APPENDIX B
STAGE 5 GEOTECHNICAL BORINGS

TIERRA

September 6, 2012

HDR, Inc.
5426 Bay Center Drive, Suite 400
Tampa, Florida 33609

Attn: Mr. Richard Siemering, P.E.

RE: Geotechnical Drilling Services
SE County Landfill Stage 5
Hillsborough County, Florida
Tierra Project No.: 6511-12-089

Mr. Siemering:

Tierra, Inc. has completed Geotechnical Drilling Services for the above referenced project. The results of the field tests are presented herein.

As requested, Tierra performed twenty-three (23) Standard Penetration Test (SPT) borings at the subject site. The boring locations were directed by others in the field. The boring locations were survey located by Pickett & Associates, Inc. The boring ground surface elevations were also surveyed and recorded by Pickett & Associates, Inc. The boring locations are shown on the attached **Boring Location Plan (Sheet 1)**. A copy of the survey information provided by Pickett & Associates, Inc. is attached for reference.

The SPT borings were performed with the use of a CME-55 drill rig. The soil sampling was performed in general accordance with ASTM D-1586 - "Penetration Test and Split-Barrel Sampling of Soils". To perform each boring, steel casing was advanced through the existing landfill material to depths ranging from approximately 20 to 45 feet below the existing grades. The soil borings were advanced using mud-rotary wash-drilling methods. The drilling fluid used to advance the casing through the landfill materials was replaced with "clean" drilling fluid prior to advancing the test borings beyond the casing depth.

For Test Borings CLB-3, CLB-6, CLB-10, CLB-14, and CLB-19, samples were taken at 5 foot intervals from the ground surface to approximately 10 to 14 feet above the bottom of the landfill material layer. Continuous 2 foot samples were then taken to several feet into or below the waste phosphatic clay layer, at which point, sampling returned to 5 foot intervals, to the boring termination depths.

7351 Temple Terrace Highway • Tampa, FL 33637
Phone (813) 989-1354 • Fax (813) 989-1355
Florida Certificate of Authorization No. 6486

For all other borings, rotary wash drilling was used from the ground surface down to approximately 10 to 14 feet above the waste phosphatic clay layer. Continuous 2 foot samples were then taken to boring termination depths. The elevation of the top of the waste phosphatic clay (TOC) is provided on **Sheet 1**.

It should be noted that all sampling was performed with the use of an automatic hammer. The *FDOT Soils and Foundations Handbook,* Section 4.1 indicates that SPT N-values obtained during SPT tests performed using an automatic hammer can be converted for design purposes to an equivalent safety hammer N-value by the following relationship:

$N_{ES} = X * N_{AUTO}$

Where:

N_{ES} = The Equivalent Safety Hammer N-value

X = The Equivalent Safety Hammer Conversion Factor

and

N_{AUTO} = The Automatic Hammer N-value

Based on the results of an FDOT study, a value of 1.24 should be used for X in the above relationship.

The soil types encountered during geotechnical explorations at the site and used for the subject study are listed below.

Stratum Number	Typical Soil Description	Unified Soil Classification System Symbol
	Landfill Material (Not Sampled)	---(1)
1	Gray to Light Brown Waste Phosphatic CLAY	CH
2	Gray to Dark Brown Fine SAND to SAND with Silt	SP/SP-SM
3	Brown to Gray Silty-Clayey SAND to Clayey SAND to Sandy CLAY	SM-SC/SC/CL
4	Gray to Green Sandy SILT to Sandy CLAY	MH/CH
5	Weathered Limestone	---(2)
6	Landfill Material Including Soil	---(1)
7	Gray to Brown Fine SAND to Silty SAND with Landfill Material	SP/SM
8	Brown Silty SAND	SM

(1) USCS does not have a classification symbol for Landfill Material
(2) USCS does not have a classification symbol for Weathered Limestone

Representative soil samples collected from the SPT borings were classified and stratified in general accordance with the Unified Soil Classification System. A Geotechnical Engineer based soil stratification on a visual review of the recovered samples and interpretation of the field boring logs. The boring stratification lines represent the approximate boundaries between soil types of significantly different engineering properties; however, the actual transition may be gradual. In some cases, small variations in properties not considered pertinent to our engineering evaluation may have been abbreviated or omitted for clarity. The boring profiles represent the conditions at the particular boring location and variations do occur between the borings. The results of the test borings completed for this study are provided on **Sheets 2 through 5** of this report.

The groundwater level was not apparent in any of the borings. When performing SPT borings, the use of drilling fluid can limit the ability to obtain accurate groundwater table measurements when the groundwater table depth is greater than the depth where the drilling fluid is introduced. As a result, GNA (Groundwater Not Apparent) is indicated on the soil profiles in the attachments.

Tierra, Inc. appreciates the opportunity to be of service to HDR, Inc. on this project. If you have any questions or comments regarding this report, please contact our office at your earliest convenience.

Sincerely,

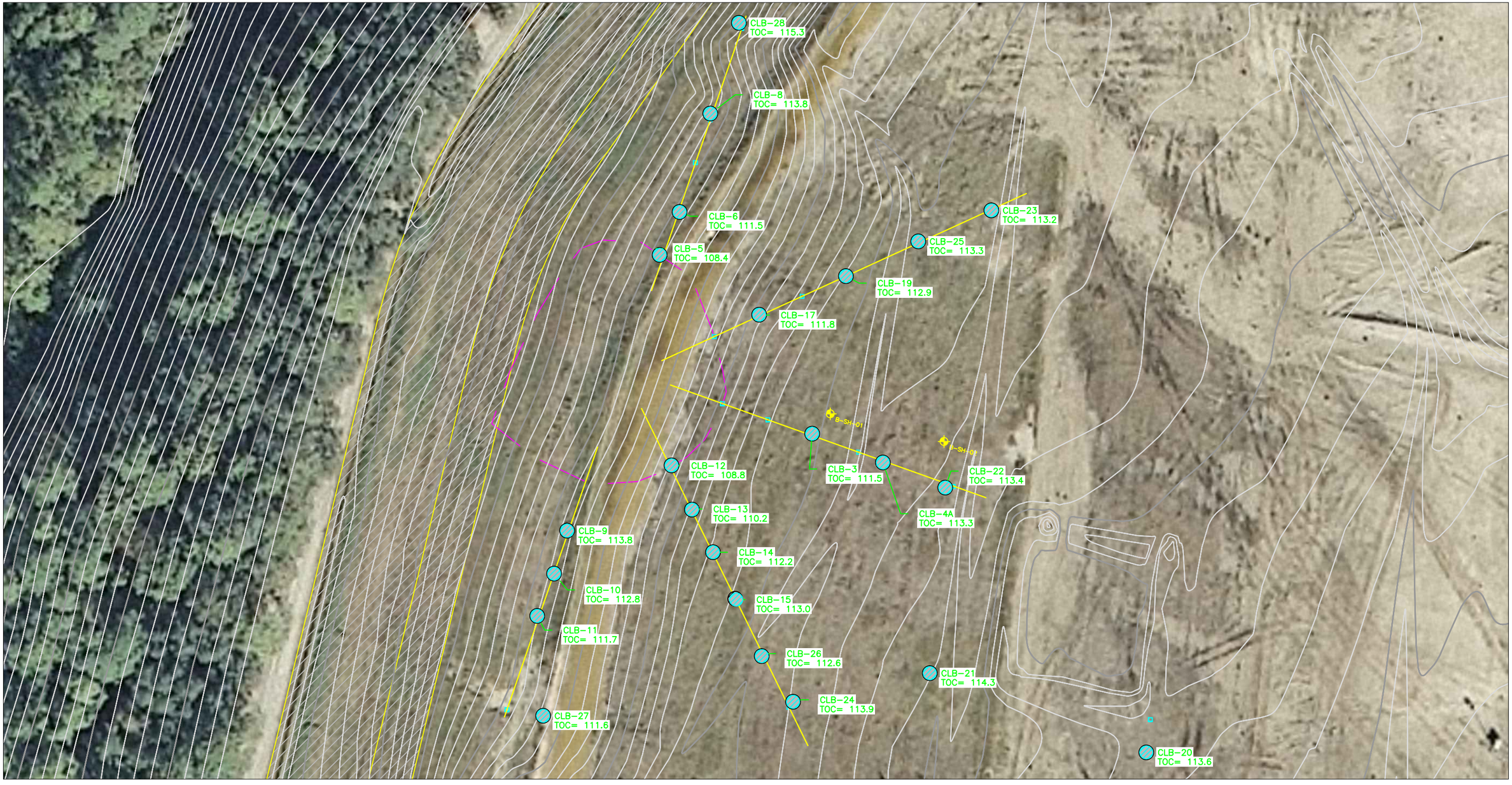
TIERRA, INC.

Danny McBride, E.I.
Geotechnical Engineer Intern

Larry P. Moore, P.E.
Principal Geotechnical Engineer
Florida License No. 47673

Attachments: Boring Location Plan (Sheet 1)
Soil Profiles (Sheets 2 - 5)
Survey Information – Pickett & Associates, Inc.

Cc: Mr. Barry Meyer, P.E. – HDR, Inc.
Mr. Joe O'Neill, P.E. – Civil Design Services



NOTE: BASE MAP PROVIDED BY HDR, INC.

BORING LOCATION PLAN

0 50'

PLAN SCALE

N

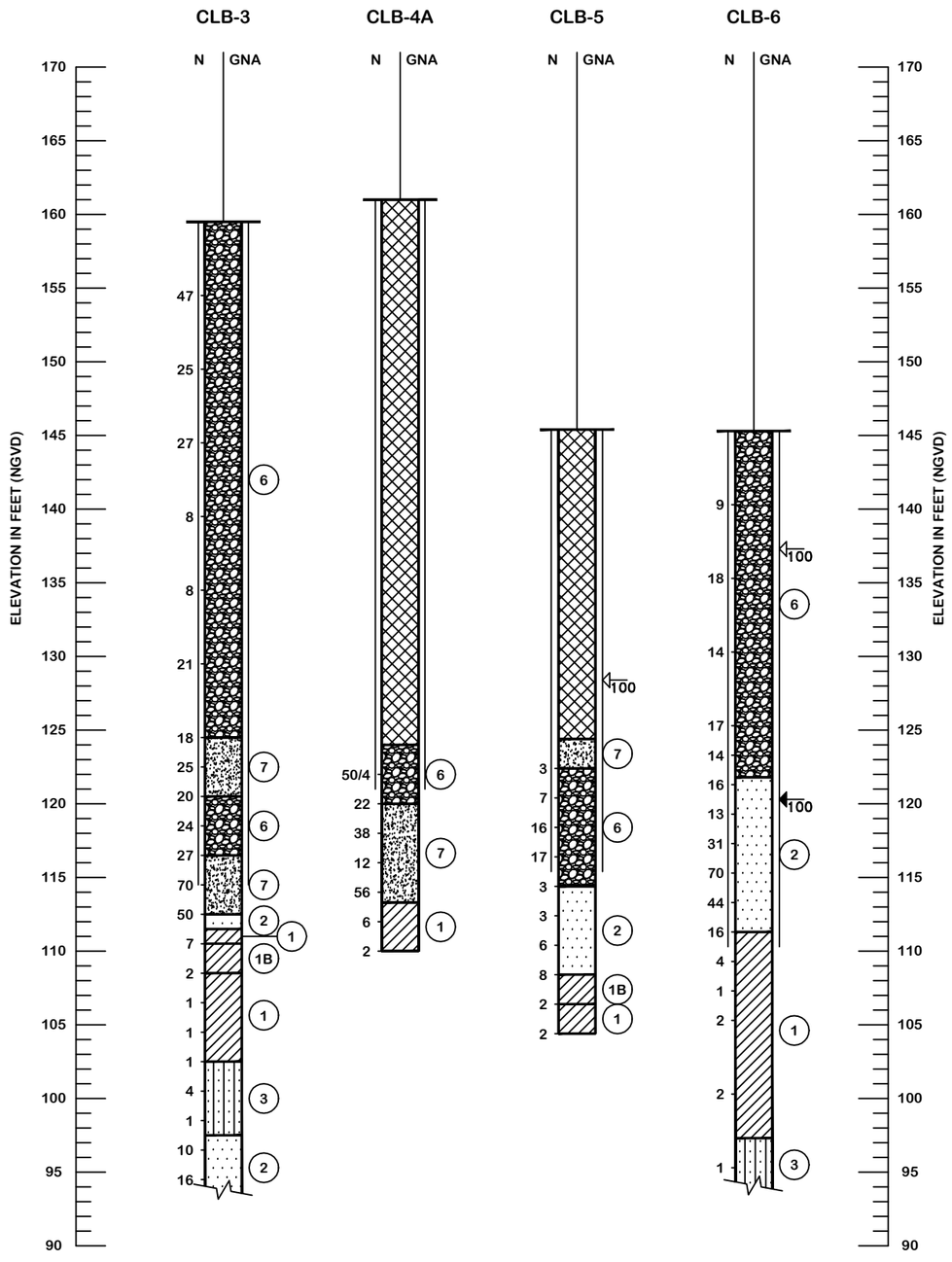
LEGEND

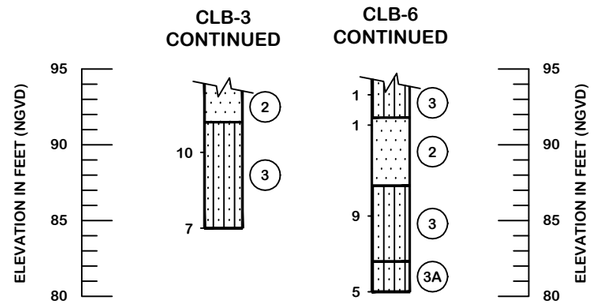
APPROXIMATE LOCATION OF SPT BORING

TOC = 113.30 TOP OF CLAY ELEVATION, FEET (NGVD 29)

DRAWN BY: SW CHECKED BY: DM	APPROVED BY: LPM DATE: AUG 2012	ENGINEER OF RECORD: LARRY P. MOORE, P.E. FLORIDA LICENSE NO.: 47673	TIERRA 7351 Temple Terrace Highway Tampa, Florida 33637 Phone: 813-989-1354 Fax: 813-989-1355 FL Cert. No.: 6486	SCALE: NOTED	PROJECT NUMBER: 6511-12-089	GEOTECHNICAL ENGINEERING SERVICES SE COUNTY LANDFILL HILLSBOROUGH COUNTY, FLORIDA	SHEET 1

SOIL PROFILES





LEGEND

1. GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
2. GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
3. BROWN TO GRAY SILTY-CLAYEY SAND TO CLAYEY SAND TO SANDY CLAY (SM-SC/SC/CL)
4. GRAY TO GREEN SANDY SILT TO SANDY CLAY (MH/CH)
5. WEATHERED LIMESTONE
6. LANDFILL MATERIAL INCLUDING SOIL
7. GRAY TO BROWN FINE SAND TO SILTY SAND WITH LANDFILL MATERIAL (SP/SM)
8. BROWN SILTY SAND (SM)

LANDFILL MATERIAL (NOT SAMPLED)

A - WITH PHOSPHATE GRANULES
B - WITH WOOD/PLANT MATTER

N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
GNA	GROUNDWATER LEVEL NOT APPARENT DUE TO DRILLING METHOD USED
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
	CASING
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
WR	FELL UNDER WEIGHT OF ROD
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD	NATIONAL GEODETIC VERTICAL DATUM OF 1929
NOTE:	ALL BORINGS PERFORMED WITH THE USE OF AN AUTOMATIC HAMMER

GRANULAR MATERIALS-RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40

SILTS AND CLAYS CONSISTENCY	SPT N-VALUE (BLOWS/FT.)
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

DRAWN BY: SW
CHECKED BY: DM
APPROVED BY: LPM
DATE: AUG 2012
ENGINEER OF RECORD: LARRY P. MOORE, P.E.
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GEOTECHNICAL ENGINEERING SERVICES
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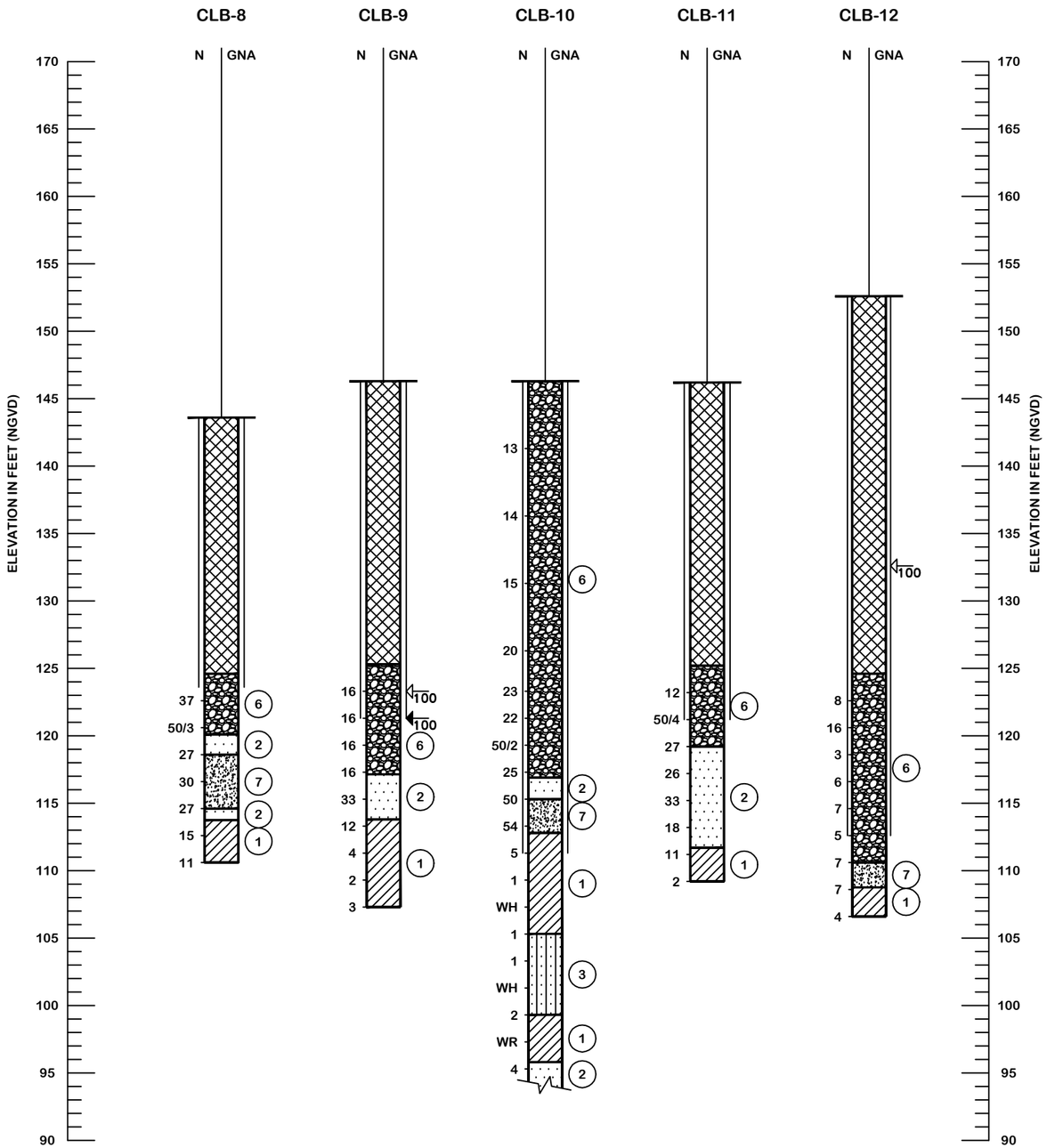
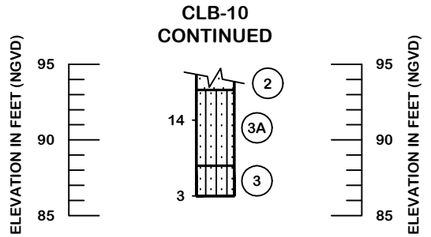
HILLSBOROUGH COUNTY, FLORIDA

SHEET 2

SOIL PROFILES





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GNA	GROUNDWATER LEVEL NOT APPARENT DUE TO DRILLING METHOD USED
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
	CASING
100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)
100	REGAINED CIRCULATION OF DRILLING FLUID (100%)
WR	FELL UNDER WEIGHT OF ROD
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
NGVD	NATIONAL GEODETIC VERTICAL DATUM OF 1929

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VERY STIFF	12 TO 24
HARD	GREATER THAN 24

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ENGINEER OF RECORD:
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FLORIDA LICENSE NO.:
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GEOTECHNICAL ENGINEERING SERVICES
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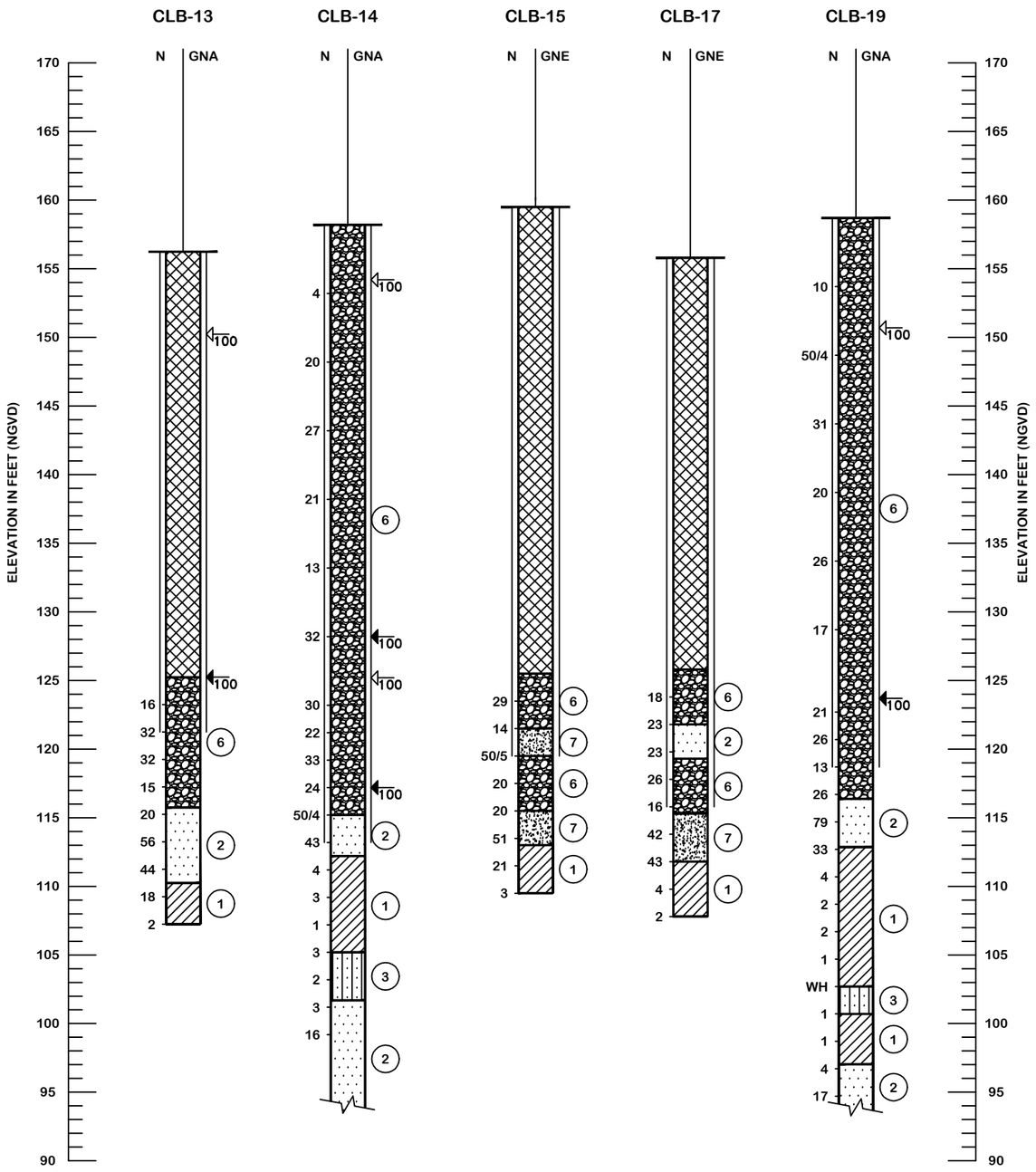
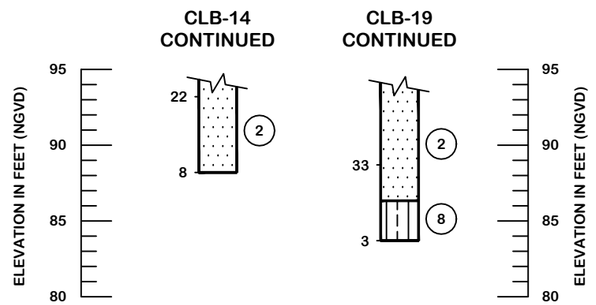
SHEET 3

SOIL PROFILES





LEGEND

- LANDFILL MATERIAL (NOT SAMPLED)
- GRAY TO LIGHT BROWN WASTE PHOSPHATIC CLAY (CH)
- 2 — GRAY TO DARK BROWN FINE SAND TO SAND WITH SILT (SP/SP-SM)
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GEOTECHNICAL ENGINEERING SERVICES
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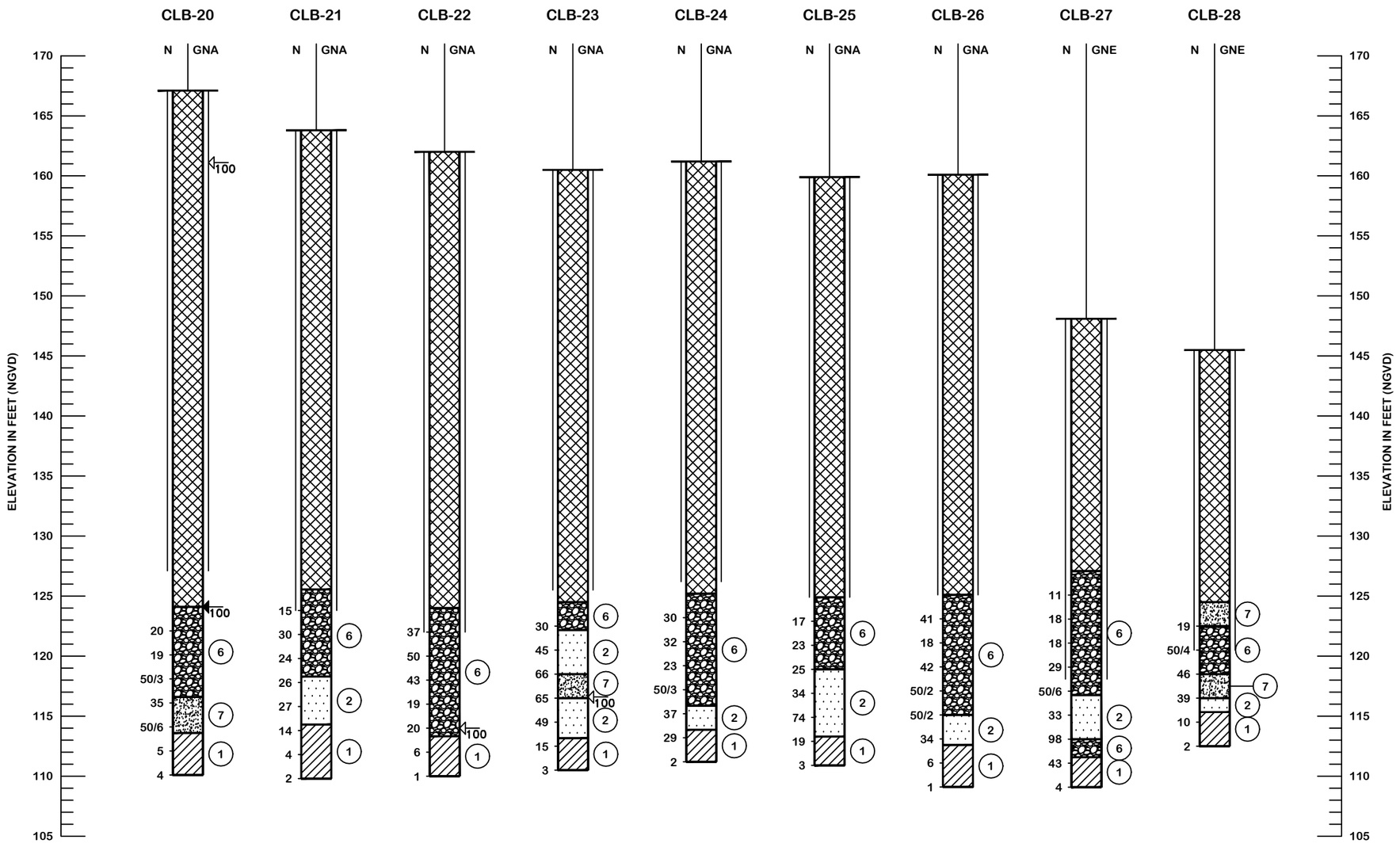
HILLSBOROUGH COUNTY, FLORIDA

SHEET 4

SOIL PROFILES



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SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

NOTE: GROUND SURFACE ELEVATIONS AT BORING LOCATIONS WERE PROVIDED BY THE PROJECT SURVEYOR PICKET & ASSOCIATES, INC.

DRAWN BY: SW
CHECKED BY: DM

APPROVED BY: LPM
DATE: AUG 2012

ENGINEER OF RECORD:
LARRY P. MOORE, P.E.
FLORIDA LICENSE NO.:
47673

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7351 Temple Terrace Highway
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Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

SCALE: NOTED

PROJECT NUMBER: 6511-12-089

GEOTECHNICAL ENGINEERING SERVICES
SE COUNTY LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

SHEET 5

SURVEYOR'S REPORT

Southeast Landfill
Survey of Twenty-Four Soil Borings
Hillsborough County, Florida

Prepared for:

HDR | ONE COMPANY *Many Solutions®*

Prepared by:

PICKETT
SURVEYING & PHOTOGRAMMETRY

PICKETT & ASSOCIATES PROJECT NO.: 12131-14
TYPE OF SURVEY: SPECIFIC PURPOSE SURVEY
DATE OF SURVEY: 07/02/12
DATE OF THIS REPORT: 07/03/12
Revision 1: Added Soil Borings CLB-20 & CLB-21

NOTE: THIS REPORT IS NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.

Pickett & Associates, Inc. • 475 South First Avenue • Bartow, FL 33830 • (863) 533-9095

PROJECT DESCRIPTION

The specific purpose of this project was to locate twenty-four (24) soil borings and determine the elevation of the ground at each location at the Hillsborough County Southeast Landfill.

ACCURACY STATEMENT

All points have an estimated horizontal positional accuracy of 0.10' or less and a vertical positional accuracy of 0.10' or less. All control established in this area is subject to ground settlement. All coordinates and elevations are in US Survey Feet.

DATUM

HORIZONTAL

North and the Coordinates are based on the West Zone of the Florida State Plane Coordinate System, North American Datum of 1983, 1990 adjustment and are based upon provided control referenced to Hillsborough County Horizontal Control Monuments LW-H (PID AG8963) and BY-E (PID AG8747).

VERTICAL

Elevations are to National Geodetic Vertical Datum of 1929 (NGVD29) and are based upon provided control referenced to Hillsborough County Horizontal Control Monument VR-B (PID AG9078), elevation is 103.08' from Hillsborough County's Vertical Control Network.

METHODS

Site control points set for the purpose of this survey were surveyed using Real Time Kinematic (RTK) Global Positioning System (GPS) RTK GPS and were observed at least twice with a new initialization between each observation. Observations have at least 10 minute intervals between them.

Boring coordinates and elevations as listed in Project Results were measured using a Trimble 5600 total station and are based on the site control specified above.

PROJECT RESULTS

CONTROL

POINT# 151399
Set Nail & Disk
stamped "LB 364"
N 1251664.21
E 595291.75
Elevation 126.27'

POINT# 151397
Set 5/8" steel Rod & Cap
stamped "REF. PT. LB 364"
N 1251473.69
E 595210.26
Elevation 130.79'

GROUND ELEVATIONS AT BORING LOCATIONS

CLB-2
N 1251417.67
E 595392.06
Ground Elevation = 158.3'

CLB-3
N 1251410.34
E 595415.47
Ground Elevation = 159.5'

CLB-4A
N 1251395.46
E 595452.13
Ground Elevation = 161.0'

CLB-5
N 1251503.00
E 595336.45
Ground Elevation = 145.4'

CLB-6
N 1251525.21
E 595346.72
Ground Elevation = 145.3'

CLB-8
N 1251576.20
E 595362.71
Ground Elevation = 143.6'

CLB-9
N 1251360.11
E 595288.46
Ground Elevation = 146.3'

CLB-10
N 1251337.84
E 595281.65
Ground Elevation = 146.3'

CLB-11
N 1251315.13
E 595272.93
Ground Elevation = 146.2'

CLB-12
N 1251393.91
E 595342.57
Ground Elevation = 152.6'

CLB-13
N 1251371.03
E 595353.18
Ground Elevation = 156.2'

CLB-14
N 1251348.98
E 595364.05
Ground Elevation = 158.2'

CLB-15
N 1251324.88
E 595375.61
Ground Elevation = 159.5'

CLB-17
N 1251471.97
E 595388.01
Ground Elevation = 155.8'

CLB-18
N 1251481.51
E 595410.11
Ground Elevation = 156.6'

~~CLB-20~~ CLB-21
N 1251286.31
E 595476.47
Ground Elevation = 163.8'

~~CLB-21~~ CLB-20
N 1251245.25
E 595588.73
Ground Elevation = 167.1'

CLB-22
N 1251382.44
E 595484.47
Ground Elevation = 162.0'

CLB-23
N 1251526.11
E 595508.39
Ground Elevation = 160.5'

CLB-24
N 1251271.44
E 595405.55
Ground Elevation = 161.2'

CLB-25
N 1251510.01
E 595470.47
Ground Elevation = 159.9'

CLB-26
N 1251297.11
E 595389.34
Ground Elevation = 160.1'

CLB-27
N 1251264.22
E 595275.99
Ground Elevation = 148.1'

CLB-28
N 1251623.22
E 595377.52
Ground Elevation = 145.5'

Gregory A. Prather, P.S.M.
Florida Registration No. 5135
Pickett & Associates, Inc.
Florida Registration No. 364

7/2/12
Survey Date