U.S. EPA REMOVAL ACTION
WALTON AND LONSBURY SITE
ATTLEBORO, MASSACHUSETTS

PERFORMANCE SPECIFICATION
for
SOIL MIXING FOR GROUND IMPROVEMENT

Revision 2, 7 March 2012

PART 1 – GENERAL

1.1. INTRODUCTION

A. This specification includes requirements for Soil Mixing for Ground Improvement and related work as indicated on the drawings and as hereinafter specified. The work consists of furnishing all plant, labor, equipment, and materials, and performing all operations as required to increase the bearing strength of soils in the Ground Improvement Area using the soil mixing method. Soil conditions are further described in Paragraph 1.7.

B. The work shall consist of Dry Soil Mixing for ground improvement, within the limits indicated on the project drawings to meet the acceptance criteria presented in these specifications. Dry Soil Mixing is the basis for this specification and bid; however, alternative proposals that use grout will be considered, and specifications for work elements involving grout and other wet mix approaches are included.

C. It shall be the Contractor's responsibility to determine and implement the systems and criteria to ensure that the specified performance is achieved.

1.2. REFERENCES

The publications listed below form a part of this specification to the extent referenced and shall be the latest edition and revision thereof. The publications are referred to within the text by the basic designation only.

API Spec 13A	API Specification for Oil-Well Drilling-Fluid Materials
API RP 13B-1	API Recommended Practice Standard Procedure for Field Testing Water-Based Drilling Fluids
ASTM C 150	Specification for Portland Cement
ASTM D 422	Particle-Size Analysis of Soils
ASTM D 1633	Unconfined Compressive Strength of Soil-Cement

ASTM D 4832 Preparation and Testing of Soil-Cement Slurry Test Cylinders

ASTM D 5084 Hydraulic Conductivity Using a Flexible Wall Permeameter

1.3. DEFINITIONS

A. API - American Petroleum Institute

B. ASTM - American Society for Testing and Materials

C. EPA - U.S. Environmental Protection Agency

D. COR - Contracting Officer Representative

E. ERRS - Emergency Rapid Response Services - the EPA Contractor assigned to the project.

F. Field Quality Control Representative (FQCR) - The individual given specific inspection tasks identified in this specification.

G. GPS - Global Positioning System

H. Grout - A stable colloidal suspension of powdered cement, bentonite, additives and/or other similar materials in water. The terms "grout" and "slurry" are used interchangeably in these specifications.

I. Injection Ratio - A volumetric ratio of grout to soils (e.g., 100 gallons/cubic yard) to be mixed in a SM column. The grout injection ratio is determined for each column based on the column dimensions, soil density, pattern of treatment, and desired application rate.

J. Soil Mixing (SM) - A soil improvement technique used to construct in situ soil structures or treat soils in place, without excavation or dewatering. Soil mixing uses an SM Machine to advance a Mixing Device into the ground while adding reagent binder materials to the soil. Stabilized soil columns are created that may be joined together by overlapping to form retaining walls, foundation elements or to treat a large block of soil or sludge.

K. Dry Soil Mixing - The mechanical homogenization of soil with a dry cementitious reagent binder to produce a physically strengthened soil “soilcrete,”

L. Soil Mixing Specialist - An individual who has had proven and successful experience in soil mixing construction.

M. SM Cell - One completed addition and mixing of the soil and treatment materials with the Mixing Device within a defined area to the design depth. This creates a

cell of treated soil. In most cases, "cell" and "column" are used interchangeably in this specification.

N. SM Column - One completed insertion, injection and mixing of the soil with the Mixing Device to the design depth. This creates a column of treated soil. The column may be primary (through virgin soils), secondary (connecting primary columns) or tertiary, etc.

O. Mixing Device (or Mixing Tool) - The special mechanical stirring and shearing tool that attaches to the SM Machine and is inserted into the ground to mix the soils. The device may be fitted with ports for injecting grout, mixing paddles, auger blades, etc.

P. Mixing Pass - Operation of the Mixing Device from the top of the column to the bottom. Generally, a number of passes are required to completely mix a SM column.

Q. Overlap Ratio - The ratio between the overlap distance (measured along the column diameter) and the diameter of the column. For example; a pattern of columns with a 15% overlap ratio has an overlap of 1.2 ft between two 8-ft-diameter columns.

R. Reagent Binder - One or more materials including cement, flyash, slag, lime and an assortment of additives with the soil to increase its strength and stiffness.

S. Binder Delivery System - The equipment involved with storing and pneumatically pumping the dry binder materials to the mixing tool.

T. Swell - The excess material resulting from adding grout to the in situ soils. The swell is typically a mixture of soil and grout similar to the materials in the SM column.

U. Working Platform - The working platform is the surface of stable soils from which the SM equipment operates.

1.4. SYSTEM DESCRIPTION

A. Project Objectives

The soft deposits (organic silt and clay soils) in the Ground Improvement Area, shown in the attached Figure 1, need to support construction of a drainage system and soil cap. Additional area may be determined to require increased bearing strength and may be added to the Scope of Work prior to Award. The additional area is shown as Expanded Ground Improvement Area in attached Figure 1. If awarded, the additional area shall be considered part of the Ground Improvement Area as referenced in this specification.

B. Project Performance Requirements

The soft deposits shall be mixed and treated as one unit which shall achieve the following specifications after 28-day cure:

- Unconfined compressive strength, q_u, of 50 psi or greater for all treated cells or columns;
- Permeability of less than 5×10^{-6} cm/sec for all treated cells or columns.
- No more than 10% of the tests may be less than the design strength value.

C. Design Requirements

1. Design Mix Development laboratory work is being performed by Kemron, Inc., Atlanta, Georgia. The technical scope of work for the laboratory is included in Appendix C. Preliminary laboratory submittals indicate that admixing dry Type I Portland Cement to the organic silt will likely achieve the compressive strength requirements of this project.

2. Based on preliminary design mix development, the design mix shall be the addition of Type I Portland Cement within the range of 200 to 300 kilograms per cubic meter of wet soil. Laboratory testing is underway to identify a more specific mix value and the laboratory report will be available as Appendix D prior to Award.

1.5. SUBMITTALS

Submit the following for review in accordance with submittal procedures specified in the Scope of Work.

A. Bidder Submittals (submitted as part of Bid documents)

1. Bidder Qualifications:

a. The Bidder shall submit evidence of Contractor Firm qualifications as required by Paragraph 1.6. The evidence shall include references from at least five similar and successful projects constructed over the last 5 years. Project descriptions shall include at a minimum the dimensions of work, type of mixture (grout or dry, and key components), and equipment description.

b. The Bidder shall submit evidence of qualifications of assigned personnel as required by Paragraph 1.6. The name and qualifications of the proposed SM Specialist and, if necessary, an alternate SM

Specialist, shall be provided with the Bid. The name and qualifications of at least two proposed Key Personnel shall be provided with the Bid.

2. The Bidder shall identify the equipment proposed for use on the project and indicate whether the equipment is owned and maintained by the Bidder or leased.

3. The Bidder shall submit a general description of any Bench-Scale Testing that the Bidder will perform as part of the work.

4. [Deleted].

5. The Bidder shall identify any site preparation requirements (to be performed by ERRS) that need to be completed prior to start of construction.

6. The Bid shall include a preliminary project schedule, starting from a presumed date of award, including major milestones. At a minimum, schedule shall include the following milestones: start of bench-scale tests (if performed by Bidder), submittal of bench-scale test report (if performed by Bidder), submittal of Draft Work Plan (concurrent with bench-scale testing, if performed by Bidder), submittal of Final Work Plan, mobilization to project site, completion of soil mixing, demobilization, submittal of final construction documentation.

B. Design Mix Development (prior to pre-construction conference)

1. In the event that the Contractor (successful Bidder) requires independent bench-scale testing in order to meet the performance requirements, the Contractor shall commence design mix development in accordance with the Project Schedule required in Paragraph 1.5A(6). Soil samples from the Ground Improvement Area will be provided by ERRS. Water samples (groundwater and City water) will be provided by ERRS. All other materials required for Design Mix development shall be provided by the Contractor.

2. If, following completion of independent testing, the Contractor wishes to propose a revised Design Mix, the Contractor shall submit a Bench Scale Testing Report including but not limited to the following information:

   a. Recommended SM grout mix or SM soil mixture, including raw materials binder types, and ratio and dose and injection ratios.

   b. Laboratory report shall include unconfined compressive strength and permeability on at least two samples of the organic silt material treated with the proposed design mix.

c. Details of anticipated binder mixture, mixing rates, flow rates, air injection pressure and volume flow rates, mixing tools rotational speed, mixing tools down pressure (if applicable), and mixing tools penetration and withdrawal rates (if applicable).

C. Work Plan (prior to pre-construction conference)

The Contractor shall submit a detailed Work Plan describing his proposed construction equipment, procedures, and schedules. The Work Plan shall be submitted in accordance with the Project Schedule required in Paragraph 1.5A(6). The Work Plan shall include, but not be limited to, the Contractor's plan for:

1. Listing of supervisory personnel: Name and experience of the various persons, their role and primary responsibilities.

2. Equipment set-up and site use layout: including storage areas, mixing plant location, haul roads, and work platform.

3. Soil Mixing equipment specifications, including maximum depth capability of the SM Machine, dimensions of the Mixing Device and capacity of mixing plant.

4. Source of all imported material, including cement and any additives. Shipment of materials to the site shall be accompanied by the vendor's written certification of the quality or specification of the material and Material Safety Data Sheets.

5. Construction means and methods: Listing of equipment and capabilities, construction steps, handling of excess grout/admixtures and swell, layout, overlap control, control of drainage, spills, wastes, etc.

6. A layout drawing showing the location, geometry, overlaps, depths, dimensions, and sequence of the SM cells or the SM column overlapping pattern using site-specific coordinate system or other survey baselines.

7. A Quality Assurance/Quality Control (QA/QC) Plan describing all testing, sampling, reporting forms, methods, responsible persons, non-conformance procedures, and all other means to ensure the quality of the work and document that the finished work achieves the Project Performance Requirements. QA/QC Plan shall include:

   a. A detailed outline of the QA/QC Program to be undertaken each day during production to confirm the soil mix achieves specified performance requirements.

   b. Details of procedures for a test section.

c. Measures to be implemented each day during Soil Mixing to monitor, modify, record, and control binder ratios, and injection pressures and quantities, mixing energy, mixing tool penetration and withdrawal rates, and other related aspects of the Soil Mixing process.

d. Proposed method for Field Penetration Testing required in Paragraph 3.5C(2). Include documentation that the proposed method is in wide-spread accepted use in the industry and the correlation between the method's field test results to laboratory strength testing.

e. Field Quality Control Plan

f. Example formats of Daily Production Reports meeting the requirements stated herein

8. Schedule: A bar chart schedule showing all major activities and durations.

9. Work plan shall be submitted in Draft form and then re-submitted in Final form, incorporating EPA comments as necessary.

D. Progress Submittals (submitted during the work)

1. Accurate daily records of the work, including:

a. Area mixed (by station, offset,…) as shown on construction layout drawing(s) for each container of binder

b. Working grade

c. Mixing depth

d. Start time

e. Finish time

f. Binder mix details (mass per unit of untreated volume)

g. Binder injection rate

h. Total binder weight injected

i. Tool rpm during binder injection

j. Description of obstructions or other interruptions of binder injections

k. Type of mixing tool

2. Any change in the predetermined Soil Mixing program necessitated by a change in the subsurface conditions.

E. Completion Report (submitted after the work)

Documentation shall be submitted to the EPA COR or designee for the record upon completion of soil mixing activities but prior to acceptance of the work.

1. A report documenting the observations and results of the tests. This report will certify that the specified improvement has been achieved.

2. Production test results.

1.6. QUALIFICATIONS

A. Qualifications of Contractor

The Contractor firm shall be experienced and competent to construct the project using the Soil Mixing method. Experience shall include soil mixing using both dry mix and wet (grout) mix techniques with least five similar and successful projects constructed over the last 5 years. The Contractor will have sufficient competent experienced personnel and proven methods and equipment to carry out the operations specified.

B. Qualifications of Assigned Personnel

1. The SM Specialist shall supervise in the field the construction, grout preparation, soil mixing, and quality control. This individual shall be knowledgeable both dry mix and wet (grout) mix techniques including: (1) the proper mixing methods employed to mix, control and test grout, (2) SM construction equipment and tools, (3) in situ mixing injection ratios, overlaps and overlap ratios, and (4) testing for SM quality control. The SM Specialist shall have been in responsible charge of Soil Mixing for at least five completed successful construction projects similar in scope, size, and complexity to this project.

2. The Bidder's Key Personnel shall have a minimum of 2 years of experience with Soil Mixing projects of similar scope. Other Key Personnel include FQCR, equipment operators, grout plant operators, and technical staff involved with the SM Machine operation.

1.7. PROJECT/SITE CONDITIONS

A. Existing Conditions

There are two general types of soil that require treatment: a dark brown organic material generally described as organic sandy silt (Stratum 1) underlain by a greenish-grey fine-grained inorganic material generally described as a clayey silt (Stratum 2). Both materials are very soft, with measured Standard Penetration Resistance (N) values which were less than 1 blow per foot (bpf) (i.e., weight of rods, weight of hammer, or 1 blow per 24 inches). The soil requiring treatment is underlain by coarse sand and gravel with N values which were at least 14 bpf. Boring logs and geotechnical test results are attached as Appendix A and Appendix B, respectively.

The thickness of the soft deposits varies significantly across the treatment area. The boring logs (locations noted on Figure 1) provide the available information regarding the thickness of the soft deposits at five locations. Note that the water content, organic content, and thickness of the soft soil deposits are highly variable in samples obtained across the Ground Improvement Area. In some portions of the Expanded Ground Improvement Area, the surface of the soft soils may lay beneath standing water at an elevation lower than the target top elevation of the soil treatment.

Based on information available, the thickness of the soil layers that require soil mixing vary from 0 feet (ft) to 14 ft in thickness across the Ground Improvement Area. Mixing shall be performed in the soft soils only. Large vegetation (stumps, roots, and vegetative mat) will be removed from the Ground Improvement Area by others prior to the start of this work; however, small quantities of these materials may remain and shall be removed during the soil mixing operation. Soft soil located at an elevation above approximately 118 ft will be removed by others prior to mixing. The estimated total in situ volume of soft soil requiring treatment is approximately 10,000 cubic yards in the Ground Improvement Area. An additional volume of approximately 3,700 cubic yards is located in the Expanded Ground Improvement Area.

PART 2 – PRODUCTS

2.1. MATERIALS

A. Type I Portland Cement

The Portland Cement used shall conform to ASTM C 150. The cement shall be adequately protected from moisture and contamination in storage on the jobsite. Reclaimed cement or cement containing lumps or deleterious matter shall not be used.

B. Grout

1. If proposed for use on this project, grout shall consist of a stable colloidal suspension of cement, and/or other additives in water. The grout shall be pumpable and workable with the SM injection equipment.

2. Cement used in preparing grout shall conform to ASTM C 150. The cement shall be adequately protected from moisture and contamination in storage on the jobsite. Reclaimed cement or cement containing lumps or deleterious matter shall not be used.

C. Water

1. ERRS will provide potable water, obtained from the City public water supply and distributed via a water truck. It is the responsibility of the Contractor to provide any facilities necessary to store and pump water for its use (e.g., for mixing grout). It is the responsibility of the Contractor to provide adequate notice to ERRS regarding its water requirements, and to be prepared to receive water delivered by ERRS.

2. Given the high water content of the soils to be treated at the site, use of water for soil mixing should be kept to a minimum.

D. Additives

Admixtures were not required to meet project performance specifications in the laboratory and are not expected to be required during field implementation. If the Contractor anticipates requesting permission to use an admixture, submittals are required with the Bid. Propriety chemicals may be approved based on the results of pre-construction tests. No additives may be used without the approval of the EPA COR.

E. SM Material

The material formed by mixing the grout with the in situ soil shall have an unconfined compressive strength of 50 psi minimum at 28 days and a permeability of less than 5×10^{-6} cm/sec at 28 days.

2.2. EQUIPMENT

A. SM Machine

The SM machine may consist of any purpose-designed excavator-mounted or crane-mounted equipment. The SM Machine shall have necessary capability to deliver grout or air-conveyed solids to the Mixing Device. The Mixing Device shall be capable of delivering grout or solids into the soil matrix. The Mixing Device may be configured with mixing paddles, teeth, etc. as necessary to be capable of

blending the soil and grout into a homogeneous mixture. The power source shall be sufficient to maintain the required penetration rate and mixing speed from a stopped position in up to 15 ft of mixed soil.

B. Storage Tanks for Dry Binder Materials

Dry binder materials shall be stored and delivered to the mixing points in closed pressure tanks suitable to be used as pressure vessels, for all pressures required including those to be used to load and unload the materials. Storage tanks shall be tanks or silos with adequate storage space for continuous production, and shall be equipped with air filters.

C. Grout Mixing Plant

The grout mixing plant, if required, shall include the necessary equipment including a mixer capable of producing a colloidal suspension of cement and additives in water, and pumps, valves, hoes, supply lines, and all other equipment as required to adequately supply grout to the SM Machine and Mixing Device. Positive displacement grout pumps shall be used to transfer the grout to the Mixing Device. The grout pump shall be capable of pumping the required distance and elevations to provide an adequate supply of grout to the Mixing Device. The plant shall be equipped to accept dry or liquid additives in measured amounts. Storage tanks shall be provided as needed to store to allow for an adequate supply of batches or continuously mixed grout to the SM Machine. Grout shall be agitated until fully mixed and recirculated in the storage tanks to maintain a homogeneous mix and prevent setting of the grout. Grout meters or calibrated tanks shall be provided to measure injection volumes.

D. In Situ Sampling Tool

A sampling tool shall be provided by the Contractor for obtaining samples of the wet, mixed soil, at depth in the SM column. The sampler shall consist of a weighted chamber, which can be opened and closed from the surface to obtain mixed soil and grout. The sampler may be attached to the SM Machine or supported by a second machine.

2.3. TESTS, INSPECTION, AND VERIFICATIONS

A. MATERIALS

All permanent materials shall be certified by the manufacturer to comply with the specified standard. Certificates of Compliance with the specification shall accompany each truckload of materials received on site.

PART 3 – EXECUTION

3.1. EXAMINATION

A. Pre-Bid Site Visit

Prior to submitting a bid price for the Soil Mixing, the Contractor shall attend a pre-bid site visit to examine the site. During the site visit the Contractor will become familiar with the location and condition of the soil within the Ground Improvement Area, as well as the site access, staging areas, proximity of residences, work already performed or to be performed by others, known activities requiring coordination, and expectations for interaction with EPA and other contractors at the site.

3.2. PREPARATION

A. AIR EMISSIONS

The Contractor shall control dust emissions such that the emissions tests (performed by EPA or others) meet the established project requirements.

B. RECEIVING, STORAGE, AND HANDLING OF MATERIALS

The Contractor shall coordinate all receiving, storage, and handling of treatment chemicals with the EPA COR or designee. The Contractor shall maintain at the jobsite a sufficient quantity of raw materials and other supplies such that the work can proceed uninterrupted by material shortages.

C. ALIGNMENT

1. ERRS shall accurately stake the Ground Improvement Area, as shown on Figure 1. If applicable, the area may exceed the area shown on Figure 1 and may include some or all of the Extended Ground Improvement Area.

2. ERRS shall establish two sets of control lines by survey outside the limits of the work. The Contractor shall measure (or establish by string lines between the control lines) the center of each SM column or cell from these control lines based on a drawing of the overlap pattern. Alternative proposals for use of GPS for location documentation will be considered.

3. The SM work shall advance stepwise, using primary, secondary, etc. columns/cells and overlapping portions of previously completed columns/cells to ensure a proper overlap and continuity.

3.3. PRE-PRODUCTION TEST SECTION

A. Test section locations within the treatment area will be agreed upon by the Contractor and the EPA COR or designee.

B. The test section shall consist of mixing binder elements for columnar mixing or a 10-ft by 10-ft area for mass stabilization from the ground surface to top of the coarse sand and gravel unit.

C. If the pre-production test section indicates that the required improvement has not been achieved, the Contractor shall revise the work procedure plan and perform an additional test program.

3.4. INSTALLATION

A. General

The Ground Improvement Area shall be treated using SM such that the top elevation is as shown on Figure 1 or to the top of the existing soil elevation plus swell, whichever is lower. The SM structure shall have essentially vertical walls at the boundary, with a pattern of overlapping columns and shall extend through the soft soils to contact the sand and gravel unit. A generalized description of the soil profile through which the SM is to be constructed is provided on the boring logs attached to this specification. Actual depth of treatment shall be to the surface of the coarse sand and gravel unit

B. Column Depth

1. The depth of the SM columns/cells shall be determined in the field. The SM Specialist may observe the power usage of the SM machine as an aid in verifying the proper depth.

2. The total depth of penetration shall be measured and recorded on each column and for each cell. The depth may be observed by pre-measured marks on a Kelly bar or similar feature of the SM Mixing equipment, or survey of a fixed point on the Kelly bar or equipment. Alternative proposals for use of GPS for total depth measurement will be considered. The depth of each column/cell shall be measured from the bottom of the Mixing Device to the top elevation shown on Figure 1.

C. Tolerances.

The following tolerances shall apply to the SM dimensions and construction. Measurements and/or survey shall be by the Contractor and included as part of daily reports.

1. The SM columns shall be essentially vertical. The working platform and/or crane shall be leveled to be plumb within 3% of vertical and/or the Kelly bar shall be measured to be within 3% of vertical.

2. SM cells shall be homogeneously mixed. Where SM cells are constructed adjacent to previously-treated SM cells, mixing shall overlap into the adjacent treated SM cells.

3. The depth of the SM columns and SM cells shall be determined based on resistance encountered at the interface between the soft soils and the coarse sand and gravel. The top of the SM columns shall be measured or surveyed to within 6 inches of the elevation shown on Figure 1. The depth of each SM column shall be measured from the finished surface to the bottom of the Mixing Device.

4. The SM pattern of overlaps shall be surveyed and staked to ensure that the overlap ratio is constructed as designed.

5. Construction will not be permitted when the air temperature is below 20^{o}F or when severe weather conditions may compromise the quality of the work.

6. For grout injection, the injection ratio shall be calculated and checked for each SM column. The injection ratio may be corrected for previous overlaps in the same column. In all cases, the minimum injection ratio shall be observed. There shall be no maximum injection ratio.

7. For dry soil mixing, the mix ratio shall be calculated and checked for each SM cell.

8. The volume of swell shall be measured at a frequency agreeable to ERRS and the Contractor.

D. Obstructions

If obstructions including boulders, bedrock or other potentially damaging materials are encountered, the SM operator shall stop drilling and immediately notify the EPA COR or designee. The mixing tool shall be removed from the treatment area. Obstructions shall be penetrated with drilling equipment or other approved methods to remove the obstruction(s) or to loosen the obstructions, including any dense layers, sufficiently to allow the installation of the Soil Mix column / panel unless otherwise indicated by the EPA COR or designee. Obstructions, which cannot be penetrated, may be remediated by removal by ERRS, the Soil Mix column / panel may be completed to the maximum depth penetrated, or by other acceptable means as directed by the EPA COR or designee. Obstructions, which reduce the drilling rate to less than 1 foot of

penetration per minute for at least 5 minutes, may be acceptable as refusal upon approval of the EPA COR or designee.

E. Grout Plant

The grout plant shall consist of a slurry mixer, transfer pumps, storage tanks, metering, proportioning or weighing equipment and other equipment, as needed. The proportioning equipment may use meters, weights or weight-volumes to ensure proper proportions. The density of the grout shall be monitored and recorded, as per the Quality Control Plan to verify grout proportion. Weighing equipment shall be calibrated to within 2% of standard at the beginning of the project and verified monthly thereafter.

F. Soil Mixing and Penetration

1. Each soil column shall be penetrated while simultaneously injecting grout or binder and then mixed by repeated passes of the Mixing Device. The number of mixing passes shall be monitored and optimized and recorded for each column to ensure adequate mixing. The mixing rotation speed shall be adjusted to accommodate drilling conditions based on the degree of drilling difficulty. Additional mixing or passes may be required to evenly distribute the grout throughout the column.

2. For dry soil mixing, each cell shall be mixed until a homogeneous mix is achieved.

G. Injection Rate

1. The grout injection rate shall be monitored and recorded for each column and adjusted as necessary for minimum drilling resistance and to accommodate the design mix. The minimum injection rate shall be calculated for each stroke based on the volume of unmixed soil in the column, the density of the soil, and the volume of grout required to achieve the design mix proportions. The flow of grout to the Mixing Device shall be verified prior to each stroke by observing the flow out of the Mixing Device while it is suspended in the air above column. Any blockage shall be cleared prior to injection and mixing.

2. For dry soil mixing, the total quantity of treatment material added for each cell, and the estimated volume of the cell, shall be recorded.

H. SM Swell Management

The Contractor shall place and otherwise manage SM swell (excess materials resulting from the SM treatment). These materials shall be placed in a location designated by the ERRS Response Manager. The Contractor shall coordinate activities with the ERRS Response Manager to prevent interruptions or delays in

work progress due to SM swell. EPA shall not be responsible for retreatment of swell that is improperly managed.

3.5. FIELD QUALITY CONTROL

A. Program

1. The Contractor shall maintain his own quality control for the SM construction under the direction of the SM Specialist. The Contractor shall perform all testing required by the Work Plan and QA/QC Plan.

2. All Soil Mixing operations shall be performed under the inspection of the FQCR.

3. Monitoring and logging of Soil Mixing operations for both test areas and production work shall be done by the FQCR.

4. Layout of the Soil Mix elements shall be by the Contractor.

5. Daily records shall be maintained by the Contractor per Paragraph 1.5D.

B. SM Treated Soil Continuity And Depth

1. The Contractor shall be responsible for demonstrating to the satisfaction of the EPA COR or designee that the work is continuous and achieves the minimum specified depth. The EPA COR or designee will be available on site to verify these measurements. SM continuity shall be assured by an overlapping pattern of the SM columns constructed in accordance with these specifications.

C. Tests

1. Grout

If grout is used, a series of tests shall be conducted at the mixer or holding tank containing fresh grout ready for injection into the soil. Tests shall include density to ensure that the specified design mix is properly prepared for injection into the soils.

2. Soil Mixed Material – Field Penetration Testing

a. During the course of the work, one location each day of treatment operations will be subjected to a Field Penetration Test to obtain a measure of strength. Probe testing shall be done on these selected locations to provide a record of force with depth.

3. Soil Mixed Material – Laboratory Testing

   a. Samples of the soil mixed materials shall be obtained with the in situ sampler, formed into test cylinders, cured and tested. A series of test cylinders shall be made once for the first 250 cubic yards treated and then once for every 1000 cubic yards treated.

   b. Treated batch samples shall be obtained within 2 hours of completion of mixing. Samples shall be taken at two depth intervals, representing approximately 20% and 80% of the depth interval treated for the column/cell. Four test cylinders shall be prepared from the sample from each depth interval. The Soil Mixing Contractor shall perform the following quality control tests for each sample depth interval:

      - After curing for seven (7) days, one shall be subjected to an unconfined compressive strength test in accordance with ASTM D 4832
      - After curing for twenty-eight (28) days, one shall be subjected to an unconfined compressive strength test in accordance with ASTM D 4832.
      - After curing for twenty-eight (28) days, one shall be subjected to permeability testing in a triaxial type permeability cell in accordance with ASTM D 5084.
      - The fourth test cylinder shall be held for additional testing as may be required.

D. Documentation

All quality control records, tests, and inspections shall be documented by the Contractor and available for review by the EPA COR or their designee. The Contractor shall record all measurements and test results for submittal to the EPA COR each day. During construction, records shall be maintained by the Contractor for all test results, descriptions, measurements, and inspections performed to ascertain that the treated soil meets the specifications.

3.6. CLEAN-UP AND TREATMENT FOR TOP OF SM CONSTRUCTION

A. The top surface of the treated soil shall be shaped while the material is workable, and the top elevation shall achieve the target top elevation (Figure 1) with a tolerance of + 0.5 feet. The Contractor is responsible for final shaping of the treated soil to meet this requirement.

B. Upon completion of the SM construction, the Contractor shall remove all unused raw materials, including grout, from the site. ERRS will manage swell material that has been placed in the location designated by the ERRS Site Manager. The Contractor shall remove all swell material that has not been properly managed by the Contractor.

End of Section

ATTACHMENTS

The following documents are attached to this performance specification and considered part of the specification document:

- Figure 1 – Soil Mixing Ground Improvement Area Site Plan (2/15/12)
- Appendix A – Boring Logs
- Appendix B – Geotechnical Laboratory Test Results
- Appendix C – Soil Mixing Bench-Scale Laboratory Scope of Work
- Appendix D – Soil Mixing Bench-Scale Laboratory Report Data

REVISION HISTORY

Revision 0, 30 January 2012 – Original issue.

Revision 1, 2 February 2012 – Miscellaneous revisions to clarify division of responsibility.

Revision 2, 7 March 2012 – Added Appendix D, Added revised Figure 1 previously distributed.

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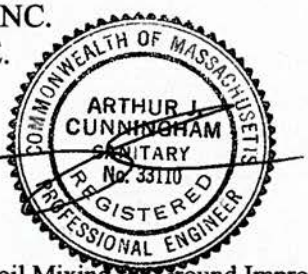
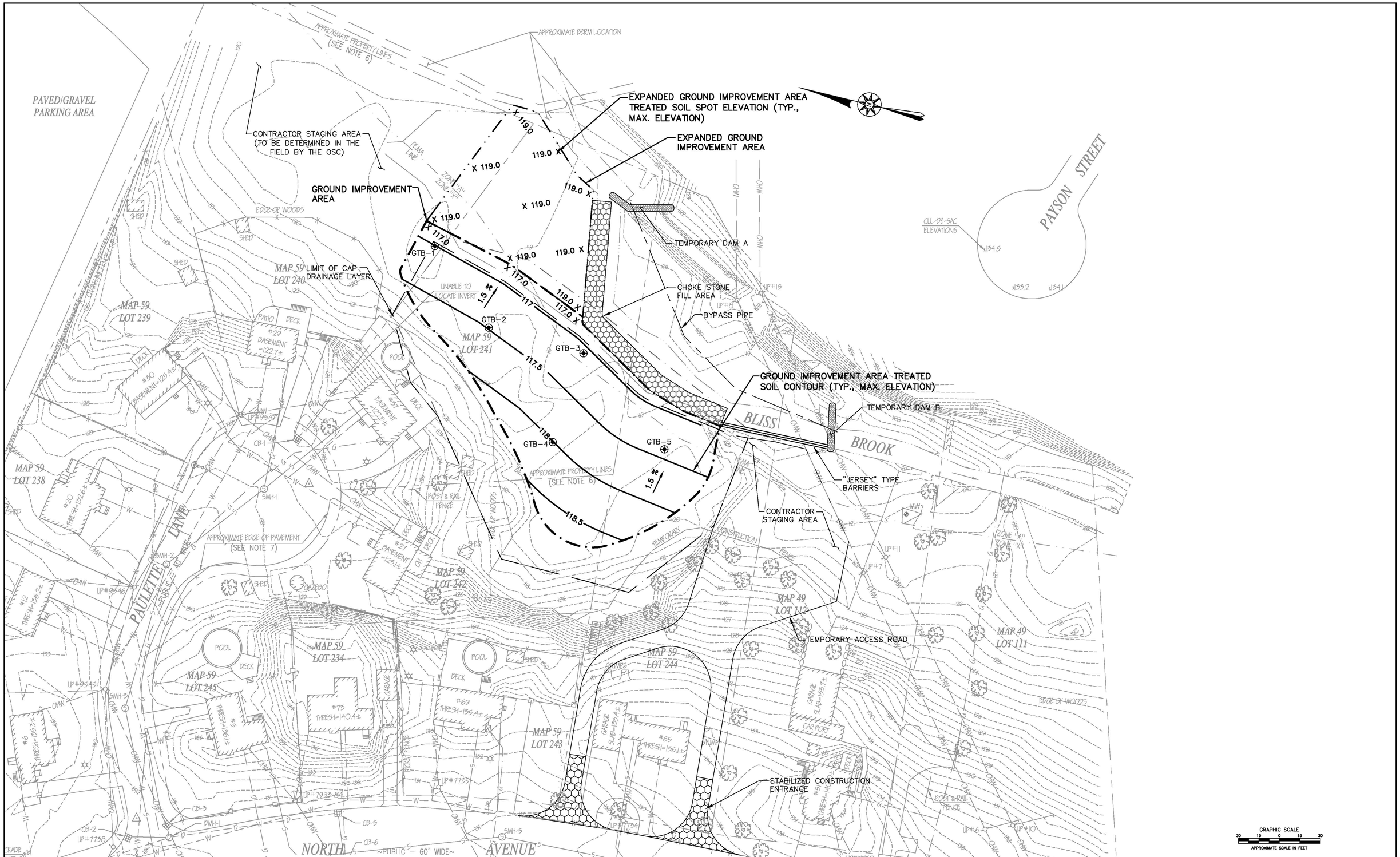


FIGURE 1

SOIL MIXING GROUND IMPROVEMENT AREA SITE PLAN



NO.	DATE	APPR.	REVISION
C	2/15/12	A.J.C.	REVISED/ADDED STAGING AREA, REVISED LIMIT OF GROUND IMPROVEMENT AREA
B	1/30/12	A.J.C.	ISSUE FOR BID
A	10/24/11	A.J.C.	INITIAL ISSUE

TIME CRITICAL REMOVAL ACTION AND SITE RESTORATION
WALTON AND LONSBURY SITE–ATTLEBORO, MASSACHUSETTS
U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 1
CONTRACT NUMBER EP–W–05–04
TASK ORDER NUMBER 0003

WESTON SOLUTIONS
CONCORD NEW HAMPSHIRE

		DATE
CHECKED	L.J.B.	JAN 2012
DES. ENG.	T.A.C.	JAN 2012
PROJ. ENG.	A.J.C.	JAN 2012
PROJ. MGR.	E.D.A.	JAN 2012
APPROVED	A.J.C.	JAN 2012
APPROVED		

CLIENT APPROVALS — DATE

ISSUED FOR — DATE

SOIL MIXING GROUND IMPROVEMENT AREA SITE PLAN

DRAWN	DATE	FIGURE NO.	REV. NO.
TAC	OCT 2011	1	C
SCALE	W.O. NO.		
AS SHOWN	20114.062.003	SHT. ____ OF ____	

APPENDIX A

BORING LOGS

WESTON SOLUTIONS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

DRILL RIG BORING LOG

BORING No. GTB–01

PROJECT: WALTON AND LONSBURY SITE, ATTLEBORO, MASSACHUSETTS
SHEET No. 1 **OF** 2
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
TDD NO. 01–09–06–0002
BORING CONTRACTOR: NEW HAMPSHIRE BORING
ELEVATION: 119.0 feet

GROUNDWATER:					CAS.	SAMP.	CORE	TUBE
DATE	TIME	WATER ELEVATION	SCREEN	TYPE		SS		
8/10/11	--	--	NA	DIA.		2"		
				WT.		140 lb.		
				FALL		30"		

DATE STARTED: 10 August 2011
DATE FINISHED: 10 August 2011
OPERATOR: Walter Hoeckele
ASSISTANT: Dan Strickland
GEOLOGIST: George Mavris

WELL CONST.	DEPTH (FEET)	SPLIT SPOON NO.	BLOW COUNTS (N)	REC. (In.)	CLASSIFICATION	SOIL TYPE/ CLAY CONSISTENCY	PHOTOGRAPH NUMBER
	0	1	WH/1	9	Weight of hammer pushed split spoon 1 foot and 1 blow advanced split spoon 2 feet. 0 –9 " Dark brown, CLAY, little silt, spongy (organic). Wet. P = 0.25. Augers sank to 3 feet, no split spoon sample collected.	Very Soft	100–0076
	3	2	1–0–1–1	14	0 –6 " Dark brown, CLAY, little silt, spongy (organic). Wet. P = 0. 6 –14 " Black, CLAY, little silt and roots (organic). Wet. P = 0.50. Augers sank to 6.3 feet.	Very Soft	100–0077
	7	3	NA	19	Split spoon hydraulically pushed from 6.3 – 7 feet. 0 – 15" Slough. 15 – 19" Dark brown, CLAY, little silt, trace roots, spongy (organic). Wet. P = 0.75.	Very Soft	100–0078
SAND PACK	10	NA	NA	NA	Augers sank to 7.0 feet. Inserted Shelby Tube and lowered into boring.Shelby Tube sank to 7.65 feet. Not known if any soil went into Shelby Tube as it sank, therefore Shelby Tube was hydraulically pushed only 1.75 feet, from7.65 – 9.4 feet. Approximately 29 inches recovery (organic clay and silt). Bottom of Shelby Tube contained ~0.5 inches of greenish–gray clay.	Very Soft	NA
	12	4	WR/1	10	Augered to 10 feet. Augers sank to 11.3 feet. One blow advanced split spoon to 12 feet. 0 – 10" Greenish–gray, CLAY, little silt, trace fine gravel. Wet. P = 0.25.	Very Soft	NA

WESTON SOLUTIONS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

DRILL RIG BORING LOG

BORING No. GTB–01

PROJECT: WALTON AND LONSBURY SITE, ATTLEBORO, MASSACHUSETTS
SHEET No. 2 **OF** 2
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
TDD NO. 01–09–06–0002
BORING CONTRACTOR: NEW HAMPSHIRE BORING
ELEVATION: 128.5 feet

GROUNDWATER:					CAS.	SAMP.	CORE	TUBE
DATE	TIME	WATER ELEVATION	SCREEN	TYPE		SS		
8/10/11	--	--	NA	DIA.		2"		
				WT.		140 lbs.		
				FALL		30"		

DATE STARTED: 4 August 2011
DATE FINISHED: 5 August 2011
OPERATOR: Walter Hoeckele
ASSISTANT: Dan Strickland
GEOLOGIST: George Mavris

WELL CONST.	DEPTH (FEET)	SPLIT SPOON NO.	BLOW COUNTS (N)	REC. (In.)	CLASSIFICATION	SOIL TYPE/ CLAY CONSISTENCY	PHOTOGRAPH NUMBER
	12	5	WH/WR–2–8–6	13	Augered to 12 feet. Split spoon sank to 12.8 feet. 0 – 11" Greenish–gray, CLAY, little silt (more silt between 8 – 11"), Wet. P = 0.25. 11– 13" Orange–brown, very coarse–to–fine SAND, Trace coarse gravel and silt. Wet	Medium Stiff	100–0079
	13						
	14	6	9–6–9–10	9	0 – 3 " Slough. 3 – 9" Light brown, very coarse–to–fine SAND and coarse–to–fine gravel (angular granitic gravel). Wet.	Medium Dense	100–0080
	15						
	16	7	8–8–7–9	8	0 – 8" Light brown, very coarse–to–fine SAND, trace coarse–to–fine gravel (angular red–granitic gravel). Wet.	Medium Dense	100–0081
	17						
	18	8	4–7–9–9	9	0 – 4 " Slough. 4 – 9" Brown, very coarse–to–fine SAND, little coarse–to–fine gravel, trace silt. Wet. EOB = 20 feet.	Medium Dense	100–0082
	19						
	20				NOTES: 1) Burmeister Soil Classification System. 2) Water added to augers to control running sands. 3) Collected soil samples from each interval and placed in zip–lock bag for potential future evaluation. 4) P = Penetrometer reading with foot attachment, in units of Kilograms per square centimeter (Kg/cm^2). 5) WH = Weight of hammer. 6) WR = Weight of rods 7) NA = Not applicable 8) EOB = End of Boring.		

WESTON SOLUTIONS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

DRILL RIG BORING LOG

BORING No. GTB–02

PROJECT: WALTON AND LONSBURY SITE, ATTLEBORO, MASSACHUSETTS
SHEET No. 1 **OF** 2
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
TDD NO. 01–09–06–0002
BORING CONTRACTOR: NEW HAMPSHIRE BORING
ELEVATION: 119.5 feet

GROUNDWATER:					CAS.	SAMP.	CORE	TUBE
DATE	TIME	WATER ELEVATION	SCREEN	TYPE		SS		
8/9/11	--	--	NA	DIA.		2"		
				WT.		140 lb.		
				FALL		30"		

DATE STARTED: 9 August 2011
DATE FINISHED: 10 August 2011
OPERATOR: Walter Hoeckele
ASSISTANT: Dan Strickland
GEOLOGIST: George Mavris

WELL CONST.	DEPTH (FEET)	SPLIT SPOON NO.	BLOW COUNTS (N)	REC. (In.)	CLASSIFICATION	SOIL TYPE/ CLAY CONSISTENCY	PHOTOGRAPH NUMBER
	0	1	0–1–0–1	2	0 –2 " Dark brown and black, SILT and CLAY, trace roots, spongy (organic). Wet. Recovered in tip of split spoon.	Very Soft	NA
	2	2	0–1–0–2	0	No Recovery.	Very Soft	NA
GROUT	4	Shelby Tube	NA	NA	Augered to 4 feet and hydraulically pushed Shelby Tube from 4 – 6 feet. Approximately 20 inches recovery (organic clay and silt).	NA	NA
	6	3	WR–15–16–12	24	0 – 5" Slough. 5 – 8" Black, CLAY, little silt, trace roots, spongy (organic). Wet. P = 0.25. 8 – 17" Greenish–gray, CLAY. Wet. P = 0. 17 – 22" Light brown and reddish–brown, fine SAND. Wet. 22 – 24" Light brown, very coarse–to–fine SAND, some coarse–to–fine gravel. Wet.	Dense	100–0070
	8	4	9–10–15–18	5	0 – 5" Light brown, very coarse–to–fine SAND, little fine–to–coarse gravel, trace silt. Wet.	Medium Dense	NA
	10	5	9–8–7–10	4	0 – 4" Light brown, very coarse–to–fine SAND, trace fine–to–coarse gravel and silt. Wet.	Medium Dense	100–0071
	12						

WESTON SOLUTIONS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

DRILL RIG BORING LOG

BORING No. GTB-02

PROJECT: WALTON AND LONSBURY SITE, ATTLEBORO, MASSACHUSETTS
SHEET No. 2 OF 2
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
TDD NO. 01-09-06-0002
BORING CONTRACTOR: NEW HAMPSHIRE BORING
ELEVATION: 119.5 feet

GROUNDWATER:					CAS.	SAMP.	CORE	TUBE
DATE	TIME	WATER ELEVATION	SCREEN	TYPE		SS		
8/10/11	--	--	NA	DIA.		2"		
				WT.		140 lbs.		
				FALL		30"		

DATE STARTED: 9 August 2011
DATE FINISHED: 10 August 2011
OPERATOR: Walter Hoeckele
ASSISTANT: Dan Strickland
GEOLOGIST: George Mavris

WELL CONST.	DEPTH (FEET)	SPLIT SPOON NO.	BLOW COUNTS (N)	REC. (In.)	CLASSIFICATION	SOIL TYPE/ CLAY CONSISTENCY	PHOTOGRAPH NUMBER
	12	6	9-9-14-38	12	0 - 2" Light brown, very coarse-to-fine SAND, little fine-to-coarse gravel and silt. Wet. 2 - 3" Light brown, very fine SAND, trace silt. Wet. P = 2.5. 3 - 12" Same as 0 - 2-inch interval.	Medium Dense	100-0072
	13						
	14	7	9-8-9-9	7	0 - 7" Brown, very coarse-to-fine SAND, some coarse-to-fine gravel (angular), trace silt. Wet.	Medium Dense	100-0073
	15						
	16	8	6-7-12-13	0	Split spoon advanced to 17.4 feet. No recovery (all slough).	Medium Dense	NA
	17						
	18	9	4-9-10-22	12	Split spoon advanced from 17.4 - 20 feet. 0 - 3" Slough. 3 - 12" Brown, very coarse-to-fine SAND, little coarse-to-fine gravel, trace silt. Wet. P = 1.5. EOB = 20 feet.	Medium Dense	100-0075
	19						
	20				NOTES: 1) Burmeister Soil Classification System. 2) Water added to augers to control running sands. 3) Collected soil samples from each interval and placed in zip-lock bag for potential future evaluation. 4) P = Penetrometer reading with foot attachment, in units of Kilograms per square centimeter (Kg/cm^2). 5) WH = Weight of hammer. 6) WR = Weight of rods 7) NA = Not applicable. 8) EOB = End of Boring.		

WESTON SOLUTIONS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

DRILL RIG BORING LOG

BORING No. GTB–03

PROJECT: WALTON AND LONSBURY SITE, ATTLEBORO, MASSACHUSETTS
SHEET No. 1 **OF** 2
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
TDD NO. 01–09–06–0002
BORING CONTRACTOR: NEW HAMPSHIRE BORING
ELEVATION: 118.5 feet

GROUNDWATER:					CAS.	SAMP.	CORE	TUBE
DATE	TIME	WATER ELEVATION	SCREEN	TYPE		SS		
8/11/11	--	--	NA	DIA.		2"		
				WT.		140 lb.		
				FALL		30"		

DATE STARTED: 11 August 2011
DATE FINISHED: 12 August 2011
OPERATOR: Walter Hoeckele
ASSISTANT: Dan Strickland
GEOLOGIST: George Mavris

WELL CONST.	DEPTH (FEET)	SPLIT SPOON NO.	BLOW COUNTS (N)	REC. (In.)	CLASSIFICATION	SOIL TYPE/ CLAY CONSISTENCY	PHOTOGRAPH NUMBER
	0	1	WR	0	Split spoon sank to 2 feet with weight of rods. No recovery.	Very Soft	NA
	1						
	2	2	WR/WH	10	0 – 10" Dark brown and black, CLAY and SILT, trace roots and leaf matter, (organic). Wet. P = 0.25. Co–located, pushed auger to 3 feet, and hydraulically pushed Shelby Tube from 3 – 5 feet. Approximately 14 inches recovery (organic clay and silt).	Very Soft	100–0083
Shelby Tube	3	Shelby Tube					
Shelby Tube	4	3 Shelby Tube	WR/WH	14	0 – 14" Dark brown and black, CLAY and SILT, trace roots and leaf matter (organic). Wet. P = 0.25. Co–located, augered to 4 feet, and inserted Shelby Tube from 4 – 6 feet. No recovery. Co–located, augered to 5 feet, and inserted Shelby Tube from 5 – 7 feet. Approximately 29 inches recovery (organic clay and silt).	Very Soft	100–0084
	5						
	6						
	7	4	WR/WH	15	0 – 9" Dark brown and black, CLAY and SILT, trace roots and leaf matter,(organic). Wet. P = 0. 9 – 15" Greenish–gray, CLAY and SILT. Wet. P = 0.50.	Very Soft	100–0101
	8						
	9	5	WR–WR–2–5	7	0 – 4" Greenish–gray and light brown CLAY and SILT. Wet. P = 0.25. 4 – 7" Light brown and orange brown, very coarse–to–fine SAND, trace fine–to–coarse gravel. Wet.	Very Soft	100–0102
	10						
	11						
	12						

WESTON SOLUTIONS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

DRILL RIG BORING LOG

BORING No. GTB-03

PROJECT: WALTON AND LONSBURY SITE, ATTLEBORO, MASSACHUSETTS
SHEET No. 2 OF 2
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
TDD NO. 01-09-06-0002
BORING CONTRACTOR: NEW HAMPSHIRE BORING
ELEVATION: 118.5 feet

GROUNDWATER:					CAS.	SAMP.	CORE	TUBE
DATE	TIME	WATER ELEVATION	SCREEN	TYPE		SS		
8/12/11	--	--	NA	DIA.		2"		
				WT.		140 lbs.		
				FALL		30"		

DATE STARTED: 11 August 2011
DATE FINISHED: 12 August 2011
OPERATOR: Walter Hoeckele
ASSISTANT: Dan Strickland
GEOLOGIST: George Mavris

WELL CONST.	DEPTH (FEET)	SPLIT SPOON NO.	BLOW COUNTS (N)	REC. (In.)	CLASSIFICATION	SOIL TYPE/ CLAY CONSISTENCY	PHOTOGRAPH NUMBER
	11	6	3-9-22-29	13	0 - 13" Light brown, fine-to-very coarse SAND, little fine-to-coarse gravel (rounded). Wet.	Dense	100-0103
	12						
	13	7	7-7-14-46	8	0 - 1" Slough. 1 - 3" Light brown, very fine SAND, trace silt. Wet. 3 - 8" Light brown, very coarse-to-fine SAND, trace, fine-to-coarse gravel and silt. Wet.	Medium Dense	100-0104
	14						
	15	8	12-9-7-12	10	0 - 1" Slough. 1 - 10" Light brown, very coarse-to-fine SAND and fine-to-coarse gravel (well sorted). Wet.	Medium Dense	100-0106 100-0107
	16						
	17	9	11-48-61-42	13	0 - 13" Light brown, very coarse-to-fine SAND, trace coarse-to-fine gravel (angular) and silt. Wet. EOB = 19 feet.	Very Dense	100-0108
	18						
	19				NOTES: 1) Burmeister Soil Classification System. 2) Water added to augers to control running sands. 3) Collected soil samples from each interval and placed in zip-lock bag for potential future evaluation. 4) P = Penetrometer reading with foot attachment, in units of Kilograms per square centimeter (Kg/cm^2). 5) WH = Weight of hammer. 6) WR = Weight of rods 7) NA = Not applicable. 8) EOB = End of Boring.		

WESTON SOLUTIONS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

DRILL RIG BORING LOG

BORING No. GTB-04

PROJECT: WALTON AND LONSBURY SITE, ATTLEBORO, MASSACHUSETTS
SHEET No. 1 **OF** 2
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
TDD NO. 01-09-06-0002
BORING CONTRACTOR: NEW HAMPSHIRE BORING
ELEVATION: 119.5 feet

GROUNDWATER:					CAS.	SAMP.	CORE	TUBE
DATE	TIME	WATER ELEVATION	SCREEN	TYPE		SS		
8/9/11	--	--	NA	DIA.		2"		
				WT.		140 lb.		
				FALL		30"		

DATE STARTED: 9 August 2011
DATE FINISHED: 9 August 2011
OPERATOR: Walter Hoeckele
ASSISTANT: Dan Strickland
GEOLOGIST: George Mavris

WELL CONST.	DEPTH (FEET)	SPLIT SPOON NO.	BLOW COUNTS (N)	REC. (In.)	CLASSIFICATION	SOIL TYPE/ CLAY CONSISTENCY	PHOTOGRAPH NUMBER
	0	1	1-3-1-0	3	0 -2 " Dark brown and black, SILT and CLAY, trace roots, spongy (organic). Wet. 2 - 3" Gray, very fine SAND and SILT. Wet. P = 2.5 .	Very Soft	NA
	2	2	2-1-2-4	7	0 - 4" Gray, medium-to-fine SAND, trace fine gravel, silt, and clay. Wet. 4 - 7" Dark gray, CLAY and SILT, trace roots. Wet. P = 0.75. Augered to 2 feet in co-location and hydraulically pushed Shelby Tube from 2 - 4 feet. No recovery.	Very Soft	NA
	4	3	1-1-1-2	10	0 - 5" Gray, CLAY and SILT, trace fine gravel and roots, spongy (organic). Wet. P = 0. 5 - 10" Greenish-gray, CLAY, some silt. Wet. P = 1.75.	Very Soft	NA
GROUT	6	Shelby Tube	NA	NA	Augered to 6 feet and hydraulically pushed Shelby Tube from 6 - 8 feet. Approximately 16 inches recovery (clay).	NA	NA
	8	4	WR-WH-3-7	24	0 - 20" Greenish-gray, CLAY and SILT. Wet. P = 0. 20 - 22" Gray (mottled, reddish-brown), CLAY and SILT. Wet. P = 0.75. 22 - 24" Light brown, very coarse-to-fine SAND, trace silt. Wet.	Very Soft	NA
	10	5	3-6-12-18	15	0 -2 " Brown, very fine SAND and SILT. Wet. P = 0.25. 2 - 6" Greenish-gray (mottled, orange-brown), CLAY and SILT. Wet. P = 0.25. 6 - 10" Brown, very coarse-to-fine SAND, little fine-to-coarse gravel. Wet. P = 0. 10- 15" Brown, fine SAND, trace fine gravel. Wet. P = 1.0.	Medium Dense	NA
	12						

WESTON SOLUTIONS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

DRILL RIG BORING LOG

BORING No. GTB–04

PROJECT: WALTON AND LONSBURY SITE, ATTLEBORO, MASSACHUSETTS
SHEET No. 2 **OF** 2
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
TDD NO. 01–09–06–0002
BORING CONTRACTOR: NEW HAMPSHIRE BORING
ELEVATION: 119.5 feet

GROUNDWATER:					CAS.	SAMP.	CORE	TUBE
DATE	TIME	WATER ELEVATION	SCREEN	TYPE		SS		
8/9/11	––	––	NA	DIA.		2"		
				WT.		140 lbs.		
				FALL		30"		

DATE STARTED: 9 August 2011
DATE FINISHED: 9 August 2011
OPERATOR: Walter Hoeckele
ASSISTANT: Dan Strickland
GEOLOGIST: George Mavris

WELL CONST.	DEPTH (FEET)	SPLIT SPOON NO.	BLOW COUNTS (N)	REC. (In.)	CLASSIFICATION	SOIL TYPE/ CLAY CONSISTENCY	PHOTOGRAPH NUMBER
	12	6	9–13–25–13	9	0 – 1" Slough. 1 – 9" Gray, very coarse–to–fine SAND, little coarse–to–fine gravel. Wet. P = 0.50.	Dense	NA
	13						
	14	7	11–41–29–34	2	0 – 2" Light brown, very coarse–to–fine SAND, trace fine gravel. Wet. Gray crystalline cobble stuck in tip of split spoon.	Very Dense	NA
	15						
	16				Auger refusal at 16.5 feet. EOB = 16.5 feet.		
	17						
	18				NOTES: 1) Burmeister Soil Classification System. 2) Water added to augers to control running sands. 3) Collected soil samples from each interval and placed in zip–lock bag for potential future evaluation. 4) P = Penetrometer reading with foot attachment, in units of Kilograms per square centimeter (Kg/cm^2). 5) WH = Weight of hammer. 6) WR = Weight of rods 7) NA = Not applicable. 8) EOB = End of Boring.		

WESTON SOLUTIONS
REGION I SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM

DRILL RIG BORING LOG

BORING No. GTB–05

PROJECT: WALTON AND LONSBURY SITE, ATTLEBORO, MASSACHUSETTS
SHEET No. 1 **OF** 1
CLIENT: U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION I
TDD NO. 01–09–06–0002
BORING CONTRACTOR: NEW HAMPSHIRE BORING
ELEVATION: 119.0 feet

GROUNDWATER:					CAS.	SAMP.	CORE	TUBE
DATE	TIME	WATER ELEVATION	SCREEN	TYPE		SS		
8/10/11	––	––	NA	DIA.		2"		
				WT.		140 lb.		
				FALL		30"		

DATE STARTED: 11 August 2011
DATE FINISHED: 11 August 2011
OPERATOR: Walter Hoeckele
ASSISTANT: Dan Strickland
GEOLOGIST: George Mavris

WELL CONST.	DEPTH (FEET)	SPLIT SPOON NO.	BLOW COUNTS (N)	REC. (In.)	CLASSIFICATION	SOIL TYPE/ CLAY CONSISTENCY	PHOTOGRAPH NUMBER
	0	1	1	3	Advance split spoon to 4 feet: 1 blow advanced split spoon 2 feet, and two additional blows advanced split spoon 1 foot each.	Very Soft	NA
	1						
	2		1/1		0 – 3" Black, CLAY and SILT, trace roots, spongy (organic). Wet.	Very Soft	NA
	3						
	4	2	WR/WH	7	0 – 3" Black, CLAY and SILT, trace roots, spongy (organic). Wet. 3 – 7" Greenish–gray, CLAY and SILT. Wet. Co–located and augered to 5 feet. Hydraulically pushed Shelby Tube from 5– 7 feet. Recovered approximately 19 inches of clay and silt layer.	Very Soft	NA
Shelby Tube	5	Shelby Tube					
	6		WR/WH–3–5–6	13	0 – 11" Greenish–gray, CLAY and SILT. Wet. 11 – 13" Orange–brown, very coarse–to–fine SAND and very coarse–to–fine gravel, trace silt. Wet	Medium Stiff	100–0109
	7	3					
	8				EOB = 8 feet.		
	9				NOTES: 1) Burmeister Soil Classification System. 2) Water added to augers to control running sands. 3) P = Penetrometer reading with foot attachment, in units of Kilograms per square centimeter (Kg/cm^2). 4) WH = Weight of hammer. 5) WR = Weight of rods 6) NA = Not applicable. 7) EOB = End of Boring.		
	10						
	11						
	12						

APPENDIX B

GEOTECHNICAL LABORATORY RESULTS

GeoTesting
EXPRESS

125 Nagog Park
Acton, MA 01720
978 635 0424 Tel
978 635 0266 Fax

Transmittal

TO:

John Burton
Weston Solutions, Inc.
3 Riverside Dr.
Andover, MA 01810

DATE: 8/25/2011	GTX NO: 11069
RE: DAS Case 0829F	

COPIES	DATE	DESCRIPTION
	8/25/2011	**August 2011 Laboratory Test Report**

REMARKS:

SIGNED: Joe Tomei, Laboratory Manager

CC:

APPROVED BY: Nancy Hubbard, Project Manager

GeoTesting
EXPRESS

Boston
Atlanta
New York

www.geotesting.com

August 25, 2011

John Burton
Weston Solutions, Inc.
3 Riverside Dr.
Andover, MA 01810

RE: DAS Case 0829F, (GTX-11069)

Dear John:

Enclosed are the test results you requested for the above referenced project. GeoTesting Express, Inc. (GTX) received six samples from you on 8/12/2011. These samples were labeled as follows:

Boring Number	Sample Number	Depth
GTB-01	D30550	7.65-9.4 ft
GTB-02	D30551	4-6 ft
GTB-03	D30552	3-5 ft
GTB-03	D30553	5-7 ft
GTB-04	D30554	6-8 ft
GTB-05	D30555	5-7 ft

GTX performed the following tests on these samples:

4 ASTM D 2216 - Moisture Content
4 ASTM D 2974 - Organic Content
4 ASTM D 422 - Grain Size Analyses with Hydrometer
4 ASTM D 4318 - Atterberg Limits
4 ASTM D 2487 - Soil Classification
2 ASTM D 854 - Specific Gravity
2 ASTM D 2435 - Incremental Consolidation
6 ASTM D 2850 - UU Triaxial Shear

The results presented in this report apply only to the items tested. This report shall not be reproduced except in full, without written approval from GeoTesting Express. The remainder of these samples will be returned to you for proper disposal. Please call me if you have any questions or require additional information. Thank you for allowing GeoTesting Express the opportunity of providing you with testing services. We look forward to working with you again in the future.

Respectfully yours,

Joe Tomei
Laboratory Manager

GeoTesting
EXPRESS

125 Nagog Park
Acton, MA 01720
978 635 0424 Tel
978 635 0266 Fax

Geotechnical Test Report

8/25/2011

GTX-11069
DAS Case 0829F Project

Prepared for:

Weston Solutions, Inc.

GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID:	---	Sample Type:	---	Tested By:	jef
Sample ID:	---	Test Date:	08/23/11	Checked By:	jdt
Depth :	---	Sample Id:	---		

Moisture Content of Soil - ASTM D 2216-05

Boring ID	Sample ID	Depth	Description	Moisture Content,%
GTB-01	D30550	7.65-9.4 ft	Moist, dark olive brown organic silt with sand	282.6
GTB-02	D30551	4-6 ft	Moist, very dark brown silty, clayey sand with gravel and organics	367.1
GTB-03	D30552	3-5 ft	Moist, very dark brown organic silt	424.6
GTB-04	D30554	6-8 ft	Moist, dark olive brown silty sand	40.8

Notes: Temperature of Drying : 110° Celsius

GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID: ---		Sample Type: ---		Tested By:	jef
Sample ID:---		Test Date:	08/19/11	Checked By:	jdt
Depth : ---		Test Id:	215029		

Moisture, Ash, and Organic Matter - ASTM D 2974

Boring ID	Sample ID	Depth	Description	Moisture Content,%	Ash Content,%	Organic Matter,%
GTB-01	D30550	7.65-9.4 ft	Moist, dark olive brown organic silt with sand	283	82.8	17.2
GTB-02	D30551	4-6 ft	Moist, very dark brown silty, clayey sand with gravel and organics	367	32.7	67.3
GTB-03	D30552	3-5 ft	Moist, very dark brown organic silt	425	76.8	23.2
GTB-04	D30554	6-8 ft	Moist, dark olive brown silty sand	41	97.8	2.2

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass;
dried to a constant mass at temperature of 110° C
Ash content and organic matter determined by Method C; dried to constant mass at temperature 440° C

GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID: ---		Sample Type: ---		Tested By:	jbr
Sample ID:---		Test Date:	08/23/11	Checked By:	jdt
Depth : ---		Test Id:	215028		

USCS Classification - ASTM D 2487-06

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
GTB-01	D30550	7.65-9.4 ft	organic silt with sand	OH	0.0	21.2	78.8
GTB-02	D30551	4-6 ft	Silty, clayey sand with gravel	SC-SM	41.7	43.1	15.2
GTB-03	D30552	3-5 ft	organic silt	OH	0.0	9.4	90.6
GTB-04	D30554	6-8 ft	Silty sand	SM	0.0	56.7	43.3

Remarks: Grain Size analysis performed by ASTM D422, results enclosed
Atterbeg Limits performed by ASTM 4318, results enclosed

GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID:	---	Sample Type:	---	Tested By:	ema
Sample ID:	---	Test Date:	08/18/11	Checked By:	jdt
Depth :	---	Test Id:	215024		

Specific Gravity of Soils by ASTM D 854-06

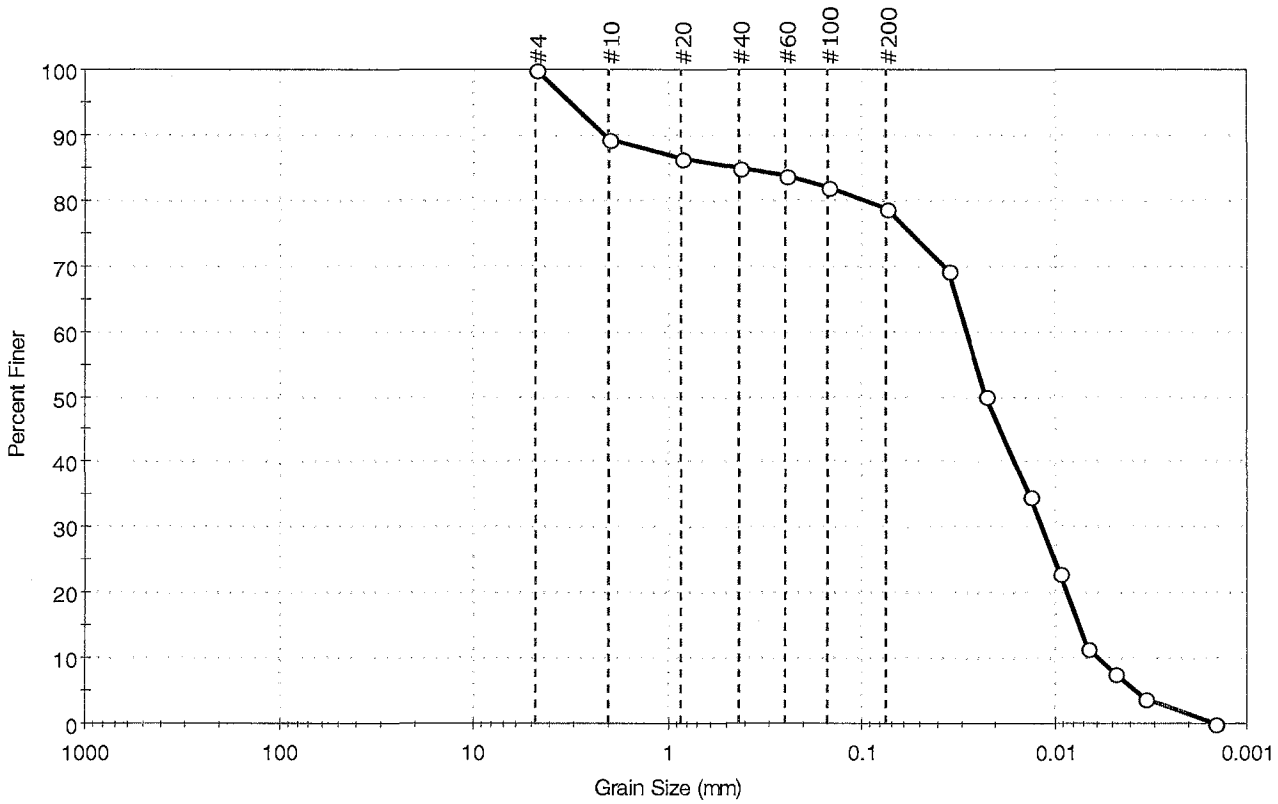
Boring ID	Sample ID	Depth	Visual Description	Specific Gravity
GTB-01	D30550	7.65-9.4 ft	Moist, dark olive brown organic silt with sand	2.1
GTB-04	D30554	6-8 ft	Moist, dark olive brown silty sand	2.6

Notes: Specific Gravity performed by using method A (oven dried specimens) of ASTM D 854
Moisture Content determined by ASTM D 2216.

GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID:	GTB-01	Sample Type:	tube	Tested By:	jbr
Sample ID:	D30550	Test Date:	08/19/11	Checked By:	jdt
Depth :	7.65-9.4 ft	Test Id:	215006		
Test Comment:	---				
Sample Description:	Moist, dark olive brown organic silt with sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	21.2	78.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	89		
#20	0.85	86		
#40	0.42	85		
#60	0.25	84		
#100	0.15	82		
#200	0.075	79		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0357	69		
---	0.0229	50		
---	0.0134	35		
---	0.0095	23		
---	0.0068	12		
---	0.0048	8		
---	0.0034	4		
---	0.0015	0		

Coefficients

D_{85} = 0.4446 mm	D_{30} = 0.0117 mm
D_{60} = 0.0288 mm	D_{15} = 0.0075 mm
D_{50} = 0.0229 mm	D_{10} = 0.0059 mm
C_u = N/A	C_c = N/A

Classification

ASTM organic silt with sand (OH)

AASHTO Clayey Soils (A-7-5 (177))

Sample/Test Description

Sand/Gravel Particle Shape :

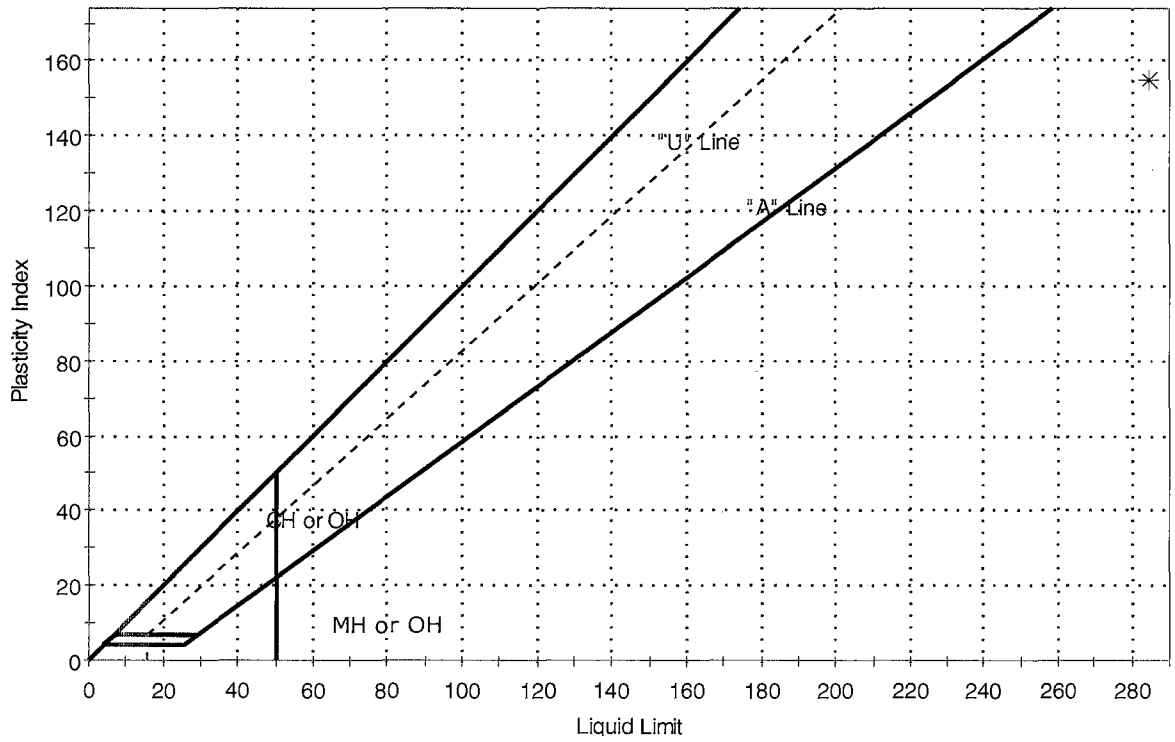
Sand/Gravel Hardness :

GeoTesting EXPRESS

Client:	Weston Solutions, Inc.		
Project:	DAS Case 0829F		
Location:		Project No:	GTX-11069
Boring ID: GTB-01	Sample Type: tube	Tested By:	cam
Sample ID:D30550	Test Date: 08/17/11	Checked By:	jdt
Depth : 7.65-9.4 ft	Test Id: 215009		
Test Comment:	---		
Sample Description:	Moist, dark olive brown organic silt with sand		
Sample Comment:	---		

Atterberg Limits - ASTM D 4318-05

Plasticity Chart



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
✳	D30550	GTB-01	7.65-9.4 ft	283	285	130	155	1	organic silt with sand (OH)

Sample Prepared using the WET method

15% Retained on #40 Sieve

Dry Strength: MEDIUM

Dilentancy: RAPID

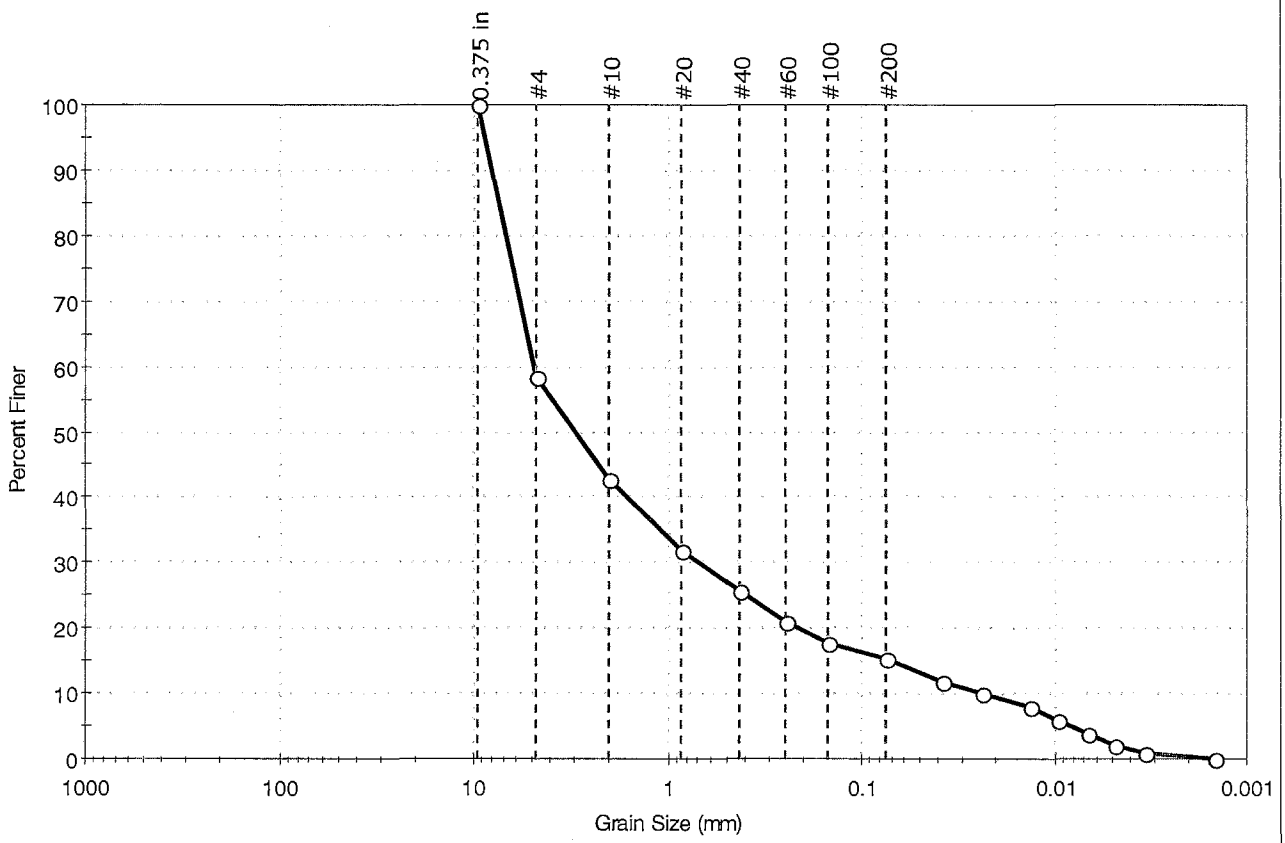
Toughness: MEDIUM

Due to a high organic content an Oven Dried Liquid Limit was peformed.
The Oven Dried Liquid Limit was determined to be non-plastic.

GeoTesting EXPRESS

Client:	Weston Solutions, Inc.		
Project:	DAS Case 0829F		
Location:		Project No:	GTX-11069
Boring ID: GTB-02	Sample Type: tube	Tested By:	jbr
Sample ID:D30551	Test Date: 08/17/11	Checked By:	jdt
Depth : 4-6 ft	Test Id: 215007		
Test Comment:	---		
Sample Description:	Moist, very dark brown silty, clayey sand with gravel and organics		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	41.7	43.1	15.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	58		
#10	2.00	43		
#20	0.85	32		
#40	0.42	26		
#60	0.25	21		
#100	0.15	18		
#200	0.075	15		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0384	12		
---	0.0236	10		
---	0.0134	8		
---	0.0096	6		
---	0.0068	4		
---	0.0048	2		
---	0.0034	1		
---	0.0015	0		

Coefficients

D_{85} =7.4044 mm	D_{30} =0.6923 mm
D_{60} =4.8876 mm	D_{15} =0.0721 mm
D_{50} =2.9870 mm	D_{10} =0.0241 mm
C_u =N/A	C_c =N/A

Classification

ASTM Silty, clayey sand with gravel (SC-SM)

AASHTO Clayey Gravel and Sand (A-2-7 (20))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : SOFT

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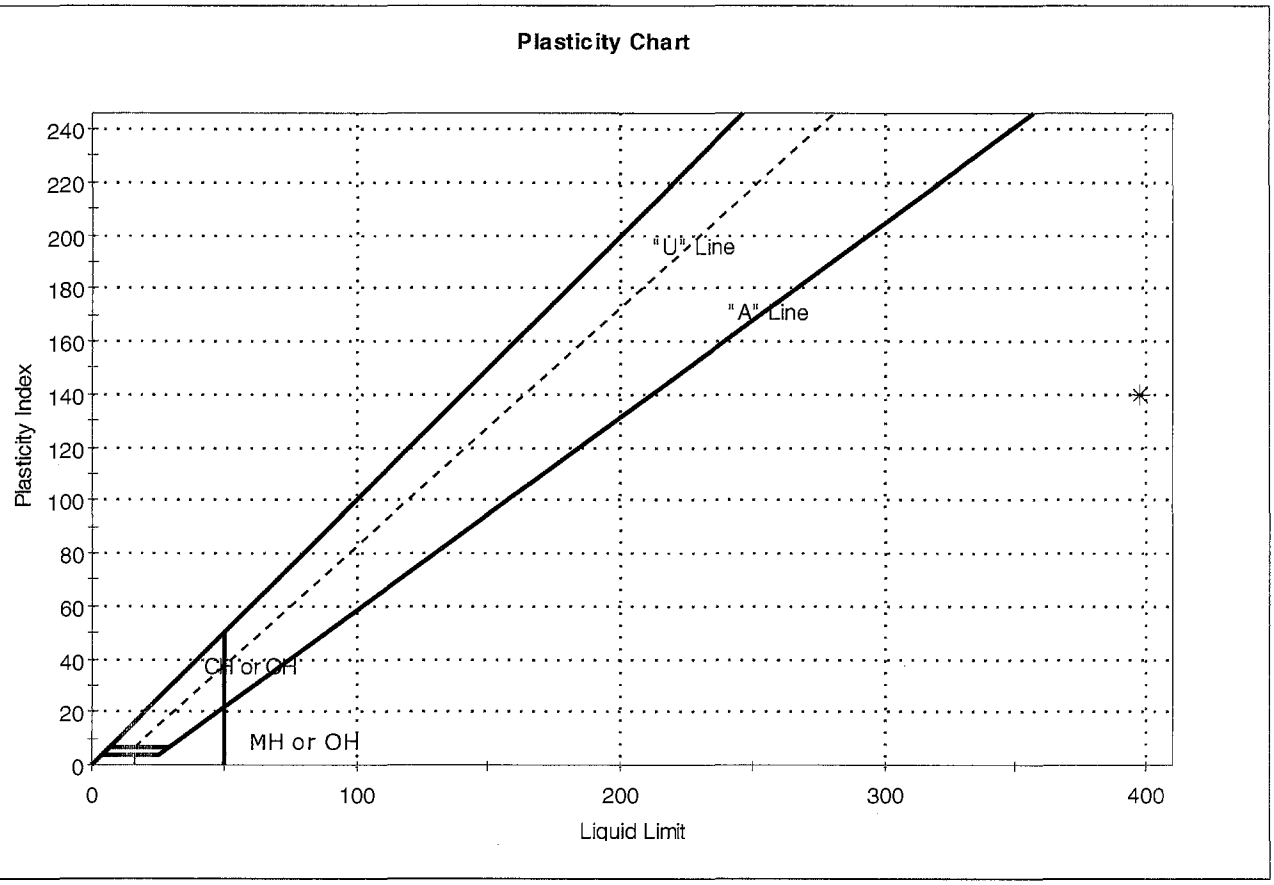
GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID:	GTB-02	Sample Type:	tube	Tested By:	cam
Sample ID:	D30551	Test Date:	08/17/11	Checked By:	jdt
Depth :	4-6 ft	Test Id:	215010		
Test Comment:	---				
Sample Description:	Moist, very dark brown silty, clayey sand with gravel and organics				
Sample Comment:	---				

Atterberg Limits - ASTM D 4318-05



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
✳	D30551	GTB-02	4-6 ft	367	398	258	140	1	Silty, clayey sand with gravel (SC-SM)

Sample Prepared using the WET method

74% Retained on #40 Sieve

Dry Strength: MEDIUM

Dilentancy: SLOW

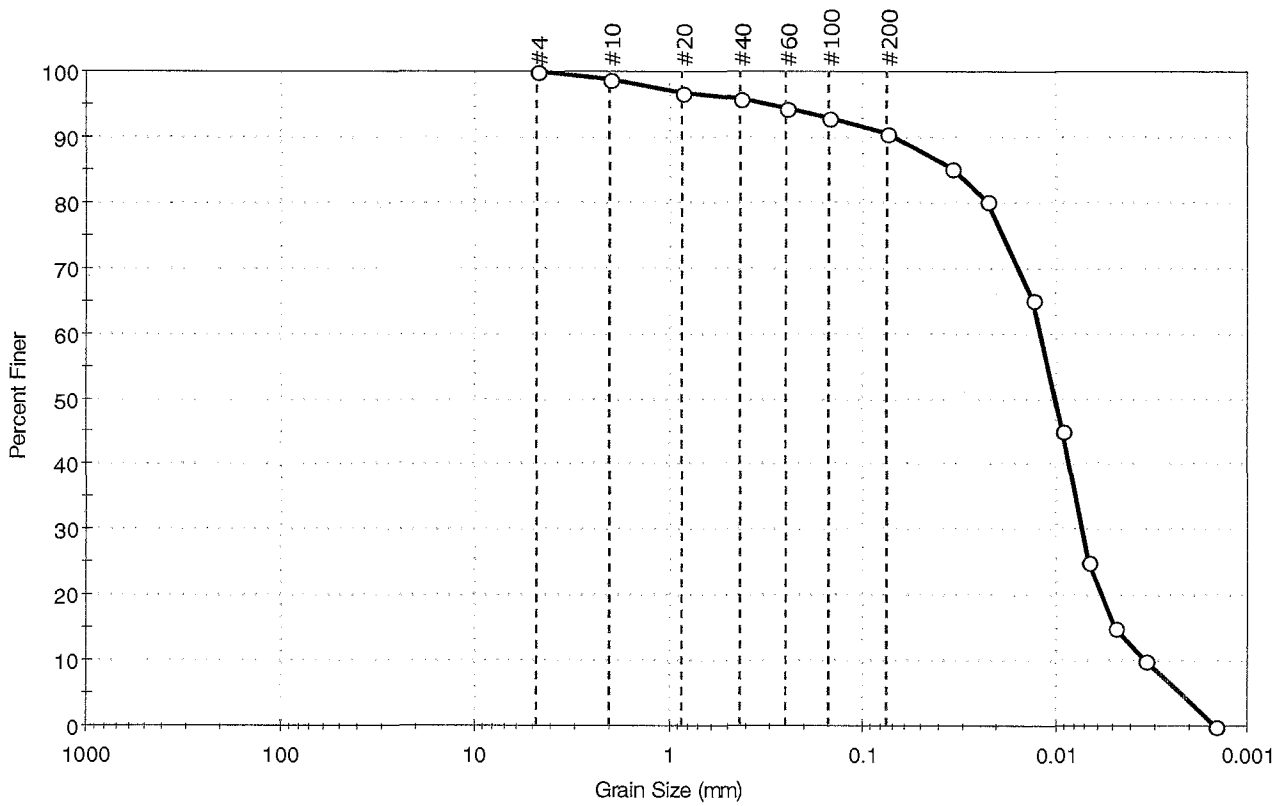
Toughness: LOW

Due to a high organic content an Oven Dried Liquid Limit was peformed.
The Oven Dried Liquid Limit was determined to be non-plastic.

GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID:	GTB-03	Sample Type:	tube	Tested By:	jbr
Sample ID:	D30552	Test Date:	08/19/11	Checked By:	jdt
Depth :	3-5 ft	Test Id:	215008		
Test Comment:	---				
Sample Description:	Moist, very dark brown organic silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



%Cobble	%Gravel	%Sand	%Silt & Clay Size
---	0.0	9.4	90.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	99		
#20	0.85	97		
#40	0.42	96		
#60	0.25	95		
#100	0.15	93		
#200	0.075	91		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0353	85		
---	0.0225	80		
---	0.0132	65		
---	0.0093	45		
---	0.0067	25		
---	0.0048	15		
---	0.0034	10		
---	0.0015	0		

Coefficients

D_{85} =0.0348 mm	D_{30} =0.0073 mm
D_{60} =0.0121 mm	D_{15} =0.0048 mm
D_{50} =0.0101 mm	D_{10} =0.0034 mm
C_u =N/A	C_c =N/A

Classification

ASTM organic silt (OH)

AASHTO Clayey Soils (A-7-5 (334))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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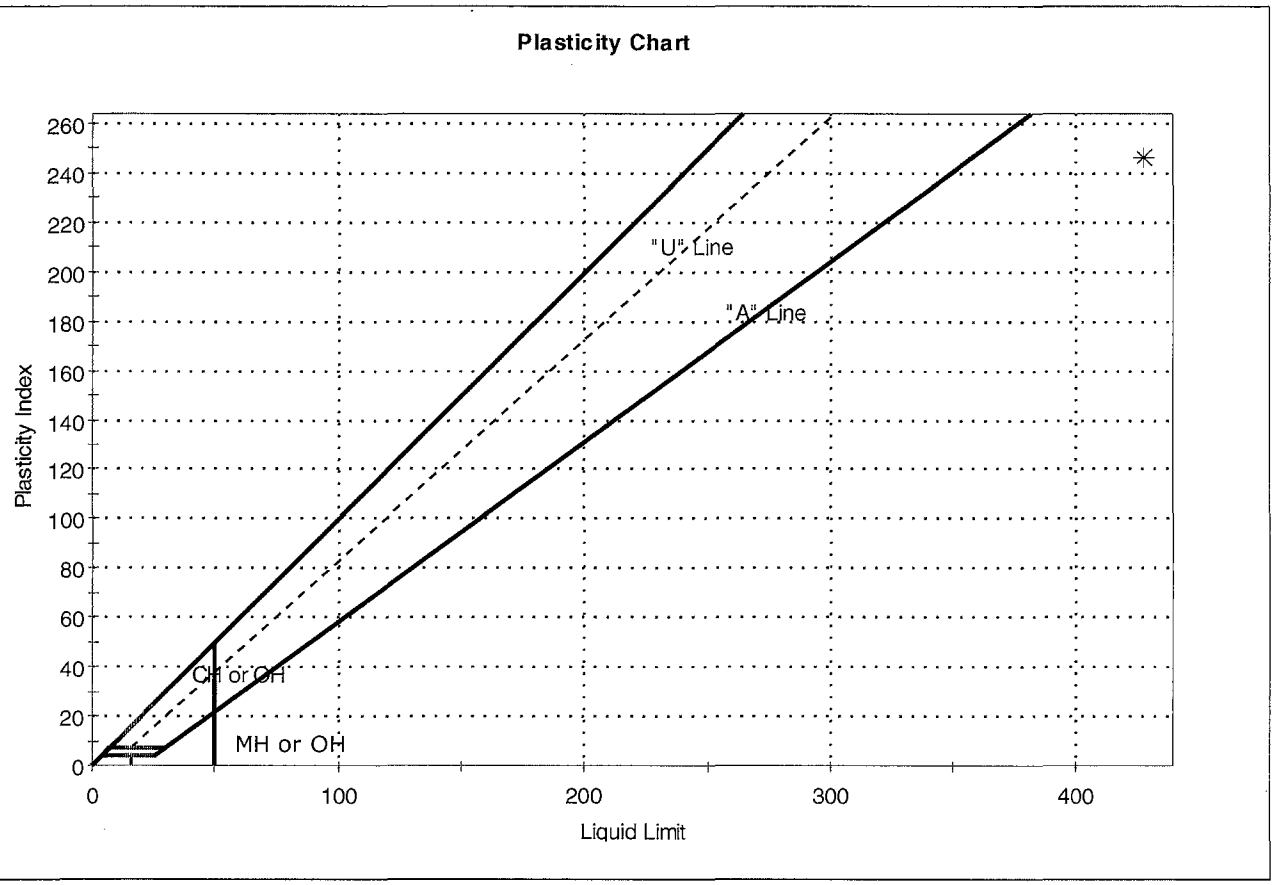
GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID:	GTB-03	Sample Type:	tube	Tested By:	cam
Sample ID:	D30552	Test Date:	08/17/11	Checked By:	jdt
Depth :	3-5 ft	Test Id:	215011		
Test Comment:	---				
Sample Description:	Moist, very dark brown organic silt				
Sample Comment:	---				

Atterberg Limits - ASTM D 4318-05



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
✳	D30552	GTB-03	3-5 ft	425	428	181	247	1	organic silt (OH)

Sample Prepared using the WET method

4% Retained on #40 Sieve

Dry Strength: MEDIUM

Dilentancy: SLOW

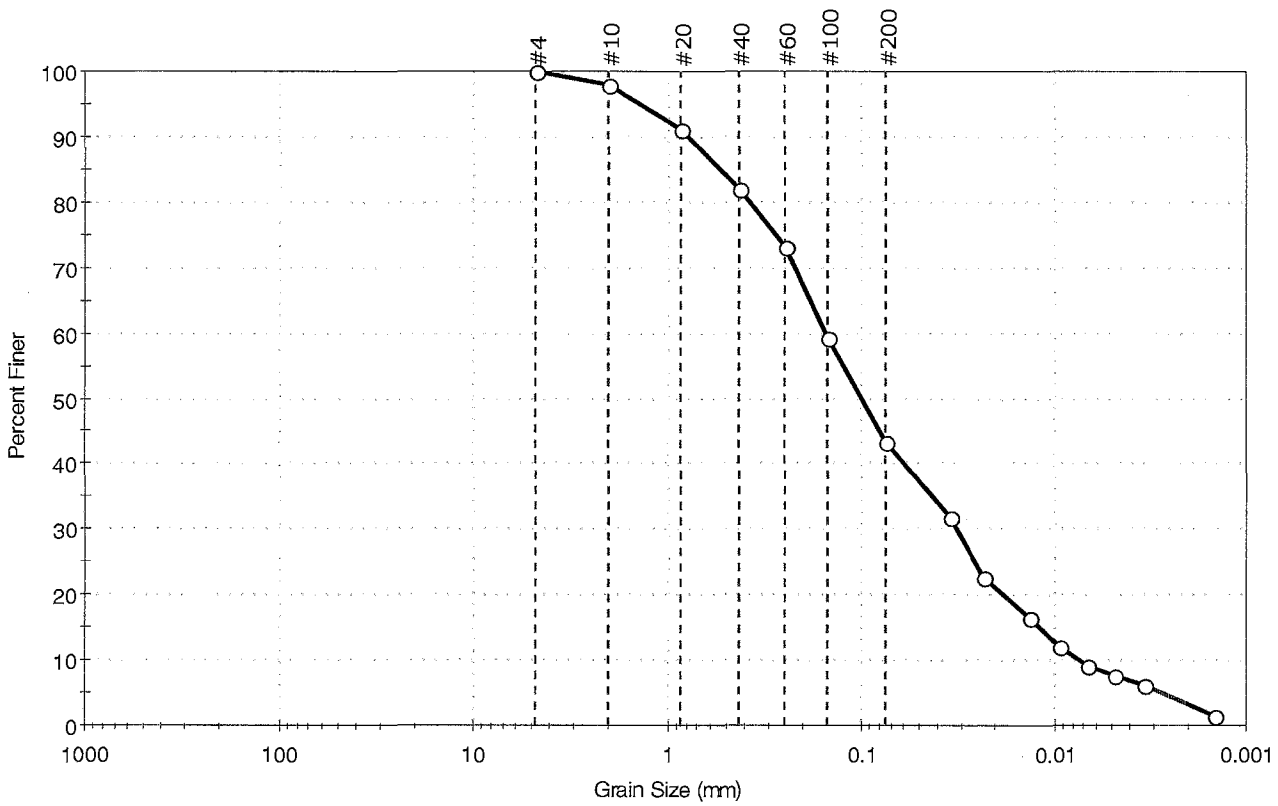
Toughness: LOW

Due to a high organic content an Oven Dried Liquid Limit was peformed.
The Oven Dried Liquid Limit was determined to be non-plastic.

GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID:	GTB-04	Sample Type:	tube	Tested By:	jbr
Sample ID:	D30554	Test Date:	08/17/11	Checked By:	jdt
Depth :	6-8 ft	Test Id:	215026		
Test Comment:	---				
Sample Description:	Moist, dark olive brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
--	0.0	56.7	43.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	98		
#20	0.85	91		
#40	0.42	82		
#60	0.25	73		
#100	0.15	59		
#200	0.075	43		
---	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0347	32		
---	0.0231	23		
---	0.0133	17		
---	0.0094	12		
---	0.0067	9		
---	0.0048	8		
---	0.0034	6		
---	0.0014	2		

Coefficients

D_{85} = 0.5315 mm D_{30} = 0.0321 mm
D_{60} = 0.1546 mm D_{15} = 0.0118 mm
D_{50} = 0.1004 mm D_{10} = 0.0075 mm
C_u = N/A C_c = N/A

Classification

ASTM Silty sand (SM)

AASHTO Silty Soils (A-4 (1))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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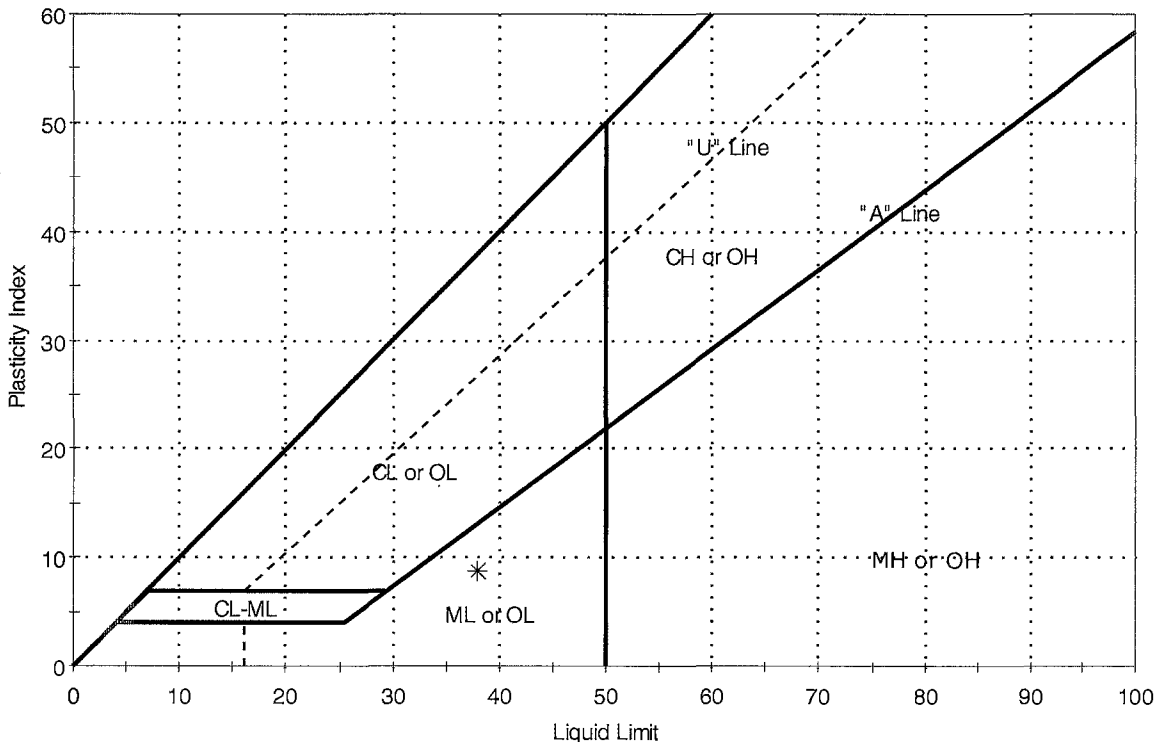
GeoTesting EXPRESS

Client:	Weston Solutions, Inc.				
Project:	DAS Case 0829F				
Location:				Project No:	GTX-11069
Boring ID:	GTB-04	Sample Type:	tube	Tested By:	cam
Sample ID:	D30554	Test Date:	08/17/11	Checked By:	jdt
Depth :	6-8 ft	Test Id:	215027		
Test Comment:	---				
Sample Description:	Moist, dark olive brown silty sand				
Sample Comment:	---				

Atterberg Limits - ASTM D 4318-05

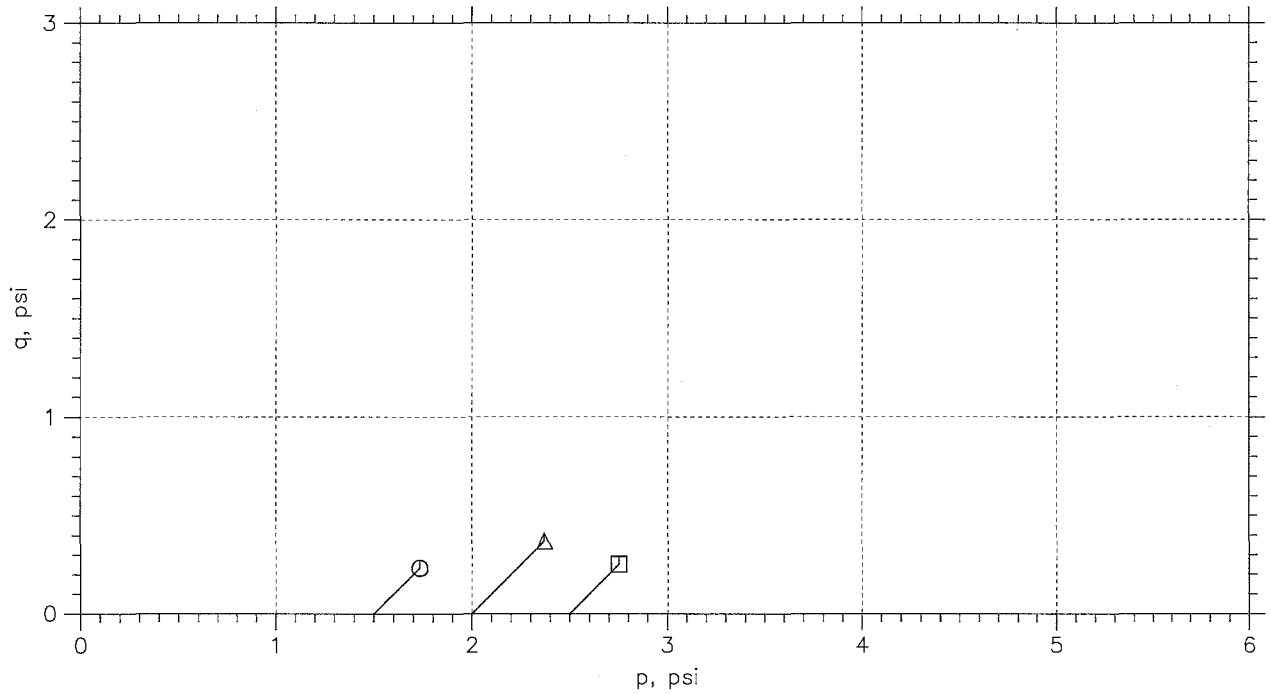
Plasticity Chart

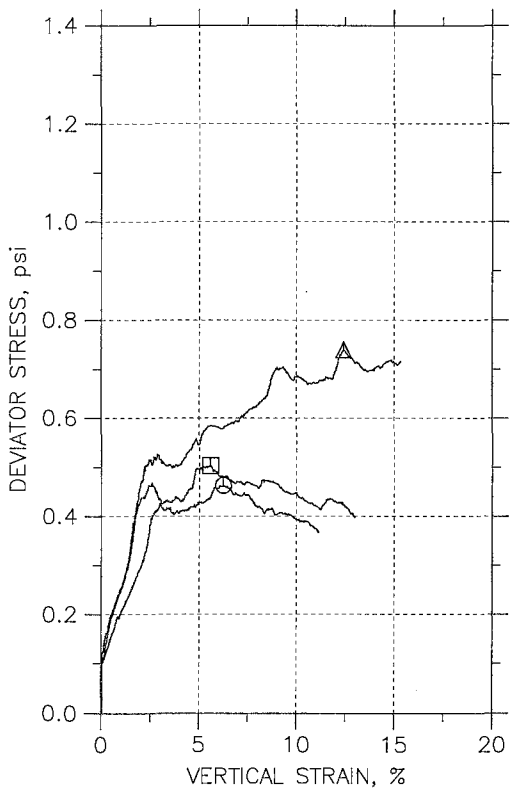


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
*	D30554	GTB-04	6-8 ft	41	38	29	9	1	Silty sand (SM)

Sample Prepared using the WET method
18% Retained on #40 Sieve
Dry Strength: MEDIUM
Dilentancy: SLOW
Toughness: MEDIUM

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⊙	△	⊡	
Sample No.	D 30553	D 30553	D 30553	
Test No.	UU-6	UU-5	UU-4	
Depth	5-7 ft	5-7 ft	5-7 ft	
Tested by	md	md	md	
Test Date	8/17/11	8/17/11	08/17/11	
Checked by	jdt	jdt	jdt	
Check Date	08/19/11	08/19/11	08/19/11	
Diameter, in	2.87	2.87	2.87	
Height, in	6.09	6	6.1	
Water Content, %	508.7	390.1	162.0	
Dry Density, pcf	10.85	14.02	27.87	
Saturation, %	94.7	95.9	87.3	
Void Ratio	14	10.6	4.82	
Confining Stress, psi	1.5	2	2.5	
Undrained Strength, psi	0.2316	0.3698	0.2516	
Max. Dev. Stress, psi	0.4631	0.7396	0.5031	
Strain at Foilure, %	6.21	12.4	5.55	
Strain Rate, %/min	1	1	1	
Estimated Specific Gravity	2.6	2.6	2.6	
Liquid Limit	---	---	---	
Plastic Limit	---	---	---	
Plasticity Index	---	---	---	

GeoTesting EXPRESS

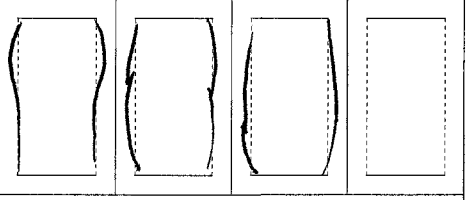
Project: DAS Case 0829F

Location: ---

Project No.: GTX-11069

Boring No.: GTB-03

Sample Type: tube



Description: Wet, brown organic silt

Remarks: System W

Phase calculations based on start and end of test.

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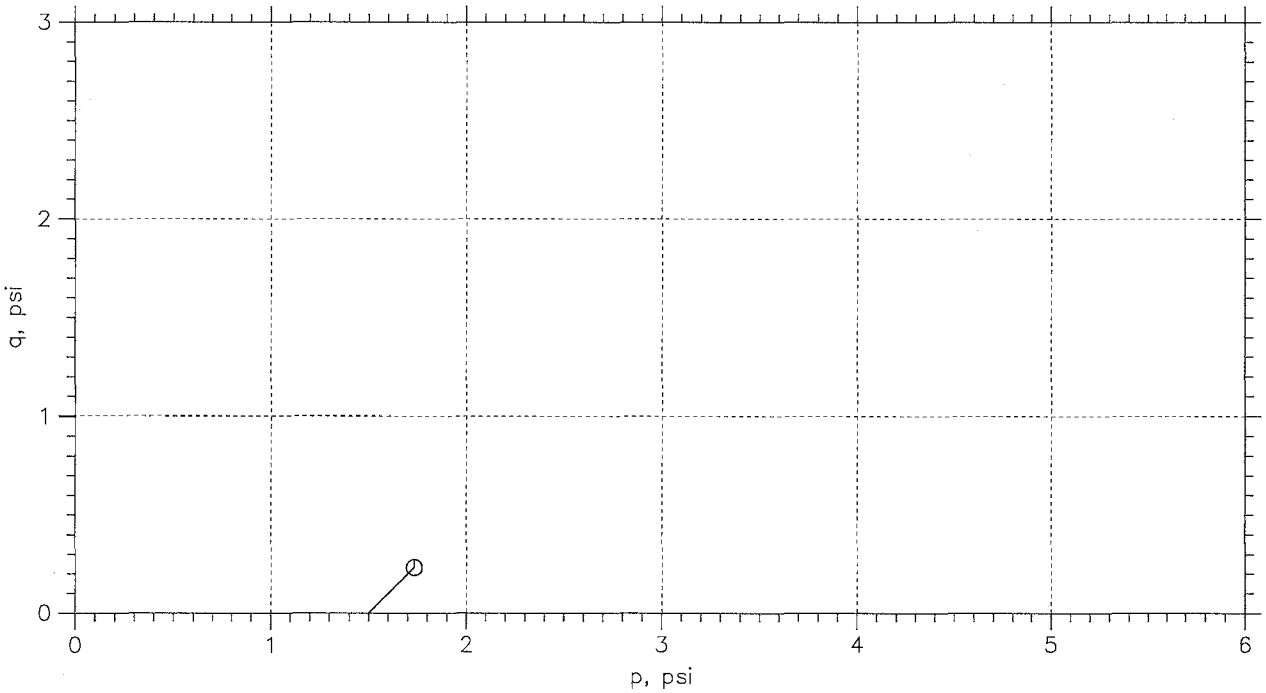
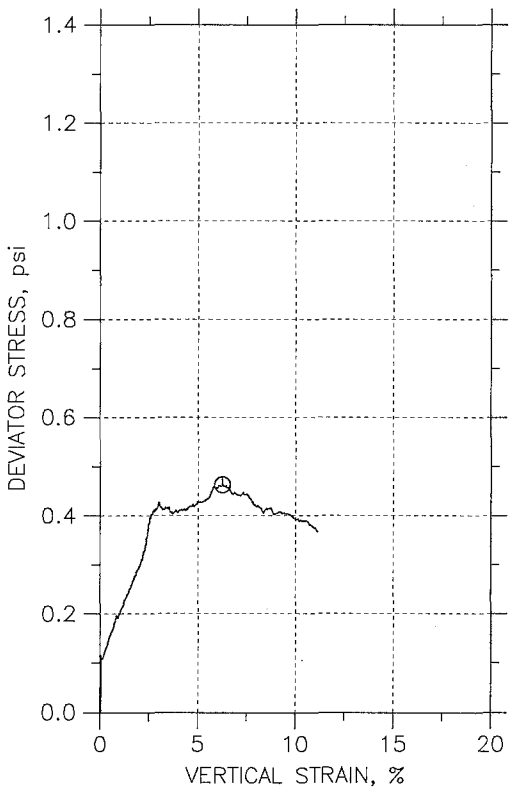
UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏀			
Sample No.	D 30553			
Test No.	UU-6			
Depth	5-7 ft			
Tested by	md			
Test Date	8/17/11			
Checked by	jdt			
Check Date	08/19/11			
Diameter, in	2.87			
Height, in	6.09			
Water Content, %	508.7			
Dry Density, pcf	10.85			
Saturation, %	94.7			
Void Ratio	14			
Confining Stress, psi	1.5			
Undrained Strength, psi	0.2316			
Max. Dev. Stress, psi	0.4631			
Strain at Failure, %	6.21			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.6			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			

GeoTesting EXPRESS

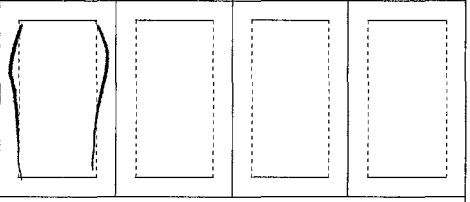
Project: DAS Case 0829F

Location: ---

Project No.: GTX-11069

Boring No.: GTB-03

Sample Type: tube



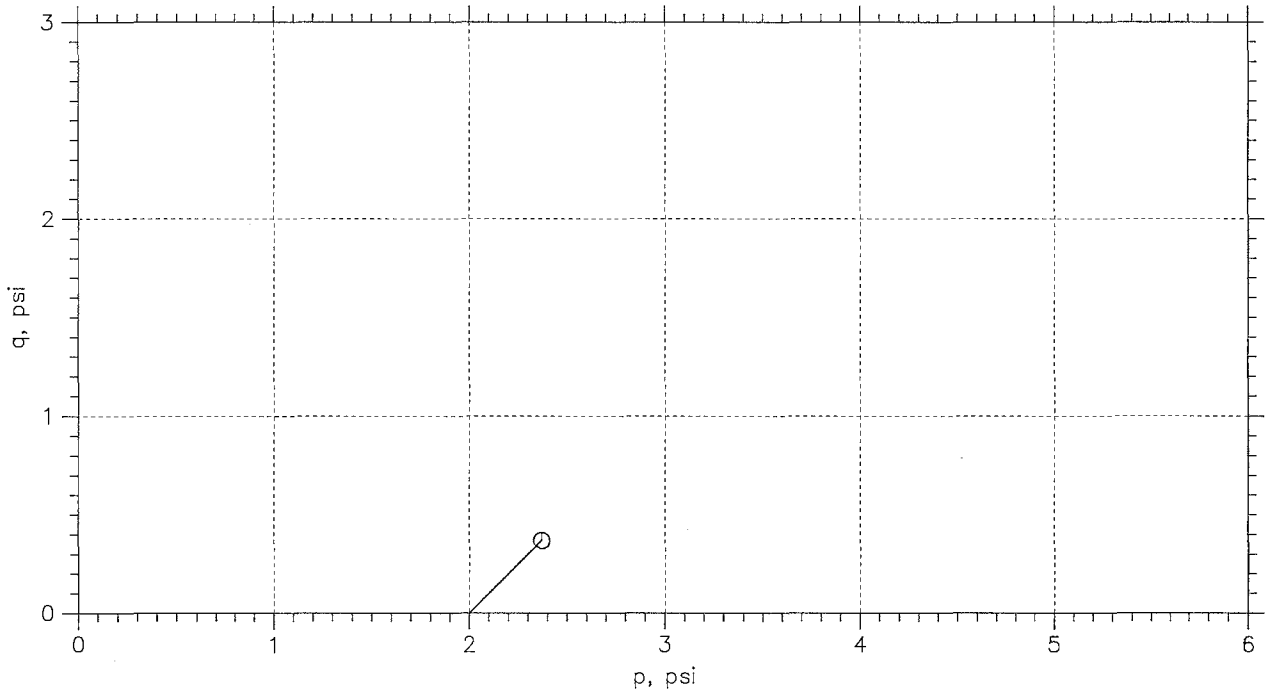
Description: Wet, brown organic silt

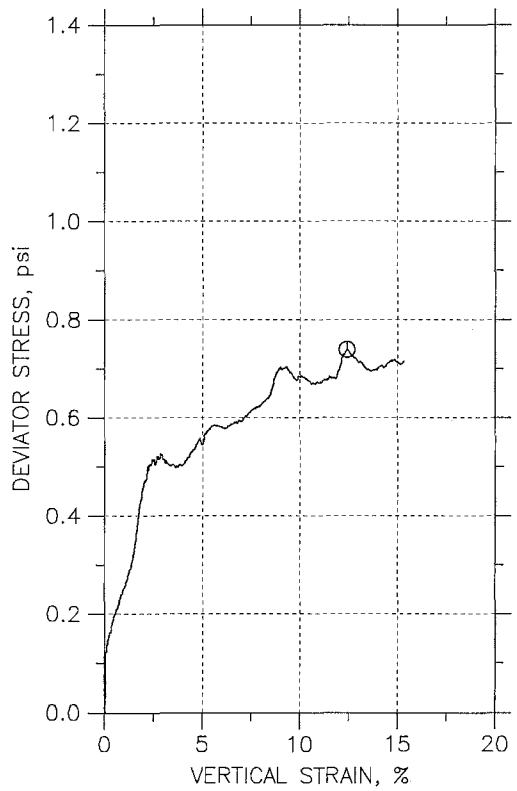
Remarks: System W

Phase calculations based on start and end of test.

Fri, 19-AUG-2011 11:19:19

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏀			
Sample No.	D 30553			
Test No.	UU-5			
Depth	5-7 ft			
Tested by	md			
Test Date	8/17/11			
Checked by	jdt			
Check Date	08/19/11			
Diameter, in	2.87			
Height, in	6			
Water Content, %	390.1			
Dry Density, pcf	14.02			
Saturation, %	95.9			
Void Ratio	10.6			
Confining Stress, psi	2			
Undrained Strength, psi	0.3698			
Max. Dev. Stress, psi	0.7396			
Strain at Failure, %	12.4			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.6			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			

GeoTesting EXPRESS

Project: DAS Case 0829F

Location: ---

Project No.: GTX-11069

Boring No.: GTB-03

Sample Type: tube

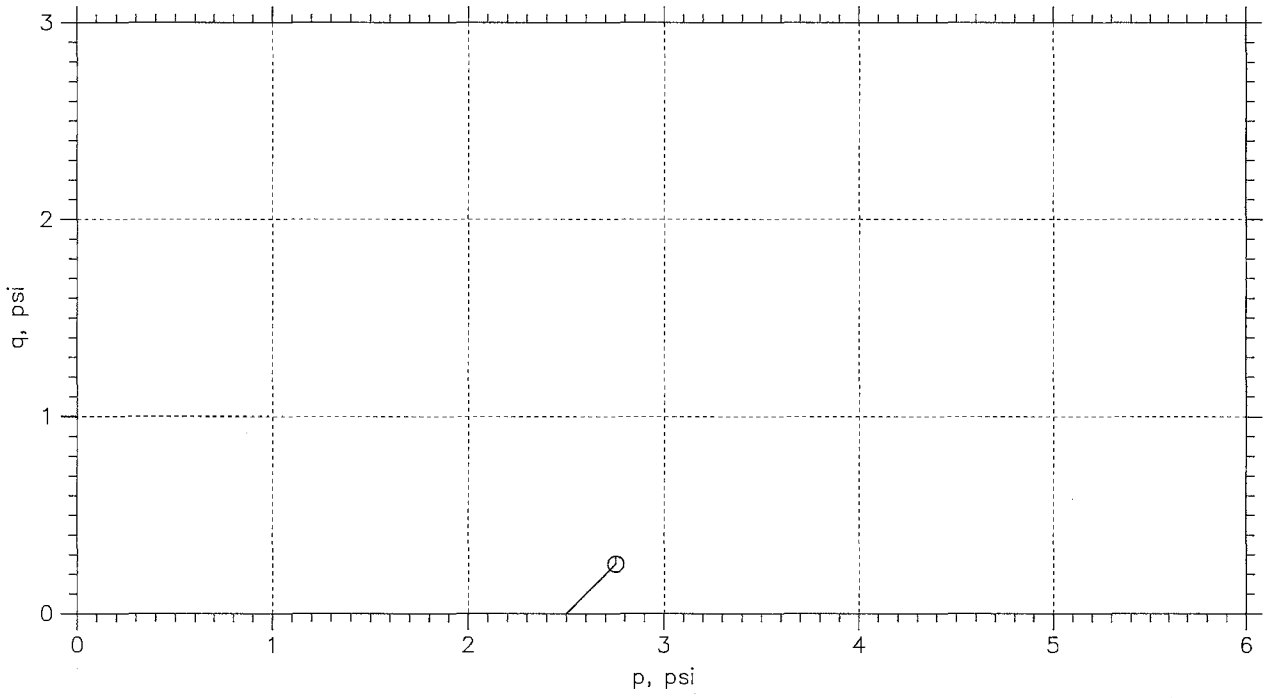
Description: Wet, brown organic silt

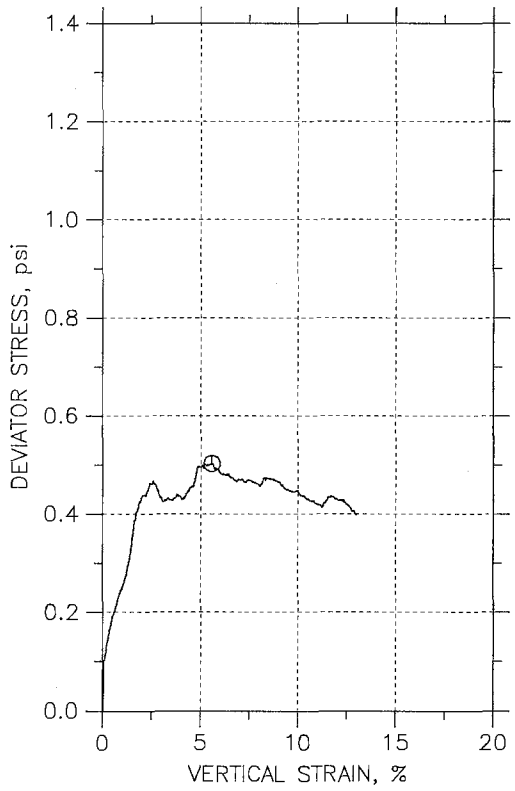
Remarks: System W

Phase calculations based on start and end of test.

Fri, 19-AUG-2011 11:18:59

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⊙			
Sample No.	D 30553			
Test No.	UU-4			
Depth	5-7 ft			
Tested by	md			
Test Date	08/17/11			
Checked by	jdt			
Check Date	08/19/11			
Diameter, in	2.87			
Height, in	6.1			
Water Content, %	162.0			
Dry Density, pcf	27.87			
Saturation, %	87.3			
Void Ratio	4.82			
Confining Stress, psi	2.5			
Undrained Strength, psi	0.2516			
Max. Dev. Stress, psi	0.5031			
Strain at Failure, %	5.55			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.6			
Liquid Limit	---			
Plastic Limit	---			
Plasticity Index	---			

GeoTesting EXPRESS

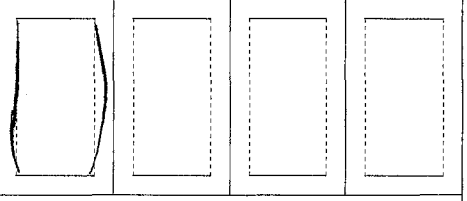
Project: DAS Case 0829F

Location: ---

Project No.: GTX-11069

Boring No.: GTB-03

Sample Type: tube



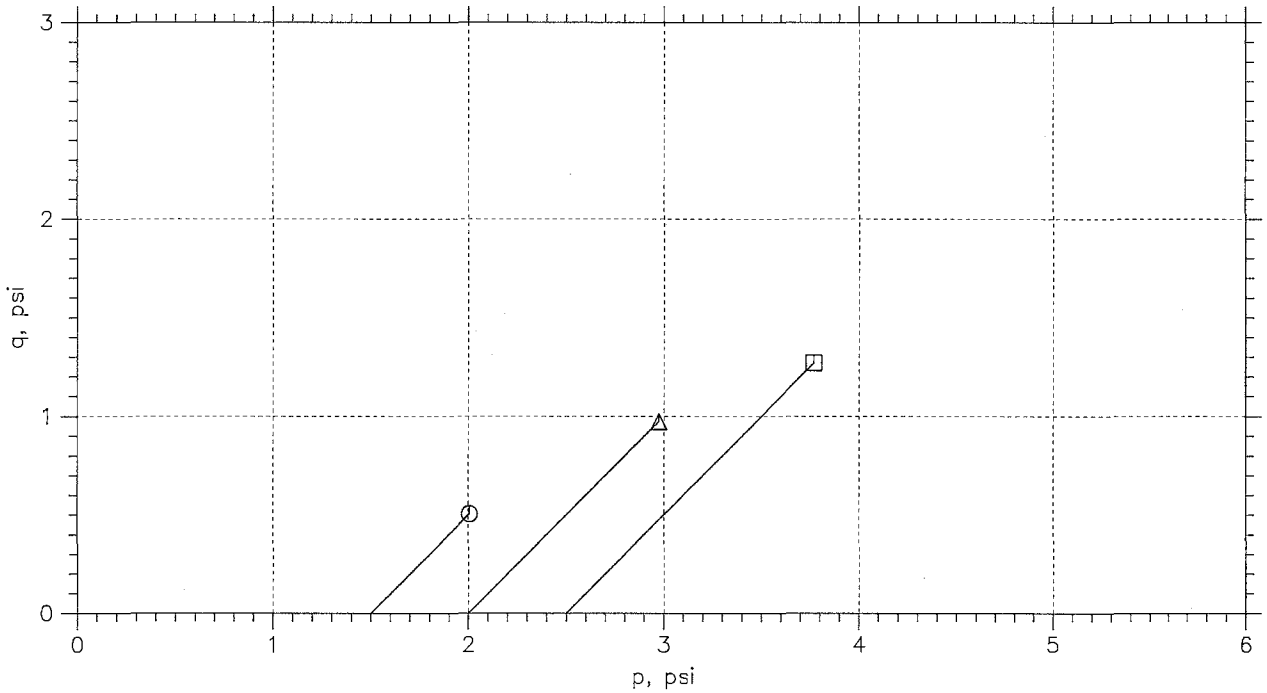
Description: Wet, brown organic silt

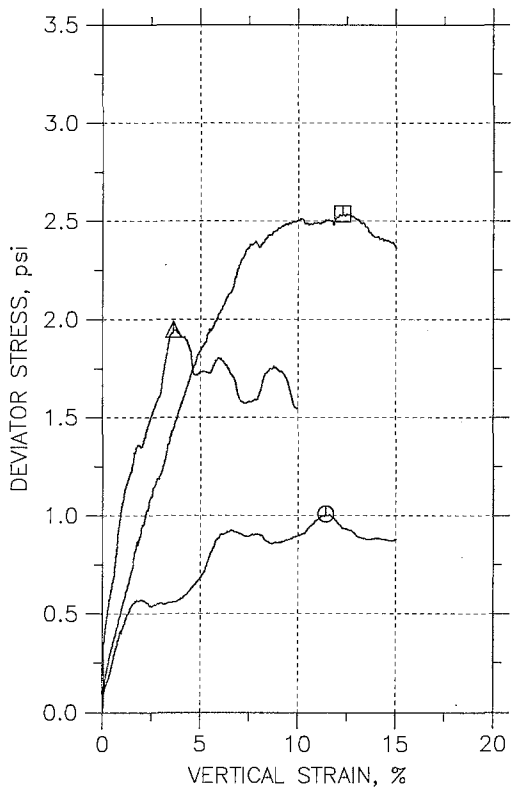
Remarks: System W

Phase calculations based on start and end of test.

Fri, 19-AUG-2011 11:18:34

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏀	△	⏍	
Sample No.	D 30554	D 30554	D 30554	
Test No.	UU-3	UU-2	UU-1	
Depth	6-8 ft	6-8 ft	6-8 ft	
Tested by	md	md	md	
Test Date	8/17/11	8/16/11	8/16/11	
Checked by	jdt	jdt	jdt	
Check Date	08/19/11	08/19/11	08/19/11	
Diameter, in	2.01	2.01	2.01	
Height, in	4.2	4.04	4.05	
Water Content, %	53.9	76.2	62.0	
Dry Density, pcf	66.96	54.1	62.12	
Saturation, %	98.4	99.0	100.0	
Void Ratio	1.42	2	1.61	
Confining Stress, psi	1.5	2	2.5	
Undrained Strength, psi	0.5046	0.9737	1.268	
Max. Dev. Stress, psi	1.009	1.947	2.537	
Strain at Failure, %	11.4	3.6	12.3	
Strain Rate, %/min	1	1	1	
Measured Specific Gravity	2.6	2.6	2.6	
Liquid Limit	38	38	38	
Plastic Limit	29	29	29	
Plasticity Index	9	9	9	

GeoTesting EXPRESS

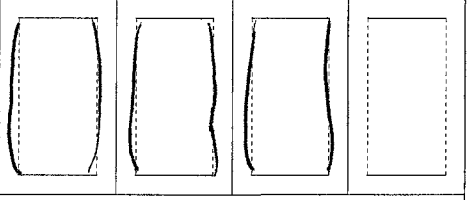
Project: DAS Case 0829F

Location: ---

Project No.: GTX-11069

Boring No.: GTB-04

Sample Type: tube

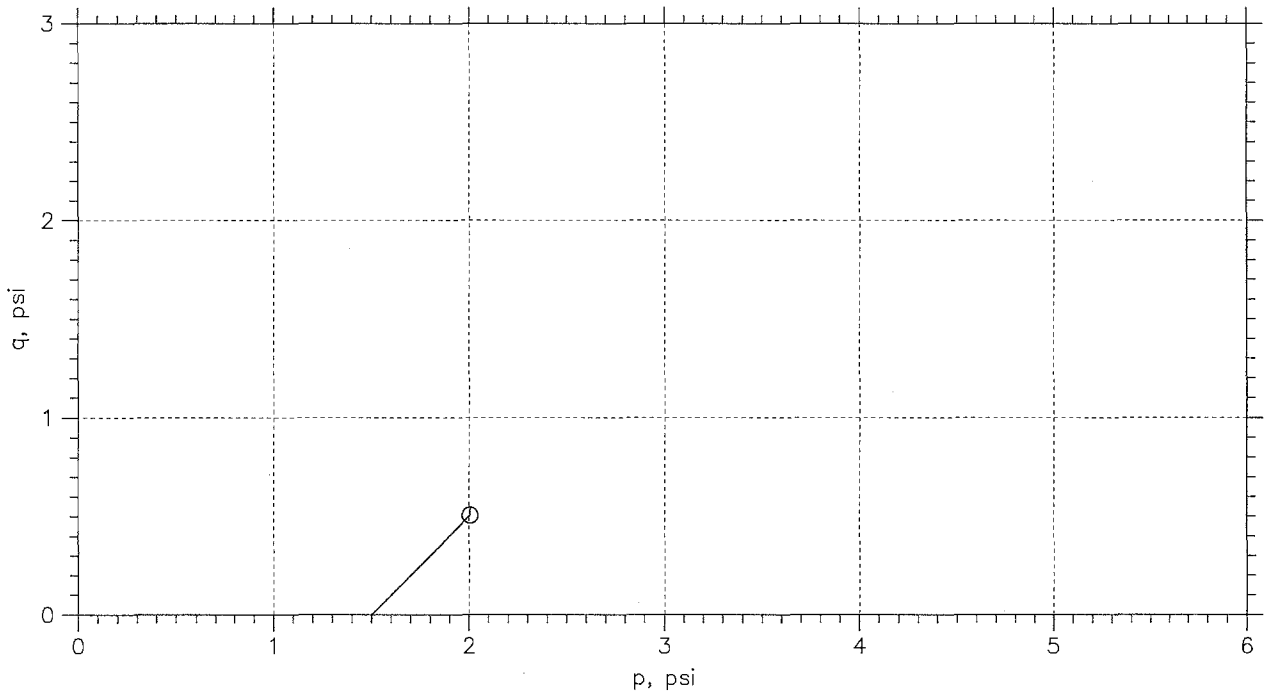


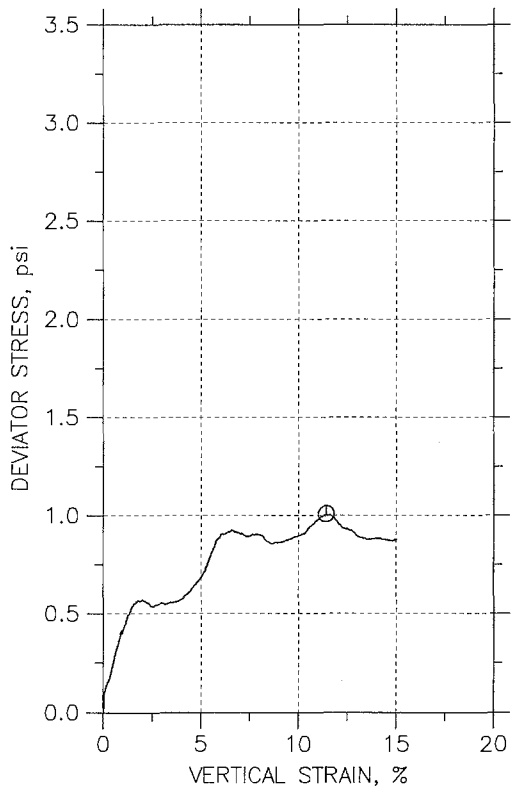
Description: Moist, dark olive brown silty sand

Remarks: System W

Phase calculations based on start and end of test.

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏀			
Sample No.	D 30554			
Test No.	UU-3			
Depth	6-8 ft			
Tested by	md			
Test Date	8/17/11			
Checked by	jdt			
Check Date	08/19/11			
Diameter, in	2.01			
Height, in	4.2			
Water Content, %	53.9			
Dry Density, pcf	66.96			
Saturation, %	98.4			
Void Ratio	1.42			
Confining Stress, psi	1.5			
Undrained Strength, psi	0.5046			
Max. Dev. Stress, psi	1.009			
Strain at Failure, %	11.4			
Strain Rate, %/min	1			
Measured Specific Gravity	2.6			
Liquid Limit	38			
Plastic Limit	29			
Plasticity Index	9			

GeoTesting EXPRESS

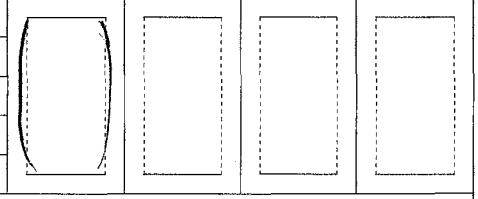
Project: DAS Case 0829F

Location: ---

Project No.: GTX-11069

Boring No.: GTB-04

Sample Type: tube



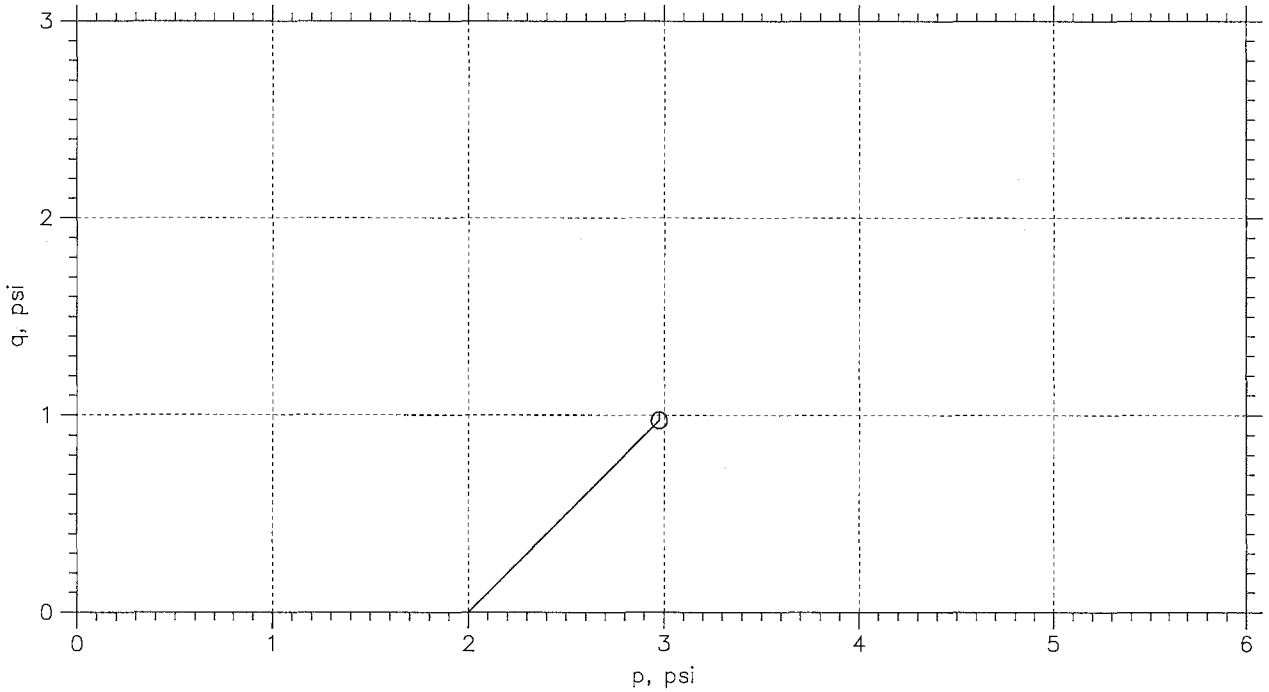
Description: Moist, dark olive brown silty sand

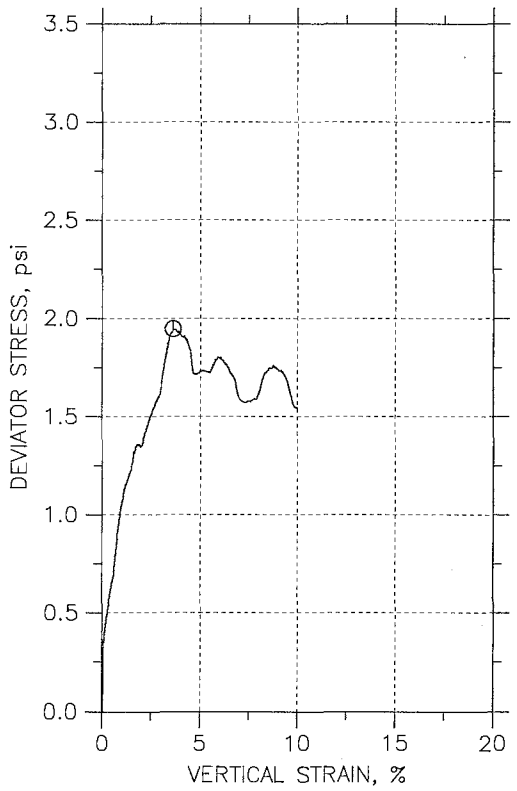
Remarks: System W

Phase calculations based on start and end of test.

Fri, 19-AUG-2011 10:22:42

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⏀			
Sample No.	D 30554			
Test No.	UU-2			
Depth	6-8 ft			
Tested by	md			
Test Date	8/16/11			
Checked by	jdt			
Check Date	08/19/11			
Diameter, in	2.01			
Height, in	4.04			
Water Content, %	76.2			
Dry Density, pcf	54.1			
Saturation, %	99.0			
Void Ratio	2			
Confining Stress, psi	2			
Undrained Strength, psi	0.9737			
Max. Dev. Stress, psi	1.947			
Strain at Failure, %	3.6			
Strain Rate, %/min	1			
Measured Specific Gravity	2.6			
Liquid Limit	38			
Plastic Limit	29			
Plasticity Index	9			

GeoTesting EXPRESS

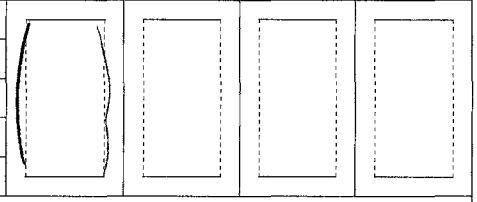
Project: DAS Case 0829F

Location: ---

Project No.: GTX-11069

Boring No.: GTB-04

Sample Type: tube

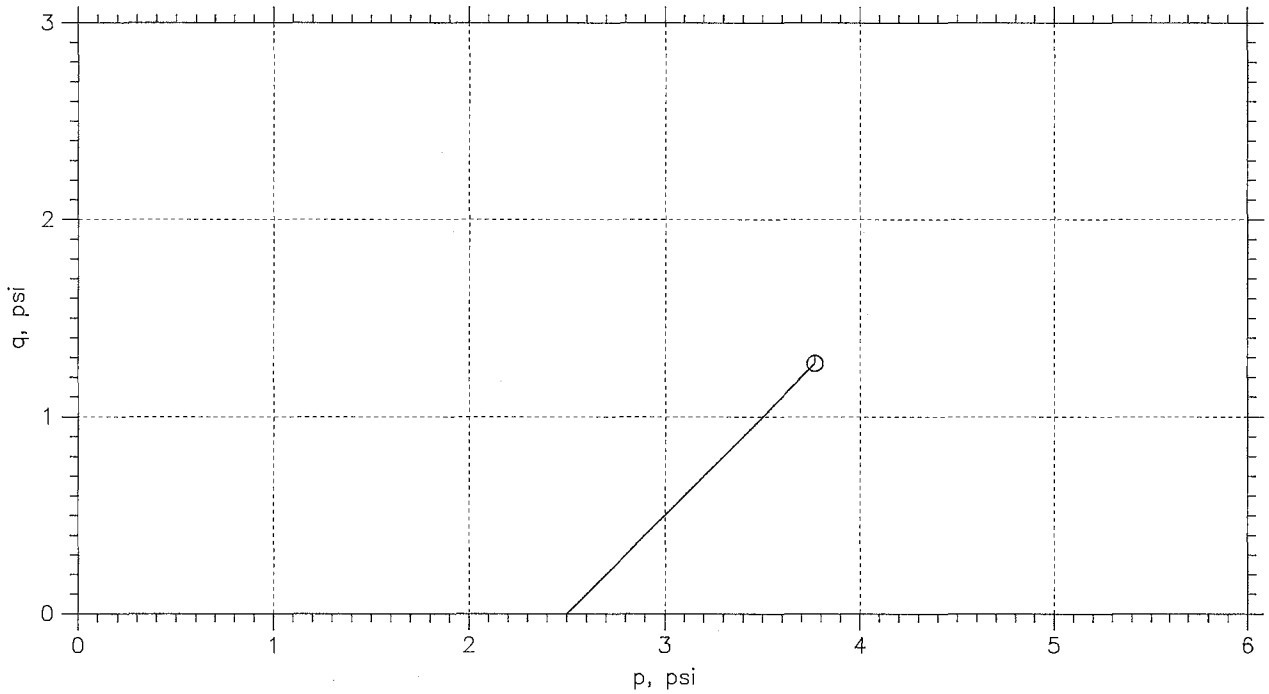


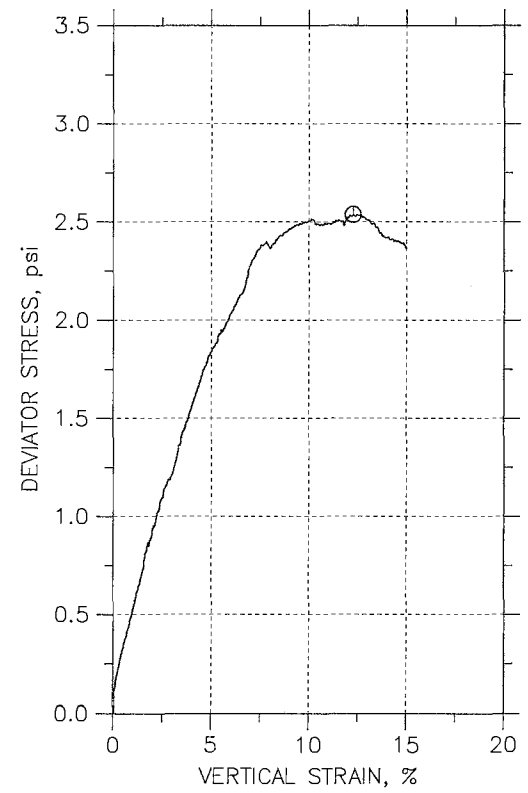
Description: Moist, dark olive brown silty sand

Remarks: System W

Phase calculations based on start and end of test.

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⊙			
Sample No.	D 30554			
Test No.	UU-1			
Depth	6-8 ft			
Tested by	md			
Test Date	8/16/11			
Checked by	jdt			
Check Date	08/19/11			
Diameter, in	2.01			
Height, in	4.05			
Water Content, %	62.0			
Dry Density, pcf	62.12			
Saturation, %	100.0			
Void Ratio	1.61			
Confining Stress, psi	2.5			
Undrained Strength, psi	1.268			
Max. Dev. Stress, psi	2.537			
Strain at Failure, %	12.3			
Strain Rate, %/min	1			
Measured Specific Gravity	2.6			
Liquid Limit	38			
Plastic Limit	29			
Plasticity Index	9			

GeoTesting EXPRESS

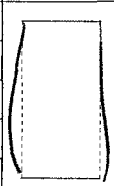
Project: DAS Case 0829F

Location: ---

Project No.: GTX-11069

Boring No.: GTB-04

Sample Type: tube



Description: Moist, dark olive brown silty sand

Remarks: System W

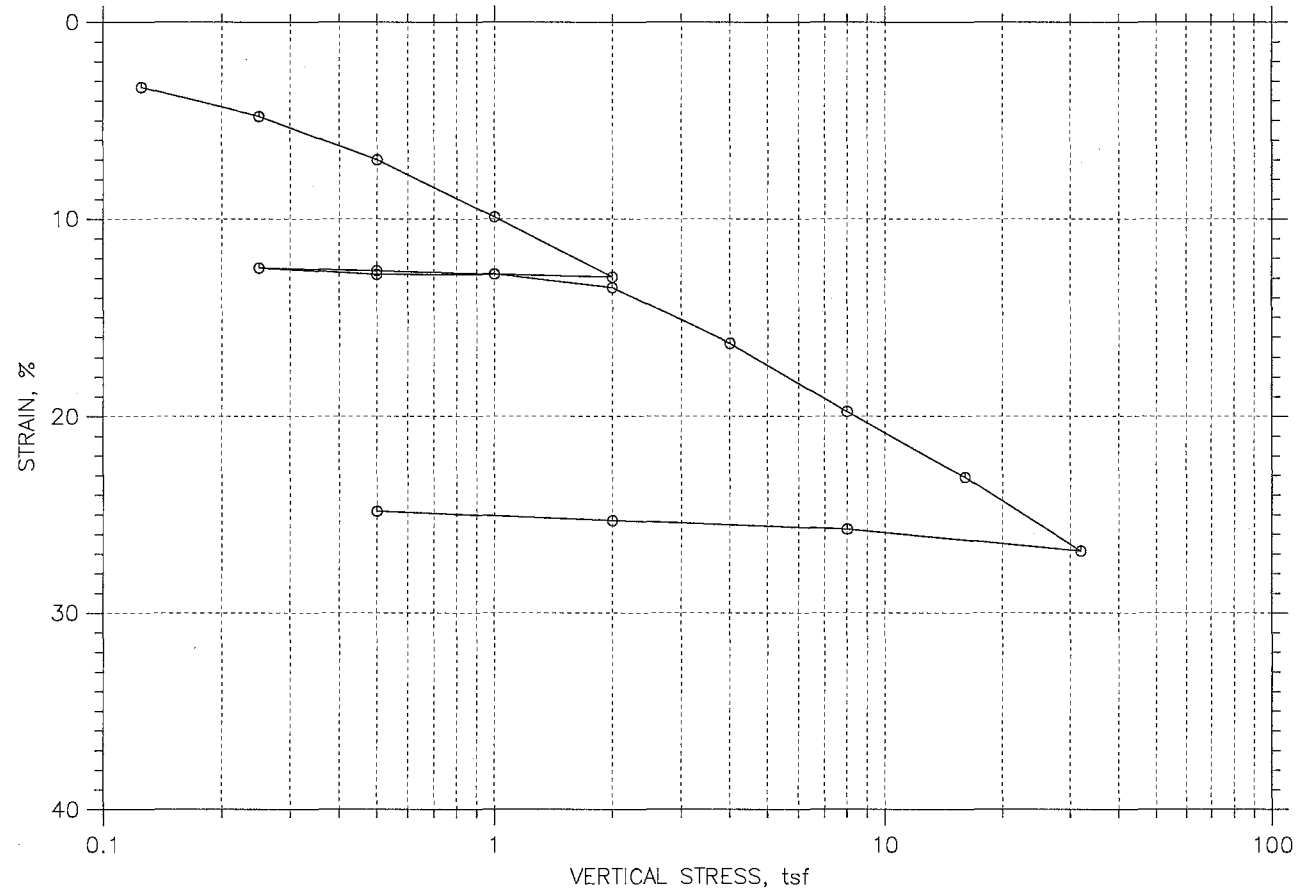
Phase calculations based on start and end of test.

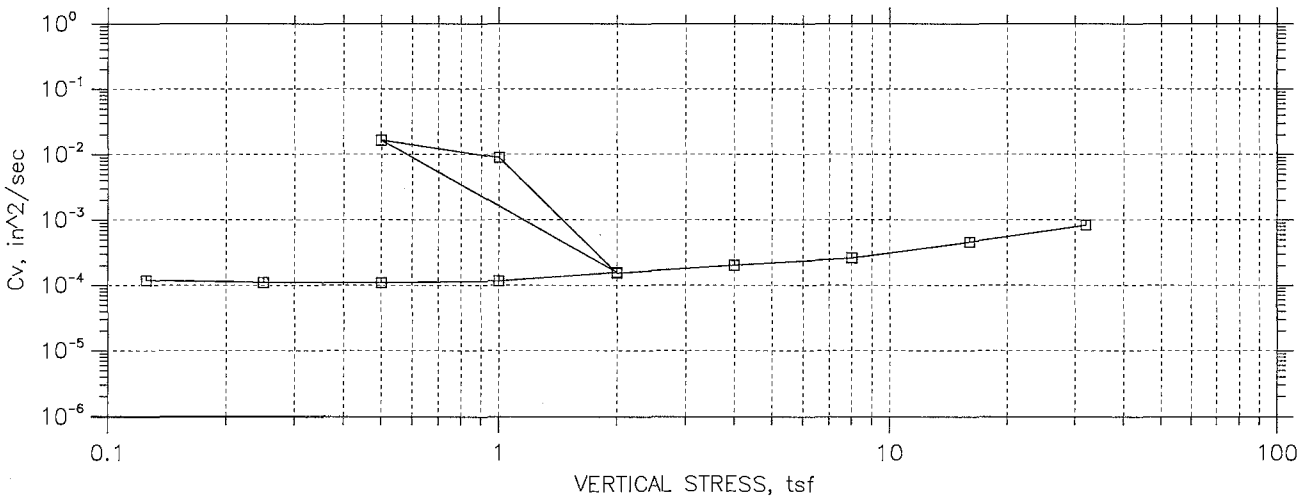
Fri, 19-AUG-2011 10:23:23

ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

CONSOLIDATION TEST DATA

SUMMARY REPORT





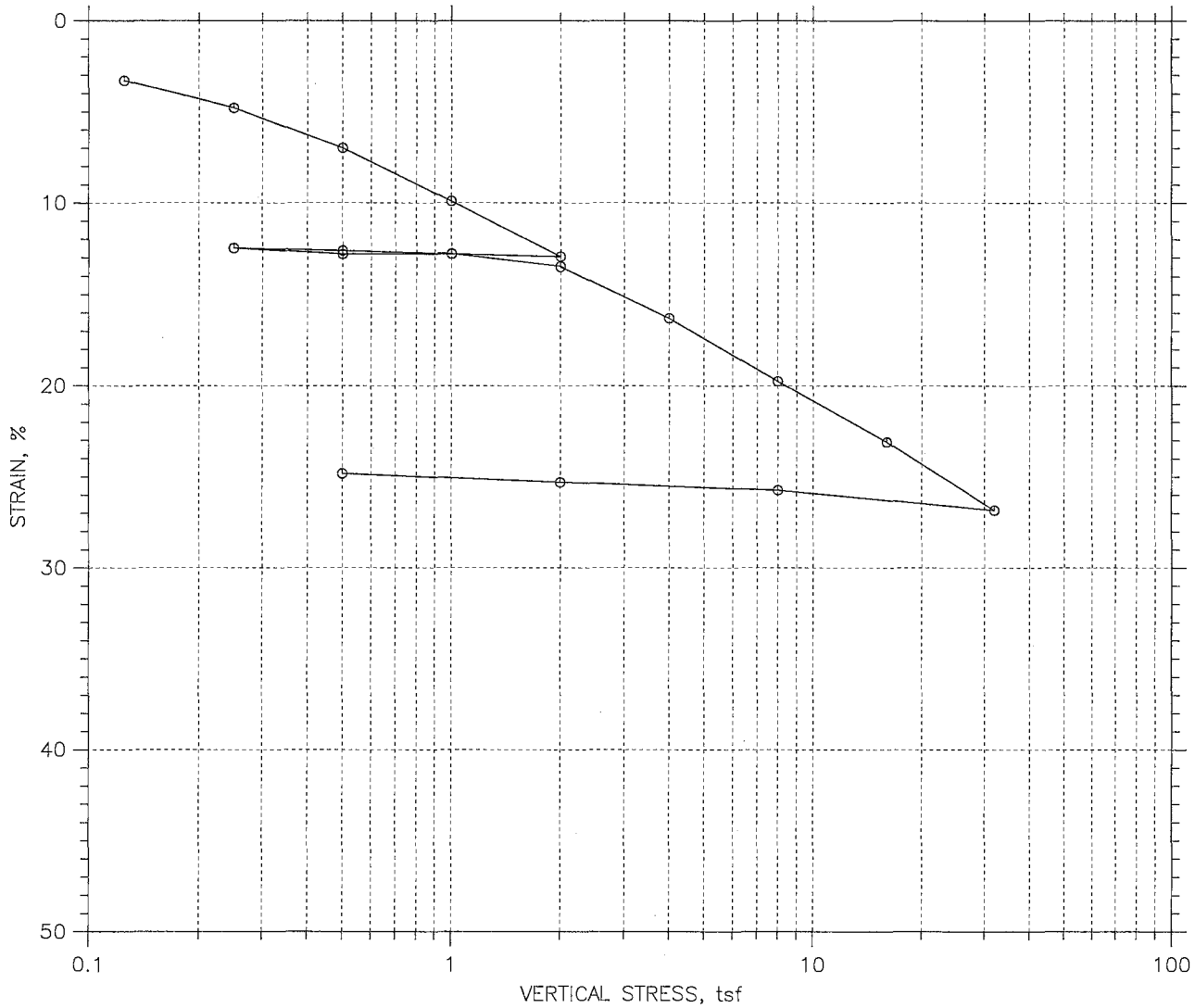
GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

Tue, 23-AUG-2011 12:24:50

ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

CONSOLIDATION TEST DATA

SUMMARY REPORT



				Before Test	After Test
Overburden Pressure: ---				Water Content, %	38.71	20.73
Preconsolidation Pressure: ---				Dry Unit Weight, pcf	83.01	110.4
Compression Index: ---				Saturation, %	98.24	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.10	0.58
LL: ---	PL: ---	PI: ---	GS: 2.79			

GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

Tue, 23-AUG-2011 12:24:50

ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

CONSOLIDATION TEST DATA

Project: DAS Case 0829F
Boring No.: GTB-02
Sample No.: D 30551
Test No.: C-2

Location: ---
Tested By: md
Test Date: 8/15/11
Sample Type: tube

Project No.: GTX-11062
Checked By: jdt
Depth: 4-6 ft
Elevation: ---

Soil Description: Moist, gray clay
Remarks: System E

Estimated Specific Gravity: 2.79
Initial Void Ratio: 1.10
Final Void Ratio: 0.58

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Initial Height: 1.00 in
Specimen Diameter: 2.50 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	6951	RING		6995
Wt. Container + Wet Soil, gm	310.81	256.37	237.14	137.79
Wt. Container + Dry Soil, gm	223.14	214.96	214.96	115.66
Wt. Container, gm	8.57	108	108	8.93
Wt. Dry Soil, gm	214.57	106.96	106.96	106.73
Water Content, %	40.86	38.71	20.73	20.73
Void Ratio	---	1.10	0.58	---
Degree of Saturation, %	---	98.24	100.00	---
Dry Unit Weight, pcf	---	83.011	110.43	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

CONSOLIDATION TEST DATA

Project: DAS Case 0829F
Boring No.: GTB-02
Sample No.: D 30551
Test No.: C-2

Location: ---
Tested By: md
Test Date: 8/15/11
Sample Type: tube

Project No.: GTX-11062
Checked By: jdt
Depth: 4-6 ft
Elevation: ---

Soil Description: Moist, gray clay
Remarks: System E

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. in^2/sec	Coefficient of Consolidation Log in^2/sec	Coefficient of Consolidation Ave. in^2/sec
1	0.125	0.03308	1.031	3.31	5.6	7.8	1.43e-004	1.01e-004	1.19e-004
2	0.25	0.048	1.000	4.80	5.8	7.8	1.29e-004	9.73e-005	1.11e-004
3	0.5	0.06995	0.954	6.99	6.2	7.1	1.18e-004	1.03e-004	1.10e-004
4	1	0.09896	0.893	9.90	5.3	6.5	1.30e-004	1.06e-004	1.17e-004
5	2	0.1295	0.829	12.95	3.4	4.7	1.89e-004	1.38e-004	1.60e-004
6	1	0.1281	0.832	12.81	0.2	0.1	3.98e-003	8.50e-003	5.42e-003
7	0.5	0.1282	0.832	12.82	0.4	0.0	1.67e-003	0.00e+000	1.67e-003
8	0.25	0.1249	0.838	12.49	2.8	0.0	2.22e-004	0.00e+000	2.22e-004
9	0.5	0.1262	0.836	12.62	0.0	0.0	1.46e-002	1.92e-002	1.66e-002
10	1	0.1279	0.832	12.79	0.1	0.0	8.98e-003	0.00e+000	8.98e-003
11	2	0.1348	0.818	13.48	4.0	0.0	1.55e-004	0.00e+000	1.55e-004
12	4	0.163	0.758	16.30	2.8	3.1	2.15e-004	1.94e-004	2.04e-004
13	8	0.1976	0.686	19.76	1.9	2.3	2.97e-004	2.36e-004	2.63e-004
14	16	0.2309	0.616	23.09	1.1	0.0	4.60e-004	0.00e+000	4.60e-004
15	32	0.2684	0.537	26.84	0.5	0.0	8.43e-004	0.00e+000	8.43e-004
16	8	0.2574	0.560	25.74	0.0	0.0	1.62e-002	0.00e+000	1.62e-002
17	2	0.2531	0.569	25.31	0.2	0.0	2.28e-003	0.00e+000	2.28e-003
18	0.5	0.2483	0.579	24.83	1.9	0.0	2.43e-004	0.00e+000	2.43e-004

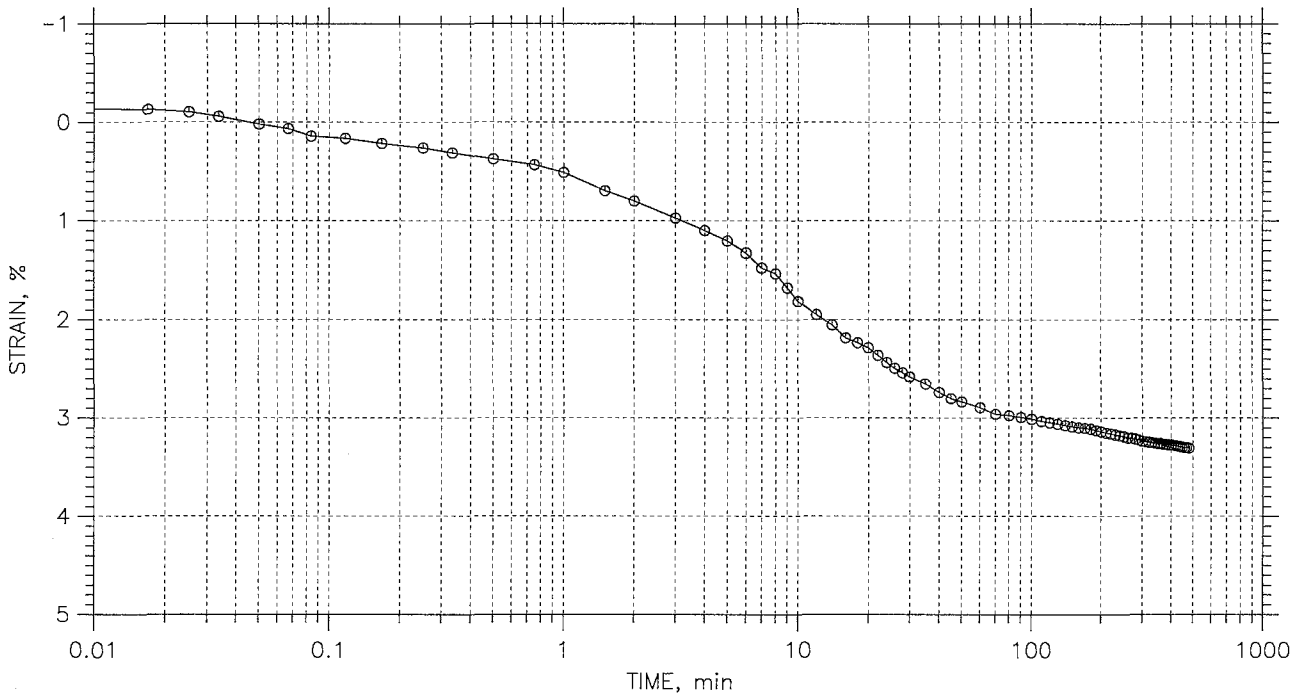
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

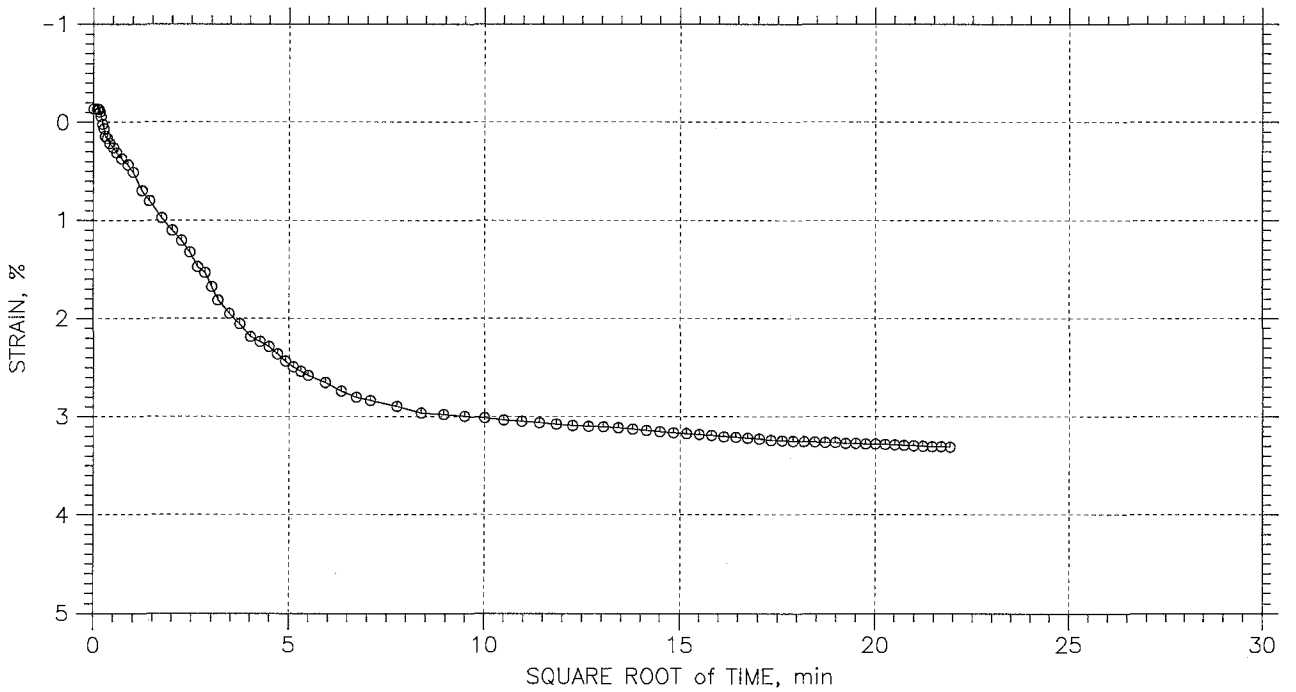
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 1 of 18

Stress: 0.125 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

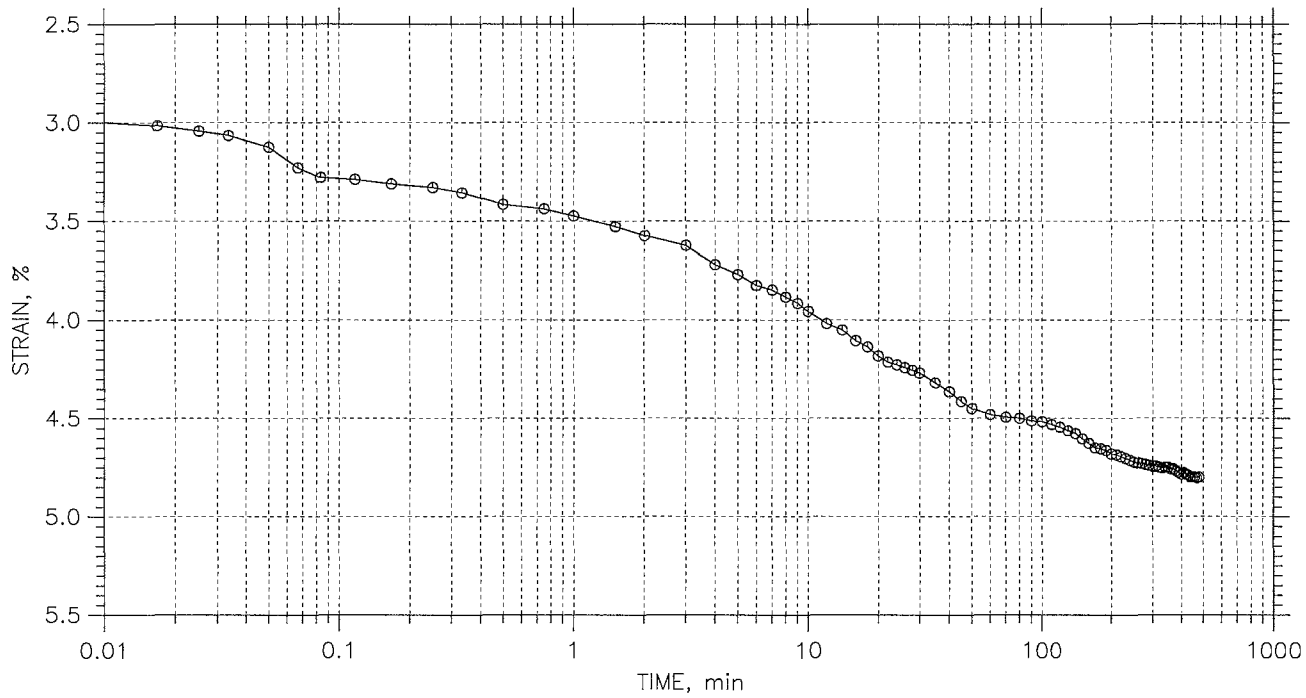
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

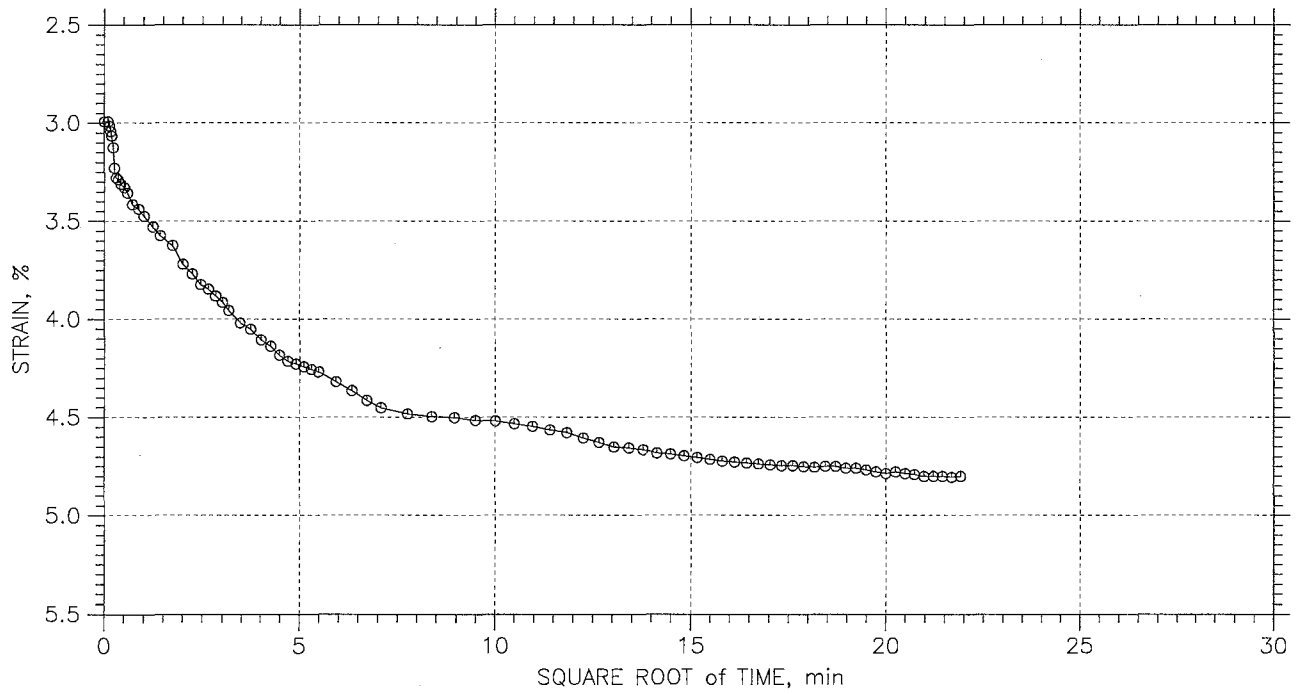
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 18

Stress: 0.25 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

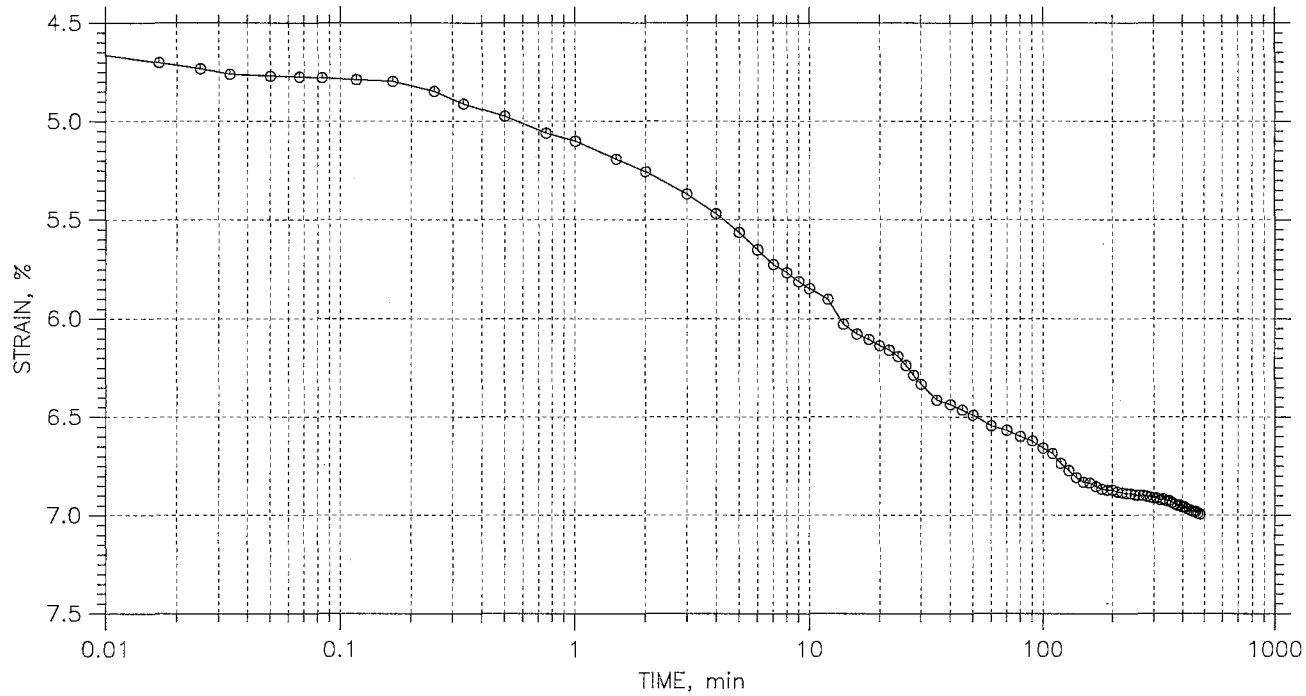
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

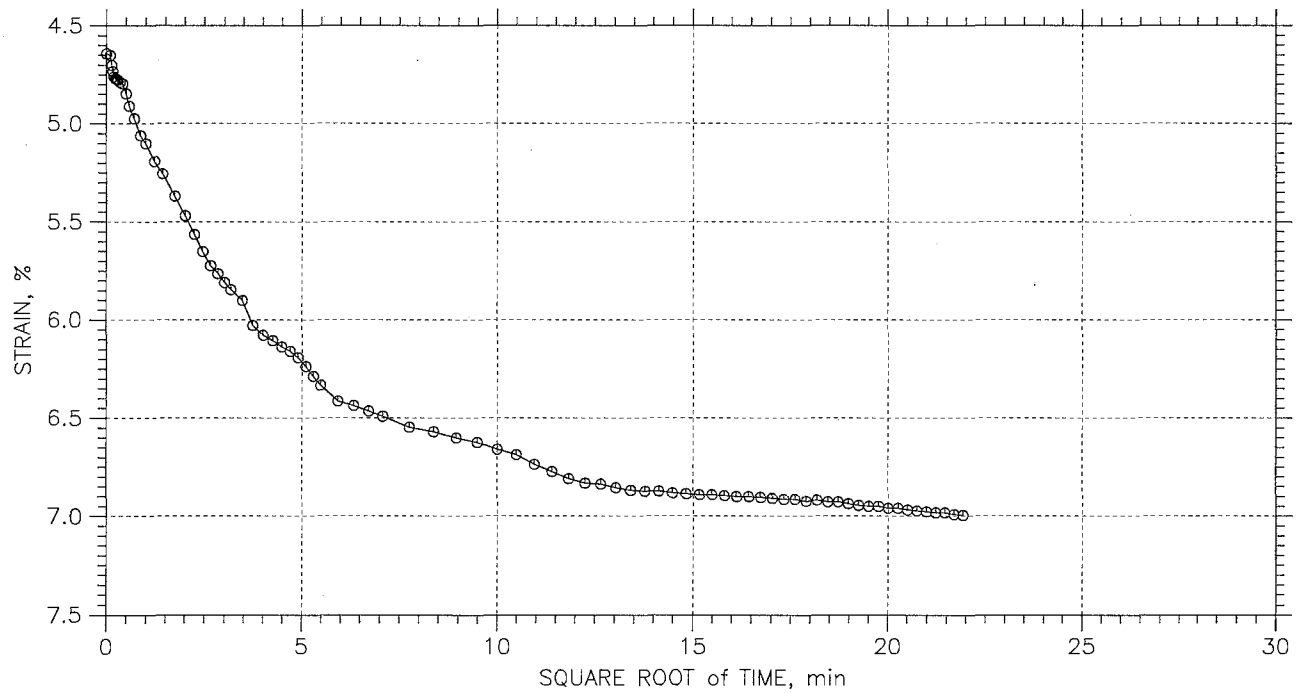
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 18

Stress: 0.5 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

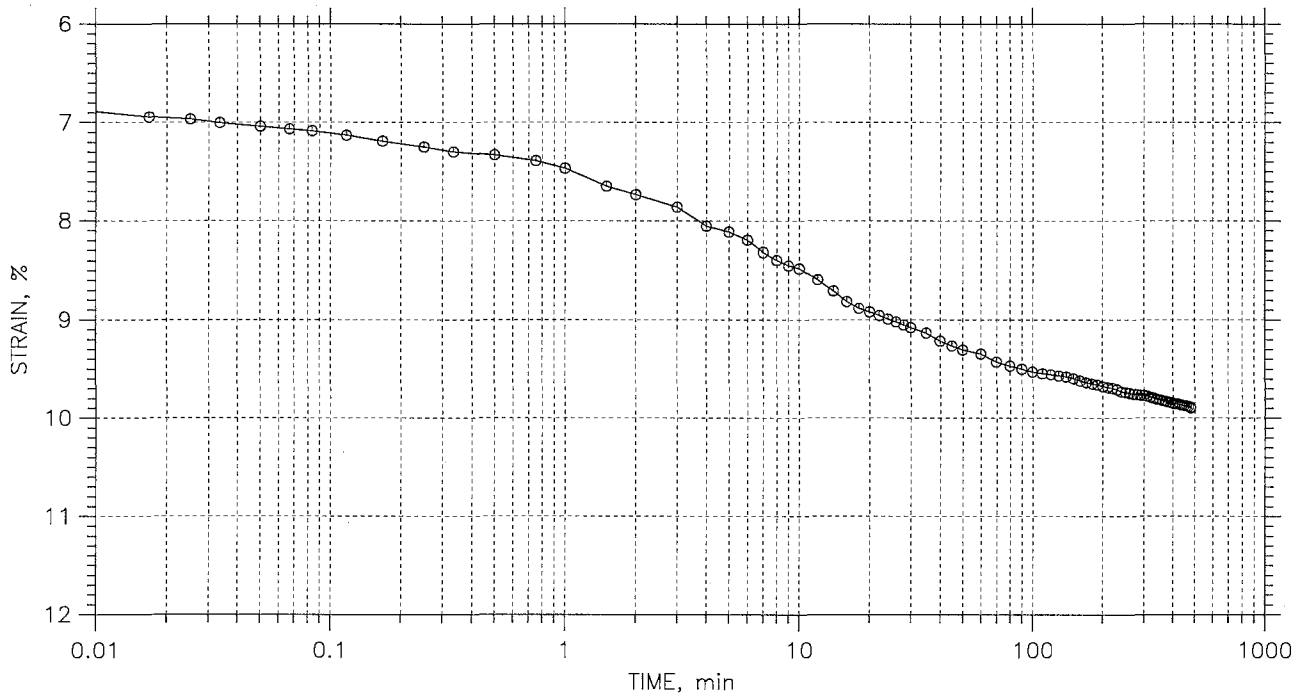
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

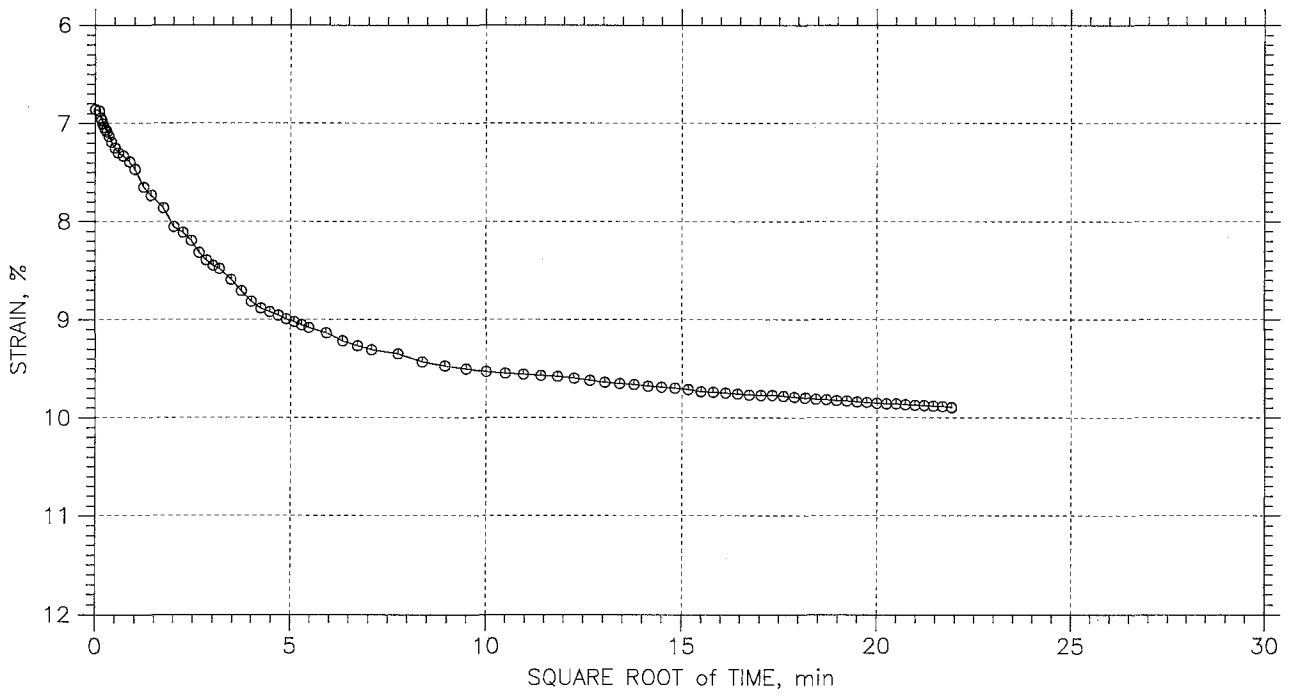
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 18

Stress: 1. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

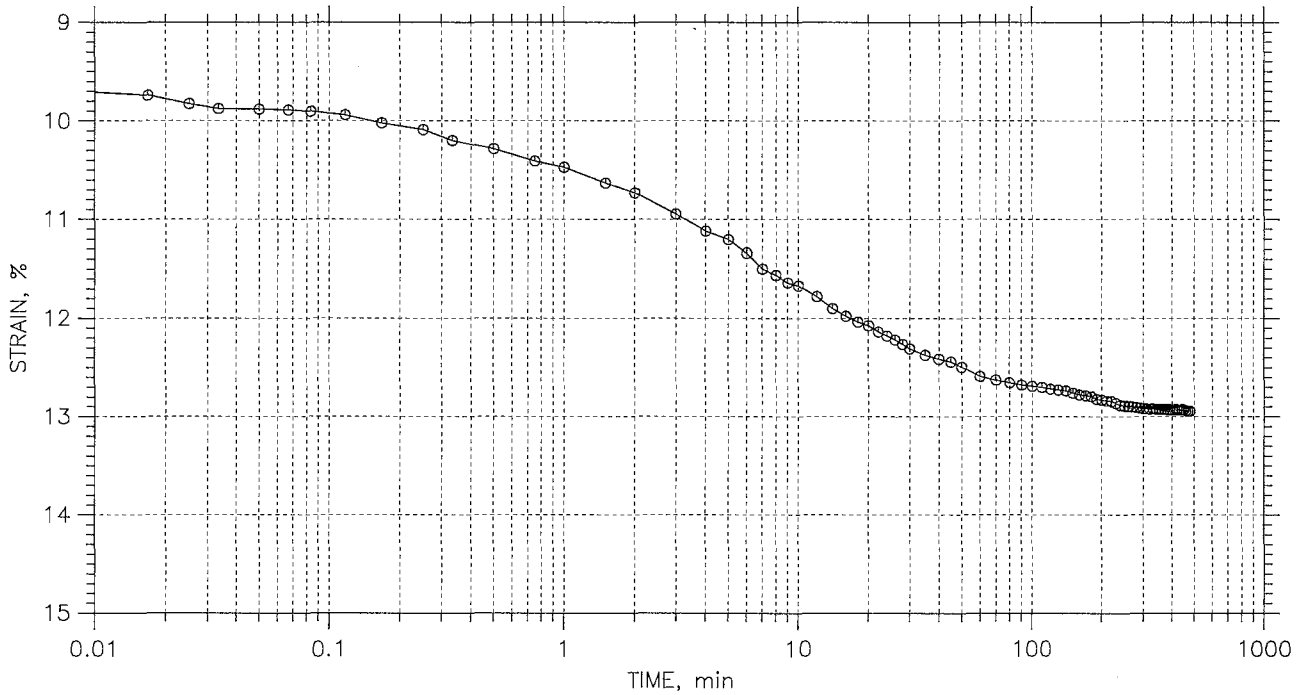
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

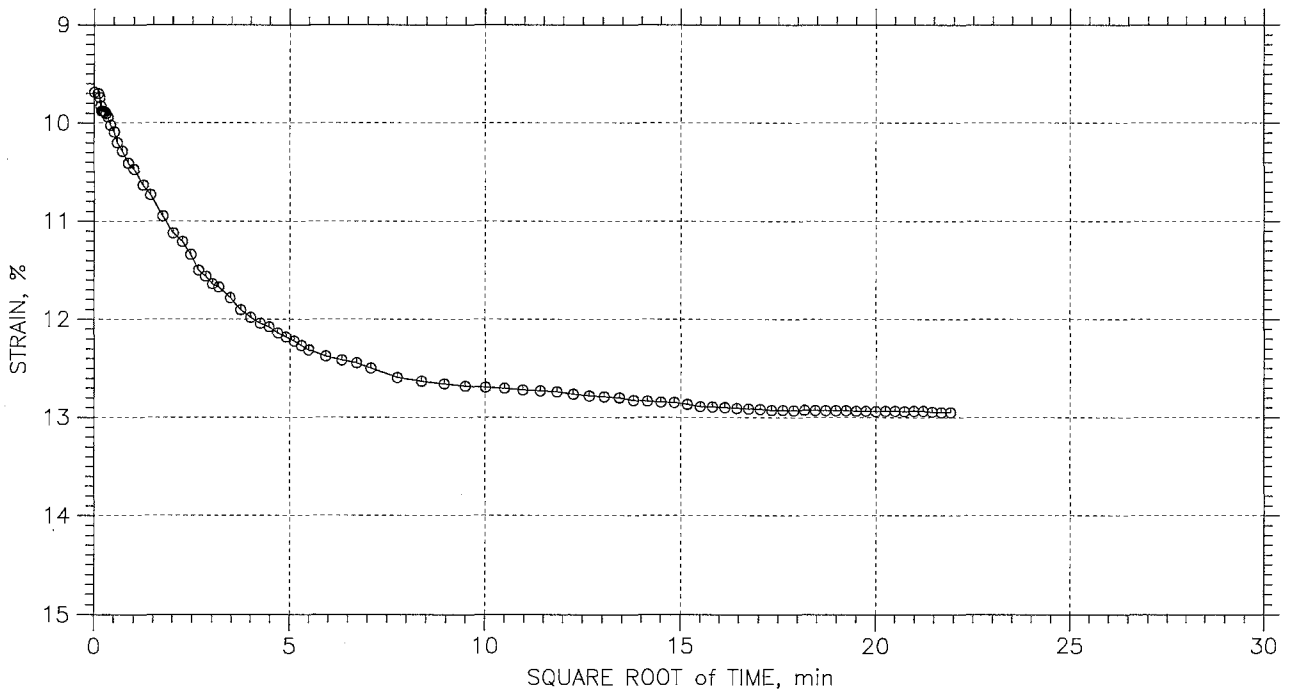
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 18

Stress: 2. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

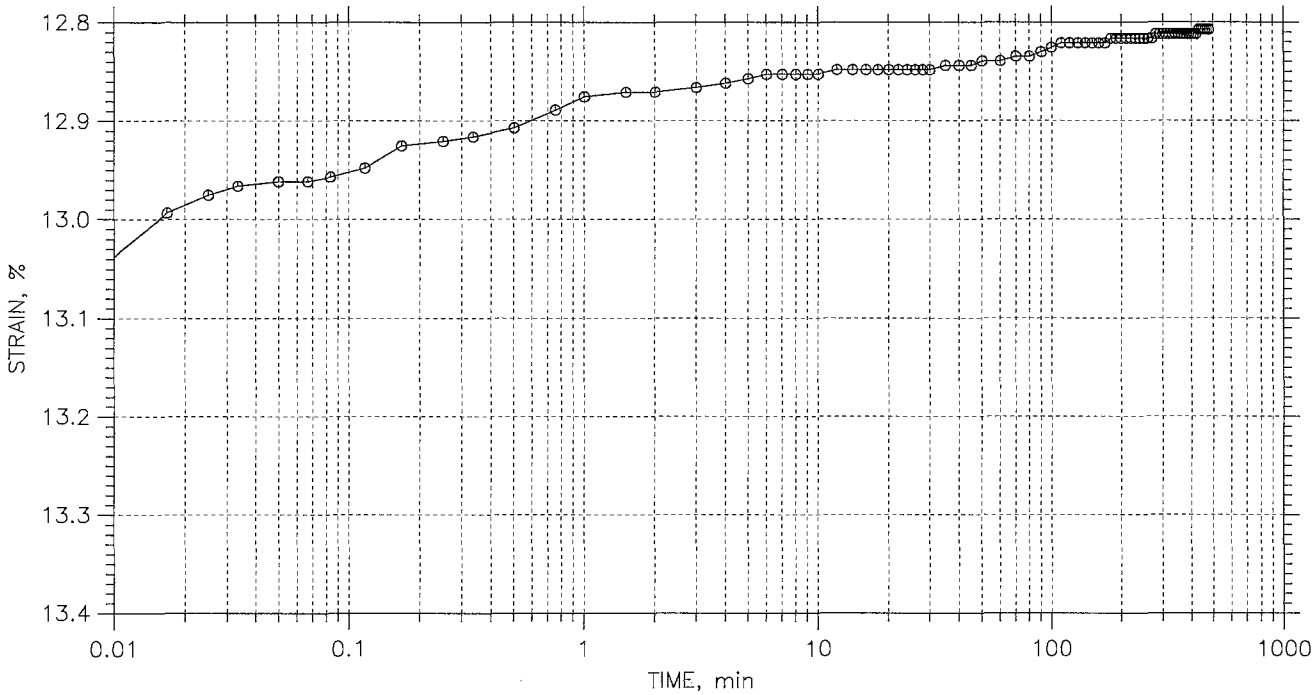
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

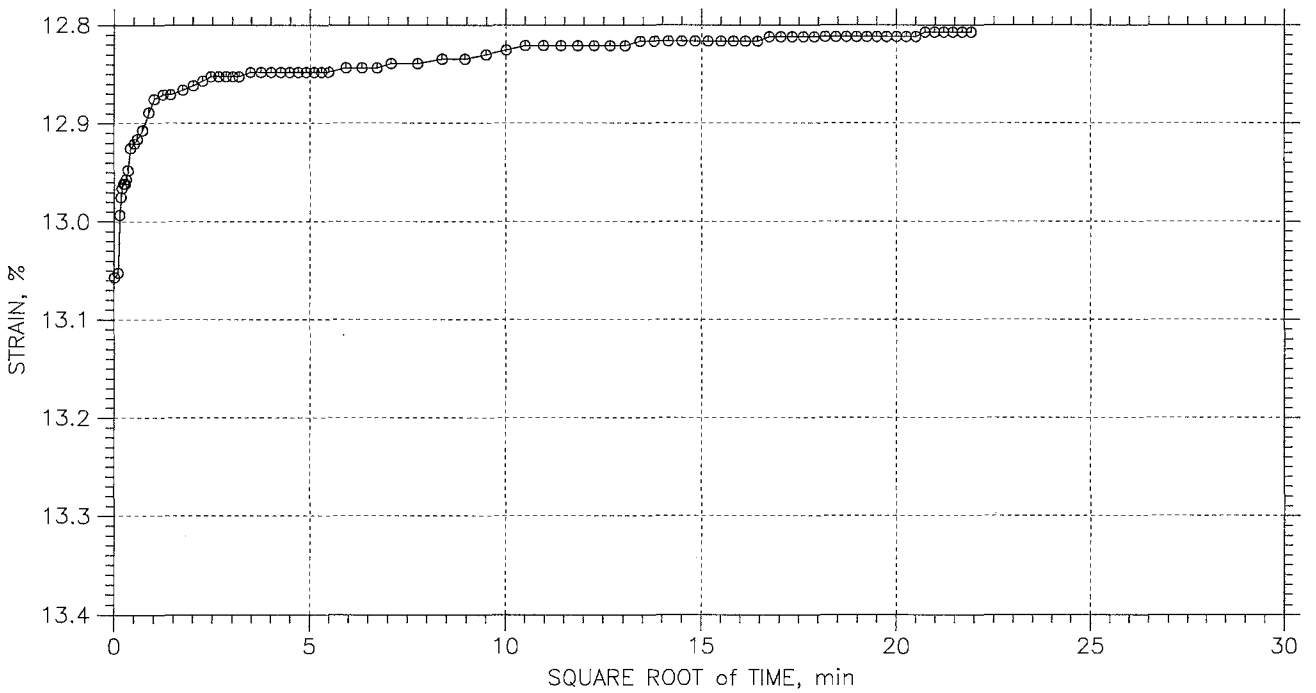
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 18

Stress: 1. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

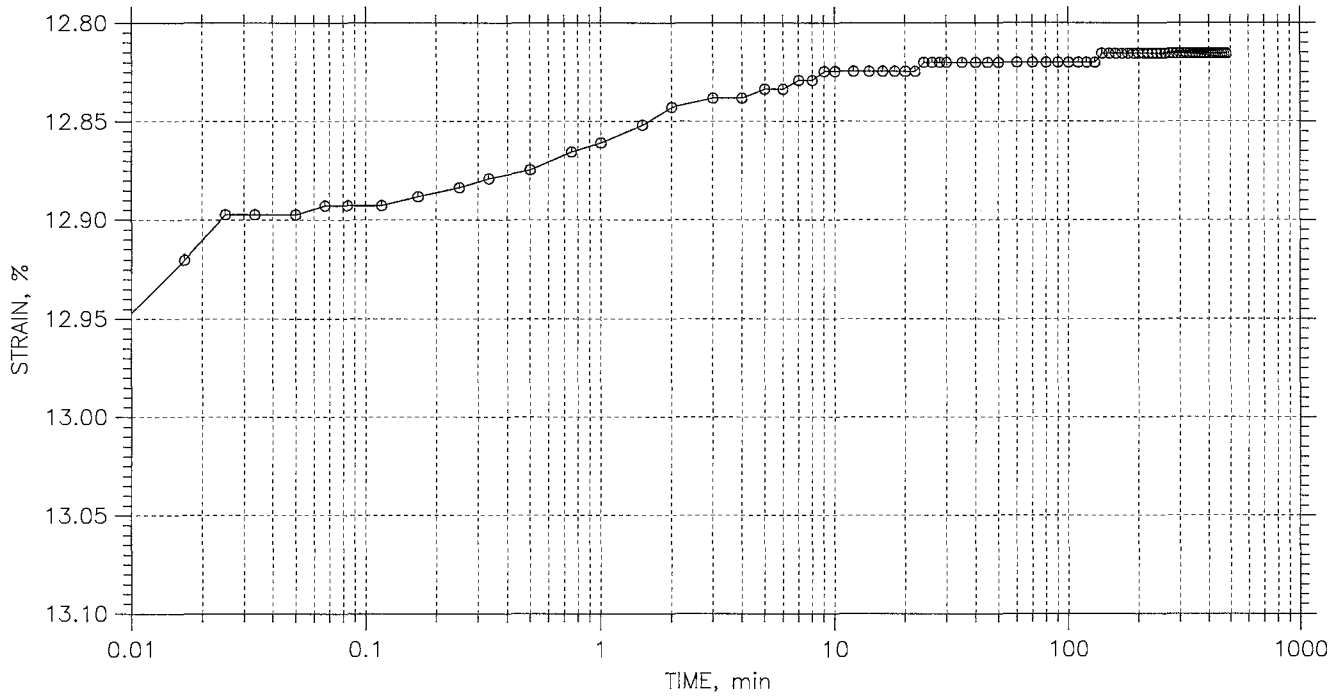
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

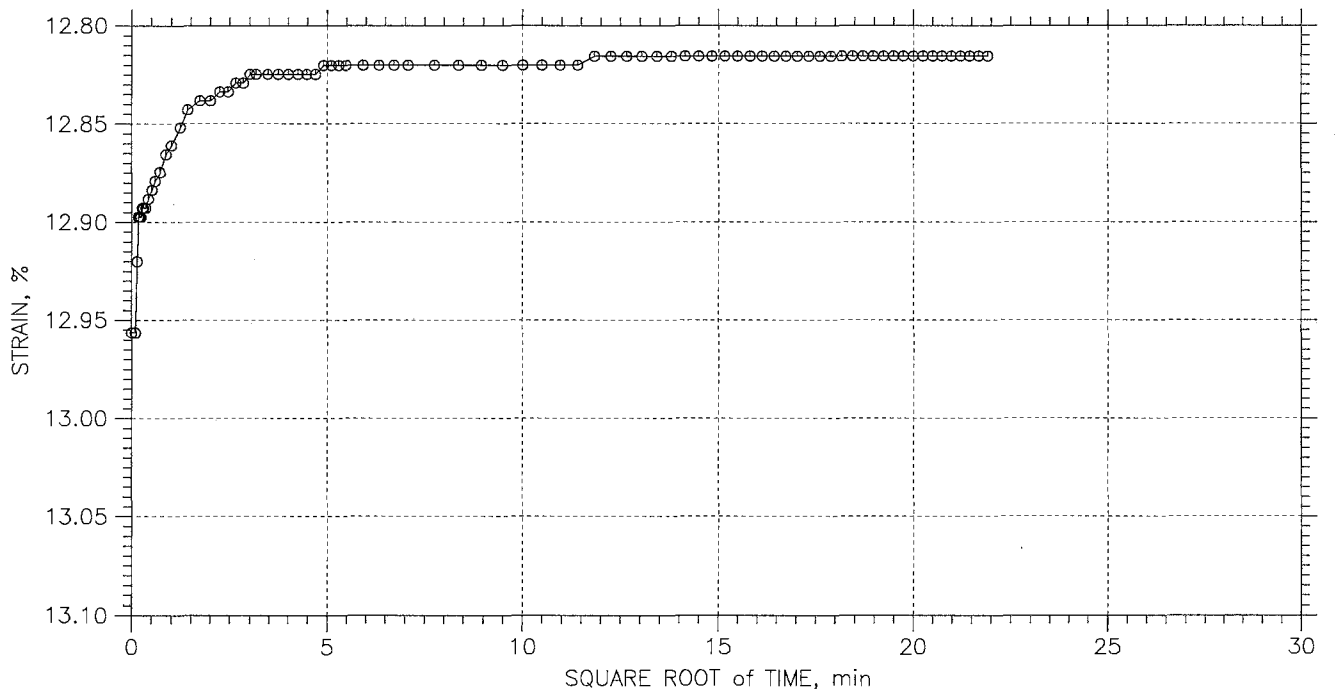
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 18

Stress: 0.5 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

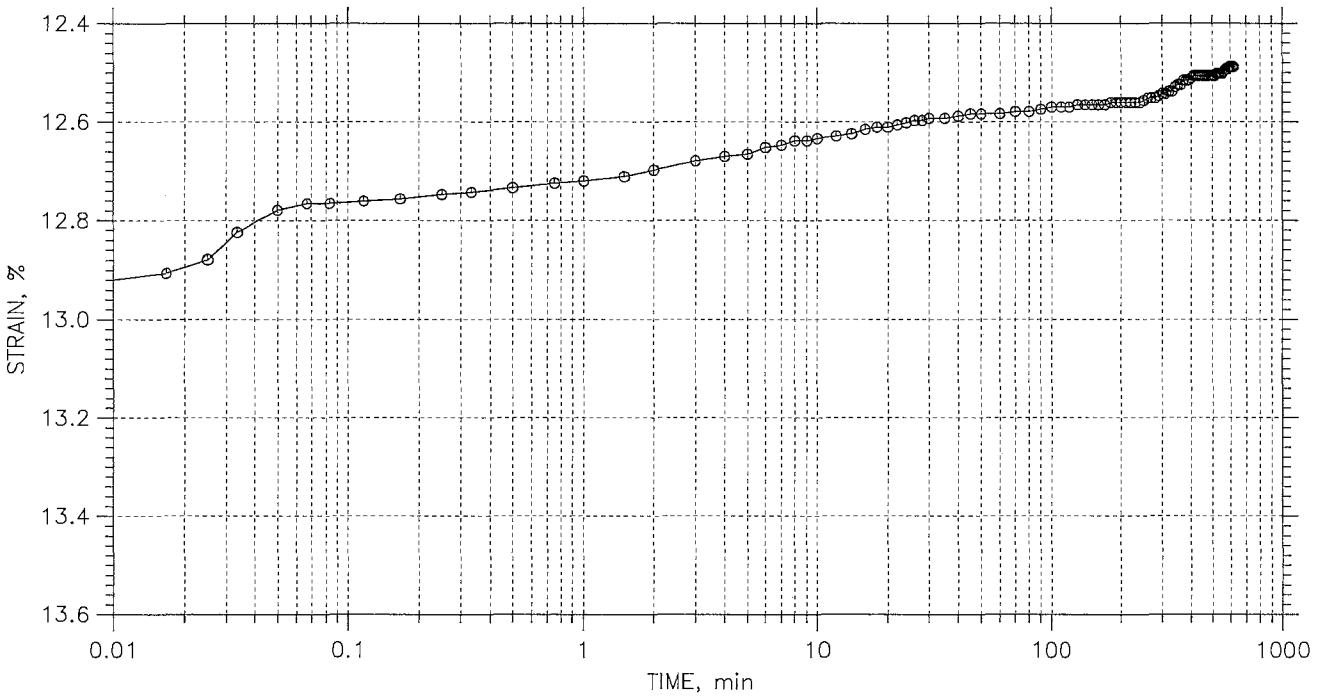
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

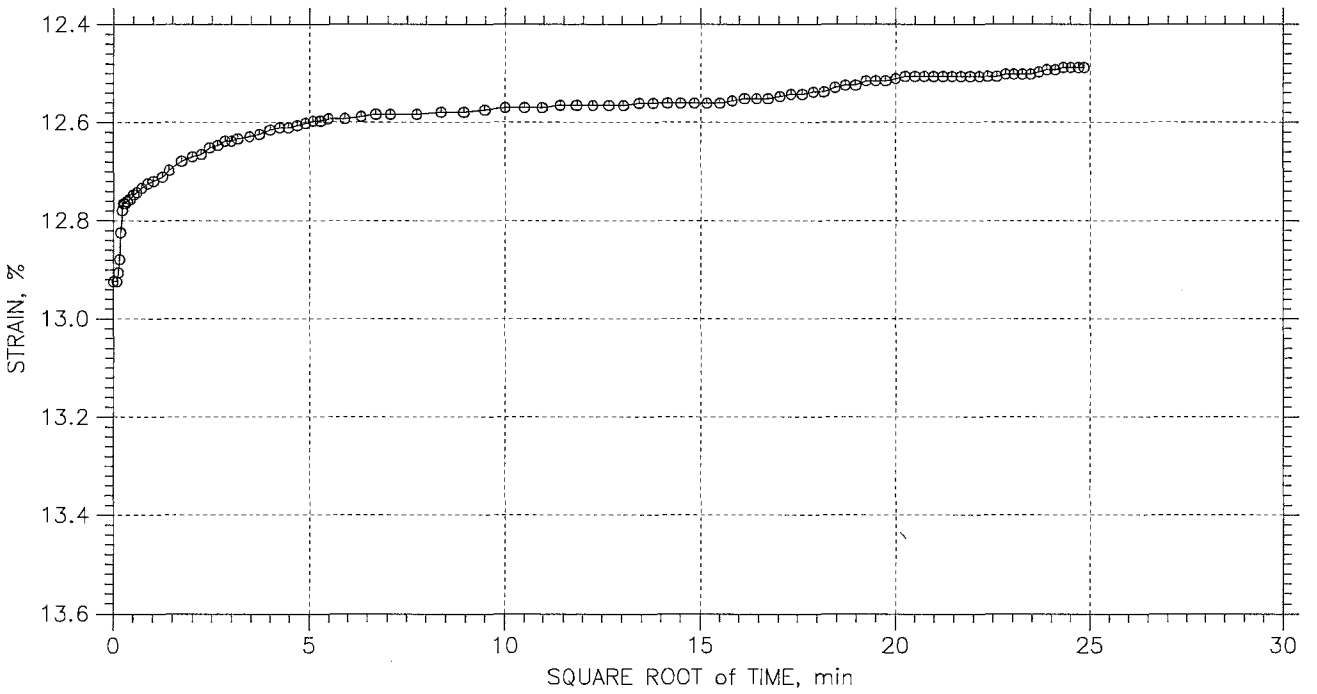
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 18

Stress: 0.25 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

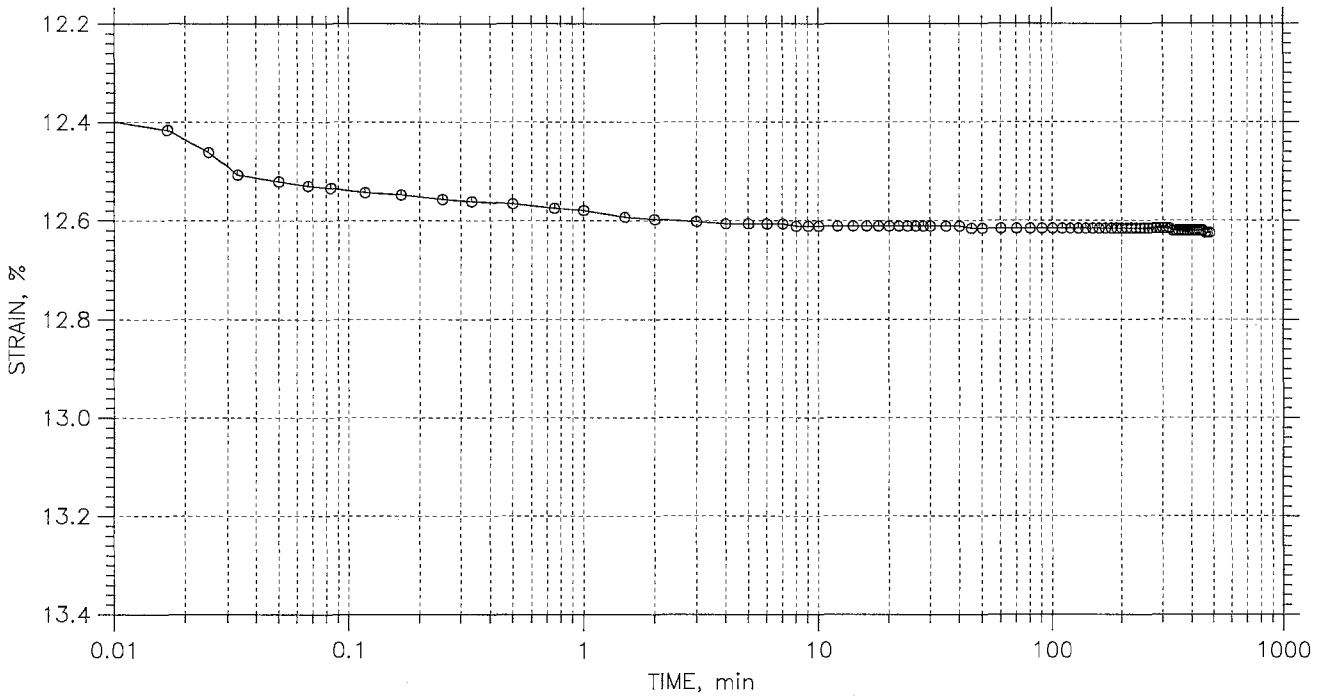
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

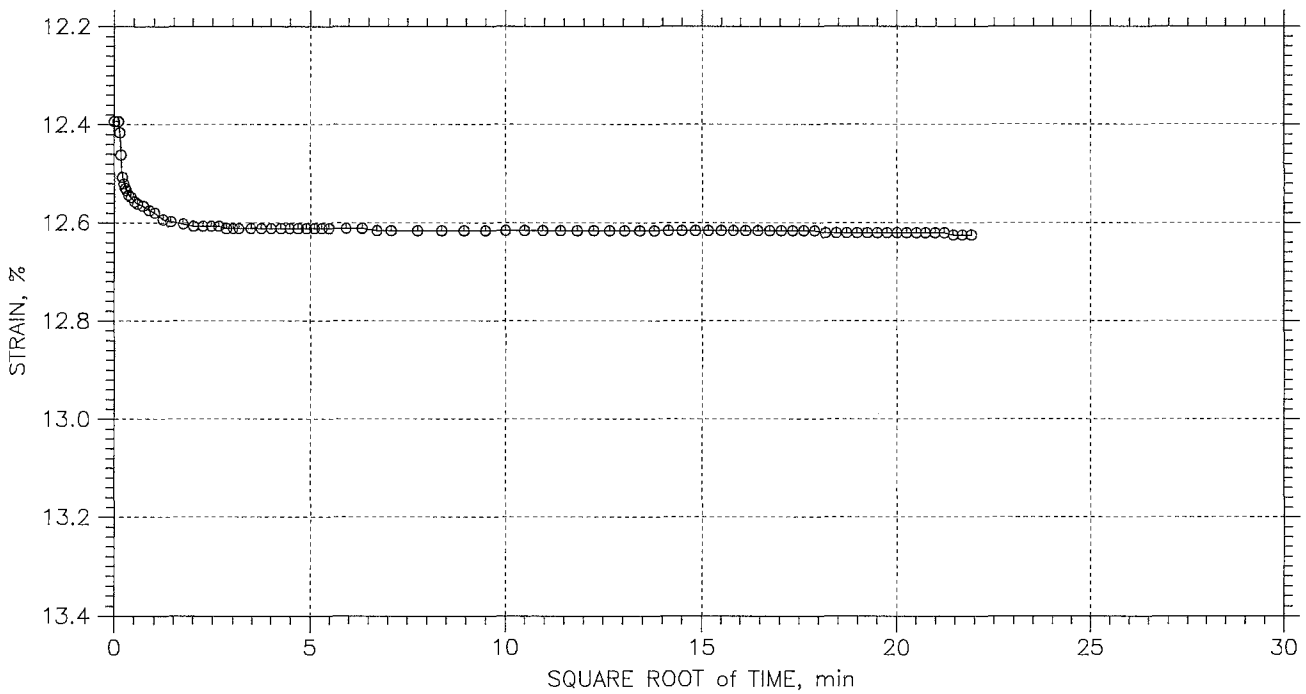
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 18

Stress: 0.5 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

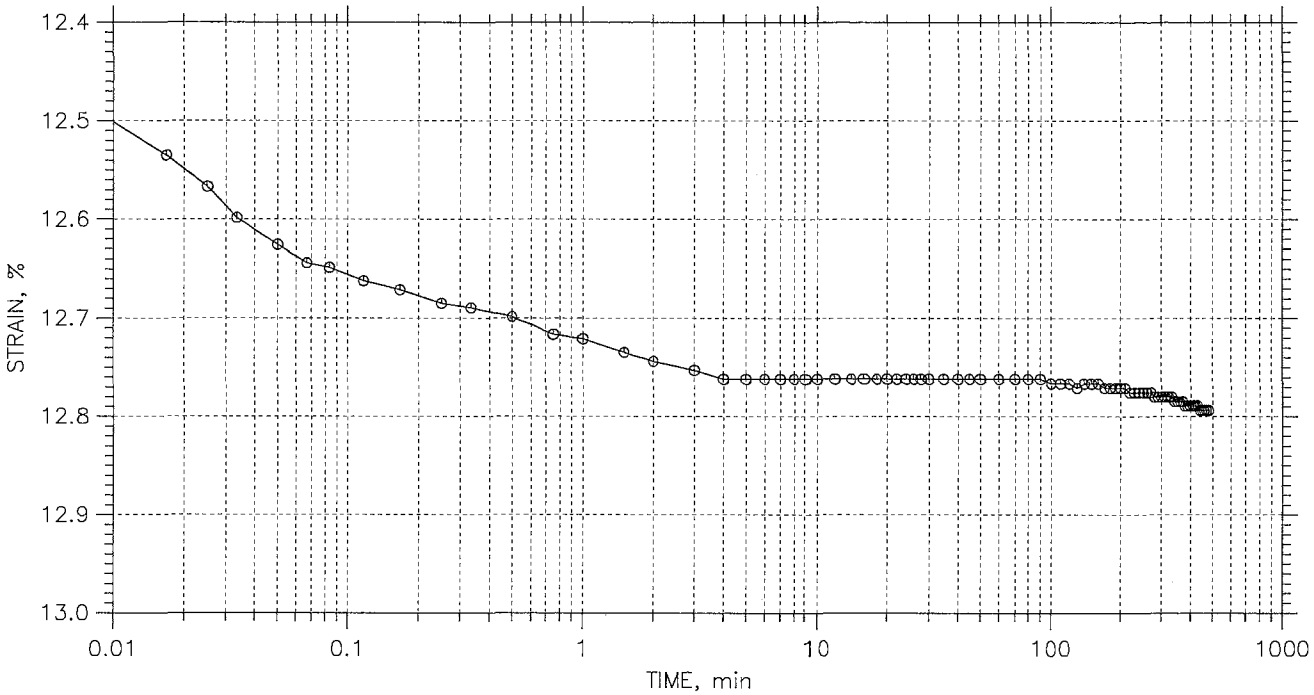
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

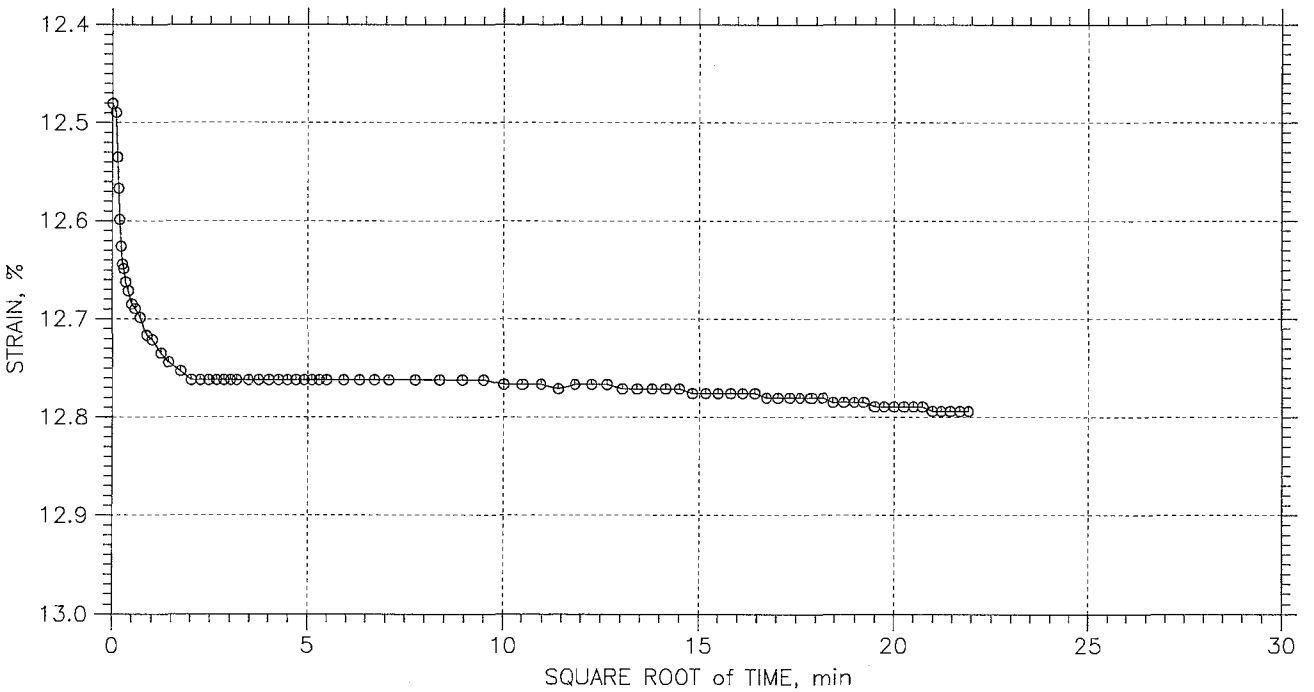
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 18

Stress: 1. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

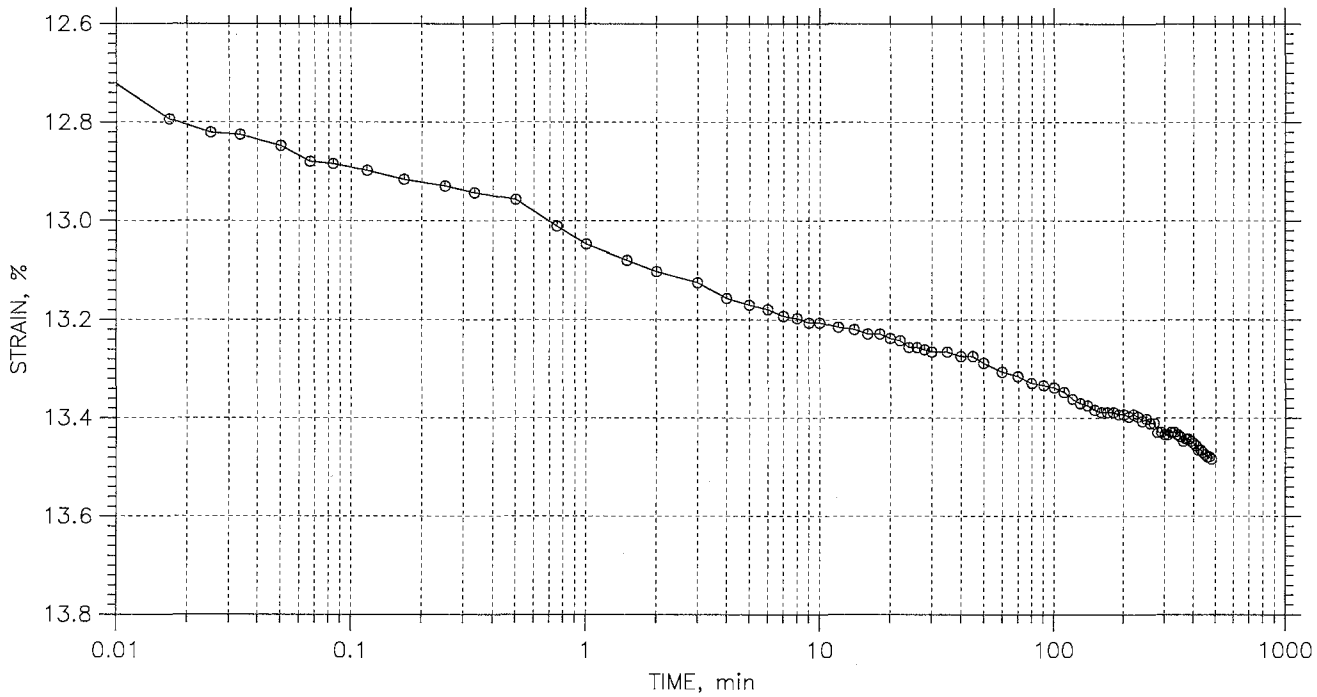
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

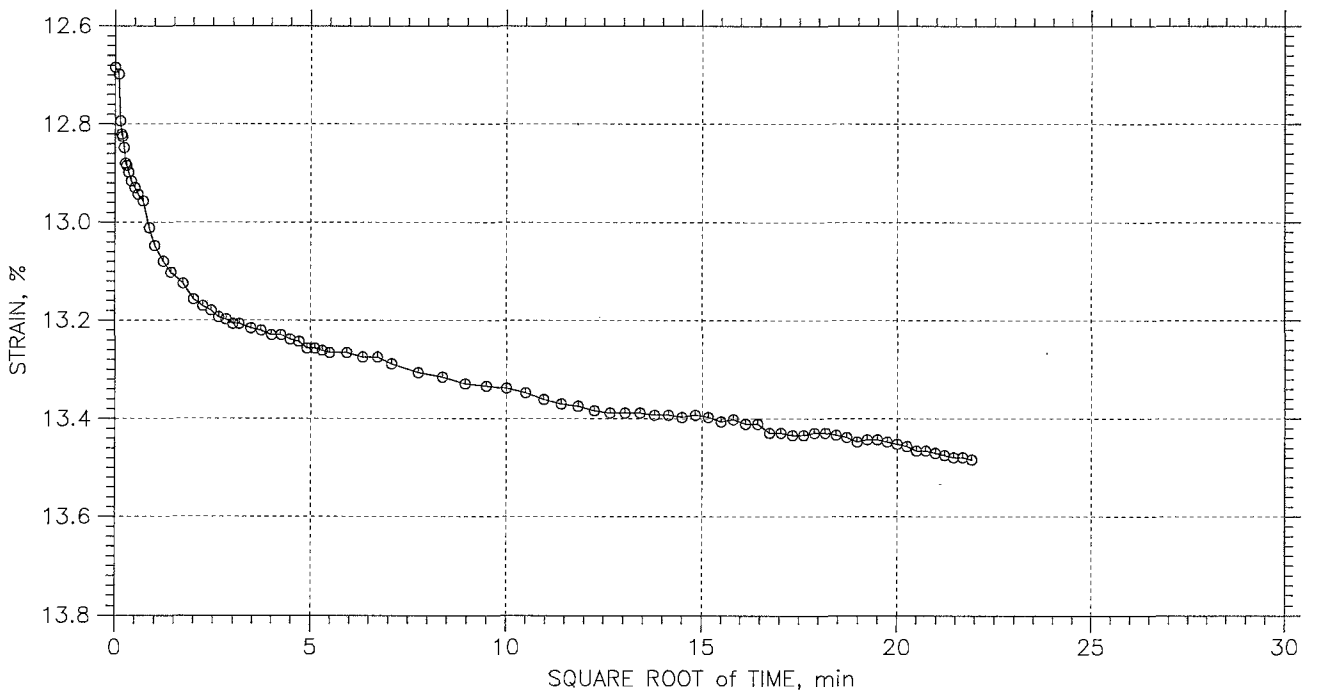
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 18

Stress: 2. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

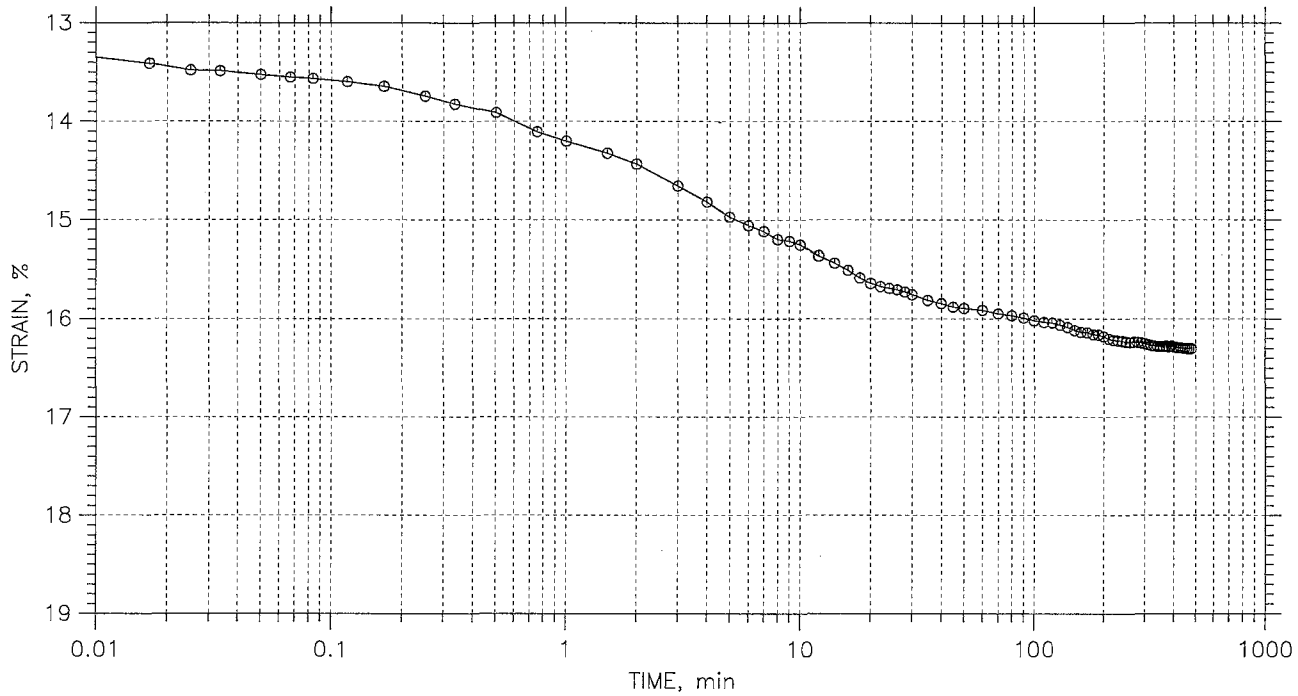
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

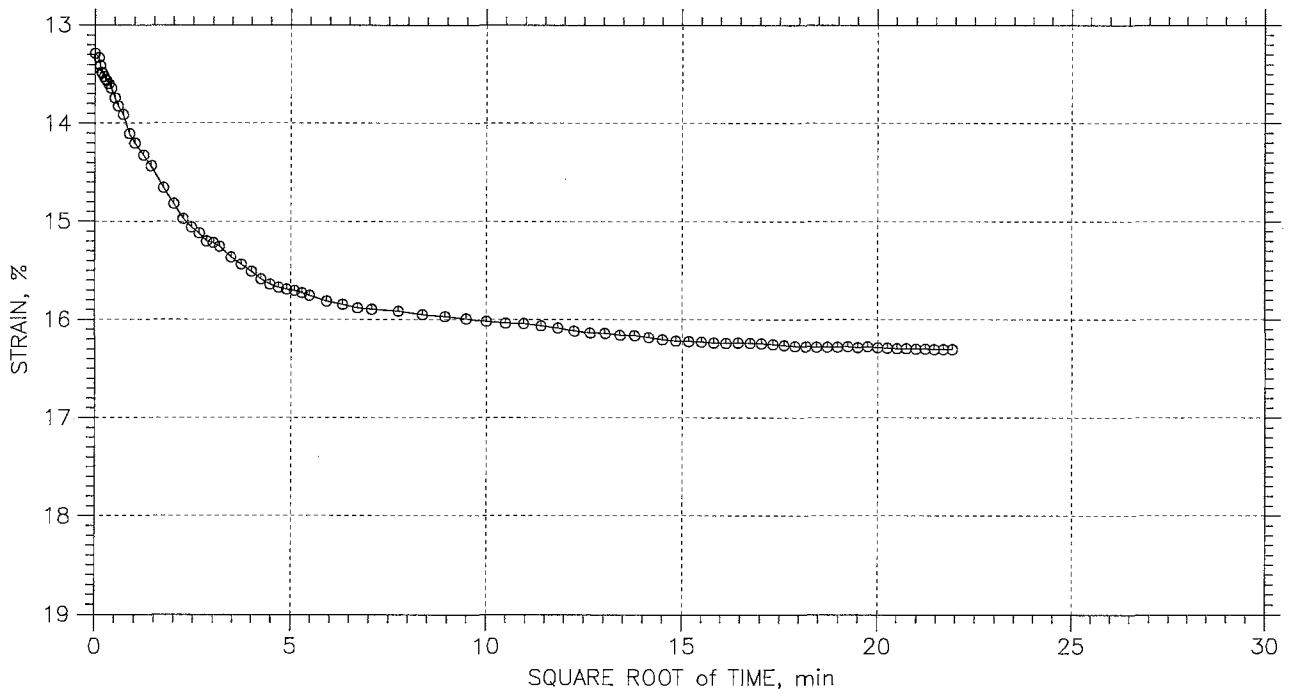
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 18

Stress: 4. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

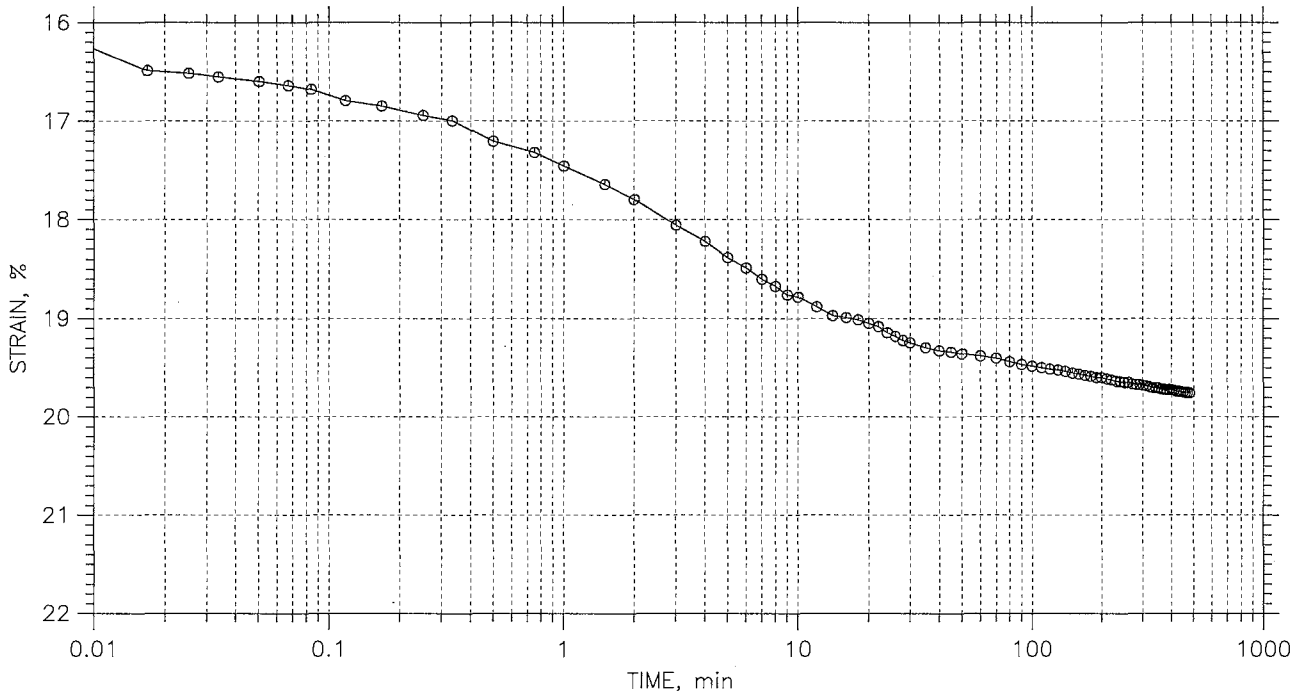
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

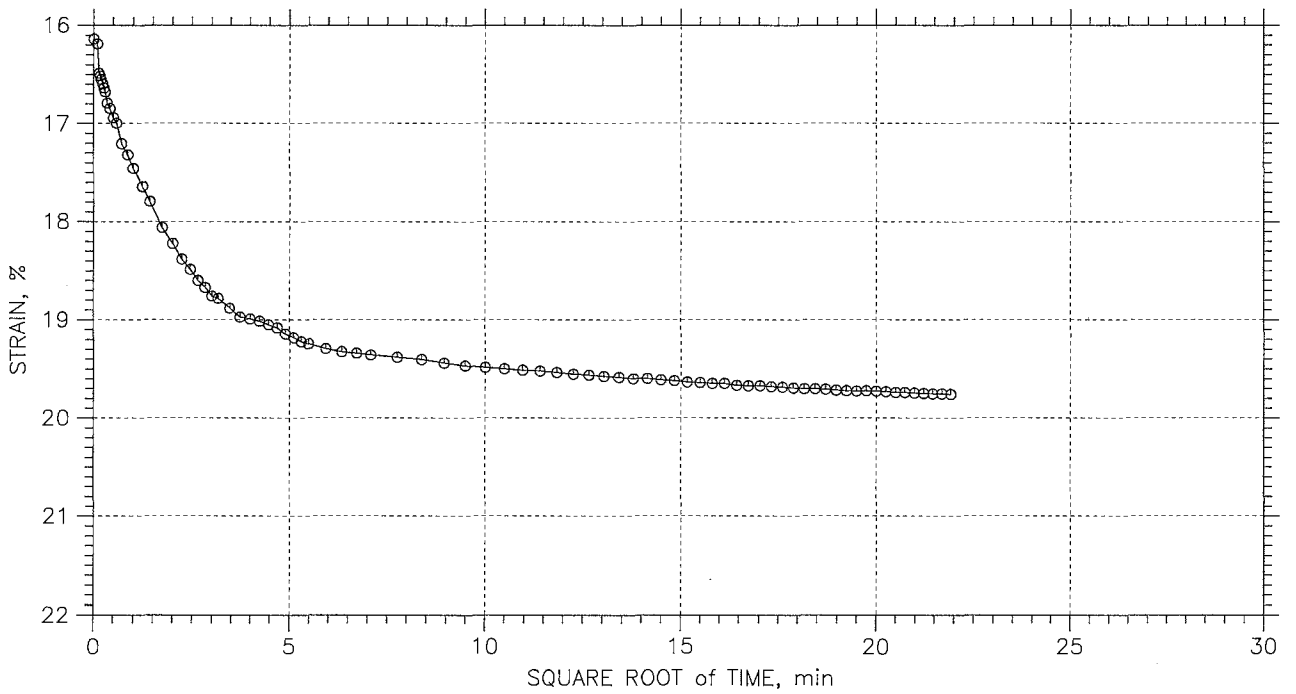
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 18

Stress: 8. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

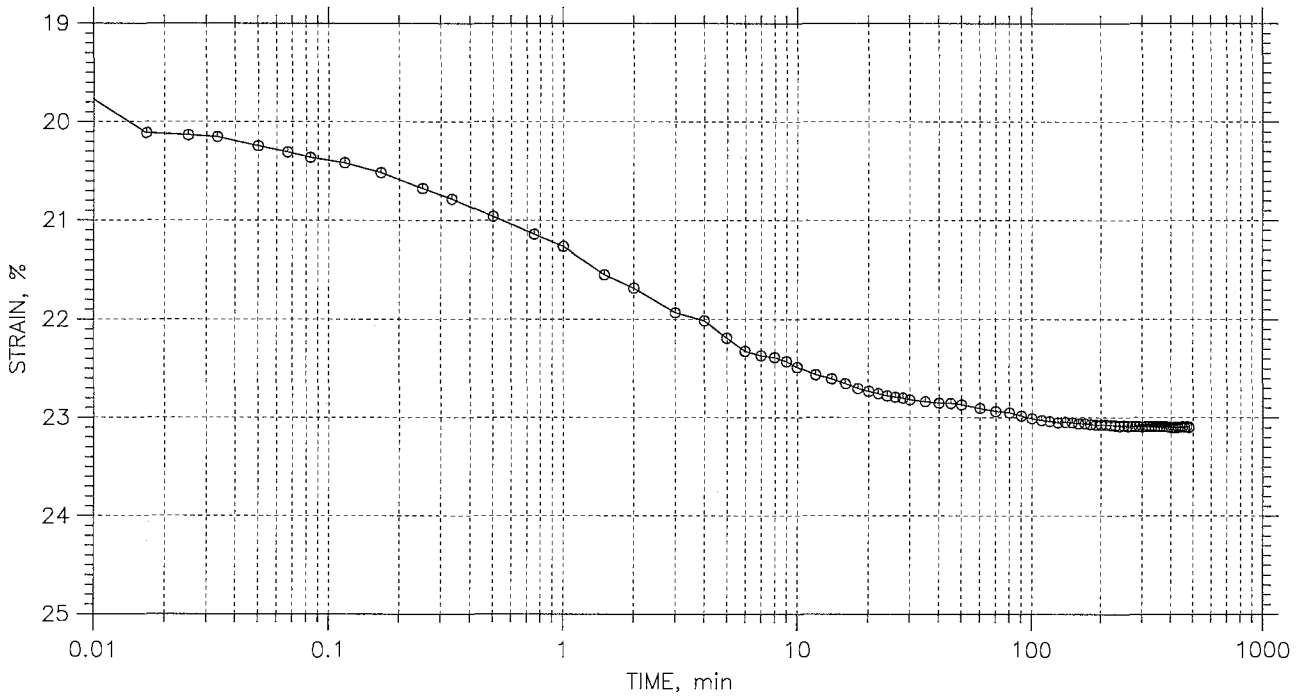
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

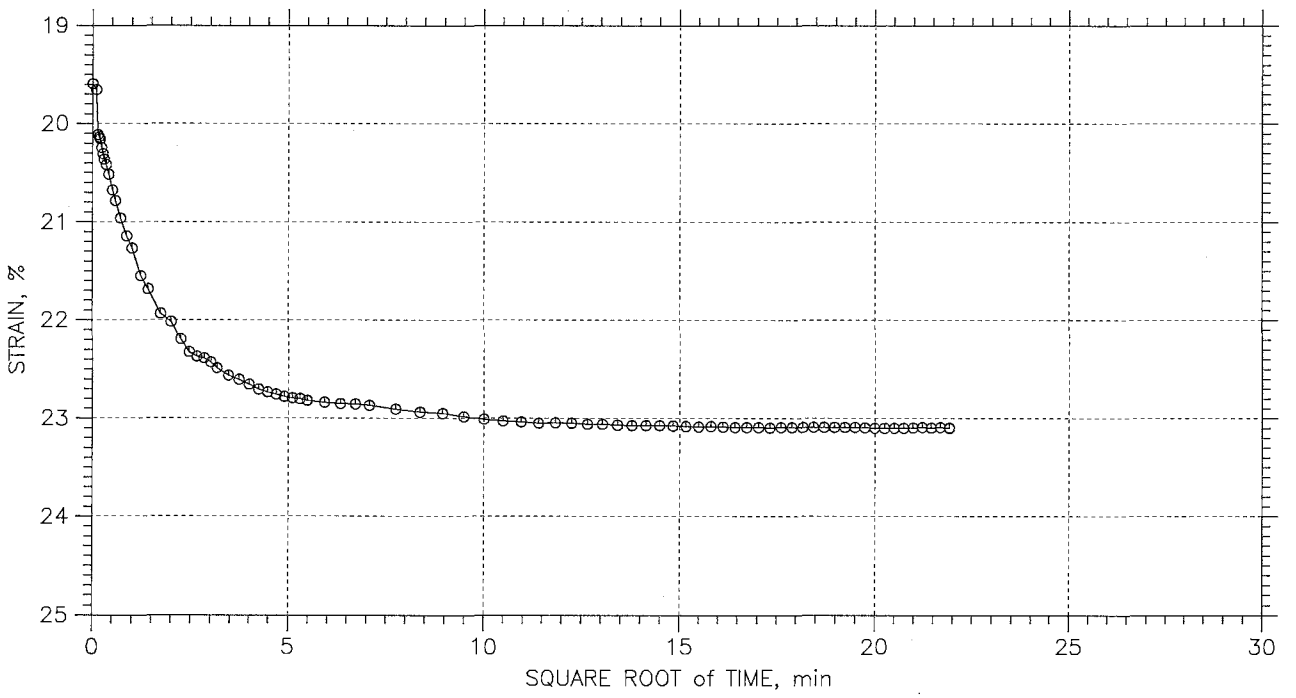
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 18

Stress: 16. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

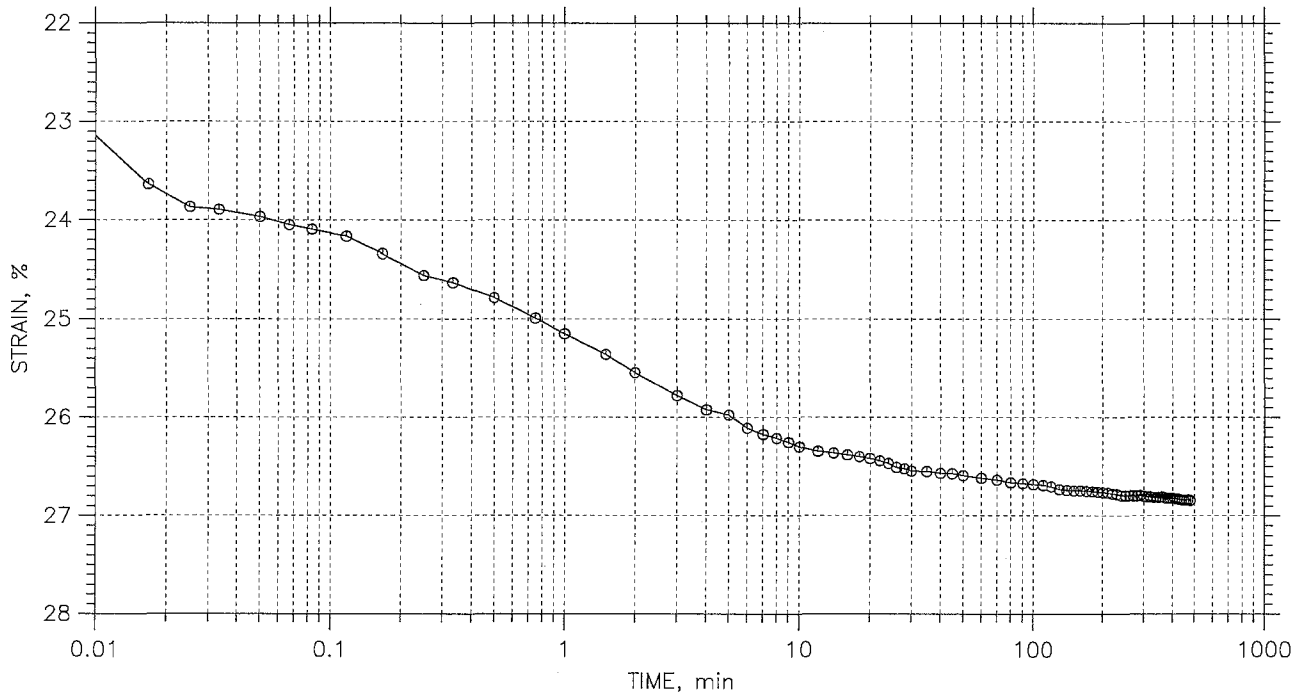
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

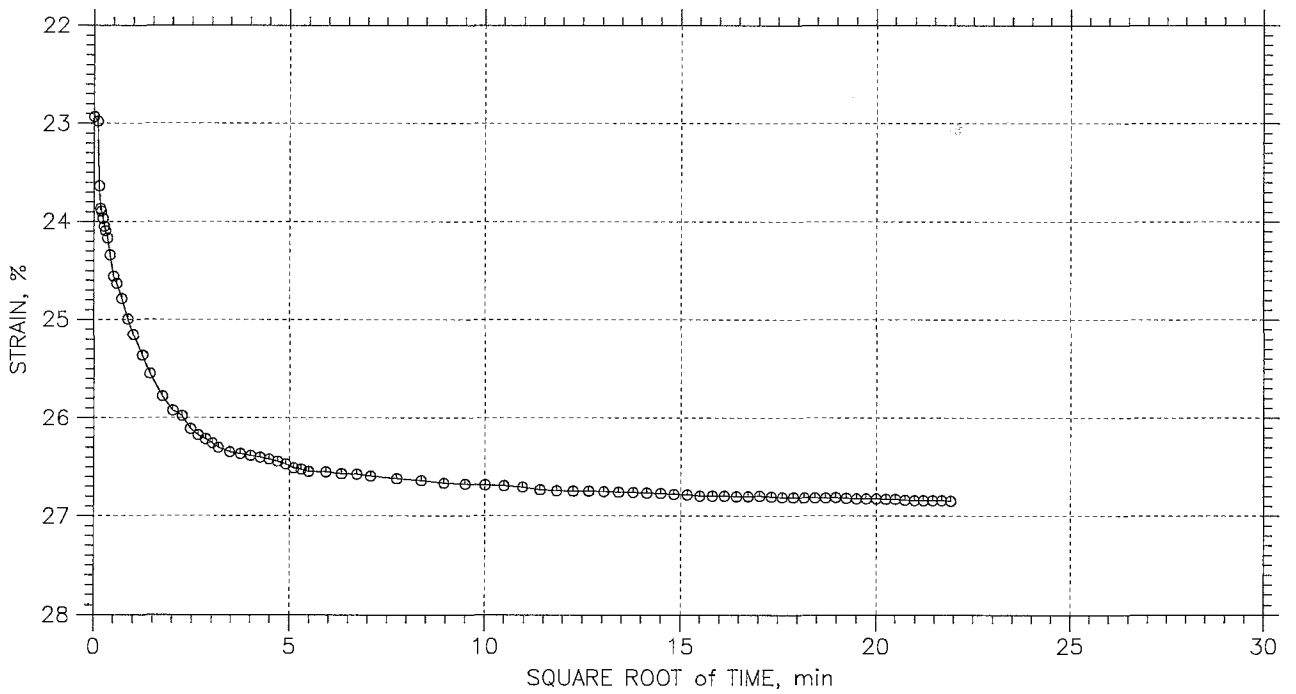
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 18

Stress: 32. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

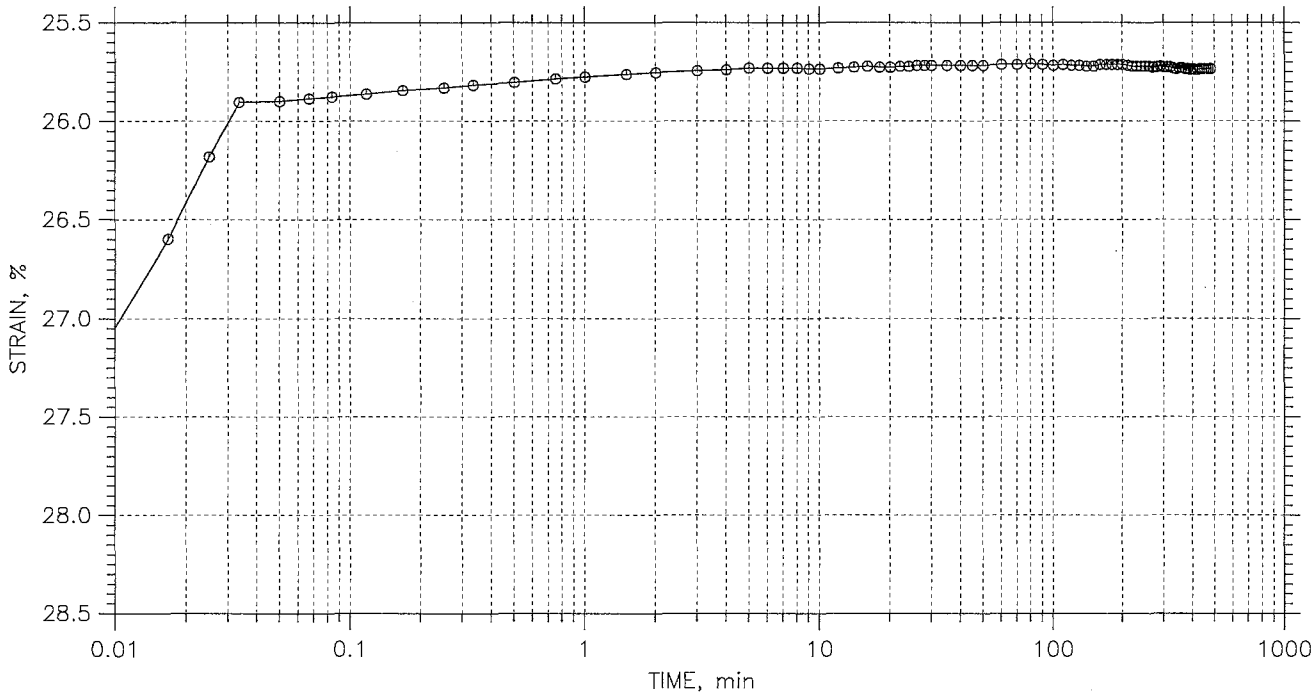
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

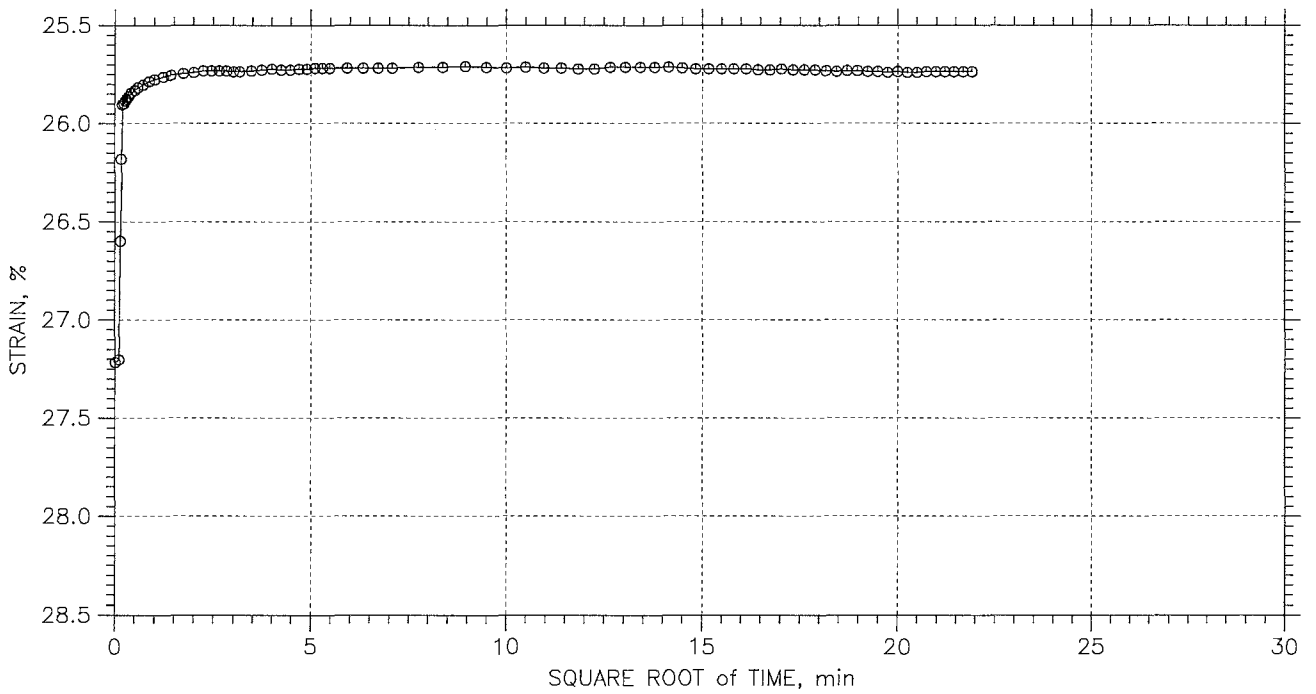
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 16 of 18

Stress: 8. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

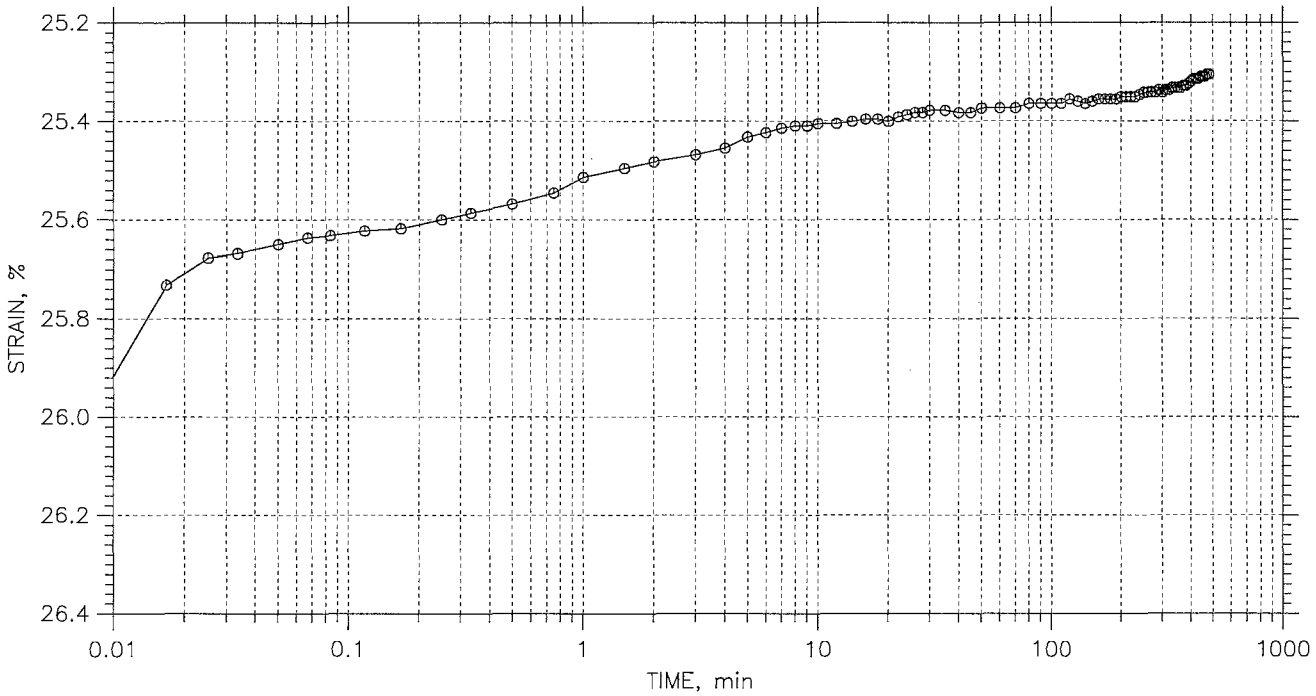
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

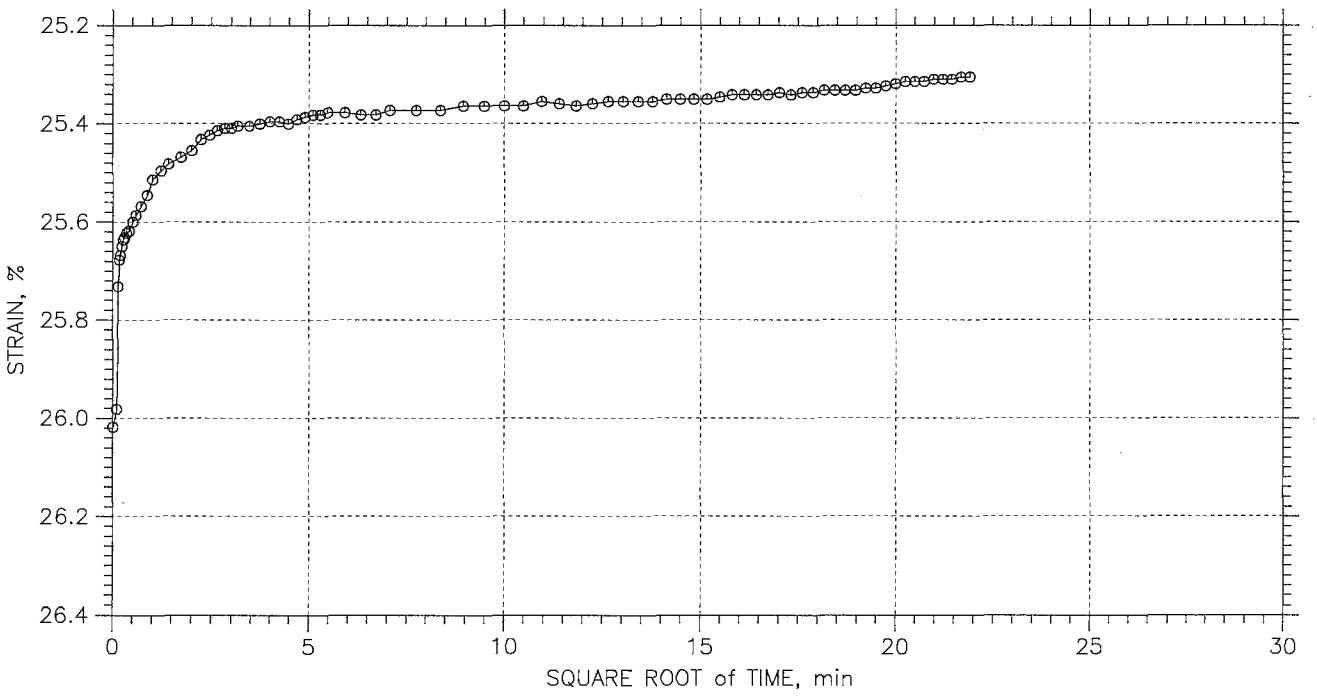
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 17 of 18

Stress: 2. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

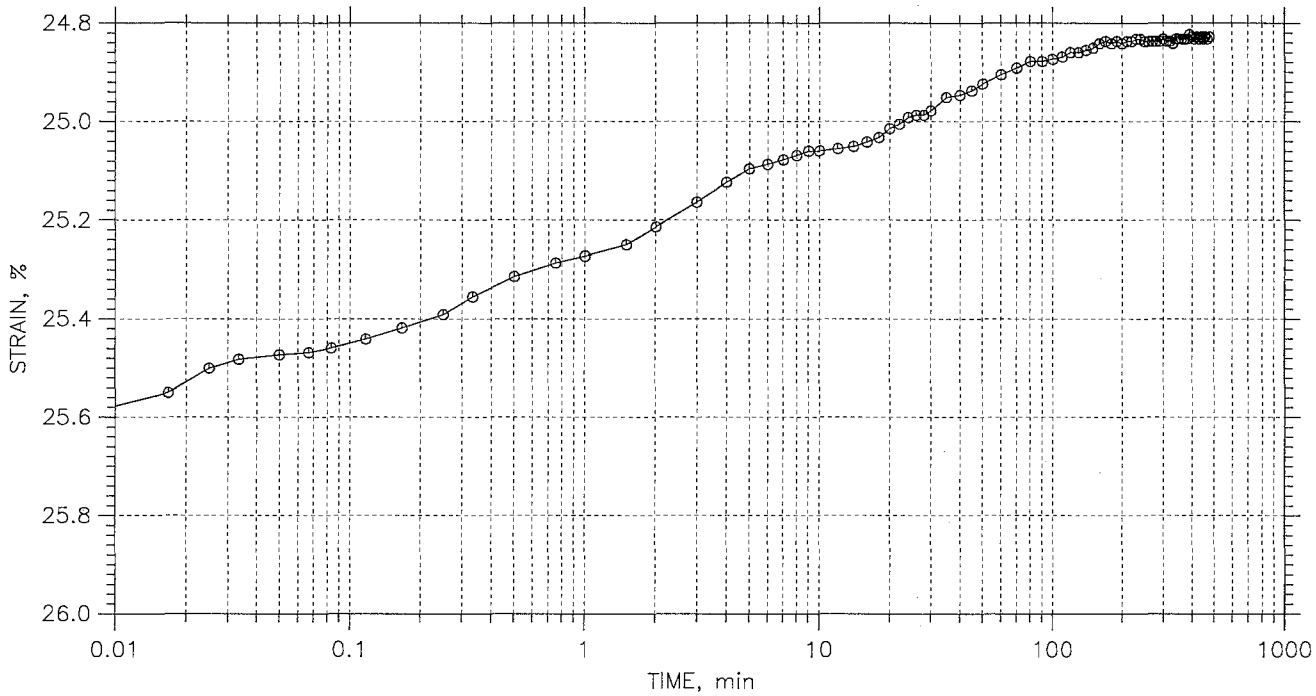
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

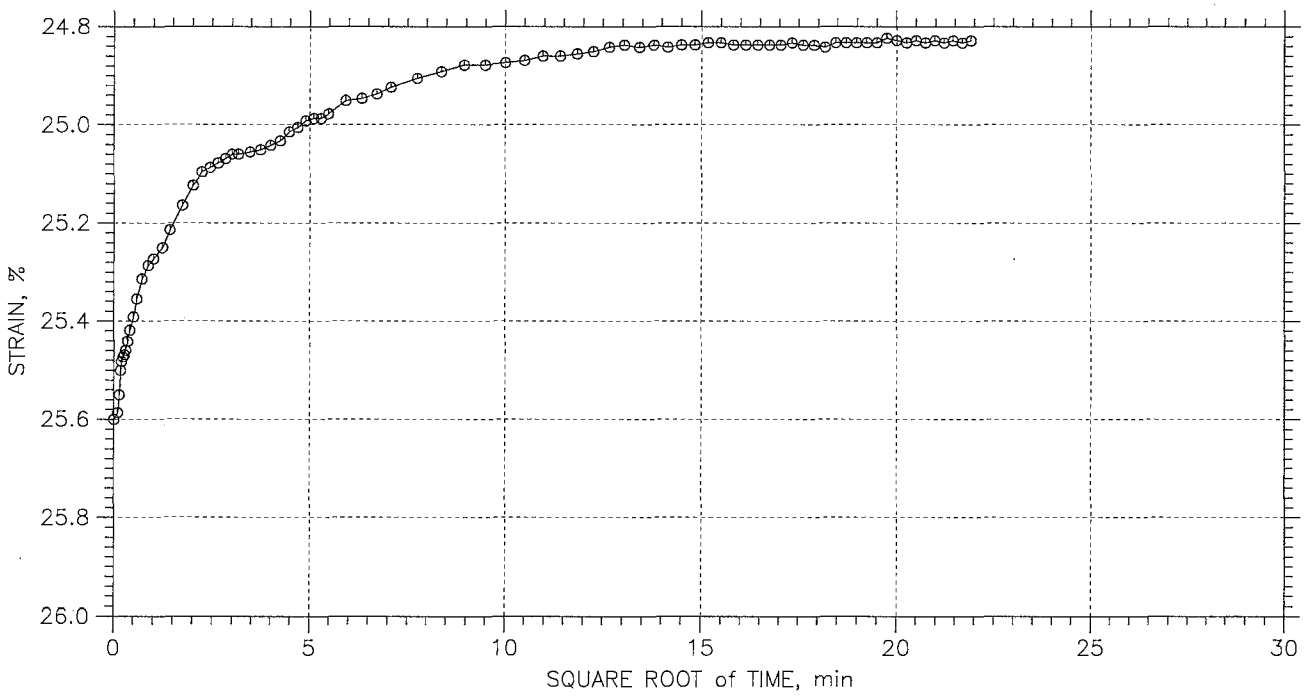
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 18 of 18

Stress: 0.5 tsf



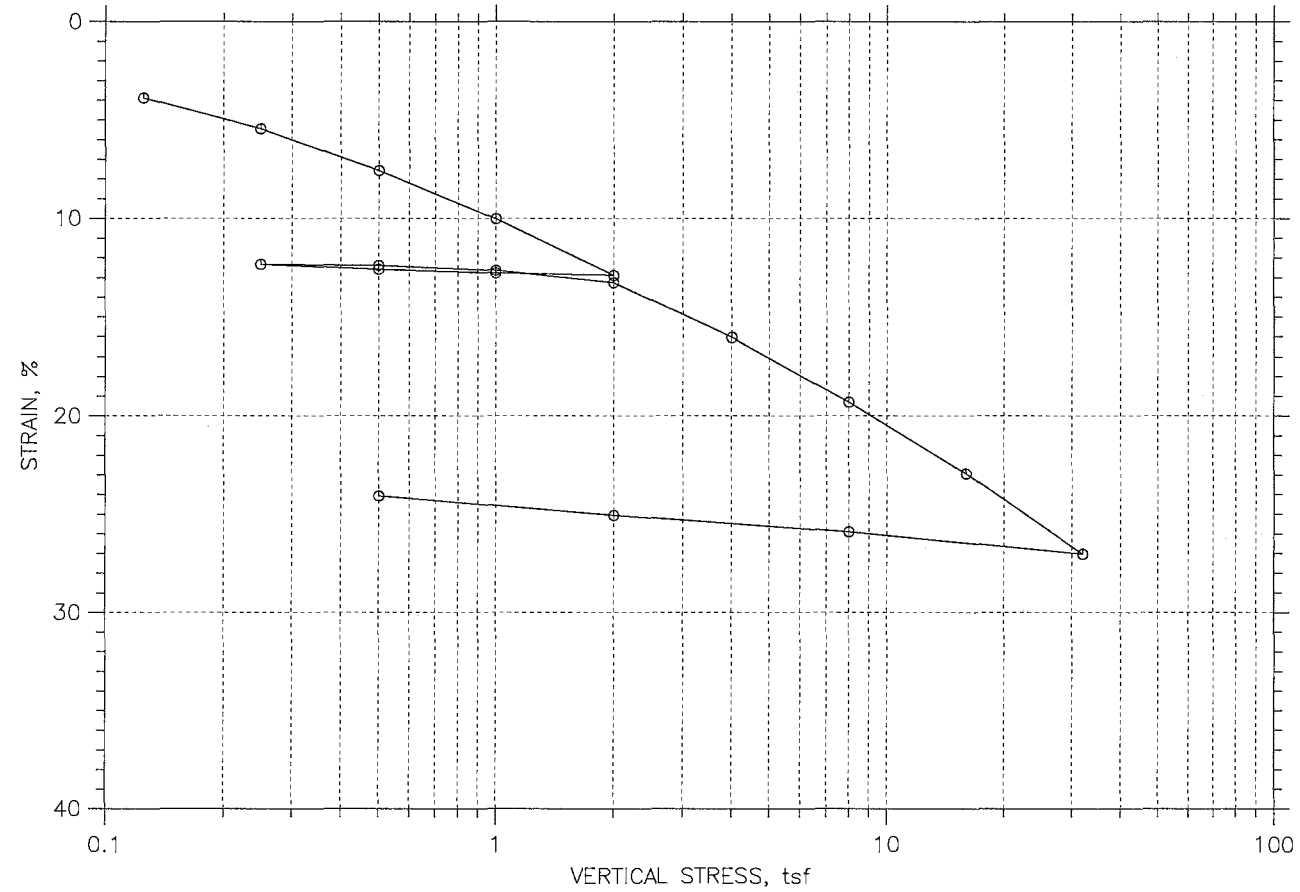


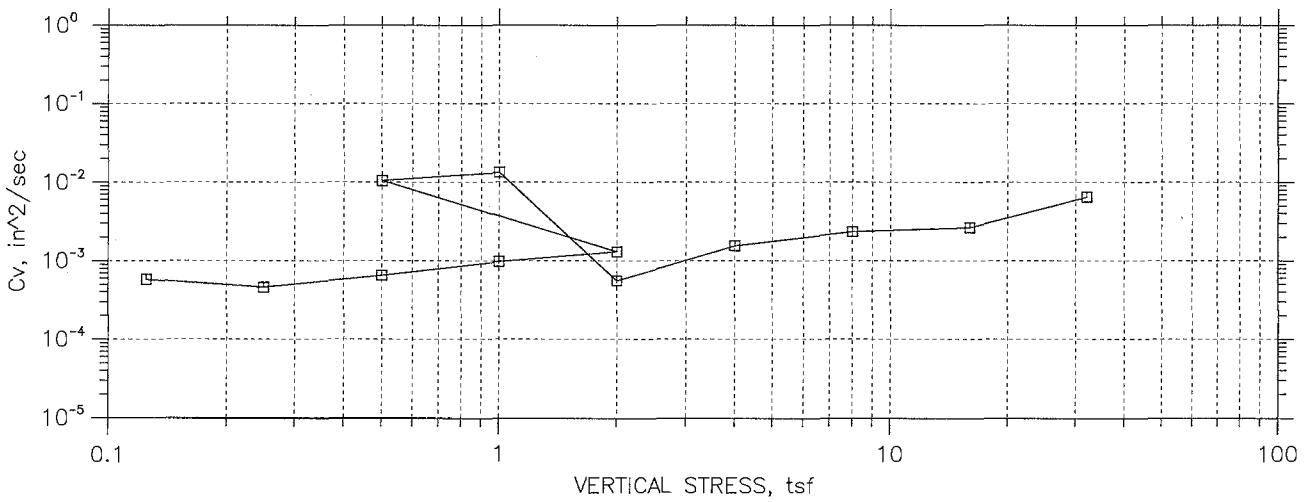
GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11062
	Boring No.: GTB-02	Tested By: md	Checked By: jdt
	Sample No.: D 30551	Test Date: 8/15/11	Depth: 4-6 ft
	Test No.: C-2	Sample Type: tube	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System E		

ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

CONSOLIDATION TEST DATA

SUMMARY REPORT





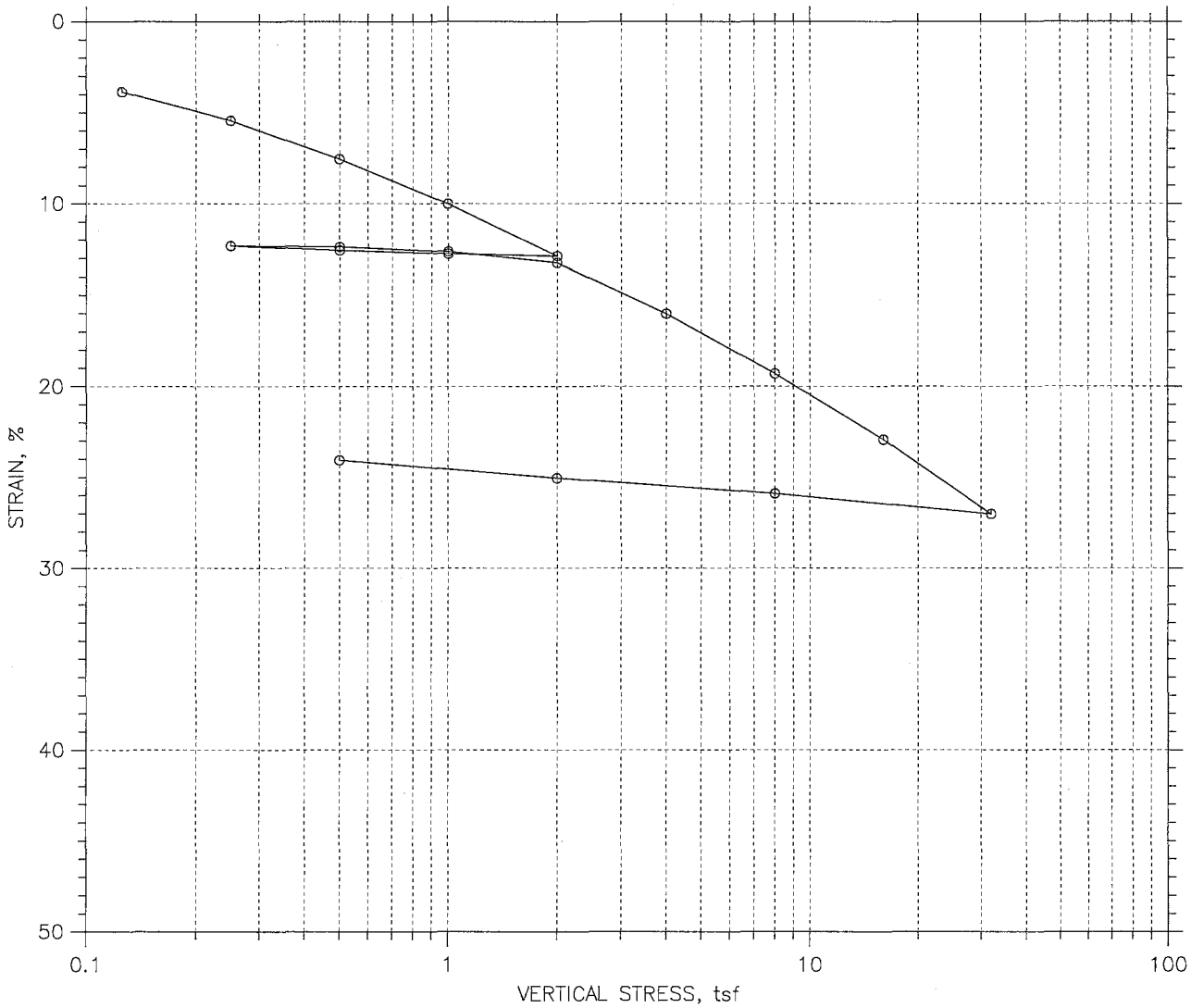
GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

Tue, 23-AUG-2011 12:02:58

ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

CONSOLIDATION TEST DATA

SUMMARY REPORT



				Before Test	After Test
Overburden Pressure: ---				Water Content, %	42.06	23.01
Preconsolidation Pressure: ---				Dry Unit Weight, pcf	77.11	101.6
Compression Index: ---				Saturation, %	98.96	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.11	0.60
LL: 38	PL: 29	PI: 9	GS: 2.60			

GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

Tue, 23-AUG-2011 12:02:58

ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

CONSOLIDATION TEST DATA

Project: DAS Case 0829F
Boring No.: GTB-04
Sample No.: D 30554
Test No.: C-1

Location: ---
Tested By: md
Test Date: 8/15/11
Sample Type: tube

Project No.: GTX-11069
Checked By: jdt
Depth: 6-8 ft
Elevation: ---

Soil Description: Moist, dark olive brown silty sand
Remarks: System F

Measured Specific Gravity: 2.60
Initial Void Ratio: 1.11
Final Void Ratio: 0.60

Liquid Limit: 38
Plastic Limit: 29
Plasticity Index: 9

Initial Height: 1.00 in
Specimen Diameter: 2.50 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	7603	RING		8326
Wt. Container + Wet Soil, gm	250.01	250.71	231.78	128.26
Wt. Container + Dry Soil, gm	180.93	208.92	208.92	105.83
Wt. Container, gm	8.6	109.57	109.57	8.34
Wt. Dry Soil, gm	172.33	99.352	99.352	97.49
Water Content, %	40.09	42.06	23.01	23.01
Void Ratio	---	1.11	0.60	---
Degree of Saturation, %	---	98.96	100.00	---
Dry Unit Weight, pcf	---	77.105	101.56	---

ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

CONSOLIDATION TEST DATA

Project: DAS Case 0829F
Boring No.: GTB-04
Sample No.: D 30554
Test No.: C-1

Location: ---
Tested By: md
Test Date: 8/15/11
Sample Type: tube

Project No.: GTX-11069
Checked By: jdt
Depth: 6-8 ft
Elevation: ---

Soil Description: Moist, dark olive brown silty sand
Remarks: System F

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. in^2/sec	Coefficient of Consolidation Log in^2/sec	Coefficient of Consolidation Ave. in^2/sec
1	0.125	0.03877	1.023	3.88	1.4	0.0	5.80e-004	0.00e+000	5.80e-004
2	0.25	0.05444	0.990	5.44	1.5	1.7	4.95e-004	4.32e-004	4.61e-004
3	0.5	0.0757	0.946	7.57	1.0	1.2	7.46e-004	5.82e-004	6.54e-004
4	1	0.1002	0.894	10.02	0.8	0.6	8.16e-004	1.24e-003	9.85e-004
5	2	0.1288	0.834	12.88	0.6	0.4	1.02e-003	1.82e-003	1.31e-003
6	1	0.1277	0.836	12.77	0.0	0.0	1.94e-002	0.00e+000	1.94e-002
7	0.5	0.1257	0.840	12.57	0.1	0.0	9.00e-003	1.45e-002	1.11e-002
8	0.25	0.1232	0.846	12.32	0.3	0.1	2.46e-003	1.01e-002	3.96e-003
9	0.5	0.1239	0.844	12.39	0.1	0.0	1.05e-002	0.00e+000	1.05e-002
10	1	0.1264	0.839	12.64	0.0	0.0	1.32e-002	1.36e-002	1.34e-002
11	2	0.1326	0.826	13.26	1.1	0.0	5.57e-004	0.00e+000	5.57e-004
12	4	0.1602	0.768	16.02	0.5	0.2	1.12e-003	2.56e-003	1.56e-003
13	8	0.1931	0.699	19.31	0.3	0.2	1.78e-003	3.47e-003	2.35e-003
14	16	0.2294	0.622	22.94	0.3	0.1	1.82e-003	4.94e-003	2.66e-003
15	32	0.2703	0.536	27.03	0.1	0.0	4.99e-003	9.31e-003	6.50e-003
16	8	0.259	0.560	25.90	0.0	0.0	1.83e-002	0.00e+000	1.83e-002
17	2	0.2506	0.578	25.06	0.0	0.0	1.32e-002	1.92e-002	1.57e-002
18	0.5	0.2408	0.598	24.08	0.3	0.0	1.49e-003	1.09e-002	2.63e-003

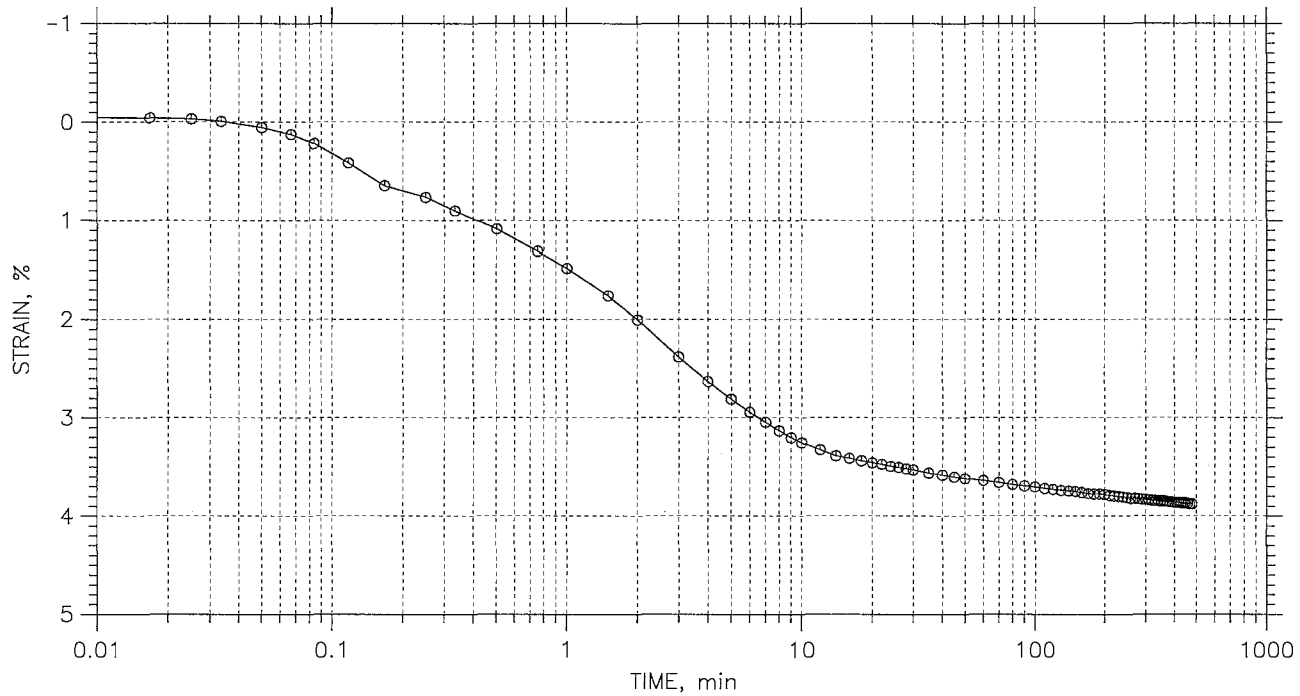
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

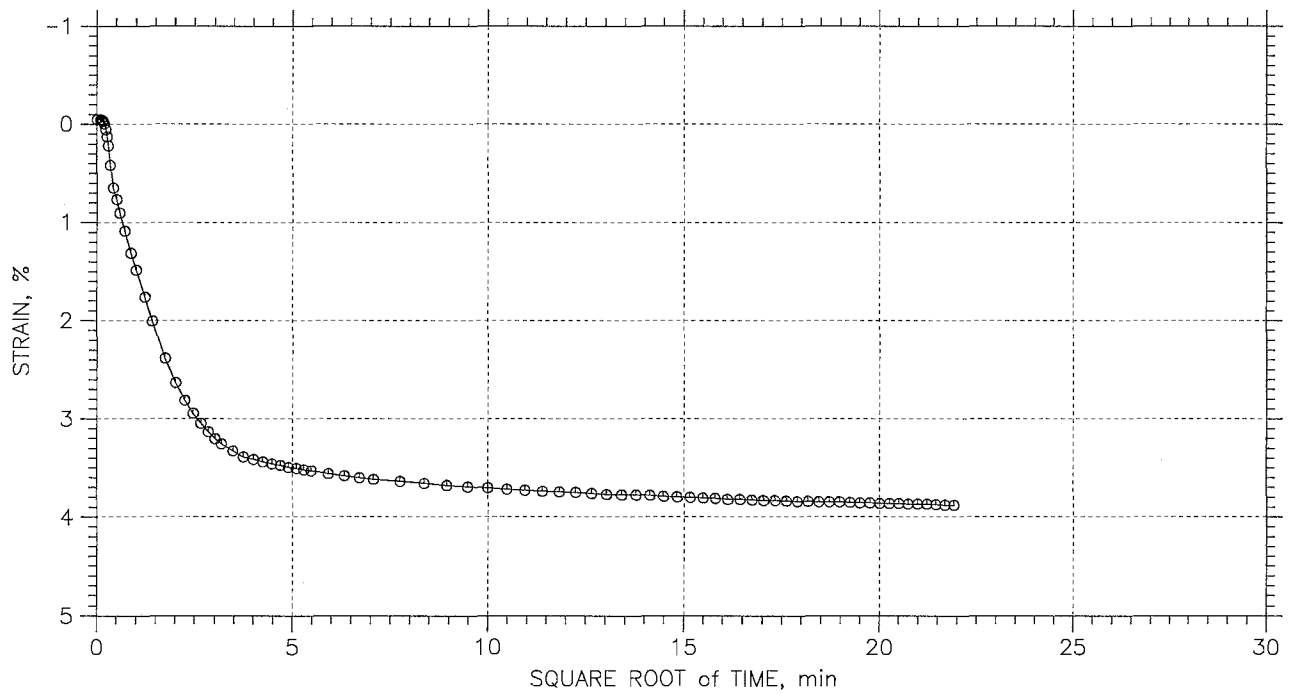
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 1 of 18

Stress: 0.125 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

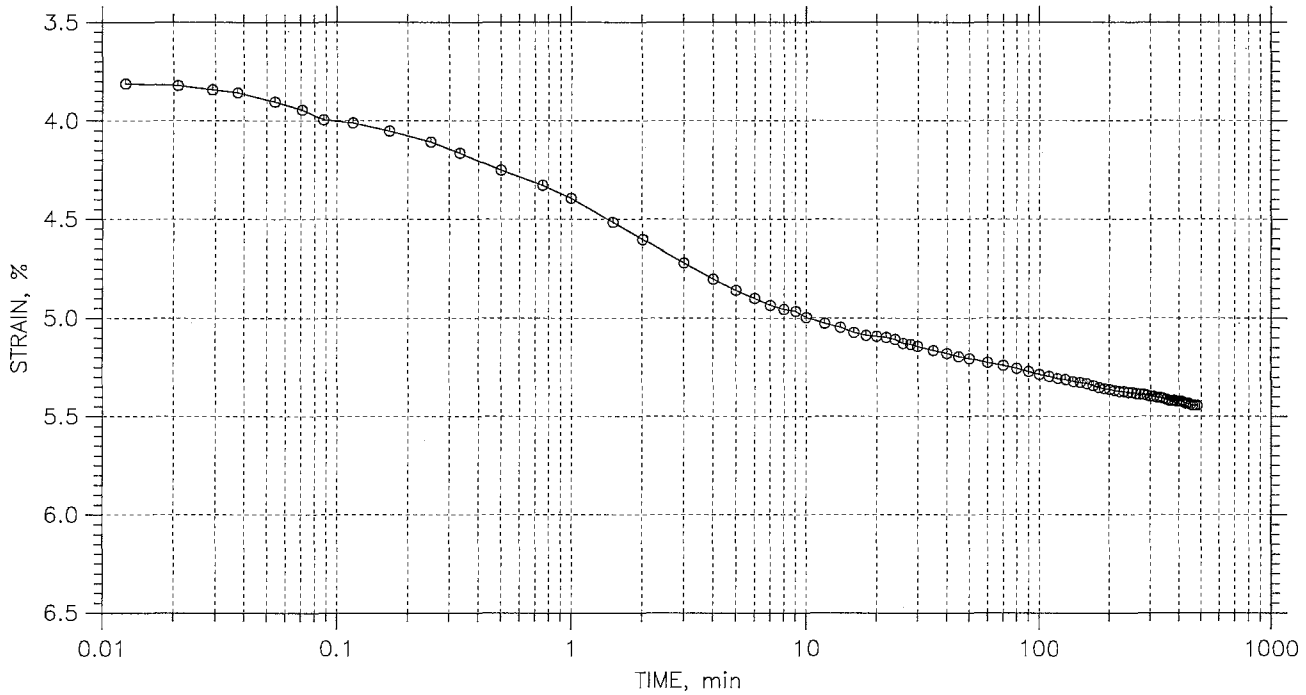
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

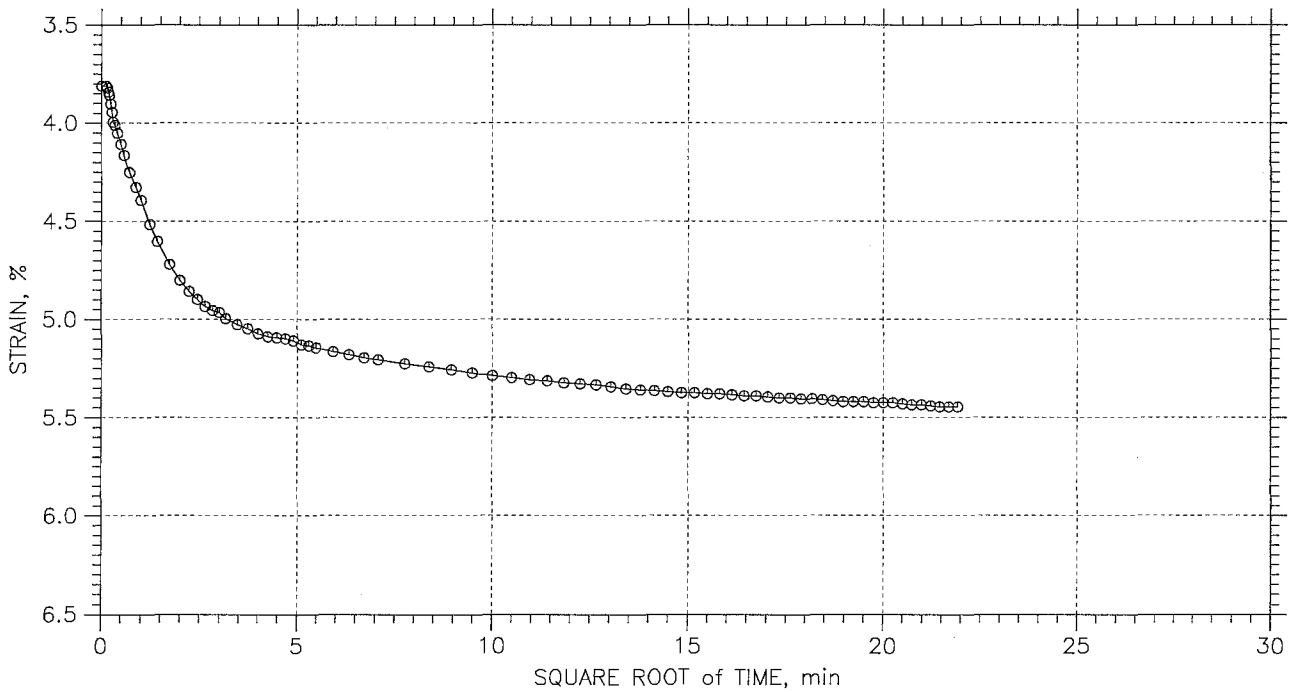
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 18

Stress: 0.25 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

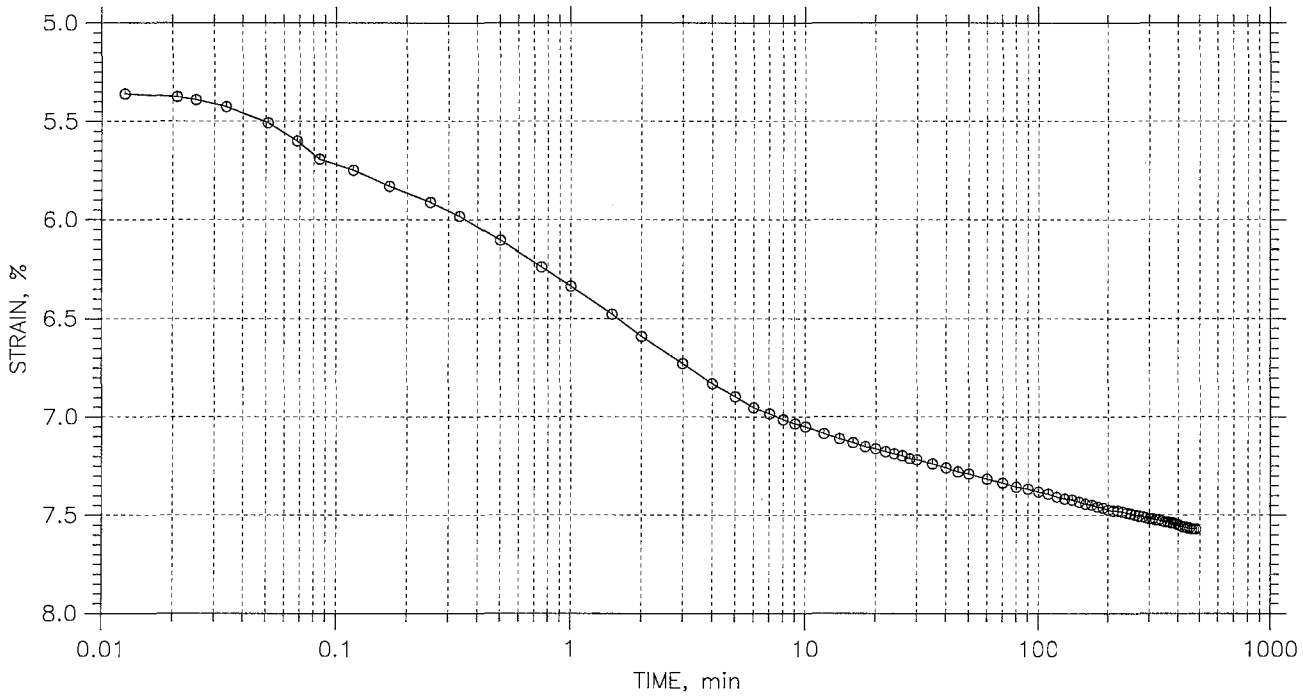
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

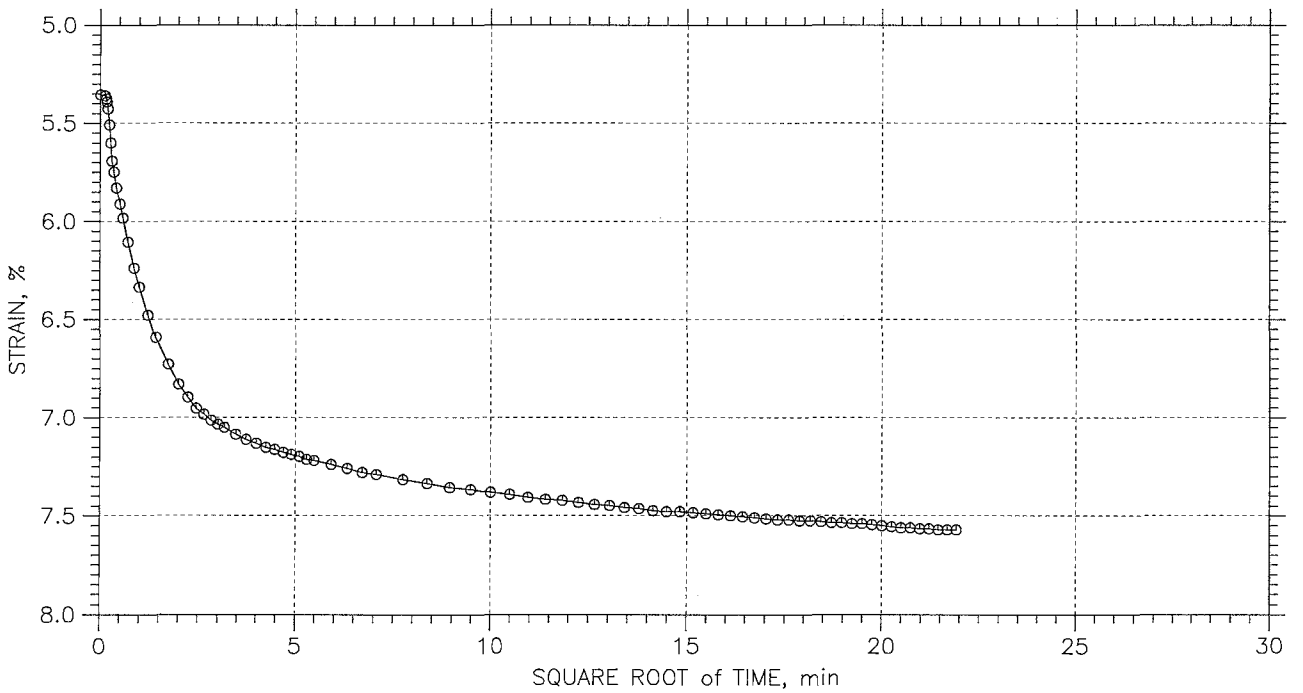
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 18

Stress: 0.5 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

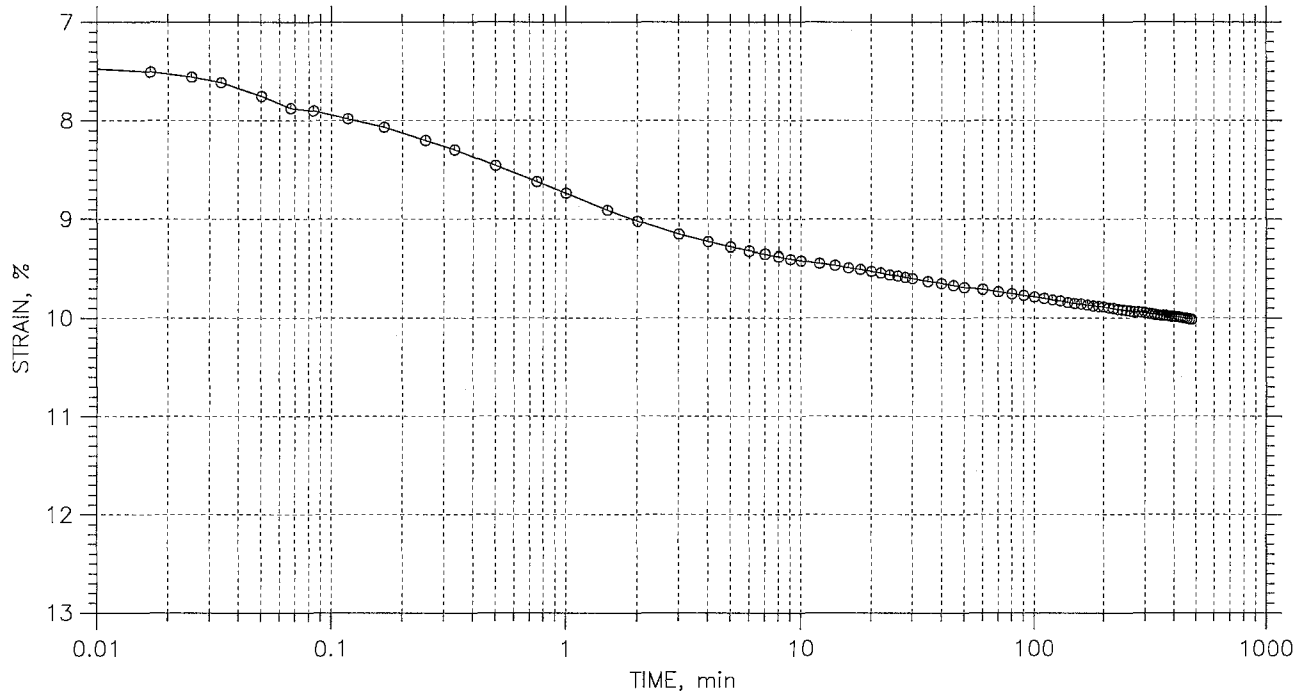
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

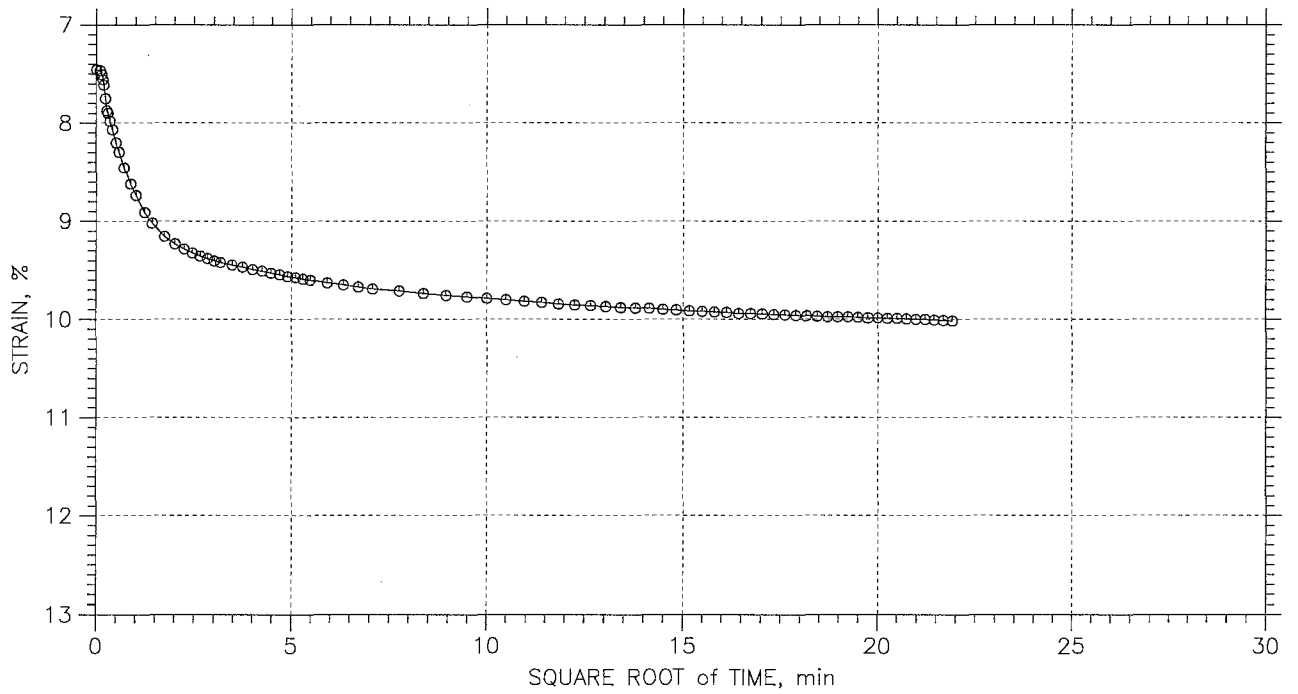
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 18

Stress: 1. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

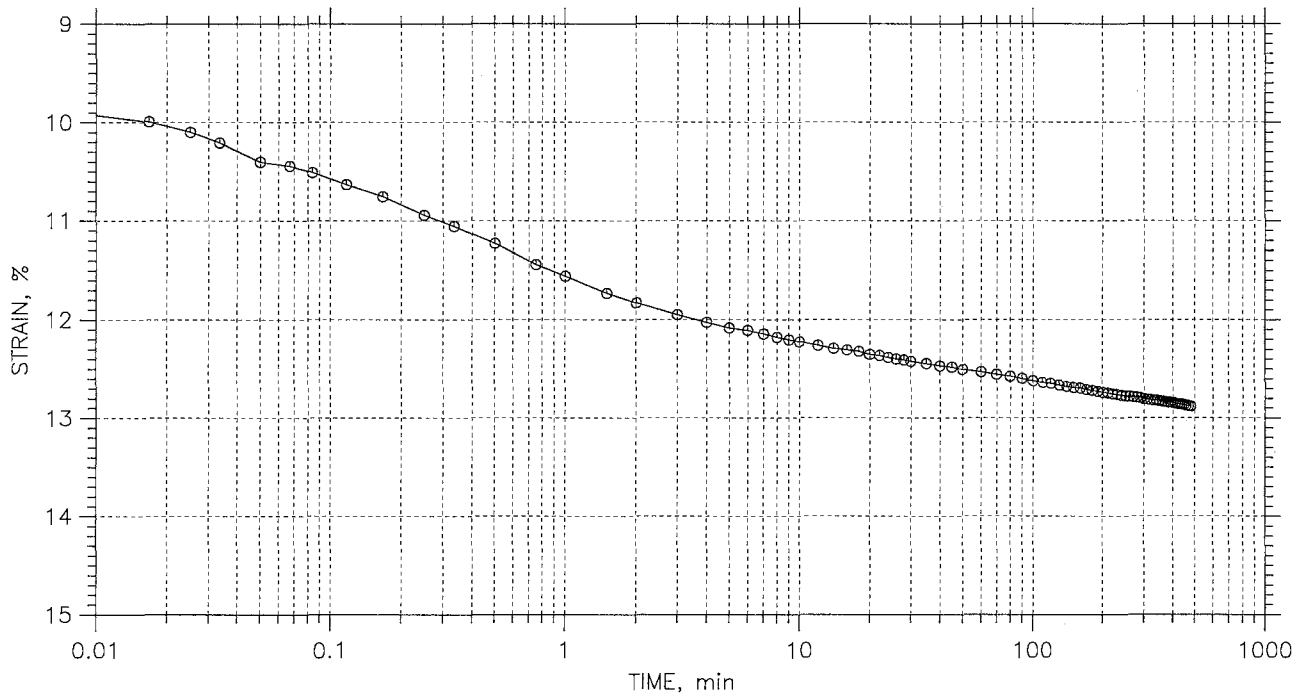
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

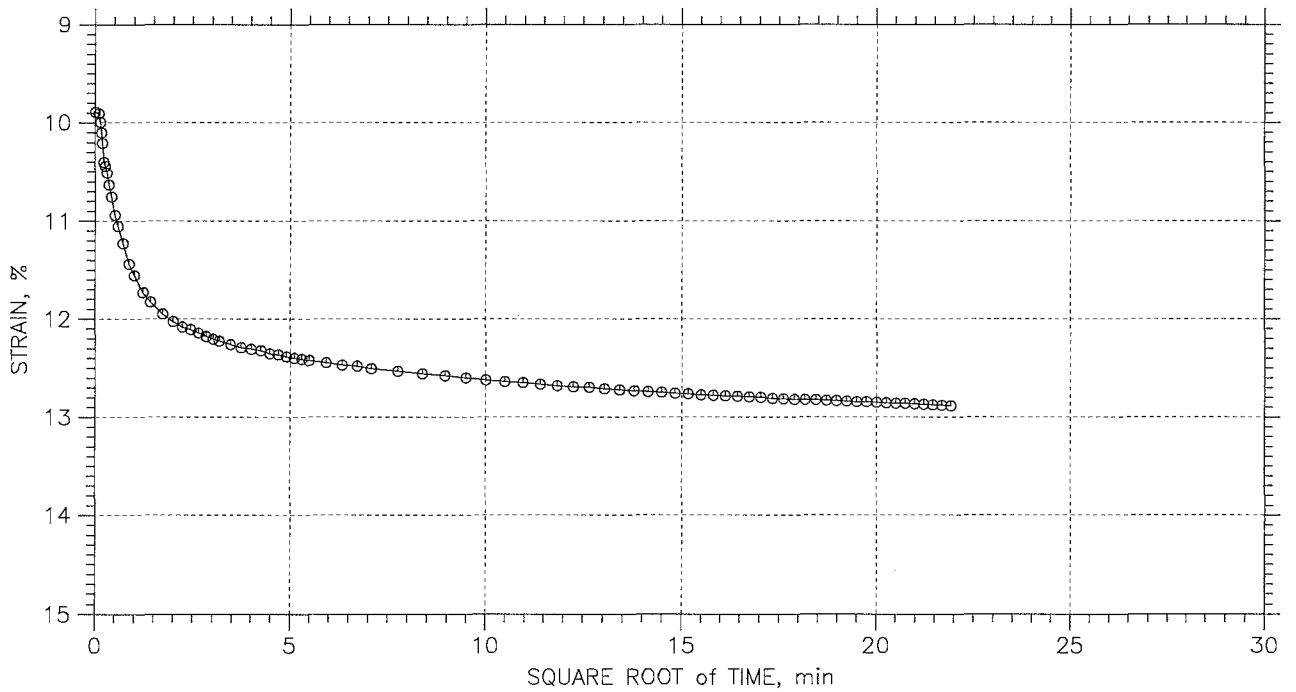
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 18

Stress: 2. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

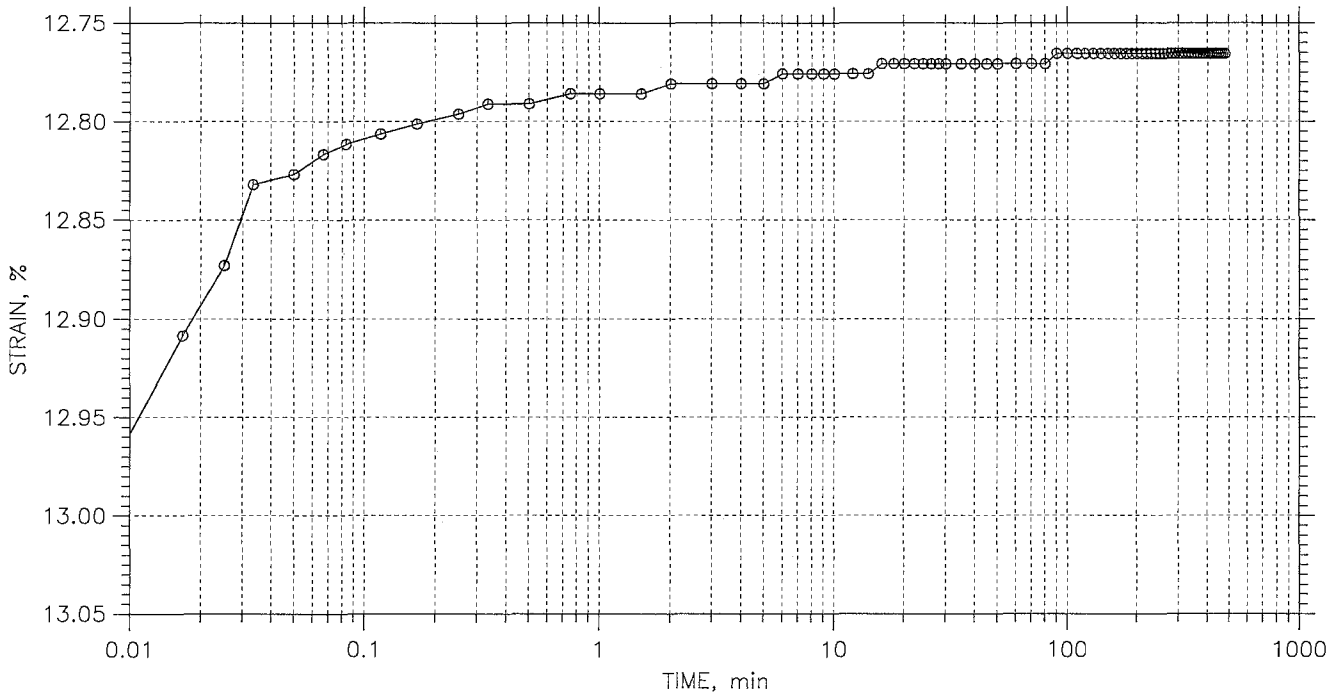
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

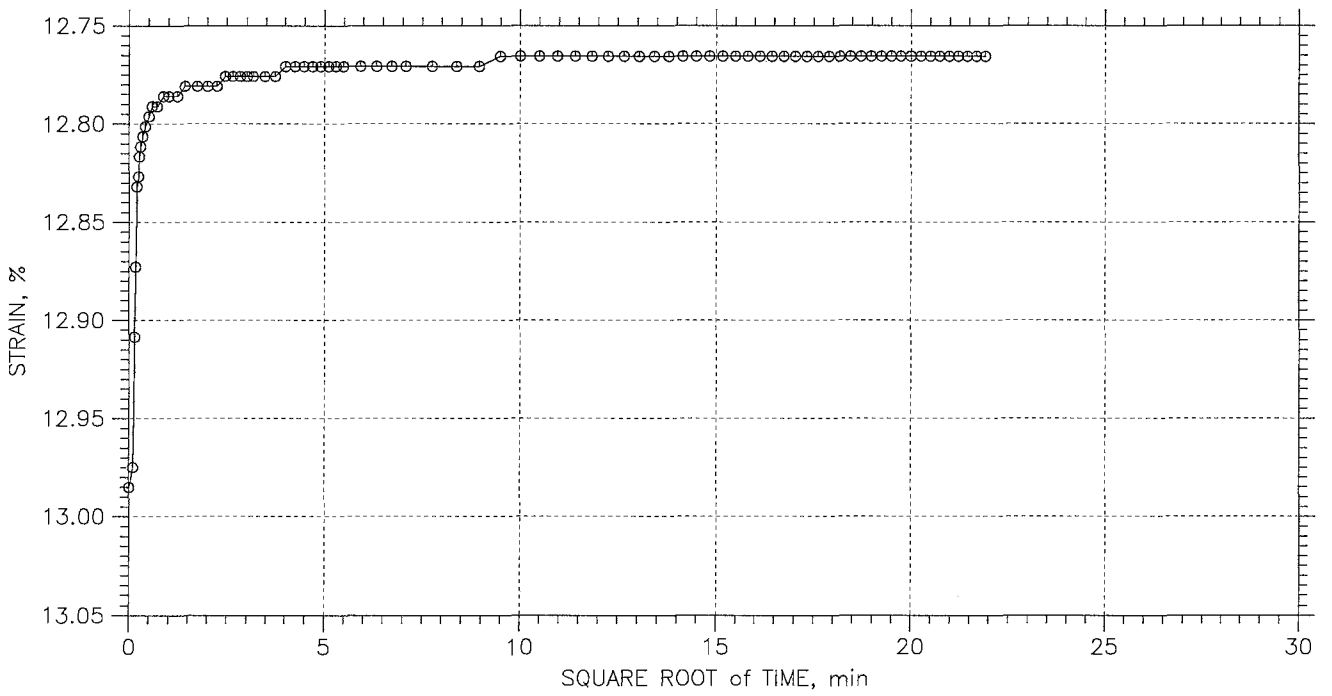
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 18

Stress: 1. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

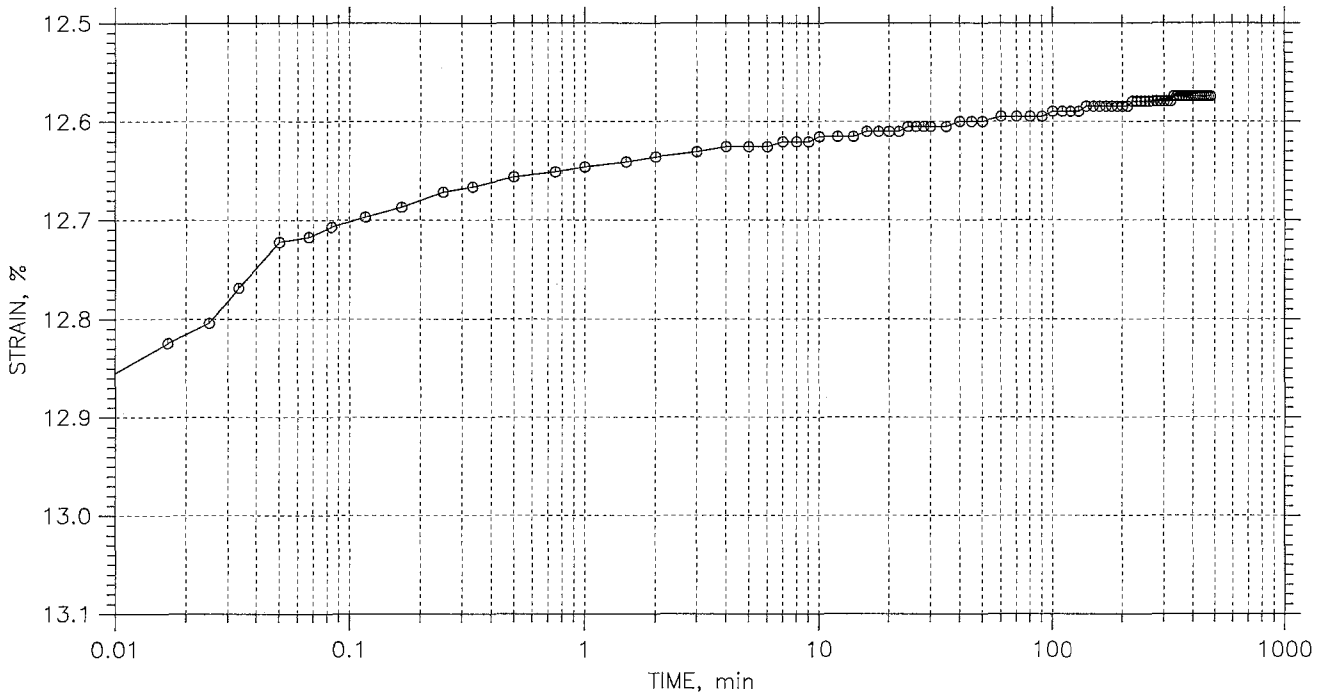
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

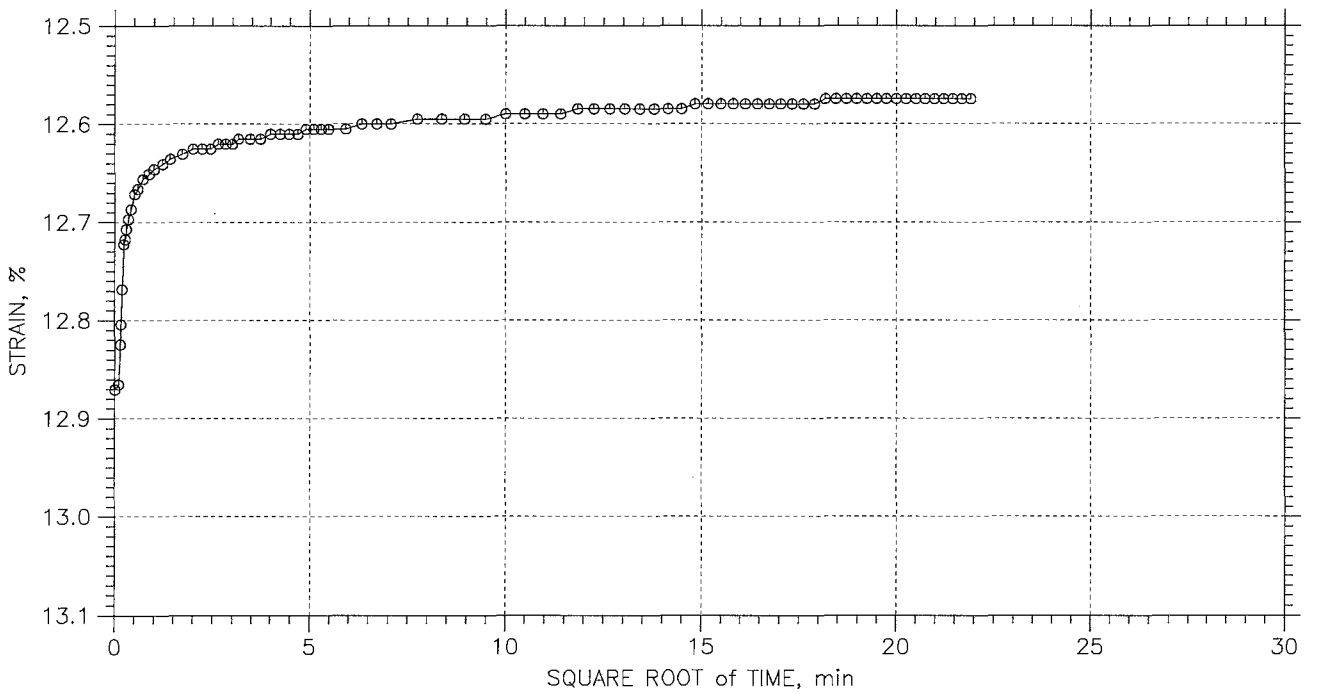
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 18

Stress: 0.5 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

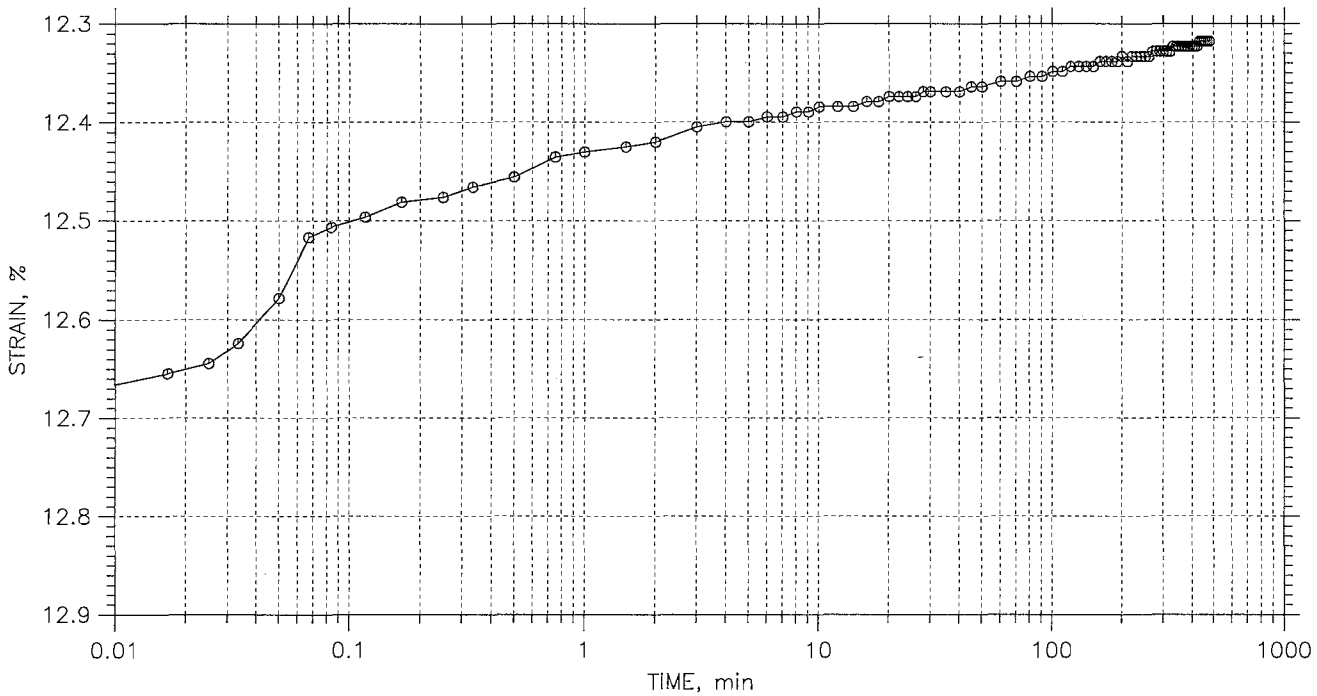
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

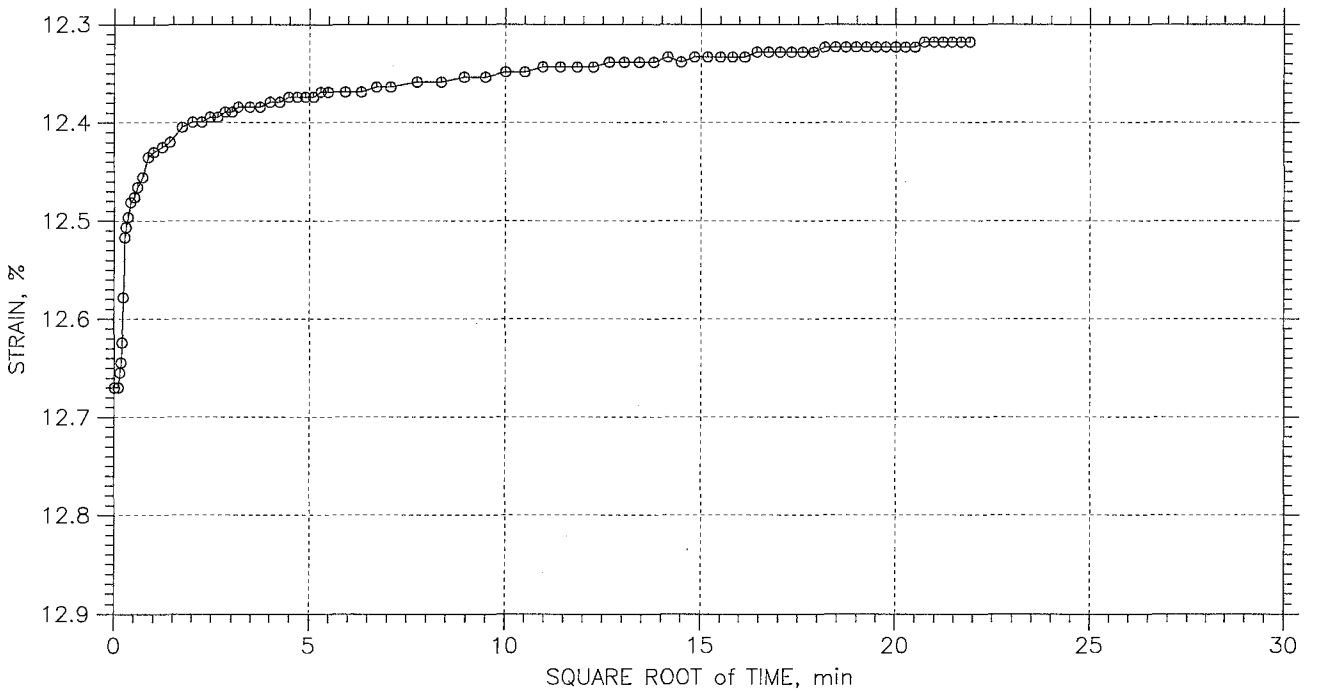
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 18

Stress: 0.25 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

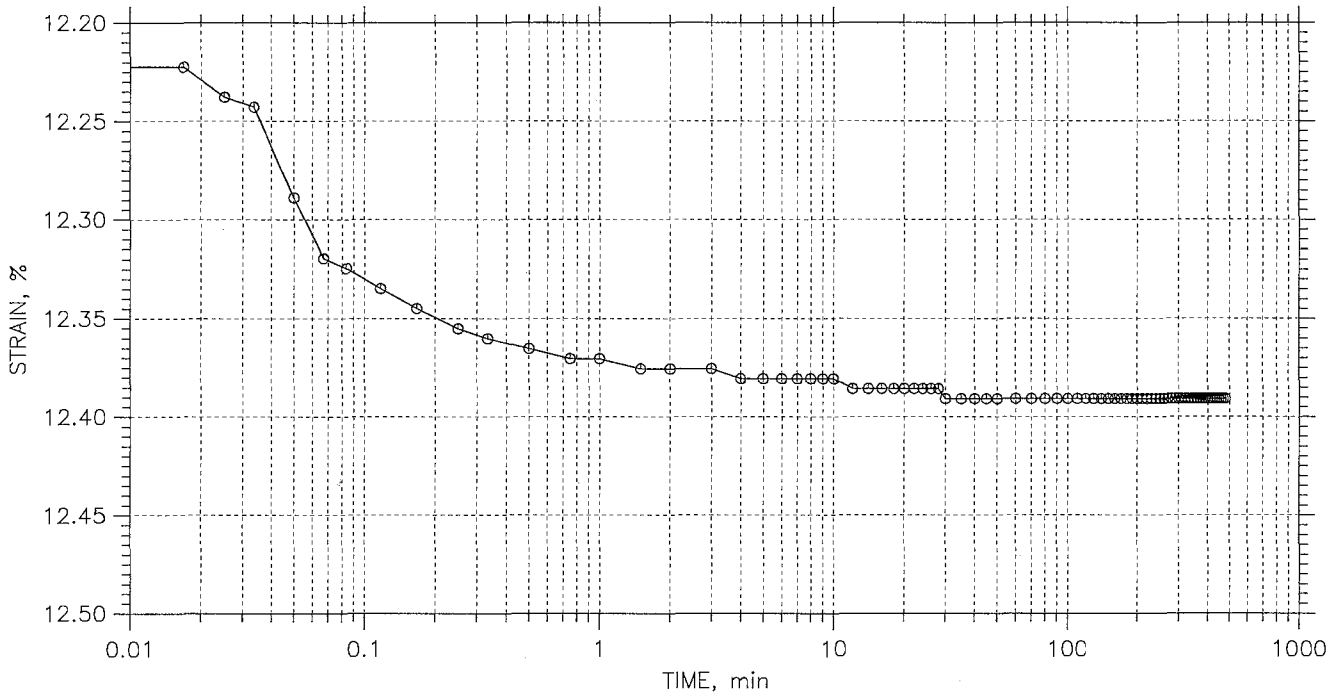
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

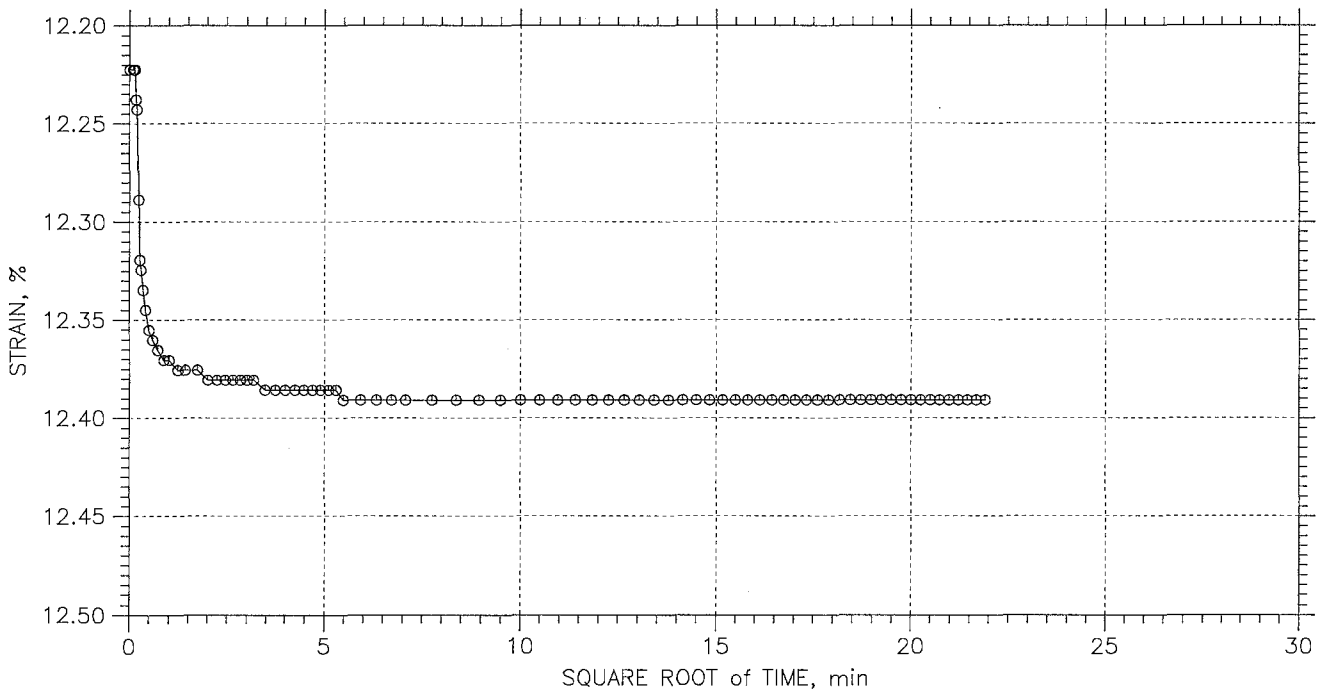
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 18

Stress: 0.5 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

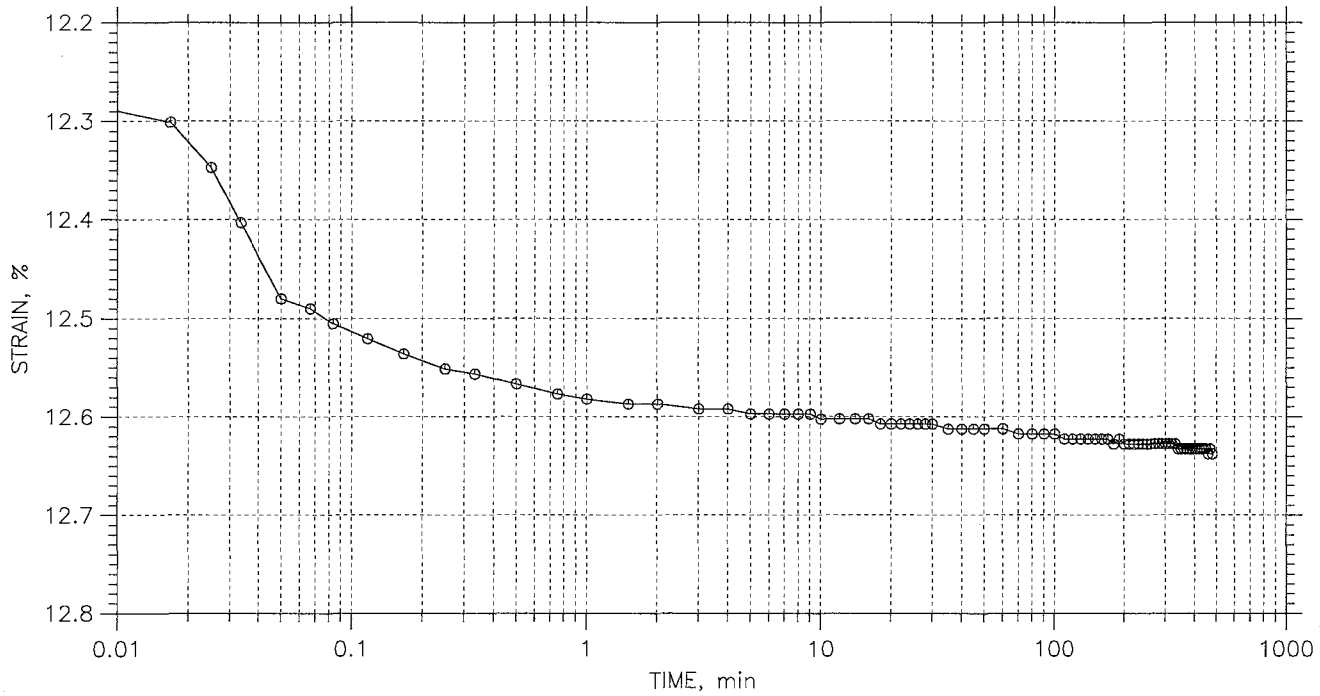
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

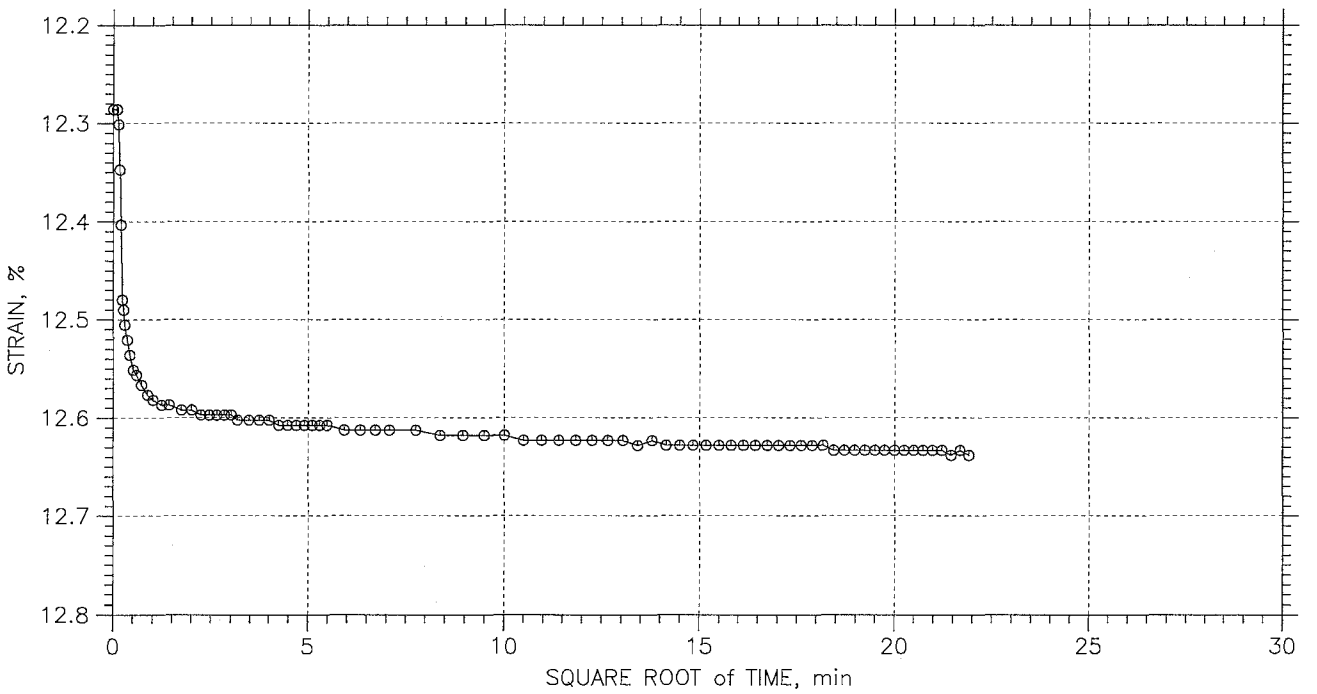
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 18

Stress: 1. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

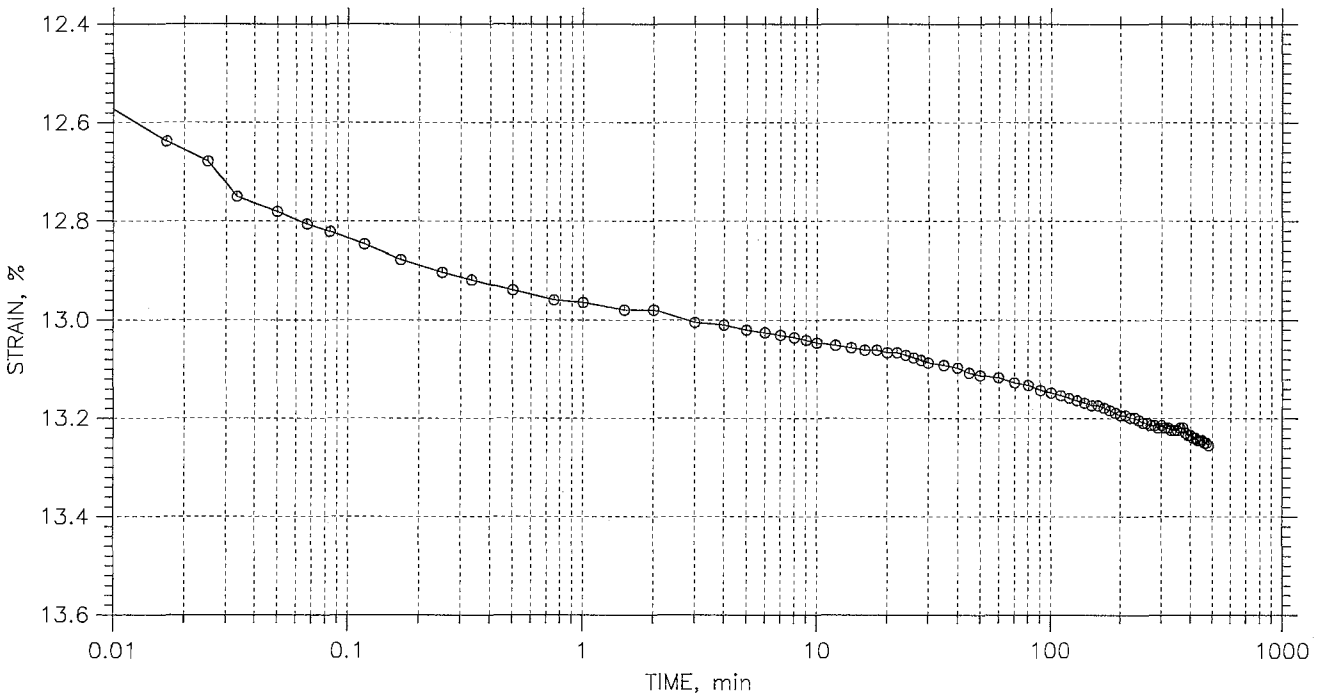
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

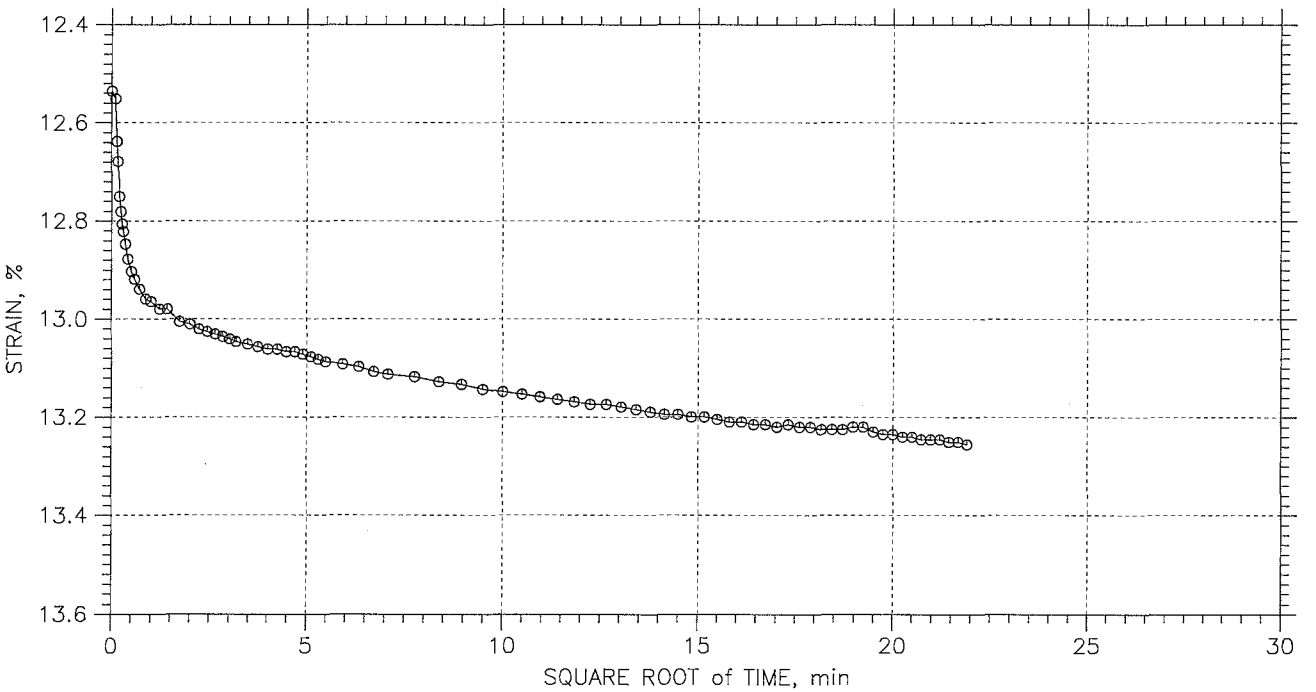
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 18

Stress: 2. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

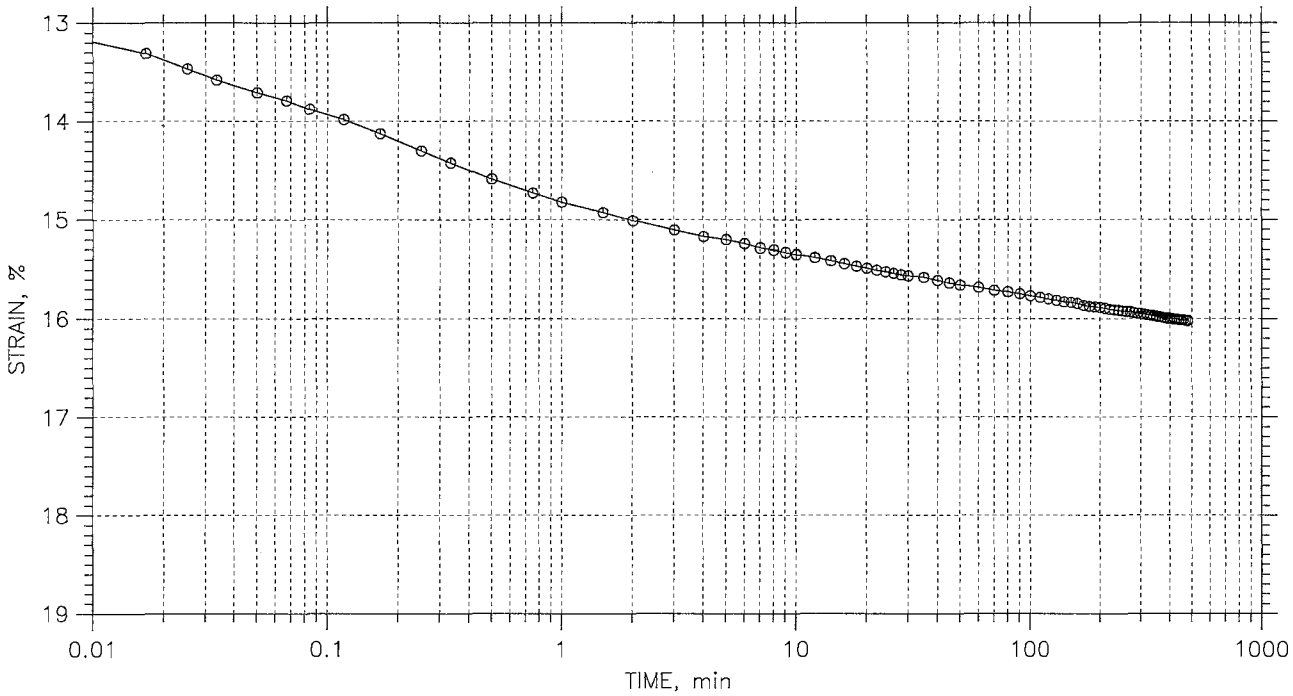
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

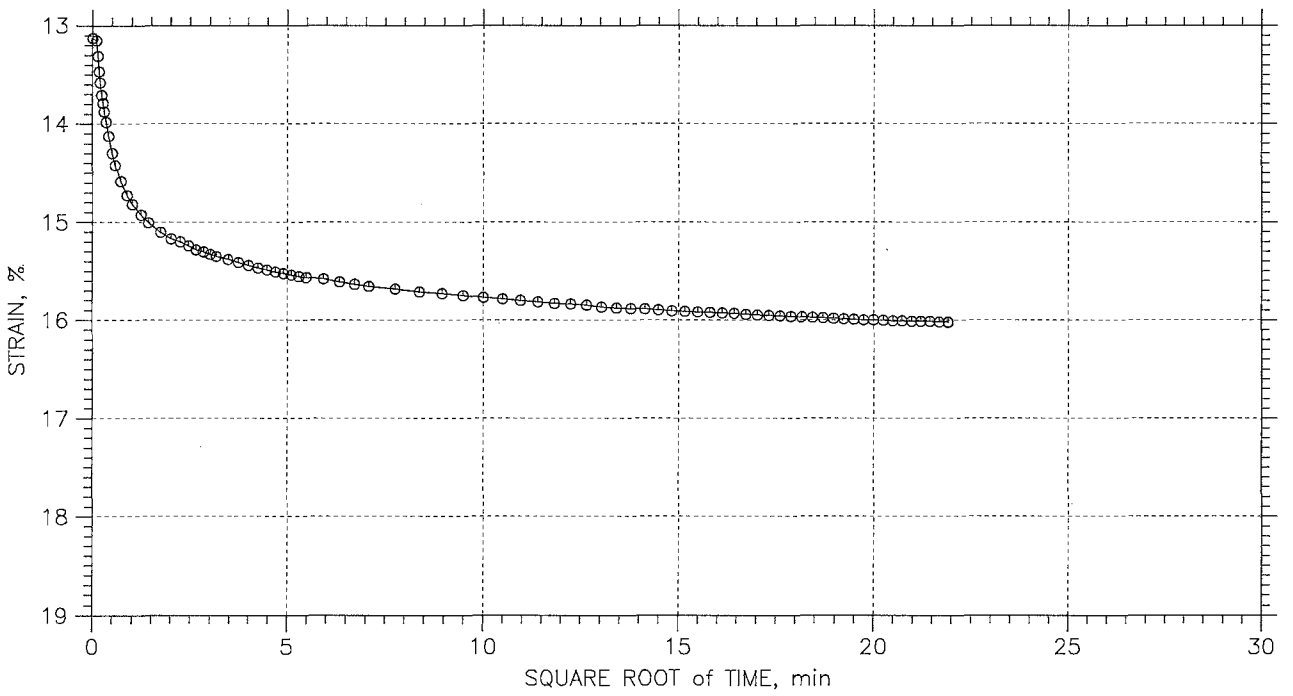
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 18

Stress: 4. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

Tue, 23-AUG-2011 12:03:02

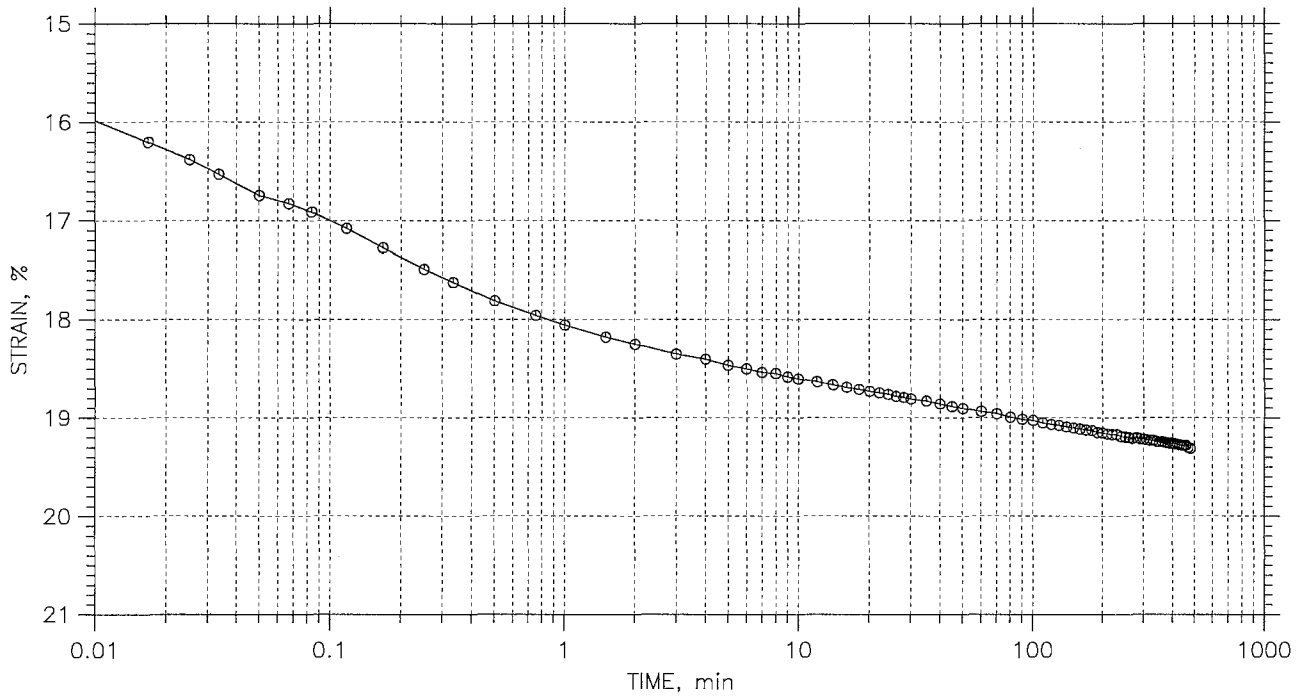
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

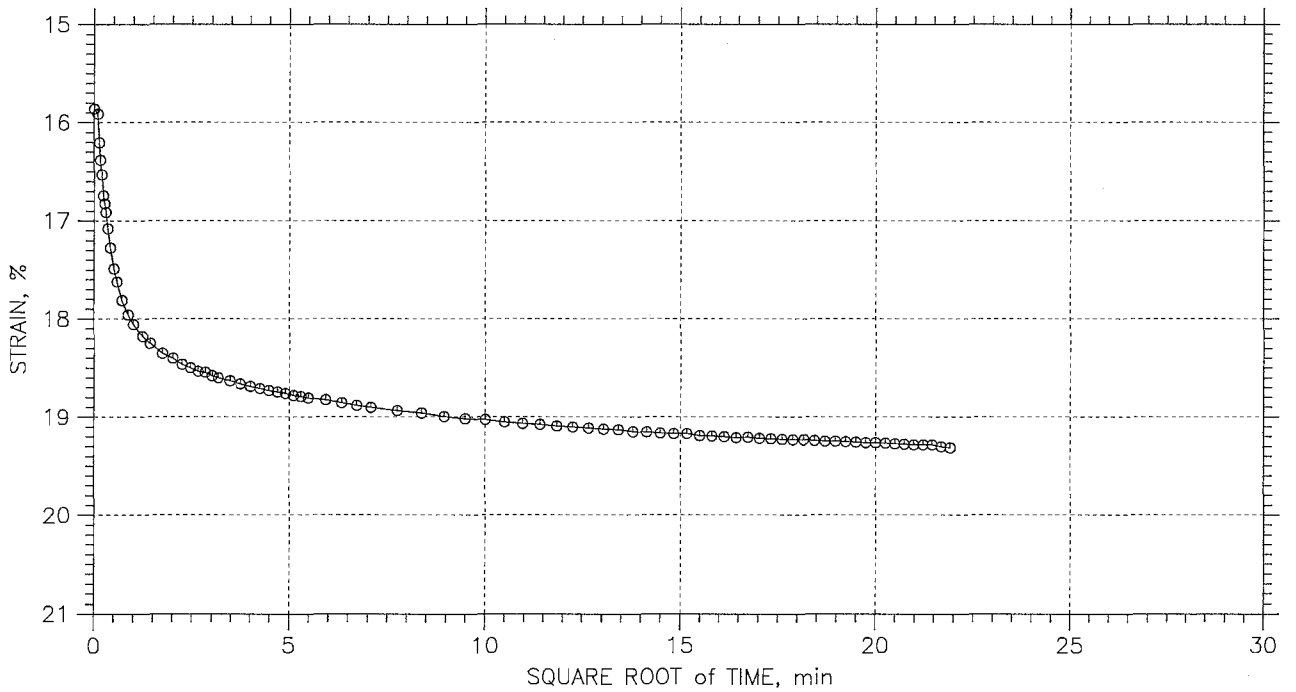
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 18

Stress: 8. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

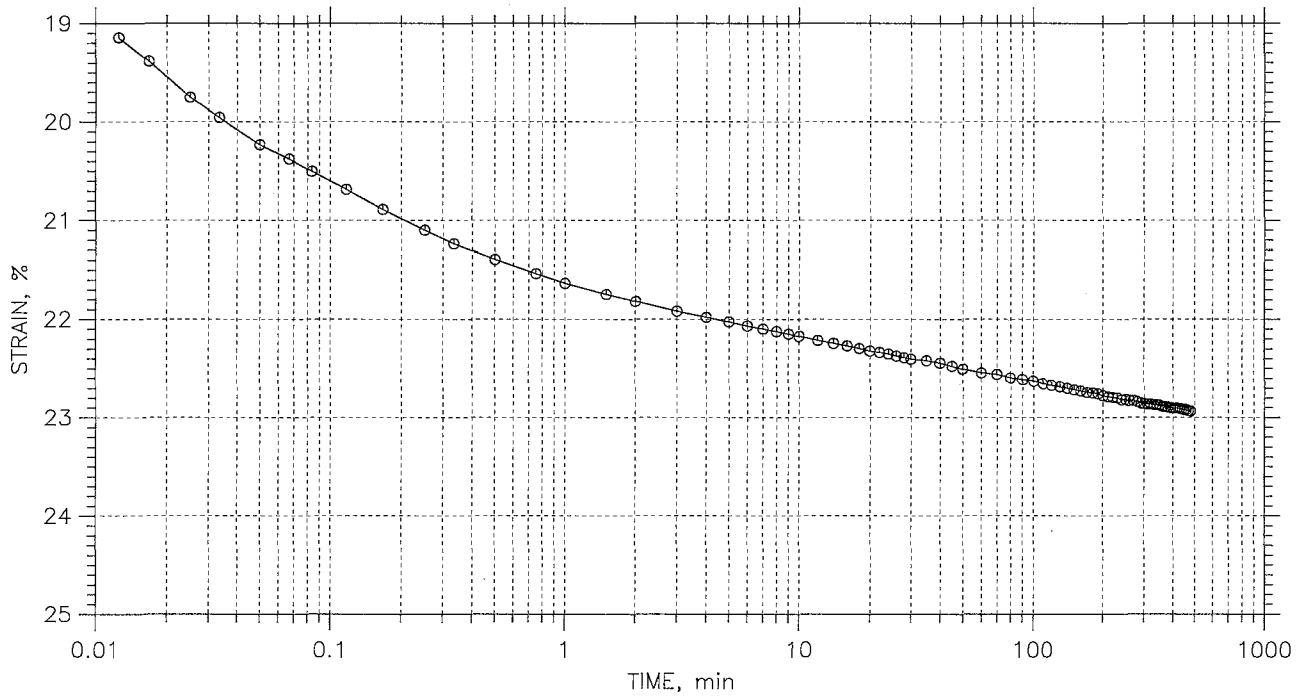
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

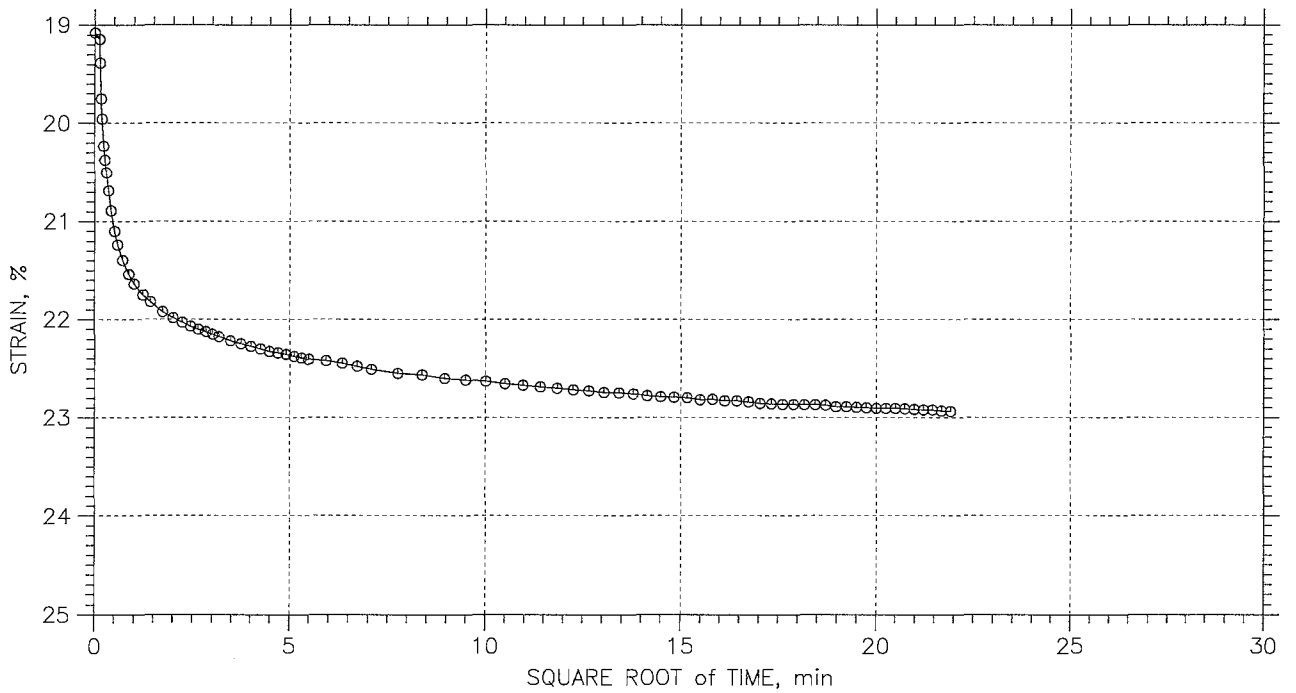
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 18

Stress: 16. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

Tue, 23-AUG-2011 12:03:02

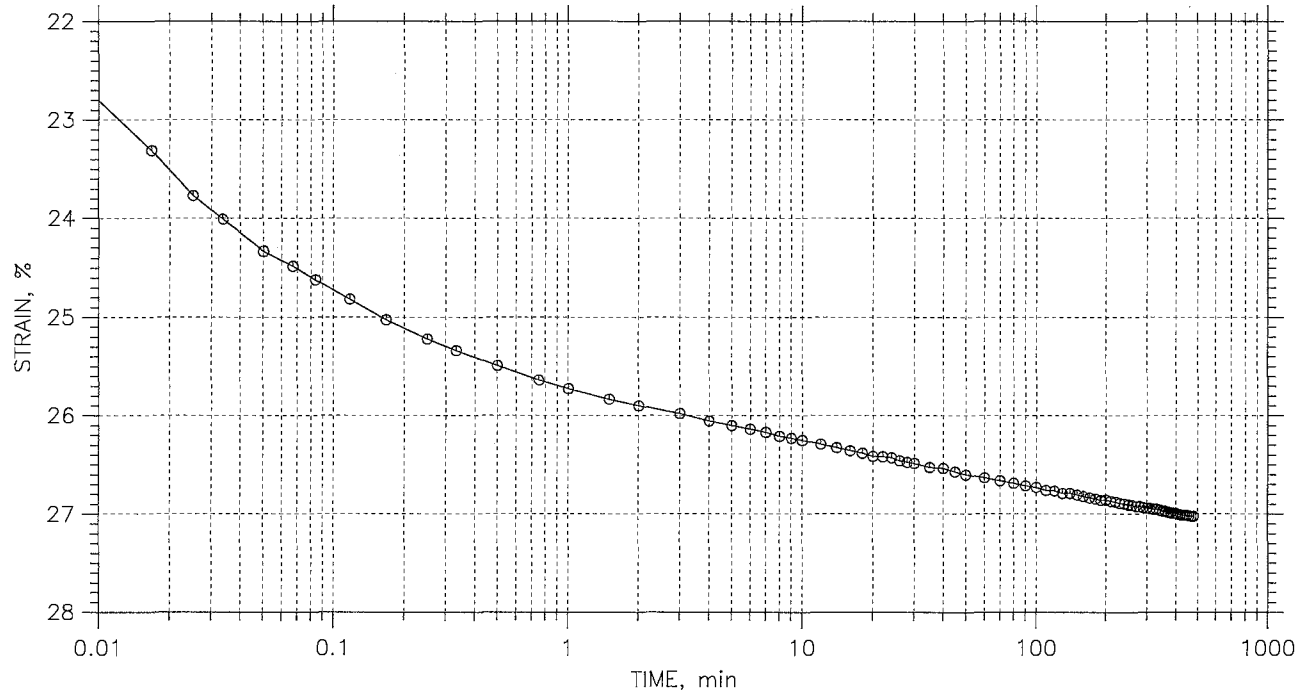
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

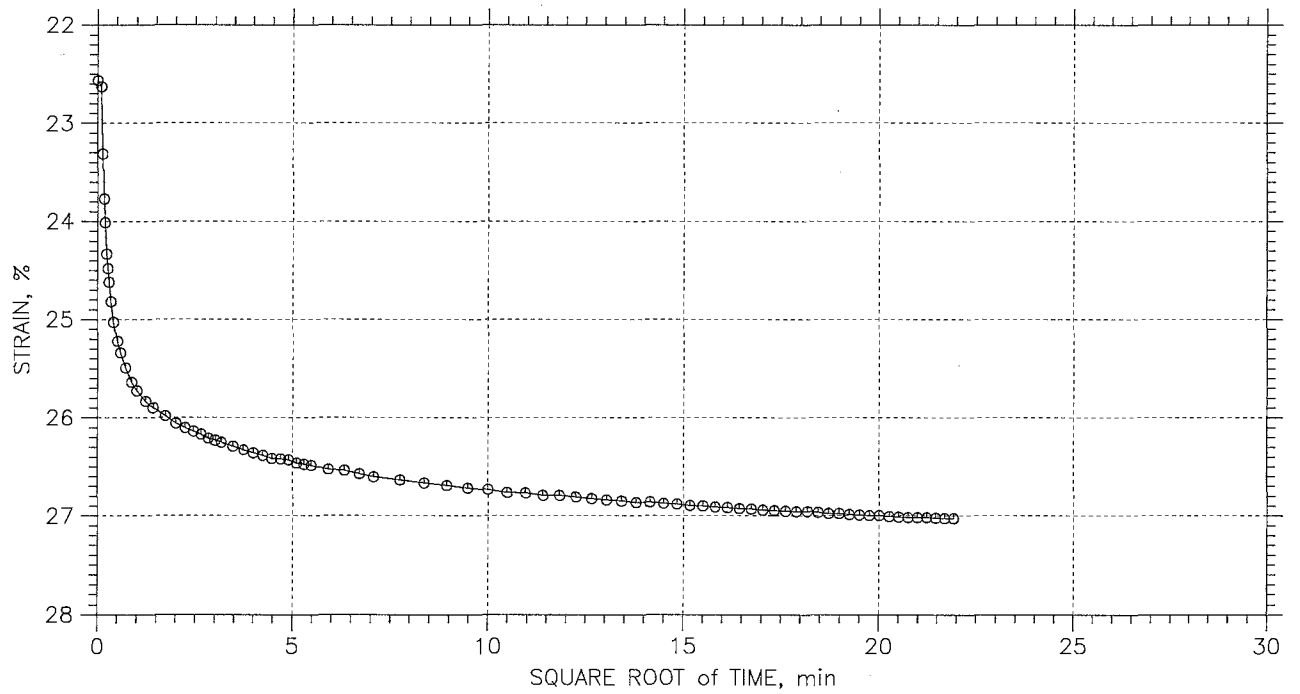
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 18

Stress: 32. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

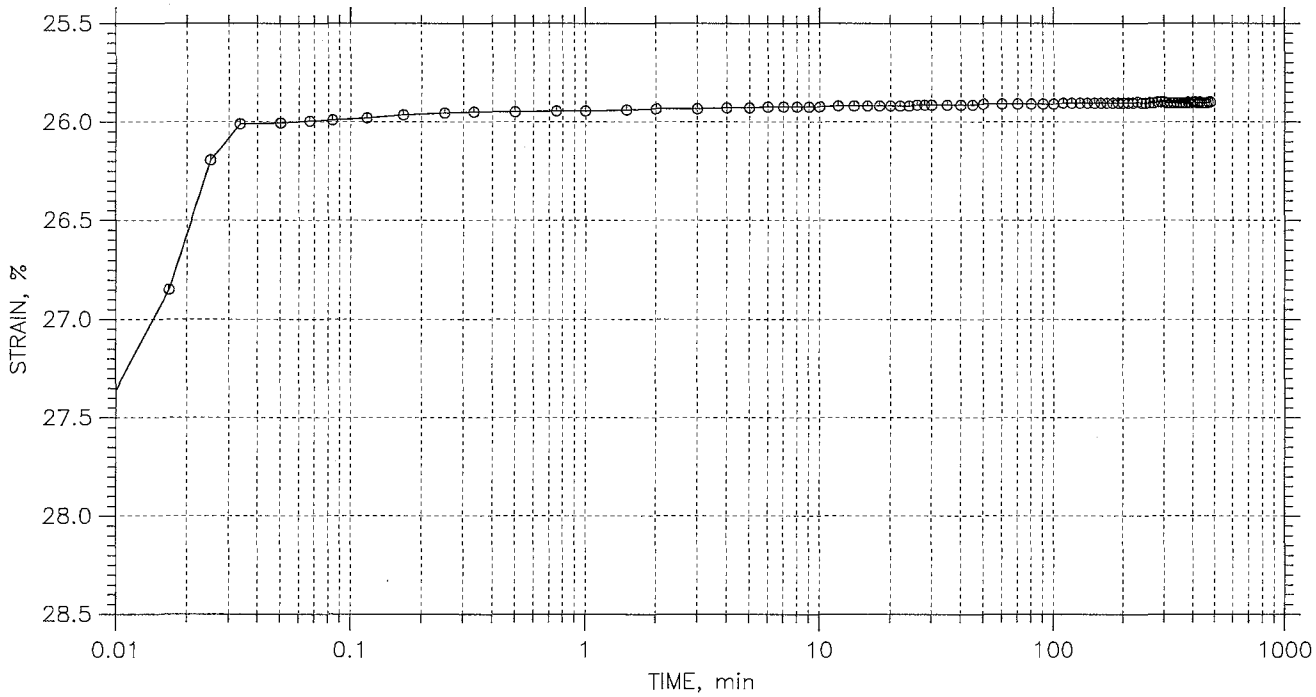
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

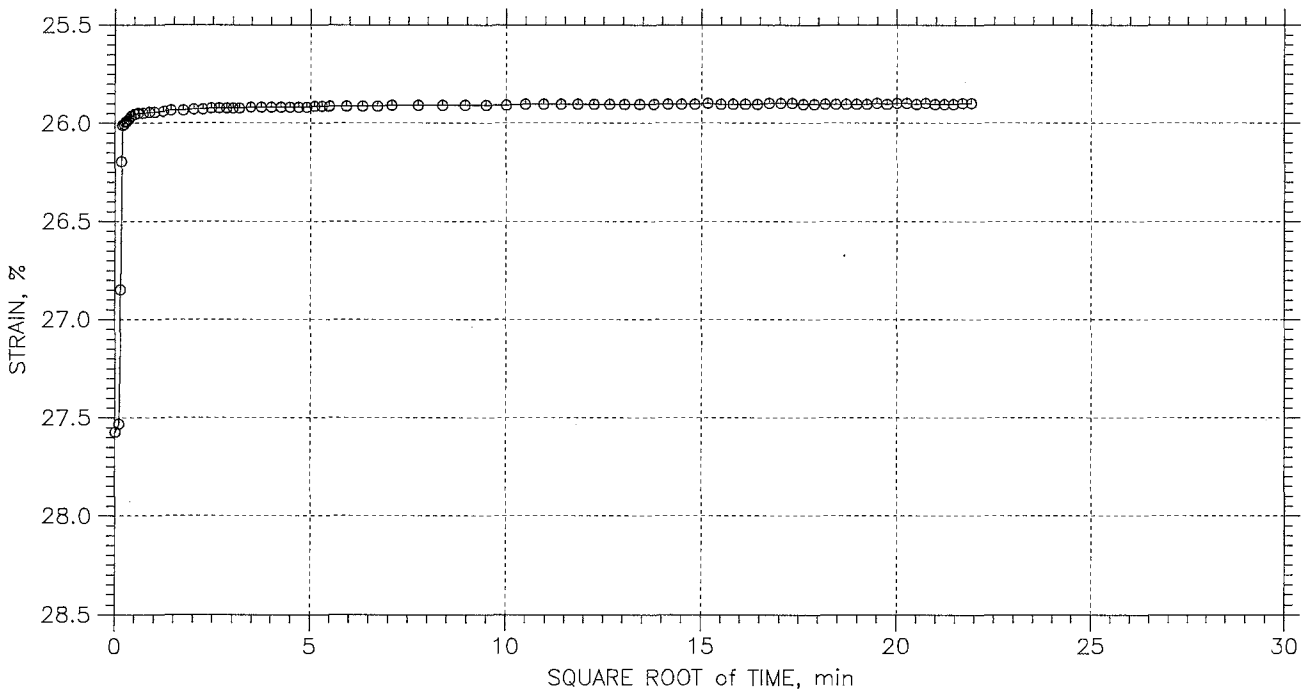
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 16 of 18

Stress: 8. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

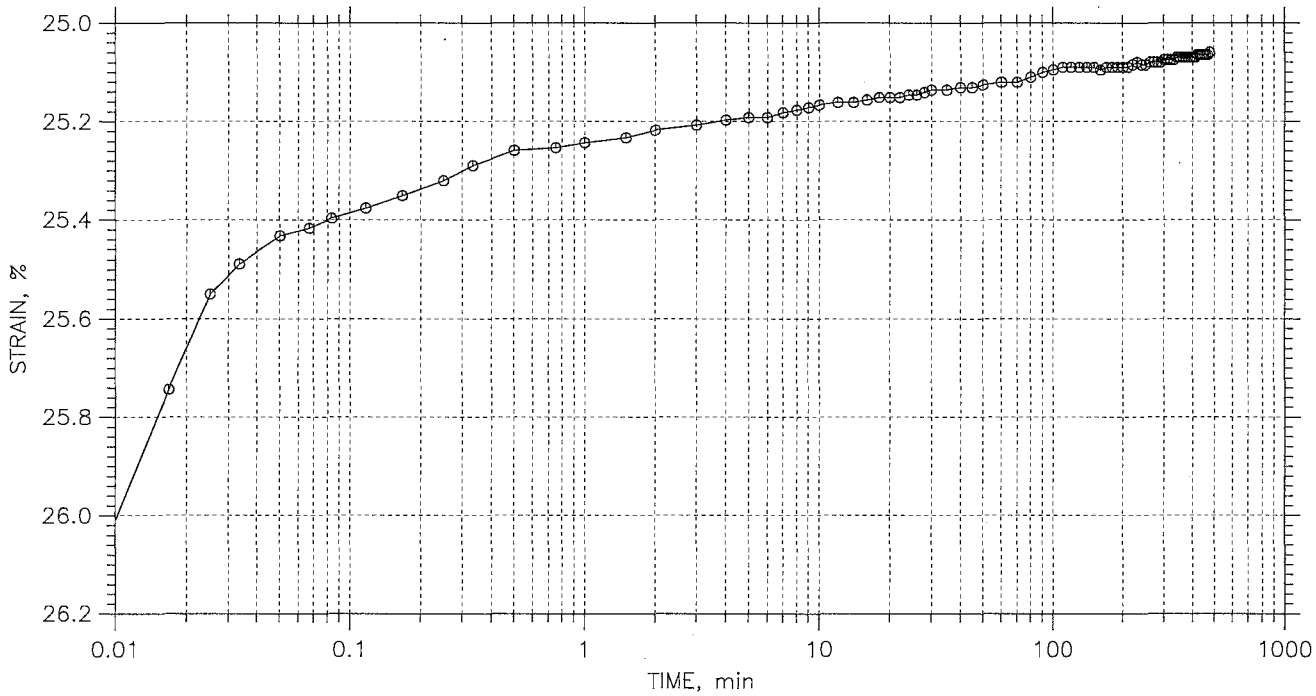
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

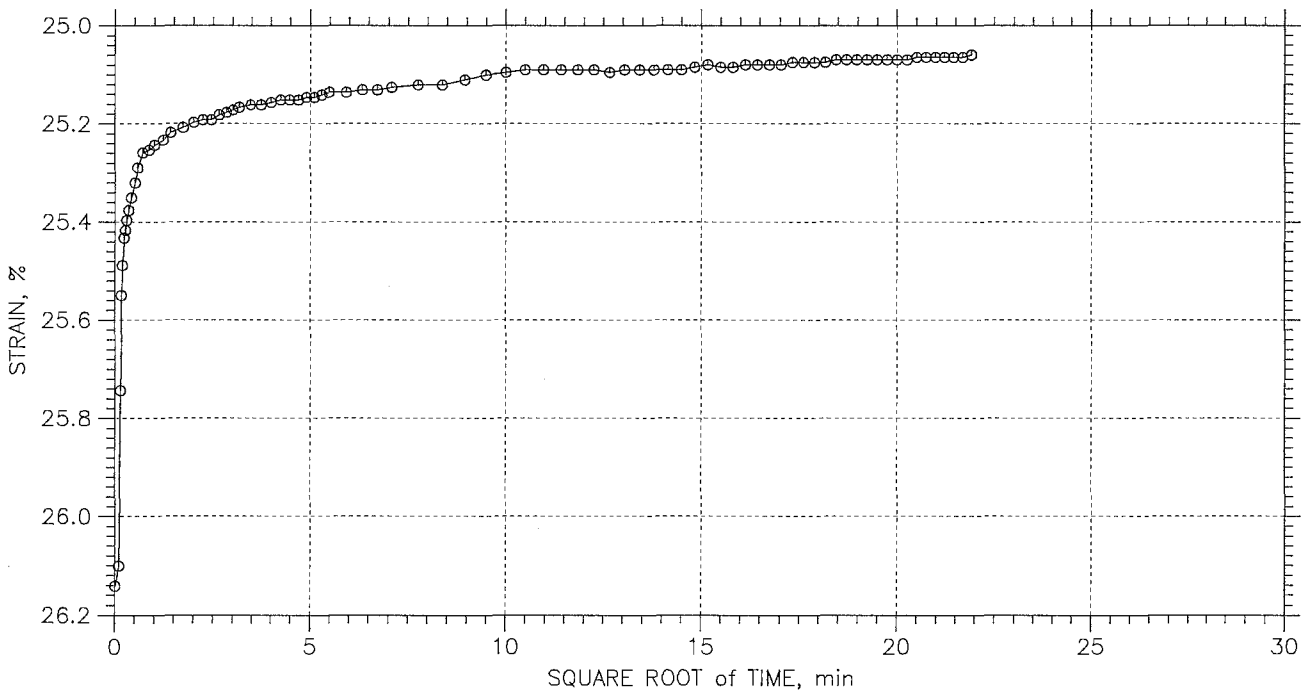
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 17 of 18

Stress: 2. tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

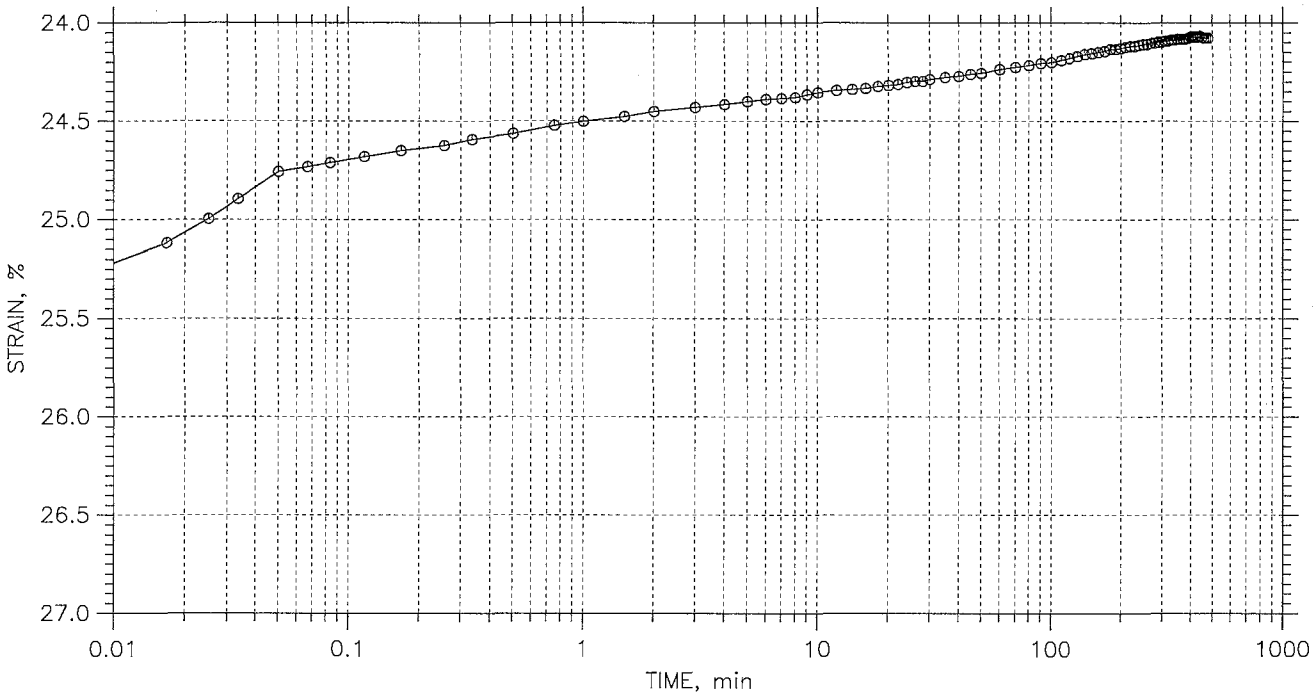
ONE-DIMENSIONAL CONSOLIDATION by ASTM D 2435-04 - Method B

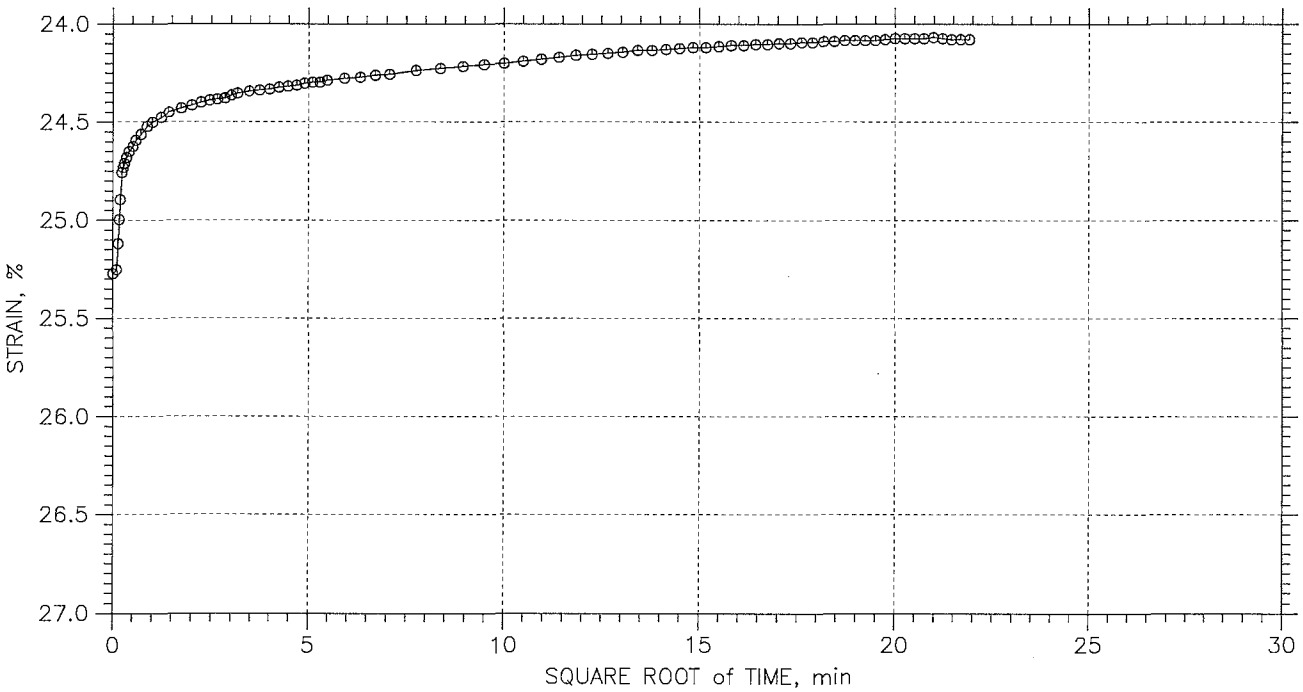
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 18 of 18

Stress: 0.5 tsf





GeoTesting EXPRESS	Project: DAS Case 0829F	Location: ---	Project No.: GTX-11069
	Boring No.: GTB-04	Tested By: md	Checked By: jdt
	Sample No.: D 30554	Test Date: 8/15/11	Depth: 6-8 ft
	Test No.: C-1	Sample Type: tube	Elevation: ---
	Description: Moist, dark olive brown silty sand		
	Remarks: System F		

GeoTesting EXPRESS

WARRANTY and LIABILITY

GeoTesting Express (GTX) warrants that all tests it performs are run in general accordance with the specified test procedures and accepted industry practice. GTX will correct or repeat any test that does not comply with this warranty. GTX has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

GTX may report engineering parameters that require us to interpret the test data. Such parameters are determined using accepted engineering procedures. However, GTX does not warrant that these parameters accurately reflect the true engineering properties of the *in situ* material. Responsibility for interpretation and use of the test data and these parameters for engineering and/or construction purposes rests solely with the user and not with GTX or any of its employees.

GTX's liability will be limited to correcting or repeating a test which fails our warranty. GTX's liability for damages to the Purchaser of testing services for any cause whatsoever shall be limited to the amount GTX received for the testing services. GTX will not be liable for any damages, or for any lost benefits or other consequential damages resulting from the use of these test results, even if GTX has been advised of the possibility of such damages. GTX will not be responsible for any liability of the Purchaser to any third party.

Commonly Used Symbols

A	pore pressure parameter for $\Delta\sigma_1 - \Delta\sigma_3$
B	pore pressure parameter for $\Delta\sigma_3$
CIU	isotropically consolidated undrained triaxial shear test
CR	compression ratio for one dimensional consolidation
C_c	coefficient of curvature, $(D_{30})^2 / (D_{10} \times D_{60})$
C_u	coefficient of uniformity, D_{60}/D_{10}
C_c	compression index for one dimensional consolidation
C_α	coefficient of secondary compression
c_v	coefficient of consolidation
c	cohesion intercept for total stresses
c'	cohesion intercept for effective stresses
D	diameter of specimen
D_{10}	diameter at which 10% of soil is finer
D_{15}	diameter at which 15% of soil is finer
D_{30}	diameter at which 30% of soil is finer
D_{50}	diameter at which 50% of soil is finer
D_{60}	diameter at which 60% of soil is finer
D_{85}	diameter at which 85% of soil is finer
d_{50}	displacement for 50% consolidation
d_{90}	displacement for 90% consolidation
d_{100}	displacement for 100% consolidation
E	Young's modulus
e	void ratio
e_c	void ratio after consolidation
e_o	initial void ratio
G	shear modulus
G_s	specific gravity of soil particles
H	height of specimen
PI	plasticity index
i	gradient
K_o	lateral stress ratio for one dimensional strain
k	permeability
LI	Liquidity Index
m_v	coefficient of volume change
n	porosity
PI	plasticity index
P_c	preconsolidation pressure
p	$(\sigma_1 + \sigma_3) / 2$, $(\sigma_v + \sigma_h) / 2$
p'	$(\sigma'_1 + \sigma'_3) / 2$, $(\sigma'_v + \sigma'_h) / 2$
p'_c	p' at consolidation
Q	quantity of flow
q	$(\sigma_1 - \sigma_3) / 2$
q_f	q at failure
q_o, q_i	initial q
q_c	q at consolidation
S	degree of saturation
SL	shrinkage limit
s_u	undrained shear strength
T	time factor for consolidation
T	temperature
t	time
U, UC	unconfined compression test
UU, Q	unconsolidated undrained triaxial test
u_a	pore gas pressure
u_e	excess pore water pressure
u, u_w	pore water pressure
V	total volume
V_g	volume of gas
V_s	volume of solids
V_v	volume of voids
V_w	volume of water
V_o	initial volume
v	velocity
W	total weight
W_s	weight of solids
W_w	weight of water
w	water content
w_c	water content at consolidation
w_f	final water content
w_l	liquid limit
w_n	natural water content
w_p	plastic limit
w_s	shrinkage limit
w_o, w_i	initial water content
α	slope of q_f versus p_f
α'	slope of q_f versus p_f'
γ_t	total unit weight
γ_d	dry unit weight
γ_s	unit weight of solids
γ_w	unit weight of water
ε	strain
ε_{vol}	volume strain
ε_h, ε_v	horizontal strain, vertical strain
μ	Poisson's ratio, also viscosity
σ	normal stress
σ'	effective normal stress
σ_c, σ'_c	consolidation stress in isotropic stress system
σ_h, σ'_h	horizontal normal stress
σ_v, σ'_v	vertical normal stress
σ_1	major principal stress
σ_2	intermediate principal stress
σ_3	minor principal stress
τ	shear stress
φ	friction angle based on total stresses
φ'	friction angle based on effective stresses
φ'_r	residual friction angle
φ_{ult}	φ for ultimate strength

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UNDISTURBED SAMPLE LOG

CLIENT: Weston Solutions		LOGGED BY:	GTX#: 11069
PROJECT: DAS Case 08291F		CHECKED BY:	BORING: GTB-04
LOCATION: —	SAMPLE ID: ~~GTB~~ - D 30554		DEPTH: 6-8
SAMPLE SIZE AND TYPE: 2&7 x 30			DATE: 8-16-11

SECTION	DEPTH	DESCRIPTION OF SAMPLE
	(in) 1	
	5	
	10	
4	FC	
3	UU 15	
2	UU 20	
1	UU 25	Moist Tan grey Clay w/Sand
		wet
	30	Sand
	35	

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UNDISTURBED SAMPLE LOG

CLIENT: Weston Solutions	LOGGED BY: MD	GTX#: 11669
PROJECT:	CHECKED BY:	BORING: GTB-103
LOCATION:	SAMPLE ID: 30552	DEPTH: 13.5
SAMPLE SIZE AND TYPE: 2" x 30		DATE: 8/16/11

SECTION	DEPTH	DESCRIPTION OF SAMPLE
	(in) 1	
	5	
	10	
	15	
		WOX
	20	
	25	
1	Index	Wet brown Peat
	30	
	35	

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UNDISTURBED SAMPLE LOG

CLIENT: Weston Solutions	LOGGED BY: MD	GTX#: 11069
PROJECT: DAS Case 0F29F	CHECKED BY:	BORING: GTB-02
LOCATION:	SAMPLE ID: D-30551	DEPTH: 4-6
SAMPLE SIZE AND TYPE:		DATE: 8-15

SECTION	DEPTH	DESCRIPTION OF SAMPLE
	(in) 1	Packing Sand
	5	VOC
	10	Moist dark brown Peat
		Moist grey CLAY
	15	
	20	
	25	Moist/wet grey CLAY
1	FC 30	
	35	

APPENDIX C

SOIL MIXING BENCH-SCALE LABORATORY SCOPE OF WORK

U.S. EPA REMOVAL ACTION
WALTON AND LONSBURY SITE
ATTLEBORO, MASSACHUSETTS

SPECIFICATION
for
SOIL MIXING BENCH-SCALE TESTING

25 October 2011
Revision 1, 19 January 2012

PART 1 SCOPE OF WORK

This specification includes requirements for Soil Mixing Bench-Scale Testing and related work as hereinafter specified.

1.1 PROJECT OBJECTIVES

The soft deposits (organic silt and clay soils) in the Ground Improvement Area, shown in the attached Figure 1, need to support construction of a maximum 5-foot thickness of granular grading fill, including a geosynthetic drainage system and a soil cap.

1.2 PROJECT PERFORMANCE REQUIREMENTS

The soft deposits shall be mixed and treated as one unit which shall achieve the following specifications after 28-day cure:

- Unconfined compressive strength, q_u, of 3.6 tons per square foot or greater for the treated soil.

A secondary set of objectives has been developed. Targets have been set but these are not performance requirements:

- Permeability of less than 5×10^{-6} cm/sec for the treated soil.
- Reduce the compressibility of the treated soil to minimize settlement of the completed cap.
- Chromium concentration in leachate, as measured using the Synthetic Precipitation Leaching Procedure (SPLP) method, less than 100 ug/L.
- Reduce chromium flux, in ug/m^2s, as measured using a flux-based mass transfer test with periodic leachant renewal (PreMethod 1315), while balancing the cost of soil mixing materials.

- Minimize the increase in treated soil volume, expressed as a percentage of untreated soil volume. The target is less than 115% (i.e. a volume increase of less than 15%).

- Given the high water content of soil in the Ground Improvement Area, minimize the addition of water.

1.3 SITE CONDITIONS

There are two general types of soil that require treatment: a dark brown organic material generally described as organic sandy silt (Stratum 1) underlain by a greenish-grey fine-grained inorganic material generally described as a clayey silt (Stratum 2). Both materials are very soft, with measured Standard Penetration Resistance (N) values which were less than 1 blow per foot (bpf) (i.e., weight of rods, weight of hammer, or 1 blow per 24 inches). The soil requiring treatment is underlain by coarse sand and gravel with N values which were at least 14 bpf. Boring logs and geotechnical test results are attached as Appendix A and Appendix B, respectively.

The thickness of the soft deposits varies significantly across the treatment area. The boring logs (locations noted on Figure 1) provide the available information regarding the thickness of the soft deposits at five locations. Note that the water content, organic content, and thickness of the soft soil deposits are highly variable in samples obtained across the Ground Improvement Area.

There are no monitoring wells within the Ground Improvement Area, however, groundwater samples obtained upgradient of the area contain up to 9 mg/L of hexavalent chromium. Pore water in the Ground Improvement Area should be presumed to contain similar concentrations of hexavalent chromium.

1.4 ABBREVIATIONS AND DEFINITIONS

ASTM — American Society for Testing and Materials

EPA — U.S. Environmental Protection Agency

COR — Contracting Officer Representative

Dry Soil Mixture (DSM) — A ground improvement technique that improves the characteristics of soft, high moisture content, weak soils using dry cementitous binder. A paddled mixing tool is used to blend the dry cement with soft, wet soil from the design depth to near-surface to form individual columns of treated soil. The process is repeated with rows of columns to achieve the desired stabilization.

Injection Ratio — A dry weight based ratio of dry admixture weight to in situ dry soil solids weight to be mixed in a DSM column. The injection ratio is determined for each column based on the column dimensions, in situ soil density, pattern of treatment, and laboratory determined mix rates.

MSDS	Material Safety Data Sheet
N	Standard Penetration Resistance determined by the Standard Penetration Test
QC	Quality Control
SOP	Standard Operating Procedures

PART 2 SUBMITTALS

2.1 BID SUBMITTALS

a. Bidder Qualifications:

The Bidder shall submit evidence that the company is experienced and competent in developing soil mixes at bench scale and optimization of soil mixes to meet the project objectives. The evidence shall include references from similar bench scale studies. This evidence will ensure that the Contractor will have sufficient competent experienced personnel and proven methods and equipment to carry out the tests specified.

b. The Bidder shall submit a general description of the Bench-Scale Testing approach, including:

- Additives that the Bidder intends to evaluate.
- General description of the approach to select initial screening mixes, evaluate initial mixes and optimization mixes, and prepare final or confirmation test mixes.
- Laboratory methods to be used and data to be collected/recorded during the test.
- Description (contents and delivery method) of proposed progress reports.
- Contents of final Bench-Scale Testing Report.

c. The Bid shall include a preliminary project schedule, starting from the anticipated date of award stated in the solicitation, including major milestones. At a minimum, schedule shall include the following milestones: submittal of Quality Assurance Plan and Standard Operating Procedures (SOP), start of bench-scale tests, start of final or confirmation test mixes, and submittal of Bench-Scale Test Report.

2.2 BENCH SCALE TESTING SUBMITTALS

The Contractor (successful Bidder) shall submit a Quality Assurance Plan for review and approval, to consist of the SOP used by the Contractor and any subcontracted laboratories during performance of the tests required for this contract.

The Contractor (successful Bidder) shall also submit a Final Bench Scale Testing Report for review and acceptance, including but not limited to the following information:

a. Soil characterization data.

b. Laboratory soil mixtures, including additives, soils mixed, and injection ratios for all screening, optimization, and confirmation mixes.

c. Results for all tests required in this specification.

d. Additional available product information for additives, including manufacturer's product quality certifications and Material Safety Data Sheets.

The Contractor shall make informal information submittals during the course of the project, including at a minimum:

a. Transmittal of initial soil characterization data.

b. Test results for initial screening mixes and optimization mixes.

c. Recommendations for the optimization mixes and confirmation mix, to be submitted prior to preparation of the recommended mix.

d. Unconfined strength test results for confirmation mixes.

PART 3 PROJECT REQUIREMENTS

3.1 GENERAL

The Contractor shall commence design mix development in accordance with the Project Schedule required in Subsection 2.1, and submit the Final Report in accordance with the Project Schedule.

3.2 SAMPLE COLLECTION

Soil samples from the Ground Improvement Area will be provided to the Contractor by others. Soil samples will consist of four 5-gallon soil samples, two representative of Stratum 1 and two representative of Stratum 2.

Water samples (groundwater and City water) will be provided to the Contractor by others. Samples will consist of 5 gallons of potable water obtained from the City public water supply and 5 gallons of groundwater obtained from wells upgradient of the Ground Improvement Area.

All other materials required for Design Mix development shall be provided by the Contractor.

3.3 INITIAL SAMPLE CHARACTERIZATION

Soil samples shall be homogenized to ensure that testing is performed on samples with uniform properties. Large objects (greater than 1-inch nominal diameter) shall be removed from the sample but the sample shall not be size-reduced. The homogenized soil samples shall be classified using the Unified Soil Classification System.

In order to characterize the soil used in bench-scale testing, soil samples shall be obtained after homogenization in the laboratory. One soil sample shall be obtained from homogenized sample (total of two samples, one for each Stratum) and analyzed for the following parameters:

- Natural Moisture Content.
- Gradation by sieve plus hydrometer analyses.
- Atterberg limits (Liquid Limit, Plastic Limit, Plasticity Index).
- Total (i.e., wet) unit weight as it exists within each of the four sample containers (buckets).
- Organic Content.
- Total and hexavalent chromium.
- Lead.
- SPLP leaching test for lead and total and hexavalent chromium .

In order to characterize the water used for the bench-scale testing, samples of the groundwater and City water provided shall be obtained immediately prior to the first day of use of the water. Each water sample shall be analyzed for the following parameters:

- Total and hexavalent chromium.
- Specific conductance.
- pH.

The bench-scale soil mixing trials shall proceed concurrently with the above laboratory analyses in order to expedite the project schedule.

3.4 ADDITIVES

A total of three dry additives (e.g., Portland cement, granulated blast furnace slag, cement kiln dust, lime, lime/cement, etc.) shall be selected for subsequent testing based on the Contractor's knowledge, experience, and literature searches. Additives should be selected based on effectiveness, cost, and proximity/availability to the project site. Proprietary chemicals shall only be used if approved by the EPA COR prior to the tests.

For each additive, perform quality control (QC) sampling and analysis of the material as-received. In addition to QC testing, if the following information is not provided by the manufacturer, analyze each additive for:

- Trace metals (antimony, arsenic, barium, beryllium, cadmium, total chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, vanadium, and zinc).
- Nutrients (total nitrogen, ammonia-nitrogen, nitrate-nitrogen, nitrite-nitrogen, and total phosphorus).
- Volatile or semivolatile hydrocarbons or other organic compounds suspected to be present in the additive.

The bench-scale soil mixing trials shall proceed concurrently with the above laboratory analyses in order to expedite the project schedule.

Material Safety Data Sheets (MSDS) shall also be obtained by the Contractor for each of the three candidate additives. Appropriate health and safety protocols shall be strictly enforced in the laboratory consistent with these documents.

3.5 PREPARATION AND EVALUATION OF INITIAL SCREENING MIXES

The first set of bench-scale mixes are referred to herein as "initial screening mixes". Initial screening mixes shall evaluate dry mix techniques. The objective of initial screening is to quickly identify the admixtures that are likely to be most successful for treating the soil to meet the high compressive strength and low permeability objectives.

Initial screening mixes will generally consist of mixing small volumes of the Stratum 1 soil with the selected admixtures at the following mix ratios, measured as dry weight of additive per volume of wet soil, in units of kilograms per cubic meter (kg/m^3) :

- 150 kg/m^3 of Type I Portland Cement
- 250 kg/m^3 of Type I Portland Cement
- 350 kg/m^3 of Type I Portland Cement
- 150 kg/m^3 of NewCem blast furnace slag cement
- 200 kg/m^3 of NewCem blast furnace slag cement
- 250 kg/m^3 of NewCem blast furnace slag cement
- 350 kg/m^3 of cement kiln dust (CKD) plus 150 kg/m^3 of Type I Portland Cement
- 350 kg/m^3 of CKD plus 175 kg/m^3 of Type I Portland Cement
- 350 kg/m^3 of CKD plus 200 kg/m^3 of Type I Portland Cement

A total of two small cylinder specimens (e.g. 2-inch diameter and 4-inch height) shall be completed for each of the three admixtures; i.e., 18 total cylinders shall be prepared. Mix preparation procedures and curing methods shall be proposed by the Contractor.

One of the two admixed soil specimens for each admixture/mix ratio shall be allowed to cure for a period of 24 hours. These specimens shall then be emptied from a drop height of 6 inches onto a horizontal flat surface and the resulting pile height measured and recorded to the nearest ¼ inch.

The second of the two admixed soil specimens for each admixture/mix ratio shall be allowed to cure for a period of 7 days. The tops of these cylindrical samples shall be tested within the cylinders for unconfined compressive strength (q_u) using a pocket penetrometer equipped with the enlarged head. These nine measured values shall also be recorded.

Excess material from each of the mixtures shall be retained for possible subsequent evaluation or testing.

The pile height and compressive strength data shall be submitted to the Engineer along with a statement regarding which of the admixtures should be selected for optimization mixes.

3.6 OPTIMIZATION OF SELECTED ADMIXTURE EFFECTIVENESS (OPTIMIZATION MIXES)

The second set of bench-scale mixes to be performed under this Contract are referred to herein as the "optimization mixes". The objective of this stage of the mix design is to optimize the mix ratio for the admixture selected via the screening mix program. The optimization test mixes will generally consist of mixing small volumes of site soil with:

- The same ratios that provided favorable results in the initial screening mix.
- Variations in ratio of one or more mix components.

The optimization test shall be performed for both Stratum 1 and Stratum 2 soil because, at full-scale, mixing will occur across the interface of the two soil types.

The Contractor shall prepare three uncompacted cylindrical samples of stabilized Stratum 1 and Stratum 2 soil specimens (a total of 6 specimens). The three admixture doses to be used are:

- 200 kg Portland Cement per wet cubic meter of soil,
- 250 kg Portland Cement per wet cubic meter of soil, and
- 300 kg Portland Cement per wet cubic meter of soil.

The samples shall be prepared in 2-inch diameter, 4-inch high cylindrical cardboard or plastic molds.

Following 48-hour, 7-day, and 14-day cure times, the tops of all 6 specimens shall be tested within the molds for unconfined compressive strength (q_u) using a pocket penetrometer equipped with the enlarged head. These 18 measured values shall be recorded by the Contractor.

On day 14 of the cure period, after the unconfined compressive strength test, the molds shall be removed in their entirety. The 6 specimens shall then be tested for unconfined compressive strength using the procedures of ASTM D 1633.

The volume increase (swell) of the admixture at 14 days shall be calculated compared to the initial volume of soil.

The failed specimens from the compressive strength test shall be retained for possible subsequent evaluation or testing.

The compressive strength data (ASTM D1633 and pocket penetrometer results) shall be submitted to the Engineer along with a statement regarding which of the admixture should be selected for the confirmation mix.

3.7 CONFIRMATION TESTING PROGRAM (CONFIRMATION MIXES)

Two (2) additional sets of cylinders shall be prepared for testing two of the Stratum 1 bench-sale mixes as the "confirmation mixes". (Note that this differs from section 3.4 of the KEMRON Work Plan, which assumed one mix for each of the two soil types. The total number of sets is still two.) One set shall have an admixture of 200 kg of Portland Cement per wet cubic meter and the second set shall have an admixture of 300 kg of Portland Cement per wet cubic meter.

Each confirmation mix will generally consist of preparation of sufficient quantity of soil/additive to support the laboratory test program and to measure swell. The testing program shall include:

- 4 cylinders (2-inch diameter by 4-inch height) for performing unconfined compressive strength tests in accordance with ASTM D 1633 (one cylinder each for 7-day and 21-day testing, and two cylinders each for 28-day testing). (Note that the 14-day cylinder is not needed in section 3.7 because it is to be prepared for testing under section 3.6.)
- 1 cylinder for permeability testing by method ASTM D 5804. This test will be performed after 28-day curing time.
- 1 cylinder (2-inch diameter by 4-inch height) for storage for possible subsequent evaluation or testing.
- Additional treated soil sample for performing a one-dimensional consolidation test (ASTM D 2435-04) after 28-day curing time.
- Additional treated soil sample for performing the SPLP leaching test.
- 2 cylinders (2 inches diameter by 4 inches) for PreMethod 1315 leaching test. These tests will be performed after 28-day curing time. Leachate shall be analyzed for lead and chromium (total and hexavalent). In addition, if one or more contaminants are present in the additives at levels of concern to EPA, the Contractor may be required to analyze the leachate for these contaminants.
- Additional sample as required to measure the amount of volume increase (swell) (initial and 28-day) caused by the mix. Swell shall be measured and quantified as a percent of the initial soil volume.

The failed specimens from the compressive strength test shall be retained for possible subsequent evaluation or testing

For the purpose of developing Bid pricing, assume that two confirmation test mixes will be prepared.

The results of all compressive strength tests shall be submitted to the Engineer upon completion of the 28-day test.

PART 4 QUALITY CONTROL

The Contractor shall perform work in accordance with the SOP developed by the laboratory and, where applicable, in accordance with the EPA or ASTM method referenced in this specification. Non-standard test procedures generally should not be used when an EPA or ASTM method is available, however, non-standard procedures may be proposed by the Contractor. The SOP shall be submitted for review and approval prior to start of work.

Geotechnical testing shall be performed using the following methods:

- Natural moisture content (ASTM D2216).
- Particle Size Analysis of Soils, including Sieve and Hydrometer (ASTM D422).
- Atterberg Limits (ASTM D4318).
- Unified Soil Classification System Classification (ASTM D2487).
- Organic Content (ASTM D2974).
- Specific Gravity (ASTM D854).
- Compressive Strength of Molded Soil-Cement Cylinders (ASTM D1633).
- One Dimensional Consolidation Properties of Soils Using Incremental Loading (ASTM D2435-04).

The following geotechnical test shall be used if requested (this is an alternate method):

- Preparation and Testing of Controlled Low Strength Material Test Cylinders (ASTM D4832).

Permeability testing shall be performed using the following method:

- Measurement of hydraulic conductivity of saturated porous materials using a flexible wall permeameter (ASTM D 5084).

Leaching tests shall be performed using the following methods:

- Synthetic Precipitation Leaching Procedure (EPA Method 1312).
- Mass Transfer rates in Monolithic or Compacted Granular Materials Using a Semi-Dynamic Tank Leaching Procedure (EPA PreMethod 1315). (Note: This method is only to be used for the confirmation test solidified material, after 28-day cure.)

Analysis of leachate generated using the SPLP and PreMethod 1315 shall be performed using EPA methods and shall achieve the following laboratory reporting limits:

- Total chromium (Method 6010A), 5 ug/L .
- Hexavalent chromium (Method 7196A or 7199), 5 ug/L.
- Lead (Method 6010B), 5 ug/L.

Analysis of leachate generated using the SPLP method may include additional contaminants due to addition of contaminants in an additive. Analysis of additional contaminants shall be performed using an approved EPA method and shall achieve the following laboratory reporting limits: the lowest of the Massachusetts Contingency Plan GW-1, GW-2, or GW-3 standards for each contaminant.

Analysis of samples of groundwater and City water (per Section 3.3) shall be performed using EPA test methods and shall achieve the following laboratory reporting limits:

- Total chromium (Method 6010B), 5 ug/L.
- Hexavalent chromium (Method 7196A or 7199), 5 ug/L.

Analysis of samples of soil (per Section 3.3) shall be performed using EPA methods and shall achieve the following laboratory reporting limits:

- Total chromium (Method 3050B/6010B), 10 mg/kg.
- Hexavalent chromium (Methods 3060A/7196A or 3060A/7199), 10 mg/kg.
- Lead (Method 3050B/6010B), 10 mg/kg.

End of Section

ATTACHMENTS

The following documents are attached to this performance specification and considered part of the specification document:

- Figure 1 – Soil Mixing Bench-Scale Testing Site Plan, Revision A, dated 24 Oct 2011.
- Appendix A – Boring Logs.

- Appendix B – Geotechnical Laboratory Test Results.

REVISION HISTORY

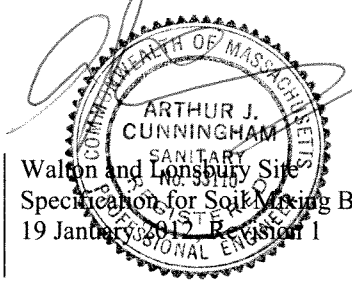
Revision 0, 25 Oct 2011 – Original issue.

Revision 1, 19 Jan 2012 – Revisions affecting subsections 1.2, 3.3, 3.5, 3.6, and 3.7, summarized as follows:

- Subsection 1.2: to change the unconfined compressive strength target from 30 pounds per square inch to 3.6 tons per square foot.
- Subsection 3.3: to change the number of homogenized samples from 4 to 2.
- Subsection 3.5: to specify the admixtures for initial screening mixes and modify the size of cylinders.
- Subsection 3.6: to change the total number of soil mix specimens from 10 to 6; specify the admixtures; modify the size of cylinders; and specify the number of days for the swell test.
- Subsection 3.7: to specify the admixtures; modify the size of cylinders; allow plastic cylinder molds; and decrease the number of required cylinders by one (eliminating the cylinder for the 14-day unconfined compressive strength test).

PREPARED BY:

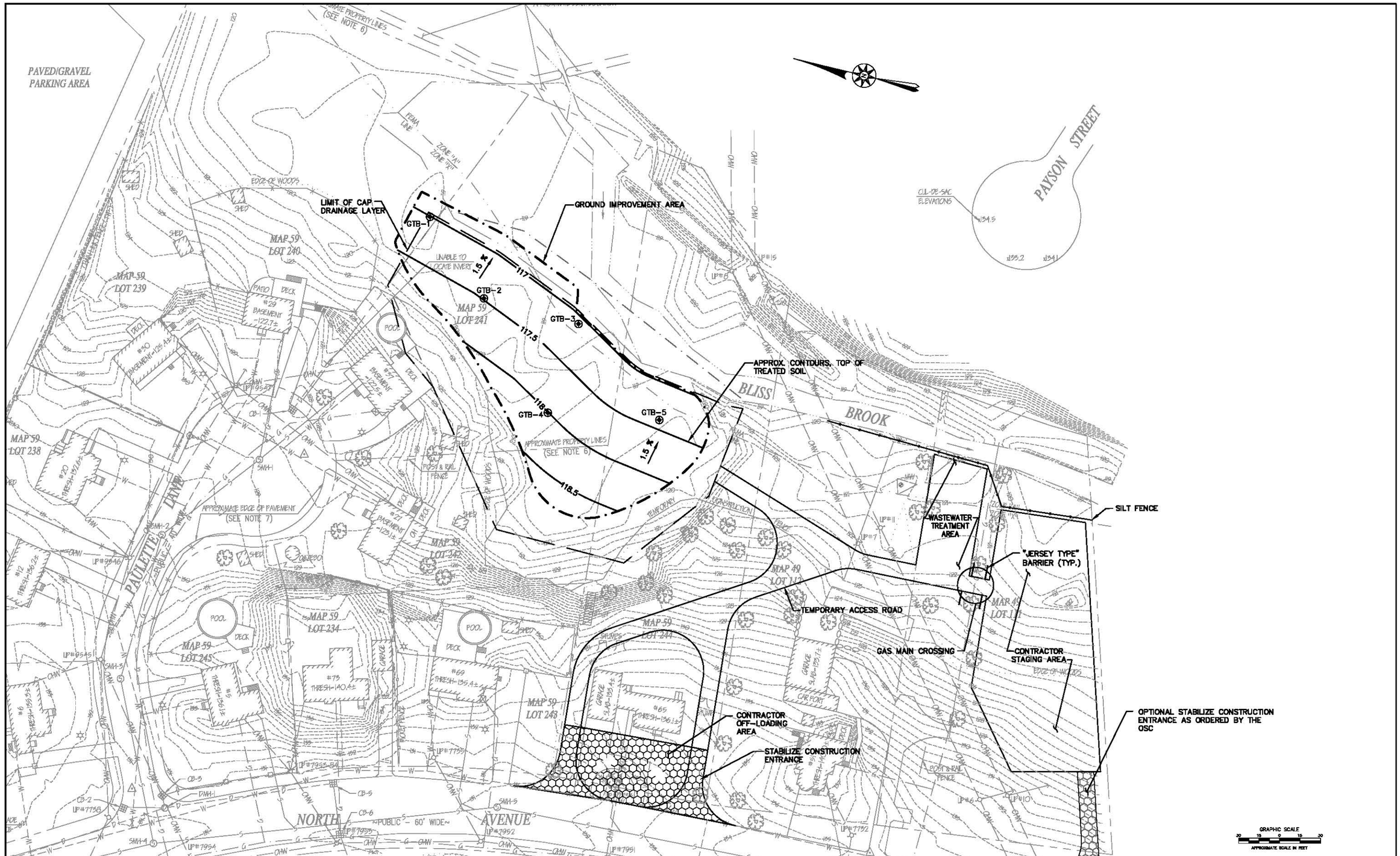
WESTON SOLUTIONS, INC.
Arthur J. Cunningham, PE



1/19/12

FIGURE 1

SITE PLAN



NO.	DATE	APPR.	REVISION
A	11/11	A.J.C.	INITIAL ISSUE

TIME CRITICAL REMOVAL ACTION AND SITE RESTORATION
WALTON AND LONSBURY SITE–ATTLEBORO, MASSACHUSETTS
U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 1
CONTRACT NUMBER EP–W–05–04
TASK ORDER NUMBER 0003

WESTON SOLUTIONS
CONCORD NEW HAMPSHIRE

		DATE
CHECKED	L.J.B.	MAY 2011
DES. ENG.	T.A.C.	MAY 2011
PROJ. ENG.	A.J.C.	MAY 2011
PROJ. MGR.	E.D.A.	MAY 2011
APPROVED	A.J.C.	MAY 2011
APPROVED		

CLIENT APPROVALS — DATE

ISSUED FOR — DATE

SOIL MIXING BENCH–SCALE TESTING SITE PLAN

DRAWN	DATE	FIGURE NO.	REV. NO.
TAC	OCT 2011	1	A
SCALE: AS SHOWN	W.O. NO.: 20114.062.003	SHT. ____ OF ____	

APPENDIX A

BORING LOGS

Same as provided with

Performance Specification
For
Soil Mixing For Ground Improvement

APPENDIX B

GEOTECHNICAL LABORATORY RESULTS

Same as provided with

Performance Specification
For
Soil Mixing For Ground Improvement

APPENDIX D

SOIL MIXING BENCH-SCALE LABORATORY REPORT DATA

Walton & Lonsbury Site
Attleboro, Massachusetts
Soil Mixing Bench-Scale Treatability Study
SH-0405

Prepared for:

Weston Solutions, Inc.
Northeast Division
3 Riverside Drive
Andover, Massachusetts 01810

Prepared by:

KEMRON Environmental Services, Inc.
1359-A Ellsworth Industrial Boulevard
Atlanta, Georgia 30318

March 7, 2012

Table of Contents

List of Tables and Appendices

1.0 INTRODUCTION

KEMRON Environmental Services, Inc. (KEMRON), is pleased to present Weston Solutions, Inc. (Weston), with this report of the Soil Mixing Bench-Scale Treatability Study performed on materials sampled from the Walton & Lonsbury Site in Attleboro, Massachusetts. Testing was conducted in general accordance with the Project Implementation Plan submitted by KEMRON to Weston on November 8, 2011, and with Weston's Specification for Soil Mixing Bench-Scale Testing, Revision 1, 19 January 2012 . This report provides the methodology and protocols used, as well as the results of testing performed on the untreated and treated site materials.

The primary objective of the bench-scale study was to identify candidate stabilization treatment alternatives for the site soil. The primary performance criteria for the treated materials is an unconfined compressive strength (UCS) of 50 pounds per square inch (psi) or greater.
A secondary set of objectives was also provided. Targets were set but these were not performance requirements:

- Permeability of less than 5 x 10^{-6} cm/sec for the treated soil.
- Reduce the compressibility of the treated soil to minimize settlement of the completed cap.
- Chromium concentration in leachate, as measured using the Synthetic Precipitation Leaching Procedure (SPLP) method, less than 100 µg/L.
- Reduce chromium flux, in µg/m^2s, as measured using a flux-based mass transfer test with periodic leachant renewal (PreMethod 1315), while balancing the cost of soil mixing materials.
- Minimize the increase in treated soil volume, expressed as a percentage of untreated soil volume. The target is less than 115% (i.e. a volume increase of less than 15%).

2.0 MATERIAL RECEIPT, HOMOGENIZATION, AND CHARACTERIZATION

On November 23, 2011, KEMRON received three 5-gallon buckets labeled “TSS-01” (Stratum 1) and two 5-gallon buckets labeled “TSS-02” (Stratum 2) from the site for potential use in the treatability study. Additionally, one 5-gallon container of groundwater, labeled “TSL-03”, and one 5-gallon container of potable water, labeled “TSL-04”, were received on the same date. Immediately following sample receipt, KEMRON logged the materials into a sample tracking database and placed them in a 4-degree-Celsius (°C) walk-in cooler for storage.

KEMRON individually homogenized TSS-01 and TSS-02 by placing the contents from the shipping containers into a pre-cleaned plastic mixing pan and gently blending by hand using a stainless steel spoon until visually homogenous. Any particles measuring greater than 0.5 inches in diameter were removed in order to facilitate bench-scale treatment and adhere to particle-size limits outlined in certain ASTM and EPA test methods for UCS and permeability testing. KEMRON performed homogenization on chilled samples to minimize volatilization of organic contaminants.

In order to assist in the development of appropriate reagent(s) and addition rates, KEMRON evaluated selected physical and chemical properties of each material by conducting the following tests:

PARAMETER	METHOD
Moisture Content	ASTM D2216
Bulk Density	ASTM D2937
Solid Specific Gravity	ASTM D854
Porosity	Calculated
Organic Content	ASTM D2974
Soil Classification	USCS D2487
Particle Size Analysis with Hydrometer	ASTM D422
Atterberg Limits	ASTM D4381
Total Chromium and Lead	EPA Method 6010
Hexavalent Chromium	EPA Method 3060A/7196A
SPLP Chromium and Lead	EPA Method 1312/6010
SPLP Hexavalent Chromium	EPA Method 1312/3060A/7196A

A summary of the results of the physical properties testing are provided on **Table 1**, and physical properties data sheets for the untreated materials are included in **Appendix A**. Samples of the untreated materials were sent to ESC Lab Sciences in Mt. Juliet, Tennessee, for total chromium, lead, and hexavalent chromium analyses. In addition,

the Synthetic Precipitation Leaching Procedure (SPLP) for TSS-01 (Stratum 1) was performed. Laboratory analytical results are summarized on **Table 2**, and the laboratory reports are included in **Appendix B**.

The results of the untreated characterization are summarized in the following tables.

TABLE # 1

UNTREATED PHYSICAL PROPERTIES TESTING

TESTING PARAMETER	TEST METHOD	UNIT	UNTREATED SAMPLE NO. TSS-01	TSS-02
Moisture Content	ASTM D2216			
ASTM Moisture Content		%	434.84	65.91
Percent Solids		%	18.72	60.28
Bulk Unit Weight	ASTM D2937	pcf	67.9	96.3
Solid Specific Gravity	ASTM D854	s.u.	1.89	2.56
Loss on Ignition	ASTM D2974			
Average Moisture Content		%	492.52	69.51
Average Loss on Ignition		%	38.36	2.38
Particle Size Distribution	ASTM D422/D854			
Gravel		%	2	1.3
Sand		%	25.1	35.4
Silt		%	69.9	56.8
Clay		%	3	6.5
Atterberg Limits	ASTM D4318			
Liquid Limit		LL	NV	49
Plastic Limit		PL	NP	33
Plasticity Index		PI	NP	16
Sample Description			Black silt with sand	Very dark greenish gray sandy silt
Sample Classification	USCS D2487		ML	ML
Total Porosity	Calculated	%	89.2	63.7

Notes

% = Percent
pcf = pounds per cubic foot
s.u. = standard units
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
NV = No Value
NP = Non-Plastic

Based on the results of the untreated characterization, both materials are fairly similar from a grain size and USCS classification. However, TSS-01 (Stratum 1) has significantly more organic material as well as higher moisture content. The density as well as the specific gravity of TSS-01 is lower than TSS-02.

TABLE # 2
UNTREATED MATERIAL ANALYTICAL RESULTS

	Sample ID	TSS-01 UNTREATED			TSS-02 UNTREATED		
Parameter	Units	Value	Qual	MDL	Value	Qual	MDL
Total Hexavalent Chromium	mg/kg	8.4	J	0.71	1.9	J	0.71
Total Chromium	mg/kg	3400		0.085	30		0.085
Total Lead	mg/kg	38		0.09	11		0.09
SPLP - Hexavalent Chromium	ug/L	U		3.9	NA		
SPLP - Chromium	ug/L	32		4	NA		
SPLP - Lead	ug/L	4.8	J	4.8	NA		

Notes
MDL = method detection limit
mg/kg = milligrams per kilogram
ug/L = micrograms per liter
U = Not Detected
NA = Not Analyzed
Qual = Qualifiers:
J = (EPA) - Estimated value below the lowest calibration point. Confidence correlates with concentration.

The results of the untreated chemical analysis reveal that TSS-01 is significantly more impacted with the constituents of concern.

3.0 STABILIZATION EVALUATIONS

The mixture designs were developed by Weston, including reagent selection and reagent addition rates. The reagents used by KEMRON included:

REAGENT	SUPPLIER
Type I Portland Cement	Local retail hardware store
Seattle NewCem	Lafarge Concrete Lab, Seattle WA
Cement Kiln Dust	Lafarge North America, Ravena NY

Each reagent material was homogenized individually prior to mixture development by blending each material manually until visually homogenous.

3.1 PRELIMINARY STABILIZATION EVALUATIONS

KEMRON prepared a total of nine preliminary mixture designs (mixes 0405-001 through 0405-009) using the TSS-01 material, with combinations of three different reagent types: Type I Portland Cement (PC), Seattle NewCem, and cement kiln dust (CKD).

All mixtures were prepared using a Hobart-type kitchen mixer with a paddle-type mixing arm. Mixtures were prepared by placing an aliquot of the untreated material into the mixing chamber. The appropriate reagents were then added dry to the untreated material while mixing. Each mixture was blended for a period of approximately 60 to 90 seconds at a rate of approximately 60 revolutions per minute (rpm).Treatment utilizing this mixer is intended to simulate potential full-scale remediation options, to the extent possible on the bench-scale. This approach is routinely utilized to simulate a wide range of potential full-scale remediation approaches, including both in-situ and ex-situ applications.

For the first three mixes (0405-001 through 0405-003), PC alone was added at ratios of 150, 250, and 350 kilograms per cubic meter (kg/m^3) to TSS-01 (Stratum 1). Seattle NewCem was used in the next three mixes (0405-004 through 0405-006) at addition rates of 150, 200, and 250 kg/m^3. The final three preliminary mixes (0405-007 through 0405-009) all contained 350 kg/m^3 of CKD, with PC added at ratios of 150, 175, and 200 kg/m^3. Preliminary solidification mixture designs are provided on **Table 3**. Preliminary mixture development data sheets are provided in **Appendix C**.

The following is a summary of treated material curing techniques, testing performed on the treated samples, and brief descriptions of the protocols utilized for the preliminary stabilization evaluations:

- The nine preliminary mixtures were poured into cylindrical curing molds and allowed to cure at ambient temperature (68 ˚F to 72 ˚F) in moisture-sealed

containers.

- KEMRON performed pile slump testing on each of the nine preliminary mixture designs after seven days of curing. The treated material was poured out of the mold onto a hard, flat surface from a height of six inches, and the height of the resulting pile was measured. Results of the pile slump testing are noted individually on each of the mixture design sheets provided in **Appendix C**, and are summarized on **Table 3**.
- KEMRON performed pocket penetrometer testing on each of the nine preliminary mixture designs after seven days of curing. Approximately 100 grams of each treated material was poured into a small cup, cured, and tested to evaluate the approximate strength of each sample. Results of the pocket penetrometer testing are noted individually on each of the mixture design sheets provided in **Appendix C**, and are summarized on **Table 3**.

The results of the slump pile testing and penetrometer testing are summarized below.

TABLE # 3
PRELIMINARY MIXTURE DESIGNS - PILE SLUMP - POCKET PENETROMETER RESULTS

KEMRON	UNTREATED	REAGENT	Reagent Addition Rate		Curing Characteristics	
					Pile Slump (Day 1)	Penetrometer (Day 7)
Mix No	MATERIAL ID	ID	Kg/M^3 Untreated	% by Weight	(inches)	(tsf)
0405-001	TSS-01	Type I PC	150	13.8	5.25 - 5.75	2.25 (1)
0405-002	TSS-01	Type I PC	250	22.9	5.75	2.75 (1)
0405-003	TSS-01	Type I PC	350	32.1	5.75 - 6.25	4.25 (1)
0405-004	TSS-01	NewCem	150	13.8	2.75	0.00 (2)
0405-005	TSS-01	NewCem	200	18.4	3.00	0.00 (2)
0405-006	TSS-01	NewCem	250	22.9	3.00	0.00 (2)
0405-007	TSS-01	CKD / PC	350 / 150	32.1 / 13.8	5.75	1.25 (1)
0405-008	TSS-01	CKD / PC	350 / 175	32.1 / 16.0	5.75	2.5 (1)
0405-009	TSS-01	CKD / PC	350 / 200	32.1 / 18.4	5.75	3.25 (1)

Notes
% = Percent
Kg/M3 = Kilograms per cubic meter
CKD = Cement Kiln Dust
PC = Type I Portland Cement
(1) Penetrometer strengths were taken without the aid of an expanded area foot.
(2) Penetrometer strengths were taken using an expanded area foot.

The results of the penetrometer testing revealed that the NewCem reagent could not

effectively set up with TSS-01. In addition, the penetrometer results suggest that the PC alone sets up more rapidly and at a greater strength than used with CKD. The results of the pile testing revealed similar results (approximately 5.75) for the mixtures using PC alone and PC and CKD combined.

3.2 OPTIMIZATION STABILIZATION EVALUATIONS

Results of the preliminary stabilization evaluation results indicated that the mixes using PC alone provided the greatest strength after seven days of curing. Therefore, Weston designed three additional mixture designs for TSS-01 (mixes 0405-010 through 0405-012), using 200, 250, and 300 k/m^3 of PC. Three mixture designs were also created for TSS-02 (mixes 0405-013 through 0405-015) using the same PC addition ratios, because mixing will occur across the interface of the two soil types during full-scale treatment.

The following is a summary of treated material curing techniques, testing performed on the treated samples, and brief descriptions of the protocols utilized for the optimization stabilization evaluations:

- The six optimization mixtures were poured into cylindrical curing molds and allowed to cure at ambient temperature (68 ˚F to 72 ˚F) in moisture-sealed containers.
- Pocket penetrometer testing was performed by KEMRON on the optimization mixture designs, following cure times of approximately 2, 7, and 14 days. Approximately 100 grams of each treated material was put into a small cup, then cured at the above intervals and tested to evaluate the approximate cured strength of each sample. Results of the pocket penetrometer testing are noted individually on each of the mixture design sheets provided in **Appendix C**, and are summarized on **Table 4**.
- After 14 days of curing, the volumetric expansion of each of the six optimization samples was evaluated. Exactly 100 grams of untreated material was added to a plastic cylindrical mold. The height of the untreated material was measured and recorded. The reagent slurry was then added at the appropriate addition rate to the untreated material, and the mixture was allowed to cure for 14 days. At this time, the height of material was measure and recorded. The volumetric expansion of the material was then calculated and recorded on the mixture design sheet. Volumetric expansion results are noted individually on each of the mixture design sheets provided in **Appendix B**, and are summarized on **Table 4**.
- After 14 days of curing, KEMRON tested the unconfined compressive strength (UCS) of each of the six optimization mixture designs. UCS testing was performed in accordance with ASTM Method D1633 by first removing each cured sample specimen from its cylindrical mold. The weight and physical

dimensions of the sample were recorded on the appropriate data sheet. The specimen was then placed on the load frame and compressed at a rate of 1% strain per minute until the sample failed or 15% of the strain had been achieved. Throughout the testing, KEMRON documented the load at specific strain values. A representative aliquot of the post-test specimen was then subjected to moisture content testing. UCS test results are presented on **Table 5**, and the data sheets are provided in **Appendix D**.

The following table summarizes the Penetrometer Testing and Volumetric Expansion testing performed on the optimization mixes.

TABLE # 4

OPTIMIZATION/CONFIRMATION MIXTURE DESIGNS - POCKET PENETROMETER RESULTS

KEMRON Mix No	UNTREATED MATERIAL ID	REAGENT ID	Reagent Addition Rate kg/m^3 Untreated	Reagent Addition Rate Percent by Weight	Penetrometer Testing Day 2[2] (tsf)	Penetrometer Testing Day 3[1] (tsf)	Penetrometer Testing Day 7[1] (tsf)	Penetrometer Testing Day 14[1] (tsf)	Volumetric Expansion Day 14 %	Volumetric Expansion Day 28 %
0405-010	TSS-01	Type I PC	200	18.4	>4.5	NT	1.5	1.5	6.6	5.5
0405-011	TSS-01	Type I PC	250	23	>4.5	2.0	3.25	3.5	4.9	NT
0405-012	TSS-01	Type I PC	300	27.6	>4.5	3.5	4.0	4.5	5.5	7.1
0405-013	TSS-02	Type I PC	200	13.0	>4.5	>4.5	>4.5	>4.5	9.4	NT
0405-014	TSS-02	Type I PC	250	16.2	>4.5	>4.5	>4.5	>4.5	9.4	NT
0405-015	TSS-02	Type I PC	300	19.4	>4.5	>4.5	>4.5	>4.5	11.8	NT
0405-016	TSS-02	Type I PC	100	6.5	NT	NT	NT	NT	NT	NT

Notes
% = Percent
tsf = tons per square foot
kg/m3 = Kilograms per cubic meter
NT = Not tested

(1) Penetrometer strengths were taken without the aid of an expanded area foot.
(2) Penetrometer strengths were taken using an expanded area foot.

The results of the Penetrometer and Volumetric Testing indicate that each optimization mix meets the study volumetric expansion objective of less than 15%. Pocket Penetrometer data reveals that the mixture of PC and TSS-02 sets up very effectively.

TABLE # 5

OPTIMIZATION / CONFIRMATION EVALUATION
Summary of Unconfined Compressive Strength Testing – ASTM D1633

FIELD SAMPLE ID	Cure Time (days)	UNCONFINED COMPRESSIVE STRENGTH			
		Moisture Content (%)	Bulk Density (lbs/ft^3)	Dry Density (lbs/ft^3)	UCS (lbs/in^2)
0405-010	7	201.73	78.4	26.0	13.6
	14	196.87	78.3	26.4	14.6
	21	186.77	77.5	27.0	17.7
	28	183.24	77.0	27.2	18.7
0405-011	14	173.55	77.9	28.5	23.4
	34	158.09	77.8	30.1	31.3
0405-012	7	152.29	82.2	32.6	35.6
	14	146.16	81.1	32.9	41.9
	21	137.75	81.2	34.1	47.9
	28	144.59	79.7	32.6	51.5
0405-013	14	47.35	104.2	70.7	282.5
0405-014	14	47.77	105.1	71.2	343.5
0405-015	14	43.65	105.0	73.1	456.8
0405-016	14	TBD	TBD	TBD	TBD
	28	TBD	TBD	TBD	TBD

Notes:
psi = pounds per square inch
TBD = To be determined

The results of the UCS testing revealed that the mixture designs for TSS-02 were from 282.5 pcf to 456.8 pcf, well in excess of the 50 psi objective. In addition, mixture design 0405-10 was not able to achieve the minimum 50 psi objective for the site.

3.3 CONFIRMATION STABILIZATION EVALUATIONS

Based on optimization testing, two of the TSS-01 mixtures, 0405-010 and 0405-012, were initially chosen for confirmation stabilization evaluations. However, upon review of the 28-day UCS confirmation testing, mixture 0405-010 did not gain enough strength to meet the criteria of 30 psi. Therefore, continued testing of this mixture was abandoned, and confirmation testing was planned for TSS-01 mixture 0405-011. However, due to the modification of the UCS criteria, mixture 0405-011 failed to gain the target strength of 50 psi. Weston reviewed the data presented in the optimization evaluation and directed KEMRON to develop an additional TSS-02 mixture with a 100 kg/m^3 addition ratio of PC for confirmation testing. Confirmation testing of this mixture, 0405-016 and 0405-012, is currently underway and the results will be submitted to Weston in a supplementary report.

The following is a summary of treated material curing techniques, testing performed on the treated samples, and brief descriptions of the protocols utilized for the confirmation stabilization evaluations:

- After 28 days of curing, confirmation mixture designs 0405-010 and 0405-012 were evaluated to determine the percentage of volumetric expansion. Based on the previous data of the study, the volumetric expansion testing will not be warranted for mixture 0405-016. Volumetric expansion results are noted individually on each of the mixture design sheets provided in **Appendix B**, and are summarized on **Table 4**.
- KEMRON tested the unconfined compressive strength (UCS) of confirmation mixture designs 0405-010 and 0405-012 after 7, 21, and 28 days. Additionally, mixture 0405-011 was subjected to a UCS test after 34 days. Mixture 0405-016 will be tested at a cure date of 14 and 28 days and will be reviewed by Weston. UCS test results are presented on **Table 5**, and the data sheets are provided in **Appendix D**.
- Permeability testing was conducted on mixtures 0405-11 and 0405-012 after 28 days of curing, in accordance with ASTM D5084. The mixtures were removed from the curing molds, and the weights and physical dimensions of the samples were recorded on the appropriate data sheets. The permeameter was assembled, and the samples were saturated to a minimum value of 95%, then consolidated using a standard 10-psi confining pressure. Water was then passed through the samples, and the permeabilities were determined. Permeability test results are presented on **Table 6**, and the data sheets are provided in **Appendix E**.

- After a minimum of 14 days, one dimensional consolidation testing will be performed on mixtures 0405-012 and 0405-016 to evaluate the ability of these mixes to minimize settlement of the completed cap. Testing will be conducted in accordance with ASTM D2435. The solidified sample will be cored using a drill press to a diameter of 2.5 inches. The core will then be cut with a fine diamond blade table saw to inch. The dimensions and weight of the cut solidified sample will be measured and placed in the consolidation ring. The sample will then be placed in consolidometer apparatus. Since both Stratum 1 and 2 are in the groundwater, the consolidation testing will be performed with the sample submerged in the site groundwater (TSL-03). The samples will be subjected to incremental loads of .25 ksf, 0.5 ksf, 1.0 ksf, 2 ksf, 4, ksf, 8 ksf, 16 ksf, and 32 ksf. No rebound component of the testing appears warranted. Testing will be conducted in accordance with ASTM D2435. The consolidation testing results will be submitted to Weston in a supplemental report.

- In addition, the Synthetic Precipitation Leaching Procedure (SPLP) for treated mixture design 0405-012 was performed after 28 days of curing. Laboratory analytical results will be submitted to Weston in a supplemental report.

- After 28 days of curing, the EPA Premethod 1315 leaching test was begun for mixture designs 0405-011 and 0405-012. The samples were removed from their cylindrical molds and placed in a deionized-water bath in airtight polypropylene containers. The leaching procedure will proceed as follows: after intervals of 2 hours and 1, 2, 7, 14, 28, 42, 49, and 63 days, each sample will be moved to a fresh bath, and the resulting eluates will be analyzed to determine pH, specific conductivity, and oxidation-reduction potential. The eluates will then be filtered through a 0.45-µm membrane, sampled, and shipped to ESC Lab Sciences for laboratory analysis of chromium, lead, and hexavalent chromium. The leaching test is in progress and will be submitted to Weston in a supplemental report.

The results of the permeability testing of mixes 0405-011 and 0405-012 are summarized below.

TABLE # 6

OPTIMIZATION / CONFIRMATION EVALUATION
Summary of Permeability Testing - ASTM D5084

FIELD SAMPLE ID	Cure Time (days)	PERMEABILITY (k)			
		Moisture Content (%)	Bulk Density (lbs/ft^3)	Dry Density (lbs/ft^3)	Permeability (cm/sec)
0405-011	34	165.70	78.3	29.5	5.2E-06
0405-012	28	150.90	79.5	31.7	5.6E-06

Notes:
% = percent
lb/ft³ = pounds per cubic foot
cm/sec = centimeters per second

Permeability results indicate that both mixtures 0405-011 and 0405-12 meet the performance objective of 5×10^{-6} after a minimum curing time of 28 days.

4.0 CONCLUSIONS

The results of this study indicate that, an addition rate of 300 kilograms of Portland cement per cubic meter of soil for the TSS-01 (Stratum 1) material is required to meet the specified performance criteria of 50 psi or greater. UCS testing results presented on **Table 5** show that mixture 0405-012, with a PC addition rate of 300 kg/m^3, exceed the site criteria of 50 psi following approximately 28 days of curing. Addition rates of 200 kg/m^3 result in UCS values greater than 282 psi after 7 days of curing. A supplemental report will be issued to Weston evaluating the 14 and 28 day cure strength of 100 kg of PC per m^3 of soil.

Permeability testing, summarized on **Table 6**, indicates that both mixtures 0405-011 and 0405-012 exhibit permeability values that meet the site objective of less than 5×10^{-6} cm/sec, with permeabilities of 5.2×10^{-6} and 5.6×10^{-6}, respectively.

Volumetric expansion testing, summarized on **Table 4**, indicates that all of the mixtures tested meet the site objective of less than 15% increase in volume of the treated material.

A supplemental report is planned to be issued to provide the results of the Premethod 1315, as well as consolidation testing, and UCS strengths of selected mixture designs identified in the optimization and confirmation phases of this study. This report should be reviewed in its entirety, including all attachments and appendices, prior to making decisions concerning a remedial approach. This study is intended to suggest what will occur in the field, but does not guarantee the same results.

If you have any questions concerning the data provided in this report, please do not hesitate to contact us at 404-601-6927.

Sincerely,
KEMRON Environmental Services, Inc.

Jill G. Suhm
Project Engineer

Tommy A. Jordan, P.G
Program Manager

TABLES

KEMRON
ENVIRONMENTAL SERVICES

WESTON
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KEMRON PROJECT No: SE-0405

TABLE # 1

UNTREATED PHYSICAL PROPERTIES TESTING

TESTING PARAMETER	TEST METHOD	UNIT	UNTREATED SAMPLE NO.	
			TSS-01	TSS-02
Moisture Content	ASTM D2216			
ASTM Moisture Content		%	434.84	65.91
Percent Solids		%	18.72	60.28
Bulk Unit Weight	ASTM D2937	pcf	67.9	96.3
Solid Specific Gravity	ASTM D854	s.u.	1.89	2.56
Loss on Ignition	ASTM D2974			
Average Moisture Content		%	492.52	69.51
Average Loss on Ignition		%	38.36	2.38
Particle Size Distribution	ASTM D422/D854			
Gravel		%	2	1.3
Sand		%	25.1	35.4
Silt		%	69.9	56.8
Clay		%	3	6.5
Atterberg Limits	ASTM D4318			
Liquid Limit		LL	NV	49
Plastic Limit		PL	NP	33
Plasticity Index		PI	NP	16
Sample Description			Black silt with sand	Very dark greenish gray sandy silt
Sample Classification	USCS D2487		ML	ML
Total Porosity	Calculated	%	89.2	63.7

Notes
% = Percent
pcf = pounds per cubic foot
s.u. = standard units
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
NV = No Value

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TABLE # 2

UNTREATED MATERIAL ANALYTICAL RESULTS

	Sample ID	TSS-01 UNTREATED			TSS-02 UNTREATED		
Parameter	**Units**	**Value**	**Qual**	**MDL**	**Value**	**Qual**	**MDL**
Total Hexavalent Chromium	mg/kg	8.4	J	0.71	1.9	J	0.71
Total Chromium	mg/kg	3400		0.085	30		0.085
Total Lead	mg/kg	38		0.09	11		0.09
SPLP - Hexavalent Chromium	ug/L	U		3.9	NA		
SPLP - Chromium	ug/L	32		4	NA		
SPLP - Lead	ug/L	4.8	J	4.8	NA		

Notes
MDL = method detection limit
mg/kg = milligrams per kilogram
ug/L = micrograms per liter
U = Not Detected
NA = Not Analyzed
Qual = Qualifiers:
J = (EPA) - Estimated value below the lowest calibration point. Confidence correlates with concentration.

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KEMRON PROJECT No: SE-0405

TABLE # 3

PRELIMINARY MIXTURE DESIGNS - PILE SLUMP - POCKET PENETROMETER RESULTS

KEMRON Mix No	UNTREATED MATERIAL ID	REAGENT ID	Reagent Addition Rate		Curing Characteristics	
			Kg/M^3 Untreated	% by Weight	Pile Slump (Day 1) (inches)	Penetrometer (Day 7) (tsf)
0405-001	TSS-01	Type I Portland Cement	150	13.8	5.25 - 5.75	2.25 (1)
0405-002	TSS-01	Type I Portland Cement	250	22.9	5.75	2.75 (1)
0405-003	TSS-01	Type I Portland Cement	350	32.1	5.75 - 6.25	4.25 (1)
0405-004	TSS-01	NewCem	150	13.8	2.75	0.00 (2)
0405-005	TSS-01	NewCem	200	18.4	3.00	0.00 (2)
0405-006	TSS-01	NewCem	250	22.9	3.00	0.00 (2)
0405-007	TSS-01	CKD / PC	350 / 150	32.1 / 13.8	5.75	1.25 (1)
0405-008	TSS-01	CKD / PC	350 / 175	32.1 / 16.0	5.75	2.5 (1)
0405-009	TSS-01	CKD / PC	350 / 200	32.1 / 18.4	5.75	3.25 (1)

Notes
% = Percent
Kg/M3 = Kilograms per cubic meter
CKD = Cement Kiln Dust
PC = Type I Portland Cement

It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

(1) Penetrometer strengths were taken without the aid of an expanded area foot.
(2) Penetrometer strengths were taken using an expanded area foot.

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KEMRON PROJECT No: SE-0405

TABLE # 4

OPTIMIZATION/CONFIRMATION MIXTURE DESIGNS - POCKET PENETROMETER RESULTS

KEMRON Mix No	UNTREATED MATERIAL ID	REAGENT ID	Reagent Addition Rate		Penetrometer Testing				Volumetric Expansion	
			kg/m^3 Untreated	Percent by Weight	Day 2[2] (tsf)	Day 3[1] (tsf)	Day 7[1] (tsf)	Day 14[1] (tsf)	Day 14 %	Day 28 %
0405-010	TSS-01	Type I Portland Cement	200	18.4	>4.5	NT	1.5	1.5	6.6	5.5
0405-011	TSS-01	Type I Portland Cement	250	23	>4.5	2.0	3.25	3.5	4.9	NT
0405-012	TSS-01	Type I Portland Cement	300	27.6	>4.5	3.5	4.0	4.5	5.5	7.1
0405-013	TSS-02	Type I Portland Cement	200	13.0	>4.5	>4.5	>4.5	>4.5	9.4	NT
0405-014	TSS-02	Type I Portland Cement	250	16.2	>4.5	>4.5	>4.5	>4.5	9.4	NT
0405-015	TSS-02	Type I Portland Cement	300	19.4	>4.5	>4.5	>4.5	>4.5	11.8	NT
0405-016	TSS-02	Type I Portland Cement	100	6.5	NT	NT	NT	NT	NT	NT

Notes
% = Percent
tsf = tons per square foot
kg/m3 = Kilograms per cubic meter
NT = Not tested

(1) Penetrometer strengths were taken without the aid of an expanded area foot.
(2) Penetrometer strengths were taken using an expanded area foot.

KEMRON
ENVIRONMENTAL SERVICES

WESTON
WALTON & LONSBURY SITE
KEMRON PROJECT No: SE-0405

TABLE # 5

OPTIMIZATION / CONFIRMATION EVALUATION
Summary of Unconfined Compressive Strength Testing - ASTM D1633

FIELD SAMPLE ID	Cure Time (days)	UNCONFINED COMPRESSIVE STRENGTH			
		Moisture Content (%)	Bulk Density (lbs/ft^3)	Dry Density (lbs/ft^3)	UCS (lbs/in^2)
0405-010	7	201.73	78.4	26.0	13.6
	14	196.87	78.3	26.4	14.6
	21	186.77	77.5	27.0	17.7
	28	183.24	77.0	27.2	18.7
0405-011	14	173.55	77.9	28.5	23.4
	34	158.09	77.8	30.1	31.3
0405-012	7	152.29	82.2	32.6	35.6
	14	146.16	81.1	32.9	41.9
	21	137.75	81.2	34.1	47.9
	28	144.59	79.7	32.6	51.5
0405-013	14	47.35	104.2	70.7	282.5
0405-014	14	47.77	105.1	71.2	343.5
0405-015	14	43.65	105.0	73.1	456.8
0405-016	14	TBD	TBD	TBD	TBD
	28	TBD	TBD	TBD	TBD

Notes:
psi = pounds per square inch
TBD = To be determined

KEMRON
ENVIRONMENTAL SERVICES

WESTON
WALTON & LONSBURY SITE
KEMRON PROJECT No: SE-0405

TABLE # 6

OPTIMIZATION / CONFIRMATION EVALUATION
Summary of Permeability Testing - ASTM D5084

FIELD SAMPLE ID	Cure Time (days)	PERMEABILITY (k)			
		Moisture Content (%)	Bulk Density (lbs/ft^3)	Dry Density (lbs/ft^3)	Permeability (cm/sec)
0405-011	34	165.70	78.3	29.5	5.2E-06
0405-012	28	150.90	79.5	31.7	5.6E-06

Notes:
% = percent
lb/ft^3 = pounds per cubic foot
cm/sec = centimeters per second

APPENDIX A

UNTREATED PHYSICAL PROPERTIES TESTING

MOISTURE CONTENT DETERMINATION

REPORT FORM
ASTM D 2216

PROJECT:	Walton & Lonsbury Site
PROJECT No.:	SE0405
SAMPLE No.:	TSS-01 Untreated
TESTING DATE:	11/30/11
TESTED BY:	JGS
TRACKING CODE:	7769_MC

MOISTURE CONTENT (Dry & Wet Basis)						
1. MOISTURE TIN NO.	A		B		C	
2. WT MOISTURE TIN (tare weight)	67.01	g	63.88	g	69.19	g
3. WT WET SOIL + TARE	118.59	g	111.43	g	117.79	g
4. WT DRY SOIL + TARE	76.41	g	73.22	g	78.08	g
5. WT WATER, Ww	42.18	g	38.21	g	39.71	g
6. WT DRY SOIL, Ws	9.40	g	9.34	g	8.89	g
7. ASTM MOISTURE CONTENT	448.72	%	409.10	%	446.68	%
8. PERCENT SOLIDS	18.22	%	19.64	%	18.29	%
9. AVERAGE ASTM MOISTURE CONTENT	434.84	%				
10. AVERAGE PERCENT SOLIDS	18.72	%				

MOISTURE CONTENT DETERMINATION

REPORT FORM
ASTM D 2216

PROJECT:	Walton & Lonsbury Site
PROJECT No.:	SE0405
SAMPLE No.:	TSS-02 Untreated
TESTING DATE:	12/01/11
TESTED BY:	JGS
TRACKING CODE:	7771_MC

MOISTURE CONTENT (Dry & Wet Basis)						
1. MOISTURE TIN NO.	A		B		C	
2. WT MOISTURE TIN (tare weight)	111.27	g	110.60	g	113.15	g
3. WT WET SOIL + TARE	158.65	g	161.92	g	165.95	g
4. WT DRY SOIL + TARE	139.74	g	141.27	g	145.35	g
5. WT WATER, Ww	18.91	g	20.65	g	20.60	g
6. WT DRY SOIL, Ws	28.47	g	30.67	g	32.20	g
7. ASTM MOISTURE CONTENT	66.42	%	67.33	%	63.98	%
8. PERCENT SOLIDS	60.09	%	59.76	%	60.98	%
9. AVERAGE ASTM MOISTURE CONTENT	65.91	%				
10. AVERAGE PERCENT SOLIDS	60.28	%				

UNIT WEIGHT DETERMINATION

DATA SHEET
ASTM D7263

PROJECT:	Walton & Lonsbury Site
PROJECT No.:	SE-0405
SAMPLE No.:	TSS-01 Untreated
TESTING DATE:	11/30/11
TESTED BY:	JGS
TRACKING CODE:	7769_UW

UNIT WEIGHT (DENSITY)						
1. SAMPLE NO.	A		B		C	
2. WT OF MOLD (tare weight)	18.86	g	18.86	g	18.86	g
3. WT OF MOLD + SOIL	243.33	g	242.97	g	242.24	g
4. WT OF WET SOIL, W	224.47	g	224.11	g	223.38	g
5. DIAMETER OF SPECIMEN, D	2.00	in	2.00	in	2.00	in
6. HEIGHT OF SPECIMEN, H	4.00	in	4.00	in	4.00	in
7. VOLUME OF SPECIMEN	12.57	in^3	12.57	in^3	12.57	in^3
8. BULK UNIT WEIGHT	68.0	pcf	67.9	pcf	67.7	pcf
9. BULK SPECIFIC GRAVITY	1.1		1.1		1.1	
10. AVERAGE BULK UNIT WEIGHT	67.9	pcf				
11. AVERAGE BULK SPECIFIC GRAVITY	1.1					

UNIT WEIGHT DETERMINATION

DATA SHEET
ASTM D7263

PROJECT:	Walton & Lonsbury Site
PROJECT No.:	SE-0405
SAMPLE No.:	TSS-02 Untreated
TESTING DATE:	12/1/11
TESTED BY:	JGS
TRACKING CODE:	7771_UW

UNIT WEIGHT (DENSITY)						
1. SAMPLE NO.	A		B		C	
2. WT OF MOLD (tare weight)	18.86	g	18.86	g	18.86	g
3. WT OF MOLD + SOIL	333.95	g	344.26	g	331.61	g
4. WT OF WET SOIL, W	315.09	g	325.40	g	312.75	g
5. DIAMETER OF SPECIMEN, D	2.00	in	2.00	in	2.00	in
6. HEIGHT OF SPECIMEN, H	4.00	in	4.00	in	4.00	in
7. VOLUME OF SPECIMEN	12.57	in^3	12.57	in^3	12.57	in^3
8. BULK UNIT WEIGHT	95.5	pcf	98.6	pcf	94.8	pcf
9. BULK SPECIFIC GRAVITY	1.5		1.6		1.5	
10. AVERAGE BULK UNIT WEIGHT	96.3	pcf				
11. AVERAGE BULK SPECIFIC GRAVITY	1.5					

SOLID SPECIFIC GRAVITY

ASTM D 854
DATA SHEET

PROJECT:	Walton & Lonsbury Site
PROJECT No.:	SE0405
TESTING DATE:	12/2/2011
TESTED BY:	JGS/SEM
TRACKING CODE:	7769_GS
SAMPLE NO:	TSS-01 Untreated

SOLID SPECIFIC GRAVITY		
1. SAMPLE NUMBER	TSS-01 Untreated	
2. FLASK NUMBER	6	
3. TEMPERATURE	24.0	°C
4. WT. FLASK & WATER	161.50	g
5. WT. WATER, FLASK & SOIL	183.87	g
6. WT OF SOIL	22.37	g
7. CALIBRATION WATER & FLASK	360.39	g
8. DEAIRED SAMPLE	370.92	g
9. SPECIFIC GRAVITY	1.89	
10. CORRECTION FACTOR K	0.9991	
11. Gs @ 20 °C	1.89	

SOLID SPECIFIC GRAVITY

ASTM D 854
DATA SHEET

PROJECT:	Walton & Lonsbury Site
PROJECT No.:	SE0405
TESTING DATE:	12/2/2011
TESTED BY:	JGS/SEM
TRACKING CODE:	7771_GS
SAMPLE NO:	TSS-02 Untreated

SOLID SPECIFIC GRAVITY		
1. SAMPLE NUMBER	TSS-02 Untreated	
2. FLASK NUMBER	5	
3. TEMPERATURE	24.0	°C
4. WT. FLASK & WATER	141.70	g
5. WT. WATER, FLASK & SOIL	163.54	g
6. WT OF SOIL	21.84	g
7. CALIBRATION WATER & FLASK	359.77	g
8. DEAIRED SAMPLE	373.07	g
9. SPECIFIC GRAVITY	2.56	
10. CORRECTION FACTOR K	0.9991	
11. Gs @ 20 °C	2.56	

LOSS ON IGNITION
(ORGANIC CONTENT)
ASTM D2974

PROJECT:	Walton & Lonsbury
PROJECT No.:	SE0405
SAMPLE No.:	TSS-01 Untreated
TESTING DATE:	12/2/11
TESTED BY:	SEM/JGS
TRACKING CODE:	7769_LI

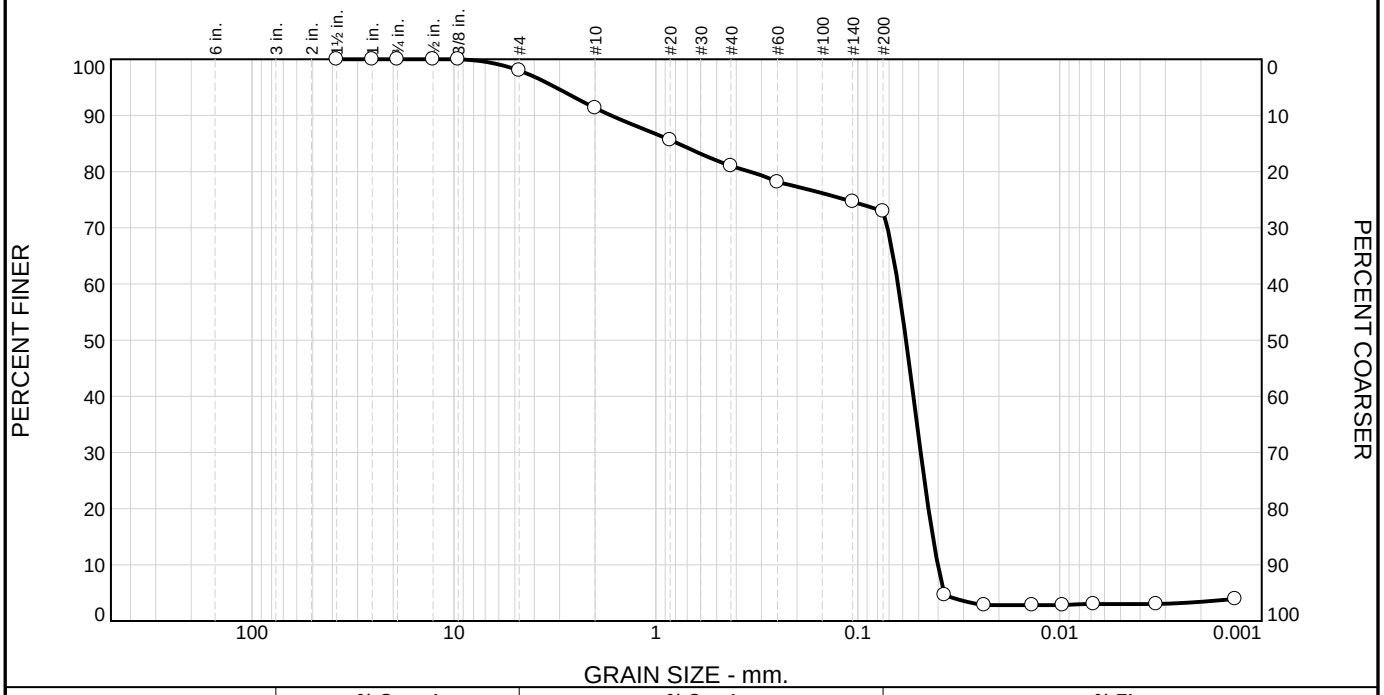
MOISTURE CONTENT / LOSS ON IGNITION						
1. MOISTURE TIN NO.	A		B		C	
2. WT MOISTURE TIN (tare weight)	56.996	g	59.214	g	53.553	g
3. WT WET SOIL + TARE	115.782	g	122.074	g	120.743	g
4. WT DRY SOIL + TARE	66.682	g	69.767	g	65.239	g
5. WT WATER, Ww	49.100	g	52.307	g	55.504	g
6. WT DRY SOIL, Ws	9.686	g	10.553	g	11.686	g
7. WT FINAL SOIL + TARE	62.876	g	65.617	g	60.978	g
8. WT FINAL SOIL, Wf	5.880	g	6.403	g	7.424	g
9. WT ORGANICS, Wo	3.806	g	4.151	g	4.261	g
10. MOISTURE CONTENT(ASTM)	506.94	%	495.65	%	474.98	%
11. LOSS ON IGNITION	39.30	%	39.33	%	36.47	%
12. AVERAGE MOISTURE CONTENT	492.52	%				
13. AVERAGE LOSS ON IGNITION	38.36	%				

LOSS ON IGNITION
(ORGANIC CONTENT)
ASTM D2974

PROJECT:	Walton & Lonsbury
PROJECT No.:	SE0405
SAMPLE No.:	TSS-02 Untreated
TESTING DATE:	12/2/11
TESTED BY:	SEM/JGS
TRACKING CODE:	7771_LI

MOISTURE CONTENT / LOSS ON IGNITION				
1. MOISTURE TIN NO.	A		B	
2. WT MOISTURE TIN (tare weight)	52.250	g	53.156	g
3. WT WET SOIL + TARE	121.344	g	113.283	g
4. WT DRY SOIL + TARE	93.267	g	88.406	g
5. WT WATER, Ww	28.077	g	24.877	g
6. WT DRY SOIL, Ws	41.017	g	35.250	g
7. WT FINAL SOIL + TARE	92.323	g	87.536	g
8. WT FINAL SOIL, Wf	40.073	g	34.380	g
9. WT ORGANICS, Wo	0.944	g	0.870	g
10. MOISTURE CONTENT(ASTM)	68.45	%	70.57	%
11. LOSS ON IGNITION	2.30	%	2.47	%
12. AVERAGE MOISTURE CONTENT	69.51	%		
13. AVERAGE LOSS ON IGNITION	2.38	%		

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.0	6.7	10.3	8.1	69.9	3.0

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1.0	100.0		
.75	100.0		
.5	100.0		
.375	100.0		
#4	98.0		
#10	91.3		
#20	85.6		
#40	81.0		
#60	78.1		
#140	74.6		
#200	72.9		
0.0372 mm.	4.6		
0.0237 mm.	2.8		
0.0137 mm.	2.8		
0.0097 mm.	2.8		
0.0068 mm.	3.0		
0.0033 mm.	3.0		
0.0014 mm.	3.9		

* (no specification provided)

Material Description

Black silt with sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 1.6667 D_{85}= D_{60}= 0.0633
D_{50}= 0.0577 D_{30}= 0.0488 D_{15}= 0.0425
D_{10}= 0.0402 C_u= 1.57 C_c= 0.94

Remarks

F.M.=0.83

Date Received: 11/23/11 **Date Tested:** 12/5/11

Tested By: SEM

Checked By: TAJ

Title: Program Manager

Location: Walton and Lonsbury

Sample Number: TSS-01

Date Sampled: 11/22/11

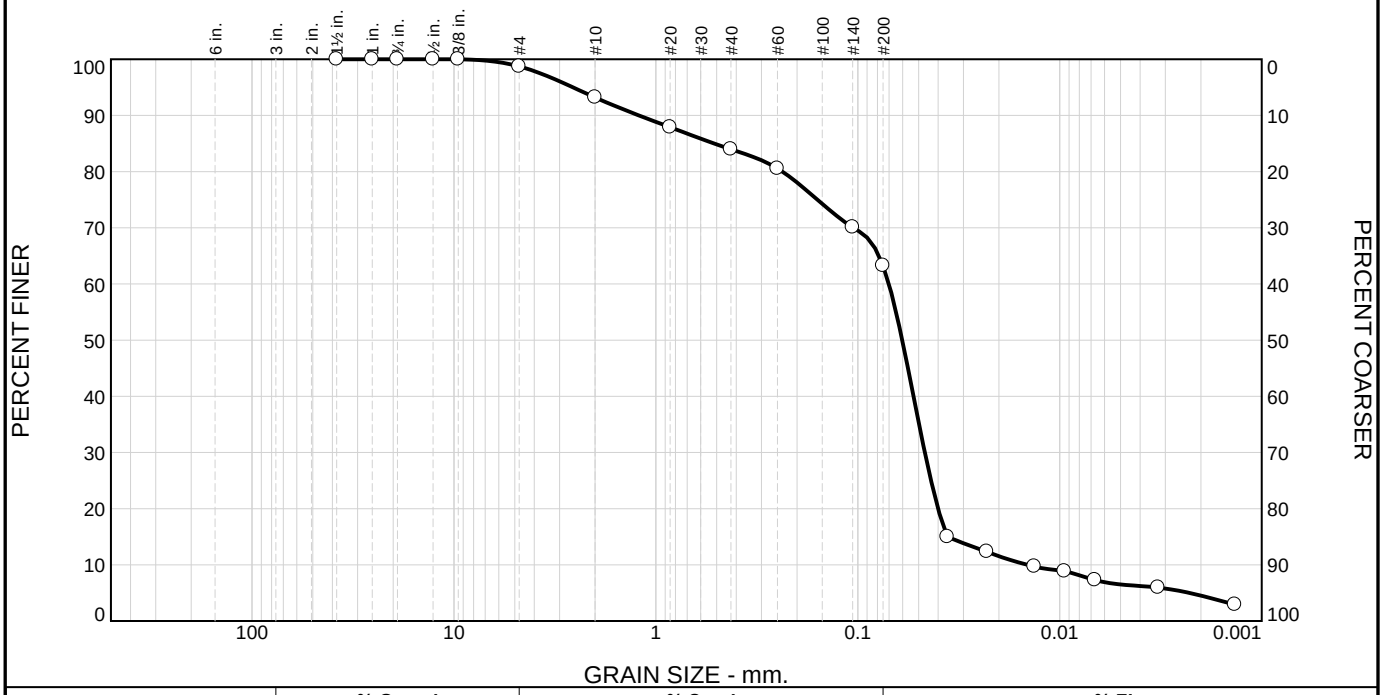
KEMRON Environmental Services Inc.
Atlanta, Georgia

Client: Weston

Project: Walton and Lonsbury

Project No: SE-0405 **Lab ID** TSS-01_GR

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.3	5.5	9.2	20.7	56.8	6.5

Test Results (ASTM D 422 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1.5	100.0		
1.0	100.0		
.75	100.0		
.5	100.0		
.375	100.0		
#4	98.7		
#10	93.2		
#20	87.9		
#40	84.0		
#60	80.6		
#140	70.1		
#200	63.3		
0.0360 mm.	15.0		
0.0230 mm.	12.3		
0.0134 mm.	9.7		
0.0095 mm.	8.9		
0.0067 mm.	7.3		
0.0033 mm.	6.0		
0.0014 mm.	2.9		

* (no specification provided)

Material Description

Very dark greenish gray sandy silt

Atterberg Limits (ASTM D 4318)

PL= 33 **LL=** 49 **PI=** 16

Classification

USCS (D 2487)= ML **AASHTO (M 145)=** A-7-5(10)

Coefficients

D_{90}= 1.2127 D_{85}= D_{60}= 0.0702
D_{50}= 0.0603 D_{30}= 0.0466 D_{15}= 0.0360
D_{10}= 0.0144 C_u= 4.87 C_c= 2.14

Remarks

F.M.=0.75

Date Received: 11/23/11 **Date Tested:** 12/5/11

Tested By: SEM

Checked By: TAJ

Title: Program Manager

Location: Walton and Lonsbury **Date Sampled:** 11/22/11

Sample Number: TSS-02

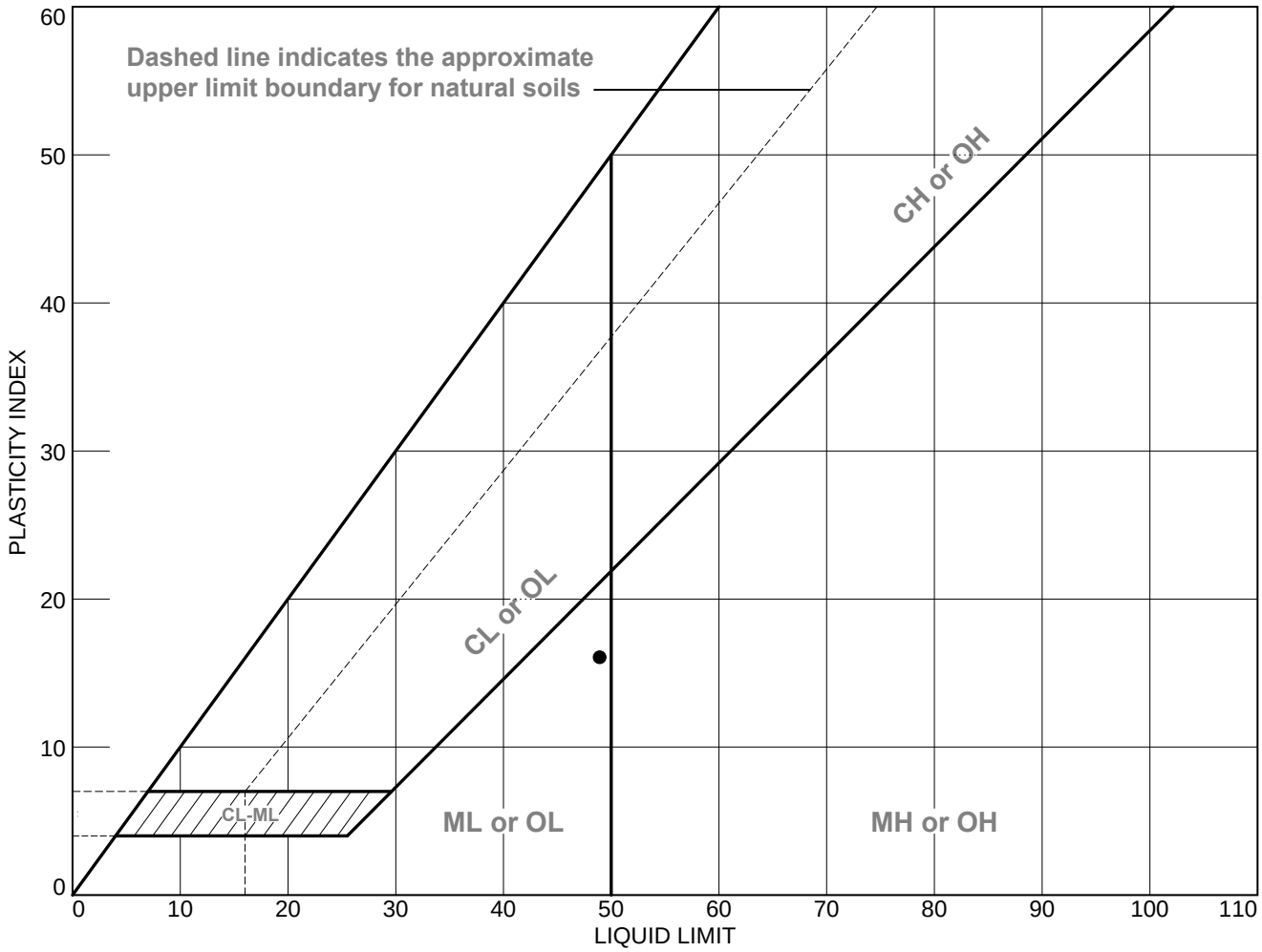
KEMRON Environmental Services Inc.
Atlanta, Georgia

Client: Weston

Project: Walton and Lonsbury

Project No: SE-0405 **Lab ID** TSS-02_GR

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		TSS-02			33	49	16	ML
■		TSS-01			NP	NV	NP	ML

KEMRON Environmental Services Inc.
Atlanta, Georgia

Client: Weston
Project: Walton and Lonsbury

Project No.: SE-0405 **Lab ID**

TOTAL POROSITY

Report Form

By Calculation

PROJECT:	Walton & Lonsbury Site
PROJECT No.:	SE0405
SAMPLE No.:	TSS-1 Untreated
TESTING DATE:	12/2/2011
TESTED BY:	JGS
TRACKING CODE:	7769_TP

Total porosity and Pore Volume Calculation		
SAMPLE No.	TSS-01 Untreated	
1. Bulk Density	67.9	lbs/ft^3
2. Moisture Content	434.8	%
3. Specific Gravity	1.9	-
4. Dry Density	12.7	lbs/ft^3
6. Weight of Solids$_{(1)}$	0.2035	g
7. Volume of Solids$_{(1)}$	0.1076	cm^3
8. Volume of Voids$_{(1)}$	0.8924	cm^3
9. Total Porosity (*n*)	**89.2**	**%**
10. Reactor Sample Volume		**cc**
11. Pore Volume	**0.0**	**cc**

1 Calculated for 1 cubic centimeter

TOTAL POROSITY

Report Form

By Calculation

PROJECT:	Walton & Lonsbury Site
PROJECT No.:	SE0405
SAMPLE No.:	TSS-2 Untreated
TESTING DATE:	12/2/2011
TESTED BY:	JGS
TRACKING CODE:	7771_TP

Total porosity and Pore Volume Calculation		
SAMPLE No.	TSS-02 Untreated	
1. Bulk Density	96.3	lbs/ft^3
2. Moisture Content	65.9	%
3. Specific Gravity	2.6	-
4. Dry Density	58.0	lbs/ft^3
6. Weight of Solids$_{(1)}$	0.9302	g
7. Volume of Solids$_{(1)}$	0.3634	cm^3
8. Volume of Voids$_{(1)}$	0.6366	cm^3
9. Total Porosity (*n*)	**63.7**	**%**
10. Reactor Sample Volume		**cc**
11. Pore Volume		**0.0 cc**

1 Calculated for 1 cubic centimeter

APPENDIX B

UNTREATED ANALYTICAL REPORTS

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Tommy Jordan
Kemron Environmental
1359-A Ellsworth Industrial Blvd.
Atlanta, GA 30318

Report Summary

Wednesday December 07, 2011

Report Number: L549420
Samples Received: 12/02/11
Client Project: SE0405

Description: Weston, Walton & Lonsbury Site

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Mark W. Beasley , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487
GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704, ND - R-140
NJ - TN002,NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 00109, WV - 233
AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032008A,
TX - T104704245, OK-9915, PA - 68-02979

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.
Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Tommy Jordan
Kemron Environmental
1359-A Ellsworth Industrial Blvd.
Atlanta, GA 30318

December 07,2011

ESC Sample # : L549420-01

Site ID :

Project # : SE0405

Date Received : December 02, 2011
Description : Weston, Walton & Lonsbury Site

Sample ID : TSS-01 UNTREATED

Collected By : Jill Suhm
Collection Date : 11/30/11 14:10

Parameter	Dry Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium,Hexavalent	8.4	0.71	12.	mg/kg	J	3060A/71	12/07/11	1
ORP	160			mV		2580	12/05/11	1
pH	5.9			su		9045D	12/05/11	1
Total Solids	17.			%		2540G	12/07/11	1
Chromium	3400	0.085	3.0	mg/kg		6010B	12/06/11	1
Lead	38.	0.090	1.5	mg/kg		6010B	12/06/11	1

Results listed are dry weight basis.
U = ND (Not Detected)
MDL = Minimum Detection Limit = LOD
RDL = Reported Detection Limit = LOQ = PQL = EQL
Note:

The reported analytical results relate only to the sample submitted
Reported: 12/07/11 15:44 Printed: 12/07/11 16:04
L549420-01 (PH) - 5.88@20.9c

ESC LAB SCIENCES
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Tommy Jordan
Kemron Environmental
1359-A Ellsworth Industrial Blvd.
Atlanta, GA 30318

December 07,2011

ESC Sample # : L549420-02

Site ID :

Project # : SE0405

Date Received : December 02, 2011
Description : Weston, Walton & Lonsbury Site

Sample ID : TSS-02 UNTREATED

Collected By : Jill Suhm
Collection Date : 12/01/11 13:25

Parameter	Dry Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium,Hexavalent	1.9	0.71	3.5	mg/kg	J	3060A/71	12/07/11	1
ORP	130			mV		2580	12/05/11	1
pH	5.8			su		9045D	12/05/11	1
Total Solids	57.			%		2540G	12/07/11	1
Chromium	30.	0.085	0.88	mg/kg		6010B	12/06/11	1
Lead	11.	0.090	0.44	mg/kg		6010B	12/06/11	1

Results listed are dry weight basis.
U = ND (Not Detected)
MDL = Minimum Detection Limit = LOD
RDL = Reported Detection Limit = LOQ = PQL = EQL
Note:

The reported analytical results relate only to the sample submitted
Reported: 12/07/11 15:44 Printed: 12/07/11 16:04
L549420-02 (PH) - 5.77@21.0c

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L549420-01	WG568504	SAMP	Chromium,Hexavalent	R1957474	J
L549420-02	WG568504	SAMP	Chromium,Hexavalent	R1957474	J

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J	(EPA) - Estimated value below the lowest calibration point. Confidence correlates with concentration.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE

12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Tommy Jordan
Kemron Environmental
1359-A Ellsworth Industrial Blvd.
Atlanta, GA 30318

Report Summary

Thursday January 26, 2012

Report Number: L556880
Samples Received: 01/21/12
Client Project: SH0405

Description: Walton Lonsbury

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Mark W. Beasley , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.
Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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REPORT OF ANALYSIS

Tommy Jordan
Kemron Environmental
1359-A Ellsworth Industrial Blvd.
Atlanta, GA 30318

January 26, 2012

ESC Sample # : L556880-01

Date Received : January 21, 2012
Description : Walton Lonsbury

Site ID :

Sample ID : TSS-01 UNTREATED

Project # : SH0405

Collected By : Jill Suhm
Collection Date : 01/20/12 14:52

Parameter	Result	MDL	RDL	Units	Qualifier	Method	Date	Dil.
Chromium,Hexavalent	U	3.9	10.	ug/l		7196A	01/24/12	1
SPLP Extraction	-					1312	01/23/12	1
Chromium	32.	4.0	10.	ug/l		6010B	01/24/12	1
Lead	4.8	1.7	5.0	ug/l	J	6010B	01/25/12	1
Water Extraction	-					1312	01/24/12	1

U = ND (Not Detected)
RDL = Reported Detection Limit = LOQ = PQL = EQL
MDL = Minimum Detection Limit = LOD = SQL(TRRP)
Note:
The reported analytical results relate only to the sample submitted.

.
Reported: 01/25/12 16:51 Revised: 01/26/12 10:07

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L556880-01	WG575295	SAMP	Lead	R2011593	J

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J	(EPA) - Estimated value below the lowest calibration point. Confidence correlates with concentration.

Qualifier Report Information

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Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
01/26/12 at 10:07:10

TSR Signing Reports: 134
R5 - Desired TAT

Sample: L556880-01 Account: KEMENVAGA Received: 01/21/12 09:00 Due Date: 01/27/12 00:00 RPT Date: 01/25/12 16:51
Rotate for SPLP CRICP, CR6, PBICP

APPENDIX C

MIXTURE DEVELOPMENT SHEETS

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-001
MIXING DATE:	22-Dec-11	MIXED BY:	SEM

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**750 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	13.80 %	103.5 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

Pile Height Testing @ 24 hrs.
Pocket Penetrometer: Day 7

Pile Slump Testing: It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	7 (with foot)	7 (no foot)			
PENETROMETER (TSF)	>4.5	3.25			

VOLUMETRIC EXPANSION

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

PILE SLUMP TESTING

INITIAL HEIGHT (in):	6	FINAL HEIGHT (in):	5.25 - 5.75

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-002
MIXING DATE:	22-Dec-11	MIXED BY:	SEM

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**750 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	22.90 %	171.8 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

Pile Height Testing @ 24 hrs.
Pocket Penetrometer: Day 7

Pile Slump Testing: It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	7 (with foot)	7 (no foot)			
PENETROMETER (TSF)	>4.5	2.75			

VOLUMETRIC EXPANSION

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

PILE SLUMP TESTING

INITIAL HEIGHT (in):	6	FINAL HEIGHT (in):	5.75

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-003
MIXING DATE:	22-Dec-11	MIXED BY:	SEM

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**750 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	32.10 %	240.8 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

Pile Height Testing @ 24 hrs.
Pocket Penetrometer: Day 7

Pile Slump Testing: It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	7 (with foot)	7 (no foot)			
PENETROMETER (TSF)	>4.5	4.25			

VOLUMETRIC EXPANSION

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

PILE SLUMP TESTING

INITIAL HEIGHT (in):	6	FINAL HEIGHT (in):	5.75 - 6.25

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-004
MIXING DATE:	22-Dec-11	MIXED BY:	SEM

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**750 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Seattle New Cem #920	13.80 %	103.5 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

Pile Height Testing @ 24 hrs.
Pocket Penetrometer: Day 7

Pile Slump Testing: It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	7 (with foot)				
PENETROMETER (TSF)	0.0				

VOLUMETRIC EXPANSION

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

PILE SLUMP TESTING

INITIAL HEIGHT (in):	6	FINAL HEIGHT (in):	2.75

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-005
MIXING DATE:	22-Dec-11	MIXED BY:	SEM

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**750 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Seattle New Cem #920	22.90 %	171.8 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

Pile Height Testing @ 24 hrs.
Pocket Penetrometer: Day 7

Pile Slump Testing: It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	7 (with foot)				
PENETROMETER (TSF)	0.0				

VOLUMETRIC EXPANSION

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

PILE SLUMP TESTING

INITIAL HEIGHT (in):	6	FINAL HEIGHT (in):	3.0

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-006
MIXING DATE:	22-Dec-11	MIXED BY:	SEM

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**750 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Seattle New Cem #920	32.10 %	240.8 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

Pile Height Testing @ 24 hrs.
Pocket Penetrometer: Day 7

Pile Slump Testing: It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	7 (with foot)				
PENETROMETER (TSF)	0.0				

VOLUMETRIC EXPANSION

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

PILE SLUMP TESTING

INITIAL HEIGHT (in):	6	FINAL HEIGHT (in):	3.0

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-007
MIXING DATE:	22-Dec-11	MIXED BY:	SEM

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**750 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement # 842	13.80 %	103.5 g
Cement Kiln Dust # 841	32.10 %	240.8 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

Pile Height Testing @ 24 hrs.
Pocket Penetrometer: Day 7

Pile Slump Testing: It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	7 (with foot)	7 (no foot)			
PENETROMETER (TSF)	>4.5	1.25			

VOLUMETRIC EXPANSION

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

PILE SLUMP TESTING

INITIAL HEIGHT (in):	6	FINAL HEIGHT (in):	5.75

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-008
MIXING DATE:	22-Dec-11	MIXED BY:	SEM

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**750 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement # 842	16.00 %	120.0 g
Cement Kiln Dust # 841	32.10 %	240.8 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

Pile Height Testing @ 24 hrs.
Pocket Penetrometer: Day 7

Pile Slump Testing: It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	7 (with foot)	7 (no foot)			
PENETROMETER (TSF)	>4.5	2.5			

VOLUMETRIC EXPANSION

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

PILE SLUMP TESTING

INITIAL HEIGHT (in):	6	FINAL HEIGHT (in):	5.75

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-009
MIXING DATE:	22-Dec-11	MIXED BY:	SEM

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**750 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement # 842	18.40 %	138.0 g
Cement Kiln Dust # 841	32.10 %	240.8 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

Pile Height Testing @ 24 hrs.
Pocket Penetrometer: Day 7

Pile Slump Testing: It was necessary to cut the samples from the 3 inch diameter by 6 inch high curing molds prior to pile slump testing. The monolith was dropped onto a hard surface from a height of approximately 6 inches. The height of the resulting pile was then measured to the nearest 0.25 inch.

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	7 (with foot)	7 (no foot)			
PENETROMETER (TSF)	>4.5	3.25			

VOLUMETRIC EXPANSION

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

PILE SLUMP TESTING

INITIAL HEIGHT (in):	6	FINAL HEIGHT (in):	5.75

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-010
MIXING DATE:	19-Jan-12	MIXED BY:	JGS

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**3,500 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	18.40 %	644.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

2,7,14 day Pocket Penetrometer with enlarged foot
7, 14, 21, 28 day UCS (ASTM D1633)
VE at 14 and 28 Days
28 day permeability
Extra 2x4 inch mold
1-D Consolidation (1 3x6 inch mold 1.5 inches in height) at 28 days
SPLP Anslysis
PreMethod 1315 (2 2x4 inch molds)

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	2 (with foot)	7 (no foot)	14 (no foot)		
PENETROMETER (TSF)	>4.5	1.5	1.5		

VOLUMETRIC EXPANSION - 14 DAYS

INITIAL HEIGHT (in):	1.82	FINAL HEIGHT (in):	1.94
VOLUMETRIC EXPANSION (%):		6.6	

VOLUMETRIC EXPANSION - 28 DAYS

INITIAL HEIGHT (in):	1.82	FINAL HEIGHT (in):	1.92
VOLUMETRIC EXPANSION (%):		5.5	

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-011
MIXING DATE:	19-Jan-12	MIXED BY:	JGS

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**1,250 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	23.00 %	287.5 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

2,7,14 day Pocket Penetrometer with enlarged foot
14 day UCS (ASTM D1633)
VE at 14 Days
2 Extra 2x4 inch molds

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	2 (with foot)	3 (no foot)	7 (no foot)	14 (no foot)	
PENETROMETER (TSF)	>4.5	2.0	3.25	3.5	

VOLUMETRIC EXPANSION - 14 DAYS

INITIAL HEIGHT (in):	1.82	FINAL HEIGHT (in):	1.91
VOLUMETRIC EXPANSION (%):	4.9		

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-012
MIXING DATE:	19-Jan-12	MIXED BY:	JGS

UNTREATED MATERIAL TYPE		TSS-1
WEIGHT OF UNTREATED MATERIAL		**2,000 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	27.60 %	552.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

2,7,14 day Pocket Penetrometer with enlarged foot
7, 14, 21, 28 day UCS (ASTM D1633)
VE at 14 and 28 Days
28 day permeability
Extra 2x4 inch mold
1-D Consolidation (1 3x6 inch mold 1.5 inches in height) at 28 days
SPLP Anslysis
PreMethod 1315 (2 2x4 inch molds)

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	2 (with foot)	3 (no foot)	7 (no foot)	14 (no foot)	
PENETROMETER (TSF)	>4.5	3.5	4.0	4.5	

VOLUMETRIC EXPANSION - 14 DAYS

INITIAL HEIGHT (in):	1.82	FINAL HEIGHT (in):	1.92
VOLUMETRIC EXPANSION (%):		5.5	

VOLUMETRIC EXPANSION - 28 DAYS

INITIAL HEIGHT (in):	1.82	FINAL HEIGHT (in):	1.95
VOLUMETRIC EXPANSION (%):		7.1	

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-013
MIXING DATE:	19-Jan-12	MIXED BY:	JGS

UNTREATED MATERIAL TYPE		TSS-2
WEIGHT OF UNTREATED MATERIAL		**1,250 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	13.00 %	162.5 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

2,7,14 day Pocket Penetrometer with enlarged foot
14 day UCS (ASTM D1633)
VE at 14 Days
2 Extra 2x4 inch molds

Sample drier and not as workable for mixing as TSS-01

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	2 (with foot)	3 (no foot)	7 (no foot)	14 (no foot)	
PENETROMETER (TSF)	>4.5	>4.5	>4.5	>4.5	

VOLUMETRIC EXPANSION - 14 DAYS

INITIAL HEIGHT (in):	1.27	FINAL HEIGHT (in):	1.39
VOLUMETRIC EXPANSION (%):	9.4		

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-014
MIXING DATE:	19-Jan-12	MIXED BY:	JGS

UNTREATED MATERIAL TYPE		TSS-2
WEIGHT OF UNTREATED MATERIAL		**1,250 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	16.20 %	202.5 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

2,7,14 day Pocket Penetrometer with enlarged foot
14 day UCS (ASTM D1633)
VE at 14 Days
2 Extra 2x4 inch molds

Sample drier and not as workable for mixing as TSS-01

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	2 (with foot)	3 (no foot)	7 (no foot)	14 (no foot)	
PENETROMETER (TSF)	>4.5	>4.5	>4.5	>4.5	

VOLUMETRIC EXPANSION - 14 DAYS

INITIAL HEIGHT (in):	1.27	FINAL HEIGHT (in):	1.39
VOLUMETRIC EXPANSION (%):	9.4		

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-015
MIXING DATE:	19-Jan-12	MIXED BY:	JGS

UNTREATED MATERIAL TYPE		TSS-2
WEIGHT OF UNTREATED MATERIAL		**1,250 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	19.40 %	242.5 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

2,7,14 day Pocket Penetrometer with enlarged foot
14 day UCS (ASTM D1633)
VE at 14 Days
2 Extra 2x4 inch molds

Sample drier and not as workable for mixing as TSS-01

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)	2 (with foot)	3 (no foot)	7 (no foot)	14 (no foot)	
PENETROMETER (TSF)	>4.5	>4.5	>4.5	>4.5	

VOLUMETRIC EXPANSION - 14 DAYS

INITIAL HEIGHT (in):	1.27	FINAL HEIGHT (in):	1.42
VOLUMETRIC EXPANSION (%):	11.8		

MIX DEVELOPMENT DATA SHEET

PROJECT:	Walton and Lonsbury Site	MIX No.	
PROJECT No.:	SE-0405		0405-016
MIXING DATE:	23-Feb-12	MIXED BY:	JGS

UNTREATED MATERIAL TYPE		TSS-2
WEIGHT OF UNTREATED MATERIAL		**1,500 g**
REAGENT TYPE AND LOT NUMBER	ADDITION RATE	WEIGHT
Portland Cement #842	6.50 %	97.5 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
	%	0.0 g
Water Addition	%	0.0 g

OBSERVATIONS / NOTES **Dry Reagent Addition**

14 and 28 day UCS (ASTM D1633)
14- OR 28-day consolidation

Sample drier and not as workable for mixing as TSS-01

MONITORING ACTIVITIES

MONITORING ACTIVITIES	TIME PERIOD				
	Initial	Initial Mix	5 min	10 min	30 Min
MAXIMUM PID (ppm)					
MAXIMUM TEMP (øC)					
OTHER:					

PENETROMETER ANALYSES

CURE TIME (Days)					
PENETROMETER (TSF)					

VOLUMETRIC EXPANSION - 14 DAYS

INITIAL HEIGHT (in):	FINAL HEIGHT (in):
VOLUMETRIC EXPANSION (%):	

APPENDIX D

UNCONFINED COMPRESSIVE STRENGTH DATA SHEETS

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-010 (7 day)		
TESTING DATE:	26-Jan-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7854_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-010 (7 day)	
2. WT MOISTURE TIN (tare weight)	167.24	g
3. WT WET SOIL + TARE	256.07	g
4. WT DRY SOIL + TARE	196.68	g
5. WT WATER, Ww	59.39	g
6. WT DRY SOIL, Ws	29.44	g
7. MOISTURE CONTENT, W	**201.73**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	1.98	in.	3.95	in.
No. 2	1.97	in.	3.96	in.
No. 3	1.97	in.	3.95	in.
Average	**1.97**	**in.**	**3.95**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***248.89***	***g***
Initial Area, Ao	3.06	in^2
Initial Volume, Vo	12.09	in^3
Initial Bulk Unit Weight,	78.4	lb/ft^3
Initial Dry Unit Weight	26.0	lb/ft^3
Maximum Load (Peak)	43.00	lbs.
UCS	13.6	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.058	0.0000	0.0
43	0.125	0.125	3.158	0.0316	13.6

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-010 (14 day)		
TESTING DATE:	2-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7861_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-010 (14 day)	
2. WT MOISTURE TIN (tare weight)	113.47	g
3. WT WET SOIL + TARE	173.20	g
4. WT DRY SOIL + TARE	133.59	g
5. WT WATER, Ww	39.61	g
6. WT DRY SOIL, Ws	20.12	g
7. MOISTURE CONTENT, W	**196.87**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.01	in.	3.88	in.
No. 2	1.99	in.	3.87	in.
No. 3	1.98	in.	3.87	in.
Average	**1.99**	**in.**	**3.87**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***248.45***	***g***
Initial Area, Ao	3.12	in^2
Initial Volume, Vo	12.09	in^3
Initial Bulk Unit Weight,	78.3	lb/ft^3
Initial Dry Unit Weight	26.4	lb/ft^3
Maximum Load (Peak)	47.00	lbs.
UCS	14.6	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.121	0.0000	0.0
47	0.125	0.125	3.225	0.0323	14.6

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-010 (21 day)		
TESTING DATE:	9-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7874_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-010 (21 day)	
2. WT MOISTURE TIN (tare weight)	115.31	g
3. WT WET SOIL + TARE	196.61	g
4. WT DRY SOIL + TARE	143.66	g
5. WT WATER, Ww	52.95	g
6. WT DRY SOIL, Ws	28.35	g
7. MOISTURE CONTENT, W	**186.77**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.01	in.	3.98	in.
No. 2	1.98	in.	3.97	in.
No. 3	2.00	in.	3.96	in.
Average	**2.00**	**in.**	**3.97**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***252.86***	***g***
Initial Area, Ao	3.13	in^2
Initial Volume, Vo	12.43	in^3
Initial Bulk Unit Weight,	77.5	lb/ft^3
Initial Dry Unit Weight	27.0	lb/ft^3
Maximum Load (Peak)	57.00	lbs.
UCS	17.7	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.131	0.0000	0.0
57	0.110	0.110	3.220	0.0277	17.7

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-0010 (28-day)		
TESTING DATE:	16-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	SEM	TRACKING CODE:	7908_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-010 (28-day)	
2. WT MOISTURE TIN (tare weight)	66.97	g
3. WT WET SOIL + TARE	136.28	g
4. WT DRY SOIL + TARE	91.44	g
5. WT WATER, Ww	44.84	g
6. WT DRY SOIL, Ws	24.47	g
7. MOISTURE CONTENT, W	**183.24**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.00	in.	3.93	in.
No. 2	2.00	in.	3.93	in.
No. 3	2.01	in.	3.94	in.
Average	**2.00**	**in.**	**3.93**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***250.74***	***g***
Initial Area, Ao	3.15	in^2
Initial Volume, Vo	12.40	in^3
Initial Bulk Unit Weight,	77.0	lb/ft^3
Initial Dry Unit Weight	27.2	lb/ft^3
Maximum Load (Peak)	60.00	lbs.
UCS	18.7	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.152	0.0000	0.0
60	0.070	0.070	3.209	0.0178	18.7

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-011 (14 day)		
TESTING DATE:	2-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7862_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-011 (14 day)	
2. WT MOISTURE TIN (tare weight)	113.33	g
3. WT WET SOIL + TARE	165.66	g
4. WT DRY SOIL + TARE	132.46	g
5. WT WATER, Ww	33.20	g
6. WT DRY SOIL, Ws	19.13	g
7. MOISTURE CONTENT, W	**173.55**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.02	in.	3.90	in.
No. 2	2.00	in.	3.90	in.
No. 3	1.98	in.	3.91	in.
Average	**2.00**	**in.**	**3.90**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***250.70***	***g***
Initial Area, Ao	3.14	in^2
Initial Volume, Vo	12.26	in^3
Initial Bulk Unit Weight,	77.9	lb/ft^3
Initial Dry Unit Weight	28.5	lb/ft^3
Maximum Load (Peak)	75.00	lbs.
UCS	23.4	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.142	0.0000	0.0
75	0.080	0.080	3.207	0.0205	23.4

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-011 (34-day)		
TESTING DATE:	22-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	SEM	TRACKING CODE:	7920_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-011	
2. WT MOISTURE TIN (tare weight)	69.75	g
3. WT WET SOIL + TARE	128.80	g
4. WT DRY SOIL + TARE	92.63	g
5. WT WATER, Ww	36.17	g
6. WT DRY SOIL, Ws	22.88	g
7. MOISTURE CONTENT, W	**158.09**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.00	in.	3.96	in.
No. 2	2.01	in.	3.97	in.
No. 3	2.01	in.	3.97	in.
Average	**2.01**	**in.**	**3.97**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***256.17***	***g***
Initial Area, Ao	3.16	in^2
Initial Volume, Vo	12.54	in^3
Initial Bulk Unit Weight,	77.8	lb/ft^3
Initial Dry Unit Weight	30.1	lb/ft^3
Maximum Load (Peak)	100.00	lbs.
UCS	31.3	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.163	0.0000	0.0
100	0.045	0.045	3.199	0.0113	31.3

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-012 (7 day)		
TESTING DATE:	26-Jan-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7854_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-012 (7 day)	
2. WT MOISTURE TIN (tare weight)	160.06	g
3. WT WET SOIL + TARE	233.25	g
4. WT DRY SOIL + TARE	189.07	g
5. WT WATER, Ww	44.18	g
6. WT DRY SOIL, Ws	29.01	g
7. MOISTURE CONTENT, W	**152.29**	**%**

SOIL SPECIMEN DIMENSIONS		
	DIAMETER	***LENGTH***
No. 1	1.99 in.	3.84 in.
No. 2	1.99 in.	3.84 in.
No. 3	1.98 in.	3.86 in.
Average	**1.99 in.**	**3.85 in.**

SPECIMEN CONDITIONS	
Initial Specimen WT, Wo	***257.24 g***
Initial Area, Ao	3.10 in^2
Initial Volume, Vo	11.92 in^3
Initial Bulk Unit Weight,	82.2 lb/ft^3
Initial Dry Unit Weight	32.6 lb/ft^3
Maximum Load (Peak)	112.00 lbs.
UCS	35.6 lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.100	0.0000	0.0
112	0.060	0.060	3.149	0.0156	35.6

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-012 (14 day)		
TESTING DATE:	2-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7863_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-012 (14 day)	
2. WT MOISTURE TIN (tare weight)	114.03	g
3. WT WET SOIL + TARE	185.12	g
4. WT DRY SOIL + TARE	142.91	g
5. WT WATER, Ww	42.21	g
6. WT DRY SOIL, Ws	28.88	g
7. MOISTURE CONTENT, W	**146.16**	**%**

SOIL SPECIMEN DIMENSIONS		
	DIAMETER	***LENGTH***
No. 1	2.02 in.	3.92 in.
No. 2	2.00 in.	3.91 in.
No. 3	1.98 in.	3.90 in.
Average	**2.00 in.**	**3.91 in.**

SPECIMEN CONDITIONS	
Initial Specimen WT, Wo	***261.51 g***
Initial Area, Ao	3.14 in^2
Initial Volume, Vo	12.28 in^3
Initial Bulk Unit Weight,	81.1 lb/ft^3
Initial Dry Unit Weight	32.9 lb/ft^3
Maximum Load (Peak)	134.00 lbs.
UCS	41.9 lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.142	0.0000	0.0
134	0.065	0.065	3.195	0.0166	41.9

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-012 (21 day)		
TESTING DATE:	9-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7875_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-012 (21 day)	
2. WT MOISTURE TIN (tare weight)	114.13	g
3. WT WET SOIL + TARE	162.63	g
4. WT DRY SOIL + TARE	134.53	g
5. WT WATER, Ww	28.10	g
6. WT DRY SOIL, Ws	20.40	g
7. MOISTURE CONTENT, W	**137.75**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.00	in.	3.91	in.
No. 2	2.01	in.	3.89	in.
No. 3	2.02	in.	3.90	in.
Average	**2.01**	**in.**	**3.90**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***263.63***	***g***
Initial Area, Ao	3.17	in^2
Initial Volume, Vo	12.38	in^3
Initial Bulk Unit Weight,	81.2	lb/ft^3
Initial Dry Unit Weight	34.1	lb/ft^3
Maximum Load (Peak)	154.00	lbs.
UCS	47.9	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.173	0.0000	0.0
154	0.050	0.050	3.214	0.0128	47.9

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-012 (28-day)		
TESTING DATE:	16-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	SEM	TRACKING CODE:	7909_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-012 (28-day)	
2. WT MOISTURE TIN (tare weight)	63.55	g
3. WT WET SOIL + TARE	131.40	g
4. WT DRY SOIL + TARE	91.29	g
5. WT WATER, Ww	40.11	g
6. WT DRY SOIL, Ws	27.74	g
7. MOISTURE CONTENT, W	**144.59**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.00	in.	3.91	in.
No. 2	2.01	in.	3.91	in.
No. 3	2.01	in.	3.91	in.
Average	**2.01**	**in.**	**3.91**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***258.83***	***g***
Initial Area, Ao	3.16	in^2
Initial Volume, Vo	12.37	in^3
Initial Bulk Unit Weight,	79.7	lb/ft^3
Initial Dry Unit Weight	32.6	lb/ft^3
Maximum Load (Peak)	165.00	lbs.
UCS	51.5	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.163	0.0000	0.0
165	0.050	0.050	3.204	0.0128	51.5

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-013 (14 day)		
TESTING DATE:	2-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7864_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-013 (14 day)	
2. WT MOISTURE TIN (tare weight)	111.27	g
3. WT WET SOIL + TARE	161.96	g
4. WT DRY SOIL + TARE	145.67	g
5. WT WATER, Ww	16.29	g
6. WT DRY SOIL, Ws	34.40	g
7. MOISTURE CONTENT, W	**47.35**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.00	in.	3.98	in.
No. 2	2.00	in.	3.99	in.
No. 3	1.99	in.	3.98	in.
Average	**2.00**	**in.**	**3.98**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***341.13***	***g***
Initial Area, Ao	3.13	in^2
Initial Volume, Vo	12.47	in^3
Initial Bulk Unit Weight,	104.2	lb/ft^3
Initial Dry Unit Weight	70.7	lb/ft^3
Maximum Load (Peak)	898.00	lbs.
UCS	282.5	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.131	0.0000	0.0
898	0.060	0.060	3.179	0.0151	282.5

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-014 (14 day)		
TESTING DATE:	2-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7865_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-014 (14 day)	
2. WT MOISTURE TIN (tare weight)	114.26	g
3. WT WET SOIL + TARE	193.85	g
4. WT DRY SOIL + TARE	168.12	g
5. WT WATER, Ww	25.73	g
6. WT DRY SOIL, Ws	53.86	g
7. MOISTURE CONTENT, W	**47.77**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.00	in.	3.98	in.
No. 2	1.99	in.	3.98	in.
No. 3	1.99	in.	3.99	in.
Average	**1.99**	**in.**	**3.98**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***343.09***	***g***
Initial Area, Ao	3.12	in^2
Initial Volume, Vo	12.43	in^3
Initial Bulk Unit Weight,	105.1	lb/ft^3
Initial Dry Unit Weight	71.2	lb/ft^3
Maximum Load (Peak)	1091.00	lbs.
UCS	343.5	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.121	0.0000	0.0
1091	0.070	0.070	3.177	0.0176	343.5

UNCONFINED COMPRESSION TEST

ASTM D 1633

PROJECT:	Walton & Lonsbury		
PROJECT No.:	SH0405		
SAMPLE No.:	0405-015 (14 day)		
TESTING DATE:	2-Feb-12	LOADING RATE:	0.04in./min.
TESTED BY:	JGS	TRACKING CODE:	7866_US

MOISTURE CONTENT (Dry Basis)		
1. MOISTURE TIN NO.	0405-015 (14 day)	
2. WT MOISTURE TIN (tare weight)	112.25	g
3. WT WET SOIL + TARE	189.88	g
4. WT DRY SOIL + TARE	166.29	g
5. WT WATER, Ww	23.59	g
6. WT DRY SOIL, Ws	54.04	g
7. MOISTURE CONTENT, W	**43.65**	**%**

SOIL SPECIMEN DIMENSIONS				
	DIAMETER		***LENGTH***	
No. 1	2.02	in.	3.98	in.
No. 2	2.00	in.	3.98	in.
No. 3	1.99	in.	3.98	in.
Average	**2.00**	**in.**	**3.98**	**in.**

SPECIMEN CONDITIONS		
Initial Specimen WT, Wo	***345.94***	***g***
Initial Area, Ao	3.15	in^2
Initial Volume, Vo	12.55	in^3
Initial Bulk Unit Weight,	105.0	lb/ft^3
Initial Dry Unit Weight	73.1	lb/ft^3
Maximum Load (Peak)	1462.00	lbs.
UCS	456.8	lb/in^2

COMPRESSIVE LOAD (lbs.)	DIAL GAGE READING (in.)	SPECIMEN DEFORMATION (in.)	CORRECTED AREA (in^2)	AXIAL STRAIN (in/in)	UNCONFINED COMPRESSIVE STRENGTH (lb/in^2)
0	0.000	0.000	3.152	0.0000	0.0
1462	0.060	0.060	3.200	0.0151	456.8

APPENDIX E

PERMEABILITY DATA SHEETS

PERMEABILITY ASTM D5084

SPECIMEN CONDITIONS

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7920_PM
SAMPLE No.:	0405-011 (34-Day)	EQUIPMENT No.:	2
TEST DATE:	2/21/2012		

MOISTURE CONTENT (Dry Basis)	***INITIAL***	***FINAL***
1. MOISTURE TIN NO.	0405-011	0405-011
2. WT MOISTURE TIN (tare weight)	0.00 ***g***	232.89 ***g***
3. WT WET SOIL + TARE	333.07 ***g***	568.63 ***g***
4. WT DRY SOIL + TARE	125.36 ***g***	358.25 ***g***
5. WT WATER, Ww	207.71 g	210.38 g
6. WT DRY SOIL, Ws	125.36 g	125.36 g
7. MOISTURE CONTENT, W	165.69 %	167.82 %

SOIL SPECIMEN DIMENSIONS				
TRIPLICATE	***DIAMETER***		***HEIGHT***	
ANALYSES	***INITIAL***	***FINAL***	***INITIAL***	***FINAL***
No. 1	***2.98 in.***	***2.98 in.***	***2.33 in.***	***2.33 in.***
No. 2	***2.98 in.***	***2.98 in.***	***2.33 in.***	***2.33 in.***
No. 3	***2.97 in.***	***2.97 in.***	***2.33 in.***	***2.33 in.***
Average	2.98 in.	2.98 in.	2.33 in.	2.33 in.

SPECIMEN CONDITIONS	***INITIAL***	***FINAL***
Specimen WT, Wo	***333.07 g***	***336.00 g***
Area, Ao	6.96 in^2	6.96 in^2
Volume, Vo	16.21 in^3	16.21 in^3
Bulk Unit Weight	78.3 lb/ft^3	78.9 lb/ft^3
Dry Unit Weight	29.5 lb/ft^3	29.5 lb/ft^3

PERMEABILITY ASTM D5084

BACK-PRESSURE SATURATION

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7920_PM
SAMPLE No.:	0405-011 (34-Day)	EQUIPMENT No.:	2
TEST DATE:	2/21/2012		

TEST	TIME	TESTED	TEST PRESSURES (psi)						
			APPLIED		PORE		PRESSURE CHANGE		
DATE	(military)	BY	CELL	BACK	SAT.	TEST	CELL	PORE	B-Value
02/22/12	10 : 18	SEM	7.0	5.0	4.8				
02/22/12	10 : 47	SEM	17.0	15.0	15.2	10.1	10.0	5.3	0.53
02/22/12	11 : 47	SEM	27.0	25.0	25.2	22.5	10.0	7.3	0.73
02/22/12	12 : 50	SEM	37.0	35.0	35.2	33.7	10.0	8.5	0.85
02/22/12	13 : 53	SEM	47.0	45.0	45.1	44.3	10.0	9.1	0.91
02/22/12	15 : 2	SEM	57.0	55.0	*	54.6	10.0	9.5	0.95
02/22/12	15 : 3	SEM	47.0	45.0	*	*	*	*	*

* Saturation check - no data available.

PERMEABILITY ASTM D5084

SPECIMEN CONSOLIDATION

PROJECT:	Walton & Lonsbury Site	SEM
PROJECT No.:	SH 0405	7920_PM
SAMPLE No.:	0405-011 (34-Day)	2
TEST DATE:	2/21/2012	

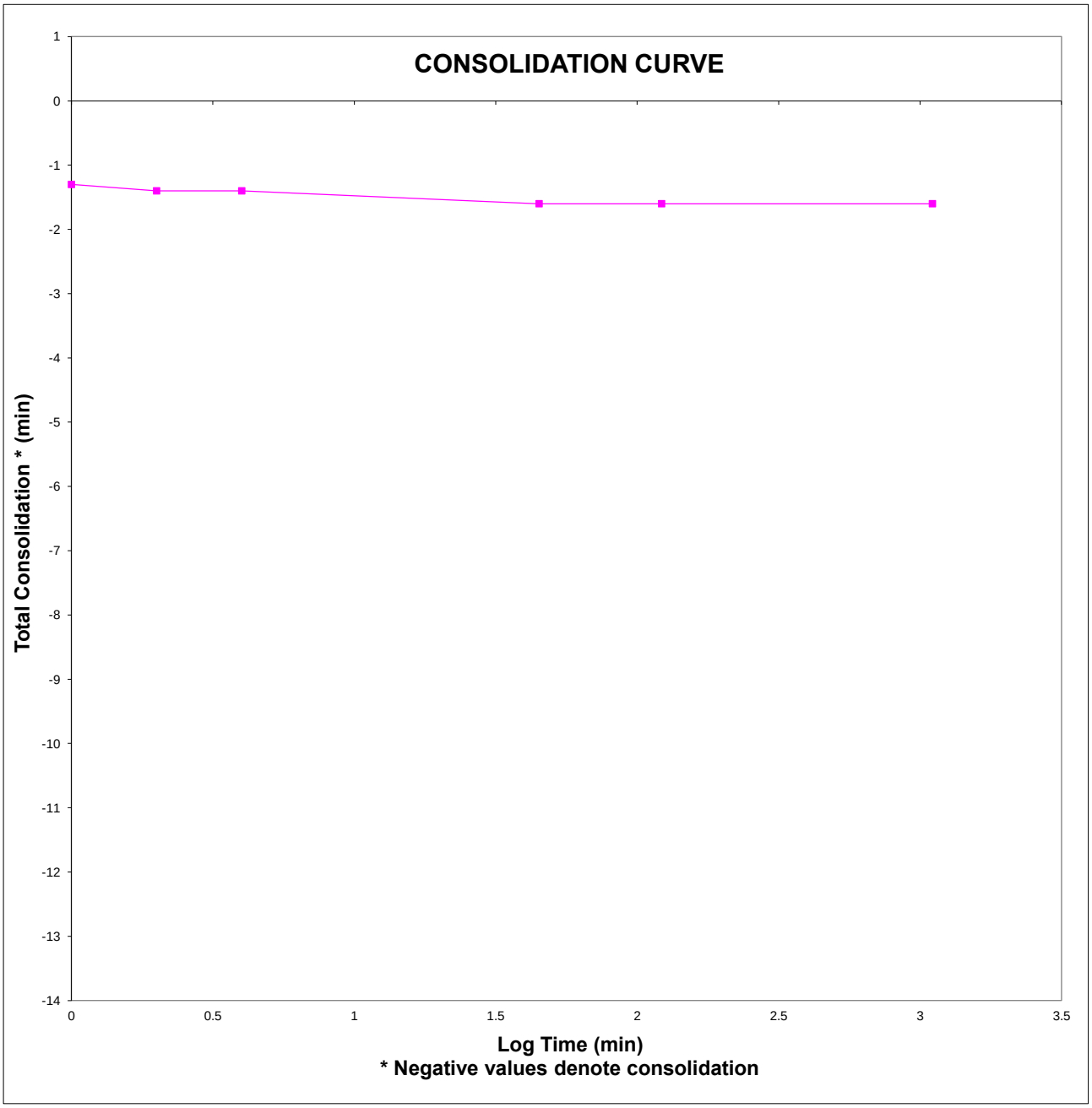
CELL PRESSURE: 55 psi **BACK PRESSURE:** 45 psi **EFFECTIVE STRESS:** 10 psi

TEST DATE	*TESTED BY*	*TIME (Military)*	*ELAPSED TIME (minutes)*	*TOTAL TIME (minutes)*	*TOTAL TIME (Log)*	*SPECIMEN CONSOLIDATION (ML)* READING *BOTTOM*	*TOP*	*ACTUAL TOTAL (Ct)*
2 / 22 / 2012	SEM	15 : 8				24.0	24.0	0.0
2 / 22 / 2012	SEM	15 : 9	1	1	0.00	23.4	23.3	1.3
2 / 22 / 2012	SEM	15 : 10	1	2	0.30	23.4	23.2	1.4
2 / 22 / 2012	SEM	15 : 12	2	4	0.60	23.4	23.2	1.4
2 / 22 / 2012	SEM	15 : 53	41	45	1.65	23.3	23.1	1.6
2 / 22 / 2012	SEM	17 : 10	77	122	2.09	23.3	23.1	1.6
2 / 23 / 2012	SEM	9 : 34	984	1106	3.04	23.3	23.1	1.6

PERMEABILITY ASTM D5084

CONSOLIDATION CURVE

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7920_PM
SAMPLE No.:	0405-011 (34-Day)	EQUIPMENT No.:	2
TEST DATE:	2/21/2012		



PERMEABILITY ASTM D5084

TEST DATA

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7920_PM
SAMPLE No.:	0405-011 (34-Day)	EQUIPMENT No.:	2
TEST DATE:	2/21/2012		

DATE	TESTED BY	TIME (military)	ELAPSED TIME (minutes)	HYDRAULIC HEAD (cm)		TEMP. C°	GAUGE PRESSURE (psi)		
				INFLUENT	EFFLUENT		CELL	INFLUENT	EFFLUENT
2 / 23 / 12	SEM	9 : 38		0.0	24.0	20.0	55.0	45.0	45.0
2 / 23 / 12	SEM	9 : 50	12	0.7	23.3	20.0	55.0	45.0	45.0
2 / 23 / 12	SEM	10 : 10	20	1.6	22.4	20.0	55.0	45.0	45.0
2 / 23 / 12	SEM	10 : 28	18	2.5	21.5	20.0	55.0	45.0	45.0
2 / 23 / 12	SEM	10 : 57	29	3.8	20.2	20.0	55.0	45.0	45.0
2 / 23 / 12	SEM	11 : 16	19	4.5	19.5	20.0	55.0	45.0	45.0
2 / 23 / 12	SEM	11 : 43	27	5.4	18.6	20.0	55.0	45.0	45.0
2 / 23 / 12	SEM	12 : 35	52	6.8	17.2	20.0	55.0	45.0	45.0

PERMEABILITY ASTM D5084

TEST DATA (continued)

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7920_PM
SAMPLE No.:	0405-011 (34-Day)	EQUIPMENT No.:	2
TEST DATE:	2/21/2012		

ELAPSED TIME (minutes)	*HYDRAULIC HEAD DIFFERENCE (cm)*		*EFFLUENT - INFLUENT RATIO*	*HYDRAULIC GRADIENT (cm/cm)*	*HYDRAULIC CONDUCTIVITY (cm/sec)*	
	INFLUENT	*EFFLUENT*			*@ Temp.*	*@ 20° C*
RESET				4.055		
12	0.7	0.7	1.00	3.819	5.50E-06	5.53E-06
20	0.9	0.9	1.00	3.515	4.56E-06	4.58E-06
18	0.9	0.9	1.00	3.210	5.52E-06	5.55E-06
29	1.3	1.3	1.00	2.771	5.57E-06	5.60E-06
19	0.7	0.7	1.00	2.535	5.16E-06	5.18E-06
27	0.9	0.9	1.00	2.230	5.20E-06	5.22E-06
52	1.4	1.4	1.00	1.757	5.04E-06	5.06E-06

PERMEABILITY ASTM D5084

SUMMARY OF RESULTS

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7920_PM
SAMPLE No.:	0405-011 (34-Day)	EQUIPMENT No.:	2
TEST DATE:	2/21/2012		

TESTING PARAMETER	INITIAL	FINAL
BULK UNIT WEIGHT	78.3 lb/ft³	78.9 lb/ft³
DRY UNIT WEIGHT	29.5 lb/ft³	29.5 lb/ft³
MOISTURE CONTENT	165.7 %	167.8 %
PERMEABILITY @ 20°C	5.2E-06 cm/sec	

PERMEABILITY ASTM D5084

SPECIMEN CONDITIONS

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7909_PM
SAMPLE No.:	0405-012 (28-Day)	EQUIPMENT No.:	2
TEST DATE:	2/16/2012		

MOISTURE CONTENT (Dry Basis)	***INITIAL***	***FINAL***
1. MOISTURE TIN NO.	0405-012	0405-012
2. WT MOISTURE TIN (tare weight)	0.00 ***g***	225.79 ***g***
3. WT WET SOIL + TARE	367.05 ***g***	596.55 ***g***
4. WT DRY SOIL + TARE	146.28 ***g***	372.07 ***g***
5. WT WATER, Ww	220.77 g	224.48 g
6. WT DRY SOIL, Ws	146.28 g	146.28 g
7. MOISTURE CONTENT, W	150.92 %	153.46 %

SOIL SPECIMEN DIMENSIONS				
TRIPLICATE	***DIAMETER***		***HEIGHT***	
ANALYSES	***INITIAL***	***FINAL***	***INITIAL***	***FINAL***
No. 1	***2.97 in.***	***2.97 in.***	***2.53 in.***	***2.54 in.***
No. 2	***2.97 in.***	***2.97 in.***	***2.54 in.***	***2.54 in.***
No. 3	***2.97 in.***	***2.97 in.***	***2.55 in.***	***2.55 in.***
Average	2.97 in.	2.97 in.	2.54 in.	2.54 in.

SPECIMEN CONDITIONS	***INITIAL***	***FINAL***
Specimen WT, Wo	***367.05 g***	***370.81 g***
Area, Ao	6.93 in^2	6.93 in^2
Volume, Vo	17.60 in^3	17.62 in^3
Bulk Unit Weight	79.5 lb/ft^3	80.2 lb/ft^3
Dry Unit Weight	31.7 lb/ft^3	31.6 lb/ft^3

PERMEABILITY ASTM D5084

BACK-PRESSURE SATURATION

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7909_PM
SAMPLE No.:	0405-012 (28-Day)	EQUIPMENT No.:	2
TEST DATE:	2/16/2012		

			TEST PRESSURES (psi)						
TEST	*TIME*	*TESTED*	*APPLIED*		*PORE*		*PRESSURE CHANGE*		
DATE	*(military)*	*BY*	*CELL*	*BACK*	*SAT.*	*TEST*	*CELL*	*PORE*	*B-Value*
02/16/12	16 : 51	SEM	7.0	5.0	5.0				
02/16/12	18 : 18	SEM	17.0	15.0	15.0	9.3	10.0	4.3	0.43
02/16/12	19 : 9	SEM	27.0	25.0	25.0	21.7	10.0	6.7	0.67
02/17/12	9 : 15	TAJ	37.0	35.0	35.3	34.2	10.0	9.2	0.92
02/17/12	10 : 1	TAJ	47.0	45.0	45.2	44.6	10.0	9.3	0.93
02/17/12	10 : 45	TAJ	57.0	55.0	*	54.8	10.0	9.6	0.96
02/17/12	10 : 46	TAJ	47.0	45.0	*	*	*	*	*

* Saturation check - no data available.

PERMEABILITY ASTM D5084

SPECIMEN CONSOLIDATION

PROJECT:	Walton & Lonsbury Site		SEM
PROJECT No.:	SH 0405		7909_PM
SAMPLE No.:	0405-012 (28-Day)		2
TEST DATE:	2/16/2012		

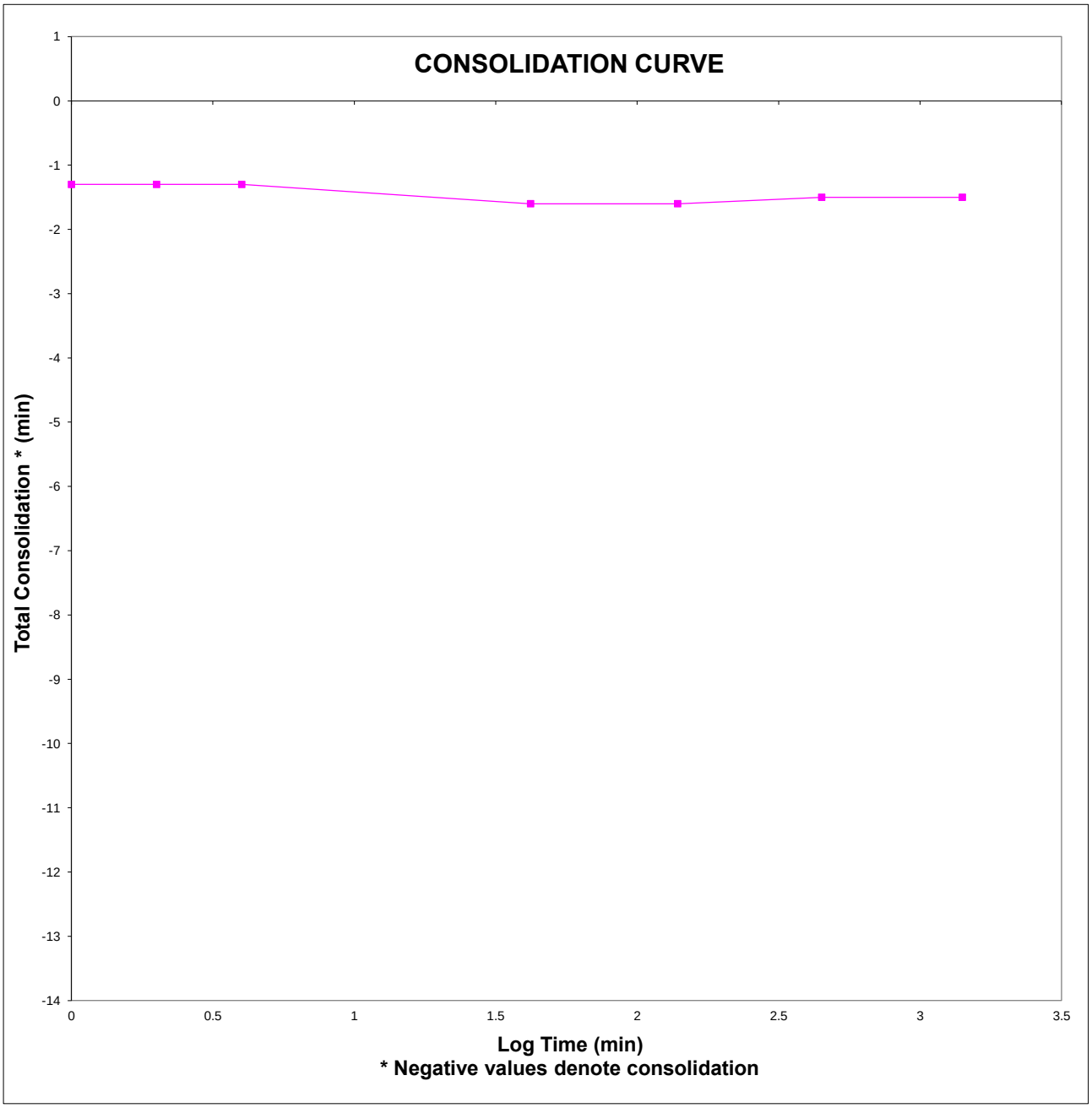
CELL PRESSURE: 55 psi **BACK PRESSURE:** 45 psi **EFFECTIVE STRESS:** 10 psi

TEST DATE	TESTED BY	TIME (Military)	ELAPSED TIME (minutes)	TOTAL TIME (minutes)	TOTAL TIME (Log)	SPECIMEN CONSOLIDATION (ML) READING BOTTOM	READING TOP	ACTUAL TOTAL (Ct)
2 / 17 / 2012	TAJ	10 : 51				24.0	24.0	0.0
2 / 17 / 2012	TAJ	10 : 52	1	1	0.00	23.4	23.3	1.3
2 / 17 / 2012	TAJ	10 : 53	1	2	0.30	23.4	23.3	1.3
2 / 17 / 2012	TAJ	10 : 55	2	4	0.60	23.4	23.3	1.3
2 / 17 / 2012	TAJ	11 : 33	38	42	1.62	23.1	23.3	1.6
2 / 17 / 2012	TAJ	13 : 10	97	139	2.14	23.0	23.4	1.6
2 / 17 / 2012	TAJ	18 : 20	310	449	2.65	23.0	23.5	1.5
2 / 18 / 2012	SEM	10 : 22	962	1411	3.15	23.0	23.5	1.5

PERMEABILITY ASTM D5084

CONSOLIDATION CURVE

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7909_PM
SAMPLE No.:	0405-012 (28-Day)	EQUIPMENT No.:	2
TEST DATE:	2/16/2012		



PERMEABILITY ASTM D5084

TEST DATA

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7909_PM
SAMPLE No.:	0405-012 (28-Day)	EQUIPMENT No.:	2
TEST DATE:	2/16/2012		

DATE	TESTED BY	TIME (military)	ELAPSED TIME (minutes)	HYDRAULIC HEAD (cm)		TEMP. C°	GAUGE PRESSURE (psi)		
				INFLUENT	EFFLUENT		CELL	INFLUENT	EFFLUENT
2 / 18 / 12	SEM	10 : 36		0.0	24.0	20.0	55.0	45.0	45.0
2 / 18 / 12	SEM	12 : 0	84	4.0	20.0	20.0	55.0	45.0	45.0
2 / 18 / 12	SEM	12 : 26	26	4.9	19.1	20.0	55.0	45.0	45.0
2 / 18 / 12	SEM	14 : 6	100	7.6	16.4	20.0	55.0	45.0	45.0
2 / 20 / 12	SEM	10 : 19	RESET	0.0	24.0	20.0	55.0	45.0	45.0
2 / 20 / 12	SEM	10 : 31	12	0.6	23.4	20.0	55.0	45.0	45.0
2 / 20 / 12	SEM	10 : 44	13	1.2	22.8	20.0	55.0	45.0	45.0
2 / 20 / 12	SEM	11 : 0	16	2.0	22.0	20.0	55.0	45.0	45.0
2 / 20 / 12	SEM	11 : 20	20	2.9	21.1	20.0	55.0	45.0	45.0

PERMEABILITY ASTM D5084

TEST DATA (continued)

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7909_PM
SAMPLE No.:	0405-012 (28-Day)	EQUIPMENT No.:	2
TEST DATE:	2/16/2012		

ELAPSED TIME (minutes)	*HYDRAULIC HEAD DIFFERENCE (cm)*		*EFFLUENT - INFLUENT RATIO*	*HYDRAULIC GRADIENT (cm/cm)*	*HYDRAULIC CONDUCTIVITY (cm/sec)*	
	INFLUENT	*EFFLUENT*			*@ Temp.*	*@ 20° C*
RESET				3.720		
84	4.0	4.0	1.00	2.480	5.81E-06	5.83E-06
26	0.9	0.9	1.00	2.201	5.52E-06	5.55E-06
100	2.7	2.7	1.00	1.364	5.76E-06	5.78E-06
RESET				3.720		
12	0.6	0.6	1.00	3.534	5.14E-06	5.17E-06
13	0.6	0.6	1.00	3.348	5.00E-06	5.03E-06
16	0.8	0.8	1.00	3.100	5.79E-06	5.81E-06
20	0.9	0.9	1.00	2.821	5.67E-06	5.70E-06

PERMEABILITY ASTM D5084

SUMMARY OF RESULTS

PROJECT:	Walton & Lonsbury Site	TESTED BY:	SEM
PROJECT No.:	SH 0405	TRACKING CODE:	7909_PM
SAMPLE No.:	0405-012 (28-Day)	EQUIPMENT No.:	2
TEST DATE:	2/16/2012		

TESTING PARAMETER	INITIAL	FINAL
BULK UNIT WEIGHT	79.5 lb/ft³	80.2 lb/ft³
DRY UNIT WEIGHT	31.7 lb/ft³	31.6 lb/ft³
MOISTURE CONTENT	150.9 %	153.5 %
PERMEABILITY @ 20°C	5.6E-06 cm/sec	