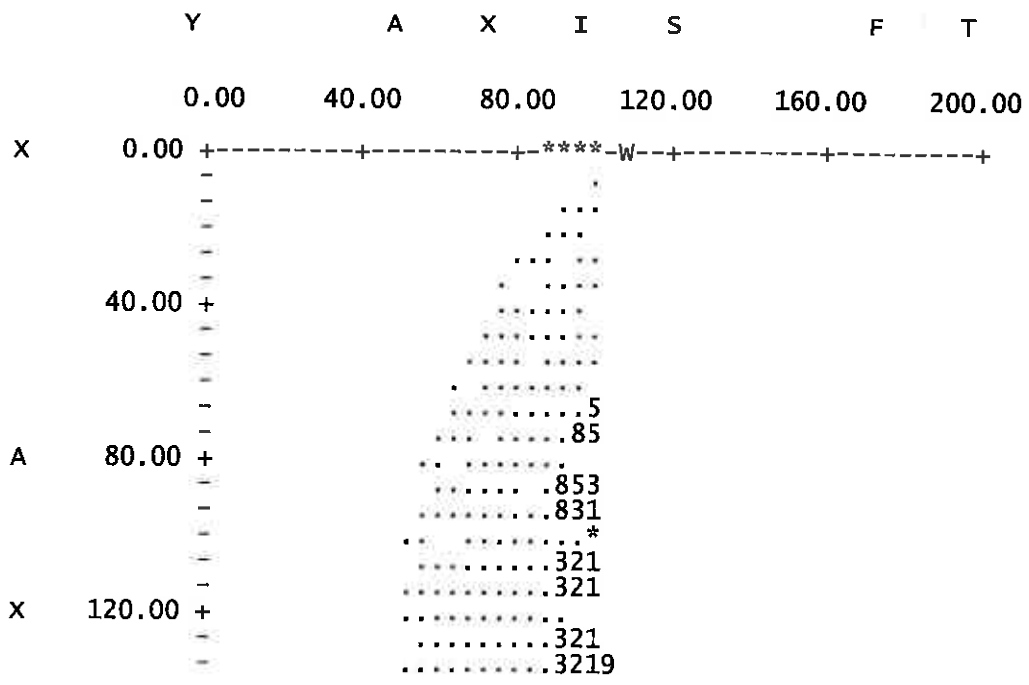
Failure Surface Specified By 12 Coordinate Points

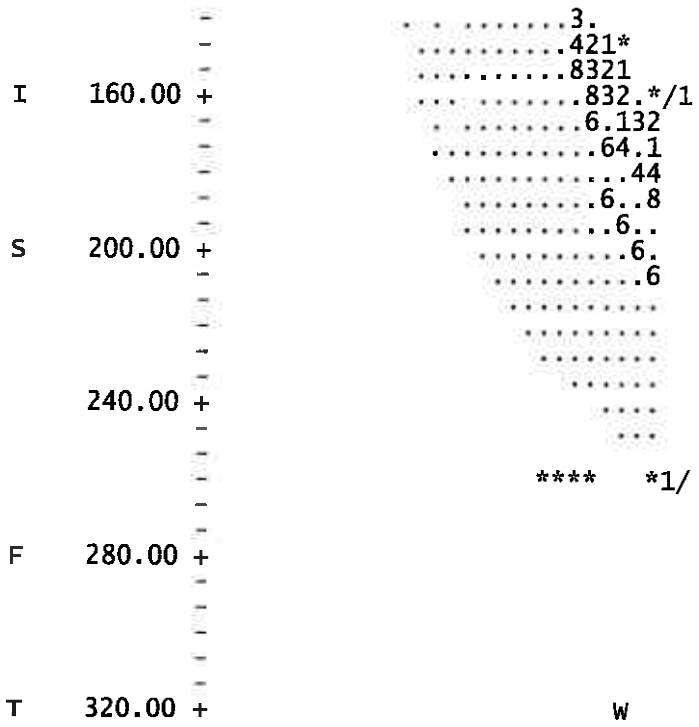
Point No.	X-Surf ft.	Y-Surf ft.
1	75.00	100.00
2	84.29	96.30
3	93.94	93.67
4	103.82	92.14
5	113.81	91.73
6	123.79	92.45
7	133.62	94.29
8	143.18	97.22
9	152.34	101.22
10	161.01	106.21
11	169.05	112.15
12	171.04	114.00

Circle Center At X = 112.4 ; Y = 180.4 and Radius, 88.7

*** 3.703 ***

1



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******************************************
******  EXECUTION OF STABL ABORTED  ******
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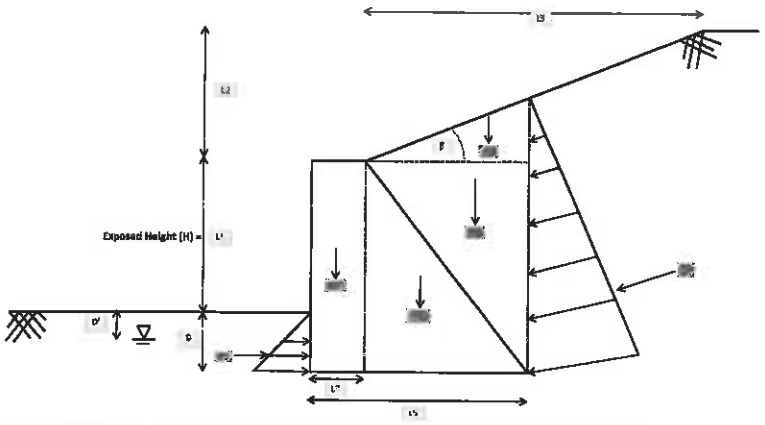
APPENDIX F

GRAVITY WALL ANALYSIS

*** ALL MEASURMENTS ARE IN (ft, psf, pcf, degrees)**



L3 ≥ 7.25 ft or L3 ≥ 6.5 ft

Calculated based on backslope (5H:12V)

L1 = 8		<= Input
L2 =		Does not come into play
L3 = 7.25		
L7 = 0.67		
L8 = 8 + 4		
β = 26.6		<= Input
D' = 0.00		<= Input
D = 3.00		<= Input

Σ V

150*L7*(D+L1) =	854.25
150*0.5*(L8-L7)*(D+L1) =	2257.81
γ(Backfill)*0.5*(L8-L7)*(D+L1)=	1806.25
γ(Backfill)*0.5*(L8-L7)*((L8-L7)*TAN β)=	367.07

Σ H

0.5*γ(Backfill)*(D+L1+((L8-L7)*TAN β))^2*Ka=	1259.46
γ(Bearing)*0.5*D^2*Kp=	1205

Component Forces of Pa

Pa * SIN β =	1428.85
Pa * COS β =	1929.58

SLIDING

Critical State for Sliding Strength 1-a

LF_1= 0.9	
LF_2= 1	
LF_3= 1.5	
LF_4= 0.75	
ϕ(sliding) = 0.8	

Calculate Vertical and Horizontal Forces

Sum Wc * (LF_1) = 2800.856

Sum Ws * (LF_2) = 2173.32

Pa_v * (LF_2) = 1428.853

Sum V_i' = 6403.028

Pa_H * (LF_3) = 4394.373

Pp * (LF_4) = 1653.75 <= Set equal to zero if desired

Sum H_i' = 4394.373

Check Friction Force vs Pushing Force

Check: [Sum V_i' * tan(δ) * ϕ]+ Pp ≥ Sum H_i'

CDR = [Sum VI' * tan(δ) * phi] / Sum HI'

[Sum VI' * tan(δ) * ϕ]+ Pp = 4980.29

Check CDR ≥ 1 : YES CDR = 1.1333336

Σ M$_R$

Wc_1*(L7/2) =	Mwc_1 = 286.17
Wc_2*(((L8-L7)*(1/3)+L7) =	Mwc_2 = 4178.21
Ws_1*(((L8-L7)*(2/3))+L7) =	Mws_1 = 5474.94
Ws_2*((L8-L7)*(2/3)+L7) =	Mws_2 = 1112.63
Pp*(2/3)*D =	MPp = 5145

Σ M$_o$

Pa_H*((1/3)*(D+L1+((L8-L7)*TAN β))) =	MPa_H = 10306.43
Pa_v*L8 =	MPa_V = -6017.85

OVERTURNING

Critical State for Overturning Strength 1-a

LF_1= 0.9	
LF_2= 1	
LF_3= 1.5	
LF_4= 0.75	

Calculate Resisting and Overturning Moments

ΣMwc * (LF 1) = 4017.943

ΣMws * (LF 2) = 6587.573

MPp * (LF 4) = 3858.75 <= Set equal to zero if desired

Total Mr = 14464.37

MPa_H * (LF 3)= 15459.65

MPa_V * (LF 3)= -9026.775

Total Mo = 6432.872 CDR = Mr/Mo

Check CDR ≥ 1 YES CDR= 2.248849274

Soil Parameters

γ(Backfill) = 120	Ka = 0.52
θ(Backfill) = 30	
δ =θ(Bearing) = 32	Kp = 3
γ(Bearing) = 120	

Sq=Sg= 1 + .1*Kp*(B/L)

Sq=Sg= 1.059999

dq=dg= 1 + .1*(Kp^1/2)*(D/B)

dq=dg= 1.143938

tan(Φ) = Sum Ht/ Sum Vt

(Φ) = #DIV/0!

Nq= 32.23

Ny= 31.94

BEARING

Critical State for Bearing Strength 1-b

LF_1 = 1.25	
LF_2 = 1.35	
LF_3 = 1.75	
LF_4 = 1.5	
LF_5 = 1.75	
ϕ(bearing) = 0.55	

Calculate Vertical Force "R"

Sum Wc * (LF 5) = 5580.477

Sum Ws * (LF 6) = 2933.981

Pa_v * (LF 6) = 1928.951

R = Sum Wc * (LF 5) + Sum Ws * (LF 6) + Pa_v * (LF 6) = 10443.41

Sum Mwc * (LF 5) = 5580.477

Sum Mws * (LF 6) = 8883.224

MPp * (LF 4) = 3858.75 <= Set equal to zero if desired

Sum Mr = Sum Mr (Wc) * (LF 5) + Sum Mr (Ws)* (LF 6) = 18322.45

Mpa_H * (LF 8) = 15459.65

Mpa_V * (LF 6) = -8124.098

Sum Mo = Mpa * (LF 8) + MPa_V * (LF 6) = 7335.55

Xbar = (Mr-Mo)/R

Xbar = 1.052999

B/2 = Xbar + e

e = B/2 - Xbar = 1.052834

B' = B - 2e

B' = 2.105998

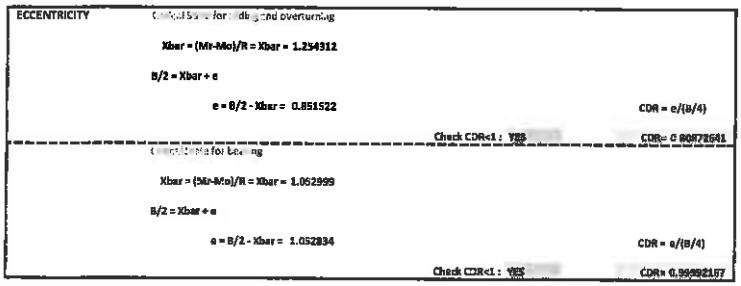
Stress by Foundation = R/B' = 4958.888 psf

Qult = [(Qbar*Nq*Sq*dq*kq) + (1/2 gamma * B' * Ng*Sg*dg*ig)]

Qult = 9819.974 psf

Qult'=Qult * ϕ = 5400.985 CDR = Qult'/(R/B')

Check CDR ≥ 1 : YES CDR= 1.08941283


ECCENTRICITY
Xbar = (Mr-Mo)/R = Xbar = 1.254312
B/2 = Xbar + e
e = B/2 - Xbar = 0.851522
CDR = e/(B/4)
Check CDR<1 : YES
CDR= 0.80872641
Xbar = (Mr-Mo)/R = Xbar = 1.052999
B/2 = Xbar + e
e = B/2 - Xbar = 1.052834
CDR = e/(B/4)
Check CDR<1 : YES
CDR= 0.99992157

APPENDIX G

Technical Special Provision
For
Settlement Plates

TECHNICAL SPECIAL PROVISION
FOR
SETTLEMENT PLATES

44TH AVENUE EAST FROM 30TH STREET EAST TO 45TH STREET EAST
MANATEE COUNTY, FLORIDA
MANATEE COUNTY PROJECT NO. 6071160

Notice: The official record of this document is the electronic file signed and sealed under Rule 61G15-23.003, F.A.C.

Prepared by: Erick M. Frederick, P.E.
Florida License No.: 63920
Date: 12/2/2010
Pages 1 through 4

SETTLEMENT PLATES

T-141-1 DESCRIPTION

A. Fabricate, install, protect and maintain settlement plates in accordance with Florida Department of Transportation (FDOT) Design Standard index 540, these Technical Special Provisions, the details shown on the plans and as directed by the Engineer. The Contractor shall be responsible for the fabrication, installation, protection and maintenance of settlement plates.

B. The system of settlement plates is designed to enable the Engineer to observe and determine the magnitude and rate of embankment settlement. The determination of the time at which the at which the necessary consolidation settlement has taken place and the embankment may be released for additional lifts or placement of roadway base will be determined by the Engineer on the basis of the data obtained from the combined settlement monitoring instrumentation.

T141-2 MATERIALS

The settlement plate assemblies shall be constructed in accordance with the plate and stem options as shown in Standard Index 540. All iron pipe and fittings shall be schedule 40; the size shall be as shown on Standard Index 540. Materials will be accepted on the basis of a visual inspection.

T141-3 INSTALLATION

A. Install the settlement plates once the causeway embankment fill height is approximately 6 inches above the water level within Seller's Pit at the time of construction; establishing a working platform.

B. Install the settlement plates at the locations shown on the **Settlement Monitoring for Causeway Construction** plan sheet.

C. Make an excavation slightly larger than the settlement plate. Excavate to form a pit a minimum of twelve inches deep with a level bottom.

D. Place the plate in the pit with one section of marker pipe attached. The attached marker pipe shall be4.5 feet in length as shown in FDOT Standard Index 540. Ensure that the plate has full bearing and the marker pipe is plumb before proceeding with the stem assembly. When realignment of the plate and marker pipe is necessary, remove the plate and pipe and reshape the pit bottom for proper alignment. If timber plates are selected for installation, and the soil is dense enough to suspend the plate on the fabrication bolts, seat the plate by grooving the bottom of the pit under the lines of bolts.

E. With plate and marker pipe in place, wrap the lower 6 inches of marker pipe with oakum; slip one section of casing pipe over the marker pipe; and lower the casing to uniformly encase the oakum seal while seating the casing on the plate as shown in FDOT Standard Index 540.

F. With marker pipe and casing centered with respect to each other and maintained in a vertical position, backfill the pit in layers by hand and thoroughly compact by hand to the

elevation of the natural ground. Prior to backfilling the pit, determine the elevation of the top of the plate. A maximum of one foot of soil cover can be placed to stabilize the settlement plates.

G. When the installation described in these Technical Special Provisions is complete, the Contractor shall notify the Engineer to determine the elevation of the top of the marker pipe at that time. No embankment fill shall be placed until this elevation has been determined. The casing shall be capped, as shown in Standard Index 540, immediately after the elevation is determined. The settlement plate shall be flagged and protected from construction vehicles and equipment. If the settlement plate assembly is disturbed, it shall be replaced in kind within 24 hours, unless otherwise directed by the Engineer.

H. Place and compact the embankment material in the immediate vicinity of the settlement plate stem in accordance with the requirements of the FDOT Standard Specifications, or as directed by the Engineer. Hand place and hand compact embankment within three feet of the stem with non-impact, light vibratory plate compactors.

I. When surface of the embankment reaches a level approximately two feet below the top of the stem section in place, notify the Engineer. After the Engineer establishes the elevation of the marker pipe in place, install the next section of marker pipe and casing in the presence of the Engineer. As soon as the Engineer establishes the elevation of the added marker pipe, cap the casing and flag the stem for protection. Added sections will be five feet in length.

J. As the height of the embankment increases, repeat this procedure until the embankment is completed.

K. Settlement plate assemblies shall remain in place and become the property of the County.

L. The Engineer will obtain and record all measurements and elevation necessary for accurate determinations of settlement data during construction of the embankment and surcharge.

T141-4 PROTECTION AND MAINTENANCE

A. The settlement plate stem shall remain in a vertical position at all times during the life of this Contract. The Contractor shall operate his equipment in a manner to insure that settlement plate assemblies are not damaged or displaced laterally. Each assembly shall be clearly marked and flagged as approved by the Engineer and protective barricades shall be erected around each assembly. Stems deviating from a vertical position, becoming uncoupled or broken shall be repaired or replaced by the Contractor, as directed by the Engineer, at the Contractor's Expense.

B. The Contractor will not be held responsible for repair or replacement of any settlement plate assembly which is made inoperable as a result of instability of the embankment caused by factors, which in the opinion of the Engineer, are beyond the control of the Contractor.

T141-5 Method of Measurement and Basis of Payment

Each settlement plate assembly acceptably installed and maintained in a satisfactory and operating condition until final acceptance of the project, will be paid for at the unit price bid for each assembly which price and payment shall be full compensation for furnishing all material, labor and equipment for proper installation of the assembly, for protecting the assembly, for repair and replacing damaged assemblies and for all other work and incidentals necessary to complete the work.

Payment will be made under:

Item No. 141-70 - Settlement Plate Assembly – per assembly

END OF THIS TECHNICAL SPECIAL PROVISION

APPENDIX H

FHWA Checklist

GTR REVIEW CHECKLIST (SITE INVESTIGATION)

A. Site Investigation Information

Since the most important step in the geotechnical design process is the conduct of an adequate site investigation, presentation of the subsurface information in the geotechnical report and on the plans deserves careful attention.

Geotechnical Report Text (Introduction) (Pages 322-325)	YES	NO	UNKNOWN OR N/A
1. Is the general location of the investigation described and/or a vicinity map included?	☒	☐	☐
2. Is scope and purpose of the investigation summarized?	☒	☐	☐
3. Is concise description given of geologic setting and topography of area?	☒	☐	☐
4. Are the field explorations and laboratory tests on which the report is based listed?	☒	☐	☐
5. Is general description of subsurface soil, rock, and groundwater conditions given?	☒	☐	☐
*6. Is the following information included with the geotechnical report (typically included in report appendices):			
a. Test hole logs? (Pages 25-33)	☒	☐	☐
b. Field test data?			
c. Laboratory test data? (Pages 74 - 75)			
d. Photographs (if pertinent)?			
Plan and Subsurface Profile (Pages 24, 47-49, 335)			
*7. Is a plan and subsurface profile of the investigation site provided?	☒	☐	☐
8. Are the field explorations located on the plan view?	☒	☐	☐
*9. Does the conducted site investigation meet minimum criteria outlined in Table 2?	☒	☐	☐

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (SITE INVESTIGATION)			
Plan and Subsurface Profile (Pages 24, 47-49, 335) Continued	YES	NO	UNKNOWN OR N/A
10. Are the explorations plotted and correctly numbered on the profile at their true elevation and location?	☒	☐	☐
11. Does the subsurface profile contain a word description and/or graphic depiction of soil and rock types?	☒	☐	☐
12. Are groundwater levels and date measured shown on the subsurface profile?	☒	☐	☐
Subsurface Profile or Field Boring Log (Pages 16-17, 25-29)			
13. Are sample types and depths noted?	☒	☐	☐
*14 Are SPT blow counts, percent core recovery, and RQD values shown?	☒	☐	☐
15. If cone penetration tests were made, are plots of cone resistance and friction ratio shown with depth?	☐	☐	☒
Laboratory Test Data (Pages 60, 74-75)			
*16 Were lab soil classification tests such as natural moisture content, gradation, Atterberg limits, performed on selected representative samples to verify field visual soil identifications?	☒	☐	☐
17. Are laboratory test results such as shear strength (Page 62), consolidation (Page 68), etc., included and/or summarized?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (CENTERLINE CUTS & EMBANKMENTS)			
B. Centerline Cuts and Embankments (Pages 6-9) In addition to the basic information listed in Section A, is the following information provided in the project geotechnical report?			
Are station to station descriptions included for:	YES	NO	UNKNOWN OR N/A
1. Existing surface and subsurface drainage?	☐	☐	☒
2. Evidence of springs and excessively wet areas?	☐	☐	☒
3. Slides, slumps, and faults noted along the alignment?	☐	☐	☒
Are station to station recommendations included for:			
General Soil Cut or Fill			
4. Specific surface/subsurface drainage recommendations?	☐	☐	☒
5. Excavation limits of unsuitable materials?	☒	☐	☐
*6. Erosion protection measures for backslopes, side slopes, and ditches, including riprap recommendations or special slope treatments?	☐	☐	☒
Soil Cuts (Pages 101-102)			
*7. Recommended cut slope design?	☒	☐	☐
8. Are clay cut slopes designed for minimum F.S. = 1.50?	☐	☐	☒
9. Special usage of excavated soils?	☒	☐	☐
10. Estimated shrink-swell factors for excavated materials?	☐	☐	☒
11. If answer to 3 is YES, are recommendations provided for design treatments?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (CENTERLINE CUTS & EMBANKMENTS)			
Fills (Pages 77-79)	YES	NO	UNKNOWN OR N/A
11. Recommended fill slope design?	☒	☐	☐
12. Will fill slope design provide minimum F.S. = 1.25?	☒	☐	☐
Rock Slopes			
*13 Are recommended slope designs and blasting specifications provided?	☐	☐	☒
*14 Is the need for special rock slope stabilization measures, e.g., rockfall catch ditch, wire mesh slope protection, shotcrete, rock bolts, addressed?	☐	☐	☒
15. Has the use of "template" designs been avoided (such as designing all rock slopes on 1/4 to 1 rather than designing based on orientation of major rock jointing)?	☐	☐	☒
*16 Have effects of blast induced vibrations on adjacent structures been evaluated?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (EMBANKMENTS OVER SOFT GROUND)

C. Embankments over Soft Ground

Where embankments must be built over soft ground (such as soft clays, organic silts, or peat), stability and settlement of the fill should be carefully evaluated. In addition to the basic information listed in Section A, is the following information provided in the project geotechnical report?

Embankment Stability (Pages 77-79, 95-97)	YES	NO	UNKNOWN OR N/A
*1 Has the stability of the embankment been evaluated for minimum safety factors of 1.25 for side slope stability and 1.30 for end slope stability of bridge approach embankments?	☒	☐	☐
*2. Has the shear strength of the foundation soil been determined from lab testing and/or field vane shear or static cone penetrometer tests?	☐	☐	☒
*3. If the proposed embankment does not provide minimum factors of safety given above, are recommendations given for feasible treatment alternates which will increase factor of safety to minimum acceptable (such as change alignment, lower grade, use stabilizing counterberms, excavate and replace weak subsoil, fill stage construction, lightweight fill, geotextile fabric reinforcement, etc.)?	☐	☐	☒
*4. Are cost comparisons of treatment alternates given and a specific alternate recommended?	☐	☐	☒
Settlement of Subsoil (Pages 146-160)			
5. Have consolidation properties of fine grained soils been determined from laboratory consolidation tests?	☐	☐	☒
*6. Have settlement amount and settlement time been estimated?	☒	☐	☐
7. For bridge approach embankments, are recommendations made to get the settlement out before the bridge abutment is constructed (waiting period, surcharge, or wick drains)?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (EMBANKMENTS OVER SOFT GROUND)			
Settlement of Subsoil (Pages 146-160)	YES	NO	UNKNOWN OR N/A
8. If geotechnical instrumentation is proposed to monitor fill stability and settlement, are detailed recommendations provided on the number, type, and specific locations of the proposed instruments?	☒	☐	☐
9. Construction Considerations (Pages 183, 331-334)			
a. If excavation and replacement of unsuitable shallow surface deposits (peat, muck, top soil) is recommended - are vertical and lateral limits of recommended excavation provided?	☒	☐	☐
b. Where a surcharge treatment is recommended, are plan and cross-section of surcharge treatment provided in geotechnical report for benefit of the roadway designer?	☐	☐	☒
c. Are instructions or specifications provided concerning instrumentation, fill placement rates and estimated delay times for the contractor?	☒	☐	☐
d. Are recommendations provided for disposal of surcharge material after the settlement period is complete?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (LANDSLIDE CORRECTIONS)

D. Landslide Corrections (Pages 77-80, 103-105)

In addition to the basic information listed in Section A, is the following information provided in the landslide study geotechnical report? (Refer to Table 4 for guidance on the necessary technical support data for correction of slope instabilities.)

	YES	NO	UNKNOWN OR N/A
*1. Is a site plan and scaled cross-section provided showing ground surface conditions both before and after failure?	☐	☐	☒
*2. Is the past history of the slide area summarized - including movement history, summary of maintenance work and costs, and previous corrective measures taken (if any?)	☐	☐	☒
*3. Is a summary given of results of site investigation, field and lab testing, and stability analysis, including cause(s) of the slide?	☐	☐	☒
Plan			
4. Are detailed slide features - including location of ground surface cracks, head scarp, and toe bulge - shown on the site plan?	☐	☐	☒
Cross Section			
*5. Are the cross sections used for stability analysis included with the soil profile, water table, soil unit weights, soil shear strengths, and failure plane shown as it exists?	☐	☐	☒
*6. Is slide failure plane location determined from slope indicators?	☐	☐	☒
*7. For an active slide, was soil strength along the slide failure plane backfigured using a safety factor equal to 1.0 at the time of failure?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (LANDSLIDE CORRECTIONS)			
Landslide Corrections (Continued) Text	YES	NO	UNKNOWN OR N/A
*8. Is the following information presented for each proposed correction alternate: (typical correction methods include buttress, shear key, rebuild slope, surface drainage, subsurface drainage-interceptor, drain trenches or horizontal drains and retaining structures)? a. Cross-section of proposed alternate? b. Estimated safety factor? c. Estimated cost? d. Advantages and disadvantages?	☐	☐	☒
9. Is a recommended correction alternate(s) given which provide a minimum F.S. = 1.25?	☐	☐	☒
10. If horizontal drains are proposed as part of slide correction, has subsurface investigation located definite water bearing strata that can be tapped with horizontal drains?	☐	☐	☒
11. If a toe counterberm is proposed to stabilize an active slide, has field investigation confirmed that the toe of the existing slide does not extend beyond the toe of the proposed counterberm?	☐	☐	☒
12. Construction Considerations:			
a. Where proposed correction will require excavation into the toe of an active slide (such as for buttress or shear key), has the "during construction backslope F.S." with open excavation been determined?	☐	☐	☒
b. If open excavation F.S. is near 1.0, has excavation stage construction been proposed?	☐	☐	☒
c. Has seasonal fluctuation of groundwater table been considered?	☐	☐	☒
d. Are special construction features, techniques and materials described and specified?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (RETAINING WALLS)

E. Retaining Walls (See Section 5 of "Geotechnical Engineering Notebook")

In addition to the basic information listed in Section A, is the following information provided in the project geotechnical report?

	YES	NO	UNKNOWN OR N/A
*1. Does the geotechnical report include recommended soil strength parameters and groundwater elevation for use in computing wall design lateral earth pressures and factor of safety for overturning, sliding, and external slope stability?	☒	☐	☐
2. Is it proposed to bid alternate wall designs?	☐	☐	☒
*3. Are acceptable reasons given for the choice and/or exclusion of certain wall types (gravity, reinforced soil, tieback, cantilever, etc.)?	☒	☐	☐
*4. Is an analysis of the wall stability included with minimum acceptable factors of safety against overturning (F.S. = 2.0), sliding (F.S. = 1.5), and external slope stability (F.S. = 1.5)?	☒	☐	☐
5. If wall will be placed on compressible foundation soils, is estimated total settlement, differential settlement, and time rate of settlement given?	☐	☐	☒
6. Will wall types selected for compressible foundation soils allow differential movement without distress?	☐	☐	☒
7. Are wall drainage details including materials and compaction provided?	☐	☒	☐
8. Construction Considerations			
a. **Are excavation requirements covered - safe slopes** for open excavations, need for sheeting or shoring?	☒	☐	☐
b. Fluctuation of groundwater table?	☒	☐	☐

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (SPREAD FOOTINGS)

F. Structure Foundations - Spread Footings
(Pages 191-205)

In addition to the basic information listed in Section A, is the following information provided in the project foundation report?

	YES	NO	UNKNOWN OR N/A
*1. Are spread footings recommended for foundation support? If not, are reasons for not using them discussed?	☐	☐	☒
If spread footing supports are recommended, are conclusions/recommendations given for the following:			
*2. Is recommended bottom of footing elevation and reason for recommendation (e.g., based on frost depth, estimated scour depth, or depth to competent bearing material) given?	☐	☐	☒
*3. Is recommended allowable soil or rock bearing pressure given?	☐	☐	☒
*4. Is estimated footing settlement and time given?	☐	☐	☒
5. Where spread footings are recommended to support abutments placed in the bridge end fills, are special gradation and compaction requirements provided for select end fill and backwall drainage material? (Pages 137-141)	☐	☐	☒
6. Construction Considerations:			
a. Have the materials been adequately described on which the footing is to be placed so the project inspector can verify that material is as expected?	☐	☐	☒
b. Have excavation requirements been included for safe slopes in open excavations, need for sheeting or shoring, etc?	☐	☐	☒
c. Has fluctuation of the groundwater table been addressed?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (PILE FOUNDATIONS)

G. Structure Foundations - Piles
(Pages 224-311)

In addition to the basic information listed in Section A, if pile support is recommended or given as an alternate, conclusions/recommendations should be provided in the project geotechnical report for the following:

	YES	NO	UNKNOWN OR N/A
*1. Is the recommended pile type given (displacement, nondisplacement, pipe pile, concrete pile, H-pile, etc.) with valid reasons given for choice and/or exclusions? (Pages 224-226)	☐	☐	☒
2. Do you consider the recommended pile type(s) to be the most suitable and economical?	☐	☐	☒
*3. Are estimated pile lengths and estimated tip elevations given for the recommended allowable pile design loads?	☐	☐	☒
4. Do you consider the recommended design loads to be reasonable?	☐	☐	☒
5. Has pile group settlement been estimated (only of practical significance for friction pile groups ending in cohesive soil)? (Pages 245-247)	☐	☐	☒
6. If a specified or minimum pile tip elevation is recommended, is a clear reason given for the required tip elevation, such as underlying soft layers, scour, downdrag, piles uneconomically long, etc.?	☐	☐	☒
*7. Has design analysis (wave equation analysis) verified that the recommended pile section can be driven to the estimated or specified tip elevation without damage (especially applicable where dense gravel-cobble-boulder layers or other obstructions have to be penetrated?	☐	☐	☒
8. Where scour piles are required, have pile design and driving criteria been established based on mobilizing the full pile design capacity below the scour zone?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (PILE FOUNDATIONS)			
G. Structure Foundations - Piles (Pages 224-311) - Continued	YES	NO	UNKNOWN OR N/A
9. Where lateral load capacity of large diameter piles is an important design consideration, are P-Y curves (load vs. deflection) or soil parameters given in the geotechnical report to allow the structural engineer to evaluate lateral load capacity of all piles?	☐	☐	☒
*10. For pile supported bridge abutments over soft ground:			
a. Has the abutment pile downdrag load been estimated and solutions such as bitumen coating considered in design? Not generally required if surcharging of the fill is being performed (Pages 248-251)	☐	☐	☒
b. Is bridge approach slab recommended to moderate differentials settlement between bridge ends and fill?	☐	☐	☒
c. If the majority of subsoil settlement will not be removed prior to abutment construction (by surcharging), has estimate been made of the amount of abutment rotation that can occur due to lateral squeeze of soft subsoil? (Pages 114-115)	☐	☐	☒
d. Does the geotechnical report specifically alert the structural designer to the estimated horizontal abutment movement?	☐	☐	☒
11. If bridge project is large, has pile load test program been recommended? (Pages 299-302)	☐	☐	☒
12. For a major structure in high seismic risk area, has assessment been made of liquefaction potential of foundation soil during design earthquake (note: only loose saturated sands and silts are "susceptible" to liquefaction)?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (PILE FOUNDATIONS)			
G. Structure Foundations - Piles (Pages 224-311) - Continued	YES	NO	UNKNOWN OR N/A
13. Construction Considerations: (Pages 279-311)			
Have the following important construction considerations been adequately addressed?	☐	☐	☒
a. Pile driving details such as: boulders or obstructions which may be encountered during driving - need for preaugering, jetting, spudding, need for pile tip reinforcement, driving shoes, etc.?	☐	☐	☒
b. Excavation requirements - safe slope for open excavations, need for sheeting or shoring? Fluctuation of groundwater table?	☐	☐	☒
c. Have effects of pile driving operation on adjacent structures been evaluated - such as protection against damage caused by footing excavations or pile driving vibrations?	☐	☐	☒
d. Is preconstruction condition survey to be made of adjacent structures to prevent unwarranted damage claims?	☐	☐	☒
e. On large pile driving projects, have other methods of pile driving control been considered such as dynamic testing or wave equation analysis?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (DRILLED SHAFTS)

H. Structure Foundations - Drilled Shafts
(Pages 252-260)

In addition to the basic information listed in Section A, if drilled shaft support is recommended or given as an alternate, are conclusions/recommendations provided in the project foundation report for the following:

	YES	NO	UNKNOWN OR N/A
*1. Are recommended shaft diameter(s) and length(s) for allowable design loads based on an analysis using soil parameters for side friction and end bearing?	☐	☐	☒
*2. Settlement estimated for recommended design load?	☐	☐	☒
*3. Where lateral load capacity of shaft is an important design consideration, are P-Y (load vs. deflection) curves or soils data provided in geotechnical report which will allow structural engineer to evaluate lateral load capacity of shaft?	☐	☐	☒
4. Is static load test (to plunging failure) recommended?	☐	☐	☒
5. Construction Considerations:			
a. Have construction methods been evaluated, (i.e., can less expensive dry method or slurry method be used or will casing be required)?	☐	☐	☒
b. If casing will be required, can casing be pulled as shaft is concreted (this can result in significant cost savings on very large diameter shafts)?	☐	☐	☒
c. If artesian water was encountered in explorations, have design provisions been included to handle it (such as by requiring casing and tremie seal)?	☐	☐	☒
d. Will boulders be encountered? (Note: If boulders will be encountered, then the use of shafts should be seriously questioned due to construction installation difficulties and resultant higher costs the boulders can cause.)	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (MATERIAL SITES)

I. Material Sites

In addition to the basic information listed in Section A, is the following information provided in the project Material Site Report?

	YES	NO	UNKNOWN OR N/A
1. Material site location, including description of existing or proposed access routes and bridge load limits (if any)?	☐	☐	☒
*2. Have soil samples representative of all materials encountered during the pit investigation been submitted and tested?	☐	☐	☒
*3. Are laboratory quality test results included in the report?	☐	☐	☒
4. For aggregate sources, do the laboratory quality test results (such as L.A. abrasion, sodium sulfate, degradation, absorption, reactive aggregate, etc.) indicate if specification materials can be obtained from the deposit using normal processing methods?	☐	☐	☒
5. If the lab quality test results indicate that specification material cannot be obtained from the pit materials as they exist naturally - has the source been rejected or are detailed recommendations provided for processing or controlling production so as to ensure a satisfactory product?	☐	☐	☒
*6. For soil borrow sources, have possible difficulties been noted - such as above optimum moisture content clay-silt soils, waste due to high PI, boulders, etc?	☐	☐	☒
*7. Where high moisture content clay-silt soils must be used, are recommendations provided on the need for aeration to allow the materials to dry out sufficiently to meet compaction requirements?	☐	☐	☒
8. Are estimated shrink-swell factors provided?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.

GTR REVIEW CHECKLIST (MATERIAL SITES)			
I. Material Site - Continued	YES	NO	UNKNOWN OR N/A
*9. Do the proven material site quantities satisfy the estimated project quantity needs?	☐	☐	☒
10. Where materials will be excavated from below the water table, has seasonal fluctuation of the water table been determined?	☐	☐	☒
11. Are special permits requirement covered?	☐	☐	☒
12. Have pit reclamation requirements been covered adequately?	☐	☐	☒
13. Has a material site sketch (plan and profile) been provided for inclusion in the plans, which contains:	☐	☐	☒
* Material site number?			
* North arrow and legal subdivision?	☐	☐	☒
* Test hole or test pit logs, locations, number and date?	☐	☐	☒
* Water table elevation and date?	☐	☐	☒
* Depth of unsuitable overburden which will have to be stripped?	☐	☐	☒
* Suggested overburden disposal area?	☐	☐	☒
* Proposed mining area and previously mined areas?	☐	☐	☒
* Existing stockpile locations?	☐	☐	☒
* Existing or suggested access roads?	☐	☐	☒
* Bridge load limits?	☐	☐	☒
* Reclamation details?	☐	☐	☒
14. Are recommended special provisions provided?	☐	☐	☒

* A response other than (Yes) or (N/A) for any of these checklist questions is cause to contact the appropriate geotechnical engineer for a clarification and/or to discuss the project.