Environmental Consultants

3012 U.S. Highway 301 N
Suite 700
Tampa, FL 33619-2242

813 621-0080
FAX 813 623-6757

SCS ENGINEERS

May 31, 2005
File No. 09200020.15

Ms. Susan J. Pelz, P.E.
Florida Department of Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, Florida 33619

RECEIVED
MAY 31 2005
EPC Waste Management Division

Subject: Southeast County Landfill Phosphatic Clay Annual Evaluation
Hillsborough County, Florida - Permit No. 35435-006-SO

Dear Mr. Ford:

On behalf of the Hillsborough County Solid Waste Department, SCS Engineers (SCS) is submitting the attached report regarding the evaluation of the performance of the waste phosphatic clays at the Southeast County Landfill (SCLF) as required by the above referenced permit, specifically Specific Condition No. 16.f. As stated in the attached report by Ardaman and Associates, Inc. (Ardaman), the piezocone soundings show that, under existing conditions, an upward gradient exists at the locations PC-1K, PC-1L, and PC-4F.

At the location of PC-3E, a slight downward potentiometric head 0.4 feet was measured (measured from the head on top of the clay versus the excess pore pressure in the middle of the clay). SCS concurs with Ardaman's assessment that this condition is not significant considering that the phosphatic clay layer has a permeability of less than $1x10^{-8}$ cm/sec and the pore pressures within the clays will increase upon placement of the next lift of waste in this area.

Based on the data obtained by Ardaman, the performance of the waste phosphatic clays are consolidating and strengthening in general accordance with the original design assumptions. SCS recommends that no further action be taken at this time and that the annual evaluation as required by Specific Condition No. 16.f be continued.

Please call should you have any questions or require additional information.

Sincerely,

Joseph H. O'Neill, P.E.
Project Manager
SCS ENGINEERS

Raymond J. Dever, P.E., DEE
Vice President
SCS ENGINEERS

JHO/RJD:jho

cc: Patricia V. Berry, SWMD
Ron Cope, EPCHC

Hillsborough County Files in SCS Library

Description	Count	Date	Project No.
Title V Air Permit Application, Southeast County Landfill	Hillsborough County SWMD		03-Jul-86 0995029.33
Permanent Pump Station B Construction Permit Application Responses to the FDEP Letter dated Jan. 22, 1998	Hillsborough County		12-May-87 0995029.13
Contruction Permit Application Phases V and VI Improvements Southeast County LF	Hillsborough County		03-Aug-88 0995029.23
Evaluation & Ranking of Sanitary Landfill Sites Selected for Detailed Investigation	Hillsborough County Dept of Solid Waste		13-Jul-89 0990018.03
Operation Permit Renewal Responses	Hillsborough County Dept of Solid Waste		03-Aug-89 0990018.35
Barry Road Landfill Contamination Assessment Plan	Hillsborough County Dept of Solid Waste		30-Mar-90 0990018.63
Report of Geotechnical Exploration, Borrow Pit, Southeast Landfill Hillsborough County, FL	Hillsborough County		30-Nov-90 0990018.03
Recommended Spare Parts Manual for SELF LTRF	Hillsborough County		28-Jul-92 0990018.45
Contract Documents and Specifications for: Construction and Operation of Southeast County Leachate Treatment and Reclamation Facility Volumes 1 & 2	Hillsborough County		20-Oct-92 0990018.42
Contract Documents & Specifications for: Hillsborough Heights Property Maintenance...	Hillsborugh County		17-Nov-92 0995028.13
Waste Tire Processing Facility Permit Renewal Application	Hillsborough County		05-Apr-93 0990018.35
LFG Specialties - Flares - RE: Taylor Road Landfill Utility Flare System	Hillsborough County		19-Jul-93 0990018.01
Construction Quality Assurance for Hypalon Berm Liner - SELF	Hillsborough County Dept of Solid Waste		01-Oct-93 0990018.35
Preliminary Site Characterization Summary Report - Taylor Road LF - 3 Volumes	Hillsborough County Dept of Solid Waste		23-Dec-93 0990018.14
Permanent Pump Station B Construction Permit Application and Design Engineering Report	Hillsborough County Dept. of Solid Waste		07-Jan-94 0995029.13
Contamination Assessment Report - Barry Road Landfill, Volume 2 of 2	Hillsborough County		01-Feb-94 0997033.01
Long-term Care Permit Renewal Application Hillsborough Heights and Taylor Road Class I Landfills Hillsborough County, Florida	Hillsborough County		31-May-94 0999024.11
Quality Assurance Project Plan - Taylor Road LF	Hillsborough County Dept of Solid Waste		04-Aug-94 0990018.13
Operation Permit Renewal Application	Hillsborough County Dept of Solid Waste		22-Aug-94 0985027.11
Report of Landfill Closure - Northwest Class III Landfill	Hillsborough County		30-Aug-94 0990018.22
Waste Projections and Future Disposal Alternatives	Hillsborough County Dept of Solid Waste		29-Sep-94 0990018.03
Phase I Methane Gas Migration Investigation - Gunn Highway Landfill	Hillsborough County Dept. of Solid Waste		06-Oct-94 0993010
General Conditions, Supplemental Conditions, and Technical Specifications - SELF Leachate Treatment	Hillsborough County		08-Nov-94 0990018.42
Operation Permit Renewal Application - SELF (3 vols)	Hillsborough County		18-Nov-94 0990018.34
Long-Term Care Permit Renewal Application Hillsborough Heights/Taylor Road Landfill Hillsborough County, Florida	Hillsborough County, Florida		30-Nov-94 0990018.15
Long-Term Care Permit Renewal Application Additional Information Hillsborough Heights/Taylor Road Landfills	Hillsborough County Dept. of Solid Waste		30-Nov-94 0990018.15
Solid Waste Composition Study Update	Hillsborough County Dept of Solid Waste		01-Dec-94 0990018.03
Operation and Maintenance Manual Taylor Road Landfill Landfill Gas Migration Control System, Hillsborough County Florida	Hillsborough County		15-Dec-94 0990018.15
Photos	Hillsborough County Dept of Solid Waste		19-Dec-94 0985027.07
Leachate Management Report	Hillsborough County		27-Jan-95 990018.03
Geotechnical Exploration, Proposed Leachate Treatment Plant Southeast Landfill	Hillsborough County Dept of Solid Waste		07-Mar-95 0990018.03
Operation Permit Renewal Responses	Hillsborough County Dept of Solid Waste		24-Mar-95 0985027.11
Operation Permit Renewal Application Responses - SELF	Hillsborough County Dept of Solid Waste		24-Mar-95 0990018.35
Proposed Final Feasibility Study Taylor Road Landfill Site	Hillsborough County, FL		01-May-95 0990018.15
Phase II Methane Gas Migration Investigation Gunn Highway Landfill	Hillsborough County Solid Waste Mgmt. Dept.		19-May-95 0993010.00
Draft Landfill Gas Investigations Hillsborough Heights Landfill	Hillsborough County		23-May-95 0985027.13
Draft Remedial Investigation/Feasibility Study Work Plan - TRLF	Hillsborough County		23-May-95 0990018.13
Wetland Delineation Report SELF Proposed Class I Expansion	Hillsborough County		23-May-95 0990018.53
Endangered and Threatened Species Report for the Southeast County Facility Proposed Class I Expansion Site	Hillsborough County		23-May-95 0990018.55
Endangered & Threatened Species Report - SELF Proposed Class I Expansion Site	Hillsborough County		23-May-95 0990018.55
Landfill Gas Recovery Projects	Hillsborough County Dept of Solid Waste		04-Aug-95 0985027.13
Phase IV Cleanout Construction Observations & Documentation Report - SELF	Hillsborough County		29-Sep-95 0990018.35
Initial Operational Period Evaluation Report for the Leachate Treatment and Reclamation Facility Southeast County Landfill	Hillsborough County Solid Waste Mgmt. Dept.		02-Jul-96 995029.21
Hydrogeological Investigation Southeast County Landfill	Hillsborough County Dept of Solid Waste		02-Jul-96 0985027.11
Contract Documents & Specifications For: Taylor Rd. LF Gas Migration Control System	Hillsborough County SWMD		11-Oct-96 0990018.13
Air Emissions Inventory & Potential to Emit Documentation Southeast County Landfill	Hillsborough County SWMD		11-Oct-96 0995029.12
Air Emissions Inventory & Potential to Emit Documentation-SELF	Hillsborough County SWMD		11-Oct-96 0995029.12
Wetland Delineation Report SELF Proposed Class I Expansion Site	Hillsborough County		16-Oct-96 0990018.55
Phase I Methane Migration Investigation & Proposed Phase II Actions	Hillsborough County Dept of Solid Waste		19-Nov-96 0993010.00
Long-Term Care Permit Renewal Application - HH/TRLF	Hillsborough County Dept of Solid Waste		25-Nov-96 0990018.15
Pollution Prevention Plans and Best Management Practices - SELF	Hillsborough County Dept of Solid Waste		25-Mar-97 0990018.33
Evaluation of Filling Schedules & Stability Analyses for SELF	Hillsborough County		25-Aug-97 0985027.11
Permanent Pump Station B Construction Permit Application Responses to the FDEP	Hillsborough County		15-Oct-97 0995029.13
Closure Permit Responses	Hillsborough County Dept of Solid Waste		31-Oct-97 0985027.14
Contamination Assessment Plan	Hillsborough County Dept. of Solid Waste		17-Dec-97 0990018.63
Contamination Assessment Report - Barry Road Landfill, Volume 1 of 2	Hillsborough County		17-Dec-97 0997033.01
PCAR for Morris Bridge Road Landfill	Hillsborough County Dept of Solid Waste		24-Dec-97 0990018.92
Technical Specifications Phase II Drainage Improvements	Hillsborough County Dept of Solid Waste		29-Dec-97 0990018.01
Title V Air Permit Application Southeast County Landfill Hillsborough County, Florida	Hillsborough County Dept. of Solid Waste		31-Dec-97 0995029.33
Tier 2 Sampling and Analysis Results for the Southeast County Landfill	Hillsborough County Solid Waste Management Dept.		31-Dec-97 0995029.33
Operations and Maintenance Manual Landfill Gas Migration and Odor Control Facility HH LF	Hillsborough County		05-Feb-98 0998527.05
Construction of Hills. Heights LF Gas Migration & Ofor Control System ('Cont. Doc & Specs)	Hillsborough County		13-Mar-98 0998527.04
Interim Remedial Action Plan/Contamination Assessment Plan/Pleasant Grove LF	Hillsborough County		26-Jun-98 0998005.00
SCLF July 1998 PPS-B Construction	Hillsborough County		01-Jul-98 09195029.23
Groundwater Monitoring Plan Biennial Evaluation SE Cty Class I LF	Hillsborough County		15-Jul-98 0995029.13
Phase I Environmental Site Assessment Proposed Middle School "HH"	Hillsborough County		29-Jul-98 0998035.00
Phase I Environmental Site Assessment Proposed High School Fish Hawk Ranch Develop.	Hillsborough County		04-Sep-98 0998043.00
Northwest Transfer Facility Hillsborough County, Florida Operation Permit Renewal Application	Hillsborough County		30-Sep-98 0998028.13
Leachate Management Plan Southeast County Landfill Hillsborough County, Florida	Hillsborough County, Florida		20-Oct-98 0995029.24
Operations and Contingency Plan for Excavation of Landfill Waste Materials Young Magnet Middle	Hillsborough County School Board		03-Nov-98 0997052.02
Contract Documents & Specifications for Hillsborough Heights Landfill Leachate Tank Containment Area	Hillsborough County		31-Dec-98 0995028.13
Report of Construction February 8, 1999 - March 3, 1999 SELF Geotarp Installation for Phases V&VI HC Contract No. PC-338-98	Hillsborough County		31-Dec-98 0995029.24
Additional Information to FDEP regarding the SCLF, Phases V and VI Operations Mod. Pending No. 35435-003	Hillsborough County		12-Feb-99 0995029.14
Operation Permit Modification Southeast County Landfill Hillsborough County, Florida Responses to the FDEP	Hillsborough County		02-Mar-99 0995029.14
	987 Hillsborough County		09-Apr-99 0995028.14
Report of Construction Hillsborough Heights Landfill Hillsborough County, Florida Landfill Gas System Improvements	Hillsborough County		09-Apr-99 0995028.14
Hillsborough County Solid Waste Management Department Internal Pump Station "B" SELF Photos Book 1	Hillsborough County		09-Apr-99 0995029.13
Southeast County Landfill Geotarp Installation for Phases V & VI Phase V Activation Hills.Cty contract No. PC-338-98	Hillsborough County		07-May-99 0995028.24

Description	Count	Date	Project No.
Contamination Assessment Report Pleasant Grove Landfill Hillsborough County, Florida Volume II Appendices (2 copies)	Hillsborough County	07-May-99	0998005.00
Contamination Assessment Report Pleasant Grove Landfill Hillsborough County, Florida - Volume I	Hillsborough County	07-May-99	0998005.00
Waste Tire Processing Facility Operating Permit Renewal	Hillsborough County	02-Sep-99	0990018.35
Northwest Class III Landfill Long Term Care Permit Renewal Application	Hillsborough County	29-Sep-99	0990018.64
Waste Tire Processing Facility Operation Permit Renewal	Hillsborough County	15-Oct-99	09195029.15
Wetland Delineation Report Southeast County Facility Proposed Class I Expansion Site	Hillsborough County	26-Oct-99	0990018.55
Long-Term Care Permit Renewal Application Hillsborough Heights and Taylor Road Class I Landfills Hillsborough County, Florida	Hillsborough County	26-Oct-99	099024.11
Long-Term Care Permit Renewal Appl. Hillsborough Heights and Taylor Rd Class I Landfills and Responses dated 12/22/99 & 2/24/00	Hillsborough County	26-Oct-99	0999024.11
Long-term Care Permit Renewal Application Northwest Class III Landfill Hillsborough County, Florida	Hillsborough County	16-Nov-99	0995028.24
Contract Documents & Specifications for: Hillsborough Heights Landfill Gas Control System Improvements	Hillsborough County	02-Dec-99	0995028.13
Contract Documents & Specifications for: Geotarp for Phases IV, V, and VI Southeast County Landfill	Hillsborough County	02-Dec-99	0995029.13
Remedial Action Plan Pleasant Grove Landfill Hillsborough County, Florida	Hillsborough County (2 copies)	21-Feb-2000	091998005.00
Taylor Road Landfill Superfund Site Groundwater Quality Statistical Evaluations Hillsborough County, Florida	Hillsborough County	09-Jun-2000	09199024.11
Hillsborough Heights and Taylor Road Landfills Landfill Gas Control System Improvements Construction	Hillsborough County	08-Dec-2000	09199024.12
Leachate Management Plan Southeast County Landfill Hillsborough County, Florida	Hillsborough County	08-Dec-2000	09200020.21
Certification of Construction Completion Report Pleasant Grove Landfill Department of Solid Waste Management Hillsborough County, Florida Vol. 1&2	Hillsborough County	25-May-2001	09198005.00
Contract Documents & Specifications for Capacity Expansion Section 1 Southeast County Landfill, by Hillsborough County	Hillsborough County	19-Jul-2001	09200020.32
Groundwater Quality Statistical Evaluation Taylor Road Landfill - Superfund Site Hillsborough County, Florida January 1995-April 2001	Hillsborough County	31-Aug-2001	0999024.32
Construction Certification Report Hillsborough Heights and Taylor Road Landfills, Landfill Gas Control System Improvements Construction	Hillsborough County	13-Jun-2002	09199024.13
Certification of Construction Completion Report Expansion of Surface Impoundment - Pond B Southeast County Landfill	Hillsborough County	05-Aug-2002	09200020.22
Operations Permit Application - Capacity Expansion, Section 7 Southeast County Landfill Hillsborough County, Florida Attachment L-1 - Operations Plan	Hillsborough County	13-Sep-2002	09200020.32
Operations Permit Application - Capacity Expansion, Section 7 Southeast County Landfill Hillsborough County, Florida	Hillsborough County	13-Sep-2002	09200020.32
New Source Performance Standards (NSPS) Tier 2 Sampling and Non-Methane Organic Compound Emissions Estimate Five-Year Retest Southeast County Landfill, Hillsborough County, Florida	Hillsborough County	07-Oct-2002	09200020.12
Responses to Request for Additional Information Capacity Expansion, Section 7 Southeast County Landfill Hillsborough County, Florida	Hillsborough County	10-Dec-2002	09200020.33
Closed Landfill Investigation Program February 2003	Hillsborough County	01-Feb-2003	09199024.34
Operations Plan Southeast County Landfill Phases I-VI Hillsborough County, Florida	Hillsborough County	15-Apr-2003	09200020.13
Leachate Management Plan Southeast County Landfill Hillsborough County, Florida	Hillsborough County	15-Apr-2003	09200020.23
Operation Plan Southeast County Landfill, Phases I-IV and Section 7 Capacity Expansion, Hillsborough County, Florida	Hillsborough County	12-May-2003	09200020.13
Leachate Management Plan Southeast County Landfill (Phases I-IV) Hillsborough County, Florida	Hillsborough County	12-May-2003	09200020.23
Construction Certification Report Hillsborough Heights & Taylor Road Landfills Sideslope Ditch Improvements	Hillsborough County	06-Jun-2003	09199024.14
Taylor Road Landfill Superfund Site Groundwater Quality Statistical Evaluations Hillsborough County, Florida	Hillsborough County	27-Jun-2003	09199024.34
Application for Title V Air Operation Permit Renewal Permit No. 0570854-001-AV Southeast County Landfill Hillsborough Coutny, FL	Hillsborough County	01-Aug-2003	09200020.13
Minor Permit Modification Southeast County Landfill Stormwater Basin "A" Permit No. 35435-006-SO	Hillsborough County	10-Sep-2003	09200020.13
Certfication of Construction Completion Report Southeast County Landfill Capacity Expansion Section 7 Construction Volume 1 of 3	Hillsborough County	21-Oct-2003	09200020.34
Certfication of Construction Completion Report Southeast County Landfill Capacity Expansion Section 7 Construction Volume 2 of 3	Hillsborough County	21-Oct-2003	09200020.34
Certfication of Construction Completion Report Southeast County Landfill Capacity Expansion Section 7 Construction Volume 3 of 3	Hillsborough County	21-Oct-2003	09200020.34
Responses to Request for Additional Information Hillsborough County Northewest Transfer Station Pending Permit No.: 126750-002-SO	Hillsborough County	15-Dec-2003	09199024.25
Construction Permit Application, Capacity Expansion,and and Responses for Section 8, Southeast County Landfill Hillsborough County, Florida-Draft	Hillsborough County	19-Jan-2004	09200020.34
Revised Taylor Road Landfill Superfund Site Updated Water Well Survey	Hillsborough County	06-May-2004	09199024.35
Waste Tire Processing Facility Permit Renewal Application Southeast County Landfill	Hillsborough County	23-Jun-2004	09200020.14
Groundwater Quality Statistical Evaluation Taylor Road Landfill - Superfund Site Hillsborough County, Florida January 1995-January 2004 (2 copies)	Hillsborough County	30-Jun-2004	09199024.35
Hillsborough Heights Landfill Landfill Gas System Renovation Technical Specifications	Hillsborough County	21-Jul-2004	09199024.15
Groundwater Monitoring Plan Evlauation Southeast County Landfill & Capacity Expansion Area Hillsborough County Florida February 2001 - February 2004	Hillsborough County	21-Jul-2004	09200020.14
Long-Term Care Permit Renewal Application Northwest Class III Landfill, Hillsborough County Florida	Hillsborough County	17-Aug-2004	09199024.25
Application for Construction Permit to Renovate the Landfill Gas Collection & Control System Hillsborough Heighs Landfill	Hillsborough County	30-Aug-2004	09199024.15
Contract Documents & Specifications for: Southeast County Landfill Expansion Section 8	Hillsborough County	16-Sep-2004	09200020.34
Long-Term Care Permit Renewal Application Hillsborough Heights and Taylor Road Class I Landfills	Hillsborough County	14-Mar-2005	09204021.11
Technical Evaluation for Cyanide Reduction at the Leachate Treatment and Reclamation Facility	Hillsborough County	31-Mar-2005	09200020.45
Long-Term Care Permit Renewal Application Hillsborough Heights and Taylor Road Class I Landfills	Hillsborough County	27-May-2005	09204021.11
Taylor Road Landfill Superfund Site Groundwater Quality Statistical Evaluations	Hillsborough County	22-Jul-2005	09204021.11
Capacity Expansion Section 9 Expansion Area Southeast County Landfill, Volume 1 of 2 Engineering Support Calculations	Hillsborough County	05-Aug-2005	09200020.55
Capacity Expansion Section 9 Expansion Area Southeast County Landfill, Volume 2 of 2 Engineering Support Calculations	Hillsborough County	05-Aug-2005	09200020.55
Operation Permit Application Capacity Expansion, Section 8, Southeast County Landfill	Hillsborough County	17-Aug-2005	09200020.35
Groundwater Monitroing Plan Phases I-VI and Section 7 and 8, Southeast County Landfill	Hillsborough County	17-Aug-2005	09200020.35
Operation Plan Phases I-VI and Sections 7 and 8 Capacity Expansion	Hillsborough County	17-Aug-2005	09200020.35
Methane Gas Investigation Plan - Gunn Highway Landfill	Hillsborough County Dept of Solid Waste	13-Jan--95	0993010
Operation and Maintenance Manual Hillsborough Heights Landfill Leachate Tank Containment Area	Hillsborough County	1995	0995028.13
Contract Documents and Specifications for: Taylor Road Landfill Gas Migration Control System Improvements	Hillsborough County	1999	0995028.14
Contract Document Bid No. C-118-96 for Operation of the Southeast County Landfill Leachate Treatment and Reclamation Facility for Solid Waste Department	Hillsborough County	December 1995	0990018.43
Construction Permit Application Effluent/Leachate Storage Pond Southeast County Landfill Hillsborough County, Florida	Hillsborough County	December 2000	09195029.25
Hillsborough Cty SE Cty Sanitary Landfill Application for Permit to Construct & Operate a SW Resource Recovery & Mgmt Facility	Hillsborough County	February 1983	0985027.11
Permanent Pump Station 8 Videos 09195029.23	Hillsborough County	Hillsborough County	09195029.23
Contamination Assessment Report Pleasant Grove Landfill Hillsborough County, Florida - Volume II	Hillsborough County	Jan-March 1999	0998005.00
Draft Landfill Gas Investigations Hillsborough Heights Landfill	Hillsborough County	January 1990	0985027.13
Closed Landfill Investigation Program (CLIP)	Hillsborough County	January 2000	09199024.31
Leachate Management Plan Southeast County Landfill Hillsborough County, Florida	Hillsborough County	July 2001 Revised March 2002	09200020.11
Preliminary Contamination Assessment Report - Leto High School Closed Landfill, Tampa,FL	Hillsb. Cnty Solid Waste Management Dept.	Mar 97	0995028.00
Request for Proposals for the Continuing Construction and Operation of the Hillsborough County Southeast Landfill	Hillsborough County	May 1989	09985027.11
Preliminary Contamination Assessment Report -Leto Hight School Closed LF	Hillsborough County Solid Waste Mgmt Dept.	May 1994	0995028.32
Progress Report for Geotechnical Investigation at Southeast Landfill	Hillsborough County	May 1995	0990018.34
Operation Permit Renewal Application Southeast County Landfill Hillsborough County, Florida	Hillsborough County	May 2001	09200020.11
Operation Permit Renewal Application Southeast County Landfill Hillsborough County, Florida Attachment K-1 - Operations Plan	Hillsborough County	May 2001	09200020.11
Operation Permit Renewal Application Southeast County Landfill Hillsborough County, Florida Attachment L-2 Groundwater Monitoring Program	Hillsborough County	May 2001	09200020.11
Responses to FDEP Operation Permit Renewal Application Southeast County Landfill, Hillsborough County, Florida	Hillsborough County	May 2001 (Revised July 16, 2001)	09200020.11
Operation Permit Renewal Application Southeast County Landfill Hillsborough County, Florida Attachment L-2 Groundwater Monitoring Plan	Hillsborough County	May 2001 (Revised July 16, 2001)	09200020.11
Leachate Management Plan Southeast County Landfill Hillsborough County, Florida	Hillsborough County	May 2001 (Revised July 16, 2001)	09200020.21
Operations Plan Southeast County Landfill Hillsborough County, Florida	Hillsborough County	May 2001 Revised March 2002	09200020.11
Groundwater Monitoring Plan Southeast County Landfill Hillsborough County, Florida	Hillsborough County	May 2001, Revised April 2002	09200020.11
Contract Documents & Specifications for: Geotarp for Phases IV, V, & VI Southeast County Landfill Bid No.: PC-338-98 C.I.P. No.: N/A	Hillsborough County	October 30, 1998	0995029.24
Contract Documents & Specifications for: Taylor Road/Hillsborough Heights Landfill Gas Control System Improvements (Rebid)	Hillsborough County	Preconstruction/Notice to Proceed Meeting August 30, 2000	09199024.12
Operation and Maintenance Manual - LFG Migration and Odor Control Facilities	Hillsborough County Dept of Solid Waste		0985027

Description	Count	Date	Project No.
Investigation of Groundwater Contamination in the Vicinity of the Hillsborough Heights Landfill	Hillsborough County Dept of Solid Waste		0985027.07
Operations and Maintenance Manual	Hillsborough County Dept of Solid Waste		0985027.07
Geotechnical Exploration, Leachate Containment Area	Hillsborough County Dept of Solid Waste		0985027.11
Landfill Gas Recovery Program	Hillsborough County Dept of Solid Waste		0985027.11
Operation and Maintenance Manual LFG Migration & Odor Control Facilities	Hillsborough County Dept of Solid Waste		0985027.11
SELF Operating Manual	Hillsborough County Dept of Solid Waste		0985027.11
SELF Task Force RFP	Hillsborough County		0985027.11
Contract Documents & Specifications	Hillsborough County Dept of Solid Waste		0985027.13
Draft Landfill Gas Investigations	Hillsborough County Dept of Solid Waste		0985027.13
Closure Permit Application	Hillsborough County Dept of Solid Waste		0985027.14
Field and Data Reduction Manual Hydrogeological Monitoring Program SELF	Hillsborough County Dept. of Solid Waste		0985029.11
Contract Documents (including Specs) Cap, Cover and Drainage System Improvements	Hillsborough County Dept of Solid Waste		0990018.00
Contract Documents (including Specs) Gas Control System at Taylor Road Landfill	Hillsborough County Dept of Solid Waste		0990018.00
Contract Documents & Specifications for Hillsborough Heights LF-Ph II Drainage Improvements	Hillsborough County		0990018.01
Landfill Gas Recovery Project	Hillsborough County Dept of Solid Waste		0990018.01
Application for Permit to Construct & Operate a Solid Waste Resource Recovery & Mgmt Facility	Hillsborough County Dept of Solid Waste		0990018.03
Design Report Leachate Management System	Hillsborough County Dept of Solid Waste		0990018.03
Soils Report Leachate Treatment Plan	Hillsborough County Dept of Solid Waste		0990018.03
Second Draft Field Sampling Plan - Taylor Road LF	Hillsborough County Dept of Solid Waste		0990018.13
Second Draft RI/FS Workplan - Taylor Road LF	Hillsborough County Dept of Solid Waste		0990018.13
LFG Specialties, Inc. Utility Flare Manual Operation & Maintenance Manual Taylor Road Landfill - LFG Ops Manual	Hillsborough County		0990018.14
Draft Remedial Investigation Report Taylor Road Landfill Study Area	Hillsborough County, FL		0990018.14
Proposed Final Feasibility Study - TRLF	Hillsborough County		0990018.15
TRLF Draft Feasibility Study (ERM-South)	Hillsborough County Dept of Solid Waste		0990018.15
Geotechnical Investigation at SELF, by Ardaman & Assoc.	Hillsborough County		0990018.34
Geomembrane Repair Certification Documentation	Hillsborough County Dept. of SW		0990018.35
Leachate Management Plan - SELF	Hillsborough County Dept of Solid Waste		0990018.35
Operation Permit Renewal Application Southeast Landfill	Hillsborough County		0990018.35
Phase IV Temporary Pump Station No. 5 Construction Observations & Documentation	Hillsborough County		0990018.35
Pollution Prevention Plans & Best Management Practices Rev. 12/19/94	Hillsborough County Dept of Solid Waste		0990018.35
Hillsborough County Dept of Planning & Development Mgmt Site Development Review Package	Hillsborough County Dept of Solid Waste		0990018.42
SWFWMD Construction Permit Application	Hillsborough County Dept of Solid Waste		0990018.42
SWFWMD Surface Water Management Construction Permit Application	Hillsborough County Dept of Solid Waste		0990018.42
Site Development Review Package Resubmittal	Hillsborough County Dept of Solid Waste		0990018.42
Contract Doc. & Specs for Construction&Operation of SE Cty Leachate Treatment Fac.	Hillsborough County		0990018.43
Review of Revised CPM Schedule & Request for Extension	Hillsborough County		0990018.44
Construction Quality Assurance Monitoring of Phases V and VI of the SELF (2 vols)	Hillsborough County		0990018.52
Endangered & Threatened Species Report for SELF Proposed Class I LF	Hillsborough County		0990018.55
New Class I Landfill Hillsborough Cty (Presented by: CH2MHill) Volumes 1&2	Hillsborough County		0990018.55
Contamination Assessment Report - Northwest Landfill Site - 3 Volumes	Hillsborough County Department of Solid Waste		0990018.64
Hillsborough Heights Landfill Drainage Improvements Phase II Photos	Hillsborough County Dept of Solid Waste		0990018.72
Construction Completion Report, Landfill Gas Migration Barrier/Vent Trench Gunn Highway Landfill Site	Hillsborough County		0993010.00
Mango Clay Pit Losed Landfill - PreliminaryContamination Assessment Report	Hillsborough County SWMD		0995028.32
Air Emissions Inventory & Potential to Emith Documentation Southeast County Landfill	Hillsborough County		0995029.12
Evaluation of the Leachate Treatment and Reclamation Facility Jan-Sep 1996	Hillsborough County		0995029.22
Technical Evaluation for Leachate Treatment Alternatives at the Leachate Treatment and Reclamation Facility	Hillsborough County		0995029.54
Investigation of Ground-water Contamination in the vicinity of the Hillsborough Heights Landfill	Hillsborough County Dept of Solid Waste		28527-06
Contract Documents and Specs for: Const.and Operations of Southeast County Leachate Treatment and Reclamation Facility	Hillsborough County		

Ardaman & Associates, Inc.

Geotechnical Study Associated with
2005 Annual Monitoring of Phosphatic Clay Liner
Beneath the Southeast Landfill
in Hillsborough County

May 27, 2005

Ardaman & Associates, Inc.

OFFICES

Orlando, 8008 S. Orange Avenue, Orlando, Florida 32809, Phone (407) 855-3860
Bartow, 1525 Centennial Drive, Bartow, Florida 33830, Phone (863) 533-0858
Cocoa, 1300 N. Cocoa Blvd., Cocoa, Florida 32922, Phone (321) 632-2503
Fort Myers, 9970 Bavaria Road, Fort Myers, Florida 33913, Phone (239) 768-6600
Miami, 2608 W. 84th Street, Hialeah, Florida 33016, Phone (305) 825-2683
Port Charlotte, 740 Tamiami Trail, Unit 3, Port Charlotte, Florida 33954, Phone (941) 624-3393
Port St. Lucie, 460 Concourse Place NW, Unit 1, Port St. Lucie, Florida 34986, Phone (772) 878-0072
Sarasota, 2500 Bee Ridge Road, Sarasota, Florida 34239, Phone (941) 922-3526
Tallahassee, 3175 West Tharpe Street, Tallahassee, Florida 32303, Phone (850) 576-6131
Tampa, 3925 Coconut Palm Drive, Suite 115, Tampa, Florida 33619, Phone (813) 620-3389
West Palm Beach, 2200 North Florida Mango Road, Suite 101, West Palm Beach, Florida 33409, Phone (561) 687-8200

MEMBERS:
A.S.F.E.
American Concrete Institute
American Society for Testing and Materials
Florida Institute of Consulting Engineers

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

May 27, 2005
File Number 05-010

SCS Engineers
3012 US Highway 301 North
Suite 700
Tampa, FL 33619

Attention: Mr. Joe O'Neill, P.E.

Subject: Geotechnical Study Associated with 2005 Annual Monitoring of Phosphatic Clay Liner Beneath the Southeast Landfill in Hillsborough County

Gentlemen:

As requested by SCS Engineers (SCS), Ardaman & Associates, Inc., (Ardaman) has completed a geotechnical study associated with annual monitoring of the phosphatic clay liner beneath the Southeast Landfill in Hillsborough County. The annual monitoring program was mandated by the Florida Department of Environmental Protection (FDEP) under Specific Condition No. 16f of the Landfill Operation Permit No. 35435-006-SO issued on June 25, 2002, which requires performance of piezocone soundings and measurements of pore water pressures in the vicinity of the following four test sites where a number of piezocone soundings and pore pressure measurements had previously been performed by Ardaman and Madrid Engineering Group, Inc., (Madrid) in 2001/2002: (i) PC-1B in the Phase I area; (ii) PC-4B/PC-4C in the Phase IV area; (iii) PC-3/PC-3B in the Phase III area; and (iv) PC-1F in the Phase I area. Specifically, the permit condition required documentation and interpretation of the following data:

- Piezometric elevations in the drainage sand layer above the phosphatic clay.
- Top and bottom elevations of the phosphatic clay layer.
- Pore water pressures near the top, middle, and bottom of the phosphatic clay layer.
- Piezometric elevations in the natural soils below the phosphatic clay.

Evaluations of the phosphatic clay liner in 2003 and 2004 were documented in two Ardaman reports dated April 12, 2003 and April 15, 2004. This report contains the results of the piezocone soundings and pore pressure measurements obtained by Ardaman in March and April 2005, and presents our interpretation of the test data.

For this year, in addition to the four test sites in the Phase I, III, and IV areas required by the FDEP permit, SCS requested Ardaman to perform an electric Dutch cone sounding at a test site in the Phase VI area for the sole purpose of determining the top elevation of the phosphatic clay.

Site Location

The Southeast Landfill is located within Sections 14, 15, 22, and 23 of Township 31 South, Range 21 East, in Hillsborough County, Florida. More specifically, the landfill site is located between

Picnic and Pinecrest, about 2 miles west of State Road 39 and about 0.5 miles north of County Road 672. The approximate site location, as superimposed on a reproduction of the United States Geological Survey (USGS) quadrangle map of Lithia, Florida (1955, photorevised 1987), is shown in Figure 1.

Project History

The Southeast Landfill is constructed directly above a waste clay settling area at a former phosphate mine known as Lonesome Phosphate Mine or Boyette Mine. The settling area, also known as Settling Area No. 1, was built on natural ground within a perimeter dike constructed of sand borrowed from surrounding areas. Waste phosphatic clay was deposited within the settling area for a number of years during the mining operation.

A comprehensive geotechnical study was conducted by Ardaman between 1981 and 1983 to characterize the phosphatic clay deposit and to evaluate the feasibility of constructing a landfill within the waste clay settling area. Results from that study were documented in an Ardaman report titled "Hydrogeological Investigation, Southeast County Landfill, Hillsborough County, Florida", dated February 22, 1983. Based on the data and analyses documented in that report, Ardaman concluded that a landfill could be constructed directly on top of the phosphatic clay. However, to maintain an adequate factor of safety against slope failure, the waste disposal area was divided into different phases, and each phase had to be filled in lifts such that filling above a previous lift would occur only when the underlying phosphatic clay had consolidated under the weight of the previous refuse lift and experienced sufficient increase in shear strength to support the additional load. In areas where the clay thickness was greater than 14 feet, it was recommended that the clay should be pre-loaded prior to placement of the first lift of refuse. A diagram that shows the original thickness of the phosphatic clay within the settling area, as reproduced from the 1983 Ardaman report, is shown in Figure 2. As shown, the phosphatic clay deposit had an original thickness that varied between 4 and 18 feet.

Another comprehensive geotechnical study was completed by Ardaman in 1994 in association with operation permit renewal for the Southeast Landfill. Results from that study were documented in an Ardaman report titled "Geotechnical Investigation at Southeast Landfill, Hillsborough County, Florida", dated March 7, 1994. The strength and consolidation properties of the phosphatic clay obtained from that study were in good agreement with those used in the original stability analyses and affirmed the recommended filling schedule.

In support of the last operation permit renewal application in 2002, SCS retained Madrid and Ardaman to perform supplemental studies to confirm the engineering properties of the phosphatic clay, and to determine whether the material had been consolidating and gaining strength as predicted and whether the 7-year waiting period for placements of successive refuse lifts in the landfill should be modified. Results from the latest study were presented in an Ardaman report titled "Geotechnical Study Associated with Operation Permit Renewal for Hillsborough County Southeast Landfill", dated March 4, 2002.

The original geotechnical investigation completed in 1983 and the follow-up studies completed in 1994 and 2002 recommended that each lift of refuse should have a thickness no greater than 20 feet and that a minimum waiting period of 7 years should be provided between placements of successive refuse lifts. These requirements were derived based on stability analyses using an undrained shear strength to effective vertical stress ratio of 0.21 and a coefficient of consolidation of 1.5x10^{-4} cm^2/sec for the waste phosphatic clay. The undrained shear strength to effective vertical stress ratio determines the magnitude of strength increase in the phosphatic clay, whereas the coefficient of consolidation governs the rate of strength increase.

Field Test Program

Current operation at the Southeast Landfill divides the waste disposal area into six phases designated Phases I through VI, as shown on a topographic site plan in Figure 3. The topographic site plan was generated from survey data obtained on January 18, 2005. As part of our scope of work for the annual monitoring program stipulated in Specific Condition No. 16f of the FDEP Permit No. 35435-006-SO issued on June 25, 2002, Ardaman performed piezocone soundings and pore water pressure measurements at four test sites within the Phase I, III, and IV areas where a number of field tests and measurements had previously been performed by Madrid and Ardaman in 2001/2002.

Four test sites, designated PC-1K, PC-1L, PC-3E, and PC-4F, were selected by SCS for performance of piezocone soundings and installation of piezoprobes. The approximate locations of these test sites are shown in Figure 3 along with the test site locations selected in the 2001/2002 studies performed by Madrid and Ardaman as well as the test site locations selected for the 2003 and 2004 annual monitoring programs. As shown in Figure 3, two of the four test sites were located in the Phase I area (i.e., PC-1K and PC-1L), one test site was located within the Phase III area (i.e., PC-3E), and the remaining test site was located within the Phase IV area (i.e., PC-4F). PC-1K was located in close proximity to the previous PC-1B, PC-1H, and PC-1J test site locations, and PC-1L was selected adjacent to the previous PC-1F and PC-1I test site locations. PC-3E was located near the previous PC-3, PC-3B, and PC-3D test site locations. PC-4F was selected adjacent to the PC-4E test site location used in the 2004 annual monitoring program. The current field work and testing were undertaken by Ardaman in March and April 2005.

For this year, in addition to performance of piezocone soundings and installation of piezoprobes at the above four test sites, SCS also requested the performance of an electric Dutch Cone sounding at a test site designated PC-6F in the Phase VI area for the sole purpose of determining the top elevation of the phosphatic clay layer.

The surveyed coordinates and ground surface elevations at the current test site locations, as provided by Pickett & Associates, Inc., are summarized in Table 1. The elevations were surveyed using both the NGVD29 and NGVD88 datums. Although Hillsborough County mostly uses the NGVD88 datum for elevation data, the elevation data used in the previous geotechnical studies were based on the NGVD29 datum. For ease of data comparisons, the elevations based on the NGVD29 datum are used in this report.

Piezocone Penetration Tests

The piezocone consists of a conical point attached to a steel rod and a friction sleeve. The test is performed by pushing the assembly into the soil at a constant rate of penetration. Resistance to penetration at the cone tip and on the friction sleeve are measured by load cells placed within the assembly, and the pore pressure in the soil is measured using a pressure transducer connected to the porous element placed near the cone tip. Prior to pushing of the piezocone through the waste phosphatic clay, a hollow stem auger was used to create a borehole through the refuse.

Results of the four piezocone penetration tests (i.e., PC-1K, PC-1L, PC-3E, and PC-4F) performed at the four test site locations are presented in Figures 4 through 7, respectively. As shown in the figures, results are presented in the form of tip resistance (i.e., the resistance to penetration at the cone tip), sleeve resistance (i.e., the resistance to penetration of the friction sleeve), pore pressure (i.e., the total pore water pressure including the pore pressure generated due to penetration of the cone), friction ratio (i.e., the ratio of sleeve resistance to tip resistance), soil type (i.e., soil classification), and approximate standard penetration test blow count values (i.e., SPT N values) versus depth.

Since sandy soils typically exist above and below the phosphatic clay, the depth and thickness of the phosphatic clay layer could be inferred by examining the variations of tip resistance and pore pressure with depth. The tip resistance and the pore pressure in a clayey soil are expected to be lower and higher, respectively, than those in a sandy soil. Higher friction ratios are generally indicative of clayey soil types, whereas lower ratios generally indicate the presence of silty and sandy soils. Sudden changes in tip resistance, pore pressure, and friction ratio are expected to occur at the interface between the drainage sand layer and the underlying phosphatic clay as well as the interface between the phosphatic clay and the underlying natural sandy soils.

Thickness of Refuse

Based on results of the auger borings and piezocone soundings, the refuse thicknesses at the four test sites (i.e., PC-1K, PC-1L, PC-3E, and PC-4F) in March 2005 ranged from approximately 35 feet at PC-3E to 65 feet at PC-1L.

PC-1K was located in the western portion of the Phase I area. The refuse thickness at PC-1K in March 2005 was estimated to be 50 feet, compared to a refuse thickness of 65 feet at PC-1J in March 2004 and a refuse thickness of 50 to 55 feet at PC-1H in March 2003. The reason for the variation in refuse thickness was because the test sites were not at identical locations. PC-1K was located approximately 110 feet northwest of PC-1J and at the toe of slope between the Phase I and IV areas. The land surface elevation at PC-1K was approximately 14 feet lower than the land surface elevation at PC-1J, but was very close to the land surface elevation at PC-1H.

PC-1L was located in the eastern portion of the Phase I area. The refuse thickness at PC-1L in March 2005 was estimated to be 65 feet, compared to a refuse thickness of 50 feet at the nearby PC-1I in March 2004 and a refuse thickness of 50 to 55 feet at the nearby PC-1G in March 2003.

The refuse thickness at PC-3E in March 2005 was approximately 35 feet. We understand that the refuse thickness in the Phase III area has remained approximately the same since 2001/2002.

The refuse thickness at PC-4F in March 2005 was slightly greater than 60 feet, compared to a refuse thickness of slightly greater than 50 feet at PC-4E in March 2004 and at PC-4D in March 2003. We understand that refuse was last placed near these test site locations in the Phase IV area in March/April 2003.

Filling Schedule

In March 2005, refuse was being placed in the Phase II area. The filling originated in the Phase I area that began in March 2003 and progressed from west to east towards the Phase II area. Filling occurred in the vicinity of PC-1K around June 2003 and in the vicinity of PC-1L around July

2004. A comparison of the surveyed data in the Phase I area indicated that the thickness of the refuse lift was approximately 16 to 17 feet. The previous refuse lift in the Phase I area was completed in August 1997.

Filling of the Phase III area began in December 1990 and ended in June 1994. In the Phase IV area, approximately 13 feet of refuse was placed in the vicinity of PC-4F in March/April 2003 (i.e., just prior to filling of the Phase I area).

Elevations and Thicknesses of Phosphatic Clay

Prior to landfill construction, the surface of the waste phosphatic clay within the former settling area was documented to have typical elevations in the range of +121 to +123 feet (NGVD), and the bottom of the phosphatic clay reportedly occurred at typical elevations ranging from +103 to +117 feet (NGVD). As indicated previously, the original thickness of the phosphatic clay ranged from 4 to 18 feet.

Based on results of the piezocone soundings, the top and bottom elevations of the phosphatic clay as well as the phosphatic clay thickness encountered at the four test sites are summarized in Table 2. As shown, the top elevations of the phosphatic clay ranged from a low of +110.7 feet (NGVD) at PC-1K to a high of +118.7 feet (NGVD) at PC-3E. The bottom elevations of the phosphatic clay layer ranged from a low of +103.3 feet (NGVD) at PC-1K to a high of +112.9 feet (NGVD) at PC-1L.

At the location of PC-1K, the top and bottom of the phosphatic clay layer were encountered at approximately +110.7 and +103.3 feet (NGVD), respectively, for a clay thickness of about 7.4 feet. This thickness was approximately 1.2 feet greater than the clay thickness (6.2 feet) documented at PC-1J in March 2004. As indicated previously, approximately 17 feet of refuse was placed in the vicinity of PC-1K in June 2003. Because the PC-1K test site in 2005 was located about 110 feet from the PC-1J test site in 2004, the apparent difference could be a result of variation of phosphate clay thickness between the two test sites.

Based on the piezocone sounding performed at the location of PC-1L, the phosphatic clay had top and bottom elevations of +116.9 and +112.9 feet (NGVD), respectively, for a phosphatic clay thickness of 4.0 feet, which is close to the thickness (3.6 feet) documented at the nearby PC-1I in 2004. As indicated previously, approximately 17 feet of refuse was placed in the vicinity of PC-1L in July 2004.

The piezocone sounding performed at the location of PC-3E revealed the top elevation of the phosphatic clay at +118.7 feet (NGVD) and the bottom elevation at +110.3 feet (NGVD), for a clay thickness of 8.3 feet, which is very close to the thickness (8.0 feet) documented at the nearby PC-3D test site in 2004. As indicated previously, no refuse has been placed in the Phase III area since June 1994.

Based on the piezocone sounding performed at the location of PC-4F, the top and bottom elevations of the phosphatic clay were documented at +113.7 and +106.8 feet (NGVD), for a clay thickness of 6.9 feet, which is 2.9 feet less than the thickness (9.8 feet) documented at the nearby PC-4E test site in 2004. As noted previously, approximately 13 feet of refuse was added at this location in April 2003.

In summary, the phosphatic clay elevations and thicknesses documented at the four test sites in 2005 (i.e., PC-1K, PC-1L, PC-3E, and PC-4F) indicated that there were minimal changes in clay thickness from March 2004 to March 2005 at the locations of PC-1L and PC-3E. The apparent increase in clay thickness at PC-1K from 2004 to 2005 could be attributed to variation of clay thickness between the 2004 and 2005 test sites. The observed decrease in phosphatic clay layer thickness at PC-4F from March 2004 to March 2005 (about 3 feet) could be attributed to compression of the phosphatic clay layer by refuse loading. However, it could also be a result of variation of phosphatic clay thickness between the test sites in 2004 and 2005.

Piezometric Elevations on Top of Phosphatic Clay

The piezometric heads in the drainage sand layer on top of the phosphatic clay could be inferred from the piezocone penetration test results. As the piezocone was pushed through the drainage sand layer on top of the phosphatic clay, it was held stationary at selected depths to allow the excess pore water pressure generated as a result of pushing of the piezocone to stabilize. Because of the relatively high permeability of the sand, any excess pore pressure should dissipate in a short duration. The pore pressures were monitored for several minutes to make sure that the final readings represented the stabilized pore pressures at the selected depths.

Based on the piezocone soundings performed at the four test sites, the piezometric heads in the drainage sand layer on top of the phosphatic clay are summarized in Table 3 and are further displayed in Figure 8. Piezometric heads documented from previous studies are also shown on the same figure for comparisons.

As shown in Table 3 and Figure 8, results of the piezocone soundings indicated that the piezometric heads on top of the phosphatic clay at the four test site locations ranged from 6.6 to 8.8 feet. The highest piezometric elevation of +125.3 feet (NGVD) was observed at PC-3E (i.e., 6.6 feet above the top of the phosphatic clay). The piezometric heads in the drainage sand on top of the phosphatic clay at PC-1K, PC-1L, and PC-4F were measured to be 8.8, 7.2 and 6.9 feet above the top of the phosphatic clay, respectively. On the average, the piezometric heads in the drainage sand layer in March 2005 were approximately 3 feet higher than the previous readings obtained in March 2004 and March 2003.

Piezometric Elevations Below Phosphatic Clay

Based on the piezocone sounding results, the piezometric elevations in the natural soils below the phosphatic clay are summarized in Table 4. As shown, the piezometric elevations at the test site locations were documented at approximately +118 to +122 feet (NGVD). These piezometric elevations were generally in good agreement with those obtained in March 2004 and March 2003.

Piezoprobe Tests Within Phosphatic Clay

The piezoprobe tests were performed by installing piezoprobes to pre-selected depths and holding them stationary until the excess pore pressure generated from probe penetration completely dissipated, and the measured pore pressure reached the actual pore pressure before probe penetration.

The dissipation of excess pore pressures generated due to probe penetrations are presented in Figures 9 to 12 in the form of normalized excess pore pressure (i.e., the ratio of excess pore water pressure at any time to the initial excess pore water pressure immediately after piezoprobe penetration) versus time. As shown in the figures, all pore pressures reached equilibrium conditions at the end of the monitoring periods. The rate of dissipation of excess pore pressure generated by probe penetration can be used to estimate the *in situ* coefficient of consolidation of the phosphatic clay.

At the locations of PC-1K, PC-3E, and PC-4F with approximately 7 to 8 feet of phosphatic clay, piezoprobe tests were performed at three different depths to measure the pore pressures near the top, middle, and bottom of the phosphatic clay layer. Because of the limited phosphatic clay thickness at PC-1L (4 feet), only one piezoprobe was installed. Results from the piezoprobe tests are summarized in Table 5.

At the location of PC-1K, the equilibrium piezometric elevations for the three piezoprobes installed with tip elevations at +109.3, +107.2 and +105.2 feet (NGVD) were documented to be approximately +130.4, +135.4 and +132.0 feet (NGVD), respectively. The excess pore water pressures within the phosphatic clay layer at the tip elevations were estimated to be 10.4, 14.9 and 10.8 feet of water, respectively. As indicated previously, approximately 17 feet of refuse was placed in the vicinity of PC-1K in June 2003.

At the location of PC-1L, one piezoprobe test was performed with the piezoprobe tip elevation at +115.7 feet (NGVD). The piezometric elevation at that depth was documented to be +129.5 feet (NGVD), corresponding to an excess pore water pressure that is equivalent to approximately 7.1 feet of water. As indicated previously, approximately 17 feet of refuse was placed in the vicinity of PC-1L in July 2004. Because the phosphatic clay thickness at PC-1L (4.0 feet) was less than that at PC-1K (7.4 feet), the excess pore water pressure from refuse loading would have dissipated at a faster rate.

At the location of PC-3E, three piezoprobe tests were performed within the phosphatic clay layer with the piezoprobe tip elevations at +116.7, +114.7 and +112.7 feet (NGVD). The excess pore water pressures documented by the piezoprobes were equivalent to only 0.2 to 1.8 feet of water. This is not unexpected since there has been no refuse placed in the Phase III area since July 1994.

At the location of PC-4F, three piezoprobe tests were performed within the phosphatic clay layer with the piezoprobe tip elevations at +111.9, +110.2 and +108.4 feet (NGVD) with the equilibrium piezometric elevations at +124.7, +124.9 and +124.5 feet (NGVD), respectively. The excess pore water pressures near the top, middle, and bottom of the phosphatic clay were equivalent to 19.4, 29.0 and 31.9 feet of water, respectively. High excess pore water pressures were also observed in the Phase IV area in previous piezoprobe measurements in 2003 and 2004. The high excess pore water pressures could be attributed to refuse loading in the Phase IV area. As noted previously, approximately 13 feet of refuse was added in the vicinity of PC-4F in April 2003.

Coefficient of Consolidation

The coefficient of consolidation governs the rate of strength increase in the phosphatic clay upon loading from a refuse lift and thus the waiting period between placement of successive refuse lifts in an area. The filling schedule at the Southeast Landfill was originally based on a design vertical coefficient of consolidation, c_v, of 1.5×10^{-4} cm^2/sec.

Based on the rates of excess pore pressure dissipation shown in Figures 9 through 12, the horizontal coefficients of consolidation, c_h, of the phosphatic clay obtained from the piezoprobe tests were calculated and are presented in Table 6. The *in situ* vertical coefficients of consolidation, c_v, can be estimated from the horizontal coefficients of consolidation, c_h, based on the following empirical relationship proposed by Baligh, M. et al (ASCE Journal of Geotechnical Engineering, Vol. 112, No. 7, July, 1986): $c_v = 0.05 \times c_h$, and are also presented in Table 6.

The *in situ* vertical coefficients of consolidation from the piezoprobe measurement at PC-1L and the piezoprobe measurements at the top of the phosphatic clay layer at PC-1K and PC-3E indicated an average c_v value of 1.7×10^{-4} cm^2/sec, which is close to the design vertical coefficient of consolidation. However, the *in situ* vertical coefficients of consolidation from the piezoprobe measurements at mid-depth and bottom of the phosphatic clay layer at PC-1K and PC-3E had an average c_v value of 3.1×10^{-5} cm^2/sec. The c_v values of the phosphatic clay layer at PC-4F averaged 2.8×10^{-5} cm^2/sec for the three measurements at different depths.

Although the vertical coefficients of consolidation documented at the middle and bottom of PC-1K and PC-3E were lower than the original design value of 1.5×10^{-4} cm/sec, the piezoprobe measurements in 2003 and 2004 at nearby test sites had vertical coefficients of consolidation that were consistent with the design value. Because the Phase I area has just been recently loaded and no significant excess pore water pressure was observed in the phosphatic clay within the Phase III area, the lower vertical coefficients of consolidation documented in 2005 should not be an issue at this time. At PC-4F, because low vertical coefficients of consolidation were also documented at the nearby test site in 2004, Ardaman recommends performance of additional field tests to measure the undrained shear strength of the clay or any excess pore water pressure in the phosphatic clay prior to placement of the next lift of refuse in the Phase IV area.

Settlement plate data at the location of Pump Station B in the Phase VI area, as provided by Hillsborough County, are plotted in Figure 13. At this location, the initial thickness of the phosphatic clay was approximately 13 feet. As shown in Figure 13, the phosphatic clay has undergone a settlement of about 4 feet over a period of 5 years. Assuming that an average degree of consolidation of 95% has been reached under double drainage condition with an average consolidating thickness of 11 feet, the backalculated c_v from the settlement observations is 2.0×10^{-4} cm^2/sec, which is consistent with the design value.

Comparisons of Piezometric Heads

The piezometric elevations in the materials directly above and below the phosphatic clay layer, as documented from the piezocone soundings, are summarized in Table 7. The piezometric heads within the phosphatic clay layer are also shown on the same table for comparison.

The piezometric head within the phosphatic clay will be highest after loading of a new refuse lift and will decrease gradually as excess pore water pressure dissipates. If the piezometric head within the phosphatic clay is higher than the piezometric head on top of the phosphatic clay, there will be no downward migration of leachate. Once the excess pore water pressure from landfill loading dissipates, the flow direction through the phosphatic clay will be a function of the piezometric head difference across the phosphatic clay. If the piezometric elevation in the natural soils below the phosphatic clay is higher than the piezometric elevation on top of the phosphatic clay, upward flow will occur. Conversely, if the piezometric elevation in the natural soils is lower than the piezometric elevation on top of the phosphatic clay, leachate will migrate downward, at a rate governed by the piezometric head difference, and the hydraulic conductivity and thickness of the phosphatic clay deposit.

As shown in Table 7, the existing maximum piezometric heads within the phosphatic clay layer are higher than the piezometric heads in the materials above and below the phosphatic clay at the PC-1K, PC-1L, and PC-4F test site locations. Accordingly, under existing condition, there should be no downward leachate migration or upward groundwater flow through the phosphatic clay layer at these locations. At the PC-3E test site location, the piezometric elevation on top of the phosphatic clay layer is slightly higher than the maximum piezometric head within the phosphatic clay and the piezometric head in the material below the phosphatic clay. This condition will result in downward leachate flow. However, the flow is not expected to be significant considering the thickness of the phosphatic clay layer (8 feet), the relatively small hydraulic head (< 4 feet), and the low hydraulic conductivity of the phosphatic clay material (< $1x10^{-8}$ cm/sec).

Electric Dutch Cone Sounding in Phase VI Area

For this year, SCS requested Ardaman to perform an electric Dutch cone sounding at a test site designated PC-6F in the Phase VI area for the sole purpose of determining the elevation at the top of the phosphatic clay. Results of the Dutch cone sounding test are presented in Figure 14. As shown in the figure, results are presented in the form of tip resistance (i.e., the resistance to penetration at the cone tip), sleeve resistance (i.e., the resistance to penetration of the friction sleeve), friction ratio (i.e., the ratio of sleeve resistance to tip resistance), soil type (i.e., soil classification), and approximate standard penetration test blow count values (i.e., SPT N values) versus depth. As shown in Table 2, the top of the phosphatic clay was encountered at a depth of 52.0 feet. The elevation of ground surface at the test location was at +167.31 feet (NGVD), and the top of the phosphatic clay was at elevation +115.3 feet (NGVD).

Summary of Observations

The following key observations were made from the 2005 annual monitoring data based on the field work completed:

- The refuse surface elevations increased by 17 and 13 feet compared to March 2004 at test locations PC-1L and PC-4F, respectively. At test location PC-3E, the existing grade remained unchanged. At test location PC-1K, the refuse elevation was about the same as test location PC-1H in 2003.

- The top elevations of the phosphatic clay were as expected and generally consistent with the data obtained in 2004.

- The thicknesses of the phosphatic clay were also generally consistent with the data obtained in 2004. The phosphatic clay thickness at PC-1K, PC-1L, and PC-3E were found to be higher by 1.2, 0.4 and 0.3 feet, respectively, compared to the thicknesses estimated in 2004. At PC-4F, the clay thickness was 2.9 feet less than that observed in PC-4E in 2004. The observed decrease in phosphatic clay layer thickness at PC-4F from March 2004 to March 2005 could be attributed to compression of the phosphatic clay layer by refuse loading. However, it could also be a result of variation of phosphatic clay thickness between the test sites in 2004 and 2005.

- A considerable amount of excess pore pressure was documented within the phosphatic clay layer at PC-1L, PC-1K, and especially PC-4F. Because these areas have been loaded recently, the excess pore pressure was not unexpected. There were minimal excess pore pressure documented within the phosphatic clay at PC-3E.

- The piezometric heads above the phosphatic clay at the PC-1K, PC-1L, PC-3E, and PC-4F test site locations were measured to be 8.8, 7.2, 6.6 and 6.9 feet, respectively. On the average, these measurements were about 3 feet higher than the readings obtained in 2004.

- The piezometric elevations below the phosphatic clay were observed to be at approximately +118 to +122 feet (NGVD). These elevations are similar to those observed in 2003 and 2004.

Recommendation

High excess pore water pressures at PC-4F were recorded but are not unexpected due to recent refuse placement in this area. However, because of the lower than expected coefficients of consolidation documented at different depths of the phosphatic clay layer at PC-4F, additional field tests should be performed to measure the undrained shear strength of the clay or any excess pore water pressure in the clay prior to placement of the next lift of refuse. For all other areas, the 7-year waiting period between placement of successive refuse lifts remain valid.

Closure

This report has been prepared for the exclusive use of SCS and the Hillsborough County Solid Waste Department for specific application to annual monitoring of the phosphatic clay liner at the Southeast Landfill in accordance with generally accepted geotechnical engineering practice. No other warranty, expressed or implied, is made.

Ardaman appreciates the opportunity to assist you on this project. Please contact us if you have any questions concerning this report or need additional information.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.

Shawkat Ali, Ph.D., P.E.
Project Engineer

Francis K. Cheung, P.E.
Senior Project Manager
Florida License No. 36382
05/27/05

Enclosures

Table 1

Test Site Locations and Elevations

Test Site	Area	State Plan Coordinates		Approx Ground Surface Elevations (feet)	
		Northing	Easting	NGVD29	NGVD88
PC-1K	Phase I	1,250,443.55	595,886.47	+163.53	+162.62
PC-1L	Phase I	1,249,916.34	597,283.83	+188.66	+187.75
PC-3E	Phase III	1,251,089.80	597,409.63	+154.67	+153.76
PC-4F	Phase IV	1,250,656.68	596,423.09	+178.15	+177.24
PC-6F	Phase VI	1,250,983.97	596,262.97	+167.31	+166.40

Table 2

Top and Bottom Elevations of Phosphatic Clay

Area	Test Site	Date	Approx Ground Surface Elevation (ft, NGVD)	Top of Clay		Bottom of Clay		Clay Thickness (ft)
				Depth (ft, BLS)	Elevation (ft, NGVD)	Depth (ft, BLS)	Elevation (ft, NGVD)	
Phase I	PC-1K	03/14/05	+163.53	52.8	+110.7	60.2	+103.3	7.4
	PC-1L	03/16/05	+188.66	71.8	+116.9	75.8	+112.9	4.0
Phase III	PC-3E	03/11/05	+154.67	36.0	+118.7	44.3	+110.3	8.3
Phase IV	PC-4F	03/09/05	+178.15	64.5	+113.7	71.4	+106.8	6.9
Phase VI	PC-6F	03/03/05	+167.31	52.0	+115.3	--	--	--

Table 3

Piezometric Levels on Top of Phosphatic Clay

Area	Test Site	Date	Ground Surface Elevation (ft, NGVD)	Piezometric Elevation on Top of Phosphatic Clay (ft, NGVD)	Top of Clay Elevation (ft, NGVD)	Piezometric Head on Top of Phosphatic Clay (ft)
Phase I	PC-1K	04/14/05	+163.53	+119.5	+110.73	8.8
	PC-1L	04/12/05	+188.66	+124.2	+116.9	7.2
Phase III	PC-3E	04/14/05	+154.67	+125.3	+118.7	6.6
Phase IV	PC-4F	04/14/05	+178.15	+119.5	+113.7	6.9

Table 4

Piezometric Elevations Below Phosphatic Clay

Area	Test Site	Date	Ground Surface Elevation (ft, NGVD)	Piezometric Elevation Below Phosphatic Clay (ft, NGVD)
Phase I	PC-1K	03/14/05	+163.53	+121.7
	PC-1L	04/18/05	+188.66	+118.3
Phase III	PC-3E	04/25/05	+154.67	+121.8
Phase IV	PC-4F	03/09/05	+178.15	+118.4

Table 5

Pore Pressures Within Phosphatic Clay

Area	Test Site	Ground Surface Elevation (ft, NGVD)	Top of Clay Elevation (ft, NGVD)	Bottom of Clay Elevation (ft, NGVD)	Piezoprobe Designation	Piezoprobe Tip Below Ground Surface (ft)	Elevation of Piezoprobe Tip (ft, NGVD)	Stabilized Pore Pressure at Piezoprobe Tip After Dissipation (ft of H_2O)	Piezometric Elevation at Piezoprobe Tip Level (ft, NGVD)	Piezometric Elevation on Top of Clay (ft, NGVD)	Piezometric Elevation Below Clay (ft, NGVD)	Excess Pore Pressure at Piezoprobe Tip Level (ft of H_2O)
Phase I	PC-1K	+163.53	+110.7	+103.3	PC-1K	54.2 56.3 58.3	+109.3 +107.2 +105.2	21.1 28.2 26.7	+130.4 +135.4 +132.0	+119.5	+121.7	10.4 14.9 10.8
	PC-1L	+188.66	+116.9	+112.9	PC-1L	73.0	+115.7	13.8	+129.5	+124.2*	+118.2	7.1
Phase III	PC-3E	+154.67	+118.7	+121.2	PC-3E	38.0 40.0 42.0	+116.7 +114.7 +112.7	8.0 10.2 11.87	+124.7 +124.9 +124.5	+125.3	+121.8	0.2 1.3 1.8
Phase IV	PC-4F	+1178.15	+113.7	+106.8	PC-4E	66.3 68.0 69.8	+111.9 +110.2 +108.4	26.7 37.8 42.2	+138.6 +148.0 +150.6	+119.5	+118.5	19.4 29.0 31.9

Table 6

Computed Coefficients of Consolidation from Piezoprobe Tests

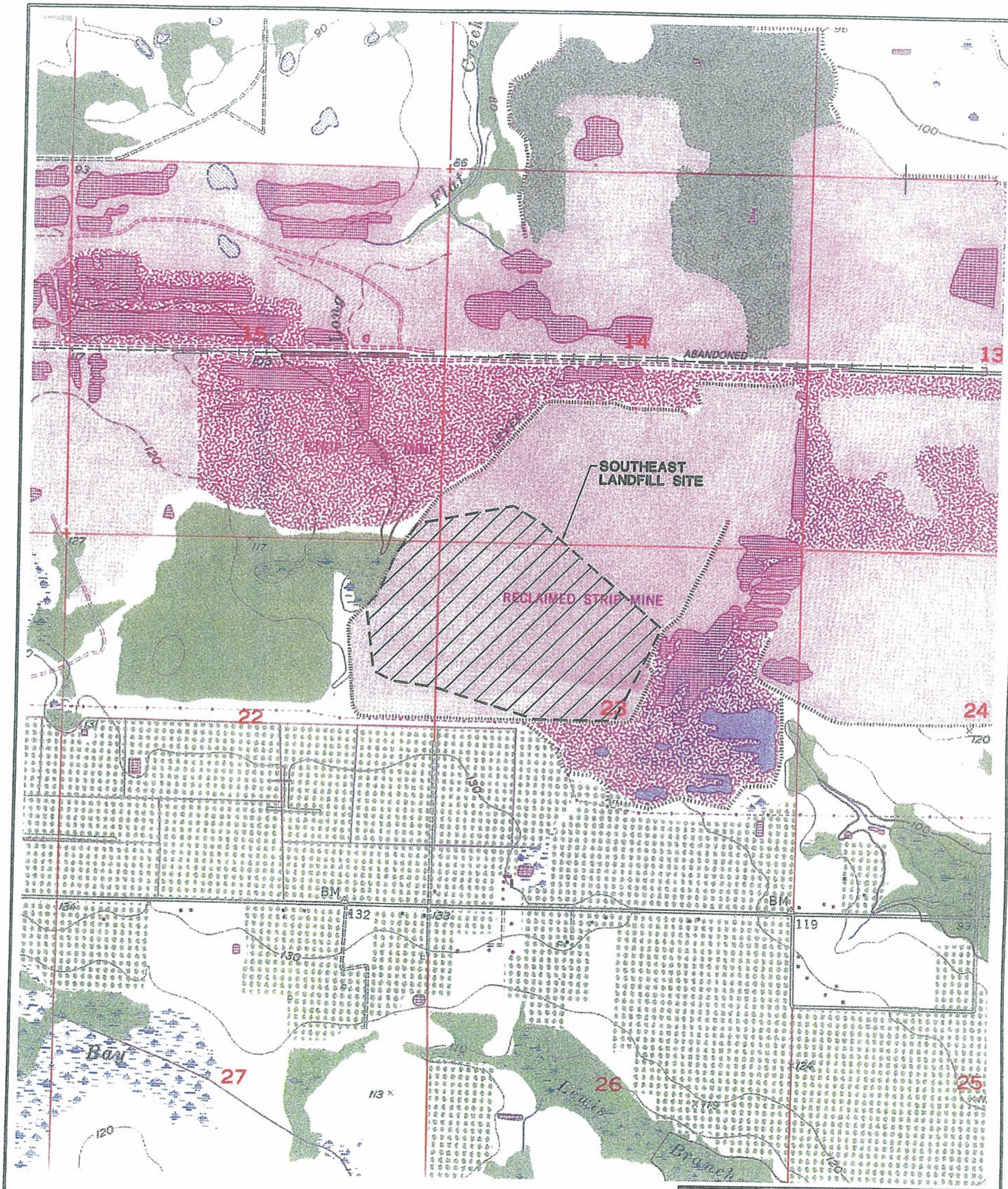
Area	Test Site	Piezoprobe Designation	Piezoprobe Tip Depth Below Ground Surface (ft)	Elevation of Piezoprobe Tip (ft, NGVD)	Horizontal Coefficient of Consolidation, c_h (cm²/sec)	Vertical Coefficient of Consolidation, c_v* (cm²/sec)
Phase I	PC-1K	PC-1K	54.2 56.3 58.3	+109.3 +107.2 +105.2	$3.0x10^{-3}$ $6.6x10^{-4}$ $5.8x10^{-4}$	$1.5x10^{-4}$ $3.2x10^{-5}$ $2.9x10^{-5}$
	PC-1L	PC-1L	73.0	+115.7	$2.6x10^{-3}$	$1.3x10^{-4}$
Phase III	PC-3E	PC-3E	38.0 40..0 42.0	+116.7 +114.7 +112.7	$4.9x10^{-3}$ $7.8x10^{-4}$ $4.8x10^{-4}$	$2.4x10^{-4}$ $3.8x10^{-5}$ $2.3x10^{-5}$
Phase IV	PC-4F	PC-4F	66.3 68.0 69.8	+111.9 +110.2 +108.4	$9.2x10^{-4}$ $3.4x10^{-4}$ $4.5x10^{-4}$	$4.5x10^{-5}$ $1.7x10^{-5}$ $2.2x10^{-5}$

* c_v using empirical relationship recommended by Baligh et al., 1986.

Table 7

Comparisons of Piezometric Elevations

Area	Test Site	Date	Ground Surface Elevation (ft, NGVD)	Piezometric Elevation on Top of Phosphatic Clay (ft, NGVD)	Existing Maximum Piezometric Elevation Within Clay (ft, NGVD)	Piezometric Elevation Below Phosphatic Clay (ft, NGVD)	Location of Existing Maximum Head
Phase I	PC-1K	04/14/05	+163.53	+119.5	+135.5	+121.7	Within Clay
	PC-1L	04/12/05	+188.66	+124.2	+129.5	+118.3	Within Clay
Phase III	PC-3E	04/14/05	+154.67	+125.3	+124.9	+121.8	Above Clay
Phase IV	PC-4F	04/14/05	+178.15	+119.5	+150.6	+118.4	Within Clay



N

0 1000 2000

SCALE: — 1"=2000'

TOWNSHIP 31 SOUTH
RANGE 21 EAST
SECTIONS 14, 15, 22 AND 23

OBTAINED FROM U.S.G.S. QUAD MAP:
LITHIA, FLORIDA 1955
(PHOTOREVISED 1987)

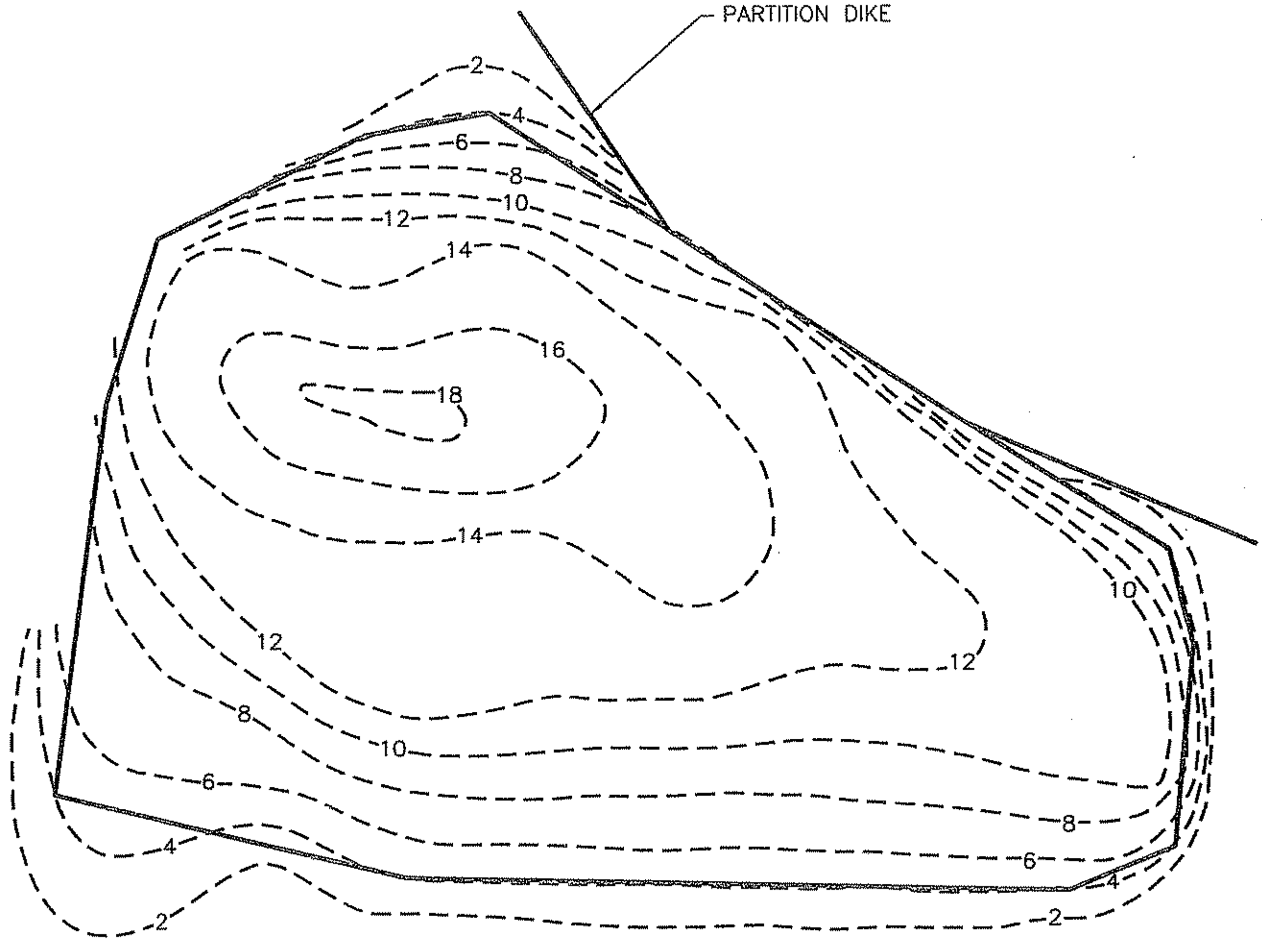
SITE LOCATION MAP

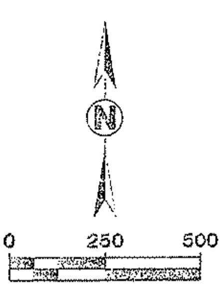
Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

GEOTECHNICAL STUDY ASSOCIATED
WITH ANNUAL MONITORING
SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

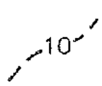
DRAWN BY: BTW	CHECKED BY: SK	DATE: 05/16/05
FILE NO. 05-010	APPROVED BY: FKC	FIGURE: 1

T:\Corporate\05\05-010\05010-01.dwg, 5/24/2005 10:31:25 AM, bwhite





LEGEND



CONTOURS OF CLAY THICKNESS IN FEET

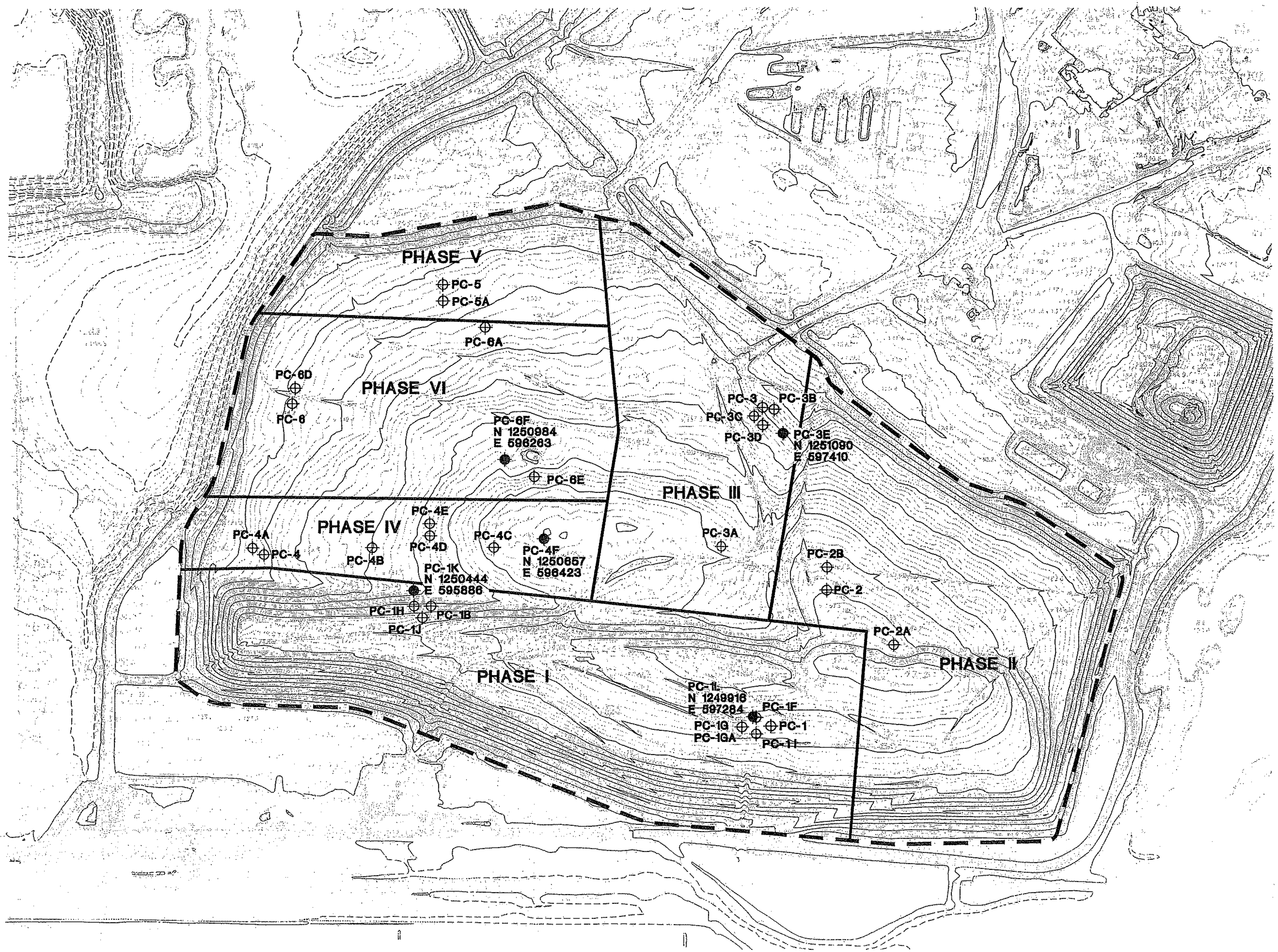
NOTE: REPRODUCED FROM ARDAMAN & ASSOCIATES' 1981-1983 STUDY

THICKNESS OF PHOSPHATIC CLAY BEFORE LANDFILL CONSTRUCTION

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING
SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

DRAWN BY: BTW	CHECKED BY: SA	DATE: 05/16/05
FILE NO. 05-010	APPROVED BY: FCC	FIGURE: 2



N

0 200 400

SCALE: 1"=400'

NOTE: THE TOPOGRAPHIC SITE PLAN WAS BASED ON SURVEY DATA OBTAINED ON JAN 18, 2005.

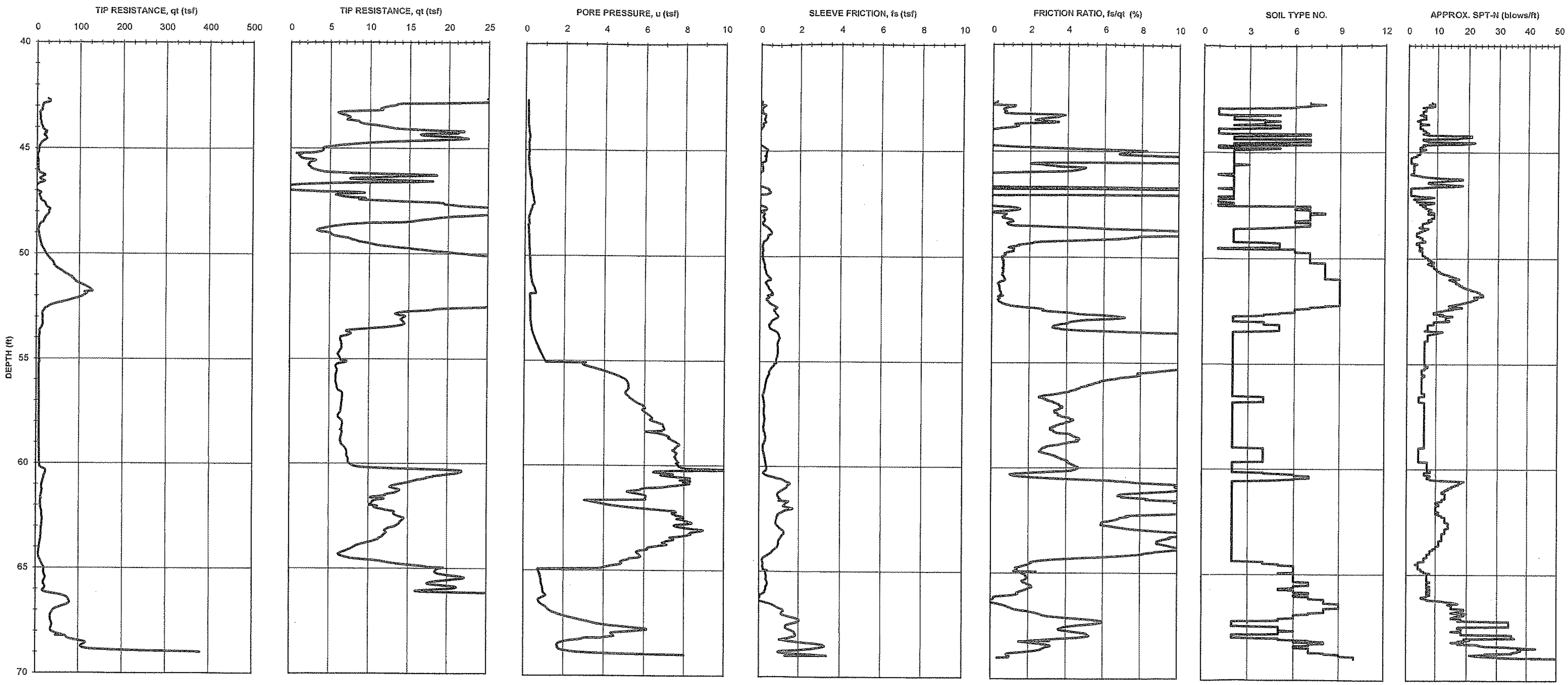
LEGEND

⊕ TEST SITES IN 2001–2004

● TEST SITES IN 2005

LANDFILL LAYOUT AND FIELD TEST LOCATION MAP		
Ardaman & Associates, Inc. Geotechnical, Environmental and Materials Consultants		
GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING SOUTHEAST LANDFILL HILLSBOROUGH COUNTY, FLORIDA		
DRAWN BY: RDC	CHECKED BY: SA	DATE: 05/16/05
FILE NO. 05-010	APPROVED BY: PKC	FIGURE: 3

T:\Corporate\05\05-010\05010-03.dwg. 5/18/2005 4:46:52 PM, Revised By: RDC



Soil I.D. #	Soil Description	UCS
1	Sensitive Fine Grained	OH/CH
2	Organic Material	OH
3	Clay	CH
4	Silty Clay to Clay	CL/MH
5	Clayey Silt to Silty Clay	MH/CL
6	Silty Sand to Sandy Silt	SC

Soil I.D. #	Soil Description	UCS
7	Sand to Sandy Silt	SP/SC
8	Sand to Silty Sand	SP
9	Sand	SP/SW
10	Gravelly Sand to Sand	SP/GW
11	Very Stiff Fine Grained	OC Clay
12	Sand to Clayey Sand	Cemented

Soil Classification by Robertson etal., 1986

TEST SITE: PC-1K

SOUNDING DATE 3/14/05

SURFACE ELEVATION (FT, NGVD) 163.53

COORDINATE LOCATION (FT) N 1,250,443.55

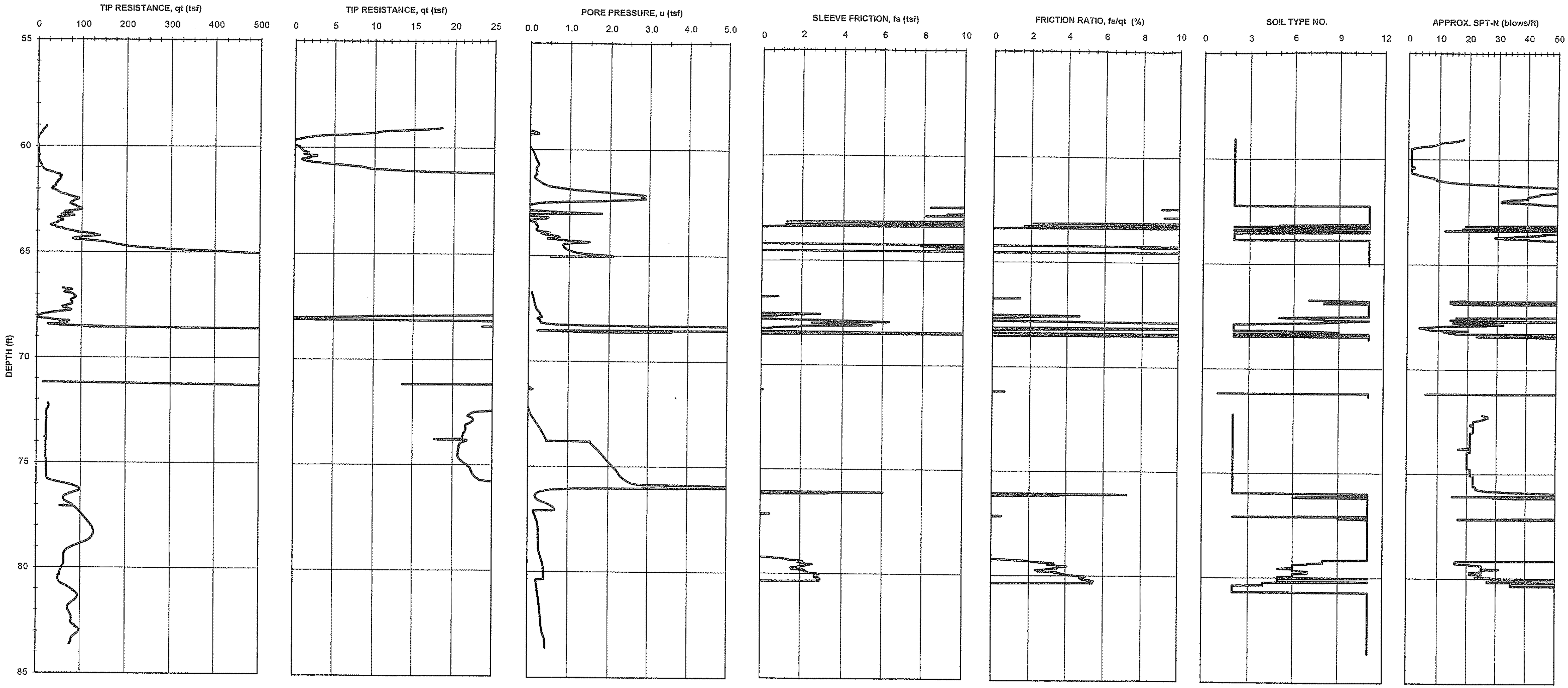
E 595,886.47

Ardaman & Associates, Inc.
Piezocone Test Results

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING

SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FL

DRAWN BY: SA	CHECKED BY: SA	DATE: 05-16-05
FILE NO.: 05-010	APPROVED BY: FKC	FIGURE: 4



Soil I.D. #	Soil Description	UCS
1	Sensitive Fine Grained	OH/CH
2	Organic Material	OH
3	Clay	CH
4	Silty Clay to Clay	CL/MH
5	Clayey Silt to Silty Clay	MH/CL
6	Silty Sand to Sandy Silt	SC

Soil I.D. #	Soil Description	UCS
7	Sand to Sandy Silt	SP/SC
8	Sand to Silty Sand	SP
9	Sand	SP/SW
10	Gravelly Sand to Sand	SP/GW
11	Very Stiff Fine Grained	OC Clay
12	Sand to Clayey Sand	Cemented

Soil Classification by Robertson et al., 1986

TEST SITE: PC-1L

SOUNDING DATE 3/16/05

SURFACE ELEVATION (FT, NGVD) 188.66

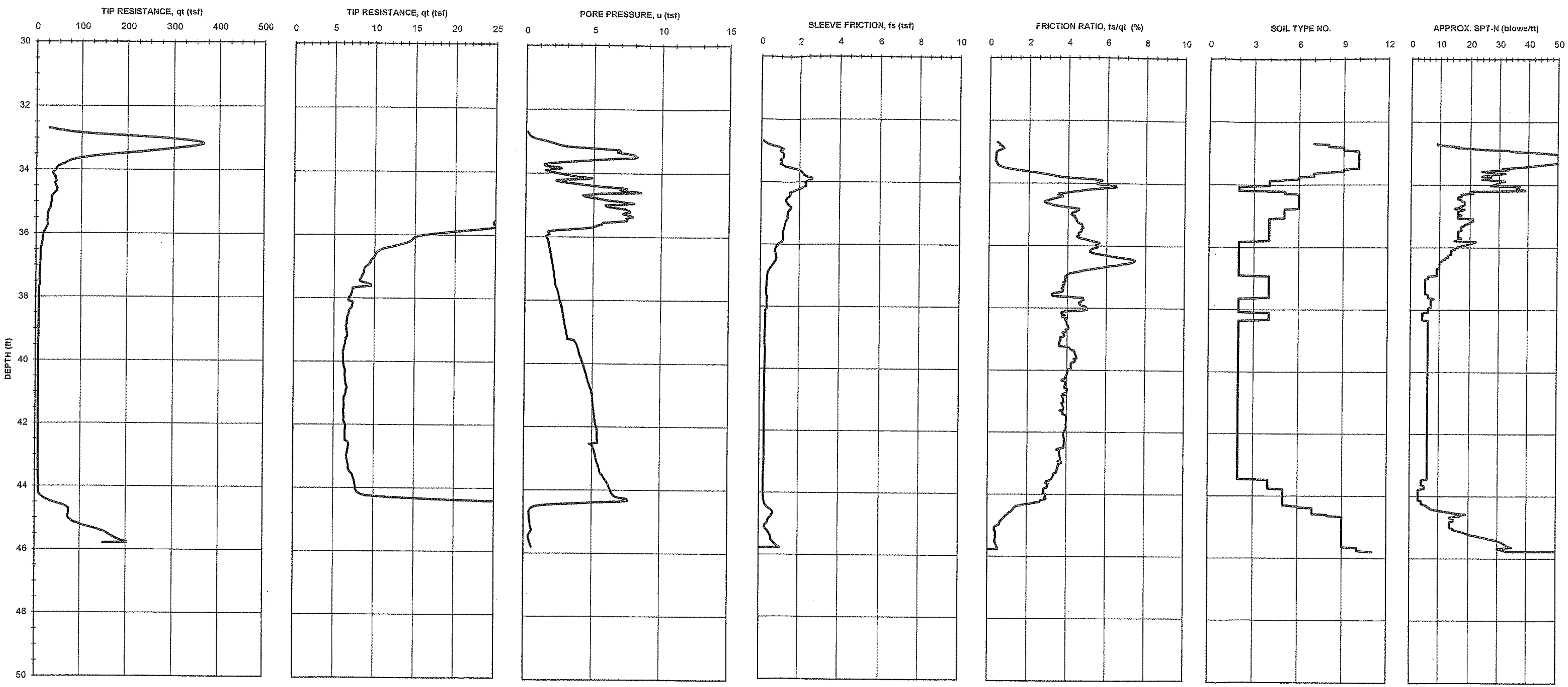
COORDINATE LOCATION (FT) N 1,249,916.34
E 597,283.83

Ardaman & Associates, Inc.
Piezocone Test Results

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING

SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FL

DRAWN BY: SA	CHECKED BY: SA	DATE: 05-16-05
FILE NO.: 05-010	APPROVED BY: FCC	FIGURE: 5



Soil I.D. #	Soil Description	UCS
1	Sensitive Fine Grained	OH/CH
2	Organic Material	OH
3	Clay	CH
4	Silty Clay to Clay	CL/MH
5	Clayey Silt to Silty Clay	MH/CL
6	Silty Sand to Sandy Silt	SC

Soil I.D. #	Soil Description	UCS
7	Sand to Sandy Silt	SP/SC
8	Sand to Silty Sand	SP
9	Sand	SP/SW
10	Gravelly Sand to Sand	SP/GW
11	Very Stiff Fine Grained	OC Clay
12	Sand to Clayey Sand	Cemented

Soil Classification by Robertson et al., 1986

TEST SITE: PC-3E

SOUNDING DATE 3/11/05

SURFACE ELEVATION (FT, NGVD) 154.67

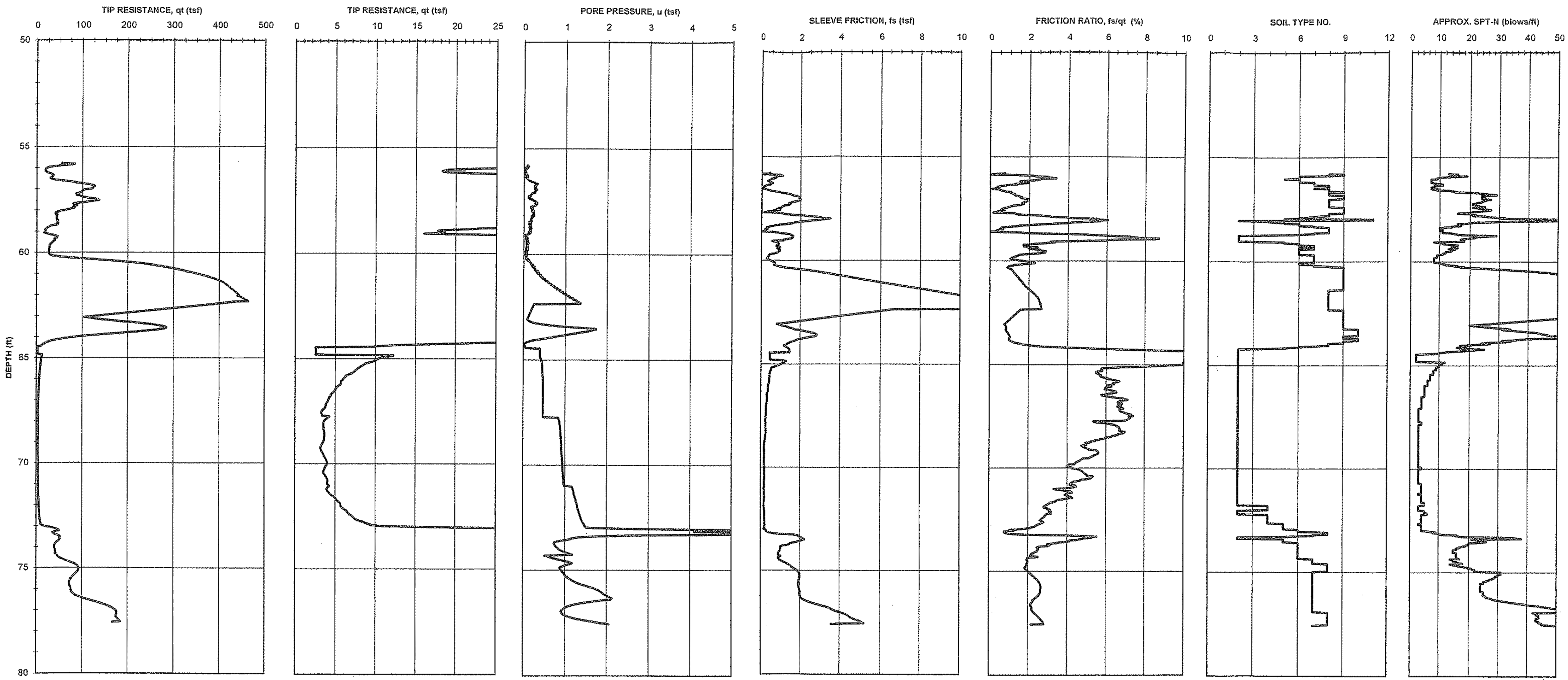
COORDINATE LOCATION (FT) N 1,251,089.80
E 597,409.63

Ardaman & Associates, Inc.
Piezocone Test Results

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING

SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FL

DRAWN BY: SA	CHECKED BY: SA	DATE: 05-16-05
FILE NO.: 05-010	APPROVED BY: FKC	FIGURE: 6



Soil I.D. #	Soil Description	UCS
1	Sensitive Fine Grained	OH/CH
2	Organic Material	OH
3	Clay	CH
4	Silty Clay to Clay	CL/MH
5	Clayey Silt to Silty Clay	MH/CL
6	Silty Sand to Sandy Silt	SC

Soil Classification by Robertson et al., 1986

Soil I.D. #	Soil Description	UCS
7	Sand to Sandy Silt	SP/SC
8	Sand to Silty Sand	SP
9	Sand	SP/SW
10	Gravelly Sand to Sand	SP/GW
11	Very Stiff Fine Grained	OC Clay
12	Sand to Clayey Sand	Cemented

TEST SITE: PC-4F

SOUNDING DATE 3/9/05

SURFACE ELEVATION (FT, NGVD) 178.15

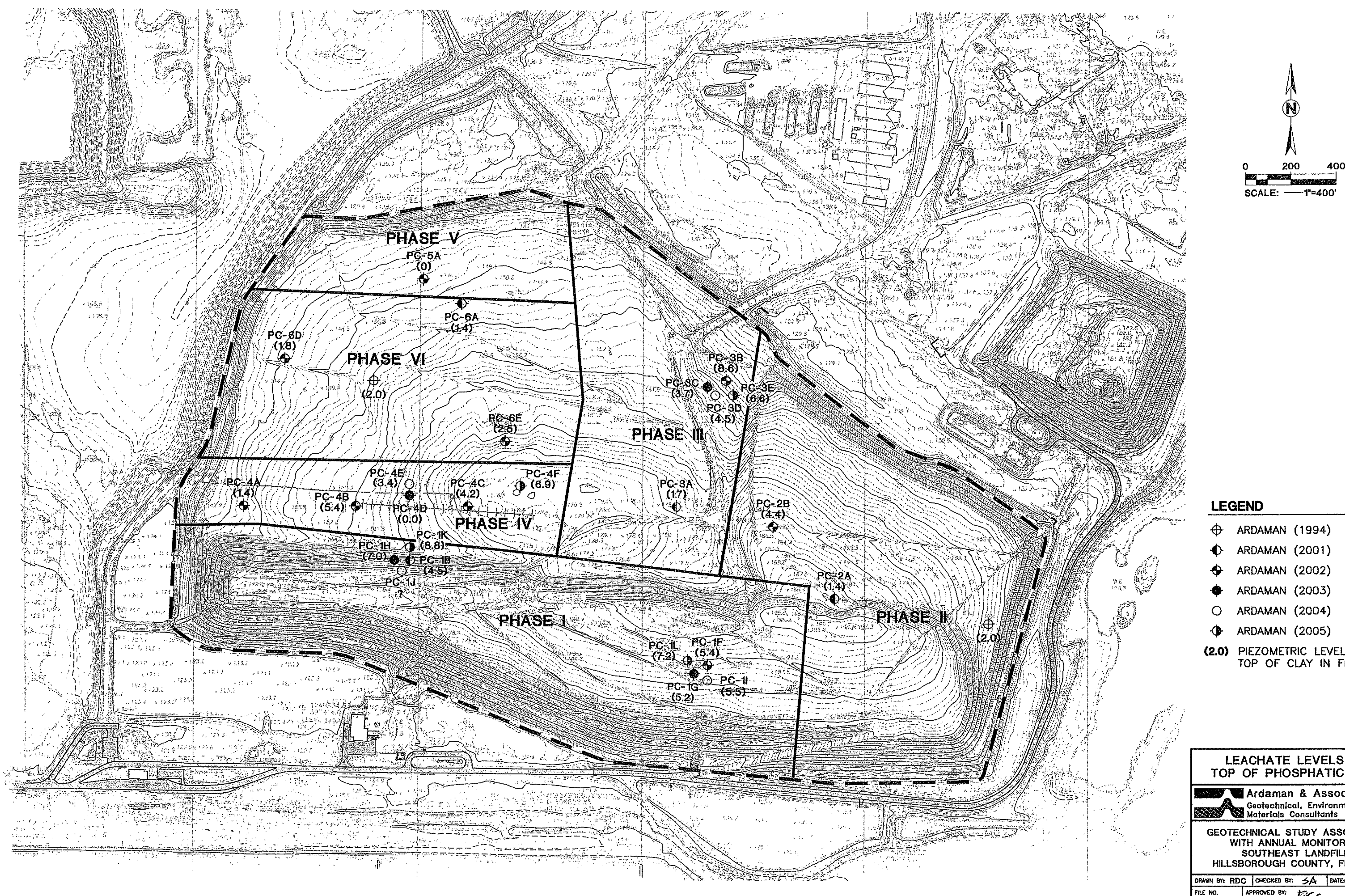
COORDINATE LOCATION (FT) N 1,250,656.68
E 596,423.09

Ardaman & Associates, Inc.
Piezocone Test Results

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING

**SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FL**

DRAWN BY: SA	CHECKED BY: SA	DATE: 05-16-05
FILE NO.: 05-010	APPROVED BY: PCC	FIGURE: 7



LEGEND

- ARDAMAN (1994)
- ARDAMAN (2001)
- ARDAMAN (2002)
- ARDAMAN (2003)
- ARDAMAN (2004)
- ARDAMAN (2005)

(2.0) PIEZOMETRIC LEVEL ABOVE TOP OF CLAY IN FEET

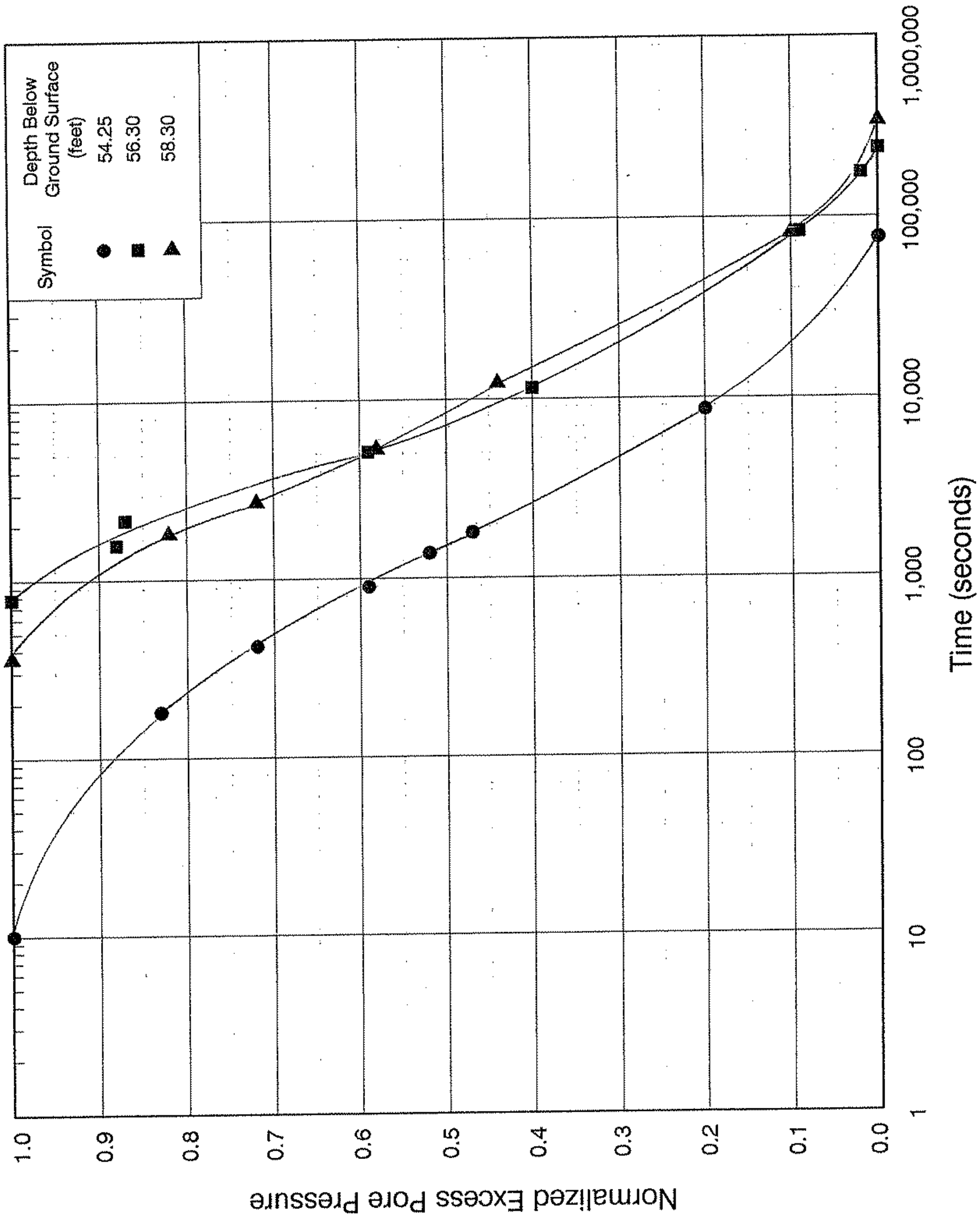
LEACHATE LEVELS ON TOP OF PHOSPHATIC CLAY

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING
SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

DRAWN BY: RDC	CHECKED BY: SA	DATE: 05/16/05
FILE NO. 05-010	APPROVED BY: PCC	FIGURE: 8

T:\Corporate\05\05-010\05010-08.dwg, 5/18/2005 4:20:57 PM, Revised By: RDC



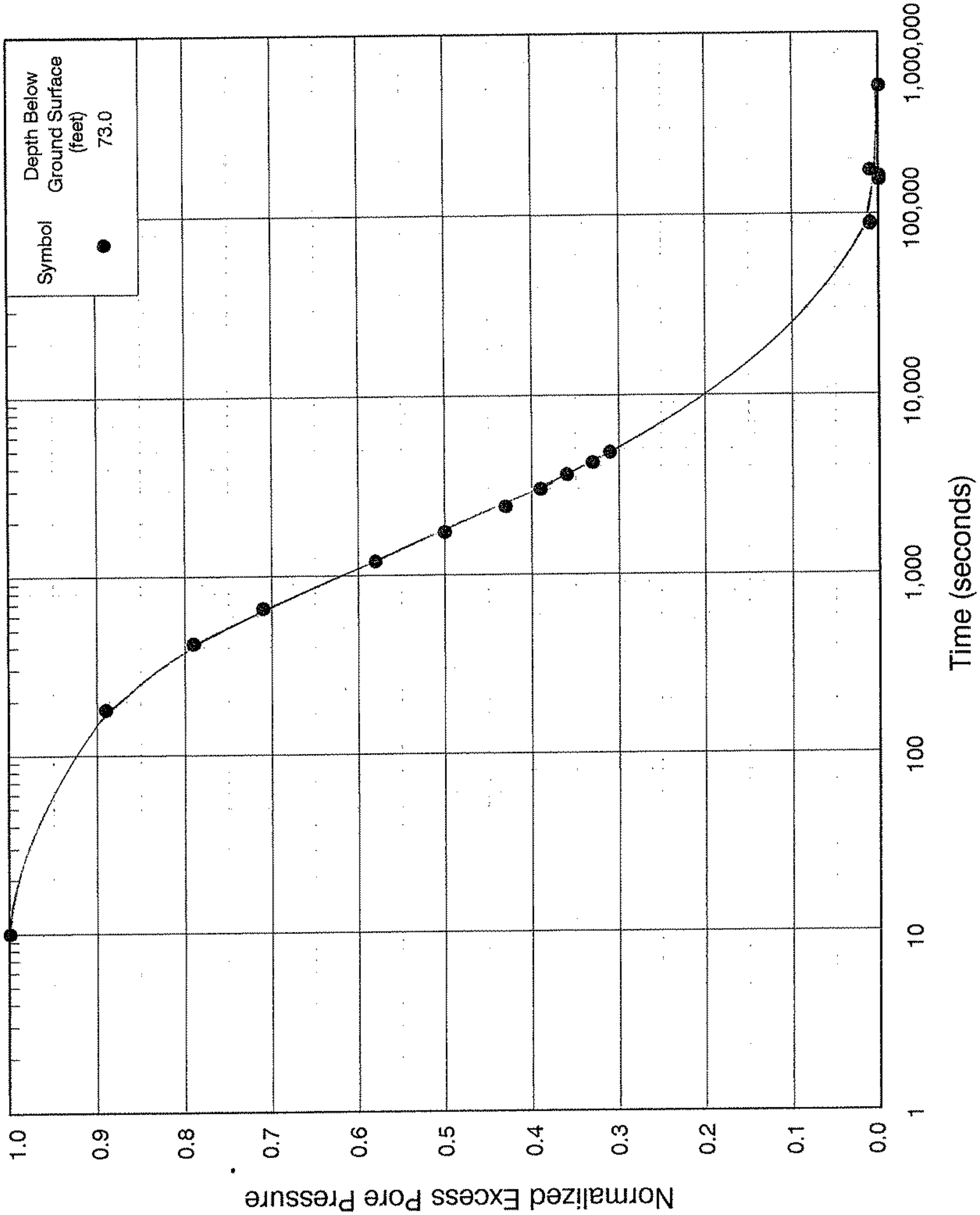
EXCESS PORE PRESSURE DISSIPATION
PIEZOPROBE AT TEST LOCATION PC-1K

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING
SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

DRAWN BY: SA	CHECKED BY: SA	DATE: 05-16-03
FILE NO.: 05-010	APPROVED BY: PKC	FIGURE: 9

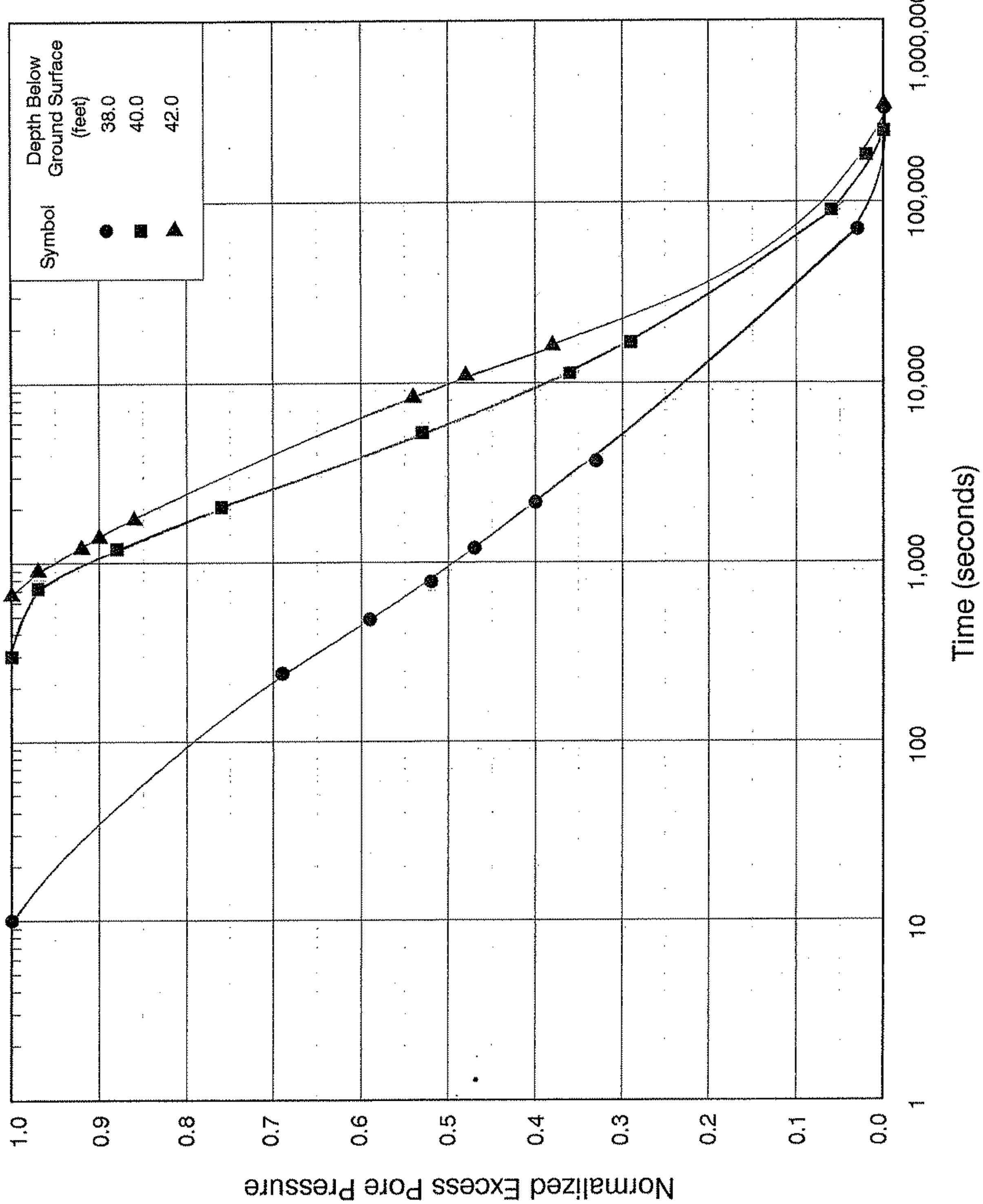
pc 1kds.drw



EXCESS PORE PRESSURE DISSIPATION
PIEZOPROBE AT TEST LOCATION PC-1L

Ardaman & Associates, Inc. Geotechnical, Environmental and Materials Consultants					
GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING SOUTHEAST LANDFILL HILLSBOROUGH COUNTY, FLORIDA					
DRAWN BY:	SA	CHECKED BY:	SA	DATE:	05-16-03
FILE NO.: 05-010		APPROVED BY: FKC		FIGURE: 10	

pc1l.dw

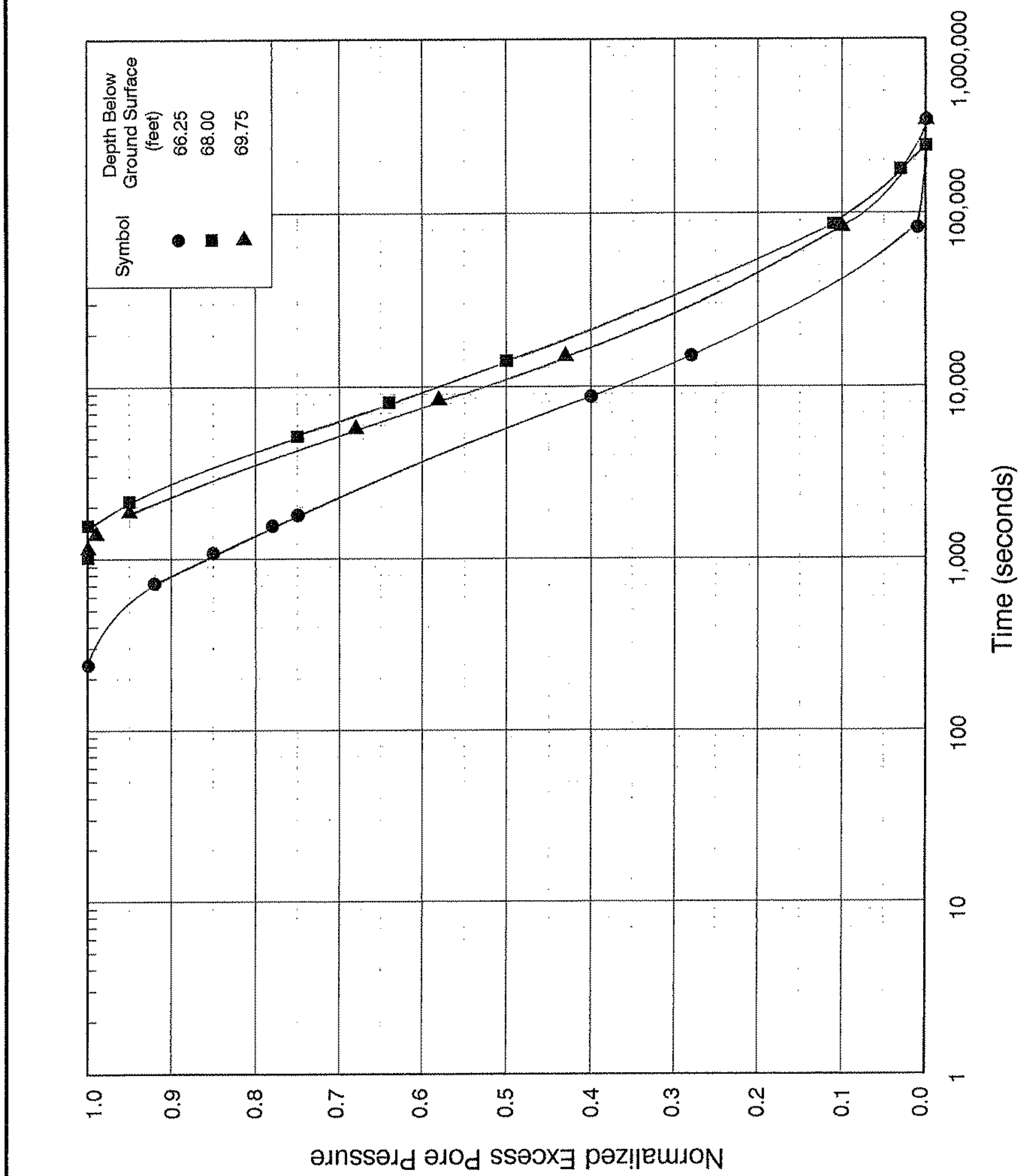


EXCESS PORE PRESSURE DISSIPATION
PIEZOPROBE AT TEST LOCATION PC-3E

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING
SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

DRAWN BY: SA	CHECKED BY: SA	DATE: 05-16-03
FILE NO.: 05-010	APPROVED BY: ACC	FIGURE: 11

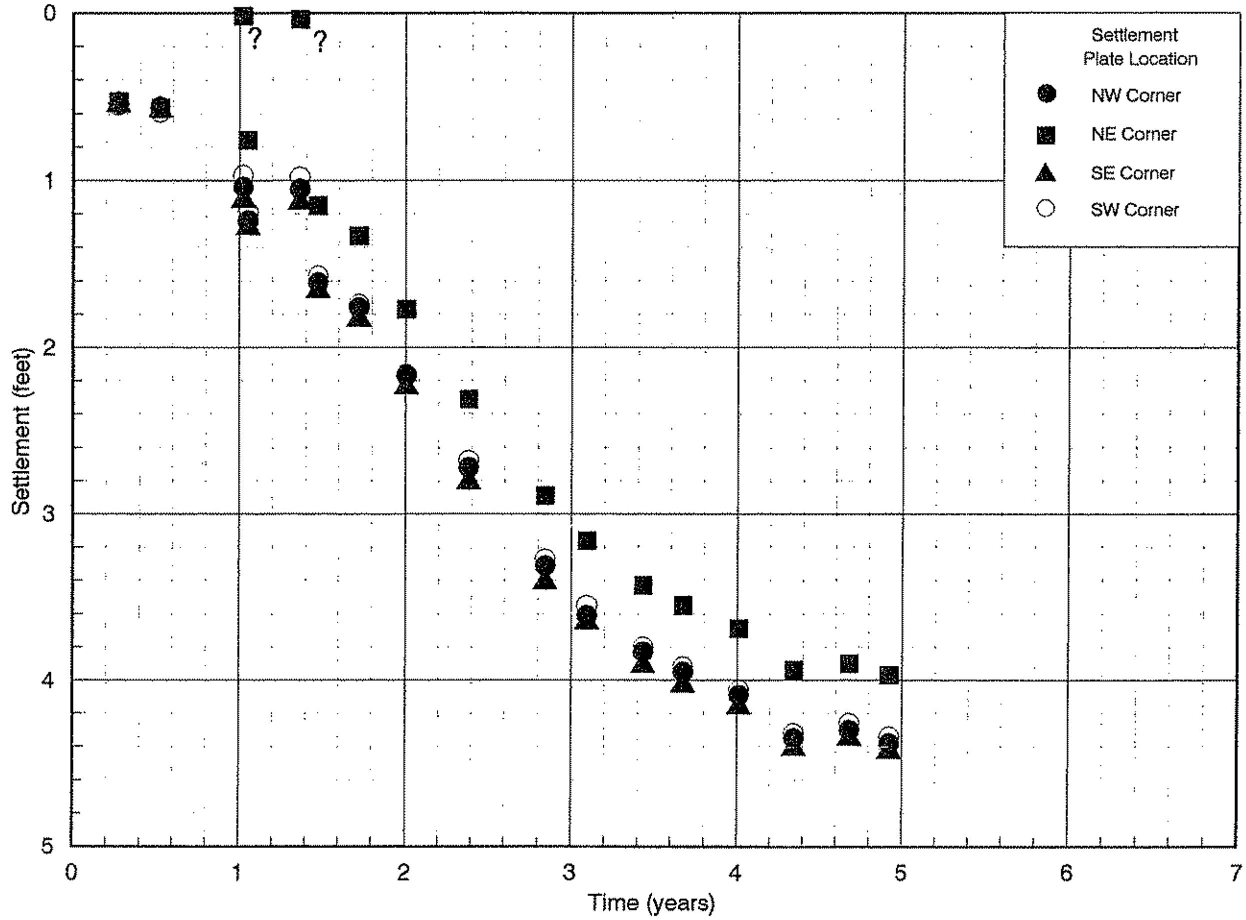


EXCESS PORE PRESSURE DISSIPATION
PIEZOPROBE AT TEST LOCATION PC-4F

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING
SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

DRAWN BY: SA	CHECKED BY: SA	DATE: 05-16-03
FILE NO.: 05-010	APPROVED BY: FKC	FIGURE: 12



SETTLEMENT VERSUS TIME

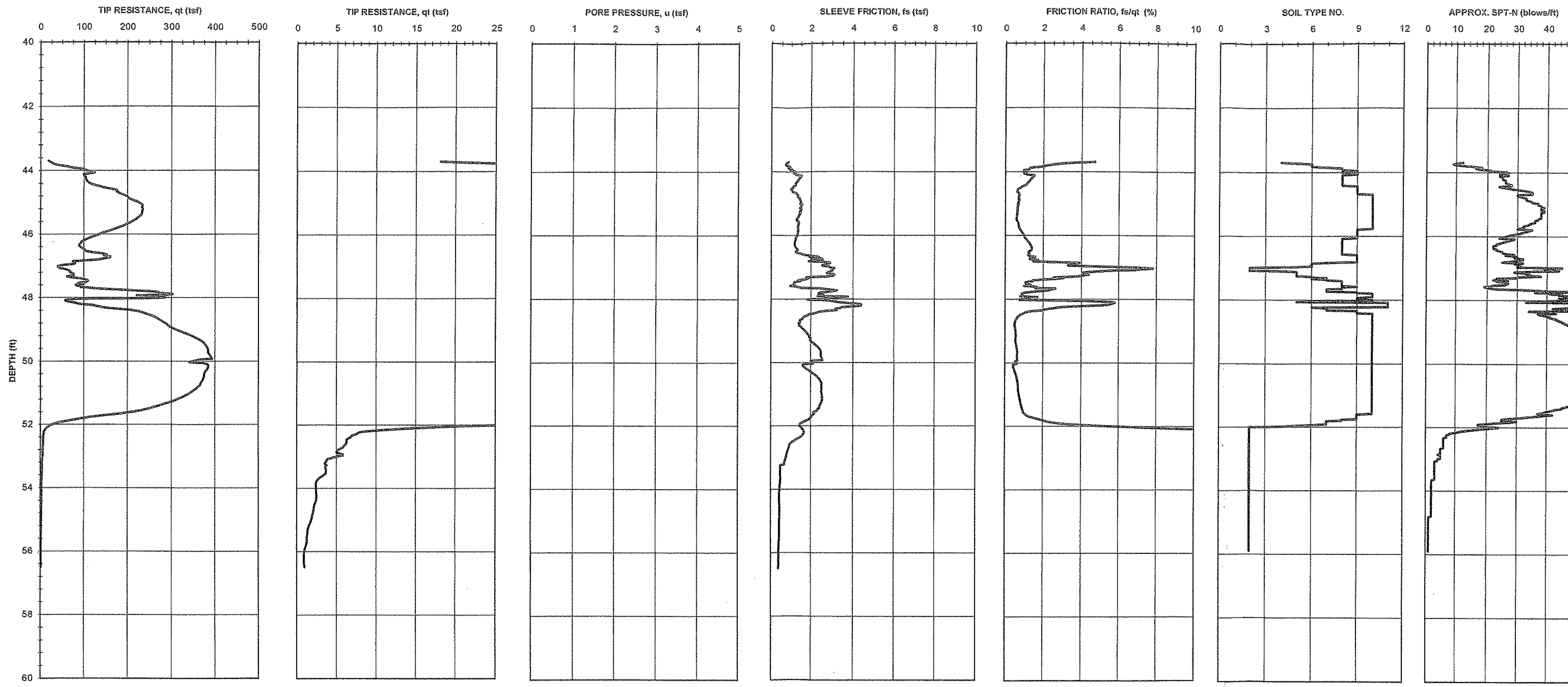
SETTLEMENT OF TOP OF PHOSPHATIC CLAY AT PUMP STATION B SUMP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING
SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FLORIDA

DRAWN BY: SA	CHECKED BY: SA	DATE: 05-16-03
FILE NO.: 05-010	APPROVED BY: PCC	FIGURE: 13

timesett.drw



Soil I.D. #	Soil Description	UCS
1	Sensitive Fine Grained	OH/CH
2	Organic Material	OH
3	Clay	CH
4	Silty Clay to Clay	CL/MH
5	Clayey Silt to Silty Clay	MH/CL
6	Silty Sand to Sandy Silt	SC

Soil I.D. #	Soil Description	UCS
7	Sand to Sandy Silt	SP/SC
8	Sand to Silty Sand	SP
9	Sand	SP/SW
10	Gravelly Sand to Sand	SP/GW
11	Very Stiff Fine Grained	OC Clay
12	Sand to Clayey Sand	Cemented

Soil Classification by Robertson et al., 1986

TEST SITE: PC-6F

SOUNDING DATE 3/3/05

SURFACE ELEVATION (FT, NGVD) 167.31

COORDINATE LOCATION (FT) N 1,250,983.97
E 96,262.97

Ardaman & Associates, Inc.
Piezocone Test Results

GEOTECHNICAL STUDY ASSOCIATED WITH ANNUAL MONITORING

SOUTHEAST LANDFILL
HILLSBOROUGH COUNTY, FL

DRAWN BY: SA | CHECKED BY: SA | DATE: 05-16-05
FILE NO.: 05-010 | APPROVED BY: FCC | FIGURE: 14