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July 15, 2008
Revised December 23, 2008

Mr. J. David Alewine
Director, Contract Management
Fluor Enterprises
STP 3 & 4
100 Fluor Daniel Drive, Mail Code: PW0503N
Greenville, SC 29607

Subject: **Data Report**
Results of Subsurface Investigation and Laboratory Testing
STP COL Project Units 3 & 4
South Texas Project Electric Generating Station
MACTEC Project 6234-08-4660
Fluor Submittal No. A3SC.00.K004.023

Dear Mr. Alewine:

MACTEC Engineering and Consulting, Inc. (MACTEC), is pleased to submit this revised data report for the subsurface investigation and laboratory testing scope of work that was performed for the South Texas Project (STP) COL Units 3 & 4 located at the South Texas Project Electric Generating Station (STPEGS) in Matagorda County, Texas.

It has been a pleasure to perform the work described in the attached report. If you have any questions, or if we may be of further service, please contact us at your convenience.

Very truly yours,

MACTEC ENGINEERING AND CONSULTING, INC.

STATE OF TEXAS
Robert Edward Smith Jr.
101433
12-23-08
LICENSED
PROFESSIONAL ENGINEER

Robert E. Smith, Jr.
Project Manager
Registered TX 101433

For Kathryn A. White
With Permission
Nicole A. Howe

Kathryn A. White, P.E.
Principal Geotechnical Engineer
Registered TX 81590

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MACTEC Engineering and Consulting, Inc.
2801 Yorkmont Road, Suite 100 • Charlotte, NC 28208 • Phone: 704-357-8600 • Call for Fax
www.mactec.com

REVISED DATA REPORT

RESULTS OF SUBSURFACE INVESTIGATION AND LABORATORY TESTING

SOUTH TEXAS PROJECT UNITS 3 & 4

Matagorda County, Texas

July 15, 2008
Revised December 23, 2008

Prepared By:

MACTEC ENGINEERING AND CONSULTING, INC.

CHARLOTTE, NORTH CAROLINA

MACTEC PROJECT NUMBER 6234-08-4660

Fluor PDDM
☒ A - PROCEED
☐ B - PROCEED AS NOTED, CHANGE AS NOTED AND RESUBMIT
☐ C - DO NOT PROCEED CHANGE AS NOTED AND RESUBMIT
☐ D - INFORMATION ONLY, RECEIPT ACKNOWLEDGED
Fluor Nuclear Power
a Division of
Fluor Enterprises, Inc
SIGNATURE _____ DATE 1-12-09

Submitted To:

FLUOR ENTERPRISES, INC

Greenville, South Carolina

FLUOR SUBCONTRACT A3SC.00.K004
FLUOR SUBMITTAL No. A3SC.00.K004.023

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Attachment D Laboratory Testing Results

LIST OF ACRONYMS, SYMBOLS AND TERMINOLOGY

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials International
ABWR	Advanced Boiling Water Reactor
bpf	blows per foot
C_c	Compression Index
C_e	SPT Energy Ratio to ER=60%
cf	cubic feet
CH	fat clay, high plasticity
CL	lean clay, low plasticity
C_n	vertical effective stress correction factor for SPT-N
COC	Chain of Custody
COL	Combined Construction and Operating License
C_R	Recompression Index
CU	Consolidated-Undrained Triaxial
D_{10}	grain diameter corresponding to 10% passing
D_{30}	grain diameter corresponding to 30% passing
D_{60}	grain diameter corresponding to 60% passing
DCC	Document Control Center
DCN	Document Control Number
DOE	Department of Energy
D_r	relative density
EFV	Energy transmitted to the drill rods (Force-Velocity)
EM	Electro Magnetic
ER	Energy Ratio for Standard Penetration Test
ETR	Energy Transfer Ratio
e_o	initial void ratio
Fluor	Fluor Enterprises, Inc.
ft	foot or feet

g	acceleration due to gravity
G	shear modulus
G_s	specific gravity
GPS	Global Positioning System
gINT	Geotechnical Data presentation Software provided by gINT, Inc.
GC	clayey gravel
GM	silty gravel
G_{max}	low strain shear modulus
GP	poorly graded gravel
GWT	ground water table or depth
GW	well-graded gravel
H	layer thickness
HASP	Health and Safety Plan
ID	inside diameter
K_a	active earth pressure coefficient
K_o	at-rest earth pressure coefficient
K_p	passive earth pressure coefficient
kip	1,000 pounds
km	kilometer
ksf	kips per square foot
LL	liquid limit
LL_f	Live Load, force or pressure
m/sec	meters per second
MACTEC	MACTEC Engineering and Consulting, Inc.
MH	high compressible silt
ML	low compressible silt
mm	millimeter
MSL	mean sea level in feet
M&TE	Measuring and Test Equipment
N-value	Sum of second and third set of recorded blows from the SPT
N60, N_{60}	SPT N-value corrected to 60 percent energy ratio (ER)
N_1	SPT N-value normalized to 1 tsf

$(N_1)_{60}$	SPT N-value normalized to 1 tsf and 60% max. hammer energy ratio (also modified to account for room for liner but no sample liner used for Project)
NIST	National Institute of Standards and Technology
NQA	National Quality Assurance
NRC	Nuclear Regulatory Commission
NV	Non Viscous
MDD	maximum dry density, pcf (laboratory compaction test)
OCR	overconsolidation ratio
OD	outside diameter
OL	organic silt
OH	organic clay
OMC	optimum moisture content, percent (%) (laboratory compaction test)
p - q	total stress path strength parameters
p' - q'	effective stress path strength parameters
p_c or P_c	preconsolidation pressure (also called σ_c')
p_o or P_o	existing vertical effective stress (also called σ_o')
pcf	pounds per cubic foot
pci	pounds per cubic inch
PDA	Pile Driving Analyzer
PE	Theoretical Potential Energy
PI	plasticity index
PL	plastic limit
PMT	Pressuremeter Testing
psf	pounds per square foot
psi	pounds per square inch
PT	peat
PVC	Polyvinyl Chloride
QA	quality assurance
QAPD	Quality Assurance Project Document
QAR	Quality Assurance Representative
q_a	allowable bearing pressure

QC	quality control
REC	Recovery (SPT Samples and UD Samples)
RTK-GPS	Real Time Kinematic-Global Positioning Satellite
r_u	pore water pressure ratio = $\Delta u/\sigma_0'$
SC	clayey sand
slickenside surface	parting surface in sample with particles oriented parallel to surface, giving shiny appearance
SM	silty sand
SP	poorly graded sand
SW	well-graded sand
SPT	Standard Penetration Test
SRP	Standard Review Plan
SS	split spoon sample
ST	Shelby tube (undisturbed (UD) soil sampling)
STD	standard
STDEV	standard deviation
STPEGS	South Texas Project Electric Generating Station
STPNOC	South Texas Project Nuclear Operating Company
S_u	undrained shear strength
t	time
tsf	tons per square foot
TX	triaxial
UD	undisturbed soil sampling: ST (Shelby Tube Sample), pushed or Pitcher (Pitcher Tube Sample), drilled
UNC	Unconfined Compression Test
US	United States
USCS	Unified Soil Classification System (e.g. SM, SC, etc.)
USNRC	U. S. Nuclear Regulatory Commission
UU	unconsolidated-undrained triaxial compression test
v_s	S-wave velocity (shear wave velocity)
$(v_s)_1$	S-wave velocity normalized to 1 ton per square foot
WI	Work Instruction

WC or W	water content (moisture content)
α	total stress path angle
α'	effective stress path angle
ε or γ	shear strain
ε_r or γ_r	reference strain
ϕ	total stress friction angle
ϕ'	effective stress friction angle
γ	unit weight of soil
γ_s	saturated unit weight of soil
γ'	effective or buoyant unit weight of soil, $\gamma_s - \gamma_w$
γ_w	unit weight of water
ρ	mass density of the soil
σ_1, σ_3	principal normal stresses
σ_c'	preconsolidation pressure
σ_o'	initial effective vertical stress
σ_v'	effective vertical stress
σ_{vo}	initial total vertical stress
τ	shear stress
υ	Poisson's ratio

SECTION 1
OVERVIEW

1.1 INTRODUCTION

MACTEC Engineering and Consulting, Inc. (MACTEC) was retained by Fluor Enterprises, Inc. (Fluor) to conduct a subsurface investigation and laboratory testing program for the South Texas Project proposed ABWR Units 3 and 4 at the South Texas Project Electric Generating Station (STPEGS) in Matagorda County, Texas. MACTEC's services were completed as part of the Combined Operating License (COL) Revision 3 application for the South Texas Project Nuclear Operating Company (STPNOC) and were executed in accordance with Fluor Subcontract A3SC.00.K004.

Field work commenced on June 23, 2008 and was substantially completed on June 27, 2008. Some site restoration field activities occurred after June 27, 2008. The last drilling related activity conducted at the site was abandoning two borings with cement-bentonite grout on June 27, 2008. Laboratory testing commenced in August, 2008 and was substantially completed on November 26, 2008.

The Scope of Work was defined in Contract Modification 003 of Fluor Subcontract A3SC.00.K004 and the technical requirements were defined in Fluor's Specification No. 770.210.02210, Geotechnical Exploration, Rev. 2 dated June 10, 2008 and MACTEC's Geotechnical Engineering Work Plan latest revision. The scope of work is briefly described below:

- Prepare and submit a quality plan (Quality Assurance Project Document, QAPD).
- Prepare and submit a Health and Safety Plan (HASP).
- Prepare and submit a Geotechnical Work Plan.
- Provide quality assurance inspectors (surveillance) of the field and laboratory work activities.
- Locate exploration points by GPS and survey methods using coordinates contained in the specifications.
- Coordinate and clear overhead and underground utilities with plant personnel prior to advancing any exploratory activities.
- Drill geotechnical borings at locations specified by Fluor, boring locations adjusted as necessary and as approved by Fluor's representatives to accommodate access and utility conflicts.
- Conduct SPT Energy Measurements.
- Conduct Standard Penetration Testing (SPT) and obtain disturbed and undisturbed soil samples.
- Conduct Pressuremeter Testing in two borings.
- Prepare field logs for all drilling and sampling.
- Transfer all samples to a secure, on-site sample storage facility, provided by STPNOC.
- Seal all borings by grouting.
- Conduct laboratory testing on soil samples as assigned by MACTEC.

The work was completed under a Quality Assurance Program meeting the Code of Federal Regulations 10CFR50, Appendix B and conforming to the provisions of ANSI/ASME NQA-1-1994.

This Data Report generally describes the field and laboratory testing methods and presents the laboratory testing results.

1.2 PERSONNEL

Field work was performed by MACTEC personnel and/or qualified subcontractors with the assistance of the STPNOC who provided on-site office space and a sample storage facility. Prior to conducting any field activities, project personnel were qualified per the MACTEC QAPD and trained in quality assurance, 10 CFR 21, and safety procedures. Additionally, any field personnel who worked at the site for two weeks or more completed drug and alcohol screening. Key MACTEC personnel and their responsibilities are shown below:

- Robert E. Smith, Jr., Project Manager
- Kathryn A. White, P.E., Project Principal Engineer
- Shaun Lehman, Site Supervisor/Site Safety Officer
- Dan Haug, P.G., Site Coordinator/Assistant Site Safety Officer
- Andy Kottenstette, Quality Assurance Manager
- Douglas Whitaker, Quality Assurance Representative (QAR)
- Edward Littell, Surveillant

Rig Geologist/Engineers:

- Rodney Clark
- Mandel Harvey
- Martha Herrera
- Jon Honeycutt
- Johnny Liles
- Tom Longley
- Ram Mogulla
- Adamson Mwembeshi
- Nick Smith
- Alexandra Taylor

In addition to MACTEC personnel, Fluor provided a full time on-site representative for duration of field activities. That person was:

- Eugene Stover

The organizations that performed on-site work or laboratory testing of samples as part of this effort are listed below.

- AE Drilling Services, LLC (Drilling Subcontractor)
- In-Situ Engineering (Pressuremeter Testing)
- Jones Environmental Drilling (JEDI, Drilling Subcontractor)
- Lewis Environmental Drilling (Drilling Subcontractor)
- Miller Drilling Company, Inc. (Drilling Subcontractor)
- Survcon, Inc. (Surveyor Subcontractor)

1.3 ORGANZATION OF REPORT

This report and its appendices are organized in the following sequence; transmittal letter; table of contents; list of tables; list of figures; list of appendices; list of acronyms, symbols and terminology; text, tables and figures; and attachments.

1.4 QUALITY ASSURANCE

Quality related activities performed by MACTEC and its subcontractor organizations that provided equipment and personnel during the completion of this project were in accordance with the MACTEC Quality Assurance (QA) Manual and the MACTEC Quality Assurance Project Document. The MACTEC QA program complies with NQA-1-1994 Subpart 2.20 and to the requirements of 10 CFR 50 Appendix B.

SECTION 2
TEST METHODS

2.1 SURVEYING

The surveying for this project was conducted in two phases. The initial phase was preliminary staking of planned boring locations in accordance with Fluor's "Soil Boring Location Plan Supplemental Exploration" (Fluor Dwg. No. UO-C-BP-PL-003, Rev. 2). Survcon, Inc. personnel using previously established horizontal and vertical datums based on South Texas Plant control points completed a preliminary staking. Stakes were driven in-place to mark the surveyed locations. Relocation of a few borings was required due to site access and/or underground utility concerns.

The final "as-built" survey of all test locations was performed under MACTEC's Quality Assurance program by Survcon, Inc. horizontal and vertical datums were based on South Texas Plant control points. Horizontal datum of NAD27 and vertical datum of NGVD 29 were used for this survey. Horizontal coordinates achieved third-order accuracy (1:5,000) and vertical elevation met or exceeded 0.1-foot tolerance. A description of procedures and "as-built" locations from the survey are contained in Attachment A.

2.2 UTILITY LOCATION

Prior to the execution of drilling activities, MACTEC personnel conducted an electromagnetic (EM) survey of a 10-ft radius around each proposed boring. The intent was to locate any metallic underground utilities that would pose a risk to drilling personnel. Several underground water lines leading to fire hydrants were identified and marked.

In addition to the EM survey, "as-built" drawings provided by STPNOC were used to identify potential underground utility hazards. Final release for the commencement of drilling activities was provided by STPNOC only after the "as-built" records were checked against the EM survey findings.

Aside from underground utilities, there were overhead power lines on the site. The following pre-drilling activities were accomplished to avoid encounters with power lines:

1. Each pole associated with the overhead power lines in the area where borings were planned was inspected for lines leading underground. STPNOC was consulted and checked whether any lines thus located are energized;
2. Energized underground lines indicated in step (1) were traced for short distances and marked with paint and flagged on the ground surface so they could be avoided. If there were indications an underground line may pass near a boring, the lines within a 10-foot radius of the planned boring were marked.

2.3 DRILLING EQUIPMENT/METHODS

Drilling equipment mobilized to the site included the following:

Drill Rig Model Serial Number	Owner	Drill Rig	Driller
328848	AE Drilling	CME 750	Marty King
165447	JEDI	CME 75	Oscar Garcia
92007	Lewis	Mobile B61	Danny Gonzalez / Steve Casique
196383	MACTEC – Atlanta	CME 550	Larry Carter
505	MACTEC – Atlanta	CME 55	Phil Pitts
211797	MACTEC – Charlotte	CME 75	Jimmy Warren
331145	MACTEC – Raleigh	CME 55 LC	David White
270356	Miller	CME 85	Jason Cook
299708	Miller	CME 750	Glenn Bilbrey
271353	Miller	CME 550	Rick White

In addition, one rubber-tired highway-type water tanker truck was utilized to haul water from a STPNOC provided water source.

Borings for geotechnical purposes were advanced in soil using mud rotary methods to a predetermined termination depth.

The boring locations were filled using a cement-bentonite grout prior to demobilizing from the site. The borings were grouted from the bottom of the boring by pumping the grout through a tremie pipe. The grout mixture of approximately eight gallons of water and 2.5 pounds of bentonite per 94 pound sack of Portland cement was used per the MACTEC Work Plan.

2.4 SPT ENERGY MEASUREMENTS

SPT energy measurements were conducted for each of the drill rigs performing standard penetration testing (SPT). Energy measurements were recorded during SPT sampling at the depth intervals shown in Appendix B, Table B-1. The length of the drill rod string, including the instrumented drill rod insert for each sample was generally 4 feet longer than the depth of the sample being collected.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAK and calibrated accelerometers and strain gages. A section of drill rod two feet long and the same size as the drill rod used to advance the boring and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT automatic hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod.

The work was conducted in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The EFV method of energy calculation is recommended in ASTM Standard D 4633-05. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed were tabulated and averaged to obtain the average measured energy at each depth tested. The ratio of the average measured energy to the theoretical potential energy of the SPT system (140 lb weight with the specified 30-inch fall) is the ETR.

The average ETR measured for the automatic hammers used at the site ranged from 79.7 to 93.5 percent of the theoretical potential energy. These ETR values are within the range of typical values for automatic hammers. The ETR values (as percent of the theoretical value) are shown in Attachment B, Table B-1. Individual energy reports for each drilling rig are also found in Attachment B.

2.5 SAMPLING IN GEOTECHNICAL BORINGS

2.5.1 Standard Penetration Test Sampling (SPT)

SPT sampling in the geotechnical borings was generally conducted at 2.5-foot intervals from the ground surface to a depth of 15 feet. The SPT sampling interval below 15 feet was at five-foot intervals generally to a depth of 50 or 100 feet. Thereafter, SPT sampling occurred at 10-foot intervals. The equipment and methods are described in ASTM D 1586-08. Four borings, U3-3, T3-5, U4-3, and T4-3, were sampled at 2.5-foot intervals from the surface to approximately 100 feet, then every 5 feet from 100 feet to approximately 200 feet, and every 10 feet below 200 feet. Automatic hammers were used to perform the SPT testing. The split barrel sampler was typically driven 18 inches in soil with blows recorded for each six-inch interval of penetration. The weight of the hammer ranged from 138.4 to 141.1 pounds, meeting the ASTM requirements. In very hard soils, driving was terminated after 50 blows were recorded for a six-inch, or less, interval and the actual penetration recorded (e.g., 50 blows / 3 inches).

The split barrel sampler was opened at the drill site and the recovered materials were visually described, classified, and photographed by MACTEC's rig geologist or engineer. A selected portion of the sample (typically the lower portion of the sample) was placed in a glass sample jar with a vapor-sealed lid. Sample jars were labeled, placed in cardboard boxes, and transported to the on-site secure storage area at the end of each work day.

2.5.2 Undisturbed Soil Sampling

Undisturbed soil samples were obtained using a 3-inch thin-walled Shelby tube sampler in accordance with ASTM D 1587-00(2007)e1. The undisturbed samples were sealed at the top and bottom against moisture loss, labeled, kept in an upright condition, and transported to the climate-controlled on-site storage area following ASTM D 4220-95(2007).

2.6 BORING LOGS

The soil descriptions on the boring logs in Attachment B are based on the field descriptions (ASTM D 2488-06) by the rig geologist or engineer and modified according to ASTM D 2487-06 using laboratory test results when available. The depths on the boring logs are from observations during drilling. The boring logs in Attachment B were prepared using the computer program "gINT" (Version 8).

2.7 PRESSUREMETER TESTING (PMT)

Pressuremeter testing was performed in two borings (T3-5A and T4-3A) within the proposed extents of service water tunnels for STP Units 3 and 4. The borings were advanced using mud rotary drilling methods. The same method was used to perform an SPT. Upon reaching a testing depth, a nominal 3-inch pilot hole is drilled 5 feet below the bottom of the boring. The engineering technician inflates the pressuremeter using compressed gas, loading the borehole wall, then deflates the pressuremeter, as necessary, unloading the borehole wall for a series of cycles. The loading and unloading cycles develop a series of hysteric loops whose linear slope is interpreted as the soil shear modulus (without accounting for rubber membrane or steel sheathing modulus corrections). In general, ASTM D 4719-07, the standard procedure for prebored pressuremeter testing in soils, prescribes data collection of 10 points during loading only to form the boundary value data; unloading is not considered. With electronic types of instruments, there are no restrictions on the form of the boundary value data and electronic recording can develop curves with over 100 points during loading and unloading. As such, the ASTM standard does not apply. The test procedure used is detailed in the Attachment C along with the pressuremeter testing results.

SECTION 3
SAMPLE STORAGE

3.1 ON-SITE SAMPLE STORAGE FACILITY

Consistent with MACTEC's QAPD Requirements, an on-site sample storage facility was established. The sample storage facility was provided by STPNOC by designating a lockable sample storage space. The space was accessible by one doorway from the warehouse's exterior. The space was bordered on 3 sides by an 8-foot high chain link fence and a warehouse wall. Ample shelves and undisturbed sample racks were provided and assembled by the STPNOC. This warehouse is conveniently located just south of the Unit 4 Power Block borings. The facility is insulated and climate controlled by the STPNOC.

Samples were transported daily from the field to the sample storage warehouse by the rig geologists/engineers. All samples were transported in accordance with ASTM D 4220-95(2007). SPT samples were transported as Group "A" samples in their compartmentalized cardboard boxes, each labeled to show the contents therein. The UD samples were treated as Group "C" samples.

A chain-of-custody form was completed for all samples removed from the facility.

SECTION 4
LABORATORY TESTING - GEOTECHNICAL

Laboratory testing was performed on disturbed and relatively undisturbed soil samples obtained during the subsurface investigation and laboratory testing phases. Testing was performed in accordance with the current ASTM standards or other standards where applicable. Selection of the samples to be tested and the tests to be performed on the samples were done by MACTEC.

Testing of soil samples was done in MACTEC's Charlotte, North Carolina and Atlanta, Georgia laboratories.

The following tests were assigned and performed:

4.1 IDENTIFICATION TESTS

- Moisture content - ASTM D 2216-05
- Sieve and hydrometer analysis - ASTM D 422-63(2007) and ASTM D 6913-04e1
- Atterberg limits - ASTM D 4318-05
- Specific Gravity – ASTM D 854-06

4.2 STRENGTH TESTS

- Unconsolidated Undrained Triaxial Shear – ASTM D 2850-03a(2007)
- Consolidated Undrained Triaxial Shear – ASTM D 4767-04

4.3 COMPRESSIBILITY TESTS

- One Dimensional Consolidation – ASTM D 2435-04

4.4 REPORTING

The geotechnical laboratory test reports, consisting of individual test data and results sheets as required by the testing standard, are contained in Attachment D, Table 5.

TABLES

Table 1 Summary of Boring Locations

Table 2 Soil Zones

Table 3 Key to Symbols and Descriptions on Boring Logs

Table 4 Summary of Energy Transfer Ratios

Table 5 Summary of Laboratory Testing Results

TABLE 1 - Summary of Boring Locations

STP COL Units 3 and 4
MACTEC Engineering and Consulting, Inc.
MACTEC Project No. 6234-08-4660
Revised December 23, 2008

Boring Number	Safety Related Structure	Total Boring Depth (ft)	Boring Elevation[1] (NGVD 29, ft)	Northing[1] (ft)	Easting[1] (ft)
D3-1	Unit 3 Diesel Generator Pads	180.0	27.10	362910.88	2943288.67
D3-1A	Unit 3 Diesel Generator Pads	100.0	28.57	362911.19	2943301.76
D3-2	Unit 3 Diesel Generator Pads	183.5	28.74	362829.44	2943311.39
D3-3	Unit 3 Diesel Generator Pads	180.0	26.89	362915.83	2943452.37
D4-1	Unit 4 Diesel Generator Pads	183.5	30.81	362912.28	2942384.58
D4-1A	Unit 4 Diesel Generator Pads	47.4	30.97	362912.08	2942374.37
D4-2	Unit 4 Diesel Generator Pads	180.0	30.57	362828.30	2942419.97
D4-3	Unit 4 Diesel Generator Pads	180.0	31.31	362913.46	2942551.60
T3-1	Unit 3 Service Water Tunnel	203.1	29.17	363300.56	2943207.69
T3-2	Unit 3 Service Water Tunnel	200.0	30.56	363199.62	2943180.22
T3-3	Unit 3 Service Water Tunnel	283.2	29.21	363201.75	2943241.78
T3-4	Unit 3 Service Water Tunnel	204.5	29.04	363102.33	2943241.93
T3-5	Unit 3 Service Water Tunnel	280.0	29.07	363002.20	2943235.13
T3-5A	Unit 3 Service Water Tunnel	104.1	29.05	363012.09	2943233.51
T3-5B	Unit 3 Service Water Tunnel	272.0	29.46	363002.49	2943224.87
T3-6	Unit 3 Service Water Tunnel	199.8	28.97	362901.81	2943243.19
T3-7	Unit 3 Service Water Tunnel	279.9	28.80	362803.70	2943243.08
T4-1	Unit 4 Service Water Tunnel	199.8	32.03	363302.37	2942313.19
T4-2	Unit 4 Service Water Tunnel	204.3	31.58	363201.32	2942281.56
T4-3	Unit 4 Service Water Tunnel	282.3	31.56	363201.98	2942341.95
T4-3A	Unit 4 Service Water Tunnel	111.5	31.55	363203.59	2942351.91
T4-3B	Unit 4 Service Water Tunnel	232.0	31.74	363201.89	2942335.38
T4-4	Unit 4 Service Water Tunnel	200.5	31.38	363102.57	2942333.93
T4-5	Unit 4 Service Water Tunnel	280.0	31.28	363001.52	2942349.69
T4-6	Unit 4 Service Water Tunnel	202.9	31.25	362902.61	2942332.96
T4-7	Unit 4 Service Water Tunnel	284.5	31.12	362801.49	2942350.24
U3-1	Unit 3 UHS	307.3	29.63	362566.46	2943213.19
U3-2	Unit 3 UHS	300.0	29.34	362571.77	2943506.16
U3-2A	Unit 3 UHS	100.0	29.65	362570.96	2943514.18
U3-3	Unit 3 UHS	302.7	28.96	362633.07	2943359.08
U3-3A	Unit 3 UHS	62.0	28.79	362635.06	2943349.10
U3-4	Unit 3 UHS	299.6	29.49	362710.66	2943219.68
U3-5	Unit 3 UHS	302.9	28.83	362709.58	2943505.46
U3-6	Unit 3 UHS Pump House	300.8	28.40	362749.55	2943299.70
U3-6A	Unit 3 UHS Pump House	102.0	28.78	362748.98	2943309.46
U4-1	Unit 4 UHS	299.6	30.04	362564.16	2942312.84
U4-1A	Unit 4 UHS	279.25	30.42	362572.17	2942309.34
U4-2	Unit 4 UHS	304.5	30.42	362561.08	2942606.54
U4-3	Unit 4 UHS	300.9	30.65	362630.99	2942460.53
U4-3A	Unit 4 UHS	87.0	30.54	362629.54	2942470.64
U4-4	Unit 4 UHS	304.5	31.09	362702.74	2942313.38
U4-5	Unit 4 UHS	299.8	30.74	362710.71	2942606.76
U4-6	Unit 4 UHS Pump House	299.3	29.93	362749.99	2942389.05
U4-6A	Unit 4 UHS Pump House	267.0	30.64	362749.40	2942373.75

[1] Referenced from Attachment A

Prepared By/Date: HJC 7/15/08
Reviewed By/Date: 7/15/08

TABLE 2 – Soil Zones

STP COL Units 3 and 4
MACTEC Engineering and Consulting, Inc.
MACTEC Project No. 6234-08-4660
Revised December 23, 2008

SOIL ZONE	DESCRIPTION
FILL	Man-placed materials or fill soils dredged or hauled to create a raised level site for use as a construction lay-down yard during the construction of Reactor Units 1 and 2 of the South Texas Project.
FLUVIAL - MARINE	The materials below the surface and fill soils the project site consist of the Beaumont Formation, which is Quaternary Pleistocene in geologic age. The Quaternary is locally divided into three separately mapped areas: dominantly sand (Qbs); dominantly clay (Qbc); and with barrier island and beach deposits (Qbb)[1]. The STP project area is underlain primarily by an area of dominantly clay and mud of low permeability, high water holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, and high plasticity. This geologic unit includes; interdistributary muds, abandoned channel-fill muds, and fluvial over bank muds. The Beaumont Formation consists mostly of clay, silt, sand, and gravel. The formation includes; mainly stream channels, point bars, natural levees, and backswamp deposits. To a lesser extent the formation includes; coastal marshes, mud flats, lagoonal deposits, new and older lake deposits, clay dunes, and sand dune deposits. Concretions, massive amounts of calcium carbonate (caliche), concretions of iron oxide and iron-manganese oxides occur within the zone of weathering. The land surface is almost featureless in the vicinity of the STP facility. This area has poorly defined meanderbelt ridges that are separated by smooth featureless backswamp deposits. The total thickness of the Beaumont Formation is approximately 500 to 600 feet. Another formation present that directly underlies the Beaumont Formation is the Lissie Formation, which is Quaternary Pleistocene in age. The Lissie Formation is very similar to the Beaumont Formation and may or may not have been penetrated by the two deep borings at the project site. The Lissie formation consists of sand, silt, clay, and a minor amount of gravel. Iron oxide and iron-manganese nodules are common in the zone of weathering. The upper portion of the formation is locally calcareous and has concretions of calcium carbonate. This geologic unit includes meanderbelt, levee, crevasse splay, and distributary sands and flood basin muds over meanderbelt sands. The total thickness of the Lissie Formation is approximately 500 to 600 feet.

[1]Qbs, Qbc, Qbb are taken from Geologic Maps of Texas

Prepared By/Date: HAC 12/23/08
Reviewed By/Date: 12/23/08

TABLE 3 - Key To Symbols And Descriptions On Boring Logs

STP COL Units 3 and 4
MACTEC Engineering and Consulting, Inc.
MACTEC Project No. 6234-08-4660
Revised December 23, 2008

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.
			GP	Poorly graded gravels or grave - sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel - sand - silt mixtures.
			GC	Clayey gravels, gravel - sand - clay mixtures.
	SANDS (50% or more of coarse fraction is SMALLER than the No. 4 Sieve Size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand - silt mixtures.
			SC	Clayey sands, sand - clay mixtures.
FINE GRAINED SOILS (50% or more of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts and with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit of 50 or GREATER)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No.200 No.40 No.10 No.4 3/4" 3" 12"
U.S. STANDARD SIEVE SIZE

References: ASTM D 2487-06, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Soil Classification System)
ASTM D 2488-06, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

	GROUP SYMBOLS	TYPICAL NAMES
SAMPLE TYPE	SPT	Split Spoon Sample
	PMT	Pressuremeter Test Location
	UD	Undisturbed Sample

* is defined as the last 12" of 18" penetration

ABBREVIATIONS

SAA - Same As Above
NA - Not Applicable
ND - Not Determined
WOH - Weight of Hammer
WOR - Weight of Rods

Correlation of Penetration Resistance with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
No. of Blows*	Relative Density	No. of Blows*	Consistency
< 4	Very Loose	< 2	Very Soft
4 - 10	Loose	2 - 4	Soft
11 - 20	Firm	5 - 8	Firm
21 - 30	Very Firm	9 - 15	Stiff
31 - 50	Dense	16 - 30	Very Stiff
> 50	Very Dense	> 30	Hard

Datum Reference Information	Horizontal - NAD27
	Elevation - NGVD29

KEY TO SYMBOLS AND DESCRIPTIONS FOR SOIL LOGS

MACTEC

South Texas Project COL Units 3 & 4

Prepared By/Date: 7/15/08
Reviewed By/Date: 7/15/08

TABLE 4 – Summary of Energy Transfer Ratios

STP COL Units 3 and 4
MACTEC Engineering and Consulting, Inc.
MACTEC Project No. 6234-08-4660
Revised December 23, 2008

Drilling Rig	Hammer Serial Number	Number Of Measurements	ETR Range (%)	ETR Average (1) (%)	Hammer Weight (lbs.)
AE Drilling CME 750	848	3	87-89	88.3	139.0
JEDI CME 75	447	6	87-92	89.6	139.2
Lewis Mobile B61	007	3	92-96	93.5	139.8
MACTEC – Atlanta CME 550	MEC 08	5	83-86	84.6	138.8
MACTEC – Atlanta CME 55	505	5	82-87	84.7	141.1
MACTEC – Charlotte CME 75	797	3	76-81	79.7	139.5
MACTEC – Raleigh CME 55 LC	MEC-2	3	87-92	88.9	138.4
Miller Drilling CME 85	356	5	90-93	91.0	140.5
Miller Drilling CME 750	07	5	87-95	89.5	139.6
Miller Drilling CME 550	353	4	84-89	87.0	139.2

(1)Energy Transfer Ratio (ETR) = the percent of measured SPT hammer energy versus the theoretical SPT hammer energy (350 foot-pounds)

Prepared By/Date: HC 7/15/08
Reviewed By/Date: 7/15/08

TABLE 5 - SUMMARY OF LABORATORY TESTING RESULTS

STP COL UNITS 3 & 4

MACTEC ENGINEERING AND CONSULTING, INC.

PROJECT NO 6234-08-4660

Prepared by: 12/4/08 Reviewed by: DAK 12-4-08

SAMPLE INFORMATION						PHYSICAL PROPERTIES																																		
						Grain Size (Passing %)					Natural Moisture Content (%) at e_o					Atterberg Limits				Dry Density (pcf) at e_o						Void Ratio					Triaxial Tests						Consolidation				
Boring Number	Sample Number	Sample Top Depth, feet	Sample Bottom Depth, feet	USCS Symbol	USCS Material Description	Gravel	Sand	Silt	Clay	Fines	Physical Properties	Triaxial, Direct Shear, or Unconfined 1	2	3	Consolidation	Average	Liquid Limit, LL	Plastic Limit, PL	Plasticity Index, PI	Specific Gravity, Gs	Triaxial, Direct Shear, or Unconfined 1	2	3	Consolidation	Average	Wet Density (pcf)	Triaxial, Direct Shear, or Unconfined 1	2	3	Consolidation	Average	Test Type (1)	q_u (ksf)	C' (ksf)	φ' (degree)	C (ksf)	φ (degree)	P_o (ksf)	P_c (ksf)	OCR	C_c	C_r
U3-2A	UD-1	48.0	50.0	CH	Fat Clay	0.0	0.5	14.6	84.9	99.5		34.9				34.9	61	25	36	2.75	87.4				87.4	118	0.965				0.97	UU	4.4			2.2	0.0					
U3-3A	UD-2	50.0	52.0	CH	Fat Clay	0.3	7.4	25.7	66.6	92.3		27.6	26.7	26.6		27.0	60	24	36	2.78	93.8	97.2	97.5		96.2	122	0.852	0.788	0.782		0.81	CU		2.1	1.0	2.2	0.0					
U3-3A	UD-3	60.0	62.0	CL	Lean Clay	0.0	1.7	51.4	46.9	98.3		22.2			20.4	21.3	35	16	19	2.76	104.9			107.3	106.1	129	0.643			0.610	0.63	UU	6.0			3.0	0.0	3.9	17.5	4.5	0.206	0.017
U3-4	SS-13	48.1	49.6	CH	Fat Clay	0.0	2.0	21.2	76.8	98.0	35.5						70	24	46																							
U3-4	SS-16	78.1	79.6	CL	Sandy Lean Clay	0.0	40.7	25.8	33.5	59.3	19.9						27	10	17																							
U3-6A	UD-3	100.0	102.0	CL	Lean Clay	0.0	0.2	59.4	40.4	99.8		27.0	23.6	24.2	27.1	25.5	43	18	25	2.78	95.7	101.3	99.8	95.8	98.2	123	0.812	0.712	0.737	0.810	0.77	CU		1.6	18.3	1.0	14.0	6.8	11.7	1.7	0.382	0.029
U4-1	SS-14	58.1	59.6	CL	Lean Clay with sand	0.0	23.8	48.1	28.1	76.2	18.8						24	16	8																							
U4-1A	UD-2	108.0	110.0	CH	Fat Clay	0.5	7.7	23.0	68.8	91.8					25.0	25.0	60	22	38	2.74				97.6	97.6	122				0.750	0.75							7.4	18.5	2.5	0.292	0.027
U4-1A	UD-4	218.0	220.0	CH	Fat Clay	0.0	0.3	37.2	62.5	99.7		40.4	33.9	35.9		36.7	61	22	39	2.79	80.4	86.0	83.2		83.2	114	1.170	1.030	1.100		1.10	CU		2.6	9.5	3.1	4.6					
U4-1A	UD-5	228.0	230.0	CH	Fat Clay	0.0	0.5	17.8	81.7	99.5					41.1	41.1	68	29	39	2.79				79.7	79.7	112				1.190	1.19							15.0	14.5	1.0	0.664	0.082
U4-1A	UD-6	268.5	270.5	CH	Fat Clay	0.5	9.5	28.7	61.3	90.0					43.0	43.0	74	24	50	2.75				78.3	78.3	112				1.190	1.19							17.7	11.7	0.7	0.322	0.060
U4-1A	UD-7	277.0	279.2	CH	Fat Clay	0.0	3.5	18.4	78.1	96.5			32.8	33.0		32.9	81	27	54	2.69		90.0	89.4		89.7	119		0.865	0.877		0.87	CU		1.5	10.2	0.6	10.2					
U4-1A	UD-7	277.0	279.2	CH	Fat Clay	0.0	3.5	18.4	78.1	96.5		32.2				32.2	81	27	54	2.69	88.6				88.6	117	0.896				0.90	UU	6.9			3.5	0.0					
U4-3	SS-24	59.4	60.9	CL	Lean Clay with sand	0.0	23.8	49.0	27.2	76.2	20.9						23	14	9																							
U4-3A	UD-1	52.0	54.0	CL	Lean Clay	1.1	11.5	42.2	45.2	87.4		21.2	21.7	21.9		21.6	46	20	26	2.76	106.1	105.3	104.1		105.2	128	0.625	0.638	0.656		0.64	CU		0.7	23.8	1.0	12.2					
U4-3A	UD-2	85.0	87.0	CL	Lean Clay	0.0	8.0	68.4	23.6	92.0		27.9				27.9	30	19	11	2.73	95.5				95.5	122	0.755				0.75	UU	0.7			0.4	0.0					
U4-4	SS-15	63.0	64.5	CL	Lean Clay	0.0	10.2	50.5	39.3	89.8	21.1						30	14	16																							
U4-6A	UD-3	110.5	112.5	CH	Fat Clay	0.0	7.6	18.6	73.8	92.4		30.7				30.7	84	22	62	2.76	91.9				91.9	120	0.875				0.88	UU	1.7			0.9	0.0					
U4-6A	UD-4	265.0	267.0	CH	Fat Clay	0.0	0.2	5.1	94.7	99.8		38.6				38.8	87	34	53	2.77	83.3				83.3	116	1.080				1.08	UU	6.0			3.0	0.0					
T3-6B	UD-4	98.0	100.0	CH	Fat Clay	0.0	0.5	35.9	63.6	99.5		26.2	29.1			27.7	55	25	30	2.75	99.1	95.7			97.4	124	0.735	0.797			0.77	CU		1.1	20.8	1.0	13.6					
T3-7	SS-7	18.4	19.9								22.6																															
T3-7	SS-8	23.4	24.9								22.6																															

TABLE 5 - SUMMARY OF LABORATORY TESTING RESULTS

STP COL UNITS 3 & 4

MACTEC ENGINEERING AND CONSULTING, INC.

PROJECT NO 6234-08-4660

Prepared by: JK 12/4/08 Reviewed by: DAK 12-4-08

SAMPLE INFORMATION						PHYSICAL PROPERTIES																																		
						Grain Size (Passing %)					Natural Moisture Content (%) at e_o					Atterberg Limits				Dry Density (pcf) at e_o						Void Ratio					Triaxial Tests						Consolidation				
Boring Number	Sample Number	Sample Top Depth, feet	Sample Bottom Depth, feet	USCS Symbol	USCS Material Description	Gravel	Sand	Silt	Clay	Fines	Physical Properties	Triaxial, Direct Shear, or Unconfined 1	2	3	Consolidation	Average	Liquid Limit, LL	Plastic Limit, PL	Plasticity Index, PI	Specific Gravity, Gs	Triaxial, Direct Shear, or Unconfined 1	2	3	Consolidation	Average	Wet Density (pcf)	Triaxial, Direct Shear, or Unconfined 1	2	3	Consolidation	Average	Test Type (1)	q_u (ksf)	C' (ksf)	φ' (degree)	C (ksf)	φ (degree)	P_o (ksf)	P_c (ksf)	OCR	C_c	C_r
T3-7	SS-9	28.4	29.9								22.2																													
T3-7	SS-10	33.4	34.9								23.7																													
T3-7	S-11	38.4	39.9								23.8																													
T3-7	SS-12	43.4	44.9								23.4																													
T3-7	SS-14	53.2	54.9								24.9																													
T3-7	SS-15	58.4	59.9								23.9																													
T3-7	SS-16	63.4	64.9								22.9																													
T3-7	SS-17	68.4	69.8								22.6																													
T3-7	SS-18	73.4	74.9								24.2																													
T3-7	SS-19	78.4	79.9								18.4																													
T3-7	SS-20	83.4	84.9								23.6																													
T3-7	SS-21	88.4	89.8								27.7																													
T3-7	SS-22	93.4	94.9								26.2																													
T3-7	SS-23	98.4	99.9								34.6																													
T3-7	SS-24	108.4	109.9								24.5																													
T3-7	SS-25	118.4	119.9								20.3																													
T3-7	SS-26	128.4	129.9								22.4																													
T3-7	SS-27	138.4	139.9								21.4																													
T3-7	SS-28	148.4	149.9								23.2																													
T3-7	SS-29	158.4	159.9								20.3																													
T3-7	SS-31	178.4	179.9								26.2																													
T3-7	SS-32	188.4	189.9								29.1																													

TABLE 5 - SUMMARY OF LABORATORY TESTING RESULTS

STP COL UNITS 3 & 4

MACTEC ENGINEERING AND CONSULTING, INC.

PROJECT NO 6234-08-4660

Prepared by: DJ 12/4/08 Reviewed by: DAH 12-4-08

SAMPLE INFORMATION						PHYSICAL PROPERTIES																																	
						Grain Size (Passing %)					Natural Moisture Content (%) at e_o					Atterberg Limits				Dry Density (pcf) at e_o						Void Ratio					Triaxial Tests						Consolidation				
Boring Number	Sample Number	Sample Top Depth, feet	Sample Bottom Depth, feet	USCS Symbol	USCS Material Description	Gravel	Sand	Silt	Clay	Fines	Physical Properties	Triaxial, Direct Shear, or Unconfined 1	2	3	Consolidation	Average	Liquid Limit, LL	Plastic Limit, PL	Plasticity Index, PI	Specific Gravity, Gs	Triaxial, Direct Shear, or Unconfined 1	2	3	Consolidation	Average	Wet Density (pcf)	Triaxial, Direct Shear, or Unconfined 1	2	3	Consolidation	Average	Test Type (1)	q_u (ksf)	C' (ksf)	φ' (degree)	C (ksf)	φ (degree)	P_o (ksf)	P_c (ksf)	OCR	C_c	C_r
T3-7	SS-33	198.4	199.9								33.7																															
T3-7	SS-34	218.4	219.9								20.1																															
T3-7	SS-35	238.4	239.9								20.0																															
T3-7	SS-36	248.4	249.9								30.2																															
T3-7	SS-38	268.4	269.9								38.6																															
T3-7	SS-39	278.4	279.9								34.3																															
D3-1A	UD-1	48.0	50.0	CH	Fat Clay	0.9	6.1	35.5	57.5	93.0		32.5	32.8	29.0	23.4	29.4	60	20	40	2.76	87.1	88.5	94.9	97.2	92.0	119	0.992	0.961	0.829	0.780	0.89	CU		0.4	23.8	0.2	17.3	3.0	10.0	3.3	0.299	0.008
D3-1A	UD-2	98.0	100.0	CL	Lean Clay with sand	0.0	15.4	41.6	43.0	84.6		24.5	23.1	24.6		24.1	44	18	26	2.69	100.0	96.7	99.1		98.6	122	0.680	0.738	0.696		0.70	CU		1.1	18.4	1.3	9.4					

Notes: (1) UU = Unconsolidated - Undrained, CU = Consolidated - Undrained

ATTACHMENT A

SURVEY REPORT

SURVCON INC.
PROFESSIONAL SURVEYORS

SURVCON
5757 Woodway, Suite 101 West, Houston, Texas 77057-1599
T 713.780.4123 F 713.267.3295 www.survcon.com

SURVEY REPORT FOR AS-BUILT GEOSPATIAL LOCATIONS OF GEOTECHNICAL BORINGS AT THE SOUTH TEXAS PROJECT NUCLEAR GENERATING STATION, MATAGORDA COUNTY, TEXAS MAY 2008 TO JUNE 2008

Introduction

SURVCON INC. performed a stake-out and as-built survey for the geospatial locations of 30 planned geotechnical borings specified by MACTEC Engineering and Consulting Inc. and 17 offset geotechnical borings at the South Texas Project Nuclear Power Generating Plant (STP) in Matagorda County, Texas. Over a period between: May 2008 to June 2008, SURVCON INC. established horizontal coordinates and vertical elevations for the center point of each position. The methodologies and horizontal and vertical datums adhered to are as follows.

Horizontal and Vertical Control

Horizontal and vertical control for the as-built geospatial locations of the borings and CPT's are referenced to the (previously established by others) STP site coordinate system. Positional data for three independent STP site horizontal monuments and the three independent STP site vertical monuments were released to SURVCON INC. from Mike Svetlik of STP Maintenance Engineering Department. The STP site coordinate system is based on the North American Datum of 1927 (NAD27) for horizontal coordinates and the National Geodetic Vertical Datum of 1929 (NGVD29) for vertical elevations. All six monuments were located in the field. A differential level loop between all monuments and GPS rapid static observations between the horizontal monuments were performed in order to establish the internal accuracy of the STP site coordinate system. Once it was determined that the STP site coordinate system was within the specifications outlined by MACTEC, in *MACTEC's South Texas COL Project Units 3 & 4 Geotechnical and Engineering Work Plan, Rev 1*, Attachment 1, the monuments were used to perform a site calibration with the GPS equipment. The site calibration enabled data to be collected relative to the STP site coordinate system. The control coordinates for the horizontal and vertical STP coordinate system are as follows:

Horizontal Control:

Description	Northing NAD27 US Feet	Easting NAD27 US Feet	Elevation NGVD29 US Feet
HN	364,000.23	2,944,759.94	27.25
HL	364,000.23	2,945,360.08	26.75
HE-1	361,564.92	2,941,664.84	31.88

Vertical Control

Description	Northing NAD27 US Feet	Easting NAD27 US Feet	Elevation NGVD29 US Feet
HF-VERT	361,564.92	2,943,999.89	28.04
VP-VERT	363,899.79	2,942,899.50	38.78
VE-1 VERT	361,574.65	2,941,665.86	32.09

Methodology

Accuracy standards specified in *MACTEC's South Texas COL Project Units 3 & 4 Geotechnical and Engineering Work Plan, Rev 1, Attachment 1*, were achieved by collecting spatial data using Real Time Kinematic-Global Positioning Satellite (RTK-GPS) techniques. The Leica GPS System 1200 was used to collect all field data and observations, and Leica Geomatics Office Version 2.0 was used to process all GPS data. As stated in requirement 2.2 of aforementioned publication, all data collected for the spatial locations of geotechnical borings and CPT's were done so in a manner to achieve accuracy in the horizontal component to met or exceeded a third order accuracy of 1:5,000 and all data collected for the spatial locations of geotechnical borings and CPT's in the vertical component met or exceeded an accuracy of 0.1 feet.

Two observations were made on each geotechnical spatial location using RTK-GPS methods. The RTK-GPS observations were made at different time periods and different days to ensure independent satellite geometry for each respective boring and CPT. The independent observations were then processed through Leica Geomatics Office and a least squares adjustment and error analysis were performed in order to check the accuracy of the collected geospatial locations of the geotechnical borings and CPT's.

The processed averaged coordinate values for the geotechnical borings and their coordinate differences between planned and as-built locations are as follows:

BORING NO.	AS-BULT NORTHING NAD27	AS-BUILT EASTING NAD27	AS-BUILT ELEV. NGVD 29	PLANNED BORING	PLANNED NORTHING	PLANNED EASTING	DELTA X	DELTA Y
D3-1	362910.88	2943288.67	27.10	D3-1	362911.58	2943292.00	0.70	3.33
D3-1A	362911.19	2943301.76	28.57	NA				
D3-2	362829.44	2943311.39	28.74	D3-2	362829.58	2943312.00	0.14	0.61
D4-1	362912.28	2942384.58	30.81	D4-1	362911.58	2942392.00	-0.70	7.42
D4-1A	362912.08	2942374.37	30.97	NA				
D4-2	362828.30	2942419.97	30.57	D4-2	362829.58	2942411.47	1.28	-8.50
D4-3	362913.46	2942551.60	31.31	D4-3	362911.58	2942552.00	-1.88	0.40
T3-1	363300.56	2943207.69	29.17	T3-1	363302.03	2943213.25	1.47	5.56
T3-2	363199.62	2943180.22	30.56	T3-2	363202.03	2943180.33	2.41	0.11
T3-3	363201.75	2943241.78	29.21	T3-3	363202.03	2943242.00	0.28	0.22
T3-4	363102.33	2943241.93	29.04	T3-4	363102.03	2943242.00	-0.30	0.08
T3-5	363002.20	2943235.13	29.07	T3-5	363002.03	2943242.00	-0.17	6.87
T3-5A	363012.09	2943233.51	29.05	NA				
T3-5B	363002.49	2943224.87	29.46	NA				
T3-6	362901.81	2943243.19	28.97	T3-6	362902.03	2943242.00	0.22	-1.19
T3-7	362803.70	2943243.08	28.80	T3-7	362802.03	2943242.00	-1.67	-1.08
T4-1	363302.37	2942313.19	32.03	T4-1	363302.03	2942313.25	-0.34	0.06
T4-2	363201.32	2942281.56	31.58	T4-2	363202.03	2942280.33	0.71	-1.23
T4-3	363201.98	2942341.95	31.56	T4-3	363202.03	2942342.00	0.06	0.05
T4-3A	363203.59	2942351.91	31.55	NA				
T4-3B	363201.89	2942335.38	31.74	NA				
T4-4	363102.57	2942333.93	31.38	T4-4	363102.03	2942342.00	-0.54	8.07
T4-5	363001.52	2942349.69	31.28	T4-5	363002.03	2942342.00	0.51	-7.69
T4-6	362902.61	2942332.96	31.25	T4-6	362902.03	2942342.00	-0.58	9.04
T4-7	362801.49	2942350.24	31.12	T4-7	362802.03	2942342.00	0.54	-8.24
U3-1	362566.46	2943213.19	29.63	U3-1	362555.58	2943213.00	-10.88	-0.19
U3-2	362571.77	2943506.16	29.34	U3-2	362555.58	2943507.00	-16.19	0.84
U3-2A	362570.96	2943514.18	29.65	NA				
D3-3	362915.83	2943452.37	26.89	D3-3	362911.58	2943452.00	-4.25	-0.37
U3-3	362633.07	2943359.08	28.96	U3-3	362632.58	2943360.00	-0.49	0.92
U3-3A	362635.06	2943349.10	28.79	NA				
U3-4	362710.66	2943219.68	29.49	U3-4	362709.58	2943213.00	-1.08	-6.68
U3-5	362709.58	2943505.46	28.83	U3-5	362709.58	2943507.00	0.00	1.54
U3-6	362749.55	2943299.70	28.40	NA				
U3-6A	362748.98	2943309.46	28.78	NA				
U4-1	362564.16	2942312.84	30.04	U4-1	362555.58	2942313.00	-8.58	0.16
U4-1A	362572.17	2942309.34	30.42	NA				
U4-2	362561.08	2942606.54	30.42	U4-2	362555.58	2942607.00	-5.50	0.46
U4-3	362630.99	2942460.53	30.65	U4-3	362632.58	2942460.00	1.59	-0.53
U4-3A	362629.54	2942470.64	30.54	NA				
U4-4	362702.74	2942313.38	31.09	U4-4	362709.58	2942313.00	6.84	-0.38
U4-5	362710.71	2942606.76	30.74	U4-5	362709.58	2942607.00	-1.13	0.24
U4-6	362749.99	2942389.05	29.93	NA				
U4-6A	362749.40	2942373.75	30.64	NA				

Conclusion

Many offset borings were drilled in proximity to the planned boring locations to arrive at a total of 44 geotechnical borings. The geospatial locations for all geotechnical borings and on the STP site as defined by MACTEC Inc. were as-built located within accuracies as defined by *MACTEC's South Texas COL Project Units 3 & 4 Geotechnical and Engineering Work Plan, Rev 1, Attachment 1, Matagorda County, Texas.*

Compiled by Adam Salazar III, RPLS
Project Surveyor
SURVCON INC.
Houston, Texas
July 7, 2008
Job No. 60045104
Revised: July 15, 2008

STATE OF TEXAS
REGISTERED
ADAM SALAZAR III
5965
PROFESSIONAL
LAND SURVEYOR

07/15/08

ATTACHMENT B

BORING LOGS

SPT ENERGY REPORTS

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. D3-1
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 Diesel Generator Pads N 362910.88 E 2943288.67		Total Depth 180 feet
Drilling Contractor and Rig LEWIS ENV / Mobile B-61	Elevation at boring 27.1 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.8 / 30 inches	No. of Samples 26	Date Started 6/18/08
	Borehole Inclination 0	Logged by A. Mwembeshi	Date Completed 6/20/08

Reviewed by / Date HLC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	3 3 4	5/18					SP-SM	FILL: light gray (7.5YR 7/1); gravel; silt; SAND (SP-SM); dry; loose; fine sand; some gravel little silt; trace clay; organics	
4–5	X	SS 2	3 3 4	6/18						FILL: dark greenish gray (GLEY 1 4/10Y); gravel; silt; SAND (SP-SM); dry; loose; fine sand; some gravel; little silt; trace clay; organics	
7	X	SS 3	2 1 3	11/18					SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); moist; very loose; mostly fine sand; some silt	
9–10	X	SS 4	3 2 3	18/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); moist; loose; mostly fine sand; some silt; trace clay	SS-4A: 8.5' to 9.2' SS-4B: 9.2' to 10.0'
10–11									CH	BEAUMONT: yellowish red (5/YR 5/8); CLAY (CH); moist; firm; trace silt	
12	X	SS 5	3 2 3	22/18					SM	BEAUMONT: strong brown (7.5YR 5/8); silt; SAND (SM); wet; loose; mostly fine sand; some silt; trace gravel	
14–15	X	SS 6	1 1 2	14/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; very loose; mostly fine sand; some silt	
19–20	X	SS 7	3 6 9	12/18						BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SM); moist; firm; mostly fine sand; some silt	
24–25	X	SS 8	10 11 12	12/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); moist; very firm; mostly fine to medium sand; some silt	
29–30	X	SS 9	4 8 8	12/18						BEAUMONT: brownish yellow (10YR 6/6); silt; SAND (SM); wet; firm; mostly medium sand; some silt	
34–35	X	SS 10	6 9 13	14/18						BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SM); moist; very firm; mostly medium sand; some silt	
39–40	X	SS 11	7 9 10	12/18						BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SM); moist; firm; mostly fine to medium	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SM	sand; some silt	
44–45	X	SS 12	11 12 13	12/18						BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); moist; very firm; mostly fine sand; some silt; trace mica	
46–48											Driller indicated significant loss of return water. Thickness could not be determined. Possible gravelly layer between 45 and 48 feet
49–50	X	SS 13	4 4 7	13/18					CH	BEAUMONT: greenish gray (GLEY 1 6/5GY); CLAY (CH); moist; stiff; trace gravel	
51–58											
59–60	X	SS 14	5 9 10	17/18						BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; very stiff; visually homogeneous	
61–68											
69–70	X	SS 15	4 7 7	18/18					SM	BEAUMONT: strong brown (7.5YR 5/8); silt; SAND (SM); wet; firm; mostly fine to medium sand; some silt; trace mica	
71–78											
79–80	X	SS 16	8 13 19	18/18					CH SM	BEAUMONT: brown (7.5YR 5/3); gravel; CLAY (CH); moist; hard; some gravel; little silt; trace sand	SS-16A: 78.5' to 79.3'

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–88									SM	BEAUMONT: brown (7.5YR 4/3); silt; SAND (SM); moist; dense; fine sand; some silt; trace mica	SS-16B: 79.3' to 80.0'
89–90	X	SS 17	7 9 10	19/18					CH	BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; very stiff; trace silt; visually homogeneous	
99–100	X	SS 18	5 6 6	22/18						BEAUMONT: greenish gray (GLEY 1 5/10Y); CLAY (CH); moist; stiff; trace gravel	
109–110	X	SS 19	7 8 13	19/18						BEAUMONT: light greenish gray (GLEY 1 7/10GY); CLAY (CH); moist; very stiff; trace silt; trace gravel	
119–120	X	SS 20	7 13 14	15/18						BEAUMONT: light greenish gray (GLEY 1 8/10GY) and red (2.5YR 5/6); CLAY (CH); moist; very stiff	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123											
124											
125											
126											
127											
128										BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; visually homogeneous	
129	X	SS 21	13 15 15	16 / 18							SS-21A: 128.5' to 129.4' SS-21B: 129.4' to 130.0'
130									SP-SC	BEAUMONT: light greenish gray (GLEY 1 8/10GY); clay; SAND (SP-SC); dry; very firm; mostly fine sand; few clay	
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 22	10 14 15	19.5 / 18					CH	BEAUMONT: greenish gray (GLEY 1 5/10Y); sand; CLAY (CH); moist; very stiff; some fine sand	
140											
141											
142											
143											
144											
145											
146											
147											
148											
149	X	SS 23	12 11 13	19 / 18					SC CH	BEAUMONT: light greenish gray (GLEY 1 7/10Y); clay; SAND (SC); moist; very firm; mostly fine sand; some clay; little silt	SS-23A: 148.5' to 148.8' SS-23B: 148.8' to 150.0'
150										BEAUMONT: red (2.5YR 5/6); CLAY (CH); moist; very stiff; trace silt	
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 24	6 13 18	11 / 18						BEAUMONT: light greenish gray (GLEY 1 7/5GY) and yellowish brown (10YR 5/6); CLAY (CH);	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH	moist; hard; trace gravel	
161											
162											
163											
164											
165											
166											
167											
168											
169	X	SS 25	16 20 21	18/18					SM	BEAUMONT: yellowish brown (5YR 5/6); silt; SAND (SM); moist; dense; some silt; trace clay	SS-25A: 168.5' to 169.5' SS-25B: 169.5' to 170.0'
170									CH	BEAUMONT: red (2.5YR 4/6); CLAY (CH); moist; hard; blocky	
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS 26	9 11 17	18/18						BEAUMONT: red (2.5YR 4/6); CLAY (CH); moist; very stiff; blocky	
180										Boring terminated at 180 ft	
181											
182											
183											
184											
185											
186											
187											
188											
189											
190											
191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/2/08

Project Name : Job Number MACTEC STP COL Units 3 & 4 : 6234-08-4660			SOIL LOG - Boring No. D3-1A
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 Diesel Generator Pads N 362911.19 E 2943301.76		Total Depth 100 feet
Drilling Contractor and Rig AE Drilling / CME 750 ATV	Elevation at boring 28.57 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Undisturbed	Driving Hammer Wt./Drop NA / NA	No. of Samples 2	Date Started 6/24/08
	Borehole Inclination 0	Logged by T. Longley	Date Completed 6/25/08

Reviewed by / Date HC 12/2/2008

Reviewed by / Date 12/2/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0											Boring D3-1A offset approximately 10' east of Boring D3-1
1											
2											
3											Drill to first sample at 48 ft
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-1A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49		UD 1		26/24	29.4	93.0	60/40		CH	BEAUMONT: reddish brown (2.5YR 5/4) and light greenish gray (GLEY 1 7/1); CLAY (CH); moist; gravelly concretions; trace black organic flecs	Pocket Penetometer (TSF): 3.5, 3.5, 2.75
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-1A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99		UD 2		28/24	24.1	84.6	44/26		CL	BEAUMONT: brown (7.5YR 5/2); CLAY with sand (CL); moist; gray mottling; black organic spots	Pocket Penetometer (TSF): 2.5, 2.75, 2.75
100										Boring terminated at 100.0 ft	
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-2

Type and Diameter of Boring: Mud Rotary / 4 inches	Boring Location: Unit 3 Diesel Generator Pads, N 362829.44 E 2943311.39		Total Depth: 183.5 feet
Drilling Contractor and Rig: LEWIS ENV / Mobile B-61	Elevation at boring: 28.74 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Split Spoon	Driving Hammer Wt./Drop: 139.8 / 30 inches	No. of Samples: 27	Date Started: 6/20/08
	Borehole Inclination: 0	Logged by: A. Mwembeshi	Date Completed: 6/24/08

Reviewed by / Date HLC 7/3/08
Reviewed by / Date DG 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	7 7 4	1.5/18					SM	FILL: dusky red (10R 3/4); silt; SAND (SM); dry; firm; fine to medium sand; some silt; little clay; few gravel; roots	
4–5	X	SS 2	3 2 3	2/18					CH	FILL: very dark gray (7.5YR 3/1); CLAY (CH); moist; firm; trace sand; trace gravel; few fine roots	
6–7	X	SS 3	1 2 2	4/18					SM	FILL: strong brown (7.5YR 5/6); silt; gravel; SAND (SM); wet; very loose; some silt; little gravel	
9–10	X	SS 4	2 2 3	18/18					SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; loose; fine sand; some silt	Driller notes possible change in material at 8 ft
12	X	SS 5	2 4 5	18/18					CH	BEAUMONT: red (2.5YR 4/6); CLAY (CH); moist; stiff; trace gravel	
14–15	X	SS 6	4 4 6	13.5/18						BEAUMONT: red (2.5YR 4/6); CLAY (CH); moist; stiff	
19	X	SS 7	2 4 5	14/18					SM	BEAUMONT: reddish yellow (5YR 6/8); silt; SAND (SM); wet; loose; fine sand; some silt	
24–25	X	SS 8	3 6 8	11/18						BEAUMONT: reddish yellow (5YR 6/6); silt; SAND (SM); wet; firm; medium sand; some silt	
29	X	SS 9	4 7 10	12/18						BEAUMONT: yellowish brown (10YR 5/8); silt; SAND (SM); moist; firm; fine to medium sand; some silt; trace mica	
34–35	X	SS 10	6 12 18	10/18						BEAUMONT: reddish yellow (5YR 6/6); silt; SAND (SM); wet; very firm; fine sand; little silt	
38–39	X	SS 11	14 22 39	18/18					SP-SM	BEAUMONT: reddish yellow (5YR 6/6); silt; SAND (SP-SM); wet; very dense; fine sand; few silt	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41									SP-SM		
42	X	SS 12	9 11 15	10/18					SM	BEAUMONT: yellowish brown (10YR 6/6); silt; SAND (SM); wet; very firm; fine sand; some silt; trace mica	
43											
44											
45											
46										BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SM); moist; firm; fine sand; some silt; trace mica	
47	X	SS 13	12 10 6	10/18					CH	BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; little shells	SS-13A: 47.0' to 47.7' SS-13B: 47.7' to 48.5'
48											
49											
50											
51											
52											
53											
54											
55											
56											
57	X	SS 14	5 6 8	18/18						BEAUMONT: yellowish red (5YR 4/6) with light greenish gray (GLEY 1 7/10GY); CLAY (CH); moist; stiff; trace gravel	
58											
59											
60											
61											
62											
63											
64											
65											
66											
67	X	SS 15	7 9 8	12/18					SM	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); wet; firm; fine sand; some silt; trace mica	
68											
69											
70											
71											
72											
73											
74											
75											
76											
77	X	SS 16	6 7 10	11/18						BEAUMONT: yellowish brown (10YR 5/8); silt; SAND (SM); moist; firm; fine to medium sand; some silt	
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–86									SM		
87–88	X	SS 17	5 8 10	19/18					CH	BEAUMONT: brown (7.5YR 5/3); CLAY (CH); moist; very stiff; visually homogeneous	
89–96											
97–98	X	SS 18	5 7 10	20/18					SC	BEAUMONT: light greenish gray (GLEY 1 7/5GY); clay; SAND (SC); moist; firm; fine sand; some clay	
99–106											
107–108	X	SS 19	WOH	22/18					CH	BEAUMONT: gray (5YR 5/1); CLAY (CH); moist; very soft; visually homogeneous	
109–116											
117–118	X	SS 20	8 9 15	17/18					ML	BEAUMONT: strong brown (7.5YR 5/8) and light greenish gray (GLEY 1 7/5GY); SILT (ML); moist; very stiff; trace fine sand; trace clay	
119–120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									ML		
121											
122											
123											
124											
125											
126											
127	X	SS 21	7 10 13	18/18					CH	BEAUMONT: yellowish brown (5YR 5/6); CLAY (CH); moist; very stiff; trace sand	
128											
129											
130											
131											
132											
133											
134											
135											
136											
137	X	SS 22	9 13 16	14.5/18					SM	BEAUMONT: light greenish gray (GLEY 1 8/5GY) and brownish yellow (10YR 6/8); silt; SAND (SM); dry; very firm; fine sand; some silt; little clay	
138											
139											
140											
141											
142											
143											
144											
145											
146										BEAUMONT: light reddish brown (5YR 6/3); silt; SAND (SM); wet; dense; fine sand; some silt	
147	X	SS 23	29 17 18	15/18					CH	BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; hard; trace sand; trace gravel	SS-23A: 147.0' to 147.3' SS-23B: 147.3' to 148.5'
148											
149											
150											
151											
152											
153											
154											
155											
156											
157	X	SS 24	9 13 16	19/18						BEAUMONT: reddish brown (2.5YR 5/4); CLAY (CH); moist; very stiff; trace silt	
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161											
162											
163											
164											
165											
166											
167	X	SS	9	18.5						BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; very stiff; visually homogeneous	
168	X	25	13 17	18							
169											
170											
171											
172											
173											
174											
175											
176											
177	X	SS	9	16.5					MH	BEAUMONT: yellowish red (5YR 5/6); clay; SILT (MH); dry; hard; some clay; little sand	SS-26A: 177.0' to 177.4'
178	X	26	15 17	18					SM	BEAUMONT: yellowish red (5YR 5/6); silt; SAND (SM); moist; dense; fine sand; some silt	SS-26B: 177.4' to 178.5'
179											
180											
181											
182	X	SS	12	18					CH	BEAUMONT: reddish brown (2.5YR 4/4); CLAY (CH); moist; hard; silty sand lenses	
183	X	27	14 18	18							
184										Boring terminated at 183.5 ft	
185											
186											
187											
188											
189											
190											
191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	**SOIL LOG - Boring No. D3-3**	
Type and Diameter of Boring Mud Rotary / 4 inches	Boring Location Unit 3 Diesel Generator Pads N 362915.83 E 2943452.37		Total Depth 180 feet
Drilling Contractor and Rig AE Drilling / CME 750 ATV	Elevation at boring 26.89 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.0 / 30 inches	No. of Samples 26	Date Started 6/23/08
	Borehole Inclination 0	Logged by T. Longley	Date Completed 6/23/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date DJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	2 2 3	16/18					CH	FILL: Disturbed soil; roots; wet BEAUMONT: black (10YR 2/1); CLAY (CH); moist; firm	
2–3											
4–5	X	SS 2	2 1 2	16/18						BEAUMONT: dark gray (10YR 4/1) to reddish brown (2.5YR 5/4); CLAY (CH); moist; soft; carbonate concretions and shells	
6–7	X	SS 3	3 2 3	16/18						BEAUMONT: reddish brown (2.5YR 5/4) and pinkish gray (5YR 6/2); CLAY (CH); moist; firm; carbonate concretions	
8											
9–10	X	SS 4	2 1 2	20/18					ML	BEAUMONT: reddish brown (5YR 4/4); sand; SILT (ML); wet; soft; some fine sand, trace clay	
11–12	X	SS 5	6 4 5	16/18					CH	BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; stiff; few silt; very thin silt seams	
13–14	X	SS 6	5 5 7	19/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; gravelly carbonate concretions	
15–18											
19	X	SS 7	5 5 7	21/18					MH	BEAUMONT: yellowish red (5YR 4/6); SILT (MH); wet; stiff; little clay; few fine sand	SS-7A: 18.5' to 19.5' SS-7B: 19.5' to 20.0'
20–23									CH	BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; stiff; high plasticity	
24–25	X	SS 8	7 12 15	11/18					SP	BEAUMONT: strong brown (7.5YR 5/6); SAND (SP); wet; very firm	
26–28											
29–30	X	SS 9	4 10 14	10/18						BEAUMONT: brown (7.5YR 5/3); SAND (SP); wet; very firm	
31–33											
34–35	X	SS 10	8 6 8	14/18						BEAUMONT: light brown (7.5YR 6/4); SAND (SP); wet; firm	
36–38									CL	BEAUMONT: reddish brown (5YR 5/4); silt; CLAY (CL); moist; stiff; stratified with trace fine sand and little silt seams	
39–40	X	SS 11	7 18 19	14/18					SP	BEAUMONT: light brown (7.5YR 6/4) and reddish brown (5YR 5/4) seams; SAND (SP); wet; dense	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SP		
44–45	X	SS 12	6 10 14	14/18						BEAUMONT: brown (7.5YR 5/4) to strong brown (7.5YR 5/6); SAND (SP); wet; very firm	
46–48											
49–50	X	SS 13	4 5 7	22/18					CH	BEAUMONT: gray (5Y 6/1) mottled with strong brown (7.5YR 5/8); CLAY (CH); moist; stiff; sandy carbonate concretions	
51–58											
59–60	X	SS 14	2 3 5	21/18					ML CH	BEAUMONT: brown (7.5YR 5/4) and gray (10R 6/1); sand; SILT (ML); wet; firm; little clay; few sand BEAUMONT: strong brown (7.5YR 4/6) marbled with gray (7.5YR 6/1); CLAY (CH); moist; firm	SS-14A: 58.5' to 59.0' SS-14B: 59.0' to 60.0'
61–68											
69–70	X	SS 15	12 17 19	12/18					SP	BEAUMONT: strong brown (7.5YR 4/6) to yellowish brown (10YR 5/4); SAND (SP); wet; dense; trace silt	
71–76											
77–78										BEAUMONT: light brown (7.5YR 6/3); SAND (SP); wet; very firm; interbedded clay layers increase with depth	
79–80	X	SS 16	8 12 16	22/18					CH	BEAUMONT: reddish brown (5YR 4/8); CLAY (CH); moist; very stiff	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									CH		
81											
82											
83											
84											
85											
86											
87											
88											
89	X	SS 17	4 6 9	24/18						BEAUMONT: brown (7.5YR 5/3) mottled with strong brown (7.5YR 5/8); CLAY (CH); moist; stiff	
90											
91											
92											
93											
94											
95											
96											
97											
98											
99	X	SS 18	4 4 6	22/18						BEAUMONT: brown (7.5YR 4/2); CLAY (CH); moist; stiff; high plasticity	
100											
101											
102											
103											
104											
105											
106											
107											
108											
109	X	SS 19	12 13 17	11/18					SW	BEAUMONT: light reddish gray (2.5YR 7/1); SAND (SW); wet; very firm; trace silt; trace clay; trace rounded gravel	
110											
111											
112											
113											
114											
115											
116											
117											
118											
119	X	SS 20	9 10 13	18/18					CH	BEAUMONT: yellowish red (5YR 4/6) and light greenish gray (GLEY 1 8/1); CLAY (CH); moist;	
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	very stiff; high plasticity; black spots	
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 21	8 9 13	6 18						BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; very stiff; trace sandy carbonate concretions	
130											
131											
132											
133											
134											
135											Driller notes "gravelly" material from 134.5 ft through 138.5 ft Drill rig bouncing while drilling through material
136											
137											
138											
139	X	SS 22	48 50/4"	14 10						BEAUMONT: white (2.5Y 8/1) and light gray (2.5Y 7/1) with yellowish brown (10YR 5/4); CLAY (CH); dry to moist; hard; high content of calcareous nodules	
140											Driller notes "in and out" of "gravelly" material to 148.5 ft
141											
142											
143											
144											
145											
146											
147											
148											
149	X	SS 23	33 44 54	14 18					SM	BEAUMONT: light reddish brown (5YR 6/4); silt; SAND (SM); wet; very dense; fine poorly graded sand; little silt; trace clay	
150											Driller notes easier drilling below 150 ft
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 24	12 11 14	21 18					CH	BEAUMONT: light brownish gray (2.5Y 6/2) to light yellowish brown (2.5Y 6/4); CLAY (CH); moist; very	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH	stiff; trace silt	
161											
162											
163											
164											
165											
166											
167											
168										BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; hard; little silt	
169	X	SS 25	24 50/5"	11 11					ML	BEAUMONT: strong brown (7.5YR 5/6); sand; SILT (ML); moist; hard; trace fine sand	SS-25A: 168.5' to 169.1' SS-25B: 169.1' to 169.4'
170											
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS 26	10 13 20	18 18					CH	BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; hard; trace calcareous concretions	
180										Boring terminated at 180.0 ft	
181											
182											
183											
184											
185											
186											
187											
188											
189											
190											
191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number MACTEC STP COL Units 3 & 4 : 6234-08-4660			SOIL LOG - Boring No. D4-1
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 Diesel Generator Pads N 362912.28 E 2942384.58		Total Depth 183.5 feet
Drilling Contractor and Rig LEWIS ENV / Mobile B-61	Elevation at boring 30.81 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.8 / 30 inches	No. of Samples 29	Date Started 6/16/08
	Borehole Inclination 0	Logged by A. Mwembeshi	Date Completed 6/17/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date JS 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	2 3 3	1.5/18					SM	FILL: very pale brown (10YR 8/3); silt; SAND (SM); dry; loose; some silt; few gravel; trace clay; fine to medium sand	
4–5	X	SS 2	2 2 3	10/18					CH	FILL: very dark gray (2.5Y 3/1); gravel; CLAY (CH); moist; firm; little gravel	
6–7	X	SS 3	1 3 3	6/18					CH	BEAUMONT: red (2.5YR 3/1); CLAY (CH); moist; firm; trace gravel; trace organics	
9–10	X	SS 4	3 4 5	18/18						BEAUMONT: red (2.5YR 4/6); CLAY (CH); moist; stiff	
12	X	SS 5	4 5 5	18/18						BEAUMONT: red (2.5YR 5/6); CLAY (CH); moist; stiff; trace silt	
14–15	X	SS 6	4 5 6	16/18						BEAUMONT: yellowish red (5YR 5/6); gravel; CLAY (CH); dry; stiff; little gravel	
18	X	SS 7	3 3 4	20/18						BEAUMONT: yellowish red (5YR 5/6); silt; CLAY (CH); moist; firm; trace silt	SS-7A: 17.5' to 18.3' SS-7B: 18.3' to 19.0'
19									SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; loose; some silt; trace clay; fine sand	
23	X	SS 8	5 6 6	17/18						BEAUMONT: strong brown (7.5YR 5/6); silt; gravel; SAND (SM); wet; firm; some silt; trace gravel	
28	X	SS 9	5 5 6	9/18						BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); wet; firm; some silt; fine sand	
33	X	SS 10	6 11 9	9.5/18						BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); moist; firm; some silt; fine to medium sand	
38	X	SS 11	15 20 21	13.5/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; dense; some silt; fine to medium sand; trace mica	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									SM		
41											
42	X	SS 12	11 15 20	11/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); moist; dense; some silt; medium sand; trace mica	
43											
44											
45											
46											
47	X	SS 13	5 7 6	18/18					CH	BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; stiff; trace silt; silty sand lenses	
48											
49											
50											
51											
52	X	SS 14	4 7 8	18.5/18						BEAUMONT: greenish gray (GLEY 1 5/5G); sand; CLAY (CH); moist; stiff; trace sand; trace gravel	
53											
54											
55											
56											
57	X	SS 15	10 12 10	14/18						BEAUMONT: strong brown (7.5YR 4/6) with greenish gray (GLEY 2 6/5BG); sand; CLAY (CH); moist; very stiff; little sand; trace gravel	
58											
59											
60											
61											
62											
63											
64											
65											
66											
67	X	SS 16	11 12 15	11/18					SM	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); moist; very firm; some silt; medium sand	
68											
69											
70											
71											
72											
73											
74											
75											
76											
77	X	SS 17	15 15 18	11/18						BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); wet; dense; little silt; mostly medium sand	
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–86									SM		
87–88	X	SS 18	7 10 13	18/18					CH	BEAUMONT: brown (7.5YR 4/4); CLAY (CH); moist; very stiff; trace gravel	
89–96											
97–98	X	SS 19	7 8 10	18					SM / CH	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); moist; firm; some silt; fine sand	SS-19A: 97' to 97.3' SS-19B: 97.3' to 98.5'
99–106										BEAUMONT: greenish gray (GLEY 1 5/10Y); CLAY (CH); moist; very stiff; trace gravel	
107–108	X	SS 20	6 8 9	19/18						BEAUMONT: greenish gray (GLEY 1 5/GY); CLAY (CH); moist; very stiff; trace gravel; trace silt	
109–116											
117–118	X	SS 21	12 12 12	17/18					SW-SC	BEAUMONT: light greenish gray (GLEY 1 8/5GY) to reddish yellow (5YR 6/6); silt; gravel; clay; SAND (SW-SC); moist; very firm; trace silt; trace gravel; trace clay; well-graded fine sand	
119–120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120–126									SW-SC		
127–128	X	SS 22	13 20 32	13/18					CH	BEAUMONT: red (2.5YR 4/6); CLAY (CH); moist; hard; trace silt	SS-22A: 127' to 127.8' SS-22B: 127.8' to 128.1'
128–136									SM	BEAUMONT: reddish brown (5YR 5/4); silt; SAND (SM); wet; very dense; some silt	
137–138	X	SS 23	8 11 15	14/18					SC	BEAUMONT: light greenish gray (GLEY 1 7/5GY); silt; clay; SAND (SC); moist; very firm; some clay; little silt; fine sand	
139–146											
147–148	X	SS 24	14 17 24	11/18					SM	BEAUMONT: light bluish gray (GLEY 2 7/5PB); silt; SAND (SM); wet; dense; some silt; trace mica; fine to medium sand	
149–156											
157–158	X	SS 25	8 9 11	0/18						No Recovery	
159–160	X	SS 26	11 12 15	10.5/18						BEAUMONT: pale olive (5Y 6/3); silt; clay; SAND (SM); moist; very firm; some silt; trace clay; fine	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									SM	sand	
161											
162											
163											
164											
165											
166											
167	X	SS	17 31 33	15						BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SM); moist; very dense; some silt; fine sand	
168	X	27		18							
169											
170											
171											
172											
173											
174											
175											
176											
177	X	SS	14 19 24	18						BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SM); moist; dense; some silt; fine sand	SS-28A: 177' to 177.8'
178	X	28		18					CH	BEAUMONT: strong brown (7.5YR 4/6); gravel; CLAY (CH); dry; hard; trace gravel	SS-28B: 177.8' to 178.5'
179											
180											
181											
182	X	SS	10 13 15	20.5						BEAUMONT: reddish brown (5YR 4/4); silt; CLAY (CH); moist; very stiff; trace silt	
183	X	29		18							
184										Boring terminated at 183.5 ft	
185											
186											
187											
188											
189											
190											
191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-1A

Type and Diameter of Boring: Mud Rotary / 4 Inches	Boring Location: Unit 4 Diesel Generator Pads N 362912.08 E 2942374.37		Total Depth: 47.4 feet
Drilling Contractor and Rig: MACTEC / P. Pitts / CME 55	Elevation at boring: 30.97 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Undisturbed	Driving Hammer Wt./Drop: NA / NA	No. of Samples: 2	Date Started: 6/25/08
	Borehole Inclination: 0	Logged by: D. Athinson	Date Completed: 6/25/08

Reviewed by / Date HG 7/3/08
Reviewed by / Date DJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–8											Boring D4-1A offset approximately 10' west of Boring D4-1 Drill to first sample at 9 ft
9–11		UD 1		27.5/24					CH	BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; trace silt	Pocket Penetometer (TSF): 1.5, 2.25, 2.0 Hand Held Vane Shear (kg/cm^2): >1.0

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-1A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46		UD		17					CH	BEAUMONT: strong brown (7.5YR 5/8); CLAY (CH); moist; trace silt	Shelby push refusal at 47.4 ft Tests performed in sandy bottom of tube Pocket Penetometer (TSF): 4.5, 4.0, 4.0 Hand Held Vane Shear (kg/cm^2): 0.2
47		2		17					SP-SC	BEAUMONT: strong brown (7.5YR 5/8); clay; SAND (SP-SC); moist; fine poorly graded sand; few clay	
48										Boring terminated at 47.4 ft	
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. D4-2	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 Diesel Generator Pads N 362828.3 E 2942419.97		Total Depth 180 feet
Drilling Contractor and Rig LEWIS ENV / Mobile B-61	Elevation at boring 30.57 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.8 / 30 inches	No. of Samples 31	Date Started 6/4/08
	Borehole Inclination 0	Logged by A. Mwembeshi	Date Completed 6/13/08

Reviewed by / Date HLC 7/3/08

Reviewed by / Date DS 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	4 4 2	1/18					ML	FILL: white (2.5Y 8/1); gravel; SILT (ML); dry; firm; some fine gravel; trace fine sand; grass roots	
4–5	X	SS 2	2 2 3	14.5/18					CH	FILL: bluish black (GLEY 2 2.5/5PB); CLAY (CH); moist; firm; trace grass	
7	X	SS 3	2 2 9	15/18					CH	BEAUMONT: red (2.5YR 4/6); CLAY (CH); moist; stiff; trace silt	
9–10	X	SS 4	2 4 5	14/18						BEAUMONT: red (2.5YR 5/6); CLAY (CH); moist; stiff; trace silt	
12	X	SS 5	2 3 6	18/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; stiff; trace fine sand	
14–15	X	SS 6	3 4 5	19/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; stiff; trace silt	
19–20	X	SS 7	2 3 2	21/18					SM	BEAUMONT: strong brown (7.5YR 5/8); silt; SAND (SM); wet; loose; fine sand; some silt	
24–25	X	SS 8	3 4 4	12/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; loose; fine sand; some silt	
29–30	X	SS 9	3 5 5	9/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; loose; fine sand; some silt	
34–35	X	SS 10	6 11 13	12/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; very firm; fine to medium sand; some silt	
39–40	X	SS 11	9 14 13	10.5/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; very firm; fine sand; some silt	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SM		
44–45	X	SS 12	3 7 9	18.5/18					CH	BEAUMONT; red (2.5YR 4/6); CLAY (CH); moist; very stiff; trace silt	
46–48											
49–50	X	SS 13	4 5 7	19/18						BEAUMONT: greenish gray (GLEY 2 5/5BG); CLAY (CH); moist; stiff; trace silt	
51–53											
54–55	X	SS 14	5 8 9	16.5/18						BEAUMONT: greenish gray (GLEY 1 6/10GY); CLAY (CH); moist; very stiff; trace gravel; trace silt	
56–58											
59–60	X	SS 15	5 11 11	15/18					SC	BEAUMONT: brown (7.5YR 5/4); clay; SAND (SC); moist; very firm; fine sand; some clay	
61–63											
64–65	X	SS 16	7 14 16	12/18					SM	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); moist; very firm; fine sand; some silt	
66–68											
69–70	X	SS 17	12 12 12	12/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); moist; very firm; fine to medium sand; little silt; trace clay	
71–73											
74–75	X	SS 18	5 11 11	11/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; very firm; medium sand; little silt	
76–78											
79–80	X	SS 19	10 19 12	14/18						BEAUMONT: brown (7.5YR 4/4); silt; SAND (SM); wet; dense; fine sand; little silt	SS-19A: 78.5' to 79.7'

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–83									CH	BEAUMONT: greenish gray (GLEY 1 6/5GY); CLAY (CH); dry; hard; trace silt	SS-19B: 79.7' to 80.0'
84–88	X	SS 20	11 12 14	14/18					SM	BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SM); moist; very firm; fine sand; some silt	
89–93	X	SS 21	6 10 13	16/18					CH	BEAUMONT: greenish gray (GLEY 1 6/5GY); CLAY (CH); moist; very stiff; trace silt	
94–98	X	SS 22	16 26 27	10.5/18						BEAUMONT: strong brown (7.5YR 5/6) and greenish gray (GLEY 1 6/10GY); CLAY (CH); moist; hard; trace silt	
99–100	X	SS 23	8 11 14	16.5/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; trace silt	
101–108											
109–110	X	SS 24	7 10 12	18.5/18						BEAUMONT: light greenish gray (GLEY 1 7/5GY); CLAY (CH); moist; very stiff; trace silt	
111–118											
119–120	X	SS 25	10 11 14	16/18						BEAUMONT: strong brown (7.5YR 5/6) and light greenish gray (GLEY 1 8/5G); CLAY (CH); moist;	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	very stiff; trace silt; trace sand pockets	
121											
122											
123											
124											
125											
126											
127											
128											
129		SS 26	8 14 17	18/18						BEAUMONT: yellowish brown (5YR 5/6); CLAY (CH); moist; hard; trace silt	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139		SS 27	11 16 19	14.5/18						BEAUMONT: light greenish gray (GLEY 1 7/10Y) and brownish yellow (10YR 6/8); CLAY (CH); moist; hard; trace silt	
140											
141											
142											
143											
144											
145											
146											
147											
148											
149		SS 28	11 18 19	13.5/18					SM	BEAUMONT: light greenish gray (GLEY 1 8/5GY); silt; SAND (SM); wet; dense; fine to medium sand; little silt	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159		SS 29	11 12 13	12/18						BEAUMONT: light greenish gray (GLEY 1 7/10Y); silt; SAND (SM); wet; very firm; fine to medium	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									SM	sand; little silt	
161											
162											
163											
164											
165											
166											
167											
168											
169	X	SS	14	12						BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); wet; very dense; fine to medium sand; some silt	
170	X	30	28 40	18							
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS	15	14					CH	BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); dry; hard; trace silt	SS-31A: 178.5' to 179.2'
180	X	31	20 37	18					SM	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); moist; very dense; fine to medium sand; some silt	SS-31B: 179.2' to 180.0'
181										Boring terminated at 180.0 ft	
182											
183											
184											
185											
186											
187											
188											
189											
190											
191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. D4-3	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 Diesel Generator Pads N 362913.46 E 2942551.6		Total Depth 180 feet
Drilling Contractor and Rig LEDI Drilling / Mobile B-61	Elevation at boring 31.31 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.8 / 30 inches	No. of Samples 26	Date Started 6/14/08
	Borehole Inclination 0	Logged by A. Mwembeshi	Date Completed 6/15/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	13 13 5	8/18					SM	FILL: very pale brown (10YR 7/4); silt; gravel; SAND (SM); dry; firm; fine sand; some silt; little gravel; roots	
4–5	X	SS 2	2 2 4	9/18					CH	FILL: black (2.5YR 2.5/1); CLAY (CH); moist; firm; trace silt; trace gravel; trace roots	
7–8	X	SS 3	2 3 4	9/18					CH	BEAUMONT: yellowish brown (5YR 4/6) to black (2.5Y 2.5/1); CLAY (CH); moist; firm; trace silt; trace gravel	
9–10	X	SS 4	3 5 6	18/18						BEAUMONT: red (2.5YR 4/6); CLAY (CH); dry; stiff	
12–13	X	SS 5	2 2 3	17/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; firm; trace silt	
14–15	X	SS 6	3 4 7	18/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); dry; stiff	
19–20	X	SS 7	2 2 2	21/18					SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; very loose; fine sand; some silt	
24–25	X	SS 8	3 3 6	13/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; very firm; fine sand; some silt	
29–30	X	SS 9	5 6 9	12/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND; (SM); wet; firm; fine to medium sand; some silt	
34–35	X	SS 10	10 18 15	10/18						BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SM); moist; dense; fine sand; some silt; trace mica	
39–40	X	SS 11	20 21 10	15/18						BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SM); moist; dense; fine sand; some silt; trace mica	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SM		
44–45	X	SS 12	18 20 10	15/18					CH	BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SM); wet; very firm; fine to medium sand; some silt; trace mica	SS-12A: 43.5' to 44.5' SS-12B: 44.5' to 45.0'
46–48										BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); dry; very stiff	
49–50	X	SS 13	4 9 9	19.5/18					SM CH	BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); dry; very stiff BEAUMONT: reddish brown (5YR 4/4); silt; SAND (SM); moist; firm; fine sand; some slt; trace clay; trace mica	SS-13A: 48.5' to 49.3' SS-13B: 49.3' to 49.8' SS-13C: 49.8' to 50.1'
51–58										BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); dry; very stiff; silt lenses	
59–60	X	SS 14	9 14 15	14/18					SM	BEAUMONT: yellowish red (5YR 4/6); gravel; CLAY (CH); dry; very stiff; little gravel; trace silt BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SM); moist; firm; fine to medium sand; some silt	SS-14A: 58.5' to 59.3' SS-14B: 59.3' to 60.0'
61–68											
69–70	X	SS 15	9 20 17	11.5/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); moist; dense; medium sand; little silt	
71–78											
79–80	X	SS 16	11 41 35	12/18						BEAUMONT: yellowish brown (10YR 5/4); silt; SAND (SM); wet; very dense; fine to medium sand;	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–88									SM	some silt; trace mica	
89–90	X	SS 17	9 11 13	16/18					CH	BEAUMONT: brown (7.5YR 4/4) to gray (GLEY1 6/N); CLAY (CH); dry; very stiff	
91–98											
99–100	X	SS 18	7 9 11	17/18						BEAUMONT: brown (7.5YR 4/4) to gray (GLEY 1 6/N); CLAY (CH); dry; very stiff; trace gravel	
101–108											
109–110	X	SS 19	6 7 8	23/18						BEAUMONT: gray (2.5Y 5/1); CLAY; (CH); moist; firm; trace gravel; trace silt pockets	
111–118											
119–120	X	SS 20	12 16 16	11/18						BEAUMONT: yellowish red (5YR 5/6) with light greenish gray (GLEY 1 7/10Y); silt; gravel; CLAY	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. D4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	(CH); dry; hard; little gravel; little silt	
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 21	8 11 16	18/18						BEAUMONT: red (2.5YR 5/6); gravel; CLAY (CH); dry; very stiff; trace gravel	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 22	9 12 13	14/18					SC	BEAUMONT: light greenish gray (GLEY 1 7/10Y); clay; silt; SAND (SC); dry; very firm; fine to medium sand; some clay; some silt; trace gravel	
140											
141											
142											
143											
144											
145											
146											
147											
148											
149	X	SS 23	11 19 18	13.5/18					SM	BEAUMONT: light greenish gray (GLEY 1 8/5GY); silt; SAND (SM); wet; dense; fine to medium sand; some silt	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 24	11 16 18	6/18						BEAUMONT: light greenish gray (GLEY1 8/5GY); silt; SAND (SM); wet; dense; fine to medium sand;	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. D4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									SM	some silt	
161											
162											
163											
164											
165											
166											
167											Change in drilling resistance per driller. SS-25A: 168.4' to 169.7' SS-25B: 169.7' to 170.0'
168									CH	BEAUMONT: reddish brown (5YR 5/4); CLAY; (CH); dry; very stiff; trace gravel	
169	X	SS 25	9 15 15	20 / 18							
170									SC	BEAUMONT: reddish brown (5YR 5/4); clay; silt; SAND (SC); moist; very firm; fine sand; little clay; some silt	
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS 26	22 33 50/5"	17 / 17					SM	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); wet; very dense; fine sand; some silt	
180										Boring terminated at 180 ft	
181											
182											
183											
184											
185											
186											
187											
188											
189											
190											
191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number MACTEC STP COL Units 3 & 4 : 6234-08-4660		SOIL LOG - Boring No. T3-1	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 Service Water Tunnel N 363300.56 E 2943207.69		Total Depth 203.1 feet
Drilling Contractor and Rig Miller Drilling / CME 85	Elevation at boring 29.17 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 138.1 / 30 inches	No. of Samples 34	Date Started 6/3/08
	Borehole Inclination 0	Logged by J. Liles	Date Completed 6/5/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date MJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	2 4 3	13/18					SC	FILL: yellowish brown (10YR 5/4); clay; SAND (SC); dry; loose; contains sand clay and grass	
2–4	X	SS 2	1 2 3	15/18					CH	BEAUMONT: very dark gray (2.5Y 3/1); CLAY (CH); moist; firm	
5–6	X	SS 3	1 2 3	18/18						BEAUMONT: yellowish brown (10YR 5/6); sand; CLAY (CH); moist; firm; little fine sand	
8–9	X	SS 4	1 1 1	20/18						BEAUMONT: yellowish brown (10YR 5/6); CLAY (CH); moist; soft	
10–11	X	SS 5	2 2 3	14/18						BEAUMONT: yellowish brown (10YR 5/6); silt; CLAY (CH); moist; firm; little silt	
13–14	X	SS 6	2 3 5	21/18						BEAUMONT: yellowish brown (10YR 5/6); silt; CLAY (CH); moist; firm; little silt	
15–16	X	SS 7	2 2 3	20/18						BEAUMONT: yellowish brown (10YR 5/6); CLAY (CH); moist; firm	
21–22	X	SS 8	3 4 7	15/18					SM	BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); wet; firm; fine sand; some silt; trace mica	
26–27	X	SS 9	5 8 9	10/18					SP	BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; firm; fine sand; trace mica	
31–32	X	SS 10	10 15 13	11/18						BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very firm; poorly graded fine sand; trace mica	
36–37	X	SS 11	10 13 21	10/18						BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; dense; poorly graded fine sand; trace mica	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									SP		
41–42	X	SS 12	6 5 8	20/18					CH	BEAUMONT: yellowish brown (10YR 5/4); sand; CLAY (CH); moist; stiff; little fine sand	
43–45											
46–47	X	SS 13	4 6 7	22/18						BEAUMONT: yellowish brown (10YR 5/4); silt; CLAY (CH); moist; stiff; some silt	
48–50											
51–52	X	SS 14	3 5 6	22/18						BEAUMONT: greenish gray (10Y 6/1); CLAY (CH); moist; stiff	
53–55											
56–57	X	SS 15	5 5 10	20/18						BEAUMONT: yellowish brown (10YR 5/4); CLAY (CH); moist; stiff	
58–60											
61–62	X	SS 16	4 6 9	20/18						BEAUMONT: yellowish brown (10YR 5/4); CLAY (CH); moist; stiff	
63–65											
66–67	X	SS 17	5 7 8	19/18					SC	BEAUMONT: yellowish brown (10YR 5/4); clay; SAND (SC); wet; firm; fine sand; some clay; trace mica	
68–70											
71–72	X	SS 18	5 10 9	19/18						BEAUMONT: yellowish brown (10YR 5/4); clay; SAND (SC); wet; firm; fine sand; little clay; trace mica	
73–75										BEAUMONT: yellowish brown (10YR 5/4); clay; SAND (SC); wet; firm; fine sand; little clay; trace mica	
76–77	X	SS 19	3 11 13	16/18					SP	BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very firm; fine sand; trace mica	SS-19A: 76.0' to 76.5' SS-19B: 76.5' to 77.5'
78–80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP		
81	X	SS 20	6 11 17	13/18						BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very firm; poorly graded fine sand; trace mica	
82											
83											
84											
85											
86	X	SS 21	20 33 36	13/18						BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very dense; poorly graded fine sand	
87											
88											
89											
90											
91	X	SS 22	16 33 29	3/18						BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very dense; poorly graded fine sand	
92											
93											
94											
95											
96											
97	X	SS 23	1 5 6	23/18					CH	BEAUMONT: dark yellowish brown (10YR 4/4); CLAY (CH); moist; stiff	
98											
99											
100											
101											
102	X	SS 24	16 23 19	12/18					SP	BEAUMONT: dark yellowish brown (10YR 4/4); SAND (SP); wet; dense; poorly graded fine sand	
103											
104											
105											
106											
107											
108											
109											
110											
111	X	SS 25	7 12 17	20/18					SW	BEAUMONT: grayish brown (10YR 5/2); gravel; SAND (SW); wet; very firm; well-graded fine to coarse sand; little gravel	
112											
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120											
121									SW		
122	X	SS 26	5 6 11	21/18					CH	BEAUMONT: strong brown (7.5YR 5/6) mottled with light gray (5Y 7/2); CLAY (CH); moist; very stiff	
123											
124											
125											
126											
127											
128											
129											
130											
131											
132	X	SS 27	4 5 7	22/18						BEAUMONT: light gray (5Y 7/2) mottled with strong brown (7.5YR 5/6); sand; CLAY (CH); moist; stiff; little fine sand	
133											
134											
135											
136											
137											
138											
139											
140											
141										BEAUMONT: light gray (5Y 7/2); sand; CLAY (CH); moist; hard; little fine sand increasing with depth	
142	X	SS 28	4 12 23	14/18					SP	BEAUMONT: light gray (5Y 7/2); SAND (SP); wet; dense; poorly graded fine sand	SS-28A: 141.2' to 141.9' SS-28B: 141.9' to 142.7'
143											
144											
145											
146											
147											
148											
149											
150											
151											
152	X	SS 29	5 15 19	7/18						BEAUMONT: light yellowish brown (2.5Y 6/3); SAND (SP); wet; dense; poorly graded fine sand; trace silt	
153											
154											
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									SP		
161											
162	X	SS 30	7 18 26	22/18					CH	BEAUMONT: strong brown (7.5YR 5/6); silt; CLAY (CH); moist; hard; some silt	
163											
164											
165											
166											
167											
168											
169											
170											
171											
172	X	SS 31	4 6 11	24/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; trace silt	
173											
174											
175											
176											
177											
178											
179											
180											
181											
182	X	SS 32	5 8 12	24/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff	
183											
184											
185											
186											
187											
188											
189											
190											
191											
192	X	SS 33	4 8 10	24/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; few calcareous nodules	
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number.

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200											
201									CH		
202	X	SS 34	7 7 8	5 18						BEAUMONT: light olive gray (5Y 6/2); sand; CLAY (CH); moist; stiff; some fine sand	
203										Boring terminated 203.1 ft	
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
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226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. T3-2	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 Service Water Tunnel N 363199.62 E 2943180.22		Total Depth 200 feet
Drilling Contractor and Rig LEWIS ENV / Mobile B-61	Elevation at boring 30.56 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.8 / 30 inches	No. of Samples 33	Date Started 5/29/08
	Borehole Inclination 0	Logged by A. Mwembeshi	Date Completed 5/31/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–3	X	SS 1	4 3 2	2.4/18					SP-SM	FILL: strong brown (7.5YR 5/16); silt; SAND (SP-SM); dry; loose; poorly graded	
4–5	X	SS 2	3 3 4	0/18					ML	FILL: black (2.5YR 2.5/1); sand; SILT (ML); dry; firm; low plasticity	
6–8	X	SS 3	2 3 3	12/18					ML	BEAUMONT: reddish brown (7.5YR 4/4); sand; SILT (ML); moist; firm; low plasticity	
9–10	X	SS 4	2 1 2	19/18					SC	BEAUMONT: brown (7.5YR 5/3); clay; SAND (SC); moist; very loose; mostly sand	
11–13	X	SS 5	2 1 2	18/18					CL	BEAUMONT: yellowish brown (5YR 5/6); sand; CLAY (CL); moist; soft; low plasticity	
14–18	X	SS 6	3 5 7	16/18					MH	BEAUMONT: red (10R 4/6); sand; SILT (ML); moist; stiff; medium plasticity	Began mud drilling after recovering sample SS-6
19–23	X	SS 7	2 3 3	16/18					SM	BEAUMONT: yellowish red (5YR 5/6); silt; SAND (SM); moist; loose; little clay	
24–28	X	SS 8	5 11 11	11/18						BEAUMONT: brownish yellow (10YR 6/6); silt; SAND (SM); moist; very firm; fine sand	
29–33	X	SS 9	7 10 8	9/18						BEAUMONT: light brown (10YR 6/4); silt; SAND (SM); moist; firm; fine sand	
34–38	X	SS 10	34 30 35	18						BEAUMONT: pale brown (10YR 6/3); silt; SAND (SM); moist; very dense; fine sand	
39–40	X	SS 11	10 17 17	14/18						BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); moist; dense; fine sand	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SM		
44–45	X	SS 12	22 23 39	16/18						BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SM); moist; very dense; fine sand	
46–48											
49–50	X	SS 13	7 5 5	18					CH	BEAUMONT: reddish brown (2.5YR 4/4); silt; CLAY (CH); moist; stiff; some calcareous shell fragments	
51–53											
54–55	X	SS 14	4 6 8	18/18						BEAUMONT: light greenish gray (GLEY 1 7/10Y); silt; CLAY (CH); moist; stiff	
56–58											
59–60	X	SS 15	8 15 17	15/18					SM	BEAUMONT: light greenish gray (GLEY 1 7/10Y); silt; CLAY (CH); moist; hard; some fine sand	SS-15A: 58.5' to 58.8' SS-15B: 58.8' to 60.0'
61–63										BEAUMONT: yellowish red (5YR 5/6); silt; SAND (SM); moist; dense; little gravel	
64–65	X	SS 16	11 15 18	12.5/18						BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SM); moist; dense; some silt	
66–68											
69–70	X	SS 17	12 16 18	12/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; dense; some silt	
71–73											
74–75	X	SS 18	8 15 18	11/18					SP-SM	BEAUMONT: dark yellowish brown (10YR 4/6); silt; SAND; (SP-SM); moist; dense; little clay mottles; medium sand	
76–78											
79–80	X	SS 19	13 23 19	11/18					SM	BEAUMONT: yellowish brown (10/YR 5/6); silt; SAND (SM); wet; dense; medium sand	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–83									SM		
84–85	X	SS 20	33 41 28	14/18						BEAUMONT: light brown (7.5YR 6/3); silt; SAND (SM); wet; very dense; fine sand	
86–88											
89–90	X	SS 21	7 8 11	16/18					CH	BEAUMONT: brown (7.5YR 4/3); CLAY (CH); dry; very stiff	
91–93											
94–95	X	SS 22	5 7 10	24/18						BEAUMONT: brown (7.5YR 4/3); CLAY (CH); dry; very stiff	
96–98											
99–100	X	SS 23	8 14 15	7/18					SM	BEAUMONT: reddish gray (10R 5/1); silt; SAND (SM); wet; very firm; fine sand	
101–108											
109–110	X	SS 24	23 24 18	14/18						BEAUMONT: pale red (2.5YR 7/2); silt; gravel; SAND (SM); wet; dense; some gravel	
111–118											Penetrated possible coarse gravel layer at 113 ft
119–120	X	SS 25	10 15 17	18/18						BEAUMONT: strong brown (7.5YR 5/6) and light greenish gray (GLEY 1 8/10GY) silt; SAND; (SM);	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120–128									SM	moist; dense; fine sand; trace clay	
129–130	X	SS 26	8 10 16	18/18					CH	BEAUMONT: light red (2.5YR 6/6) with lenses of greenish gray (GLEY 1 8/5GY); CLAY (CH); moist; very stiff	
131–138											
139–140	X	SS 27	10 12 14	18/18					SC	BEAUMONT: light greenish gray (GLEY 1 7/5G) with some light red (2.5YR 6/6); clay; SAND (SC); moist; very firm; trace silt and gravel; fine sand	
141–148											
149–150	X	SS 28	14 20 22	9/18					SM	BEAUMONT: brownish yellow (10YR 6/6); silt; SAND (SM); wet; dense; fine sand	
151–158											
159–160	X	SS 29	32 38 31	13.5/18						BEAUMONT: light brown (7.5YR 6/4); silt; SAND; (SM); wet; very dense; fine sand with trace clay	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160–168									SM	mottles	
169	X	SS 30	7 12 15	18/18					SC	BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SC); wet; very firm; trace silt; fine sand	SS-30A: 168.5' to 169.7' SS-30B: 169.7' to 170.0'
170–178									CH	BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff	
179–180	X	SS 31	9 12 16	16/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff	
181–188											
189–190	X	SS 32	11 13 19	18/18					SC	BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SC); moist; dense; fine sand; some clay	
191–198											
199–200	X	SS 33	21 24 21	13/18					SM	BEAUMONT: grayish brown (10YR 5/2); silt; SAND; (SM); moist; dense; fine sand with little clay	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200										layers	
201										Boring Terminated at 200 Ft.	
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219											
220											
221											
222											
223											
224											
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226											
227											
228											
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230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-3

Type and Diameter of Boring: Mud Rotary / 4 Inches	Boring Location: Unit 3 Service Water Tunnel N 363201.75 E 2943241.78		Total Depth: 283.2 feet
Drilling Contractor and Rig: Miller Drilling / CME 85	Elevation at boring: 29.21 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Split Spoon	Driving Hammer Wt./Drop: 140.5 / 30 inches	No. of Samples: 38	Date Started: 5/29/08
	Borehole Inclination: 0	Logged by: J. Liles	Date Completed: 6/1/08

Reviewed by / Date HLC 7/3/08
Reviewed by / Date DJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	3 7 5	5/18					SM	FILL: very dark grayish brown (2.5Y 3/1); silt; SAND (SM); moist; firm; fine to coarse sand; trace organics; trace gravel; trace clay	
3–4	X	SS 2	1 2 2	14/18					CH	BEAUMONT: black (2.5Y 2.5/1); CLAY (CH); moist; soft; high plasticity	
6	X	SS 3	1 1 2	17/18						BEAUMONT: yellowish brown (10YR 5/4); CLAY (CH); moist; soft; high plasticity	
8–9	X	SS 4	2 1 3	15/18					CL	BEAUMONT: yellowish brown (10YR 5/6); CLAY (CL); moist; soft; medium plasticity; trace sand	
11	X	SS 5	2 2 2	15.5/18					CH	BEAUMONT: yellowish brown (10YR 5//6); CLAY (CH); moist; soft; high plasticity; trace gravel	
13–14	X	SS 6	3 4 7	20/18					CL	BEAUMONT: yellowish brown (10YR 5/6); CLAY (CL); moist; stiff; medium plasticity	
16	X	SS 7	1 1 2	15/18						BEAUMONT: yellowish brown (10YR 5/6); silt; CLAY (CL); moist; soft; medium plasticity	
20–21	X	SS 8	6 7 7	12/18					SM	BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); wet; firm; fine sand; trace mica	
27	X	SS 9	4 5 9	12/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); wet; firm; fine sand; trace mica	
32	X	SS 10	9 17 23	15/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); wet; dense; fine sand	
37	X	SS 11	13 12 13	13/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); wet; very firm; fine sand; trace mica	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–41									SM		
42	X	SS 12	18 26 35	14/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); wet; very dense; fine sand	
43–46											
47	X	SS 13	6 7 11	14/18					CL	BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); wet; firm; fine sand	SS-13A: 46.2' to 46.7' SS-13B: 46.7' to 47.7'
48–51										BEAUMONT: yellowish brown (10YR 5/6); CLAY (CL); moist; very stiff; trace silt; trace sand; low to medium plasticity	
52	X	SS 14	2 5 6	19/18					CH	BEAUMONT: light brownish gray (2.5Y 6/2); CLAY (CH); moist; stiff; high plasticity; trace gravel	
53–56											
57	X	SS 15	4 5 7	23/18						BEAUMONT: yellowish brown (10YR 5/6); CLAY; (CH); moist; stiff; high plasticity; trace calcareous nodules	
58–61											
62	X	SS 16	3 6 9	21/18						BEAUMONT: yellowish brown (10YR 5/6); CLAY (CH); moist; stiff; high plasticity; some calcareous nodules	
63–66											
67	X	SS 17	3 5 6	21/18					SM	BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); wet; firm; fine sand; trace clay; trace mica; no to low plasticity	
68–71											
72	X	SS 18	6 16 13	16/18					SP-SM	BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SP-SM); wet; very firm; fine sand; some silt; poorly graded; trace mica	
73–76											
77	X	SS 19	9 11 18	12/18					SM	BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); wet; very firm; fine sand; trace mica	
78–80											

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Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SM		
81											
82	X	SS 20	9 11 14	10/18					SP	BEAUMONT: yellowish brown (10YR 5/6); SAND (SP); wet; very firm; fine sand; trace silt	
83											
84											
85											
86										BEAUMONT: yellowish brown (10YR 5/6); SAND (SP); wet; very dense; fine sand; trace silt	
87	X	SS 21	27 43 25	18/18					CL	BEAUMONT: dark yellowish brown (10YR 4/4); sand; CLAY (CL); moist; hard; little fine sand, medium plasticity	SS-21A: 86.2' to 87.2' SS-21B: 87.2' to 87.7'
88											
89											
90											
91										BEAUMONT: dark yellowish brown (10YR 4/4); sand; CLAY (CL); moist; very stiff; little fine sand	
92	X	SS 22	7 16 12	18/18					SM	BEAUMONT: dark yellowish brown (10YR 4/4); silt; SAND (SM); wet; very firm; fine grained sand; some silt; trace mica	SS-22A: 91.2' to 91.8' SS-22B: 91.8' to 92.7'
93											
94											
95											
96											
97	X	SS 23	3 5 4	23/18						BEAUMONT: dark grayish brown (2.5YR 4/2); silt; SAND (SM); wet; loose; fine grained sand; some silt; trace mica	
98											
99											
100											
101											
102	X	SS 24	11 15 17	12/18					SP	BEAUMONT: dark grayish brown (2.5YR 4/2); SAND (SP); wet; dense; poorly graded; fine sand; trace silt	
103											
104											
105											
106											
107											
108											
109											
110											
111											
112	X	SS 25	11 5 8	14/18					CL	BEAUMONT: greenish gray (10YR 6/1); sand; CLAY (CL); moist; stiff; trace calcareous nodules	
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CL		
121											
122	X	SS 26	5 6 11	20/18						BEAUMONT: strong brown (7.5YR 5/6) mottled with greenish gray (10YR 6/1); CLAY (CL); moist; very stiff	
123											
124											
125											
126											
127											
128											
129											
130											
131											
132	X	SS 27	4 4 7	24/18						BEAUMONT: greenish gray (10Y 6/1); sand; CLAY (CL); moist; stiff; little fine sand	
133											
134											
135											
136											
137											
138											
139											
140											
141											
142	X	SS 28	8 9 22	19/18						BEAUMONT: greenish gray (10Y 6/1); sand; CLAY (CL); moist; hard; some fine sand increasing with depth; calcareous nodules to 142.0 ft	
143											
144											
145											
146											
147											
148											
149											
150											
151											
152	X	SS 29	11 21 29	5/18					SP	BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; dense; poorly graded; fine sand	
153											
154											
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									SP		
161											
162	X	SS 30	21 26 37	13/18					CL	BEAUMONT: yellowish brown (10YR 5/4); sand; CLAY (CL); moist; hard; little fine sand; trace calcareous nodules	
163											
164											
165											
166											
167											
168											
169											
170											
171											
172	X	SS 31	6 8 12	22/18						BEAUMONT: yellowish brown (10YR 5/4); CLAY (CL); moist; very stiff; trace calcareous nodules	
173											
174											
175											
176											
177											
178											
179											
180											
181											
182	X	SS 32	5 9 11	22/18						BEAUMONT: yellowish brown (10YR 5/4); CLAY (CL); moist; very stiff	
183											
184											
185											
186											Change in drilling resistance at 186 ft according to driller
187											
188											
189											
190											
191											
192	X	SS 33	8 22 39	16/18					SM	BEAUMONT: light olive brown (2.5Y 5/4); silt; SAND (SM); wet; very dense; fine sand; little silt; trace clay	
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									SM		
201											
202	X	SS 34	9 14 33	15/18					SC	BEAUMONT: greenish gray (10Y 5/1); clay; SAND (SC); moist; dense; fine sand; some clay	
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213									CL		Change in drilling resistance at 213 ft according to driller
214											
215											
216											
217											
218											
219											
220											
221											
222	X	SS 35	4 7 10	22/18						BEAUMONT: olive brown (2.5Y 4/3); silt; CLAY (CL); moist; very stiff; little silt	
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235									SP		Lost circulation at 235 ft
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									SP		
241											
242	X	SS 36	22 49 50/5"	13/17						BEAUMONT: light yellowish brown (2.5Y 6/3); SAND (SP); wet; very dense; poorly graded fine sand	
243											
244											
245									CH		Change in drilling resistance at 245 ft according to driller
246											
247											
248											
249											
250											
251											
252											
253											
254											
255											
256											
257											
258											
259											
260											
261											
262	X	SS 37	6 10 15	24/18						BEAUMONT: olive gray (5Y 5/2); CLAY (CH); moist; very stiff	
263											
264											
265											
266											
267											
268											
269											
270											
271											
272											
273											
274											
275											
276											
277											
278											
279											
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281											
282	X	SS 38	8 10 19	24 / 18						BEAUMONT: olive gray (5Y 5/2); CLAY (CH); moist; very stiff	
283										Boring Terminated at 283.2 Ft.	
284											
285											
286											
287											
288											
289											
290											
291											
292											
293											
294											
295											
296											
297											
298											
299											
300											
301											
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number MACTEC STP COL Units 3 & 4 : 6234-08-4660		SOIL LOG - Boring No. T3-4	
Type and Diameter of Boring Mud Rotary / 4-Inches	Boring Location Unit 3 Service Water Tunnel N 363102.33 E 2943241.93		Total Depth 204.5 feet
Drilling Contractor and Rig Miller Drilling / CME 750 ATV	Elevation at boring 29.04 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.3 / 30 inches	No. of Samples 34	Date Started 5/29/08
	Borehole Inclination 0	Logged by R. Clark	Date Completed 6/1/08

Reviewed by / Date HLC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	2 3 4	15/18					SW	FILL: strong brown (7.5YR 5/6); silt; gravel; SAND (SW); moist; loose; organics	SS-1A: 0' to 0.5' SS-1B: 0.5' to 1.5'
1–3									CL / CH	BEAUMONT: brown (7.5YR 5/2); silt; CLAY (CL); moist; firm; little organics; blocky	
4–5	X	SS 2	3 3 3	13/18					CH	BEAUMONT: brown (7.5YR 4/2); CLAY (CH); moist; firm; little silt; high plasticity; blocky; HCl reaction	
6–7	X	SS 3	3 2 3	18/18						BEAUMONT: brown (7.5YR 4/2); CLAY (CH); moist; firm; little silt; high plasticity; blocky; HCl reaction	
9–10	X	SS 4	3 4 5	16/18						BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; stiff; little silt; high plasticity; blocky; HCl reaction	
11–12	X	SS 5	1 3 4	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; firm; some to little silt; trace gravel; high plasticity; slightly mottled; granule sized nodules; HCl reaction	
14–15	X	SS 6	2 3 2	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; firm; little to some silt; HCl reaction; high plasticity; slightly mottled	
18–19	X	SS 7	2 1 2	18/18					ML	BEAUMONT: strong brown (7.5YR 5/6); sand; SILT (ML); wet; soft; some fine sand; trace clay; slight plasticity; HCl reaction	
23–24	X	SS 8	7 5 6	18/18					SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; firm; some silt; mostly fine sand; HCl reaction	
28–29	X	SS 9	5 3 6	18/18						BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SM); wet; loose; some silt; mostly fine sand; HCl reaction; trace mica	
33–34	X	SS 10	8 8 6	11/18					SP-SM	BEAUMONT: light brown (7.5YR 6/3); silt; SAND (SP-SM); wet; firm; few silt; mostly fine poorly graded quartz sand; HCl reaction	
38–39	X	SS 11	8 10 10	18/18						BEAUMONT: light brown (7.5YR 6/3); silt; SAND (SP-SM); wet; firm; trace to few silt; mostly fine poorly graded quartz sand; HCl reaction	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41									SP-SM		
42											
43	X	SS 12	12 11 7	18/18						BEAUMONT: very pale brown (10YR 7/3); silt; SAND (SP-SM); wet; firm; trace to few silt; mostly fine poorly graded quartz sand; HCl reaction	
44											
45											
46											
47											
48	X	SS 13	3 5 4	18/18					CH	BEAUMONT: light brownish gray (2.5Y 7/2) with sharp color change at 49.0 ft to brown (7.5YR 5/4); CLAY (CH); moist; stiff; trace gravel; high plasticity; blocky; slightly mottled; platy calcite nodule at color change contact; HCl reaction	
49											
50											
51											
52											
53	X	SS 14	4 7 10	18/18						BEAUMONT: light gray (2.5YR 7/2); CLAY (CH); moist; very stiff; high plasticity; blocky; slightly mottled; trace calcite nodules (gravel sized); HCl reaction	
54											
55											
56											
57											
58	X	SS 15	6 8 10	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; high plasticity; blocky; mottled; trace calcite nodules; HCl reaction	
59											
60											
61											
62											
63	X	SS 16	6 7 10	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; high plasticity; blocky mottled; HCl reaction	
64											
65											
66											
67											
68	X	SS 17	5 8 10	18/18					ML	BEAUMONT: brownish yellow (10YR 6/6); sand; SILT (ML); wet; very stiff; mostly silt; some fine sand; slightly plastic; trace clay	SS-17A: 68' to 68.7' SS-17B: 68.7' to 69.5'
69									SM	BEAUMONT: brownish yellow (10YR 6/6); silt; SAND (SM); wet; firm; mostly fine quartz sand; some silt; trace clay	
70											
71											
72											
73	X	SS 18	7 10 23	18/18						BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SM); wet; dense; mostly fine sand; some silt; trace clay	
74											
75											
76											
77											
78	X	SS 19	11 14 16	12/18						BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SM); wet; very firm; mostly fine quartz sand; some silt; HCl reaction; trace gravel sized	
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–82									SM	calcite; nodules	
83–84	X	SS 20	6 7 10	18/18					CH	BEAUMONT: brown (7.5YR 4/4); CLAY (CH); moist; very stiff; some to little silt; high plasticity; blocky; HCl reaction	Driller indicated change at approximately 83 ft
85–87											
88–89	X	SS 21	9 10 12	18/18						BEAUMONT: yellowish brown (10YR 5/4); CLAY (CH); moist; very stiff; high plasticity; blocky; HCl reaction	
90–92											
93–94	X	SS 22	6 8 11	18/18						BEAUMONT: brown (7.5YR 4/2); CLAY (CH); moist; very stiff; trace silt; high plasticity; blocky; HCl reaction; slightly mottled; trace gravel sized calcite nodules	
95–96											
97									SP-SM		Driller indicated change at approximately 96 ft
98–99	X	SS 23	21 22 15	16/18						BEAUMONT: light brownish gray (2.5YR 6/2); silt; SAND (SP-SM); wet; dense; mostly fine poorly graded quartz sand; HCl reaction	
100–102											
103–104	X	SS 24	14 19 24	9/18						BEAUMONT: light brownish gray (2.5YR 6/2); silt; SAND (SP-SM); dense; mostly fine poorly graded quartz sand; few silt; HCl reaction	
105–108											
109–112									CH		Driller indicated change at approximately 109 ft
113–114	X	SS 25	8 13 15	18/18						BEAUMONT: red (2.5YR 5/6); CLAY (CH); moist; very stiff; high plasticity; blocky; mottled with light greenish gray; HCl reaction	
115–120											

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Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123	X	SS 26	7 9 11	18/18						BEAUMONT: red (2.5YR 5/6) mottled with light greenish gray (GLEY 1 10Y 8/1); CLAY (CH); moist; very stiff; high plasticity; HCl reaction	
124											
125											
126											
127											
128											
129											
130											
131											
132											
133	X	SS 27	9 11 15	18/18					CL	BEAUMONT: light gray (2.5YR 7/2); silt; CLAY (CL); moist; very stiff; slight plasticity; little silt; trace fine sand; HCl reaction	
134											
135											
136											
137											
138											
139											
140											
141											
142											
143	X	SS 28	10 17 24	15/18					SP-SM	BEAUMONT: brownish yellow (10YR 6/6); silt; SAND (SP-SM); wet; dense; mostly fine poorly graded quartz sand; HCl reaction; trace laminations observed	
144											
145											
146											
147											
148											
149											
150											
151											
152											
153	X	SS 29	38 39 41	14/18						BEAUMONT: very pale brown (10YR 7/3); silt; SAND (SP-SM); wet; very dense; mostly fine poorly graded quartz sand; HCl reaction	
154											
155											
156									CH		Driller indicated change at approximately 156 ft
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		Slight rig chatter at 160 ft
161											
162											
163	X	SS 30	9 10 12	21 / 18						BEAUMONT: light yellowish brown (10YR 6/4); CLAY (CH); moist; very stiff; high plasticity; slightly mottled; HCl reaction	
164											
165											
166											Driller indicated hard drilling from 165.5 ft to 167.5 ft
167											
168											
169											
170											
171											
172											
173	X	SS 31	10 12 12	17 / 18						BEAUMONT: light yellowish brown (10YR 6/4); CLAY (CH); moist; very stiff; high plasticity; slightly mottled; HCl reaction	
174											
175											
176											
177											
178											
179											
180											
181											
182											
183	X	SS 32	8 12 14	18 / 18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; high plasticity; slightly mottled; HCl reaction	
184											
185											
186											
187											
188											
189											
190											
191											
192											
193	X	SS 33	29 29 37	18 / 18					SP-SM	BEAUMONT: light brownish gray (2.5YR 6/2); silt; SAND (SP-SM); wet; very dense; mostly fine quartz sand; HCl reaction	
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200											
201									SP-SM		
202											
203		SS	4	20					CH	BEAUMONT: greenish gray (GLEY 1 10Y 5/1); CLAY (CH); moist; very stiff; high plasticity; HCl reaction; trace calcium carbonate nodules	
204		34	8 12	18							
205										Boring Terminated at 204.5 Ft.	
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219											
220											
221											
222											
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5

Type and Diameter of Boring: Mud Rotary / 4 Inches	Boring Location: Unit 3 Service Water Tunnel N 363002.2 E 2943235.13		Total Depth: 280 feet
Drilling Contractor and Rig: MACTEC / J. Warren / CME 75	Elevation at boring: 29.07 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Split Spoon	Driving Hammer Wt./Drop: 139.58 lbs / 30 inches	No. of Samples: 68	Date Started: 5/29/08
	Borehole Inclination: 0	Logged by: D. Athinson	Date Completed: 6/12/08

Reviewed by / Date HIC 7/3/08
Reviewed by / Date VJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	10 5 4	8/18					SP-SM	Surface grass and topsoil approximately 3 inches BEAUMONT: very pale brown (10YR 8/3); silt; SAND (SP-SM); moist; loose; fine sand; few silt	
4–5	X	SS 2	3 5 3	3/18					CH	BEAUMONT: black (7.5YR 2.5/1); CLAY (CH); moist; firm; high plasticity	
6–7	X	SS 3	4 3 3	3.5/18						BEAUMONT: black (7.5YR 2.5/1); CLAY (CH); moist; firm; high plasticity	
8–9	X	SS 4	4 4 5	26/18						BEAUMONT: dark brown (7.5YR 3/2); CLAY (CH); moist; stiff; high plasticity	SS-4A: 8.5' to 9.5' SS-4B: 9.5' to 10.0'
10–11	X	SS 5	4 6 5	26/18					CL	BEAUMONT: strong brown (7.5YR 5/6); silt; CLAY (CL); moist; stiff; moderate plasticity	
12–13	X	SS 6	4 3 3	12/18						BEAUMONT: yellowish red (7.5YR 6/6); silt; CLAY (CL); moist; stiff; moderate plasticity	
14–15	X	SS 7	4 3 2	12/18						BEAUMONT: yellowish red (7.5YR 6/6); silt; CLAY (CL); moist; firm; moderate plasticity	
17–18	X	SS 8	3 2 3	7.5/18					SP-SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; loose; fine sand; few silt; poorly graded	
19–20	X	SS 9	5 8 10	10/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; loose; fine sand; few silt; poorly graded	
22–23	X	SS 10	4 6 10	9/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; firm; fine sand; few silt; poorly graded	
24–25	X	SS 11	6 6 7	16/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; firm; fine sand; few silt; poorly graded	
27–28	X	SS 12	5 7 10	13/18						BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SP-SM); wet; firm; fine sand; few silt; poorly graded	
29–30	X	SS 13	8 12 14	13.5/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; very firm; fine sand; few silt; poorly graded	
32–33	X	SS 14	6 12 17	13.5/18						BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SP-SM); wet; very firm; fine sand; few silt; poorly graded	
34–35	X	SS 15	5 6 15	13/18					SP-SC	BEAUMONT: strong brown (7.5YR 5/8); clay; SAND (SP-SC); wet; very firm; fine sand; few clay; poorly graded	
37–38	X	SS 16	5 18 18	12/18					SP-SM	BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SP-SM); wet; dense; fine sand; few silt; poorly graded	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41–42	X	SS 17	6 10 14	14/18					SP-SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; very firm; fine sand; few silt; poorly graded	
43											
44–45	X	SS 18	7 9 12	11.5/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; very firm; fine sand; few silt; poorly graded	
46–47	X	SS 19	10 14 17	11/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; dense; fine sand; few silt; poorly graded	
48–49	X	SS 20	16 11 7	14.5/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; firm; fine sand; few silt; poorly graded	
50–51	X	SS 21	4 4 9	21.5/18					CH	BEAUMONT: light brownish gray (2.5Y 6/2); CLAY (CH); moist; stiff; high plasticity	
52–53											
54–55	X	SS 22	7 12 12	18.5/18					CL	BEAUMONT: reddish brown (2.5YR 4/4); silt; CLAY (CL); moist; very stiff; mottled color	SS-22A: 53.5' to 53.7' SS-22B: 53.7' to 55.0'
56–57	X	SS 23	8 8 13	21.5/18					CH	BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff; mottled color	
58–59	X	SS 24	7 9 12	16.5/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff; mottled color	
60–61	X	SS 25	6 9 11	21/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff	
62–63	X	SS 26	6 9 11	19.5/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff	
64–65	X	SS 27	3 4 6	19.5/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; stiff; trace fine sand	
66–67	X	SS 28	7 13 15	22/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; trace fine sand	
68–69	X	SS 29	6 6 10	18/18					SP-SM	BEAUMONT: brown (7.5YR 4/4); silt; SAND (SP-SM); wet; firm; fine sand; few silt	
70–71	X	SS 30	3 4 6	18.5/18					CH	BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; stiff; trace fine sand	
72–73	X	SS 31	3 9 12	10.5/18					SP-SM	BEAUMONT: brown (7.5YR 4/4); silt; SAND (SP-SM); wet; very firm; fine to medium sand; few silt; trace clay	
74–75	X	SS 32	3 5 14	13.5/18						BEAUMONT: strong brown (7.5YR 5/8); silt; SAND (SP-SM); wet; firm; fine to medium sand; few silt;	
76–80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80										trace clay	
81–82	X	SS 33	41 49 54	16.5 / 18					SP-SM	BEAUMONT: yellowish brown (10YR 5/4); silt; SAND (SP-SM); wet; very dense; fine sand; few silt	
83											
84–85	X	SS 34	9 14 29	11.5 / 18						BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SP-SM); wet; dense; fine sand; few silt	
86–87	X	SS 35	6 8 11	22 / 18					CH	BEAUMONT: light yellowish brown (10YR 6/4); CLAY (CH); moist; very stiff; trace silt	
88											
89–90	X	SS 36	8 10 13	22.5 / 18						BEAUMONT: yellowish brown (10YR 5/4); CLAY (CH); moist; very stiff; trace silt	
91–92	X	SS 37	8 12 14	21 / 18						BEAUMONT: yellowish brown (10YR 5/4); CLAY (CH); moist; very stiff; trace silt	
93											
94–95	X	SS 38	8 9 12	21 / 18						BEAUMONT: dark yellowish brown (10YR 4/4); CLAY (CH); moist; very stiff; trace silt; trace fine sand	
96–97	X	SS 39	8 9 11	17.5 / 18						BEAUMONT: grayish brown (10YR 5/2); CLAY (CH); moist; very stiff; few silt	
98											
99–100	X	SS 40	4 5 8	23.5 / 18						BEAUMONT: grayish brown (10YR 5/2); CLAY (CH); moist; stiff; few silt	
101–103											
104–105	X	SS 41	48 47 45	13.5 / 18					SP	BEAUMONT: grayish brown (10YR 5/2); SAND (SP); wet; very dense; fine sand	
106–108											
109–110	X	SS 42	20 23 18	13.5 / 18						BEAUMONT: grayish brown (10YR 5/2); SAND (SP); wet; dense; fine sand	
111–113											
114–115	X	SS 43	7 11 13	19.5 / 18					CH	BEAUMONT: grayish brown (10YR 5/2); CLAY (CH); moist; very stiff; trace silt; mottled color	Switched to another drilling rig Beginning at 113' using MACTEC-Atlanta CME 55 hammer serial number 505 Hammer weight 141.1 lbs.
116–118											
119–120	X	SS 44	4 7 10	22 / 18						BEAUMONT: light brownish gray (10YR 6/2); CLAY (CH); moist; very stiff; few silt	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123											
124	X	SS 45	8 20 20	18/18					SC	BEAUMONT: gray (10YR 5/1); clay; SAND (SC); wet; dense; fine sand; some clay	
125											
126											
127											
128											
129	X	SS 46	6 9 12	20.5/18					CH	BEAUMONT: strong brown (7.5YR 5/8); CLAY (CH); moist; very stiff; few silt; trace gravel	
130											
131											
132											
133											
134	X	SS 47	8 12 14	20/18						BEAUMONT: light yellowish brown (2.5YR 6/4); CLAY (CH); moist; very stiff; few silt; trace carbonate nodules	
135											
136											
137											
138											
139	X	SS 48	8 18 20	19.5/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; hard; few silt; trace carbonate nodules; mottled color	
140											
141											
142											
143											
144	X	SS 49	9 15 26	21/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; hard; trace silt; trace carbonate nodules; mottled color	
145											
146											
147											
148											
149	X	SS 50	16 21 30	15.5/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; hard; few silt; trace fine sand; trace carbonate nodules; mottled color	
150											
151											
152											
153											
154	X	SS 51	10 15 22	18.5/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; hard; trace silt; trace carbonate nodules; slight mottled color	
155											
156											
157											
158											
159	X	SS 52	7 13 15	22/18						BEAUMONT: light olive brown (2.5Y 5/3); CLAY (CH); moist; very stiff; trace silt; mottled color	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161											
162											
163											
164	X	SS 53	8 13 17	21/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; trace silt; trace fine sand	
165											
166											
167											
168											
169	X	SS 54	25 50/3"	7/9					SC	BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SC); moist; very dense; some clay; trace silt; partially cemented layers	
170											
171											
172											
173											
174	X	SS 55	22 36 50/4"	11/16					SP-SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; very dense; poorly graded fine sand; few silt	
175											
176											
177											
178											
179	X	SS 56	40 50/1"	6/7						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; very dense; poorly graded fine sand; few silt	
180											
181											
182											
183											
184	X	SS 57	27 48 50/3"	8/15						BEAUMONT: dark yellowish brown (10YR 4/4); silt; SAND (SP-SM); wet; very dense; poorly graded fine sand; few silt	
185											
186											
187											
188											
189	X	SS 58	7 10 14	22/18					CH	BEAUMONT: reddish brown (5YR 4/3); CLAY (CH); moist; very stiff; few silt; trace fine sand	
190											
191											
192											
193											
194	X	SS 59	3 7 13	24/18						BEAUMONT: brown (7.5YR 4/3); CLAY (CH); moist; very stiff; trace silt	
195											
196											
197											
198											
199	X	SS 60	33 43 50/4"	10/16					SP-SM	BEAUMONT: light olive brown (2.5Y 6/8); silt; SAND (SP-SM); wet; very dense; fine sand; few	
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200–208									SP-SM	silt; trace mica	
209–210	X	SS 61	9 15 19	21.5 / 18					CH	BEAUMONT: brown (10YR 4/3); silt; CLAY (CH); wet; hard; few silt; trace carbonate nodules	
211–218											
219–220	X	SS 62	43 50/5"	6.5 / 11					SP-SM	BEAUMONT: brown (10YR 5/3); silt; SAND (SP-SM); very dense; fine sand; few silt	
221–228											
229–230	X	SS 63	4 6 10	23 / 18					CH	BEAUMONT: dark grayish brown (2.5Y 4/2); CLAY (CH); moist; very stiff; few silt	
231–238											
239–240	X	SS 64	50/4"	0 / 4						No Recovery	Possible very dense sand layer at 238 ft

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									CH		
241											
242											
243											
244											
245											
246											
247											
248											
249	X	SS 65	5 8 13	24/18						BEAUMONT: greenish gray (GLEY 1 5/5G); CLAY (CH); wet; very stiff; few silt; trace shell fragments	
250											
251											
252											
253											
254											
255											
256											
257											
258											
259	X	SS 66	5 10 15	24/18						BEAUMONT: brown (7.5YR 5/3); CLAY (CH); moist; very stiff; few silt; trace fine sand	
260											
261											
262											
263											
264											
265											
266											
267											
268											
269	X	SS 67	5 12 15	24/18						BEAUMONT: olive gray (5Y 5/4); CLAY (CH); moist; very stiff; few silt	
270											
271											
272											
273											
274											
275											
276											
277											
278											
279	X	SS 68	7 15 19	24/18						BEAUMONT: greenish gray (GLEY 1 5/5G); CLAY (CH); wet; hard; few silt; trace shell fragments	
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280										Boring terminated at 280 ft	
281											
282											
283											
284											
285											
286											
287											
288											
289											
290											
291											
292											
293											
294											
295											
296											
297											
298											
299											
300											
301											
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. T3-5A
Type and Diameter of Boring Mud Rotary / 3 and 4 Inches	Boring Location Unit 3 Service Water Tunnel N 363012.09 E 2943233.51		Total Depth 104.1 feet
Drilling Contractor and Rig MACTEC / D. White / CME 55 LC	Elevation at boring 29.05 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method No sampling	Driving Hammer Wt./Drop NA / NA	No. of Samples 0	Date Started 6/15/08
	Borehole Inclination 0	Logged by A. Taylor	Date Completed 6/16/08

Reviewed by / Date HLC 7/3/08

Reviewed by / Date UJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0											Drill to 92.1 ft for first pressuremeter test
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											Drill to 92.1 ft for first pressuremeter test
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85											
86											
87											
88		PMT 2		0/18							Pressuremeter test from 88.0' to 89.5'
89											
90		PMT 1		0/18							Pressuremeter test from 89.5' to 91.0'
91											
92											
93											
94											
95		PMT 4		0/18							Pressuremeter test from 94.5' to 96.0'
96											
97		PMT 3		0/18							Pressuremeter test from 96.0' to 97.5'
98											
99											
100											
101		PMT 6		0/18							Pressuremeter test from 100.5' to 102.0'
102											
103		PMT 5		0/18							Pressuremeter test from 102.0' to 103.5'
104										Boring terminated at 104.1 ft	
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/2/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. T3-5B
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 Service Water Tunnel N 363002.49 E 2943224.87		Total Depth 272 feet
Drilling Contractor and Rig MACTEC / J. Warren / CME 75	Elevation at boring 29.46 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Undisturbed	Driving Hammer Wt./Drop NA / NA	No. of Samples 10	Date Started 6/19/08
	Borehole Inclination 0	Logged by R. Mogulla	Date Completed 6/21/08

Reviewed by / Date HHG 12/2/2008

Reviewed by / Date 12/2/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–15											Boring T3-5B offset approximately 10' west of Boring T3-5 Drill to first sample at 15.5 ft
16–17		UD 1		26/24					ML	BEAUMONT: yellowish brown (10YR 5/6); sand; SILT (ML); moist; fine sand	Pocket Penetometer (TSF): 0.5, 0.75, 1.75 Hand Held Vane Shear (kg/cm^2): 0.2
18–40											

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STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56		UD 2		27.5/24					CH	BEAUMONT: yellowish brown (10YR 5/6); sand; CLAY (CH); moist; some fine sand	Pocket Penetometer (TSF): did not perform Hand Held Vane Shear (kg/cm^2): >1.0
57											
58											
59											
60											
61											
62											
63											
64											
65											
66		UD 3		28/24					SM	BEAUMONT: yellowish red (7.5YR 5/8); silt; SAND (SM); moist; fine sand; some silt	Pocket Penetometer (TSF): did not perform Hand Held Vane Shear (kg/cm^2): 0.35
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99		UD 4		27.5 / 27	27.7	99.5	55/30		CH	BEAUMONT: brown (7.5YR 5/3); CLAY (CH); moist; trace fine sand	Pocket Penetometer (TSF): 1.75, 2.0, 1.75 Hand Held Vane Shear (kg/cm^2): >1.0
100											
101		UD 5		26 / 19					SP	BEAUMONT: greenish gray (GLEY 1 5/1); SAND (SP); moist; medium sand	Pocket Penetometer (TSF): NA Hand Held Vane Shear (kg/cm^2): NA
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120											
121											
122											
123											
124											
125											
126											
127											
128											
129											
130											
131											
132											
133											
134											
135		UD 6		0/24						No recovery Second attempt at 140.0 ft	
136											
137											
138											
139											
140											
141		UD 7		28/24					CH	BEAUMONT: light greenish gray (GLEY 1 8/10R); CLAY (CH); moist; trace sand	Pocket Penetometer (TSF): >4.5 Hand Held Vane Shear (kg/cm^2): 0.45
142											
143											
144											
145											
146											
147											
148											
149											
150											
151											
152											
153											
154											
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160											
161											
162											
163											
164											
165											
166											
167											
168											
169											
170											
171											
172											
173											
174											
175											
176											
177											
178											
179											
180											
181											
182											
183											
184											
185											
186											
187											
188											
189											
190											
191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5B

Depth (feet)	Sample	Sample Type &No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200											
201											
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219											
220											
221											
222											
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233		UD 8		17.5 / 18					CL	BEAUMONT: brown (7.5YR 4/3); sand; CLAY (CL); moist; some fine sand	Pocket Penetometer (TSF): 2.75, 3.0, 2.0 Hand Held Vane Shear (kg/cm^2): 0.71
234											
235											
236											
237											
238											
239											
240											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-5B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240											
241											
242											
243											
244											
245											
246											
247											
248											
249											
250											
251											
252											
253											
254											
255											
256											
257											
258											
259											
260											
261											
262											
263											
264											
265											
266											
267											
268		UD 9		0/24						No recovery Second attempt at 270.0 ft	
269											
270											
271		UD 10		24/24					CH	BEAUMONT: very dark greenish gray (GLEY 1 3/10Y); CLAY (CH); moist	Pocket Penetometer (TSF): 2.75, 3.0, 3.0 Hand Held Vane Shear (kg/cm^2): >1.0
272										Boring terminated at 272 ft	
273											
274											
275											
276											
277											
278											
279											
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. T3-6
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 Service Water Tunnel N 362901.81 E 2943243.19		Total Depth 199.8 feet
Drilling Contractor and Rig JEDI Drilling / CME 75	Elevation at boring 28.97 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.3 / 30 inches	No. of Samples 33	Date Started 5/29/08
	Borehole Inclination 0	Logged by M. Harvey	Date Completed 6/1/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date DS 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	3 4 4	7/18					ML	Grass at surface BEAUMONT: mottled gray (2.5YR 6/1) and pink (2.5YR 8/4); sand; SILT (ML); dry; firm; little fine sand	
4–5	X	SS 2	2 2 3	20/18						BEAUMONT: dark gray (5YR 4/1); sand; clay; SILT (ML); moist; firm; few sand; some clay; increasing clay content with depth	
6–7	X	SS 3	2 1 2	20/18					CL	BEAUMONT: strong brown (7.5YR 5/6); sand; CLAY (CL); moist; soft; some fine sand; lenses of clayey fine sand	
9–10	X	SS 4	2 2 1	14/18					ML	BEAUMONT: strong brown (7.5YR 5/8); sand; SILT (ML); moist; soft; some fine sand	
12–13	X	SS 5	3 2 2	19/18						BEAUMONT: yellowish red (5YR 5/8); sand; SILT (ML); moist; soft; few fine sand; few clay stringers; trace gravel; trace black staining	
14–15	X	SS 6	2 3 2	8/18					SM	BEAUMONT: reddish yellow (7.5YR 5.5/6); silt; SAND (SM); wet; loose; trace gravel; some silt; gravel at contact between silt and sand at 14.3 ft	
19–20	X	SS 7	4 5 3	11/18					SP-SM	BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SP-SM); wet; loose; fine sand; few silt	
24–25	X	SS 8	4 9 7	11/18						BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SP-SM); wet; firm; fine sand; few silt	
29–30	X	SS 9	7 10 9	11/18						BEAUMONT: reddish yellow (7.5YR 5.5/6); silt; SAND (SP-SM); wet; firm; fine sand; few silt	
34–35	X	SS 10	8 16 22	8/18						BEAUMONT: reddish yellow (7.5YR 5.5/6); silt; SAND (SP-SM); wet; dense; fine sand; few silt	
39–40	X	SS 11	5 9 14	11/18						BEAUMONT: reddish yellow (7.5YR 5.5/6); silt; SAND (SP-SM); wet; very firm; fine sand; few silt	

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SP-SM		
44	X	SS 12	8 15 16	15/18						BEAUMONT: reddish yellow (7.5YR 5.5/6); silt; SAND (SP-SM); wet; dense; fine sand; few silt	
45–48											
49	X	SS 13	10 10 10	16/18					CH	BEAUMONT: greenish gray (GLEY 1 5GY 5/1) and reddish yellow (7.5YR 6/6); sand; CLAY (CH); moist; very stiff; little fine sand	
50–53											
54	X	SS 14	4 6 7	21/18						BEAUMONT: light greenish gray (GLEY 1 7/5GY); silt; CLAY (CH); moist; stiff; some silt; trace fine gravel sized nodules	
55–58											
59	X	SS 15	4 7 11	18/18						BEAUMONT: red (2.5YR 4/6); sand; CLAY (CH); moist; very stiff; trace coarse sand with fine sand sized nodules at 59 and 59.4 ft; veins of light greenish gray clay; trace black staining	
60–63											
64	X	SS 16	5 5 5	18/18						BEAUMONT: strong brown (7.5YR 5/6); sand; CLAY (CH); moist; stiff; some fine sand; areas of light green gray; increasing sand content with depth	
65–66									SP-SC		Rig chatter at 65.5 ft
67–68											
69	X	SS 17	5 7 4	13/18						BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SP-SC); wet; firm; fine sand; few clay	
70–73											
74	X	SS 18	9 10 15	13/18						BEAUMONT: light yellowish brown (10YR 6/4); clay; SAND (SP-SC); wet; very firm; fine sand; few clay	
75–78											
79	X	SS 19	7 15 20	13/18						BEAUMONT: light yellowish brown (10YR 6/4); clay; SAND (SP-SC); wet; dense; fine to medium	
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–83									SP-SC	sand; few clay	
84	X	SS 20	17 30 25	15/18					SP	BEAUMONT: light yellowish brown (10YR 6/4) SAND (SP); wet; very dense; fine sand	
85–88											
89	X	SS 21	5 8 10	20/18					CH	BEAUMONT: brown (7.5YR 7/4); sand; CLAY (CH); moist; very stiff; little fine sand	
90–93											
94	X	SS 22	5 8 10	20/18						BEAUMONT: brown (7.5YR 5/3); sand; CLAY (CH); moist; very stiff; little fine sand	
95–98											
99	X	SS 23	4 5 6	24/18					SC	BEAUMONT: light yellowish brown (2.5YR 6/3); clay; SAND (SC); moist; firm; some clay; mostly fine sand; decreasing clay content with depth	
100–108											
109	X	SS 24	5 6 10	20/18					CH	BEAUMONT: light greenish (2.5YR 6/3); sand; CLAY (CH); moist; very stiff; mostly clay; some fine sand; trace gravel sized nodules	
110–118											
119	X	SS 25	9 10 11	16/18						BEAUMONT: yellowish red (5YR 5/6) mottled with light greenish gray (GLEY 1 8/10Y); sand; CLAY	
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	(CH); moist; very stiff; some fine sand; mostly clay; trace black staining	
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 26	6 10 12	18/18						BEAUMONT: yellowish red (5YR 5/6); sand; CLAY (CH); moist; very stiff; little fine sand; mostly clay	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 27	7 10 13	20/18						BEAUMONT: light greenish gray (GLEY 1 7/5GY) mottled with yellowish red (5YR 5/6); sand; CLAY (CH); moist; very stiff; little fine sand; mostly clay	
140											
141											
142											
143											
144											
145											
146											
147											
148											
149	X	SS 28	8 9 14	20/18						BEAUMONT: yellowish red (5YR 5/6) mottled with light greenish gray (GLEY 1 7/5GY); gravel; sand; CLAY (CH); moist; very stiff; mostly clay; some fine sand; trace fine gravel sized nodules at 148.5 ft and 149.4 ft	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 29	8 13 15	18/18						BEAUMONT: yellowish red (5YR 5/6); gravel; sand; CLAY (CH); moist; very stiff; trace fine sand; trace	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH	gravel sized nodules	
161											Rig chatter at 161.5 ft
162											
163											
164											
165											
166											
167											
168											
169	X	SS 30	11 12 10	15/18					SC	BEAUMONT: yellowish red (5YR 5/6); clay; SAND (SC); moist; very firm; fine sand; little clay	
170											
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS 31	6 9 13	17/18					SP-SC	BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SP-SC); moist; very firm; few clay; mostly fine sand	SS-31A: 178.3' to 179.3' SS-31B: 179.3' to 179.8'
180									CH	BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; very stiff; trace fine sand; mostly clay	
181											
182											
183											
184											
185											
186											
187											
188											
189	X	SS 32	7 12 14	19/18						BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; very stiff; trace fine sand; mostly clay	
190											
191											
192											
193											
194											
195											
196											
197											
198											
199	X	SS 33	5 6 16	24/18						BEAUMONT: greenish gray (GLEY 1 5/10Y); sand; silt; CLAY (CH); moist; very stiff; fine sand; little silt	
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200										Boring terminated at 199.8 ft	
201											
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219											
220											
221											
222											
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-7

Type and Diameter of Boring: Mud Rotary / 4 Inches	Boring Location: Unit 3 Service Water Tunnel N 362803.7 E 2943243.08		Total Depth: 279.9 feet
Drilling Contractor and Rig: JEDI Drilling / CME 75	Elevation at boring: 28.8 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Split Spoon	Driving Hammer Wt./Drop: 139.2 / 30 inches	No. of Samples: 39	Date Started: 6/1/08
	Borehole Inclination: 0	Logged by: M. Harvey	Date Completed: 6/12/08

Reviewed by / Date: HJG 7/8/08
Reviewed by / Date: 7/15/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–3	X	SS 1	7 5 5	3/18					GC	FILL: very dark gray (7.5YR 3/1) and reddish yellow (7.5YR 7/6); clay; sand; GRAVEL (GC); dry; loose; little clay; little fine sand	Gravel blocked sampler
4–5	X	SS 2	3 3 3	13/18					CH	BEAUMONT: greenish gray (GLEY 1 5/5GY); sand; CLAY (CH); moist; firm; some fine sand	
6–8	X	SS 3	2 2 3	15/18					SC	BEAUMONT: strong brown (7.5YR 5/6); clay; gravel; SAND (SC); moist; loose; little clay; little gravel	
9–10	X	SS 4	1 2 3	18/18					CH	BEAUMONT: yellowish red (5YR 5/6); sand; gravel; CLAY (CH); moist; firm; some fine sand; little gravel	
11–13	X	SS 5	3 3 3	16/18						BEAUMONT: yellowish red (5YR 5/6); sand; gravel; CLAY (CH); moist; firm; mostly clay; some fine sand; little gravel nodules	
14–18	X	SS 6	1 2 2	19/18					SC	BEAUMONT: yellowish red (5YR 5/6); clay; SAND (SC); wet; very loose; some clay	
19–23	X	SS 7	1 5 6	12/18	22.6					BEAUMONT: yellowish red (5YR 5/6); clay; SAND (SC); wet; firm; mostly fine sand; little clay; trace gravelly nodules	
24–28	X	SS 8	4 6 7	12/18	22.6				SP-SC	BEAUMONT: light brown (7.5YR 6/4); clay; SAND (SP-SC); wet; firm; mostly fine sand; few clay	
29–33	X	SS 9	7 14 14	12/18	22.2				SP	BEAUMONT: strong brown (7.5YR 5/6); SAND (SP); wet; very firm; fine sand; trace fine grains	
34–38	X	SS 10	7 14 22	10/18	23.7					BEAUMONT: strong brown (7.5YR 5/6); SAND (SP); wet; dense; fine sand; trace fine grains	
39–40	X	SS 11	11 29 31	12/18	23.8					BEAUMONT: strong brown (7.5YR 5/6); SAND (SP); wet; very dense; fine sand; trace fine grains	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SP		
44–45	X	SS 12	9 12 15	8/18	23.4				SP-SC	BEAUMONT: reddish yellow (7.5YR 6/6); clay; SAND (SP-SC); wet; very firm; mostly fine sand; few clay	
46–48										BEAUMONT: strong brown (7.5YR 6/6); clay; SAND (SP-SC); wet; very firm; mostly fine sand; few clay	
49	X	SS 13	12 17 9	13/18							SS-13A: 48.4' to 49.4' SS-13B: 49.4' to 49.9'
50–53									CH	BEAUMONT: greenish gray (GLEY 1 7/5GY); sand; CLAY (CH); moist; very stiff; mostly clay; little fine sand	
54–55	X	SS 14	4 6 9	20/18	24.9					BEAUMONT: light greenish gray (GLEY 1 7/10Y); sand; CLAY (CH); moist; stiff; some fine sand; trace gravelly nodules	
56–58											
59–60	X	SS 15	6 7 12	18/18	23.9					BEAUMONT: yellowish red (5YR 5/6) mottled with light greenish gray (GLEY 1 7/10Y); sand; CLAY (CH); moist; very stiff; mostly clay; little fine sand; little calcareous nodules	
61–63											
64–65	X	SS 16	3 5 10	17/18	22.9				SC	BEAUMONT: yellowish red (5YR 5/6) mottled with light greenish gray (GLEY 1 7/5GY); clay; SAND (SC); moist; firm; mostly fine sand; some clay; decreasing sand content with depth	
66–68											
69–70	X	SS 17	5 7 8	12/18	22.6				SP-SC	BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SP-SC); wet; firm; mostly fine sand; few clay	
71–73											
74–75	X	SS 18	7 8 7	12/18	24.2					BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SP-SC); wet; firm; mostly fine sand; few clay	
76–78											
79–80	X	SS 19	11 18 22	11/18	18.4					BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SP-SC); wet; dense; mostly fine sand; few	

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–83									SP-SC	clay	
84	X	SS 20	6 9 11	19/18	23.6				CH	BEAUMONT: brown (7.5YR 5/4); sand; CLAY (CH); moist; very stiff; mostly clay; little fine sand	
89	X	SS 21	4 6 9	21/18	27.7					BEAUMONT: brown (7.5YR 5/6); sand; CLAY (CH); moist; stiff; mostly clay; little fine sand	
94	X	SS 22	4 5 7	19/18	26.2					BEAUMONT: brown (7.5YR 5/3) mottled with light olive gray (5Y 6/2); sand; CLAY (CH); moist; stiff; mostly clay; some fine sand	
99	X	SS 23	WOH 6 8	23/18	34.6					BEAUMONT: grayish brown (10YR 5/2); sand; CLAY (CH); moist; stiff; mostly clay; little fine sand	
109	X	SS 24	9 6 10	16/18	24.5					BEAUMONT: greenish gray (GLEY 1 6/5GY); sand; CLAY (CH); moist; very stiff; some fine sand; trace gravelly nodules	
119	X	SS 25	10 12 15	15/18	20.3					BEAUMONT: yellowish red (5YR 5/6) mottled with light olive gray (5Y 6/2); CLAY (CH); moist; very	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. T3-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	stiff; trace fine sand	
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 26	6 9 11	17/18	22.4					BEAUMONT: reddish brown (5YR 5/4); sand; CLAY (CH); moist; very stiff; little fine sand	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 27	12 12 12	19/18	21.4					BEAUMONT: light greenish gray (GLEY 1 6.5/10Y); sand; CLAY (CH); moist; very stiff; some fine sand; trace gravelly nodules	
140											
141											
142											
143											
144											
145											
146											
147											
148											
149	X	SS 28	5 14 16	15/18	23.2					BEAUMONT: brown (7.5YR 5/4) mottled with light greenish gray (GLEY 1 6.5/10Y); sand; CLAY (CH); moist; very stiff; some fine sand; trace gravelly nodules	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 29	7 9 22	19/18	20.3					BEAUMONT: light greenish gray (GLEY 1 6.5/10Y); sand; CLAY (CH); moist; hard; some fine sand;	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH	trace gravelly nodules; sand content increasing with depth	
161											
162											
163											
164											
165											
166											
167											
168											
169	X	SS 30	7 12 15	13/18						BEAUMONT: yellowish red (5YR 4/6); sand; CLAY (CH); moist; very stiff; mostly clay; some fine sand	
170											
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS 31	7 12 16	16/18	26.2				SC	BEAUMONT: strong brown (7.5YR 5.5/6); clay; SAND (SC); moist; very firm; mostly fine sand; some clay	
180											
181											
182											
183											
184											
185											
186											
187											
188											
189	X	SS 32	8 11 15	21/18	29.1				CH	BEAUMONT: reddish brown (5YR 5/4); sand; CLAY (CH); moist; very stiff; mostly clay; some fine sand	
190											
191											
192											
193											
194											
195											
196											
197											
198											
199	X	SS 33	1 5 9	24/18	33.7					BEAUMONT: greenish gray (GLEY 1 5/5GY); CLAY (CH); moist; stiff; mostly clay; some silt;	
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH	trace shells	
201											
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219	X	SS 34	5 WOH 5	11/18	20.1				SC	BEAUMONT: olive gray (5Y 5/2); clay; SAND (SC); wet; loose; mostly fine sand; some clay; little silt	
220											
221											
222											
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239	X	SS 35	18 25 30	12/18	20.0				SP	BEAUMONT: light greenish gray (GLEY 1 7/5GY); SAND (SP); moist; very dense; fine sand; trace fine	
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. T3-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240–248									SP	grains	
249–250	X	SS 36	9 10 13	20/18	30.2				CH	BEAUMONT: greenish gray (GLEY 1 6/10Y) mottled with brown (10YR 4.5/3); sand; CLAY (CH); moist; very stiff; some fine sand; trace gravelly nodules	
251–258											
259	X	SS 37	9 12 13	18/18						BEAUMONT: brown (7.5YR 4/3); sand; CLAY (CH); moist; very stiff; mostly clay; some fine sand in lenses	SS-37A: 258.4' to 259.3' SS-37B: 259.3' to 259.9'
260									SC	BEAUMONT: brown (10YR 5/3); clay; SAND (SC); moist; firm; mostly fine sand; some clay	
261–268											
269–270	X	SS 38	6 9 13	24/18	38.6				CH	BEAUMONT: dark grayish brown (2.5Y 4/2) and greenish gray (GLEY 1 5/5Y); silt; sand; CLAY (CH); moist; very stiff; mostly clay; some silt; little fine sand	
271–278											
279–280	X	SS 39	5 6 15	24/18	34.3					BEAUMONT: greenish gray (GLEY 2 5/10G); sand; CLAY (CH); moist; very stiff; mostly clay; little fine	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T3-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280										sand; little silt; trace gravelly nodules	
281										Boring terminated at 279.9 ft	
282											
283											
284											
285											
286											
287											
288											
289											
290											
291											
292											
293											
294											
295											
296											
297											
298											
299											
300											
301											
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. T4-1	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 Service Water Tunnel N 363302.37 E 2942313.19		Total Depth 199.8 feet
Drilling Contractor and Rig MACTEC /L. Carter / CME 550	Elevation at boring 32.03 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 138.8 / 30 inches	No. of Samples 33	Date Started 6/4/08
	Borehole Inclination 0	Logged by M.L Herrera	Date Completed 6/11/08

Reviewed by / Date HHC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	31 29 20	10/18					SP-SM	FILL: pale yellow (2.5Y 7/4); SAND (SP-SM); dry; dense; fine to coarse sand; mostly sand; little gravel; few silt; organics	
3–4	X	SS 2	2 4 5	11/18					CH	BEAUMONT: black (5Y 2.5/1); CLAY (CH); moist; stiff; mostly clay; some silt	
6–7	X	SS 3	2 4 5	15/18						BEAUMONT: dark yellowish brown (10YR 4/4) and black (5Y 2.5/1); CLAY (CH); moist; stiff; mostly clay; little silt	
8–9	X	SS 4	2 5 6	19/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; mostly clay; little silt	
11–12	X	SS 5	3 4 7	16.5/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; mostly clay; little silt	
13–14	X	SS 6	3 4 9	19/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; mostly clay	
18–19	X	SS 7	3 5 6	19/18						BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; stiff; mostly clay	
23–24	X	SS 8	1 2 2	17/18					SC	BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SC); moist; very loose; mostly fine sand; some high plasticity clay	
28–29	X	SS 9	1 2 4	9/18						BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SC); moist; loose; mostly fine sand; some high plasticity clay	
33–34	X	SS 10	5 7 10	7/18					SP-SM	BEAUMONT: strong brown (7.5YR 5/6); SAND (SP-SM); wet; firm; mostly fine sand; few silt	
38–39	X	SS 11	6 11 15	12.5/18						BEAUMONT: brownish yellow (10YR 6/6); SAND (SP-SM); wet; very firm; mostly fine sand; few silt	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41									SP-SM		
42											
43	X	SS 12	8 11 13	11.5/18						BEAUMONT: brownish yellow (10YR 6/6); SAND (SP-SM); wet; very firm; mostly fine to medium sand; few silt	
44											
45											
46											
47											
48	X	SS 13	7 8 8	14.5/18					SC	BEAUMONT: yellowish brown (10YR 5/6); clay; SAND (SC); moist; firm; mostly fine sand; some clay	
49											
50											
51											
52											
53	X	SS 14	4 6 7	22/18					CH	BEAUMONT: greenish gray (GLEY 1 5/10GY); CLAY (CH); moist; stiff; mostly clay; some silt	
54											
55											
56											
57											
58	X	SS 15	8 9 11	20/18						BEAUMONT: yellowish brown (10YR 5/6) and light greenish gray (GLEY 1 7/10GY); sand; CLAY (CH); moist; very stiff; mostly clay; some fine sand; few shells	
59											
60											
61											
62											
63	X	SS 16	3 4 6	21/18					SC	BEAUMONT: brown (7.5YR 5/4) and greenish gray (GLEY 1 6/5GY); clay; SAND (SC); moist; loose; mostly fine sand; some high plasticity clay	
64											
65											
66											
67											
68	X	SS 17	5 7 9	23/18						BEAUMONT: brown (7.5YR 5/4) and few greenish gray (GLEY 1 6/5GY); clay; SAND (SC); moist; firm; mostly fine sand; some high plasticity clay	
69											
70											
71											
72											
73	X	SS 18	17 22 29	15/18					SP-SM	BEAUMONT: light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/6); SAND (SP-SM); wet; very dense; mostly medium sand; few silt	
74											
75											
76											
77											
78	X	SS 19	19 24 24	14/18						BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP-SM); wet; dense; mostly medium sand; few silt	
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81									SP-SM		
82											
83	X	SS 20	7 10 15	21/18					CH	BEAUMONT: brown (7.5YR 4/4); CLAY (CH); moist; very stiff; mostly clay; high toughness	
84											
85											
86											
87											
88	X	SS 21	5 7 11	23/18						BEAUMONT: brown (7.5YR 4/4); CLAY (CH); moist; very stiff; mostly clay	
89											
90											
91											
92											
93	X	SS 22	8 10 15	21/18						BEAUMONT: brown (7.5YR 4/2); CLAY (CH); moist; very stiff; mostly clay	
94											
95											
96											
97											
98	X	SS 23	6 7 14	21/18						BEAUMONT: dark grayish brown (10YR 4/2); CLAY (CH); moist; very stiff; mostly clay	
99											
100											
101											
102											
103											
104											
105											
106											
107											
108											
109	X	SS 24	2 9 10	8/18					SP	BEAUMONT: yellowish brown (10YR 5/6); SAND (SP); wet; firm; mostly medium sand; rounded sand	
110											
111											
112											
113											
114											
115											
116											
117										BEAUMONT: brown (10YR 5/4); SAND (SP); wet; dense; mostly medium to coarse sand; rounded sand	
118											SS-24A: 118.3' to 118.7'
119	X	SS 25	9 18 20	24/18					CH	BEAUMONT: light greenish gray (GLEY 1 8/10Y) and yellowish red (5YR 5/6); CLAY (CH); moist;	SS-24B: 118.7' to 119.8'
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	hard; mostly clay; few silt; high toughness	
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 26	9 14 20	14.5 / 18						BEAUMONT: yellowish red (5YR 4/6) and light gray (2.5Y 7/1 to 7/2); sand; CLAY (CH); moist; hard; mostly clay; some fine sand	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 27	7 12 22	15 / 18					SC	BEAUMONT: light greenish gray (GLEY 1 8/10Y) and dark yellowish brown (10YR 4/6); clay; SAND (SC); moist; dense; mostly fine sand; some high plasticity clay	
140											
141											
142											
143											
144											
145											
146											
147											
148											
149	X	SS 28	16 18 20	9 / 18					SP-SM	BEAUMONT: light yellowish brown (10YR 6/4) and light gray (10YR 7/2); SAND (SP-SM); wet; dense; fine to medium sand; rounded sand	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 29	12 16 20	16 / 18					CH	BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; hard; mostly clay	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161											
162											
163											
164											
165											
166											
167											
168											
169	X	SS 30	12 10 19	18/18						BEAUMONT: reddish brown (5YR 5/4) to yellowish red (5YR 5/6); sand; CLAY (CH); moist; very stiff; mostly clay; some fine sand	
170											
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS 31	9 12 17	24/18						BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; very stiff; mostly clay	
180											
181											
182											
183											
184											
185											
186											
187											
188											
189	X	SS 32	8 10 14	27/18						BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; very stiff; mostly clay	
190											
191											
192											
193											
194											
195											
196											
197											
198											
199	X	SS 33	10 12 15	18						BEAUMONT: yellowish brown (10YR 5/6) and light gray (2.5Y 7/1); sand; CLAY (CH); moist; very stiff;	
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200										mostly clay; some fine sand	
201										Boring terminated at 199.8 ft	
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219											
220											
221											
222											
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. T4-2	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 Service Water Tunnel N 363201.32 E 2942281.56		Total Depth 204.3 feet
Drilling Contractor and Rig MACTEC / P. Pitts / CME 55	Elevation at boring 31.58 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 141.1 / 30 inches	No. of Samples 29	Date Started 6/21/08
	Borehole Inclination 0	Logged by D. Athinson	Date Completed 6/24/08

Reviewed by / Date HLC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	10 9 5	14/18					SP-SM	BEAUMONT: pink (5YR 4/3); silt; SAND (SP-SM); dry; firm; fine poorly graded sand; few silt	
2–3									CL	BEAUMONT: yellowish red (5YR 5/8); CLAY (CL); moist; stiff; trace fine sand; trace silt	
4–5	X	SS 2	3 5 5	9/18					MH	BEAUMONT: black (5YR 2.5/1); clay; SILT (MH); moist; stiff; some clay; trace fine sand	
6–7	X	SS 3	1 3 3	15/18					CH	BEAUMONT: brown (7.5YR 4/3); silt; CLAY (CH); moist; firm; few silt; trace gravel	
9–10	X	SS 4	1 2 4	18/18						BEAUMONT: very dark gray (10YR 3/1); silt; CLAY (CH); moist; firm; few silt; trace gravel	
11–12	X	SS 5	3 3 6	18/18						BEAUMONT: yellowish red (5YR 5/8); silt; CLAY (CH); moist; stiff; few silt	
14–15	X	SS 6	3 4 7	16/18						BEAUMONT: yellowish red (5YR 5/8); CLAY (CH); moist; stiff; trace silt	
18–19	X	SS 7	3 5 7	18/18						BEAUMONT: yellowish red (5YR 5/8); CLAY (CH); moist; stiff; trace silt	
23–24	X	SS 8	3 6 7	18/18					SP-SC	BEAUMONT: strong brown (7.5YR 5/8); clay; SAND (SP-SC); wet; firm; fine poorly graded sand; few clay	
28–29	X	SS 9	3 5 6	17/18					SP	BEAUMONT: strong brown (7.5YR 5/8); SAND (SP); wet; firm; fine poorly graded sand; trace silt	
33–34	X	SS 10	5 13 13	16.5/18						BEAUMONT: brown (7.5YR 5/4); SAND (SP); wet; very firm; fine poorly graded sand; trace silt	
38–39	X	SS 11	15 50/2"	7/8						BEAUMONT: brown (7.5YR 5/4); SAND (SP); wet; very dense; fine poorly graded sand; trace silt	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									SP		
41											
42											
43	X	SS 12	15 16 12	18/18						BEAUMONT: brown (7.5YR 5/4); SAND (SP); wet; very firm; trace silt	SS-12A: 42.8' to 43.8' SS-12B: 43.8' to 44.3'
44									CH	BEAUMONT: yellowish red (5YR 5/8); sand; CLAY (CH); moist; very stiff; few sand; trace silt	
45											
46											
47											
48	X	SS 13	5 5 6	18/18						BEAUMONT: strong brown (7.5YR 5/8); sand; CLAY (CH); moist; stiff; some sand; trace silt	
49											
50											
51											
52											
53	X	SS 14	3 6 10	18/18						BEAUMONT: dark greenish gray (GLEY 1 4/10GY); silt; CLAY (CH); moist; very stiff; some silt; trace gravel	
54											
55											
56											
57											
58											
59											
60											
61											
62											
63	X	SS 15	4 6 7	18/18						BEAUMONT: strong brown (7.5YR 5/8); silt; CLAY (CH); moist; stiff; few silt	
64											
65											
66											
67											
68											
69											
70											
71											
72											
73	X	SS 16	20 50/3"	6/9					SP-SM	BEAUMONT: dark yellowish brown (10YR 4/6); silt; SAND (SP-SM); wet; very dense; fine poorly graded sand; few silt	
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81									SP-SM		
82											
83	X	SS 17	6 12 14	18/18					CH	BEAUMONT: strong brown (7.5YR 5/8); silt; CLAY (CH); moist; very stiff; few silt	
84											
85											
86											
87											
88											
89											
90											
91											
92											
93	X	SS 18	7 11 15	18/18						BEAUMONT: brown (7.5YR 4/3); silt; CLAY (CH); moist; very stiff; few silt	
94											
95											
96											
97											
98											
99											
100											
101											
102											
103	X	SS 19	2 5 50/5"	24/17						BEAUMONT: dark grayish brown (2.5Y 4/2); silt; CLAY (CH); moist; hard; some silt; high plasticity	
104											
105											
106											
107											
108											
109											Fine to coarse sand in return water between 103' and 112'
110											
111											
112											
113	X	SS 20	6 7 7	16/18						BEAUMONT: greenish gray (GLEY 1 5GY 6/1); silt; CLAY (CH); moist; stiff; some silt; trace sand; high plasticity	
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123	X	SS 21	7 13 16	24/18						BEAUMONT: reddish brown (2.5YR 5/4) mottled with light greenish gray (GLEY 1 5GY 7/1); silt; CLAY (CH); moist; very stiff; some silt; high plasticity	
124											
125											
126											
127											
128											
129											
130											
131										BEAUMONT: reddish brown (2.5YR 5/4) mottled with light greenish gray (GLEY 1 5GY 7/1); silt; CLAY (CH); moist; very stiff; some silt; high plasticity	
132											
133	X	SS 22	4 9 13	23/18							
134									CL	BEAUMONT: pale yellow (2.5Y 7/1); sand; CLAY (CL); moist; very stiff; some sand; medium plasticity	
135											
136											
137											
138											
139											
140											
141											
142											
143	X	SS 23	7 15 21	12/18					SP-SM	BEAUMONT: pale yellow (2.5Y 7/1) mottled with brownish yellow (10YR 6/6); silt; SAND (SP-SM); moist; dense; few silt; subangular gravel	
144											
145											
146											
147											
148											
149											
150											
151											
152											
153	X	SS 24	16 34 36	14/18						BEAUMONT: gray (2.5Y 6/1); silt; SAND (SP-SM); moist; very dense; few silt	
154											
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160											
161									SP-SM		
162											
163	X	SS 25	14 18 30	24/18					CH	BEAUMONT: reddish brown (2.5YR 4/4) mottled with light gray (2.5Y 7/1); silt; CLAY (CH); moist; hard; some silt; few sand	
164											
165											
166											
167											
168											
169											
170											
171											
172											
173	X	SS 26	10 14 19	18/18						BEAUMONT: reddish brown (2.5YR 4/4); CLAY (CH); moist; hard; trace silt; trace gravel	
174											
175											
176											
177											
178											
179											
180											
181											
182											
183	X	SS 27	10 15 18	18/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; hard; trace silt	
184											
185											
186											
187											
188											
189											
190											
191											
192											
193	X	SS 28	6 14 50	18/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; hard; trace silt	
194											
195									SP-SC	BEAUMONT: light brown (7.5YR 6/4); clay; SAND (SP-SC); moist; very dense; fine poorly graded sand; few clay	
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200											
201									SP-SC		
202											
203	X	SS	6	18					CH	BEAUMONT: greenish gray (GLEY 1 6/5GY); CLAY (CH); moist; very stiff; trace silt; trace gravel	
204		29	10 14	18							
205										Boring terminated at 204.3 ft	
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
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STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. T4-3	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 Service Water Tunnel N 363201.98 E 2942341.95		Total Depth 282.3 feet
Drilling Contractor and Rig MACTEC /L. Carter / CME 550	Elevation at boring 31.56 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 138.8 / 30 inches	No. of Samples 69	Date Started 5/29/08
	Borehole Inclination 0	Logged by M.L Herrera	Date Completed 6/3/08

Reviewed by / Date HLC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–3	X	SS 1	23 23 7	9.5/18					SP	FILL: very pale brown (10YR 8/2); SAND (SP); dry; very firm; medium to coarse sand; mostly sand; few gravel	
4–5	X	SS 2	3 6 5	10.8/18					CH	BEAUMONT: very dark greenish gray (GLEY 1 3/N to 3/10Y); CLAY (CH); moist; stiff; mostly clay	
6–7	X	SS 3	3 3 4	13/18						BEAUMONT: reddish brown (5YR 5/4) to yellowish red (5YR 5/6); CLAY (CH); moist; firm; mostly clay	
9–10	X	SS 4	2 4 6	17/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; mostly clay	
11–12	X	SS 5	3 4 6	18/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; mostly clay	
14–15	X	SS 6	3 4 6	21/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; mostly clay	
16–17	X	SS 7	4 7 8	21.5/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; stiff; mostly clay; high plasticity	
19–20	X	SS 8	3 5 5	20/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; mostly clay; high plasticity	
21–22	X	SS 9	5 3 8	17/18					SC	BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SC); moist; firm; fine sand; mostly sand; some clay	
24–25	X	SS 10	7 6 3	4/18						BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SC); moist; loose; fine sand; mostly sand; some clay	
26–27	X	SS 11	8 13 15	15/18					SP-SC	BEAUMONT: strong brown (7.5YR 5/6); SAND (SP-SC); moist; very firm; fine sand; mostly sand; few clay	
29–30	X	SS 12	3 10 13	14/18						BEAUMONT: strong brown (7.5YR 5/6); SAND (SP-SC); moist; very firm; fine sand; mostly sand; few clay	
31–32	X	SS 13	2 3 4	16/18					SP	BEAUMONT: light brown (7.5YR 6/4); SAND (SP); wet; loose; fine sand; mostly sand	
34–35	X	SS 14	3 4 7	17/18						BEAUMONT: strong brown (7.5YR 5/6); SAND (SP); wet; firm; fine sand; mostly sand	
36–37	X	SS 15	5 13 22	12/18						BEAUMONT: brown (7.5YR 5/4) to strong brown (7.5YR 5/6); SAND (SP); moist; dense; fine sand; mostly sand	
39–40	X	SS 16	4 10 9	20/18						BEAUMONT: yellowish brown (10YR 5/4 to 5/6); SAND (SP); moist; firm; fine sand; mostly sand	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43	X	SS 17	8 22 30	17/18					SP	BEAUMONT: light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/4); SAND (SP); wet; very dense; fine sand; mostly sand	
44–45	X	SS 18	9 6 6	18/18					CH	BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; stiff; mostly clay; high plasticity	
46–47	X	SS 19	4 5 7	22/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; stiff; mostly clay; high plasticity	
48–50	X	SS 20	4 4 5	21/18						BEAUMONT: grayish brown (2.5Y 5/2); CLAY (CH); moist; stiff; mostly clay; high plasticity	
51–52	X	SS 21	3 4 2	24/18						BEAUMONT: dark greenish gray (GLEY 1 10Y 4/1); CLAY (CH); moist; firm; mostly clay; few shells; high plasticity	
53–55	X	SS 22	4 5 8	24/18						BEAUMONT: greenish gray (GLEY 1 5/5GY); CLAY (CH); moist; stiff; mostly clay; few shell fragments; high plasticity	
56–57	X	SS 23	5 7 10	24/18						BEAUMONT: greenish gray (GLEY 1 5/5GY); CLAY (CH); moist; very stiff; mostly clay; high plasticity	
58–60	X	SS 24	6 7 9	21/18						BEAUMONT: greenish gray (GLEY 1 5/5GY); CLAY (CH); moist; very stiff; mostly clay; few sand; high plasticity	
61–62	X	SS 25	7 7 10	20/18						BEAUMONT: brown (7.5YR 5/3); sand; CLAY (CH); moist; very stiff; mostly clay; little sand; high plasticity	
63–65	X	SS 26	5 5 6	0/18						No Recovery	
66–68	X	SS 27	5 6 10	18/18						BEAUMONT: reddish brown (5YR 4/4) and greenish gray (GLEY 1 6/5GY); CLAY (CH); moist; very stiff; mostly clay; high plasticity; medium toughness	
69–70	X	SS 28	3 5 5	26/18					SC	BEAUMONT: brown (7.5YR 5/3) and greenish gray (GLEY 1 6/10Y); clay; SAND (SC); moist; loose; fine sand; mostly sand; some clay	
71–72	X	SS 29	11 22 24	8/18					SP	BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; dense; fine sand; mostly sand; trace clay	
73–75	X	SS 30	22 42 35	15/18						BEAUMONT: brownish yellow (10YR 6/6); SAND (SP); wet; very dense; fine sand; mostly sand	
76–77	X	SS 31	18 20 23	9/18						BEAUMONT: yellowish brown (10YR 5/6); SAND (SP); wet; dense; fine sand; mostly sand	
78–80	X	SS 32	17 29 32	13.5/18						BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); wet; very dense; fine sand; mostly	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP	sand	
81	X	SS 33	6 10 13	19/18					CH	BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; very stiff	
82											
83											
84	X	SS 34	7 9 14	21/18						BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; very stiff	
85											
86	X	SS 35	7 9 10	21/18						BEAUMONT: brown (7.5YR 5/3); CLAY (CH); moist; very stiff	
87											
88											
89	X	SS 36	WOH 7 10	22/18						BEAUMONT: brown (7.5YR 5/3); CLAY (CH); moist; very stiff	
90											
91	X	SS 37	7 9 11	23/18						BEAUMONT: brown (7.5YR 5/2 to 5/3); CLAY (CH); moist; very stiff	
92											
93											
94	X	SS 38	7 9 11	23/18						BEAUMONT: brown (7.5YR 4/2); CLAY (CH); moist; very stiff	
95											
96	X	SS 39	7 10 12	20.5/18						BEAUMONT: brown (10YR 4/3); CLAY (CH); moist; very stiff	
97											
98											
99	X	SS 40	6 7 9	4.5/18						BEAUMONT: brown (10YR 4/3); CLAY (CH); moist; very stiff	
100											
101											
102											
103											
104	X	SS 41	WOH WOH 42	21/18						BEAUMONT: dark grayish brown (10YR 4/2); CLAY (CH); moist; hard	
105											
106											
107											
108											
109	X	SS 42	8 13 21	10/18					SP	BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); wet; dense; medium to coarse sand; mostly sand	
110											
111											
112											
113											
114	X	SS 43	6 9 12	22.5/18					CH	BEAUMONT: greenish gray (GLEY 1 6/5GY) and dark yellowish brown (10YR 4/4); CLAY (CH); moist; very stiff; mostly clay; few shell fragments	
115											
116											
117											
118											
119	X	SS 44	7 8 12	24/18						BEAUMONT: greenish gray (GLEY 1 6/5GY) and strong brown (7.5YR 5/6); CLAY (CH); moist; very	
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	stiff; mostly clay; few shell fragments	
121											
122											
123											
124	X	SS 45	10 13 18	22.5/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; hard; mostly clay; high toughness	
125											
126											
127											
128											
129	X	SS 46	8 11 17	17.5/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; mostly clay; high toughness	
130											
131											
132											
133										BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; mostly clay; high toughness	
134	X	SS 47	7 7 9	21/18						BEAUMONT: light greenish gray (GLEY 1 8/10Y) and yellowish red (5YR 5/6); sand; CLAY (CH); moist; very stiff; mostly clay; some sand	SS-47A: 133.3' to 133.9' SS-47B: 133.9' to 134.8'
135											
136											
137											
138											
139	X	SS 48	6 10 14	7.5/18					SC	BEAUMONT: light yellowish brown (2.5Y 6/4) and light gray (5Y 7/2); clay; SAND (SC); moist; very firm; medium grained sand; mostly sand, some clay; trace shells	
140											
141											
142											
143											
144	X	SS 49	12 20 24	12/18						BEAUMONT: light gray (5Y 7/2); clay; SAND (SC); moist; dense; fine sand; mostly sand; little clay	
145											
146											
147											
148											
149	X	SS 50	18 25 29	11.5/18					SP	BEAUMONT: pale olive (5Y 6/3) and pale yellow (5Y 7/4); SAND (SP); moist; very dense; fine sand; mostly sand	
150											
151											
152											
153											
154	X	SS 51	20 34 46	14.5/18						BEAUMONT: pale brown (10YR 6/2); SAND (SP); moist; very dense; fine to medium sand; mostly sand	
155											
156											
157											
158											
159	X	SS 52	9 10 20	18.5/18					CH	BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); dry; very stiff; mostly clay; high toughness	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161											
162											
163											
164	X	SS 53	8 12 21	21/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); dry; hard; mostly clay; high toughness	
165											
166											
167											
168											
169	X	SS 54	8 8 14	25/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; very stiff	
170											
171											
172											
173											
174	X	SS 55	8 10 14	24/18						BEAUMONT: reddish brown (5Y 4/4); CLAY (CH); dry; very stiff; mostly clay; high toughness	
175											
176											
177											
178											
179	X	SS 56	9 9 15	24/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); dry; very stiff; mostly clay; high toughness	
180											
181											
182											
183											
184	X	SS 57	9 15 18	22.5/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); dry; hard	
185											
186											
187											
188											
189	X	SS 58	3 9 12	15.5/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); dry; very stiff	
190											
191											
192											
193											
194	X	SS 59	8 17 27	16/18						BEAUMONT: light gray (2.5Y 7/2) and yellowish brown (10YR 5/6); sand; CLAY (CH); moist; hard; mostly clay; some sand	
195											
196											
197											
198											
199	X	SS 60	10 13 15	21.5/18						BEAUMONT: light greenish gray (GLEY 1 7/10Y) and yellowish brown (10YR 5/6); sand; CLAY (CH);	
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200–208									CH	moist; very stiff; mostly clay; some sand	
209–210	X	SS 61	4 5 9	2.5/18					ML	BEAUMONT: yellowish brown (10YR 5/4) and light gray (5Y 7/2); SILT (ML); moist; stiff; mostly silt; some clay	
211–218											
219–220	X	SS 62	15 9 10	23/18					CH	BEAUMONT: dark gray (2.5Y 4/1) and light olive brown (2.5Y 5/6); silt; CLAY (CH); moist; very stiff; some silt; trace fine sand	
221–228											
229–230	X	SS 63	WOR WOR 8	21/18						BEAUMONT: very dark grayish brown (2.5Y 3/2) CLAY (CH); moist; firm	
231–238											
239–240	X	SS 64	WOH 8 14	23/18						BEAUMONT: reddish brown (5YR 4/4) and dark greenish gray (GLEY1 4/5GY); CLAY (CH); moist;	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									CH	very stiff; few silt	
241											
242											
243											
244											
245											
246											
247											
248											
249	X	SS 65	7 14 14	23/18						BEAUMONT: greenish gray (GLEY 1 5/5GY) and dark grayish brown (2.5Y 4/2); CLAY (CH); moist; very stiff	
250											
251											
252											
253											
254											
255											
256											
257											
258											
259	X	SS 66	10 20 34	17/18					SC	BEAUMONT: light olive (5Y 6/2) and pale olive (5Y 6/3); clay; SAND (SC); moist; very dense; mostly sand; some clay; fine sand; high plasticity clay	
260											
261											
262											
263											
264											
265											
266											
267											
268											
269	X	SS 67	WOH 10 42	23/18					CH	BEAUMONT: olive (5Y 4/3) and light olive brown (2.5Y 5/6); CLAY (CH); moist; hard; mostly clay; few greenish gray (GLEY 1 6/10Y) fine sand	
270											
271											
272											
273											
274											
275											
276											
277											
278											
279	X	SS 68	WOH WOH 10	0/18						No Recovery	
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281	X	SS 69	9 10 14	22.5 / 18					SC	BEAUMONT: yellowish red (5YR 4/6); sand; CLAY (CH); moist; very stiff; mostly clay; little sand	SS-69A: 280.8' to 281' SS-69B: 281 to 282.3'
282										BEAUMONT: greenish gray (GLEY 1 5/5GY); clay; SAND (SC); moist; very firm; mostly sand; some clay; fine sand; high plasticity clay	
283										Boring terminated at 282.3 ft	
284											
285											
286											
287											
288											
289											
290											
291											
292											
293											
294											
295											
296											
297											
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311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. T4-3A
Type and Diameter of Boring Mud Rotary / 3 and 4 Inches	Boring Location Unit 4 Service Water Tunnel N 363203.59 E 2942351.91		Total Depth 111.5 feet
Drilling Contractor and Rig MACTEC / D. White / CME 55 LC	Elevation at boring 31.55 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method No sampling	Driving Hammer Wt./Drop NA / NA	No. of Samples 0	Date Started 6/12/08
	Borehole Inclination 0	Logged by A. Taylor	Date Completed 6/14/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0											Drill to 87.5 ft for first pressuremeter test
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											Drill to 87.5 ft for first pressuremeter test
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
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62											
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65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85		PMT 2		0/18							Pressuremeter test from 84.5' to 86.0'
86		PMT 1		0/18							Pressuremeter test from 86.0' to 87.5'
87											
88											
89											
90											
91											
92		PMT 4		0/18							Pressuremeter test from 91.5' to 93.0'
93		PMT 3		0/18							Pressuremeter test from 93.0' to 94.5'
94											
95											
96											
97		PMT 6		0/18							Pressuremeter test from 97.0' to 98.5'
98		PMT 5		0/18							Pressuremeter test from 98.5' to 100.0'
99											
100											
101											
102											
103											
104		PMT 8		0/18							Pressuremeter test from 103.5' to 105.0'
105		PMT 7		0/18							Pressuremeter test from105.0' to 106.5'
106											
107											
108											
109		PMT 10		0/18							Pressuremeter test from 108.5' to 110.0'
110		PMT 9		0/18							Pressuremeter test from 110.0' to 111.5'
111											
112										Boring terminated at 111.5 ft	
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. T4-3B
Type and Diameter of Boring Mud Rotary / 4 inches	Boring Location Unit 4 Service Water Tunnel N 363201.89 E 2942335.38		Total Depth 232 feet
Drilling Contractor and Rig MACTEC / J. Warren / CME 75	Elevation at boring 31.74 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Undisturbed	Driving Hammer Wt./Drop NA / NA	No. of Samples 9	Date Started 6/23/08
	Borehole Inclination 0	Logged by R. Mogulla	Date Completed 6/25/08

Reviewed by / Date HLC 7/3/08

Reviewed by / Date DJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–11											Boring T4-3B offset approximately 10' west of Boring T4-3 Drill to first sample at 12 ft
12–14		UD 1		0/24						No Recovery Making another attempt beginning at 15 ft	
15–17		UD 2		24/24					CH	BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist	Pocket Penetometer (TSF): 3.25, 3.5, 3.0 Hand Held Vane Shear (kg/cm^2): >1.0
18–40											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											Pocket Penetometer (TSF): 1.5, 1.5, 1.5
49		UD 3		24/24					CH	BEAUMONT: greenish gray (GLEY 1 6/10Y); CLAY (CH); moist	Hand Held Vane Shear (kg/cm^2): 0.73
50											
51		UD 4		24/24					CH	BEAUMONT: greenish gray (GLEY 1 6/10Y); CLAY (CH); moist	Pocket Penetometer (TSF): 2.25, 2.25, 2.0 Hand Held Vane Shear (kg/cm^2): >1.0
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85											
86											
87											
88		UD 5		15/24					CH	BEAUMONT: brown (7.5YR 5/4); sand; CLAY (CH); moist; some fine sand	Pocket Penetometer (TSF): 1.0, 1.0, 1.0 Hand Held Vane Shear (kg/cm^2): inaccessable to perform tests on exposed soil
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118		UD 6		23/24					CH	BEAUMONT: light greenish gray (GLEY 1 7/10Y) and strong brown (7.5YR 5/6); CLAY (CH); moist; trace fine sand	Pocket Penetometer (TSF): 4.0, 4.5, 4.5 Hand Held Vane Shear (kg/cm^2): >1.0
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120											
121											
122											
123											
124											
125											
126											
127											
128											
129											
130											
131											
132											
133											
134											
135											
136											
137											
138											
139											
140											
141											
142											
143											
144											
145											
146											
147											
148											
149											
150											
151											
152											
153											
154											
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160											
161											
162											
163											
164											
165											
166											
167											
168											
169											
170											
171											
172											
173											
174											
175											
176											
177											
178											
179		UD 7		0/24						No Recovery	
180											
181											
182											
183											
184											
185											
186											
187											
188		UD 8		24/24					CH	BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist	Pocket Penetometer (TSF): 3.0, 3.0, 2.75 Hand Held Vane Shear (kg/cm^2): >1.0
189											
190											
191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-3B

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200											
201											
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219											
220											
221											
222											
223											
224											
225											
226											
227											
228											Pocket Penetometer (TSF): 2.0, 2.25, 2.25
229											Hand Held Vane Shear (kg/cm^2): >1.0
230											
231		UD 9		24/24					CH	BEAUMONT: dark greenish gray (GLEY 1 4/10Y); CLAY (CH); moist	
232										Boring terminated at 232 ft	
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. T4-4	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 Service Water Tunnel N 363102.57 E 2942333.93		Total Depth 200.5 feet
Drilling Contractor and Rig AE Drilling / CME 750 ATV	Elevation at boring 31.38 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.0 / 30 inches	No. of Samples 28	Date Started 6/21/08
	Borehole Inclination 0	Logged by T. Longley	Date Completed 6/22/08

Reviewed by / Date HV 7/3/08

Reviewed by / Date DJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–3	X	SS 1	6 6 7	6/18					SM	FILL: black (N 2.5); silt; SAND (SM); dry; firm	
4–5	X	SS 2	3 3 4	10/18					CH	BEAUMONT: gray (5Y 5/1); CLAY (CH); moist; firm; red mottles	
6–8	X	SS 3	3 3 4	13/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; firm; small black organic flecs; few calcareous concretions	
9–10	X	SS 4	2 3 3	17/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; firm; trace calcareous nodules	
11–13	X	SS 5	3 3 6	19/18						BEAUMONT: yellowish red (5YR 5/6) marbled with light greenish gray (GLEY 1 7/1); CLAY (CH); moist; stiff; trace fine to coarse carbonate sand nodules	
14–18	X	SS 6	4 4 9	21/18						BEAUMONT: yellowish red (5YR 5/6) marbled with light greenish gray (GLEY 1 7/1); CLAY (CH); moist; stiff; calcareous concretions	
19–23	X	SS 7	4 4 7	20/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; white chert; carbonate concretions	
24–28	X	SS 8	5 7 7	12/18					SP	BEAUMONT: light reddish brown (5YR 6/4); SAND (SP); wet; firm; fine sand; trace silt	
29–33	X	SS 9	4 6 8	13/18					SM	BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SM); wet; firm; stratified with occasional silt lenses; rounded gravel	
34–38	X	SS 10	4 7 10	12/18					SP	BEAUMONT: light brown (7.5YR 6/4); SAND (SP); wet; firm	
39–40	X	SS 11	7 9 12	13/18						BEAUMONT: light brown (7.5YR 6/4); SAND (SP); wet; very firm	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SP	BEAUMONT: light yellowish brown (2.5Y 6/3) to yellowish brown (10YR 5/4); SAND (SP); wet; loose	
44–45	X	SS 12	3 4 5	20/18					CH	BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; stiff	
46–48											
49–50	X	SS 13	4 4 5	22/18						BEAUMONT: brown (7.5YR 5/4) to light brown (7.5YR 6/3); CLAY (CH); moist; stiff; thin silt lenses	
51–58											
59–60	X	SS 14	7 7 16	21/18						BEAUMONT: reddish brown (5YR 5/4) to light greenish gray (GLEY 1 7/1); CLAY (CH); moist; very stiff; calcareous nodules from 59 ft to 60 ft	
61–67											
68										BEAUMONT: light reddish brown (5YR 6/4) to reddish brown (5YR 5/4); CLAY (CH); moist; hard	
69	X	SS 15	6 10 22	20/18							
70–78									SP	BEAUMONT: light reddish brown (5YR 6/4); SAND (SP); wet; dense; trace silt	
79–80	X	SS 16	15 23 24	10/18						BEAUMONT: light brown (7.5YR 6/3); SAND (SP); wet; dense; trace silt	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP		
81											
82											
83											
84											
85											
86											
87											
88											
89	X	SS 17	6 8 13	21/18					CH	BEAUMONT: brown (7.5YR 5/3); CLAY (CH); wet; very stiff; high plasticity; trace calcareous concretions	
90											
91											
92											
93											
94											
95											
96											
97											
98											
99	X	SS 18	7 8 10	24/18						BEAUMONT: brown (7.5YR 5/3); CLAY (CH); moist; very stiff; trace silt	
100											
101											
102											
103											
104											
105											
106											
107											
108											
109	X	SS 19	17 13 11	4/18					SP	BEAUMONT: light brown (7.5YR 6/3); SAND (SP); wet; very firm	
110											
111											
112											
113											
114											
115											
116											
117											
118											
119	X	SS 20	5 5 11	22/18					CH	BEAUMONT: light greenish gray (GLEY 1 8/1) and light brown (7.5YR 6/4); CLAY (CH); moist; very	
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	stiff; trace carbonate nodules	
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 21	15 12 16	19/18						BEAUMONT: reddish brown (5YR 4/4) marbled with white (2.5Y 8/1); CLAY (CH); moist; very stiff; trace calcareous nodules; shell fragments	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 22	12 12 23	12/18					CL	BEAUMONT: light gray (5Y 7/1) to olive yellow (2.5Y 6/8); CLAY (CL); moist; hard; trace calcareous nodules	
140											
141											
142											
143											
144											
145											
146											
147											
148											
149	X	SS 23	15 23 26	14/18					SP	BEAUMONT: light gray (5Y 7/1); SAND (SP); wet; dense; calcareous nodules	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 24	17 30 25	4/18						BEAUMONT: light gray (5Y 7/1); SAND (SP); wet; very dense; poorly graded	
160											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160–168									SP		Driller notes gravel layers at 164' to 164.5' and 167' to 167.5'
169–170	X	SS 25	10 14 18	22/18					CH	BEAUMONT: reddish brown (2.5YR 4/4); CLAY (CH); moist; hard; occasional calcareous nodules	
171–178											
179–180	X	SS 26	11 15 23	19/18						BEAUMONT: reddish brown (2.5YR 5/4); CLAY (CH); moist; hard; few sandy to gravelly calcareous nodules	
181–188											
189–190	X	SS 27	11 12 18	24/18						BEAUMONT: reddish brown (2.5YR 5/4); CLAY (CH); moist; very stiff; high plasticity; few light gray (5YR 7/1) clay streaks or dendrites	
191–198											Drove split spoon twice, only first SPT values were recorded First drive - no sample recovery
199–200	X	SS 28	7 15 15	24/18						BEAUMONT: dark yellowish brown (10YR 4/4); CLAY (CH); moist; very stiff; occasional calcareous	Second drive (to 200.5') - 24" recovery

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200										nodules	
201										Boring terminated at 200.5 ft	
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219											
220											
221											
222											
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. T4-5	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 Service Water Tunnel N 363001.52 E 2942349.69		Total Depth 280 feet
Drilling Contractor and Rig MACTEC / D. White / CME 55 LC	Elevation at boring 31.28 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 138.4 / 30 inches	No. of Samples 39	Date Started 5/31/08
	Borehole Inclination 0	Logged by A. Taylor	Date Completed 6/12/08

Reviewed by / Date HJC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	12 10 8	13/18					CH	BEAUMONT: black (5Y 2.5/2); gravel; CLAY (CH); moist; very stiff; little gravel; trace silt	
4–5	X	SS 2	2 4 5	15/18						BEAUMONT: very dark gray (2.5Y 3/1); CLAY (CH); moist; stiff; mostly clay; white nodules	
7	X	SS 3	2 3 4	18/18						BEAUMONT: dark gray (5Y 4/1) and yellowish red (5YR 5/6); CLAY (CH); moist; firm; mostly clay	
9–10	X	SS 4	3 5 7	18/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; stiff; mostly clay	
12	X	SS 5	4 3 5	18/18						BEAUMONT: strong brown (7.5YR 5/6) and light gray (2.5Y 7/2); CLAY (CH); moist; firm; mostly clay	
14–15	X	SS 6	4 7 7	18/18						BEAUMONT: strong brown (7.5YR 5/6) and light gray (2.5Y 7/2); CLAY (CH); moist; stiff; mostly clay	
19–20	X	SS 7	2 4 7	15/18					MH	BEAUMONT: strong brown (7.5YR 5/6); SILT (MH); moist; stiff; mostly silt	
24–25	X	SS 8	4 5 5	4/18					ML	BEAUMONT: yellowish brown (10YR 5/8); sand; SILT (ML); moist; stiff; little sand; mostly silt	
29–30	X	SS 9	2 7 9	8/18					SM	BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); moist; firm; some silt; mostly sand	
34–35	X	SS 10	11 14 13	12/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); moist; very firm; some silt; mostly sand	
39–40	X	SS 11	11 20 25	18/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SM); moist; dense; some silt; mostly sand	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–41									SM		
41–43											Change in strata based on drilling observations
44–45	X	SS 12	3 5 6	18/18					CH	BEAUMONT: reddish yellow (7.5YR 6/6); CLAY (CH); moist; stiff; mostly clay; trace sand	
46–48											
49–50	X	SS 13	3 3 6	18/18						BEAUMONT: dark yellowish brown (10YR 5/4) and olive gray (5Y 5/2); CLAY (CH); moist; stiff; mostly clay	
51–53											
54–55	X	SS 14	4 5 7	18/18						BEAUMONT: gray (5Y 6/1); CLAY (CH); moist; stiff; mostly clay	
56–57											
58											Change in strata based on drilling observations
59–60	X	SS 15	9 12 16	18/18					SM	BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SM); moist; very firm; mostly sand; some silt	
61–63											
64–65	X	SS 16	12 20 24	10/18						BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SM); moist; dense; mostly sand; some silt	
66–68											
69–70	X	SS 17	12 17 27	14/18					SP-SM	BEAUMONT: yellowish brown (10YR 5/8); silt; SAND (SP-SM); moist; dense; mostly sand; few silt	
71–73											
74–75	X	SS 18	21 20 19	11/18					SP	BEAUMONT: light olive brown (2.5Y 5/6); SAND (SP); moist; dense; mostly sand; trace silt	
76–78											
79–80	X	SS 19	17 23 34	13.5/18						BEAUMONT: light olive brown (2.5Y 5/6); SAND (SP); moist; very dense; mostly sand; trace silt	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP		
81											Change in strata based on drilling observations
82											
83											
84	X	SS 20	5 7 11	18/18					CH	BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; mostly clay	
85											
86											
87											
88											
89	X	SS 21	5 9 12	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; mostly clay	
90											
91											
92											
93											
94	X	SS 22	6 8 11	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; mostly clay	
95											
96											
97											
98											
99	X	SS 23	5 8 10	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; mostly clay	
100											
101											
102											
103											
104										No Recovery	
105											
106											
107											
108											
109	X	SS 24	11 14 20	11/18					SP	BEAUMONT: light olive brown (2.5Y 5/3); SAND (SP); moist; dense; mostly sand; trace silt	
110											
111											
112											Change in strata based on drilling observations
113											
114											
115											
116											
117											
118											
119	X	SS 25	8 12 12	18/18					CH	BEAUMONT: light gray (5Y 7/2) and yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; mostly clay	
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 26	9 10 14	18/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; mostly clay	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 27	14 13 16	18/18						BEAUMONT: pale yellow (2.5Y 8/2) and olive yellow (5Y 6/8); CLAY (CH); moist; very stiff; mostly clay; trace sand; white nodules	
140											
141											Change in strata based on drilling observations
142											
143											
144											
145											
146											
147											
148											
149	X	SS 28	13 21 25	10/18					SM	BEAUMONT: olive yellow (2.5Y 6/8) and light gray (5Y 7/1); silt; SAND (SM); moist; dense; mostly sand; some silt	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 29	8 11 18	18/18					CH	BEAUMONT: strong brown (7.5YR 5/6) and white (5Y 8/1); CLAY (CH); moist; very stiff; mostly clay	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161											
162											
163											
164											
165											
166											
167											
168											
169	X	SS 30	4 8 12	18/18						BEAUMONT: reddish brown (7.5YR 6/6); CLAY (CH); moist; very stiff; mostly clay; little silt; trace sand	
170											
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS 31	9 12 16	18/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; mostly clay	
180											
181											
182											
183											
184											
185											
186											
187											
188											
189	X	SS 32	15 20 22	18/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; hard; mostly clay; trace white nodules	
190											
191											
192											
193											
194											
195											
196											
197											
198											
199	X	SS 33	11 11 12	18/18						BEAUMONT: gray (5Y 6/1) and olive yellow (2.5Y 6/6); CLAY (CH); moist; very stiff; mostly clay	
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219	X	SS 34	2 3 12	18/18						BEAUMONT: dark grayish brown (2.5Y 4/2); CLAY (CH); moist; stiff; mostly clay	
220											
221											
222											
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239	X	SS 35	5 13 15	0/18						No Recovery	
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									CH		
241											
242											
243											
244											
245											
246											
247											
248											
249											
250											
251											
252											
253											
254											
255											
256											
257											
258											
259	X	SS 36	5 5 9	0/18						No Recovery	
260											
261											
262											
263											
264	X	SS 37	6 11 14	18/18						BEAUMONT: greenish gray (GLEY 2 6/10G); sand; CLAY (CH); moist; very stiff; mostly clay; some medium to coarse sand	
265											
266											
267											
268											
269	X	SS 38	WOH 6 10	18/18						BEAUMONT: dark gray (2.5Y 4/1); CLAY (CH); moist; very stiff; mostly clay	
270											
271											
272											
273											
274											
275											
276											
277											
278											
279	X	SS 39	6 9 14	18/18						BEAUMONT: greenish gray (GLEY 1 5/5GY); sand; CLAY (CH); moist; very stiff; mostly clay; some	
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280										sand	
281										Boring terminated at 280.0 ft	
282											
283											
284											
285											
286											
287											
288											
289											
290											
291											
292											
293											
294											
295											
296											
297											
298											
299											
300											
301											
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-6

Type and Diameter of Boring: Mud Rotary / 4 Inches	Boring Location: Unit 4 Service Water Tunnel N 362902.61 E 2942332.96		Total Depth: 202.9 feet
Drilling Contractor and Rig: LEWIS ENV / Mobile B-61	Elevation at boring: 31.25 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Split Spoon	Driving Hammer Wt./Drop: 139.8 / 30 inches	No. of Samples: 34	Date Started: 6/1/08
	Borehole Inclination: 0	Logged by: A. Mwembeshi	Date Completed: 6/3/08

Reviewed by / Date HLC 7/3/08
Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	7 7 5	4/18					SM	FILL: pinkish white (7.5YR 8/2); silt; SAND (SM); dry; firm; fine sand; trace gravel	
4–5	X	SS 2	3 2 3	2.5/18					SP	FILL: brown (7.5YR 5/2); gravel; SAND (SP); dry; loose; some gravel	
7–8	X	SS 3	2 3 4	6/18					CH	FILL: yellowish red (5YR 4/6); CLAY (CH); dry; firm; trace gravel; trace organics	
9–10	X	SS 4	3 4 5	15/18					CH	BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; stiff; trace gravel	
12	X	SS 5	3 4 5	14/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff	
14–15	X	SS 6	3 4 7	16/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff	
19	X	SS 7	4 5 5	18/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff	SS-7A: 18.5' to 19.5' SS-7B: 19.5' to 20.0' Began wash drilling at 20 ft
20–23									SM	BEAUMONT: yellowish red (5YR 5/6); silt; SAND (SM); wet; loose, fine sand	
24–25	X	SS 8	3 2 3	21/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; loose; fine sand	
29–30	X	SS 9	3 4 7	10/18						BEAUMONT: strong brown (7.5YR 5/8); silt; SAND (SM); wet; firm; fine sand	
34–35	X	SS 10	4 5 8	14/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; firm; fine sand	
39–40	X	SS 11	19 27 22	12/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); moist; dense; fine to medium sand	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SM		
44–45	X	SS 12	7 6 6	9/18					CH	BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; stiff	
46–48											
49–50	X	SS 13	4 4 4	22/18						BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; firm	
51–53											
54–55	X	SS 14	5 8 9	18/18						BEAUMONT: greenish gray (GLEY 1 5/10GY); CLAY (CH); moist; very stiff	
56–58											
59–60	X	SS 15	8 9 11	17/18					SC	BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SC); moist; firm; fine sand; some clay; little silt	
61–63											
64–65	X	SS 16	6 9 8	14/18					SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); moist; firm; fine sand	
66–68											
69–70	X	SS 17	13 20 21	12/18						BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); wet; dense; fine sand	
71–73											
74–75	X	SS 18	13 25 20	9/18						BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); moist; dense; fine sand	
76–78											
79–80	X	SS 19	11 15 13	8.5/18						BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SM); wet; very firm; fine sand	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SM		
81											
82											
83											
84	X	SS 20	6 9 13	17/18					CH	BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff	
85											
86											
87											
88											
89	X	SS 21	6 9 11	19/18						BEAUMONT: brown (7.5YR 4/4); CLAY (CH); moist; very stiff	
90											
91											
92											
93											
94	X	SS 22	6 10 12	22/18						BEAUMONT: brown (7.5YR 4/4); CLAY (CH); moist; very stiff	
95											
96											
97											
98											
99	X	SS 23	6 9 10	21/18						BEAUMONT: strong brown (7.5YR 4/6) and bluish gray (GLEY 2 6/5B); CLAY (CH); moist; very stiff	
100											
101											
102											
103											
104											
105											
106											
107											
108											
109	X	SS 24	6 8 11	22/18						BEAUMONT: light greenish gray (GLEY 1 7/5GY); CLAY (CH); moist; very stiff	
110											
111											
112											
113											
114											
115											
116											
117											
118											
119	X	SS 25	7 9 11	20/18						BEAUMONT: light greenish gray (GLEY 1 8/5GY) some strong brown (7.5YR 5/6); CLAY (CH); moist;	
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120–128									CH	very stiff	
129–130	X	SS 26	17 21 18	18					SM / CH	BEAUMONT: strong brown (7.5YR 5/8); silt; SAND (SM); wet; dense; fine sand BEAUMONT: strong brown (7.5YR 5/8); CLAY (CH); moist; hard	SS-26A: 128.5' to 129.2' SS-26B: 129.2' to 130.0'
131–138											Driller indicated to have lost water circulation between 130 and 140 ft
139–140	X	SS 27	12 13 16	14.5 / 18					SC	BEAUMONT: light greenish gray (GLEY 1 7/10Y); clay; SAND (SC); moist; very firm; fine sand	
141–148											
149–150	X	SS 28	15 19 25	10 / 18					SM	BEAUMONT: light greenish gray (GLEY 1 7/5GY); silt; SAND (SM); wet; dense; fine sand	
151–158											
159–160	X	SS 29	8 12 16	18 / 18					CH	BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161											
162											
163											
164											
165											
166											
167										BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; hard	
168											
169	X	SS 30	12 21 50/5"	13/17					SM	BEAUMONT: reddish brown (7.5YR 5/6); silt; SAND (SM); moist; very dense; fine sand	SS-30A: 168.5' to 168.9' SS-30B: 168.9' to 169.6'
170											
171											
172											
173											
174											
175											
176											
177										BEAUMONT: reddish brown (5YR 5/4); silt; SAND (SM); moist; very firm; fine sand	
178											
179	X	SS 31	10 14 15	18/18					CH	BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); dry; very stiff	SS-31A: 178.5' to 178.75' SS-31B: 178.75' to 180.0'
180											
181											
182											
183											
184											
185											
186											
187											
188											
189	X	SS 32	9 15 22	10/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; hard; trace fine sand; trace gravel	
190											
191											
192											
193											
194											
195											
196											
197											
198											
199	X	SS 33	8 20 17	0/18						No Recovery	
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200											
201											
202	X	SS 34	5 7 10	23/18						BEAUMONT: grayish brown (10YR 5/2); CLAY (CH); moist; very stiff	
203										Boring terminated at 202.9 ft	
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219											
220											
221											
222											
223											
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. T4-7	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 Service Water Tunnel N 362801.49 E 2942350.24		Total Depth 284.5 feet
Drilling Contractor and Rig Miller Drilling / CME 750 ATV	Elevation at boring 31.12 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.6 / 30 inches	No. of Samples 38	Date Started 6/1/08
	Borehole Inclination 0	Logged by R. Clark	Date Completed 6/4/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	6 9 4	10/18					SW	FILL: brownish yellow (10YR 6/6); SAND (SW); moist; firm; HCl reaction	SS-1A: 0' to 1.5' SS-1B: 1.0' to 1.5'
1–3									CH	BEAUMONT: brown (10YR 5/3); CLAY (CH); moist; stiff; high plasticity; HCl reaction	
3–5	X	SS 2	2 3 3	15/18						BEAUMONT: dark gray (10YR 4/1); CLAY (CH); moist; firm; little silt; high plasticity; trace organics; very weak HCl reaction; trace gravel sized calcium carbonate nodules	
5–7	X	SS 3	4 3 3	16/18						BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; firm; little silt; high plasticity; trace granule sized calcium carbonate nodules; HCl reaction	
7–9	X	SS 4	2 3 4	18/18						BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; firm; little silt; high plasticity; trace granule sized calcium carbonate nodules; HCl reaction; slightly mottled	
9–11	X	SS 5	3 4 5	18/18						BEAUMONT: reddish brown (2.5YR 5/4); CLAY (CH); moist; stiff; little silt; high plasticity; HCl reaction; slightly mottled	
11–13	X	SS 6	3 4 4	18/18						BEAUMONT: yellow red (5YR 5/6); CLAY (CH); moist; firm; little silt; high plasticity; HCl reaction; slightly mottled	
13–15	X	SS 7	3 3 3	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; firm; high plasticity; blocky; HCl reaction	
15–17	X	SS 8	4 5 6	18/18					SM	BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SM); wet; firm; mostly fine quartz sand; some silt; HCl reaction; particle size increases with depth	
17–19	X	SS 9	4 4 4	18/18					SP-SM	BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SP-SM); wet; loose; HCl reaction; mostly fine poorly graded quartz sand; some silt	
19–21	X	SS 10	5 6 8	14/18						BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SP-SM); wet; firm, mostly fine poorly graded quartz sand; few silt; HCl reaction	
21–23	X	SS 11	8 12 15	14/18						BEAUMONT: very pale brown (10YR 7/4); silt; SAND (SP-SM); wet; very firm, mostly fine poorly graded quartz sand; few silt; HCl reaction	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–44	X	SS 12	8 13 7	15/18					SP-SM	BEAUMONT: very pale brown (10YR 7/4); silt; SAND (SP-SM); wet; firm, mostly fine poorly graded quartz sand; few silt; HCl reaction`	SS-12A: 43.0' to 44.1' SS-12B: 44.1' to 44.5'
45–47									CH	BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; high plasticity; HCl reaction	
48–49	X	SS 13	4 4 6	20/18						BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; stiff; high plasticity; HCl reaction; blocky; slightly mottled	
50–52											
53–54	X	SS 14	4 5 6	18/18						BEAUMONT: greenish gray (GLEY 1 10Y 7/1); CLAY (CH); moist; stiff; high plasticity; HCl reaction; trace coarse sand sized calcium carbonate nodules	
55–57											
58–59	X	SS 15	14 10 11	18/18					CL	BEAUMONT: pale yellow (5Y 7/3) to strong brown (7.5Y 5/6); silt; sand; CLAY (CL); moist; very stiff; HCl reaction; some fine sand; some silt; trace coarse sand and gravel; slight plasticity	
60–62											
63–64	X	SS 16	6 10 11	18/18					ML	BEAUMONT: light brown (7.5Y 6/4); clay; sand; SILT (ML); wet; very stiff; some fine sand; some clay; slight plasticity	
65–67											
68–69	X	SS 17	10 11 15	15/18					SP-SM	BEAUMONT: light brown (7.5YR 5/4); silt; SAND (SP-SM); wet; very firm; mostly fine poorly graded quartz sand; few silt; HCl reaction; slight stratification observed	
70–72											
73–74	X	SS 18	10 17 18	15/18						BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SP-SM); wet; dense; mostly fine poorly graded quartz sand; few silt; HCl reaction	
75–77											
78–79	X	SS 19	10 11 17	14/18						BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SP-SM); wet; very firm; mostly fine poorly graded quartz sand; few silt; HCl reaction	
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81									SP-SM		
82											
83	X	SS 20	10 10 9	17/18					ML	BEAUMONT: reddish yellow (7.5YR 6/6); clay; SILT (ML); wet; very stiff; mostly silt; some clay; trace fine sand; slight plasticity; HCl reaction	
84											
85											
86											
87											
88	X	SS 21	6 7 8	19/18					CH	BEAUMONT: greenish gray (GLEY 1 10Y 7/1); CLAY (CH); moist; stiff; mostly clay; little silt; trace sand; calcium carbonate nodules; high plasticity; HCl reaction	
89											
90											
91											
92											
93	X	SS 22	8 9 12	19/18						BEAUMONT: light brownish gray (2.5Y 6/2); CLAY (CH); moist; very stiff; mostly clay; little silt; high plasticity; HCl reaction; trace calcium carbonate and manganese nodules	
94											
95											
96											
97											
98	X	SS 23	8 9 12	18/18						BEAUMONT: yellowish red (5YR 5/6) mottled with light gray (GLEY 1 5GY 8/1); CLAY (CH); moist; very stiff; HCl reaction; high plasticity	
99											
100											
101											
102											
103	X	SS 24	8 8 12	19/18						BEAUMONT: reddish brown (5YR 5/4) mottled with light gray (GLEY 1 5GY 8/1); CLAY (CH); moist; very stiff; HCl reaction; high plasticity	
104											
105											
106											Lost all drill fluid circulation at approximately 110 ft.
107											
108											
109											
110											
111											Probable sand layer from 110 ft to 113 ft
112											
113	X	SS 25	7 7 10	17/18						BEAUMONT: light gray (2.5Y 7/2); CLAY (CH); moist; very stiff; trace dark clay; high plasticity; HCl reaction; trace calcium carbonate nodules; black (2.5Y 2.5/1) inclusions	Fluid return at 113 ft
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123	X	SS 26	8 9 13	19/18						BEAUMONT: yellowish red (5YR 5/6) mottled with light greenish gray (GLEY 1 5GY 8/1); CLAY (CH); moist; very stiff; HCl reaction	
124											
125											
126											
127											
128											
129											
130											
131											
132											
133	X	SS 27	9 11 12	19/18						BEAUMONT: reddish brown (2.5YR 5/4) mottled with light greenish gray (GLEY 1 5GY 8/1); CLAY (CH); moist; very stiff; high plasticity; HCl reaction	
134											
135											
136											
137											
138											
139											
140											
141											
142											
143	X	SS 28	6 13 20	15/18					CL	BEAUMONT: pale yellow (5Y 7/3); sand; CLAY (CL); moist; hard; slight plasticity; some fine sand; mostly clay; HCl reaction	
144											
145											
146											
147											
148											
149											
150											
151											
152											
153	X	SS 29	13 15 20	17/18					SP-SM	BEAUMONT: light gray (5Y 7/2); silt; SAND (SP-SM); wet; dense; mostly fine poorly graded quartz sand; few silt; HCl reaction; slight laminations	
154											
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160–162									SP-SM		
163–164	X	SS 30	5 11 23	18/18					SM	BEAUMONT: light brown (7.5YR 6/4); silt; clay; SAND (SM); wet; dense; mostly fine quartz sand; some silt; clayey lenses	SS-30A: 163' to 164.2' SS-30B: 164.2' to 164.5'
165–172									CH	BEAUMONT: brownish yellow (10YR 6/6); sand; CLAY (CH); moist; hard; high plasticity	
173–174	X	SS 31	21 22 19	18/18					SM	BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SM); wet; dense; mostly fine quartz sand; trace brownish yellow (10YR 6/6) clay lenses; high plasticity	
175–182											
183–184	X	SS 32	22 27 28	18/18					SP-SM	BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SP-SM); wet; very dense; mostly fine poorly graded quartz sand; HCl reaction	
185–188											
189–192											Driller indicated a change in drilling resistance at 189 ft
193–194	X	SS 33	11 16 18	9/18					CH	BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; hard; little silt; high plasticity; HCl reaction	Sand catcher damaged while driving SPT Poor sample recovery
195–200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202											
203	X	SS 34	8 10 10	20 / 18						BEAUMONT: pale brown (10YR 6/3) mottled slightly with light greenish gray (GLEY 1 5GY 8/1); CLAY (CH); moist; very stiff; high plasticity; HCl reaction	
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219											
220											
221											
222											
223	X	SS 35	WOR WOR 6	19 / 18						BEAUMONT: very dark gray (2.5Y 3/1); CLAY (CH); moist; firm; high plasticity; finely laminated	
224											
225											
226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									CH		
241											
242											
243		SS 36	7 12 15	18/18					CL	BEAUMONT: greenish gray (GLEY 1 10GY 6/1); silt; sand; CLAY (CL); moist; very stiff; moderate plasticity; mostly clay; little silt and sand; HCl reaction; trace gravel sized calcium carbonate nodules; trace shells	
244											
245											
246											
247											
248											
249											
250											
251											
252											
253											
254											
255											
256											
257											
258											
259											
260											
261											
262											
263		SS 37	6 11 13	18/18					CH	BEAUMONT: olive (5Y 5/3); CLAY (CH); moist; very stiff; some silt; mostly clay; high plasticity; HCl reaction; laminations observed	
264											
265											
266											
267											
268											
269											
270											
271											
272											
273											
274											
275											
276											
277											
278											
279											
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. T4-7

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281											
282										BEAUMONT: greenish gray (GLEY 1 5GY 5/1); CLAY (CH); moist; very stiff; some silt; HCl reaction; slightly mottled	
283		SS 38	7 14 16	18 18							SS-38A: 283.0' to 284.0' SS-38B: 284.0' to 284.5'
284									SM	BEAUMONT: greenish gray (GLEY 1 10Y 5/1); clay; silt; SAND (SM); wet; very firm; mostly fine quartz sand; HCl reaction	
285										Boring terminated at 284.5 ft	
286											
287											
288											
289											
290											
291											
292											
293											
294											
295											
296											
297											
298											
299											
300											
301											
302											
303											
304											
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306											
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311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-1

Type and Diameter of Boring: Mud Rotary / 4 Inches	Boring Location: Unit 3 UHS, N 362566.46 E 2943213.19		Total Depth: 307.3 feet
Drilling Contractor and Rig: Miller Drilling / CME 550	Elevation at boring: 29.63 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Split Spoon	Driving Hammer Wt./Drop: 139.2 / 30 inches	No. of Samples: 39	Date Started: 6/17/08
	Borehole Inclination: 0	Logged by: N. Smith	Date Completed: 6/22/08

Reviewed by / Date HLG 7/3/08
Reviewed by / Date VJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	12 18 13	7/18					CL	BEAUMONT: pink (7.5YR 7/3); silt; CLAY (CL); dry; hard; some silt; trace poorly graded gravel	
4–5	X	SS 2	1 2 1	6/18					CH	BEAUMONT: black (5Y 2.5/1); CLAY (CH); moist; soft; little silt	
7	X	SS 3	1 1 1	12/18						BEAUMONT: black (5Y 2.5/1); CLAY (CH); moist; soft; few silt	
9–10	X	SS 4	1 3 3	11/18					SM	BEAUMONT: light olive brown (2.5Y 5/4); silt; SAND (SM); moist; loose; little silt; trace gravel	
12	X	SS 5	4 2 2	15/18					SP-SM	BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SP-SM); moist; very loose; few silt; trace gravel	
14–15	X	SS 6	4 5 7	18/18					CH	BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; stiff; mostly clay; few silt	
18–19	X	SS 7	3 5 3	22/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; firm; mostly clay; few silt	
22	X	SS 8	4 11 12	12/18					SM	BEAUMONT: yellowish brown (10YR 5/8); silt; SAND (SM); wet; very firm; mostly sand; little silt	
27	X	SS 9	9 18 17	12/18					SP-SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; dense; mostly sand; few silt	
32	X	SS 10	9 13 19	13/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SP-SM); wet; dense; mostly sand; few silt	
37	X	SS 11	3 7 16	11.5/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SP-SM); wet; very firm; mostly sand; few silt	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–45									SP-SM	BEAUMONT: yellowish brown (10YR 5/4); silt; SAND (SP-SM); wet; very firm; mostly sand; few silt	
41–42	X	SS 12	6 10 15	11.5/18							
46–50									SM	BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SM); wet; very firm; mostly sand; some silt; trace clay	
46–47	X	SS 13	9 11 12	16/18							
51–60									CH	BEAUMONT: greenish gray (5G 6/1); CLAY (CH); moist; firm; mostly clay; little silt; calcareous nodules	
51–52	X	SS 14	1 3 5	18/18							
61–70									SM	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); wet; firm; mostly sand; some silt	
61–62	X	SS 15	9 8 9	14.5/18							
71–80									SP-SM	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SP-SM); wet; dense; mostly sand; few silt	
71–72	X	SS 16	12 18 19	14.5/18							

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81									SP-SM		
82											
83											
84	X	SS 17	9 15 17	19.5 / 18					CL	BEAUMONT: brown (7.5YR 5/4); silt; CLAY (CL); wet; hard; mostly clay; some silt; calcareous nodules	
85											
86											
87											
88											
89											
90											
91											
92											
93											
94	X	SS 18	6 7 12	16 / 18					CH	BEAUMONT: gray (2.5YR 6/1); CLAY (CH); moist; very stiff; mostly clay; few silt; calcareous nodules	
95											
96											
97											
98											
99											
100											
101											
102											
103											
104	X	SS 19	4 7 10	18 / 18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; mostly clay; few silt	
105											
106											
107											
108											
109											
110											
111											
112											
113											
114	X	SS 20	5 15 17	18.5 / 18						BEAUMONT: light gray (5Y 7/1); CLAY (CH); moist; hard; few silt; calcareous nodules; black nodules	
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123											
124	X	SS 21	5 8 15	19 / 18						BEAUMONT: yellowish red (5YR 4/6) mottled with light gray (5Y 7/1); CLAY (CH); moist; very stiff; mostly clay; few silt	
125											
126											
127											
128											
129											
130											
131											
132											
133											
134	X	SS 22	6 9 15	21 / 18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff; mostly clay; few silt	
135											
136											
137											
138											
139											
140											
141											
142											
143											
144	X	SS 23	5 10 17	19.5 / 18						BEAUMONT: gray (10YR 6/1); CLAY (CH); moist; very stiff; mostly clay; little silt; calcareous nodules	
145											
146											
147											
148											
149											
150											
151											
152											
153	X	SS 24	28 45 50	12 / 18					SM	BEAUMONT: reddish brown (5YR 5/4); silt; SAND (SM); moist; very dense; mostly sand; some silt	
154											
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									SM		
161											
162											
163	X	SS 25	17 27 25	20 / 18					MH	BEAUMONT: strong brown (7.5YR 4/6); SILT (MH); moist; hard; mostly silt; little clay	
164											
165											
166											
167											
168											
169											
170											
171											
172											
173											
174	X	SS 26	7 12 17	21 / 18					CH	BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; very stiff; mostly clay; few silt	
175											
176											
177											
178											
179											
180											
181											
182											
183	X	SS 27	6 8 11	23.5 / 18						BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; very stiff; mostly clay; few silt	
184											
185											
186											
187											
188											
189											
190											
191											
192											
193	X	SS 28	5 8 15	25 / 18						BEAUMONT: brown (7.5YR 4/4); CLAY (CH); moist; very stiff; mostly clay; trace silt	
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202											
203											
204	X	SS 29	3 7 13	24 / 18						BEAUMONT: dark gray (10YR 4/1); CLAY (CH); moist; very stiff; mostly clay	
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215	X	SS 30	6 12 15	24 / 18						BEAUMONT: dark bluish gray (5B 4/1); CLAY (CH); moist; very stiff; mostly clay; trace silt; high plasticity	
216											
217											
218											
219											
220											
221											
222											
223											
224											
225	X	SS 31	6 10 13	25.5 / 18						BEAUMONT: dark greenish gray (5G 4/1); CLAY (CH); moist; very stiff; mostly clay; trace silt	
226											
227											
228											
229											
230											
231											
232											
233	X	SS 32	12 18 19	24 / 18					CL	BEAUMONT: dark gray (10YR 4/1); silt; CLAY (CL); moist; hard; mostly clay; some silt; black organics	
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240–242									CL		
243–244	X	SS 33	4 7 11	23/18					CH	BEAUMONT: dark gray (10YR 4/1) mottled with dark yellowish brown (10YR 4/4); CLAY (CH); moist; very stiff; mostly clay; few silt	
245–252											
253–254	X	SS 34	12 15 17	6/18						BEAUMONT: gray (2.5Y 5/1); CLAY (CH); moist; hard; mostly clay; little silt; calcareous nodules	
255–265											
266–267	X	SS 35	6 7 16	23/18					CL	BEAUMONT: grayish brown (2.5Y 5/2); silt; CLAY (CL); moist; very stiff; mostly clay; some silt	
268–273											
274–275	X	SS 36	5 5 10	24/18					CH	BEAUMONT: dark olive gray (5Y 3/2); CLAY (CH); moist; stiff; mostly clay; few silt	
276–280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281											
282											
283											
284											
285											
286											
287	X	SS 37	6 9 14	26 18						BEAUMONT: greenish gray (5BG 5/1); CLAY (CH); moist; very stiff; mostly clay; few silt; calcareous nodules	
288											
289											
290											
291											
292											
293											
294											
295											
296	X	SS 38	19 17 17	15 18					SM	BEAUMONT: olive (5Y 4/3); silt; SAND (SM); moist; dense; mostly sand; some silt	
297											
298											
299											
300											
301											
302											
303											
304											
305											
306	X	SS 39	7 9 13	23 18					CH	BEAUMONT: brown (7.5YR 4/2); CLAY (CH); moist; very stiff; mostly clay; few silt	
307											
308										Boring terminated at 307.3 ft	
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. U3-2	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 UHS N 362571.77 E 2943506.16		Total Depth 300 feet
Drilling Contractor and Rig AE Drilling / CME 750 ATV	Elevation at boring 29.34 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.0 / 30 inches	No. of Samples 38	Date Started 6/17/08
	Borehole Inclination 0	Logged by T. Longley	Date Completed 6/20/08

Reviewed by / Date HG 7/3/08

Reviewed by / Date VJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–2	X	SS 1	6 18 6	6/18					SW	FILL: gravel; SAND (SW); wet; very firm; well-graded sand; rounded to subangular gravel	
4–5	X	SS 2	2 2 3	13/18					CH	BEAUMONT: black (GLEY 1 3/N); CLAY (CH); moist; firm; trace silt; trace calcium nodules	
6–7	X	SS 3	3 2 3	16/18						BEAUMONT: black (GLEY 1 3N) to yellowish brown (10YR 5/3) and gray (10YR 7/2); CLAY (CH); moist; firm; trace fine to coarse sand; high plasticity	
9–10	X	SS 4	3 2 3	19/18						BEAUMONT: reddish yellow (7.5YR 6/6); CLAY (CH); moist; firm; slightly mottled	
11–12	X	SS 5	2 1 4	24/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; firm; slightly mottled	
14–15	X	SS 6	3 4 5	19/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; gray mottles; trace calcareous nodules	
19–20	X	SS 7	4 3 9	18/18					ML	BEAUMONT: yellowish red (5YR 5/6); SILT (ML); wet; stiff; slight plasticity; gravelly nodules at 20 ft	
24–25	X	SS 8	6 4 4	22/18						BEAUMONT: yellowish red (5YR 4/6); SILT (ML); wet; firm; few fine sand	
29–30	X	SS 9	8 11 18	13/18					SM	BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SM); wet; very firm; little silt; non plastic	
34–35	X	SS 10	15 29 39	13/18					SP	BEAUMONT: reddish yellow (7.5YR 6/6); SAND (SP); wet; very dense; trace silt; fine sand; traces of very dense coarse sand concretions	
39–40	X	SS 11	13 15 21	13/18						BEAUMONT: pink (7.5YR 7/4); SAND (SP); wet; dense; trace silt; fine sand; massive	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									SP		Driller indicated easier drilling below 40 ft
41											
42											
43											
44	X	SS 12	5 5 7	23/18					CL	BEAUMONT: reddish brown (5YR 4/4); CLAY (CL); moist; stiff; light gray mottles	
45											
46											
47											
48											
49	X	SS 13	3 4 5	24/18					CH	BEAUMONT: gray (5YR 6/1) and weak red (10R 5/4); CLAY (CH); moist; stiff; nodules; light gray mottles; massive	
50											
51											
52											
53											
54											
55											
56											
57											
58											
59	X	SS 14	5 6 10	24/18						BEAUMONT: yellowish red (5YR 5/6) mottled with gray (5YR 7/1); CLAY (CH); moist; very stiff; trace silt; high plasticity	
60											
61											Driller indicated possible gravel zone based on rod chatter at 61 ft in depth
62											
63											
64											Strong artesian water flow at 63.5 ft
65											
66											
67											
68											
69	X	SS 15	5 4 4	24/18						BEAUMONT: reddish brown (5YR 5/4); sand; CLAY (CH); moist; firm; little fine to coarse sand	
70											
71											
72											
73											
74											
75											
76											
77											
78											
79	X	SS 16	16 27 30	6/18					SP-SM	BEAUMONT: pale yellow (2.5Y 7/3); silt; SAND (SP-SM); wet; very dense; few silt, trace clay;	
80											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–88									SP-SM	poorly graded; dialates rapidly	
89–90	X	SS 17	11 15 23	17/18					CH	BEAUMONT: yellowish brown (10YR 5/6); CLAY (CH); moist; hard; numerous gray and white concretions	
91–98											
99–100	X	SS 18	6 7 12	24/18						BEAUMONT: yellowish red (5YR 5/6) mottled with light greenish gray (GLEY 1 8/1); CLAY (CH); moist; very stiff; few calcareous nodules	
101–108											
109–110	X	SS 19	20 27 22	15/18					SC	BEAUMONT: gray (5YR 6/1) and red (2.5YR 5/3) with light greenish gray (GLEY 1 8/1) mottling; clay; SAND (SC); wet; dense; fine sand	
111–118											
119–120	X	SS 20	6 8 13	23/18					CH	BEAUMONT: yellowish red (5YR 5/8) and light gray (2.5Y 7/1); sand; CLAY (CH); moist; very stiff; fine	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	sand and silt	
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 21	7 9 13	24 18						BEAUMONT: pale red (10R 6/4) slight white (7.5YR 8/1) mottling; CLAY (CH); moist; very stiff; trace to few carbonate nodules	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 22	10 14 21	23 18					CL	BEAUMONT: light gray (2.5Y 7/1) slightly mottled with brownish yellow (10YR 6/6); CLAY (CH); moist; hard; trace fine sand; trace gravelly calcareous concretions; black streaks/dendrites at 140 ft	
140											
141											
142											
143											
144											
145											
146											
147										BEAUMONT: light gray (2.5Y 7/1) slightly mottled with brownish yellow (10YR 6/6); CLAY (CH); moist; hard; trace fine sand	
148											
149	X	SS 23	9 26 37	16 18					SP	BEAUMONT: light brown (7.5YR 6/4); SAND (SP); wet; very dense; trace fine grains; fine sand; stratified	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 24	24 48 50/3"	14 15						BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); wet; very dense; trace silt; 1-inch clay	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									SP	lense at 159 ft; stratified	
161											
162											
163											
164											
165											
166											
167											Driller indicated possible 1 ft gravel layer at 167 ft
168											
169	X	SS 25	9 10 15	24 18					CH	BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; occasional light gray (GLEY 1 7/1) marbling	
170											
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS 26	12 11 12	16 18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; occasional light gray (GLEY 1 7/1) marbling	
180											
181											
182											
183											
184											
185											
186											
187											
188											
189	X	SS 27	13 14 20	24 18						BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; hard; slight mottling; massive	
190											
191											
192											
193											
194											
195											
196											
197											
198											
199	X	SS 28	6 9 13	24 18						BEAUMONT: greenish gray (GLEY 1 6/1); CLAY (CH); moist; very stiff; high plasticity; few fine black	
200											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH	organic spots	
201											
202											
203											
204											
205											
206											
207											
208											
209	X	SS 29	10 12 18	24/18						BEAUMONT: greenish gray (GLEY 1 6/1); CLAY (CH); moist; very stiff; few light gray calcareous nodules; trace black organic flocs	
210											
211											
212											
213											
214											
215											
216											
217											
218											
219	X	SS 30	9 13 19	12/18					SM	BEAUMONT: gray (10YR 5/1); silt; SAND (SM); wet; dense; mostly fine sand; some silt; trace clay banding	
220											
221											
222											
223											
224											
225											
226											
227											
228											
229	X	SS 31	30 23 27	9/18					SC	BEAUMONT: gray (5Y 6/1); silt; clay; SAND (SC); wet; dense; mostly fine poorly graded sand; little clay and silt	
230											
231											
232											
233											
234											
235											
236											
237											
238											
239	X	SS 32	12 15 20	24/18					CH	BEAUMONT: reddish brown (2.5YR 4/3) and gray (5Y 5/1); CLAY (CH); moist; hard	
240											

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STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									CH		
241											
242											
243											
244											
245											
246											
247											
248											
249	X	SS 33	11 13 18	24/18						BEAUMONT: greenish gray (GLEY 2 6/1) to dark grayish brown (2.5Y 4/2); CLAY (CH); moist; hard; trace sand; trace calcareous nodules	
250											
251											
252											
253											
254											
255											
256											
257											
258											
259	X	SS 34	13 14 19	24/18						BEAUMONT: reddish brown (2.5YR 4/3); CLAY (CH); moist; hard	
260											
261											
262											
263											
264											
265											
266											
267											
268											
269	X	SS 35	6 10 14	24/18						BEAUMONT: greenish gray (GLEY 1 5/1) with grayish brown (2.5Y 5/2) banding; CLAY (CH); moist; very stiff; stratified; trace quartz sand	
270											
271											
272											
273											
274											
275											
276											
277											
278											
279	X	SS 36	WOR 13 14	24/18						BEAUMONT: greenish gray (GLEY 1 5/1); CLAY (CH); moist; very stiff; trace black organic streaks	
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280–288									CH		
289–298	X	SS 37	37 55/6"	5 12					SM	BEAUMONT: greenish gray (GLEY 1 6/1); silt; SAND (SM); wet; very dense; fine sand	Driller indicated possible gravel zone at 288.2 ft based on rod chatter
299–300	X	SS 38	10 12 19	24 18					CH	BEAUMONT: brown (10YR 5/3); CLAY (CH); moist; hard; possible calcareous lenses	
300–320										Boring terminated at 300 ft	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/2/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-2A

Type and Diameter of Boring: Mud Rotary / 4 Inches	Boring Location: Unit 3 UHS, N 362570.96 E 2943514.18		Total Depth: 100 feet
Drilling Contractor and Rig: Miller Drilling / CME 550	Elevation at boring: 29.65 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Undisturbed	Driving Hammer Wt./Drop: NA / NA	No. of Samples: 2	Date Started: 6/24/08
	Borehole Inclination: 0	Logged by: N. Smith	Date Completed: 6/25/08

Reviewed by / Date HNC 12/2/2008
Reviewed by / Date [illegible] 12/2/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0											Boring U3-2A offset approximately 10' east of Boring U3-2
1											
2											
3											Drill to first sample at 48 ft
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-2A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49		UD 1		26.5/24	34.9	99.5	61/36		CH	BEAUMONT: brown (7.5YR 4/4); CLAY (CH); moist; few silt	Pocket Penetometer (TSF): 2.25, 1.75, 1.5 Hand Held Vane Shear (kg/cm^2): >1.0
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ. WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-2A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											Pocket Penetometer (TSF): 4.25, 4.0, 4.5
99		UD 2		26.5/24					CH	BEAUMONT: strong brown (7.5YR 4/6) mottled with gray (10YR 5/1); CLAY (CH); moist; few silt	Hand Held Vane Shear (kg/cm^2): >1.0
100										Boring terminated at 100 ft	
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. U3-3
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 UHS N 362633.07 E 2943359.08		Total Depth 302.7 feet
Drilling Contractor and Rig Miller Drilling / CME 85	Elevation at boring 28.96 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 140.5 / 30 inches	No. of Samples 72	Date Started 6/11/08
	Borehole Inclination 0	Logged by J. Liles	Date Completed 6/18/08

Reviewed by / Date HLC 7/3/08
Reviewed by / Date JJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	9 3 7	20/18					CL	FILL: yellowish brown (10YR 5/4); sand; gravel; CLAY (CL); moist; stiff; mostly clay; little fine sand and gravel	
2–3											
4–5	X	SS 2	1 3 2	15/18					CH	BEAUMONT: black (2.5Y 2.5/1); CLAY (CH); moist; firm	
6–7	X	SS 3	2 2 3	15/18						BEAUMONT: dark yellowish brown (10YR 4/4) mottled with gray (2.5Y 6/1); CLAY (CH); moist; firm; few calcareous nodules	
8–9	X	SS 4	2 2 3	17/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; firm	
10–11	X	SS 5	2 1 3	19/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; soft; trace calcareous nodules	
12–13	X	SS 6	3 3 4	20/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; firm	
14–15	X	SS 7	2 2 1	23/18						BEAUMONT: strong brown (7.5YR 4/6); sand; CLAY (CH); wet; soft; little fine sand; trace mica	
16–17	X	SS 8	1 2 2	18/18					SC	BEAUMONT: brown (7.5YR 4/4); clay; SAND (SC); wet; very loose; fine sand; little clay; trace mica	
18–19	X	SS 9	3 7 11	12/18					SP	BEAUMONT: strong brown (7.5YR 4/6); SAND (SP); wet; firm; trace mica; fine sand	
20–21	X	SS 10	6 11 18	11/18						BEAUMONT: brown (7.5YR 4/4); SAND (SP); wet; very firm; trace mica; fine sand	
22–23	X	SS 11	5 8 13	14/18						BEAUMONT: yellowish brown (10YR 5/6); SAND (SP); wet; very firm; trace mica; fine sand	
24–25	X	SS 12	5 9 14	13/18						BEAUMONT: brown (7.5YR 4/4); SAND (SP); wet; very firm; fine sand; trace mica	
26–27	X	SS 13	6 12 14	14/18						BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very firm; trace mica; fine sand	
28–29	X	SS 14	6 7 21	14/18						BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very firm; trace mica; fine sand	
30–31	X	SS 15	14 39 32	15/18						BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very dense; trace silt; fine sand	
32–33	X	SS 16	11 12 15	13/18						BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very firm; trace silt; trace mica; fine sand	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–41									SP	BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; dense; fine sand	
41–42	X	SS 17	7 18 27	12/18							
43–44	X	SS 18	3 7 10	18/18					CH	BEAUMONT: strong brown (7.5YR 4/6); sand; CLAY (CH); moist; very stiff; little fine sand	
45–46	X	SS 19	5 9 9	18/18					SC	BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SC); wet; firm; fine sand; some interbedded clay	
47–49	X	SS 20	4 4 5	24/18					CH	BEAUMONT: light olive gray (5Y 6/2); CLAY (CH); moist; stiff	
50–51	X	SS 21	3 3 6	24/18						BEAUMONT: light olive gray (5Y 6/2); CLAY (CH); moist; stiff; trace calcareous nodules	
52–54	X	SS 22	3 3 6	21/18						BEAUMONT: light olive gray (5Y 6/2); CLAY (CH); moist; stiff; few calcareous nodules	
55–56	X	SS 23	5 5 7	21/18						BEAUMONT: strong brown (7.5YR 4/6) mottled with light olive gray (5Y 6/2); CLAY (CH); moist; stiff; some calcareous nodules	
57–59	X	SS 24	5 6 8	20/18						BEAUMONT: strong brown (7.5YR 4/6) mottled with light olive gray (5Y 6/2); CLAY (CH); moist; stiff; trace calcareous nodules	
60–61	X	SS 25	4 4 7	20/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; stiff; little silt; trace fine sand	
62–64	X	SS 26	3 4 7	17/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; stiff; little silt; trace fine sand	SS-26A: 63.5' to 64.2'
65									SP	BEAUMONT: strong brown (7.5YR 4/6); SAND (SP); wet; firm; trace clay; trace mica; fine sand	SS-26B: 64.2' to 65.0'
66–67	X	SS 27	2 2 4	16/18					SC	BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SC); wet; loose; some clay; trace mica; fine sand	
68–69	X	SS 28	9 13 16	13/18					SP	BEAUMONT: dark yellowish brown (10YR 4/6); SAND (SP); wet; very firm; trace mica; fine sand	
70–71	X	SS 29	4 6 8	14/18						BEAUMONT: dark yellowish brown (10YR 4/6); SAND (SP); wet; firm; trace mica; fine sand	
72–74	X	SS 30	4 6 11	14/18						BEAUMONT: brown (7.5YR 4/4); SAND (SP); wet; firm; trace mica; fine sand	
75–76	X	SS 31	7 10 12	9/18						BEAUMONT: brown (7.5YR 4/4); SAND (SP); wet; very firm; trace mica; fine sand	
77–79	X	SS 32	9 10 14	14/18						BEAUMONT: brown (7.5YR 4/4); SAND (SP); wet; very firm; trace mica; fine sand	
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP		
81	X	SS 33	8 20 22	21/18						BEAUMONT: yellowish brown (10YR 5/6); SAND (SP); wet; dense; fine sand; trace mica	
82											
83											
84	X	SS 34	4 5 7	21/18					CH	BEAUMONT: yellowish brown (10YR 5/6); sand; CLAY (CH); moist; stiff; little fine sand	
85											
86	X	SS 35	6 6 13	15/18					SC	BEAUMONT: yellowish brown (10YR 5/4); clay; SAND (SC); wet; firm; some clay; fine sand	
87											
88											
89	X	SS 36	9 13 15	24/18						BEAUMONT: yellowish brown (10YR 5/4); clay; SAND (SC); wet; very firm; some clay; fine sand	
90											
91	X	SS 37	4 4 6	22/18						BEAUMONT: yellowish brown (10YR 5/4); clay; SAND (SC); wet; loose; some clay; fine sand	
92											
93											
94	X	SS 38	7 9 18	15/18						BEAUMONT: light yellowish brown (10YR 6/4); clay; SAND (SC); wet; very firm; some clay; fine sand	SS-38A: 93.5' to 94.5' SS-38B: 94.5' to 95.0'
95									SP	BEAUMONT: light yellowish brown (10YR 5/4); SAND (SP); wet; very firm; fine sand	
96	X	SS 39	4 7 10	19/18					CH	BEAUMONT: yellowish red (5YR 4/6) mottled with light gray (5Y 7/2); CLAY (CH); moist; very stiff; trace fine sand	
97											
98											
99	X	SS 40	3 7 11	21/18						BEAUMONT: yellowish red (5YR 4/6) mottled with light gray (5Y 7/2); CLAY (CH); moist; very stiff	
100											
101	X	SS 41	3 4 6	22/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff	
102											
103											
104											
105											
106	X	SS 42	4 6 9	21/18						BEAUMONT: light gray (5Y 7/2); CLAY (CH); moist; stiff; trace fine sand; trace calcareous nodules	
107											
108											
109											
110											
111	X	SS 43	5 6 8	21/18						BEAUMONT: light gray (5Y 7/2); CLAY (CH); moist; stiff; trace calcareous nodules	
112											
113											
114											
115											
116	X	SS 44	5 8 9	18/18						BEAUMONT: light gray (5Y 7/2) mottled with yellowish red (5YR 4/6); sand; CLAY (CH); moist; very stiff; some fine sand	
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121	X	SS 45	5 8 13	21/18						BEAUMONT: yellowish red (5YR 4/6) mottled with light gray (5Y 7/2); CLAY (CH); moist; very stiff	
122											
123											
124											
125											
126	X	SS 46	8 11 14	19/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff	
127											
128											
129											
130											
131	X	SS 47	5 7 8	0/18						No Recovery	Damaged sand catcher during SPT
132											
133											
134											
135											
136	X	SS 48	14 16 21	8/18						BEAUMONT: light gray (2.5Y 7/2); sand; CLAY (CH); moist; hard; little fine sand	
137											
138											
139											
140											
141	X	SS 49	8 10 16	12/18						BEAUMONT: light gray (2.5Y 7/2) mottled with yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; some silt	
142											
143											
144											
145											
146	X	SS 50	9 15 22	8/18					SM	BEAUMONT: yellowish red (5YR 4/6); silt; SAND (SM); wet; dense; some silt; few clay; poorly graded fine sand	
147											
148											
149											
150											
151	X	SS 51	15 21 29	18/18					CH	BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; hard; interbedded with light gray (2.5Y 7.2) poorly graded fine sand	
152											
153											
154											
155											
156	X	SS 52	10 9 12	21/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff	
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161	X	SS 53	22 30 35	17/18					SC	BEAUMONT: light yellowish brown (10YR 6/4); clay; SAND (SC); wet; very dense; fine sand; some clay	SS-53A: 161.0' to 162.0' SS-53B: 162.0' to 162.5'
162									CH	BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; hard; little silt	
163											
164											
165											
166	X	SS 54	4 9 11	13/18					SC	BEAUMONT: yellowish red (5YR 4/6); clay; SAND (SC); wet; firm; little clay; trace silt; trace mica; fine sand	
167											
168											
169											
170											
171	X	SS 55	6 10 10	23/18					CH	BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff	
172											
173											
174											
175											
176	X	SS 56	6 9 14	20/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; trace fine sand	
177											
178											
179											
180											
181	X	SS 57	7 10 14	22/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; trace silt	
182											
183											
184											
185											
186	X	SS 58	4 8 12	23/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; little silt	
187											
188											
189											
190											
191	X	SS 59	5 8 12	26/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; little silt	
192											
193											
194											
195											
196	X	SS 60	4 5 8	24/18						BEAUMONT: olive brown (2.5Y 4/4); CLAY (CH); moist; stiff	
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202	X	SS 61	WOH 6 9	27/18						BEAUMONT: dark greenish gray (10Y 4/1); CLAY (CH); moist; stiff; little silt	
203											
204											
205											
206											
207											
208											
209											
210											
211											
212	X	SS 62	4 7 10	1/18						BEAUMONT: dark greenish gray (10Y 4/1); CLAY (CH); moist; very stiff	
213											
214											
215											
216											
217											
218											
219											
220											
221	X	SS 63	1 2 4	0/18						No Recovery	
222											
223	X	SS 64	5 6 10	20/18					SC	BEAUMONT: dark greenish gray (10Y 4/1); clay; SAND (SC); wet; firm; little clay; decreasing clay content with depth	
224											
225											
226											
227											
228											
229											
230											
231	X	SS 65	13 32 38	6/18						BEAUMONT: grayish brown (2.5Y 5/2); clay; SAND (SC); wet; very dense; fine sand; little clay	
232											
233									SP-SM		Poorly graded sand at bottom of SS-65
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240											
241	X	SS 66	27 40 50/5"	10/17					SP-SM	BEAUMONT: light olive brown (2.5Y 5/3); silt; SAND (SP-SM); wet; very dense; fine sand; few silt	
242											
243											
244											
245											
246											
247											
248											
249											
250											
251	X	SS 67	7 11 14	24/18					CH	BEAUMONT: yellowish brown (10YR 5/4) mottled with greenish gray (10Y 6/1); CLAY (CH); moist; very stiff; few calcareous nodules	
252											
253											
254											
255											
256											Change in drilling resistance according to driller
257											
258											
259											
260											
261	X	SS 68	16 23 20	13/18					SC	BEAUMONT: olive (5Y 5/3); clay; SAND (SC); wet; dense; little clay; poorly graded fine sand	
262											
263											
264											
265											
266											
267											
268											
269											
270											
271											Change in drilling resistance according to driller
272	X	SS 69	6 8 10	1/18					CH	BEAUMONT: black (2.5Y 2.5/1); CLAY (CH); moist; very stiff	
273											
274											
275											
276											
277											
278											
279											
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281											
282	X	SS 70	6 12 15	20/18						BEAUMONT: olive (5Y 5/3) mottled with brown (7.5YR 4/4); CLAY (CH); moist; very stiff	
283											
284											
285											
286											
287											
288											
289											
290											
291	X	SS 71	9 12 14	1/18						BEAUMONT: grayish brown (2.5Y 5/2); sand; gravel; CLAY (CH); wet; very stiff; little fine sand; little fine gravel	
292											
293											
294											
295											
296											
297											
298											
299											
300											
301											
302	X	SS 72	3 6 13	23/18						BEAUMONT: olive brown (2.5Y 4/3); CLAY (CH); moist; very stiff; little silt	
303										Boring terminated at 302.7 ft	
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/2/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-3A

Type and Diameter of Boring: Mud Rotary / 4 Inches	Boring Location: Unit 3 UHS, N 362635.06 E 2943349.1		Total Depth: 62 feet
Drilling Contractor and Rig: Miller Drilling / CME 550	Elevation at boring: 28.79 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Undisturbed	Driving Hammer Wt./Drop: NA / NA	No. of Samples: 3	Date Started: 6/23/08
	Borehole Inclination: 0	Logged by: N. Smith	Date Completed: 6/23/08

Reviewed by / Date HC 12/2/2008
Reviewed by / Date 12/2/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–9											Boring U3-3A offset approximately 10' west of Boring U3-3 Drill to first sample at 10 ft
10–12		UD 1		23.5/24					CH	BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; few silt	Pocket Penetometer (TSF): 3.5, 2.25, 3.5 Hand Held Vane Shear (kg/cm^2): 0.82

Page 1 of 2

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-3A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51		UD 2		25/24	27.0	92.3	60/36		CH	BEAUMONT: gray (2.5Y 5/1); CLAY (CH); moist; little silt	Pocket Penetometer (TSF): 2.25, 2.5, 2.25 Hand Held Vane Shear (kg/cm^2): >0.82
52											
53											
54											
55											
56											
57											
58											
59											
60											Pocket Penetometer (TSF): 2.0, 1.5, 2.25 Hand Held Vane Shear (kg/cm^2): >0.82
61		UD 3		27.5/24	21.3	98.3	35/19		CL	BEAUMONT: strong brown (7.5YR 4/6); CLAY (CL); moist; some silt	
62										Boring terminated at 62 ft	
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-4

Type and Diameter of Boring: Mud Rotary / 4 inches	Boring Location: Unit 3 UHS, N 362710.66 E 2943219.68		Total Depth: 299.6 feet
Drilling Contractor and Rig: JEDI Drilling / CME 75	Elevation at boring: 29.49 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Split Spoon	Driving Hammer Wt./Drop: 139.2 / 30 inches	No. of Samples: 39	Date Started: 6/13/08
	Borehole Inclination: 0	Logged by: M. Harvey	Date Completed: 6/18/08

Reviewed by / Date: HC 7/8/08
Reviewed by / Date: VS 7/15/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–3	X	SS 1	10 9 5	5/18					GC	FILL: white (2.5Y 8/1) and dark gray (2.5Y 4/1); sand; clay; GRAVEL (GC); moist; firm; some clay; little fine sand; fine angular gravel	
4–5	X	SS 2	1 1 2	11/18					CH	BEAUMONT: light olive gray (5Y 6/2); sand; CLAY (CH); moist; soft; some fine sand	
6–8	X	SS 3	WOH 3 3	12/18						BEAUMONT: reddish yellow (7.5YR 6/6); gravel; sand; CLAY (CH); moist; firm; little fine gravel and fine sand	
9–10	X	SS 4	2 2 2	0/18						No Recovery	
11–12	X	SS 5	2 2 1	18/18						BEAUMONT: yellowish red (5YR 5/8); sand; CLAY (CH); moist; soft; some fine sand	
14–15	X	SS 6	2 4 7	16/18						BEAUMONT: yellowish red (5YR 5/6); sand; CLAY (CH); moist; stiff; some fine sand	
18–19	X	SS 7	2 2 2	18/18					SC	BEAUMONT: yellowish red (5YR 5/8); clay; SAND (SC); wet; very loose; little clay	
23–24	X	SS 8	3 3 4	18/18					SP-SC	BEAUMONT: reddish yellow (7.5YR 6/8); clay; SAND (SP-SC); wet; loose; mostly fine sand; few clay	
28–29	X	SS 9	12 18 15	10/18					SP	BEAUMONT: reddish yellow (7.5YR 6/6); SAND (SP); wet; dense; trace fine grains	
33–34	X	SS 10	10 22 29	12/18						BEAUMONT: brownish yellow (10YR 6/6); SAND (SP); wet; very dense; trace fine grains; fine sand	
38–39	X	SS 11	6 20 15	10/18					SP-SC	BEAUMONT: brownish reddish yellow (7.5YR 6/6); clay; SAND (SP-SC); wet; dense; fine sand; trace fine grains	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41									SP-SC		
42											
43											
44	X	SS 12	26 30 35	11/18					SP	BEAUMONT: reddish yellow (7.5YR 6/6); SAND (SP); wet; very dense; fine sand; trace fine grains	
45											
46											
47											
48											
49	X	SS 13	9 8 8	12/18	35.5	98.0	70/46		CH	BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; little silt	
50											
51											
52											
53											
54											
55											
56											
57											
58											
59	X	SS 14	5 5 7	20/18					SC	BEAUMONT: yellowish red (5YR 5/8); clay; SAND (SC); moist; firm; mostly fine sand; some clay; trace gravelly nodules	
60											
61											
62											
63											
64											
65											
66											
67											
68											
69	X	SS 15	10 7 8	16/18					SM	BEAUMONT: strong brown (7.5YR 5/7); silt; SAND (SM); wet; firm; mostly fine sand; some silt; trace mica	
70											
71											
72											
73											
74											
75											
76											
77											
78											
79	X	SS 16	7 7 6	17/18	19.9	59.3	27/17		CL	BEAUMONT: light greenish gray (GLEY 1 7/10Y) and brown (7.5YR 5/4); sand; CLAY (CL); moist; stiff; some clay; little silt; some fine to medium	
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–87									CL	sand	
88–90	X	SS 17	10 9 11	17/18					SC	BEAUMONT: brown (7.5YR 5/4); clay; SAND (SC); moist; firm; mostly fine sand; some clay; trace gravelly nodules	
98–102	X	SS 18	6 10 13	0/18						No Recovery	
103–105	X	SS 19	3 7 8	20/18					CH	BEAUMONT: brown (10YR 5/3); CLAY (CH); moist; stiff; trace fine sand	
113–115	X	SS 20	7 10 17	18/18						BEAUMONT: light greenish gray (GLEY 1 7/5GY) mottled with yellowish brown (10YR 5/6); CLAY (CH); moist; very stiff; trace fine sand; trace fine gravelly nodules	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123											
124	X	SS 21	8 13 17	15/18						BEAUMONT: red (5R 5/6); sand; CLAY (CH); moist; very stiff; little fine sand	
125											
126											
127											
128											
129											
130											
131											
132											
133											
134	X	SS 22	5 9 13	16/18						BEAUMONT: light gray (5Y 7/2); sand; CLAY (CH); moist; very stiff; some fine sand; trace nodules	
135											
136											
137											
138											
139											
140											
141											
142											
143											
144	X	SS 23	14 25 30	15/18					SP-SC	BEAUMONT: light gray (5Y 7/2) and brown (7.5YR 5/4); clay; SAND (SP-SC); moist; very dense; mostly fine sand; few clay; trace gravelly nodules	
145											
146											
147											
148											
149											
150											
151											
152											
153											
154	X	SS 24	8 14 21	18/18					CH	BEAUMONT: red (10R 5/6) mottled with light greenish gray (GLEY 1 7/5GY); CLAY (CH); moist; hard; trace gravelly nodules; trace fine sand	
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161											
162											
163											
164	X	SS 25	11 21 25	12/18					SC	BEAUMONT: red (10YR 5/6); clay; SAND (SC); wet; dense; mostly fine sand; some clay in lenses	
165											
166											
167											
168											
169											
170											
171											
172											
173											
174	X	SS 26	12 17 19	18/18					CH	BEAUMONT: red (10YR 5/6); CLAY (CH); moist; hard; trace fine sand	
175											
176											
177											
178											
179											
180											
181											
182											
183											
184	X	SS 27	11 15 20	18/18						BEAUMONT: red (10YR 5/6); sand; CLAY (CH); moist; hard; some fine sand	
185											
186											
187											
188											
189											
190											
191											
192											
193											
194	X	SS 28	9 11 14	22/18						BEAUMONT: red (10YR 5/6); CLAY (CH); moist; very stiff; few fine sand; trace silt	
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202											
203											
204	X	SS 29	7 9 12	24/18						BEAUMONT: dark greenish gray (GLEY 1 4/5GY); sand; CLAY (CH); moist; very stiff; little fine sand	
205											
206											
207											
208											
209											
210											
211											
212											
213											
214	X	SS 30	6 11 15	19/18						BEAUMONT: greenish gray (GLEY 1 5/5G); sand; CLAY (CH); moist; very stiff; little fine sand	
215											
216											
217											
218											
219											
220											
221											
222											
223											
224	X	SS 31	6 9 4	18/18					SC	BEAUMONT: dark gray (5Y 4/1); clay; SAND (SC); wet; firm; mostly fine sand; little clay	
225											
226											
227											
228											
229											
230											
231											
232											
233											
234	X	SS 32	21 20 20	3/18						BEAUMONT: grayish brown (10YR 5/2); clay; SAND (SC); wet; dense; mostly fine sand; some clay	
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240–242									SC		
243–244	X	SS 33	30 47 50/4"	11/16					SP-SC	BEAUMONT: light brownish gray (2.5Y 6/2); clay; SAND (SP-SC); wet; very dense; mostly fine sand; few clay lenses	
245–252											
253–254	X	SS 34	7 11 16	19/18					CH	BEAUMONT: greenish gray (GLEY 1 6/5G); sand; CLAY (CH); moist; very stiff; little fine sand	
255–262											
263–264	X	SS 35	5 10 16	22/18						BEAUMONT: greenish gray (GLEY 1 6/10Y) mottled with olive brown (2.5Y 4/4); CLAY (CH); moist; very stiff; mostly clay; few fine sand	
265–272											
273–274	X	SS 36	WOH 10 13	24/18						BEAUMONT: dark greenish gray (GLEY 1 4/10Y); CLAY (CH); moist; very stiff; mostly clay; some silt; trace fine sand	
275–280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281											
282											
283										BEAUMONT: greenish gray (GLEY 1 6/5G); sand; CLAY (CH); moist; very stiff; some fine sand	
284	X	SS 37	5 10 17	22/18							
285									SP-SC	BEAUMONT: greenish gray (GLEY 1 6/5GY); clay; SAND (SP-SC); moist; very firm; mostly fine sand; few clay	
286											
287											
288											
289											
290											
291											
292											
293									CH	BEAUMONT: greenish gray (GLEY 2 6/10BG) mottled with brown (10YR 4/3); CLAY (CH); moist; very stiff; trace fine sand; trace gravelly nodules	
294	X	SS 38	6 8 13	21/18							
295											
296											
297											
298											
299	X	SS 39	8 11 17	20/18						BEAUMONT: brown (10YR 4/3); CLAY (CH); moist; very stiff; trace fine sand	
300										Boring terminated at 299.6 ft	
301											
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. U3-5
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 UHS N 362709.58 E 2943505.46		Total Depth 302.9 feet
Drilling Contractor and Rig Miller Drilling / CME 85	Elevation at boring 28.83 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 140.5 / 30 inches	No. of Samples 39	Date Started 6/19/08
	Borehole Inclination 0	Logged by J. Liles	Date Completed 6/24/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date VJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–3	X	SS 1	6 6 7	17/18					SC	FILL: dark grayish brown (10YR 4/2); clay; gravel; SAND (SC); dry to moist; firm; roots	
4–5	X	SS 2	1 1 4	11/18					CH	BEAUMONT: very dark gray (5Y 3/1); CLAY (CH); moist; firm	
6–8	X	SS 3	2 3 3	16/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; firm; trace fine sand; trace calcareous nodules	
9–10	X	SS 4	1 1 3	16/18						BEAUMONT: strong brown (7.5YR 4/6); silt; CLAY (CH); moist; soft; little silt	
11–13	X	SS 5	2 3 4	17/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; firm	
14–15	X	SS 6	1 3 4	20/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; firm	
16–20	X	SS 7	2 5 4	16/18						BEAUMONT: yellowish red (5YR 4/6); sand; CLAY (CH); moist; stiff; little fine sand	
21–23	X	SS 8	5 8 14	12/18					SP	BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); wet; very firm; fine poorly graded sand; trace mica	
26–28	X	SS 9	2 9 9	10/18						BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); wet; firm; fine poorly graded sand; trace mica	
31–33	X	SS 10	8 11 9	15/18						BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); wet; firm; fine poorly graded sand; trace mica	
36–38	X	SS 11	12 16 20	14/18						BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); wet; dense; fine poorly graded sand; trace silt; trace mica	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–41									SP		
41–42	X	SS 12	12 22 27	16/18						BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); wet; dense; fine poorly graded sand; trace mica	
43–45											
46–47	X	SS 13	15 26 21	12/18						BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); wet; dense; fine poorly graded sand; trace mica	
48–49											
49–50											Driller notes a change in drilling resistance at 49 ft
51–52	X	SS 14	2 4 6	22/18					CH	BEAUMONT: greenish gray (10Y 5/1); CLAY (CH); moist; stiff; trace fine sand	
53–60											
61–62	X	SS 15	3 4 4	21/18						BEAUMONT: brown (7.5YR 5/4); sand; CLAY (CH); moist; firm; little fine sand; trace mica	
63–70											
71–72	X	SS 16	2 7 15	9/18					SP	BEAUMONT: dark yellowish brown (10YR 4/6); SAND (SP); wet; very firm; fine poorly graded sand; trace mica	
73–80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP		
81											
82		SS 17	8 11 19	13/18						BEAUMONT: dark yellowish brown (10YR 4/6); SAND (SP); wet; very firm; fine poorly graded sand; trace mica	
83											
84											
85											
86											
87											
88											
89											
90											
91											
92		SS 18	5 13 11	22/18						BEAUMONT: dark yellowish brown (10YR 4/6); SAND (SP); wet; very firm; fine poorly graded sand; trace mica; interbedded clay	
93											
94											
95											
96											
97											
98											
99											
100											
101											
102		SS 19	2 3 4	23/18					CH	BEAUMONT: olive brown (2.5Y 4/4) mottled with greenish gray (10Y 5/1); CLAY (CH); moist; firm; trace fine sand	
103											
104											
105											
106											
107											
108											
109											
110											
111											
112		SS 20	WOH 4 4	24/18						BEAUMONT: dark grayish brown (10YR 4/2); CLAY (CH); moist; firm	
113											
114											
115											
116											
117											
118											
119											
120											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122	X	SS 21	8 10 15	20/18						BEAUMONT: brown (7.5YR 5/4) mottled with light olive gray (5Y 6/2); CLAY (CH); moist; very stiff; trace fine sand	
123											
124											
125											
126											
127											
128											
129											
130											
131											
132	X	SS 22	4 6 10	16/18						BEAUMONT: light olive gray (5Y 6/2); sand; CLAY (CH); moist; very stiff; little fine sand	
133											
134											
135											
136											
137											
138											Driller notes a change in drilling resistance at 137 ft
139											
140											
141									SP	BEAUMONT: yellowish brown (10YR 5/6); SAND (SP); wet; very firm; fine sand; trace mica	
142	X	SS 23	11 11 16	24/18							SS-23A: 141.2' to 141.9' SS-23B: 141.9' to 142.7'
143									SC	BEAUMONT: olive gray (5Y 6/2) mottled with yellowish brown (10YR 5/6); clay; SAND (SC); moist; very firm; fine poorly graded sand; some clay	
144											
145											
146											
147											
148											
149											
150											
151											
152	X	SS 24	18 27 36	17/18					SP	BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very dense; fine sand; trace mica	
153											
154											
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160											
161									SP	BEAUMONT: light olive brown (2.5Y 5/4); SAND (SP); wet; dense; fine sand; trace mica	
162	X	SS 25	33 24 15	19/18					CH	BEAUMONT: yellowish brown (10YR 5/4); sand; CLAY (CH); moist; hard; little fine sand	SS-25A: 161.1' to 161.6' SS-25B: 161.6' to 162.6'
163											
164											
165											
166											
167											
168											
169											
170											
171											
172	X	SS 26	6 10 14	23/18						BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; very stiff; trace silt	
173											
174											
175											
176											
177											
178											
179											
180											
181											
182	X	SS 27	8 11 15	23/18						BEAUMONT: reddish brown (5YR 4/4) mottled with light olive brown (2.5Y 5/6); silt; CLAY (CH); moist; very stiff; few silt	
183											
184											
185											
186											
187											
188											
189											
190											
191											
192	X	SS 28	6 8 11	24/18						BEAUMONT: brown (7.5YR 4/4); CLAY (CH); moist; very stiff; trace silt	
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202	X	SS 29	3 4 7	24/18						BEAUMONT: dark greenish gray (5GY 4/1); CLAY (CH); moist; stiff	
203											
204											
205											
206											
207											
208											
209											
210											
211											
212	X	SS 30	1 3 8	13/18					SC	BEAUMONT: greenish gray (5GY 4/1); clay; SAND (SC); moist; firm; fine poorly graded sand; some clay	
213											
214											
215											
216											
217											
218											
219											
220											
221											
222	X	SS 31	3 1 5	20/18						BEAUMONT: greenish gray (5GY 4/1); clay; SAND (SC); wet; loose; fine poorly graded sand; little clay; trace shells	
223											
224											
225											Driller notes a change in drilling resistance at 225 ft
226											
227											
228											
229											
230											
231											
232	X	SS 32	21 13 10	11/18					SW-SC	BEAUMONT: greenish gray (5GY 4/1); clay; SAND (SW-SC); wet; very firm; fine to coarse sand; few clay; few shells	
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240											
241									SW-SC	BEAUMONT: light olive brown (2.5Y 5/3); SAND (SP); wet; very dense; fine sand	
242	X	SS 33	43 50/4"	8 10					SP		
243											
244											Driller notes a change in drilling resistance at 244 ft
245											
246											
247											
248											
249											
250											
251											
252	X	SS 34	7 11 16	24 18					CH	BEAUMONT: dark yellowish brown (10YR 4/4) mottled with greenish gray (5GY 5/1); silt; CLAY (CH); moist; very stiff; few silt	
253											
254											
255											
256											
257											
258											
259											
260											Driller notes a change in drilling resistance at 260 ft
261											
262	X	SS 35	27 47 39	4 18					SP	BEAUMONT: olive gray (5Y 5/2); SAND (SP); wet; very dense; fine sand; trace clay	
263											
264											
265											
266											
267											
268											
269											
270											
271											
272	X	SS 36	2 3 7	23 18					CH	BEAUMONT: very dark gray (5Y 3/1); CLAY (CH); moist; stiff	
273											
274											
275											
276											
277											
278											
279											
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U3-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281											
282	X	SS 37	7 10 13	19/18						BEAUMONT: greenish gray (5GY 5/1); CLAY (CH); moist; very stiff; trace fine sand	
283											
284											
285											
286											
287											
288											
289											
290											
291											
292	X	SS 38	10 14 14	0/18						No Recovery	
293											
294											
295											
296											
297											
298											
299											
300											
301											
302	X	SS 39	8 11 13	23/18						BEAUMONT: greenish gray (5GY 5/1); CLAY (CH); moist; very stiff	
303										Boring terminated at 302.9 ft	
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. U3-6	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 UHS Pump House N 362749.55 E 2943299.7		Total Depth 300.8 feet
Drilling Contractor and Rig MACTEC / D. White / CME 55 LC	Elevation at boring 28.4 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 138.4 / 30 inches	No. of Samples 38	Date Started 6/17/08
	Borehole Inclination 0	Logged by A. Taylor	Date Completed 6/22/08

Reviewed by / Date HC 7/3/08

Reviewed by / Date 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	5 6 7	9/18					ML	BEAUMONT: yellowish red (5YR 5/8); sand; SILT (ML); dry; stiff; mostly silt; some sand	
5	X	SS 2	3 3 6	18/18					CH	BEAUMONT: olive gray (5Y 5/2); CLAY (CH); moist; stiff; contains black nodules	
7	X	SS 3	2 2 2	18/18						BEAUMONT: strong brown (7.5YR 5/8); silt; CLAY (CH); moist; soft	
10	X	SS 4	1 3 3	18/18						BEAUMONT: strong brown (7.5YR 5/6); silt; CLAY (CH); moist; firm	
12–13	X	SS 5	3 4 5	18/18						BEAUMONT: yellowish red (5YR 5/8); CLAY (CH); moist; stiff	
15	X	SS 6	2 2 2	18/18						BEAUMONT: red (2.5YR 5/6); CLAY (CH); moist; soft	
20	X	SS 7	2 3 10	13/18					SM	BEAUMONT: light olive brown (2.5Y 5/6); silt; SAND (SM); moist; firm; fine sand; some silt	
25	X	SS 8	9 10 14	13/18						BEAUMONT: light brown (7.5YR 6/4); silt; SAND (SM); moist; very firm; fine sand; some silt	
30	X	SS 9	5 8 13	14/18						BEAUMONT: brownish yellow (10YR 6/6); silt; SAND (SM); moist; very firm; fine sand; some silt	
35	X	SS 10	45 36 25	17/18						BEAUMONT: reddish yellow (7.5YR 6/6); silt; SAND (SM); moist; very dense; fine sand; some silt	
40	X	SS	11	14						BEAUMONT: light brown (7.5YR 6/4); silt; SAND	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40	X	11	18 16	18					SM	(SM); moist; dense; some silt	
41											
42											
43											
44											
45	X	SS 12	15 22 27	14 18						BEAUMONT: light brown (2.5YR 6/4); silt; SAND (SM); moist; dense; fine sand; some silt	
46											
47											Strata break at 47 ft based on drilling observations
48											
49											
50	X	SS 13	4 5 7	18 18					CH	BEAUMONT: light gray (5Y 7/1); CLAY (CH); moist; stiff	
51											
52											
53											
54											
55											
56											
57											
58											
59											
60	X	SS 14	6 7 12	18 18						BEAUMONT: strong brown (7.5YR 4/6) mottled with light gray (10YR 7/1); CLAY (CH); moist; very stiff	
61											
62											
63											
64											
65											
66											
67											
68											
69											
70	X	SS 15	2 4 6	17 18						BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; stiff; trace sand	
71											
72											
73											
74											
75											
76											
77											
78											
79											
80	X	SS	7	12					SM	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM);	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80	X	16	11 12	18					SM	moist; very firm; fine sand; little silt	
81											
82											
83											
84											
85											
86											Strata break at 86 ft based on drilling observations
87											
88											
89											
90	X	SS 17	6 8 11	22 18					CH	BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; very stiff	
91											
92											
93											
94											
95											
96											
97											
98											
99											
100	X	SS 18	5 5 5	18 18						BEAUMONT: brown (10YR 5/3); CLAY (CH); moist; stiff	
101											
102											
103											
104											
105											
106											
107											
108											
109											
110	X	SS 19	6 10 11	18 18						BEAUMONT: light greenish gray (GLEY 1 7/5GY); CLAY (CH); moist; very stiff; contains white nodules	
111											
112											
113											
114											
115											
116											
117											
118											
119											
120	X	SS	8	18						BEAUMONT: strong brown (7.5YR 5/6) mottled	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120	X	20	12 15	18					CH	with pale yellow (2.5Y 8/3); CLAY (CH); moist; very stiff	
121											
122											
123											
124											
125											
126											
127											
128											
129											
130	X	SS 21	8 10 13	18 18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; very stiff	
131											
132											
133											
134											
135											
136											
137											
138											
139											
140	X	SS 22	11 14 16	13 18						BEAUMONT: white (10YR 8/1); CLAY (CH); moist; very stiff; trace sand; contains cemented nodules	
141											
142											
143											
144											
145											
146											
147											
148											
149											
150	X	SS 23	24 31 42	18 18					SM	BEAUMONT: strong brown (7.5YR 5/8); silt; SAND (SM); moist; very dense; fine sand; some silt	SS-23A: 149.3' to 150.6' SS-23B: 150.6' to 150.8'
151									CH	BEAUMONT: strong brown (7.5YR 5/8); CLAY (CH); moist; hard	
152											
153											
154											
155											
156											
157											
158											
159											
160	X	SS	22	18					ML	BEAUMONT: strong brown (7.5YR 5/8); clay; SILT	

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Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160	X	24	32 39	18					ML	(ML); moist; hard	
161											
162											
163											
164											
165											
166											
167											
168											
169											
170	X	SS 25	9 13 14	16 18					CH	BEAUMONT: strong brown (7.5YR 5/8); CLAY (CH); moist; very stiff	
171											
172											
173											
174											
175											
176											
177											
178											
179											
180	X	SS 26	14 27 26	18 18						BEAUMONT: strong brown (7.5YR 5/8); sand; CLAY (CH); moist; hard; few sand	
181											
182											
183											
184											
185											
186											
187											
188											
189											
190	X	SS 27	11 14 16	18 18						BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; very stiff	
191											
192											
193											
194											
195											
196											
197											
198											
199											
200	X	SS	7	18						BEAUMONT: light olive brown (2.5Y 5/4); CLAY	

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SOIL LOG - Boring No. U3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200	X	28	10 10	18					CH	(CH); moist; very stiff	
201											
202											
203											
204											
205											
206											
207											
208											
209											
210	X	SS 29	7 13 14	18 / 18						BEAUMONT: greenish gray (GLEY 1 5/5GY); CLAY (CH); moist; very stiff	
211											
212											
213											
214											
215											
216											
217											
218											
219											
220	X	SS 30	4 7 16	18 / 18						BEAUMONT: gray (2.5Y 5/1); sand; CLAY (CH); moist; very stiff; some fine sand	
221											
222											
223											
224											
225											
226											
227											
228											
229											
230	X	SS 31	11 22 26	6 / 18					SM	BEAUMONT: light olive brown (2.5Y 5/3); silt; SAND (SM); moist; dense; fine sand; some silt	
231											
232											
233											
234											
235											
236											
237											
238											
239											
240	X	SS	25	10						BEAUMONT: gray (10YR 6/1); silt; SAND (SM);	

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STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240		32	50/5"	11					SM	moist; very dense; fine sand; some silt	
241											
242											
243											
244											
245											Strata break at 245 ft based on drilling observations
246											
247											
248											
249											
250		SS 33	12 17 18	18 18					CH	BEAUMONT: gray (5Y 6/1) mottled with yellowish brown (10YR 5/4); sand; CLAY (CH); moist; hard; few fine sand	
251											
252											
253											
254											
255											
256											
257											
258											
259											
260		SS 34	20 46 50/5"	6 17					SM	BEAUMONT: light olive gray (5Y 6/2); silt; SAND (SM); moist; very dense; fine sand; some fines	
261											
262											
263											
264											
265											
266											
267											
268											
269											
270		SS 35	6 10 12	18 18					CH	BEAUMONT: black (5Y 2.5/1) and olive gray (5Y 4/2); CLAY (CH); moist; very stiff	
271											
272											
273											
274											
275											
276											
277											
278											
279											
280		SS	7	18						BEAUMONT: greenish gray (GLEY 1 6/5G) mottled	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280	X	36	12 15	18					CH	with olive (5Y 5/4); sand; CLAY (CH); moist; very stiff; few fine sand	
281											
282											
283											
284											
285											
286											
287											
288											
289											
290	X	SS 37	23 28 25	25 18						BEAUMONT: greenish gray (GLEY 1 6/5G); CLAY (CH); moist; hard	
291											
292											
293											
294											
295											
296											
297											
298											
299											
300	X	SS 38	9 14 14	26 18						BEAUMONT: brown (10YR 4/3); silt; CLAY (CH); moist; very stiff; little silt; high plasticity	
301										Boring terminated at 300.8 ft	
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/2/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. U3-6A
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 3 UHS Pump House N 362748.98 E 2943309.46		Total Depth 102 feet
Drilling Contractor and Rig MACTEC / D. White / CME 55 LC	Elevation at boring 28.78 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Undisturbed	Driving Hammer Wt./Drop NA / NA	No. of Samples 3	Date Started 6/24/08
	Borehole Inclination 0	Logged by A. Taylor	Date Completed 6/25/08

Reviewed by / Date HC 12/2/2008
Reviewed by / Date 12/2/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–14											Boring U3-6A offset approximately 10' east of Boring U3-6 Drill to first sample at 15 ft
15–17		UD 1		25/24					CH	BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist	Pocket Penetometer (TSF): 0.75, 0.5
18–40											

Page 1 of 3

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-6A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68		UD 2		27/24					CH	BEAUMONT: light gray (5Y 7/1); CLAY (CH); moist at 68 ft	Pocket Penetometer (TSF): 1.75, 2.0, 1.75
69									SM	BEAUMONT: brown (7.5YR 5/4); silt; SAND (SM); moist; fine sand; some silt at 70 ft	
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U3-6A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100		UD 3		24/24	25.5	99.8	43/25		CL	BEAUMONT: brown (10YR 5/3) and light brownish gray (2.5Y 6/2); CLAY (CL); moist	Pocket Penetometer (TSF): 2.0, 2.5, 2.5
101											
102										Boring terminated at 102 ft	
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. U4-1	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 UHS N 362564.16 E 2942312.84		Total Depth 299.6 feet
Drilling Contractor and Rig MACTEC/L. Carter / CME 550	Elevation at boring 30.04 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 138.8 / 30 inches	No. of Samples 38	Date Started 6/12/08
	Borehole Inclination 0	Logged by M.L Herrera	Date Completed 6/15/08

Reviewed by / Date HG 7/8/08

Reviewed by / Date 7/15/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	10 25 12	16/18					SP	FILL: dark grayish brown (10YR 4/2); SAND (SP); dry; dense; mostly medium to coarse sand; few gravel; subangular to subrounded	
4–5	X	SS 2	3 4 6	15.5/18					CH	BEAUMONT: very dark gray (10YR 3/1); CLAY (CH); moist; stiff; mostly clay	
7–8	X	SS 3	WOH 3 3	17.5/18						BEAUMONT: reddish brown (5YR 4/4) to yellowish red (5YR 4/6); CLAY (CH); moist; firm; mostly clay	
9–10	X	SS 4	4 4 5	17.5/18						BEAUMONT: reddish brown (5YR 4/4) to yellowish red (5YR 4/6); CLAY (CH); moist; stiff; mostly clay	
12–13	X	SS 5	3 6 7	18/18						BEAUMONT: reddish brown (5YR 4/4) to yellowish red (5YR 4/6); CLAY (CH); moist; stiff; mostly clay	
14–15	X	SS 6	3 3 3	16/18						BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; firm; mostly clay	SS-6A: 14' to 15' SS-6B: 15' to 15.5'
									SC	BEAUMONT: reddish brown (5YR 5/4) to yellowish red (5YR 5/6); clay; SAND (SC); moist; loose; mostly fine sand; some clay; rounded	
18–19	X	SS 7	1 2 2	5/18						BEAUMONT: yellowish red (5YR 5/6); clay; SAND (SC); wet; very loose; mostly fine sand; some clay	
23–24	X	SS 8	13 15 13	13/18					SP	BEAUMONT: light brown (7.5YR 6/4); SAND (SP); moist; very firm; mostly fine sand; rounded	
28–29	X	SS 9	5 10 17	12/18						BEAUMONT: yellowish brown (10YR 5/4 to 5/6); SAND (SP); moist; very firm; mostly fine sand; rounded	
33–34	X	SS 10	7 13 15	14.5/18						BEAUMONT: light brown (7.5YR 6/4); SAND (SP); moist; very firm; mostly fine sand; rounded	
38–39	X	SS 11	7 20 24	16/18					CH SP	BEAUMONT: yellowish red (5YR 5/6); sand; CLAY (CH); moist; hard; mostly clay; some fine sand	SS-11A: 38.1' to 39.0' SS-11B: 39.0' to 39.6'

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–42									SP	BEAUMONT: light brown (7.5YR 6/4); SAND (SP); wet; dense; mostly fine sand; rounded	
43										BEAUMONT: light brown (7.5YR 6/4); SAND (SP); wet; dense; mostly fine sand; rounded	
44	X	SS 12	10 7 8	11.5 / 18					SC	BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SC); moist; firm; mostly fine sand; some clay	SS-12A: 43.1' to 43.6' SS-12B: 43.6' to 44.6'
45–47										BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SC); moist; loose; mostly fine sand; some clay	
48–49	X	SS 13	2 3 4	22 / 18					CH	BEAUMONT: brown (7.5YR 4/3); CLAY (CH); moist; firm; mostly clay	SS-13A: 48.1' to 48.6' SS-13B: 48.6' to 49.6'
50–58											
59	X	SS 14	10 8 11	11 / 18	18.8	76.2	24/8		CL	BEAUMONT: brown (7.5YR 5/4); silt; CLAY (CL); moist; very stiff; little clay; some silt; little rounded fine to medium sand	
60–68											
69	X	SS 15	10 19 18	12.5 / 18					SP-SC	BEAUMONT: brownish yellow (10YR 6/6); clay; SAND (SP-SC); moist; dense; mostly fine sand; few clay; rounded	
70–78											
79	X	SS 16	19 40 33	11.5 / 18					SP	BEAUMONT: yellowish brown (10YR 5/4); SAND (SP); wet; very dense; mostly medium sand; rounded	
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP		
81											
82											
83											
84											
85											
86											
87											
88											
89	X	SS 17	6 8 11	19/18					CH	BEAUMONT: light olive gray (5Y 6/2); CLAY (CH); moist; very stiff; mostly clay	
90											
91											
92											
93											
94											
95											
96											
97											
98											
99	X	SS 18	9 12 15	18/18						BEAUMONT: yellowish red (5YR 5/6) and light brownish gray (2.5Y 6/2); CLAY (CH); moist; very stiff; mostly clay	
100											
101											
102											
103											
104											
105											
106											
107											
108											
109	X	SS 19	6 7 9	18/18						BEAUMONT: light gray (5Y 7/1) and light yellowish brown (2.5Y 6/4); CLAY (CH); moist; very stiff; mostly clay	
110											
111											
112											
113											
114											
115											
116											
117											
118											
119	X	SS 20	11 15 15	16/18						BEAUMONT: light gray (5Y 7/1) and strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; mostly clay; few fine sand	
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123											
124											
125											
126											
127											
128	X	SS 21	10 12 16	19/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; mostly clay	
129											
130											
131											
132											
133											
134											
135											
136											
137											
138	X	SS 22	8 15 16	20/18					SC	BEAUMONT: light gray (2.5YR 7/1) and olive yellow (2.5Y 6/6); clay; SAND (SC); moist; dense; mostly fine sand; some high plasticity clay; rounded	
139											
140											
141											
142											
143											
144											
145											
146											
147											
148	X	SS 23	4 9 16	11.5/18					SP	BEAUMONT: light gray (10YR 7/2); SAND (SP); moist; very firm; mostly fine sand; rounded	
149											
150											
151											
152											
153											
154											
155											
156											
157											
158	X	SS 24	WOH 6 8	25/18					CH	BEAUMONT: strong brown (7.5YR 5/6 to 4/6); sand; CLAY (CH); moist; stiff; mostly clay; some silt; little sand	
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161											
162											
163											
164											
165											
166											
167											
168	X	SS 25	6 5 8	19.5 / 18						BEAUMONT: strong brown (7.5YR 5/6); sand; CLAY (CH); wet; stiff; mostly clay; some fine sand	
169											
170											
171											
172											
173											
174											
175											
176											
177											
178	X	SS 26	9 11 27	11 / 18						BEAUMONT: strong brown (7.5YR 5/6); sand; CLAY (CH); moist; hard; mostly clay; some fine sand	
179											
180											
181											
182											
183											
184											
185											
186											
187											
188	X	SS 27	9 10 14	22 / 18						BEAUMONT: strong brown (7.5YR 5/6); light gray (5Y 7/1); sand; CLAY (CH); moist; very stiff; mostly clay; some fine sand	
189											
190											
191											
192											
193											
194											
195											
196											
197											
198	X	SS 28	5 7 14	25 / 18						BEAUMONT: brown (7.5Y 5/4); CLAY (CH); moist; very stiff; mostly clay; few sand	
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202											
203											
204											
205											
206											
207											
208	X	SS 29	6 12 10	20/18						BEAUMONT: brown (10YR 5/3); CLAY (CH); moist; very stiff; mostly clay; few fine sand	
209											
210											
211											
212											
213											
214											
215											
216											
217											
218	X	SS 30	WOH WOH 2	25/18						BEAUMONT: dark gray (5Y 4/1); CLAY (CH); moist; soft; mostly clay; few fine sand	
219											
220											
221											
222											
223											
224											
225											
226											
227											
228	X	SS 31	WOH WOH 8	25/18						BEAUMONT: dark gray (5Y 4/1); CLAY (CH); moist; firm; mostly clay; some silt	
229											
230											
231											
232											
233											
234											
235											
236											
237											
238	X	SS 32	6 11 16	26/18						BEAUMONT: greenish gray (GLEY 1 5/5GY); CLAY (CH); moist; very stiff; mostly clay	
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									CH		
241											
242											
243											
244											
245											
246											Difficulty drilling due to hard and dry soil
247											
248											
249	X	SS 33	5 12 17	26/18						BEAUMONT: greenish gray (GLEY 1 5/5GY) and light olive brown (2.5Y 5/3); CLAY (CH); moist; very stiff; mostly clay	
250											
251											
252											
253											
254											
255											
256											
257											
258											
259	X	SS 34	7 12 14	23.5/18						BEAUMONT: brown (7.5YR 4/2); CLAY (CH); moist; very stiff; mostly clay; some silt	
260											
261											
262											
263											
264											
265											
266											
267											
268											
269	X	SS 35	WOH WOH 8	25.5/18						BEAUMONT: very dark greenish gray (GLEY 1 3/10Y); CLAY (CH); moist; firm; mostly clay; shell fragments	
270											
271											
272											
273											
274											
275											
276											
277											
278											
279	X	SS 36	7 9 14	26/18						BEAUMONT: dark greenish gray (GLEY 2 4/5BG); CLAY (CH); moist; very stiff; mostly clay; few shell fragments	
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281											
282											
283											
284											
285											
286											
287											
288											
289	X	SS 37	8 34 43	15 / 18					SC	BEAUMONT: greenish gray (GLEY 1 5/5GY); clay; SAND (SC); moist; very dense; mostly medium sand; some clay; rounded	
290											
291											
292											
293											
294											
295											
296											
297											
298											
299	X	SS 38	8 9 14	26 / 18					CH	BEAUMONT: dark grayish brown (10YR 4/2); CLAY (CH); moist; very stiff; mostly clay	
300										Boring terminated at 299.6 ft	
301											
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/2/08

Project Name : Job Number MACTEC STP COL Units 3 & 4 : 6234-08-4660			SOIL LOG - Boring No. U4-1A
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 UHS N 362572.17 E 2942309.34		Total Depth 279.25 feet
Drilling Contractor and Rig Miller Drilling / CME 750 ATV	Elevation at boring 30.42 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Undisturbed	Driving Hammer Wt./Drop NA / NA	No. of Samples 7	Date Started 6/23/08
	Borehole Inclination 0	Logged by J. Honeycutt	Date Completed 6/27/08

Reviewed by / Date HJC 12/2/2008

Reviewed by / Date JJ 12/2/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–6											Boring U4-1A offset approximately 10' west of Boring U4-1 Drill to first sample at 7 ft
7–9		UD 1		26/24					CH	BEAUMONT: red (2.5YR 4/8); CLAY (CH); moist; some silt	Pocket Penetometer (TSF): 2.0, 2.0, 2.5 Hand Held Vane Shear (kg/cm^2): >1.0

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STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											
106											
107											
108		UD 2		26.3/24	25.0	91.8	60/38		CH	BEAUMONT: light greenish gray (GLEY 1 10Y 7/1); CLAY (CH); moist; some silt	Pocket Penetometer (TSF): 3.75, 3.75, 2.75 Hand Held Vane Shear (kg/cm^2): >1.0
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120											
121											
122											
123											
124											
125											
126											
127											
128											
129											
130											
131											
132											
133		UD 3		22/24					CH	BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; some silt	Pocket Penetometer (TSF): 4.5, 4.5, 4.0 Hand Held Vane Shear (kg/cm^2): >1.0
134											
135											
136											
137											
138											
139											
140											
141											
142											
143											
144											
145											
146											
147											
148											
149											
150											
151											
152											
153											
154											
155											
156											
157											
158											
159											
160											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160											
161											
162											
163											
164											
165											
166											
167											
168											
169											
170											
171											
172											
173											
174											
175											
176											
177											
178											
179											
180											
181											
182											
183											
184											
185											
186											
187											
188											
189											
190											
191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200											
201											
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
216											
217											
218											
219		UD 4		25.4/24	36.7	99.7	61/39		CH	BEAUMONT: dark gray (GLEY 1 4/N); CLAY (CH); moist; little silt	Pocket Penetometer (TSF): 4.0, 4.5, 4.5 Hand Held Vane Shear (kg/cm^2): 0.5
220											
221											
222											
223											
224											
225											
226											
227											
228											
229		UD 5		27/24	41.1	99.5	68/39		CH	BEAUMONT: very dark greenish gray (GLEY 1 10Y 3/1); CLAY (CH); moist; little silt	Pocket Penetometer (TSF): 2.5, 2.75, 2.75 Hand Held Vane Shear (kg/cm^2): >1.0
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-1A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240											
241											
242											
243											
244											
245											
246											
247											
248											
249											
250											
251											
252											
253											
254											
255											
256											
257											
258											
259											
260											
261											
262											
263											
264											
265											
266											
267											
268											
269–270		UD 6		4.5/24	43.0	90.0	74/50		CH	BEAUMONT: greenish gray (GLEY 1 10Y 5/1); CLAY (CH); moist; little silt	Pocket Penetometer (TSF): did not perform Hand Held Vane Shear (kg/cm^2): did not perform Tests were not performed due to accessibility to bottom of sample
271											
272											
273											
274											
275											
276											Pocket Penetometer (TSF): 3.0, 3.0, 2.0 Hand Held Vane Shear (kg/cm^2): >1.0
277–279		UD 7		27/27	32.7	96.5	81/54		CH	BEAUMONT: dark bluish gray (GLEY 2 5B 4/1); CLAY (CH); moist; some silt	
280										Boring terminated at 279.25 ft	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-2

Type and Diameter of Boring: Mud Rotary / 4 Inches	Boring Location: Unit 4 UHS, N 362561.08 E 2942606.54		Total Depth: 304.5 feet
Drilling Contractor and Rig: Miller Drilling / CME 750 ATV	Elevation at boring: 30.42 feet	Ground Water Depth: N/A	Depth to Bedrock: N/A
Sampling Method: Split Spoon	Driving Hammer Wt./Drop: 139.6 / 30 inches	No. of Samples: 39	Date Started: 6/15/08
	Borehole Inclination: 0	Logged by: R. Clark	Date Completed: 6/21/08

Reviewed by / Date HK 7/3/08
Reviewed by / Date DJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	5 7 9	18/18					SW	FILL: dark yellowish brown (10YR 4/4); clay; silt; gravel; SAND (SW); moist; firm; well-graded	
4–5	X	SS 2	3 2 3	15/18						FILL: dark yellowish brown (10Y 4/4); gravel; SAND (SW); moist; loose; some organics; trace clay	
7–8	X	SS 3	1 2 1	12/18					SM	BEAUMONT: yellowish brown (10YR 5/4); silt; SAND (SM); wet; very loose; fine quartz sand; trace gravel; trace clay; HCl reaction	
9–10	X	SS 4	1 2 3	15/18					CH	BEAUMONT: brown (7.5YR 5/4); CLAY (CH); moist; firm; high plasticity; HCl reaction; slightly mottled; trace organics (roots)	
12	X	SS 5	3 3 4	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; firm; high plasticity; trace sand sized calcareous nodules	
14–15	X	SS 6	4 3 5	17/18						BEAUMONT: yellowish red (5YR 5/6) slightly mottled with greenish gray (GLEY 1 5GY 7/1); silt; CLAY (CH); moist; firm; some silt; high plasticity	
18–19	X	SS 7	2 4 3	18/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; firm; some silt; high plasticity; HCl reaction	
23–24	X	SS 8	3 4 5	18/18					SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; loose; fine quartz sand; few silt; trace clay; HCl reaction	Driller indicated possible change in drilling at 21 ft
28–29	X	SS 9	6 11 15	17/18					SP-SM	BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SP-SM); wet; very firm; fine poorly graded quartz sand; some silt; HCl reaction	
33–34	X	SS 10	7 8 10	12/18						BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SP-SM); wet; firm; fine poorly graded quartz sand; few silt; HCl reaction	
38–39	X	SS 11	10 15 13	16/18						BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SP-SM); wet; very firm; fine poorly graded quartz sand; few silt; HCl reaction	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–41									SP-SM		
42											Driller indicated change in drilling resistance at 41 ft
43–44	X	SS 12	5 5 6	12/18					CH	BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; stiff; high plasticity; blocky; HCl reaction	
45–47											
48–49	X	SS 13	7 7 11	18/18					SP-SM	BEAUMONT: brownish yellow (10YR 6/6); silt; SAND (SP-SM); wet; firm; fine poorly graded quartz sand; few silt; HCl reaction	
50–52											
53–54	X	SS 14	4 5 6	18/18					CH	BEAUMONT: very pale brown (10YR 7/3); silt; CLAY (CH); moist; stiff; some silt; trace sand sized calcareous nodules; high plasticity; HCl reaction	
55–62											
63–64	X	SS 15	12 13 18	15/18					SP-SM	BEAUMONT: light brown (7.5YR 6/2); silt; SAND (SP-SM); wet; dense; fine poorly graded quartz sand; few silt; HCl reaction	
65–72											
73–74	X	SS 16	16 18 22	16/18						BEAUMONT: brownish yellow (10YR 6/6); silt; SAND (SP-SM); wet; dense; fine poorly graded quartz sand; few silt; HCl reaction	
75–78											
79–80											Driller indicated change in

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									CH		water pressure at 80 ft
81										BEAUMONT: yellowish red (5YR 5/6) mottled with light greenish gray (GLEY 1 5GY 7/1); silt; CLAY (CH); moist; very stiff; some silt; trace fine sand; high plasticity	
82											
83	X	SS 17	8 7 12	18/18					SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); moist; firm; fine quartz sand; some silt	SS-17A: 83.0' to 83.3' SS-17B: 83.3' to 84.8' SS-17C: 83.8' to 84.5'
84									CH	BEAUMONT: strong brown (7.5YR 5/6); silt; CLAY (CH); moist; very stiff; some silt; trace fine sand; HCl reaction; high plasticity	
85											
86											
87											
88											
89											
90											
91											
92											
93	X	SS 18	8 10 12	21/18						BEAUMONT: strong brown (7.5YR) 5/6) mottled with greenish gray (GLEY 1 5GY 5/1); CLAY (CH); moist; very stiff; high plasticity	
94											
95											
96											
97											
98											
99											
100											
101											
102											
103	X	SS 19	6 7 7	20/18						BEAUMONT: reddish brown (2.5YR 5/4) slightly mottled with greenish gray (GLEY 1 5GY 6/1); CLAY (CH); moist; stiff; high plasticity; blocky	
104											
105											
106											
107											
108											
109											
110											
111											
112											
113	X	SS 20	6 7 9	20/18						BEAUMONT: light yellowish brown (2.5Y 6/3); silt; CLAY (CH); moist; very stiff; little silt; trace sand sized calcareous nodules; high plasticity; HCl reaction	
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123	X	SS 21	5 9 10	20/18						BEAUMONT: yellowish red (5YR 5/6) slightly mottled with greenish gray (GLEY 1 5GY 5/1); CLAY (CH); moist; very stiff; high plasticity; HCl reaction	
124											
125											
126											
127											
128											
129											
130											
131											
132											
133	X	SS 22	9 10 13	20/18						BEAUMONT: strong brown (7.5YR 5/6) mottled slightly with greenish gray (GLEY 1 5GY 6/1); CLAY (CH); moist; very stiff; trace silt; high plasticity; HCl reaction	
134											
135											
136											
137											
138											
139											
140											
141											Driller indicated change in drilling resistance at 141 ft
142											
143	X	SS 23	8 18 19	16/18					SP-SM	BEAUMONT: light gray (5Y 7/2); silt; SAND (SP-SM); wet; dense; fine poorly graded quartz sand; few silt; trace clay; HCl reaction	
144											
145											
146											
147											
148											
149											
150											
151											
152											
153	X	SS 24	7 8 9	19/18					SM	BEAUMONT: light gray (5Y 7/1); clay; silt; SAND (SM); wet; firm; fine quartz sand; some silt; little clay; HCl reaction	
154											
155											Driller indicated change in water pressure at 155 ft Change in color of recirculating fluid
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									CH		
161											
162									CH	BEAUMONT: yellowish red (5YR 5/6); silt; CLAY (CH); moist; very stiff; little silt; trace fine sand; high plasticity; HCl reaction	
163	X	SS 25	7 9 11	17/18							SS-25A: 163.0' to 163.6' SS-25B: 163.6' to 164.5'
164									ML	BEAUMONT: strong brown (7.5YR 5/6); clay; SILT (ML); wet; very stiff; some clay; trace fine sand; HCl reaction; slight plasticity	
165											Driller indicated high water pressure similar to drilling while in clay materials at 165 ft
166											
167											
168											
169											
170											
171											
172											
173	X	SS 26	9 12 15	20/18					CH	BEAUMONT: yellow red (5YR 5/6); CLAY (CH); moist; very stiff; trace sand sized calcareous nodules; high plasticity; HCl reaction	
174											
175											
176											
177											
178											
179											
180											
181											
182											
183	X	SS 27	7 11 13	18/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; some silt; trace sand sized calcareous nodules; high plasticity; HCl reaction	
184											
185											
186											
187											
188											
189											
190											
191											
192											
193	X	SS 28	8 9 13	21/18						BEAUMONT: yellowish red (5YR 5/6); silt; CLAY (CH); moist; very stiff; some silt; high plasticity; HCl reaction	
194											
195											
196											Driller indicated possible SAND zone from 196' to 198' due to drop in water pressure Slight rod chatter Screened return water cuttings and observed some sand in wash
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202											
203	X	SS 29	12 15 17	23/18						BEAUMONT: yellowish brown (10YR 5/6); silt; CLAY (CH); moist; hard; some silt; high plasticity; HCl reaction	
204											
205											
206											
207											
208											
209											
210											
211											
212											
213	X	SS 30	4 6 13	19/18						BEAUMONT: brown (7.4YR 4/4); CLAY (CH); moist; very stiff; high plasticity; slight laminations; HCl reaction	
214											
215											
216											
217											
218											
219											
220											
221											
222											
223	X	SS 31	8 9 12	20/18						BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; very stiff; high plasticity; HCl reaction; slightly mottled	
224											
225											
226											
227											
228											
229											
230											
231											
232											
233	X	SS 32	7 13 17	18/18						BEAUMONT: olive gray (5Y 4/2); CLAY (CH); moist; very stiff; trace sand sized calcareous nodules; high plasticity; HCl reaction; slightly mottled	
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									CH		
241											
242											
243	X	SS 33	7 11 14	23/18						BEAUMONT: greenish gray (GLEY 1 10GY 7/1); CLAY (CH); moist; very stiff; trace sand sized calcareous nodules; high plasticity; HCl reaction	
244											
245											
246											
247											
248											
249											
250											
251											
252											
253	X	SS 34	8 11 14	19/18						BEAUMONT: greenish gray (GLEY1 10 GY 7/1) slightly mottled with yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; trace sand gravel sized calcareous nodules; high plasticity; HCl reaction	
254											
255											
256											
257											
258											
259											
260											
261											
262											
263	X	SS 35	7 8 10	0/18						No Recovery	Plastic sand catcher damaged; replaced with steel catcher
264											
265											
266											
267											
268											
269											
270											
271											
272											
273	X	SS 36	WOH WOH 5	22/18						BEAUMONT: greenish black (GLEY 1 5GY 2.5/1); silt; CLAY (CH); moist; firm; trace fine sand; high plasticity	
274											
275											
276											
277											
278											
279											
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-2

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280											
281									CH		
282										BEAUMONT: greenish gray (GLEY 1 10Y 5/1); sand; CLAY (CH); moist; hard; few sand; high plasticity	
283											
284	X	SS 37	13 29 23	8 / 18					SC	BEAUMONT: greenish gray (GLEY 1 10Y 5/1); clay; SAND (SC); moist; very dense; little clay	SS-37A: 283.0' to 283.5' SS-37B: 283.5' to 284.5'
285											
286											
287											
288											
289											
290											Driller indicated hard drilling at 290 ft
291											
292											
293											
294	X	SS 38	9 14 17	18 / 18					CH	BEAUMONT: dark grayish brown (10YR 4/2) slightly mottled with (GLEY 1 10Y 5/1); silt; CLAY (CH); moist; hard; some silt; high plasticity; thin layer of decomposed shells	
295											
296											
297											
298											
299											
300											
301											
302										BEAUMONT: dark greenish gray (GLEY 1 10Y 4/1); silt; CLAY (CH); moist; very stiff; some silt; high plasticity; little decomposed shell fragments throughout	
303											
304	X	SS 39	4 9 11	24 / 18							
305										Boring terminated at 304.5 ft	
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. U4-3	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 UHS N 362630.99 E 2942460.53		Total Depth 300.9 feet
Drilling Contractor and Rig MACTEC / P. Pitts / CME 55	Elevation at boring 30.65 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 141.1 / 30 inches	No. of Samples 70	Date Started 6/13/08
	Borehole Inclination 0	Logged by D. Athinson	Date Completed 6/20/08

Reviewed by / Date HJC 7/8/08

Reviewed by / Date 7/15/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–3	X	SS 1	9 5 5	6/18					SP-SM	Grass at surface (approximately 3 inches) FILL: white (5YR 8/1); silt; SAND (SP-SM); moist; loose; fine poorly graded sand; few silt; trace gravel	
4–5	X	SS 2	2 4 4	3/18					ML	BEAUMONT: reddish black (2.5YR 2.5/1); SILT (ML); moist; firm; trace gravel	
6–7	X	SS 3	2 2 4	15/18					CH	BEAUMONT: dark grayish brown (2.5Y 4/2); CLAY (CH); moist; firm; few silt; trace gravel	
9–10	X	SS 4	2 4 6	16/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; stiff; few silt	
11–12	X	SS 5	2 2 3	17/18						BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; firm; few silt; trace fine sand	
14–15	X	SS 6	3 5 8	18/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; stiff; few silt	
17–18	X	SS 7	2 6 7	15.5/18						BEAUMONT: reddish brown (5YR 4/3); CLAY (CH); moist; stiff; few silt	
20–21	X	SS 8	2 2 5	13.5/18					SC	BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SC); moist; loose; fine poorly graded sand; some clay; trace silt	
22–23	X	SS 9	4 5 10	12/18						BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SC); moist; firm; fine poorly graded sand; some clay; trace silt	
25–26	X	SS 10	4 5 9	15/18						BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SC); moist; firm; fine poorly graded sand; some clay; trace silt	
27–28	X	SS 11	10 10 10	11.5/18					SP-SM	BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SP-SM); moist; firm; fine poorly graded sand; few silt	
30–31	X	SS 12	4 5 11	14.5/18					SC	BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SC); moist; firm; fine poorly graded sand; some clay	
32–33	X	SS 13	5 7 7	16/18					SP-SM	BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SP-SM); wet; firm; fine poorly graded sand; few silt	
35–36	X	SS 14	5 14 15	18/18						BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SP-SM); wet; very firm; fine poorly graded sand; few silt	
37–38	X	SS 15	6 12 15	12/18						BEAUMONT: strong brown (7.5YR 4/6); silt; SAND (SP-SM); wet; very firm; fine poorly graded sand; few silt	
40	X		6							BEAUMONT: yellowish brown (10YR 5/4); silt;	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–41	X	SS 16	12 15	13/18					SP-SM	SAND (SP-SM); wet; very firm; fine poorly graded sand; few silt	
42–43	X	SS 17	6 12 29	16.5/18						BEAUMONT: yellowish brown (10YR 5/4); silt; SAND (SP-SM); wet; dense; fine poorly graded sand; few silt	
44–46	X	SS 18	6 15 22	11.5/18						BEAUMONT: yellowish brown (10YR 5/6); silt; SAND (SP-SM); wet; dense; fine poorly graded sand; few silt; trace clay	
47–48	X	SS 19	3 6 10	17/18					CH	BEAUMONT: yellowish red (5YR 4/6); CLAY (CH); moist; very stiff; trace silt	
50–51	X	SS 20	9 11 8	18/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff; trace silt; trace fine sand	
52–53	X	SS 21	WOH 1 4	18/18						BEAUMONT: pale olive (5Y 6/3); CLAY (CH); moist; firm; few silt	
55–56	X	SS 22	3 6 9	18/18						BEAUMONT: pale olive (5Y 6/3); CLAY (CH); moist; stiff; few silt	
57–58	X	SS 23	5 13 9	17.5/18					CL	BEAUMONT: strong brown (7.5YR 5/6); sand; CLAY (CL); moist; very stiff; some fine poorly graded sand; trace gravel	
60–61	X	SS 24	6 9 11	15/18	20.9	76.2	23/9			BEAUMONT: strong brown (7.5YR 5/6); silt; CLAY (CL); moist; very stiff; little clay; some silt; little fine to medium sand	
62–63	X	SS 25	9 12 13	15/18					SP-SC	BEAUMONT: dark yellowish brown (10YR 4/4); clay; SAND (SP-SC); wet; very firm; fine sand; few clay	
65–66	X	SS 26	3 7 13	13.5/18					CH	BEAUMONT: strong brown (7.5YR 5/6); sand; CLAY (CH); wet; very stiff; few fine poorly graded sand	
67–68	X	SS 27	13 22 28	14/18					SP-SC	BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SP-SC); wet; dense; fine sand; few clay	
70–71	X	SS 28	12 20 27	12/18						BEAUMONT: strong brown (7.5YR 4/6); clay; SAND (SP-SC); wet; dense; fine sand; few clay	
72–73	X	SS 29	8 18 23	13.5/18						BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SP-SC); wet; dense; fine sand; few clay	
75–76	X	SS 30	7 20 27	13/18					SP-SM	BEAUMONT: strong brown (7.5YR 5/8); silt; SAND (SP-SM); wet; dense; fine sand; few silt	
77–78	X	SS 31	12 14 16	10.5/18						BEAUMONT: yellowish brown (10YR 5/4); silt; SAND (SP-SM); wet; very firm; fine sand; few silt	
80	X		4							BEAUMONT: strong brown (7.5YR 5/6); clay;	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–81	X	SS 32	5 15	14/18					SW-SC	SAND (SW-SC); wet; firm; fine to coarse well-graded sand; few clay	
82–83	X	SS 33	5 6 11	17/18					CH	BEAUMONT: olive (5Y 5/3); CLAY (CH); moist; very stiff; few silt; trace gravel	
85–86	X	SS 34	3 7 8	17.5/18						BEAUMONT: brown (7.5YR 5/4) mottled with olive (5Y 5/3); CLAY (CH); moist; stiff; few silt; trace fine sand	
87–88	X	SS 35	3 6 9	18/18						BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; stiff; trace silt	
90–91	X	SS 36	5 10 14	17/18						BEAUMONT: light olive gray (5Y 6/2); CLAY (CH); moist; very stiff; trace silt; trace gravel	
92–93	X	SS 37	7 12 17	16.5/18						BEAUMONT: light olive gray (5Y 6/2); CLAY (CH); moist; very stiff; trace silt; trace gravel	
95–96	X	SS 38	6 10 15	18/18						BEAUMONT: strong brown (7.5YR 5/6) mottled with light olive (5Y 6/2); CLAY (CH); moist; very stiff; trace gravel	
97–98	X	SS 39	5 11 13	18/18						BEAUMONT: strong brown (7.5YR 4/6) mottled with light olive (5Y 6/2); CLAY (CH); moist; very stiff; trace gravel	
100–101	X	SS 40	5 8 14	18/18						BEAUMONT: strong brown (7.5YR 4/6) mottled with light yellowish brown (2.5Y 6/4); CLAY (CH); moist; very stiff	
105–106	X	SS 41	5 8 12	18/18						BEAUMONT: strong brown (7.5YR 5/8); CLAY (CH); moist; very stiff; trace silt	
110–111	X	SS 42	3 7 9	18/18						BEAUMONT: light yellowish brown (2.5Y 6/4); CLAY (CH); moist; very stiff; trace silt	
115–116	X	SS 43	5 8 11	18/18						BEAUMONT: light olive gray (5Y 6/2); CLAY (CH); moist; very stiff; few silt; trace gravel	
120	X		5							BEAUMONT: light gray (2.5Y 7/2); sand; CLAY	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120–121	X	SS 44	17 16	12/18					CH	(CH); moist; hard; some fine poorly graded sand	
125–126	X	SS 45	7 12 15	18/18						BEAUMONT: yellowish red (5YR 5/6) mottled with light gray (2.5Y 7/2); CLAY (CH); moist; very stiff; trace silt	
130–131	X	SS 46	6 10 14	18/18						BEAUMONT: yellowish red (5YR 5/6) mottled with light gray (2.5Y 7/2); CLAY (CH); moist; very stiff; trace silt	
135–136	X	SS 47	8 12 15	8/18						BEAUMONT: strong brown (7.5YR 5/8); CLAY (CH); moist; very stiff; trace silt	
140–141	X	SS 48	6 15 16	17/18						BEAUMONT: light brownish gray (2.5Y 6/2); sand; CLAY (CH); moist; hard; some fine poorly graded sand	
144										BEAUMONT: strong brown (7.5YR 5/8); CLAY (CH); moist; very stiff; trace silt	
145–146	X	SS 49	6 9 13	13/18					SP-SC	BEAUMONT: light gray (2.5Y 6/2); clay; SAND (SP-SC); wet; very firm; fine sand; few clay	SS-49A: 144.4' to 144.6' SS-49B: 144.6' to 145.9'
150–151	X	SS 50	12 20 27	8/18						BEAUMONT: light gray (2.5Y 6/2); clay; SAND (SP-SC); wet; dense; fine sand; few clay	
155–156	X	SS 51	11 15 18	14/18						BEAUMONT: light brownish gray (10YR 6/2); clay; SAND (SP-SC); wet; dense; fine sand; few clay; clay lenses	
160	X		6							BEAUMONT: strong brown (7.5YR 5/6); sand;	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160	X	SS 52	10 14	18/18					CH	CLAY (CH); moist; very stiff; some fine poorly graded sand	
161											
162											
163											
164											
165	X	SS 53	9 13 22	16/18					SP-SC	BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SP-SC); moist; dense; fine sand; few clay	
166											
167											
168											
169											
170	X	SS 54	9 14 19	18/18					SC	BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SC); wet; dense; fine sand; some clay; 2-inch interbedded clay lens	
171											
172											
173											
174											
175	X	SS 55	7 11 14	18/18					CH	BEAUMONT: yellowish red (5YR 5/8); CLAY (CH); moist; very stiff; trace silt	
176											
177											
178											
179											
180	X	SS 56	6 11 14	18/18						BEAUMONT: yellowish red (5YR 5/8); CLAY (CH); moist; very stiff; trace silt	
181											
182											
183											
184											
185	X	SS 57	22 25 50/2"	8/14					SP-SC	BEAUMONT: light brown (7.5YR 6/4); clay; SAND (SP-SC); moist; very dense; fine sand; few clay	
186											
187											
188											
189											
190	X	SS 58	8 14 19	16/18					CH	BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); moist; hard; few silt; trace sand	
191											
192											
193											
194											
195	X	SS 59	5 8 14	17/18						BEAUMONT: strong brown (7.5YR 5/8); CLAY (CH); moist; very stiff; few silt; trace fine sand	
196											
197											
198											
199											
200	X		5							BEAUMONT: strong brown (7.5YR 5/8); CLAY	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200	X	SS 60	9 9 9	18/18					CH	(CH); moist; very stiff; little silt; trace fine sand	
201											
202											
203											
204											
205											
206											
207											
208											
209											
210	X	SS 61	8 8 10	18/18						BEAUMONT: brown (10YR 5/3); CLAY (CH); moist; very stiff; little silt; trace fine poorly graded sand	
211											
212											
213											
214											
215											
216											
217											
218											
219											
220	X	SS 62	5 1 5	18/18						BEAUMONT: dark gray (10YR 4/1); CLAY (CH); moist; firm; some silt; trace fine sand	
221											
222											
223											
224											
225											
226											
227											
228											
229											
230	X	SS 63	WOH WOH WOH	18/18						BEAUMONT: dark gray (10YR 4/1); CLAY (CH); moist; very soft; some silt; trace fine sand	
231											
232											
233											
234											
235											
236											
237											
238											
239											
240	X		6							No recovery	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240	X	SS 64	12 13	0 18					CH		
241											
242											
243											
244											
245											
246											
247											
248											
249											
250	X	SS 65	7 13 16	18 18						BEAUMONT: dark grayish brown (2.5Y 4/2) mottled with dark olive gray (5Y 3/2); CLAY (CH); moist; very stiff; few silt; trace shells	
251											
252											
253											
254											
255											
256											
257											
258											
259											
260	X	SS 66	7 13 14	18 18						BEAUMONT: brown (10YR 4/3); sand; CLAY (CH); moist; very stiff; some fine poorly graded sand; trace silt	
261											
262											
263											
264											
265											
266											
267											
268											
269											
270	X	SS 67	WOH WOH 6	18 18						BEAUMONT: very dark gray (5Y 3/1); CLAY (CH); moist; firm; some silt; trace shell fragments	
271											
272											
273											
274											
275											
276											
277											
278											
279											
280	X		WOH							BEAUMONT: dark greenish gray (GLEY 2 4/5G);	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-3

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280		SS 68	8 14	18/18					CH	CLAY (CH); moist; very stiff; few silt; trace shell fragments	
281											
282											
283											
284											
285											
286											
287											
288											
289											
290		SS 69	18 30 30	11/18					SP-SC	BEAUMONT: greenish gray (GLEY 1 5/10Y); clay; SAND (SP-SC); moist; very dense; fine sand; few clay	
291											
292											
293											
294											
295											
296											
297											
298											
299											
300		SS 70	4 10 16	18/18					CH	BEAUMONT: very dark grayish brown (10YR 3/2); CLAY (CH); moist; very stiff; trace silt	
301										Boring terminated at 300.9 ft	
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/2/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. U4-3A
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 UHS N 362629.54 E 2942470.64		Total Depth 87 feet
Drilling Contractor and Rig AE Drilling / CME 750 ATV	Elevation at boring 30.54 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Undisturbed	Driving Hammer Wt./Drop NA / NA	No. of Samples 2	Date Started 6/25/08
	Borehole Inclination 0	Logged by T. Longley	Date Completed 6/25/08

Reviewed by / Date HC 12/2/2008

Reviewed by / Date DJ 12/4/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0											Boring U4-3A offset approximately 10' east of Boring U4-3 Drill to first sample at 52 ft
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-3A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53		UD 1		28/24	21.6	87.4	46/26		CL	BEAUMONT: light reddish brown (5YR 6/4) to light olive gray (5Y 6/2); silt; CLAY (CL); moist; little silt; trace fine sand; red mottling	Pocket Penetometer (TSF): 3.5, 3.0, 2.5
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-3A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85											
86		UD 2		18/24	27.9	92.0	30/11		CL	BEAUMONT: light gray (10YR 7/1) to light brown (7.5YR 6/4); CLAY (CL); moist	Pocket Penetometer (TSF): 2.0, 1.75, 2.25
87										Boring terminated at 87 ft	
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											
106											
107											
108											
109											
110											
111											
112											
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. U4-4	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 UHS N 362702.74 E 2942313.38		Total Depth 304.5 feet
Drilling Contractor and Rig Miller Drilling / CME 750 ATV	Elevation at boring 31.09 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.3 / 30 inches	No. of Samples 39	Date Started 6/11/08
	Borehole Inclination 0	Logged by R. Clark	Date Completed 6/15/08

Reviewed by / Date HC 7/8/08

Reviewed by / Date DG 7/15/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–3	X	SS 1	9 7 7	16/18					SW	FILL; light yellowish brown (10YR 6/4); SAND (SW); moist; firm; medium to coarse sand; angular to subrounded gravel; trace organics; trace silt	Driller indicated change in drilling resistance at approximately 2.0 ft
4–5	X	SS 2	2 3 4	19/18					CH	BEAUMONT: black (7.5YR 2.5/1); CLAY (CH); moist; firm; trace silt; trace coarse sand sized carbonate nodules; high plasticity; HCl reaction	
6–8	X	SS 3	3 2 2	20/18						BEAUMONT: grayish brown (10YR 5/2) grading to yellowish red (5YR 5/6) at 6.3 ft; CLAY (CH); moist; soft; trace silt; high plasticity; HCl reaction	
9–10	X	SS 4	2 3 3	16/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; firm; trace silt; trace rounded sand sized carbonate nodules; high plasticity; slightly mottled; HCl reaction	
11–13	X	SS 5	3 5 4	19/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; stiff; trace silt; high plasticity; slightly mottled; HCl reaction	
14–17	X	SS 6	3 5 5	19/18						BEAUMONT: yellowish red (5YR 5/6) slightly mottled with light greenish gray (GLEY 1 5GY 8/1); CLAY (CH); moist; stiff; trace silt; trace sand sized calcareous nodules; high plasticity; HCl reaction	
18–19	X	SS 7	2 3 3	18/18					CL	BEAUMONT: strong brown (7.5YR 5/6); CLAY (CL); moist to wet; firm; some silt; moderate plasticity	SS-7A: 18.0' to 19.0' SS-7B: 19.0' to 19.5'
19–22									ML	BEAUMONT: strong brown (7.5YR 5/6); SILT (ML); wet; firm; HCl reaction	
23–24	X	SS 8	6 6 6	18/18					SM	BEAUMONT: strong brown (7.5YR 5/6); silt; SAND (SM); wet; firm; fine sand texture; trace clay layers; HCl reaction	
28–29	X	SS 9	3 3 6	17/18						BEAUMONT; yellowish brown (10YR 5/6); silt; SAND (SM); wet; loose; fine poorly graded quartz sand; little silt; HCl reaction	
33–34	X	SS 10	7 9 9	15/18					SP-SM	BEAUMONT: brownish yellow (10YR 6/6); silt; SAND (SP-SM); wet; firm; fine poorly graded quartz sand; few silt, HCl reaction	
38–39	X	SS 11	8 14 50	14/18						BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SP-SM); wet; very dense; fine poorly graded quartz sand; few silt; HCl reaction	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–42									SP-SM		
43–44	X	SS 12	6 5 7	16/18					CH	BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; stiff; high plasticity; HCl reaction	
48–49	X	SS 13	5 5 6	21/18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; stiff; some silt; high plasticity; HCl reaction; slightly mottled	
53–54	X	SS 14	3 5 6	19/18						BEAUMONT: greenish gray (GLEY 1 5GY 6/1); CLAY (CH); moist; stiff; little silt; trace sand sized calcareous nodules; high plasticity; HCl reaction	
63–64	X	SS 15	5 7 11	18/18	21.1	89.8	30/16		CL	BEAUMONT: brown (7.5YR 5/4); silt; CLAY (CL); moist; very stiff; mostly silt; few fine to medium sand; slight to medium plasticity; HCl reaction; increasing silt content with depth	Driller indicated a change in drilling resistance at 69 ft
73–74	X	SS 16	12 15 21	15/18					SP-SM	BEAUMONT: light yellowish brown (10YR 6/4); silt; SAND (SP-SM); wet; dense; fine poorly graded quartz sand; few silt; HCl reaction; trace mica; trace phosphate or manganese nodules	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81									SP-SM		
82											
83	X	SS 17	5 8 10	20/18					CH	BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; little silt; high plasticity; HCl reaction; slightly mottled	
84											
85											
86											
87											
88											
89											
90											
91											
92											
93	X	SS 18	8 10 14	20/18						BEAUMONT: light yellowish brown (10YR 6/4) mottled with light greenish gray (GLEY 1 5GY 7/1); CLAY (CH); moist; very stiff; little silt; blocky; trace sand sized calcareous nodules; HCl reaction	
94											
95											
96											
97											
98											
99											
100											
101											
102											
103	X	SS 19	4 8 10	19/18						BEAUMONT: reddish brown (5Y 5/4) mottled with light greenish gray (GLEY 1 5GY 7/1); CLAY (CH); moist; very stiff; trace silt; high plasticity; HCl reaction; blocky	
104											
105											
106											
107											
108											
109											
110											
111											
112											
113	X	SS 20	6 7 9	21/18						BEAUMONT: light greenish gray (GLEY 1 10Y 7/1) mottled with yellowish brown (10YR 5/6); CLAY (CH); moist; very stiff; trace sand sized calcareous nodules; high plasticity; HCl reaction; trace black organic silt inclusions	
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH		
121											
122											
123	X	SS 21	6 10 12	20/18						BEAUMONT: yellowish red (5YR 5/6) mottled with light greenish gray (GLEY 1 10Y 8/1); CLAY (CH); moist; very stiff; little silt; high plasticity; HCl reaction; blocky	
124											
125											
126											
127											
128											
129											
130											
131											
132											
133	X	SS 22	4 8 12	18/18						BEAUMONT: yellowish red (5YR 5/6) mottled with light greenish gray (GLEY 1 10Y 8/1); CLAY (CH); moist; very stiff; little silt; high plasticity; HCl reaction; blocky	
134											
135											
136											
137											
138											
139											
140											Drilled indicated change in drilling resistance at 140 ft
141											
142											
143	X	SS 23	10 15 16	12/18					SP-SM	BEAUMONT: light brownish gray (2.5Y 6/2); silt; SAND (SP-SM); wet; dense; fine poorly graded quartz sand; few silt; trace mica; HCl reaction	
144											
145											
146											
147											
148											
149											
150											
151											
152											
153	X	SS 24	13 13 18	17/18					SM	BEAUMONT: pale yellow (5Y 8/2); silt; SAND (SM); wet; dense; fine quartz sand; some silt; HCl reaction; clay lense from 153.9'-154'	SS-24A: 153.0' to 153.9' SS-24B: 153.9' to 154.0' SS-24C: 154.0' to 154.5'
154											
155											
156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									SM		
161											
162											
163									SP-SM		
164	X	SS 25	11 17 23	18 / 18						BEAUMONT: light gray (2.5Y 7/2); silt; SAND (SP-SM); wet; dense; fine poorly graded quartz sand; few silt; HCl reaction	
165											
166											
167											
168											Driller indicated increase in water pressure between 167 and 171 ft
169											
170											Possible clay layers
171											
172											Driller indicated subsidence in water pressure at 171 ft
173											
174	X	SS 26	9 15 21	15 / 18						BEAUMONT: very pale brown (10YR 7/3); silt; SAND (SP-SM); wet; dense; fine poorly graded quartz sand; few silt; HCl reaction	
175											
176											
177											
178											Driller indicated increase in water pressure at 177 ft
179											
180											
181											
182											
183									CH		
184	X	SS 27	10 11 15	12 / 18						BEAUMONT: strong brown (7.5YR 5/6); CLAY (CH); moist; very stiff; some silt; trace fine sand; high plasticity; HCl reaction	
185											
186											
187											
188											
189											
190											
191											
192											
193											
194	X	SS 28	11 12 14	20 / 18						BEAUMONT: yellowish red (5Y 5/6) mottled with light greenish gray (GLEY 1 10Y 8/1); CLAY (CH); moist; very stiff; trace gravelly sandy calcareous nodules; high plasticity; HCl reaction	
195											
196											
197											
198											
199											Relatively hard drilling based on rod chatter from 199 ft to 199.5 ft
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202											
203	X	SS 29	2 9 11	20/18						BEAUMONT: yellowish brown (10YR 5/4) mottled with greenish gray (GLEY 1 5GY 6/1); CLAY (CH); moist; very stiff; high plasticity; HCl reaction; some laminations	
204											
205											
206											
207											
208											
209											
210											
211											
212											
213	X	SS 30	9 11 15	19/18						BEAUMONT: strong brown (7.5YR 5/5) mottled with light greenish gray (GLEY 1 5GY 7/1); CLAY (CH); moist; very stiff; high plasticity; HCl reaction; trace shell fragments; trace laminations	
214											
215											
216											
217											
218											
219											
220											
221											
222											
223	X	SS 31	10 11 10	20/18						BEAUMONT: dark gray (10YR 4/1); CLAY (CH); moist; very stiff; trace sand sized calcareous nodules; high plasticity; HCl reaction; blocky	
224											
225											
226											
227											
228											
229											
230											
231											
232											
233	X	SS 32	7 9 12	20/18						BEAUMONT: greenish gray (GLEY 1 5GY 6/1) mottled with yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; high plasticity; HCl reaction; trace gravelly and sandy calcareous nodules	
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									CH		
241											
242											
243	X	SS 33	14 13 9	19/18						BEAUMONT: light greenish gray (GLEY 1 5GY 7/1) mottled with brown (7.5YR 5/4); CLAY (CH); moist; very stiff; high plasticity; HCl reaction; trace coarse sand sized calcareous nodules	
244											
245											
246											
247											
248											
249											
250											
251											
252											
253	X	SS 34	8 12 16	18/18						BEAUMONT: brown (7.5YR 5/4) mottled with greenish gray (GLEY 1 5GY 6/1); CLAY (CH); moist; very stiff; high plasticity; HCl reaction; trace calcareous nodules	
254											
255											
256											
257											
258											
259											
260											
261											
262											
263	X	SS 35	8 7 9	18/18						BEAUMONT: greenish gray (GLEY 1 10GY 6/1) slightly mottled with brown (7.5YR 5/4); CLAY (CH); moist; very stiff; some silt; high plasticity; HCl reaction	
264											
265											
266											
267											
268											
269											
270											
271											
272											
273	X	SS 36	3 10 9	22/18						BEAUMONT: dark gray (GLEY 1 10Y 4/1); CLAY (CH); moist; very stiff; high plasticity; HCl reaction; trace shell fragments; trace calcareous nodules	
274											
275											
276											
277											
278											
279											
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/15/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-4

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281											
282											
283	X	SS 37	4 9 12	21 / 18						BEAUMONT: greenish gray (GLEY 1 10GY 6/1); CLAY (CH); moist; very stiff; some silt; high plasticity; HCl reaction; trace sand sized calcareous nodules; blocky	
284											
285											
286											
287											
288											
289											
290											
291											
292											
293	X	SS 38	8 13 15	20 / 18						BEAUMONT: light olive brown (2.5Y 5/3); silt; CLAY (CH); moist; very stiff; some silt; high plasticity; HCl recation; some laminations; trace weathered shell fragments	
294											
295											
296											
297											
298											
299											
300											
301											
302											
303	X	SS 39	3 8 12	21 / 18						BEAUMONT: dark grayish brown (2.5Y 4/2); CLAY (CH); moist; very stiff; high plasticity; HCl reaction; blocky	
304											
305										Boring terminated at 304.5 ft	
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660	MACTEC	SOIL LOG - Boring No. U4-5	
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 UHS N 362710.71 E 2942606.76		Total Depth 299.8 feet
Drilling Contractor and Rig MACTEC /L. Carter / CME 550	Elevation at boring 30.74 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 138.8 / 30 inches	No. of Samples 38	Date Started 6/16/08
	Borehole Inclination 0	Logged by M.L Herrera	Date Completed 6/25/08

Reviewed by / Date HLC 7/3/08

Reviewed by / Date DJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	✓	SS 1	3 6 6	11/18					CH	FILL: dark grayish brown (10YR 4/2); sand; CLAY (CH); moist; stiff; some medium to coarse sand; few organics	
4–5	✓	SS 2	2 5 6	5/18					CH	BEAUMONT: dark gray (5Y 4/1); sand; CLAY (CH); wet; stiff; some medium to coarse sand	
6–7	✓	SS 3	2 3 4	15.5/18						BEAUMONT: dark gray (5Y 4/1); sand; CLAY (CH); wet; firm; few coarse sand	SS-3A: 6.0' to 6.5' SS-3B: 6.5' to 7.5'
									CL-ML	BEAUMONT: reddish brown (5YR 5/4); silt; CLAY (CL-ML); moist; firm; some silt	
9–10	✓	SS 4	4 2 3	17.5/18						BEAUMONT: strong brown (7.5YR 5/6 to 4/6); silt; CLAY (CL-ML); moist; firm; some silt; few fine sand	
12–13	✓	SS 5	2 4 3	20/18						BEAUMONT: reddish brown (5YR 5/4); silt; CLAY (CL-ML); moist; firm; some silt; few fine sand	
14–15	✓	SS 6	4 5 6	18/18					CH	BEAUMONT: reddish brown (5YR 5/4) to yellowish red (5YR 5/6); CLAY (CH); moist; stiff	
19–20	✓	SS 7	2 2 3	19/18					SC	BEAUMONT: brown (7.5YR 5/4); clay; SAND (SC); wet; loose; fine sand; some clay	
24–25	✓	SS 8	5 10 10	13/18						BEAUMONT: brown (7.5YR 5/4) to strong brown (7.5YR 5/6); clay; SAND (SC); wet; firm; fine sand; some clay	
29–30	✓	SS 9	18 18 24	12.5/18					SP	BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); moist; dense; fine to medium sand; rounded	
34–35	✓	SS 10	10 10 14	13/18						BEAUMONT: light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/6); SAND (SP); moist; very firm; fine to medium sand; rounded	
39–40	✓	SS 11	12 14 14	12/18						BEAUMONT: light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/6); SAND (SP); moist;	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									SP	very firm; fine to medium sand; rounded	
41											
42											
43											
44	X	SS 12	12 13 14	18/18						BEAUMONT: light yellowish brown (10YR 6/4); SAND (SP); moist; very firm; fine to medium sand; rounded	
45											
46											
47											
48											
49	X	SS 13	8 6 7	18.5/18					CH	BEAUMONT: yellowish brown (10YR 5/4) and grayish brown (2.5Y 5/2); CLAY (CH); moist; stiff; few silt	
50											
51											
52											
53											
54											
55											
56											
57											
58											
59	X	SS 14	9 7 11	19/18					SC	BEAUMONT: light olive gray (5Y 6/2) and brown (7.5YR 5/4); clay; SAND (SC); moist; firm; fine sand; some high plasticity clay	
60											
61											
62											
63											
64											
65											
66											
67											
68											
69	X	SS 15	14 21 24	12/18					SP-SC	BEAUMONT: light yellowish brown (10YR 6/4) and light gray (10YR 7/2); clay; SAND (SP-SC); moist; dense; fine to medium sand; few clay; rounded	
70											
71											
72											
73											
74											
75											
76											
77											
78											
79	X	SS 16	8 11 18	23/18					CH	BEAUMONT: brown (7.5YR 5/4) and light olive gray (5Y 6/2); sand; CLAY (CH); moist; very stiff;	
80											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									CH	little fine sand	
81											
82											
83											
84											
85											
86											
87											
88											
89	X	SS 17	3 5 11	23/18						BEAUMONT: light olive gray (5Y 6/2); CLAY (CH); moist; very stiff	
90											
91											
92											
93											
94											
95											
96											
97											
98											
99	X	SS 18	6 7 14	16.5/18						BEAUMONT: yellowish red (5YR 5/6) and light gray (5Y 7/2); CLAY (CH); moist; very stiff; few silt	
100											
101											
102											
103											
104											
105											
106											
107											
108											
109	X	SS 19	7 8 11	20.5/18						BEAUMONT: light olive gray (5Y 6/2) and yellowish brown (10YR 5/4); CLAY (CH); moist; very stiff	
110											
111											
112											
113											
114											
115											
116											
117											
118											
119	X	SS 20	7 12 12	19/18						BEAUMONT: strong brown (7.5YR 5/6) and light olive gray (5Y 6/2); CLAY (CH); moist; very stiff;	
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	few silt; few shell fragments	
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 21	9 14 16	20/18						BEAUMONT: yellowish red (5YR 4/6) to strong brown (7.5YR 4/6); CLAY (CH); moist; very stiff	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 22	10 14 17	18/18					SC	BEAUMONT: pale yellow (2.5Y 7/3) and brownish yellow (10YR 6/6); clay; SAND (SC); moist; dense; fine sand; some high plasticity clay	
140											
141											
142											
143											
144											
145											
146											
147											
148											
149	X	SS 23	10 10 14	6.5/18						BEAUMONT: light gray (5Y 7/2); clay; SAND (SC); moist; very firm; fine to medium sand; some clay	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 24	30 57 30	16/18					SP-SC	BEAUMONT: light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/5); clay; SAND (SP-SC);	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160										moist; very dense; medium sand; few clay	
161									SP-SC		
162											
163											
164											
165											
166											
167											
168											
169	X	SS 25	8 13 15	15/18					SC	BEAUMONT: strong brown (7.5YR 5/6 to 4/6); clay; SAND (SC); moist; very firm; fine sand; some high plasticity clay; rounded	
170											
171											
172											
173											
174											
175											
176											
177											
178											
179	X	SS 26	9 13 18	18/18					CH	BEAUMONT: reddish brown (5YR 5/4); CLAY (CH); moist; hard; few silt	
180											
181											
182											
183											
184											
185											
186											
187											
188											
189	X	SS 27	6 11 16	24/18						BEAUMONT: reddish brown (5YR 4/4); CLAY (CH); moist; very stiff; few silt	
190											
191											
192											
193											
194											
195											
196											
197											
198											
199	X	SS 28	WOH 8 12	18/18						BEAUMONT: dark yellowish brown (10YR 4/4); CLAY (CH); moist; very stiff	
200											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202											
203											
204											
205											
206											
207											
208											
209	X	SS 29	3 5 8	26/18						BEAUMONT: brown (10YR 4/3); CLAY (CH); moist; stiff	
210											
211											
212											
213											
214											
215											
216											
217											
218											
219	X	SS 30	10 9 9	15.5/18						BEAUMONT: dark gray (10YR 4/1) to dark grayish brown (10YR 4/2); CLAY (CH); moist; very stiff; little silt	
220											
221											
222											
223											
224											
225											
226											
227											
228											
229	X	SS 31	WOH WOH 7	25/18						BEAUMONT: dark gray (2.5Y 4/1); CLAY (CH); moist; firm	
230											
231											
232											
233											
234											
235											
236											
237											
238											
239	X	SS 32	WOH WOH 10	26/18						BEAUMONT: gray (GLEY 1 5/N) to greenish gray (GLEY 1 5/10Y); CLAY (CH); moist; stiff; little silt;	
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240–248									CH	few fine sand	
249	X	SS 33	8 11 15	26/18						BEAUMONT: light olive brown (2.5Y 5/3) to greenish gray (GLEY 1 5/10GY); CLAY (CH); moist; very stiff; little silt	
250–258											
259	X	SS 34	7 11 14	17/18					SC	BEAUMONT: light olive brown (2.5Y 5/3 to 5/6); clay; SAND (SC); moist; very firm; fine sand; some clay	
260–266											
267										BEAUMONT: greenish gray (GLEY 1 5/10GY); clay; SAND (SC); moist; firm; fine sand; some clay; little shell fragments	
268											
269	X	SS 35	10 9 5	25/18					CH	BEAUMONT: dark gray (GLEY 1 4/N) and olive gray (5Y 4/2); CLAY (CH); moist; stiff	SS-35A: 268.3' to 268.8' SS-35B: 268.8' to 269.8'
270–278											
279	X	SS 36	WOH 7 12	26/18						BEAUMONT: greenish gray (GLEY 2 5/10G); CLAY (CH); moist; very stiff	
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-5

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (Inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		
281											
282											
283											
284											
285											
286											
287											
288											
289	X	SS 37	20 39 44	5.5 18					SC	BEAUMONT: greenish gray (GLEY 1 6/5GY); clay; SAND (SC); moist; very dense; fine to medium sand; some high plasticity clay	
290											
291											
292											
293											
294											
295											
296											
297											
298											
299	X	SS 38	6 11 16	26 18					CH	BEAUMONT: dark grayish brown (10YR 4/2); CLAY (CH); moist; very stiff	
300										Boring terminated at 299.8 ft	
301											
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number MACTEC STP COL Units 3 & 4 : 6234-08-4660			SOIL LOG - Boring No. U4-6
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 UHS Pump House N 362749.99 E 2942389.05		Total Depth 299.3 feet
Drilling Contractor and Rig JEDI Drilling / CME 75	Elevation at boring 29.93 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Split Spoon	Driving Hammer Wt./Drop 139.2 / 30 inches	No. of Samples 38	Date Started 6/19/08
	Borehole Inclination 0	Logged by M. Harvey	Date Completed 6/26/08

Reviewed by / Date HLC 7/3/08

Reviewed by / Date DJ 7/3/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–1	X	SS 1	5 4 3	4/18					GC	FILL: brown (10YR 5/3); clay; sand; GRAVEL (GC); dry; loose; some fine to medium sand; little clay	
4–5	X	SS 2	1 2 2	4/18					CH	BEAUMONT: dark gray (5Y 4/1); CLAY (CH); moist; soft; few gravel	
6–7	X	SS 3	1 1 2	18/18						BEAUMONT: yellowish red (5YR 5/6) and dark grayish brown (2.5Y 4/2); sand; CLAY (CH); moist; soft; some fine sand; trace gravel	
9–10	X	SS 4	2 3 5	16/18						BEAUMONT: red (2.5YR 5/6); sand; CLAY (CH); moist; firm; little fine sand	
11–12	X	SS 5	2 4 4	18/18						BEAUMONT: yellowish red (5YR 5/6); sand; CLAY (CH); moist; firm; little fine sand	
14–15	X	SS 6	3 5 7	16/18						BEAUMONT: yellowish red (5YR 5/6); sand; CLAY (CH); moist; stiff; little fine sand	
19	X	SS 7	2 2 4	14/18					SP-SC	BEAUMONT: yellowish red (5YR 5/6); clay; SAND (SP-SC); wet; loose; fine sand; few clay	
24	X	SS 8	2 3 4	12/18						BEAUMONT: strong brown (7.5YR 5/6); clay; SAND (SP-SC); wet; loose; fine sand; few clay	
29	X	SS 9	4 8 11	6/18					SP	BEAUMONT: strong brown (7.5YR 5/8); SAND (SP); wet; firm; trace clay	
34	X	SS 10	13 12 13	10/18						BEAUMONT: strong brown (7.5YR 5/6); SAND (SP); wet; very firm; fine sand; trace gravelly concretions	
39	X	SS 11	11 19 21	10/18						BEAUMONT: reddish yellow (7.5YR 6/6); SAND (SP); wet; dense; fine sand	

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40–43									SP	BEAUMONT: brownish yellow (10YR 6/6); SAND (SP); wet; firm; fine to medium sand	
43–44	X	SS 12	11 10 9	12/18							
44–48									CH	BEAUMONT: yellowish red (5YR 5/6); sand; CLAY (CH); moist; very stiff; little fine sand	
48–49	X	SS 13	4 6 7	20/18						BEAUMONT: reddish brown (5YR 5/4); sand; CLAY (CH); moist; stiff; little fine sand; trace silt	
49–58											
58–59	X	SS 14	6 10 11	16/18					SC	BEAUMONT: reddish yellow (7.5YR 6/6) and light gray (5Y 7/1); clay; SAND (SC); moist; very firm; fine sand; some clay; trace gravel at 59.1 ft	
59–68											
68–69	X	SS 15	14 20 23	11/18					SP-SC	BEAUMONT: brownish yellow (10YR 6/6); clay; SAND (SP-SC); wet; dense; fine sand; few clay	
69–78											
78–79	X	SS 16	15 15 41	11/18					SC	BEAUMONT: brown (7.5YR 5/5); clay; SAND (SC); wet; very dense; fine sand; little clay	
79–80											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80–87									SC		
88–89	X	SS 17	6 10 13	16/18					CH	BEAUMONT: light greenish gray (GLEY 1 7/8GY); sand; CLAY (CH); moist; very stiff; little fine sand; trace fine gravel nodules	
98–99	X	SS 18	8 10 14	16/18						BEAUMONT: yellowish red (5YR 5/6); CLAY (CH); moist; very stiff; trace fine sand	
108–109	X	SS 19	5 7 10	20/18						BEAUMONT: light greenish gray (GLEY 1 8/10Y); sand; CLAY (CH); moist; very stiff; little fine sand; trace silt	
118–119	X	SS 20	9 9 11	15/18					SC	BEAUMONT: pale gray (5Y 7/2) mottled with red (2.5YR 5/6); clay; SAND (SC); moist; firm; fine sand; some clay	

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									SC		
121											
122											
123											
124											
125											
126											
127											
128											
129	X	SS 21	8 13 17	17/18					CH	BEAUMONT: red (2.5YR 5/8); CLAY (CH); moist; very stiff; few fine sand	
130											
131											
132											
133											
134											
135											
136											
137											
138											
139	X	SS 22	8 13 15	18/18					SC	BEAUMONT: light greenish gray (GLEY 1 7/10GY); clay; SAND (SC); moist; very firm; fine sand; some clay	
140											
141											
142											
143											
144											
145											
146											
147											
148											
149	X	SS 23	15 20 28	14/18					SP-SC	BEAUMONT: light gray (2.5Y 7/1); clay; SAND (SP-SC); wet; dense; fine sand; few clay	
150											
151											
152											
153											
154											
155											
156											
157											
158											
159	X	SS 24	18 27 31	12/18					SP	BEAUMONT: pale yellow (2.5Y 7/3); SAND (SP); wet; very dense; fine sand; trace fine grains	
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

MACTEC

SOIL LOG - Boring No. U4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160									SP		
161											
162											
163											
164											
165											
166											
167											
168	X	SS 25	17 22 33	10/18						BEAUMONT: pale yellow (2.5Y 7/3); SAND (SP); wet; very dense; fine sand; trace fine grains	
169											
170											
171											
172											
173											
174											
175											
176											
177											
178	X	SS 26	9 14 16	21/18					CH	BEAUMONT: reddish brown (5YR 5/4); sand; CLAY (CH); moist; very stiff; some fine sand	
179											
180											
181											
182											
183											
184											
185											
186											
187											
188	X	SS 27	21 24 23	17/18						BEAUMONT: yellowish red (5YR 5/6); sand; CLAY (CH); moist; hard; some fine sand	
189											
190											
191											
192											
193											
194											
195											
196											
197											
198	X	SS 28	4 6 10	21/18						BEAUMONT: olive yellow (2.5Y 6/6); sand; CLAY (CH); moist; very stiff; some fine sand	
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200									CH		
201											
202											
203											
204											
205											
206											
207											
208											
209	X	SS 29	7 13 11	18/18					ML	BEAUMONT: brown (7.5YR 4/3); SILT (ML); moist; very stiff; some clay; trace fine sand	
210											
211											
212											
213											
214											
215											
216											
217											
218											
219	X	SS 30	14 14 9	12/18						BEAUMONT: dark gray (2.5Y 4/1); sand; SILT (ML); moist; very stiff; some fine sand; little clay	
220											
221											
222											
223											
224											
225											
226											
227											
228											
229	X	SS 31	6 10 12	22/18						BEAUMONT: dark greenish gray (GLEY 1 4/10Y); SILT (ML); moist; very stiff; trace fine sand	
230											
231											
232											
233											
234											
235											
236											
237											
238											
239	X	SS 32	9 14 16	18/18					CH	BEAUMONT: greenish gray (GLEY 2 5/5BG) mottled with reddish brown (5YR 5/4); sand; CLAY (CH); moist; very stiff; few fine sand; trace gravelly	
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number
STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240									CH	nodules	
241											
242											
243											
244											
245											
246											
247											
248											
249	X	SS 33	8 12 15	18/18						BEAUMONT: brown (10YR 4/3) mottled with greenish gray (GLEY 1 5/5GY); sand; CLAY (CH); moist; very stiff; little fine sand; little silt; trace gravelly nodules	
250											
251											
252											
253											
254											
255											
256											
257											
258											
259	X	SS 34	9 11 16	18/18						BEAUMONT: brown (7.5YR 4/3); sand; CLAY (CH); moist; very stiff; some fine sand; increasing sand content with depth	
260											
261											
262											
263											
264											
265											
266											
267											
268											
269	X	SS 35	WOH 2 10	18/18					ML	BEAUMONT: dark greenish gray (GLEY 2 4/10BG); SILT (ML); moist; stiff; some clay; trace fine sand	
270											
271											
272											
273											
274											
275											
276											
277											
278											
279	X	SS 36	1 8 10	20/18					CH	BEAUMONT: dark greenish gray (GLEY 2 4/10BG); CLAY (CH); moist; very stiff; trace gravelly nodules; trace fine sand	
280											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 7/3/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-6

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 Inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
280									CH		Changed drill rigs at 280 ft AE Drilling: CME 750, Serial No. 328848, Hammer Wt: 139.0 lbs.
281											
282											
283											
284											
285											
286											
287											
288											
289	X	SS 37	17 23 31	7 / 18					SC	BEAUMONT: greenish gray (GLEY 1 5/10Y); clay; SAND (SC); moist; very dense; fine sand; little clay	
290											
291											
292											
293											
294											
295											
296											
297											
298	X	SS 38	10 12 17	18 / 18					CL	BEAUMONT: dark olive brown (2.5Y 3/3); CLAY (CL); moist; very stiff; little silt	
299											
300										Boring terminated at 299.3 ft	
301											
302											
303											
304											
305											
306											
307											
308											
309											
310											
311											
312											
313											
314											
315											
316											
317											
318											
319											
320											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/2/08

Project Name : Job Number STP COL Units 3 & 4 : 6234-08-4660 MACTEC			SOIL LOG - Boring No. U4-6A
Type and Diameter of Boring Mud Rotary / 4 Inches	Boring Location Unit 4 UHS Pump House N 362749.3963 E 2942373.748		Total Depth 267 feet
Drilling Contractor and Rig AE Drilling / CME 750 ATV	Elevation at boring 30.64 feet	Ground Water Depth N/A	Depth to Bedrock N/A
Sampling Method Undisturbed	Driving Hammer Wt./Drop NA / NA	No. of Samples 4	Date Started 6/26/08
	Borehole Inclination 0	Logged by M. Harvey	Date Completed 6/27/08

Reviewed by / Date HC 12/2/2008

Reviewed by / Date 12/2/08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0–7											Boring U4-6A offset approximately 10' west of Boring U4-6A Drill to first sample at 8 ft
8–10		UD 1		20/24					CH	BEAUMONT: red (5YR 5/6); CLAY (CH); moist; little sand	Pocket Penetometer (TSF): 1.75, 1.75, 1.5 Hand Held Vane Shear (kg/cm^2): 0.85

Page 1 of 7

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-6A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
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57											
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73											
74											
75											
76											
77											
78											
79											
80											

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-6A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											
106											
107											
108											
109		UD 2		0/24						No Recovery	No Recovery Drill to 110.5 ft and make another attempt
110											
111		UD 3		13/24	30.7	92.4	84/62		CH	BEAUMONT: light greenish gray (GLEY 1 7/10Y); CLAY (CH); moist; little silt; trace sand; trace gravelly nodules	Pocket Penetometer (TSF): 3.75, 4.0, 3.5 Hand Held Vane Shear (kg/cm^2): >1.0
112											
113											
114											
115											
116											
117											
118											
119											
120											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-6A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120											
121											
122											
123											
124											
125											
126											
127											
128											
129											
130											
131											
132											
133											
134											
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136											
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138											
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156											
157											
158											
159											
160											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-6A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160											
161											
162											
163											
164											
165											
166											
167											
168											
169											
170											
171											
172											
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191											
192											
193											
194											
195											
196											
197											
198											
199											
200											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-6A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200											
201											
202											
203											
204											
205											
206											
207											
208											
209											
210											
211											
212											
213											
214											
215											
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226											
227											
228											
229											
230											
231											
232											
233											
234											
235											
236											
237											
238											
239											
240											

STP SOIL STP BORING LOGS.GPJ WLA.GDT 12/4/08

Project Name : Job Number

STP COL Units 3 & 4 : 6234-08-4660

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SOIL LOG - Boring No. U4-6A

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Grain Size	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
240											
241											
242											
243											
244											
245											
246											
247											
248											
249											
250											
251											
252											
253											
254											
255											
256											
257											
258											
259											
260											
261											
262											
263											
264											
265		UD 4		24/24	38.8	99.8	87/53		CH	BEAUMONT: olive brown (2.5Y 4/3); CLAY (CH); moist; little silt; few fine sand	Pocket Penetometer (TSF): 4.4, 3.3, 3.5 Hand Held Vane Shear (kg/cm^2): >1.0
266											
267										Boring terminated at 267.0 ft	
268											
269											
270											
271											
272											
273											
274											
275											
276											
277											
278											
279											
280											

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engineering and constructing a better tomorrow

July 14, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Kathryn White KAW 7/14/08

Subject: **Report of SPT Energy – A.E. Drilling CME 750 ATV**
Hammer Serial No. 848 Automatic Hammer
WORK INSTRUCTION No. 18 (FLR-085)
STP COL Project
Matagorda County, Texas
MACTEC Project No. 6234-08-4660

Jonathan Honeycutt, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on June 17, 2008 during drilling of Boring U3-2 at the referenced site. The testing was performed by Jonathan Honeycutt from approximately 5:29 PM to 6:02 PM on June 17 under clear skies and a temperature of 95 degrees Fahrenheit. The boring was drilled with personnel and equipment from A.E. Drilling. The drilling equipment consisted of a CME 750 model ATV drill rig with an SPT automatic hammer. The drilling tools consisted of NW-J-sized drilling rods and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during sampling was Mr. Marty King. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. K990 and K983) and strain gages (Serial Nos. NW #146/1 and NW#146/2). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert had a cross-sectional area of approximately 1.49 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25 inches, respectively. The recommended operation rate of the hammer is not known. Due to the closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

Calibration Records

The calibration records for all the above are filed in DCN FLR-079.

13 Pages Total

MACTEC Engineering and Consulting, Inc.
2801 Yorkmont Road, Suite 100 • Charlotte, NC 28208 • Phone: 704.357.8600 • Fax: 704.357.8638 www.mactec.com

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDIPLOT tables and are also shown graphically in the PDIPLOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction.

- The average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 304 foot-pounds to

311 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 87% to 89% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) was 309.0 foot-pounds, with an average ETR of 88.3%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN FLR-085 – 1 Page
Page 6 Record of SPT Energy Measurement – 1 Page
Pages 7 – 13 PDIPLOT Output – 7 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
South Texas Project (STP) COL Site - Units 3 and 4
Wadsworth, Texas
MACTEC Project No. 6234-08-4660

Rig Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Date Tested	Drill Rod Size	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs)[a]	Energy Transfer Ratio (%)[b] (Average ETR)
848 (CME 750 ATV)	A.E. Drilling	Marty King	U3-2	6/17/2008	NW-J	23.5 - 25.0	6 - 4 - 4	14	310	88.6%
						28.5 - 30.0	8 - 11 - 18	35	304	86.9%
						33.5 - 35.0	15 - 29 - 39	83	311	88.9%
								Average for Rig:	**309.0**	**88.3%**

[a]Measured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy.
EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).
[b]Energy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet).
The average ETR values may differ slightly and insignificantly from those in the PDIPLOT tables due to roundoff.

Prepared By: STEVE KISER	Date: 7-14-08		Checked By:	Date: 7/14/08

Work Instruction No. 18
STP Units 3 & 4 COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6234-08-4660

Issued To: Steve Kiser, Jon Honeycutt **Rev. No.** 0
Issued By: Robert E. Smith **Date:** June 5, 2008
Valid From: June 5, 2008 **To:** June 5, 2009

Task Description: Perform SPT Energy Measurements of drill rigs

Applicable Technical Procedures or Plans, or other reference:

Work Plan (current revision), ASTM D4633-05.

Specific Instructions (note attachments where necessary): Perform energy measurements for each drill rig on site collecting split-spoon samples in accordance with ASTM D-4633-05. Consult with Site Coordinator as to schedule for rigs that may be planned for use that are not yet present. Hammer weights have been checked by site personnel, and records will be available on site. All rigs are using automatic hammer systems. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, but should begin at a minimum depth of 10 feet. Collect at least three energy measurements per drill rig.

Submit copies of calibration records for equipment to Quality Assurance for review prior to beginning work on site.

Special Instructions (note attachments where necessary): Confirm with Site Supervisor that approval of equipment calibration records has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, notify Shaun Lehman and Rob Smith immediately.

Report Format: Standard report in accordance with ASTM D 4633-05 requirements.

Specific Quality Assurance Procedures Applicable: QAP 20-1; QAP 25-1; QAP for Reporting Nuclear-Related Defects, or Noncompliances, per Federal Regulation 10CFR21 and Section 206 of the Energy Reorganization Act of 1974. Current revisions apply.

Hold Points or Witness Points: None

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)
Project Manager: _____ Date: 6/6/08 06/6/08
Project Principal Engineer: _____ Date: _____
Site Manager/Coordinator: _____ Date: _____
Pages: **DCN:** FLR-085
Attachments:

MACTEC

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	South Texas Project COL Site	MAKE:	CME
LOCATION:	Matagorda County, Texas	MODEL:	750
PROJECT NO.:	6234-08-4660	SERIAL NO.:	848
DATE:	6-17-2008	HAMMER TYPE:	Auto
WEATHER:	Sunny, Breezy 75°F	ROPE CONDITION:	N/A
INSPECTOR:	JN Hammond	ROD SIZE:	NW 3
DRILLING COMPANY:	A.E. Oralos	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	~~MS~~ MS-2	MS-2	
DEPTH DRILLED:	Various		
TIME DRIVEN:	Various		
RIG OPERATOR:	Marty King		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	A1-K996 - A2-K983		
STRAIN SERIAL NOS.:	NW149 #1/2		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)
~~20~~	
~~25-26.5~~	
23.5-25	6-4-3
28.5-30	8-11-18
33.5-35	15-29-37

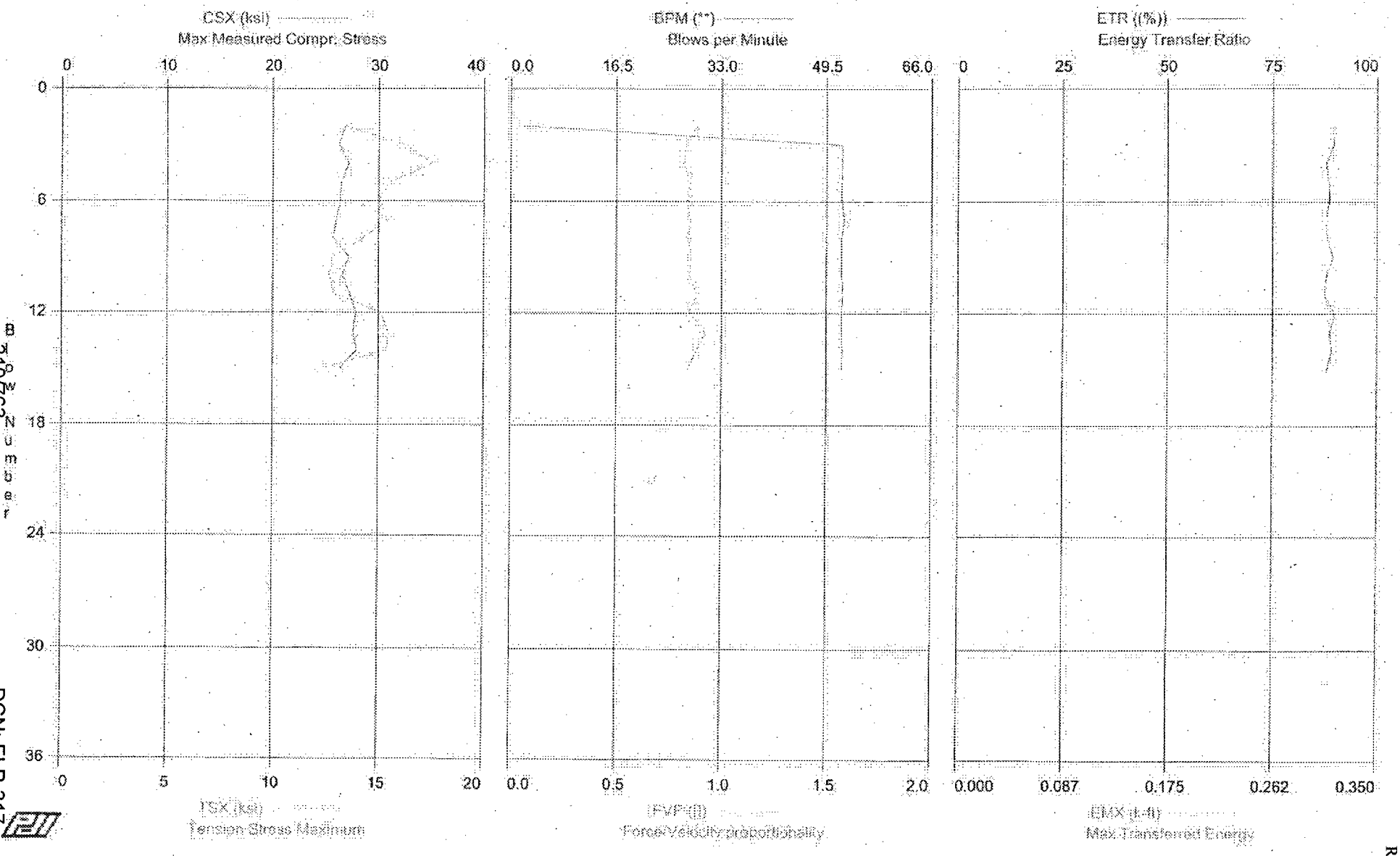
REMARKS:

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 17-Jun-2008

STP COL SITE - Boring U3-2; 23.5' - 25' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-2; 23.5' - 25' Sample
OP: JNH

Hammer ID: 848 (AE DRILL - CME 750)
Test date: 17-Jun-2008

AR: 1.49 in^2
LE: 29.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	26.8	13.4	40	14.9	1.9	0.88	0.319	90	0.314
3	0.00	26.2	15.2	39	14.9	52.0	0.83	0.329	90	0.314
4	0.00	27.2	17.5	40	14.7	52.0	0.82	0.334	88	0.307
5	0.00	26.4	15.5	39	15.0	51.9	0.85	0.331	89	0.310
6	0.00	26.3	15.0	39	15.0	51.9	0.84	0.331	89	0.310
7	0.00	26.0	15.4	39	15.0	52.3	0.85	0.333	88	0.307
8	0.00	25.7	14.3	38	14.8	51.9	0.84	0.330	88	0.309
9	0.00	27.2	12.8	40	14.8	51.9	0.86	0.335	90	0.313
10	0.00	26.5	12.7	40	14.9	51.9	0.85	0.332	88	0.308
11	0.00	27.2	12.9	41	14.6	52.1	0.88	0.328	88	0.306
12	0.00	27.8	15.1	41	14.9	51.9	0.84	0.334	90	0.315
13	0.00	27.6	15.5	41	14.6	51.9	0.92	0.334	89	0.311
14	0.00	27.9	15.4	42	15.3	52.0	0.88	0.340	89	0.312
15	0.00	26.4	12.3	39	15.4	51.9	0.84	0.336	88	0.308
	Average	26.8	14.6	40	14.9	48.4	0.86	0.332	89	0.310

Total number of blows analyzed: 14

Time Summary

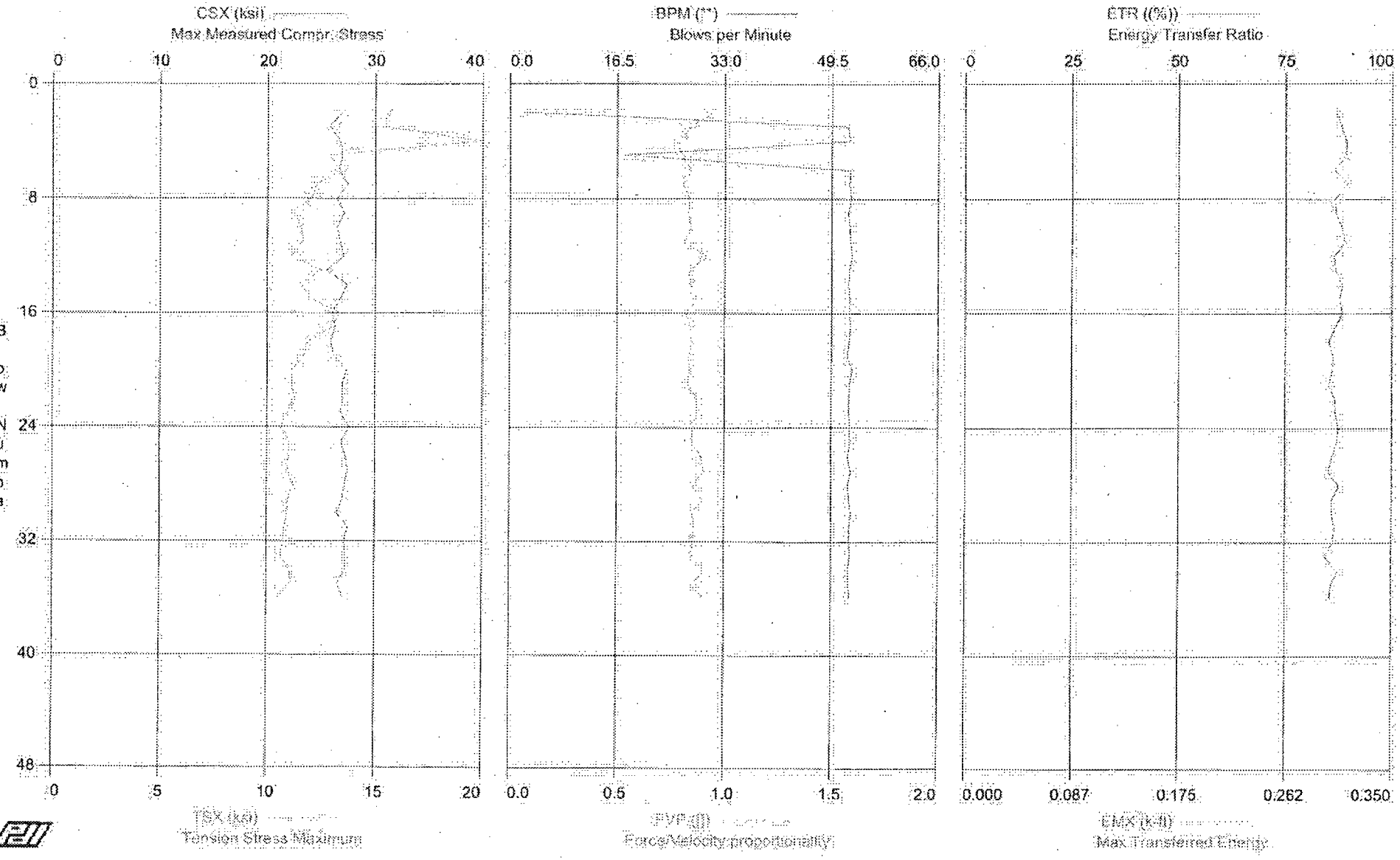
Drive 15 seconds 5:29:41 PM - 5:29:56 PM (6/17/2008) BN:2 - 15

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 17-Jun-2008

STP COL SITE - Boring U3-2, 28.5' - 30' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-2; 28.5' - 30' Sample
OP: JNH

Hammer ID: 848 (AE DRILL - CME 750)
Test date: 17-Jun-2008

AR: 1.49 in^2
LE: 34.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	26.9	15.7	40	14.4	1.9	0.95	0.320	87	0.304
3	0.00	25.7	15.3	38	14.7	52.0	0.84	0.314	88	0.308
4	0.00	26.6	25.5	40	14.6	52.3	0.77	0.324	89	0.312
5	0.00	26.9	12.8	40	15.0	17.4	0.80	0.330	89	0.312
6	0.00	26.6	13.4	40	14.6	52.4	0.84	0.327	86	0.303
7	0.00	27.4	12.3	41	14.9	52.2	0.81	0.334	90	0.313
8	0.00	26.4	12.0	39	13.9	52.5	0.84	0.324	87	0.303
9	0.00	27.1	11.3	40	14.4	52.0	0.83	0.327	87	0.304
10	0.00	26.4	11.6	39	14.0	52.3	0.84	0.321	88	0.309
11	0.00	26.7	11.6	40	15.2	52.4	0.81	0.332	89	0.311
12	0.00	27.1	11.1	40	13.9	52.6	0.92	0.327	86	0.302
13	0.00	25.5	12.5	38	14.4	52.2	0.83	0.329	87	0.304
14	0.00	27.4	11.6	41	14.8	52.1	0.84	0.334	88	0.309
15	0.00	26.7	12.0	40	14.5	52.3	0.87	0.330	88	0.307
16	0.00	26.0	13.3	39	15.2	52.2	0.82	0.332	88	0.309
17	0.00	26.2	13.0	39	14.7	52.4	0.84	0.328	87	0.303
18	0.00	25.8	11.9	38	14.6	52.2	0.85	0.328	85	0.298
19	0.00	26.1	11.7	39	14.8	51.9	0.83	0.329	86	0.302
20	0.00	27.3	11.1	41	14.8	52.7	0.84	0.331	86	0.301
21	0.00	26.9	11.2	40	14.8	52.3	0.83	0.325	85	0.298
22	0.00	27.0	11.2	40	14.0	52.2	0.87	0.326	87	0.303
23	0.00	26.8	10.9	40	14.6	52.2	0.87	0.330	87	0.304
24	0.00	27.6	10.6	41	14.6	52.3	0.85	0.329	88	0.306
25	0.00	26.8	11.0	40	14.6	52.4	0.85	0.327	87	0.305
26	0.00	27.3	11.0	41	14.2	52.0	0.89	0.327	86	0.301
27	0.00	27.5	10.9	41	14.1	52.5	0.91	0.328	85	0.298
28	0.00	27.2	11.2	40	14.2	52.0	0.85	0.325	88	0.307
29	0.00	27.0	11.0	40	14.0	52.2	0.90	0.323	86	0.301
30	0.00	26.4	11.0	39	14.6	52.5	0.85	0.325	86	0.301
31	0.00	27.5	10.8	41	14.2	52.3	0.86	0.325	87	0.303
32	0.00	27.1	10.8	40	14.9	52.3	0.85	0.325	86	0.302
33	0.00	27.2	10.7	41	13.9	52.4	0.86	0.326	84	0.295
34	0.00	27.3	11.1	41	14.4	52.1	0.92	0.327	87	0.306
35	0.00	26.5	11.1	40	15.0	52.2	0.84	0.330	86	0.300
36	0.00	27.0	10.5	40	14.4	52.3	0.91	0.325	86	0.299
	Average	26.8	12.1	40	14.5	49.8	0.85	0.327	87	0.304

Total number of blows analyzed: 35

Time Summary

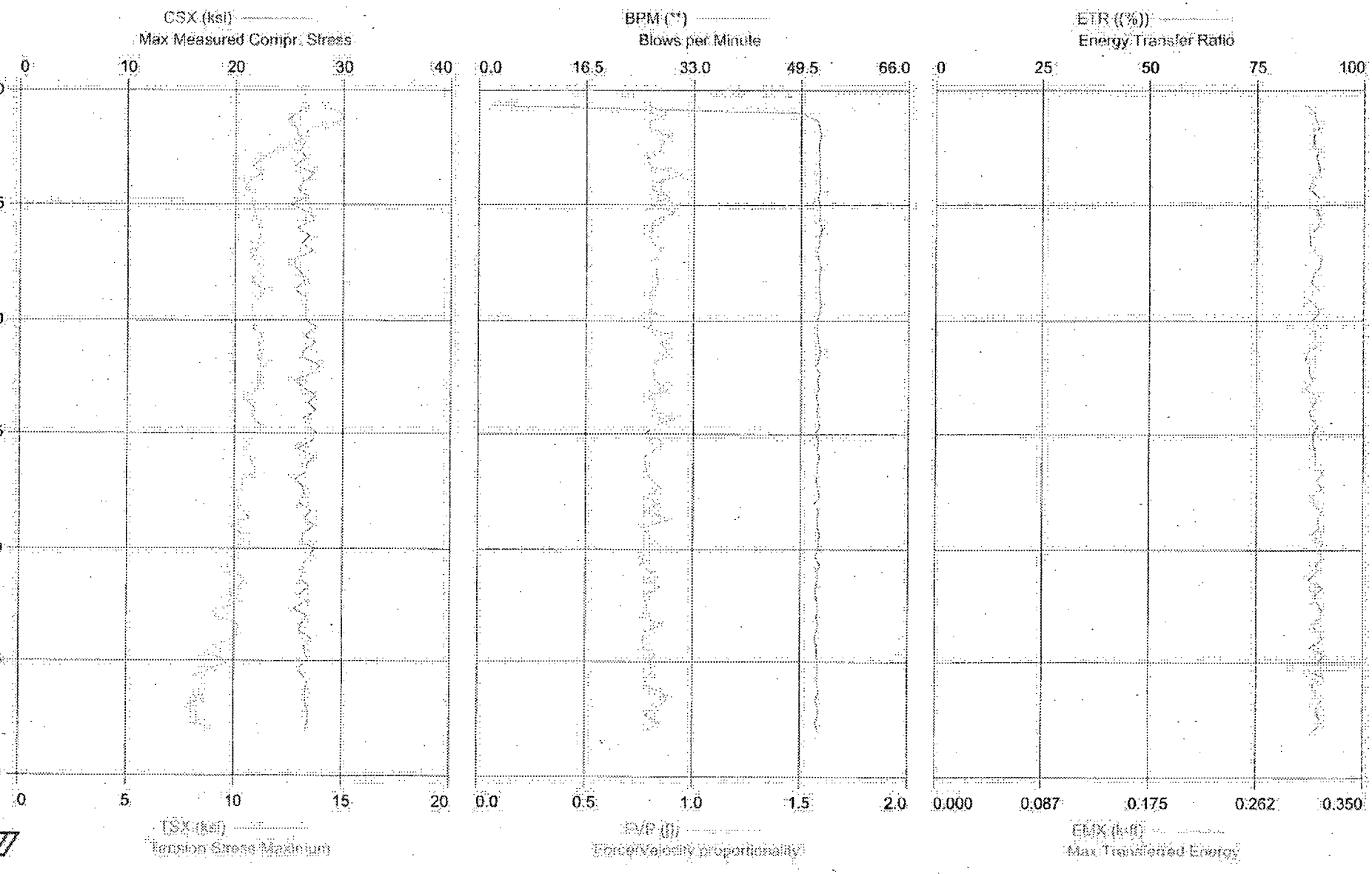
Drive 41 seconds 5:47:38 PM - 5:48:19 PM (6/17/2008) BN 2 - 36

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 17-Jun-2008

STP COL SITE - Boring U3-2; 33.5' - 35' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-2; 33.5' - 35' Sample
OP: JNH

Hammer ID: 848 (AE DRILL. - CME 750)
Test date: 17-Jun-2008

AR: 1.49 in^2
LE: 39.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	26.8	14.0	40	14.5	1.9	0.79	0.321	86	0.303
3	0.00	25.7	14.9	38	14.2	49.5	0.87	0.317	88	0.309
4	0.00	24.8	15.0	37	14.5	51.9	0.80	0.319	89	0.311
5	0.00	25.6	13.5	38	14.3	52.3	0.80	0.322	90	0.313
6	0.00	25.8	13.0	38	13.7	52.5	0.88	0.315	88	0.309
7	0.00	26.4	12.8	39	14.0	52.2	0.86	0.325	88	0.309
8	0.00	26.0	11.8	39	14.1	52.2	0.84	0.320	89	0.312
9	0.00	26.5	11.2	39	14.2	52.3	0.78	0.325	89	0.311
10	0.00	25.5	10.8	38	14.3	52.2	0.79	0.324	90	0.313
11	0.00	27.3	11.2	41	13.6	52.4	0.95	0.327	90	0.314
12	0.00	26.3	10.6	39	13.8	52.2	0.83	0.323	88	0.307
13	0.00	25.7	10.5	38	13.9	52.4	0.81	0.319	87	0.305
14	0.00	26.8	10.8	40	14.0	52.0	0.89	0.324	90	0.313
15	0.00	25.0	10.8	37	14.3	52.3	0.79	0.319	89	0.310
16	0.00	26.7	10.9	40	13.8	52.4	0.91	0.322	89	0.313
17	0.00	27.3	11.0	41	14.2	52.2	0.81	0.326	90	0.315
18	0.00	25.6	11.1	38	14.3	52.7	0.80	0.321	89	0.311
19	0.00	26.9	11.2	40	14.1	52.3	0.80	0.322	88	0.306
20	0.00	26.1	11.1	39	14.2	52.3	0.81	0.316	88	0.306
21	0.00	27.1	11.0	40	14.5	51.9	0.85	0.327	88	0.310
22	0.00	25.5	10.8	38	14.5	52.1	0.81	0.323	90	0.315
23	0.00	25.5	11.3	38	14.5	52.5	0.83	0.320	90	0.314
24	0.00	26.2	10.9	39	14.5	52.3	0.83	0.322	88	0.309
25	0.00	26.4	10.8	39	13.6	52.3	0.83	0.320	88	0.307
26	0.00	25.4	11.4	38	14.6	52.3	0.82	0.321	89	0.313
27	0.00	26.7	11.2	40	14.3	52.4	0.80	0.325	87	0.304
28	0.00	26.5	10.8	39	14.4	52.5	0.81	0.325	89	0.311
29	0.00	26.5	10.8	40	14.6	52.3	0.79	0.321	90	0.314
30	0.00	26.6	10.8	40	14.2	51.9	0.81	0.322	88	0.308
31	0.00	27.6	10.8	41	14.4	52.0	0.79	0.328	89	0.310
32	0.00	26.4	11.3	39	13.8	52.0	0.91	0.322	89	0.310
33	0.00	27.4	11.1	41	13.9	52.2	0.84	0.331	90	0.316
34	0.00	26.3	11.2	39	13.8	52.5	0.88	0.323	87	0.306
35	0.00	26.2	11.0	39	14.2	52.3	0.83	0.324	86	0.302
36	0.00	27.9	11.4	42	14.3	51.8	0.81	0.330	87	0.306
37	0.00	27.3	11.1	41	14.2	52.4	0.82	0.325	87	0.306
38	0.00	25.5	11.2	38	14.4	52.0	0.82	0.324	88	0.309
39	0.00	26.3	11.1	39	13.9	52.3	0.89	0.319	86	0.303
40	0.00	27.5	10.4	41	15.2	51.8	0.78	0.335	90	0.314
41	0.00	26.8	10.7	40	14.1	52.2	0.82	0.322	88	0.309
42	0.00	27.5	10.9	41	14.3	51.9	0.81	0.326	87	0.306
43	0.00	26.4	10.8	39	13.9	52.1	0.91	0.319	88	0.308
44	0.00	26.6	11.2	40	15.0	52.4	0.82	0.325	89	0.313
45	0.00	27.6	11.1	41	14.9	51.7	0.78	0.328	88	0.309
46	0.00	27.1	10.6	40	14.5	52.2	0.86	0.324	88	0.309
47	0.00	25.8	10.4	38	14.1	52.0	0.82	0.318	89	0.310
48	0.00	27.3	10.7	41	14.8	52.4	0.77	0.322	89	0.311
49	0.00	26.7	10.9	40	15.0	52.0	0.78	0.324	89	0.311
50	0.00	26.6	11.0	40	15.3	52.0	0.79	0.325	90	0.317
51	0.00	25.6	10.4	38	14.7	51.9	0.81	0.321	89	0.312
52	0.00	26.3	10.4	39	14.6	52.1	0.85	0.322	90	0.316
53	0.00	26.5	9.8	39	14.9	52.4	0.78	0.325	88	0.308
54	0.00	26.0	10.1	39	14.4	51.6	0.84	0.317	89	0.310
55	0.00	27.1	10.3	40	15.3	52.3	0.77	0.325	90	0.316
56	0.00	26.5	10.7	39	14.1	52.0	0.90	0.316	89	0.313
57	0.00	27.4	9.8	41	15.0	52.1	0.77	0.326	90	0.314
58	0.00	26.3	10.3	39	14.5	52.4	0.79	0.321	88	0.308
59	0.00	26.2	10.5	39	14.9	52.2	0.81	0.316	91	0.317
60	0.00	27.4	9.9	41	15.0	52.1	0.76	0.323	90	0.314
61	0.00	27.0	10.2	40	14.9	51.8	0.77	0.324	91	0.317
62	0.00	26.4	9.7	39	14.6	52.5	0.76	0.317	89	0.312
63	0.00	26.4	9.7	39	14.8	52.1	0.81	0.319	89	0.312
64	0.00	26.1	10.6	39	14.6	52.1	0.79	0.318	87	0.305
65	0.00	27.0	10.2	40	14.8	51.9	0.85	0.321	91	0.317
66	0.00	26.0	9.7	39	14.7	51.9	0.78	0.321	89	0.311

MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-2; 33.5' - 35' Sample
OP: JNH

Hammer ID: 848 (AE DRILL - CME 750)
Test date: 17-Jun-2008

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX ft/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
67	0.00	26.7	10.3	40	14.4	52.1	0.78	0.317	89	0.312
68	0.00	25.5	9.5	38	14.9	52.2	0.79	0.320	90	0.316
69	0.00	26.8	9.1	40	14.8	52.0	0.76	0.317	90	0.316
70	0.00	26.3	10.2	39	14.1	52.2	0.86	0.313	88	0.307
71	0.00	26.0	10.2	39	15.2	52.0	0.78	0.318	90	0.315
72	0.00	27.1	10.1	40	14.7	51.7	0.77	0.319	91	0.317
73	0.00	26.5	9.0	39	14.3	52.1	0.77	0.316	88	0.307
74	0.00	26.6	8.6	40	14.8	52.0	0.83	0.319	91	0.319
75	0.00	26.9	9.8	40	15.0	52.2	0.79	0.323	89	0.313
76	0.00	25.8	9.1	38	14.3	52.2	0.81	0.317	87	0.305
77	0.00	26.4	8.2	39	15.0	52.1	0.80	0.318	91	0.318
78	0.00	26.8	8.5	40	14.5	52.1	0.77	0.318	88	0.309
79	0.00	26.6	8.2	40	14.4	52.4	0.86	0.319	89	0.310
80	0.00	26.5	8.7	40	14.5	51.9	0.88	0.317	90	0.316
81	0.00	26.7	7.8	40	14.6	52.3	0.83	0.322	89	0.312
82	0.00	26.9	8.3	40	15.0	52.3	0.78	0.327	90	0.313
83	0.00	26.8	8.3	40	14.6	51.9	0.85	0.319	91	0.317
84	0.00	26.7	8.9	40	14.6	52.2	0.79	0.320	88	0.309
	Average	26.5	10.6	39	14.4	51.5	0.82	0.322	89	0.311

Total number of blows analyzed: 83

Time Summary

Drive 1 minute 34 seconds 6:00:45 PM - 6:02:19 PM (6/17/2008) BN 2 - 84

MACTEC

engineering and constructing a better tomorrow

July 14, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Kathryn White KAW 7/14/08

Subject: **Report of SPT Energy – JEDI CME 75 Truck Hammer Serial No. 447 Automatic Hammer WORK INSTRUCTION No. 18 (FLR-085)**
STP COL Project
Matagorda County, Texas
MACTEC Project No. 6234-08-4660

Jonathan Honeycutt, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on June 13 and 14, 2008, during drilling of Boring U3-4 at the referenced site. The testing was performed by Jonathan Honeycutt from approximately 12:44 PM to 2:46 PM on June 13 under scattered showers and a temperature of 85 degrees Fahrenheit, and from 12:06 PM to 12:35 PM on June 14 in rainy conditions and a temperature of 85 degrees Fahrenheit. The boring was drilled with personnel and equipment from JEDI Drilling. The drilling equipment consisted of a CME 75 model truck-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of NW-J-sized drilling rods and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during sampling was Mr. Oscar Garcia. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. K990 and K983) and strain gages (Serial Nos. NW #146/1 and NW#146/2). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert had a cross-sectional area of approximately 1.49 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25 inches, respectively. The recommended operation rate of the hammer is not known. Due to the closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

Calibration Records

The calibration records for all the above are filed in DCN FLR-079.

20 Pages Total

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDIPLOT tables and are also shown graphically in the PDIPLOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction.

- The average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 303 foot-pounds to 322 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 87% to 92% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) was 313.5 foot-pounds, with an average ETR of 89.6%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN FLR-085 – 1 Page
Pages 6 – 7 Record of SPT Energy Measurement – 2 Pages
Pages 8 – 20 PDIPLOT Output – 13 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)

South Texas Project (STP) COL Site - Units 3 and 4
Wadsworth, Texas
MACTEC Project No. 6234-08-4660

Rig Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Date Tested	Drill Rod Size	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs)[a]	Energy Transfer Ratio (%)[b] (Average ETR)
447 (CME 75 Truck)	Jedi Drilling	Oscar Garcia	U3-4	6/13/2008	NW-J	23.1 - 24.6	3 - 3 - 4	11	303	86.6%
						28.1 - 29.6	12 - 18 - 15	46	308	88.0%
						33.1 - 34.6	10 - 22 - 29	62	313	89.4%
						38.1 - 39.6	6 - 20 - 15	41	316	90.3%
				6/14/2008		98.1 - 99.6	6 - 10 - 13	26	322	92.0%
						103.1 - 104.6	3 - 7 - 8	19	317	90.6%
								Average for Rig:	**313.5**	**89.6%**

[a]Measured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy.

EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).

[b]Energy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet). The average ETR values may differ slightly and insignificantly from those in the PDIPLOT tables due to roundoff.

Prepared By: Steve Kiser	Date: 7-14-08		Checked By:	Date: 7/14/08

Work Instruction No. 18
STP Units 3 & 4 COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6234-08-4660

Issued To: Steve Kiser, Jon Honeycutt **Rev. No.** 0
Issued By: Robert E. Smith **Date:** June 5, 2008
Valid From: June 5, 2008 **To:** June 5, 2009

Task Description: Perform SPT Energy Measurements of drill rigs

Applicable Technical Procedures or Plans, or other reference:

Work Plan (current revision), ASTM D4633-05.

Specific Instructions (note attachments where necessary): Perform energy measurements for each drill rig on site collecting split-spoon samples in accordance with ASTM D-4633-05. Consult with Site Coordinator as to schedule for rigs that may be planned for use that are not yet present. Hammer weights have been checked by site personnel, and records will be available on site. All rigs are using automatic hammer systems. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, but should begin at a minimum depth of 10 feet. Collect at least three energy measurements per drill rig.

Submit copies of calibration records for equipment to Quality Assurance for review prior to beginning work on site.

Special Instructions (note attachments where necessary): Confirm with Site Supervisor that approval of equipment calibration records has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, notify Shaun Lehman and Rob Smith immediately.

Report Format: Standard report in accordance with ASTM D 4633-05 requirements.

Specific Quality Assurance Procedures Applicable: QAP 20-1; QAP 25-1; QAP for Reporting Nuclear-Related Defects, or Noncompliances, per Federal Regulation 10CFR21 and Section 206 of the Energy Reorganization Act of 1974. Current revisions apply.

Hold Points or Witness Points: None

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)
Project Manager: _____ Date: 6/6/06 08 06/6/08
Project Principal Engineer: _____ Date: _____
Site Manager/Coordinator: _____ Date: _____
Pages: **DCN:** FLR-085
Attachments:

MACTEC

2801 YORKMONT ROAD, SUITE 100 ☐ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	South Texas Project COL Site	MAKE:	CME
LOCATION:	Matagorda County, Texas	MODEL:	75
PROJECT NO.:	6234-08-4660	SERIAL NO.:	447
DATE:	6-14-2008	HAMMER TYPE:	Auto
WEATHER:	Rain 85°	ROPE CONDITION:	N/A
INSPECTOR:	JVM	ROD SIZE:	NWJ
DRILLING COMPANY:	JED	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	43-4		
DEPTH DRILLED:	Various		
TIME DRIVEN:	Various		
RIG OPERATOR:	Garcia		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	A1-K990 A2-K983		
STRAIN SERIAL NOS.:	NW146 - #112		

	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)
1*	98.1-98.6	6-10-13
	103.1-104.1	3-7-8

REMARKS: 1* Oscar Garcia Started Driving before PDA was Calibrated
∴ 3-4 Blows lost

MACTEC

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	South Texas Project COL Site	MAKE:	CME
LOCATION:	Matagorda County, Texas	MODEL:	75
PROJECT NO.:	6234-08-4660	SERIAL NO.:	447
DATE:	6-13-2008	HAMMER TYPE:	Auto
WEATHER:	Scattered Showers, sunny	ROPE CONDITION:	N/A
INSPECTOR:	JW Honeycutt	ROD SIZE:	NWJ
DRILLING COMPANY:	JEDI	NO. OF SHEAVES:	N/A

BORING DATA

BORING NUMBER:	43-4		
DEPTH DRILLED:	Various		
TIME DRIVEN:	Various		
RIG OPERATOR:	Garcia		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	K-990-#1 ; K993-#2		
STRAIN SERIAL NOS.:	NW146-#1/2		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)
23.1-24.6	3-3-4
28.1-29.6	12-18-15
33.1-34.6	10-22-29
38.1-39.6	6-20-15

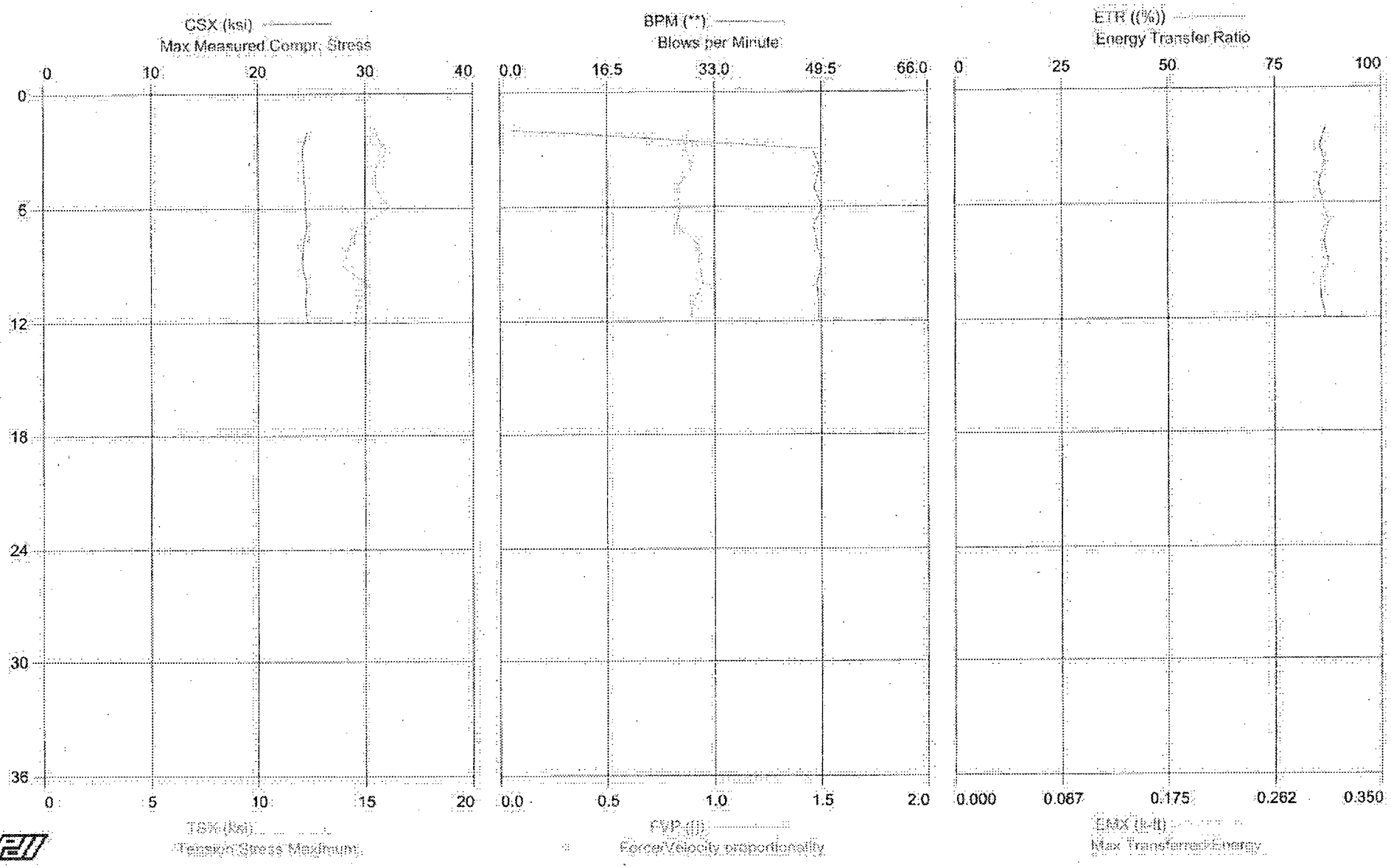
REMARKS:

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 13-Jun-2008

STP COL SITE - Boring U3-4; 23.1' - 24.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-4; 23.1' - 24.6' Sample
OP: JNH

Hammer ID: 447 (JEDI-CME 75)
Test date: 13-Jun-2008

AR: 1.49 in^2
LE: 29.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	24.6	15.3	37	14.2	1.9	0.88	0.309	87	0.305
3	0.00	24.2	16.0	36	14.4	48.1	0.87	0.310	86	0.300
4	0.00	24.3	15.4	36	14.9	49.3	0.90	0.308	87	0.304
5	0.00	24.4	15.5	36	14.4	48.4	0.82	0.309	85	0.299
6	0.00	24.4	16.1	36	14.5	49.6	0.84	0.309	86	0.302
7	0.00	24.6	14.7	37	14.9	48.3	0.82	0.311	88	0.307
8	0.00	24.2	14.2	36	14.5	48.9	0.93	0.311	87	0.303
9	0.00	24.1	14.0	36	14.5	49.6	0.93	0.313	88	0.307
10	0.00	24.6	15.1	37	14.4	48.8	0.95	0.311	86	0.300
11	0.00	24.4	14.6	36	14.2	49.1	0.90	0.308	86	0.301
12	0.00	24.6	14.5	37	14.3	49.1	0.89	0.308	87	0.305
	Average	24.4	15.1	36	14.5	44.6	0.88	0.310	87	0.303

Total number of blows analyzed: 11

Time Summary

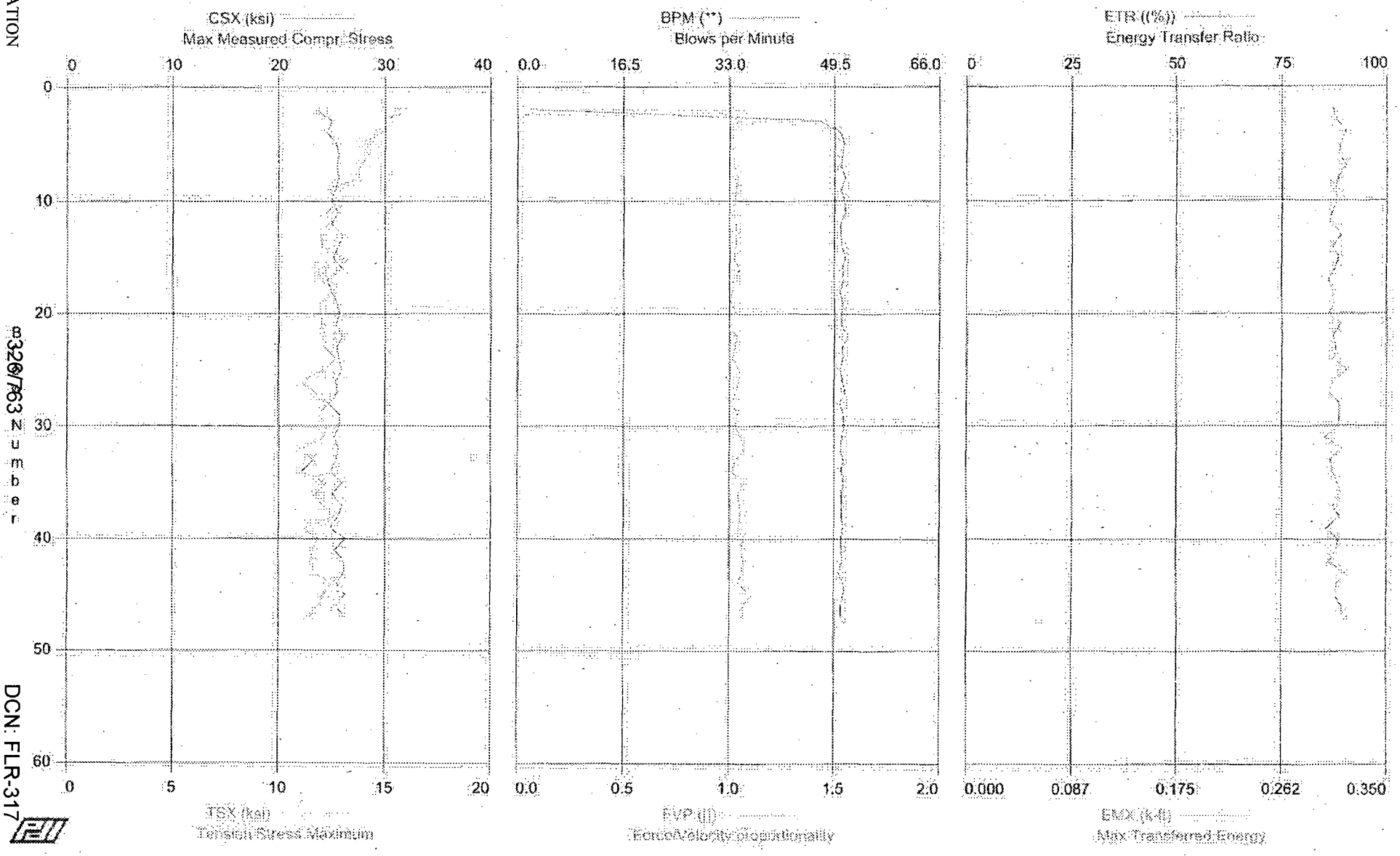
Drive 12 seconds 12:44:57 PM - 12:45:09 PM (6/13/2008) BN 2 - 12

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 13-Jun-2008

STP COL SITE - Boring U3-4, 28.1' - 29.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-4; 28.1' - 29.6' Sample
OP: JNH

Hammer ID: 447 (JEDI-CME 75)
Test date: 13-Jun-2008

AR: 1.49 in^2
LE: 34.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	23.4	15.8	35	14.1	1.9	0.92	0.306	87	0.305
3	0.00	24.9	15.1	37	13.3	47.1	1.04	0.322	88	0.308
4	0.00	24.5	14.9	37	13.6	50.4	1.01	0.322	90	0.316
5	0.00	25.3	13.8	38	13.9	51.0	1.02	0.319	89	0.311
6	0.00	25.6	14.2	38	14.1	50.8	1.02	0.321	89	0.310
7	0.00	25.4	13.8	38	14.1	50.6	1.02	0.323	90	0.316
8	0.00	25.6	13.8	38	13.8	51.2	1.04	0.324	88	0.310
9	0.00	25.3	12.3	38	13.7	50.5	1.03	0.320	88	0.307
10	0.00	24.9	12.8	37	13.3	51.1	1.02	0.325	88	0.309
11	0.00	25.6	12.2	38	14.0	51.2	1.02	0.319	87	0.304
12	0.00	24.9	12.5	37	13.5	50.5	1.03	0.318	87	0.303
13	0.00	26.0	12.0	39	14.1	50.5	1.03	0.326	89	0.312
14	0.00	25.5	12.0	38	13.8	50.7	1.03	0.321	87	0.305
15	0.00	25.1	13.1	37	13.6	51.2	1.02	0.322	88	0.310
16	0.00	26.0	11.8	39	13.7	50.8	1.05	0.329	88	0.307
17	0.00	24.5	11.9	37	13.4	51.0	1.02	0.320	86	0.301
18	0.00	24.9	12.7	37	13.7	50.4	1.01	0.322	87	0.305
19	0.00	25.4	11.9	38	14.1	50.8	1.00	0.322	87	0.306
20	0.00	25.7	12.0	38	13.8	50.6	1.04	0.319	86	0.302
21	0.00	25.3	12.0	38	14.5	50.6	0.99	0.320	89	0.311
22	0.00	25.9	12.2	39	13.9	51.6	1.03	0.325	87	0.305
23	0.00	25.4	12.2	38	13.8	50.8	1.03	0.321	88	0.308
24	0.00	25.6	12.7	38	14.1	50.9	1.01	0.320	87	0.306
25	0.00	25.9	12.1	39	13.9	50.4	1.05	0.324	90	0.317
26	0.00	25.4	11.0	38	13.5	50.8	1.05	0.321	87	0.305
27	0.00	25.5	11.7	38	13.8	51.3	1.03	0.316	87	0.303
28	0.00	24.7	12.3	37	13.8	50.4	1.01	0.316	89	0.311
29	0.00	25.7	11.9	38	13.8	51.0	1.04	0.317	89	0.311
30	0.00	25.7	12.2	38	14.0	51.1	1.03	0.316	89	0.310
31	0.00	25.2	12.1	38	13.3	50.7	1.05	0.323	85	0.299
32	0.00	25.6	11.0	38	13.4	50.5	1.07	0.322	90	0.313
33	0.00	25.4	11.6	38	13.7	51.0	1.03	0.318	87	0.303
34	0.00	24.9	11.1	37	13.7	50.6	1.01	0.322	87	0.305
35	0.00	26.0	12.2	39	13.6	51.0	1.07	0.320	88	0.309
36	0.00	25.0	11.7	37	13.6	50.6	1.04	0.315	89	0.312
37	0.00	25.9	12.0	39	13.7	50.7	1.05	0.319	87	0.305
38	0.00	25.6	12.6	38	13.8	50.6	1.05	0.319	89	0.311
39	0.00	24.8	11.2	37	13.2	50.9	1.05	0.314	86	0.300
40	0.00	26.3	11.9	39	13.7	50.6	1.07	0.321	88	0.310
41	0.00	25.2	11.6	38	13.4	50.7	1.06	0.315	88	0.308
42	0.00	26.1	11.5	39	13.6	50.8	1.07	0.321	86	0.302
43	0.00	26.1	11.7	39	13.9	50.2	1.06	0.324	90	0.316
44	0.00	25.4	12.4	38	13.7	51.0	1.04	0.321	88	0.308
45	0.00	26.3	12.1	39	13.3	51.0	1.11	0.323	88	0.307
46	0.00	25.4	11.9	38	13.3	50.6	1.07	0.324	89	0.313
47	0.00	26.2	11.4	39	13.8	50.6	1.07	0.328	89	0.313
	Average	25.4	12.4	38	13.7	49.6	1.04	0.321	88	0.308

Total number of blows analyzed: 46

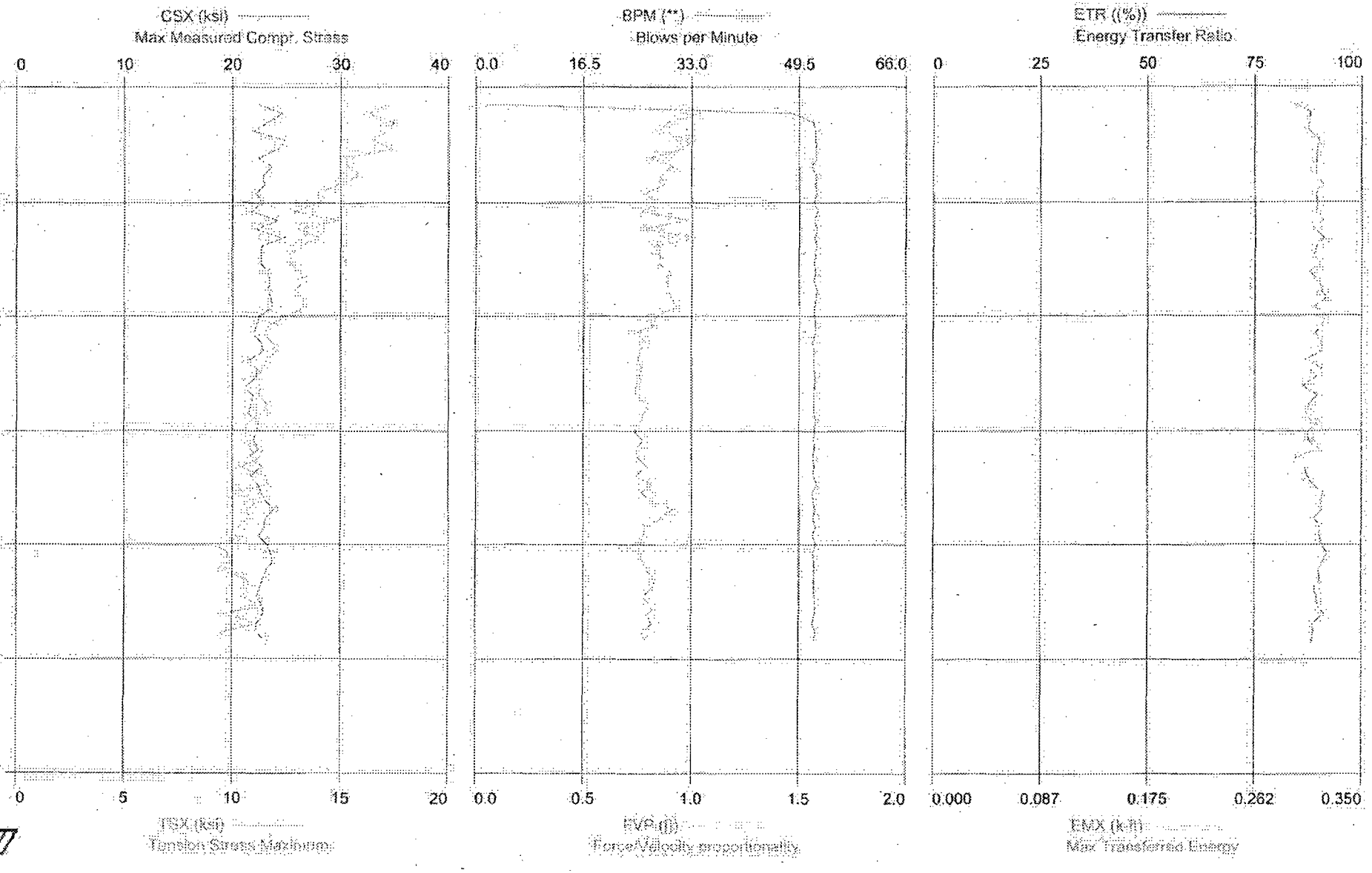
Time Summary
Drive: 54 seconds 2:04:58 PM - 2:05:52 PM (6/13/2008) BN 2 - 47

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 13-Jun-2008

STP COL SITE - Boring U3-4; 33.1' - 34.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-4; 33.1' - 34.6' Sample
OP: JNH

Hammer ID: 447 (JEDI-CME 75)
Test date: 13-Jun-2008

AR: 1.49 in^2
LE: 39.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM ↔	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	22.4	17.1	33	13.7	1.9	0.95	0.301	84	0.295
3	0.00	24.6	16.3	37	13.9	48.3	1.04	0.326	88	0.308
4	0.00	23.2	17.5	35	14.6	51.7	0.89	0.313	88	0.307
5	0.00	21.9	17.1	33	14.6	52.0	0.84	0.303	87	0.306
6	0.00	24.8	16.5	37	14.2	52.0	1.00	0.322	90	0.315
7	0.00	24.2	17.4	36	14.0	52.2	0.97	0.324	90	0.314
8	0.00	22.4	15.1	33	14.9	52.2	0.81	0.312	90	0.314
9	0.00	23.7	15.4	35	14.4	51.5	0.92	0.315	89	0.313
10	0.00	22.8	15.7	34	14.9	52.2	0.86	0.312	89	0.313
11	0.00	22.9	14.9	34	14.7	52.0	0.88	0.315	91	0.319
12	0.00	22.1	13.9	33	15.6	52.2	0.78	0.302	89	0.313
13	0.00	22.8	14.1	34	15.0	51.8	0.85	0.316	90	0.314
14	0.00	21.6	12.9	32	15.5	52.4	0.77	0.303	90	0.313
15	0.00	24.2	14.9	36	13.9	51.8	0.98	0.330	91	0.319
16	0.00	22.1	13.1	33	15.6	52.3	0.77	0.301	89	0.310
17	0.00	24.6	14.0	37	13.4	51.9	1.02	0.336	91	0.319
18	0.00	22.6	13.1	34	15.3	52.2	0.82	0.310	89	0.313
19	0.00	22.6	12.7	34	14.7	52.0	0.86	0.314	89	0.311
20	0.00	22.6	12.8	34	14.9	51.9	0.85	0.318	91	0.318
21	0.00	23.3	13.2	35	14.4	52.1	0.90	0.311	88	0.307
22	0.00	23.4	13.3	35	14.8	51.8	0.89	0.322	90	0.316
23	0.00	23.2	13.0	35	14.6	52.3	0.89	0.319	91	0.317
24	0.00	23.6	13.3	35	14.6	52.1	0.91	0.322	92	0.321
25	0.00	23.6	13.3	35	14.2	51.9	0.93	0.321	89	0.312
26	0.00	22.5	12.6	33	15.1	51.9	0.84	0.312	92	0.321
27	0.00	22.2	11.7	33	15.1	52.0	0.82	0.308	91	0.318
28	0.00	21.9	11.5	33	16.0	52.1	0.74	0.298	89	0.312
29	0.00	22.6	11.9	34	15.6	51.6	0.79	0.309	91	0.317
30	0.00	22.8	12.1	34	15.7	51.9	0.76	0.306	91	0.318
31	0.00	21.5	11.6	32	15.7	51.8	0.75	0.297	87	0.304
32	0.00	22.3	11.4	33	15.7	51.8	0.77	0.304	91	0.318
33	0.00	22.2	11.0	33	15.7	52.0	0.75	0.297	89	0.312
34	0.00	21.2	11.4	32	15.6	51.9	0.74	0.292	86	0.301
35	0.00	21.9	11.2	33	16.0	51.8	0.74	0.296	90	0.314
36	0.00	21.7	11.6	32	15.2	51.8	0.80	0.302	88	0.307
37	0.00	21.4	11.4	32	15.4	51.8	0.78	0.293	87	0.305
38	0.00	22.4	10.7	33	15.6	52.1	0.77	0.299	90	0.316
39	0.00	22.3	10.6	33	15.9	51.9	0.73	0.278	87	0.306
40	0.00	21.9	10.7	33	15.2	51.8	0.78	0.297	88	0.306
41	0.00	22.4	10.8	33	15.8	51.9	0.74	0.299	90	0.315
42	0.00	21.5	11.3	32	15.1	51.7	0.75	0.281	84	0.296
43	0.00	22.7	10.3	34	15.3	51.9	0.79	0.291	87	0.303
44	0.00	21.7	11.5	32	15.4	51.7	0.74	0.286	87	0.305
45	0.00	22.3	11.6	33	15.1	52.3	0.82	0.301	88	0.310
46	0.00	22.6	9.9	34	15.8	51.6	0.77	0.312	91	0.319
47	0.00	23.1	11.2	34	15.2	51.7	0.82	0.308	90	0.316
48	0.00	23.8	10.6	35	14.7	52.0	0.91	0.319	91	0.318
49	0.00	23.0	10.8	34	15.0	51.7	0.85	0.315	89	0.311
50	0.00	22.9	10.2	34	15.5	52.1	0.79	0.305	90	0.316
51	0.00	22.5	10.6	33	15.8	51.7	0.78	0.296	90	0.316
52	0.00	23.2	9.3	35	16.0	52.2	0.76	0.313	91	0.318
53	0.00	23.6	9.8	35	16.2	51.7	0.76	0.309	92	0.322
54	0.00	23.7	9.8	35	16.1	51.9	0.78	0.304	91	0.318
55	0.00	23.1	9.5	34	15.6	51.9	0.80	0.309	90	0.315
56	0.00	22.8	10.7	34	15.4	51.8	0.83	0.307	90	0.316
57	0.00	22.5	10.8	34	15.3	51.8	0.83	0.302	89	0.311
58	0.00	22.2	10.4	33	15.5	51.9	0.77	0.307	89	0.313
59	0.00	22.8	11.4	34	15.2	52.0	0.83	0.313	90	0.314
60	0.00	22.8	9.6	34	15.9	51.9	0.80	0.308	91	0.319
61	0.00	22.2	11.2	33	14.9	51.7	0.82	0.302	89	0.310
62	0.00	22.1	9.6	33	15.4	52.1	0.77	0.297	89	0.311
63	0.00	23.2	9.6	35	15.6	51.8	0.79	0.297	88	0.309
	Average	22.7	12.3	34	15.2	51.1	0.83	0.307	89	0.313

Total number of blows analyzed: 62

MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-4; 33.1' - 34.6' Sample
OP: JNH

Hammer ID: 447 (JEDI-CME 75)
Test date: 13-Jun-2008

Time Summary

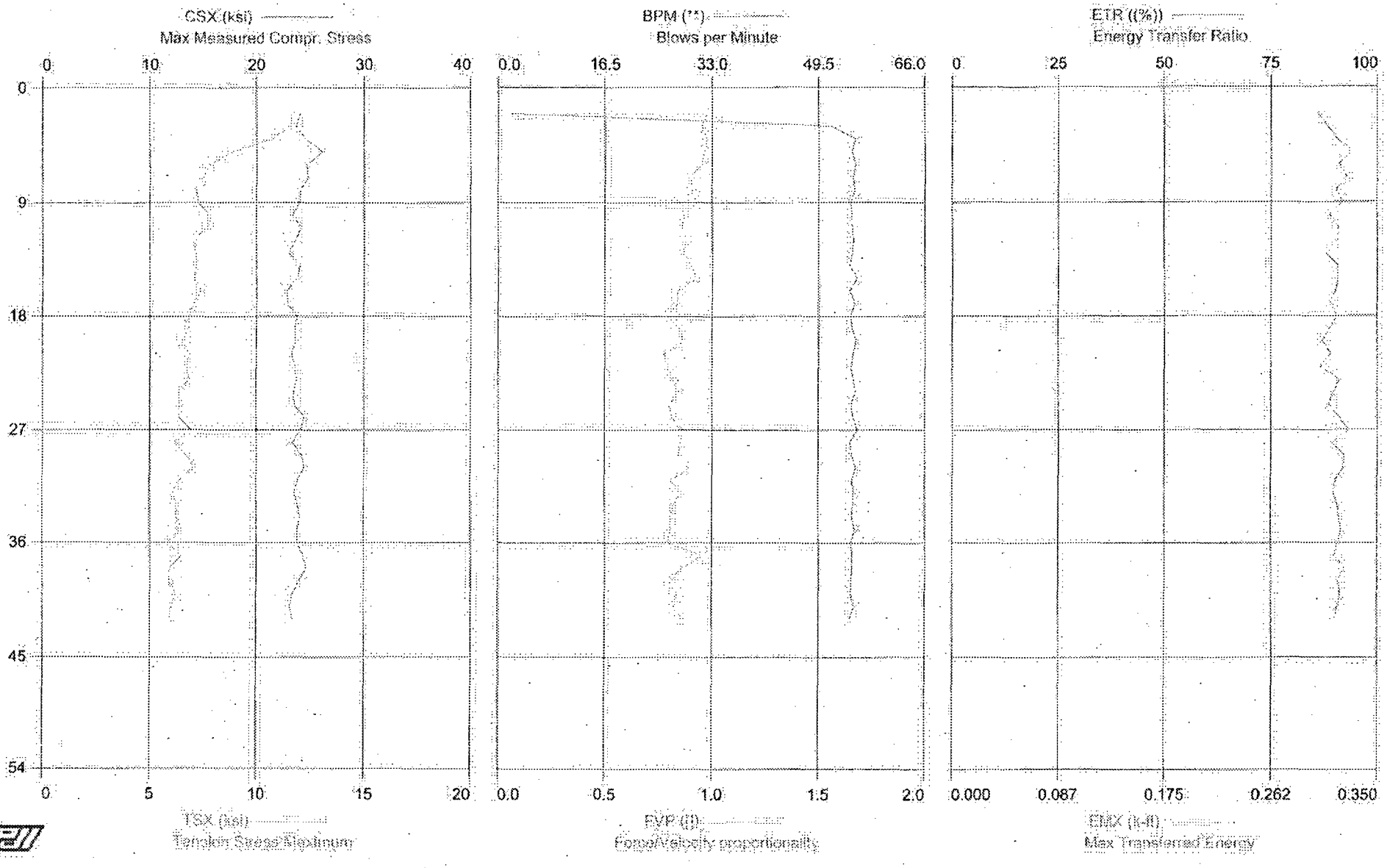
Drive	1 minute 10 seconds	2:32:34 PM - 2:33:44 PM (6/13/2008) BN 2 - 63

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 13-Jun-2008

STP COL SITE - Boring U3-4; 38.1' - 39.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-4; 38.1'-39.6' Sample
OP: JNH

Hammer ID: 447 (JEDI-CME 75)
Test date: 13-Jun-2008

AR: 1.49 in^2
LE: 44.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	24.1	11.7	36	13.7	1.9	0.98	0.308	86	0.301
3	0.00	23.7	11.6	35	14.0	51.4	0.95	0.308	88	0.309
4	0.00	24.7	10.7	37	14.2	55.2	0.98	0.322	90	0.317
5	0.00	26.2	8.9	39	14.3	54.6	0.97	0.336	94	0.328
6	0.00	24.7	7.8	37	14.4	55.2	0.95	0.319	91	0.318
7	0.00	24.8	7.5	37	14.7	54.8	0.90	0.325	93	0.325
8	0.00	24.1	7.2	36	14.9	55.1	0.91	0.317	90	0.316
9	0.00	24.1	7.3	36	14.6	54.5	0.93	0.316	92	0.322
10	0.00	23.4	7.9	35	14.8	54.6	0.87	0.306	89	0.311
11	0.00	24.2	7.8	36	15.1	54.7	0.86	0.315	91	0.318
12	0.00	23.7	7.1	35	15.1	54.9	0.88	0.308	91	0.318
13	0.00	23.0	7.2	34	14.9	54.7	0.87	0.302	88	0.307
14	0.00	24.1	7.2	36	15.1	54.3	0.90	0.312	91	0.317
15	0.00	23.9	7.1	36	14.4	55.5	0.93	0.314	91	0.318
16	0.00	22.8	7.4	34	15.3	54.3	0.84	0.303	90	0.316
17	0.00	22.9	7.1	34	15.2	55.1	0.84	0.306	89	0.311
18	0.00	23.8	6.9	36	15.6	54.5	0.79	0.302	91	0.317
19	0.00	23.6	6.8	35	15.5	54.7	0.85	0.305	89	0.311
20	0.00	23.6	6.6	35	15.2	55.3	0.87	0.303	87	0.305
21	0.00	23.3	6.9	35	15.3	54.8	0.78	0.293	89	0.312
22	0.00	23.6	6.7	35	14.9	54.5	0.79	0.297	87	0.303
23	0.00	23.8	6.9	35	16.0	54.9	0.82	0.307	91	0.319
24	0.00	23.5	6.4	35	15.6	55.2	0.85	0.303	90	0.314
25	0.00	23.6	6.4	35	16.1	54.5	0.80	0.303	89	0.310
26	0.00	24.4	6.4	36	15.7	54.8	0.82	0.308	91	0.319
27	0.00	24.2	7.0	36	15.7	55.5	0.86	0.312	93	0.327
28	0.00	23.4	6.2	35	15.4	54.3	0.85	0.303	89	0.312
29	0.00	24.2	6.7	36	15.7	54.6	0.84	0.313	92	0.323
30	0.00	24.5	7.1	36	15.1	55.2	0.90	0.317	92	0.322
31	0.00	23.9	6.4	36	16.1	54.7	0.81	0.310	90	0.316
32	0.00	23.6	6.1	35	15.4	54.9	0.86	0.307	90	0.314
33	0.00	23.9	6.3	36	15.6	54.8	0.82	0.307	91	0.317
34	0.00	24.1	6.3	36	15.4	54.7	0.81	0.310	91	0.319
35	0.00	23.9	6.5	36	15.2	55.1	0.81	0.310	91	0.320
36	0.00	23.8	5.8	35	16.1	54.5	0.79	0.303	91	0.317
37	0.00	24.3	6.5	36	14.3	54.7	0.95	0.319	90	0.315
38	0.00	24.6	5.9	37	15.4	54.7	0.86	0.318	92	0.323
39	0.00	24.0	5.9	36	15.7	54.5	0.80	0.303	91	0.317
40	0.00	23.4	6.2	35	15.6	54.5	0.84	0.311	91	0.320
41	0.00	23.2	6.0	35	15.8	55.0	0.82	0.303	91	0.317
42	0.00	23.4	5.9	35	15.2	54.3	0.86	0.306	90	0.315
	Average	23.9	7.1	36	15.2	53.4	0.86	0.310	90	0.316

Total number of blows analyzed: 41

Time Summary

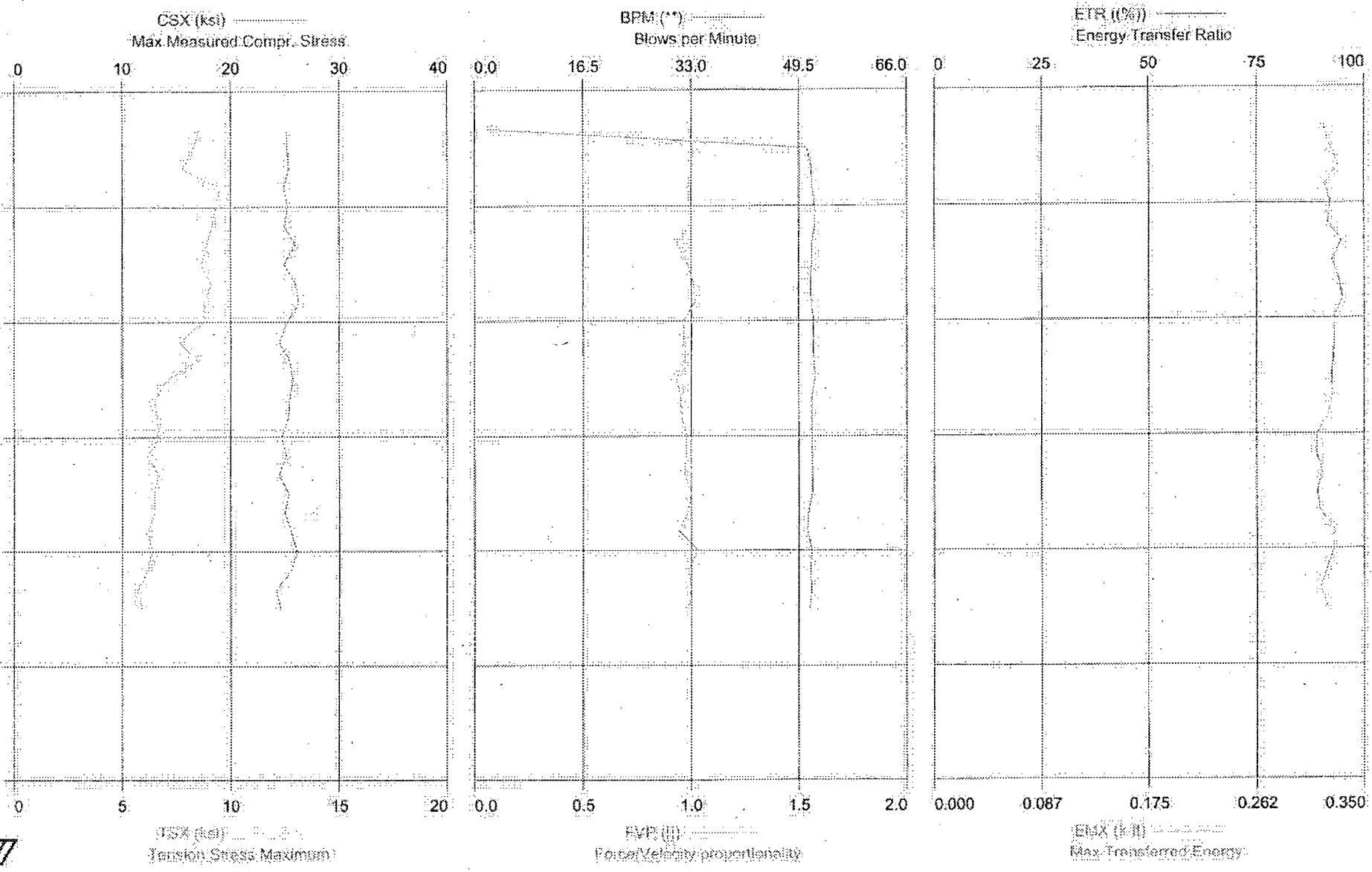
Drive 44 seconds 2:46:12 PM - 2:46:56 PM (6/13/2008) BN 2 - 42

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 14-Jun-2008

STP COL SITE - Boring U3-4; 98.1' - 99.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-4; 98.1' - 99.6' Sample
OP: JNH

Hammer ID: 447 (JEDI-CME 75)
Test date: 14-Jun-2008

AR: 1.49 in^2
LE: 104.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	25.1	8.6	37	14.2	1.9	0.99	0.314	91	0.317
3	0.00	25.3	8.2	38	14.0	50.8	1.01	0.314	92	0.322
4	0.00	25.4	7.8	38	14.2	51.4	1.01	0.314	94	0.329
5	0.00	24.9	9.5	37	14.1	51.6	0.99	0.311	91	0.318
6	0.00	25.3	9.3	38	14.3	51.9	0.99	0.311	92	0.323
7	0.00	25.0	9.1	37	14.1	52.0	0.99	0.310	92	0.320
8	0.00	25.9	8.9	39	14.5	51.5	0.94	0.318	95	0.332
9	0.00	25.0	8.6	37	14.2	51.5	0.98	0.320	93	0.324
10	0.00	26.0	9.1	39	14.5	51.3	1.01	0.316	94	0.330
11	0.00	26.3	8.8	39	14.4	51.4	1.02	0.322	95	0.333
12	0.00	25.3	8.8	38	14.7	51.8	0.97	0.314	93	0.325
13	0.00	24.5	7.7	36	14.2	51.7	0.97	0.313	93	0.326
14	0.00	25.4	8.5	38	14.7	51.8	0.97	0.310	93	0.325
15	0.00	25.7	7.1	38	14.5	52.0	0.93	0.310	92	0.324
16	0.00	25.4	6.5	38	14.4	51.5	0.95	0.309	93	0.324
17	0.00	25.3	6.6	38	14.9	51.5	0.96	0.306	92	0.321
18	0.00	24.7	6.7	37	14.1	51.5	0.98	0.303	89	0.312
19	0.00	25.1	6.2	37	14.4	51.6	0.98	0.305	89	0.311
20	0.00	24.5	6.7	36	14.1	51.6	0.97	0.306	90	0.316
21	0.00	25.4	6.5	38	14.2	51.6	1.00	0.303	89	0.312
22	0.00	25.0	6.5	37	14.2	51.0	0.99	0.302	90	0.314
23	0.00	25.6	6.2	38	14.4	50.8	0.94	0.310	93	0.326
24	0.00	26.1	6.4	39	14.2	51.5	1.03	0.315	93	0.326
25	0.00	25.6	6.2	38	14.5	51.3	0.99	0.308	91	0.320
26	0.00	24.2	5.7	36	13.6	51.5	1.00	0.304	90	0.315
27	0.00	24.6	5.9	37	13.7	51.2	0.99	0.308	91	0.320
	Average	25.3	7.5	38	14.3	49.6	0.98	0.311	92	0.322

Total number of blows analyzed: 26

Time Summary

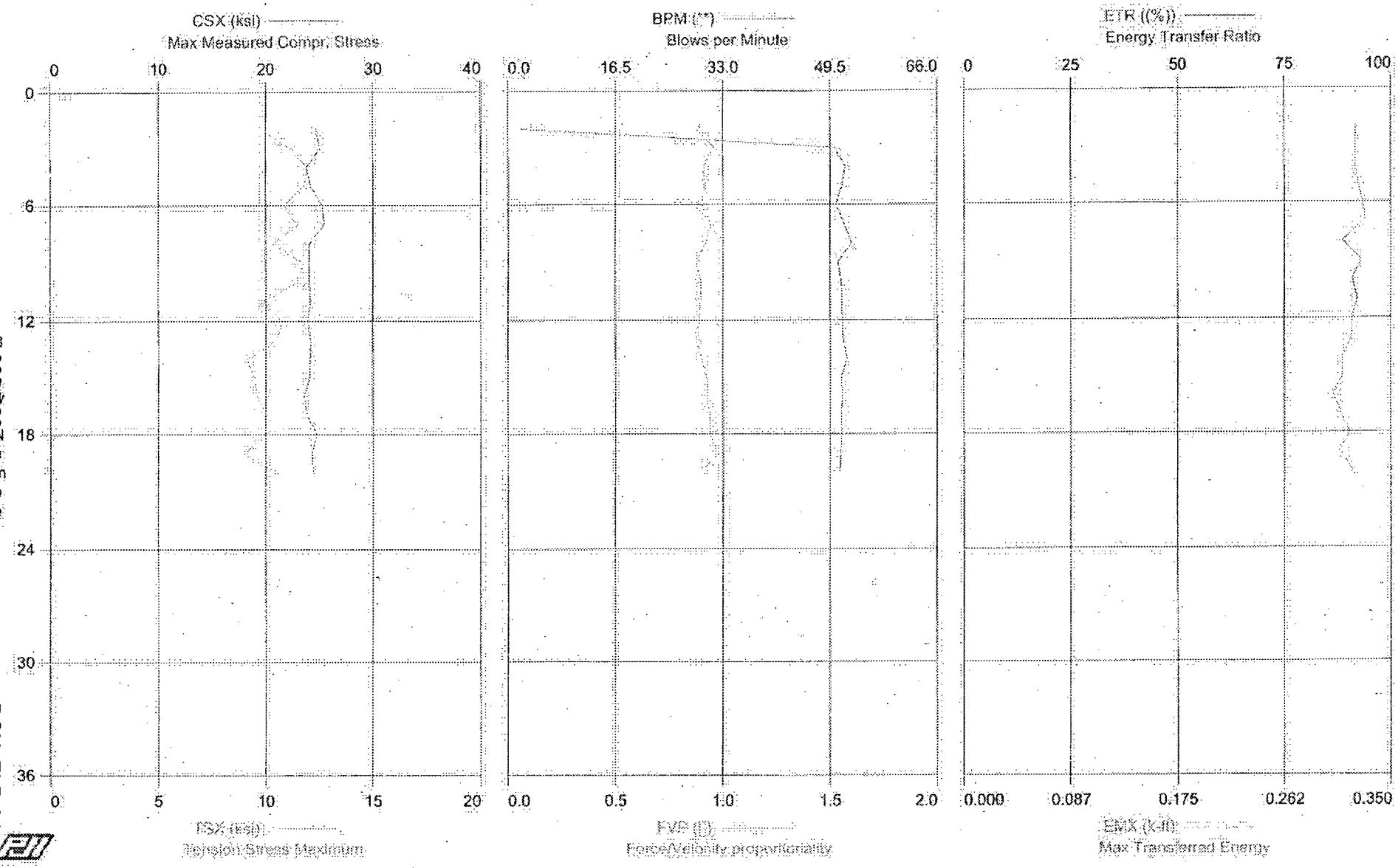
Drive 29 seconds 12:06:03 PM - 12:06:32 PM (6/14/2008) BN 2 - 27

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 14-Jun-2008

STP COL SITE - Boring U3-4; 103.1' - 104.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U3-4; 103.1' - 104.6' Sample
OP: JNH

Hammer ID: 447 (JEDI-CME 75)
Test date: 14-Jun-2008

AR: 1.49 in^2
LE: 109.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	24.7	9.9	37	14.7	1.9	0.88	0.309	92	0.321
3	0.00	25.0	11.2	37	14.6	50.2	0.96	0.310	92	0.321
4	0.00	23.8	12.0	35	14.7	51.8	0.91	0.304	91	0.320
5	0.00	24.2	11.8	36	14.9	51.3	0.92	0.308	92	0.323
6	0.00	25.3	10.9	38	15.1	50.4	0.90	0.315	93	0.327
7	0.00	25.5	11.5	38	15.2	51.6	0.94	0.318	94	0.329
8	0.00	24.1	10.3	36	14.7	52.8	0.92	0.299	89	0.310
9	0.00	24.1	11.8	36	15.5	50.7	0.87	0.304	93	0.326
10	0.00	24.1	11.5	36	15.0	51.2	0.90	0.301	91	0.318
11	0.00	24.2	9.8	36	15.1	51.3	0.90	0.302	92	0.322
12	0.00	23.9	10.8	36	15.1	51.4	0.89	0.298	91	0.318
13	0.00	24.2	10.5	36	14.8	51.5	0.87	0.303	91	0.318
14	0.00	24.2	9.1	36	15.0	52.1	0.90	0.298	89	0.310
15	0.00	24.1	9.5	36	14.6	51.2	0.93	0.294	89	0.310
16	0.00	23.6	9.6	35	14.2	51.4	0.93	0.290	87	0.303
17	0.00	23.9	10.1	36	14.3	51.2	0.94	0.295	88	0.309
18	0.00	24.8	10.1	37	14.8	51.3	0.94	0.302	90	0.316
19	0.00	24.3	9.0	36	14.0	51.1	0.97	0.297	88	0.308
20	0.00	24.4	10.5	36	14.7	51.0	0.90	0.303	91	0.319
	Average	24.3	10.5	36	14.8	48.7	0.91	0.303	91	0.317

Total number of blows analyzed: 19

Time Summary

Drive 21 seconds 12:35:12 PM - 12:35:33 PM (6/14/2008) BN 2 - 20

MACTEC

engineering and constructing a better tomorrow

July 14, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Kathryn White KAW 7/15/08

Subject: **Report of SPT Energy – Lewis Drilling Mobile B-61**
Hammer Serial No. 007 Automatic Hammer
WORK INSTRUCTION No. 18 (FLR-085)
STP COL Project
Matagorda County, Texas
MACTEC Project No. 6234-08-4660

Jonathan Honeycutt, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on June 14 and 15, 2008, during drilling of Boring D4-3 at the referenced site. The testing was performed by Jonathan Honeycutt from approximately 6:36 PM to 6:37 PM on June 14 under sunny and cloudy skies and a temperature of 90 in degrees Fahrenheit, and from 9:34 AM to 10:23 AM on June 15 under sunny skies and a temperature of 85 degrees Fahrenheit. The boring was drilled with personnel and equipment from Lewis Drilling. The drilling equipment consisted of a Mobile B-61 model truck-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of NW-J-sized drilling rods and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during energy testing was Mr. Daniel Gonzalez. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. K990 and K983) and strain gages (Serial Nos. NW #146/1 and NW#146/2). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert had a cross-sectional area of approximately 1.49 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25 inches, respectively. The recommended operation rate of the hammer is not known. Due to the closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

Calibration Records

The calibration records for all the above are filed in DCN FLR-079.

13 Pages Total

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDIPLOT tables and are also shown graphically in the PDIPLOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction.

- The average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 321 foot-pounds to 335 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 92% to 96% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) was 327.2 foot-pounds, with an average ETR of 93.5%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN FLR-085 – 1 Page
Pages 6 – 7 Record of SPT Energy Measurement – 2 Pages
Pages 8 – 13 PDIPLOT Output – 6 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
South Texas Project (STP) COL Site - Units 3 and 4
Wadsworth, Texas
MACTEC Project No. 6234-08-4660

Rig Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Date Tested	Drill Rod Size	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs)[a]	Energy Transfer Ratio (%)[b] (Average ETR)
007 (Mobile B-61)	Lewis Drilling	Gonzalez	D4-3	6/14/2008	NW-J	88.5 - 90.0	9 - 11 - 13	32	335	95.7%
				6/15/2008		98.5 - 100.0	7 - 9 - 11	27	323	92.3%
						108.7 - 110.2	6 - 7 - 8	22	321	91.7%
								Average for Rig:	**327.2**	**93.5%**

[a]Measured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy.
EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).
[b]Energy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet).
The average ETR values may differ slightly and insignificantly from those in the PDIPLOT tables due to roundoff.

Prepared By:	Date:		Checked By:	Date:
STEVE KIDER	7-14-08			7/15/08

Work Instruction No. 18
STP Units 3 & 4 COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6234-08-4660

Issued To: Steve Kiser, Jon Honeycutt **Rev. No.** 0
Issued By: Robert E. Smith **Date:** June 5, 2008
Valid From: June 5, 2008 **To:** June 5, 2009

Task Description: Perform SPT Energy Measurements of drill rigs

Applicable Technical Procedures or Plans, or other reference:

Work Plan (current revision), ASTM D4633-05.

Specific Instructions (note attachments where necessary): Perform energy measurements for each drill rig on site collecting split-spoon samples in accordance with ASTM D-4633-05. Consult with Site Coordinator as to schedule for rigs that may be planned for use that are not yet present. Hammer weights have been checked by site personnel, and records will be available on site. All rigs are using automatic hammer systems. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, but should begin at a minimum depth of 10 feet. Collect at least three energy measurements per drill rig.

Submit copies of calibration records for equipment to Quality Assurance for review prior to beginning work on site.

Special Instructions (note attachments where necessary): Confirm with Site Supervisor that approval of equipment calibration records has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, notify Shaun Lehman and Rob Smith immediately.

Report Format: Standard report in accordance with ASTM D 4633-05 requirements.

Specific Quality Assurance Procedures Applicable: QAP 20-1; QAP 25-1; QAP for Reporting Nuclear-Related Defects, or Noncompliances, per Federal Regulation 10CFR21 and Section 206 of the Energy Reorganization Act of 1974. Current revisions apply.

Hold Points or Witness Points: None

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)
Project Manager: _____ Date: 6/6/06 08 06/6/08
Project Principal Engineer: _____ Date: _____
Site Manager/Coordinator: _____ Date: _____
Pages: **DCN:** FLR-085
Attachments:

MACTEC

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	South Texas Project COL Site	MAKE:	Mobil
LOCATION:	Matagorda County, Texas	MODEL:	B-61
PROJECT NO.:	6234-08-4660	SERIAL NO.:	00 Z
DATE:	6-15-2008	HAMMER TYPE:	Auto
WEATHER:	Sunny, Breezy 85°F	ROPE CONDITION:	N/A
INSPECTOR:	JN Honeycutt	ROD SIZE:	NW 5
DRILLING COMPANY:	LEDI	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	D4-3		
DEPTH DRILLED:	Various		
TIME DRIVEN:	Various		
RIG OPERATOR:	Gonzalez		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	a1-K990 : a2-L983		
STRAIN SERIAL NOS.:	NW146 - #112		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)
98.5-100	7-9-11
~~108.5-110~~	
108.7-110.2	6-7-8

REMARKS: Hammer Hit 1 Extra Blow past last 6" increment (8): Gonzalez Reported (9)
Used 2ft spacer for Hammer
1" Ribbed. Adam: Reported 3.42/0.03 Δ in Depth after Pen. Reported 1.42+
108.5-110 with the Recorder [illegible]

MACTEC

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	South Texas Project COL Site	MAKE:	Mobil
LOCATION:	Matagorda County, Texas	MODEL:	B-61
PROJECT NO.:	6234-08-4600	SERIAL NO.:	007
DATE:	6-14-2008	HAMMER TYPE:	Auto
WEATHER:	Sunny, Cloudy - 90°F	ROPE CONDITION:	N/A
INSPECTOR:	JWH	ROD SIZE:	NW-5
DRILLING COMPANY:	LEDI	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	D4-3		
DEPTH DRILLED:	VARIOUS		
TIME DRIVEN:	VARIOUS		
RIG OPERATOR:	Gonzalez		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	A1-K990 A2-K983		
STRAIN SERIAL NOS.:	NW146 #1/2		

	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)
#1	72.5-90	~~=010~~
*	88.5-90	9-11-13

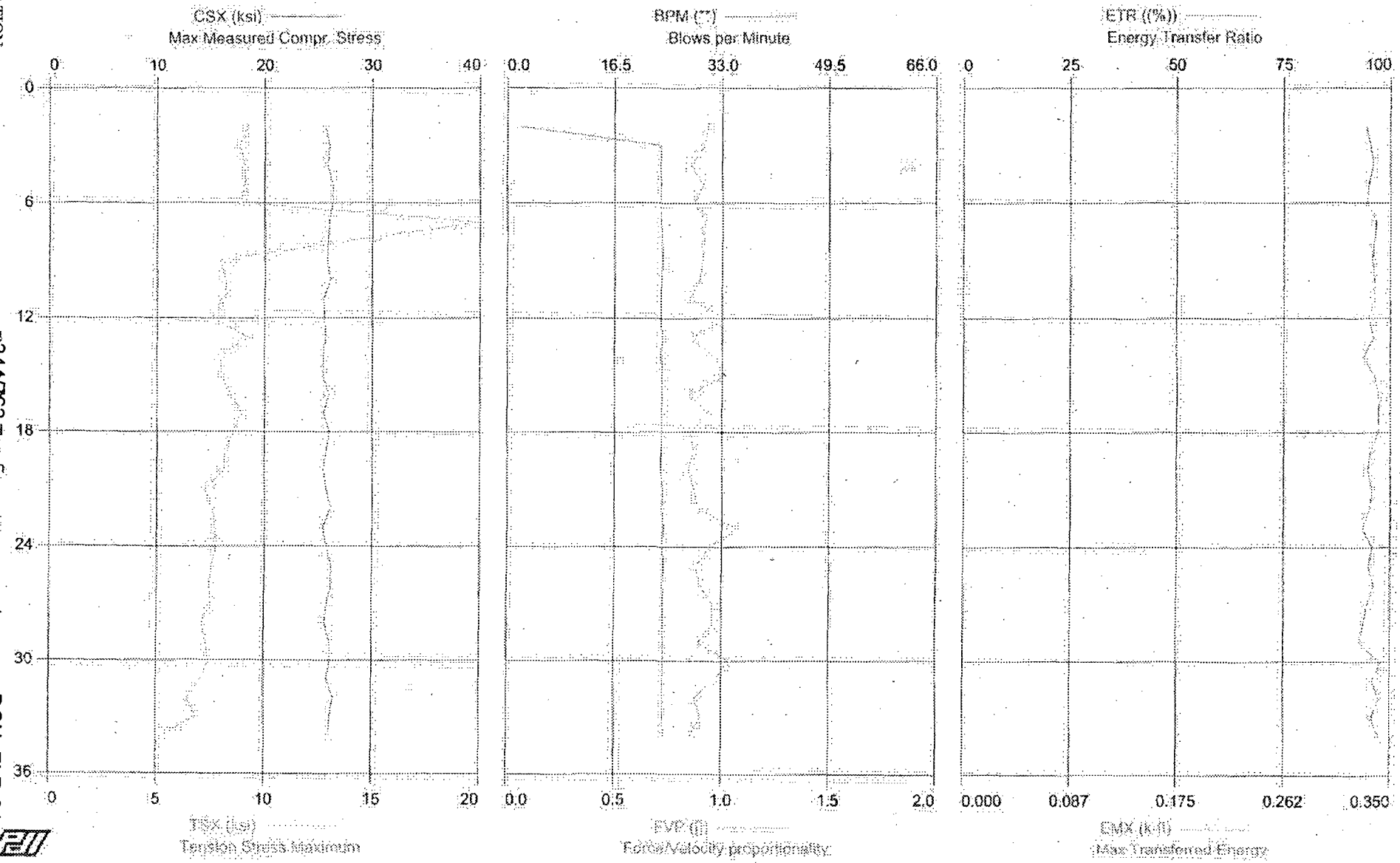
REMARKS: DISREGARD - STOPPED IN MUDDY TEST - NOT ENOUGH ROD TO REACH 15 FT.

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 14-Jun-2008

STP COL SITE - Boring D4-3; 88.5' - 90' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring D4-3; 88.5' - 90' Sample
OP: JNH

Hammer ID: 007 (LEDI - MOBIL B-61)
Test date: 14-Jun-2008

AR: 1.49 in^2
LE: 96.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	25.6	9.2	38	14.0	1.9	0.93	0.347	94	0.330
3	0.00	26.0	8.8	39	14.3	23.4	0.92	0.355	95	0.333
4	0.00	25.8	9.1	38	14.0	23.5	0.85	0.355	96	0.336
5	0.00	26.3	9.1	39	14.4	23.6	0.91	0.354	95	0.332
6	0.00	26.3	8.9	39	14.4	23.5	0.87	0.352	94	0.331
7	0.00	26.0	21.0	39	14.7	23.6	0.92	0.362	97	0.338
9	0.00	25.8	8.0	38	14.7	23.8	0.91	0.360	96	0.335
10	0.00	26.1	8.2	39	14.7	23.6	0.89	0.362	96	0.337
11	0.00	25.5	8.2	38	14.2	23.6	0.85	0.361	96	0.337
12	0.00	25.6	7.6	38	14.0	23.6	1.02	0.355	95	0.332
13	0.00	25.7	9.2	38	14.1	23.7	0.86	0.358	96	0.336
14	0.00	25.5	8.0	38	14.2	23.6	0.96	0.351	94	0.328
15	0.00	25.4	8.0	38	14.0	23.7	1.02	0.357	96	0.337
16	0.00	26.0	8.4	39	14.2	23.7	0.84	0.362	97	0.340
17	0.00	25.5	8.9	38	14.7	23.7	0.94	0.362	97	0.341
18	0.00	26.0	8.5	39	14.4	23.7	0.85	0.364	97	0.340
19	0.00	25.7	8.1	38	14.2	23.6	0.87	0.359	95	0.334
20	0.00	25.5	8.2	38	14.3	23.6	0.84	0.360	95	0.332
21	0.00	25.7	7.2	38	14.6	23.8	0.87	0.334	96	0.335
22	0.00	26.1	7.6	39	14.2	23.7	0.89	0.358	95	0.333
23	0.00	25.4	7.7	38	13.3	23.9	1.07	0.353	94	0.327
24	0.00	25.8	7.8	38	14.2	23.8	0.95	0.364	96	0.335
25	0.00	26.2	7.6	39	14.3	23.9	0.88	0.361	95	0.332
26	0.00	26.2	7.5	39	14.6	23.8	0.90	0.367	96	0.337
27	0.00	25.8	7.5	38	14.1	23.9	0.96	0.359	95	0.331
28	0.00	25.6	7.1	38	14.0	23.9	0.96	0.347	94	0.328
29	0.00	26.1	7.3	39	13.7	24.0	0.89	0.343	93	0.325
30	0.00	26.1	7.4	39	14.1	24.0	1.04	0.367	98	0.343
31	0.00	25.8	7.1	39	14.3	23.9	0.97	0.366	96	0.336
32	0.00	26.5	6.5	39	14.7	24.0	0.87	0.365	97	0.341
33	0.00	26.1	6.8	39	14.3	23.9	0.90	0.359	96	0.335
34	0.00	26.0	5.4	39	14.5	24.0	0.85	0.369	98	0.341
	Average	25.9	8.3	39	14.3	23.1	0.91	0.358	96	0.335

Total number of blows analyzed: 32

Time Summary

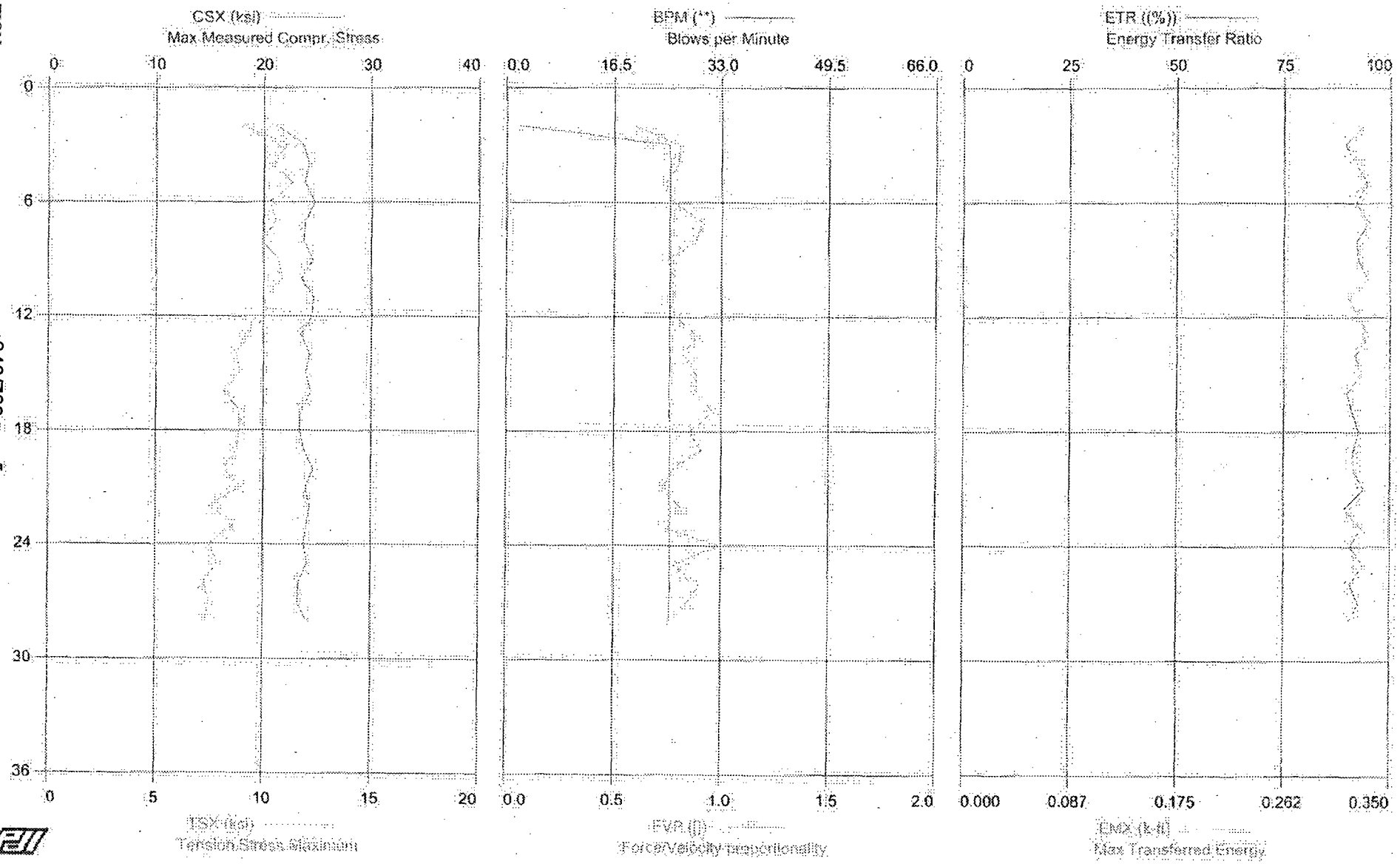
Drive 1 minute 21 seconds 6:36:24 PM - 6:37:45 PM (6/14/2008) BN 2 - 34

MACTEC Engineering and Consulting, Inc. - Case Method Results

DIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 15-Jun-2008

STP COL SITE - Boring D4-3; 98.5' - 100' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring D4-3; 98.5' - 100' Sample
OP: JNH

Hammer ID: 007 (LEDI - MOBIL B-61)
Test date: 15-Jun-2008

AR: 1.49 in^2
LE: 104.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	21.2	8.9	32	16.9	1.9	0.59	0.303	93	0.327
3	0.00	23.6	11.0	35	13.7	24.9	0.80	0.333	89	0.313
4	0.00	24.2	10.5	36	14.5	25.0	0.80	0.336	92	0.322
5	0.00	23.8	11.3	36	14.6	25.0	0.74	0.332	95	0.331
6	0.00	24.7	10.3	37	14.4	25.0	0.78	0.335	92	0.321
7	0.00	23.9	10.6	36	14.7	25.0	0.91	0.337	95	0.332
8	0.00	23.7	9.9	35	14.0	25.0	0.88	0.333	92	0.322
9	0.00	24.6	10.7	37	14.2	25.0	0.75	0.334	93	0.324
10	0.00	23.5	10.9	35	15.1	25.0	0.78	0.337	95	0.332
11	0.00	24.6	10.0	37	13.8	25.0	0.75	0.343	90	0.316
12	0.00	24.4	10.2	36	14.8	25.0	0.79	0.332	93	0.324
13	0.00	23.5	9.1	35	14.5	25.0	0.89	0.339	95	0.332
14	0.00	24.3	8.7	36	14.1	25.0	0.82	0.336	92	0.321
15	0.00	23.9	8.9	36	14.8	25.0	0.88	0.338	93	0.326
16	0.00	24.3	8.1	36	13.7	24.9	0.88	0.339	90	0.314
17	0.00	23.4	8.9	35	13.6	25.0	0.97	0.332	91	0.319
18	0.00	23.4	8.9	35	14.5	25.1	0.85	0.333	93	0.324
19	0.00	23.7	8.7	35	13.7	25.0	0.91	0.332	91	0.320
20	0.00	24.6	8.1	37	14.2	25.1	0.77	0.339	91	0.320
21	0.00	23.9	8.9	36	14.3	25.1	0.73	0.346	94	0.328
22	0.00	24.3	7.5	36	13.7	25.1	0.81	0.336	89	0.312
23	0.00	24.0	8.6	36	14.2	25.1	0.73	0.336	93	0.327
24	0.00	23.8	7.5	35	13.5	25.1	0.99	0.328	91	0.317
25	0.00	24.1	7.8	36	14.8	25.1	0.78	0.333	94	0.328
26	0.00	23.3	7.3	35	13.8	25.2	0.90	0.338	91	0.317
27	0.00	23.2	7.5	35	14.6	25.1	0.84	0.329	93	0.324
28	0.00	24.0	7.3	36	14.2	25.1	0.76	0.323	90	0.316
	Average	23.9	9.1	36	14.3	24.2	0.82	0.334	92	0.323

Total number of blows analyzed: 27

Time Summary

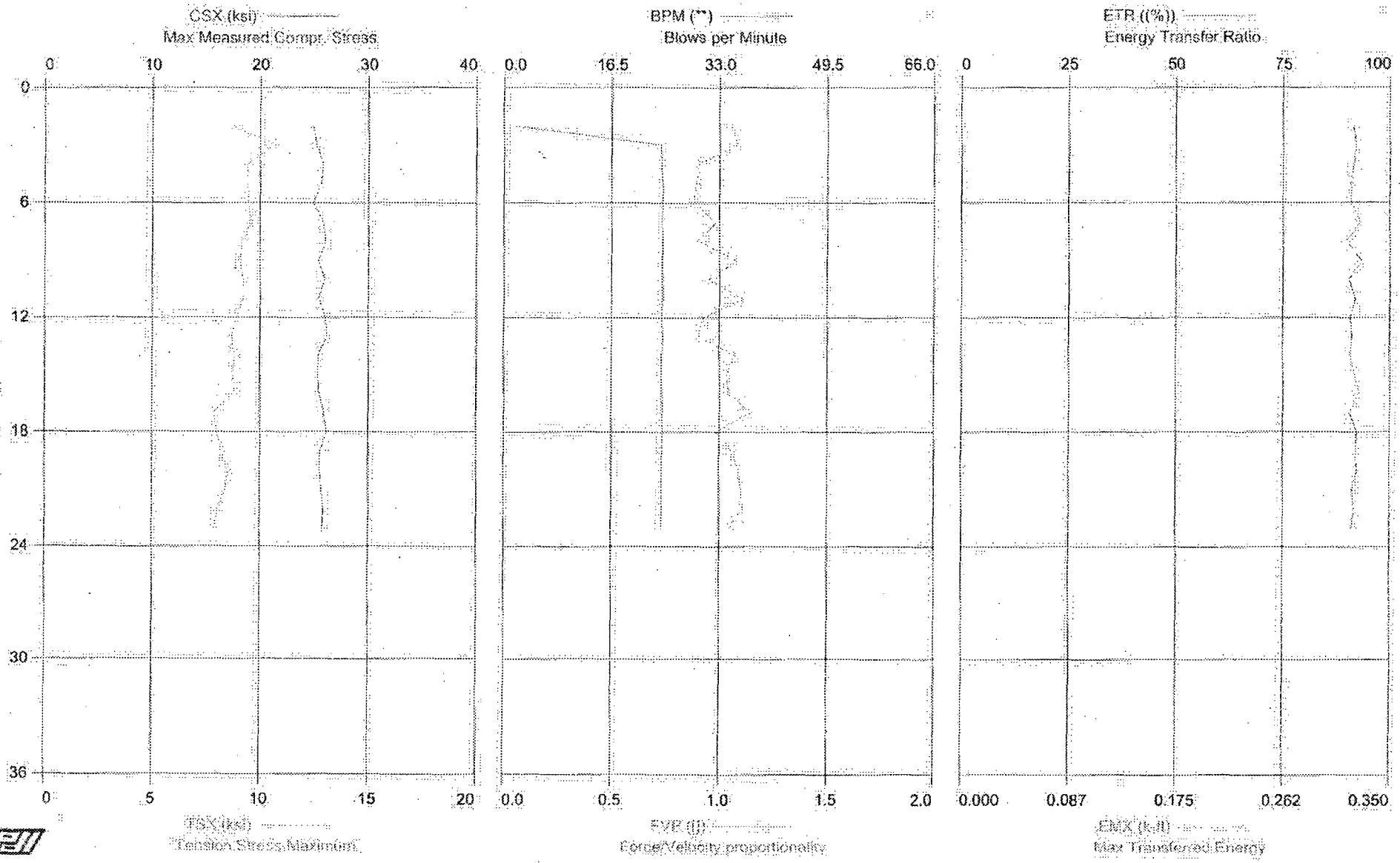
Drive 1 minute 2 seconds 9:34:41 AM - 9:35:43 AM (6/15/2008) BN 2 - 28

MACTEC Engineering and Consulting, Inc. - Case Method Results

DIPLOT Ver. 2008.1 - Printed: 15-Jul-2008

Test date: 15-Jun-2008

STP COL SITE - Boring D4-3; 108.7' - 110.2' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 15-Jul-2008

STP COL SITE - Boring D4-3, 108.7' - 110.2' Sample
OP: JNH

Hammer ID: 007 (LEDI - MOBIL B-61)
Test date: 15-Jun-2008

AR: 1.49 in^2
LE: 116.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	24.8	8.7	37	12.9	1.9	1.06	0.347	92	0.320
3	0.00	25.1	10.7	37	13.0	24.0	1.08	0.354	92	0.322
4	0.00	25.8	9.4	38	13.0	24.1	0.91	0.351	92	0.321
5	0.00	25.6	9.4	38	12.8	24.3	0.89	0.352	91	0.318
6	0.00	24.9	9.4	37	12.6	24.3	0.88	0.352	91	0.319
7	0.00	25.8	9.6	38	13.7	24.2	0.98	0.358	93	0.326
8	0.00	26.0	9.1	39	13.0	24.3	0.90	0.353	90	0.314
9	0.00	25.4	9.1	38	13.1	24.3	1.08	0.361	93	0.327
10	0.00	25.9	9.2	39	13.2	24.3	0.95	0.353	90	0.317
11	0.00	25.4	9.2	38	12.8	24.3	1.11	0.350	92	0.322
12	0.00	26.0	8.9	39	13.2	24.2	0.93	0.355	91	0.318
13	0.00	26.1	8.7	39	13.0	24.3	0.90	0.357	91	0.319
14	0.00	25.4	8.8	38	13.1	24.2	1.07	0.357	91	0.318
15	0.00	25.3	8.7	38	13.3	24.1	1.03	0.355	92	0.321
16	0.00	25.4	8.8	38	13.3	24.2	1.04	0.359	93	0.325
17	0.00	25.8	7.8	39	12.6	24.2	1.14	0.356	91	0.317
18	0.00	26.2	8.0	39	13.7	24.3	0.98	0.360	92	0.323
19	0.00	25.5	8.1	38	13.3	24.2	1.06	0.361	92	0.322
20	0.00	25.5	8.5	38	13.1	24.2	1.09	0.359	92	0.324
21	0.00	25.6	8.4	38	13.0	24.2	1.10	0.355	91	0.319
22	0.00	25.8	8.0	38	13.1	24.2	1.11	0.359	92	0.321
23	0.00	25.8	7.9	38	13.5	24.2	1.04	0.360	91	0.319
	Average	25.6	8.8	38	13.1	23.2	1.02	0.356	92	0.321

Total number of blows analyzed: 22

Time Summary

Drive 51 seconds 10:22:56 AM - 10:23:47 AM (6/15/2008) BN 2 - 23

MACTEC

engineering and constructing a better tomorrow

July 14, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Kathryn White KAW 7/15/08

Subject: **Report of SPT Energy – MACTEC Atlanta CME 550 ATV Hammer Serial No. MEC 08 Automatic Hammer WORK INSTRUCTION No. 18 (FLR-085)**
STP COL Project
Matagorda County, Texas
MACTEC Project No. 6234-08-4660

Jonathan Honeycutt, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on June 12, 2008, during drilling of Boring U4-1 at the referenced site. The testing was performed by Jonathan Honeycutt from approximately 3:42 PM to 4:39 PM on June 12 under partly cloudy skies and a temperature of 90 degrees Fahrenheit. The boring was drilled with personnel and equipment from MACTEC Atlanta. The drilling equipment consisted of a CME 550 model ATV drill rig with an SPT automatic hammer. The drilling tools consisted of N3-sized drilling rods and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during sampling was Mr. Larry Carter. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. K990 and K983) and strain gages (Serial Nos. NW #146/1 and NW#146/2). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert had a cross-sectional area of approximately 1.49 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25 inches, respectively. The recommended operation rate of the hammer is not known. Due to the closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

Calibration Records

The calibration records for all the above are filed in DCN FLR-079.

16 Pages Total

MACTEC Engineering and Consulting, Inc.
2801 Yorkmont Road, Suite 100 • Charlotte, NC 28208 • Phone 704.357.8600 • Fax 704.357.8638 www.mactec.com

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDIPLOT tables and are also shown graphically in the PDIPLOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction.

- The average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 290 foot-pounds to 302 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 83% to 86% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) was 296.0 foot-pounds, with an average ETR of 84.6%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN FLR-085 – 1 Page
Page 6 Record of SPT Energy Measurement – 1 Page
Pages 7 – 16 PDIPLOT Output – 10 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
South Texas Project (STP) COL Site - Units 3 and 4
Wadsworth, Texas
MACTEC Project No. 6234-08-4660

Rig Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Date Tested	Drill Rod Size	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs)[a]	Energy Transfer Ratio (%)[b] (Average ETR)
MEC 08 (CME 550 ATV)	MACTEC Atlanta	Larry Carter	U4-1	6/12/2008	N3	23.1 - 24.6	13 - 15 - 13	40	290	82.9%
						28.1 - 29.6	5 - 10 - 17	33	292	83.4%
						33.1 - 34.6	7 - 13 - 15	36	297	84.9%
						38.1 - 39.6	7 - 20 - 24	52	302	86.3%
						43.1 - 44.6	10 - 7 - 8	26	297	84.9%
								Average for Rig:	**296.0**	**84.6%**

[a]Measured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy.

EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).

[b]Energy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet).

The average ETR values may differ slightly and insignificantly from those in the PDIPLOT tables due to roundoff.

Prepared By: SLK Date: 7-14-08		Checked By: Kathryn A. Hulse Date: 7/15/08
STEVE KISER		

Work Instruction No. 18
STP Units 3 & 4 COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6234-08-4660

Issued To: Steve Kiser, Jon Honeycutt **Rev. No.** 0
Issued By: Robert E. Smith **Date:** June 5, 2008
Valid From: June 5, 2008 **To:** June 5, 2009

Task Description: Perform SPT Energy Measurements of drill rigs

Applicable Technical Procedures or Plans, or other reference:

Work Plan (current revision), ASTM D4633-05.

Specific Instructions (note attachments where necessary): Perform energy measurements for each drill rig on site collecting split-spoon samples in accordance with ASTM D-4633-05. Consult with Site Coordinator as to schedule for rigs that may be planned for use that are not yet present. Hammer weights have been checked by site personnel, and records will be available on site. All rigs are using automatic hammer systems. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, but should begin at a minimum depth of 10 feet. Collect at least three energy measurements per drill rig.

Submit copies of calibration records for equipment to Quality Assurance for review prior to beginning work on site.

Special Instructions (note attachments where necessary): Confirm with Site Supervisor that approval of equipment calibration records has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, notify Shaun Lehman and Rob Smith immediately.

Report Format: Standard report in accordance with ASTM D 4633-05 requirements.

Specific Quality Assurance Procedures Applicable: QAP 20-1; QAP 25-1; QAP for Reporting Nuclear-Related Defects, or Noncompliances, per Federal Regulation 10CFR21 and Section 206 of the Energy Reorganization Act of 1974. Current revisions apply.

Hold Points or Witness Points: None

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)
Project Manager: _____ Date: 6/6/08 06/6/08
Project Principal Engineer: _____ Date: _____
Site Manager/Coordinator: _____ Date: _____
Pages: **DCN:** FLR-085
Attachments:

MACTEC

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	South Texas Project COL Site	MAKE:	CME
LOCATION:	Matagorda County, Texas	MODEL:	550
PROJECT NO.:	6234-08-4660	SERIAL NO.:	MEL08
DATE:	6-12-2008	HAMMER TYPE:	AUTO
WEATHER:	P. Cl. Sunny 90°F BR	ROPE CONDITION:	N/A
INSPECTOR:	JN Honeycutt	ROD SIZE:	N3
DRILLING COMPANY:	MACTEC ATL	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	M4-1		
DEPTH DRILLED:	Various		
TIME DRIVEN:	Various		
RIG OPERATOR:	Carlen		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	A1-K990 ; A2-K983		
STRAIN SERIAL NOS.:	NW-196 #1/2		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)
23.1-24.6	13-15-13
28.1-29.6	5-10-17
33.1-34.6	7-13-15
38.1-39.6	7-20-24
43.1-44.6	10-7-8

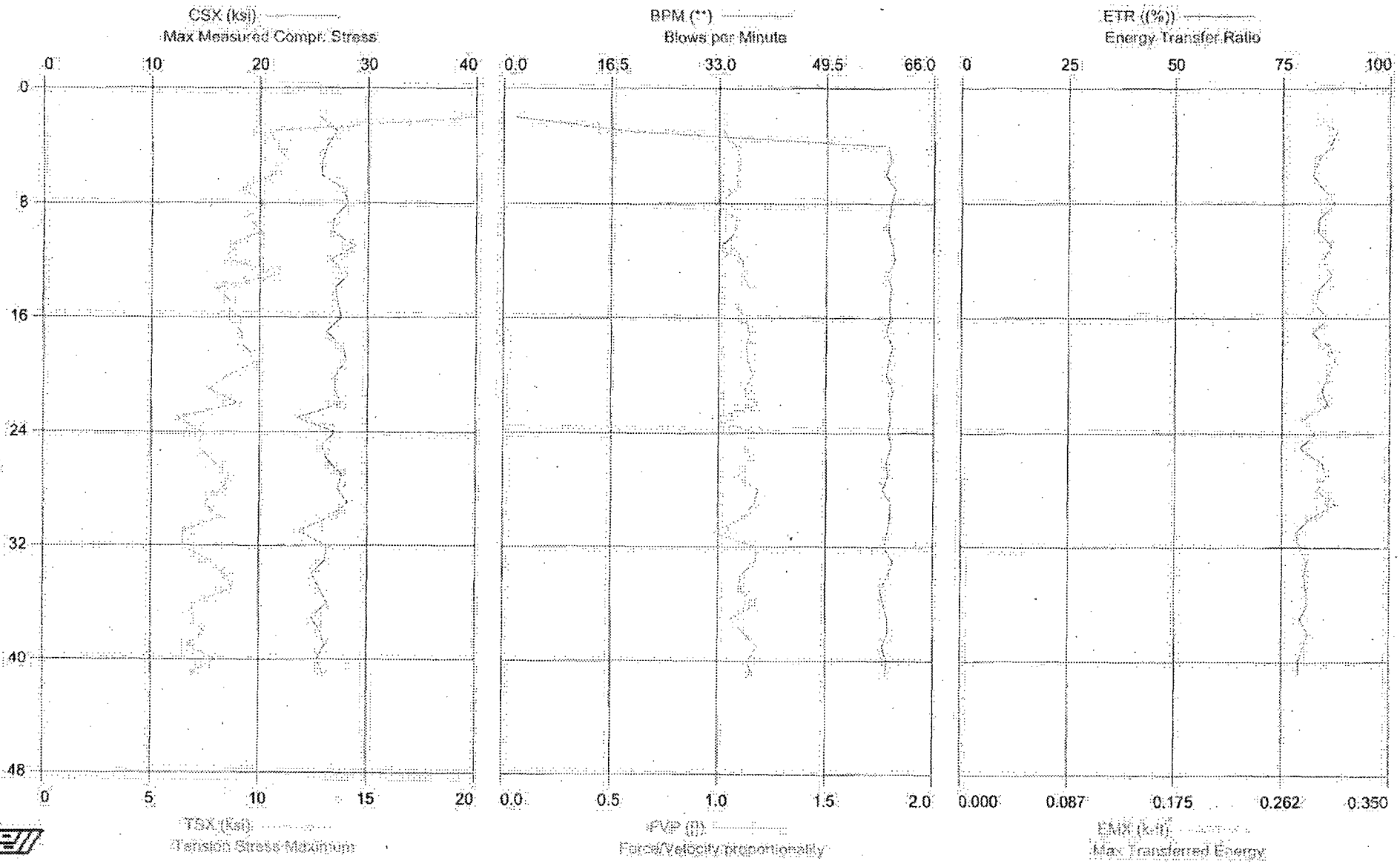
REMARKS:

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 12-Jun-2008

STP COL SITE - Boring U4-1; 23.1' - 24.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U4-1; 23.1' - 24.6' Sample
OP: JNH

Hammer ID: MEC08 (MACTEC ATL-CME 550)
Test date: 12-Jun-2008

AR: 1.49 in^2
LE: 28.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	25.7	20.3	38	13.8	1.9	1.02	0.303	83	0.289
3	0.00	27.1	10.5	40	14.5	19.7	1.02	0.329	88	0.307
4	0.00	26.2	10.8	39	13.6	58.9	1.08	0.323	86	0.300
5	0.00	25.8	11.3	38	13.0	59.3	1.10	0.316	83	0.291
6	0.00	25.7	10.6	38	13.1	58.6	1.08	0.311	82	0.287
7	0.00	27.7	9.2	41	13.9	60.0	1.08	0.328	84	0.296
8	0.00	28.1	10.2	42	15.0	59.4	0.98	0.328	87	0.305
9	0.00	26.9	9.4	40	13.8	59.1	1.08	0.323	83	0.292
10	0.00	26.7	10.1	40	13.4	59.0	1.08	0.317	83	0.291
11	0.00	28.7	8.6	43	14.7	59.6	1.01	0.327	86	0.302
12	0.00	26.6	8.5	40	13.4	60.0	1.11	0.325	84	0.295
13	0.00	28.1	10.9	42	14.2	58.8	1.11	0.339	86	0.303
14	0.00	27.0	8.0	40	13.2	59.5	1.15	0.324	84	0.292
15	0.00	27.3	8.7	41	13.8	59.2	1.08	0.322	83	0.289
16	0.00	27.5	8.6	41	13.7	59.3	1.12	0.334	85	0.299
17	0.00	26.2	9.1	39	12.7	58.7	1.14	0.317	82	0.287
18	0.00	27.7	9.3	41	13.8	59.6	1.13	0.336	86	0.301
19	0.00	28.0	10.0	42	13.9	59.1	1.14	0.334	87	0.306
20	0.00	27.0	8.6	40	13.0	58.7	1.16	0.330	86	0.299
21	0.00	27.0	7.7	40	13.5	59.8	1.12	0.320	84	0.295
22	0.00	27.6	9.0	41	12.9	59.2	1.18	0.335	86	0.300
23	0.00	23.5	6.2	35	13.4	59.4	0.97	0.285	79	0.278
24	0.00	27.0	7.4	40	12.8	59.0	1.19	0.326	83	0.290
25	0.00	25.8	7.2	38	12.9	59.6	1.12	0.305	79	0.277
26	0.00	26.3	7.8	39	12.8	58.7	1.16	0.322	84	0.295
27	0.00	27.6	8.6	41	13.6	59.0	1.09	0.323	85	0.298
28	0.00	27.2	8.4	41	12.8	58.1	1.18	0.329	83	0.290
29	0.00	28.2	7.4	42	13.7	59.4	1.17	0.336	88	0.306
30	0.00	26.6	8.2	40	13.3	59.3	1.11	0.315	81	0.284
31	0.00	23.7	6.5	35	13.5	58.9	0.98	0.291	78	0.274
32	0.00	26.3	6.5	39	12.2	58.5	1.18	0.256	79	0.277
33	0.00	26.1	7.6	39	12.5	59.8	1.17	0.309	81	0.283
34	0.00	24.9	8.4	37	12.6	59.0	1.10	0.295	80	0.280
35	0.00	25.7	8.8	38	12.8	57.9	1.11	0.309	81	0.283
36	0.00	26.4	6.9	39	12.6	58.4	1.18	0.311	81	0.283
37	0.00	24.9	6.9	37	12.8	59.0	1.06	0.295	79	0.277
38	0.00	25.7	7.5	38	12.8	59.0	1.12	0.312	81	0.284
39	0.00	26.1	6.6	39	11.8	58.2	1.18	0.256	80	0.280
40	0.00	25.4	8.0	38	12.4	58.9	1.14	0.304	79	0.276
41	0.00	26.0	6.8	39	12.1	58.7	1.16	0.258	79	0.276
	Average	26.5	8.8	40	13.2	56.7	1.11	0.314	83	0.290

Total number of blows analyzed: 40

Time Summary

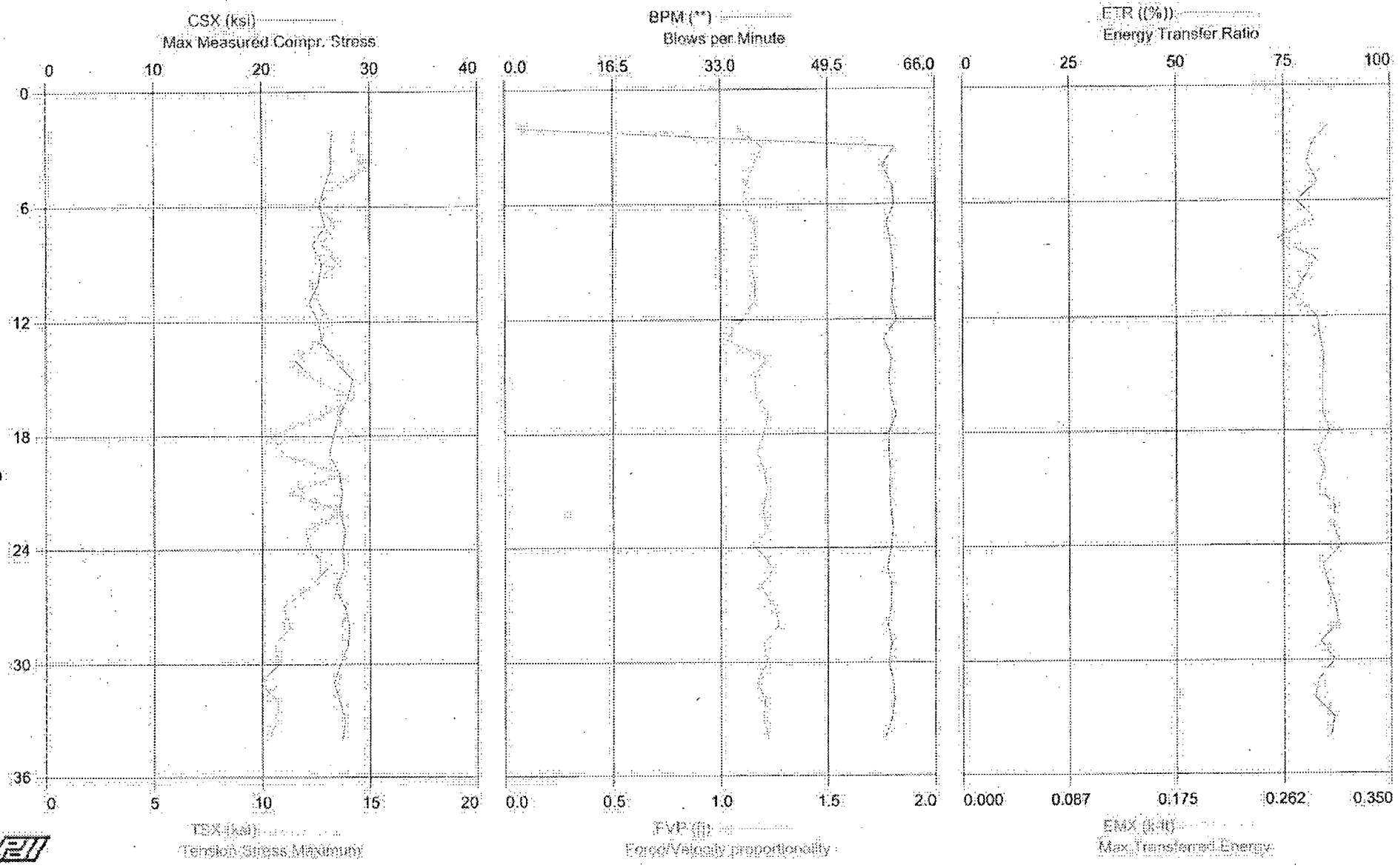
Drive 41 seconds 3:42:25 PM - 3:43:06 PM (6/12/2008) BN 2 - 41

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 12-Jun-2008

STP COL SITE - Boring U4-1; 28.1' - 29.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U4-1: 28.1' - 29.6' Sample
OP: JNH

Hammer ID: MEC08 (MACTEC ATL-CME 550)
Test date: 12-Jun-2008

AR: 1.49 in^2
LE: 34.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	26.6	14.3	40	13.8	1.9	1.08	0.323	85	0.299
3	0.00	26.4	14.2	39	12.4	59.8	1.19	0.305	82	0.286
4	0.00	26.4	14.6	39	12.8	57.9	1.15	0.298	80	0.281
5	0.00	25.8	13.3	38	12.7	59.4	1.12	0.305	83	0.290
6	0.00	25.3	12.6	38	11.8	59.7	1.11	0.296	78	0.273
7	0.00	25.9	13.4	39	12.7	58.5	1.16	0.313	82	0.288
8	0.00	24.7	12.8	37	12.4	59.2	1.17	0.275	74	0.257
9	0.00	25.6	13.6	38	12.9	59.5	1.14	0.312	82	0.289
10	0.00	25.3	12.3	38	12.2	59.6	1.16	0.297	80	0.279
11	0.00	24.4	12.6	36	11.7	59.3	1.16	0.287	77	0.271
12	0.00	25.3	13.1	38	12.8	60.1	1.10	0.309	83	0.290
13	0.00	25.6	12.7	38	12.5	58.1	1.03	0.304	83	0.292
14	0.00	26.8	11.5	40	12.4	59.3	1.21	0.318	84	0.295
15	0.00	28.4	12.5	42	13.0	58.9	1.16	0.323	84	0.294
16	0.00	28.0	14.3	42	13.2	59.2	1.16	0.319	84	0.294
17	0.00	27.1	12.6	40	12.3	60.0	1.22	0.323	84	0.294
18	0.00	26.6	10.4	40	12.5	58.8	1.20	0.317	86	0.300
19	0.00	26.3	11.1	39	12.2	58.9	1.17	0.308	83	0.290
20	0.00	27.2	13.7	40	12.6	59.1	1.20	0.324	84	0.296
21	0.00	27.4	11.3	41	12.6	59.0	1.22	0.320	83	0.291
22	0.00	27.2	13.7	41	12.8	59.2	1.20	0.325	87	0.304
23	0.00	27.7	12.0	41	12.7	59.5	1.22	0.328	86	0.303
24	0.00	27.5	12.3	41	12.7	59.2	1.16	0.325	88	0.309
25	0.00	27.6	13.0	41	12.4	58.6	1.25	0.320	84	0.294
26	0.00	26.8	12.1	40	12.4	59.3	1.19	0.319	85	0.299
27	0.00	27.7	11.0	41	12.5	59.2	1.25	0.324	87	0.304
28	0.00	28.1	11.3	42	12.5	58.7	1.27	0.328	88	0.307
29	0.00	27.9	10.6	42	12.3	59.3	1.20	0.329	84	0.292
30	0.00	27.2	10.8	41	12.5	58.8	1.22	0.329	87	0.304
31	0.00	26.7	9.9	40	12.2	59.5	1.17	0.319	83	0.291
32	0.00	27.2	10.7	41	12.5	59.7	1.21	0.320	82	0.288
33	0.00	27.7	10.7	41	12.6	59.3	1.20	0.330	87	0.304
34	0.00	27.5	10.3	41	12.6	58.3	1.22	0.333	86	0.301
	Average	26.7	12.3	40	12.5	57.4	1.18	0.315	84	0.292

Total number of blows analyzed: 33

Time Summary

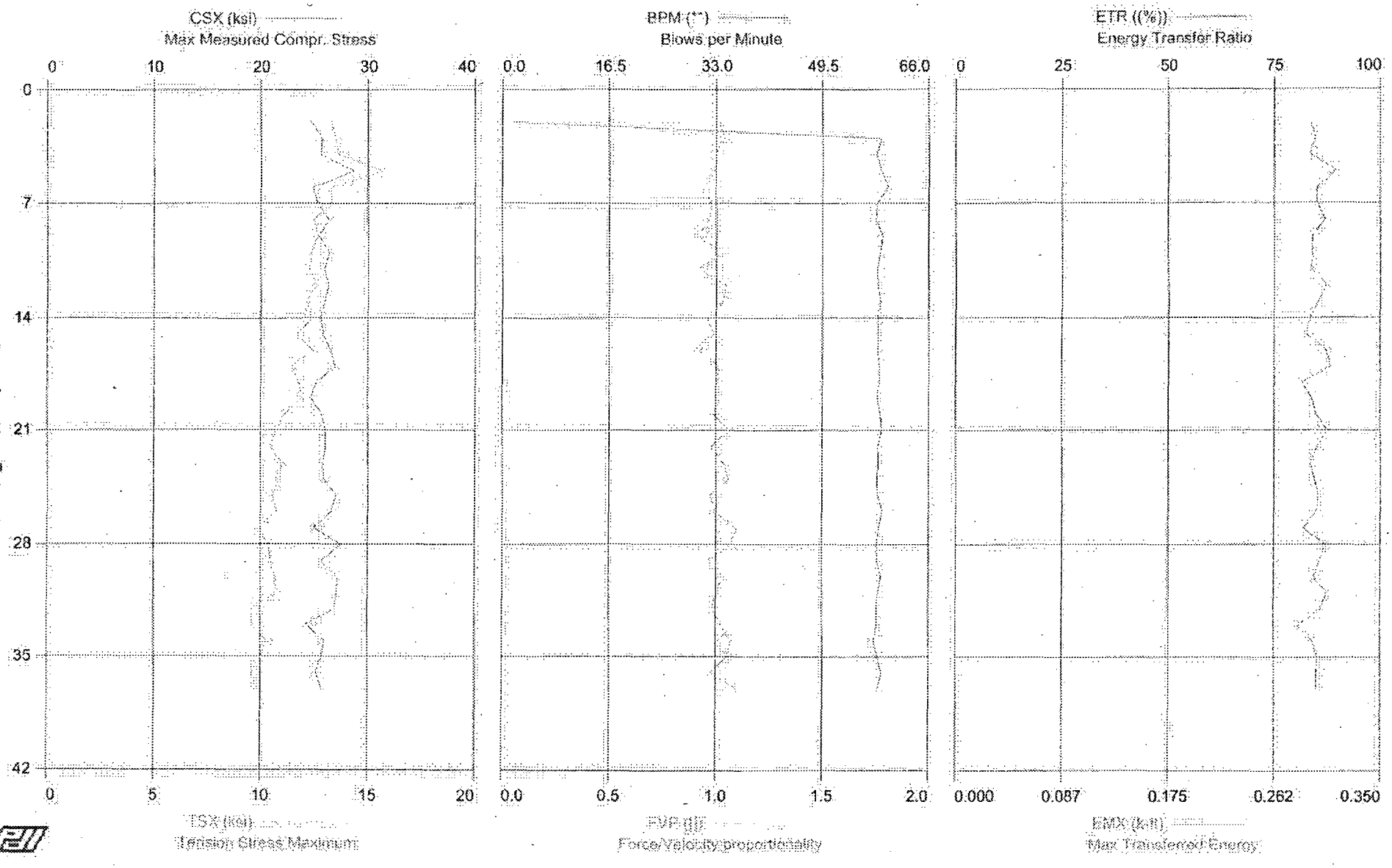
Drive 32 seconds 4:00:17 PM - 4:00:49 PM (6/12/2008) BN 2 - 34

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 12-Jun-2008

STP COL SITE - Boring U4-1; 33.1' - 34.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

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Test date: 12-Jun-2008

AR: 1.49 in^2
LE: 39.00 ft
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BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	24.7	13.3	37	13.6	1.9	1.01	0.299	84	0.293
3	0.00	25.6	13.5	38	13.7	58.7	1.04	0.320	85	0.296
4	0.00	25.5	13.6	38	13.9	57.9	1.00	0.305	83	0.292
5	0.00	28.6	15.7	43	14.9	58.6	0.99	0.333	89	0.313
6	0.00	24.8	13.2	37	13.4	59.7	0.94	0.307	85	0.298
7	0.00	25.3	13.3	38	13.7	58.0	0.98	0.308	85	0.298
8	0.00	26.3	12.4	39	14.2	57.8	0.97	0.327	87	0.305
9	0.00	25.4	12.6	38	13.2	58.9	0.91	0.315	84	0.294
10	0.00	26.4	12.4	39	13.5	58.5	1.04	0.319	84	0.294
11	0.00	25.9	12.2	39	13.5	58.0	0.92	0.319	84	0.293
12	0.00	26.3	12.6	39	13.7	58.1	1.05	0.320	87	0.305
13	0.00	25.9	12.1	39	13.6	58.5	1.03	0.320	85	0.299
14	0.00	25.5	12.3	38	13.2	58.1	0.96	0.311	83	0.292
15	0.00	25.8	11.7	38	13.3	58.1	0.99	0.308	83	0.289
16	0.00	26.5	12.4	39	13.6	58.1	0.92	0.329	87	0.305
17	0.00	26.9	11.4	40	13.9	58.3	1.01	0.332	88	0.309
18	0.00	25.1	11.7	37	13.0	58.3	1.01	0.306	82	0.285
19	0.00	24.6	11.9	37	13.2	58.0	1.02	0.309	84	0.293
20	0.00	25.6	11.1	38	13.1	58.5	0.99	0.317	85	0.297
21	0.00	26.0	10.7	39	13.6	58.7	1.06	0.324	87	0.306
22	0.00	26.0	10.4	39	13.2	58.1	0.98	0.320	85	0.298
23	0.00	25.7	11.0	38	13.4	58.2	1.03	0.322	83	0.292
24	0.00	25.8	10.9	38	13.4	58.0	1.06	0.308	84	0.296
25	0.00	27.0	10.5	40	13.5	58.1	0.97	0.328	85	0.299
26	0.00	26.5	10.7	40	13.6	58.8	0.99	0.328	85	0.297
27	0.00	24.9	9.9	37	12.7	58.3	1.10	0.306	82	0.287
28	0.00	27.5	10.4	41	13.8	57.9	1.07	0.335	87	0.305
29	0.00	25.6	10.4	38	13.3	58.0	0.96	0.313	86	0.300
30	0.00	27.2	10.7	41	13.5	58.6	1.04	0.323	84	0.295
31	0.00	27.1	10.7	40	13.8	58.1	1.00	0.330	87	0.306
32	0.00	26.9	9.6	40	13.6	58.0	0.99	0.323	86	0.301
33	0.00	24.1	9.6	36	12.6	58.0	1.02	0.291	81	0.282
34	0.00	25.9	10.3	39	13.0	57.5	1.07	0.313	84	0.294
35	0.00	25.7	10.0	38	13.2	58.1	1.05	0.312	85	0.298
36	0.00	25.1	9.6	37	13.1	58.7	0.97	0.320	85	0.297
37	0.00	25.6	9.8	38	13.1	58.1	1.10	0.320	85	0.297
	Average	25.9	11.5	39	13.5	56.7	1.01	0.317	85	0.297

Total number of blows analyzed: 36

Time Summary

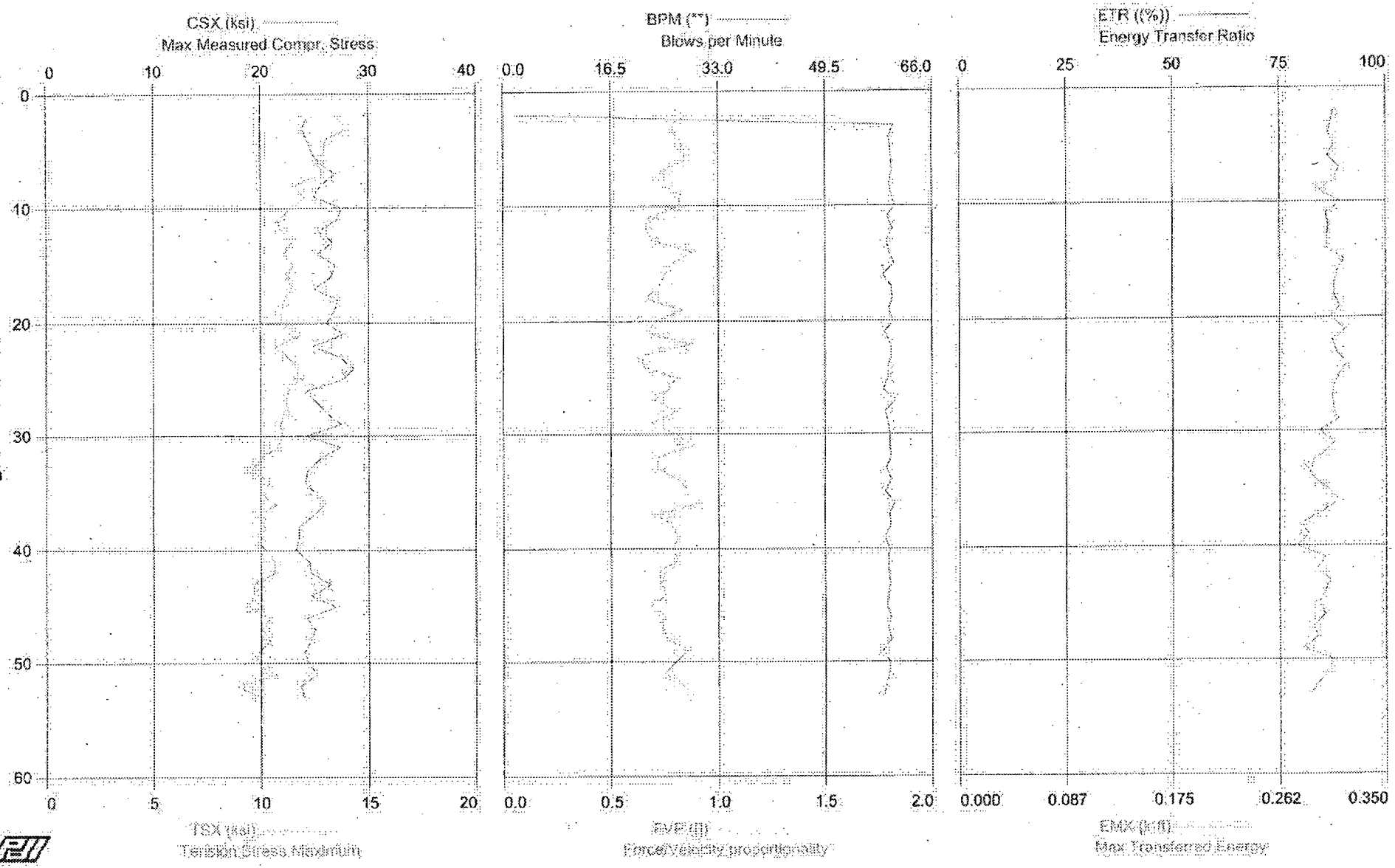
Drive 36 seconds 4:12:02 PM - 4:12:38 PM (6/12/2008) BN 2 - 37

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 12-Jun-2008

STP COL SITE - Boring U4-1; 38.1' - 39.5' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U4-1; 38.1' - 39.5' Sample
OP: JNH

Hammer ID: MEC08 (MACTEC ATL-CME 550)
Test date: 12-Jun-2008

AR: 1.49 in^2
LE: 44.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	24.3	13.5	36	15.4	1.9	0.83	0.305	88	0.307
3	0.00	23.8	14.1	36	15.3	60.0	0.79	0.305	87	0.305
4	0.00	24.2	13.0	36	15.2	59.3	0.80	0.307	86	0.303
5	0.00	24.6	12.9	37	15.1	59.6	0.84	0.309	88	0.307
6	0.00	25.3	12.6	38	15.1	59.7	0.84	0.311	86	0.302
7	0.00	26.9	12.9	40	15.8	59.8	0.73	0.318	89	0.312
8	0.00	25.5	11.5	38	14.9	59.4	0.72	0.312	88	0.308
9	0.00	24.9	12.0	37	14.8	59.7	0.82	0.306	84	0.295
10	0.00	27.5	11.4	41	15.5	60.2	0.82	0.322	89	0.313
11	0.00	27.1	10.6	40	15.3	59.1	0.68	0.309	86	0.301
12	0.00	25.4	10.9	38	14.1	59.9	0.67	0.304	86	0.303
13	0.00	26.6	11.4	40	14.7	59.0	0.69	0.316	86	0.302
14	0.00	25.2	11.1	38	14.7	59.3	0.88	0.318	86	0.301
15	0.00	26.9	11.5	40	15.8	60.1	0.78	0.326	90	0.316
16	0.00	26.5	11.2	39	15.3	58.4	0.75	0.328	89	0.310
17	0.00	24.9	11.4	37	14.2	59.7	0.72	0.305	88	0.308
18	0.00	27.1	11.1	40	14.7	59.9	0.66	0.315	88	0.307
19	0.00	26.8	10.9	40	14.8	59.3	0.83	0.315	89	0.312
20	0.00	26.0	11.0	39	14.9	60.0	0.70	0.309	87	0.305
21	0.00	27.6	11.9	41	15.3	58.7	0.68	0.320	90	0.316
22	0.00	24.8	10.7	37	14.6	59.6	0.88	0.307	88	0.306
23	0.00	27.3	11.3	41	14.3	59.8	0.65	0.309	88	0.310
24	0.00	28.6	11.7	43	15.1	59.2	0.65	0.322	91	0.318
25	0.00	27.5	11.7	41	15.3	59.2	0.80	0.320	89	0.312
26	0.00	24.2	11.3	36	14.2	58.5	0.77	0.304	88	0.307
27	0.00	25.1	11.2	37	13.8	60.4	0.70	0.296	87	0.306
28	0.00	26.1	11.3	39	14.7	58.8	0.80	0.309	88	0.307
29	0.00	27.4	10.9	41	14.8	59.2	0.69	0.314	89	0.311
30	0.00	24.1	11.0	36	14.0	59.5	0.80	0.304	84	0.296
31	0.00	27.3	10.7	41	14.7	59.4	0.88	0.309	88	0.308
32	0.00	25.5	10.0	38	14.2	59.7	0.72	0.294	85	0.298
33	0.00	24.3	9.6	36	13.8	58.9	0.72	0.295	81	0.284
34	0.00	24.1	10.4	36	14.3	59.7	0.82	0.302	83	0.290
35	0.00	24.9	10.0	37	13.9	58.7	0.86	0.288	86	0.301
36	0.00	26.0	10.7	39	15.0	60.2	0.91	0.316	89	0.311
37	0.00	24.7	9.8	37	13.7	59.4	0.71	0.293	85	0.298
38	0.00	23.5	10.2	35	14.3	59.6	0.79	0.283	80	0.281
39	0.00	23.5	9.7	35	13.6	58.7	0.81	0.289	82	0.286
40	0.00	23.2	10.2	35	13.9	59.4	0.79	0.276	79	0.277
41	0.00	24.4	10.7	36	14.7	59.2	0.81	0.306	86	0.300
42	0.00	24.6	10.7	37	14.3	59.3	0.72	0.301	84	0.294
43	0.00	26.5	9.7	39	14.3	59.5	0.73	0.311	87	0.304
44	0.00	24.6	9.6	37	14.4	59.2	0.76	0.301	86	0.300
45	0.00	26.9	9.5	40	13.9	59.0	0.69	0.298	84	0.295
46	0.00	24.2	10.4	36	14.4	59.6	0.76	0.301	86	0.300
47	0.00	25.0	10.1	37	14.0	59.2	0.74	0.302	83	0.290
48	0.00	24.5	10.4	37	14.0	59.7	0.76	0.292	84	0.294
49	0.00	24.0	9.9	36	13.9	58.4	0.86	0.294	81	0.283
50	0.00	24.3	9.8	36	14.3	59.4	0.80	0.309	87	0.306
51	0.00	25.1	10.7	37	14.3	59.4	0.75	0.306	87	0.303
52	0.00	23.6	8.9	35	13.6	58.9	0.84	0.283	84	0.295
53	0.00	23.9	10.1	36	13.9	58.5	0.86	0.292	82	0.288
	Average	25.4	11.0	38	14.6	58.3	0.77	0.305	86	0.302

Total number of blows analyzed: 52

Time Summary

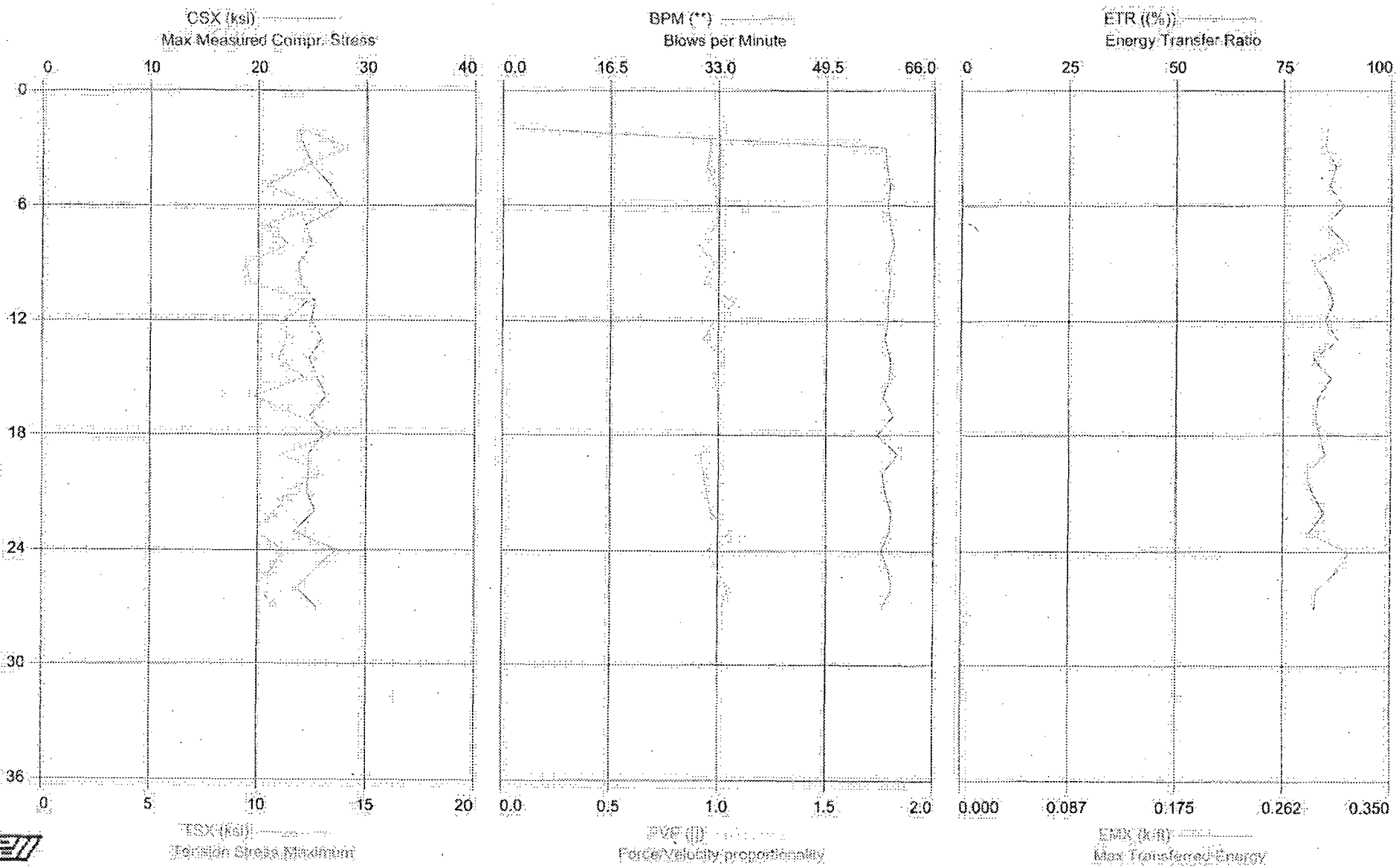
Drive: 51 seconds 4:24:50 PM - 4:25:41 PM (6/12/2008) BN 2 - 53

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 12-Jun-2008

STP COL SITE - Boring U4-1; 43.1' - 44.6' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U4-1; 43.1' - 44.6' Sample
OP: JNH

Hammer ID: MEC08 (MACTEC ATL-CME 550)
Test date: 12-Jun-2008

AR: 1.49 in^2
LE: 49.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	23.7	11.9	35	13.5	1.9	0.95	0.297	85	0.298
3	0.00	24.1	14.1	36	13.1	58.4	0.96	0.310	85	0.296
4	0.00	25.0	12.1	37	13.3	58.7	0.95	0.308	87	0.305
5	0.00	26.6	10.3	40	13.4	59.2	0.99	0.307	86	0.300
6	0.00	27.6	12.8	41	14.1	58.8	0.99	0.328	89	0.311
7	0.00	24.3	10.4	36	12.9	59.3	0.99	0.301	85	0.297
8	0.00	24.9	11.4	37	12.8	59.9	0.91	0.304	90	0.314
9	0.00	23.7	9.4	35	12.4	59.0	0.98	0.298	82	0.287
10	0.00	23.9	9.6	36	12.9	59.3	0.93	0.303	85	0.297
11	0.00	25.2	12.2	37	13.2	58.9	1.07	0.308	87	0.303
12	0.00	24.8	11.3	37	12.6	58.9	0.98	0.308	85	0.296
13	0.00	25.8	11.3	38	13.6	58.5	0.93	0.332	88	0.307
14	0.00	24.7	10.9	37	12.4	59.3	1.03	0.288	82	0.287
15	0.00	25.4	12.1	38	13.4	59.2	0.98	0.324	86	0.301
16	0.00	26.2	9.8	39	13.1	58.3	1.01	0.299	83	0.291
17	0.00	24.7	11.8	37	12.7	59.8	1.00	0.311	83	0.289
18	0.00	26.0	13.6	39	13.2	57.3	1.01	0.310	83	0.292
19	0.00	24.7	11.1	37	12.9	60.5	0.92	0.299	85	0.296
20	0.00	24.6	12.8	37	12.6	58.1	0.93	0.295	80	0.281
21	0.00	24.5	11.4	37	12.2	58.6	0.95	0.292	82	0.287
22	0.00	25.2	10.8	38	13.2	59.5	0.97	0.308	84	0.296
23	0.00	23.3	9.9	35	12.2	59.2	1.06	0.298	81	0.284
24	0.00	27.2	11.2	41	13.9	58.0	0.95	0.324	90	0.316
25	0.00	25.3	10.7	38	12.8	59.1	1.00	0.316	88	0.307
26	0.00	23.6	9.9	35	12.5	59.6	1.05	0.307	83	0.290
27	0.00	25.5	11.0	38	12.9	58.1	1.02	0.297	82	0.288
	Average	25.0	11.3	37	13.0	56.7	0.98	0.307	85	0.297

Total number of blows analyzed: 26

Time Summary

Drive 26 seconds 4:39:14 PM - 4:39:40 PM (6/12/2008) BN 2 - 27

MACTEC

engineering and constructing a better tomorrow

July 14, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Kathryn White KAW 7/15/08

Subject: **Report of SPT Energy – MACTEC Atlanta CME 55 Truck Hammer Serial No. 505 Automatic Hammer**
WORK INSTRUCTION No. 18 (FLR-085)
STP COL Project
Matagorda County, Texas
MACTEC Project No. 6234-08-4660

Jonathan Honeycutt, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on June 13 and 14, 2008, during drilling of Boring U4-3 at the referenced site. The testing was performed by Jonathan Honeycutt from approximately 5:09 PM to 6:09 PM on June 13 under scattered showers and a temperature of 85 degrees Fahrenheit, and from 3:50 PM to 4:34 PM on June 14 under rainy conditions and of about 85 to 90 degrees Fahrenheit. The boring was drilled with personnel and equipment from MACTEC Atlanta. The drilling equipment consisted of a CME 55 model truck-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of NW-J-sized drilling rods and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during sampling was Mr. Phil Pitts. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. K990 and K983) and strain gages (Serial Nos. NW #146/1 and NW#146/2). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert had a cross-sectional area of approximately 1.49 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25 inches, respectively. The recommended operation rate of the hammer is not known. Due to the closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

Calibration Records

The calibration records for all the above are filed in DCN FLR-079.

17 Pages Total

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDIPLOT tables and are also shown graphically in the PDIPLOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction.

- The average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 288 foot-pounds to 304 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 82% to 87% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) was 296.3 foot-pounds, with an average ETR of 84.7%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN FLR-085 – 1 Page
Page 6 – 7 Record of SPT Energy Measurement – 2 Pages
Pages 8 – 17 PDIPLOT Output – 10 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
South Texas Project (STP) COL Site - Units 3 and 4
Wadsworth, Texas
MACTEC Project No. 6234-08-4660

Rig Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Date Tested	Drill Rod Size	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs)[a]	Energy Transfer Ratio (%)[b] (Average ETR)
505 (CME 55 Truck)	MACTEC Atlanta	Phil Pitts	U4-3	6/13/2008	NW-J	36.0 - 37.5	6 - 12 - 15	33	302	86.3%
						41.0 - 42.5	6 - 12 - 29	40	304	86.9%
						46.0 - 47.5	3 - 6 - 10	20	299	85.4%
				6/14/2008		71.9 - 73.4	8 - 18 - 23	49	288	82.3%
						76.9 - 78.4	12 - 14 - 16	43	293	83.7%
								Average for Rig:	**296.3**	**84.7%**

[a]Measured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy.
EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).
[b]Energy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet).
The average ETR values may differ slightly and insignificantly from those in the PDIPLOT tables due to roundoff.

Prepared By:	Date: 7-14-08		Checked By:	Date: 7/15/08
STEVE KISOL				

Work Instruction No. 18
STP Units 3 & 4 COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6234-08-4660

Issued To: Steve Kiser, Jon Honeycutt **Rev. No.** 0
Issued By: Robert E. Smith **Date:** June 5, 2008
Valid From: June 5, 2008 **To:** June 5, 2009

Task Description: Perform SPT Energy Measurements of drill rigs

Applicable Technical Procedures or Plans, or other reference:

Work Plan (current revision), ASTM D4633-05.

Specific Instructions (note attachments where necessary): Perform energy measurements for each drill rig on site collecting split-spoon samples in accordance with ASTM D-4633-05. Consult with Site Coordinator as to schedule for rigs that may be planned for use that are not yet present. Hammer weights have been checked by site personnel, and records will be available on site. All rigs are using automatic hammer systems. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, but should begin at a minimum depth of 10 feet. Collect at least three energy measurements per drill rig.

Submit copies of calibration records for equipment to Quality Assurance for review prior to beginning work on site.

Special Instructions (note attachments where necessary): Confirm with Site Supervisor that approval of equipment calibration records has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, notify Shaun Lehman and Rob Smith immediately.

Report Format: Standard report in accordance with ASTM D 4633-05 requirements.

Specific Quality Assurance Procedures Applicable: QAP 20-1; QAP 25-1; QAP for Reporting Nuclear-Related Defects, or Noncompliances, per Federal Regulation 10CFR21 and Section 206 of the Energy Reorganization Act of 1974. Current revisions apply.

Hold Points or Witness Points: None

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)
Project Manager: _____ Date: 6/6/08 06/6/08
Project Principal Engineer: _____ Date: _____
Site Manager/Coordinator: _____ Date: _____
Pages: **DCN:** FLR-085
Attachments:

MACTEC

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	South Texas Project COL Site	MAKE:	CME
LOCATION:	Matagorda County, Texas	MODEL:	55
PROJECT NO.:	6234-08-4660	SERIAL NO.:	505
DATE:	6-14-2008	HAMMER TYPE:	Auto
WEATHER:	RAIN 95°F-90°F	ROPE CONDITION:	N/A
INSPECTOR:	JNH	ROD SIZE:	NWJ
DRILLING COMPANY:	MACTEC ATL	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	4-3		
DEPTH DRILLED:	Various		
TIME DRIVEN:	Various		
RIG OPERATOR:	P.Smith		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in2		
ACCEL. SERIAL NOS.:	AL-K990 : K-983-42		
STRAIN SERIAL NOS.:	NW 146 & 1/2		

	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)
1*	71.9-73.2	8-18-23
2*	76.9-78.2	12-17-16

REMARKS: 1* low Readings 5-6% Possibly wrong wave speed
2* " " " Same

MACTEC

2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	South Texas Project COL Site	MAKE:	CME
LOCATION:	Matagorda County, Texas	MODEL:	55
PROJECT NO.:	6234-08-4660	SERIAL NO.:	505
DATE:	6-13-2008	HAMMER TYPE:	auto
WEATHER:	Scattered Showers, Sunny 85°F	ROPE CONDITION:	N/A
INSPECTOR:	JW Honeycutt	ROD SIZE:	NWJ
DRILLING COMPANY:	MACTEC AEL	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	UH-3		
DEPTH DRILLED:	Various		
TIME DRIVEN:	Various		
RIG OPERATOR:	P. Pitts		
HAMMER OPERATOR:	N/A		
PDA PAK SERIAL NO.:	3622L		
INSTR. ROD AREA:	1.49 in²		
ACCEL. SERIAL NOS.:	A1-K990 ; K983-A2		
STRAIN SERIAL NOS.:	NW 146 & 1/2		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)
36-37.5	6-12-15
* 41-42.5	6-12-29
26-42.5	3-6-10

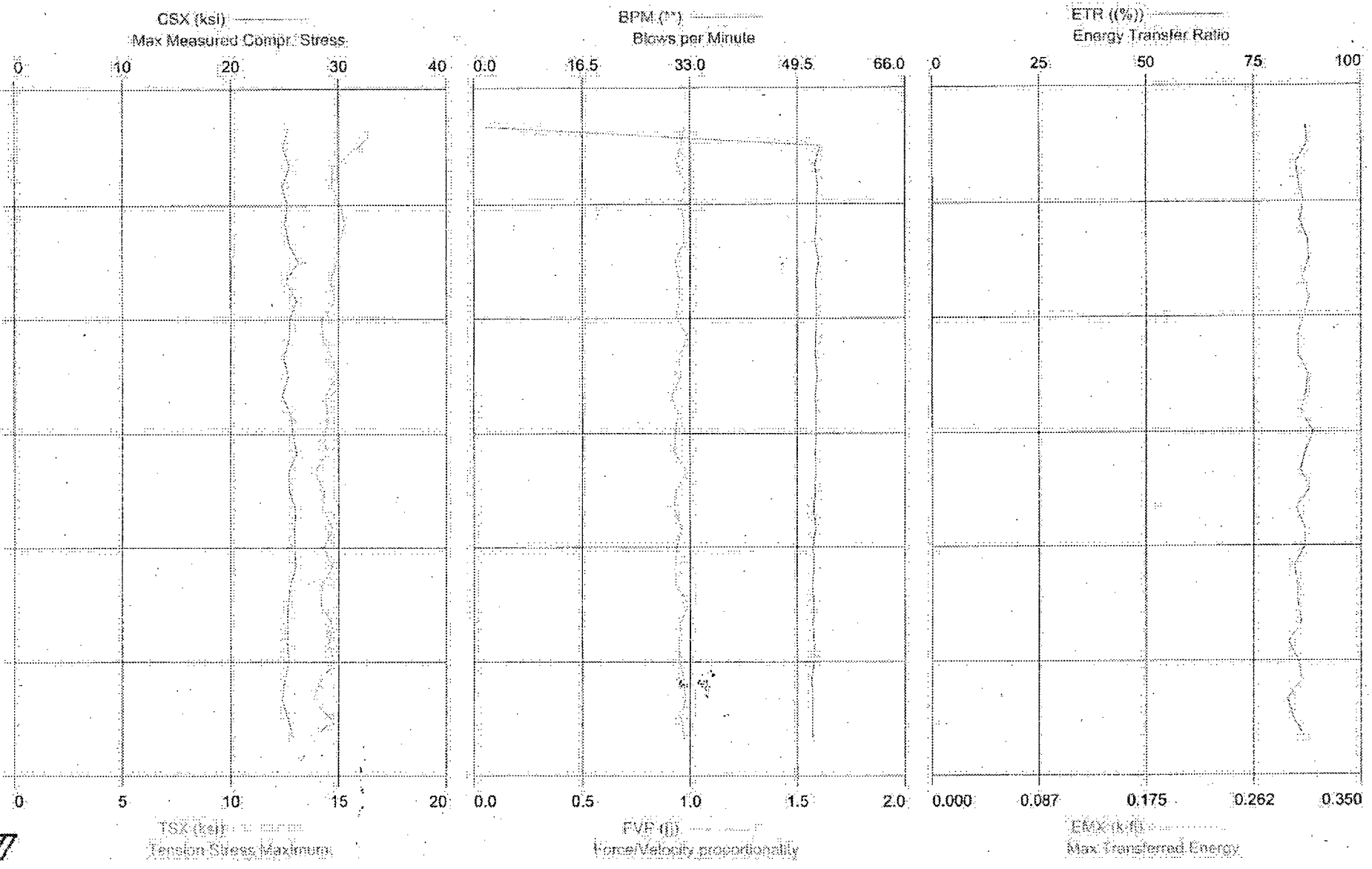
REMARKS: DEPTH 37.5-39 - Discard - wrong interval from Rig Geo.
* 41-42.5 - Drill Pitts started test while in calibration mode JWH

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 13-Jun-2008

STP COL SITE - Boring U4-3; 36' - 37.5' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U4-3; 36' - 37.5' Sample
OP: JNH

Hammer ID: 505 (MACTEC-CME 55)
Test date: 13-Jun-2008

AR: 1.49 in^2
LE: 42.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	25.3	16.8	38	14.2	1.9	0.98	0.315	87	0.305
3	0.00	24.9	15.9	37	14.3	53.0	0.95	0.308	87	0.306
4	0.00	25.5	14.8	38	14.3	52.2	0.94	0.310	85	0.297
5	0.00	24.8	14.7	37	14.2	52.6	0.98	0.308	85	0.299
6	0.00	25.2	15.1	38	14.6	52.5	0.95	0.316	87	0.303
7	0.00	25.1	15.3	37	14.3	52.4	0.97	0.314	86	0.300
8	0.00	25.4	15.0	38	14.7	52.2	0.97	0.319	88	0.307
9	0.00	26.3	14.9	39	14.8	52.8	0.93	0.321	88	0.307
10	0.00	25.1	14.6	37	14.6	52.3	0.95	0.318	86	0.302
11	0.00	26.1	14.8	39	14.7	52.4	0.95	0.319	88	0.308
12	0.00	25.5	14.2	38	14.4	52.4	0.94	0.308	87	0.303
13	0.00	25.4	14.3	38	14.3	52.3	0.99	0.312	85	0.298
14	0.00	24.9	14.7	37	14.5	52.3	0.95	0.303	85	0.299
15	0.00	25.3	14.9	38	14.7	52.6	0.96	0.311	88	0.307
16	0.00	24.8	14.4	37	14.7	52.2	0.92	0.310	87	0.305
17	0.00	25.6	14.5	38	14.6	52.4	0.94	0.314	86	0.301
18	0.00	25.8	14.3	38	14.6	52.4	0.93	0.316	89	0.311
19	0.00	26.1	14.4	39	14.6	52.2	0.93	0.318	87	0.305
20	0.00	25.4	13.9	38	14.4	52.3	0.98	0.315	86	0.301
21	0.00	25.5	14.3	38	14.3	52.2	0.93	0.311	88	0.308
22	0.00	26.0	14.3	39	14.3	52.0	0.93	0.307	85	0.297
23	0.00	25.9	14.7	39	14.6	52.3	0.96	0.316	87	0.304
24	0.00	25.9	14.3	39	14.5	51.9	0.94	0.310	87	0.305
25	0.00	26.0	14.7	39	14.3	52.1	0.93	0.307	85	0.296
26	0.00	25.5	14.2	38	14.1	51.8	0.93	0.313	85	0.298
27	0.00	25.3	14.2	38	14.3	52.1	0.99	0.307	85	0.299
28	0.00	25.3	14.7	38	14.4	51.9	0.95	0.301	86	0.301
29	0.00	25.2	14.5	38	13.8	52.1	0.95	0.303	83	0.291
30	0.00	25.4	14.8	38	14.1	52.1	0.95	0.308	85	0.299
31	0.00	25.0	14.1	37	14.4	51.7	0.97	0.304	86	0.302
32	0.00	24.8	13.8	37	14.1	51.9	0.98	0.299	83	0.290
33	0.00	25.3	14.7	38	14.0	51.9	0.96	0.306	84	0.295
34	0.00	25.8	13.9	38	14.4	51.9	0.97	0.312	87	0.304
	Average	25.4	14.6	38	14.4	50.7	0.95	0.311	86	0.302

Total number of blows analyzed: 33

Time Summary

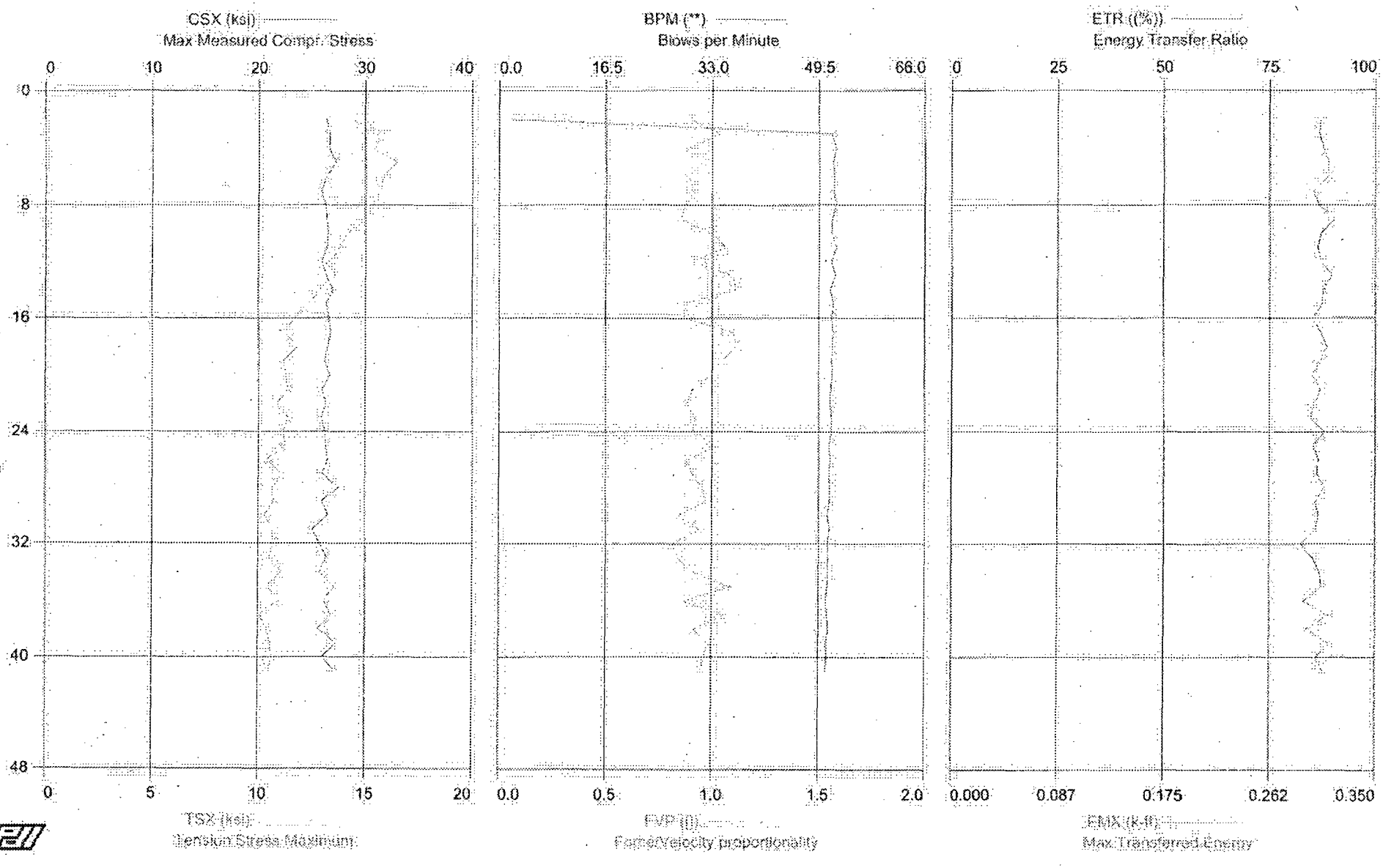
Drive 37 seconds 5:09:17 PM - 5:09:54 PM (6/13/2008) BN 2 - 34

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 13-Jun-2008

STP COL SITE - Boring U4-3; 41' - 42.5' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U4-3; 41' - 42.5' Sample
OP: JNH

Hammer ID: 505 (MACTEC-CME 55)
Test date: 13-Jun-2008

AR: 1.49 in^2
LE: 47.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	26.3	14.4	39	13.6	1.9	0.89	0.323	87	0.305
3	0.00	26.6	15.9	40	13.5	51.5	1.04	0.315	87	0.304
4	0.00	26.6	15.3	40	13.8	52.2	0.90	0.323	88	0.307
5	0.00	27.2	16.5	40	13.7	51.7	0.96	0.330	89	0.311
6	0.00	26.3	15.8	39	13.7	51.9	0.89	0.322	89	0.311
7	0.00	25.8	15.7	38	13.4	51.8	0.91	0.312	85	0.298
8	0.00	26.2	15.3	39	13.4	52.2	0.88	0.319	87	0.303
9	0.00	26.3	15.2	39	13.7	51.6	0.85	0.322	90	0.316
10	0.00	26.5	14.1	39	13.6	51.5	0.99	0.317	87	0.305
11	0.00	26.3	13.8	39	13.3	52.2	1.06	0.321	86	0.302
12	0.00	25.8	13.3	39	13.6	51.4	0.90	0.317	87	0.305
13	0.00	26.3	13.5	39	13.5	52.1	1.10	0.324	90	0.314
14	0.00	27.0	12.9	40	13.6	51.3	1.11	0.320	88	0.307
15	0.00	26.3	12.3	39	13.3	51.8	0.86	0.314	88	0.306
16	0.00	26.6	11.7	40	13.5	51.5	0.87	0.317	85	0.298
17	0.00	26.7	11.2	40	13.6	51.7	1.10	0.320	87	0.305
18	0.00	26.4	11.6	39	13.4	51.6	1.11	0.318	88	0.310
19	0.00	26.1	11.2	39	13.6	51.5	1.04	0.316	87	0.304
20	0.00	26.6	11.3	40	13.4	51.6	1.00	0.315	85	0.298
21	0.00	25.9	11.4	39	13.9	51.4	0.91	0.316	87	0.305
22	0.00	26.3	10.8	39	13.5	51.3	0.88	0.316	85	0.299
23	0.00	25.8	11.4	38	13.5	51.5	0.92	0.315	85	0.297
24	0.00	26.2	11.2	39	13.7	51.5	0.91	0.320	88	0.308
25	0.00	26.2	11.3	39	13.2	51.1	1.02	0.317	85	0.299
26	0.00	26.4	10.3	39	13.6	51.3	0.88	0.318	86	0.303
27	0.00	25.9	11.1	39	13.9	51.1	0.91	0.315	86	0.302
28	0.00	27.5	10.7	41	13.9	51.3	0.96	0.324	88	0.308
29	0.00	25.9	10.7	39	13.1	51.2	0.97	0.314	86	0.300
30	0.00	26.5	10.3	39	13.4	50.9	0.84	0.315	87	0.303
31	0.00	25.0	10.7	37	13.1	51.2	0.94	0.307	86	0.300
32	0.00	25.6	10.7	38	12.9	50.9	0.81	0.304	82	0.288
33	0.00	26.3	10.5	39	13.3	51.0	0.84	0.313	85	0.298
34	0.00	25.7	11.1	38	13.7	51.0	0.91	0.316	87	0.304
35	0.00	27.1	10.5	40	13.9	50.9	1.09	0.318	87	0.305
36	0.00	26.1	11.0	39	13.3	50.6	0.87	0.307	83	0.291
37	0.00	26.8	10.0	40	13.7	50.8	1.06	0.322	89	0.311
38	0.00	25.5	10.4	38	13.4	51.0	0.91	0.311	84	0.293
39	0.00	27.2	10.6	41	14.0	50.7	0.99	0.322	89	0.311
40	0.00	26.0	10.6	39	13.3	50.8	0.96	0.313	86	0.301
41	0.00	27.1	10.5	40	14.0	50.6	0.95	0.319	88	0.307
	Average	26.3	12.2	39	13.5	50.1	0.95	0.317	87	0.304

Total number of blows analyzed: 40

Time Summary

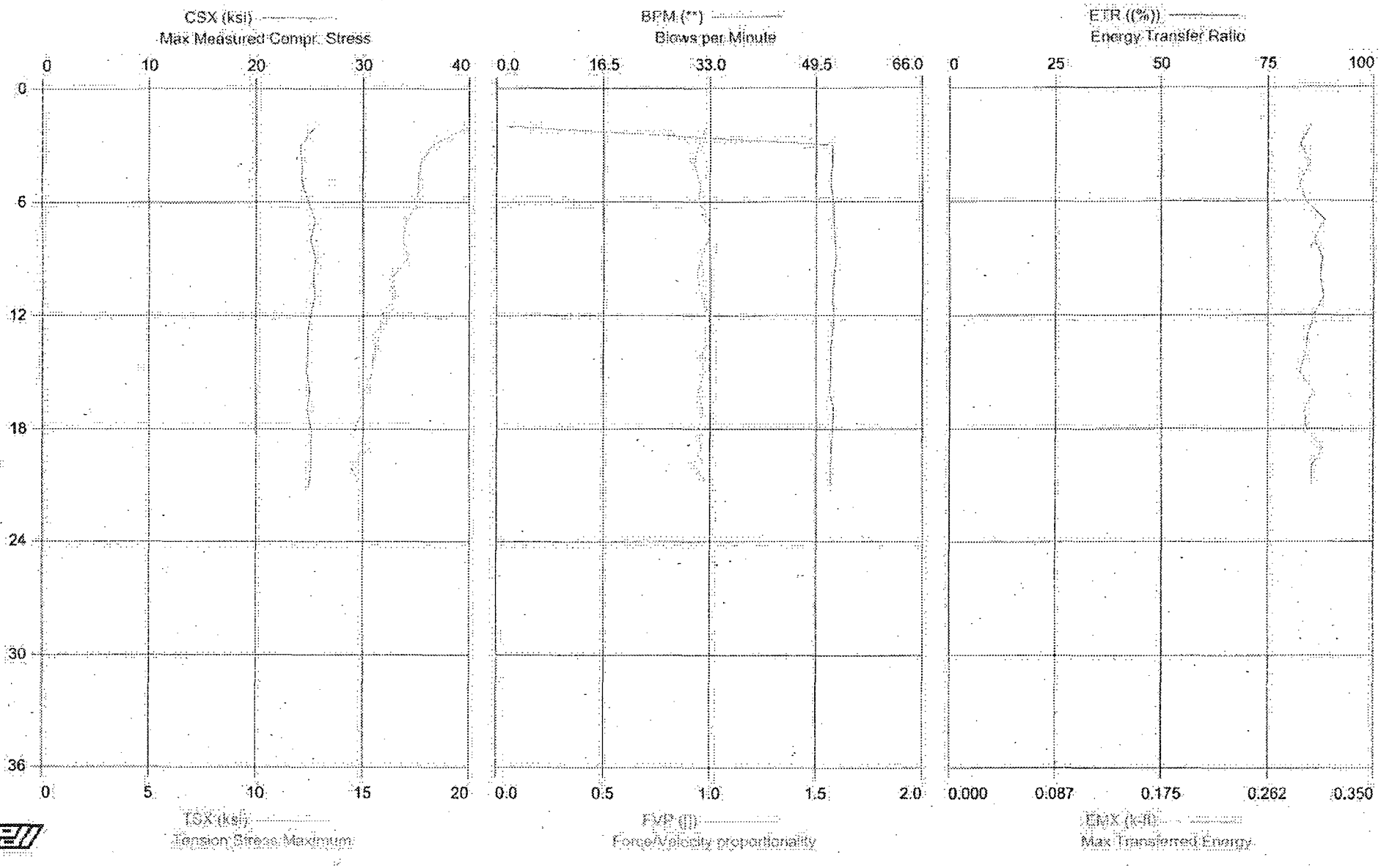
Drive 45 seconds 5:39:13 PM - 5:39:58 PM (6/13/2008) BN 2 - 41

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

Test date: 13-Jun-2008

STP COL SITE - Boring U4-3, 46' - 47.5' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U4-3, 46' - 47.5' Sample
OP: JNH

Hammer ID: 505 (MACTEC-CME 55)
Test date: 13-Jun-2008

AR: 1.49 in^2
LE: 52.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	25.5	20.8	38	14.2	1.9	0.98	0.315	85	0.298
3	0.00	24.1	18.2	36	14.1	52.1	0.95	0.299	83	0.289
4	0.00	24.3	17.7	36	14.4	52.0	0.92	0.304	85	0.298
5	0.00	24.3	17.6	36	14.1	51.8	0.95	0.301	82	0.289
6	0.00	25.0	17.6	37	13.9	52.2	0.95	0.303	84	0.294
7	0.00	25.5	17.0	38	14.3	52.2	1.00	0.319	89	0.310
8	0.00	25.1	16.9	37	14.1	52.4	0.99	0.311	86	0.301
9	0.00	25.6	17.1	38	14.4	52.6	0.96	0.318	88	0.308
10	0.00	25.3	16.3	38	14.1	52.2	0.94	0.310	87	0.306
11	0.00	25.5	16.5	38	14.5	52.0	0.96	0.314	88	0.309
12	0.00	25.1	15.8	37	14.1	52.3	0.99	0.314	86	0.301
13	0.00	24.9	15.8	37	13.8	52.0	1.01	0.304	84	0.296
14	0.00	24.8	15.5	37	14.2	51.7	0.96	0.301	84	0.294
15	0.00	24.8	15.4	37	14.2	51.8	0.97	0.302	83	0.289
16	0.00	25.1	15.1	37	14.0	51.6	0.95	0.305	86	0.300
17	0.00	24.8	15.0	37	14.2	52.2	0.97	0.302	84	0.293
18	0.00	25.2	14.6	37	14.0	52.0	0.94	0.310	84	0.294
19	0.00	25.1	15.3	37	14.5	51.9	0.96	0.313	88	0.309
20	0.00	25.1	14.4	37	14.1	51.8	0.92	0.308	85	0.299
21	0.00	25.0	15.0	37	14.0	51.8	1.00	0.305	85	0.299
	Average	25.0	16.4	37	14.2	49.5	0.96	0.308	85	0.299

Total number of blows analyzed: 20

Time Summary

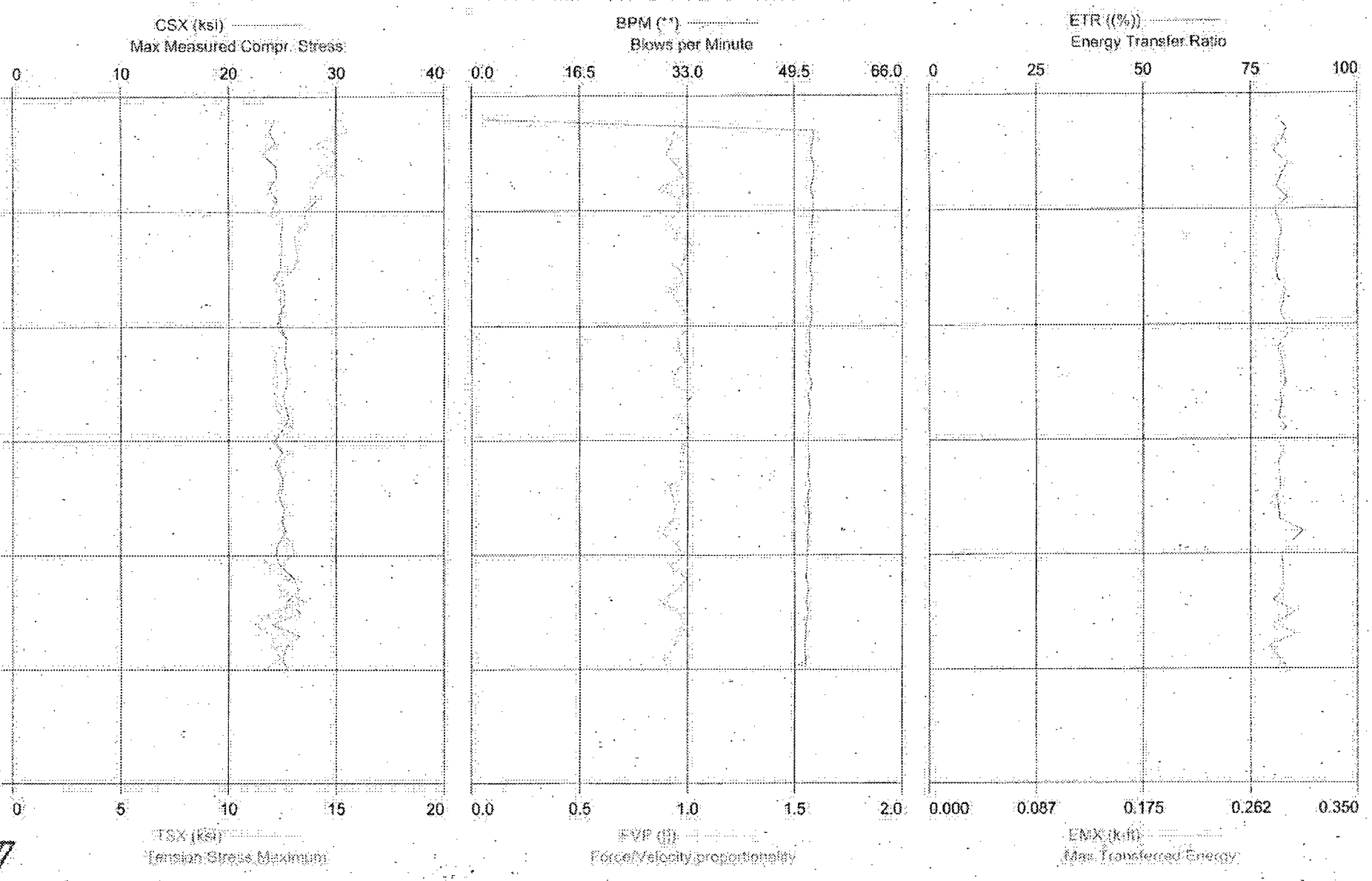
Drive 22 seconds 6:09:33 PM - 6:09:55 PM (6/13/2008) BN 2 - 21

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 14-Jun-2008

STP COL SITE - Boring U4-3; 71.9' - 73.4' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U4-3; 71.9' - 73.4' Sample
OP: JNH

Hammer ID: 505 (MACTEC ATL-CME 55)
Test date: 14-Jun-2008

AR: 1.49 in^2
LE: 78.00 ft
WS: 16,800.0 f/s

SP: 0.492 k/ft3
EM: 29,972 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	24.3	15.2	36	13.7	1.9	0.99	0.302	81	0.285
3	0.00	23.8	15.5	35	14.2	52.5	0.94	0.302	83	0.292
4	0.00	24.4	14.1	36	14.5	52.3	0.93	0.301	82	0.288
5	0.00	23.2	15.1	35	14.2	52.0	0.90	0.291	80	0.281
6	0.00	24.4	14.8	36	14.5	52.5	0.95	0.305	84	0.293
7	0.00	24.5	14.1	36	14.0	52.5	0.98	0.302	82	0.288
8	0.00	23.8	13.9	35	14.7	52.0	0.86	0.294	81	0.284
9	0.00	24.5	14.1	37	14.1	52.4	0.97	0.309	84	0.293
10	0.00	24.0	13.5	36	13.9	52.4	0.96	0.295	81	0.282
11	0.00	25.0	13.6	37	13.9	52.2	0.91	0.309	81	0.285
12	0.00	24.9	13.0	37	14.0	52.3	0.95	0.304	82	0.288
13	0.00	24.9	13.1	37	13.6	52.1	1.02	0.304	81	0.285
14	0.00	24.9	13.2	37	14.0	52.2	0.99	0.298	82	0.285
15	0.00	24.8	13.0	37	13.8	51.9	0.96	0.301	81	0.283
16	0.00	24.2	12.6	36	13.8	52.3	0.99	0.295	81	0.284
17	0.00	25.2	12.4	38	13.6	52.0	0.92	0.306	83	0.291
18	0.00	25.2	12.4	38	13.9	51.9	0.98	0.301	83	0.289
19	0.00	24.7	12.5	37	13.6	52.2	1.00	0.301	82	0.287
20	0.00	24.9	12.2	37	13.6	51.9	1.02	0.308	83	0.292
21	0.00	25.3	12.7	38	13.8	51.8	0.96	0.309	84	0.292
22	0.00	25.3	12.3	38	13.7	51.9	0.96	0.295	81	0.285
23	0.00	25.2	12.1	38	13.6	51.8	0.99	0.304	82	0.288
24	0.00	25.4	12.2	38	13.7	51.7	0.94	0.309	83	0.290
25	0.00	25.4	12.3	38	13.6	52.2	0.94	0.310	83	0.291
26	0.00	25.1	12.1	37	13.5	51.6	1.02	0.303	82	0.287
27	0.00	25.3	12.2	38	13.8	51.9	0.98	0.305	82	0.288
28	0.00	25.6	12.5	38	13.9	51.7	0.96	0.306	82	0.285
29	0.00	25.0	13.0	37	13.8	51.7	1.01	0.307	83	0.292
30	0.00	24.3	11.9	36	13.7	51.7	0.99	0.297	81	0.284
31	0.00	25.0	12.8	37	14.0	51.7	0.98	0.302	83	0.289
32	0.00	24.3	12.3	36	14.0	51.8	0.96	0.300	81	0.285
33	0.00	25.0	12.4	37	14.0	51.6	0.98	0.303	82	0.286
34	0.00	25.1	12.4	37	14.1	51.9	0.92	0.303	82	0.287
35	0.00	24.7	12.3	37	14.1	51.5	0.93	0.298	81	0.284
36	0.00	25.2	12.9	38	14.0	51.7	0.94	0.303	82	0.285
37	0.00	24.9	12.5	37	14.1	51.8	0.93	0.301	82	0.286
38	0.00	25.3	12.5	38	14.6	51.5	0.88	0.312	87	0.305
39	0.00	24.6	12.9	37	14.2	51.6	0.95	0.303	85	0.296
40	0.00	24.4	13.1	36	13.8	51.4	0.98	0.303	82	0.288
41	0.00	24.9	11.8	37	14.1	51.4	0.92	0.300	82	0.289
42	0.00	26.0	12.9	39	13.8	51.3	1.00	0.312	83	0.289
43	0.00	26.5	12.4	39	14.2	51.7	0.95	0.315	83	0.290
44	0.00	25.4	13.5	38	13.6	51.3	0.88	0.300	80	0.281
45	0.00	26.6	12.0	40	14.2	51.7	0.96	0.313	85	0.299
46	0.00	24.0	11.2	36	13.4	51.2	0.98	0.298	81	0.282
47	0.00	26.6	12.1	40	14.3	51.2	0.95	0.315	85	0.299
48	0.00	25.4	12.1	38	13.7	51.1	0.94	0.291	79	0.277
49	0.00	25.0	12.4	37	13.8	51.2	0.89	0.298	82	0.286
50	0.00	25.4	11.6	38	13.9	51.1	0.91	0.310	84	0.292
	Average	24.9	12.9	37	13.9	50.8	0.95	0.303	82	0.288

Total number of blows analyzed: 49

Time Summary

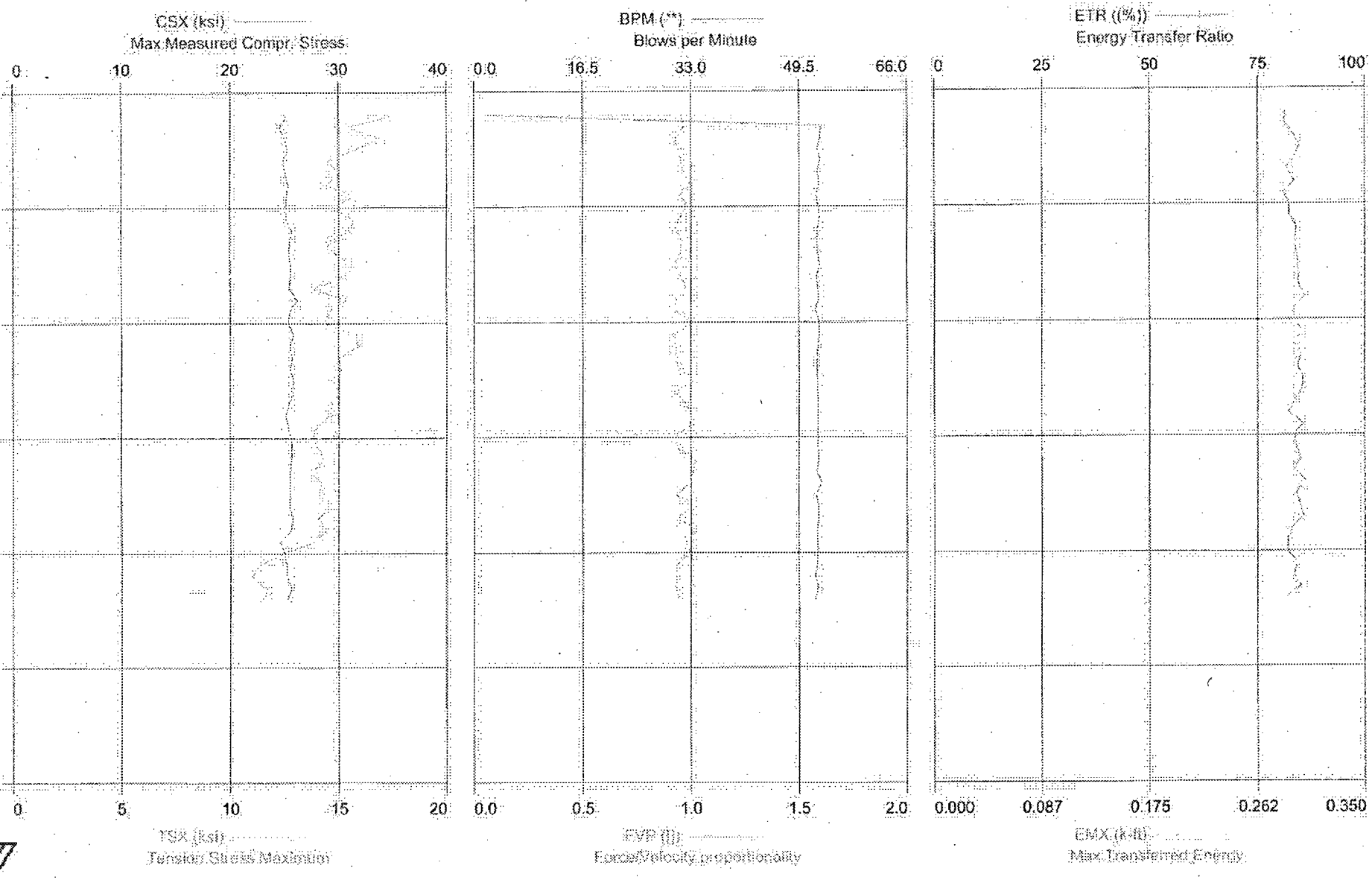
Drive 56 seconds 3:50:44 PM - 3:51:40 PM (6/14/2008) BN 2 - 50

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

MACTEC Engineering and Consulting, Inc. - Case Method Results

Test date: 14-Jun-2008

STP COL SITE - Boring U4-3; 76.9' - 78.4' Sample



MACTEC Engineering and Consulting, Inc.
Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jun-2008

STP COL SITE - Boring U4-3; 76.9' - 78.4' Sample
OP: JNH

Hammer ID: 505 (MACTEC ATL-CME 55)
Test date: 14-Jun-2008

AR: 1.49 in^2
LE: 83.00 ft
WS: 16,800.0 f/s

SP: 0.492 k/ft3
EM: 29,972 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	25.3	17.5	38	14.1	1.9	0.95	0.295	81	0.285
3	0.00	24.6	15.4	37	14.2	52.8	0.97	0.293	81	0.284
4	0.00	25.1	16.9	37	14.5	52.7	0.93	0.300	83	0.292
5	0.00	25.3	15.7	38	14.5	52.3	0.94	0.303	85	0.297
6	0.00	24.9	14.4	37	14.5	52.7	0.95	0.301	83	0.292
7	0.00	25.1	15.1	37	14.3	52.3	0.96	0.298	82	0.286
8	0.00	25.4	14.4	38	14.3	52.5	1.00	0.307	84	0.292
9	0.00	25.2	15.7	38	14.2	52.1	0.94	0.298	81	0.283
10	0.00	25.2	14.7	37	14.3	52.4	0.99	0.305	82	0.288
11	0.00	25.2	15.7	38	14.2	52.6	0.94	0.296	82	0.288
12	0.00	25.8	15.6	38	14.2	52.3	0.93	0.312	84	0.294
13	0.00	25.5	14.4	38	14.5	52.3	0.96	0.305	84	0.293
14	0.00	25.4	14.8	38	14.5	52.3	0.95	0.304	84	0.294
15	0.00	25.6	15.6	38	14.4	52.6	0.93	0.304	84	0.295
16	0.00	25.6	15.2	38	14.5	52.2	0.95	0.307	85	0.296
17	0.00	25.5	13.8	38	14.5	52.3	0.98	0.307	84	0.296
18	0.00	26.2	15.4	39	14.6	52.5	0.93	0.316	86	0.301
19	0.00	25.5	14.5	38	14.1	52.0	0.92	0.303	83	0.292
20	0.00	25.4	14.4	38	14.0	52.5	1.02	0.304	83	0.292
21	0.00	25.9	15.8	39	14.3	52.6	0.92	0.312	85	0.299
22	0.00	25.5	15.9	38	14.1	52.4	0.93	0.305	83	0.292
23	0.00	25.7	15.0	38	14.1	52.2	0.93	0.311	85	0.298
24	0.00	25.6	15.1	38	14.5	52.2	0.94	0.308	84	0.295
25	0.00	25.9	14.6	39	14.2	52.3	1.02	0.311	86	0.300
26	0.00	25.8	15.1	39	14.2	52.3	0.92	0.309	85	0.299
27	0.00	25.5	14.7	38	14.3	52.4	0.97	0.306	84	0.293
28	0.00	25.2	14.6	37	13.9	52.4	1.01	0.304	82	0.288
29	0.00	25.4	14.0	38	14.3	52.4	1.00	0.310	86	0.300
30	0.00	25.7	13.8	38	13.9	52.3	0.92	0.308	84	0.293
31	0.00	25.7	14.1	38	14.3	52.4	0.94	0.312	84	0.294
32	0.00	25.7	14.3	38	14.1	52.5	1.02	0.311	85	0.298
33	0.00	25.5	13.7	38	14.1	52.2	1.01	0.308	84	0.293
34	0.00	25.6	14.2	38	14.5	52.9	0.99	0.314	86	0.302
35	0.00	25.6	14.1	38	14.0	52.1	0.93	0.306	84	0.294
36	0.00	25.5	14.6	38	14.4	52.5	1.00	0.311	85	0.297
37	0.00	25.8	14.0	38	14.3	52.5	0.94	0.313	86	0.300
38	0.00	25.6	14.5	38	14.0	52.2	1.03	0.310	83	0.291
39	0.00	24.7	13.9	37	14.1	52.3	0.98	0.297	82	0.287
40	0.00	25.0	12.5	37	14.0	52.4	1.00	0.300	82	0.287
41	0.00	25.3	11.3	38	14.3	52.2	0.93	0.300	84	0.295
42	0.00	25.3	11.0	38	14.1	52.0	0.93	0.301	84	0.292
43	0.00	25.7	11.8	38	14.4	52.4	0.93	0.306	85	0.298
44	0.00	25.3	11.6	38	14.1	52.0	0.95	0.299	82	0.287
	Average	25.4	14.5	38	14.3	51.2	0.96	0.305	84	0.293

Total number of blows analyzed: 43

Time Summary

Drive 48 seconds 4:33:28 PM - 4:34:16 PM (6/14/2008) BN 2 - 44