DRAFT GEOTECHNICAL REPORT

Collinsville Onshore Investigation

Collinsville – Pittsburg 230 kV

Prepared for

LS Power Grid California, LLC
16150 Main Circle Drive, Suit 310
Chesterfield. MO 63017

Prepared by

Geosyntec Consultants, Inc.
1111 Broadway, 6th Floor
Oakland, California 94607

Project Number: WG3444

Date: 7/1/2025

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Project Number: WG3444

Date: 7/1/2025

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ACRONYMS AND ABBREVIATIONS

API	American Petroleum Institute
ASTM	ASTM International
bgs	below ground surface
CDF	controlled density fill
CGS	California Geological Survey
CH	fat clay
CL	lean clay
Cooper	Cooper Testing Laboratory
EI	expansion index
GC	clayey gravel
Geosyntec	Geosyntec Consultants, Inc.
GP	poorly graded gravel
GPS	global positioning system
Gregg	Gregg Drilling, Inc
HSA	hollow stem auger
LFRD	load and resistance factor design
LL	liquid limit
LS Power	LS Power Grid California, LLC
MH	elastic silt
ML	silt
Mod-Cal	Modified California sampler
M_w	Moment Magnitude
N	SPT blows per foot
N_{60}	SPT blows per foot normalized to 60% energy ratio
NAVFAC	Naval Facilities Engineering Command
NESC	National Electric Safety Code
NSHM	National Seismic Hazard Model
OH	highly organic soils
OSHA	Occupational Safety and Health Administration
PGA	peak ground acceleration

PI	plasticity index
ppm	parts per million
psf	pounds per square foot
SC	clayey sand
Sealaska	Sealaska, Inc.
Site	Collinsville onshore portion of the Pittsburg-Collinsville 230 kV transmission line
SM	silty sand
SP	poorly graded sand
SP-SM	poorly graded sand with silt
SPT	Standard Penetration Test
THA	Task Hazard Assessment
TX-UU	unconsolidated undrained triaxial test
USA	Underground Service Alert
USCS	Unified Soil Classification System
USGS	United States Geological Survey

1. INTRODUCTION

1.1 Purpose and Scope

LS Power Grid California, LLC (LS Power) is developing a series of four or six submarine cables which will cross the Sacramento River to connect the new Collinsville substation to the existing Pittsburg substation, as part of the Collinsville-Pittsburg 230 kV transmission line project. To support the design of the project, LS Power commissioned Gregg Drilling, LLC (Gregg), a subsidiary of Sealaska, Inc. (Sealaska), to perform an offshore investigation in the Sacramento River, and onshore investigations on the north and south sides of the river (Collinsville and Pittsburg, respectively). Gregg retained Geosyntec Consultants, Inc. (Geosyntec) to provide geotechnical support during the investigation. This report summarizes the onshore investigation that was performed in Collinsville, Solano County, California, to the north of the Sacramento River (Figure 1).[1]

The site investigation was performed in accordance with the specifications for the onshore investigation (Power Engineers 2024). In particular, the investigation comprised a total of 3 geotechnical borings in Collinsville, each to a depth of approximately 80 feet below ground surface (ft bgs). We understand that these borings are intended to support the design for deep foundations for transmission line structures and a new substation. The boring locations are shown in Figure 2 and are summarized on Table 1. The investigation also included the collection of soil samples for geotechnical and soil thermal testing. Gregg retained Geosyntec to provide geotechnical support during the Collinsville onshore investigation by logging the soil borings, collecting geotechnical soil samples, coordinating geotechnical laboratory testing, and preparing this geotechnical report. The site investigation also included laboratory soil thermal testing within the upper 15 feet of B-103. The soil thermal testing was performed by Geotherm USA under a separate subcontract with Gregg; discussion of the soil thermal results is outside the scope of this report.

This report includes the data collected during the geotechnical investigation, provides a summary of the geotechnical laboratory testing, and presents the findings of the geotechnical investigation. This report also includes requested design parameters for soil layers encountered during the investigation, provides geotechnical recommendations for site development and foundations, and includes general construction considerations. This report is intended to provide data and geotechnical design parameters for support of the design of the foundations for the Collinsville substation and transmission line structures. We understand that the detailed analysis and design of these structures will be performed by others.

1.2 Report Organization

The remainder of this geotechnical report has been organized into the following sections:

[1] For details of the offshore investigation in the Sacramento River, refer to Geosyntec (2024). Findings from the onshore investigation to the south of the Sacramento River in Pittsburg, Contra Costa County, California, has been provided in a separate report (Geosyntec 2025).

- Section 2 describes the site and geological conditions;
- Section 3 describes the geotechnical investigation field program;
- Section 4 provides details on the geotechnical laboratory testing;
- Section 5 describes the subsurface conditions that were encountered;
- Section 6 presents the recommended geotechnical parameters for design of foundations;
- Section 7 provides limitations relating to the use of this report; and
- Section 8 lists the references used to prepare this report.

Boring logs are included as Appendix A. Daily field reports are included as Appendix B. A photo log is provided as Appendix C. Geotechnical laboratory test results are included as Appendix D.

2. SITE AND GEOLOGIC CONDITIONS

Our knowledge of the site conditions has been developed from a review of published geologic maps of the immediate site area, geologic literature, professional experience, and the field investigation performed for the project.

2.1 Regional Geologic Setting

The site lies on the northern edge of the Sacramento-San Joaquin River Delta (Delta) located in the western Great Valley geomorphic province (Great Valley), which extends approximately 400 miles (northwest to southeast) from Jones Valley to Wheeler Ridge. The Great Valley is approximately 50 miles wide and is situated between the Coastal Ranges to the west and the Sierra Nevada Mountains (Sierras) to the east. It is commonly described as a forearc basin where sedimentation has occurred almost continuously since the Jurassic age (160 million years ago) (California Geological Survey [CGS] 2002). The Great Valley is characterized by an extensive alluvial plain and thick sedimentary assemblages, which form a U-shaped trough that thickens to the west. This resultant trough formed through isostatic subsidence, where sedimentation combined with tectonic activity allowed sediments to gradually sink into the Earth's crust.

The Great Valley is characterized by a combination of flat-lying marine and non-marine sediments (the Great Valley Sequence) with accumulations as much as 20,000 to 40,000 feet thick (CGS 2015). Marine sediments were deposited during the Jurassic to Cretaceous periods; however, as the ocean receded during the early Eocene, alluvial sediments were deposited from the surrounding Coastal Ranges and Sierras. Sedimentation in the Great Valley continued throughout the Holocene; however, due to modern infrastructure (i.e., flood control, reservoirs, managed wetlands), periodic sedimentation now primarily occurs through flood events.

The Delta is a complex network of waterways, sloughs, marshes, and islands spanning west from the confluence of the Sacramento and San Joaquin rivers to San Francisco Bay. Sediments are typically deposited on floodplains and wetlands during periods of high flow, however, tidal actions from the San Francisco Bay additionally contribute to sedimentation within the Delta. The site is located adjacent to Marshall Cut, approximately 0.8 miles north of the western tip of Sherman Island and 0.9 miles east of Collinsville Road. Based on published geologic maps (Dawson 2009, Graymer et al. 2002, United States Geologic Survey [USGS] 2006), the southern site vicinity is underlain by Holocene-age Delta Mud, which consists of fine-grained silt and clay. Delta Mud is typically mixed with variable levels of organic material and sand. The northern site vicinity is underlain by the Pleistocene-age Montezuma Formation, which consists of poorly consolidated clayey sand, silt, and fine gravel. A regional geologic map is presented in Figure 3.

2.2 Seismic Setting

The site is located in an area with high seismic hazard. Figure 4 illustrates significant active and potentially active faults within an approximate 62-mile (100-km) radius of the Site.

Based on a review of the National Seismic Hazard Model (NSHM) fault sections database published by the USGS (2023), the nearest fault is the Pittsburg-Kirby Hills section of the Great Valley fault zone. An inferred trace of this fault is located approximately 5.8 km to the west of the approximate middle of the site.[2] The second nearest fault is the Los Medanos-Roe Island Fault, located approximately 15.7 km to the southwest of the site. The Midland section of the Great Valley Fault lies approximately 16.9 km to the east, and the Concord Fault lies approximately 21.3 km to the southwest. The site is in close proximity to many other significant faults, including the Mount Diablo Fault, Greenville Fault, Green Valley Fault, Calaveras Fault, and Hayward-Rodgers Creek Fault.

Numerous sizeable earthquakes have been recorded in the San Francisco Bay Area, the most recent of which has been the South Napa Earthquake on August 24, 2014, with a moment magnitude (M_w) of 6.0. The epicenter of the South Napa Earthquake was approximately 47 km west-northwest of the site. Another recent earthquake within 50 km of the site is the M_w 5.8 Livermore Earthquake on January 24, 1980. The more distant San Andreas Fault is capable of producing larger earthquakes, including the M_w 6.9 Loma Prieta earthquake in 1989 and the M_w 7.9 San Francisco earthquake in 1906.

The southern site vicinity (near B-103) is located in an area that was mapped by USGS as having very high susceptibility to liquefaction (USGS 2006), while the northern site vicinity (near B-101 and B-102) was mapped as not likely susceptible to liquefaction (Figure 5). The liquefaction hazard offshore within the Sacramento River channel has not been mapped.

[2] Distances are estimated relative to the approximate middle of the Collinsville onshore site, assumed to be located at approximately 38.0766 N latitude, 121.8315 W longitude.

3. FIELD INVESTIGATION PROGRAM

3.1 Introduction

Gregg and Geosyntec performed a field investigation to evaluate the subsurface soil conditions for the Collinsville onshore site. The investigation consisted of drilling three borings and collecting soil samples for laboratory testing. The onshore exploration program was developed after reviewing/considering the following:

- Specifications provided for the onshore investigation (Power Engineers 2024), including the location and termination criteria for each boring.
- Available geological maps.
- Boring access at the time of the investigation.

Each boring was completed to an approximate depth of 80 ft bgs. Figure 2 shows the approximate locations of completed borings. Table 1 provides a summary of the boring depths and coordinates.

3.2 Preparation

Prior to drilling, Gregg, Geosyntec, and LS Power reviewed the following with the exploration team:

- Field exploration goals, objectives, and scope;
- Sampling procedure and requirements for laboratory testing;
- Borehole logging protocol and sample storage; and
- Health and safety requirements while performing the investigation.

Field operations were summarized in a daily progress email to the project team.

In addition, Geosyntec prepared a site-specific Task Hazard Assessment (THA) for Geosyntec personnel to address potential hazards associated with the onshore investigation. Once on site, field personnel participated in daily site safety tailgate meetings with Gregg's drilling personnel.

Prior to the field investigation, Gregg marked out the boring locations, placed an Underground Service Alert (USA) North call, and obtained a drilling/boring permit from the Solano County Environmental Health Division.

3.3 Onshore Drilling

The onshore investigation was performed from 14 April 2025 to 16 April 2025. Gregg used a Mobile D-83 drill rig. The drill rig remained stationed at Collinsville during the investigation.

Two alternate drilling techniques were utilized to advance the three borings. Within the upper 21.5 ft (at B-101 and B-103) to 37.5 ft (at B-102A), borings were completed using a 6.25-inch diameter drill bit attached to NWJ drill rods and advanced with the hollow stem auger (HSA) drilling technique. The remainder of each boring was then completed using a 4-inch diameter drill bit attached to NWJ drill rods and advanced with the mud rotary drilling technique to the bottom of the boring.

During the investigation, the depth to groundwater was measured using a groundwater level monitor. Groundwater depth readings were typically obtained after allowing water levels in the boring to equilibrate, and prior to switching to the mud rotary drilling technique.

At the completion of each boring, the borehole was backfilled in accordance with Solano County regulations, using cement grout placed from the bottom of the boring via the tremie method.

3.4 Drilling and Logging

Geosyntec field staff completed a boring log for each boring drilled. The boring log was created based on visual-manual observations of soil samples collected from each boring, in accordance with ASTM International (ASTM) D2488. The completed boring log was reviewed by the Geosyntec project manager. Once laboratory test results were received, the data was reviewed, and logs were updated where appropriate. Where discrepancies between field logging and laboratory test data occurred, the field staff and project manager reviewed the log and, if necessary, re-evaluated the samples to finalize the boring log. The completed boring logs are included in Appendix A.

Additional details about the investigation are provided in the daily field reports (Appendix B). Representative photos from the investigation are included in Appendix C.

3.5 Sampling Techniques

Three types of soil samplers were used during the onshore field investigation program: Standard Penetration Test (SPT) samplers, Modified California samplers (Mod-Cal), and thin-walled Shelby tubes. The sampling methods are summarized below:

- SPT samplers were generally used in granular soil types. Samples obtained by this method were considered "disturbed."
- Mod-Cal samplers were used in all material types to obtain sufficient material for both geotechnical and geothermal laboratory testing (by Geotherm USA). Samples collected using this method were considered "disturbed."
- A fixed-head, thin-walled Shelby tube sampler was hydraulically pushed to obtain "relatively undisturbed" samples from subsurface fine-grained soils.

Samples were identified using "B#-S#", where B# represents the boring number and S# represents the sample number within that boring (e.g., 103-4 represents the fourth sample collected in Boring B-103). The locations and names of samples are noted on the boring logs.[3]

[3] The geotechnical investigation specifications (Power Engineers 2024) also required pressuremeter testing at selected borings; however, LS Power removed requirement from the scope prior to the start of the investigation.

3.5.1 Standard Penetration Test Sampling

An SPT sampler with a 2-inch outside diameter and a 1.375-inch inside diameter was used for sample collection in accordance with ASTM D1586. The SPT samplers were advanced 18 inches into the soil by using a 140-pound automatic trip hammer falling through a vertical height of 30 inches. The number of blows required for each 6-inch penetration was recorded on the boring logs. Where clean sand was encountered, a sand catcher was used to improve sample recovery.

3.5.2 Modified California Sampling

A Mod-Cal sampler with a 3-inch outside diameter and a 2.5-inch inside diameter was used to obtain samples across all soil types encountered during the project. Six-inch long brass liners were used within the Mod-Cal sampler to collect samples for index testing. The Mod-Cal samplers were advanced to a depth of either 18 or 24 inches using a 140-pound automatic trip hammer falling through a vertical height of 30 inches. The number of blows required for each 6-inch penetration was recorded on the boring logs. Where clean sand was encountered, a sand catcher was used to improve sample recovery. The brass liners were then individually capped and labeled with postscripts A, B, C, and D, corresponding to the first 6-inches, the second 6-inches, etc., of each Mod-Cal sample interval. The end caps were taped to reduce moisture loss.

In general, Mod-Cal samples were collected at depths where geothermal testing was required as listed in onshore investigation specification (Power Engineers 2024). At the completion of the investigation, Geosyntec and Gregg coordinated shipment of samples from the upper 15 feet of B-103 to Geotherm USA for laboratory geothermal testing.

3.5.3 Shelby Tube Sampling

Thin-walled Shelby tube samplers were pushed where soft silt and clay materials were encountered. The tubes were 3 feet long with an outer diameter of 3 inches. The driller advanced the samplers approximately 30 inches by continuous pushing to limit sample disturbance. The maximum hydraulic pressure was recorded over the sample interval. Samples were capped and sealed for storage and transportation. Samples were stored and transported vertically to minimize disturbance.

3.6 Blow Counts

During SPT sampling, the sum of the number of hammer blows required for the second and third 6 inches of penetration (i.e., between 6 and 18 inches) are known as SPT N values. These N values are recorded on the boring logs.

SPT N values are frequently used for correlations with other engineering properties. In addition, blow count values are sensitive to the energy of each specific SPT hammer used. Therefore, in accordance with ASTM D1586, the SPT blow counts are typically normalized to a standard 60% efficiency which is represented by N_{60}. Both SPT and Mod-Cal blows per 6 in. values are included on the boring logs. Corrected N_{60} values are included in a second column on the boring logs, for SPT sampling only. Note that because of the different sampler dimensions, Mod-Cal blow counts must be corrected to make them approximately equivalent to SPT N values prior to being used in analysis.

Gregg provided the results of the previous energy calibration performed on the automatic hammer used with the Mobile D-83 rig. Although the previous energy measurement was performed for a different project, these energy measurements are considered relevant, as we understand that the same automatic hammer and Mobile D-83 drill rig were used on both projects. The previous energy measurement was performed on 22 October 2024. Hammer calibrations were conducted in accordance with ASTM D4633 using dynamic measurements on SPT samples collected at depths between 15 and 25 feet below ground surface. The energy transfer ratio measured during this previous calibration ranged between 81% and 90%, with an average of 85%. The average measured energy transfer ratio of 85% was used to estimate the SPT N60 values which are reported on the boring logs.

4. LABORATORY TESTING PROGRAM

Samples obtained during the exploration program were reviewed and selected soil samples were sent to Cooper Testing Laboratory (Cooper) of Palo Alto, California for evaluation of geotechnical properties, including density, Atterberg limits, gradation, permeability, consolidation, and strength. Test samples and test methods were selected based on requirements listed in the onshore investigation specifications (Power Engineers 2024), review of the subsurface conditions encountered in the borings, and considering the planned infrastructure at each boring location. A draft test request sheet was prepared and distributed to Gregg and LS Power prior to submitting the samples for geotechnical testing.

The following geotechnical laboratory tests have been performed on samples collected during the field investigations:

- Moisture Content/Dry Density (ASTM D7263b)
- Atterberg Limits via the dry prep method (ASTM D4318)
- Grain Size Distribution (ASTM D6913)
- Sieve Analysis with Hydrometer (ASTM D7928)
- Sieve Analysis (ASTM D6913)
- Organics Content (ASTM D2974)
- Soil pH, Soluble Chlorides & Sulphates, and Resistivity (ASTM G51, D4327, and G57)
- Consolidation (ASTM D2435)
- Expansion Index (ASTM D4829)
- Unconsolidated Undrained Triaxial Tests (TX-UU) (ASTM D2850)
- Consolidated Undrained Triaxial Tests with Pore Pressure (TX-CU) (ASTM D4767)

The results of the geotechnical laboratory tests are presented in Appendix D. Table 2 provides a summary of the laboratory results. Table 3 provides an interpretation of the consolidation test data.

5. SUBSURFACE CONDITIONS

5.1 Soil Stratigraphy

The subsurface soil conditions were evaluated based on field observation and soil samples collected during the investigation. Unified Soil Classification System (USCS) designations are provided in accordance with ASTM D2487 for samples that have been subjected to laboratory testing. These USCS designations are provided below and listed in the boring logs included in Appendix A.

The subsurface soils can be idealized and categorized into the soil units described below.[4] Idealized subsurface stratigraphy for each boring is provided in Figure 6 using the unit descriptions below. Due to the large spacing between borings, the subsurface stratigraphy was not interpolated between borings. Due to the complex depositional environment at the project site, there is variability in stratigraphy that can be seen in the different borings, and there is potential for significant variability between borings.

5.1.1 Unit 1N: Fat CLAY with Sand

This soil unit consists of high plasticity clay and sandy clay (USCS: CH) with between 5 and 45% fine sand. This unit is very stiff to hard with corrected blow counts (N60) values ranging between approximately 25 blows per foot to over 50 blows per foot. This unit occurs in all three borings, but is especially predominant in B-101, where this unit was observed between 2.5 and 60 ft bgs and from 65 ft bgs to the bottom of the boring at 81.5 bgs[5]. This unit is considered to be expansive soil based on a high measured plasticity index (PI) of at least 30. An expansion index test was performed on a sample of this soil at B-101 at a depth of 10-11.5 ft bgs, and an expansion index (EI) of 153 was measured, indicating a very high expansion potential.

5.1.2 Unit 2N: Very Stiff to Hard Lean CLAY with Sand

This soil unit consists of lean clay to lean clay with sand (USCS: CL). Atterberg limits tests in the fine-grained fraction of this unit indicate that the fine-grained material has low to medium plasticity. This unit is observed to be very stiff to hard and to have up to 20% fine sand. It occurs within all three borings with thicknesses between 5 feet to over 30 feet (B-102A from approximately 53 feet to the bottom of the boring).

5.1.3 Unit 3N: Organic Fat CLAY

This soil unit was encountered in B-103 between a depth of 50.5 and 60 ft bgs and consists of stiff organic clay (USCS: OH). Index testing on this soil unit indicates a water content of approximately 75%, a plasticity index of 33, and an organic content of 15.5%.

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[4] Note that the term unit is used here as a convenience to refer to soils with similar descriptions and does not necessarily indicate that the soils are in the same stratigraphic unit.
[5] A surficial layer of silt was observed in the upper 2.5 ft of B-101. Due to the small thickness of this silt layer, it has not been subdivided into a separate soil unit and has been excluded from Table 4.

5.1.4 Unit 4N: Very Soft to Soft SILT and CLAY Mixed with Fine Sand

This soil unit was encountered within the upper 8.5 feet of B-103 and consists of soft to very soft elastic silt and fat clay (USCS: MH and CH) with fine sand. Index tests of this material indicate a water content of approximately 56% and a plasticity index of 27.

5.1.5 Unit 5N: Dense to Very Dense Clayey SAND

This soil unit consists dense to very dense clayey sand (USCS: SC). This unit was encountered in B-102A between a depth of approximately 9 to 21 ft bgs. A sieve analysis on this soil unit indicates approximately 23% clayey fines. Measured N60 values on this unit ranged from 48 to 60 blows per foot.

5.1.6 Unit 6N: Medium Dense Poorly Graded SAND with Clay

This soil unit consists of poorly graded fine sand with clay (USCS: SP to SP-SC). This soil unit occurs in the upper 9 feet of B-102A, and in B-103 from 8.5 to 43 ft bgs, and from 75.5 ft bgs to the bottom of the boring. SPT N60 values for this material range from 16 to over 50 blows per foot. Sieve tests on this unit indicates between 5% and 14% medium plasticity fines.

5.1.7 Unit 7N: Very Dense SAND with Gravel

This soil unit was encountered in the upper 9 feet of boring B-102A. It consists of approximately 85% fine sand and 15% coarse gravel. One SPT was performed on this unit and indicates a corrected blow count (N60) of over 50 blows per foot.

5.2 Groundwater Elevations

Geosyntec estimated the depth of the groundwater table at each boring using a water level meter, and recorded the depth to groundwater after readings from hollow stem auger boreholes had equilibrated. The depth to groundwater is shown on the boring logs (Appendix A). At B-101, the depth to groundwater was measured at 18.5 ft bgs; at B-102A, the depth to groundwater was measured to be 36.4 ft bgs; and at B-103, near the river, the depth to groundwater was measured to be 9.9 ft bgs.

The groundwater elevations may have seasonal variation. The groundwater elevation at B-103 may also experience tidal variation due to its' proximity to the Sacramento River.[6]

Based on the water levels observations during the site investigation, review of the site topography surrounding each boring, and in consideration of potential seasonal and tidal variations, we have assumed a 5-ft depth to groundwater at B-103, and a 10-ft depth to groundwater at B-101 and B-102A. This groundwater level assumption is considered appropriate for current conditions, but excludes potential impacts from extreme tides and sea level rise.

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[6] For reference, the NOAA tidal information for Pittsburg, New York Slough, Suisun Bay, CA (Station #9415096) indicates that Mean Higher High Water (MHHW) is approximately 4.29 feet above Mean Lower Low Water (MLLW) at the site. During the site investigation at B-103 on 14 April 2025, the measured tidal range was approximately 0.04 to 5.05 feet above MLLW (NOAA Tide Predictions 2025).

6. GEOTECHNICAL DESIGN RECOMMENDATIONS

This section of the report is provided to describe the design parameters and geotechnical recommendations for the proposed development at the site.

6.1 Corrosion Resistance

As summarized in Table 2, laboratory tests were conducted on two samples from the investigation to measure the pH, the concentrations of chlorides and sulfates, and electrical resistivity. These results are also provided below, as follows:

Boring ID	Depth (ft)	Soil Unit	pH	Chlorides (ppm)	Sulfates (ppm)	Electrical Resistivity (Ohm-cm)
B-101	0 - 2.5	Unit 4N	7.7	17	115	1,984
B-102A	25 – 26.5	Unit 2N	7.9	236	236	883
B-103	5 – 6.5	Unit 4N	6.5	1,047	1,047	221

Soils are typically considered to be corrosive for structural elements (concrete, reinforced concrete or steel) if one of the following criteria is met, based on section 6.1 of Caltrans (2021):

- pH equal to or less than 5.5
- Chlorides equal to or greater than 500 ppm
- Sulfates equal to or greater than 1,500 ppm

Based on the results in Table 2 and Appendix D, the soil tested at B-103 may be considered corrosive for the design of concrete foundations. In particular, the high chloride concentration at this location can cause corrosion of the reinforcing steel of structural concrete. To limit this, commercially available corrosion inhibitors conforming to ASTM C1582, *Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete*, can be added to the concrete. These inhibitors not only reduce corrosion but also provide water repellency and restrict the ingress of water-soluble chlorides. Additionally, the concrete mix proportions play a significant role in preventing corrosion. To maximize chloride corrosion resistance, we recommend reducing the permeability of the concrete by specifying a maximum water-cementitious material ratio of 0.4 or less (Stark 1989) and ensuring at least seven days of moist curing. Increasing the concrete cover over the steel also helps slow the migration of chlorides, with a recommendation of at least three and a half inches of cover over the steel in concrete exposed to chlorides or other corrosive solutions. Other methods include using epoxy-coated reinforcing steel (ASTM D3963 or AASHTO M 284) or corrosion-resistant steel.

We recommend that these results and the final concrete mix design be reviewed by a corrosion specialist.

6.2 Consolidation Settlement

Laboratory consolidation testing was performed on three fine grained soils identified during the investigation. Laboratory test results are included in Appendix D and the measured and interpreted consolidation parameters are summarized in Table 3.

These results indicate that the fine-grained soils in Unit 1N and have moderate potential for consolidation settlement if additional load, typically in the form of new fill or new structural loads from foundations (e.g., footings or piles), is introduced to the site. Unit 2N was not tested for consolidation; however given the relatively high blow counts and the leaner nature of the clay compared to Unit 1N, it is expected to behave similarly or better than Unit 1N. The consolation test on the relatively thin Unit 3N (sample 103-15 in B-103 at 60 feet deep) indicated a potentially normally consolidated condition, which indicates a higher susceptibility for settlement under new load compared to the overconsolidated samples tested in Unit 1N. Finally, while no sample was available for testing, the soft and high plasticity soils in Unit 4N, near the surface of B-103, are considered the most susceptible to settlement.

The magnitude of settlement is dependent on how much new load is introduced to the soil and where the load application occurs. For example, a large uniform thickness areal fill across the site could cause several inches of settlement across the area, with differential settlement occurring because of the variability in subsurface stratigraphy across the site, in particular in the vicinity of B-103. Localized loading from footings or pile foundations would be more likely to introduce localized settlements around the foundations.

Based on the project specifications, our understanding is that LS Power does not intend to perform site grading, and in subsequent sections we provide recommendations for controlling settlement for pile supported structures. If site development plans change, we recommend performing settlement analyses specific to the anticipated loading.

6.3 Liquefaction Susceptibility

Geosyntec has performed a preliminary liquefaction susceptibility assessment using ground motions derived from ASCE 7-22 (ASCE 2022)[7] along with the SPT-based liquefaction susceptibility evaluation procedure presented in Boulanger and Idriss (2014). Based on this review, the loose to medium dense saturated poorly graded sand in B-103 (Unit 6N) may be susceptible to liquefaction under the ground motions considered.

Unit 6N at B-103 could produce several inches of liquefaction-induced settlement in a strong seismic event. Since B-103 is near the Sacramento River channel, Unit 6N may also be subject to lateral spreading, particularly if there is a continuous liquefiable layer in the subsurface in the vicinity of the river channel. Lateral spreading is a phenomenon in which the loss of strength

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[7] Based on our communication with LS Power, we understand that transmission lines at this site are governed by General Order 95 (GO-95) and the National Electric Safety Code (NESC), not ASCE 7. However, ASCE 7 was used as a point of reference for this preliminary liquefaction assessment. A seismic site classification of Class E was assumed, along with a seismic risk category of II. Based on these assumptions, ASCE 7-22 estimates a design peak ground acceleration (PGA) of 0.56 g. A characteristic earthquake magnitude (M_w) of 6.5 was assumed based on the seismic hazard deaggregation for an earthquake with a 475-year return period based on USGS (2025).

from liquefaction leads to deformation of the ground towards a free face such as a river. The magnitude of lateral spreading depends on the thickness and continuity of the liquefiable soil, and the distance it extends back from the river.

An evaluation of liquefaction induced settlement and lateral spreading are not within the current scope of work. Should project elements be susceptible to several inches of seismic settlement or potentially several feet of lateral spreading, we recommend performing additional more detailed liquefaction assessment and considering design options to either mitigate liquefaction or increase the resilience of the system to handle these deformations.

6.4 Drilled Pier Recommendations

Based on our communication with LS Power, we understand that a new substation, overhead transmission lines, and a transition structure, will be developed at Collinsville. We understand that the structures at these locations are proposed to be founded on drilled pier foundations.

The recommended parameters for drilled pile design are provided in Table 4. As required by the geotechnical investigation specifications (Power Engineers 2024), the recommended pile design parameters have been developed for input into pile design computer programs, and where indicated, design parameters have been developed based on user’s manuals from FAD (FAD Tools 2015), LPILE (Ensoft 2013), GROUP (Ensoft 2022), and SHAFT (Ensoft 2023).

Earth pressure coefficients, soil moduli, maximum side friction, and maximum end bearing values for each layer are also shown in Table 4 and have been developed with reference to published correlations and values recommended in API (API [American Petroleum Institute] 2002), NAVFAC DM 7.1 (NAVFAC [Naval Facilities Engineering Command] 2022), and Fellenius (2023).

The side friction and end bearing values provided are for calculation of ultimate (unfactored) pile capacities. These capacities should be reduced either by an appropriate factor of safety (FS) when using allowable stress design or by resistance factors when using load and resistance factor design (LRFD) (load factors should also be applied when using LRFD). Typical FS values for axial capacity of pile foundations range from 2 to 3, with FS of 2 used when load testing is performed to validate the capacities, and FS of 3 used when no load testing is performed and for uplift capacity. Values of computed vertical and lateral bearing capacity can be increased by $1/3^{rd}$ for short term wind and seismic loads.

Note that axial and lateral pile capacities can be affected by pile spacing when piers or piles are installed in closely spaced groups (typically at center-to-center spacings of 6 pile diameters or less). If LS Power is considering pile groups as part of their design, appropriate reduction factors (e.g., as incorporated in Ensoft’s GROUP software for lateral pile analysis) should be considered.

If instead of drilled piers, driven H-piles or open pipe piles are used that rely on plugging of the pile to create end bearing, then the piles should be advanced at least 5 pile diameters into the bearing layer before account for bearing capacity.

7. LIMITATIONS

This report has been prepared for the sole use of Gregg and LS Power to support the design of the Collinsville onshore portion of the Collinsville-Pittsburg 230 kV transmission project, located on the northern shore of the Sacramento River in Collinsville, California. Use by any other party is at their own discretion and risk. The data and observations presented in this report have been formulated in accordance with accepted geotechnical engineering practices in Northern California at the time this report was prepared. No warranty, expressed or implied, is made or should be inferred.

Conclusions in this memorandum are based upon our review of the soil conditions encountered during the geotechnical site investigation in April 2025. Subsurface conditions described in this report are based on subsurface soil conditions at limited exploration locations. Variations in subsurface conditions may exist between exploration locations, and the project team may not be able to identify all adverse conditions along the project area.

Data presented in this report are time-sensitive in that they apply only to locations and conditions existing at the time of the exploration and preparation of this report. Data should not be applied to any other projects in or near the area of this study, nor should they be applied at a future time without appropriate verification.

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TABLES

Table 1: Investigation Summary

Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

Boring	Date Started	Date Completed	Termination Depth (ft)[1]	Easting[2],[3]	Northing[2],[3]	Design Element[4]
B-101	4-16-25	4-16-25	81.5	6609530.45	1791054.52	Proposed Substation
B-102A	4-15-25	4-15-25	82.5	6611048.96	1789621.48	Transmission Line
B-103	4-14-25	4-14-25	81.5	6610053.12	1788198.58	Transmission Lines and Transistion Station

1. Termination depth refers to bottom of the boring, in feet below existing ground surface.
2. Northings and Eastings are based on design coordinates provided by LS Power to Gregg Drilling on 19 December 2024: "24-12-5_Rev-3_Collinsville to Pittsburg Geotechnical Investigation.kmz" Borings locations were marked out in the field by Gregg Drilling prior to the start of drilling.
3. Boring coordinates are in terms of NAD83, California State Plane Zone 2, in US Feet.
4. Design elements for each boring are based on review of the geotechnical investigation specifications from Power Engineers, dated 25 June 2024, and subsequent email coordination between Geosyntec and LS Power.
5. The drill rig experienced refusal at B-102 at 10.5 feet below ground surface. Therefore, the drilling crew stepped out approximately 10 feet to the south of B-102. The redrilled boring was referred to as B-102A. The as-built coordinates of B-102A was not surveyed.

Table 2: Geotechnical Laboratory Test Results Summary

Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

Boring	Sample ID	Depth	Sampler	USCS	Moisture and Density		Atterberg Limits			Organic Content	pH	Resistivity @ 15.5 °C	Chloride	Sulfate	Grain Size Distribution			Expansion Index	TX-UU [2]		TX-CU [3]	
					Moisture Content[1]	Wet Unit Weight	LL	PL	PI						% Gravel	% Sand	% Fine		Confining Pressure	Undrained Shear Stress	φ'	c'
		(ft)			(%)	(pcf)				(%)		(Ohm-cm)	(mg/kg)	(mg/kg)	(%)	(%)	(%)		(psf)	(psf)	Degrees	(psf)
B-101	101-1	0'-2.5'	Bag	ML	18.4	--	--	--	--	--	7.7	1984	17	115	--	--	--	--	--	--	--	--
B-101	101-2	2.5'-4'	SPT	CH	--	--	57	27	30	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-3	5'-6.5'	SPT	CH	27.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-4	10'-11.5'	Mod Cal	CH	27.6	122.5	--	--	--	--	--	--	--	--	--	--	--	153	--	--	--	--
B-101	101-5	15'-17.5'	Shelby	CH	26.0	122.1	--	--	--	--	--	--	--	--	--	--	--	--	1195	2550	--	--
B-101	101-6	20'-21.5'	SPT	CH	26.0	--	72	23	49	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-7	25'-26.5'	Modcal	CH	21.2	129.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-8	30'-32.5'	Shelby	CH	37.9	110.9	--	--	--	2.9	--	--	--	--	--	--	--	--	--	--	33.3[3]	90[3]
B-101	101-9	35'-36.5'	SPT	CH	23.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-10	40'-41.5'	Modcal	CH	26.6	123.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-11	45'-47.5'	Shelby	CH	27.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-12	50'-51.5'	SPT	CH	--	--	--	--	--	--	--	--	--	--	0.0	21.2	78.8	--	--	--	--	--
B-101	101-13	55'-56.5'	Modcal	CH	31.6	119.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-14	60'-62.5'	Shelby	CL	22.2	122.1	48	21	27	--	--	--	--	--	--	--	--	--	2794	6491	--	--
B-101	101-15	65'-66.5'	Modcal	CH	18.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-16	70'-71.5'	SPT	CH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-101	101-17	75'-77.5'	Shelby	CH	25.8	120.1	--	--	--	--	--	--	--	--	0.0	8.4	91.6	--	--	--	--	--
B-101	101-18	80'-81.5'	SPT	CH	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-1A	6'-7.5'	SPT	SC	6.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-2A	10'-11.5'	SPT	SC	--	--	--	--	--	--	--	--	--	--	0.1	77.1	22.8	--	--	--	--	--
B-102A	102-3A	15'-16.5'	SPT	SC	4.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-4A	20'-21.5'	SPT	CL	24.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-5A	25'-26.5'	Modcal	CL	24.6	115.5	42	16	26	--	7.9	883	184	236	0.0	12.4	87.6	--	--	--	--	--
B-102A	102-7A	35'-37.5'	Shelby	CH	25.7	122.8	63	24	39	--	--	--	--	--	--	--	--	--	2707	2637	--	--
B-102A	102-8A	40'-42'	Modcal	CH	54.5	97.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-9A	45'-47.5'	Shelby	CH	19.3	124.1	--	--	--	--	--	--	--	--	0.0	22.4	77.6	--	2995	4532	--	--
B-102A	102-10A	50'-51.5'	SPT	CH	47.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-11A	55'-56.5'	SPT	CL	23.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-12A	60'-61.5'	Modcal	CL	22.0	128.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-13A	65'-67.5'	Shelby	CL	20.1	130.9	37	20	17	--	--	--	--	--	--	--	--	--	3715	6087	--	--
B-102A	102-14A	70'-71.5'	SPT	CL	28.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-15A	75'-76.5'	Modcal	CL	25.5	124.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-102A	102-16A	80'-82.5'	Shelby	CL	24.8	127.4	--	--	--	--	--	--	--	--	--	--	--	--	4104	5289	--	--

Table 2: Geotechnical Laboratory Test Results Summary

Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

Boring	Sample ID	Depth	Sampler	USCS	Moisture and Density		Atterberg Limits			Organic Content	pH	Resistivity @ 15.5 °C	Chloride	Sulfate	Grain Size Distribution			Expansion Index	TX-UU [2]		TX-CU [3]	
					Moisture Content[1]	Wet Unit Weight	LL	PL	PI						% Gravel	% Sand	% Fine		Confining Pressure	Undrained Shear Stress	φ'	c'
		(ft)			(%)	(pcf)				(%)		(Ohm-cm)	(mg/kg)	(mg/kg)	(%)	(%)	(%)		(psf)	(psf)	Degrees	(psf)
B-103	103-1	0'-2'	Bag	MH	52.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-2	2'-2.5'	Bag	CH	62.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-3	2.5'-4'	SPT	CH	--	--	56	29	27	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-4	5'-6.5'	Modcal	CH	53.3	--	--	--	--	--	6.5	221	4687	1047	0.0	1.9	98.1	--	--	--	--	--
B-103	103-5	10'-12'	Modcal	SP-SC	34.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-6	15'-16.5'	Modcal	SP-SC	--	--	--	--	--	--	--	--	--	--	0.0	87.8	12.2	--	--	--	--	--
B-103	103-7	20'-21.5'	SPT	SP-SC	30.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-8	25'-26.5'	SPT	SP-SC	--	--	--	--	--	--	--	--	--	--	0.0	91.4	8.6	--	--	--	--	--
B-103	103-9	30'-31.5'	SPT	SP-SC	25.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-10	35'-36.5'	SPT	SP-SC	26.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-11	40'-41.5'	SPT	SP-SC	22.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-12	45'-48'	Modcal/SPT	CH	38.5	--	--	--	--	--	--	--	--	--	0.1	18.0	81.9	--	--	--	--	--
B-103	103-13	50'-51.5'	SPT	OH	67.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-14	55'-57'	Modcal	OH	84.3	87	88	55	33	15.5	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-15	60-62.5'	Shelby	CL	28.8	120.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	31.7	150
B-103	103-16	65'-66.5'	Modcal	CL	30.4	120.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-17	70'-72.5'	Shelby	CL	21.4	127.3	41	16	25	--	--	--	--	--	--	--	--	--	2722	3095	--	--
B-103	103-18	75'-76.5'	SPT	SP-SC	24.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B-103	103-19	80'-81.5'	SPT	SP-SC	21.3	120.6	--	--	--	--	--	--	--	--	2.5	83.8	13.7	--	--	--	--	--

Symbols:

--	not tested
φ'	effective stress friction angle
c'	effective stress cohesion
% Gravel	percentage of sample coarser than #40 sieve (by mass)
% Sand	percentage of sample between #200 and #40 sieve (by mass)
% Fines	percentage of sample passing #200 sieve (by mass)

Abbreviations:

ASTM	American Society for Testing and Materials
CH	Fat Clay
CL	Lean Clay
cm/s	centimeters per second
ft	feet
k	hydraulic conductivity (centimeters per second)
LL	liquid limit
mg/kg	milligrams per kilogram
MH	Elastic Silt
ML	Silt
Mod Cal	Modified California Sampler
OH	Highly Organic Soil
ohm-cm	ohms centimeter
pcf	pounds per cubic feet
pH	potential of hydrogen
PI	plasticity limit
PL	plastic limit
psf	pounds per square feet
SC	Clayey Sand
Shelby	Shelby Tube Sampler
SP	Poorly Graded Sand
SP-SC	Poorly Graded Sand with Clay
SPT	Standard Penetration Test Sampler
TX-CU	Consolidated Undrained Triaxial Compression with Pore Pressure (ASTM D4767)
TX-UU	Unconsolidated Undrained Triaxial Compression (ASTM D2850)
USCS	Unified Soil Classification System

Notes:

[1] Moisture content and wet unit weights are based on moisture-density measurements (ASTM D7263b) where available; otherwise, these values have been extracted from initial readings from strength, consolidation, or organic content tests.

[2] TX-UU samples were subject to an isotropic confining pressure of slightly higher than the estimated in-situ stress, and back-pressure saturated prior to shear. Undrained shear strength was taken as half the peak deviator stress.

[3] TX-CU test result indicates a curved strength envelope. The estimated effective friction angle (φ') and effective cohesion (c') provide an approximate strength relationship within the range of test pressures considered (4 - 15 ksf); however, engineering judgement should be used when estimating effective strength outside this stress range.

Table 3: Consolidation Laboratory Test Interpretation

Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

				Initial Test Conditions			Compression Indices		Modified Compression Indices		Estimated Stress History	
Boring	Sample	Depth (ft)	USCS	e_o	Dry Unit Weight (pcf)	Wet Unit Weight (pcf)	C_c	C_r	$C_{c\varepsilon}$	$C_{r\varepsilon}$	σ_p' (psf)	OCR
B-101	101-8	30-32.5	CH	1.17	80.4	110.9	0.43	0.09	0.20	0.04	15,000	4.9
B-102A	102-7A	35-37.5	CH	0.79	97.7	122.8	0.31	0.04	0.17	0.02	19,000	4.3
B-103	103-15	60-62.5	CL	0.86	93.8	120.8	0.24	0.03	0.13	0.02	2,450	1.0

Symbols:

e_o	initial void ratio
C_c	Compression index
C_r	Recompression index
$C_{c\varepsilon}$	Modified compression index $(=C_c/(1+e_o))$
$C_{r\varepsilon}$	Modified recompression index $=(C_r/(1+e_o))$
σ_p'	maximum past pressure
OCR	overconsolidation ratio

Abbreviations:

ft	feet
pcf	pounds per cubic feet
psf	pounds per square feet
USCS	Unified Soil Classification System

Table 4: Summary of Design Parameters

Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

								Pile design parameters						
			Strength		Earth Pressure Coefficients			FAD	GROUP & LPILE		Axial Capacity			
Soil Unit	Description	Total unit weight [1] γ_t (pcf)	Undrained Shear Strength [2] S_u (psf)	Effective Friction Angle ϕ' (degrees)	At-rest K_o	Active K_a	Passive K_p	Modulus of Deformation [3] E_D (ksi)	Strain at 50% Stress [4] ε_{50}	p-y modulus [5] k (pci)	Shaft Friction Factor [6] β	Limiting Shaft Friction Values [6],[7] q_s (psf)	Maximum End Bearing [6],[8],[10],[11] q_b (psf)
Unit 1N	Fat CLAY with Sand	120	2,000 for z < 40 ft 3,000 for z > 40 ft	--	0.58	0.41	2.46	2.0	0.01	1000	--	1,100 for z < 40 ft 1,500 for z > 40 ft	18,000 for z < 40 ft 27,000 for z > 40 ft
Unit 2N	Very Stiff to Hard Lean CLAY with Sand	120	3,000	--	0.53	0.36	2.77	2.0	0.01	1000	--	1,500	27,000
Unit 3N	Organic Fat CLAY	85	1,000	--	0.66	0.49	2.04	0.60	0.02	--	--	550	NR
Unit 4N	Very Soft to Soft SILT and CLAY Mixed with Fine Sand	110	500	--	0.66	0.49	2.04	0.15	0.02	--	--	275	NR
Unit 5N	Dense to Very Dense Clayey SAND	130	--	36	0.41	0.26	3.85	3.0	--	100	0.37	1,700	$20 \cdot \sigma_v' \leq 100{,}000$
Unit 6N	Medium Dense Poorly Graded SAND with Clay	120	--	34	0.44	0.28	3.54	2.0	--	50	0.29	1,400 [12]	$12 \cdot \sigma_v' \leq 60{,}000$ [12]
Unit 7N	Very Dense SAND with Gravel	130	--	36	0.41	0.26	3.85	3.0	--	100	0.37	1,700	$20 \cdot \sigma_v' \leq 100{,}000$

Abbreviations:

-- : Not applicable based on soil type
σ_v': Vertical effective stress at the depth of interest
NR: Not Recommended to have unit as a pile end bearing stratum.
ksi: kips per square inch
pcf: pounds per cubic foot
pci: pounds per cubic inch
psf: Pounds per square foot
z: depth below ground surface

Notes:

1. Total unit weight refers to the moist density. For soil beneath the groundwater table, the effective unit weight can be estimated by subtracting the unit weight of water (62.4 pcf).
2. Undrained shear strength can be used to represent total stress cohesion (c) of cohesive soil layers, for pile analysis in FAD, LPILE, SHAFT, and GROUP.
3. Estimates of the modulus of deformation are based on Figures 1-4 and 1-8 of: FAD Tools, *FAD 5.1 User's Guide* , Revision 0, December 2015 (after DiGioia et al. 1975 and Schmertmann 1970, respectively).
4. ε_{50} values are based on review of stress-strain curves from TX-UU and TX-CU tests, along with published correlations in the LPILE Technical Manual (Ensoft 2013).
5. k values are based on review of relationships and representative values provided in: Ensoft, Inc. 2013. "Technical Manual for LPile 2013 (Using Data Format Version 7)."
6. Shaft friction factor, maximum allowable side friction, and limiting end bearing estimates are based on API (2002): American Petroleum Institute. 2002. *API Recommended Practice 2A-WSD-Planning, Designing, and Constructing Fixed Offshore Platforms - Working Stress Design*. 21st ed.
7. Limiting side friction in Unit 1N, 2N, 3N, and 4N, have been estimated via: $q_s = \alpha \cdot S_u$, where α = adhesion factor. $\alpha = 0.55$ for $S_u/P_a \leq 1.5$ and $0.55\text{-}0.1(S_u/P_a\text{-}1.5)$ for $1.5 \leq S_u/P_a \leq 2.5$ (FHWA; O'Neil and Reese 1999). α is equal to 0.55 if z < 40 ft and 0.50 if z > 40 ft for drilled shaft in Unit 1N, 0.50 for Unit 2N, 0.55 for Unit 3N and Unit 4N.
8. End bearing assumes a drilled pier or closed end pile, or an open-ended pile with a plugged base extending at least 5 pile diameters into the bearing stratum. The ultimate end bearing stress for Unit 1N and Unit 2N has been estimated via $q_b = N_c \cdot S_u$, where N_c is taken as equal to 9.0. The ultimate end bearing stress for Unit 5N, and 6N assume a bearing capacity factor (N_q) based on API (2002) and Fellenius (2023). To estimate ultimate end bearing load (Q_b), multiply the bearing stress by the base area of the pile (A_b).
9. All parameters shown represent conditions for static loading below the groundwater table.
10. Side friction and end bearing values represent ultimate, not allowable loads. To obtain allowable loads, the structural engineer should apply appropriate factors of safety (FS) when using allowable stress design, or by applying load and resistance factors when using load and resistance factor design. Typical allowable stress FS values for axial capacity range from 2 to 3. A FS of 2 is used when load testing is performed, while a FS of 3 is generally used for axial capacity when no load testing is performed, and for uplift capacity.
11. Units with NR listed for maximum end bearing are not recommended as the end bearing layer for piles/piers.
12. Unit 6N is not recommended for end bearing or shaft resistance in B-103 above a depth of 43 feet due to potential susceptibility to liquefaction and associated strength loss.

FIGURES

Site Location Map

Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

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WG3444 | July 2025

Figure 1

\\oakland-01\data\GIS\CollinsvillePittsburg\Project\2025-03_CollinsvilleOnshore\Figures.aprx\Fig01_SiteLocationMap 3/31/2025 11:32 AM (kwalton)

Legend

B-101 (81.5') Boring ID (Termination Depth, in Feet Below Ground Surface)

Electrical Transmission Cable

Parcel Boundary

Notes:
1. The cable alignment is based on the 60% design alignment provided to Geosyntec by Power Engineers on 29 August 2024.
2. The boring locations are based on the .kmz provided to Gregg Drilling by LS Power on 19 December 2024: "24-12-5_Rev-3_Collinsville to Pittsburg Geotechnical Investigation.kmz"
3. Aerial imagery source: Nearmap, June 2024.
4. Boring B-102 experienced refusal at 10.5 feet below ground surface, therefore, the drilling crew completed B-102A instead. B-102A is located approximately 10 feet to the south of B-102.

N

0 500 Feet

Site Layout Map

Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

Geosyntec consultants

WG3444	July 2025	**Figure** 2

\\oakland-01\data\GIS\CollinsvillePittsburg\Project\2025-03_CollinsvilleOnshore\Figures.aprx\Fig02_SiteLayout 3/31/2025 11:32 AM (kwalton)

Legend

B-101 (81.5') Boring ID (Termination Depth, in Feet Below Ground Surface)

Electrical Transmission Cable

Geology [1]

- af: Artificial Fill
- Qhym: Mud Deposits (late Holocene)
- Qha: Alluvium (Holocene)
- Qhy: Alluvium (late Holocene)
- Qpa: Alluvium (Peistocene)
- Qs: Beach and Dune Sand (Quaternary)
- QTs: Sediments (Early Pleistocene and/or Pliocene)

Notes:

1. Surface geology is based on: USGS. 2006. "Geologic map of the San Francisco Bay Region" Compliers: Graymer, R.W. B. C. Moring, G.J. Saucedo, C. M. Wentworth, E. E. Brabb, K. L. Knudsen. 19 April 2006. Honker Bay and Antioch North quadrangles. Electronic data at https://earthquake.usgs.gov/education/geologicmaps/geology.php, accessed 23 September 2024.
2. Aerial imagery source: Nearmap, June 2024.
3. The cable alignment is based on the 60% design alignment provided to Geosyntec by Power Engineers on 29 August 2024.
4. The boring locations are based on the .kmz provided to Gregg Drilling by LS Power on 19 December 2024: "24-12-5_Rev-3_Collinsville to Pittsburg Geotechnical Investigation.kmz"
5. Boring B-102 experienced refusal at 10.5 feet below ground surface, therefore, the drilling crew completed B-102A instead. B-102A is located approximately 10 feet to the south of B-102.

N

0 1,200 Feet

Surface Geology

Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

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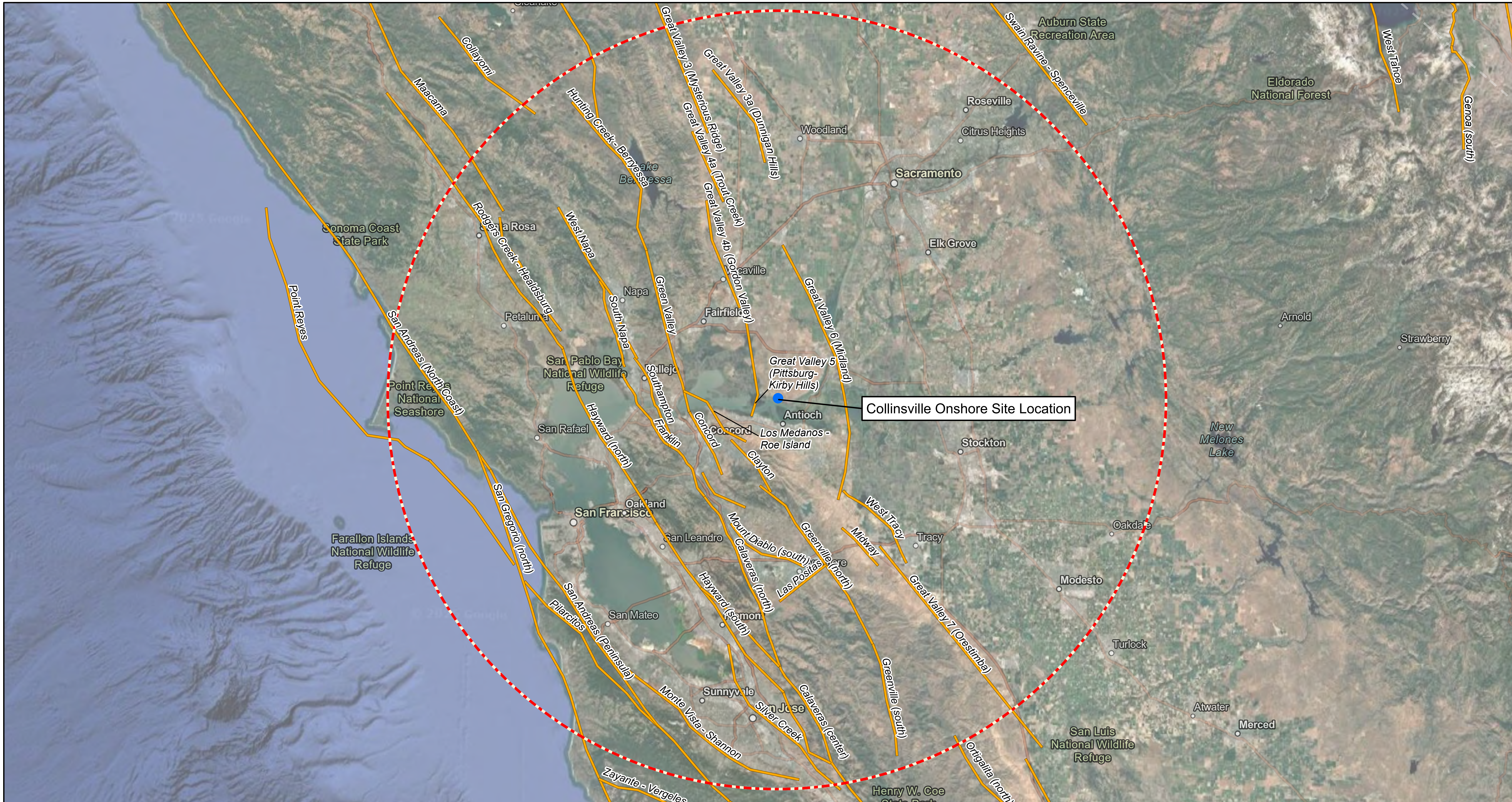
WG3444	July 2025

Figure 3

\\oakland-01\data\GIS\CollinsvillePittsburg\Project\2025-03_CollinsvilleOnshore\Figures.aprx\Fig03_SurfaceGeology 3/31/2025 11:32 AM (kwalton)



Legend

2023 National Seismic Hazard Model Fault Line

100-Kilometer Radius

Notes:
Fault locations are from Hatem et al. (2021) and represent the earthquake catalog and fault sections used in the USGS 2023 National Seismic Hazard Model.

N

0 15 Miles

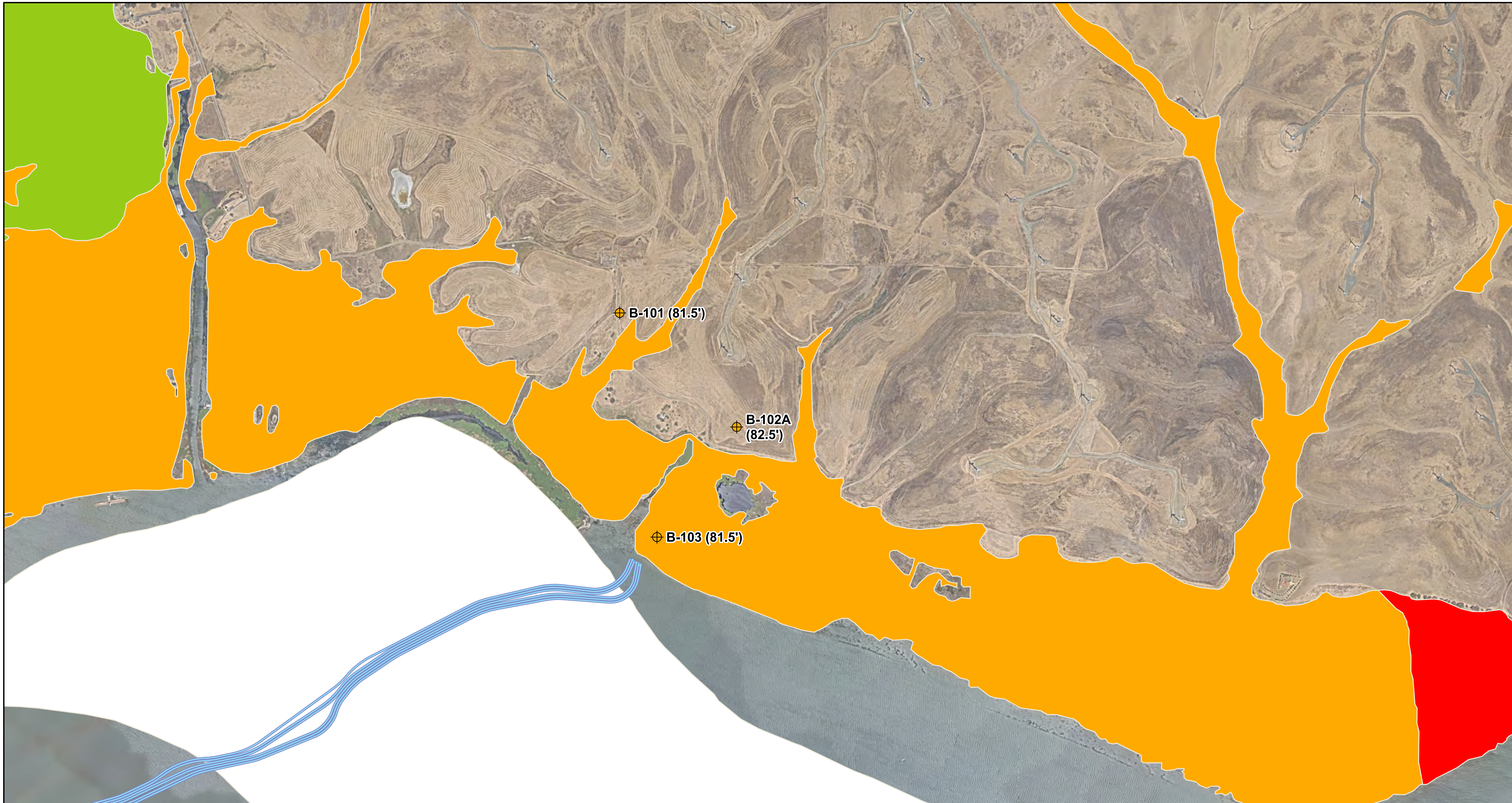
Location of Faults in the Vicinity of the Site

Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

Geosyntec consultants

WG3444	July 2025	**Figure** 4

\\oakland-01\data\GIS\CollinsvillePittsburg\Project\2025-03_CollinsvilleOnshore\Figures.aprx\Fig04_Faults 3/31/2025 11:32 AM (kwalton)



Legend

B-101 (81.5') ⊕ Boring ID (Termination Depth, in Feet Below Ground Surface)

Electrical Transmission Cable

Liquefaction Susceptibility [1]

- Low
- Moderate
- High
- Very High
- Not Mapped

Notes:

1. Liquefaction susceptibility is based on: USGS and CGS. 2006. "Maps of Quaternary Deposits and Liquefaction Susceptibility in the Central San Francisco Bay Region, California." USGS Open-File Report 2006-1037, accessed September 23, 2024, at: https://earthquake.usgs.gov/education/geologicmaps/liquefaction.php.
2. Liquefaction susceptibility not mapped in Sacramento County or within the Sacramento-San Joaquin river channel.
3. Aerial imagery source: Nearmap, June 2024.
4. The cable alignment is based on the 60% design alignment provided to Geosyntec by Power Engineers on 29 August 2024.
5. The boring locations are based on the .kmz provided to Gregg Drilling by LS Power on 19 December 2024: "24-12-5_Rev-3_Collinsville to Pittsburg Geotechnical Investigation.kmz"
6. Boring B-102 experienced refusal at 10.5 feet below ground surface, therefore, the drilling crew completed B-102A instead. B-102A is located approximately 10 feet to the south of B-102.

N

0 1,200 Feet

Liquefaction Susceptibility

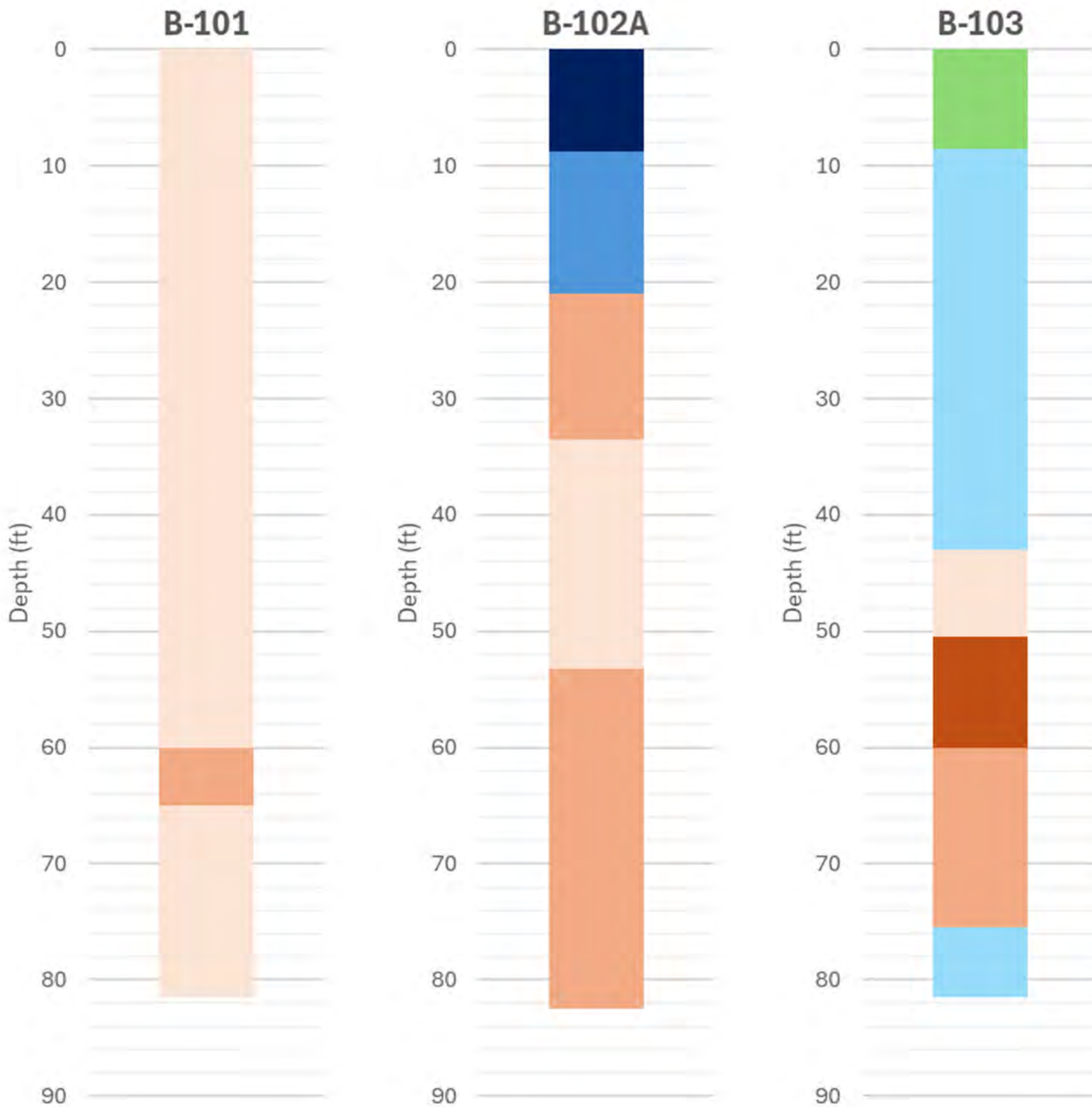
Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

Geosyntec consultants

WG3444	July 2025

Figure 5

\\oakland-01\data\GIS\CollinsvillePittsburg\Project\2025-03_CollinsvilleOnshore\Figures.aprx\Fig05_LiquefactionSusceptibility 3/31/2025 11:32 AM (kwalton)



LEGEND

- Unit 1N: Fat CLAY with Sand (2)
- Unit 2N: Very Stiff to Hard Lean CLAY with Sand
- Unit 3N: Organic Fat CLAY
- Unit 4N: Very Soft to Soft SILT and CLAY Mixed with Fine Sand
- Unit 5N: Dense to Very Dense Clayey SAND
- Unit 6N: Medium Dense Poorly Graded SAND with Clay
- Unit 7N: Very Dense SAND with Gravel

Notes:

1. See report text for descriptions of each soil unit.
2. Includes a surficial layer of silt within the upper 2.5 ft of B-101.

Idealized Stratigraphy at Each Boring
Collinsville-Pittsburg 230 kV Onshore Investigation
Collinsville, Solano County, California

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WG3444 | July 2025

Figure 6

APPENDIX A
Boring Logs

GROUP SYMBOLS AND NAMES

Graphic	Group Names	Graphic	Group Names	Graphic	Group Names
	Lean Clay (CL)		Lean Clay with Sand (CL)		Sandy Lean Clay (CL)
	Silty Clay (CL-ML)		Silty Clay with Sand (CL-ML)		Silt (ML)
	Silt with Sand (ML)		Sandy Silt (ML)		Poorly Graded Sand (SP)
	Poorly Graded Sand with Gravel (SP)		Poorly Graded Sand with Clay (SP-SC)		Poorly Graded Sand with Silt (SP-SM)
	Well-Graded Sand (SW)		Well-Graded Sand with Clay (SW-SC)		Well-Graded Sand with Silt (SW-SM)
	Well-Graded Sand with Silt and Gravel (SW-SM)		Clayey Sand (SC)		Silty Clayey Sand (SC-SM)
	Silty Sand (SM)		Silty Sand with Gravel (SM)		Well-Graded Gravel with Sand (GW)
	Well-Graded Gravel with Clay and Sand (GW-GC)		Well-Graded Gravel with Silt and Sand (GW-GM)		Clayey Gravel with Sand (GC)
	Silty Gravel with Sand (GM)		Gravelly Lean Clay with Sand (CL)		Lean Clay with Gravel (CL)
	Fat Clay (CH)		Fat Clay with Gravel (CH)		Gravelly Lean Clay (CL)
	Fat Clay with Sand (CH)		Gravelly Fat Clay with Sand (CH)		Sandy Lean Clay with Gravel (CL)
	Organic Silt (OL)		Organic Silt with Gravel (OL)		Clayey Sand with Gravel (SC)
	Organic Elastic Silt (OH)		Poorly Graded Gravel with Sand (GP)		Poorly Graded Sand with Silt and Gravel (SP-SM)
	Clayey Sand with Gravel (SC)				

Note: Soils were classified in the field in general accordance with ATM D2488-06, Standard Practice for Description and Identification of Soils (Visual Manual Procedure). Where laboratory testing was performed, classifications were modified in general accordance with ASTM D2487-06, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

Borderline symbols, two group symbols separated by a slash, may be used in field visual classification when (1) percentage of fines is estimated to be between 45% and 55%, (2) percentages of sand and gravel are estimated to be about the same, (3) soil could be either well graded or poorly graded, (4) soil could be either a silt or a clay, or (5) fine-grained soil has properties indicating that it is at the boundary between low and high plasticity. Refer to DWR Soil and Rock Logging, Classification, and Presentation Manual for guidelines in the use of borderline symbols.

FIELD AND LABORATORY TESTS

AL	Atterberg Limits - Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02 & T 90-00)
CL	Collapse Potential (ASTM D 5333-03)
CN	Consolidation (ASTM D 2435-04)
CP	Relative Compaction (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
HD	Hydrometer (ASTM)
N_{60}	N_{60}(ASTM)=N_m*(Eri/60)
OC	Organic Content (ASTM D 2974-07)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PE	Permeability (CTM 220 - 05)
PM	Pressure Meter
PP	Pocket Penetrometer
RV	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression (ASTM D 2166-06)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223 - 96 [2004])
WC	Water Content (ASTM D 2216-05)

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (1.4 in. ID)
- Standard California (2.5 in. ID)
- Modified California (2.0 in. ID)
- Shelby Tube (2.87 in. or 2.37 in. ID)
- Bag Sample
- Sonic Core
- HQ Core
- Punch Core

WELL GRAPHIC SYMBOLS

- Blank casing in cement grout
- Blank casing in filter sand
- Native backfill or slough
- Blank casing in bentonite seal
- Slotted casing in filter sand
- Vibrating wire piezometer

WATER LEVEL SYMBOLS

- First water encountered during drilling
- Water level measured at end of drilling
- Static water level reading (short-term)
- Static water leavel reading (long-term)

GEOS LEVEE LEGEND P1

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BORING LEGEND

Sheet 1 of 2

CONSISTENCY OF COHESIVE SOILS (AASHTO 1988)		
Descriptor	Pocket Penetrometer (tsf)	Torvane (tsf)
Very Soft	< 0.25	< 0.12
Soft	0.25 - 0.50	0.12 - 0.25
Medium Stiff	0.50 - 1.0	0.25 - 0.50
Stiff	1.0 - 2.0	0.50 - 1.0
Very Stiff	2.0 - 4.0	1.0 - 2.0
Hard	> 4.0	> 2.0

APPARENT DENSITY OF COHESIONLESS SOILS (ASTM 6066-96 (2004))	
Descriptor	SPT N(60) - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE (ASTM D 2488-06)	
Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

SOIL PARTICLE SIZE (ASTM D 2488-06)		
Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS (ASTM D 2488-06)	
Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

DRY STRENGTH OF FINE-GRAINED SOILS (ASTM D 2488-06)	
Descriptor	Criteria
None	Dry specimen crumbles into powder with mere pressure of handling.
Low	Dry specimen crumbles into powder with some finger pressure.
Medium	Dry specimen breaks into pieces or crumbles with considerable finger pressure.
High	Dry specimen cannot be broken with finger pressure; will break into pieces between thumb and a hard surface.
Very High	Dry specimen cannot be broken between thumb and a hard surface.

DILATANCY OF FINE-GRAINED SOILS (ASTM D 2488-06)	
Descriptor	Criteria
None	No visible change in the specimen.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear, or disappears slowly, upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

TOUGHNESS OF FINE-GRAINED SOILS (ASTM D 2488-06)	
Descriptor	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness.
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

CEMENTATION (ASTM D 2488-06)	
Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure.

DATE STARTED	DATE COMPLETED	GROUND ELEVATION	ELEVATION DATUM	TOTAL DEPTH OF BORING
4/16/2025	4/16/2025	--		81.5'
DRILLING CONTRACTOR Gregg Drilling		**DRILLER'S NAME** N/A	**HELPER'S NAME** N/A	**TOTAL DEPTH OF FILL** N/A
DRILLING METHOD HSA/Mud Rotary		**DRILL RIG MAKE AND MODEL** Mobile D83		**CONSULTANT COMPANY** Geosyntec
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) 6.25" (HSA); 4" (Mud Rotary)		**DRILLING ROD TYPE AND DIAMETER** N/A		**FIELD LOGGER** J. Harker
BOREHOLE INCLINATION N/A		**CASING TYPE, DIAMETER, INSTALLATION DEPTH** N/A		**FIELD LOG REVIEWER** L. Anderson/D. Umberg
SAMPLER TYPE(S) SPT, Mod Cal, Shelby		**SPT HAMMER TYPE** Automatic, 140 lb/30"		**HAMMER EFFICIENCY** 85%
BOREHOLE BACKFILL OR COMPLETION Grout				**DEPTH TO GROUNDWATER** 18.5'

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	0		SILT (ML); stiff; dark brown; moist; ~95% medium plasticity fines; ~5% fine sand.		101-1	100				18.4				Corrosivity suite	08:30 AM
	3		Sandy FAT CLAY (CH); very stiff; light brown to gray with reddish brown mottling; dry; ~55% high plasticity fines; ~45% fine sand.		101-2	5	7 9 13 [22]	31			57	30			08:40 AM
	5		As above.		101-3	5	9 15 12 [27]	38		27.4					08:46 AM
	10		As above.		101-4	90	10 14 19			27.6				Expansion index= 153	08:54 AM 101-4A 101-4B 101-4C
	10.5		FAT CLAY with sand (CH); very stiff to hard; light brown; dry; ~85% high plasticity fines; ~15% fine sand.												
	15		As above.		101-5	60				26.0				TX-UU	09:05 AM; 900 psi; pushed 18"
	20														

(continued)

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Borehole Location: Collinsville **County:** Solano
Coordinates: **Northing:** 1791054.52 **Easting:** 6609530.45
Latitude: 38.0801556 N **Longitude:** 121.8337306 W
Coord. System: NAD83, CA State Plane Zone 2
Survey Method: N/A
Channel / River Name / Feature: Collinsville Onshore

LOG OF BORING
B-101

Collinsville-Pittsburg 230 kV Onshore

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	20		FAT CLAY (CH); very stiff; light brown to olive; moist; ~95% high plasticity fines; ~5% fine sand.		101-6	40	6 8 11 [19]	27		26.0	72	49			09:15 AM; mud rotary from 21.5 ft bgs
	25		Sandy FAT CLAY (CH); hard; light brown to gray; moist; ~60% high plasticity fines; ~40% fine sand.		101-7	75	0 22 22 34			21.2					09:55 AM 101-7A 101-7B 101-7C 101-7D
	30		As above, except trace organics (2.9% organics).		101-8	100				37.9				Organic content, TX-CU	10:11 AM; 950 psi; pushed 18"
	35		As above, except very stiff; ~55% fines; ~45% fine sand; no traces of organics.		101-9	40	11 11 15 [26]	37		23.2					10:24 AM
	40		FAT CLAY (CH); hard; dark brown; moist; ~95% high plasticity fines; ~5% fine sand.		101-10	100	14 17 29			26.6					10:36 AM 101-10A 101-10B 101-10C
	45														

(continued)

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	45		FAT CLAY with sand (CH); hard; light brown to tan; moist; ~70% high plasticity fines; ~30% fine sand.		101-11	70				27.9					10:48 AM; 1000 psi; pushed 20"; bottom of 3" Shelby is damaged
	50		As above, except hard; dark brown to gray with reddish staining; moist; ~78.8% high plasticity fines; ~21.2% fine sand.		101-12	40	11 18 20 [38]	54					78.8		11:04 AM
	55		As above, except gray to olive.		101-13	100	21 28 40			31.6					11:23 AM 101-13A 101-13B 101-13C
	60		LEAN CLAY with sand (CL); hard; brown; moist; ~85% medium plasticity fines; ~15% fine sand.		101-14	95				22.2	48	27		TX-UU	11:36 AM; 1000 psi; pushed 16"
	65		FAT CLAY (CH); hard; brown; moist; ~95% high plasticity fines; ~5% fine sand.		101-15	100	26 35 49			18.8					12:37 PM 101-15A 101-15B 101-15C
	70														

(continued)

Borehole Location: Collinsville **County:** Solano
Coordinates: **Northing:** 1791054.52 **Easting:** 6609530.45
Latitude: 38.0801556 N **Longitude:** 121.8337306 W
Coord. System: NAD83, CA State Plane Zone 2
Survey Method: N/A
Channel / River Name / Feature: Collinsville Onshore

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LOG OF BORING
B-101

Collinsville-Pittsburg 230 kV Onshore

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	70		As above, except brown to dark gray.		101-16	90	21 21 21 [42]	60							13:10 PM
	75		FAT CLAY (CH); very stiff to hard; dark brown to gray; moist; ~91.6% high plasticity fines; ~8.4% fine sand.		101-17	40				25.8			91.6		13:30 PM; 950 psi; pushed 20"
	80		As above, except hard.		101-18	60	19 25 30 [55]	78							14:00 PM
	82		Boring terminated at 81.5 feet bgs.												

Depth scale: 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95

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Borehole Location: Collinsville **County:** Solano
Coordinates: **Northing:** 1791054.52 **Easting:** 6609530.45
Latitude: 38.0801556 N **Longitude:** 121.8337306 W
Coord. System: NAD83, CA State Plane Zone 2

Survey Method: N/A
Channel / River Name / Feature: Collinsville Onshore

LOG OF BORING
B-101

Collinsville-Pittsburg 230 kV Onshore

DATE STARTED 4/15/2025	DATE COMPLETED 4/15/2025	GROUND ELEVATION --	ELEVATION DATUM	TOTAL DEPTH OF BORING 82.5'
DRILLING CONTRACTOR Gregg Drilling		DRILLER'S NAME N/A	HELPER'S NAME N/A	TOTAL DEPTH OF FILL N/A
DRILLING METHOD HSA/Mud Rotary		DRILL RIG MAKE AND MODEL Mobile D83		CONSULTANT COMPANY Geosyntec
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) 6.25" (HSA); 4" (Mud Rotary)		DRILLING ROD TYPE AND DIAMETER N/A		FIELD LOGGER J. Harker
BOREHOLE INCLINATION N/A		CASING TYPE, DIAMETER, INSTALLATION DEPTH N/A		FIELD LOG REVIEWER L. Anderson/D. Umberg
SAMPLER TYPE(S) SPT, Mod Cal, Shelby		SPT HAMMER TYPE Automatic, 140 lb/30"		HAMMER EFFICIENCY 85%
BOREHOLE BACKFILL OR COMPLETION Grout				DEPTH TO GROUNDWATER 36.4'

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	0		POORLY GRADED SAND with gravel (SP); yellowish brown; dry; ~85% fine sand; ~15% gravel.												09:30 AM; hand auger to 5 ft bgs
	5		SILT with sand (ML); very stiff; dark brown; dry; ~85% medium plasticity fines; ~15% fine sand.												
	6		POORLY GRADED SAND with gravel (SP); very dense; yellowish brown to tan; dry; ~85% fine sand; ~15% coarse gravel.	X	102-1	40	7 22 26 [48]	68		6.0					09:38 AM
	9		CLAYEY SAND (SC); dense; dark yellowish brown; dry; ~77.1% fine sand; ~22.8% medium plasticity fines; 0.1% gravel.												
	10			X	102-2	80	3 12 18 [30]	48					22.8		09:43 AM
	15		As above.	X	102-3	80	13 17 25 [42]	60		4.8					09:50 AM
	20														

(continued)

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	20		As above, except medium dense.		102-4	80	10 12 15 [27]	48		24.6					09:55 AM
	21		LEAN CLAY (CL); hard; dark yellowish brown; moist; ~85% medium plasticity fines; ~15% fine sand.												
	25		As above, except very dense; ~87.6% medium plasticity fines; ~12.4% fine sand.		102-5	80	17 29 46			24.6	42	26	87.6	Corrosivity suite	10:03 AM 102A-5A 102A-5B 102A-5C
	30		As above.		102-6	50	6 11 14 [25]	35		54.5					10:20 AM
	33.5														
	35		FAT CLAY with sand (CH); very stiff; olive to light brown; moist; ~85% fines; ~15% fine sand.		102-7	60			3.5P	25.7	63	39		TX-UU	10:48 AM; 900 psi; pushed 18"
	37.5														Hit a rock, damaged bottom of Shelby; mud rotary from 37.5 ft bgs
	40		As above, except hard.		102-8	100	0 20 23 27								10:57 AM 102A-8A 102A-8B 102A-8C 102A-8D
	45														

(continued)

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	45		As above, except ~77.6% high plasticity fines; ~22.4% fine sand.		102-9	60				19.3			77.6	TX-UU	11:10 AM; 900 psi; pushed 12"
	49		Sandy FAT CLAY (CH); hard; olive to light brown; moist; ~70% high plasticity fines; ~30% fine sand.		102-10	90	25 30 40 [70]	99		47.7					12:27 PM
	53		LEAN CLAY with sand (CL); hard; olive to light brown; moist; ~80% high plasticity fines; ~20% fine sand.		102-11	30	16 19 24 [43]	61		23.2					12:41 PM
	60		As above, except dark olive brown.		102-12	75	21 25 46			22.0					13:07 PM 102A-12A 102A-12B 102A-12C
	65		As above.		102-13	100				20.1	37	17		TX-UU	13:24 PM; 950 psi; pushed 20"
	70														

(continued)

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Borehole Location: Collinsville
County: Solano
Coordinates: Northing: 1789621.48
Easting: 6611048.96
Latitude: 38.076213 N
Longitude: 121.828465 W
Coord. System: NAD83, CA State Plane Zone 2
Survey Method: N/A
Channel / River Name / Feature: Collinsville Onshore

LOG OF BORING
B-102A

Collinsville-Pittsburg 230 kV Onshore

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	70		As above.		102-14	25	12 16 23 [39]	55		28.1					13:43 PM
	75		As above.		102-15	100	19 19 35			25.5					14:14 PM 102A-15A 102A-15B 102A-15C
	80		As above.		102-16	100				24.8				TX-UU	14:56 PM; 1000 psi; pushed 20"

Boring terminated at 82.5 feet bgs.

Coordinates are for original B-102 location. B-102A was stepped out ~10 ft south of original B-102 location due to refusal at B-102 at 10.5 ft bgs.

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Borehole Location: Collinsville **County:** Solano
Coordinates: **Northing:** 1789621.48 **Easting:** 6611048.96
Latitude: 38.076213 N **Longitude:** 121.828465 W
Coord. System: NAD83, CA State Plane Zone 2

Survey Method: N/A
Channel / River Name / Feature: Collinsville Onshore

LOG OF BORING
B-102A

Collinsville-Pittsburg 230 kV Onshore

DATE STARTED 4/14/2025 **DATE COMPLETED** 4/14/2025	**GROUND ELEVATION** -- **ELEVATION DATUM**	**TOTAL DEPTH OF BORING** 81.5'
DRILLING CONTRACTOR Gregg Drilling	**DRILLER'S NAME** N/A **HELPER'S NAME** N/A	**TOTAL DEPTH OF FILL** N/A
DRILLING METHOD HSA/Mud Rotary	**DRILL RIG MAKE AND MODEL** Mobile D83	**CONSULTANT COMPANY** Geosyntec
DRILL BIT SIZE AND TYPE (HOLE DIAMETER) 6.25" (HSA); 4" (Mud Rotary)	**DRILLING ROD TYPE AND DIAMETER** N/A	**FIELD LOGGER** J. Harker
BOREHOLE INCLINATION N/A	**CASING TYPE, DIAMETER, INSTALLATION DEPTH** N/A	**FIELD LOG REVIEWER** L. Anderson/D. Umberg
SAMPLER TYPE(S) SPT, Mod Cal, Shelby	**SPT HAMMER TYPE** Automatic, 140 lb/30"	**HAMMER EFFICIENCY** 85%
BOREHOLE BACKFILL OR COMPLETION Grout		**DEPTH TO GROUNDWATER** 9.9'

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	0		ELASTIC SILT (MH); soft; brown; moist; ~98% fines; ~2% fine sand.		103-1	100				52.0					09:20 AM
	2		FAT CLAY (CH); very soft to soft; light brown to gray; moist; ~98% high plasticity fines; ~2% fine sand.		103-2	100				62.4					09:25 AM
	3		FAT CLAY with sand (CH); very soft; gray; ~85% high plasticity fines; ~15% fine sand.		103-3	5	0 1 1 [2]	3			56	27			09:30 AM
	5		CLAYEY SAND (SC); very loose; gray; wet; ~60% poorly graded fine sand; ~40% fines.		103-4	100	2 2 2			53.3			98.1	Corrosivity suite	09:40 AM 103-4A 103-4B 103-4C Sample C to Geotherm USA
	6		FAT CLAY (CH); soft to medium stiff; light gray to olive brown; moist; ~98.1% high plasticity fines; ~1.9% fine sand.												
	10		POORLY GRADED SAND with clay (SP-SC); loose; dark gray to black; wet; ~90% fine sand; ~10% high plasticity fines.		103-5	100	0 2 3 4			34.4					09:50 AM 103-5A 103-5B 103-5C 103-5D Sample B to Geotherm USA
	15		As above, except medium dense; ~87.8% fine sand; ~12.2% high plasticity fines.		103-6	100	5 5 7						12.2		09:57 AM 103-6A 103-6B 103-6C Sample B to Geotherm USA
	20														

(continued)

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Borehole Location: Collinsville **County:** Solano
Coordinates: Northing: 1788198.58 **Easting:** 6610053.12
Latitude: 38.072311 N **Longitude:** 121.831933 W
Coord. System: NAD83, CA State Plane Zone 2

Survey Method: N/A
Channel / River Name / Feature: Collinsville Onshore

LOG OF BORING
B-103

Collinsville-Pittsburg 230 kV Onshore

GEOS LEVEE TEMPLATE CP REV2

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	20		As above.	X	103-7	90	3 4 7 [11]	16		30.5					10:05 AM; mud rotary from 21.5 ft bgs
	25		As above, except dense; moist; ~91.4% fine sand; ~8.6% high plasticity fines.	X	103-8	100	8 11 14 [25]	35					8.6		10:52 AM
	30		As above, except coarse sand.	X	103-9	--	5 11 16 [27]	38		25.6					11:05 AM; Lean CLAY recovered in shoe; likely slough
	33														
	35		POORLY GRADED SAND (SP); medium dense; dark gray to black; moist; ~95% coarse sand; ~5% low plasticity fines.	X	103-10	95	3 6 8 [14]	20		26.3					11:19 AM
	38														
	40		POORLY GRADED SAND with clay (SP-SC); dense; dark gray to black; moist; ~90% coarse sand; ~10% low plasticity fines.	X	103-11	70	10 11 13 [24]	34		22.9					11:38 AM
	43														
	45														

(continued)

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Borehole Location: Collinsville **County:** Solano
Coordinates: **Northing:** 1788198.58 **Easting:** 6610053.12
Latitude: 38.072311 N **Longitude:** 121.831933 W
Coord. System: NAD83, CA State Plane Zone 2
Survey Method: N/A
Channel / River Name / Feature: Collinsville Onshore

LOG OF BORING
B-103

Collinsville-Pittsburg 230 kV Onshore

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA: Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	45		FAT CLAY with sand (CH); stiff; gray; moist; ~81.9% high plasticity fines; ~18% fine sand; 0.1% gravel.			0									12:15 PM 103-12A 103-12B 103-12C used SPT sampler below Mod-Cal to collect material for 103-12. SPT material collection with weight of hammer (no blow count available) 12:27 PM
	47				103-12	80	9 6 7 [13]			38.5			81.9		
	50		As above.		103-13	100	4 4 5 [9]	13		67.1					12:40 PM
			Organic FAT CLAY with sand (OH); stiff; dark gray to olive; moist; ~85% high plasticity fines (including 15.5% organics); ~15% fine sand.												
	55		As above, except very stiff.		103-14	30	0 4 6 10			84.3	87	33		Organic content	12:58 PM 103-14A 103-14B 103-14C 103-14D no recovery in Samples A and B
	60		LEAN CLAY with sand (CL); very stiff to hard; gray; moist; ~80% medium plasticity fines; ~20% fine sand.		103-15	100				28.8				TX-CU	13:10 PM; 250 psi; pushed 30"
	65		As above.		103-16	100				30.4					13:30 PM 103-16A 103-16B 103-16C blow counts not recorded
	70														

(continued)

Borehole Location: Collinsville | County: Solano
Coordinates: Northing: 1788198.58 | Easting: 6610053.12
Latitude: 38.072311 N | Longitude: 121.831933 W
Coord. System: NAD83, CA State Plane Zone 2
Survey Method: N/A
Channel / River Name / Feature: Collinsville Onshore

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LOG OF BORING
B-103

Collinsville-Pittsburg 230 kV Onshore

ELEVATION (ft)	DEPTH (feet)	Material Graphics	CLASSIFICATION OF MATERIALS (Description)	Sample Location	Sample Number	Recovery (%)	Blows per 6 in. [Blows per foot]	N_{60} (ASTM)	PP or TV, tsf	LABORATORY DATA Water Content (%)	Liquid Limit	Plasticity Index	Fines, % <200	Other Lab Tests	REMARKS
	70–72.5		As above.		103-17	100				21.4	41	26		TX-UU	13:42 PM; 500 psi; pushed 30"
	75–76.5		As above, except very stiff. POORLY GRADED SAND with clay (SP-SC); dense; tan/olive; moist; ~90% fine sand; ~10% medium plasticity fines.		103-18	95	10 11 13 [24]	34		24.4					13:57 PM
	80–81.5		As above, except very dense; ~83.8% fine sand; ~13.7% medium plasticity fines; 2.5% gravel.		103-19	80	18 30 34 [64]	91		21.3			13.7		14:08 PM
	81.5		Boring terminated at 81.5 feet bgs.												

Depth scale: 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95

GEOS LEVEE TEMPLATE CP REV2

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Borehole Location: Collinsville **County:** Solano
Coordinates: **Northing:** 1788198.58 **Easting:** 6610053.12
Latitude: 38.072311 N **Longitude:** 121.831933 W
Coord. System: NAD83, CA State Plane Zone 2
Survey Method: N/A
Channel / River Name / Feature: Collinsville Onshore

LOG OF BORING
B-103

Collinsville-Pittsburg 230 kV Onshore

APPENDIX B
Daily Field Reports

Geosyntec consultants

Daily Field Log

1111 Broadway, Floor 6
Oakland, California 94607
PH 510 285 2700
FAX 510 836 3036

Project Name: Collinsville-Pittsburg 230kV **Project Number:** WG3414/02 **Page** 1 **of** 1

Date: 4/14/25 **Location:** Collinsville, CA **Logged By:** Jack Harker

Weather Conditions: Sunny H: 83° L: 53°

Tailgate Safety Meeting Time: 0800 **Contractor:** Gregg

Personnel: Name	Company	Time In	Time Out
Jack Harker (JH)	Geosyntec	0730	
Shawn Crispens	LS Power	0730	
Gregg Crew (x3)	Gregg	0745	
Claire Holiday	Insignia Environmental	0750	

Time	Activities
0730	JH + Shawn Crispens on Site.
0745	Gregg crew of 2 on site, waiting on 3rd crew member.
0830	Gregg crew getting set up at B-103.
0900	1 additional Gregg crew members on site.
0915	Began drilling at B-103. Hand Augered to 5' then used hollow stem auger from 5-21.5'.
1015	Gregg crew switched to mud rotary drilling.
1415	B-103 terminated at 81.5' bgs. Gregg crew prepared to grout boring.
1445	Grouting complete.
1515	Offsite.

Copy to: ____ **Total Hrs.:** 7.75 **Signature:** [signature]

Geosyntec consultants

Daily Field Log

1111 Broadway., Floor 6
Oakland, California 94607
PH 510.285.2700
FAX 510.836.3036

Project Name: Collinsville-Pittsburg 230kV **Project Number:** WG3444 **Page** 1 of 1

Date: 4/15/25 **Location:** Collinsville, CA **Logged By:** Jack Harker

Weather Conditions: Cloudy H: 66° L: 49°

Tailgate Safety Meeting Time: 0800 **Contractor:** Gregg

Personnel: Name	Company	Time In	Time Out
Jack Harker (JH)	Geosyntec	0730	1545
Gregg (x3)	Gregg	0730	1545
Shawn Crispens	LS Power	0730	1545
Claire Holliday	Insignia Environmental	0730	1545

Time	Activities
0730	All personnel on site.
0745	Gregg crew mobilizing rig and support equipment to B-102 location.
0800	Safety Briefing.
0815	Gregg crew began drilling at B-102 using hollow stem auger.
0900	At 10.5 ft bgs, refusal was reached at B-102 likely a boulder or rock in drilling path.
0930	Gregg crew stepped out boring B-102 location 10 ft South of planned location. ↳ Coordinates: ~~38.07[illegible]° N, 121.82896° W~~
0935	Began drilling at B-102 step-out location (B-102A), using hollow stem auger.
1045	Water level at B-102A tagged at 36.4 ft bgs, Gregg crew switched to mud rotary.
1500	Drilling complete at B-102A, began preparing grout backfill.
1515	Grouting complete.
1545	All personnel off site.

DU: Coordinates obtained via phone survey are approximate only. Actual coordinates of B-102A was approximately 10 ft south of the design location of B-102.

JH 4-15-25

Copy to: ______ **Total Hrs.:** 8.25 **Signature:** [signature]

Geosyntec consultants

1111 Broadway., Floor 6
Oakland, California 94607
PH 510.285.2700
FAX 510.836.3036

Daily Field Log

Project Name: Collinsville-Pittsburg 230kV **Project Number:** WG3444 **Page** 1 **of** 1

Date: 4/16/25 **Location:** Collinsville, CA **Logged By:** Jack Harker

Weather Conditions: Sunny H:65° L:49°

Tailgate Safety Meeting Time: 0815 **Contractor:** Gregg

Personnel: Name	Company	Time In	Time Out
Jack Harker (JH)	Geosyntec	0730	1445
Gregg (x3)	Gregg	0730	1445
Shawn Crispens	LS Power	0730	1445
Claire Haliday	Insignia Environmental	0730	1445

Time	Activities
0730	All personnel on site.
0745	Safety meeting.
0800	Gregg crew mobilizing equipment to B-101 location.
0820	Began drilling at B-101 using hollow stem auger.
0920	Tagged B-101 water level at 18.5 ft bgs. Gregg crew switched to mud rotary drilling.
1400	Drilling complete at B-101, Gregg began preparing grout backfill.
1408	Grouting B-101.
1415	Grouting complete, cleaning site and equipment.
1445	All personnel off site.

Copy to: ____________ **Total Hrs.:** 7.25 **Signature:** [signature]

APPENDIX C

Photo Log

Photo No.:	1	**Date:**	April 14, 2025
Photographer:	Jack Harker		
Subject:	View of Gregg's D-83 Mobile Drill Rig set up at Boring B-103 (looking South).		
Project:	Collinsville-Pittsburg 230 kV Onshore	**City/State:**	Collinsville, CA

Photo No.:	2	**Date:**	April 14, 2025
Photographer:	Jack Harker		
Subject:	Mud rotary drilling at B-103 using a 4-inch drill bit.		
Project:	Collinsville-Pittsburg 230 kV Onshore	**City/State:**	Collinsville, CA

Photo No.:	3	**Date:**	April 14, 2025
Photographer:	Jack Harker		
Subject:	View of Sample 103-9. Sampled with SPT sampler. Soil Unit 6N: Medium dense poorly graded SAND with clay.		
Project:	Collinsville-Pittsburg 230 kV Onshore	**City/State:**	Collinsville, CA

Photo No.:	4	**Date:**	April 15, 2025
Photographer:	Jack Harker		
Subject:	View of Gregg's D83 Mobile Drill Rig set up at Boring B-102A (looking south). Drilling using a 6.25-inch diameter hollow stem auger.		
Project:	Collinsville-Pittsburg 230 kV Onshore	**City/State:**	Collinsville, CA

Photo No.:	5	**Date:**	April 15, 2025
Photographer:	Jack Harker		
Subject:	View of Sample 102-6. Sampled with SPT sampler. Soil Unit 2N: Very stiff to hard lean CLAY with sand.		
Project:	Collinsville-Pittsburg 230 kV Onshore	**City/State:**	Collinsville, CA

Photo No.:	6	Date:	April 16, 2025
Photographer:	Jack Harker		
Subject:	View of Gregg's D83 Mobile Drill Rig set up at Boring B-101 (looking southwest). Drilling using a 6.25-inch diameter hollow stem auger.		
Project:	Collinsville-Pittsburg 230 kV Onshore	**City/State:**	Collinsville, CA

Photo No.:	7	**Date:**	April 16, 2025
Photographer:	Jack Harker		
Subject:	View of Sample 101-16. Sampled with SPT sampler. Soil Unit 1N: Fat CLAY with sand.		
Project:	Collinsville-Pittsburg 230 kV Onshore	**City/State:**	Collinsville, CA

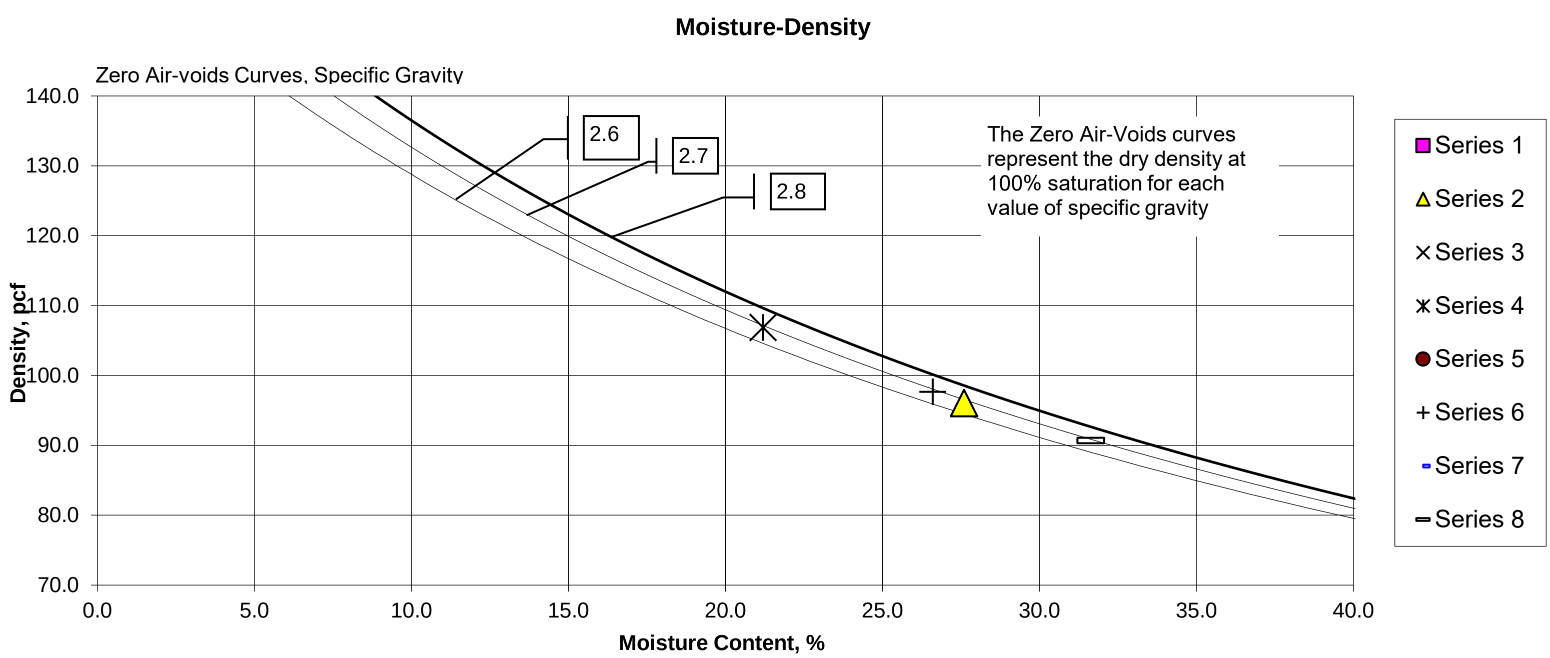
APPENDIX D
Laboratory Test Results

Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No: 461-388a **Project No.** WG3444 **By:** RU
Client: Geosyntec Consultants **Date:** 05/28/25
Project Name: Collinsville-Pittsburg 230KV Onshore **Remarks:**

Boring:	B-101	B-101	B-101	B-101	B-101	B-101	B-101	B-101
Sample:	101-3	101-4	101-6	101-7	101-9	101-10	101-11	101-13
Depth, ft:	5-6.5	10-11.5	20-215	25-26.5	35-36.5	40-41.5	45-47.5	55-56.5
Visual Description:	Brown CLAY w/ Sand	Olive Brown CLAY w/ Sand	Brown Fat CLAY w/ Sand	Brown CLAY w/ Sand	Brown CLAY w/ Sand	Brown CLAY w/ Sand	Olive Brown CLAY	Brown CLAY w/ Sand
Actual G_s								
Assumed G_s		2.70		2.70		2.70		2.70
Moisture, %	27.4	27.6	26.0	21.2	23.2	26.6	27.9	31.6
Wet Unit wt, pcf		122.5		129.5		123.6		119.4
Dry Unit wt, pcf		96.0		106.9		97.7		90.7
Dry Bulk Dens.ρb, (g/cc)		1.54		1.71		1.56		1.45
Saturation, %		98.7		99.2		99.0		99.5
Total Porosity, %		43.0		36.6		42.1		46.2
Volumetric Water Cont,Θw,%		42.5		36.3		41.6		46.0
Volumetric Air Cont., Θa,%		0.6		0.3		0.4		0.3
Void Ratio		0.76		0.58		0.73		0.86
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.

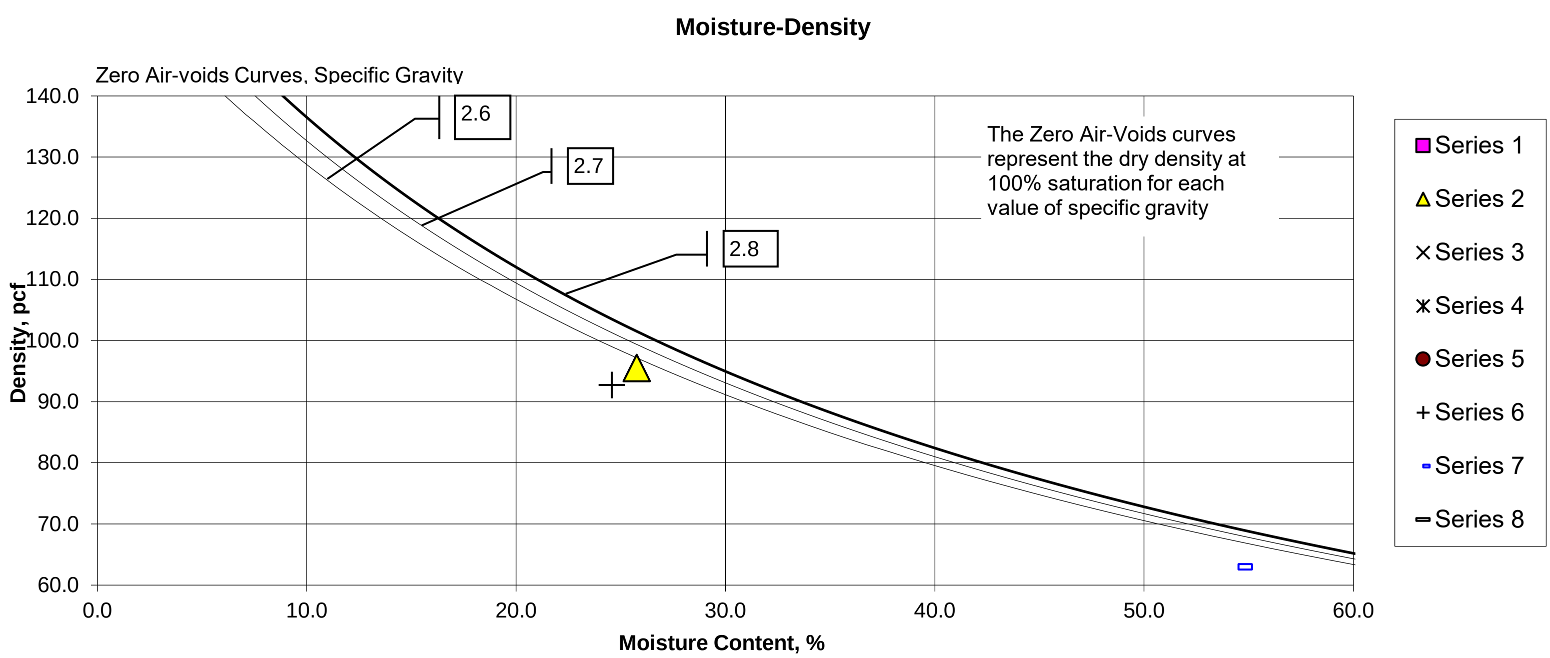


Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No: 461-388b **Project No.** WG3444 **By:** RU
Client: Geosyntec Consultants **Date:** 05/28/25
Project Name: Collinsville-Pittsburg 230KV Onshore **Remarks:**

Boring:	B-101	B-101	B-102A	B-102A	B-102A	B-102A	B-102A	B-102A
Sample:	101-15	101-17	102-1A	102-3A	102-4A	102-5A	102-6A	102-10A
Depth, ft:	65-66.5	75-77.5	6-7.5	15-16.5	20-21.5	25-26.5	40-42	50-51.5
Visual Description:	Brown CLAY w/ Sand	Brownish Gray CLAY	Light Brown CLAY w/ Sand & rocks	Brown SAND	Grayish Brown CLAY w/ Sand	Brown Lean CLAY	Brown CLAY w/ Sand	Brown CLAY w/ Sand
Actual G_s								
Assumed G_s		2.70				2.70	2.70	
Moisture, %	18.8	25.8	6.0	4.8	24.6	24.6	54.5	47.7
Wet Unit wt, pcf		120.1				115.5	97.3	
Dry Unit wt, pcf		95.5				92.7	63.0	
Dry Bulk Dens.ρb, (g/cc)		1.53				1.49	1.01	
Saturation, %		91.0				81.1	87.8	
Total Porosity, %		43.3				45.0	62.6	
Volumetric Water Cont,Θw,%		39.4				36.5	55.0	
Volumetric Air Cont., Θa,%		3.9				8.5	7.6	
Void Ratio		0.76				0.82	1.68	
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.

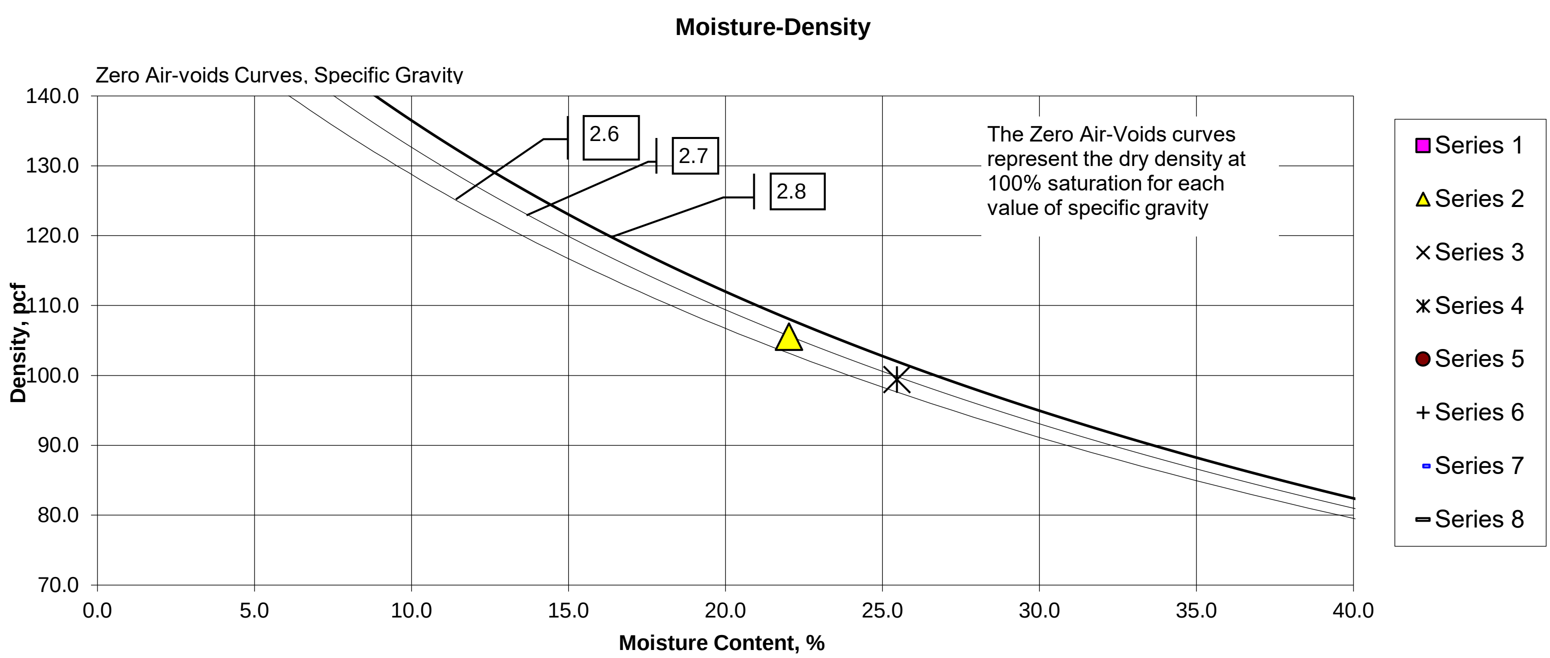


Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No: 461-388c **Project No.** WG3444 **By:** RU
Client: Geosyntec Consultants **Date:** 05/29/25
Project Name: Collinsville-Pittsburg 230KV Onshore **Remarks:**

Boring:	B-102A	B-102A	B-102A	B-102A	B-103	B-103	B-103	B-103
Sample:	102-11A	102-12A	102-14A	102-15A	103-1	103-2	103-5	103-7
Depth, ft:	55-56.5	60-61.5	70-71.5	75-76.5	0-2	2-2.5	10-12	20-21.5
Visual Description:	Brown CLAY w/ Sand	Brown CLAY w/ Sand	Grayish Brown CLAY w/ Sand	Brown CLAY w/ Sand	Brown CLAY w/ Sand	Brown CLAY w/ Sand	Dark Gray CLAY w/ Sand	Dark Brown SAND
Actual G_s								
Assumed G_s		2.70		2.70				
Moisture, %	23.2	22.0	28.1	25.5	52.0	62.4	34.4	30.5
Wet Unit wt, pcf		128.8		124.7				
Dry Unit wt, pcf		105.6		99.4				
Dry Bulk Dens.ρb, (g/cc)		1.69		1.59				
Saturation, %		99.6		98.8				
Total Porosity, %		37.4		41.0				
Volumetric Water Cont,Θw,%		37.2		40.5				
Volumetric Air Cont., Θa,%		0.1		0.5				
Void Ratio		0.60		0.70				
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



Moisture-Density-Porosity Report

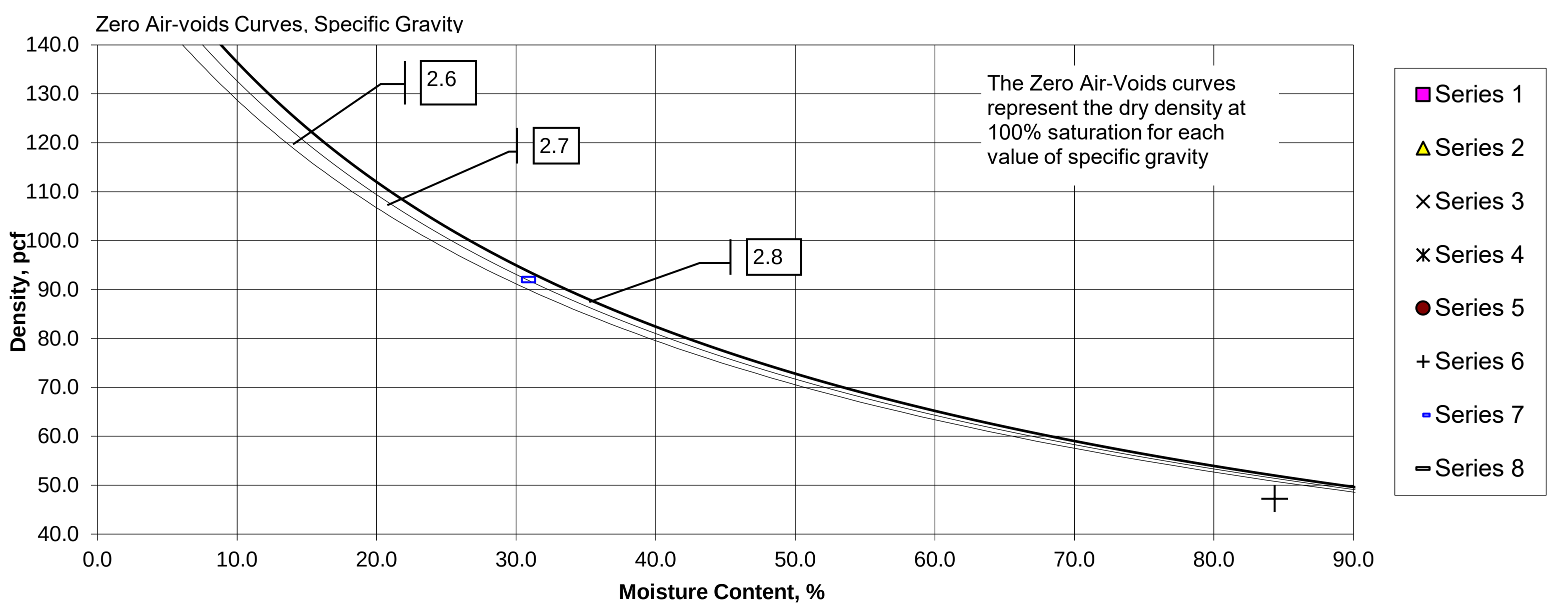
Cooper Testing Labs, Inc. (ASTM D7263b)

CTL Job No:	461-388d	**Project No.**	WG3444	**By:**	RU
Client:	Geosyntec Consultants	**Date:**	05/29/25		
Project Name:	Collinsville-Pittsburg 230KV Onshore	**Remarks:**			

Boring:	B-103	B-103	B-103	B-103	B-103	B-103	B-103	B-103
Sample:	103-9	103-10	103-11	103-12	103-13	103-14	103-16	103-18
Depth, ft:	30-31.5	35-36.5	40-41.5	45-46.5	50-51.5	55-57	65-66.5	75-76.5
Visual Description:	Brown Silty SAND	Grayish Brown Silty SAND	Brown Silty SAND	Dark Gray CLAY w/ Sand	Gray CLAY w/ Sand	Dark Brown Elastic SILT w/ Sand	Gray CLAY w/ Sand	Brown Clayey SAND
Actual G_s								
Assumed G_s						2.70	2.70	
Moisture, %	25.6	26.3	22.9	38.5	67.1	84.3	30.4	24.4
Wet Unit wt, pcf						87.0	120.1	
Dry Unit wt, pcf						47.2	92.1	
Dry Bulk Dens.ρb, (g/cc)						0.76	1.47	
Saturation, %						88.6	98.8	
Total Porosity, %						72.0	45.4	
Volumetric Water Cont,Θw,%						63.8	44.9	
Volumetric Air Cont., Θa,%						8.2	0.5	
Void Ratio						2.57	0.83	
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.

Moisture-Density

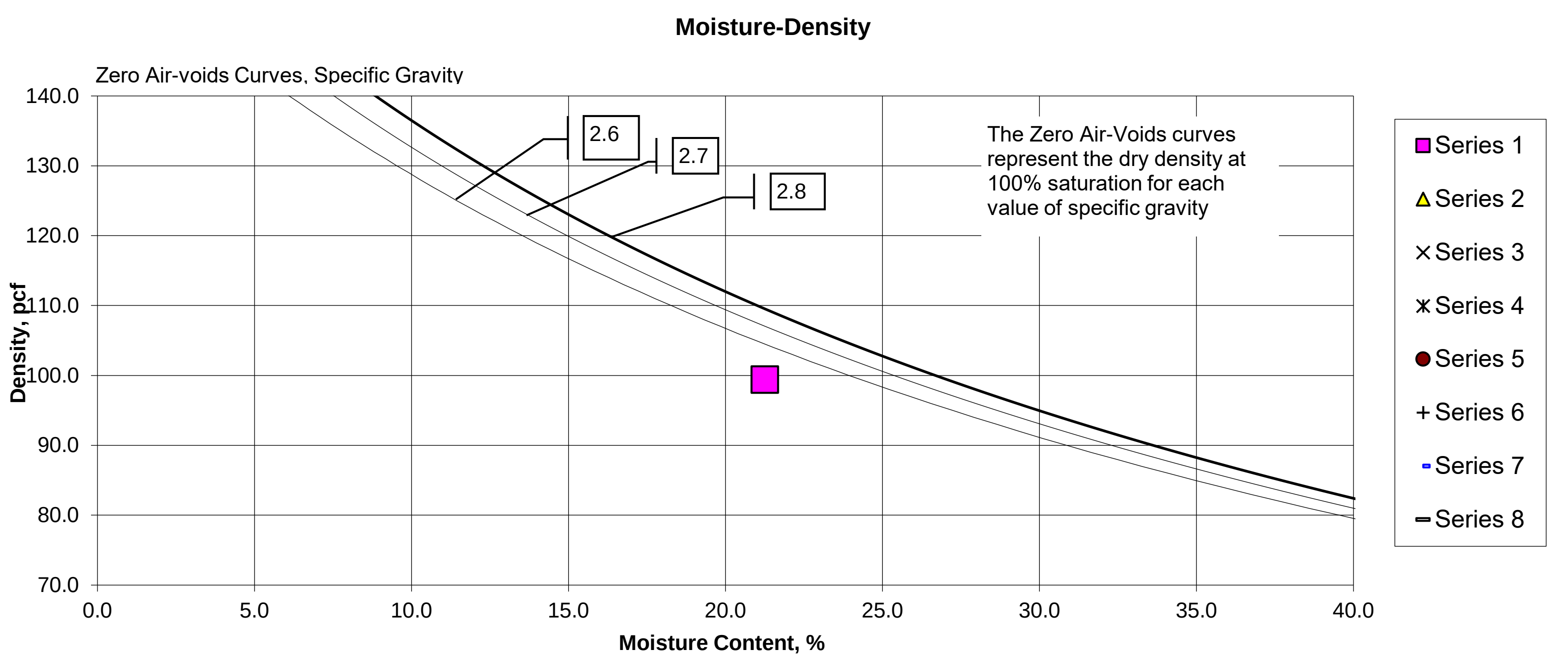


Moisture-Density-Porosity Report
Cooper Testing Labs, Inc. (ASTM D7263b)

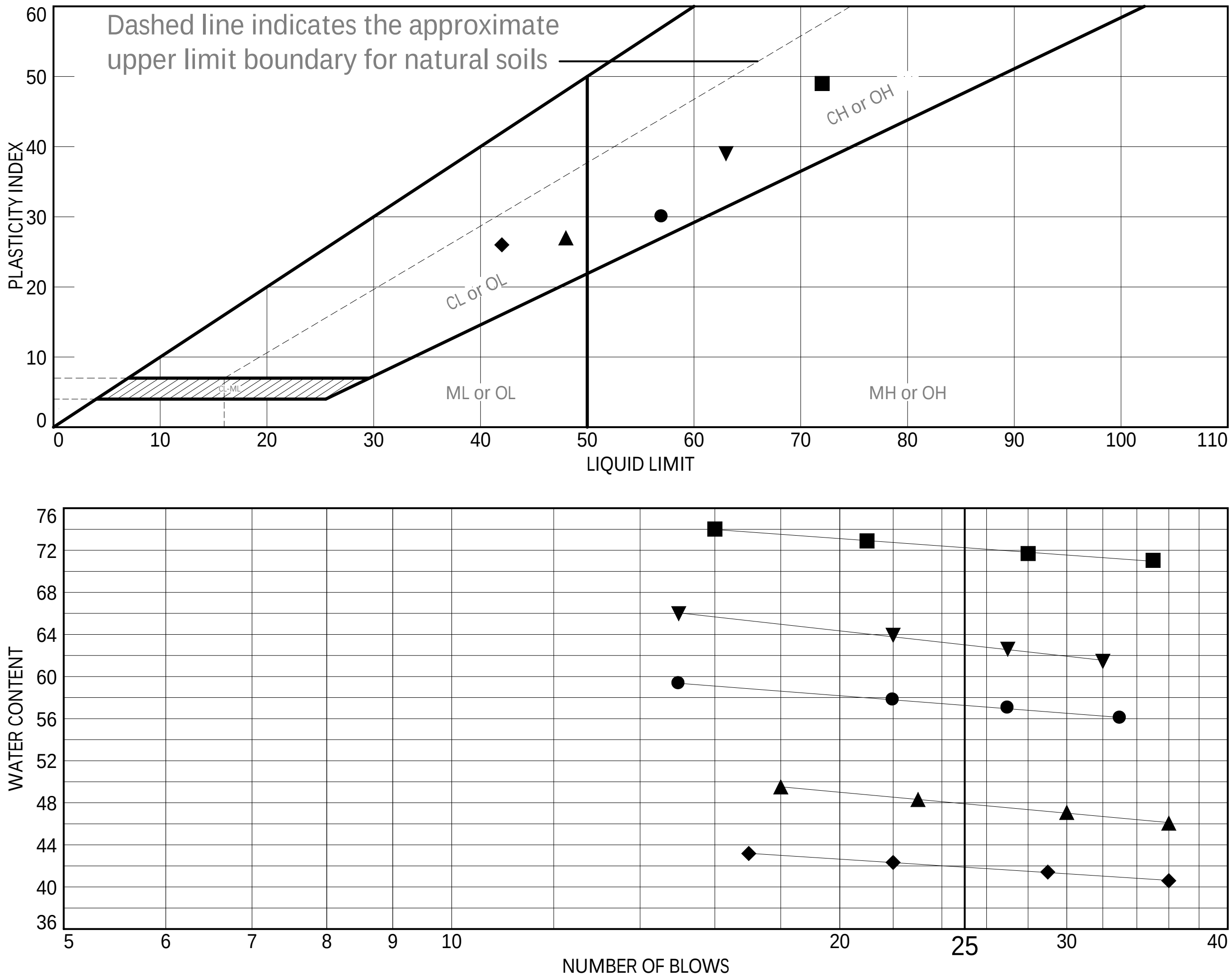
CTL Job No: 461-388e **Project No.** WG3444 **By:** RU
Client: Geosyntec Consultants **Date:** 05/29/25
Project Name: Collinsville-Pittsburg 230KV Onshore **Remarks:**

Boring:	B-103							
Sample:	103-19							
Depth, ft:	80-81.5							
Visual Description:	Brown Silty SAND							
Actual G_s								
Assumed G_s	2.70							
Moisture, %	21.3							
Wet Unit wt, pcf	120.6							
Dry Unit wt, pcf	99.4							
Dry Bulk Dens.ρb, (g/cc)	1.59							
Saturation, %	82.5							
Total Porosity, %	41.0							
Volumetric Water Cont,Θw,%	33.9							
Volumetric Air Cont., Θa,%	7.2							
Void Ratio	0.70							
Series	1	2	3	4	5	6	7	8

Note: All reported parameters are from the as-received sample condition unless otherwise noted. If an assumed specific gravity (Gs) was used then the saturation, porosities, and void ratio should be considered approximate.



LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Fat CLAY w/ Sand	57	27	30			
■	Brown Fat CLAY w/ Sand	72	23	49			
▲	Olive Brown Lean CLAY	48	21	27			
◆	Brown Lean CLAY	42	16	26	99.4	87.6	CL
▼	Olive Brown Fat CLAY	63	24	39			

Project No. 461-388 Client: Geosyntec Consultants

Project: Collinsville-Pittsburg 230KV Onshore - WG3444

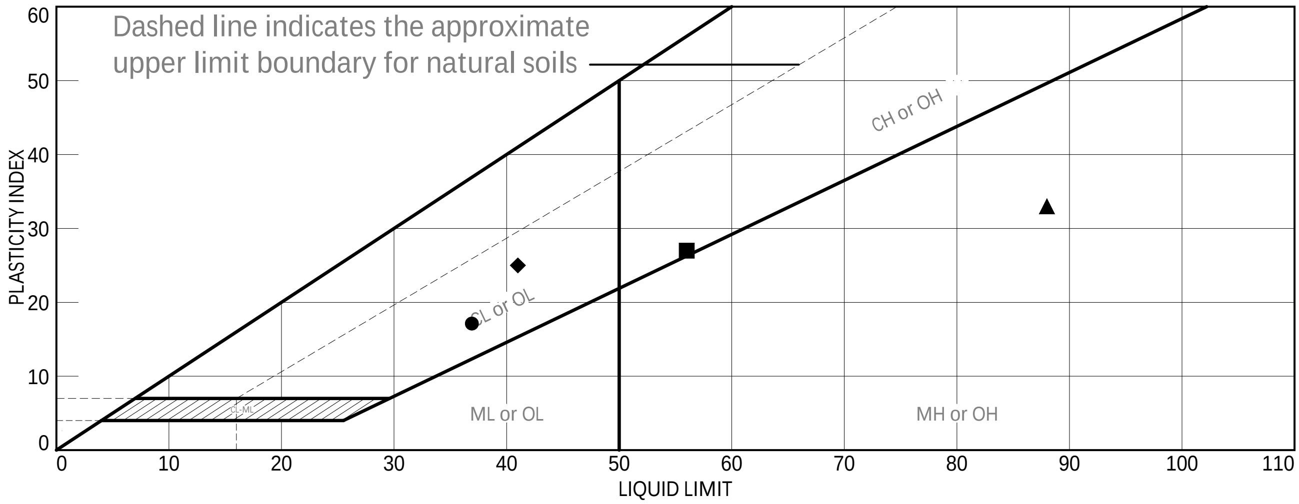
	Source of Sample	Depth	Sample Number
●	B-101	2.5-4'	101-2
■	B-101	20-21.5'	101-6
▲	B-101	60-62.5'	101-14
◆	B-102A	25-26.5'	102-5A
▼	B-102A	35-37.5'	102-7A

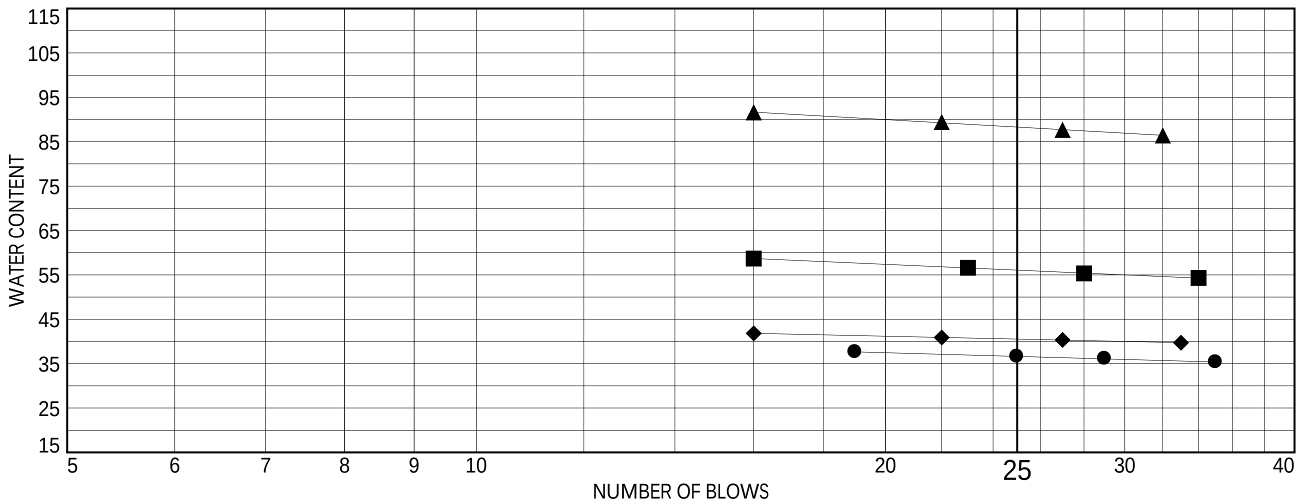
Remarks:

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Olive Brown Sandy Lean CLAY	37	20	17			
■	Brown Fat CLAY w/ Sand	56	29	27			
▲	Dark Brown Elastic SILT w/ Sand	88	55	33			
◆	Gray Sandy Lean CLAY	41	16	25			

Project No. 461-388 Client: Geosyntec Consultants

Project: Collinsville-Pittsburg 230KV Onshore - WG3444

●Source of Sample: B-102A Depth: 65-67.5' Sample Number: 102-13A
■Source of Sample: B-103 Depth: 2.5-4' Sample Number: 103-3
▲Source of Sample: B-103 Depth: 55-57' Sample Number: 103-14
◆Source of Sample: B-103 Depth: 70-72.5' Sample Number: 103-17

Remarks:

COOPER TESTING LABORATORY

Figure

Expansion Index

ASTM D-4829-07 X

COOPER TESTING LABORATORY

CTL Job No.:	461-388	**Boring:**	B-101	**Date:**	5/22/2025
Client:	Geosyntec Consultants	**Sample:**	101-4	**By:**	PJ
Project Name:	Coloinsville-Pittsburg 230KV Onshore	**Depth:**	10-11.5'		
Project No:	WG3444				

Visual Description: Olive Brown CLAY w/ Sand

Processing:

Percent Passing #4 Sieve

Total Air Dry Weight:	N/A
Wt. Retained on #4 Sieve:	N/A
% Retained	N/A
% Passing #4 Sieve:	N/A

Sample Dimensions

Height (in.)= 1.003 **Diameter (in.) =** 4.001

Moisture Calcs

	Initial	Final
Tare #		
Wet Wt. + Tare, (gm)	821.3	888.5
Dry Wt. + Tare, (gm)	769.5	769.5
Tare Wt., (gm)	116.3	116.3
Wt. Of Water, (gm)	51.8	119.0
% Water	18.1	41.5

Remolding:

Tamp two lifts, 15 blows/lift @ slightly below optimum moisture content

	Initial	Final	
Ring & Sample:	705.0	772.2	grams
Ring:	366.7	366.7	grams
Remolded Wet Wt.:	338.3	405.5	grams
Wet Density	102.2	106.3	pcf
Dry Density	86.6	75.1	pcf
% Sat. = (2.7)(dry dens.)(m/c) / 168.48 - (dry dens.)	51.5	90.2	UBC Saturation range 49-51% ASTM Saturation range 48-52%

Expansion Test:

Date	Time	Dial	Delta h, %
5/20/2025	11:57	0.0000	0.000
5/20/2025	12:08	-0.0129	1.286
5/20/2025	13:53	-0.0562	5.603
5/20/2025	17:39	-0.0980	9.771
5/21/2025	6:48	-0.1531	15.264
5/21/2025	8:14	-0.1532	15.274
		Total Dial	15.3

Tested with 1 psi Surcharge

Remarks:

Expansion Index

$$\frac{\text{initial dial - final dial}}{\text{initial sample height}} \times 1000$$

Results

EI =	153

This test is a simplified index test and may not show the full potential for expansion and/or shrinkage. Use result with caution! See ASTM D 3877 or D4546

Organic Content Test
ASTM D 2974-20 (Method A - 440 ºC)

COOPER TESTING LABORATORY

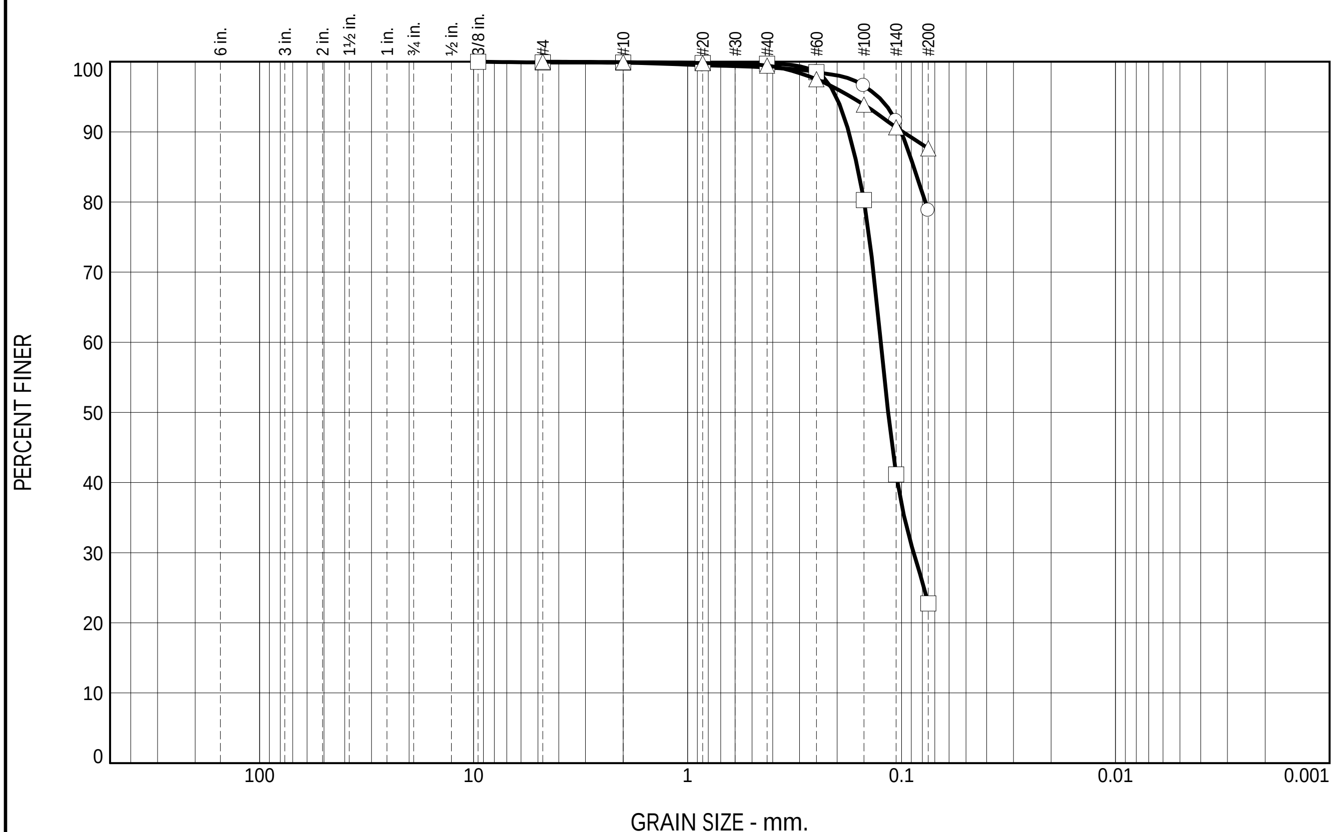
CTL Number: 461-388 **Project Name:** Collinsville-Pittsburg 230KV Onshore **Date:** 5/15/2025
Client Name: Geosyntec Consultants **Project Number:** WG3444 **By:** RU

Boring	B-101	B-103						
Sample	101-8	103-14						
Depth (ft)	30-32.5	55-57						
Visual Description	Olive Gray CLAY	Dark Brown Organic Elastic SILT w/ Sand						
Dish Number								
Dish weight (g)	63.70	81.76						
Soil, Org, Dish & H_2O (g)	191.37	201.59						
Oven Dry wt (110°C) (g)	157.06	129.07						
Furnace Dry wt. (440°C) (g)	154.38	121.72						
Moisture Content (%)	36.8	153.3						
Ash Content (%)	97.1	84.5						
Organic Material (%)	2.9	15.5						

Note: ASTM provides no guidelines for including information about the organic content of a sample in the description when the wet/dry liquid limit data is not available. CTL developed the following guidelines to fill this gap:

0-5%: The organics are either not mentioned or mentioned as being "trace".
5-15%: The soil is considered as inorganic and is classified, as per ASTM 2487, with "with organics" included in the description.
15-50%: The soil is considered as organic and is described, per ASTM 2487.
> 50%: The soil is described as "Peat".

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PL	PI
○	0.0	0.0	21.2	78.8					
□	0.0	0.1	77.1	22.8					
△	0.0	0.0	12.4	87.6		CL	42	16	26

SIEVE inches size	PERCENT FINER ○	□	△
3/8"		100.0	
GRAIN SIZE			
D_{60}		0.1250	
D_{30}		0.0878	
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	99.9	100.0
#10	99.9	99.9	99.9
#20	99.5	99.8	99.8
#40	99.2	99.7	99.4
#60	98.5	98.5	97.5
#100	96.6	80.3	93.9
#140	91.6	41.2	90.6
#200	78.8	22.8	87.6

Material Description

○ Brown CLAY w/ Sand

□ Brown Silty SAND

△ Brown Lean CLAY

REMARKS:

○

□

△

○ Source of Sample: B-101 Depth: 50-51.5' Sample Number: 101-12

□ Source of Sample: B-102A Depth: 10-11.5' Sample Number: 102-2A

△ Source of Sample: B-102A Depth: 25-26.5' Sample Number: 102-5A

COOPER TESTING LABORATORY

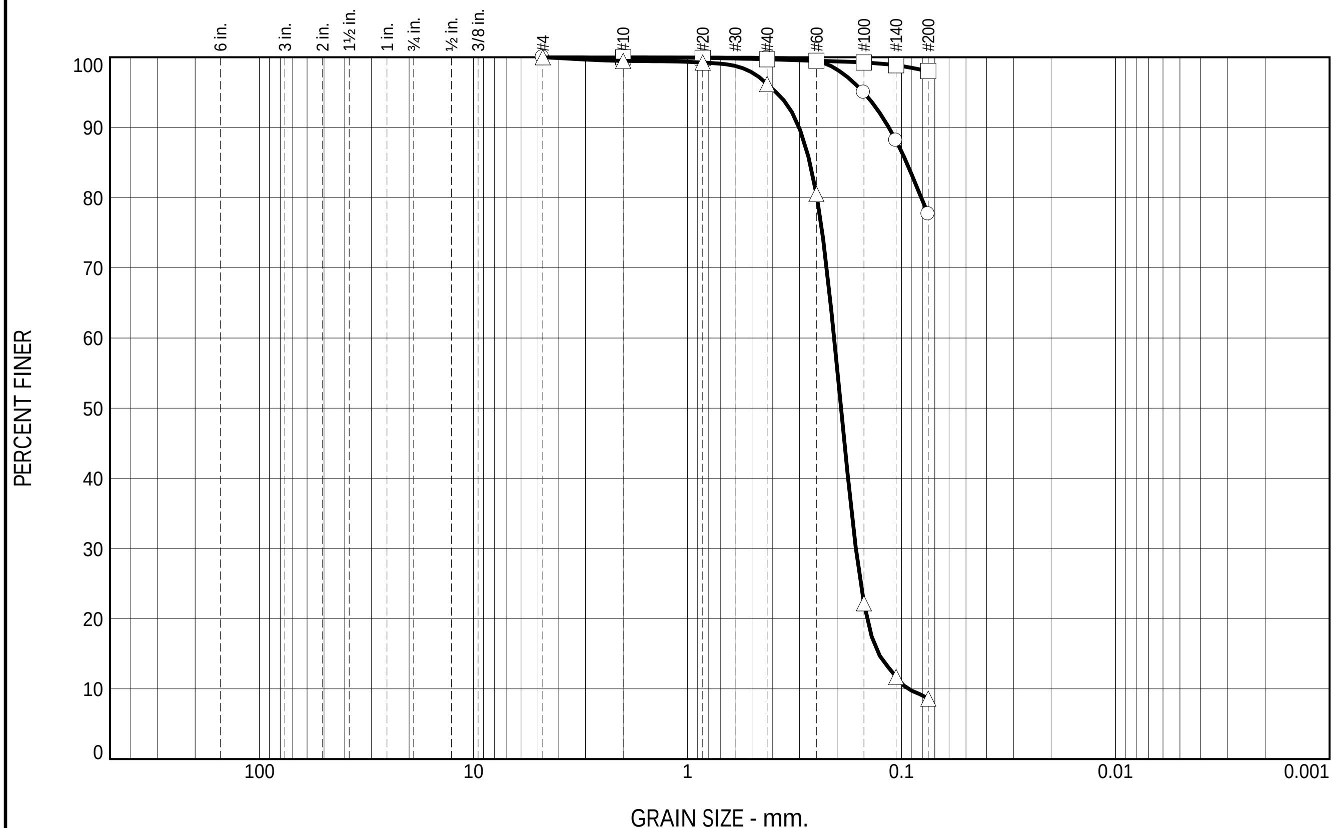
Client: Geosyntec Consultants

Project: Collinsville-Pittsburg 230KV Onshore - WG3444

Project No.: 461-388

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PL	PI
○	0.0	0.0	22.4	77.6					
□	0.0	0.0	1.9	98.1					
△	0.0	0.0	91.4	8.6					

SIEVE inches size	PERCENT FINER ○	□	△
GRAIN SIZE			
D_{60}			0.2066
D_{30}			0.1634
D_{10}			0.0930
COEFFICIENTS			
C_c			1.39
C_u			2.22

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0		100.0
#10	100.0	100.0	99.5
#20	100.0	99.9	99.2
#40	99.9	99.7	96.2
#60	99.5	99.5	80.5
#100	95.0	99.3	22.2
#140	88.1	98.9	11.7
#200	77.6	98.1	8.6

Material Description

○ Olive Brown SILT w/ Sand

□ Gray SILT

△ Brown Poorly Graded SAND w/ Silt

REMARKS:

○

□

△

○ Source of Sample: B-102A Depth: 45-46.5' Sample Number: 102-9A

□ Source of Sample: B-103 Depth: 5-6.5' Sample Number: 103-4

△ Source of Sample: B-103 Depth: 25-26.5' Sample Number: 103-8

COOPER TESTING LABORATORY

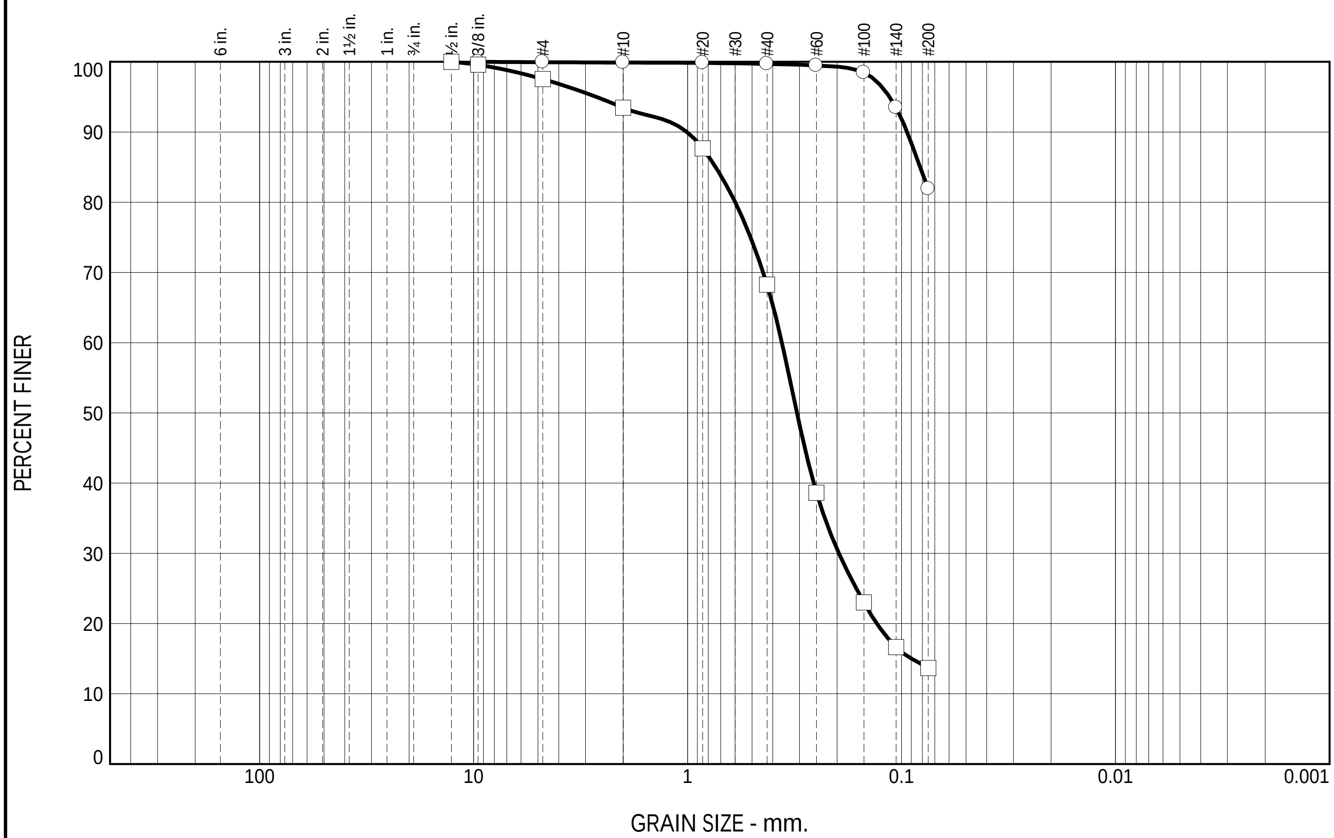
Client: Geosyntec Consultants

Project: Collinsville-Pittsburg 230KV Onshore - WG3444

Project No.: 461-388

Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PL	PI
○	0.0	0.1	18.0	81.9					
□	0.0	2.5	83.8	13.7					

SIEVE inches size	PERCENT FINER ○	□	
1/2"		100.0	
3/8"	100.0	99.6	
	GRAIN SIZE		
D_{60}		0.3622	
D_{30}		0.1962	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	
#4	99.9	97.5	
#10	99.9	93.5	
#20	99.8	87.7	
#40	99.7	68.3	
#60	99.5	38.6	
#100	98.5	23.0	
#140	93.5	16.6	
#200	81.9	13.7	

Material Description

○ Dark Gray CLAY w/ Sand

□ Brown Silty SAND

REMARKS:

○

□

○ Source of Sample: B-103 Depth: 45-46.5' Sample Number: 103-12

□ Source of Sample: B-103 Depth: 80-81.5' Sample Number: 103-19

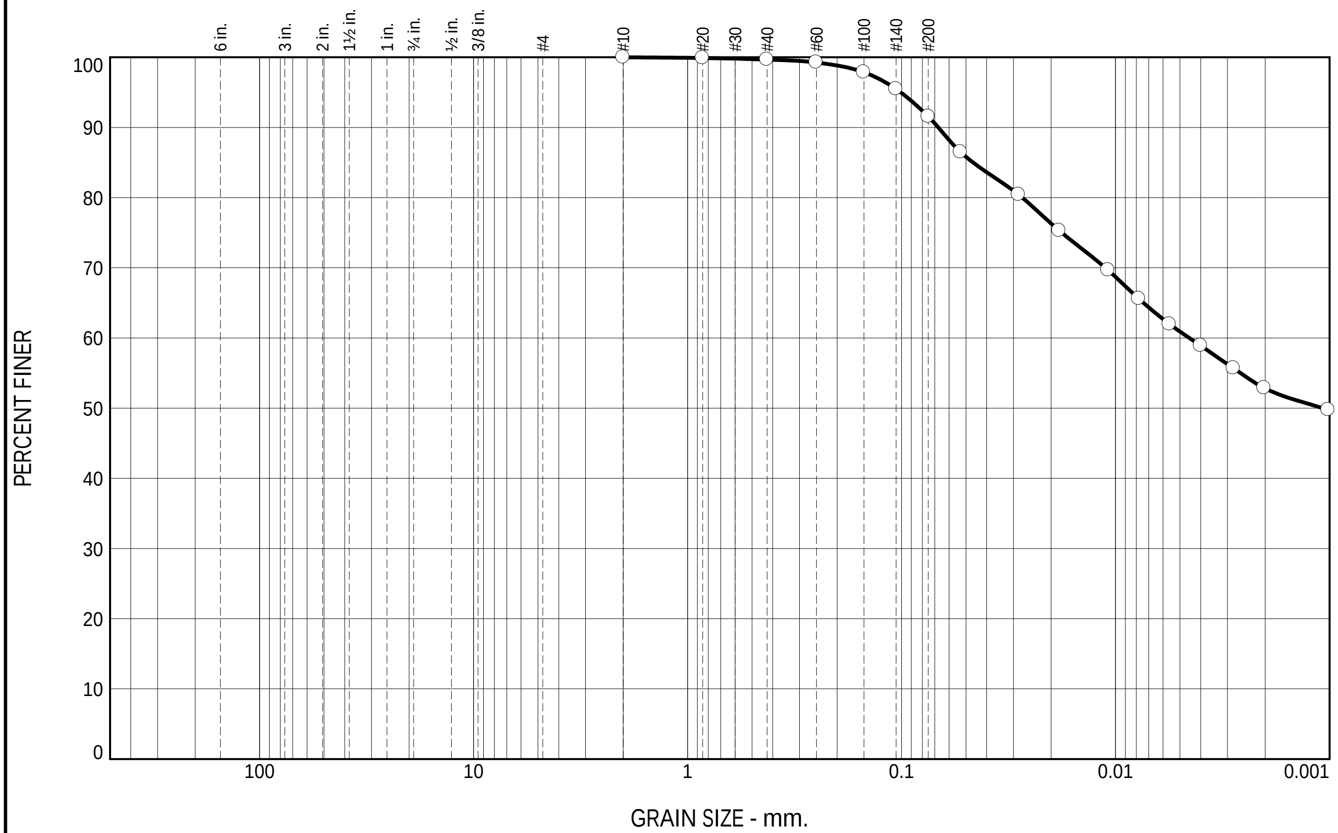
COOPER TESTING LABORATORY

Client: Geosyntec Consultants

Project: Collinsville-Pittsburg 230KV Onshore - WG3444

Project No.: 461-388 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PL	PI
○	0.0	0.0	8.4	38.8	52.8				

SIEVE inches size	PERCENT FINER ○		
	GRAIN SIZE		
D_{60}	0.0045		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○		
#10	100.0		
#20	99.9		
#40	99.7		
#60	99.3		
#100	97.9		
#140	95.5		
#200	91.6		
#270	86.5		

Material Description

○ Brownish Gray CLAY

REMARKS:

○

○ Source of Sample: B-101 Depth: 75-77.5' Sample Number: 101-17

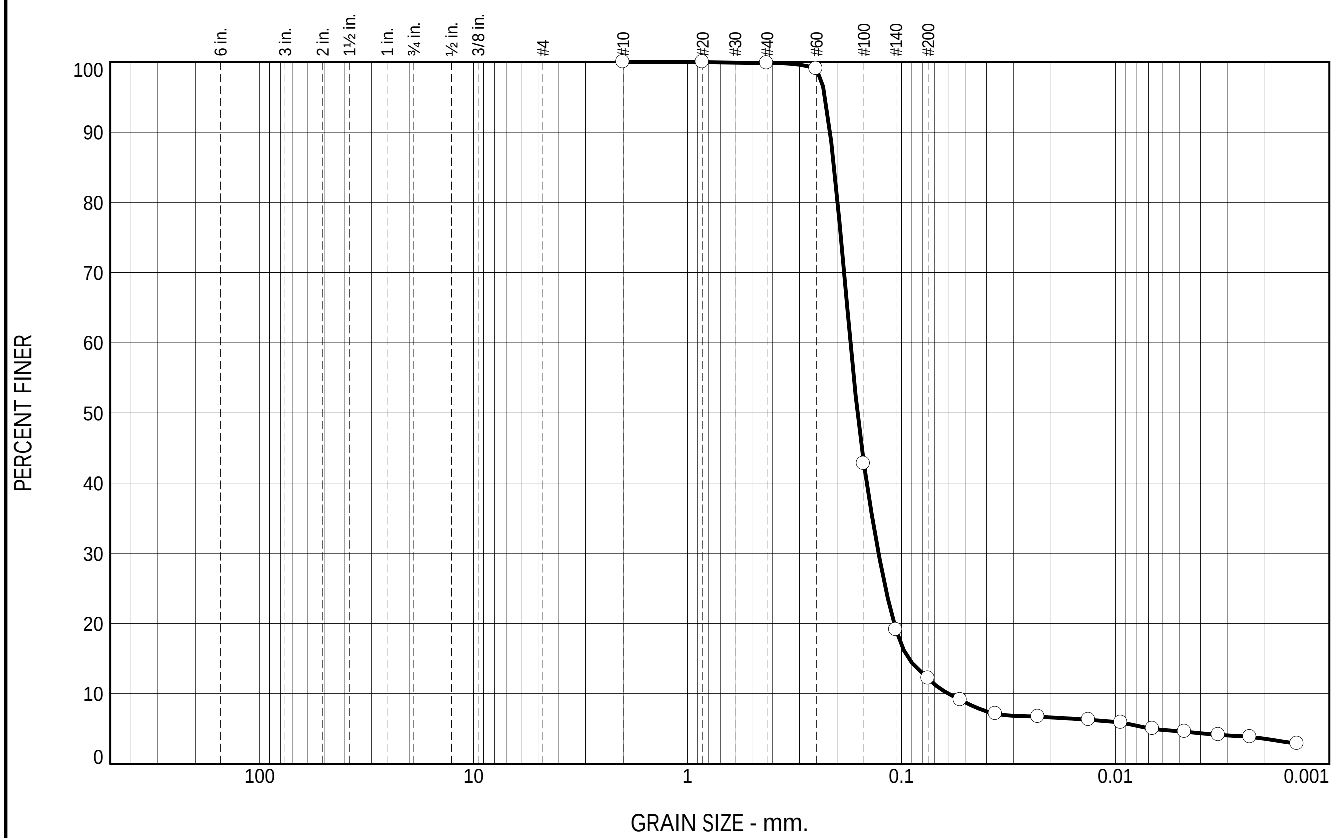
COOPER TESTING LABORATORY

Client: Geosyntec Consultants

Project: Collinsville-Pittsburg 230KV Onshore - WG3444

Project No.: 461-388 Figure

Particle Size Distribution Report



	+3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PL	PI
○	0.0	0.0	87.8	8.6	3.6				

SIEVE inches size	PERCENT FINER ○		

	GRAIN SIZE		
D_{60}	0.1730		
D_{30}	0.1280		
D_{10}	0.0604		

	COEFFICIENTS		
C_c	1.57		
C_u	2.87		

SIEVE number size	PERCENT FINER ○		
#10	100.0		
#20	100.0		
#40	99.8		
#60	99.0		
#100	42.8		
#140	19.1		
#200	12.2		
#270	9.1		

Material Description

○ Dark Gray Silty SAND

REMARKS:

○

○ Source of Sample: B-103 Depth: 15-16.5' Sample Number: 103-6

COOPER TESTING LABORATORY

Client: Geosyntec Consultants

Project: Collinsville-Pittsburg 230KV Onshore - WG3444

Project No.: 461-388 Figure

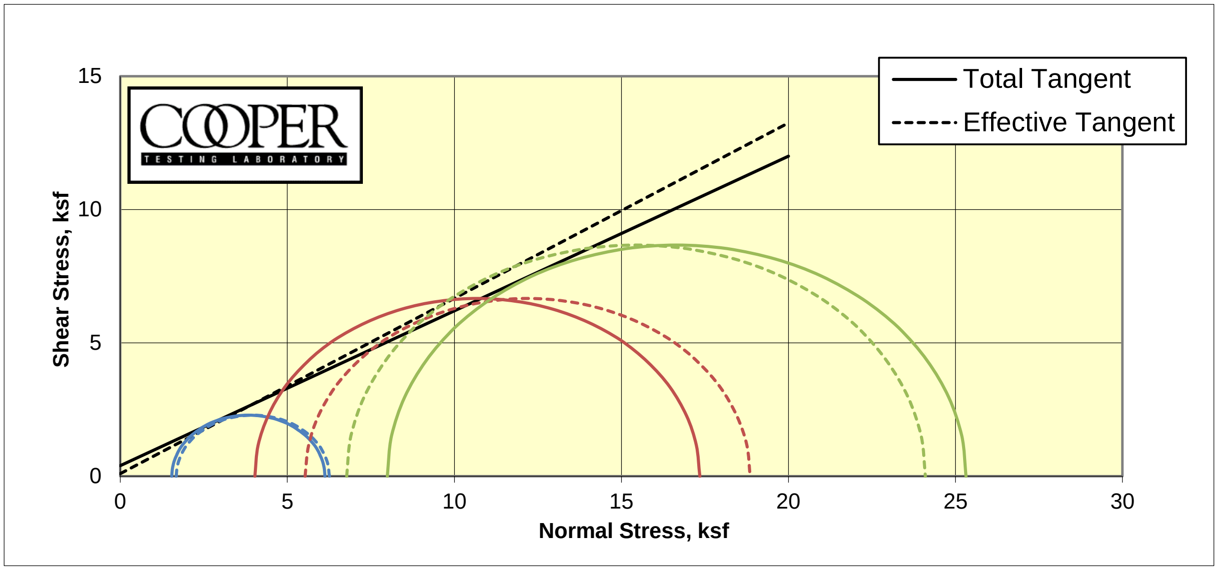
Corrosivity Tests Summary

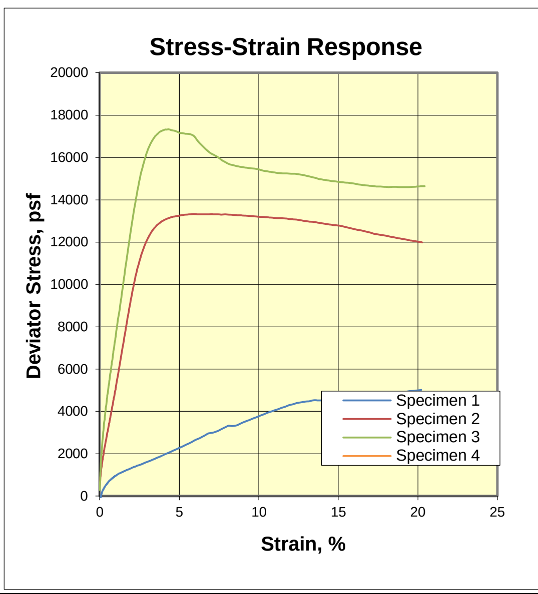
COOPER TESTING LABORATORY

CTL # 461-388 **Date:** 5/29/2025 **Tested By:** PJ **Checked:** PJ
Client: Geosyntec Consultants, Inc. **Project:** Collinsville-Pittsburg 230KV Onshore **Proj. No:** WG3444
Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate		pH	ORP		Sulfide	Moisture	Soil Visual Description
			As Rec.	Min	Sat.	mg/kg	mg/kg	%		(Redox)		Qualitative	At Test	
						Dry Wt.	Dry Wt.	Dry Wt.		E_H (mv)	At Test	by Lead	%	
Boring	**Sample, No.**	**Depth, ft.**	ASTM G57	Cal 643	ASTM G57	ASTM D4327	ASTM D4327	ASTM D4327	ASTM G51	ASTM G200	Temp °C	Acetate Paper	ASTM D2216	
B-101	101-1	0'-2.5'	1,984	-	-	17	115	0.0115	7.7	-	-	-	18.4	Brown Sandy CLAY
B-102A	102-5A	25'-26.5'	883	-	-	184	236	0.0236	7.9	-	-	-	23.7	Brown Lean CLAY
B-103	103-4	5'-6.5'	221	-	-	4,687	1,047	0.1047	6.5	-	-	-	53.3	Gray SILT

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767



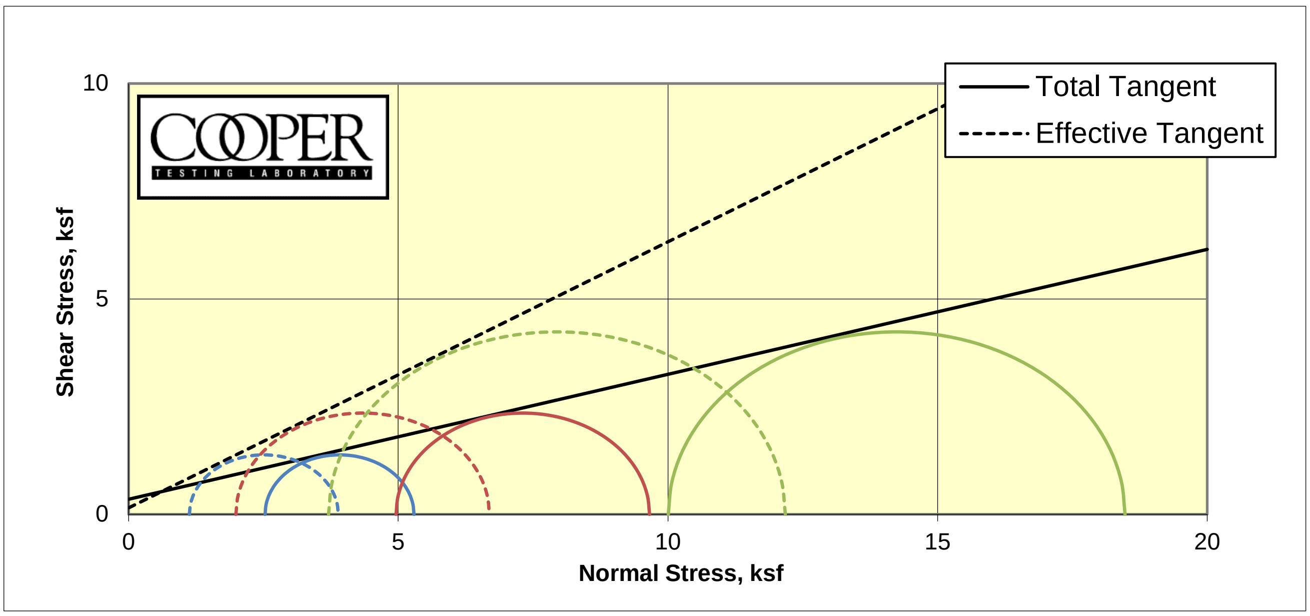


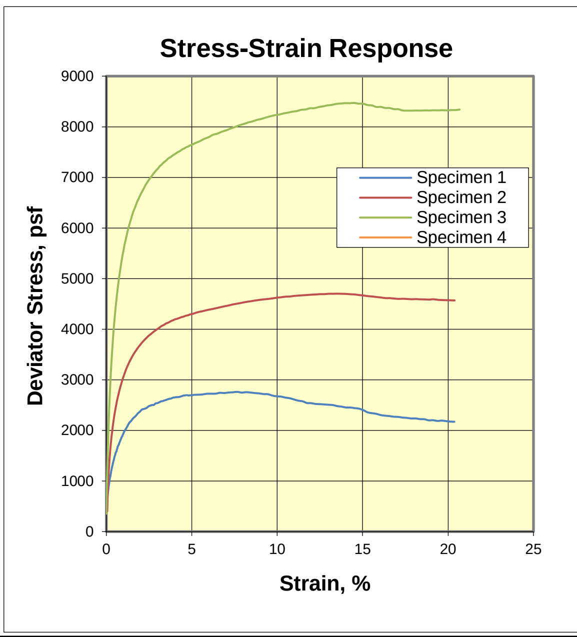
CTL Number:	461-388			
Client Name:	Geosyntec Consultants			
Project Name:	Collinsville-Pittsburg 230KV Onshore			
Project Number:	WG3444			
Date:	5/22/2025	By:	MD/DC	
Total C	**0.400**	**ksf**		
Total phi	**30.1**	**degrees**		
Eff. C	**0.090**	**ksf**		
Eff. Phi	**33.3**	**degrees**	©	

Remarks: Engineering judgement is required to determine phi and cohesion, no phi or cohesion is reported. Curved strength envelope. Best fit line may overstate cohesion. To add phi and cohesion to the report go to the “Report” tab and in cells M18 through P19 enter end points for a line through the Mohr's circles. The points plotted can be changed on the "Shear Values" tab using cells B3, F3, and J3.

Specimen	**1**	**2**	**3**	**4**
Boring	B-101	B-101	B-101	
Sample	101-8	101-8	101-8	
Depth	30-32.5(Tip-17")	30-32.5(Tip-10.5")	30-32.5(Tip-4")	
Visual Description	Olive Gray CLAY w/ Sand	Olive Gray CLAY w/ Sand	Olive Gray CLAY w/ Sand	
MC (%)	28.7	24.2	22.7	
Dry Density (pcf)	95.6	100.1	102.3	
Saturation (%)	99.1	93.2	92.0	
Void Ratio	0.795	0.714	0.678	
Diameter (in)	2.87	2.87	2.87	
Height (in)	5.99	6.01	6.00	
		Final		
MC (%)	28.3	25.9	23.2	
Dry Density (pcf)	96.5	100.3	104.8	
Saturation (%)	100.0	100.0	100.0	
Void Ratio	0.778	0.712	0.638	
Diameter (in)	2.87	2.89	2.87	
Height (in)	5.93	5.93	5.87	
Cell Pressure (psi)	90.0	107.8	135.4	
Back Pressure (psi)	79.3	79.8	79.9	
		Effective Stresses At:		
Strain (%)	15.0	5.9	4.3	
Deviator (ksf)	4.582	13.321	17.327	
Excess PP (psi)	-0.9	-10.5	8.4	
Sigma 1 (ksf)	6.260	18.856	24.104	
Sigma 3 (ksf)	1.678	5.535	6.777	
P (ksf)	3.969	12.196	15.441	
Q (ksf)	2.291	6.661	8.663	
Stress Ratio	3.730	3.407	3.557	
Rate (in/min)	0.0005	0.0005	0.0005	

Consolidated Undrained Triaxial Compression with Pore Pressure
ASTM D4767





CTL Number:	461-388
Client Name:	Geosyntec Consultants
Project Name:	Collinsville-Pittsburg 230KV Onshore
Project Number:	WG3444
Date:	5/27/2025 By: MD/DC
Total C	**0.350** ksf
Total phi	**16.2** degrees
Eff. C	**0.150** ksf
Eff. Phi	**31.7** degrees

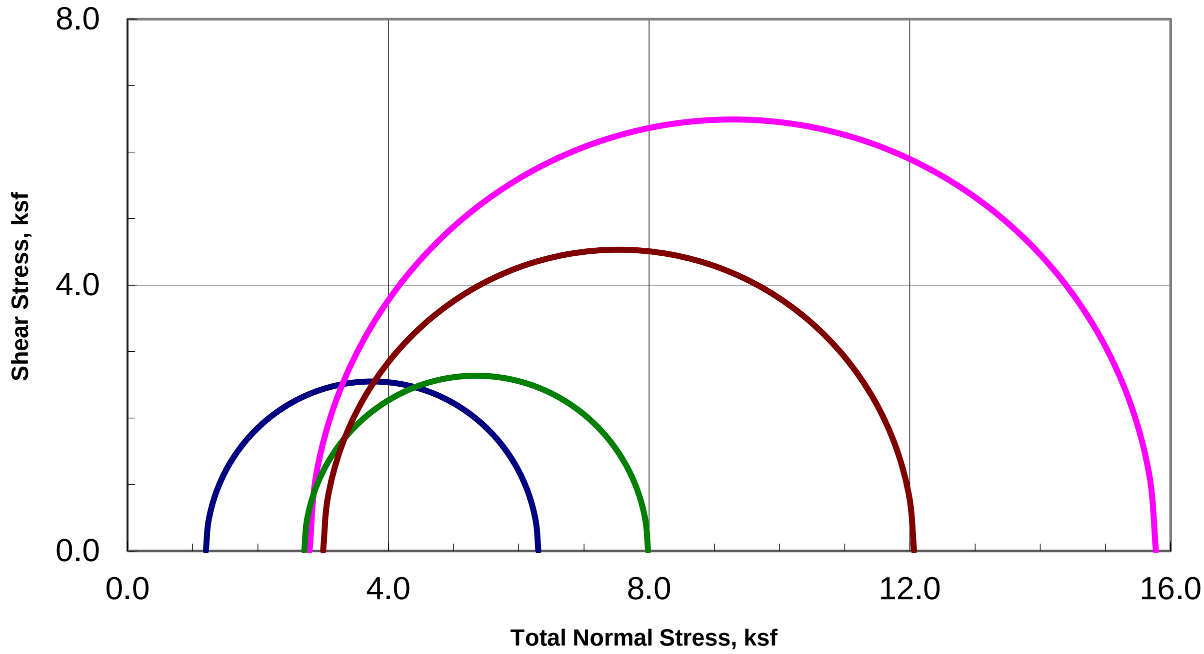
©

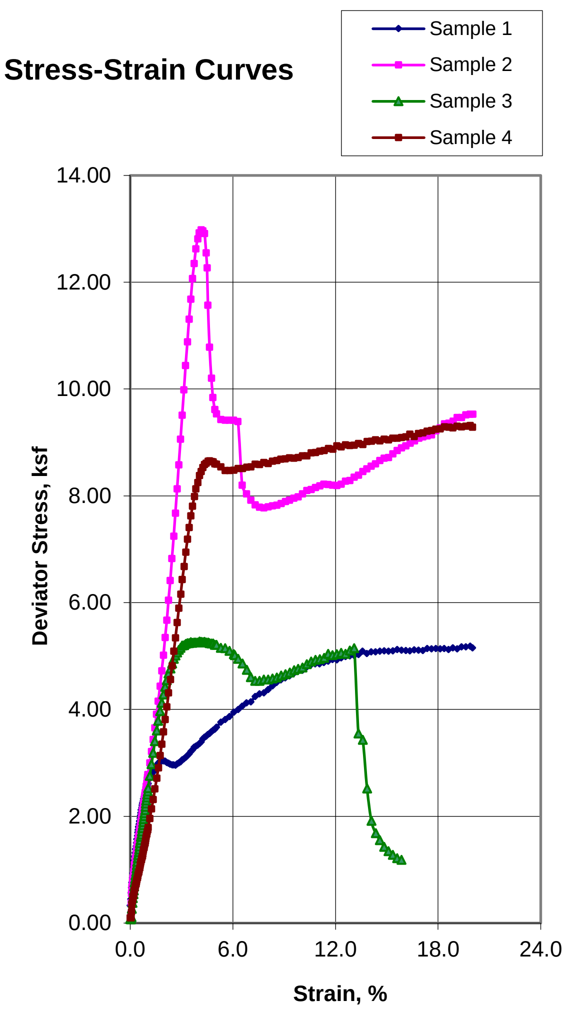
Specimen	1	2	3	4
Boring	B-103	B-103	B-103	
Sample	103-15	103-15	103-15	
Depth	60-62.5(Tip-17")	60-62.5(Tip-10.5")	60-62.5(Tip-4")	
Visual Description	Gray CLAY w/ Sand	Gray CLAY w/ Sand	Gray CLAY w/ Sand	
MC (%)	40.8	39.1	35.1	
Dry Density (pcf)	79.6	81.3	86.2	
Saturation (%)	97.0	96.7	97.4	
Void Ratio	1.156	1.112	0.992	
Diameter (in)	2.86	2.87	2.86	
Height (in)	5.99	6.00	6.00	
	Final			
MC (%)	39.3	34.7	27.4	
Dry Density (pcf)	82.5	87.8	97.9	
Saturation (%)	100.0	100.0	100.0	
Void Ratio	1.081	0.954	0.753	
Diameter (in)	2.84	2.78	2.73	
Height (in)	5.88	5.89	5.80	
Cell Pressure (psi)	67.6	84.4	119.6	
Back Pressure (psi)	50.1	50.0	50.1	
	Effective Stresses At:			
Strain (%)	7.7	13.5	14.5	
Deviator (ksf)	2.761	4.701	8.470	
Excess PP (psi)	9.7	20.6	43.7	
Sigma 1 (ksf)	3.888	6.690	12.177	
Sigma 3 (ksf)	1.127	1.989	3.707	
P (ksf)	2.507	4.340	7.942	
Q (ksf)	1.381	2.351	4.235	
Stress Ratio	3.451	3.364	3.285	
Rate (in/min)	0.0005	0.0005	0.0005	

Cooper Testing Labs, Inc.
937 Commercial Street
Palo Alto, CA 94303

COOPER TESTING LABORATORY

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data	1	2	3	4
Moisture %	26.0	22.2	24.4	19.3
Dry Den,pcf	96.9	99.9	98.6	104.0
Void Ratio	0.740	0.686	0.709	0.620
Saturation %	95.0	87.5	93.1	84.1
Height in	6.06	5.67	6.07	6.08
Diameter in	2.88	2.88	2.88	2.87
Cell psi	8.3	19.4	18.8	20.8
Strain %	15.00	4.14	4.04	15.00
Deviator, ksf	5.099	12.982	5.273	9.063
Rate %/min	1.00	1.00	1.00	1.00
in/min	0.060	0.057	0.061	0.061
Job No.:	461-388a			
Client:	Geosyntec Consultants			
Project:	WG3444			
Boring:	B-101	B-101	B-102A	B-102A
Sample:	101-5	101-14	102-7A	102-9A
Depth ft:	15-17.5	60-62.5	35-37.5	45-47.5

Visual Soil Description

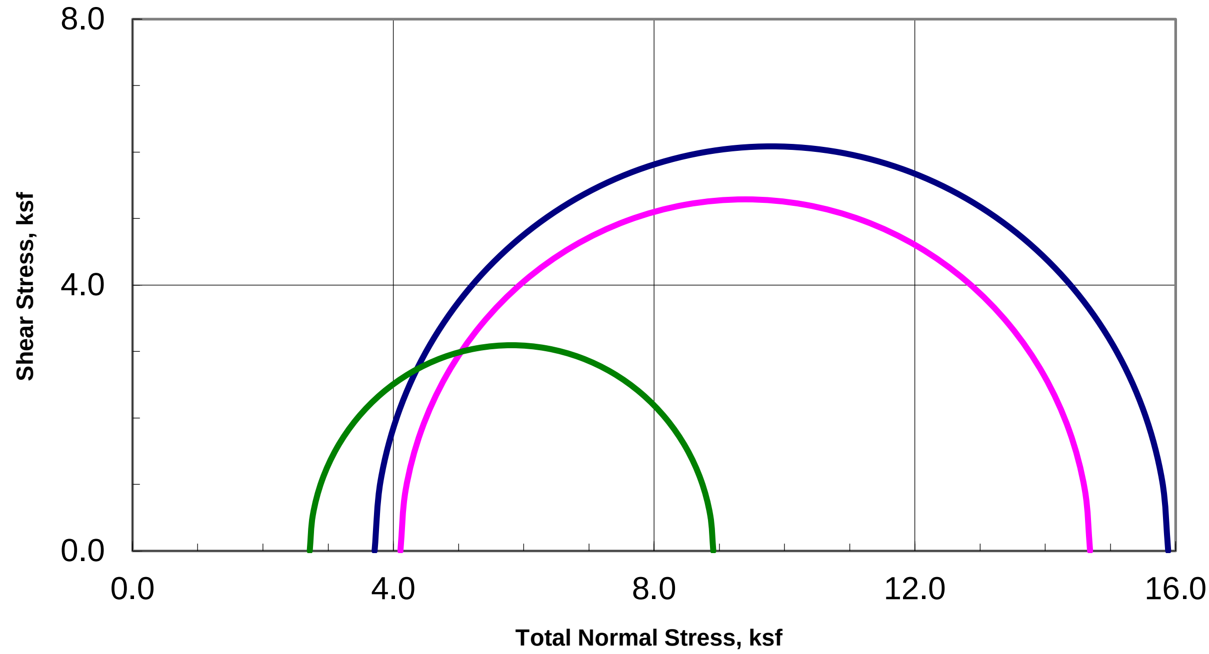
Sample #	
1	Olive CLAY w/ Sand
2	Olive Brown Lean CLAY
3	Olive Brown Fat CLAY
4	Olive Brown SILT w/ Sand

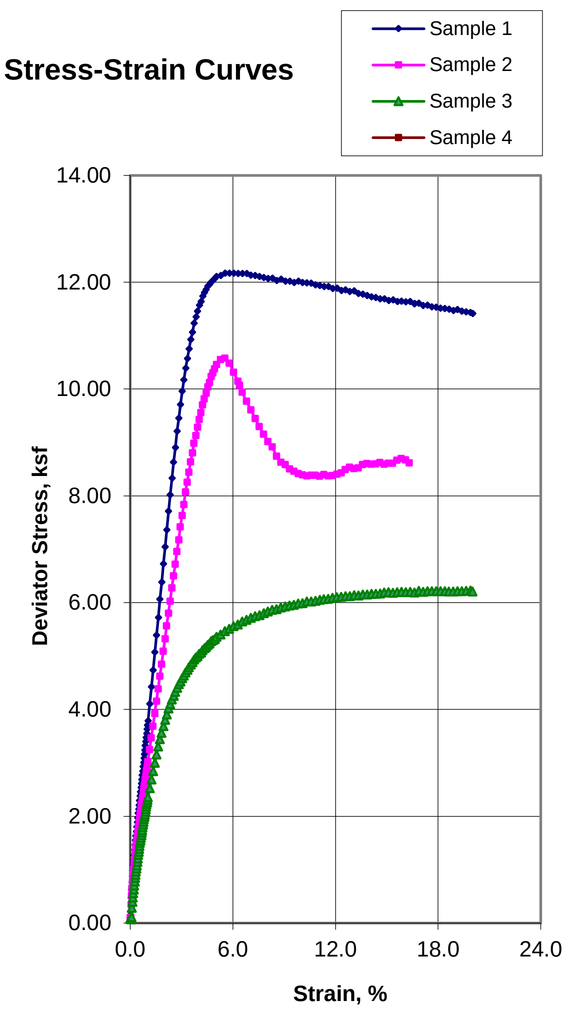
Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

Cooper Testing Labs, Inc.
937 Commercial Street
Palo Alto, CA 94303

Unconsolidated-Undrained Triaxial Test
ASTM D2850





Sample Data				
	1	2	3	4
Moisture %	20.1	24.8	21.4	
Dry Den,pcf	109.0	102.1	104.9	
Void Ratio	0.604	0.711	0.666	
Saturation %	93.4	97.6	90.1	
Height in	6.07	6.06	6.07	
Diameter in	2.86	2.86	2.87	
Cell psi	25.8	28.5	18.9	
Strain %	6.05	5.54	15.00	
Deviator, ksf	12.173	10.578	6.190	
Rate %/min	1.00	1.00	1.00	
in/min	0.061	0.060	0.061	
Job No.:	**461-388b**			
Client:	**Geosyntec Consultants**			
Project:	**WG3444**			
Boring:	B-102A	B-102A	B-103	
Sample:	102-13A	102-16A	103-17	
Depth ft:	65-67.5	80-82.5	70-72.5	

Visual Soil Description

Sample #	
1	Olive Brown Sandy Lean CLAY
2	Olive Gray Sandy SILT
3	Gray Sandy Lean CLAY
4	

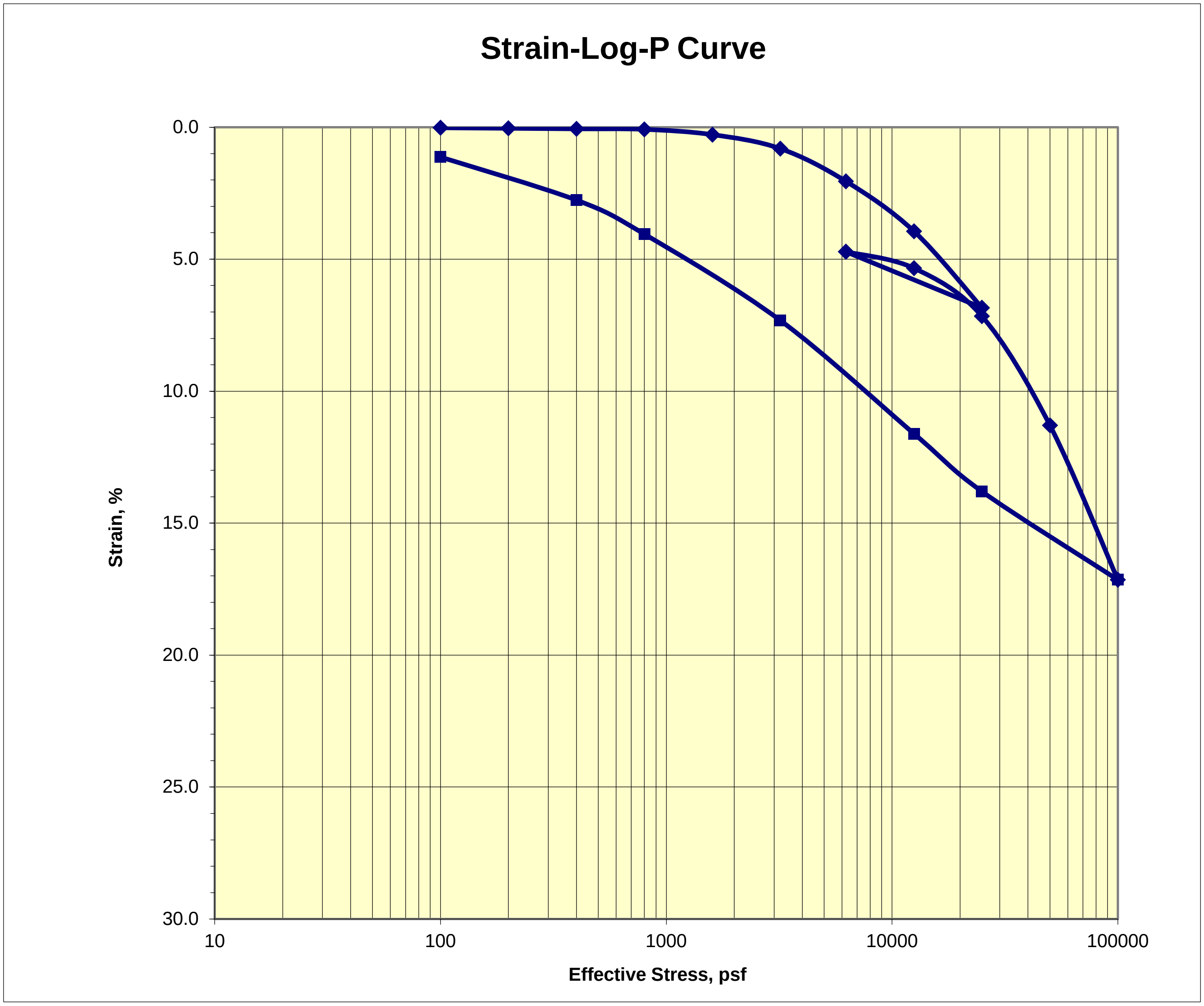
Remarks:

Note: Strengths are picked at the peak deviator stress or 15% strain which ever occurs first per ASTM D2850.

Consolidation Test
ASTM D2435

COOPER TESTING LABORATORY

Job No.:	461-388	**Boring:**	B-101	**Run By:**	HM
Client:	Geosyntec Consultants	**Sample:**	101-8	**Reduced:**	RU
Project:	WG3444	**Depth, ft.:**	30-32.5	**Checked:**	PJ
Soil Type:	Olive Gray CLAY			**Date:**	5/28/2025



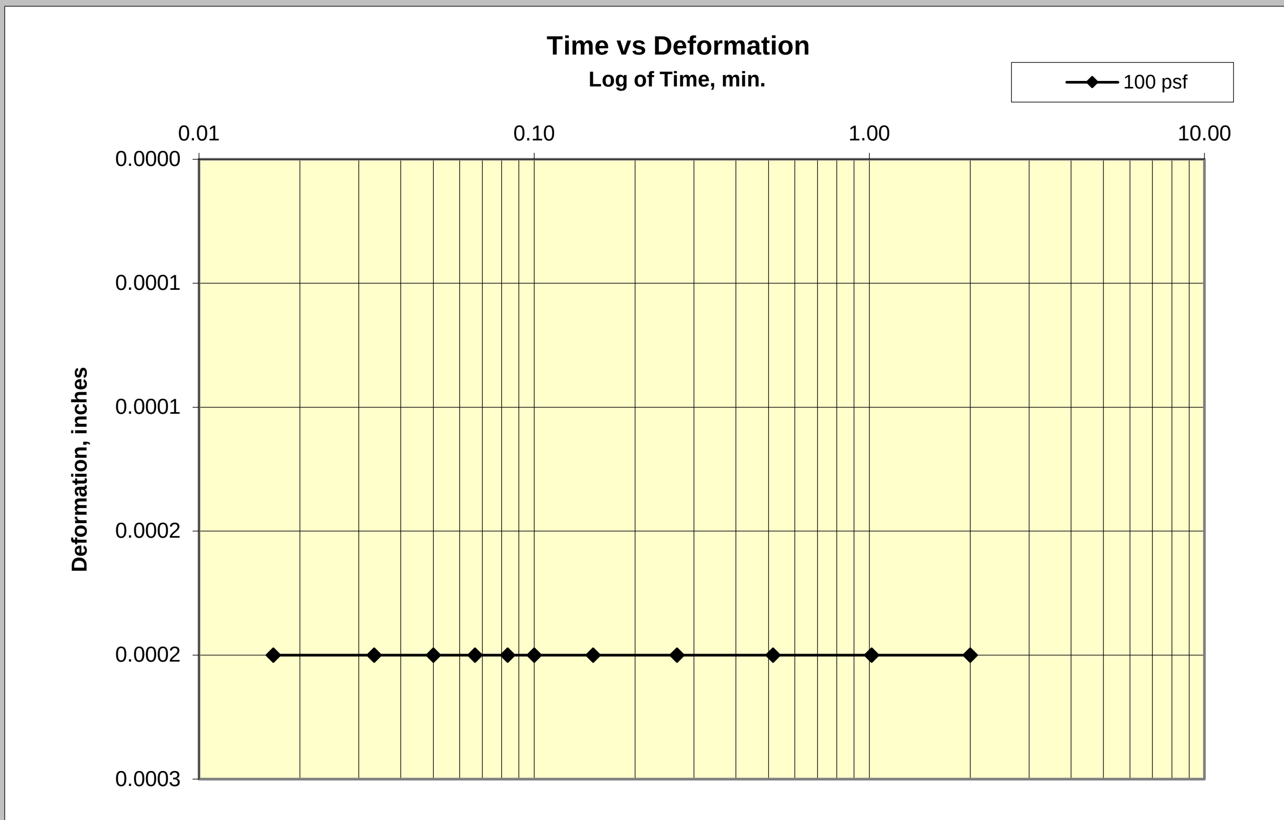
Assumed Gs 2.8	**Initial**	**Final**
Moisture %:	37.9	41.6
Dry Density, pcf:	80.4	80.8
Void Ratio:	1.174	1.165
% Saturation:	90.5	100.0

Remarks:

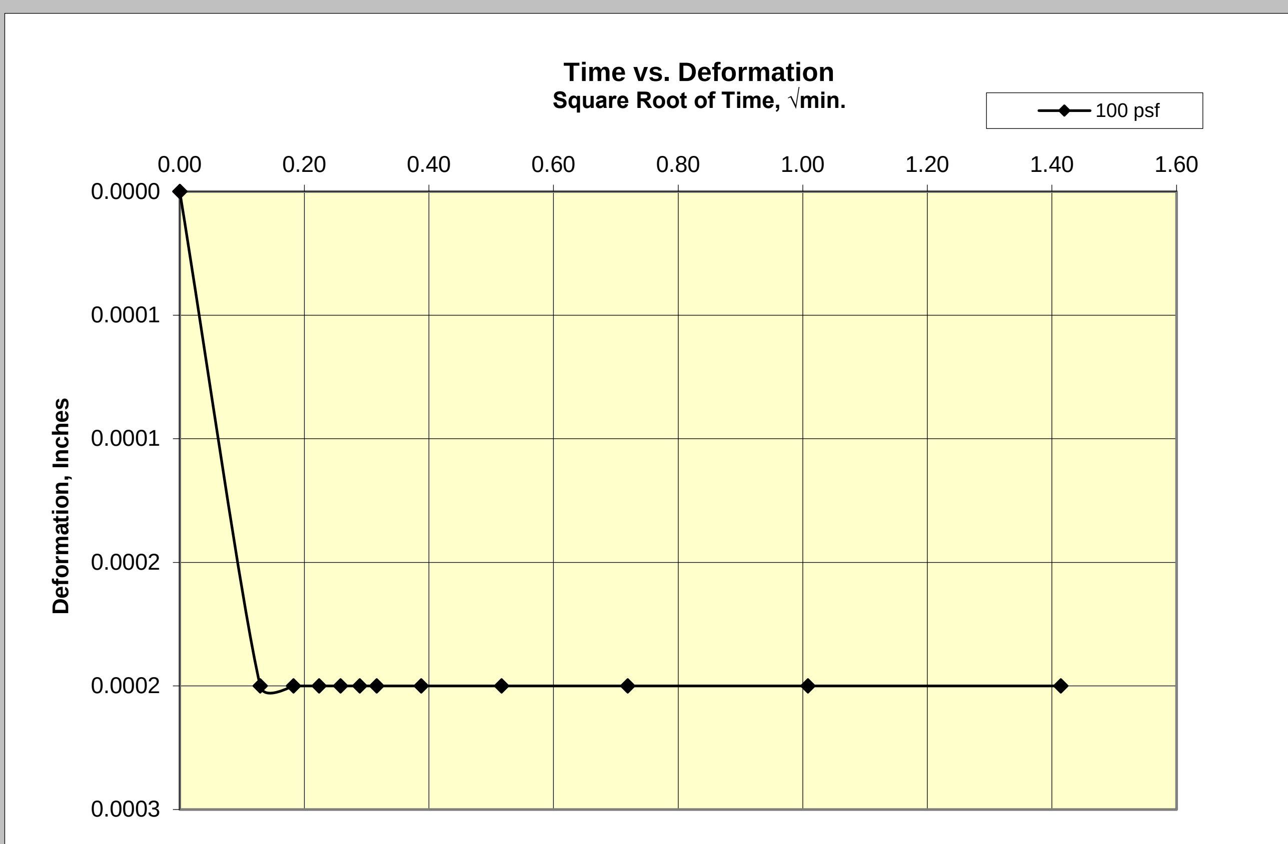
Cooper Testing Labs, Inc.

Load 1

100 psf

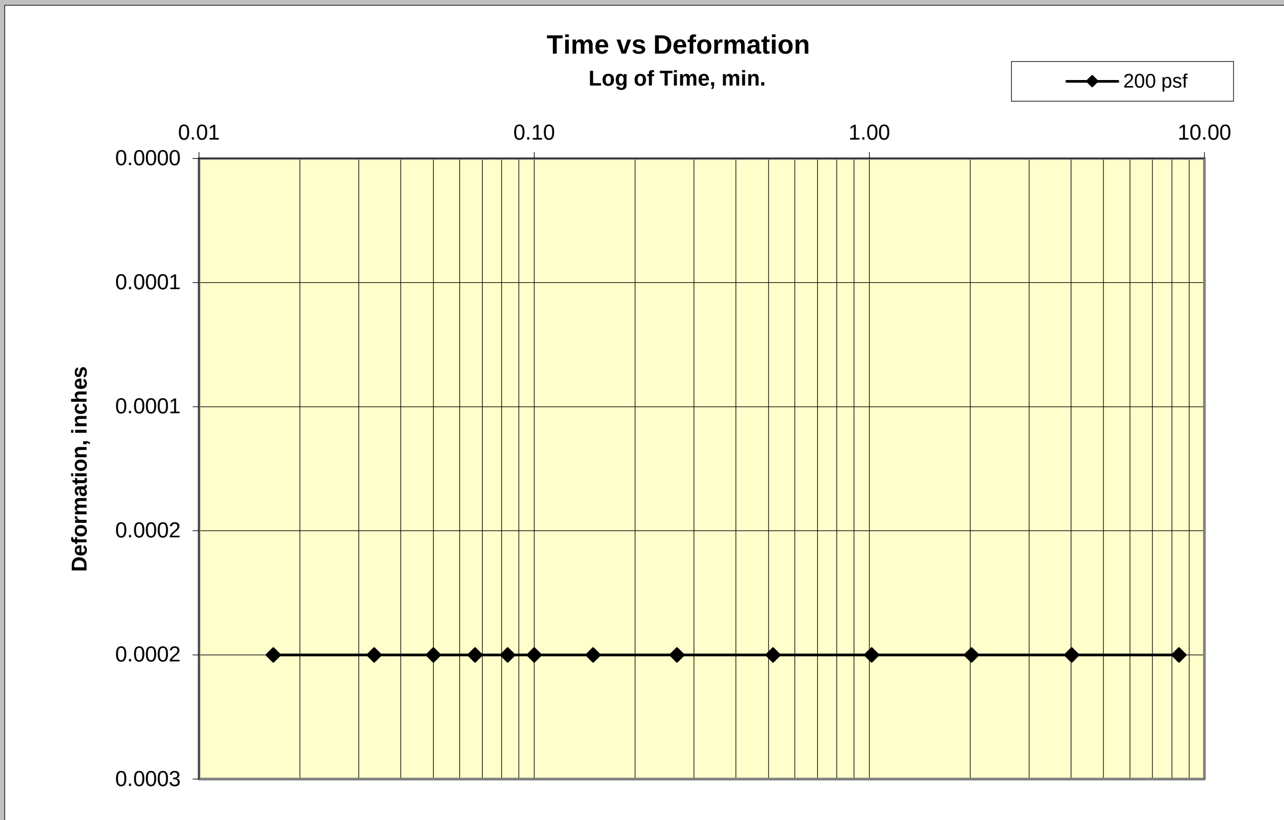


100 psf

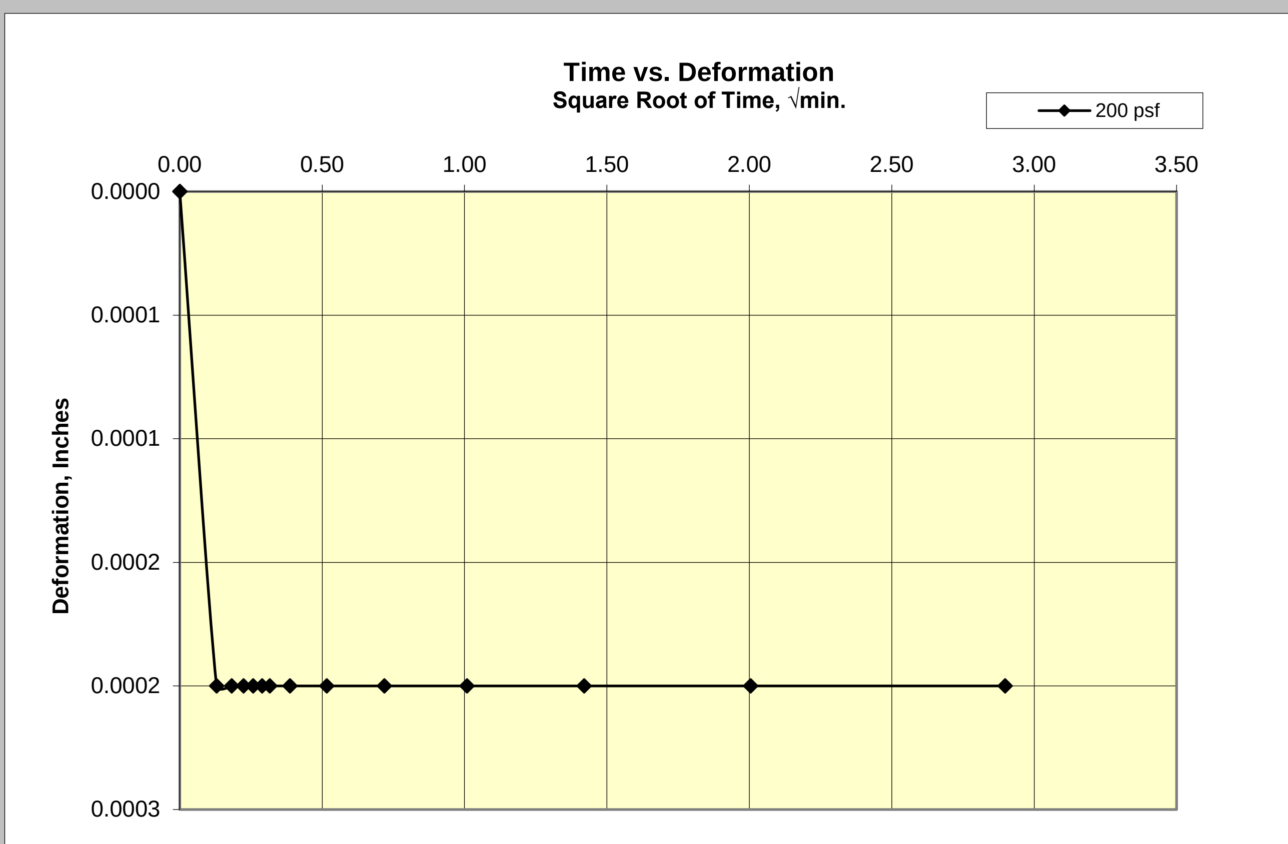


Cooper Testing Labs, Inc.

Load 2 | 200 psf

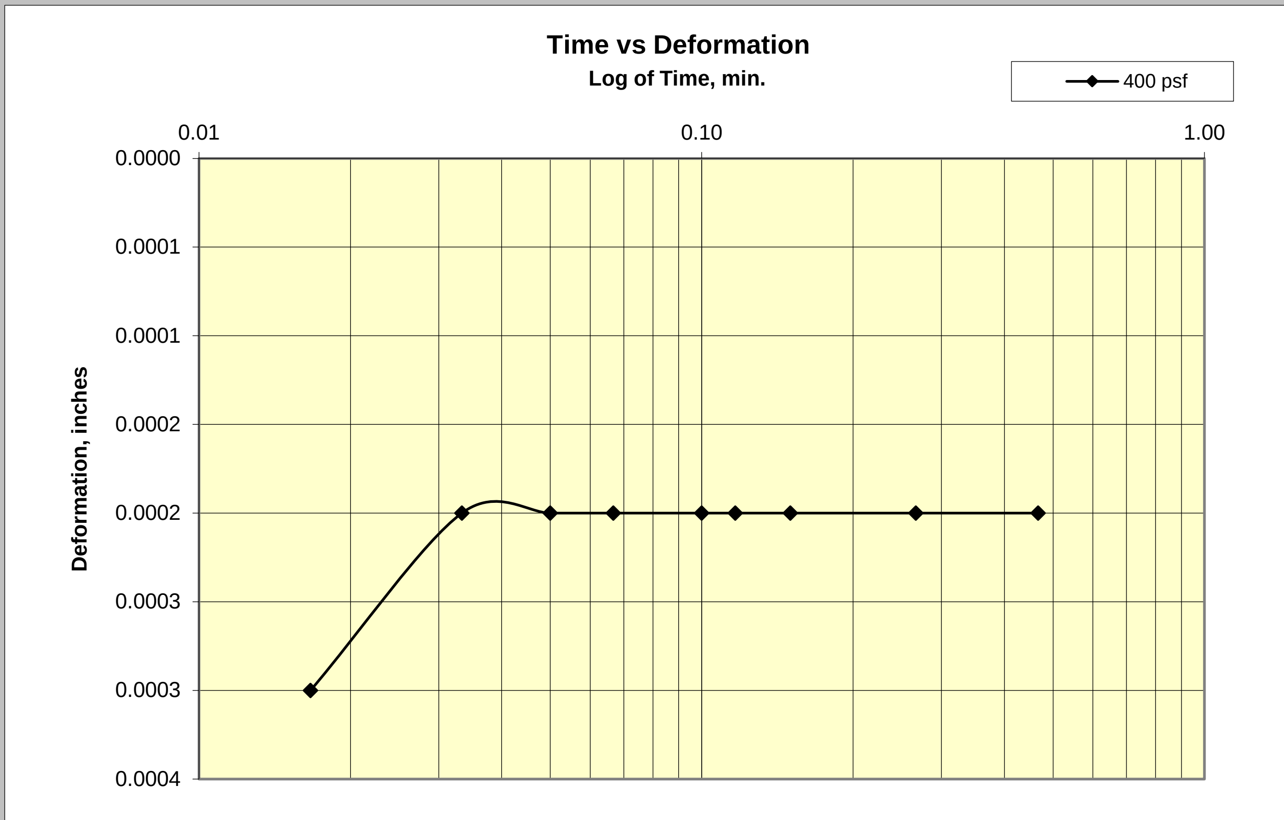


200 psf

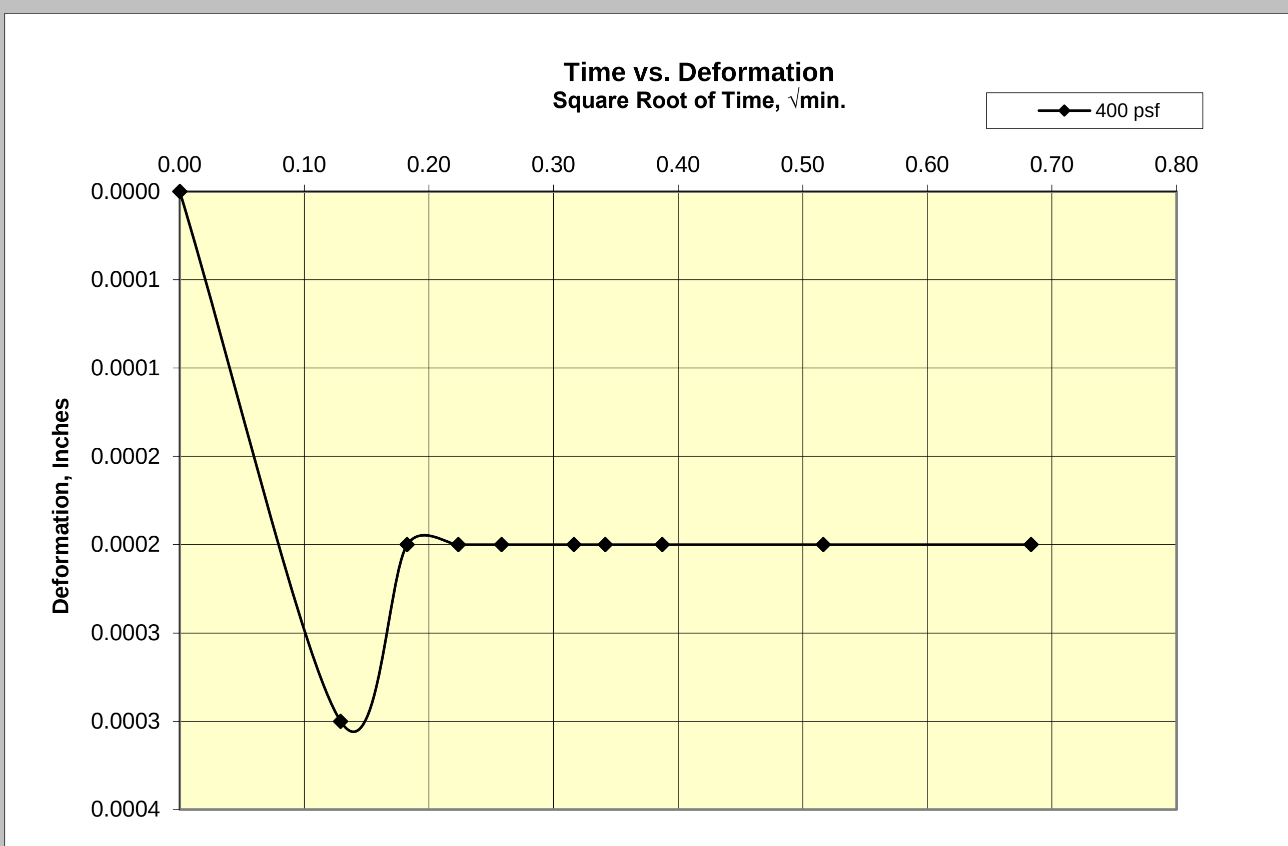


Cooper Testing Labs, Inc.

Load 3 400 psf



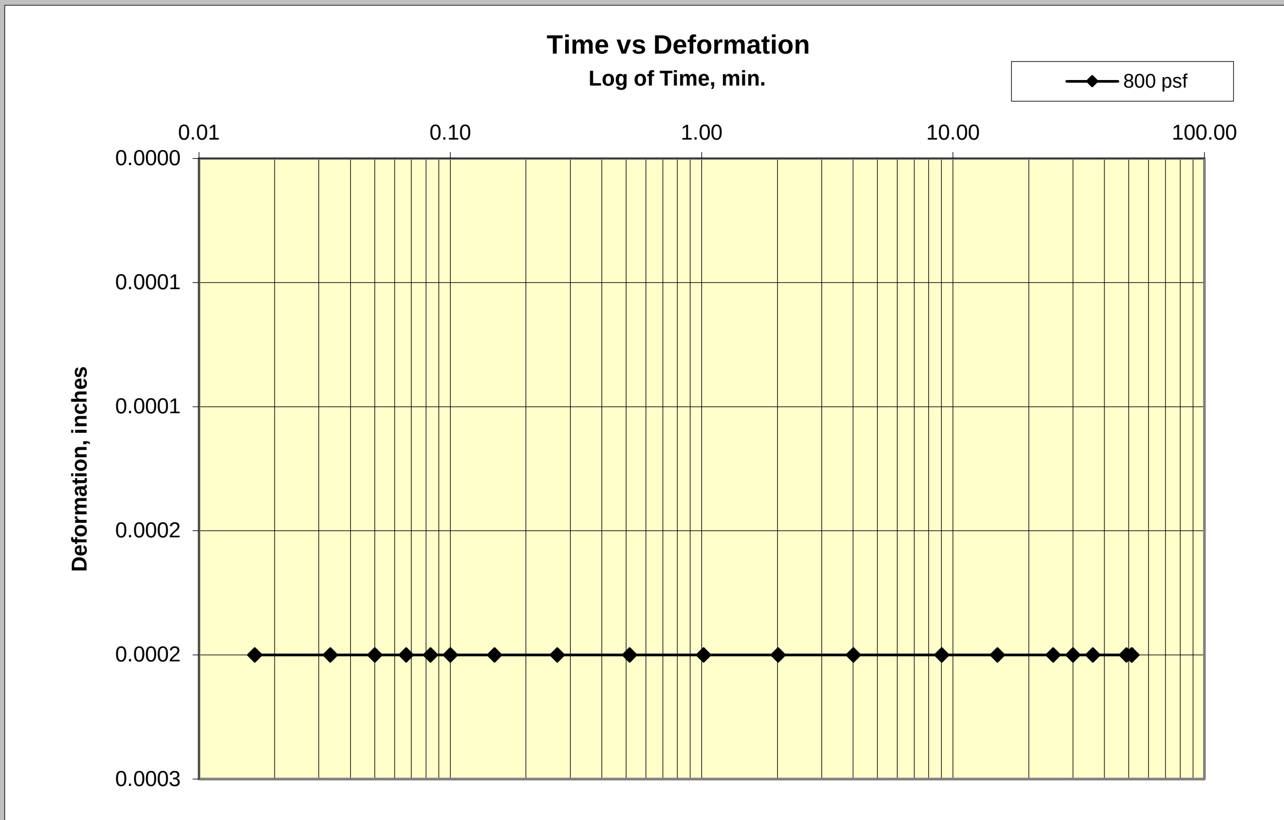
400 psf



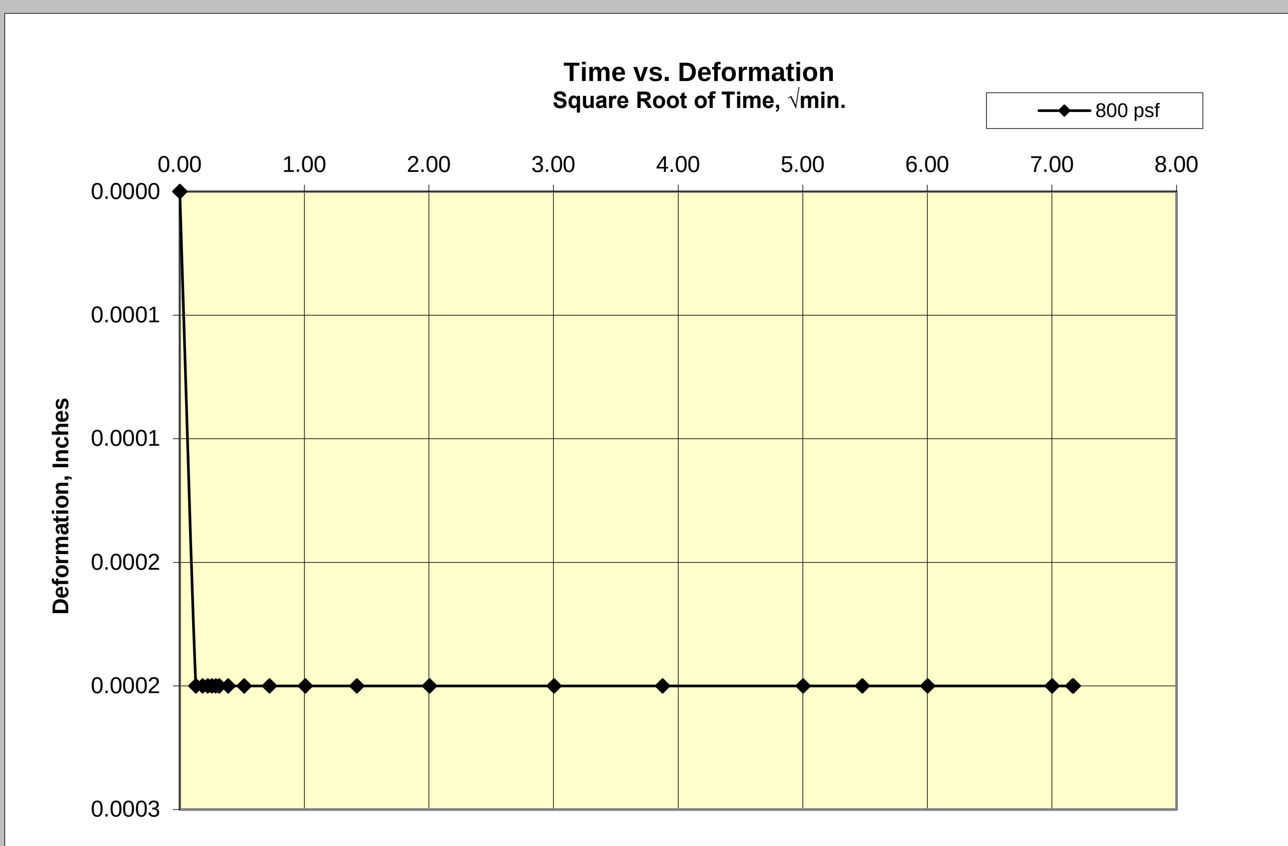
Cooper Testing Labs, Inc.

Load 4

800 psf



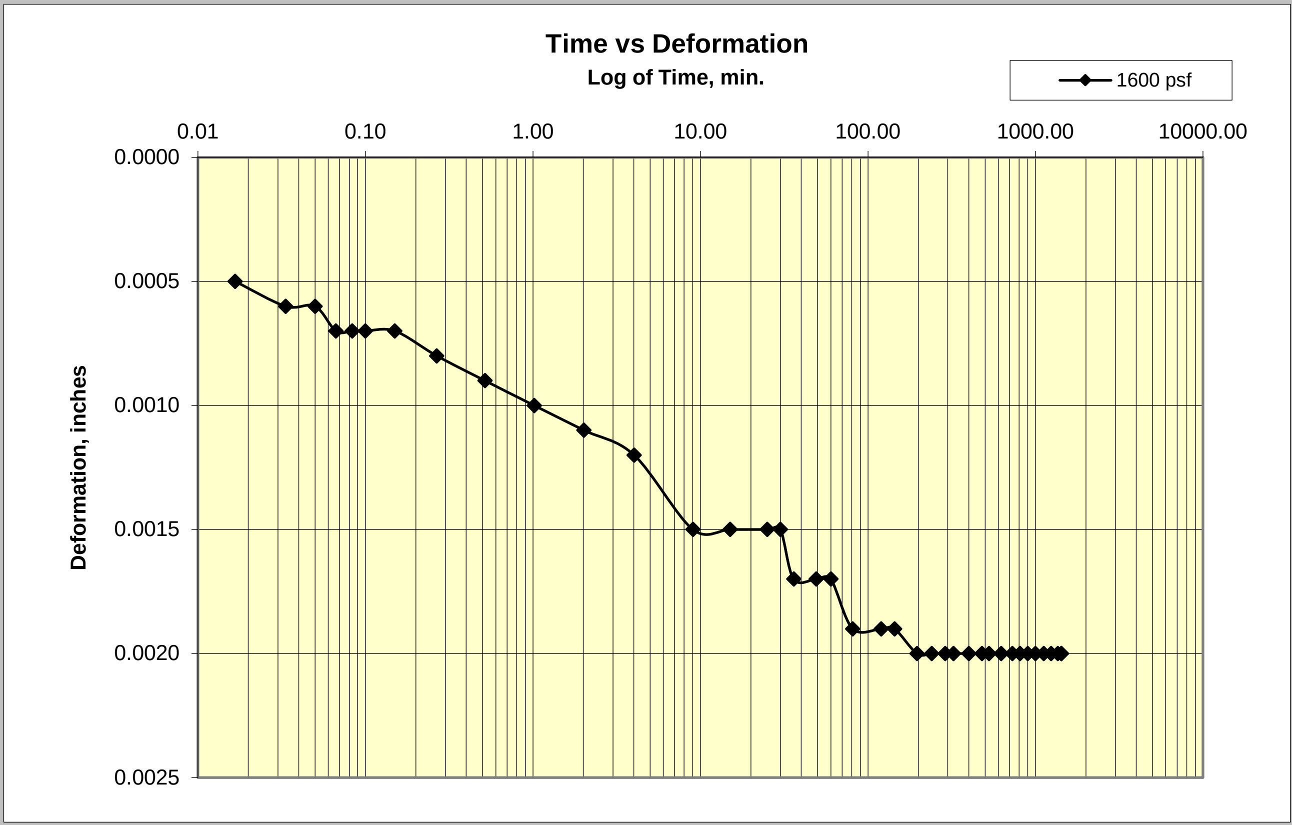
800 psf



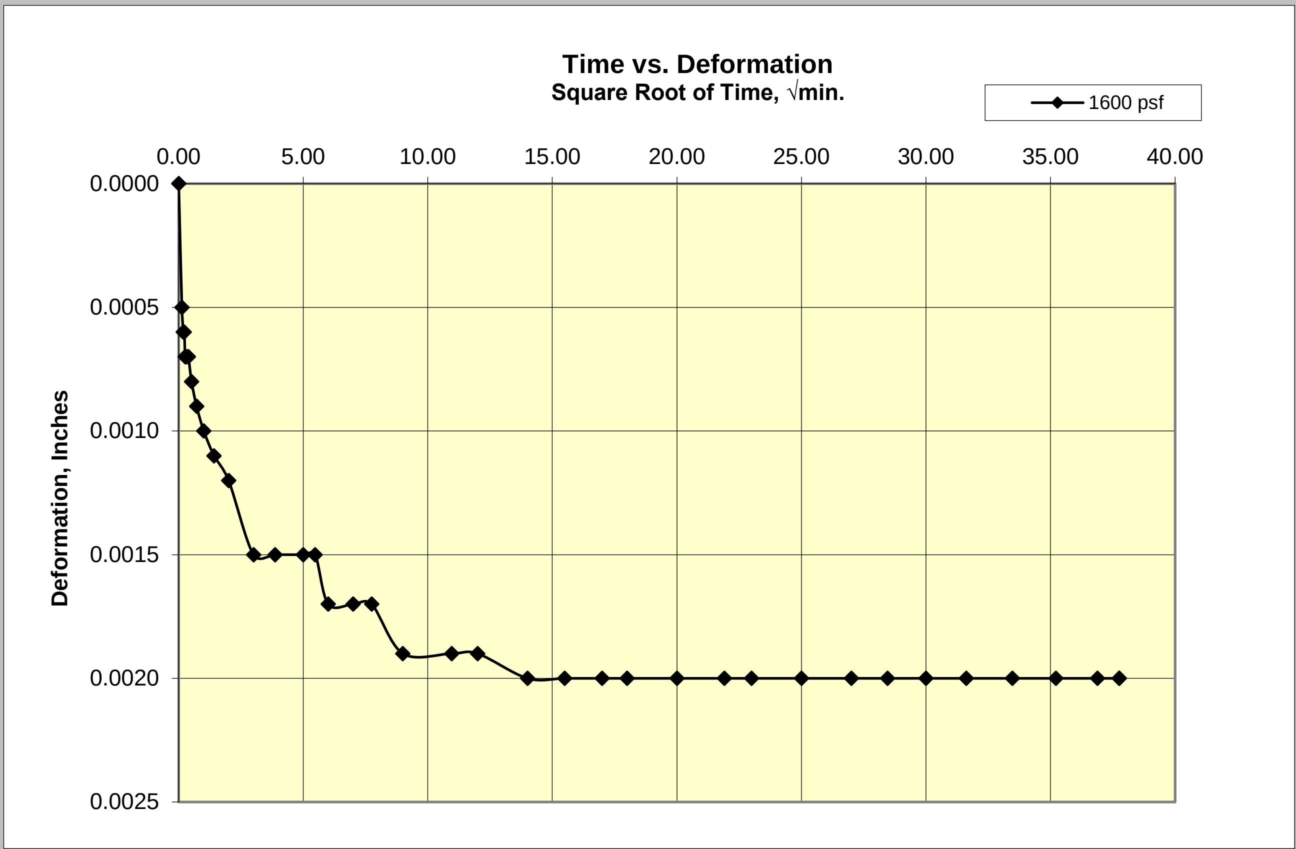
Cooper Testing Labs, Inc.

Load 5

1600 psf



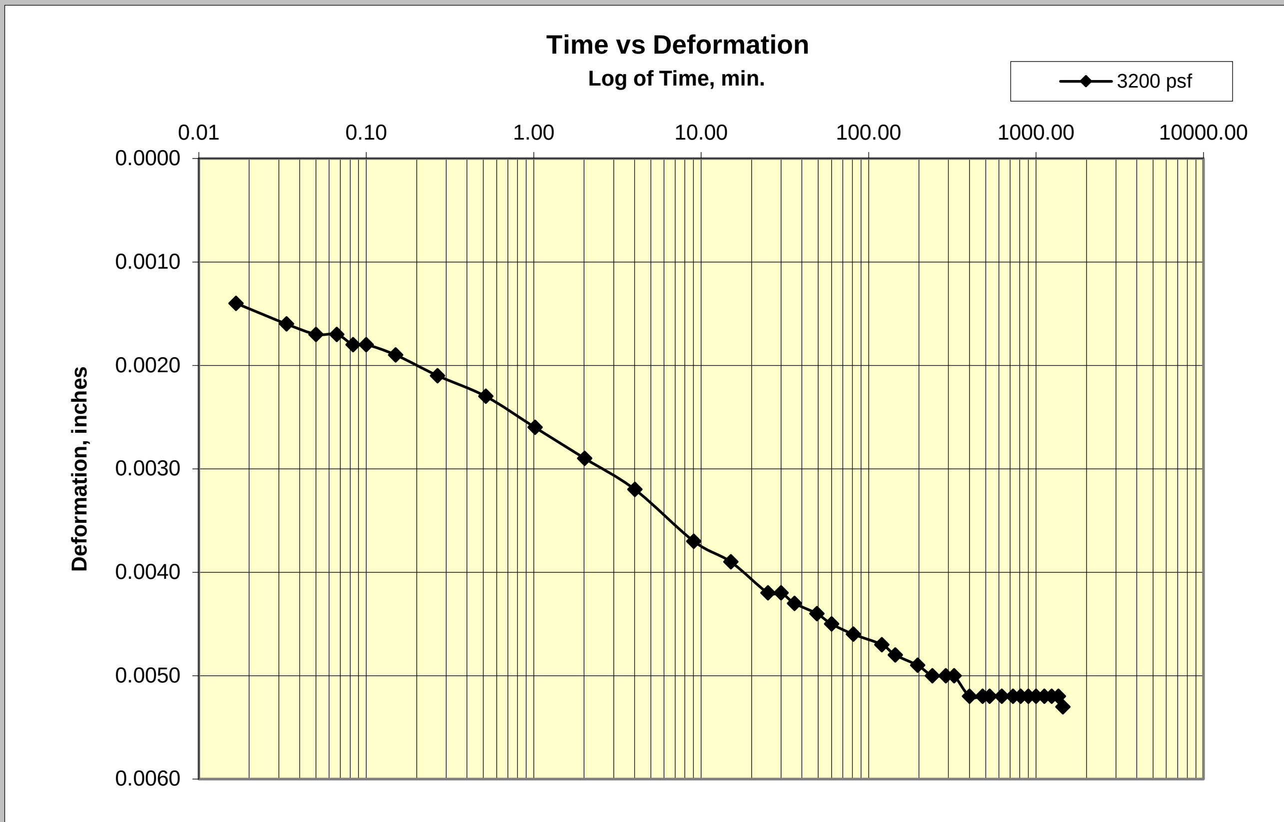
1600 psf



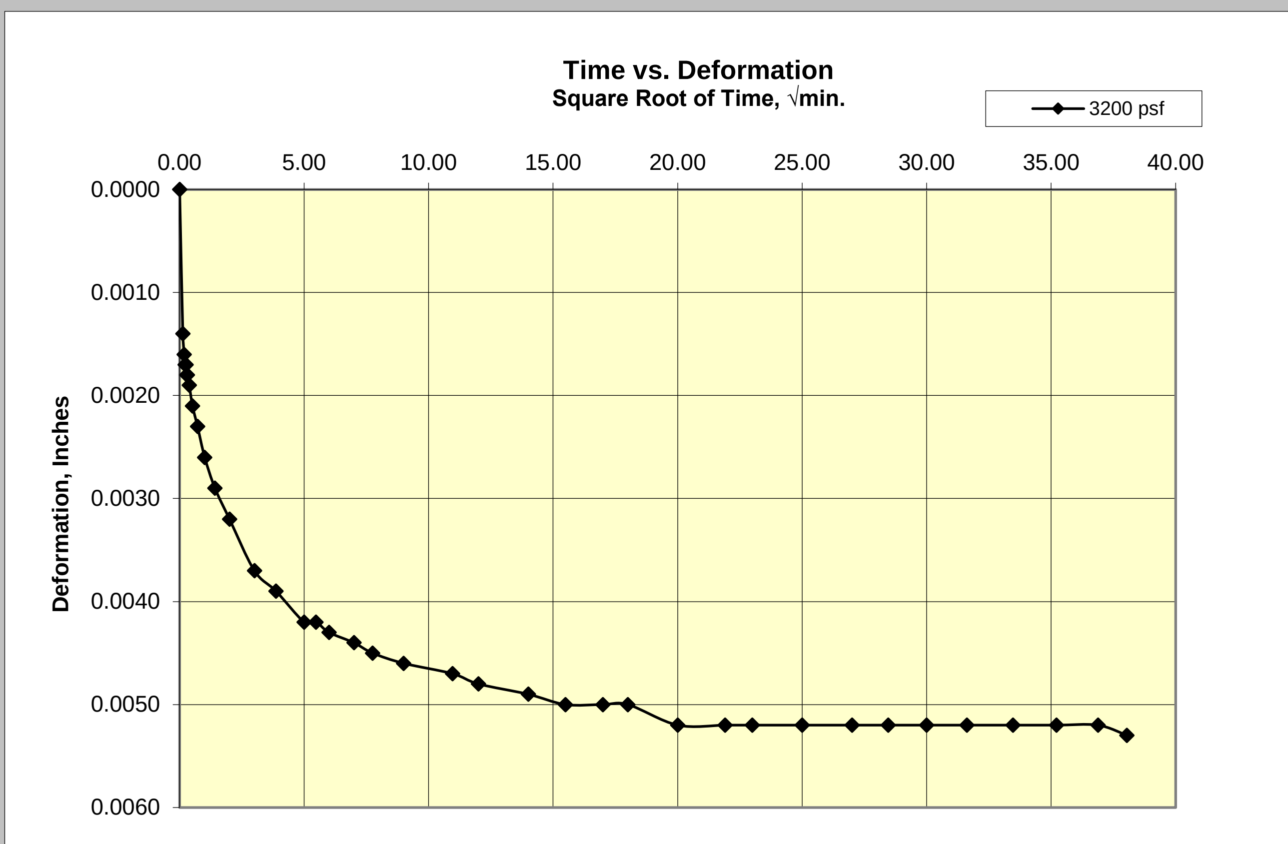
Cooper Testing Labs, Inc.

Load 6

3200 psf



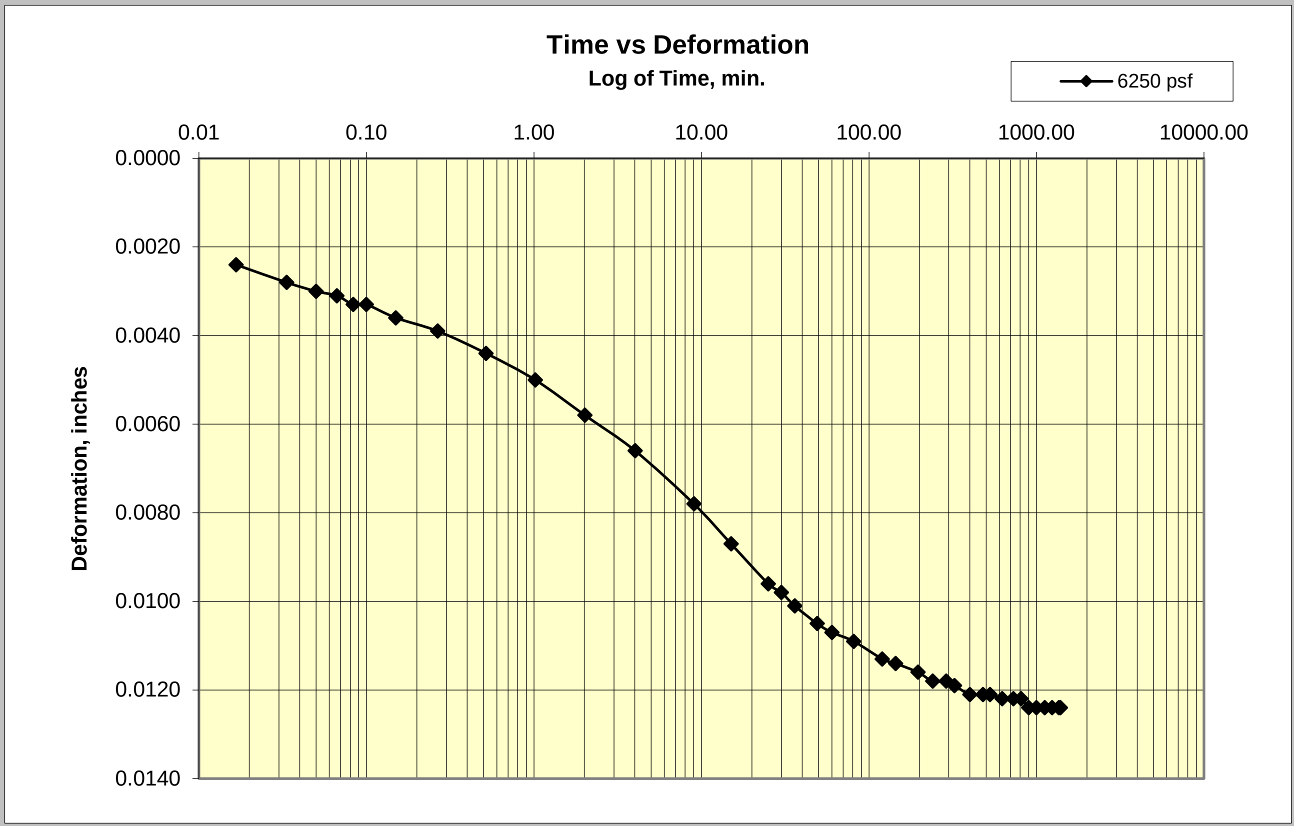
3200 psf



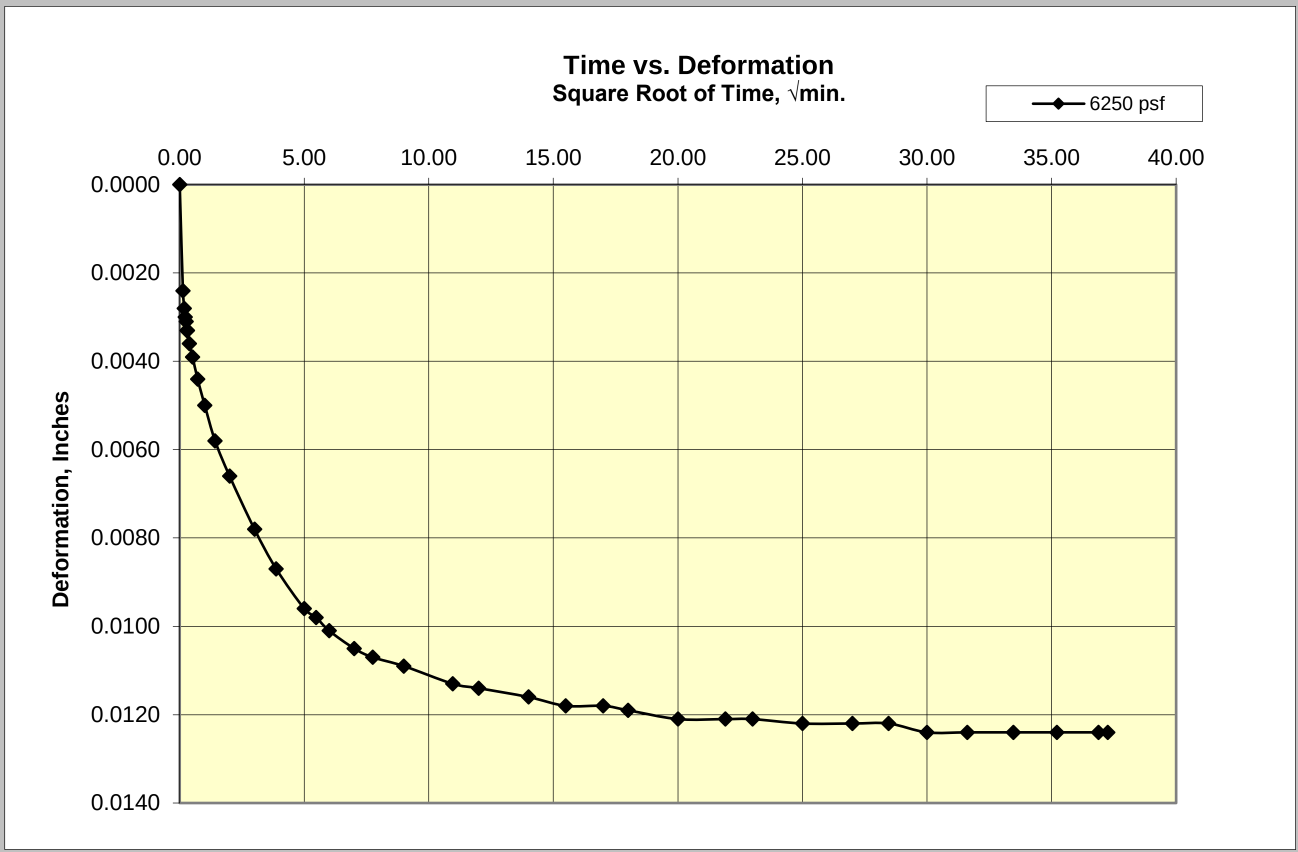
Cooper Testing Labs, Inc.

Load 7

6250 psf

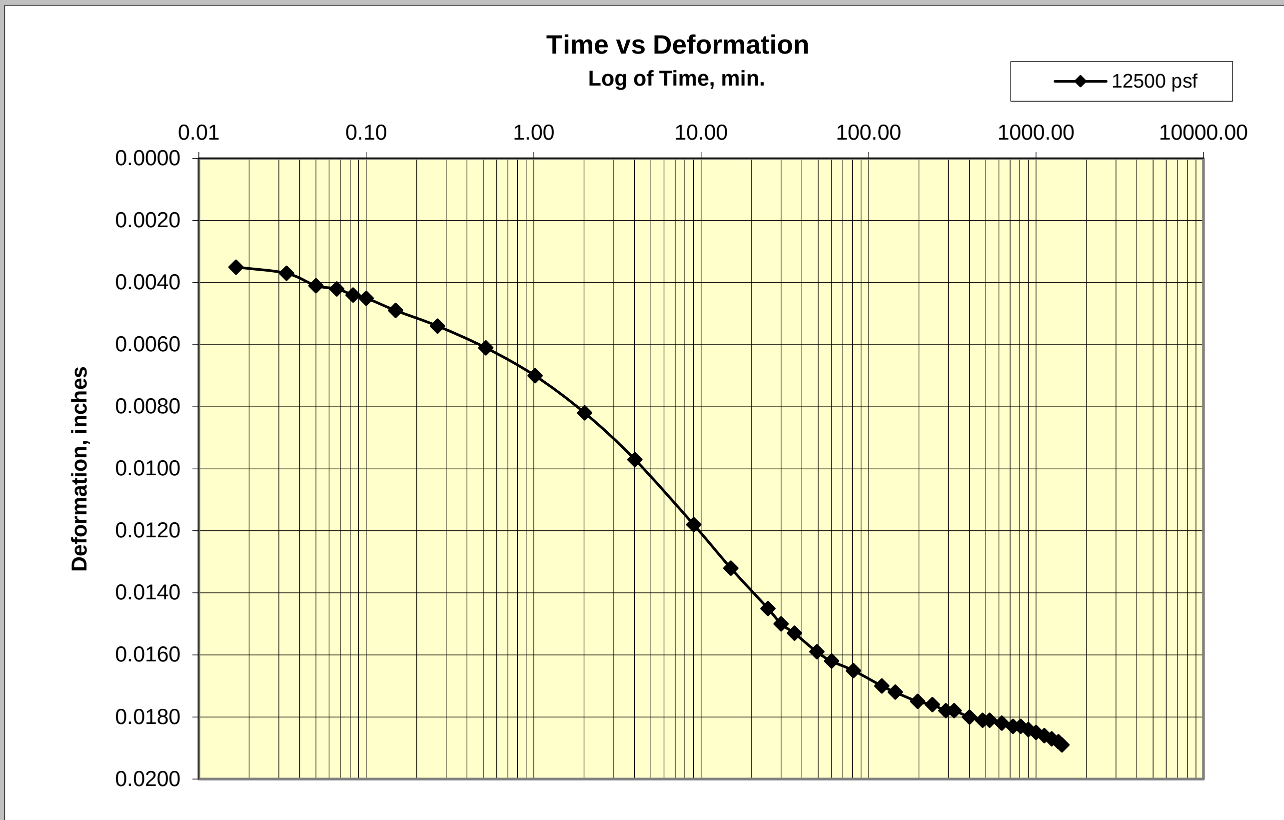


6250 psf

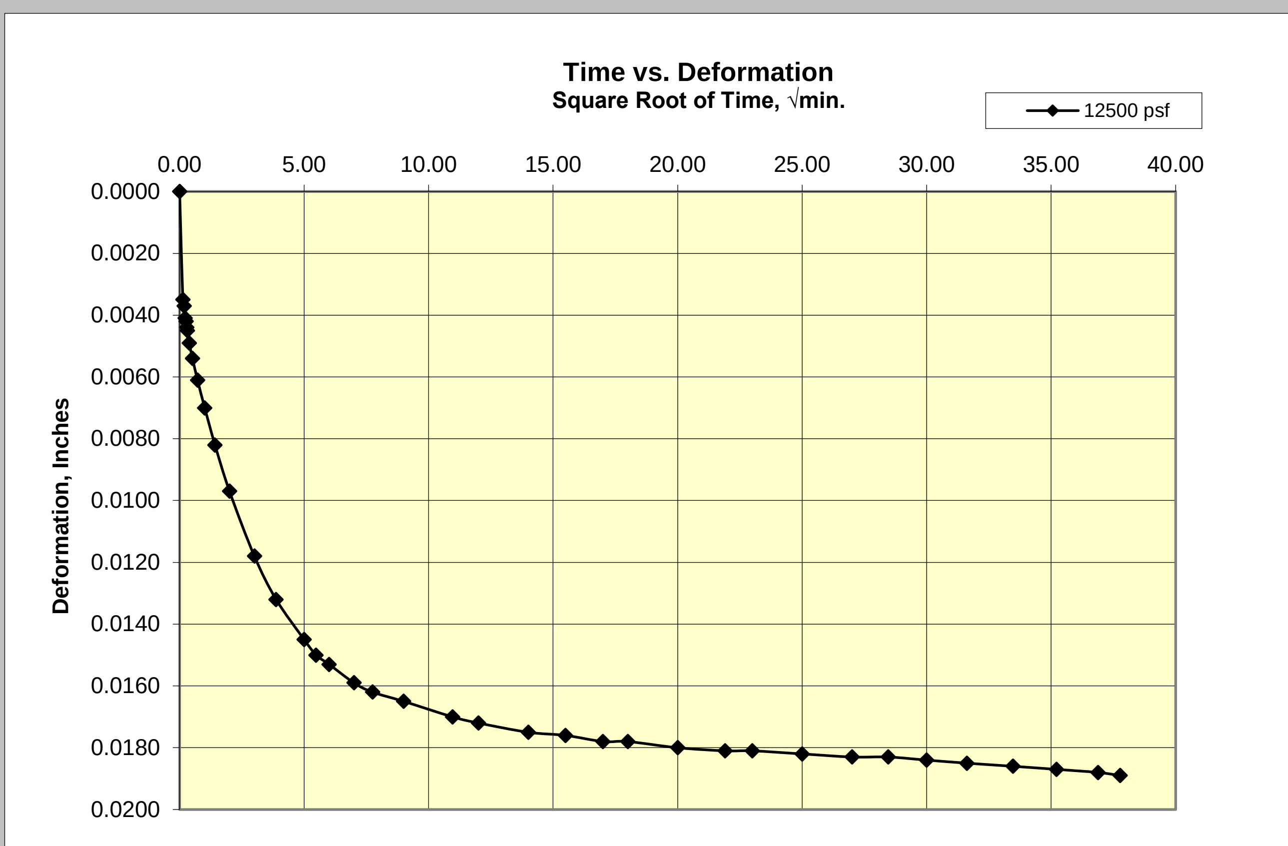


Cooper Testing Labs, Inc.

Load 8 | 12500 psf



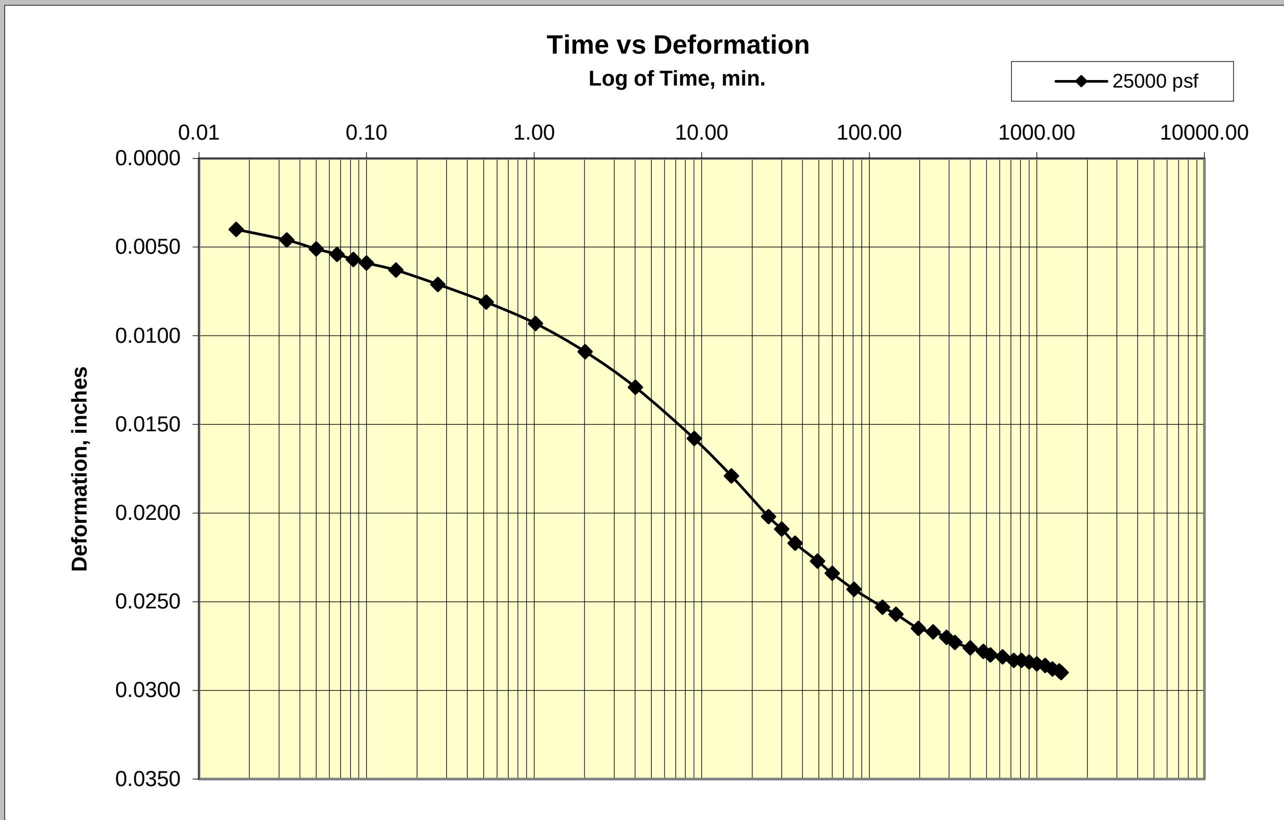
12500 psf



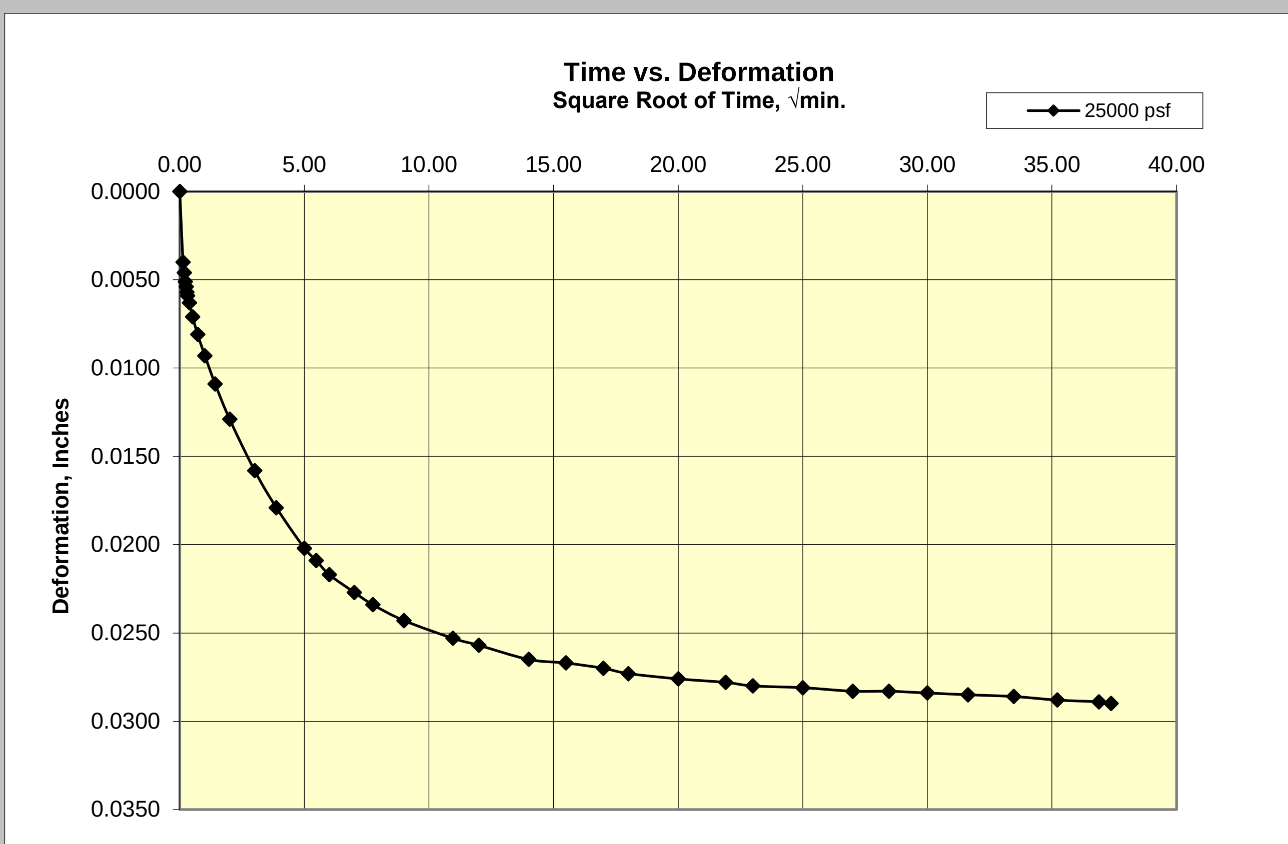
Cooper Testing Labs, Inc.

Load 9

25000 psf



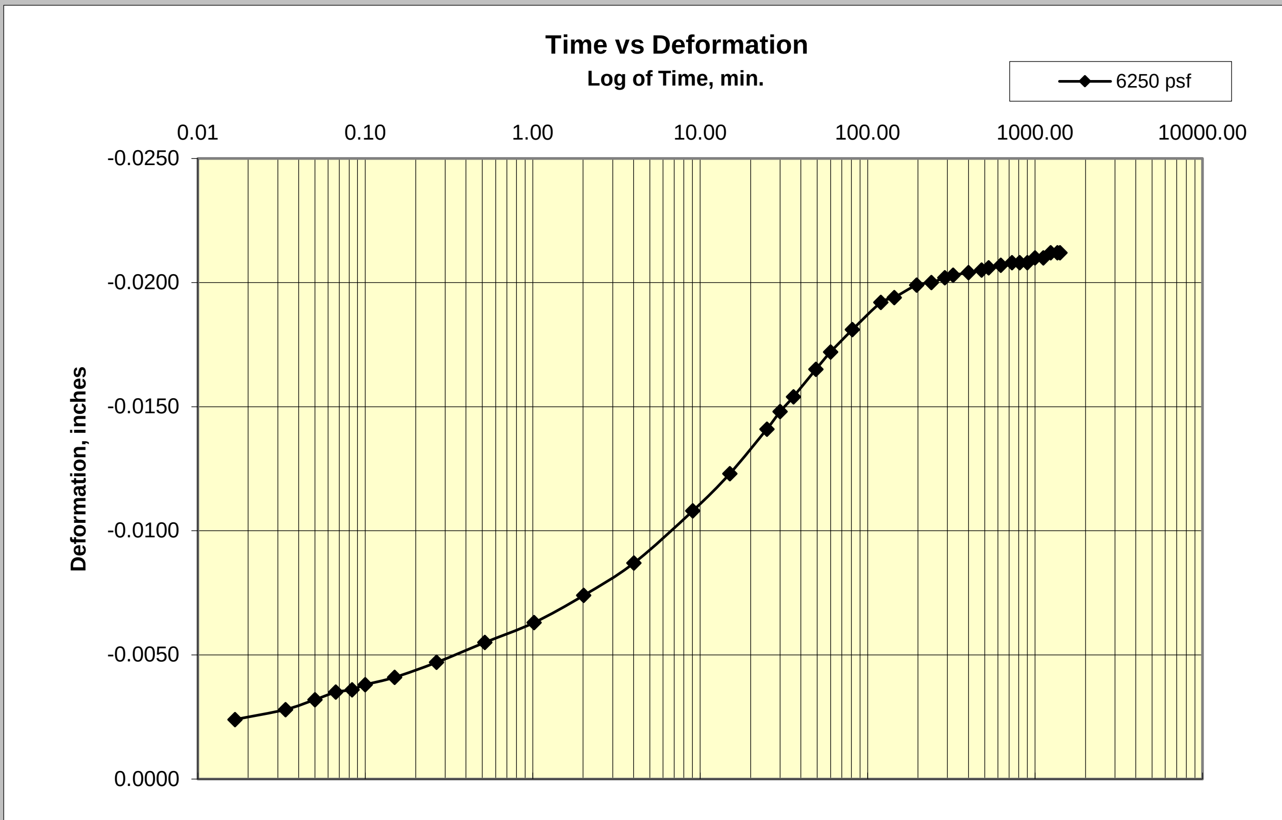
25000 psf



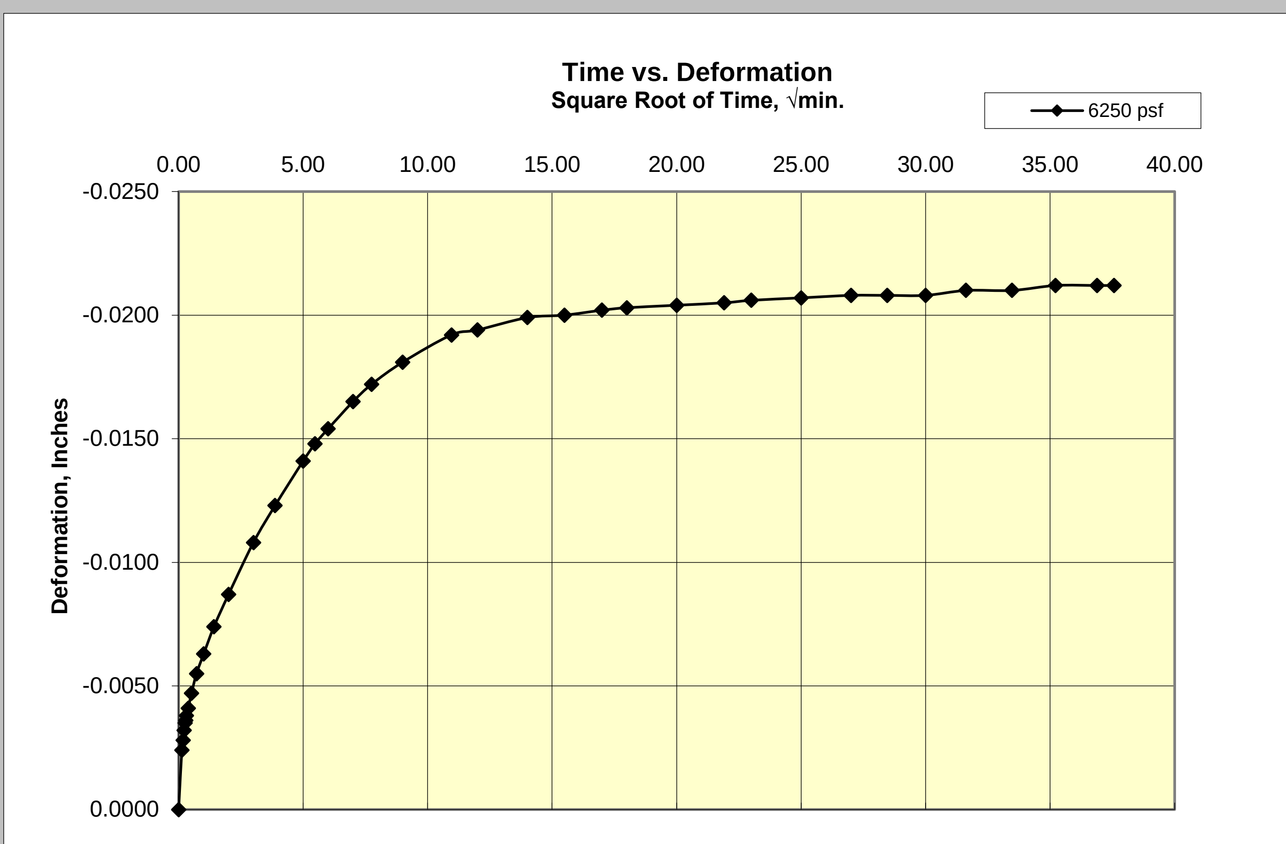
Cooper Testing Labs, Inc.

Load 10

6250 psf

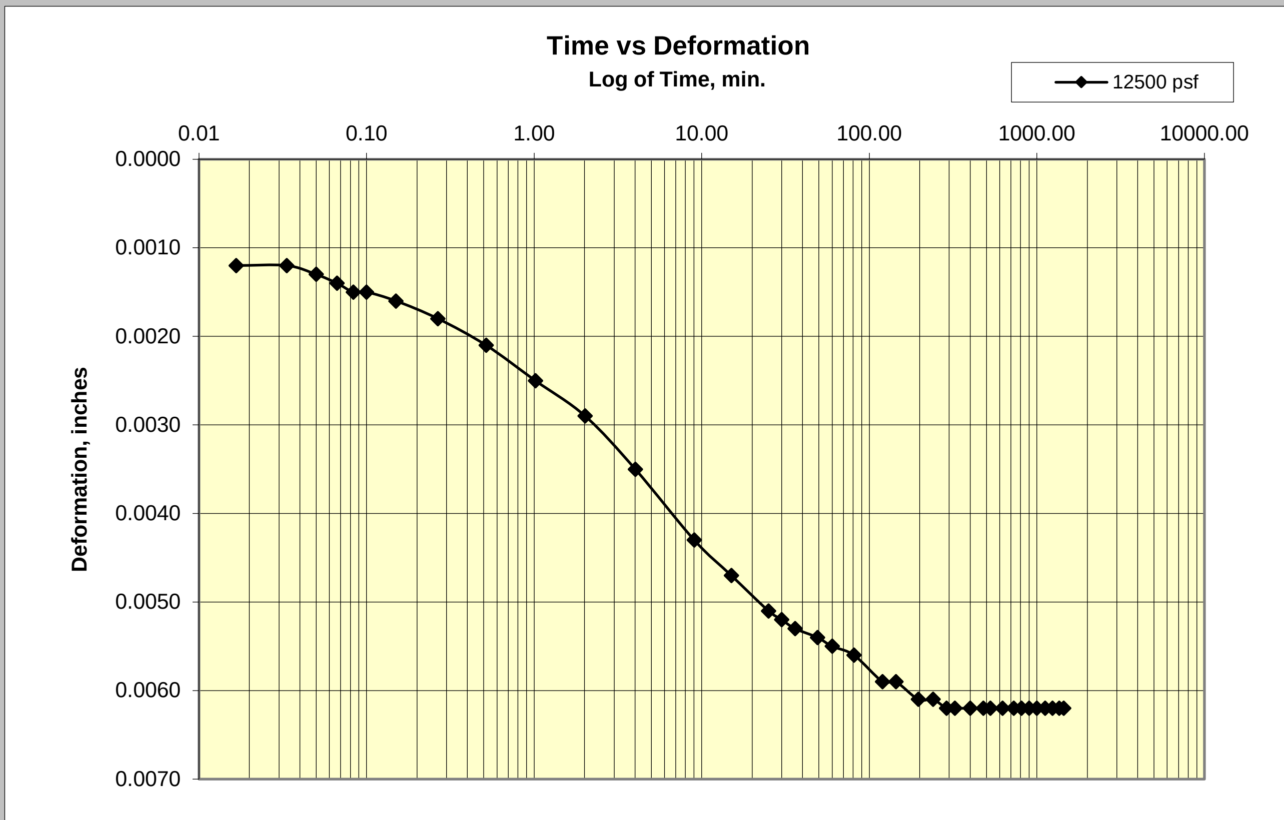


6250 psf

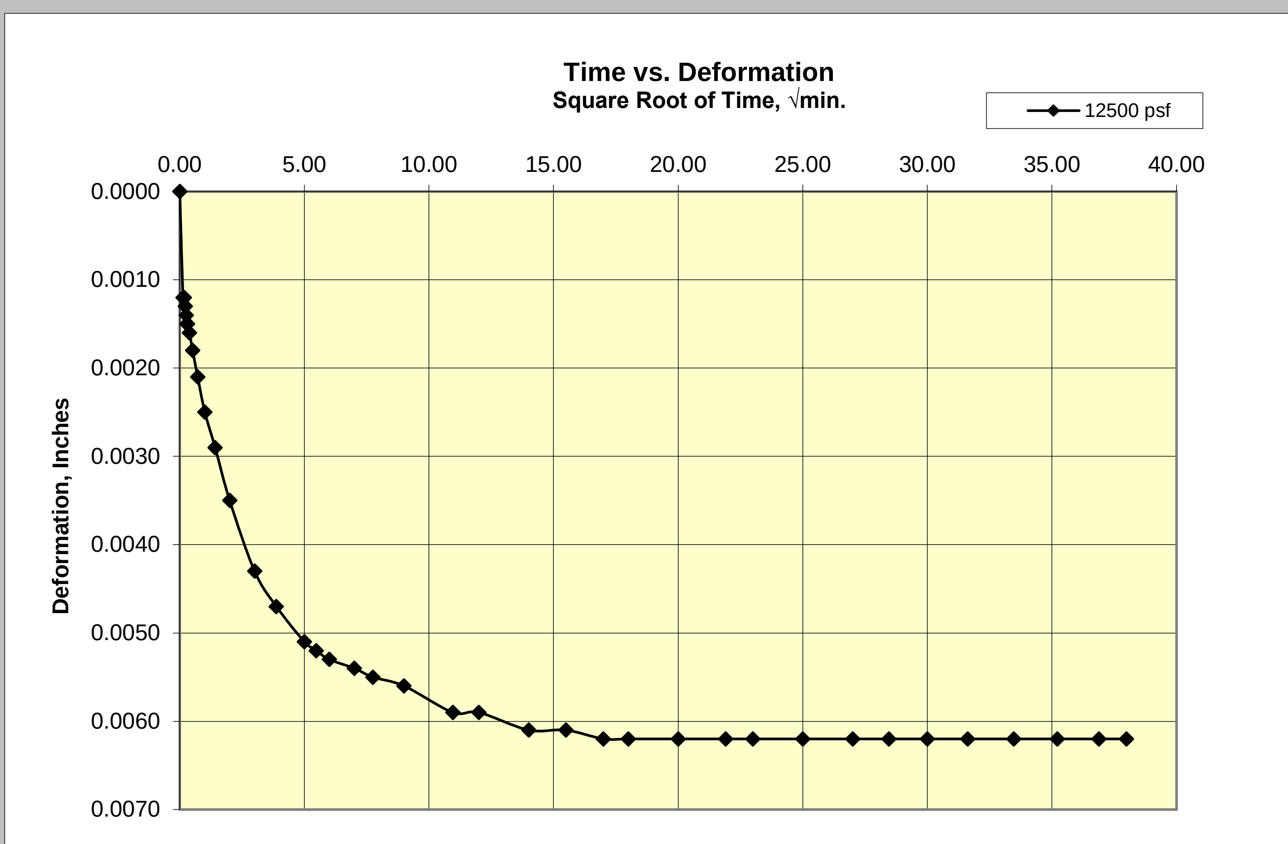


Cooper Testing Labs, Inc.

Load 11 | 12500 psf



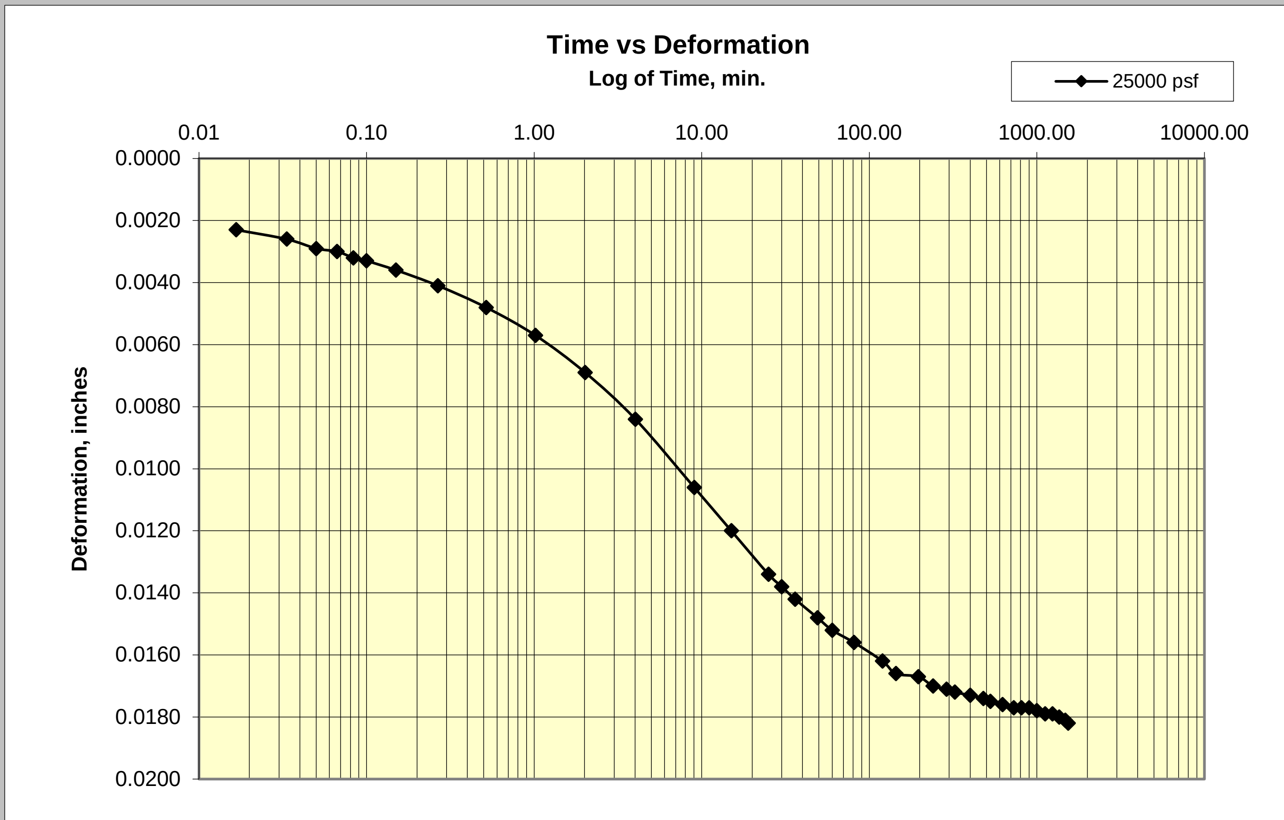
12500 psf



Cooper Testing Labs, Inc.

Load 12

25000 psf



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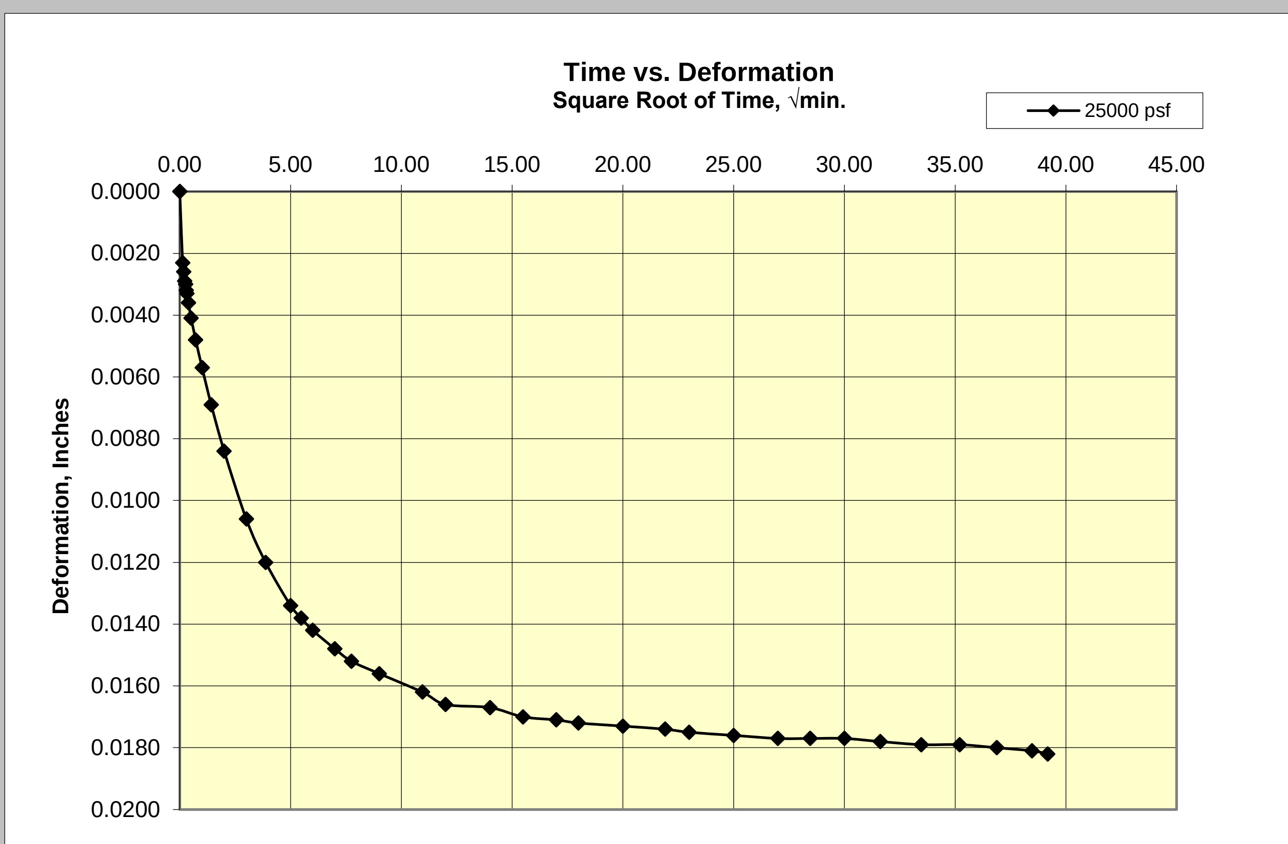
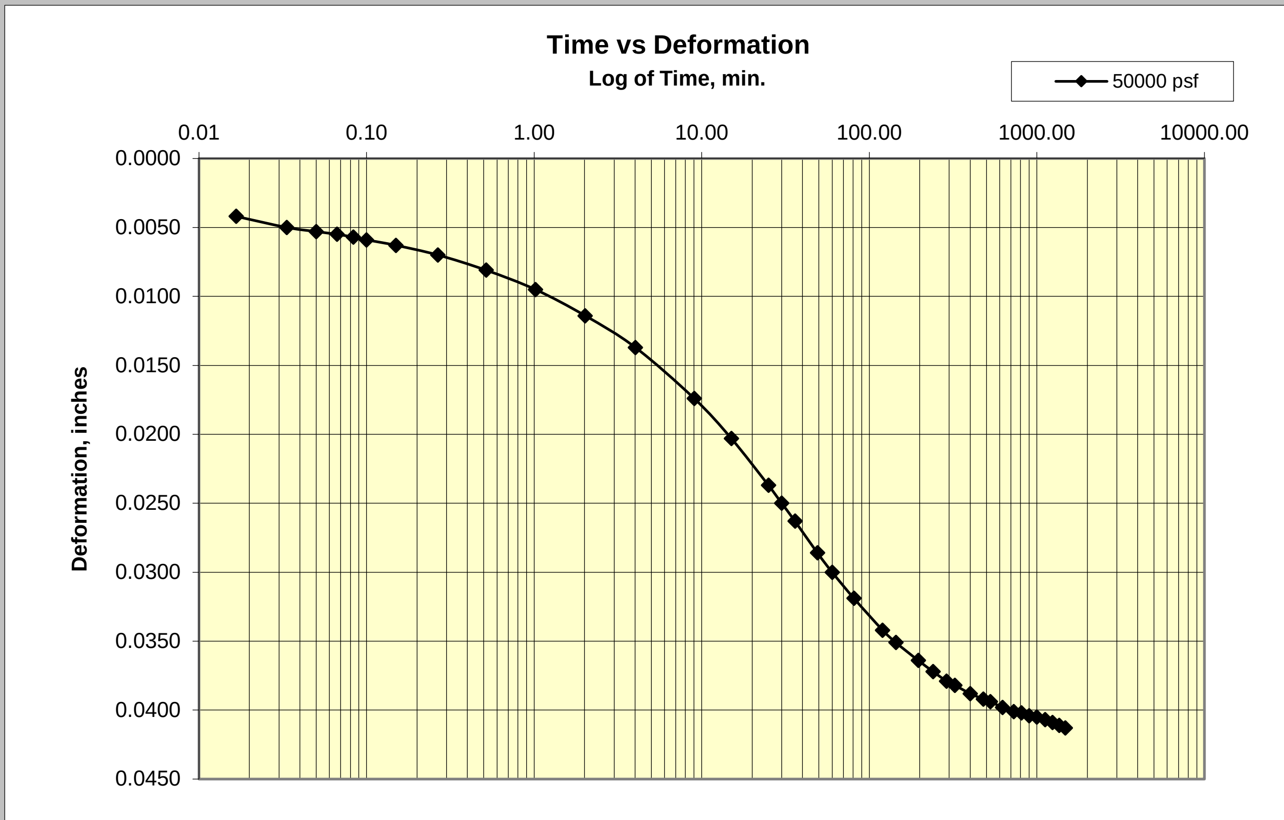


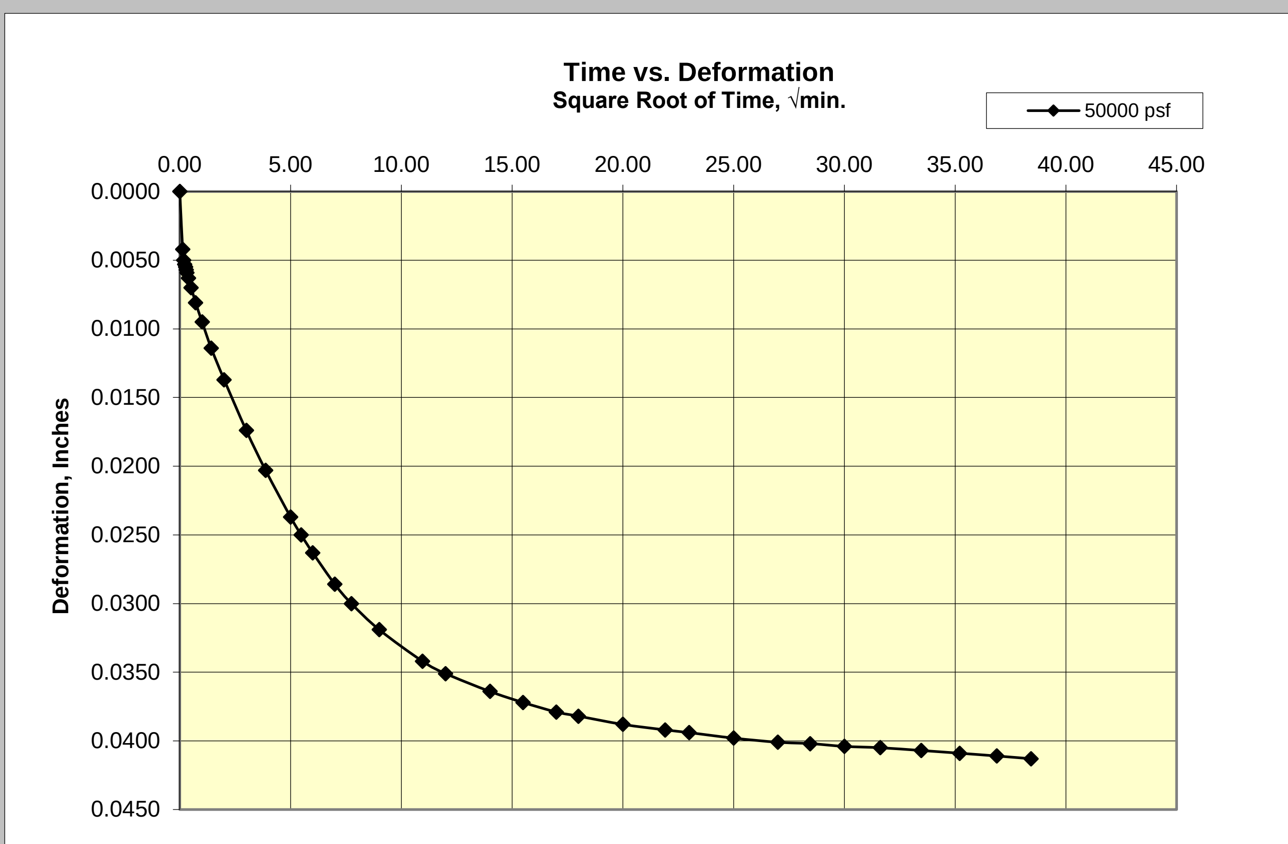
Cooper Testing Labs, Inc.

Load 13

50000 psf



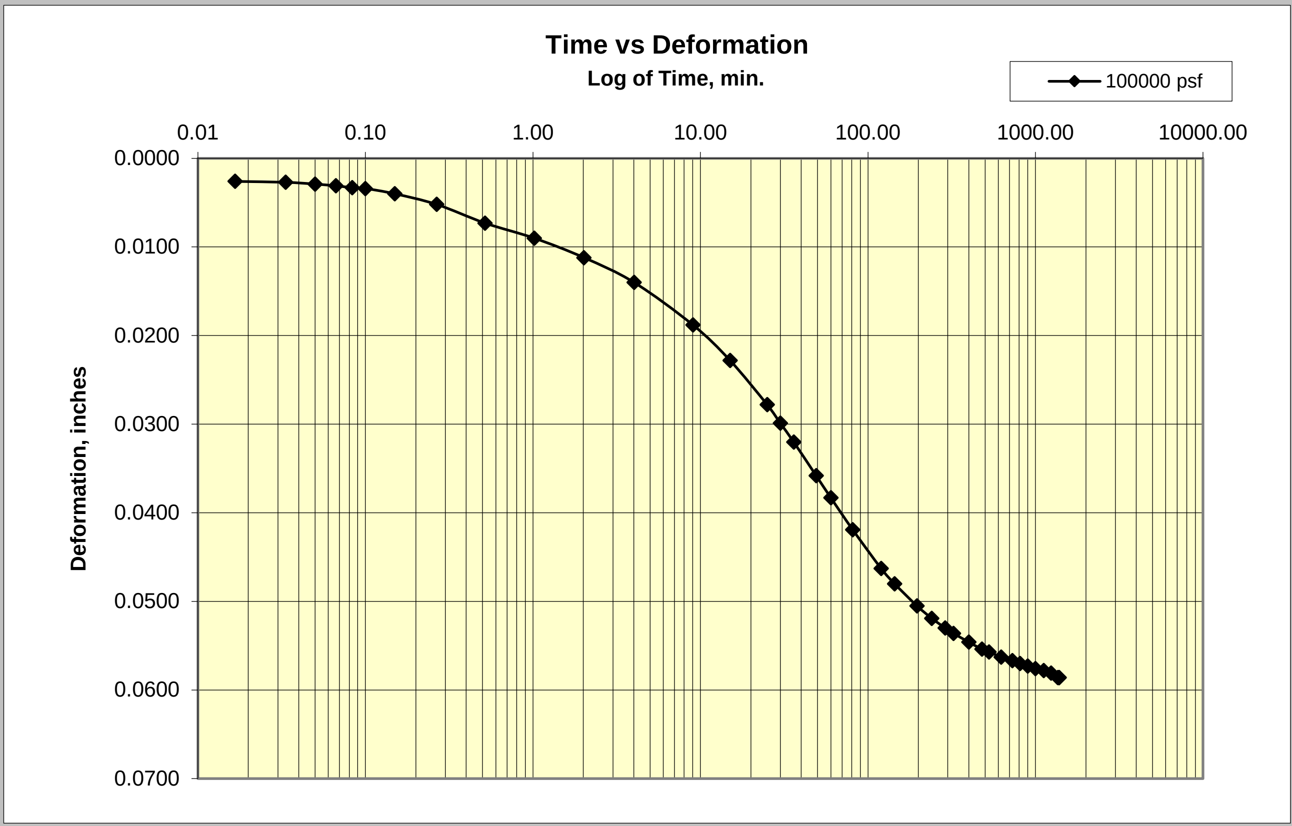
50000 psf



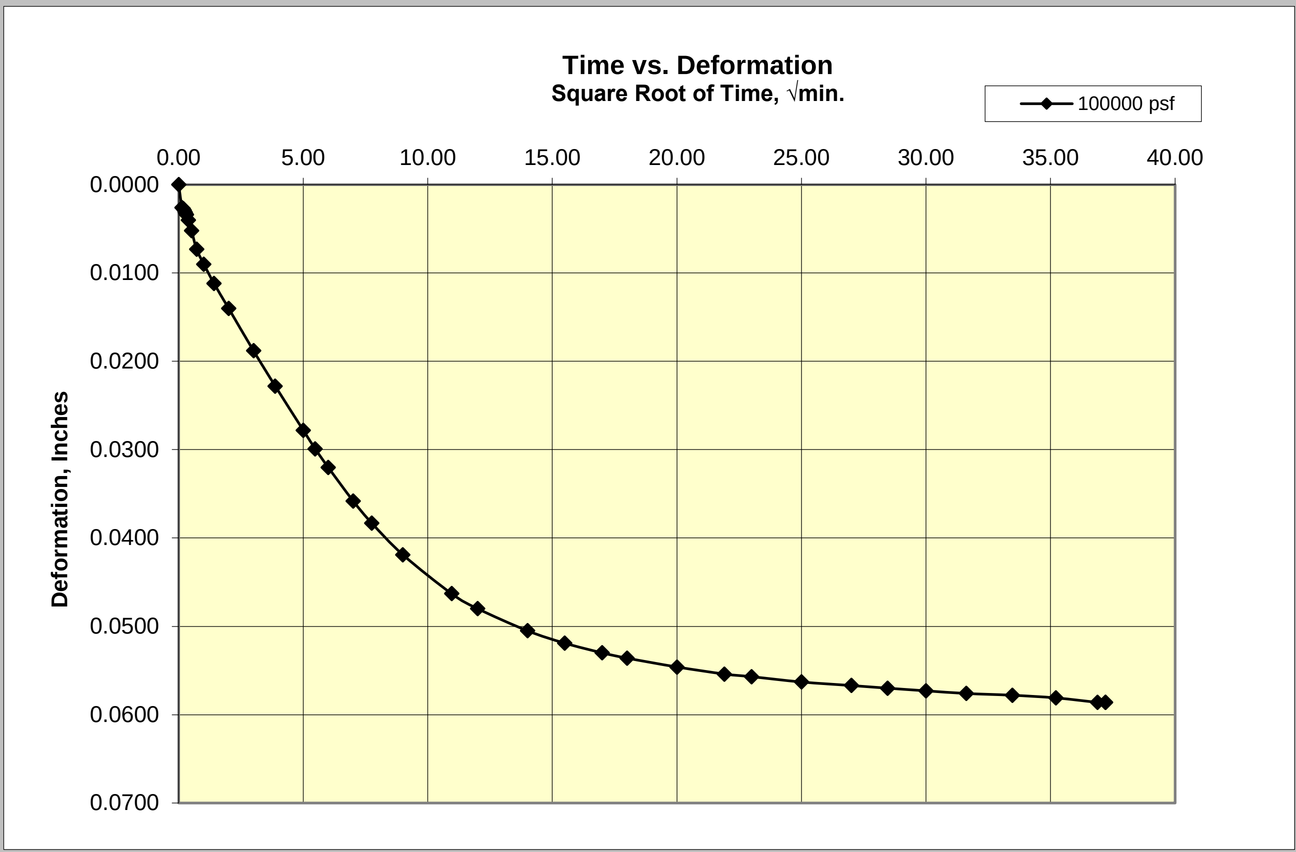
Cooper Testing Labs, Inc.

Load 14

100000 psf



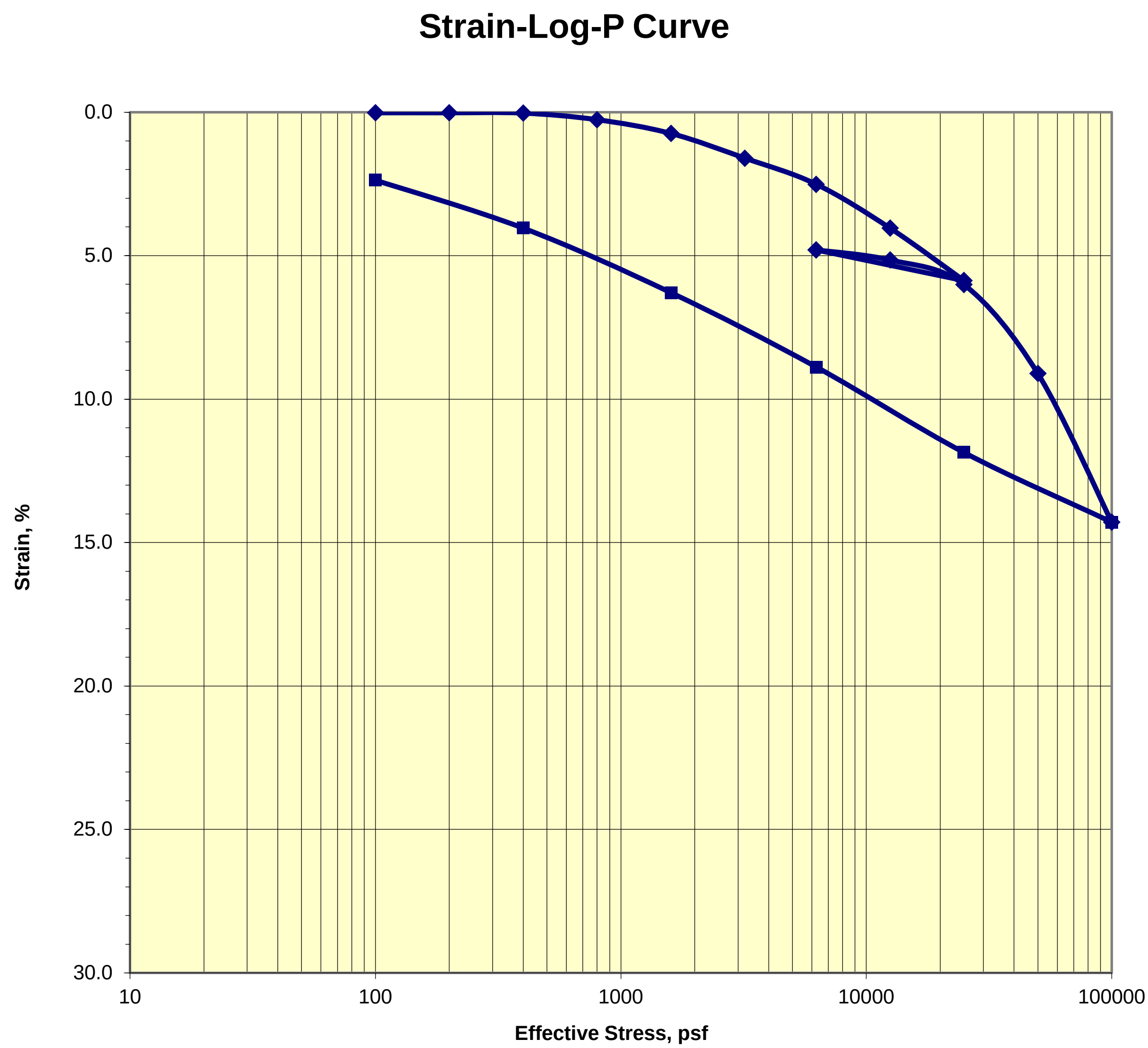
100000 psf



Consolidation Test
ASTM D2435

COOPER TESTING LABORATORY

Job No.:	461-388	**Boring:**	B-102A	**Run By:**	HM
Client:	Geosyntec Consultants	**Sample:**	102-7A	**Reduced:**	RU
Project:	WG3444	**Depth, ft.:**	35-37.5(Tip-6")	**Checked:**	PJ
Soil Type:	Olive Brown Fat CLAY			**Date:**	5/28/2025

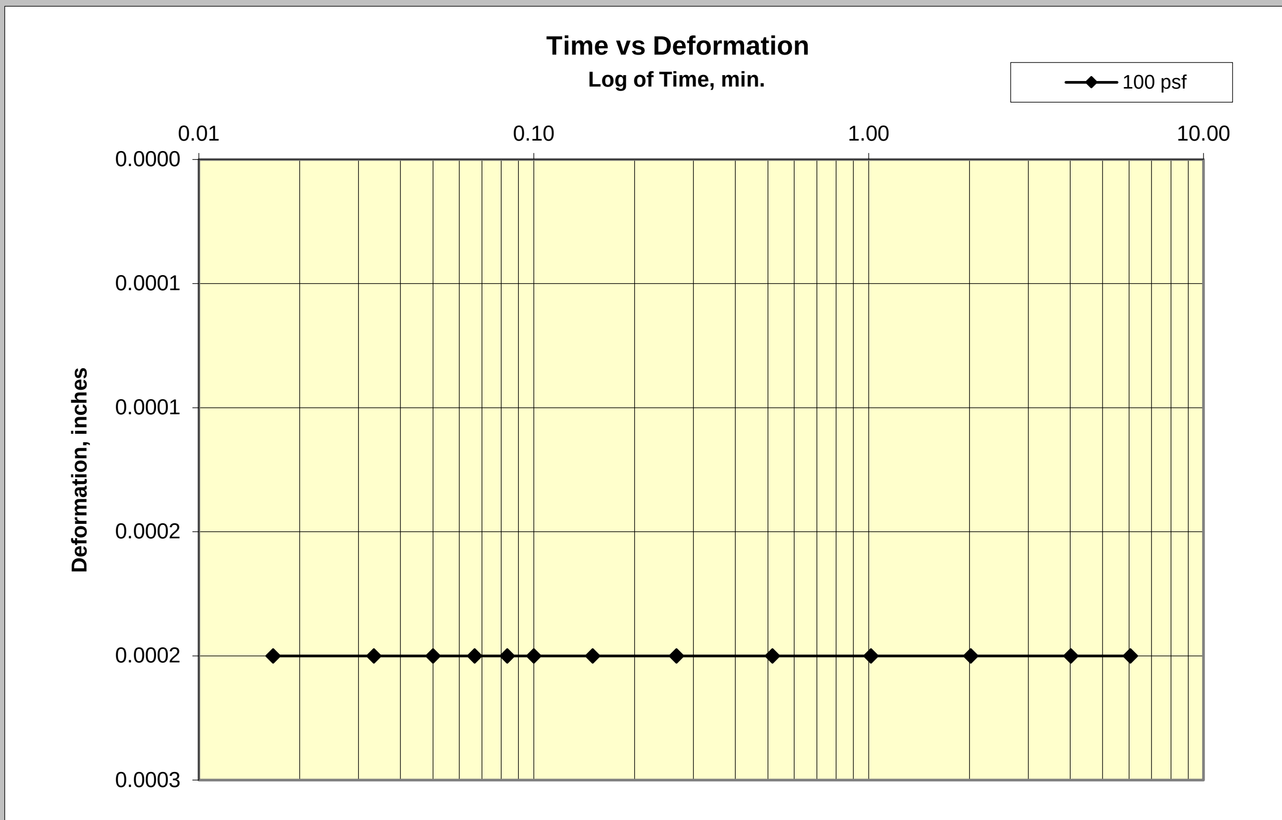


Assumed Gs 2.8	**Initial**	**Final**
Moisture %:	25.7	27.7
Dry Density, pcf:	97.7	98.5
Void Ratio:	0.789	0.774
% Saturation:	91.2	100.0

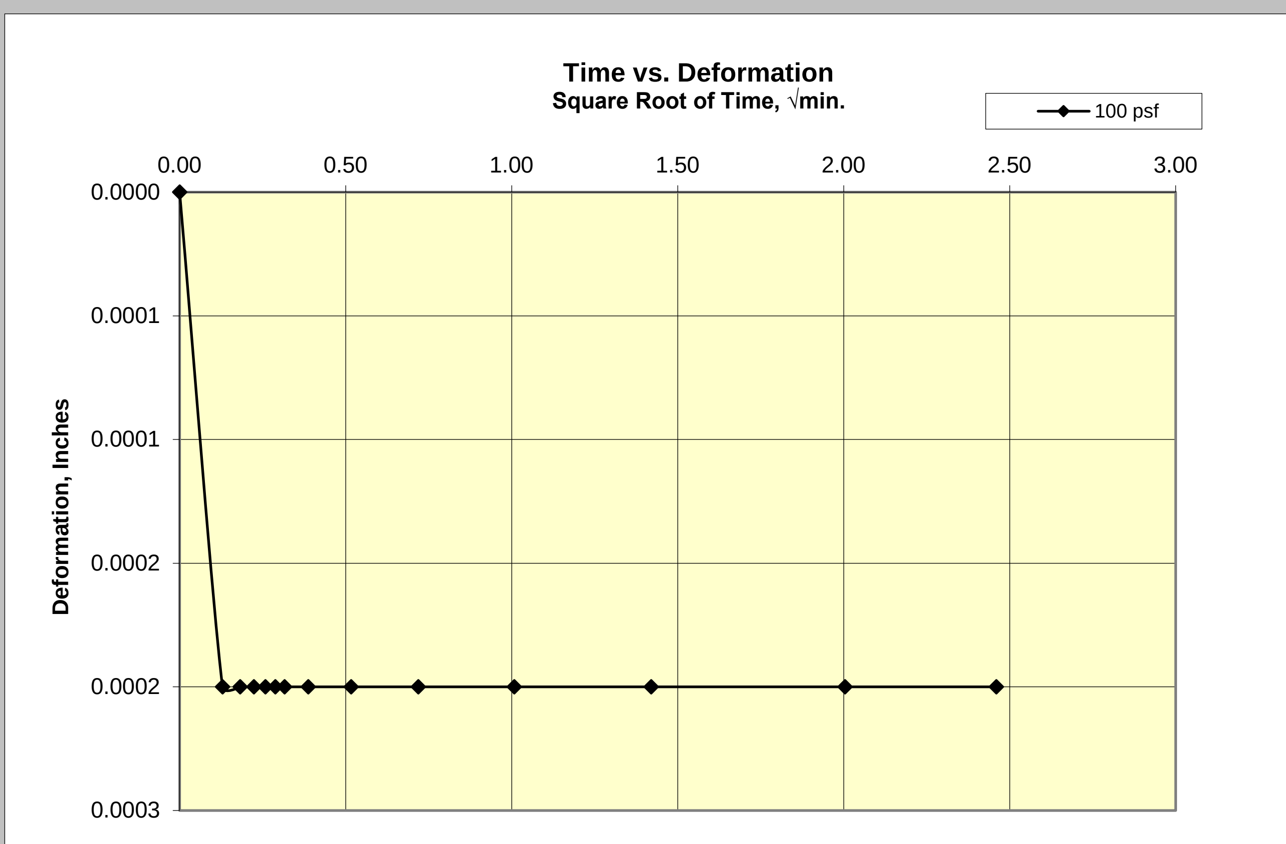
Remarks:

Cooper Testing Labs, Inc.

Load 1 100 psf



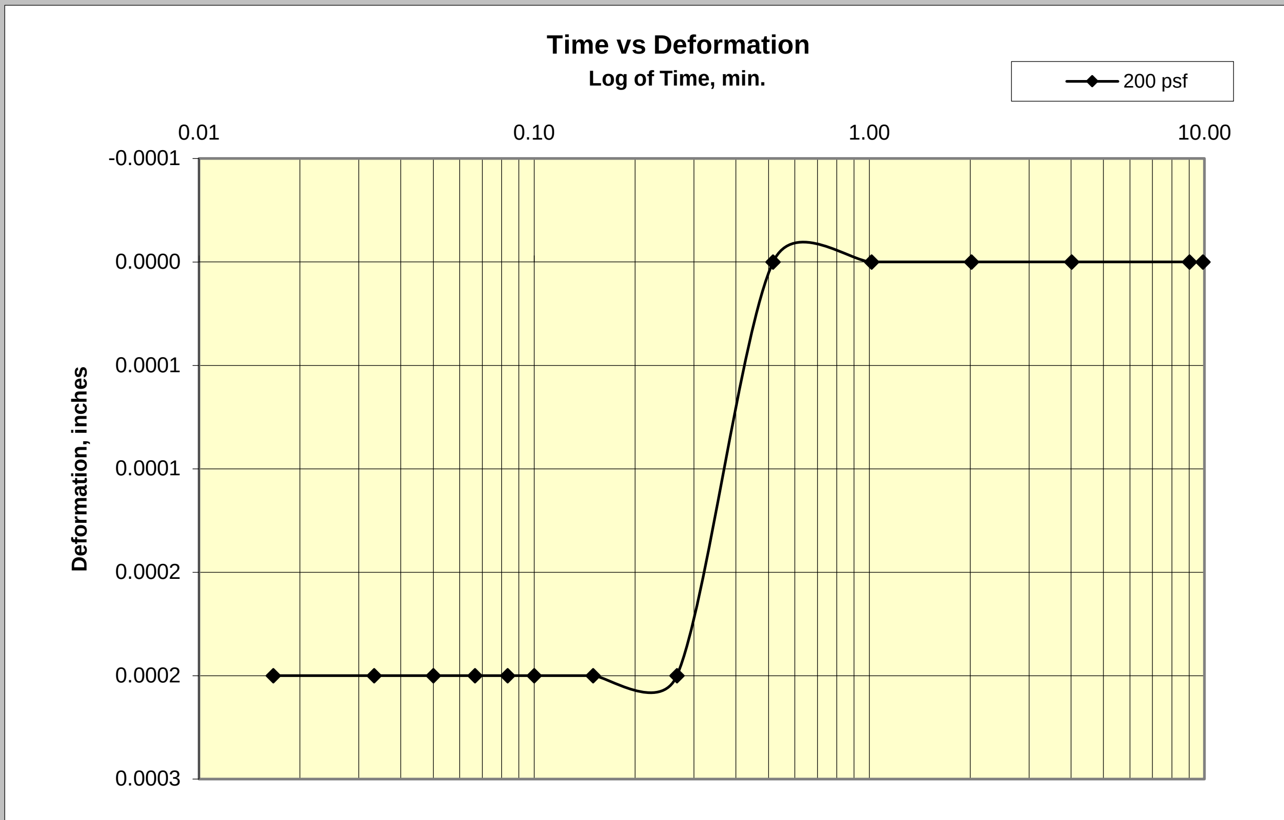
100 psf



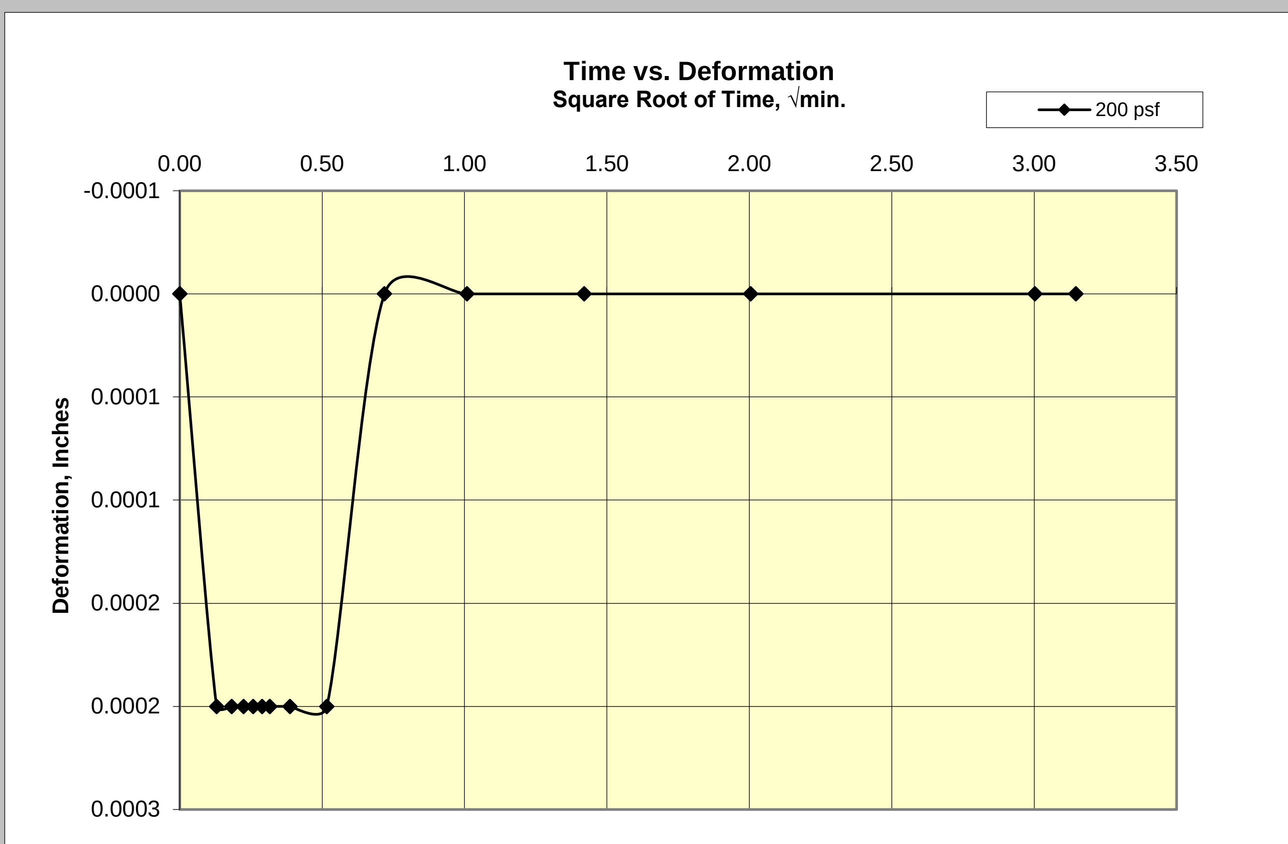
Cooper Testing Labs, Inc.

Load 2

200 psf



200 psf



Cooper Testing Labs, Inc.

Load 3

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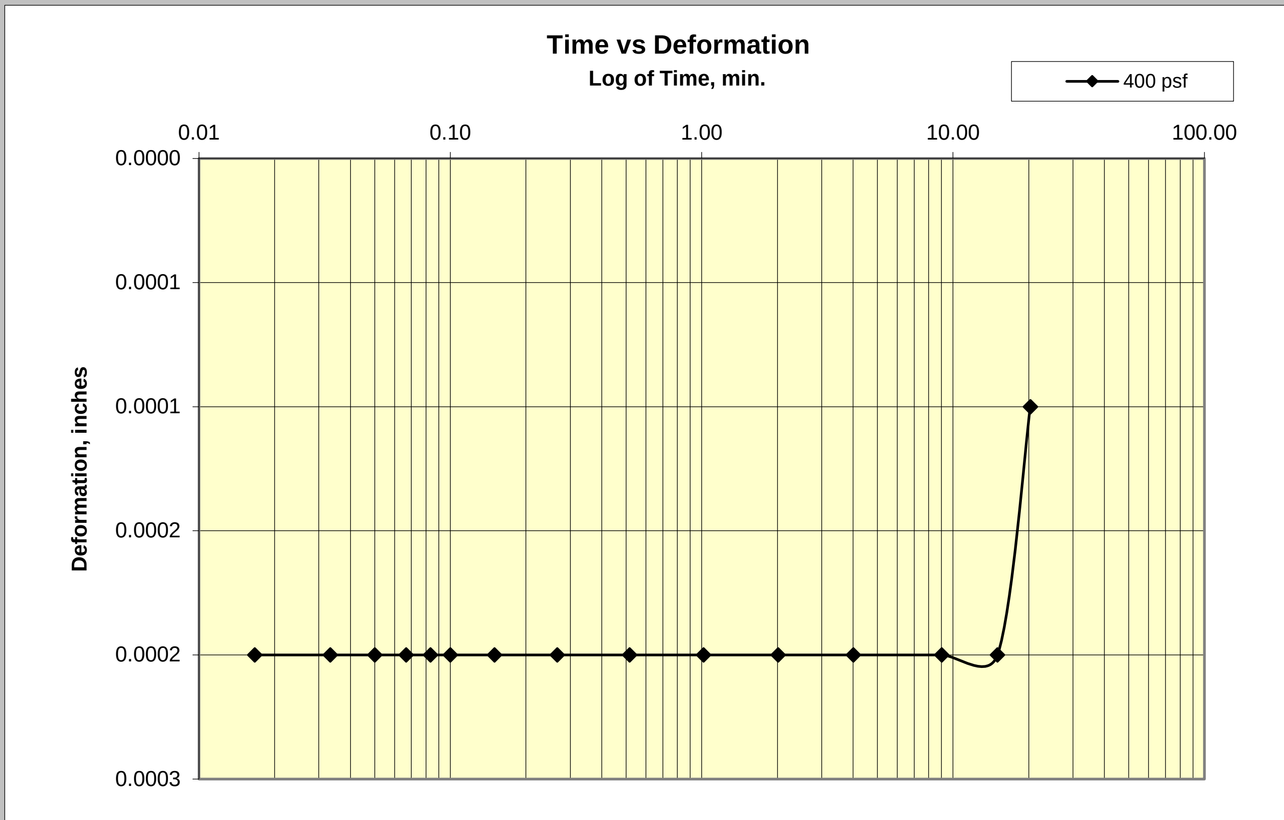
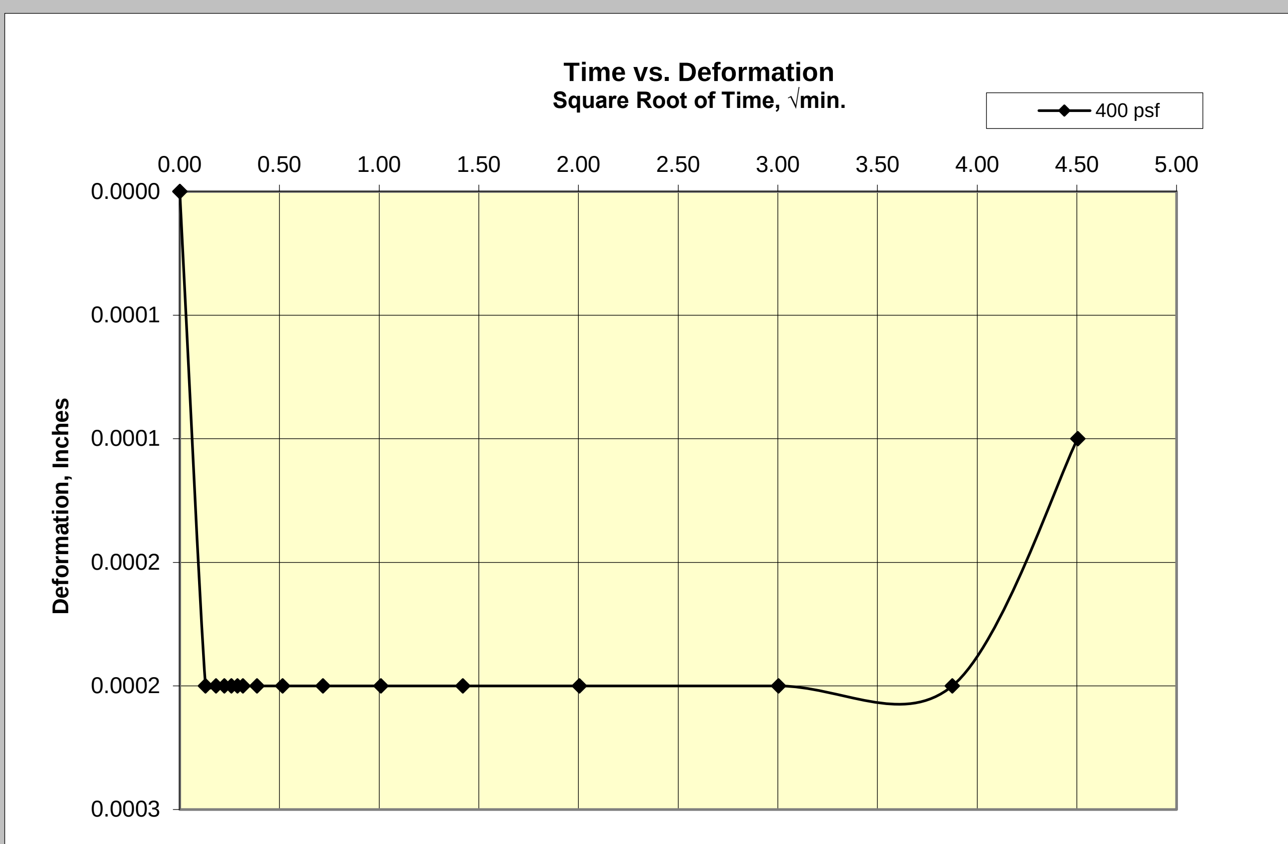


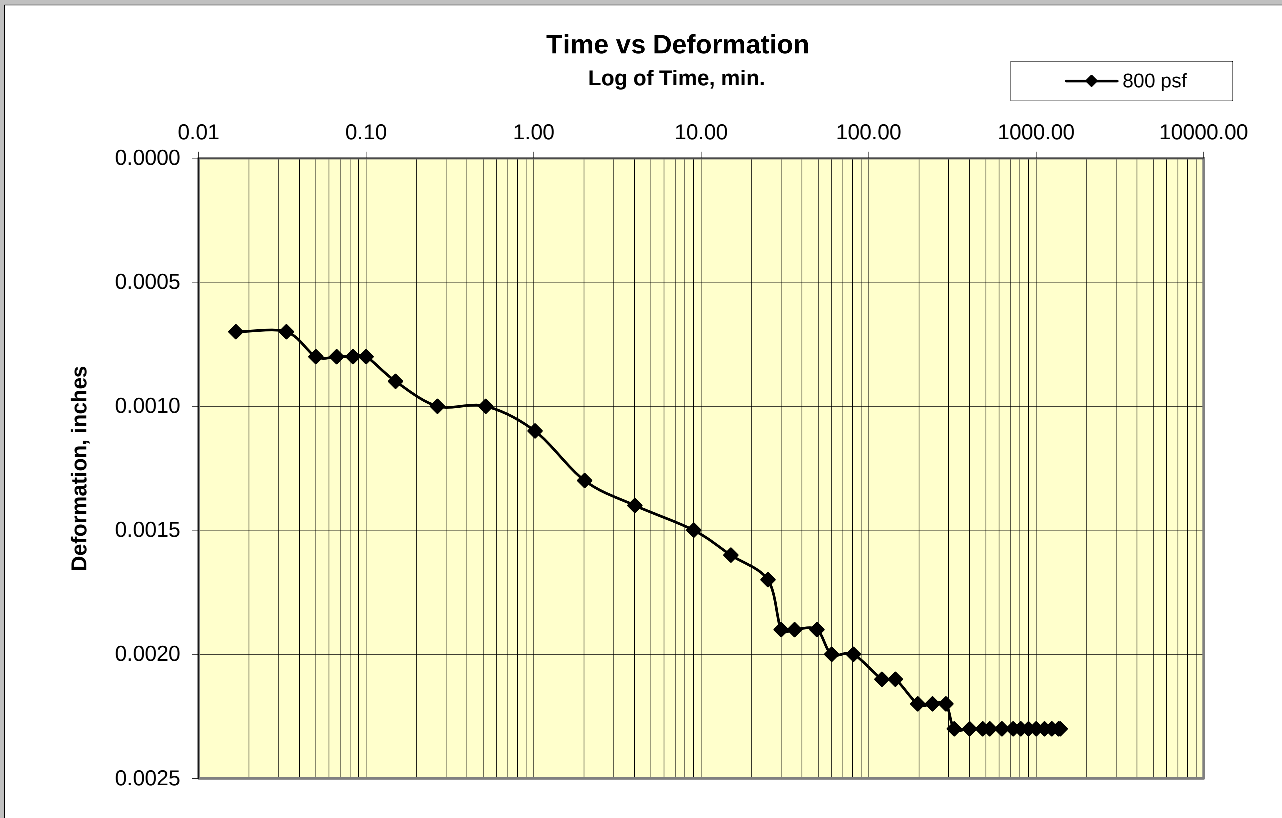
400 psf



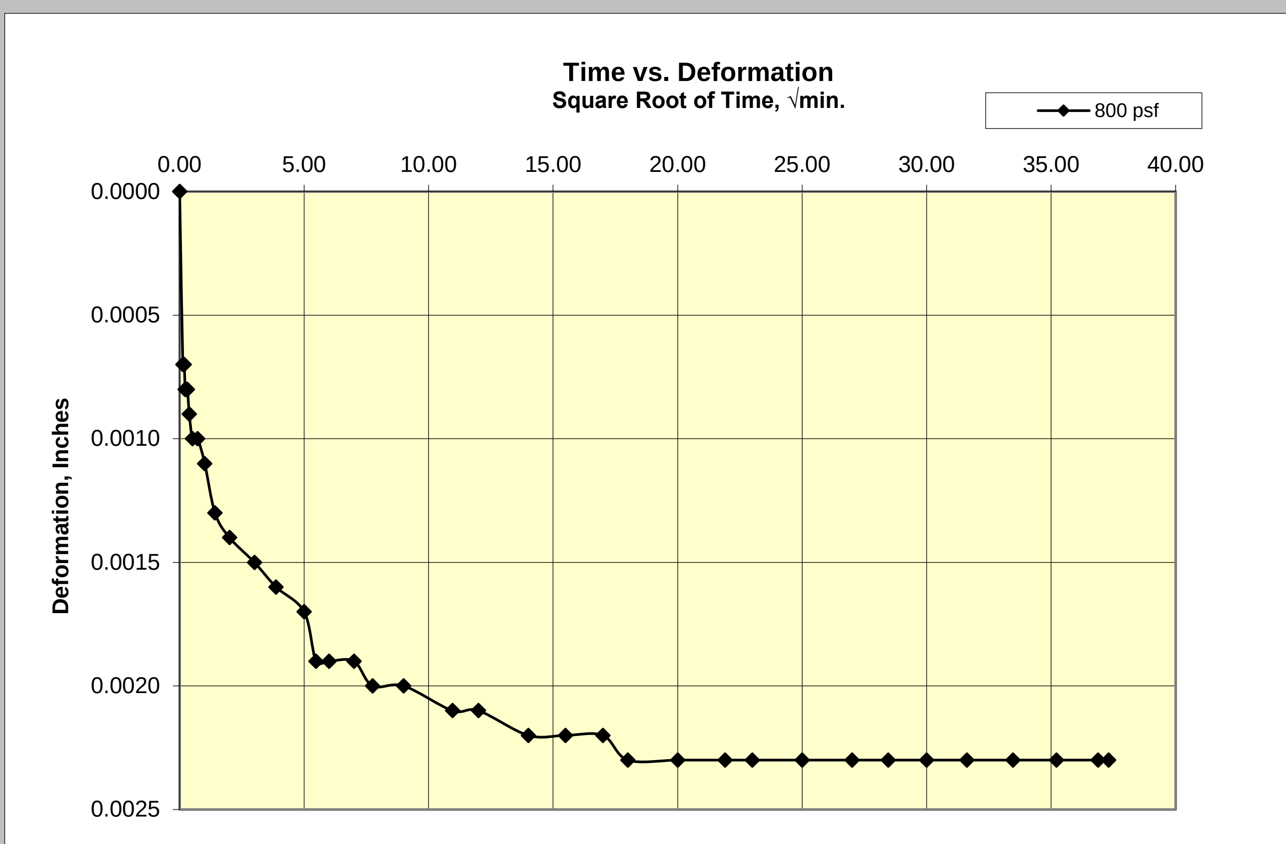
Cooper Testing Labs, Inc.

Load 4

800 psf



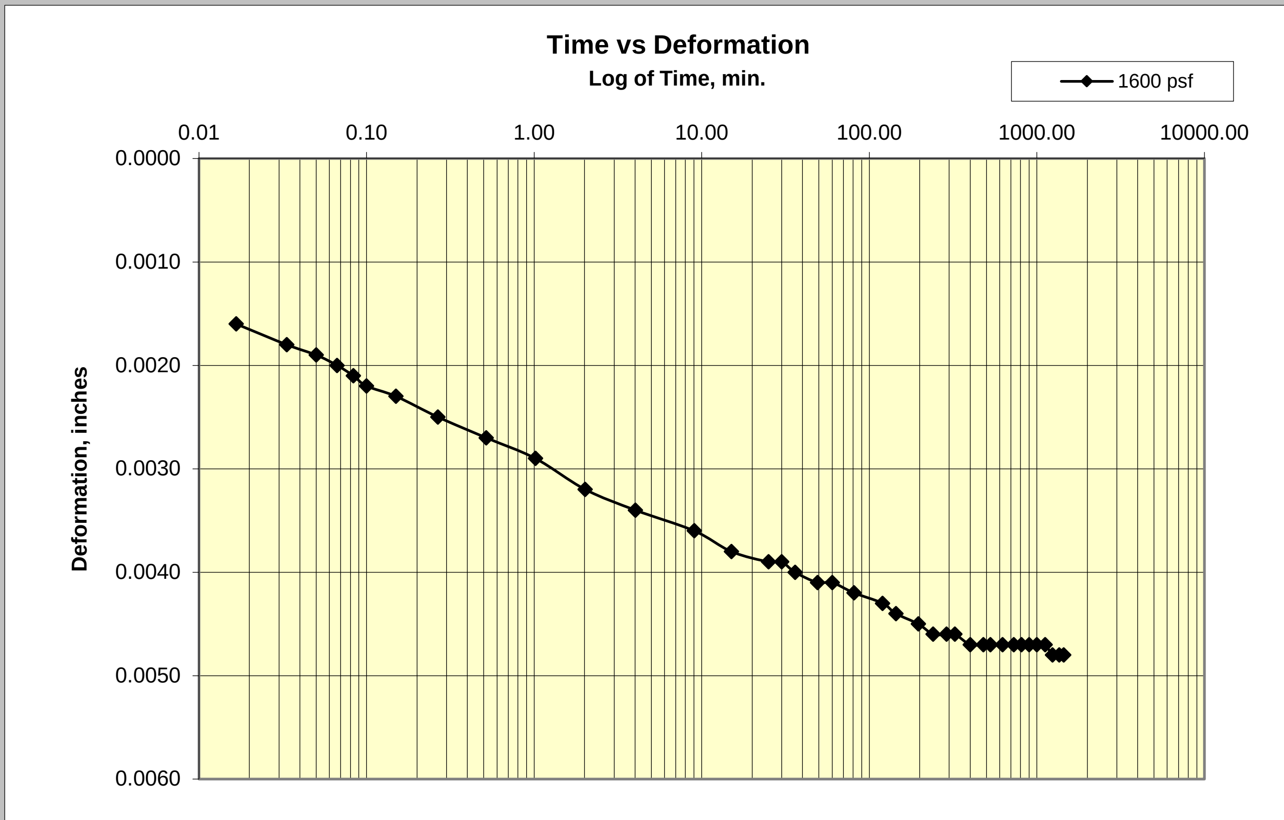
800 psf



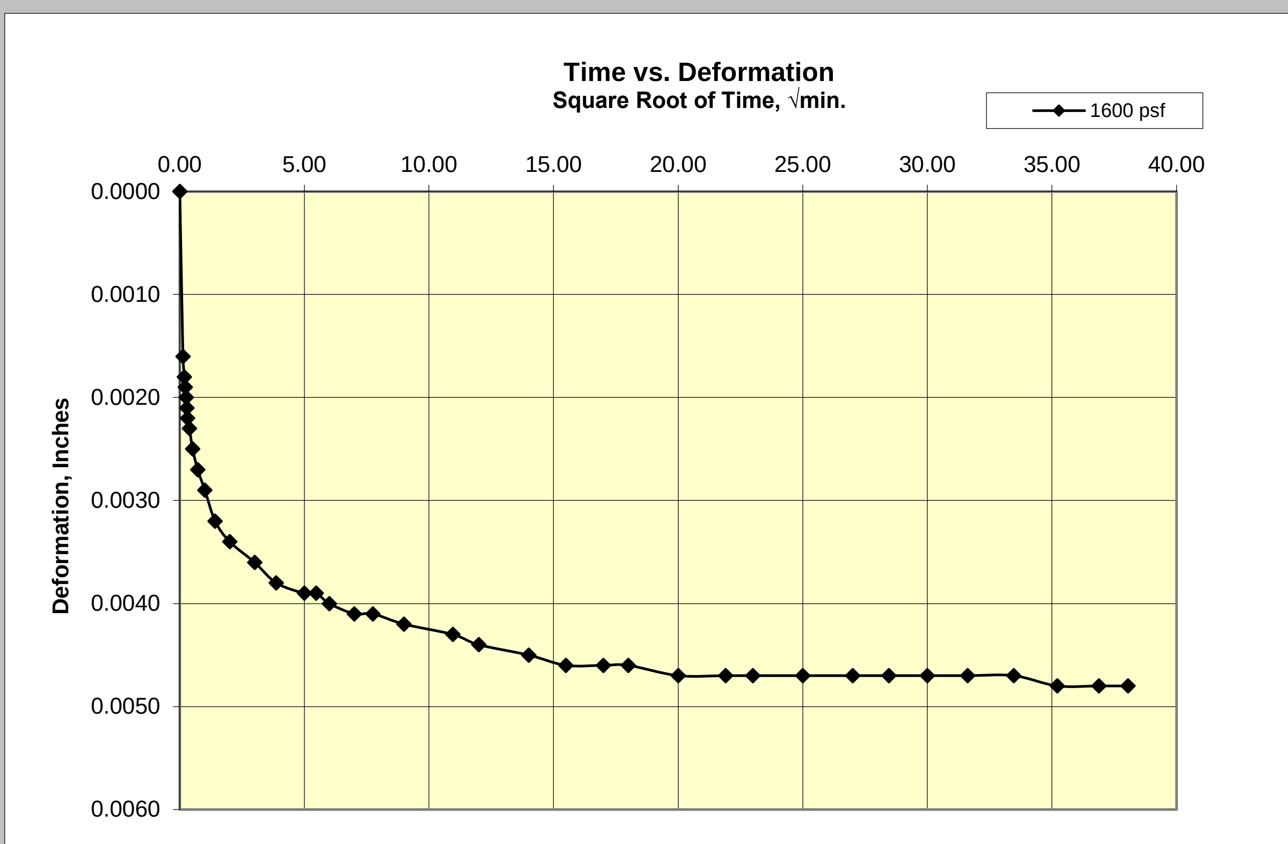
Cooper Testing Labs, Inc.

Load 5

1600 psf



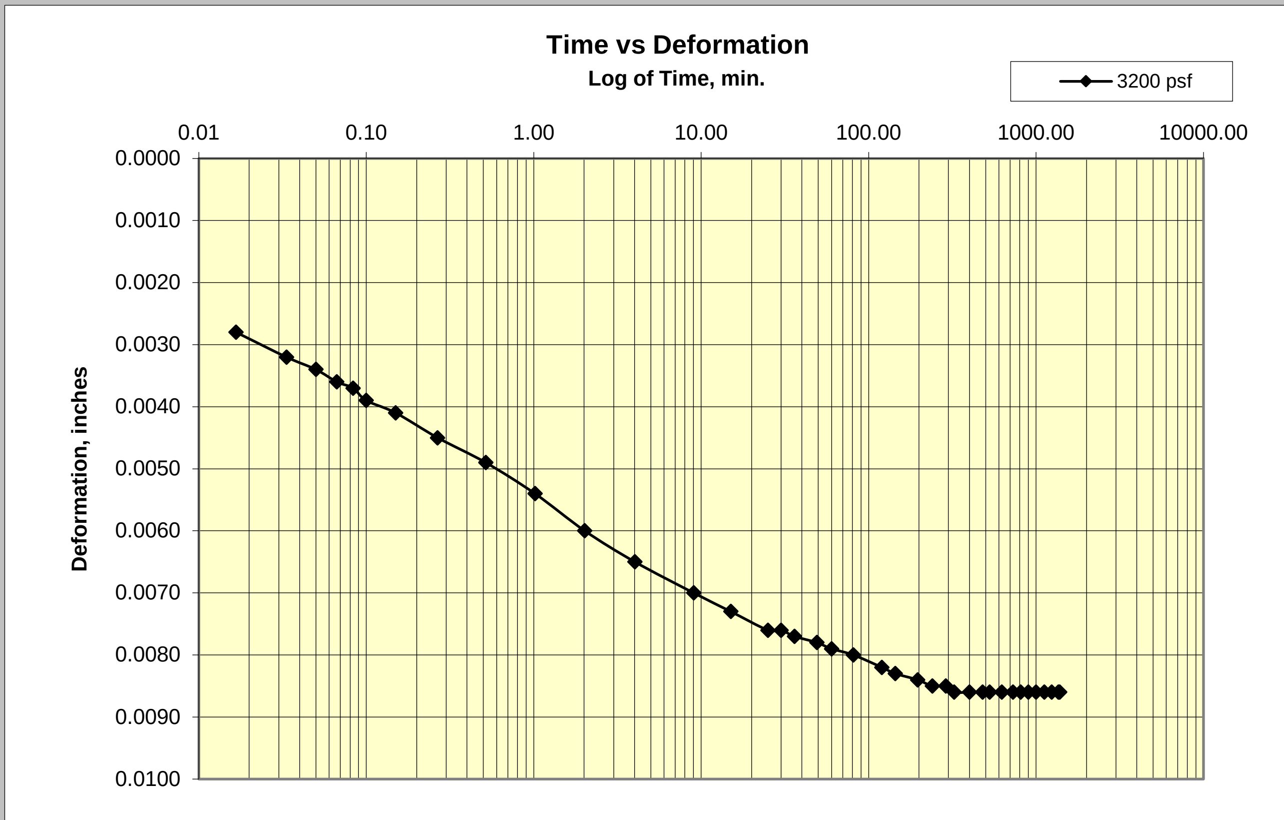
1600 psf



Cooper Testing Labs, Inc.

Load 6

3200 psf



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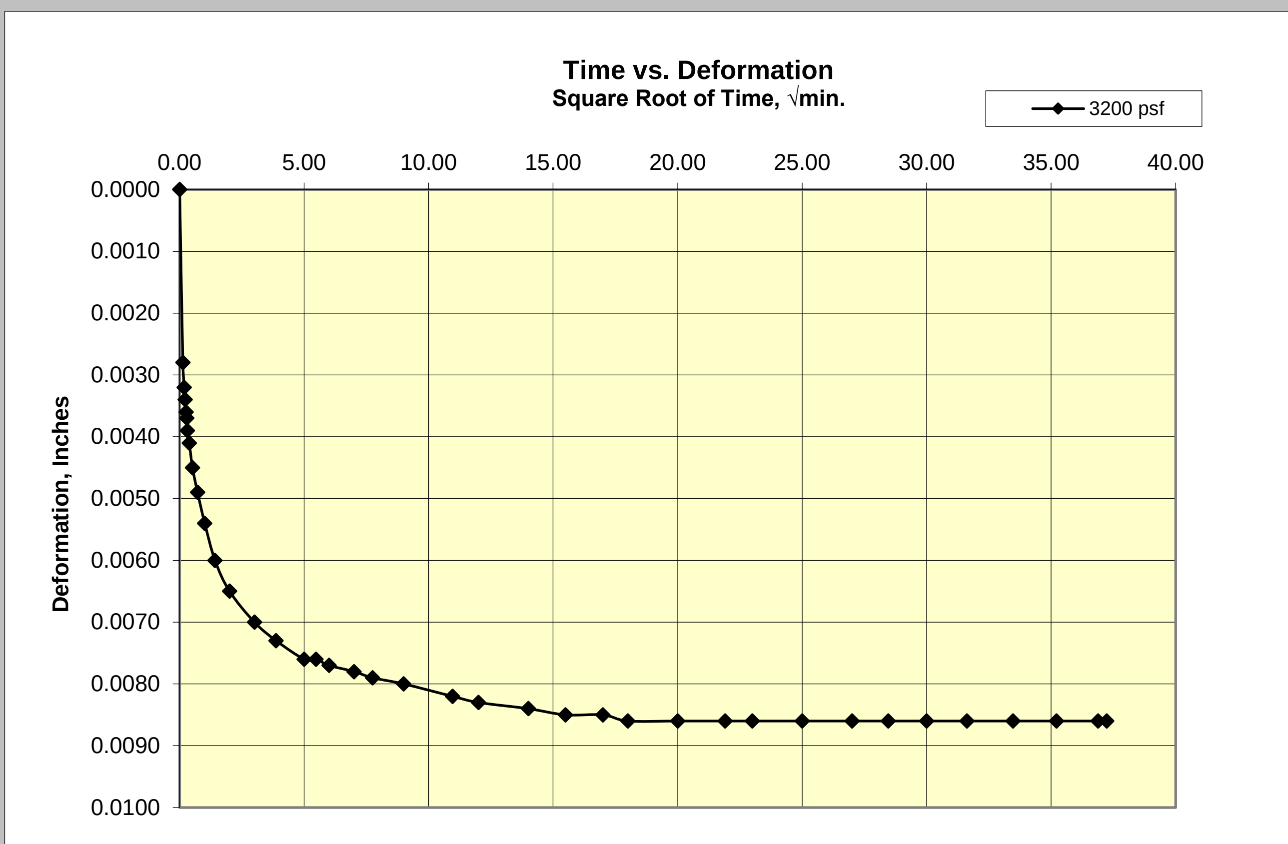
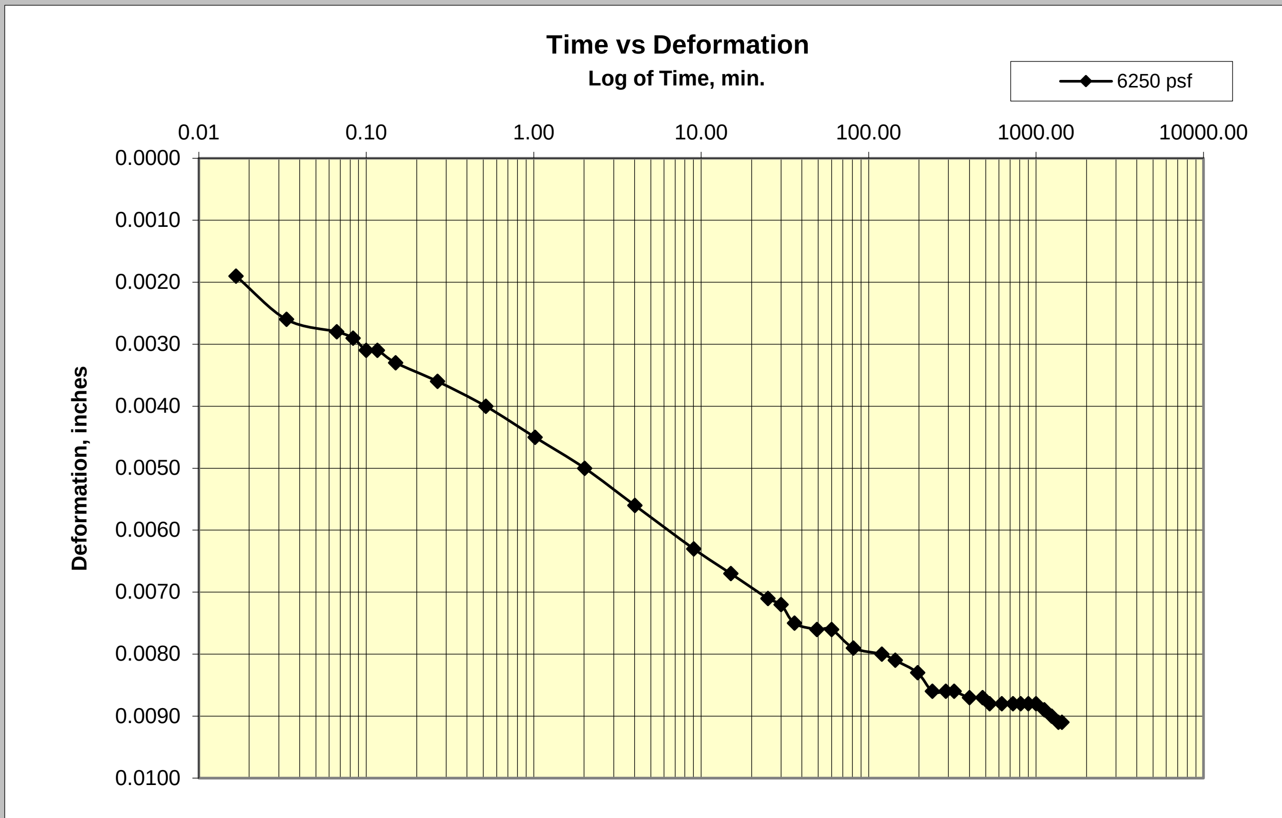
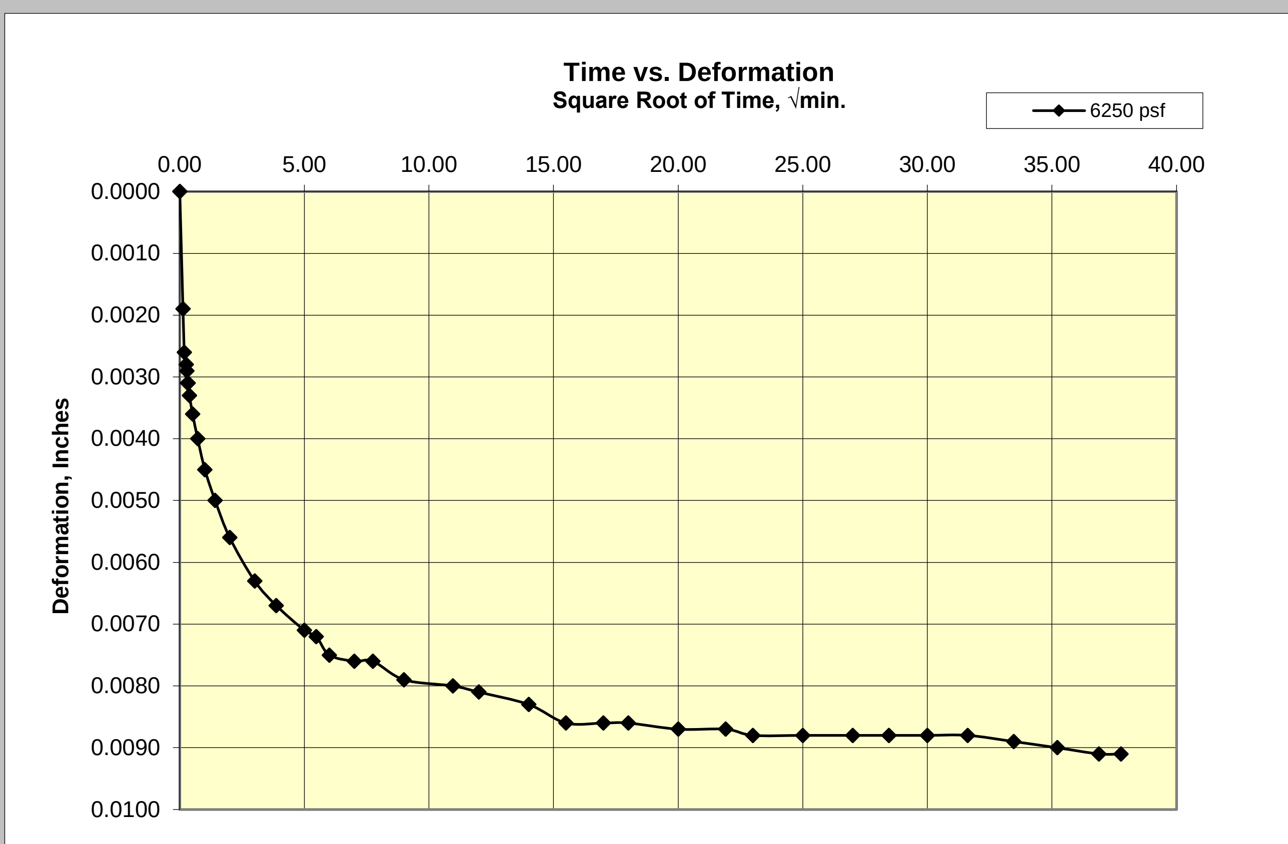


Cooper Testing Labs, Inc.

Load 7 | 6250 psf



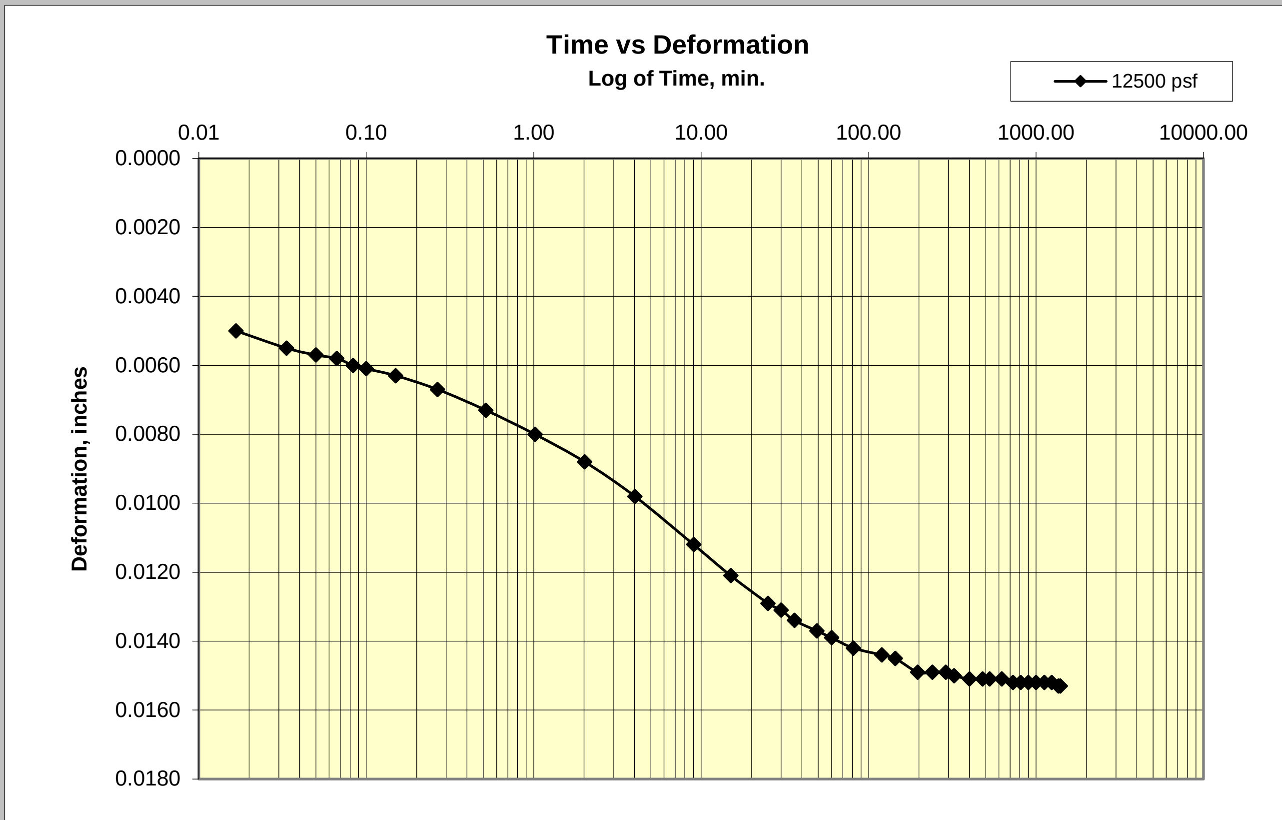
6250 psf



Cooper Testing Labs, Inc.

Load 8

12500 psf



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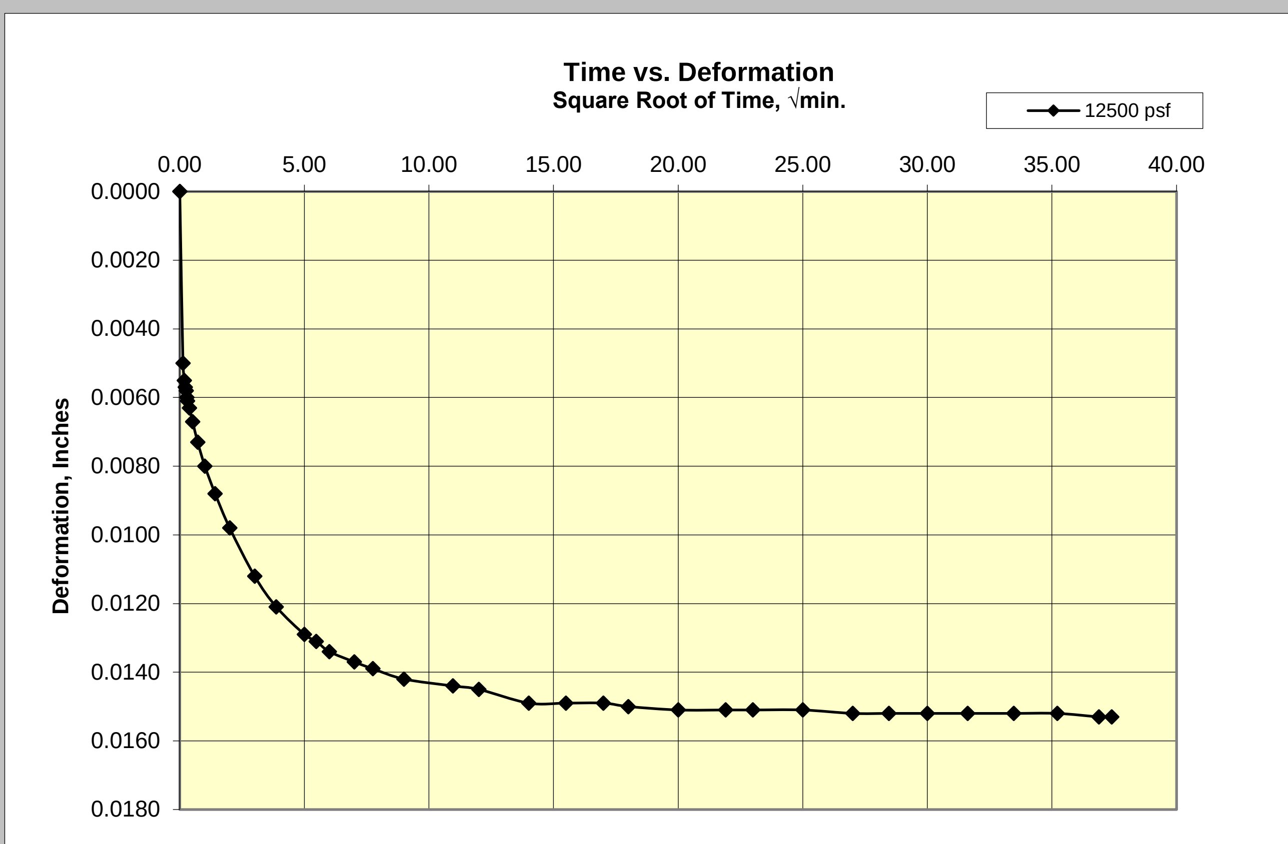
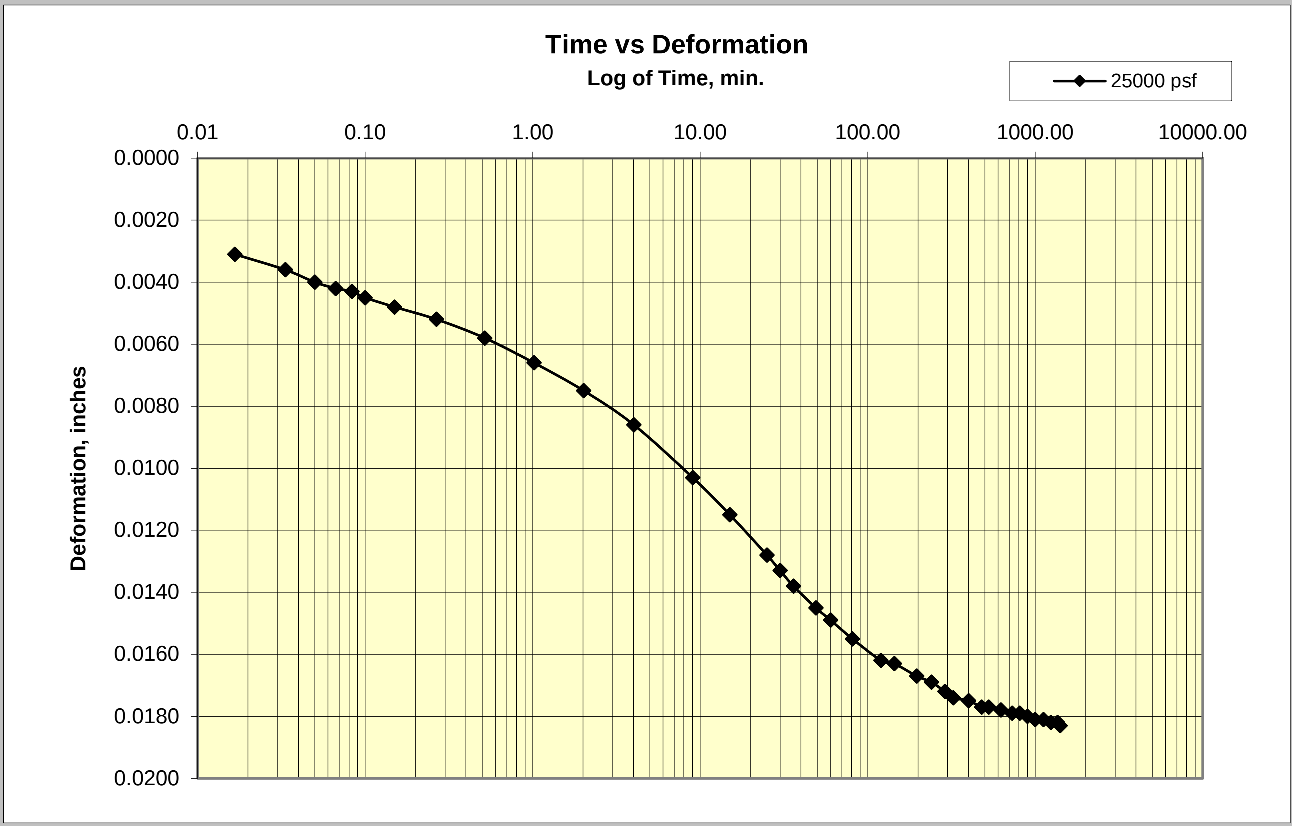


Cooper Testing Labs, Inc.

Load 9

25000 psf



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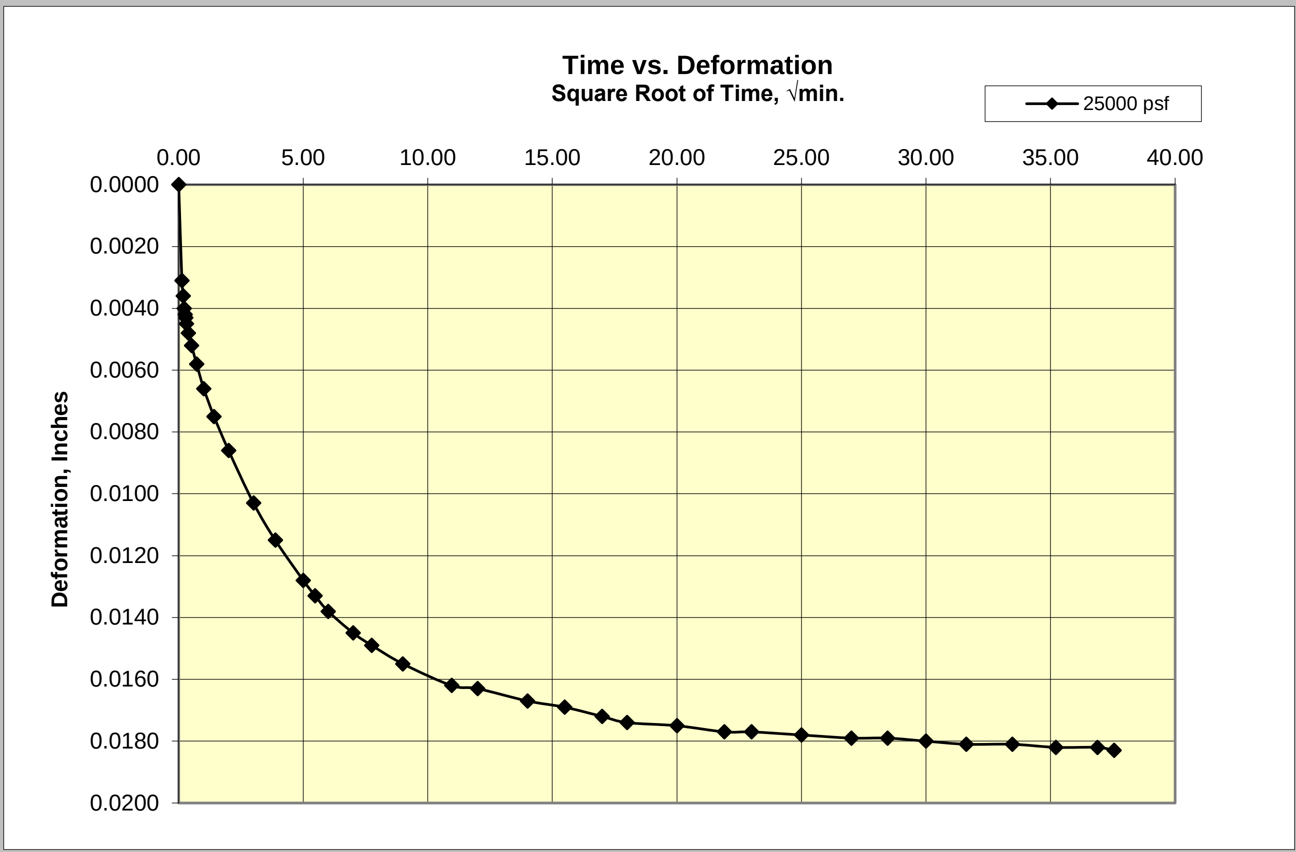
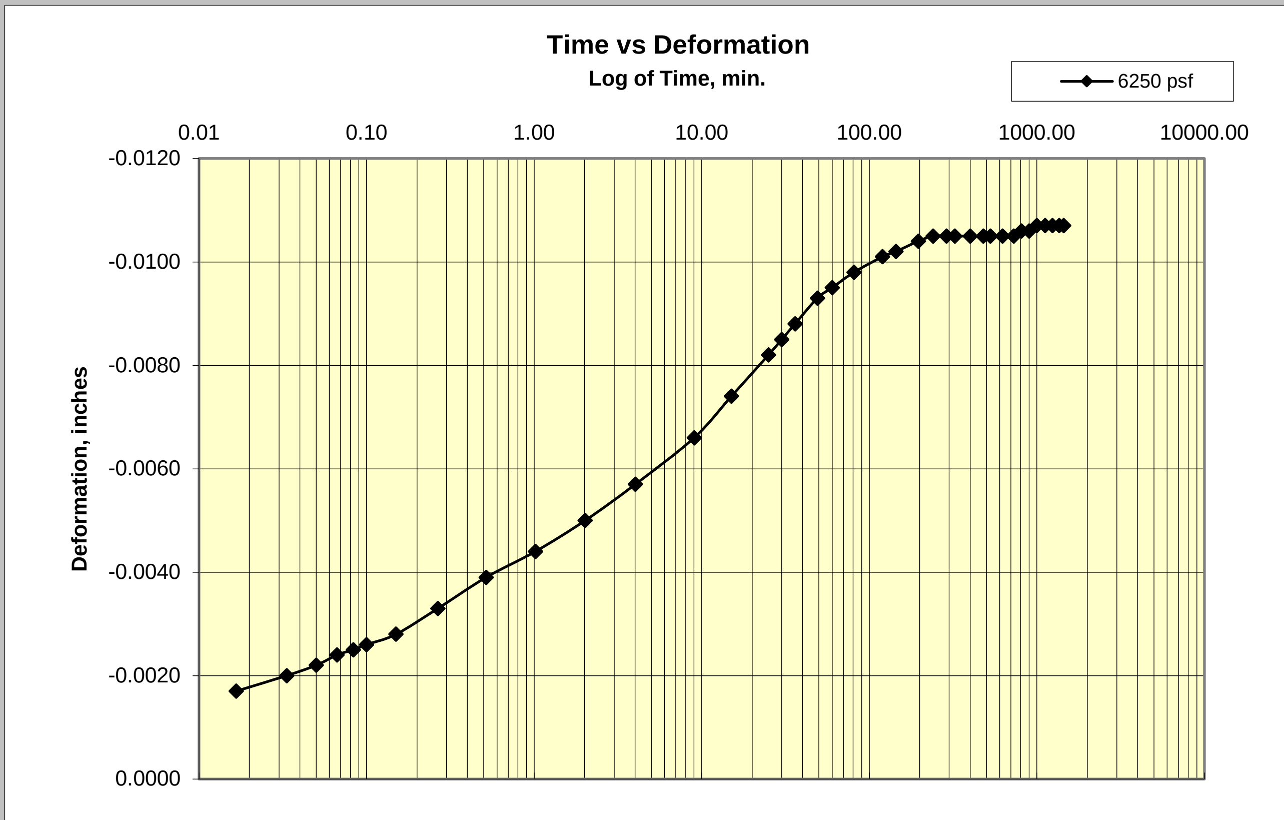


Cooper Testing Labs, Inc.

Load 10

6250 psf



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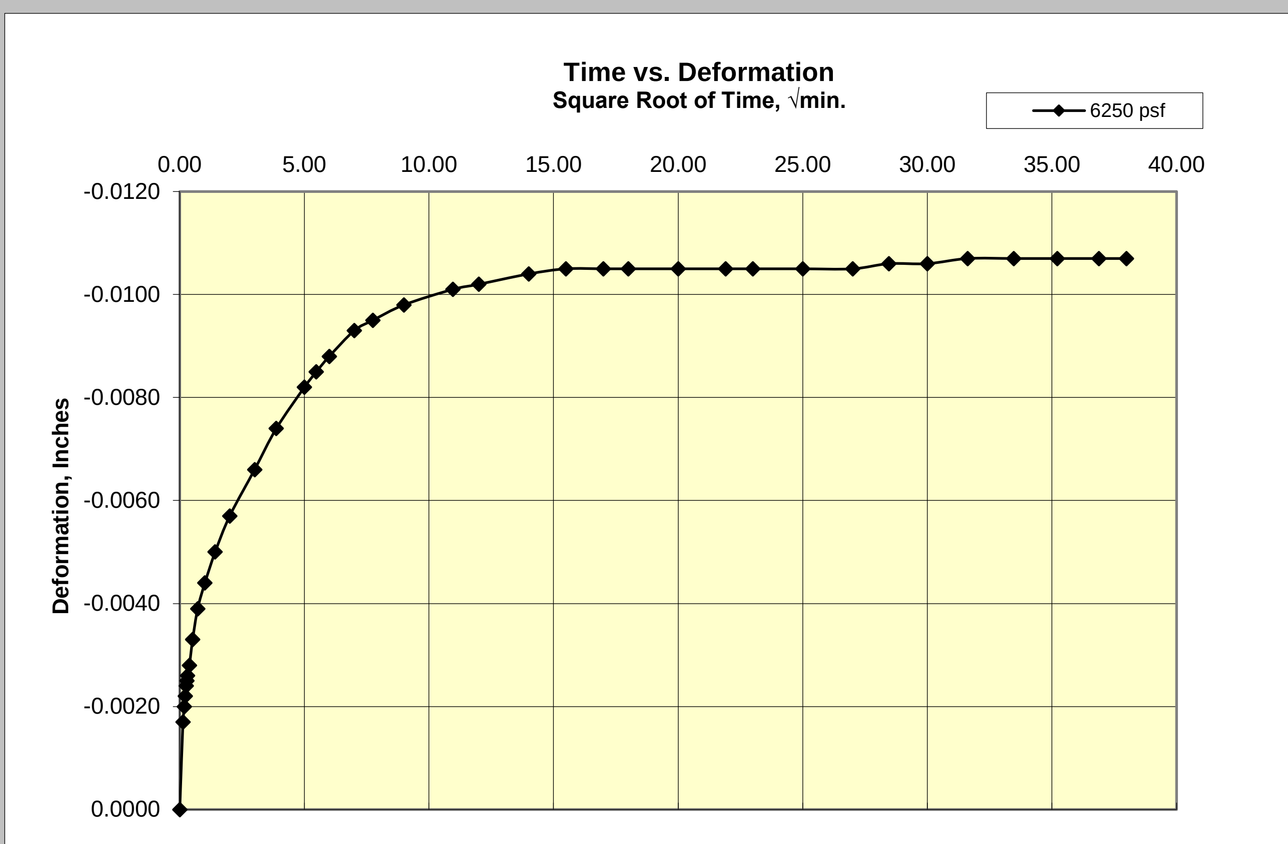
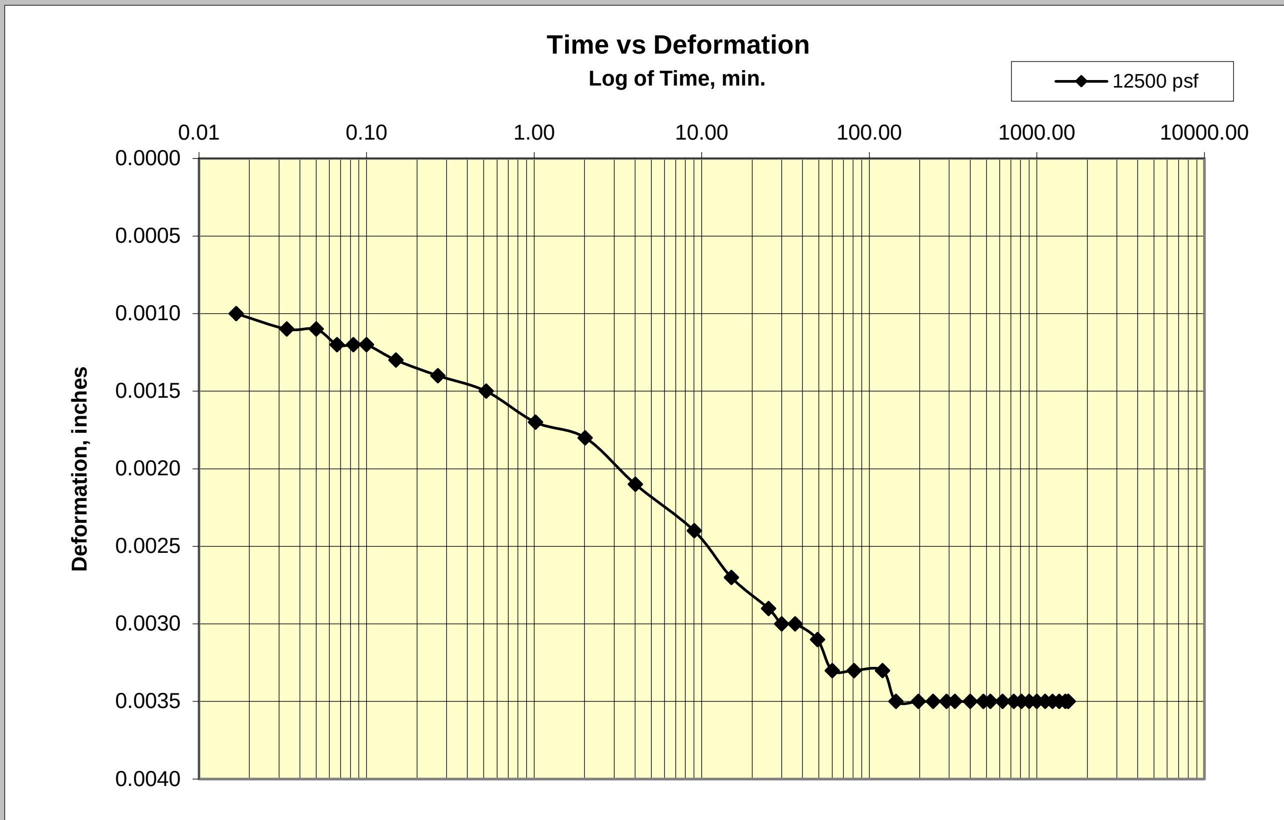


Cooper Testing Labs, Inc.

Load 11 | 12500 psf



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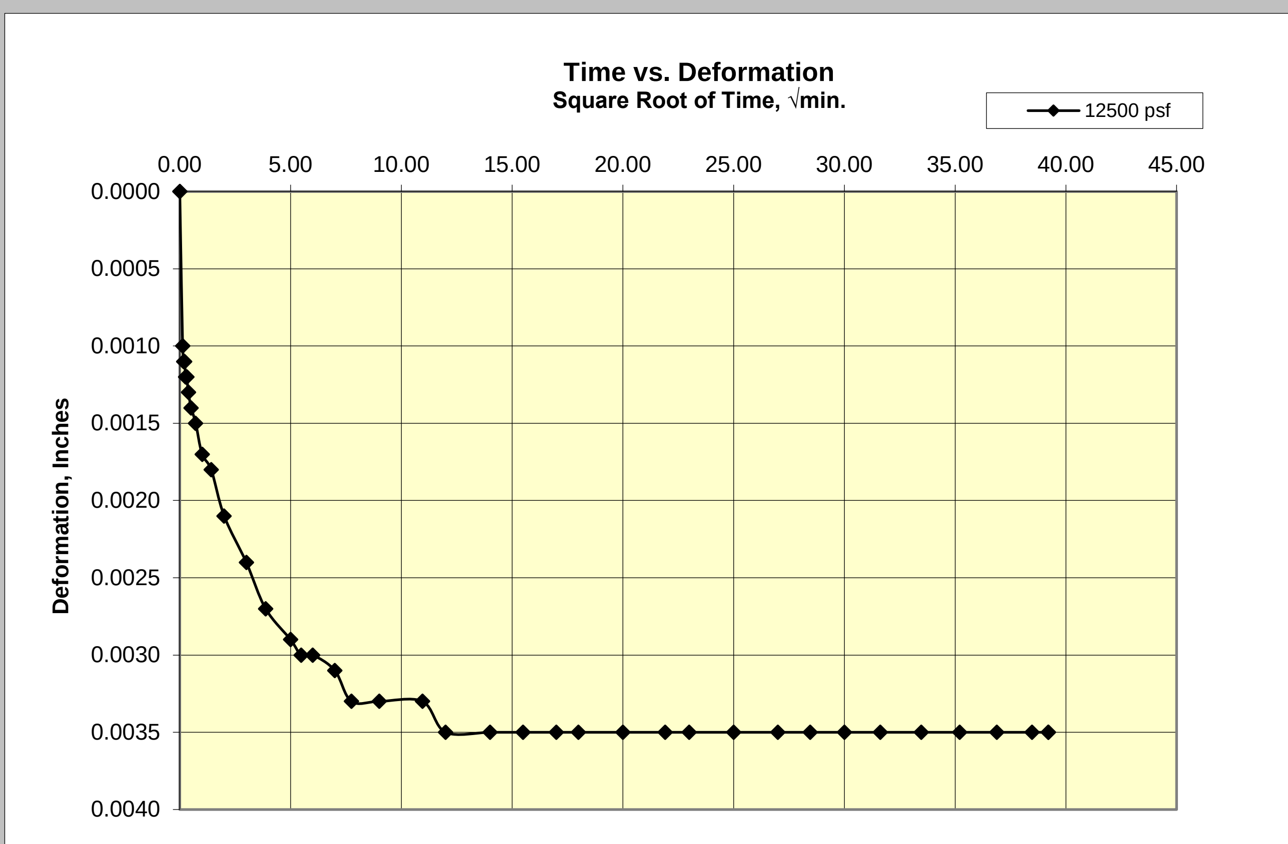
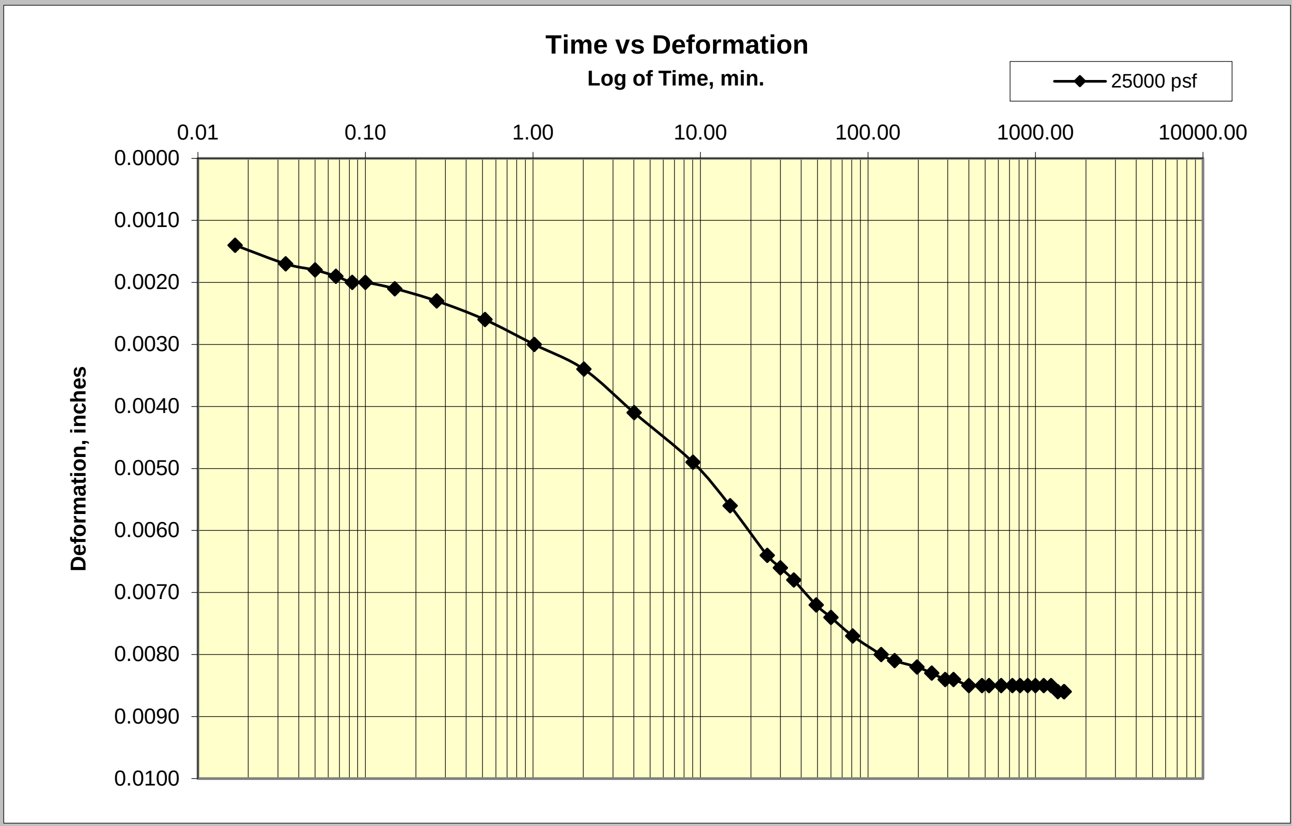


Cooper Testing Labs, Inc.

Load 12

25000 psf



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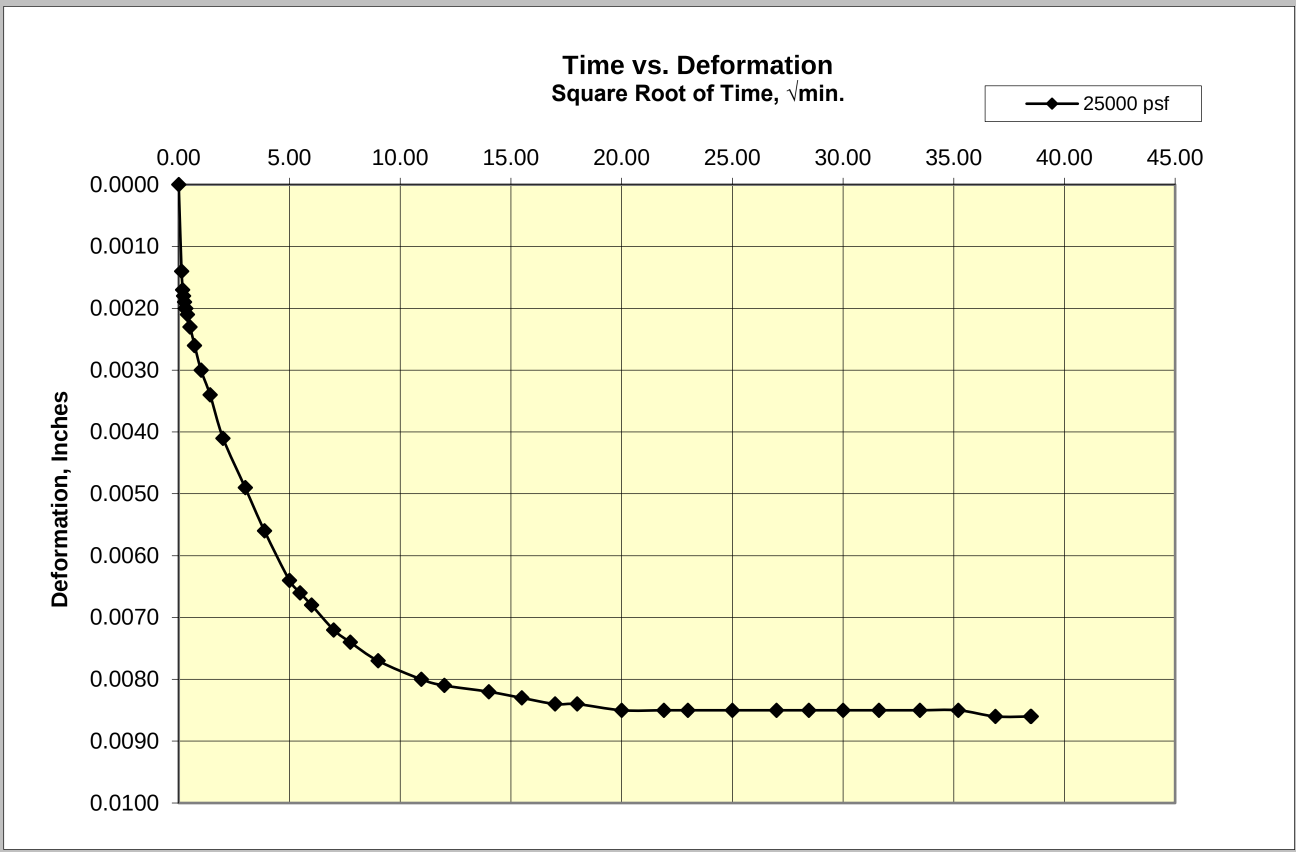
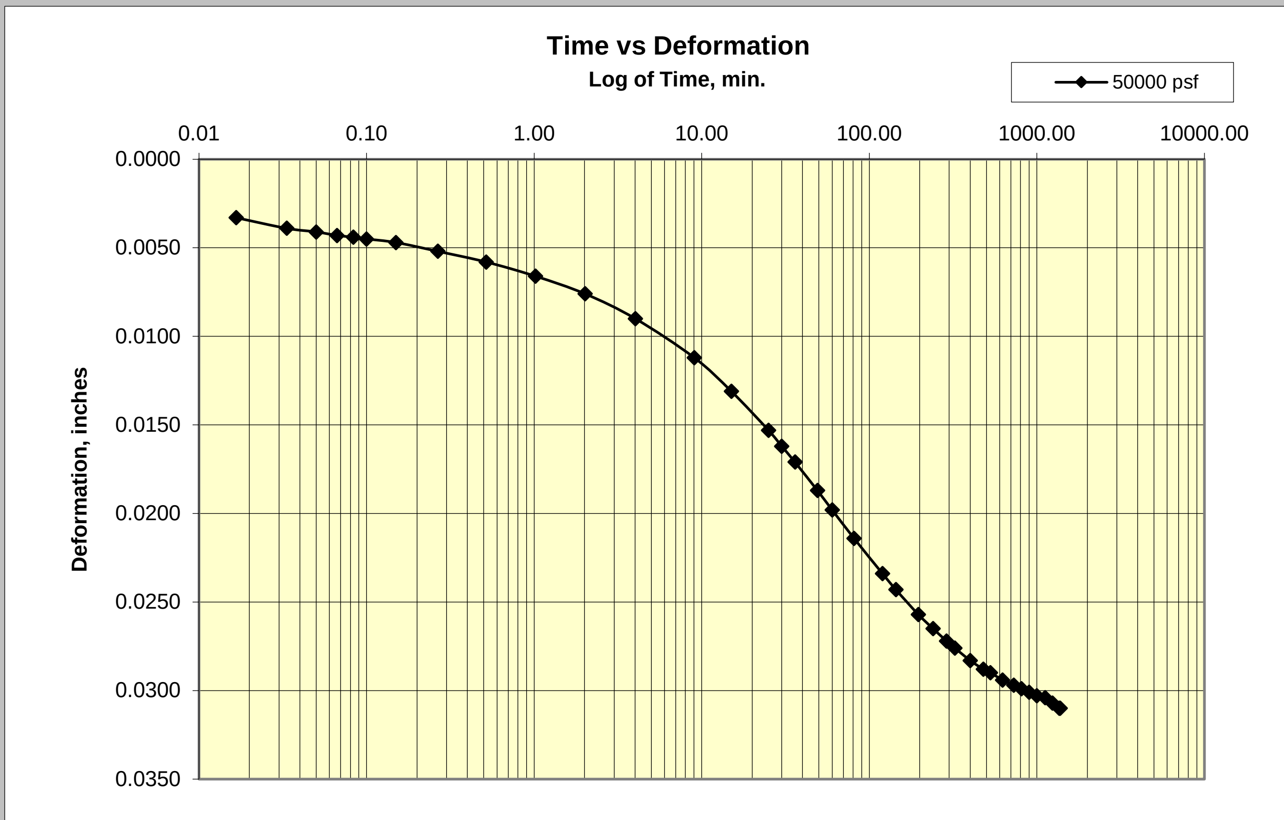


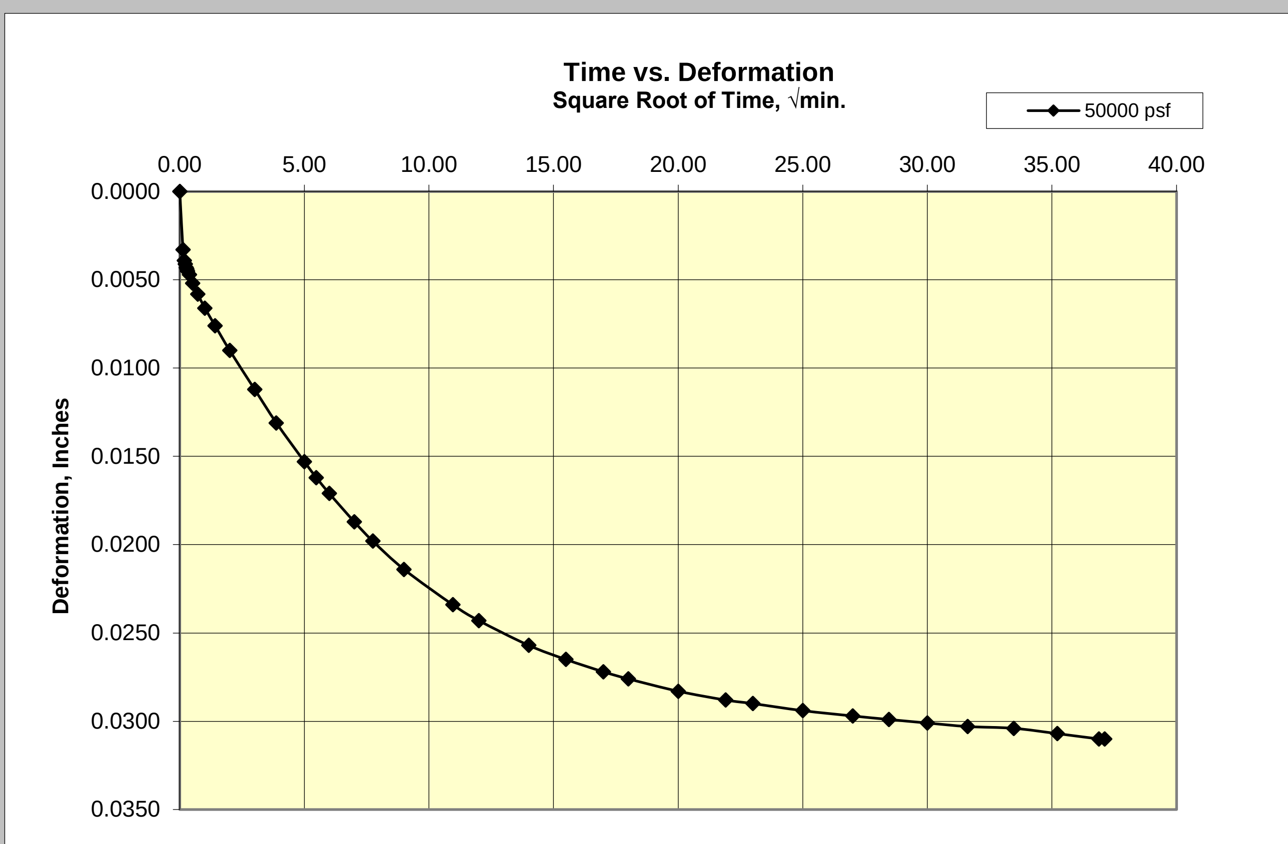
Cooper Testing Labs, Inc.

Load 13

50000 psf



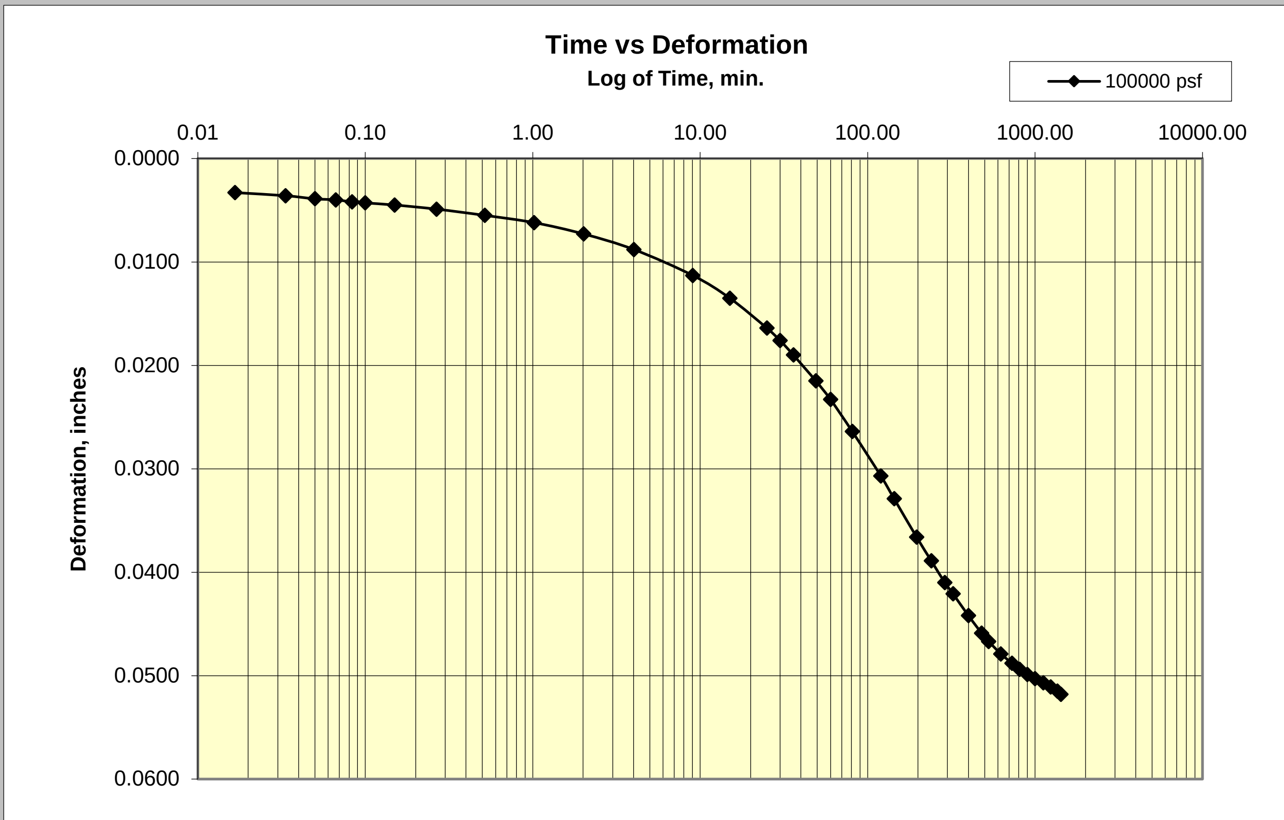
50000 psf



Cooper Testing Labs, Inc.

Load 14

100000 psf



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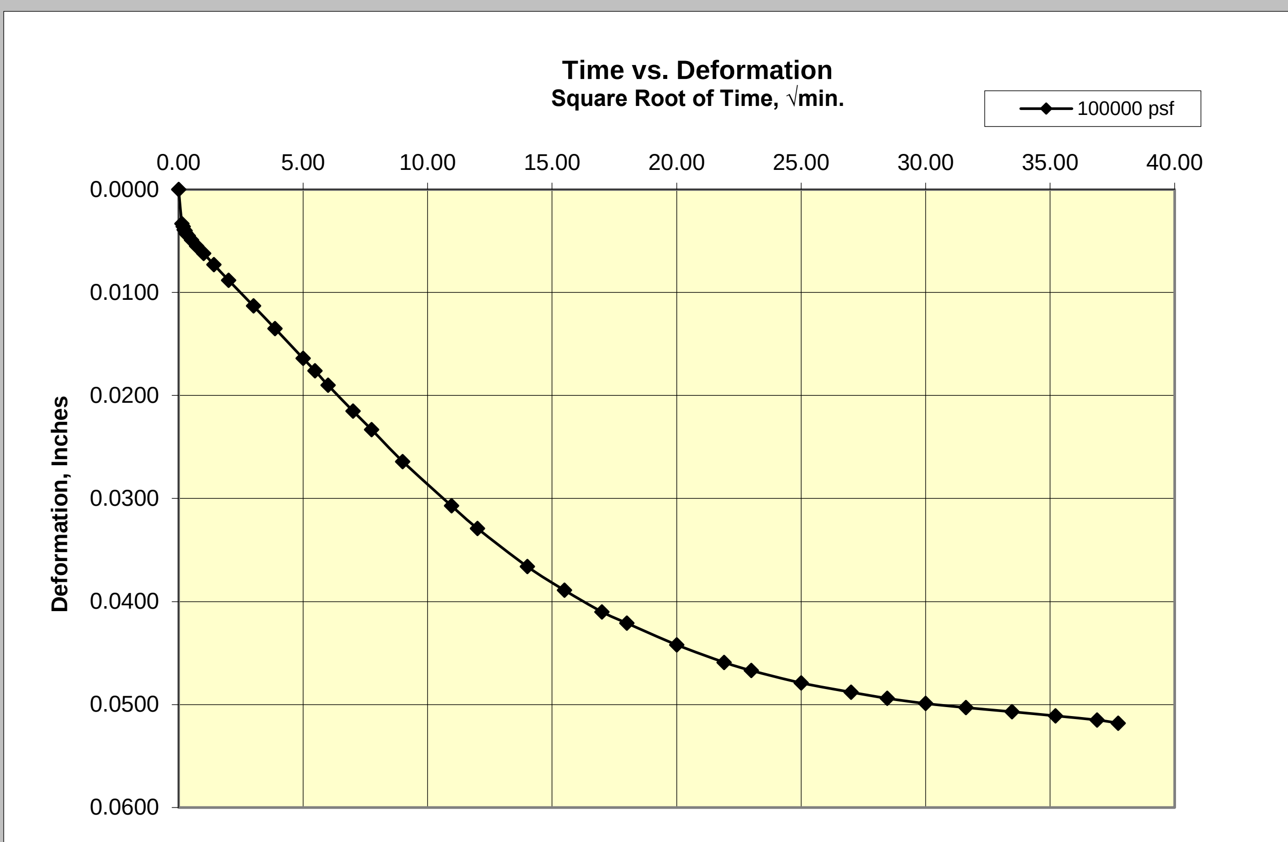
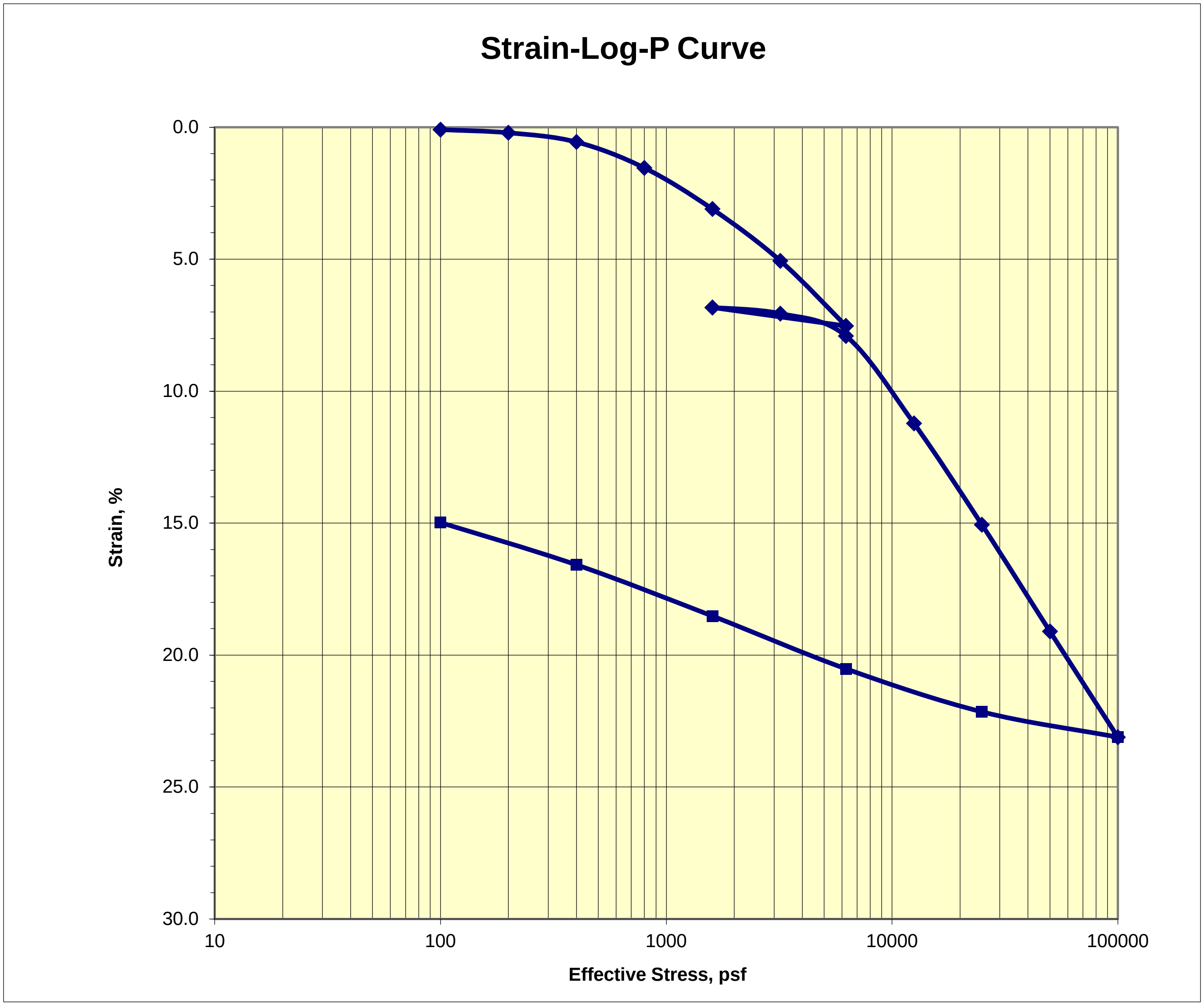


Consolidation Test
ASTM D2435

COOPER TESTING LABORATORY

Job No.:	461-388	**Boring:**	B-103	**Run By:**	HM
Client:	Geosyntec Consultants	**Sample:**	103-15	**Reduced:**	RU
Project:	WG3444	**Depth, ft.:**	60-62.5	**Checked:**	PJ
Soil Type:	Dark Gray CLAY w/ Sand			**Date:**	5/29/2025



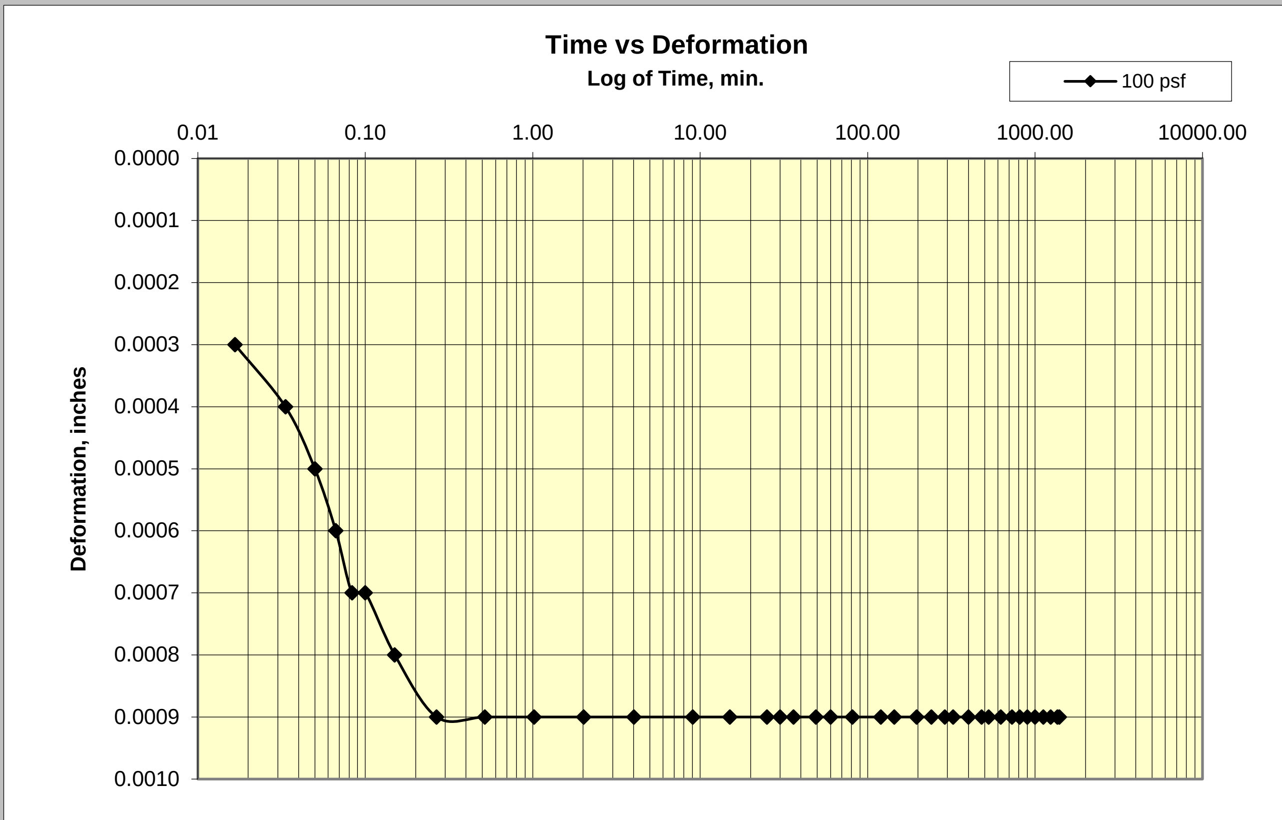
Assumed Gs 2.8	**Initial**	**Final**
Moisture %:	28.8	21.7
Dry Density, pcf:	93.8	108.7
Void Ratio:	0.864	0.608
% Saturation:	93.3	100.0

Remarks:

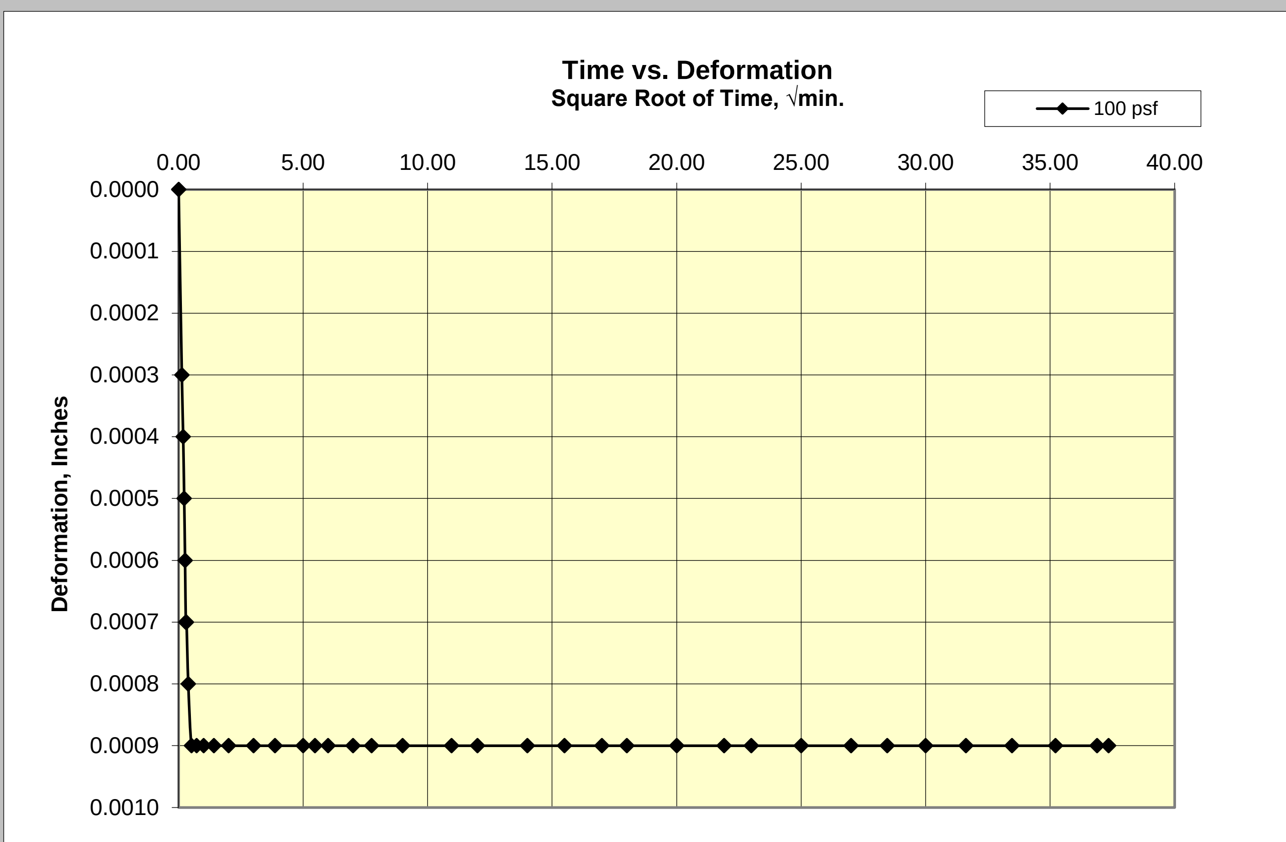
Cooper Testing Labs, Inc.

Load 1

100 psf

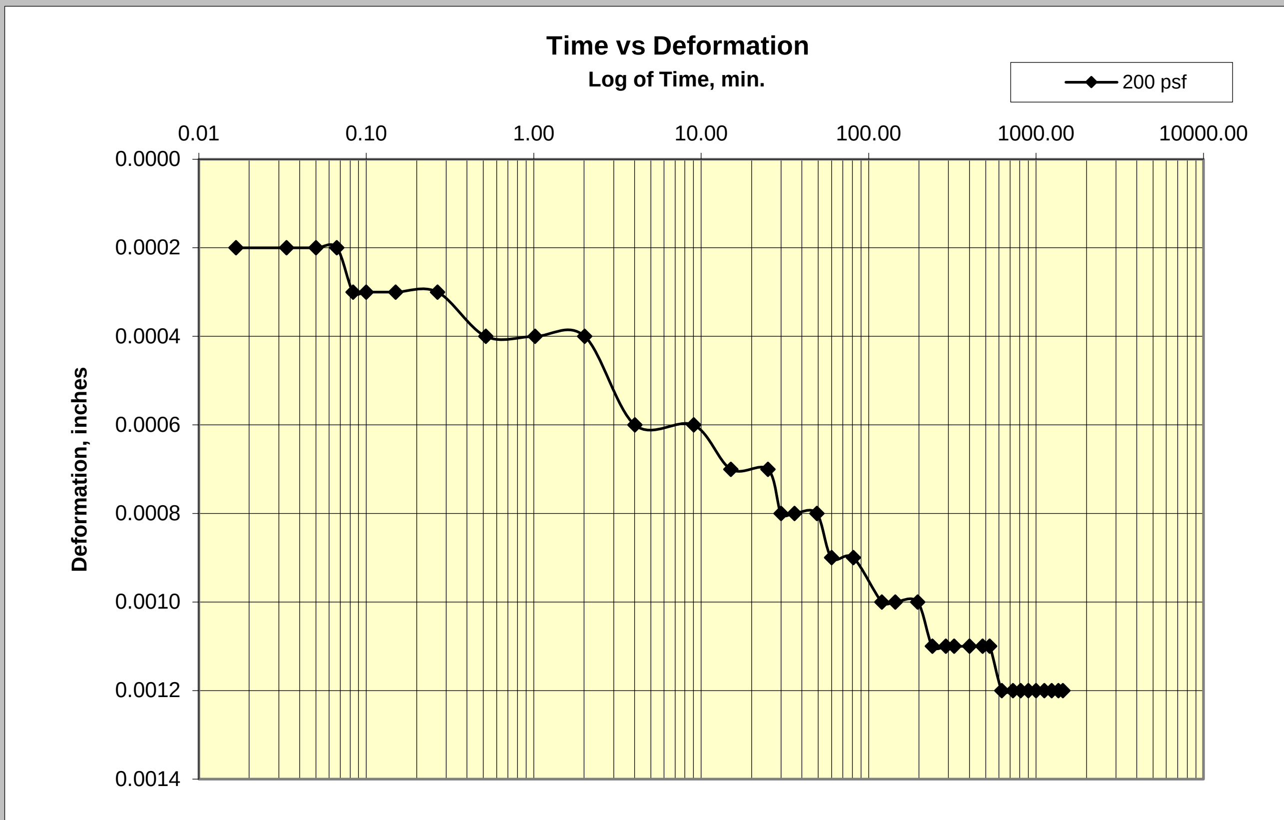


100 psf

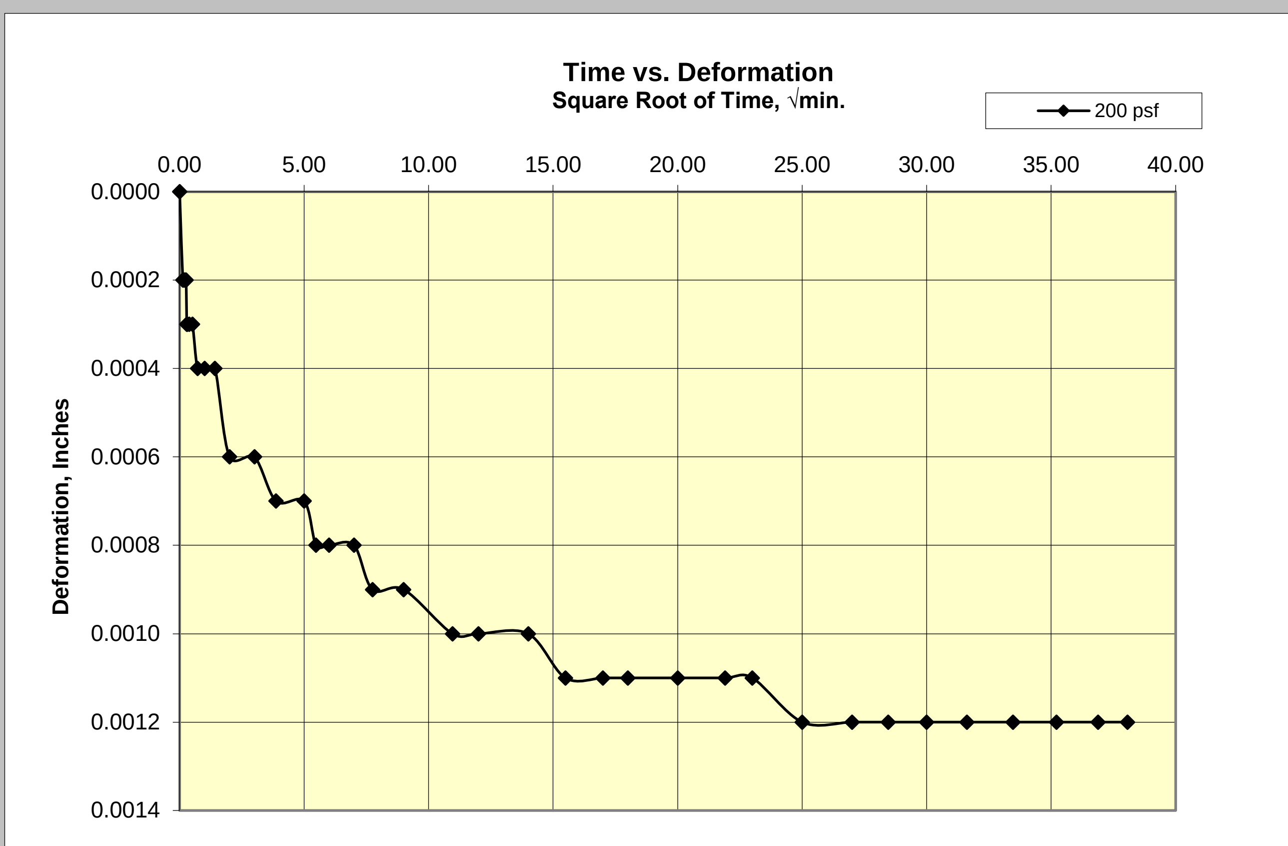


Cooper Testing Labs, Inc.

Load 2 | 200 psf



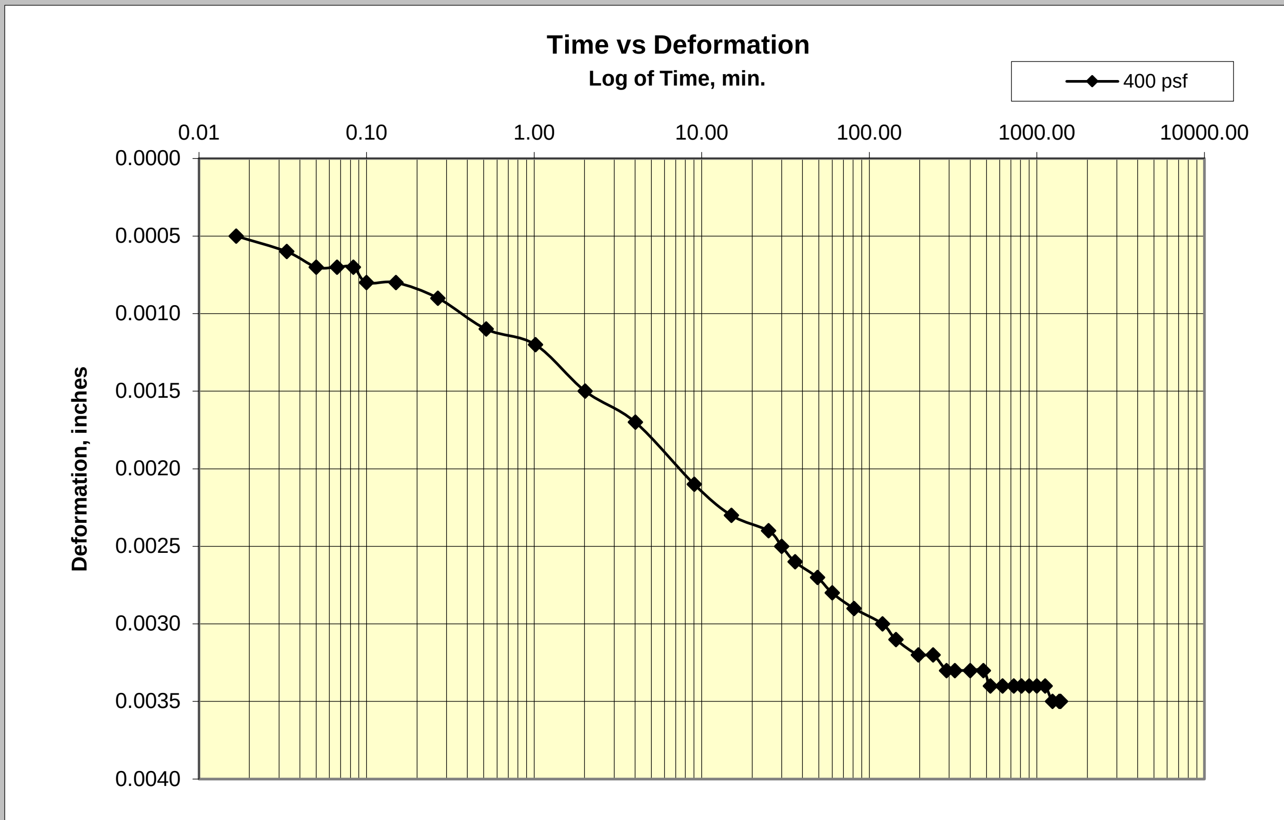
200 psf



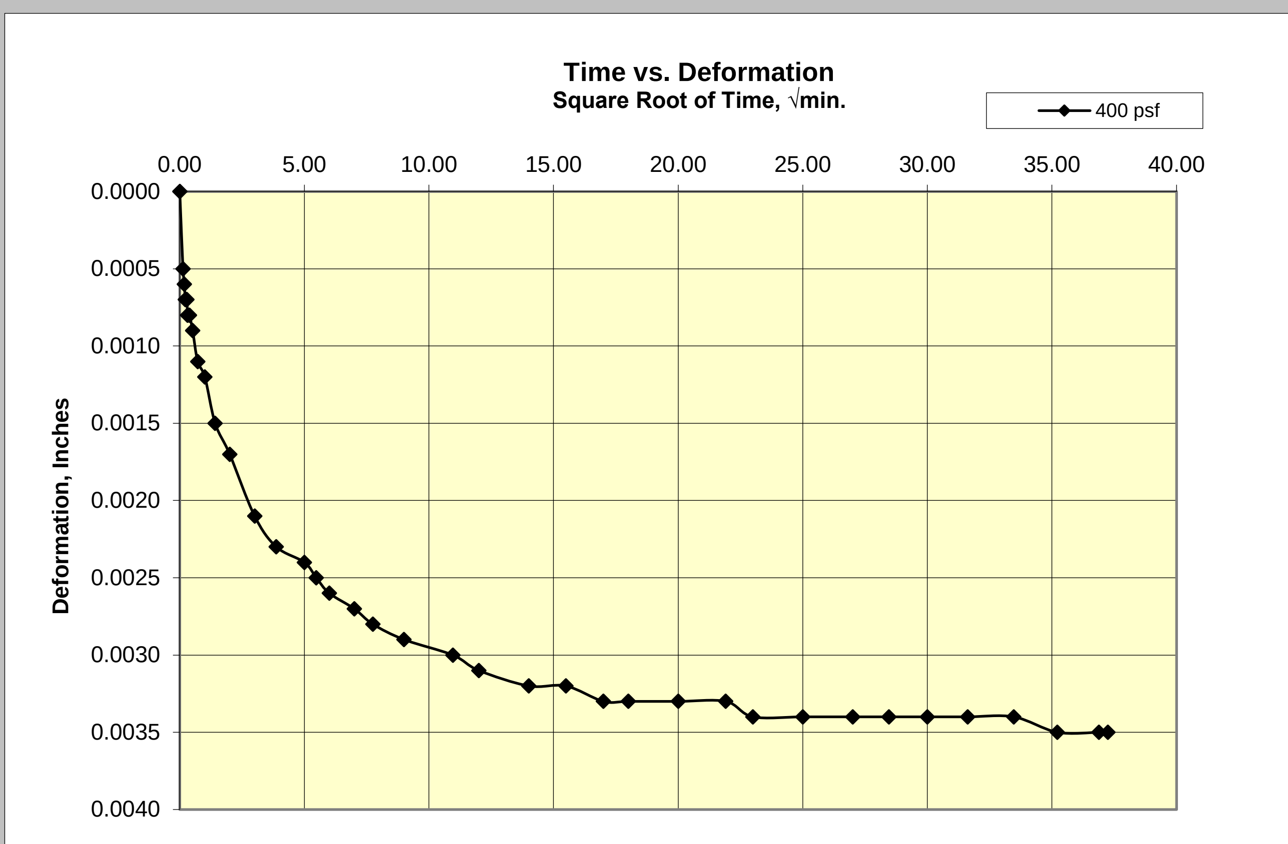
Cooper Testing Labs, Inc.

Load 3

400 psf



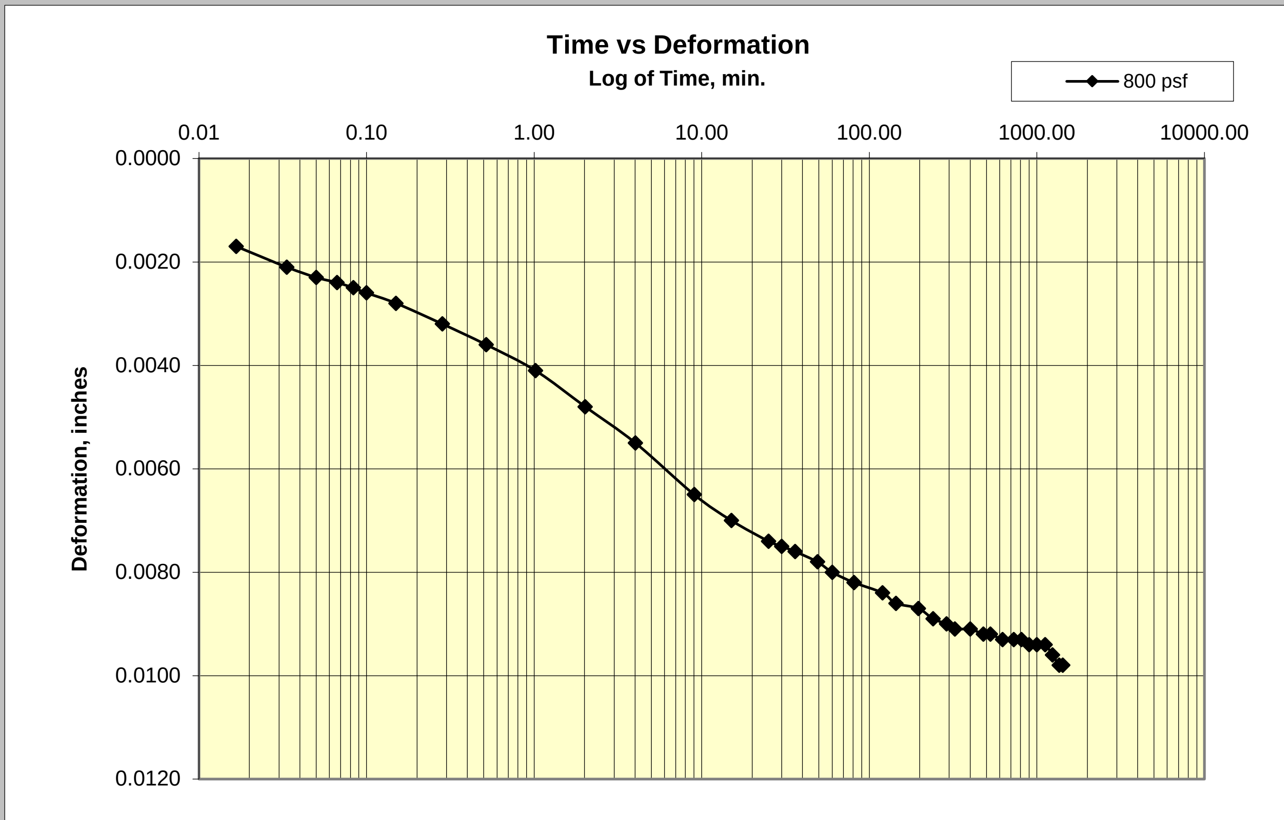
400 psf



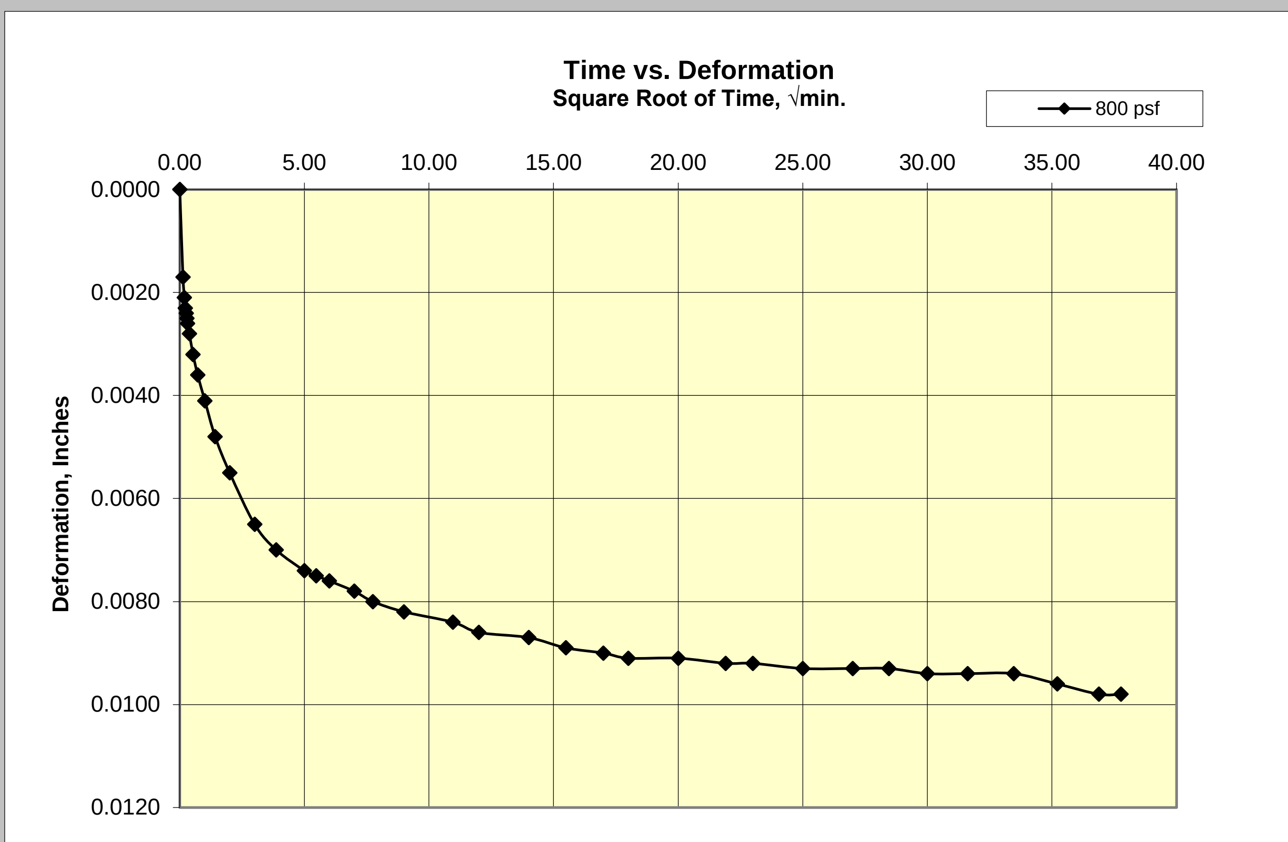
Cooper Testing Labs, Inc.

Load 4

800 psf



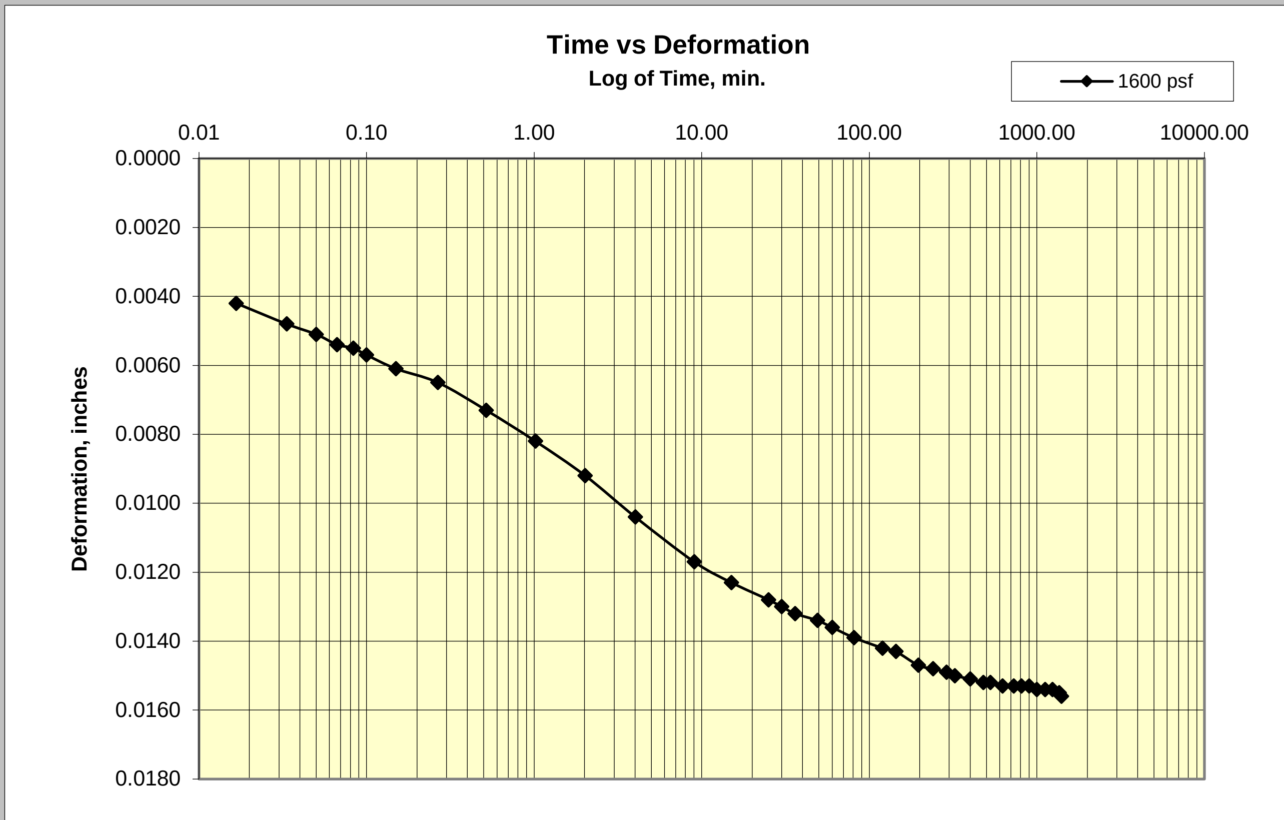
800 psf



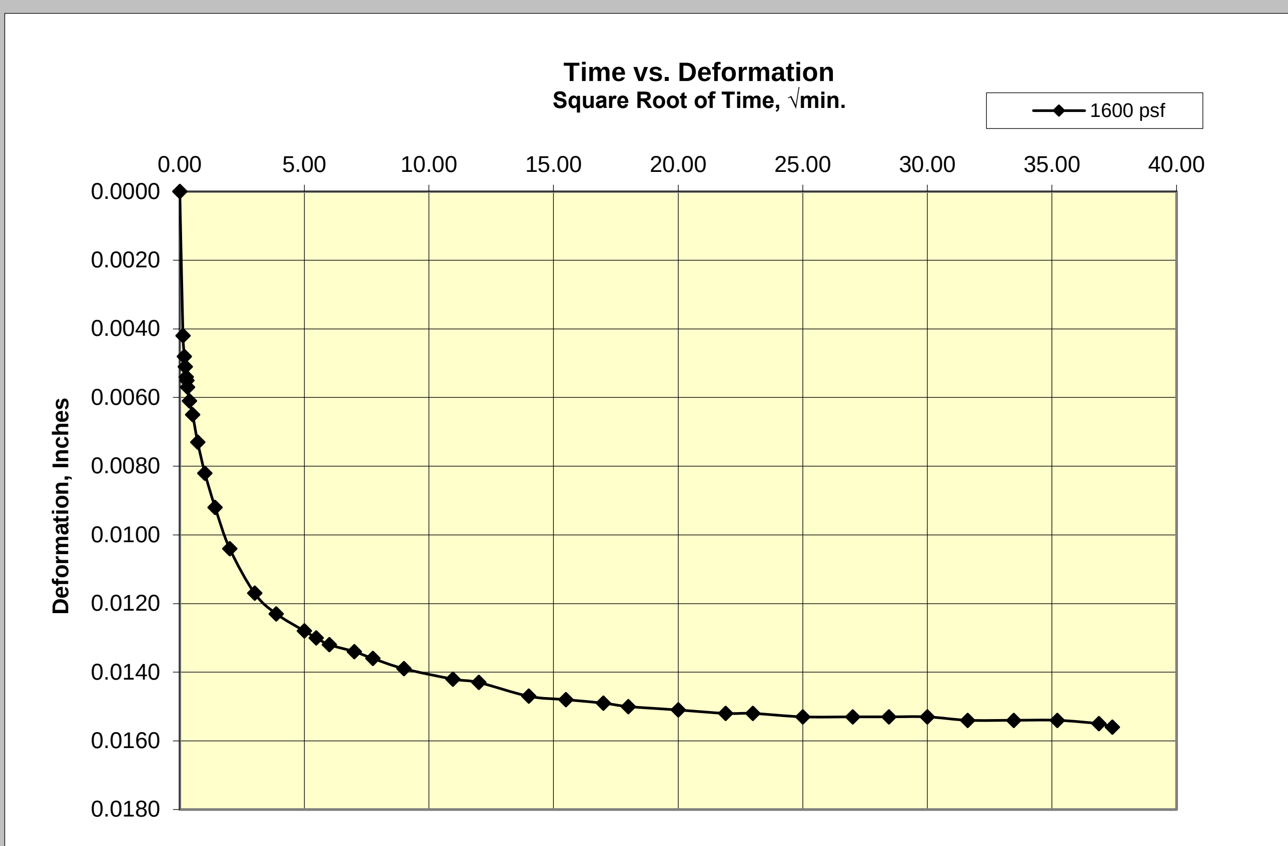
Cooper Testing Labs, Inc.

Load 5

1600 psf



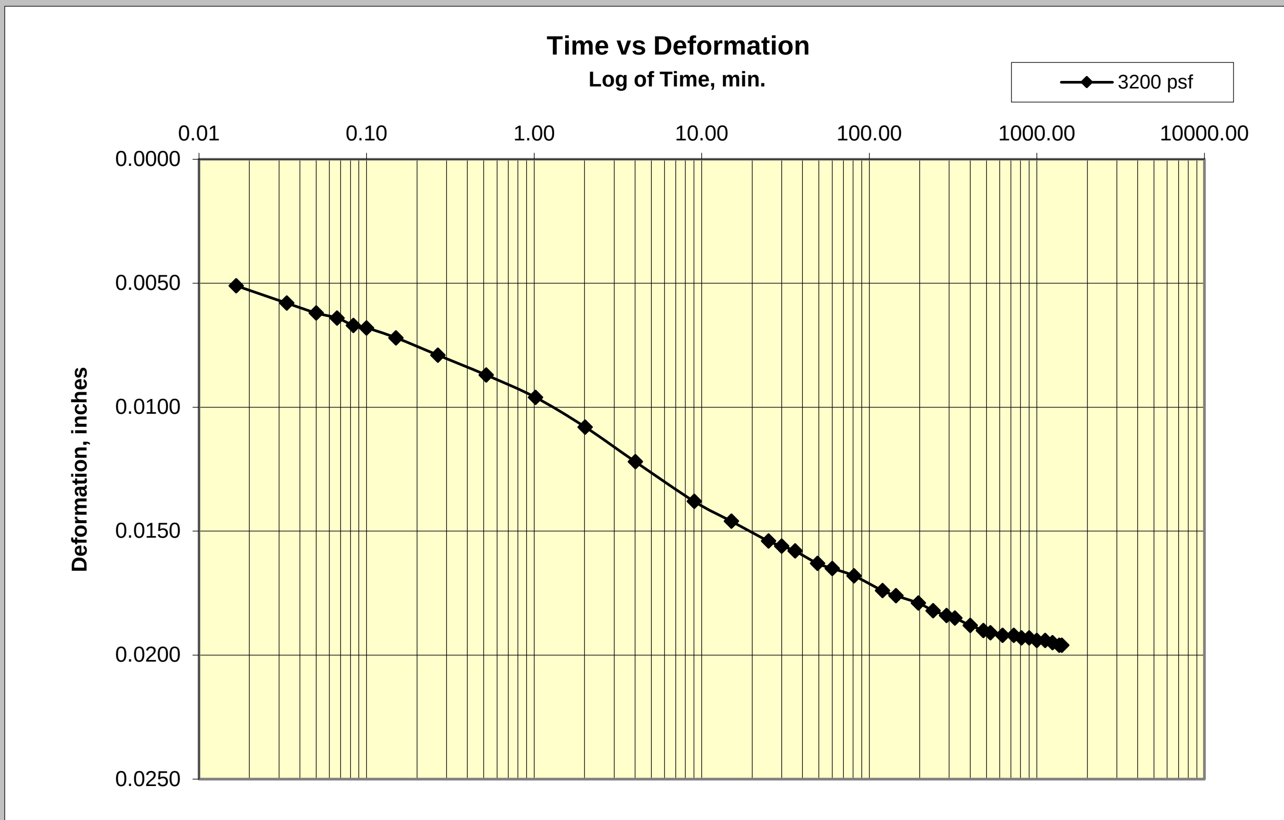
1600 psf



Cooper Testing Labs, Inc.

Load 6

3200 psf



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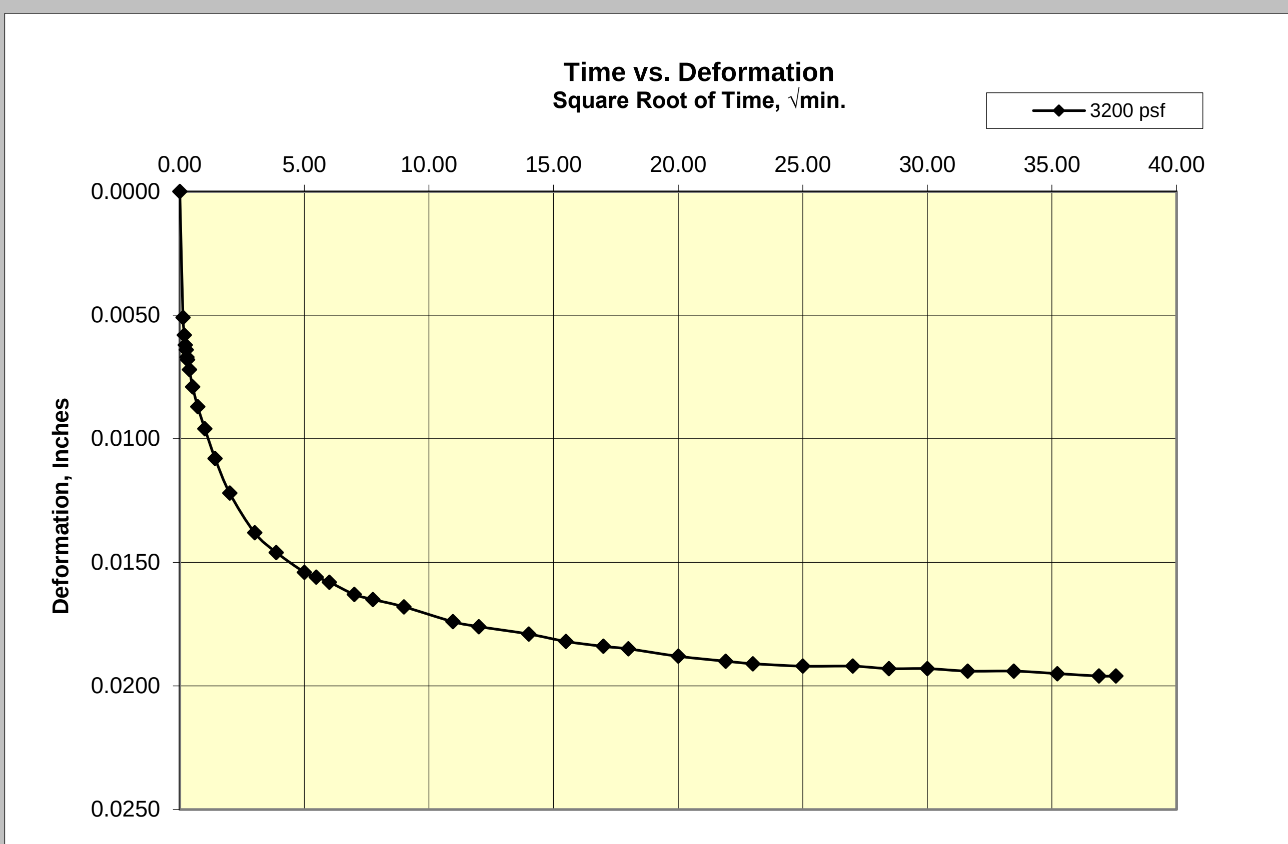
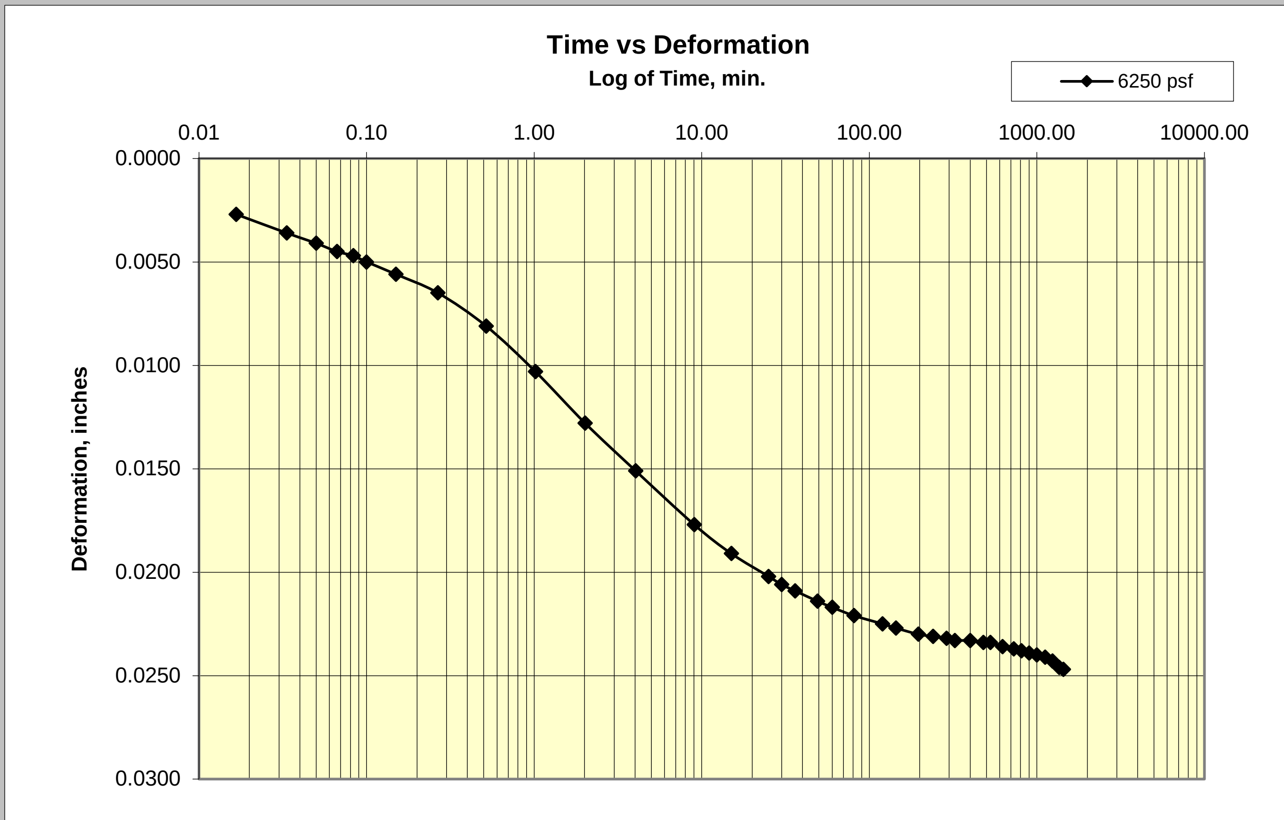


Cooper Testing Labs, Inc.

Load 7

6250 psf



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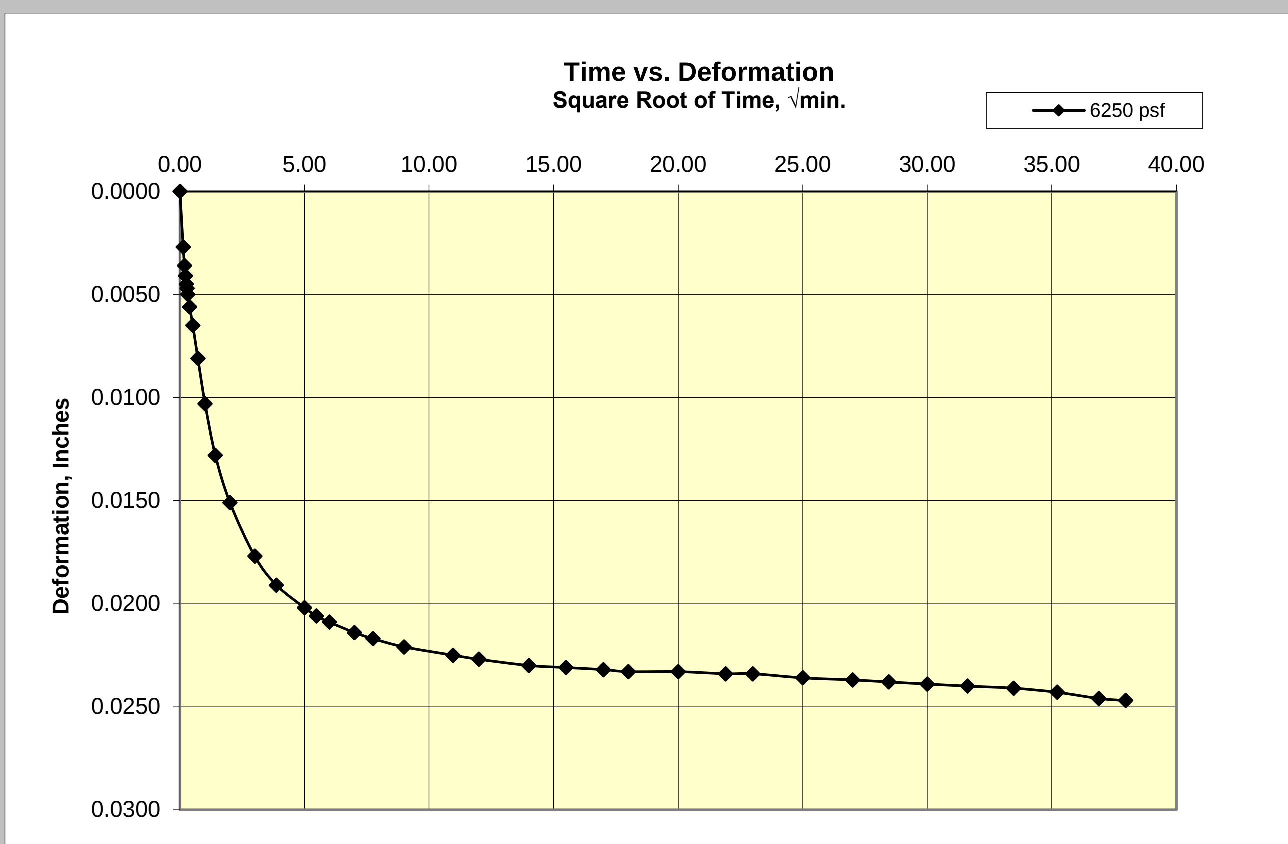
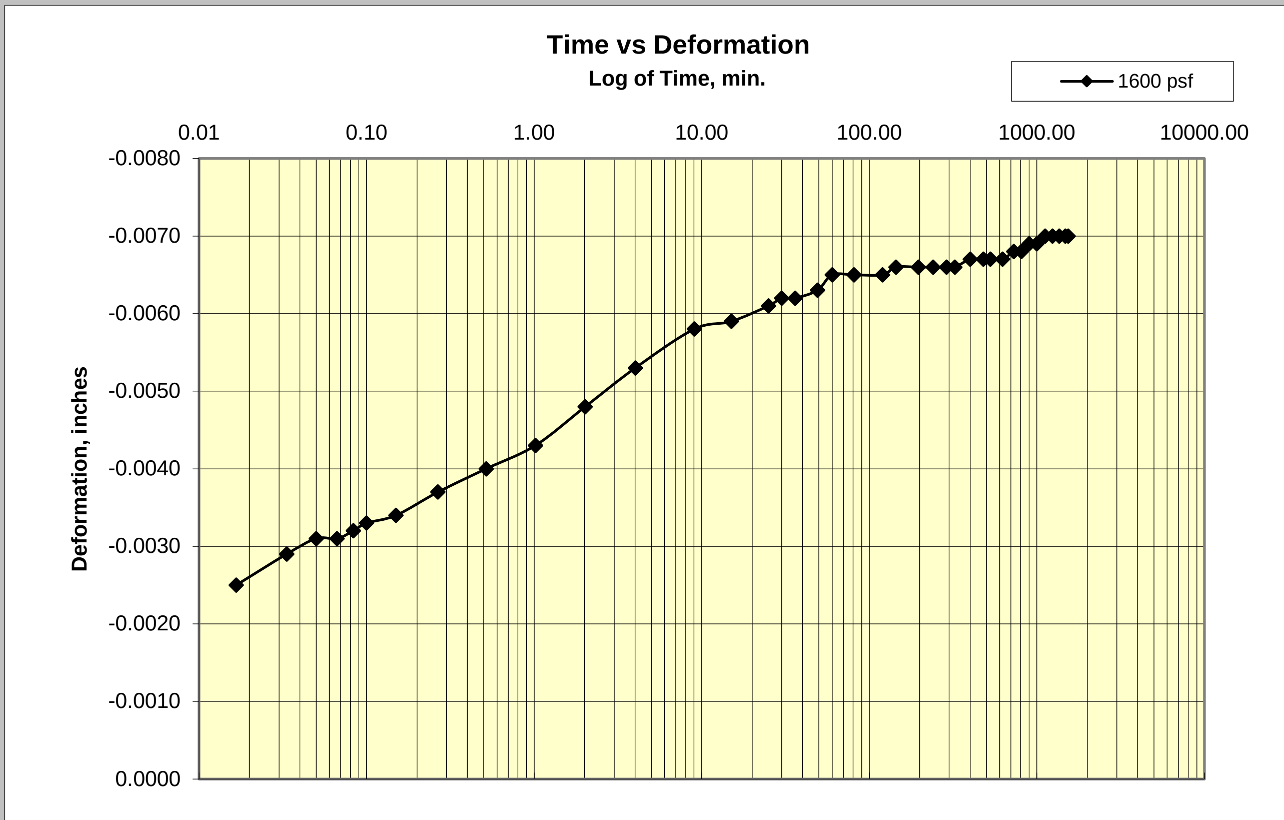


Cooper Testing Labs, Inc.

Load 8

1600 psf



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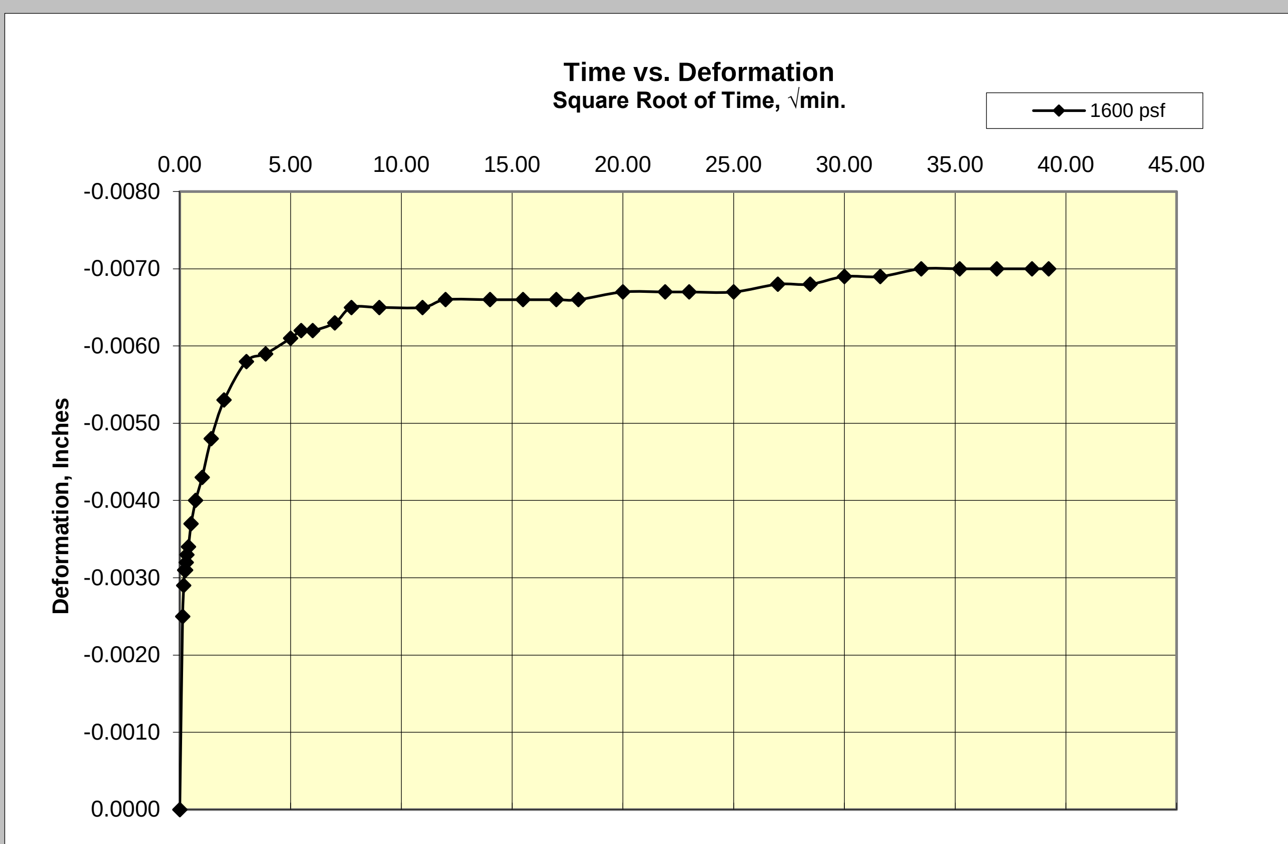
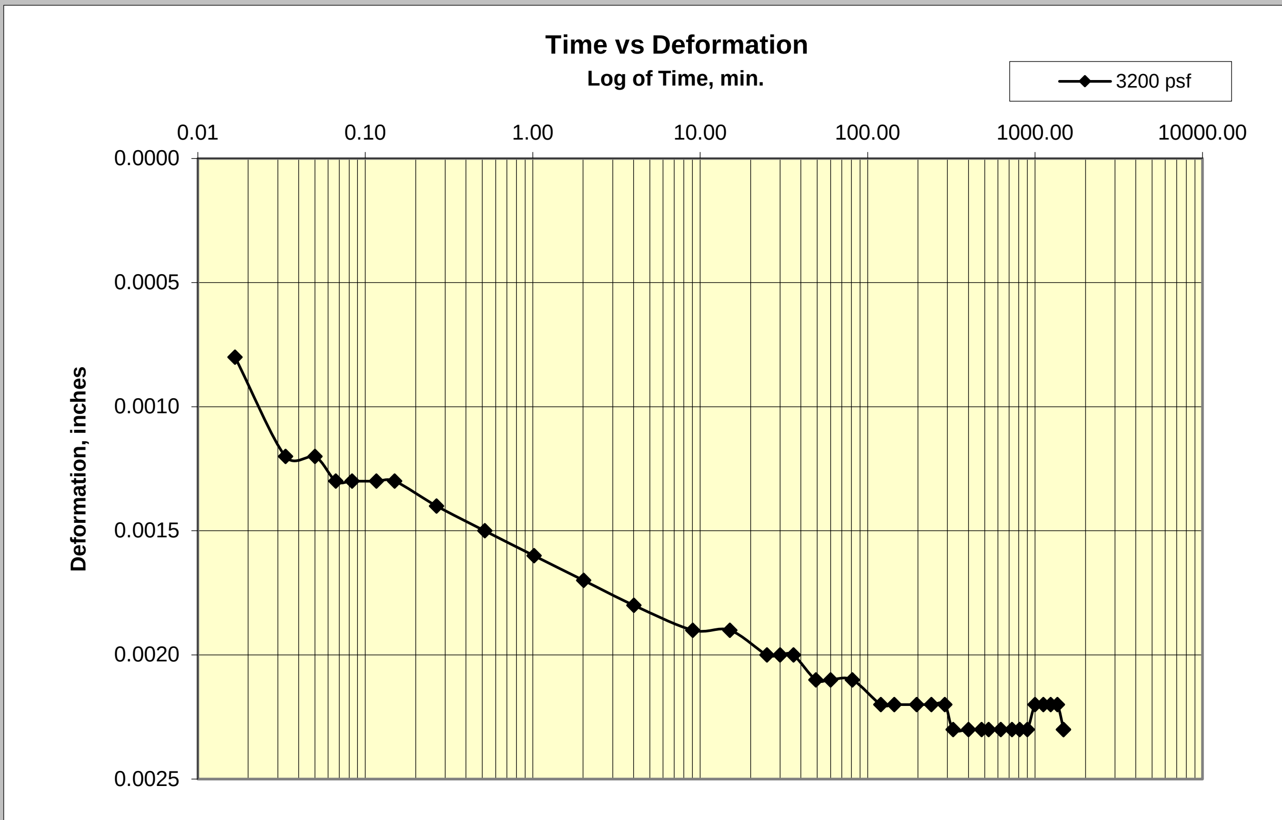


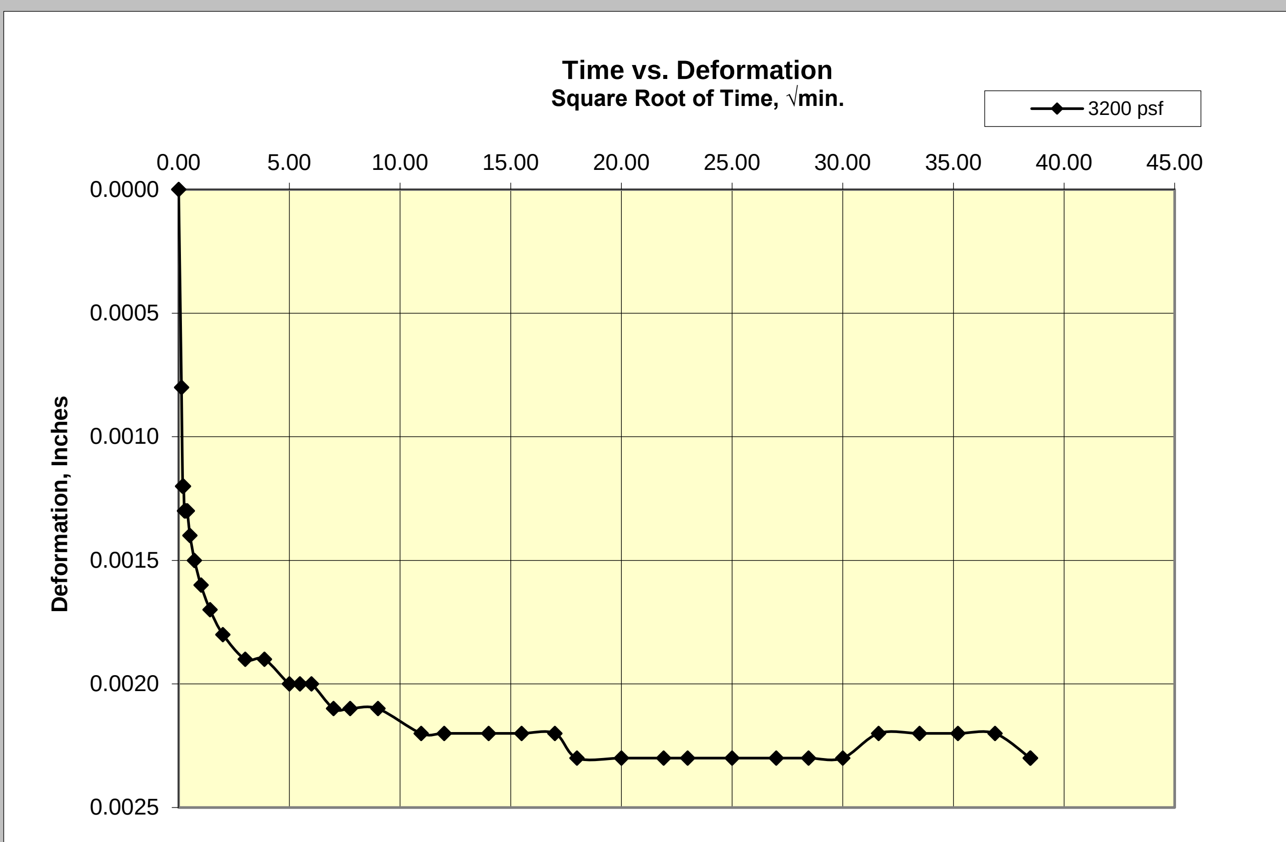
Cooper Testing Labs, Inc.

Load 9

3200 psf



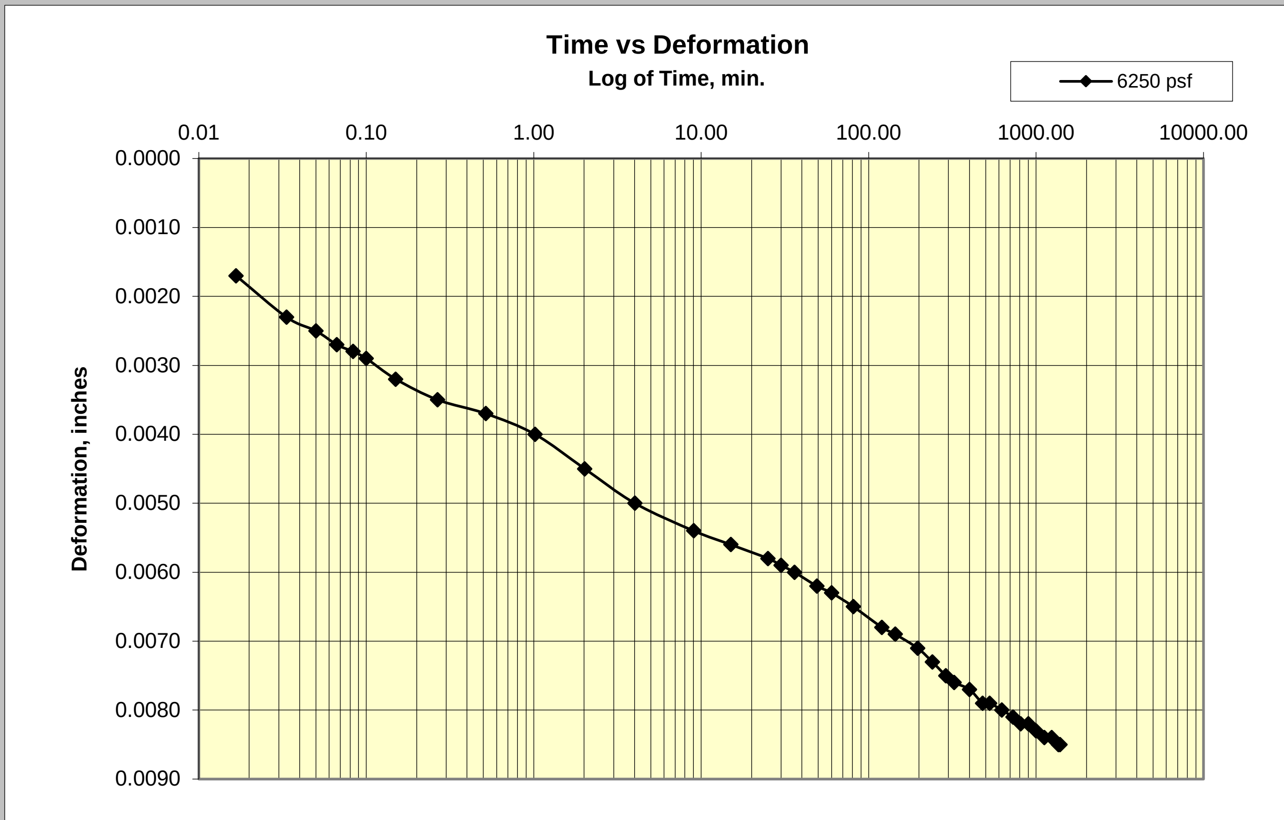
3200 psf



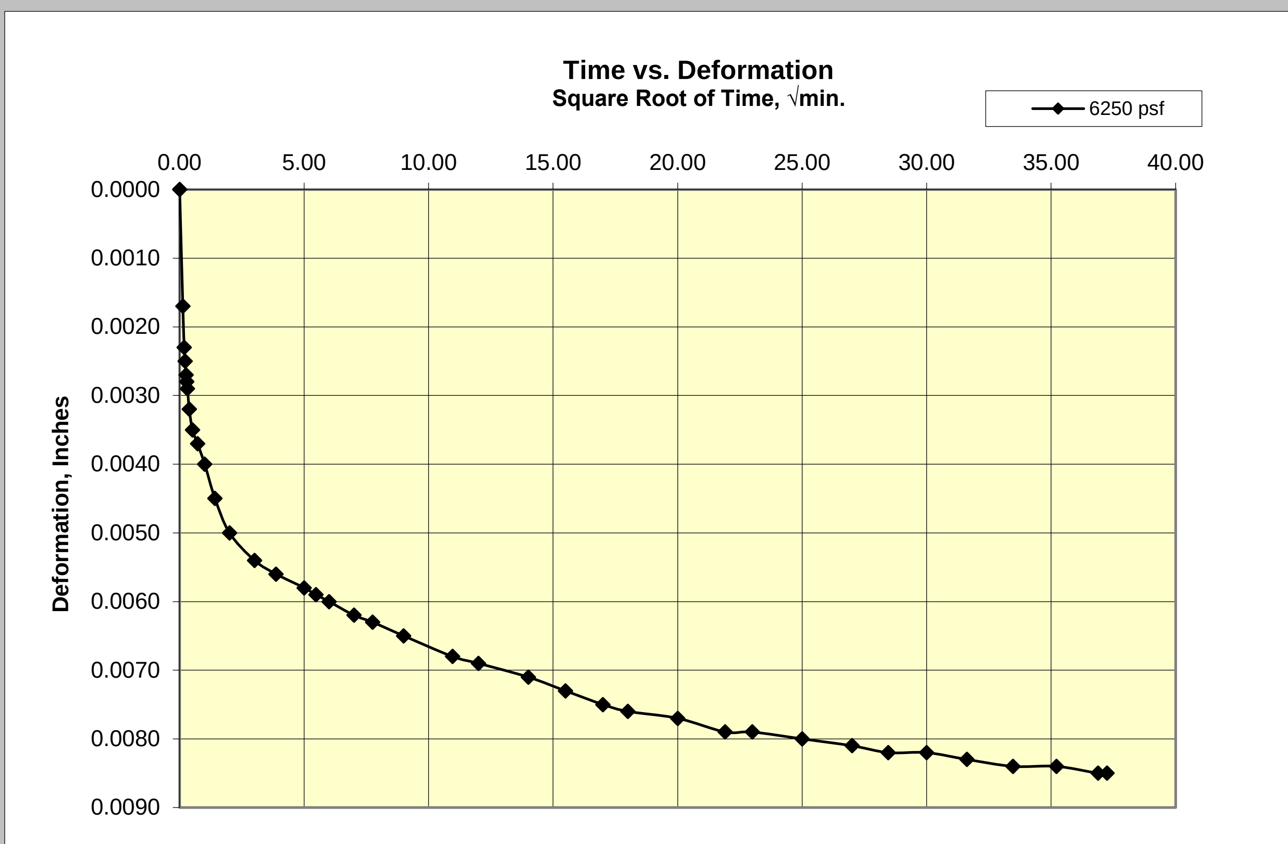
Cooper Testing Labs, Inc.

Load 10

6250 psf



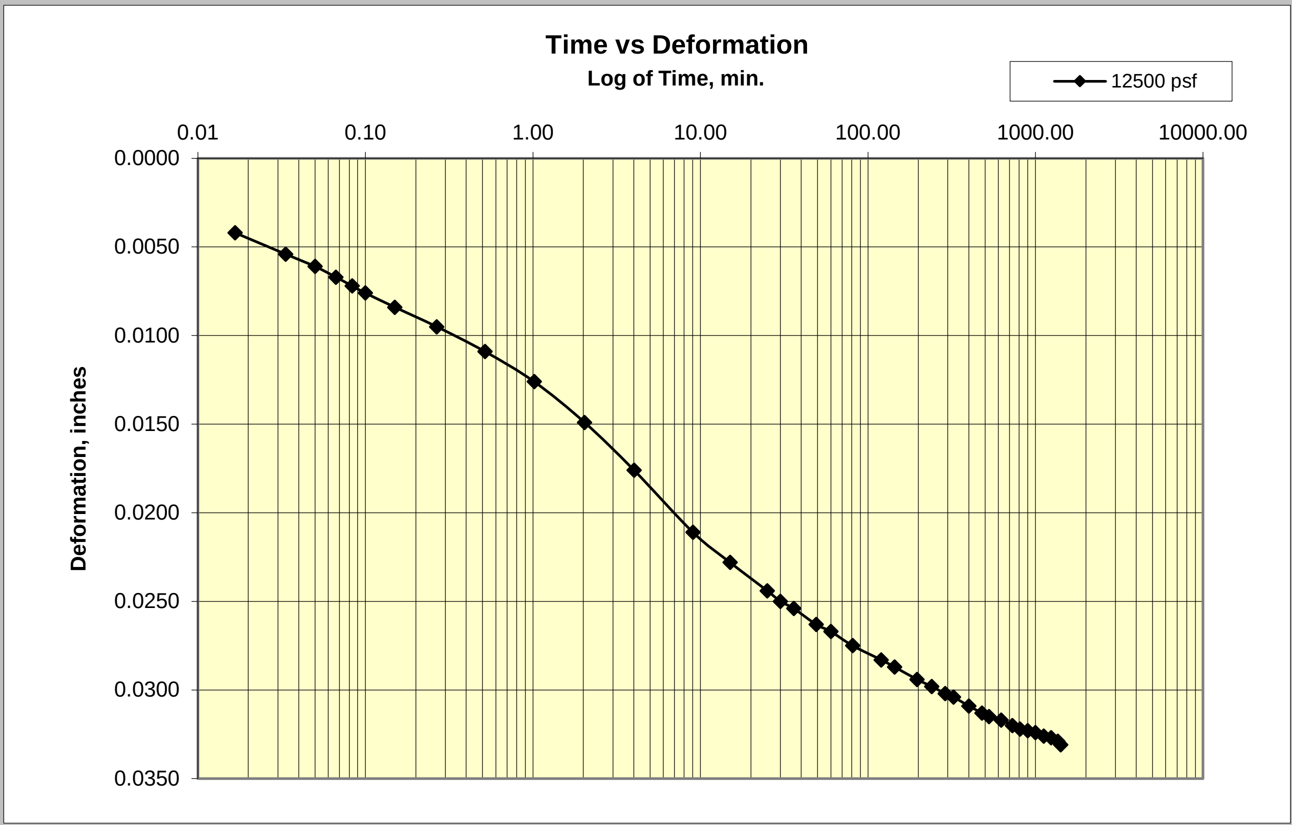
6250 psf



Cooper Testing Labs, Inc.

Load 11

12500 psf



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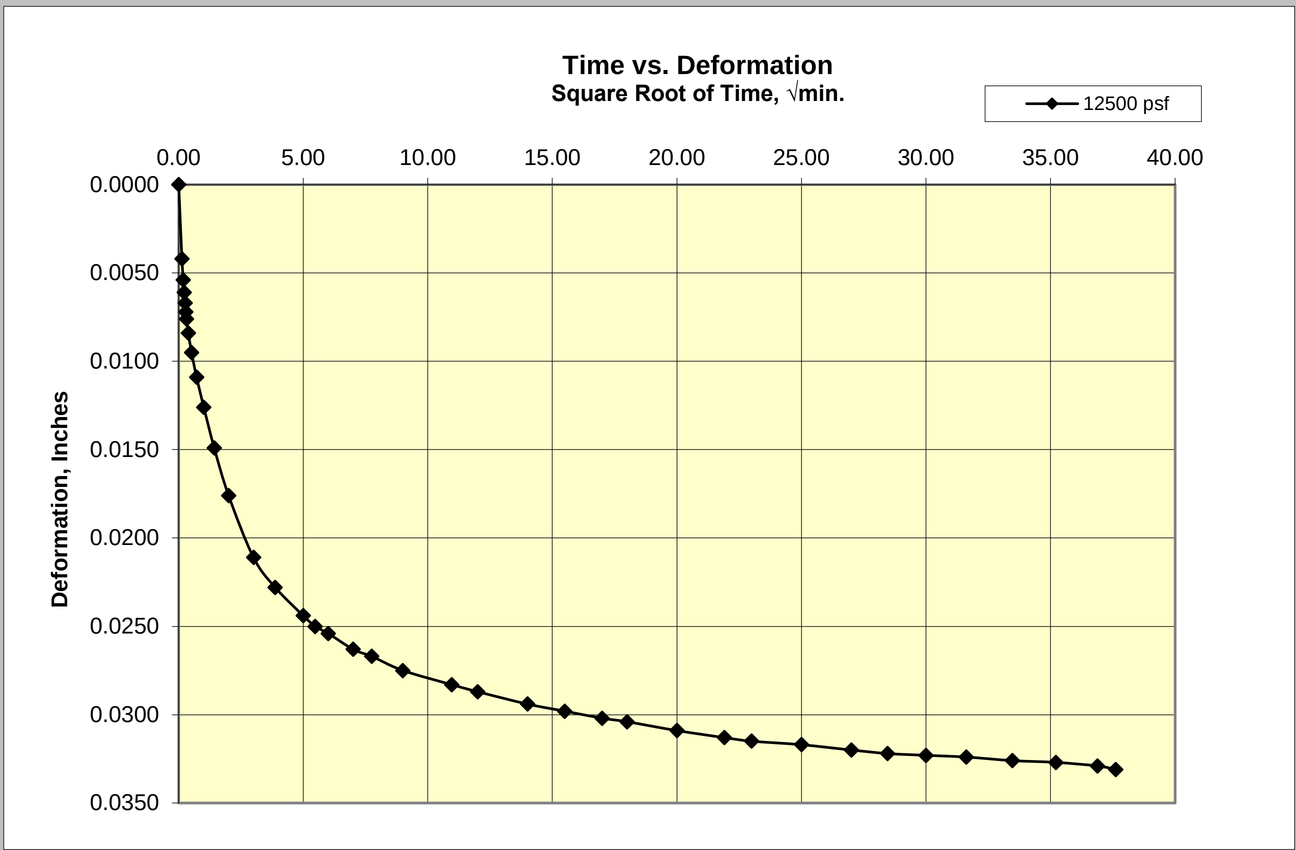
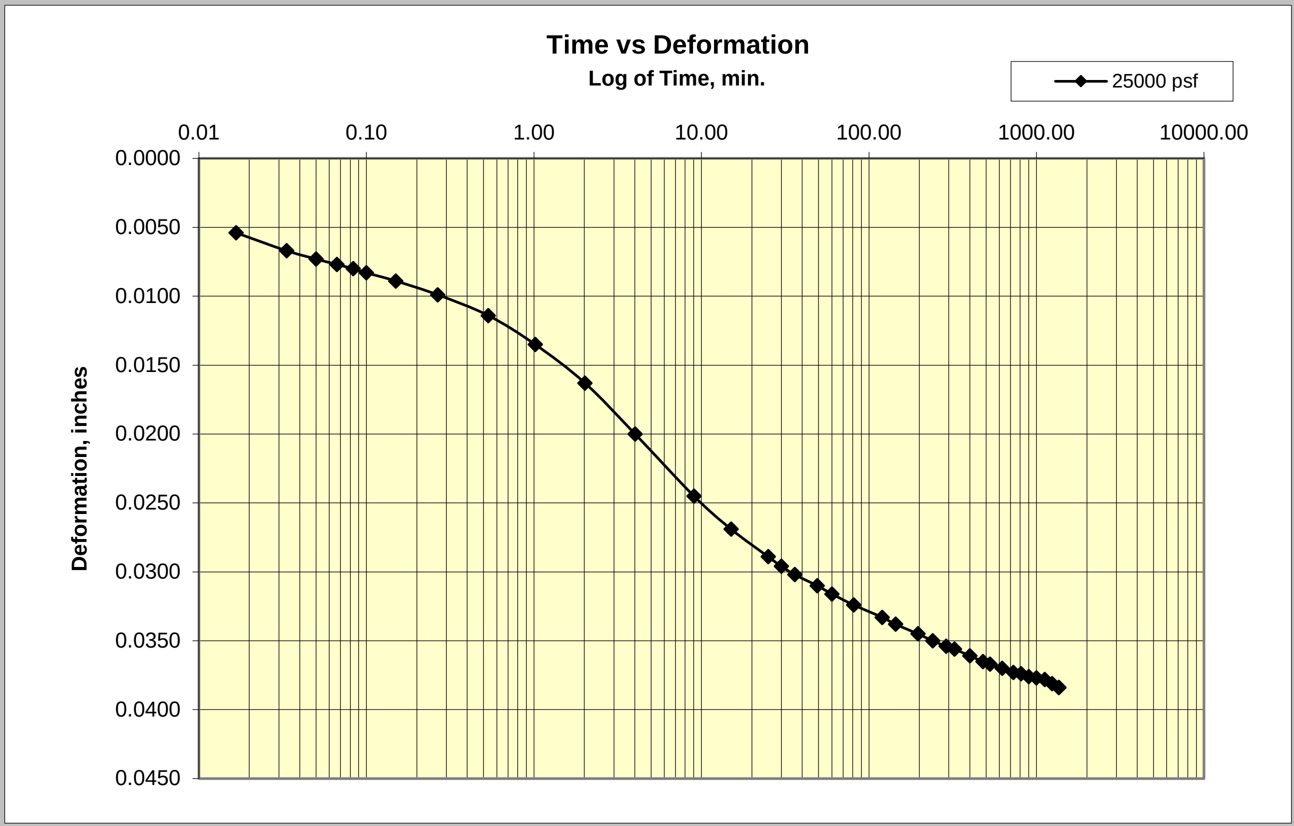


Cooper Testing Labs, Inc.

Load 12

25000 psf



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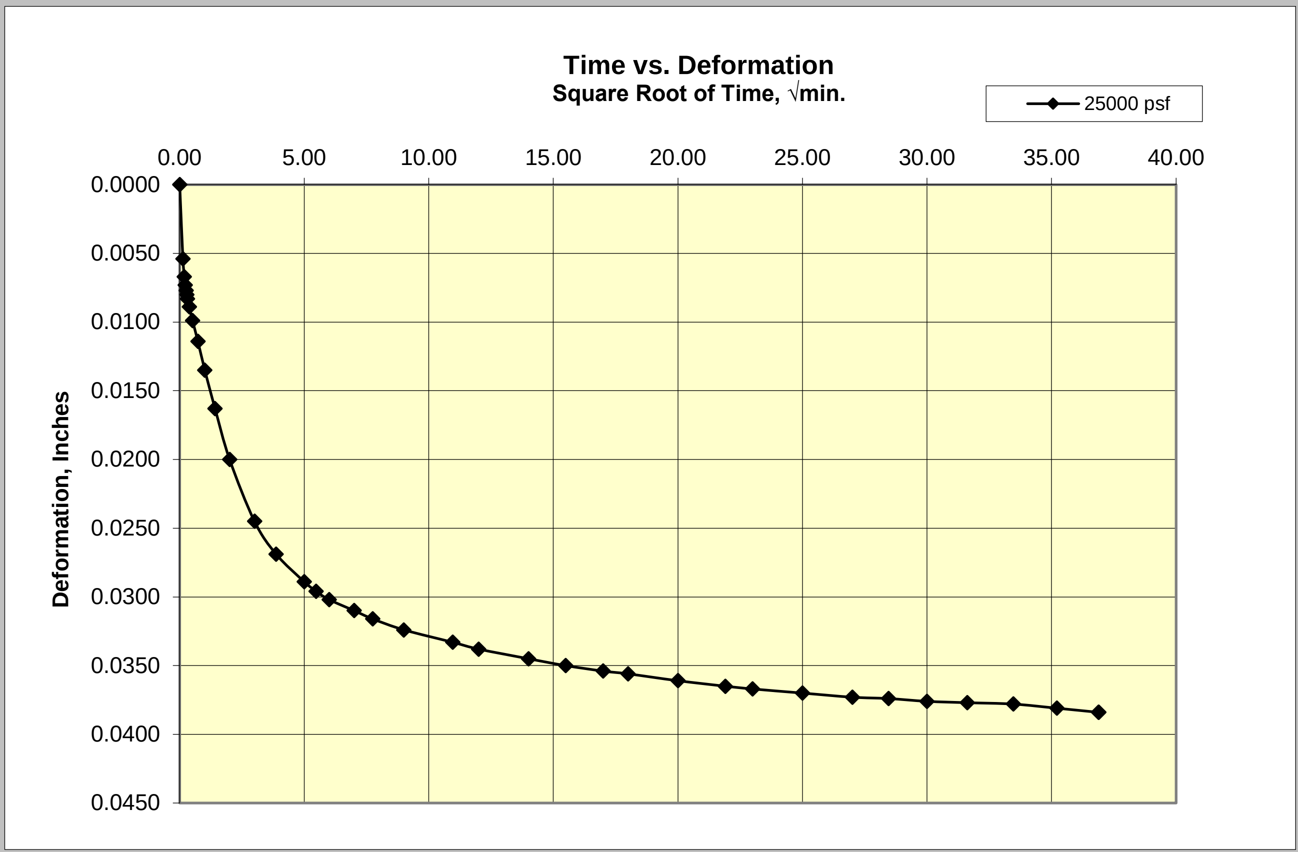

Cooper Testing Labs, Inc.

Load 13

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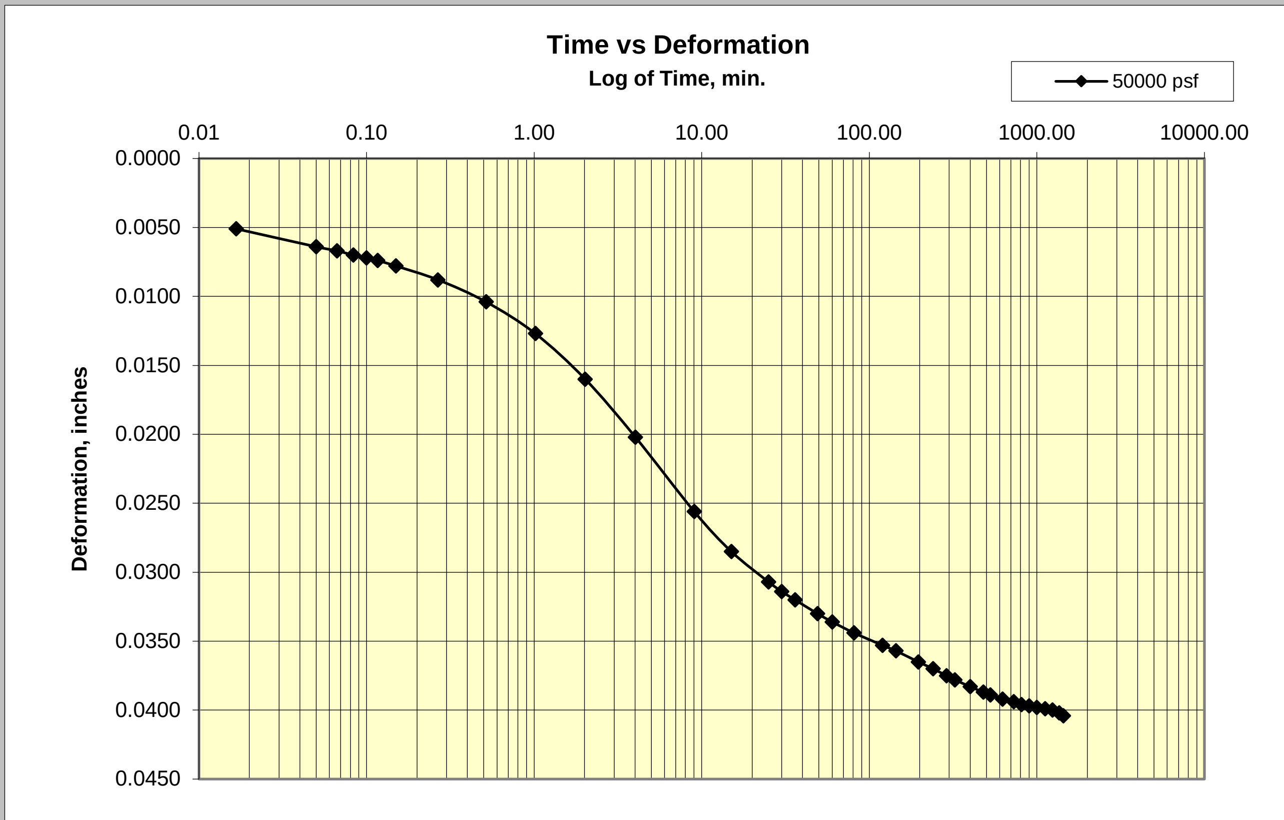

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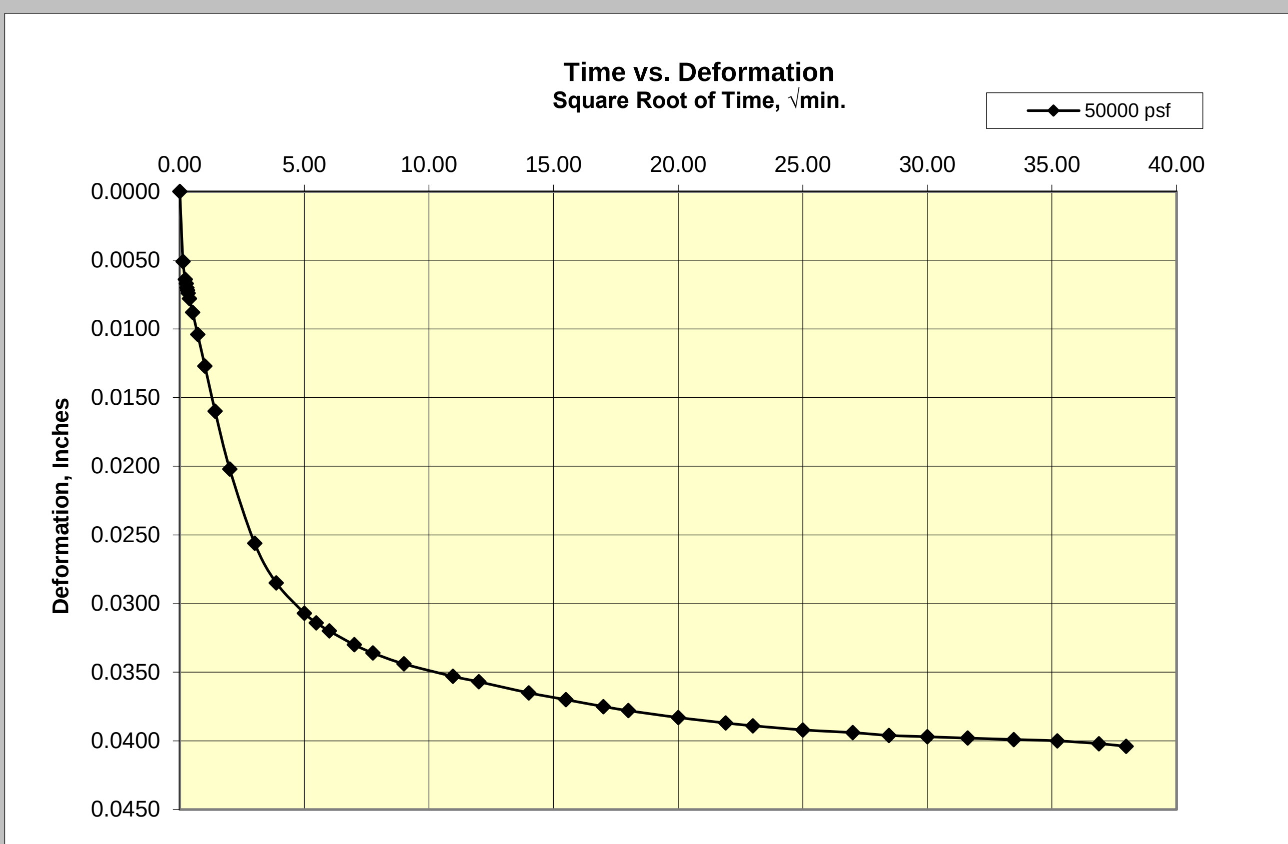
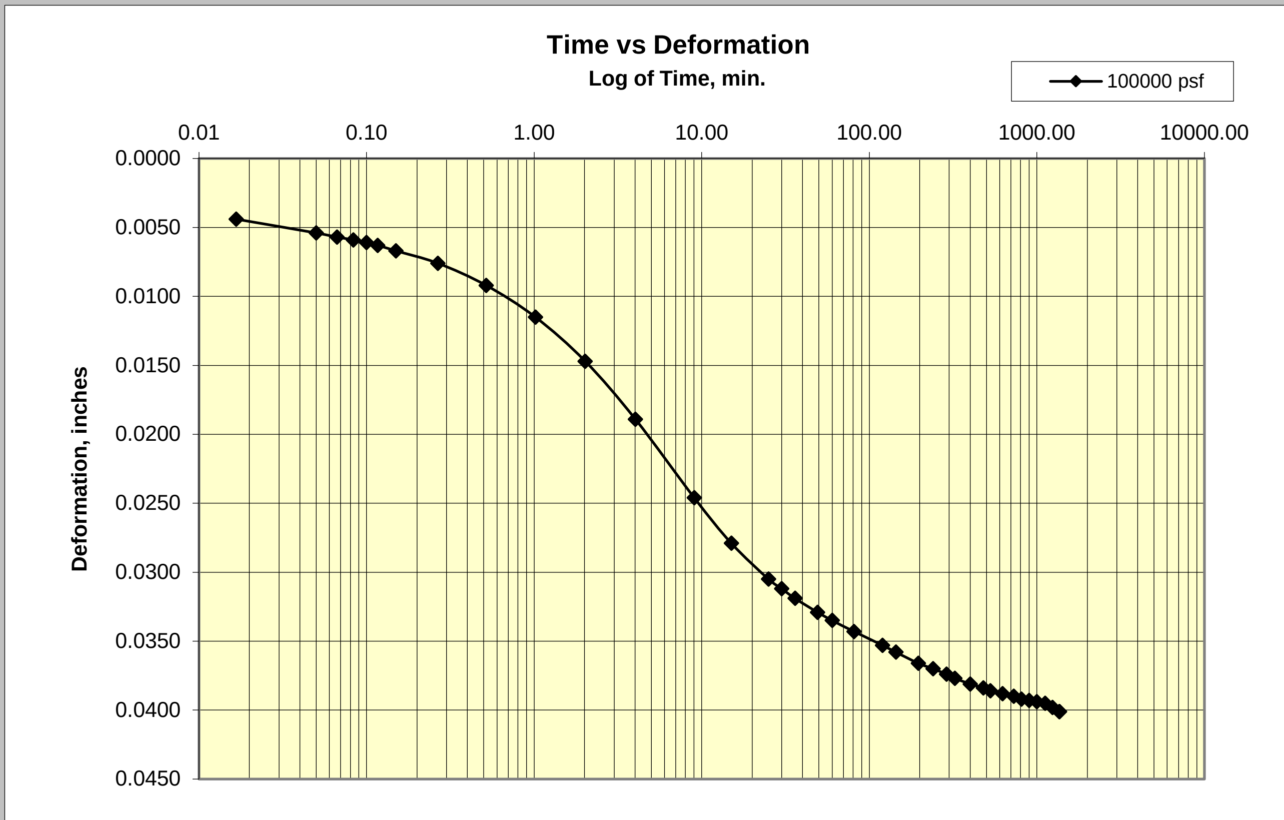


Cooper Testing Labs, Inc.

Load 14

100000 psf



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