APPENDIX K.3 **FORMER BRISBANE LANDFILL CLOSURE PLAN AND POST-CLOSURE MAINTENANCE PLAN**



BRISBANE BAYLANDS LANDFILL

BRISBANE BAYLANDS, CALIFORNIA

CLOSURE AND POST-CLOSURE MAINTENANCE PLAN

SUBMITTED TO

Mr. Howard Pearce
Baylands Development, Inc.
150 Executive Boulevard, Suite 1180
San Francisco, CA 94134

PREPARED BY

ENGEO Incorporated

December 8, 2021
Latest Revision March 25, 2022

PROJECT NO.

17270.000.002

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ENGEO
Expect Excellence

Project No.
17270.000.002

December 8, 2021
Latest Revision March 25, 2022

Mr. Howard Pearce
Baylands Development, Inc.
150 Executive Boulevard, Suite 1180
San Francisco, CA 94134

Subject: Brisbane Baylands Landfill
GeoTracker ID: L10001853784
Brisbane, California

CLOSURE AND POST-CLOSURE MAINTENANCE PLAN

Dear Mr. Pearce:

ENGEO is pleased to present this document package for the Brisbane Baylands Landfill site (Site), located south of Beatty Drive, east of Tunnel Avenue, north of Lagoon Way, and west of U.S. Highway 101 in Brisbane, California (Figure 1). This submittal includes landfill closure and post-closure maintenance requirements in accordance with California Code of Regulations Title 27 and the Waste Discharge Requirements (WDRs) for the Class III Brisbane Landfill.

Please let us know if you have any questions pertaining to the items included herein. We look forward to our continued correspondence with you on this project.

Sincerely,

ENGEO Incorporated



Brooke Spruit, PE



Jeffrey A. Adams, PhD, PE

Stephen Fallon

bs/sf/jaa/ar

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1.0 INTRODUCTION

1.1 PURPOSE AND SITE LOCATION

ENGEO prepared this Closure and Post-Closure Maintenance Plan (CPCMP) for the closure of Brisbane Baylands Landfill (Site), located in Brisbane, California. A Vicinity Map is provided as Figure 1. The Site is located south of Beatty Drive, east of the Joint Power Board (JPB) / Caltrain railroad tracks, north of Brisbane Lagoon, and west of U.S. Highway 101. The Brisbane Lagoon, formerly referred to as the Guadalupe Lagoon, is located further south of the Site, and the San Francisco Bay is located further east of the Site. The Site measures approximately 319 acres in area and is associated with portions of the Assessor's Parcel Numbers (APNs) listed in Table 1.1-1 and shown in Figure 2. The Brisbane Baylands Landfill is currently owned by Sunquest Properties, Inc. (Sunquest).

TABLE 1.1-1: Assessor's Parcel Information

APN	ADDRESS
005-152-060	--
005-152-240	535 Tunnel Avenue
005-152-250	541 Tunnel Avenue
005-152-260	555 Tunnel Avenue
005-152-270	595 Tunnel Avenue
005-162-300	--
005-162-430	--
005-340-040	--
005-340-050	--
005-350-020	
005-350-080	--
005-350-060	--

The San Francisco Regional Water Quality Control Board (RWQCB) has identified the Brisbane Landfill as a Class III landfill (regulated landfill area). This CPCMP is in accordance with California Code of Regulations (CCR) Title 27 and the Waste Discharge Requirements (WDRs), as required for the approval of the Specific Plan for the development at the Baylands Landfill.

The maximum extent of the Brisbane Landfill that requires closure is approximately 364 acres. However, this CPCMP applies only to the approximately 319-acre portion of the landfill owned by Sunquest (Figure 1), excluding areas of the lumber yard and portions of the land currently under the ownership and control of others. Upon the request of Baylands Development Inc. and the approval of the San Francisco Regional Water Quality Control Board this Landfill Plan may be amended to addition portions of the landfill that become under the ownership or control of Sunquest or related entity.

1.2 PROJECT DESCRIPTION

The proposed development will include commercial structures with associated utilities, roadways, sidewalks, solar field area, energy storage, and underground utilities (Figure 4). The development will also include open space, including wetland area surrounding the Visitacion Creek. A detention area will be located immediately upstream of the wetlands. The overall Baylands Development will include residential structures, which are located outside of the landfill footprint.

We anticipate that earth-disturbing work will begin in mid- to late-2024 and will follow the project phasing. Closure activities will commence following the removal of stockpiled soil for reuse on the Western portion of the Baylands project under a soil management plan approved by the RWQCB. All such reuse soil will meet applicable import criteria (Appendix H) for the Baylands Railyard site. The landfill closure would be completed within approximately 10 years from the date when soil is removed. Landfill closure will commence with initial preparation of the Site, including removal of existing soil stockpiles, followed by implementation of geotechnical site mitigation. Geotechnical improvements for each phase of work would follow the following sequence.

1. Earthwork site preparation
2. Installation of wick drains
3. Performance of deep dynamic compaction
4. Placement of civil fill, landfill cover, and surcharge fill
5. Removal of surcharge fill
6. Movement of excess surcharge fill to next phase

After geotechnical mitigation is complete, the landfill cover and control systems will be constructed with mass grading in sequence with the project phasing. The future site development consists of various development areas as illustrated in Exhibit 1.2-1. Following the implementation of the landfill cover and control systems (i.e. compliance with Section 21090 of California Code of Regulations Title 27) for each completed development area, or part thereof, closure will be sought for that area. Site development activities (e.g. construction of roads, buildings, landscaped areas) and necessary associated mitigation measures are not landfill closure measures unless specifically designed for that purpose.

EXHIBIT 1.2-1: Proposed Development Areas for Project Phasing



The construction of the landfill closure in conjunction with site development/grading activities may begin with construction of Water Detention Area (OS-C) and Visitacion Creek (OS-D) as soon as the soil required for the closure of OS-C and OS-D has been transported to the Railyard Site. The water recycling and waste water treatment facilities and Geneva Avenue extension in Area F may close first. This will be followed by the future Energy Storage area in portions of Areas D west of Tunnel Avenue and Area G. The completion of the remaining portion designated for commercial/industrial use in Area D will follow the completion of the energy storage facility. It has been anticipated that utility and roadway infrastructure within the commercial and solar energy parcel will then be constructed followed by vertical development of solar energy generation (Area E). The bay trail and open space improvement construction will follow. Lastly buildings will be constructed based on market demand at Area D.

1.3 ELEVATION DATUM

The elevation datum applied to the project is the North American Vertical Datum of 1988 (NAVD88). Unless otherwise stated, the figures and data presented in this report reference elevations based on this datum.

It should be noted that many of the previous reports refer to Mean Sea Level (MSL) datum based on the National Geodetic Vertical Datum of 1929 (NGVD29). At Brisbane Baylands, the following equation shows the general relationship between the datums; however, variation may exist as this is dependent on geographic location.

$$NAVD88 = NGVD29 + 2.33$$

1.4 REGULATORY REQUIREMENTS

This CPCMP has been developed in accordance with the post-closure land use requirements of CCR Title 27. In accordance with Section 21090 of CCR Title 27, *Closure and Post-Closure Maintenance Requirements for Solid Waste Landfills*, the landfill final cover must provide:

- A foundation layer of at least 2 feet of soil compacted to the maximum density obtainable at optimum moisture content. These materials may be soil, contaminated soil, incinerator ash, or other waste materials, provided such materials have appropriate engineering properties to be used for a foundation layer.
- Low-hydraulic conductivity layer of no less than 1 foot of soil with a hydraulic conductivity of $1x10^{-6}$ centimeters per second (cm/sec) or less.
- Erosion resistance via a vegetation layer or a mechanical erosion and ultraviolet light-resistant layer. The depths of vegetation roots must not exceed the erosion-resistant or topsoil layer thickness.

Under these requirements, the RWQCB can allow any alternative final cover design that it finds will continue to isolate the waste from precipitation and irrigation waters and is in conformance with the applicable prescriptive standards listed above.

Provision C(8) of the Brisbane Landfill WDRs requires that the final cover system design for the Site be developed in general accordance with the intent of CCR Title 27. The final cover design components described in the current WDRs are attached as Appendix I (RWQCB, 2001). The WDRs allows for alternative barrier layers under RWQCB approval.

In accordance with Section 21109 of CCR Title 27, proposed postclosure land uses shall be designed and maintained to:

- Protect public health and safety and prevent damage to structures, roads, utilities, and gas monitoring and control systems;
- Prevent public contact with waste, landfill gas and leachate; and
- Prevent landfill gas explosions.

The leachate and landfill gas management systems proposed as part of this CPCMP meet the conditions of Section 21090 and 21109 of CCR Title 27. Structural improvements within the landfill area will meet the conditions of Section 21109 of CCR Title 27.

Upon approval of this CPCMP, construction-level documents will be prepared for submittal to the regulatory agencies for review and approval. Site closure construction will follow. The construction documents will include the following:

- Construction Drawings
- Technical Specifications
- Construction Quality Assurance (CQA) Plan

2.0 EXISTING CONDITIONS

2.1 SITE HISTORY

Prior to 1932, the area now occupied by the Brisbane Landfill was part of the San Francisco Bay. The landfill was operational from 1932 to 1967. The Site was used for the disposal of primarily non-hazardous solid wastes, including domestic, industrial, and shipyard wastes, sewage, and rubble. The Site has not received waste since 1967.

In 1896, the Site was purchased by the Southern Pacific Transportation Company (SPTC) and, by 1914, a railroad had been constructed along the western perimeter of the landfill. In 1932, the Site was leased by the Sanitary Fill Company (SFC) through SPTC. SFC had subcontracted the day-to-day filling operations to the Easly and Brassy Company by the mid-1930s. U.S. Highway 101 (aka James Lick Freeway) was constructed in the mid-1950s, adjacent to the eastern landfill boundary. Records indicate that the highway was constructed on fill material sourced from the nearby Candlestick Point area and San Bruno Mountain. The highway acted to isolate the Site from direct wave action generated in San Francisco Bay.

Generally, the landfill was filled in three main areas (Figure 3A) (RWQCB, 2001).

- Fill Area I (northwestern portion) – Waste was placed from 1932 through 1952. This fill area occupied approximately 1,000 feet into San Francisco Bay from the Southern Pacific's railroad track area.
- Fill Area II (northeastern portion) – Waste disposal from 1953 through 1956. This area occupied approximately 600 feet further eastward into San Francisco Bay, and filling extended to the current eastern property boundary. An access road and Visitacion Creek divide Areas I and II from Area III to the south.

- Fill Area III (southern portion) – Waste was placed from 1956 until 1967, when the landfill stopped receiving waste (RWQCB, 2001). The construction of an earthfill dike was completed to facilitate the expansion of the landfill to the south.

In 1967, the Easly and Brassy Company ceased to operate at the landfill, and the landfill has not accepted waste since then. The waste at the Site has since been covered with fill and inert debris. No records of the hydraulic properties or thickness of the fill were identified. A total estimated volume of 12½ million cubic yards of waste was disposed at the Site. An estimated 73 percent of this waste was produced by residential and commercial activities. Inert fill accounts for approximately 25 percent, and the remaining 2 percent was assumed to be liquid waste (RWQCB, 2001).

At the time of the Brisbane Landfill operation and closure, modern waste disposal practices were not yet developed, and formal regulatory closure plans were not yet required. The Site does not have a liner, waste was not segregated into disposal cells, and there was no leachate collection system. Typical of the standard practice during that period, waste containment was accomplished by placing waste into the water directly on the underlying native soil.

Various commercial and industrial structures, including petroleum storage tanks, have been constructed on the landfill since the 1950s. Portions of the landfill have been paved, but the surface cover of a majority of the Site consists of permeable soil. Clean cover materials were added from the late 1960s until September 2017 on a large portion of the Site.

In 1958, the RWQCB adopted Resolution 58-278 for the Brisbane Landfill, which prohibited waste discharge directly to surface water and required a monitoring program be established. Between 1988 and 1992, a groundwater monitoring well network was installed on the portion of the landfill owned by Sunquest. A landfill gas (LFG) extraction system was installed from 1990 to 1991, which consisted of vertical and horizontal extraction wells.

In 1992, as required by Section 13273 of the California Water Code (CWC), a Solid Waste Water Quality Assessment Test (SWAT) was prepared for the Brisbane Landfill (Kleinfelder, 1992). The report identified contaminants of potential concern (COPC) with the potential for off-Site migration, particularly along the eastern and southern landfill boundaries. Hazardous materials were not identified.

Cleanup and Abatement Order (CAO) No. 94-134 was issued by the RWQCB in 1994 and required 2 feet of clean soil cover be maintained, a positive drainage gradient be maintained, and compliance with State Water Board Order 92-08, which required a Stormwater Pollution Prevention Plan (SWPPP) for the Site.

WDRs were adopted in 2001 for the Brisbane Landfill as referenced in Appendix I.

2.2 SUBSURFACE CONDITIONS

2.2.1 Geology

The site is mapped by Bonilla (1998) as being underlain by artificial fill. Based on geotechnical explorations conducted by ENGEO (Appendix B) and Geosyntec (2008b), the subsurface conditions at the project site from youngest to oldest are: (1) artificial fill from the soil recycling operation; (2) waste, (3) Holocene Bay Deposits consisting of Young Bay Mud and Marine Sand; (4) Pleistocene Aeolian, Alluvial, and Marine deposits; and (5) Franciscan Bedrock at depth.

The artificial fill encountered at the Site is highly variable and ranges from sandy clay to silty gravel with sand, but the majority of the fill encountered is clayey sand. The fill material included soil, concrete, bricks, tires, steel, and wood. The thickness of the fill is highly variable across the Site, ranging from 3 to 5 feet on the northern portion, 15 to 38 feet in the northeastern portion, and over 40 feet in the southern portion. The waste material encountered in the borings included wood, paper, plastic, glass, wires, metals, and gravelly soil and mostly composed of wood and paper. Over the majority of the Site, the thickness of the waste ranges between 25 and 30 feet. The bottom of the waste layer is intermixed with the underlying Young Bay Mud that contains the waste. The thickness of the Young Bay Mud generally increases away (east) from the former shoreline and varies from 20 to 60 feet. In some areas of the Site, the Bay Deposits include sandy soil strata underlying the Young Bay Mud. This layer is up to 15 feet thick and is loose to medium dense. Below the Holocene Bay Deposits, the explorations encountered Pleistocene sand and clay that were deposited in aeolian, alluvial, and marine environments. The Pleistocene marine clay deposits are locally known as Old Bay Clay.

Bedrock was encountered between -100 and -240 feet across the Site in a previous investigation performed by Geosyntec in 2005 and referenced in the 2008 Geosyntec preliminary geotechnical report (Geosyntec, 2008b). The bedrock mapped by Bonilla (1964) ranges from Elevation 0 feet to -250 feet mean sea level across the project Site, with the shallower bedrock being at the northern and southwestern extents of the Site and the deepest bedrock in the middle.

2.2.2 Hydrogeology

The Brisbane Landfill is oriented between surface water drainage sources Visitacion Valley to the north and Guadalupe Valley to the south. Drainages originating from higher elevations in San Bruno Mountain direct runoff to lower elevations of San Francisco Bay. The drainages from Visitacion Valley and Guadalupe Valley maintain local groundwater levels. Groundwater generally flows to the east towards San Francisco Bay.

The landfill is located in an unconfined water table, located in a discharge area generally characterized by upward groundwater vertical hydraulic gradients. Shallow groundwater exists above the Young Bay Mud in the interior of the landfill, at approximately Elevation 7 to 9 feet (NAVD 88 Datum) at the central portion of the landfill north of Visitacion Creek and varies from Elevation 4 to 7 feet (NAVD 88 Datum) south of Visitacion Creek as shown on Figure 3B (Geosyntec, 2022). The current groundwater near the existing Visitacion Creek and lagoon edge is approximately Elevation 4 to 5 feet (NAVD 88 Datum) (Geosyntec, 2022). Deep groundwater exists between the Young Bay Mud and Old Bay Mud or found in bedrock. An upward vertical gradient exists from deep groundwater to shallow groundwater, which is increased by the weight of the stockpiled soil and the consolidation of the underlying Young Bay Mud. The Young Bay Mud acts as a confining layer between the underlying Pleistocene deposits and the landfill waste (Geosyntec, 2021). Wells, screened in the Pleistocene deposits below the Young Bay Mud, exhibit higher potentiometric surfaces than wells screened directly in the waste (i.e., vertical upward gradient). The relatively thick layer of Young Bay Mud and the upward groundwater gradient likely prevents downward migration of contaminants from the landfill (Geosyntec, 2021).

2.3 FAULTING AND SEISMICITY

Because of the presence of multiple active faults, the Bay Area Region is considered seismically active. Numerous small earthquakes occur every year in the region, and large (greater than Moment Magnitude 7) earthquakes have been recorded and can be expected to occur in the future.

The California Geologic Survey (CGS) defines an active fault as one that has had surface displacement within Holocene time (about the last 11,700 years) (CGS, 2018).

The Site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone, and no known surface expression of active faults is believed to exist within the Site; therefore, fault rupture through the Site is not anticipated. The trace of the City College Fault Zone is shown crossing the Site on the Regional Geologic Map (Figure 3). This fault zone is considered not to have been active in the late quaternary and there is no seismicity associated with it (CGS, 2018).

The 2015 Working Group on California Earthquake Probabilities evaluated the 30-year probability of a Moment Magnitude 6.7 or greater earthquake occurring on the known active fault systems in the Bay Area in the Third Uniform California Earthquake Rupture Forecast (UCERF3). UCERF3 estimated an overall probability of 72 percent for the Bay Area as a whole and a probability of 6.4 for the Northern San Andreas fault.

Based on the historical seismicity, the proximity of known active faults, and the estimated earthquake probabilities for the Bay Area as a whole, it should be expected that the Site will experience strong seismic ground shaking during the lifetime of the proposed improvements. The ground shaking hazard levels at the Site are similar to those for most of the Bay Area.

2.3.1 Seismic Criteria

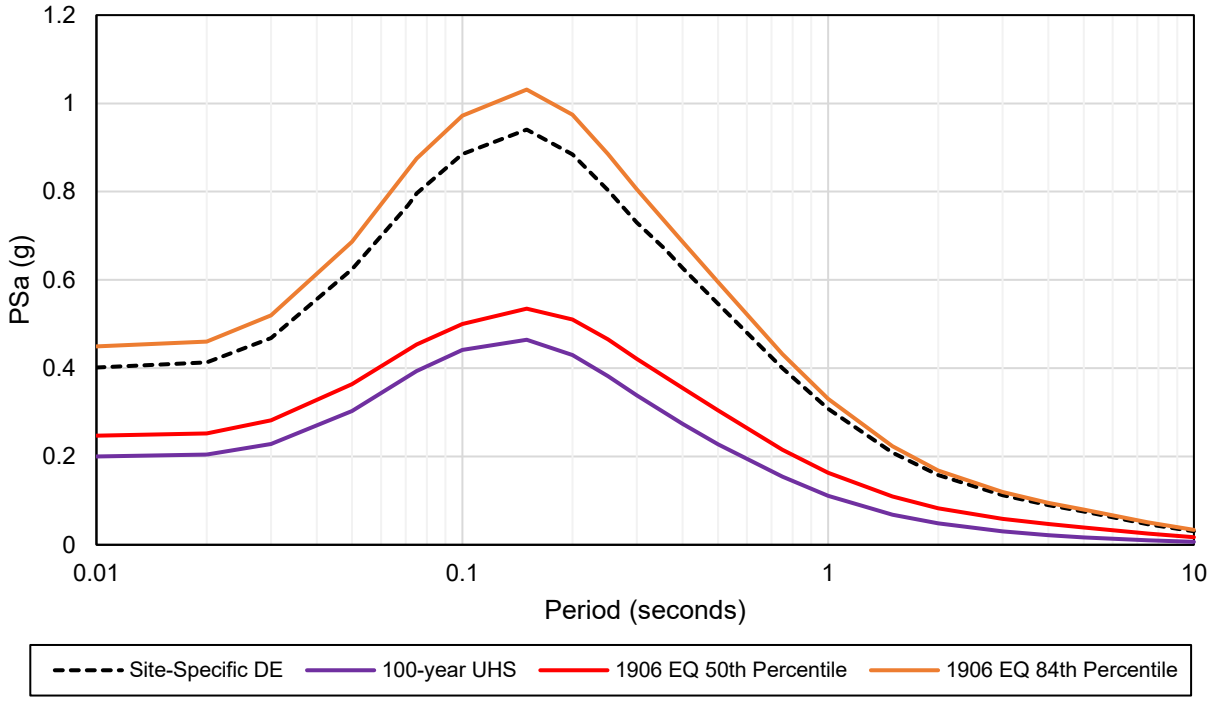
According to Section 20237 of Title 27, Class III landfills shall be designed to withstand the Maximum Probable Earthquake (MPE) without damage to the foundation or to the structures which control leachate, surface drainage, or erosion, or gas. The MPE is defined as the “maximum earthquake that is likely to occur during a 100-year interval.” According to Title 27, development of the MPE requires consideration of active faults within a 62-mile (100-kilometer) radius and probability of seismic activity, although a specific return period (i.e., probability of exceedance during the design life) is not specified. Additionally, Title 27 states that the MPE is superseded by any more powerful seismic event that has occurred within historic time in area of interest.

Based on the language in Title 27, the MPE could be interpreted as an earthquake with a return period of 100 years. However, the requirement that the MPE be superseded by any more powerful seismic event within historic time indicates that the 1906 San Francisco Earthquake should also be considered in developing the MPE. Since the return period of the 1906 event exceeds 100 years, it governs for this project. Accordingly, we used the NGA West 2 Ground-Motion Models (GMMs) to estimate the 50th percentile (i.e., lognormal mean) pseudo-spectral acceleration (PSa) response spectra for the 1906 event. Based on the definition of the MPE in Title 27, we opine that this 50th percentile response spectrum meets the criteria for the MPE. Additionally, we also calculated the 84th percentile (lognormal mean plus one standard deviation) for reference. We considered a source-to-site distance of 9.3 miles (15 kilometers) and a moment magnitude (M_W) of 7.9 in the GMMs. We calculated PSa at the bedrock level, as this was the input location of the ground motions used in our finite element seismic slope deformation analyses. We show the 50th and 84th percentile response spectra in Exhibit 2.3.1-1. We also show the Uniform Hazard Response Spectrum (UHS) associated with a 100-year return period.

As described in our Landfill Closure Geotechnical Report (Appendix B), we developed a median component bedrock-level Design Earthquake (DE) response spectrum in accordance with the 2019 California Building Code and ASCE 7-16 standard. This DE is the seismic criteria for the evaluating slope stability for future development at the Site. As shown in Exhibit 2.3.1-1, the DE significantly exceeds the 50th percentile response spectrum for the 1906 event. Additionally, the

DE is within less than 10 percent of the 84th percentile response spectrum. Accordingly, we opine that the DE exceeds the requirements of the MPE. Therefore, we performed our slope stability analyses at the DE-level, as this seismic criteria exceeds the landfill closure requirements and governs for future development.

EXHIBIT 2.3.1-1: Response Spectra Considered in Development of MPE Response Spectrum



2.4 CURRENT SITE CONDITIONS

2.4.1 Surface Conditions

The Site has recently been used as a soil recycling facility. The active stockpiling is generally occurring in the northern quarter of the Site and commercial and industrial facilities are located in this portion of the Site, including Baylands Soil Processing, Brisbane Recycling Company, Golden State Lumber, Transdev, Google Bus, and Avis Car Rental. A landfill gas extraction system is in place and has been maintained to provide continuous operation. A flare system for the landfill gas extraction system and compressor for the leachate management system are located on the northwest corner of the landfill. An industrial plant and Kinder Morgan Terminal are adjacent to the southwest of the Site, within the limits of the landfill (Figure 1). The rest of the site is covered with stockpiles that are covered with seasonal grasses. Ground surface elevations range from approximately 15 to 30 feet in the northern portion and around the stockpiles and 60 to 70 feet at the top of the stockpiles.

Three public roads currently exist around the landfill (Beatty Avenue, Tunnel Avenue, and Lagoon Road), and various haul roads are present around the interior of the site. Visitacion Creek extends east-west through the central portion of the Site.

2.4.2 Existing Landfill Cover

Based on review of a Landfill Cover Thickness Investigation Report for the Brisbane Landfill prepared by Burns & McDonnell (B&MD) (B&MD, 2001), the existing soil stockpile material that is overlying the waste ranges in thickness from 1 to 37 feet. Figure 3 provides a contour map of the estimated top of waste based on the data from the 2001 study; however, we anticipate significant settlement has occurred at the site since the study was performed and the top of waste to be lower than shown. Future study to update the location of waste material will be performed for final project design.

2.4.3 Surface Water

Visitacion Creek currently transports surface runoff from the western drainage basins to San Francisco Bay. Tidal and freshwater wetlands are currently present along the edges of Visitacion Creek. The Site is shown as being mapped outside of the 100-year flood zone as reported by the Federal Emergency Management Agency (FEMA) (FEMA, 2019) with the exception of Visitacion Creek. The Visitacion Creek wetlands will be restored as part of the proposed development.

Geosyntec performed modeling of the future groundwater levels accounting for 2100 Sea Level Rise projections and construction of the landfill leachate control system. Their model indicates a decrease of groundwater levels throughout majority of the Landfill whereas the groundwater levels are estimated to increase up to 1 foot along the railroad tracks along the western boundary of the Landfill (Geosyntec, 2022).

2.5 EXISTING MONITORING AND CONTROL SYSTEMS

The existing monitoring programs and control systems at the Brisbane Landfill are described in this section. These programs and systems have been installed and operated in accordance with requirements included in the WDRs (RWQCB, 2001), Permit to Operate (PTO), issued by the Bay Area Air Quality Management District (BAAQMD) (2021), Title 27, and National Pollutants Discharge Elimination System (NPDES). Regular standardized observations of the landfill surface are required by the WDRs. No significant violations have been reported and we are not presently in violation.

Additionally, in accordance with the Discharge Monitoring Program (DMP) in Part B of the WDRs (RWQCB, 2001), observations include detailing erosion, surface cracks (which might allow LFG to escape or promote water infiltration), presence of seeps, ponding water, and surface settlement.

The water quality monitoring program for the Brisbane Landfill currently includes requirements for the following items.

- Groundwater
- Leachate
- Surface water and seeps
- Stormwater

Monitoring is performed in accordance with the requirements of the DMP No. 01-0041 attached to the WDRs (RWQCB, 2001). Currently groundwater, leachate, surface-water, seeps, and surface water monitoring and sampling stations are utilized at the Site.

Groundwater, leachate, surface water, and seep samples are analyzed for the constituents identified in the DMP. Stormwater discharge samples are tested in accordance with the SWPPP and reported to the State Water Board via Stormwater Multiple Application and Report Tracking System (SMARTS).

2.5.1 Groundwater

A groundwater monitoring well network was installed within portions of the Brisbane Landfill between 1987 and 2003 in accordance with the WDRs. There are 20 monitoring wells and two leachate monitoring wells located on the Site. The Brisbane Landfill requires semi-annually groundwater monitoring (Order No. 01-041 and Title 27).

Semi-annual discharge monitoring is performed for the Brisbane Landfill. The most recent Summer-Fall (August) 2021 Monitoring Report (Geosyntec, 2021) has reported groundwater and leachate monitoring well data to be consistent with historical data and indicated that the groundwater gradient is generally towards the south and east with a local component of flow towards Visitacion Creek. Groundwater elevations vary from 3 feet to 10 feet (MSL) as provided from the Summer-Fall (August) 2021 Monitoring Report (Figure 3B).

Increasing trends were observed for arsenic in Well MW-37A and total dissolved solids (TDS) in Well MW-40A. However, the remaining shallow monitoring wells within the footprint of the landfill showed no significant increasing trends. Decreasing trends were observed for total organic carbon (TOC) and barium in limited wells downgradient from the Brisbane Landfill. The concentrations of volatile organic compounds (VOCs) were generally consistent with previous monitoring events and below their respective maximum contaminant levels (MCLs). Low concentrations of metals (arsenic, barium, nickel, lead, and selenium) were reported in shallow monitoring wells. A number of semi-volatile organic compounds (SVOCs) were detected at low concentrations about the above reporting limits. Some SVOCs and polychlorinated biphenyls (PCBs) were detected at trace concentrations.

The analyses showed TDS and sulfate to have statistically significant increasing trends during the analysis. Temporal trend analyses showed that barium and TOC in shallow monitoring wells exhibited statistically significant decreasing trends. No statistically significant trends were identified for VOCs. No significant exceedances were reported.

2.5.2 Leachate

The three sources of leachate at the Site include surface infiltration, upward flow of pore water from Young Bay Mud consolidation, and upward flow from settlement and decomposition of waste. As described in the WDRs, leachate contains dissolved metals, elevated ammonia, VOCs, and SVOCs within the shallow and deep aquifer within the Brisbane Landfill. Landfill leachate is brackish to saline. Brisbane Landfill is following a Leachate Monitoring Plan (LMP) that is in accordance with the WDRs (Geosyntec, 2008a).

The existing Leachate Seep Collection and Transmission System (LSCTS) at the Brisbane Landfill began operation on August 7, 2009, following its RWQCB approval in 2008 (Appendix D). The LSCTS has five extraction wells and four piezometers located along the southern Site boundary (Figure 3B). This limited system is designed to eliminate surface seepage of leachate from the Site into the Brisbane Lagoon. Pneumatic pumps in the wells create an inward gradient and intercept leachate flowing toward the seeps. An air compressor located near the flare station at the northwest corner of the Site powers the pumps. The pneumatic pumps automatically

activate when water is detected. Air lines, running along the western Site boundary, transfer the compressed air across the Site to the leachate pumps. Leachate is discharged to a Bayshore Sanitary District (BSD) sewer line for treatment and disposal. The San Francisco Public Utility Commission (SFPUC) requires that the LSCTS discharge is sampled semi-annually for chemicals required by the permit. Leachate sampling results are reported to SFPUC and BSD. From August 10, 2009, to August 27, 2021, approximately 36.1 million gallons of leachate were discharged to the BSD sewer line (Sunquest, 2021).

The system receives regular maintenance and repair. The compressor was recently replaced in 2020. The existing LSCTS components are in general working order.

Semi-annual sampling events are performed for the Brisbane Lagoon seeps, Visitacion Creek seeps, and leachate wells within the landfill footprint. Perimeter seep inspections occur on a quarterly basis. Water levels in interior leachate wells LW-1 and LW-2 (Figure 3B) have shown an approximately 3-foot build-up of leachate within the landfill over the past 15 years. Infiltration of precipitation and consolidation of waste and Young Bay Mud under the weight of stockpiled soil are the likely source of the apparent leachate buildup (Geosyntec, 2008a).

In the Summer-Fall 2021 Semiannual Discharge Monitoring Report (Geosyntec, 2021), the groundwater quality data collected at the Site were statistically evaluated in order to identify trends or possible releases from the landfill. Various VOCs including1,4-dichlorobenzene, naphthalene, and chlorobenzene were detected above the reporting limit. SVOCs, including pyrene, acenaphthene, fluorene, and n-nitrosodiphenyl-amine were detected above the reporting limit. LW-1 and LW-2 were not tested for organochlorine pesticides (OCPs) or PCBs during the August 2021 sampling event. Metals (arsenic, barium, nickel, lead, and selenium) were detected within the range of their historical concentrations. Detections of TDS, TOC, un-ionized ammonia, nitrate, and sulfate were within their historical range. No significant exceedances were reported.

2.5.3 Surface Water and Seeps

There are two surface water stations located along Visitacion Creek, five seeps along the southern border of the Site (near the Brisbane Lagoon), and three seeps along the eastern border of the Site (along U.S. Highway 101). The two surface water stations along Visitacion Creek and the five seeps along the Brisbane Lagoon are included in semiannual sampling and quarterly perimeter observations, in accordance with the WDRs (RWQCB, 2001).

Based on the Summer-Fall 2021 Monitoring Report (Geosyntec, 2021), two surface water samples and two seep samples were collected. No VOCs, SVOCs, PCBs and OCPs were detected in the surface water samples. Metals detected, including arsenic, barium, lead, nickel, and selenium, were within the range of historic concentrations. TDS was 31,000 mg/L, and sulfate at 2,400 mg/L, and nitrate was not detected. The maximum concentration criterion for un-ionized ammonia was not exceeded in the 2021 monitoring event. The seeps tests along the Brisbane Lagoon indicated a presence of only chlorobenzene and 1,4-dichlorobenzene at maximum concentrations, below the California Maximum Contaminant Limit (MCL). One SVOC, 1,4-dichlorobenzene, was detected. No PCBs and OCPs were detected in the seep samples. The un-ionized portion of ammonia (as N) was calculated to be 2.68 mg/L (SG-3) and 0.53 mg/L (SG-4).

In 2021, Geosyntec observed interior stations that were dry, with no odors, no ponded water, and no evidence of cover erosion or daylighted waste. The perimeter stations also were observed to be generally dry, without odors, and no liquid was seen entering or leaving the landfill at the 16 perimeter stations. No significant exceedances were reported.

2.5.4 Stormwater Drainage System

Stormwater runoff, erosion, and sediment are currently controlled at the Site by use of the following control systems:

- Drainage ditches, channels, culverts, inlets, and outlets
- Temporary diversion dikes
- Strawbale barriers
- Erosion control measures
  - Seeding
  - Turf reinforcement mats (TRM)
  - Sedimentation basins

The purpose of the stormwater drainage system is to ensure stormwater is diverted from the landfill in a controlled manner to off-Site drainage areas. These drainage areas currently include the following Visitacion Creek, Brisbane Lagoon, and San Francisco Bay.

These stormwater management systems are currently inspected and maintained in accordance with the existing SWPPP (B&M, 2018).

2.5.5 Landfill Gas Management System

An existing gas collection and control system, installed in 1991, operates within the Brisbane Landfill on a less than continuous permit due to decreasing methane production, under PTO No. A5691. The landfill gas extraction system has received various maintenance during its operation. Due to low landfill gas production, the flare currently operates a couple hours per week. There are 57 landfill gas extraction monitoring wells located on the Site, and landfill gas is monitored on a quarterly basis. The main header of the Landfill Gas Extraction System (LFGES) surrounds the approximately 240-acre plot located east of Tunnel Avenue, north of Lagoon Way and west of U.S. Highway 101 (Appendix E). Monitoring reports indicate the landfill gas extraction system has been in compliance with the Bay Area Air Quality Management District's operational criteria.

2.5.5.1 System Specifications

The existing Brisbane LFGES consists of the following appurtenances (Rios, 2001) (Appendix E).

- A Lamson Corporation Model 854 GD blower with four stages of direct drive 50-horsepower (hp) electric motor
  - Maximum capacity of the blower is 1,600 standard cubic feet per minute (SCFM)
  - A variable speed drive (VSD) controls motor speed (typically operated at 33 percent)
- A Sur-Lite Corp flare system flare located behind the existing Sierra Point Lumber Company site (at 601 Tunnel Avenue)
  - The maximum heat input of the flare system is 10 million British thermal unit (BTU)
  - The maximum LFG flow rate of the flare system is 1,100 SCFM

  - The flare system was designed to have a destruction efficiency of greater than 98 percent with a combustion temperature of at least 1,400 degrees Fahrenheit

- The system includes 28 horizontal and 26 vertical extraction wells
  - Horizontal extraction wells consist of 4-inch–diameter, Schedule 40 polyvinyl chloride (PVC) piping
    - Piping is embedded in 2 feet of 1½- to 3-inch crushed rock covered with a plastic liner and 2 feet of soil cover
    - Horizontal piping is set at approximately 3 feet below the ground surface (bgs)
  - Vertical extraction wells consist of 3-inch–diameter, Schedule 40 PVC piping
    - Vertical wells were constructed to between 11 and 19 feet bgs, depending on the depth to groundwater
  - Wells have sample ports and valves to collect samples and control LFG flow
- The main header of the LFGES surrounds the approximately 240-acre plot located east of Tunnel Avenue, north of Lagoon Way, and west of U.S. Highway 101
  - Piping segments include 6-, 8-, 10- and 12-inch-diameter PVC piping
- A condensate collection system includes 1,000-gallon tanks
- Flow and temperature controls shut the system down if the methane gas concentrations fall below 20 percent or if the LFG flow rate falls below 250 SCFM
- A Honeywell Model DR4500A Turbine Circular Chart Recorder records temperature

2.5.5.2 Current Conditions

The existing LFGES has operated since 1991, and the LFG generation has significantly declined in recent years. The age and types of waste in the landfill are the main reasons for the decline in LFG production. The Brisbane Landfill flare currently operates under PTO No. A5691, and the BAAQMD has granted approval of "less than continuous operation", due to the limited LFG production (Montrose, 2021). The PTO expires on September 1, 2022 (BAAQMD, 2021).

The flare station operates under a BAAQMD less than continuous permit (#A5691) under the following conditions, due to decreasing methane production: "*The LFG flare system must be operated at least 7 hours per day. If the methane concentration in the main header falls below 20 percent by volume, or the LFG flow rate falls below 250 cfm measured at the blower discharge, then the LFG flare system may be operated less than 7 hours per day.*" Due to the age of the landfill and lack of LFG flow, the flare is currently only operating a few hours each week (Montrose, 2021).

The LFGES is operating satisfactorily and meeting the operational criteria set by the BAAQMD. The new system will also need to be designed to take the proposed development constraints into account (i.e., possible settlement, final cover layers, elevation changes).

3.0 ENGINEERING EVALUATION

Detailed discussion of the potential geohazards at the Site, our engineering analysis, and recommended mitigation is in the Landfill Closure Geotechnical Report included as Appendix B.

3.1 NON-ENGINEERED FILL

Non-engineered fill over 40 feet thick is present at the Site from the soil recycling operation. Non-engineered fill can undergo excessive settlement, especially under loading from new fill and/or buildings. The geotechnical mitigation measures associated with reducing settlement of the waste will require removal of the non-engineered fill material to the top of the waste, depending on the groundwater conditions. If the soil material is free of debris and deleterious matter, it may be reused as engineered fill at the Site.

3.2 STATIC SETTLEMENT EVALUATION

The Site is underlain by various materials that are subject to static settlement: the waste, Young Bay Mud, and Old Bay Clay. The waste will be subject to settlement due to various processes related to breakdown of the waste material. The Young Bay Mud and Old Bay Clay are subject to consolidation settlement when new loads are applied that exceed the maximum past pressure experienced by the material as well as recompression from any new loading applied.

3.2.1 Consolidation Settlement

The site is underlain by 20 to 65 feet of Young Bay Mud. These deposits are highly compressible and may be susceptible to significant settlement when subjected to additional loading from raising of Site grades or from future structures.

The amount of settlement of the Young Bay Mud depends on proposed loads, the thickness, and the stress history of the Young Bay Mud. In areas where there will be increased loading from raising site grades or placement of buildings, the Young Bay Mud will experience additional consolidation settlement. If mitigation is not implemented, we estimate future settlement from consolidation of Young Bay Mud could be up to 35 inches and take over 50 years. In general, the average settlement across the site is approximately 20 inches if left unmitigated. With mitigation, we anticipate less than 1 inch of settlement.

The Old Bay Clay is considerably less compressible under the range of anticipated loads for the planned infrastructure improvements and raising of site grades. We calculated up to 3 inches of settlement in the Old Bay Clay. However, given the depth of this material, any settlement from the Old Bay Clay will manifest as general subsidence of the site rather than localized settlement. Future building loads may trigger consolidation of the Old Bay Clay if the foundations induce significant stress on this layer. The potential consolidated settlement of the Old Bay Clay due to the planned building loads should be evaluated during building design. Settlement due to consolidation of the Old Bay Clay is considered to be negligible.

Based on the total and differential settlement potential, we recommend mitigation of the compressible Young Bay Mud through either surcharging or compensating with lightweight backfill as discussed in Appendix B.

3.2.2 Waste Settlement

The Site was formerly part of San Francisco Bay, which became a waste landfill that accepted waste between approximately 1932 and 1967. The thickness of the waste varies from approximately 20 to 35 feet across the Site. The waste will experience settlement that occurs over time resulting from primary and secondary consolidation. The primary consolidation mostly takes

place over the first year; however, secondary consolidation will continue over time due to various processes. According to Sharma and De (2007), these processes are:

1. Physical and mechanical processes (reorientation of particles, movement of the fine materials into larger voids, and collapse of void spaces)
2. Chemical processes (corrosion, combustion, and oxidation)
3. Dissolution processes (dissolving soluble substances by percolating liquids and forming leachate)
4. Biological decomposition of organics

Since the primary consolidation of waste is generally assumed to occur over a short time span, we did not account for additional settlement from waste in our analysis. In 2008, Geosyntec implemented a test surcharge settlement program to estimate the secondary settlement characteristics of the waste at the Site. For our analysis, we used parameters correlated from the test program and from data published by Sharma and De (2007). We estimate waste settlement will occur over 50 years from landfill closure will be an average of 2 feet and up to a maximum of 3 feet. Future study will be performed to obtain additional data to refine the settlement analysis.

We proposed to mitigate the static waste settlement though Deep Dynamic Compaction (DDC). We estimate that the post-improvement settlement of the waste will be less than 24 inches. Further discussions and post-mitigation settlement estimates are presented in the Landfill Closure Geotechnical report in Appendix B.

3.3 LIQUEFACTION EVALUATION

The existing non-engineered fill encountered at the Site is predominantly sandy material that generally ranges from medium dense to very dense. Given the method of placement, portions of the fill are likely loose. Although fill below the water table was encountered in the explorations, there are very few blow count recorded in this material, since many of the explorations were focused on characterizing the material below the waste. We assume that much of the fill would be subject to liquefaction and cyclic densification during a design seismic event. Since we anticipate that the Site will receive mitigation of other geotechnical hazards by implementation of ground improvement techniques that will require removal of majority of the undocumented fill, the remaining fill above the landfill waste to facilitate implementation of the ground improvement will have limited susceptibility to liquefaction.

In addition, some explorations encountered a sand layer within the Holocene Bay Deposits beneath the Young Bay Mud, portions of which are potentially liquefiable, as indicated in our analysis. Based on the Site explorations, the top of this layer is at least 80 feet below the proposed grades. Based on Cetin et al. (2009), the effect of liquefaction on ground surface settlement decreases with the depth of the liquefiable material, and below a depth of 59 feet, the liquefaction of deeper layers has no effect on surface settlement. Since the potentially liquefiable layers are anticipated to be much deeper than 59 feet, we expect liquefaction manifestation resulting in settlement at the ground surface will be negligible during a design earthquake event.

3.3.1 Lateral Spreading

Lateral spreading is a failure that causes soil to move toward a free face or down a gentle slope due to the pore-pressure build-up during liquefaction of an underlying saturated material. Lateral spreading often occurs along riverbanks and shorelines where loose, saturated sandy soil is commonly encountered at shallow depths.

As discussed above, a likely continuous potentially liquefiable sand layer exists beneath the Young Bay Mud. However, this layer varies from 40 to 90 feet deep, well below the bottom of the adjacent San Francisco Bay at the shoreline along the eastern border of the Landfill. As such, the risk of liquefaction-induced lateral spreading is negligible.

3.4 SEISMIC DEFORMATION ANALYSES

Since the elevation of the waste is much lower than the existing site grades and is at or below the surrounding grades, the stability of the waste mass is not at risk at this site. Furthermore, the final cover and landfill control systems will generally be at relatively low elevations compared to the design grades, these are not at risk from slope deformation at the project site. Our analysis investigated the stability of the engineered slopes that will be constructed above the waste.

To estimate seismic slope deformation, we performed non-linear dynamic deformation analysis on the east slope of Cross-Section A-A' and the east and west slopes of Cross-Section B-B'. This deformation analysis included two-dimensional (2D) non-linear, finite-element dynamic slope stability and deformation analyses using the computer program PLAXIS version 2016 (Brinkgreve et al., 2016). We used site-specific horizontal design earthquake spectra per ASCE 7-16 as our input ground motion at the top of the bedrock. Based on our analysis, we estimated lateral deformation due to the design earthquake ground motion.

We then performed a pseudostatic analysis on Cross Sections A-A' and B-B' and calibrated the soil parameters in order to result in similar deformations as estimated by the finite element analysis. We then used the calibrated parameters to estimate the deformation at the rest of the cross-sections at the project Site based on the pseudostatic analysis. Table 3.4-1 shows the estimated deformation results from analysis.

TABLE 3.4-1: Lateral Slope Deformation Results

CROSS SECTION	LATERAL DEFORMATION (inches)
A-A' West	0
A-A' East	7
B-B' East	9
B-B' West	6½
C-C' East	4
C-C' West	1
D-D'	0
E-E'	2
F-F'	3
G-G'	5

The lateral deformations calculated in our analysis are acceptable for performance of landfill cover. However, greater than 6 inches of deformation may have impacts to the proposed commercial development. Therefore, we recommend a setback from the top of slope for the structures in the commercial development. The solar farm, open space, and roadways can be repaired following a design earthquake and do not present a life safety hazard; therefore, they do not need to be set back. We present setback distances for buildings in Table 3.4-2.

TABLE 3.4-2: Setback Distances to 6-inch Lateral Deformation Threshold

CROSS SECTION	SETBACK DISTANCE TO YIELD LESS THAN 6" OF LATERAL DEFROMATION*
A-A' East	50 feet
A-A' West	40 feet
B-B' East	100 feet
B-B' West	40 feet
C-C' East	50 feet
C-C' West	40 feet
D-D'	-
E-E'	-
F-F	-
G-G'	40 feet

**Distance measured from the top of slope*

3.5 FINAL COVER STABILITY ANALYSIS

As discussed in Section 4.2, the final landfill cover options include Geosynthetic Clay Liner and/or Geomembrane or a Compacted Clay Liner. We assumed conservative strengths of these materials for our analysis. The strengths will need to be confirmed as part of the construction quality assurance program prior to Site construction. The final cover will likely be located at a lower elevation than the final Site grades and the proposed slopes shown on Figure 4 will likely consist of engineered fill and not the landfill final cover. However, we conservatively analyzed final cover stability for 3:1 and 5:1 (horizontal:vertical) slopes. We used the pseudostatic methodology presented in Matasovic (1991) for our cover stability analysis. For the seismic condition, we used the minimum yield acceleration (k_y) of 0.17 from our slope deformation analysis.

Our analysis of the final cover of the landfill did not yield an adequate factor of safety for the short-term condition with seepage with 3:1 (horizontal:vertical) slopes, but the factor of safety for the short-term case is adequate for 5:1 (horizontal:vertical) slopes. Therefore, if the final design of the cover includes slopes that are steeper than 5:1 (horizontal:vertical), then a drainage system consisting of a blanket drainage layer and a network of perforated pipes is necessary for closure. We should reevaluate the short-term final cover stability during the final design.

The final cover factor of safety is not adequate for the seismic case. As discussed in Appendix B, there will be some deformation of the slopes at the project Site during a design earthquake. If we conservatively assume that the final cover will be the proposed 3:1 (horizontal:vertical) Site slopes, then our analysis indicates that there could be up to 9 inches of deformation during a design earthquake.

The USEPA Seismic Design Guidance for Municipal Solid Waste Landfill Facilities (USEPA, 1995) states "*As cover deformations are readily observable and damage to the cover is repairable, larger deformations are typically considered acceptable along interfaces in the cover system than along liner system interfaces.*"

Therefore, while deformation may be experienced on a 3:1 slope during a design earthquake, it is an acceptable condition provided that the slope areas at the Site are repaired.

4.0 PROPOSED FINAL LANDFILL COVER AND SYSTEMS

Each of the proposed capping alternatives was screened based on effectiveness and implementability.

The following factors were used to select the proposed capping alternatives.

- Overall Protection of Human Health and the Environment – This criterion evaluates whether the capping method provides adequate protection to human health and the environment, specifically in consideration to infiltration and vapor mitigation.
- Short-Term Effectiveness – This criterion evaluates the effects of the capping method during the construction and implementation phase until the capping objectives are met. It accounts for the protection of workers and the community during capping activities and environmental impacts from implementing the capping action.
- Long-Term Effectiveness and Permanence – This criterion addresses issues related to the management of material on Site after capping has been performed.
- Geotechnical Considerations for Construction Feasibility – This criterion evaluates the potential for each alternative based on previous geotechnical investigations of the Site, knowledge of underlying soil materials, settlement, and proposed ground improvements.
- Implementability – This criterion evaluates the technical and administrative feasibility of implementing the alternative, as well as the availability of the necessary equipment and services. This includes the ability to design and install the proposed cap, ability to obtain and maintain services and equipment, and ability to monitor the performance and effectiveness of technologies.

Following approval of the CPCMP, supplemental field investigations, and closure construction documents will be prepared for subsequent approval. A summary of the closure cost estimate is provided in Appendix G.

4.1 DECOMMISSIONING OF ENVIRONMENTAL CONTROL SYSTEMS

Structures will be demolished prior to or during decommissioning of environmental control systems or site grading.

4.1.1 Existing Leachate System

The existing LSCTS limits seepage of leachate along a portion of the southern boundary, minimizing leachate entering Brisbane Lagoon. However, a more robust leachate management system will be required to prevent leachate migration off the Site following the proposed redevelopment. The existing system will be abandoned and decommissioned to facilitate the

installation of a more robust system. The conceptual design of the new leachate system is described in Section 4.3.

As the closure and proposed development of the landfill will likely occur in phases, the existing LSCTS will not be removed until the southern portion of the Site is closed. During closure of the southern area, the existing LSCTS components will be demolished. The pumps will be removed from the extraction wells, and the compressor and air lines will be decommissioned. The five extraction wells and four piezometers located along the Brisbane Lagoon will be abandoned under permit, in accordance with San Mateo County requirements. The system will be operated until either the seeps in that area can be eliminated with grading or the new leachate system is installed.

4.1.2 Existing Landfill Gas Extraction System

The LFGES is operating satisfactorily and meeting the operational criteria set by the BAAQMD. The new system, as outlined in Section 4.4., will also need to be designed to take into account the proposed development constraints (i.e., potential settlement, final cover layers, elevation changes). The new system will be installed during the proposed development of the site.

In order to maintain vapor mitigation during the transitional development period, the existing system will be modified to allow for continuous operation (to the extent practicable) and the eventual transfer of operation to the new system. Temporary vacuum hoses and/or hard piping will be utilized to bypass piping as needed to keep the system operating. The horizontal extraction wells will be abandoned in place or removed during the grading and deep dynamic compaction efforts. These wells will first be blinded from the rest of the system. Some vertical wells may require abandonment, depending on the extents of the grading and soil improvement efforts.

Following the transition to the new landfill gas system, the existing system will be decommissioned. Where feasible, existing vertical extraction wells will be reused to be incorporated into the new system. The remaining horizontal and vertical extraction wells will be destroyed where accessible, and the remaining inaccessible portions will be abandoned in place. The headers, manifolds, and flare systems will be demolished and replaced.

4.2 FINAL LANDFILL COVER

The Site generally consists of the following distinct areas that require capping: commercial buildings, impervious pavement, vegetated landscaped areas, utilities, solar array fields, wetlands, and open space. The landfill cover will terminate north of the existing Kinder Morgan Pipeline (Figure 4), along with the leachate management system barrier, in the event it is not relocated. A buffer of 20 feet will be maintained to minimize construction impacts to the pipeline. Soil improvements and construction techniques to support the buried Kinder Morgan pipes will be evaluated and implemented to mitigate potential impacts during landfill closure and construction of the shoreline improvements. The evaluation will also include the alternative to relocate the pipes to the north of the existing location.

4.2.1 Foundation Layer

Existing on-site soil fill may be used as the foundation layer per the Title 27 requirements, which may consist of soil, contaminated soil, incinerator ash, or other waste materials, provided that such materials have appropriate engineering properties to be used for a foundation layer. The foundation layer must be a minimum of 2 feet over the last lift of waste with appropriate

engineering properties to provide low permeability. The existing cover soil may require stripping, scarification, and re-compaction to obtain strength and compressibility in accordance with our geotechnical recommendations (Appendix B).

4.2.2 Low-Hydraulic Conductivity Layer Alternatives

Prior to installation of the low-hydraulic conductivity layer, the upper 6 inches of the minimum 2-foot soil existing foundation layer material would be scarified, moisture conditioned, and compacted per the Landfill Closure Geotechnical Report (Appendix B). All low-hydraulic conductivity layer alternatives must be placed at a minimum of a 2 percent slope to mitigate drainage above the cap. The low-hydraulic conductivity layer elevation will vary across the Site with the lowest portion of the low-hydraulic conductivity layer at the wetlands around Elevation 0 feet . The elevation of the low-hydraulic conductivity layer will vary depending on proposed utility and building foundation penetrations. It is anticipated that the elevation of the low-hydraulic conductivity layer will be lower on the southern solar area portion of the Site and will be higher in elevation beneath buildings for sealing around pier penetrations of the cap. Utilities will likely remain mostly above the low-hydraulic conductivity layer where possible. The final grading of the low-hydraulic conductivity layer will be prepared as part of the final construction design drawings. Transitional areas between different low-hydraulic conductivity layer alternatives will require a minimum of 3 feet of overlap. Details for transitional areas will be provided as part of the final construction design drawings.

As shown in Figure 4, the Site includes the different land use areas provided in the table below. The following alternatives may be considered for each of the development areas:

TABLE 4.2.2-1: Low-Hydraulic Conductivity Alternatives

LAND USE	RECOMMENDED ALTERNATIVES	DISCUSSION
Wetlands/Water Detention Area	Wetlands Low-Hydraulic Conductivity Layer	The proposed wetland final cover is recommended as a more impermeable barrier than that of the other alternatives to prevent migrating of leachate to the wetlands.
Commercial	Alternative 1 Alternative 2 Alternative 3 Alternative 4	Alternative 4 may be used within hardscaped portions of the Site outside of building footprints. Beneath building footprints require capping by Alternatives 1, 2, or 3.
Solar Field/ Energy Use/Landscaping	Alternative 1 Alternative 2 Alternative 3	Alternatives 1, 2, or 3 may be considered for the energy use/landscaping area.
Baylands Preserve	Alternative 1 Alternative 2 Alternative 3	Alternatives 1, 2, or 3 may be considered for the Baylands Preserve.
Lagoon Park	Alternative 1 Alternative 2 Alternative 3	Alternatives 1, 2, or 3 may be considered for the Lagoon Park.
Renewable Energy Storage	Alternative 1 Alternative 2 Alternative 3	Alternatives 1, 2, or 3 may be considered for the Renewable Energy Storage area.

These areas are discussed in detail in the following sections.

4.2.2.1 Wetlands Low-Hydraulic Conductivity Layer

A geosynthetic clay liner (GCL) and geomembrane is proposed beneath the wetlands portion of the Site shown on Figure 4. This capping method manufactured product consists of a relatively thin layer (0.25 inches) of processed clay (typically bentonite) bonded to a 40-mil high-density polyethylene (HDPE) or liner-low density polyethylene (LLDPE) geomembrane or fixed between two sheets of geotextile by gluing, stich-bonding, or needle-punching with a 40-mil HDPE or LLDPE geomembrane above. Hydraulic conductivities for GCLs in dry conditions are approximately 10^{-6} cm/sec and 10^{-9} cm/sec when saturated (USEPA, 2001).
Penetrations of the GCL/geomembrane would require flexible boots made from HDPE or LLDPE geomembrane to minimize water infiltration into the waste or LFG migration out of the waste at the penetration location. These may include future building foundations, well boxes for the leachate collection system, and future monitoring wells. The design details for penetrations as well transition between the GCL and compacted clay liner will be included in the Construction Drawings. Conceptual typical details are shown in Figures 7A and 8B.

4.2.2.2 Alternative 1 – Compacted Clay Liner (CCL)

The Site may be capped above the soil foundation layer with a compacted clay liner consisting of reconditioned on-Site material, chemically treated soil, or imported material that meets a hydraulic conductivity of 10^{-6} cm/sec or less. Chemical treatment may include bentonite, cement, lime, and/or similar additive treatment to meet the required hydraulic conductivity. Testing would be performed to ensure the hydraulic conductivity specifications are met. This will be further specified in the Construction Quality Assurance Plan. Import fill must adhere to the 2011 *Fill Soil Criteria for Brisbane Landfill* and revisions (Appendix H). Penetration areas for foundations, wells, or other structural components would be self-sealed by the clay layer.

Details are shown on Figure 7A as Alternative 1.

Engineered alternative designs (EADs) are permitted by the WDRs and are as follows.

4.2.2.3 Alternative 2 – Geosynthetic Clay Liner (GCL)

A GCL is proposed as a capping alternative within the Site. This capping method manufactured product consists of a relatively thin layer (0.25 inch) of processed clay (typically bentonite) bonded to a 40-mil HDPE or LLDPE geomembrane or fixed between two sheets of geotextile by gluing, stich-bonding, or needle-punching. Hydraulic conductivities for GCLs in dry conditions are approximately 10^{-6} cm/sec and 10^{-9} cm/sec when saturated (USEPA, 2001).

Penetrations of the GCL/geomembrane would require flexible boots made from HDPE or LLDPE geomembrane to minimize water infiltration into the waste or LFG migration out of the waste at the penetration location. The design details for penetrations as well transition between the GCL and compacted clay liner will be included in the Construction Drawings.

Details are shown on Figure 7A as Alternative 2.

4.2.2.4 Alternative 3 - Geomembrane

A 40-mil HDPE or LLDPE geomembrane is proposed as a capping alternative within the Site. A 40-mil HDPE liner or LLDPE liner encased between 12-ounce geotextiles. A 12-ounce geotextile

would be placed above the conditioned subgrade soil to provide protection to the geomembrane. A 12-ounce geotextile would be placed above the geomembrane to provide protection during fill placement.

Penetrations of the geomembrane would require flexible boots made from HDPE or LLDPE geomembrane to minimize water infiltration into the waste or LFG migration out of the waste at the penetration location. The design details for penetrations as well transition between the GCL and compacted clay liner will be included in the Construction Drawings.

Details are shown on Figure 7A as Alternative 3.

4.2.2.5 Alternative 4 - Low-Permeability Pavement for Hardscaped Areas

The commercial area within the northern portion of the Site will be primarily hardscaped composing of pavement and building foundations. Fill thickness within this area will vary, with some areas beneath the commercial pad having over 40 feet of fill above the waste. Paved areas, outside of the building footprints may be capped with pavement, such that the permeability of the pavement is 10^{-6} cm/sec or less. A drainage geocomposite will be placed within the engineered fill beneath the paved area for management of potential infiltration. Drainage will be routed to sub-drains that will discharge to stormwater improvements within the Site as discussed in Appendix C. Ancillary landscaped areas within the commercial paved area will require another capping alternative.

Details are shown in Figure 7B as Alternative 4.

4.2.3 Drainage Layer

A drainage layer will be placed on top of the low-hydraulic conductivity layer. This drainage layer will facilitate infiltrated water above the final cover and convey to the wetland areas or drainage facilities. This may consist of a drainage geocomposite or granular material (crushed rock or gravel). Drainage piping may be necessary to collect and drain infiltrated water. The final construction drawings and specifications will show the final material selection, final cover grading, the location of the drainage layer based on final design details, and drainage pipes.

Details are shown in Figures 7A and 7B.

4.2.4 Erosion-Resistant Layer

Engineered fill consisting of primarily on-Site material will be placed above the low-hydraulic conductivity and drainage layers at varying thicknesses greater than 1 foot in accordance with proposed grades (Figure 4). Final finished grades will be either vegetated wetlands or landscaping, paved, or vertically constructed. This erosion-resistant layer will accommodate appropriate root depths, utilities, and shallow foundations where possible. The stormwater drainage system will be installed within the top or within this layer for runoff from impervious portions of the Site. All irrigated portions of the landfill shall contain a subdrain beneath the vegetative layer of the final cover (RWQCB, 2001). Placement and relative compaction requirements will be specified during preparation of the final construction drawings and specifications.

The wetlands will specifically include Young Bay Mud or similar material beneath the creek bed. Gabion mattresses or equivalent should also be used in addition to the Young Bay Mud ud layer as an additional erosion-resistant layer within the saltwater tidal wetlands as shown on Figure 8B.

4.2.5 Leachate Management System

Future potential off-Site migration of leachate will be managed through the installation and operation of a leachate collection and removal system (LCRS) collection trench with a low-permeability cut-off wall. This proposed LCRS system will extend from across the majority of the eastern and southern Site boundaries. Additionally, the leachate collection system will extend under the proposed wetland area along the Visitacion Creek alignment to reduce static water pressure under the landfill cap. The proposed LCRS system will replace the existing LSCTS located along the Brisbane Lagoon (Appendix D).

A low-permeability cut-off wall and LCRS trench will work in concert to minimize off-Site migration through restricting lateral movement and by continuously collecting, removing, and conveying leachate to the BSD sewer line. The cut-off wall should extend from the landfill cover to the top of the Young Bay Mud layer (Appendix B, Figure 8). The proposed alignment of the LCRS trench is provided in Figure 5. The design and extent of the LCRS system was determined based on the groundwater flow regime and Site boundaries (Figure 3B). The hydraulic gradient underneath the Site trends southward and eastward. The LCRS system will restrict lateral groundwater flow and intercept leachate prior to off-Site migration.

The LCRS system is proposed to consist of the following components (Figures 8A and 8B).

- Exterior segments of cut-off wall with LCRS trench along the majority of the eastern and southern landfill boundaries
- Additional leachate lines will be installed below the future creek alignment under Visitacion Creek. These lines will reduce hydrostatic pressure under the final cover at the creek.
- Leachate sumps will be located along the LCRS trench and interior LCRS lines to collect and pump leachate to conveyance lines.
  - Manholes will be necessary to act as sumps for the interior LCRS lines
- Pipe cleanouts will be located along the LCRS trench to allow for periodic inspection and maintenance of the LCRS trench piping.
  - Interior LCRS manholes may be designed to house lateral cleanout piping, acting as access/junction points facilitating pipe cleaning and other maintenance
- A compressor with air lines will be operated to power pneumatic pumps to convey the extracted leachate from the sumps and manholes to the BSD sewer line.

Water pressure head can be measured at the cleanouts to verify continued functionality via trench connectivity. Additionally, transects calculated from existing and proposed monitoring well data will be monitored to confirm that the water level in the trench is lower than surrounding groundwater within the Site (i.e., maintaining the inward gradient). The low-permeability cut-off wall will function to reinforce the generation of an inward hydraulic gradient.

The Construction Drawings and Specifications for the final cover system will include the final design of the LCRS system. They will also include a pre-design field investigation, a hydraulic analysis of potential leachate inflow rates, and electrical and mechanical specification.

4.3 LANDFILL GAS COLLECTION AND CONTROL SYSTEM

A new LFG management system will be installed during site grading, and temporary piping will be utilized to maintain operation of the existing system during the transition period (to the extent practicable). A field investigation will be performed during the design level phase to determine if any of the existing perimeter LFG extraction wells will be reusable.

During closure and redevelopment, the existing LFG extraction system will continue to operate in accordance with Section 20920 of Title 27 and BAAQMD permit, whenever possible. As the closure and redevelopment will take place in phases, the existing LFG system will be modified to allow for the continuous operation and eventual transfer of operation to the new LFG system. The LFG operations team will endeavor to minimize the amount of time that the system is off-line. The details related to abandonment of the old system and transition to the new proposed system will be approved by the BAAQMD prior to field activities. Figure 6 and Appendix E show the proposed and existing LFG system plans, respectively.

Based on the need for ground improvement described in Appendix B (i.e., Deep Dynamic Compaction (DDC), surcharge program, etc.) and the expected Site settlement, the proposed LFG system will consist of vertical LFG extraction wells only. The final spacing, screen depths, locations, and other design details of the vertical LFG extraction wells will be determined during the detailed design phase. However, based on the age of the landfill, the low level of LFG generation, and other development factors, we opine a perimeter LFGES is sufficient. DDC is anticipated to damage the existing horizontal LFG extraction wells. Horizontal extraction wells will be abandoned in-place prior to DDC, and continued operation of the existing vertical LFG wells will occur until the proposed new vertical LFG extraction well field can be completed. If necessary, the top of existing vertical LFG wells will be temporarily extended vertically to allow for continued operation during fill placement. Any damaged or non-functional vertical wells will be abandoned. These modifications will occur in phases based on the project development schedule.

The existing LFG management system utilizes a flare station to combust the extracted gases. Based on the low LFG production rates that have been observed at the Site in recent years, the transition to a granular activated carbon (GAC) system is anticipated moving forward. The flow rate has been shown to be as low as 2 SCFM. The GAC tank will remove the non-methane organic compounds (NMOC) from the flow and the low levels of methane would be managed through a permitting exemption to emit the methane to the atmosphere. The concentrations of methane do not permit combustion without supplementing the flow with propane, which increases atmospheric emissions.

Two approximately 1,000-gallon GAC tanks are anticipated for the proposed system. These tanks will be connected either in parallel or with a lead-lag design. Initially, GAC will likely need to be replaced annually. The necessary investigation and design will take place during the design phase, to confirm that a GAC system will be adequate to manage the LFG into the future.

The vertical LFG extraction wells will be installed through the proposed clay landfill cap, and construction of a robust annular seal will be accomplished via hydrated bentonite and/or cement grout installed at depths corresponding to the final cover design elevation. Proposed lateral collection piping will be placed above the final landfill final cover layer (wherever possible), to

facilitate maintenance and sampling without disturbing the barrier layer. Figures 9A through 9C show typical well installation details.

Care will be taken during the installation of final cover material or during fill placement to protect against damage to existing LFG systems during the transition period from the old to the new LFG systems. The LFG condensate will drain along the sub-headers and main headers to collection sumps. When the headers are re-installed after final cover construction, they will gravity drain back to newly designed collection sumps.

The LFGES will be tied into the LCRS trench material, the LCRS sumps and manholes, and any access vaults to ensure that explosive conditions are not present. On-Site building pads will be constructed with LFG sensors and a landfill gas intrusion mitigation system (LGIMS) to detect and prevent landfill gas intrusion into the proposed structures.

4.4 STORMWATER CONTROL SYSTEMS

4.4.1 Drainage System Design

In accordance with Title 27 and WDRs requirements for the Brisbane Landfill, drainage control facilities have been conceptually designed to accommodate the 100-year, 24-hour storm event. Run-on and runoff drainage control features are prepared by the project Civil Engineer as shown on Figures 10a and 10b.

Hydrologic and hydraulic calculations are provided in the Landfill Closure Drainage System Calculations by BKF Engineers dated November 19, 2021 (Appendix C). The calculations performed focus on the sizing of stormwater features for the design peak flow and water quality. The final stormwater design will be performed during preparation of the final construction design drawings.

Proposed roadway storm drain infrastructure as well as bioswales/bioretention channels will convey runoff from the commercial, solar array, and sloped areas to the wetlands and stormwater detention areas that will be located adjacent to Visitacion Creek. Flow will be directed to the JPB/Caltrans right-of-way and culvert under U.S. Highway 101 that will eventually exit the existing outfalls to San Francisco Bay. Roadway grades will vary from 0.5 to 5 percent and landscape area grades will be at 2 percent or greater. Landscaping will be sloped to culverts and down drains to avoid ponding and infiltration.

4.4.2 Erosion Control

Erosion and sediment control during the landfill post-closure maintenance period will be maintained through the use of hardscape and permanent seeding. Vegetation will occur as soon as possible where the greatest potential for erosion of slopes exists. Mulch may be applied to prior to vegetation establishment to protect slopes. Energy dissipaters, such as rip-rap, will be constructed in localized areas, as needed, to reduce flow velocities. These will specifically be implemented at outfall locations shown on Figure 10a. Rip-rap and other energy dissipaters will be sized during construction-level design.

Primary erosion control features to be used during grading and construction include drainage ditches, vegetation, the use of fiber rolls (wattles), rip-rap, and drain pipes. A SWPPP will be prepared during the construction level-design. Erosion control features will be specified as part of this plan.

Final drainage and erosion control systems will be included in the final construction design drawings.

4.5 MONITORING WELLS

Groundwater monitoring wells within the Site development limits, including at least LW-1, LW-2, MW-31A, MW-33A, MW-34A, MW-43A, MW-36A, MW-37A, MW-39A, and MW-40A, as shown in Figure 3B, will be destroyed under regulatory oversight. Four perimeter wells will be installed along with the perimeter of the Site downgradient of the leachate collection system with two wells along the eastern boundary and two along the southern boundary (Figure 5). Wells will be monitored semi-annually to ensure the leachate collection system is performing. Wells may move to a less than semi-annual basis once post-closure conditions have been established. Wells should be installed to a sufficient depth to monitor shallow groundwater conditions for the Site. Installation work plans will be prepared under a separate report for regulatory review.

4.6 LANDFILL GAS INTRUSION MITIGATION SYSTEM

A LGIMS consisting of a vapor barrier and a gas venting system layer will underlay the commercial building footprints. The LGIMS will include the following general conceptual design which will be implemented during the post-closure period.

A minimum 60-mil Liquid Boot® or equivalent vapor barrier would be placed between protective fabrics beneath the concrete slab and extend into the footing or grade beams of the building foundation. A 12-inch-thick gravel layer with a Liquid Boot Geovent® or equivalent gas venting system that would operate in a passive mode to mitigate potential gases and discharge via 2-inch-diameter vent risers at designated locations at the perimeter of the buildings. This gravel layer would be placed above existing soil and/or rock. Soil, and if necessary, rock will need to be excavated to accommodate the required 12-inch-thick gas venting system layer and Liquid Boot vapor barrier. The vapor barrier and gas venting system layer would need to be uniform across the building foundation to effectively mitigate potential gas intrusion. The Liquid Boot vapor barrier would be installed to seal penetrations and accommodate abrupt changes geometry that may result from aggregate base piers, footings, and grade beams. Sub-slab monitoring probes (SSPs) for collecting sub-slab soil gas samples and measuring sub-slab pressure would be implemented. Methane detection alarms would be implemented throughout the buildings. If necessary, the venting system will be designed so that it could be converted and operated as an active venting system to more systematically extract sub-slab gas to the atmosphere if methane is detected within indoor air. Typical details are provided on Figure 7C.

Fresh air flows into, and any accumulated methane flows out of, a passive sub-slab venting system (SSV) in response to normal diurnal variations in barometric pressure. This passive air flow dilutes and reduces methane concentrations beneath the building. Rooftop wind-driven ventilators may also be used to draw soil gas from below the building slab to the roof to be vented to the outdoor air without assistance of a powered fan. No electrical energy or permit is required in this mode. The passive system reduces concentrations in sub-slab soil gas.

However, in the event that methane is detected within the buildings, the venting system can be converted to an active venting system to more systematically extract sub-slab gas for discharge to the atmosphere.

5.0 CONSTRUCTION QUALITY ASSURANCE PLAN

In accordance with Title 27 requirements, a Construction Quality Assurance Plan (QAP) is required for construction and any repairs of the low-hydraulic layer. Following approval of this Final Closure and Post-Closure Maintenance Plan, a QAP will be prepared by a registered Civil Engineer or Certified Engineering Geologist. The QAP will include the following elements.

- Final construction drawings and technical specifications.
- Procedures to be implemented during final cover and collection systems construction.
- Testing for quality assurance of constructed final cover and collection system components.
- Designated CQA officer in charge or observing installation of work, evaluating materials for conformance with plans and specifications, and testing.
- Daily recordkeeping and reporting of inspections and construction activities.

This QAP will be provided the RWQCB and San Mateo County Division of Environmental Health Services (San Mateo County) for review.

6.0 FINAL LANDFILL CAP AND SYSTEMS CONSTRUCTION COMPLETION

6.1 INITIAL SURVEY AND MAP

In accordance with Title 27 Requirements and the WDRs, a minimum of two surveyed permanent monuments near the landfill from which the location and elevation of waste, containment structures, and monitoring facilities can be determined throughout the post-closure maintenance period, are required. A survey, including the surveyed permanent monuments, should be performed within 60 days of completion of the landfill cap. A California-licensed land surveyor or California-registered civil engineer shall install these monuments.

6.2 CERTIFICATION OF CLOSURE AND RECORDING

Upon construction of the Section 21090 requirement of Title 17, a certification of closure will be submitted to the RWQCB, California Department of Resources Recycling and Recovery (CalRecycle), and the Enforcement Agency (EA) for approval. This will be prepared by a professional civil engineer or certified engineering geologist.

7.0 POST-CLOSURE MAINTENANCE PLAN

Landfill post-closure inspection, maintenance, and repair shall be completed for the time period specified by the regulatory agencies. However, for discussion and cost estimation purposes, the post-closure period for the Brisbane Landfill will be 30 years after closure.

The following Post-Closure Maintenance Plan shall be implemented for the post-closure maintenance period as required by the EA, RWQCB, and CalRecycle. Once approved, this plan will be considered an enforceable document for the Site. Updated copies of the approved Final Closure Plan will be continuously maintained at the Responsible Party's office. Revisions to this

Final Closure Plan are anticipated due to the phasing of redevelopment over an extended time period.

7.1 RESPONSIBLE PARTIES

The various landfill closure systems will be owned and operated by Sunquest who will be considered the Responsible Party, or "Owner," for enforcement of operations and maintenance in accordance with this document. The Owner will be responsible for identifying and preventing events that may impact the performance or integrity of the following landfill systems. A third party entity, including a site management organization, community facilities district, or other management, may replace Sunquest, upon a demonstration that the replacement entity maintains a financial assurance mechanism to support the cost of operation and maintenance obligations.

- Final landfill cover
- Leachate management system
- Landfill gas collection and control system
- Stormwater control systems (swales, wetlands, streams, etc.)
- Monitoring wells (groundwater, leachate)
- Building landfill gas intrusion mitigation systems

The current name and address of the Owner of the Brisbane Landfill is identified below.

Mr. Howard Pearce
Sunquest Properties, Inc.
150 Executive Boulevard, Suite 1180
San Francisco, CA 94134
Telephone Number: (415) 468-6676

In the event that the ownership of all or portions of the Site change, this document will be provided to the new owner. Additionally, the responsibilities described herein will pass to the new owner and their representatives. In the event that a change of ownership occurs during the closure process, Sunquest will notify the EA, the RWQCB, and CalRecycle of a change within 30 days.

The Owner has responsibility for implementing the operation, monitoring, and maintenance described in this document, and for maintaining operation, monitoring, and maintenance records. The Owner may hire third parties, including environmental professionals and contractors, to assist with these tasks.

The wetlands monitoring will be specified under a separate document.

7.2 INSPECTION AND REPORTING REQUIREMENTS

Site inspections will be completed as specified for each of the systems. However, additional inspections will be completed in the event that one of the following events is observed, to verify landfill control systems are not damaged from the event.

- Earthquake that registers a ground acceleration above 0.25g at the Site.
- An earthquake within 100 miles of Site that registers 5.0 or greater on Richter scale.

- A flood or major storm event that produces greater than 6.0 inches of rainfall within a 24-hour period.
- Any fire that occurs on or below the cap.
- Any other damage in area of Site observed by the Owner, such as damaged sustained by high winds, facility, or vehicular accidents.

If the above occurs, a final cover inspection should be scheduled within 72 hours. Inspection reports will be prepared following each inspection. The reports will provide a description and location of deficiencies and any corrective measures taken to remedy the deficiency. Post-closure inspection reports will be generated and entered into the operating record of the Brisbane Landfill. The form provided in Appendix A should be revised as appropriate.

Corrective actions should be taken as soon as practicable. Prior to disturbance of the subsurface within the landfill, RWQCB and San Mateo County will be notified to secure acknowledgement and/or permission to commence these activities. A Post-Closure Maintenance Log (Appendix A) will be completed to document maintenance and repair activities performed following the identification of required corrective action(s). The log provides potential problems requiring repair and the corresponding maintenance procedures, heavy equipment, and materials that may be required to perform maintenance. The form provided in Appendix A should be revised as appropriate. This form should include the maintenance type, a summary of maintenance procedures, and a list of materials and equipment utilized.

Reports should be prepared within 60 days of the completion of the maintenance event. An initial inspection should be performed within 60 days of the completion of construction. Inspection and maintenance records shall be maintained by the Owner throughout the duration of the post-closure maintenance period. These records will be made available to local, State, and Federal regulatory agencies upon request.

Maintenance reports summarizing the maintenance and repairs undertaken, will be prepared and submitted by the Owner by April 1 of each calendar year to document maintenance activities over the course each previous calendar year. Reports will include the following:

- Date of visual inspection
- Visual inspection records
- Documentation of non-routine subsurface work, such as construction or utility repair that results in exposure of material beneath the final cover
- Photographs
- Figures as necessary documenting notable identified areas
- Corrective measures taken to remedy deficiencies identified

In addition to the annual inspection reports, landfill gas monitoring will be recorded on a quarterly basis for at least the first year of operation. An evaluation of methane concentrations will determine the necessity of ongoing operation of and monitoring of the landfill gas collection within the building footprints.

Appendix A includes inspection forms that can be used for reporting.

7.3 BASELINE CONDITIONS

The first inspection conducted under this plan will occur within 60 days of construction completion and will be considered a "baseline" event. This will include the preparation of as-built plans including building foundations, pavement sections, utility final cover penetrations, landscaping areas, monitoring wells, leachate extraction system components, landfill gas extraction system components, and stormwater systems.

7.4 POST-CLOSURE INSPECTION, MAINTENANCE, AND REPAIR

7.4.1 Final Cover

It is unlikely that repair of the final cover will be required due to its depth below the ground surface across the majority of the Site. The final cover will mostly require inspections along the perimeter, slopes, and within the wetlands. The following inspection and maintenance items should be performed to address potential differential settlement, erosion, or other potential effects on the integrity of the final cover. Should a repair be required for the final cover, such should be conducted in accordance with this CPCMP, final construction drawings and specifications, and manufacturer recommendations.

Inspection and Maintenance

The following items shall be inspected at least annually.

TABLE 7.4.1-1: Final Cover Typical Inspection and Maintenance

INSPECTION ITEM	CAP CONDITION	MAINTENANCE REQUIRED
Settlement	Differential or general subsidence and surface water ponding (outside of wetlands or BMPs). Surface soil and pavements should be evaluated for cracking, sumps, or ponding.	Geotechnical engineering evaluation should be performed by certified professional. For sag and ponding, repairs should be generally performed by exposing the low-hydraulic conductivity layer. For areas within the CCL, additional clay material in conformance with the specifications in this plan should be placed and compacted to restore the CCL. For areas within the GCL or geomembrane, the GCL or geomembrane should be cut to expose the foundation layer and the foundation soil should be re-established. The GCL or Geomembrane layer should be patched in accordance with manufacture recommendations. The erosion-resistant material should be restored upon completion. Alternatively, if the low-hydraulic conductivity layer has not been compromised, sag and ponding repairs could be made by restoring the erosion-resistant layer to promote stormwater runoff and prevent ponding. Settlement monitoring will be performed as discussed in Section 7.7.
Seepage	Slopes should be evaluated to ensure subsurface drainage, above the final cap, is performing as specified.	Geotechnical engineering evaluation should be performed by certified professional.

INSPECTION ITEM	CAP CONDITION	MAINTENANCE REQUIRED
Erosion	Areas of where significant erosion may be occurring due to failed drainage, deteriorating erosion control measures, or significant storm event flow. Assess for animal burrow holes, specifically within wetland area.	Additional erosion-resistant material should be placed immediately to prevent the final cover exposure. Engineering evaluation may be required to address failed drainage or energy dissipation material. If erosion has advanced into the low-hydraulic conductivity layer, removal of additional erosion-resistant material may be necessary to inspect low-hydraulic conductivity layer. If burrow animal holes consistently occur, inspection and control of the animal population may be required.
Slope Failure	Approximately 2:1 slopes will be constructed on portions of the Site. Slopes should be evaluated to ensure sliding or failure is not occurring.	Geotechnical engineering evaluation should be performed by certified professional.
Vegetation	Vegetation should be evaluated to ensure a loss is not occurring. Landscaping shall be evaluated for surface coverage in vegetated areas and stress indications such as stunted growth, discolorations, and dead material. Vegetation remedies should be implemented as necessary.	Replanting and vegetative maintenance should be performed as necessary to ensure soil cover. Causes of stress or limited coverage should be identified and remediated. Landscaping monitoring and maintenance parameters shall include weed control, reseeding, fire control, and rodent control.
Exposed CCL, GCL, or Geomembrane	CCL, GCL, or Geomembrane is exposed due to soil erosion, severe weather, burrowing animals, etc.	Visually assess for any defects or punctures or defect. If a puncture is identified in GCL, patch in accordance with manufacturer specifications. Additional compacted clay meeting the final cover engineered specifications may require replacement or addition. Add/replace erosion-resistant material to maintain at least 12 inches above the cap.
Punctured Geomembrane	Small holes less than ¼ inch in diameter/maximum dimension	Repair by extrusion welding using a bead of extruded material over the hole. This should ultimately defer to the selected manufacturer's recommendations.
	Large holes greater than ¼ inch in diameter/maximum dimension	Patch with geomembrane material with a minimum of 3 inches overlap beyond the edge of defect. This should ultimately defer to the selected manufacturer's recommendations.

Elective intrusion of the landfill final cover shall be avoided when possible. If necessary, excavation should be conducted in coordination with the RWQCB and applicable regulatory agencies. An inspection form is provided in Appendix A.

7.4.2 Leachate Management System

Title 27 requires that existing LSCTS be operated throughout the closure and post-closure maintenance period, to the extent practicable. As described in Section 4.3, the proposed leachate management system (LMS) at the Brisbane Landfill will consist of a leachate collection and repair system (LCRS) collection trench, a low-permeability cut-off wall, and interior LCRS system in the wetland area, and the associated facilities. The existing LSCTS will be abandoned based on the proposed LMS installation schedule, the constraints related to grading and/or soil improvements, considerations of constructability, and other pertinent factors. The LCRS trench will consist of perforated HDPE piping, cleanouts, sumps, extraction pumps, and lateral HDPE piping for conveyance. The LMS will be located around the east and south Site perimeters and below the

proposed interior creek alignment. Sumps and lateral piping are utilized to transfer leachate to the BSD sewage manhole for treatment and disposal.

Operation, inspections, maintenance, and testing will be required regularly if the potential for leachate to flow into the LCRS trench sumps exists. Monitoring during the post-closure period will depend on field conditions thought any given year. Generally, leachate production decreases with time once the final cover is installed. Moisture content will generally stabilize and then decrease as the final cover and cut-off wall systems take effect. Depending on hydrostatic pressure conditions at the interior LCRS, continuous leachate production may occur.

The conditions outlined in the most current WDRs and the BSD permit will dictate the monitoring frequency and testing protocols. The quantity of leachate produced by the LCRS will be recorded, as well. The leachate sampling regime required by the groundwater monitoring program will be used for the LCRS unless otherwise stipulated in the WDRs and BSD permit. Monitoring reports shall be submitted to the RWQCB and BSD.

Leachate management and system maintenance and monitoring activities shall be carried out in accordance with the LMP to be developed at the time of system detailed design and construction.

Inspection and Maintenance

Regular maintenance and inspections will be required for the LMS. Inspections, looking for worn or malfunctioning elements, shall be completed based on equipment manufacturer's recommended maintenance and inspection schedules. Any damaged elements shall be repaired or replaced, as appropriate. The repair shall be performed by qualified Owner-contracted personnel. If a sediment buildup occurs in LMS piping, the piping shall be flushed. The LCRS system shall be tested on an annual basis to demonstrate proper operation.

The following initial monitoring, cleaning, and maintenance schedule is anticipated for the LMS. However, as the system is demonstrated to be operating effectively, the schedule should be modified appropriately. Additionally, telemetric data may be used to reduce the need for field personnel with online real-time system data.

- Weekly monitoring
- Monthly cleaning and maintenance
- Annual full system inspection, optimization, and maintenance

The following items will be inspected based on the manufacturer's recommended schedules and based on use. Components will be inspected at least annually.

TABLE 7.4.2-1: Leachate Management System Typical Inspection and Maintenance

INSPECTION ITEM	LMS CONDITION	MAINTENANCE REQUIRED
Sump Pumps	Sump pumps operations are impeded by damage, corrosion, fouling, and/or clogging.	Sump pumps should be repaired or replaced as soon as possible following the manufacturer's recommendations.
Air Compressor	Air compressor is not functioning appropriately, due to leaks, corrosion, or damage.	Compressor components should be repaired or replaced as soon as possible following the manufacturer's recommendations.

INSPECTION ITEM	LMS CONDITION	MAINTENANCE REQUIRED
Compressor Lines	Compressor lines are leaking due to poor connections, cracking or degraded tubing, and/or physical damage.	Compressor lines and connections should be repaired or replaced as soon as possible following the identification of issues.
Valves	Valves are leaking or broken due to clogging, damage, or corrosion.	Valves should be repaired or replaced as soon as possible following the identification of issues.
Manholes/Sumps	Manholes/sumps sustain structural damage or leakage is detected.	Manholes/sumps should be repaired or replaced as soon as possible following the identification of issues.
	Low- or high-water levels in the manholes/sumps.	A low-water level in the manholes/sumps may be indicative of the need for leachate piping cleaning or repaired. Leachate lines should be inspected to ensure proper function. A high-water level in the manholes/sumps may be indicative of pump problems. The pumps, compressor lines, and compressor should be inspected to ensure proper function.
Cleanout Piping	Piping exhibits leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls.	Piping should be cleaned, repaired, or replaced as soon as possible following the identification of issues.
Leachate Piping	Piping exhibits leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls.	Piping should be cleaned, repaired, or replaced as soon as possible following the identification of issues. Large portions of leachate piping will likely be buried underground, so pressure monitors and piezometers should be used to identify pressure drops across sections of piping. Drops in pressure across a section of piping may be indicative of leaking or clogged piping.
Conveyance Piping	Piping exhibits leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls.	Piping should be cleaned, repaired, or replaced as soon as possible following the identification of issues.
Low-Permeability Cut-off Wall	If exposed, the low-permeability cut-off wall should be inspected for signs of soil erosion, cracking, settlement, and damage caused from severe weather damage or burrowing animals.	Sections of the low-permeability cut-off wall should be repaired as soon as possible following the identification of issues.

7.4.3 Landfill Gas Collection and Control System

As discussed in Section 2.5.5, the existing LFGES is composed of a blower/flare station, LFG extraction wells, horizontal collectors, and associated piping. The new proposed LFGES consists of similar components, however, only vertical extraction wells are proposed. The old system will be abandoned in phases and the new proposed system will be operated, inspected, maintained and repaired in accordance with the manufacturer's recommendations and based on need and usage.

Operation, inspections, and maintenance of the LFGES will continue throughout the 30-year post-closure period or as long as it is required by the regulatory agencies. Title 27 requires that existing LFGES be operated throughout the closure and post-closure maintenance period, to the extent practicable. The existing Site LFGES is presented in Appendix E.

LFG condensate that forms in the LFG collection piping gravity drains to the LFG sumps. Condensate is pumped to a purge groundwater storage tank from the sumps.

Inspection and Maintenance

Regular maintenance and inspections will be required for the LFGES. Inspections, looking for worn or malfunctioning elements, shall be completed based on equipment manufacturer's recommended maintenance and inspection schedules. Any damaged elements shall be repaired or replaced, as appropriate. The repair shall be performed by qualified Owner-contracted personnel.

The following initial monitoring, cleaning, and maintenance schedule is anticipated for the LFGES. However, as the system is demonstrated to be operating effectively, the schedule should be modified appropriately. Additionally, telemetric data may be used to reduce the need for field personnel with online real-time system data. No surface monitoring is anticipated related to LFG.

- Weekly LFG station inspections
- Monthly LFG extraction well readings
- Quarterly LFGES component monitoring and maintenance
- Annual full system inspection, optimization, and maintenance

The following items will be inspected based on the manufacturer's recommended schedules and based on use. Components will be inspected at least annually. Periodic maintenance will be performed per manufacturer's recommendations.

TABLE 7.4.3-1: Landfill Gas Extraction System Typical Inspection and Maintenance

INSPECTION ITEM	LFG SYSTEM CONDITION	MAINTENANCE REQUIRED
LFGES Piping and Wellhead Assemblies	LFGES piping and wellhead assemblies shall be inspected for pipeline leaks, breakage, cracking, abnormalities, and/or deformations. Pipeline couplings, connections, and piping should be inspected. A gas odor, hissing sounds, elevated gas concentrations in surface air samples, and/or elevated oxygen readings in the collection system are evidence of leakage.	LFGES piping and wellhead assemblies should be repaired or replaced as soon as possible following the identification of issues.
Valves and Sample Ports	The valves and sample ports should be inspected for damage or leakage.	Valves and sample ports should be repaired or replaced as soon as possible following the identification of issues.
ower/Flare Station	The blower and flare station components should be inspected and repaired in accordance with the manufacturer's recommendations. The destruction efficiency and other operational data for the LFGES shall be recorded continuously and/or regularly depending on the subject data.	The blower and flare station components should be repaired or replaced as soon as possible following the identification of issues. Repairs and replacement of parts should be completed in accordance with the manufacturer's recommendations.

INSPECTION ITEM	LFG SYSTEM CONDITION	MAINTENANCE REQUIRED
Condensate Piping, Knockouts, and Traps	Piping should be inspected for leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls.	Piping exhibiting leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls should be cleaned, repaired, or replaced as soon as possible following the identification of issues.
Condensate Tank(s)	Condensate tanks should be inspected for structural damage and leakage.	Condensate tanks should be repaired or replaced as soon as possible following the identification of issues.
Condensate Pumps	The sump pumps should be inspected for damage, corrosion, fouling, and/or clogging.	Sump pumps should be repaired or replaced as soon as possible following the identification of issues.

7.4.4 Stormwater Control Systems

Maintenance of the stormwater drainage system will be required throughout the post-closure period to ensure that the system performs adequately. Stormwater runoff, erosion, and sediment will be managed during the landfill post-closure maintenance period will be managed utilizing the following system components as discussed in Section 4.4.

- Wetlands
- Bioswales / bioretention basins
- Drainage ditches/channels
- Temporary and/or permanent seedling
- Drainage pipes
- Culverts
- Down drains

All repairs to stormwater drainage components will be completed utilizing techniques consistent with the repair of the final cover system and the erosion layer. Only soil with suitable properties for the repair will be utilized.

Wetland monitoring will be conducted in accordance with the U.S. Army Corps of Engineers (USACE) permit requirements for the first several years after construction.

Inspection and Maintenance

The stormwater drainage system will be inspected quarterly for the following.

TABLE 7.4.4-1: Stormwater Management System Typical Inspection and Maintenance

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED
Standing Water	Temporary accumulation of water in the SWDS is anticipated. However, the SWDS will be designed to collect stormwater and route it to the proposed freshwater wetlands. Standing water in the SWDS components should be evaluated to ensure the components are functioning properly.	Remove sediment at component inlets and outlets, as needed. Add vegetative soil to design elevation of soil. Rake, till, or amend with vegetative soil until infiltration rate is restored. Modification of components to ensure proper storage and transference of stormwater into SWDS components and then into the freshwater wetland.

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED
Downspouts and Inlets to Planters	Flow to the facility is impeded, or downspouts are clogged, or pipes are damaged. Splash blocks and rocks in need of repair/replenishment.	Repair or replace broken downspouts, inlets, piping, and curb cuts as needed, so that flow is conveyed efficiently in the manner specified by the system design. Repair, replace, or replenish splash blocks/cobbles, to protect soil from erosive flows at downspouts and inlets. Small amounts of silt and debris may be removed by buckets or fire hose flushing. Extensive clogging may require a vacuum pump or water jet spray.
Debris, Siltation, and/or Vegetation	Appropriate flow to and from these systems is impeded by debris, siltation, and/or excessive vegetation.	Remove any debris, silt, or other obstruction that is impeding the flow of stormwater in stormwater facilities, specifically the bioswales and bioretention basins. Excessive erosion, settlement, or damage to these systems should be repaired as soon as possible following the identification of issues. Erosion and sediment controls should be maintained (i.e., silt fences, straw bales, riprap). Loose material in eroded areas should be replaced with competent material sloped to match adjacent areas. Ponding in bioswales may require re-graded to establish proper drainage.
Exposed geomembrane or CCL	Geomembrane or CCL is exposed due to soil erosion, severe weather, burrowing animals, etc.	Visually assess for any defects or punctures. If a puncture is identified, patch in accordance with manufacturer specifications. Replace vegetated soil layer and replant as necessary.
Settlement	Differential or general subsidence and surface water ponding within the SWDS. Surface soil and pavements should be evaluated for cracking, sumps, or ponding.	Geotechnical engineering evaluation should be performed by certified professional. Sag and ponding repairs could be made by restoring the erosion-resistant layer to promote stormwater runoff and prevent ponding. The erosion-resistant material should be restored upon completion. If settlement has impacted the low-hydraulic conductivity layer, removal of additional erosion-resistant material may be necessary to inspect low-hydraulic conductivity layer.
Seepage	Slopes should be evaluated to ensure subsurface drainage, above the final cap, is performing as specified.	Geotechnical engineering evaluation should be performed by certified professional.
Erosion	Areas of where significant erosion may be occurring due to failed drainage, deteriorating erosion control measures, or significant storm event flow. Assess for burrow animal holes within SWDS areas.	Additional erosion-resistant should be placed immediately to ensure proper function of the SWDS components. Engineering evaluation may be required to address failed drainage or energy dissipation material. If erosion has advanced into the low-hydraulic conductivity layer, removal of additional erosion-resistant material may be necessary to inspect low-hydraulic conductivity layer. If burrow animal holes consistently occur, inspection and control of the animal population may be required.

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED
Slope Failure	Approximately 2:1 slopes will be constructed on portions of the Site. Slopes should be evaluated to ensure sliding or failure is not occurring.	Geotechnical engineering evaluation should be performed by certified professional.
Damage	Stormwater conveyance systems and structures should be inspected for joint separation, invert failure and/or structural failure	Replacement and/or repair of damage feature. Placement of sealants may be used.

7.4.5 Groundwater and Leachate Monitoring Wells

Three shallow groundwater monitoring wells will operate off-Site along the eastern perimeter of the Site. Two leachate monitoring wells operate within the Site, one within the commercial northern portion and one within the southern solar array portion (Figure 5). Monitoring will occur on a semi-annual basis for the constituents stipulated in the WDRs.

Inspection and Maintenance

Monitoring wells are a robust system, and usually will last the life of the project if properly maintained. Monitoring wells should be inspected during monitoring events to ensure there has not been tampering, damage, or degradation of the well components. The well vaults, caps, casings, and seals will be visually inspected to ensure they are all in working order. Damage or severe degradation should be repaired as soon as possible following identification of a problem that impairs the normal operations of monitoring.

Wells that show evidence of sediment buildup in the well over 4 feet should be redeveloped to bring the well back to design specifications. Total depth measurements should be collected during monitoring activities. These data can be compared over time to determine levels of sedimentation in the wells.

7.4.6 Building Landfill Gas Intrusion Mitigation Systems

A LGIMS consisting of a vapor barrier and a gas venting system layer will underlay the commercial building and maintenance facility footprints.

The key components of the vapor control system are described below.

Sub-Slab Ventilation (SSV) Equipment

The SSV system utilizes rooftop air inlets and rooftop ventilators to draw fresh outside air below the slab and sweep gases out of rooftop vent riser outlets. Use of natural wind cycles and diurnal barometric pressure fluctuations provide the driving force to draw fresh air into the sub-slab gravel blanket and expel any gases that may accumulate beneath the building slab. There are no power requirements for the SSV systems, and the simplicity of the systems make the SSV system simple to implement and maintain. Sub-slab gases are exhausted through the riser piping above the building roofline. Sample ports on the riser pipe and sub-barrier probes facilitate collection of pressure readings and gas samples from the gravel blanket beneath the slab and vapor barrier.

Sub-Slab Piping

Sub-slab gas moves from the permeable gravel layer through sub-slab vent piping installed in the gravel layer. Outside air typically enters the sub-slab through one of the vent risers while soil gas is typically exhausted through the other vent riser. Incoming air is distributed through the gravel blank by a combination of pressure-driven and concentration driven flow.

Riser Pipe Venting and Sampling Ports

The SSV system will be connected by polyethylene (PE) (or equivalent) riser pipes. System performance can be evaluated via monitoring the SSPs within the gravel layer underlying the vapor barrier. SSPs facilitate sub-slab pressure measurement and sub-slab gas sampling.

7.4.6.1 SSV System Monitoring

An SSV uses roof-mounted, wind-driven ventilators and diurnal barometric pressure variations to move sub-slab soil gas out from beneath the building without electrical power or permit requirements. A system inspection, maintenance, and calibration should be performed on a quarterly basis.

Methane sampling using ASTM Method D1946 will be performed at designated sub-slab sampling ports throughout the building on a quarterly basis for the first year. After the first year, sampling may be reduced to an annual basis, depending on the sampling results. After the first year, in the event that system operations have been determined to be successful through monitoring activities, the Owner may contact RWQCB and San Mateo County to discuss a potential reduction (i.e., measured on an annual basis) and/or cessation in monitoring activities. Monitoring is the responsibility of the Owner, who may retain a qualified environmental professional to conduct monitoring. An owner's representative can also be trained to collect data from the vapor systems in a predetermined format.

7.4.6.2 Inspection and Maintenance

A qualified third party may be contracted to implement the Operation and Maintenance (O&M) Plan and certify Annual Reports of system performance and any other required reports. General activities associated with the O&M of the LGIMS include:

- The exterior exposed portions of the LGIMS, sampling ports/stations, roof riser pipes, vents/turbines, and penetration flashing/seals, will be inspected on an annual basis to assess proper system operation and to confirm there is not visual evidence that the system has been damaged, destroyed, or modified.
- A Site reconnaissance will be performed to confirm that Site conditions have not changed in an obvious manner in a way that could impact the functioning or measurement of the LGIMS.
- On an annual basis, changes in ownership, tenant, and/or building conditions and potential modification of the enforceable mechanism will be reviewed. RWQCB and San Mateo County will be notified of applicable changes within 60 days of identification of any changes.

Maintenance procedures and checklists will be developed during the design phase. The following maintenance should be performed annually.

SSV System Maintenance

The rooftop ventilators should periodically be observed to confirm they are rotating to allow the SSV system to operate. If the ventilators are not rotating in a steady wind, a competent service representative, who can access the rooftop ventilators, should be engaged to perform maintenance.

The air intake vents at the building corners should periodically (annually) be inspected to verify that they remain open and are not plugged with debris or other material. Remove debris to re-open any air inlet that is plugged that would prevent the SSV system from operating.

Piping System Maintenance

The sub-slab piping system, including the perforated and non-perforated vent piping, should not require maintenance under normal operating conditions. The riser pipe is within a structural chase and the discharge vent is exposed and could potentially be damaged or clogged over time. Any such clogging or damage should be promptly repaired to maintain system effectiveness.

Sub-Slab Liner Maintenance

No ongoing maintenance is required for the sub-slab vapor barrier liner as long as it is not disturbed. The liners are installed beneath the slab of each building and are not easily accessed.

Riser Pipe Venting and Wind-Drive Turbine

On an annual basis, a visual inspection of the above-roof portions of the venting riser pipe and wind-driven turbine will be performed. Roofs will be accessed via the interior of respective structures, if available. As an alternative, ladders and/or power lifts with appropriate fall protection equipment will be used to provide access to locations of inspections of above-roof system components. The turbine will be inspected to confirm it is able to rotate freely and is free of impediments (e.g., debris, nesting birds). Visible cracks, breaks, or other deterioration in the riser pipe, turbine, or connections will be repaired promptly by qualified personnel.

Sub-Slab Pressure Port Sampling Stations (Passive)

At the time of sampling, a visual inspection of the sub-slab pressure port sampling stations will be performed. The access hatch, whether wall-mounted or flush ground-mounted, will be inspected to confirm that access impediments (structures, vegetation, etc.) are not present. The connection ports will be inspected to confirm they are in proper working order and maintain a proper connection to connected sampling and measuring equipment. Visible cracks, breaks, or other deterioration in the access hatch, connections, or related equipment/devices will be repaired promptly by qualified personnel.

7.4.6.3 Conversion of Active System

As an additional precautionary measure, the passive sub-slab vent system will be configured such that it can be converted to an active system, via the installation of blowers at the roof level. The LGIMS system will be converted from a passive system to an active fan-driven system within 30 days if either or both of the two following conditions exist.

- If methane is detected by the indoor continuous methane monitoring system at levels above those stated in the following section (Section 7.5). The methane alarm will sound in this case.
- If one or more COPCs exceed the design limits during any of the quarterly LGIMS port sampling events, and such exceedance is replicated during one or both consecutive confirmatory LGIMS port sampling events performed 15 days and 30 days after the initial exceedance. The LGIMS will continue to be operated as an active system for at least 6 months until the owner desires to discontinue the active operation after notification to the RWQCB. Once operation of the active LGIMS is discontinued, two consecutive quarterly LGIMS port sampling events will be conducted to demonstrate no further COPC exceedances.

Once the LGIMS has been converted back to a passive system and the post-conversion sampling events described in the above bullet points demonstrate that the system can remain passive, four quarters of consecutive LGIMS port sampling as previously described will be conducted. If there are no COPC exceedances detected during these events, then monitoring may cease.

7.5 INDOOR CONTINUOUS METHANE MONITORING

The proposed buildings will be protected from and monitored for landfill gas intrusion. Monitoring is the responsibility of the Owner, who may retain a qualified environmental professional to conduct monitoring. An owner's representative can also be trained to collect data from the vapor systems in a predetermined format.

Section 20921 of Title 27 of the California Code of Regulations requires landfill gas controls to maintain the following conditions.

- Periodic methane gas monitoring conducted inside all buildings and underground utilities.
- Methane gas concentrations shall not exceed 1.25 percent volume in air within on-Site structures.
- Concentrations of methane gas migrating from the landfill property shall not exceed 5 percent by volume in air at the facility property boundary.
- Trace gases shall be controlled to prevent adverse acute and chronic exposure to toxic and/or carcinogenic compounds.
- Automatic methane gas sensors shall be installed within the permeable gas layer within building footprints, and inside the building to trigger an audible alarm when methane gas concentrations are detected.

A continuous methane monitoring system, such as the Honeywell Sensepoint XCD Sensors, or equivalent, should be implemented within the buildings to ensure that there is no hazard due to the accumulation of levels of landfill methane gas above 5,000 parts per million by volume (ppmv). This goal is accomplished by using workspace sensors, which will be set to sound an audible and visual alarm at 20 percent of the lower explosive limit of methane gas (10,000 ppmv). Locations would be specified with the final LGIMS plans. Each building would have a main controller (Honeywell Touchpoint Plus or equivalent) for all sensors in each building. A system inspection, maintenance, calibration, and sampling should be performed on a quarterly basis.

Testing and calibration would be performed in accordance with the manufacturer specifications of the selected methane detection system at a minimum of a semi-annual basis.

In the unlikely event that an alarm condition occurs, active ventilation of buildings and sub-slab conditions will be implemented to mitigate accumulated methane gases. In the event methane concentrations cannot be reduced within a 24-hour period, the following actions should be taken.

- The RWQCB, San Mateo County, and the certified engineer shall be notified promptly of the condition.
- Soil gas samples shall be collected from the sub-slab sampling ports within 3 days and analyzed for methane (ASTM Method D1946) on a rush basis.
- Upon receipt, the soil gas analytical results shall promptly be submitted to the RWQCB, San Mateo County, and the LGIMS Engineer.
- The LGIMS Engineer shall evaluate the issue(s) with the ventilation system and the soil gas analytical results and provide an assessment of potential exposure risks and mitigative measures to the RWQCB and San Mateo County promptly upon receipt of the soil gas testing results.
- The Owner or Owner's representative shall implement any mitigative measures recommended by the LGIMS Engineer and/or the RWQCB and San Mateo County.

In the event that catastrophic damage to a building resulting in significant foundation and offsetting, indoor air samples should be collected from units where significant foundation cracks are present as soon as reasonably practicable to assess indoor air quality. Methane levels are identified in indoor air in excess of Title 27 requirements (1.25 percent), the source of potential soil gas intrusion will be minimized or eliminated as soon as possible. Upon completion of such repairs, an additional round of confirmation indoor air sampling shall be performed. If unacceptable levels of methane remain in indoor air greater than 24 hours, the Owner or Owner's representative will confer with RWQCB and San Mateo County and determine an appropriate course of action. All sampling and repairs described in this section shall be undertaken by the Owner or Owner's representative.

7.6 SECURITY

Site security will be implemented to ensure care and prevent public access to the leachate collection system and landfill gas extraction system components. Security fencing, access gates, and signs shall be implemented around major system components such as the landfill gas management station.

7.7 ISO-SETTLEMENT MAPS/TRACKING DIFFERENTIAL SETTLEMENT

As discussed in Section 3.2 and Section 4.0 of Appendix B, a geotechnical ground improvement program will be implemented as part of the landfill closure activities to reduce post-construction settlement of the soil. As part of the ground improvement program, regular monitoring of settlement will be performed to evaluate the efficacy of the ground improvement technique and provide information to estimate future post-construction settlement. The frequency of settlement monitoring throughout grading construction will be performed biweekly for the first 3 months after the surcharge height has been reached and then monthly for the subsequent 3 to 6 months, depending on settlement progress. This is discussed in detail in Section 4.1.1.1 of Appendix B. The initial survey and map will be used as a baseline condition for the landfill at closure. In accordance with Title 27 requirements, an iso-settlement map will be produced at least every 5 years to depict the estimate total change in elevation at each portion of the final cover's low

hydraulic conductivity layer. Prior to conducting periodic grading operations, the contractor shall note on a map the approximate location and outline of areas where differential settlement is visually obvious. As part of post closure maintenance, inspections will be performed to record areas where differential settlement is observed. Areas of differential settlement that affect the final cover integrity will require repair in accordance with the Post-Closure Maintenance Plan.

7.8 POST-CLOSURE MAINTENANCE COST ESTIMATE

We have prepared a 30-year estimated budget for the operation and maintenance of the landfill final cover alternatives and associated landfill management systems.

A detailed budget is provided in Appendix G.

The post-closure financial responsibility document for the Brisbane Landfill meeting requirements of Title 27 will be submitted to the regulatory agencies by the Owner under a separate cover.

7.9 COMPLETION OF POST-CLOSURE MAINTENANCE PERIOD

Per Section 21900(a) of Title 27, “The operator of a solid waste landfill may be released from post-closure, after a minimum period of thirty (30) years upon demonstration to and approval by CalRecycle, the EA, and the RWQCB that the solid waste landfill no longer poses a threat to the public health and safety and the environment. The Brisbane Landfill stopped receiving waste in 1967 and has implemented landfill gas, leachate, and landfill cover controls; however, not under a formal CPCMP. The ongoing need for the leachate management system, landfill gas collection and control system, and groundwater and leachate monitoring may be reevaluated after the first year of operation.

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FIGURES

FIGURE 1: Vicinity Map
FIGURE 2: Assessor's Parcel Map
FIGURE 3A: Existing Waste Conditions
FIGURE 3B: Existing Groundwater Conditions
FIGURE 4: Proposed Conditions
FIGURE 5: Proposed Leachate Collection System
FIGURE 6: Proposed Landfill Gas Extraction System
FIGURE 7A: Final Cap Typical Details
FIGURE 7B: Final Cap Typical Details
FIGURE 7C: Building Details
FIGURE 8A: Leachate Details
FIGURE 8B: Wetlands Typical Cross-Section
FIGURE 9A: Typical Vertical Landfill Gas Extraction Well Details
FIGURE 9B: Typical Landfill Well Modification Detail
FIGURE 9C: Typical Landfill Gas Header Details
FIGURE 10A: Preliminary Grading and Tributary Areas
FIGURE 10B: Preliminary Drainage Concept

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BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO
Expect Excellence

VICINITY MAP

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002	FIGURE NO. 1
SCALE: AS SHOWN	
DRAWN BY: CC	CHECKED BY: LC

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EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

PROJECT SITE

PARCEL BOUNDARY

BASEMAP SOURCE: GOOGLE EARTH MAPPING SERVICE 2020 AND SAN MATEO COUNTY ASSESSOR'S OFFICE

ENGEO Expect Excellence

ASSESSOR'S PARCEL MAP

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

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FIGURE NO. 2

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LAYOUT: PARCEL USER: MTURRES

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FILL AREA I

FILL AREA II

FILL AREA III

SITE

TUNNEL AVENUE

JPB/CALTRAIN RAILROAD TRACKS

JAMES LICK FREEWAY (HIGHWAY 101)

BAYSHORE BOULEVARD

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- SITE DEVELOPMENT LIMITS/ LANDFILL CLOSURE AREA
- LIMITS OF LANDFILL
- EXISTING 10" AND 12" KINDER MORGAN FUEL PIPELINES
- TOP OF WASTE ELEVATION CONTOUR

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BASE MAP SOURCE: BKF ENGINNERS

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EXISTING WASTE CONDITIONS

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

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FIGURE NO. 3A

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LF-7A
MW-10AR
MW-7A
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MW-16
MW-15
MW-1
MW-12
MW-14R
MW-2
MW-20
MW-3R
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MW-8
MW-5
MW-6
MW-22
MW-23
MW-10A
MW-44A
MW-42A
MW-34A
LW-2
LW-1
MW-36A
SITE
MW-37A
MW-39A
MW-40A
JAMES LICK FREEWAY (HIGHWAY 101)
JFB/CALTRAIN RAILROAD TRACKS
TUNNEL AVENUE
BAYSHORE BOULEVARD
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EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- SITE DEVELOPMENT LIMITS /LANDFILL CLOSURE AREA
- LIMITS OF LANDFILL
- EXISTING 10" AND 12" FUEL PIPELINES
- GROUNDWATER CONTOUR (NAVD88) (GEOSYNTEC, 2022)
- MONITORING WELL (GEOSYNTEC, ARCADIS, AND BURNS & McDONNELL REPORT, 2021)
- LEACHATE WELL LOCATION (GEOSYNTEC, 2020)

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BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

EXISTING GROUNDWATER CONDITIONS

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002

SCALE: AS SHOWN

DRAWN BY: LL CHECKED BY: LC

FIGURE NO. 3B

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WASTE WATER TREATMENT FACILITY FG 20' TO 30'

OFFSITE LUMBER YARD

BAY TRAIL FG 20' TO 28'

COMMERCIAL FG 50'

RENEWABLE ENERGY STORAGE FG 20'

TUNNEL AVENUE

JPB/CAL TRAIN RAILROAD TRACKS

JAMES LICK FREEWAY (HIGHWAY 101)

WETLANDS FG 0 TO 20'

WATER DETENTION AREA FG 1.5' TO 20'

BAYSHORE BOULEVARD

BAYLANDS PRESERVE FG 20' TO 23'

ENERGY USE/ LANDSCAPING FG 50'

LAGOON PARK FG 8' TO 15'

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- SITE DEVELOPMENT LIMITS /LANDFILL CLOSURE AREA
- LIMITS OF LANDFILL
- EXISTING 10" AND 12" KINDER MORGAN FUEL PIPELINES
- PROPOSED VISITATION CREEK ALIGNMENT

NOTE: ELEVATION ARE IN NAVD88

0 500 FEET

N

BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

PROPOSED CONDITIONS
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002
SCALE: AS SHOWN
DRAWN BY: CC CHECKED BY: LC

FIGURE NO. 4

ORIGINAL FIGURE PRINTED IN COLOR

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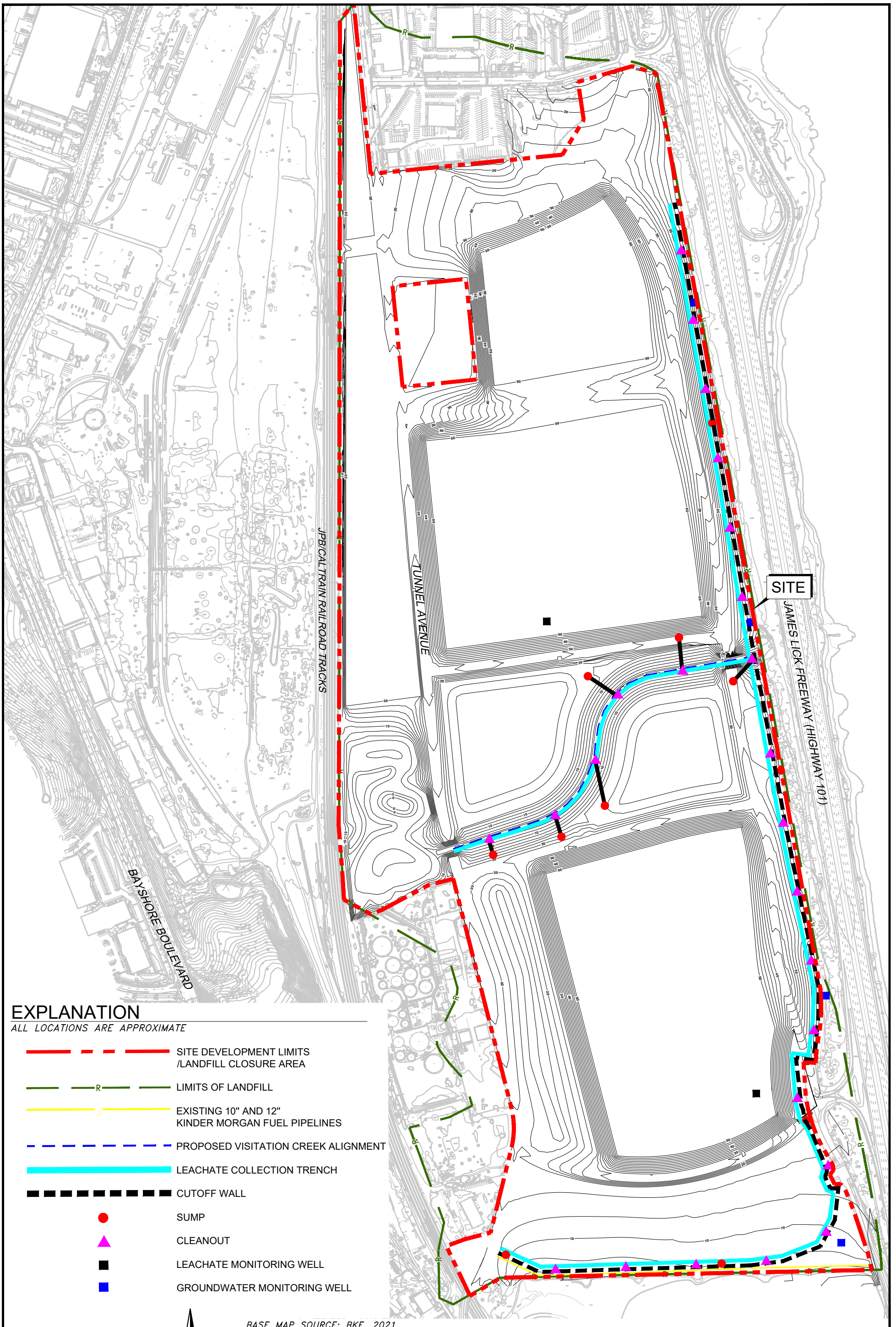

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- SITE DEVELOPMENT LIMITS /LANDFILL CLOSURE AREA
- LIMITS OF LANDFILL
- EXISTING 10" AND 12" KINDER MORGAN FUEL PIPELINES
- PROPOSED VISITATION CREEK ALIGNMENT
- LEACHATE COLLECTION TRENCH
- CUTOFF WALL
- SUMP
- CLEANOUT
- LEACHATE MONITORING WELL
- GROUNDWATER MONITORING WELL

0 500 FEET

N

BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

PROPOSED LEACHATE COLLECTION SYSTEM

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002		FIGURE NO. 5
SCALE: AS SHOWN		
DRAWN BY: CC	CHECKED BY: LC	

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JPB/CALTRAIN RAILROAD TRACKS

TUNNEL AVENUE

JAMES HICK FREEWAY (HIGHWAY 101)

BAYSHORE BOULEVARD

SITE

PROPOSED LOCATION OF LANDFILL GAS AND LEACHATE MANAGEMENT SYSTEM: CONDENSATE TANK, GAC SYSTEM, COMPRESSOR, AND BLOWER

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- SITE DEVELOPMENT LIMITS /LANDFILL CLOSURE AREA
- LIMITS OF LANDFILL
- EXISTING 10" AND 12' ' KINDER MORGAN FUEL PIPELINES
- PROPOSED VISITATION CREEK ALIGNMENT
- LANDFILL GAS EXTRACTION SYSTEM
- CUTOFF WALL
- SUMP
- VERTICAL LAND FILL GAS EXTRACTION WELL

NOTE: FINAL WELL, PIPING, SUMPS, AND LANDFILL GAS MANAGEMENT SYSTEM COMPONENT LOCATIONS WILL BE DETERMINED DURING THE DESIGN PHASE.

0 500 FEET

N

BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

PROPOSED LANDFILL GAS EXTRACTION SYSTEM

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

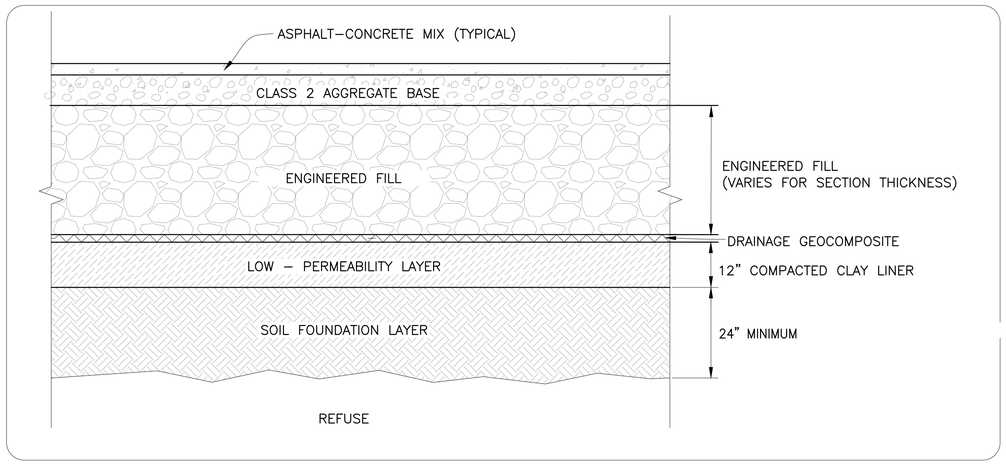
PROJECT NO.: 17270.000.002

SCALE: AS SHOWN

DRAWN BY: LL CHECKED BY: LC

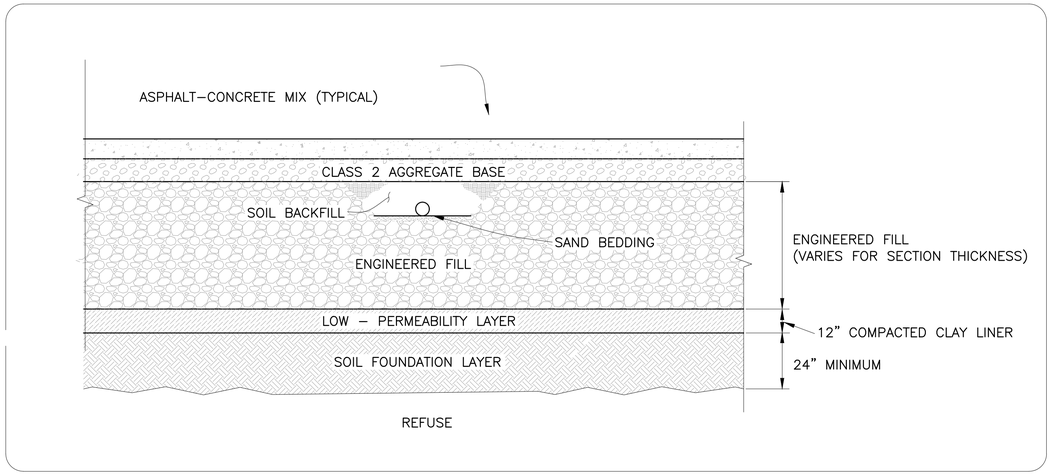
FIGURE NO. 6

ORIGINAL FIGURE PRINTED IN COLOR



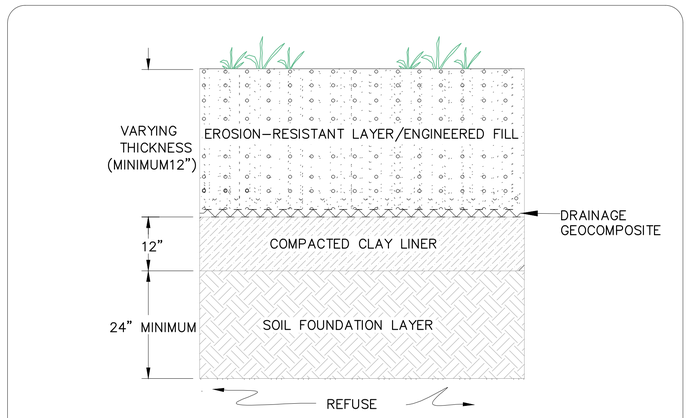
ALTERNATIVE 1 TYPICAL CAPPING DETAIL (HARDSCAPED AREAS)

NO SCALE



ALTERNATIVE 1 TYPICAL CAPPING DETAIL (UTILITY CORRIDOR)

NO SCALE



ALTERNATIVE 1 TYPICAL CAPPING DETAIL (LANDSCAPED AREAS)

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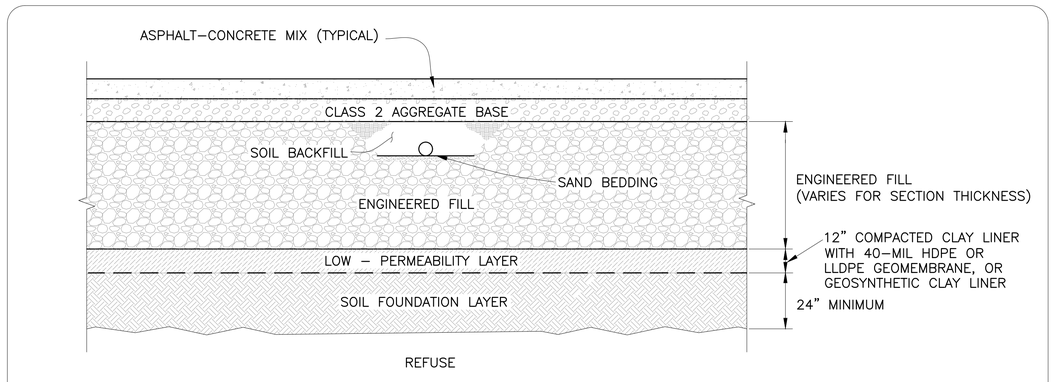

ALTERNATIVE 2/3 TYPICAL CAPPING DETAIL (UTILITY CORRIDOR)

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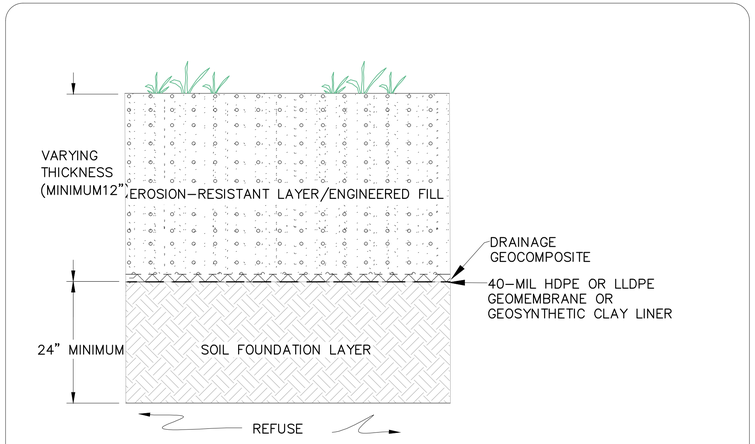

ALTERNATIVE 2/3 TYPICAL CAPPING DETAIL (LANDSCAPED AREAS)

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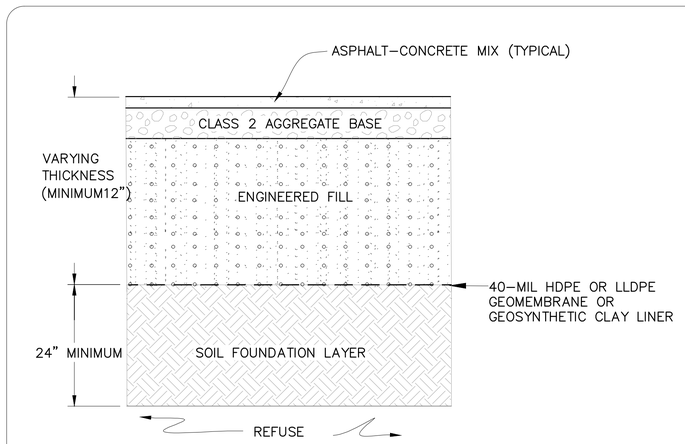

ALTERNATIVE 2/3 TYPICAL CAPPING DETAIL (HARDSCAPE AREAS)

NO SCALE

ENGEO Expect Excellence	FINAL CAP TYPICAL DETAILS BRISBANE BAYLANDS LANDFILL BRISBANE, CALIFORNIA	PROJECT NO.: 17270.000.002 SCALE: AS SHOWN DRAWN BY: CC CHECKED BY: LC ORIGINAL FIGURE PRINTED IN COLOR

FIGURE NO. 7A

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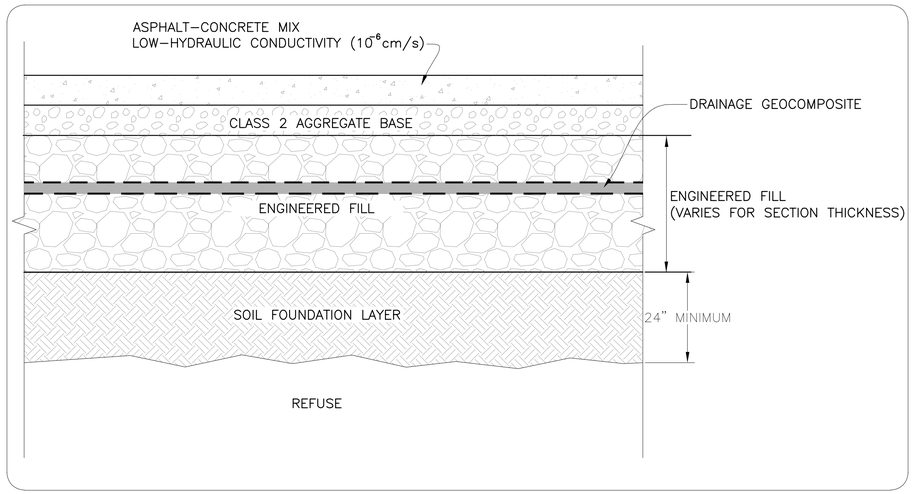
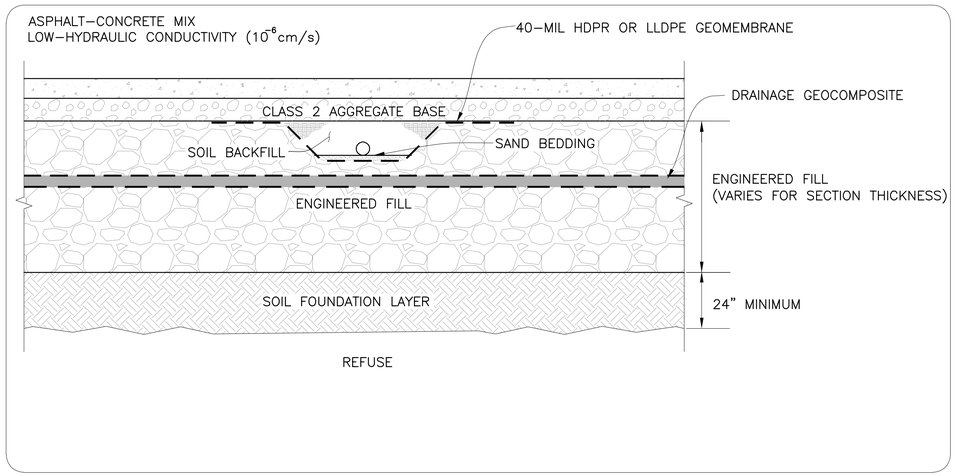


ALTERNATIVE 4 TYPICAL CAPPING DETAIL (LOW-HYDRAULIC CONDUCTIVITY PAVEMENT)
NO SCALE



ALTERNATIVE 4 TYPICAL CAPPING DETAIL (UTILITY CORRIDOR)
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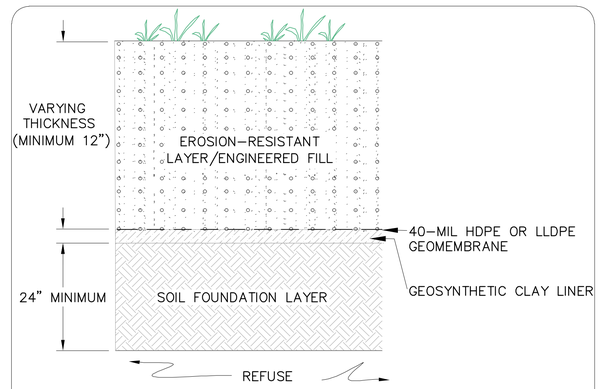
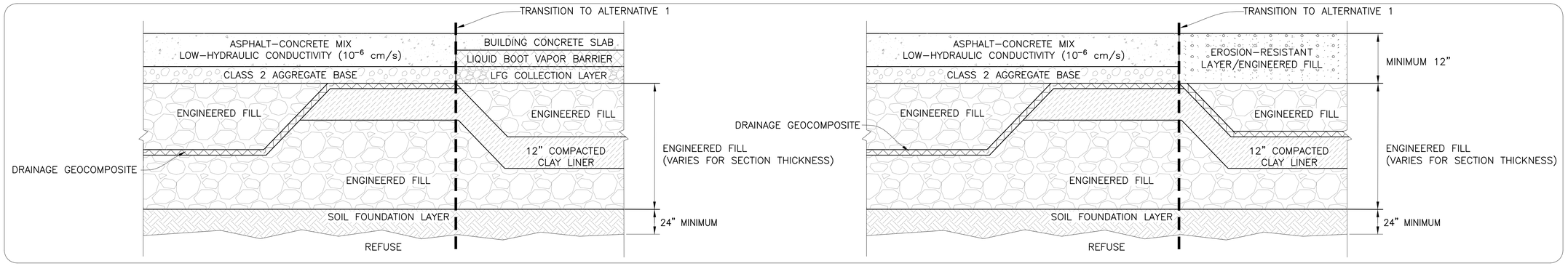


WETLANDS TYPICAL CAPPING DETAIL
NO SCALE



ALTERNATIVE 4 TYPICAL TRANSITION TO ALTERNATIVE 1 (CLAY CAP)
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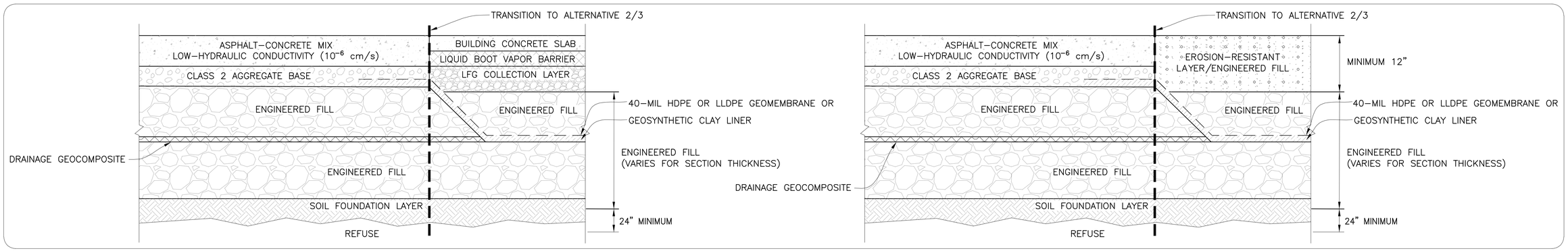

ALTERNATIVE 4 TYPICAL TRANSITION TO ALTERNATIVE 2/3 (GEOMEMBRANE/GEOSYNTHETIC CLAY LINER)
NO SCALE

NOTE: FINAL CAP WILL BE DESIGNED WITH A MINIMUM 2% SLOPE

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FINAL CAP TYPICAL DETAILS
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002
SCALE: AS SHOWN
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FIGURE NO. 7B

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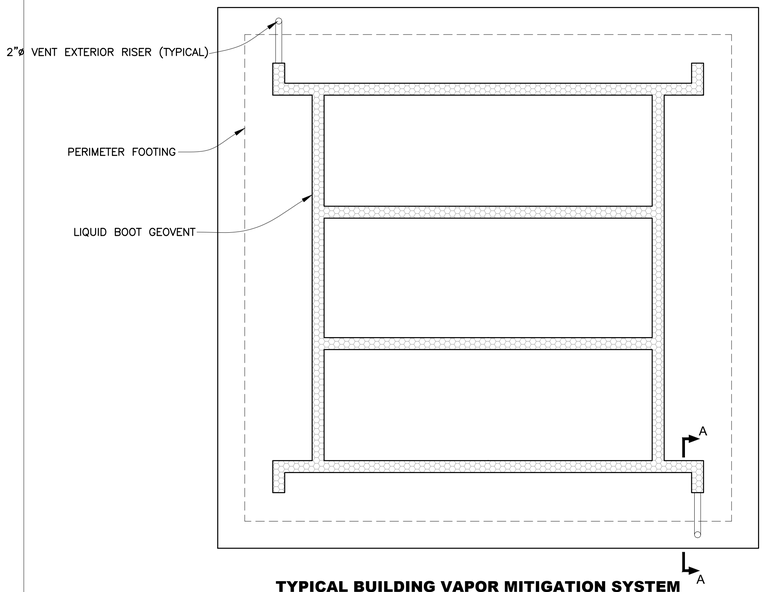
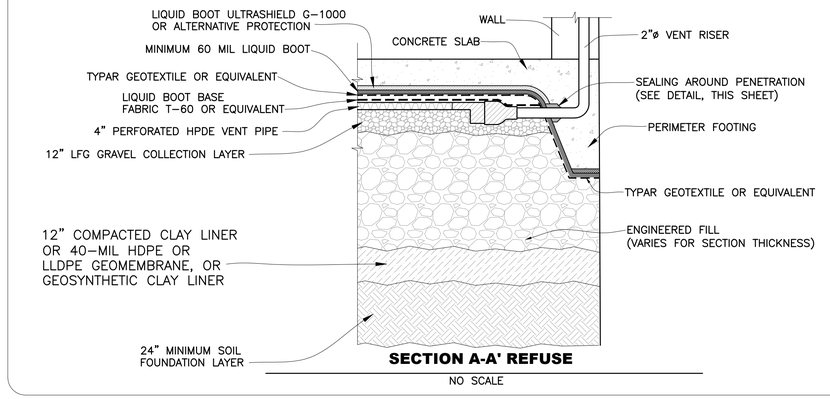


TYPICAL BUILDING VAPOR MITIGATION SYSTEM PLAN VIEW

NO SCALE

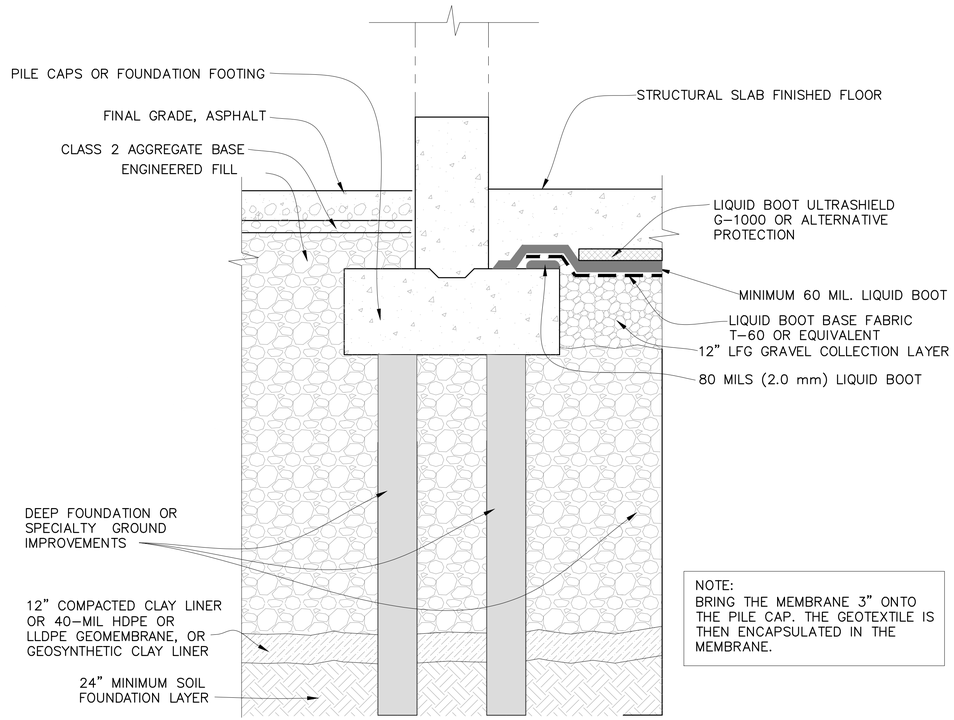


SECTION A-A' REFUSE

NO SCALE

TYPICAL DETAIL FOR BUILDING CONCRETE SLAB ON GRADE WITH VENT RISER

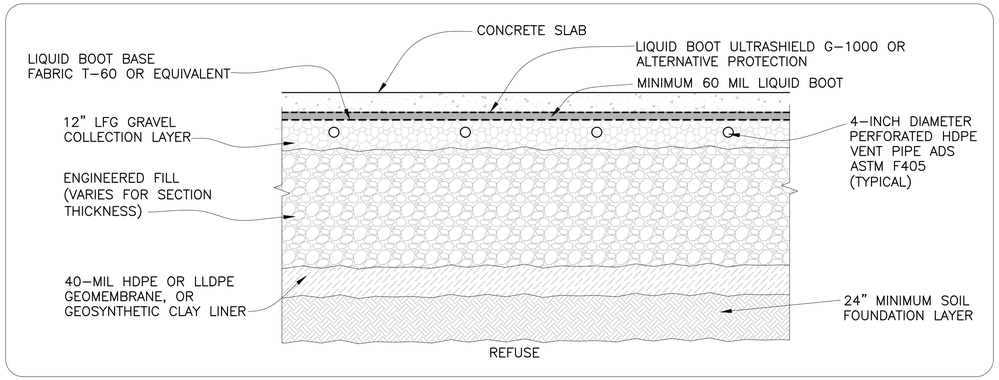
NO SCALE



NOTE:
BRING THE MEMBRANE 3" ONTO THE PILE CAP. THE GEOTEXTILE IS THEN ENCAPSULATED IN THE MEMBRANE.

TYPICAL DETAIL FOR BUILDING FOUNDATION PIERS

NO SCALE



TYPICAL BUILDING FOUNDATION DETAIL

NO SCALE

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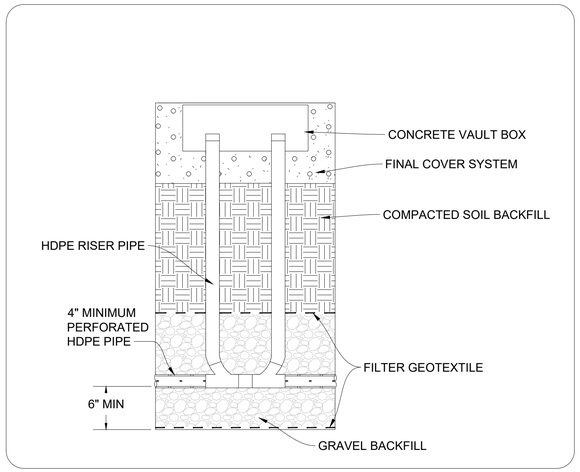
BUILDING DETAILS
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

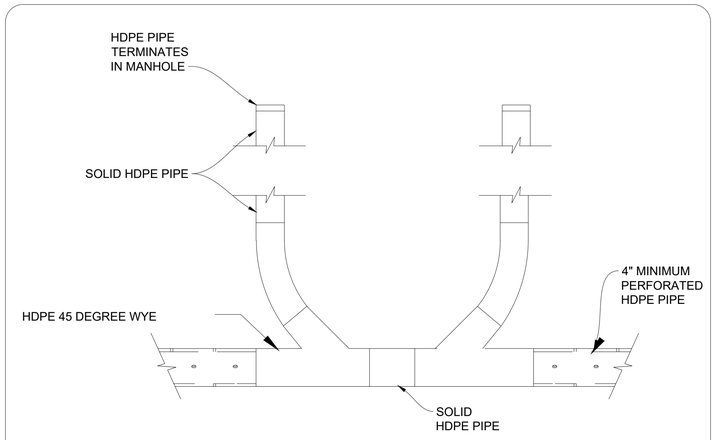
PROJECT NO.: 17270.000.002
SCALE: AS SHOWN
DRAWN BY: LL
CHECKED BY: LC
ORIGINAL FIGURE PRINTED IN COLOR

FIGURE NO. 7C



LCRS TRENCH PIPE CLEANOUT

NO SCALE



LCRS TRENCH PIPE CLEANOUT

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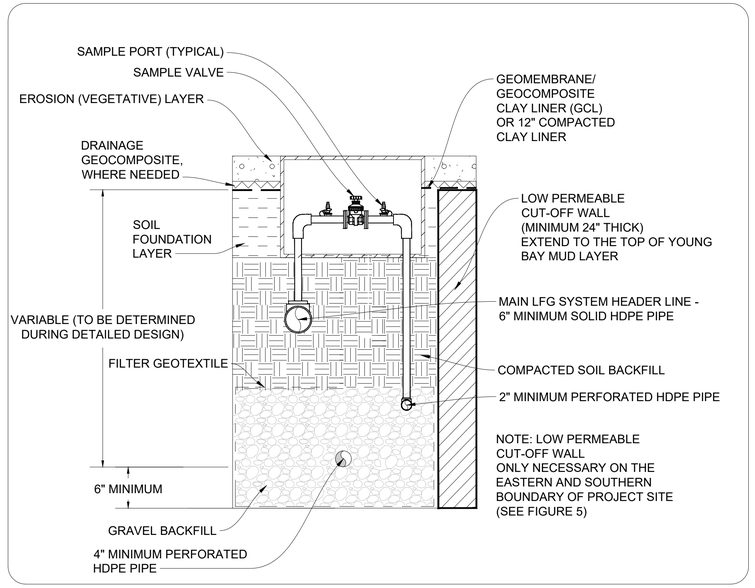
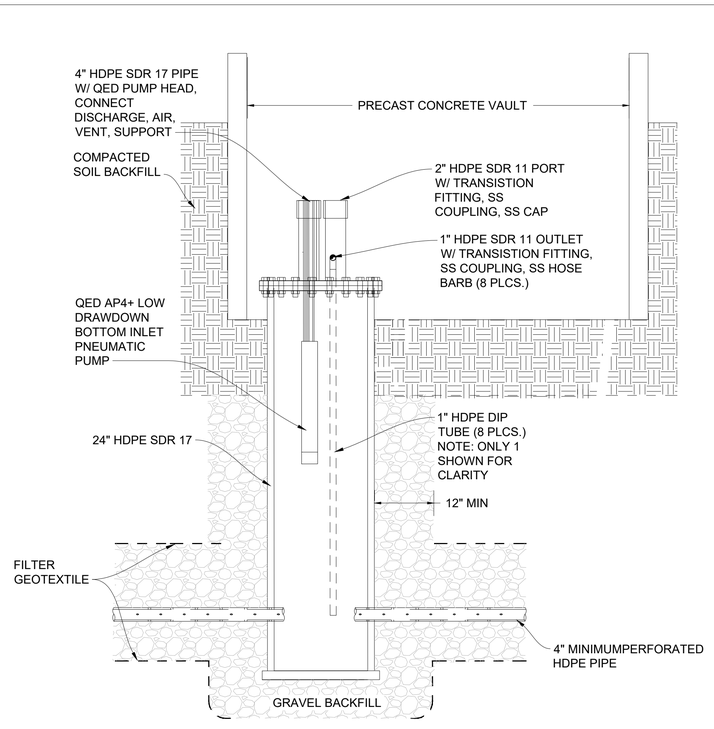


PERIMETER LCRS TRENCH AND CUT-OFF WALL

NO SCALE



LCRS TRENCH SUMP

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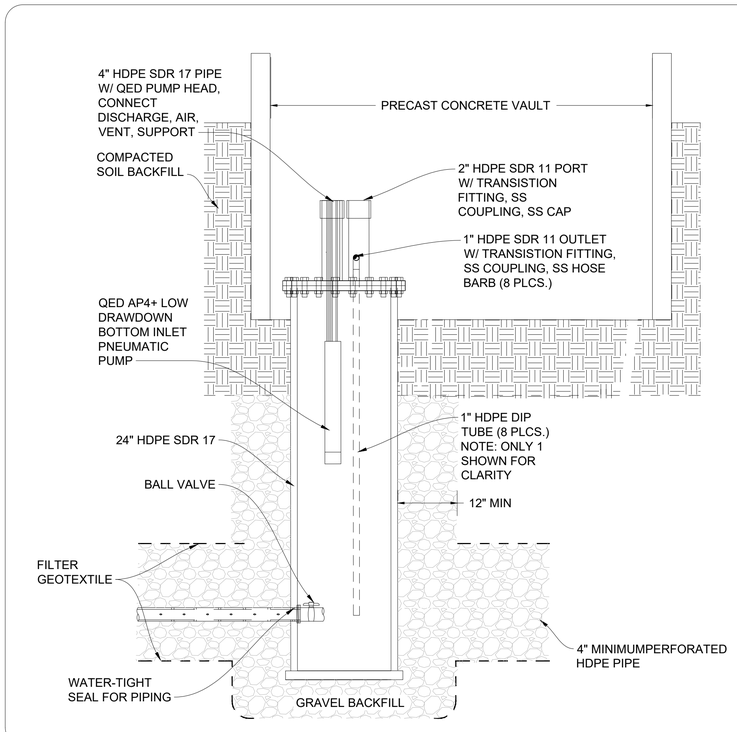

INTERIOR LCRS MANHOLE

NO SCALE

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LEACHATE DETAILS
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002
SCALE: NO SCALE
DRAWN BY: LL
CHECKED BY: LC

FIGURE NO. 8A

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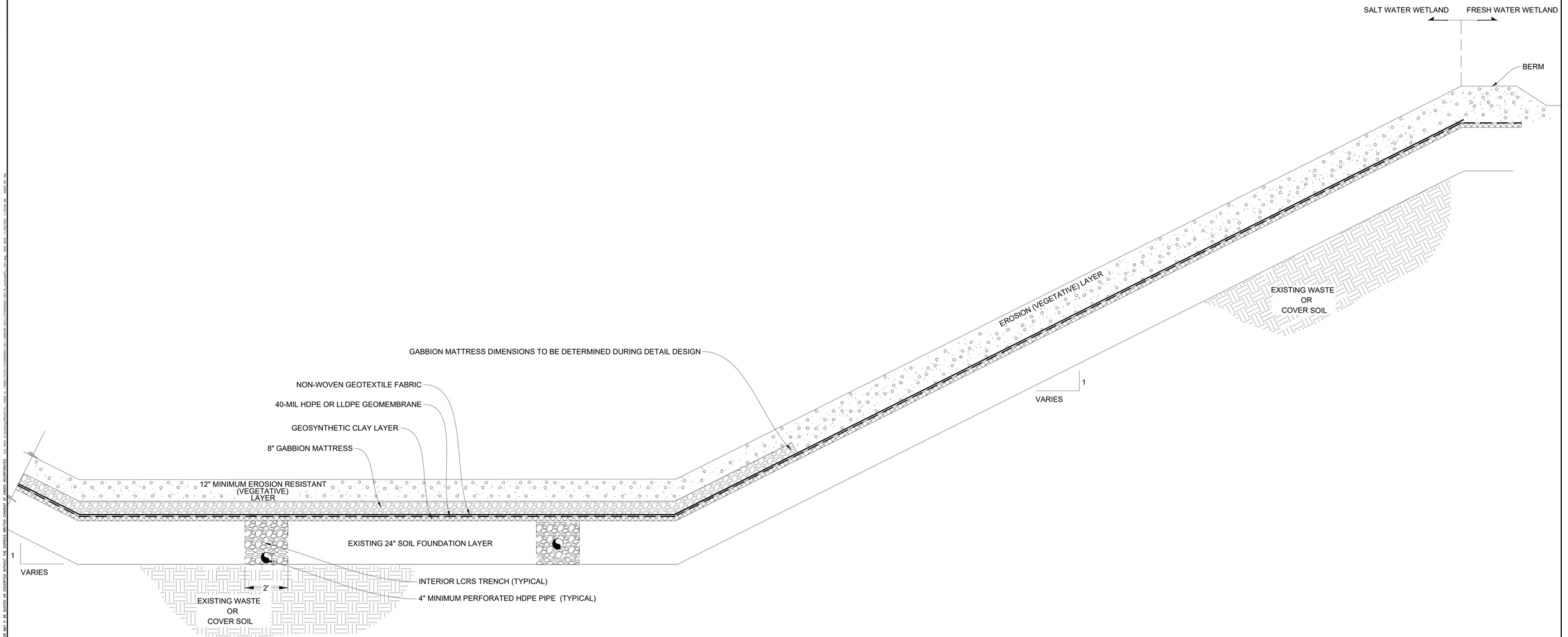

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WETLANDS TYPICAL CROSS-SECTION
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002
SCALE: NO SCALE
DRAWN BY: LL
CHECKED BY: LC

FIGURE NO.
8B

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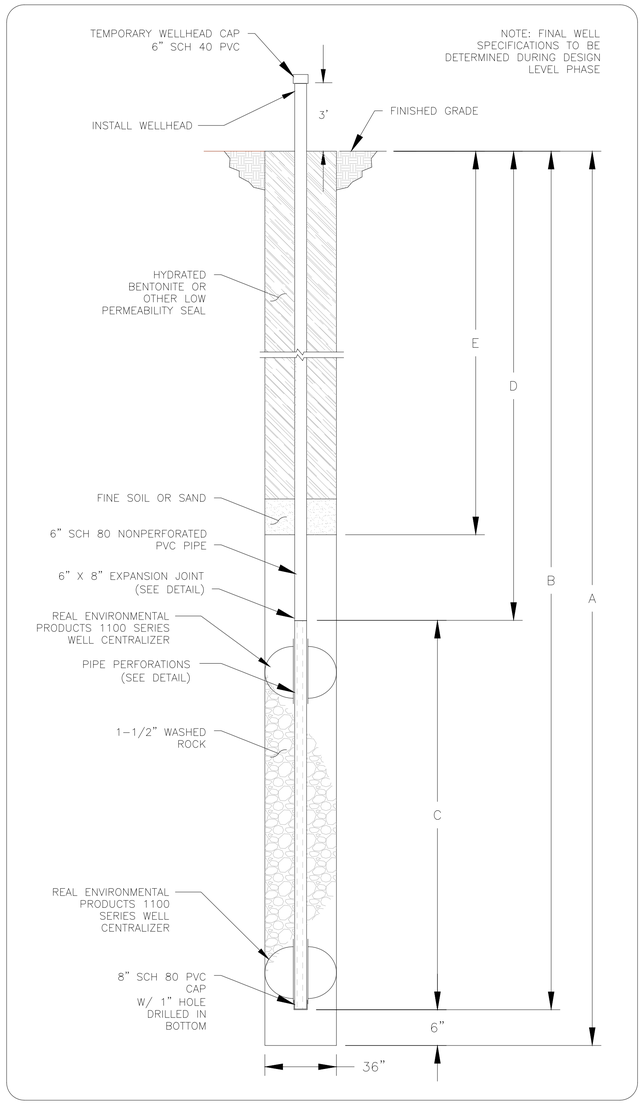

VERTICAL LANDFILL GAS EXTRACTION WELL
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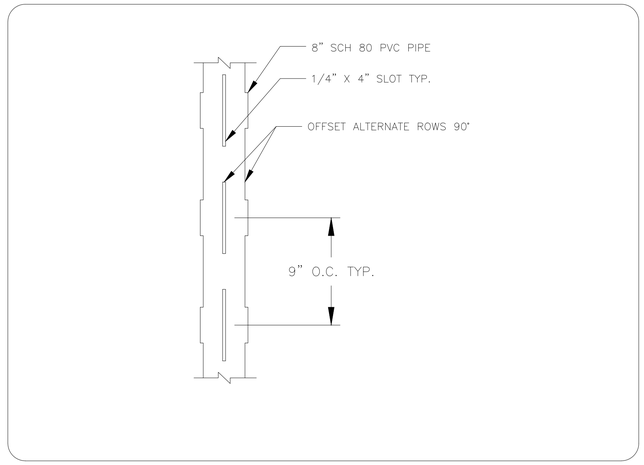

PIPE PERFORATIONS
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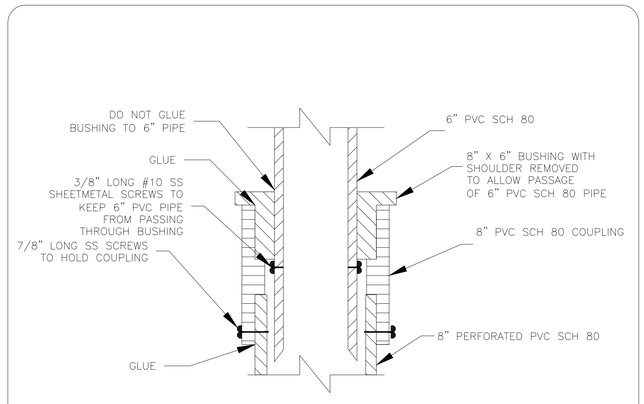

EXPANSION JOINT
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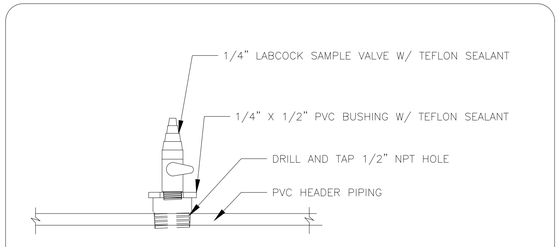

SAMPLE PORT
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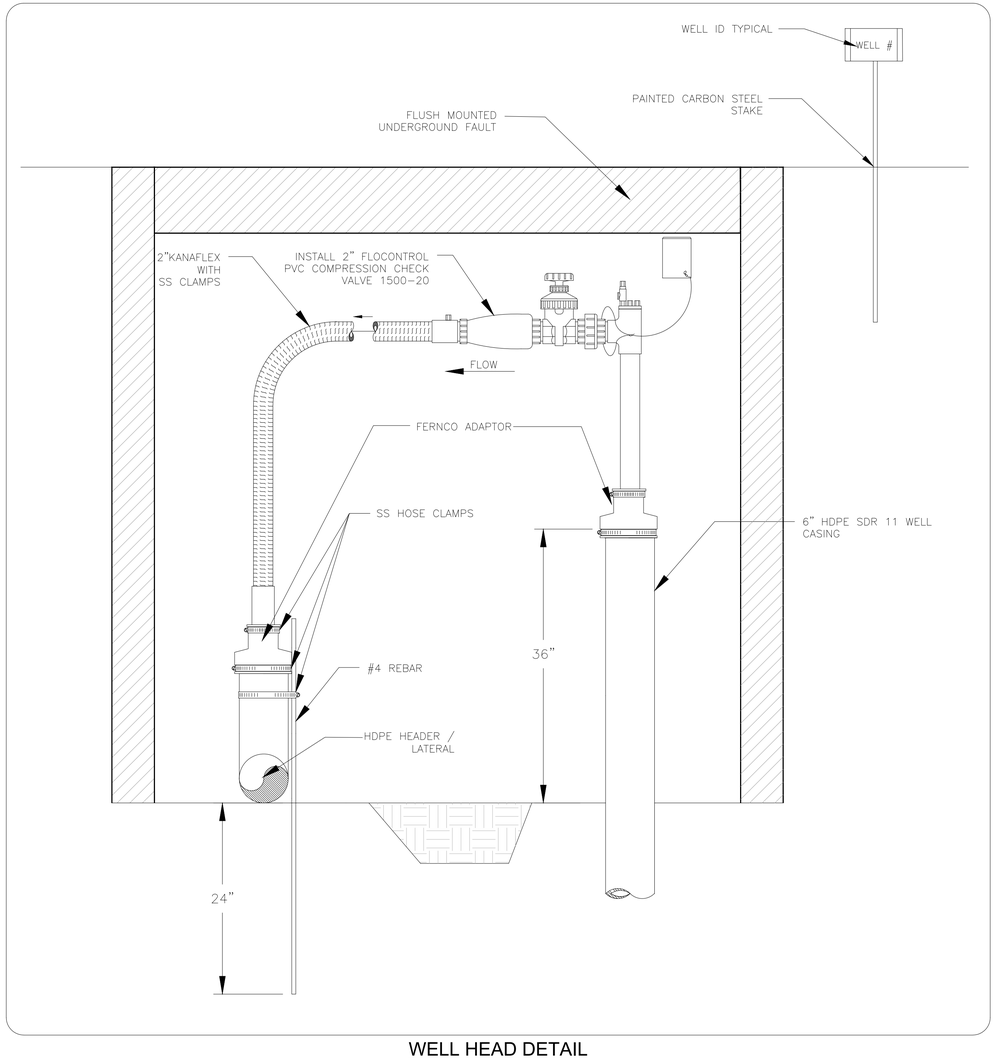

WELL HEAD DETAIL
NO SCALE

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TYPICAL VERTICAL LANDFILL GAS EXTRACTION WELL DETAILS
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002
SCALE: AS SHOWN
DRAWN BY: CC
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FIGURE NO. 9A

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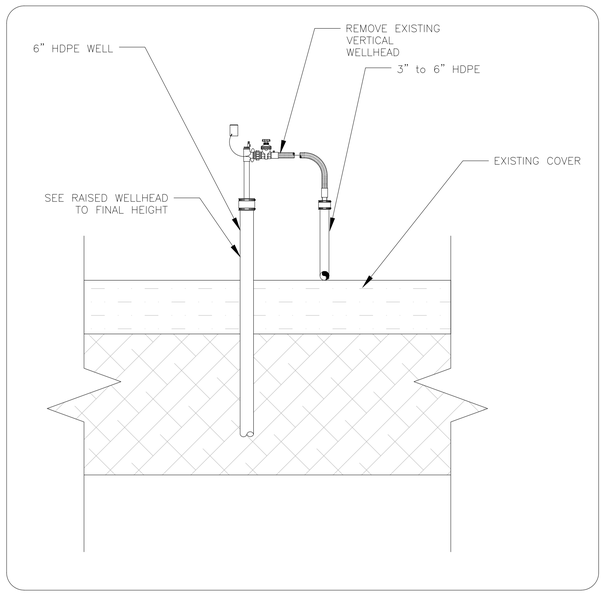

EXISTING VERTICAL LANDFILL GAS EXTRACTION WELL
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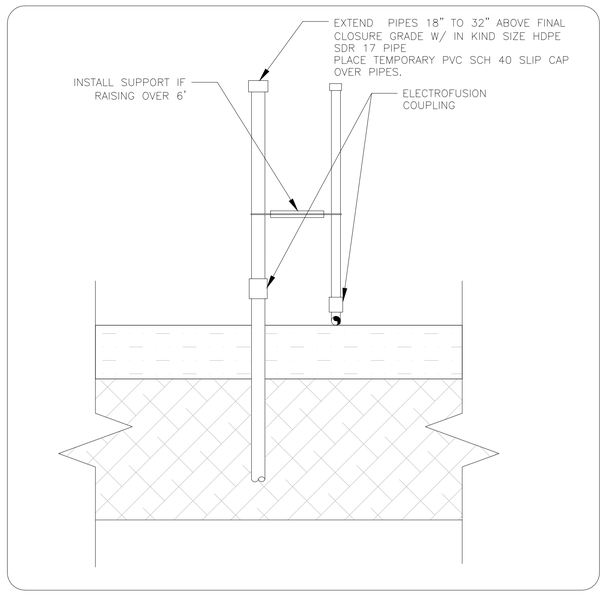
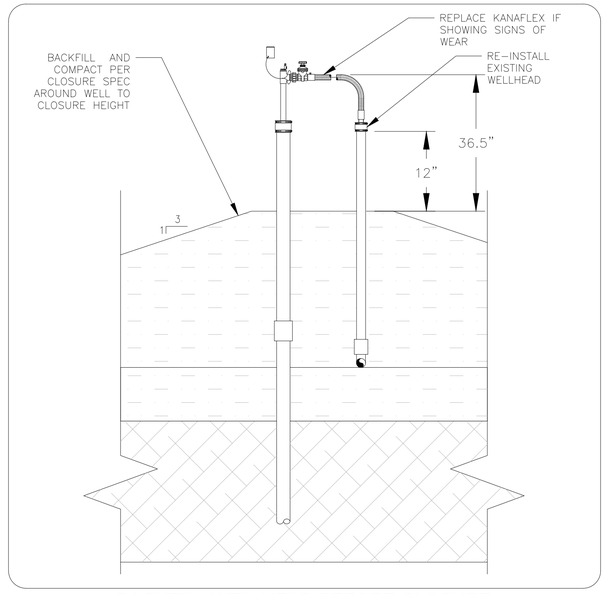
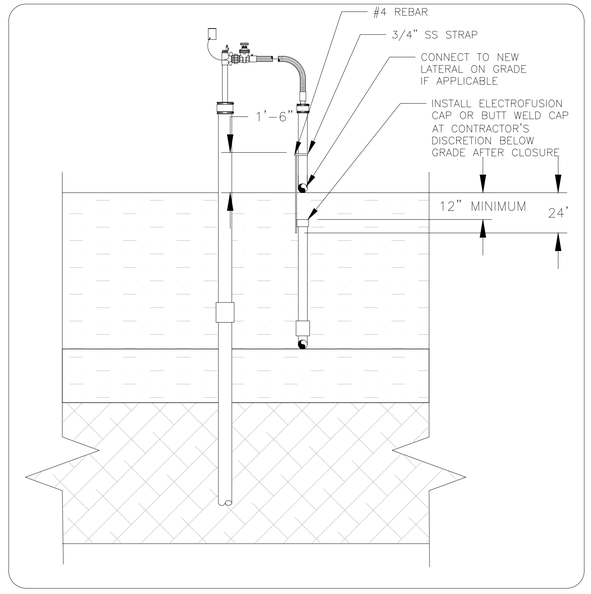


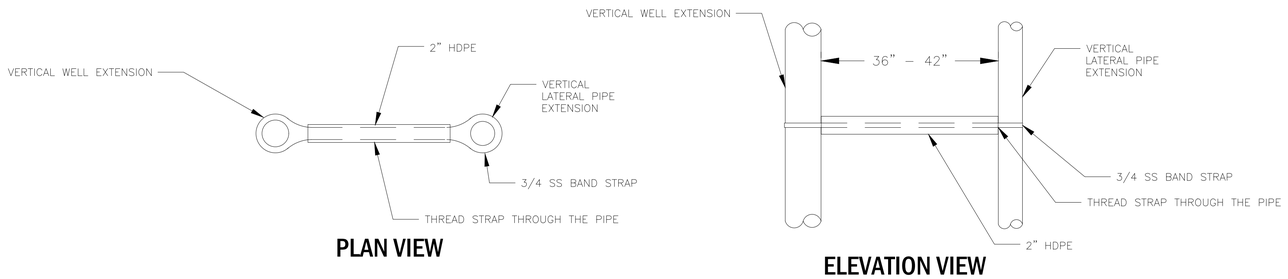
RAISED WELLHEAD TO FINAL HEIGHT
NO SCALE



BACKFILL WELLHEAD BEFORE CLOSURE
NO SCALE



COMPLETE CLOSURE AROUND WELLHEAD
NO SCALE



RAISED WELLHEAD SUPPORT
NO SCALE

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TYPICAL LANDFILL WELL MODIFICATION DETAIL
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002
SCALE: AS SHOWN
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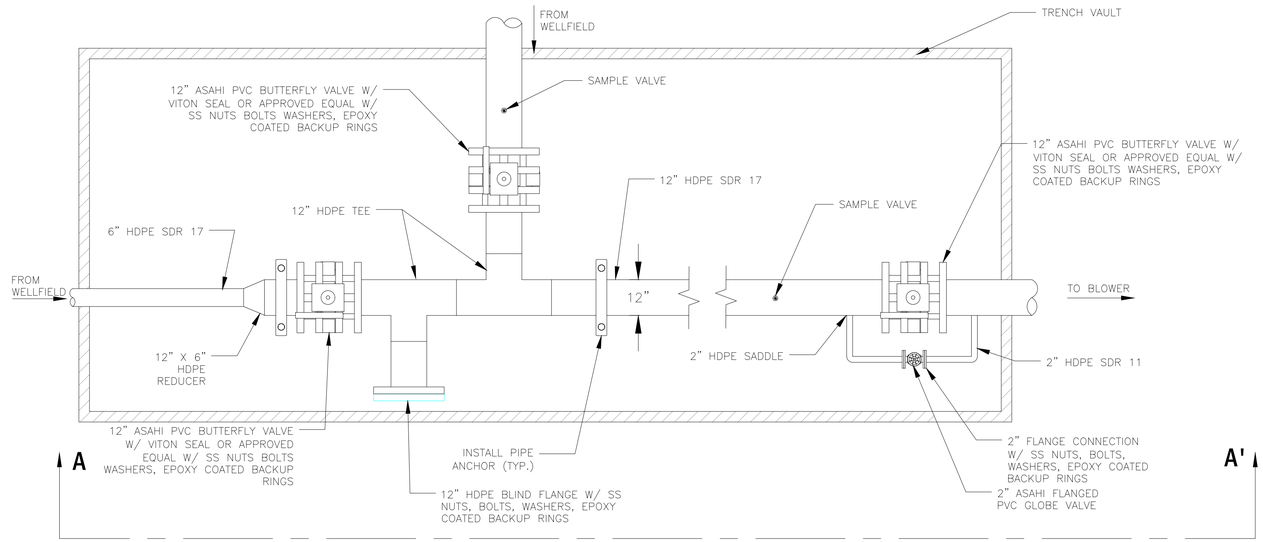
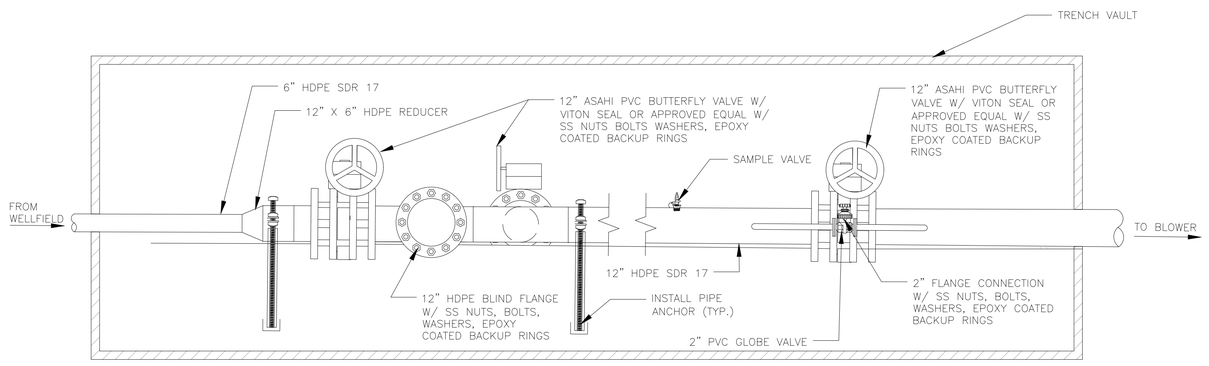
FIGURE NO. 9B

ORIGINAL FIGURE PRINTED IN COLOR



PLAN VIEW



SECTION A-A'

HEADER CONNECTION

NO SCALE

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ENGEO Expect Excellence	TYPICAL LANDFILL GAS HEADER DETAILS BRISBANE BAYLANDS LANDFILL BRISBANE, CALIFORNIA	PROJECT NO.: 17270.000.002 SCALE: AS SHOWN DRAWN BY: CC CHECKED BY: LC	FIGURE NO. 9C

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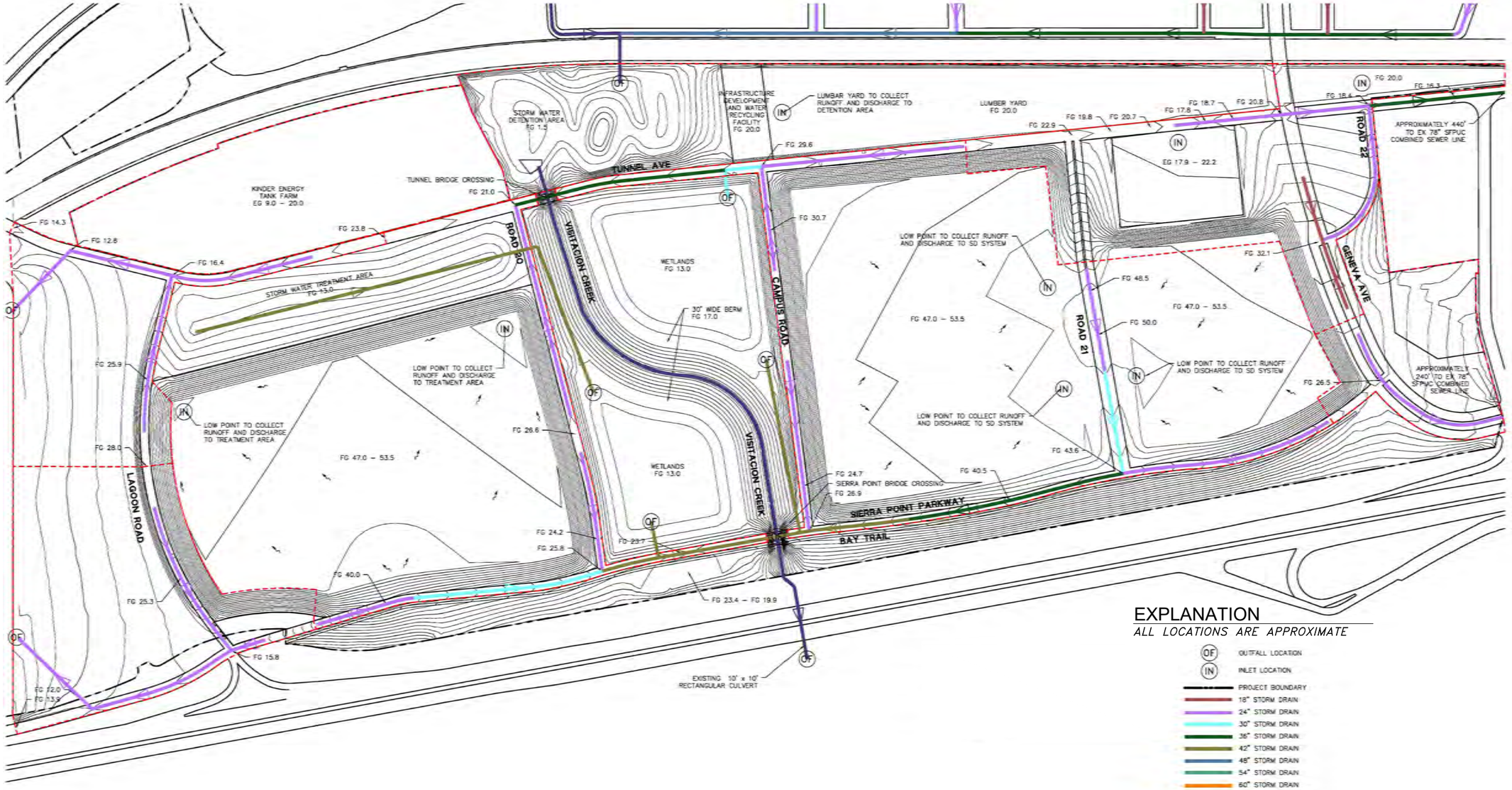

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- OF — OUTFALL LOCATION
- IN — INLET LOCATION
- PROJECT BOUNDARY
- 18" STORM DRAIN
- 24" STORM DRAIN
- 30" STORM DRAIN
- 36" STORM DRAIN
- 42" STORM DRAIN
- 48" STORM DRAIN
- 54" STORM DRAIN
- 60" STORM DRAIN
- 66" STORM DRAIN
- CUSTOM SIZE STORM DRAIN
- SHEET FLOW
- TRIBUTARY AREA

N

0 600
FEET

BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

PRELIMINARY GRADING AND TRIBUTARY AREAS

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002		FIGURE NO. 10A
SCALE: AS SHOWN		
DRAWN BY: LL	CHECKED BY: LC	

ORIGINAL FIGURE PRINTED IN COLOR

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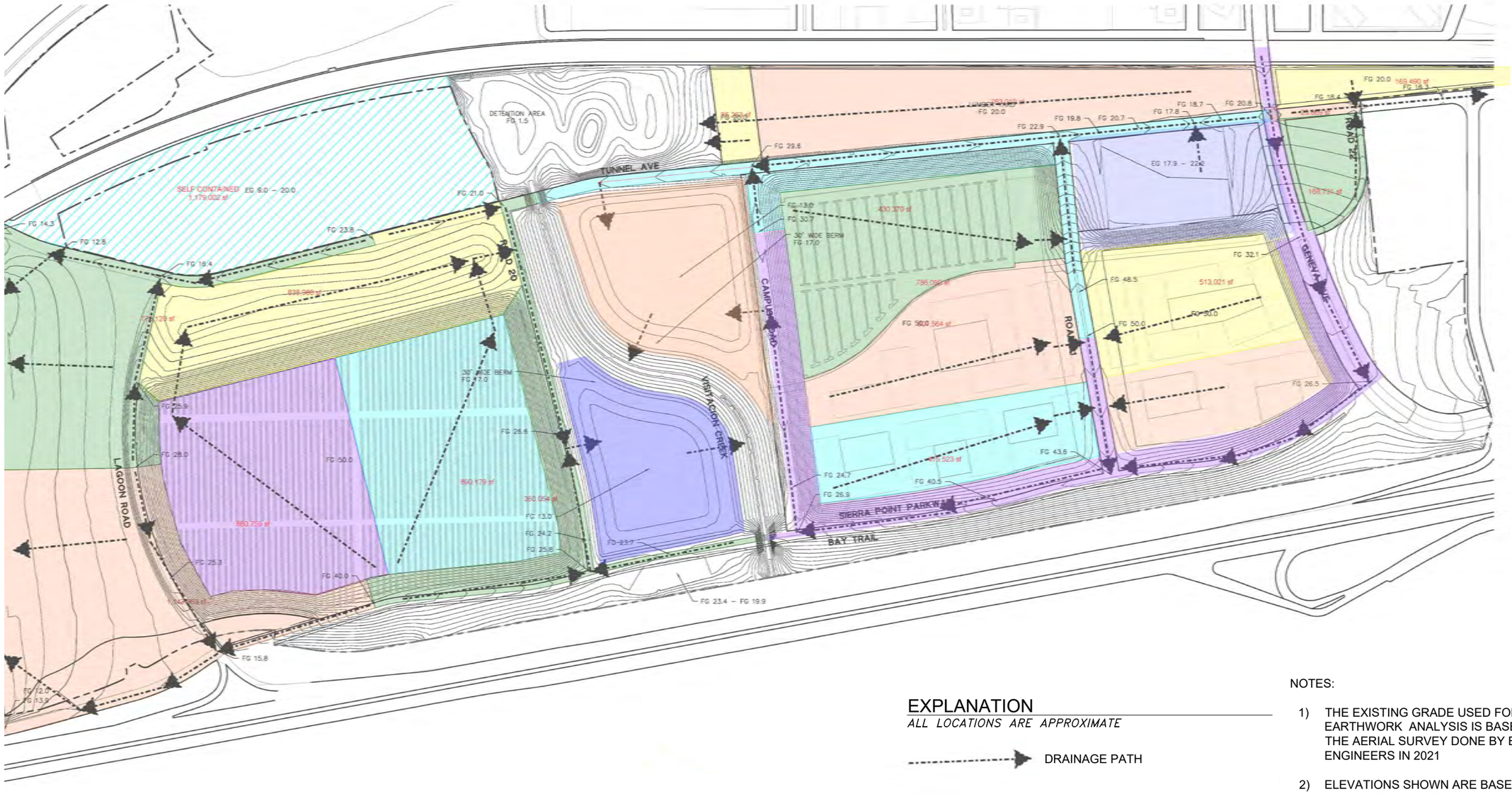

N

0 500
FEET

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

DRAINAGE PATH

COLORED AREAS REPRESENT INDIVIDUAL DRAINAGE MANAGEMENT AREAS

NOTES:

1) THE EXISTING GRADE USED FOR THIS EARTHWORK ANALYSIS IS BASED ON THE AERIAL SURVEY DONE BY BKF ENGINEERS IN 2021

2) ELEVATIONS SHOWN ARE BASED ON THE NAVD 88 VERTICAL DATUM

BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

PRELIMINARY DRAINAGE CONCEPT
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002
SCALE: AS SHOWN
DRAWN BY: LL
CHECKED BY: LC

FIGURE NO. 10B



APPENDIX A

POST-CLOSURE MAINTENANCE INSPECTION LOGS

POSTCLOSURE MAINTENANCE INSPECTION LOGS

Brisbane Landfill

San Mateo County, California

Date:_____

Inspector: _____

Company:_____

TABLE 1: Hardscaped and Landscaped Cap Maintenance

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Settlement	Differential or general subsidence and surface water ponding (outside of wetlands or BMPs). Surface soils and pavements should be evaluated for cracking, sumps, or ponding.	Geotechnical engineering evaluation should be performed by certified professional. For sag and ponding, repairs should be generally performed by exposing the low-hydraulic conductivity layer. For areas within the CCL, additional clay material in conformance with the specifications in this plan should be placed and compacted to restore the CCL. For areas within the GCL or geomembrane material, the GCL or geomembrane should be cut to expose the foundation layer and the foundation soil should be re-established. The GCL or Geomembrane layer should be patched in accordance with manufacture recommendations. The erosion-resistant material should be restored upon completion. Alternatively, if the low-hydraulic conductivity layer has not been compromised, sag and ponding repairs could be made by restoring the erosion-resistant layer to promote stormwater runoff and prevent ponding.			
Seepage	Slopes should be evaluated to ensure subsurface drainage, above the final cap, is performing as specified.	Geotechnical engineering evaluation should be performed by certified professional.			

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Erosion	Areas of where significant erosion may be occurring due to failed drainage, deteriorating erosion control measures, or significant storm event flow. Assess for animal burrow holes, specifically within wetland area.	Additional erosion-resistant should be placed immediately to prevent the final cap exposure. Engineering evaluation may be required to address failed drainage or energy dissipation material. If erosion has advanced into the low-hydraulic conductivity layer, removal of additional erosion-resistant material may be necessary to inspect low-hydraulic conductivity layer. If burrow animal holes consistently occur, inspection and control of the animal population may be required.			
Slope Failure	Approximately 2:1 slopes will be constructed on portions of the Site. Slopes should be evaluated to ensure sliding or failure is not occurring.	Geotechnical engineering evaluation should be performed by certified professional.			
Vegetation	Vegetation should be evaluated to ensure a loss is not occurring. Landscaping shall be evaluated for surface coverage in vegetated areas and stress indications such as stunted growth, discolorations, and dead material. Stressed vegetation should be remediated as necessary.	Replanting and vegetative maintenance should be performed as necessary to ensure soil cover. Causes of stress or limited coverage should be identified and remediated. Landscaping monitoring and maintenance parameters shall include weed control, reseeding, fire control, and rodent control.			
Exposed CCL or GCL	CCL or GCL/Geomembrane is exposed due to soil erosion, severe weather, burrowing animals, etc.	Visually assess for any defects or punctures or defect. If a puncture is identified in GCL, patch in accordance with manufacturer specifications. Additional compacted clay meeting the final cap engineered specifications may require replacement or addition. Add/replace erosion-resistant material to maintain at least 12-inches above the cap.			

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Punctured Geomembrane	Small holes less than ¼-inch in diameter/maximum dimension	Repair by extrusion welding using a bead of extruded material over the hole. This should ultimately defer to the selected manufacturer's recommendations.			
	Large holes greater than ¼ inch in diameter/maximum dimension	Patch with geomembrane material at a minimum of 3 inches overlap beyond the edge of defect. This should ultimately defer to the selected manufacture's recommendations.			
Irrigation	Irrigation system is not working properly.	Repair as needed and confirm irrigation system works properly and is distributing water evenly.			

TABLE 2: Leachate Management System

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Sump Pumps	Sump pumps operations are impeded by damage, corrosion, fouling, and/or clogging.	Sump pumps should be repaired or replaced as soon as possible following the manufacturer's recommendations.			
Air Compressor	Air compressor is not functioning appropriately, due to leaks, corrosion, or damage.	Compressor components should be repaired or replaced as soon as possible following the manufacturer's recommendations.			
Compressor Lines	Compressor lines are leaking due to poor connections, cracking or degraded tubing, and/or physical damage.	Compressor lines and connections should be repaired or replaced as soon as possible following the identification of issues.			
Valves	Valves are leaking or broken due to clogging, damage, or corrosion.	Valves should be repaired or replaced as soon as possible following the identification of issues.			
Manholes/Sumps	Manholes/sumps sustain structural damage or leakage is detected.	Manholes/sumps should be repaired or replaced as soon as possible following the identification of issues.			
	Low- or high-water levels in the manholes/sumps.	A low-water level in the manholes/sumps may be indicative of the need for leachate piping cleaning or repaired. Leachate lines should be inspected to ensure proper function. A high-water level in the manholes/sumps may be indicative of pump problems. The pumps, compressor lines, and compressor should be inspected to ensure proper function.			

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Cleanout Piping	Piping exhibits leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls.	Piping should be cleaned, repaired, or replaced as soon as possible following the identification of issues.			
Leachate Piping	Piping exhibits leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls.	Piping should be cleaned, repaired, or replaced as soon as possible following the identification of issues. Large portions of leachate piping will likely be buried underground, so pressure monitors and piezometers should be used to identify pressure drops across sections of piping. Drops in pressure across a section of piping may be indicative of leaking or clogged piping.			
Conveyance Piping	Piping exhibits leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls.	Piping should be cleaned, repaired, or replaced as soon as possible following the identification of issues.			
Low-Permeability Cut-off Wall	If exposed, the low-permeability cut-off wall should be inspected for signs of soil erosion, cracking, settlement, and damage caused from severe weather damage or burrowing animals.	Sections of the low-permeability cut-off wall should be repaired as soon as possible following the identification of issues.			

TABLE 3: Landfill Gas Extraction System

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
LFGES Piping and Wellhead Assemblies	LFGES piping and wellhead assemblies shall be inspected for pipeline leaks, breakage, cracking, abnormalities, and/or deformations. Pipeline couplings, connections, and piping should be inspected. A gas odor, hissing sounds, elevated gas concentrations in surface air samples, and/or elevated oxygen readings in the collection system are evidence of leakage.	LFGES piping and wellhead assemblies should be repaired or replaced as soon as possible following the identification of issues.			
Valves and Sample Ports	The valves and sample ports should be inspected for damage or leakage.	Valves and sample ports should be repaired or replaced as soon as possible following the identification of issues.			
Blower/Flare Station	The blower and flare station components should be inspected and repaired in accordance with the manufacturer's recommendations. The destruction efficiency and other operational data for the LFGES shall be recorded continuously and/or regularly depending on the subject data.	The blower and flare station components should be repaired or replaced as soon as possible following the identification of issues. Repairs and replacement of parts should be completed in accordance with the manufacturer's recommendations.			
Condensate Piping, Knockouts, and Traps	Piping should be inspected for leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls.	Piping exhibiting leaking, damage, fouling, clogging, and/or buildup of particulate matter on pipe walls should be cleaned, repaired, or replaced as soon as possible following the identification of issues.			

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Condensate Tank(s)	Condensate tanks should be inspected for structural damage and leakage.	Condensate tanks should be repaired or replaced as soon as possible following the identification of issues.			
Condensate Pumps	The sump pumps should be inspected for damage, corrosion, fouling, and/or clogging.	Sump pumps should be repaired or replaced as soon as possible following the identification of issues.			
LFGES Piping and Wellhead Assemblies	LFGES piping and wellhead assemblies shall be inspected for pipeline leaks, breakage, cracking, abnormalities, and/or deformations. Pipeline couplings, connections, and piping should be inspected. A gas odor, hissing sounds, elevated gas concentrations in surface air samples, and/or elevated oxygen readings in the collection system are evidence of leakage.	LFGES piping and wellhead assemblies should be repaired or replaced as soon as possible following the identification of issues.			

TABLE 4: Stormwater Management System

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Standing Water	Temporary accumulation of water in the SWDS is anticipated. However, the SWDS will be designed to collect stormwater and route it to the proposed freshwater wetlands. Standing water in the SWDS components should be evaluated to ensure the components are functioning properly.	Remove sediment at component inlets and outlets, as needed. Add vegetative soil to design elevation of soil. Rake, till, or amend with vegetative soil until infiltration rate is restored. Modification of components to ensure proper storage and transference of stormwater into SWDS components and then into the freshwater wetland.			
Downspouts and Inlets to Planters	Flow to the facility is impeded, or downspouts are clogged, or pipes are damaged. Splash blocks and rocks in need of repair/replenishment.	Repair or replace broken downspouts, inlets, piping, and curb cuts as needed, so that flow is conveyed efficiently in the manner specified by the system design. Repair, replace, or replenish splash blocks/cobbles, to protect soil from erosive flows at downspouts and inlets. Small amounts of silt and debris may be removed by buckets or fire hose flushing. Extensive clogging may require a vacuum pump or water jet spray.			

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Debris, Siltation, and/or Vegetation	Appropriate flow to and from these systems is impeded by debris, siltation, and/or excessive vegetation.	Remove any debris, silt, or other obstruction that is impeding the flow of stormwater in stormwater facilities, specifically the bioswales and bioretention basins. Excessive erosion, settlement, or damage to these systems should be repaired as soon as possible following the identification of issues. Erosion and sediment controls should be maintained (i.e., silt fences, straw bales, riprap). Loose material in eroded areas should be replaced with competent material sloped to match adjacent areas. Ponding in bioswales may require re-graded to establish proper drainage.			
Exposed geomembrane or clay cap	Geomembrane or clay cap is exposed due to soil erosion, severe weather, burrowing animals, etc.	Visually assess for any defects or punctures. If a puncture is identified, patch in accordance with manufacturer specifications. Replace vegetated soil layer and replant as necessary.			

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Settlement	Differential or general subsidence and surface water ponding within the SWDS. Surface soils and pavements should be evaluated for cracking, sumps, or ponding.	Geotechnical engineering evaluation should be performed by certified professional. Sag and ponding repairs could be made by restoring the erosion-resistant layer to promote stormwater runoff and prevent ponding. The erosion-resistant material should be restored upon completion. If settlement has impacted the low-hydraulic conductivity layer, removal of additional erosion-resistant material may be necessary to inspect low-hydraulic conductivity layer.			
Seepage	Slopes should be evaluated to ensure subsurface drainage, above the final cap, is performing as specified.	Geotechnical engineering evaluation should be performed by certified professional.			
Erosion	Areas of where significant erosion may be occurring due to failed drainage, deteriorating erosion control measures, or significant storm event flow. Assess for burrow animal holes within SWDS areas.	Additional erosion-resistant should be placed immediately to ensure proper function of the SWDS components. Engineering evaluation may be required to address failed drainage or energy dissipation material. If erosion has advanced into the low-hydraulic conductivity layer, removal of additional erosion-resistant material may be necessary to inspect low-hydraulic conductivity layer. If burrow animal holes consistently occur, inspection and control of the animal population may be required.			

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Slope Failure	Approximately 2:1 slopes will be constructed on portions of the Site. Slopes should be evaluated to ensure sliding or failure is not occurring.	Geotechnical engineering evaluation should be performed by certified professional.			
Damage	Stormwater conveyance systems and structures should be inspected for joint separation, invert failure and/or structural failure	Replacement and/or repair of damage feature. Placement of sealants may be used.			

TABLE 5: Groundwater and Leachate Monitoring Wells

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Well Vaults, Caps, Casings, And Seals	Monitoring wells should be inspected during monitoring events to ensure there has not been tampering, damage, or degradation of the well components. The will be visually inspected to ensure they are all in working order.	Damage or severe degradation should be repaired as soon as possible following identification of a problem that impairs the normal operations of monitoring.			

TABLE 6: Building Landfill Gas Intrusion Mitigation Systems

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
SSV System	Rooftop ventilators should be observed periodically to confirm they are rotating.	If ventilators are not rotating in a steady wind, competent service representative, who can access the rooftop ventilators, should be engaged to perform maintenance.			
	The air intake vents at the building corners should periodically (annually) be inspected to verify that they remain open and are not plugged with debris or other material.	Remove debris to re-open any air inlet that is plugged that would prevent the SSV system from operating.			
Penetration Flashing/Seals	Penetration flashing/seals should be inspected to verify that they are properly sealed and are not damaged.	Any leaks or damage should be promptly repaired to maintain system effectiveness			
Piping System	The sub-slab piping system, including the perforated and non-perforated vent piping, should not require maintenance under normal operating conditions. The riser pipe is within a structural chase and the discharge vent is exposed and could potentially be damaged or clogged over time.	Any such clogging or damage should be promptly repaired to maintain system effectiveness.			
Sub-Slab Liner	No ongoing maintenance is required for the liquid boot liner as long as it is not disturbed. The liners are installed beneath the slab of each building and are not easily accessed.				

INSPECTION ITEM	CONDITION	MAINTENANCE REQUIRED	ACTION REQUIRED? YES/NO	COMMENTS (LOCATION, SEVERITY, DAMAGE DESCRIPTION)	DATE OF REPAIR AND ACTION
Riser Pipe Venting and Wine-Drive Turbine	On an annual basis, a visual inspection of the above-roof portions of the venting riser pipe and wind-driven turbine will be performed. Roofs will be accessed via the interior of respective structures, if available. As an alternative, ladders and/or power lifts with appropriate fall protection equipment will be used to provide access to locations of inspections of above-roof system components. The turbine will be inspected to confirm it is able to rotate freely and is free of impediments (e.g., debris, nesting birds).	Visible cracks, breaks, or other deterioration in the riser pipe, turbine, or connections will be repaired promptly by qualified personnel.			
Sub-Slab Pressure Port Sampling Stations	The access hatch, whether wall-mounted or flush ground-mounted, will be inspected to confirm that access impediments (structures, vegetation, etc.) are not present. The connection ports will be inspected to confirm they are in proper working order and maintain a proper connection to connected sampling and measuring equipment.	Visible cracks, breaks, or other deterioration in the access hatch, connections, or related equipment/devices will be repaired promptly by qualified personnel.			



APPENDIX B

FINAL LANDFILL CLOSURE GEOTECHNICAL EXPLORATION (ENGEO, 2022)



BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

FINAL LANDFILL CLOSURE GEOTECHNICAL REPORT

SUBMITTED TO
Mr. Frederick Daven
Baylands Development, Inc.
150 Executive Park Blvd., Suite 1180
San Francisco, CA 94134

PREPARED BY
ENGEO Incorporated

December 8, 2021
Latest Revision March 25, 2022

PROJECT NO.
17270.000.002

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ENGEO
Expect Excellence

Project No.
17270.000.002

December 8, 2021
Latest Revision March 25, 2022

Mr. Frederick Daven
Baylands Development, Inc.
150 Executive Park Blvd., Suite 1180
San Francisco, CA 94134

Subject: Brisbane Baylands Landfill
Brisbane, California

FINAL LANDFILL CLOSURE GEOTECHNICAL REPORT

Dear Mr. Daven:

We prepared this geotechnical report in support of the final landfill closure of the Brisbane Baylands Landfill site in accordance with Title 27 of the California Code of Regulations and the Waste Discharge Requirements (WDRs) for the Brisbane Baylands Landfill. The main geotechnical concerns that we analyzed for their impact on the proposed landfill cover, the proposed landfill control systems, and the proposed site development include:

- Seismic deformation of the landfill slopes.
- Static settlement of compressible Young Bay Mud subjected to loading from future development.
- Static settlement of the waste material from compression and degradation.
- Variability and extent of non-engineered artificial fill/soil stockpile.
- Seismic settlement of the existing fill and marine sand below the Young Bay Mud.

These items and other geotechnical issues are discussed in this report and should be considered in the planning for the study area. If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

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sos/lc/jaf/dt

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

We prepared this report as outlined in our agreement dated November 3, 2021. Baylands Development Inc. authorized us to conduct the following scope of services.

- Review previous reports and data by other consultants listed in the Site References, available literature, historical aerial images, and published geologic maps covering the study area
- Review existing subsurface field exploration and laboratory testing
- Analyze and interpret the geological and geotechnical data
- Prepare findings and discussions of the geotechnical hazard analyses pertinent to the landfill closure
- Prepare geotechnical mitigation alternatives for the landfill closure with consideration of future site development

We prepared this report for the exclusive use of Baylands Development Inc. and their consultants for design of this project. In the event that any changes are made in the character, design, or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended.

1.2 PROJECT LOCATION AND BACKGROUND

The Baylands Landfill site is an approximately 350-acre former municipal landfill located west of Highway 101 in Brisbane, California. A site location map is presented as Figure 1. The project site was formerly part of the open water of the San Francisco Bay until the 1930s, when reclamation of the bay to create new land in the area of the Landfill site began. The railroad tracks that form the western limit of the site were constructed in the early 1910s. These tracks and associated right-of-way are currently administered by the Joint Powers Board (JPB) and Caltrain. The construction of Highway 101 (James Lick Highway) in the late 1950s set the eastern limit of the bay-filling activities and defined the eastern limit of the project site. Records indicate that the highway was constructed on fill material sourced from the nearby Candlestick Point area and San Bruno Mountain during the mid-1950s. A site plan is presented as Figure 2.

We understand that the landfill is unlined and was in operation from the early 1930s until the landfill stopped accepting waste in 1967. In the early 2000s, the landfill site started receiving soil material as a soil recycling facility. This operation has led to various changes in the site topography over the years. An existing east-west drainage channel, Visitacion Creek, divides the Landfill site. The average current elevation of the ground surface across the site generally varies between Elevation 17 and 43 feet. Localized areas south of Visitacion Creek are occupied by taller soil stockpiles up to approximately Elevation 70 feet.

1.3 PROJECT DESCRIPTION

The Baylands Landfill site is part of the master plan Brisbane Baylands project. Future development at the site will be subjected to approval of the project Specific Plan. We understand the Landfill portion is proposed to be developed with commercial buildings up to four stories tall, open space, wetlands, energy generation facilities, and associated infrastructure. Prior to future site development, the closure of the landfill will involve construction of the landfill cover, landfill

gas collection and control system, and the leachate management system as outlined in the Closure and Post-Closure Maintenance Plan (CPCMP). The landfill gas collection, control system, and the leachate management system, herein, will be referred to as the landfill control systems. As part of the California Code of Regulations (CCR) Title 27 compliance, a vapor intrusion mitigation system (VIMS) is recommended underneath future buildings.

The future site development comprises various development areas in accordance with the project phasing as illustrated in Exhibit 1.3-1.

EXHIBIT 1.3-1: Proposed Development Areas for Project Phasing



The final grade at the major development areas designated for commercial/industrial (Area D) and solar field (Area E) is proposed to be approximately Elevation 50 feet. The Water Detention Area (OS-C) and Visitacion Creek (OS-D) will vary between approximately Elevation 0 and 20 feet. The remaining areas around the perimeter of the site, including Lagoon Park (OS-G), Bay Trail (OS-E), Energy Storage (Areas D and G), Baylands Preserve (OS-F), Wastewater Treatment Facility (Area F), and Geneva Avenue extension (Area F), will have design grades between approximately Elevation 10 and 30 feet.

1.4 EIR MITGATION MEASURE COMPLIANCE

We prepared this report to be in compliance with the Brisbane Baylands Development Final Environmental Impact Report (EIR) Mitigation Measure 4.E-2a. Sections 3.5, 4.2, and 5.0 are in compliance with Mitigation Measure 4.E-3, and Section 3.6 is in compliance with Mitigation Measures 4.E-4a and 4.E-4b.

1.5 ELEVATION DATUM

The elevation datum applied to the project is the North American Vertical Datum of 1988 (NAVD88). Unless otherwise stated, the figures and data presented in this report reference elevations based on this datum.

It should be noted that many of the previous reports refer to Mean Sea Level (MSL) datum based on the National Geodetic Vertical Datum of 1929 (NGVD29). At Brisbane Baylands, the following equation shows the general relationship between the datums. However, variation may exist as this is dependent on geographic location.

$$NAVD88 = NGVD29 + 2.33$$

1.6 EXISTING DATA

The following geotechnical explorations were previously performed at the Landfill site between 1977 and 2008.

- John V. Lowney & Associates (1977), 22 borings between depths of 52 and 91 feet below ground surface (bgs)
- Kleinfelder (1989), 3 borings between depths of approximately 61 to 81 feet bgs.
- Geosyntec (2004), 8 borings between depths of 20 and 97 feet bgs
- Geosyntec (2005), 6 borings between depths of 55 and 263 feet bgs and six cone penetration tests (CPTs) between depths of 15 and 62 feet bgs
- Geosyntec (2008), 4 borings between depths of 125 and 269 feet bgs

We reviewed, compiled, and used, as deemed appropriate, the previous data in preparation of this current report. The locations of the previous explorations are shown on Figure 2. The previous exploration logs are presented in Appendix D and the previous laboratory data is presented in Appendix E.

In addition, a characterization of the top of the waste was performed by Burns & McDonnell Engineering Company (B&M) in 2001. This study included 40 shallow borings conducted by B&M and 38 shallow borings performed by Geosyntec. These explorations are shown on Figure 6, and the logs are presented in Appendix F.

2.0 FINDINGS

2.1 REGIONAL GEOLOGY

The site is in the western portion of the San Francisco Bay, which lies within the Coast Ranges geomorphic province. The northwesterly trend of ridges and valleys characteristic of the Coast Ranges are apparent in the hills due west of the site. The San Francisco Bay lies within a dropped-down crustal block bounded by the East Bay Hills and the Santa Cruz Mountains. The San Francisco Bay depression resulted from interaction between the major faults of the San Andreas Fault zone, particularly the Hayward and San Andreas faults located east and west of the bay, respectively (Atwater, 1979).

The topography of the Coast Range on the San Francisco Peninsula is characterized by relatively rugged hills resulting mainly from east-west compression of coastal California during the late Pliocene and Pleistocene epochs (Norris and Webb, 1990). The site is underlain at depth by Jurassic- to Cretaceous-aged bedrock of the Franciscan complex, consisting of highly deformed and fractured sedimentary rocks.

Quaternary sediments deposited on eroded Franciscan bedrock underlie the low-lying areas of the site vicinity. Sediment deposition within the pre-historic bay margin has been influenced by oscillating late-Quaternary sea levels that resulted from the advance and retreat of glaciers worldwide. The resulting sequence of alternating estuarine and terrestrial sediments correspond to high and low sea-level stands, respectively. Quaternary sediments in the plains landward of the bay are predominantly terrestrial.

By late Pleistocene time, the high sea level associated with the Sangamon interglacial (125,000 years ago) resulted in deposition of the Yerba Buena Mud. Also known locally as “Old Bay Clay,” the Yerba Buena Mud was deposited in an estuarine environment similar in character and extent to the present bay. Sea level lowering associated with the onset of the Wisconsin glaciation exposed the bay floor and resulted in terrestrial sedimentation, such as the Colma Formation, on top of the Old Bay Clay. Sea level rose again starting roughly 20,000 years ago, fed by the melting of Wisconsin-age glaciers. The sea re-entered the Golden Gate about 10,000 years ago (Atwater, 1979). Inundation of the present bay resulted in deposition of estuarine sediments, called Young Bay Mud, which continues to accumulate regionally within the present bay.

Historical development of the San Francisco Bay shoreline resulted in placement of artificial fill material over substantial portions of modern estuaries, marshlands, tributaries, and creek beds in an effort to reclaim land (Nichols and Wright, 1971). The majority of the site is mapped as artificial fill (Qaf) by Bonilla (1998) as shown on Figure 3.

2.2 SEISMICITY

Because of the presence of multiple active faults, the Bay Area Region is considered seismically active. Numerous small earthquakes occur every year in the region, and large (greater than Moment Magnitude 7) earthquakes have been recorded and can be expected to occur in the future. Figure 4 shows the approximate location of active and potentially active faults and significant historic earthquake epicenters mapped within the San Francisco Bay Region. The California Geologic Survey (CGS) defines an active fault as one that has had surface displacement within Holocene time (about the last 11,700 years) (CGS, 2018).

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist within the site; therefore, fault rupture through the site is not anticipated. A trace of the City College Fault Zone is shown crossing the site on the Regional Geologic Map (Figure 3). This fault zone is considered not to have been active in the late quaternary and there is no seismicity associated with it (CGS, 2018); therefore, it is not considered active.

The 2015 Working Group on California Earthquake Probabilities evaluated the 30-year probability of a Moment Magnitude 6.7 or greater earthquake occurring on the known active fault systems in the Bay Area in the Third Uniform California Earthquake Rupture Forecast (UCERF3). UCERF3 estimated an overall probability of 72 percent for the Bay Area as a whole and a probability of 6.4 for the Northern San Andreas fault, which is the closest active fault to the site. We describe the seismic-hazard analysis that we performed for the site in Section 3.6.2.1

Based on the historical seismicity, the proximity of known active faults, and the estimated earthquake probabilities for the Bay Area as a whole, it should be expected that the site will experience strong seismic ground shaking during the lifetime of the proposed improvements. The ground shaking hazard levels at the site are similar to those for most of the Bay Area.

The site is mapped in the current seismic hazard zonation with potential permanent ground displacements due to liquefaction based on the California Geologic Survey Seismic Hazard Zone Maps. This liquefaction susceptibility mapping is based on regional geologic mapping of soil and rock deposits and is not based on site-specific exploration or analyses. We performed detailed analysis of the liquefaction-induced settlement and provide the results in Section 3.5.

2.3 HISTORICAL AERIAL PHOTOGRAPHS AND SITE HISTORY

The Landfill site is formerly part of the San Francisco Bay. The site and the adjacent Baylands Railyard site have undergone land reclamation fill placement beyond the edge of the historical San Francisco Bay shoreline. We studied the historical placement activities at the site to understand the characteristics of the subsurface conditions underneath the site. Based on historical aerial photographs from 1930 to 2000, the following is a brief overview and timeline of development-related events at the site.

EXHIBIT 2.3-1: Timeline of Development-Related Events at the Site



2.4 FIELD EXPLORATION AND LABORATORY TESTING

Our field exploration included drilling two borings (1-B1 and 1-B2) and advancing six cone penetration tests (CPTs) (1-CPT02, 1-CPT03, 1-CPT04, 1-CPT05, 1-CPT06A, and 1-CPT06B) at various locations on the site. The locations of our 2021 explorations are shown on Figure 2. An explanation of our field exploration methods and the boring logs are presented in Appendix A and our CPT data is presented in Appendix B.

2.4.1 Borings

We performed two borings at the site between June 4 and June 11, 2021, to depths of approximately 117 and 140 feet bgs. The borings were drilled using the hollow-stem auger drilling method through the fill and the waste and the mud rotary wash drilling method below the waste. An engineer from our firm was present during the drilling to log the borings. The boring logs are presented in Appendix A.

We obtained bulk soil samples from drill cuttings and retrieved disturbed and relatively "undisturbed" soil samples at various intervals in the borings using a 1½-inch-inside-diameter (I.D.) standard penetration test (SPT) sampler, 2½-inch I.D. California-type split-spoon sampler fitted with 6-inch-long steel liners, or a 3-inch-outside diameter (O.D.) thin-walled Shelby tube. In addition, we collected samples of the sand underlying the Young Bay Mud with a Dames & Moore piston sampler, which uses approximately 18-inch, thin-walled brass liners with an I.D. of 2.4 inches. We drove the SPT and California-type samplers with a 140-pound auto trip hammer falling a distance of 30 inches. We field recorded the penetration of the SPT and California-type sampler into the soil material as the number of blows needed to drive the sampler 18 inches in 6-inch increments. The boring logs show the number of blows counts for the last 12 inches the sampler was driven, and we have not corrected the blow counts reported on the logs using any correction factors.

2.4.2 Cone Penetration Tests

We retained the services of a subcontractor with a CPT rig to advance multiple CPTs at the project site between June 10 and June 14, 2021. Due to obstructions, we had difficulties penetrating the fill and waste. Where obstructions were encountered, we made several attempts to advance the CPT probe. Below is a summary of our CPT attempts and final depths.

- 1-CPT01A-C – three attempts that hit refusal between 3 and 8 feet bgs
- 1-CPT02 – one CPT to 100 feet bgs
- 1-CPT03 – one CPT to 90 feet bgs
- 1-CPT04A-B – one attempt that hit refusal at 44 feet bgs and one CPT that terminated at 127 feet bgs due to alignment issues
- 1-CPT05A-E – four attempts that hit refusal between 16 and 24 feet bgs and one CPT that terminated at 137 feet bgs due to alignment issues
- 1-CPT06A-B – two attempts that hit refusal at approximately 55 feet bgs

We performed the CPTs in general accordance with ASTM D-5778. Measurements include the tip resistance to penetration of the cone (Qc), the resistance of the surface sleeve (Fs), and pore pressure (U) (Robertson and Campanella, 1988). The CPT data is presented in Appendix B.

2.4.3 Laboratory Testing

We collected select samples from our field exploration and transported them to our laboratory. The laboratory tests that we performed for this study are listed in Table 2.4.3-1.

TABLE 2.4.3-1: Laboratory Testing

SOIL CHARACTERISTIC	TESTING METHOD
Natural Unit Weight	ASTM D7263
Natural Moisture Content	ASTM D2216
Plasticity Index (PI) (Wet Method)	ASTM D4318
Grain Size Distribution	ASTM D1140
Consolidation – Constant Rate of Strain	ASTM D4186
Cyclic Simple Shear (CSS)	ASTM D6528
Triaxial Compression – Unconsolidated, Undrained (TXUU)	ASTM D2850

Our laboratory test results are presented in Appendix C, and select test results are presented on the boring logs in Appendix A.

2.4.3.1 Cyclic Simple Shear (CSS) Testing

We tested four samples from our exploration in cyclic simple shearing. In this test, a sample is consolidated to the effective pressure that simulates the predicted loading condition of the in-situ material. The specimen was consolidated with negligible applied horizontal shear stress ($\alpha \approx 0$). The sample is then subjected to undrained loading consisting of cycles of stress-controlled loading at a given amplitude. The magnitude of the loading is described by the Cyclic Stress Ratio (CSR), which for simple shear testing is defined as the half-amplitude horizontal shear stress divided by the vertical effective consolidation stress:

$$CSR = \tau_{Hor}/\sigma'_{V,O}$$

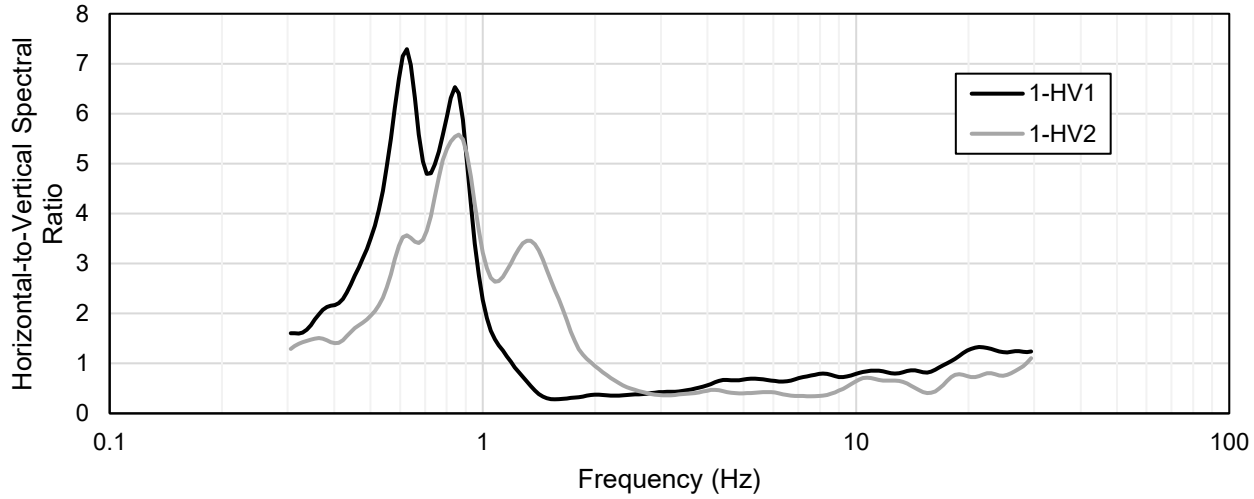
We performed the tests in a “constant height” mode, wherein the vertical position of the top cap is rigidly locked immediately prior to the shearing portion of the test, such that specimen cannot change height during shearing (simulating undrained shear of a saturated specimen). In this situation, material that is prone to contracting or developing positive pore water pressure is observed to have the vertical deviatoric stress drop during shearing (which can be measured, since the load cell is beneath the clamping point on the load system). Such a decline in vertical stress in essentially a loss of confining stress, which combines with any positive pore pressures generated to reduce the effective stress during a test. Exhibit 3.4.3-1 shows our CSS device.

The samples for this study were subjected to loading at CSR levels equal to 0.1, 0.2, and 0.3 applied as a sinusoidal cycle with a frequency of 0.5 Hz. The CSS results in Appendix C show the time history of the shear stress and shear strain, the resulting hysteresis loop, and the post-cyclic vertical strain. We recorded data at a rate of 50 readings per second and included the shear load, shear deformation, vertical deformations, vertical deviatoric load, chamber pressure, and apparent changes in pore pressure. We used the results of this testing to calibrate the PM4 sand layer in our finite element model as discussed in Section 3.6.2.

2.4.4 Horizontal-to-Vertical Spectral Ratio Testing

We performed horizontal-to-vertical spectral ratio (HVSR) testing adjacent at two locations (1-HV1 and 1-HV2) in order to estimate the fundamental shear wave resonant frequency (f_0) or, equivalently, the fundamental period (T_0) of the site (SESAME 2004). This testing involves placing a small, three-component seismometer at the ground surface and recording ambient vibrations for a period of approximately 1 hour. The ambient vibration recordings are used to calculate HVSR as a function of frequency. To calculate HVSR, we divided the full-time record at each location into 180-second time windows. We smoothed each window using the procedures discussed in Konno and Ohmachi (1998) and tapered the ends using a cosine taper with a width of 5 percent of the time window length. We chose the squared average of the Fourier Amplitude Spectra (FAS) of the north-south and east-west components to represent the average horizontal component. We then divided the average horizontal FAS by the vertical FAS to obtain HVSR. We logarithmically averaged the HVSR spectra from individual time windows at each location. We present the median HVSR curves of all time windows in Exhibit 2.4.4-1.

EXHIBIT 2.4.4-1: Horizontal-to-Vertical Spectral Ratio Testing Results



If a well-defined peak is present in the HVSR spectrum, this peak can be used to estimate f_0 (SESAME 2004). The results from 1-HV1 exhibit one dominant peak at 0.86 Hz, which we infer to be f_0. The results from 1-HV2 exhibit two peaks at 0.62 and 0.86 Hz with similar amplitudes. When calibrating our ground-response analyses, we considered the highest amplitude peak at 0.62 Hz to be associated with f_0.

2.5 SUBSURFACE CONDITIONS

The majority of the site was mapped by Bonilla (1998) as being covered by artificial fill (Qaf) (Figure 3). Based on the explorations, the subsurface conditions at the project site from youngest to oldest are: (1) artificial fill and soil stockpiled from the soil recycling operation; (2) waste; (3) Holocene Bay Deposits consisting of Young Bay Mud and marine sand; (4) Pleistocene deposits comprising aeolian, alluvial, and marine deposits; and (5) Franciscan Bedrock. Seven subsurface Cross Sections (A-A' through G-G') showing idealized site geology are provided on Figures 5A and 5B.

2.5.1 Artificial Fill and Soil Stockpile (Non-Engineered Fill)

The upper soil layer at the project site consists of soil stockpiled from the soil recycling operation. This layer is highly variable and ranges from sandy clay to gravel with sand, but the majority of the fill we encountered is silty clayey sand. Corrected blow counts from borings ($N_{1,60}$) indicate that this material ranges from loose to very dense. The explorations encountered variable amounts of debris consisting of concrete, bricks, tires, steel, and wood, resulting in drilling resistance and isolated higher blow counts. Records regarding the placement and compaction of this material are not available, as such the fill should be considered non-engineered.

The thickness of the fill is highly variable across the site. The current site elevation ranges from Elevation 15 to 70 feet primarily due to differing fill thickness. In general, the fill on the northern portion of the site, where the site elevation is lower, is relatively thin, ranging in thickness from 3 to 5 feet. Fill up to 40 feet thick was encountered in borings on the southern portion of the site, but it is likely thicker in the areas of higher elevation.

2.5.2 Waste

The Brisbane Landfill is an unlined Class III Landfill. Based on the Waste Discharge Requirements from the California Regional Water Quality Control Board (RWQCB), it was used for the disposal of primarily non-hazardous solid wastes composed of domestic, industrial, and shipyard waste, sewage, and rubble. The waste material encountered in explorations included wood, paper, plastic, glass, wires, metals, and gravelly soil. Figure 6 presents contours of the top of waste elevation. The data for these contours comes primarily from the shallow borings from the study performed by B&M and Geosyntec in 2000. Settlement of the waste and underlying Young Bay Mud is ongoing and Figure 6 may not reflect the current elevation of the top of waste. Over the majority of the site, the thickness of the waste ranges between 25 and 30 feet. Figure 7 presents contours of the waste thickness across the site.

In most of the explorations, the bottom of the waste layer is intermixed with the underlying Young Bay Mud. In the 1941 aerial photograph of the area, slope failures caused by rotated/subsided Young Bay Mud during waste placement can be seen. Such failures likely resulted in intermixing of the waste and Young Bay Mud, as well as creating isolated locations where the thickness of waste is irregular.

2.5.3 Holocene Bay Deposits

The Holocene Bay Deposits include intermixed soft to medium stiff clay and silt and loose to medium dense sand deposited by bay and intertidal activities. The Bay Deposits include zones of highly compressible clay, locally known as Young Bay Mud. The thickness of the Young Bay Mud generally increases away (east) from the former shoreline. There are two troughs of deeper Young Bay Mud in the southern portion of the site leading to the former drainage outlets of Visitacion Valley and Guadalupe Valley. Estimated elevation contours of the bottom of the Young Bay Mud deposits are shown on Figure 8, and the approximate thickness of the Young Bay Mud is shown on Figure 9. Laboratory testing and CPT data indicate that the Young Bay Mud has a shear strength varying from 450 to 1,000 pounds per square foot (psf) and is normally to slightly overconsolidated. In some areas of the site, the Bay Deposits include sandy soil strata underlying the Young Bay Mud. This layer is up to 10 feet thick and is loose to medium dense.

Our interpretations of laboratory tests indicate that the Young Bay Mud is normally consolidated with coefficient of consolidation ranging from 0.30 to 0.36. When subjected to new loads from fill or structures greater than the material has previously experienced, Young Bay Mud will undergo long-term consolidation resulting in settlement that could affect the planned improvements in the project area. Additionally, the sandy layers within the Bay Deposits may be susceptible to liquefaction during cyclic loading. Further discussion of the compressible/potentially liquefiable soil and recommended measures to reduce the risk of these on the proposed development are presented later in this report.

2.5.4 Pleistocene Aeolian, Alluvial and Marine Deposits

Below the Holocene Bay Deposits, the explorations encountered Pleistocene sand and clay that were deposited in aeolian, alluvial, and marine environments. The Pleistocene marine clay deposits are locally known as Old Bay Clay. The sand deposits range from greenish gray to orangish brown and are medium dense to dense. The Old Bay Clay ranges from greenish gray to olive brown and generally increases in strength with depth from approximately 1,100 to 3,500 psf. Old Bay Clay shear strength results from the 2004, 2005, and 2008 studies were as low as 250 psf. Based on our considerable experience with Old Bay Clay, these are artificially low, possibly due to disturbance during sampling or transport. Old Bay Clay generally has similar consolidation properties as Young Bay Mud; however, it is only susceptible to settlement from higher loading conditions since it is overconsolidated.

2.5.5 Jurassic- and Cretaceous-Age Franciscan Bedrock

The Pleistocene deposits are underlain by Jurassic- and Cretaceous-age Franciscan bedrock that is generally composed of interbedded mélange matrix and siltstone/sandstone. The bedrock mapped by Bonilla (1964) ranges from Elevation 0 feet to -250 feet mean sea level across the project site, with the shallower bedrock being at the northern and southwestern extents of the site and the deepest bedrock in the middle. We show the contour map for the top of bedrock on Figure 10. The Franciscan bedrock typical of the area is friable to strong and severely weathered, consisting of Greenstone, Serpentinite, Siltstone, and Greywacke Sandstone.

2.6 GROUNDWATER CONDITIONS

There are a number of groundwater monitoring wells on the Landfill site and Geosyntec has been routinely performing monitoring of them. In Site Reference 6, Geosyntec modeled the current groundwater near the existing internal drainage channel and the lagoon edge as approximately Elevation 4 foot to 5 feet (NAVD 88 Datum), and generally as Elevation 7 to 9 feet (NAVD 88 Datum) at the central portion of the landfill north of Visitacion Creek and varies from Elevation 4 to 7 feet south (NAVD 88 Datum) of Visitacion Creek. Groundwater generally flows from the central area of the northern and southern portions of the Landfill site towards the landfill edge and the interior drainage channel. See Figure 3B of the CPCMP for an estimate of groundwater level contours by Geosyntec.

Fluctuations in the level of groundwater may occur due to variations in tidal fluctuations from the San Francisco Bay, earthwork activities, rainfall, irrigation practice, and other factors not evident at the time measurements were made. Geosyntec performed modeling of the future groundwater levels accounting for 2100 Sea Level Rise projections and construction of the landfill leachate control system. Their model indicates a decrease of groundwater levels throughout majority of the Landfill whereas the groundwater levels are estimated to increase up to 1 feet along the

railroad tracks along the western boundary of the Landfill. For design and geotechnical evaluation, we recommend using a groundwater table of Elevation 10 feet.

3.0 GEOLOGICAL AND GEOTECHNICAL HAZARDS

From a geotechnical engineering viewpoint, the planned landfill cover and control systems required by CCR Title 27 and future site development are feasible. We evaluated the site with respect to known geologic and other hazards common to the greater San Francisco Bay Region. The primary hazards and the risks associated with these hazards with respect to the planned development are discussed in the following sections of this report.

3.1 STATIC SETTLEMENT ANALYSIS

The site is underlain by various materials that are subject to static settlement: the waste, Young Bay Mud, and Old Bay Clay. The waste will be subject to settlement due to various processes related to breakdown of the waste material as well as immediate settlement from compression of the items within the waste and any voids. The Young Bay Mud and Old Bay Clay are subject to consolidation settlement when new loads are applied that exceed the maximum past pressure experienced by the material as well as recompression from any new loading applied. We divided the site into 22 zones for settlement analysis based on the thickness of proposed new fill, waste, and Young Bay Mud. These zones are shown on Figure 11. Our static settlement analysis is presented in Appendix G.

3.1.1 Consolidation Settlement

The site is underlain by 20 to 65 feet of Young Bay Mud. The approximate thickness of the Young Bay Mud deposits is depicted on Figure 9. Young Bay Mud deposits are of particular concern since they are highly compressible and will be susceptible to significant settlement when subjected to additional loading. Placement of the waste from the 1932 to 1967 and the subsequent continuous soil recycling operation has subjected the Young Bay Mud to loading and settlement from primary consolidation. Future additional loading will induce continued settlement of this deposit.

The amount of settlement of the Young Bay Mud depends on proposed loads, the thickness, and the stress history of the Young Bay Mud. The Young Bay Mud deposits in areas where there will be increased loading from raising site grades or placement of buildings, will experience additional consolidation settlement. If mitigation is not implemented, we estimate future settlement could be up to 35 inches and take over 50 years. In general, the average settlement across the site is approximately 20 inches if left unmitigated.

The Old Bay Clay is considerably less compressible under the range of anticipated loads for the planned infrastructure improvements and raising of site grades. We calculated up to 3 inches of settlement in the Old Bay Clay. However, given the depth of this material, any settlement from the Old Bay Clay will manifest as general subsidence of the site rather than localized settlement. Future building loads may trigger consolidation of the Old Bay Clay if the foundations induce significant stress on this layer. The potential consolidated settlement of the Old Bay Clay due to the planned building loads should be evaluated during building design.

Based on the total and differential settlement potential, we recommend mitigation of the compressible Young Bay Mud through either surcharging or compensating for the planned loads with lightweight backfill, as discussed in Section 4.1.

3.1.2 Waste Settlement

The Landfill site is underlain by 15 to 35 feet of waste that was placed in various sequences between the 1930s and 1960s. Contours of the top of waste elevation and the waste thickness are provided on Figures 6 and 7. Figure 12 shows the approximate timeline for infilling of various parts of the landfill. The waste will continue to settle over time due to various processes. According to Sharma and De (2007), these processes are:

1. Physical and mechanical processes (reorientation of particles, movement of the fine material into larger voids, and collapse of void spaces).

2. Chemical processes (corrosion, combustion, and oxidation).

3. Dissolution processes (dissolving soluble substances by percolating liquids and forming leachate).

4. Biological decomposition of organics.

These four processes combined constitute both primary and secondary consolidation processes. The primary consolidation of waste as a result of these processes is generally assumed to occur over a short time span (less than a year). We have not accounted for primary settlement in our analysis since the surcharge program for pre-consolidation of the Young Bay Mud will be implemented prior to construction of the landfill closure systems and site development; the surcharge program will drive primary settlement of the waste so that it occurs prior to development. The surcharge program is discussed further in Section 4.1.1.

We used the method proposed by Sharma and De (2007) to estimate the potential secondary settlement of the waste. In 2008, Geosyntec implemented a test surcharge settlement program to study the settlement characteristics of the waste at the site (Site Reference 2). Two test surcharge pads were constructed at the site representing different time sequences of waste placement as summarized in Table 3.1.2-1.

TABLE 3.1.2-1: Waste Test Pad

LOCATION	PLACEMENT TIME
Tunnel Avenue Pad	1931 to 1935
Channel Pad	1955 to 1956

Settlement of these test surcharge pads was monitored from 2008 until 2013 (Site Reference 2) and then again in 2017 (Site Reference 3). Based on the data from this monitoring, we estimated the secondary settlement coefficients for each area. Data published by Sharma and De (2007) provides guidelines for estimating the secondary settlement coefficients for waste. We considered the values shown in Table 3.1.2-2 in performing our analysis as described below.

TABLE 3.1.2-2: Waste Secondary Settlement Coefficients

SECONDARY COEFFICENT	TUNNEL AVENUE PAD	CHANNEL PAD	FROM PUBLISHED LITERATURE
$C\alpha$ (self-weight)	0.17	0.25	0.30
$C\alpha$ (external load)	0.01	0.01	0.01

We estimated the sequence and timeline of waste placement at the project site from published aerial photographs, as shown on Figure 12. Based on this timeline, we decided where to use the various secondary coefficients. The locations where we applied each of the various secondary coefficients are shown in Table 3.1.2-3.

TABLE 3.1.2-3: Waste Secondary Settlement Coefficient Zones

SECONDARY COEFFICIENT USED		WASTE SEQUENCE	SETTLEMENT ZONE(S)*
Cα (SELF-WEIGHT)	Cα (EXTERNAL LOAD)		
0.17	0.01	1931 to 1935	1
0.25	0.01	1935 to 1956	2 through 15
0.30	0.01	After 1956	15 thought 22

*Settlement zones are shown on Figure 11

For our waste settlement analysis, we considered a timeline of 50 years after landfill closure, which is estimated to occur in 2029. Based on our analysis, within the studied timeline of 50 years, the settlement for self-weight at the site ranges between 11 and 26 inches, and the settlement due to external loads ranges from 1 to 10 inches in that same time frame. The total combined settlement of the waste is estimated to range between 11 to 36 inches.

The larger settlement estimates are from the southern portion of the site and areas of thickest waste layer where there is a lack of data for us to fine tune the settlement estimate. In addition, organic waste decomposes through aerobic and subsequent anaerobic processes producing landfill gasses. According to ongoing landfill gas monitoring records, methane generated at the site has been decreasing. A correlation between methane generation and long-term settlement of waste has been studied by Zekkos, et al. (2013). Initial discussion with Professor Dimitrios Zekkos of the University of California Berkeley suggests further study and correlation of the data is necessary to refine the settlement analysis. Once additional data is collected in future studies, we anticipate updating these settlement estimates.

3.1.2.1 Post-Mitigation Waste Settlement

As discussed in Zekkos et al. (2013) deep dynamic compaction (DDC) has been used to densify waste and reduce settlement of landfills for redevelopment. Based on this study, we used a DDC depth of improvement of 20 feet and a post-improvement secondary compression index ranging from 0.01 to 0.05 to estimate the potential post-improvement waste settlement. We estimate that the post-improvement settlement of the waste will be less than 24 inches. Contours of post-improvement settlement are shown on Figure 13. We discuss waste settlement mitigation further in Section 4.3.

In addition, the surcharge program recommended for the mitigation of Young Bay Mud consolidation settlement will further improve the waste at the site and reduce the post-construction settlement. However, there is limited published literature on quantifying the amount of potential settlement reduction.

3.2 NON-ENGINEERED FILL

Non-engineered fill over 40 feet thick is present at the project site from the soil recycling operation. Non-engineered fill can undergo excessive settlement, especially under loading from new fill and/or buildings. The geotechnical mitigation measures associated with reducing settlement of

the waste will require removal of the non-engineered fill material to the top of the waste, depending on the groundwater conditions. If the soil material is free of debris and deleterious matter, it may be reused as engineered fill at the site. We present non-engineered fill removal recommendations in Section 4.2.

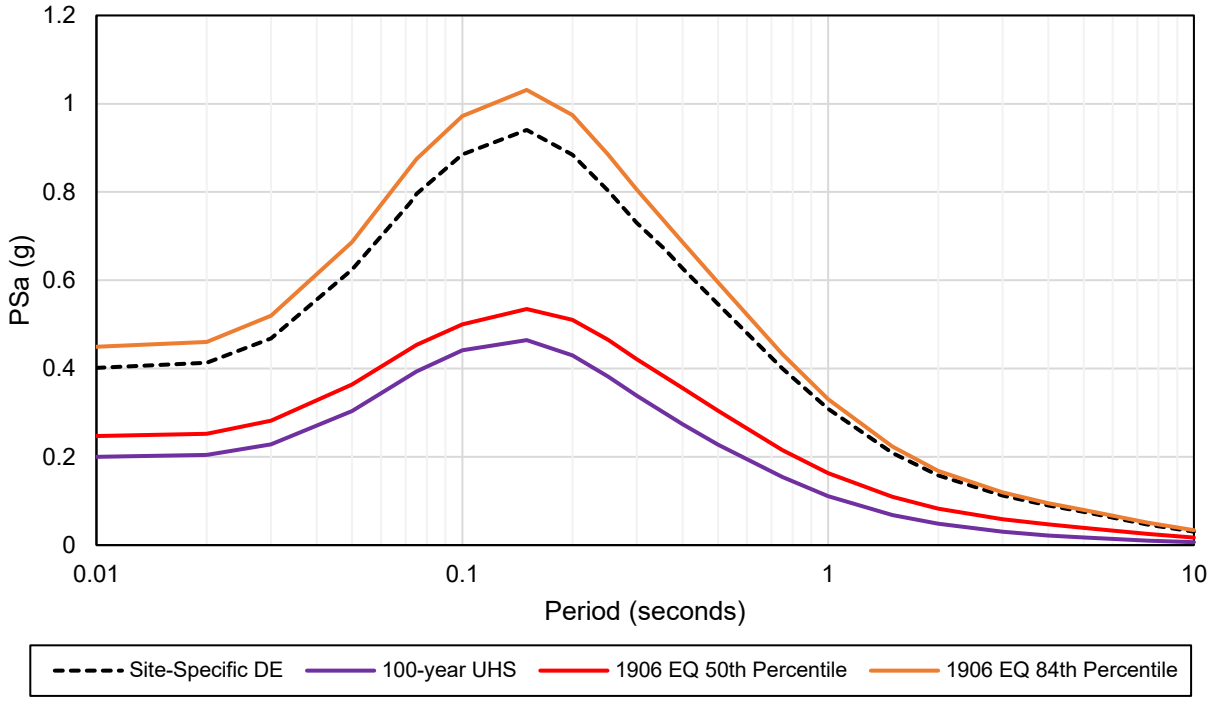
3.3 SEISMIC CRITERIA

According to §20237 of CCR Title 27, Class III landfills shall be designed to withstand the Maximum Probable Earthquake (MPE) without damage to the foundation or to the structures which control leachate, surface drainage, or erosion, or gas. The MPE is defined as the "maximum earthquake that is likely to occur during a 100-year interval." According to CCR Title 27, development of the MPE requires consideration of active faults within a 62-mile (100-kilometer) radius and probability of seismic activity, although a specific return period (i.e., probability of exceedance during the design life) is not specified. Additionally, CCR Title 27 states that the MPE is superseded by any more powerful seismic event that has occurred within historic time in area of interest.

Based on the language in CCR Title 27, the MPE could be interpreted as an earthquake with a return period of 100 years. However, the requirement that the MPE be superseded by any more powerful seismic event within historic time indicates that the 1906 San Francisco Earthquake should also be considered in developing the MPE. Since the return period of the 1906 event exceeds 100 years, it governs for this project. Accordingly, we used the NGA West 2 Ground-Motion Models (GMMs) to estimate the 50th percentile (i.e., lognormal mean) pseudo-spectral acceleration (PSa) response spectra for the 1906 event. Based on the definition of the MPE in CCR Title 27, we opine that this 50th percentile response spectrum meets the criteria for the MPE. Additionally, we also calculated the 84th percentile (lognormal mean plus one standard deviation) for reference. We considered a source-to-site distance of 9.3 miles (15 kilometers) and a moment magnitude (M_W) of 7.9 in the GMMs. We calculated PSa at the top of the bedrock, as this was the input location of the ground motions used in our finite element seismic slope deformation analyses (Section 3.6.2). We show the 50th and 84th percentile response spectra in Exhibit 3.3-1. We also show the Uniform Hazard Response Spectrum (UHS) associated with a 100-year return period.

As described in Section 3.6.2.1, we developed a median component bedrock-level Design Earthquake (DE) response spectrum in accordance with the 2019 California Building Code and ASCE 7-16 standard. This DE is the seismic criteria for the evaluating slope stability for future development at the site. As shown in Exhibit 3.3-1, the DE significantly exceeds the 50th percentile response spectrum for the 1906 event. Additionally, the DE is within less than 10 percent of the 84th percentile response spectrum. Accordingly, we opine that the DE exceeds the requirements of the MPE. Therefore, we performed our slope stability analyses at the DE-level, as this seismic criteria exceeds the landfill closure requirements and governs for future development.

EXHIBIT 3.3-1: Response spectra considered in development of MPE response spectrum



3.4 SEISMIC HAZARDS

Potential seismic hazards resulting from a design earthquake at the project site include ground rupture (surface faulting), ground shaking, ground lurching, liquefaction, lateral spreading, and seismic slope deformation. The following sections present a discussion of these hazards. Liquefaction and lateral spreading are discussed in Section 3.5, and seismic slope deformation is discussed in Section 3.6.

3.4.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone, ground rupture is unlikely at the project site.

3.4.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, structures should be designed using sound engineering judgment and the 2019 CBC requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code

recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.4.3 Ground Lurching

Ground lurching is a result of the rolling motion imparted to the ground surface during energy released by an earthquake. Such rolling motion can cause ground cracks to form in weaker soil. The potential for the formation of these cracks is considered greater at contacts between deep alluvium and bedrock. Such an occurrence is possible at the site as in other locations in the San Francisco Bay region, but based on the site location, the offset will be minor.

3.5 LIQUEFACTION ANALYSIS

We prepared this section to be in compliance with the Brisbane Baylands Development Final EIR Mitigation Measure 4.E-3.

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. The soil most susceptible to liquefaction is clean, loose, saturated, uniformly graded fine sand below the groundwater table. In addition to liquefaction of sandy soil, fine-grained soil can also undergo “cyclic-softening” or strength loss as a result of cyclic loading. Since the stratigraphy at the project site includes clay layers, we considered this effect in our analyses. Dynamic-densification settlement of loose to medium-dense granular soil above the groundwater table, also known as dry-sand settlement, can also cause ground surface settlement with earthquake-induced vibrations.

The existing non-engineered fill encountered at the site is predominantly sandy material that generally ranges from medium dense to very dense. Given the method of placement, portions of the fill are likely loose. Although fill below the water table was encountered in the explorations, there are very few blow counts of this material, since many of the explorations were focused on characterizing the material below the waste. We assume that much of the fill would be subject to liquefaction and cyclic densification during a design seismic event. Since we anticipate that the site will receive mitigation of other geotechnical hazards by implementation of ground improvement techniques that will require removal of majority of the undocumented fill, the remaining fill left in place to facilitate implementation of the ground improvement will have limited susceptibility to liquefaction.

In addition, some explorations encountered a sand layer within the Holocene Bay Deposits beneath the Young Bay Mud. This material consists of medium dense gray sand. There are limited blow counts on this material since it was mostly sampled using a Shelby tube or Dames and Moore push sampler.

Using the limited blow count data, we estimated liquefaction potential using the method developed by Idriss and Boulanger (2008). Based on this potential, we estimated the liquefaction-induced ground settlement using the methods by Ishiara & Yoshimine (1990) and Tokimatsu & Seed (1984). In addition, we analyzed the data from our CPTs to estimate both liquefaction potential and liquefaction-induced ground settlement using the software program Cliq, and the methodology published by Boulanger & Idriss (2014).

Cetin et al. (2009) recognized the effect of liquefaction on ground surface settlement decreases with the depth of the liquefiable material, and after a certain depth, the liquefaction of deeper layers has no effect of surface settlement. This paper states that "A weighting scheme, linearly decreasing with depth, inspired by the recommendations of Iwasaki et al. (1982), is considered in our analysis. Aside from the better model fit it produced, the rationale behind the use of a depth weighting factor is based on the following: (1) upward seepage, triggering void ratio redistribution, and resulting in unfavorably higher void ratios for the shallower sublayers of soil layers; (2) reduced induced shear stresses and number of shear stress cycles transmitted to deeper soil layers due to initial liquefaction of surficial layers; and (3) possible arching effects due to non-liquefied soil layers. All these may significantly reduce the contribution of volumetric settlement of deeper soil layers to the overall ground surface settlement. It is assumed that the contribution of layers to surface settlement diminishes as the depth of susceptible layer increases, and beyond a certain depth (z_{cr}), settlement of an individual layer cannot be traced at the ground surface. After statistical assessments, the optimum value of this threshold depth was found to be 18 m [59 feet]."

We implemented the weighting factor in our analyses. The sand layer in the Holocene Bay Deposits at the site is much deeper than 59 feet below the anticipated finish grade of the proposed dev; therefore, the liquefaction of this deeper layer will not likely result in settlement that will manifest to the surface causing impacts to the landfill cover and the future site development. The results of our liquefaction analyses are attached as Appendix H.

3.5.1 Liquefaction Settlement Analysis Conclusion

As discussed above, a comprehensive analysis of the liquefaction and cyclic densification settlement of the exiting fill could not be performed for this study due to the lack of data; however, we estimate that if not mitigated, liquefaction and cyclic densification settlement of the fill material would be more than the landfill control systems, or the planned development could tolerate. We recommend removing and replacing the existing fill as discussed in Section 4.2.

If the existing fill is removed and replaced, then we estimate that the remaining liquefaction-induced settlement from the sand below the Young Bay Mud will be negligible since this material is deeper than 59 feet below the planned site elevation. While settlement will be negligible at the ground surface, deep foundations penetrating through this layer may experience drag load. The depth of the liquefiable soil makes it impractical to mitigate with ground improvement technique. However, drag load from settlement around pile foundation is common and can be addressed in pile foundation design.

3.5.2 Shallow Soil Liquefaction

As discussed by Youd and Garris (1995), liquefiable soil that is not overlain by a sufficiently thick layer of soil that is not liquefiable is more prone to ground surface disruptions such as fissures and sand boils. Sand boils formed in portions of Alameda during the 1989 Loma Prieta Earthquake, though none are known to have formed at the project site. Building foundations bearing on shallow liquefiable soil could be subject to localized bearing capacity failures or excessive settlement due to ground loss. The thickness of non-liquefiable soil necessary to reduce this risk is a function of the thickness of the liquefiable soil layer below.

Since the landfill closure will involve reworking of the site soil by replacing it with compacted engineered fill to Elevation 49 feet and 50 feet and the depth of the liquefiable sand is 40 to 90 feet

below the existing ground surface, we consider the risk of sand boils forming within the project footprint to be negligible.

3.5.3 Cyclic Simple Shear Testing

Although liquefaction-induced settlement of the sand beneath the Young Bay Mud will not affect the proposed landfill systems due to the depth, the loss of strength of the material could affect the global stability of the landfill during an earthquake. Therefore, we performed CSS testing (Section 2.4.3.1) on select samples of sand deposits beneath the Young Bay Mud recovered from our Dames and Moore samplers to more accurately assess the cyclic response of the fine-grained site soil.

We performed CSS testing on fine-grained samples recovered at depths of approximately 60 feet below ground surface. Based on review of the CSS test results (Appendix C), the samples did not exhibit cyclic softening when subjected to cyclic stress ratios (CSRs) of 0.1 and 0.2. However, samples of the material experienced large shear strains after a couple cycles of loading when subjected to a CSR of 0.3. We used this data to calibrate the PM4 sand layer in our finite element model. We have a detailed discussion of this calibration in Section 3.6.2.2.

3.5.4 Lateral Spreading

Lateral spreading is a failure that causes soil to move toward a free face or down a gentle slope due to the pore-pressure build-up during liquefaction of an underlying saturated material. Lateral spreading often occurs along riverbanks and shorelines where loose, saturated sandy soil is commonly encountered at shallow depths.

As discussed above, a likely continuous potentially liquefiable sand layer exists beneath the Young Bay Mud. However, this layer varies from 40 to 90 feet deep, well below the bottom of the adjacent San Francisco Bay at the shoreline along the eastern border of the Landfill. As such, the risk of liquefaction-induced lateral spreading is negligible.

3.6 SLOPE DEFORMATION ANALYSES

We prepared this section to be in compliance with the Brisbane Baylands Development Final EIR Mitigation Measures 4.E-4a and 4.E-4b.

CCR Title 27 requires that the landfill CPCMP analyze the static and dynamic stability of the final cover and the landfill control systems. The elevation of the final cover at the project site will vary depending on proposed site use, utility locations, and building foundation penetrations. We anticipate that the elevation of the final cover will be lower at Visitacion Creek, the solar field, Bay Trail, and Lagoon Park. Whereas the final cover will be higher beneath buildings for sealing around foundation penetrations at Development Area D and F. Utilities will remain above the final cover where possible. The final grading of the final cover will be prepared as part of the final construction design drawings.

As shown on our cross sections (Figures 5A and 5B), the elevation of the waste is much lower than the existing site grades and is at or below the surrounding grades. Therefore, the stability of the waste itself is not at risk at this site. Since the final cover and landfill control systems will generally be at relatively low elevations compared to the design grades, these are not at risk from slope deformation at the project site.

The post-closure site development could be subject to seismic deformation; therefore, we have performed our slope deformation analysis with the final site development grades, which is more conservative than the configuration with just the final cover.

3.6.1 Analysis Approach

To perform our slope deformation analysis, we created seven idealized cross sections across the project site. The locations of the cross sections are depicted on Figure 2 with the section details in Figures 5A and 5B. A topographic survey of the current site grades and the proposed finished grades of the development were provided by BKF, 2021. We used these conceptual plans as the basis of our slope stability analysis.

To understand the seismic performance of the slopes around the perimeter of the site that will be constructed as part of the landfill closure and future site development, we performed seismic finite element analysis using the input ground-motion time histories described below on two cross sections (A-A' and B-B') that represent the most critical subsurface conditions at the site. The results of this analysis provide an in-depth understanding of the seismic behavior of the soil and the deformation risk. We then calibrated simplified limit-equilibrium slope stability analysis to the finite element results for these for these critical cross sections. Using this calibration, we performed simplified limit-equilibrium slope stability analysis to determine the slope deformation risk across the rest of the project site.

3.6.2 Finite-Element Analysis

In this section we describe the seismic finite-element analyses that we performed to evaluate the seismic slope deformation hazard for the project. First, we describe the development of the input ground-motion time histories and calibration of the material properties. Next, we describe the finite element modeling approach and parameters. We then summarize the results. We provide finite element analysis outputs in Appendix K.

3.6.2.1 Seismic Input for Finite Element Model

We performed a seismic-hazard analysis for the bedrock (base-of-profile) condition in order to develop a "target" response spectrum for use in ground-motion selection, scaling, and spectral matching. We then used these ground motions to perform one-dimensional ground-response analysis for calibration purposes and in our finite element analyses.

Seismic-Hazard Analyses

We performed our seismic-hazard analysis (SHA) in accordance with the 2019 California Building Code (2019 CBC). The 2019 CBC utilizes the seismic design criteria described in the 2016 ASCE/SEI 7 Standard (ASCE 7-16). As discussed in Section 3.4, the Design Earthquake response spectrum exceeds the MPE criteria and is the criteria that we selected for evaluating the seismic slope deformation hazard. In our experience with neighboring projects in the San Francisco Bay Area, the DE will provide a more conservative assessment considering higher level provisions are required for design of projects with structures to safeguard public life safety.

As discussed in Section 2.5, the site is underlain by Franciscan bedrock. Based on previous explorations at the site, we estimate that Franciscan bedrock is a depth of approximately 200 to 260 feet below the ground surface at Cross Sections A-A' and B-B'. We classified this bedrock as Site Class B per Chapter 20 of ASCE 7-16 based on measurements of shear-wave velocity (V_S)

and subsurface data in proximity to the site. We completed the following tasks to develop the Maximum Considered Earthquake (MCE) and Design Earthquake (DE) response spectra for this site.

- Perform probabilistic seismic-hazard analysis (PSHA) to develop a median-component (RotD50) response spectrum corresponding to a 2 percent probability of exceedance in 50 years (2,475-year return period).
- Perform deterministic seismic-hazard analysis (DSHA) to develop an 84th percentile RotD50 response spectrum.
- Compare the probabilistic and the deterministic response spectra to obtain the site-specific MCE response spectrum for the basement bedrock (base-of-profile) condition for the site.
- Multiply the site-specific MCE response spectrum by two-thirds to obtain the site-specific DE spectrum for the base-of-profile condition for the site.
- Compare the MCE and DE response spectra developed in the previous step with their corresponding 80 percent general response spectra to develop the recommended site-specific MCE and DE response spectra.

We used four semi-empirical ground-motion models (GMMs) from the Next Generation Attenuation West 2 (NGA West 2) project in the seismic-hazard analysis for this project. These include Abrahamson et al. (2014), Boore et al. (2014), Campbell and Bozorgnia (2014), and Chiou and Youngs (2014). We performed our analysis using all four GMMs for a spectral damping of 5 percent of critical damping. We used a logic-tree approach and assigned equal weight (0.25) to each of the four GMMs in our analysis.

The ground-motion models incorporate “site parameters” to model how subsurface soil will amplify or attenuate ground motions as they propagate from deeper underlying basement bedrock. These site parameters include:

- Time-averaged shear-wave velocity over the top 100 feet or 30 meters (V_{S30}).
- Depth at which the shear-wave velocity (V_S) reaches 3,280 feet/sec or 1.0 kilometer/sec ($z_{1.0}$).
- Depth at which V_S reaches 8,200 feet/sec or 2.5 kilometers/sec ($z_{2.5}$).

We estimated a bedrock V_{S30} based on V_S data collected from other project sites underlain by similar Franciscan bedrock in close proximity to the site; these sites include San Francisco International Airport located approximately 1½ miles from the site. Based on our understanding of the local and regional geology, the bedrock material at our other considered sites is consistent with the basement bedrock at the project site. Accordingly, we estimated a V_{S30} value of 3,000 feet per second (ft/s) (914 meters second per second (m/s)) for the bedrock/base-of-profile condition for the site, which corresponds to Site Class B.

We utilized the V_{S30}-based relationships described in the NGA West 2 GMM references (Abrahamson et al., 2014; Cambell and Bozorgnia, 2014; Chiou and Youngs, 2014) to estimate $z_{1.0}$ and $z_{2.5}$. We used $z_{1.0}$ values of 53 and 46 feet (16 and 14 meters) for the Abrahamson et al. (2014) and Chiou and Youngs (2014) GMMs, respectively, based on the suggested values in the associated references. Boore et al. (2014) recommends the same value as recommended by Chiou and Youngs (2014) in their GMM. Therefore, we used a $z_{1.0}$ value of 46 feet in the BSSA GMM. We used a $z_{2.5}$ value of 1,611 feet (491 meters) for the Campbell and Bozorgnia (2014) GMM.

We performed a probabilistic seismic-hazard analysis (PSHA) for the project site to develop a uniform hazard response spectrum (UHS) for a return period of 2,475 years. We used UCERF3, which is the most up-to-date rupture forecast model for the state of California and is required by ASCE 7-16. We calculated the seismic hazard using the standard methodology for seismic-hazard analysis (McGuire, 2004). The seismic-hazard calculations can be represented by the following equation, which is an application of the total-probability theorem.

$$H(a) = \sum_i v_i \iint P[A > a|m,r]\, f_{Mi}(\mathrm{m})\, f_{Ri|Mi}(\mathrm{r},\mathrm{m}) dr dm$$

In this equation, the hazard **H*(a)*** is the annual frequency of earthquakes that produce a ground motion amplitude ***A*** higher than ***a***. Amplitude ***A*** may represent peak ground acceleration, velocity, or it may represent spectral pseudo-spectral acceleration (PSa) at a given frequency. The summation in the equation shown extends over all sources (i.e., over all faults and areas). In the above equation, v_i is the annual rate of earthquakes (with magnitude higher than some threshold M_i) in source ***i***, and $f_{Mi}(m)$ and $f_{Ri|Mi}(r,m)$ are the probability density functions on magnitude and distance, respectively. ***P[A > a|m, r]*** is the probability that an earthquake of magnitude ***m*** at distance ***r*** produces a ground-motion amplitude ***A*** at the site that is greater than ***a***. Seismic sources may be either faults or area sources; the specification of source geometries and the calculation of $f_{Ri|Mi}$, are performed differently for these two types of sources.

We disaggregated the seismic hazard associated with the 2,475-year return period at the peak ground acceleration, and at spectral periods of 0.5, 2.0, and 5.0 seconds. These disaggregation results are presented in Appendix I. We summarize the dominant scenarios and their relative contributions to the hazard at each period in Table 3.6.2.1-1. These results represent sources contributing at least one percent to the seismic hazard at the site for the spectral periods considered and for the given return period. Gridded or areal sources are not presented. Bracketed numbers represent the UCERF3 subsection for a given fault.

TABLE 3.6.2.1-1: Summary of Disaggregation Results for a 2,475-Year Return Period*

SOURCE	R_{RUP}		M_W	PERCENT CONTRIBUTION			
	km	miles		PGA	0.5 SEC	2.0 SEC	5.0 SEC
San Andreas (Peninsula) [10]	8.6	5.4	7.95	75.3	78.7	81.4	83.7
San Gregorio (North) [5]	16.0	9.9	7.79	5.1	5.9	6.4	6.7
Hayward (North) [0]	21.6	13.4	7.47	2.3	3.1	2.9	< 1.0

*Based on USGS Unified Hazard Tool: Dynamic Conterminous U.S. 2014 (update) (v4.2.0)

Per ASCE 7-16, performing the deterministic seismic-hazard analysis involves development of the 84th percentile (i.e., lognormal mean plus one standard deviation) response spectrum for a spectral damping ratio of 5 percent considering characteristic magnitudes of significant faults, without background seismicity; however, it is important to note that the definition of characteristic magnitude is ambiguous when using the UCERF3 model due to its complexity. Based on the 2020 NEHRP Provisions, “scenario” earthquakes with significant contribution to the 2,475-year hazard should be used in lieu of “characteristic” earthquakes when performing deterministic analyses with UCERF3. We considered the sources presented in Table 3.6.2.1-1 to develop 84th percentile RotD50 DSHA response spectra. Per ASCE 7-16, we enveloped the results. The DSHA results are governed at all periods by the San Andreas (Peninsula) [0] scenario.

Structural design generally considers risk-targeted Maximum Considered Earthquake (MCE_R) response spectra. MCE_R response spectra are developed by applying maximum rotation factors and mapped risk factors to the RotD50 MCE response spectra; however, RotD50 MCE values are generally used, without the application of maximum-rotation or risk factors, in geotechnical analyses, including slope stability and liquefaction evaluations. Therefore, we did not apply mapped risk and maximum-rotation factors to the PSHA and DSHA response spectra for our slope stability analyses.

Per Chapter 21 of ASCE 7-16, the MCE is controlled by the lesser of the 2,475-year UHS and the 84th percentile deterministic response spectra. In accordance with Section 21.3 of ASCE 7-16, the MCE response spectrum is not permitted to be less than 80 percent of the general response spectrum (i.e., the code minimum) for the applicable site class. Since the code minimum is defined for the MCE_R response spectrum, we divided the code minimum by the period-dependent maximum rotation factors defined in Shahi and Baker (2014) in order to convert it to an associated MCE response spectrum. Note that we also compared the DSHA response spectrum against the equivalent RotD50 lower limit defined in Supplement 1 of ASCE 7-16. We considered these minimums and the PSHA and DSHA results described above to develop the base-of-profile MCE response spectrum. Per Section 21.3 of ASCE 7-16, we then calculated the DE response spectrum as two-thirds of the MCE. We present the base-of-profile MCE and DE response spectra in Exhibit 3.6.2.1-1 and Table 3.6.2.1-2.

EXHIBIT 3.6.2.1-1: Site-Specific Base-of-Profile MCE and DE Response Spectra

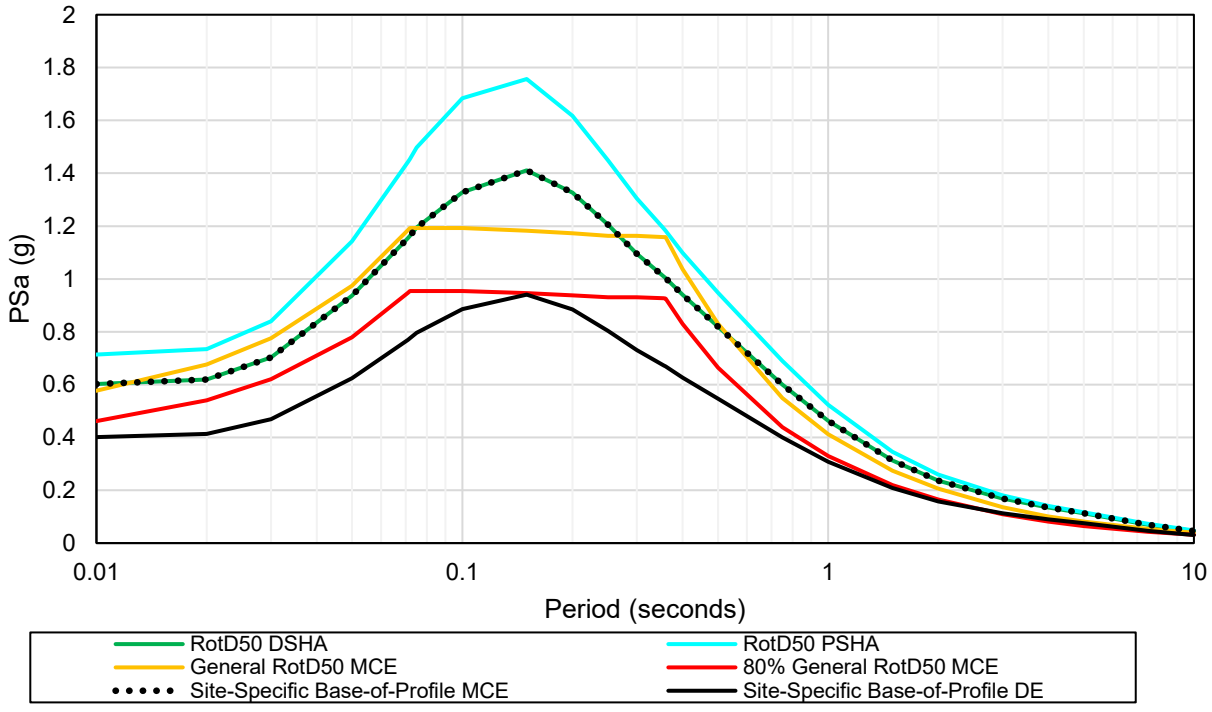


TABLE 3.6.2.1-2: Site-Specific, Base-of-Profile Bedrock MCE and DE Response Spectra

PERIOD (seconds)	PSEUDO-SPECTRAL ACCELERATION (g)	
	MCE	DE
0.01	0.603	0.402
0.02	0.619	0.413
0.03	0.703	0.469
0.05	0.937	0.624
0.071	1.154	0.770
0.072	1.163	0.775
0.075	1.194	0.796
0.10	1.328	0.885
0.15	1.411	0.941
0.20	1.326	0.884
0.25	1.205	0.803
0.30	1.095	0.730
0.356	1.009	0.673
0.36	1.003	0.669
0.40	0.940	0.627
0.50	0.819	0.546
0.75	0.600	0.400
1.0	0.463	0.308
1.5	0.313	0.208
2.0	0.237	0.158
3.0	0.169	0.113
4.0	0.135	0.090
5.0	0.113	0.075
7.5	0.070	0.046
10.0	0.046	0.031

Ground-Motion Selection, Scaling, and Matching

We selected eleven horizontal ground-motion (GM) time histories for use in our ground-response analysis and dynamic slope deformation analysis. First, we selected eleven pairs of orthogonal, horizontal ground-motion time histories. We then rotated each pair to an appropriate orientation and performed “hybrid” scaling-matching as described below.

When selecting GM time histories, we considered the disaggregation results (refer to Table 3.6.2.1-1 and Appendix I), including the dominant magnitudes, distances, and fault mechanisms. Additionally, we considered Arias Intensity (I_a), based on the Travasarou et al. (2003) and Foulser-Piggot and Stafford (2011) models, and significant duration ($D_{5\text{-}95}$), based on the Abrahamson and Silva (1996) and Kempton and Stewart (2006) models. Based on the Hayden et al. (2014) criteria, we selected five ground motions with velocity pulses.

We selected an appropriate component from each pair of GM time histories for use in subsequent analyses. Specifically, we resolved each pair of GM time histories into their non-redundant components (azimuths of 0 to 180 degrees). For those ground motions that do not contain a velocity pulse, we selected the azimuth that corresponds to the RotD50 PSa at the approximate softened period of the sliding mass. We assumed a softened period of 1.5 times the elastic period of the sliding mass (T_S). We estimated a T_S of approximately 0.75 second and a softened period

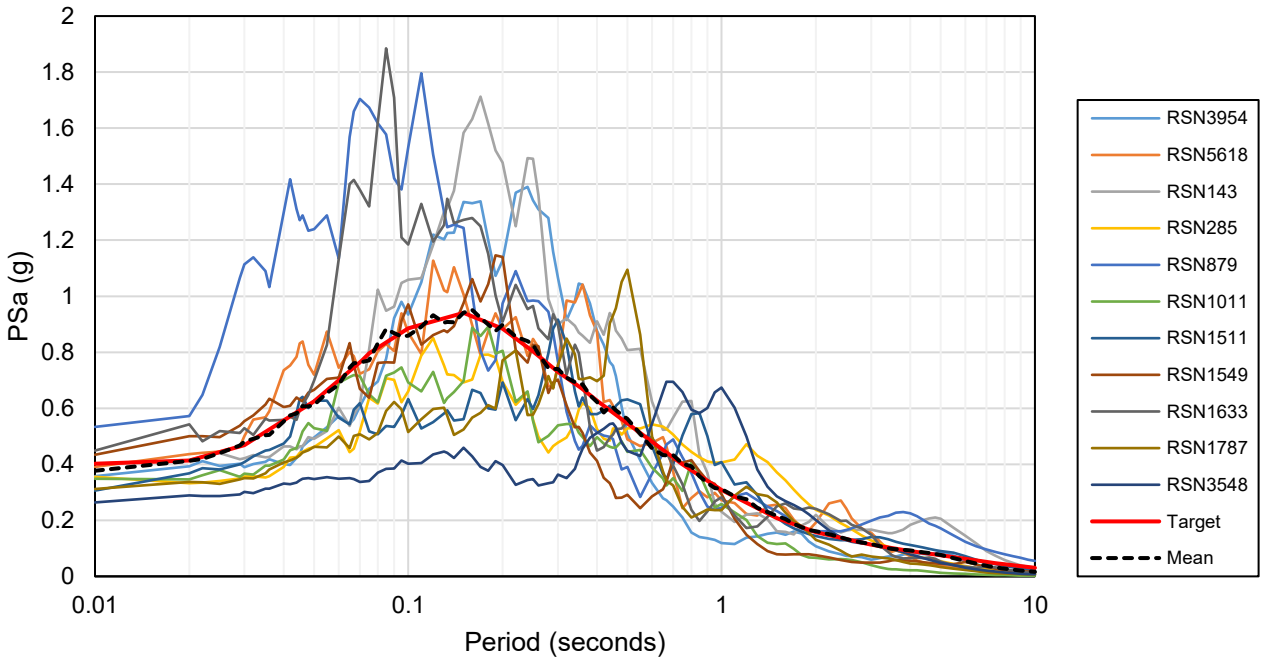
of 1.1 seconds. For the GMs with a velocity pulse, we selected the orientation that corresponds to the maximum component (RotD100) PSa at the softened period of the sliding mass. We also ensured that this component contained the velocity pulse. We provide a summary of the GM time histories that we selected in Table 3.6.2.1-3.

We applied the "Hybrid Matching" approach for spectral modification (Mazzoni et al., 2012). The process involves scaling the ground motions, then applying small modifications through spectral matching. This approach preserves the variability of the ground-motion suite and ensures that the key features of each time history are preserved, including the presence of a velocity pulse. We performed the Hybrid Matching approach such that the mean of all individual response spectra is approximately equal to the target base-of-profile DE response spectrum. We used the spectral matching algorithm described by Al-Atik and Abrahamson (2010) as implemented in the EZ-Frisk v8.06 software. The response spectra for all ground motions are shown in Exhibit 3.6.2.1-2, along with the mean and target. We show the initial scaled and matched ground-motion time histories in Appendix J.

TABLE 3.6.2.1-3: Properties of Scaled Ground-Motion Time Histories

RSN	EARTH-QUAKE	PULSE PERIOD (sec)	MAG. (M_W)	R_{RUP} (km)	FAULT TYPE	V_{S30} (m/s)	D_{5-95} (sec)	Azimuth (°)	INITIAL DE SCALE FACTOR	Ia (m/s)	PGA (g)	PGV (cm)
143	Tabas, Iran	6.19	7.35	2.1	Reverse	767	14.5	126	0.44	3.3	0.42	66.0
285	Irpinia, Italy-01	1.71	6.90	8.2	Normal	650	16.8	122	1.67	1.2	0.31	52.6
879	Landers	5.12	7.28	2.2	Strike Slip	1369	13.3	89	0.70	4.6	0.55	92.7
1011	Northridge-01	-	6.69	20.3	Reverse	1223	8.9	49	2.33	1.0	0.33	21.3
1511	Chi-Chi, Taiwan	4.73	7.62	2.7	Reverse Oblique	615	29.0	16	0.77	2.5	0.25	49.0
1549	Chi-Chi, Taiwan	-	7.62	1.8	Reverse Oblique	511	31.0	177	0.67	3.0	0.42	29.3
1633	Manjil, Iran	-	7.37	12.6	Strike Slip	724	30.2	59	0.83	4.3	0.41	34.1
1787	Hector Mine	-	7.13	11.7	Strike Slip	726	11.2	87	0.89	1.6	0.31	32.8
3548	Loma Prieta	1.57	6.93	5.0	Reverse Oblique	1070	4.7	42	0.57	0.8	0.26	55.2
3954	Tottori, Japan	-	6.61	15.6	Strike Slip	967	7.7	36	1.83	1.7	0.35	24.4
5618	Iwate, Japan	-	6.90	16.3	Reverse	826	21.5	23	1.43	2.8	0.39	32.5

EXHIBIT 3.6.2.1-2: Response Spectra for Matched Ground Motions



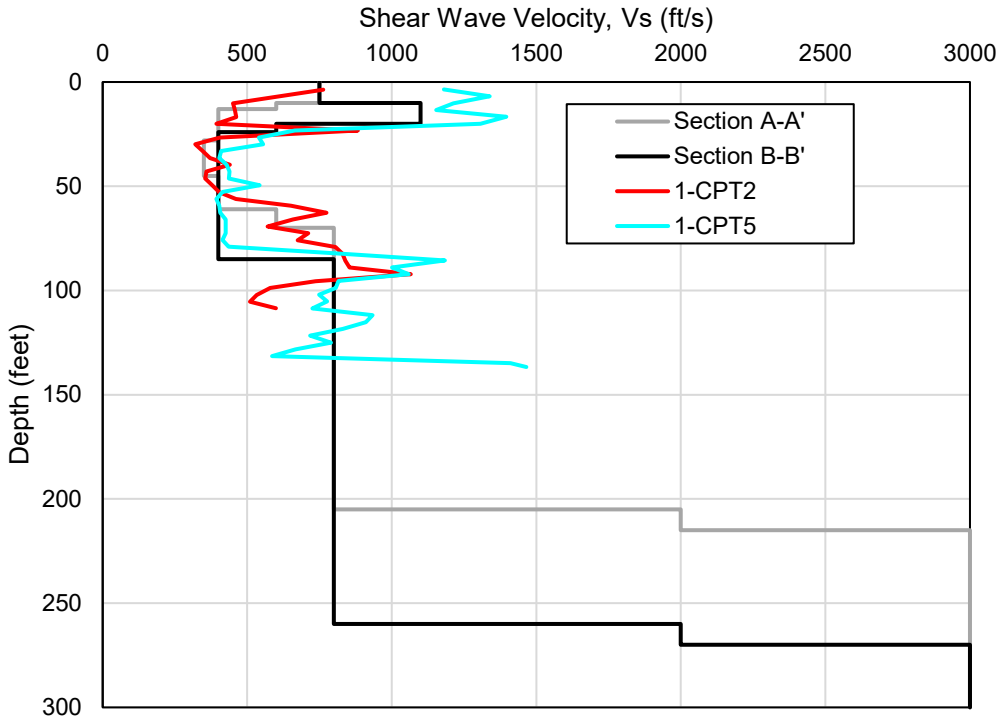
One-Dimensional Ground-Response Analysis

We performed one-dimensional (1D) ground-response analysis (GRA) to support our dynamic slope deformation analysis. Specifically, we performed 1D GRA for Cross Sections A-A' and B-B' in order to obtain "within" GM time histories at the top of bedrock. We then used these "within" GM time histories at the base of our finite element model, as described in Section 3.6.2.2. We describe critical aspects of the 1D GRA below.

We relied on shear-wave velocity data that we collected from 1-CPT2 and 1-CPT5 to develop representative V_S profiles for Cross Sections A-A' and B-B'. For depths where V_S data was not available, we extended the V_S profiles to the estimated bedrock depth such that the theoretical elastic site period was consistent with the inferred site period from our HVSR data. Initially, we modeled the Pleistocene deposits with three layers that gradually increase in V_S from 600 to 800 ft/s to represent the Old Bay Clay. However, after further review of the geotechnical data, and based on the presence of dense sand interlayers at various depths, we found it more appropriate to model the Pleistocene deposits with a single composite V_S of 800 ft/s.

We show the V_S data and idealized V_S profiles in Exhibit 3.6.2.1-3. Note that these profiles represent the current condition, since we used these profiles to calibrate against the HVSR data, which is influenced by current grades. As described previously, additional fill will be placed to meet the proposed grades. We accounted for these final proposed grades in our finite element analyses.

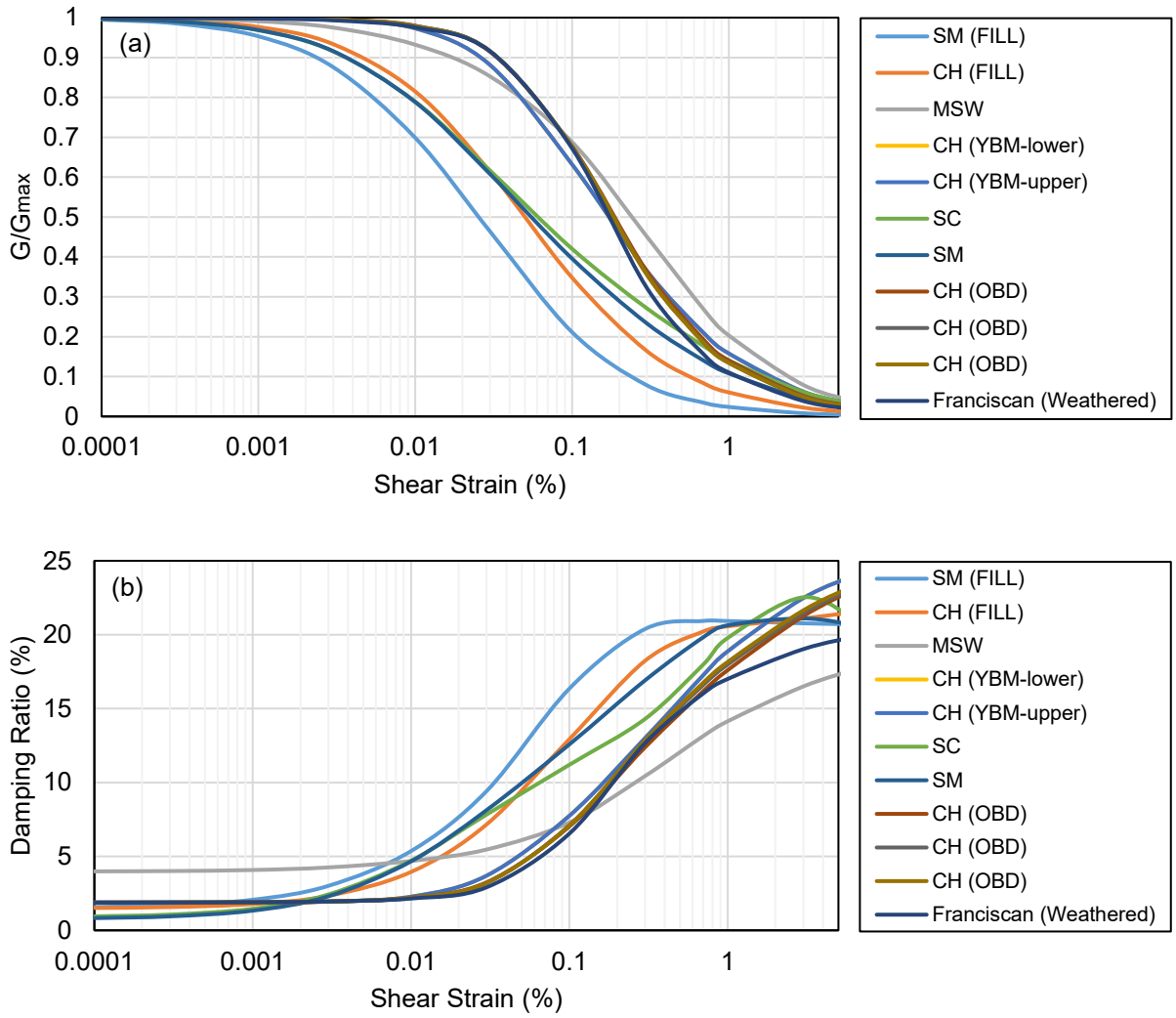
EXHIBIT 3.6.2.1-3: Idealized Shear-Wave Velocity Profiles



Non-linear modulus reduction (G/G_{max}) and damping (D) curves are required for each soil layer considered in the site-response analysis. We assigned G/G_{max} and D curves for the fill and granular Pleistocene deposits based on the confining pressure and material dependent relationships provided in Darendeli (2001). We assigned G/G_{max} and D curves for the Young Bay Mud and Old Bay Clay based on data obtained from the same material at other sites (Vahdani et al., 2002). We assigned the G/G_{max} and D curves for the waste material based on the generalized curves in Zekkos et al. (2011) for municipal solid waste with 62 to 76 percent less than 20 millimeters. We show representative G/G_{max} and D curves in Exhibit 3.6.2.1-4.

At large strains (greater than approximately 0.5 percent), the G/G_{max} curves from empirical relationships are unbounded by laboratory measurements and can imply unrealistic shear strengths. Thus, when large strains are expected in the site-response analysis, it is necessary to adjust the large strain portions of the G/G_{max} curves to account for the soil shear strength. Accordingly, we adjusted the high-strain G/G_{max} values in all layers to reflect the estimated shear strength of the soil (Groholski et al., 2016). We estimated the shear strengths from the available exploration data.

EXHIBIT 3.6.2.1-4: (a) Modulus Reduction and (b) Damping Ratio Curves Used in 1D GRA



We performed nonlinear (NL) site-response analyses in order to account for the degradation of soil stiffness and increase in damping with increasing strain levels. We used the General Quadratic/Hyperbolic (GQ/H) constitutive model, as implemented in DEEPSOIL v7.1 (Groholski et al. 2016; Hashash et al. 2017), to perform the NL analyses. Note that NL analyses are performed in the time domain and solve for the dynamic response of multi-degree-of-freedom systems subject to base excitation (Kim et al., 2016). Thus, the NL analyses did not directly use the G/G_{max} and damping curves above. Rather, we calibrated the constitutive model parameters such that the nonlinear behavior implied by the G/G_{max} and damping curves was captured.

We extracted "within" GM time histories at the top of bedrock to input into our dynamic slope deformation analysis. We present comparisons between 1D GRA and the finite element model in the next section.

3.6.2.2 PLAXIS 2D Modeling

We performed two-dimensional (2D) nonlinear, finite-element, dynamic slope deformation analyses on Cross Sections A-A' and B-B' using the computer program PLAXIS 2D, Version 21.

Geometry, Boundary Conditions, and Input Ground Motions

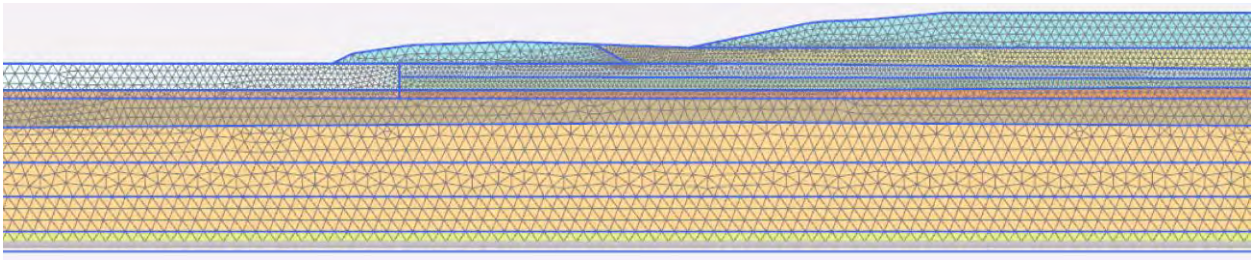
We specified the analysis input ground motions (refer to Section 3.6.2.1) at the base of the model. We used "within" type ground motions that we extracted from DEEPSOIL v7.1 in our analysis at the top of the Franciscan bedrock. We applied the ground motions as acceleration time histories in the horizontal direction, with the base fixed in the vertical direction. Consistent with "within" type ground motions, we used a rigid boundary condition at the base of the model. We defined the horizontal boundaries of the model as "free-field" to absorb incoming waves.

We performed our analysis for each ground motion record in the positive and negative horizontal directions and averaged the deformations obtained from the two directions. This approach removes directional biases and corrects for sliding of the entire model, which is a potential outcome due to the nature of the modelling.

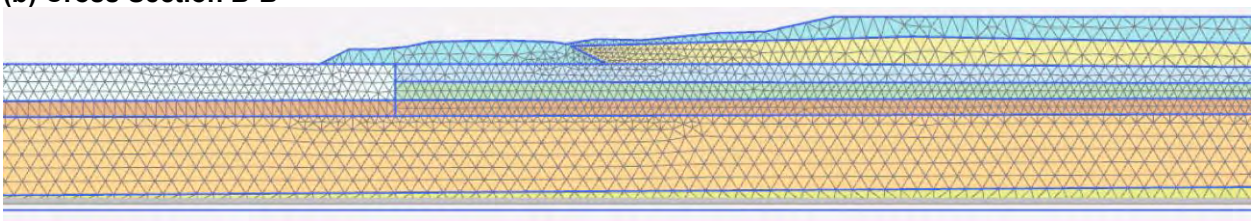
Exhibit 3.6.2.2-1 shows the geometry and "connectivity plots," or finite element meshing, for Cross Sections A-A' and B-B'. In Appendix K, we provide connectivity plots with additional details including layer names and lateral and vertical dimensions. We optimized the mesh sizing with a sensitivity analysis in order to maintain both accuracy and mesh efficiency.

EXHIBIT 3.6.2.2-1: Connectivity Plots for:

(a) Cross Section A-A'



(b) Cross Section B-B'



Constitutive Models

We simulated the response of the soil and bedrock in our analysis using the Hardening Soil with Small Strains (HS-Small) and PM4Sand models. The HS-Small model is a modification of the Hardening Soil model that accounts for the increased stiffness of soil at small strains and its nonlinear degradation with increasing strain. The PM4Sand model PM4Sand is a stress-ratio controlled, critical

state compatible, bounding surface plasticity model for sand and other purely non-plastic granular soil.

We used the HS-Small model to simulate the behavior of all existing fill and proposed engineered fill, Young Bay Mud, deeper layers of the marine sand, and Old Bay Deposits. For shallower layers of the marine sand that were generally found to be susceptible to liquefaction, we used the PM4Sand model calibrated against cyclic simple shear testing. Additionally, for ground motions that triggered liquefaction throughout large portions of the PM4Sand layer early in the time history, we switched to the HS-Small model and utilized a residual strength material to account for liquefaction-induced strength loss and to increase computational efficiency. We summarize the HS-Small and PM4Sand properties that we used in our analysis in Table 3.6.2.2-1. We developed these material properties based on our boring and CPT logs, laboratory testing, and geophysical testing at the site.

Based on our laboratory testing, we assigned a dynamic undrained strength ratio (S_U/σ'_{vo}) of 0.36 to the Young Bay Mud. This strength ratio is approximately 20 percent higher than the static strength to account for rate effects and corresponds to a strength increase of approximately 17 psf per foot of depth. The onshore Young Bay Mud is stronger due to the higher in situ vertical effective stress. For the sand layers that we modeled with the HS-Small model and a post-liquefied shear strength, we assigned an undrained strength ratio of 0.2 based on Idriss and Boulanger (2008). We assumed similar strength ratios in the Old Bay Clay as the Young Bay Mud. The stress dependence of the stiffness of a material is a function of friction angle for the HS-Small model. In order to capture variations in stiffness over the thickness of each material, we developed representative cohesion and friction angles to capture the S_U/σ'_{vo} for each layer. We assigned a friction angle of 33 degrees to the waste material based on Kavazanjian et al. (1995).

We selected the HS-Small parameters such that the hysteretic response under seismic loading is consistent with the modulus reduction and damping curves presented in Exhibit 3.6.2.1-4. We introduced Raleigh damping in each soil layer to capture the small-strain damping. The Raleigh damping parameters are summarized in Table 3.6.2.2-1.

TABLE 3.6.2.2-1a: Hardening Soil with Small Strains Parameters Part 1

PARAMETER	SYMBOL	FILL (SM)	WASTE	YBM – Upper (CH)
Material Model		HS-small	HS-small	HS-small
Drainage Type		Drained	Drained	Undrained (A)
Unsaturated Unit Weight (pcf)	γ_{unsat}	125	100	110
Saturated Unit Weight (pcf)	γ_{sat}	125	100	110
Small Strain Shear Modulus (ksf)	G_0^{ref}	2,184	497	419
Nonlinearity Parameter	$\gamma_{0.7}$	0.1×10^{-3}	0.65×10^{-3}	0.6×10^{-3}
Young's Modulus (ksf)	E_{50}^{ref}	582	133	84
Volumetric Stiffness (ksf)	E_{oed}^{ref}	582	133	84
Unloading-Reloading Modulus (ksf)	E_{ur}^{ref}	1,747	398	251
Effect of Confining Stress	m	0.5	0.5	0.5
Cohesion (psf)	c'_{ref}	100	180	100
Peak Friction Angle (°)	φ'	34	33	18
Rayleigh Damping Parameter	α	0.06258	0.06258	0.06258
Rayleigh Damping Parameter	β	0.6341×10^{-3}	0.6341×10^{-3}	0.6341×10^{-3}

TABLE 3.6.2.2-1b: Hardening Soil with Small Strains Parameters Part 2

PARAMETER	SYMBOL	YBM – LOWER (CH)	YBM – OFFSHORE (CH)	MARINE SAND – NON. LIQ. (SM)
Material Model		HS-small	HS-small	HS-small
Drainage Type		Undrained (A)	Undrained (A)	Drained
Unsaturated Unit Weight (pcf)	γ_{unsat}	110	110	125
Saturated Unit Weight (pcf)	γ_{sat}	110	110	125
Small Strain Shear Modulus (ksf)	G_0^{ref}	547	419	2,484
Nonlinearity Parameter	$\gamma_{0.7}$	0.6×10^{-3}	0.6×10^{-3}	0.22×10^{-3}
Young's Modulus (ksf)	E_{50}^{ref}	109	84	353
Volumetric Stiffness (ksf)	E_{oed}^{ref}	109	84	353
Unloading-Reloading Modulus (ksf)	E_{ur}^{ref}	328	251	1,060
Effect of Confining Stress	m	0.5	0.5	0.5
Cohesion (psf)	c'_{ref}	100	50	3,000
Peak Friction Angle (°)	φ'	18	15	15
Rayleigh Damping Parameter	α	0.06258	0.06258	0.06258
Rayleigh Damping Parameter	β	0.6341×10^{-3}	0.6341×10^{-3}	0.6341×10^{-3}

TABLE 3.6.2.2-1c: Hardening Soil with Small Strains Parameters Part 3

PARAMETER	SYMBOL	MARINE SAND – RESIDUAL (SM)	OBD (CH)	FRANCISCAN
Material Model		HS-small	HS-small	HS-small
Drainage Type		Drained	Undrained (A)	Undrained (A)
Unsaturated Unit Weight (pcf)	γ_{unsat}	125	110	135
Saturated Unit Weight (pcf)	γ_{sat}	125	110	135
Small Strain Shear Modulus (ksf)	G_0^{ref}	349	2,186	16,770
Nonlinearity Parameter	$\gamma_{0.7}$	0.25×10^{-3}	0.7×10^{-3}	0.7×10^{-3}
Young's Modulus (ksf)	E_{50}^{ref}	75	437	2,683
Volumetric Stiffness (ksf)	E_{oed}^{ref}	75	437	2,683
Unloading-Reloading Modulus (ksf)	E_{ur}^{ref}	186	1,310	8,050
Effect of Confining Stress	m	0.5	0.5	0.5
Cohesion (psf)	c'_{ref}	0	50	5,000
Peak Friction Angle (°)	φ'	11.3	17.5	15
Rayleigh Damping Parameter	α	0.06258	0.06258	0.06258
Rayleigh Damping Parameter	β	0.6341×10^{-3}	0.6341×10^{-3}	0.6341×10^{-3}

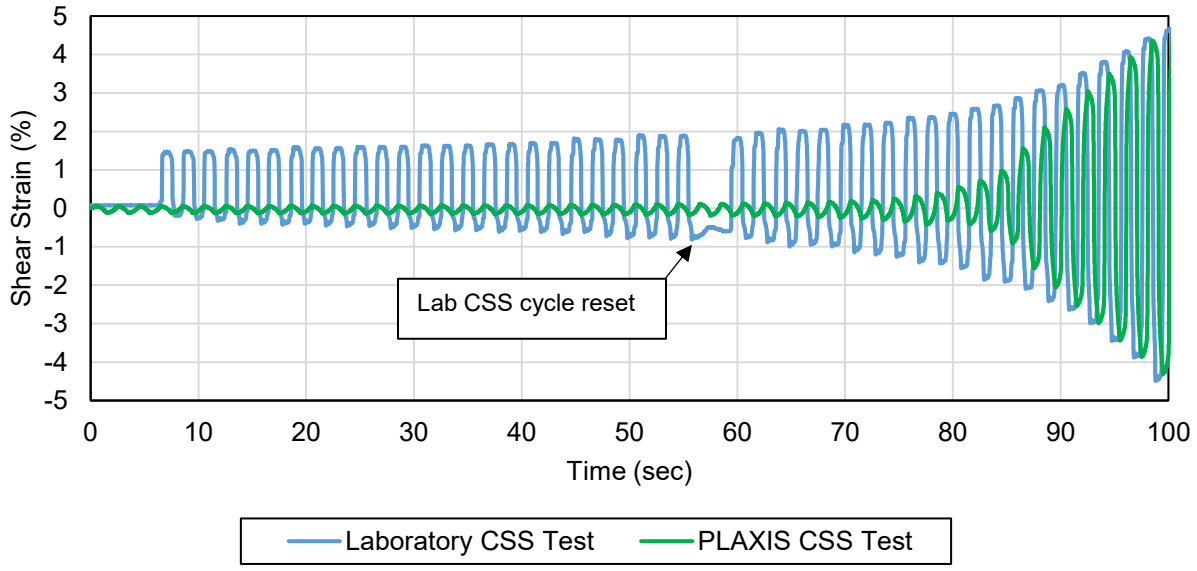
TABLE 3.6.2.2-1d: PM4Sand Parameters

PARAMETER	SYMBOL	MARINE SAND (SC)
Material Model		PM4Sand
Drainage Type		Undrained (A)
Unsaturated Unit Weight (pcf)	γ_{unsat}	125
Saturated Unit Weight (pcf)	γ_{sat}	125
Relative Density	D_{R0}	0.666
Shear Modulus Coefficient	G_0	1200
Contraction Rate Parameter	h_{p0}	2.0

PARAMETER	SYMBOL	MARINE SAND (SC)
Atmospheric Pressure (psf)	p_A	2116
Maximum Void Ratio	e_{max}	0.8
Minimum Void Ratio	e_{min}	0.3
Bounding Surface Parameter	n^b	0.5
Dilatancy Surface Parameter	n^d	0.1
Critical State Friction Angle (°)	φ_{cv}	36
Poisson's Ratio	v	0.3
Critical State Line Parameters	Q	10
	R	1.5
Post Shake Switch	PostShake	0
Rayleigh Damping Parameter	α	0.06258
Rayleigh Damping Parameter	β	0.6341×10^{-3}

The PM4Sand constitutive model parameters are generally grouped into primary and secondary parameters. The primary parameters, which include relative density (D_{R0}), shear modulus coefficient (G_0), and contraction rate parameter (h_{p0}), are considered to be the most important for model calibration. The secondary set of parameters may be set to the provided default values or modified by the user (Boulanger and Ziotopoulou, 2017). We estimated the relative density and shear modulus coefficient using our CPT and shear-wave velocity data, respectively. We then calibrated the contraction rate parameter against the results of our laboratory cyclic simple shear tests. For comparison purposes, we simulated a cyclic simple shear test using the PLAXIS SoilTest module in order to verify that the cyclic response of a single element reasonably matched our laboratory test results. Exhibit 3.6.2.2-2 shows the comparison of shear strain development versus time for a CSR of 0.20. While the simulated results show lower strains during the early stages of the loading, the simulated and laboratory tests show similar behavior at strains greater than approximately 2 percent.

EXHIBIT 3.6.2.2-2: Comparison of Laboratory and Simulated CSS Tests



We calibrated the material properties used in the PLAXIS modelling by comparing acceleration response spectra developed from 1D GRA (Section 3.6.2.1) to the response spectra obtained from a 1D "free-field" PLAXIS model that we created for calibration purposes. After initially setting model parameters based on our field and laboratory data and consideration of appropriate modulus reduction and damping ratio curves, we calibrated the material properties in our numerical model to result in reasonable consistency between the DEEPSOIL and PLAXIS analyses. Exhibits 3.6.2.2-3 and 3.6.2.2-4 compare response spectra extracted from both models at the surface (i.e., in the engineered fill) and in the Young Bay Mud layers for ground motions RSN143 and RSN1011, respectively.

EXHIBIT 3.6.2.2-3: Comparison of Response Spectra Obtained from DEEPSOIL and PLAXIS for RSN 143

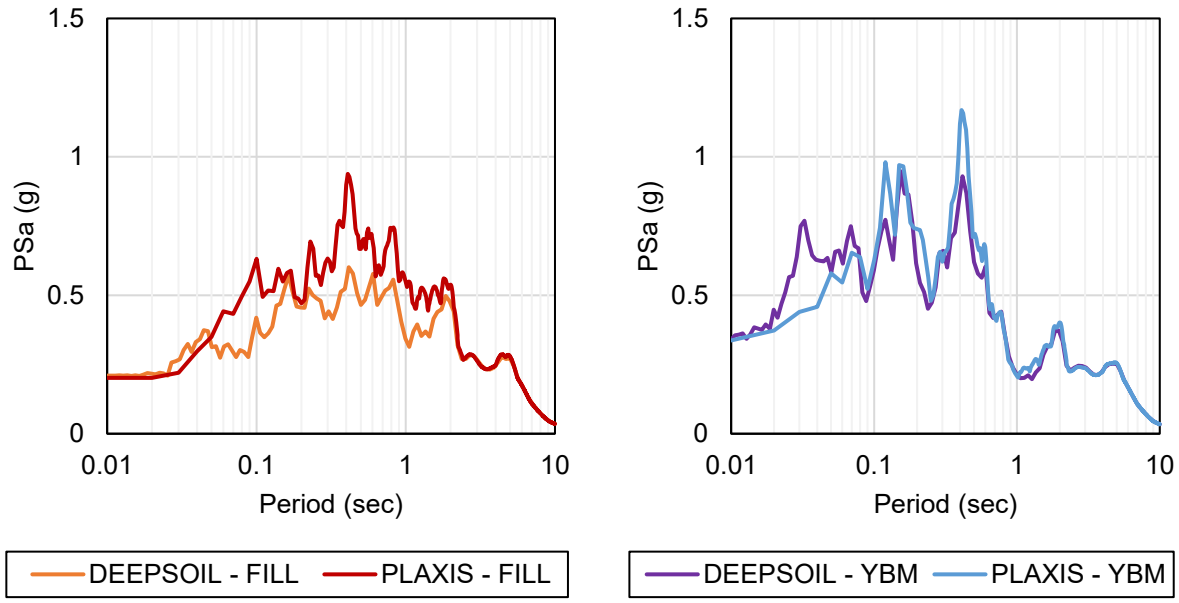
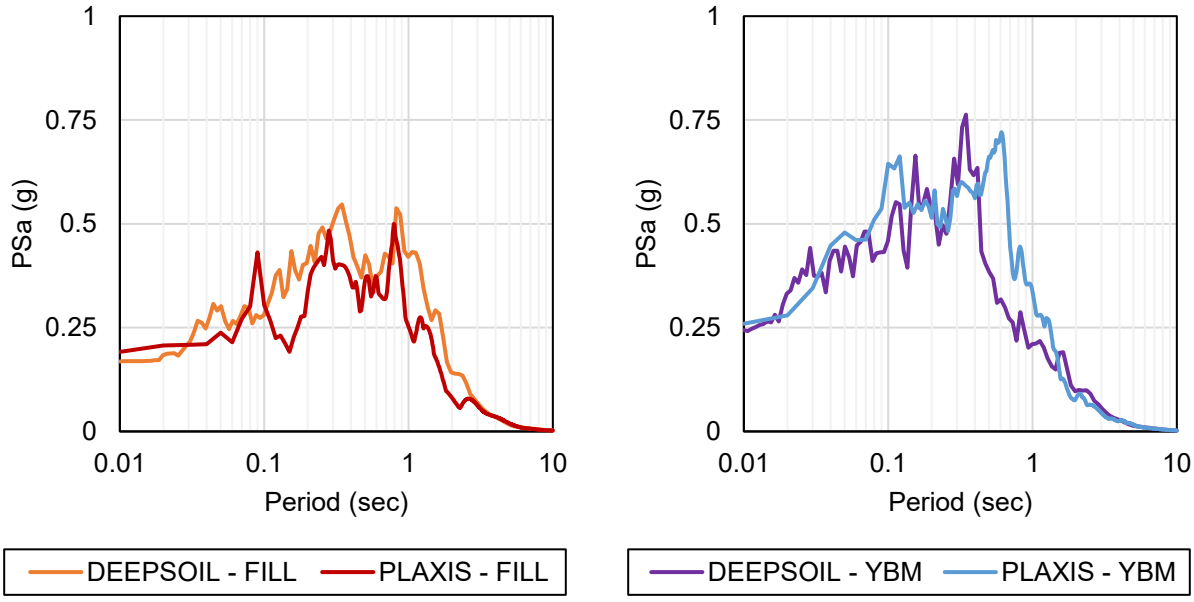


EXHIBIT 3.6.2.2-4: Comparison of Response Spectra Obtained from DEEPSOIL and PLAXIS for RSN 1011



3.6.2.3 PLAXIS Deformation Analysis Results

We summarize the seismic slope deformations obtained from our finite element analyses below.

We evaluated deformations relative to the top of the Old Bay Clay, as deeper deformations appeared to be related to lateral translation of the upper portion of the model rather than slope instability. Accurate modeling of this deeper movement requires an impractically large model. In our experience, slope stability analyses in the Bay Area generally are governed Young Bay Mud and potentially liquefiable material; therefore, we focused on these materials in our modeling.

In Exhibit 3.6.2.3-1, we show the lateral deformation profile at an *x*-value of 1,250 feet in Cross Section A-A', which corresponds to the top of the slope. On average, the maximum lateral deformation at this location is approximately ½ foot, with deformations decreasing with depth. In Exhibit 3.6.2.3-2, we show the lateral deformation profile at an *x*-value of 1,300 feet in Cross Section B-B', which corresponds to the top of slope at that location. Lateral deformations are higher at this location, with an average maximum deformation of approximately one foot.

We show the lateral deformations at the ground surface for Cross Sections A-A' and B-B' in Exhibits 3.6.2.3-3 and 3.6.2.3-4, respectively. We used these exhibits to develop our setback recommendations provided in Section 3.6.4.

We provide additional finite element analysis outputs in Appendix K.

EXHIBIT 3.6.2.3-1: Lateral Deformation Profiles for Section A-A' at an *x*-value of 1,250 feet (negative values indicate movement to the left in model)

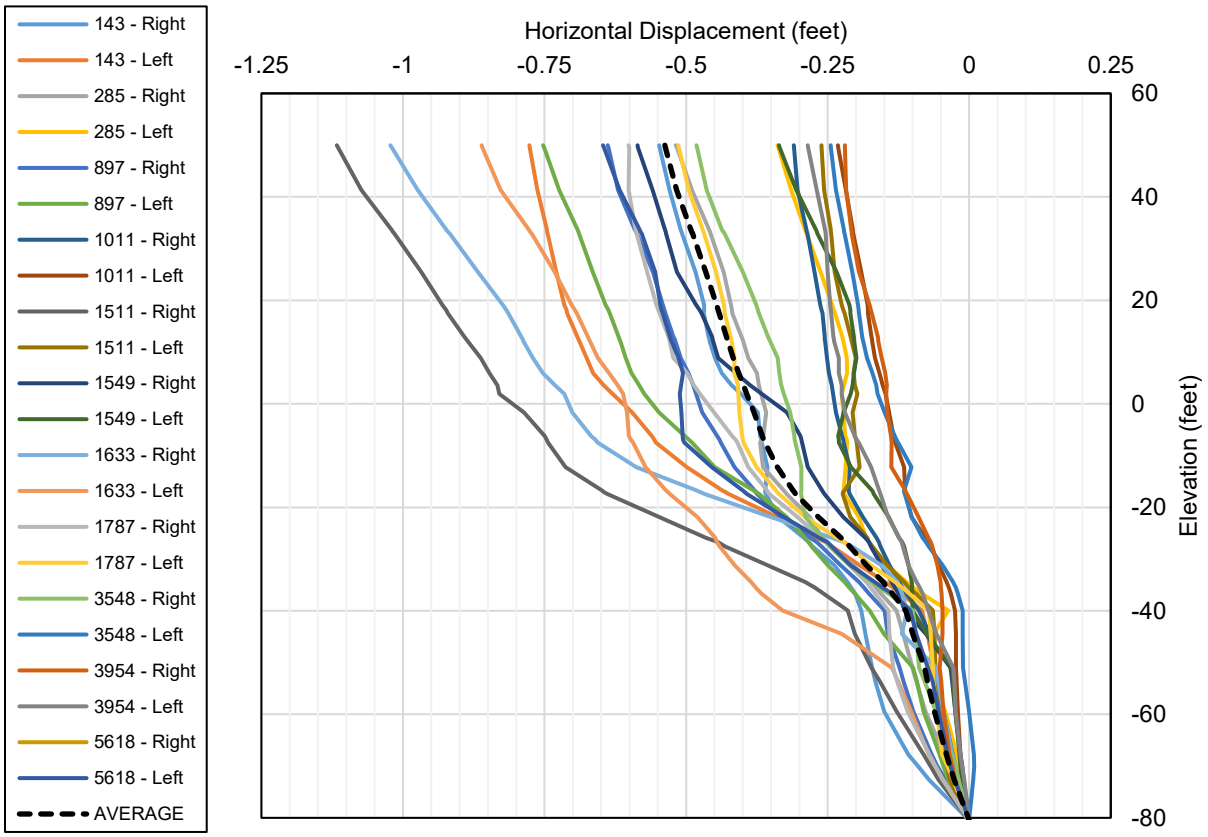


EXHIBIT 3.6.2.3-2: Lateral Deformation Profiles for Section B-B' at an *x*-value of 1,300 feet (negative values indicate movement to the left in model)

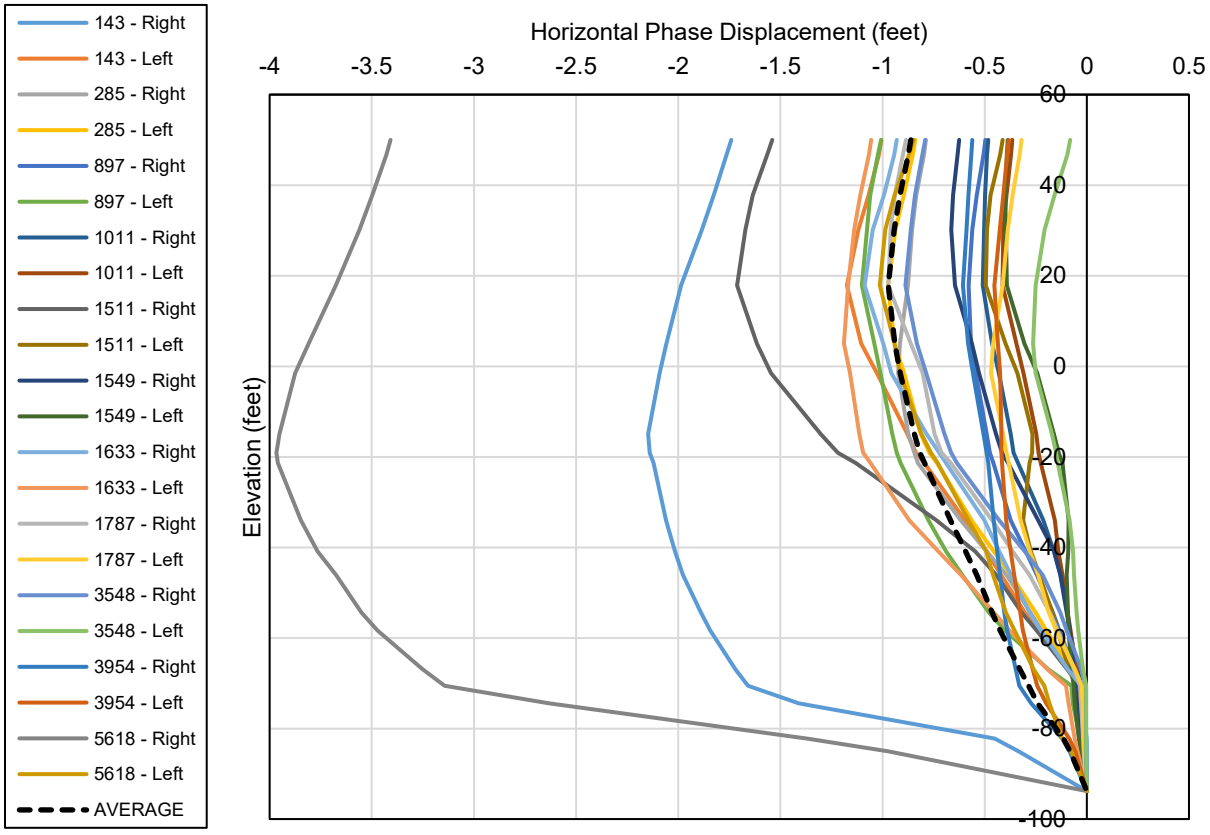


EXHIBIT 3.6.2.3-3: Lateral Deformations at the Ground Surface for Section A-A' (negative values indicate movement to the left in model)

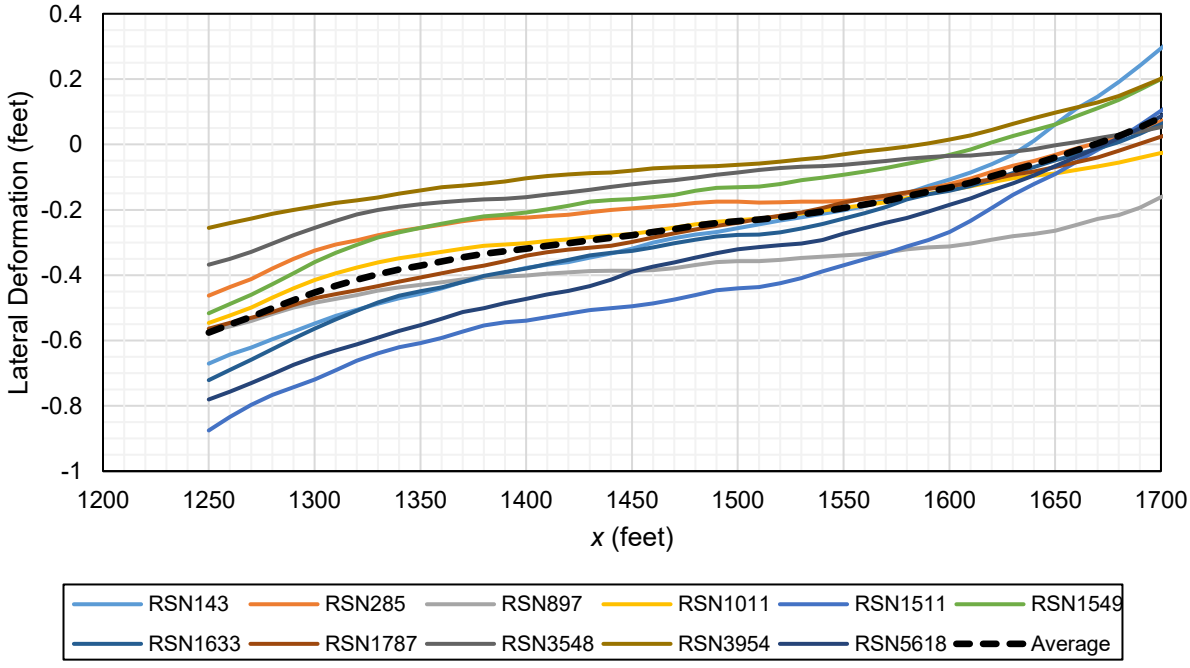
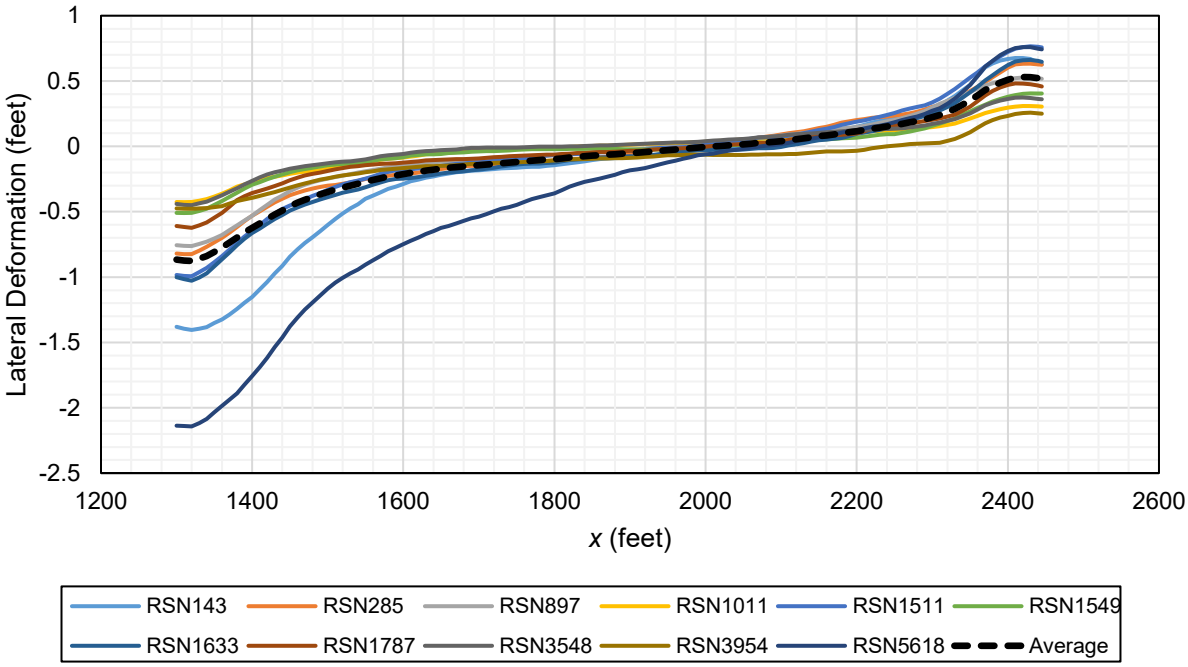


EXHIBIT 3.6.2.3-4: Lateral Deformations at the Ground Surface for Section B-B' (negative values indicate movement to the left in model)



3.6.3 Limit-Equilibrium Analysis

3.6.3.1 Pseudostatic Limit-Equilibrium Analysis

In addition to our finite element analysis, we performed a pseudostatic analysis on Cross Sections A-A' and B-B' and calibrated the soil parameters in order to result in similar deformations as estimated by the finite element analysis. We then used the calibrated parameters to estimate the deformation at the rest of the cross sections at the project site based on the pseudostatic analysis. We used a SHANSEP method to model the Young Bay Mud strength. We calibrated the pseudostatic analysis to the finite element analysis by varying vertical stress ratio (S_u/σ'_v). Table 3.6.3.1-1 shows the lateral deformation from the finite element analysis, the yield acceleration for the pseudostatic analysis to result in the same deformation, and S_u/σ'_v calibrated for the deformation. Our pseudostatic deformation analysis methodology is detailed below in Section 3.6.3.2.

TABLE 3.6.3.1-1: Pseudostatic Strength Calibration

CROSS SECTION	LATERAL DEFORMATION	YIELD ACCELERATION (k_y)	RESULTING UNDRAINED STRENGTH RATIO (S_u/σ'_v)
A-A' East	7 inches	0.18	0.30
B-B' East	9 inches	0.17	0.27
B-B' West	6½ inches	0.19	0.27

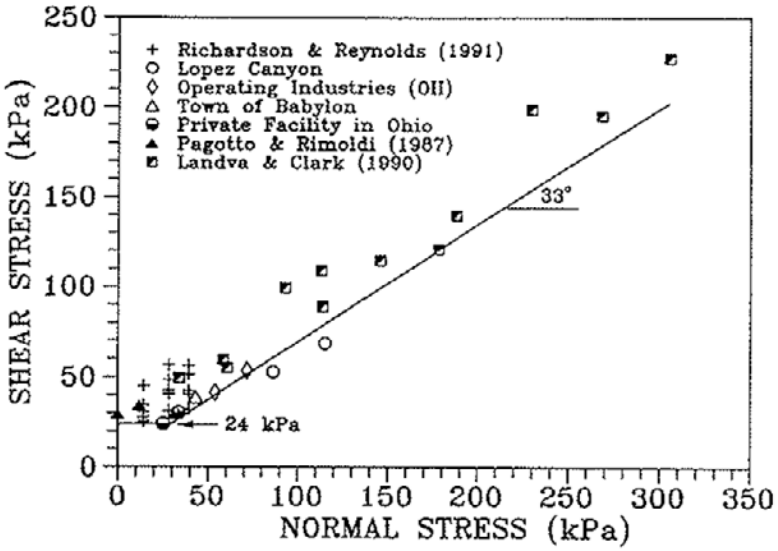
Based on our pseudostatic strength calibration, we used an average S_u/σ'_v value of 0.28 for the pseudostatic analysis of the rest of the cross sections. The sand below the Young Bay Mud has portions that will liquefy. We used a composite S_u/σ'_v to model the strength of this layer, with S_u/σ'_v of 0.20 for the portions that liquefy and S_u/σ'_v of 0.78 for the portions that do not, resulting in a composite S_u/σ'_v of 0.48. We also calibrated the strength of the Old Bay Clay to model failure surfaces in the pseudostatic analysis that are consistent with the finite element analysis. The material properties used in the limit-equilibrium analysis are summarized in Table 3.6.3.1-2.

TABLE 3.6.3.1-2: Pseudostatic Slope Deformation Analysis Material Properties

SOIL LAYER	UNIT WEIGHT (pcf)	COHESION (psf)	FRICTION ANGLE (degree)	COHESION CHANGE (psf/ft)	S_u/σ'_v	SHANSEP m
Fill	125	125	31	-	-	-
Waste	100	-	-	-	-	-
Young Bay Mud (YBM)	110	-	-	-	0.28	0.9
Sand (static)	125	0	35	-	-	-
Sand (Pseudo Static)	125	-	-	-	0.48	-
Old Bay Clay (OBC)	110	1,600 to 2,200	-	20	-	-

For the strength of the waste, we used a bilinear strength envelope based on Kavazanjian et al. (1995). Exhibit 3.6.3.1-1 shows this strength envelope.

EXHIBIT 3.6.3.1-1: Bilinear Waste Strength Envelope (from Kavazanjian et al., 1995)



3.6.3.2 Method of Analysis

We performed our pseudostatic analysis using the computer program SLIDE, which is a limit equilibrium program that allows the user various search routines to locate the minimum factor of safety and critical slip surface. The pseudostatic method models the effects of transient earthquake loading on a potential slide mass by using an equivalent sustained horizontal force determined as the product of a seismic coefficient and the weight of the potential slide mass. We used a staged pseudostatic strength for the calculation of effective stresses. We used circular

and non-circular searching methods and Spencer's method for our analyses (Spencer, 1973). We used a circular-type failure surface for our final analyses, as a circular-type failure appears to provide a more reasonable estimate of the failure surface shape and size indicated in the finite element analyses. We performed a slope search with defined boundary conditions. We used a design groundwater level of Elevation 10 feet.

We looked at the following three procedures for estimation of deformation during our calibration to the finite element results: National Cooperative Highway Research Program (NCHRP-Report 611), Makdisi and Seed (1978), and Bray and Travasarou (2007) to estimate lateral deformation. For the Bray and Travasarou method, we used a spectral acceleration of 1.4g. We ultimately concluded that the method from NCHRP-Report 611 was the best fit for the calibration to the finite element results, and we used this method to estimate the deformation for the rest of the cross sections around the project site.

3.6.3.3 Pseudostatic Displacement Analysis

Table 3.6.3.3-1 shows the estimated deformation results from our pseudostatic analysis.

TABLE 3.6.3.3-1: Pseudostatic Analysis Lateral Deformation Results

SECTION	YIELD ACCELERATION (k_y)	LATERAL DEFORMATION (inches)
A-A' West	0.28	0
C-C' East	0.20	4
C-C' West	0.23	1
D-D'	0.31	0
E-E'	0.23	2
F-F'	0.21	3
G-G'	0.19	5

3.6.3.4 Static Limit-Equilibrium Analysis

Using the program SLIDE, and the material properties and methods described above, we performed a static limit-equilibrium analysis for the proposed slopes at the project site. Table 3.6.3.4-1 shows the resulting factors of safety for our static limit-equilibrium analysis.

TABLE 3.6.3.4-1: Static Limit-Equilibrium Analysis Results

CROSS SECTION	FACTOR OF SAFETY
A-A' East	2.0
A-A' West	3.0
B-B' East	2.7
B-B' West	2.7
C-C' East	2.7
C-C' West	2.6
D-D'	3.7
E-E'	2.7
F-F	2.5
G-G'	2.2

The static factors of safety for all cross sections at the project site are above 1.5 and are deemed acceptable. The results of our static limit-equilibrium analysis are shown in Appendix M.

3.6.4 Slope Deformation Setback

For Cross Sections A-A' East, B-B' East, and B-B' West, we estimated the setback distance where the lateral deformation is estimated to be less than 6 inches based on our finite element analysis. We estimated setback distances for the remaining cross sections based on comparing the finite element and pseudostatic results. We present these setback distances in Table 3.6.4-1.

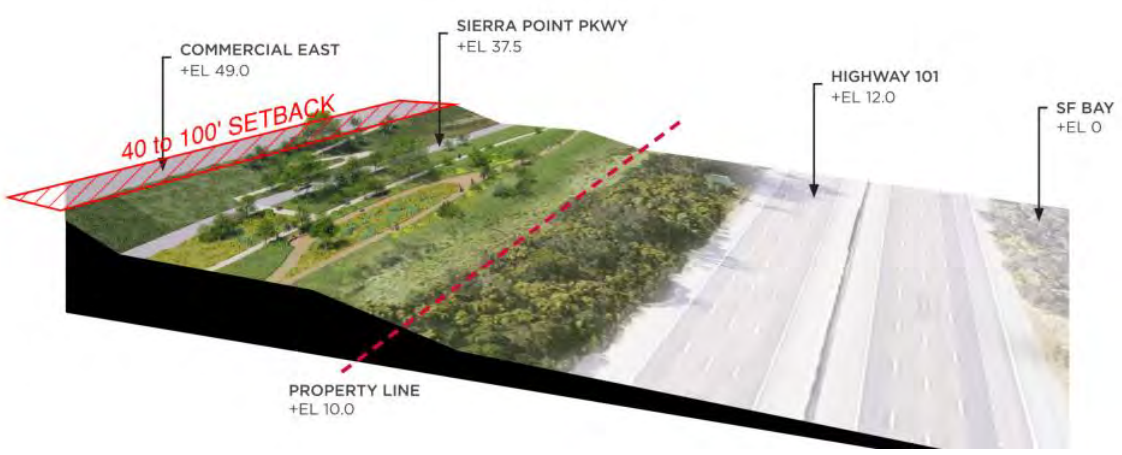
TABLE 3.6.4-1: Setback Distances to 6-inch Lateral Deformation Threshold

CROSS SECTION	SETBACK DISTANCE TO YIELD LESS THAN 6 INCHES OF LATERAL DEFORMATION*
A-A' East	50 feet
A-A' West	40 feet
B-B' East	100 feet
B-B' West	40 feet
C-C' East	50 feet
C-C' West	40 feet
D-D'	-
E-E'	-
F-F	-
G-G'	40 feet

**Distance measured from the top of slope (Exhibit 3.6.4-1)*

Based on our understanding of the planned development, the edges of future buildings are set back more than 100 feet from the top of slope. The zones within the setbacks are dedicated for open space, parking lots, roads, and solar equipment. These areas can be maintained and repaired in the event deformation occurs during a design earthquake, but deformation in these areas does not present a life safety hazard. If future adjustments to the land plan require a higher performance within the setback zones, a DSM ground improvement system extending to the bottom of the Young Bay Mud can be constructed to limit slope deformation. Exhibit 3.6.4-1 depicts the setback distance from the top of the proposed slope for a typical section at the project site adjacent to the future commercial development at Area D.

EXHIBIT 3.6.4-1.: Typical Section Illustrating Setback Distance (*Rendering from HDR*)



3.7 FINAL COVER STABILITY ANALYSIS

The site generally consists of the following distinct areas that require landfill cover: commercial buildings, impervious pavement, vegetated landscaped areas, utilities, solar array fields, wetlands, and open space. Per CCR Title 27, all final cover alternatives must be placed at a minimum of a 2 percent slope to mitigate drainage above the cap. The final cover elevation will vary across the site with the lowest portion of the cap at the wetlands around Elevation 0 feet. The elevation of the final cover will vary depending on proposed utility and building foundation penetrations. We anticipate that the elevation of the cover will be lower on the southern solar area portion of the site and will be higher beneath buildings for sealing around foundation penetrations through the landfill cover. Utilities will remain mostly above the cap where possible. The final grades of the cover will be prepared as part of the final construction design drawings. The final cover will include a 2-foot-thick foundation layer consisting of the existing on-site soil and a low-hydraulic conductivity layer. Table 3.7-1 shows the options for the final cover and the assumed strengths used in our final cover stability analysis.

TABLE 3.7-1: Final Cover Strength Parameters

FINAL COVER ALTERNATIVES	FRICTION ANGLE (degree)	COHESION (psf)
Geosynthetic Clay Liner and/or Geomembrane	22	10
Compacted Clay Liner	28	10

The strengths assumed will need to be confirmed as part of the construction quality assurance program prior to site construction. The commercial area within the northern portion of the site will be primarily hardscaped composing of pavement and building foundations. Paved areas, outside of the building footprints may be capped with pavement. Since this capping will be located on the flat portions of the site, we did not analyze it in our final cover analysis.

The final cover will likely be located at a lower elevation than the final site grades and the proposed slopes shown on Figure 2 will likely consist of engineered fill and not the landfill final cover. We analyzed final cover stability for 3:1 and 5:1 (horizontal:vertical) slopes. We used the pseudo static methodology presented in Matasovic (1991) for our cover stability analysis.

For the seismic condition, we used the minimum yield acceleration (k_y) of 0.17 from our slope deformation analysis discussed in Section 3.6.3.2. For this conservative analysis included a 12-inch vegetative layer above the low-hydraulic conductivity layer. Table 3.7-2 shows the minimum factors of safety for the conditions analyzed.

TABLE 3.7-2: Final Cover Minimum Factors of Safety

CONDITION	MINIMUM FACTOR OF SAFETY
Long-Term (No Seepage)	1.5
Short-Term (Seepage)	1.3
Seismic	1.0

Tables 3.7-3 and 3.7-4 show the factors of safety results for the various conditions analyzed with 3:1 and 5:1 (horizontal:vertical) slopes. Our analysis is in included in Appendix N.

TABLE 3.7-3: Final Cover Factors of Safety for 3:1 Slopes

FINAL COVER ALTERNATIVES	LONG TERM (NO SEEPAGE)	SHORT TERM (SEEPAGE)	SEISMIC
Geosynthetic Clay Liner and/or Geomembrane	1.5	0.8	0.5
Compacted Clay Liner	1.9	1.0	0.6

TABLE 3.7-4: Final Cover Factors of Safety for 5:1 Slopes

FINAL COVER ALTERNATIVES	LONG TERM (NO SEEPAGE)	SHORT TERM (SEEPAGE)	SEISMIC
Geosynthetic Clay Liner and/or Geomembrane	2.4	1.4	0.7
Compacted Clay Liner	3.1	1.6	0.8

Our analysis of the final cover of the landfill did not yield an adequate factor of safety for the short-term condition with seepage with 3:1 (horizontal:vertical) slopes, but the factor of safety for the short-term case is adequate for 5:1 (horizontal:vertical) slopes. Therefore, if the final design of the cover includes slopes that are steeper than 5:1 (horizontal:vertical), then a drainage system consisting of a blanket drainage layer and a network of perforated pipes is necessary for closure. We should reevaluate the short-term final cover stability during the final design. We should reevaluate the short-term final cover stability during the final design.

The final cover factor of safety is not adequate for the seismic case. As discussed in Section 3.6, there will be some deformation of the slopes at the project site during a design earthquake. If we conservatively assume that the final cover will be the proposed 3:1 (horizontal:vertical) site slopes, then our analysis indicates that there could be up to 9 inches of deformation during a design earthquake.

The United States Environmental Protection Agency (US EPA) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities (US EPA, 1995) states "*As cover deformations are readily observable and damage to the cover is repairable, larger deformations are typically considered acceptable along interfaces in the cover system than along liner system interfaces."* Following a design earthquake, some of the slope areas at the site may need repair.

4.0 GEOTECHNICAL HAZARD MITIGATION RECOMMENDATIONS

From a geotechnical engineering viewpoint, the closure of the landfill and proposed future development is subject to the geological and geotechnical hazards discussed in the previous section of this report. The primary geotechnical hazards to be mitigated at the site include:

- Static settlement of compressible soil subjected to loading from future development.
- Static settlement of the waste material from compression and degradation.
- Variability and extent of non-engineered artificial fill/soil stockpile.

The geotechnical mitigation alternatives viable to reduce the impact of these geotechnical hazards to the landfill cover and control measures and future development are discussed in the following sections of this report.

4.1 CONSOLIDATION SETTLEMENT MITIGATION

4.1.1 Surcharge Program

Consolidation settlement of the Young Bay Mud due to new loading will affect the proposed landfill cover, the proposed landfill control systems, and proposed site development if not mitigated prior to control systems and improvements construction. Surcharge programs have been successfully used to mitigate consolidation settlement from Young Bay Mud in the San Francisco Bay Area; previous surcharging of Young Bay Mud is discussed in Section 4.1.1.2. In a surcharge program, additional fill is placed in areas to receive new loads and removed once we determine that the desired degree of consolidation has been achieved.

Surcharging is often accelerated with installation of prefabricated vertical wick drains, which allow excess pore pressures to drain laterally, shortening the drainage path, and taking advantage of the fact that the horizontal permeability of soil is normally much greater than the vertical permeability. The rate of consolidation can be approximated, and duration of surcharge managed by altering the spacing between drains. We recommend that wick drains extended a minimum of 5 feet below the bottom of the Young Bay Mud (Figure 8).

Based on the Preliminary Grading Plan by BKF (Site Reference 6), the finished pad elevation for the Landfill Closure and future development will be Elevation 49 to 50 feet. This will require cut and fill from the existing grades that varies across the site (Site Reference 7). The thickness of required surcharge fill is dependent on the proposed new fill thickness, the thickness of the Young Bay Mud, and the construction schedule. The surcharge program should be facilitated by vertical wick-drains installed in a triangular spacing pattern of 5 or 6 feet for approximate surcharge durations of 6 or 12 months, respectively. For planning purposes, we estimated the range of surcharge thickness in the northern and southern portions of the project site; these ranges are provided in Table 4.1.1-1.

TABLE 4.1.1-1: Surcharge Thickness Ranges

AREA	SURCHARGE THICKNESS RANGE (feet)
North of Visitacion Creek	10 to 15
South of Visitacion Creek	5 to 20

During surcharge design, we will further refine the thickness of the surcharge fill and/or spacing of wick drains to optimize the surcharge program. We understand the surcharge program for the project will likely be implemented in phases, as such, the surcharge fill should extend 30 feet beyond adjacent development phases, so that infrastructure and improvements constructed within the phase will not be impacted by settlement induced by future adjacent surcharge program.

Even with proper surcharging, some amount of long-term settlement from secondary compression of the Young Bay Mud should be anticipated. The magnitude of this residual settlement will be dependent on the amount of fill placed, thickness of Young Bay Mud, and time allowed for surcharging. In general, this secondary settlement will be approximately 4 to 6 percent of the primary settlement (less than 1 inch).

4.1.1.1 Surcharge Settlement Monitoring

To assess the completion of a surcharge program, the induced settlement should be monitored throughout the program. This is often achieved by installing settlement-monitoring plates prior to surcharge placement to monitor the settlement. We should determine the number and location of the settlement monitoring plates during surcharge design. The settlement-monitoring plates should be surveyed until we confirm that the desired degree of surcharge driven preconsolidation has been achieved. For conceptual planning purposes, settlement monitoring will be performed biweekly for the first 3 months after the surcharge height has been reached and then monthly for the subsequent 3 to 6 months, depending on settlement progress. We will provide the frequency of the monitoring program during surcharge design. All readings of settlement should be tied to benchmarks established well beyond the surcharge zone of influence.

4.1.1.2 Summary of Bay Area Surcharge Program Implementation

Surcharge reconsolidation using wick drains has been an acceptable means of mitigating settlement of Young Bay Mud on numerous projects in the San Francisco Bay Area and across the United States. Due to the properties of the Young Bay Mud, wick drains are necessary to accelerate preconsolidation to achieve the desirable amount of settlement during the surcharge program and to reduce impacts to future site improvements. In particular, surcharge programs have been successfully implemented on many neighboring master planned redevelopment projects in San Francisco and San Mateo Counties. These projects include:

TABLE 4.1.1.2-1: List of Recent Surcharge Mitigation Projects in San Francisco and San Mateo Counties

PROJECT NAME	CITY
Candlestick Point Redevelopment	San Francisco
India Basin Redevelopment	San Francisco
Visitacion Valley Redevelopment	San Francisco
Treasure Island Redevelopment	San Francisco
Pier 70 Redevelopment	San Francisco
Blu Harbor Development	Redwood City
Docktown Development	Redwood City
Foster Square Development	Foster City
Water Technology Redevelopment	San Mateo

4.1.2 Compensation Loading with Lightweight Fill

An alternate consolidation settlement mitigation measure that can be utilized is removing existing fill and replacing it with a lightweight cellular concrete (LWC) as a means to compensate the load being added (either by adding new fill or a relatively light structural load). Cellular concrete is a cement and water mixture mixed with a stable foam to create a low-density material that cures in place without compaction. Cellular concrete can be prepared with a strict tolerance on the cured unit weight as well as other properties, such as compressive strength; unit weights of cellular concrete commonly range between 27 pounds per cubic foot (pcf) and 45 pcf depending on mix specified. For the purpose of this report, LWC refers to a 30-pcf mix commonly used for this application. Assuming a unit weight of 30 pcf for the LWC, we generally recommend that for every 1 foot of new fill placed onsite, 4½ inches of existing soil be removed and backfilled with cellular

concrete. Generally, this mitigation is more expensive than surcharging, but it is typically faster and has less impact on directly adjacent improvements that exist prior to construction; so, we would typically recommend this mitigation in areas where surcharging is not possible due to adjacent constraints or timing. We can provide LWC recommendations for specific areas during the design process.

Because cellular concrete is lighter than water, it will be buoyant when cast below the water table. Where water is encountered in areas to receive cellular concrete, the groundwater should be temporarily lowered to allow placing the cellular concrete and kept dewatered until the material has cured and a minimum weight of LWC and soil has been placed to provide enough weight to prevent uplift. Uplift pressures of any cellular concrete constructed below the groundwater table should be included in design of elements supported on cellular concrete. Uplift pressures will be equal to approximately 30 pcf for each 1 foot of cellular concrete below the groundwater.

Cellular concrete lift height should be limited to 3 to 4 feet in thickness to limit the risk of collapsing under its own weight; the cellular concrete should be allowed to cure at least 12 hours or the minimum manufacturer specification before placing the next lift. If any collapse occurs, the resulting cellular concrete will be heavier than planned, therefore, the entire lift of material will need to be removed and disposed of prior to placing the next lift. We recommend we be retained to observe the cellular concrete backfill on a full-time basis to monitor the unit weight and collect samples for compressive strength testing. Pulverized or fractured pieces of lightweight fill should not be reused as backfill of areas receiving LWF compensation mitigation.

4.2 NON-ENGINEERED FILL SETTLEMENT MITIGATION

We prepared this section to be in compliance with the Brisbane Baylands Development Final EIR Mitigation Measure 4.E-3.

The non-engineered fill imported as part of the on-going soil recycling operation at the site could undergo static settlement from new civil fill and site improvement loads. In addition, liquefaction and cyclic densification settlement is possible in the non-engineered fill. The most effective technique to mitigate the settlement performance of the non-engineered fill is remove and recompact the soil. In addition, all fill at the site will have to be removed to perform mitigation on the waste layer below; mitigation of the waste is discussed in Section 4.3. The removal of fill should avoid excavation that extends below the groundwater table to maintain a stable platform for construction traffic and waste mitigation. This elevation shall be determined during construction based on the depth to groundwater and the soil conditions. For planning purposes, subexcavation should be no deeper than 5 feet above the ground water level or 5 feet above the top of the waste (approximately Elevation 15 feet). Any existing fill or waste remaining below the working platform can be densified by ground improvement techniques discussed below in Section 4.3.1.

4.3 WASTE SETTLEMENT MITIGATION

As discussed in Section 3.1.2, the waste will continue to settle over time due to various internal processes as well as from external loading. We estimate that the site could settle 1 to 3 feet from waste settlement in the 50 years after the landfill closure. We recommend deep dynamic compaction (DDC) to densify the waste that reduce settlement for the landfill cap, landfill control systems, and proposed future development.

As discussed in Zekkos et al. (2013), DDC has been used to densify waste and reduce settlement of landfills for redevelopment. Zekkos et al. (2013) analyzed various data from 56 landfill sites that were previously subjected to DDC prior to redevelopment. This paper states that DDC *"results in a denser waste matrix that increases the stiffness of the waste by a factor of 2.8-24 compared with its unimproved state and results in reduction of waste compression upon load application. The achieved higher density and more stable structure of the MSW [waste] result in a lower rate and amount of long-term settlement."* We utilized the data from this study to estimate the potential range pf post-improvement settlement of the waste. Our estimate of pre- and post-mitigation settlement is presented in Table 4.3-1, and contours of estimated post-improvement settlement are shown on Figure 12.

TABLE 4.3-1: Estimated Pre- and Post-Ground Improvement Waste Settlement

PROJECT PHASE	WASTE SETTLEMENT (inches)
Prior to Ground Improvement	10 to 36
Post-Ground Improvement	3 to 24

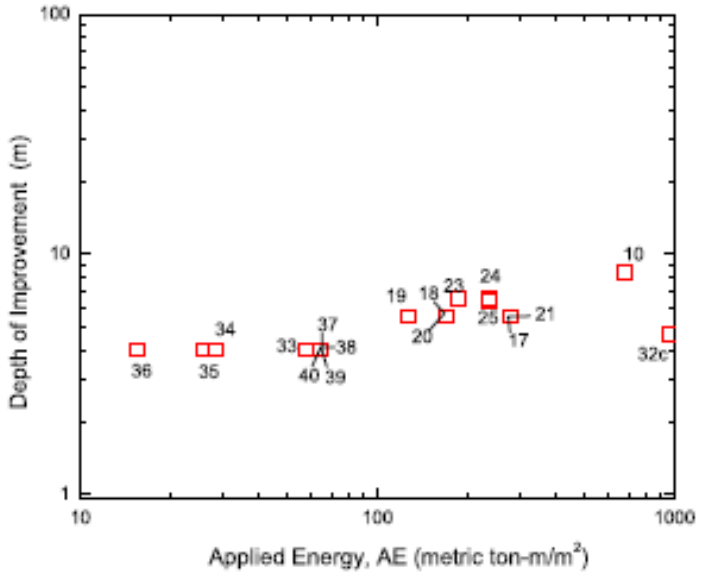
DDC methodology is discussed in Section 4.3.1 below. Due to the age since placement of the waste and the lack of existing current data, the estimate of residual settlement of the waste post landfill closure will be further refined with completion of additional studies.

Alternative methods to densify the waste could include aggregate piers, rapid impact compaction, permeation grouting, and compaction grouting. The degree of improvement to reduce settlement of the waste is subject to the thickness of the fill, the depth of influence, and the material composition within the waste. Due to the variability of the waste and soil within the waste, the final selection of the ground improvement technique will be based on their efficacy to densify the waste based on conducting test sections with pre- and post-improvement testing. We will coordinate with the regulatory agencies to secure approval of the methodology prior to site-wide application to confirm that the ground improvement method selected is acceptable to comply with regulatory standards.

4.3.1 Deep Dynamic Compaction

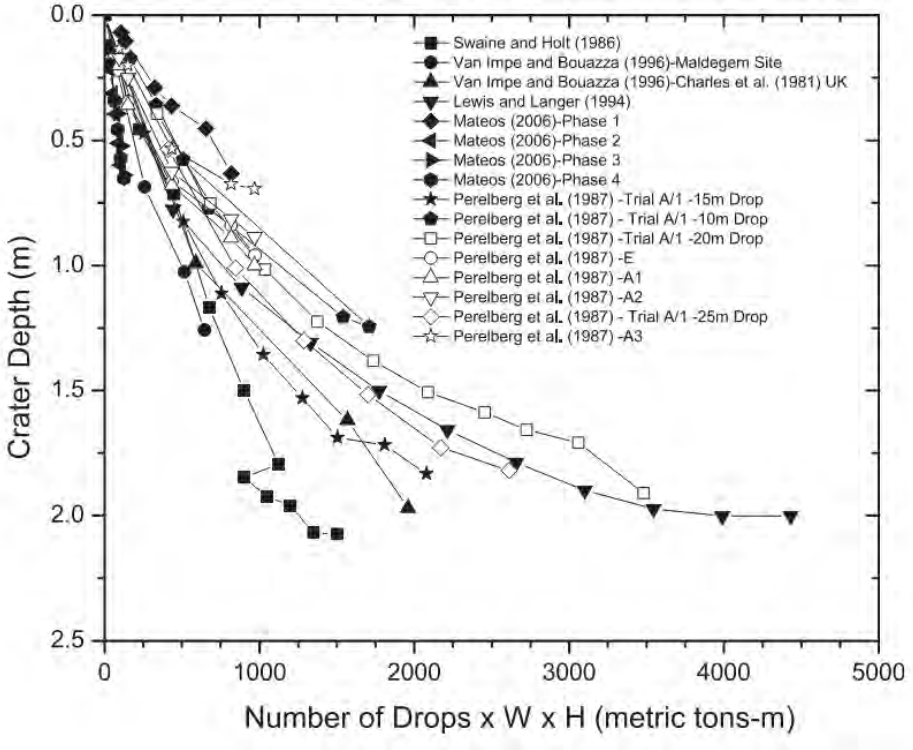
The deep dynamic compaction (DDC) ground improvement technique utilizes impact energy from a large weight free falling from a significant height to densify the ground. The weight is repeatedly dropped in a grid pattern from a defined drop height; the number of drop times at each location is determined based on using the principles of transforming potential energy to kinetic energy. At impact with the ground, the energy is transmitted at depth to densify loose material. Since the impact force is at the surface, the effective depth of improvement is typically limited to the upper 20 to 30 feet. As shown in Exhibit 4.3.1-1 from Zekkos et al. (2013), the depth of improvement varies from 15 to 30 feet depending on the applied energy with an application of 2 to 3 passes of DDC.

EXHIBIT 4.3.1-1: Depth of Improvement versus Applied Energy of DDC at Studied Landfill Sites (from Zekkos et al., 2013)



To estimate the post-ground improvement settlement provided in Table 4.3-1, we conservatively assumed DDC has a depth of improvement of 20 feet. Zekkos et al. (2013) also suggests that the high impact energy from DDC will form craters that vary from 2 to 6 feet based on the applied energy (Exhibit 4.3.1-2). These craters should be backfilled and compacted as engineered fill once the densification program is complete.

EXHIBIT 4.3.1-2: Crater Depth versus Energy Induced Observed at Studied Landfill Sites (from Zekkos et al., 2013)



DDC has been widely used as a means to densify loose sand and other granular fill. As an example, we have performed a DDC test program at the neighboring Candlestick Park redevelopment to confirm the effectiveness of this method for rocky fill that was generated from locally derived bedrock material. To test the efficacy of DDC on loose soil and waste material at the Baylands Landfill site, a full-scale test program with a footprint of approximately 100 feet wide by 100 feet long should be implemented prior to closure. A pre- and post-ground improvement testing program will be established during design to assess the depth of improvement.

5.0 PRELIMINARY FOUNDATION CONSIDERATIONS

We prepared this section to be in compliance with the Brisbane Baylands Development Final EIR Mitigation Measure 4.E-3.

Where the site-wide ground improvement approaches presented in Section 4.0 are not implemented or the remaining settlement exceeds what is tolerable for building and improvement performance, deep foundations deriving support from competent native material underneath the Holocene Bay Deposits or alternative ground improvement can be considered to mitigate settlement. Foundation design for structures will be performed during future design phase; for planning purposes, some viable options are presented below.

5.1 ALTERNATIVE GROUND IMPROVEMENT METHODS

There are several ground improvement methods that can minimize settlement within a localized area where the elements are constructed, thereby allowing for the use of a conventional shallow foundation system. These methods can be performed in a grid pattern to provide a site-wide treatment; however, due to the large footprint of the project site, it would be more economical to apply these methods locally to support structural building loads or localized improvement areas. Due to the ability of these ground improvement techniques to also increase bearing capacity, they are often designed in coordination with the design of the building foundations. Some of these methods are Compaction Grouting, Rigid Inclusions, and Deep Soil Mixing (DSM). A design-build or specialty contractor generally designs ground improvement. The use of these methods to support the planned structures or improvements will need to be coordinated with the Environmental Engineer for compatibility with the landfill cover and reviewed by the RWQCB for acceptance.

5.1.1 Compaction Grouting

Where the impact and disturbance of DDC improvement of the waste are not desired, low-impact ground improvement techniques that will reduce voids within the waste can be considered. The use of compaction grouting as ground improvement in compressible solid waste landfills have been documented (Tsitsas, 2019). Compaction grouting is a method by which solid grout is injected at a slow and controlled rate under large pressure. The injection will displace and compact the material thus densifying the material. A column of overlapping grout bulbs will be created from the target depth of treatment to the ground surface. Since compaction grouting is applied locally, it can be used to mitigate settlement under future footings and provide a high modulus for bearing support. Compaction grouting should extend at least 5 feet below the waste. If performed in combination with a surcharge program, post-construction settlement of the waste can be reduced to less than 1 to 2 inches.

5.1.2 Deep Soil Mixing (DSM)

Deep Soil Mixing (DSM) could be used to provide localized mitigation of waste and Young Bay Mud settlement. This method is commonly used to support structures and in some instances for lineal improvements. It could be very costly for a site-wide application. However, in areas where the landfill control systems are sensitive to settlement and cannot be mitigated with the site-wide approaches in Section 4.0, DSM could be used to support the systems and structures.

DSM includes numerous proprietary methods, including grouting, grout-mixing, and deep soil mixing. Each of these methods involves mixing the subsurface soil with cement and water to create columns of stiffened soil. The columns can be oriented as individual columns or overlapped to create walls around unimproved soil. The untreated soil is not enhanced by this technique and remains susceptible to settlement. Therefore, the DSM columns are typical oriented in a lattice or interlocked cells to support structures.

DSM relies on the improved stiffness of the columns to raise the composite stiffness of the site and reduce loading on the compressible material to avoid triggering settlement. This method results in spoils that will be rich in cement; spoils could be mixed with on-site soil to reduce the cement content and be used as structural fill once the cement has cured. Depending on cement concentration and hydration time, the reaction of cement in the spoils could make conventional soil compaction verification techniques difficult.

5.1.3 Rigid Inclusions

Another possible ground improvement approach to mitigate impacts of waste and Young Bay Mud settlement is the use of rigid inclusions, commonly known as Drilled Displacement Columns. Rigid inclusions are constructed by first drilling to a desired depth of improvement with a heavy crowd. Once the desired depth is reached, the auger is slowly raised while simultaneously injecting grout under high pressure to form a well-defined cement column. Steel rebar can be inserted within the column as a final step to improve the shear resistance. Rigid Inclusions decrease the proportion of loose or soft soil, thereby, decreasing the total susceptibility to excessive deformation resulting from additional loads. The construction has negligible vibration and is relatively quiet. The grouted columns are a displacement treatment method and typically generate spoil volumes less than 3 percent of the volume of soil being improved. However, the area outside of installed improvement sees very little improvement and remains susceptible to settlement risks. Rigid inclusions are proprietary and should be designed by a design-build or specialty contractor.

5.2 DEEP FOUNDATION SYSTEMS

Deep foundation systems are suitable for support of structures sensitive to post-construction settlement. Deep foundation elements will derive support from competent material beneath the waste and Young Bay Mud from friction resistance in competent soil deep beneath the ground surface. Post-construction settlement of structures supported on deep foundation would to be minor (less than 1 inch)

Differential settlement between pile-supported structures and surrounding areas will occur since all post-construction settlement of the waste cannot be mitigated (Figure 13). Thus, entries and pipe connections to pile-supported buildings will require flexibility to accommodate differential settlement.

5.2.1 Driven Piles

Driven concrete piles are commonly used on landfill sites but will create noise and vibration. Based on our experience, driven precast pre-stressed concrete piles or steel piles are feasible to support the planned commercial buildings. However, due to the depth of the bottom of Young Bay Mud beneath the future finish grades, pre-stressed concrete piles may not be efficient as they are restrictive to splicing to be extended to depths of the competent soil. Steel piles can be easily spliced and can overcome driving resistance when advancing through debris-laden waste. Recommendations for steel piles consisting of H-piles or pipe piles can be provided in the design-level geotechnical reports for individual buildings. A pile load test program consisting of indicator piles and static load tests should be performed to confirm pile capacity.

5.2.2 Drilled Piles

If neighboring properties are sensitive to noise and vibration during foundation construction, auger cast piles, micropiles, or drilled piers may be used. These piles are constructed by drilling and removing the soil to the required design depth and backfilled with cement. A steel reinforcement cage is inserted to provide lateral and uplift resistance. With the exception of auger cast pile drilled with displacement tooling, drilled piles will create significant amounts of spoils. The spoils from drilling through the waste will need to be disposed of at an approved facility or location underneath the landfill cover onsite. Recommendations for these piles can be provided in design-level geotechnical reports for individual parcels. Prior to production pile construction, a pile load test program consisting of indicator piles and static load tests should be performed to confirm pile capacity.

5.3 GROUND IMPROVEMENT AND LANDFILL COVER CONSTRUCTION SEQUENCES

We understand the project will be constructed in phases. Site preparation will begin with the removal of loose fill and stockpiled soil across the site in the project phase sequencing. We recommend that the fill be removed to no less than 5 feet above the top of waste or above the groundwater table, whichever is shallower. Once stockpiled soil has been removed, vertical wick drains will be installed in a triangular grid pattern. DDC will then be implemented within areas where wick drain installation is completed. Once the ground has received the appropriate level of densification, compacted engineered fill will be placed to establish civil grades along with the landfill cover layers at the appropriate elevations. The work will continue with placement of the surcharge fill above the finished pad elevation in accordance with the surcharge grading plan to be developed during design in collaboration with the Project Civil Engineer. Once the surcharge program is completed as determined by our evaluation of an ongoing settlement monitoring program, the excess surcharge fill will be moved to the subsequent phase. The landfill control systems will be constructed concurrently as other site development takes place.

6.0 EARTHWORK AND OTHER RECOMMENDATIONS

6.1 GENERAL SITE CLEARING

Areas to be developed should be cleared of surface and subsurface deleterious material, including existing building foundations, slabs, buried utility and irrigation lines, pavements, debris, and designated trees, shrubs, and associated roots prior to removal of the existing fill. Following clearing, the site should be stripped to remove surface organic material. Organics should be

stripped from the ground surface to a depth of at least 2 to 3 inches below the surface. Strippings should be removed from the site or, if considered suitable by the landscape architect and owner, used in landscape fill.

6.2 OVER-OPTIMUM SOIL MOISTURE CONDITIONS

The contractor should anticipate encountering excessively over-optimum (wet) soil moisture conditions in the area of the future wetlands, during winter or spring grading, or during or following periods of rain. Wet soil may make proper compaction difficult or impossible. Wet soil conditions may be mitigated by:

1. Frequent spreading and mixing during warm dry weather,
2. Mixing with drier material,
3. Mixing with a lime, lime-flyash, or cement product, or
4. Stabilizing with aggregate or geotextile stabilization fabric, or both.

We should evaluate Options 3 and 4 prior to implementation.

6.3 ACCEPTABLE FILL

With the exception of construction debris (wood, brick, asphalt, concrete, metal, etc.), trees, high organic content soil (soil which contains more than 3 percent organic content by weight), highly plastic clay soil, and environmentally impacted soil (if any), we anticipate the existing fil above the waste is suitable for reuse as engineered fill. Highly plastic clay soil could be used as the low permeability landfill cover, erosion resistant layers in the wetlands, or in landscaping areas of the site. The existing fill should be processed to remove concentrations of organic material, debris, and particles greater than 6 inches in maximum dimension.

Imported fill material should meet the above requirements and have a plasticity index less than 20. We should be allowed to sample and test proposed imported fill material at least 72 hours prior to delivery to the site.

6.4 FILL COMPACTION

After removing the existing fill as discussed in Section 4.2, the contractor should perform subgrade compaction prior to fill placement. The contractor should first scarify to a depth of at least 12 inches and then moisture condition and compact the subgrade in accordance with Table 6.4-1. The contractor should then place engineered fill in loose lifts that do not exceed 12 inches or the depth of penetration of the compaction equipment used, whichever is less. The contractor should then moisture condition and compact engineered fill in accordance with Table 6.4-1.

TABLE 6.4-1: Subgrade and Engineered Fill Compaction and Moisture Content Requirements

MATERIAL	MINIMUM RELATIVE COMPACTION (%)	MINIMUM RELATIVE COMPACTION (%) - UPPER 6 INCHES OF FILL IN PAVEMENT AREAS	MINIMUM MOISTURE CONTENT (percentage points above optimum)
Import	90	95	1
On-Site (PI < 20)	90	95	1
On-Site (PI > 20)	87-92	--	2
Pavement AB*	95	--	0

*As specified in Section 8.3

The relative compaction and optimum moisture content of soil and aggregate base referred to in this report are based on the most recent ASTM D1557 test method. Compacted soil is not acceptable if it is unstable. It should exhibit only minimal flexing or pumping, as observed by our field representative. As used in this report, the term “moisture condition” refers to adjusting the moisture content of the soil by either drying if too wet or adding water if too dry.

6.4.1 Landscape Fill

In landscaping areas, the contractor should process, place, and compact fill in accordance with our engineered fill recommendations, except the compaction requirement is reduced to a minimum of 85 percent relative compaction.

6.5 SITE DRAINAGE

The project Civil Engineer is responsible for designing surface drainage improvements. With regard to geotechnical engineering issues, we recommend that finish grades be sloped away from buildings and pavements to the maximum extent practical to reduce the potentially damaging effects of expansive soil. The latest California Building Code Section 1804.3 specifies a minimum slope of 5 percent away from foundations for all pervious surfaces. As a minimum, we recommend the following.

- Discharge roof downspouts into closed conduits and direct away from foundations to appropriate drainage devices.
- Consider the use of surface drainage collection system to reduce ponding of water at the ground surface near the foundation, pavements, or exterior flatwork.

6.6 STORMWATER BIORETENTION AREAS

Due to the level of existing fill that will be reworked prior to re-establishing the final site grade, the permeability of the soil to facilitate the design of bioretention facilities should be based on infiltration tests performed once rough grading is completed.

If bioretention areas are implemented, we recommend that, when practical, they be planned a minimum of 5 feet away from structural site improvements, such as buildings, streets, retaining walls, and sidewalks/driveways. When this is not practical, bioretention areas located within 5 feet of structural site improvements may either:

1. Be constructed with structural side walls capable of withstanding the loads from the adjacent improvements, or
2. Incorporate filter material compacted to between 85 and 90 percent relative compaction and a waterproofing system designed to reduce the potential for moisture transmission into the subgrade soil beneath the adjacent improvement.

In addition, one of the following options should be followed.

1. We recommend that bioretention design incorporate a waterproofing system lining the bioswale excavation and a subdrain, or other storm drain system, to collect and convey water to an approved outlet. The waterproofing system should cover the bioretention area excavation in such a manner as to reduce the potential for moisture transmission beneath the adjacent improvements.

2. Alternatively, and with some risk of movement of adjacent improvements, if infiltration is desired, we recommend the perimeter of the bioretention areas be lined with an HDPE tree root barrier that extends at least 1 foot below the bottom of the bioretention areas/infiltration trenches.

Site improvements located adjacent to bioretention areas that are underlain by base rock, sand, or other imported granular material, should be designed with a deepened edge that extends to the bottom of the imported material underlying the improvement.

Where adjacent site improvements include buildings greater than three stories, streets steeper than 3 percent, or design elements subject to lateral loads (such as from impact or traffic patterns), additional design considerations may be recommended. In addition, although not recommended, if trees are to be planted within bioretention areas, HDPE Tree Boxes that extend below the bottom of the bioretention system should be installed to reduce potential impact to subdrain systems that may be part of the bioretention area design. For this condition, the waterproofing system should be connected to the HPDE Tree Box with a waterproof seal.

Given the nature of bioretention systems and possible proximity to improvements, we recommend that we be retained to review design plans and provide testing and observation services during the installation of linings, compaction of the filter material, and connection of designed drains.

It should be noted that the contractor is responsible for conducting all excavation and shoring in a manner that does not cause damage to adjacent improvements during construction and future maintenance of the bioretention areas. As with any excavation adjacent to improvements, the contractor should reduce the exposure time such that the improvements are not detrimentally impacted.

7.0 IMPROVEMENTS AND LANDFILL CONTROL SYSTEMS CONSTRUCTION

7.1 SETTLEMENT

Young Bay Mud settlement will be mitigated where the surcharge program is implemented. Settlement from waste will be partially mitigated with the ground improvement indicated above. Remaining settlement that is not mitigated should be accommodated in the design of the utilities and leachate collection systems.

The largest risks of total and differential settlement are to the gravity utilities. Localized differential settlement along gravity utilities could result in loss of flow gradient and a change in the flow velocities. Additionally, differential soil movement could result in pipeline breaks at connections to manholes. It should be expected that some areas of localized differential settlement could experience reduced flow velocity due to flattening of the slope at the invert, but other areas of the pipeline could become steeper. Some amount of repair or maintenance of the public improvements should be expected with settlement of the waste.

Utility connections to structures supported on deep foundations or ground improvement should have flexible connections to allow for the potential post-construction site settlement from compressible soil and waste. Also, exterior walkways and entrances to building could experience settlement relative to the structures. Over time, adjustments to the site may have to be performed to account for the lowering of surrounding grades relative to the buildings.

We provide estimates of the total and differential settlement across the site considering implementation of the surcharge program and dynamic densification as shown in Figure 12. These estimates will be refined with future exploration and studies and shall be used for planning purposes only.

7.2 EXTERIOR SLAB-ON-GRADE

This section provides recommendations for secondary slabs such as exterior slabs and walkways. As much as possible, secondary slabs-on-grade should be constructed as units that are structurally independent from of the foundation systems. This allows the slabs to move with minimum distress to the slabs or the foundation.

Slabs-on-grade should be designed specifically for their intended use and loading requirements. As a minimum, slabs-on-grades should be reinforced for control of cracking and should be designed by the Structural Engineer. As a minimum, slab reinforcement should consist of No. 3 bars spaced 16 inches on center each way. Minor concrete cracking should be expected in the future due to concrete shrinkage and expansive soil movement. Frequent joints should be provided in the slabs at a spacing determined from ACI Publication ACE 302.1R-89 recommendations. Exterior slabs-on-grade should have a minimum thickness of 5 inches with a thickened edge. The subgrade material under the exterior slabs should be uniform and properly moisturized. The upper 12 inches of subgrade should be moisture conditioned to at least 4 percentage points above optimum moisture content. The subgrade should not be allowed to dry prior to concrete placement.

7.3 SHORING AND BACKFILL

Due to the shallow groundwater table conditions, heterogeneity of the existing fill, and soft nature of the Young Bay Mud, excavations extending into these deposits may become unstable. Temporary shoring, such as sheet piling or continuous hydraulic shoring, should be anticipated. The design of shoring systems is the sole responsibility of the Contractor and/or shoring designer. Supplemental recommendations for shoring design will be provided if needed.

It is the responsibility of the Contractor to provide stable, safe trench and construction slope conditions and to follow OSHA safety requirements. It is also the responsibility of the Contractor to provide a trained “competent person” as defined by OSHA to supervise all excavation operations, ensure that all personnel are working in safe conditions, and have thorough knowledge of OSHA excavation safety requirements. The contractor should not stockpile soil, place heavy construction material or park equipment near trenches or excavations extending into the Young Bay Mud.

7.4 UNDERGROUND UTILITY AND LANDFILL CONTROL SYSTEM BACKFILL PLACEMENT AND COMPACTION

Soft subgrade conditions will be encountered at the bottom of the utility excavations in some portions of the site. It may become necessary to perform subgrade stabilization to mitigate such conditions. Excavations that bottom in unstable soft soil should be covered with a stabilization fabric overlain by at least 18 inches of aggregate base, subbase, Caltrans Class 2 material, or be chemically treated in-place with cement. The stabilization fabric should be Mirafi 600X or an equivalent fabric as approved by us. Other approaches may be acceptable, and we should be consulted if alternative approaches are desired.

Pipe zone backfill (i.e., material beneath and immediately surrounding the pipe) may consist of a well-graded import or native material less than ¾ inch in maximum dimension. Trench zone backfill (i.e., material placed between the pipe zone backfill and the ground surface) may consist of native soil. Pipe and trench zone back fill should be compacted according to the recommendations in Section 6.4.

Where import material is used for pipe zone backfill, we recommend it consist of fine- to medium-grained sand or a well-graded mixture of sand and gravel and that this material not be used within 2 feet of finish grades. In general, uniformly graded gravel should not be used for pipe or trench zone backfill due to the potential for migration of: (1) soil into the relatively large void spaces present in this type of material and (2) water along trenches backfilled with this type of material. Where utility trenches pass under a building perimeter, they must be provided with an impervious seal consisting of native material or concrete. The impervious plug should extend at least 2 feet to each side of the crossing. This is to reduce surface-water percolation into the material under foundations and pavements where such water would remain trapped in a perched condition, allowing clay soil to develop its full expansion potential.

Care should be exercised where utility trenches are located beside foundation areas. Utility trenches constructed parallel to foundations should be located entirely above a plane extending down from the lower edge of the footing at an angle of 45 degrees. Utility companies and Landscape Architects should be made aware of this requirement.

Compaction of trench backfill by jetting should not be allowed at this site. If there appears to be a conflict between The City or other agency requirements and the recommendations contained in this report, this should be brought to the Owner's attention for resolution prior to submitting bids.

8.0 PRELIMINARY PAVEMENT DESIGN

8.1 FLEXIBLE PAVEMENT

We provide preliminary pavement design values below based on assumed Traffic Index and an assumed subgrade resistance value (R-value) of 20. The Civil Engineer or appropriate public agency should determine the Traffic Index.

TABLE 8.1-1: Preliminary Flexible Pavement Design

TRAFFIC INDEX (TI)	PAVEMENT SECTION	
	AB (INCHES)	AC (INCHES)
4.0	6	3
5.0	8	3
6.0	10	4
7.0	12	5

Notes: AB is aggregate base Class 2 Material with minimum R = 78
AC is asphalt concrete

These sections are for estimating purposes only; actual sections should be based on R-Value tests performed on samples of actual subgrade material recovered at the time of grading. Pavement construction and all material should comply with the requirements of the Standard Specifications of the State of California Department of Transportation, Civil Engineer, and appropriate public agency.

8.2 CUTOFF CURBS

Saturated pavement subgrade or aggregate base may cause premature failure or increased maintenance of asphalt concrete pavements. This condition often occurs where landscape areas directly abut and drain toward pavements. If desired to install pavement cutoff barriers, they should be considered where pavement areas lie downslope of any landscape areas that are to be sprinklered or irrigated, and should extend to a depth of at least 4 inches below the base rock layer. Cutoff barriers may consist of deepened concrete curbs or deep-root moisture barriers.

If reduced pavement life and greater than normal pavement maintenance are acceptable to the owner, then the cutoff barrier may be eliminated.

8.3 PAVEMENT CONSTRUCTION

Pavement construction and all material should conform to the specifications and requirements of the Standard Specifications by the State of California, Department of Transportation (Caltrans), latest edition, City of Brisbane requirements, and the following minimum requirements.

- The contractor should compact finished subgrade and aggregate base in accordance with Section 6.4.
- Subgrade soil should be in a stable, non-pumping condition at the time aggregate base material is placed and compacted.
- Adequate provisions must be made such that the subgrade soil and aggregate base material are not allowed to become overly wet.
- Aggregate Base should meet the requirements for ¾-inch maximum Class 2 AB in accordance with Section 26 of the latest Caltrans Standard Specifications.
- Asphalt paving material should meet current Caltrans specifications for asphalt concrete.

9.0 CONSTRUCTION MONITORING

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems may be significantly lowered by retaining the design geotechnical engineering firm to:

1. Review the final grading plans prior to construction to evaluate whether our recommendations have been implemented, and to provide additional or modified recommendations, as needed. This also allows us to check if any changes have occurred in the nature, design, or location of the proposed improvements and provides the opportunity to prepare a written response with updated recommendations.
2. Perform construction monitoring to check the validity of the assumptions we made to prepare this report. Earthwork operations should be performed under the observation of our representative to check that the site is properly prepared, the selected fill material is satisfactory, and that placement and compaction of the fill has been performed in accordance with our recommendations and the project specifications. Sufficient notification to us prior to earthwork is important.

If we are not retained to perform the services described above, then we are not responsible for any party's interpretation of our report (and subsequent addenda, letters, and verbal discussions).

10.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical recommendations for design of the improvements discussed in Section 1.3 for the Baylands Landfill project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth material. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data is representative of the actual subsurface conditions across the site. Considering possible underground variability of soil, rock, stockpiled material, and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, notify us immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, or flood potential. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous material.

This document must not be subject to unauthorized reuse, that is, reusing without our written authorization. Such authorization is essential because it requires us to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications, or other changes to our documents. Therefore, we must be engaged to prepare the necessary clarifications, adjustments, modifications, or other changes before construction activities commence or further activity proceeds. If our scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, we cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

We determined the lines designating the interface between layers on the exploration logs using visual observations. The transition between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

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FIGURES

FIGURE 1: Vicinity Map
FIGURE 2: Site Plan
FIGURE 3: Regional Faulting and Seismicity Map
FIGURE 4: Regional Geologic Map (Bonilla)
FIGURE 5A and 5B: Cross Sections
FIGURE 6: Top of Waste Map
FIGURE 7: Waste Thickness Map
FIGURE 8: Young Bay Mud Elevation Map
FIGURE 9: Young Bay Mud Thickness Map
FIGURE 10: Bedrock Elevation Map
FIGURE 11: Waste Placement Map
FIGURE 12: Bay Reclamation Timeline
FIGURE 13: Post Improvement Settlement

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VICINITY MAP

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002	FIGURE NO. 1
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CPT05-1
CPT05-3
CPT05-5
EB-21
GT05-7
EB-20

A
A'
B
B'
C
C'
D
D'
E
E'
F
F'
G
G'

SITE

TUNNEL AVENUE
JPB/CALTRAIN RAILROAD TRACKS
JAMES LICK FREEWAY (HIGHWAY 101)
BAYSHORE BOULEVARD
LAGOON

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- 1869 SHORELINE LIMIT
- 1-B1 — BORING (ENGEO, 2021)
- GT04-8 — BORING (GEOSYNTEC, 2004-2008)
- B-9 — BORING (KLEINFELDER, 1987)
- EB-19 — BORING (LOWNEY, 1977)
- 1-CPT06A — CONE PENETRATION TEST (ENGEO, 2021)
- CPT05-1 — CONE PENETRATION TEST (GEOSYNTEC, 2005)
- 1-HV2 — HORIZONTAL TO VERTICAL SPECTRAL RATIO TEST (ENGEO, 2021)
- G G' — GEOLOGIC CROSS-SECTION

0 500 FEET

N

BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

SITE PLAN

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002

SCALE: AS SHOWN

DRAWN BY: CC CHECKED BY: LC

FIGURE NO. 2

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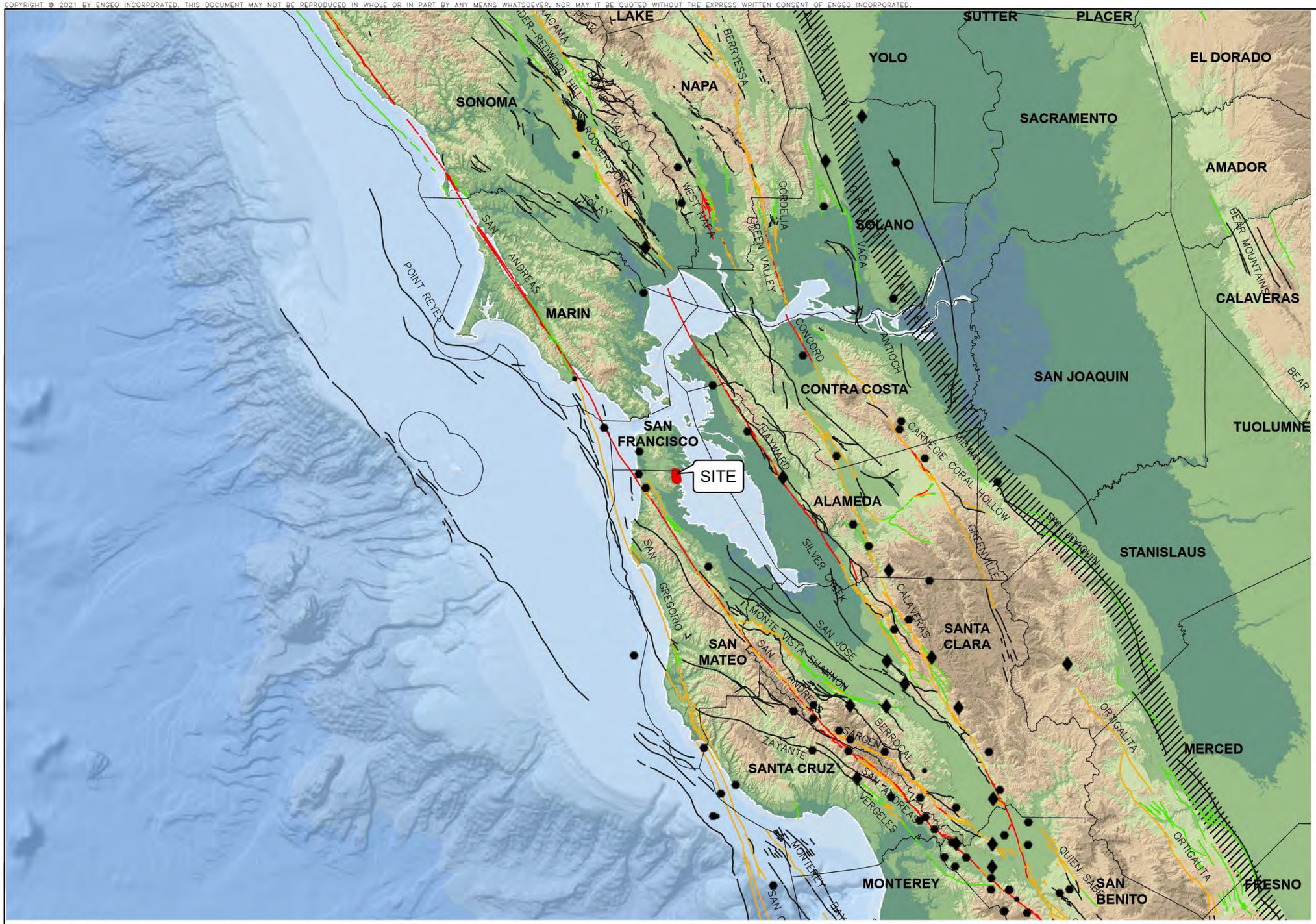

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

EARTHQUAKE

- MAGNITUDE 7+
- MAGNITUDE 6-7
- MAGNITUDE 5-6

USGS QUATERNARY FAULTS

- HISTORICAL (<150 YEARS)
- LATEST QUATERNARY (<15,000 YEARS)
- LATE QUATERNARY (<130,000 YEARS)
- UNDIFFERENTIATED QUATERNARY (<1.6 MILLION YEARS)
- HISTORIC BLIND THRUST FAULT ZONE

BASE MAP SOURCE
ESRI, GEBCO, DELORME, NATURALVUE
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2018
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-PRESENT)

ENGEO Expect Excellence

REGIONAL FAULTING AND SEISMICITY

BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO. : 17270.000.002		FIGURE NO. 3
SCALE: AS SHOWN		
DRAWN BY: CC	CHECKED BY: SOS	

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LAYOUT: FAULT&SEISMICITY USER: LLEE

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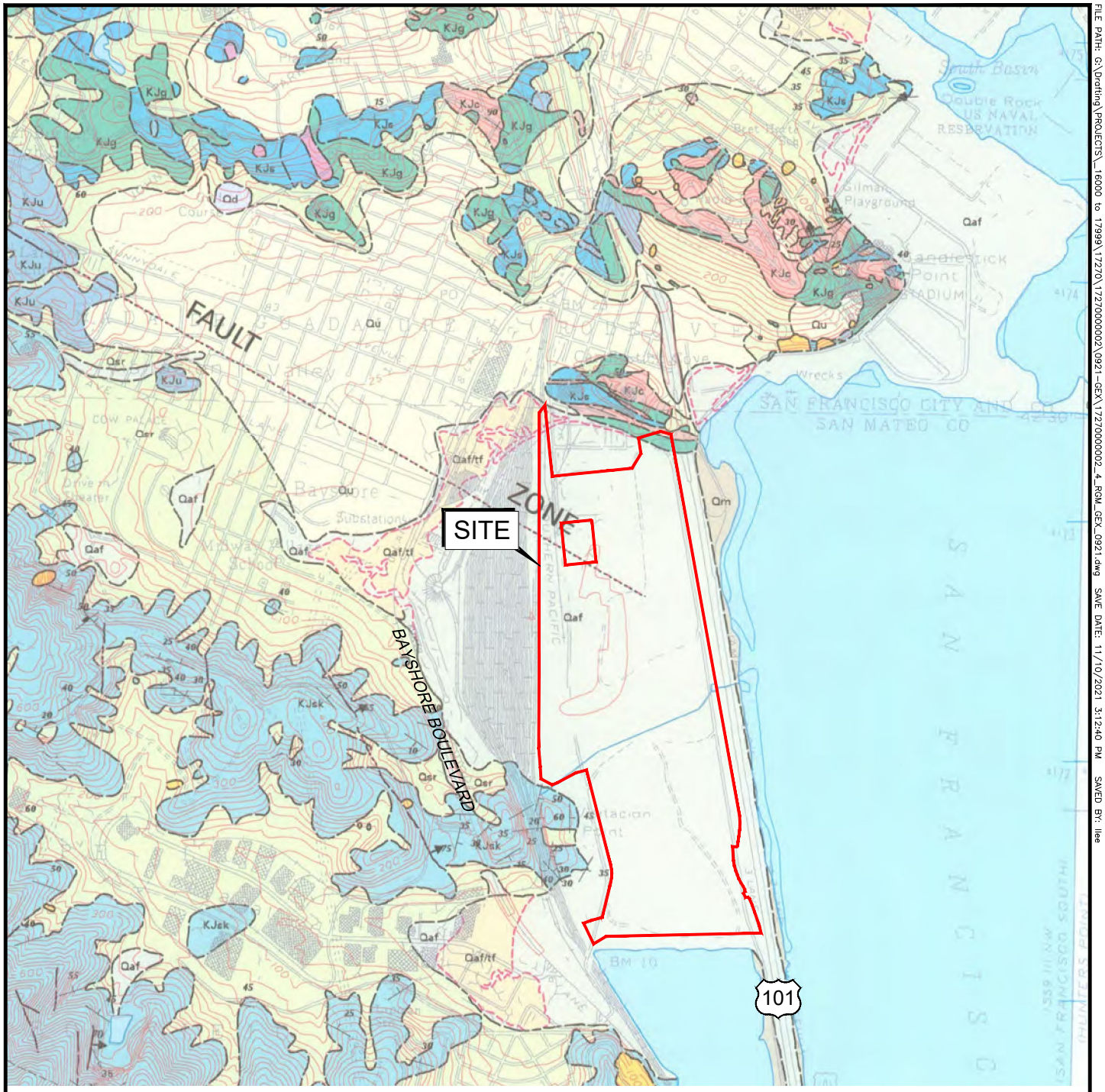

N

0 2000
FEET

EXPLANATION

Qaf	ARTIFICIAL FILL	KJs	SANDSTONE AND SHALE, INTERBEDDED
Qaf/tf	ARTIFICIAL FILL OVER TIDAL FLAT	KJsk	SANDSTONE AND SHALE
Qm	BAY MUD	KJc	CHERT
Qd	DUNE SAND	KJg	GREENSTONE
Qsr	SLOPE DEBRIS AND RAVINE FILL	KJu	SHEARED ROCKS
Qu	SEDIMENTARY DEPOSITS		

BASE MAP SOURCE: OFR98-0354 BONILLA, 1998

ENGEO Expect Excellence

REGIONAL GEOLOGIC MAP

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002		FIGURE NO. 4
SCALE: AS SHOWN		
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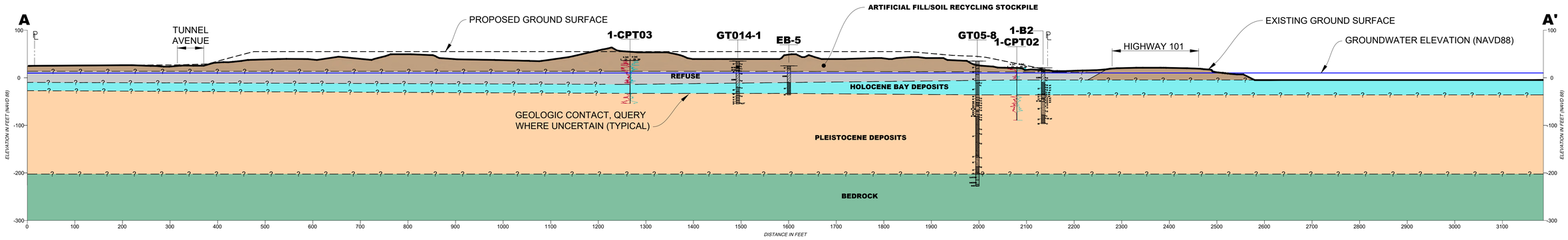
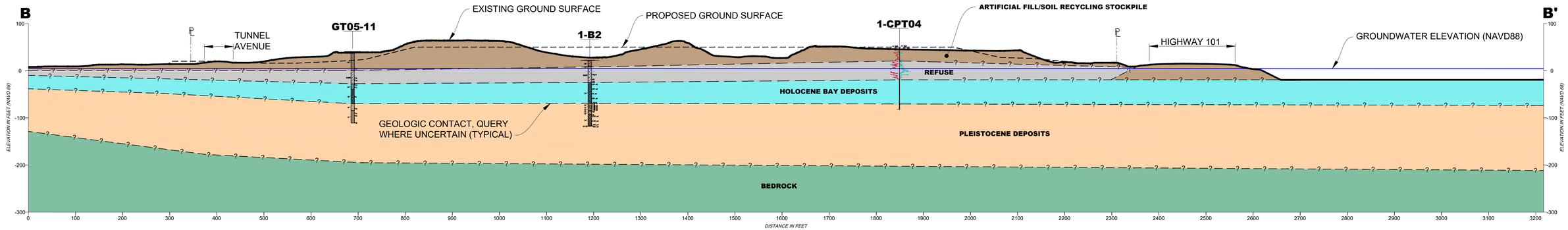


SECTION A-A'
1"-100'



SECTION B-B'
1"-100'

EXPLANATION
ALL LOCATIONS ARE APPROXIMATE

1-B2	BORING (ENGEO, 2021)
GT014-1	BORING (GEOSYNTEC, 2004-2008)
EB-5	BORING (LOWNEY, 1977)
1-CPT04	CONE PENETRATION TEST (ENGEO, 2021)
ARTIFICIAL FILL / SOIL RECYCLING MATERIAL	HIGHLY VARIABLE SOIL CONSISTING OF GRAVEL, SAND, CLAY, AND SILT, WITH ROCK FRAGMENTS AND CONSTRUCTION DEBRIS
REFUSE	REFUSE PLACED BETWEEN 1935 AND 1967. INCLUDES WOOD, PAPER, PLASTIC, GLASS, WIRES, METALS, AND GRAVEL OF VARYING SIZE
HOLOCENE BAY DEPOSITS	SOFT AND COMPRESSIBLE FAT CLAY LOCALLY KNOWN AS YOUNG BAY MUD WITH SAND LENSES
PLEISTOCENE DEPOSITS	SAND AND CLAY LAYERS. THE UPPER LAYER IS COMPRISED OF MEDIUM DENSE TO DENSE SAND. A LAYER OF OVERCONSOLIDATED STIFF CLAY, LOCALLY KNOWN AS OLD BAY CLAY, LIES BENEATH THE UPPER SAND
BEDROCK	JURASSIC AND CRETACEOUS FRANCISCAN BEDROCK. COMPRISED OF INTERBEDDED MELANGE MATRIX AND SILTSTONE/SANDSTONE.

100 0 100
SCALE IN FEET

ENGEO — Expect Excellence

GEOLOGIC CROSS SECTIONS A-A' AND B-B'
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002
SCALE: AS SHOWN
DRAWN BY: CC
CHECKED BY: LC
FIGURE NO. 5A
ORIGINAL FIGURE PRINTED IN COLOR

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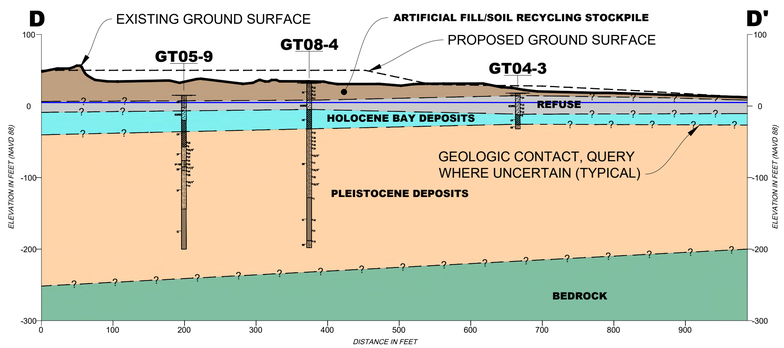
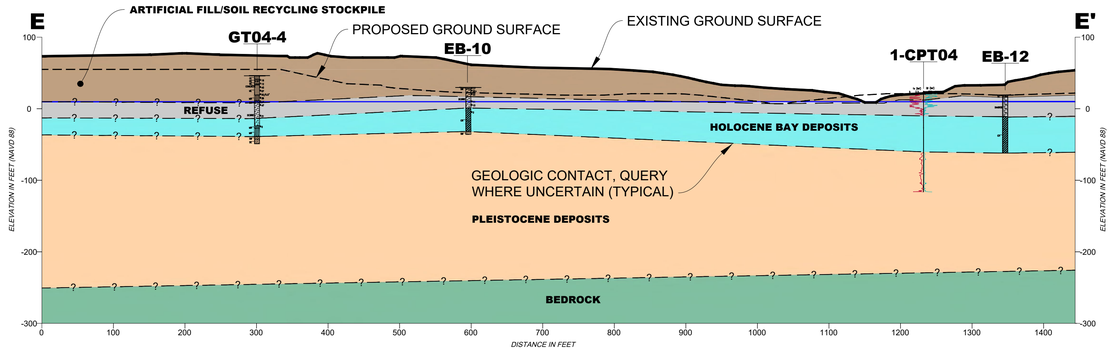
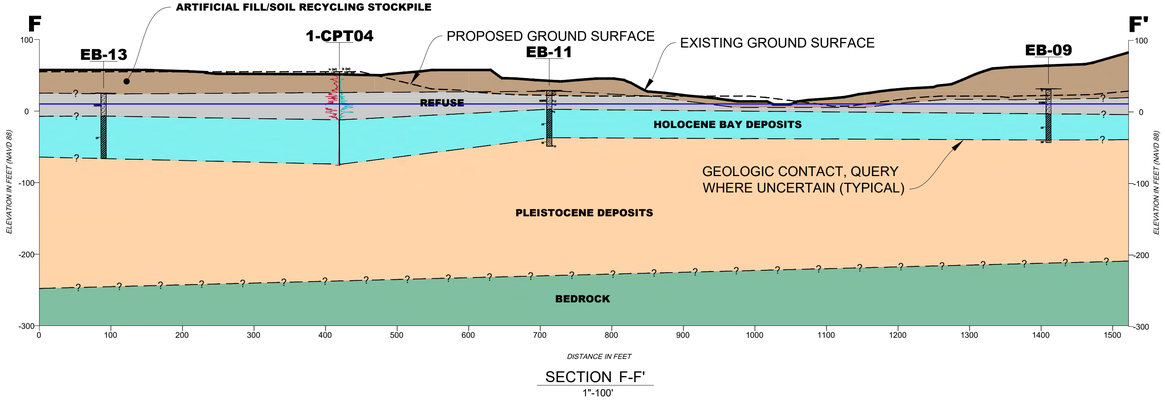


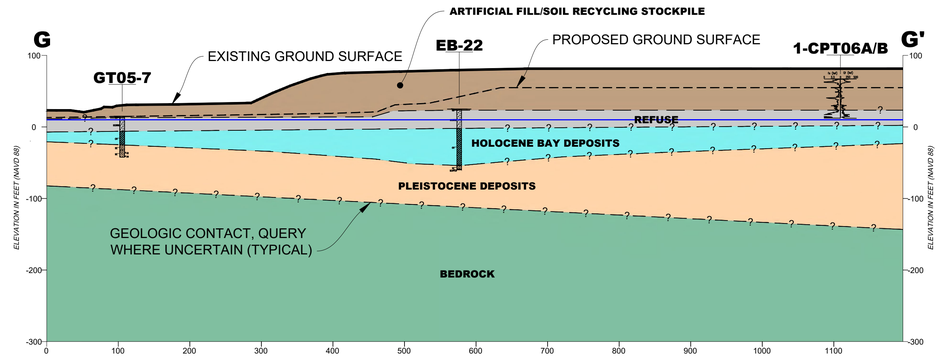
SECTION D-D'
1"-100'



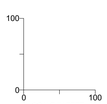
SECTION E-E'
1"-100'



SECTION F-F'
1"-100'



SECTION G-G'
1"-100'



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

1-B2	BORING (ENGEO, 2021)
GT014-1	BORING (GEOSYNTEC, 2004-2008)
EB-5	BORING (LOWNEY, 1977)
1-CPT04	CONE PENETRATION TEST (ENGEO, 2021)
ARTIFICIAL FILL / SOIL RECYCLING MATERIAL	HIGHLY VARIABLE SOIL CONSISTING OF GRAVEL, SAND, CLAY, AND SILT, WITH ROCK FRAGMENTS AND CONSTRUCTION DEBRIS
REFUSE	REFUSE PLACED BETWEEN 1935 AND 1967. INCLUDES WOOD, PAPER, PLASTIC, GLASS, WIRES, METALS, AND GRAVEL OF VARYING SIZE
HOLOCENE BAY DEPOSITS	SOFT AND COMPRESSIBLE FAT CLAY LOCALLY KNOWN AS YOUNG BAY MUD WITH SAND LENSES
PLEISTOCENE DEPOSITS	SAND AND CLAY LAYERS. THE UPPER LAYER IS COMPRISED OF MEDIUM DENSE TO DENSE SAND. A LAYER OF OVERCONSOLIDATED STIFF CLAY, LOCALLY KNOWN AS OLD BAY CLAY, LIES BENEATH THE UPPER SAND
BEDROCK	JURASSIC AND CRETACEOUS FRANCISCAN BEDROCK, COMPRISED OF INTERBEDDED MELANGE MATRIX AND SILTSTONE/SANDSTONE.

ENGEO — Expect Excellence

GEOLOGIC CROSS SECTIONS C-C',D-D',E-E', AND G'-G'
BRISBANE BAYLANDS LANDFILL
BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002
SCALE: AS SHOWN
DRAWN BY: CC
CHECKED BY: LC

FIGURE NO. 5B

ORIGINAL FIGURE PRINTED IN COLOR

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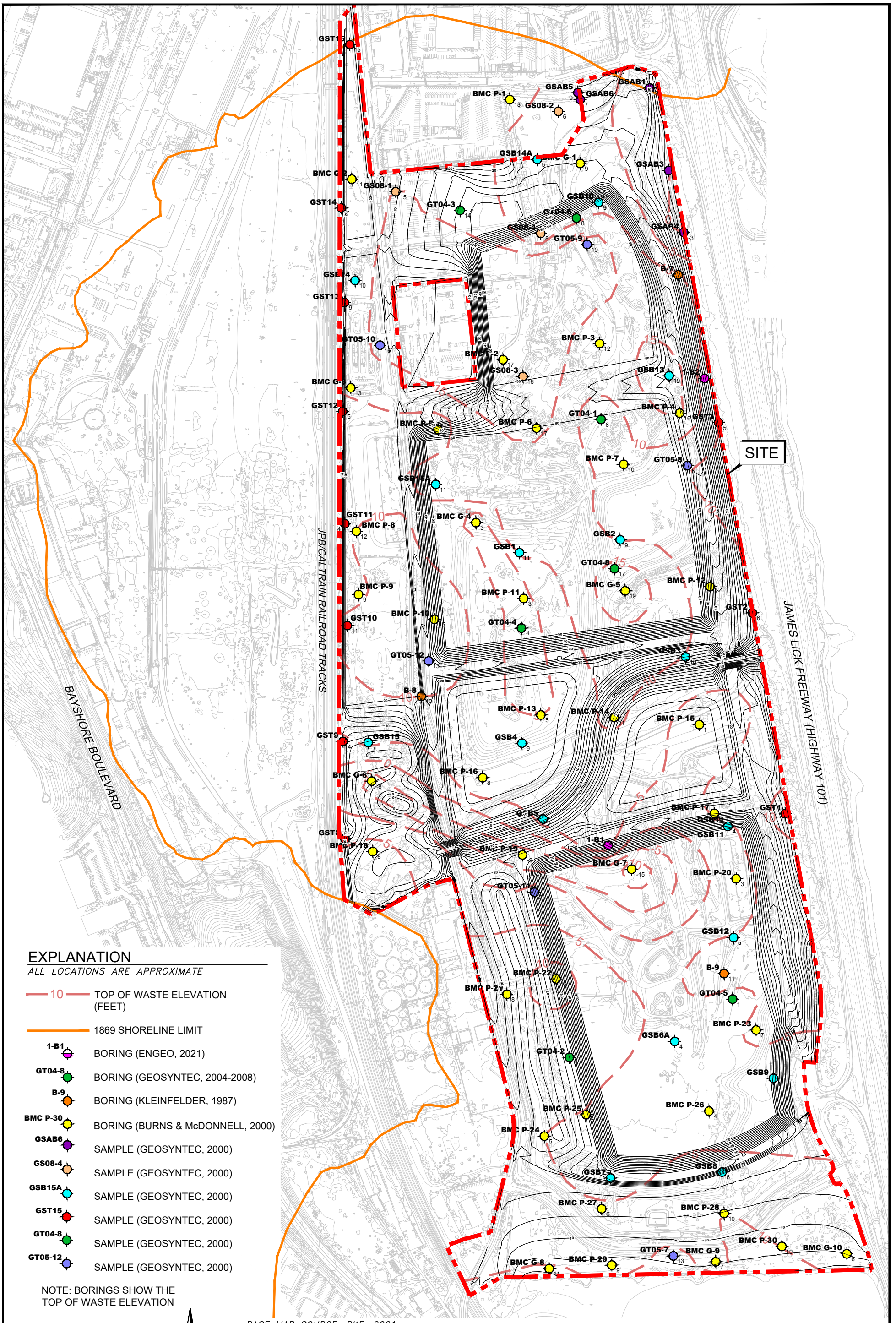

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- 10 — TOP OF WASTE ELEVATION (FEET)
- 1869 SHORELINE LIMIT
- 1-B1 — BORING (ENGEO, 2021)
- GT04-8 — BORING (GEOSYNTEC, 2004-2008)
- B-9 — BORING (KLEINFELDER, 1987)
- BMC P-30 — BORING (BURNS & McDONNELL, 2000)
- GSAB6 — SAMPLE (GEOSYNTEC, 2000)
- GS08-4 — SAMPLE (GEOSYNTEC, 2000)
- GSB15A — SAMPLE (GEOSYNTEC, 2000)
- GST15 — SAMPLE (GEOSYNTEC, 2000)
- GT04-8 — SAMPLE (GEOSYNTEC, 2000)
- GT05-12 — SAMPLE (GEOSYNTEC, 2000)

NOTE: BORINGS SHOW THE TOP OF WASTE ELEVATION

0 500 FEET

N

BASE MAP SOURCE: BKF, 2021

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TOP OF WASTE

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002	FIGURE NO. 6
SCALE: AS SHOWN	
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GS08-2
GS08-1
EB-01
GT04-3
GT04-6
GS08-4
GT05-9
B-7
EB-03
EB-04
GT05-10
GS08-3
1-B2
1-CPT02
GT04-1
EB-05
1-CPT03
GT05-8
EB-06
EB-07
EB-08
GT04-8
SITE
GT04-4
GT05-12
EB-09
EB-10
B-8
1-CPT05
EB-11
EB-12
1-CPT04
1-B1
GT05-11
EB-13
EB-14
B-9
GT04-5
EB-16
EB-15
GT04-2
1-CPT06B
1-CPT06A
EB-22
EB-18
EB-17
EB-19
CPT05-2
CPT05-4
CPT05-6
CPT05-1
EB-21
GT05-7
CPT05-3
CPT05-5
EB-20

15 20 25 30 35

JPB/CALTRAIN RAILROAD TRACKS

BAYSHORE BOULEVARD

JAMES LICK FREEWAY (HIGHWAY 101)

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- 30 — WASTE THICKNESS (FEET)
- 1869 SHORELINE LIMIT
- 1-B1 — BORING (ENGEO, 2021)
- GT04-8 — BORING (GEOSYNTEC, 2004-2008)
- B-9 — BORING (KLEINFELDER, 1987)
- EB-19 — BORING (LOWNEY, 1977)
- 1-CPT06A — CONE PENETRATION TEST (ENGEO, 2021)
- CPT05-1 — CONE PENETRATION TEST (GEOSYNTEC, 2005)

0 500 FEET

N

BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

WASTE THICKNESS MAP

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002	FIGURE NO. 7
SCALE: AS SHOWN	
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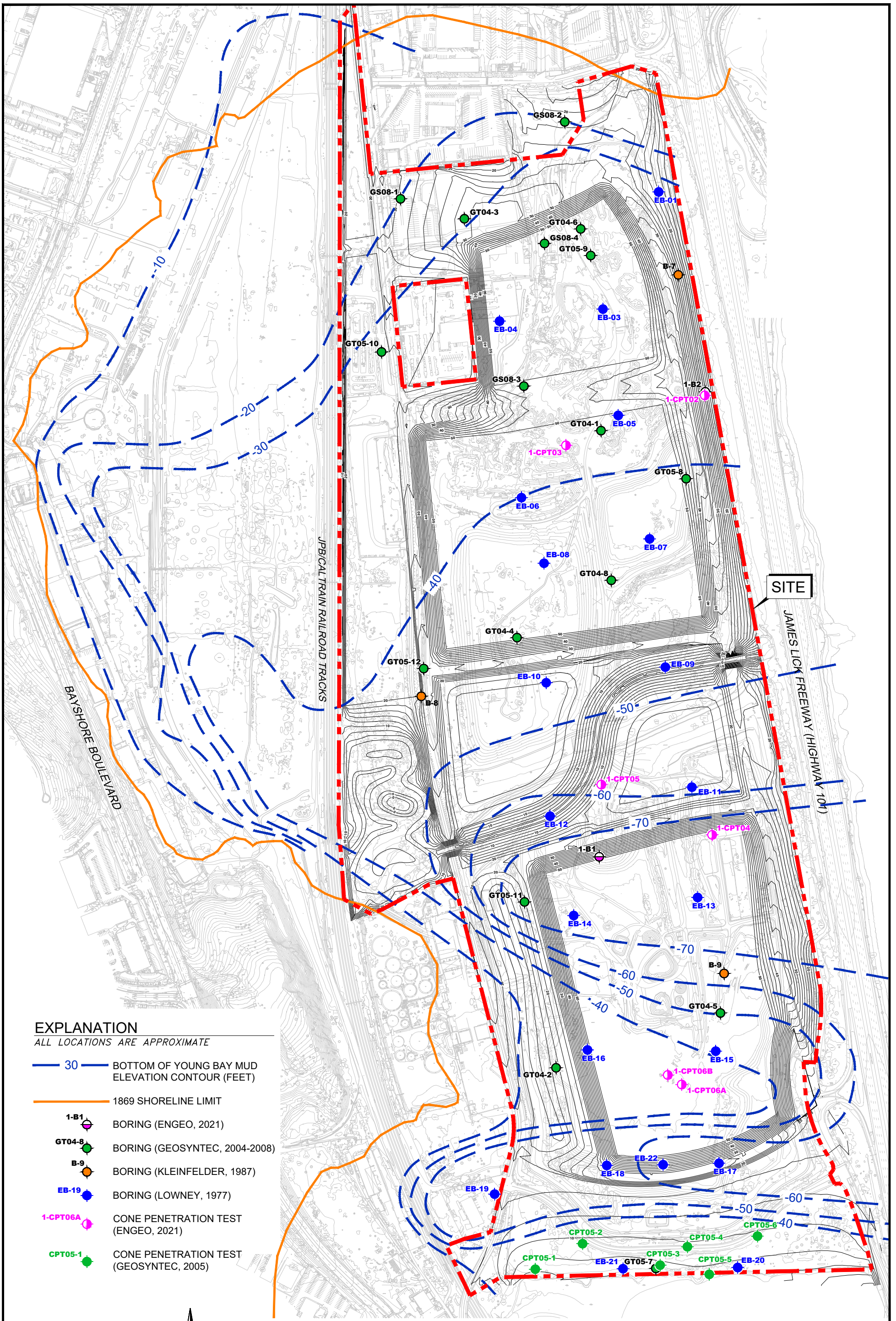

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- 30 — BOTTOM OF YOUNG BAY MUD ELEVATION CONTOUR (FEET)
- 1869 SHORELINE LIMIT
- 1-B1 — BORING (ENGEO, 2021)
- GT04-8 — BORING (GEOSYNTEC, 2004-2008)
- B-9 — BORING (KLEINFELDER, 1987)
- EB-19 — BORING (LOWNEY, 1977)
- 1-CPT06A — CONE PENETRATION TEST (ENGEO, 2021)
- CPT05-1 — CONE PENETRATION TEST (GEOSYNTEC, 2005)

BASE MAP SOURCE: BKF, 2021

0 500 FEET

N

ENGEO Expect Excellence

YOUNG BAY MUD ELEVATION MAP

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002

SCALE: AS SHOWN

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FIGURE NO. 8

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BAYSHORE BOULEVARD

JPB/CALTRAIN RAILROAD TRACKS

JAMES LICK FREEWAY (HIGHWAY 101)

SITE

GS08-2 GS08-1 GT04-3 GT04-6 GS08-4 GT05-9 B-7 EB-01 EB-03 EB-04 GT05-10 GS08-3 1-B2 1-CPT02 GT04-1 EB-05 1-CPT03 GT05-8 EB-06 EB-07 EB-08 GT04-8 GT04-4 GT05-12 EB-09 EB-10 B-8 1-CPT05 EB-11 EB-12 1-CPT04 1-B1 GT05-11 EB-13 EB-14 B-9 GT04-5 EB-16 EB-15 GT04-2 1-CPT06B 1-CPT06A EB-22 EB-18 EB-17 EB-19 CPT05-2 CPT05-4 CPT05-6 CPT05-1 CPT05-3 CPT05-5 EB-21 GT05-7 EB-20

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- 30 — YOUNG BAY MUD THICKNESS (FEET)
- 1869 SHORELINE LIMIT
- 1-B1 — BORING (ENGEO, 2021)
- GT04-8 — BORING (GEOSYNTEC, 2004-2008)
- B-9 — BORING (KLEINFELDER, 1987)
- EB-19 — BORING (LOWNEY, 1977)
- 1-CPT06A — CONE PENETRATION TEST (ENGEO, 2021)
- CPT05-1 — CONE PENETRATION TEST (GEOSYNTEC, 2005)

0 500 FEET

N

BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

YOUNG BAY MUD THICKNESS MAP

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002

SCALE: AS SHOWN

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FIGURE NO. 9

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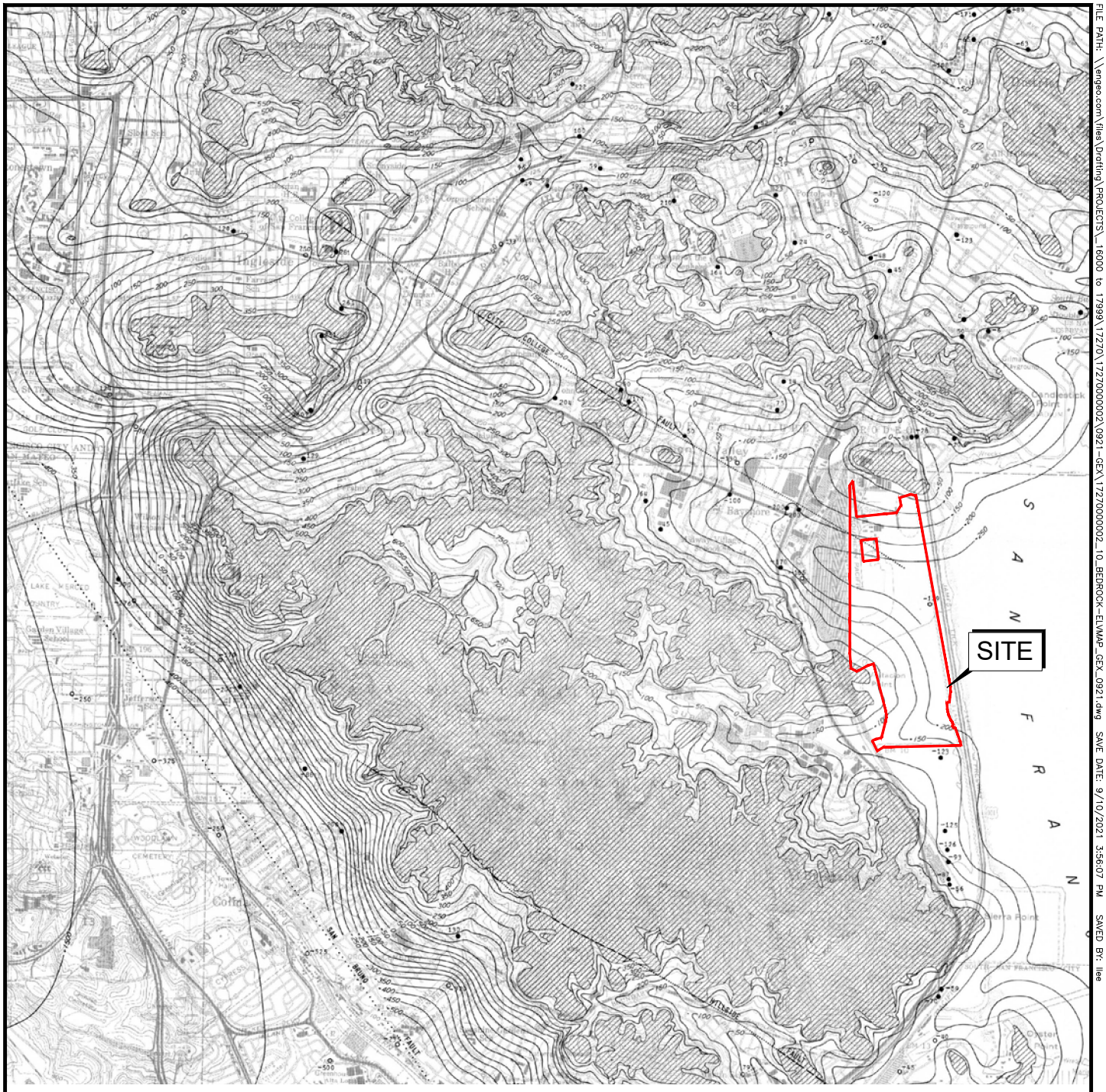

EXPLANATION

- BEDROCK AT SURFACE
- —150— CONTOUR ON TOP OF BEDROCK WHERE BEDROCK IS BURIED, SHOWN IN FEET
- •-200? LOCATION OF BOREHOLE AND ELEVATION OF TOP OF BEDROCK IN BOREHOLE
- o-220 LOCATION OF BOREHOLE THAT DID NOT REACH BEDROCK
- Fault FAULT
- Hypothetical fault HYPOTHETICAL FAULT

N

0 4000
FEET

BASE MAP SOURCE: U.S.G.S MF-334/BONILLA, 1964

ENGEO Expect Excellence

BEDROCK ELEVATION MAP

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002	FIGURE NO. 10
SCALE: AS SHOWN	
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TUNNEL AVEUNE TEST PAD

CHANNEL TEST PAD

SITE

ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
ZONE 6
ZONE 7
ZONE 8
ZONE 9
ZONE 10
ZONE 11
ZONE 12
ZONE 13
ZONE 14
ZONE 15
ZONE 16
ZONE 17
ZONE 18
ZONE 19
ZONE 20
ZONE 21
ZONE 22

GS08-1
GS08-2
GS08-3
GS08-4
GT04-1
GT04-2
GT04-3
GT04-4
GT04-5
GT04-6
GT04-8
GT05-1
GT05-2
GT05-3
GT05-4
GT05-5
GT05-6
GT05-7
GT05-8
GT05-9
GT05-10
GT05-11
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EB-14
EB-15
EB-16
EB-17
EB-18
EB-19
EB-20
EB-21
EB-22
B-7
B-8
B-9
1-B1
1-B2
1-CPT02
1-CPT03
1-CPT04
1-CPT05
1-CPT06A
1-CPT06B

JPB/CALTRAIN RAILROAD TRACKS
BAYSHORE BOULEVARD
JAMES LICK FREEWAY (HIGHWAY 101)

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- 1-B1 — BORING (ENGEO, 2021)
- GT04-8 — BORING (GEOSYNTEC, 2004-2008)
- B-9 — BORING (KLEINFELDER, 1987)
- EB-19 — BORING (LOWNEY, 1977)
- 1-CPT06A — CONE PENETRATION TEST (ENGEO, 2021)
- CPT05-1 — CONE PENETRATION TEST (GEOSYNTEC, 2005)

0 500
FEET

N

BASE MAP SOURCE: BKF, 2021

ENGEO
Expect Excellence

SETTLEMENT ZONES MAP

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002

SCALE: AS SHOWN

DRAWN BY: CC

CHECKED BY: LC

FIGURE NO. 11

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TUNNEL AVEUNE TEST PAD

1956 TO 1963

1930 TO 1935

1935 TO 1938

PRIOR TO 1930

1938 TO 1941

1950 TO 1956

SITE

1941 TO 1946

JAMES LICK FREEWAY (HIGHWAY 101)

JPB/CAL TRAIN RAILROAD TRACKS

BAYSHORE BOULEVARD

CHANNEL TEST PAD

1946 TO 1950

1956 TO 1963

1963 TO 1967

PRIOR TO 1930

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- MARSH LIMIT
- 1869 SHORELINE LIMIT
- PRIOR TO 1930
- 1930 TO 1935
- 1935 TO 1938
- 1938 TO 1941
- 1941 TO 1946
- 1946 TO 1950
- 1950 TO 1956
- 1956 TO 1963
- 1963 TO 1967

0 500 FEET

N

BASE MAP SOURCE: BKF, 2021

ENGEO Expect Excellence

WASTE PLACEMENT TIMELINE

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002	FIGURE NO. 12
SCALE: AS SHOWN	
DRAWN BY: CC	CHECKED BY: LC

ORIGINAL FIGURE PRINTED IN COLOR

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JPB/CAL TRAIN RAILROAD TRACKS

BAYSHORE BOULEVARD

JAMES LICK FREEWAY (HIGHWAY 101)

SITE

6-10
1-5
11-15
16-20
15

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

16 -20 ESTIMATED RANGE OF POST-IMPROVEMENT SETTLEMENT (INCHES)

1869 SHORELINE LIMIT

0 500
FEET

N

BASE MAP SOURCE: BKF, 2021

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POST IMPROVEMENT SETTLEMENT

BRISBANE BAYLANDS LANDFILL

BRISBANE, CALIFORNIA

PROJECT NO.: 17270.000.002	FIGURE NO. 13
SCALE: AS SHOWN	
DRAWN BY: CC	CHECKED BY: LC

ORIGINAL FIGURE PRINTED IN COLOR



APPENDIX A

KEY TO BORING LOGS
EXPLORATION LOGS

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity CL - Inorganic clay with low to medium plasticity OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity CH - Fat clay with high plasticity OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE					CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4 "	3"	12"		
SILTS AND CLAYS	SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE			

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

- Modified California (3" O.D.) sampler
- California (2.5" O.D.) sampler
- S.P.T. - Split spoon sampler
- Shelby Tube
- Dames and Moore Piston
- Continuous Core
- Bag Samples
- Grab Samples
- NR No Recovery

MOISTURE CONDITION

DRY	Dusty, dry to touch
MOIST	Damp but no visible water
WET	Visible freewater

LINE TYPES

- ———— Solid - Layer Break
- – – – – – Dashed - Gradational or approximate layer break

GROUNDWATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

ENGEO
Expect Excellence

LOG OF BORING 1-B1

Expect Excellence

LATITUDE: 37.695 LONGITUDE: -122.3963

Geotechnical Exploration
Baylands Landill
Brisbane, CA
17270.000.002

DATE DRILLED: 6/9/2021
HOLE DEPTH: Approx. 140 ft.
HOLE DIAMETER: 6.5 in.
SURF ELEV (NAVD88): Approx. 22 ft.

LOGGED / REVIEWED BY: J. Tognolini / JAF
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
0	20		SILTY GRAVEL (GM), brown, moist, fine to coarse, angular to rounded, approximately 30% fines, approximately 20% fine- to coarse-grained sand [FILL]												
5	15		brick fragments												
			concrete fragments												
10	10		grades to increasing clay, easier drilling												
			CLAYEY SAND (SC), bluish gray, moist, fine- to medium-grained sand, approximately 40% fines [FILL]												
15	5		WASTE, dark blue to black, saturated, some gravel, plastic, wood, metal, strong burnt rubber odor		▽										
20	0														
25															

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B1

ENGEO Expect Excellence

LATITUDE: 37.695 LONGITUDE: -122.3963

Geotechnical Exploration
Baylands Landill
Brisbane, CA
17270.000.002

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			WASTE, dark blue to black, saturated, some gravel, plastic, wood, metal, strong burnt rubber odor becomes wet												
	-5														
			YBM/waste mix, plastic, wood, softer drilling												
30						50/6									
	-10														
35															
	-15														
40			grades to fine to coarse gravel, fine- to coarse-grained sand, glass, metal			81	36	18	18						
	-20														
45						25									
			approximately 80% YBM and 20% waste												
	-25		FAT CLAY (CH), bluish gray, medium stiff to stiff, wet, high plasticity, trace shell fragments [YBM]												
50															

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B1

ENGEO Expect Excellence

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Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			FAT CLAY (CH), bluish gray, medium stiff to stiff, wet, high plasticity, trace shell fragments [YBM]			50 psi									
	-30														
55															
	-35														
60						50 psi					65.9	61	806		UU
	-40														
65															
	-45														
70						0 psi					52.9	70	1016		UU
	-50														
75															

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B1

ENGEO Expect Excellence

LATITUDE: 37.695 LONGITUDE: -122.3963

Geotechnical Exploration
Baylands Landill
Brisbane, CA
17270.000.002

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Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			FAT CLAY (CH), bluish gray, medium stiff to stiff, wet, high plasticity, trace shell fragments [YBM]												
	-55														
80						50 psi					60.7	63	762		UU
	-60														
85															
	-65														
90															
	-70		CLAYEY SAND (SC), dark greenish gray, medium dense, wet, fine- to medium-grained sand, approximately 20% fines			50 psi									
						200 psi									
			alternating between approximately 20% to 50% fines			23									
95						100 psi									
	-75		SANDY CLAY (CL), dark greenish gray, wet, medium plasticity, approximately 30% fine- to medium-grained sand, trace shell fragments			200 psi					18.8	113	3461		UU
100															

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B1

Expect Excellence

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Baylands Landill
Brisbane, CA
17270.000.002

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Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
						200 psi									
	-80		CLAYEY SAND (SC), light yellowish brown mottled with light bluish gray, wet, fine- to medium-grained sand, approximately 30% fines			200 psi									
105						200 psi									
	-85		LEAN CLAY WITH SAND (CL), greenish gray mottled with brown, moist, approximately 15% fine-grained sand, trace fine subangular gravel												
			CLAYEY SAND (SC), dark greenish gray, very dense, wet, fine- to medium-grained sand, 15% fine subrounded to subangular gravel			59				19	17.4				
110															
	-90														
115			FAT CLAY (CH), light bluish gray, soft, wet, high plasticity, trace fine-grained sand [OBC]			0									
	-95														
			grades to stiff			100 psi				100	54.2	69	1103		UU
120															
	-100														
125															

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B1

ENGEO Expect Excellence

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			FAT CLAY (CH), light bluish gray, soft, wet, high plasticity, trace fine-grained sand [OBC]												
	-105														
			grades to very stiff			100 psi					50.5	73	2150		UU
130															
	-110														
135															
	-115														
			WELL GRADED SAND WITH CLAY (SW-SC), dark bluish gray, wet, fine- to coarse-grained sand, approximately 45% fine to coarse gravel			400 psi				6	13.6				
140						800 psi									
			Bottom of boring at approximately 140 feet below ground surface. Groundwater encountered at approximately 25 feet below ground surface.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B2

LATITUDE: 37.7019 LONGITUDE: -122.3945

Geotechnical Exploration
Baylands Landill
Brisbane, CA
17270.000.002

DATE DRILLED: 6/4/2021
HOLE DEPTH: Approx. 117½ ft.
HOLE DIAMETER: 6.5 in.
SURF ELEV (NAVD88): Approx. 16 ft.

LOGGED / REVIEWED BY: J. Tognolini / JAF
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: HSA/Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
0	15		SILTY GRAVEL (GM), brown, moist, fine to coarse gravel, angular to rounded, approximately 30% fines [FILL]												
5	10		SANDY CLAY (CH), bluish gray, moist, approximately 30% fine- to medium-grained sand, approximately 10% fine rounded gravel [FILL]												
10	5		WASTE, dark blue to black, saturated, some gravel, plastic, wood, metal		▽										
15	0														
20	-5														
25															

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B2

ENGEO Expect Excellence

LATITUDE: 37.7019 LONGITUDE: -122.3945

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Baylands Landill
Brisbane, CA
17270.000.002

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	-10		WASTE, dark blue to black, saturated, some gravel, plastic, wood, metal			25									
30	-15					5									
			FAT CLAY (CH), bluish gray, medium stiff, wet, some waste (wood, cloth netting) [YBM]												
35	-20					50 psi					62.9	62	454		UU
			FAT CLAY (CH), bluish gray, medium stiff, wet, some shell fragments [YBM]												
40	-25					50 psi					64.5	62	486		UU
45	-30					50 psi					72.6	57	606		UU
50															

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B2

ENGEO Expect Excellence

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	-35		FAT CLAY (CH), bluish gray, medium stiff, wet, some shell fragments [YBM]			0 psi									
			no shell fragments			0 psi					63.7	63	956		UU
55			FAT CLAY WITH SAND (CH), bluish gray, wet, approximately 20% fine- to medium-grained sand [YBM]												
	-40		CLAYEY SAND (SC), bluish gray to brown, loose, wet, fine- to medium-grained sand, with shell fragments			0 psi									
						40 psi				18					
60			POORLY GRADED SAND WITH CLAY (SP-SC), bluish gray, loose, wet, fine- to medium-grained sand												
	-45					150 psi				7					
						80 psi									
			FAT CLAY WITH SAND (CH), bluish gray, wet, approximately 20% fine- to medium-grained sand												
65															
	-50		POORLY GRADED SAND WITH SILT (SP-SM), bluish gray to olive brown, dense, wet, fine- to medium-grained sand, approximately 10% fines												
						32									
70															
	-55		SILTY SAND (SM), bluish gray to olive brown, medium dense, wet, fine- to medium-grained sand												
						17				27	19.4				
75															

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B2

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Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	-60		SILTY SAND (SM), bluish gray to olive brown, medium dense, wet, fine- to medium-grained sand												
80	-65		grades to dense, trace shell fragments			43									
85	-70														
90	-75		grades to pockets of very stiff lean clay, medium dense, no shell fragments			25					18.8				
95	-80														
100			FAT CLAY (CH), greenish gray, soft, wet, [OBC]												

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21

LOG OF BORING 1-B2

ENGEO Expect Excellence

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Brisbane, CA
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	-85		FAT CLAY (CH), greenish gray, soft, wet, [OBC]			0									
105			grades to medium stiff												
	-90					100 psi					63.6	63	863		UU
											56.3	66	692		UU
110															
	-95														
115			SILTY SAND (SM), greenish gray, wet, fine- to medium-grained sand, approximately 15% fines			500 psi					23	106	6070		UU
	-100					61									
			Bottom of boring at approximately 117½ feet below ground surface. Groundwater encountered at approximately 8 feet below ground surface.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV BORING LOGS.GPJ ENGEO INC.GDT 12/7/21



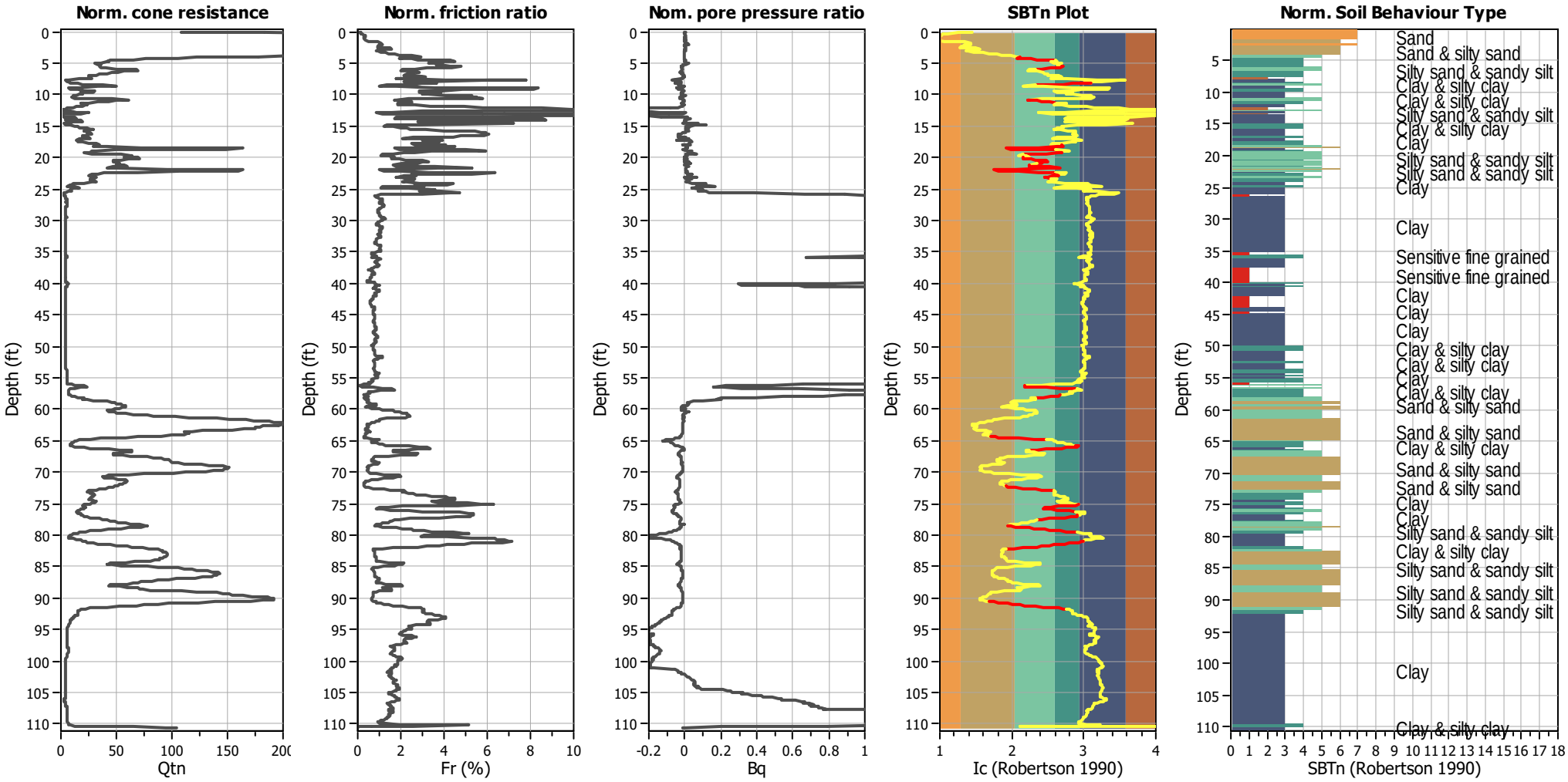
APPENDIX B

CONE PENETRATION TEST LOGS

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT02
Total depth: 110.65 ft

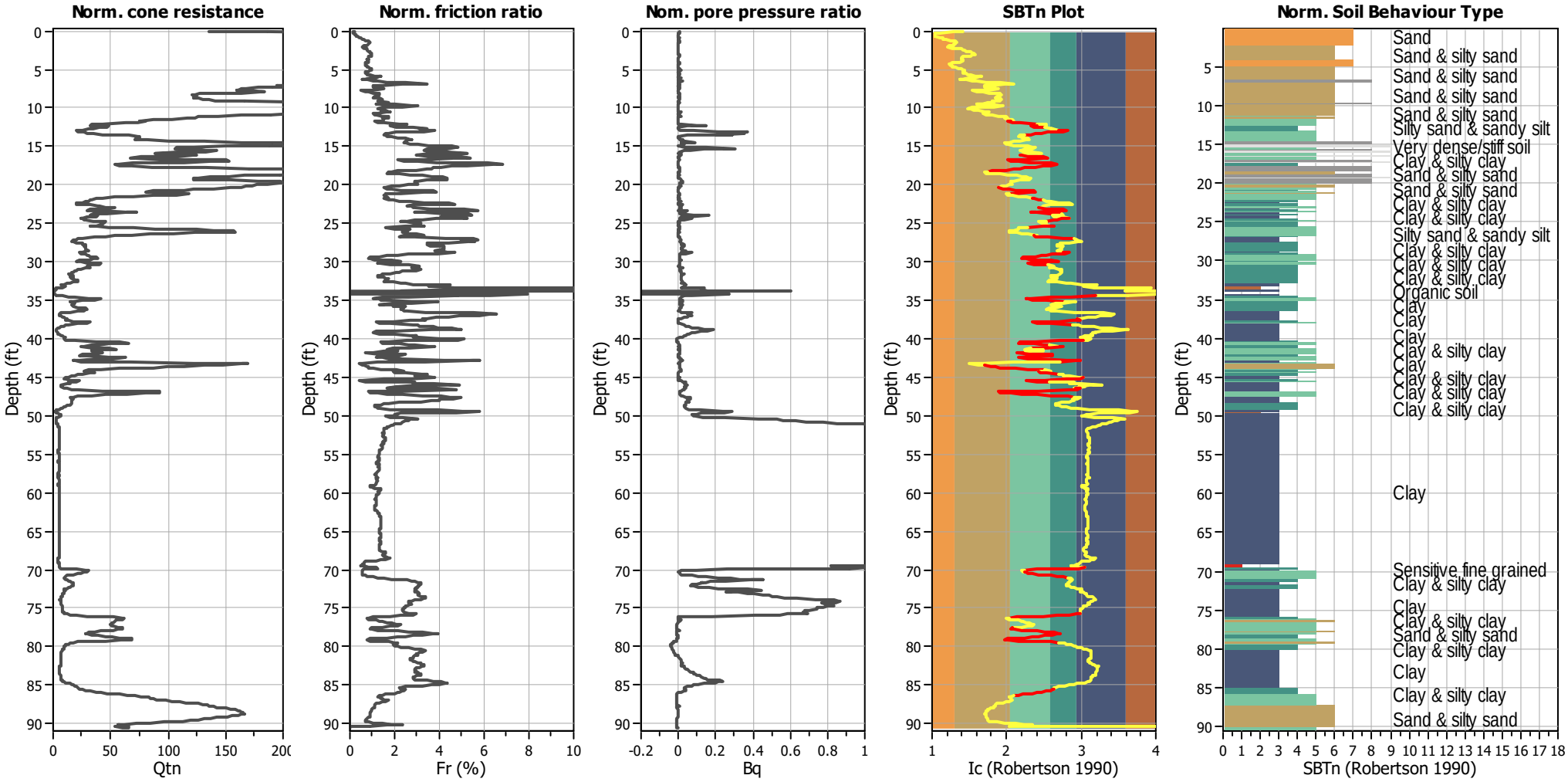


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT03
Total depth: 90.55 ft

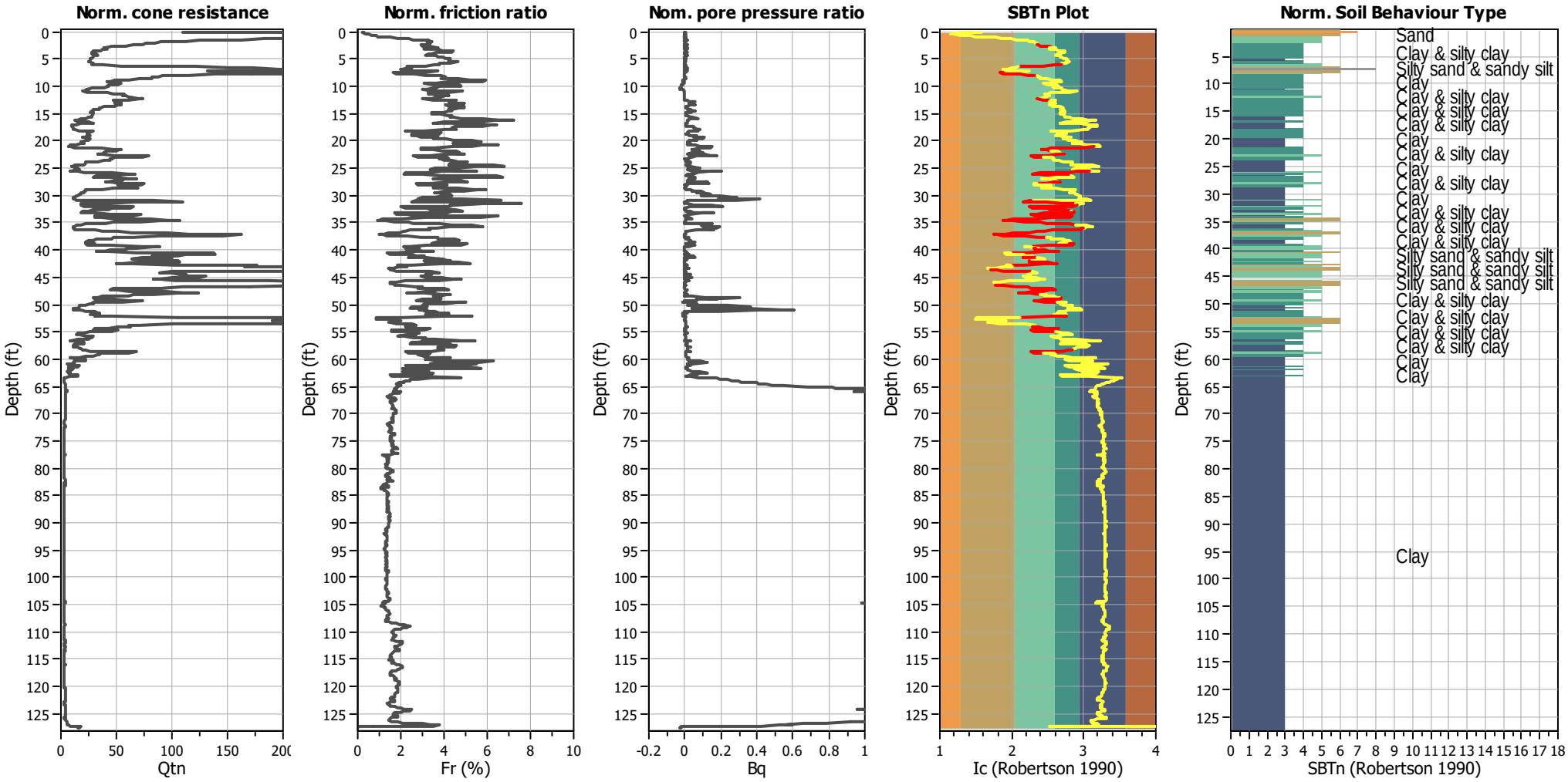


Analysis method:	B&I (2014)	G.W.T. (in-situ):	36.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	36.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT04
Total depth: 127.62 ft

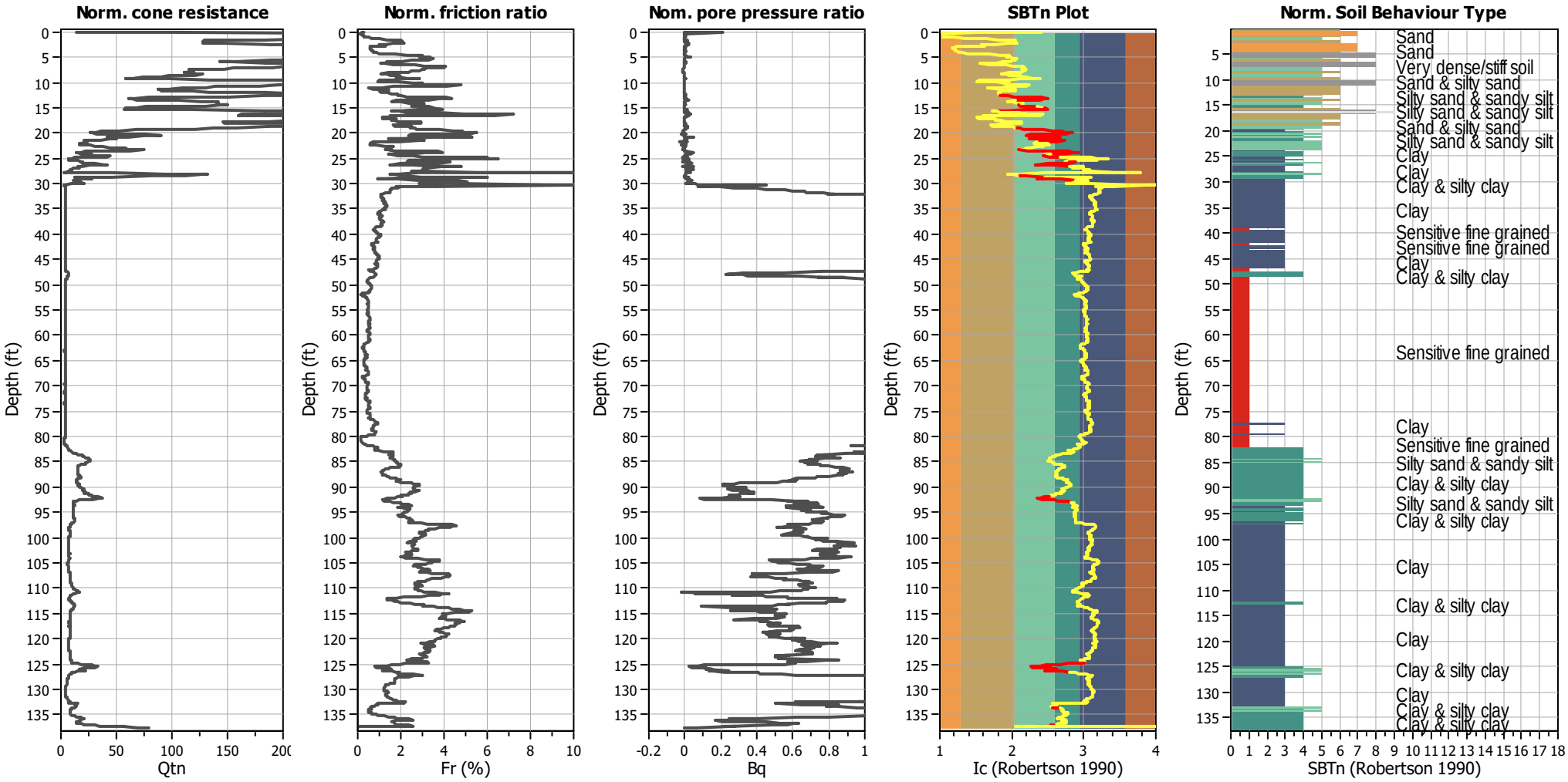


Analysis method:	B&I (2014)	G.W.T. (in-situ):	33.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	33.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT05
Total depth: 137.63 ft

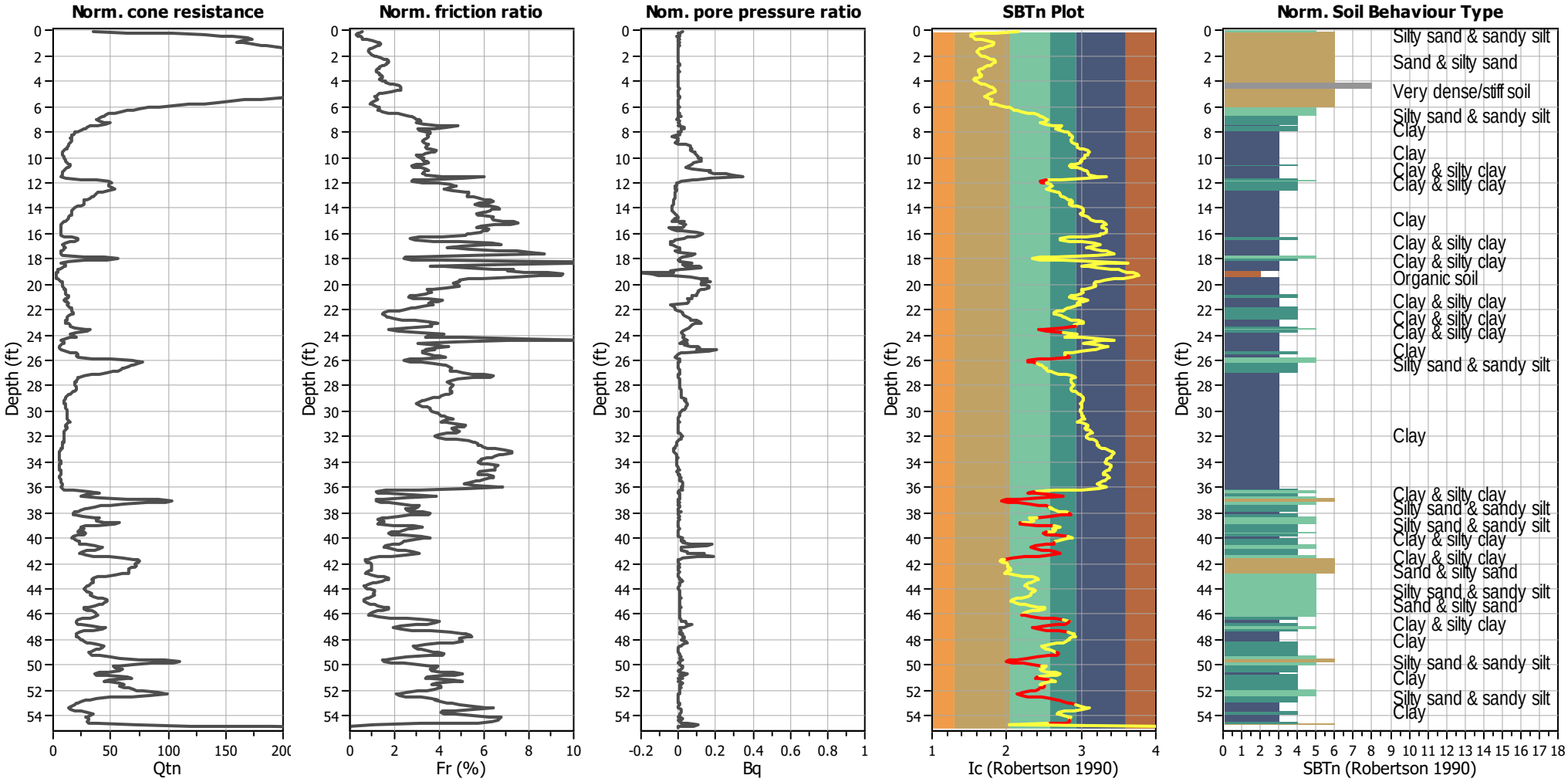


Analysis method:	B&I (2014)	G.W.T. (in-situ):	13.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT06A
Total depth: 54.95 ft

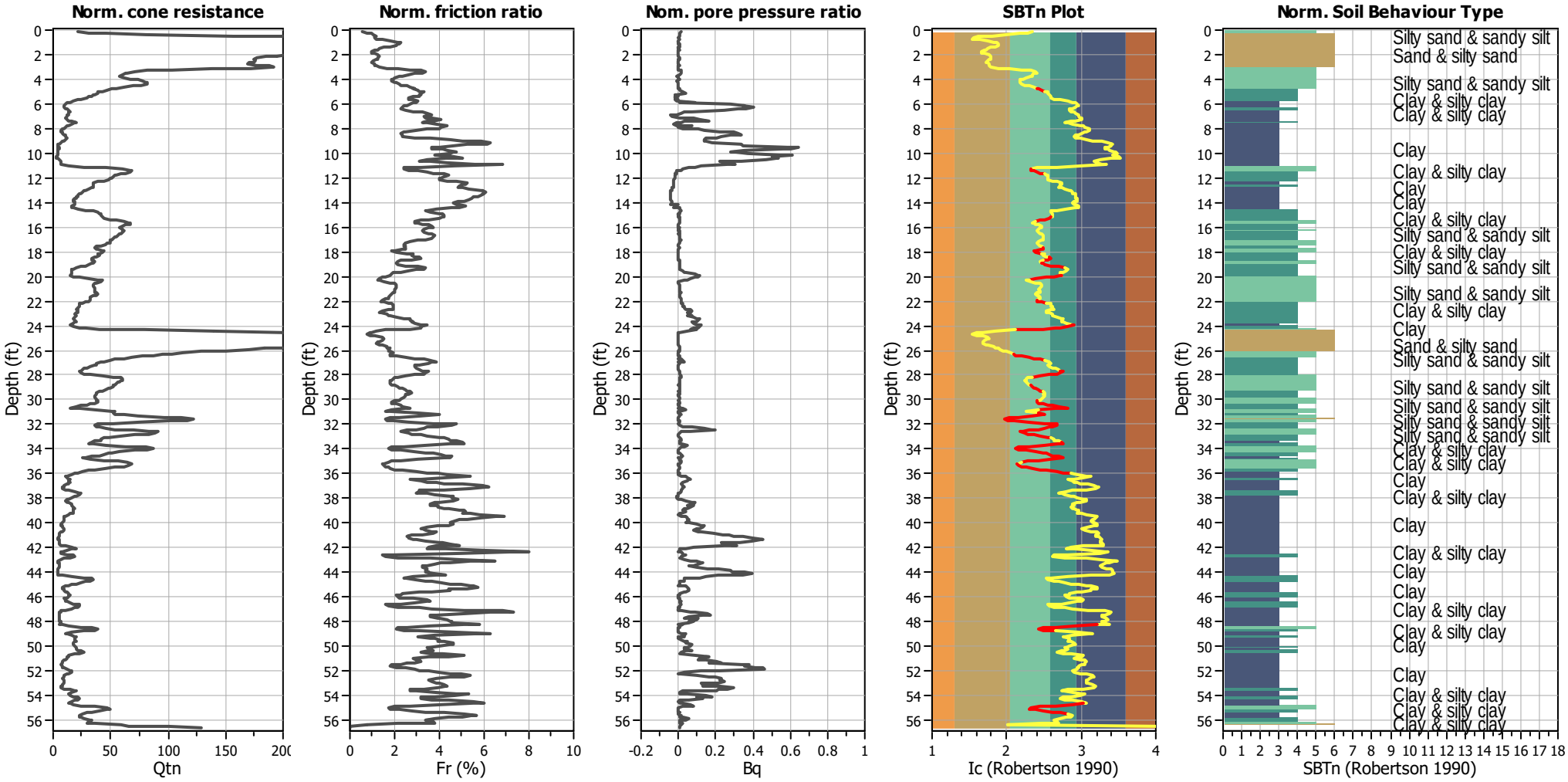


Analysis method:	B&I (2014)	G.W.T. (in-situ):	52.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	52.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT06B
Total depth: 56.68 ft



Analysis method:	B&I (2014)	G.W.T. (in-situ):	56.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	56.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



APPENDIX C

LABORATORY TEST DATA

MOISTURE CONTENT REPORT
ASTM D2216

SAMPLE ID	1-B01 @108	1-B01 @137.5						
DEPTH (ft.)	108	137.5						
METHOD A OR B	B	B						
MOISTURE CONTENT (%)	17.4	13.6						

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CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002 PH001
PROJECT LOCATION: Brisbane, California
REPORT DATE: 6/17/2021
TESTED BY: P. Galicia
REVIEWED BY: G. Criste

MOISTURE CONTENT REPORT
ASTM D2216

SAMPLE ID	1-B02	1-B02						
DEPTH (ft.)	72.5	90						
METHOD A OR B	B	B						
MOISTURE CONTENT (%)	19.4	18.8						

SAMPLE ID								
DEPTH (ft.)								
METHOD A OR B								
MOISTURE CONTENT (%)								

SAMPLE ID								
DEPTH (ft.)								
METHOD A OR B								
MOISTURE CONTENT (%)								

SAMPLE ID								
DEPTH (ft.)								
METHOD A OR B								
MOISTURE CONTENT (%)								

SAMPLE ID								
DEPTH (ft.)								
METHOD A OR B								
MOISTURE CONTENT (%)								

SAMPLE ID								
DEPTH (ft.)								
METHOD A OR B								
MOISTURE CONTENT (%)								

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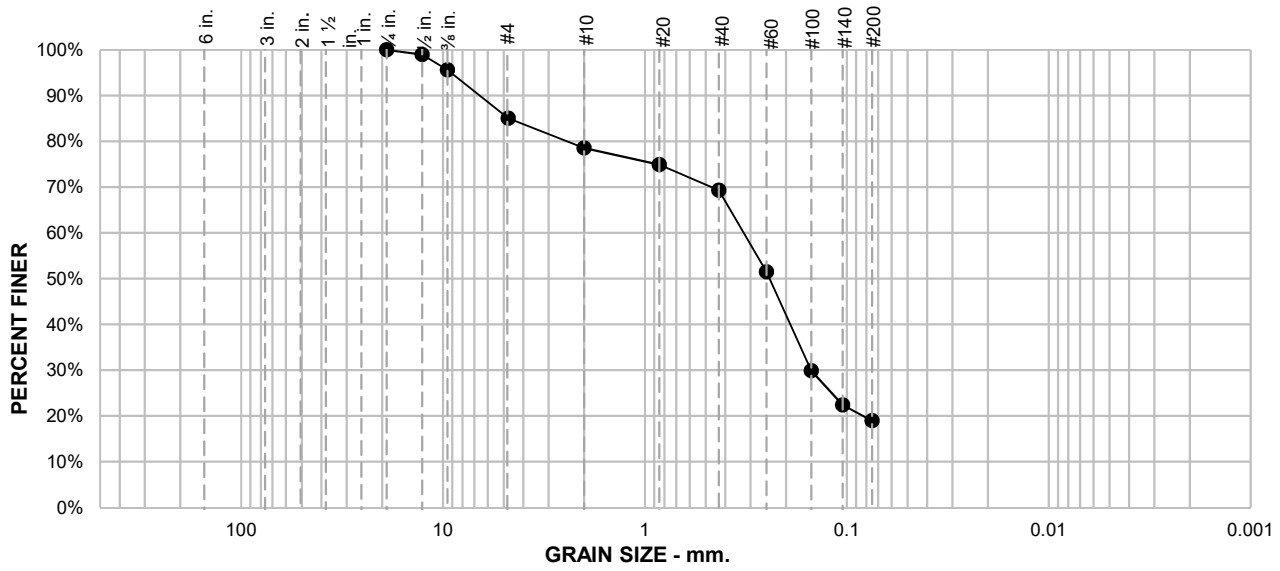
CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002 PH001
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/17/2021
TESTED BY: K. Lecce
REVIEWED BY: V. Navarro

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B01@108

DEPTH (ft): 108

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
		15.0	6.4	9.3	50.4	18.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
¾ in.	100.0		
½ in.	99.0		
⅜ in.	95.6		
#4	85.0		
#10	78.6		
#20	74.9		
#40	69.3		
#60	51.5		
#100	29.9		
#140	22.4		
#200	18.9		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 6.5952 mm D_{85} = 4.7500 mm D_{60} = 0.3239 mm

D_{50} = 0.2413 mm D_{30} = 0.1504 mm D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

* (no specification provided)

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CLIENT: Baylands Development, Inc.

PROJECT NAME: Baylands Landfill Closure Study

PROJECT NO: 17270.000.002 PH001

PROJECT LOCATION: Brisbane, California

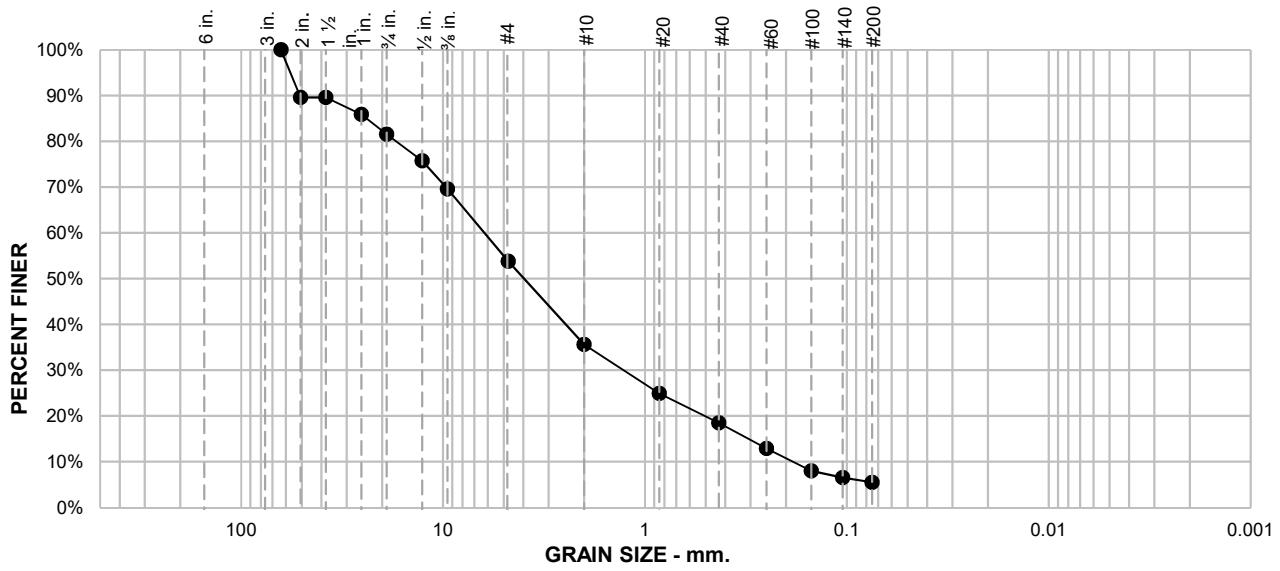
REPORT DATE: 6/22/2021

TESTED BY: P. Galicia

REVIEWED BY: G. Criste

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B01@137.5

DEPTH (ft): 137.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
	18.4	27.8	18.2	17.1	13.0	5.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2.5 in.	100.0		
2 in.	89.6		
1-½ in.	89.6		
1 in.	85.9		
¾ in.	81.6		
½ in.	75.7		
⅜ in.	69.6		
#4	53.8		
#10	35.6		
#20	24.9		
#40	18.5		
#60	12.9		
#100	8.0		
#140	6.5		
#200	5.5		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 51.2379 mm D_{85} = 23.9157 mm D_{60} = 6.2412 mm

D_{50} = 3.9651 mm D_{30} = 1.2780 mm D_{15} = 0.3064 mm

D_{10} = 0.1848 mm C_u = 33.78 C_c = 1.42

CLASSIFICATION

USCS =

REMARKS

* (no specification provided)

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CLIENT: Baylands Development, Inc.

PROJECT NAME: Baylands Landfill Closure Study

PROJECT NO: 17270.000.002 PH001

PROJECT LOCATION: Brisbane, California

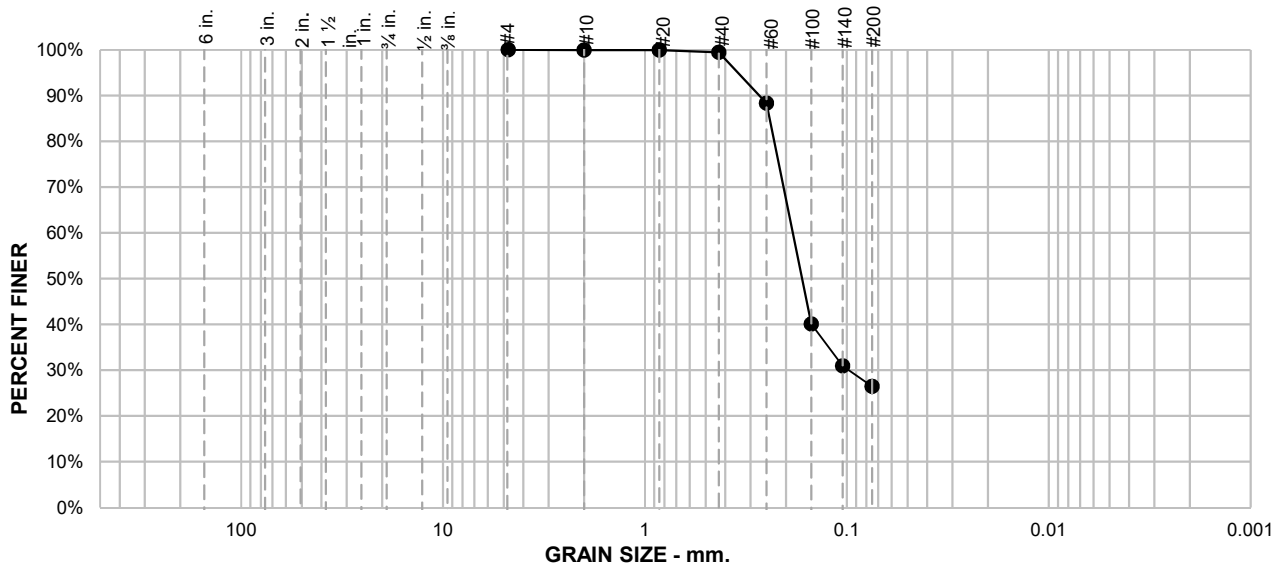
REPORT DATE: 6/22/2021

TESTED BY: P. Galicia

REVIEWED BY: G. Criste

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B02@72.5'

DEPTH (ft): 72.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
			0.1	0.4	73.0	26.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.9		
#40	99.5		
#60	88.3		
#100	40.1		
#140	31.0		
#200	26.5		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 0.2715 mm D_{85} = 0.2414 mm D_{60} = 0.1852 mm

D_{50} = 0.1666 mm D_{30} = 0.0974 mm D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

* (no specification provided)

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CLIENT: Baylands Development, Inc.

PROJECT NAME: Baylands Landfill Closure Study

PROJECT NO: 17270.000.002 PH001

PROJECT LOCATION: Brisbane, CA

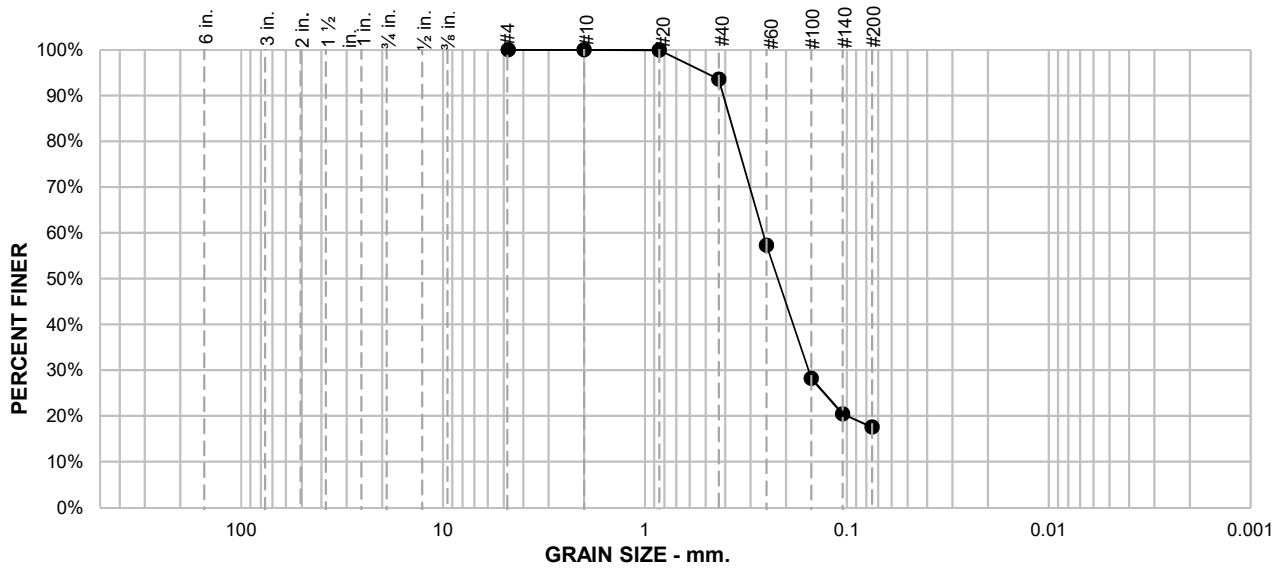
REPORT DATE: 6/17/2021

TESTED BY: E. Korogianos

REVIEWED BY: K. Lecce

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B02@57.5

DEPTH (ft): 57.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
				6.4	76.1	17.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	93.6		
#60	57.3		
#100	28.2		
#140	20.4		
#200	17.5		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 0.4075 mm D_{85} = 0.3782 mm D_{60} = 0.2603 mm

D_{50} = 0.2199 mm D_{30} = 0.1548 mm D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

* (no specification provided)

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CLIENT: Baylands Development, Inc.

PROJECT NAME: Baylands Landfill Closure Study

PROJECT NO: 17270.000.002 PH001

PROJECT LOCATION: Brisbane, California

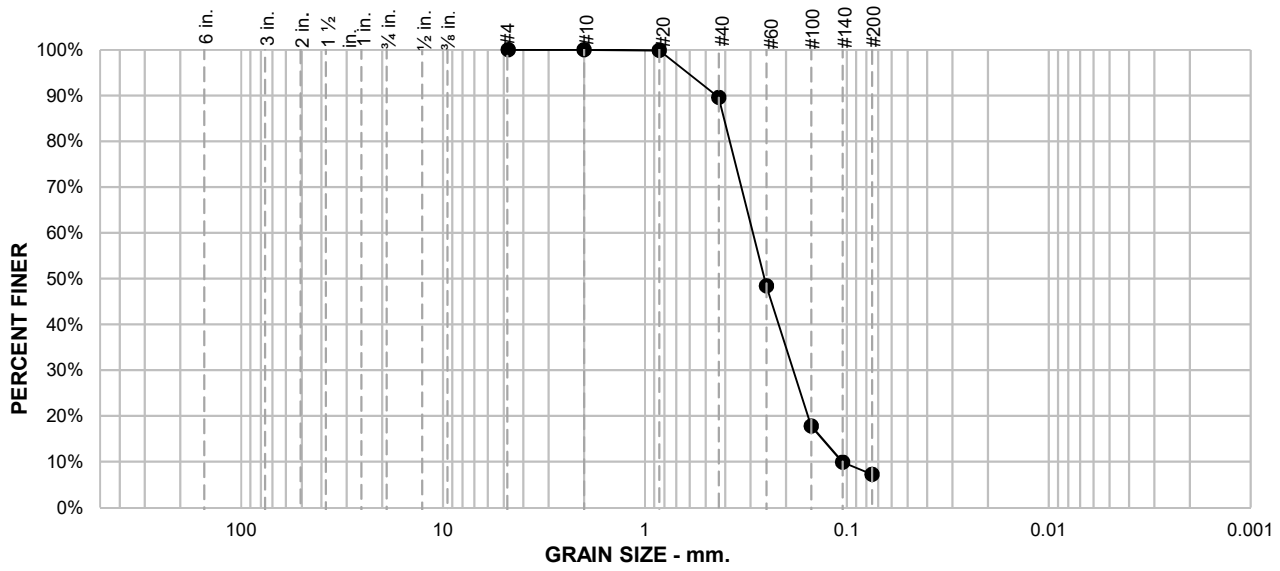
REPORT DATE: 6/24/2021

TESTED BY: P. Galicia

REVIEWED BY: G. Criste

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D6913, Method B



SAMPLE ID: 1-B02@60

DEPTH (ft): 60

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
				10.4	82.4	7.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	89.6		
#60	48.4		
#100	17.8		
#140	9.9		
#200	7.2		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = 0.4415 mm D_{85} = 0.4047 mm D_{60} = 0.2912 mm

D_{50} = 0.2553 mm D_{30} = 0.1839 mm D_{15} = 0.1322 mm

D_{10} = 0.1055 mm C_u = 2.76 C_c = 1.10

CLASSIFICATION

USCS =

REMARKS

* (no specification provided)

CLIENT: Baylands Development, Inc.

PROJECT NAME: Baylands Landfill Closure Study

PROJECT NO: 17270.000.002 PH001

PROJECT LOCATION: Brisbane, California

REPORT DATE: 6/21/2021

TESTED BY: P. Galicia

REVIEWED BY: G. Criste

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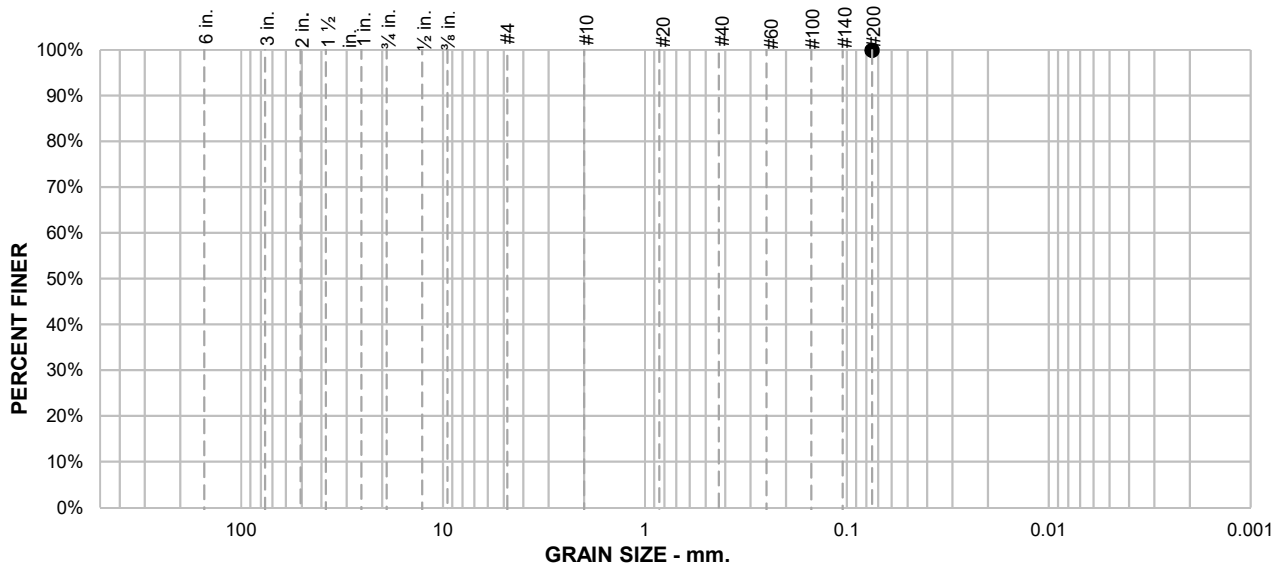
PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B01@117.5

DEPTH (ft): 117.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						99.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	99.9		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 300 min
Dry sample weight = 83.1 g

* (no specification provided)

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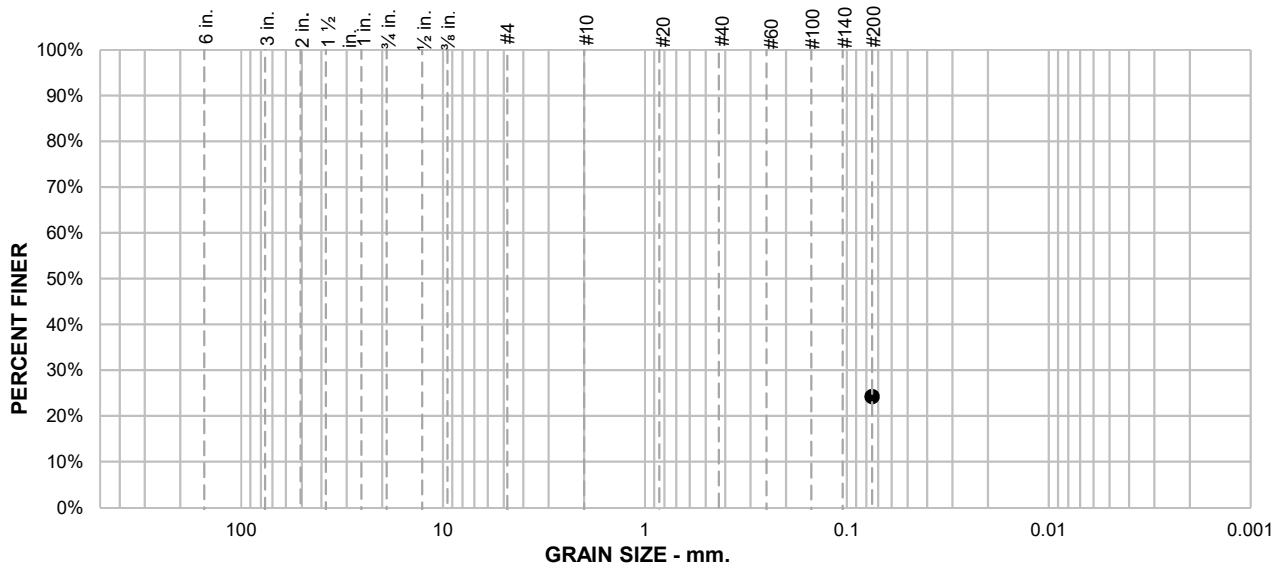
CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002 PH001
PROJECT LOCATION: Brisbane, California
REPORT DATE: 6/23/2021
TESTED BY: M. Quasem
REVIEWED BY: G. Criste

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B2 @ 72.5-74

DEPTH (ft): 72.5-74

LOCATION: 1-B2

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						24.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	24.2		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = NP LL = NV PI = NP

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

PI: ASTM D4318, Wet Method
USCS: ASTM D2488

Soak time = 180 min
Dry sample weight = 66.1 g

* (no specification provided)

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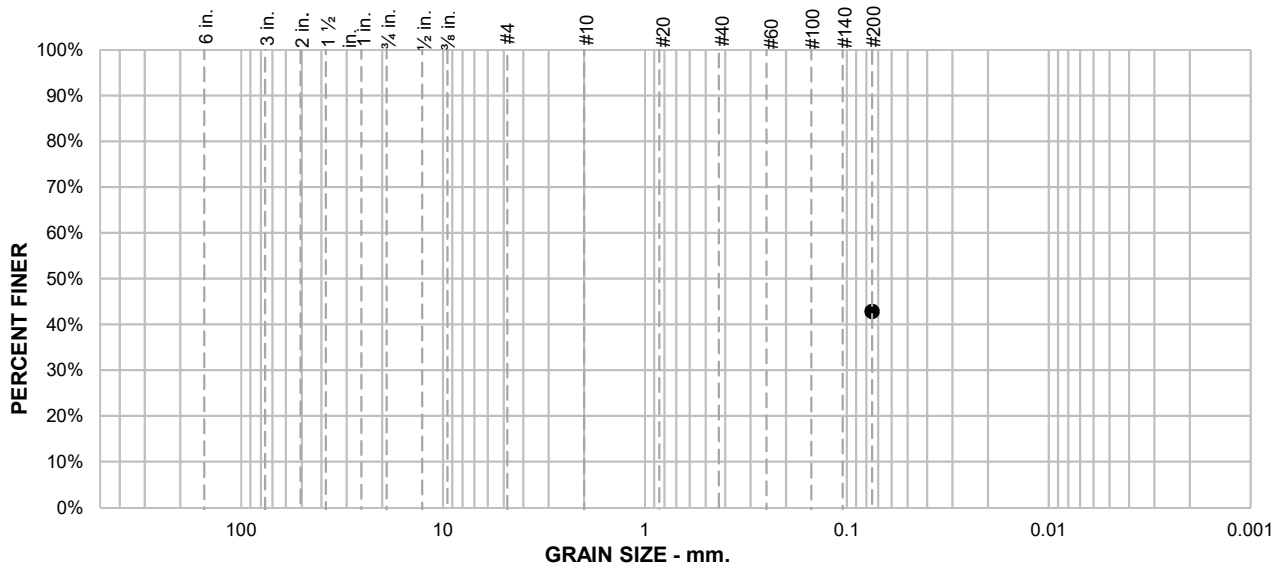
CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002 PH001
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 7/1/2021
TESTED BY: K. Lecce
REVIEWED BY: K. Paul

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B2 @ 90-91.5

DEPTH (ft): 90-91.5

LOCATION: 1-B2

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						42.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	42.8		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = NP LL = NV PI = NP

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

PI: ASTM D4318, Wet Method
USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 45.8 g

* (no specification provided)

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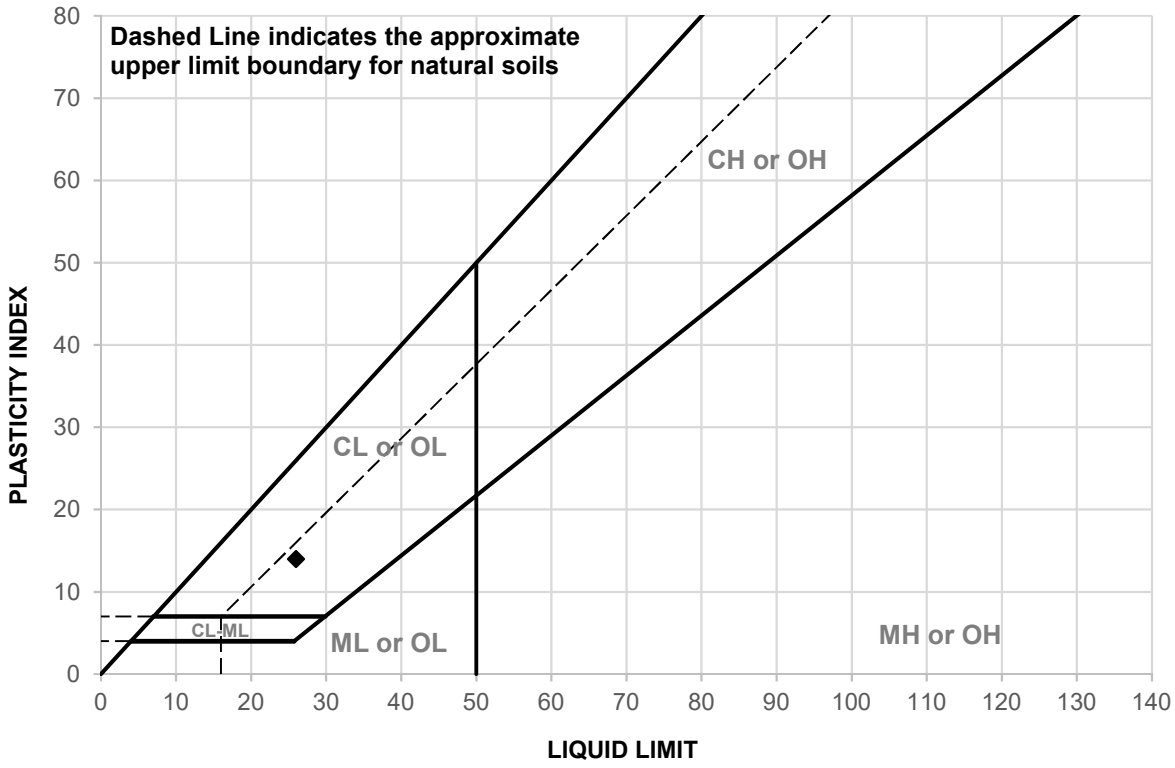
CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002 PH001
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 7/1/2021
TESTED BY: K. Lecce
REVIEWED BY: K. Paul

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B2 @ 72.5-74	72.5-74	See exploration logs	NV	NP	NP
◆	1-B2 @ 90-91.5	90-91.5	See exploration logs	26	12	14

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B2 @ 72.5-74	PI: ASTM D4318, Wet Method	
◆	1-B2 @ 90-91.5	PI: ASTM D4318, Wet Method	

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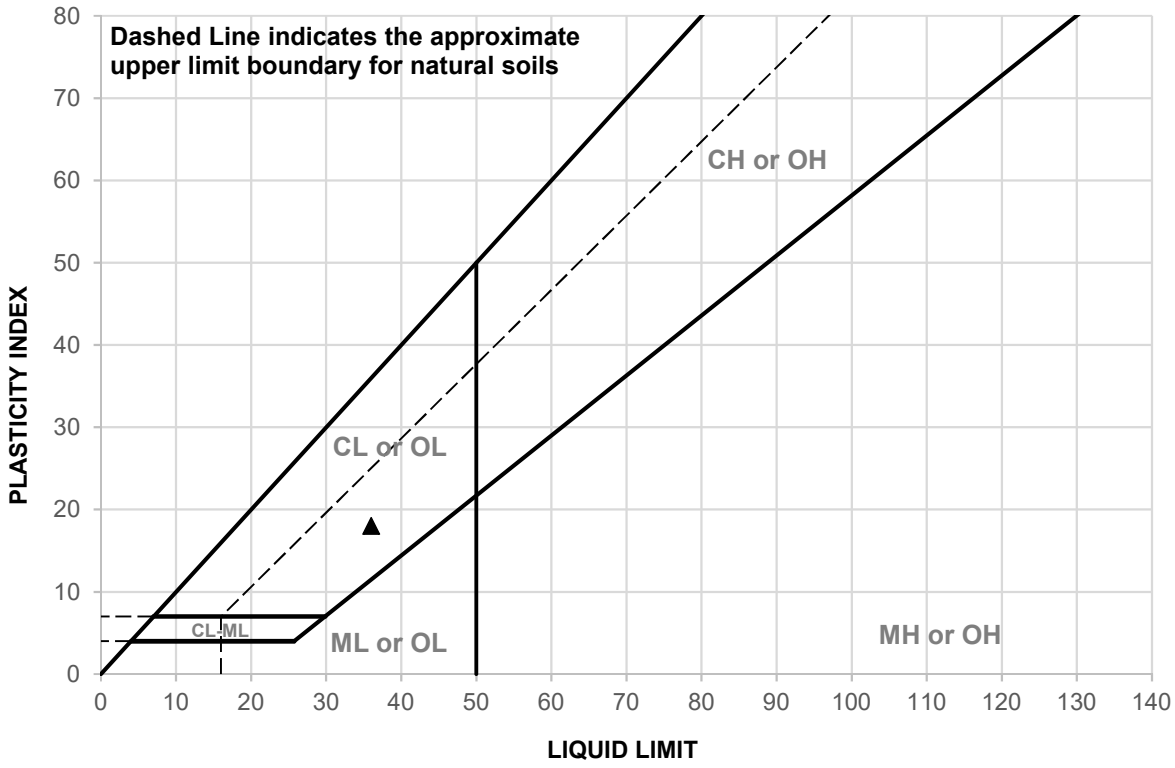
CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002 PH001
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 7/1/2021
TESTED BY: K. Lecce
REVIEWED BY: K. Paul

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B01@40	40 feet	See exploration logs	36	18	18

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B01@40	PI: ASTM D4318, Wet Method	

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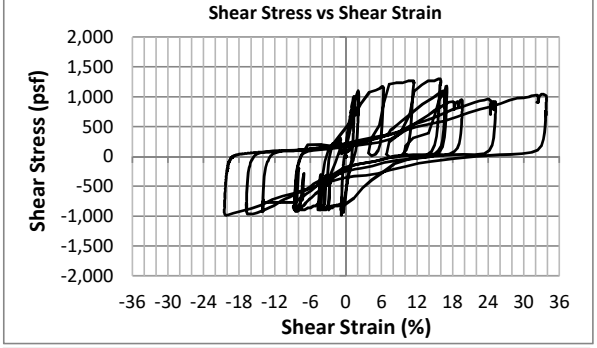
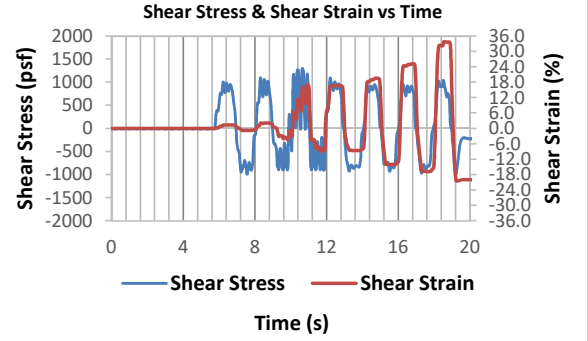
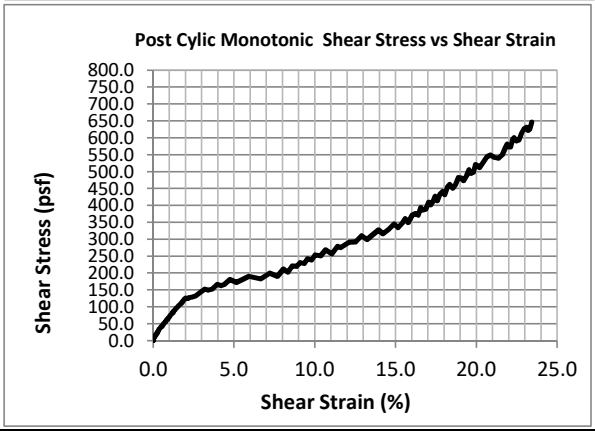
CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002 PH001
PROJECT LOCATION: Brisbane, CA
REPORT DATE: 6/28/2021
TESTED BY: M. Quasem
REVIEWED BY: W. Miller

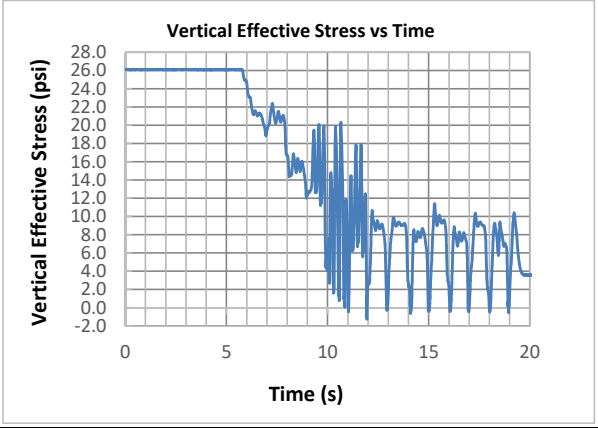
Cyclic Simple Shear

ASTM D8296 - Modified









Test Conditions	
Confinement Condition	Plain Membrane w/Chamber Pressure
Applied Lateral Effective Stress (psf)	2455.2
Resulting K_o after applied vertical stress, σ_{vc}'	0.65
Applied Loading Frequency (Hz)	0.50
Cycle Limit, N	7
Single Amp. Strain (+/-)	26.9
Applied τ_{cyc} (psf)	1145
Applied σ_{vc}' (psf)	3763
Applied CSR	0.30

Results		Maximum	Minimum
Vertical Effective Stress (psf)	Deviatoric	1291.1	-251.9
	Isotropic	2455.2	2455.2
Shear Strain (%)		33.8	-20.5
Post Cyclic Vertical Strain (%)		N/A	

Cyclic Preshear Specimen Condition	
Preshear Moisture Content (%)	15.2%
Preshear Void Ratio	0.412
Preshear Saturation (%)	100.4%
Preshear Dry Density (pcf)	120.5

Test Date: 1/0/1900

ASTM D2216	As Received	Final
Moisture (%):	15.5%	15.2%
Dry Density (pcf):	118.2	119.5
Saturation (%):	100.2%	100.0%
Void Ratio:	0.423	0.424

ASTM D4318 - Wet Method	
Liquid Limit:	
Plastic Limit:	
ASTM D854 - Measured	
Specific Gravity:	2.730
Soil Description:	See exploration logs

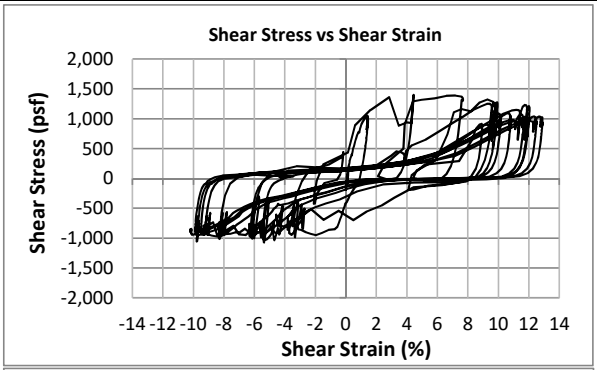
Project Number: 17270.000.002 **Depth:** 58' 9"
Sample Number: 1-B02 @ 57.5 **Boring #:** 1-B02
Project Name: Baylands Landfill Closure Study
Client: Baylands DevelopmentGroup
Location: Brisbane, California
Tested By: D. Seibold **Reviewed By:** S. O'Reilly-Shah

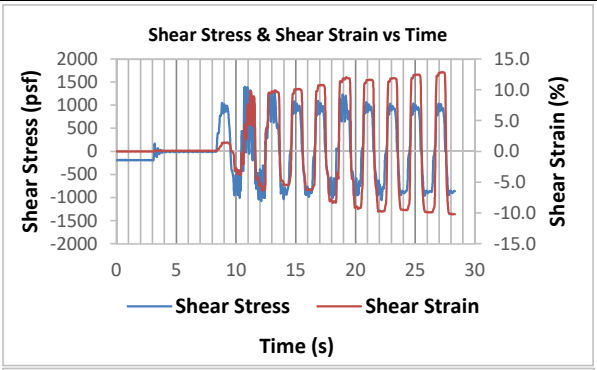
ENGEO Expect Excellence

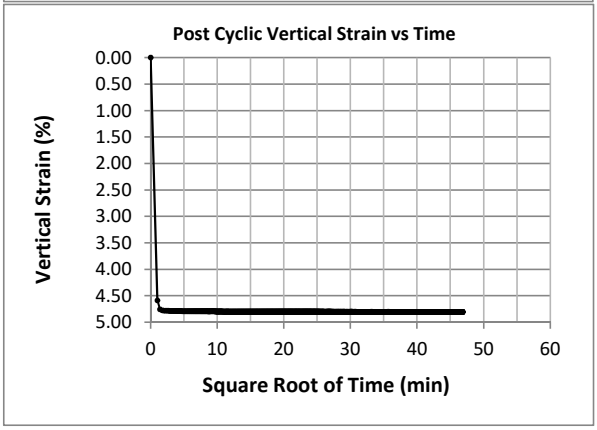
Remarks: 17.2% of the specimen was passing the #200 sieve. Contains abundant ferrous minerals.

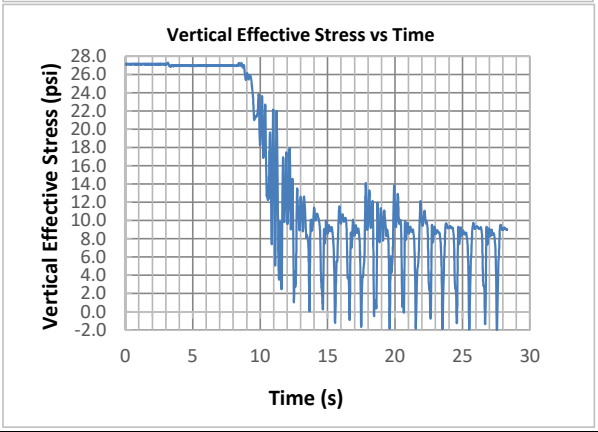
Cyclic Simple Shear

ASTM D8296 - Modified









Test Conditions		Results		Maximum	Minimum
Confinement Condition	Plain Membrane w/Chamber Pressure	Vertical Effective Stress (psf)	Deviatoric	1433.0	-48.1
Applied Lateral Effective Stress (psf)	2574.0		Isotropic	2574.0	2574.0
Resulting K_o after applied vertical stress, σ_{vc}'	0.65	Shear Strain (%)		12.9	-10.2
Applied Loading Frequency (Hz)	0.50	Post Cyclic Vertical Strain (%)		4.81	
Cycle Limit, N	10				
Single Amp. Strain (+/-)	11.5	**Cyclic Preshear Specimen Condition**			
Applied τ_{cyc} (psf)	1237	Preshear Moisture Content (%)		16.8%	
Applied σ_{vc}' (psf)	3932	Preshear Void Ratio		0.455	
Applied CSR	0.31	Preshear Saturation (%)		100.4%	
		Preshear Dry Density (pcf)		116.9	

Test Date: 6/23/2021

ASTM D2216	As Received	Final	ASTM D4318 - Wet Method	
Moisture (%):	16.9%	9.1%	Liquid Limit:	
Dry Density (pcf):	115.0	122.7	Plastic Limit:	
Saturation (%):	97.4%	100.0%	ASTM D854 - Measured	
Void Ratio:	0.474	0.385	Specific Gravity:	2.727
			Soil Description:	See exploration logs

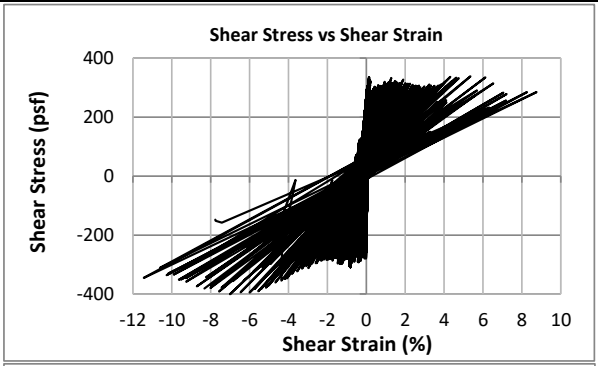
Project Number:	17270.000.002	**Depth:**	61' 3"
Sample Number:	1-B02 @ 60	**Boring #:**	1-B02
Project Name:	Baylands Landfill Closure Study		
Client:	Baylands Development Group		
Location:	Brisbane, California		
Tested By:	D. Seibold	**Reviewed By:**	S. O'Reilly-Shah

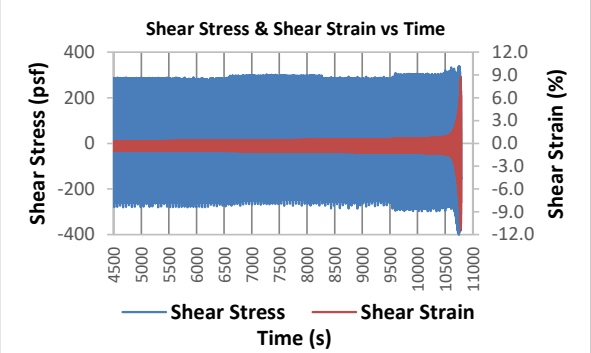
ENGEO Expect Excellence

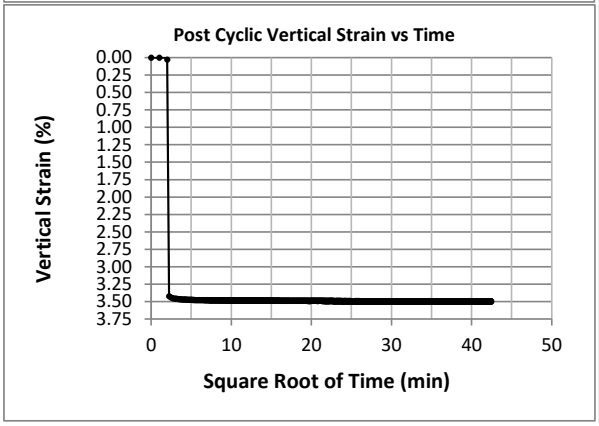
Remarks: 9.0% of the specimen passed the #200 sieve. Contained abundant ferrous minerals

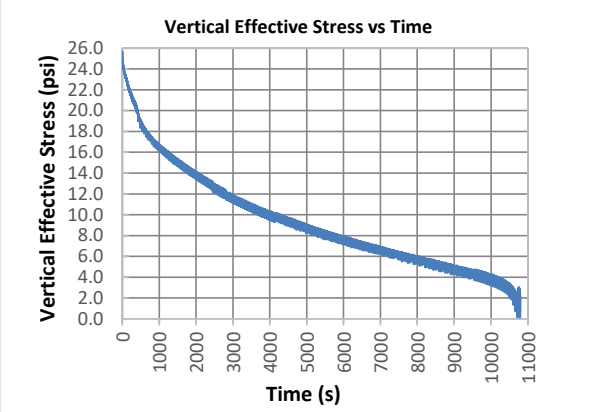
Cyclic Simple Shear

ASTM D8296 - Modified









Test Conditions		Results		Maximum	Minimum
Confinement Condition	Plain Membrane w/Chamber Pressure	Vertical Effective Stress (psf)	Deviatoric	1237.9	18.3
Applied Lateral Effective Stress (psf)	2455.2		Isotropic	2455.2	2455.2
Resulting K_o after applied vertical stress, σ_{vc}'	0.66	Shear Strain (%)		8.7	-11.4
Applied Loading Frequency (Hz)	0.50	Post Cyclic Vertical Strain (%)		3.48	
Cycle Limit, N	5396				
Single Amp. Strain (+/-)	10.1	**Cyclic Preshear Specimen Condition**			
Applied τ_{cyc} (psf)	370	Preshear Moisture Content (%)		14.7%	
Applied σ_{vc}' (psf)	3692	Preshear Void Ratio		0.401	
Applied CSR	0.10	Preshear Saturation (%)		100.3%	
		Preshear Dry Density (pcf)		121.6	

Test Date: 6/17/2021

ASTM D2216	As Received	Final	ASTM D4318 - Wet Method	
Moisture (%):	16.0%	15.8%	Liquid Limit:	
Dry Density (pcf):	121.4	124.5	Plastic Limit:	
Saturation (%):	100.4%	100.0%	ASTM D854 - Measured	
Void Ratio:	0.435	0.366	Specific Gravity:	2.730
			Soil Description:	See exploration logs

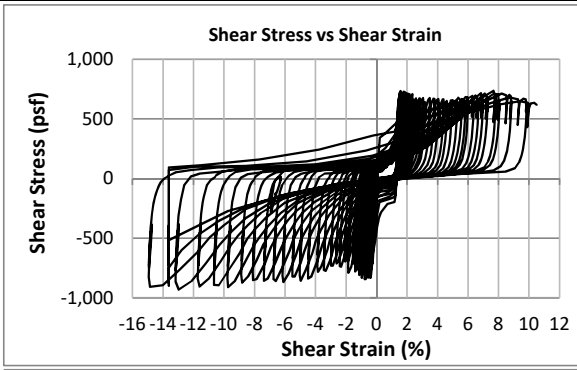
Project Number:	17270.000.002	**Depth:**	58' 6"
Sample Number:	1-B02 @ 57.5	**Boring #:**	1-B02
Project Name:	Baylands Landfill Closure Study		
Client:	Baylands Development Group		
Location:	Brisbane, California		
Tested By:	D. Seibold	**Reviewed By:**	S. O'Reilly-Shah

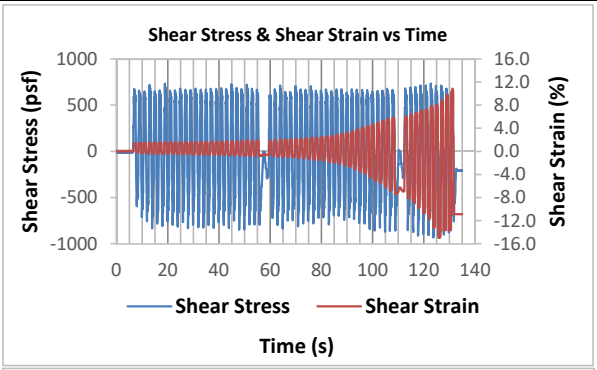
Remarks: 18.8% of the specimen was passing the #200 sieve. Contains abundant ferrous minerals.

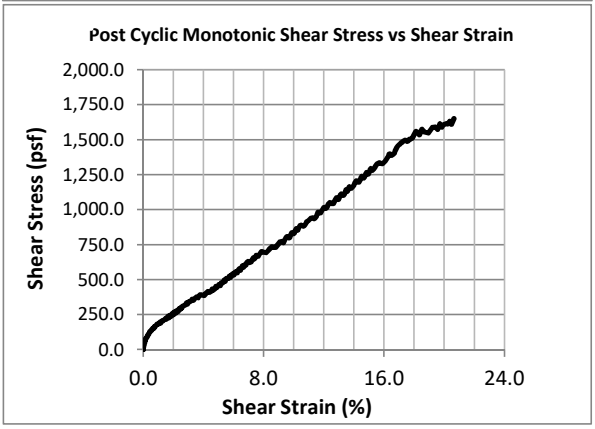
ENGEO Expect Excellence

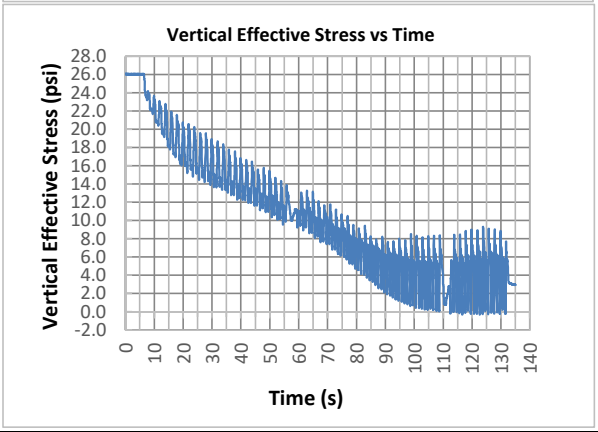
Cyclic Simple Shear

ASTM D8296 - Modified









Test Conditions		Results		Maximum	Minimum
Confinement Condition	Plain Membrane w/Chamber Pressure	Vertical Effective Stress (psf)	Deviatoric	1288.1	-70.8
Applied Lateral Effective Stress (psf)	2455.2		Isotropic	2455.2	2455.2
Resulting K_o after applied vertical stress, σ_{vc}'	0.65	Shear Strain (%)		10.9	-14.9
Applied Loading Frequency (Hz)	0.50	Post Cyclic Vertical Strain (%)		N/A	
Cycle Limit, N	62				
Single Amp. Strain (+/-)	12.9				
Applied τ_{cyc} (psf)	834				
Applied σ_{vc}' (psf)	3756				
Applied CSR	0.22				

Cyclic Preshear Specimen Condition	
Preshear Moisture Content (%)	15.7%
Preshear Void Ratio	0.429
Preshear Saturation (%)	100.1%
Preshear Dry Density (pcf)	119.2

Test Date: 6/30/2021

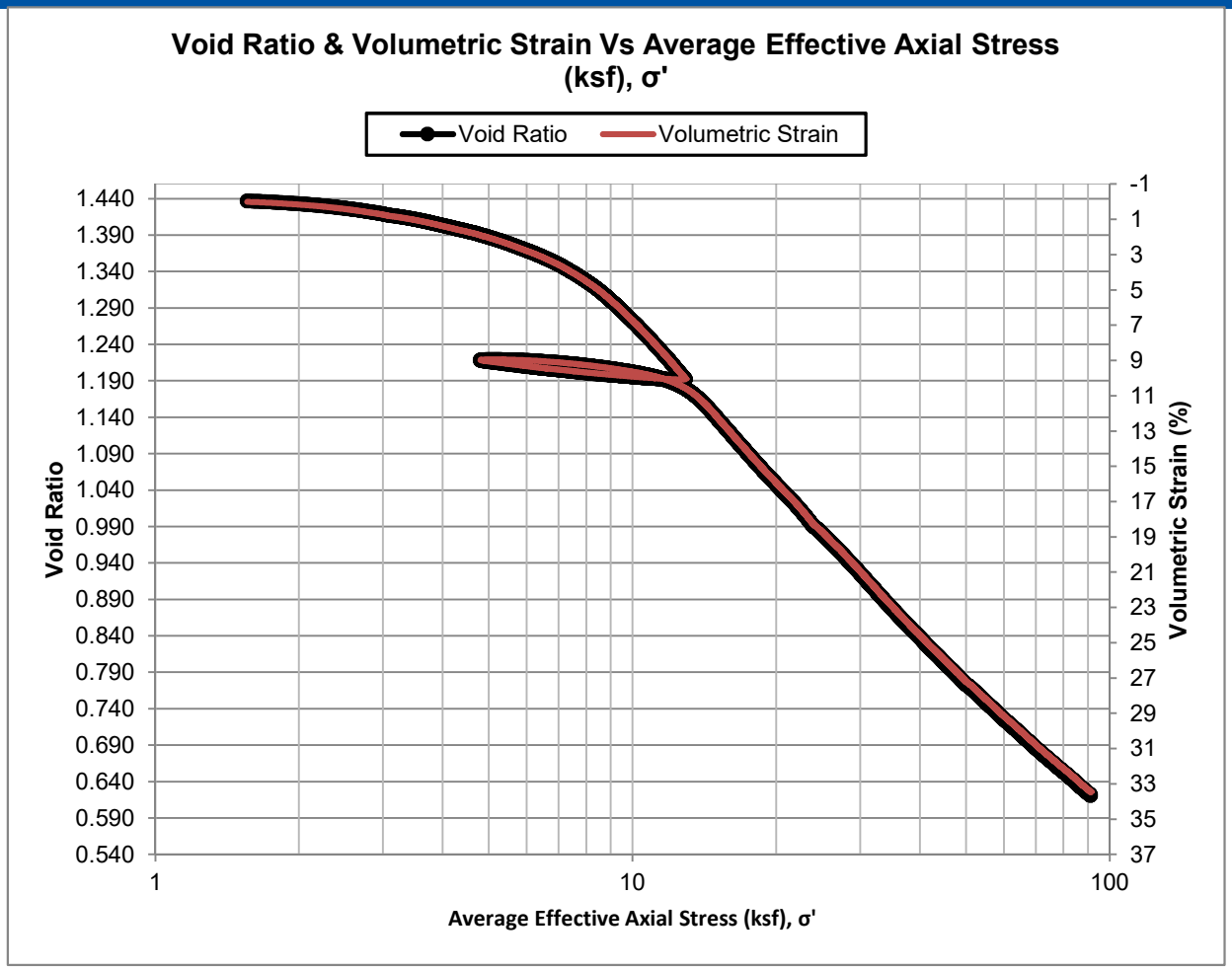
ASTM D2216	As Received	Final	ASTM D4318 - Wet Method	
Moisture (%):	15.8%	14.6%	**Liquid Limit:**	
Dry Density (pcf):	119.0	119.9	**Plastic Limit:**	
Saturation (%):	100.5%	100.0%	**ASTM D854 - Measured**	
Void Ratio:	0.429	0.418	**Specific Gravity:**	2.730
			Soil Description:	See exploration logs

Project Number:	17270.000.002	**Depth:**	58' 8"
Sample Number:	1-B2 @ 57.5	**Boring #:**	1-B2
Project Name:	Baylands Landfill Closure Study		
Client:	Baylands Development Group		
Location:	Brisbane, California		
Tested By:	D. Seibold	**Reviewed By:**	S. O'Reilly-Shah

ENGEO Expect Excellence

Remarks: 19.0% of the specimen passed the #200 sieve. Contains adundant ferrous minerals.

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B01 @ 117.5	**DEPTH:**	119.75-120
SOIL DESCRIPTION:	See exploration logs		
REMARKS:			

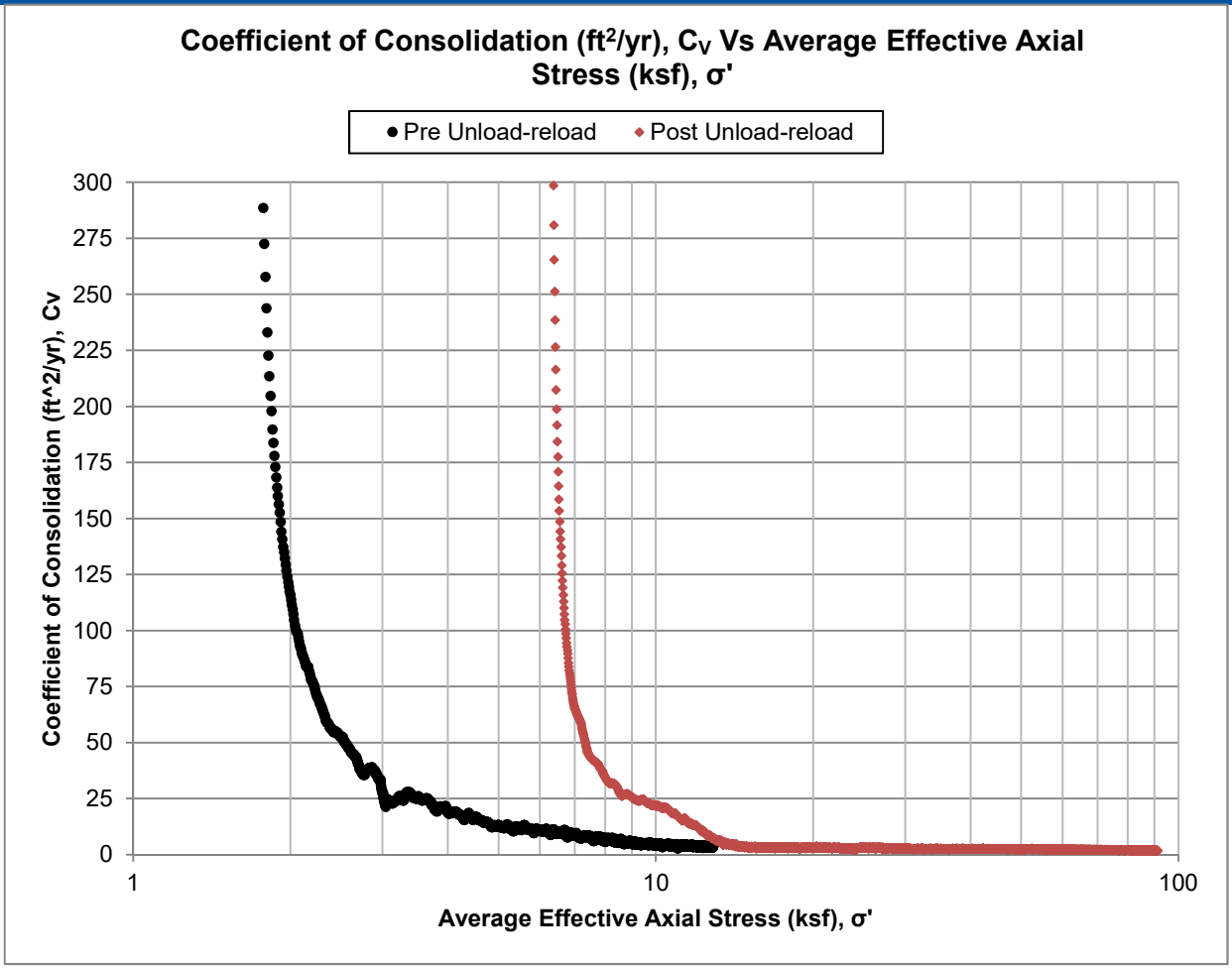
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	51.46	28.96	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	70.35	105.77	**PLASTIC LIMIT:**	
SATURATION (%):	98.6	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.436	0.621	**SPECIFIC GRAVITY**	2.751
STRAIN RATE (in/min):	0.00007			

ENGEO
Expect Excellence

CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 6/24/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B01 @ 117.5	**DEPTH:**	119.75-120
SOIL DESCRIPTION:	See exploration logs		
REMARKS:			

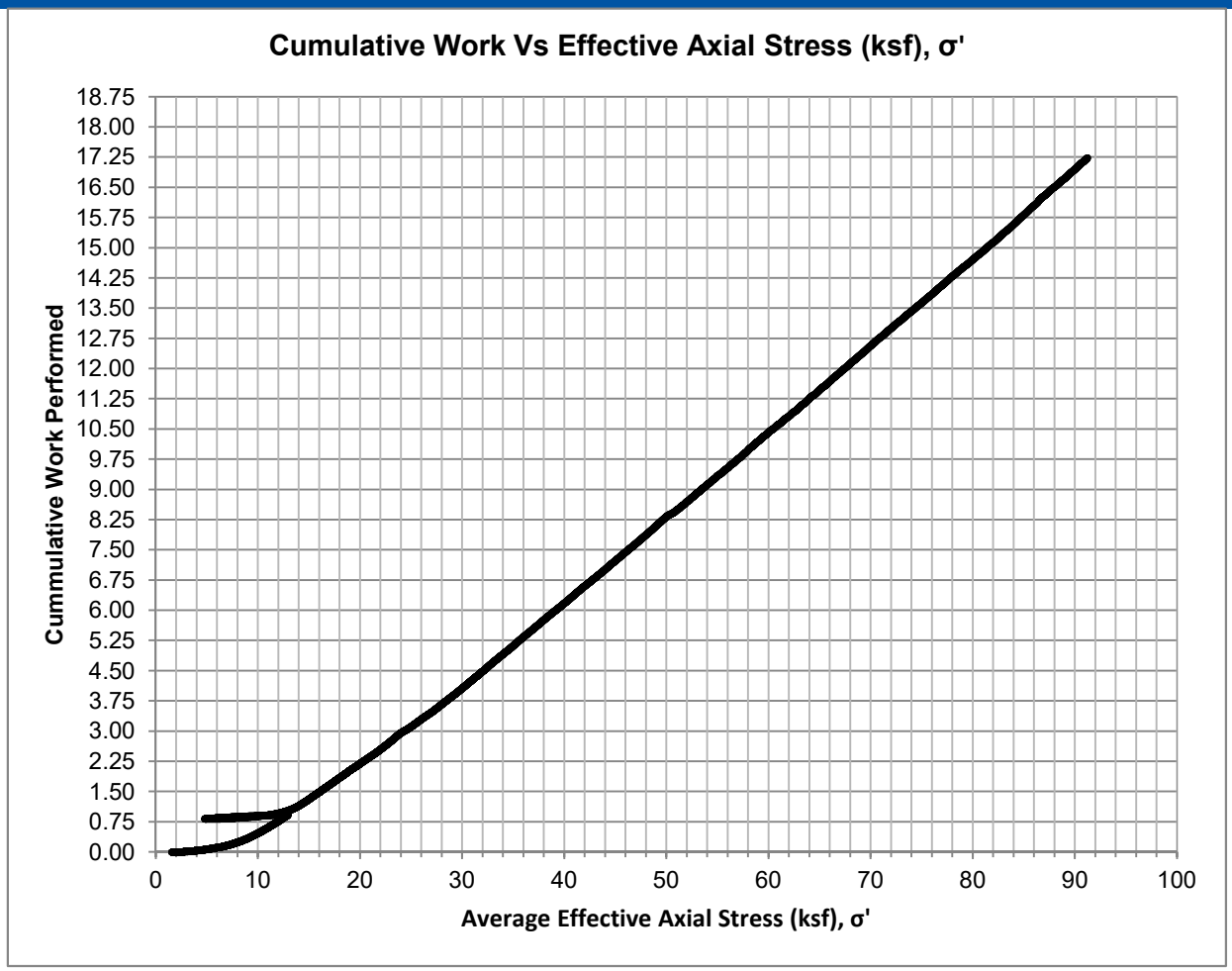
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	51.5	29.0	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	70.4	105.8	**PLASTIC LIMIT:**	
SATURATION (%):	98.6	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.436	0.621	**SPECIFIC GRAVITY**	2.751
STRAIN RATE (in/min):	0.00007			

ENGEO
Expect Excellence

CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 6/24/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B01 @ 117.5	**DEPTH:**	119.75-120
SOIL DESCRIPTION:	See exploration logs		
REMARKS:			

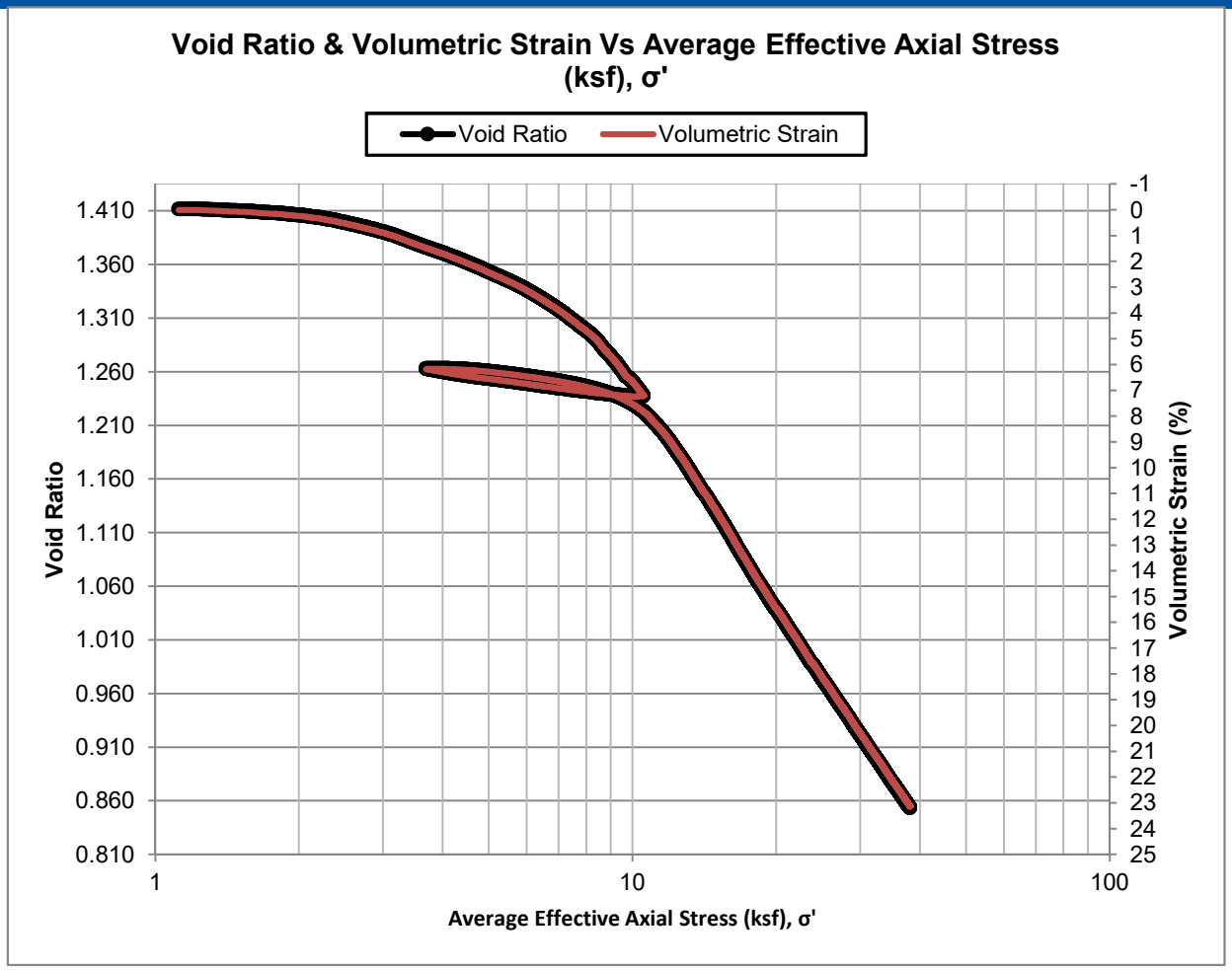
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	51.46	28.96	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	70.35	105.77	**PLASTIC LIMIT:**	
SATURATION (%):	98.6	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.436	0.621	**SPECIFIC GRAVITY**	2.751
STRAIN RATE (in/min):	0.00007			

ENGEO
Expect Excellence

CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 6/24/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B01 @ 127.5	**DEPTH:**	129.5-129.75
SOIL DESCRIPTION:	See Exploration Logs		
REMARKS:			

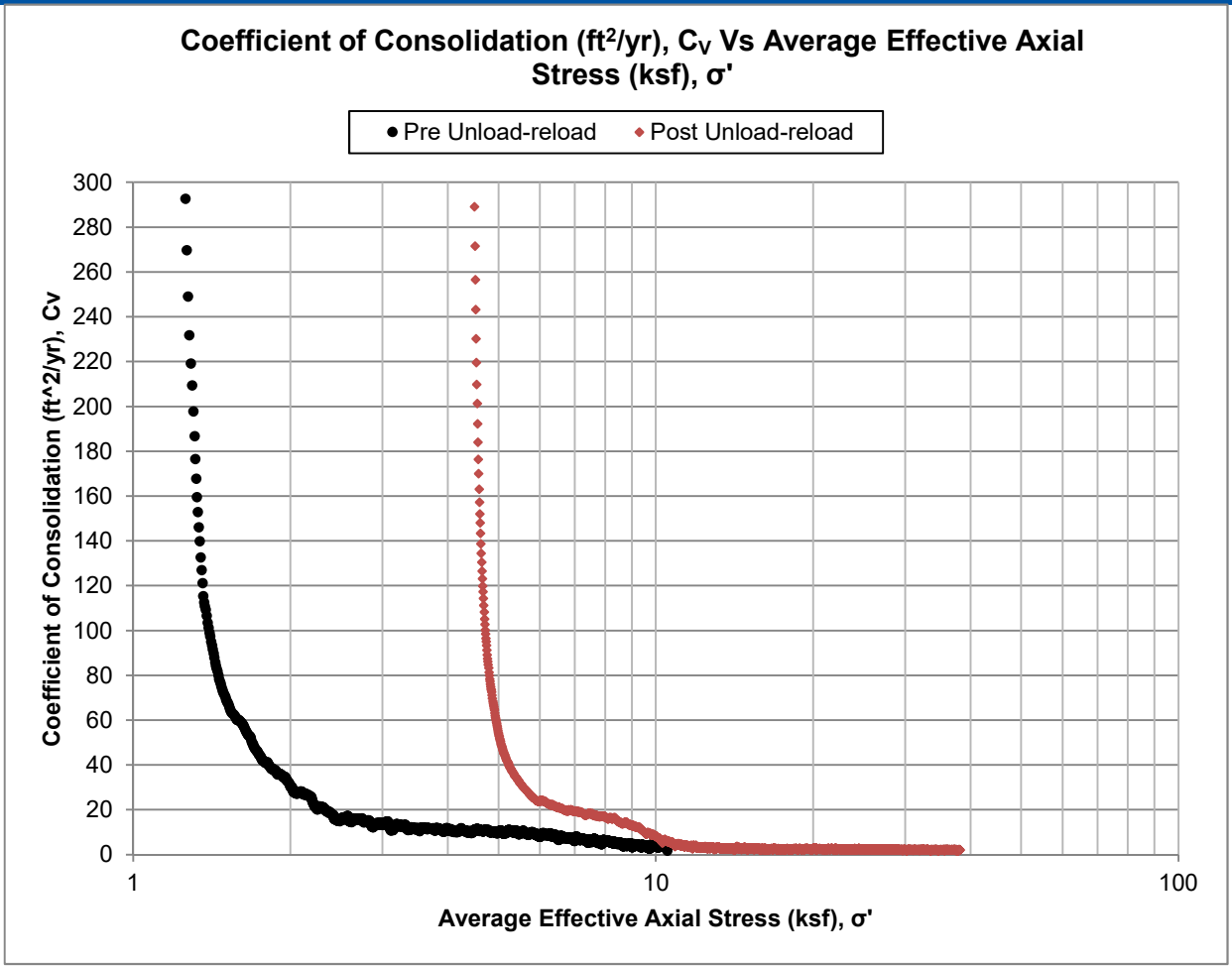
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	50.01	36.41	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	70.92	92.29	**PLASTIC LIMIT:**	
SATURATION (%):	97.2	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.412	0.853	**SPECIFIC GRAVITY**	2.745
STRAIN RATE (in/min):	0.00005			

ENGEO
Expect Excellence

CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/6/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B01 @ 127.5	**DEPTH:**	129.5-129.75
SOIL DESCRIPTION:	See Exploration Logs		
REMARKS:			

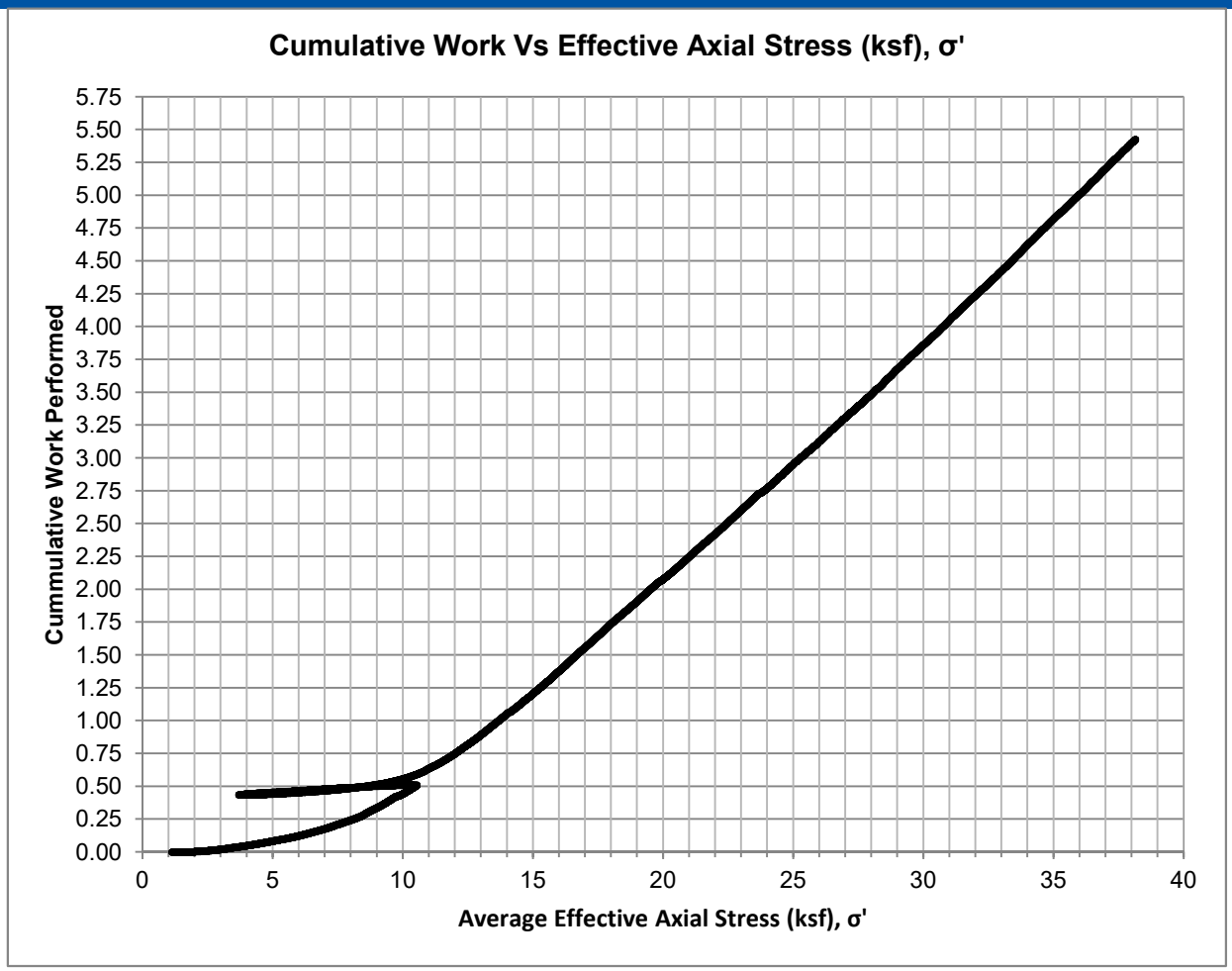
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	50.01	36.41	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	70.92	92.29	**PLASTIC LIMIT:**	
SATURATION (%):	97.2	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.412	0.853	**SPECIFIC GRAVITY**	2.745
STRAIN RATE (in/min):	0.00005			

ENGEO
Expect Excellence

CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/6/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B01 @ 127.5	**DEPTH:**	129.5-129.75
SOIL DESCRIPTION:	See Exploration Logs		
REMARKS:			

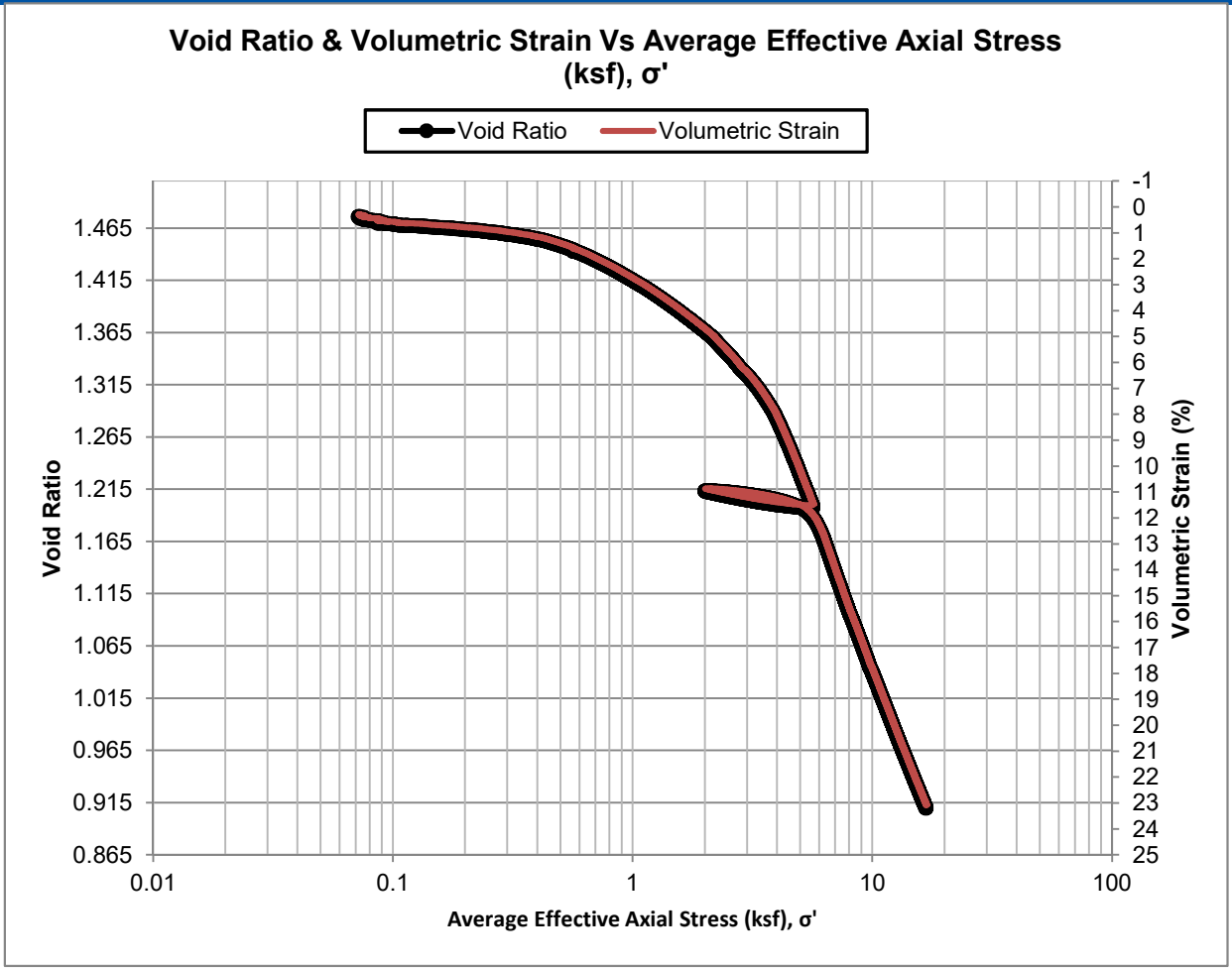
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	50.01	36.41	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	70.92	92.29	**PLASTIC LIMIT:**	
SATURATION (%):	97.2	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.412	0.853	**SPECIFIC GRAVITY**	2.745
STRAIN RATE (in/min):	0.00005			

ENGEO
Expect Excellence

CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/6/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B01 @ 70	**DEPTH:**	71.25-71.50
SOIL DESCRIPTION:	See exploration logs		
REMARKS:			

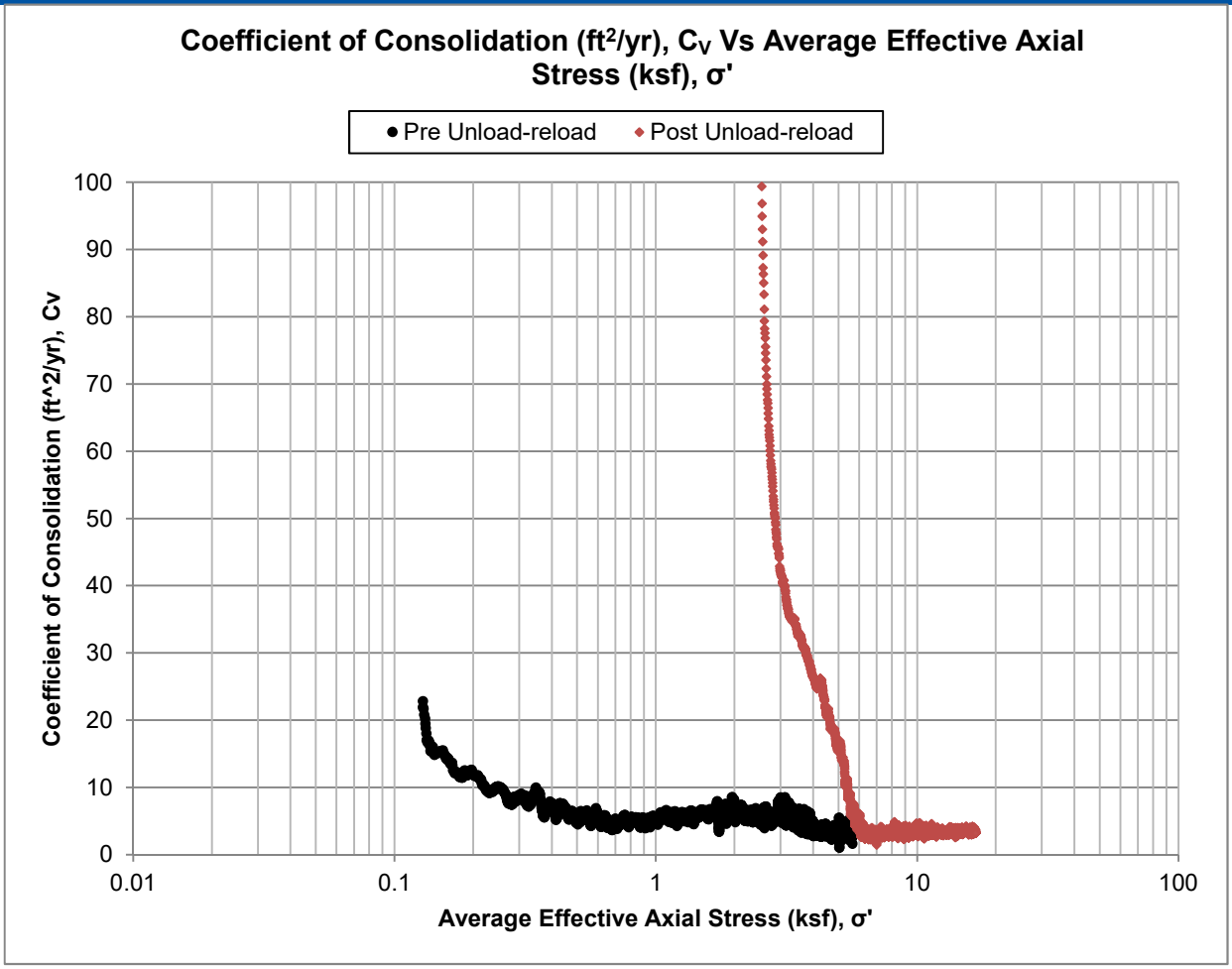
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	55.09	40.08	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	66.46	86.41	**PLASTIC LIMIT:**	
SATURATION (%):	98.4	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.483	0.910	**SPECIFIC GRAVITY**	2.648
STRAIN RATE (in/min):	0.00005			

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/6/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B01 @ 70	**DEPTH:**	71.25-71.50
SOIL DESCRIPTION:	See exploration logs		
REMARKS:			

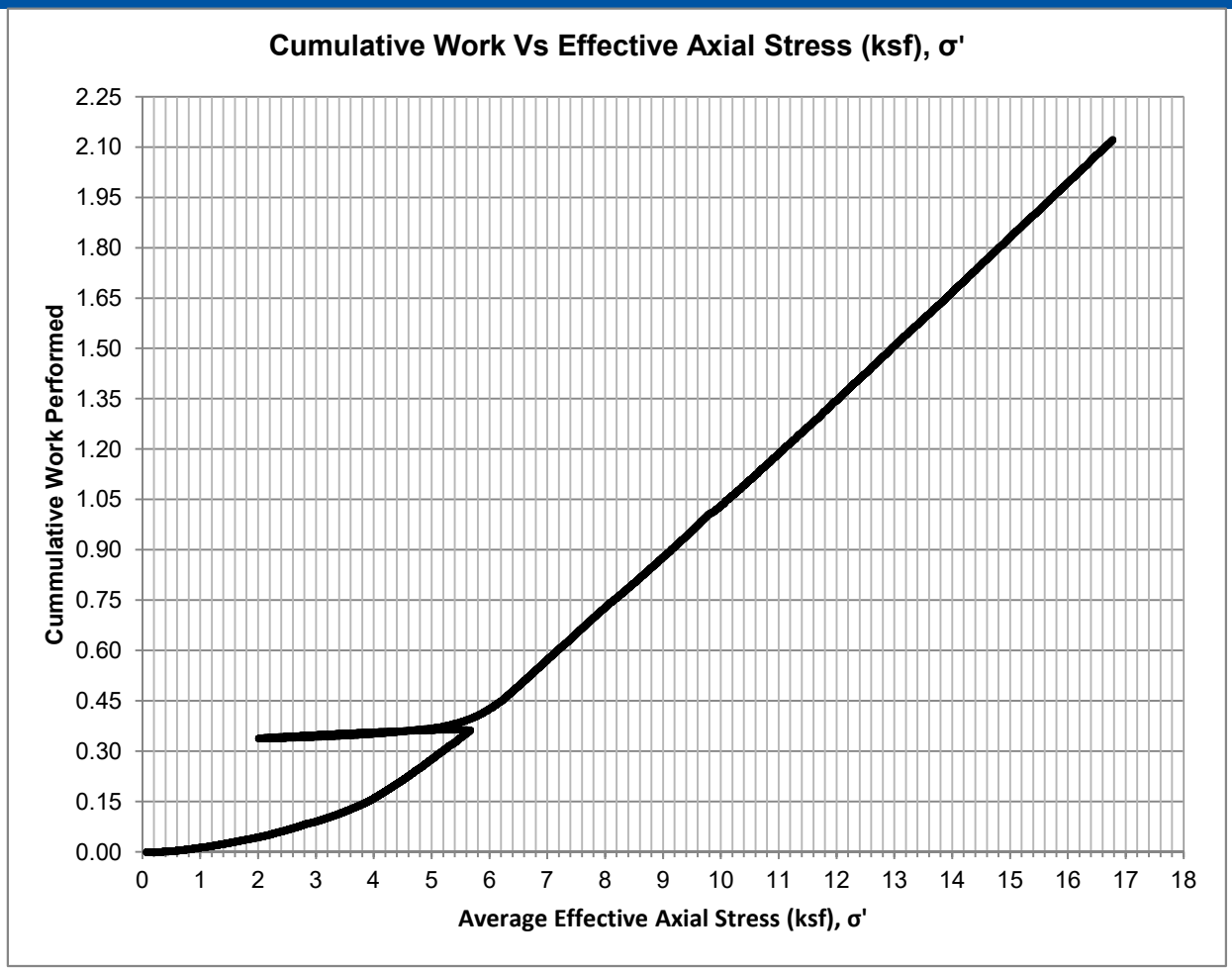
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	55.09	40.08	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	66.46	86.41	**PLASTIC LIMIT:**	
SATURATION (%):	98.4	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.483	0.910	**SPECIFIC GRAVITY**	2.648
STRAIN RATE (in/min):	0.00005			

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/6/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B01 @ 70	**DEPTH:**	71.25-71.50
SOIL DESCRIPTION:	See exploration logs		
REMARKS:			

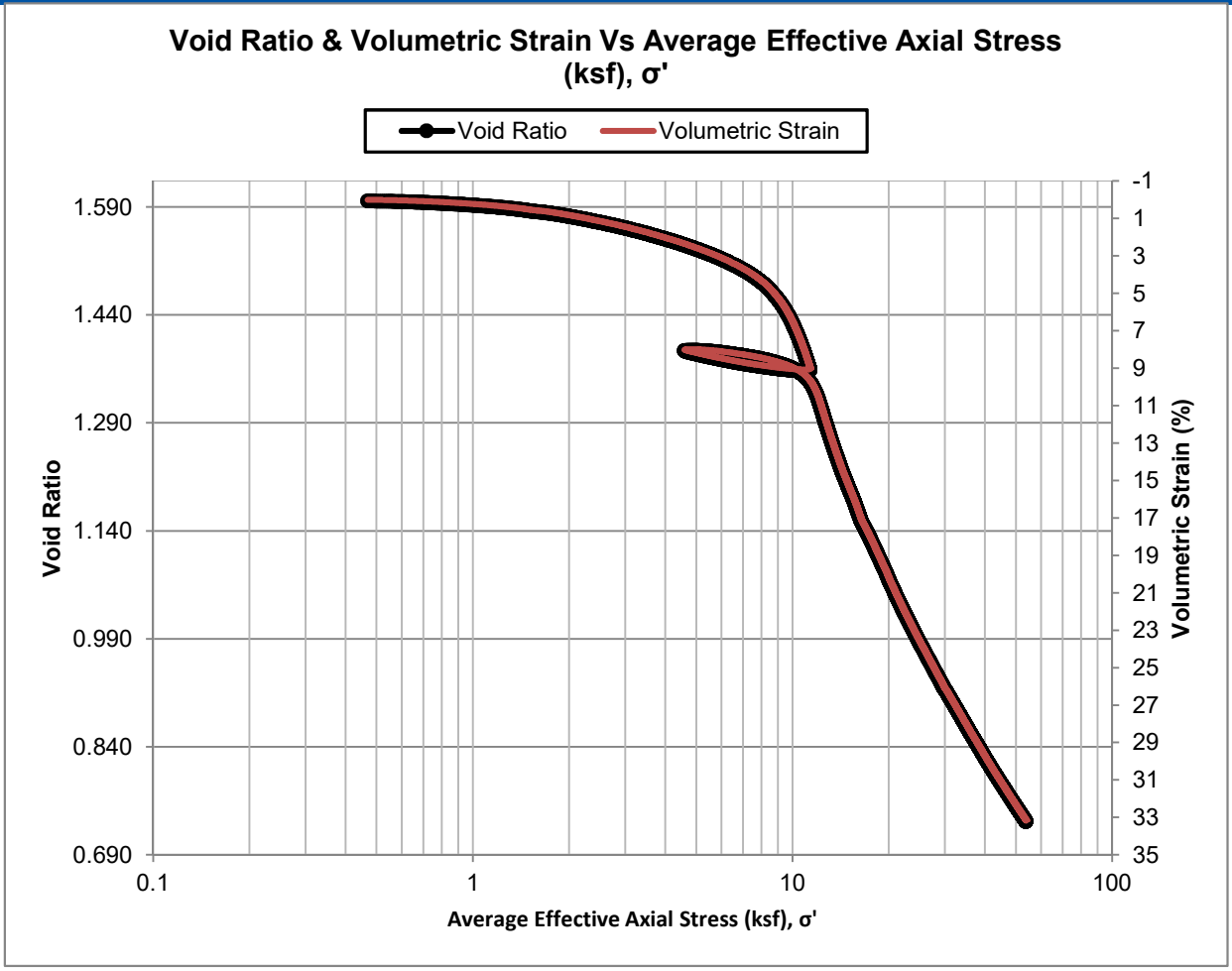
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	55.09	40.08	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	66.46	86.41	**PLASTIC LIMIT:**	
SATURATION (%):	98.4	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.483	0.910	**SPECIFIC GRAVITY**	2.648
STRAIN RATE (in/min):	0.00005			

ENGEO
Expect Excellence

CLIENT: Baylands Development Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/6/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B02 @ 105	**DEPTH:**	104.25-104.5
SOIL DESCRIPTION:	See exploration logs		
REMARKS:			

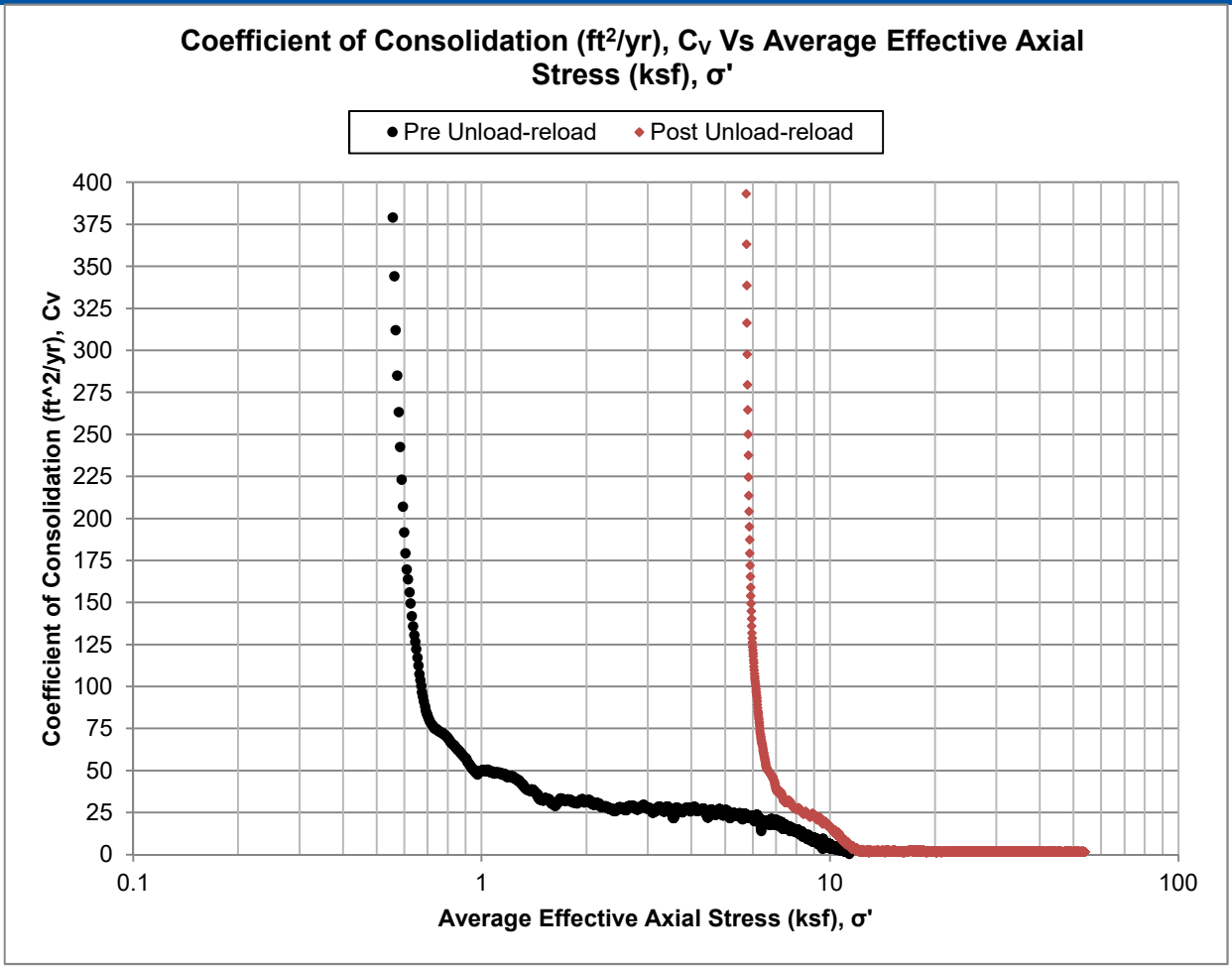
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	56.68	32.60	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	65.91	98.64	**PLASTIC LIMIT:**	
SATURATION (%):	97.5	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.598	0.736	**SPECIFIC GRAVITY**	2.748
STRAIN RATE (in/min):	0.00006			

ENGEO
Expect Excellence

CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 6/24/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B02 @ 105	**DEPTH:**	104.25-104.5
SOIL DESCRIPTION:	See exploration logs		
REMARKS:			

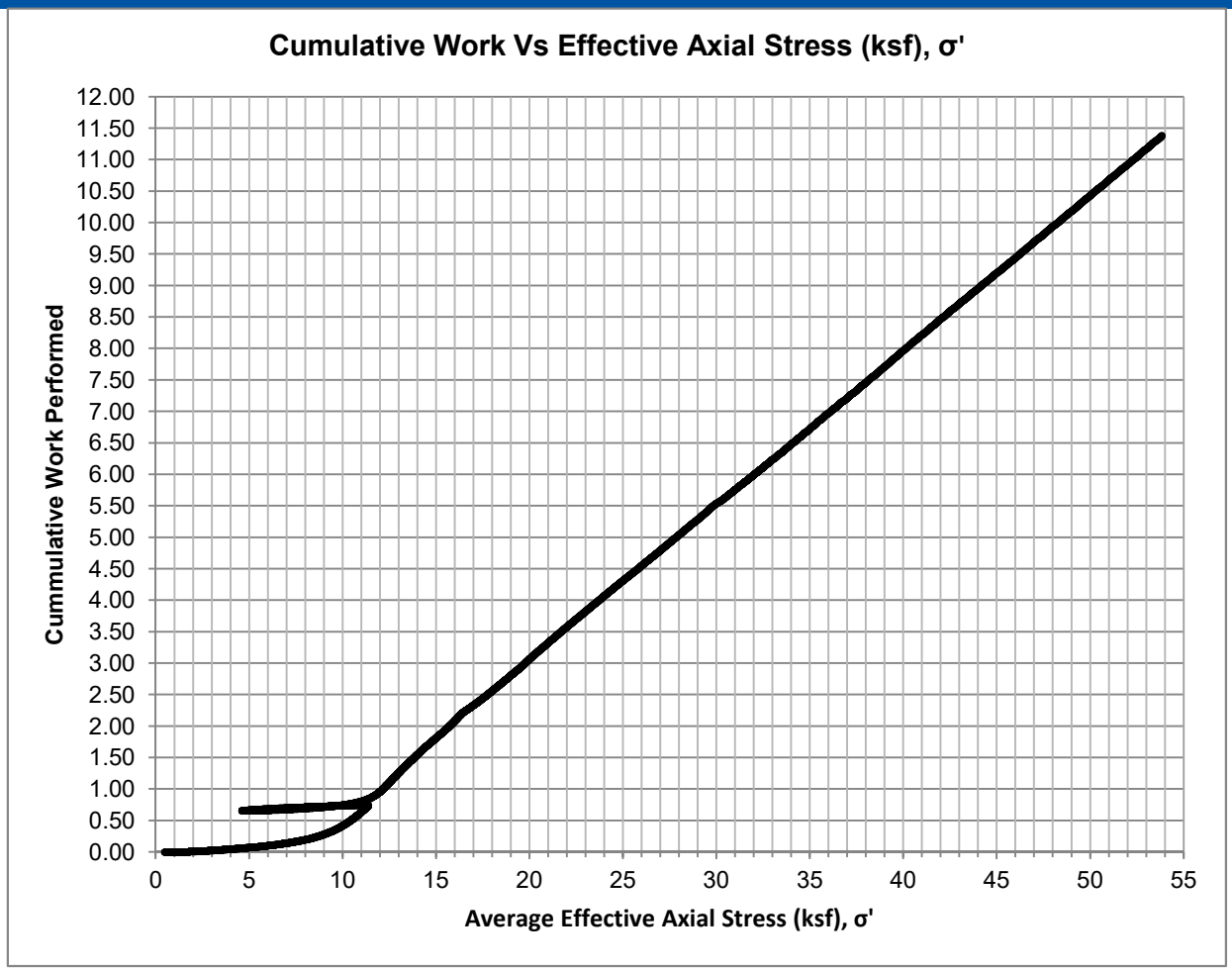
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	56.68	32.60	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	65.91	98.64	**PLASTIC LIMIT:**	
SATURATION (%):	97.5	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.598	0.736	**SPECIFIC GRAVITY**	2.748
STRAIN RATE (in/min):	0.00006			

ENGEO
Expect Excellence

CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 6/24/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID:	1-B02 @ 105	**DEPTH:**	104.25-104.5
SOIL DESCRIPTION:	See exploration logs		
REMARKS:			

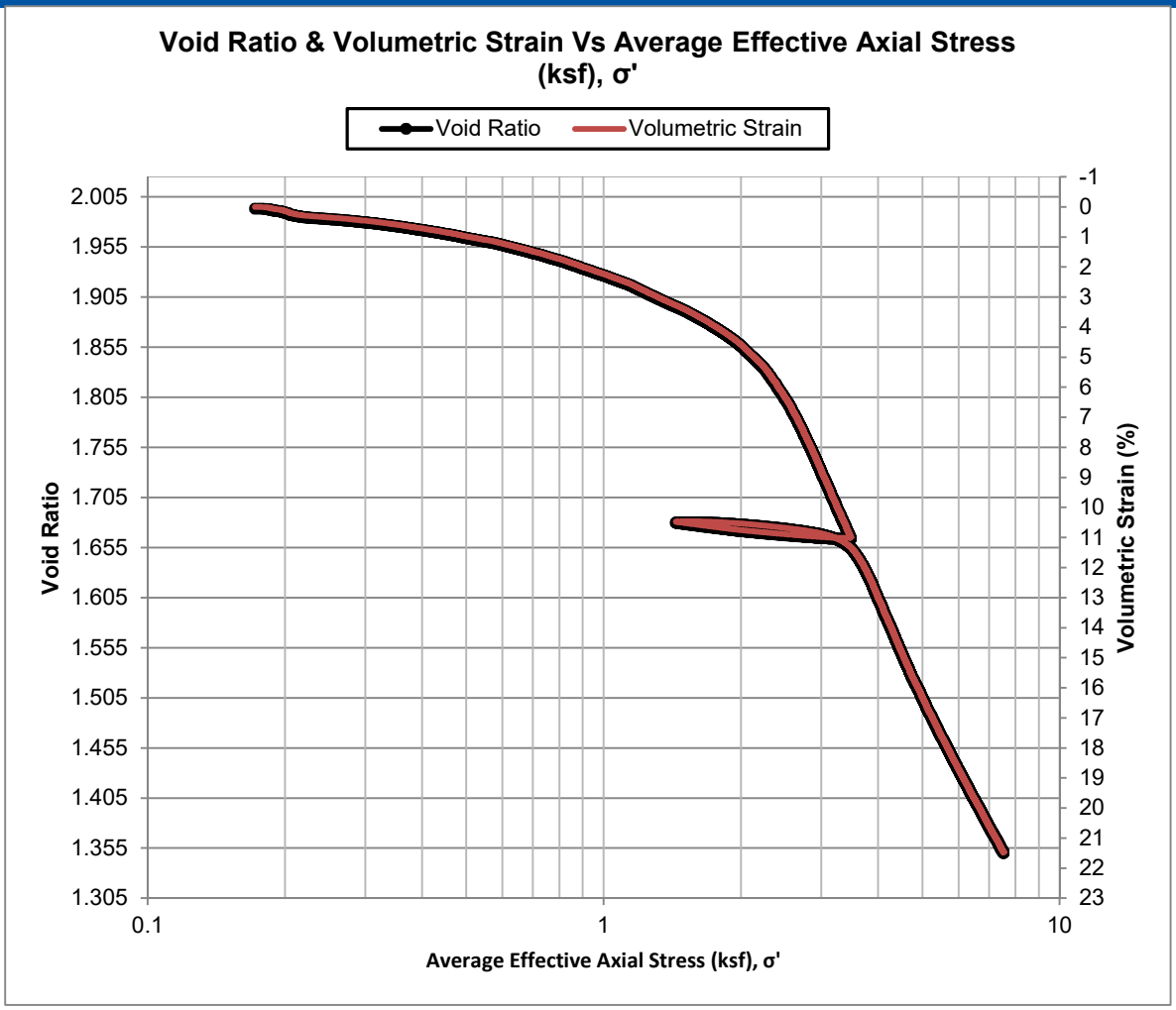
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	56.68	32.60	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	65.91	98.64	**PLASTIC LIMIT:**	
SATURATION (%):	97.5	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.598	0.736	**SPECIFIC GRAVITY**	2.748
STRAIN RATE (in/min):	0.00006			

ENGEO
Expect Excellence

CLIENT: Baylands Development, Inc.
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 6/24/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B02 @ 40 **DEPTH:** 42-42.25 ft

SOIL DESCRIPTION: See exploration logs

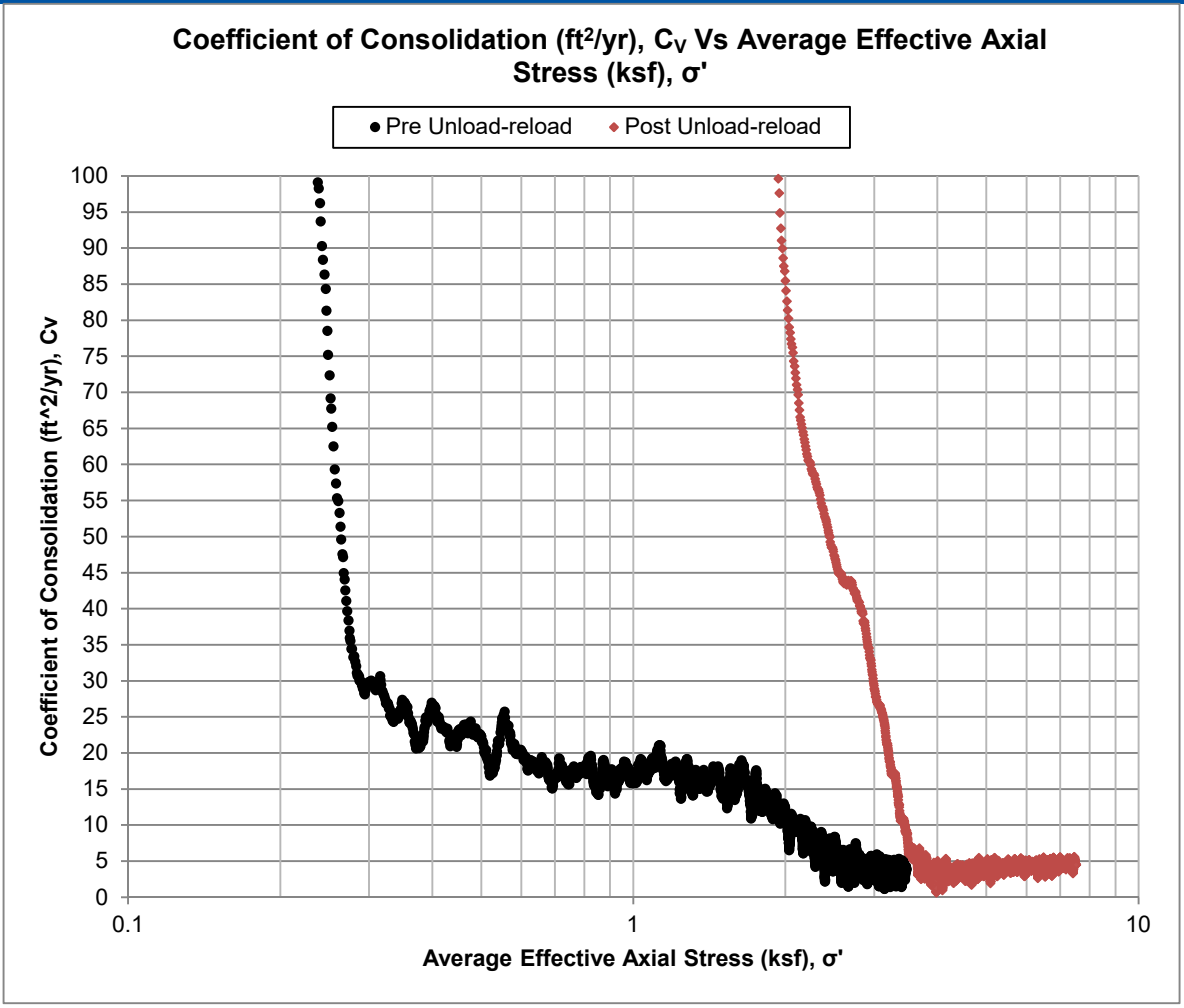
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	72.0	54.8	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	56.6	72.1	**PLASTIC LIMIT:**	
SATURATION (%):	98.2	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.994	1.350	**SPECIFIC GRAVITY**	2.719
STRAIN RATE (in/min):	0.00007			

ENGEO
Expect Excellence

CLIENT: Baylands Development Group
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/4/2021
TESTED BY: D. Seibold
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B02 @ 40 **DEPTH:** 42-42.25 ft

SOIL DESCRIPTION: See exploration logs

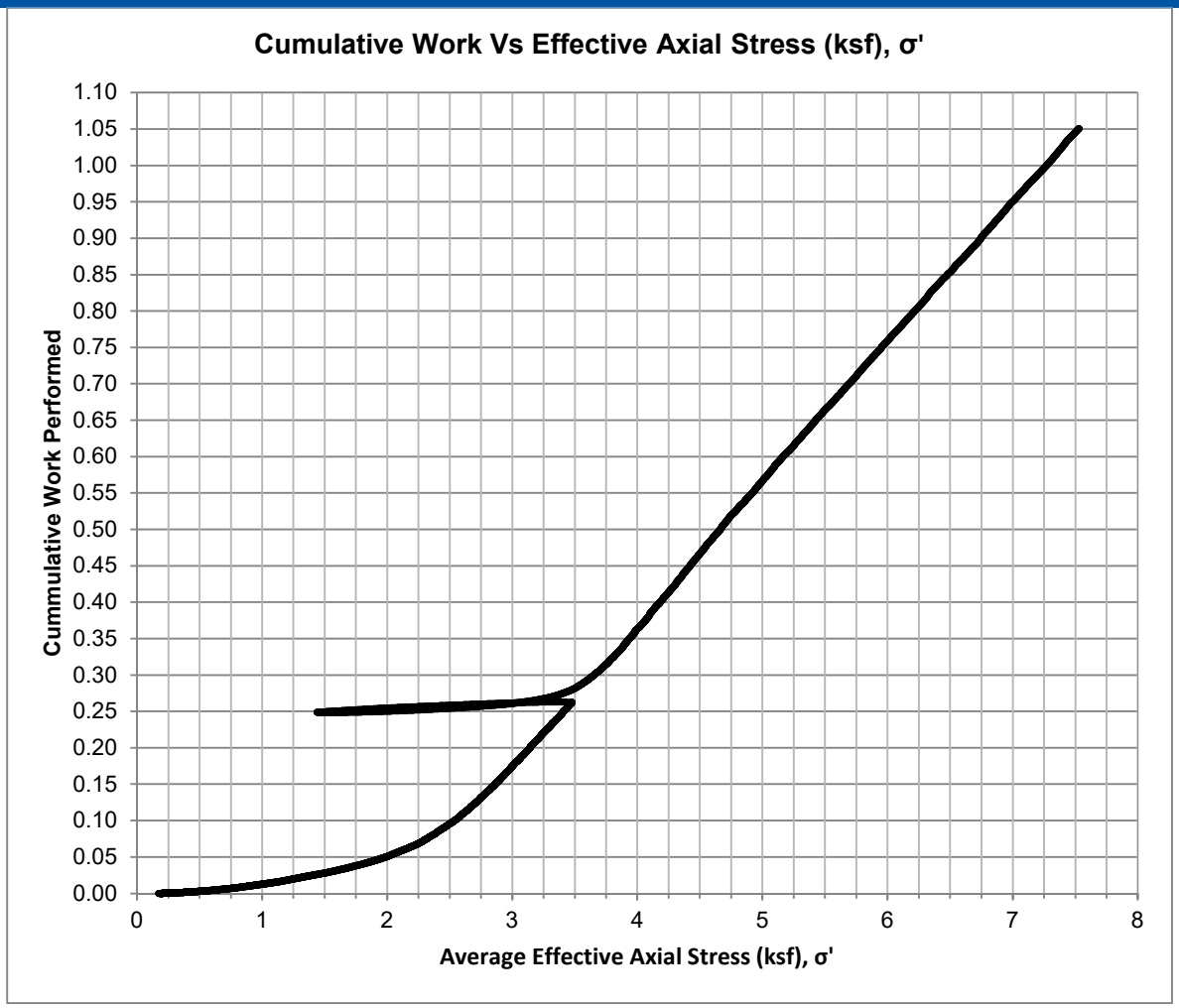
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	72.0	54.8	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	56.6	72.1	**PLASTIC LIMIT:**	
SATURATION (%):	98.2	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.994	1.350	**SPECIFIC GRAVITY**	2.719
STRAIN RATE (in/min):	0.00007			

ENGEO Expect Excellence

CLIENT: Baylands Development Group
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/4/2021
TESTED BY: D. Seibold
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B02 @ 40 **DEPTH:** 42-42.25 ft

SOIL DESCRIPTION: See exploration logs

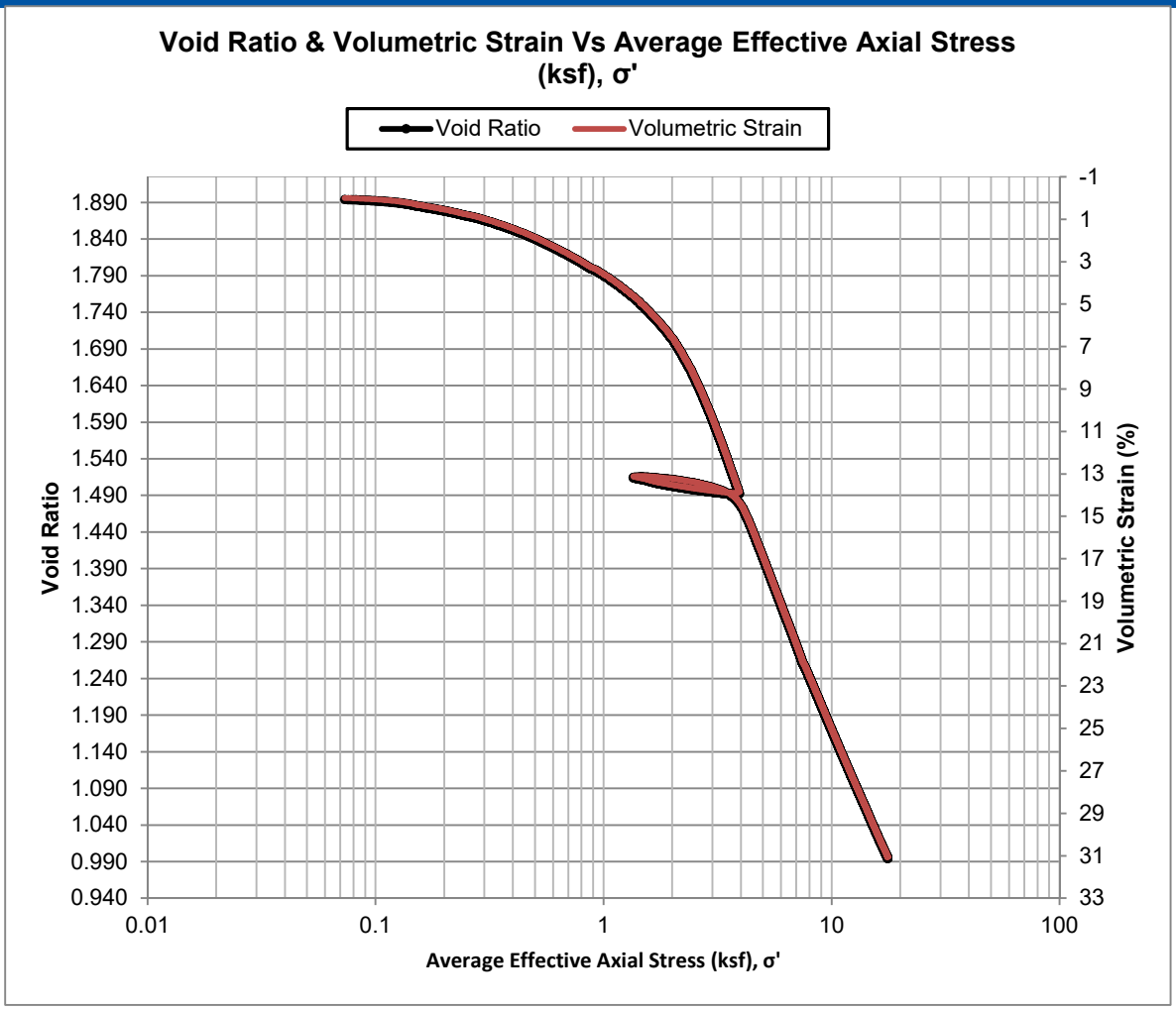
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	72.0	54.8	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	56.6	72.1	**PLASTIC LIMIT:**	
SATURATION (%):	98.2	100.0	**ASTM D854 - Measured**	
VOID RATIO:	1.994	1.350	**SPECIFIC GRAVITY**	2.719
STRAIN RATE (in/min):	0.00007			

ENGEO
Expect Excellence

CLIENT: Baylands Development Group
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/4/2021
TESTED BY: D. Seibold
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B02 @ 45 **DEPTH:** 47.5-47.75 ft

SOIL DESCRIPTION: See exploration logs

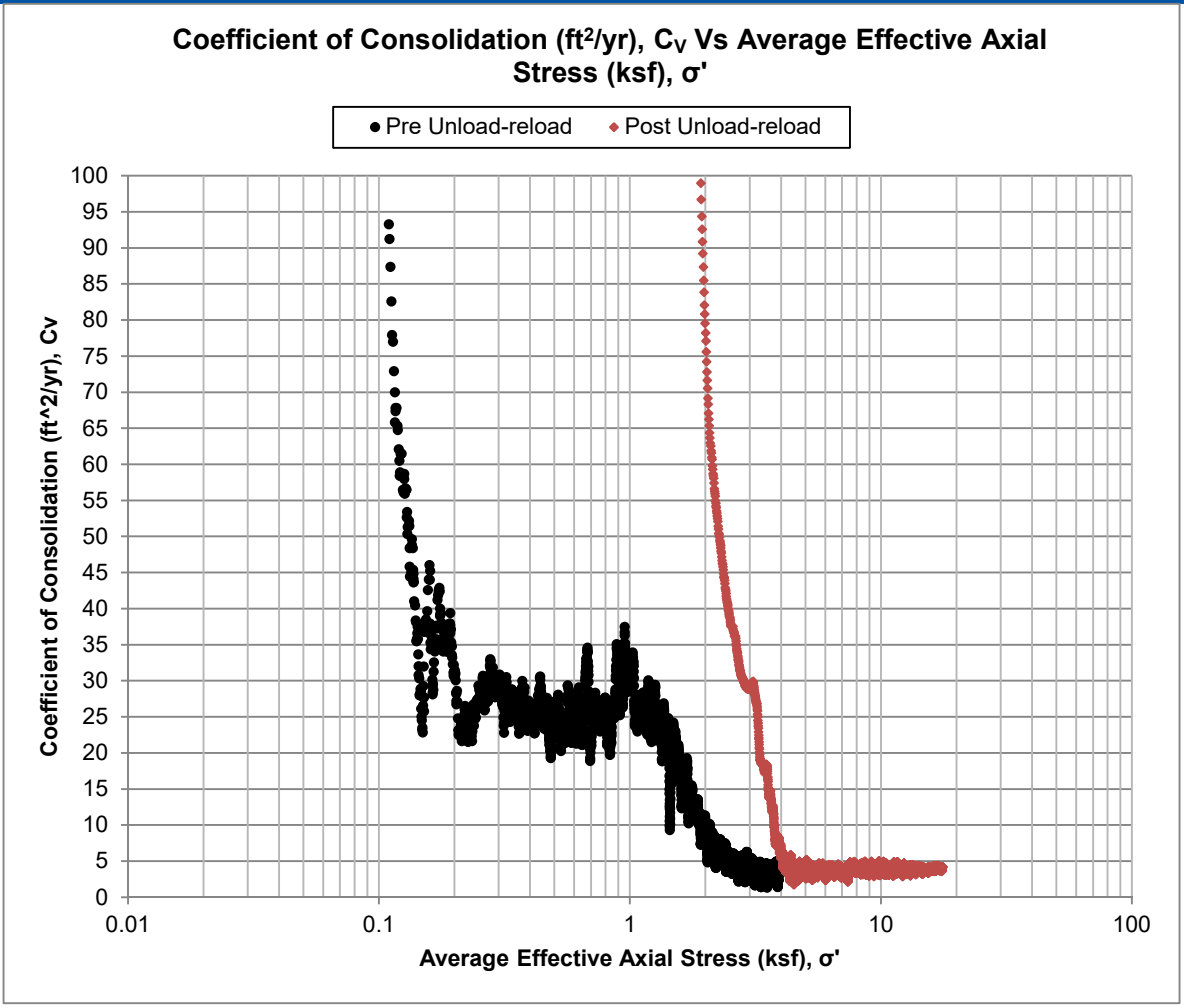
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	68.1	44.9	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	57.9	84.1	**PLASTIC LIMIT:**	
SATURATION (%):	96.8	116.1	**ASTM D854 - Measured**	
VOID RATIO:	1.894	0.995	**SPECIFIC GRAVITY**	2.691
STRAIN RATE (in/min):	0.00007			

ENGEO
Expect Excellence

CLIENT: Baylands Development Group
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/9/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B02 @ 45 **DEPTH:** 47.5-47.75 ft

SOIL DESCRIPTION: See exploration logs

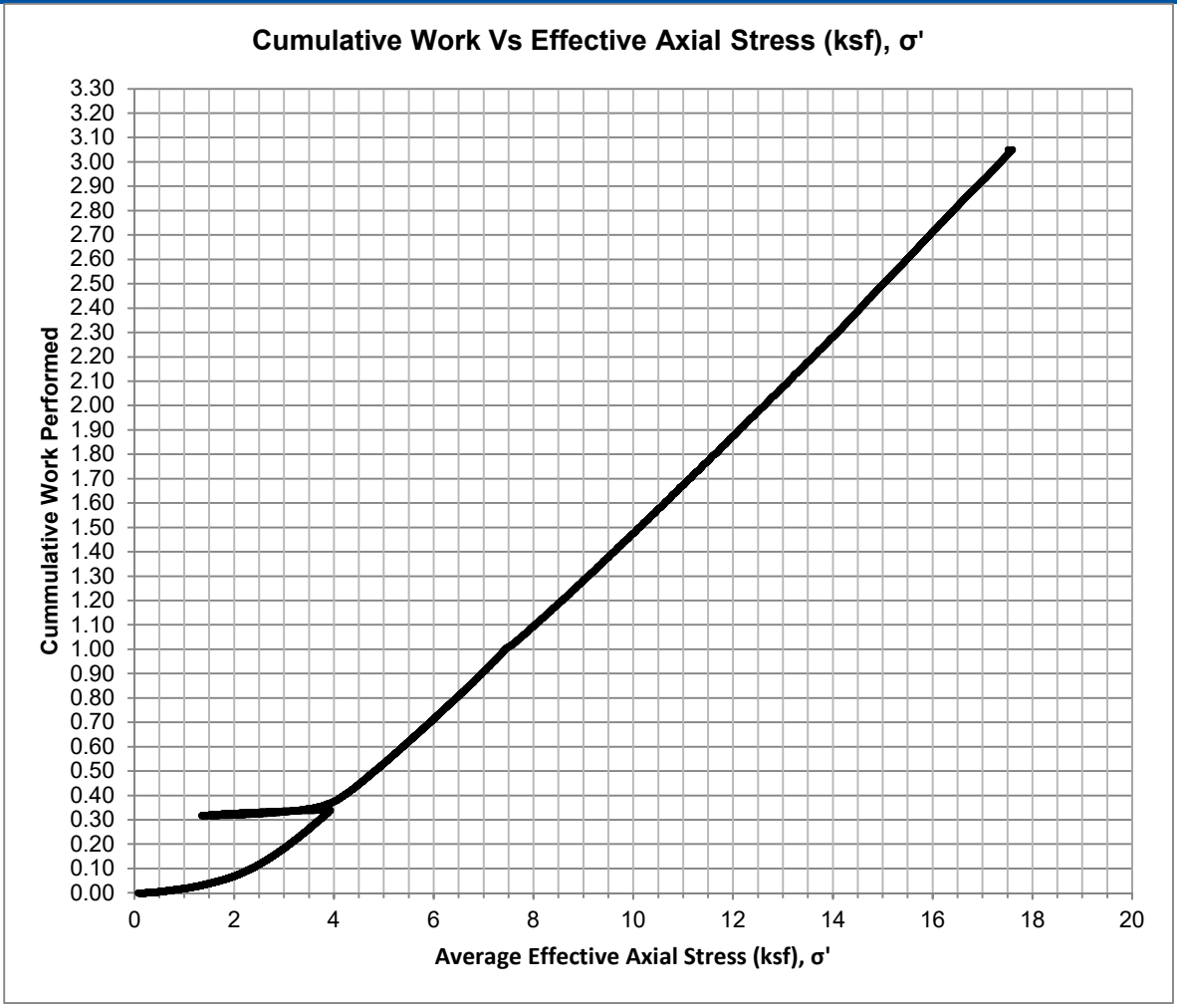
TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	68.1	44.9	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	57.9	84.1	**PLASTIC LIMIT:**	
SATURATION (%):	96.8	116.1	**ASTM D854 - Measured**	
VOID RATIO:	1.894	0.995	**SPECIFIC GRAVITY**	2.691
STRAIN RATE (in/min):	0.00007			

ENGEO Expect Excellence

CLIENT: Baylands Development Group
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/9/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

Constant Rate of Strain Consolidation
ASTM D4186



SPECIMEN INFORMATION

SAMPLE ID: 1-B02 @ 45 **DEPTH:** 47.5-47.75 ft

SOIL DESCRIPTION: See exploration logs

TEST DATA

	INITIAL	FINAL	ASTM D4318 - Wet Method	
MOISTURE CONTENT (%):	68.1	44.9	**LIQUID LIMIT:**	
DRY DENSITY (pcf):	57.9	84.1	**PLASTIC LIMIT:**	
SATURATION (%):	96.8	116.1	**ASTM D854 - Measured**	
VOID RATIO:	1.894	0.995	**SPECIFIC GRAVITY**	2.691
STRAIN RATE (in/min):	0.00007			

ENGEO
Expect Excellence

CLIENT: Baylands Development Group
PROJECT NAME: Baylands Landfill Closure Study
PROJECT NO: 17270.000.002
PROJECT LOCATION: Brisbane, California
REPORT DATE: 7/9/2021
TESTED BY: W. Miller
REVIEWED BY: S. O'Reilly-Shah

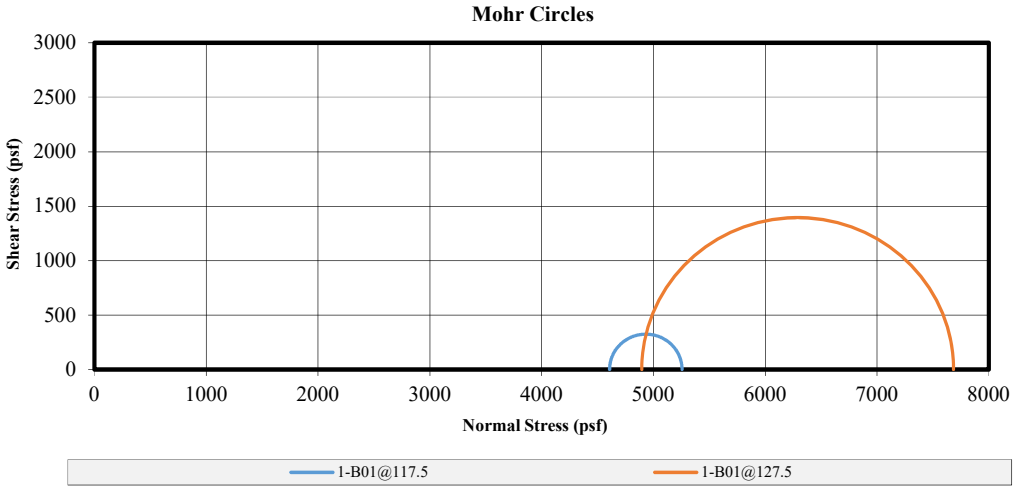
Isotropic Unconsolidated Undrained Triaxial Test
ASTM D2850

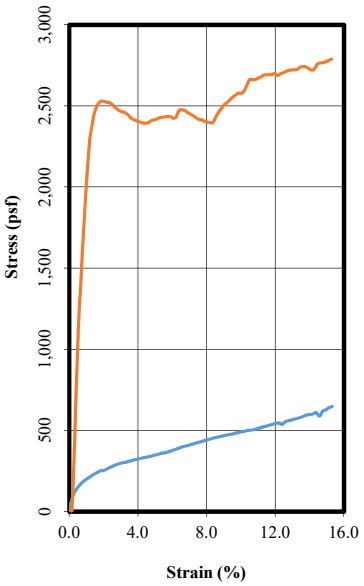
Date: 06/30/21

Checked By: M. Quasem

Date: 6/30/2021

Tested By: W. Miller





Before Test	Specimen 1-B01@117.5	1-B01@127.5		
Water Content (%)	52.95	46.14		
Dry Density (pcf)	69.50	75.40		
Saturation (%)	99.77	100.18		
Void Ratio	1.44	1.25		
Diameter (in)	2.820	2.820		
Height (in)	5.490	6.100		
Height-to-Diameter Ratio	1.947	2.163		
ASTM D4318 - Wet Method				
Liquid Limit				
Plastic Limit				
ASTM D854 - Assumed				
Specific Gravity	2.720	2.720		
After Test	**1-B01@117.5**	**1-B01@127.5**		
Water Content (%)	52.95	46.14		
Saturation (%)	99.77	100.00		
Strain Rate (%/min)	0.05	0.05		
Peak Deviator Stress (psf)	647.8	2788.7		
Axial Strain @ Failure (%)	15.324	15.280		
	Cell Pressure			
Cell (psf)	4608.0	4896.0		
Back (psf)	n/a	n/a		
	Principle Stresses at Failure			
σ1 (psf)	5255.8	7684.7		
σ3 (psf)	4608.0	4896.0		
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)			Cohesion at Failure with a Zero Friction Angle (Ø=0)			
Cohesion, c (psf)	n/a		323.9	1394.3		
Friction Angle Ø	n/a		n/a	n/a		

Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, California
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence

Isotropic Unconsolidated Undrained Triaxial Test
ASTM D2850

Date: 06/30/21

Checked By: M. Quasem

Date: 6/30/2021

Tested By: W. Miller

SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B01@117.5	SAMPLE NUMBER: 1-B01@127.5
	
SAMPLE NUMBER:	**SAMPLE NUMBER:**

Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, California
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO
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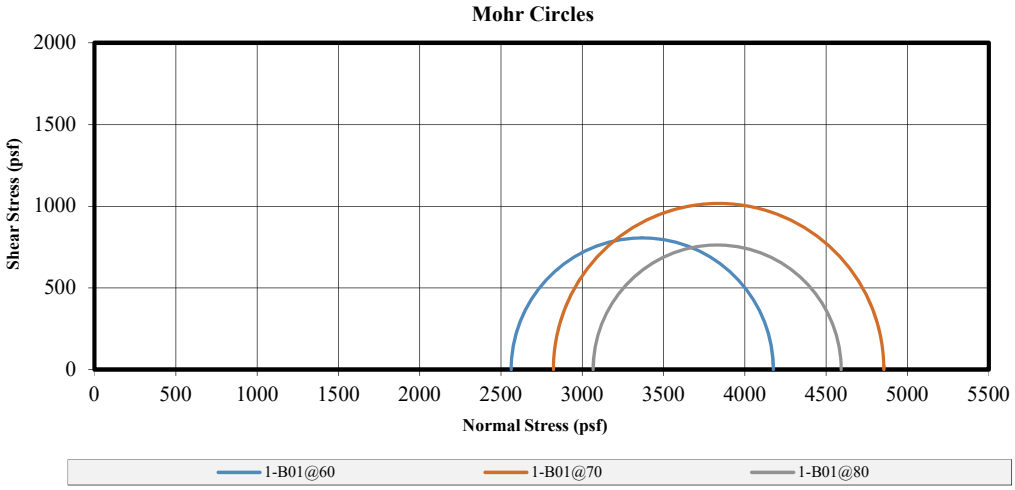
Isotropic Unconsolidated Undrained Triaxial Test
ASTM D2850

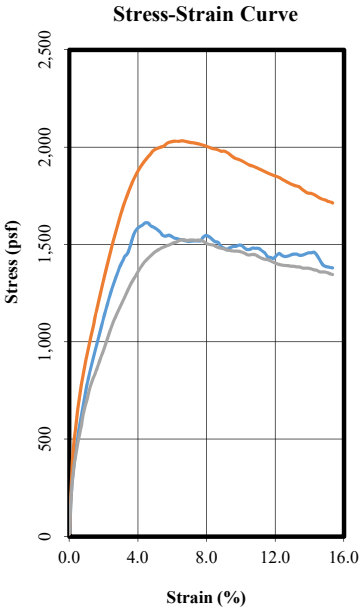
Date: 06/25/21

Checked By: V. Navarro

Date: 6/24/2021

Tested By: G. Criste, P, Galicia





Before Test	Specimen 1-B01@60	1-B01@70	1-B01@80	
Water Content (%)	65.87	52.87	60.73	
Dry Density (pcf)	61.00	70.00	62.80	
Saturation (%)	100.00	99.95	97.00	
Void Ratio	1.81	1.46	1.70	
Diameter (in)	2.861	2.864	2.861	
Height (in)	5.884	5.974	5.969	
Height-to-Diameter Ratio	2.057	2.086	2.086	
ASTM D4318 - Wet Method				
Liquid Limit				
Plastic Limit				
ASTM D854 - Assumed				
Specific Gravity	2.745	2.754	2.720	
After Test	**1-B01@60**	**1-B01@70**	**1-B01@80**	
Water Content (%)	65.87	52.87	60.73	
Saturation (%)	100.00	99.95	97.00	
Strain Rate (%/min)	0.06	0.06	0.06	
Peak Deviator Stress (psf)	1611.2	2032.4	1524.6	
Axial Strain @ Failure (%)	4.419	6.528	6.701	
	Cell Pressure			
Cell (psf)	2563.2	2822.4	3067.2	
Back (psf)	n/a	n/a	n/a	
	Principle Stresses at Failure			
σ1 (psf)	4174.4	4854.8	4591.8	
σ3 (psf)	2563.2	2822.4	3067.2	
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)			Cohesion at Failure with a Zero Friction Angle (Ø=0)			
Cohesion, c (psf)	n/a		805.6	1016.2	762.3	
Friction Angle Ø	n/a		n/a	n/a	n/a	

Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, California
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO
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Isotropic Unconsolidated Undrained Triaxial Test
ASTM D2850

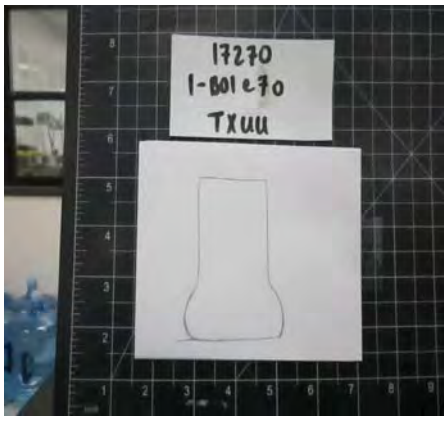
Date: 06/25/21

Checked By: V. Navarro

Date: 6/24/2021

Tested By: G. Criste, P, Galicia

SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B01@60	SAMPLE NUMBER: 1-B01@70
	
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Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, California
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence

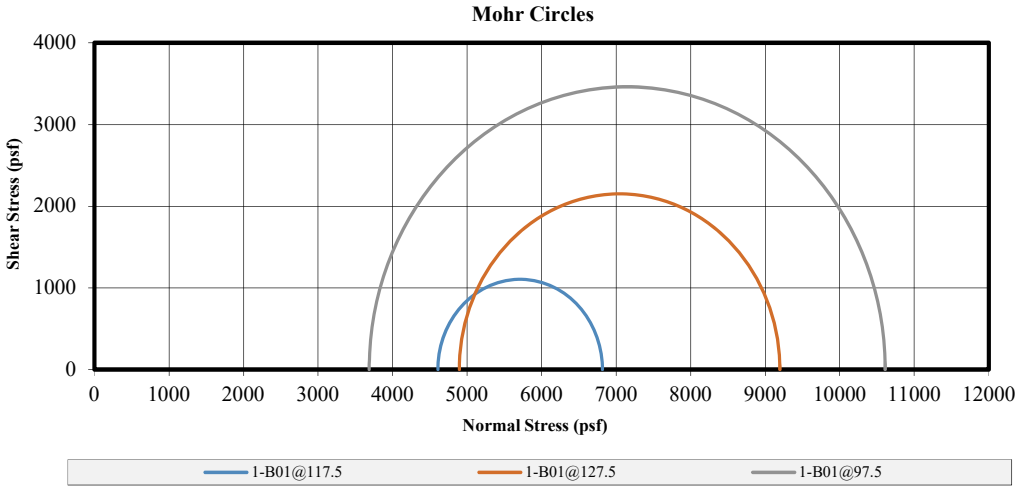
Isotropic Unconsolidated Undrained Triaxial Test
ASTM D2850

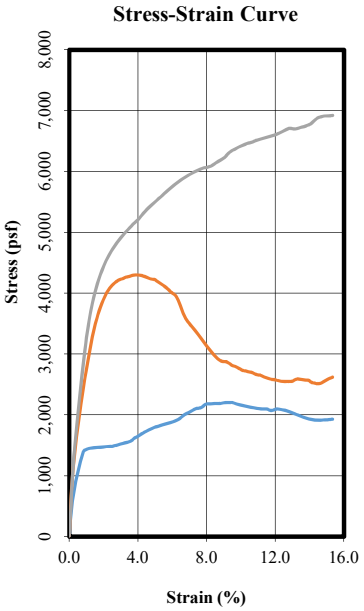
Date: 06/23/21

Checked By: G. Criste

Date: 6/22/2021

Tested By: P. Galicia





Before Test	Specimen 1-B01@117.5	1-B01@127.5	1-B01@97.5	
Water Content (%)	54.23	50.53	18.82	
Dry Density (pcf)	68.90	72.50	112.90	
Saturation (%)	100.02	100.05	99.41	
Void Ratio	1.49	1.42	0.52	
Diameter (in)	2.870	2.858	2.417	
Height (in)	6.047	6.021	4.977	
Height-to-Diameter Ratio	2.107	2.107	2.059	
ASTM D4318 - Wet Method				
Liquid Limit				
Plastic Limit				
ASTM D854 - Assumed				
Specific Gravity	2.751	2.805	2.750	
After Test	**1-B01@117.5**	**1-B01@127.5**	**1-B01@97.5**	
Water Content (%)	54.23	50.53	18.82	
Saturation (%)	100.00	100.00	99.41	
Strain Rate (%/min)	0.06	0.06	0.05	
Peak Deviator Stress (psf)	2206.8	4300.6	6922.9	
Axial Strain @ Failure (%)	9.426	3.986	15.341	
	Cell Pressure			
Cell (psf)	4608.0	4896.0	3686.4	
Back (psf)	n/a	n/a	n/a	
	Principle Stresses at Failure			
σ1 (psf)	6814.8	9196.6	10609.3	
σ3 (psf)	4608.0	4896.0	3686.4	
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)			Cohesion at Failure with a Zero Friction Angle (Ø=0)			
Cohesion, c (psf)	n/a		1103.4	2150.3	3461.4	
Friction Angle Ø	n/a		n/a	n/a	n/a	

Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, California
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO
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Isotropic Unconsolidated Undrained Triaxial Test
ASTM D2850

Date: 06/23/21

Checked By: G. Criste

Date: 6/22/2021

Tested By: P. Galicia

SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B01@117.5	SAMPLE NUMBER: 1-B01@127.5
	
SAMPLE NUMBER: 1-B01@97.5	
	

Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, California
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence

Isotropic Unconsolidated Undrained Triaxial Test

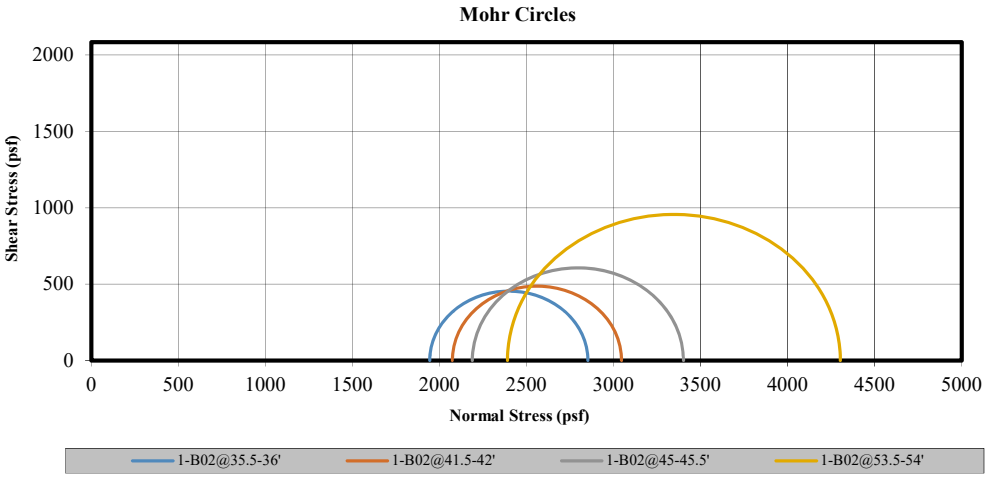
ASTM D2850

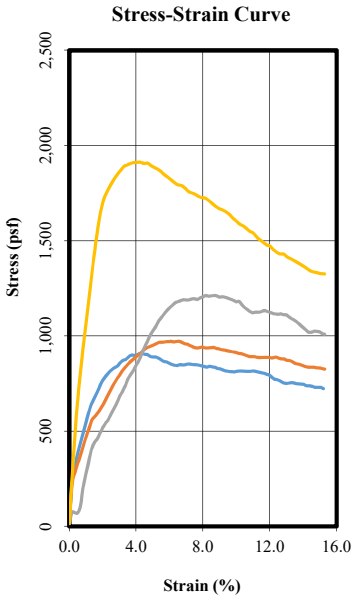
Date: 06/17/21

Checked By: K. Lecce

Date: 6/17/2021

Tested By: V. Navarro





Before Test	Specimen 1-B02@35.5-36'	1-B02@41.5-42'	1-B02@45-45.5'	1-B02@53.5-54'
Water Content (%)	62.88	64.54	72.59	63.74
Dry Density (pcf)	63.10	62.20	57.10	62.70
Saturation (%)	99.58	99.85	99.95	99.72
Void Ratio	1.77	1.81	1.98	1.79
Diameter (in)	2.834	2.838	2.839	2.399
Height (in)	6.192	5.912	6.004	4.912
Height-to-Diameter Ratio	2.185	2.083	2.115	2.048
ASTM D4318 - Wet Method				
Liquid Limit				
Plastic Limit				
ASTM D854 - Assumed				
Specific Gravity	2.800	2.800	2.720	2.800
After Test	1-B02@35.5-36'	1-B02@41.5-42'	1-B02@45-45.5'	1-B02@53.5-54'
Water Content (%)	62.88	64.54	72.59	63.74
Saturation (%)	99.58	99.85	99.95	99.71
Strain Rate (in/min)	0.05	0.05	0.05	0.05
Peak Deviator Stress (psf)	908.5	972.3	1212.5	1912.3
Axial Strain @ Failure (%)	4.361	6.089	8.661	4.275
	Cell Pressure			
Cell (psf)	1944.0	2073.6	2188.8	2390.4
Back (psf)	n/a	n/a	n/a	n/a
	Principle Stresses at Failure			
σ1 (psf)	2852.5	3045.9	3401.3	4302.7
σ3 (psf)	1944.0	2073.6	2188.8	2390.4
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)			Cohesion at Failure with a Zero Friction Angle (Ø=0)			
Cohesion, c (psf)	n/a		454.3	486.1	606.2	956.2
Friction Angle Ø	n/a		n/a	n/a	n/a	n/a

Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, CA
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence

Isotropic Unconsolidated Undrained Triaxial Test

ASTM D2850

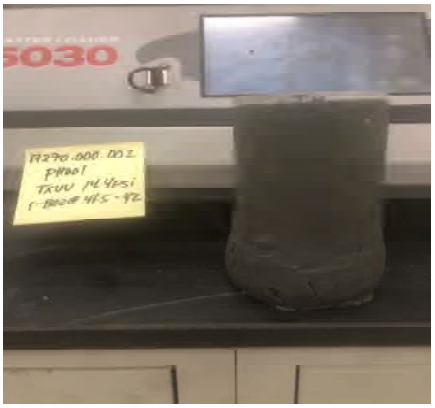
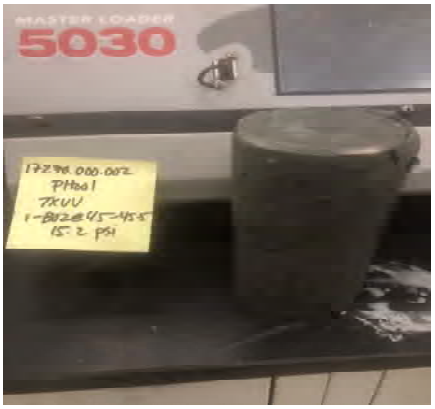
Date: 06/17/21

Checked By: K. Lecce

Date: 6/17/2021

Tested By: V. Navarro

SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B02@35.5-36'	SAMPLE NUMBER: 1-B02@41.5-42'
	
SAMPLE NUMBER: 1-B02@45-45.5'	**SAMPLE NUMBER: 1-B02@53.5-54'**
	

Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, CA
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence

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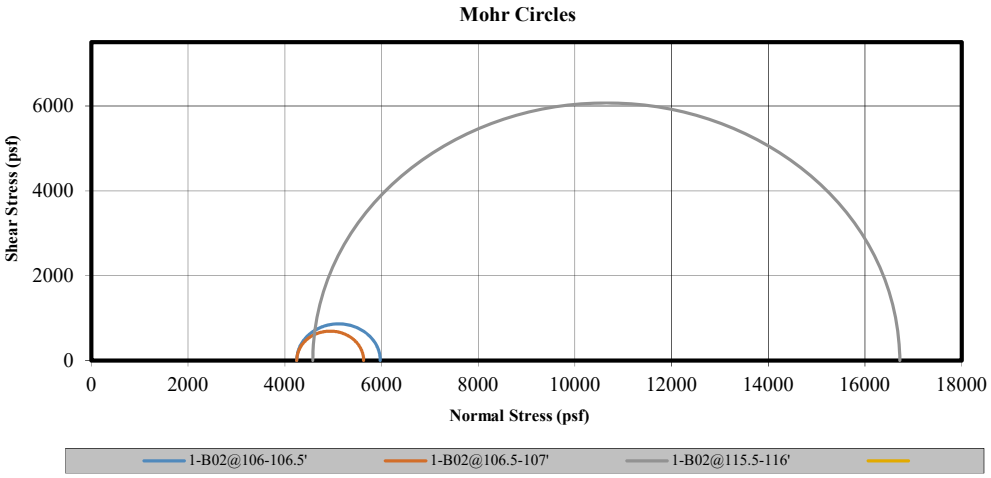
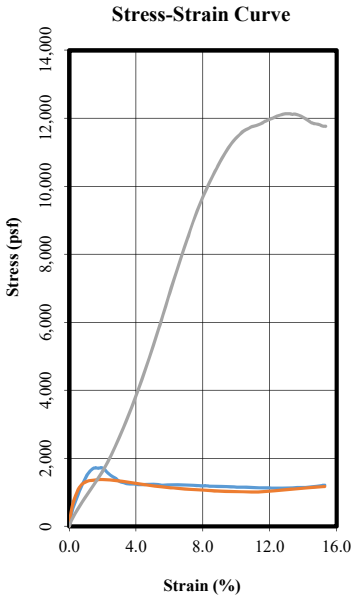




Before Test	Specimen 1-B02@106-106.5'	1-B02@106.5-107'	1-B02@115.5-116'	
Water Content (%)	63.55	56.34	23.04	
Dry Density (pcf)	62.70	66.10	105.90	
Saturation (%)	99.64	97.65	99.16	
Void Ratio	1.79	1.57	0.65	
Diameter (in)	2.865	2.861	2.855	
Height (in)	5.786	6.102	6.072	
Height-to-Diameter Ratio	2.020	2.133	2.127	
ASTM D4318 - Wet Method				
Liquid Limit				
Plastic Limit				
ASTM D854 - Assumed				
Specific Gravity	2.800	2.720	2.800	
After Test	1-B02@106-106.5'	1-B02@106.5-107'	1-B02@115.5-116'	
Water Content (%)	63.55	56.34	23.04	
Saturation (%)	99.64	97.65	99.16	
Strain Rate (in/min)	0.05	0.05	0.05	
Peak Deviator Stress (psf)	1726.4	1383.0	12139.3	
Axial Strain @ Failure (%)	1.901	1.967	13.175	
	Cell Pressure			
Cell (psf)	4248.0	4248.0	4579.2	
Back (psf)	n/a	n/a	n/a	
	Principle Stresses at Failure			
σ1 (psf)	5974.4	5631.0	16718.5	
σ3 (psf)	4248.0	4248.0	4579.2	
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)			Cohesion at Failure with a Zero Friction Angle (Ø=0)			
Cohesion, c (psf)	n/a		863.2	691.5	6069.6	
Friction Angle Ø	n/a		n/a	n/a	n/a	

Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, CA
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence

Isotropic Unconsolidated Undrained Triaxial Test

ASTM D2850

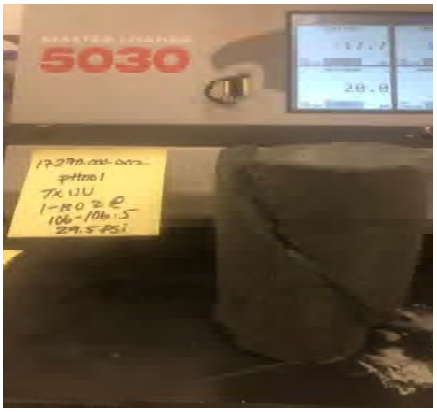
Date: 06/17/21

Checked By: K. Lecce

Date: 6/17/2021

Tested By: V. Navarro

SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B02@106-106.5'	SAMPLE NUMBER: 1-B02@106.5-107'
	
SAMPLE NUMBER: 1-B02@115.5-116'	**SAMPLE NUMBER:**
	

Project Information	
Project Name:	Baylands Landfill Closure Study
Project Number:	17270.000.002 PH001
Project Location:	Brisbane, CA
Client:	Baylands Development, Inc.
Description:	See exploration logs
Test Remarks:	

ENGEO Expect Excellence



APPENDIX D

PREVIOUS GEOTECHNICAL EXPLORATION LOGS
John V. Lowney & Associates, 1977
Kleinfelder, 1989
Geosyntec, 2004, 2005, 2008

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW		Well-graded gravels or gravel sand mixtures, little or no fines.
		GP		Poorly-graded gravels or gravel sand mixture, little or no fines.
		GM		Silty gravels, gravel-sand-clay mixtures.
		GC		Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW		Well-graded sands or gravelly sands, little or no fines.
		SP		Poorly-graded sands or gravelly sands, little or no fines.
		SM		Silty sands, sand-silt mixtures.
		SC		Clayey sands, sand-clay mixtures.

MAJOR DIVISIONS		LTR	ID	DESCRIPTION
FINE GRAINED SOILS	SILTS AND CLAYS LL<50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL		Organic silts and organic silt-clays of low plasticity
	SILTS AND CLAYS LL>50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays.
		OH		Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils.

Standard Penetration Split Spoon Sampler

Modified California Sampler

Shelby Tube Sampler

Water level first observed in boring

Water level observed in boring following drilling

Note: Blow count represents the number of blows of a 140 pound hammer falling 30 inches per blow required to drive a sampler through the last 12 inches of an 18-inch penetration, unless otherwise noted.

Note: The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

BORING LOG LEGEND

PLATE B-1

Date Completed: 12/7/89

Logged By: Mike James

Total Depth: 61.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								Surface Elevation: Estimated 13 feet (MSLD)
		28	99 100	0 10		Ø= 36 deg c=1050psf		**FILL: GRAVELLY SILT (ML)** Firm, medium brown, moist, gravel to 1/2", trace sand -grey, siltier
5		14						**FILL: REFUSE AND SOIL** Primarily paper, glass fragments, wood fibers, pieces of metal and rubble mixed with... Clayey Silty Sand (SM-ML) Loose, dark brown, wet, fine grained
10		50/6"						-rubble
15		7						
20		17	59	69				**SILTY CLAY (CH) - BAY MUD** Very soft, medium blue-grey, wet, with shells, with pockets of refuse consisting of wood fibers, paper, glass fragments, etc.
25		4						-soft, without refuse
30		4	61	64			0.5	
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-7

PLATE

B-14

Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		2					0.9	...Bay Mud -firm
40								
45						LL = 62 PI = 32	0.5	
50								
55						LL = 65 PI = 38		-sandy
								SILTY SAND (SM-ML) Medium dense, medium blue-grey with some brown and black, fine grained
60		24	79	17				
								Bottom of boring at 61.5 feet
65								
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-7

PLATE

B-15

Date Completed: 12/7/89

Logged By: Mike James

Total Depth: 66.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID Shelby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LAB: Dry Density pcf	LAB: Moisture Content %	LAB: Compress. Strength tsf	LAB: Other Tests	Pen, tsf	DESCRIPTION
								Surface Elevation: Estimated 23 feet (MSLD)
		22	100	7		Ø=34 deg c=490psf		**FILL: SILTY SAND (SM-ML)** Medium dense, orange-brown, moist, medium grained, with some clayey pockets and rock fragmets to 1-1/2"
5		40	120	11				Lens of Sandy Silt (ML) Very stiff, dark grey, moist, with some gravel to 1/2" -Clayey Sand (SC)
10		36						Lens of Sand (SP) Dense, medium brown, moist
15		23	112	20				**FILL: REFUSE AND SOIL** Primarily paper, wood fibers, glass fragments and pieces of metal mixed with... Silty Clay (CH) Soft to firm, dark grey and black, damp, with some gravel to 1/2" and sandy areas
20		17						
25		15	58	68				
30		10						
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-8

PLATE

B-16

Depth, ft	Sample	Blows/ft	Dry Density pcf	Moisture Content %	Compress. Strength tsf	Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		14						...Fill: Refuse and Soil
40		28	102	20				
45		9						
50		7						
								SILTY CLAY (CH) - BAY MUD Firm, medium blue-grey, damp
55		4	49	81			0.5	-dark blue-grey
60			49	90		LL = 102 PI = 59		Lens of Silty Clayey Sand (SC-CL) Medium dense, dark brown, wet, fine grained -light blue-grey
65		32	110	17				SILTY SAND (SM) Medium dense, moist, medium blue-grey, fine grained
								Bottom of boring at 66.5 feet
70								
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-8

PLATE

B-17

Date Completed: 12/8/89

Logged By: Mike James

Total Depth: 81.5 ft

Sampler: Modified California - 2.5" OD, 2.0" ID
Shelby Tube - 2.8" DIA (nominal)

Hammer Wt: 140 lbs, drop 30 in

Depth, ft	FIELD: Sample	FIELD: Blows/ft	LABORATORY: Dry Density pcf	LABORATORY: Moisture Content %	LABORATORY: Compress. Strength tsf	LABORATORY: Other Tests	Pen, tsf	DESCRIPTION
								Surface Elevation: Estimated 26 feet (MSLD)
		10						FILL: SANDY CLAY (CL) Firm, orange-brown, moist, with rock fragments and pockets of brown clay (CL)
5		37	107	15				Lens of Sand (SP) Medium dense, medium brown, moist -with some fine gravel Lens of Silty Sand (SM-ML) Dense, dark brown, moist, with wood chips
10		32						FILL: SAND (SP) Medium dense, medium brown, moist, fine grained, trace silt
15		42						FILL: ROCK Predominately fragments of sandstone and shale
20		50/5"						FILL: REFUSE AND SOIL Primarily paper and wood fibers mixed with... Silty Clayey Sand (SC-CH) Loose, very dark brown, wet
25								
30		11						-Refuse mixed with... Sandy Clay (CH) Very soft, dark grey, wet
35								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-9

PLATE

B-18

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		50/ 6"						...Fill: Refuse and Soil
40								**SILTY CLAY (CH) - BAY MUD** Soft to firm, medium blue-grey, moist, mixed with pockets of refuse containing paper, glass fragments, etc.
45								-firm, dark grey, with some roots, without refuse
50								-dark blue-grey, with some shells, with some refuse (paper)
55								-mixed with refuse (paper, wood fibers, metal, plastic)
60								-firm, without refuse
65		5	61	62		Torvane 1.8 tsf		
70		5				Torvane 1.7 tsf		
75								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-9

PLATE

B-19

Depth, ft	FIELD Sample	FIELD Blows/ft	LABORATORY Dry Density pcf	LABORATORY Moisture Content %	LABORATORY Compress. Strength tsf	LABORATORY Other Tests	Pen, tsf	DESCRIPTION
								(Continued from previous plate)
		4	67	52				...Bay Mud -dark grey, trace fine grained sand
80		30	104	22				SILTY CLAY (CL-ML) - (OLD BAY CLAY) Very stiff, blue-grey, moist
								Bottom of boring at 81.5 feet
85								
90								
95								
100								
105								
110								
115								

KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

LOG OF BORING NO. B-9

PLATE

B-20

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS — MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS — LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS — LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

DEFINITION OF TERMS

U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4"	3"	12"	
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

SANDS AND GRAVELS	BLOWS/FOOT†
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

SILTS AND CLAYS	STRENGTH‡	BLOWS/FOOT†
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

†Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).

‡Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

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KEY TO EXPLORATORY BORING LOGS
Unified Soil Classification System (ASTM D-2487)

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE
169-11A	May 1977

Figure A-1

DEPTH TO GROUNDWATER 13.0 feet	BORING DIAMETER 8 inches	DATE DRILLED 3/10/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
CLAYEY SAND; medium to coarse grained with scattered gravel, some roots (FILL)		brown	medium dense	SC	1		8	10		
					2					
					3					
*Dry density = 110 pcf					4	*		22		
					5		17			
Augered through concrete or rock at 6 - 8 feet					6					
					7					
					8					
					9					
GRAVELLY SAND, with some clay (FILL)		gray	medium dense	SP	10		14	9		
					11					
					12					
					13			▽		Groundwater level measured 3/22/77
Weathered rock encountered at 14 - 14½ feet highly fractered (Red Rock)		red-brown			14		50/4"	7		
CLEAN FILL					15					
GARBAGE, mixed with clayey sand and some weathered rock		black and brown			16					
					17			▽		Groundwater at time of drilling
Approximately 30% garbage including glass, plastic, and wood					18					
					19					
					20		14	34		

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-1

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 17.30	LOGGED BY GC
DEPTH TO GROUNDWATER 13.0 feet	BORING DIAMETER 8 inches	DATE DRILLED 3/10/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE (continued)		black and brown			21 22 23 24 25					
GARBAGE FILL					26					
CLAYEY SILT - SILTY CLAY mixed with some garbage * Dry density = 57 pcf		black	firm	MH CH	27 28 29					
					30	*	13	75	0.35	
becoming					31 32 33 34 35 36 37 38					
SILTY CLAY, with scattered sea shells and small pockets of peat (Bay Mud)		gray	firm	CH	39 40		pushed 250 psi			

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-1

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.30	LOGGED BY	GC
DEPTH TO GROUNDWATER	13.0 feet	BORING DIAMETER	8 inches	DATE DRILLED	3/10/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
SILTY CLAY (continued)		gray	firm	CH	41					
					42					
					43					
					44					
					45		8	65	0.55	1.1
					46					
					47					
					48					
					49					
					50					
					51					
?		?			52					
SILTY SAND, very fine to medium grained		gray	medium dense	SM	53					
					54		pushed 400 psi			
					55					
					56					
					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	May 1977	EB-1

DRILL RIG Hollow Flight Auger | SURFACE ELEVATION +7.50 | LOGGED BY GC

DEPTH TO GROUNDWATER 13.0 feet | BORING DIAMETER 8 inches | DATE DRILLED 3/10/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY SAND, very fine to medium grained		gray	medium dense	SM	61					
					62					
					63					
					64					
					65		7	24		
Bottom of Boring = 65.5 feet					66					
Note; The stratification lines represent the approximate boundary between soil and fill material types and the transition may be gradual					67					
					68					
					69					
					70					
					71					
					72					
					73					
					74					
					75					
					76					
					77					
					78					
					79					
					80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO. EB-1

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 21.30	LOGGED BY GG
DEPTH TO GROUNDWATER 17.0 feet	BORING DIAMETER 8 inches	DATE DRILLED 3/11/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
½inch Asphaltic Concrete at surface CLAYEY SAND, fine to coarse with angular gravel (FILL)		red brown	medium dense to dense	SC	1 2		30	7		
SANDY CLAY - CLAYEY SAND fine to coarse grained with some gravel sized pieces of weathered serpentene (FILL) * Dry density = 95pcf ** Dry density = 107 pcf becoming Weathered Red Rock; angular fragments to ½" in clay matrix CLEAN FILL		gray-green dark red	stiff dense	CL SC	3 4 5 6 7 8 9 10 11 12 13 14 15 16	* ** 44/9"	21 17	12 17		
GARBAGE; saturated, decomposed, fragments of glass, wood, and paper mixed with clayey silt. (50% garbage) *** Dry density = 86 pcf		gray to black			17 18 19 20	***	13	▽ 26		

ground wat level meas 3/22/77

ground wat at time c drilling

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EXPLORATORY BORING LOG

260-ACRE COMMERICAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	May 1977	EB-2

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 21.30	LOGGED BY GC
DEPTH TO GROUNDWATER 17.0 feet	BORING DIAMETER 8 inches	DATE DRILLED 3/11/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) with seashells and scattered pockets of peat		gray	firm	CH	41					
					42					
					43					
			firm to stiff		44		pushed 300-350 psi		1.0	
					45					
					46					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					47					
					48					
					49					
					50					
					51					
					52					
					53					
			firm to stiff		54		pushed 300-350 psi		1.1	
					55					
					56					
					57					
SILTY SAND, very fine to medium grained with some clay		black with brown motting	medium dense	SM	58					
					59		13	19		
Bottom of Boring = 60.0 feet					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERICAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
269-11A	May 1977	EB-2

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	22.0	LOGGED BY	GC
DEPTH TO GROUNDWATER	17.5 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/22/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
CLAYEY SAND, fine to coarse with angular gravel to 3/4"		red-brown	medium dense to dense	SC	1		23			
becoming					2					
SILTY SAND, very fine grained with some scattered serpentine fragments (FILL)		gray-green	dense	SM	3					
* Dry density = 126 pcf.					4					
					5		32	15		
					6					
					7					
SANDY CLAY - CLAYEY SAND (FILL)		red	dense		8					
CLEAN					9					
WEATHERED SERPENTINE FILL		green			10		13	14		
GARBAGE; glass, paper, wood and metal mixed with fine grained silty sand, approximately 90% garbage					11					
** Dry density = 98 pcf.					12					
					13					
					14					
					15		45	35		
					16					
concrete or rock at 17 feet					17			▽	ground water level measured 3/22/77	
					18					
					19					
					20		24	45		

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-3

DRILL RIG: Hollow Flight Auger	SURFACE ELEVATION 22.0	LOGGED BY GC
DEPTH TO GROUNDWATER 17.5 feet	BORING DIAMETER 8 inches	DATE DRILLED 2/22/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE, (continued) Mixed with clayey silt approximately 70% garbage * Dry density = 62 pcf.		gray to black			21–23					
Sample on rock at 24.5 feet					24	✕	50+	53		
					25–28			▽ groundwater level time of drilling		
					29		27			
GARBAGE FILL					30–32					
SILTY CLAY, with scattered seashells and small pockets of peat (Bay Mud)		gray	soft	CH	33					
					34		12	(lost sample)		
					35–38					
** Liquid Limit = 73 Plasticity Index = 50 Dry density = 67 pcf.					39			pushed 250 psi	48	
					40		**			

DESCRIPTION AND CLASSIFICATION

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	Mar. 1977	EB-3

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	22.0	LOGGED BY	GC
DEPTH TO GROUNDWATER	17.5 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/22/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (continued) scattered seashells and small pockets of peat.		gray	soft to firm	CH	41					
					42					
					43					
					44		pushed 300-350 psi		0.5	
					45					
					46					
					47					
					48					
					49		pushed 300 psi	(no sample recovery)		
					50					
			firm to stiff		51		pushed 300 psi			
* Dry density = 61 pcf					52			64	1.0	
					53					
					54					
					55					
					56					
					57					
					58					
Sandy layer 59-60 feet					59		pushed 375 psi	37		
					60			60	1.0	

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
269-11A	May 1977	EB-3

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	22.0	LOGGED BY	GC
DEPTH TO GROUNDWATER	17.5 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/22/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued)		gray	firm to stiff	CH	61					
SAND, fine to medium grained		yellow brown	medium dense	SP	62					
					63					
					64		pushed 750-1000 psi			
					65					
Bottom of Boring = 65 feet					66					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual					67					
					68					
					69					
					70					
					71					
					72					
					73					
					74					
					75					
					76					
					77					
					78					
					79					
					80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-3

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	19.75	LOGGED BY	CMC
DEPTH TO GROUNDWATER	23 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
Asphalt Concrete										
CLAYEY GRAVEL		dark brown	medium dense	GC	1 2 3					
GARBAGE		multi colored			4 5 6 7 8 9 10 11 12 13 14					
GARBAGE, mixed with clayey silt		black	soft	MH	15 16 17 18 19 20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11A	Jan 1977	

DRILL RIG	Hollow Flaigt Auger	SURFACE ELEVATION	19.75	LOGGED BY	CMC
DEPTH TO GROUNDWATER	23 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE, mixed with clayey silt (continued)		black	soft	MH	21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40			▽	groundwate level at time of drilling	
SILTY CLAY (BAY MUD)		gray	soft	CH						

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	19.75	LOGGED BY	CMC
DEPTH TO GROUNDWATER	23.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY, (BAY MUD) (continued)		gray	soft	CH	41 42 43 44 45 46 47 48 49 50					
Refusal at 52 feet					51		pushed 1000 psi			
Bottom of Boring = 52 feet Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual					52 53 54 55 56 57 58 59 60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11A	May 1977	EB-4

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	24.55	LOGGED BY	LMC
DEPTH TO GROUNDWATER	22.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
CLAYEY SAND, with silt and miscellaneous debris (concrete, wood, gravel)		brown	medium dense	SC	1 2 3 4 5 6					
CLEAN FILL ↑										
GARBAGE		multi color			7 8 9 10 11 12 13 14 15 16 17 18 19 20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11A	[illegible]	B-5

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	24.55	LOGGED BY	CMC
DEPTH TO GROUNDWATER	22.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE (continued)					21					
					22			▽ groundwater level at time of drilling		
					23					
					24					
					25					
					26					
					27					
					28					
					29					
					30					
					31					
					32					
					33					
GARBAGE FILL					34					
SILTY CLAY (Bay Mud) Note: Hollow flight augers were used until Bay Mud was encountered. A 2-inch O.D. (1-3/8 inch I.D) Split spoon sampler was pushed by hydraulic pressure to probe through the Bay Mud.		gray	soft	CH	35		pushed 350 psi			
					36					
					37					
					38					
					39					
					40					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
		EB-5

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	24.55	LOGGED BY	CMC
DEPTH TO GROUNDWATER	22.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (Bay Mud) (continued)		gray	soft to firm	CH	41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58		pushed 400 psi			
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual										
SILTY SAND		gray	medium dense	SM	59		pushed 800-1000 psi			
Bottom of Boring = 61 feet					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-5

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	25.30	LOGGED BY	GC
DEPTH TO GROUNDWATER	21. 0 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/25/77

DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SAND; fine-medium		brown	loose	SP						
CLAYEY SAND, with angular fragments of weathered serpentine to 3/4" (FILL) * Dry density = 111pcf (1½" layer of gray silty clay at 5 feet) CLEAN FILL		gray-green	dense	SC	1 2 3 4 5 6 7 8	*	46 22	9 16		
GARBAGE, mixed with clayey sand. Wood brick, glass, metal. Approximately 50% trash (augered through 8" - 10" wood at 10 feet) **Dry density = 95 pcf		gray-green gray			9 10 11 12 13 14 15 16 17 18 19 20	* *	18 24	25		

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-6

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	25.30	LOGGED BY	GC
DEPTH TO GROUNDWATER	21.0 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/25/

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE, mixed with clayey sand (continued)		gray			21			▽		groundwate level measured 3/22/77
					22			▽		groundwate at time of
(augered through concrete/ rock at 22-23 feet)					23					drilling
					24					
					25					
					26					
					27					
					28					
Red Rock fragments mixed with garbage below 29 feet		gray and red			29	*	22	42		
					30					
*Dry density = 65 pcf					31					
					32					
					33					
					34					
					35					
					36					
					37					
					38					
					39		jar sample	35		
					40					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING

DRILL RIG: Hollow Flight Auger	SURFACE ELEVATION 25.30	LOGGED BY GC
DEPTH TO GROUNDWATER 21.0 feet	BORING DIAMETER 8 inches	DATE DRILLED 2/25/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
GARBAGE, mixed with clayey sand and Red Rock fragments (continued)		gray and red			41 42 43 44					
GARBAGE FILL										
SILTY CLAY, mixed with trash		gray	soft	CH	45 46 47 48 49 50 51 52 53		pushed 350 psi	32		
SILTY CLAY, with scattered seashells and small pockets of peat (BAY MUD)		gray	firm	CH	54 55 56 57 58 59 60		pushed 250-300 psi		0.9	

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-6

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	25.30	LOGGED BY	GC
DEPTH TO GROUNDWATER	21.0 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/25/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued)		gray	firm	CH	61					
					62					
					63					
					64		pushed 250 psi			
CLAYWY SAND - SANDY CLAY fine to medium grained (decomposed Serpentine) Mottled with black silty sand.		green and black	stiff to very stiff	CL SC	65		pushed 500 psi			
					66					
					67					
					68					
Bottom of Boring = 68.5 feet					69					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual					70					
					71					
					72					
					73					
					74					
					75					
					76					
					77					
					78					
					79					
					80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-6

Hollow Flight Auger — 24.45 — GC

DEPTH TO GROUNDWATER 15.7 feet | BORING DIAMETER 8 inches | DATE DRILLED 3/11/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SANDY - SILTY CLAY fine- grained CLEAN FILL		mottled brown and gray	firm	CL ML	1–3		5	22		
GARBAGE, mixed with sandy to silty clay, some gravel to 3/4" *Dry density = 112pcf becoming GARBAGE, with very little soil below 6-feet approximately 90% trash, strong odor.		blue-green and brown			4–9	*	17	19		
(augered through wood at 10-feet)					10–13					
** Dry density = 36pcf saturated below 16 feet					14–20	* *	50+	31 ▽ groundwater level measured 3/22/77		

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-7

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 24.45	LOGGED BY GC
DEPTH TO GROUNDWATER 15.7 feet	BORING DIAMETER 8 inches	DATE DRILLED 3/11/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE (continued)		gray to black			21 22 23 24 25		20	(lost sample)		
					26 27 28 29 30 31 32 33 34 35		23			
GARBAGE FILL					36 37					
SILTY CLAY, scattered sea shells and small pockets of peat. Some pieces of trash mixed with the clay. (Bay Mud)		gray	soft	CH	38 39 40		pushed 350 psi	70	0.35	

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-7

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	24.45	LOGGED BY	GC
DEPTH TO GROUNDWATER	15.7 feet	BORING DIAMETER	8 inches	DATE DRILLED	3/11/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY, scattered sea shells and small pockets of peat. (Bay Mud)		gray	soft	CH	41					
					42					
					43					
*Dry Density = 62 pcf Liquid Limit = 57% Plasticity Index = 35%					44		pushed 250-300 psi			
					45	*		63	0.45	0.6
					46					
					47					
					48					
**Dry density = 62 pcf					49		pushed 250-300 psi			
					50	**		62	0.30	
					51					
					52					
					53					
					54		pushed 250 psi			
*** Dry density = 58 pcf					55	***		68	0.45	
					56					
					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-7

DRILLING [illegible]		
DEPTH TO GROUNDWATER 15.7 feet	BORING DIAMETER 8 inches	DATE DRILLED 3/11/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) (Bay Mud)		gray	soft	CH	61 62					
SILTY SAND		gray	medium dense	SM	63 64 65		pushed 500 psi			
Bottom of Boring = 65.5 feet Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					66 67 68 69 70 71 72 73 74 75 76 77 78 79 80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-7

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	21.90	LOGGED BY	CMC
DEPTH TO GROUNDWATER	17.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
SILTY SAND, with concrete and rubble		brown	medium dense	SM	1					
SILTY SAND, with some rubble		dark gray to black	medium dense	SM	2 3 4 5					
CLEAN FILL					6					
GARBAGE		multi colored			7 8 9 10 11 12 13 14 15					
(wood encountered between 15' to 16')					16					
(high concentration of creosote noticed in groundwater near 17')					17 18 19 20					

groundwater level at time of drilling

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11A	May 1977	EB-8

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	21.90	LOGGED BY	CMC
DEPTH TO GROUNDWATER	17.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/7

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE (continued)					21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO. | DATE

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	21.90	LOGGED BY	CMC
DEPTH TO GROUNDWATER	17.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE (continued) GARBAGE FILL					41					
SILTY CLAY, (Bay Mud) Note: Hollow flight augers were used until Bay Mud was encountered. A 2-inch O.D. (1-3/8 inch I.D.) split spoon sampler was pushed by hydraulic pressure to probe through the Bay Mud.		gray	soft	CH	42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60		pushed 350-400 psi			

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EXPLORATORY BORING LOG

260- ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11a		EB-9

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	21.90	LOGGED BY	CMC
DEPTH TO GROUNDWATER	17.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY, (Bay Mud) (continued)		gray	soft	CH	61		pushed 350-400 psi			
					62					
					63		pushed 1000 psi			
Bottom of Boring = 63 feet Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
369-11A	May 1977	EB-8

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	23.80	LOGGED BY	GC
DEPTH TO GROUNDWATER	- - -	BORING DIAMETER	8 inches	DATE DRILLED	3/11/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SANDY CLAY, with some gravel CLEAN FILL ↑		brown	stiff	CL	1					
GARBAGE; wood, metal, plastic, strong odor		multi colored			2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20					
(drilled easier at 20 feet)										

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	[illegible]	EB-9

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	23.80	LOGGED BY	GC
DEPTH TO GROUNDWATER	- - -	BORING DIAMETER	8 inches	DATE DRILLED	3/11/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE (continued) (augered through wood at 30 feet) GARBAGE FILL					21 22 23 24 25 26 27 28 29 30 31 32 33 34 35					
SILTY CLAY (Bay Mud) Note: Hollow flight augers were used until Bay Mud was encountered. A 2inch O.D. (1 3/8inch I.D.)split spoon sampler was pushed by hydraulic pressure to probe through the Bay Mud.		gray	soft	CH	35 36 37 38 39 40		pushed 350-400 psi			

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	May 1977	EB-9

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	23.80	LOGGED BY	GC
DEPTH TO GROUNDWATER	- - -	BORING DIAMETER	8 inches	DATE DRILLED	3/11/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
SILTY CLAY (Bay Mud)		gray	soft to firm	CH	41		pushed 350-400 psi			
					42					
					43					
					44					
					45					
					46					
					47					
					48					
					49					
					50		pushed 400 psi			
					51					
					52					
					53					
					54					
					55					
					56					
					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
160-11?	May 1977	EB-9

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	23.80	LOGGED BY	CC
DEPTH TO GROUNDWATER	- - -	BORING DIAMETER	8 inches	DATE DRILLED	3/11/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
SILTY CLAY (Bay Mud)		gray	soft to firm	CH	61		pushed 400 psi			
					62					
					63					
					64					
					65					
					66					
					67					
					68					
					69					
					70		pushed 450 psi			
					71					
SILTY SAND, with clay		gray green	medium dense	SM	72		pushed 700 psi			
					73					
					74					
					75					
Bottom of Boring = 75 feet					76					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					77					
					78					
					79					
					80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-9

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	21.90	LOGGED BY	GC
DEPTH TO GROUNDWATER	16.3 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/25/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY SAND, fine grained with some clay and scattered brick fragments. (FILL)		brown	medium dense	SM	1		17	12		
GARBAGE - paper, wood, glass, metal, rubber mixed with approximately 25% sandy clay soil, very strong odor.		gray brown			2					
					3					
					4		30+			
					5					
					6					
					7					
					8					
					9		22	37		
					10					
					11					
					12					
					13					
					14					
					15					
					16			▽		
					17			groundwater level measured 3/22/77		
(saturated below 18 feet)					18					
					19		11	(no sample recovery)		
					20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-10

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	21.90	LOGGED BY	GC
DEPTH TO GROUNDWATER	16.3 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/25/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE (continued)		gray			21–25		10	22		
GARBAGE FILL					25–28					
?		?								
SILTY CLAY - mixed with garbage. Scattered sea shells. (Bay Mud)		gray	very soft to soft	CH	29–34					
*Dry Density = 67% Liquid Limit = 58% Plasticity Index = 37%					34–35	*	2	67	0.5	
Less garbage becoming SILTY CLAY - scattered sea shells (Bay Mud)		gray	soft	CH	35–40					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-10

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 21.90	LOGGED BY GC
DEPTH TO GROUNDWATER 16.3 feet	BORING DIAMETER 8 inches	DATE DRILLED 2/25/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) (Bay Mud)		gray	soft	CH	41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60		pushed 300 psi		0.5	
*Dry Density = 59 pcf						*	pushed 300 psi	64	0.5	

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EXPLORATORY BORING LOG

260-ACRE COMMERICAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-10

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 21.90	LOGGED BY GC
DEPTH TO GROUNDWATER 16.3 feet	BORING DIAMETER 8 inches	DATE DRILLED 2/25/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) (Bay Mud)		gray	soft to firm	CH	61					
SILTY SAND - with some clay, fine to medium grained		light gray mottled brown	medium dense	SM	62 63 64		pushed 500 psi	19		
Bottom of Boring = 65.5 feet Note: The stratification lines represent the approximate boundary between soil types and the transisiton may be gradual.					65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-10

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	19.90	LOGGED BY	GC
DEPTH TO GROUNDWATER	9.2 feet	BORING DIAMETER	8 inches	DATE DRILLED	3/10/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
CLAYEY SAND, with gravel (FILL)		brown-gray	medium dense	SC	1		21			
GARBAGE - newspaper, metal, cloth, plastic, strong odor.		gray, tan, black			2					
					3					
					4					
					5		15	33		
					6					
					7					
					8					
					9			▽		groundwater level measured 3/22/77
					10					
					11					
					12					
(saturated)					13			▽		groundwater level at time of drilling (lost sample)
					14		12			
					15					
					16					
					17					
					18					
					19		14			
					20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
269-11A	May 1977	EB-11

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 19.90	LOGGED BY GC
DEPTH TO GROUNDWATER 9.2 feet	BORING DIAMETER 8 inches	DATE DRILLED 3/10/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE (continued) (augered through wood 20-21 feet) GARBAGE FILL		?			21–26					
SILTY CLAY mixed with some trash		gray	soft	CH	27					
					28–29					
					30		5	63		
					31–32					
decreasing trash becoming					33					
					34		pushed 350 psi			
SILTY CLAY - scattered sea shells and small pockets of peat (Bay Mud) *Dry Density = 58 pcf Liquid Limit = 54% Plasticity Index = 32%		gray	soft	CH	35			(no sample recovery)		
					36			75		
					37–38					
					39		pushed 350 psi			
					40	*		66	0.3	

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11A	May 1977	[illegible]

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 19.90	LOGGED BY GC
DEPTH TO GROUNDWATER 9.2 feet	BORING DIAMETER 8 inches	DATE DRILLED 3/10/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) scattered sea shells and small pockets of peat. (Bay Mud)		gray	soft	CH	41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60		pushed 350 psi		0.3	
							pushed 300 psi		0.15	(sample distu
							pushed 300 psi		0.3	

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11A	May 1977	EB-11

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 19.90	LOGGED BY GC
DEPTH TO GROUNDWATER 9.2 feet	BORING DIAMETER 8 inches	DATE DRILLED 3/10/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) scattered sea shells and small pockets of peat. (Bay Mud)		gray	soft	CH	61 62 63 64 65					
?		?			66					
SANDY CLAY, fine grained with silt		gray-brown	soft to firm	CL	67 68 69 70		pushed 300 psi		0.4	
SANDY CLAY, fine to medium grained Note; The stratification lines represent the approximate boundary between soil types the the transition may be gradual.		blue-green mottled red-brown	stiff to very stiff	CL	71 72 73 74 75 76 77 78		31	14	1.8	
Bottom of Boring = 78 feet					79 80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11A	[illegible]	EB-11

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.50	LOGGED BY	CMC
DEPTH TO GROUNDWATER	17.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SANDY CLAY, with silt and gravel		brown	firm to stiff	CL	1					
CLEAN FILL					2					
GARBAGE		multi colored			3					
					4					
					5					
					6					
					7					
					8					
					9					
					10					
					11					
					12					
					13					
					14					
					15					
					16					
					17			▽		
					18					
					19					
					20					

groundwater level at time of drilling

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
		EB-12

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.50	LOGGED BY	CNC
DEPTH TO GROUNDWATER	17.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
GARBAGE (continued)					21 22 23 24 25 26 27 28 29					
GARBAGE FILL					30					
SILTY CLAY (Bay Mud)		gray	soft	CH	31 32 33 34 35 36 37 38 39 40					

Note: Hollow flight augers were used down to 40 feet. A 2inch O.D. split spoon sample was pushed by hydraulic pressure to probe through the Bay Mud below 40 feet.

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-1??	[illegible] 1977	B3-12

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.50	LOGGED BY	CMC
DEPTH TO GROUNDWATER	17.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (Bay Mud) (continued)		gray	soft	CH	41		pushed 350 psi			
					42					
					43					
					44					
					45					
					46					
					47					
					48					
					49					
					50					
					51					
					52					
					53					
					54					
					55					
					56					
					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	[illegible] 1977	EB-12

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.50	LOGGED BY	CMC
DEPTH TO GROUNDWATER	17.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (Bay Mud) (continued)		gray	soft	CH	61		pushed 350 psi			
					62					
					63					
					64					
					65		pushed 400-450 psi			
					66					
					67					
					68					
					69					
					70					
					71					
					72					
					73					
					74					
					75		pushed 450-500 psi			
					76					
					77					
					78					
					79					
					80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-12

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.50	LOGGED BY	CMC
DEPTH TO GROUNDWATER	17.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
Refusal at 81.0 feet					81		pushed 800-1000 psi			
Bottom of Boring = 81.0 feet										
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					82					
					83					
					84					
					85					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
		EB-12

DRILL RIG: Hollow Flight Auger	SURFACE ELEVATION: 18.15	LOGGED BY: CMC	
DEPTH TO GROUNDWATER: 15.0 feet ATD	BORING DIAMETER: 8 inches	DATE DRILLED: 3/21/77	

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
CLAYEY SAND, with silt and some rock fragments		brown	medium dense	SC						
GARBAGE		multi colored								
								▽	groundwater level at time of drilling	

EXPLORATORY BORING LOG

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260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	May 1977	EB-13

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	18.15	LOGGED BY	CNC
DEPTH TO GROUNDWATER	15.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE (continued)					21 22 23 24 25 26 27 28 29 30 31					
GARBAGE FILL										
SILTY CLAY (Bay Mud)		gray	soft	CH	32 33 34 35 36 37 38 39 40		pushed 350 psi			
Note: Hollow flight augers were used until Bay Mud was encountered. A 2inch D.D. (13/8 inch I.D.) split spoon sampler was pushed by hydraulic pressure to probe through the Bay Mud.										

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
	1977	EB-13

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	18.15	LOGGED BY	CMC
DEPTH TO GROUNDWATER	15.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (Bay Mud) (continued)		gray	soft	CH	41		pushed 350 psi			
					42					
					43					
					44					
					45					
					46					
					47					
					48					
					49					
					50					
					51					
					52					
					53					
					54					
					55					
					56					
					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	May 197[illegible]	EB-13

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	18.15	LOGGED BY	CNC
DEPTH TO GROUNDWATER	15.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (Bay Mud) (continued)		gray	soft	CH	61		pushed 350 psi			
					62					
					63					
					64					
					65					
					66					
					67					
					68					
					69					
					70					
					71		pushed 400 psi			
					72					
					73					
					74					
					75					
					76					
					77					
					78					
					79					
					80		pushed 500 psi			

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
149-11A	May 1977	EB-13

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	18.15	LOGGED BY	CNC
DEPTH TO GROUNDWATER	15.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/21/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (Bay Mud) (continued)		gray	firm	CH	81		pushed 500 psi			
					82					
					83					
					84					
					85					
					86					
					87					
					88					
					89		pushed 600 psi			
Refusal at 91 feet					90					
					91		pushed 1000 psi			
Bottom of Boring = 91 feet					92					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					93					
					94					
					95					
					96					
					97					
					98					
					99					
					100					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-13

DRILL RIG Hollow Flight Auger	SURFACE ELEVATION 17.00	LOGGED BY GC
DEPTH TO GROUNDWATER 12.5 feet	BORING DIAMETER 8 inches	DATE DRILLED 2/22/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
CLAYEY SAND with gravel		red-brown	medium dense	SC						
WEATHERED SERPENTINE fragments CLEAN FILL		green	medium dense	GC	1		21			
GARBAGE - cloth, glass, wood, paper - strong odor		multi-colored			2					
					3					
					4					
*Dry Density = 48 pcf					5	*	45	24		
					6					
					7					
					8					
					9					
(mixed with weathered, decomposed serpentine 9 - 16 feet)		gray-green			10	* *	10	18		
**Dry Density = 112 pcf					11					
					12					groundwater level meas 3/22/77
(saturated)					13					groundwater level at t of drillin
					14					
***Dry Density = 101 pcf					15	* * *	11	21		
					16					
					17					
					18					
					19					
					20		10	(lost sample)		

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-14

DRILLING Hollow Flight Auger	SURFACE ELEVATION 17.00	LOGGED BY GC
DEPTH TO GROUNDWATER 12.5 feet	BORING DIAMETER 8 inches	DATE DRILLED 2/22/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE (continued)		gray to black			21 22 23 24 25		68			
GARBAGE FILL					26					
SILTY CLAY mixed with trash		gray	soft	CH	27 28 29		pushed 350 psi	(no sample recovery)		
decreasing trash					30 31 32 33					
*Dry Density = 52 pcf Liquid Limit = 62% Plasticity Index = 42%					34 35 36	*	pushed 350 psi	78	0.32	
SILTY CLAY, scattered sea shells and small pockets of peat. (Bay Mud)		gray	soft	CH	37 38 39 40		pushed 400 psi (sampled to 41 feet)		0.34	

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-14

DRILL RIG	Hollow Flight Auger	SURFACE ELEVA...	17.00	LOGGED BY	GC
DEPTH TO GROUNDWATER	12.5 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/22/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) scattered sea shells and small pockets of peat		gray	soft	CH	41		(continued from 39 feet)			
					42					
					43					
					44		pushed 300 psi			
					45				0.4	
					46					
					47					
					48					
					49		pushed 300-325 psi			
					50				0.38	
					51					
					52					
					53					
					54		pushed 300 psi		(no smaple recovery	
					55					
					56					
					57					
					58					
					59		pushed 300 psi		0.4	
					60				(sample to 61 fee	

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-14

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.00	LOGGED BY	GC
DEPTH TO GROUNDWATER	12.5 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/22/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (continued) scattered sea shells and small pockets of peat. (Bay Mud)		gray	soft	CH	61		(continued from 59 feet)			
					62					
					63					
					64		pushed 300 psi		0.4	
					65					
					66					
					67					
					68					
					69					
					70					
					71					
					72					
					73					
					74		(no sample recovery			
					75					
					76					
					77					
					78					
					79					
					80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-14

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.00	LOGGED BY	GC
DEPTH TO GROUNDWATER	12.5 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/22/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
SILTY CLAY (continued) (Bay Mud)		gray	soft to firm	CH	81					
SANDY CLAY, fine grained (Decomposed Serpentine)		gray-green	stiff to very stiff	CL	82 83 84 85 86		pushed 500-850 psi		1.8	
Bottom of Boring = 86 feet Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual					87 88 89 90 91 92 93 94 95 96 97 98 99 100					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
161-11A	May 1977	EB-14

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	15.50		GC
DEPTH TO GROUNDWATER	10.0 feet	BORING DIAMETER	8 inches	DATE DRILLED	3/2/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
CLAYEY SAND - fine to coarse with gravel (FILL)		red brown	medium dense	SC	1		10	14		
GARBAGE - paper, glass, metal, rubber, wood, strong odor (Newspaper dated 1966 at 5 feet)		multi colored			2 3 4 5 6 7 8 9					
					10		6	56 ▽ groundwater measured 3/22/77		
		gray to black			11 12 13 14 15 16 17 18 19		5	▽ groundwater level at time of drilling		
					20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
160-11A	May 1977	EB-15

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	15.50	LOGGED BY	GC
DEPTH TO GROUNDWATER	10.0 feet	BORING DIAMETER	8 inches	DATE DRILLED	3/2/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE (continued)		gray-black			21					
SILTY CLAY, mixed with trash		gray	very soft	CH	22					
					23					
					24		1	(no sample recovery)		
					25					
					26					
					27					
					28					
Less trash					29		pushed 300 psi	65		
					30					
					31					
					32					
					33					
					34					
SILTY CLAY, with scattered sea shells and small pockets of peat (Bay Mud)		gray	soft	CH	35					
					36					
					37					
					38					
					39		pushed 300 psi			
					40					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11A	May 1977	B5-15

DRILL RIG: Hollow Flight Auger	SURFACE ELEVATION: 15.50	LOG BY: GC
DEPTH TO GROUNDWATER: 10.0 feet	BORING DIAMETER: 8 inches	DATE DRILLED: 3/2/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) scattered sea shells and small pockets of peat (Bay Mud)		gray	soft	CH	41 42 43 44 45 46 47 48					
*Dry density = 56 pcf Liquid limit = 49% Plasticity Index = 29%					49 50	*	pushed 350 psi	69	0.2	
					51 52 53 54 55 56 57 58					
SILTY SAND, with clay		gray to brown	medium dense	SM	59 60		16	19		

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-15

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	15.50		
DEPTH TO GROUNDWATER	10.0 feet	BORING DIAMETER	8 inches	DATE DRILLED	3/2/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY SAND, with clay		gray-green	medium dense	SM	61					
becoming					62					
SANDY CLAY, with silt		mottled brown and green	very stiff	CL	63				2.0+	
					64		28			
Bottom of Boring = 64.5 feet					65					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual					66					
					67					
					68					
					69					
					70					
					71					
					72					
					73					
					74					
					75					
					76					
					77					
					78					
					79					
					80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]-11A	May 197[illegible]	EB-15

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.05	LOGGED BY	CMC
DEPTH TO GROUNDWATER	14 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/22/7

DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE
CLAYEY SAND, with silt CLEAN FILL		brown	medium dense	SC	1					
GARBAGE		multi colored			2					
					3					
					4					
					5					
					6					
					7					
					8					
					9					
					10					
					11					
					12					
					13					
					14			▽	groundwat level at time of drilling	
					15					
					16					
concentration of rock from 16 feet to 22.5 feet					17					
					18					
					19					
					20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
15-11A	[illegible]	

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.05	LOGGED BY	CMC
DEPTH TO GROUNDWATER	14 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/22/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE (continued)					21 22 23 24 25 26 27 28 29 30 31 32 33					
GARBAGE FILL										
SILTY CLAY (Bay Mud)		gray	soft	CH	34 35 36 37 38 39 40		pushed 350 psi			

Note: Hollow flight augers were used until Bay Mud was encountered. A 2inch O.D. (1 3/8 inch I.D.) split spoon sampler was pushed by hydraulic pressure to probe through the Bay Mud.

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING
169-11A	[illegible]	[illegible]

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.05	LOGGED BY	CNC
DEPTH TO GROUNDWATER	14 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/22/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (Bay Mud)		gray	soft	CH	41		pushed 350 psi			
					42					
					43					
					44					
					45					
					46					
					47					
					48					
					49					
					50					
CLAYEY SAND		green	dense to very dense		51		pushed 600-1000 psi			
					52		50/6"			
Bottom of Boring = 52 feet					53					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					54					
					55					
					56					
					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
166-113	May 1977	EB16

DRILLING	Hollow Flight Auger	SURFACE ELEVATION	17.65	LOGGED BY	GC
DEPTH TO GROUNDWATER	- - -	BORING DIAMETER	8 inches	DATE DRILLED	3/2/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
CLAYEY SAND, with some gravel CLEAN FILL		brown	medium dense	SC	1					
GARBAGE		multi colored			2					
					3					
					4					
					5					
					6					
					7					
					8					
					9					
concrete from 10'-11'					10					
					11					
					12					
					13					
					14					
					15					
					16					
SILTY CLAY (Bay Mud) mixed with garbage					17					
					18					
					19					
					20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	[illegible] 1977	ER-17

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.85	LOGGED BY	GC
DEPTH TO GROUNDWATER	- - -	BORING DIAMETER	8 inches	DATE DRILLED	3/2/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (Bay Mud) mixed with garbage. GARBAGE FILL					21 22 23 24 25					
SILTY CLAY (Bay Mud)		gray	soft	CH	26 27 28 29 30 31 32 33 34 35 36 37 38 39 40		pushed 300 psi			
Note: Hollow flight augers were used down to 33 feet. A 2 inch O.D. (1 3/8inch I.D.) split spoon sampler was pushed by hydraulic pressure to probe through the Bay Mud beyond 33 feet.										

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	May 1977	EB-17

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.85	LOGGED BY	GC
DEPTH TO GROUNDWATER	- - -	BORING DIAMETER	8 inches	DATE DRILLED	3/2/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY. (Bay Mud) (continued)		gray	soft	CH	41					
					42					
					43					
					44					
					45					
					46					
					47					
					48					
					49					
					50		pushed 350 psi			
					51					
					52					
					53					
					54					
					55					
					56					
					57					
					58					
					59					
					60		pushed 375 psi			

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	May 1977	EB-17

DRILLING	Hollow Flight Auger	SURFACE ELEVATION	17.85	LOGGED BY	GC
DEPTH TO GROUNDWATER	- - -	BORING DIAMETER	8 inches	DATE DRILLED	3/2/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (Bay Mud) (continued)					61					
					62					
(stiffer at 63 feet then softer below)					63		pushed 600 psi			
					64					
					65					
					66					
					67					
					68					
					69					
					70		pushed 400 psi			
					71					
					72					
					73					
					74					
					75		pushed 450 psi			
					76					
					77					
					78					
					79					
					80		pushed 500 psi			

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EXPLORATORY BORING LOG

260- ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
[illegible]	MAR 1977	EB-17

DRILLING Hollow Flight Auger	SURFACE ELEVATION 17.85	LOGGED BY GC
DEPTH TO GROUNDWATER - - -	BORING DIAMETER 8 inches	DATE DRILLED 3/2/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (Bay Mud) (continued)		gray	soft to firm	CH	81		pushed 500 psi			
					82					
					83					
					84					
Refusal at 85 feet					85		pushed 1000+ psi			
Bottom of Boring = 85 feet					86					
Note: The stratification lines represent the approx-, imate boundary between soil types and the transition may be gradual.					87					
					88					
					89					
					90					
					91					
					92					
					93					
					94					
					95					
					96					
					97					
					98					
					99					
					100					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
133-11	May 1977	EB-17

DRILLING	Hollow Flight Auger	SURFACE ELEVATION	17.95	LOGGED BY	GC
DEPTH TO GROUNDWATER	13.1 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/25/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SERPENTINE, highly weatered and decomposed mixed with Red Rock CLEAN FILL		green and red	dense	SC	1		36			
GARBAGE, paper, glass, metal, strong odor		multi colored			2					
					3					
					4		19	(Partial sample recovery)		
					5			40		
					6					
					7					
					8					
					9		50/3"	(no recovery)		
					10					
					11					
					12					
					13			▽ groundwater level at time of drilling (groundwater level measured at 13.1 feet 3/22/77)		
					14					
					15					
					16					
					17					
					18					
					19		39			
					20			105		

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-18

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.95	LOGGED BY	CC
DEPTH TO GROUNDWATER	13.1 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/25/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE (continued)		gray to black			21					
					22					
					23					
					24					
GARBAGE FILL					25					
SILTY CLAY, mixed with some refuse (Bay Mud)		gray	soft	CH	26					
					27					
					28					
					29		5	74		
?		?			30					
SILTY CLAY, with scattered sea shells and small pockets of peat. (Bay Mud)		gray	soft	CH	31					
					32					
					33					
					34					
					35					
					36					
					37					
					38					
Dry density = 62 pcf Liquid limit = 50% Plasticity index = 34%					39	*	pushed 300 psi	62	0.35	.55
					40					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-18

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.95	LOGGED BY	GC
DEPTH TO GROUNDWATER	13.1 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/25/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (continued) scattered sea shells and small pockets of peat.		gray	soft	CH	41					
					42					
					43					
					44					
					45					
					46					
					47					
					48					
					49		pushed 300 psi	(no sample recovery)		
					50					
					51					
					52					
					53					
					54					
					55					
					56					
		soft to firm			57					
					58					
					59		pushed 300 psi		0.55	
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-18

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.95	LOGGED BY	GC
DEPTH TO GROUNDWATER	13.1 feet	BORING DIAMETER	8 inches	DATE DRILLED	2/25/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (continued) scattered sea shells and small pockets of peat. (Bay Mud)		gray	soft to firm	CH	61					
					62					
					63					
					64					
					65					
					66					
					67					
					68					
*Dry density = 56 pcf Liquity limit = 58% Plasiticity index = 38%					69		pushed 350 psi	74	0.46	
					70	*				
					71					
					72					
CLAYEY SAND - SANDY CLAY (decomposed Serpentine)		green	stiff	SC CL	73					
					74					
					75					
					76					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual					77					
					78					
					79			17		
Bottom of Boring = 80 feet					80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-13

DEPTH TO GROUNDWATER 16.0 feet ATD	BORING DIAMETER 8 inches	DATE DRILLED 3/22/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY SAND, with clay and gravel CLEAN FILL		brown	medium dense	SM SC	1					
GARBAGE		multi colored			2					
					3					
					4					
					5					
					6					
					7					
					8					
					9					
					10					
					11					
					12					
					13					
					14					
					15					
					16			▽	groundwater at time of drilling	
					17					
					18					
					19					
					20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-19

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.25	LOGGED BY	CMC
DEPTH TO GROUNDWATER	16.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/22/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
GARBAGE (continued)					21 22 23 24					
GARBAGE FILL					25					
SILTY CLAY (Bay Mud)					26 27 28 29 30 31 32 33 34 35 36 37 38 39 40		pushed 350-400 psi			

Note: Hollow flight augers were used until Bay Mud was encountered. A 2inch O.D. (1 3/8inch I.D.) split spoon sampler was pushed by hydraulic pressure to probe through the Bay Mud.

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-19

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.25	LOGGED BY	CMC
DEPTH TO GROUNDWATER	16.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/22/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (Bay Mud) (continued)		gray	soft	CH	41		pushed 350-400 psi			
					42					
					43					
					44					
					45					
					46					
					47					
					48					
					49					
					50					
					51					
					52					
					53					
					54					
					55		pushed 400-500 psi			
					56					
					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
165-11	May 1977	EB-19

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.25	LOGGED BY	CNC
DEPTH TO GROUNDWATER	16.0 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/22/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (Bay Mud)		gray	soft to firm	CH	61–68		pushed 400–500 psi			
CLAYEY SAND		blue green	medium dense to dense	SC	68–70		pushed 1000+ psi			
Bottom of Boring = 70 feet Note: The stratification lines represent the approximate boundary between soil types and the transition may by gradual.					70–80					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-19

DRILLING	BOTTOM FLIGHT AUGER	[illegible]	GC
DEPTH TO GROUNDWATER	9.8 feet	BORING DIAMETER	8 inches	DATE DRILLED	3/2/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
CLAYEY SAND - fine to coarse with gravel		brown	loose	SC	1		6	12		
GARBAGE, paper wood, cloth, metal, strong odor		gray-brown			2					
					3					
					4					
					5		12	209		
					6					
					7					
					8					
					9					
					10			▽	groundwater	
					11			▽	measured 3/ groundwater level at time of drilling	
GARBAGE, mixed with silt 11 to 15 feet, very strong odor, saturated		black			12					
					13					
*Dry density = 116 pcf					14					
					15	*	18	16		
Rock fragments 3/4" - 1" mixed with garbage 15 to 17 feet		dark gray			16					
					17					
					18					
					19					
					20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-20

DRILL RIG Hollow Flight Auger

DEPTH TO GROUNDWATER 9.8 feet | BORING DIAMETER 8 inches | DATE DRILLED 3/2/77

DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE (continued)		gray			21					
					22					
SILTY CLAY (Bay Mud) mixed with trash		gray	soft	CH	23					
					24					
					25		4	(no sample recovery)		
					26					
					27					
					28					
less trash					29					
becoming					30		4	(no sample recovery)		
					31					
SILTY CLAY, with scattered sea shells and small pockets of peat (Bay Mud)					32					
					33					
		gray	soft	CH	34		pushed 250 psi			
*Dry density = 59pcf Liquid limit = 52% Plasticity index = 33%					35	*		65	0.28	.37
					36					
					37					
					38					
					39					
					40					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-20

DEPTH TO GROUNDWATER	9.8 feet	BORING DIAMETER	8 inches	DATE DRILLED	3/2/77

DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (Bay Mud) (continued)		gray	soft to firm	CH	41					
					42					
					43					
					44		pushed 250 psi			
(some very fine sand interbedded)					45					
					46				0.6	
					47					
					48					
					49					
					50					
					51					
(drilled stiffer at 52 feet)					52					
CLAYEY SAND, fine to medium grained					53					
		green / brown	medium dense to dense	SC	54					
					55		28	18		
Bottom of Boring = 55.5 feet					56					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-20

DRILLING Hollow Flight Auger		ELEVATION 17.90		CAS.
DEPTH TO GROUNDWATER 17.5 feet ATD	BORING DIAMETER 8 inches		DATE DRILLED 3/22/77	

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
CLAYEY SAND, with silt and gravel		brown	medium dense	SC	1					
CLEAN FILL					2					
GARBAGE		multi colored			3					
					4					
					5					
					6					
					7					
					8					
					9					
					10					
					11					
					12					
					13					
					14					
					15					
					16					
					17			▽ groundwater level at time of drilling		
					18					
					19					
					20					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-21

DRILL RIG	Hollow Flight Auger	SURFACE ELEVATION	17.90	LOGGED BY	CNC
DEPTH TO GROUNDWATER	17.5 feet ATD	BORING DIAMETER	8 inches	DATE DRILLED	3/22/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE (continued) concentration of rock from 21 feet to 23 feet					21 22 23 24 25 26 27 28 29 30 31 32 33					
GARBAGE FILL										
SILTY CLAY, (Bay Mud) Note: Hollow flight augers were used until Bay Mud was encountered. A 2-inch O.D. (1 3/8 inch I.D.) split spoon sampler was pushed by hydraulic pressure to probe through the Bay Mud.		gray	soft	CH	34 35 36 37 38 39 40		pushed 350 psi			

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-21

DRILL RIG Hollow Flight Auger | SURFACE ELEVATION 17.90 | LOGGED BY: CMC

DEPTH TO GROUNDWATER 17.5 feet ATD | BORING DIAMETER 8 inches | DATE DRILLED 3/22/77

DESCRIPTION AND REMARKS	SYM-BOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
SILTY CLAY (Bay Mud) (continued)		gray	soft	CH	41		pushed 350 psi			
					42					
					43					
					44					
					45					
					46					
					47					
					48					
					49					
SILTY SAND, fine to medium		green	medium dense	SM	50		pushed 1000 psi			
					51					
					52					
Bottom of Boring = 52 feet					53					
Note: The stratification lines represent the approximate boundary between soil types and the transition may be gradual.					54					
					55					
					56					
					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-21

DRILL RIG	Rotary Wash	SURFACE ELEVATION			
DEPTH TO GROUNDWATER	13.0 feet	BORING DIAMETER	8 inches	DATE DRILLED	4/21/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
CLAYEY SAND, with gravel CLEAN FILL		red brown	medium dense	SC	1					
GARBAGE, paper, metal, plastic, wood, strong odor		multi colored			2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20			▽	groundwater level at time of drilling Same level measured 5/5/77	
Encountered wood at 20 – 21 feet										

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	May 1977	EB-22

DRILL RIG	Rotary Wash	SURFACE ELEVATION	17.75	LOGGED BY	GC
DEPTH TO GROUNDWATER	13.0 feet	BORING DIAMETER	8 inches	DATE DRILLED	4/21/77

DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE	DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
GARBAGE (continued) Note: Hole cased to 30 feet GARBAGE FILL		gray to black			21–27					
SILTY CLAY, (Bay Mud) mixed with garbage		gray	soft	CH	28					
less trash becoming					29–31					
SILTY CLAY, with scattered sea shells and small pockets of peat (Bay Mud)		gray	soft	CH	32–34	*		58	0.35	.52
					35–37					
*Dry density = 67 pcf					38–40					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	[illegible]	EB-22

Rotary Wash

DEPTH TO GROUNDWATER 13.0 feet	BORING DIAMETER 8 inches	DATE DRILLED 4/21/77

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) (Bay Mud)		gray	soft	CH	41					
					42	*		63	0.4	.79
*Dry density = 59 pcf					43					
					44					
					45					
					46					
					47					
					48					
					49					
					50		pushed 200 psi			
					51				0.42	
					52					
					53					
					54					
					55					
*Dry density = 61 pcf					56	*		65	0.42	.72
					57					
					58					
					59					
					60					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
169-11A	[illegible] 1977	EB-22

DRILLING METHOD Rotary Wash		DATE DRILLED 4/21/77
DEPTH TO GROUNDWATER 13.0	BORING DIAMETER 8 inches	

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY (continued) (Bay Mud)		gray	soft	CH	61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79		pushed 250 psi pushed 300 psi pushed 300 psi		0.35 0.4 0.4	0.80
SILTY CLAY, highly organic very peaty		black	soft	OH	80			44	0.45	

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisabane, California

PROJECT NO.	DATE	BORING NO. EB-22

[illegible] Rotary Wash	SURFACE ELEVATION 17.75	LOGGED BY CC	
DEPTH TO GROUNDWATER 13.0 feet	BORING DIAMETER 8 inches	DATE DRILLED 4/21/77	

DESCRIPTION AND CLASSIFICATION					DEPTH (FEET)	SAMPLER	PENETRATION RESISTANCE (BLOWS/FT.)	WATER CONTENT (%)	SHEAR STRENGTH BY TORVANE (KSF)	UNCONFINED COMPRESSIVE STRENGTH (KSF)
DESCRIPTION AND REMARKS	SYMBOL	COLOR	CONSIST.	SOIL TYPE						
SILTY CLAY, highly organic, very peaty		black	soft	OH	81					
					82					
					83					
DECOMPOSED SERPENTINE		green			84					
					85					
Bottom of Boring = 83.0 feet					86					
Note : The stratification lines represent the approximate boundary between soil types and the transition may be gradual					87					
					88					
					89					
					90					
					91					
					92					
					93					
					94					
					95					
					96					
					97					
					98					
					99					
					100					

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EXPLORATORY BORING LOG

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	BORING NO.
		EB-22

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KEY SHEET
CLASSIFICATIONS AND SYMBOLS

Preliminary Geotechnical Investigation
Location: Brisbane, California — **Brisbane Landfill** — **Number: WL0657, Task 2**

EMPIRICAL CORRELATIONS WITH STANDARD PENETRATION RESISTANCE N VALUES *

	N Value * (Blows/ft)	Consistency	Unconfined Compressive Strength (tons/sq ft)
FINE GRAINED SOILS	0 - 2	Very Soft	<0.25
	3 - 4	Soft	0.25 - 0.50
	5 - 8	Medium Stiff	0.50 - 1.00
	9 - 15	Stiff	1.00 - 2.00
	16 - 30	Very Stiff	2.00 - 4.00
	>30	Hard	>4.00

	N Value * (Blows/ft)	Relative Density
COARSE GRAINED SOILS	0 - 4	Very Loose
	5 - 10	Loose
	11 - 30	Medium Dense
	31 - 50	Dense
	>50	Very Dense

* ASTM D 1586; number of blows of 140-pound hammer falling 30 inches to drive a 2-inch-O.D., 1.4-inch-I.D. sampler one foot.

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

MAJOR DIVISIONS			SYMBOLS	DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL COARSER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO.4 SIEVE	CLEAN GRAVELS — LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES — APPRECIABLE AMOUNT OF FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING NO.4 SIEVE	CLEAN SANDS — LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES — APPRECIABLE AMOUNT OF FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL FINER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT

NOTE: DUAL SYMBOLS USED FOR BORDERLINE CLASSIFICATIONS

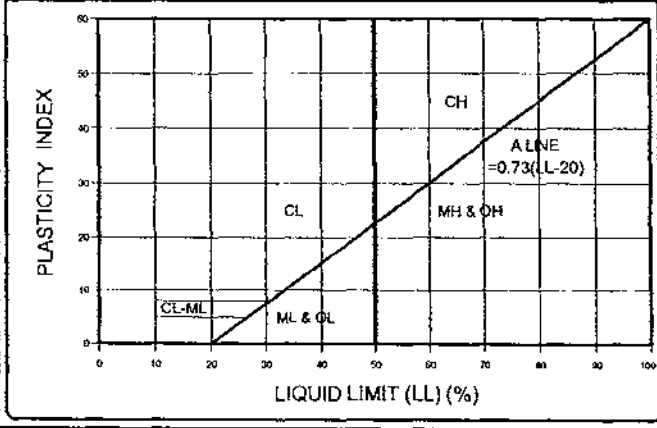
PARTICLE SIZE IDENTIFICATION

BOULDERS	>300 mm
COBBLES	75 - 300 mm
GRAVEL: COARSE	19.0 - 75 mm
GRAVEL: FINE	4.75 - 19 mm
SAND: COARSE	2.00 - 4.75 mm
SAND: MEDIUM	0.425 - 2.00 mm
SAND: FINE	0.075 - 0.425 mm
SILT	0.075 - 0.002 mm
CLAY	<0.002 mm

WELL GRADED - HAVING WIDE RANGE OF GRAIN SIZES AND APPRECIABLE AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES

POORLY GRADED - PREDOMINANTLY ONE GRAIN SIZE, OR HAVING A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING

PLASTICITY CHART



SAMPLE SYMBOLS

- SPT split spoon (2-inch OD)
- Shelby tube (3-inch OD)
- California (3-inch OD) with brass liners
- California Modified (2.5-inch OD), lined
- Bulk sample
- Grab sample

WELL SYMBOLS

- Concrete
- Cement-bentonite or cement grout
- Bentonite seal
- Filter sand
- Screen in filter sand
- Slough / soil backfill

WATER LEVEL SYMBOLS

- Water level at time of drilling
- Static water level measured at specified time after drilling/sampling or well completion

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Soil descriptions and stratum lines are interpretive, and actual changes may be gradual. Field descriptions may have been modified to reflect results of laboratory tests.
2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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LOG OF BORING GT04-1

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Start Date	02/04/2004	Finish Date	02/05/2004	Total Depth Drilled (ft bgs)	89.0
Drilling Method	Hollow-Stem Auger / Mud Rotary	Drilling Contractor	PC Exploration	Ground Surface Elevation (ft MSL)	29.26
Drill Rig	CME 850	Hammer Type	Automatic	Borehole Backfill	Portland cement grout
Sampling Method(s)	SPT, Modified California, California (3-inch-OD), Shelby	Hammer Weight/Drop	140 lbs / 30 inches	Coordinate Location	N 2,083,428.23 E 6,013,010.38
Comments	Refer to site plan for boring location.			Logger B. Baturay	Reviewer F. Settepani

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	0						FILL: Clayey SAND (SC), dark gray; ~20-30% fines, well-graded sand				Start drilling on 2/4/2004 using hollow-stem auger. It has been raining for two days. Rain stops just before drilling begins.
-25	5		1	4-4-12	100		Becomes gray with brown lenses, moist, medium dense; fine to coarse sand (3:1:1), with few gravel particles				Drilling hard 5-10 ft. Water seeping into the hole and filling it up.
-20	10		2	4-3-2	40		FILL: GRAVEL with clay and sand (GW-GC), greenish blue and brown mixed, moist, loose; ~5-10% fines, fine to coarse gravel (max. particle size 1 inch), few wood pieces				Drilling easy.
15	15		3	12-32-39	70		FILL: SAND with clay (SW-SC), brown, gray, and black lenses, slightly moist, very dense; ~5-10% plastic fines, scattered gravel lenses; some odor in sample				Check for LFG; no reading.
-10	20		4	8-3-4	0		FILL: Silty SAND (SM), gray, loose; ~10-20% fines				No recovery on first attempt. Push the sampler again and collect sample. Drilling easy.
5	25		5	9-11-11	100		GARBAGE: paper plastic, glass, thin metal pieces				Using sand catchers. Wood in bit. Garbage was expected at 26 ft based on old data.
-0	30										

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LOG OF BORING GT04-1

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	30						GARBAGE (continued)				
-5	35										
-10	40		6	13-25-24	40		GARBAGE: wood and gravel, black, wet				Using sand catchers. Rock in sampler shoe.
-15	45										Drilling easy.
-20	50										
-25	55		7	6-7-7	30		BAY MUD: Elastic SILT (MH), dark gray, wet, medium stiff to stiff; high plasticity, <5% sand				Stop for 2/4/2004. Resume on 2/5/2004.
-30	60		8		50			55.2		65/31	Wait 10 minutes before pulling out Shelby tube. Pocket Penetrometer (PP) = 0.75 tsf
								55.4	66.6		Consolidation Test
								55.4	64.6		Triaxial UU Test - Saturated: q_u=11.4 psi S_u=821 psf
-35	65						Silty SAND (SM) [see next page]				

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LOG OF BORING GT04-1

Sheet 3 of 3

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	65						Silty SAND (SM), gray, wet; ~40-50% fines, fine sand (1:0:0)				Push Shelby 2.25 ft to refusal.
			9		100		Decrease in fines content to ~20-30%				Switch to mud rotary.
-40	70										
			10	4-9-10	100		Clayey SAND (SC), gray, wet, loose; ~30-40% fines, fine sand (1:0:0)				Mud rotary is tight. Sampler slips out of liners.
-45	75						Becomes brown				PP = 2.5 tsf
			11		100		Sandy CLAY (CL), gray, wet; medium plasticity, very stiff, ~30-40% fine sand	27.5		47/24	1000 psi pressure for Shelby push. PP = 2.25 tsf
-50	80							28.8	93.6		Triaxial UU Test - Saturated: q_u=16.4 psi, S_u=1180 psf
			12		100		Silty SAND (SM), light brown and gray mixed, wet; ~20-30% fines, fine sand (1:0:0)				Drilling hard at 81 ft. Push Shelby only 10 inches with 1500 psi pressure.
-55	85										Drilling harder.
			13	29-48-50/5"	30		SAND (SP), brown, wet, very dense; fine to coarse sand (3:1:1), fine gravel (max. particle size 1/3 inch)				
-60	90						**Boring drilled to 87.5 feet; sampled to 89.0 feet.**				End drilling on 2/5/2004.
-65	95										
-70	100										

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LOG OF BORING GT04-2

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Start Date	02/10/2004	Finish Date	02/11/2004	Total Depth Drilled (ft bgs)	94.5
Drilling Method	Hollow-Stem Auger / Mud Rotary	Drilling Contractor	PC Exploration	Ground Surface Elevation (ft MSL)	42.66
Drill Rig	CME 850	Hammer Type	Automatic	Borehole Backfill	Portland cement grout
Sampling Method(s)	SPT, Modified California, California (3-inch-OD), Shelby	Hammer Weight/Drop	140 lbs / 30 inches	Coordinate Location	N 2,079,803.52 E 6,012,782.43
Comments	Refer to site plan for boring location.			Logger B. Baturay	Reviewer F. Settepani

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	0						FILL: Silty SAND (SM), dark brown, moist; ~20-30% fines, fine to medium sand				Start drilling on 2/10/2004 using hollow-stem auger.
40							Becomes wet				
	5		1	4-5-7	100		FILL: CLAY with sand (CL), grayish brown, slightly moist, stiff; low plasticity, ~15% fine sand				Drilling easy. No big concrete blocks are encountered.
35							FILL: brick and gravel mixed with wood				
	10		2	2-4-5	100		FILL: Clayey SAND (SC), brown, slightly moist, loose; ~30% fines, well-graded sand				Bag the clayey sand.
							FILL: brick and gravel mixed with gray sand				
30							FILL: Clayey SAND (SC), brown, slightly moist, loose; ~30-40% fines, fine to medium sand				
	15		3	9-12-15	75		FILL: Clayey GRAVEL with sand (GC), brown, gray, and black mixed, slightly moist with lenses of water, medium dense; ~20% fines, ~30% fine sand, ~50% fine to coarse gravel (max. particle size 1-1/2 inches)				One tube sample kept; rest is bagged.
25											
	20		4	17-36-25	80		Becomes dense				
							FILL: SAND with silt (SP-SM), gray, moist, dense; ~10% fines, fine sand				
20											Drilling hard at 23 ft.
	25		5	12-14-19	100		FILL: Clayey SAND (SC), light brown, slightly moist, dense; ~40% fines, fine to medium sand				Retain sample in three separate bags.
							FILL: Clayey SAND with gravel (SC), brown, slightly moist, dense; ~15% fines, well-graded sand, ~20% gravel				
15											
	30										

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LOG OF BORING GT04-2

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
30	0		6	20-17-31	100		FILL: Clayey SAND (SC), gray, dry, dense; ~20% fines, well-graded sand, some concrete pieces				Hard drilling at 33-34 ft.
-10	40										
35	5		7	19-50/3"	60		FILL: SAND with silt and gravel (SP-SM), gray, moist, very dense; <10% fines, fine to coarse sand (3:1:1), ~30-40% gravel (max. particle size 1-1/4 inches)				
-5	45										
40	10		8	16-20-10	0		GARBAGE (in cuttings)				No sample recovery. Water table is within the garbage layer.
-0	50										
45	15						GARBAGE: black slough in cuttings				
-5	55										
50	20		9	3-10-35/3"	50		GARBAGE: paper, wood fog				
-10	60										
55	25										
-15	65		10	7-5-3	100		GARBAGE: wood BAY MUD: Elastic SILT (MH), gray, wet, soft to medium stiff; high plasticity, ~5% fine sand				Wood on the bit. Bag the bay mud sample.
60	30										
-20	65										

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LOG OF BORING GT04-2

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	65		11		0		BAY MUD: Elastic SILT (MH), gray, wet, soft to medium stiff; high plasticity, ~5% fine sand (continued)				No recovery. Pieces of wood on outside of Shelby tube.
-25											
			12		0						No recovery.
	70										Drilling very easy; no resistance by soil.
			13		100		BAY MUD: Sandy SILT (MH), gray, wet; high plasticity, high dry strength, ~30-40% fine sand, few organics; sand content decreases with depth				Use piston sampler to push Shelby tube.
-30											
											Drilling harder. Color change at 74 ft.
	75		14		100		BAY MUD: Sandy SILT / Fat CLAY (MH/CH), light gray, wet, hard; high plasticity, ~30% fine sand, some wood pieces				Push Shelby 1.5 ft; too hard. Pocket Penetrometer (PP) = 4.25 tsf
											Switch to mud rotary.
-35			15		0						700 psi pressure for Shelby push. No recovery.
	80										
							Silty SAND (SM), light gray, wet; ~30-40% fines, fine sand				
-40			16		100			27.6		30/8	1000 psi pressure for Shelby push.
							Lean CLAY (CL), light brown, wet; low plasticity, high dry strength	27.5 27.2	94.6 96.5		Consolidation Test Triaxial UU Test - Saturated: q_u=15.3 psi S_u=1100 psf
	85										
-45			17		100		Elastic SILT / Fat CLAY (MH/CH), light brown and light gray mixed, wet; high plasticity, high dry strength (more silty than above)				1200 psi pressure for Shelby push.
	90										
							Fat CLAY (CH), light brown, wet, stiff; high plasticity				
-50			18		100		Becomes gray	34.6		72/44	700 psi pressure for Shelby push. PP = 1.75 tsf
	95						**Boring drilled to 92 feet; sampled to 94.5 feet.**				End drilling on 2/11/2004.
-55											
	100										

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LOG OF BORING GT04-3

Sheet 1 of 2

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Start Date	02/20/2004	Finish Date	02/20/2004	Total Depth Drilled (ft bgs)	50.0
Drilling Method	Hollow-Stem Auger (8-inch OD)	Drilling Contractor	PC Exploration	Ground Surface Elevation (ft MSL)	16.15
Drill Rig	CME 850	Hammer Type	Automatic	Borehole Backfill	Portland cement grout
Sampling Method(s)	Bulk from cuttings, SPT, Modified California, Shelby	Hammer Weight/Drop	140 lbs / 30 inches	Coordinate Location	N 2,084,635.69 E 6,012,233.66
Comments	Drilled on property next to landfill; refer to site plan for boring location.			Logger B. Baturay	Reviewer F. Settepani

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	0						FILL: 2 inches of loose asphalt over 6-inch-thick concrete slab				Core a 10-inch-dia. hole through the concrete slab.
15							FILL: Sandy SILT (ML), greenish gray				
			B1				FILL: Clayey SAND with gravel (SC)	17.0		46/24	Sieve Analysis: % Fines = 38.1 % Gravel = 17.2
							FILL: SAND (SP), brown, coarse				
	5						GARBAGE: gravel and wood, black, strong odor				
10			1	5-7-5	70		GARBAGE: wood, plastic, gravel, very strong odor				No sample retained.
							GARBAGE: wood and wires mixed with soil				Drilling hard at 7 ft, easy below that depth.
	10										Detect high level of methane. Stop drilling for 5 minutes.
5							▽ GARBAGE: gravel, no cuttings				Water level at 12 ft bgs during drilling.
	15										Water on the bit. Having hard time taking the bit out of augers.
0			2	4-7-6	40		GARBAGE: sandy clay mixed with wood				No sample retained.
							GARBAGE: plastic				
	20										
-5			3	7-17-16	50		GARBAGE: coarse gravel-size rock, red				Drilling hard.
											Drilling easy below 23 ft.
	25										
-10			4	4-7-7	20		GARBAGE: gravel (2-inch size), wood, and wires				No mud on the bit.
	30										Drilling very easy.

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LOG OF BORING GT04-3

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample Interval / Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	30									
-15		5	0-3-4	100		BAY MUD: Elastic SILT (MH), gray, wet, medium stiff; high plasticity, <5% fine sand, scattered seashells				No mud on the bit. Sampler sinks 7 inches with its own weight.
		6		100						Use piston sampler to push Shelby tube. Pocket Penetrometer (PP) = 0.75 tsf
	35									Use piston sampler to push Shelby tube.
							59.5		59/27	PP = 0.6 tsf
-20		7		100			59.4	64.6		Consolidation Test
							60.3	62.6		Triaxial UU Test - Saturated: q_u=8.6 psi S_u=619 psf
	40					Becomes medium stiff to stiff				
-25		8		80						Use piston sampler to push Shelby tube. PP = 1.0 tsf
	45					SILT with sand (ML), dark grayish brown, wet; nonplastic, ~15% fine sand				
-30		9		100		Silty SAND (SM), gray, wet; fine sand	18.7			Sieve Analysis % Fines = 15.5 % Gravel = 0
	50									Sand is backing up into the hole.
-35						**Boring drilled to 50.0 feet.**				
	55									
-40										
	60									
-45										
	65									

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LOG OF BORING GT04-4

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Start Date	02/12/2004	Finish Date	02/16/2004	Total Depth Drilled (ft bgs)	96.5
Drilling Method	Hollow-Stem Auger (8-inch OD)	Drilling Contractor	PC Exploration	Ground Surface Elevation (ft MSL)	39.35
Drill Rig	CME 850	Hammer Type	Automatic	Borehole Backfill	Portland cement grout
Sampling Method(s)	Bulk from cuttings, SPT, Modified California, Shelby	Hammer Weight/Drop	140 lbs / 30 inches	Coordinate Location	N 2,082,259.36 E 6,012,527.64
Comments	Refer to site plan for boring location.			Logger B. Baturay	Reviewer F. Settepani

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	0						FILL: Sandy CLAY (CL), brown, moist				Start drilling on 2/12/2004. Drill site is wet at surface.
35			B1					19.0		38/20	Collect one bucket of cuttings from 3-9 ft. Corrosion Test R-Value Test Sieve Analysis: % Fines = 54.6 % Gravel = 3.4
	5		1	10-8-8	25		FILL: Clayey GRAVEL with sand (GC), gray, moist, medium dense; ~30% fines, ~30% well-graded sand, ~40% fine gravel				
30							FILL: Clayey SAND with gravel (SC), gray, slightly moist, medium dense; ~40% fines, fine to coarse sand (3:1:1), ~20-30% fine gravel				
	10		2	2-5-7	80						
							FILL: concrete				Hard drilling at 12 ft.
25							FILL: Sandy SILT (ML), dark gray, wet; ~60% fines, ~40% fine to coarse sand (4:1:1); contains layers of predominantly concrete and brick fragments				Hit fine-grained soil and water at 13 ft.
	15		3	14-26-17	100		Concrete and brick fragments in sandy silt matrix, dry				Retain one liner. Black, greasy soil at the tip.
20							Concrete fragments mixed with sandy silt				
	20		4	20-34-33	100		Concrete and brick fragments in sandy silt matrix				Dry concrete pieces in cuttings.
15											
	25		5	43-50/5.5"	80		Predominantly concrete fragments				
10							FILL: Sandy SILT (MH) and Silty SAND (SM), gray, moist; ~30-90% plastic fines, fine to medium sand; contains layers of predominantly concrete fragments				
	30										

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LOG OF BORING GT04-4

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	30		6	11-19-20	100		FILL: Sandy SILT (MH) and Silty SAND (SM), gray, moist; ~30-90% plastic fines, fine to medium sand; contains layers of predominantly concrete fragments (continued)				
							Predominantly concrete fragments				Drilling hard.
-5	35		7	5-9-8	60		FILL: Silty SAND / Sandy SILT (SM/MH) , dark gray, moist, medium dense / stiff; ~30-90% plastic fines, ~10-70% fine sand				Drilling easy.
-0	40		8	11-20-27	30		GARBAGE: mostly wood, some glass, paper, and plastic, moist				Drilling easy.
-5	45										No sampling at 45 ft.
-10	50										Muddy cuttings at 48 ft; possibly water table. No sampling at 50 ft.
-15	55		9	10-12-9	70		GARBAGE: wood, paper, glass, and cloth, wet				
							GARBAGE: gravel in cuttings				Drilling hard.
-20	60										Drilling very hard. Augers are chattering.
-25	65										Drilling easy. May be out of garbage.

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LOG OF BORING GT04-4

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample interval / Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	65					GARBAGE (continued): gravel in cuttings				
-30	70	10	18-15-17	0		BAY MUD: Sandy SILT (MH) [recovered on outside of sampler]				No recovery. Blows may be high due to wood pieces wrapped on the bit.
										Apply 4000 psi with piston sampler; rods lifted during sampling. Shelby ripped at the bottom by wires / metal; wire also on the bit.
-35		11		0		BAY MUD: Elastic SILT (MH), dark gray, wet; high plasticity, <5% fine sand and organics, few seashells				
	75					Becomes gray to dark gray				
		12		80			54.5		64/31	Recover lost sample with Mod Cal.
										Wood and nail at bottom of sample #12.
-40		13		0						700 psi pressure for Shelby push (without piston sampler).
	80									
-45						Becomes gray				Wood and wires on the bit.
	85	14		100		Silty SAND (SM), greenish gray, wet; ~40% fines, fine sand				Apply 2000 psi pressure with piston sampler. Wood at the tip of the tube.
-50						Clayey SAND (SC), greenish gray, wet; ~40% fines, fine sand				No wood on bit. Apply 2000 psi with piston sampler.
	90	15		40			19.1	110.9	31/16	Sieve Analysis: % Fines = 36.1 % Gravel = 0 Triaxial UU Test - Saturated: q_u=18.0 psi S_u=1296 psf
-55	95	16		60						Apply 4000 psi with piston sampler. Shelby refused at 96.5 ft; large wire in bottom of tube.
						Boring drilled to 95 feet; sampled to 96.5 feet.				End drilling on 2/16/2004.
-60	100									

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LOG OF BORING GT04-5

Preliminary Geotechnical Investigation

Location: Brisbane, California — **Brisbane Landfill** — **Number: WL0657, Task 2**

Start Date	02/17/2004	Finish Date	02/18/2004	Total Depth Drilled (ft bgs)	92.5
Drilling Method	Hollow-Stem Auger (8-inch OD)	Drilling Contractor	PC Exploration	Ground Surface Elevation (ft MSL)	35.00
Drill Rig	CME 650	Hammer Type	Automatic	Borehole Backfill	Portland cement grout
Sampling Method(s)	Bulk from cuttings, SPT, Modified California, Shelby	Hammer Weight/Drop	140 lbs / 30 inches	Coordinate Location	N 2,080,106.47 E 6,013,716.72
Comments	Refer to site plan for boring location.			Logger B. Baturay	Reviewer F. Settepani

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
35	0		B1				FILL: Clayey SAND (SC), brown, moist; ~30-40% fines, fine to coarse sand (2:2:1)				Start drilling on 2/17/2004. Collect one bucket of cuttings from 0-3 ft.
							← Brick				
30	5		1	6-7-5	100		FILL: Silty SAND (SM), gray, moist, medium dense; ~20-30% fines, well-graded sand; contains layers of predominantly concrete fragments ← Gravel				
							} Concrete fragments mixed with silty sand				Drilling hard (concrete).
25	10		2	2-6-7	70		FILL: Silty SAND with gravel (SM), dark gray, moist, medium dense; ~10-20% fines, well-graded sand, ~15% fine gravel (max. particle size 1/4 inch); contains layers of predominantly concrete fragments				
							} Concrete fragments mixed with silty sand				Drilling hard (concrete).
20	15		3	30-27-23	0		} Predominantly concrete fragments				Drilling very hard between 14 ft and 16 ft (concrete or cobbles).
							FILL: Silty SAND (SM) and Sandy CLAY (CL), brown and dark gray, moist; ~10-70% fines, well-graded sand; mixed with concrete pieces				Drilling hard at 19 ft.
15	20		4	29-19-40	70		} Sandy CLAY (CL), brown/dark gray, moist; ~30% well-graded sand				
											Drilling hard (concrete)
10	25		5	12-26-40	80		} Concrete, wood, and brick fragments mixed with silty sand and sandy clay ▽				Water table at 27 ft at time of drilling.
											Drilling easy at 28 ft.
5	30										Drilling hard.

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LOG OF BORING GT04-5

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample Interval / Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
-5	30	6	17-25-48	70		FILL: coarse sand-size, black asphalt-like material and concrete in a matrix of Silty SAND (SM), dark gray, wet; ~10-20% fines, fine to coarse sand (3:0:1)				Drilling easy below 33 ft.
0	35	7	2-6-10	70		Becomes predominantly Silty SAND (SM), ~10-20% fines, fine sand				
						GARBAGE: paper, plastic, and glass				
-5	40									
-10	45	8	25-50/4"	100		GARBAGE: wood (99%) and glass, wet				Stop for 2/17/2004. Resume on 2/18/2004. Cloth on the bit.
-15	50									Drilling easier than above.
-20	55	9	17-9-9	0		GARBAGE: shredded pieces of wood, wet				Using sand catchers.
										Drilling very easy.
-25	60	10	10-9-9	0		GARBAGE: shredded pieces of wood, wet				Using sand catchers.
-30	65					BAY MUD: Elastic SILT (MH), gray, wet, medium stiff				Bay mud on bit.

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LOG OF BORING GT04-5

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample Interval / Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	65					BAY MUD: Elastic SILT (MH), gray, wet, medium stiff; high plasticity, <5% fine sand (continued)				Use piston sampler to push Shelby tube.
		11		80		←Garbage at bottom of tube				
-35	70									
		12		100		←Light-colored sand seams in cuttings				Use piston sampler to push Shelby tube. Pocket Penetrometer (PP) = 0.65 tsf
-40	75					BAY MUD: Fat CLAY (CH), gray, wet, medium stiff; high plasticity, <5% fine sand	49.2		57/29	Use piston sampler to push Shelby tube. PP = 0.65 tsf
		13		100			49.4	70.4		Triaxial UU Test - Saturated: q_u=11.5 psi, S_u=828 psf
-45	80									
		14		50		BAY MUD: Elastic SILT with sand (MH), gray, wet; high plasticity, 20% fine sand; increasing sand content with depth				Drilling hard below 81 ft.
						BAY MUD: Elastic SILT (MH), light gray, wet; high plasticity, ~5-10% fine sand				Sandy silt on bit. Center of augers is plugged.
-50	85	15	14-26-27	100		Sandy CLAY (CH), yellowish brown, wet, hard; high plasticity, ~30-40% fine sand				Using Mod Cal without liners; retain two bags of sample. PP = 4.5 tsf
-55	90									1000 psi pressure for Shelby push.
		16		100		Lean / Fat CLAY (CL/CH), yellowish brown, wet, very stiff; medium to high plasticity, ~5-10% fine sand	27.3		49/24	PP = 2.75 tsf
							25.0	100.9		Consolidation Test
							24.4	102.5		Triaxial UU Tests - Unsaturated *
							24.6	100.1		Saturated *
						Boring drilled to 90 feet; sampled to 92.5 feet.				End drilling on 2/18/2004.
-60	95									* Triaxial UU Results Unsaturated: q_u=42.6 psi, S_u=3065 psf Saturated: q_u=18.1 psi, S_u=1305 psf
-65	100									

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LOG OF BORING GT04-6

Sheet 1 of 2

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Start Date	02/03/2004	Finish Date	02/03/2004	Total Depth Drilled (ft bgs)	31.5
Drilling Method	Hollow-Stem Auger (8-Inch OD)	Drilling Contractor	PC Exploration	Ground Surface Elevation (ft MSL)	30.43
Drill Rig	CME 850	Hammer Type	Automatic	Borehole Backfill	Portland cement grout
Sampling Method(s)	SPT, Modified California	Hammer Weight/Drop	140 lbs / 30 inches	Coordinate Location	N 2,084,589.13 E 6,012,885.96
Comments	Refer to site plan for boring location.			Logger B. Baturay	Reviewer F. Settepani

Elevation, feet	Depth, feet	Sample Interval	Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
-30	0						FILL: Silty SAND (SM), dark gray; ~20-30% fines, well-graded sand, ~5-10% gravel				It has been raining for two days, and is raining off and on during drilling.
-25	5		1	14-50/4"	100		Becomes greenish gray, dry, very dense; sand grades fine, with crushable rock fragments				Drilling hard at 6 ft.
-20	10		2	39-36-24	10		FILL: Clayey SAND (SC), dark gray, dry, dense With gravel, organics in cuttings				Retain sample in bag.
-15	15		3	13-18-20	0		FILL: Silty SAND (SM), gray, moist, medium dense; fine sand, lenses of gravel at 15.5 ft and 16.5 ft				Water seeping from surface layer into the hole, preventing cuttings from coming up. Drilling harder due to water.
-10	20		4	7-8-3	60		FILL: Sandy CLAY (CL), bluish gray and dark gray, wet, stiff; ~20-40% sand, few coarse sand particles, crushable rock fragments in shoe, odor in sample				Piece of cloth in the shoe.
-5	25		5	13-17-31	0		GARBAGE: pieces of wood in sampler shoe, strong odor GARBAGE: wood and cloth in cuttings				
	30										

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LOG OF BORING GT04-6

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Elevation, feet	Depth, feet	Sample Interval / Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
0	30	6	8-11-13	75		GARBAGE: GRAVEL with sand (GP), dark gray, wet, medium dense; some paper and wood				
						Boring drilled to 30 feet; sampled to 31.5 feet.				
-5	35									
-10	40									
-15	45									
-20	50									
-25	55									
-30	60									
	65									

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LOG OF BORING GT04-7

Sheet 1 of 1

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Start Date	02/06/2004	Finish Date	02/09/2004	Total Depth Drilled (ft bgs)	21.5
Drilling Method	Hollow-Stem Auger (8-inch OD)	Drilling Contractor	PC Exploration	Ground Surface Elevation (ft MSL)	31.29
Drill Rig	CME 850	Hammer Type	Automatic	Borehole Backfill	Portland cement grout
Sampling Method(s)	SPT, Modified California	Hammer Weight/Drop	140 lbs / 30 inches	Coordinate Location	N 2,083,199.50 E 6,012,476.78
Comments	Energy measurements at 5 ft and 9 ft. Refer to site plan for boring location.			Logger B. Baturay	Reviewer F. Settepani

Elevation, feet	Depth, feet	Sample Interval / Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
30	0					FILL: concrete and gravel in sand matrix				Start drilling on 2/6/2004.
25	5	1	8-9-10	40		FILL: SAND with clay (SW-SC), brown, dry, medium dense; well-graded sand (max. particle size 1/8 inch); tire pieces at 5 ft, concrete in shoe Wood and concrete pieces Metal pieces				
20	10	2	19-12-12	50		Recover tire (3 inches), brick (3 inches), concrete (3 inches) Tire pieces and brick fragments in sand matrix Concrete piece				Tire at 9 ft.
15	15	3	9-10-10	80		FILL: Lenses of SILT (MH) and SAND with silt (SP-SM), dark gray, slightly moist, fine sand; mixed with concrete pieces; wood at 15 ft				Water at 7 ft.
10	20	4	3-8-6	100		FILL: SAND with silt (SW-SM), gray, slightly moist, loose to medium dense; ~10% fines, well-graded sand; wet wood at 15-15.75 ft				
		5	5-5-5	100		GARBAGE: glass, wood, and paper mixed with few gravel, moist				Glass and wire in sampler shoe.
5	25					Boring drilled to 20 feet; sampled to 21.5 feet.				End drilling on 2/9/2004.
	30									

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LOG OF BORING GT04-8

Sheet 1 of 1

Preliminary Geotechnical Investigation
Location: Brisbane, California **Brisbane Landfill** **Number: WL0657, Task 2**

Start Date	02/06/2004	Finish Date	02/06/2004	Total Depth Drilled (ft bgs)	20.0
Drilling Method	Hollow-Stem Auger (8-inch OD)	Drilling Contractor	PC Exploration	Ground Surface Elevation (ft MSL)	29.30
Drill Rig	CME 850	Hammer Type	Automatic	Borehole Backfill	Portland cement grout
Sampling Method(s)	SPT, Modified California	Hammer Weight/Drop	140 lbs / 30 inches	Coordinate Location	N 2,082,588.40 E 6,013,085.14
Comments	Energy measurements performed for each sampling interval. Refer to site plan for boring location.			Logger B. Baturay	Reviewer F. Settepani

Elevation, feet	Depth, feet	Sample Interval / Sample Number	Blows per 6 inches	Recovery, %	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Liquid Limit / Plasticity Index	REMARKS AND OTHER TESTS
	0					FILL: concrete and gravel in sand matrix				
25	5	1	24-32-21	10		FILL: Clayey SAND (SC), brown, slightly moist, very dense; ~30-40% fines, fine sand (3:1:0), few wood pieces				
						With gravel lenses				
20	10	2	9-14-7	30		Becomes more sandy, coarser, medium dense; ~20-30% fines, well-graded sand (1:1:1), fine gravel (max. particle size 1/4 inch)				
15	15	3	5-14-8	15		GARBAGE: wood				Tire at 14 ft.
10	20	4	50/4"	50		GARBAGE: wood, black				Sampler bouncing at 18 ft. on wood or tire.
						Boring drilled to 20 feet.				
5	25									
0	30									

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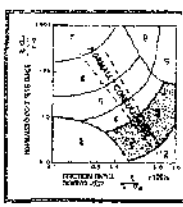

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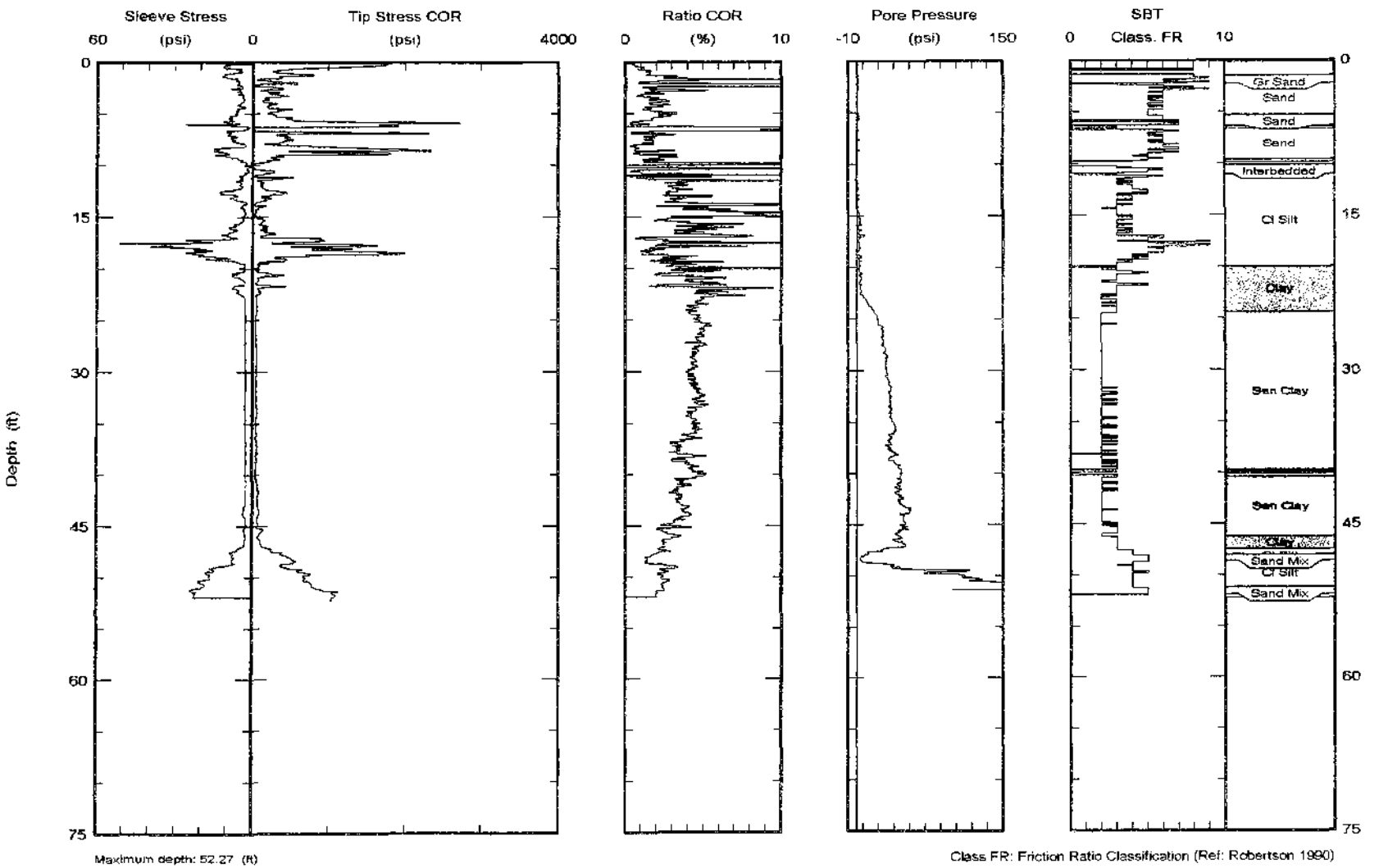
Northing:
Easting:
Elevation:

Date: 02/Jun/2005
Test ID: cptgto5-1
Project: Geosyntec

Client: Geosyntec
Site: Brisbanelandfill



Maximum depth: 52.27 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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Northing:
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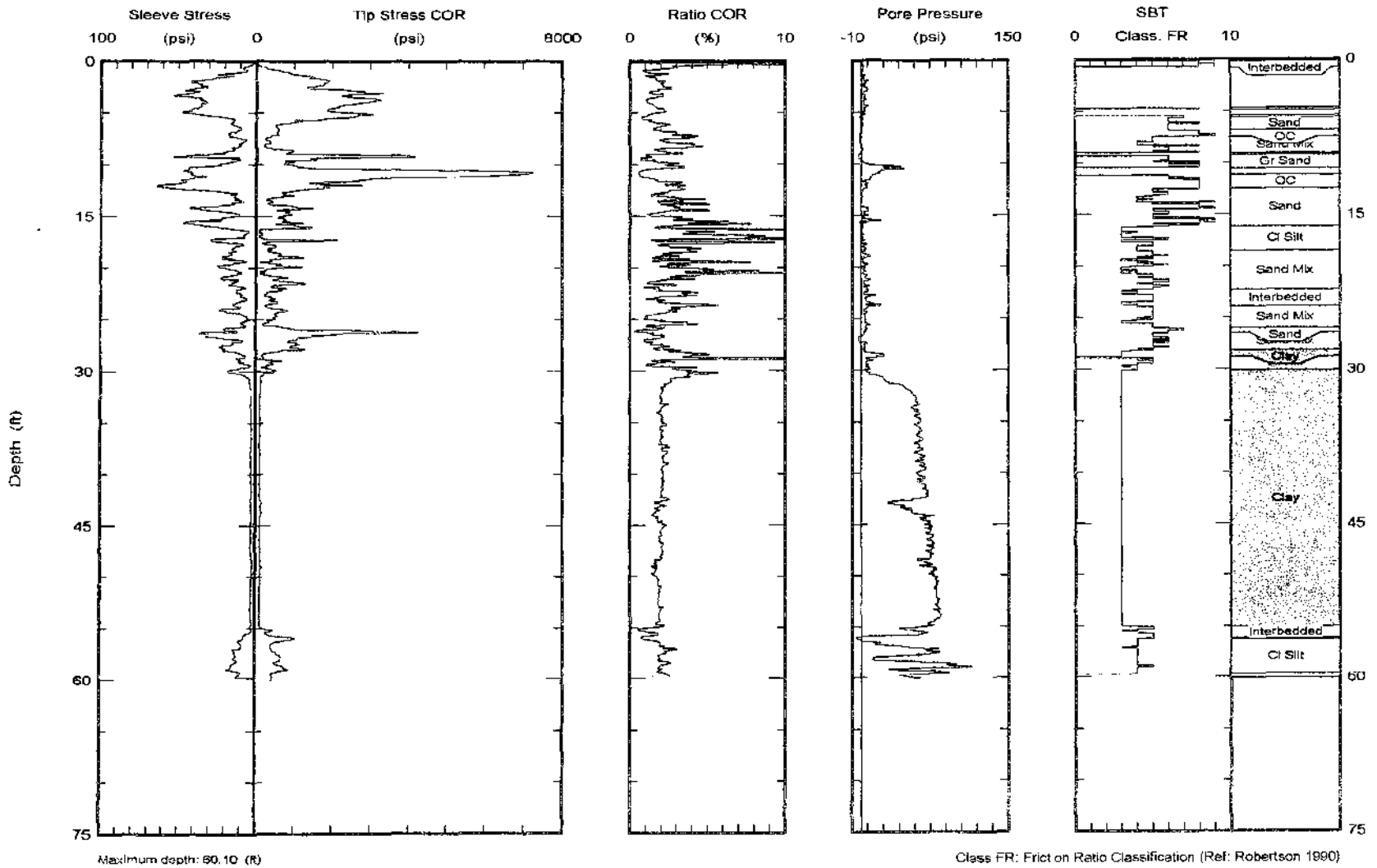
Elevation:

Date: 01/Jun/2005
Test ID: cptgto5-2
Project: Geosyntec

Client: Geosyntec
Site: Brisbanelandfill



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Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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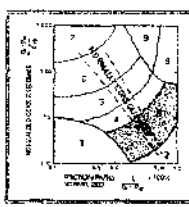

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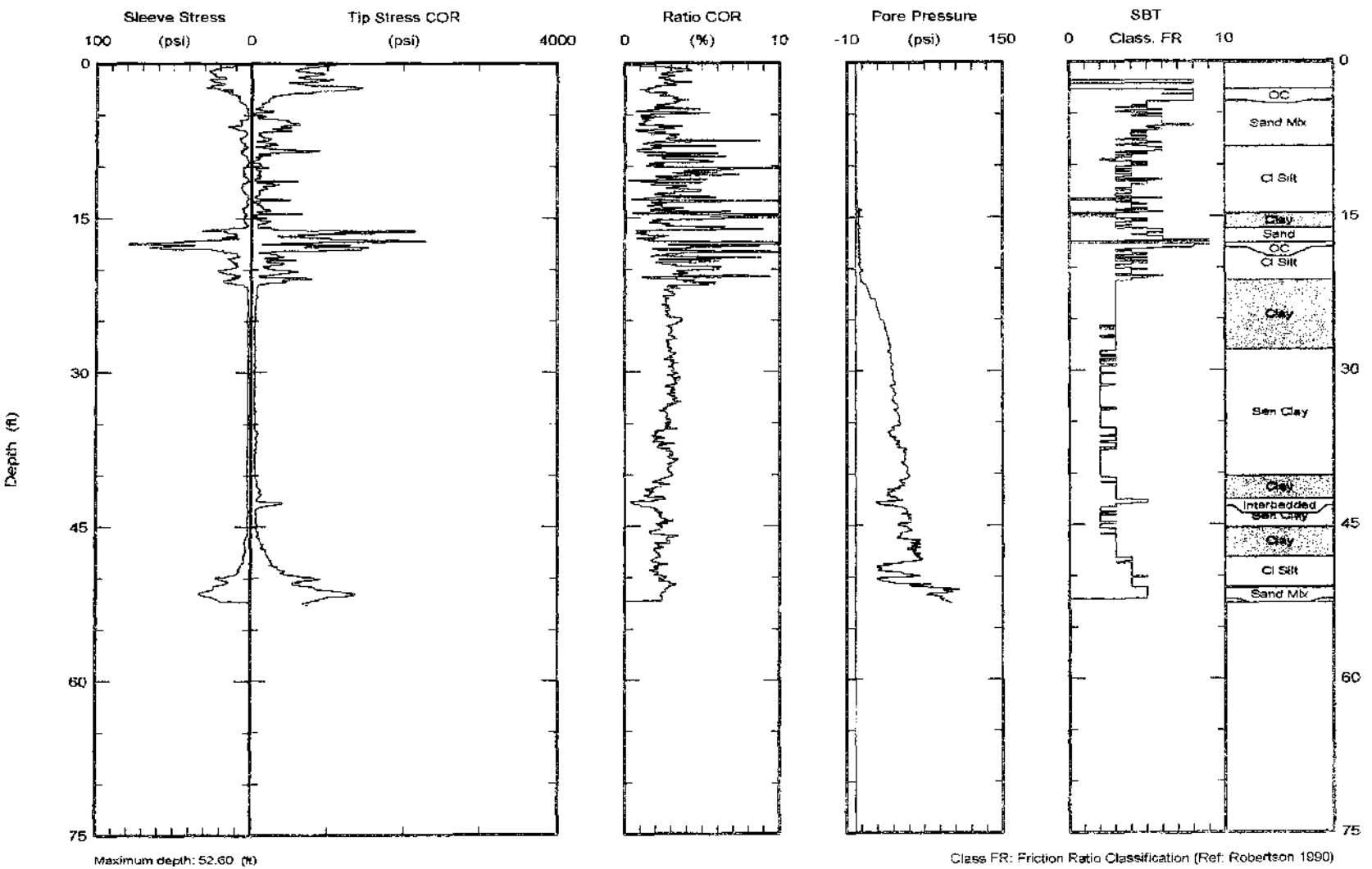
Northing:
Easting:
Elevation:

Date: 01/Jun/2005
Test ID: cptgto5-3
Project: Geosyntec

Client: Geosyntec
Site: Brisbanelandfill



Maximum depth: 52.60 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

Test ID: cptgto5-3
File: CP201U0503C.ECP

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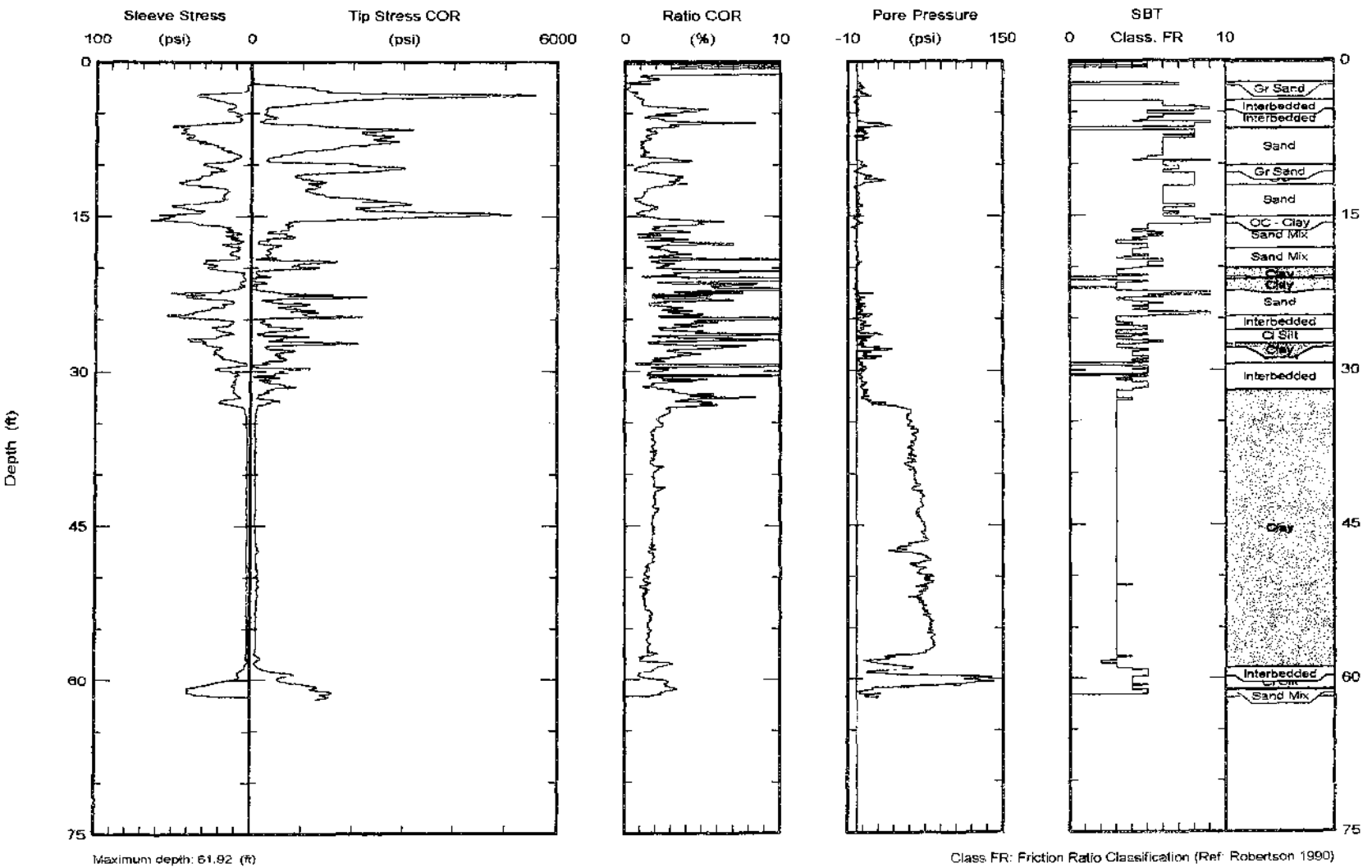
Northing:
Easting:
Elevation:

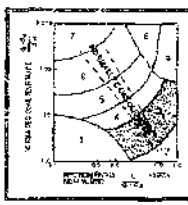
Date: 01/Jun/2005
Test ID: cptgto5-4
Project: Geosyntec

Client: Geosyntec
Site: Brisbanelandfill



Maximum depth: 61.92 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)



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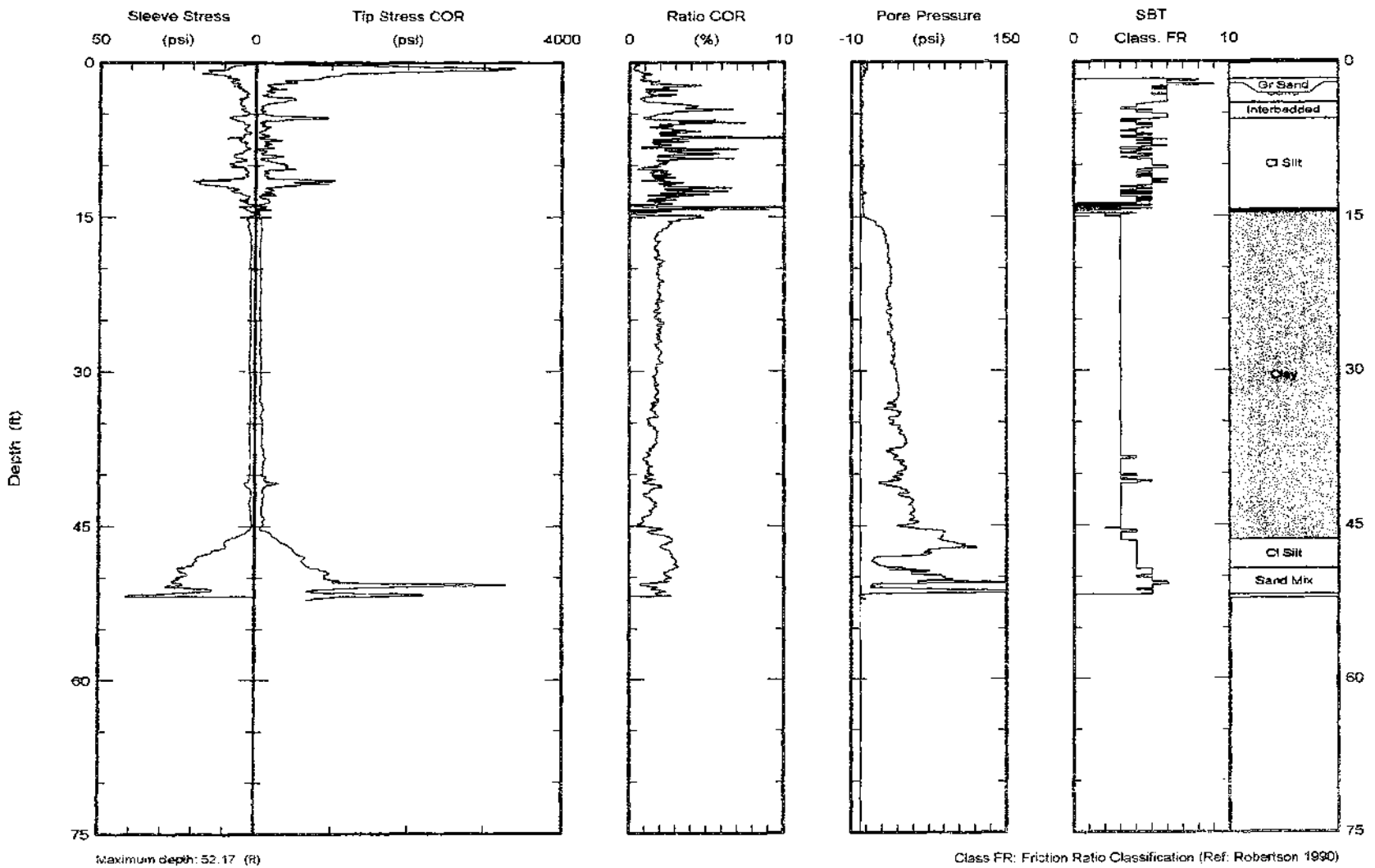
Northing:
Easting:
Elevation:

Date: 02/Jun/2005
Test ID: cptgto5-5
Project: Geosyntec

Client: Geosyntec
Site: Brisbanelandfill



Maximum depth: 52.17 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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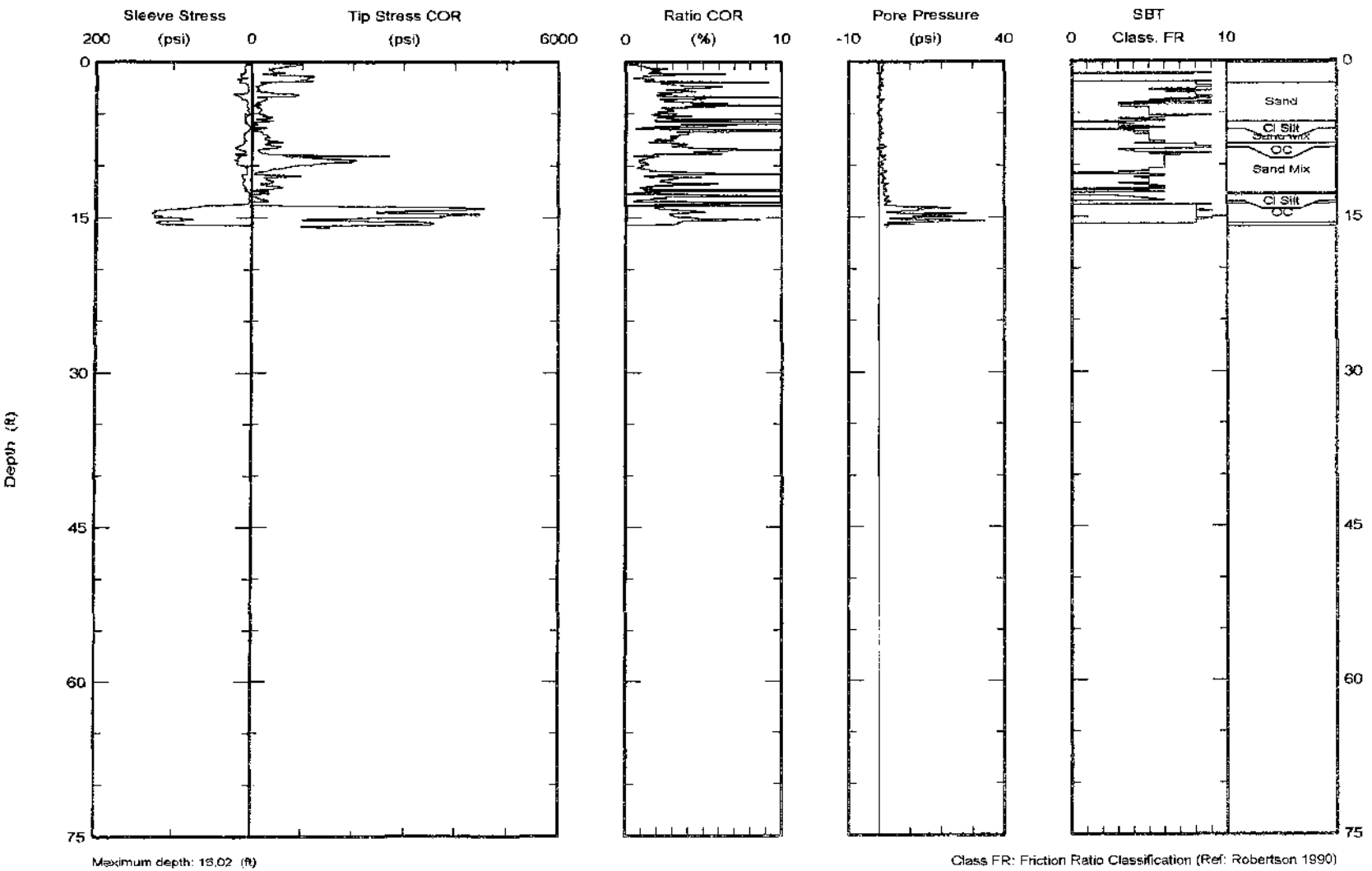
Northing:
Easting:
Elevation:

Date: 02/Jun/2005
Test ID: cptgto5-6
Project: Geosyntec

Client: Geosyntec
Site: Brisbanelandfill



Maximum depth: 18.02 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

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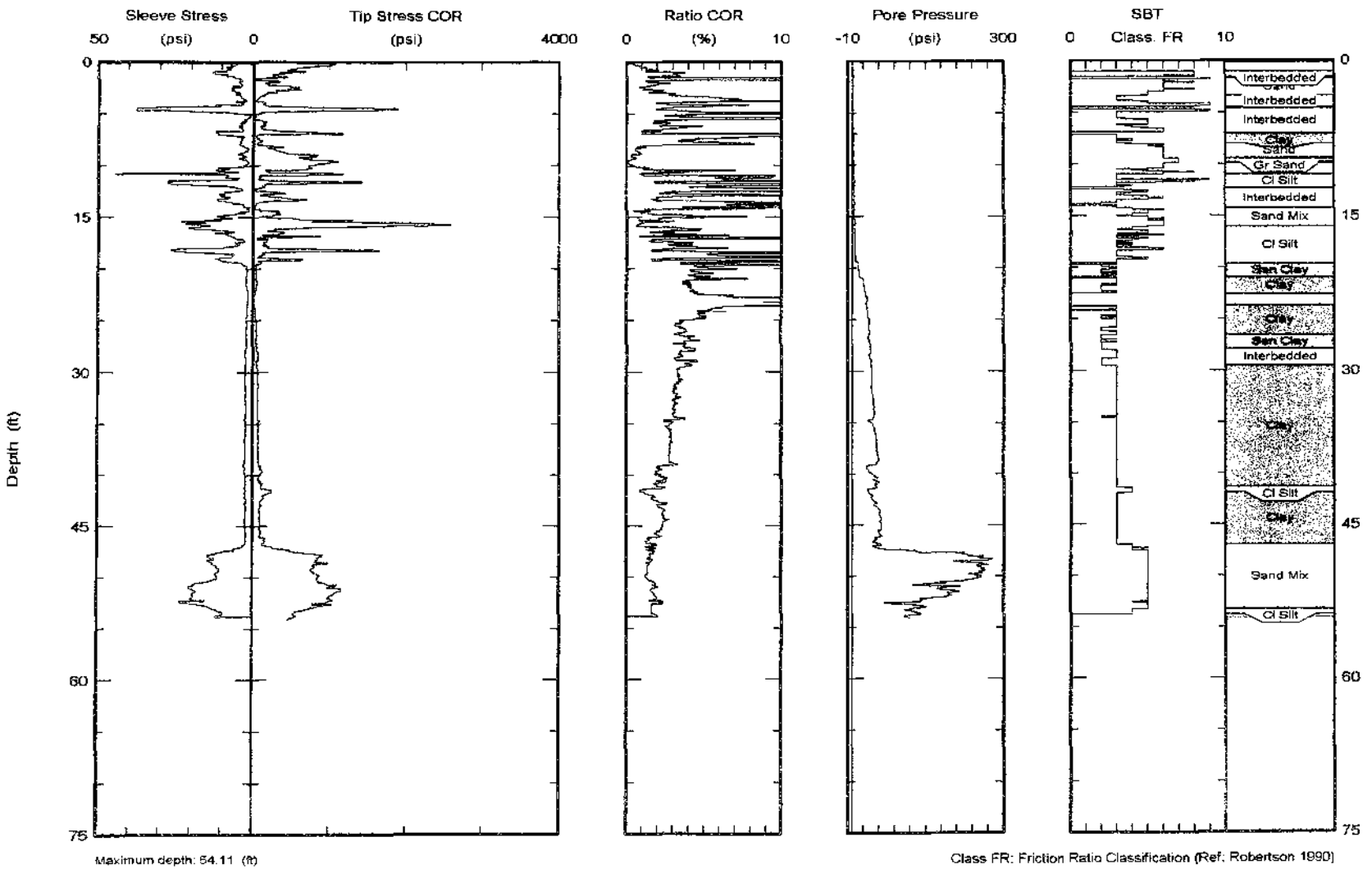
Northing:
Easting:
Elevation:

Date: 02/Jun/2005
Test ID: cptgto5-6b
Project: Geosyntec

Client: Geosyntec
Site: Brisbanelandfill



Maximum depth: 64.11 (ft)

Class FR: Friction Ratio Classification (Ref: Robertson 1990)

Test ID: cptgto5-6b
File: CP202U0504C.ECP

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING **GT05-7** SHEET **1 OF 2**
START DATE **21 Jun 05** ELEVATION **12.76 FT**
FINISH DATE **22 Jun 05** DATUM **Mean Seal Level**
PROJECT **Brisbane Landfill**
LOCATION **Brisbane, CA**
NUMBER **WL0805**

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
0	Top Soil		12.76						
	REFUSE Paper, plastic, cloth		10						Drilling easy between 0 and 11 ft bgs.
5			5						
10	▽								Groundwater encountered at 10 ft bgs, based on wet rod length.
	Cobbles/coarse gravel		0						
15									Drilling hard from 11 to 21 ft bgs.
			-5						
20									
	YOUNG BAY MUD: Elastic SILT (MH), gray, wet, with shell fragments		-10						
25							0		Switched to mud rotary, gravel stuck in shelby.
			-15						
30							0		Pushed shelby, no recovery.
			-20				90		
35									Wn=66%; Su=331 psf; Dry Density=59.7 pcf

CONTRACTOR **Major Drilling** NORTHING **2078663.5**
EQUIPMENT **CME-75** EASTING **6013345.8**
DRILL MTHD **Hollow Stem Auger/Mud Rotary** ANGLE **Vertical**
DIAMETER **8"** BEARING **------**
LOGGER **BB** REVIEWER **ACP** PRINTED **14 Oct 05**

REMARKS:

COORDINATE SYSTEM: **NAD83**
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

GEOSYNTEC CONSULTANTS
475 14th Street, Suite 450
Oakland California 94612
Tel: (510) 836-3034 Fax: (510) 836-3036

GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-7 **SHEET** 2 OF 2
START DATE 21 Jun 05 **ELEVATION** 12.76 FT
FINISH DATE 22 Jun 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	BLOWS PER 6"	RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
							60		
			-25						
40	OLD BAY DEPOSITS: Clayey SAND (SC), gray, wet, ~40% fines, with shell fragments, fine sand Traces of fine sand below 41 ft						40		Fines=41.8%; Sand=44.4% Wn=47%; PI=22; LL=44
			-30						The sandy material was retrieved with split spoon sampler going back into the hole.
45									
	Silty/clayey SAND (SM/SC), wet, light brown and gray mixed, ~15% fines		-35						
50	Medium dense					9/12/17	100		Fines=27.4%; Sand=72.6% PI=14; LL=28; Wn=17%
			-40						
55	Elastic SILT/CLAY (MH/CH), wet, brown, no coarse size material.					10/11/13	100		Fines=40.9%; Sand=59.1%; PI=11, LL=28; Wn=17%
	Boring drilled to 55 feet; sampled to 56.5 feet								

CONTRACTOR Major Drilling **NORTHING** 2078663.5
EQUIPMENT CME-75 **EASTING** 6013345.8
DRILL MTHD Hollow Stem Auger/Mud Rotary **ANGLE** Vertical
DIAMETER 8" **BEARING** ------
LOGGER BB **REVIEWER** ACP **PRINTED** 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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BOREHOLE RECORD

BORING GT05-8 **SHEET** 1 OF 8
START DATE 22 Jun 05 **ELEVATION** 30.04 FT
FINISH DATE 6 Jul 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS PER 6"	SAMPLES: RECOVERY (%)	SAMPLES: PID READING (ppm)	REMARKS AND OTHER TESTS
0	FILL: Clayey SAND (SC), brown, dry, with gravel		30						Hard Drilling; medium down to ~30 ft.
5	Moist		25						
10	GRAVEL (GP) gray, dry, with sand		20						
15	Silty SAND (SM), dark gray, dry		15						
20	▽		10						Groundwater at approximately 20 ft bgs.
25	Moist		5						
	REFUSE								
30	Silty SAND		0						Hard drilling from 30 to 32 ft bgs.
									Easy drilling below 32 ft bgs.
35									

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER BB **REVIEWER** ACP

NORTHING 2083166.4
EASTING 6013501.0
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING	**GT05-8**		**SHEET 2 OF 8**
START DATE	**22 Jun 05**	**ELEVATION**	**30.04 FT**
FINISH DATE	**6 Jul 05**	**DATUM**	**Mean Seal Level**
PROJECT	**Brisbane Landfill**		
LOCATION	**Brisbane, CA**		
NUMBER	**WL0805**		

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
40			-10						
45			-15			11/11/6	0		
	YOUNG BAY MUD: Elastic SILT (MH), dark gray, wet, with shell fragments								
50			-20			2/2/3	100		Wood piece in sample. Disturbed sample, did not keep.
55			-25						Switched to mud rotary.
60			-30						
	No shell fragments, very high dry strength						60	0.5	Dry Density: 62.5 pcf; Wn=59%; PI=32; LL=65; Su=590 psf; Consolidation
65			-35				80	1.0	
70									

CONTRACTOR	**Major Drilling**	**NORTHING**	**2083166.4**
EQUIPMENT	**CME-75**	**EASTING**	**6013501.0**
DRILL MTHD	**Hollow Stem Auger**	**ANGLE**	**Vertical**
DIAMETER	**8"**	**BEARING**	**------**
LOGGER	**BB** **REVIEWER** **ACP**	**PRINTED**	**14 Oct 05**

REMARKS:

COORDINATE SYSTEM: NAD83
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BOREHOLE RECORD

BORING **GT05-8** SHEET **3 OF 8**
START DATE **22 Jun 05** ELEVATION **30.04 FT**
FINISH DATE **6 Jul 05** DATUM **Mean Seal Level**
PROJECT **Brisbane Landfill**
LOCATION **Brisbane, CA**
NUMBER **WL0805**

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
75	OLD BAY DEPOSITS: Silty SAND (SM), gray, wet, fine grained, ~30% fines		-45				0		
	Clayey SAND (SC), light brown, wet, fine grained, ~20% fines					7/10/12	100		
80			-50						
	Silty SAND (SM), gray, wet, medium dense, fine grained, ~30% fines					5/10/11	30		
85			-55						
	Elastic CLAY (CH), light gray/brown, wet, very high dry strength, traces of fine sand					5/9/10	100		
	Sandy CLAY (CL), gray, wet,~30% fines								
90			-60						
	Silty SAND (SM), gray, wet, very dense, fine grained, ~20% fines					13/29/38	100		
	SAND with Silt (SP-SM), gray, wet, very dense, fine grained, ~10% fines								
95	SAND (SP), brown, wet, dense, fine grained		-65						
						12/19/28	100		
100			-70						
	Dark gray					11/14/11	60		
	Sandy SILT/Silty SAND (MH-SM), dark gray, wet, plastic fines, ~50% fines								
105									

CONTRACTOR **Major Drilling** NORTHING **2083166.4**
EQUIPMENT **CME-75** EASTING **6013501.0**
DRILL MTHD **Hollow Stem Auger** ANGLE **Vertical**
DIAMETER **8"** BEARING **-----**
LOGGER **BB** REVIEWER **ACP** PRINTED **14 Oct 05**

REMARKS:

COORDINATE SYSTEM: **NAD83**
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BOREHOLE RECORD

BORING **GT05-8** SHEET **4** OF **8**
START DATE **22 Jun 05** ELEVATION **30.04 FT**
FINISH DATE **6 Jul 05** DATUM **Mean Seal Level**
PROJECT **Brisbane Landfill**
LOCATION **Brisbane, CA**
NUMBER **WL0805**

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
110	Silty SAND (SM), dark gray, wet, plastic, fine grained, ~30% fines		-80				0		
	Sand/Silty (SP-SM), dark gray, wet, dense, fine grained, trace of fines					16/25/24	80		Wn=21%; Fines=10.3%
115			-85						
	Fat CLAY (CH), gray, wet, firm very high dry strength					6/7/7	100		
120			-90					1.25	
						6/9/11	100		
125			-95					1.25	
							100	1.25	
130			-100						
135			-105						
							0		
140									

CONTRACTOR **Major Drilling**
EQUIPMENT **CME-75**
DRILL MTHD **Hollow Stem Auger**
DIAMETER **8"**
LOGGER **BB** REVIEWER **ACP**

NORTHING **2083166.4**
EASTING **6013501.0**
ANGLE **Vertical**
BEARING **----**
PRINTED **14 Oct 05**

REMARKS:

COORDINATE SYSTEM: **NAD83**
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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-8 SHEET 5 OF 8
START DATE 22 Jun 05 ELEVATION 30.04 FT
FINISH DATE 6 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
	Stiff, with sand; ~20% fine sand					9/11/13	100		
145			-115						
150			-120			9/11/12	100	1.75	
155			-125						
160			-130				35	2.25	Dry Density: 66.6 pcf; Wn=56%; PI=43; LL=74; Su=1260 psf; Consolidation
165			-135						
170			-140			7/9/13	100	1.25	
175									

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER BB REVIEWER ACP

NORTHING 2083166.4
EASTING 6013501.0
ANGLE Vertical
BEARING ------
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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BOREHOLE RECORD

BORING GT05-8 SHEET 6 OF 8
START DATE 22 Jun 05 ELEVATION 30.04 FT
FINISH DATE 6 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
180			-150						
							100	1.5	Dry Density: 70.6 pcf; Wn=47%; PI=38; LL=67; Su= 547 psf; Consolidation
185			-155						
190			-160						
195			-165						
	Sandy Fat CLAY (CH), light gray, wet, ~30% fine sand, ~50% medium sand size cemented clumps								
200			-170						
	Clayey SAND (SC), mixture of light gray fines and gray sand, very dense, very high dry strength, fine grained, ~15% plastic fines.					18/32/41	60	3.5	
205			-175						
									Occasionally, clay was observed in cuttings.
210									

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER BB REVIEWER ACP

NORTHING 2083166.4
EASTING 6013501.0
ANGLE Vertical
BEARING ------
PRINTED 14 Oct 05

REMARKS:

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-8 SHEET 7 OF 8
START DATE 22 Jun 05 ELEVATION 30.04 FT
FINISH DATE 6 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
215			-185						
	Coarse sand								Hard drilling at this depth.
220	Clayey SAND (SC), mixture of light gray fines and gray sand, very dense, fine grained, very high dry strength, ~15% plastic fines		-190						
	Fat CLAY (CH), gray/brown mix, wet, very stiff					19/29/33	60		
225			-195					5	
									Fine sand in cuttings.
									Hard drilling.
230			-200						
	BEDROCK: FRANCISCAN FORMATION								Hard drilling below this depth.
235	Gravelly CLAY (CH), gray clay with black gravel, dry, fine to coarse grained sand, fine grained gravel, ~20% sand and ~30% gravel, max particle size ~1", angular/subangular, crumbles by hand		-205			70/6" R			Bit changed to a tricone bit.
	238'-240.3': Rock chips in clay matrix, dark brown clay and black claystone chips						95		Switched back to coring.
240	240.3'-241': WEATHERED SANDSTONE, gray with white includsions, oxidation along fractures 241'-424': Rock Chips in Clay Matrix, wet, relatively intact		-210						
	244'-245.5': Heavily fractured rock chips, dark gray/black, wet						90		Note: Clay material is observed usually along the sample boundaries maybe due to the drilling mixing.
245									

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER BB REVIEWER ACP

NORTHING 2083166.4
EASTING 6013501.0
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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BOREHOLE RECORD

BORING GT05-8 SHEET 8 OF 8
START DATE 22 Jun 05 ELEVATION 30.04 FT
FINISH DATE 6 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
	245.5'-246': CLAYSTONE, dark gray								Hard Drilling.
	246'-246.5': Heavily fractured rock chips, black								
	246.5'-247': 2" CLAYSTONE, dark gray/black, clayey weathered rock chips matrix, wet						100		Blocked off 4ft sample.
	247'-248': Mostly intact CLAYSTONE, dark gray (black with white and gray inclusions), easily breakable with soft spots of clay						80		
250	249'-249.5': SWGH-Clarney, crushed rock chips		-220						
	249.5'-251.5': Intact SANDSTONE with white inclusions								
	251.5'-252': Clay matrix of CLAYSTONE/SANDSTONE chips								
	252'-253': SANDSTONE, crushed probably during drilling								
	Crushed SANDSTONE						90		
255			-225						
	2" intact SANDSTONE						100		
	Soft, SHALE chips in clay matrix. Black chips in dark brown/gray clay								
260			-230						
	Boring Drilled to 263 feet.								

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER BB REVIEWER ACP

NORTHING 2083165.4
EASTING 6013501.0
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-9 SHEET 1 OF 2
START DATE 20 Jul 05 ELEVATION 33.92 FT
FINISH DATE 20 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
0	FILL: Silty SAND/Sandy SILT with gravel (MH-SM), brown, loose; gravel ,1" diameter, subangular; trace of coarse-grained sand		30						
5			25						
10	The fill started coming out wet								
	REFUSE: CLAY with Sand/Sand with Clay (SP), dark brown, wet, plastic, fine grained sand		20					0.3	
	Cuttings came out like a slurry (wet spot)								
15	Dark brown		15						
20								0.0	
25			10						
								0.0	
30			5						
	Soils started coming out of the hole as a slurry mix, gray, soft							0.0	
35			0						

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER ACP REVIEWER ACP

NORTHING
EASTING
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

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BOREHOLE RECORD

BORING GT05-9 SHEET 2 OF 2
START DATE 20 Jul 05 ELEVATION 33.92 FT
FINISH DATE 20 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
40	CLAY with Sand and Silt/SAND with Clay and Silt (CL-SP), wet, slight'y plastic		-5					23.0	
45	Driller encountered something very hard. After attempting to go past the obstruction the driller informed us that he could not go any further and would have to come back out. As per phone conversation with Krys Jesionek of GeoSyntec the location of the whole will be moved at least 5' in any direction and the driller will try again at this new location as GT05-9A. End of hole at 47 ft bgs. Boring Drilled to 47 feet.		-10						

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER ACP REVIEWER ACP
NORTHING
EASTING
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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BOREHOLE RECORD

BORING **GT05-9A** SHEET **1 OF 7**
START DATE **20 Jul 05** ELEVATION **33.92 FT**
FINISH DATE **28 Jul 05** DATUM **Mean Seal Level**
PROJECT **Brisbane Landfill**
LOCATION **Brisbane, CA**
NUMBER **WL0805**

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
0	FILL: SILT with Sand (SM), brown, moist, loose, coarse grained		30					0.9	
5								0.4	
10	Spoils are looking wet		25						
	Clay with Sand (CL), dark brown, firm, plastic, moist (observed from spoils); sand is coarse and fine-grained							0.0	
15			20						
	REFUSE: Pieces of wood, concrete, and adobe observed on spoils							0.3	
20	CLAY with sand (CL), dark brown-gray, moist, stiff, plastic		15					0.2	Hard drilling.
	Pieces of glass and wood visable on cuttings		10					0.4	
25	Silt with sand, light gray-brown, moist, loose, sand is fine grained, trace coarse grained							0.4	Almost no spoils coming out of hole.
	Piece of steel wire and asphalt on spoils		5						
30								0.4	Easy drilling.
	Lots of pieces of wood		0						
	Spoils started coming out as slurry								
35									

CONTRACTOR **Major Drilling**
EQUIPMENT **CME-75**
DRILL MTHD **Hollow Stem Auger**
DIAMETER **8"**
LOGGER **ACP** REVIEWER **ACP**

NORTHING **2084437.5**
EASTING **6012962.9**
ANGLE **Vertical**
BEARING **------**
PRINTED **14 Oct 05**

REMARKS:

COORDINATE SYSTEM: **NAD83**
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BOREHOLE RECORD

BORING GT05-9A SHEET 2 OF 7
START DATE 20 Jul 05 ELEVATION 33.92 FT
FINISH DATE 28 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
	YOUNG BAY MUD: Slurry is CLAY with trace silt and sand, brown-gray, soft, fine-grained sand							0.8	
			-5						
40								0.4	
			-10						
45								28	
	Clay with silt, gray		-15						
50								24	
									Easy drilling.
			-20						
55								0.0	
			-25						
60	Clay with trace of silt and sand, gray (almost liquid spoils)							0.2	
			-30						
65	Clay, black, soft, pieces of wood and metal, trace coarse-grained sand					14/15/17	22	1.0	Tip of drill bit had pieces of wood and metal, black color soil.
			-35						
70	Pieces of wood and glass came out from hole								Switched to mud rotary to

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER ACP REVIEWER ACP

NORTHING 2084437.5
EASTING 6012962.9
ANGLE Vertical
BEARING ------
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

GEOSYNTEC CONSULTANTS
475 14th Street, Suite 450
Oakland California 94612
Tel: (510) 836-3034 Fax: (510) 836-3036

GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-9A **SHEET** 3 OF 7
START DATE 20 Jul 05 **ELEVATION** 33.92 FT
FINISH DATE 28 Jul 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS PER 6"	SAMPLES: RECOVERY (%)	SAMPLES: PID READING (ppm)	REMARKS AND OTHER TESTS
	CLAY (CL), light gray, firm, plastic					3/5/7			clear hole. Last auger down to 70'. Drill bit had pieces of glass, metal, and wood, as well as a layer of gray bay mud.
	Mottled brown-gray OLD BAY DEPOSITS: SAND with Clay (SP), black, medium dense, fine grained		-40						
75	SAND (SP), light brown, wet, very dense, fine grained					28/50/5 for 1/2"	100		
			-45						
80	Trace coarse- grained sand and clayballs					27/40/46	66		
			-50						
85	Light brown-gray					50	0		Mod. Cal. sample @ 85' not recovered.
			-55						
90	Poorly graded GRAVEL (GP), brown-beige red, dense; 1/2" diameter, subangular					19/48	100		Wn=21%; Fines=6.7%; Sand=81.6%
	SAND/Silty Sand (SP-SM), fine grained, dense, wet, gray.		-60						
95	Trace gravel, brown-gray, very dense (<1/4" diameter) Trace of clay (or silt?), orange staining at discrete locations					13/29/45	100		
			-65						
100	Sloughed GRAVEL (GP) and rocks, brown, red, orange, yellow, subangular, max. diameter 1.5"					23/ 17 for 1.5"			
	SAND (SP), brown-gray with orange staing, wet, fine grained; trace silt		-70						
105	Silty SAND (SM), beige-brown								

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER ACP **REVIEWER** ACP

NORTHING 2084437.5
EASTING 6012962.9
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

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BOREHOLE RECORD

BORING GT05-9A | SHEET 4 OF 7
START DATE 20 Jul 05 | ELEVATION 33.92 FT
FINISH DATE 28 Jul 05 | DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	BLOWS PER 6"	RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
	SAND (SP), brown-gray, wet, very dense, fine grained; trace of gravel , subangular, red, brown, yellow <1/4" diameter Orange-staining at a couple of locations throughout matrix					20/42/42	100		
			-75						
110	Trace Clay or Silt					29/52	100		
			-80						
115									
			-85						
120	Trace Gravel and Clay, gravel is <1/4" diameter and subangular; orange staining at two locations along sample					35/52/4"	100		Hole caved from 130' to 100'.
	Core run came out empty except for 1 piece of quartz, 2" diameter, angular, slightly weathered (orange-stained), fractured, bedding observed on failure plane		-90						Driller encountered very hard material.
125	Brown, with beige and orange grains, medium dense					7/10/11	100		
			-95						
130									
			-100						
135									
	Light brown-gray		-105						
140									

CONTRACTOR Major Drilling | NORTHING 2084437.5
EQUIPMENT CME-75 | EASTING 6012962.9
DRILL MTHD Hollow Stem Auger | ANGLE Vertical
DIAMETER 8" | BEARING -----
LOGGER ACP | REVIEWER ACP | PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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BOREHOLE RECORD

BORING **GT05-9A** SHEET **5 OF 7**
START DATE **20 Jul 05** ELEVATION **33.92 FT**
FINISH DATE **28 Jul 05** DATUM **Mean Seal Level**
PROJECT **Brisbane Landfill**
LOCATION **Brisbane, CA**
NUMBER **WL0805**

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS PER 6"	SAMPLES: RECOVERY (%)	SAMPLES: PID READING (ppm)	REMARKS AND OTHER TESTS
145			-110						
150			-115						
155			-120						
160	CLAY [CL], light blue-gray		-125						
165			-130						
170	Stiff, plastic; trace silt		-135				29		
175			-140						

CONTRACTOR **Major Drilling** NORTHING **2084437.5**
EQUIPMENT **CME-75** EASTING **6012962.9**
DRILL MTHD **Hollow Stem Auger** ANGLE **Vertical**
DIAMETER **8"** BEARING **-----**
LOGGER **ACP** REVIEWER **ACP** PRINTED **14 Oct 05**

REMARKS:

COORDINATE SYSTEM: **NAD83**
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OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-9A SHEET 6 OF 7
START DATE 20 Jul 05 ELEVATION 33.92 FT
FINISH DATE 28 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
180	Grayish-blue		-145						
185			-150						
190			-155						
195	Dark gray, stiff, slightly plastic, slightly dessicated		-160				8		As per driller material got stiffer and harder to drill at 194'.
200	Gray; trace silt		-165						
205			-170						As per driller, materials very hard to drill.
210			-175						

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER ACP REVIEWER ACP

NORTHING 2084437.5
EASTING 6012962.9
ANGLE Vertical
BEARING ----
PRINTED 14 Oct 05

REMARKS:

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BOREHOLE RECORD

BORING GT05-9A | SHEET 7 OF 7
START DATE 20 Jul 05 | ELEVATION 33.92 FT
FINISH DATE 28 Jul 05 | DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS PER 6"	SAMPLES: RECOVERY (%)	SAMPLES: PID READING (ppm)	REMARKS AND OTHER TESTS
215	Brown, some clayey sand clusters		-180						
220	Small fragments of rock, angular, red, brown and orange in color		-185						Core bit had large amount of brown clay with rock pieces embedded on it.
	Boring drilled to 220 feet.								

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8"
LOGGER ACP REVIEWER ACP

NORTHING 2084437.5
EASTING 6012962.9
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-10 SHEET 1 OF 5
START DATE 14 Jul 05 ELEVATION 16.66 FT
FINISH DATE 18 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
0	SAND with gravel (SP), light brown, dry, medium dense, fine grained; gravel is subangular, <1" diameter		15						
	REFUSE: pieces of glass, plastic, wood cuttings, sandy fill becomes dark brown, moist, with gravel <1.5" diameter								
5			10					39	
10	Soil color changes to black, CLAY with gravel and garbage, lots of metal fragments and wood cuttings		5						
15	CLAY (CL), black, slightly plastic, methane-like odor; gravel pieces <1/4" diameter		0						Very few spoils coming out of hole.
20	Pieces of plastic, steel, and wood cuttings		-5						
25			-10						
30	Spoils started coming out slightly fluid and viscous, dark gray ▽		-15						Groundwater encountered at approximately 32.5 ft bgs based on wet rods.
35									

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger/Mud Rotary
DIAMETER 8"
LOGGER ACP REVIEWER ACP

NORTHING 2083877.6
EASTING 6011783.5
ANGLE Vertical
BEARING ------
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING	GT05-10	SHEET	2 OF 5
START DATE	14 Jul 05	ELEVATION	16.66 FT
FINISH DATE	18 Jul 05	DATUM	Mean Seal Level
PROJECT	Brisbane Landfill		
LOCATION	Brisbane, CA		
NUMBER	WL0805		

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
	Garbage plugged the entrance to sampler (wood and plastic primarily)					13/7/2	11		
40	Spoils coming out of hole were very clayey (dark gray) with pieces of garbage		-20 / -25						Easy Drilling.
45									Small amount of garbage observed on spoils.
50	YOUNG BAY MUD: CLAY (CL), dark gray, soft, slightly plastic		-30 / -35						
55	OLD BAY DEPOSITS: Clayey SAND (SC), light beige-brown, medium dense, fine grained, slightly plastic; trace of black fine sand grains		-40			13/12/11	16		Sampler got plugged with small amount of trash
60									Switched to mud rotary.
	Trace brown, coarse grained sand		-45						
65			-50				0		Shelby tube came out empty.
70									

CONTRACTOR	Major Drilling	NORTHING	2083877.6
EQUIPMENT	CME-75	EASTING	6011783.5
DRILL MTHD	Hollow Stem Auger/Mud Rotary	ANGLE	Vertical
DIAMETER	8"	BEARING	------
LOGGER	ACP REVIEWER ACP	PRINTED	14 Oct 05

REMARKS:

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OAKLAND GEOTECH WL0805.GPJ GEOSNITEC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING	GT05-10	SHEET	3 OF 5
START DATE	14 Jul 05	ELEVATION	16.66 FT
FINISH DATE	18 Jul 05	DATUM	Mean Seal Level
PROJECT	Brisbane Landfill		
LOCATION	Brisbane, CA		
NUMBER	WL0805		

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
	SAND with clay (SP), light brown, dense, fine grained; long thin pieces of steel wire embedded on sample					10/15/21	66		Bottom two tubes came out full. Pliers had to be used to separate the tubes from each other due to wires.
	Sandy CLAY (CL), light brown, dense, fine grained Iron-staining was observed (red stains) at discrete locations throughout the shoe of sample		-55						
75			-60						
80	SAND (SP), light brown-beige-black, very dense, fine grained; trace of clay (silt?)		-65			16/46/11 for 2"	86		Stopped at 14" because driller said it was too hard and he might not be able to pull it out.
85			-70						
	Clayey SAND/Sandy CLAY (SC-CL), light brown-black-beige, fine grained with some coarse-grained sand						0		Shelby tube came out empty.
90	CLAY (CL), light brown gray, firm, plastic		-75						
	Clayey SILT/Silty CLAY (SC-CL), light gray-brown-green, dense, slightly plastic, fine grained, becomes more clayey towards bottom of sample					9/19/27	88		
95			-80						
	Clayey SAND (SC), brown								
100	SAND with clay (SP), brown and black		-85						
105									

CONTRACTOR	Major Drilling	NORTHING	2083877.6
EQUIPMENT	CME-75	EASTING	6011783.5
DRILL MTHD	Hollow Stem Auger/Mud Rotary	ANGLE	Vertical
DIAMETER	8"	BEARING	----
LOGGER	ACP REVIEWER ACP	PRINTED	14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING **GT05-10** SHEET **4 OF 5**
START DATE **14 Jul 05** ELEVATION **16.66 FT**
FINISH DATE **18 Jul 05** DATUM **Mean Seal Level**
PROJECT **Brisbane Landfill**
LOCATION **Brisbane, CA**
NUMBER **WL0805**

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
110	Beige-brown and black, fine grained, loose, beige-brown and black, trace silt (clay?), slightly weathered at discrete locations (orange stains), trace gravel, angular <1/4" diameter		-90			3/2/3	100		
115			-95						
120			-100			8/18/22	100		
125			-105						
130			-110			5/11/23	83		Hole cave down 25'. Driller had to redrill lost depth. Wn=21%;Fines=10%; Sand=90%
135			-115						
140			-120						

CONTRACTOR **Major Drilling** NORTHING **2083877.6**
EQUIPMENT **CME-75** EASTING **6011783.5**
DRILL MTHD **Hollow Stem Auger/Mud Rotary** ANGLE **Vertical**
DIAMETER **8"** BEARING **------**
LOGGER **ACP** REVIEWER **ACP** PRINTED **14 Oct 05**

REMARKS:

COORDINATE SYSTEM: **NAD83**
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OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/06

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-10 **SHEET** 5 OF 5
START DATE 14 Jul 05 **ELEVATION** 16.66 FT
FINISH DATE 18 Jul 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS PER 6"	SAMPLES: RECOVERY (%)	SAMPLES: PID READING (ppm)	REMARKS AND OTHER TESTS
			-125						Hole caved while lowering sample.
	Brown-light gray					10/14/18			
	Green-gray, stiff, slightly plastic, with veins of brown clay								
145			-130						
	CLAY (CL) light gray, soft; trace of sand								
150									
	Boring drilled to 150 feet.								

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger/Mud Rotary
DIAMETER 8"
LOGGER ACP **REVIEWER** ACP

NORTHING 2083877.6
EASTING 6011783.5
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

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OAKLAND GEOTECH WL0805.GPJ GEOSYNTEC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-11 SHEET 1 OF 5
START DATE 6 Jul 05 ELEVATION 39.58 FT
FINISH DATE 12 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
0	Well Graded Crushed Rock, road base material 3"		35						Hard drilling on top.
5	FILL: Gravelly SAND (SW), brown, dry		30						Logging based on drill cuttings.
10			25						Easy drilling below 10 ft.
15			20						
20			15						
25			10					20	Hard drilling.
30	▽		5						Groundwater encountered at approximately 30 ft bgs, based on wet rod length.
35									

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger/Mud Rotary
DIAMETER 8"
LOGGER BB REVIEWER ACP

NORTHING 2080745.9
EASTING 6012591.2
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

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BOREHOLE RECORD

BORING GT05-11 SHEET 2 OF 5
START DATE 6 Jul 05 ELEVATION 39.58 FT
FINISH DATE 12 Jul 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
	Black with red brick pieces, moist, some odor					8/29/53	70		Hard drilling.
40	REFUSE:		0						Muddy cuttings.
	Muddy cuttings, sandy, with odor								Very hard drilling.
	Wire in cuttings		-5						
45									
50			-10						
55	Wood and plastic		-15			30/18/11	30		
60			-20			12/8/8	0		
65			-25						
70	YOUNG BAY MUD: pieces of wires		-30						

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger/Mud Rotary
DIAMETER 8"
LOGGER BB REVIEWER ACP

NORTHING 2080745.9
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BOREHOLE RECORD

BORING	**GT05-11**	**SHEET**	**3 OF 5**
START DATE	**6 Jul 05**	**ELEVATION**	**39.58 FT**
FINISH DATE	**12 Jul 05**	**DATUM**	**Mean Seal Level**
PROJECT	**Brisbane Landfill**		
LOCATION	**Brisbane, CA**		
NUMBER	**WL0805**		

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
						5/6/6	70		
75	Plastic SILT (MH), light gray, very soft		-35			5/5/6	40		
80	CLAY (CH), light gray, very soft, plastic		-40				60		
85	Dark greenish gray, firm, plastic		-45						
90	Dark gray, firm to stiff		-50				100		Dry Density=65.6 pcf; Wn=56%; PI=32; LL=62; Su=446 psf; Consolidation
95	Firm		-55			3/4/4	100		
100	Dark greenish gray, soft to firm, veins of dark brown clay at bottom of sample		-60				91.6		
105			-65						

CONTRACTOR	**Major Drilling**	**NORTHING**	**2080745.9**
EQUIPMENT	**CME-75**	**EASTING**	**6012591.2**
DRILL MTHD	**Hollow Stem Auger/Mud Rotary**	**ANGLE**	**Vertical**
DIAMETER	**8"**	**BEARING**	**-----**
LOGGER	**BB** **REVIEWER** **ACP**	**PRINTED**	**14 Oct 05**

REMARKS:

COORDINATE SYSTEM: NAD83

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BOREHOLE RECORD

BORING GT05-11 **SHEET** 4 OF 5
START DATE 6 Jul 05 **ELEVATION** 39.58 FT
FINISH DATE 12 Jul 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS PER 6"	SAMPLES: RECOVERY (%)	SAMPLES: PID READING (ppm)	REMARKS AND OTHER TESTS
	Veins of brown Clay at bottom of sample, trace of fine grained sand and small pieces of hard clay at bottom of sample						62.5		
			-70						
110	OLD BAY DEPOSITS: SAND with clay (SP), grayish green, medium dense, slightly plastic, fine grained						50		
			-75						
115							0		
	Fragments of shells and small pieces of gravel observed on cuttings								
			-80						
120	Mottled gray-brown					6/8/12	100		
			-85						
125	CLAY (CL), light gray-green-brown (mottled), stiff, very plastic						10		
			-90						
130	Mottled gray/light brown, very stiff, slightly plastic					7/9/12	89		
			-95						
135	CLAY with sand (silt?) (CL), mottled gray/light brown, very stiff, slightly plastic, sand (silt?) is fine grained, black.					8/11/13	100		
140			-100						

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger/Mud Rotary
DIAMETER 8"
LOGGER BB **REVIEWER** ACP

NORTHING 2080745.9
EASTING 6012591.2
ANGLE Vertical
BEARING ------
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
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BOREHOLE RECORD

BORING GT05-11 **SHEET** 5 OF 5
START DATE 6 Jul 05 **ELEVATION** 39.58 FT
FINISH DATE 12 Jul 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS PER 6"	SAMPLES: RECOVERY (%)	SAMPLES: PID READING (ppm)	REMARKS AND OTHER TESTS
	CLAY (CL), dark gray-green with veins of black (or dark brown?), very stiff, slightly plastic						33		
145			-105						
150	CLAY (CL) with sand and gravel, blue-green, very stiff, slightly plastic, dissicated at discrete locations, sand is fine grained and black, gravel fragments < 1/8" diameter.		-110			9/14/15	88		
	Boring drilled to 150 feet; Sampled to 151.5 feet.								

CONTRACTOR Major Drilling **NORTHING** 2080745.9
EQUIPMENT CME-75 **EASTING** 6012591.2
DRILL MTHD Hollow Stem Auger/Mud Rotary **ANGLE** Vertical
DIAMETER 8" **BEARING** -----
LOGGER BB **REVIEWER** ACP **PRINTED** 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

GEOSYNTEC CONSULTANTS

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-12 **SHEET** 1 **OF** 6
START DATE 29 Jul 05 **ELEVATION** 22.17 FT
FINISH DATE 4 Aug 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS PER 6"	SAMPLES: RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
0	FILL: SAND (SP), brown-orange, moist, loose, fine grained; trace silt and clay		20						Observed from spoils.
	Soil changes color to dark brown								
5	CLAY (CL), gray, moist, stiff, slightly plastic		15						Hard drilling.
	Color changes to dark brown-black								
	SAND with clay (SC), dark gray, moist, slightly plastic, fine grained, small pieces of adobe mix with soils							0.5	
10	REFUSE: CLAY (CL), black, moist, stiff, plastic		10						
15			5					5	
	Pieces of shredded wood and long pieces of twisted metals came out on spoils								
20			0					9	Hard drilling.
25			-5						
	No cuttings								No cuttings.
30			-10						Hard drilling to 33 ft bgs.
									Easy drilling below 33 ft to 50 ft.
35									

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger/Mud Rotary
DIAMETER 8"
LOGGER ACP **REVIEWER** ACP

NORTHING 2082091.6
EASTING 6011989.7
ANGLE Vertical
BEARING ----
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-12 **SHEET** 2 OF 6
START DATE 29 Jul 05 **ELEVATION** 22.17 FT
FINISH DATE 4 Aug 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
40	YOUNG BAY MUD: SILT (MH), black, with odor, metal pieces		-15			20/8/4	50		
45			-20						
50	Elastic Silt (MH), dark gray, soft, plastic, gasoline smell and trace trash at top of sample		-25				100		Switched to mud rotary. Dry Density=51.1 pcf; Wn=79%; PI=40; LL=78; Su=331 psf; Consolidation
55			-30						
60	Sandy CLAY (CL), blue gray, fine grained.		-35				0		
65	Sand and fragments of shells visible on cuttings OLD BAY DEPOSITS: SAND with silt (SM), light gray-brown with orange stains, dense, fine grained		-40			10/18/24	100		Drill bit came out with brown clay at bottom.
70			-45						

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger/Mud Rotary
DIAMETER 8"
LOGGER ACP **REVIEWER** ACP

NORTHING 2082091.6
EASTING 6011989.7
ANGLE Vertical
BEARING -----
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND GEOTECH WL0805.GPJ GEOSNTC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-12 **SHEET** 3 OF 6
START DATE 29 Jul 05 **ELEVATION** 22.17 FT
FINISH DATE 4 Aug 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	BLOWS PER 6"	RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
	CLAY (CL), mottled brown-gray-oragne, firm, plastic, slightly dessicated, veins of black clay, trace of silt					7/8/11			
75			-50						
			-55						
80	CLAY with Sand (CL), bluish-gray, stiff, plastic						0		
			-60						Sample obtained from residues on top of sampler. Driller added a lot of bentonite to the hole.
85	Sand is fine grained						0		
	Coarse-grained sand observed on cuttings.		-65						
90	SAND (SW), bluish-gray, medium dense, fine grained with trace coarse grained, trace of clay					10/7/8	16		
			-70						Only 3" of sample were recovered.
95	CLAY (CH), bluish gray, stiff, slightly dessicated					10/13/19	100		
			-75						
100	Trace of fine grained sand						0		
			-80						
105									

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger/Mud Rotary
DIAMETER 8"
LOGGER ACP **REVIEWER** ACP

NORTHING 2082091.6
EASTING 6011989.7
ANGLE Vertical
BEARING ------
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-12 **SHEET** 4 OF 6
START DATE 29 Jul 05 **ELEVATION** 22.17 FT
FINISH DATE 4 Aug 05 **DATUM** Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	BLOWS PER 6"	RECOVERY (%)	PID READING (ppm)	REMARKS AND OTHER TESTS
	Plastic		-85			6/6/6	100		Sample hard to remove from sampler.
110						7/7/8	100		Dry Density= 61.9 pcf; Wn=64%; PI=50; LL=80
	Color changes to light gray		-90						
115	Blue-green gray		-95			5/6/9	100		
120			-100						
125	Trace of sand		-105				0		
130			-110						
135	Green- gray SAND (SW), green-blue, wet, very dense, fine grained; trace clay (?)		-115			39/50 for 4.5"	55		Bit was covered in clayey sand.
140									

CONTRACTOR Major Drilling **NORTHING** 2082091.6
EQUIPMENT CME-75 **EASTING** 6011989.7
DRILL MTHD Hollow Stem Auger/Mud Rotary **ANGLE** Vertical
DIAMETER 8" **BEARING** ----
LOGGER ACP **REVIEWER** ACP **PRINTED** 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING **GT05-12** SHEET **5 OF 6**
START DATE **29 Jul 05** ELEVATION **22.17 FT**
FINISH DATE **4 Aug 05** DATUM **Mean Seal Level**
PROJECT **Brisbane Landfill**
LOCATION **Brisbane, CA**
NUMBER **WL0805**

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
	Fat CLAY (CH), blue-green-gray		-120						As per driller, sand layer ended at 142 ft.
145	Stiff, slightly plastic, veins of black clay throughout sample		-125			9/11/13	100		
150			-130						
155	Slightly dessicated		-135			8/7/9	100		Dry Density=71.1 pcf; Wn=51%; PI=58; LL=89
160			-140						
165	Gray, slightly flaky with sheets of wood and roots throughout (brown in color)		-145			6 for 3"/11/15	100		
170			-150						
175									

CONTRACTOR **Major Drilling** NORTHING **2082091.6**
EQUIPMENT **CME-75** EASTING **6011989.7**
DRILL MTHD **Hollow Stem Auger/Mud Rotary** ANGLE **Vertical**
DIAMETER **8"** BEARING **-----**
LOGGER **ACP** REVIEWER **ACP** PRINTED **14 Oct 05**

REMARKS:

COORDINATE SYSTEM: **NAD83**
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

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GS FORM: BORE 1/99

BOREHOLE RECORD

BORING GT05-12 SHEET 6 OF 6
START DATE 29 Jul 05 ELEVATION 22.17 FT
FINISH DATE 4 Aug 05 DATUM Mean Seal Level
PROJECT Brisbane Landfill
LOCATION Brisbane, CA
NUMBER WL0805

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	ELEVATION (ft)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS PER 6"	SAMPLES RECOVERY (%)	SAMPLES PID READING (ppm)	REMARKS AND OTHER TESTS
			-155			12/14/18	100		
180			-160						
185	Trace of sand on top of sample		-165			11/13/14	100		
190	Light brown-orange		-170						
195	With sand, very hard, sand is fine grained, mottled brown-orange, orange color appear to be from weathering, trace rock fragments (weathered sandstone?)		-175			24/43	50		Very hard drilling.
	SAND with Clay (SC), fine and coarse grained, very dense, brown-orange, small fragments of rock (weathered sandstone ?), <1/2" diameter.								
200	SAND (SP), orange-brown, very dense, fine grained, with pieces of sandstone.					12/24/41	100		From 200.5' to bottom of sampler, soil came out as one complete piece which broke up while transferring to bag.
	SANDSTONE, orange brown, hard, friable, no bedding or fractures observed, pieces <3/4" diameter.								
	Boring drilled to 201.5 feet, Sampled to 201.5 feet								

CONTRACTOR Major Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger/Mud Rotary
DIAMETER 8"
LOGGER ACP REVIEWER ACP

NORTHING 2082091.6
EASTING 6011989.7
ANGLE Vertical
BEARING ----
PRINTED 14 Oct 05

REMARKS:

COORDINATE SYSTEM: NAD83
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND GEOTECH WL0805.GPJ GEOSNTEC.GDT 14/10/05

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GS FORM: Oakland

BORING RECORD

BORING GS08-1 SHEET 1 OF 4
START DATE Apr 8, 08 ELEVATION 17.6 ft
FINISH DATE Apr 15, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION 541 Tunnel Ave, Brisbane, California
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES NUMBER	SAMPLES SYMBOL	SAMPLES REC & RQD (%) OR REC (%)	SPT VALUES BLOWS PER 6"	SPT VALUES N	COMMENTS	TEST RESULTS MOISTURE CONTENT(%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTICITY INDEX (%)	TEST RESULTS DRY DENSITY, pcf	TEST RESULTS UNDRAINED STRENGTH, psf
0	Dark yellowish brown to dark brownish grey, sandy SILT (ML); fine sand with trace fine gravel		15											
5	REFUSE (aluminum, plastic, glass)		10			50%	4-2-50							
10	▽		5						▽					
15			0											
20			-5											
25			-10											
30	Young Bay Mud- blueish grey high plasticity CLAY with some silt (CH)		-15						CH based on pre drilling through refuse					
35														
40	Dark grey silty SAND (SM); very wet, 15-20% fines		-20	S1-1		100%			Cased to 37'					
45	Top of sample: Dark grey sand with shells and gravel		-25			100%	6-5-6							
50	Dark yellow grey SAND with some silt (SM); fine - medium grained sand, wet, loose dense, 15% fines		-30			100%	7-9-12		Bag Sample 1-1; Fines Content- 12%, Gravel Content- 0%					
55			-35			70%	13-20-22							
60	Orange grey SAND with silt (SM); medium dense and wet, trace fine gravel, 30% fines		-40			100%	20-30-34							
65	Coarse grained sand in cuttings Coarse grained sand and gravel in toe of sampler		-45			100%	35-50 (1/1)		Photo 13; Bag Sample 1-2					
70	Orange brown SAND with silt (SM); fine - medium grained sand, very dense, wet.		-50			100%	30-22-50/5.5"							
75	@ 69'- 1" of Reddish-brown clayey SAND; very dense		-55			100%	4-5-9							

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

NORTHING 2084740.939
EASTING 6011886.826
ANGLE Vertical
BEARING ----
PRINTED Sep 30, 08

REMARKS:

COORDINATE SYSTEM: CA State Plane
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

GWL.GPJ GEO_GWL.GDT 8/30/08

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GS FORM: Oakland

BORING RECORD

BORING GS08-1 SHEET 2 OF 4
START DATE Apr 8, 08 ELEVATION 17.6 ft
FINISH DATE Apr 15, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL ABOVE MSL (ft)	SAMPLES: NUMBER	SAMPLES: SYMBOL	SAMPLES: REC & RQD (%) OR REC (%)	SAMPLES: SPT VALUES: BLOWS PER 6"	SAMPLES: SPT VALUES: N	COMMENTS	TEST RESULTS: MOISTURE CONTENT(%)	TEST RESULTS: LIQUID LIMIT (%)	TEST RESULTS: PLASTICITY INDEX (%)	TEST RESULTS: DRY DENSITY, pcf	TEST RESULTS: UNDRAINED STRENGTH, psf
80	Yellowish grey clayey SAND (SC); medium dense, wet; small pockets of reddish- brown sand within sample; gravel		-60			100%	6-13-8		Bag Sample 1-3a; Fines Content- 33%, Gravel Content- 20%					
	Yellowish grey sandy CLAY (CL) and interbedded gravel (3/8" max) and lens of red brown coarse sand		-65	S1-2						33				
85	Yellowish brown CLAY with sand (CL); high plasticity, stiff, wet								Pocket Pen: 1.25 - 1.5 tsf; consolidation; organic content- 1.8%	45	45	28	89 76.2	1468
			-70	S1-3					Only pushed 1.5'					
90	Yellow brown silty SAND (SM); very dense, moist, 20% low plasticity fines		-75											
95	Yellowish brown SAND with silt (SM); fine - medium grained sand, well graded, medium dense, streaks of reddish brown sand interbedded, moist					100%	27-50 (5.5")							
100			-80											
			-85											
105	Dark grayish brown SAND with silt (SM); wet, loose, medium - fine grained sand					75%	13-22-26							
110			-90											
			-95											
115	Dark yellowish brown SAND with silt (SM); fine - medium grained, interbedded orange brown streaks of sand, medium dense, wet					100%	11-25-35							
120			-100											
	Old Bay Deposits: Dark greenish grey CLAY (CH); very stiff, high plasticity, moist, trace sand		-105											
125				S1-4		100%	0-0-7		Pocket pen: 1.5 - 1.75 tsf					
			-110											
130				S1-5		100%			Pocket pen: 2 tsf; consolidation; organic content- 3.3%	56.9	94	67	68.4	502
			-115											
135														
			-120											
140	Dark greenish grey CLAY with sand (CL); very stiff, moist, 20% sand			S1-6		2/2"			consolidation	24			102.2	
			-125						Pocket pen: 2.75 - 3 tsf	22	47	32	106.4	3478
145	Cutting have yellow brown sandy CLAY with OBM clay													
			-130											
150						100%	14-13-32							

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

NORTHING 2084740.939
EASTING 6011886.826
ANGLE Vertical
BEARING ----
PRINTED Sep 30, 08

REMARKS:

COORDINATE SYSTEM: CA State Plane
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM: Oakland

BORING RECORD

BORING GS08-1 SHEET 3 OF 4
START DATE Apr 8, 08 ELEVATION 17.6 ft
FINISH DATE Apr 15, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES NUMBER	SAMPLES SYMBOL	SAMPLES REC & RQD (%) OR REC (%)	SAMPLES SPT VALUES BLOWS PER 6"	SAMPLES SPT VALUES N	COMMENTS	TEST RESULTS MOISTURE CONTENT(%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTICITY INDEX (%)	TEST RESULTS DRY DENSITY, pcf	TEST RESULTS UNDRAINED STRENGTH, psf
	Orange brown SAND with clay (SC); medium dense, wet		-135						Bag Sample 1-3b; Pocket Pen: 2 tsf					
	Light grayish yellow CLAY (CH); very stiff													
155	Dark orange brown sandy CLAY (CL); stiff, moist		-140											
160	Dark orange brown SAND with clay (SC); fine - medium grained, medium dense, moist, 15% medium plasticity fines		-145			100%	25-50/4"							
165			-150											
170	Dark greenish grey SILT with some clay (MH); medium stiff, moist, low plasticity		-155			100%	7-16-16							
	Dark greenish grey SILT with clay and trace gravel (ML); reddish-brown angular gravel													
175			-160											
180	Dark grey clayey SILT (ML); stiff, moist, interbedded layers of reddish-brown SILT with clay, very stiff, low plasticity		-165			100%	10-15-15							
185			-170											
190	Yellowish brown silty CLAY (CL); stiff		-175			NC	4-12-16							
195			-180											
200	Yellowish to reddish brown clayey gravelly SAND (SC); fine - coarse grained sand, fine gravel (1" max), medium dense [weathered bedrock with sandstone and chert fragments]		-185			5"/36"			Bag Sample 1-4					
205			-190											
210	Yellowish brown clayey gravelley SAND (SC); fine - coarse grained sand, fine gravel, less gravel size pieces, dense [weather bedrock]		-195			80%	20-25-22		Bag Sample 1-5					
215			-200											
220	Yellowih to reddish brown sandy CLAY (CL); fine grained sand, dense [weathered bedrock, fine grained sandstone]		-205			100%	15-16-19		Bag Sample 1-6					
225														

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

NORTHING 2084740.939
EASTING 6011886.826
ANGLE Vertical
BEARING ----
PRINTED Sep 30, 08

REMARKS:

COORDINATE SYSTEM: CA State Plane
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM: Oakland

BORING RECORD

BORING GS08-1 SHEET 4 OF 4
START DATE Apr 8, 08 ELEVATION 17.6 ft
FINISH DATE Apr 15, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES: NUMBER	SAMPLES: SYMBOL	SAMPLES: REC & RQD (%) OR REC (%)	SAMPLES: SPT VALUES: BLOWS PER 6"	SAMPLES: SPT VALUES: N	COMMENTS	TEST RESULTS: MOISTURE CONTENT(%)	TEST RESULTS: LIQUID LIMIT (%)	TEST RESULTS: PLASTICITY INDEX (%)	TEST RESULTS: DRY DENSITY, pcf	TEST RESULTS: UNDRAINED STRENGTH, psf
			-210											
	Dark grey Shale (Bedrock); soft, laminated, slightly weathered with very thin laminations and fractures.					100%	50/4"		Drilling becomes difficult; rig chatters; down pressure greater than 400 psi					
	Boring Terminated @ 229.5'													

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

NORTHING 2084740.939
EASTING 6011886.626
ANGLE Vertical
BEARING ----
PRINTED Sep 30, 08

REMARKS:

COORDINATE SYSTEM: CA State Plane
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

G:\WG\WG1099\GEOSYNTEC\GDT 9/30/08 08:04:00 JAB

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GS FORM: Oakland

BORING RECORD

BORING GS08-2 SHEET 1 OF 2
START DATE Apr 7, 08 ELEVATION 28.9 ft
FINISH DATE Apr 8, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION 5 Beatty Ave, Brisbane, California
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES NUMBER	SAMPLES SYMBOL	SAMPLES REC & RQD (%) OR REC (%)	SAMPLES SPT VALUES BLOWS PER 6"	SAMPLES SPT VALUES N	COMMENTS	TEST RESULTS MOISTURE CONTENT(%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTICITY INDEX (%)	TEST RESULTS DRY DENSITY, pcf	TEST RESULTS UNDRAINED STRENGTH, psf
0	Dark brown gravel (GC); dry								Photo 1					
5	Dark brown clayey SAND (SC); medium grained sand, moist, pieces of gravel and brick		25	GS08-2a		100%	5-5-9		Environmental sample					
	Dark brown silty clayey SAND with gravel and brick (SC); dry, fissured		20	GS08-2b		100%	3-10-8							
10	Grey/ brown silty CLAY with gravel and brick (CL); moist													
	Yellowish brown silty SAND with clay and gravel (SM); fine - coarse grained sand and		15	GS08-2c		100%	8-10-9							
15	fine gravel, moist								Bag sample 2-1					
20	Dark yellowish brown silty SAND with gravel (SM); fine - coarse gravel, wet		10	GS08-2d		80%	7-8-8		▽					
	Larger gravel in sampler													
25	Dark greenish grey silty SAND with clay (SM); very wet		5			100%	5-5-11							
	REFUSE													
30			0											
35			-5											
40	Young Bay Mud: Dark blackish grey CLAY (CH); very stiff, high plasticity, moist		-10						Photo 2					
45			-15											
	Cutting still showing YBM		-20			NR			Cased to 47'					
50	Dark greenish grey CLAY (CL); high plasticity, moist, with shell fragments			S2-1		100%								
	Dark greenish grey clayey SAND (SC); stiff, fine to medium grained sand, moist, 50% fines		-25				weight of hammer							
55	Dark grey CLAY with sand (CL); fine grained sand and large shell fragments, wet								Bag sample 2-2					
	Dark grey SAND with some medium plasticity fines (SM); wet, fine grained sand		-30	S2-2		100%	0-0-6							
60	Dark grey clayey SAND with trace gravel (SC)													
	Dark greenish grey CLAY (CL); stiff, high plasticity		-35	S2-3		100%								
65	Dark grey clayey SAND (SC); fine grained sand, moist													
			-40											
70	Cuttings: very dark black pockets of clayey fine grained SAND with YBM													
			-45	S2-4		100%								
75														

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

NORTHING 2085178.730
EASTING 6012795.305
ANGLE Vertical
BEARING ------
PRINTED Sep 30, 08

REMARKS:

COORDINATE SYSTEM: CA State Plane
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

C:\WLWINNT\Temporary Directory 1 for WG1099.GPJ 9/30/08 WG1099 GS08-2 GEOSYNTEC

Geosyntec consultants
475 14th Street, Suite 450
Oakland, CA 94612
Tel: (510) 836-3034
Fax: (510) 836-3036

GS FORM: Oakland

BORING RECORD

BORING GS08-2 SHEET 2 OF 2
START DATE Apr 7, 08 ELEVATION 28.9 ft
FINISH DATE Apr 8, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES NUMBER	SAMPLES SYMBOL	SAMPLES REC & RQD (%) OR REC (%)	SAMPLES SPT VALUES BLOWS PER 6"	SAMPLES SPT VALUES N	COMMENTS	TEST RESULTS MOISTURE CONTENT(%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTICITY INDEX (%)	TEST RESULTS DRY DENSITY, pcf	TEST RESULTS UNDRAINED STRENGTH, psf
80	Dark grey silty SAND (SM); medium dense, very wet		-50			90%	20-27-28		Fines Content- 17%, Gravel Content- 0%					
85	Orange brown clayey SAND (SC); medium dense, fine - medium grained sand; interbeded SM-CL, medium plasticity fines		-55			100%	10-11-11		Bag sample 2-3; Fines Content- 43%, Gravel Content- 0%					
90	Yellowish brown sandy CLAY (CL); stiff, fine - medium grained sand		-60			100%	6-8-9							
95	Yellowish brown CLAY with red blocky gravel (CL); very stiff, moist		-65			100%	7-7-6		Bag sample 2-4					
100	Brownish yellow silty SAND (SM); interbedded coarse sand and silty sand, moist, very dense		-70	S2-5		100%	26-40-50/4 5"		Rig sounds like it is hitting dense coarse sands Bag sample 2-5					
105	Yellowish brown silty GRAVEL (GM); very stiff, high plasticity clay, 3/9" max		-75			100%	50/4"		Bag sample 2-6					
110			-80											
115	Weathered bedrock [siltstone], very dense, moist		-85			100%	50/3 5"							
120			-90											
125			-95				100/1"							
	Boring terminated @ 125.5'													

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

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PRINTED Sep 30, 08

REMARKS:

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GWLAND LOG WG1099.GPJ GEOSYNTEC.GDT 9/30/08

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GS FORM: Oakland

BORING RECORD

BORING GS08-3 SHEET 1 OF 4
START DATE Apr 7, 08 ELEVATION 28.6 ft
FINISH DATE Apr 10, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION 5 Beatty Ave, Brisbane, California
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES NUMBER	SAMPLES SYMBOL	SAMPLES REC & RQD (%) OR REC (%)	SAMPLES SPT VALUES BLOWS PER 6"	SAMPLES SPT VALUES N	COMMENTS	TEST RESULTS MOISTURE CONTENT(%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTICITY INDEX (%)	TEST RESULTS DRY DENSITY, pcf	TEST RESULTS UNDRAINED STRENGTH, psf
0	Yellowish brown silty SAND (SM); fine to medium grained sand with few coarse grains and few fine gravel, dry		25											
5	Dark yellowish brown silty gravelly SAND (SM); fine to coarse grained sand and fine gravel with some nonplastic fines, moist			GS08-3a		90%	16-11-10							
10	Dark brownish grey as per 5' with brick (FILL), clayey sand lends @ 7'		20			100%	27-50		Refusal with continuous sampler at 7' due to concrete					
	Grey sandy GRAVEL (GC); dense, fine to coarse sand and gravel					10%	50/5"		Drilled to 10' and sampled with MC					
15	Grey clean SAND (SP); poorly graded, fine to medium grained ▽		15			50%	5-6-4		Refusal @ 11 with MC Rig chattering ▽					
	REFUSE (plastic, glass, black matrix)		10											
20														
25			5											
30			0			20%	10-9-5							
35			-5											
40			-10			100%	6-5-1		Sampler sunk very quickly					
	Young Bay Mud: Blueish grey fat CLAY (CH); high plasticity, very soft, wet		-15						Borehole cased to 44'					
45	Gravel at top of shelby tube			S3-1		95%			Pocket pen: 1 tsf; consolidation; organic content- 5.0%		67	37		
	Dark blueish grey silty CLAY (CH); very stiff, moist, with organics		-20											
50														
55	YBM: Dark blueish grey lean silty CLAY (CH); shell fragments		-25	S3-2		100%			Pocket pen: 1 tsf; consolidation		46	21		
60	Sand in cuttings		-30											
			-35											
65	Dark grey silty SAND (SM); moist, pockets of yellowish brown silty SAND, medium dense			S3-3		100%	14-20-21							
70	Yellowish brown SAND with some silt (SM); medium dense, moist		-40	S3-4		100%	10-7-11							
			-45			100%	6-11-13							
75														

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

NORTHING 2083678.298
EASTING 6012564.614
ANGLE Vertical
BEARING -----
PRINTED Sep 30, 08

REMARKS:

COORDINATE SYSTEM: CA State Plane
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM: Oakland

BORING RECORD

BORING GS08-3 | SHEET 2 OF 4
START DATE Apr 7, 08 | ELEVATION 28.6 ft
FINISH DATE Apr 10, 08 | DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES NUMBER	SAMPLES SYMBOL	SAMPLES REC & RQD (%) OR REC (%)	SPT VALUES BLOWS PER 6"	SPT VALUES N	COMMENTS	TEST RESULTS MOISTURE CONTENT(%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTICITY INDEX (%)	TEST RESULTS DRY DENSITY, pcf	TEST RESULTS UNDRAINED STRENGTH, psf
80	greensih yellow silty SAND (SM); fine - medium grained sand, 35% fines		-50			100%	23-32-40		Bag sample 3-1; Fines Content- 21%, Gravel Content- 0%					
	Lens of red Gravel, coarse Sand and shells													
	Grey clayey SAND (SC); wet													
85			-55			100%	2-2-2							
	Yellowish grey SAND with silt (SM); fine grained sand, wet, less denser than previous sample, 40% fines								Bag sample 3-2 (84'-85'); Fines Content- 36%, Gravel Content- 0%					
90	Dark yellowish grey/ orange brown silty SAND (SM); fine - medium grained sand, moist, medium dense		-60			100%	14-14-26							
95	Dark greyish brown SAND with silt (SM); moist, medium dense, 20% fines		-65			60%	18-27-29		Bag sample 3-3 (94.5'-95.5')					
100	Old Bay Deposits: Dark greenish blue clayey SILT with trace sand (ML); fine grained sand Greenish blue grey clayey SILT (ML); stiff		-70			100%	4-8-11							
105	Dark greenish grey CLAY with some silt (CH); moist, very stiff, high plasticity		-75	S3-5		100%	3-5-10		Pocket pen: 1.75 tsf					
110	Lens at top of shelby: Brownish orange SAND with clay (SC); fine - medium sand, wet Greenish grey CLAY (CH); very stiff, moist, high plasticity		-80	S3-6		100%			Pocket pen: 1.75 tsf; consolidation	48.2 48.4	71	43	73.1 72.4	1783
115	Grey lean clayey SAND (SC) with pockets of lean clay and silty sand; very wet, very dense, fine grained sand		-85	S3-7		100%			Consolidation; Fines Content- 90%, Gravel Content- 0%	27.7 28.9	26	10	94.9 94.1	529
120	Orange brown clayey SAND (SC); very wet, very dense, fine grained sand		-90			100%	15-16-21							
	Orange brown SAND with silt and some clay (SM); very wet, fine grained sand													
125			-95											
130	Orange brown SAND with some silt (SM); medium dense, very wet (10-20% fines)		-100			100%	12-25-27		Bag sample 3-4					
135	Colma formation in the toe of the sampler, orange red sand		-105											
	Greenish grey CLAY (CH); stiff, wet		-110											
140	Greyish green clayey SAND (SC); medium grained, moist, dense			S3-8		100%	10-17-23							
145			-115											
150			-120			100%	21-26-34							

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

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REMARKS:

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GWENG LOG WG1099.GPJ GEOSYN30.GDT 9/30/08

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GS FORM: Oakland

BORING RECORD

BORING GS08-3 SHEET 3 OF 4
START DATE Apr 7, 08 ELEVATION 28.6 ft
FINISH DATE Apr 10, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES NUMBER	SAMPLES SYMBOL	SAMPLES REC & RQD (%) OR REC (%)	SPT VALUES BLOWS PER 6"	SPT VALUES N	COMMENTS	TEST RESULTS MOISTURE CONTENT(%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTICITY INDEX (%)	TEST RESULTS DRY DENSITY, pcf	TEST RESULTS UNDRAINED STRENGTH, psf
155	Reddish brown with black grained SAND with silt (SM); fine - medium grained, dense, wet Greenish grey CLAY (CH); high plasticity, stiff		-125						Saw the sand to clay transition in the toe of the sampler					
160	Reddish brown silty SAND with trace clay (SM); medium dense, moist		-130			100%	49-36-33		First 3" of sample were OBM					
165			-135											
170	Dark grey SAND with silt (20% fines) (SM); fine - medium grained, medium dense, wet		-140			100%	45-50		Drill rig making rattling sounds					
175			-145											
180			-150			NC	10-18-20							
185			-155											
190	Orange brown SAND with 20% low plasticity fines (SM); fine - medium grained same, very dense		-160			100%	50/5.5"							
195	Red blocky rock in cuttings (Chert)		-165											
200	Light yellow grey silty CLAY (CL); very stiff, moist, low - medium plasticity		-170			100%	13-15-17		Bag sample 3-5					
205			-175											
210	Orange brown CLAY with trace silt (CH); very stiff, high plasticity		-180	S3-9		88%	27-33-47		Pocket pen would not go into sample					
215	Dark greenish grey clayey SILT (ML); medium plasticity, moist, interbedded pieces of white gravel (very soft rock)		-185											
220	Dark greenish grey SILT with clay (ML); low plasticity, medium stiff, moist		-190			100%	9-12-19							
225			-195											

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

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GWLOG_WG1099.GPJ GEOSYNTEC.GDT 9/30/08

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GS FORM: Oakland

BORING RECORD

BORING GS08-3 SHEET 4 OF 4
START DATE Apr 7, 08 ELEVATION 28.6 ft
FINISH DATE Apr 10, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES: NUMBER	SAMPLES: SYMBOL	SAMPLES: REC & RQD (%) OR REC (%)	SAMPLES: SPT VALUES: BLOWS PER 6"	SAMPLES: SPT VALUES: N	COMMENTS	TEST RESULTS: MOISTURE CONTENT(%)	TEST RESULTS: LIQUID LIMIT (%)	TEST RESULTS: PLASTICITY INDEX (%)	TEST RESULTS: DRY DENSITY, pcf	TEST RESULTS: UNDRAINED STRENGTH, psf
230	Upper portion of sample: grey sandy lean CLAY (CL); bottom portion: clayey SAND (SC) with trace gravel		-200	S3-10		66%			Consolidation; Fines Content- 66%, Gravel Content- 3% Pocket pen: 1.5 - 2 tsf; consolidation	29.7 19.4	35 40	17 22	93.1 110.9	
235	Brown lean clayey SAND (SC) with trace gravel		-205											
	Very dark grey sandy SILT (ML); medium plasticity, stiff, moist		-210	S3-11		100%	23-25-29		Pocket pen would not go into sample					
240														
245			-215											
250	Dark grey CLAY with some silt and few pieces of gravel (CL); high plasticity, wet		-220	S3-12		100%			Pocket pen: 2 tsf	44.6	45	27	76.5	590
255			-225											
	Dark greenish grey CLAY with small pieces of red brown rock (CH); high plasticity, very stiff		-230			33%	15-24-21							
260														
265			-235											
	Weathered bedrock Borehole terminated @ 269.5'		-240			100%	50/4"		Bag sample 3-20					

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

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GEOSYNTEC CONSULTANTS GS BORING LOG WG1099.GPJ 9/30/08

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GS FORM: Oakland

BORING RECORD

BORING GS08-4 SHEET 1 OF 4
START DATE Apr 9, 08 ELEVATION 29.7 ft
FINISH DATE Apr 16, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION 5 Beatty Ave, Brisbane, California
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES NUMBER	SAMPLES SYMBOL	SAMPLES REC & RQD (%) OR REC (%)	SAMPLES SPT VALUES BLOWS PER 6"	SAMPLES SPT VALUES N	COMMENTS	TEST RESULTS MOISTURE CONTENT(%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTICITY INDEX (%)	TEST RESULTS DRY DENSITY, pcf	TEST RESULTS UNDRAINED STRENGTH, psf
0	Dark brownish grey GRAVEL with sand (GC); poorly graded, fine to coarse sand													
5	Dark yellowish brown silty SAND with trace gravel (SM); fine to coarse sand, moist, trace fine gravel		25			80%	4-10-9							
10			20			80%	11-22-21							
15	Dark yellowish brown silty gravelly SAND with trace cobbles (SM); fine to coarse sand and gravel with few fine cobbles, medium dense to dense, moist ▽		15			100%	17-18-34		▽					
20	Interlayered dark greenish grey sandy gravelly CLAY (CL); still and moist- wet Dark yellowish brown clayey gravelly SAND (SC); dense, moist- wet, all fine to coarse sand and gravel		10			50%	17-15-13		Core refuse @17', drilled to 20' and sampled					
25	Interbedded clayey gravelly SAND (SC); reddish brown and dark reddish brown sandy gravelly CLAY, fine to corase sand and gravel REFUSE (glass, brick)		5											
30			0											
35			-5											
40	Young Bay Mud: Blueish grey silty CLAY (CH); high plasticity, soft		-10											
45	Greenish grey CLAY with shell fragments (CH); high plasticity, medium stiff		-15	S4-1		100%			Cased to 47'		61	32		
50	Greenish grey CLAY with shell fragments (CH); high plasticity, wet		-20	S4-2		100%			Pocket pen: 1 tsf; consolidation; organic content- 3.0%		59	36		
55	YBM cuttings		-25											
60	Greenish grey CLAY with some shell fragments and pieces of sandstone (CH); high plasticity, wet		-30	S4-3		100%			Pocket pen: 1.25 tsf					
65	Bottom of shelby tube: very dark black coarse silty SAND with some clay (SM) (possible organics)		-35			100%	11-18-25		On 4/9/08 hole was drilled to 65' and left for energy calibration					
70	Small layer of YBM in the top of the sampler, can see the transition between YBM and Sand Sand with 20% low plasticity fines (SM); fine - coarse grained, wet		-40			100%	22-30-30		Bag sample 4-1, E.C. #1					
75	Dark brownish grey SAND with silt (SM);		-45											

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

NORTHING 2084499.657
EASTING 6012677.760
ANGLE Vertical
BEARING ------
PRINTED Sep 30, 08

REMARKS:

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GEOSYNTEC CONSULTANTS.GPJ GEOSYNTEC.GDT 9/30/08

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GS FORM: Oakland

BORING RECORD

BORING GS08-4 SHEET 2 OF 4
START DATE Apr 9, 08 ELEVATION 29.7 ft
FINISH DATE Apr 16, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES: NUMBER	SAMPLES: SYMBOL	SAMPLES: REC & RQD (%) OR REC (%)	SAMPLES: SPT VALUES: BLOWS PER 6"	SAMPLES: SPT VALUES: N	COMMENTS	TEST RESULTS: MOISTURE CONTENT(%)	TEST RESULTS: LIQUID LIMIT (%)	TEST RESULTS: PLASTICITY INDEX (%)	TEST RESULTS: DRY DENSITY, pcf	TEST RESULTS: UNDRAINED STRENGTH, psf
	medium dense, fine - medium grained, wet, 20% fines					100%	27-23-28		Bag sample 4-2, E.C. #2					
80	Brownish grey SAND with silt (SM); medium dense, wet		-50			100%	7-8-14		Bag sample 4-3, E.C. #3; Fines Content- 13%, Gravel Content- 0%					
	Dark yellowish brown clayey SAND (SC); medium loose, wet													
85	Light yellowish grey SAND with silt (SM); wet, medium dense		-55			100%	23-20-16		Bag sample 4-4, E.C. #4					
90	Light yellowish grey SAND with silt (SM); medium - fine grained, very wet, medium dense		-60			50%	12-15-15		Bag sample 4-5, E.C. #5					
95			-65											
100	Dark grey SAND with pieces of gravel, and silt (SM); fine gravel, moist, fine - medium grained sand		-70			100%	34-50/5"		Bag sample 4-6, E.C. #6					
105			-75											
	Coarse sands in cuttings													
110	Yellowish grey SAND with fines (SM); dense, wet, medium to fine grained, low plasticity fines		-80			100%	7-13-18		Bag sample 4-7, E.C. #7; Fines Content- 36%, Gravel Content- 0%					
115			-85											
120	Orange brown SAND with silt (SM); fine to medium grained, medium dense, moist (Colma Formation?)		-90			100%	33-50		Bag sample 4-8, E.C. #8					
125			-95											
130	Dark brownish grey SAND with silt (SM); streaks of orange brown sand, fine grained, moist- wet, medium dense		-100			100%	18-25-28		Bag sample 4-9, E.C. #9					
135			-105											
140	Dark brownish grey SAND with silt (SM); medium to fine grained, dense, wet, streaks of orange brown sand		-110			100%	34-50/5"		E.C. #10					
145			-115											
150			-120											

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

NORTHING 2084499.657
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REMARKS:

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GWLANG LOG WG1099.GPJ GEOSYNTEC.GDT 9/30/08

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GS FORM: Oakland

BORING RECORD

BORING GS08-4 SHEET 3 OF 4
START DATE Apr 9, 08 ELEVATION 29.7 ft
FINISH DATE Apr 16, 08 DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES NUMBER	SAMPLES SYMBOL	SAMPLES REC & RQD (%) OR REC (%)	SAMPLES SPT VALUES BLOWS PER 6"	SAMPLES SPT VALUES N	COMMENTS	TEST RESULTS MOISTURE CONTENT(%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTICITY INDEX (%)	TEST RESULTS DRY DENSITY, pcf	TEST RESULTS UNDRAINED STRENGTH, psf
155	Coarse dark sands with marine clay pieces in cuttings		-125											
160	Greenish grey CLAY with silt (CH); medium stiff, high plasticity		-130			100%	0-0-4		E.C. #11, Pocket pen: 1.5 tsf					
165			-135											
170	Dark greenish grey CLAY with sand (CL); moist, very stiff, medium plasticity (20% sand)		-140											
175	Bottom of sample had fine grained sand		-145	S4-4		100%			Pocket pen: 3 tsf; consolidation; Fines Content- 61%, Gravel Content- 0%	18.7 16.9	34	20	111.7 114.7	4213
	Olive Gray sandy lean CLAY (CL) with change to Bluish gray lean clayey SAND													
180	Blueish gray Sandy SILT (ML)		-150											
185			-155											
190	Top 2" of sample: Dark greenish grey CLAY with little silt (CH); very wet		-160			100%	27-30-39		Bag sample 4-8, E.C. #12					
195	Transition in between is pieces of gravel Orange brown SILT with sand and gravel (ML); coarse grained sand, fine gravel, very stiff, dry (Weathered bedrock?)		-165											
200			-170											
205	Dark grey CLAY (CL); very stiff, moist, low - medium plasticity		-175			100%	7-18-19		Bag sample 4-9, E.C. # 13					
210			-180											
215			-185											
220	Orange brown silty SAND, trace gravel (SM); angular gravel, coarse sand, loose dense, moist, 40% fines		-190			100%	2-13-14		Bag sample 4-10					
225			-195											

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
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OAKLAND LOG WG1099.GPJ GEOSYNTEC.GDT 9/30/08

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GS FORM: Oakland

BORING RECORD

BORING GS08-4 | SHEET 4 OF 4
START DATE Apr 9, 08 | ELEVATION 29.7 ft
FINISH DATE Apr 16, 08 | DATUM MSL
PROJECT Brisbane Landfill
LOCATION
NUMBER WG1099

DEPTH BGS (ft)	MATERIAL DESCRIPTION	SYMBOLIC LOG	EL. ABOVE MSL (ft)	SAMPLES: NUMBER	SAMPLES: SYMBOL	SAMPLES: REC & RQD (%) OR REC (%)	SAMPLES: SPT VALUES: BLOWS PER 6"	SAMPLES: SPT VALUES: N	COMMENTS	TEST RESULTS: MOISTURE CONTENT(%)	TEST RESULTS: LIQUID LIMIT (%)	TEST RESULTS: PLASTICITY INDEX (%)	TEST RESULTS: DRY DENSITY, pcf	TEST RESULTS: UNDRAINED STRENGTH, psf
230	Borehole terminated at 230.5'		-200			100%	50/4.5"							

CONTRACTOR Pitcher
EQUIPMENT CME-55/Failing 1500
DRILL MTHD HSA/ Mud Rotary
DIAMETER 8"
LOGGER JAB REVIEWER FWS

NORTHING 2084499.657
EASTING 6012677.760
ANGLE Vertical
BEARING ------
PRINTED Sep 30, 08

REMARKS:

COORDINATE SYSTEM: CA State Plane
SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

OAKLAND LOG WG1099.GPJ GEOSYNTEC.GDT 8/30/08



APPENDIX E

PREVIOUS GEOTECHNICAL LABORATORY TEST DATA

November 2, 2000
Burns & McDonnell
Brisbane Landfill, California

SMITH-EMERY COMPANY

SEG File No. 1546-2
SEG Report No. 00-685

BRISBANE LANDFILL
ATTERBERG LIMITS RESULTS

Boring No.	Depth (ft.)	Liquid Limit	Plastic Limit	Plasticity Index	USCS Classification
BMC G-1	49'-50'	58.5	24.1	34.4	OH
BMC G-2	27'-29'	26.0	15.0	11.0	CL/ML
BMC G-3	28'-30'	66.0	30.7	35.3	CH
BMC G-4B	67'-69'	82.9	30.4	52.5	CH
BMC G-5	49'-51'	52.0	25.5	26.5	CH
BMC G-6	40'-42'	57.6	22.5	35.1	CH
BMC G-7	53'-55'	54.4	22.7	31.7	CH
BMC G-8	29'-31'	57.1	22.0	35.1	CH
BMC G-9	20'-22'	53.1	22.0	31.1	CH
BMC G-10	20'-22'	54.3	22.6	31.7	CH

November 2, 2000
Burns & McDonnell
Brisbane Landfill, California

SMITH-EMERY COMPANY

SEG File No. 1546-2
SEG Report No. 00-685

BRISBANE LANDFILL
PERMEABILITY TEST RESULTS

BMC G-1 @ 51-53 ft. Falling Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
46.2	40.0	73	83	500	9.40×10^{-8}

BMC G-2 @ 27-29 ft. Falling Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
80.4	75.5	53	57	1000	1.75×10^{-7}

BMC G-3 @ 28-30 ft. Constant Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
78.9	78.7	53	56	1000	1.35×10^{-4}

Note: 83 % shells

BMC G-4B @ 65-67 ft. Falling Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
67.5	62.8	58	63	2300	8.32×10^{-8}

BMC G-4B @ 67-69 ft. Falling Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
72.3	61.4	56	64	2400	7.85×10^{-8}

PERMEABILITY (Cont.)

BMC G-5 @ 49-51 ft. Falling Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
53.7	46.9	69	81	1800	8.69×10^{-8}

BMC G-6 @ 40-42 ft. Falling Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
75.8	61.5	54	58	1500	1.33×10^{-7}

BMC G-7 @ 53-55 ft. Falling Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
51.6	50.3	70	73	2400	8.51×10^{-8}

BMC G-8 @ 29-31 ft. Falling Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
59.0	51.6	65	71	1200	7.83×10^{-8}

BMC G-9 @ 20-22 ft. Falling Head

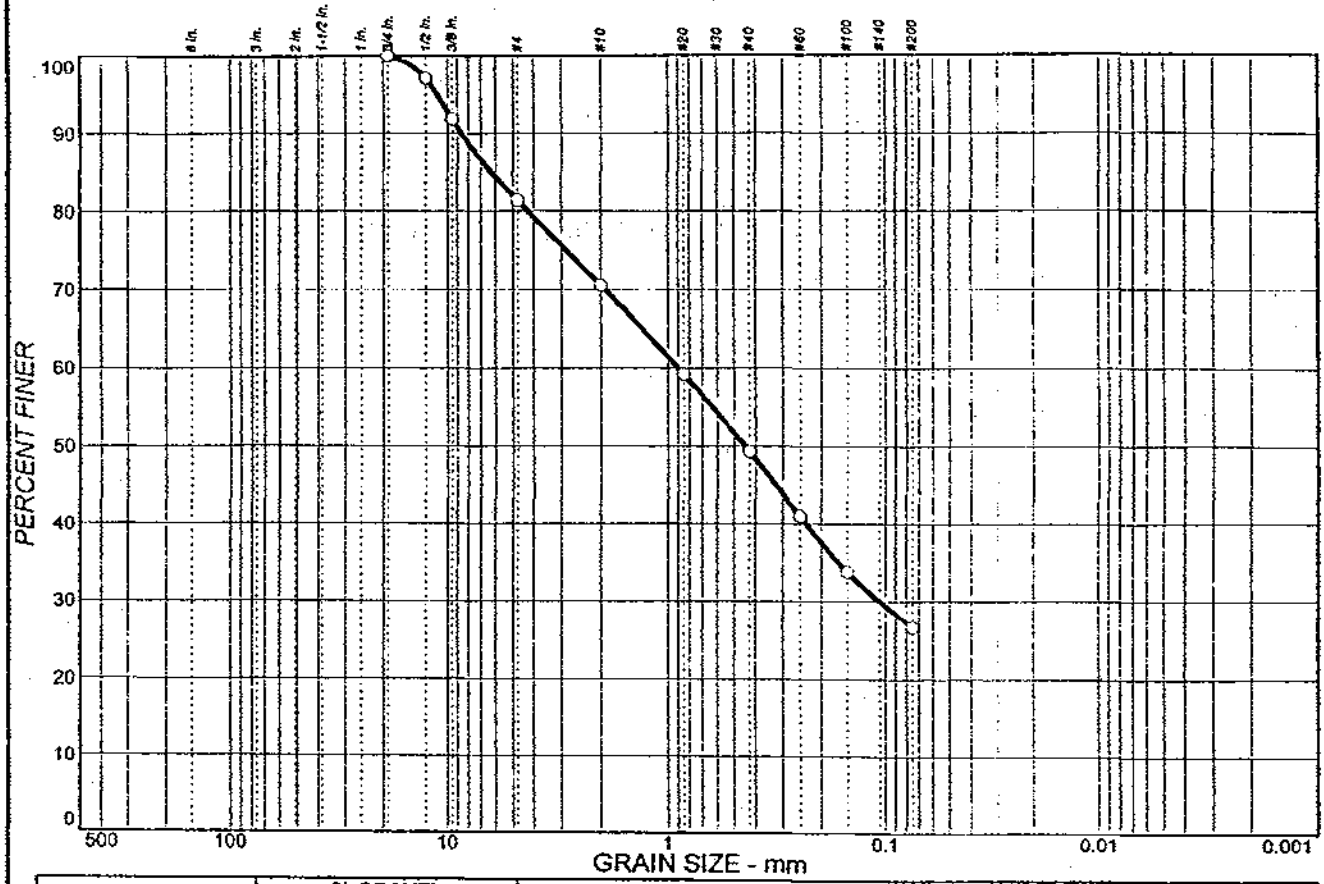
Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability K_{20}° C, avg.
Before Test	After Test	Before Test	After Test		
57.6	52.5	66	70	900	9.95×10^{-8}

PERMEABILITY (Cont.)

BMC G-10 @ 20-22 ft. Falling Head

Moisture Content (%)		Dry Density (pcf)		Surcharge, psf	Coefficient of Permeability $K_{20^\circ C}$, avg.
Before Test	After Test	Before Test	After Test		
64.8	61.6	61	65	900	2.12×10^{-7}

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	18.6	10.9	21.2	22.6	26.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	97.1		
3/8 in.	91.8		
#4	81.4		
#10	70.5		
#20	59.2		
#40	49.3		
#60	41.0		
#100	33.8		
#200	26.7		

* (no specification provided)

Soil Description

Yellow-Brown silty Sand with some gravel and debris

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 6.25 D_{60}= 0.902 D_{50}= 0.445
D_{30}= 0.106 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

F.M.=0.93

Sample No.: G-2 **Source of Sample:** Brisbane Landfill **Date:** 9/4/00
Location: Brisbane Landfill **Elev./Depth:** 2.0'-3.0'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 1

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *2.0'-3.0'*
Description: *G-2,Silty sand with gravel*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *G-2*
Date: *9/4/00* **PL:** *N/A* **LL:** *N/A* **PI:** *N/A*
USCS Classification: *SM* **AASHTO Classification:** *A-2-4(0)*
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	326.15	240.45
Tare =	0.00	0.00
Dry sample weight =	326.15	240.45

Minus #200 from wash= *26.3 %*
Tare for cumulative weight retained= *.00*

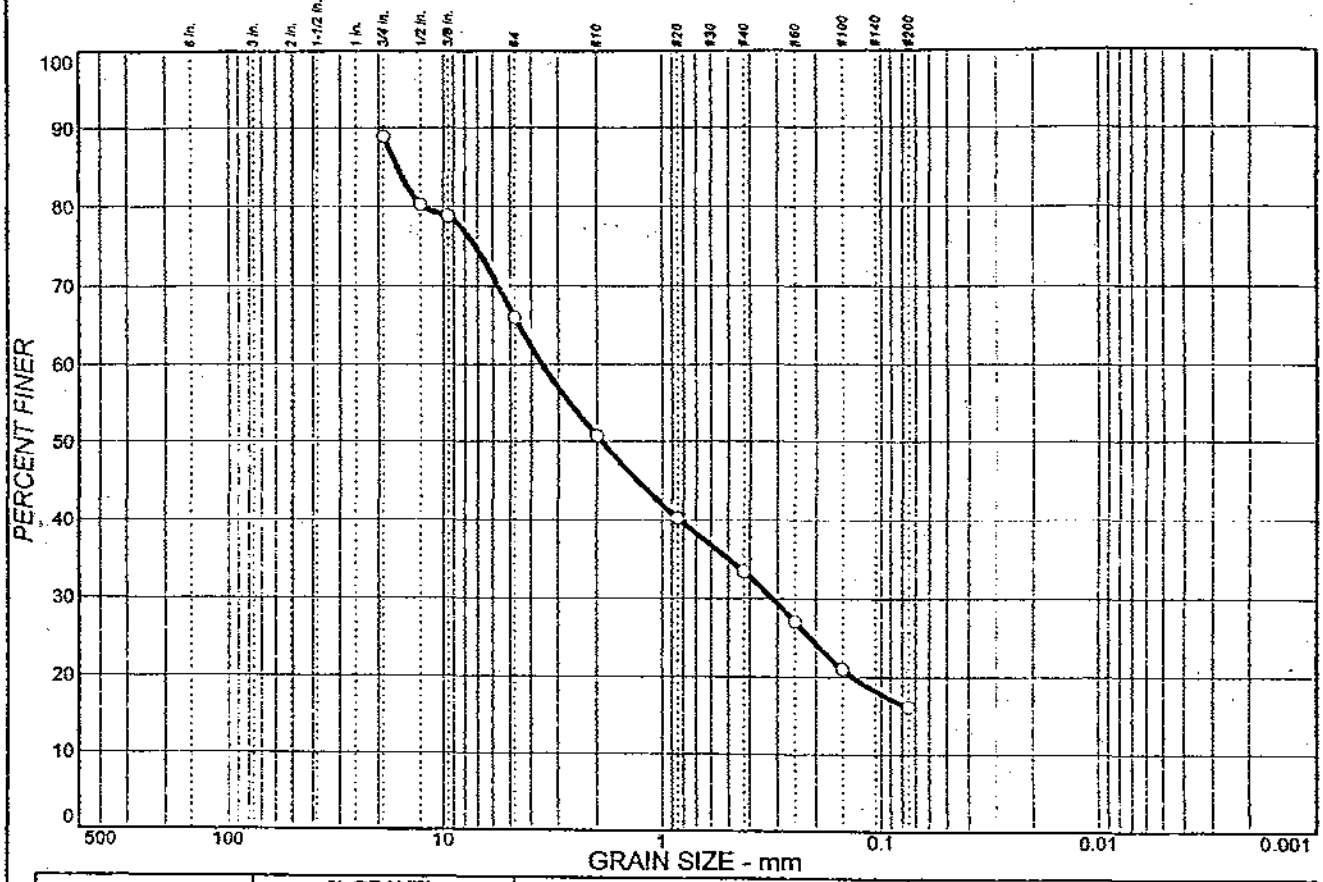
Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	0.00	100.0
1/2 inch	9.63	97.1
3/8 inch	26.92	91.8
# 4	60.79	81.4
# 10	96.25	70.5
# 20	133.11	59.2
# 40	165.42	49.3
# 60	192.50	41.0
# 100	215.99	33.8
# 200	239.12	26.7

Fractional Components

Gravel/Sand based on *#4*
Sand/Fines based on *#200*
% + 3" = **% GRAVEL =** *18.6* **(% coarse =** **% fine =** *18.6*)
% SAND = *54.7* **(% coarse =** *10.9* **% medium =** *21.2* **% fine =** *22.6*)
% FINES = *26.7*

D_{85}= *6.25* D_{60}= *0.90* D_{50}= *0.45*
D_{30}= *0.11*

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
		23.0	15.2	17.3	17.3	16.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	88.9		
1/2 in.	80.2		
3/8 in.	78.8		
#4	65.9		
#10	50.7		
#20	40.2		
#40	33.4		
#60	27.1		
#100	21.0		
#200	16.1		

* (no specification provided)

Soil Description

Light Brown Silty Sand with Gravel and Organics

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 16.4 D_{60}= 3.55 D_{50}= 1.90
D_{30}= 0.316 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

F.M.=1.45

Sample No.: G-3 **Source of Sample:** Brisbane Landfill **Date:** 9/4/00
Location: Brisbane Landfill **Elev./Depth:** 0.0'-1.0'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 2

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *0.0'-1.0'*
Description: *Light Brown Silty Sand with Gravel and Organics*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *G-3*
Date: *9/4/00* PL: *N/A* LL: *N/A* PI: *N/A*
USCS Classification: *SM* AASHTO Classification: *A-1-b*
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	380.62	320.52
Tare =	0.00	0.00
Dry sample weight =	380.62	320.52

Minus #200 from wash= 15.8 %
Tare for cumulative weight retained= .00

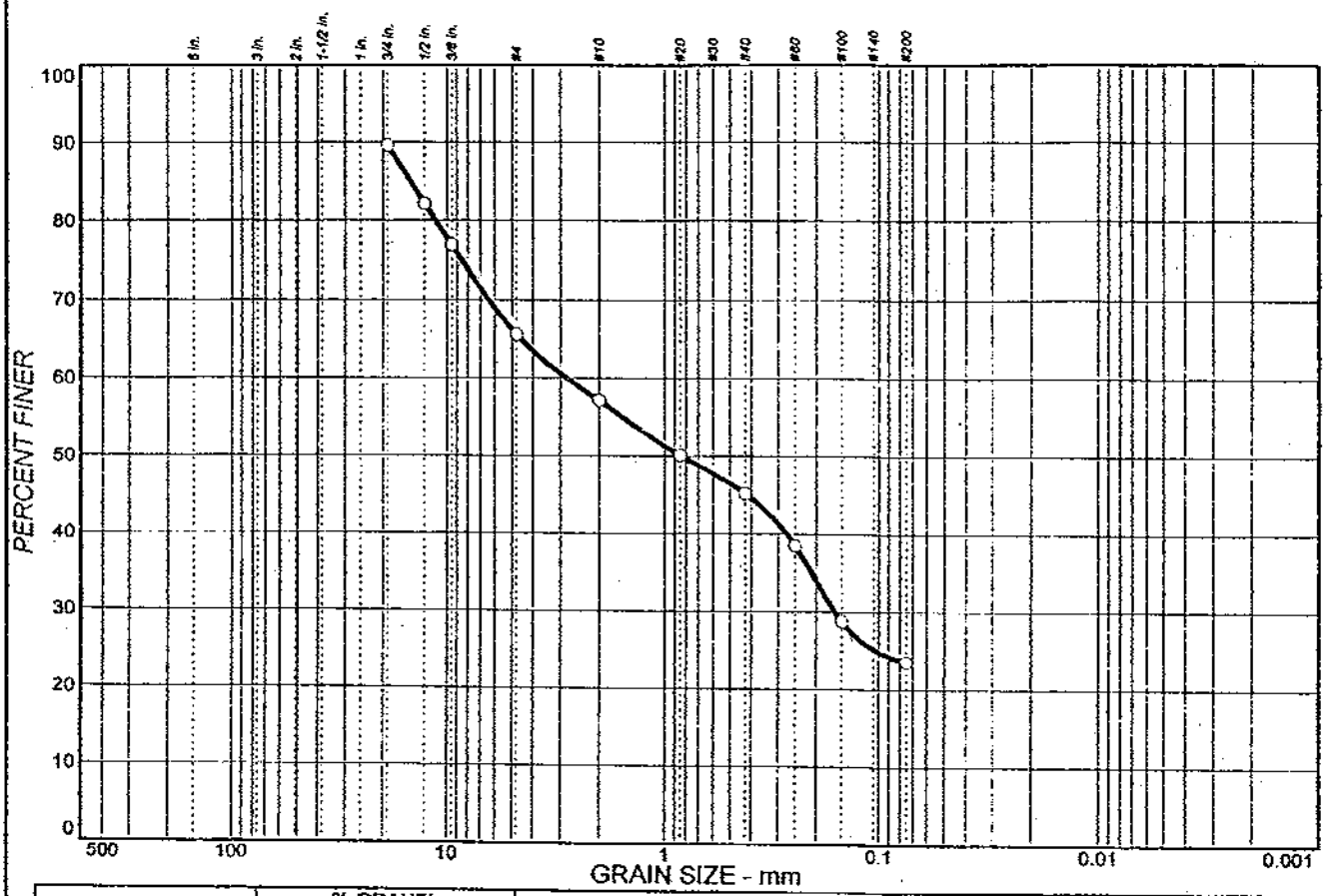
Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	42.15	88.9
1/2 inch	75.20	80.2
3/8 inch	80.90	78.8
# 4	129.93	65.9
# 10	187.65	50.7
# 20	227.52	40.2
# 40	253.35	33.4
# 60	277.57	27.1
# 100	300.63	21.0
# 200	319.39	16.1

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL = (% coarse = % fine = 23.0)
% SAND = 49.8 (% coarse = 15.2 % medium = 17.3 % fine = 17.3)
% FINES = 16.1

D_{85}= 16.43 D_{60}= 3.55 D_{50}= 1.90
D_{30}= 0.32

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
		24.0	8.5	11.9	21.6	23.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	89.6		
1/2 in.	82.2		
3/8 in.	76.9		
#4	65.6		
#10	57.1		
#20	50.1		
#40	45.2		
#60	38.5		
#100	28.8		
#200	23.6		

* (no specification provided)

Soil Description

Olive Brown Clayey Sand with Gravel

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 14.8 D_{60}= 2.81 D_{50}= 0.838
D_{30}= 0.161 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-1-b

Remarks

USCS Designation based on visual manual procedure (ASTM D2488)
F.M.=1.39

Sample No.: P-1 **Source of Sample:** Brisbane Landfill **Date:** 9-4-00
Location: Brisbane Landfill **Elev./Depth:** 10.0'-12.0'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 3

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *10.0'-12.0'*
Description: *Olive Brown Clayey Sand with Gravel*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *P-1*
Date: *9-4-00* **PL:** *N/A* **LL:** *N/A* **PI:** *N/A*
USCS Classification: *SC* **AASHTO Classification:** *A-1-b*
Testing Remarks: *USCS Designation based on visual manual procedure (ASTM D2488)*

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	342.89	262.14
Tare =	0.00	0.00
Dry sample weight =	342.89	262.14

Minus #200 from wash= 23.5 %
Tare for cumulative weight retained= .00

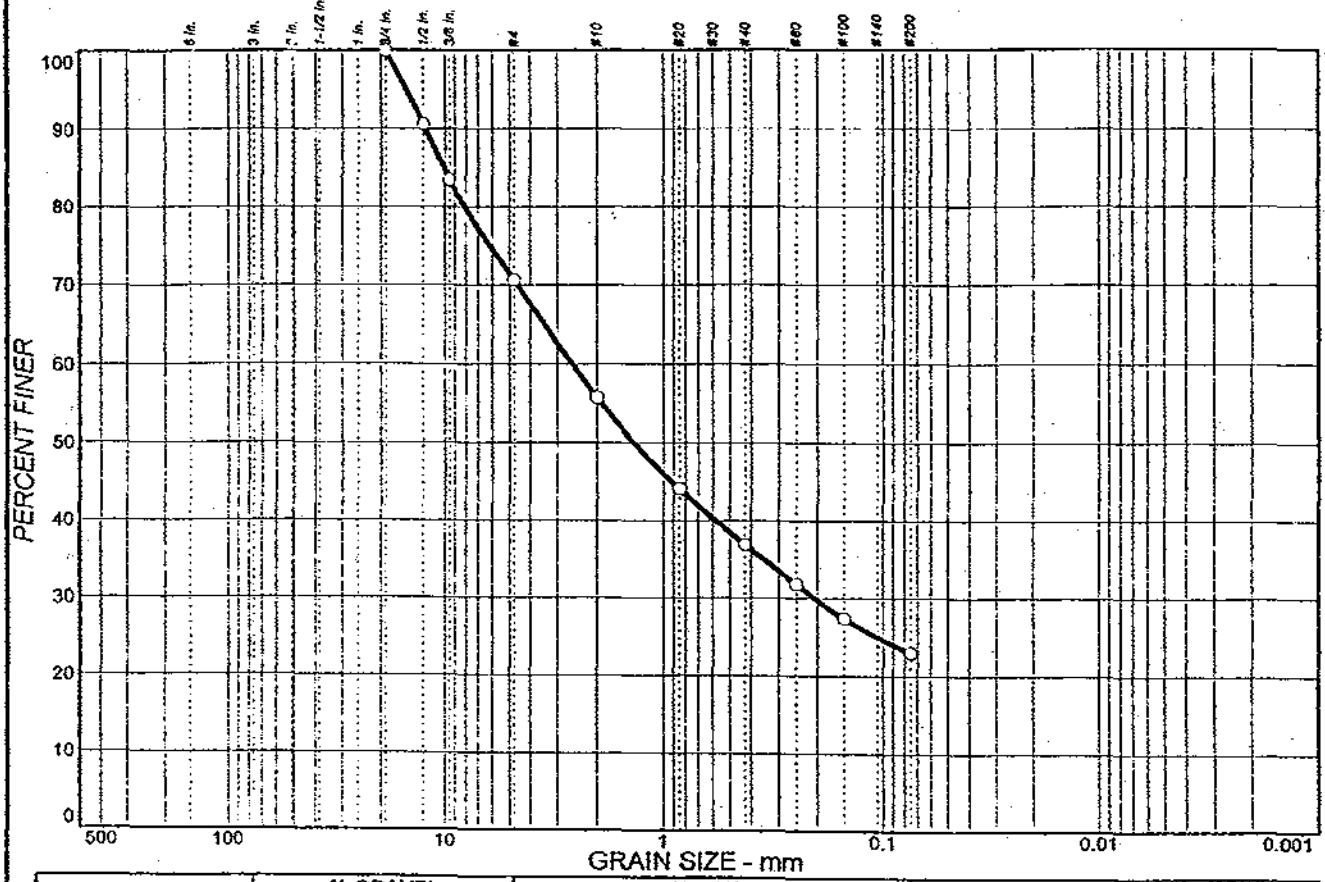
Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	35.53	89.6
1/2 inch	61.19	82.2
3/8 inch	79.07	76.9
# 4	117.85	65.6
# 10	147.06	57.1
# 20	171.16	50.1
# 40	187.90	45.2
# 60	210.98	38.5
# 100	244.26	28.8
# 200	261.90	23.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL = (% coarse = % fine = 24.0)
% SAND = 42.0 (% coarse = 8.5 % medium = 11.9 % fine = 21.6)
% FINES = 23.6

D_{85}= 14.80 D_{60}= 2.81 D_{50}= 0.84
D_{30}= 0.16

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	29.4	14.8	18.9	13.9	23.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	90.6		
3/8 in.	83.5		
#4	70.6		
#10	55.8		
#20	44.1		
#40	36.9		
#60	31.8		
#100	27.4		
#200	23.0		

* (no specification provided)

Soil Description

Gray Brown Clayey Silty Sand With Gravel

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 10.1 D_{60}= 2.58 D_{50}= 1.36
D_{30}= 0.205 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-1-b

Remarks

USCS Designation based on visual manual procedure (ASTM D2488)
F.M.=1.18

Sample No.: P-2 **Source of Sample:** Brisbane Landfill **Date:** 9-4-00
Location: Brisbane Landfill **Elev./Depth:** 5.0'-7.0'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 4

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *5.0'-7.0'*
Description: *Gray Brown Clayey Silty Sand With Gravel*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *P-2*
Date: *9-4-00* **PL:** *N/A* **LL:** *N/A* **PI:** *N/A*
USCS Classification: *SC-SM* **AASHTO Classification:** *A-1-b*
Testing Remarks: *USCS Designation based on visual manual procedure (ASTM D2488)*

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	301.50	232.31
Tare =	0.00	0.00
Dry sample weight =	301.50	232.31

Minus #200 from wash= 22.9 %
Tare for cumulative weight retained= .00

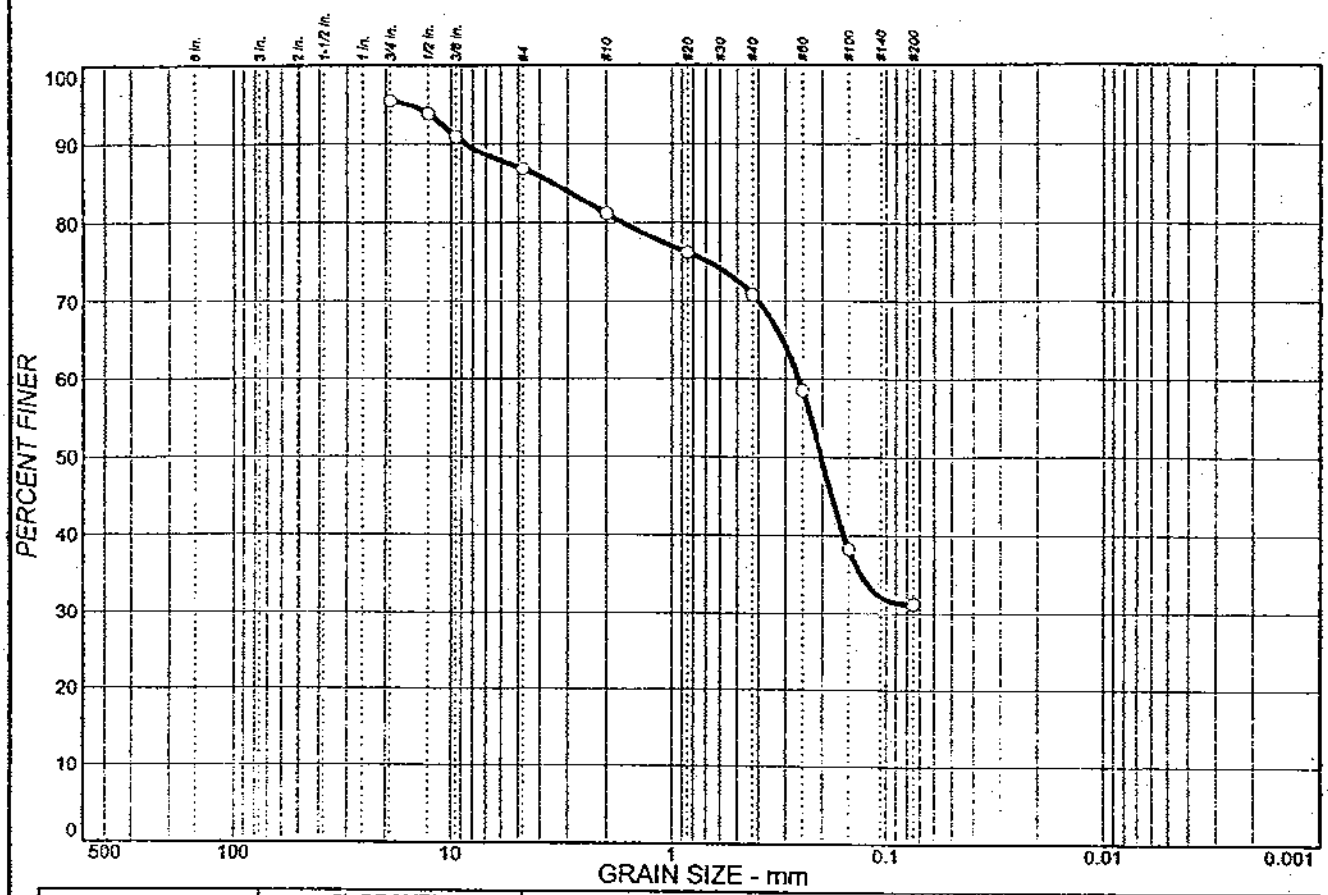
Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	0.00	100.0
1/2 inch	28.23	90.6
3/8 inch	49.64	83.5
# 4	88.64	70.6
# 10	133.28	55.8
# 20	168.62	44.1
# 40	190.30	36.9
# 60	205.57	31.8
# 100	218.85	27.4
# 200	232.30	23.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL = 29.4 (% coarse = % fine = 29.4)
% SAND = 47.6 (% coarse = 14.8 % medium = 18.9 % fine = 13.9)
% FINES = 23.0

D_{85}= 10.15 D_{60}= 2.58 D_{50}= 1.36
D_{30}= 0.21

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
		8.6	5.6	10.4	39.6	31.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	95.4		
1/2 in.	93.8		
3/8 in.	90.9		
#4	86.8		
#10	81.2		
#20	76.2		
#40	70.8		
#60	58.5		
#100	38.3		
#200	31.2		

* (no specification provided)

Soil Description

Gray Brown Silty Sand With Some Gravel

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 3.49 D_{60}= 0.261 D_{50}= 0.203
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

F.M.=0.89

Sample No.: P-4 **Source of Sample:** Brisbane Landfill **Date:** 9-4-00
Location: Brisbane Landfill **Elev./Depth:** 5'-7'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 5

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *5'-7'*
Description: *Gray Brown Silty Sand With Some Gravel*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *P-4*
Date: *9-4-00* PL: *N/A* LL: *N/A* PI: *N/A*
USCS Classification: *SM* AASHTO Classification: *A-2-4(0)*
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	350.36	241.38
Tare =	0.00	0.00
Dry sample weight =	350.36	241.38

Minus #200 from wash= *31.1 %*
Tare for cumulative weight retained= *.00*

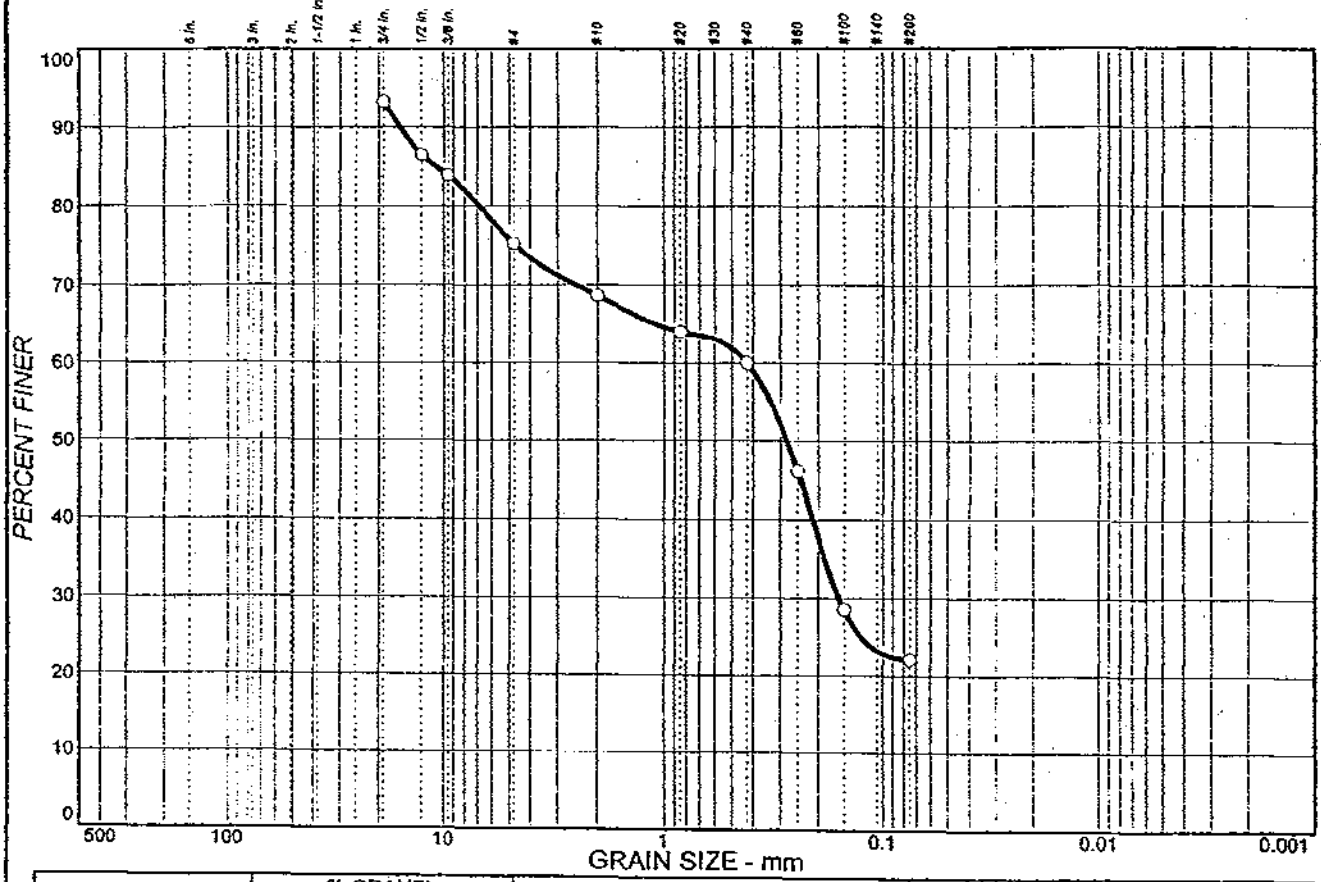
Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	*16.02*	*95.4*
1/2 inch	*21.57*	*93.8*
3/8 inch	*31.92*	*90.9*
# 4	*46.10*	*86.8*
# 10	*65.72*	*81.2*
# 20	*83.28*	*76.2*
# 40	*102.47*	*70.8*
# 60	*145.53*	*58.5*
# 100	*216.33*	*38.3*
# 200	*241.22*	*31.2*

Fractional Components

Gravel/Sand based on *#4*
Sand/Fines based on *#200*
% + 3" = % GRAVEL = (% coarse = % fine = *8.6*)
% SAND = *55.6* (% coarse = *5.6* % medium = *10.4* % fine = *39.6*)
% FINES = *31.2*

D_{85}= *3.49* D_{60}= *0.26* D_{50}= *0.20*

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
		18.0	6.7	8.6	37.9	22.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	93.3		
1/2 in.	86.5		
3/8 in.	83.9		
#4	75.3		
#10	68.6		
#20	64.0		
#40	60.0		
#60	46.2		
#100	28.5		
#200	22.1		

* (no specification provided)

Soil Description

Gray Brown Si-Sa With Gravel

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 10.9 D_{60}= 0.425 D_{50}= 0.280
D_{30}= 0.159 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

F.M.=1.19

Sample No.: P-6 **Source of Sample:** Brisbane Landfill **Date:** 9-4-00
Location: Brisbane Landfill **Elev./Depth:** 10'-12'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 6

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *10'-12'*
Description: *Gray Brown Si-Sa With Gravel*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *P-6*
Date: *9-4-00* PL: *N/A* LL: *N/A* PI: *N/A*
USCS Classification: *SM* AASHTO Classification: *A-2-4(0)*
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	353.99	276.44
Tare =	0.00	0.00
Dry sample weight =	353.99	276.44

Minus #200 from wash= *21.9* %
Tare for cumulative weight retained= *.00*

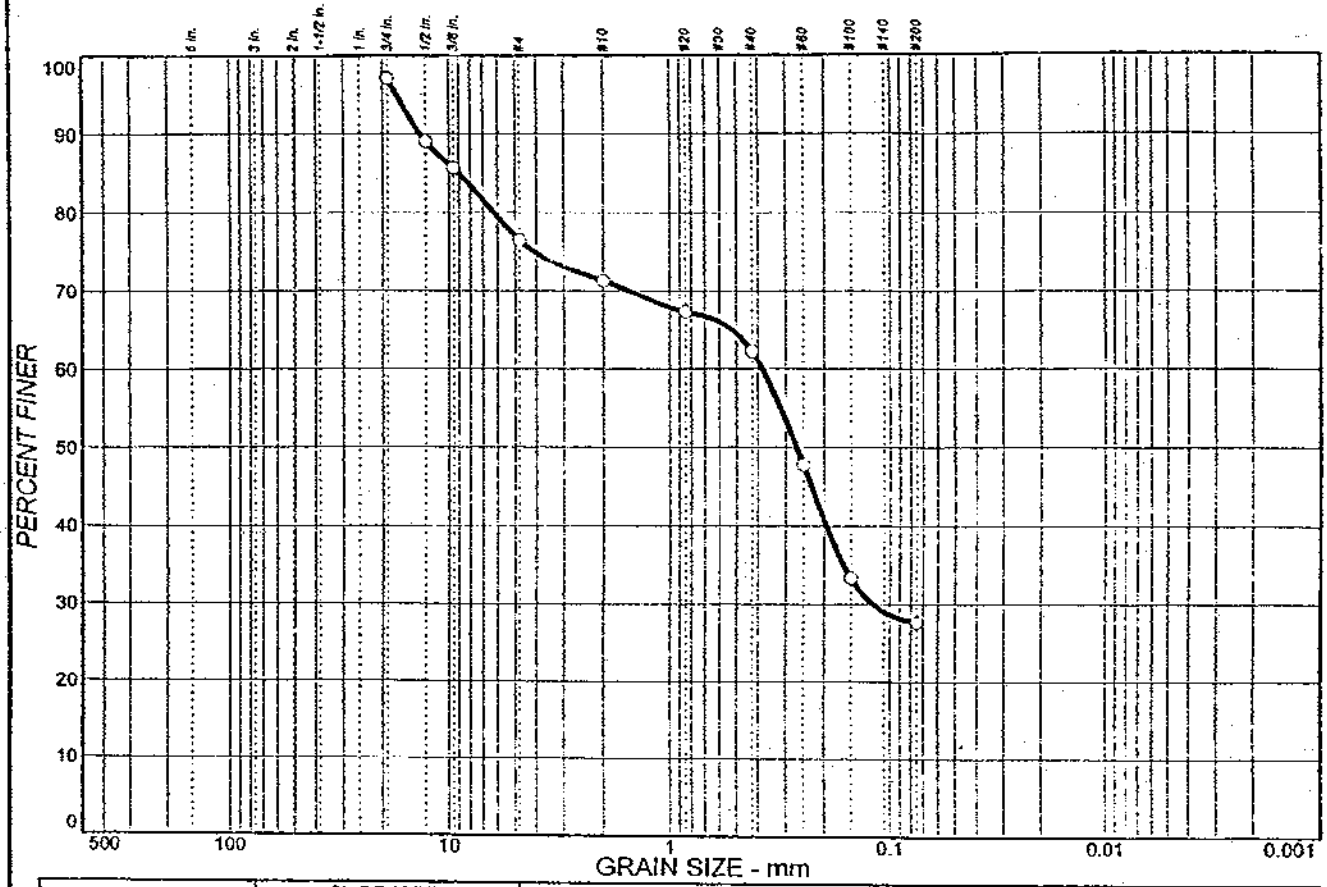
Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	*23.70*	*93.3*
1/2 inch	*47.90*	*86.5*
3/8 inch	*56.84*	*83.9*
# 4	*87.35*	*75.3*
# 10	*111.12*	*68.6*
# 20	*127.62*	*64.0*
# 40	*141.63*	*60.0*
# 60	*190.36*	*46.2*
# 100	*253.27*	*28.5*
# 200	*275.64*	*22.1*

Fractional Components

Gravel/Sand based on *#4*
Sand/Fines based on *#200*
% + 3" = % GRAVEL = (% coarse = % fine = *18.0*)
% SAND = *53.2* (% coarse = *6.7* % medium = *8.6* % fine = *37.9*)
% FINES = *22.1*

D_{85}= *10.85* D_{60}= *0.43* D_{50}= *0.28*
D_{30}= *0.16*

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
		20.6	5.2	9.1	34.5	27.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	97.1		
1/2 in.	89.0		
3/8 in.	85.7		
#4	76.5		
#10	71.3		
#20	67.3		
#40	62.2		
#60	47.8		
#100	33.4		
#200	27.7		

* (no specification provided)

Soil Description

Brown Silty Sand With Gravel

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 8.97 D_{60}= 0.382 D_{50}= 0.268
D_{30}= 0.119 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

F.M.=1.07

Sample No.: P-10 **Source of Sample:** Brisbane Landfill **Date:** 9-4-00
Location: Brisbane Landfill **Elev./Depth:** 8'-10'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 7

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *8'-10'*
Description: *Brown Silty Sand With Gravel*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *P-10*
Date: *9-4-00* **PL:** *N/A* **LL:** *N/A* **PI:** *N/A*
USCS Classification: *SM* **AASHTO Classification:** *A-2-4(0)*
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	348.46	254.43
Tare =	0.00	0.00
Dry sample weight =	348.46	254.43

Minus #200 from wash= 27.0 %
Tare for cumulative weight retained= .00

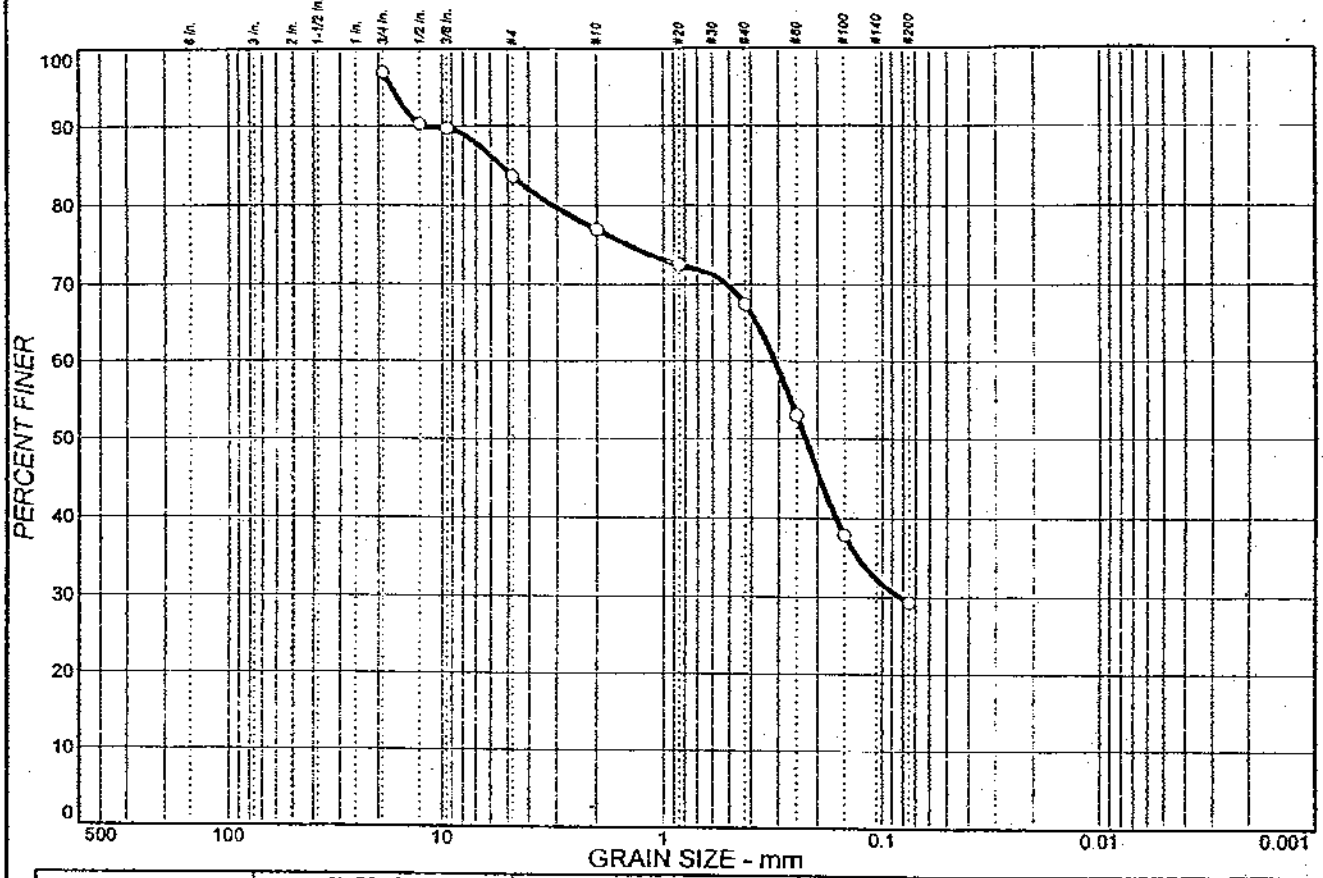
Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	10.22	97.1
1/2 inch	38.40	89.0
3/8 inch	49.82	85.7
# 4	82.01	76.5
# 10	100.00	71.3
# 20	113.92	67.3
# 40	131.79	62.2
# 60	181.86	47.8
# 100	232.25	33.4
# 200	251.99	27.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL = (% coarse = % fine = 20.6)
% SAND = 48.8 (% coarse = 5.2 % medium = 9.1 % fine = 34.5)
% FINES = 27.7

D_{85}= 8.97 D_{60}= 0.38 D_{50}= 0.27
D_{30}= 0.12

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
		13.3	6.7	9.6	38.0	29.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	97.0		
1/2 in.	90.3		
3/8 in.	89.8		
#4	83.7		
#10	77.0		
#20	72.5		
#40	67.4		
#60	53.1		
#100	37.9		
#200	29.4		

* (no specification provided)

Soil Description

Brown Clayey Si-Sa With Gravel

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 5.34 D_{60}= 0.312 D_{50}= 0.227
D_{30}= 0.0816 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

F.M.=0.92

Sample No.: P-15 **Source of Sample:** Brisbane Landfill **Date:** 9-5-00

Location: Brisbane Landfill **Elev./Depth:** P-15,5'-7'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 8

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *P-15,5'-7'*
Description: *Brown Clayey Si-Sa With Gravel*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *P-15*
Date: *9-5-00* **PL:** *N/A* **LL:** *N/A* **PI:** *N/A*
USCS Classification: *SM* **AASHTO Classification:** *A-2-4(0)*
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	332.93	238.10
Tare =	0.00	0.00
Dry sample weight =	332.93	238.10

Minus #200 from wash= 28.5 %
Tare for cumulative weight retained= .00

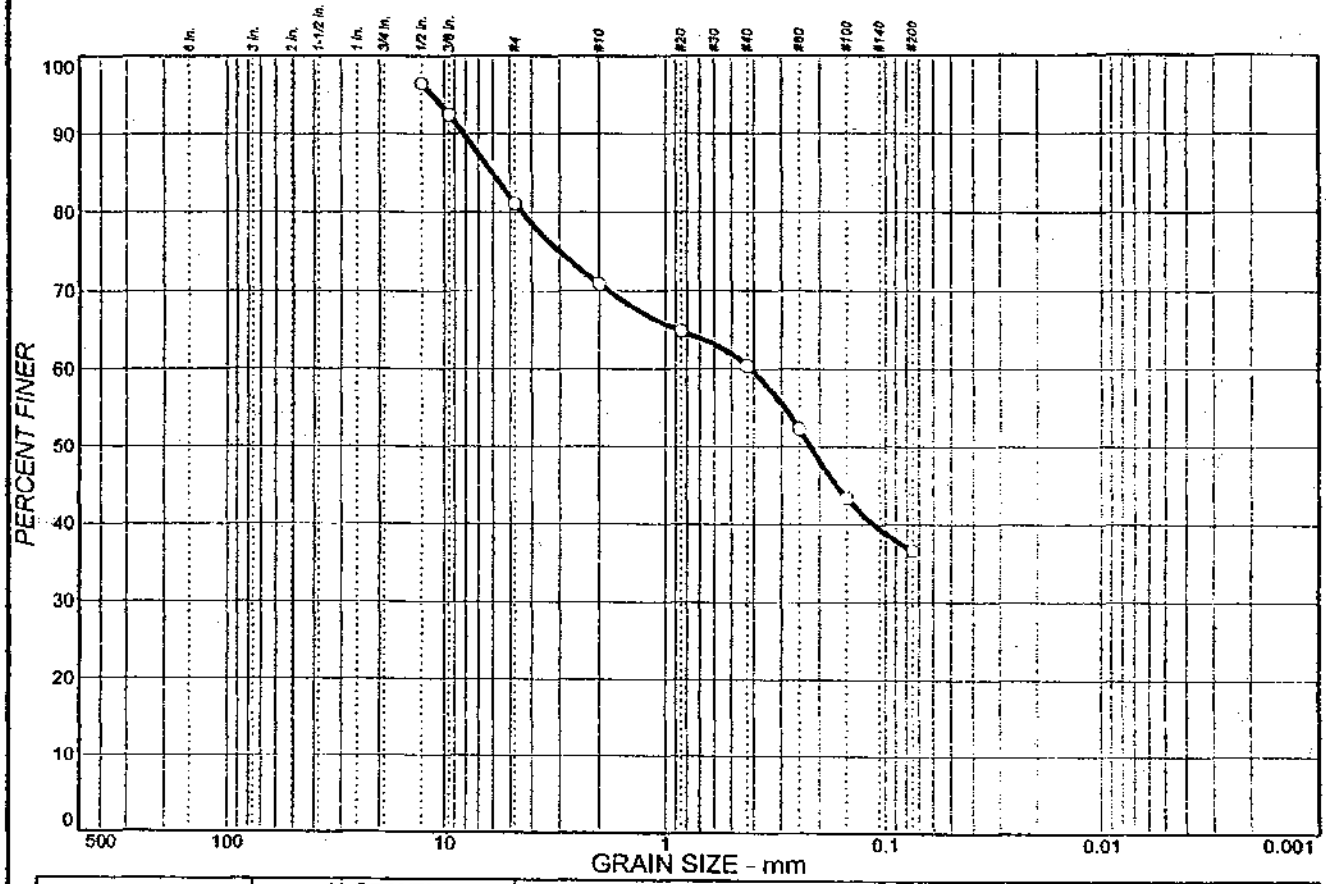
Sieve	Cumul. Wt. retained	Percent finer
3/4 inch	10.08	97.0
1/2 inch	32.41	90.3
3/8 inch	33.87	89.8
# 4	54.31	83.7
# 10	76.44	77.0
# 20	91.72	72.5
# 40	108.56	67.4
# 60	156.11	53.1
# 100	206.85	37.9
# 200	235.12	29.4

Fractional Components

Gravel/Sand based on *#4*
Sand/Fines based on *#200*
% + 3" = **% GRAVEL =** **(% coarse =** **% fine =** *13.3*)
% SAND = *54.3* **(% coarse =** *6.7* **% medium =** *9.6* **% fine =** *38.0*)
% FINES = *29.4*

D_{85}= *5.34* D_{60}= *0.31* D_{50}= *0.23*
D_{30}= *0.08*

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			10.2	10.5	23.7	36.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	96.4		
3/8 in.	92.4		
#4	81.1		
#10	70.9		
#20	64.8		
#40	60.4		
#60	52.3		
#100	43.4		
#200	36.7		

* (no specification provided)

Soil Description

Gray Clayey Sand With Gravel

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 6.05 D_{60}= 0.410 D_{50}= 0.221
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-4(0)

Remarks

USCS Designation based on visual manual procedure (ASTM D2488)
F.M.=0.83

Sample No.: P-19 **Source of Sample:** Brisbane Landfill **Date:** 9-5-00
Location: Brisbane Landfill **Elev./Depth:** 5'-6'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 9

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *5'-6'*
Description: *Gray Clayey Sand With Gravel*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *P-19*
Date: *9-5-00* **PL:** *N/A* **LL:** *N/A* **PI:** *N/A*
USCS Classification: *SC* **AASHTO Classification:** *A-4(0)*
Testing Remarks: *USCS Designation based on visual manual procedure (ASTM D2488)*

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	369.04	233.47
Tare =	0.00	0.00
Dry sample weight =	369.04	233.47

Minus #200 from wash= 36.7 %
Tare for cumulative weight retained= .00

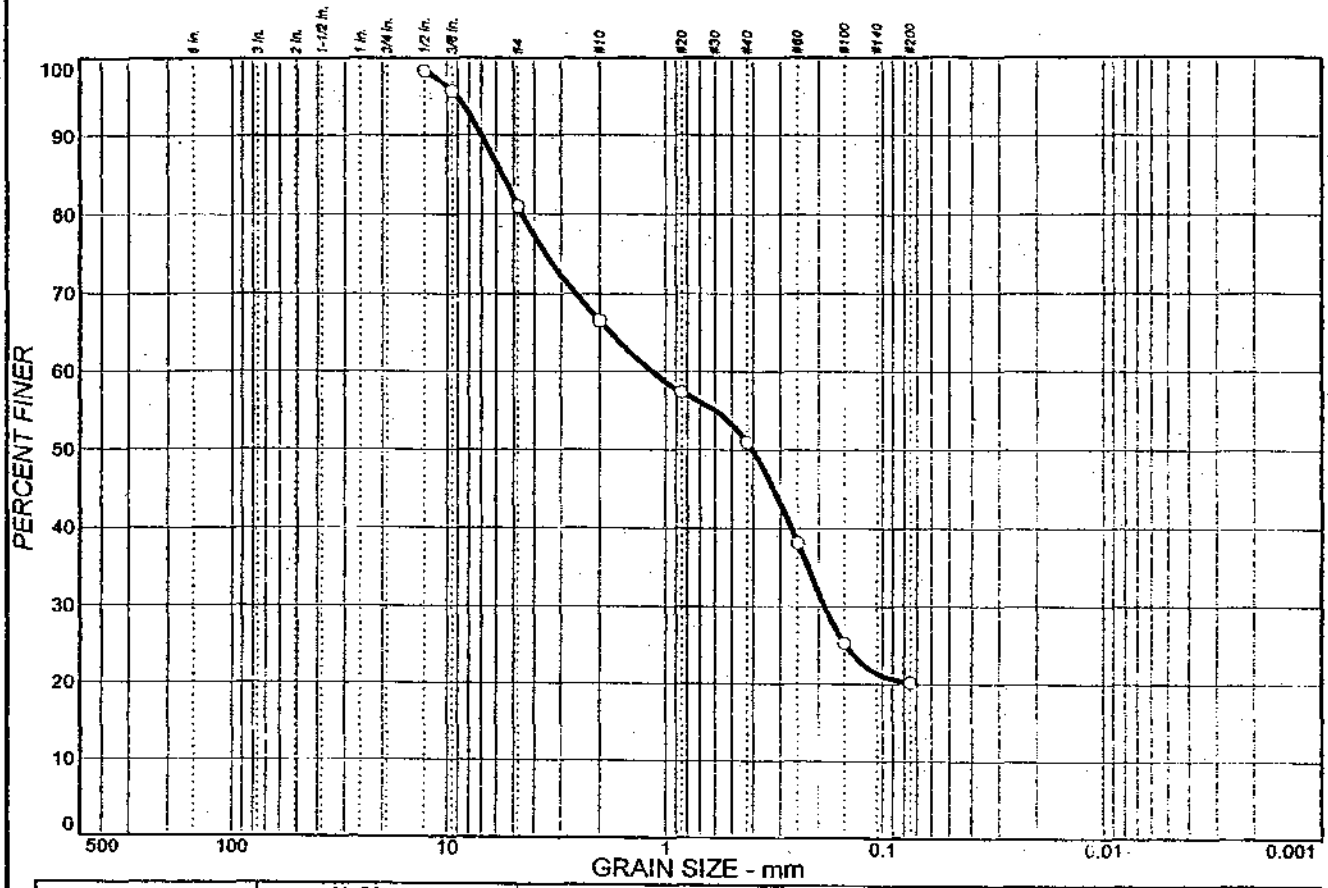
Sieve	Cumul. Wt. retained	Percent finer
1/2 inch	13.20	96.4
3/8 inch	28.02	92.4
# 4	69.79	81.1
# 10	107.53	70.9
# 20	129.82	64.8
# 40	146.13	60.4
# 60	176.00	52.3
# 100	208.79	43.4
# 200	233.48	36.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% + 3" = % GRAVEL =
% SAND = 44.4 (% coarse = 10.2 % medium = 10.5 % fine = 23.7)
% FINES = 36.7

D_{85}= 6.05 D_{60}= 0.41 D_{50}= 0.22

Particle Size Distribution Report



% + 3"	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
			14.5	15.5	30.8	20.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	98.3		
3/8 in.	95.7		
#4	81.0		
#10	66.5		
#20	57.4		
#40	51.0		
#60	38.2		
#100	25.3		
#200	20.2		

* (no specification provided)

Soil Description

Gray Brown Clayey/Silty Sand With Gravel

Atterberg Limits

PL= N/A LL= N/A PI= N/A

Coefficients

D_{85}= 5.64 D_{60}= 1.15 D_{50}= 0.402
D_{30}= 0.186 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

F.M.=0.98

Sample No.: P-29 **Source of Sample:** Brisbane Landfill **Date:** 9-5-00
Location: Brisbane Landfill **Elev./Depth:** 2'-4'

Smith-Emery Company

Project: Brisbane Landfill

Project No: 1546 **Plate** 10

Project: *Brisbane Landfill*
Project Number: *1546*

Sample Data

Source: *Brisbane Landfill*
Elev. or Depth: *2'-4'*
Description: *Gray Brown Clayey/Silty Sand With Gravel*
Sample Length (in./cm.):
Location: *Brisbane Landfill*
Sample No.: *P-29*
Date: *9-5-00* PL: *N/A* LL: *N/A* PI: *N/A*
USCS Classification: *SM* AASHTO Classification: *A-2-4(0)*
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	396.85	316.93
Tare =	0.00	0.00
Dry sample weight =	396.85	316.93

Minus #200 from wash= *20.1* %
Tare for cumulative weight retained= *.00*

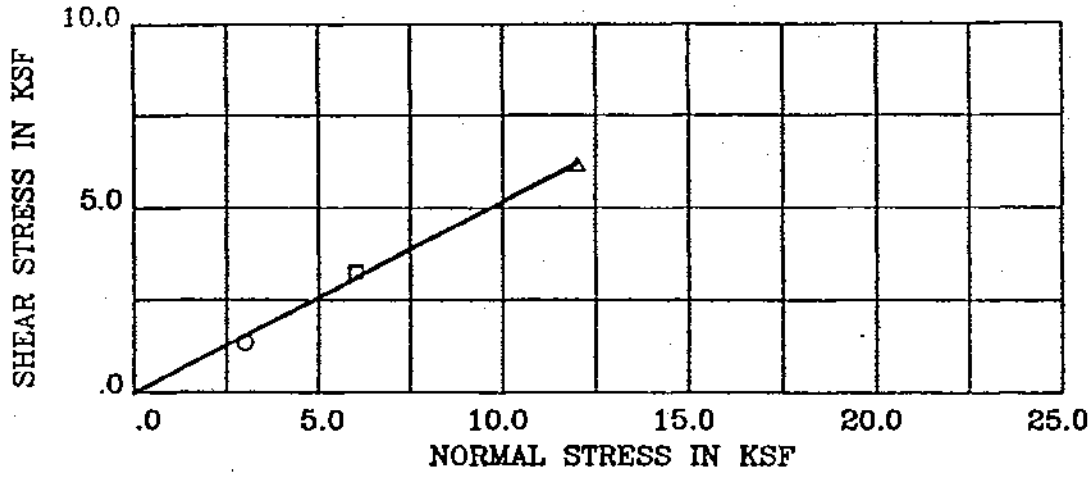
Sieve	Cumul. Wt. retained	Percent finer
1/2 inch	*6.63*	*98.3*
3/8 inch	*17.14*	*95.7*
# 4	*75.50*	*81.0*
# 10	*133.10*	*66.5*
# 20	*169.24*	*57.4*
# 40	*194.34*	*51.0*
# 60	*245.38*	*38.2*
# 100	*296.30*	*25.3*
# 200	*316.90*	*20.2*

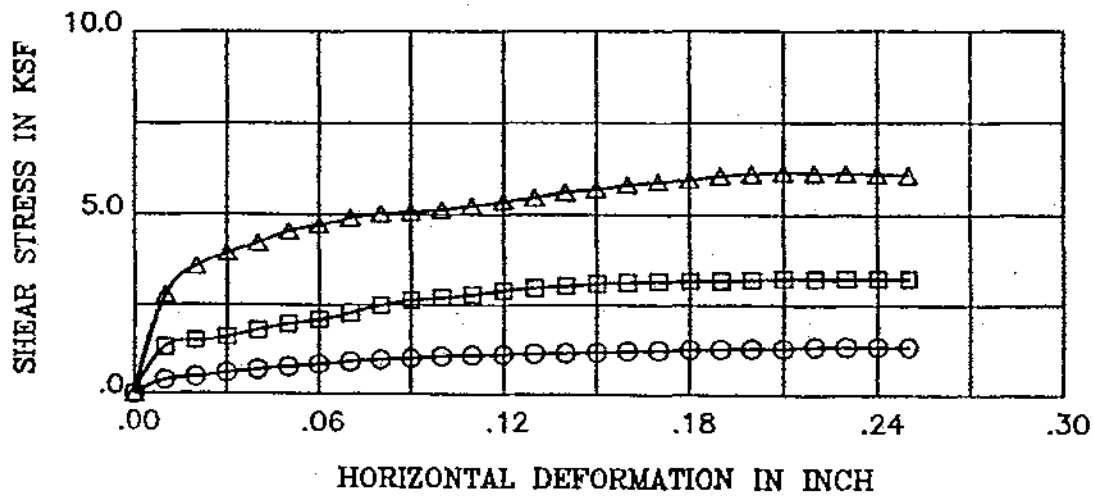
Fractional Components

Gravel/Sand based on *#4*
Sand/Fines based on *#200*
% + 3" = % GRAVEL =
% SAND = *60.8* (% coarse = *14.5* % medium = *15.5* % fine = *30.8*)
% FINES = *20.2*

D_{85}= *5.64* D_{60}= *1.15* D_{50}= *0.40*
D_{30}= *0.19*

DIRECT SHEAR TESTS



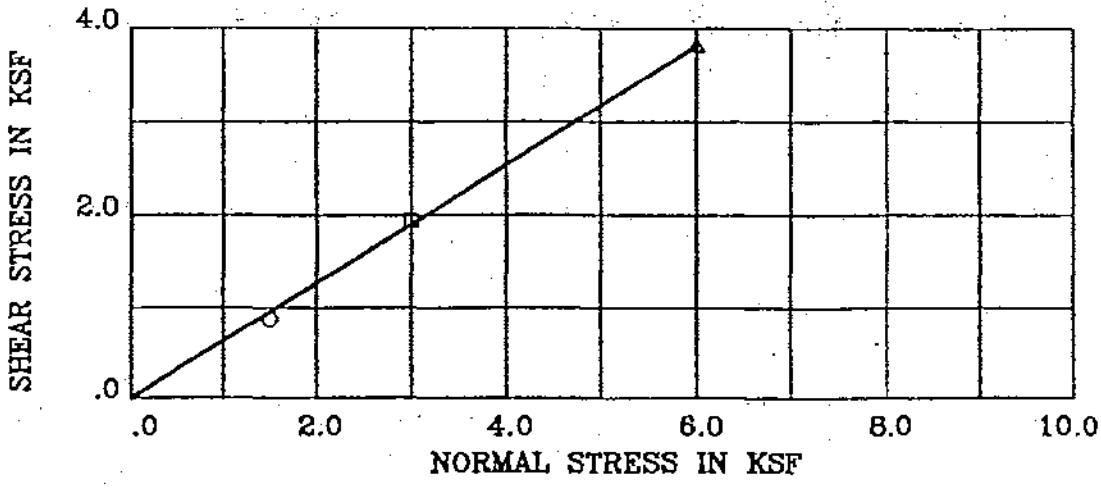


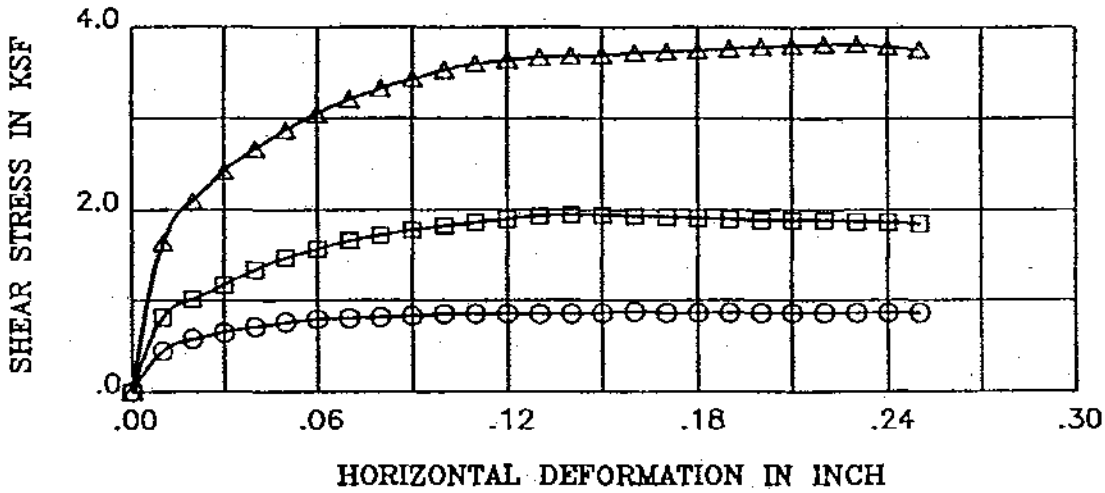
BORING/SAMPLE : BMC G-1 DEPTH (ft) : 51-53
DESCRIPTION : Gray silty Clay trace of shell
STRENGTH INTERCEPT (C) : .000 KSF
FRICTION ANGLE (PHI) : 27.3 DEG
(PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	54.3	66.9	1.518	3.00	1.35	1.34
□	54.9	64.7	1.605	6.00	3.24	3.23
△	56.5	64.9	1.595	12.00	6.16	6.09

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:



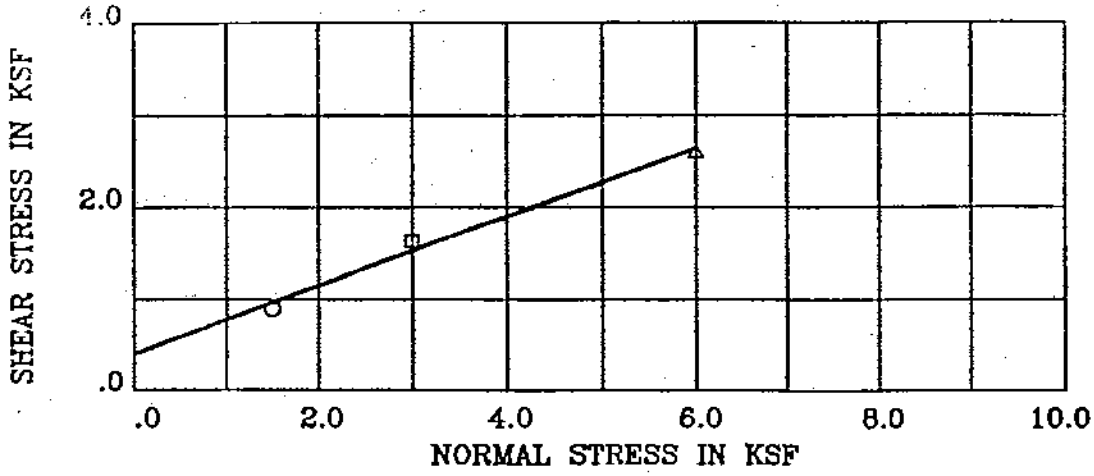


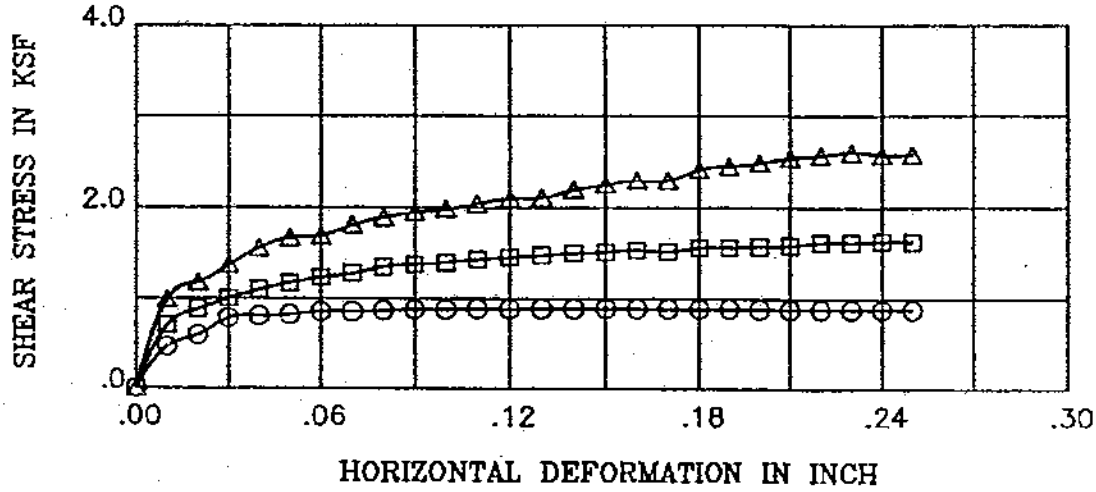
BORING/SAMPLE : BMC G-2 DEPTH (ft) : 27-29
DESCRIPTION : Gray silty fine SAND with shells
STRENGTH INTERCEPT (C) : .000 KSF
FRICTION ANGLE (PHI) : 32.4 DEG
(PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
O	29.6	90.1	.870	1.50	.87	.86
□	27.8	92.3	.824	3.00	1.94	1.84
△	31.5	89.2	.889	6.00	3.81	3.75

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:



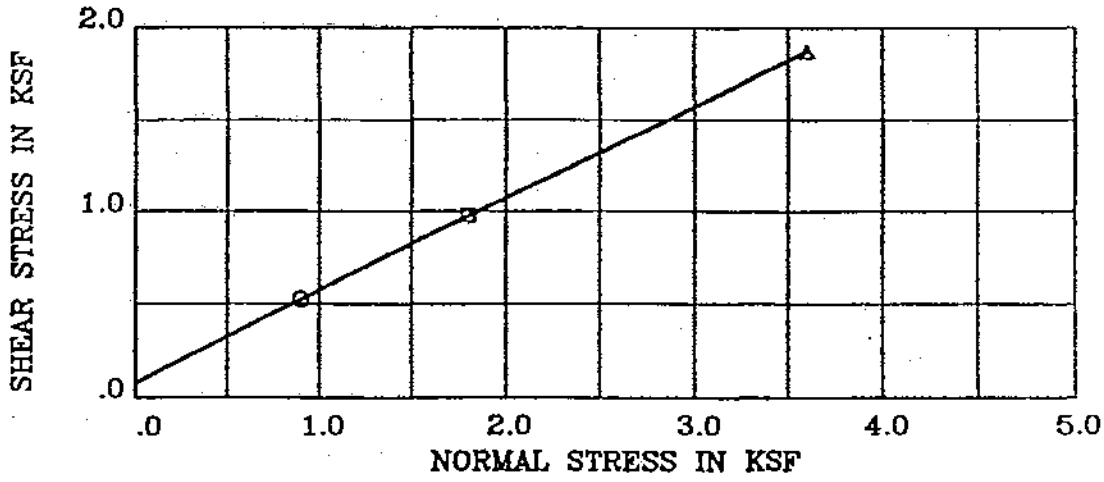


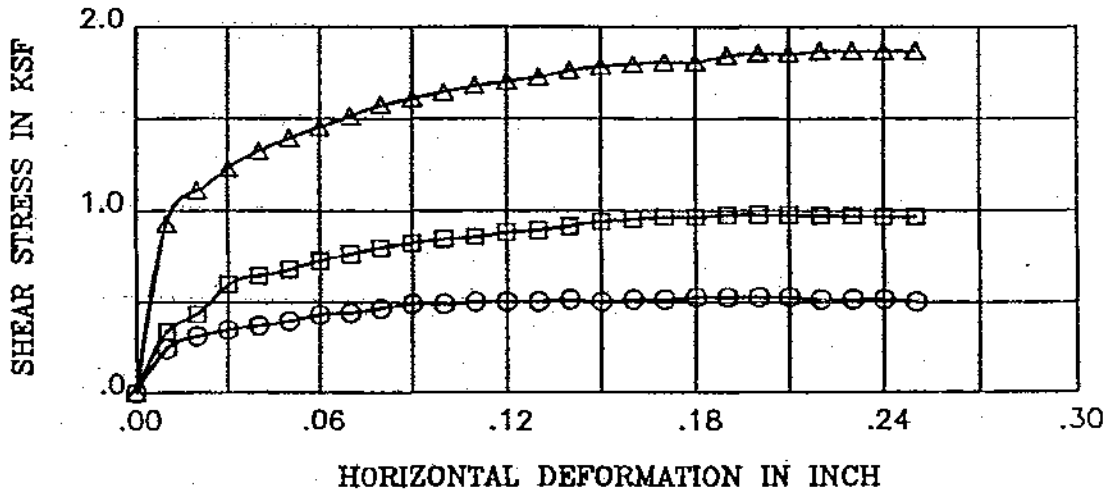
BORING/SAMPLE : BMC G-3 DEPTH (ft) : 28-30
DESCRIPTION : Gray silty Clay with some shells
STRENGTH INTERCEPT (C) : .406 KSF
FRICTION ANGLE (PHI) : 20.4 DEG
(PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	80.8	51.7	2.260	1.50	.89	.88
□	80.9	52.0	2.239	3.00	1.63	1.63
△	81.3	51.8	2.250	6.00	2.61	2.57

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:





BORING/SAMPLE : BMC G-4B DEPTH (ft) : 65-67

DESCRIPTION : Gray silty Clay

STRENGTH INTERCEPT (C) : .079 KSF

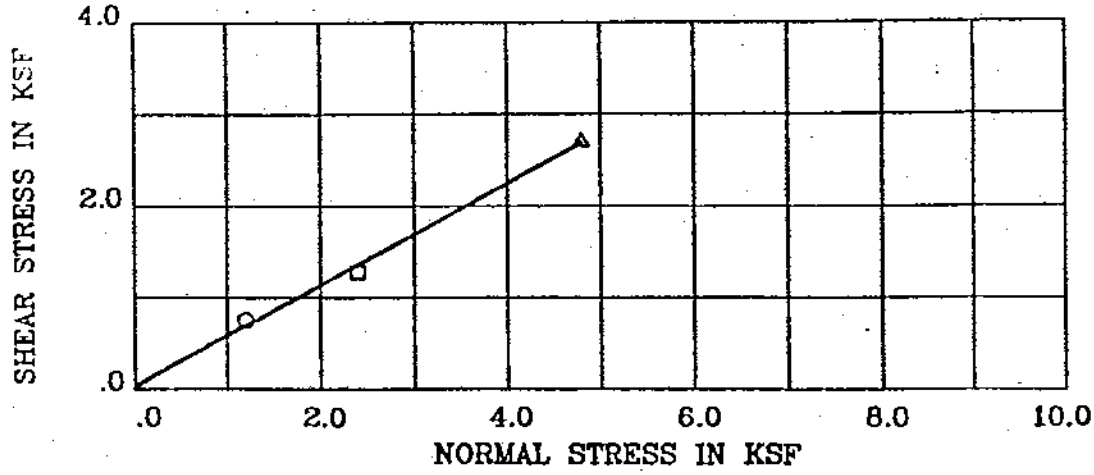
FRICTION ANGLE (PHI) : 26.5 DEG

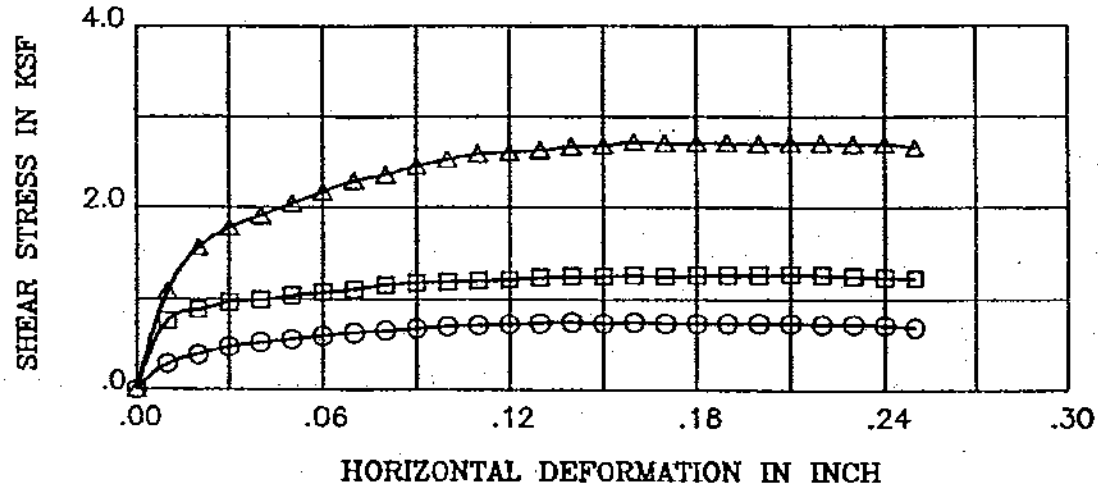
(PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	76.1	55.2	2.054	.90	.53	.50
□	76.2	55.4	2.041	1.80	.98	.97
△	73.3	56.1	2.005	3.60	1.87	1.87

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:



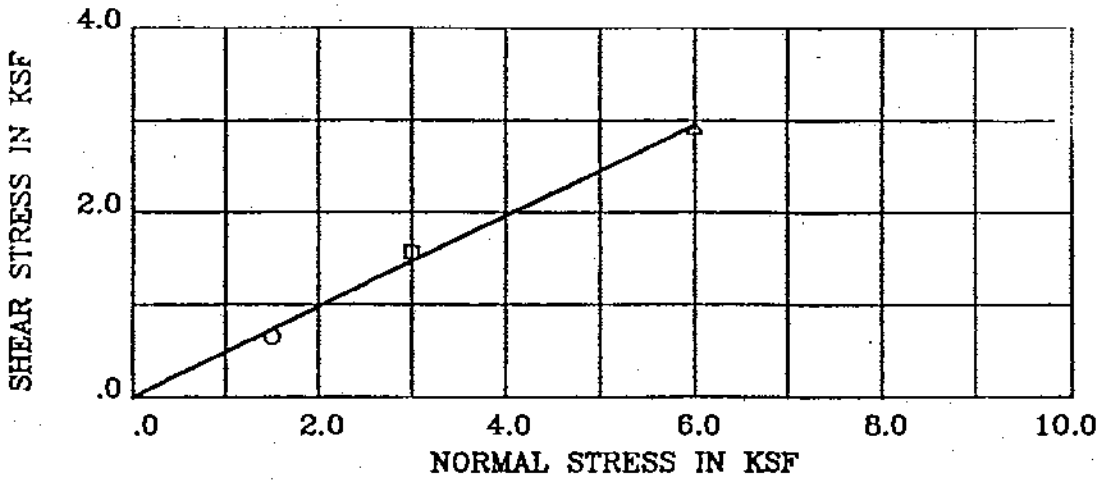


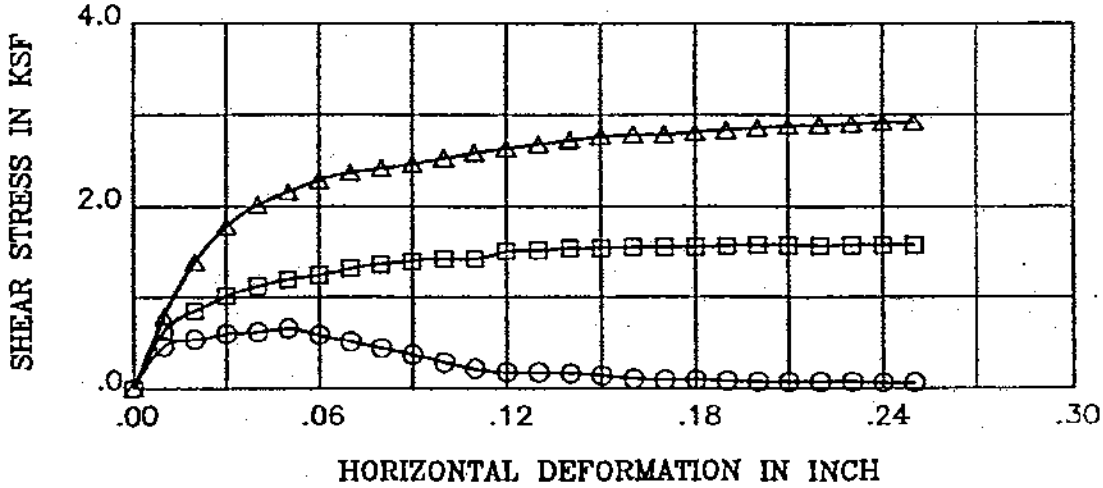
BORING/SAMPLE : BMC G-4B DEPTH (ft) : 67-69
DESCRIPTION : Gray silty Clay
STRENGTH INTERCEPT (C) : .029 KSF
FRICTION ANGLE (PHI) : 29.0 DEG (PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	78.9	54.1	2.115	1.20	.75	.69
□	83.3	52.7	2.198	2.40	1.27	1.23
△	77.2	54.8	2.073	4.80	2.71	2.65

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:





BORING/SAMPLE : BMC G-5 DEPTH (ft) : 49-51

DESCRIPTION : Gray silty CLAY

STRENGTH INTERCEPT (C) : .000 KSF

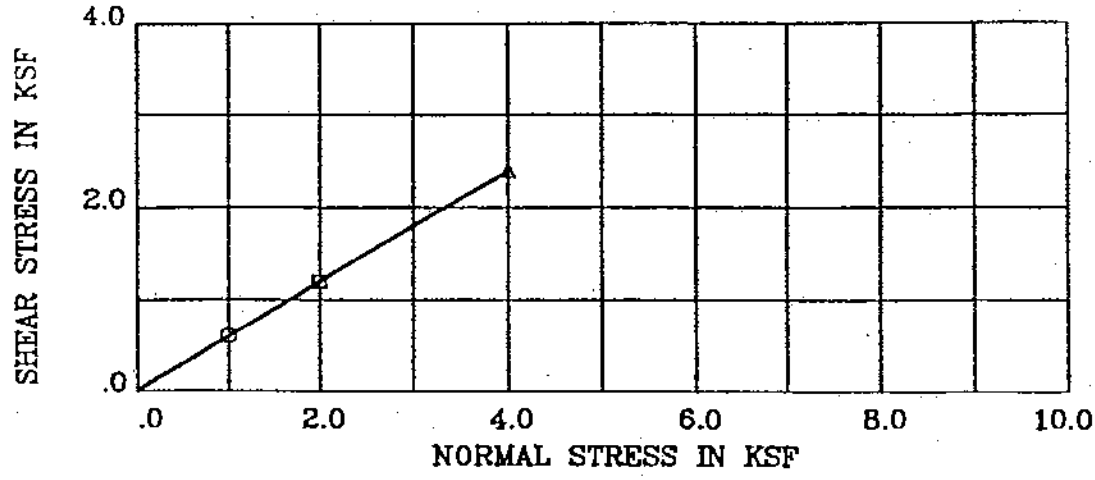
FRICTION ANGLE (PHI) : 26.2 DEG

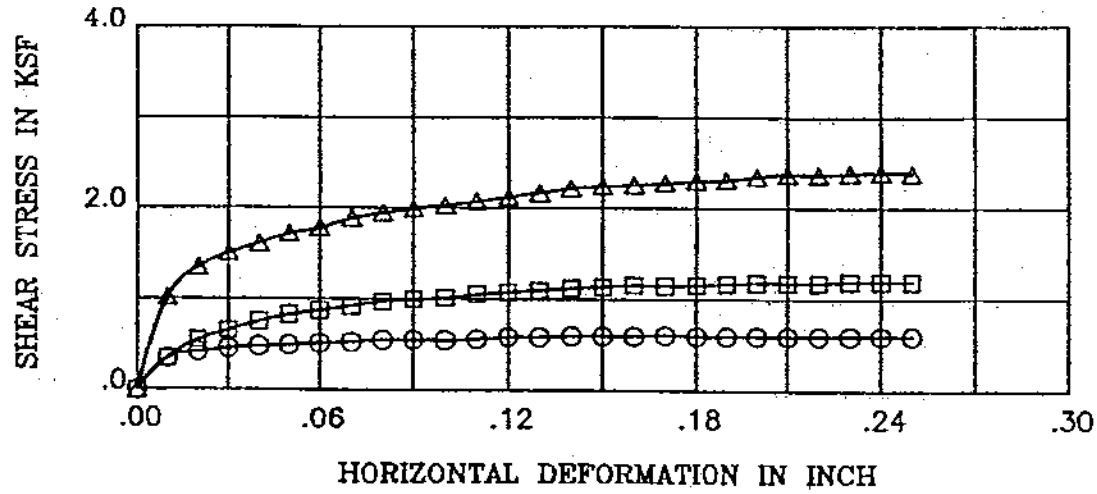
(PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
O	55.6	66.8	1.524	1.50	.65	.06
□	56.5	66.1	1.549	3.00	1.57	1.57
△	57.7	65.3	1.578	6.00	2.92	2.92

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:



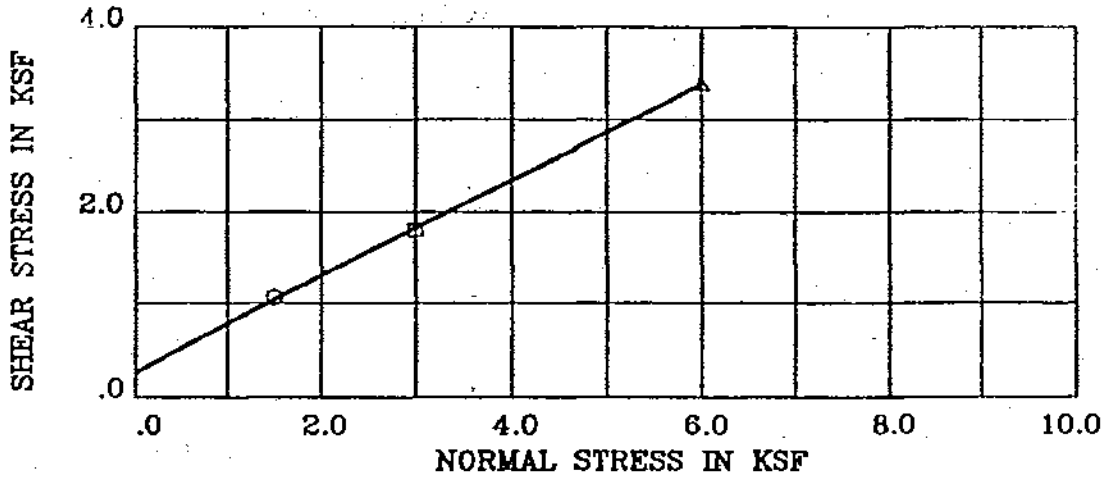


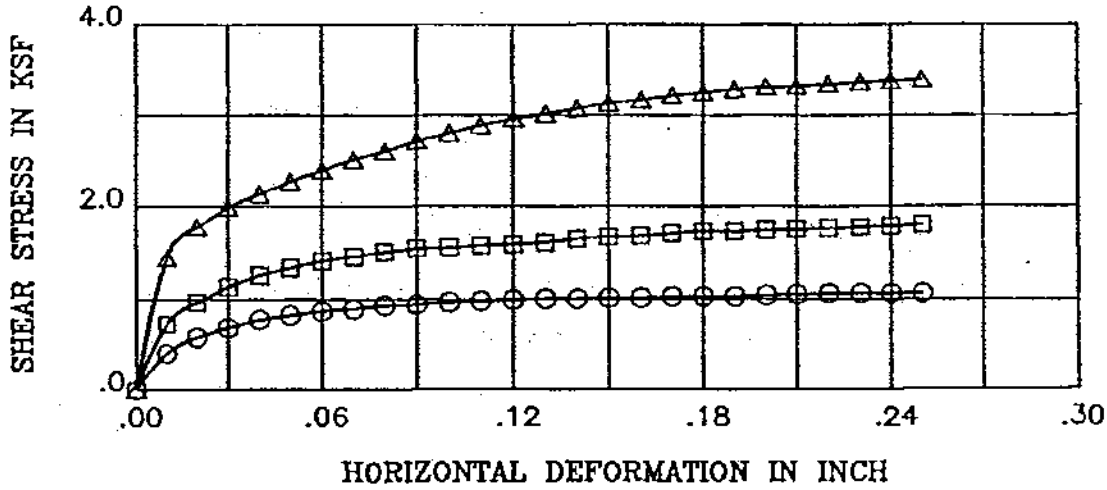
BORING/SAMPLE : BMC G-6 DEPTH (ft) : 40-42
DESCRIPTION : Gray silty Clay
STRENGTH INTERCEPT (C) : .007 KSF
FRICTION ANGLE (PHI) : 30.8 DEG (PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	78.3	54.7	2.082	1.00	.61	.59
□	74.4	55.9	2.014	2.00	1.19	1.19
△	80.3	54.2	2.110	4.00	2.39	2.38

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC – BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:





BORING/SAMPLE : BMC G-7 DEPTH (ft) : 53-55

DESCRIPTION : Gray silty fine SAND with shells

STRENGTH INTERCEPT (C) : .263 KSF

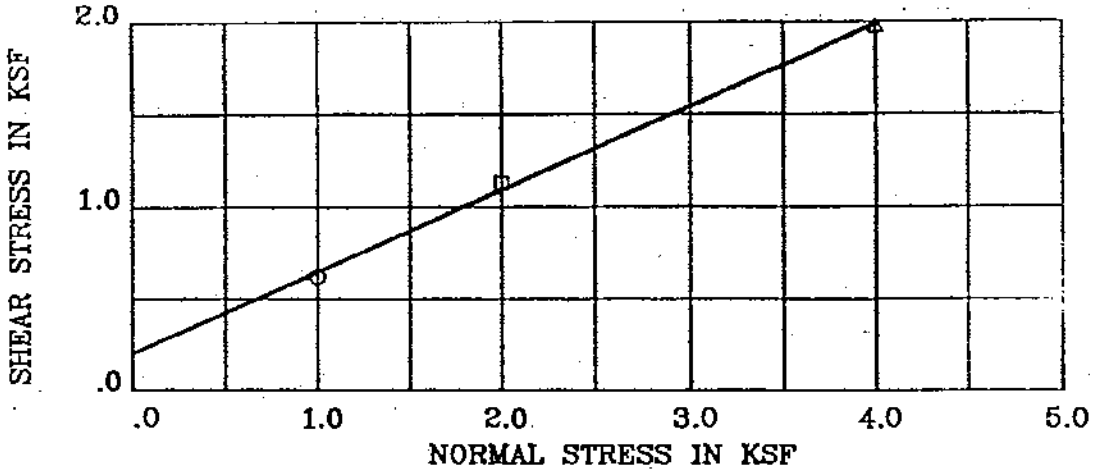
FRICTION ANGLE (PHI) : 27.5 DEG

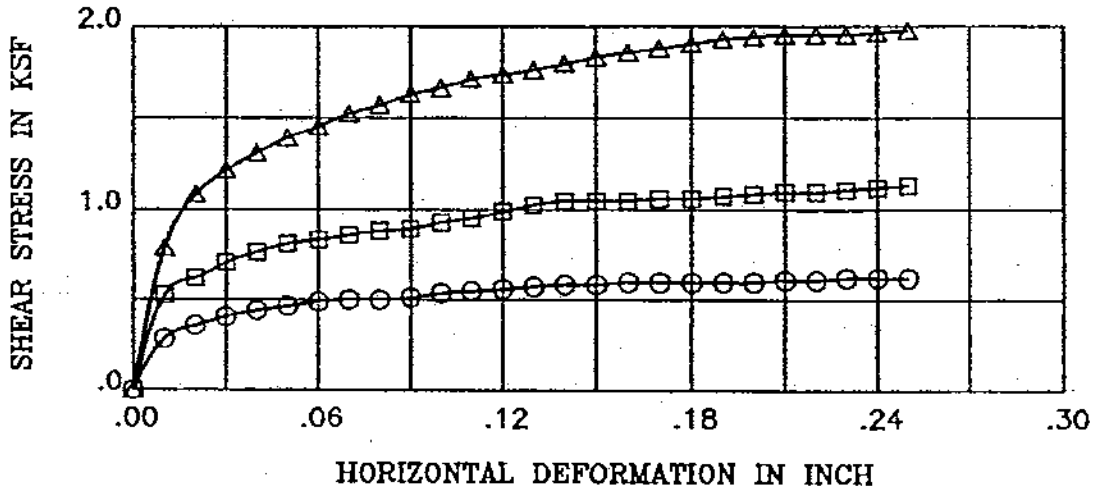
(PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	50.9	69.8	1.413	1.50	1.06	1.06
□	46.7	71.9	1.344	3.00	1.80	1.80
△	50.5	69.3	1.430	6.00	3.39	3.39

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:



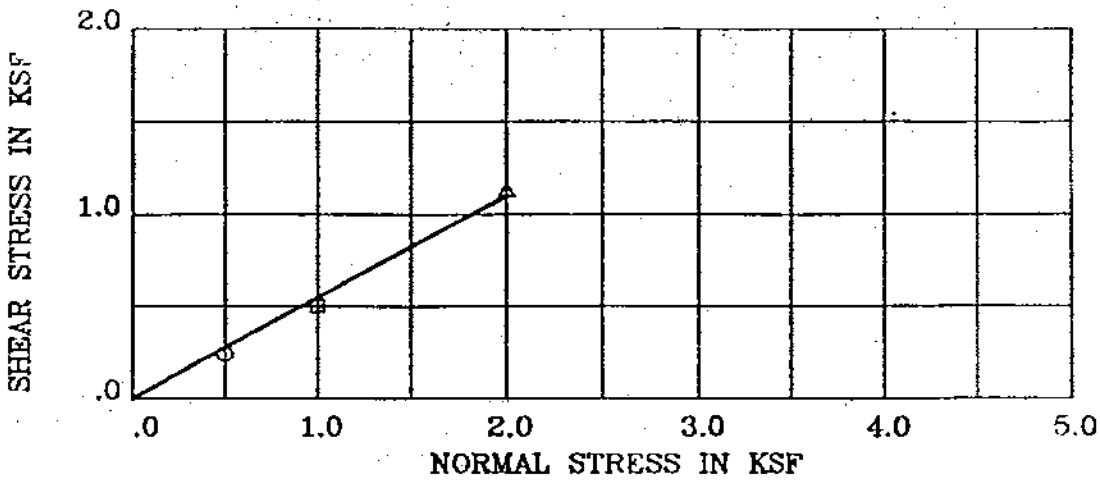


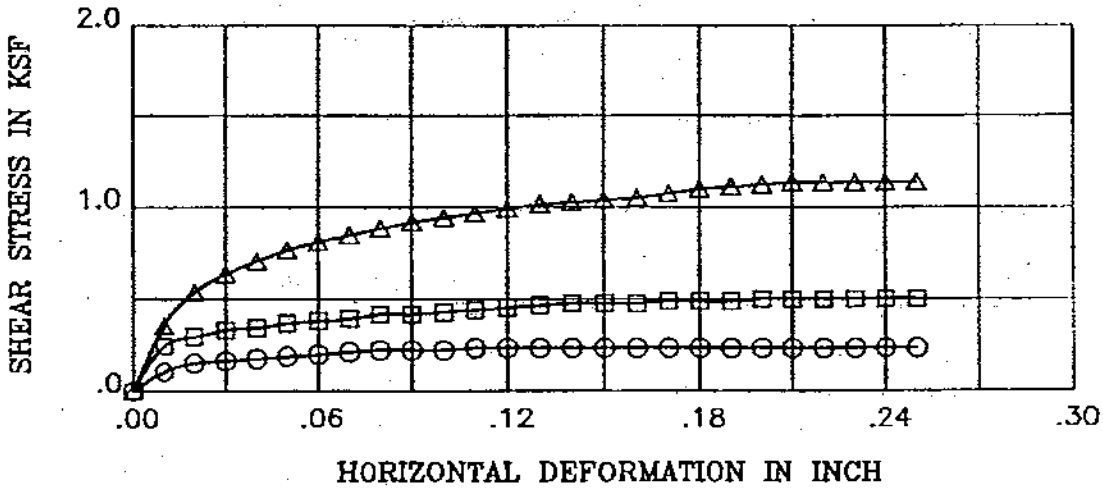
BORING/SAMPLE : BMC G-8 DEPTH (ft) : 29-31
DESCRIPTION : Gray silty Clay
STRENGTH INTERCEPT (C) : .198 KSF
FRICTION ANGLE (PHI) : 24.1 DEG
(PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	64.2	62.0	1.716	1.00	.62	.62
□	64.5	61.6	1.734	2.00	1.13	1.13
△	69.2	60.5	1.787	4.00	1.98	1.98

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:





BORING/SAMPLE : BMC G-9 DEPTH (ft) : 20-22

DESCRIPTION : Gray silty Clay

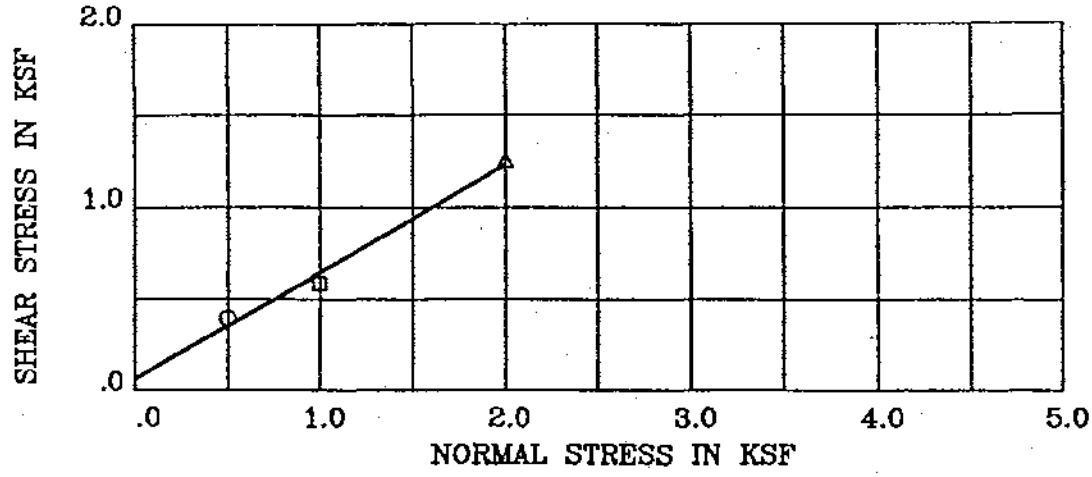
STRENGTH INTERCEPT (C) : .000 KSF

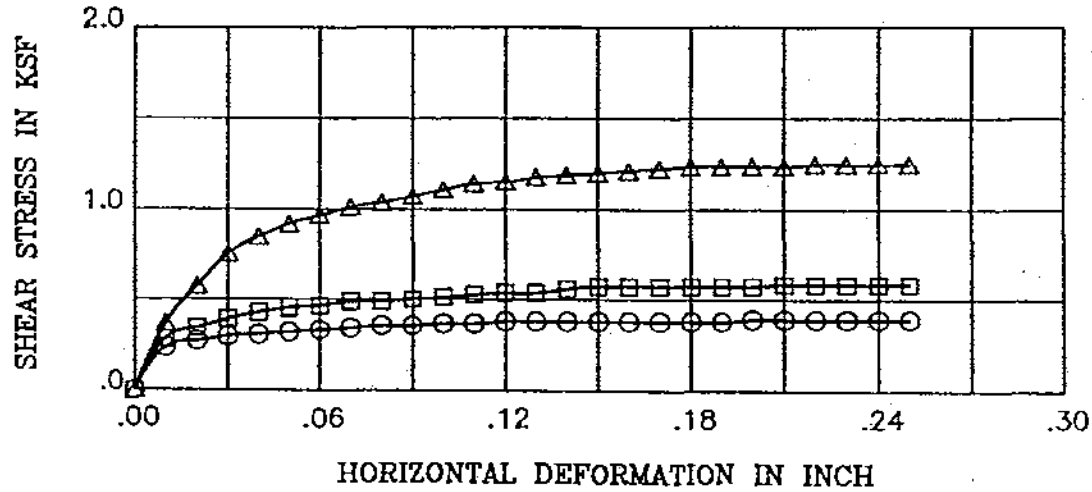
FRICTION ANGLE (PHI) : 28.8 DEG (PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	61.4	66.5	1.533	.50	.24	.24
□	60.0	66.0	1.552	1.00	.50	.50
△	55.9	67.9	1.481	2.00	1.13	1.13

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:





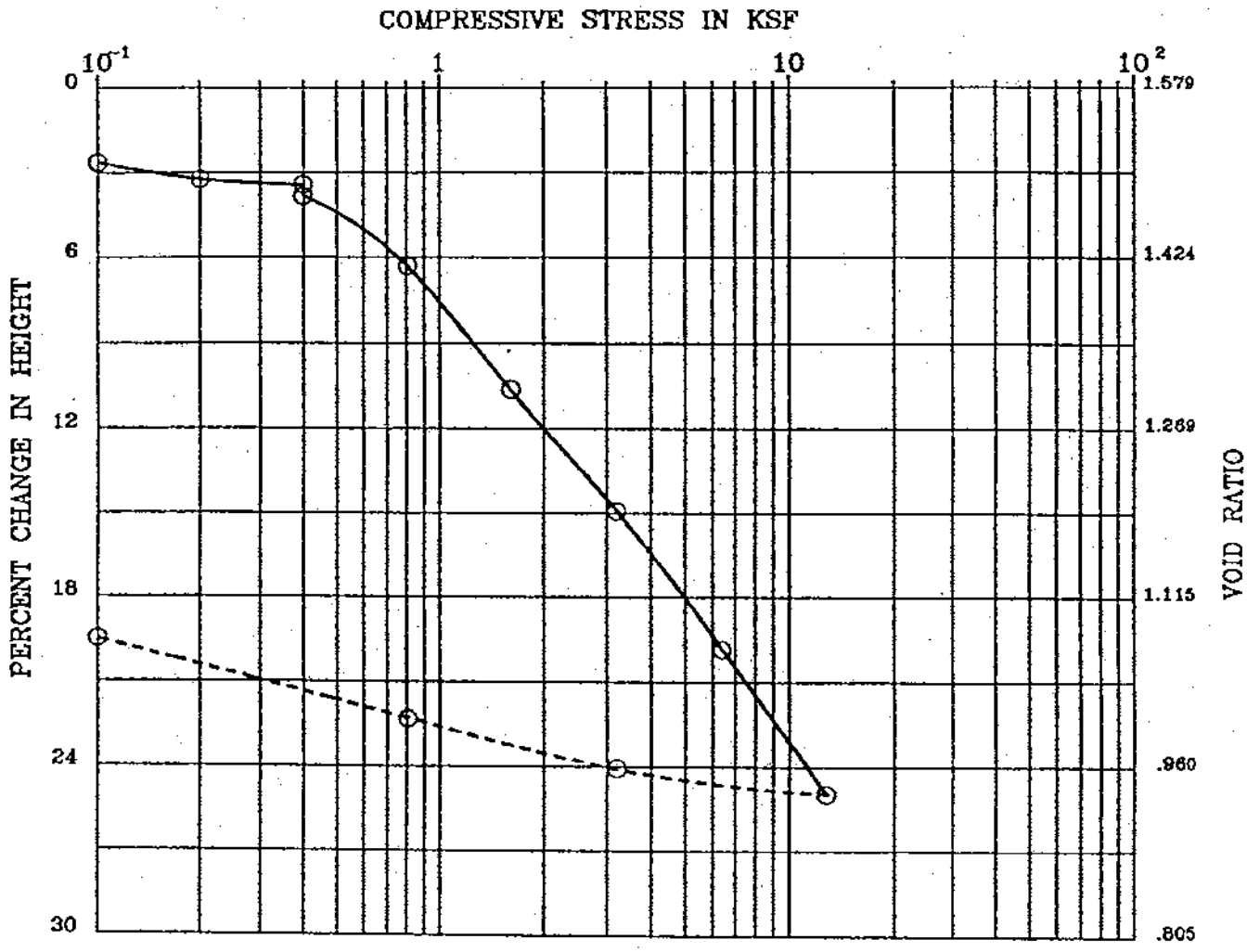
BORING/SAMPLE : BMC G-10 DEPTH (ft) : 20-22
DESCRIPTION : Gray silty Clay
STRENGTH INTERCEPT (C) : .061 KSF
FRICTION ANGLE (PHI) : 30.3 DEG
(PEAK STRENGTH)

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	VOID RATIO	NORMAL STRESS (ksf)	PEAK SHEAR (ksf)	RESIDUAL SHEAR (ksf)
○	62.8	62.6	1.691	.50	.39	.39
□	62.7	62.4	1.701	1.00	.58	.58
△	63.9	62.0	1.720	2.00	1.25	1.25

Remark : INUNDATED BEFORE AND DURING TEST

Project No.:1546-2	Project Name: BMC - BRISBANE LANDFILL
Smith-Emery Company	DIRECT SHEAR TEST Plate No.:

CONSOLIDATION TESTS



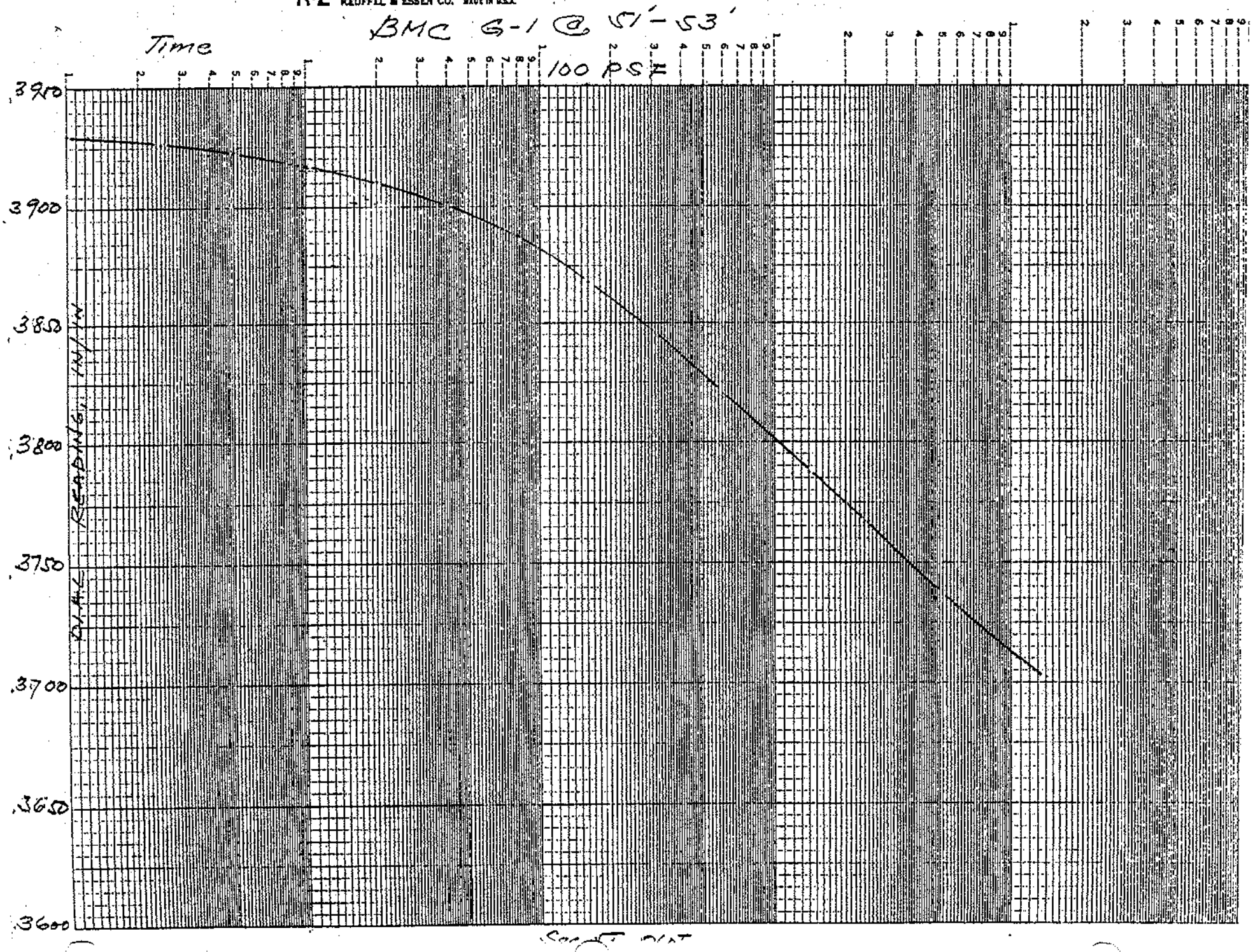
BORING : G −1
DEPTH (ft) : 51−53
SPEC. GRAVITY : 2.84

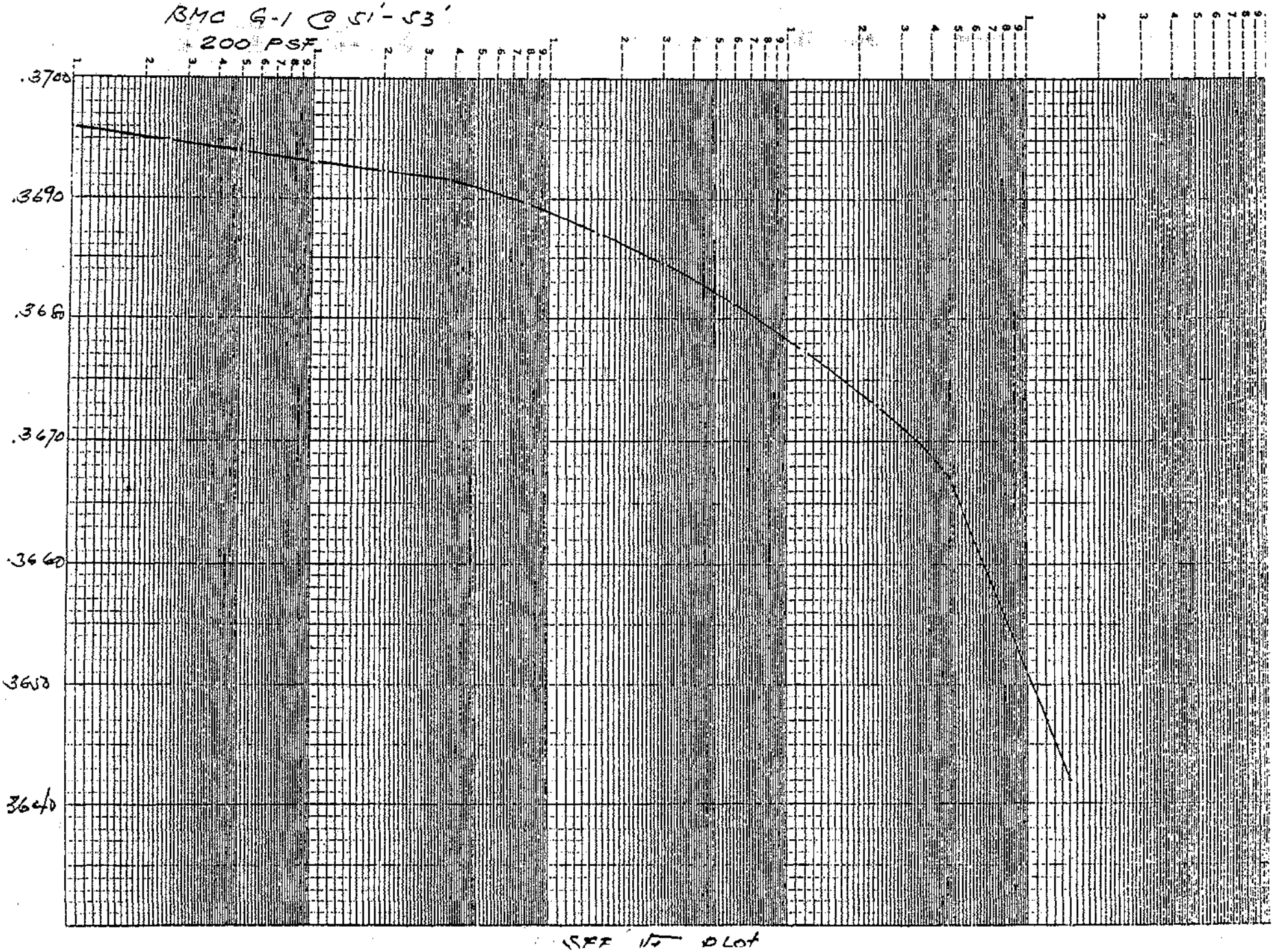
DESCRIPTION : Gray silty CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

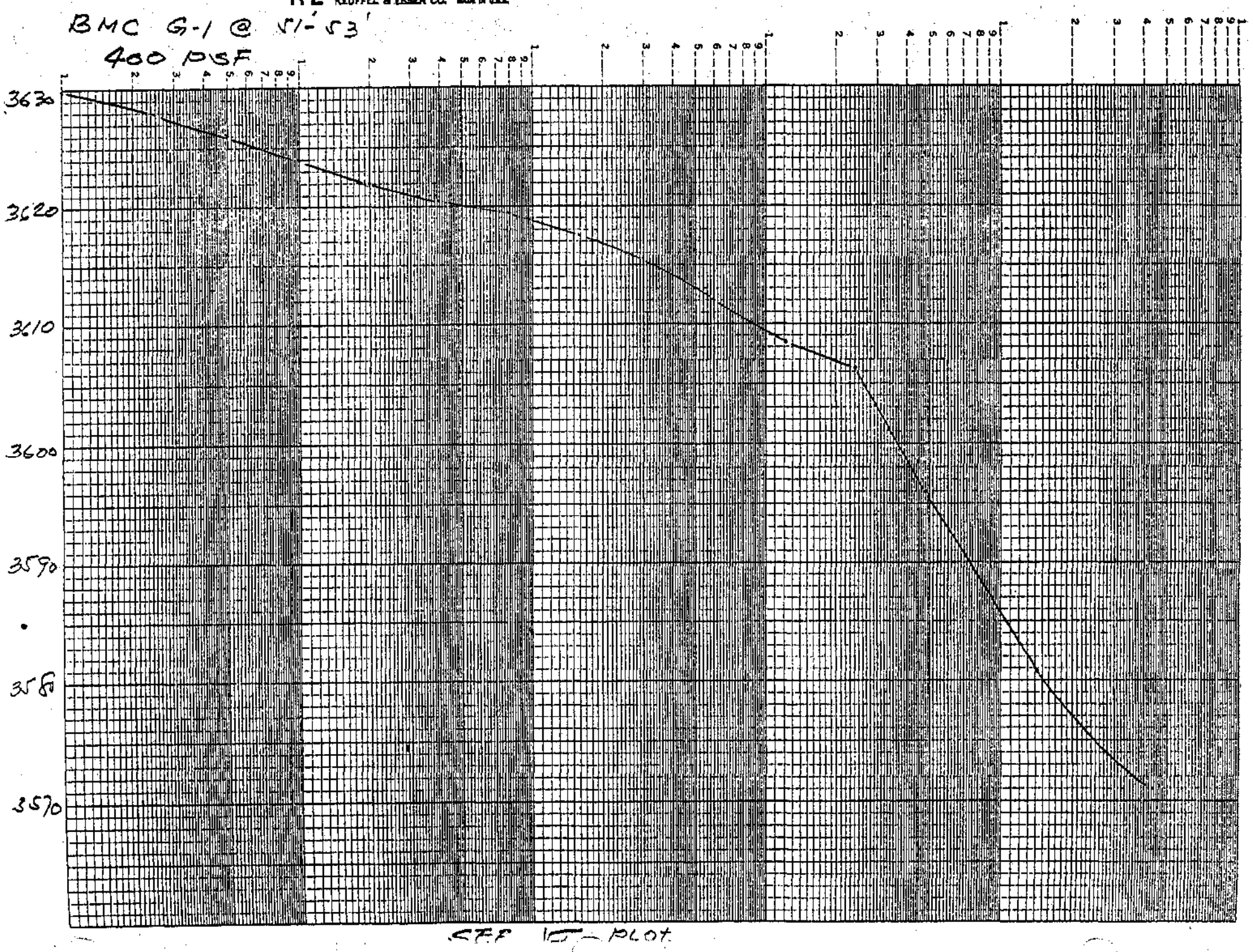
	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	52.2	68.7	94	1.579
FINAL	37.8	85.4	100	1.076

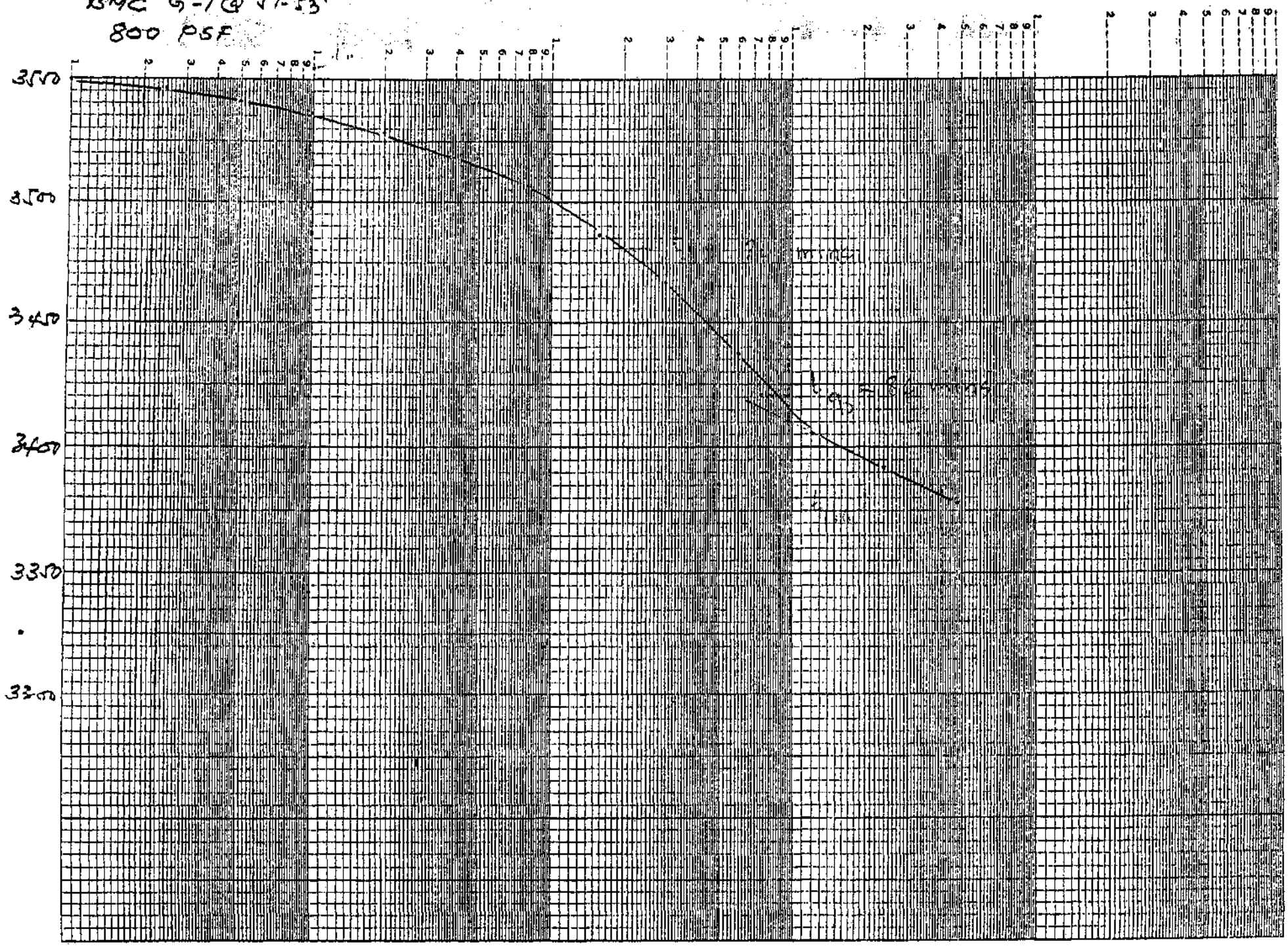
Remark : INUNDATED AT 0.4 KSF

Project No.:1546−2	BMC − BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:


K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-1 @ 51'-53'
Time
100 PSI
3950
3900
3850
3800
3750
3700
3650
3600
DYNAMIC READINGS, IN/MIN


K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVI
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-1 @ 51'-53'
200 PSF
.3700
.3690
.3680
.3670
.3660
.3650
.3640
SEE IN DLOT

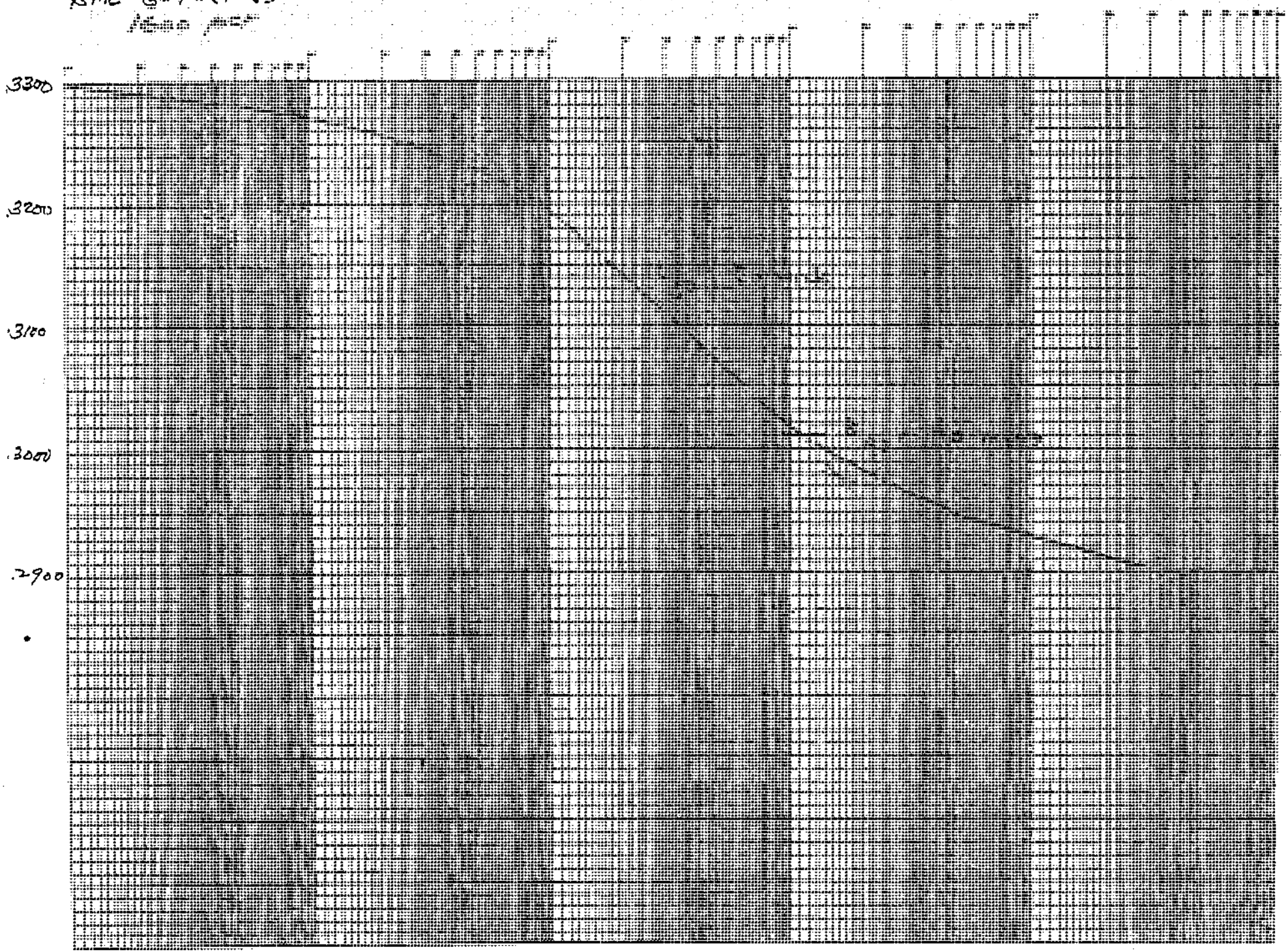

K&E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-1 @ 51'-53'
400 PSF
3630
3620
3610
3600
3590
3580
3570
SEE ET-PLOT

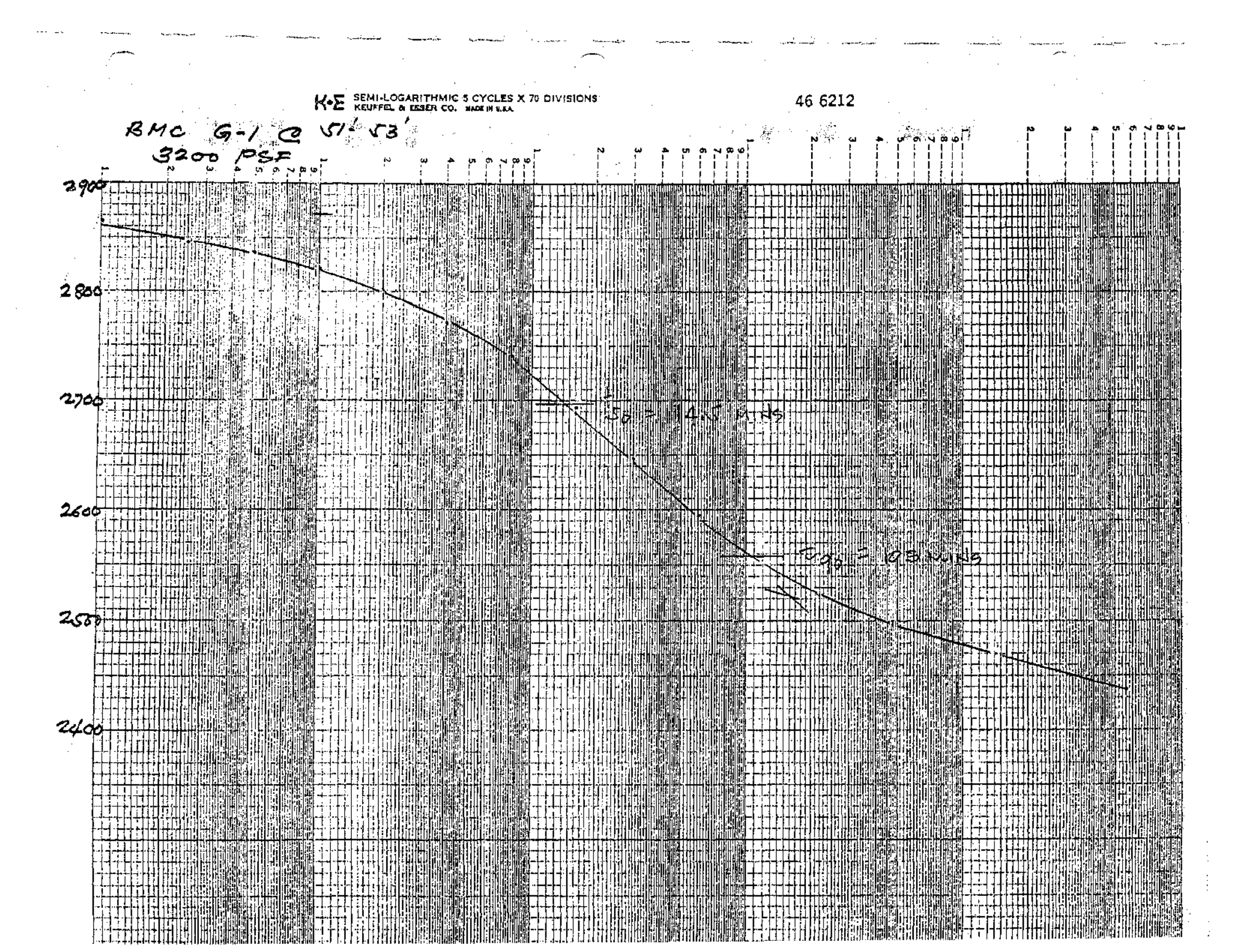

BMC G-1 @ 11-53
800 PSF
K•E
SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
3500
3450
3400
3350
3300

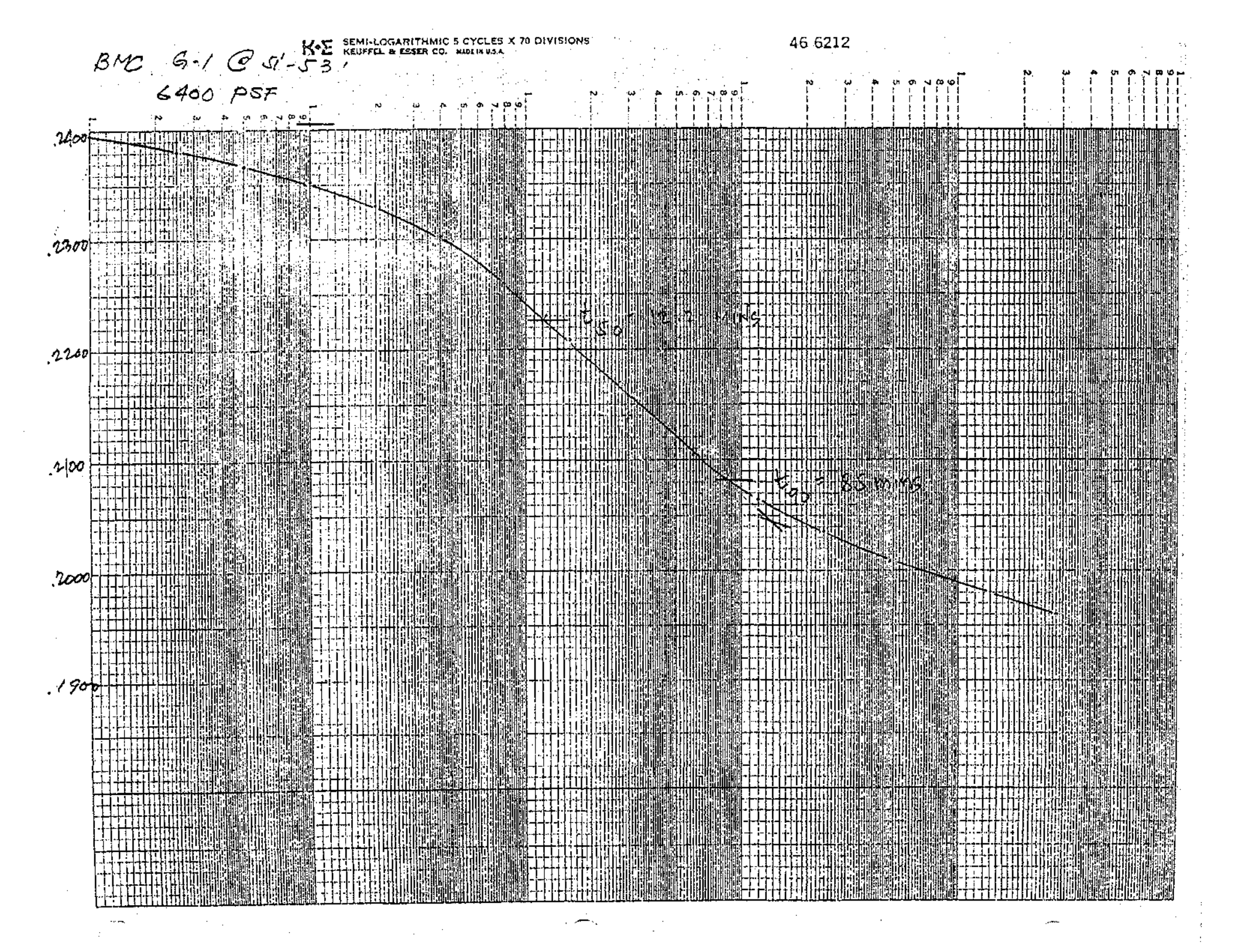
BMC 6-1-51-53

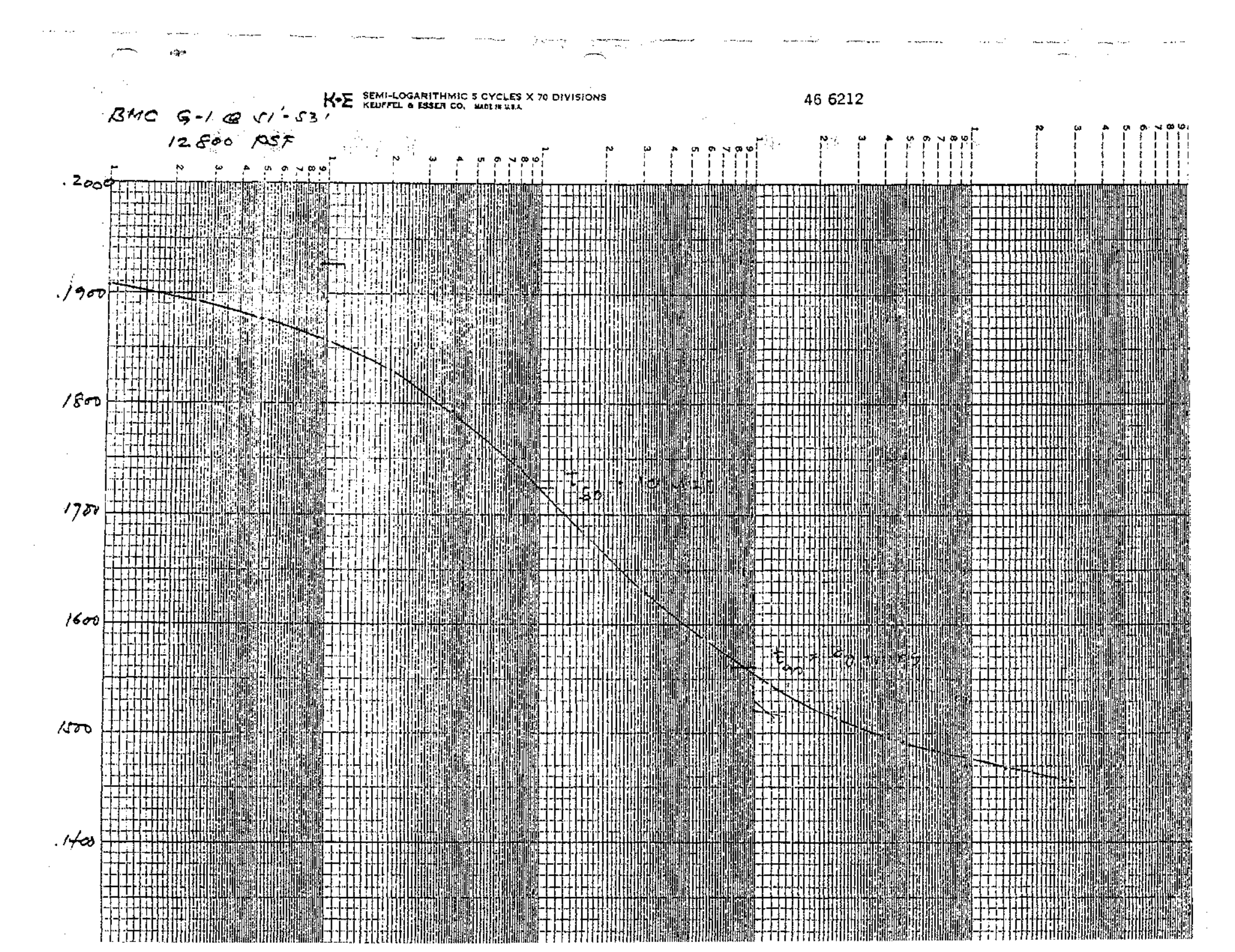
K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212



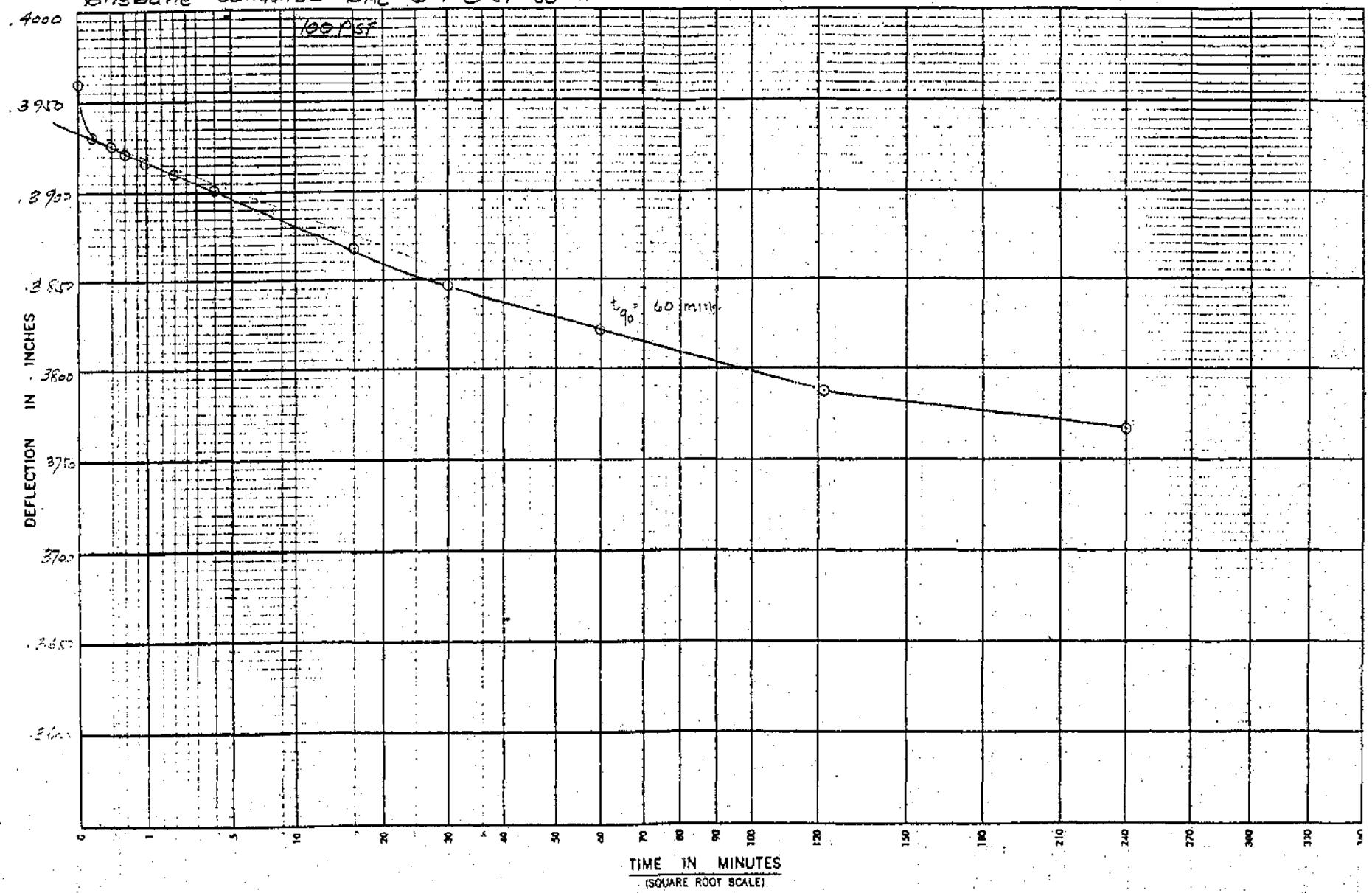

K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-1 @ 51'-53'
3200 PSF
2900
2800
2700
2600
2500
2400


K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-1 @ 51-53'
6400 PSF
.2400
.2300
.2200
.2100
.2000
.1900


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-1 @ 51'-53'
12800 PSF
.2000
.1900
1800
1700
1600
1500
.1400

Brisbane Landfill BHC G-1 @ 51'-53'

SHEET ____ OF ____

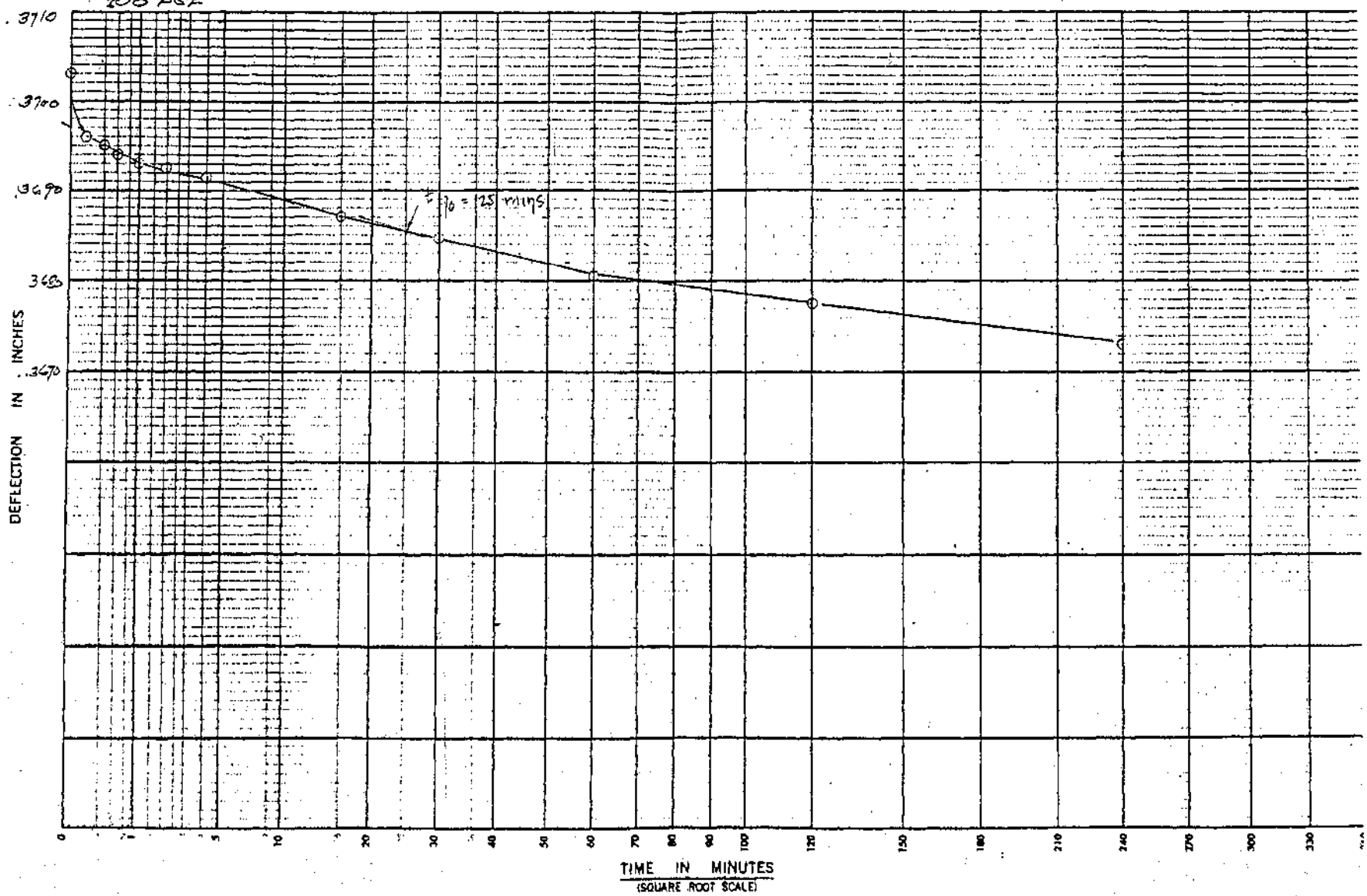


REVISIONS
1 BY ____ DATE ____
2 BY ____ DATE ____

3 BY ____ DATE ____
CHECKED BY ____

BMC 9-1 @ 47'-53'
200 PSF

SUBJECT : TIME-SETTLEA ATA
SHEET 0



REVISIONS
BY _____ DATE _____
BY _____ DATE _____

BY _____ DATE _____
CHECKED BY _____

FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ____ OF ____

BMC G-1 @ 51-53'

400 PSF

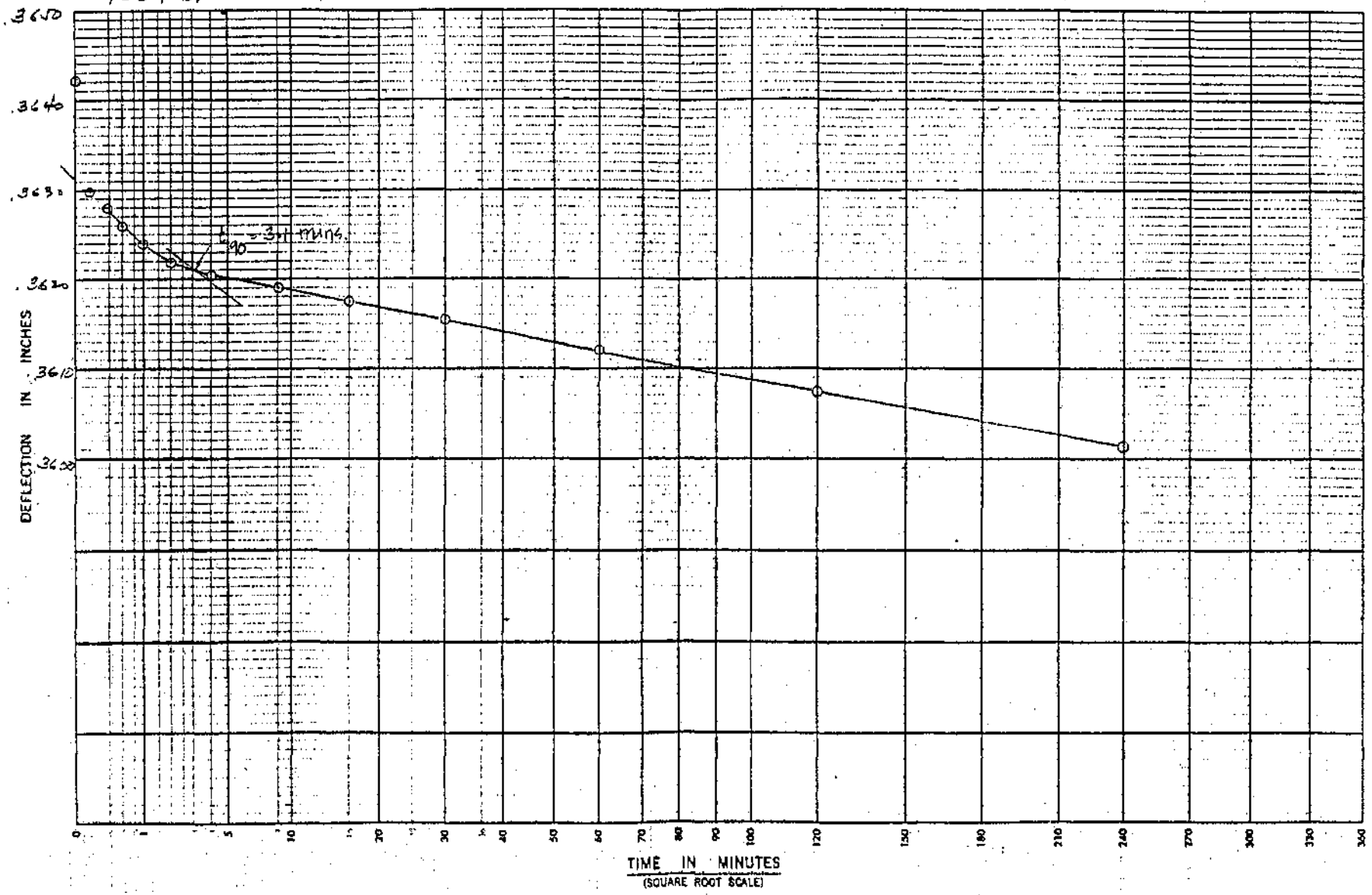
REVISIONS

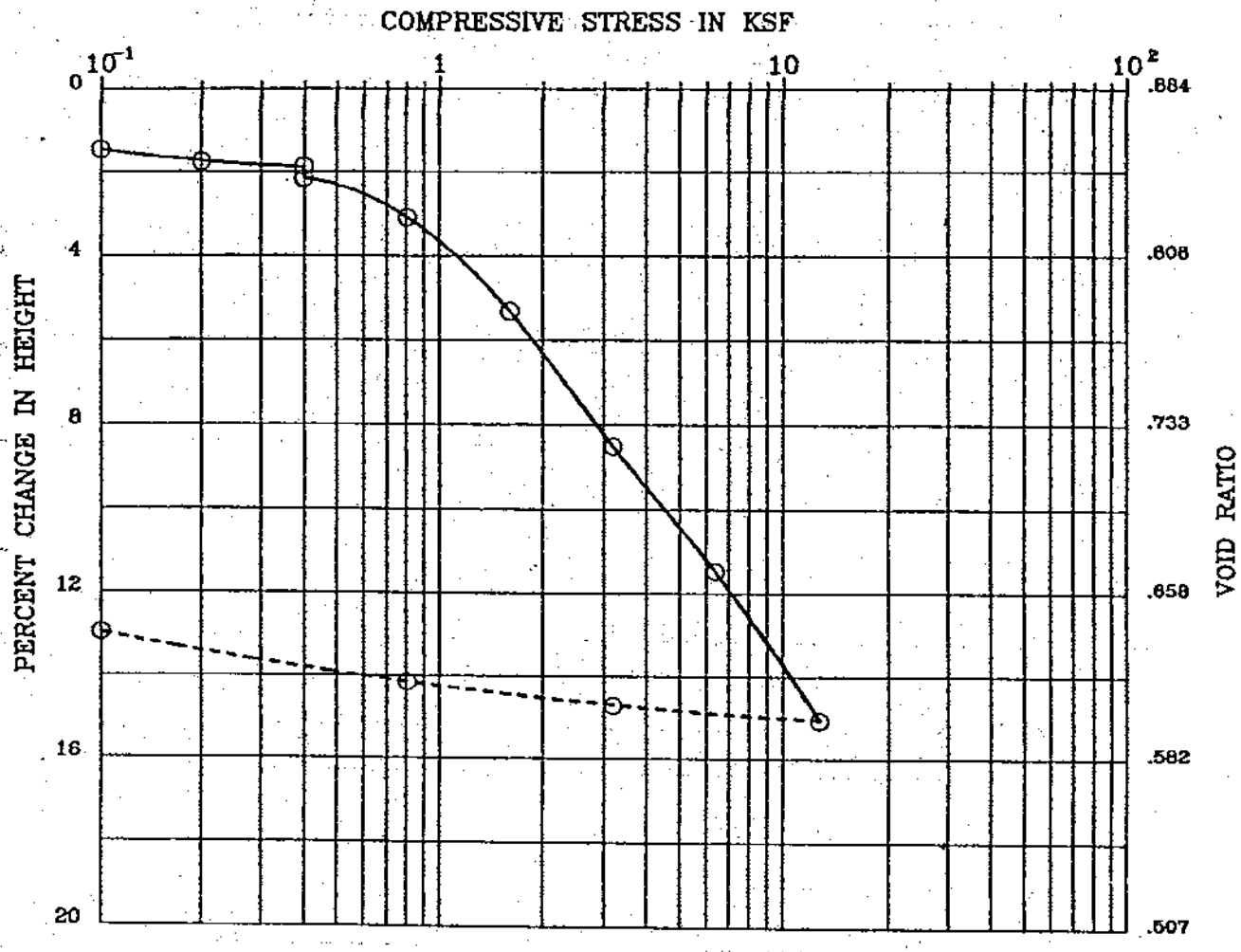
BY _____ DATE _____

BY _____ DATE _____

BY _____ DATE _____

CHECKED BY _____





BORING : G – 2
DEPTH (ft) : 27 – 29
SPEC. GRAVITY : 2.73

DESCRIPTION : Gray sandy CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	29.1	90.4	90	.884
FINAL	23.4	104.0	100	.639

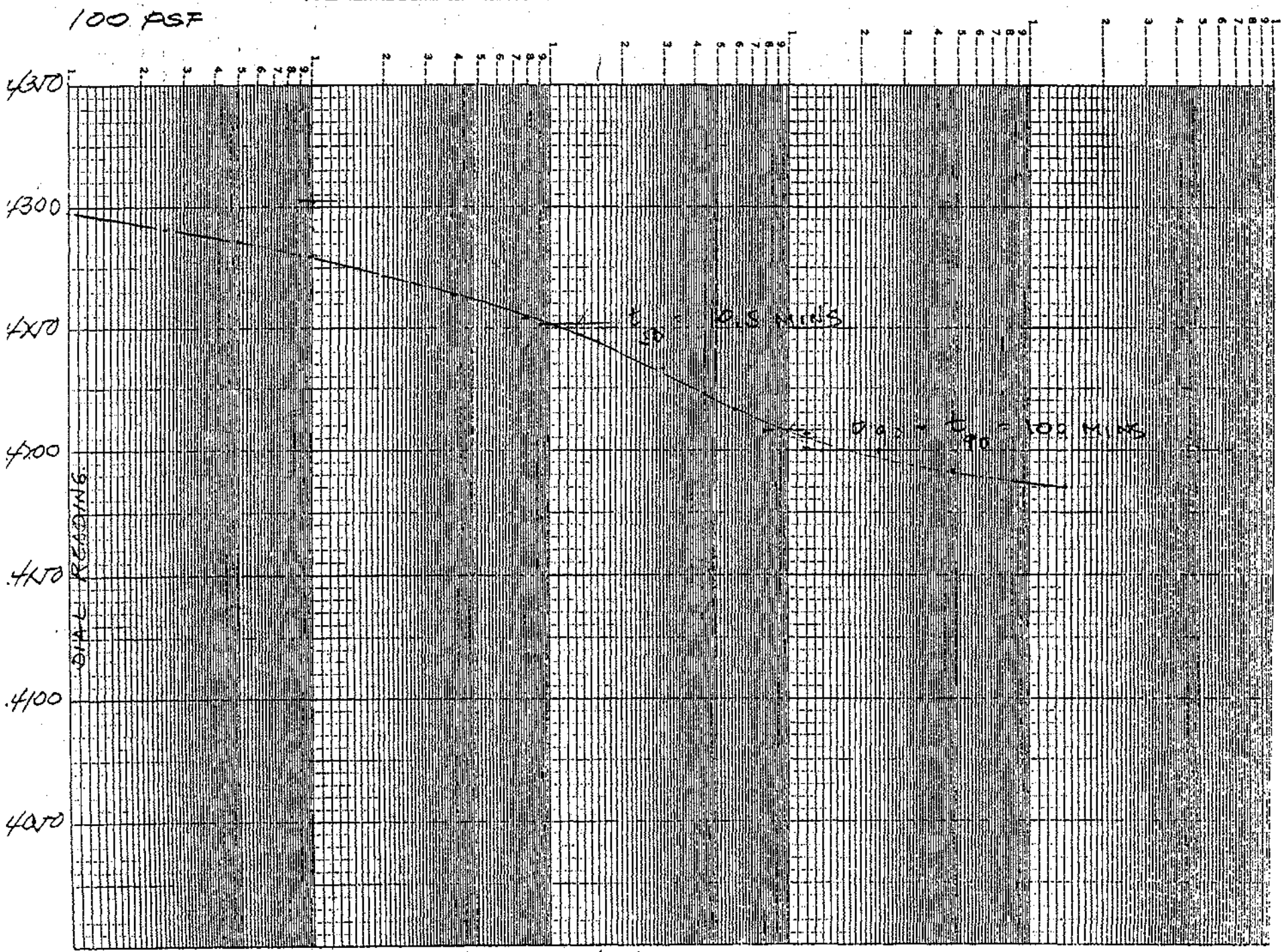
Remark : INUNDATED AT 0.4 KSF

Project No.:1546-2	BMC – BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:

K&E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

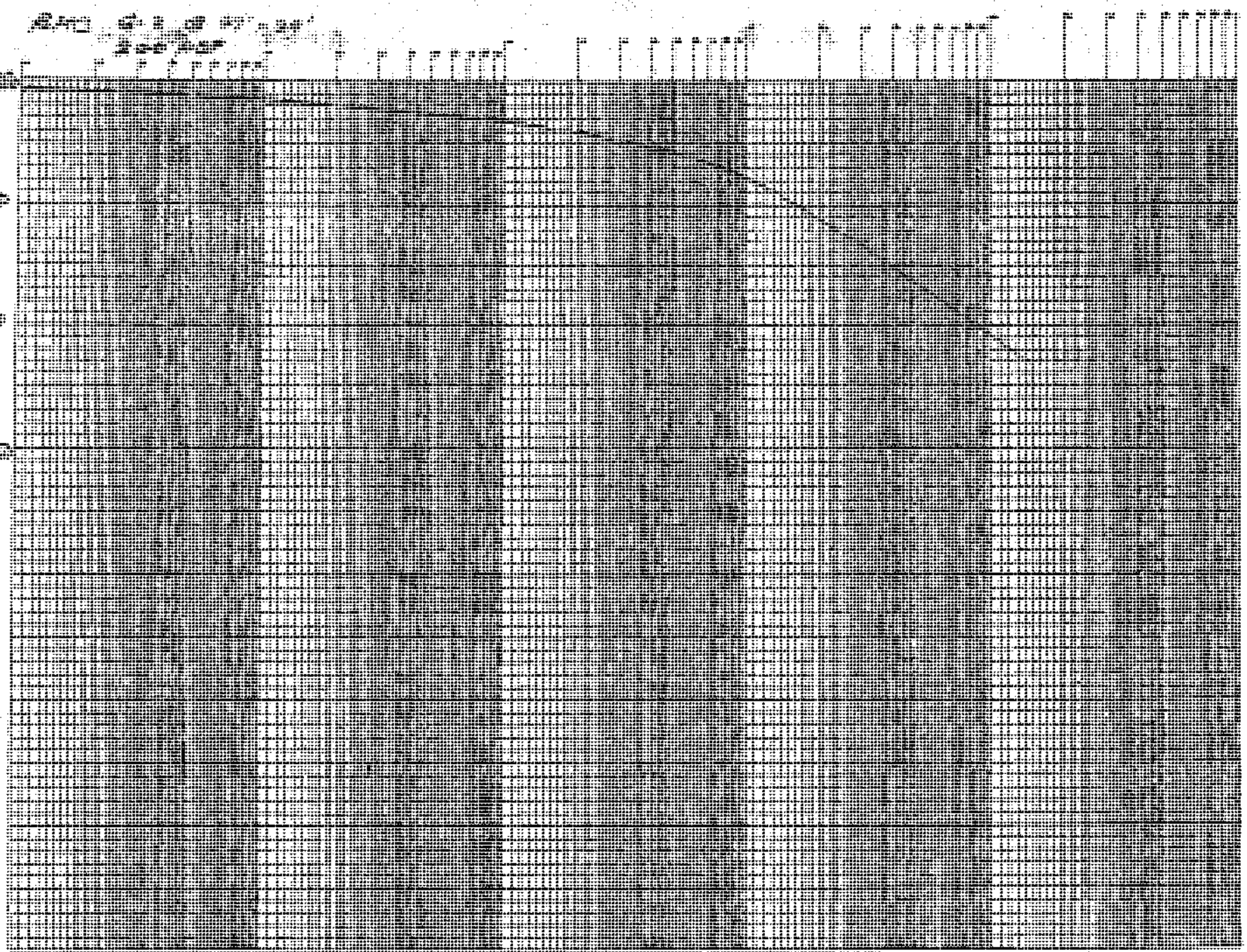
46 6212

100 PSF



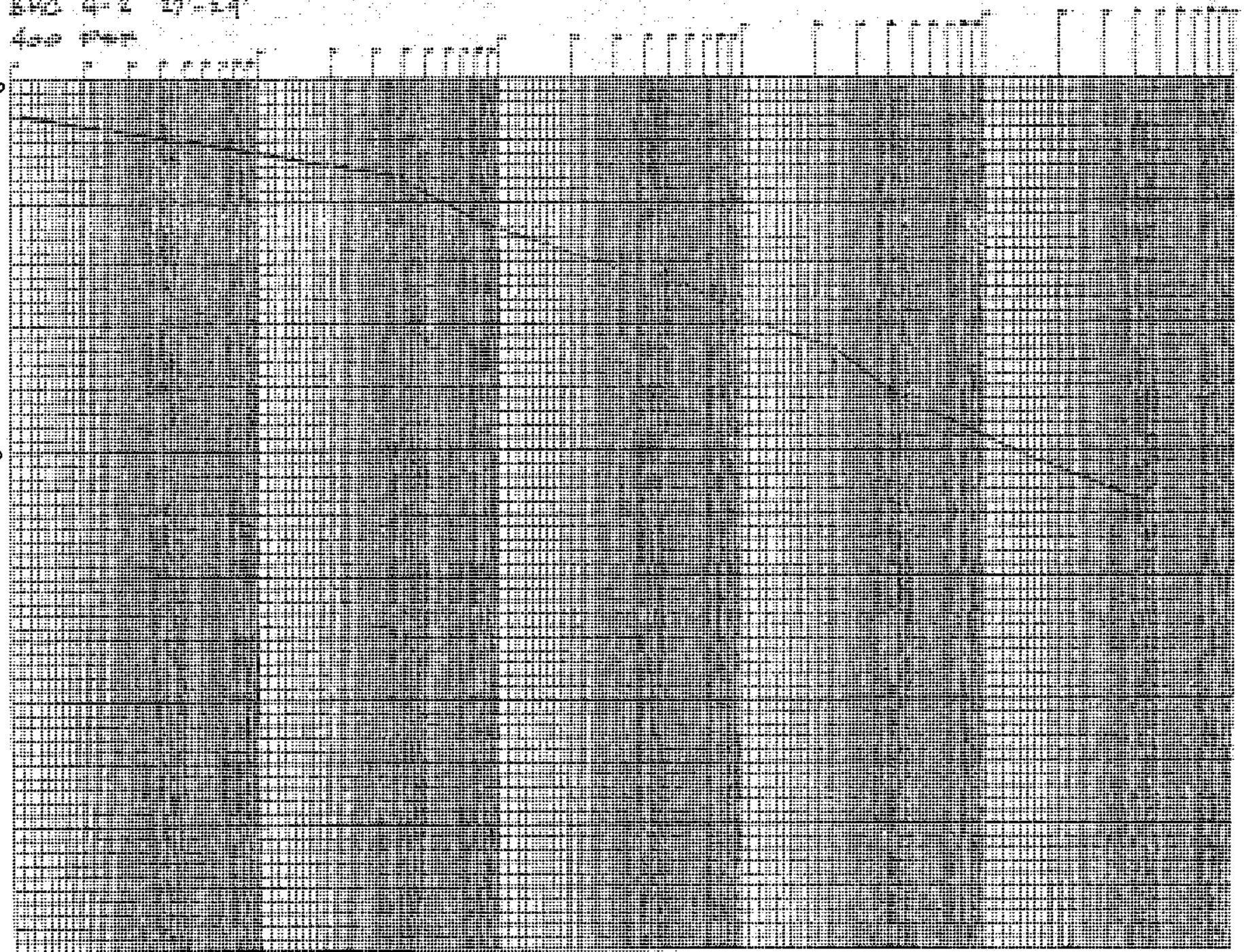
K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212



K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

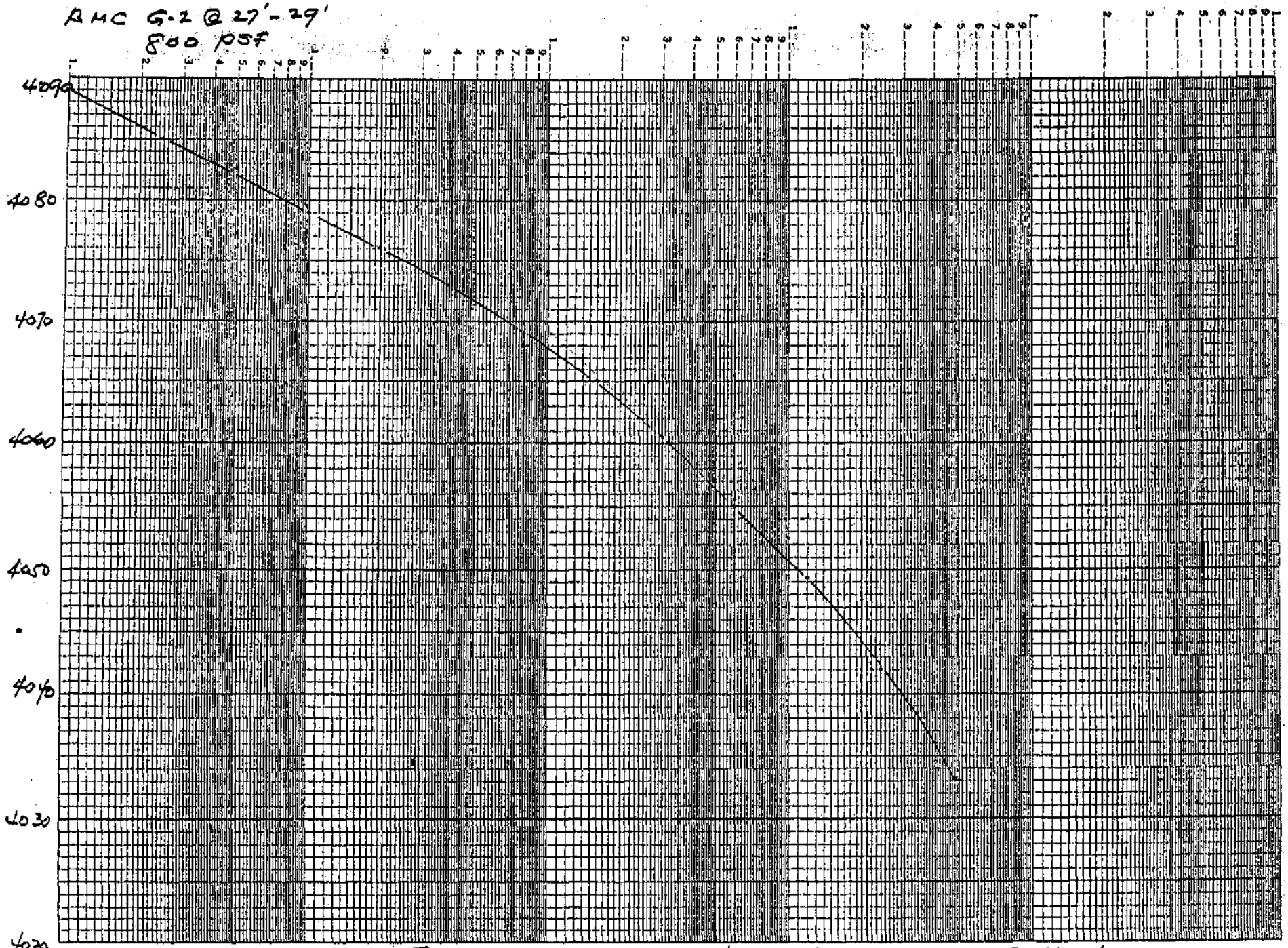
46 6212



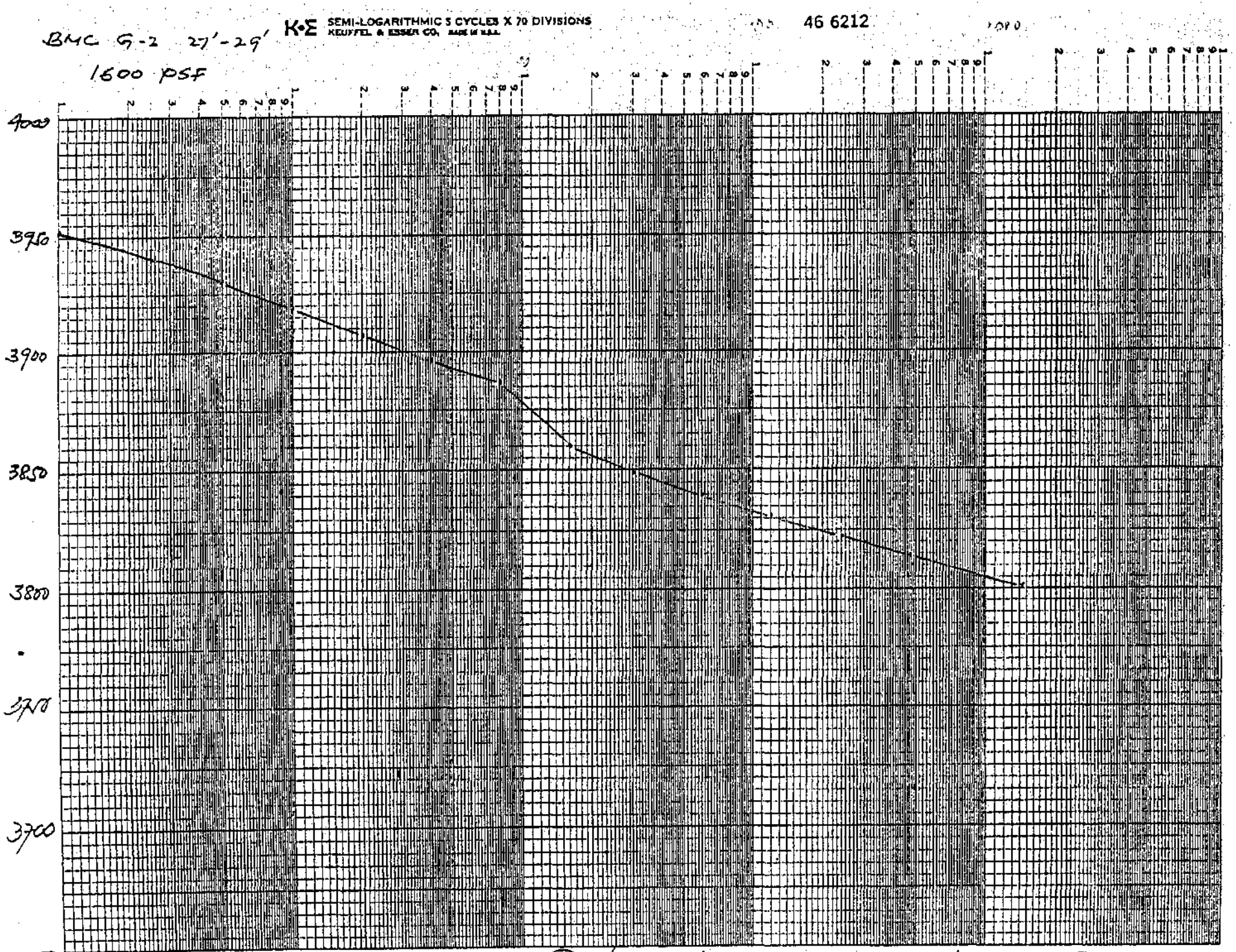
K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

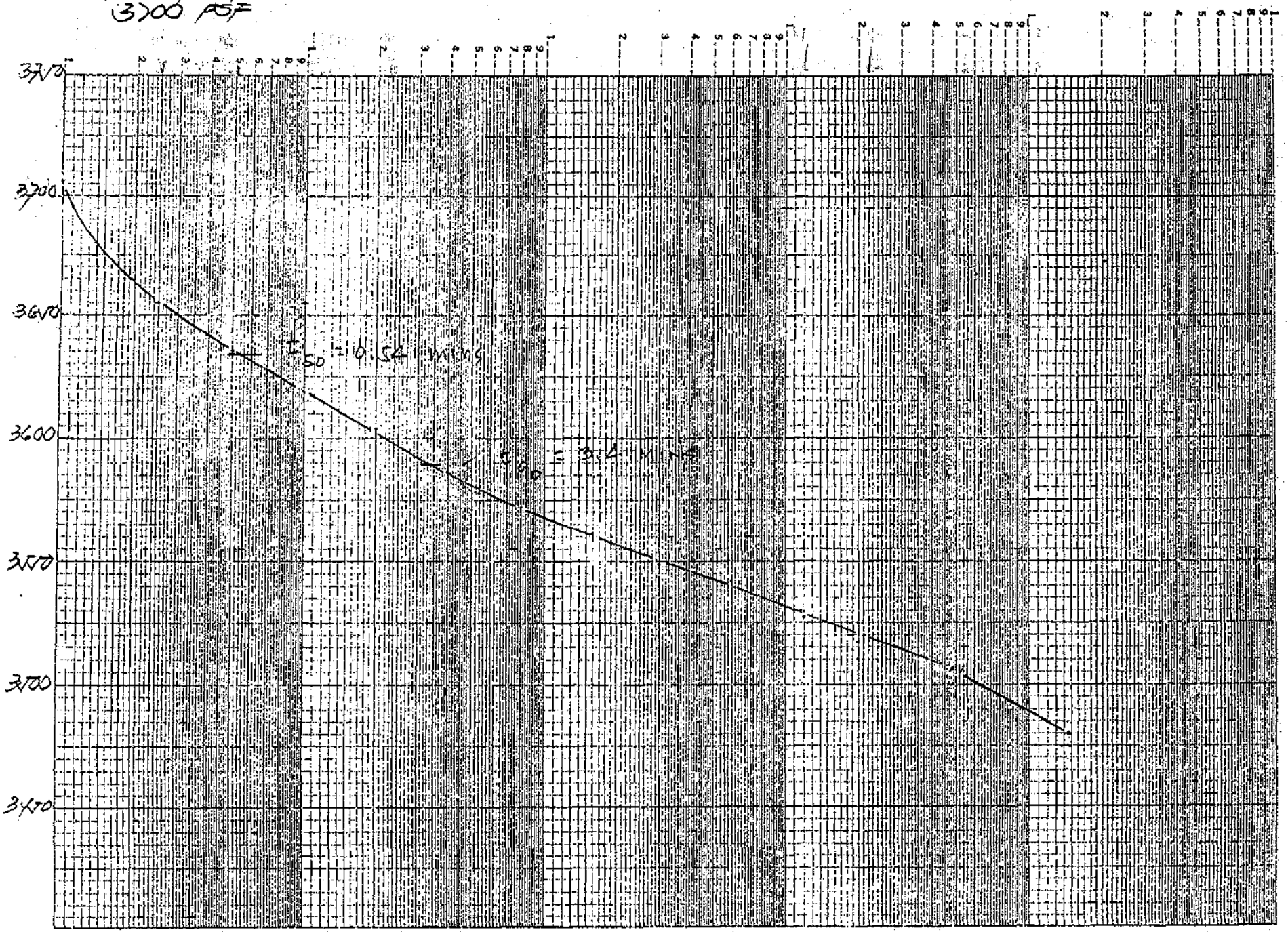
BMC G-2 @ 27'-29'
800 psf

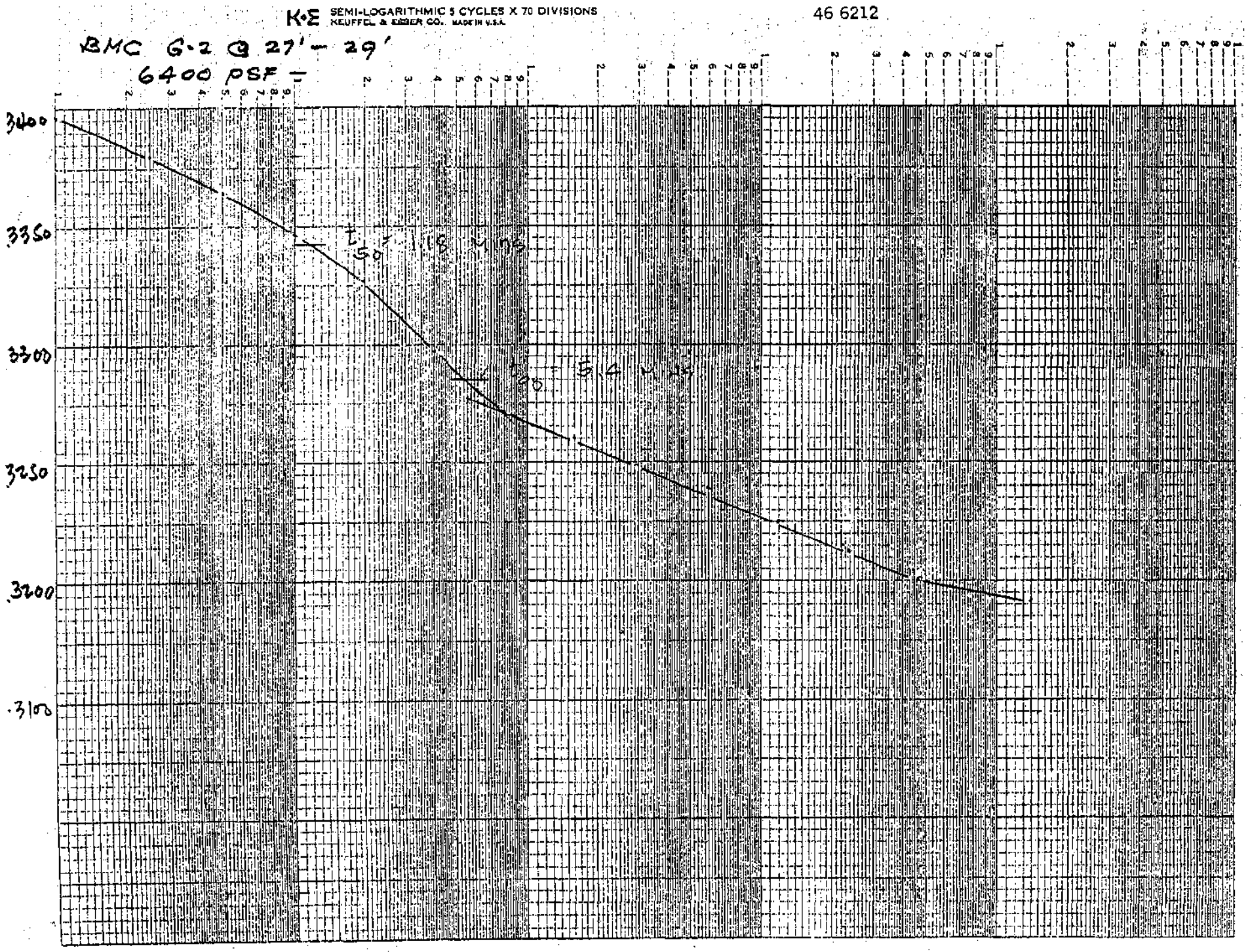


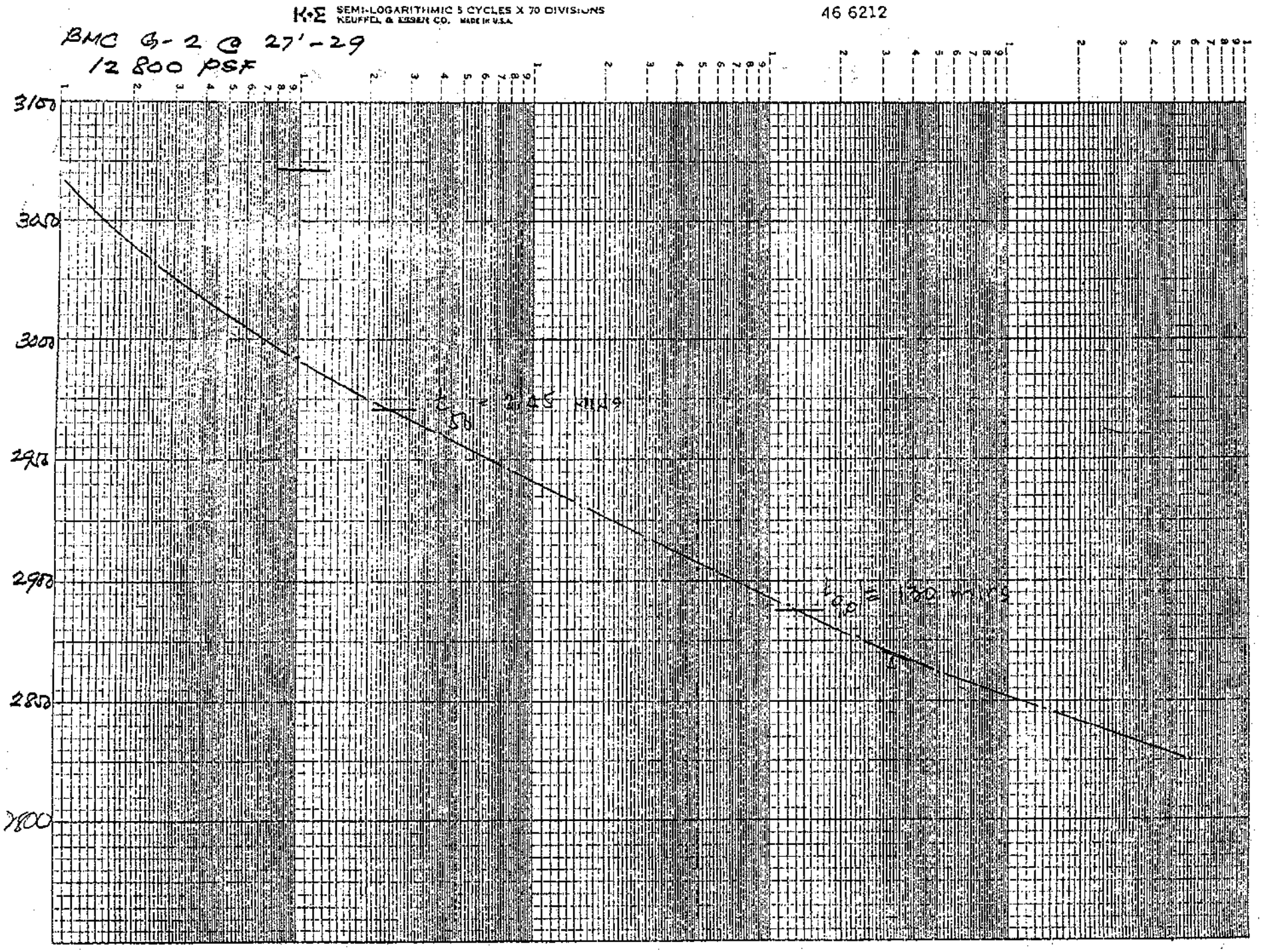
T_D + T_{90} CANNOT BE Determined, PLOTTED ON VE Sheet



T_p & T cannot be determined, plotted on VT sheet.


BMCGW 27-29
3300 ASF
K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
3700
3600
3500
3400
3300
+1.50
-0.54 MMG
+1.50
-0.54 MMG


K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-2 @ 27' - 29'
6400 PSF -
3400
3350
3300
3250
3200
3100


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-2 @ 27'-29
12 800 PSF
3100
3050
3000
2950
2900
2850
2800

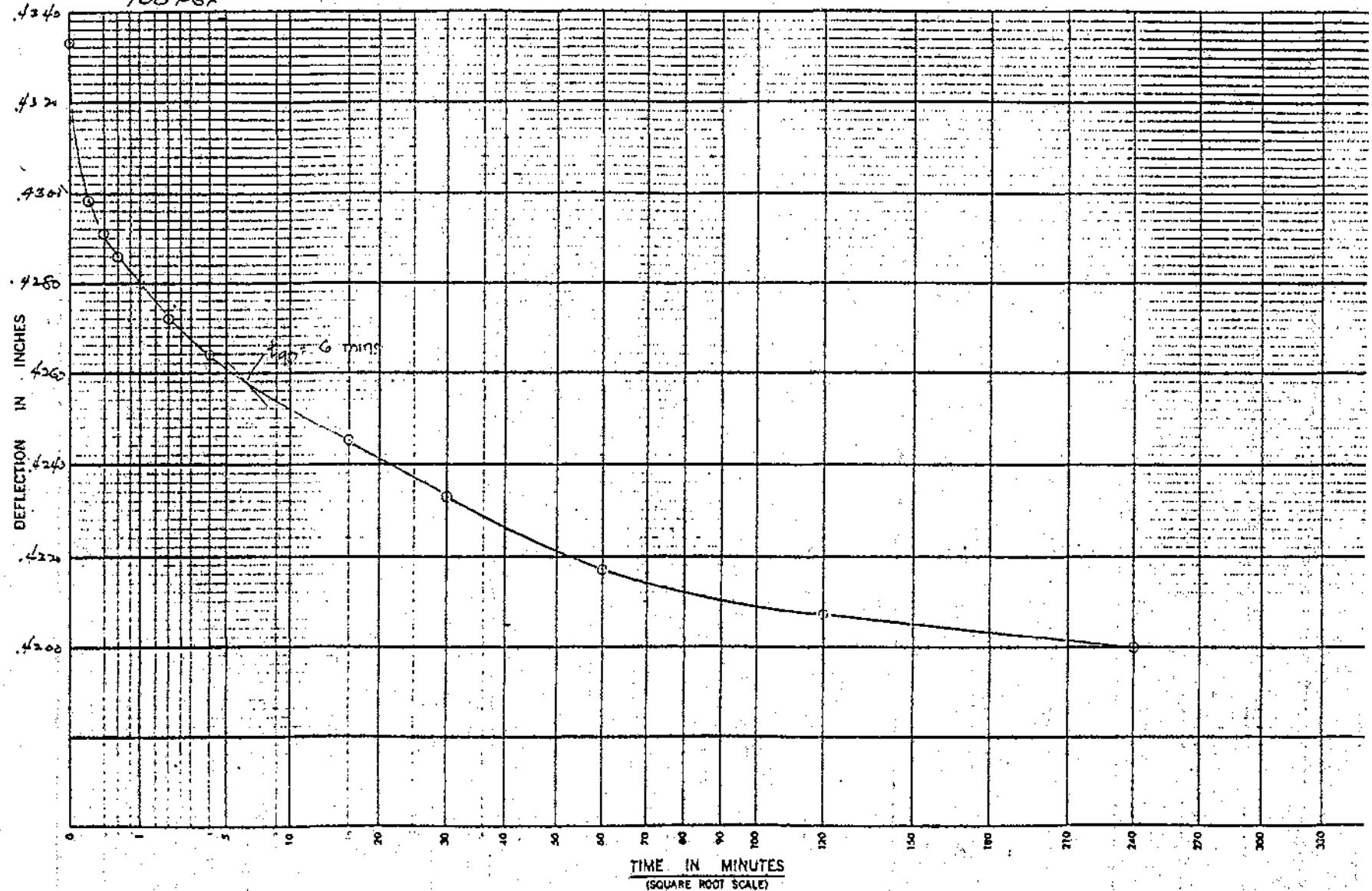
FILE

SUBJECT : TIME-SETTLEMENT DATA

SHEET

BHC G-2 @ 27'-29'

100 PSF



REVISIONS

BY _____ DATE _____

BY _____ DATE _____

BY _____ DATE _____

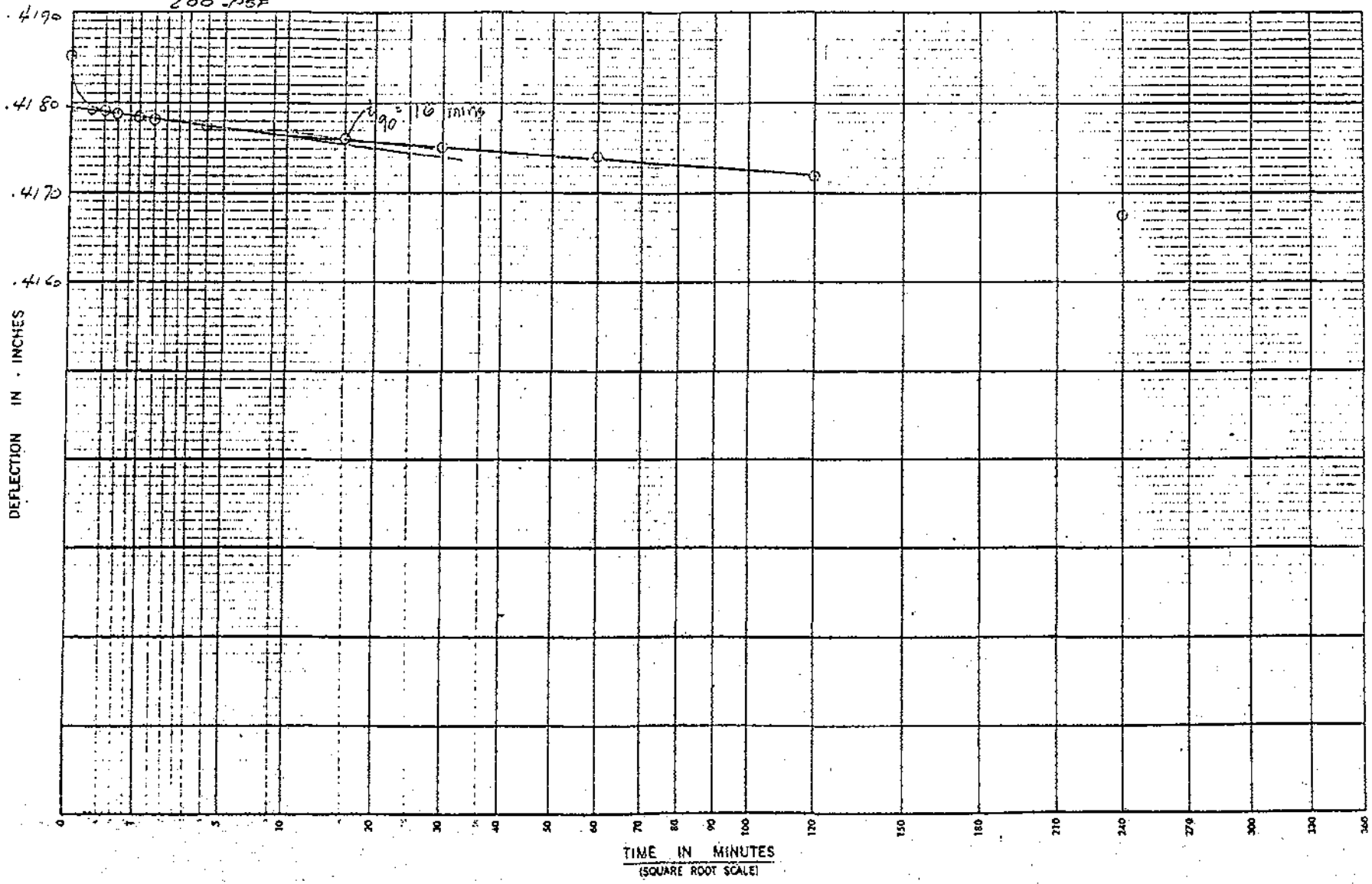
CHECKED BY _____

BMC 9-2 @ 27'-29'

200 PSF

SUBJECT : TIME-SETTLEME... /A _____

_____ SHEET ___ OF ___



REVISIONS

BY _____ DATE _____

BY _____ DATE _____

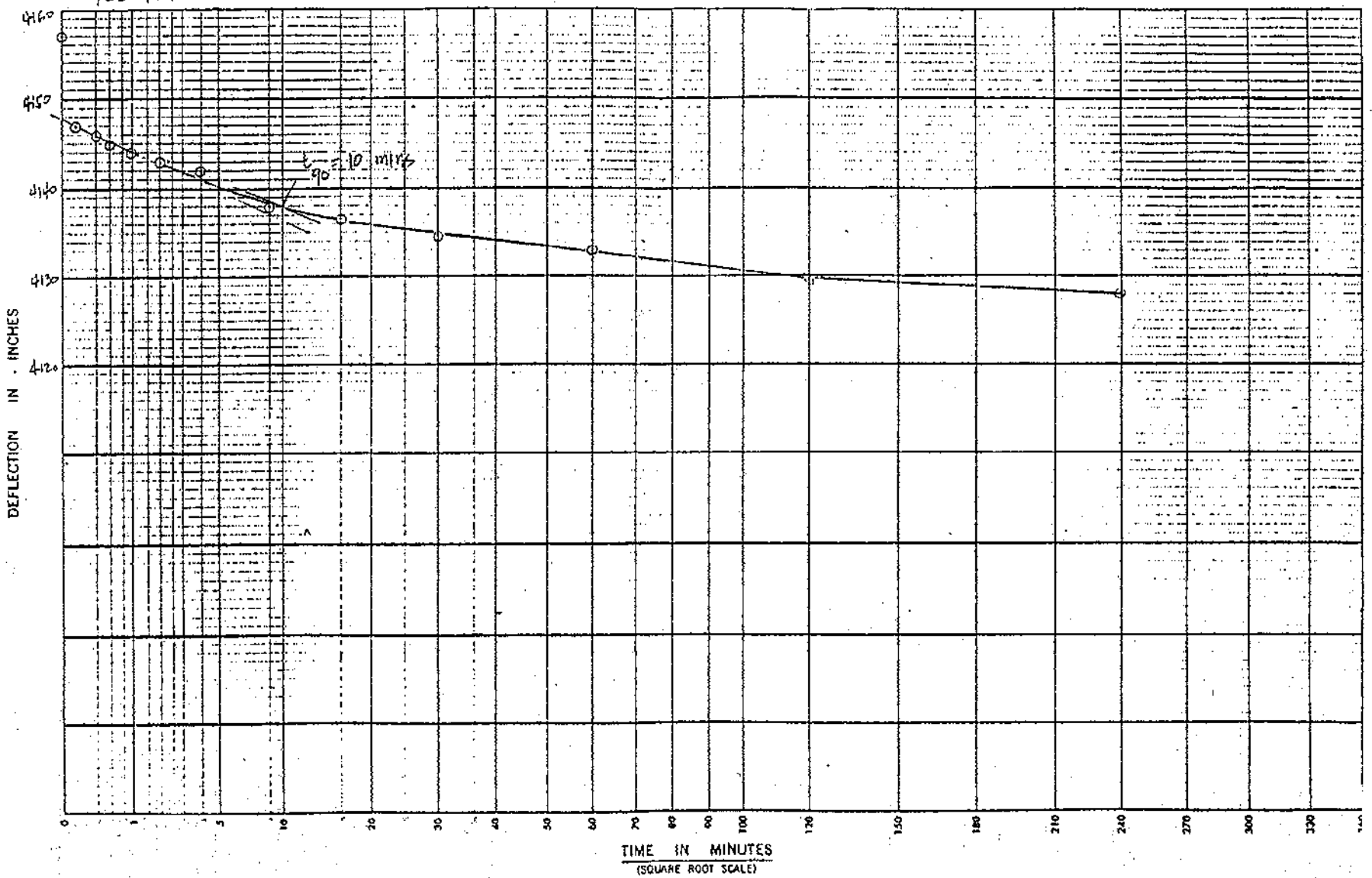
BY _____ DATE _____

CHECKED BY _____

BHC G-2 @ 27'-29'
400 PSF

SUBJECT : TIME-SETTLEMENT DATA

SHEET ____ OF ____

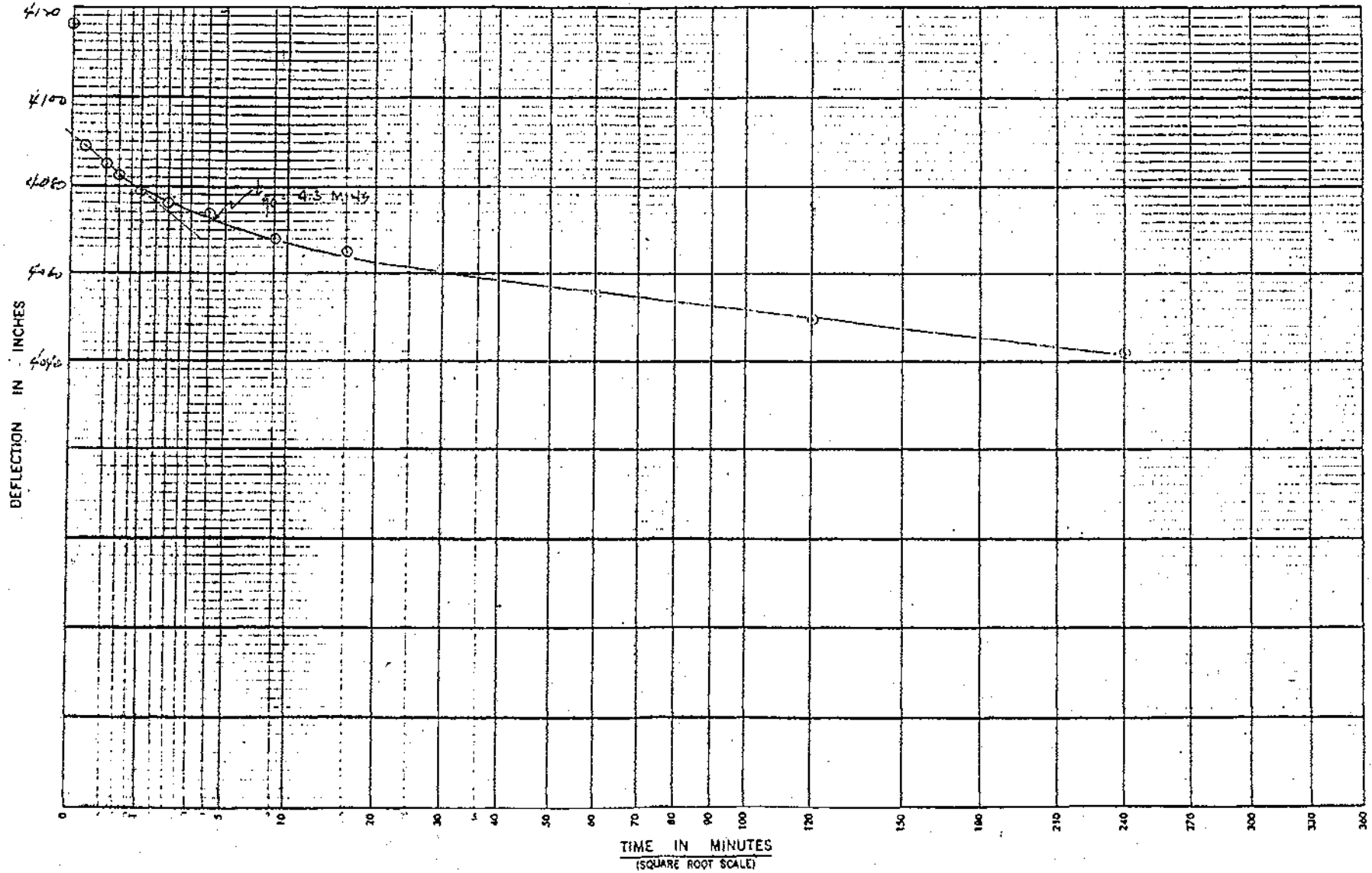


REVISIONS
BY ____ DATE ____
BY ____ DATE ____

BY ____ DATE ____
CHECKED BY ____

800 psf

SHEET ___ OF ___



BY _____ DATE _____
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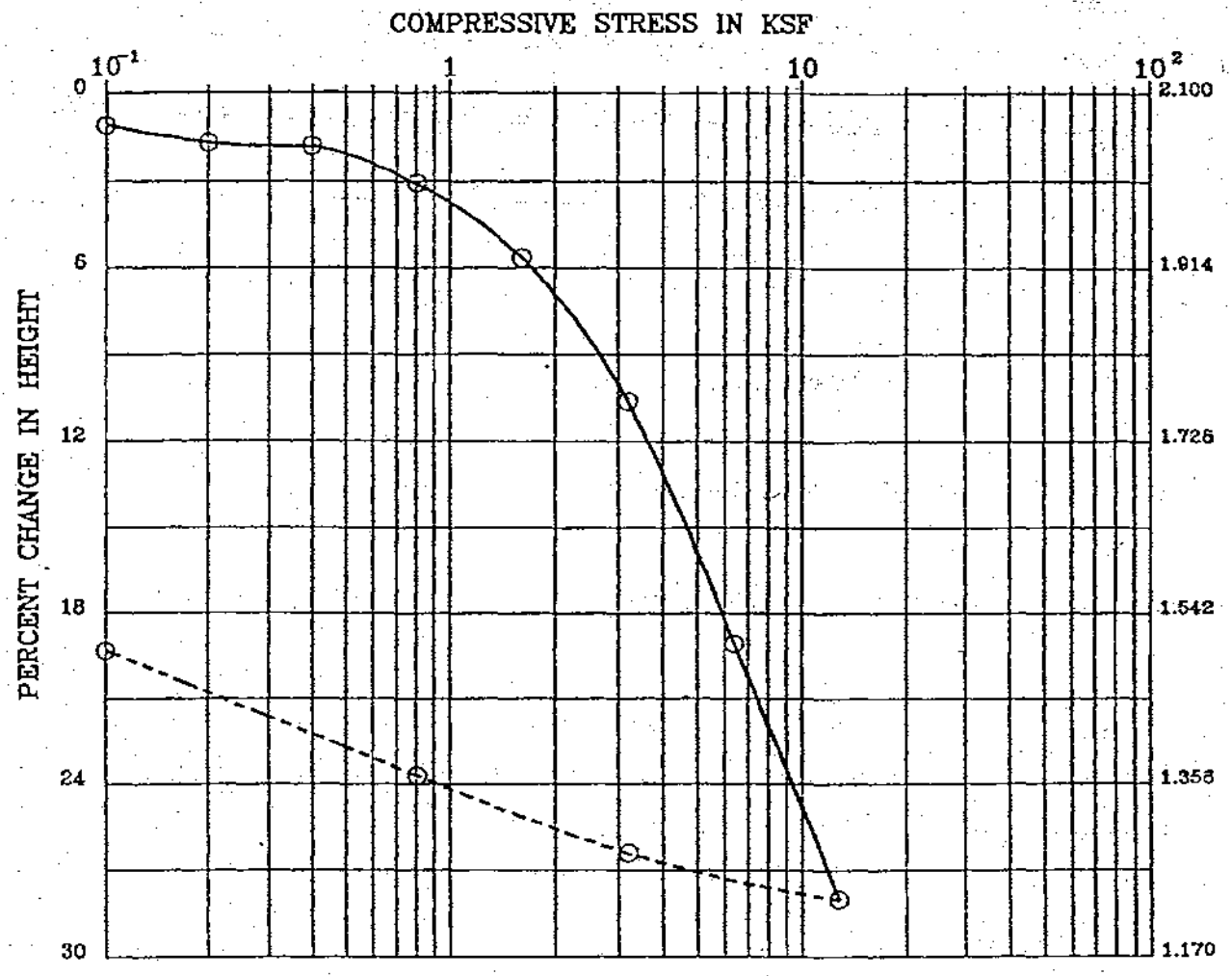


BORING : G – 3
DEPTH (ft) : 28 – 30
SPEC. GRAVITY : 2.70

DESCRIPTION : Gray silty CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	72.5	54.4	93	2.100
FINAL	53.4	67.4	96	1.502

Remark : INUNDATED AT 0.4 KSF

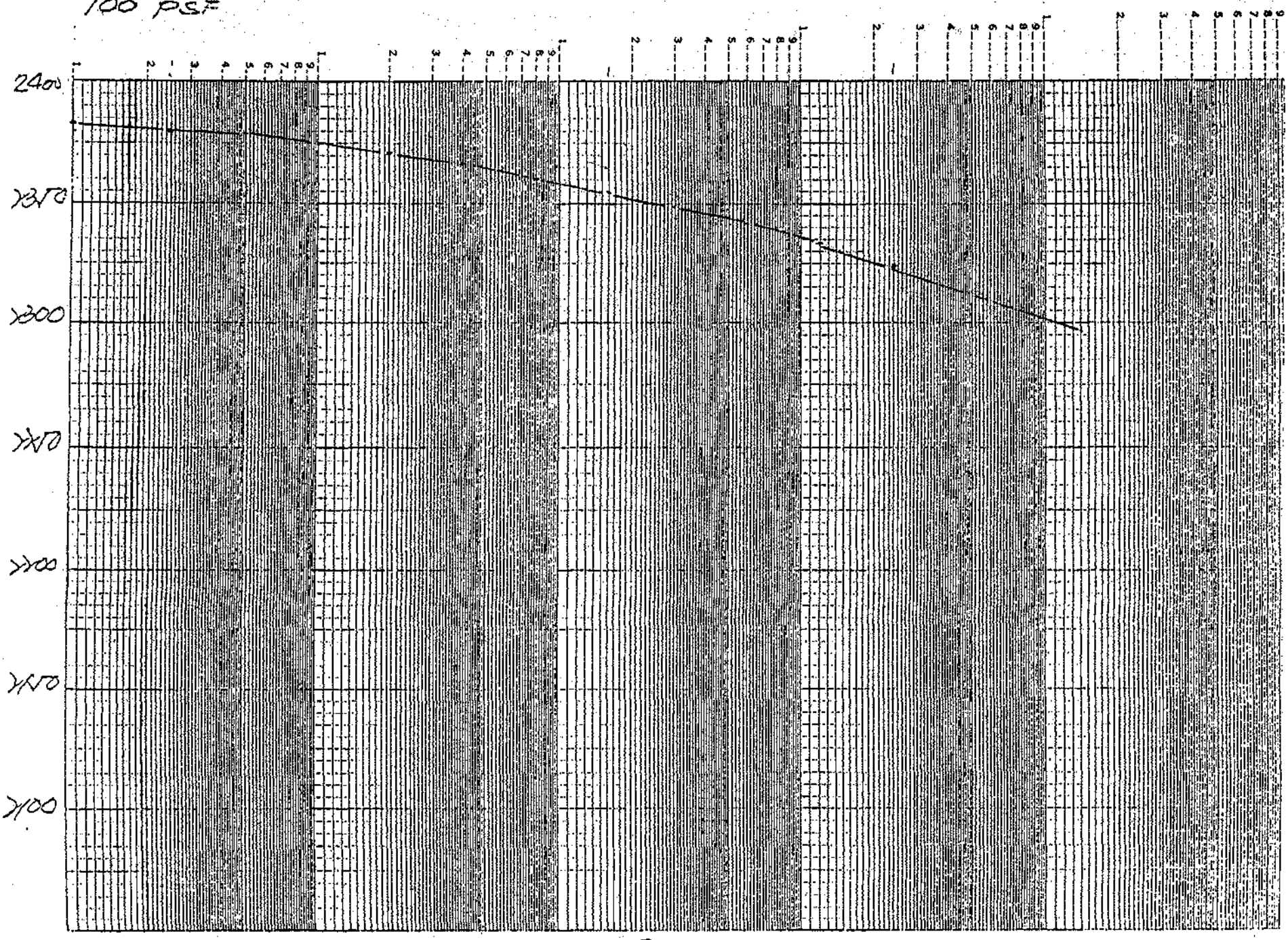
Project No.:1546-2	BMC – BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:

MC-G3 @ 28-30

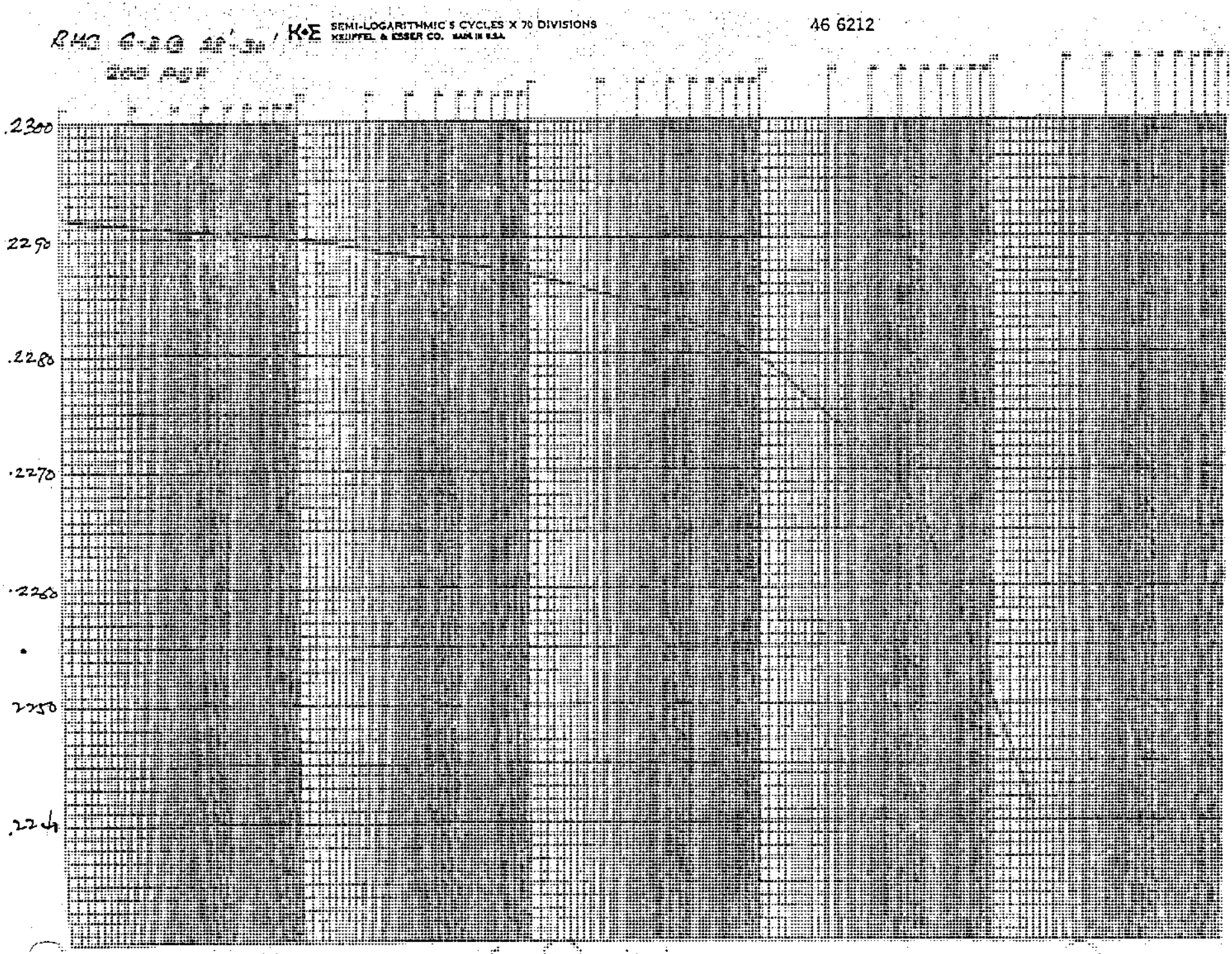
100 PSF

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212



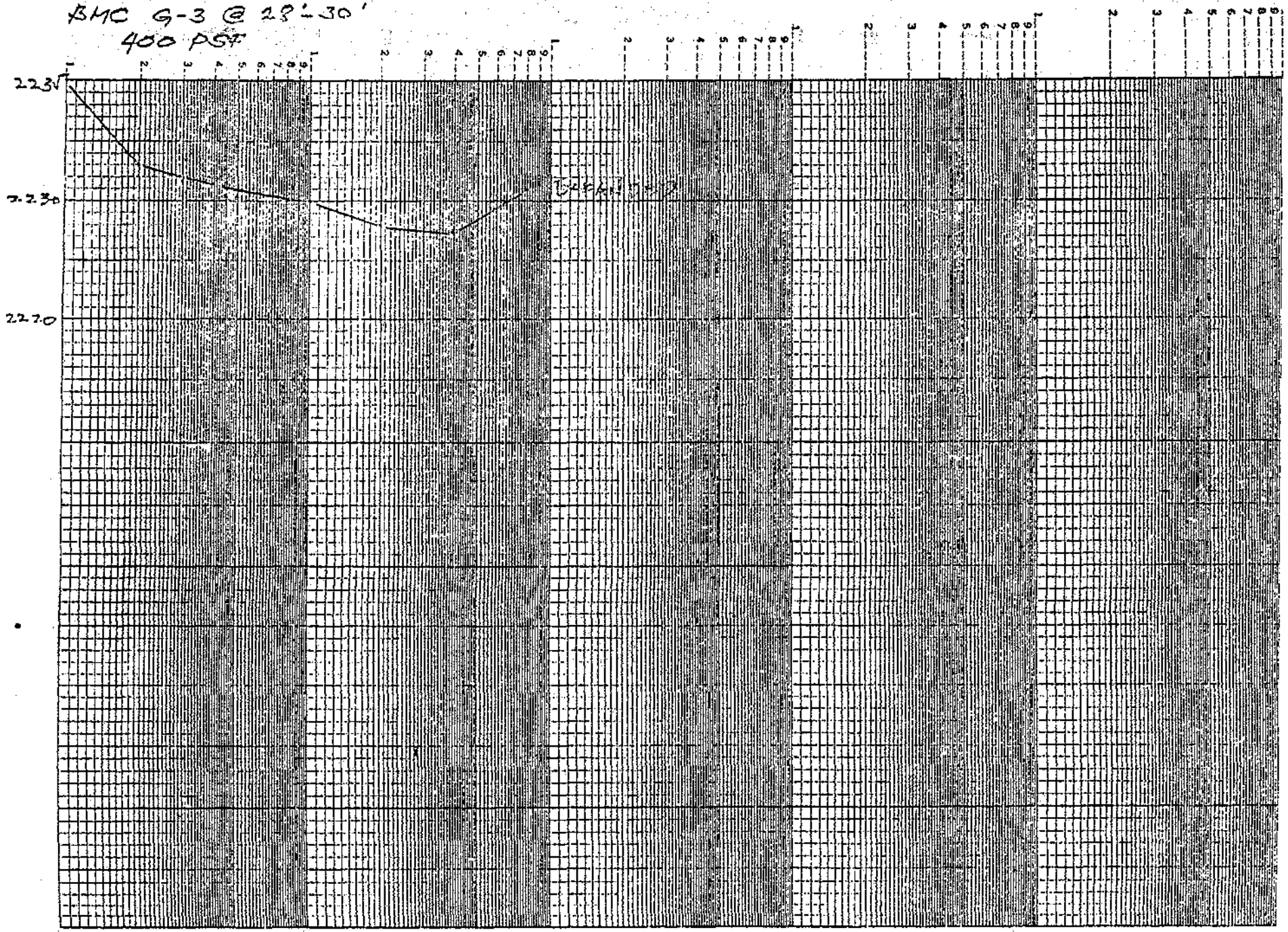
See VT Sheet

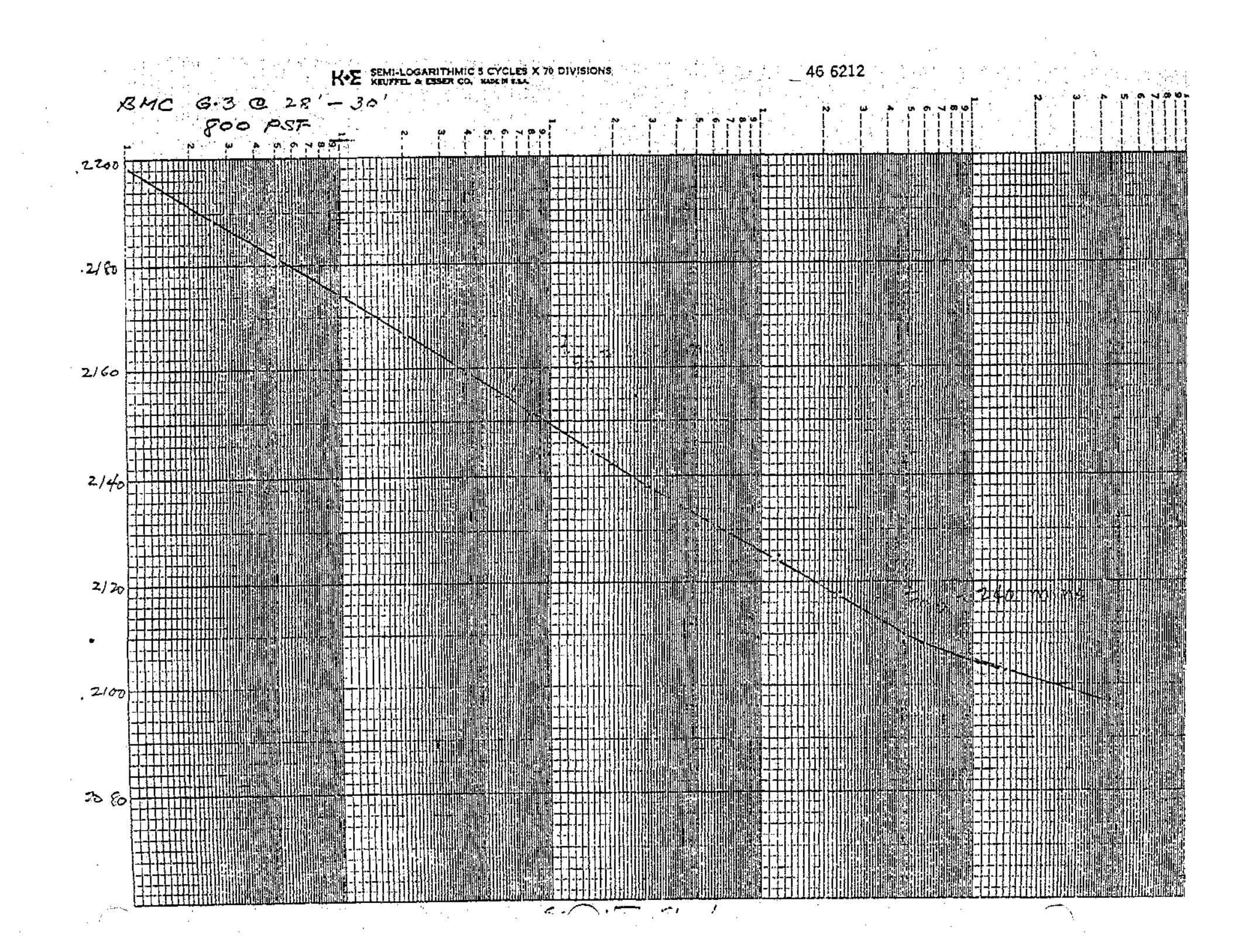

K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
.2300
2290
.2280
.2270
.2260
2250
.224

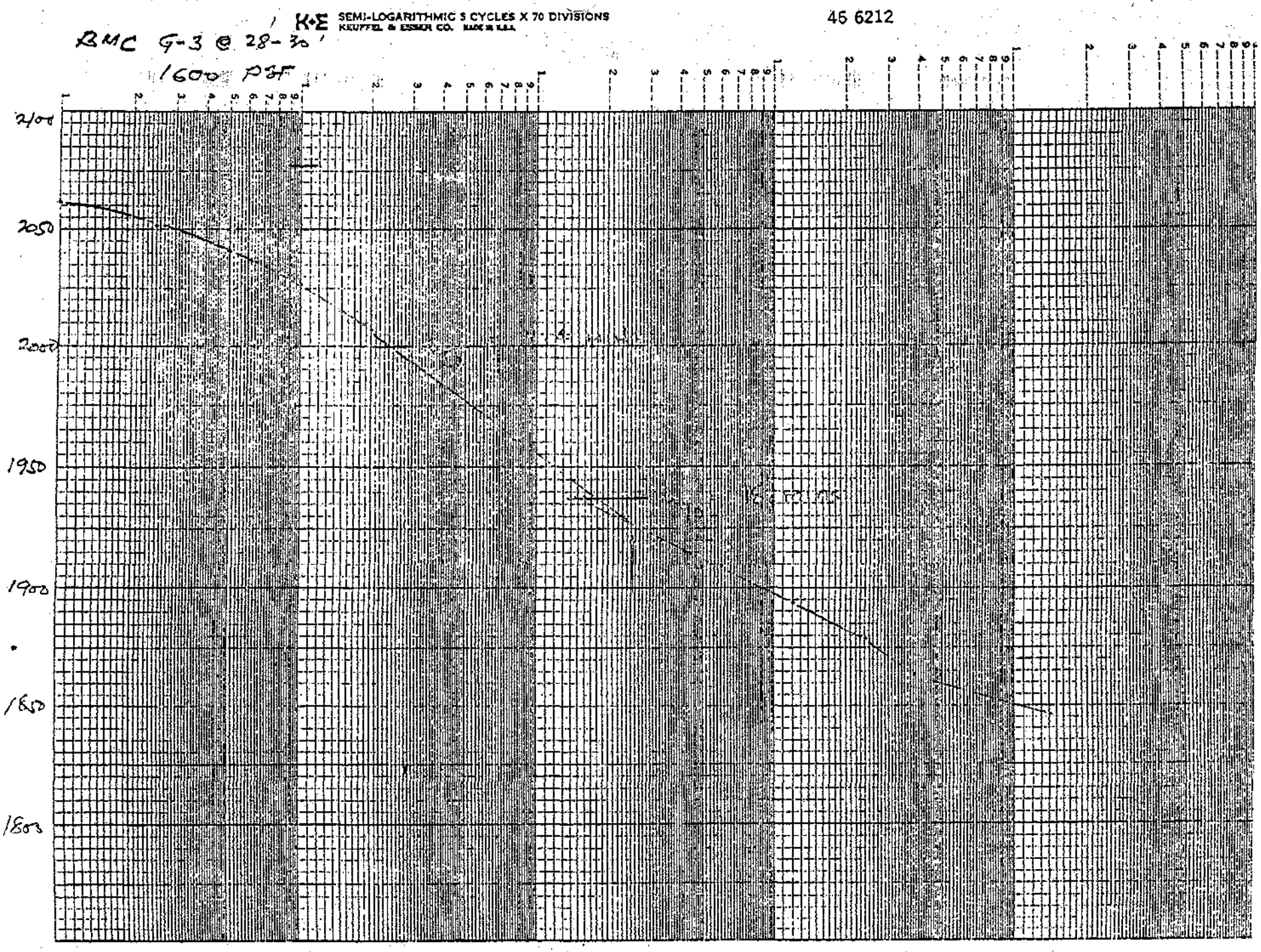
K&E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

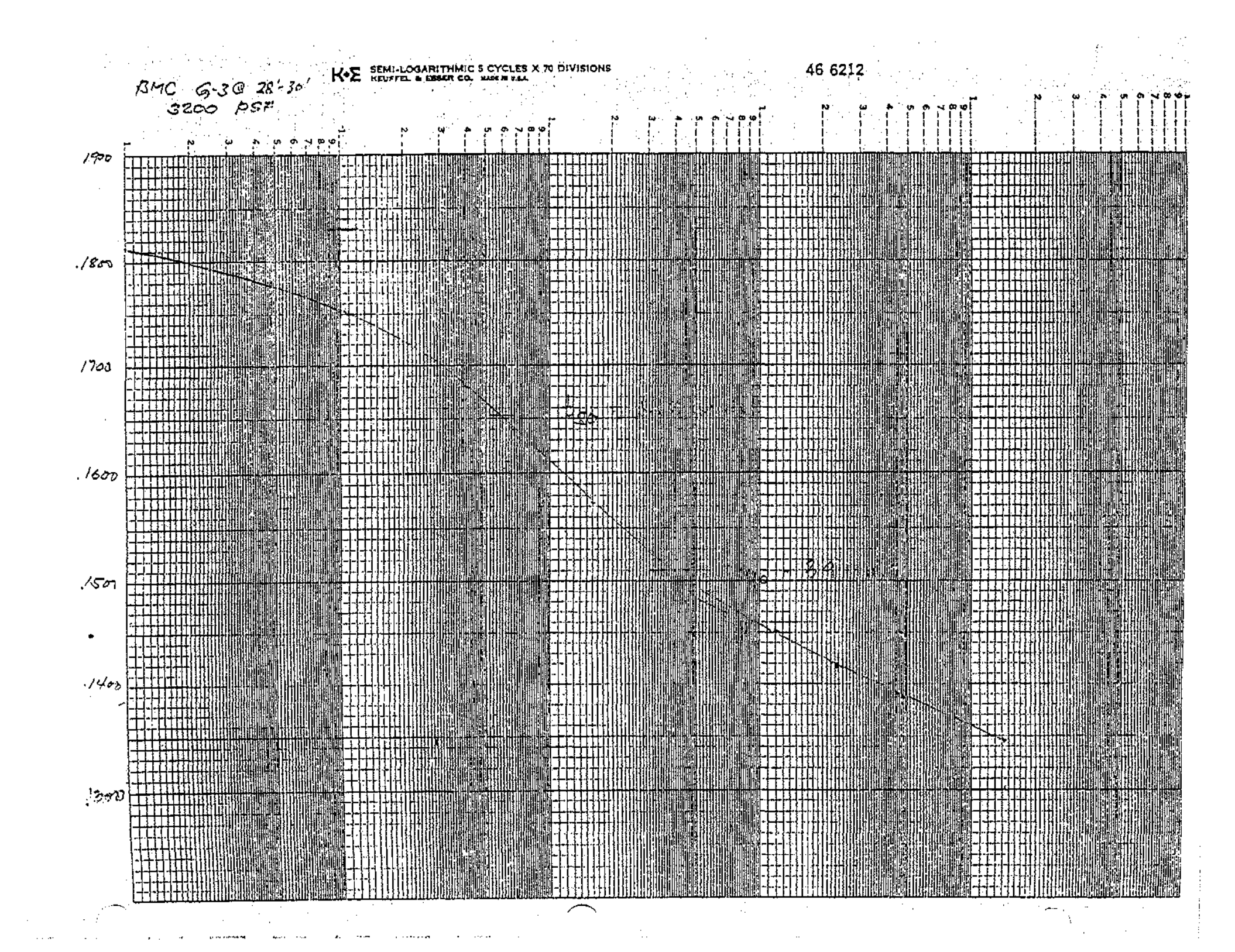
46 6212

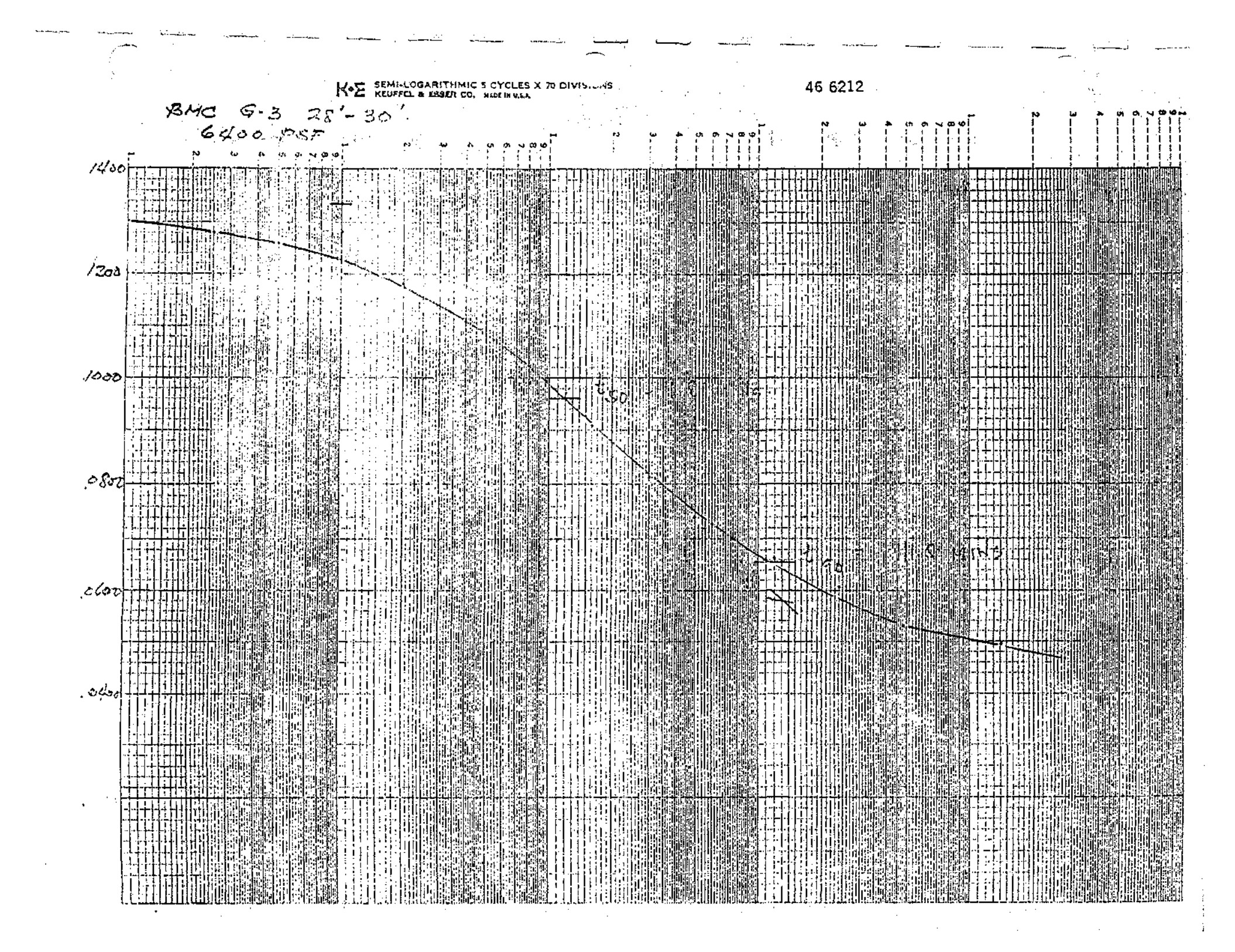
BMC G-3 @ 28'-30'
400 PSF

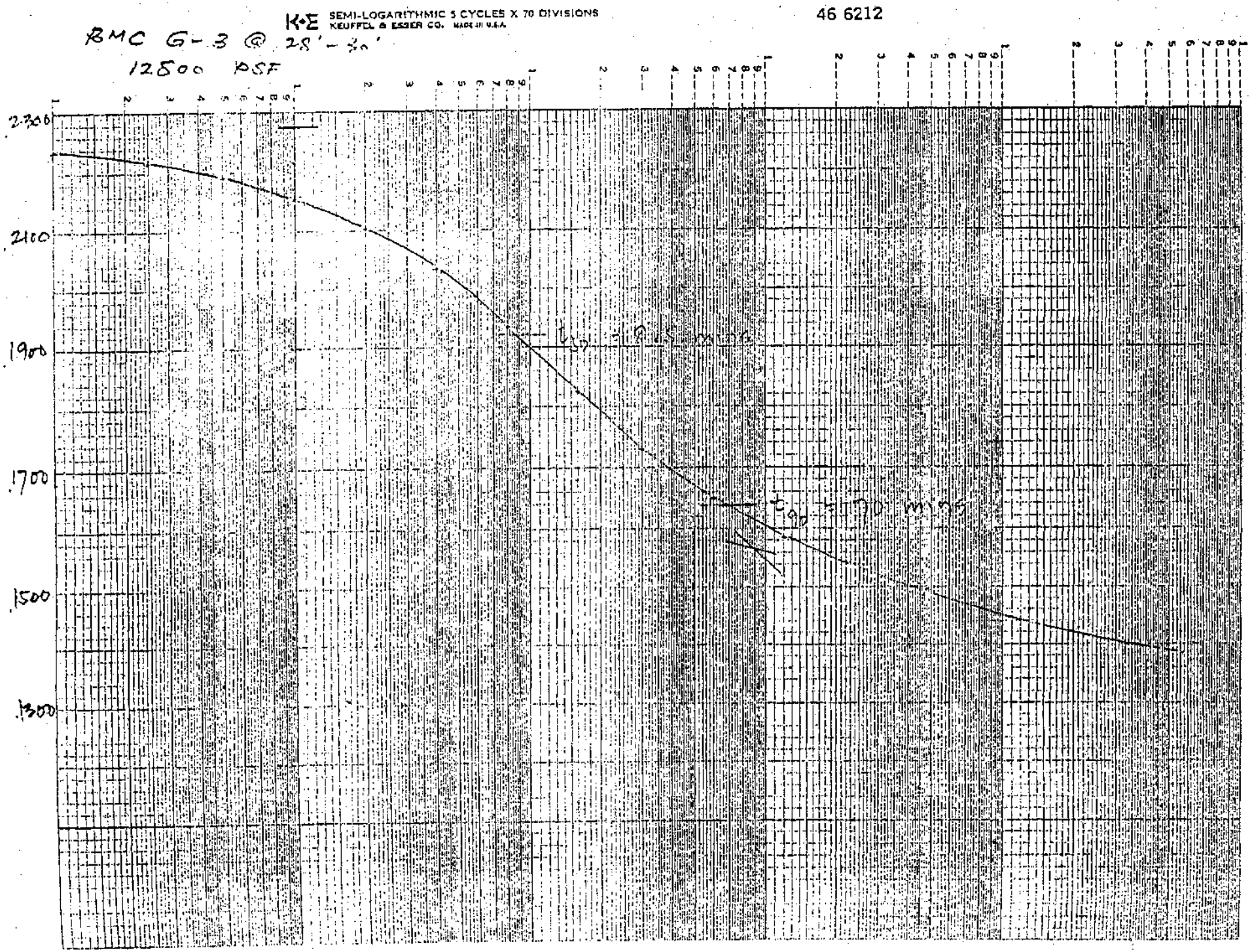



K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-3 @ 28' - 30'
800 PSF
2200
2180
2160
2140
2120
2100
2080


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
46 6212
BMC G-3 @ 28-30'
1600 PSF
2100
2050
2000
1950
1900
1850
1800


BMC G-3 @ 28'-30'
3200 PSF
K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
46 6212
.1900
.1800
.1700
.1600
.1500
.1400
.1300


K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-3 28'-30'
6400 PSF
1400
1200
1000
.0800
.0600
.0400


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-3 @ 25'-30'
12500 PSF
2300
2100
1900
1700
1500
1300

B4C - G-3 @ 28'-30'

100 PSF

FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ____ OF ____

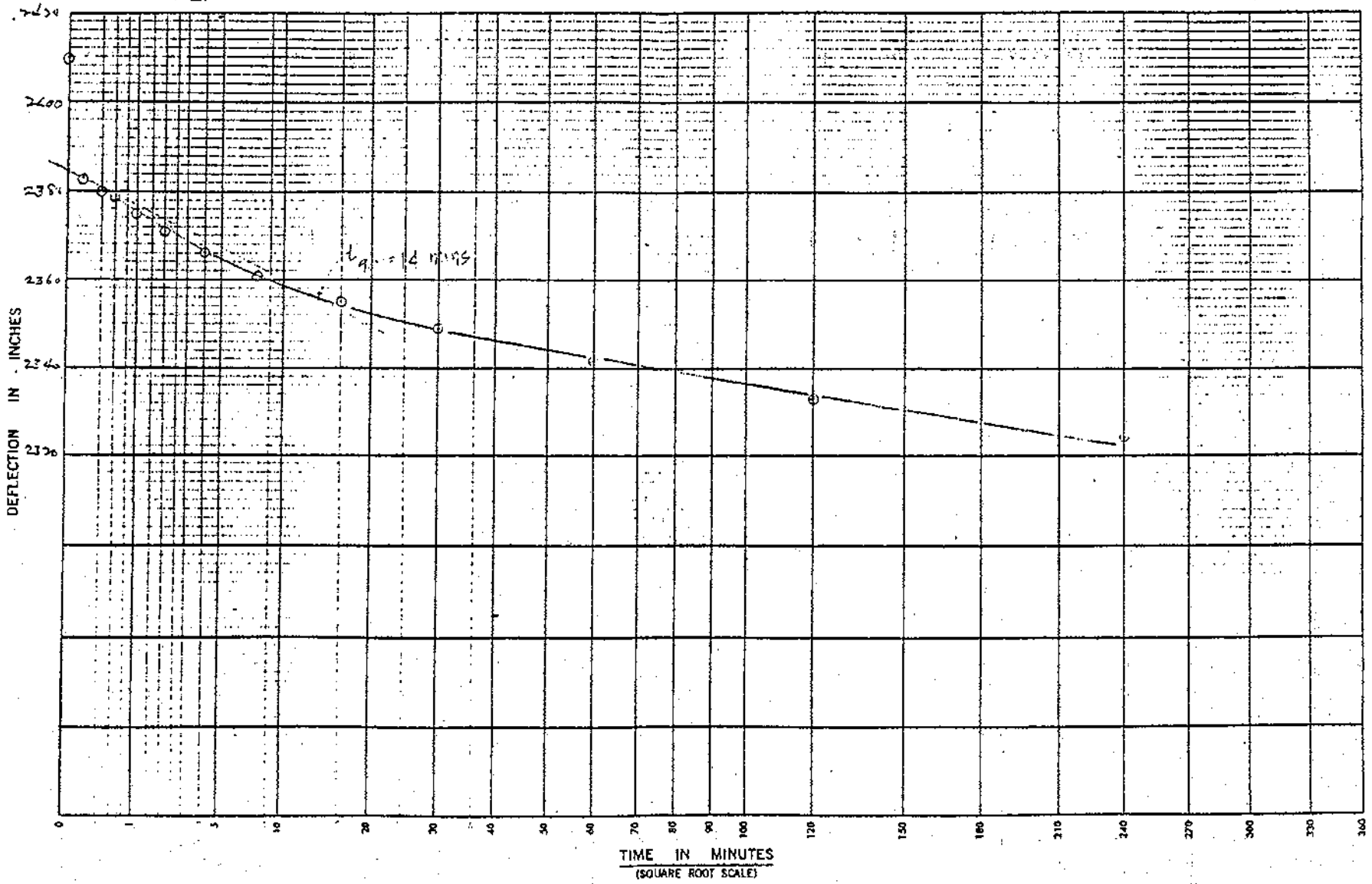
REVISIONS

BY _____ DATE _____

BY _____ DATE _____

BY _____ DATE _____

CHECKED BY _____



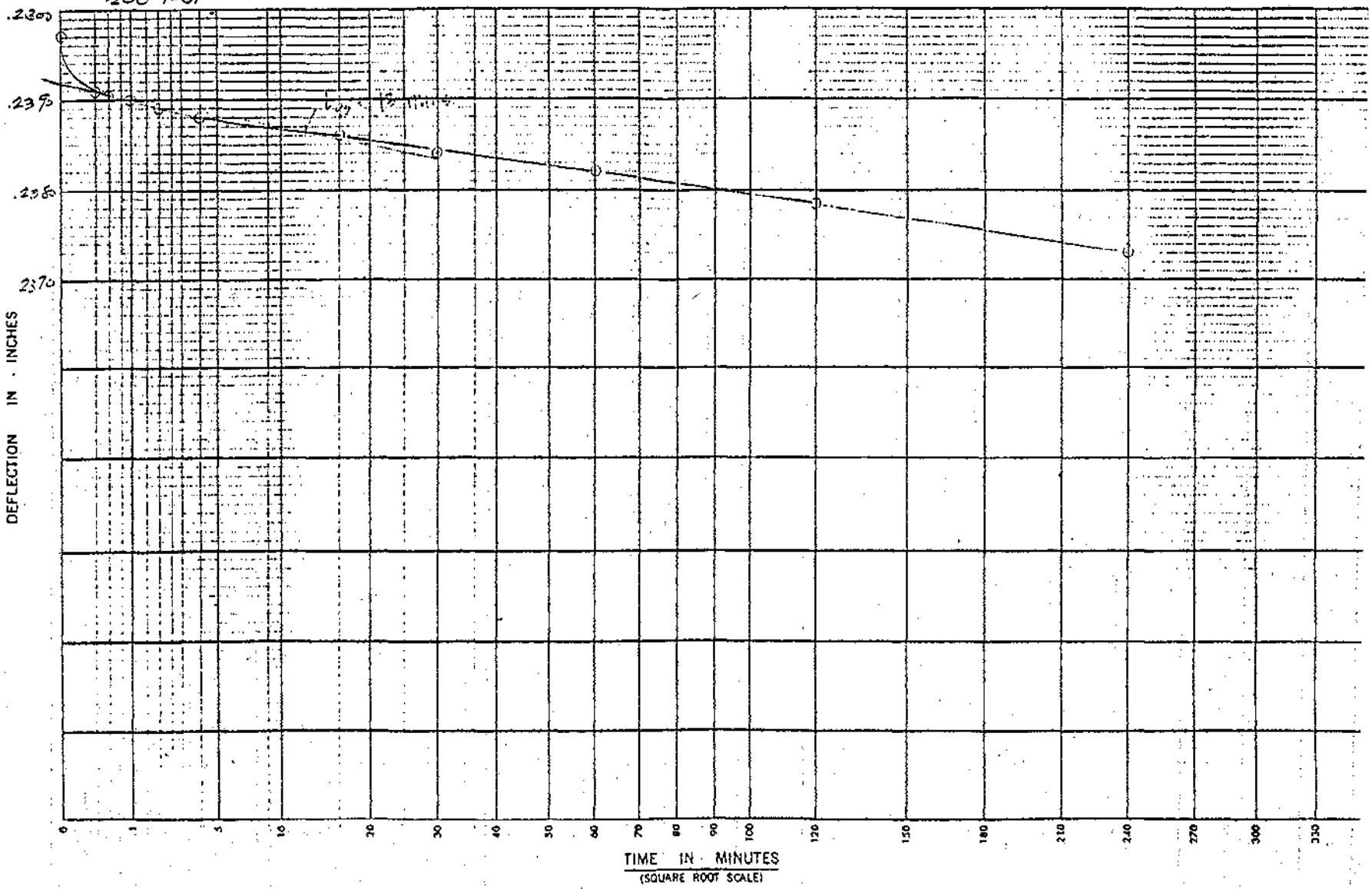
FILE

SUBJECT : TIME-SETTLEMENT DATA

SHEET 01

BMC 4-3 @ 28'-30'

200 PSF



REVISIONS

BY _____ DATE _____

BY _____ DATE _____

BY _____ DATE _____

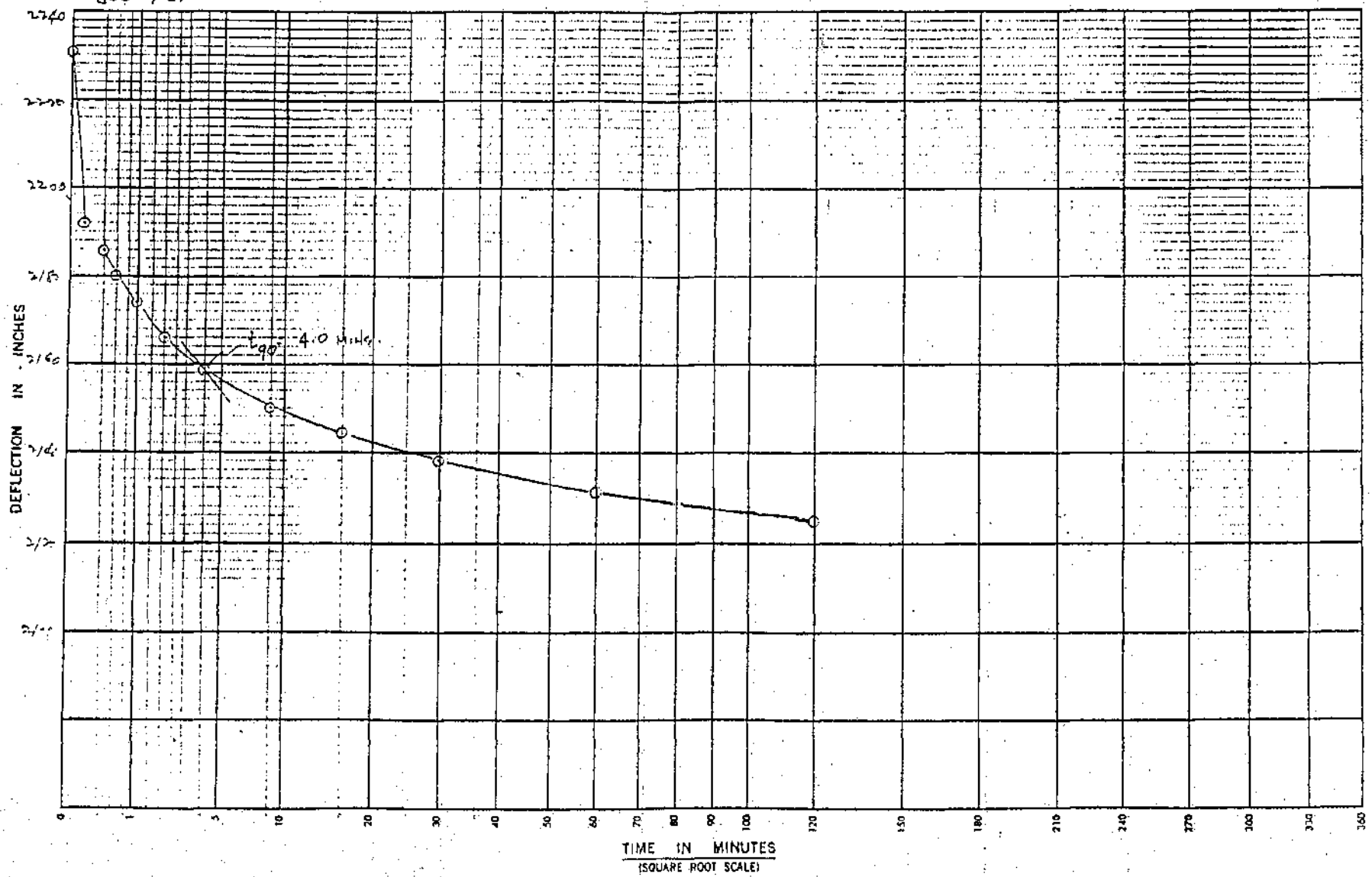
CHECKED BY _____

FILE _____

SUBJECT : TIME-SETTLEME___ATA _____

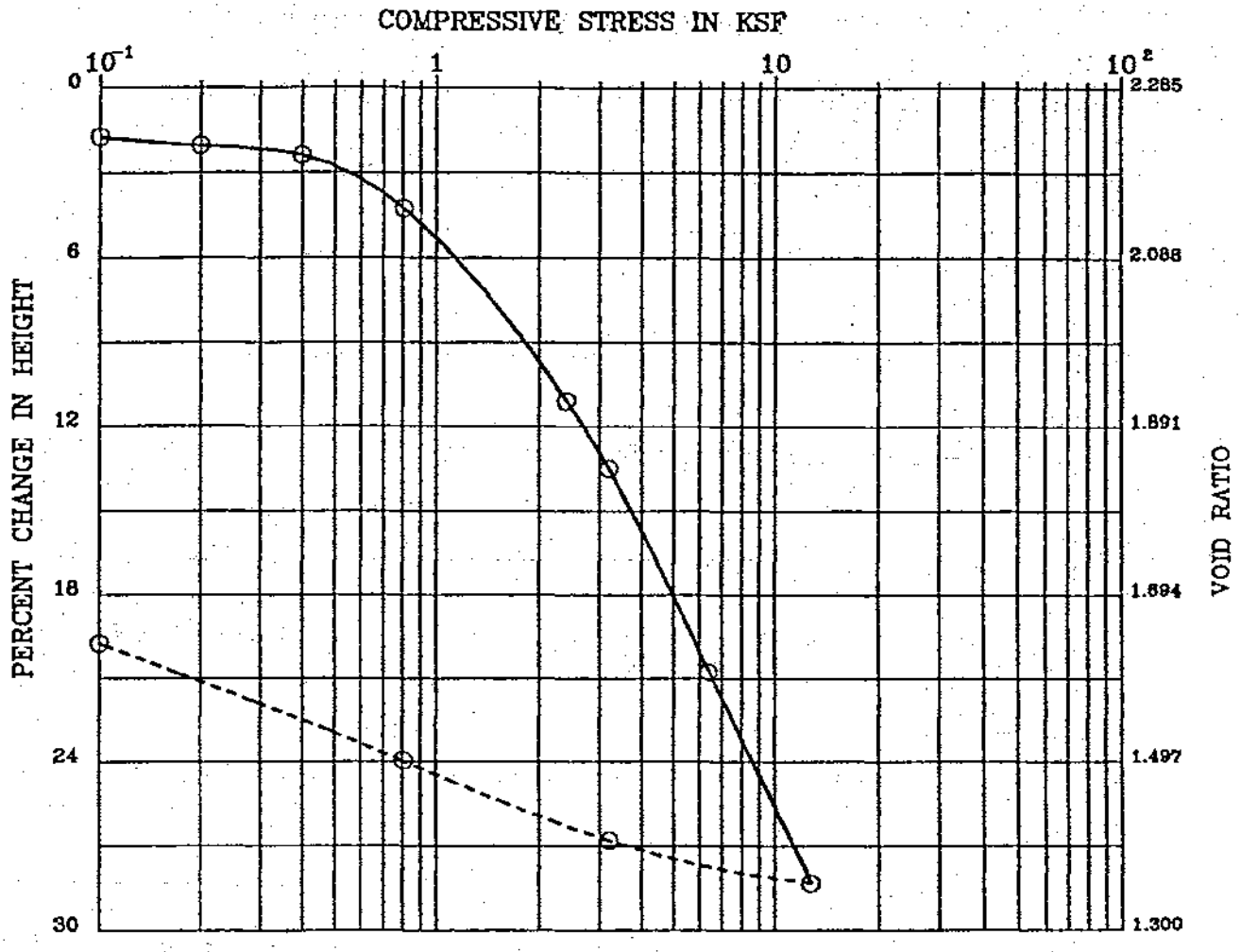
_____ SHEET ____ OF ____

BMC G-3 @ 28.30'
600 PSF



REVISIONS
BY _____ DATE _____
BY _____ DATE _____

BY _____ DATE _____
CHECKED BY _____



BORING : G - 4B
DEPTH (ft) : 67-69
SPEC. GRAVITY : 2.70

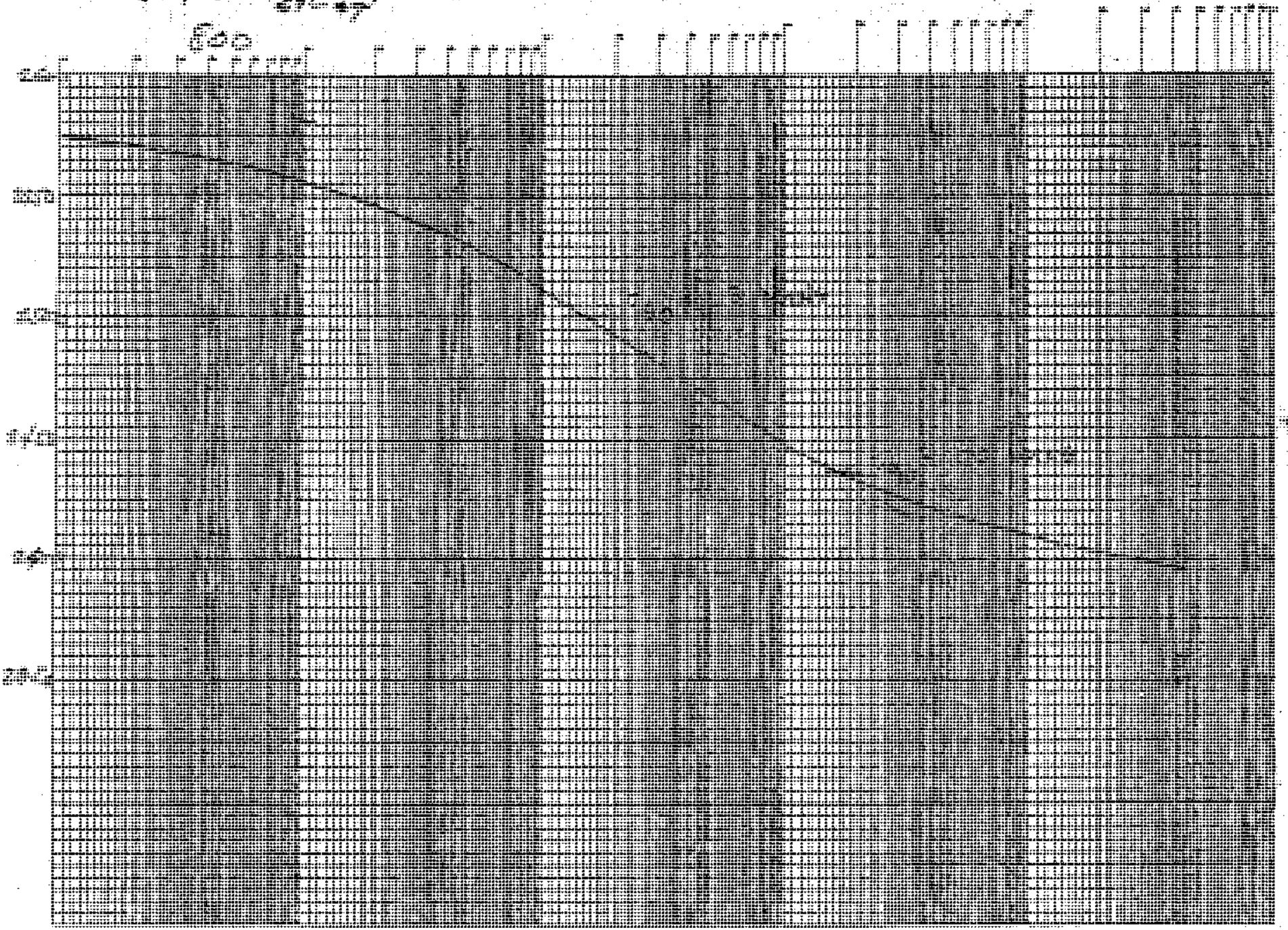
DESCRIPTION : Gray silty CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	81.3	51.4	96	2.285
FINAL	60.0	63.9	99	1.638

Remark : INUNDATED AT 0.4 KSF

Project No.:1546-2	BMC - BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:

K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212

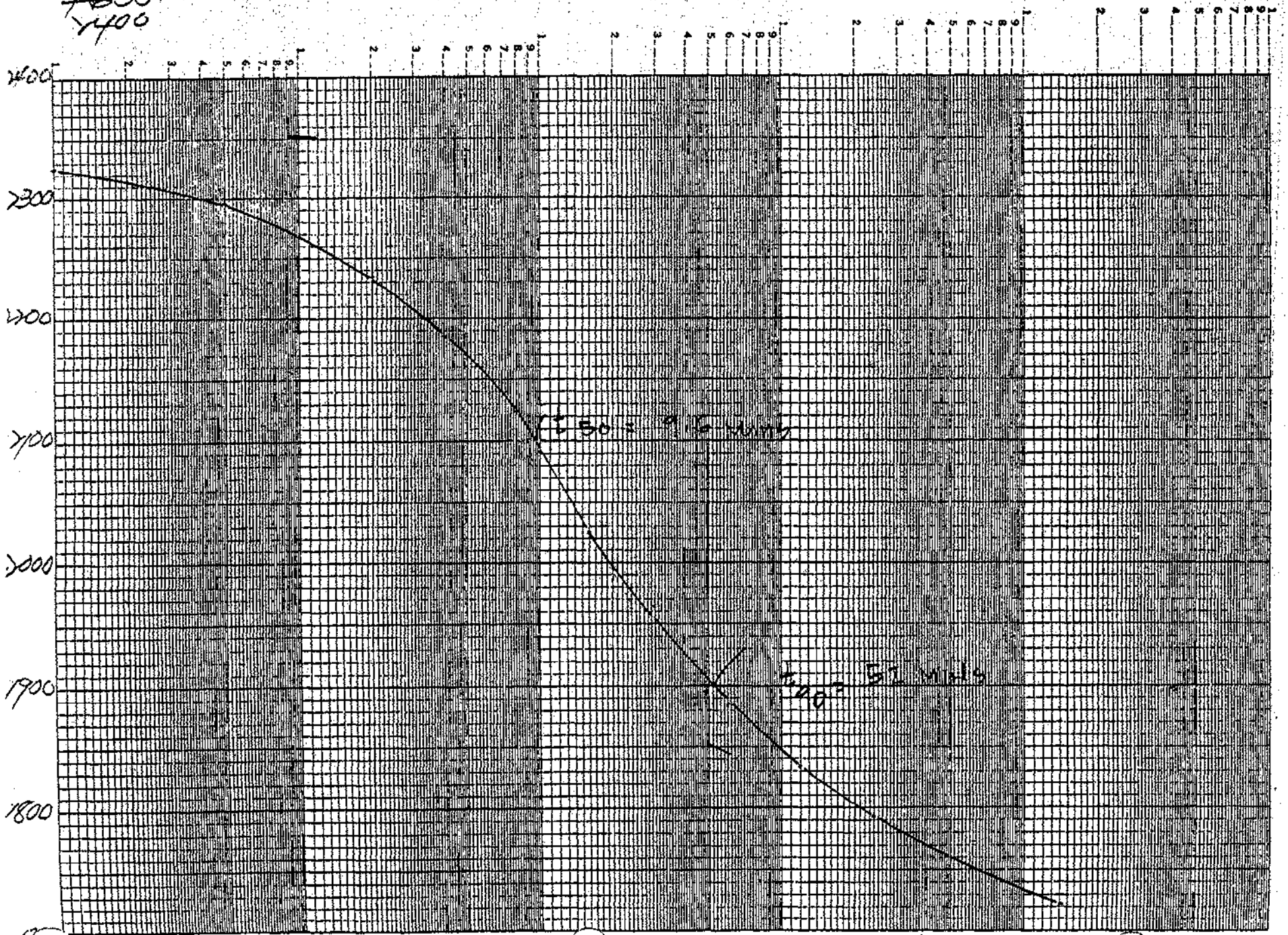


Q4B 67-69

~~1600~~
1400

K&E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

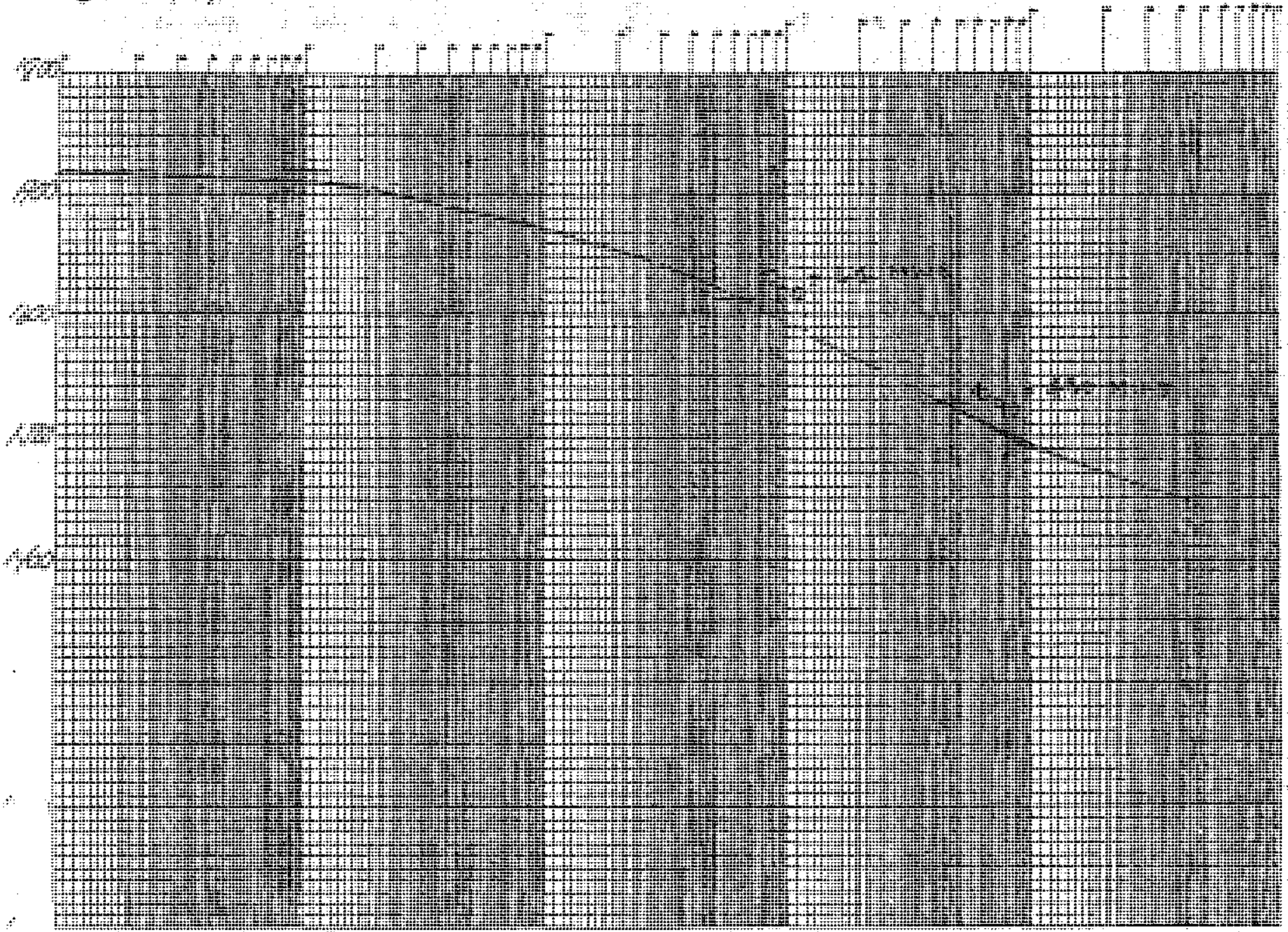
46 6212

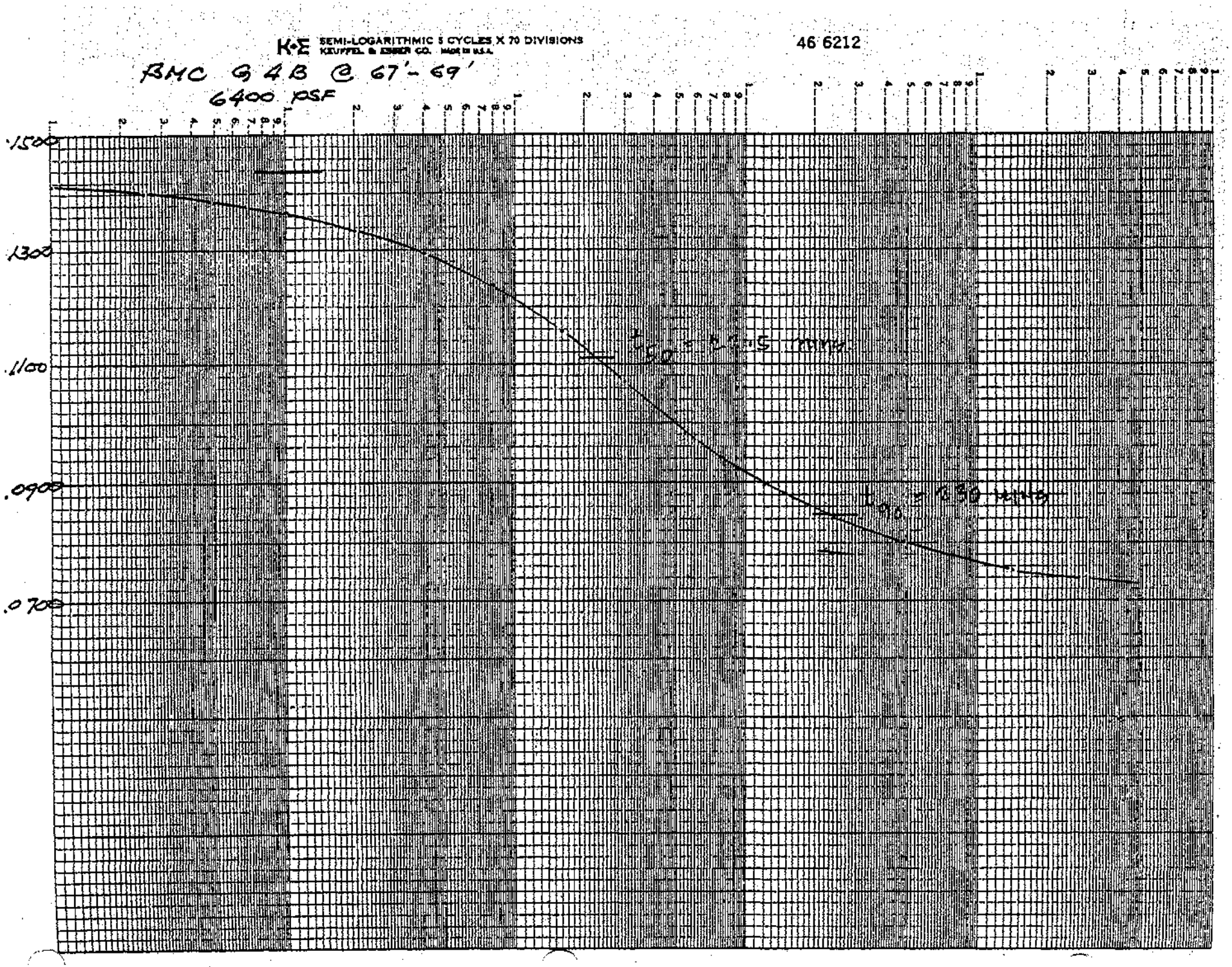


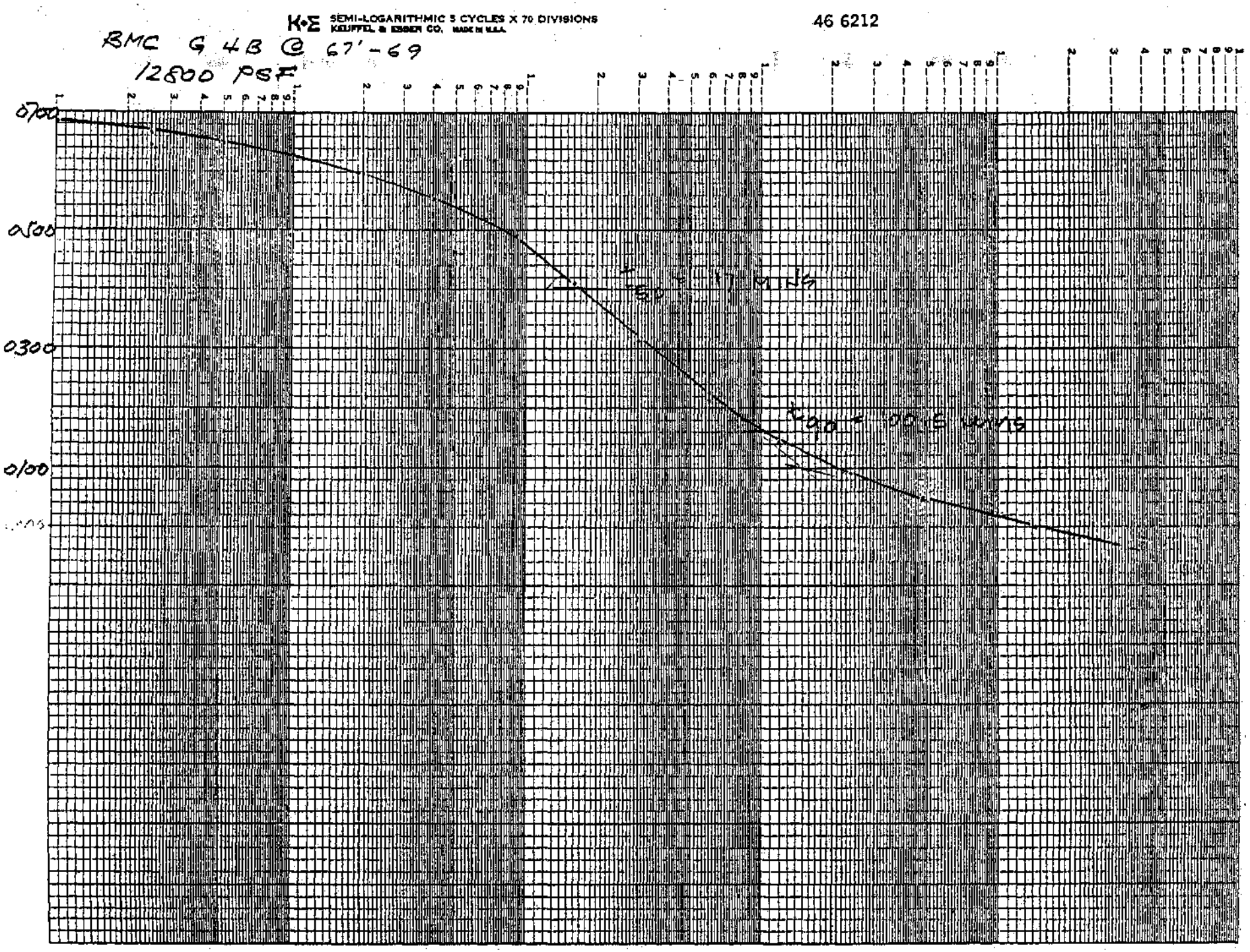
74B 67-69
3200 PSF

K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212




K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G4B @ 67'-69'
6400 PSF
.1500
.1300
.1100
.0900
.0700

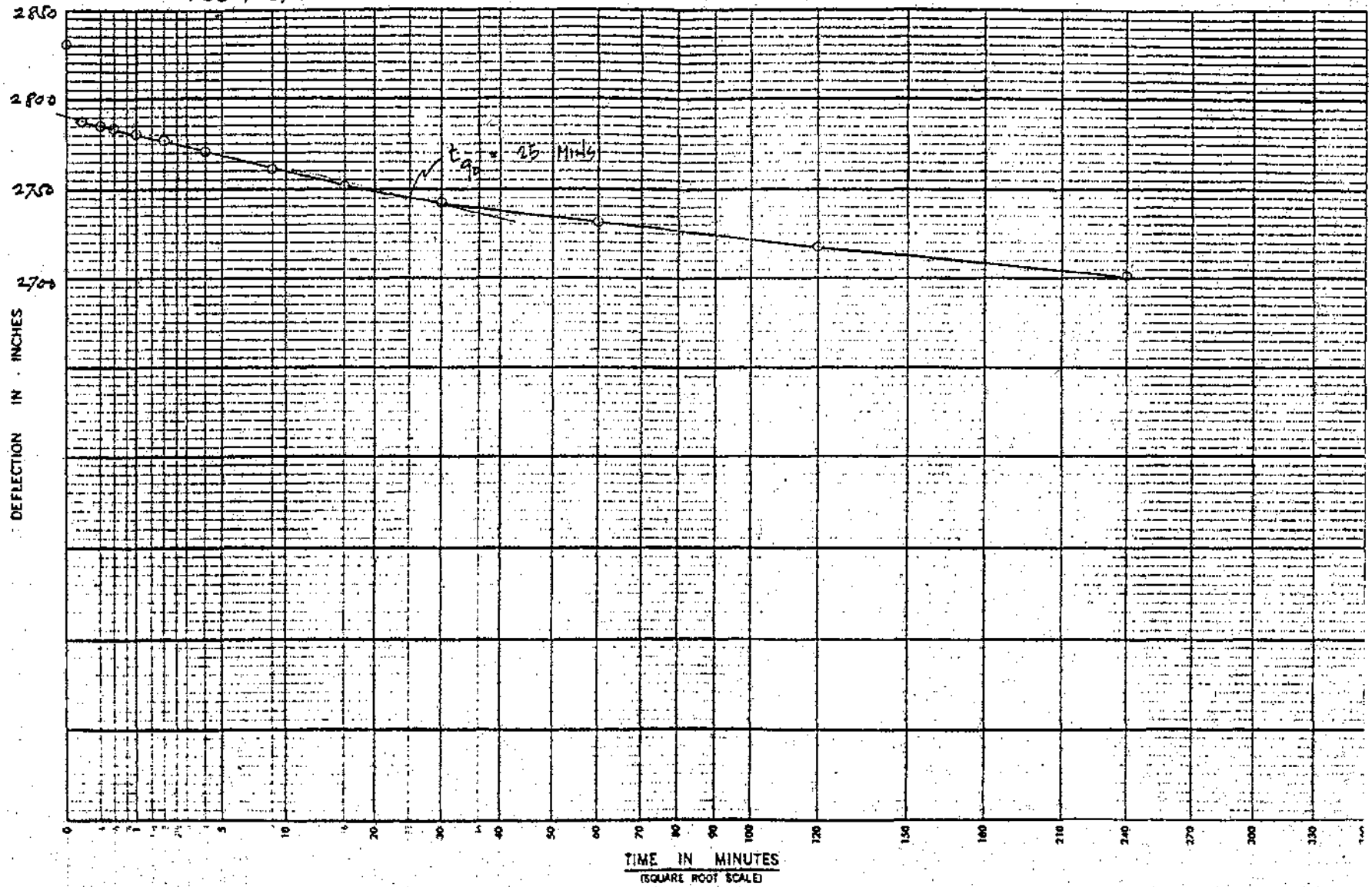

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G 4B @ 67'-69
12800 PSF
0700
0500
0300
0100
T50 = 17 MINS
T90 = 00:15 MINS

BMC of AB @ 67'-69'
100 pcf

FILE
SUBJECT : TIME-SETTLEMENT DATA
SHEET ___ OF

REVISIONS
BY ___ DATE ___
BY ___ DATE ___

BY ___ DATE ___
CHECKED BY ___

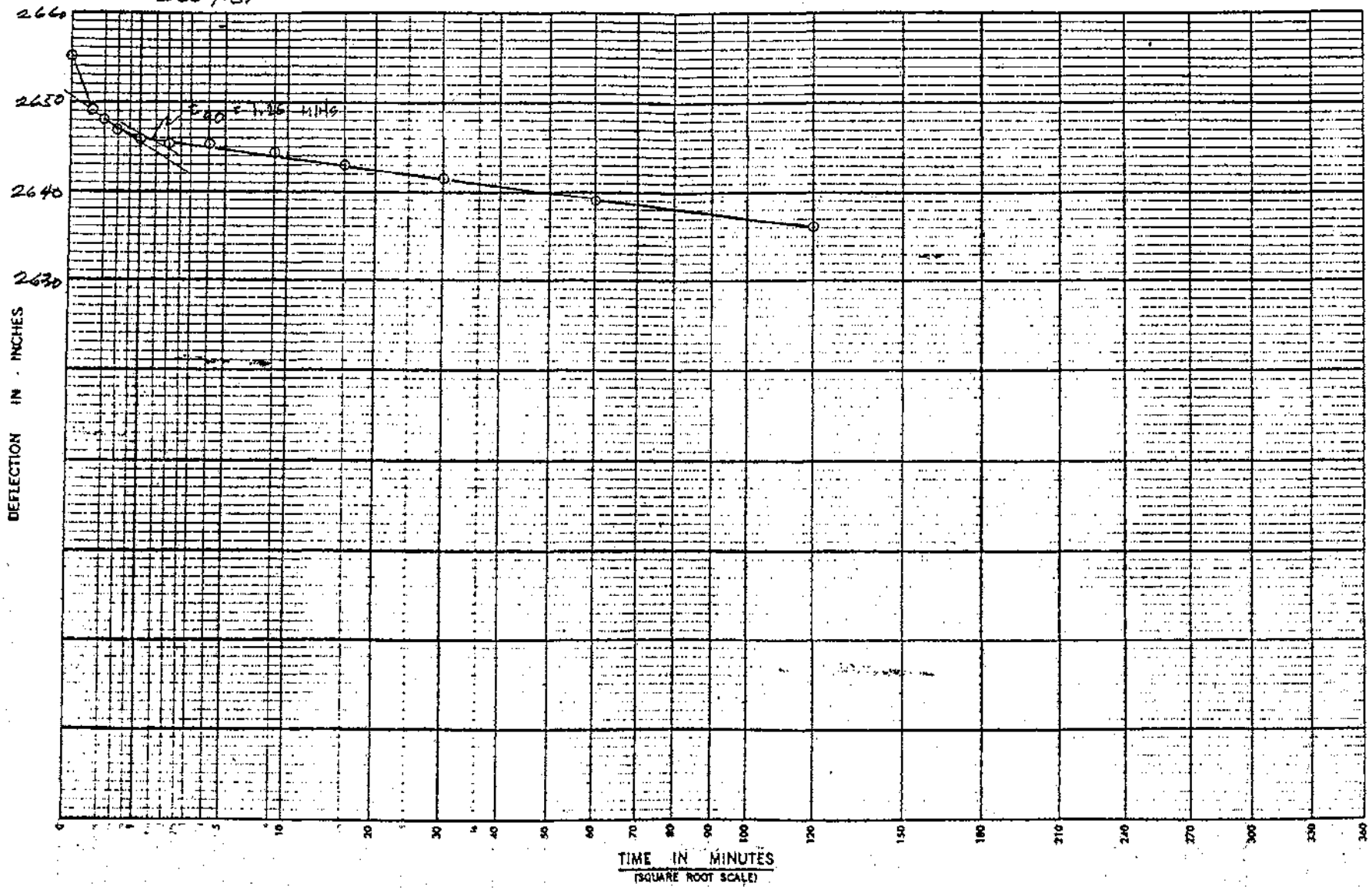


B4C 4-4B @ 67' - 69'
200 PSF

SUBJECT : TIME-SETTLE(ATA _____

_____ SHEET ___ OF

REVISIONS
BY _____ DATE _____
BY _____ DATE _____



BY _____ DATE _____
CHECKED BY _____

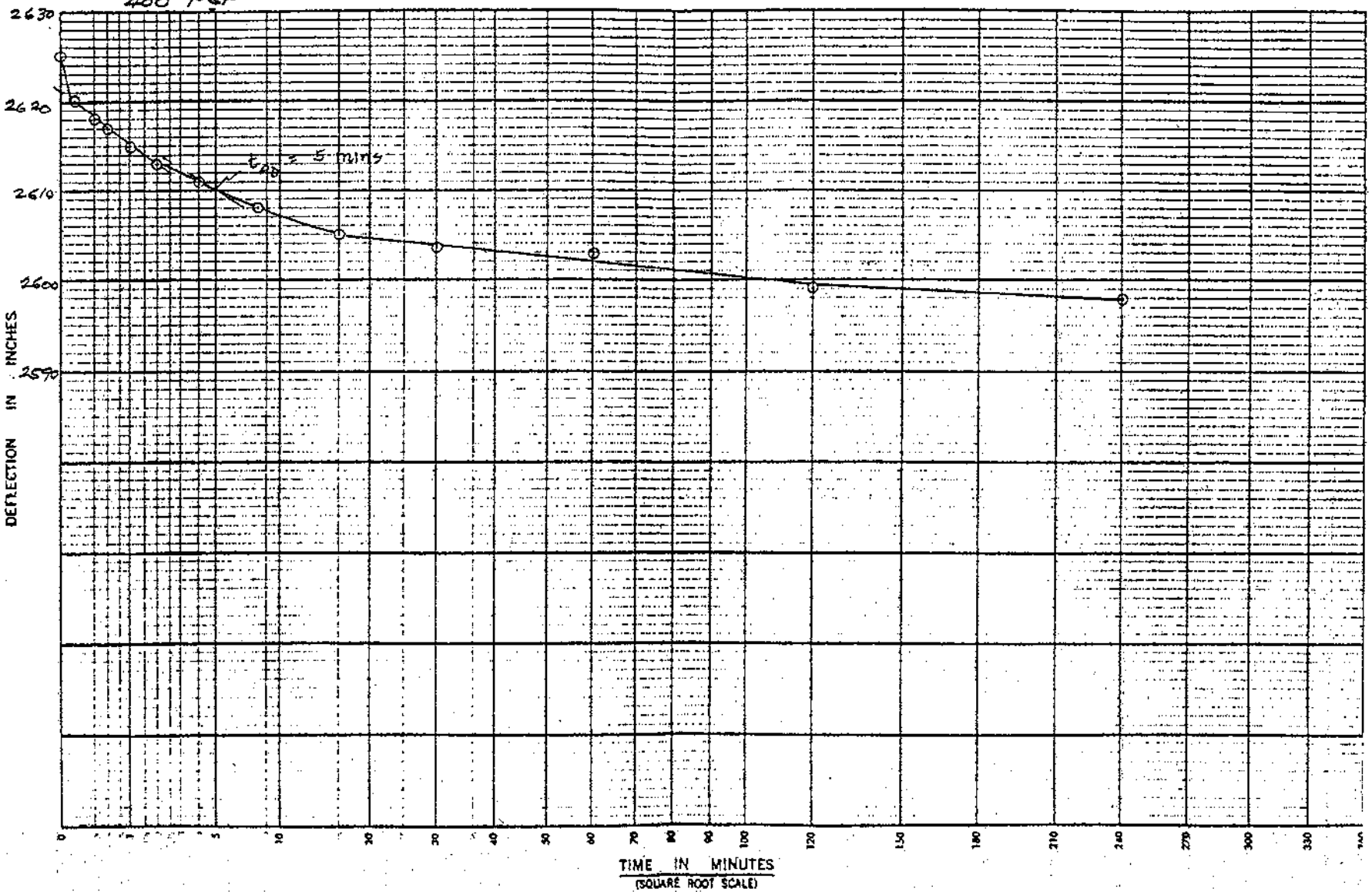
FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ____ OF ____

BMC @ 4B @ 67'-69'

400 PSF



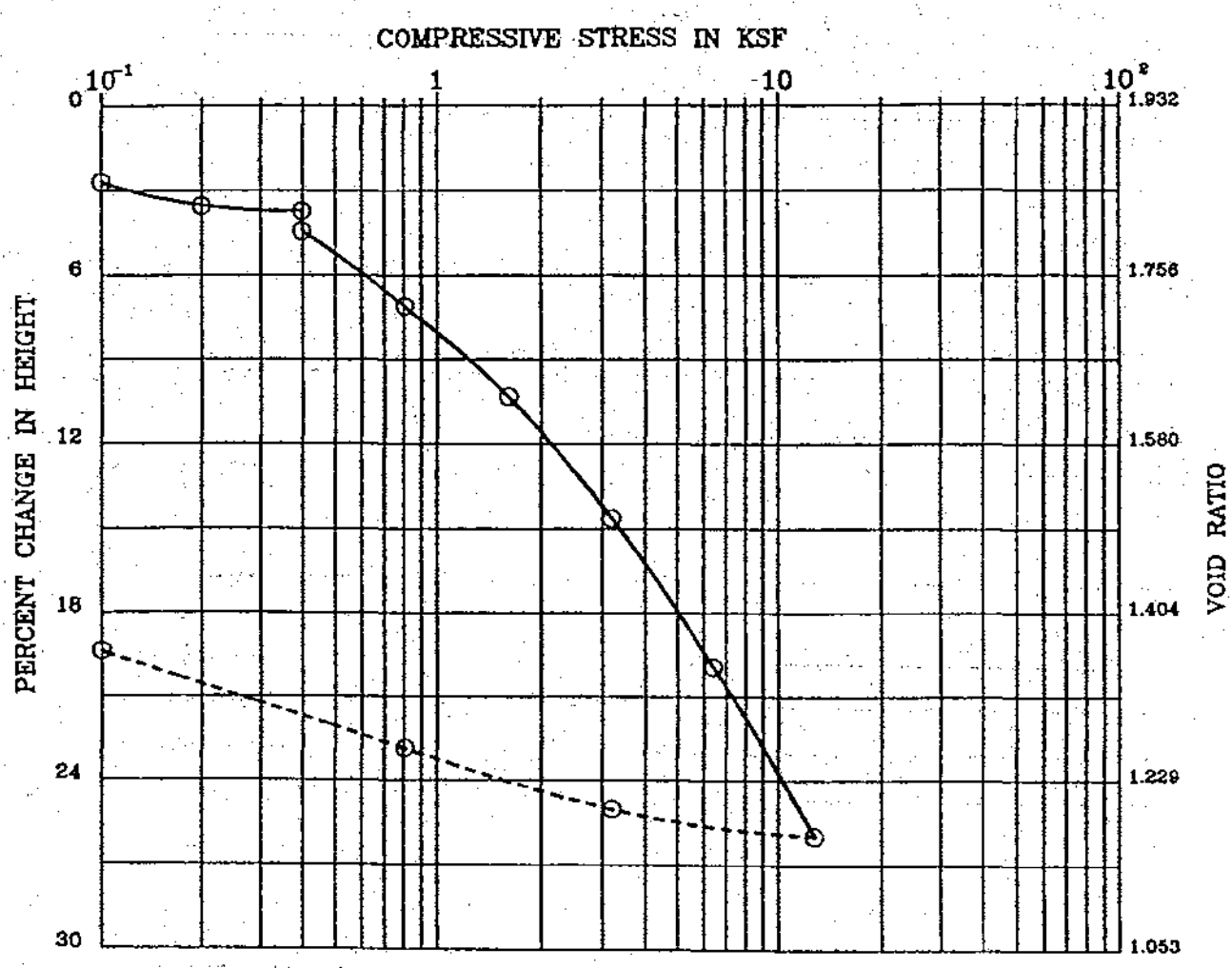
REVISIONS

BY _____ DATE _____

BY _____ DATE _____

BY _____ DATE _____

CHECKED BY _____



BORING : G -5
DEPTH (ft) : 49-51
SPEC. GRAVITY : 2.78

DESCRIPTION : Gray silty CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	66.5	59.3	96	1.932
FINAL	48.9	73.6	100	1.363

Remark : INUNDATED AT 0.4 KSF

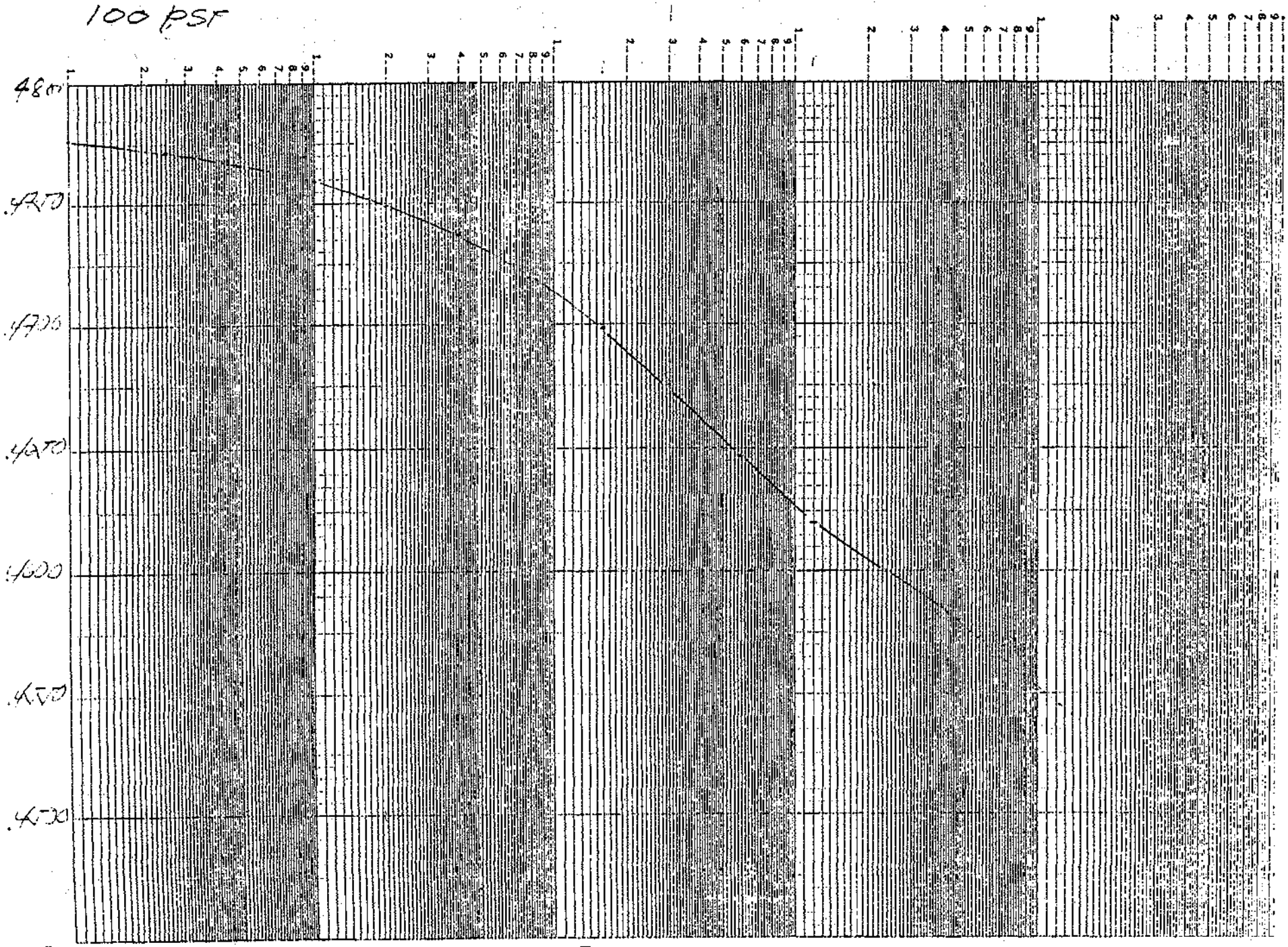
Project No.:1546-2	BMC - BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:

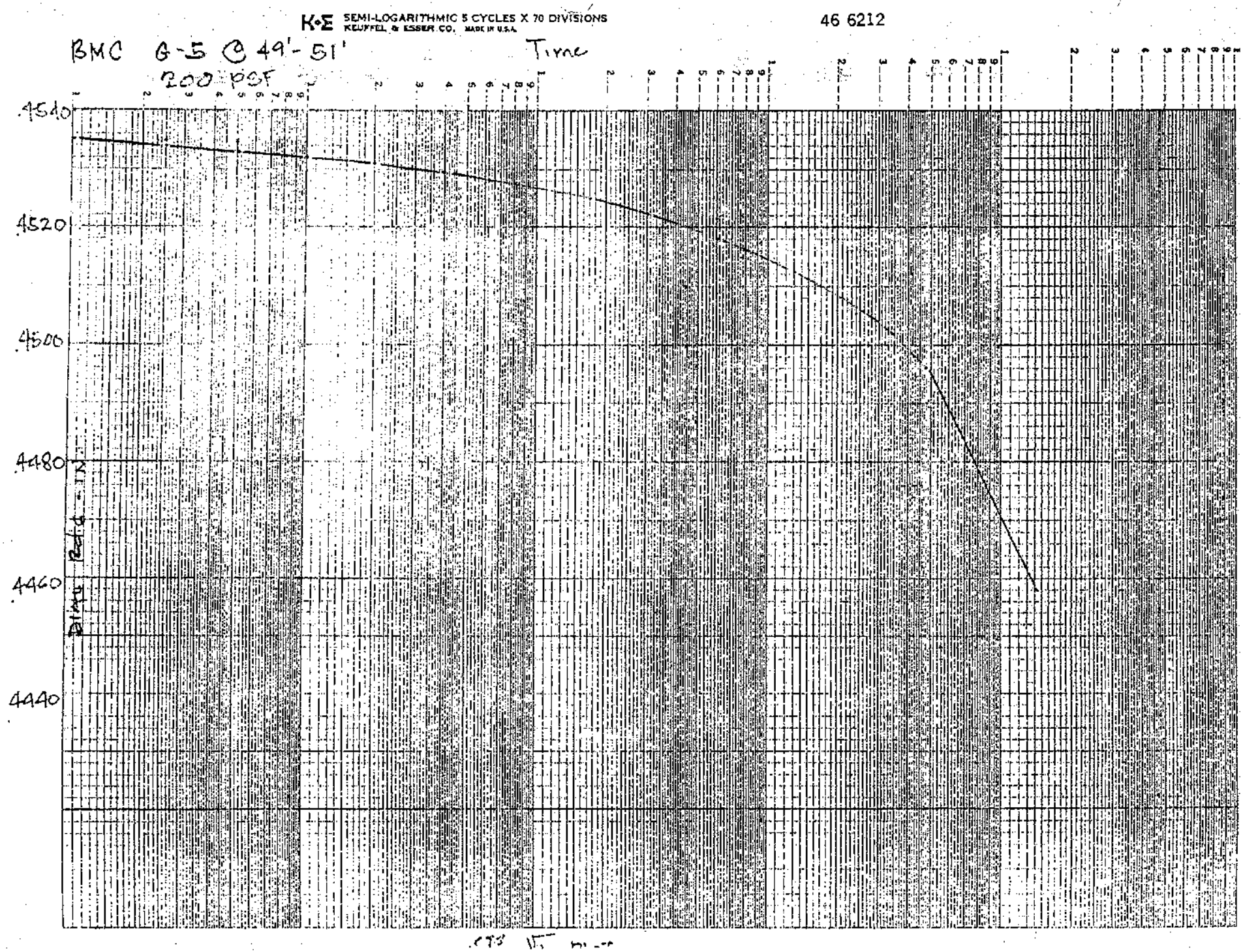
BHC-GT @ 49'-7"

100 PSF

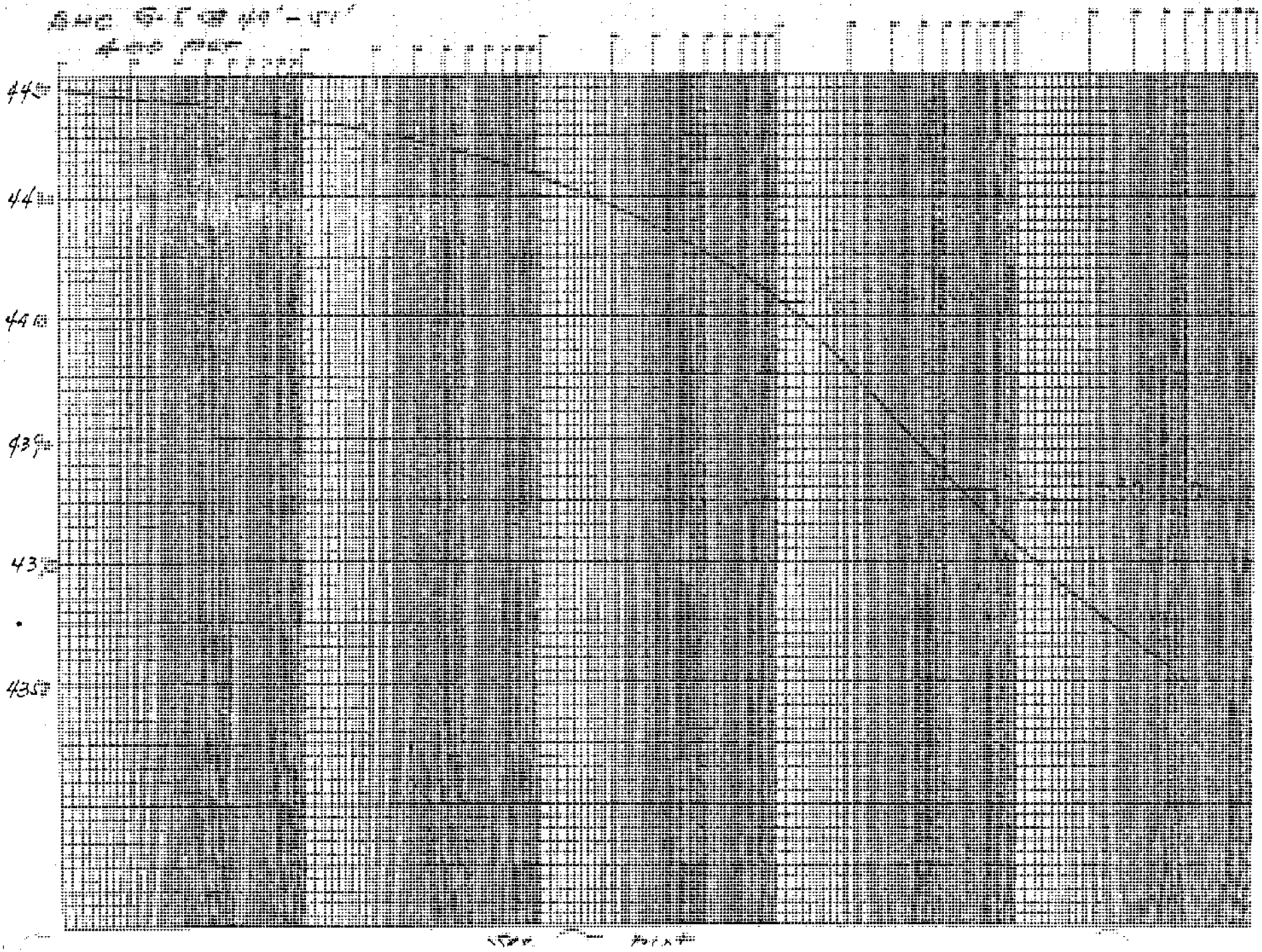
SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212



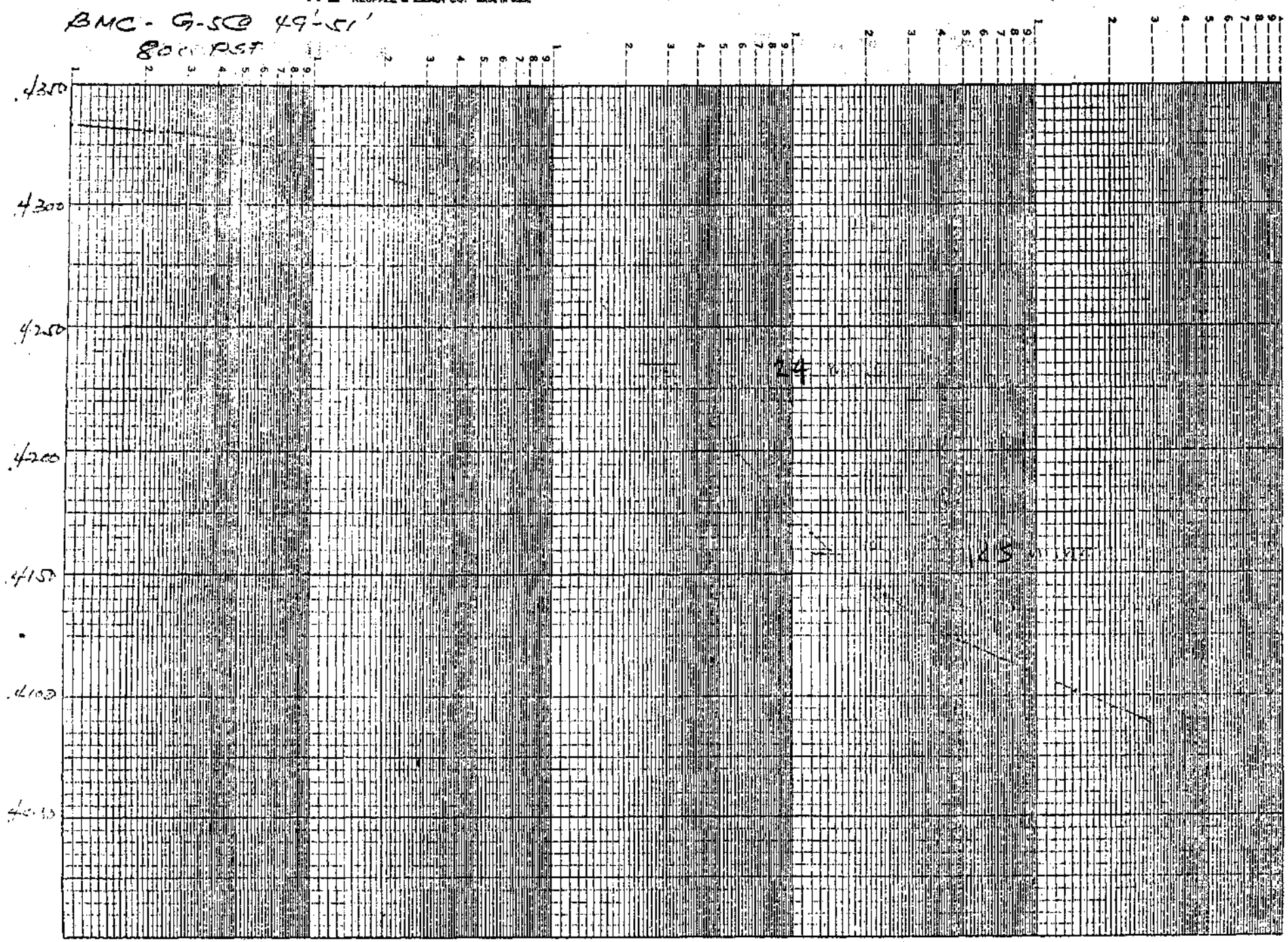

K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-5 @ 49'-51'
200 PSF
Time
4540
4520
4500
4480
4460
4440
Dial Red 4 - IN

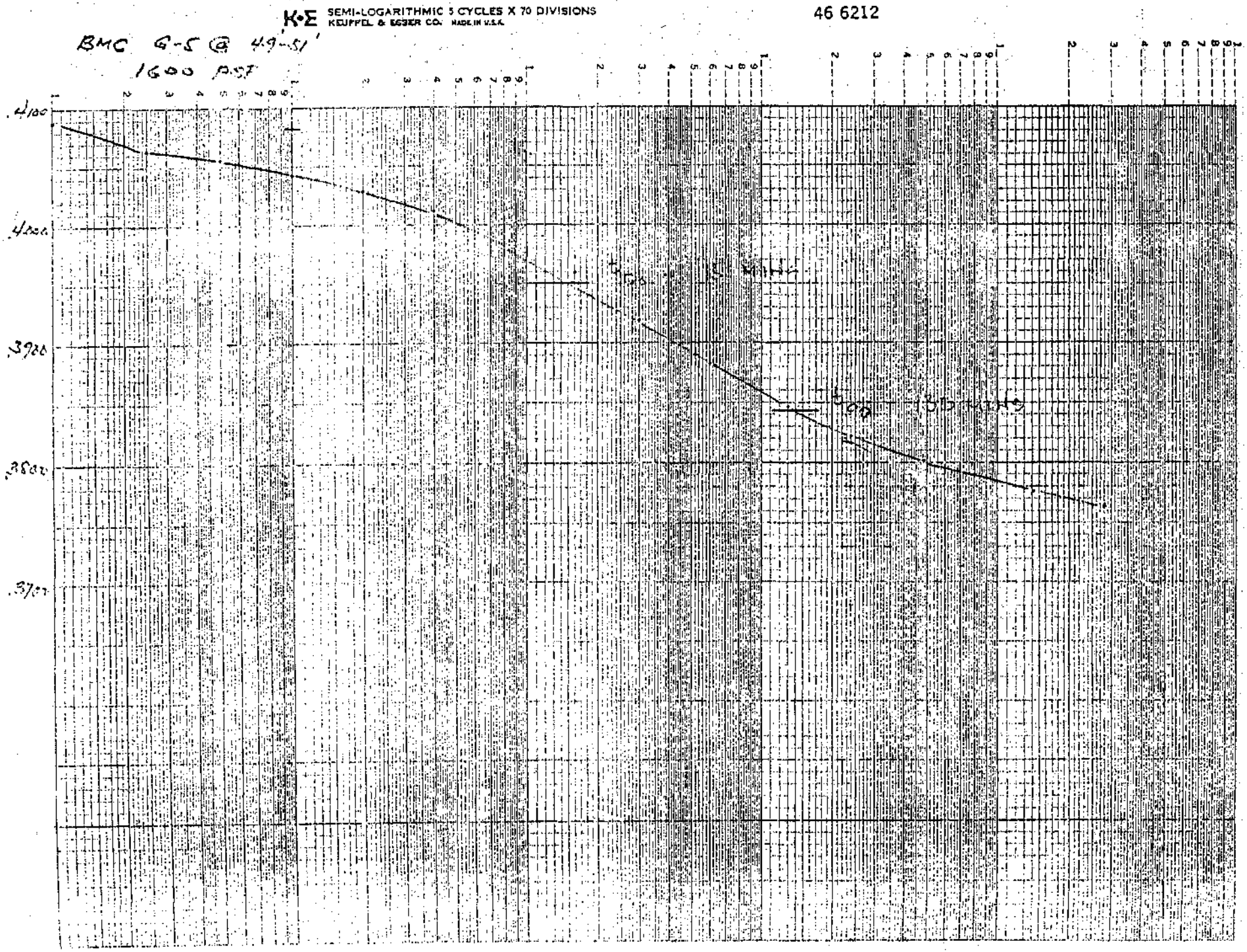
K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212

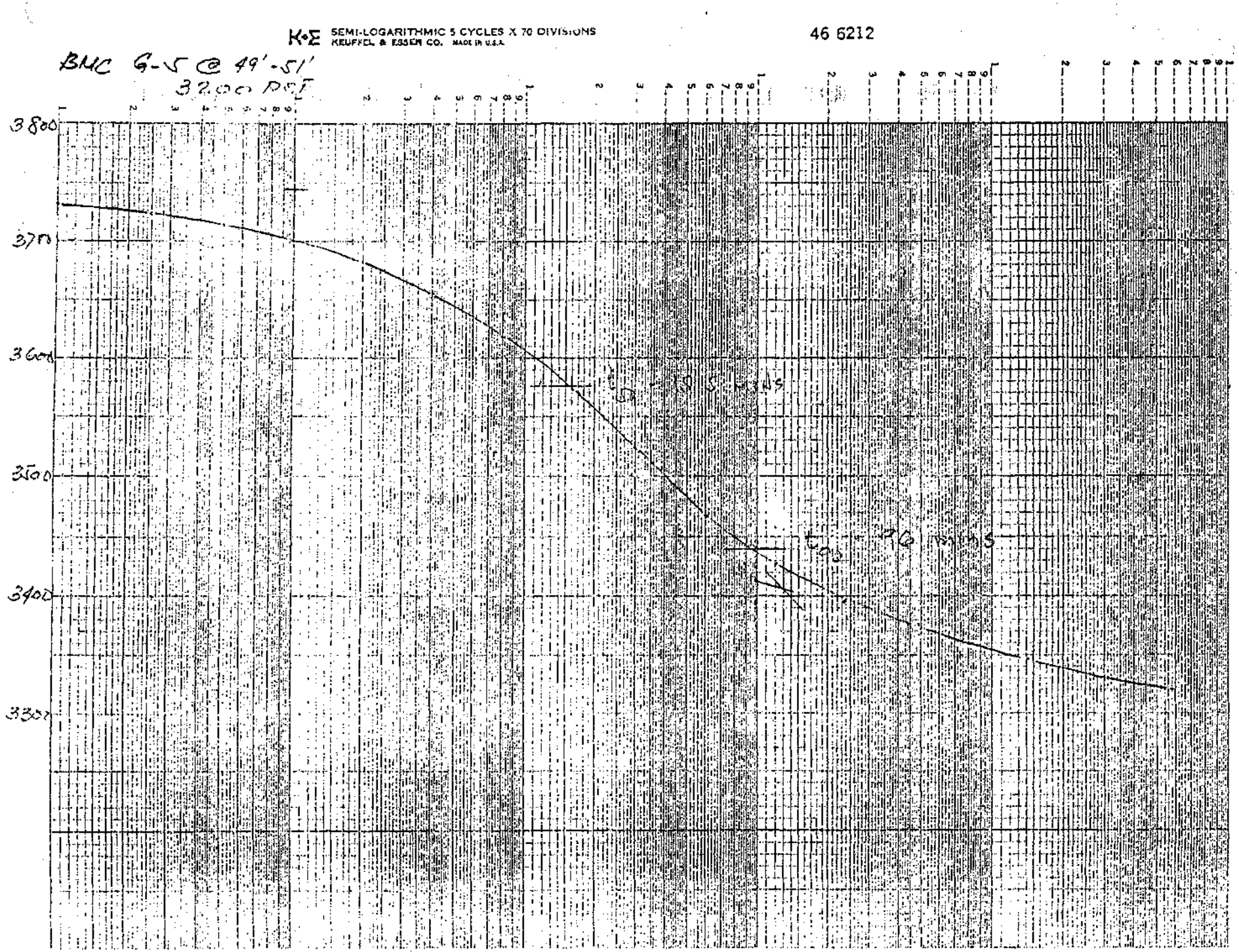


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

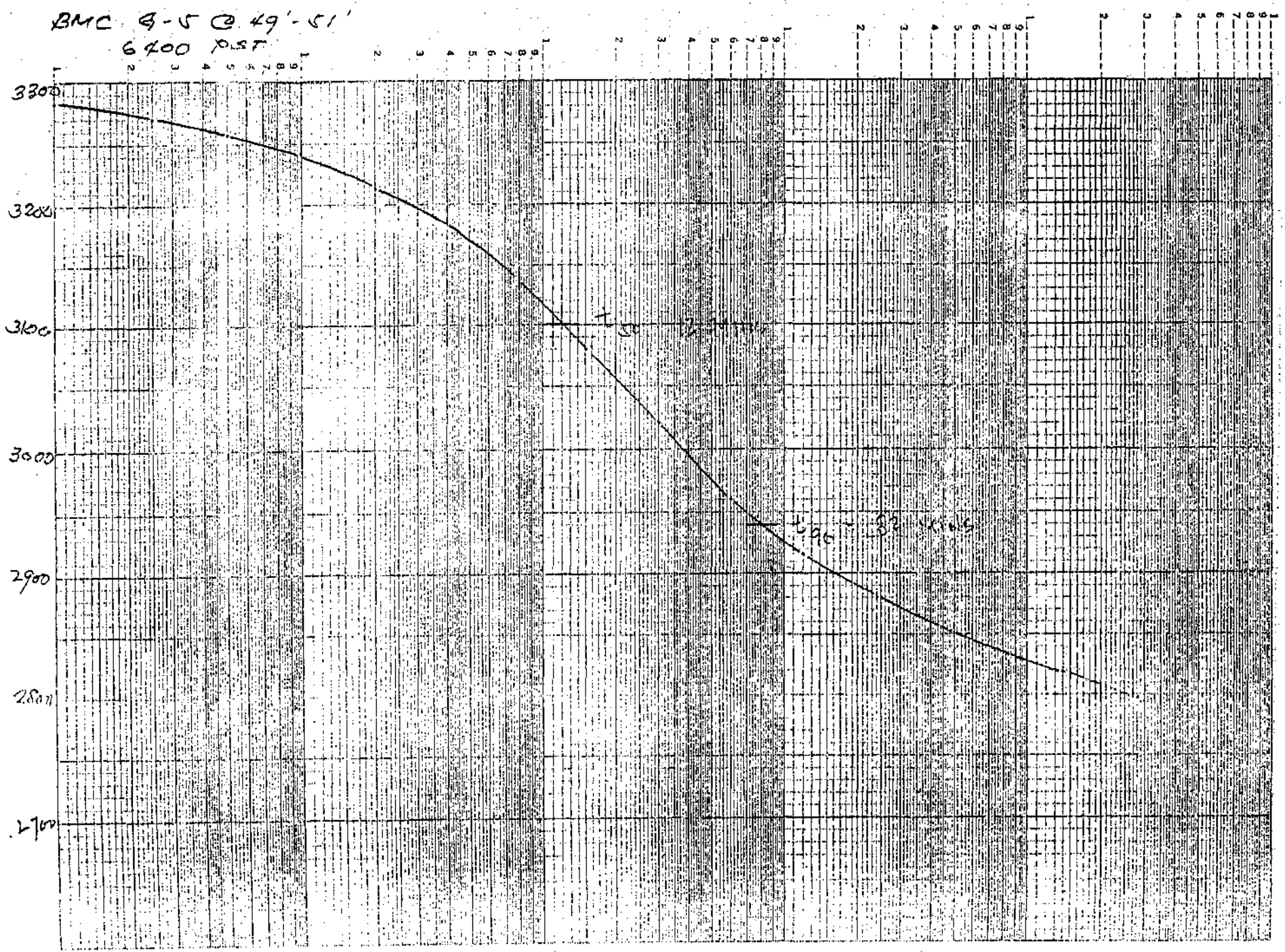


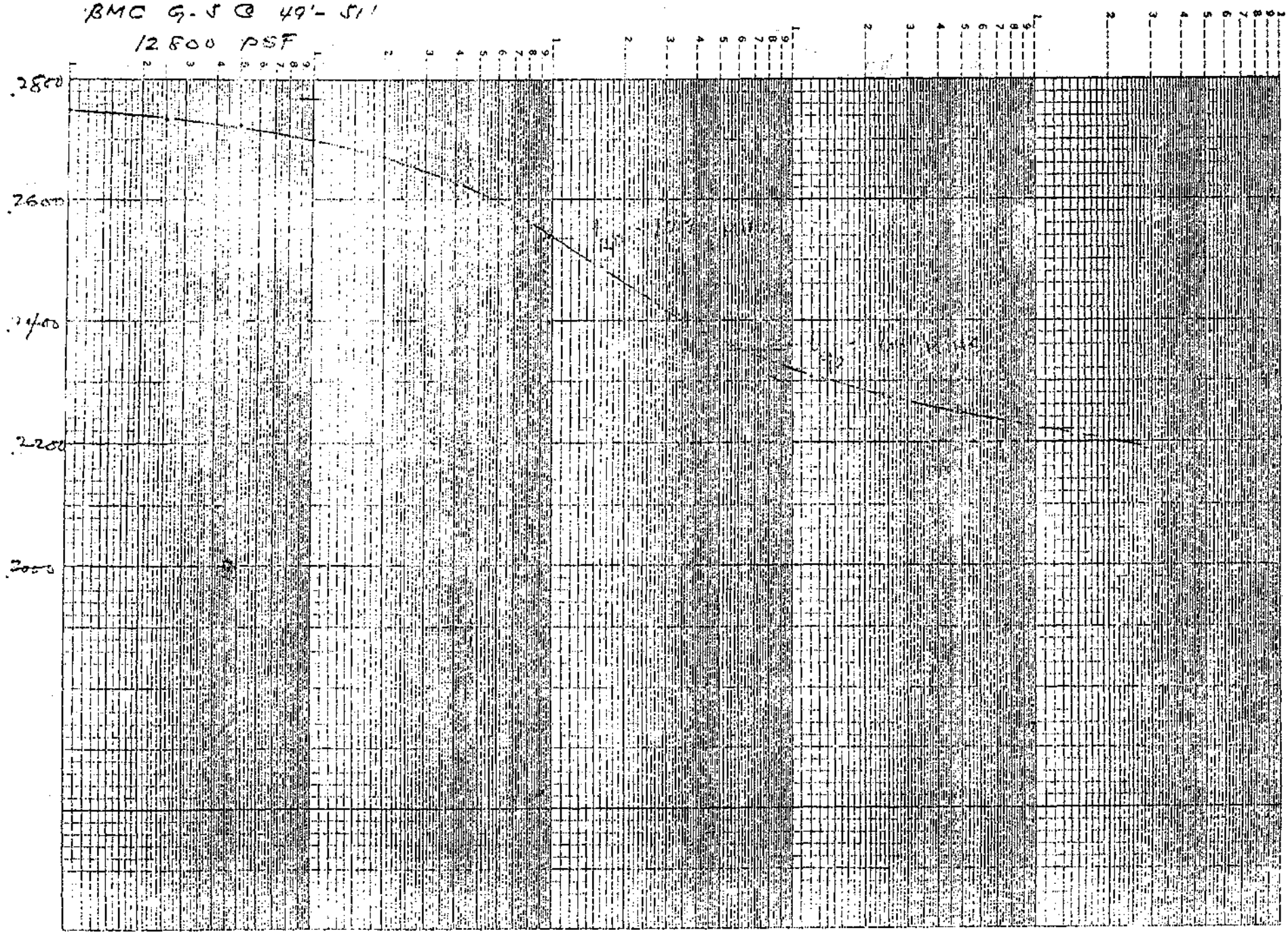

K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-5 @ 49-51'
1600 PSI
.4100
.4000
.3900
.3800
.3700


K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-5 @ 49'-51'
3200 PSF
3800
3700
3600
3500
3400
3300

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212




K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-5 @ 49'-51'
12800 PSF
2800
2600
2400
2200
2000

BHC G-5 @ 49'-51'

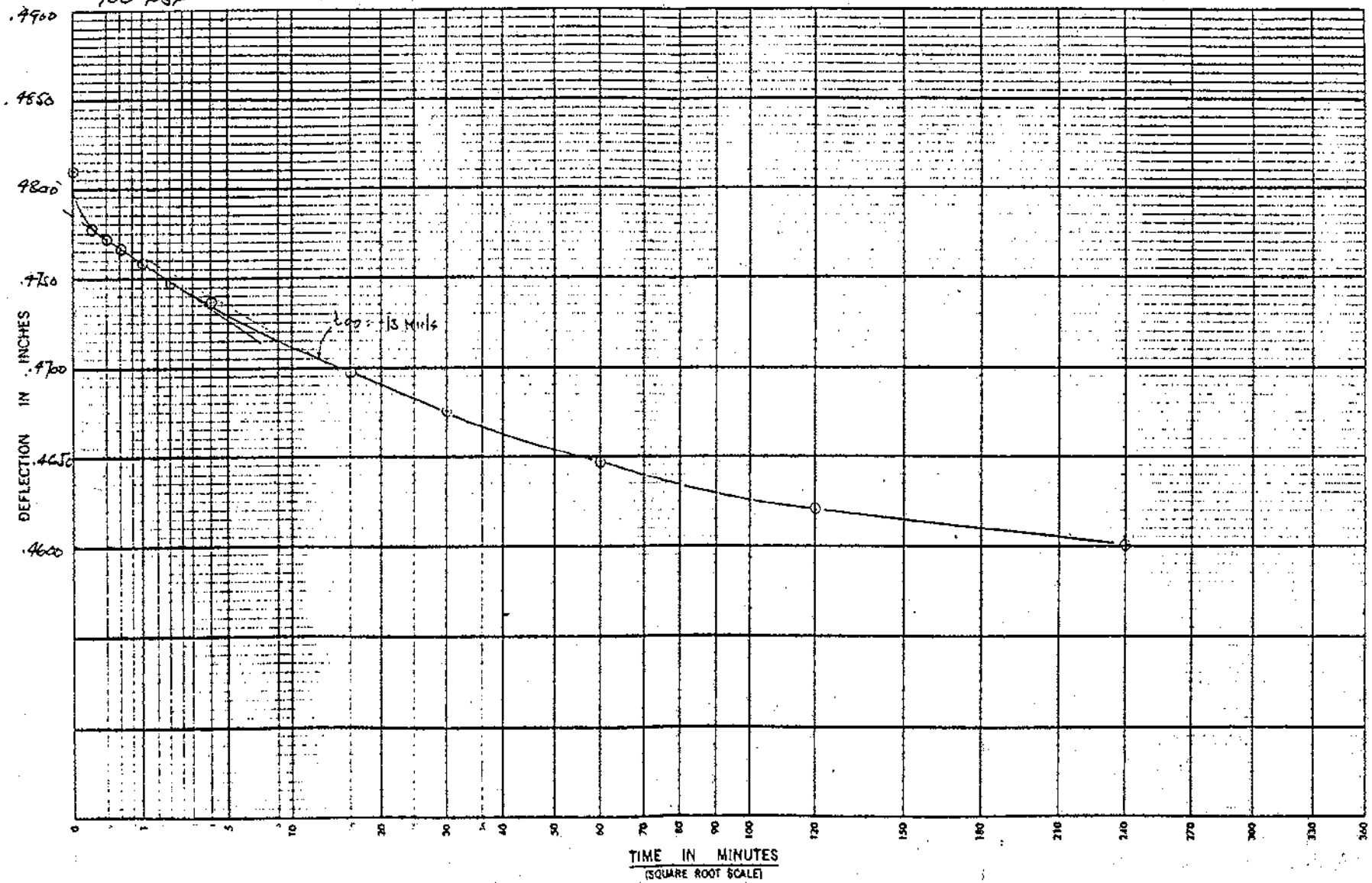
100 PSF

SUBJECT : TIME-SETTLEMENT DATA

SHEET ____ OF ____

REVISIONS
BY ____ DATE ____
BY ____ DATE ____

BY ____ DATE ____
CHECKED BY ____



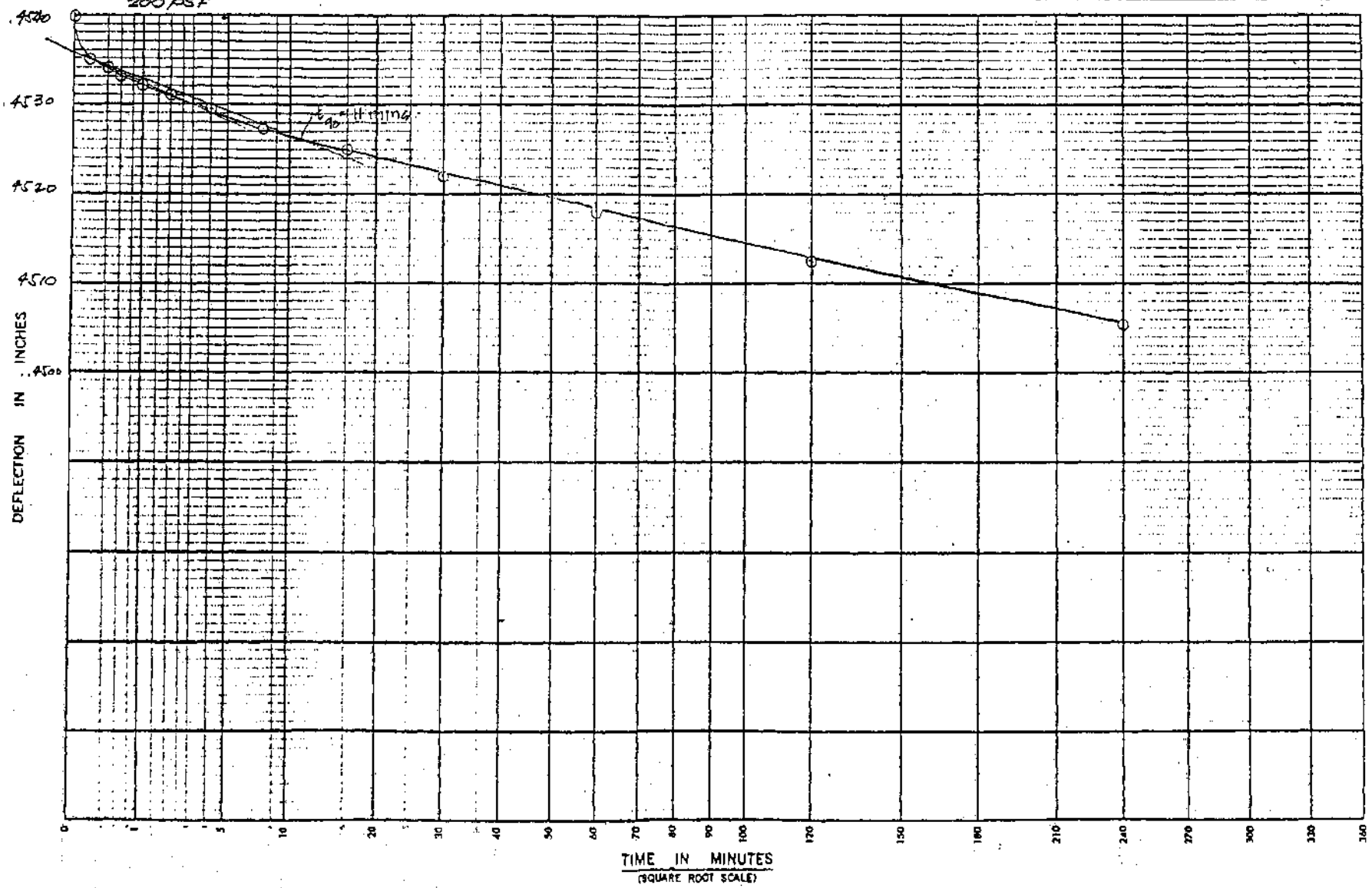
B4C 9-5 @ 4'-5'

200 PSF

FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

SHEET ___ OF ___



REVISIONS
BY _____ DATE _____
BY _____ DATE _____

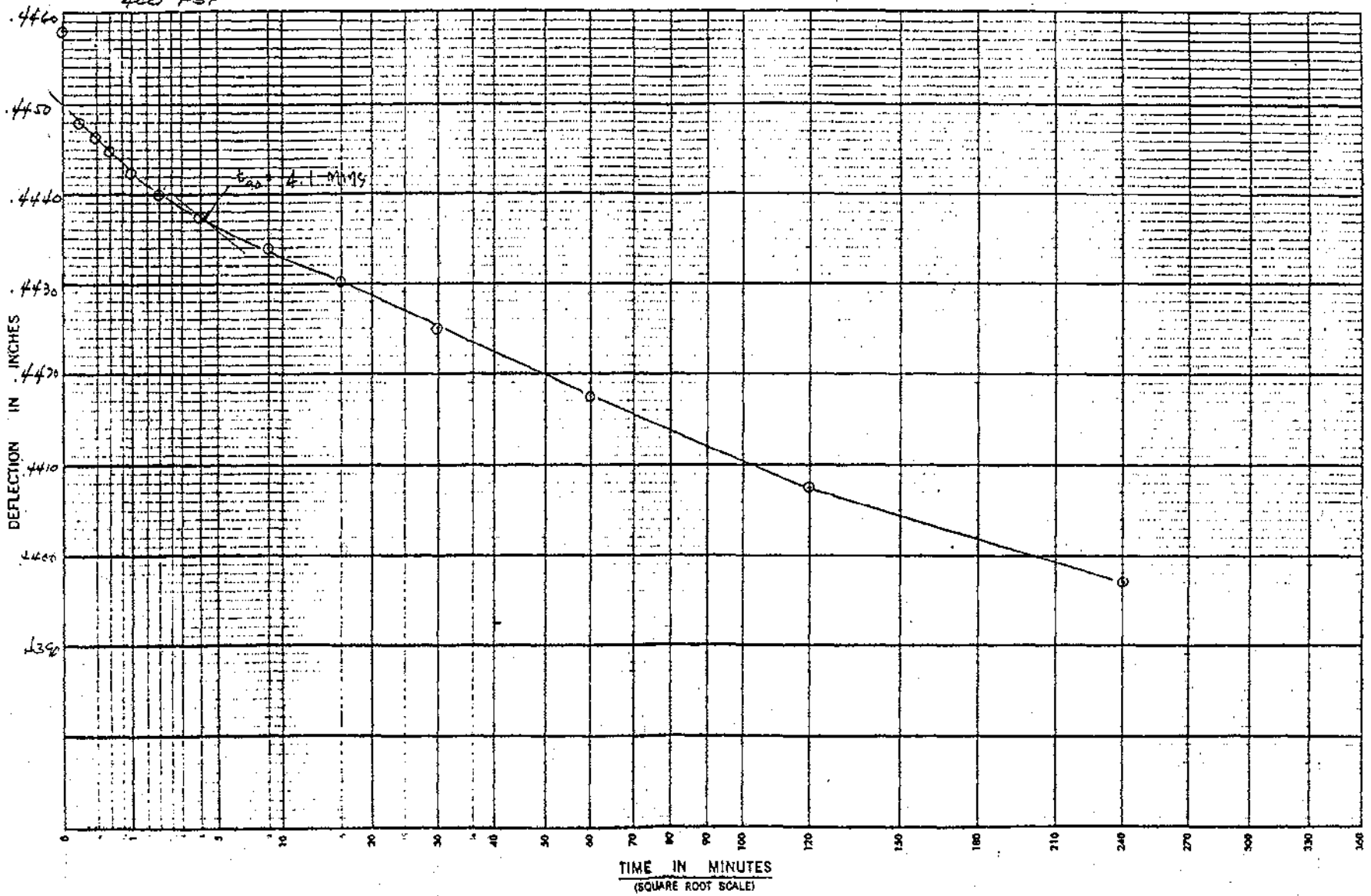
BY _____ DATE _____
CHECKED BY _____

FILE

SUBJECT : TIME-SETTLEMENT DATA

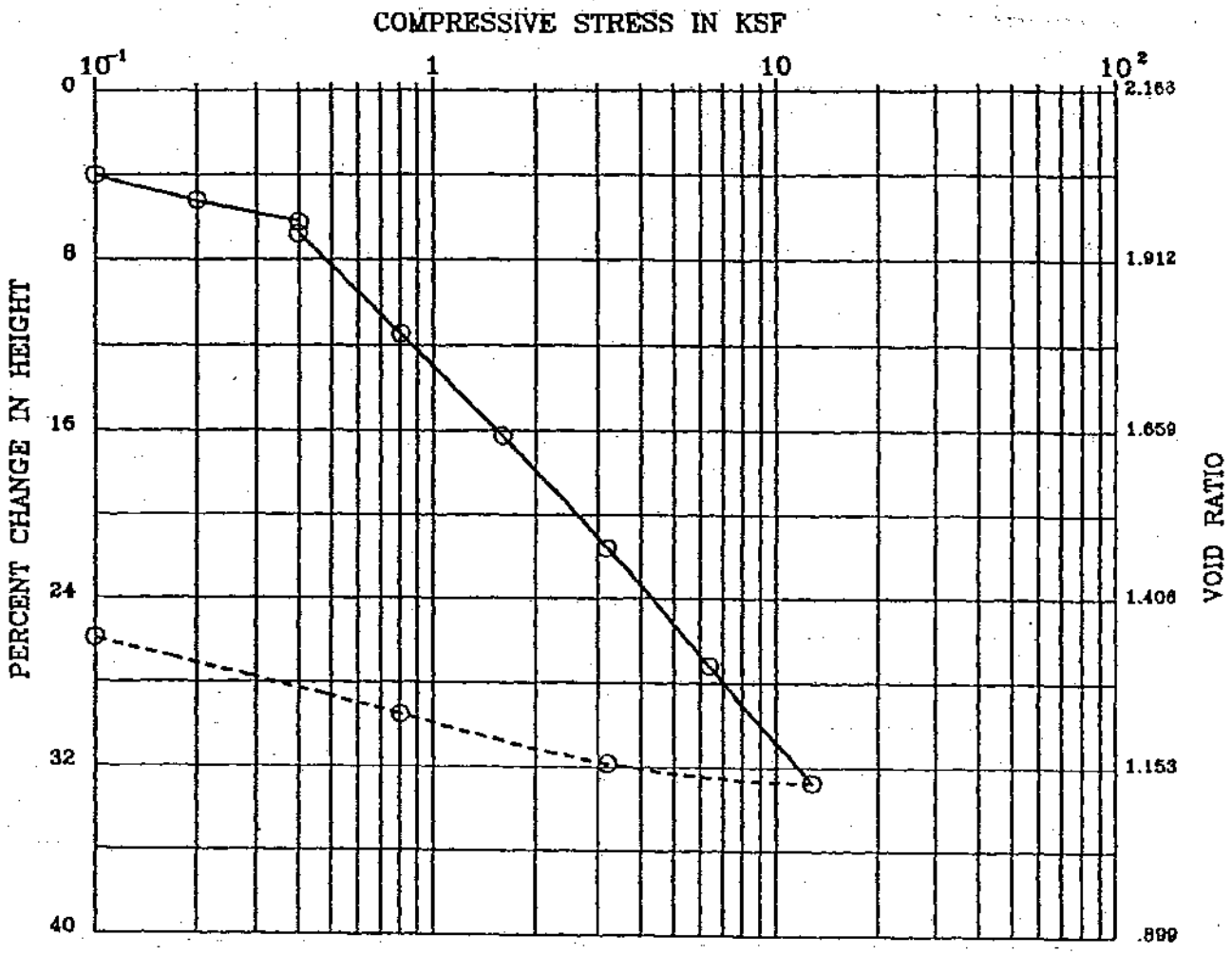
SHEET ___ OF ___

BMC G-5 @ 49'-51'
400 PSF



REVISIONS
BY _____ DATE _____
BY _____ DATE _____

BY _____ DATE _____
CHECKED BY _____



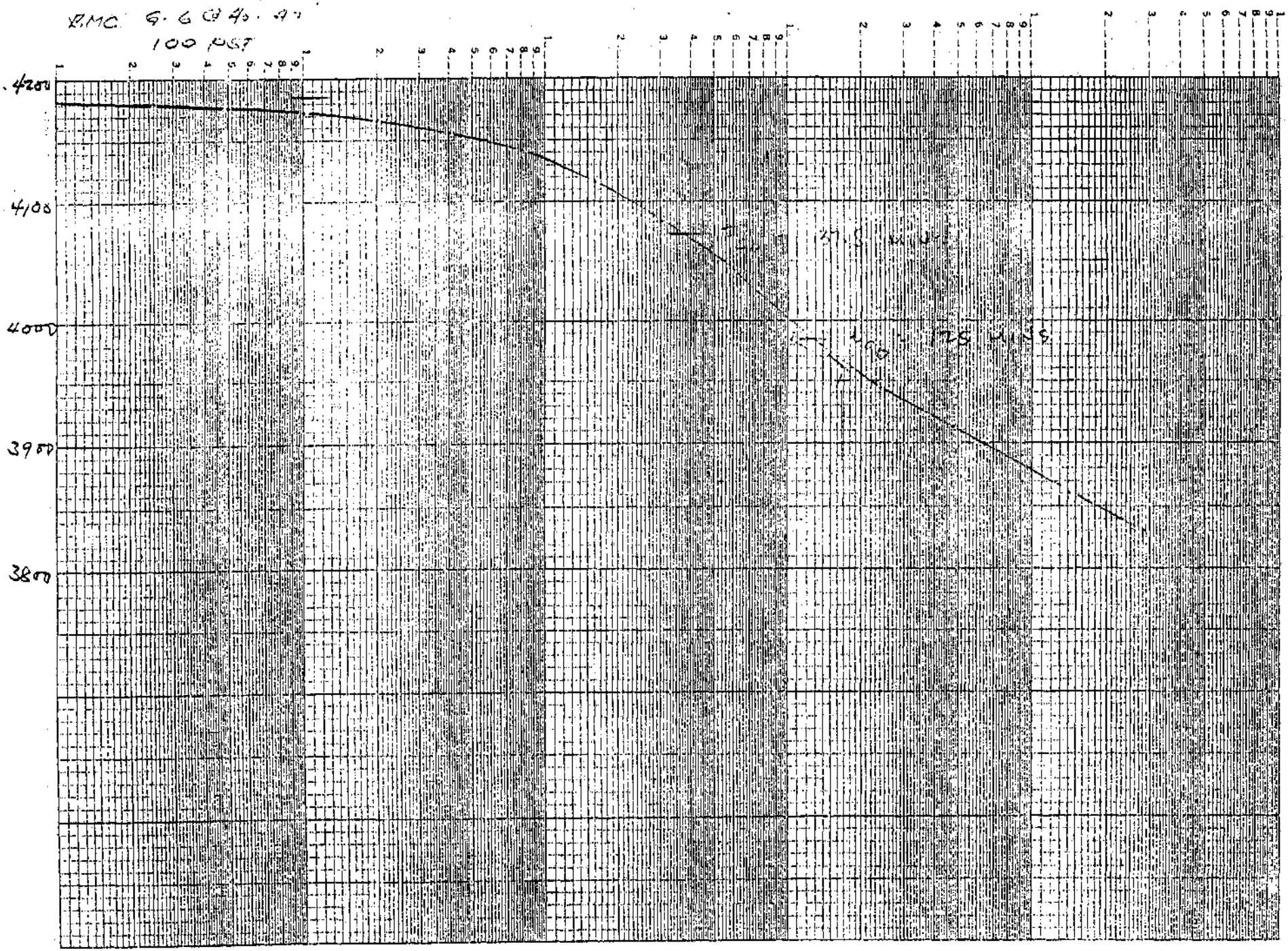
BORING : G -6
DEPTH (ft) : 40-42
SPEC. GRAVITY :

DESCRIPTION : Gray silty CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	72.1	57.2	97	2.166
FINAL	46.3	77.2	100	1.346

Remark : INUNDATED AT 0.4 KSF

Project No.:1546-2	BMC - BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:


K•Σ SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
R.M.C. 6-6 84-97
100 PSI
4200
4100
4000
3900
3800

K•Σ SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

RMC 9-6 @ 4½" dia

200 PSI

3900

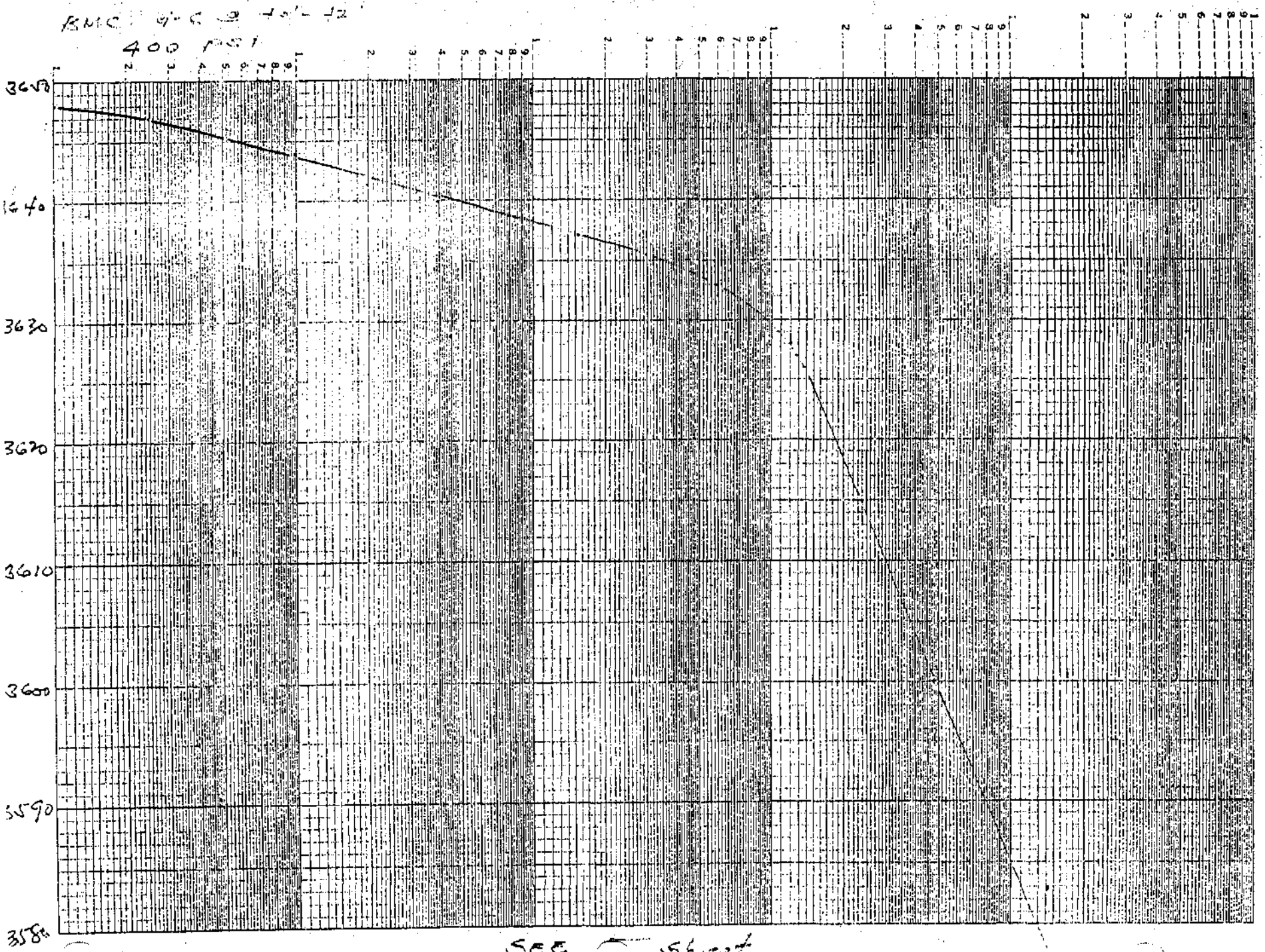
3800

3750

3700

3650

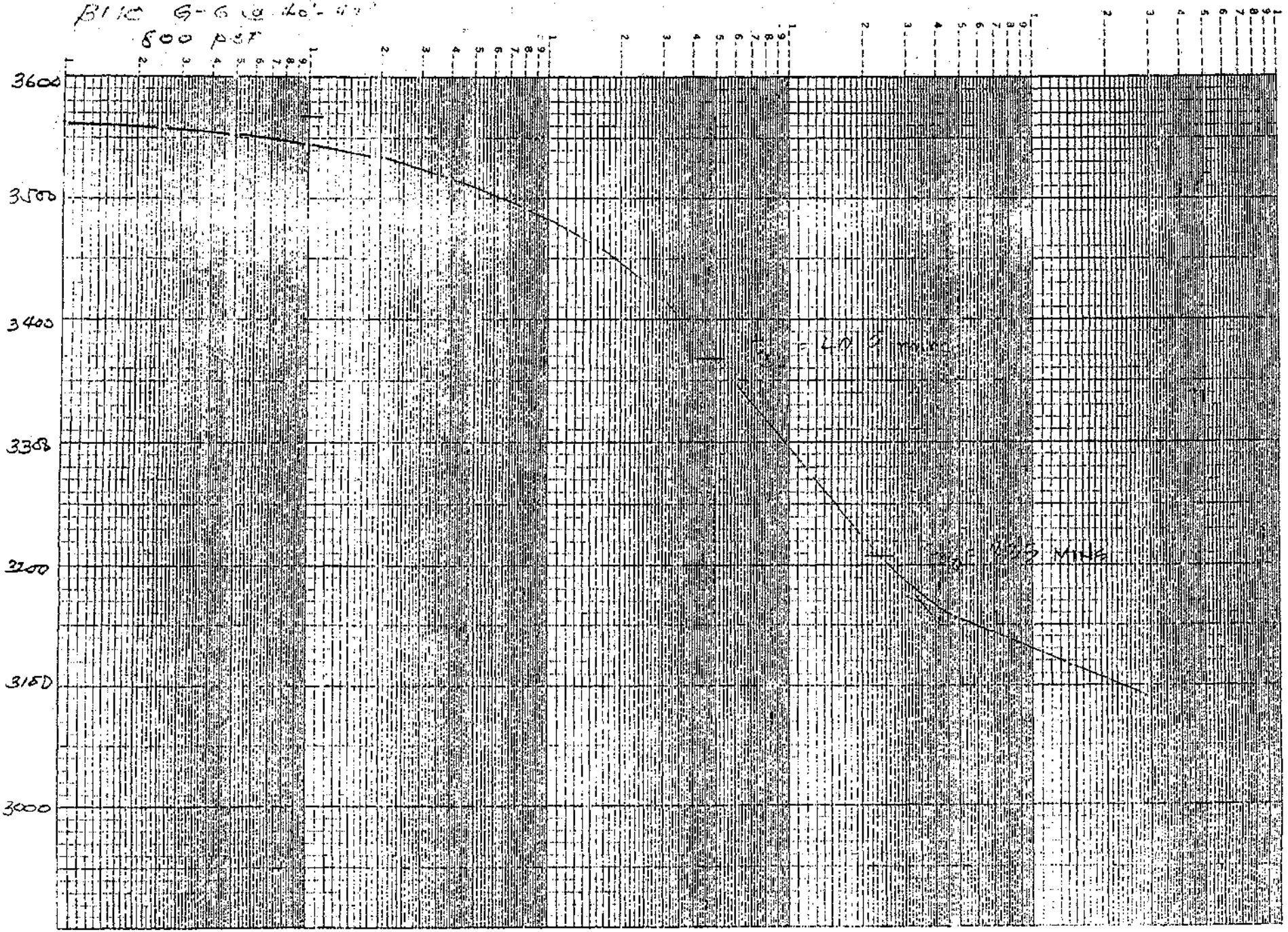
SEE VC SHEET

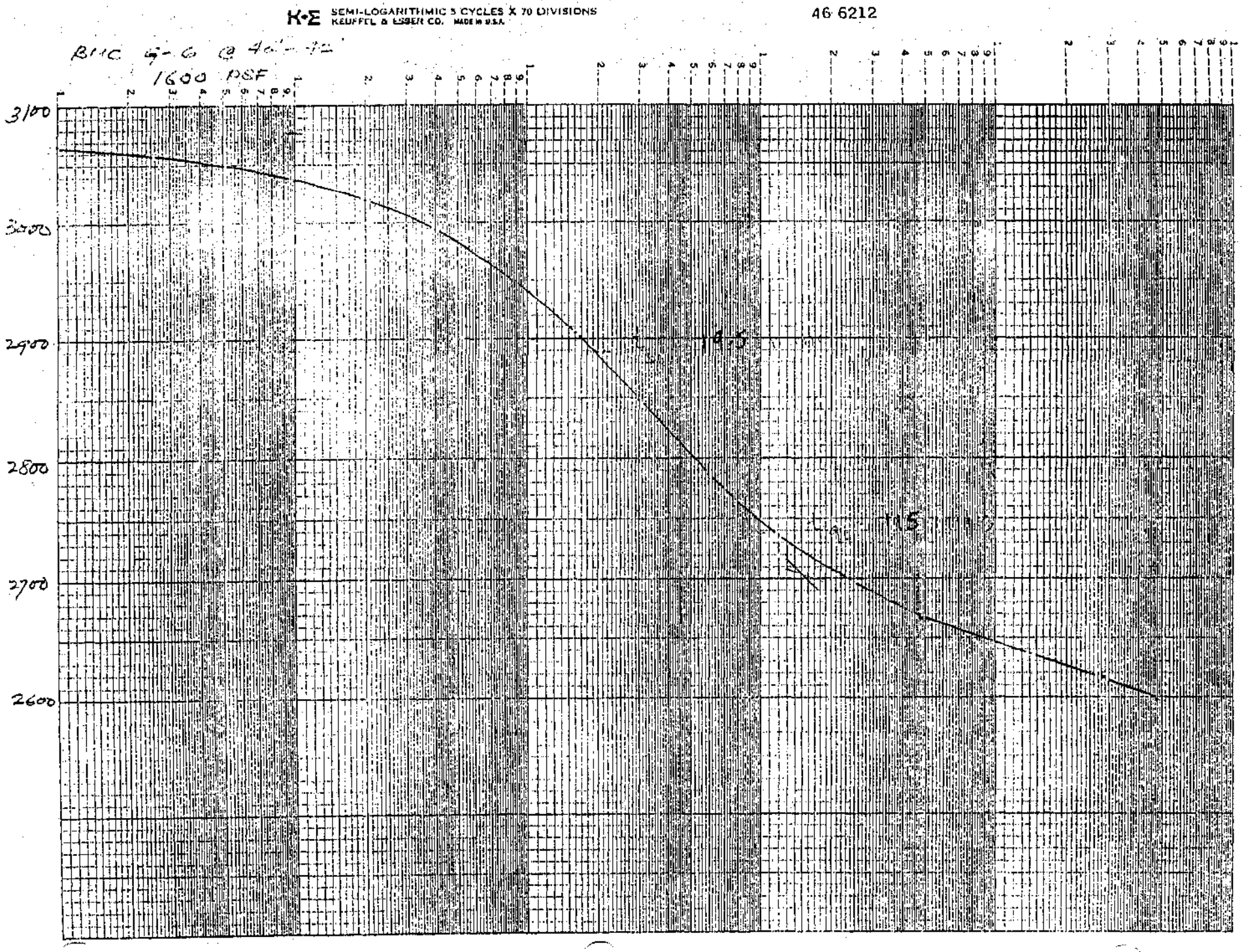

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
400 PSI
3640
3630
3620
3610
3600
3590
3580
See Sheet

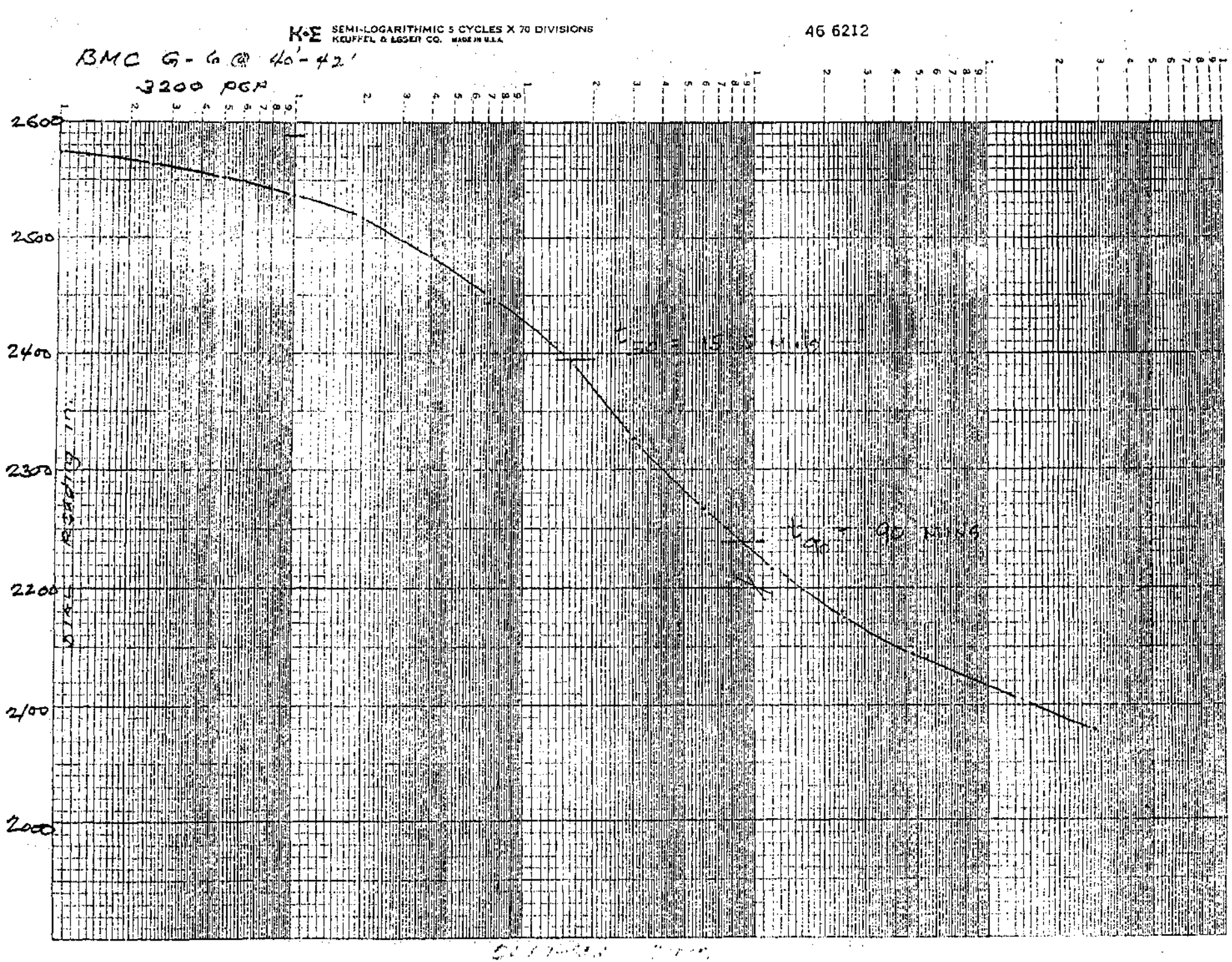
K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

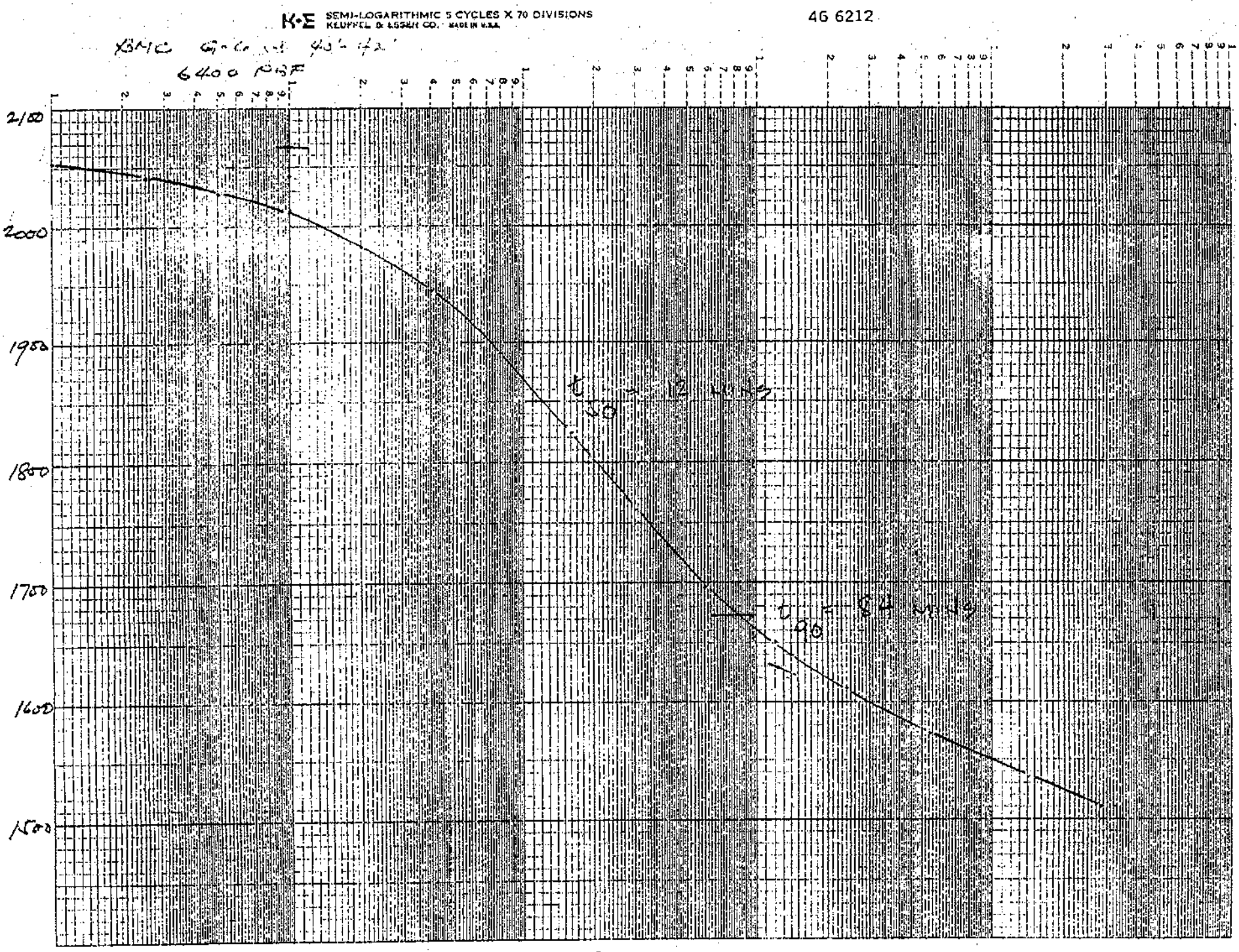
46 6212

BIC G-6 @ 40'-4"
600 psi




K-Σ SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
B11C 5-6 @ 40'-42'
1600 PSF
3100
3000
2900
2800
2700
2600
1.5
1.5

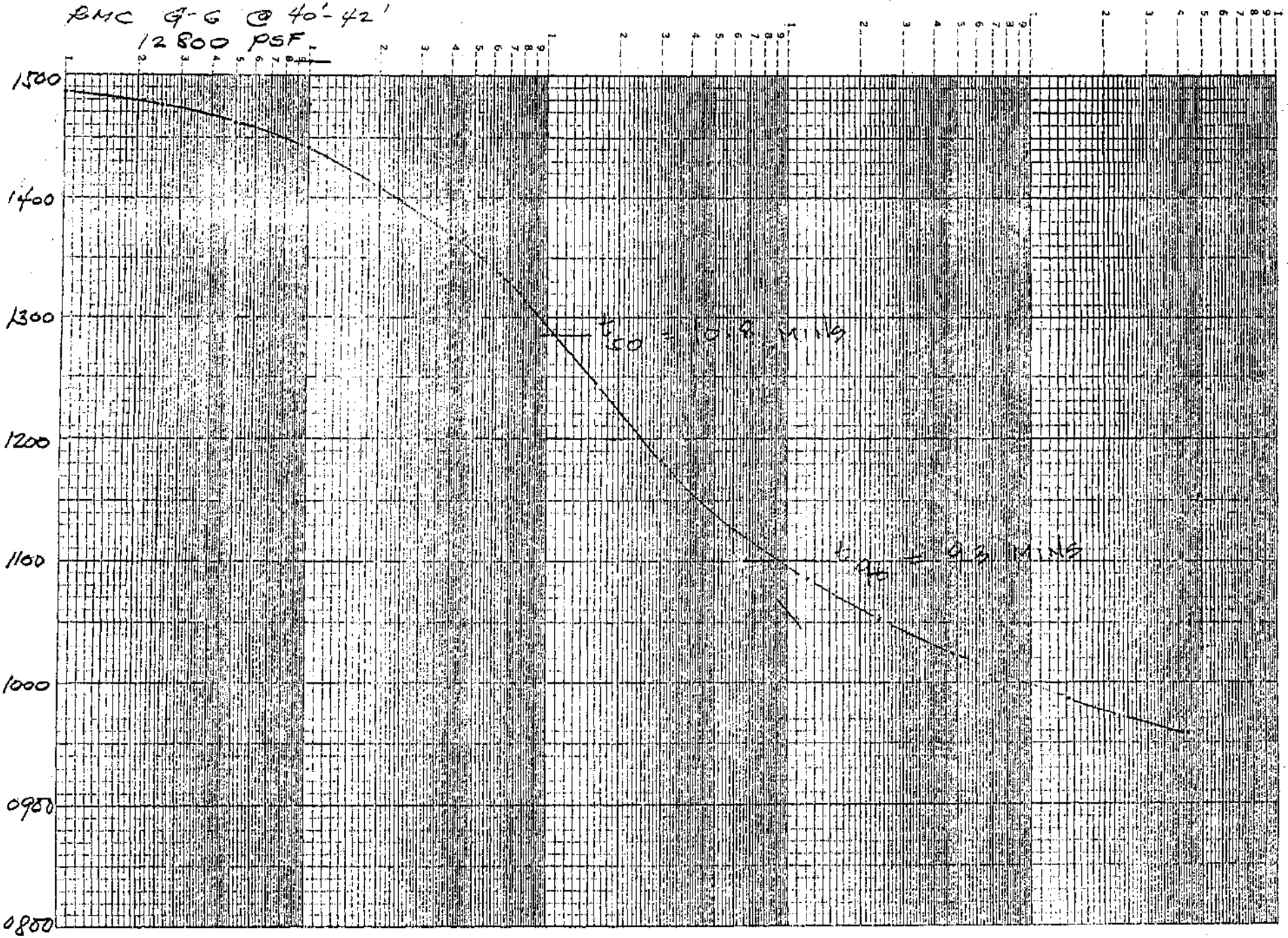

K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-6 @ 40'-42'
3200 PSI
2600
2500
2400
2300
2200
2100
2000


K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
2100
2000
1900
1800
1700
1600
1500

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

BMC G-G @ 40'-42'
12800 PSF



FILE _____

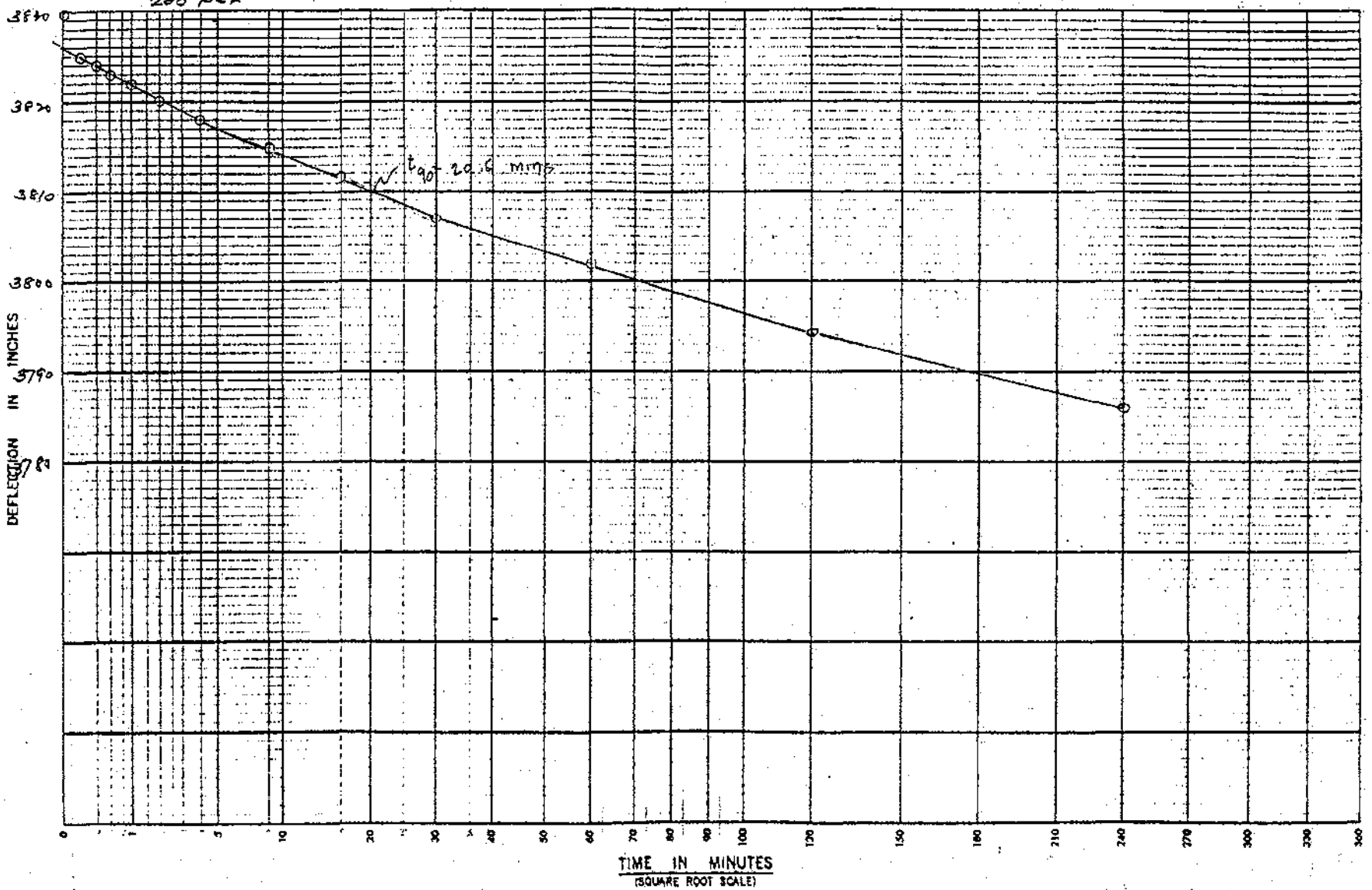
SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ____ OF ____

REVISIONS
BY _____ DATE _____
BY _____ DATE _____

BY _____ DATE _____
CHECKED BY _____

BMC C-C @ 40'-42'
200 PCF



BMC G-6 @ 40'-42'

400 PSF

FILE

SUBJECT : TIME-SETTLEMENT DATA

SHEET ___ OF ___

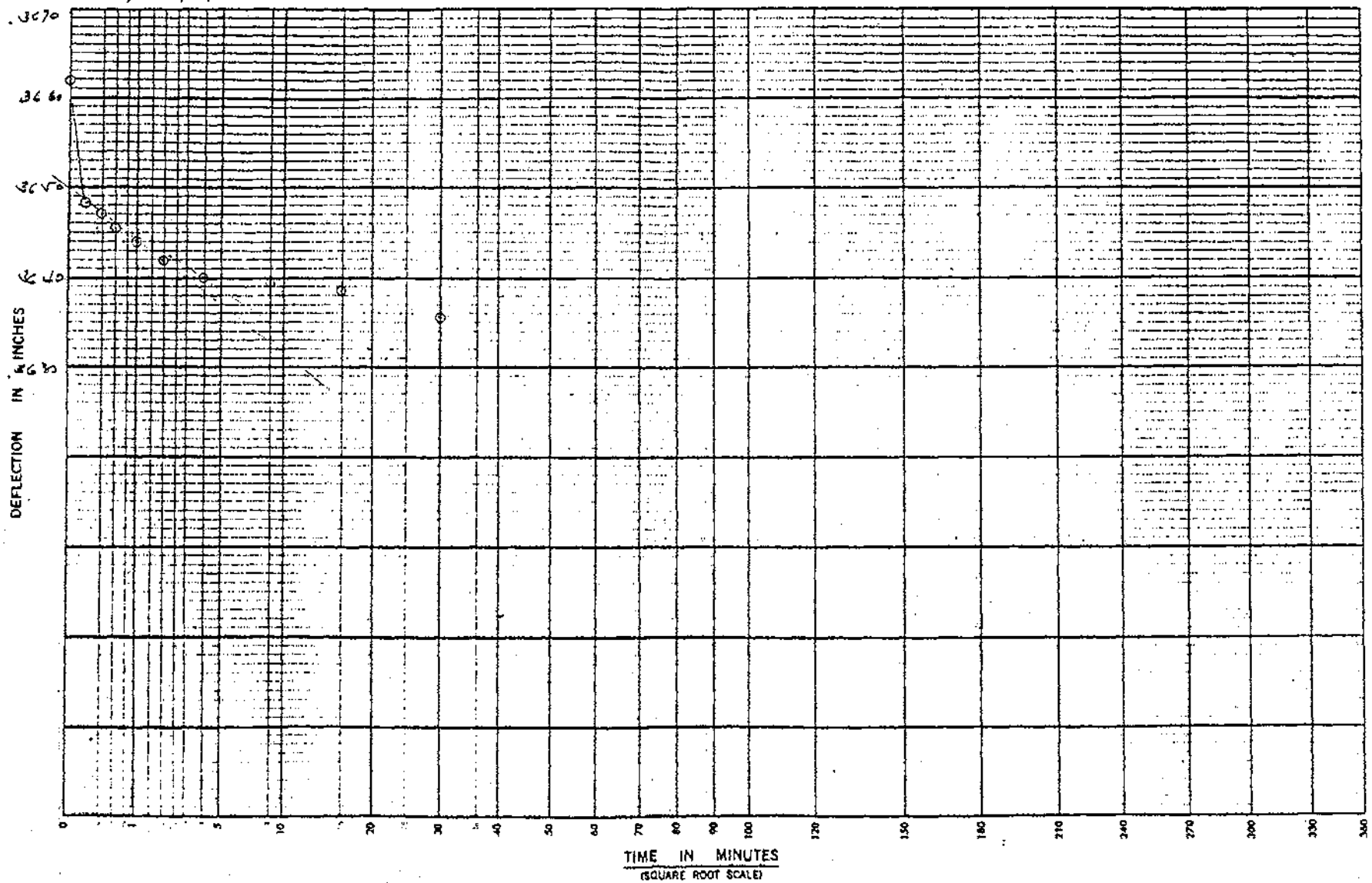
REVISIONS

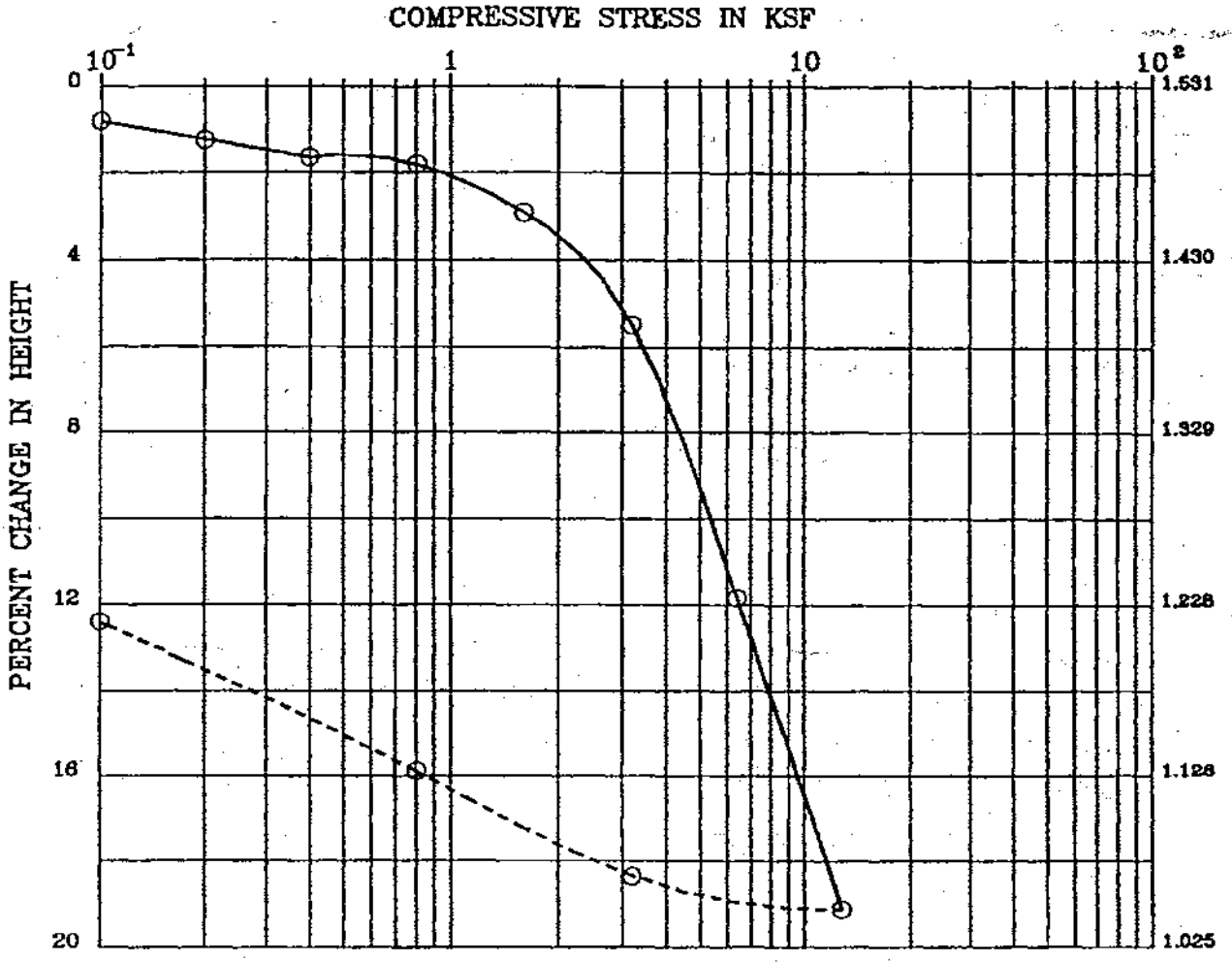
BY ____ DATE ____

BY ____ DATE ____

BY ____ DATE ____

CHECKED BY ____





BORING : G – 7
DEPTH (ft) : 53–55
SPEC. GRAVITY : 2.77

DESCRIPTION : Gray SILTY CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

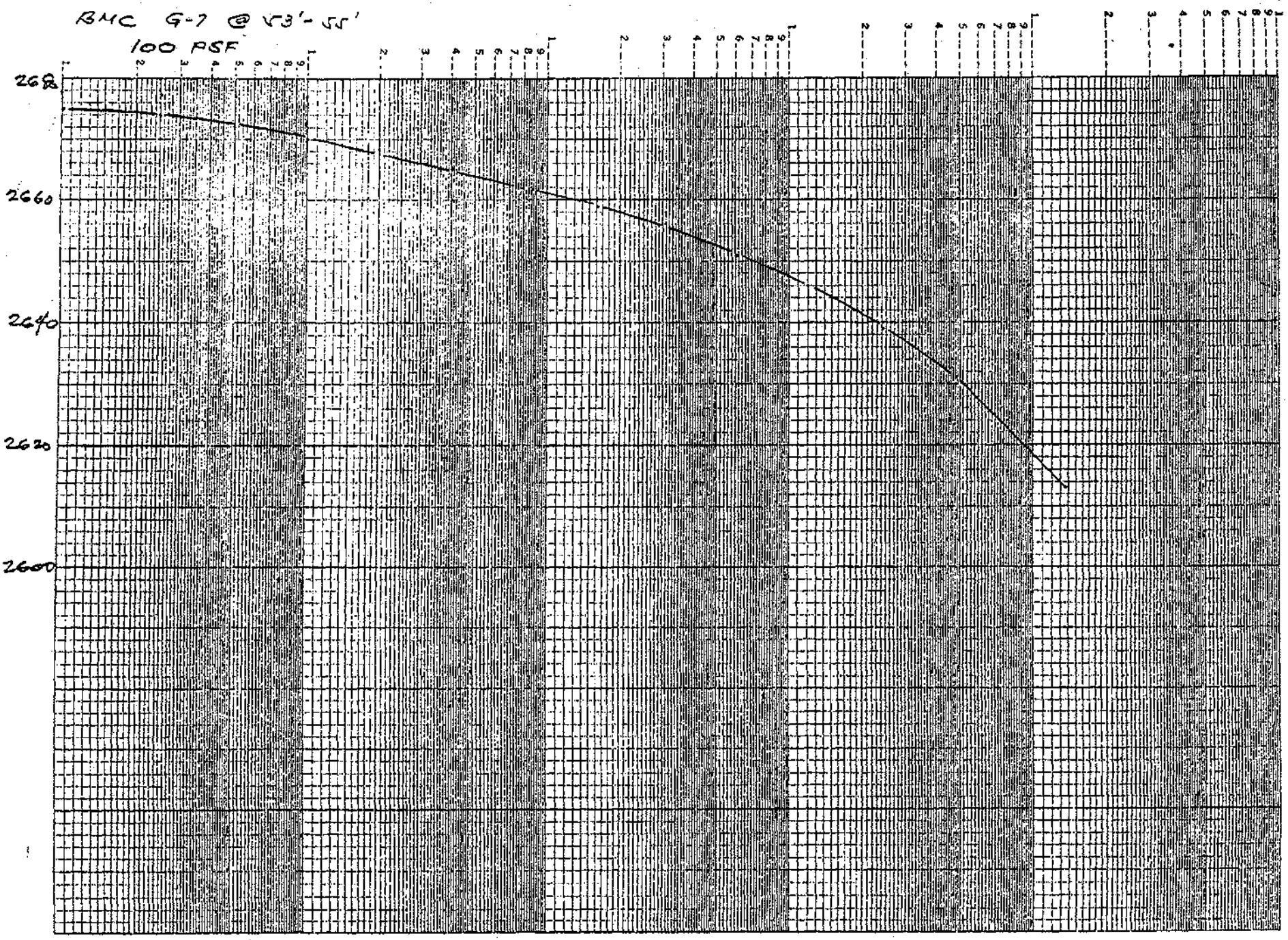
	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	53.2	68.2	96	1.531
FINAL	43.9	77.9	100	1.217

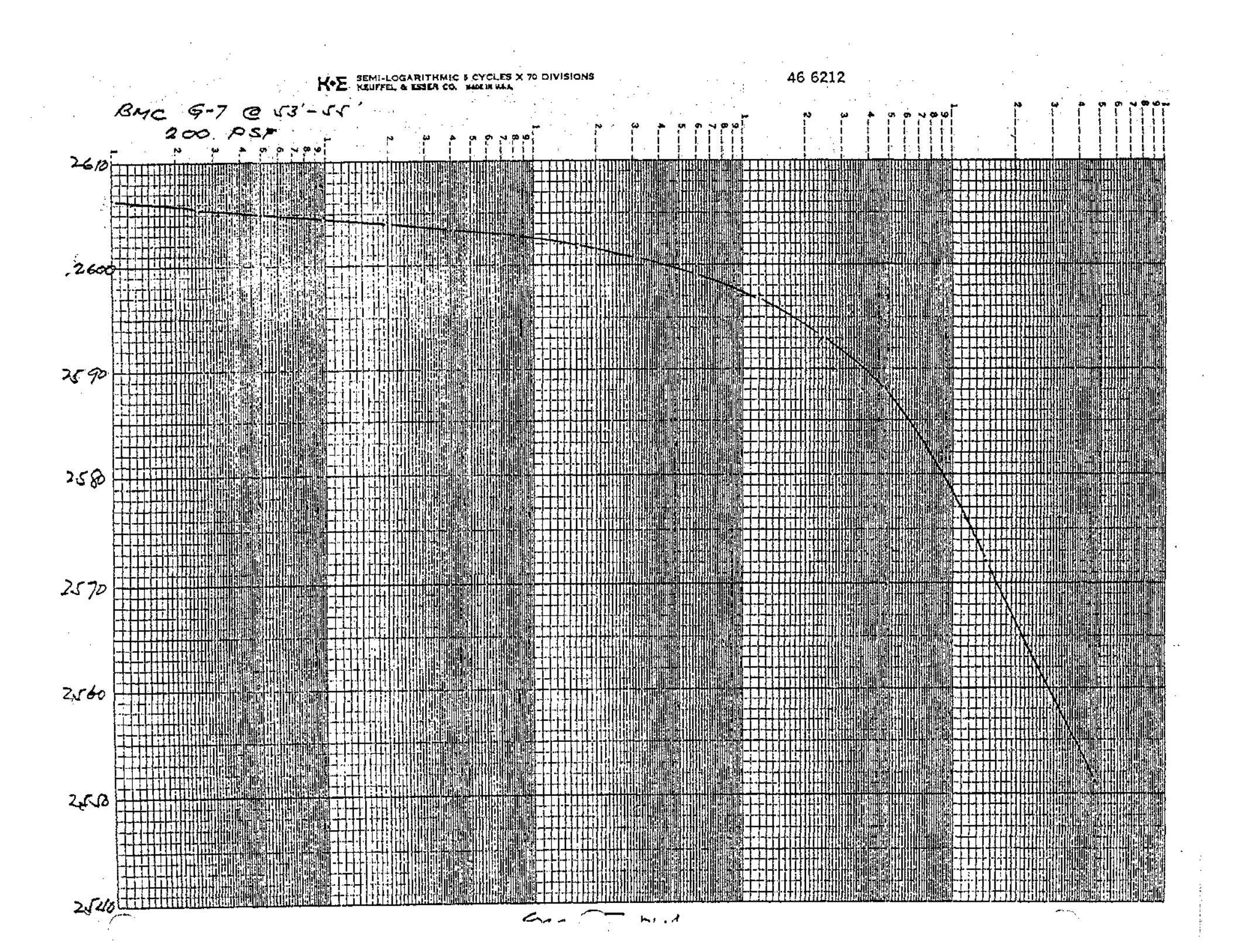
Remark : INUNDATED AT 0.4 KSF

Project No.:1546–2	BMC – BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:

K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 5212




K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-7 @ 53'-54'
200 PSF
2610
2600
2590
2580
2570
2560
2550
2540

K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

BMC G-7 @ 53'-55'

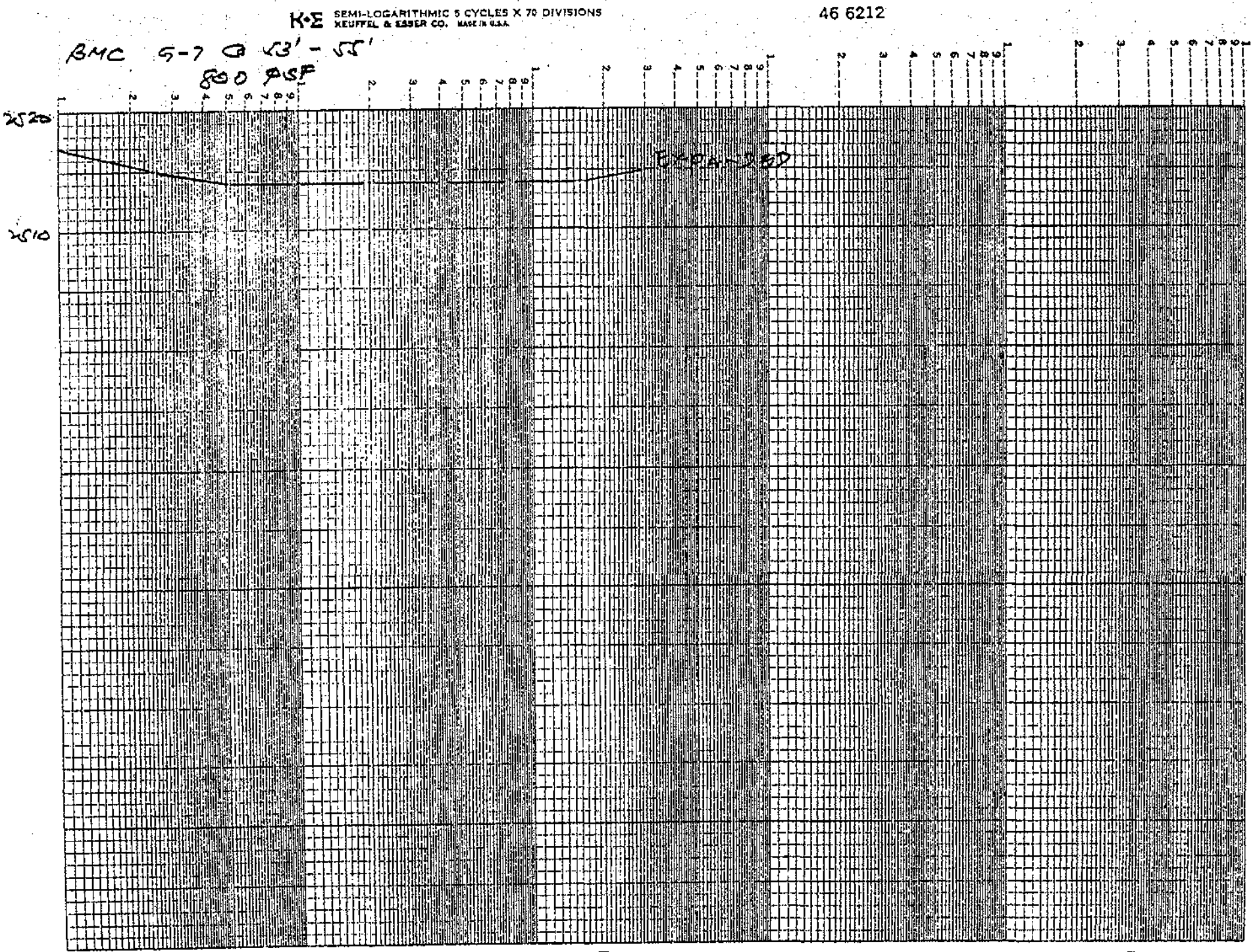
400 PSF

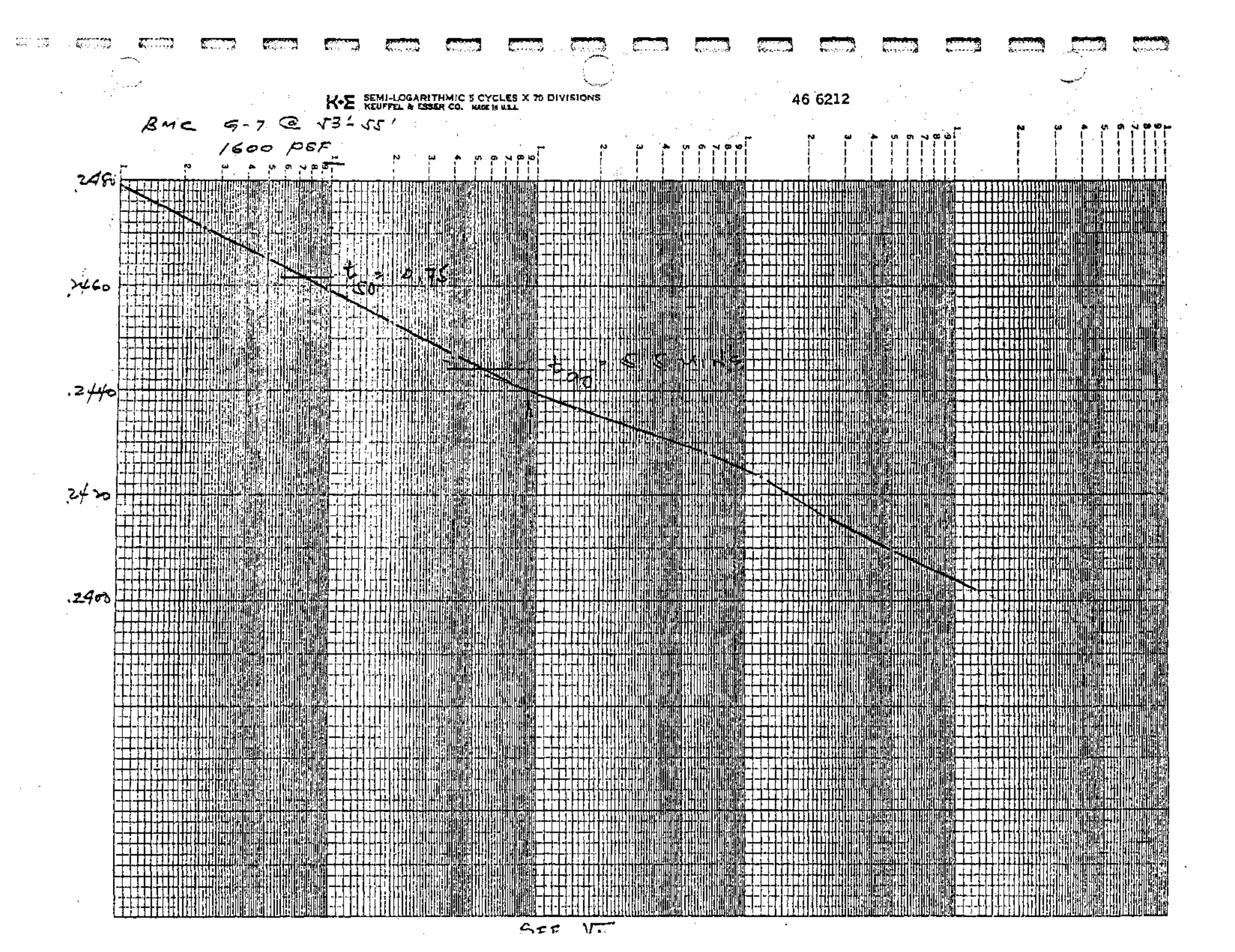
2540

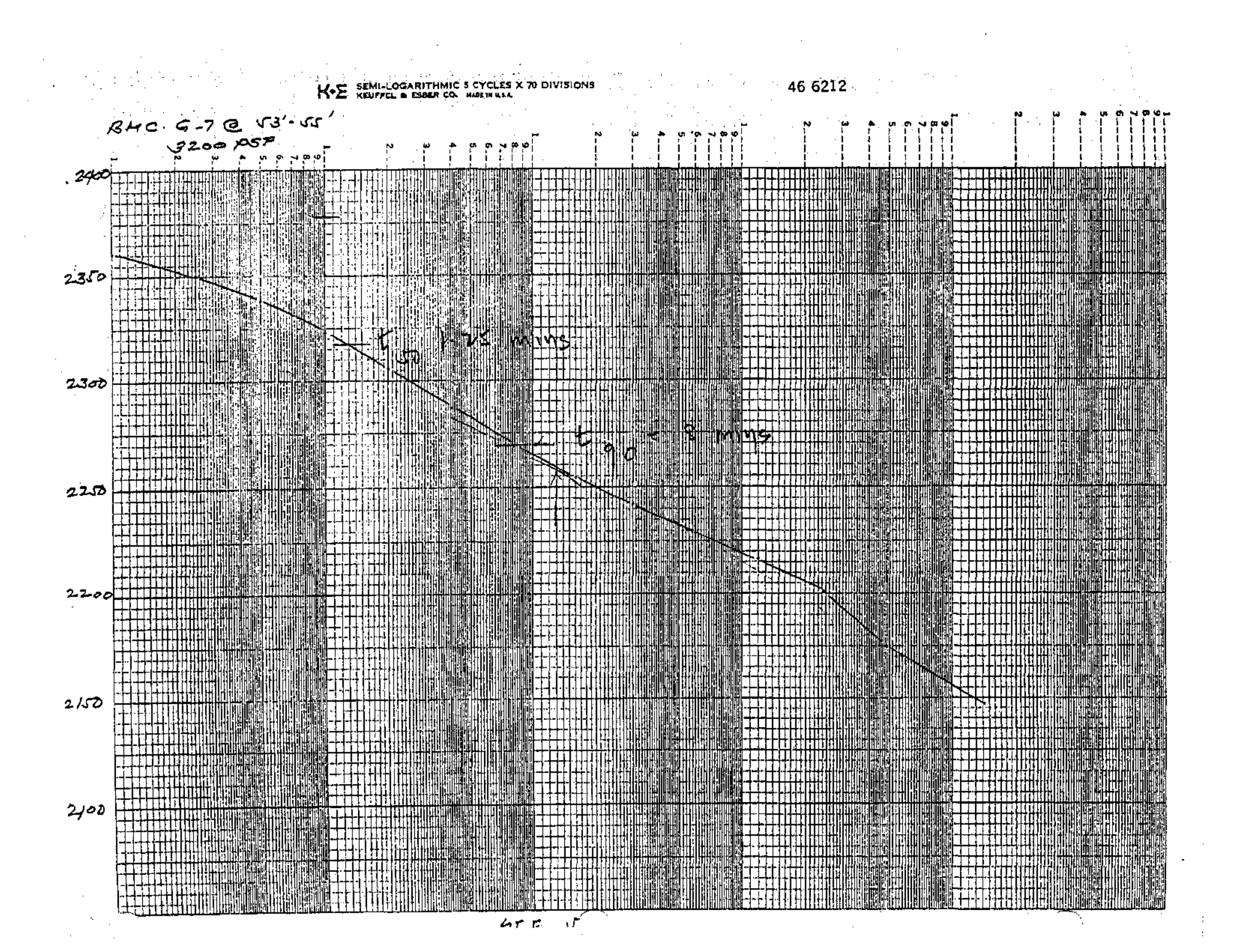
2530

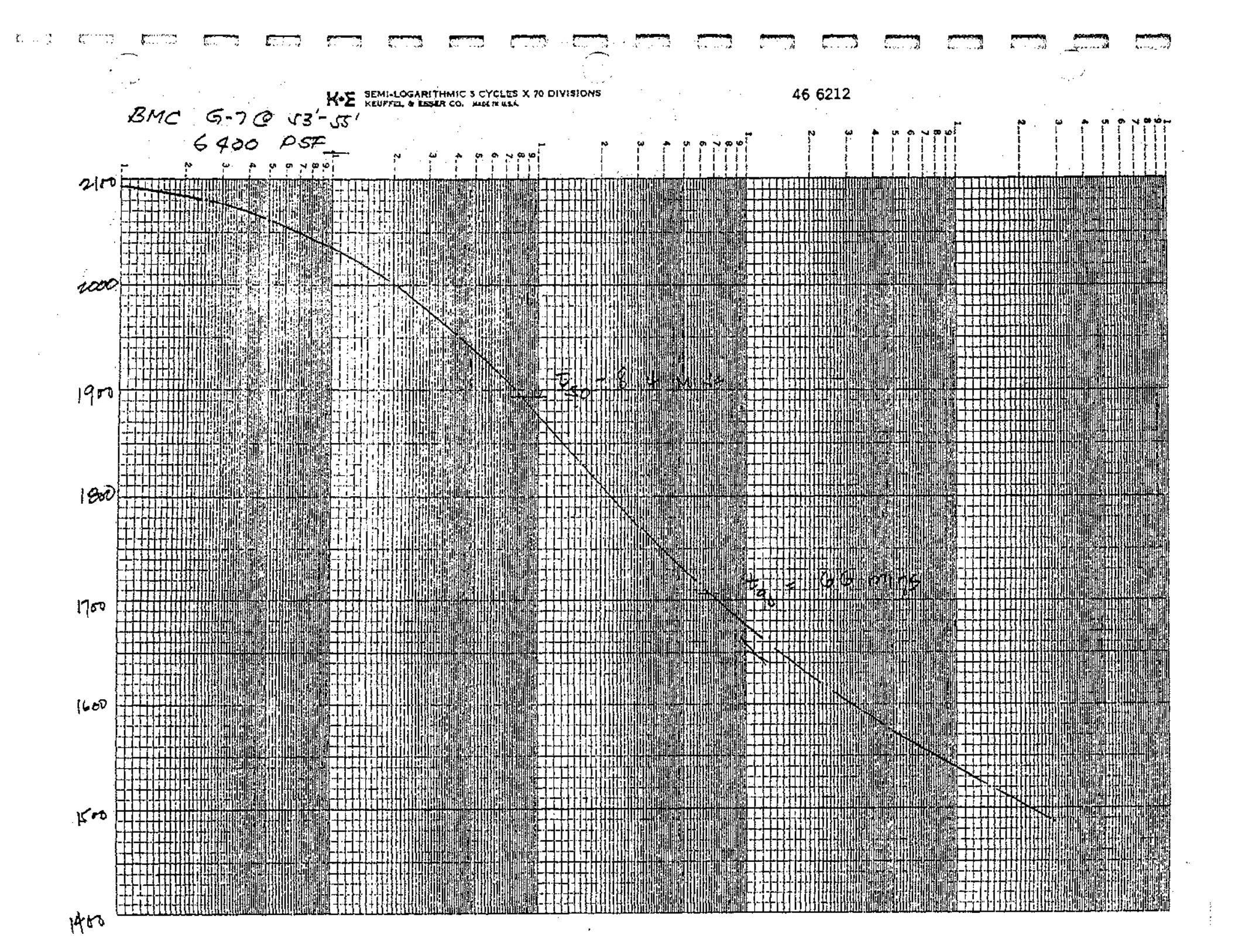
Extrapolated

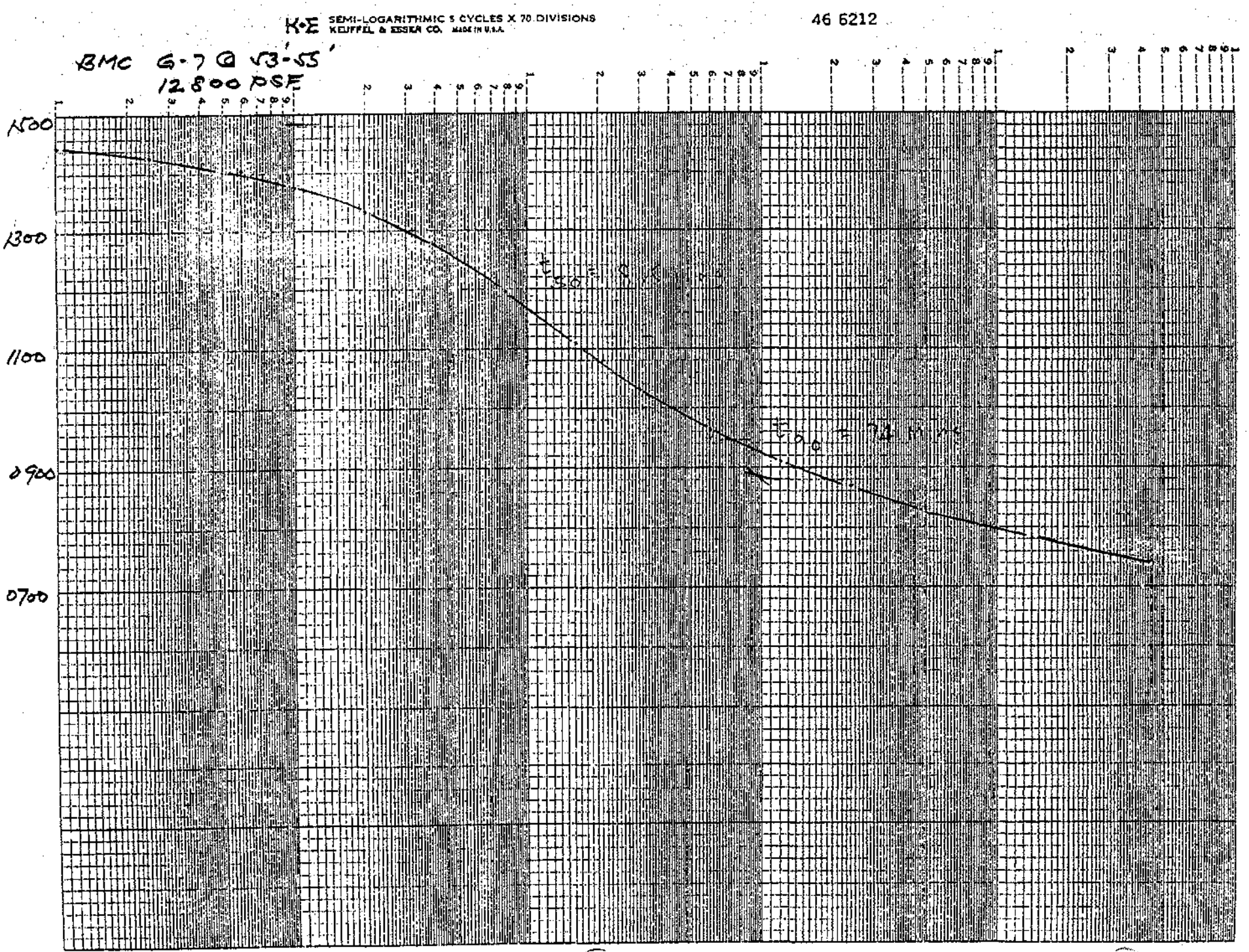
Estimated


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC 5-7 @ 13' - 15'
800 PSF
2520
2510
EXPAN-3.8D


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-7 @ ±3'-5'
1600 PCF
.248
.246
.244
.242
.240
t50 = 0.75
t90 = 5.5 x 1.5
SEE V.T.


K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BHC G-7 @ 53'-55'
3200 PSI
2400
2350
2300
2250
2200
2150
2100
t 50 1-1/2 mins
t 90 4 1/2 mins


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-7 @ 53'-55'
6400 PSF
2100
2000
1900
1800
1700
1600
1500
1400


K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-7 @ 53-55'
12800 PSF
1500
1300
1100
0900
0700

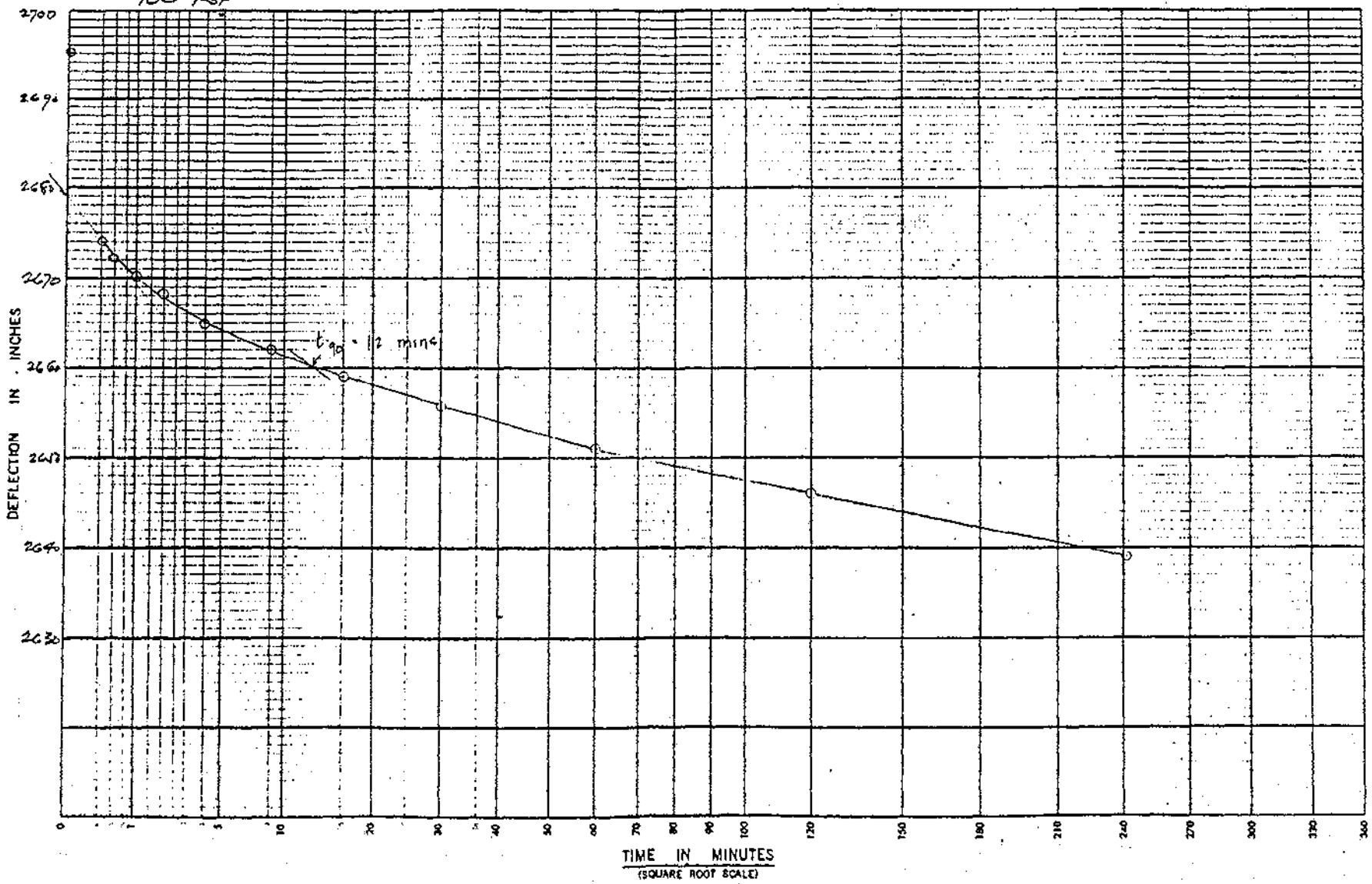
FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

SHEET ____ OF ____

REVISIONS
BY _____ DATE _____
BY _____ DATE _____

BMC 9-7 @ 43'-6"
100 PSF



BY _____ DATE _____
CHECKED BY _____

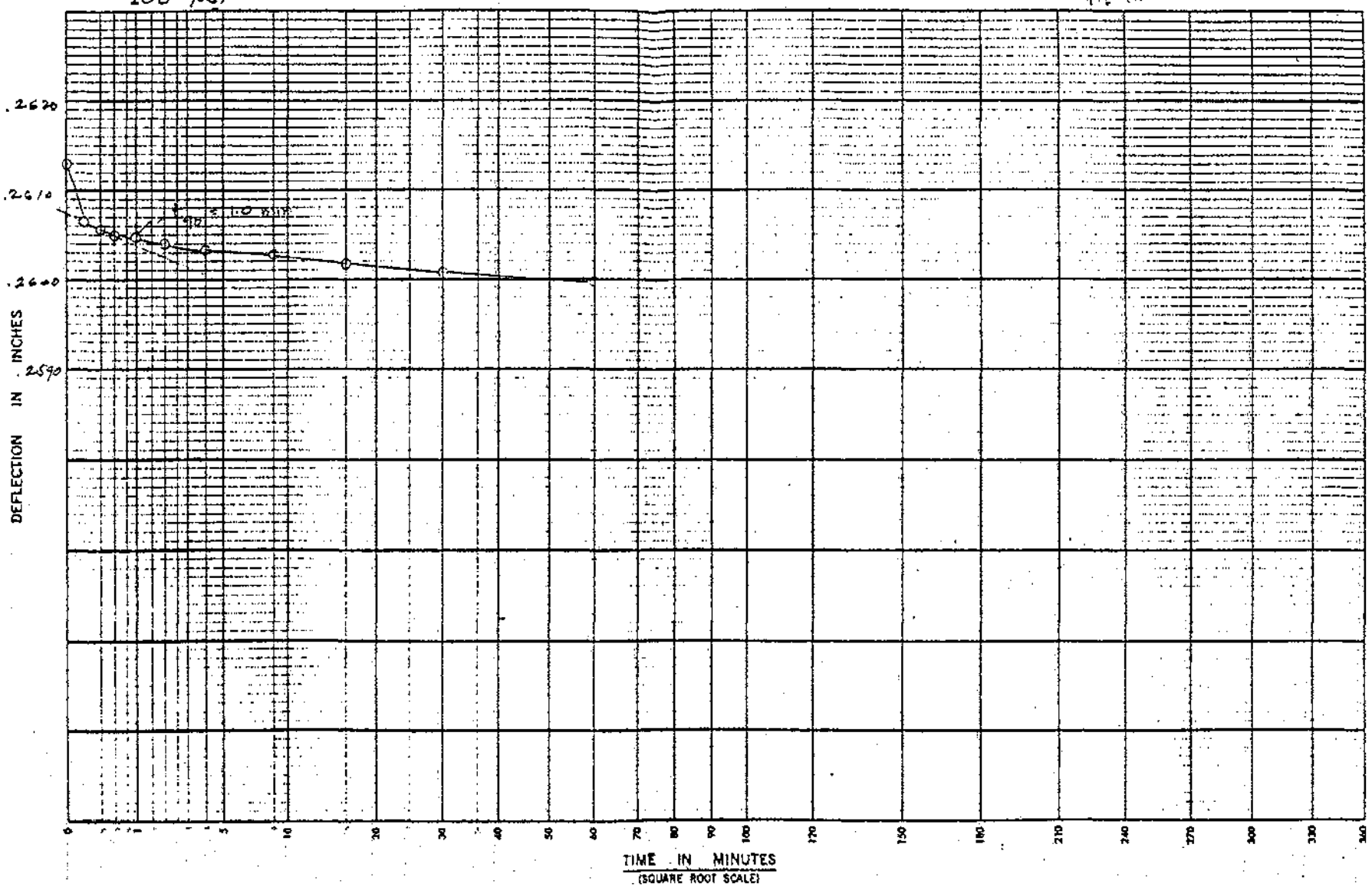
FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ____ OF ____

BHC G-7 @ 3' - 4'

200 psf



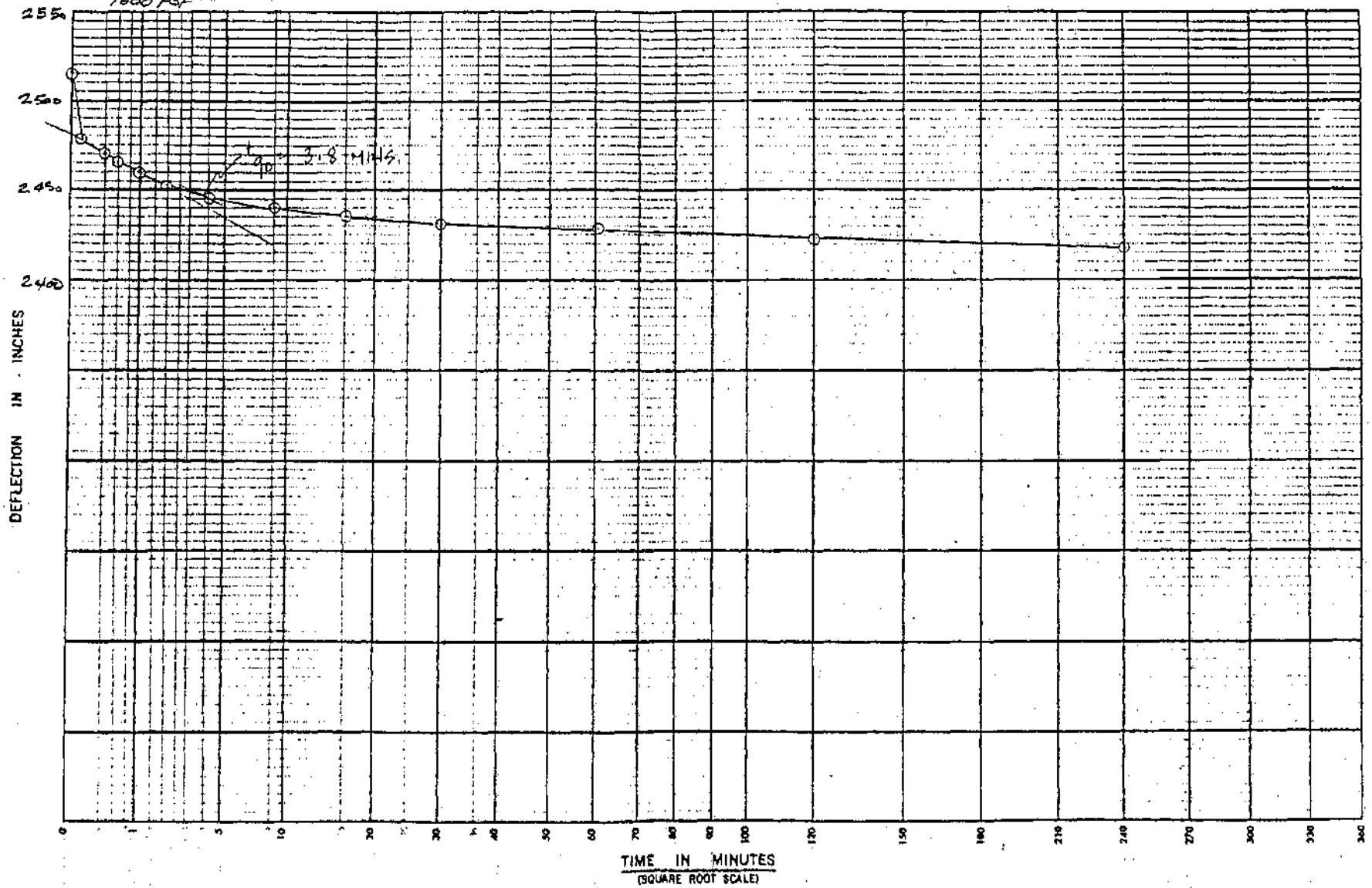
REVISIONS
BY _____ DATE _____
BY _____ DATE _____

BY _____ DATE _____
CHECKED BY _____

SUBJECT : TIME-SETTLEMENT D...

SHEET ___ OF ___

BMC G-7 @ 13'-15'
1600 PSF



REVISIONS
BY ___ DATE ___
BY ___ DATE ___

BY ___ DATE ___
CHECKED BY ___

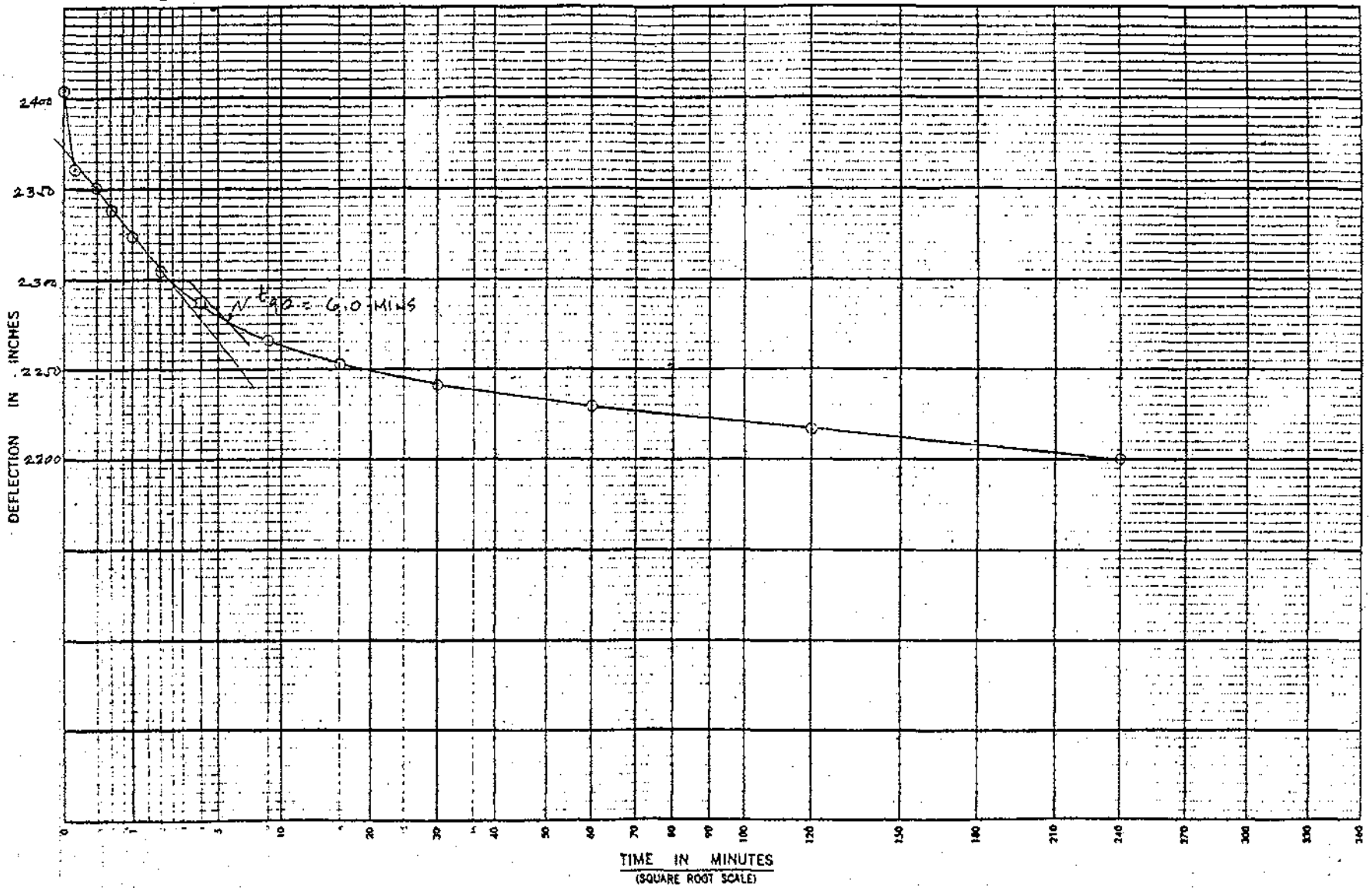
FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ____ OF ____

BMC G-7 @ 13'-5"

3200 PSF



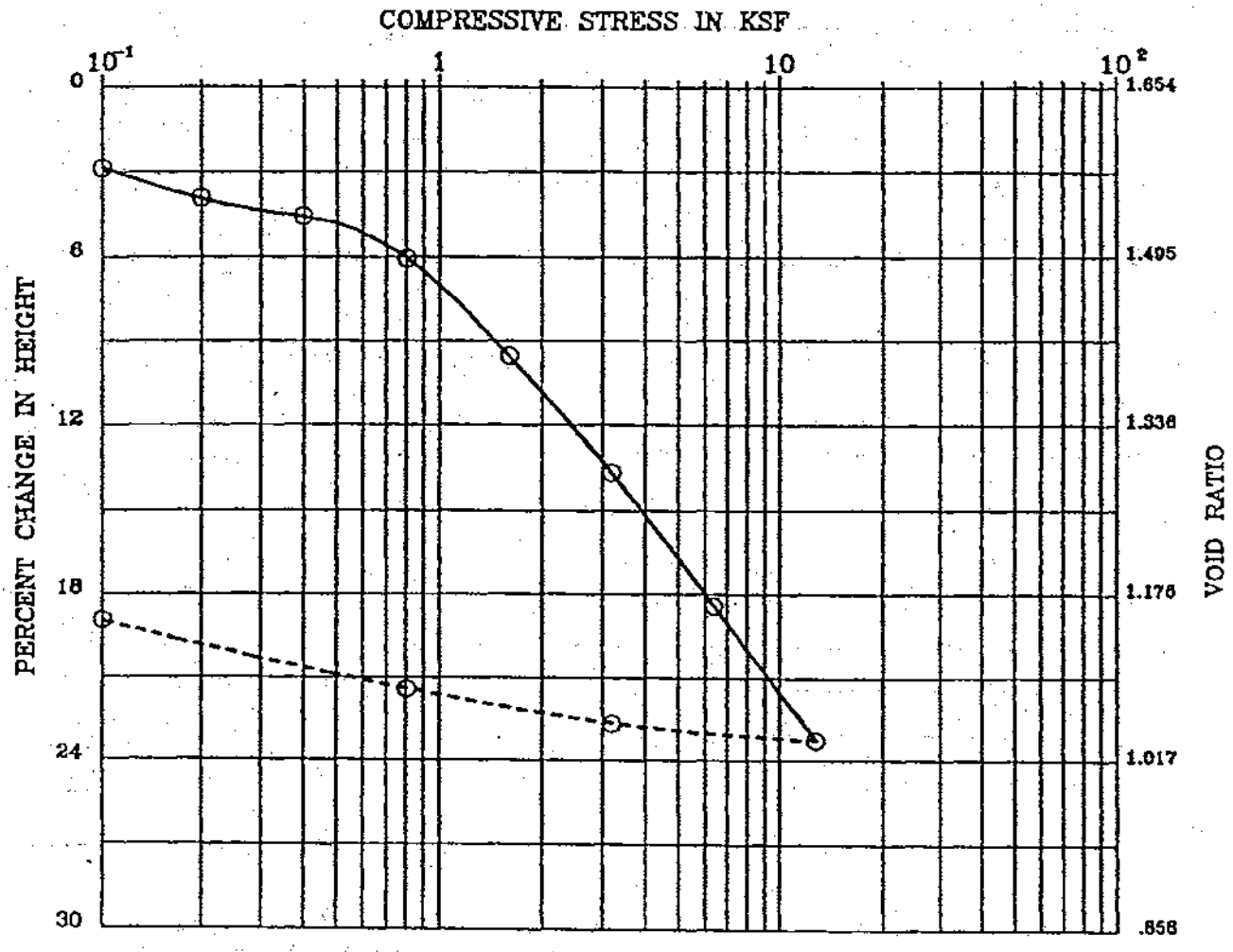
REVISIONS

BY _____ DATE _____

BY _____ DATE _____

BY _____ DATE _____

CHECKED BY _____



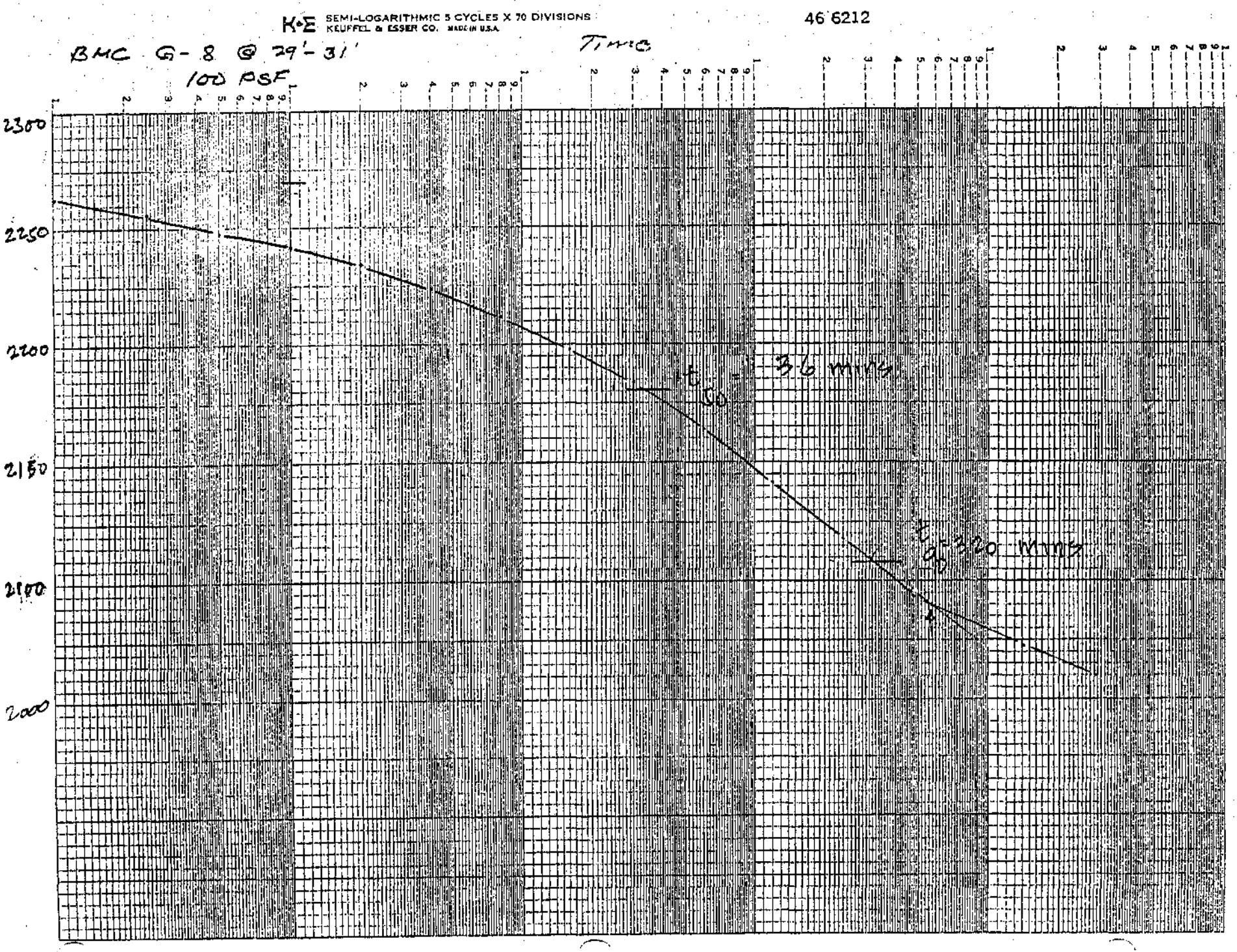
BORING : G – 8
DEPTH (ft) : 29–31
SPEC. GRAVITY :

DESCRIPTION : Gray silty CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	52.1	68.7	92	1.654
FINAL	37.5	86.9	100	1.097

Remark : INUNDATED AT 0.4 KSF

Project No.:1546–2	BMC – BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:


K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-8 @ 29'-31'
100 PSF
TIME
2300
2250
2200
2150
2100
2000
t50 = 36 mins
t90 = 320 mins

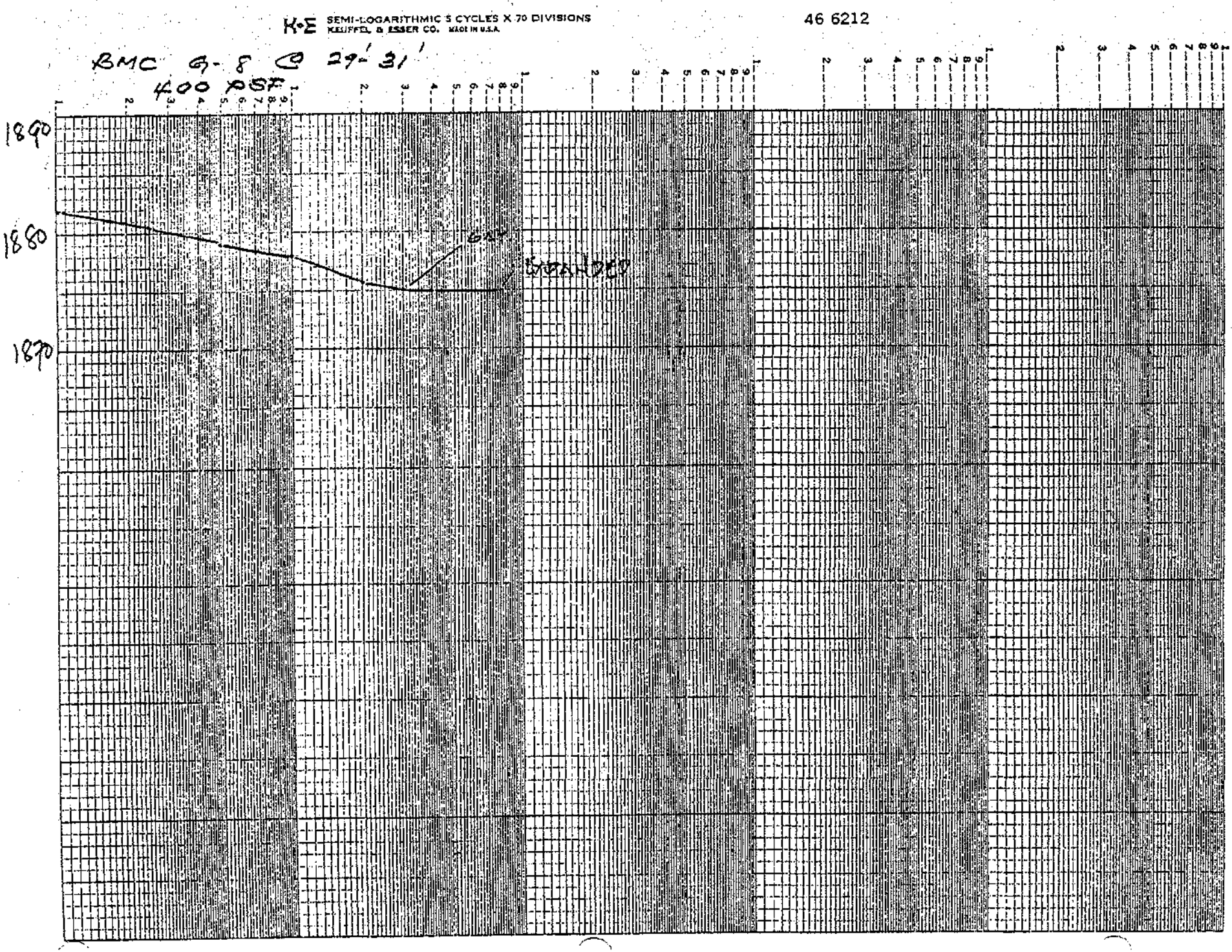
K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

BMC G-8 @ 29'-31'
200 PSF

2000
1990
1970
1950
1930
1910
1890

SEE VT SHEET


K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC @ 8 @ 29'-31'
400 PSF
1890
1880
1870
SAT
SOAKED

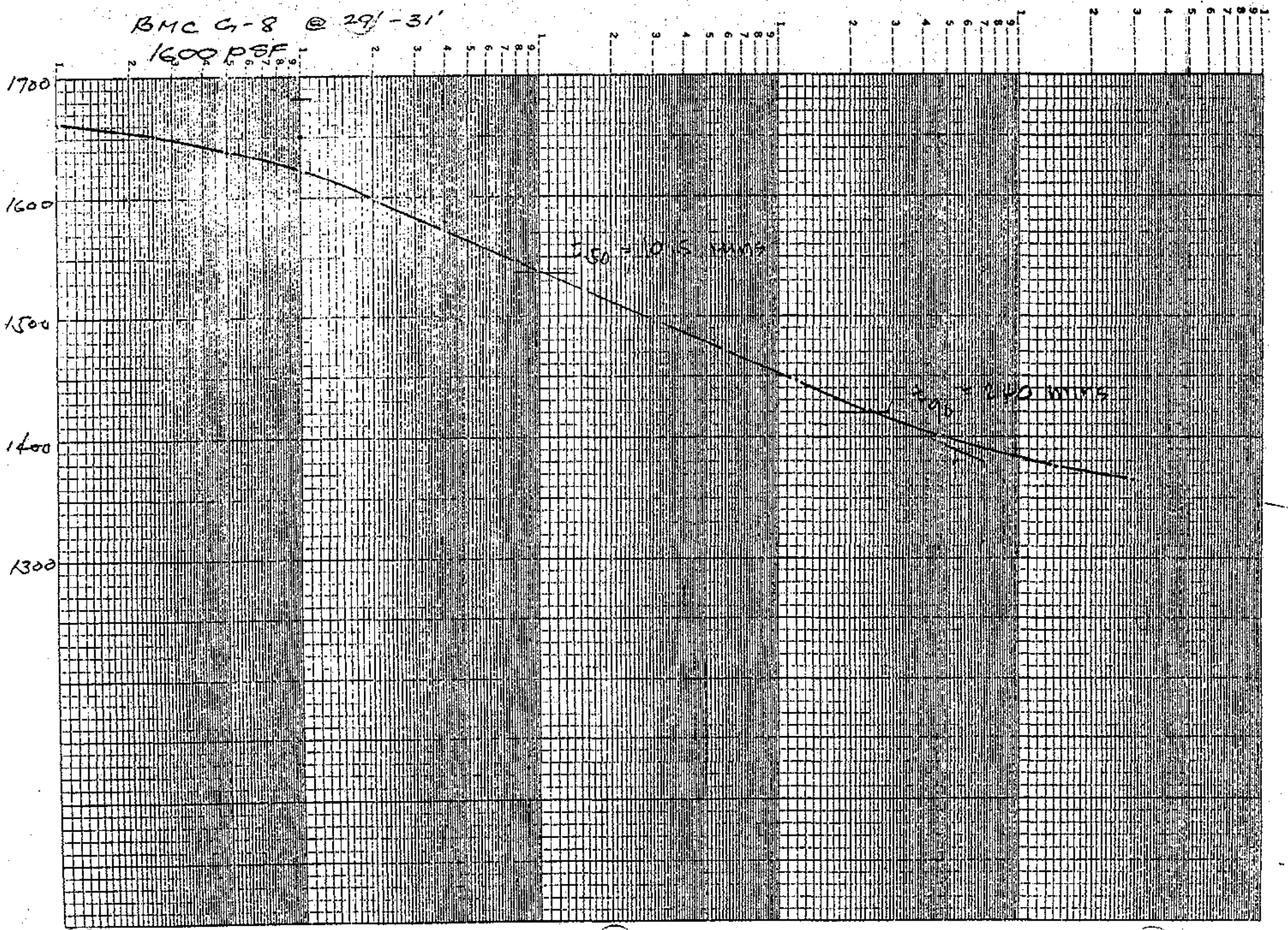
K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

BMC 9-8 @ 29'-31'
800 PSF

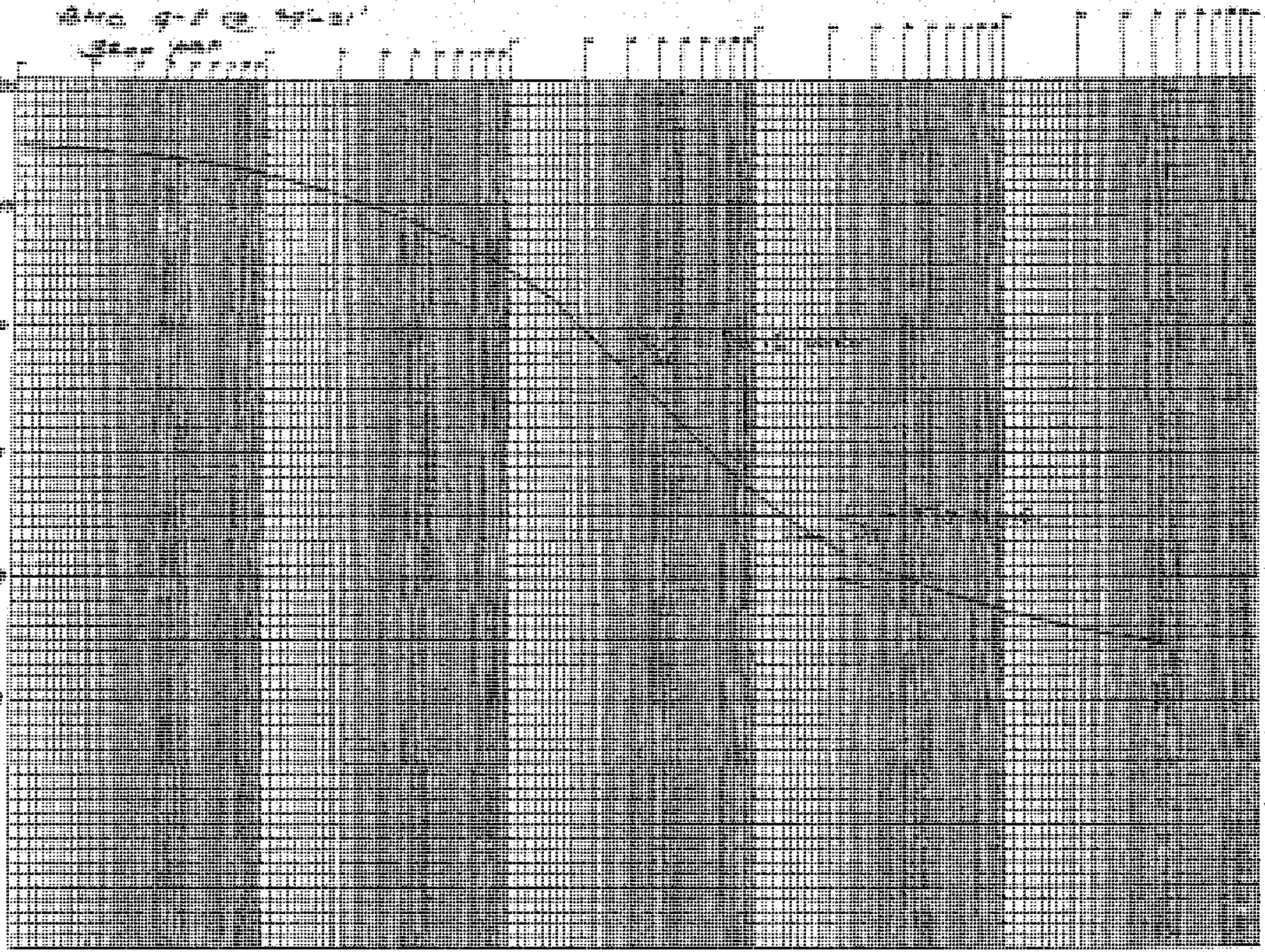
1850
1800
1750
1700
1650

SEE V+ SHEET


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-8 @ 29'-31'
1600 PSF
1700
1600
1500
1400
1300
t50 = 10 S
t90 = 240 MINS

K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

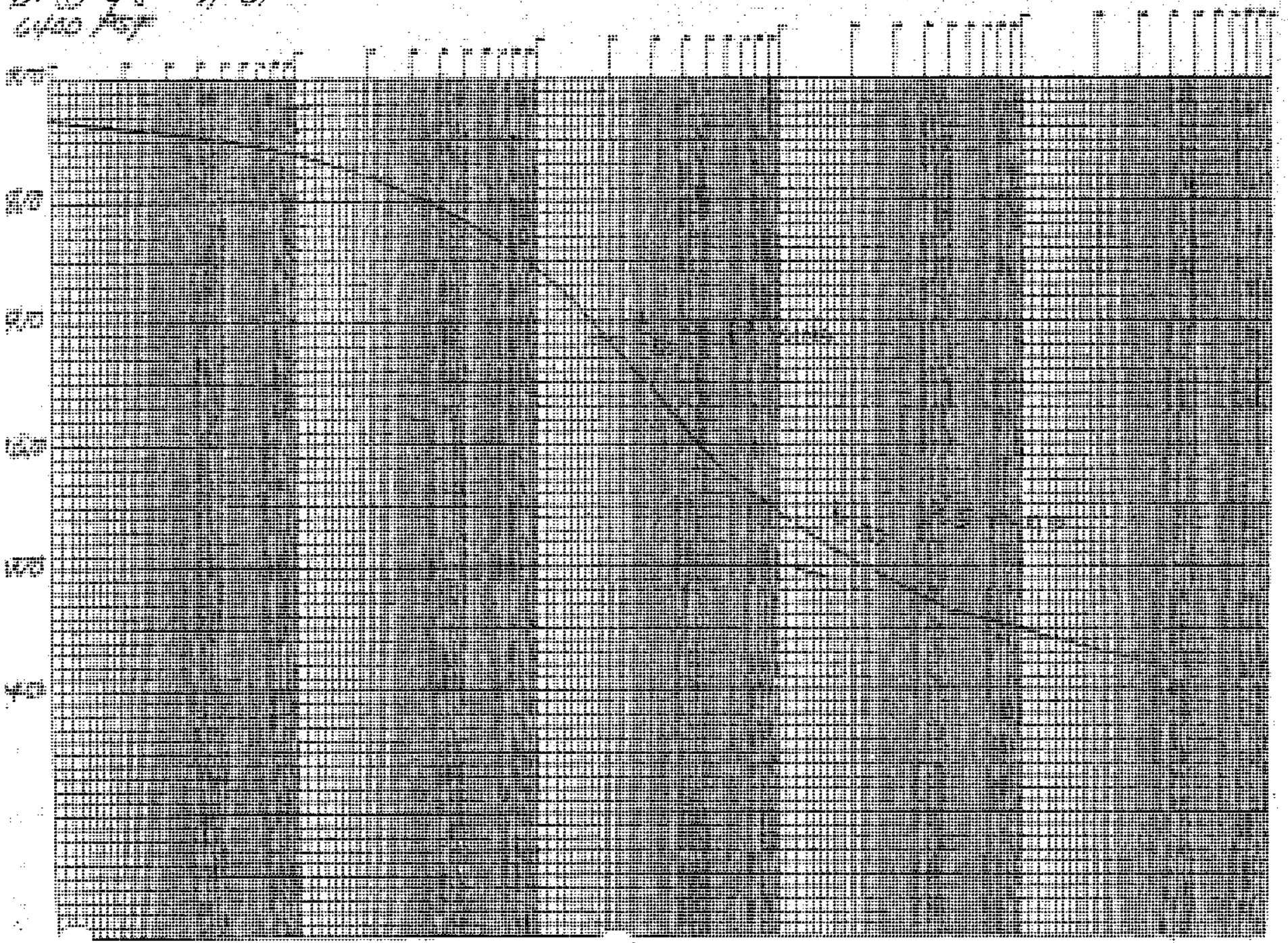
46 6212



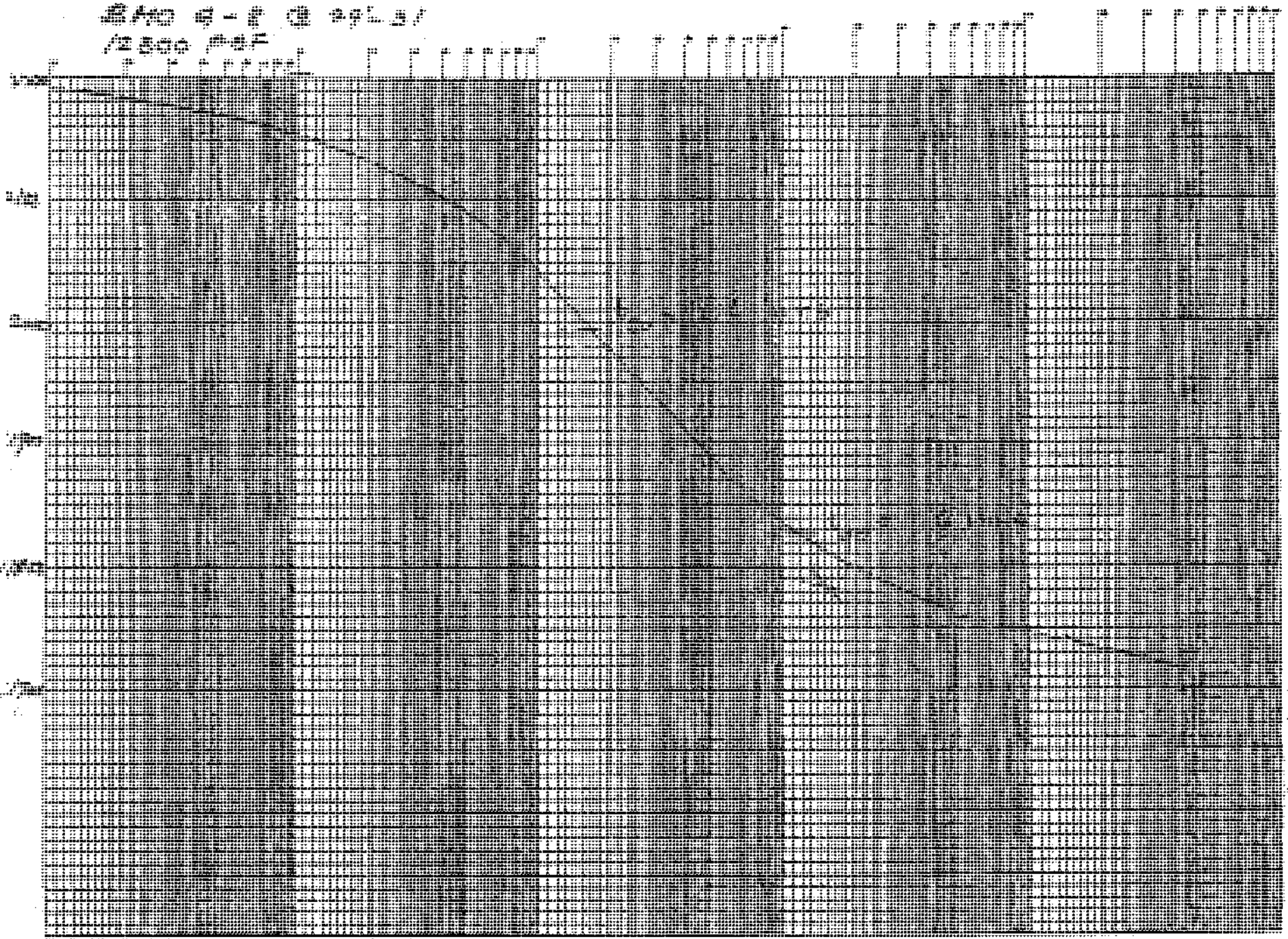
BMC G8 Y8-31

K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212



K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212

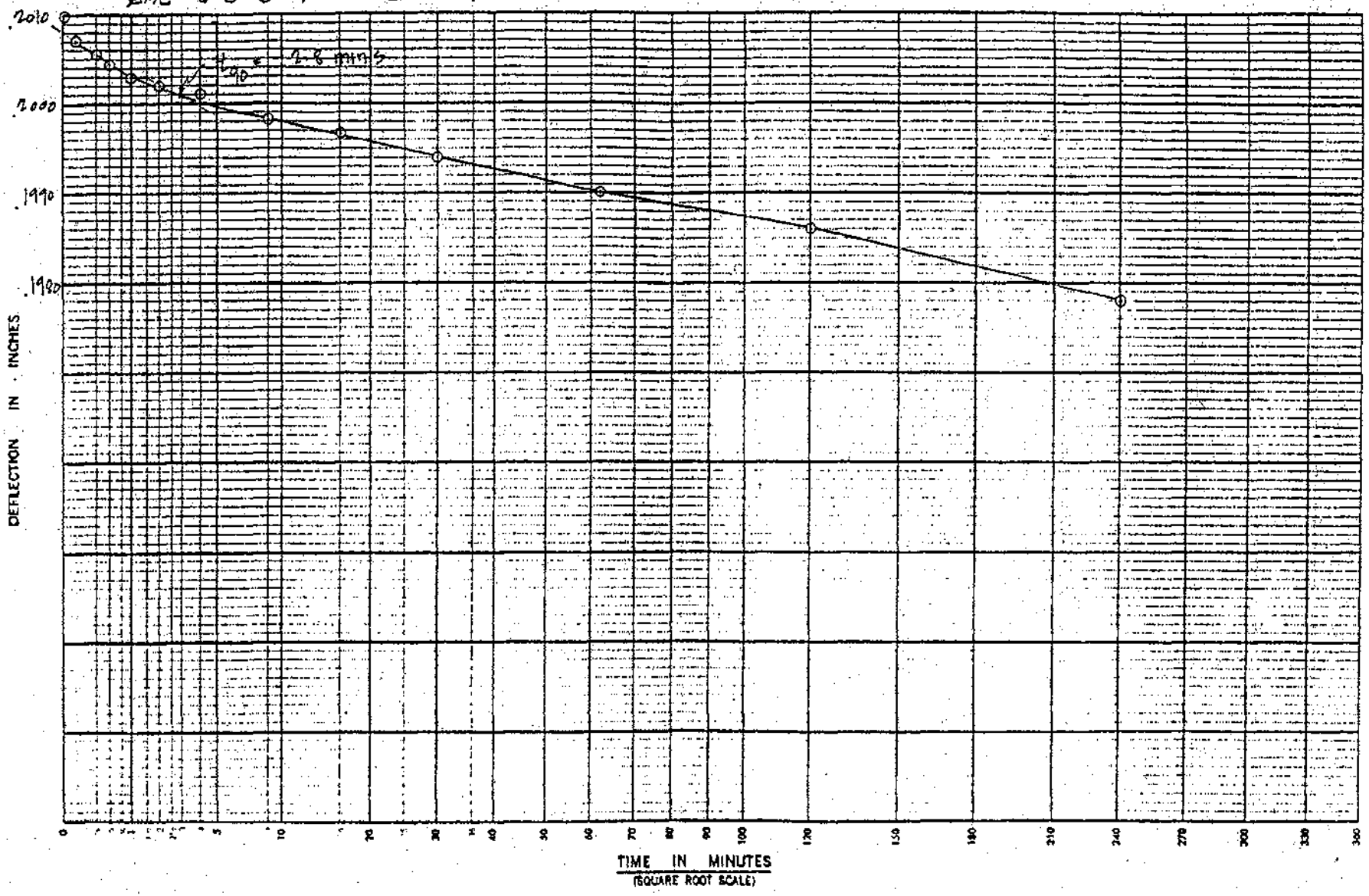


TITLE _____

SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ____ OF ____

BMC 6-B @ 29'-31' @ 200 ~~PSF~~



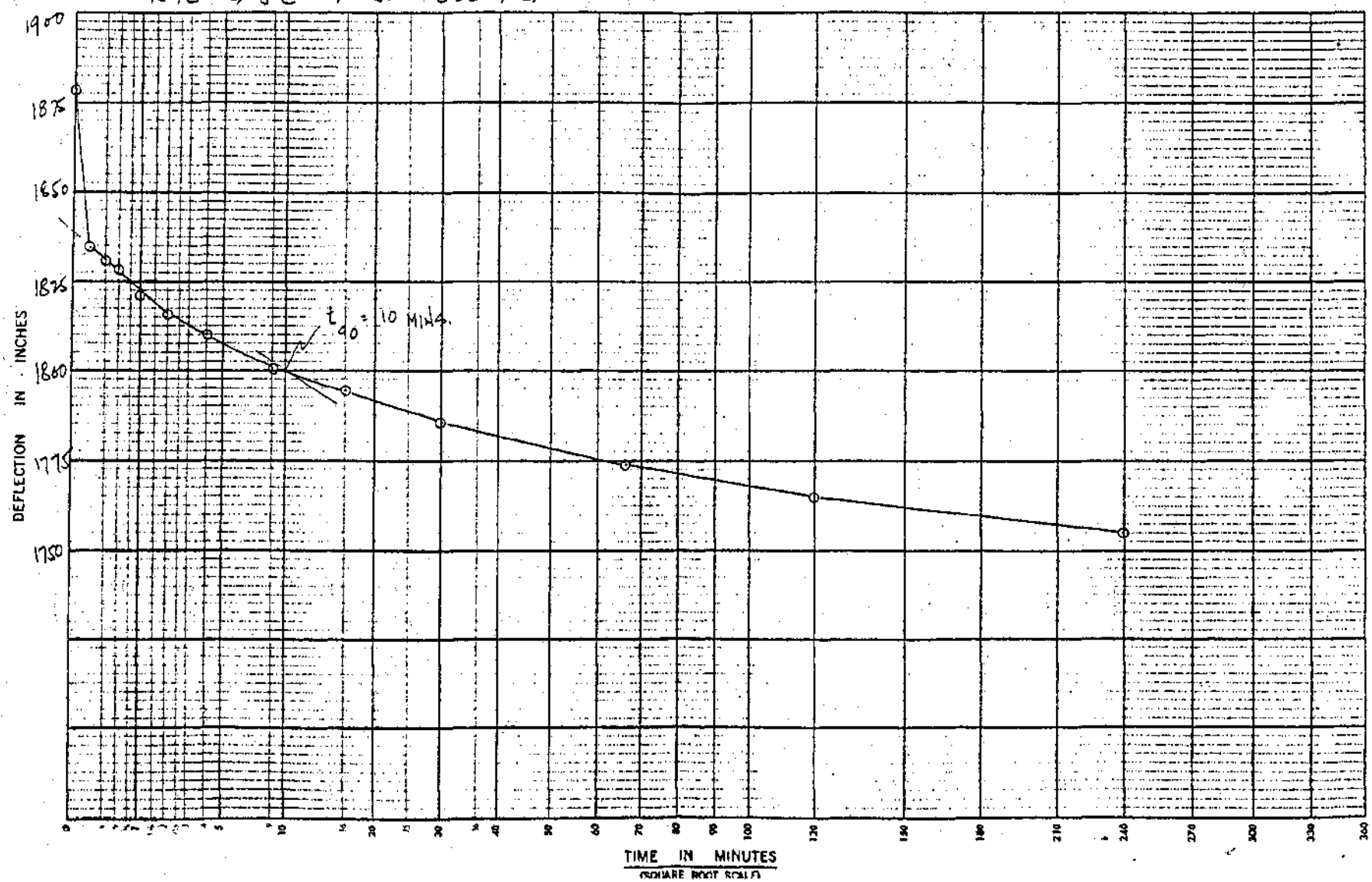
REVISIONS
BY _____ DATE _____
BY _____ DATE _____

BY _____ DATE _____
CHECKED BY _____

FILE

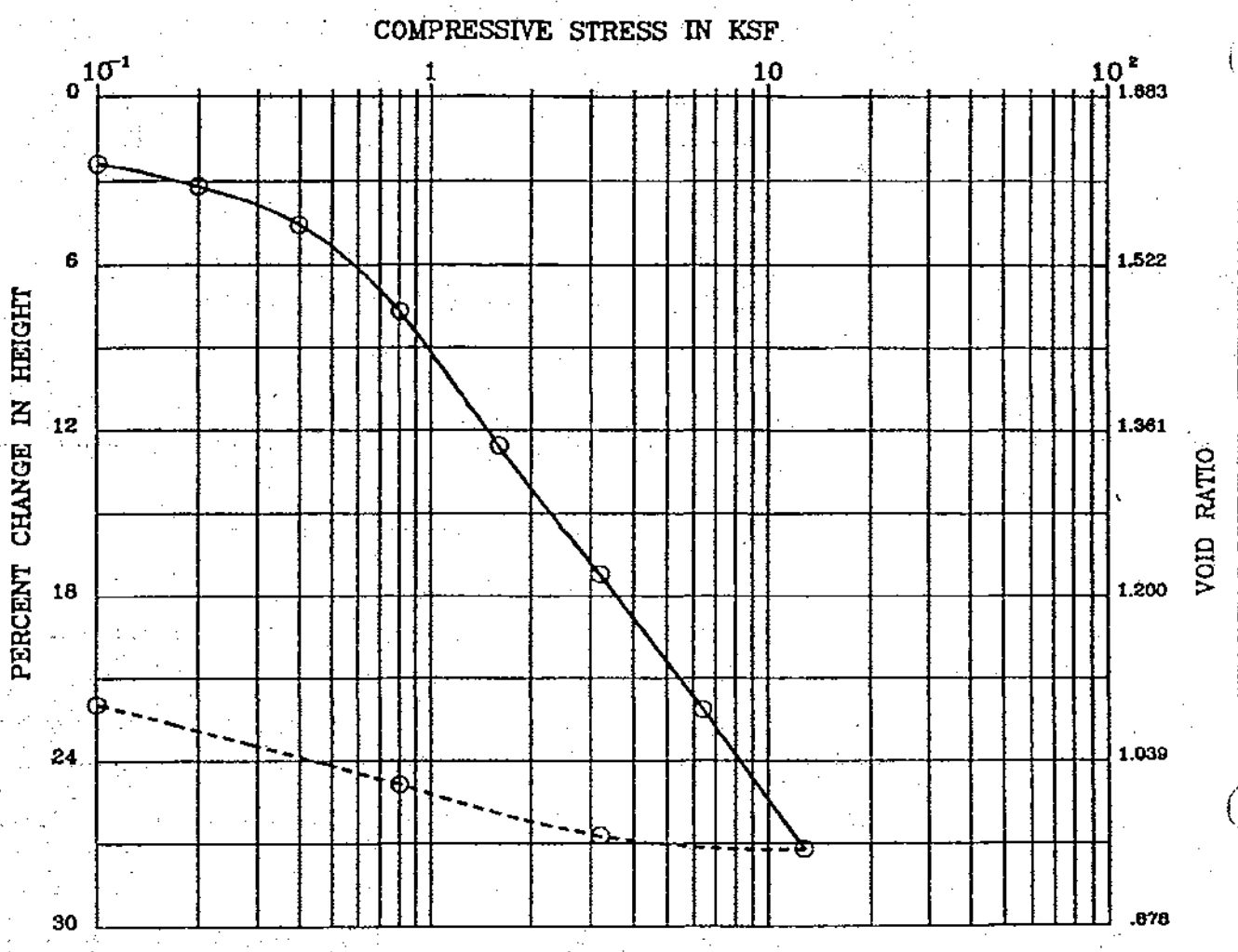
SUBJECT : TIME-SETTLEMENT DATA

SHEET ___ OF ___



REVISIONS
BY ___ DATE ___
BY ___ DATE ___

BY ___ DATE ___
CHECKED BY ___



BORING : G – 9
DEPTH (ft) : 20–22
SPEC. GRAVITY : 2.70

DESCRIPTION : Gray silty CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	61.5	62.9	99	1.683
FINAL	39.7	80.6	98	1.093

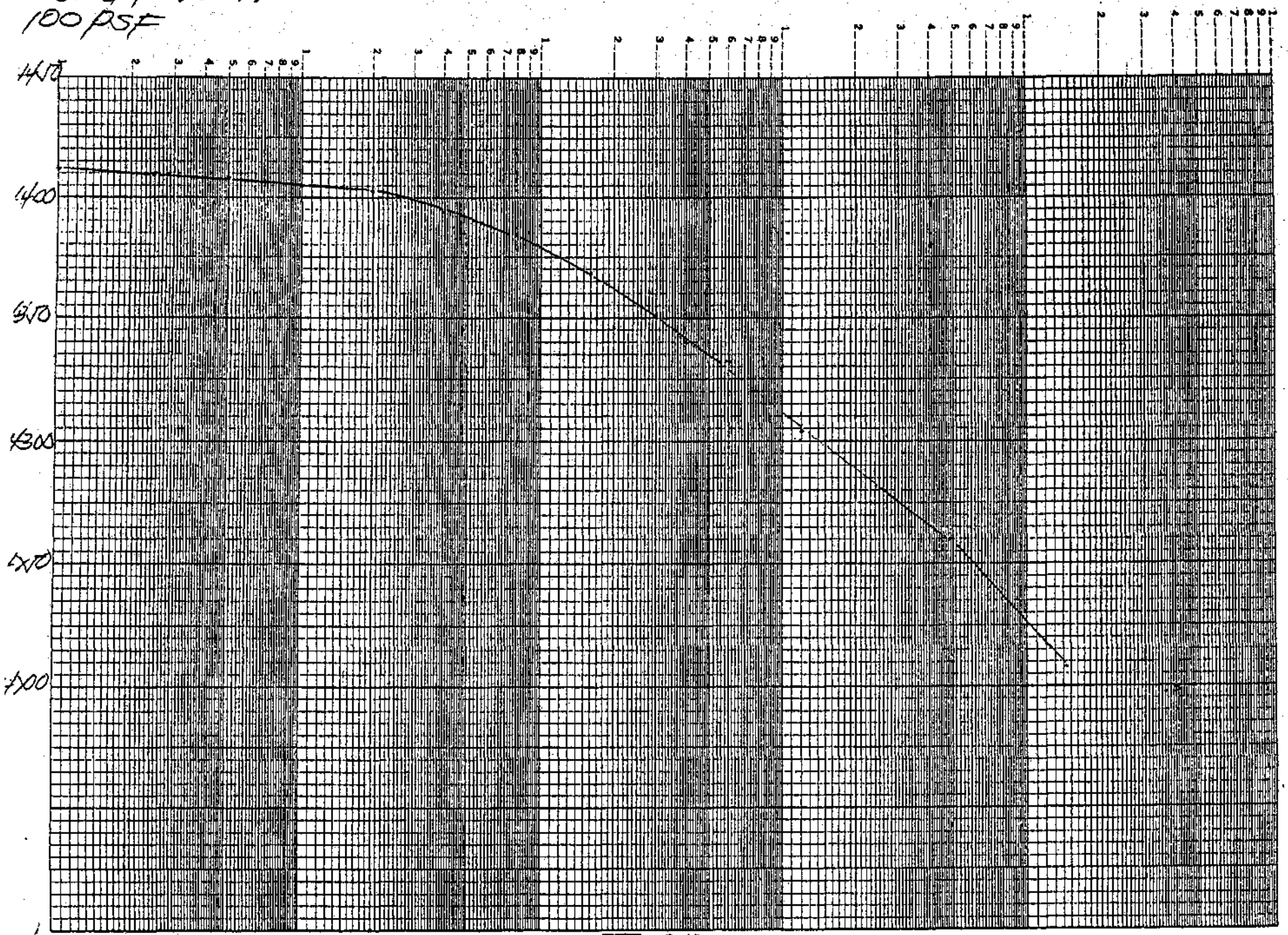
Remark : INUNDATED AT 0.4 KSF

Project No.:1546–2	BMC – BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:

BMC G9 20->>'
100 PSF

K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

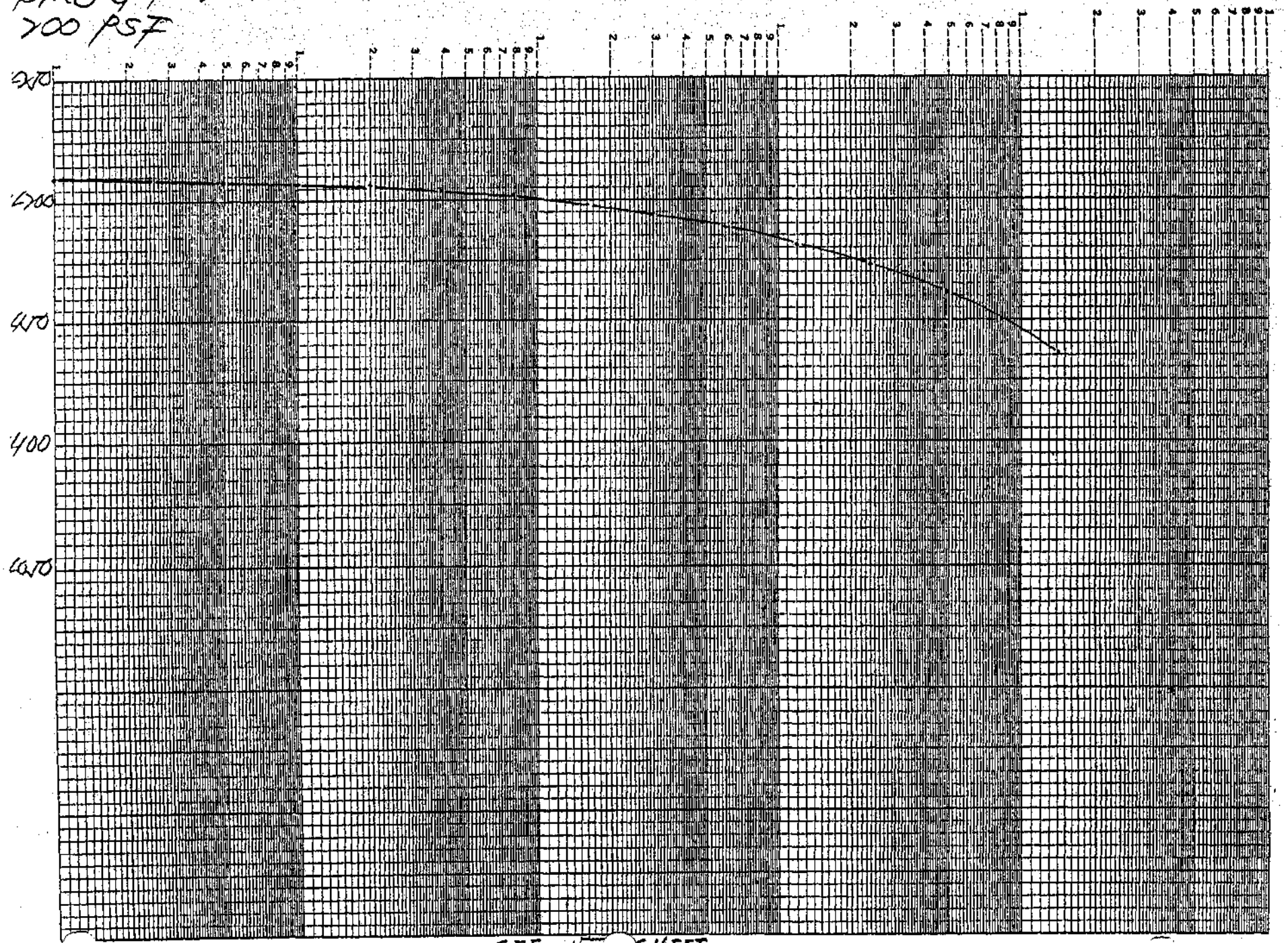


SEE 1 SHEET

BMC 97 >0->> 200 PSF

K&E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

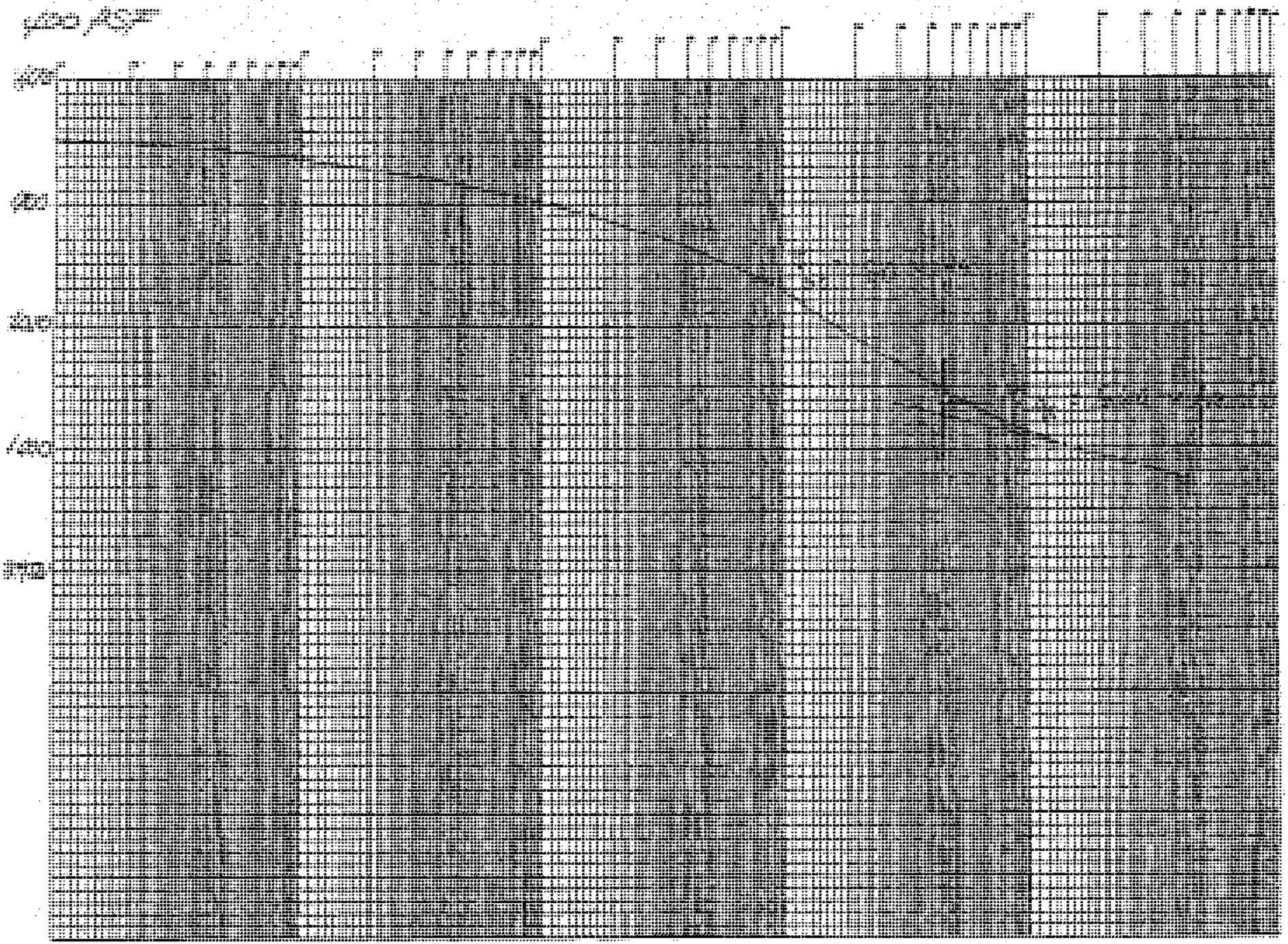


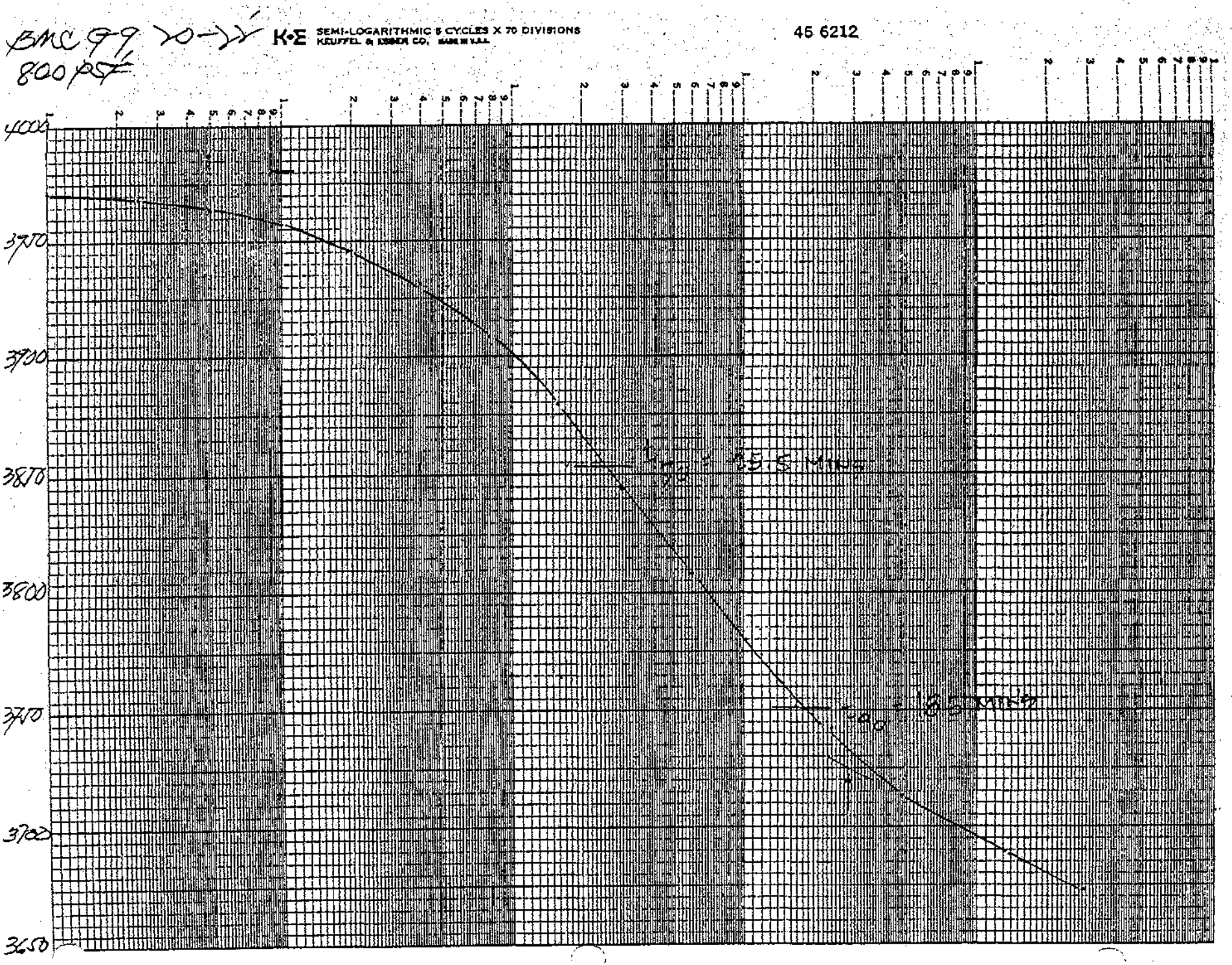
SEE V+ SHEET

BHC G9 >0->>

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

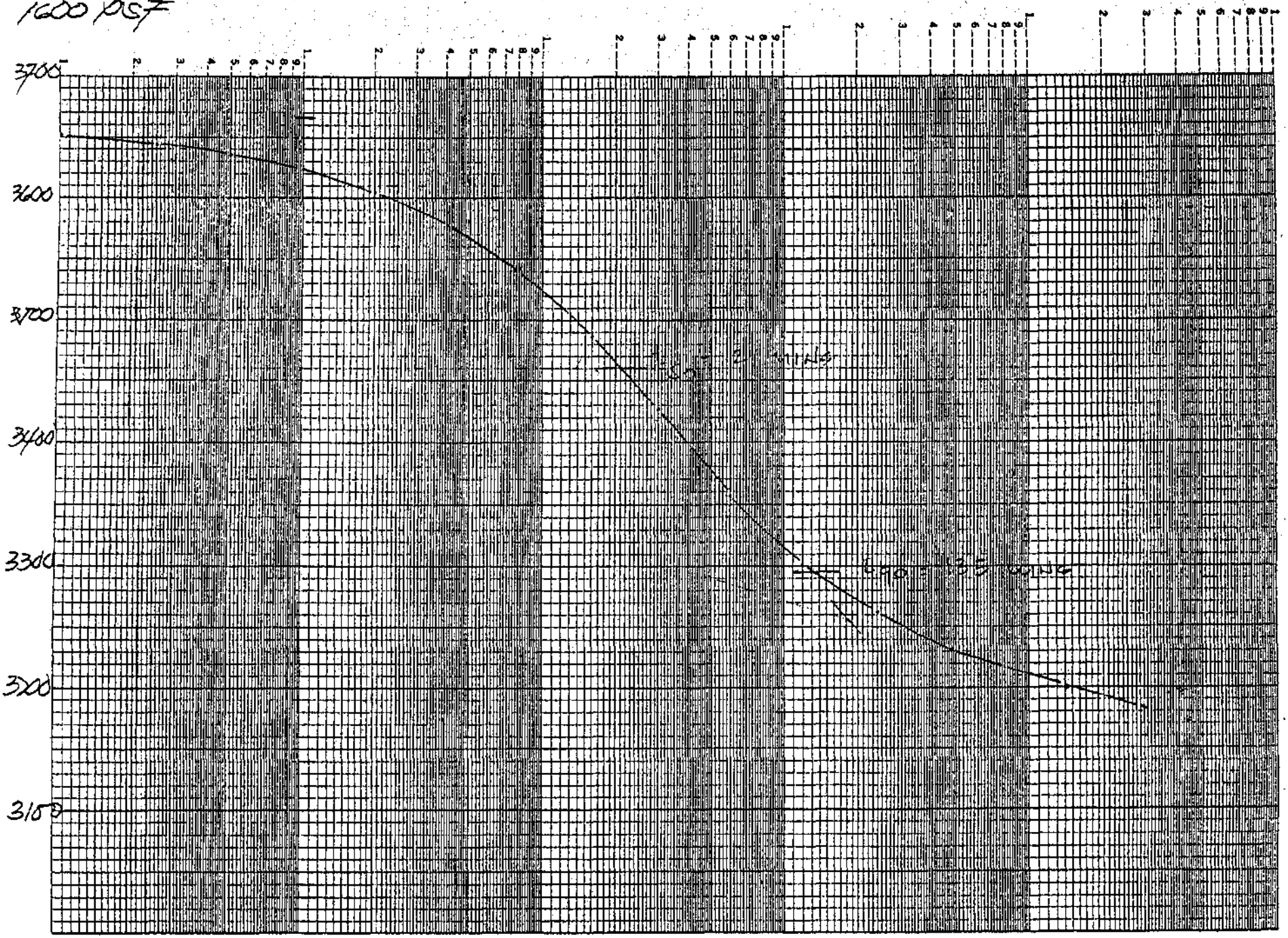


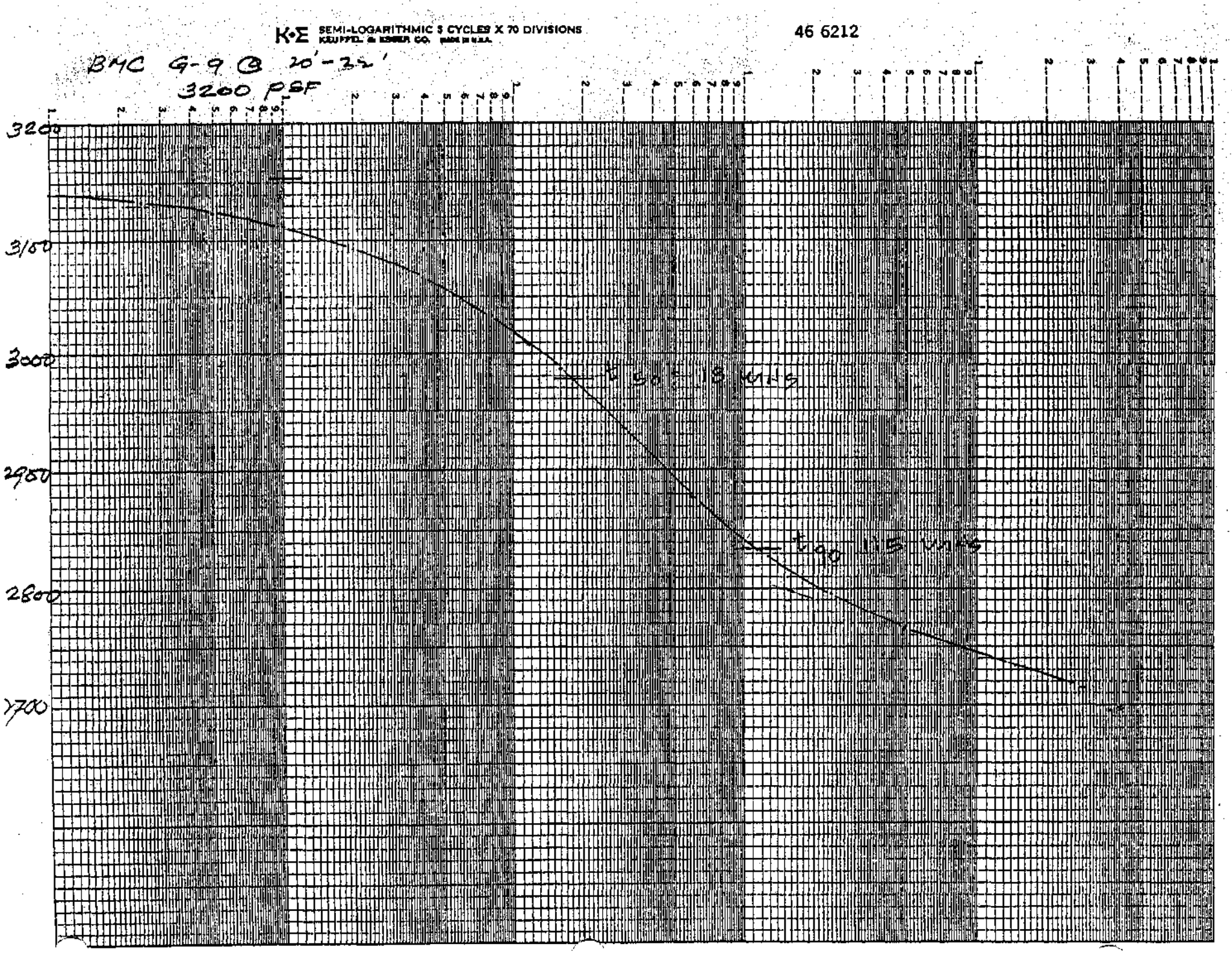

BMC 99 20-22
800 psi
K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
45 6212
4000
3900
3800
3700
3600
3500
$t_{100} = 25.5$ Min
$t_{90} = 18.5$ Min

BMC GG 20->>
1600 PSF

K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

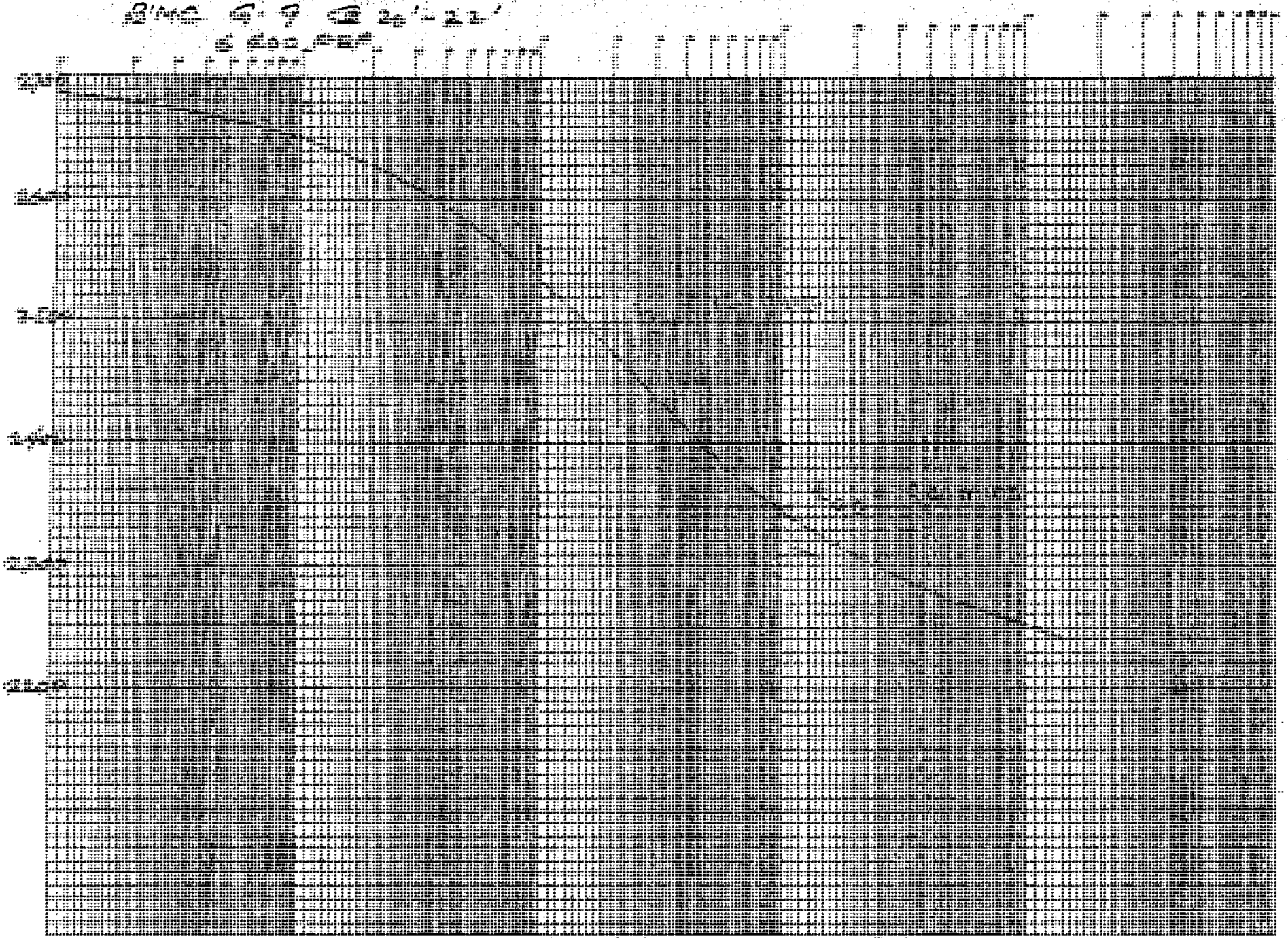
46 6212

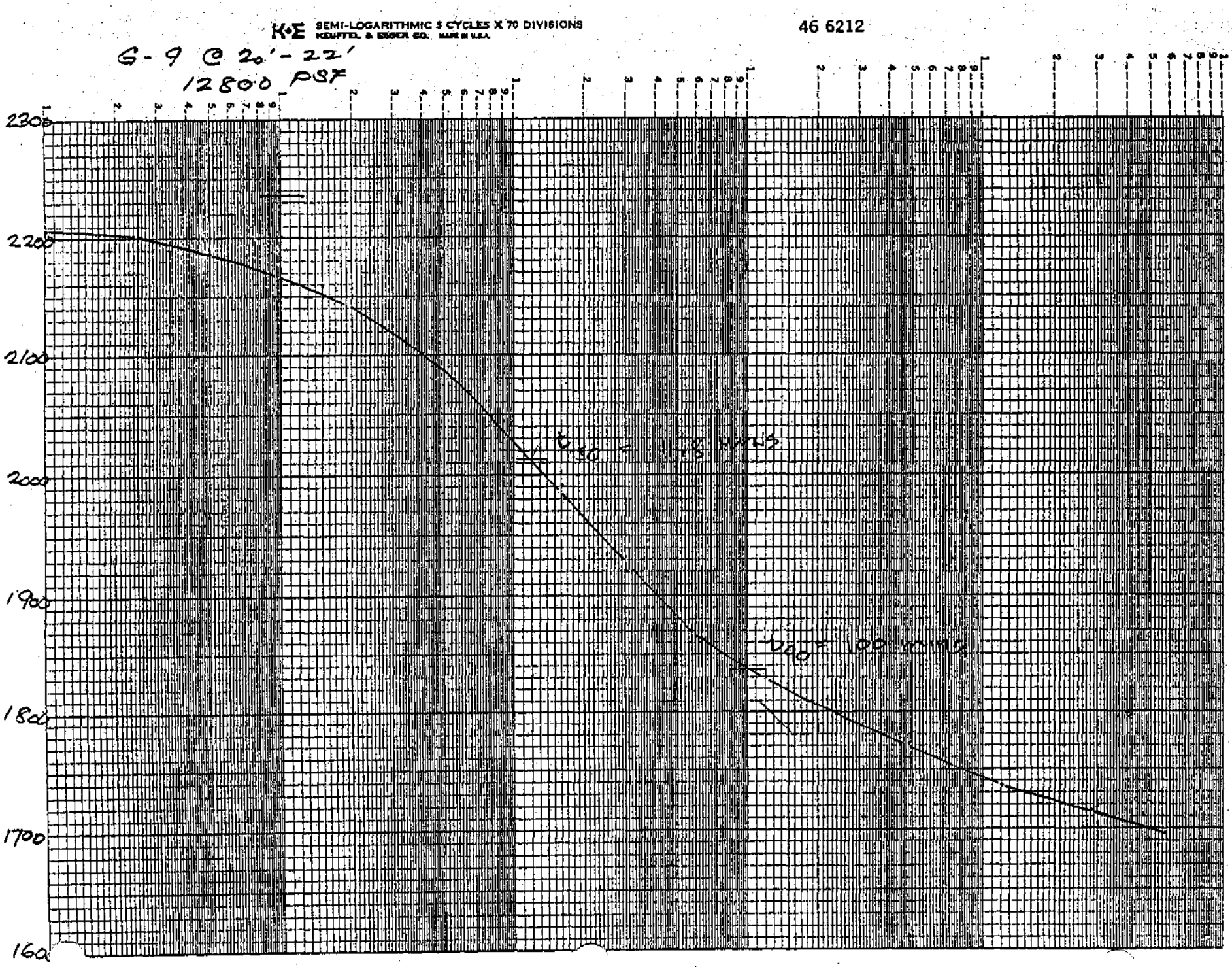



K·E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
46 6212
B4C G-9 @ 20'-32'
3200 PSF
3200
3100
3000
2900
2800
>700
t50 1.8 MIN
t90 11.5 MINS

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212



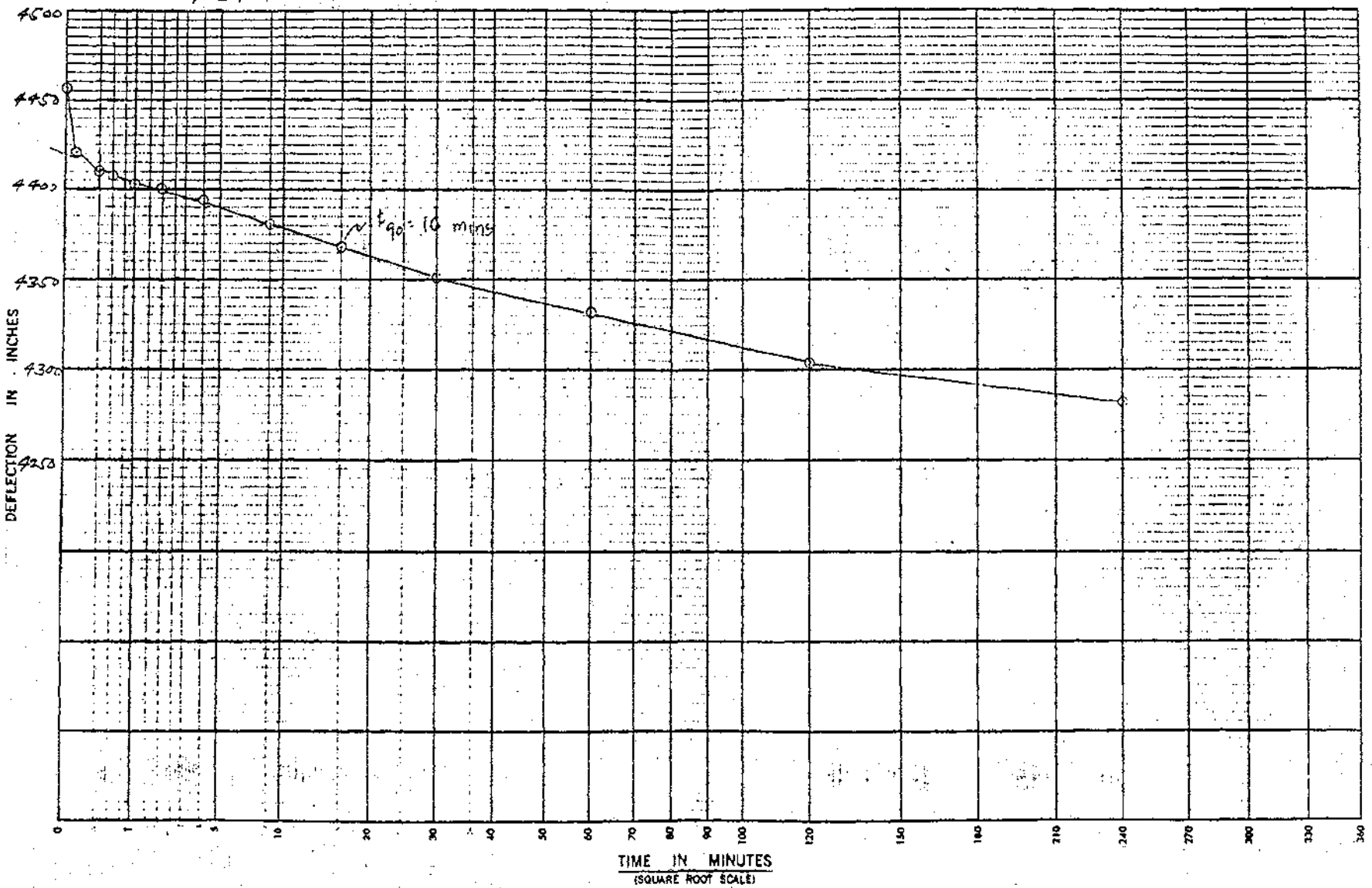

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
G-9 @ 20'-22'
12800 PSF
2300
2200
2100
2000
1900
1800
1700
1600
t_{50} = 11.8 MINS
t_{90} = 100 MINS

FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ___ OF ___

G-9 @ 20' - 22'
100 PSF



REVISIONS
BY _____ DATE _____
BY _____ DATE _____

BY _____ DATE _____
CHECKED BY _____

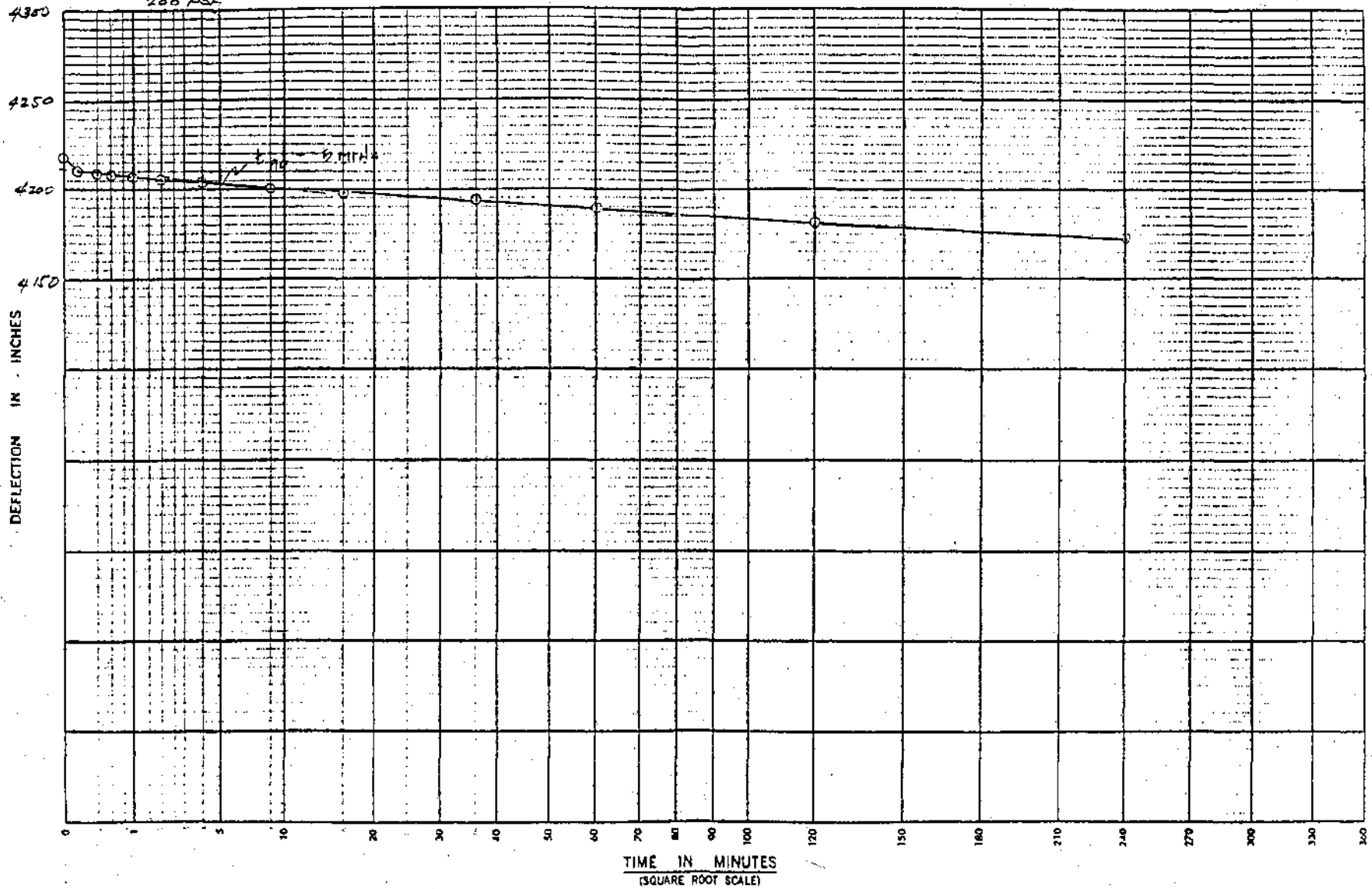
FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ____ OF ____

G-9 @ 20'-22'

200 PSF



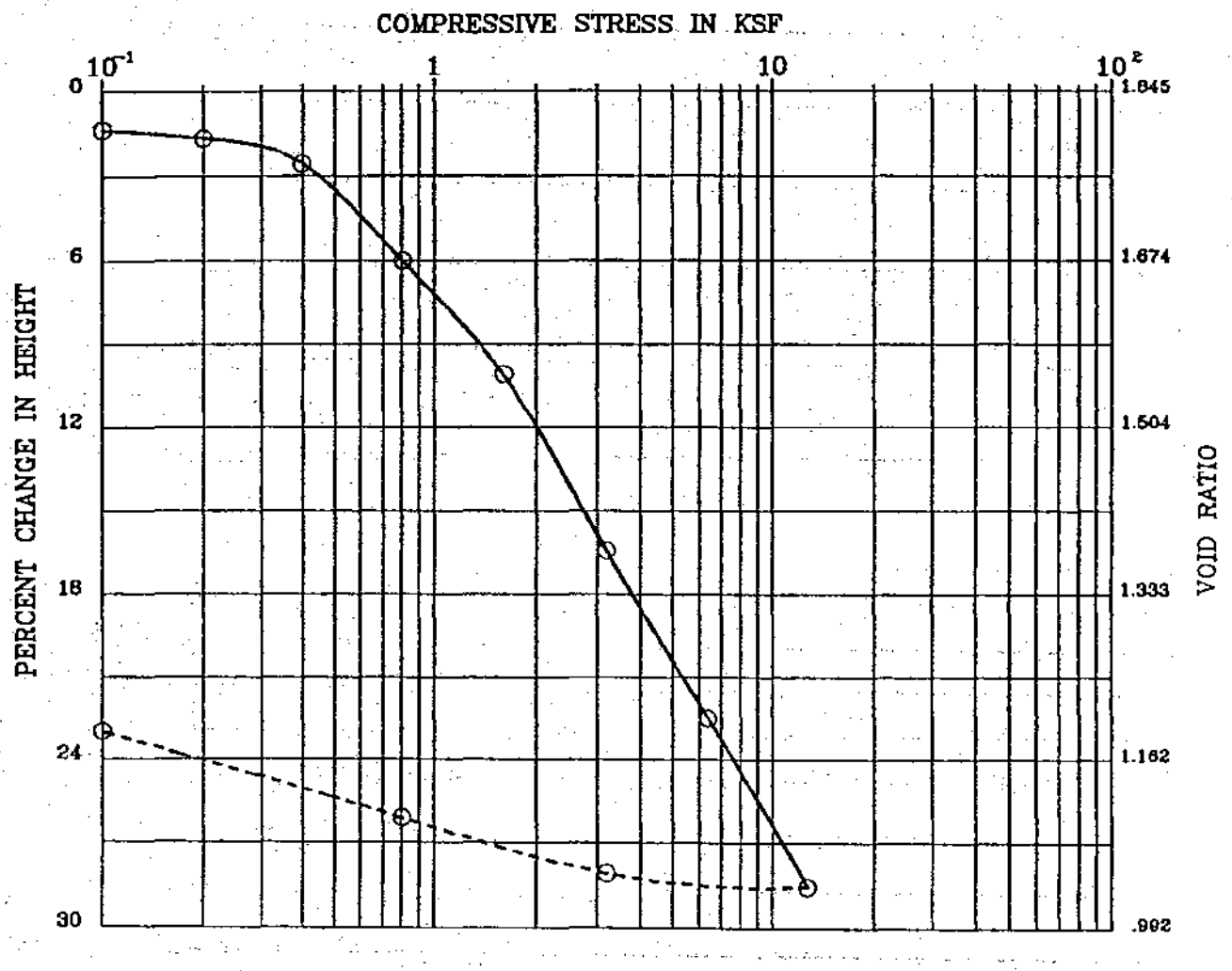
REVISIONS

BY _____ DATE _____

BY _____ DATE _____

BY _____ DATE _____

CHECKED BY _____



BORING : G – 10
DEPTH (ft) : 20-22
SPEC. GRAVITY : 2.80

DESCRIPTION : Gray silty CLAY
LIQUID LIMIT :
PLASTIC LIMIT :

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	65.9	61.5	100	1.845
FINAL	42.4	79.9	100	1.191

Remark : INUNDATED AT 0.4 KSF

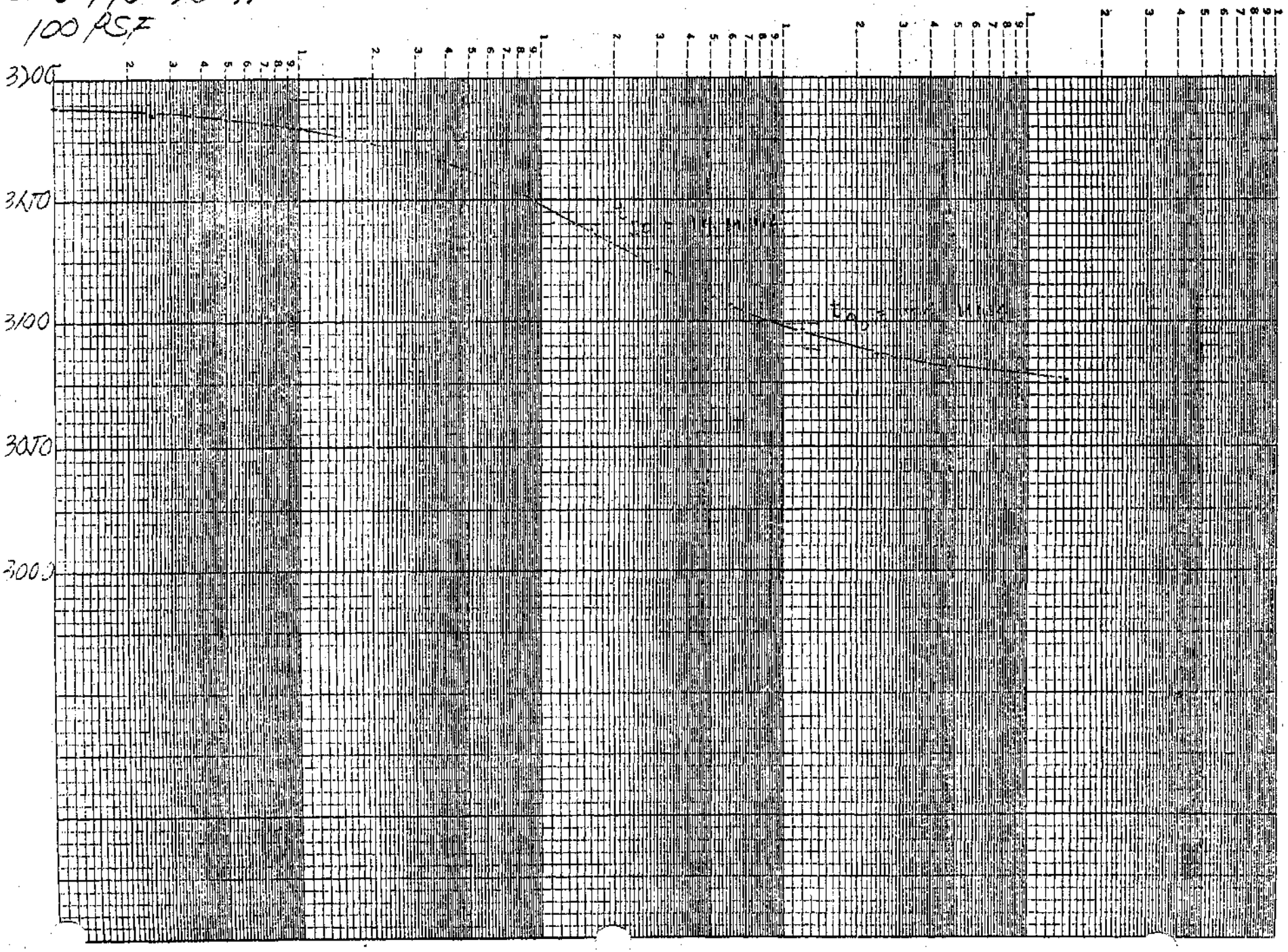
Project No.:1546-2	BMC – BRISBANE LANDFILL
SMITH EMERY	CONSOLIDATION TEST Plate No.:

BMC 9/10 20-11

100 PSI

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

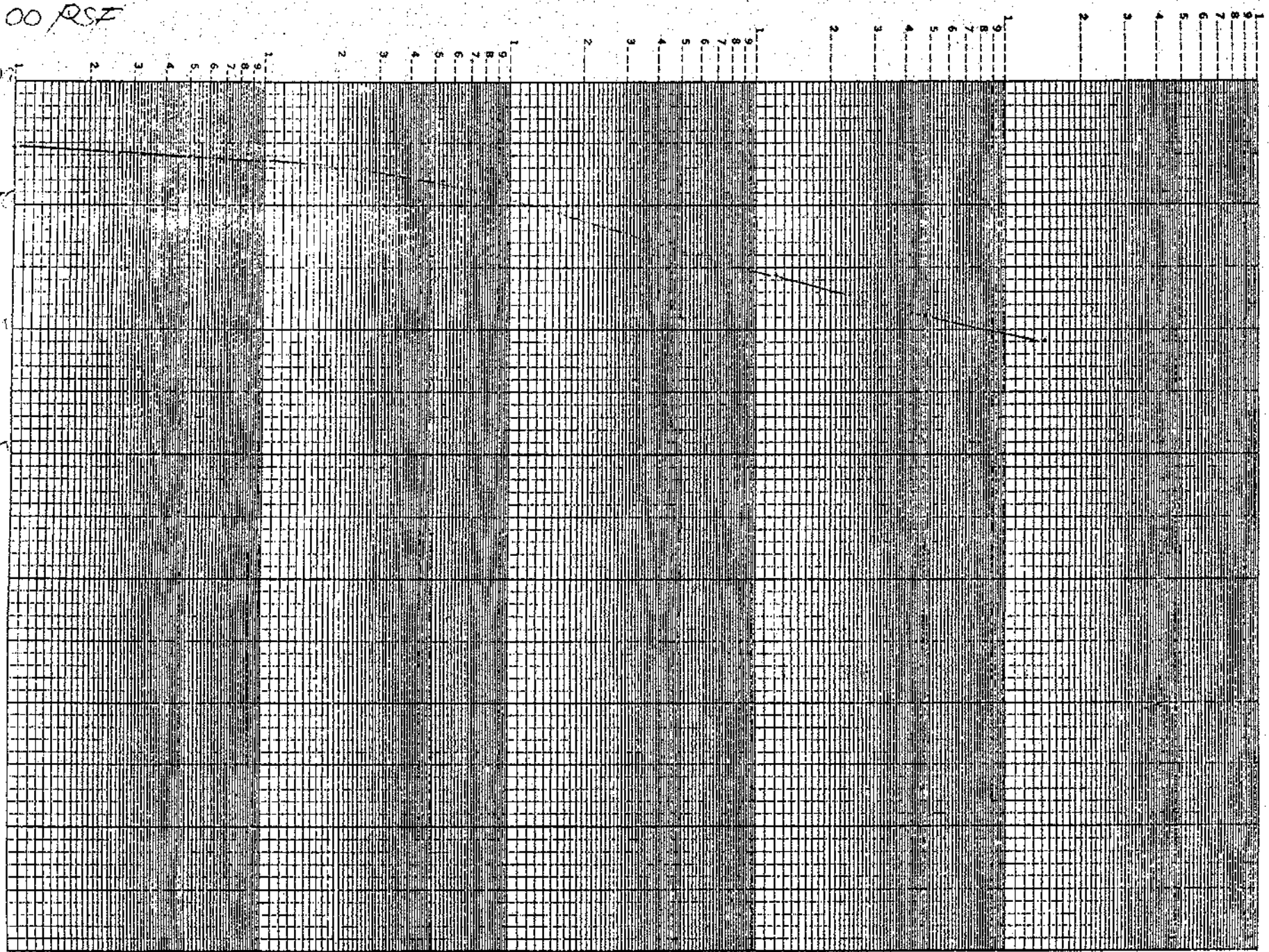


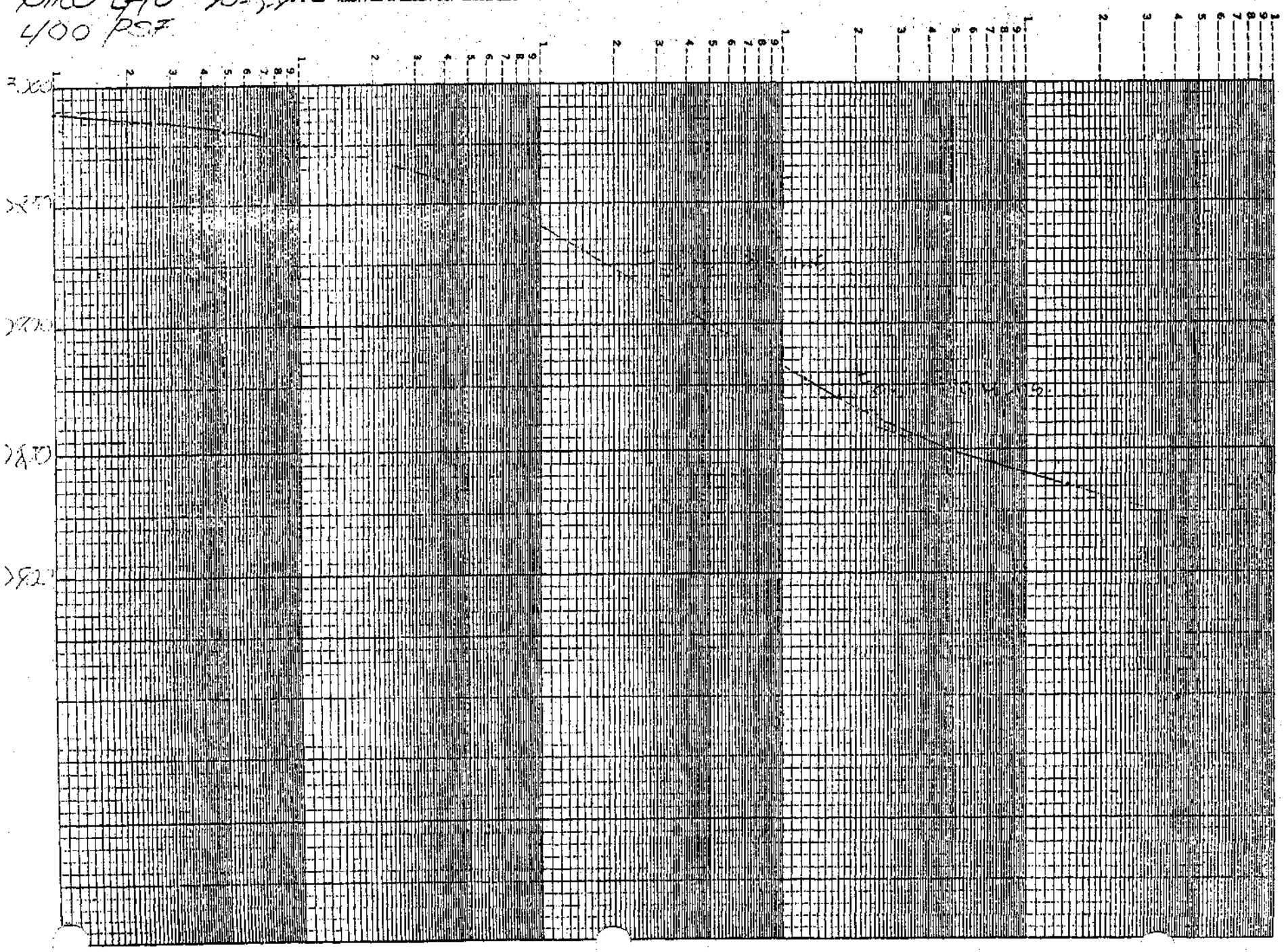
BMC G10 >0-2>

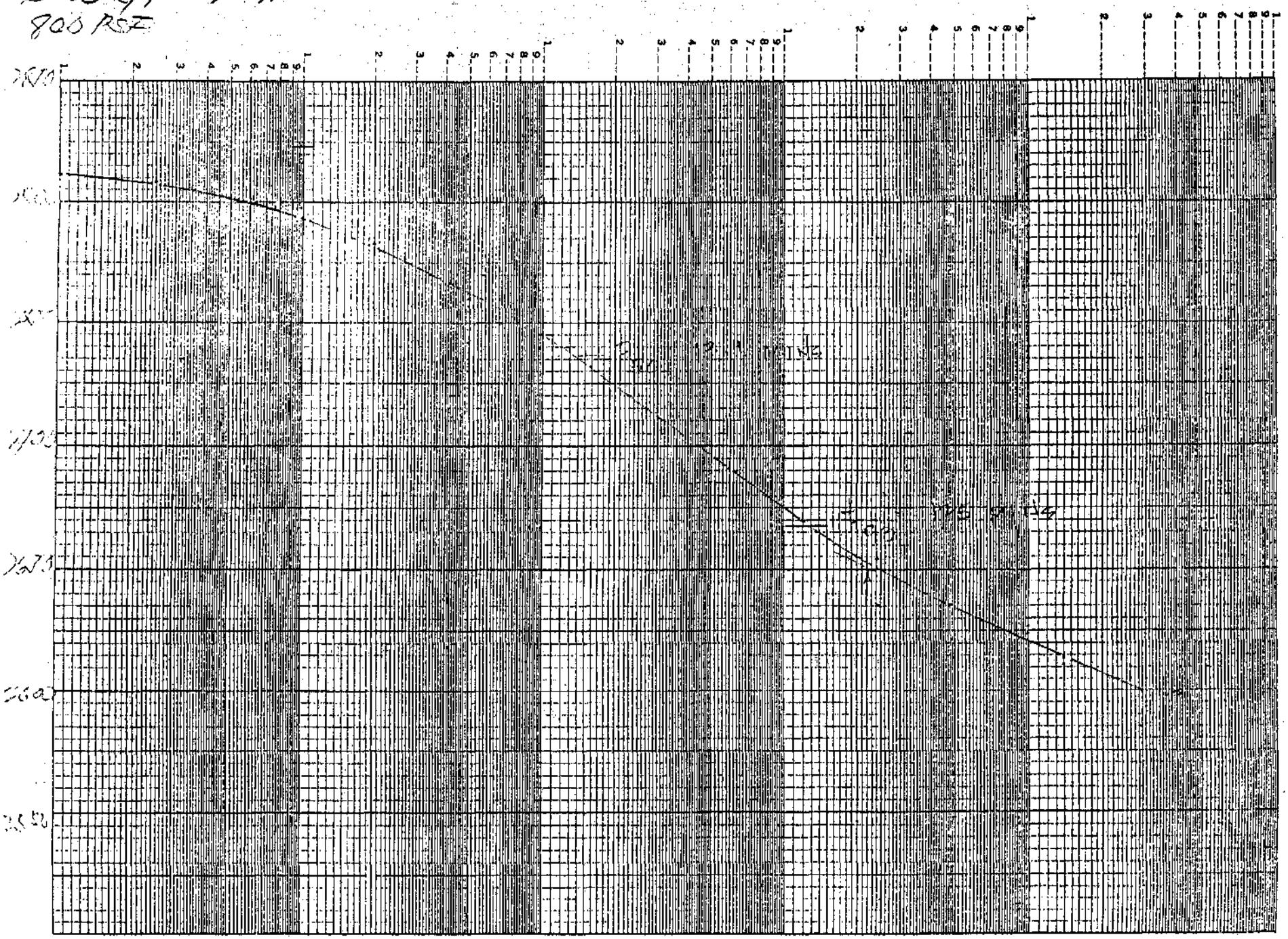
>00 RSF

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

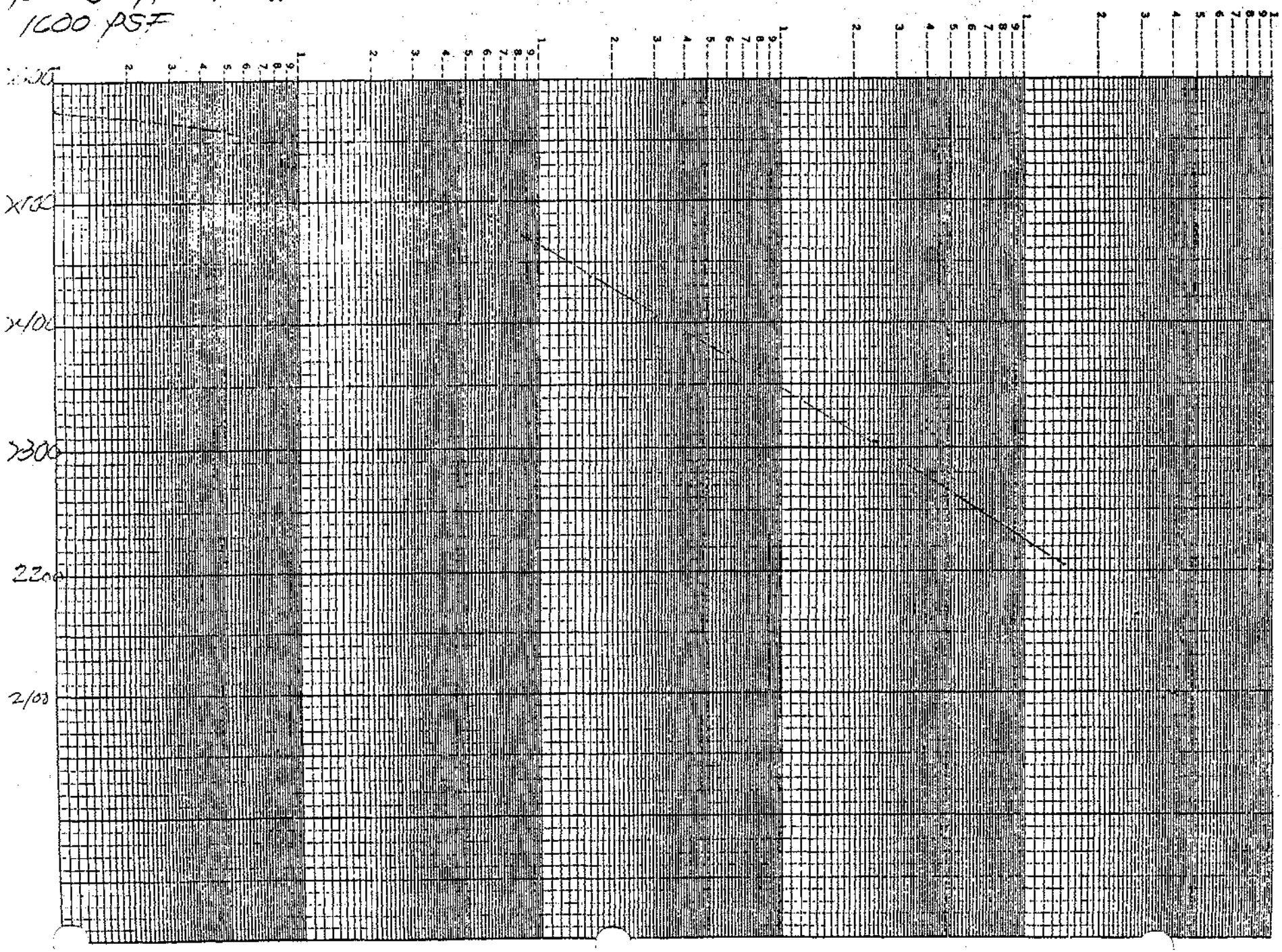


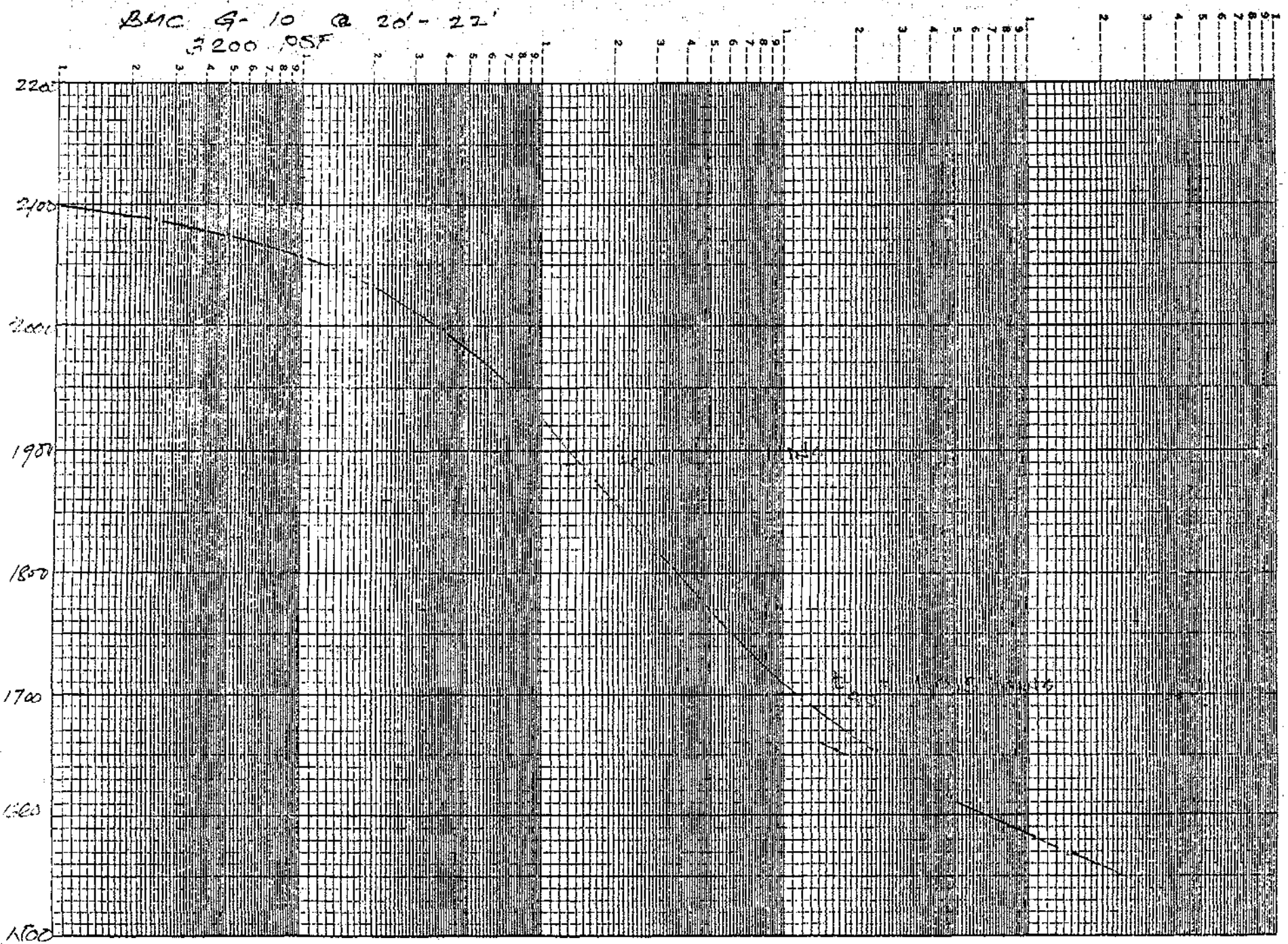

BMCU G10
400 psf
K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
46 6212


BMC G/O
800 RSE
K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212

BMC G10 X-X K&E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS KEUFFEL & ESSER CO. MADE IN U.S.A. 46 6212

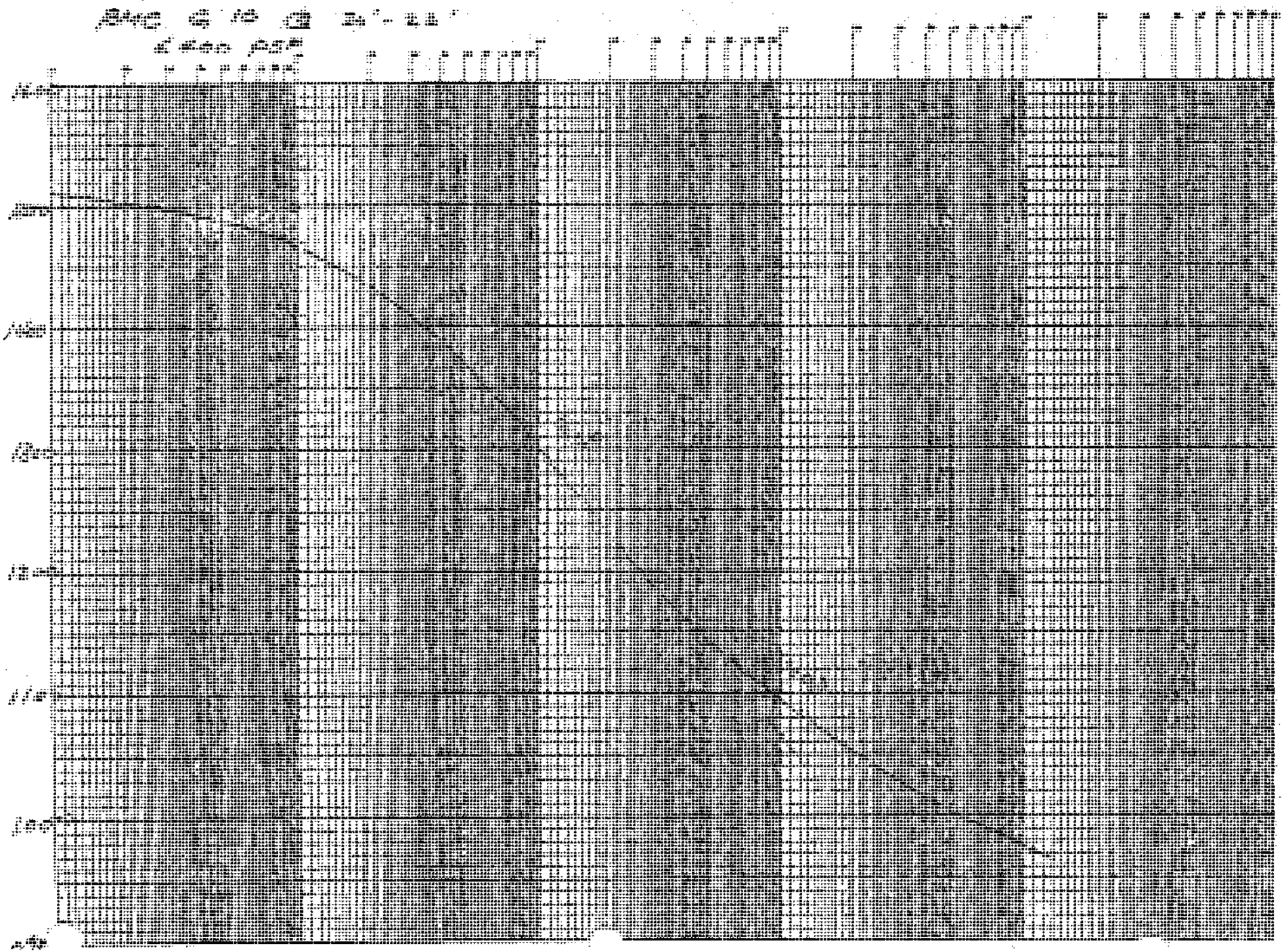
1000 PSF




K•E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
BMC G-10 @ 20'-22'
5200 PSF
2200
2100
2000
1900
1800
1700
1600
1500

K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 6212

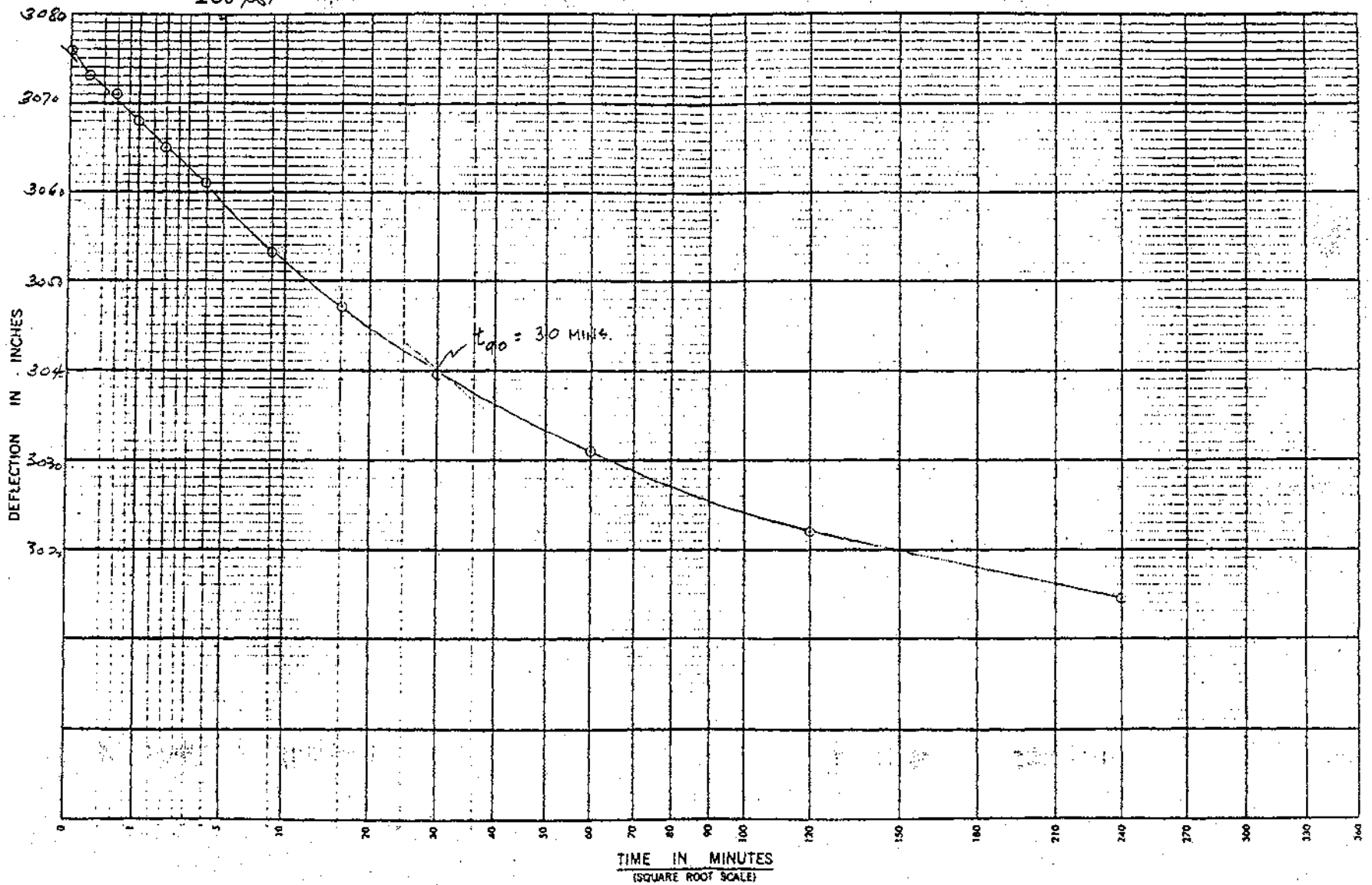


FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

_____ SHEET ____ OF ____

BMC @ 10 @ 20'-22'
200 psf



REVISIONS
BY _____ DATE _____
BY _____ DATE _____

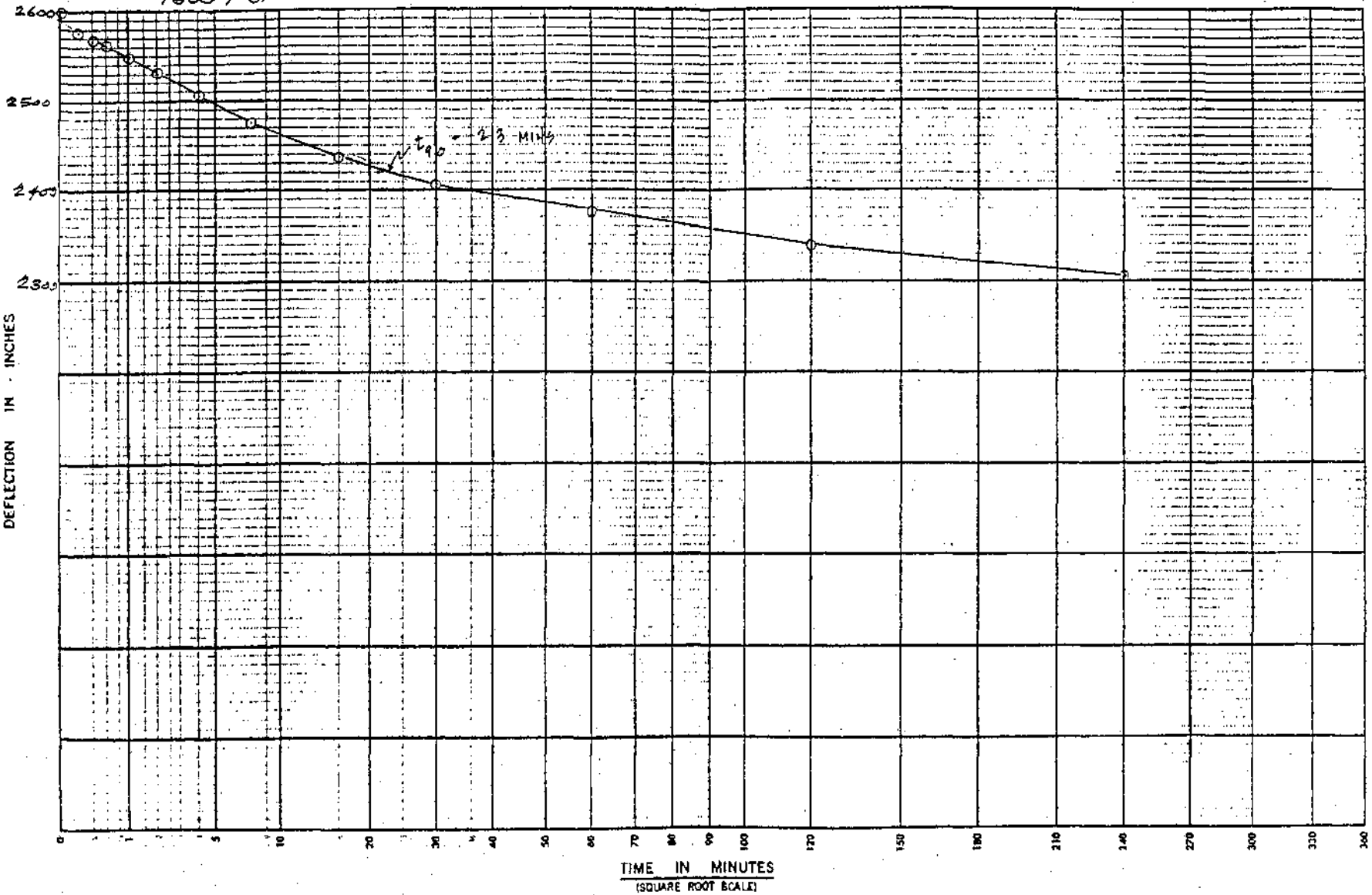
BY _____ DATE _____
CHECKED BY _____

FILE _____

SUBJECT : TIME-SETTLEMENT DATA _____

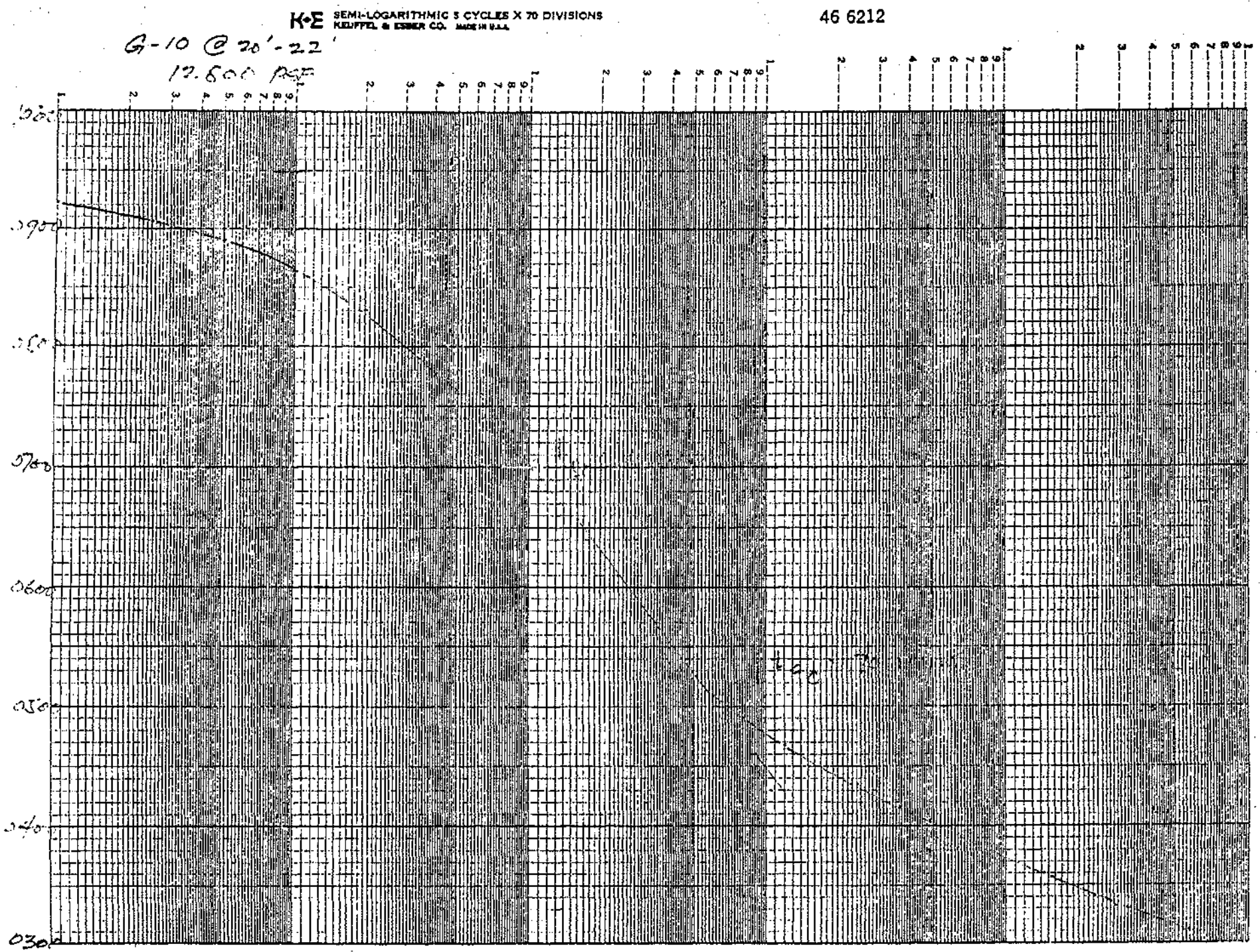
_____ SHEET ____ OF ____

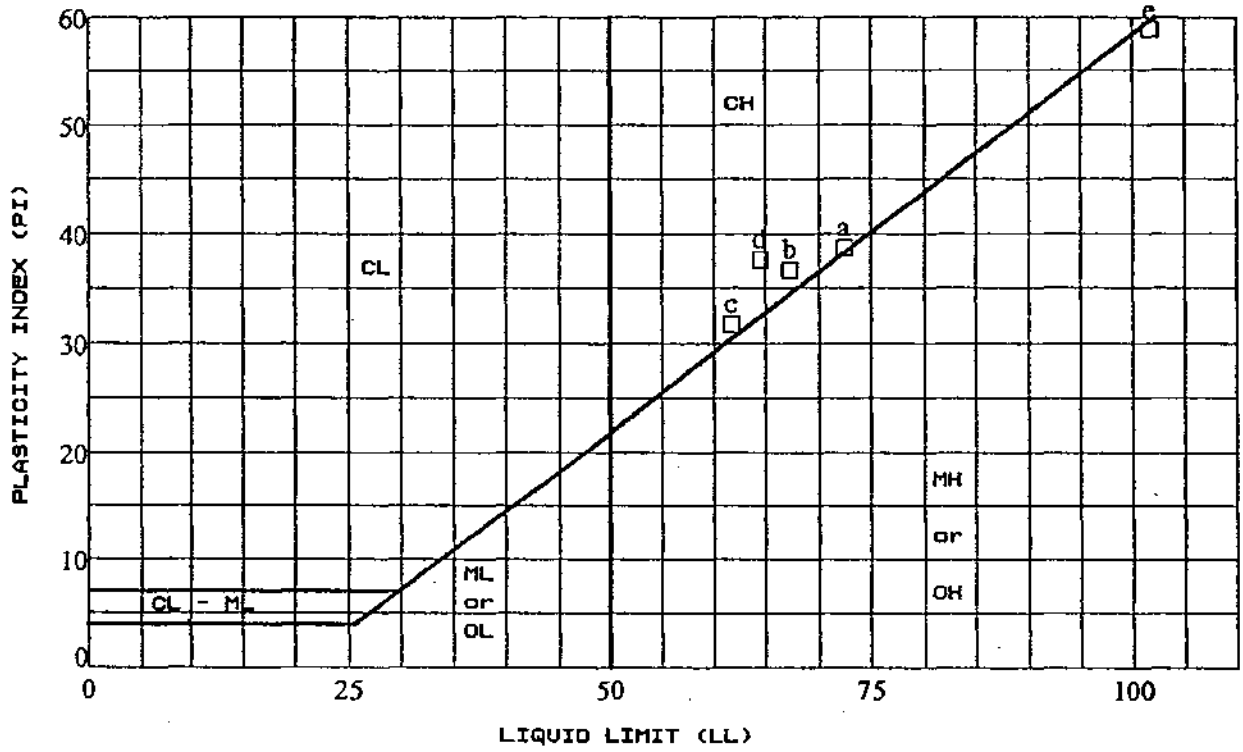
BMC A-10 @ 20'-22'
1600 PSF



REVISIONS
BY _____ DATE _____
BY _____ DATE _____

BY _____ DATE _____
CHECKED BY _____


K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 6212
G-10 @ 20'-22'
12.600 AGE



Symbol	Boring	Depth	LL	PL	PI	Sample Description
a	B-3	20.00	72	34	39	Dark blue-grey SILTY CLAY (CH) - BAY MUD
b	B-5	40.00	67	31	37	Medium grey SILTY CLAY (CH) - BAY MUD
c	B-7	45.00	62	30	32	Medium blue-grey SILTY CLAY (CH) - BAY MUD
d	B-7	55.00	65	27	38	Dark grey CLAYEY SAND (SC) - BAY MUD
e	B-8	60.00	102	43	59	Dark blue-grey CLAYEY SILT (MH-CH) - BAY MUD

Unified Soil Classification

Fine Grained Soil Groups

Symbol	LL < 50	Symbol	LL > 50
ML	Inorganic clayey silts to very fine sands of slight plasticity	MH	Inorganic silts and clayey silts
CL	Inorganic clays of low to medium plasticity	CH	Inorganic clays of high plasticity
OL	Organic silts and organic silty clays of low plasticity	OH	Organic clays of medium to high plasticity, organic silts

KLEINFELDER

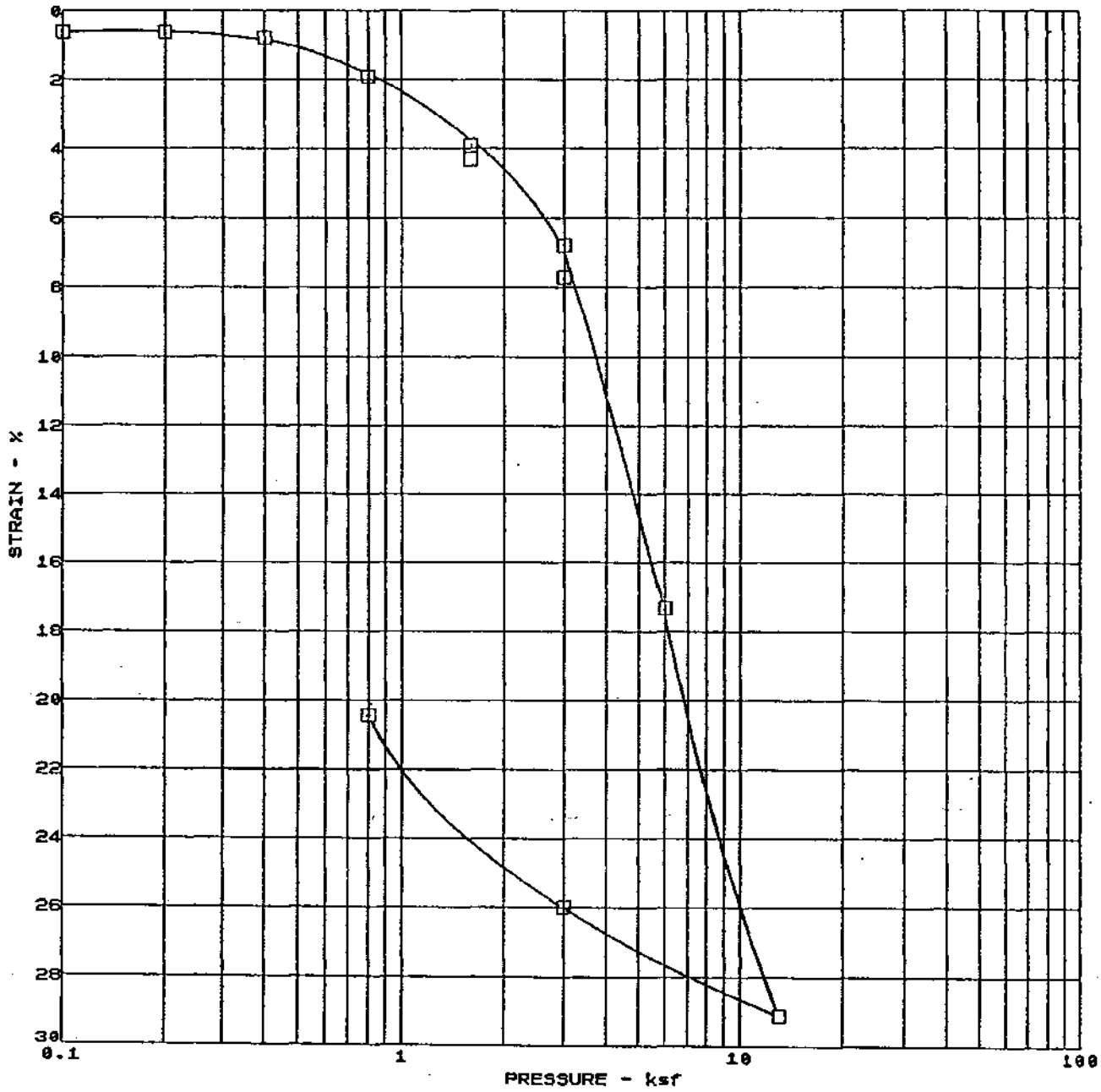
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

PLASTICITY CHART

PLATE

C-1



BORING NO. B-8
DEPTH 60.0 ft
DESCRIPTION Dark blue-grey CLAYEY SILT (MH-CH) - BAY MUD
PRECONSOLIDATION PRESSURE ksf
COMPRESSION RATIO= $C_c / 1+e_o$
RECOMPRESSION RATIO= $C_r / 1+e_o$
LL = 102 PL = 43

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	48.5	60.9
WATER CONTENT, %	89.9	68.7
VOID RATIO	2.809	2.034
DEG. OF SAT., %	94.7	100.0
SAMPLE HEIGHT, in.	0.770	0.610

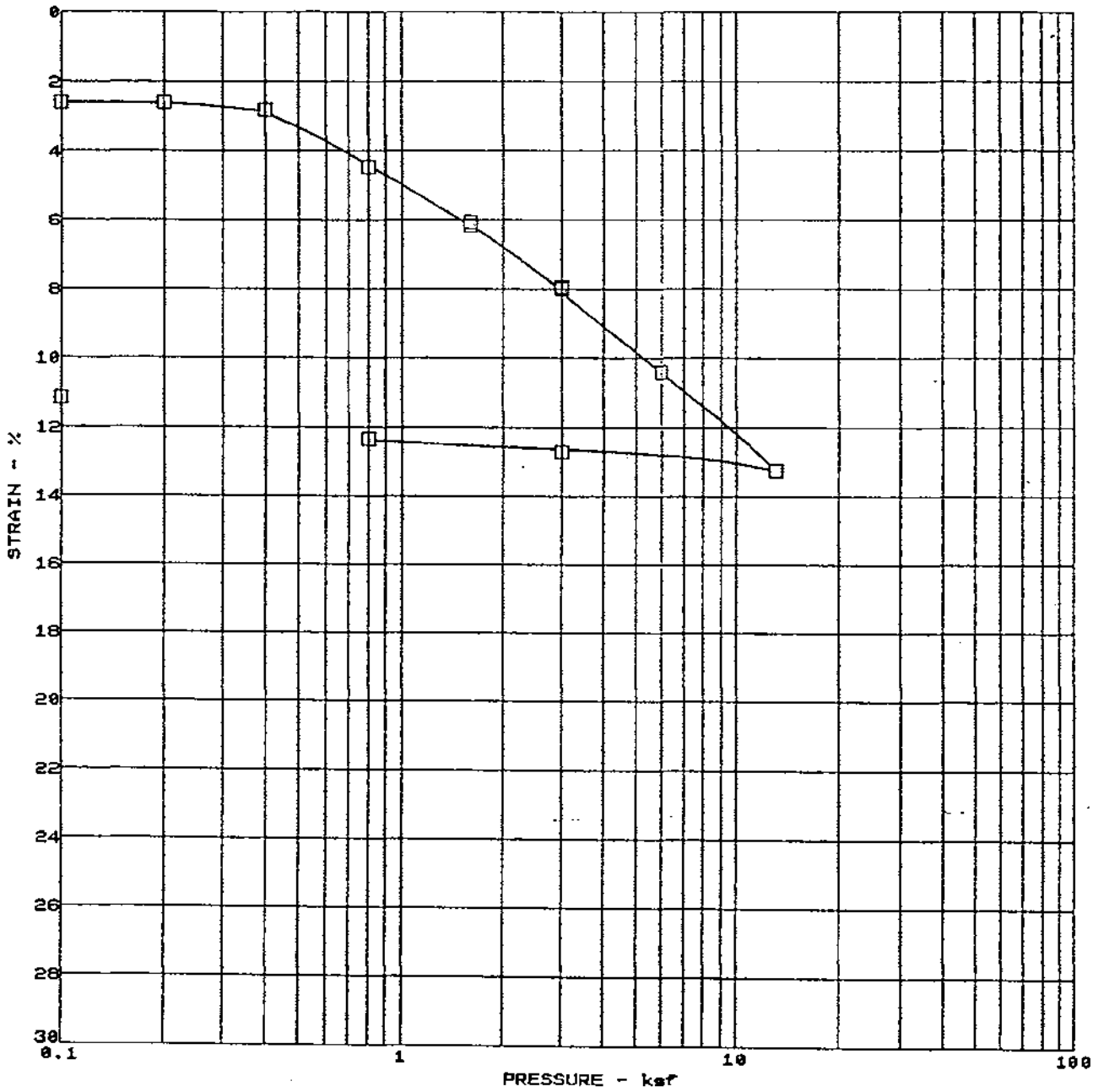
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

CONSOLIDATION TEST

PLATE C-2



BORING NO. B-11

DEPTH 50.0 ft

DESCRIPTION Dark grey SILTY CLAY (CH) - BAY MUD

PRECONSOLIDATION PRESSURE _____ ksf

COMPRESSION RATIO= $C_c / 1+e_0$ _____

RECOMPRESSION RATIO= $C_r / 1+e_0$ _____

LL = _____ PL = _____

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	84.8	95.1
WATER CONTENT, %	33.7	27.2
VOID RATIO	0.966	0.753
DEG. OF SAT., %	93.2	96.5
SAMPLE HEIGHT, in.	0.770	0.684

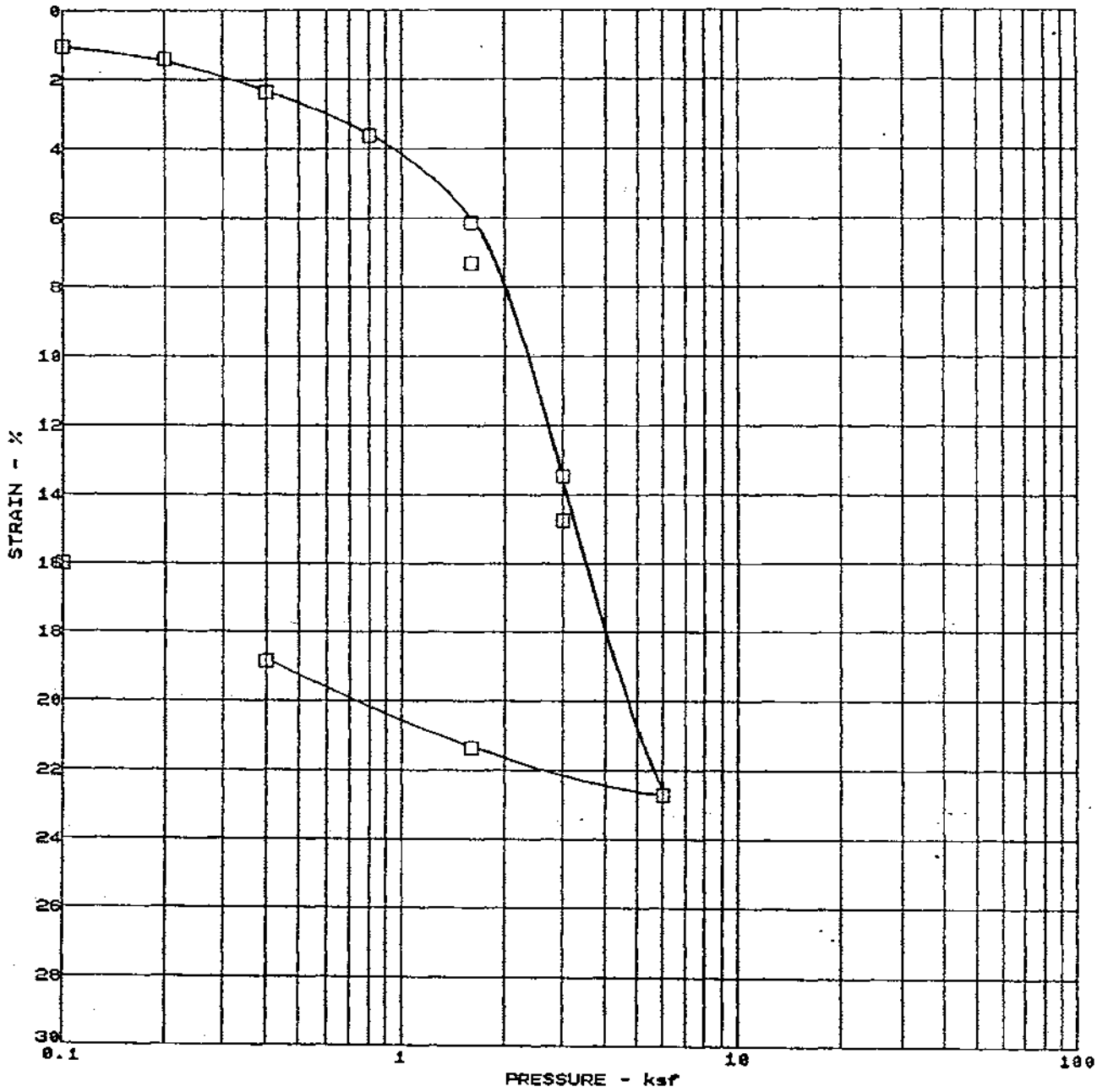
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

CONSOLIDATION TEST

PLATE C-3



BORING NO. B-12
DEPTH 20.0 ft
DESCRIPTION Dark grey SILTY CLAY (CH) - BAY MUD
PRECONSOLIDATION PRESSURE _____ ksf
COMPRESSION RATIO= $C_c / 1+e_0$ _____
RECOMPRESSION RATIO= $C_r / 1+e_0$ _____
LL = _____ PL = _____

	INITIAL	FINAL
DRY DENSITY, lb/ft^3	51.9	61.4
WATER CONTENT, %	82.5	66.3
VOID RATIO	2.398	1.872
DEG. OF SAT., %	97.2	100.0
SAMPLE HEIGHT, in.	0.750	0.630

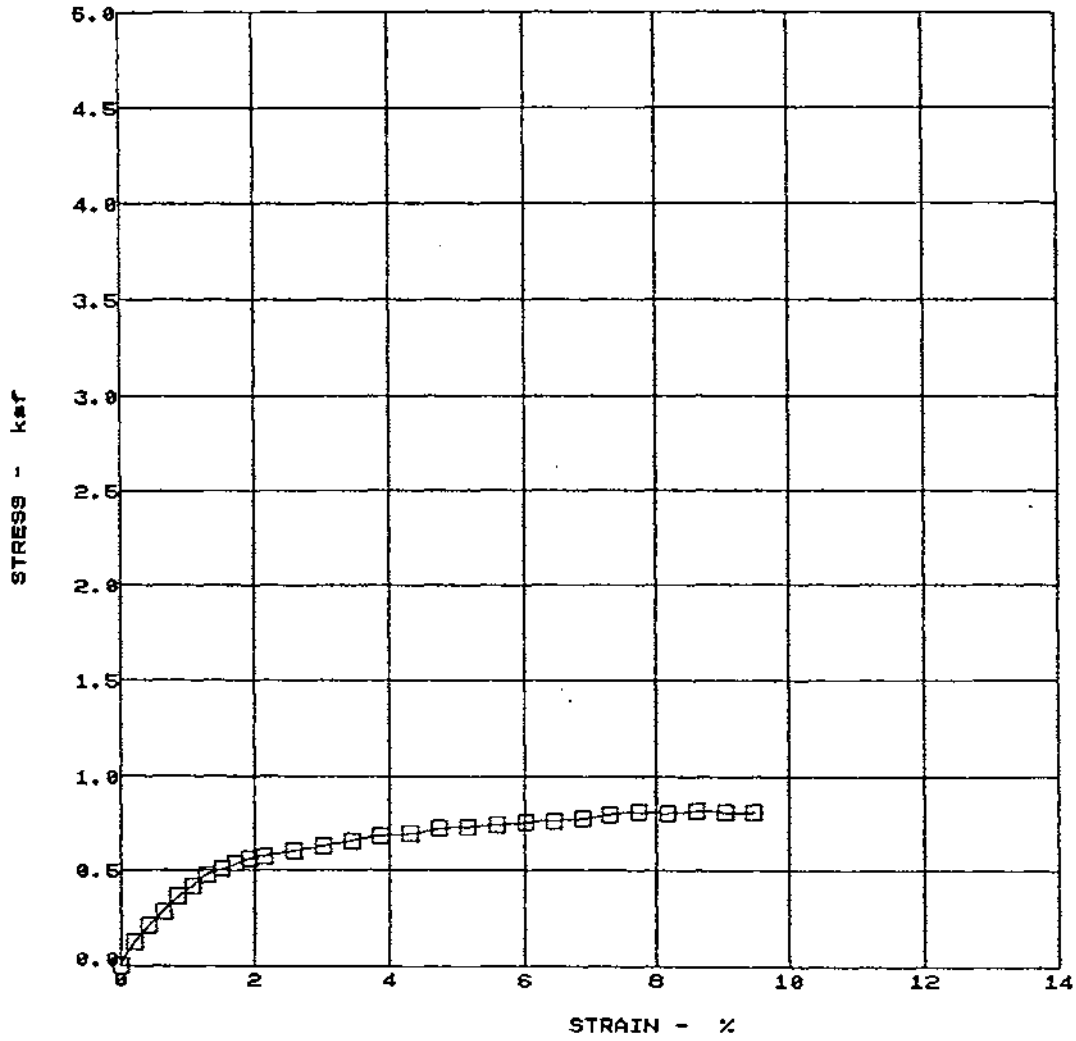
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

CONSOLIDATION TEST

PLATE C-4



BORING NO. B-6 DRY DENSITY - pcf 96

DEPTH - ft 80.0 WATER CONTENT - % 28

SOIL DESCRIPTION Dark grey SILTY CLAY (CL-ML), trace sand

MAX. UC STRENGTH= 0.8 ksf AT 8.6 % STRAIN

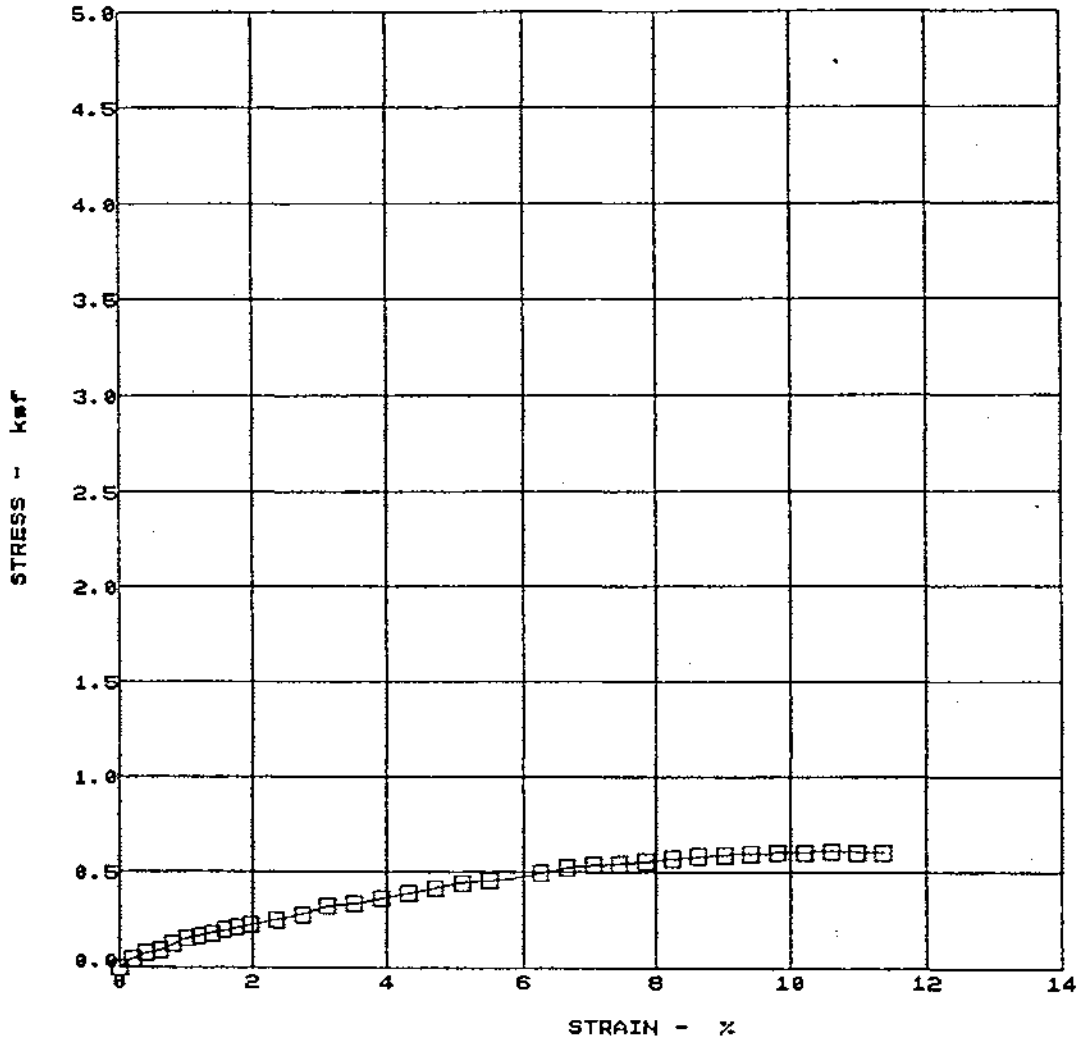
KLEINFELDER

PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

UNCONFINED COMPRESSION TEST

PLATE C-5



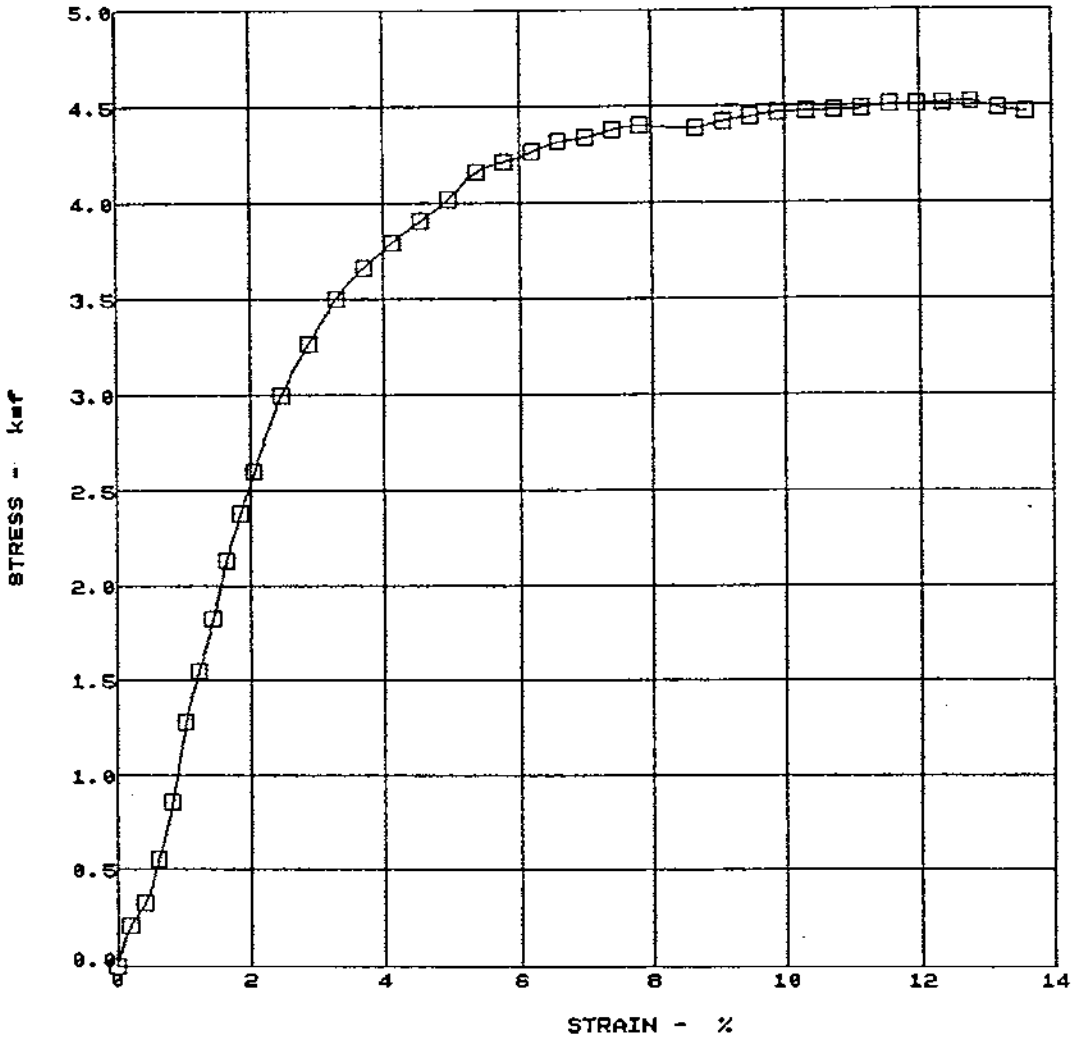
BORING NO. B-7 DRY DENSITY - pcf 99

DEPTH - ft 0.0 WATER CONTENT - % 0

SOIL DESCRIPTION Medium blue-grey SILTY CLAY (CH) - BAY MUD

MAX. UC STRENGTH= 0.6 ksf AT 10.6 % STRAIN

KLEINFELDER	Tuntex Properties Brisbane, California	PLATE
PROJECT NO. 11-2147-02	UNCONFINED COMPRESSION TEST	C-6

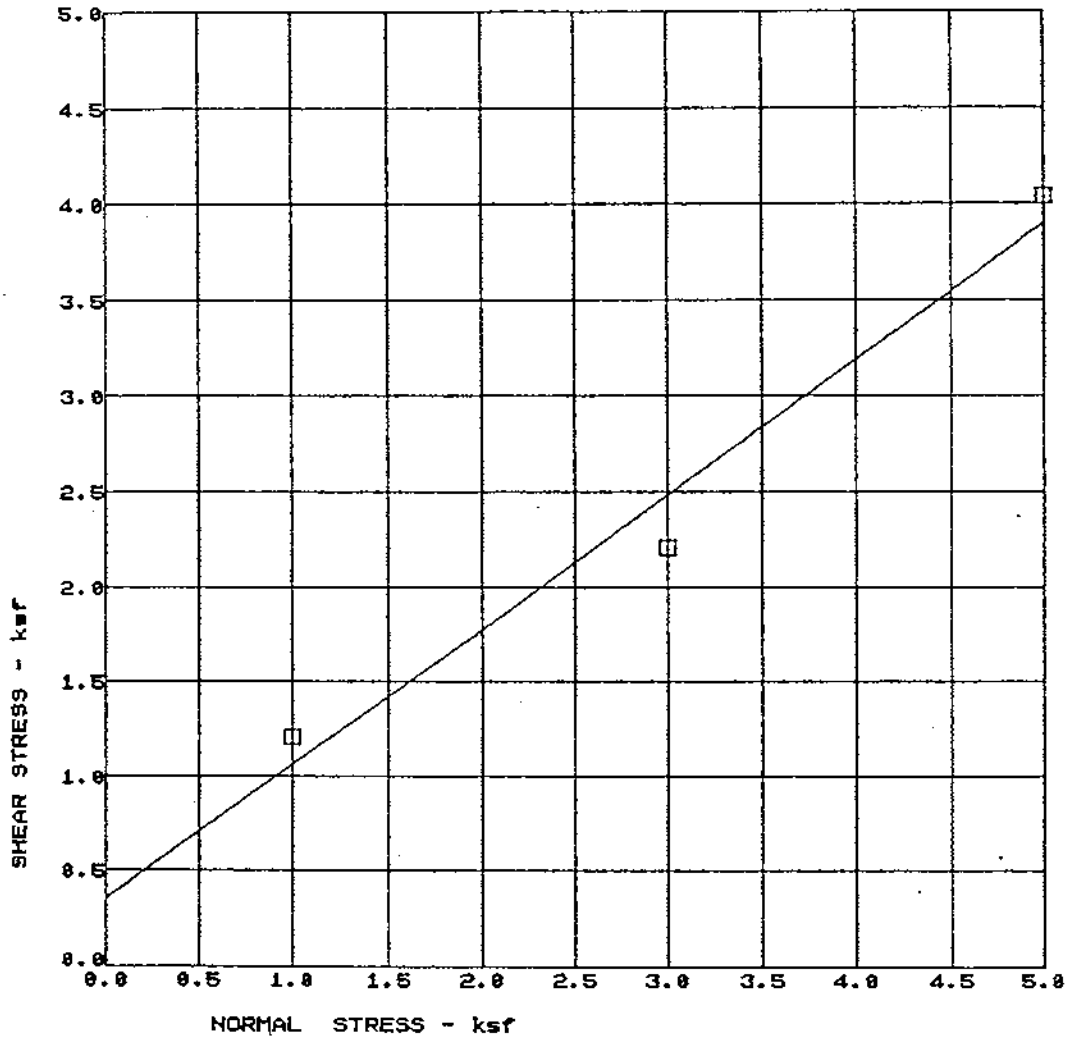


BORING NO.	B-9	DRY DENSITY - pcf	104
DEPTH - ft	80.0	WATER CONTENT - %	22

SOIL DESCRIPTION Blue-grey SILTY CLAY (CL-ML)

MAX. UC STRENGTH= 4.5 ksf AT 12.8 % STRAIN

KLEINFELDER	Tuntex Properties Brisbane, California	PLATE
PROJECT NO. 11-2147-02	UNCONFINED COMPRESSION TEST	C-7



TEST TYPE: CU / RESIDUAL

RATE OF SHEAR - in/min 0.0048

DRY DENSITY - pcf	108.8	109.3	113.7
INITIAL WATER CONTENT - %	20.2	20.2	18.0
FINAL WATER CONTENT - %	18.2	18.5	16.0
NORMAL STRESS - psf	1000	3000	5000
MAXIMUM SHEAR - psf	1205	2201	4035

BORING NO: B-2
DEPTH: 60.0 ft
SILTY CLAYEY SAND (SC-CL)

FRICTION ANGLE = 35 deg.

COHESION= 0.36 ksf

KLEINFELDER

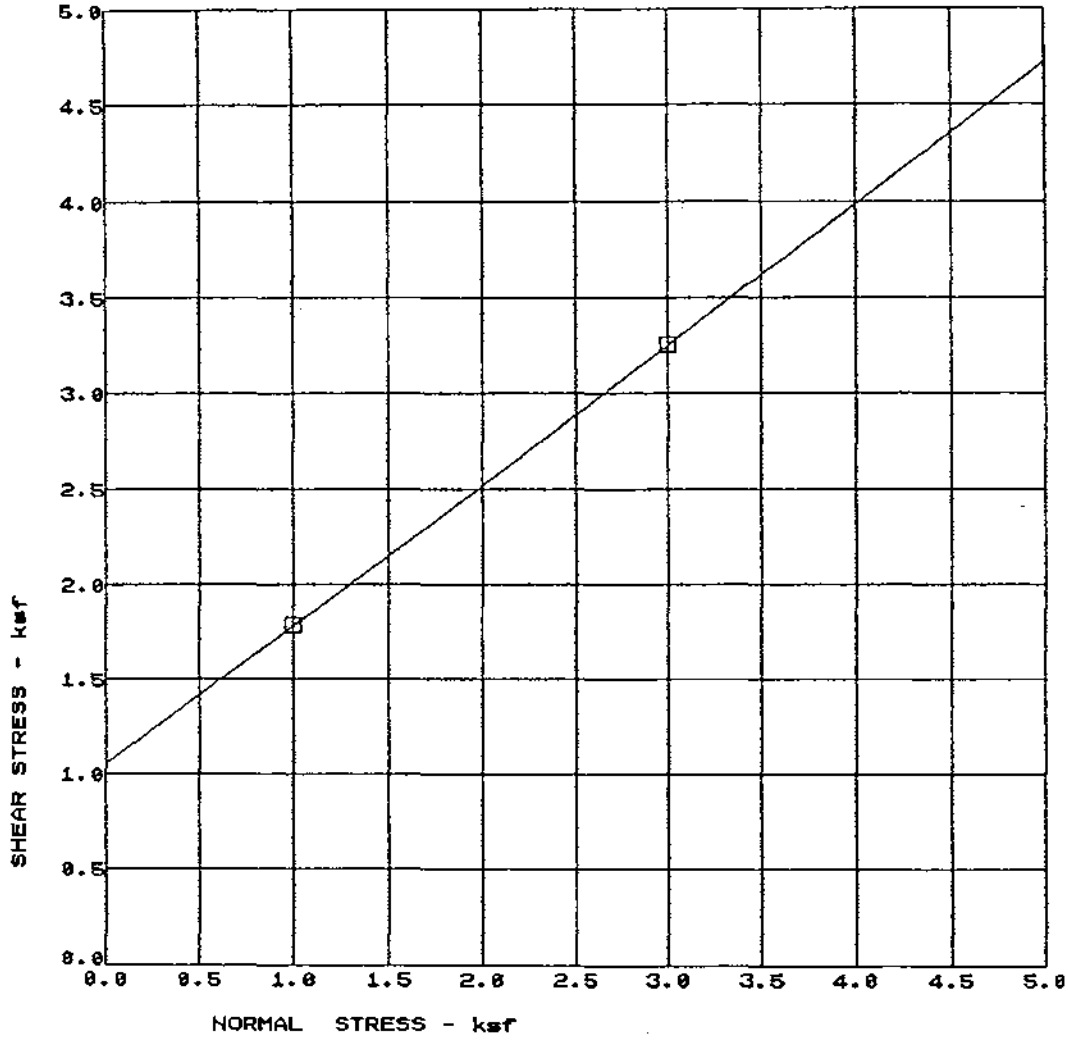
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

DIRECT SHEAR TEST

PLATE

C-8



TEST TYPE: CU / STAGED

RATE OF SHEAR - in/min 0.0032

DRY DENSITY - pcf	105.0		
INITIAL WATER CONTENT - %	15.6		
FINAL WATER CONTENT - %	15.4		
NORMAL STRESS - psf	1000		3000
MAXIMUM SHEAR - psf	1781		3249

BORING NO: B-7
DEPTH: 1.0 ft
GRAVELLY SILT (ML)

FRICTION ANGLE = 36 deg.

COHESION= 1.05 ksf

KLEINFELDER

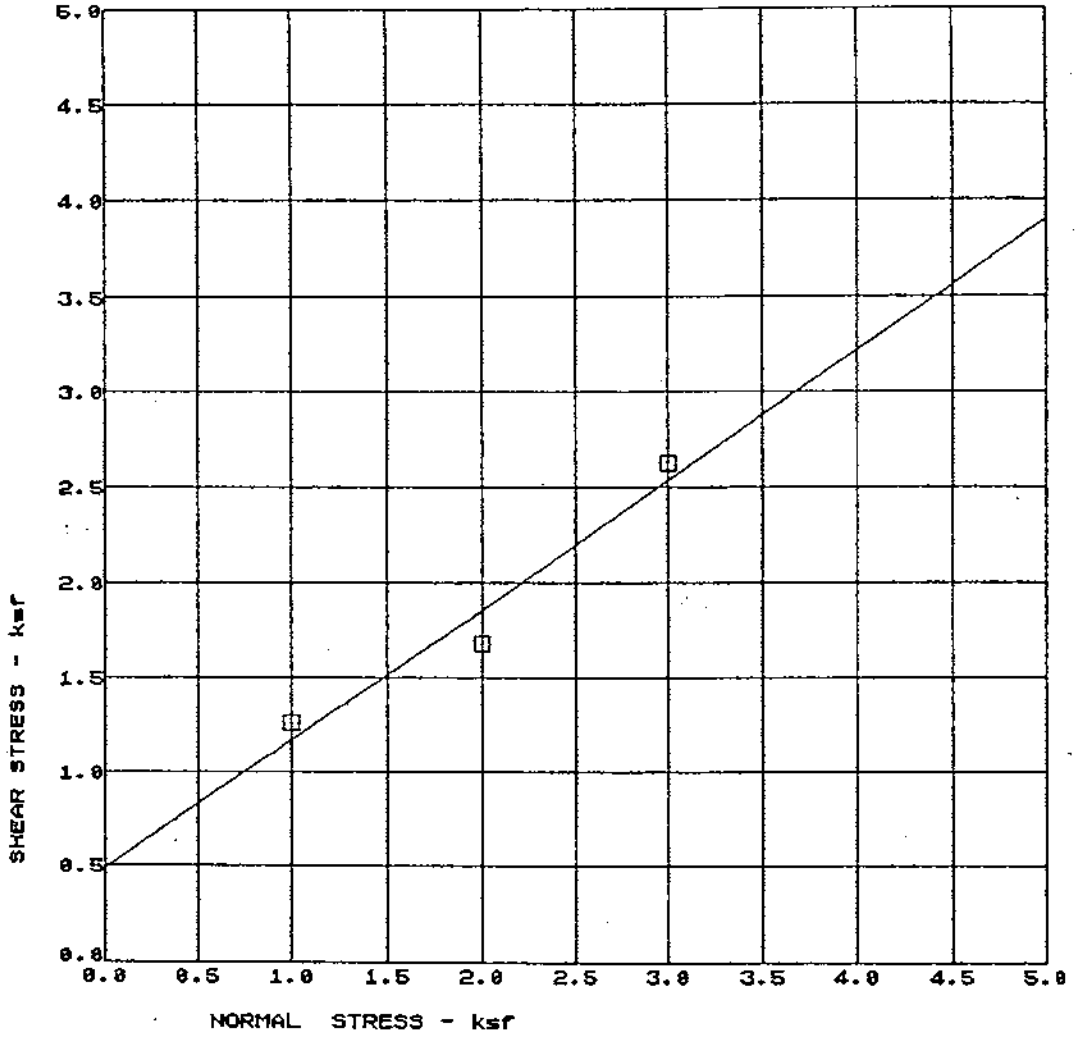
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

DIRECT SHEAR TEST

PLATE

C-9



TEST TYPE: CU / RESIDUAL

RATE OF SHEAR - in/min 0.0048

DRY DENSITY - pcf	99.6	101.7	103.8
INITIAL WATER CONTENT - %	6.8	7.9	8.9
FINAL WATER CONTENT - %	5.6	7.0	8.9
NORMAL STRESS - psf	1000	2000	3000
MAXIMUM SHEAR - psf	1258	1677	2621

BORING NO: B-8
DEPTH: 1.0 ft
Brown SILTY SAND (SM)

FRICTION ANGLE = 34 deg.

COHESION= 0.49 ksf

KLEINFELDER

PROJECT NO. 11-2147-02

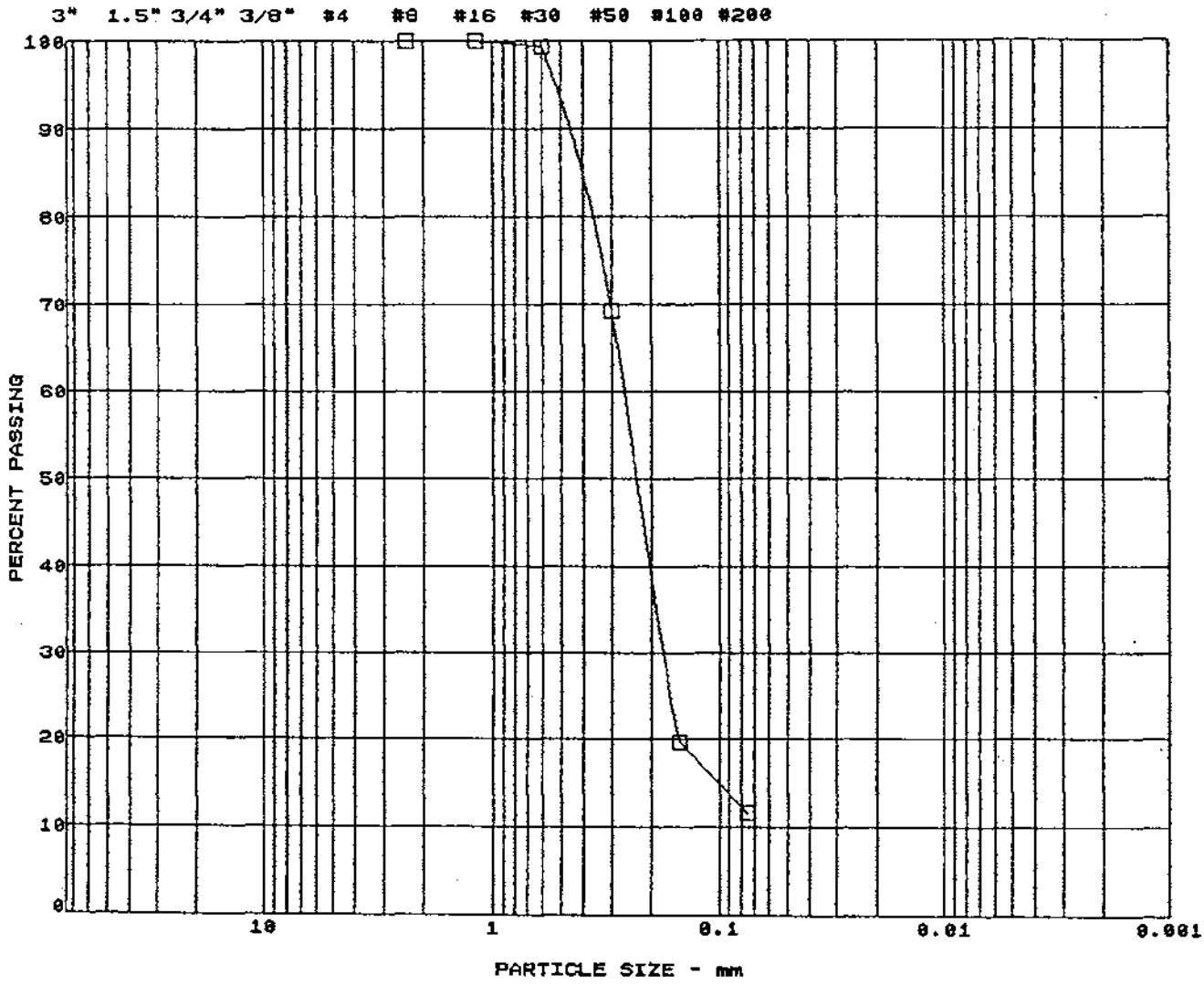
Tuntex Properties
Brisbane, California

DIRECT SHEAR TEST

PLATE

C-10

SIEVE ANALYSIS	HYDROMETER



GRAVEL		SAND			FINES
coarse	fine	coarse	medium	fine	

SYMBOL	BORING	DEPTH (ft)	CLASSIFICATION
□	B-7	55.00	Dark grey CLAYEY SAND (SC) - BAY MUD

KLEINFELDER

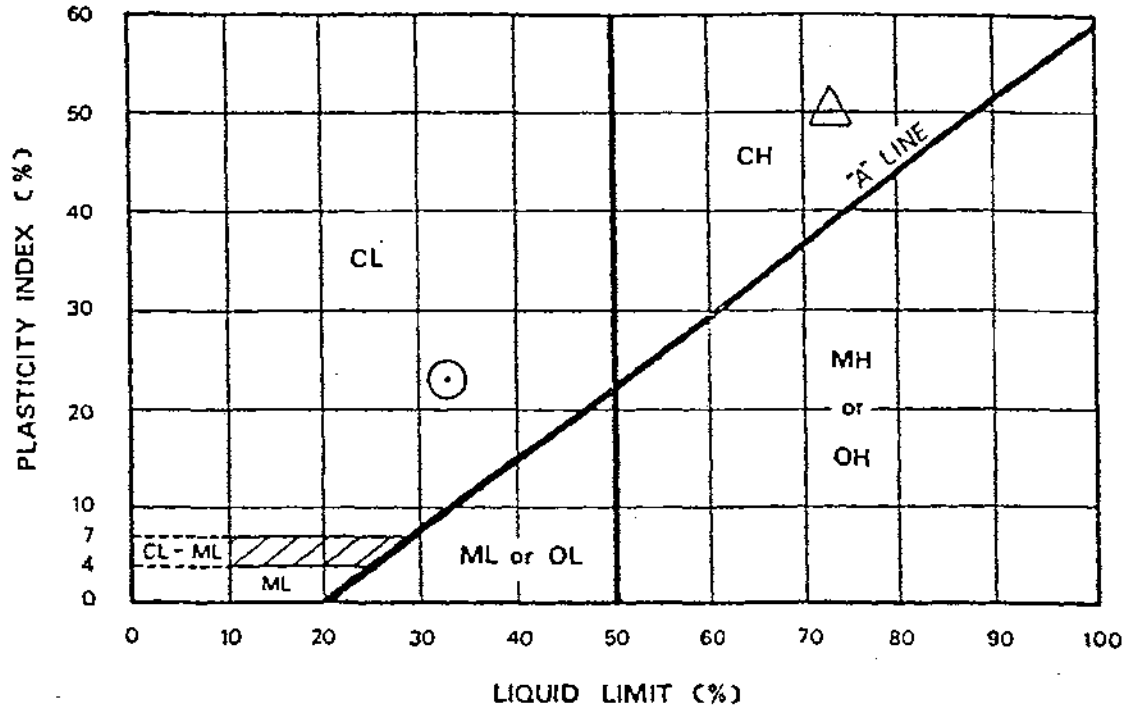
PROJECT NO. 11-2147-02

Tuntex Properties
Brisbane, California

GRAIN SIZE DISTRIBUTION

PLATE

C-11



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
△	EB-3	38.5-40.5	48	73	50	--	+0.5	CH
⊙	EB-3	58.5-60.5	37	33	23	--	+1.2	CL

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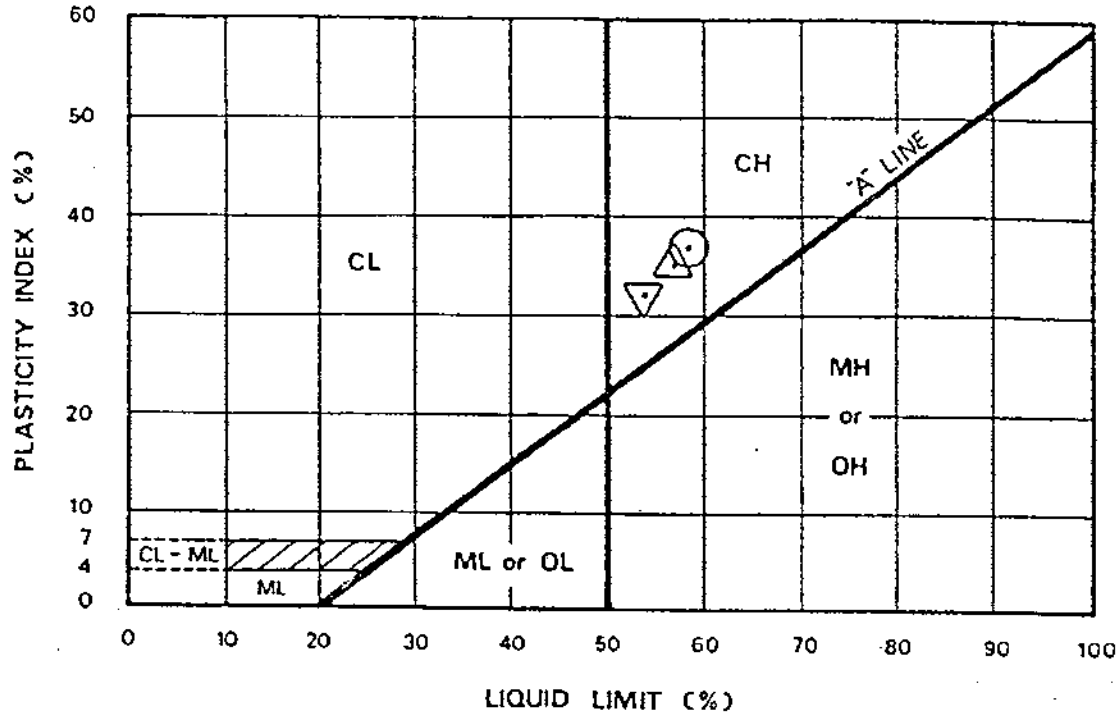
PLASTICITY CHART AND DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
169-11A	May 1977	B-1



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
△	EB-7	43.5-45	63	57	35	--	+1.2	CH
⊙	EB-10	34.5-35	67	58	37	--	+1.2	CH
▽	EB-11	38.5-40.5	66	54	32	--	+1.4	CH

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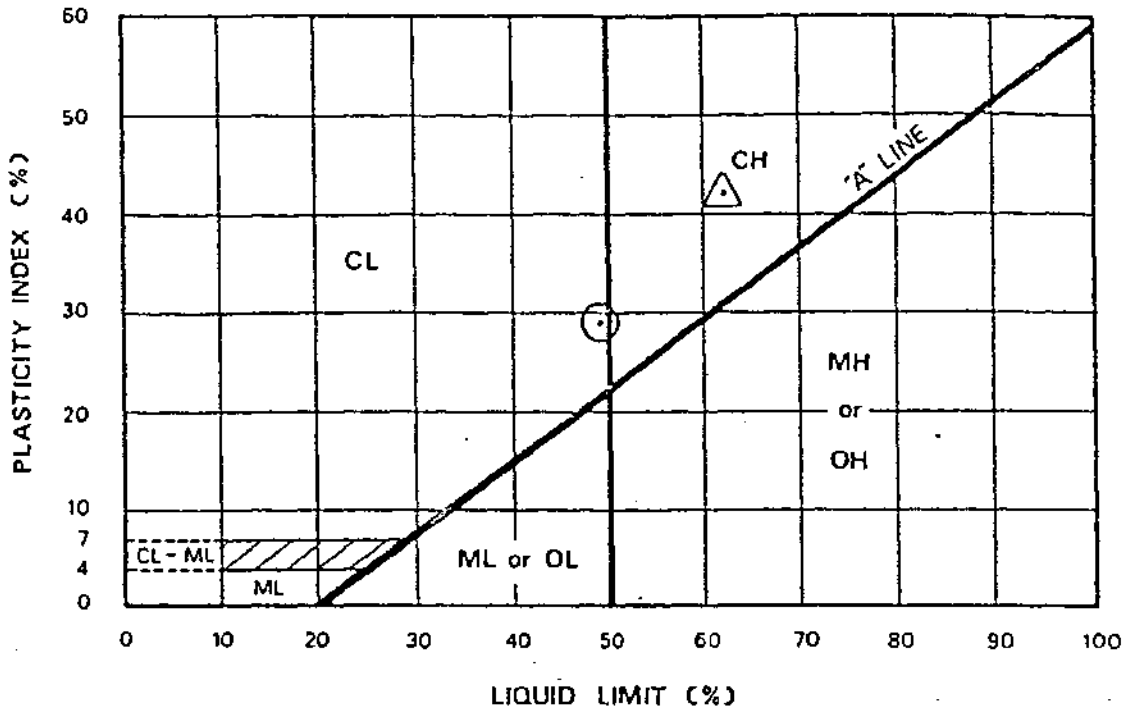
PLASTICITY CHART AND DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO	DATE
169-11A	[illegible] 1977

Figure B-2



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
△	EB-14	34-36	78	62	42	--	+1.4	CH
⊙	EB-15	48.5-50.5	70	49	29	--	+1.7	CL

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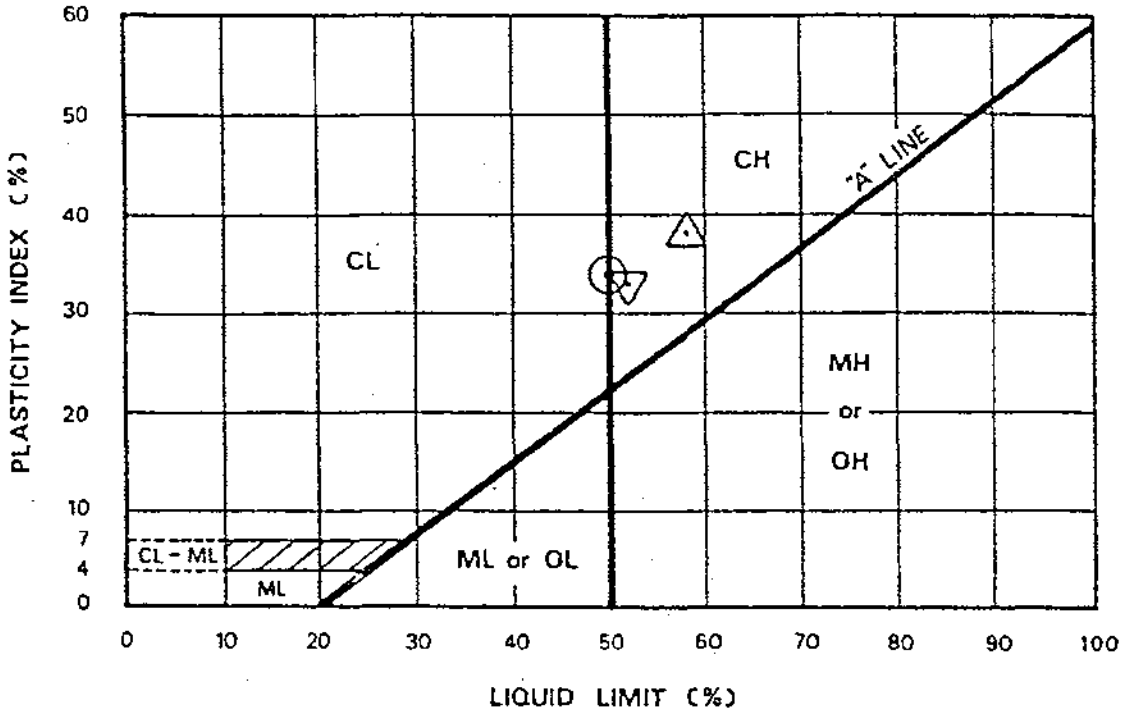
PLASTICITY CHART AND DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE
169-11A	[illegible]

Figure B-3



KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
△	EB-18	68.5-70.5	74	58	38	--	+1.4	CH
⊙	EB-18	38.5-40.5	62	50	34	--	+1.4	CL-CH
▽	EB-20	34-36	65	~~58~~ 52	33	--	+1.4	CH

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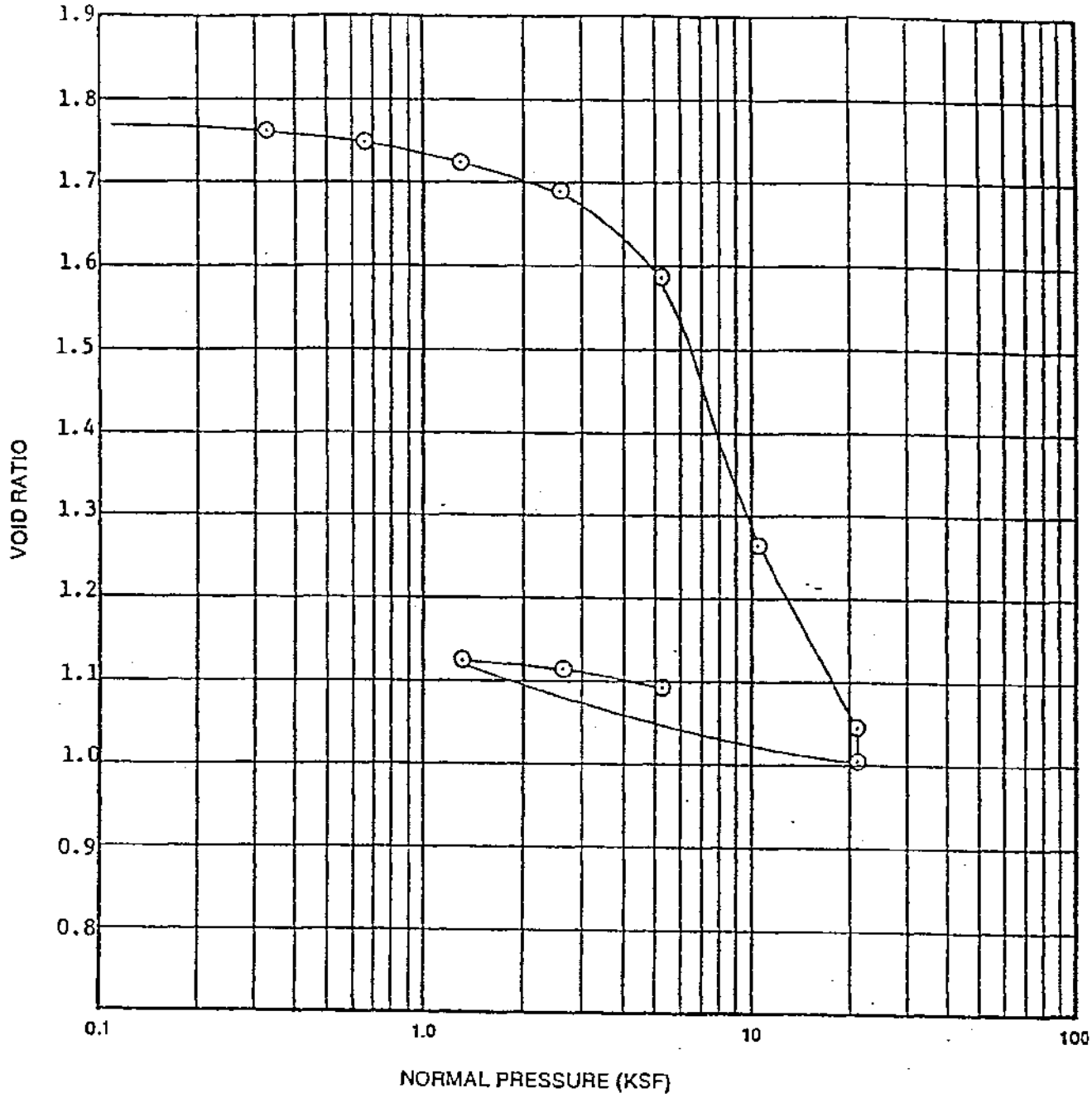
PLASTICITY CHART AND DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
260-[illegible]	[illegible] 1977	B-4



SAMPLE DATA	
BORING NO.: 3	
DEPTH (ft.): 52	ELEVATION (ft.): -30
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs) 2.70*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

*Assumed

CONSOLIDATION TEST DATA		
	INITIAL	FINAL
DRY DENSITY (PCF)	61	83
MOISTURE CONTENT (%)	64	46
VOID RATIO	1.767	1.003
DEGREE OF SATURATION (%)	-	100
HEIGHT (in.)	1.000	0.724

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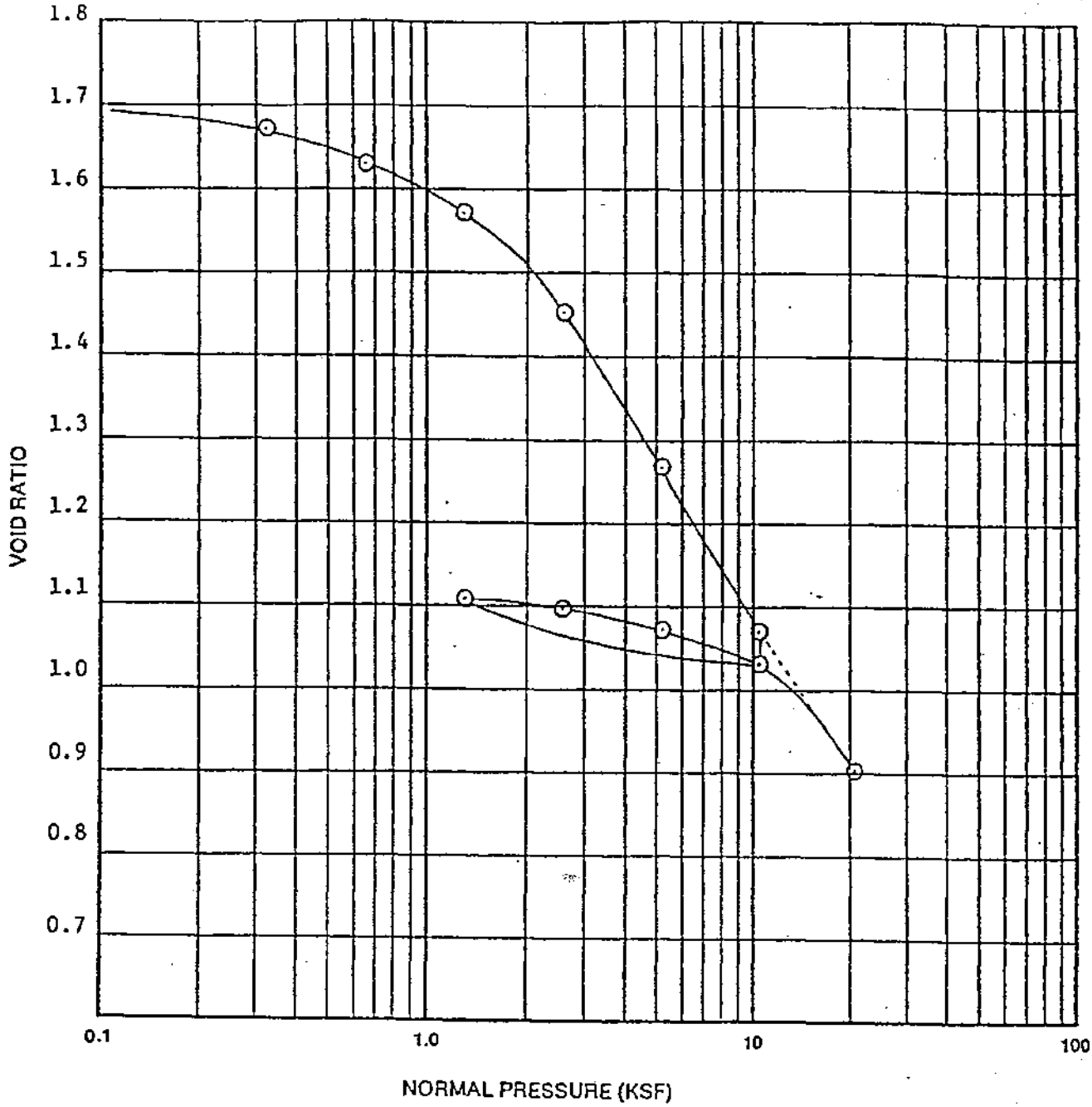
CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
169-114	May 1977	B-5



SAMPLE DATA	
BORING NO.: 7	
DEPTH (ft.): 50	ELEVATION (ft.): -25.5
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs): 2.7*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

*Assumed

CONSOLIDATION TEST DATA		
	INITIAL	FINAL
DRY DENSITY (PCF)	62	88
MOISTURE CONTENT (%)	62	42
VOID RATIO	1.696	0.904
DEGREE OF SATURATION (%)	-	100
HEIGHT (in.)	1.000	0.706

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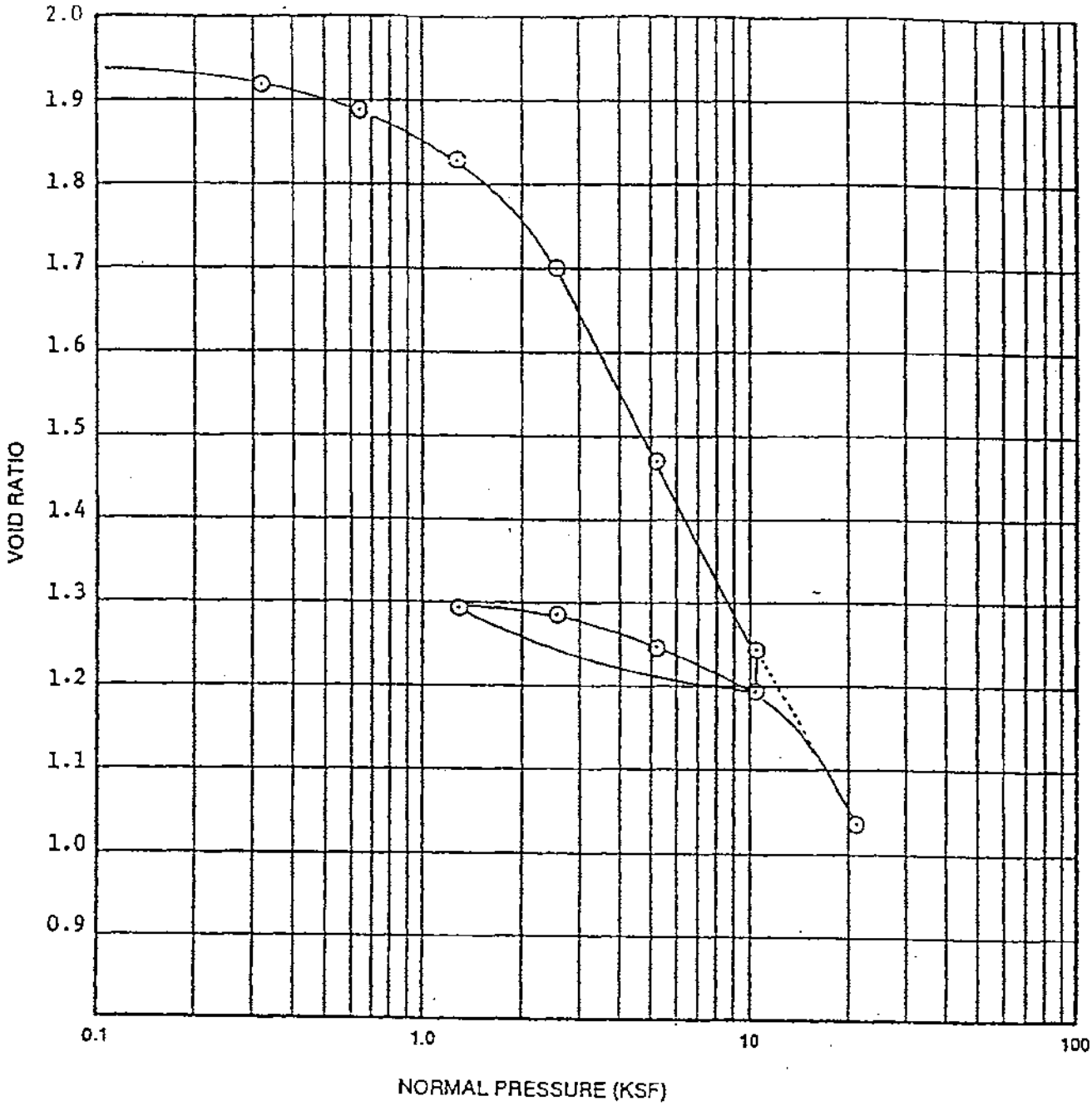
CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
140-11A	May 1977	B-6



SAMPLE DATA	
BORING NO.: 7	
DEPTH (ft.): 55	ELEVATION (ft.): -30.5
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs): 2.7*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

*Assumed

CONSOLIDATION TEST DATA		
	INITIAL	FINAL
DRY DENSITY (PCF)	58	82
MOISTURE CONTENT (%)	68	48
VOID RATIO	1.943	1.042
DEGREE OF SATURATION (%)	-	100
HEIGHT (in.)	1.000	0.694

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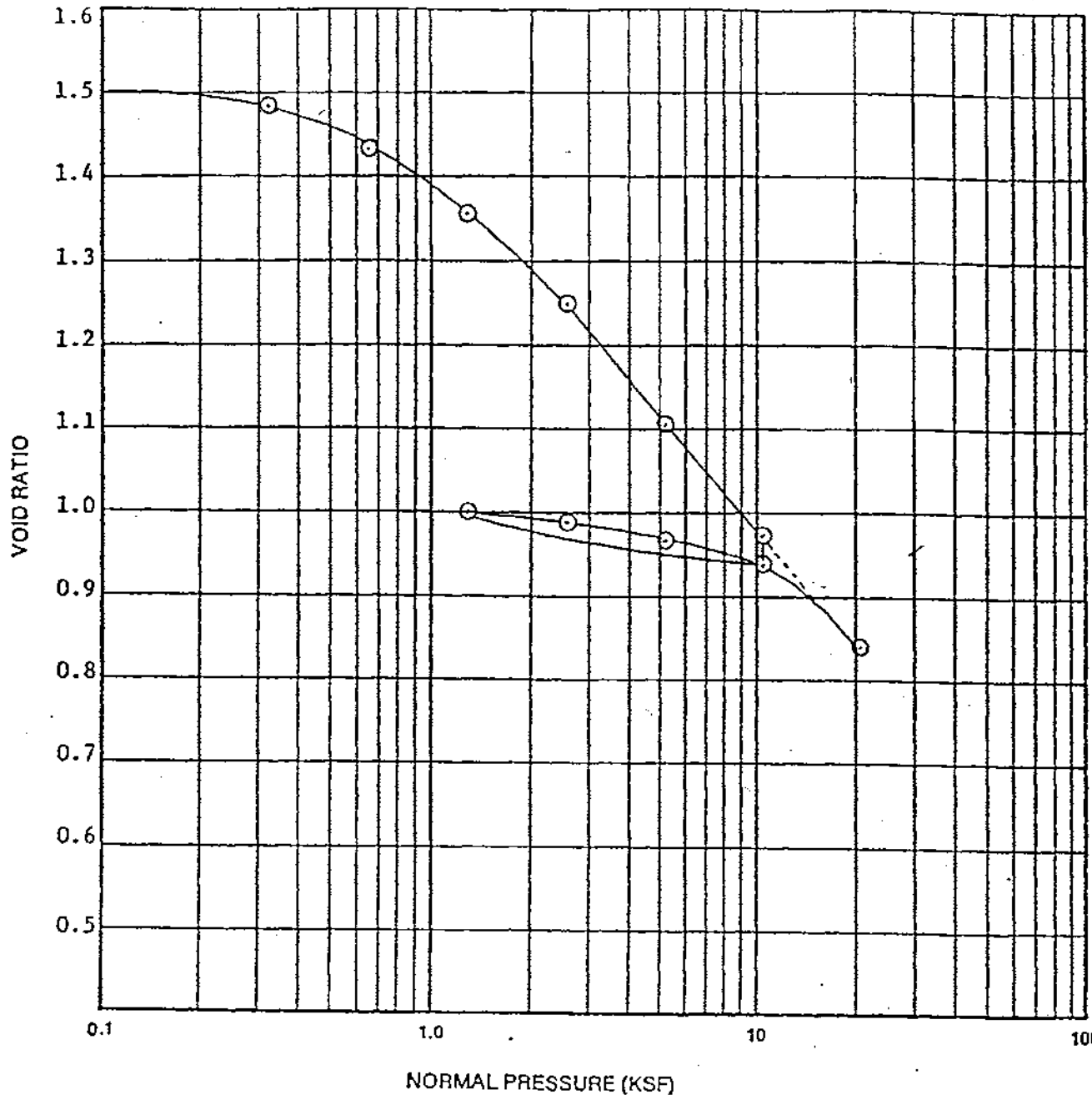
CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
159-11A	May 1977	B-7



SAMPLE DATA	
BORING NO.: 10	
DEPTH (ft.): 45	ELEVATION (ft.): -25.1
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs): 2.7*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

CONSOLIDATION TEST DATA		
	INITIAL	FINAL
DRY DENSITY (PCF)	67	92
MOISTURE CONTENT (%)	55	37
VOID RATIO	1.503	0.844
DEGREE OF SATURATION (%)	-	100
HEIGHT (in.)	1.000	0.737

*Assumed

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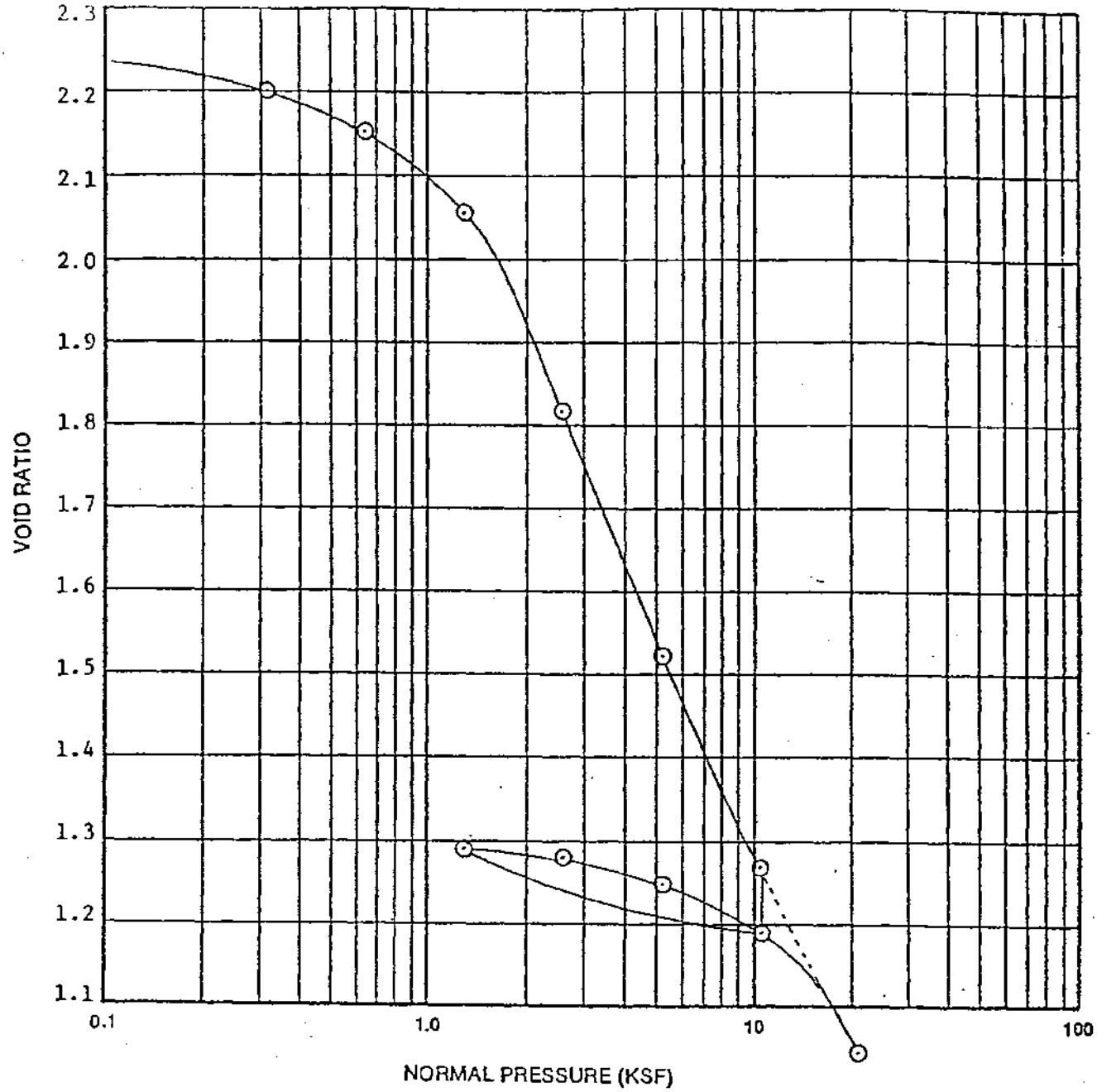
Foundation / Soil / Geological Engineers

CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
169-11A	May 1977	B-8



SAMPLE DATA	
BORING NO.: 14	
DEPTH (ft.): 50	ELEVATION (ft.): -33
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs): 2.7*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

*Assumed

CONSOLIDATION TEST DATA -	INITIAL	FINAL
DRY DENSITY (PCF)	52	81
MOISTURE CONTENT (%)	82	47
VOID RATIO	2.238	1.050
DEGREE OF SATURATION (%)	-	100
HEIGHT (in.)	1.000	0.633

John U. Lowney & Associates

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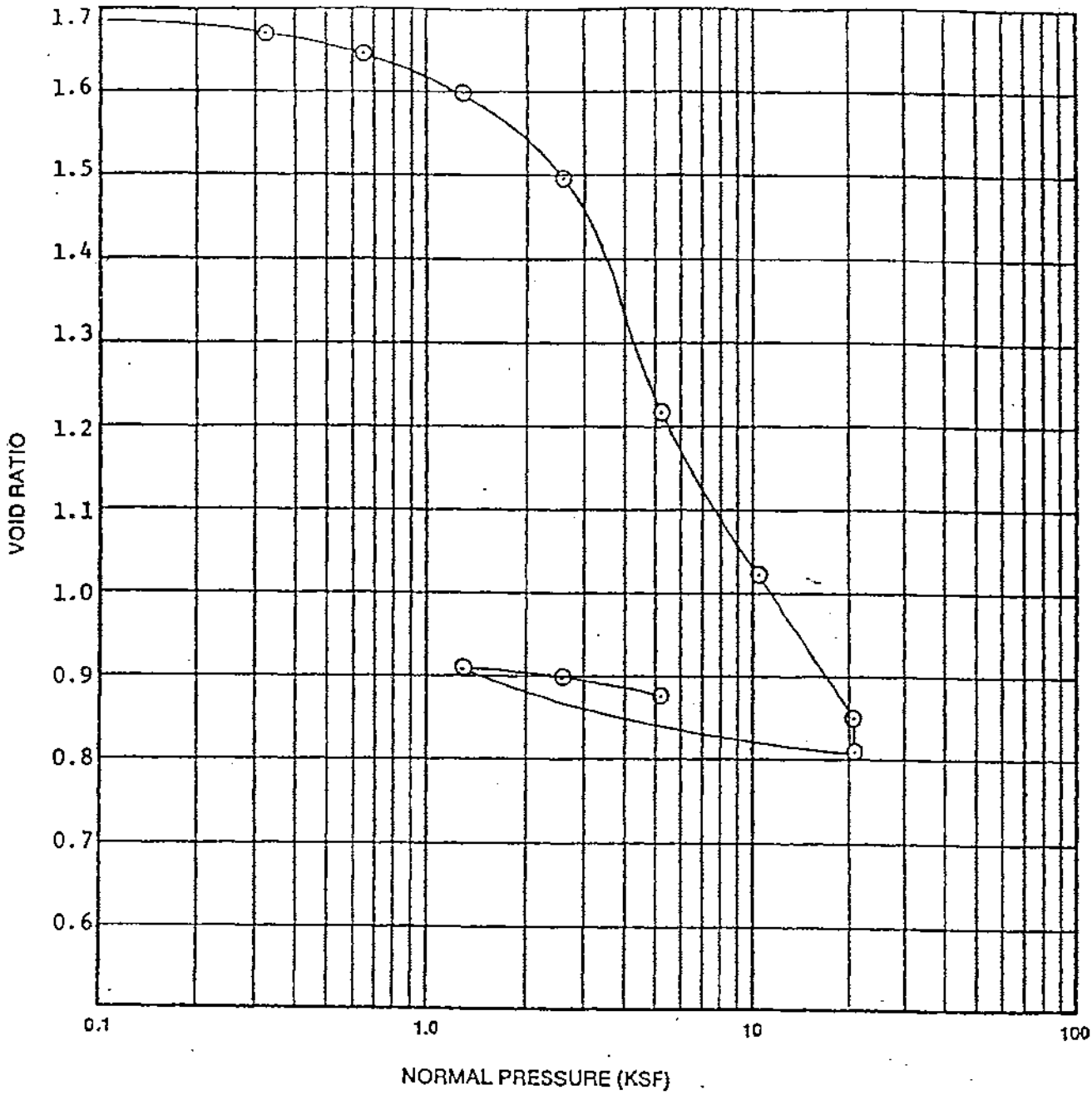
CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
169-11A	May 1977	B-9



SAMPLE DATA	
BORING NO.: 14	
DEPTH (ft.): 60	ELEVATION (ft.): -43
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs): 2.7*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

*Assumed

CONSOLIDATION TEST DATA		
	INITIAL	FINAL
DRY DENSITY (PCF)	63	93
MOISTURE CONTENT (%)	62	35
VOID RATIO	1.685	0.812
DEGREE OF SATURATION (%)	-	100
HEIGHT (in.)	1.000	0.675

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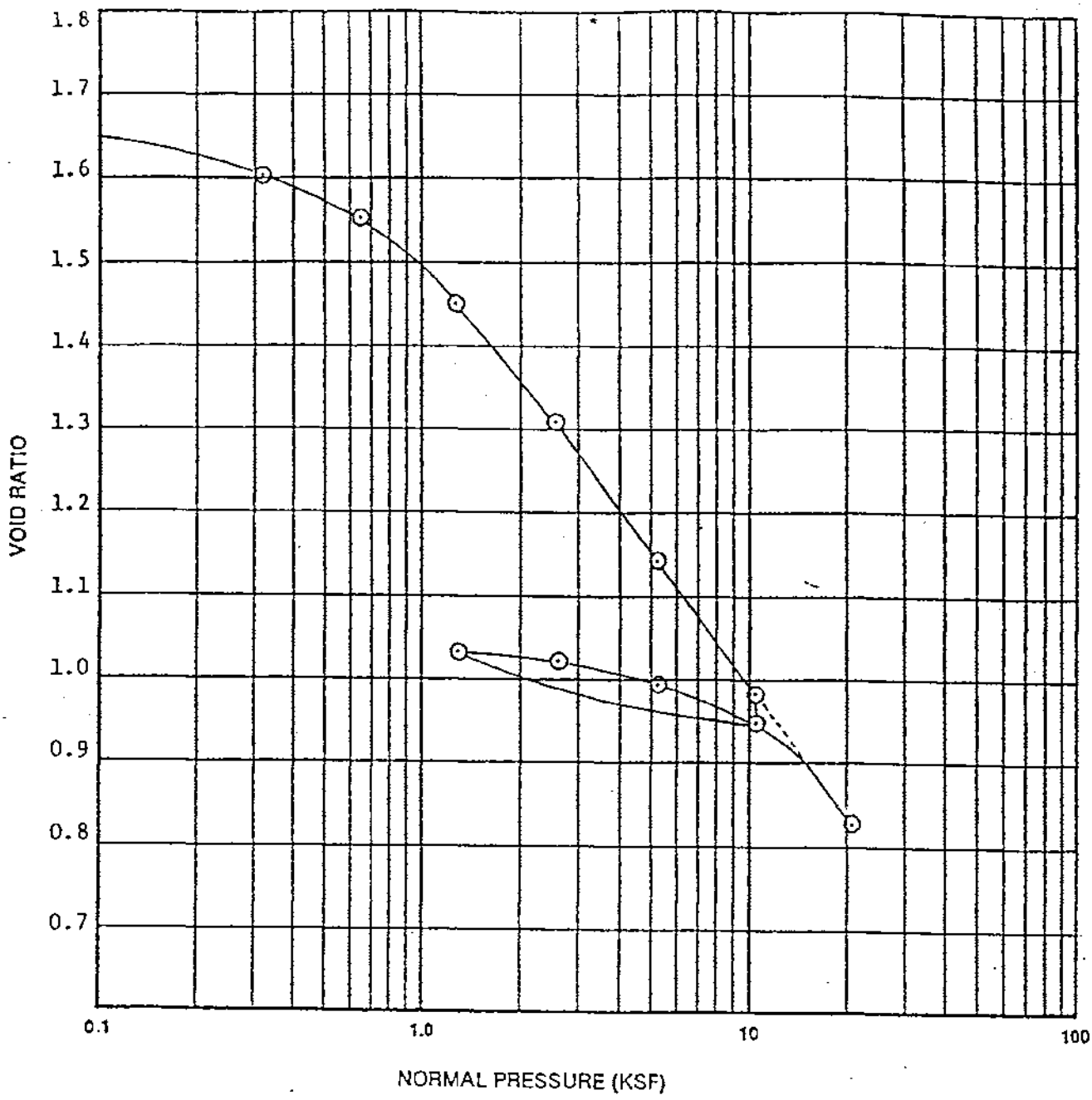
CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
169-11A	May 1977	B-10



SAMPLE DATA	
BORING NO.: 22	
DEPTH (ft.): 33.5	ELEVATION (ft.): −15.8
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs): 2.7*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

*Assumed

CONSOLIDATION TEST DATA		
	INITIAL	FINAL
DRY DENSITY (PCF)	64	91
MOISTURE CONTENT (%)	58	39
VOID RATIO	1.649	0.832
DEGREE OF SATURATION (%)	–	100
HEIGHT (in.)	1.000	0.684

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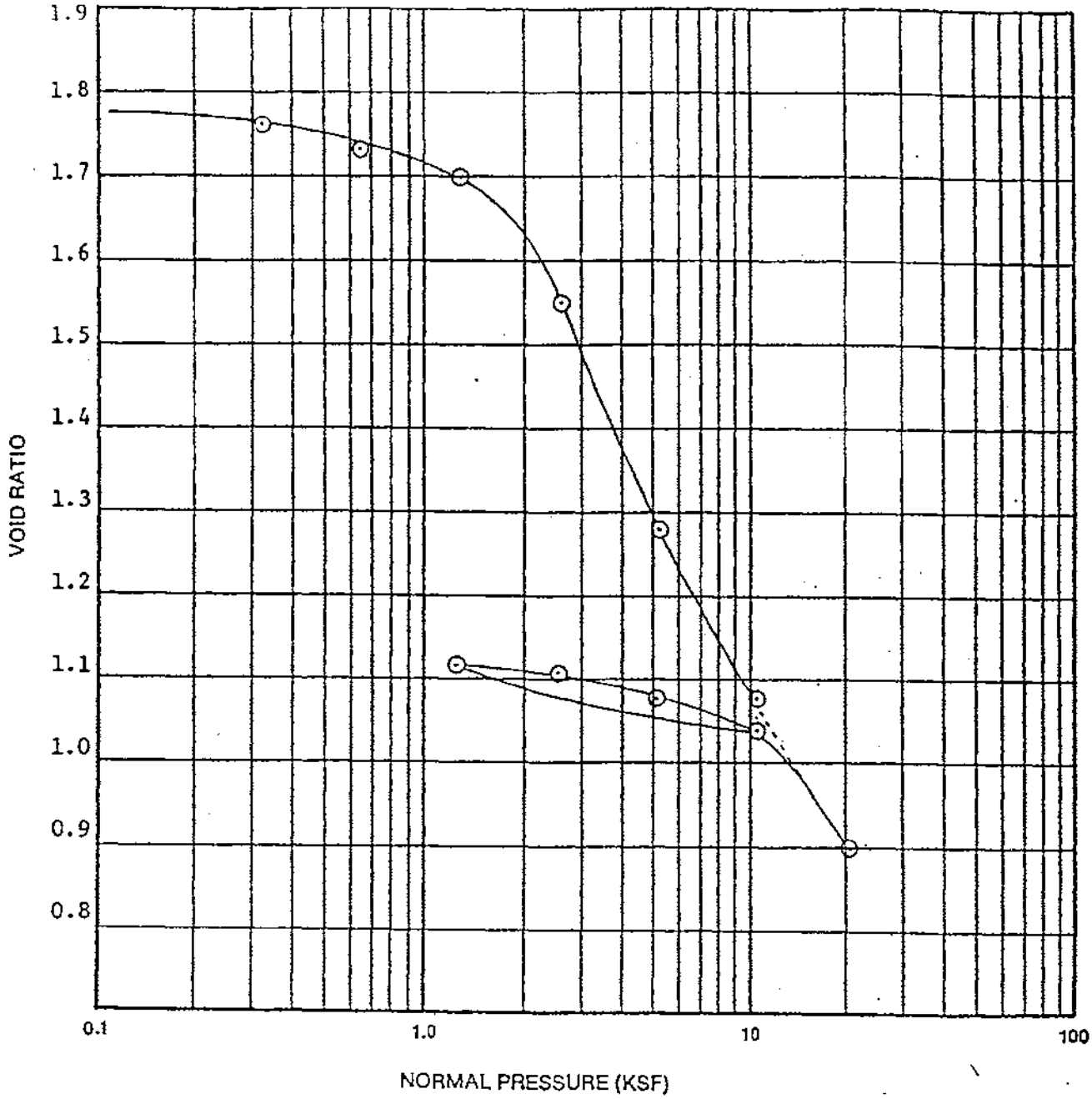
CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	
169-11A	May 1977	Figure B-11



SAMPLE DATA	
BORING NO.: 22	
DEPTH (ft.): 43	ELEVATION (ft.): -25.3
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs): 2.7*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

CONSOLIDATION TEST DATA		
	INITIAL	FINAL
DRY DENSITY (PCF)	61	88
MOISTURE CONTENT (%)	64	41
VOID RATIO	1.774	0.902
DEGREE OF SATURATION (%)	-	100
HEIGHT (in.)	1.000	0.686

*Assumed

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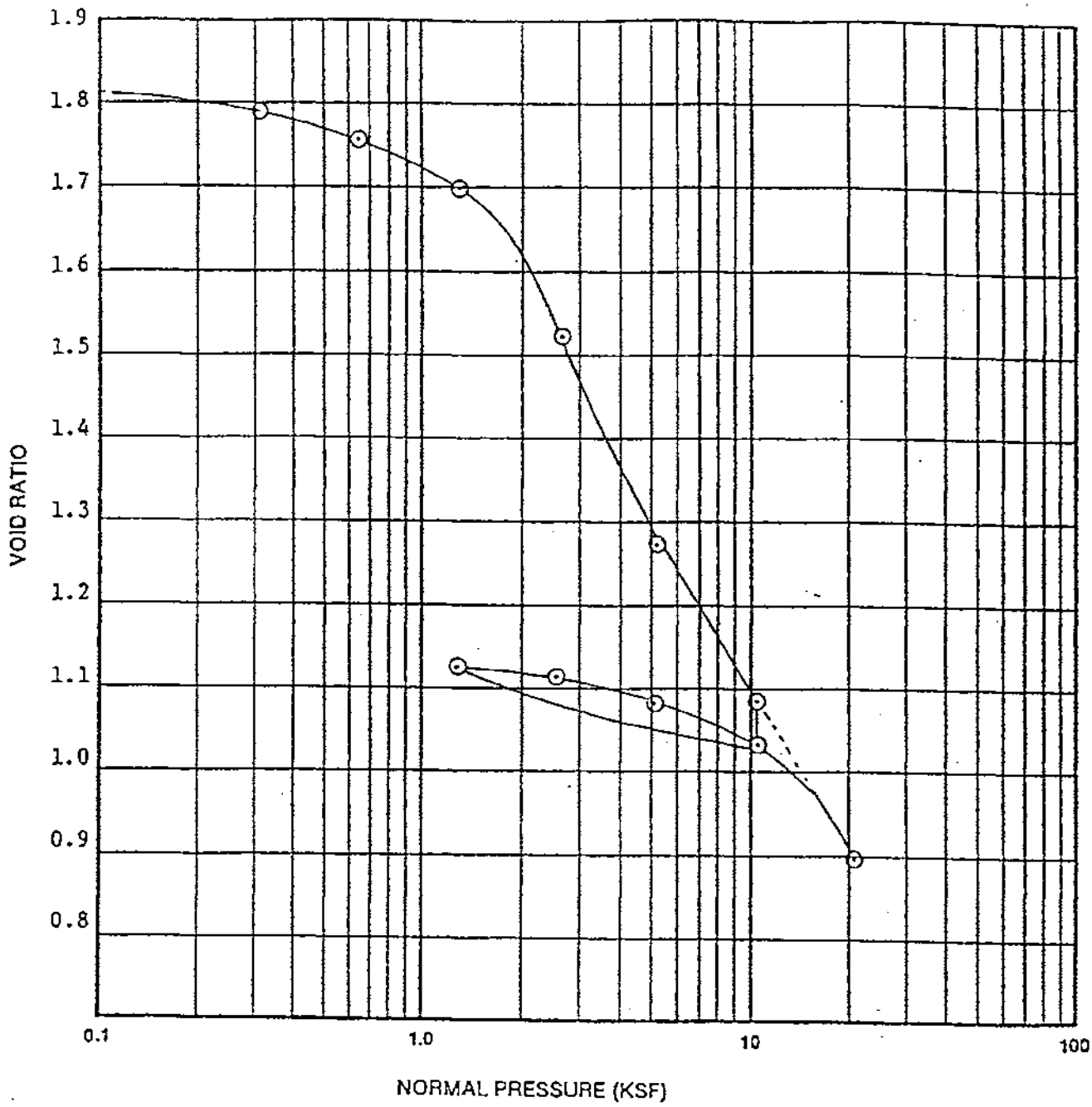
CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
169-11A	May 1977	B-12



SAMPLE DATA	
BORING NO.: 22	
DEPTH (ft.): 56	ELEVATION (ft.): -38.3
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs): 2.7*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

*Assumed

CONSOLIDATION TEST DATA		
	INITIAL	FINAL
DRY DENSITY (PCF)	61	91
MOISTURE CONTENT (%)	63	41
VOID RATIO	1.815	0.901
DEGREE OF SATURATION (%)	-	100
HEIGHT (in.)	1.000	0.676

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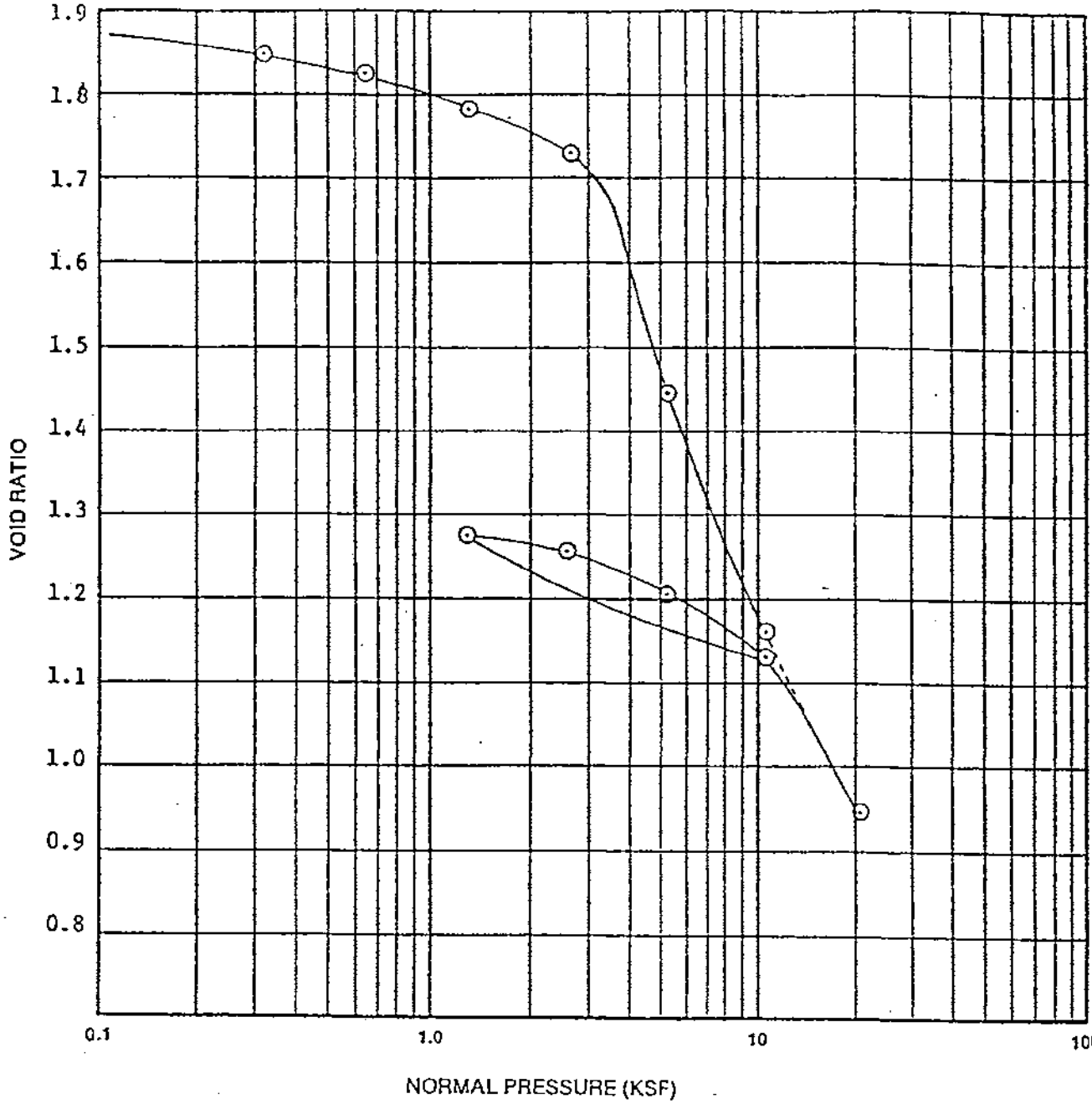
CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
169-11A	May 1977	B-13



SAMPLE DATA	
BORING NO.: 22	
DEPTH (ft.): 79	ELEVATION (ft.): -61.3
DESCRIPTION: Gray Silty Clay with scattered sea shells and small pockets of peat (Bay Mud)	
SAMPLE DIAMETER (in.): 2.5	SPECIFIC GRAVITY (Gs): 2.7*
LIQUID LIMIT (%):	PLASTICITY INDEX (%):

*Assumed

CONSOLIDATION TEST DATA		
	INITIAL	FINAL
DRY DENSITY (PCF)	59	86
MOISTURE CONTENT (%)	69	42
VOID RATIO	1.875	0.944
DEGREE OF SATURATION (%)	-	100
HEIGHT (in.)	1.000	0.676

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CONSOLIDATION TEST DATA

260-ACRE COMMERCIAL AND INDUSTRIAL SITE
Brisbane, California

PROJECT NO.	DATE	Figure
169-11A	May 1977	B-14

ATTERBERG LIMITS

ASTM D4318

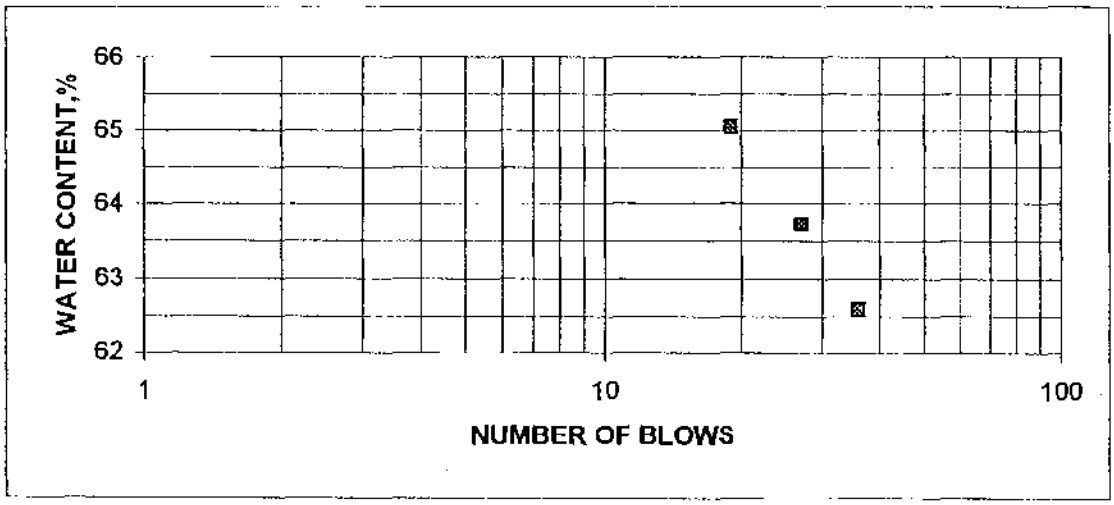
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-01	**Depth, ft.:**	60-62.5'	**Date:**	04/02/04
Description:	ELASTIC SILT, GRAY.			**Tested By:**	DGC
				Checked By:	

	Liquid Limit			Plastic Limit		Nat. w/c
Can Number	B-6	A-8	B-1	C-2	D-6	Z-1
Weight of Can + Wet Soil, gms.	71.13	71.54	70.28	45.81	46.85	178.8
Weight of Can + Dry Soil, gms.	56.07	56.10	55.23	42.34	43.07	133.76
Weight of Can, gms.	32.01	31.87	32.09	32.13	31.91	52.1
Weight of Dry Soil, gms.	24.06	24.23	23.14	10.21	11.16	81.66
Weight of Water, gms.	15.06	15.44	15.05	3.47	3.78	45.04
Water Content, %	62.6	63.7	65.0	34.0	33.9	55.2
Number of Blows	36	27	19			

Unified Soil Classification **MH**



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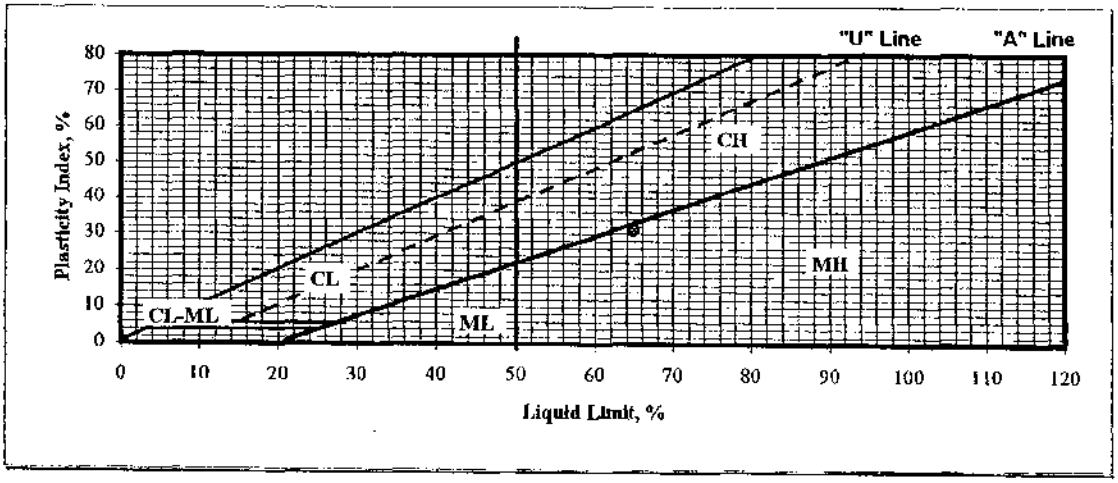

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U.U TRIAXIAL TEST

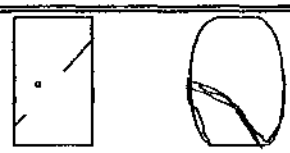
ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	04-008
Sample No.:	GT04-01	**Depth, ft.:**	60-62.5'	**Date:**	04/06/04
Description:	ELASTIC SILT, GRAY.			**Tested By:**	DGC

Total Wet Wt., gms.	1026.1
Total Dry Wt., gms.	660.4
Height, in.	6.00
Diameter, in.	2.875
Area, in.^{2}	6.4918
Volume, cf.	0.0225
Dry Density, pcf.	64.6
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



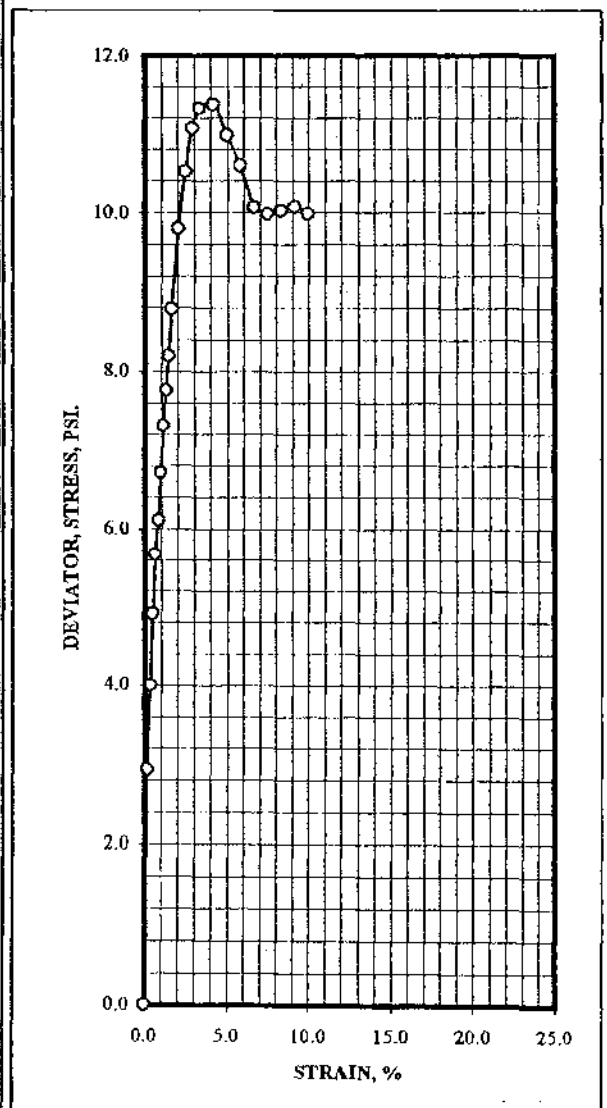
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.000

Tare Number	#6
Wet Soil + Tare, gms.	1245.7
Dry Soil + Tare, gms.	864.6
Tare Weights, gms.	204.2
Weight of Water, gms.	381.1
Wt. of Dry Soil, gms.	660.4
Water Content, %	57.7
Initial Water Content, %	55.4
Saturation	96.9
Confin. Pressure, psi.	20.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.49	0	0.00
10	0.17	6.50	19	2.92
20	0.33	6.51	26	3.99
30	0.50	6.52	32	4.90
40	0.67	6.54	37	5.66
50	0.83	6.55	40	6.11
60	1.00	6.56	44	6.71
70	1.17	6.57	48	7.31
80	1.33	6.58	51	7.75
90	1.50	6.59	54	8.19
100	1.67	6.60	58	8.79
125	2.08	6.63	65	9.80
150	2.50	6.66	70	10.51
175	2.92	6.69	74	11.07
200	3.33	6.72	76	11.32
250	4.17	6.77	77	11.37
300	5.00	6.83	75	10.98
350	5.83	6.89	73	10.59
400	6.67	6.96	70	10.06
450	7.50	7.02	70	9.97
500	8.33	7.08	71	10.03
550	9.17	7.15	72	10.07
600	10.00	7.21	72	9.98
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00

DEVIATOR VS. STRAIN GRAPH



Shaw EMCON/OWT, Inc.
A Shaw Group Company

CONSOLIDATION

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998
Sample No.:	GT04-01 @ 60-62.5'	**Tested By:**	DGC.
Description:	ELASTIC SILT, GRAY.	**Date:**	04/01/04

* Flooded with water at the beginning of test.

Consol. No.:	#1
Diameter, in.	2.42
Thickness, in.	1.00
Soil Wet Wt., gms.	124.92
Water Content, %	55.4
Dry Density, pcf.	66.6
Initial Sat.	97.7
Final Sat.	99.8

Tare Number	A-1
Wet Wt. of Soil +Tare, gms.	200.40
Dry Wt. of Soil + Tare, gms.	163.88
Weight of Tare, gms.	83.50
Weight of Water, gms.	36.52
Weight of Dry Soil, gms.	80.38
Final Water Content, %	45.4
Est. Specific Gravity	2.70

LOAD ksf.	DIAL .0001 in.	APPLIED CORRECTIONS	HEIGHT, inches.	CONSOL %	DENSITY pcf.	VOID RATIO
0.000	0.0000	0.0000	1.000	0.00	66.6	1.531
0.125	0.0007	0.0002	0.999	0.05	66.6	1.529
0.250	0.0010	0.0003	0.999	0.08	66.6	1.529
0.500	0.0029	0.0005	0.998	0.24	66.7	1.525
1.000	0.0072	0.0009	0.994	0.63	67.0	1.515
2.000	0.0181	0.0019	0.984	1.62	67.7	1.490
4.000	0.0361	0.0026	0.967	3.35	68.9	1.446
8.000	0.1145	0.0043	0.890	11.02	74.8	1.252
16.000	0.2081	0.0054	0.797	20.27	83.5	1.018
4.000	0.1905	0.0047	0.814	18.58	81.8	1.061
1.000	0.1668	0.0037	0.837	16.31	79.5	1.118
0.125	0.1222	0.0029	0.881	11.93	75.6	1.229
			0.000	0.00	0.0	0.000
			0.000	0.00	0.0	0.000
			0.000	0.00	0.0	0.000

δγχ93χονσολ

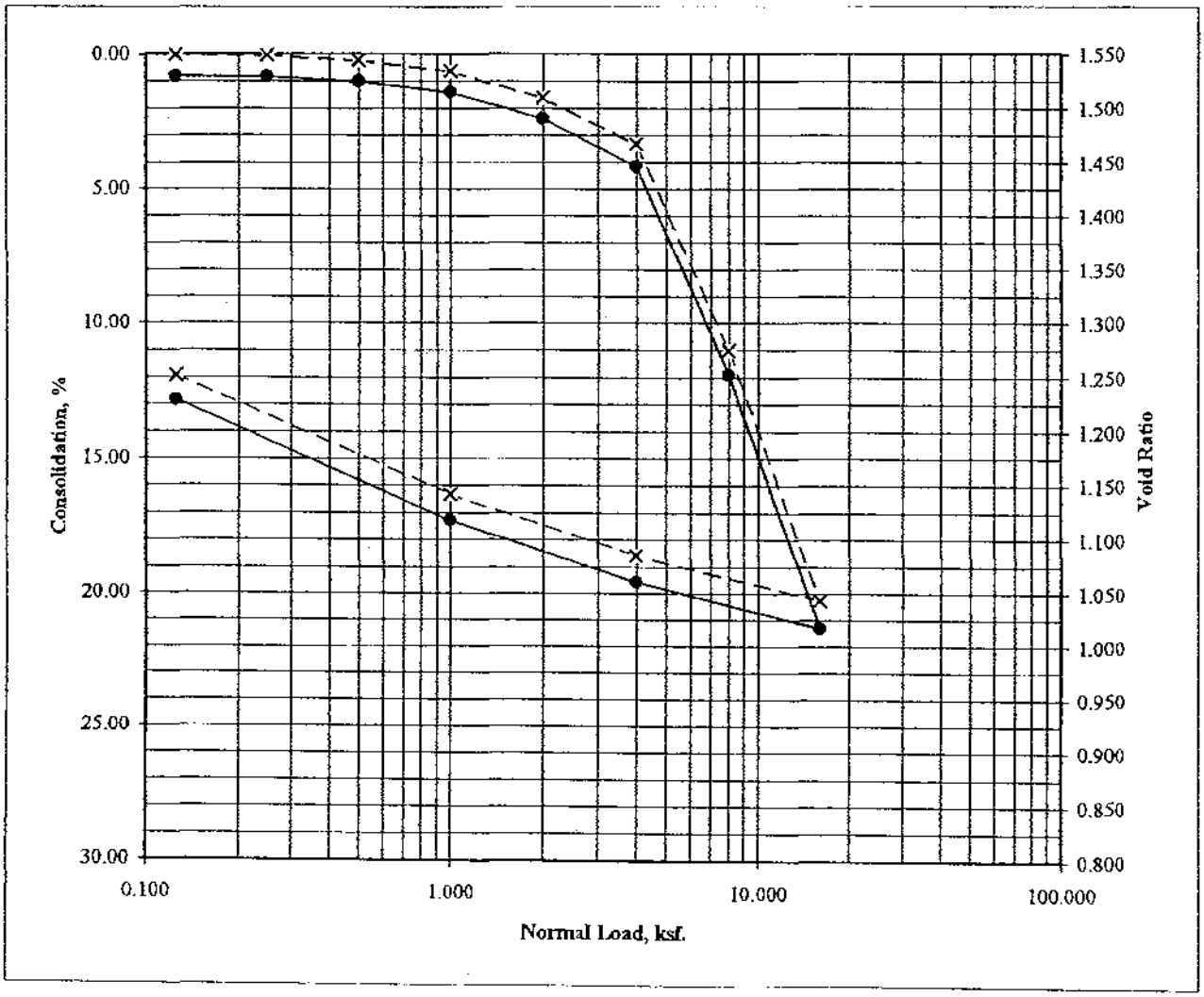
CONSOLIDATION

Shaw EMCON/OWT, Inc.
A Shaw Group Company

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998
Sample No.:	GT04-01 @ 60-62.5'	**Tested By:**	DGC.
Description:	ELASTIC SILT, GRAY.	**Date:**	04/01/04

x **Consolidation vs. Load** ● **Void Ratio vs. Load**



* Flooded with water at the beginning of test.

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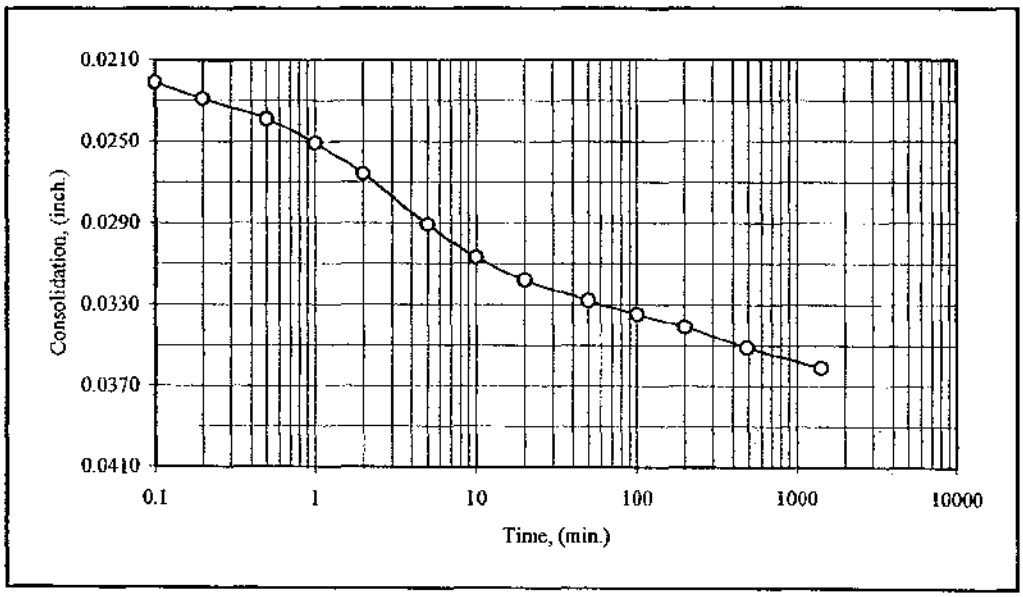
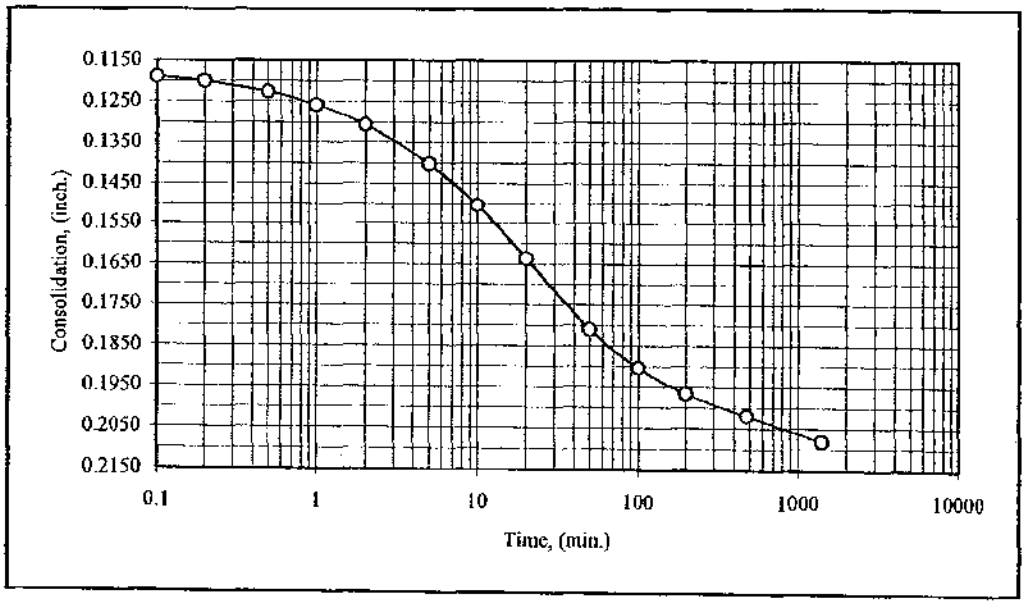
CONSOLIDATION
TIME - COMPRESSION CURVES

Project Name: BRISBANE LANDFILL **Proj. Number:** 837998
Sample No. GT04-01 @ 60-62.5' **Date:** 4/13/04
Description: ELASTIC SILT, GRAY

Load:	4 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0221
0.2	0.0229
0.5	0.0239
1	0.0251
2	0.0266
5	0.0291
10	0.0307
20	0.0318
50	0.0328
101	0.0335
200	0.0341
489	0.0351
1431	0.0361



Load	16 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.1190
0.2	0.1201
0.5	0.1227
1	0.1259
2	0.1307
5	0.1402
10	0.1505
20	0.1637
50	0.1810
100	0.1904
200	0.1966
480	0.2020
1415	0.2081



ATTERBERG LIMITS

ASTM D4318

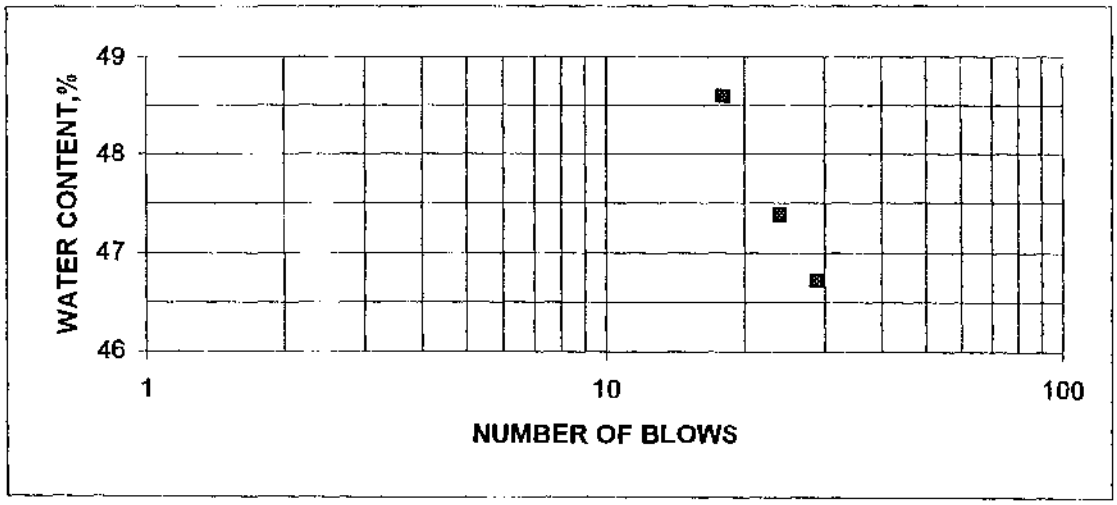
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-01	**Depth, ft.:**	77.5-80'	**Date:**	04/05/04
Description:	LEAN CLAY, GRAY BROWN.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		Nat. w/c
Can Number	M-4	J-6	B-8	G-6	A-5	V-7
Weight of Can + Wet Soil, gms.	71.00	70.19	70.61	47.11	46.75	262.8
Weight of Can + Dry Soil, gms.	58.54	57.90	58.03	44.27	43.96	224.62
Weight of Can, gms.	31.87	31.96	32.14	32.03	32.03	85.7
Weight of Dry Soil, gms.	26.67	25.94	25.89	12.24	11.93	138.92
Weight of Water, gms.	12.46	12.29	12.58	2.84	2.79	38.18
Water Content, %	46.7	47.4	48.6	23.2	23.4	27.5
Number of Blows	29	24	18			

Unified Soil Classification CL



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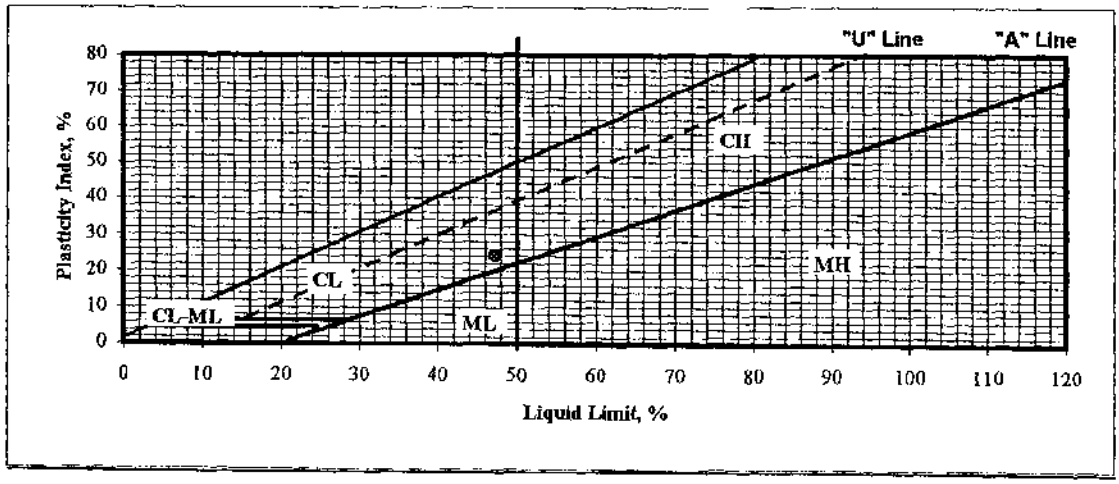

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U.U TRIAXIAL TEST

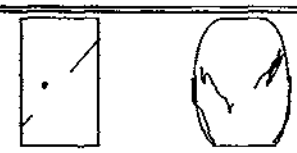
ASTM D2850

Shaw EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
▩ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	04-008
Sample No.:	GT04-01	**Depth, ft.:**	77.5-80'	**Date:**	04/08/04
Description:	LEAN CLAY, GRAY BROWN.			**Tested By:**	DGC

Total Wet Wt., gms.	1231.7
Total Dry Wt., gms.	956.6
Height, in.	6.00
Diameter, in.	2.875
Area, in.^{2}	6.4918
Volume, cf.	0.0225
Dry Density, pcf.	93.6
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



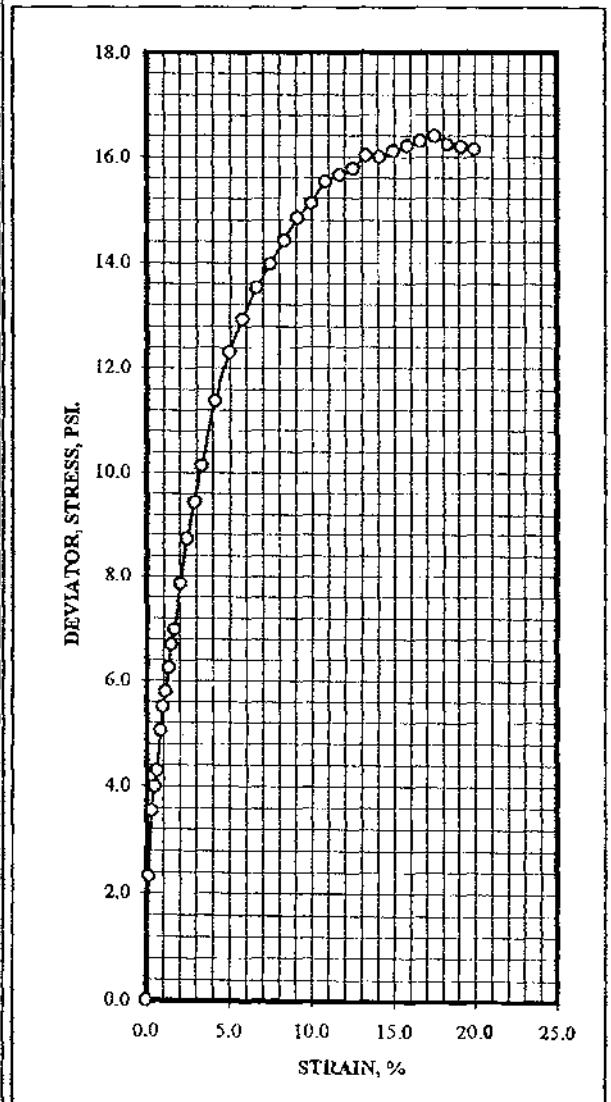
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, %/min.:	1.000

Tare Number	Q
Wet Soil + Tare, gms.	1426.1
Dry Soil + Tare, gms.	1142.2
Tare Weights, gms.	185.6
Weight of Water, gms.	283.9
Wt. of Dry Soil, gms.	956.6
Water Content, %	29.7
Initial Water Content, %	28.8
Saturation	100.1
Confin. Pressure, psi.	35.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.49	0	0.00
10	0.17	6.50	15	2.31
20	0.33	6.51	23	3.53
30	0.50	6.52	26	3.99
40	0.67	6.54	28	4.28
50	0.83	6.55	33	5.04
60	1.00	6.56	36	5.49
70	1.17	6.57	38	5.79
80	1.33	6.58	41	6.23
90	1.50	6.59	44	6.68
100	1.67	6.60	46	6.97
125	2.08	6.63	52	7.84
150	2.50	6.66	58	8.71
175	2.92	6.69	63	9.42
200	3.33	6.72	68	10.13
250	4.17	6.77	77	11.37
300	5.00	6.83	84	12.29
350	5.83	6.89	89	12.91
400	6.67	6.96	94	13.51
450	7.50	7.02	98	13.96
500	8.33	7.08	102	14.40
550	9.17	7.15	106	14.83
600	10.00	7.21	109	15.11
650	10.83	7.28	113	15.52
700	11.67	7.35	115	15.65
750	12.50	7.42	117	15.77
800	13.33	7.49	120	16.02
850	14.17	7.56	121	16.00
900	15.00	7.64	123	16.10
950	15.83	7.71	125	16.21
1000	16.67	7.79	127	16.30
1050	17.50	7.87	129	16.39
1100	18.33	7.95	129	16.23
1150	19.17	8.03	130	16.19
1200	20.00	8.11	131	16.14

DEVIATOR VS. STRAIN GRAPH



ATTERBERG LIMITS

ASTM D4318

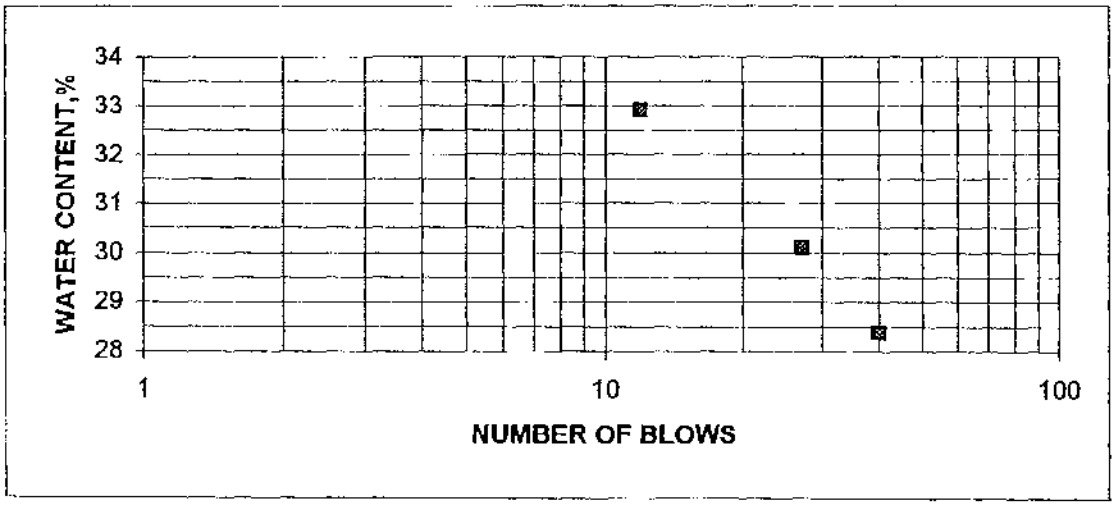
Shaw EMCON/OWT, Inc.

A Shaw Group Company

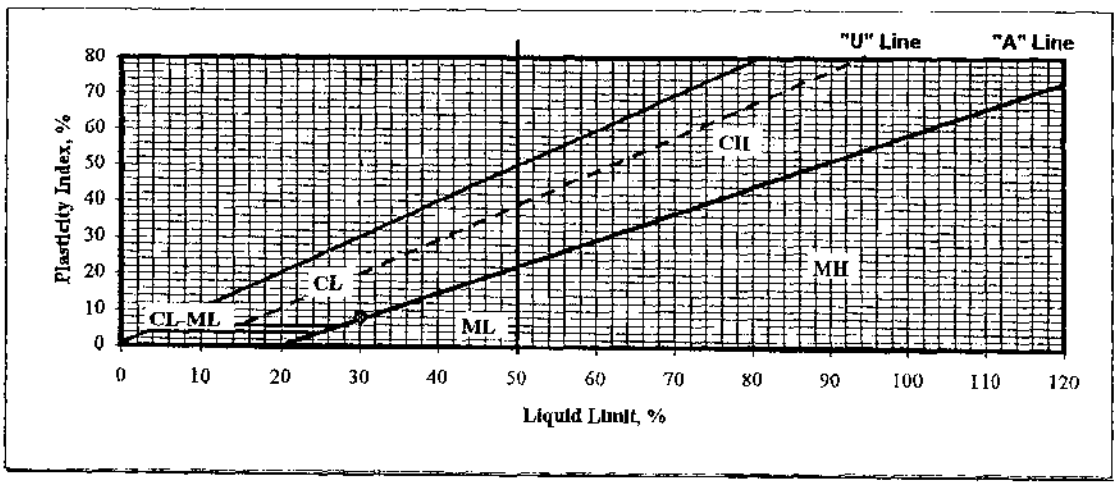
Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-02	**Depth, ft.:**	82-84.5'	**Date:**	04/02/04
Description:	LEAN CLAY, BROWN.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		Nat. w/c
Can Number	A-7	A-6	C-6	O-6	B-2	B-7
Weight of Can + Wet Soil, gms.	67.61	67.94	70.28	51.06	48.96	358.84
Weight of Can + Dry Soil, gms.	59.71	59.62	60.81	47.58	45.91	301.62
Weight of Can, gms.	31.88	31.98	32.03	32.01	32.22	94.5
Weight of Dry Soil, gms.	27.83	27.64	28.78	15.57	13.69	207.12
Weight of Water, gms.	7.90	8.32	9.47	3.48	3.05	57.22
Water Content, %	28.4	30.1	32.9	22.4	22.3	27.6
Number of Blows	40	27	12			

Unified Soil Classification **CL**



LL=	30	PL=	22	PI=	8



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U.U TRIAXIAL TEST

ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
▩ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	04-008
Sample No.:	GT04-02	**Depth, ft.:**	82-84.5'	**Date:**	04/08/04
Description:	LEAN CLAY, BROWN.			**Tested By:**	DGC

Total Wet Wt., gms.	1255.7
Total Dry Wt., gms.	986.8
Height, in.	6.00
Diameter, in.	2.875
Area, in.^{2}	6.4918
Volume, cf.	0.0225
Dry Density, pcf.	96.5
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



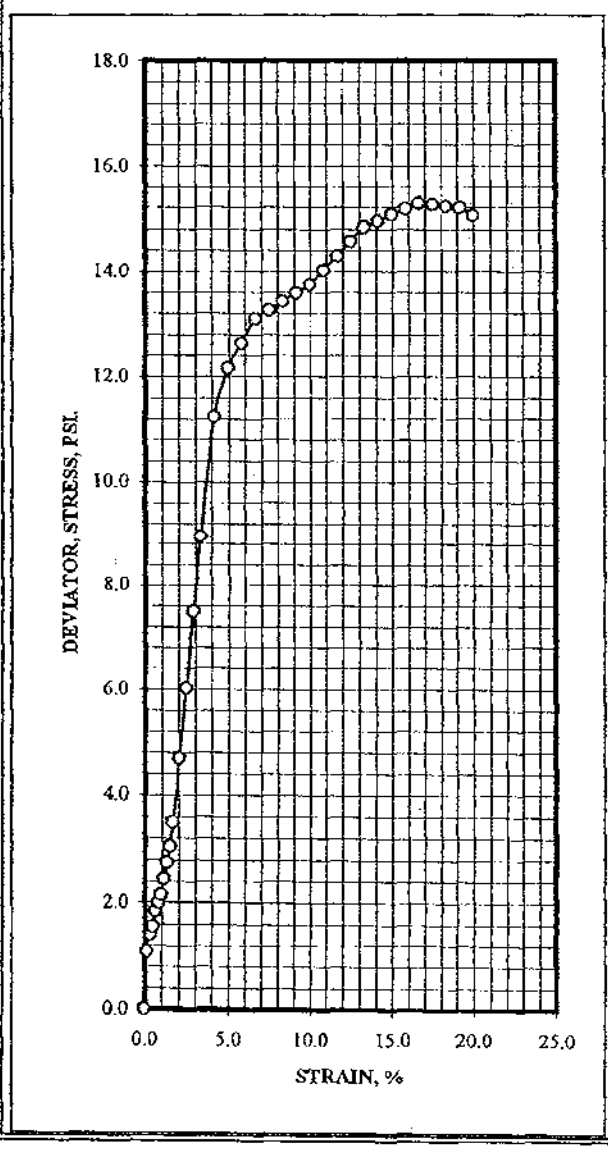
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.000

Tare Number	A-1
Wet Soil + Tare, gms.	1440.3
Dry Soil + Tare, gms.	1167.7
Tare Weights, gms.	180.9
Weight of Water, gms.	272.6
Wt. of Dry Soil, gms.	986.8
Water Content, %	27.6
Initial Water Content, %	27.2
Saturation	100.0
Confin. Pressure, psi.	35.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.49	0	0.00
10	0.17	6.50	7	1.08
20	0.33	6.51	9	1.38
30	0.50	6.52	10	1.53
40	0.67	6.54	12	1.84
50	0.83	6.55	13	1.99
60	1.00	6.56	14	2.13
70	1.17	6.57	16	2.44
80	1.33	6.58	18	2.74
90	1.50	6.59	20	3.03
100	1.67	6.60	23	3.48
125	2.08	6.63	31	4.68
150	2.50	6.66	40	6.01
175	2.92	6.69	50	7.48
200	3.33	6.72	60	8.93
250	4.17	6.77	76	11.22
300	5.00	6.83	83	12.15
350	5.83	6.89	87	12.62
400	6.67	6.96	91	13.08
450	7.50	7.02	93	13.25
500	8.33	7.08	95	13.41
550	9.17	7.15	97	13.57
600	10.00	7.21	99	13.72
650	10.83	7.28	102	14.01
700	11.67	7.35	105	14.29
750	12.50	7.42	108	14.56
800	13.33	7.49	111	14.82
850	14.17	7.56	113	14.94
900	15.00	7.64	115	15.06
950	15.83	7.71	117	15.17
1000	16.67	7.79	119	15.28
1050	17.50	7.87	120	15.25
1100	18.33	7.95	121	15.22
1150	19.17	8.03	122	15.19
1200	20.00	8.11	122	15.03

DEVIATOR VS. STRAIN GRAPH



Shaw EMCON/OWT, Inc.
A Shaw Group Company

CONSOLIDATION

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998
Sample No.:	GT04-02 @ 82-84.5'	**Tested By:**	DGC.
Description:	LEAN CLAY, BROWN.	**Date:**	04/12/04

*** Flooded with water at the beginning of test.**

Consol. No.:	#321
Diameter, in.	2.42
Thickness, in.	1.00
Soil Wet Wt., gms.	145.61
Water Content, %	27.5
Dry Density, pcf.	94.6
Initial Sat.	95.1
Final Sat.	99.4

Tare Number	B-7
Wet Wt. of Soil +Tare, gms.	235.60
Dry Wt. of Soil + Tare, gms.	208.70
Weight of Tare, gms.	94.50
Weight of Water, gms.	26.90
Weight of Dry Soil, gms.	114.20
Final Water Content, %	23.6
Est. Specific Gravity	2.70

LOAD ksf	DIAL .0001 in.	APPLIED CORRECTIONS	HEIGHT, inches.	CONSOL %	DENSITY pcf.	VOID RATIO
0.000	0.0000	0.0000	1.000	0.00	94.6	0.781
0.125	0.0020	0.0000	0.998	0.20	94.8	0.778
0.250	0.0085	0.0000	0.992	0.85	95.4	0.766
0.500	0.0154	0.0000	0.985	1.54	96.1	0.754
1.000	0.0224	0.0000	0.978	2.24	96.8	0.741
2.000	0.0311	0.0000	0.969	3.11	97.6	0.726
4.000	0.0443	0.0000	0.956	4.43	99.0	0.702
8.000	0.0636	0.0000	0.936	6.36	101.0	0.668
16.000	0.0898	0.0000	0.910	8.98	103.9	0.621
32.000	0.1206	0.0000	0.879	12.06	107.6	0.566
8.000	0.1161	0.0000	0.884	11.61	107.0	0.574
1.000	0.1032	0.0000	0.897	10.32	105.5	0.597
0.125	0.0795	0.0000	0.921	7.95	102.8	0.640
			0.000	0.00	0.0	0.000
			0.000	0.00	0.0	0.000

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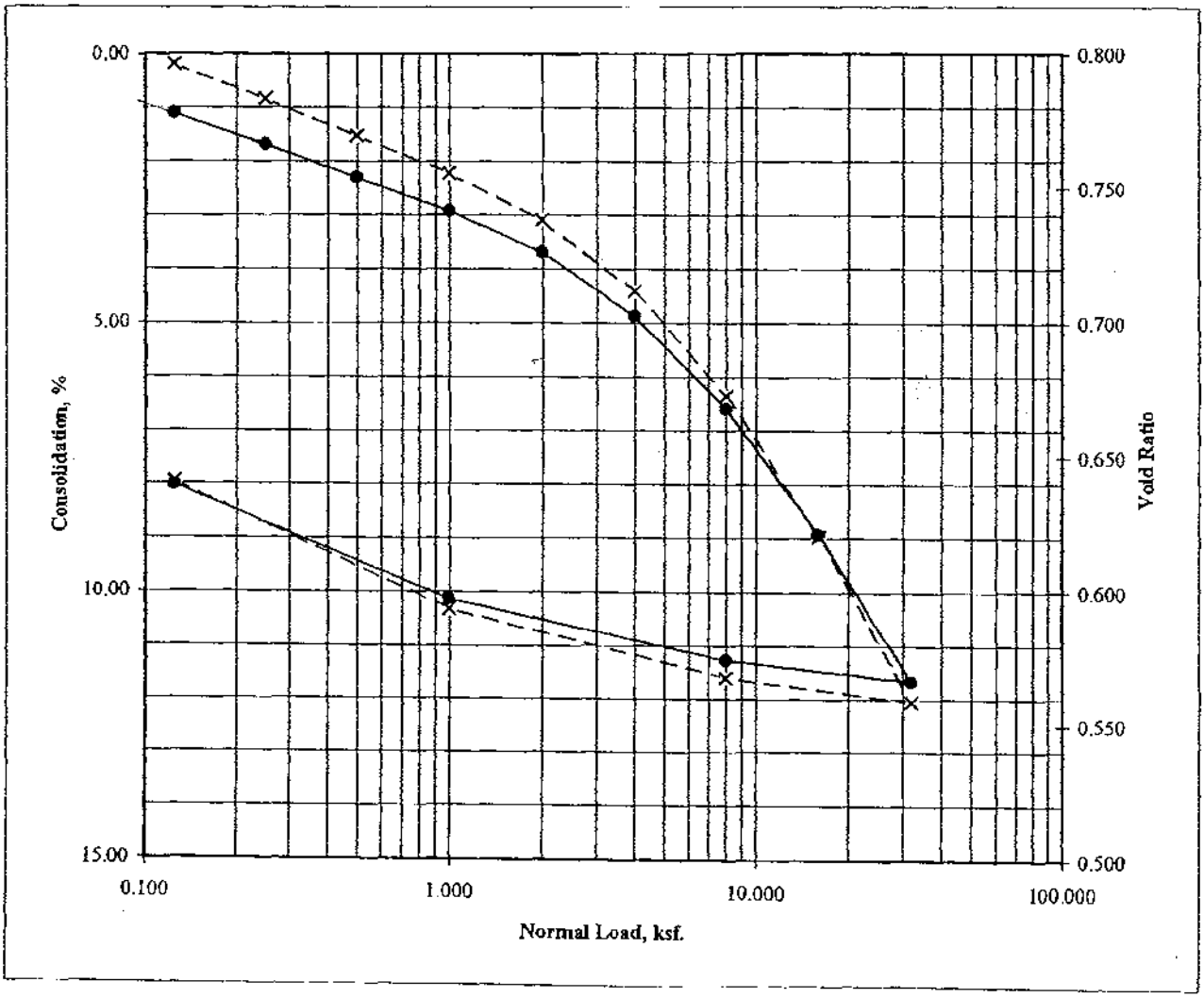
CONSOLIDATION

Shaw EMCON/OWT, Inc.
A Shaw Group Company

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998
Sample No.:	GT04-02 @ 82-84.5'	**Tested By:**	DGC.
Description:	LEAN CLAY, BROWN.	**Date:**	04/12/04

x **Consolidation vs. Load** ● **Void Ratio vs. Load**



* Flooded with water at the beginning of test.

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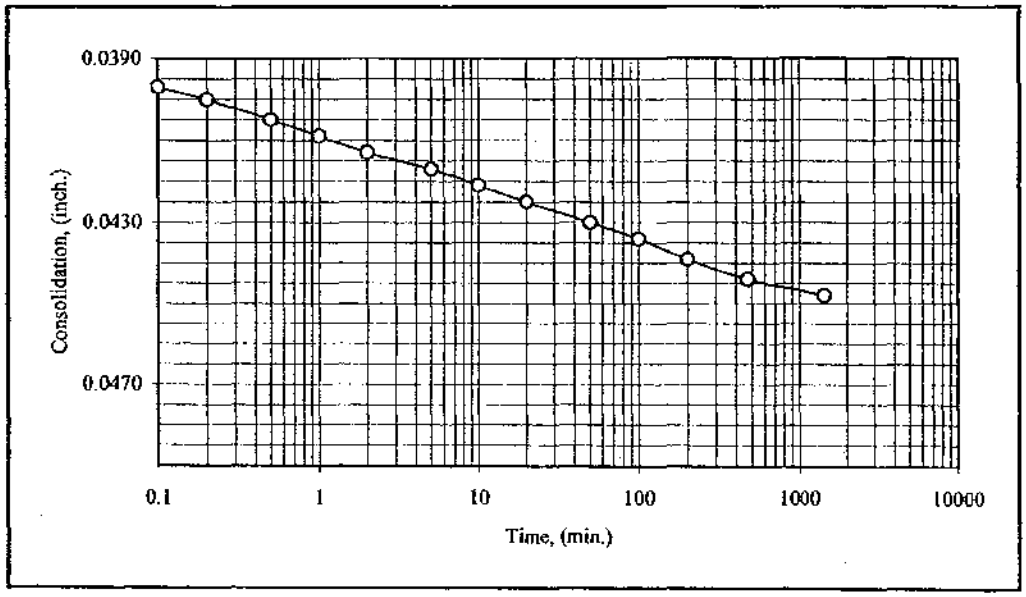
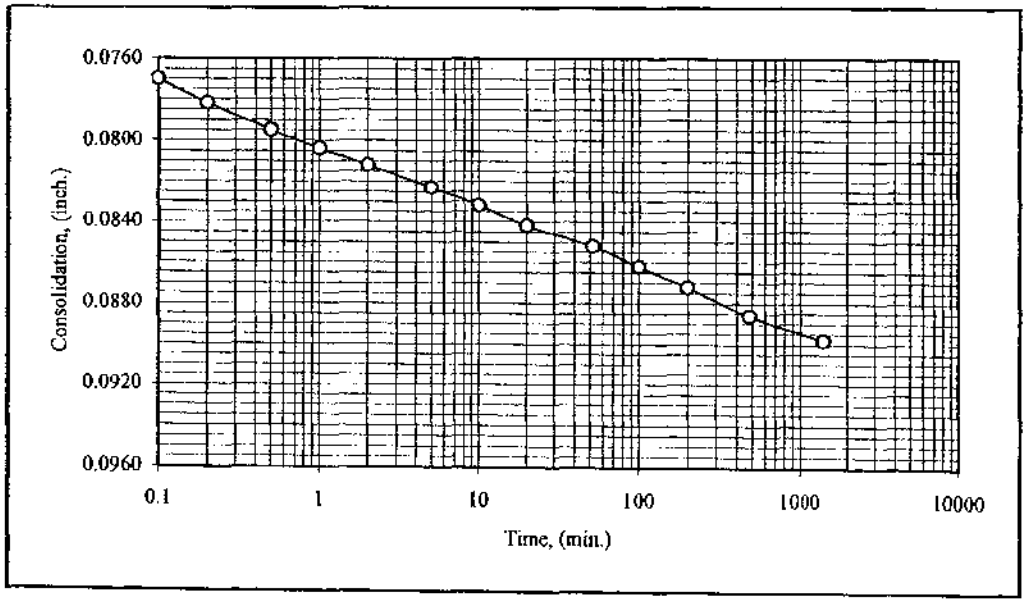
CONSOLIDATION
TIME - COMPRESSION CURVES

Project Name: BRISBANE LANDFILL **Proj. Number:** 837998
Sample No. GT04-02 @ 82-84.5' **Date:** 4/20/04
Description: LEAN CLAY, BROWN.

Load:	4 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0397
0.2	0.0400
0.5	0.0405
1	0.0409
2	0.0413
5	0.0417
10	0.0421
20	0.0425
50	0.0430
100	0.0434
200	0.0439
474	0.0444
1440	0.0448



Load	16 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0770
0.2	0.0782
0.5	0.0795
1	0.0804
2	0.0812
5	0.0823
10	0.0832
20	0.0842
52	0.0852
100	0.0862
200	0.0872
481	0.0886
1413	0.0898



ATTERBERG LIMITS

ASTM D4318

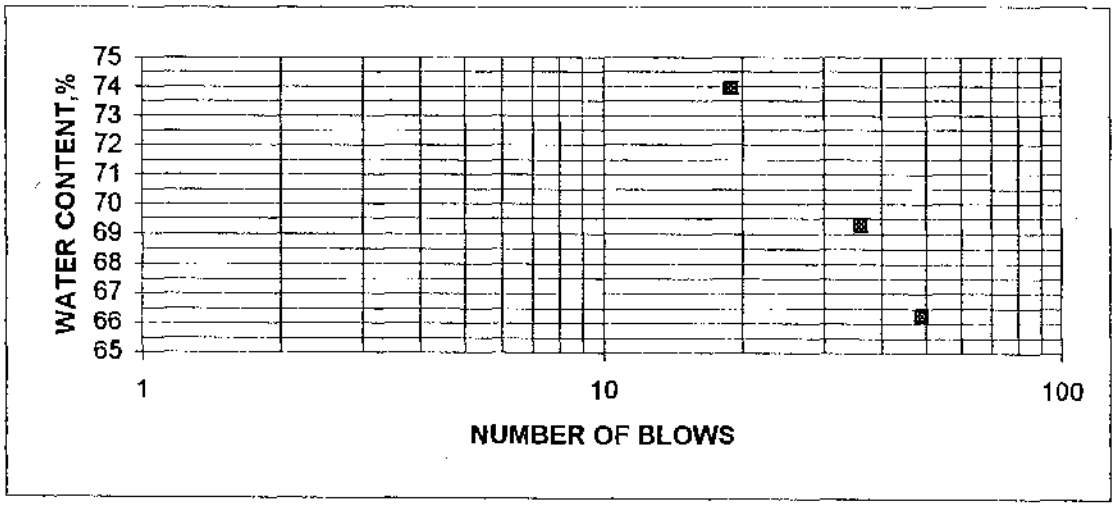
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-02	**Depth, ft.:**	92-92.5'	**Date:**	04/08/04
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		Nat. w/c
Can Number	E-4	B-7	F-6	B-3	C-1	Z-1
Weight of Can + Wet Soil, gms.	69.16	69.64	68.43	47.68	47.37	207.6
Weight of Can + Dry Soil, gms.	54.27	54.17	52.92	44.29	44.03	167.6
Weight of Can, gms.	31.80	31.84	31.94	32.16	32.04	52.1
Weight of Dry Soil, gms.	22.47	22.33	20.98	12.13	11.99	115.50
Weight of Water, gms.	14.89	15.47	15.51	3.39	3.34	40.00
Water Content, %	66.3	69.3	73.9	27.9	27.9	34.6
Number of Blows	49	36	19			

Unified Soil Classification **CH**



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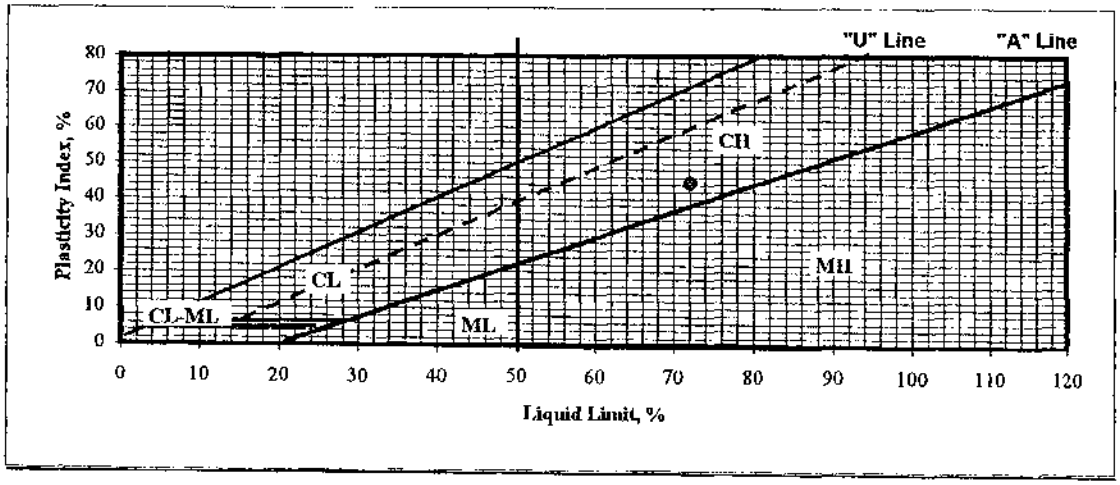

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ATTERBERG LIMITS

ASTM D4318

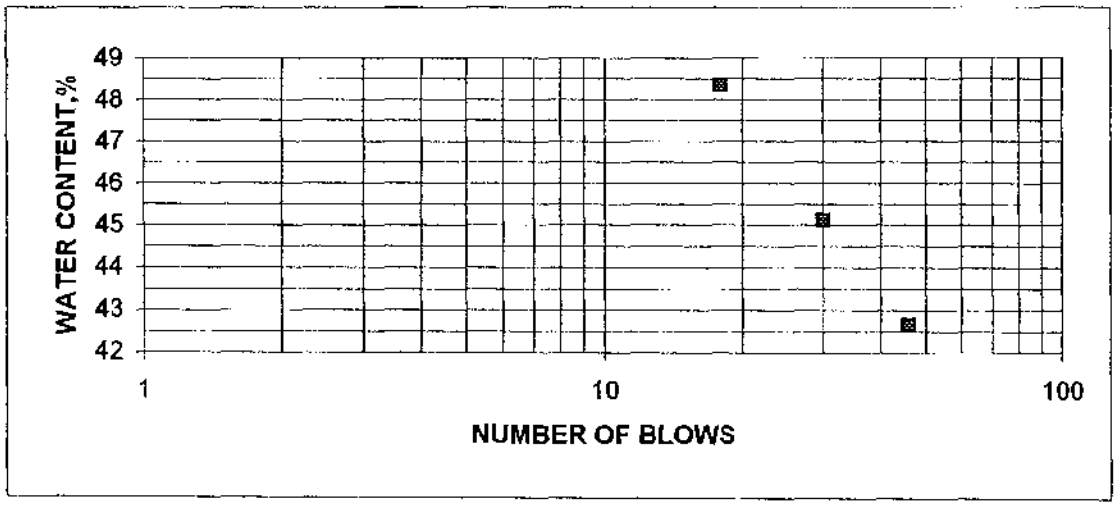
Shaw™ EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-03	**Depth, ft.:**	0-4'	**Date:**	03/31/04
Description:	CLAYEY SAND WITH GRAVEL, BROWN.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	C-1	F-6	B-7	B-3	E-4	
Weight of Can + Wet Soil, gms.	68.13	67.58	70.19	46.90	45.05	
Weight of Can + Dry Soil, gms.	57.34	56.50	57.69	44.20	42.64	
Weight of Can, gms.	32.05	31.94	31.83	32.17	31.80	
Weight of Dry Soil, gms.	25.29	24.56	25.86	12.03	10.84	
Weight of Water, gms.	10.79	11.08	12.50	2.70	2.41	
Water Content, %	42.7	45.1	48.3	22.4	22.2	
Number of Blows	46	30	18			

Unified Soil Classification **SC**



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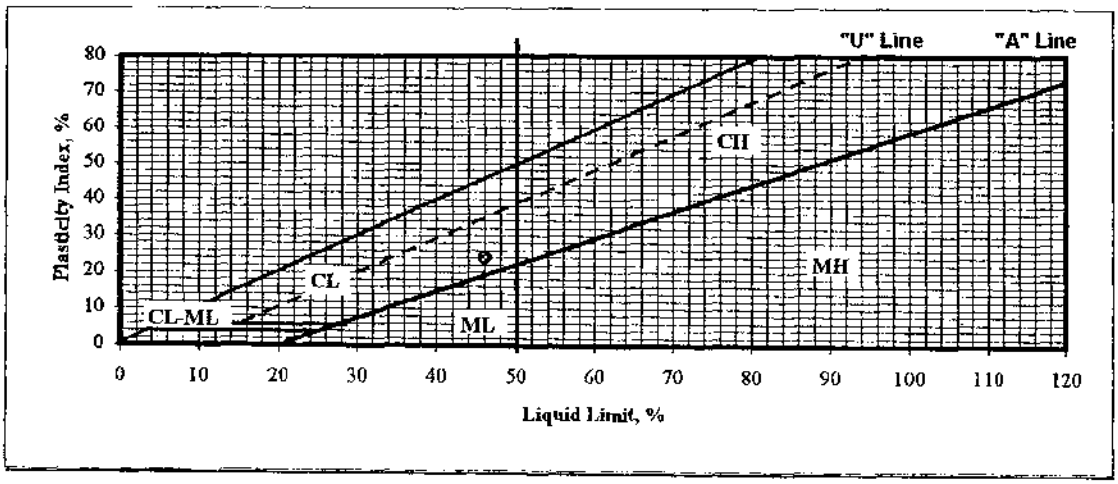

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GRAIN SIZE DISTRIBUTION

ASTM D422

Shaw™ EMCON/OWT, Inc.

A Shaw Group Company

LAB. NO.: 04-008

PROJECT NAME: BRISBANE LANDFILL — PROJECT NO.: 837998

SAMPLE NO.: GT04-03 @ 0-4' — DATE: 03/29/04

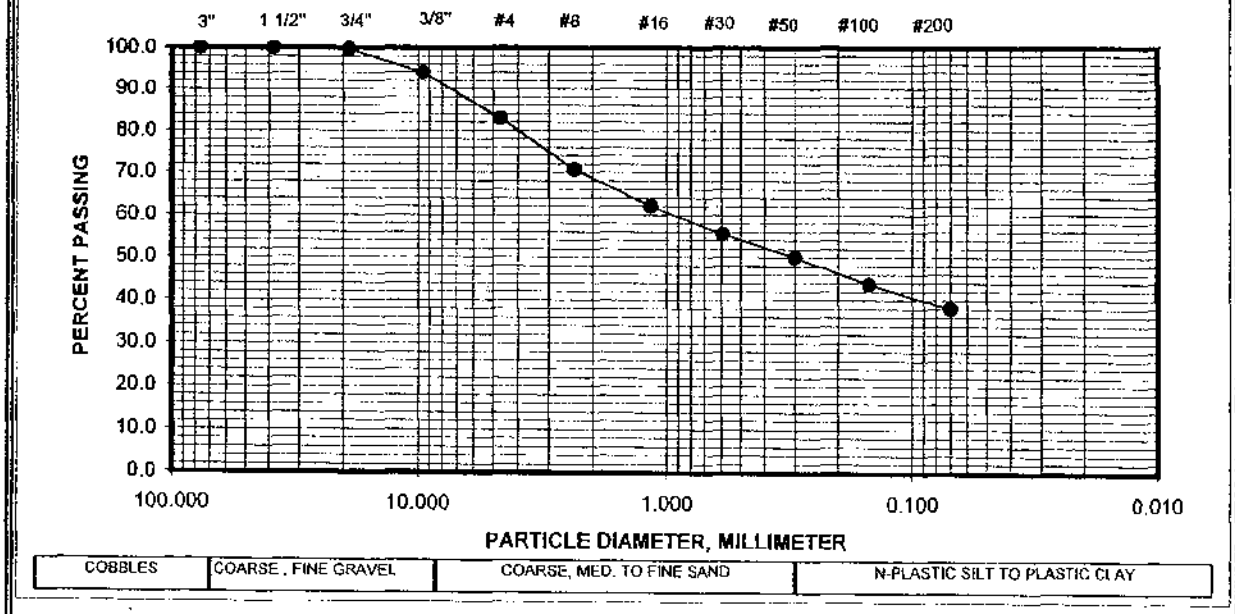
DESCRIPTION: CLAYEY SAND WITH GRAVEL, BROWN. — TECH.: DGC

UNIFIED SOIL CLASSIFICATION:	SC	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0		
Pan Number:	#502	3/4"	99.7		
Pan + Wet Soil, gms.	972.5	3/8"	93.9		
Pan + Dry Soil, gms.	850.6	D_{60}	0.942		
Wt. of Pan, gms.	133.9	D_{30}	#DIV/0!		
Wt. of Dry Soil, gms.	716.7	D_{10}	0.001	Liquid Limit:	46
Wt. of Water, gms.	121.9	C_U	813.87	Plasticity Index:	24
Water content, %.	17.0	C_C	#DIV/0!	High; Mod.; Low; NP:	

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	ARTICLES IAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	716.7	100.0
3"	3.000	76.20		0	716.7	100.0
1 1/2"	1.500	38.10		0	716.7	100.0
3/4"	0.750	18.90		0	716.7	99.7
3/8"	0.375	9.52		0	716.7	93.9
#4	0.185	4.70	84.50	84.5	632.2	82.8
#8	0.093	2.36	92.4	176.9	539.8	70.7
#16	0.046	1.17	66.1	243	473.7	62.1
#30	0.023	0.59	49.8	292.8	423.9	55.5
#50	0.012	0.30	42.3	335.1	381.6	50.0
#100	0.006	0.15	47.6	382.7	334	43.8
#200	0.003	0.07	43.4	426.1	290.6	38.1

Bulb 152H
HYDROMETER TEST
WITH DISPERSING AGENT

17.2%



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ATTERBERG LIMITS

ASTM D4318

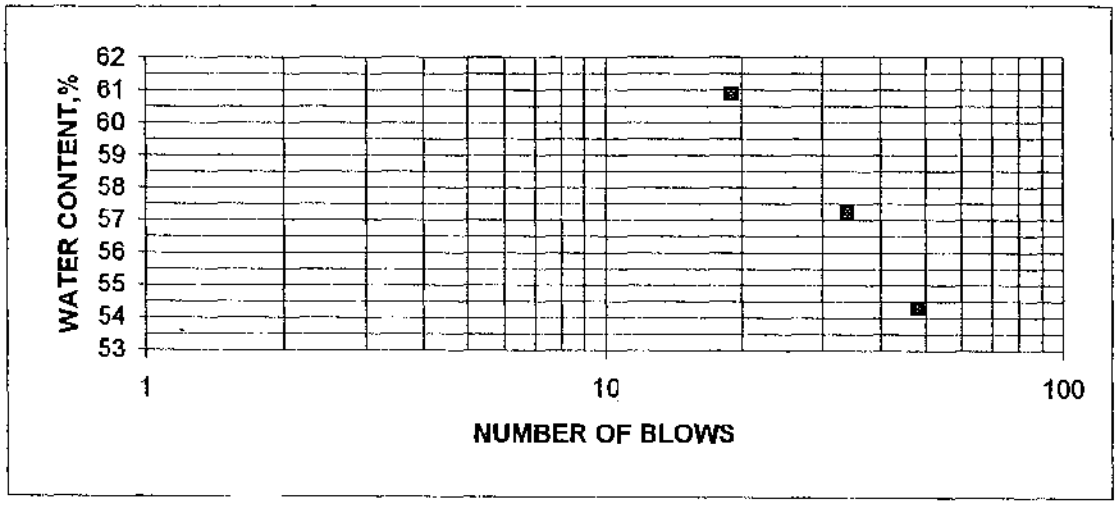
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-03	**Depth, ft.:**	35-37.5'	**Date:**	04/02/04
Description:	ELASTIC SILT, GRAY.			**Tested By:**	DGC
				Checked By:	

	Liquid Limit			Plastic Limit		Nat. w/c
Can Number	B-8	J-6	G-6	M-4	A-5	A-1
Weight of Can + Wet Soil, gms.	65.56	65.12	68.00	46.61	45.23	293.8
Weight of Can + Dry Soil, gms.	53.80	53.05	54.39	43.06	42.05	215.4
Weight of Can, gms.	32.14	31.96	32.03	31.88	32.04	83.61
Weight of Dry Soil, gms.	21.66	21.09	22.36	11.18	10.01	131.79
Weight of Water, gms.	11.76	12.07	13.61	3.55	3.18	78.40
Water Content, %	54.3	57.2	60.9	31.8	31.8	59.5
Number of Blows	48	34	19			

Unified Soil Classification **MH**



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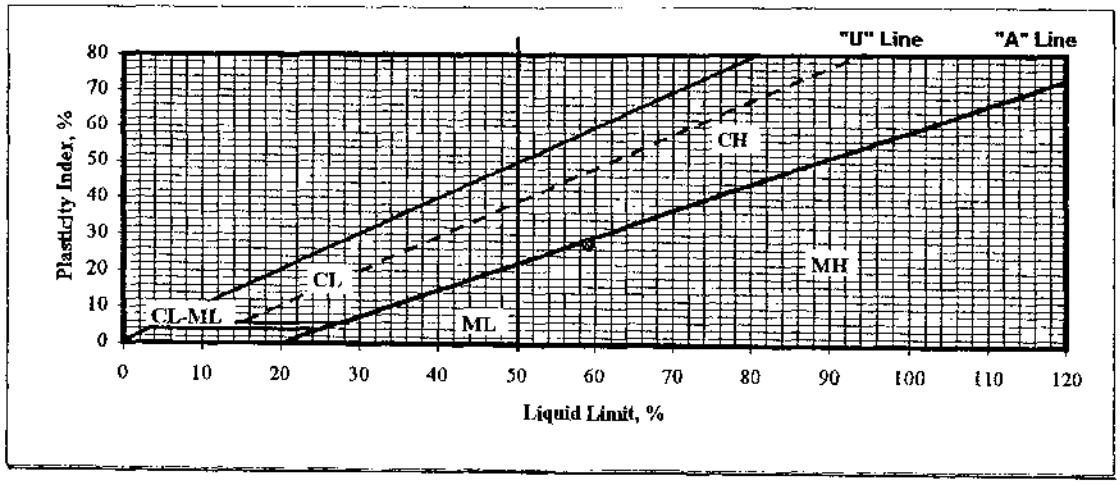

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U.U TRIAXIAL TEST

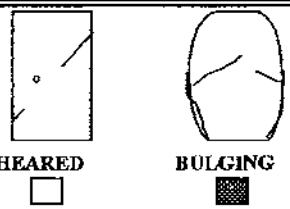
ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	04-008
Sample No.:	GT04-03	**Depth, ft.:**	35-37.5'	**Date:**	04/08/04
Description:	ELASTIC SILT, GRAY			**Tested By:**	DGC

Total Wet Wt., gms.	1026.1			Tare Number	A-1
Total Dry Wt., gms.	640.3			Wet Soil + Tare, gms.	1207.6
Height, in.	6.00			Dry Soil + Tare, gms.	821.2
Diameter, in.	2.875			Tare Weights, gms.	180.9
Area, in.^{2}	6.4918			Weight of Water, gms.	386.4
Volume, cf.	0.0225			Wt. of Dry Soil, gms.	640.3
Dry Density, pcf.	62.6			Water Content, %	60.3
Est. Spec. Gravity	2.7			Initial Water Content, %	60.3
Max. Dry Density, pcf.		L.C. Cal. lbs./div.	1.00	Saturation	96.4
Opt. Water Content, %.		Strain Rate, %/min.:	1.000	Confin. Pressure, psi.	35.0



SKETCH AT FAILURE

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.49	0	0.00
10	0.17	6.50	11	1.69
20	0.33	6.51	15	2.30
30	0.50	6.52	19	2.91
40	0.67	6.54	23	3.52
50	0.83	6.55	28	4.28
60	1.00	6.56	32	4.88
70	1.17	6.57	35	5.33
80	1.33	6.58	39	5.93
90	1.50	6.59	43	6.52
100	1.67	6.60	45	6.82
125	2.08	6.63	52	7.84
150	2.50	6.66	58	8.71
175	2.92	6.69	60	8.97
200	3.33	6.72	62	9.23
250	4.17	6.77	62	9.15
300	5.00	6.83	61	8.93
350	5.83	6.89	61	8.85
400	6.67	6.96	61	8.77
450	7.50	7.02	61	8.69
500	8.33	7.08	61	8.61
550	9.17	7.15	62	8.68
600	10.00	7.21	62	8.60
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
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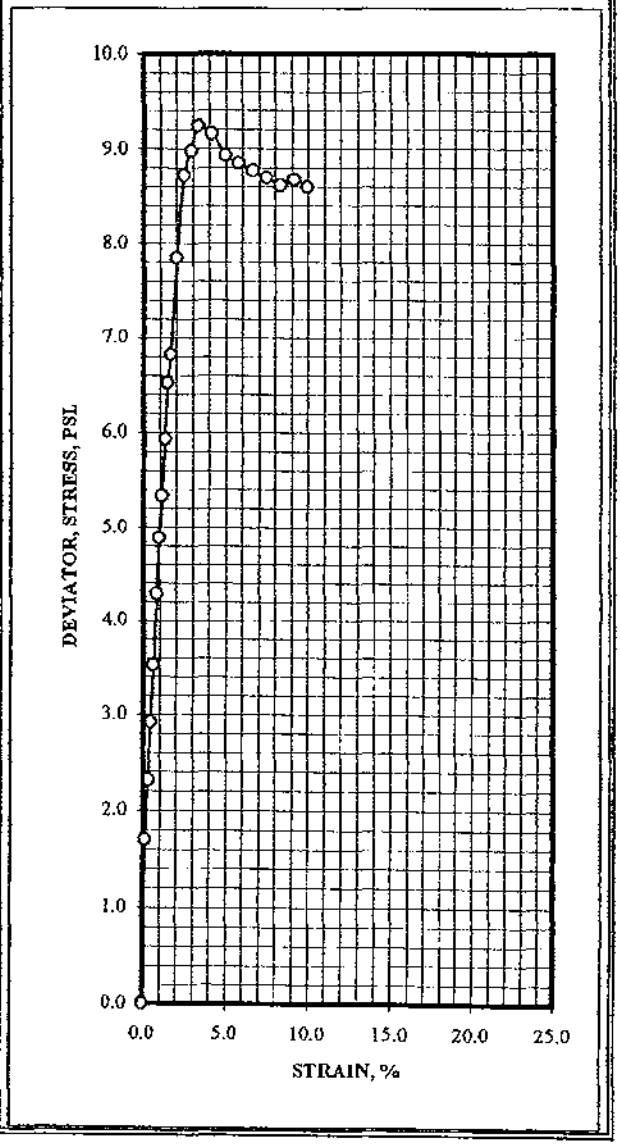
	0.00	0.00		0.00
	0.00	0.00		0.00

DEVIATOR VS. STRAIN GRAPH



Shaw EMCON/OWT, Inc.
A Shaw Group Company

CONSOLIDATION

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998
Sample No.:	GT04-03 @ 35-37.5'	**Tested By:**	DGC.
Description:	ELASTIC SILT, GRAY.	**Date:**	04/01/04

*** Flooded with water at the beginning of test.**

Consol. No.:	#2
Diameter, in.	2.42
Thickness, in.	1.00
Soil Wet Wt., gms.	124.31
Water Content, %	59.4
Dry Density, pcf.	64.6
Initial Sat.	99.7
Final Sat.	99.9

Tare Number	A-1
Wet Wt. of Soil +Tare, gms.	193.06
Dry Wt. of Soil + Tare, gms.	161.50
Weight of Tare, gms.	83.50
Weight of Water, gms.	31.56
Weight of Dry Soil, gms.	78.00
Final Water Content, %	40.5
Est. Specific Gravity	2.70

LOAD ksf.	DIAL .0001 in.	APPLIED CORRECTIONS	HEIGHT, inches.	CONSOL %	DENSITY pcf.	VOID RATIO
0.000	0.0000	0.0000	1.000	0.00	64.6	1.608
0.125	0.0007	0.0002	0.999	0.05	64.6	1.607
0.250	0.0030	0.0002	0.997	0.28	64.8	1.601
0.500	0.0096	0.0005	0.991	0.91	65.2	1.584
1.000	0.0206	0.0015	0.981	1.91	65.9	1.558
2.000	0.0463	0.0023	0.956	4.40	67.6	1.493
4.000	0.0956	0.0032	0.908	9.24	71.2	1.367
8.000	0.1850	0.0050	0.820	18.00	78.8	1.138
16.000	0.2639	0.0063	0.742	25.76	87.0	0.936
4.000	0.2532	0.0059	0.753	24.73	85.8	0.963
1.000	0.2344	0.0044	0.770	23.00	83.9	1.008
0.125	0.2004	0.0032	0.803	19.72	80.5	1.094
			0.000	0.00	0.0	0.000
			0.000	0.00	0.0	0.000
			0.000	0.00	0.0	0.000

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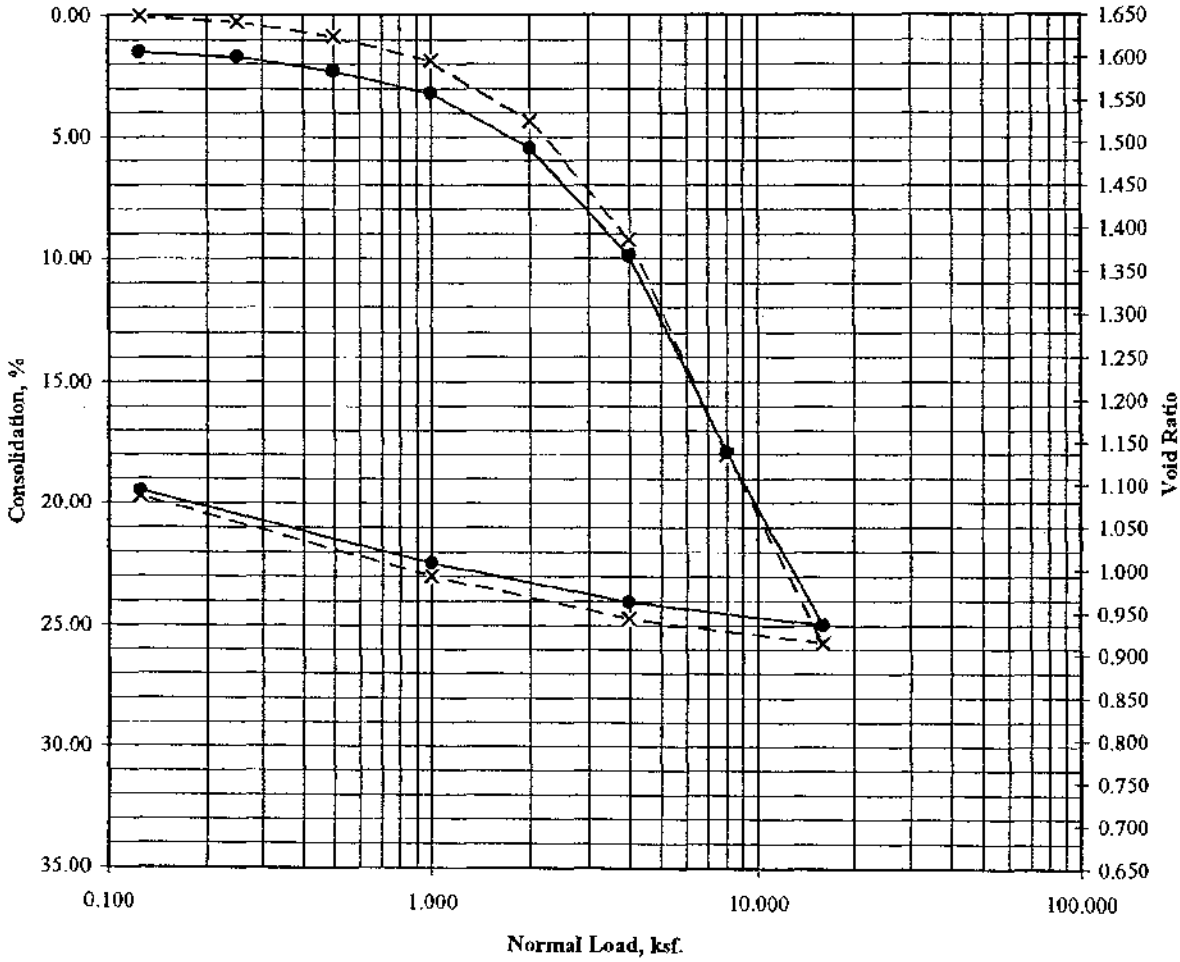
CONSOLIDATION

Shaw EMCON/OWT, Inc.
A Shaw Group Company

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998
Sample No.:	GT04-03 @ 35-37.5'	**Tested By:**	DGC.
Description:	ELASTIC SILT, GRAY.	**Date:**	04/01/04

x **Consolidation vs. Load** ● **Void Ratio vs. Load**



* Flooded with water at the beginning of test.

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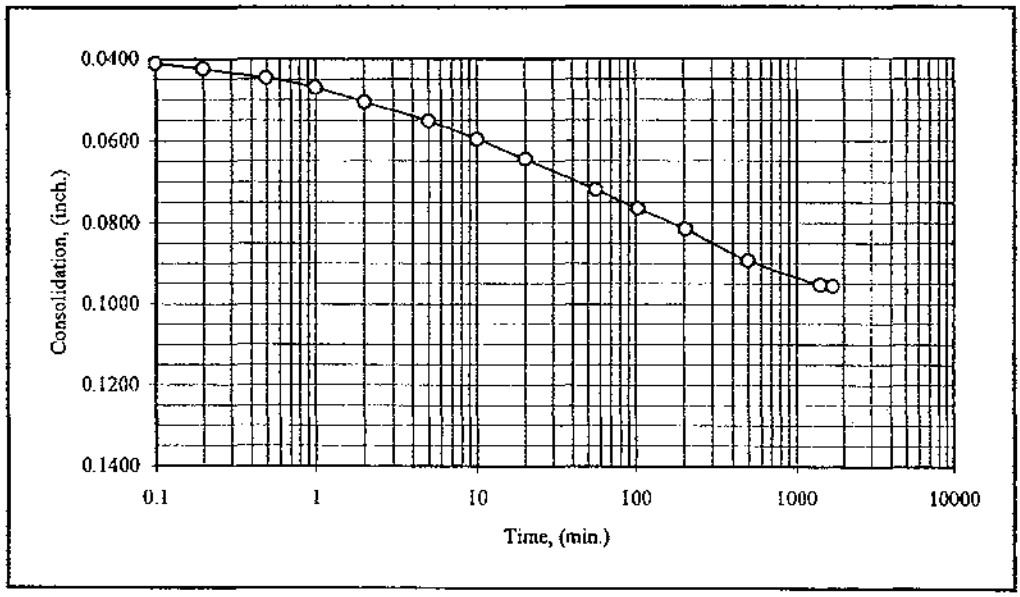
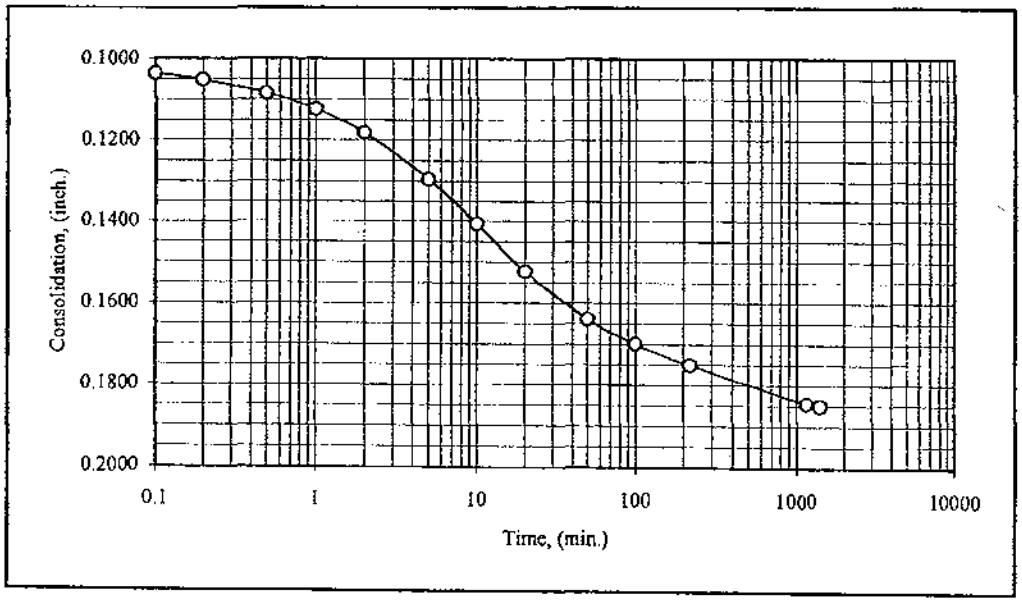
CONSOLIDATION
TIME - COMPRESSION CURVES

Project Name: BRISBANE LANDFILL **Proj. Number:** 837998
Sample No. GT04-03 @ 35-37.5' **Date:** 4/7/04
Description: ELASTIC SILT, GRAY

Load:	4 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0411
0.2	0.0425
0.5	0.0446
1	0.0470
2	0.0506
5	0.0552
10	0.0597
20	0.0645
56	0.0720
103	0.0765
204	0.0815
498	0.0893
1429	0.0953
1700	0.0956



Load	8 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.1036
0.2	0.1052
0.5	0.1085
1	0.1124
2	0.1182
5	0.1295
10	0.1406
20	0.1523
50	0.1639
100	0.1699
220	0.1752
1170	0.1845
1428	0.1850



GRAIN SIZE DISTRIBUTION

ASTM D422

Shaw™ EMCON/OWT, Inc.

A Shaw Group Company

LAB. NO.: 04-008

PROJECT NAME: BRISBANE LANDFILL — PROJECT NO.: 837998

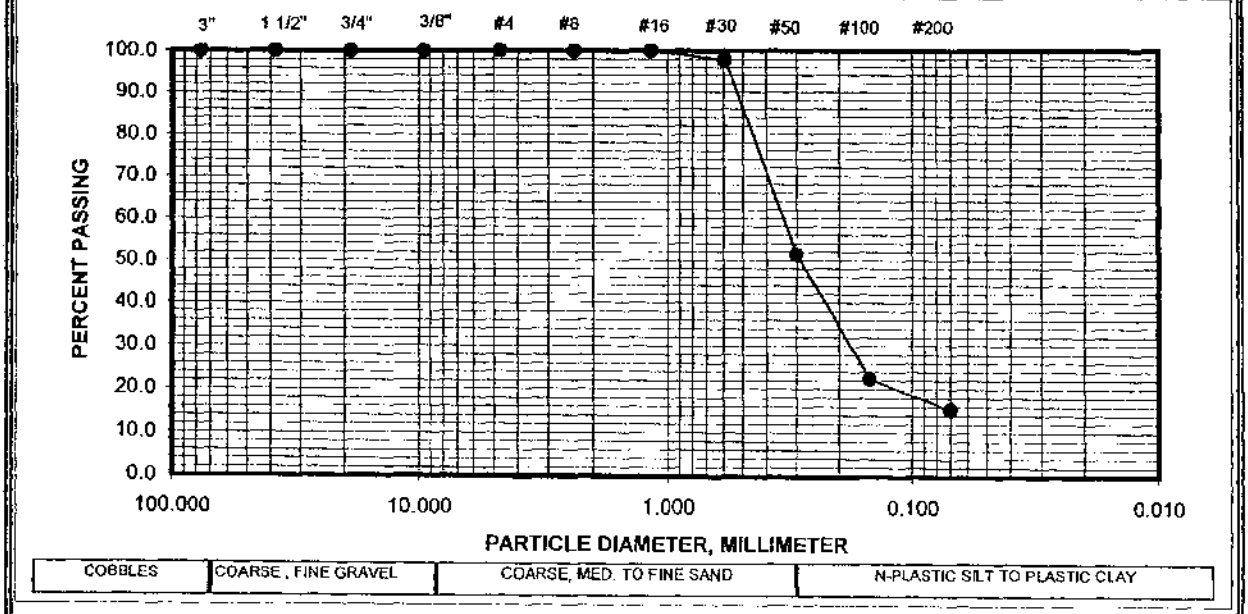
SAMPLE NO.: GT04-03 @ 45-47.5" — DATE: 03/29/04

DESCRIPTION: SILTY SAND, GRAY. — TECH.: DGC

UNIFIED SOIL CLASSIFICATION:	SM	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0		
Pan Number:	#90	3/4"	100.0		
Pan + Wet Soil, gms.	1122.0	3/8"	100.0		
Pan + Dry Soil, gms.	973.0	D_{60}	0.340		
Wt. of Pan, gms.	176.7	D_{30}	0.180		
Wt. of Dry Soil, gms.	796.3	D_{10}	0.002	Liquid Limit:	
Wt. of Water, gms.	149.0	C_U	176.16	Plasticity Index:	
Water content, %.	18.7	C_C	49.24	High; Mod.; Low; NP:	NP

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	ARTICLES IAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	796.3	100.0
3"	3.000	76.20		0	796.3	100.0
1 1/2"	1.500	38.10		0	796.3	100.0
3/4"	0.750	18.90		0	796.3	100.0
3/8"	0.375	9.52	0.0	0	796.3	100.0
#4	0.185	4.70	0.20	0.2	796.1	100.0
#8	0.093	2.36	0.2	0.4	795.9	99.9
#16	0.046	1.17	0.3	0.7	795.6	99.9
#30	0.023	0.59	16.7	17.4	778.9	97.8
#50	0.012	0.30	369.7	387.1	409.2	51.4
#100	0.006	0.15	230.6	617.7	178.6	22.4
#200	0.003	0.07	55.5	673.2	123.1	15.5

Bulb 152H
HYDROMETER TEST
WITH DISPERSING AGENT



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GRAIN SIZE DISTRIBUTION

ASTM D422

Shaw™ EMCON/OWT, Inc.

A Shaw Group Company

LAB. NO.: 04-008

PROJECT NAME: BRISBANE LANDFILL — PROJECT NO.: 837998

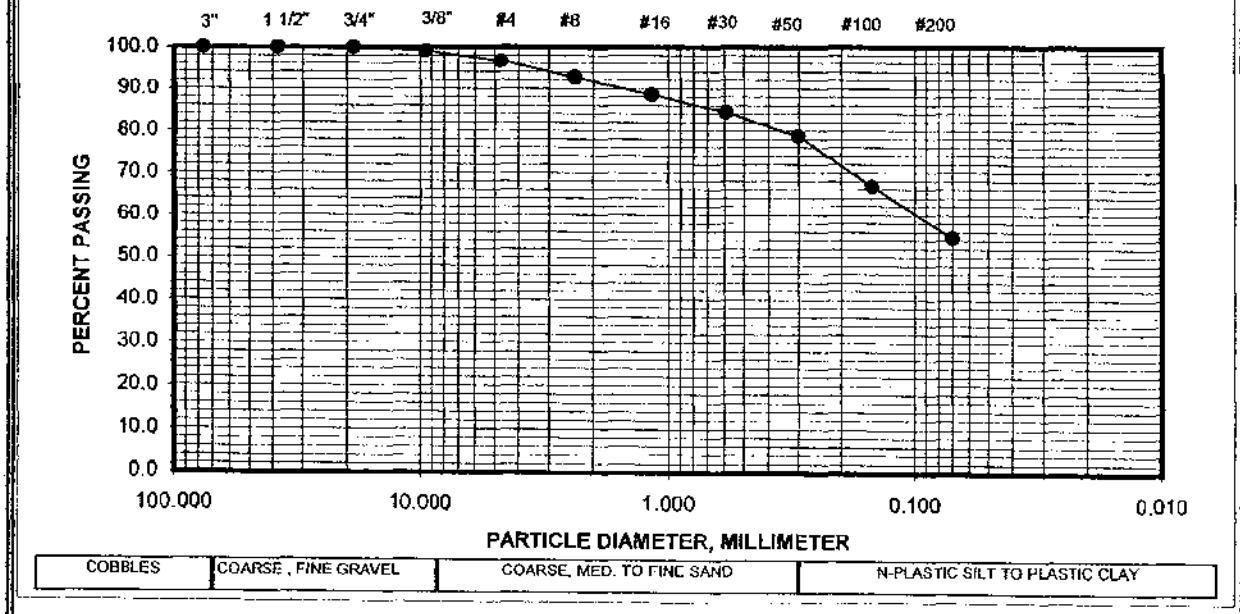
SAMPLE NO.: GT04-04 @ 3-9' — DATE: 03/29/04

DESCRIPTION: SANDY LEAN CLAY, BROWN. — TECH.: DGC

UNIFIED SOIL CLASSIFICATION:	CL	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0		
Pan Number:	#510	3/4"	100.0		
Pan + Wet Soil, gms.	903.5	3/8"	100.0		
Pan + Dry Soil, gms.	773.4	D_{60}	0.098		
Wt. of Pan, gms.	89.1	D_{30}	#DIV/0!		
Wt. of Dry Soil, gms.	684.3	D_{10}	0.001	Liquid Limit:	38
Wt. of Water, gms.	130.1	C_U	89.32	Plasticity Index:	20
Water content, %.	19.0	C_C	#DIV/0!	High; Mod.; Low; NP:	

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	ARTICLES IAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	684.3	100.0
3"	3.000	76.20		0	684.3	100.0
1 1/2"	1.500	38.10		0	684.3	100.0
3/4"	0.750	18.90		0	684.3	100.0
3/8"	0.375	9.52	6.1	6.1	678.2	99.1
#4	0.185	4.70	17.30	23.4	660.9	96.6
#8	0.093	2.36	26.9	50.3	634	92.6
#16	0.046	1.17	28.3	78.6	605.7	88.5
#30	0.023	0.59	27.8	106.4	577.9	84.5
#50	0.012	0.30	40.0	146.4	537.9	78.6
#100	0.006	0.15	81.0	227.4	456.9	66.8
#200	0.003	0.07	83.0	310.4	373.9	54.6

Bulb 152H
HYDROMETER TEST
WITH DISPERSING AGENT



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ATTERBERG LIMITS

ASTM D4318

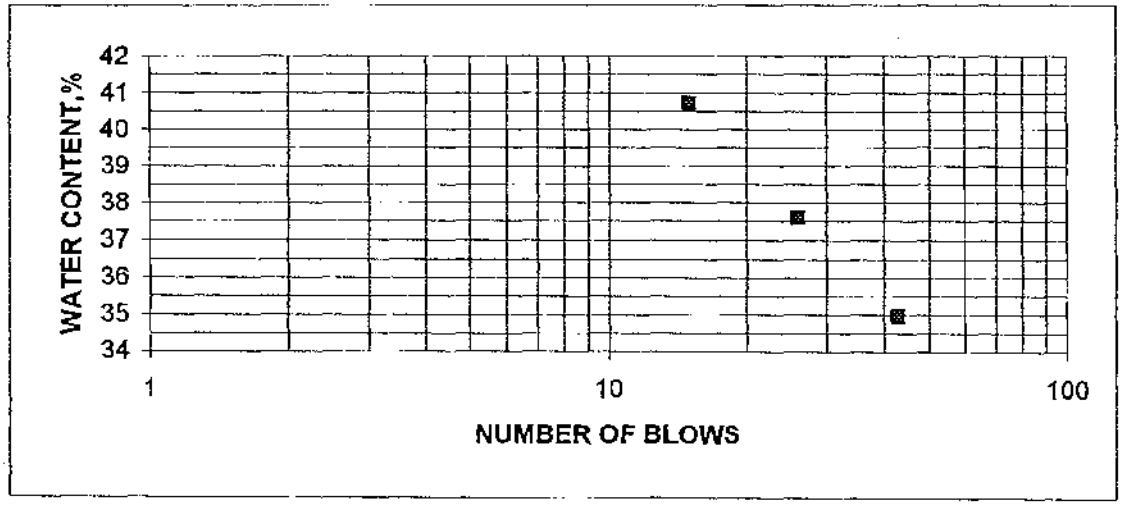
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-04	**Depth, ft.:**	3-9'	**Date:**	03/31/04
Description:	SANDY LEAN CLAY, BROWN.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	B-1	A-8	C-2	D-6	B-6	
Weight of Can + Wet Soil, gms.	66.99	66.92	69.65	48.02	46.55	
Weight of Can + Dry Soil, gms.	57.95	57.34	58.79	45.58	44.37	
Weight of Can, gms.	32.09	31.86	32.12	31.91	32.01	
Weight of Dry Soil, gms.	25.86	25.48	26.67	13.67	12.36	
Weight of Water, gms.	9.04	9.58	10.86	2.44	2.18	
Water Content, %	35.0	37.6	40.7	17.8	17.6	
Number of Blows	43	26	15			

Unified Soil Classification **CL**



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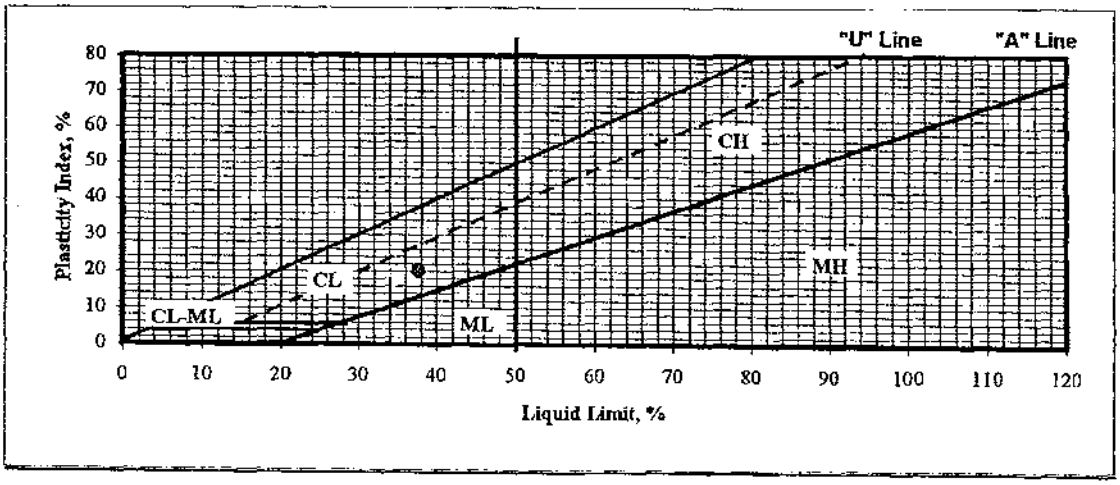

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ATTERBERG LIMITS

ASTM D4318

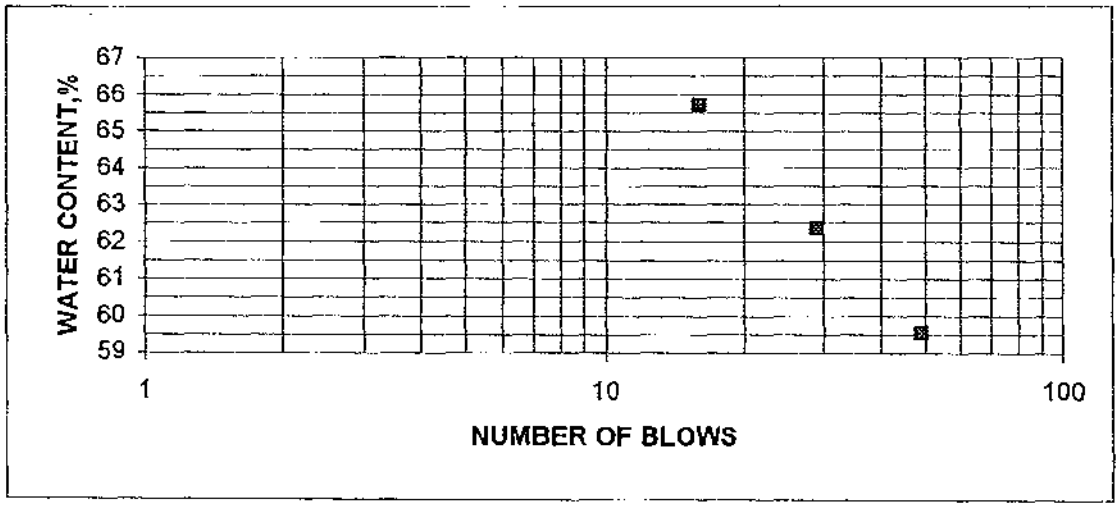
Shaw EMCON/OWT, Inc.

A Shaw Group Company

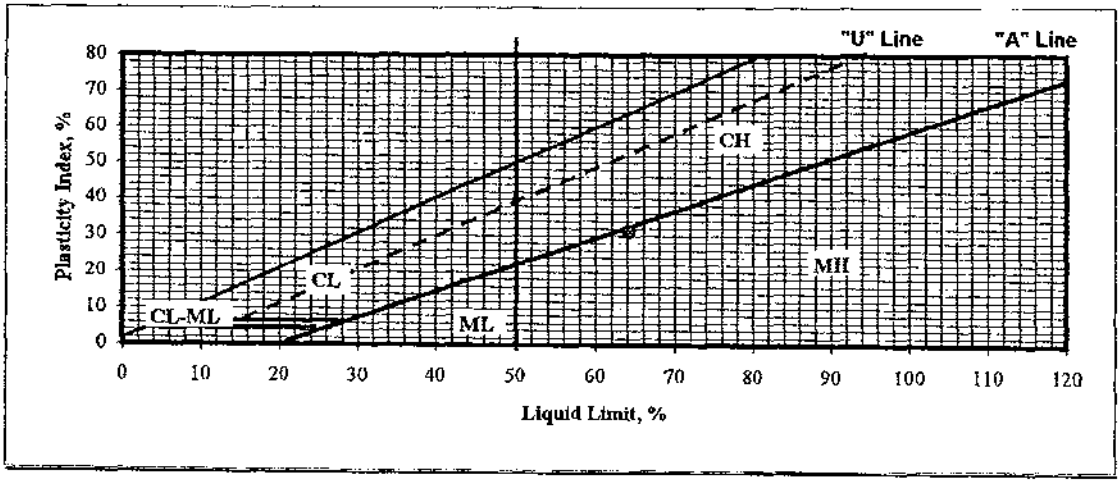
Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-04	**Depth, ft.:**	75-77.5'	**Date:**	04/05/04
Description:	ELASTIC SILT, GRAY. SOME SHELLS.			**Tested By:**	DGC
				Checked By:	

/*	Liquid Limit			Plastic Limit		Nat. w/c
Can Number	A-8	C-2	B-1	B-6	D-6	L-1
Weight of Can + Wet Soil, gms.	68.40	67.67	67.88	45.73	44.20	260.6
Weight of Can + Dry Soil, gms.	54.77	54.02	53.69	42.36	41.19	187.21
Weight of Can, gms.	31.88	32.13	32.10	32.02	31.91	52.6
Weight of Dry Soil, gms.	22.89	21.89	21.59	10.34	9.28	134.61
Weight of Water, gms.	13.63	13.65	14.19	3.37	3.01	73.39
Water Content, %	59.5	62.4	65.7	32.6	32.4	54.5
Number of Blows	49	29	16			

Unified Soil Classification **MH**



LL=	64	PL=	33	PI=	31



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GRAIN SIZE DISTRIBUTION

ASTM D422

Shaw™ EMCON/OWT, Inc.

A Shaw Group Company

LAB. NO.: 04-008

PROJECT NAME: BRISBANE LANDFILL — PROJECT NO.: 837998

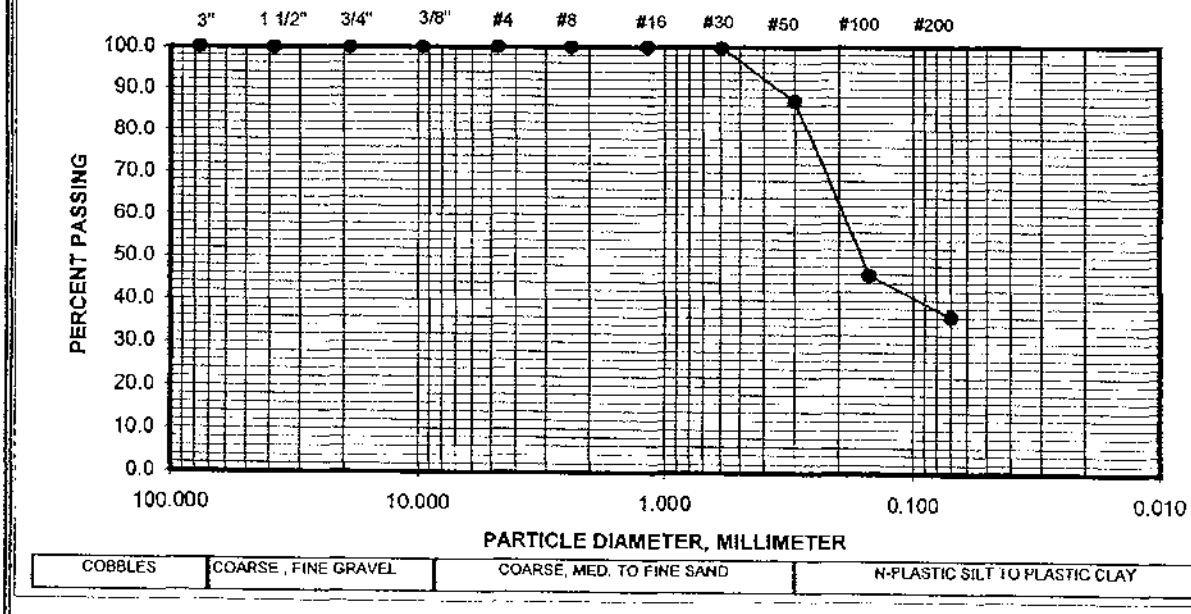
SAMPLE NO.: GT04-04 @ 90-91' — DATE: 04/08/04

DESCRIPTION: CLAYEY SAND, GRAY. — TECH.: DGC

UNIFIED SOIL CLASSIFICATION:	SC	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0		
Pan Number:	#93	3/4"	100.0		
Pan + Wet Soil, gms.		3/8"	100.0		
Pan + Dry Soil, gms.	841.9	D_{60}	0.190		
Wt. of Pan, gms.	176.1	D_{30}	#DIV/0!		
Wt. of Dry Soil, gms.	665.8	D_{10}	0.001	Liquid Limit:	31
Wt. of Water, gms.		C_U	162.77	Plasticity Index:	16
Water content, %.		C_C	#DIV/0!	High; Mod.; Low; NP:	

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	ARTICLES IAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	665.8	100.0
3"	3.000	76.20		0	665.8	100.0
1 1/2"	1.500	38.10		0	665.8	100.0
3/4"	0.750	18.90		0	665.8	100.0
3/8"	0.375	9.52		0	665.8	100.0
#4	0.185	4.70	0.00	0	665.8	100.0
#8	0.093	2.36	0.1	0.1	665.7	100.0
#16	0.046	1.17	0.2	0.3	665.5	100.0
#30	0.023	0.59	1.3	1.6	664.2	99.8
#50	0.012	0.30	85.2	86.8	579	87.0
#100	0.006	0.15	273.8	360.6	305.2	45.8
#200	0.003	0.07	65.1	425.7	240.1	36.1

Bulb 152H
HYDROMETER TEST
WITH DISPERSING AGENT



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ATTERBERG LIMITS

ASTM D4318

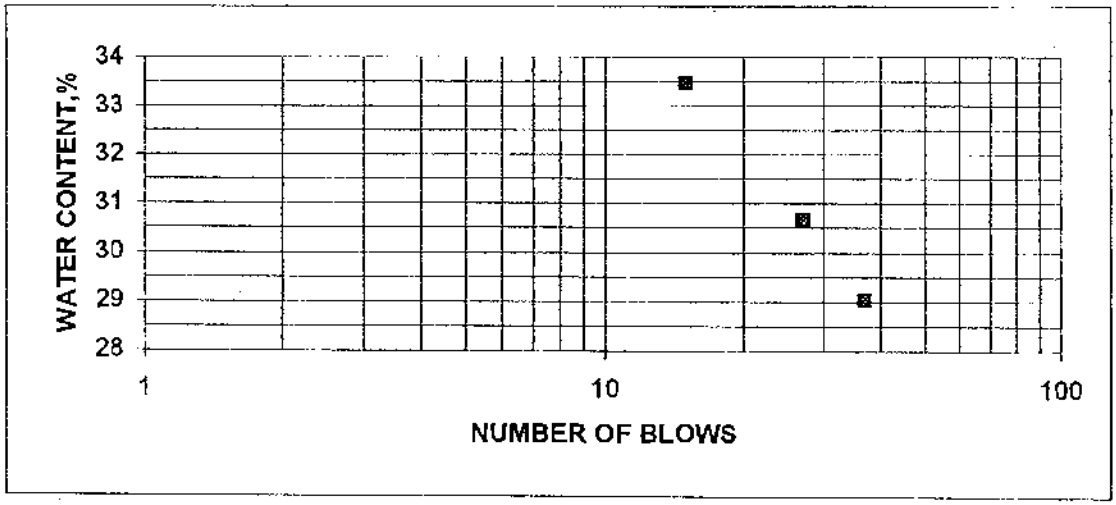
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-04	**Depth, ft.:**	90-91'	**Date:**	04/02/04
Description:	CLAYEY SAND, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	C-1	F-6	B-7	E-4	B-3	
Weight of Can + Wet Soil, gms.	77.48	73.98	72.81	49.36	50.19	
Weight of Can + Dry Soil, gms.	67.26	64.12	62.54	47.12	47.91	
Weight of Can, gms.	32.05	31.95	31.85	31.80	32.17	
Weight of Dry Soil, gms.	35.21	32.17	30.69	15.32	15.74	
Weight of Water, gms.	10.22	9.86	10.27	2.24	2.28	
Water Content, %	29.0	30.6	33.5	14.6	14.5	
Number of Blows	37	27	15			

Unified Soil Classification SC



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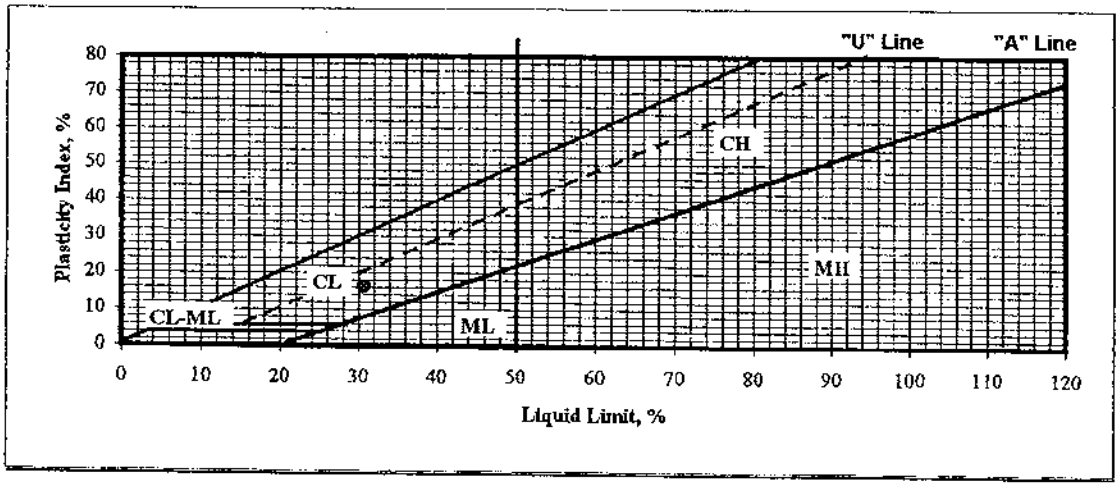

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U.U TRIAXIAL TEST

ASTM D2850

Shaw™ EMCON/OWT, Inc.

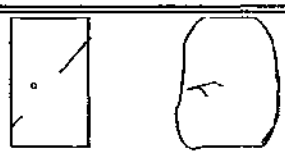
A Shaw Group Company

☐ Unsaturated

■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	04-008
Sample No.:	GT04-04	**Depth, ft.:**	90-91'	**Date:**	04/06/04
Description:	CLAYEY SAND, GRAY			**Tested By:**	DGC

Total Wet Wt., gms.	1350.0
Total Dry Wt., gms.	1133.5
Height, in.	6.00
Diameter, in.	2.875
Area, in.^{2}	6.4918
Volume, cf.	0.0225
Dry Density, pcf.	110.9
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



SHEARED ☐ BULGING ■

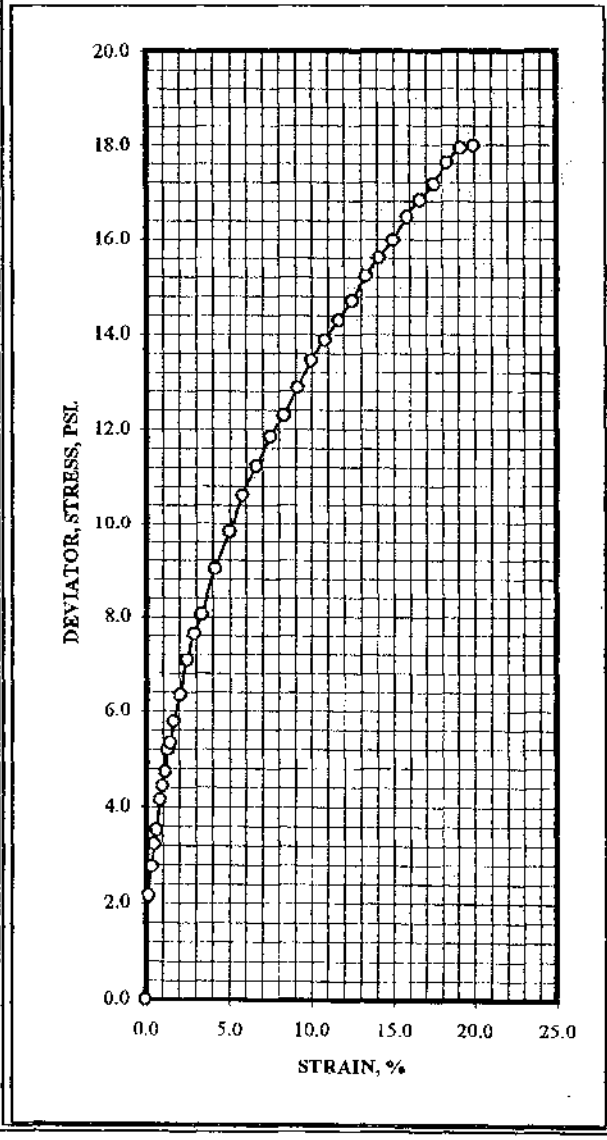
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.000

Tare Number	Q
Wet Soil + Tare, gms.	1538.2
Dry Soil + Tare, gms.	1319.1
Tare Weights, gms.	185.6
Weight of Water, gms.	219.1
Wt. of Dry Soil, gms.	1133.5
Water Content, %	19.3
Initial Water Content, %	19.1
Saturation	100.4
Confin. Pressure, psi.	40.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.49	0	0.00
10	0.17	6.50	14	2.15
20	0.33	6.51	18	2.76
30	0.50	6.52	21	3.22
40	0.67	6.54	23	3.52
50	0.83	6.55	27	4.12
60	1.00	6.56	29	4.42
70	1.17	6.57	31	4.72
80	1.33	6.58	34	5.17
90	1.50	6.59	35	5.31
100	1.67	6.60	38	5.76
125	2.08	6.63	42	6.33
150	2.50	6.66	47	7.06
175	2.92	6.69	51	7.63
200	3.33	6.72	54	8.04
250	4.17	6.77	61	9.00
300	5.00	6.83	67	9.80
350	5.83	6.89	73	10.59
400	6.67	6.96	78	11.21
450	7.50	7.02	83	11.83
500	8.33	7.08	87	12.28
550	9.17	7.15	92	12.87
600	10.00	7.21	97	13.45
650	10.83	7.28	101	13.87
700	11.67	7.35	105	14.29
750	12.50	7.42	109	14.69
800	13.33	7.49	114	15.22
850	14.17	7.56	118	15.60
900	15.00	7.64	122	15.97
950	15.83	7.71	127	16.47
1000	16.67	7.79	131	16.82
1050	17.50	7.87	135	17.16
1100	18.33	7.95	140	17.61
1150	19.17	8.03	144	17.93
1200	20.00	8.11	146	17.99

DEVIATOR VS. STRAIN GRAPH



ATTERBERG LIMITS

ASTM D4318

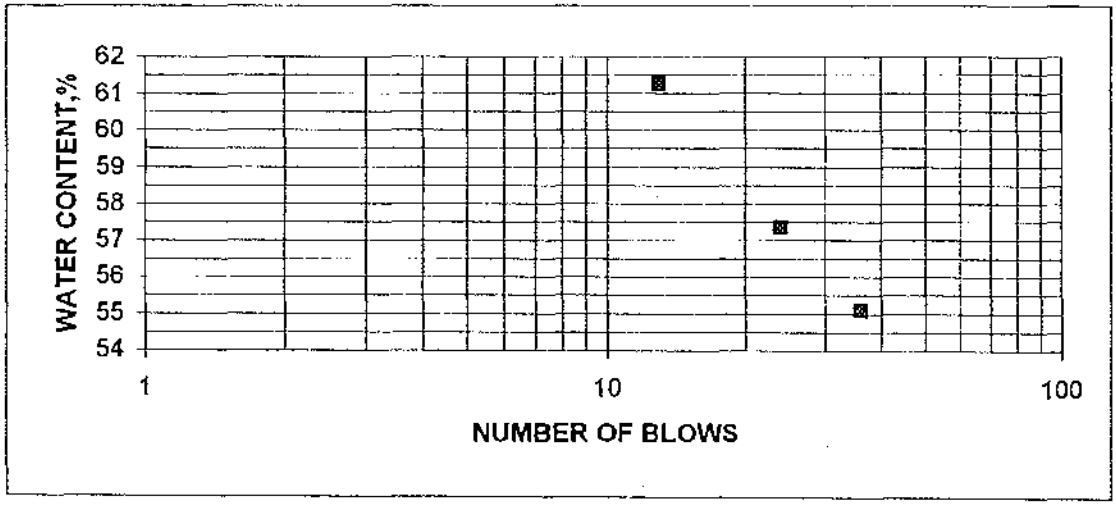
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-05	**Depth, ft.:**	75-77.5'	**Date:**	04/05/04
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		Nat. w/c
Can Number	B-7	E-4	F-6	C-1	B-3	A-1
Weight of Can + Wet Soil, gms.	67.31	68.77	67.72	47.58	44.78	349.5
Weight of Can + Dry Soil, gms.	54.71	55.30	54.13	44.21	42.03	261.77
Weight of Can, gms.	31.84	31.81	31.94	32.05	32.17	83.4
Weight of Dry Soil, gms.	22.87	23.49	22.19	12.16	9.86	178.37
Weight of Water, gms.	12.60	13.47	13.59	3.37	2.75	87.73
Water Content, %	55.1	57.3	61.2	27.7	27.9	49.2
Number of Blows	36	24	13			

Unified Soil Classification **CH**



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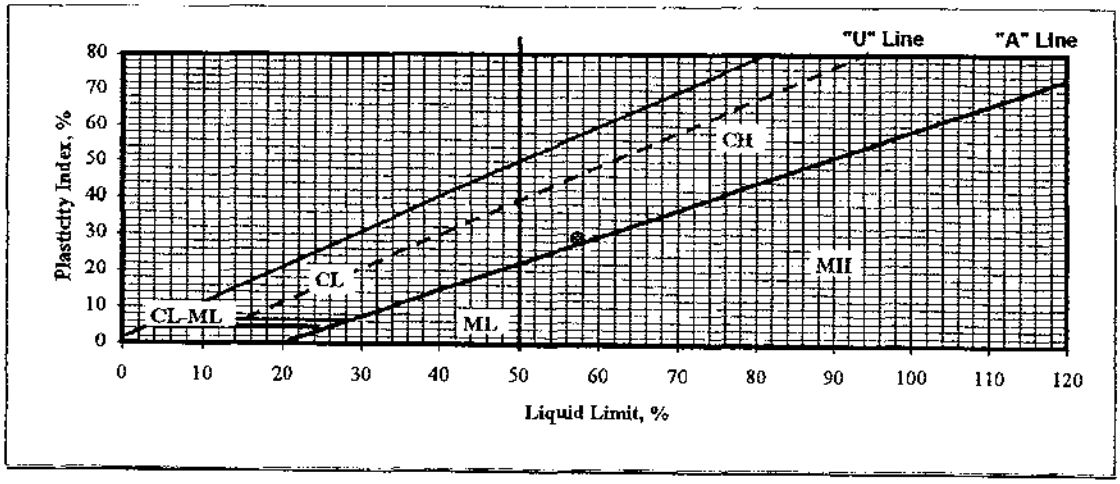

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U.U TRIAXIAL TEST

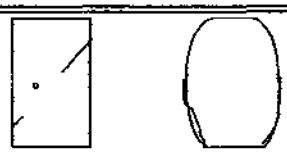
ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
▩ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	04-008
Sample No.:	GT04-05	**Depth, ft.:**	75-77.5'	**Date:**	04/06/04
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC

Total Wet Wt., gms.	1076.1
Total Dry Wt., gms.	720.3
Height, in.	6.00
Diameter, in.	2.875
Area, in^2	6.4918
Volume, cf.	0.0225
Dry Density, pcf.	70.4
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



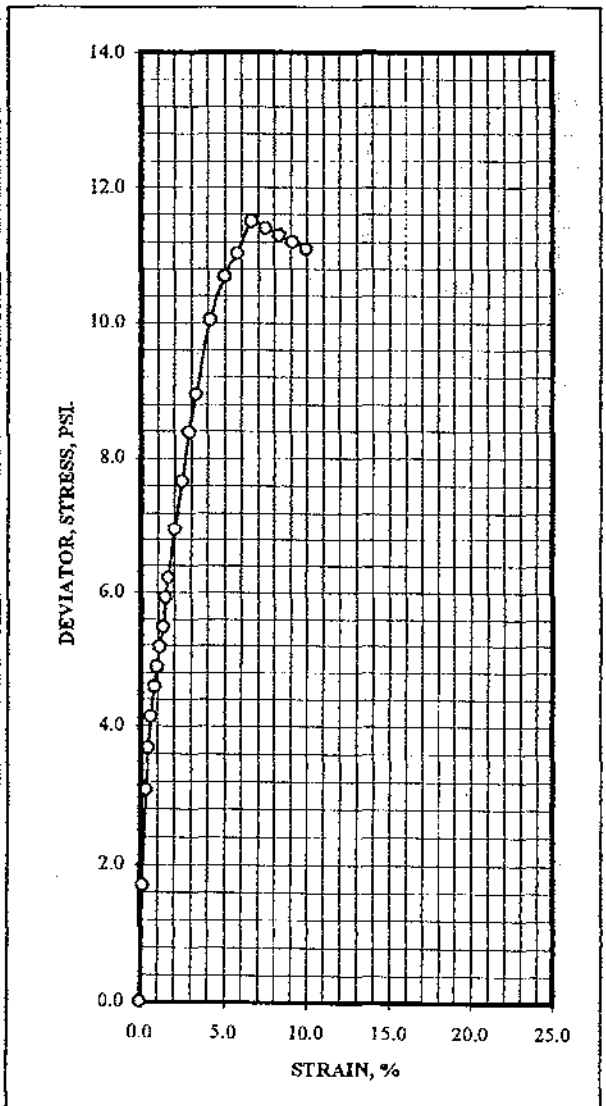
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.000

Tare Number	A-1
Wet Soil + Tare, gms.	1269.7
Dry Soil + Tare, gms.	901.2
Tare Weights, gms.	180.9
Weight of Water, gms.	368.5
Wt. of Dry Soil, gms.	720.3
Water Content, %	51.2
Initial Water Content, %	49.4
Saturation	99.3
Confin. Pressure, psi.	30.0

STRAIN, .001in./div.	STRAIN, %	AREA, in^2	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.49	0	0.00
10	0.17	6.50	11	1.69
20	0.33	6.51	20	3.07
30	0.50	6.52	24	3.68
40	0.67	6.54	27	4.13
50	0.83	6.55	30	4.58
60	1.00	6.56	32	4.88
70	1.17	6.57	34	5.18
80	1.33	6.58	36	5.47
90	1.50	6.59	39	5.92
100	1.67	6.60	41	6.21
125	2.08	6.63	46	6.94
150	2.50	6.66	51	7.66
175	2.92	6.69	56	8.37
200	3.33	6.72	60	8.93
250	4.17	6.77	68	10.04
300	5.00	6.83	73	10.68
350	5.83	6.89	76	11.02
400	6.67	6.96	80	11.50
450	7.50	7.02	80	11.40
500	8.33	7.08	80	11.30
550	9.17	7.15	80	11.19
600	10.00	7.21	80	11.09
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00
		0.00		0.00

DEVIATOR VS. STRAIN GRAPH



ATTERBERG LIMITS

ASTM D4318

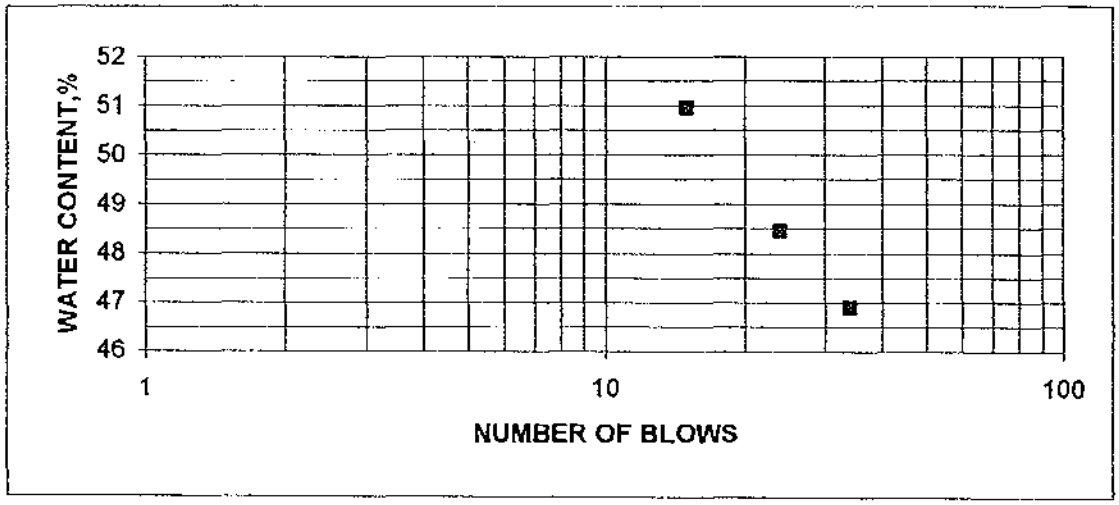
Shaw™ EMCON/OWT, Inc.

A Shaw Group Company

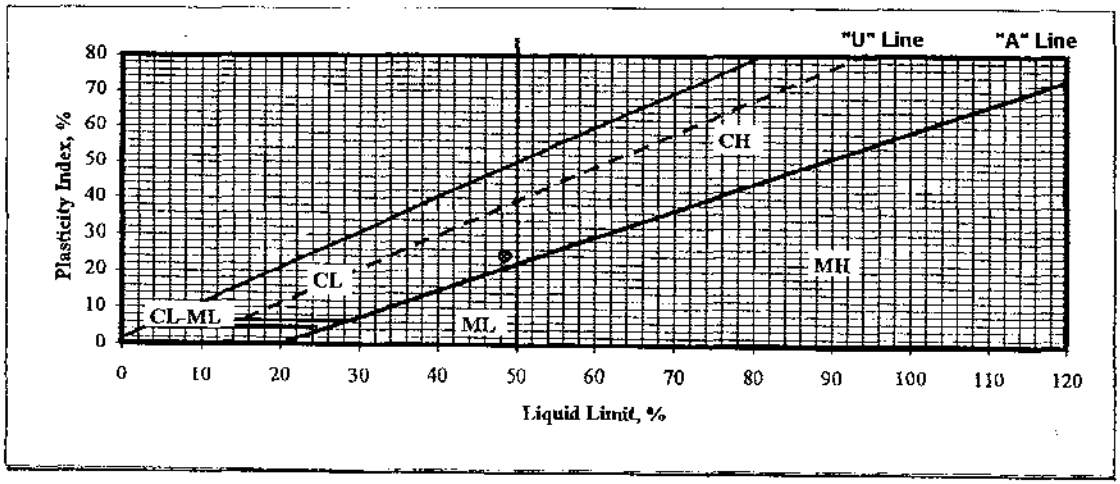
Project Name:	BRISBANE LANDFILL	**Lab. No.:**	04-008	**Proj. No.:**	837998
Sample No.:	GT04-05	**Depth, ft.:**	90-92.5'	**Date:**	04/05/04
Description:	LEAN CLAY, BROWN.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		Nat. w/c
Can Number	B-2	O-6	A-6	C-6	A-7	B-7
Weight of Can + Wet Soil, gms.	70.12	70.13	70.40	45.53	48.84	259.2
Weight of Can + Dry Soil, gms.	58.02	57.69	57.43	42.82	45.45	223.88
Weight of Can, gms.	32.22	32.01	31.97	32.03	31.88	94.3
Weight of Dry Soil, gms.	25.80	25.68	25.46	10.79	13.57	129.58
Weight of Water, gms.	12.10	12.44	12.97	2.71	3.39	35.32
Water Content, %	46.9	48.4	50.9	25.1	25.0	27.3
Number of Blows	34	24	15			

Unified Soil Classification CL



LL=	49	PL=	25	PI=	24



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U.U TRIAXIAL TEST

ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

▩ Unsaturated
☐ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	04-008
Sample No.:	GT04-05	**Depth, ft.:**	90-92.5'	**Date:**	04/08/04
Description:	LEAN CLAY, BROWN.			**Tested By:**	DGC

Total Wet Wt., gms.	1304.1
Total Dry Wt., gms.	1048.4
Height, in.	6.00
Diameter, in.	2.875
Area, in.^{2}	6.4918
Volume, cf.	0.0225
Dry Density, pcf.	102.5
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %	



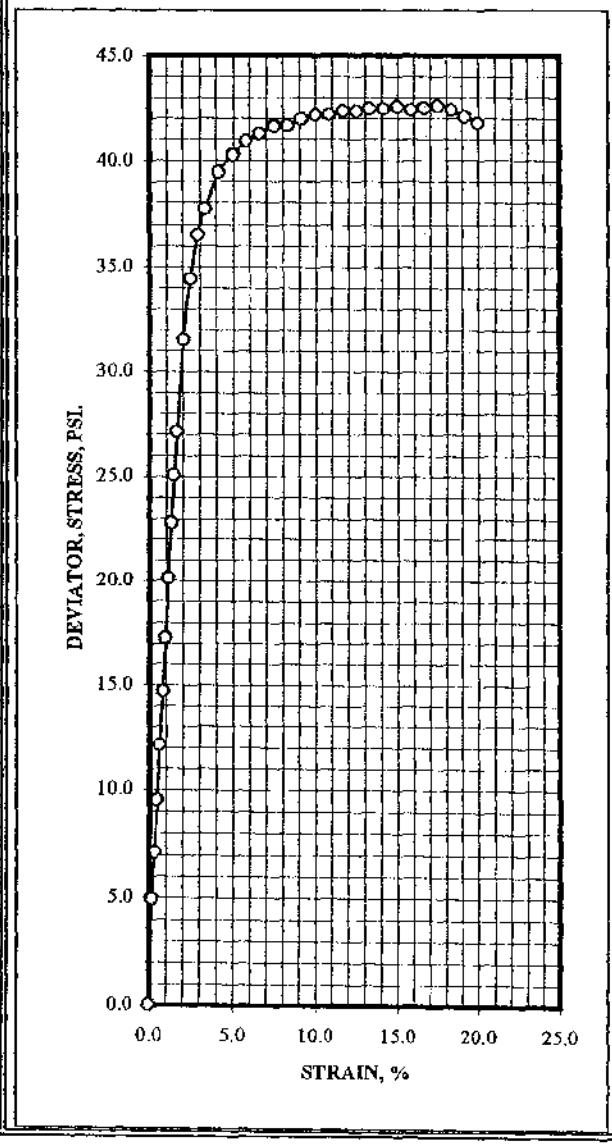
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.000

Tare Number	Q
Wet Soil + Tare, gms.	1489.3
Dry Soil + Tare, gms.	1234.0
Tare Weights, gms.	185.6
Weight of Water, gms.	255.3
Wt. of Dry Soil, gms.	1048.4
Water Content, %	24.4
Initial Water Content, %	24.4
Saturation	102.2
Confin. Pressure, psi.	35.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.49	0	0.00
10	0.17	6.50	32	4.92
20	0.33	6.51	46	7.06
30	0.50	6.52	62	9.50
40	0.67	6.54	79	12.09
50	0.83	6.55	96	14.66
60	1.00	6.56	113	17.23
70	1.17	6.57	132	20.10
80	1.33	6.58	150	22.80
90	1.50	6.59	165	25.04
100	1.67	6.60	179	27.11
125	2.08	6.63	209	31.52
150	2.50	6.66	229	34.39
175	2.92	6.69	244	36.49
200	3.33	6.72	253	37.67
250	4.17	6.77	267	39.41
300	5.00	6.83	275	40.24
350	5.83	6.89	282	40.91
400	6.67	6.96	287	41.26
450	7.50	7.02	292	41.61
500	8.33	7.08	295	41.65
550	9.17	7.15	300	41.98
600	10.00	7.21	304	42.15
650	10.83	7.28	307	42.17
700	11.67	7.35	311	42.32
750	12.50	7.42	314	42.32
800	13.33	7.49	318	42.45
850	14.17	7.56	321	42.44
900	15.00	7.64	325	42.55
950	15.83	7.71	327	42.40
1000	16.67	7.79	331	42.49
1050	17.50	7.87	335	42.57
1100	18.33	7.95	337	42.39
1150	19.17	8.03	338	42.09
1200	20.00	8.11	339	41.78

DEVIATOR VS. STRAIN GRAPH



U.U TRIAXIAL TEST

ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	04-008
Sample No.:	GT04-05	**Depth, ft.:**	90-92.5'	**Date:**	04/08/04
Description:	LEAN CLAY, BROWN.			**Tested By:**	DGC

Total Wet Wt., gms.	1275.2
Total Dry Wt., gms.	1023.4
Height, in.	6.00
Diameter, in.	2.875
Area, in.^{2}	6.4918
Volume, cf.	0.0225
Dry Density, pcf.	100.1
Est. Spec. Gravity	2.74
Max. Dry Density, pcf.	
Opt. Water Content, %.	



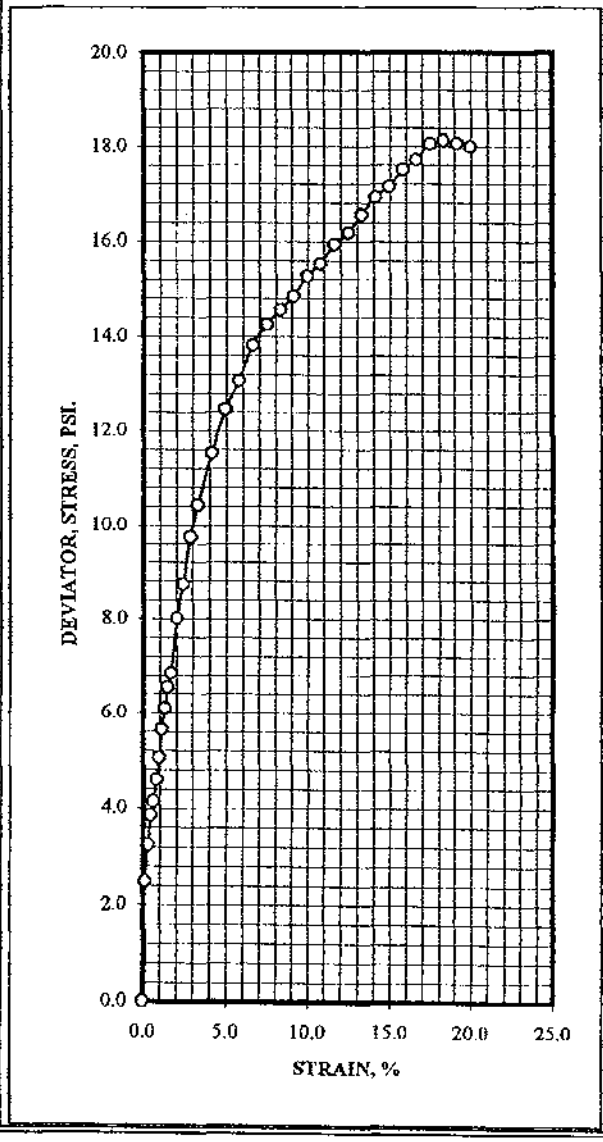
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, %/min.:	1.000

Tare Number	Q
Wet Soil + Tare, gms.	1473.5
Dry Soil + Tare, gms.	1209.1
Tare Weights, gms.	185.7
Weight of Water, gms.	264.4
Wt. of Dry Soil, gms.	1023.4
Water Content, %	25.8
Initial Water Content, %	24.6
Saturation	100.0
Confin. Pressure, psi.	35.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.49	0	0.00
10	0.17	6.50	16	2.46
20	0.33	6.51	21	3.22
30	0.50	6.52	25	3.83
40	0.67	6.54	27	4.13
50	0.83	6.55	30	4.58
60	1.00	6.56	33	5.03
70	1.17	6.57	37	5.63
80	1.33	6.58	40	6.08
90	1.50	6.59	43	6.52
100	1.67	6.60	45	6.82
125	2.08	6.63	53	7.99
150	2.50	6.66	58	8.71
175	2.92	6.69	65	9.72
200	3.33	6.72	70	10.42
250	4.17	6.77	78	11.51
300	5.00	6.83	85	12.44
350	5.83	6.89	90	13.05
400	6.67	6.96	96	13.80
450	7.50	7.02	100	14.25
500	8.33	7.08	103	14.54
550	9.17	7.15	106	14.83
600	10.00	7.21	110	15.25
650	10.83	7.28	113	15.52
700	11.67	7.35	117	15.92
750	12.50	7.42	120	16.17
800	13.33	7.49	124	16.55
850	14.17	7.56	128	16.92
900	15.00	7.64	131	17.15
950	15.83	7.71	135	17.50
1000	16.67	7.79	138	17.71
1050	17.50	7.87	142	18.05
1100	18.33	7.95	144	18.12
1150	19.17	8.03	145	18.05
1200	20.00	8.11	146	17.99

DEVIATOR VS. STRAIN GRAPH



Shaw EMCON/OWT, Inc.
A Shaw Group Company

CONSOLIDATION

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998
Sample No.:	GT04-05 @ 90-92.5'	**Tested By:**	DGC.
Description:	LEAN CLAY, BROWN.	**Date:**	04/12/04

*** Flooded with water at the beginning of test.**

Consol. No.:	#317
Diameter, in.	2.42
Thickness, in.	1.00
Soil Wet Wt., gms.	152.23
Water Content, %	25.0
Dry Density, pcf.	100.9
Initial Sat.	98.5
Final Sat.	99.6

Tare Number	V-7
Wet Wt. of Soil +Tare, gms.	234.99
Dry Wt. of Soil + Tare, gms.	207.50
Weight of Tare, gms.	85.70
Weight of Water, gms.	27.49
Weight of Dry Soil, gms.	121.80
Final Water Content, %	22.6
Est. Specific Gravity	2.74

LOAD ksf.	DIAL .0001 in.	APPLIED CORRECTIONS	HEIGHT, inches.	CONSOL %	DENSITY pcf.	VOID RATIO
0.000	0.0000	0.0000	1.000	0.00	100.9	0.695
0.125	0.0003	0.0000	1.000	0.03	100.9	0.694
0.250	0.0008	0.0000	0.999	0.08	101.0	0.694
0.500	0.0027	0.0000	0.997	0.27	101.2	0.690
1.000	0.0073	0.0000	0.993	0.73	101.6	0.683
2.000	0.0132	0.0000	0.987	1.32	102.2	0.673
4.000	0.0217	0.0000	0.978	2.17	103.1	0.658
8.000	0.0341	0.0000	0.966	3.41	104.4	0.637
16.000	0.0580	0.0000	0.942	5.80	107.1	0.597
32.000	0.0953	0.0000	0.905	9.53	111.5	0.533
48.000	0.1192	0.0000	0.881	11.92	114.5	0.493
16.000	0.1114	0.0000	0.889	11.14	113.5	0.506
2.000	0.0896	0.0000	0.910	8.96	110.8	0.543
0.125	0.0437	0.0000	0.956	4.37	105.5	0.621
			0.000	0.00	0.0	0.000

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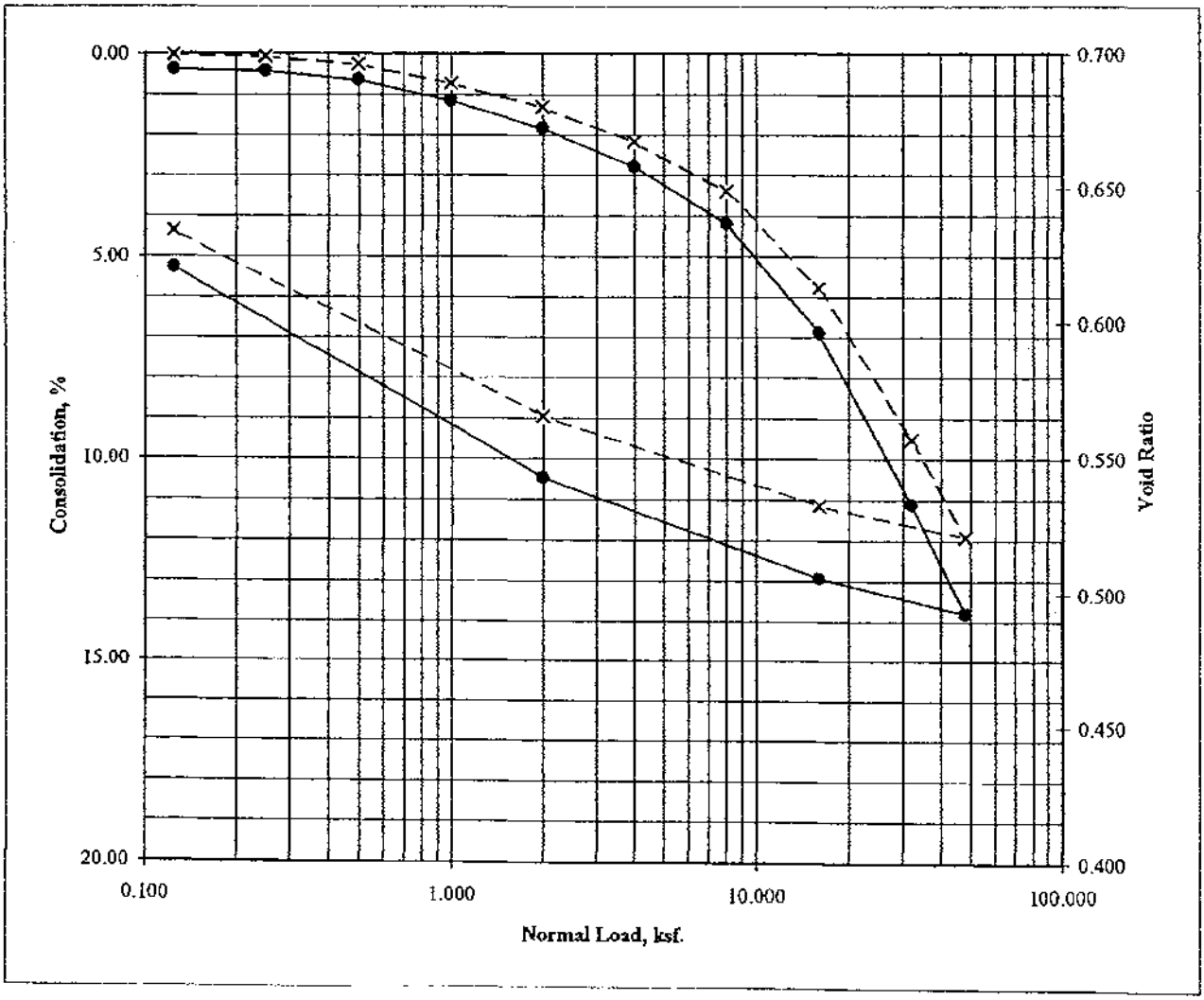
CONSOLIDATION

Shaw EMCON/OWT, Inc.
A Shaw Group Company

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998
Sample No.:	GT04-05 @ 90-92.5'	**Tested By:**	DGC.
Description:	LEAN CLAY, BROWN.	**Date:**	04/12/04

x **Consolidation vs. Load** ● **Void Ratio vs. Load**



*** Flooded with water at the beginning of test.**

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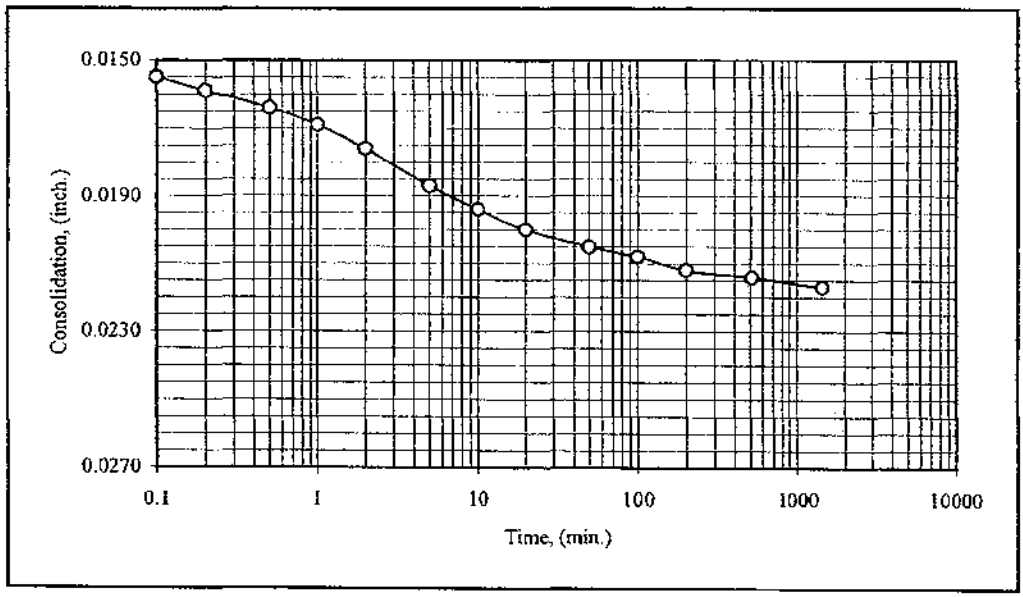
CONSOLIDATION
TIME - COMPRESSION CURVES

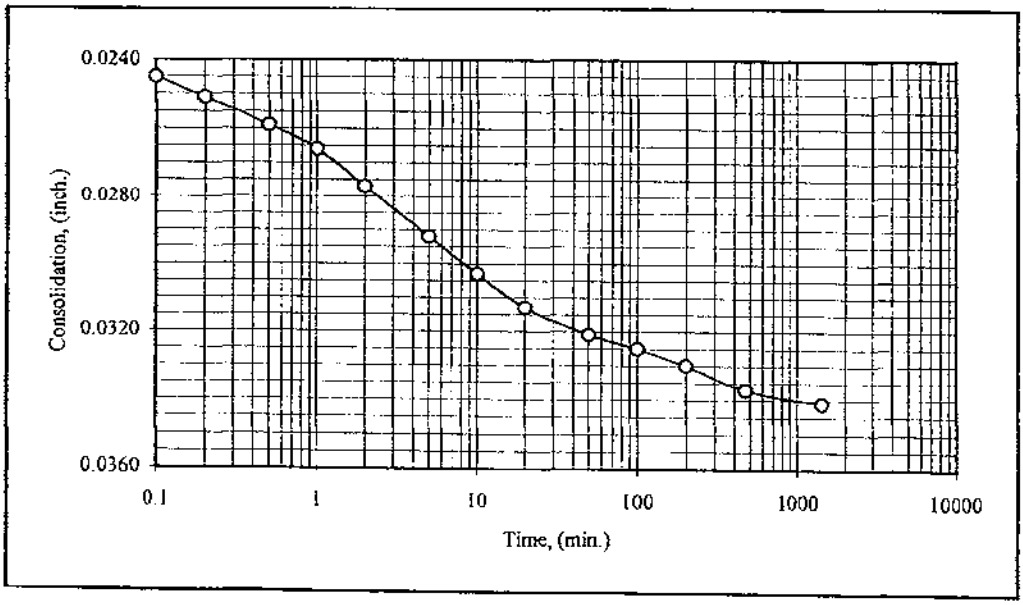
Project Name: BRISBANE LANDFILL
Sample No. GT04-05 @ 90-92.5'
Description: LEAN CLAY, BROWN.

Proj. Number: 837998
Date: 4/14/04

Load:	4 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0155
0.2	0.0159
0.5	0.0164
1	0.0169
2	0.0176
5	0.0187
10	0.0194
20	0.0200
50	0.0205
100	0.0208
200	0.0212
513	0.0214
1443	0.0217



Load	8 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0245
0.2	0.0251
0.5	0.0259
1	0.0266
2	0.0277
5	0.0292
10	0.0303
20	0.0313
50	0.0321
100	0.0325
200	0.0330
471	0.0337
1437	0.0341



GRAIN SIZE DISTRIBUTION

ASTM D422

Shaw™ EMCON/OWT, Inc.

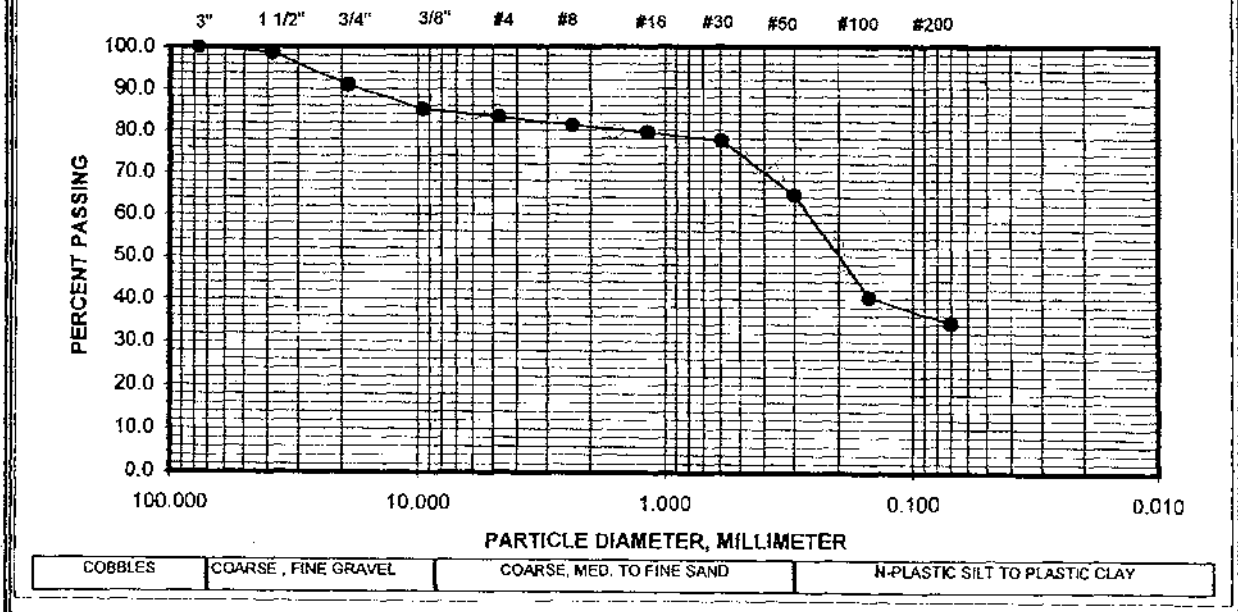
A Shaw Group Company

		LAB. NO.:	04-018
PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	GT04-10 / TP04-01@ 0-2'	DATE:	05/03/04
DESCRIPTION:	CLAYEY SAND WITH GRAVEL, BROWN.	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SC	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	98.7		
Pan Number:	#82	3/4"	90.9		
Pan + Wet Soil, gms.	851.7	3/8"	85.0		
Pan + Dry Soil, gms.	750.3	D_{60}	0.264		
Wt. of Pan, gms.	76.1	D_{30}	#DIV/0!		
Wt. of Dry Soil, gms.	674.2	D_{10}	0.001	Liquid Limit:	
Wt. of Water, gms.	101.4	C_U	223.34	Plasticity Index:	
Water content, %.	15.0	C_C	#DIV/0!	High; Mod.; Low; NP:	MOD.

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	ARTICLES IAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	674.2	100.0
3"	3.000	76.20		0	674.2	100.0
1 1/2"	1.500	38.10		0	674.2	98.7
3/4"	0.750	18.90		0	674.2	90.9
3/8"	0.375	9.52	0.0	0	674.2	85.0
#4	0.185	4.70	13.77	13.77	660.43	83.3
#8	0.093	2.36	16.10	29.87	644.33	81.2
#16	0.046	1.17	13.35	43.22	630.98	79.6
#30	0.023	0.59	15.42	58.64	615.56	77.6
#50	0.012	0.30	104.51	163.15	511.05	64.4
#100	0.006	0.15	191.47	354.62	319.58	40.3
#200	0.003	0.07	47.42	402.04	272.16	34.3

Bulb 152H
HYDROMETER TEST
WITH DISPERSING AGENT



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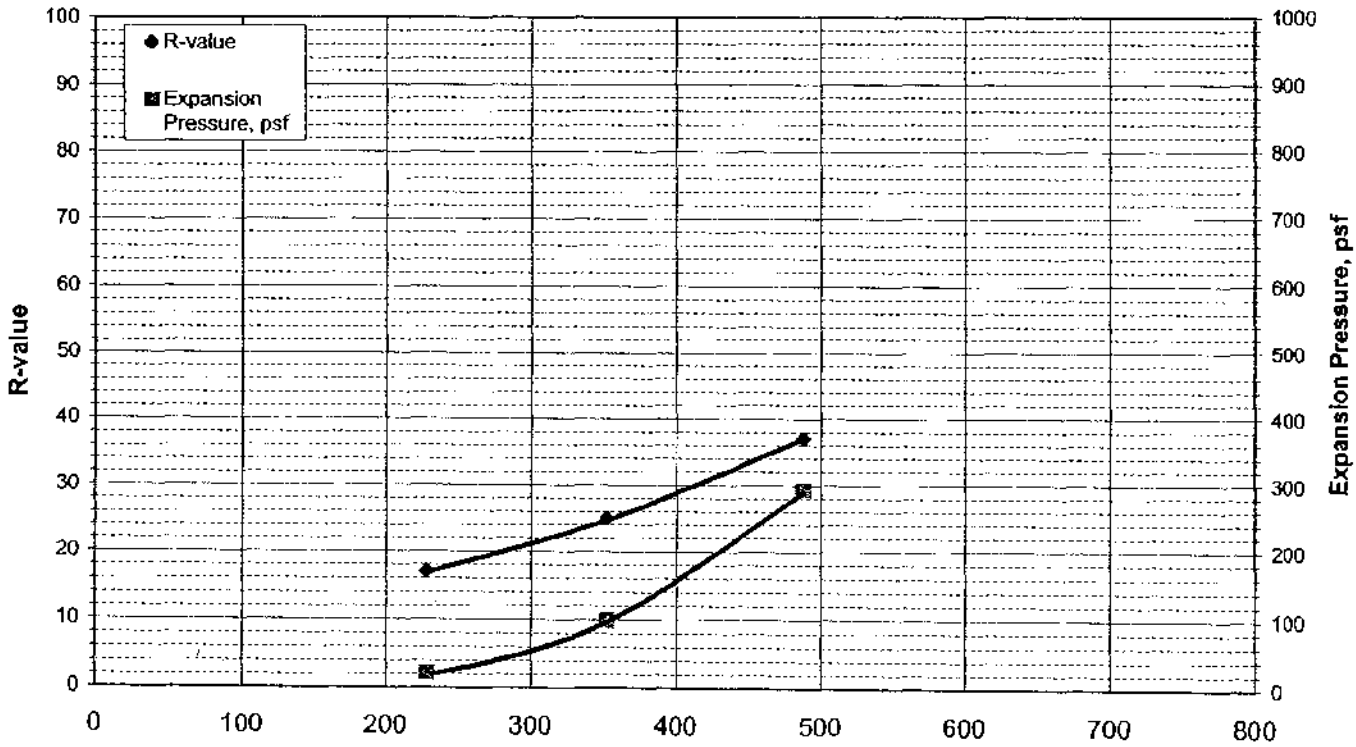
R-value Test Report (Caltrans 301)

ob No.:	461-005	Date:	05/07/04	Initial Moisture,	10.9%
lient:	GeoSyntec Consultants	Tested	MD	R-value	21
roject:	Brisbane - WL0657	Reduced	MJ		
ample	GT04-04 @ 3-9'	Checked	DC	Expansion Pressure	55 psf
oil Type:	Grayish Brown Sandy CLAY				

Specimen Number	A	B	C	D
xudation Pressure, psi	228	352	488	
repaired Weight, grams	1200	1200	1200	
inal Water Added, grams/cc	60	45	30	
/eight of Soil & Mold, grams	3189	3199	3201	
/eight of Mold, grams	2090	2095	2089	
eight After Compaction, in.	2.54	2.5	2.47	
loisture Content, %	16.5	15.1	13.7	
ry Density, pcf	112.5	116.2	119.9	
xpansion Pressure, psf	21.5	98.9	292.4	
tabilometer @ 1000				
tabilometer @ 2000	125	113	93	
urns Displacement	3.34	3.17	3.06	
-value	17	25	37	

Remarks:



Corrosivity Test Summary

CTL # 461-005 Date: 5/5/2004 Tested By: PJ Checked: PJ
Client: Geosyntec Project: Brisbane Proj. No: WL 0657
Remarks:

Sample Location or ID			Resistivity @ 15.5 °C (Ohm-cm)			Chloride	Sulfate-(water soluble)		pH	ORP	Moisture	Soil Visual Description
Boring	Sample, No.	Depth, ft.	As Rec.	Minimum	Saturated	mg/kg	mg/kg	%		(Redox)	As Received	
						Dry Wt.	Dry Wt.	Dry Wt.		mv	%	
			ASTM G57	Cal 643	ASTM G57	Cal 422-mod.	Cal 417-mod.	Cal 417-mod.	ASTM G51	SM 2580B	ASTM D2216	
GT04-04	-	3 - 9	-	-	800	200	2,654	0.2654	7.2	89	20.6	Grayish Brown CLAY w/ Sand
GT04-10/TP04-01		0 - 2	-	-	3,810	<2	<5	<0.0005	7.5	251	15.7	Brown Clayey SAND w/ Gravel

U.U TRIAXIAL TEST

ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	05-074
Sample No.:	GT05-07	**Depth, ft.:**	32.5-35'	**Date:**	09/15/05
Description:	CLAYEY SILT, GRAY.			**Tested By:**	DGC

** Couple of shells inside the sample.*

Total Wet Wt., gms.	1011.2
Total Dry Wt., gms.	607.8
Height, in.	6.00
Diameter, in.	2.87
Area, in.^{2}	6.4693
Volume, cf.	0.0225
Dry Density, pcf.	59.7
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



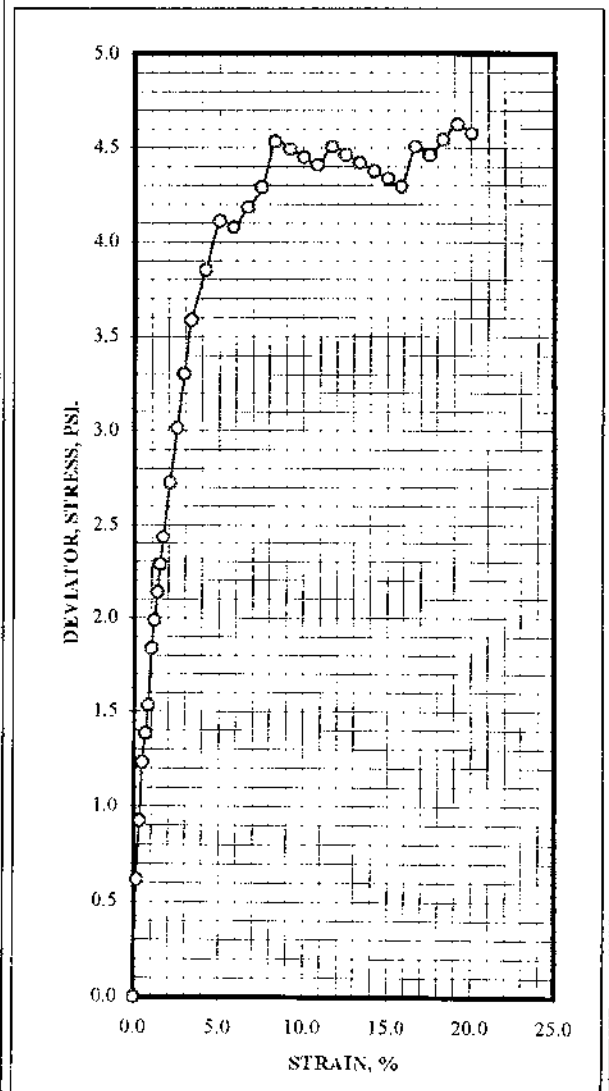
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.00

Tare Number	Q
Wet Soil + Tare, gms.	1199.2
Dry Soil + Tare, gms.	793.4
Tare Weights, gms.	185.6
Weight of Water, gms.	405.8
Wt. of Dry Soil, gms.	607.8
Water Content, %	66.8
Initial Water Content, %	66.4
Saturation	98.8
Confin. Pressure, psi.	9.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.47	0	0.00
10	0.17	6.48	4	0.62
20	0.33	6.49	6	0.92
30	0.50	6.50	8	1.23
40	0.67	6.51	9	1.38
50	0.83	6.52	10	1.53
60	1.00	6.53	12	1.84
70	1.17	6.55	13	1.99
80	1.33	6.56	14	2.14
90	1.50	6.57	15	2.28
100	1.67	6.58	16	2.43
125	2.08	6.61	18	2.72
150	2.50	6.64	20	3.01
175	2.92	6.66	22	3.30
200	3.33	6.69	24	3.59
250	4.17	6.75	26	3.85
300	5.00	6.81	28	4.11
350	5.83	6.87	28	4.08
400	6.67	6.93	29	4.18
450	7.50	6.99	30	4.29
500	8.33	7.06	32	4.53
550	9.17	7.12	32	4.49
600	10.00	7.19	32	4.45
650	10.83	7.26	32	4.41
700	11.67	7.32	33	4.51
750	12.50	7.39	33	4.46
800	13.33	7.46	33	4.42
850	14.17	7.54	33	4.38
900	15.00	7.61	33	4.34
950	15.83	7.69	33	4.29
1000	16.67	7.76	35	4.51
1050	17.50	7.84	35	4.46
1100	18.33	7.92	36	4.54
1150	19.17	8.00	37	4.62
1200	20.00	8.09	37	4.58

DEVIATOR VS. STRAIN GRAPH



ATTERBERG LIMITS

ASTM D4318

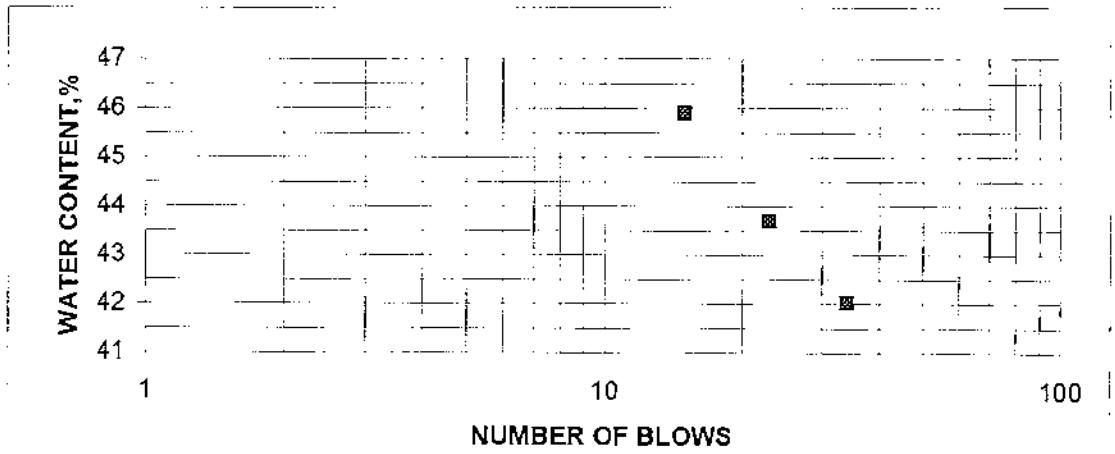
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-074	**Proj. No.:**	837998
Sample No.:	GT05-7	**Depth, ft.:**	41-43.5'	**Date:**	09/16/05
Description:	CLAYEY SAND, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	A-3	B-5	O-4	A-7	O-6	
Weight of Can + Wet Soil, gms.	67.33	67.86	68.54	46.12	46.38	
Weight of Can + Dry Soil, gms.	56.89	57.06	56.90	43.51	43.75	
Weight of Can, gms.	32.05	32.34	31.54	31.86	31.99	
Weight of Dry Soil, gms.	24.84	24.72	25.36	11.65	11.76	
Weight of Water, gms.	10.44	10.80	11.64	2.61	2.63	
Water Content, %	42.0	43.7	45.9	22.4	22.4	
Number of Blows	34	23	15			

Unified Soil Classification **SC**



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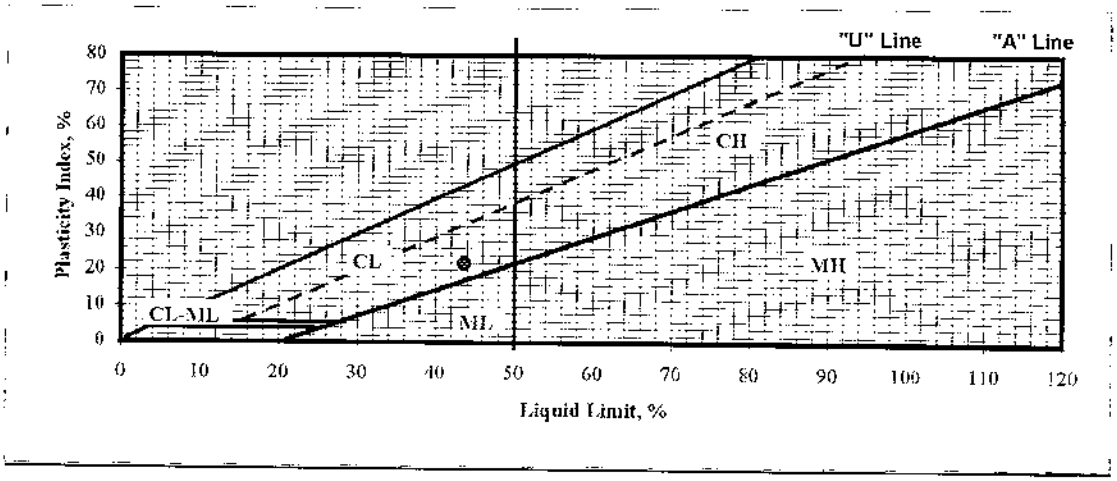

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GRAIN SIZE DISTRIBUTION

ASTM D422

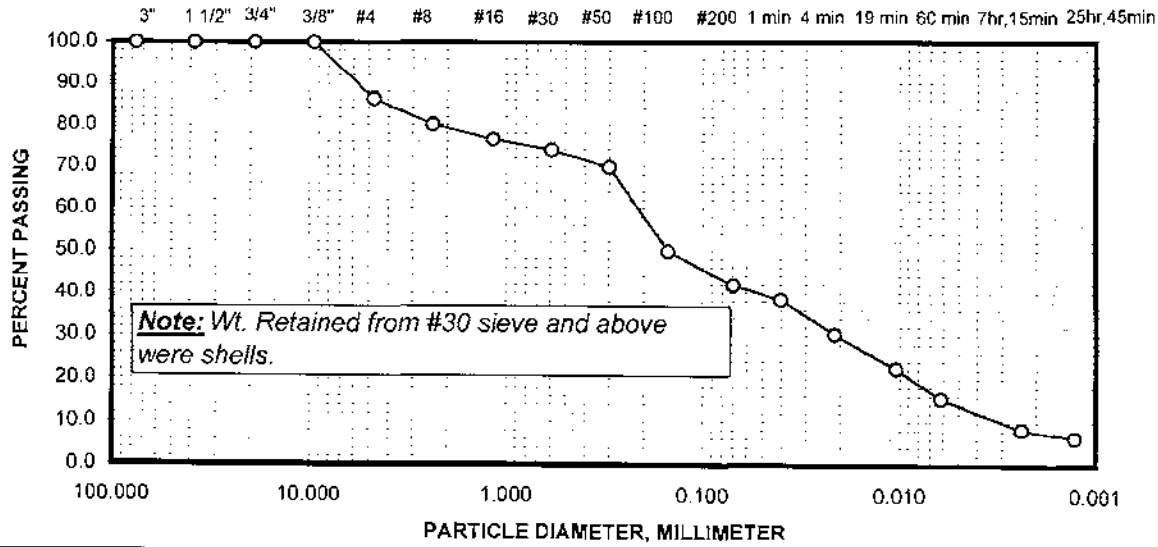
Shaw EMCON/OWT, Inc.

A Shaw Group Company

PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	GT05-07 @41-43.5'	DATE:	09/14/05
DESCRIPTION:	CLAYEY SAND, GRAY, WITH SHELLS.	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SC	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0	Dry Wt Used, Hydrom:	41.9
Pan Number:	#90	3/4"	100.0	Est. Sp. Gr., (2.60-2.80):	2.70
Pan + Wet Soil, gms.	965.6	3/8"	100.0	Temp.,(18-23) °C:	21
Pan + Dry Soil, gms.	713.3	D_{60}	0.213	Zero Correction	5.0
Wt. of Pan, gms.	177.3	D_{30}	0.021	Miniscus Correction:	0.5
Wt. of Dry Soil, gms.	536.0	D_{10}	0.003	Liquid Limit:	44
Wt. of Water, gms.	252.3	C_U	72.78	Plasticity Index:	22
Water content, %.	47.1	C_C	0.68	High; Mod.; Low; NP:	

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	PARTICLES DIAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	536	100.0
3"	3.000	76.20		0	536	100.0
1 1/2"	1.500	38.10		0	536	100.0
3/4"	0.750	18.90		0	536	100.0
3/8"	0.375	9.52	0.0	0	536	100.0
#4	0.185	4.70	73.8	73.8	462.2	86.2
#8	0.093	2.36	32.6	106.4	429.6	80.1
#16	0.046	1.17	19.8	126.2	409.8	76.5
#30	0.023	0.59	13.4	139.6	396.4	74.0
#50	0.012	0.30	21.7	161.3	374.7	69.9
#100	0.006	0.15	107.5	268.8	267.2	49.9
#200	0.003	0.07	43.0	311.8	224.2	41.8
		0.0401	1 min.		44	38.4
Bulb 152H		0.0214	4 min.		36	30.4
HYDROMETER TEST		0.0104	19 min.		28	22.5
WITH DISPERSING AGENT		0.0062	60 min.		21	15.5
		0.0024	7hr., 15min.		14	8.5
		0.0013	25hr., 45min.		12	6.5



COBBLES	COARSE , FINE GRAVEL	COARSE, MED. TO FINE SAND	N-PLASTIC SILT TO PLASTIC CLAY

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ATTERBERG LIMITS

ASTM D4318

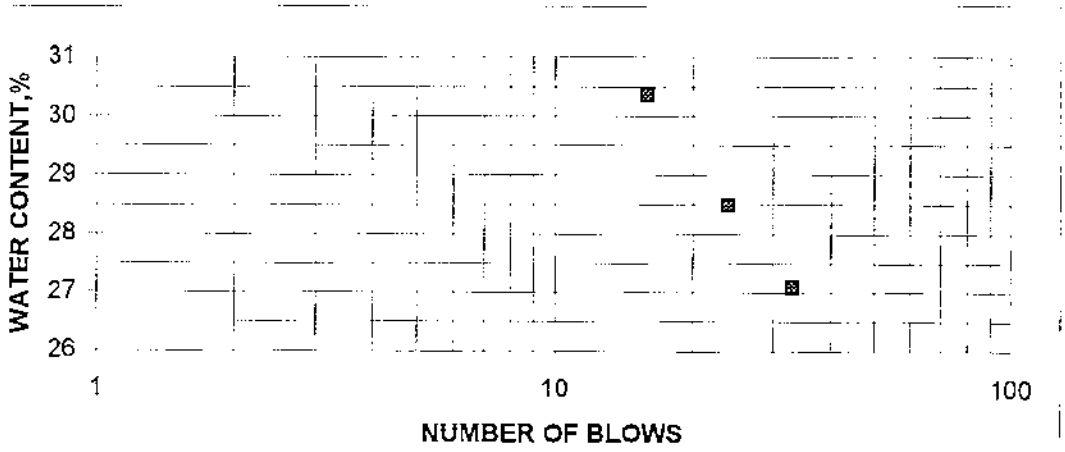
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-035	**Proj. No.:**	837998
Sample No.:	GT05-7	**Depth, ft.:**	50-51.5'	**Date:**	06/30/05
Description:	CLAYEY SAND, GREENISH BROWN.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	B-7	F-6	B-8	M-4	E-4	
Weight of Can + Wet Soil, gms.	72.87	69.87	70.62	48.03	47.41	
Weight of Can + Dry Soil, gms.	64.12	61.45	61.64	46.07	45.54	
Weight of Can, gms.	31.82	31.90	32.06	31.81	31.77	
Weight of Dry Soil, gms.	32.30	29.55	29.58	14.26	13.77	
Weight of Water, gms.	8.75	8.42	8.98	1.96	1.87	
Water Content, %	27.1	28.5	30.4	13.7	13.6	
Number of Blows	33	24	16			

Unified Soil Classification **SC**



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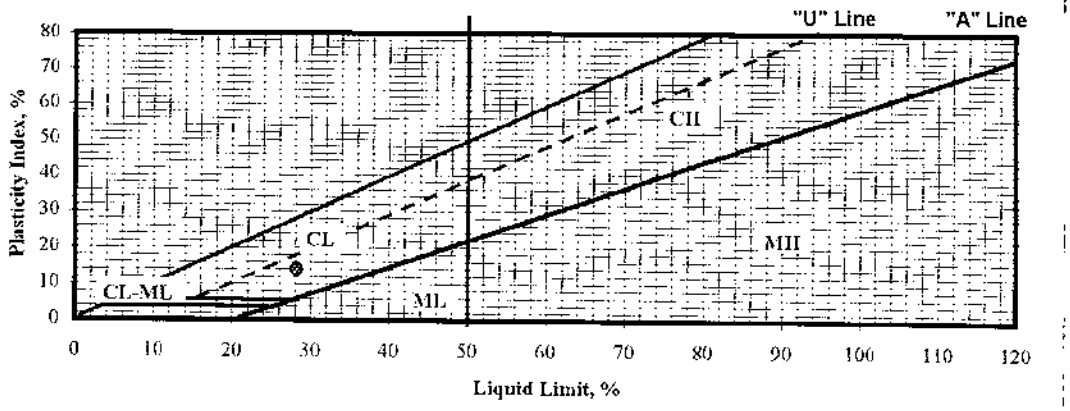

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GRAIN SIZE DISTRIBUTION

ASTM D422, -#200 ONLY

Shaw EMCON/OWT, Inc.

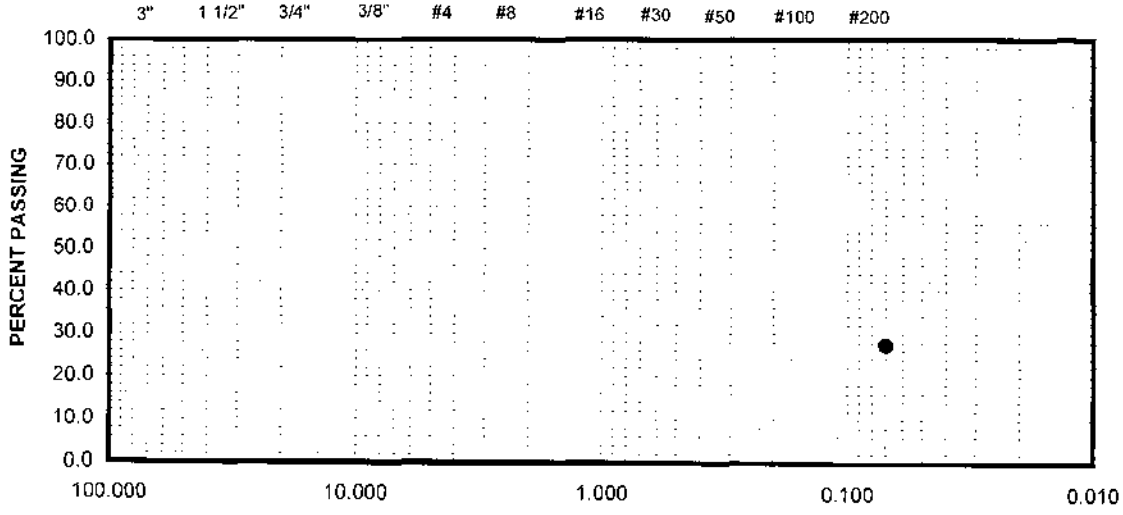
A Shaw Group Company

PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	#7 @ 50-51.5'	DATE:	06/24/05
DESCRIPTION:	CLAYEY SAND, GREENISH BROWN.	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SC	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0		
Pan Number:	#500	3/4"	100.0		
Pan + Wet Soil, gms.	640.4	3/8"	100.0		
Pan + Dry Soil, gms.	561.2	D_{60}	0.099		
Wt. of Pan, gms.	92.7	D_{30}	0.072		
Wt. of Dry Soil, gms.	468.5	D_{10}	0.001	Liquid Limit:	
Wt. of Water, gms.	79.2	C_U	78.25	Plasticity Index:	
Water content, %.	16.9	C_C	41.68	High; Mod.; Low; NP:	MOD.

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	PARTICLES DIAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	468.5	
3"	3.000	76.20		0	468.5	
1 1/2"	1.500	38.10		0	468.5	
3/4"	0.750	18.90		0	468.5	
3/8"	0.375	9.52		0	468.5	
#4	0.185	4.70		0	468.5	
#8	0.093	2.36		0	468.5	
#16	0.046	1.17		0	468.5	
#30	0.023	0.59		0	468.5	
#50	0.012	0.30		0	468.5	
#100	0.006	0.15		0	468.5	
#200	0.003	0.07	340.1	340.1	128.4	27.4

Bulb 152H
HYDROMETER TEST
WITH DISPERSING AGENT



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ATTERBERG LIMITS

ASTM D4318

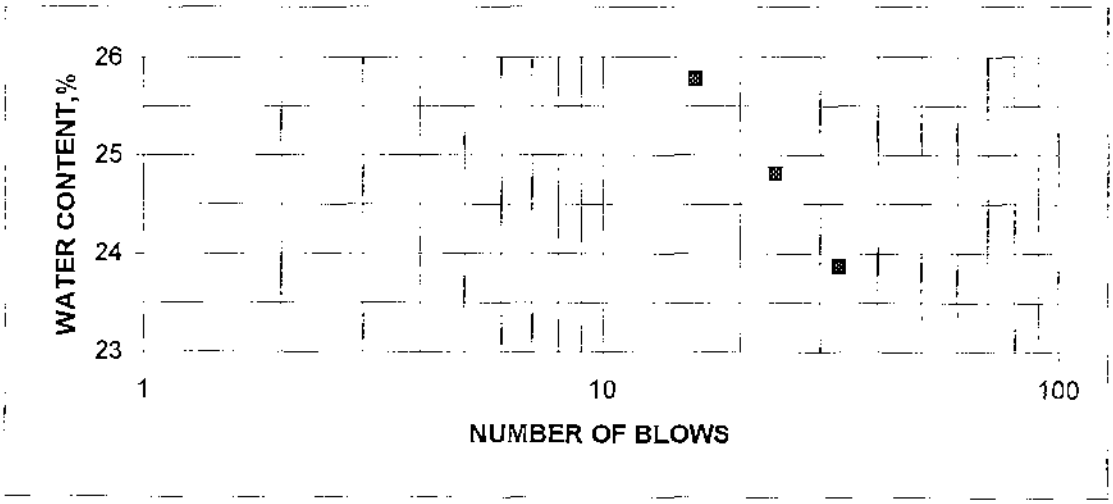
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-035	**Proj. No.:**	837998
Sample No.:	GT05-7	**Depth, ft.:**	55-56'	**Date:**	06/30/05
Description:	CLAYEY SAND, GREENISH BROWN.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	B-1	B-3	A-5	C-1	D-6	
Weight of Can + Wet Soil, gms.	65.66	67.02	69.72	46.31	44.87	
Weight of Can + Dry Soil, gms.	59.19	60.09	61.99	44.57	43.27	
Weight of Can, gms.	32.08	32.16	32.00	32.01	31.87	
Weight of Dry Soil, gms.	27.11	27.93	29.99	12.56	11.40	
Weight of Water, gms.	6.47	6.93	7.73	1.74	1.60	
Water Content, %	23.9	24.8	25.8	13.9	14.0	
Number of Blows	33	24	16			

Unified Soil Classification **SC**



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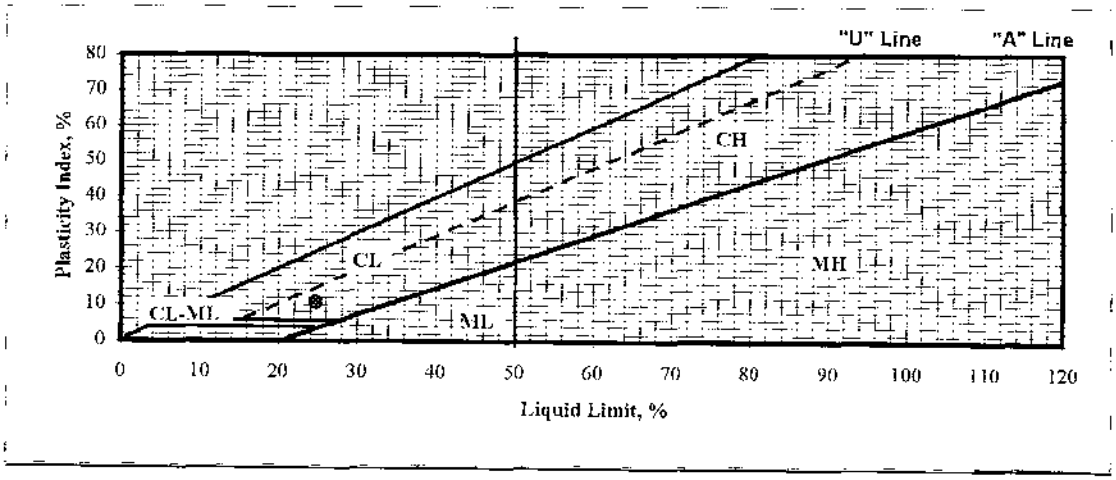

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GRAIN SIZE DISTRIBUTION

ASTM D422, -#200 ONLY

Shaw EMCON/OWT, Inc.

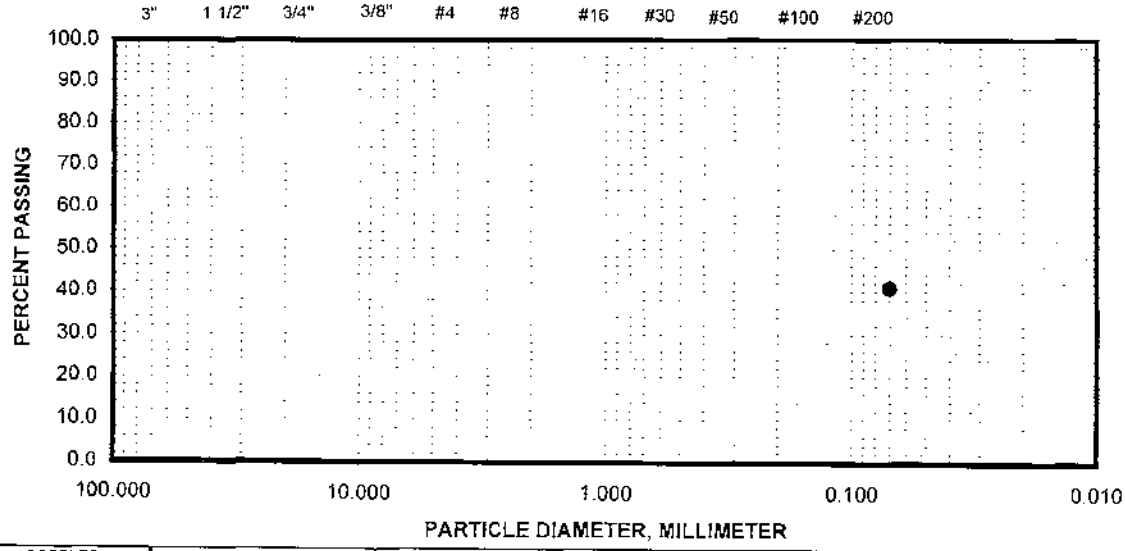
A Shaw Group Company

PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	#7 @ 55-56'	DATE:	06/24/05
DESCRIPTION:	CLAYEY SAND, GREENISH BROWN.	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SC	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0		
Pan Number:	#502	3/4"	100.0		
Pan + Wet Soil, gms.	382.1	3/8"	100.0		
Pan + Dry Soil, gms.	345.8	D_{60}	0.090		
Wt. of Pan, gms.	133.8	D_{30}	#DIV/0!		
Wt. of Dry Soil, gms.	212.0	D_{10}	0.001	Liquid Limit:	
Wt. of Water, gms.	36.3	C_U	78.37	Plasticity Index:	
Water content, %.	17.1	C_C	#DIV/0!	High; Mod.; Low; NP:	MOD.

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	PARTICLES DIAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	212	
3"	3.000	76.20		0	212	
1 1/2"	1.500	38.10		0	212	
3/4"	0.750	18.90		0	212	
3/8"	0.375	9.52		0	212	
#4	0.185	4.70		0	212	
#8	0.093	2.36		0	212	
#16	0.046	1.17		0	212	
#30	0.023	0.59		0	212	
#50	0.012	0.30		0	212	
#100	0.006	0.15		0	212	
#200	0.003	0.07	125.2	125.2	86.8	40.9

Bulb 152H
HYDROMETER TEST
WITH DISPERSING AGENT



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U.U TRIAXIAL TEST

ASTM D2850

Shaw EMCON/OWT, Inc.

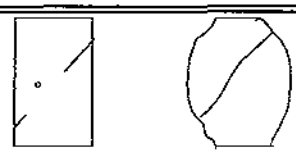
A Shaw Group Company

☐ Unsaturated

■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	05-074
Sample No.:	GT05-08	**Depth, ft.:**	62-64.5'	**Date:**	09/20/05
Description:	ELASTIC SILT, GRAY.			**Tested By:**	DGC

Total Wet Wt., gms.	1013.3
Total Dry Wt., gms.	636.9
Height, in.	6.00
Diameter, in.	2.87
Area, in.^{2}	6.4693
Volume, cf.	0.0225
Dry Density, pcf.	62.5
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



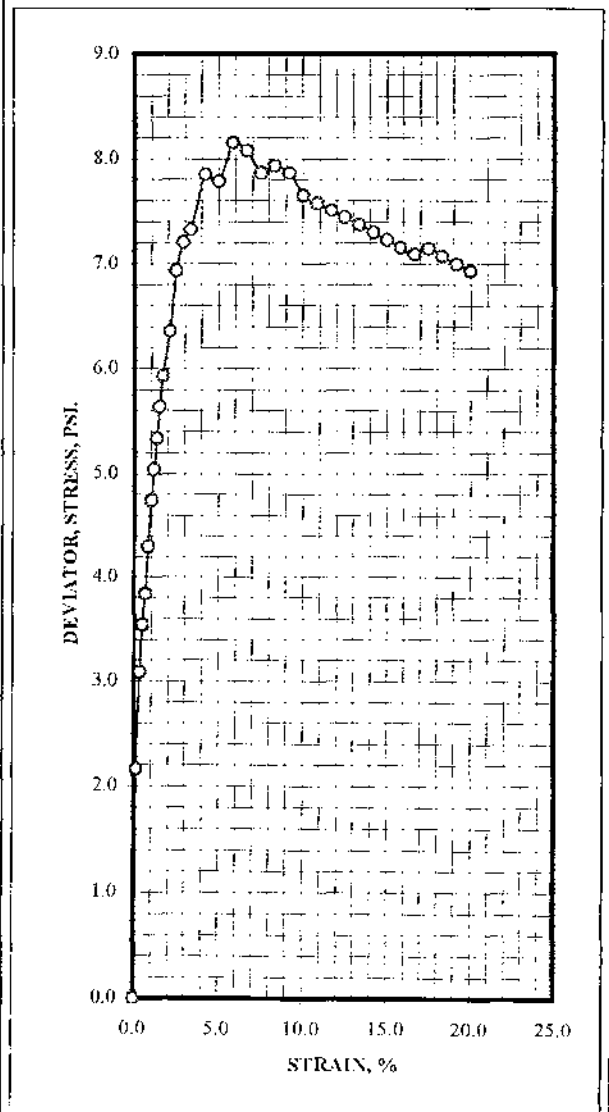
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.00

Tare Number	#43
Wet Soil + Tare, gms.	1199.8
Dry Soil + Tare, gms.	812.6
Tare Weights, gms.	175.7
Weight of Water, gms.	387.2
Wt. of Dry Soil, gms.	636.9
Water Content, %	60.8
Initial Water Content, %	59.1
Saturation	96.8
Confin. Pressure, psi.	22.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.47	0	0.00
10	0.17	6.48	14	2.16
20	0.33	6.49	20	3.08
30	0.50	6.50	23	3.54
40	0.67	6.51	25	3.84
50	0.83	6.52	28	4.29
60	1.00	6.53	31	4.74
70	1.17	6.55	33	5.04
80	1.33	6.56	35	5.34
90	1.50	6.57	37	5.63
100	1.67	6.58	39	5.93
125	2.08	6.61	42	6.36
150	2.50	6.64	46	6.93
175	2.92	6.66	48	7.20
200	3.33	6.69	49	7.32
250	4.17	6.75	53	7.85
300	5.00	6.81	53	7.78
350	5.83	6.87	56	8.15
400	6.67	6.93	56	8.08
450	7.50	6.99	55	7.86
500	8.33	7.06	56	7.93
550	9.17	7.12	56	7.86
600	10.00	7.19	55	7.65
650	10.83	7.26	55	7.58
700	11.67	7.32	55	7.51
750	12.50	7.39	55	7.44
800	13.33	7.46	55	7.37
850	14.17	7.54	55	7.30
900	15.00	7.61	55	7.23
950	15.83	7.69	55	7.16
1000	16.67	7.76	55	7.08
1050	17.50	7.84	56	7.14
1100	18.33	7.92	56	7.07
1150	19.17	8.00	56	7.00
1200	20.00	8.09	56	6.93

DEVIATOR VS. STRAIN GRAPH



ATTERBERG LIMITS

ASTM D4318

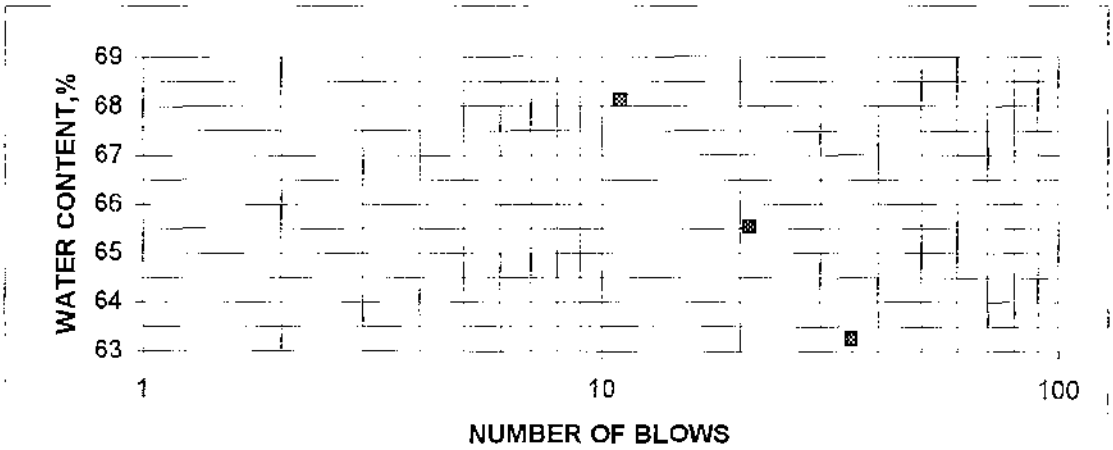
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-074	**Proj. No.:**	837998
Sample No.:	GT05-08	**Depth, ft.:**	62-64.5'	**Date:**	09/26/05
Description:	ELASTIC SILT, GRAY.			**Tested By:**	DGC
				Checked By:	

/*	Liquid Limit			Plastic Limit		
Can Number	B-5	O-4	A-3	A-7	O-6	
Weight of Can + Wet Soil, gms.	67.93	64.85	66.95	46.18	45.82	
Weight of Can + Dry Soil, gms.	54.14	51.67	52.81	42.63	42.38	
Weight of Can, gms.	32.34	31.56	32.05	31.86	31.98	
Weight of Dry Soil, gms.	21.80	20.11	20.76	10.77	10.40	
Weight of Water, gms.	13.79	13.18	14.14	3.55	3.44	
Water Content, %	63.3	65.5	68.1	33.0	33.1	
Number of Blows	35	21	11			

Unified Soil Classification **MH**



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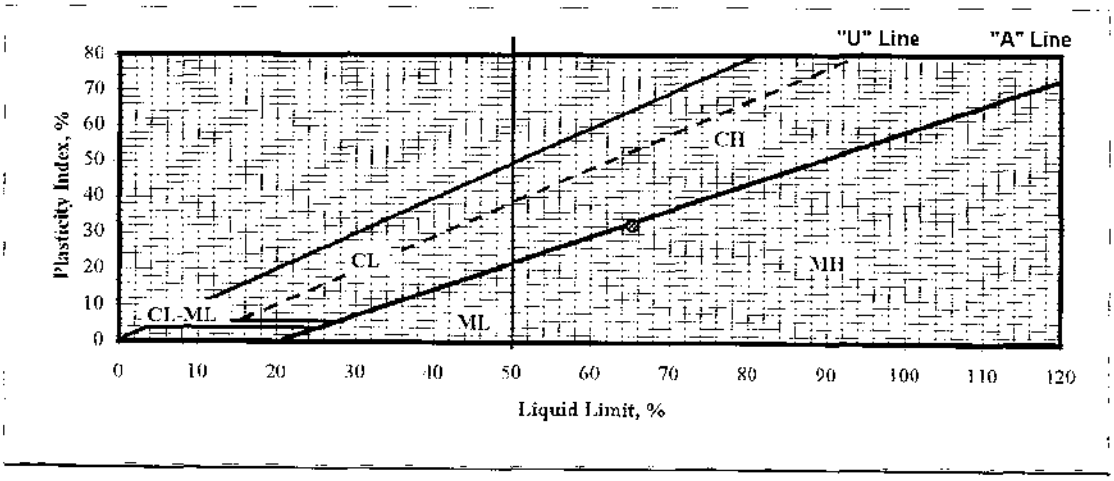

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Shaw EMCON/OWT, Inc.
A Shaw Group Company

CONSOLIDATION

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998.00
Sample No.:	GT05-08 @ 62-64.5'	**Tested By:**	DGC.
Description:	ELASTIC SILT, GRAY.	**Date:**	10/03/05

* Flooded with water at the beginning of test.

Consol. No.:	#2
Diameter, in.	2.40
Thickness, in.	1.00
Soil Wet Wt., gms.	119.33
Water Content, %	59.7
Dry Density, pcf.	62.9
Initial Sat.	96.1
Final Sat.	99.9

Tare Number	#47
Wet Wt. of Soil +Tare, gms.	169.32
Dry Wt. of Soil + Tare, gms.	153.60
Weight of Tare, gms.	78.90
Weight of Water, gms.	15.72
Weight of Dry Soil, gms.	74.70
Final Water Content, %	21.0
Est. Specific Gravity	2.70

LOAD ksf.	DIAL .0001 in.	APPLIED CORRECTIONS	HEIGHT, inches.	CONSOL %	DENSITY pcf.	VOID RATIO
0.000	0.0000	0.0000	1.0000	0.00	62.9	1.6784
0.125	0.0004	0.0002	0.9998	0.02	62.9	1.6777
0.250	0.0004	0.0002	0.9998	0.02	62.9	1.6779
0.500	0.0042	0.0005	0.9963	0.37	63.1	1.6684
1.000	0.0196	0.0015	0.9819	1.81	64.1	1.6299
2.000	0.0528	0.0023	0.9495	5.05	66.3	1.5431
4.000	0.1173	0.0032	0.8859	11.41	71.0	1.3727
8.000	0.2001	0.0050	0.8049	19.51	78.2	1.1557
16.000	0.2954	0.0063	0.7109	28.91	88.5	0.9041
32.000	0.3882	0.0088	0.6206	37.94	101.4	0.6622
8.000	0.3724	0.0069	0.6345	36.55	99.1	0.6994
4.000	0.3600	0.0059	0.6459	35.41	97.4	0.7299
16.000	0.3762	0.0063	0.6301	36.99	99.8	0.6877
32.000	0.3935	0.0088	0.6153	38.47	102.2	0.6480
48.000	0.4242	0.0098	0.5856	41.44	107.4	0.5685

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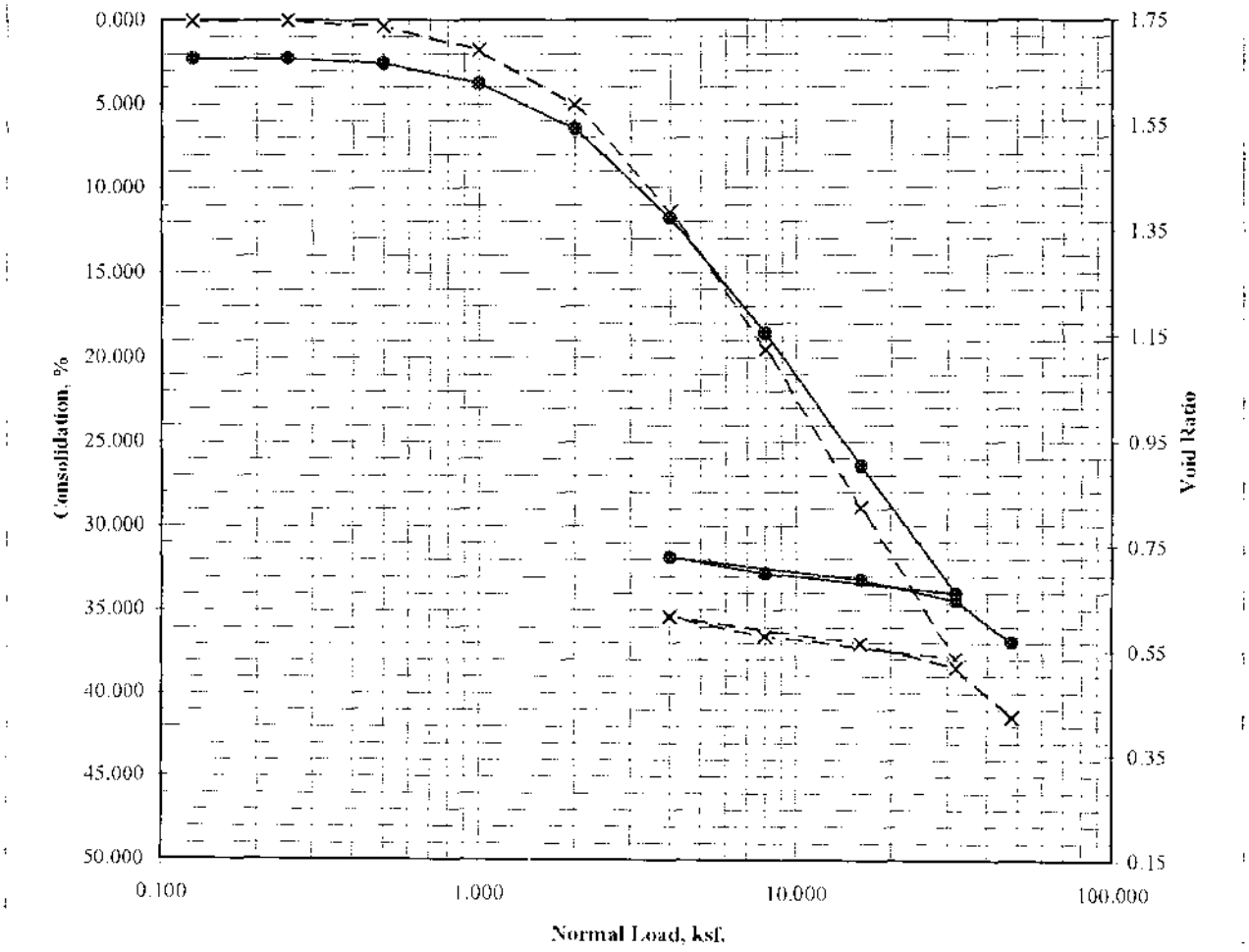
CONSOLIDATION

Shaw EMCON/OWT, Inc.
A Shaw Group Company

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998.00
Sample No.:	GT05-08 @ 62-64.5'	**Tested By:**	DGC.
Description:	ELASTIC SILT, GRAY.	**Date:**	10/03/05

x **Consolidation vs. Load** ● **Void Ratio vs. Load**



* Flooded with water at the beginning of test.

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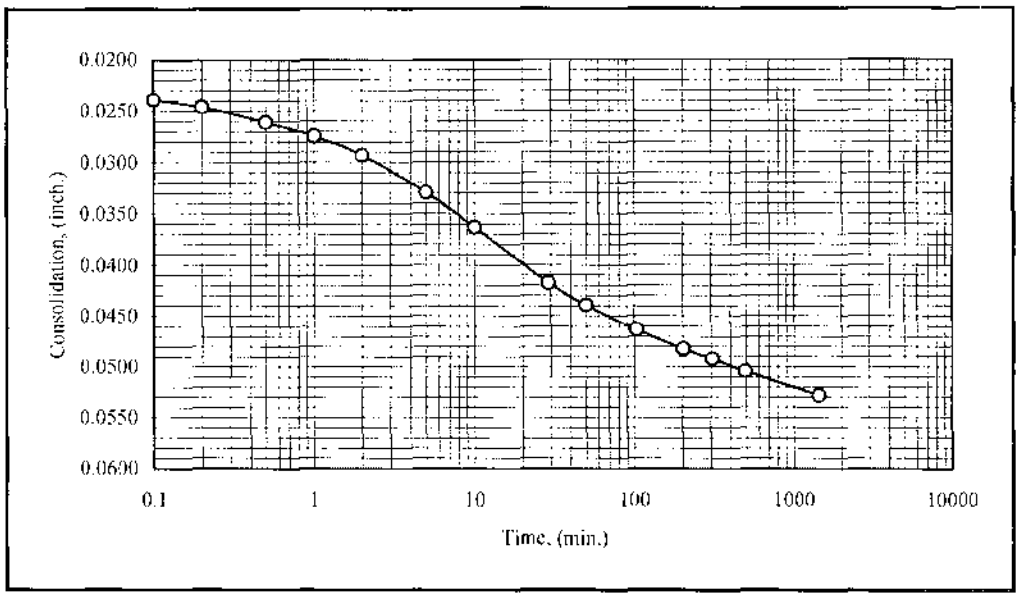
Shaw

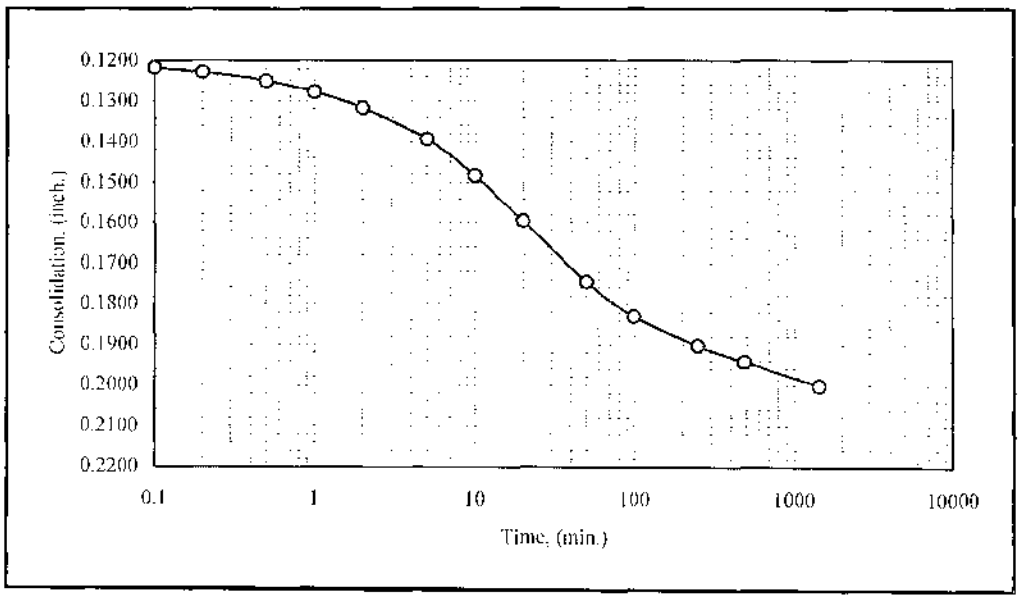
CONSOLIDATION
TIME - COMPRESSION CURVES

Project Name: BRISBANE LANDFILL **Proj. Number:** 837998
Sample No. GT05-08 @ 62-64.5' **Date:** 10/05/05
Sampel Description: ELASTIC SILT, GRAY.

Load:	2 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0239
0.2	0.0246
0.5	0.0261
1	0.0274
2	0.0293
5	0.0329
10	0.0363
29	0.0417
50	0.0439
103	0.0463
202	0.0482
307	0.0492
495	0.0504
1447	0.0528



Load	8 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.1218
0.2	0.1229
0.5	0.1251
1	0.1278
2	0.1317
5	0.1394
10	0.1482
20	0.1595
50	0.1745
100	0.1830
248	0.1902
488	0.1942
1437	0.2001



GRAIN SIZE DISTRIBUTION

ASTM D422

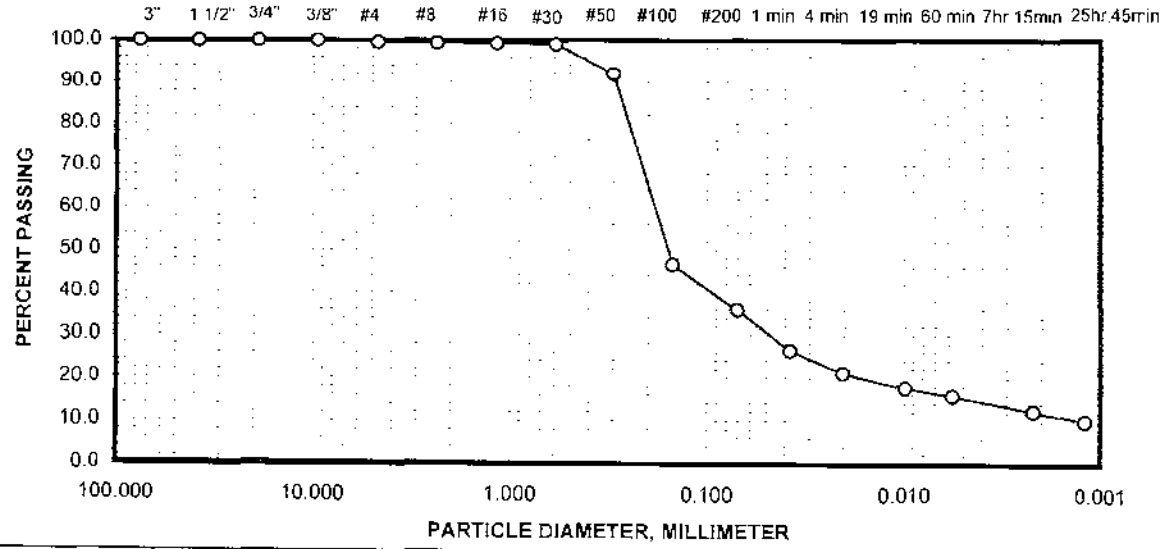
Shaw EMCON/OWT, Inc.

A Shaw Group Company

PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	GT05-08 @82-83.5'	DATE:	09/15/05
DESCRIPTION:	CLAYEY SAND, GRAY BROWN.	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SC	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0	Dry Wt Used, Hydrom:	61.8
Pan Number:	#82	3/4"	100.0	Est. Sp. Gr., (2.60-2.80):	2.70
Pan + Wet Soil, gms.	528.2	3/8"	100.0	Temp.,(18-23) °C:	21
Pan + Dry Soil, gms.	441.2	D_{60}	0.184	Zero Correction	5.0
Wt. of Pan, gms.	76.2	D_{30}	0.048	Miniscus Correction:	0.5
Wt. of Dry Soil, gms.	365.0	D_{10}	#DIV/0!	Liquid Limit:	
Wt. of Water, gms.	87.0	C_U	#DIV/0!	Plasticity Index:	
Water content, %.	23.8	C_C	#DIV/0!	High; Mod.; Low; NP:	MOD.

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	PARTICLES DIAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	365	100.0
3"	3.000	76.20		0	365	100.0
1 1/2"	1.500	38.10		0	365	100.0
3/4"	0.750	18.90		0	365	100.0
3/8"	0.375	9.52	0.0	0	365	100.0
#4	0.185	4.70	1.5	1.5	363.5	99.6
#8	0.093	2.36	1.0	2.5	362.5	99.3
#16	0.046	1.17	0.3	2.8	362.2	99.2
#30	0.023	0.59	0.7	3.5	361.5	99.0
#50	0.012	0.30	26.3	29.8	335.2	91.8
#100	0.006	0.15	165.1	194.9	170.1	46.6
#200	0.003	0.07	39.1	234	131	35.9
		0.0378	1 min.		51	26.4
Bulb 152H HYDROMETER TEST WITH DISPERSING AGENT		0.0204	4 min.		42	21.2
		0.0098	19 min.		36	17.7
		0.0057	60 min.		33	16.0
		0.0022	7hr., 15min.		27	12.5
		0.0012	25hr., 45min.		23	10.2



COBBLES	COARSE - FINE GRAVEL	COARSE, MED TO FINE SAND	N-PLASTIC SILT TO PLASTIC CLAY

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GRAIN SIZE DISTRIBUTION

ASTM D422

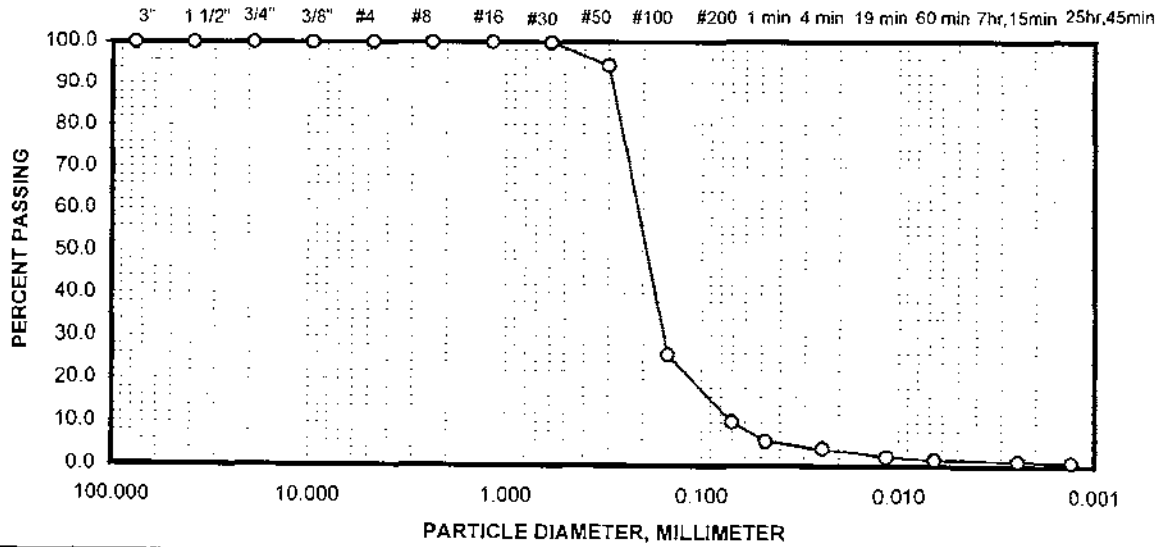
Shaw EMCON/OWT, Inc.

A Shaw Group Company

PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	GT05-08 @112-113.5'	DATE:	09/15/05
DESCRIPTION:	POORLY-GRADED SAND WITH SILT, BROWN.	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SP-SM	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0	Dry Wt Used, Hydrom:	29.1
Pan Number:	#97	3/4"	100.0	Est. Sp. Gr., (2.60-2.80):	2.70
Pan + Wet Soil, gms.	670.9	3/8"	100.0	Temp.,(18-23) °C:	21
Pan + Dry Soil, gms.	585.5	D_{60}	0.212	Zero Correction	5.0
Wt. of Pan, gms.	176.4	D_{30}	0.156	Miniscus Correction:	0.5
Wt. of Dry Soil, gms.	409.1	D_{10}	0.068	Liquid Limit:	
Wt. of Water, gms.	85.4	C_U	3.10	Plasticity Index:	
Water content, %.	20.9	C_C	1.69	High; Mod.; Low; NP:	NP

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	PARTICLES DIAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	409.1	100.0
3"	3.000	76.20		0	409.1	100.0
1 1/2"	1.500	38.10		0	409.1	100.0
3/4"	0.750	18.90		0	409.1	100.0
3/8"	0.375	9.52	0.0	0	409.1	100.0
#4	0.185	4.70	0.0	0	409.1	100.0
#8	0.093	2.36	0.0	0	409.1	100.0
#16	0.046	1.17	0.1	0.1	409	100.0
#30	0.023	0.59	0.6	0.7	408.4	99.8
#50	0.012	0.30	22.2	22.9	386.2	94.4
#100	0.006	0.15	280.5	303.4	105.7	25.8
#200	0.003	0.07	63.7	367.1	42	10.3
		0.0473	1 min.		22	5.8
Bulb 15211		0.0244	4 min.		17	4.1
HYDROMETER TEST		0.0115	19 min.		12	2.3
WITH DISPERSING AGENT		0.0066	60 min.		10	1.6
		0.0024	7hr., 15min.		9	1.2
		0.0013	25hr., 45min.		8	0.9



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ATTERBERG LIMITS

ASTM D4318

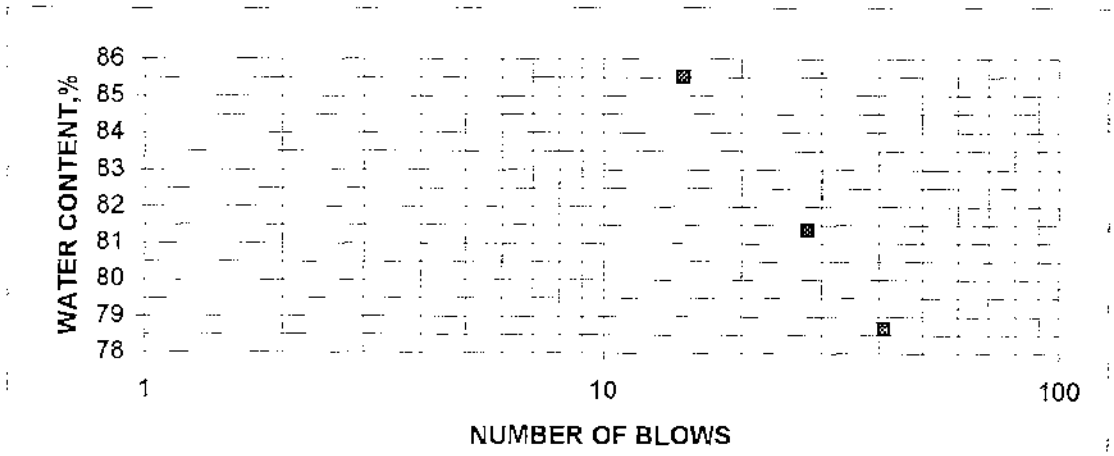
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-084	**Proj. No.:**	837998
Sample No.:	GT05-08	**Depth, ft.:**	127-129.5'	**Date:**	10/14/05
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	B-6	C-2	J-6	G-6	A-8	
Weight of Can + Wet Soil, gms.	65.08	63.75	64.70	45.37	45.19	
Weight of Can + Dry Soil, gms.	50.52	49.56	49.60	41.90	41.72	
Weight of Can, gms.	32.01	32.12	31.94	32.02	31.88	
Weight of Dry Soil, gms.	18.51	17.44	17.66	9.88	9.84	
Weight of Water, gms.	14.56	14.19	15.10	3.47	3.47	
Water Content, %	78.7	81.4	85.5	35.1	35.3	
Number of Blows	41	28	15			

Unified Soil Classification **CH**



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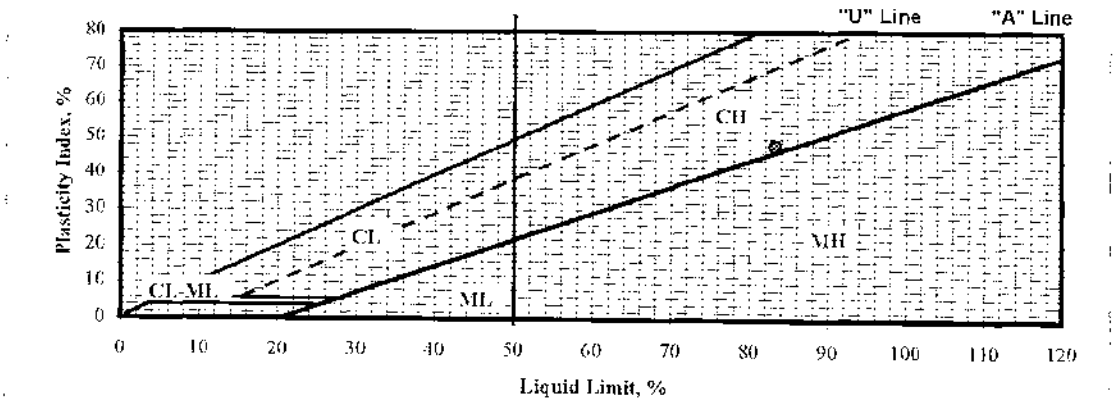

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U.U TRIAXIAL TEST

ASTM D2850

Shaw EMCON/OWT, Inc.
A Shaw Group Company

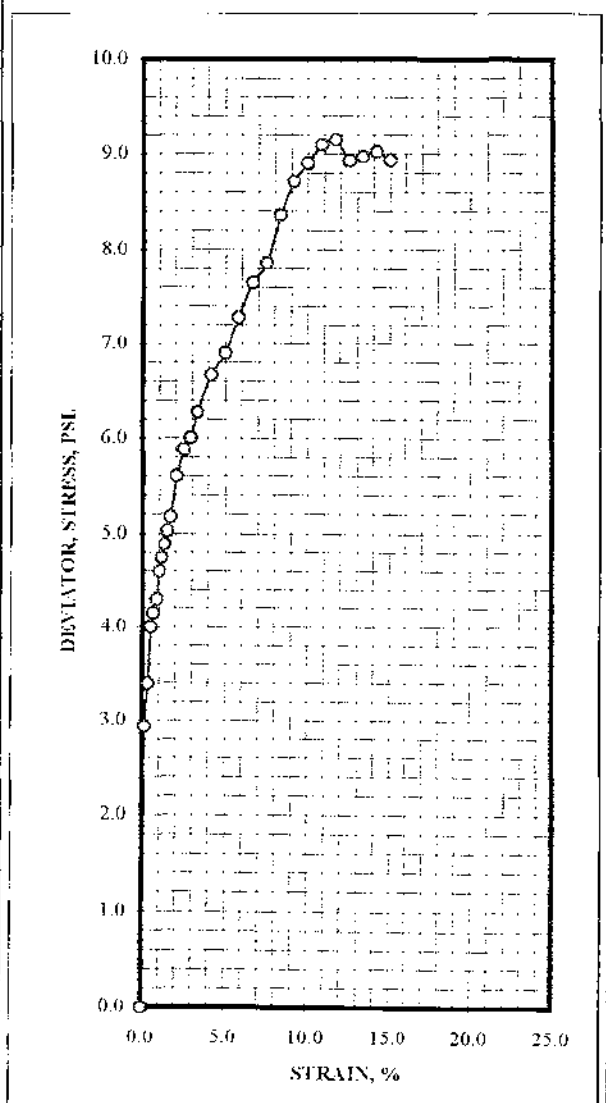
☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	05-084
Sample No.:	GT05-8	**Depth, ft.:**	127-129.5'	**Date:**	10/14/05
Description:	FAT CLAY. GRAY.			**Tested By:**	DGC

Total Wet Wt., gms.	1042.4			Tare Number	A-1
Total Dry Wt., gms.	641.4			Wet Soil + Tare, gms.	1222.0
Height, in.	6.00			Dry Soil + Tare, gms.	822.3
Diameter, in.	2.87			Tare Weights, gms.	180.9
Area, in.^{2}	6.4693	SHEARED ☐	BULGING ■	Weight of Water, gms.	399.7
Volume, cf.	0.0225			Wt. of Dry Soil, gms.	641.4
Dry Density, pcf.	62.9	SKETCH AT FAILURE		Water Content, %	62.3
Est. Spec. Gravity	2.7			Initial Water Content, %	62.5
Max. Dry Density, pcf.		L.C. Cal. lbs./div.	1.00	Saturation	100.4
Opt. Water Content, %		Strain Rate, % /min.:	1.00	Confin. Pressure, psi.	45.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.47	0	0.00
10	0.17	6.48	19	2.93
20	0.33	6.49	22	3.39
30	0.50	6.50	26	4.00
40	0.67	6.51	27	4.15
50	0.83	6.52	28	4.29
60	1.00	6.53	30	4.59
70	1.17	6.55	31	4.74
80	1.33	6.56	32	4.88
90	1.50	6.57	33	5.02
100	1.67	6.58	34	5.17
125	2.08	6.61	37	5.60
150	2.50	6.64	39	5.88
175	2.92	6.66	40	6.00
200	3.33	6.69	42	6.28
250	4.17	6.75	45	6.67
300	5.00	6.81	47	6.90
350	5.83	6.87	50	7.28
400	6.67	6.93	53	7.65
450	7.50	6.99	55	7.86
500	8.33	7.06	59	8.36
550	9.17	7.12	62	8.71
600	10.00	7.19	64	8.90
650	10.83	7.26	66	9.10
700	11.67	7.32	67	9.15
750	12.50	7.39	66	8.93
800	13.33	7.46	67	8.98
850	14.17	7.54	68	9.02
900	15.00	7.61	68	8.93
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00
	0.00	0.00		0.00

DEVIATOR VS. STRAIN GRAPH



ATTERBERG LIMITS

ASTM D4318

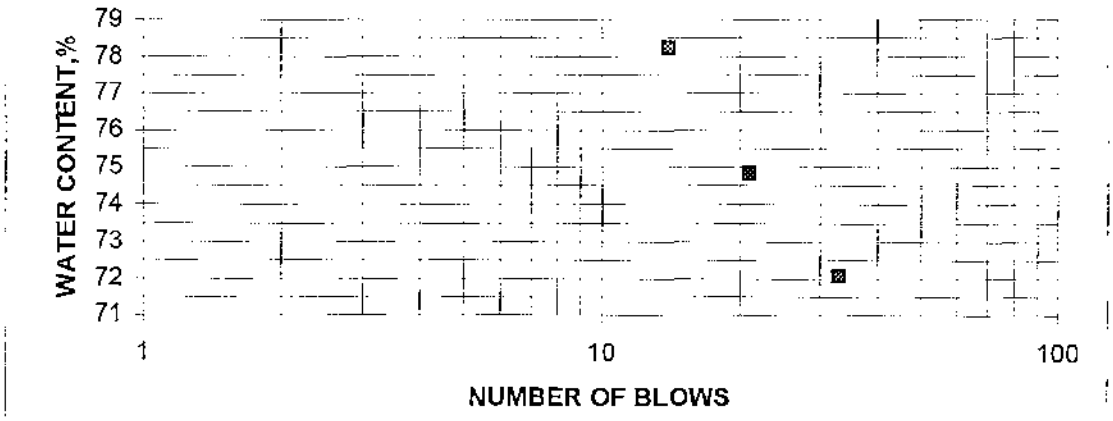
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-074	**Proj. No.:**	837998
Sample No.:	GT05-08	**Depth, ft.:**	162-163'	**Date:**	09/21/05
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	B-3	C-1	B-1	D-6	A-5	
Weight of Can + Wet Soil, gms.	62.97	63.68	63.52	43.99	43.34	
Weight of Can + Dry Soil, gms.	50.05	50.13	49.72	41.16	40.66	
Weight of Can, gms.	32.12	32.02	32.08	31.87	32.01	
Weight of Dry Soil, gms.	17.93	18.11	17.64	9.29	8.65	
Weight of Water, gms.	12.92	13.55	13.80	2.83	2.68	
Water Content, %	72.1	74.8	78.2	30.5	31.0	
Number of Blows	33	21	14			

Unified Soil Classification **CH**



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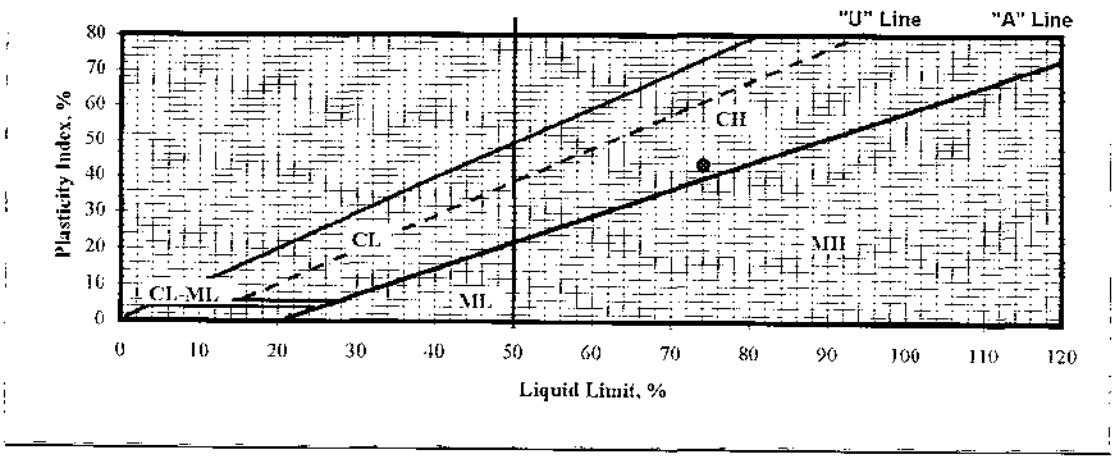

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U.U TRIAXIAL TEST

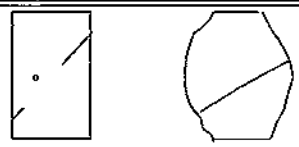
ASTM D2850

Shaw EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	05-074
Sample No.:	GT05-08	**Depth, ft.:**	162-163'	**Date:**	09/19/05
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC

Total Wet Wt., gms.	1057.4
Total Dry Wt., gms.	679.1
Height, in.	6.00
Diameter, in.	2.87
Area, in.^{2}	6.4693
Volume, cf.	0.0225
Dry Density, pcf.	66.6
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %	



SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.00

Tare Number	#86
Wet Soil + Tare, gms.	1142.2
Dry Soil + Tare, gms.	757.2
Tare Weights, gms.	78.1
Weight of Water, gms.	385.0
Wt. of Dry Soil, gms.	679.1
Water Content, %	56.7
Initial Water Content, %	55.7
Saturation	100.2
Confin. Pressure, psi.	61.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.47	0	0.00
10	0.17	6.48	40	6.17
20	0.33	6.49	63	9.71
30	0.50	6.50	79	12.15
40	0.67	6.51	90	13.82
50	0.83	6.52	100	15.33
60	1.00	6.53	106	16.22
70	1.17	6.55	110	16.81
80	1.33	6.56	114	17.39
90	1.50	6.57	115	17.51
100	1.67	6.58	114	17.33
125	2.08	6.61	107	16.20
150	2.50	6.64	102	15.37
175	2.92	6.66	98	14.71
200	3.33	6.69	98	14.64
250	4.17	6.75	97	14.37
300	5.00	6.81	96	14.10
				0.00
				0.00
				0.00
				0.00
				0.00
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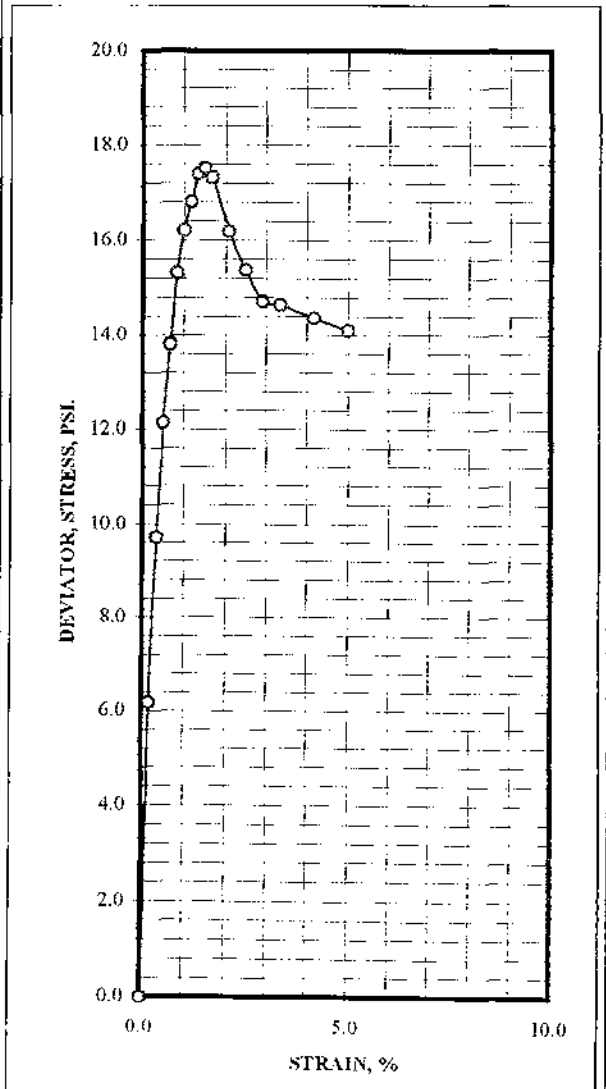
DEVIATOR VS. STRAIN GRAPH



Shaw EMCON/OWT, Inc.
A Shaw Group Company

CONSOLIDATION

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998.00
Sample No.:	GT05-08 @ 162-163'	**Tested By:**	DGC
Description:	FAT CLAY, GRAY.	**Date:**	09/19/05

* Flooded with water at the beginning of test.

Consol. No.:	#1
Diameter, in.	2.40
Thickness, in.	1.00
Soil Wet Wt., gms.	123.42
Water Content, %	55.7
Dry Density, pcf.	66.8
Initial Sat.	98.6
Final Sat.	100.1

Tare Number	V-7
Wet Wt. of Soil +Tare, gms.	189.56
Dry Wt. of Soil + Tare, gms.	164.81
Weight of Tare, gms.	85.52
Weight of Water, gms.	24.75
Weight of Dry Soil, gms.	79.29
Final Water Content, %	31.2
Est. Specific Gravity	2.70

LOAD ksf.	DIAL .0001 in.	APPLIED CORRECTIONS	HEIGHT, inches.	CONSOL %	DENSITY pcf.	VOID RATIO
0.000	0.0000	0.0000	1.0000	0.00	66.8	1.5233
0.125	0.0010	0.0002	0.9992	0.08	66.8	1.5212
0.250	0.0013	0.0003	0.9990	0.11	66.8	1.5207
0.500	0.0026	0.0005	0.9979	0.21	66.9	1.5179
1.000	0.0058	0.0009	0.9951	0.49	67.1	1.5110
2.000	0.0134	0.0019	0.9885	1.15	67.5	1.4943
4.000	0.0282	0.0026	0.9744	2.56	68.5	1.4587
8.000	0.0590	0.0043	0.9453	5.47	70.6	1.3853
16.000	0.1442	0.0054	0.8612	13.88	77.5	1.1730
32.000	0.2374	0.0073	0.7699	23.01	86.7	0.9427
16.000	0.2279	0.0054	0.7775	22.25	85.9	0.9619
4.000	0.1900	0.0047	0.8147	18.53	82.0	1.0558
16.000	0.2169	0.0054	0.7885	21.15	84.7	0.9895
32.000	0.2402	0.0073	0.7671	23.29	87.0	0.9357
48.000	0.2781	0.0082	0.7301	26.99	91.5	0.8423

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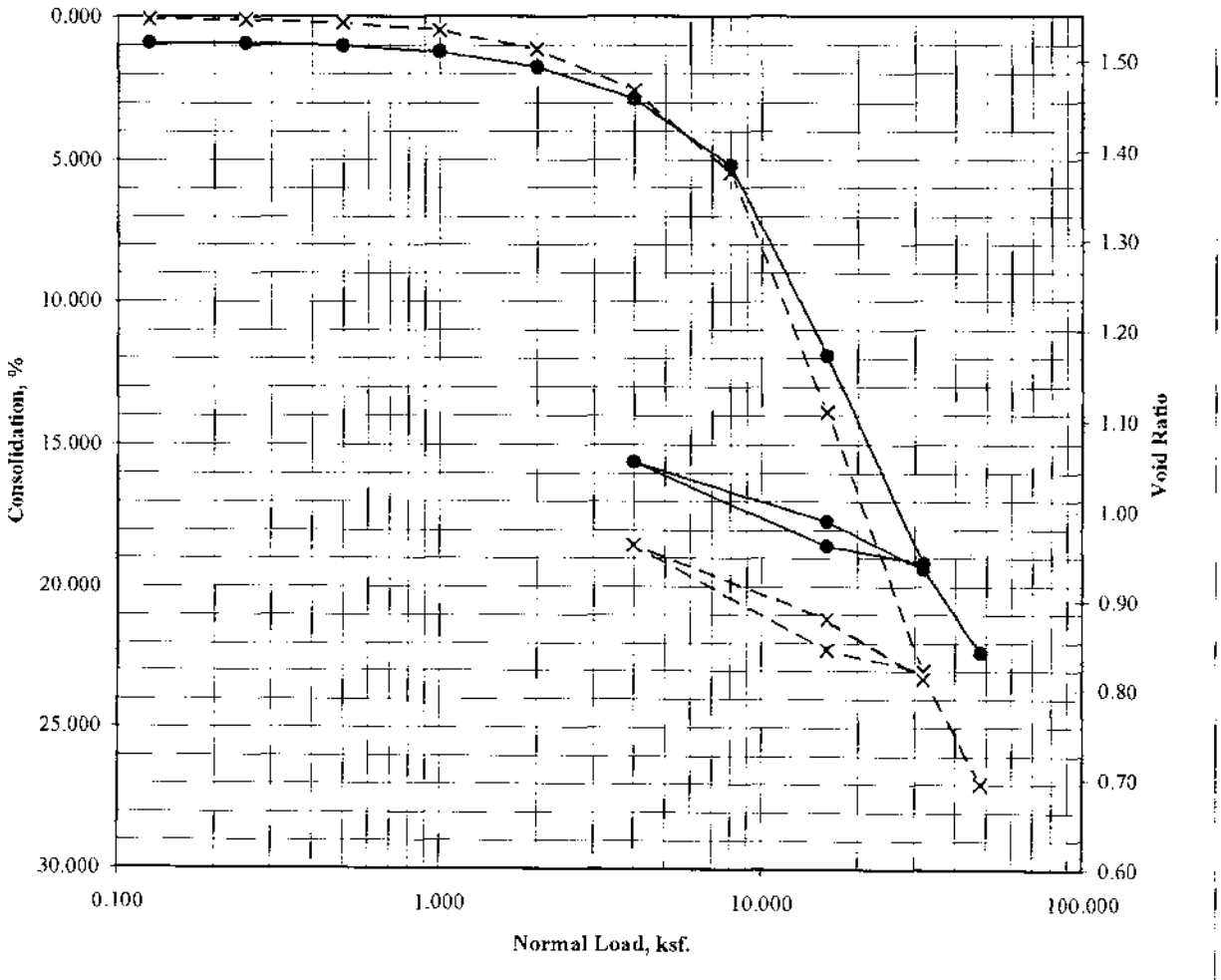
CONSOLIDATION

Shaw EMCON/OWT, Inc.
A Shaw Group Company

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998.00
Sample No.:	GT05-08 @ 162-163'	**Tested By:**	DGC.
Description:	FAT CLAY, GRAY.	**Date:**	09/19/05

x Consolidation vs. Load ● Void Ratio vs. Load



* Flooded with water at the beginning of test.

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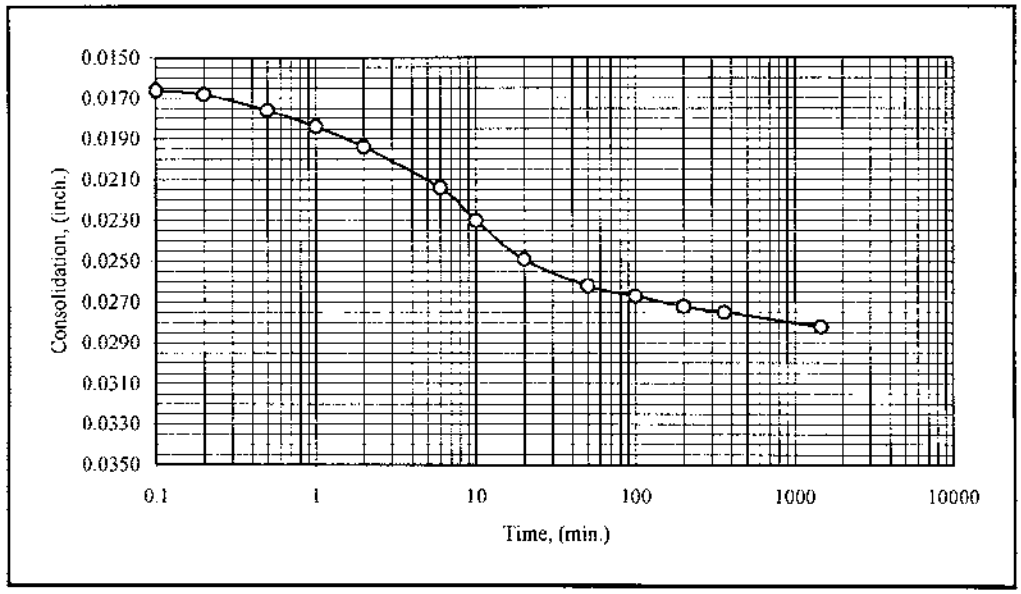
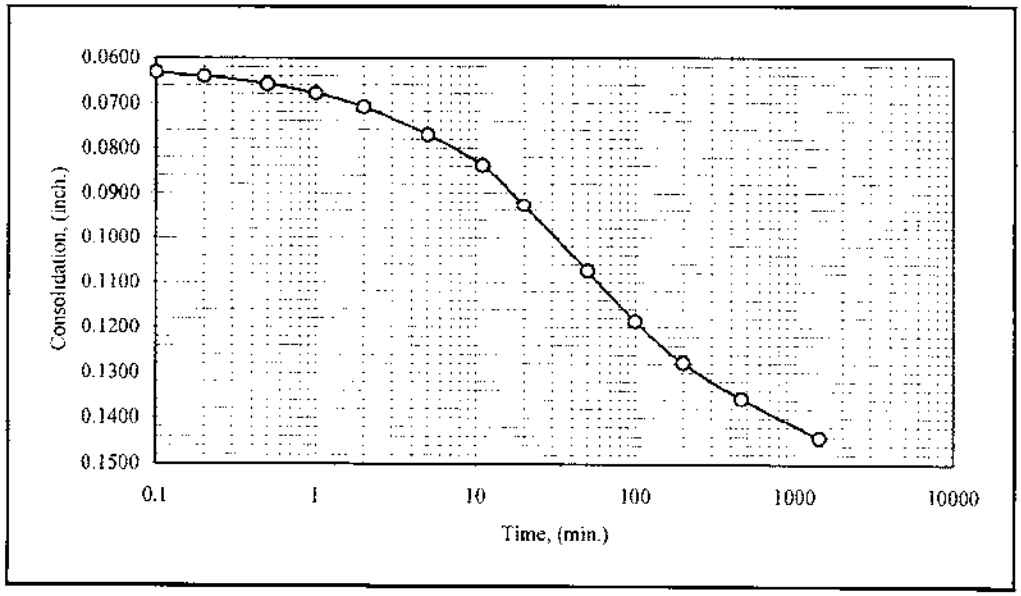
CONSOLIDATION
TIME - COMPRESSION CURVES

Project Name: BRISBANE LANDFILL **Proj. Number:** 837998
Sample No. GT05-08 @ 162-163" **Date:** 09/22/05
Sampel Description: FAT CLAY, GRAY.

Load:	4 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0166
0.2	0.0168
0.5	0.0176
1	0.0184
2	0.0194
6	0.0214
10	0.0230
20	0.0249
50	0.0262
100	0.0267
200	0.0272
359	0.0275
1466	0.0282



Load	16 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0631
0.2	0.0641
0.5	0.0658
1	0.0679
2	0.0709
5	0.0770
11	0.0838
20	0.0927
50	0.1074
100	0.1186
200	0.1277
464	0.1357
1434	0.1442



ATTERBERG LIMITS

ASTM D4318

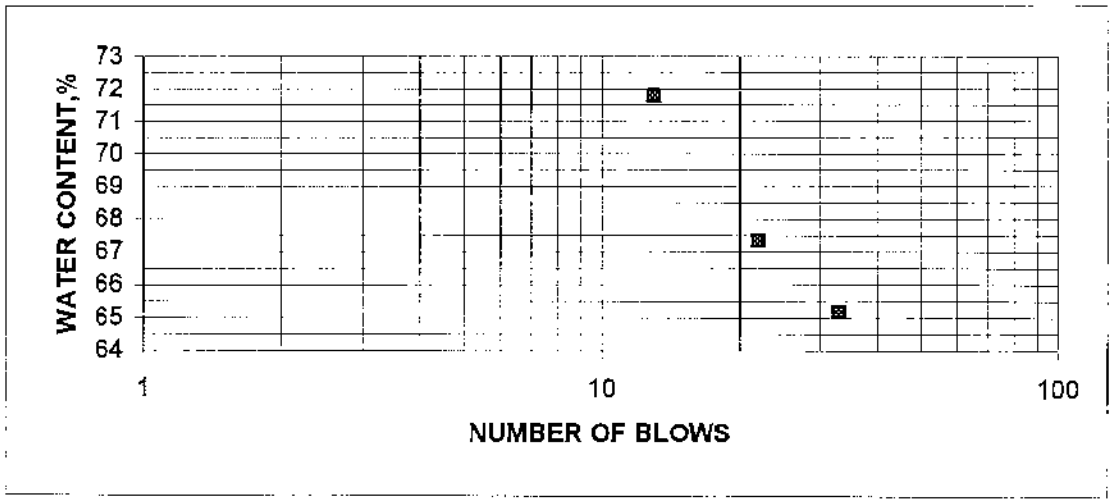
Shaw EMCON/OWT, Inc.

A Shaw Group Company

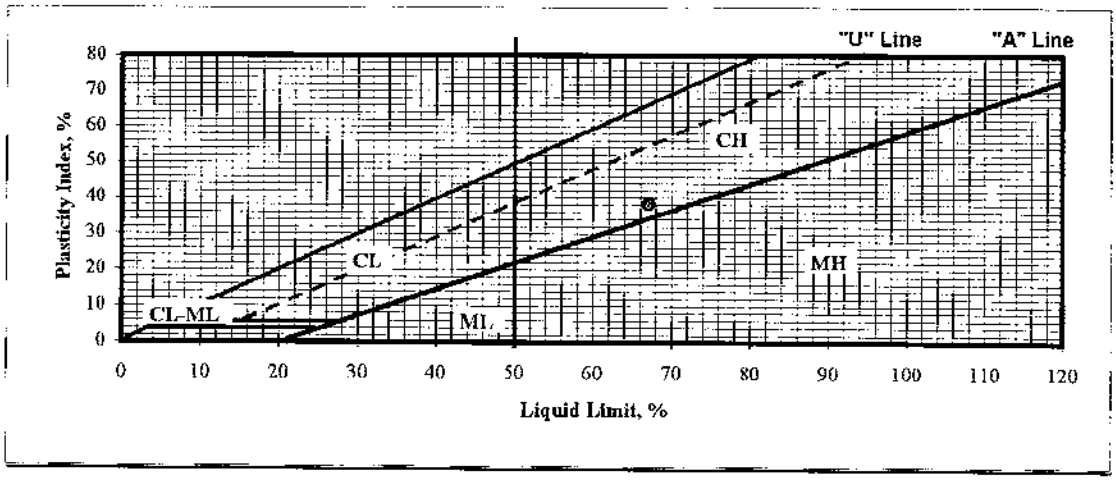
Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-074	**Proj. No.:**	837998
Sample No.:	GT05-08	**Depth, ft.:**	182-184.5'	**Date:**	09/19/05
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	D-6	C-1	B-1	B-3	A-5	
Weight of Can + Wet Soil, gms.	66.83	66.02	66.54	45.31	44.28	
Weight of Can + Dry Soil, gms.	53.04	52.33	52.14	42.40	41.51	
Weight of Can, gms.	31.88	32.00	32.08	32.15	32.01	
Weight of Dry Soil, gms.	21.16	20.33	20.06	10.25	9.50	
Weight of Water, gms.	13.79	13.69	14.40	2.91	2.77	
Water Content, %	65.2	67.3	71.8	28.4	29.2	
Number of Blows	33	22	13			

Unified Soil Classification **CH**



LL=	67	PL=	29	PI=	38



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U.U TRIAXIAL TEST

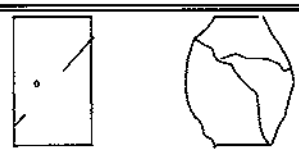
ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	05-074
Sample No.:	GT05-08	**Depth, ft.:**	182-184.5'	**Date:**	09/19/05
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC

Total Wet Wt., gms.	1060.4
Total Dry Wt., gms.	719.5
Height, in.	6.00
Diameter, in.	2.87
Area, in.^{2}	6.4693
Volume, cf.	0.0225
Dry Density, pcf.	70.6
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



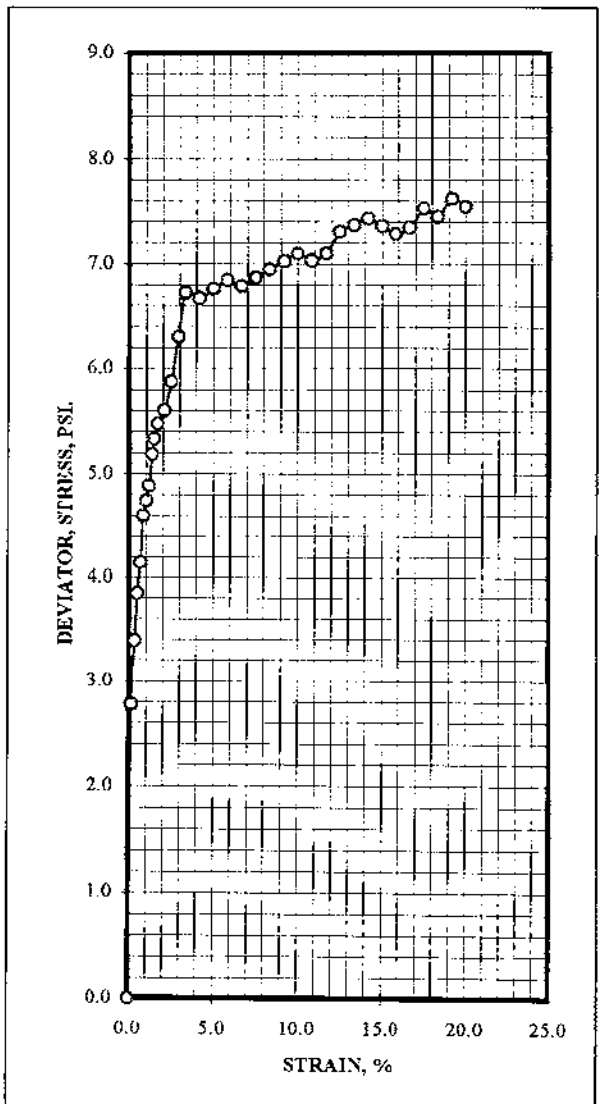
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, %/min.:	1.00

Tare Number	#82
Wet Soil + Tare, gms.	1167.8
Dry Soil + Tare, gms.	797.7
Tare Weights, gms.	78.2
Weight of Water, gms.	370.1
Wt. of Dry Soil, gms.	719.5
Water Content, %	51.4
Initial Water Content, %	47.4
Saturation	100.2
Confin. Pressure, psi.	70.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.47	0	0.00
10	0.17	6.48	18	2.78
20	0.33	6.49	22	3.39
30	0.50	6.50	25	3.85
40	0.67	6.51	27	4.15
50	0.83	6.52	30	4.60
60	1.00	6.53	31	4.74
70	1.17	6.55	32	4.89
80	1.33	6.56	34	5.19
90	1.50	6.57	35	5.33
100	1.67	6.58	36	5.47
125	2.08	6.61	37	5.60
150	2.50	6.64	39	5.88
175	2.92	6.66	42	6.30
200	3.33	6.69	45	6.72
250	4.17	6.75	45	6.67
300	5.00	6.81	46	6.76
350	5.83	6.87	47	6.84
400	6.67	6.93	47	6.78
450	7.50	6.99	48	6.86
500	8.33	7.06	49	6.94
550	9.17	7.12	50	7.02
600	10.00	7.19	51	7.10
650	10.83	7.26	51	7.03
700	11.67	7.32	52	7.10
750	12.50	7.39	54	7.30
800	13.33	7.46	55	7.37
850	14.17	7.54	56	7.43
900	15.00	7.61	56	7.36
950	15.83	7.69	56	7.29
1000	16.67	7.76	57	7.34
1050	17.50	7.84	59	7.52
1100	18.33	7.92	59	7.45
1150	19.17	8.00	61	7.62
1200	20.00	8.09	61	7.54

DEVIATOR VS. STRAIN GRAPH



Shaw EMCON/OWT, Inc.
A Shaw Group Company

CONSOLIDATION

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998.00
Sample No.:	GT05-08 @ 182-184.5'	**Tested By:**	DGC.
Description:	FAT CLAY, GRAY.	**Date:**	09/19/05

* Flooded with water at the beginning of test.

Consol. No.:	#317
Diameter, in.	2.40
Thickness, in.	1.00
Soil Wet Wt., gms.	129.70
Water Content, %	46.6
Dry Density, pcf.	74.5
Initial Sat.	99.8
Final Sat.	100.2

Tare Number	A-1
Wet Wt. of Soil +Tare, gms.	192.60
Dry Wt. of Soil + Tare, gms.	171.76
Weight of Tare, gms.	83.30
Weight of Water, gms.	20.84
Weight of Dry Soil, gms.	88.46
Final Water Content, %	23.6
Est. Specific Gravity	2.70

LOAD ksf.	DIAL .0001 in.	APPLIED CORRECTIONS	HEIGHT, inches.	CONSOL %	DENSITY pcf.	VOID RATIO
0.000	0.0000	0.0000	1.0000	0.00	74.5	1.2617
0.125	0.0003	0.0000	0.9997	0.03	74.5	1.2611
0.250	0.0006	0.0000	0.9994	0.06	74.5	1.2604
0.500	0.0016	0.0000	0.9984	0.16	74.6	1.2581
1.000	0.0054	0.0000	0.9946	0.54	74.9	1.2495
2.000	0.0142	0.0000	0.9858	1.42	75.6	1.2296
4.000	0.0314	0.0000	0.9686	3.14	76.9	1.1907
8.000	0.0676	0.0000	0.9324	6.76	79.9	1.1089
16.000	0.1512	0.0000	0.8488	15.12	87.8	0.9198
32.000	0.2352	0.0000	0.7648	23.52	97.4	0.7298
8.000	0.1998	0.0000	0.8002	19.98	93.1	0.8099
2.000	0.1608	0.0000	0.8392	16.08	88.8	0.8981
8.000	0.1841	0.0000	0.8159	18.41	91.3	0.8454
32.000	0.2403	0.0000	0.7597	24.03	98.1	0.7182
48.000	0.2773	0.0000	0.7227	27.73	103.1	0.6346

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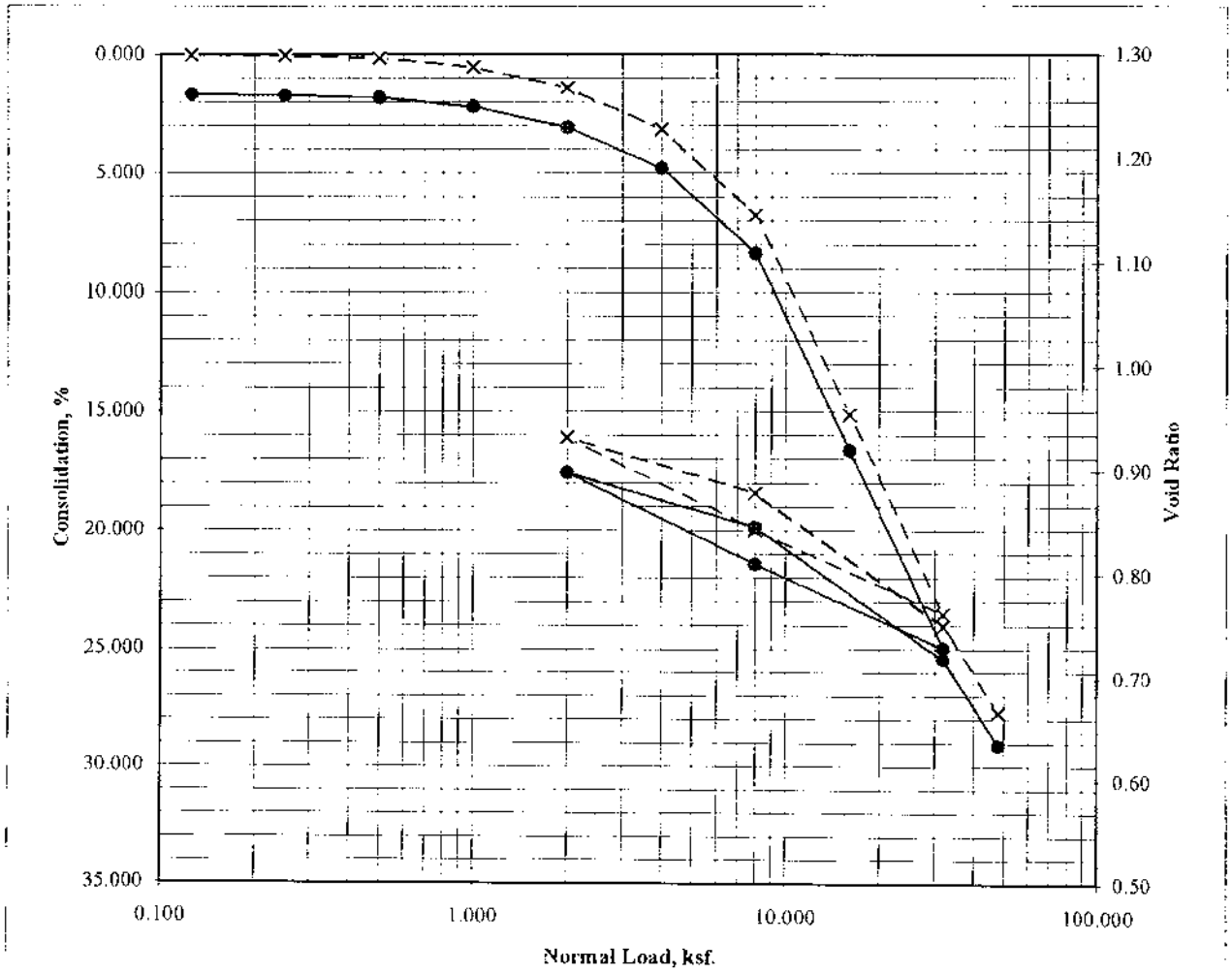
CONSOLIDATION

EMCON/OWT, Inc.
A Shaw Group Company

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998.00
Sample No.:	GT05-08 @ 182-184.5'	**Tested By:**	DGC.
Description:	FAT CLAY, GRAY.	**Date:**	09/19/05

x Consolidation vs. Load ● Void Ratio vs. Load



* Flooded with water at the beginning of test.

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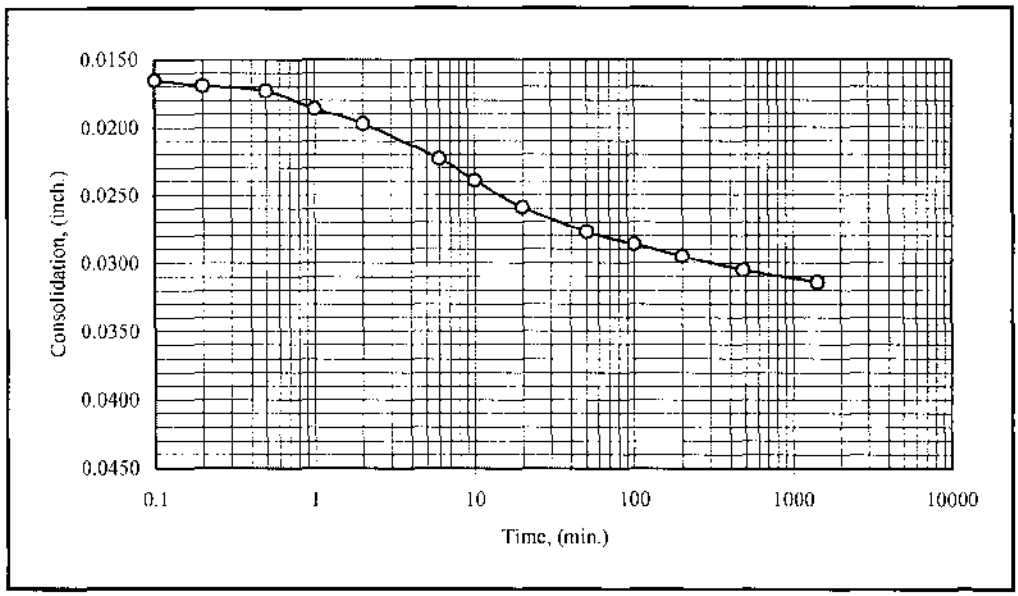
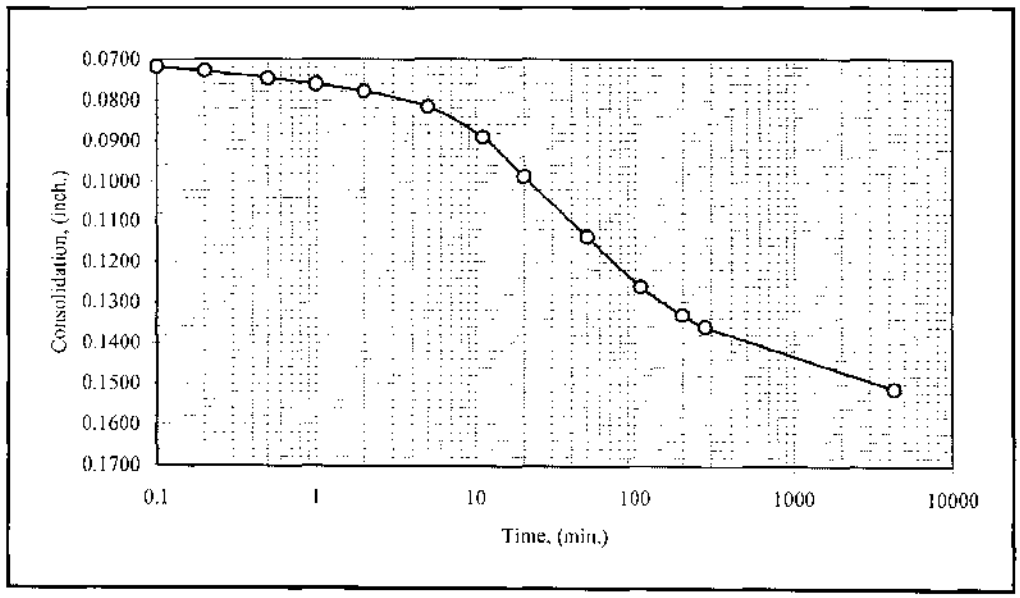
CONSOLIDATION
TIME - COMPRESSION CURVES

Project Name: BRISBANE LANDFILL **Proj. Number:** 837998
Sample No. GT05-08 @ 182-184.5' **Date:** 09/21/05
Sampel Description: FAT CLAY, GRAY.

Load:	4 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0165
0.2	0.0169
0.5	0.0173
1	0.0186
2	0.0197
6	0.0223
10	0.0239
20	0.0259
50	0.0277
100	0.0286
200	0.0295
483	0.0305
1425	0.0314



Load	16 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0717
0.2	0.0728
0.5	0.0745
1	0.0760
2	0.0778
5	0.0815
11	0.0890
20	0.0986
50	0.1138
109	0.1261
200	0.1331
277	0.1360
4299	0.1512



GRAIN SIZE DISTRIBUTION

ASTM D422

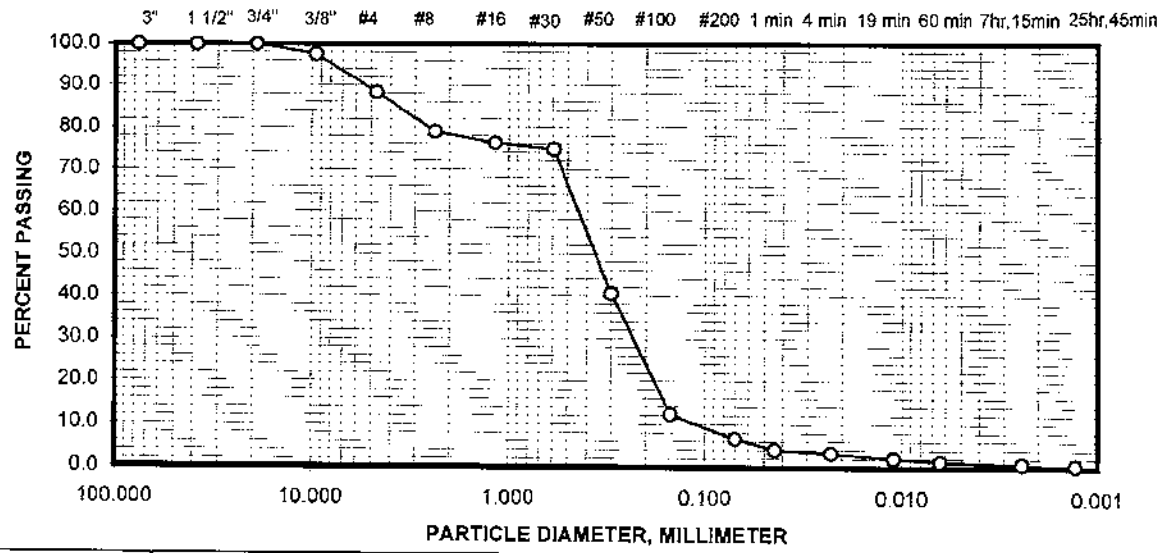
Shaw™ EMCON/OWT, Inc.

A Shaw Group Company

PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	GT05-9A @90-91.5'	DATE:	09/14/05
DESCRIPTION:	POORLY-GRADED SAND WITH SILT, BROWN.	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SP-SM	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0	Dry Wt Used, Hydrom:	44.6
Pan Number:	#502	3/4"	100.0	Est. Sp. Gr., (2.60-2.80):	2.70
Pan + Wet Soil, gms.	1030.9	3/8"	100.0	Temp.,(18-23) °C:	21
Pan + Dry Soil, gms.	873.1	D_{60}	0.440	Zero Correction	5.0
Wt. of Pan, gms.	133.9	D_{30}	0.231	Miniscus Correction:	0.5
Wt. of Dry Soil, gms.	739.2	D_{10}	0.110	Liquid Limit:	
Wt. of Water, gms.	157.8	C_U	4.01	Plasticity Index:	
Water content, %.	21.3	C_C	1.11	High; Mod.; Low; NP:	NP

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	PARTICLES DIAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	739.2	100.0
3"	3.000	76.20		0	739.2	100.0
1 1/2"	1.500	38.10		0	739.2	100.0
3/4"	0.750	18.90	0.0	0	739.2	100.0
3/8"	0.375	9.52	18.2	18.2	721	97.5
#4	0.185	4.70	68.2	86.4	652.8	88.3
#8	0.093	2.36	68.6	155	584.2	79.0
#16	0.046	1.17	20.7	175.7	563.5	76.2
#30	0.023	0.59	10.6	186.3	552.9	74.8
#50	0.012	0.30	253.0	439.3	299.9	40.6
#100	0.006	0.15	208.9	648.2	91	12.3
#200	0.003	0.07	41.7	689.9	49.3	6.7
		0.0438	1min.		33	4.1
Bulb 152H HYDROMETER TEST WITH DISPERSING AGENT		0.0227	4 min.		28	3.4
		0.0110	19 min.		20	2.2
		0.0064	60 min.		15	1.4
		0.0024	7hr., 15min.		11	0.8
		0.0013	25hr., 45min.		9	0.5



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GRAIN SIZE DISTRIBUTION

ASTM D422

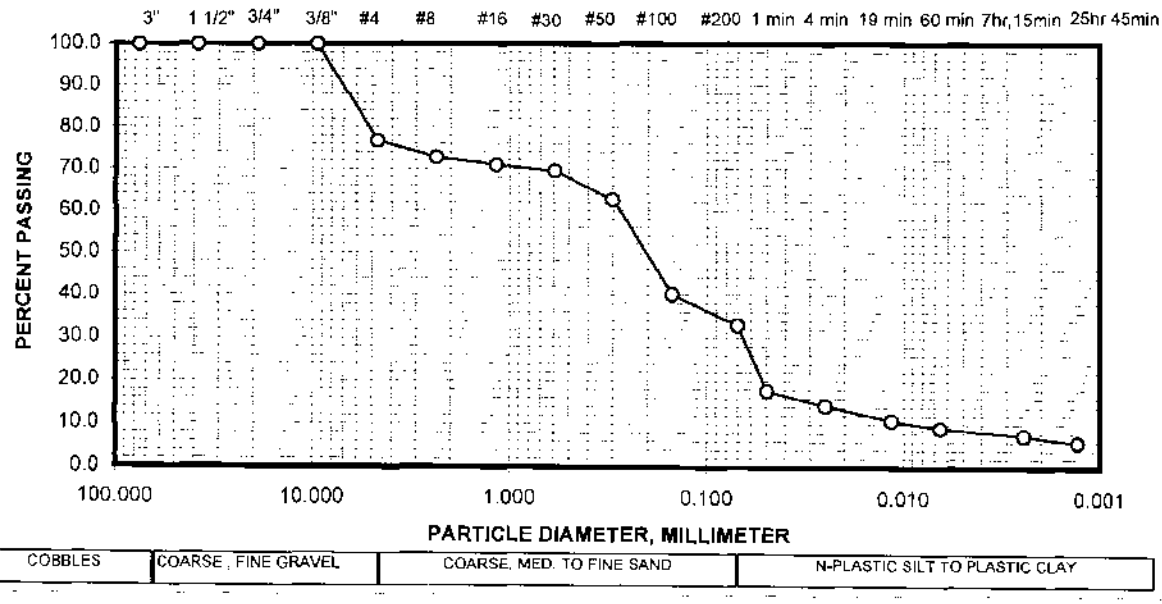
Shaw EMCON/OWT, Inc.

A Shaw Group Company

PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	GT05-10 @55-56.5'	DATE:	09/15/05
DESCRIPTION:	CLAYEY SAND WITH GRAVEL, DARK BROWN.*	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SC	CORRECTIONS:		** Pieces of glass.*	
Moisture Content Determination:		1 1/2"	100.0	Dry Wt Used, Hydrom:	19.5
Pan Number:	#504	3/4"	100.0	Est. Sp. Gr., (2.60-2.80):	2.70
Pan + Wet Soil, gms.	178.4	3/8"	100.0	Temp.,(18-23) °C:	21
Pan + Dry Soil, gms.	159.2	D_{60}	0.276	Zero Correction	5.0
Wt. of Pan, gms.	92.7	D_{30}	0.065	Miniscus Correction:	0.5
Wt. of Dry Soil, gms.	66.5	D_{10}	0.008	Liquid Limit:	
Wt. of Water, gms.	19.2	C_U	33.29	Plasticity Index:	
Water content, %.	28.9	C_C	1.87	High; Mod.; Low; NP:	MOD.

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	PARTICLES DIAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	66.5	100.0
3"	3.000	76.20		0	66.5	100.0
1 1/2"	1.500	38.10		0	66.5	100.0
3/4"	0.750	18.90		0	66.5	100.0
3/8"	0.375	9.52	0.0	0	66.5	100.0
#4	0.185	4.70	15.5	15.5	51	76.7
#8	0.093	2.36	2.6	18.1	48.4	72.8
#16	0.046	1.17	1.2	19.3	47.2	71.0
#30	0.023	0.59	1.0	20.3	46.2	69.5
#50	0.012	0.30	4.5	24.8	41.7	62.7
#100	0.006	0.15	15.0	39.8	26.7	40.2
#200	0.003	0.07	4.8	44.6	21.9	32.9
		0.0492	1 min.		16	17.7
Bulb 152H HYDROMETER TEST WITH DISPERSING AGENT		0.0248	4 min.		14	14.4
		0.0115	19 min.		12	11.0
		0.0065	60 min.		11	9.3
		0.0024	7hr., 15min.		10	7.6
		0.0013	25hr., 45min.		9	5.9



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GRAIN SIZE DISTRIBUTION

ASTM D422

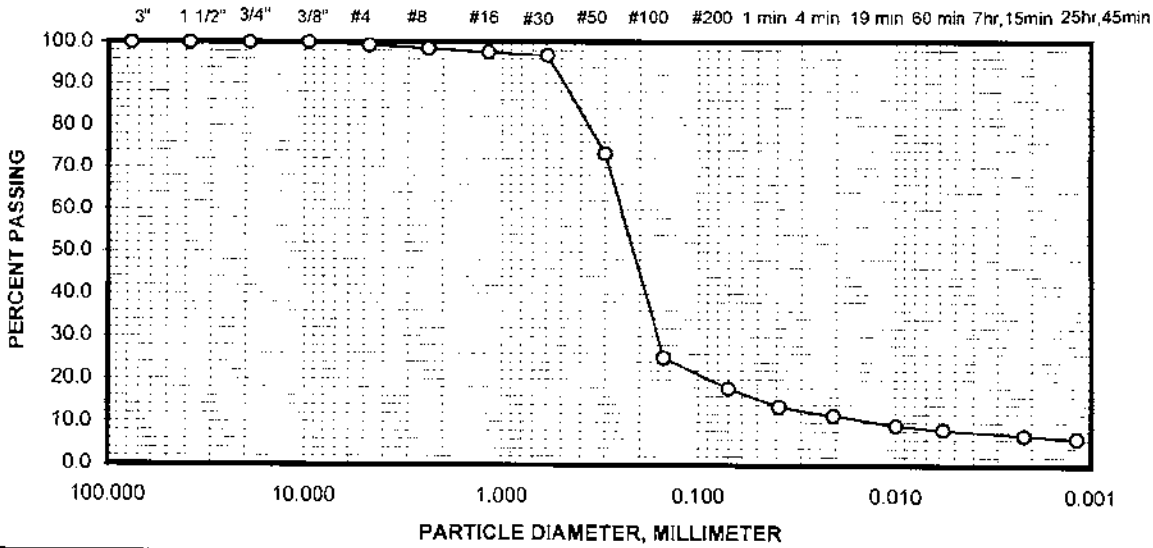
Shaw EMCON/OWT, Inc.

A Shaw Group Company

PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	GT05-10 @106-106.5'	DATE:	09/15/05
DESCRIPTION:	SILTY SAND, BROWN.	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SM	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0	Dry Wt Used, Hydrom:	54.6
Pan Number:	#510	3/4"	100.0	Est. Sp. Gr., (2.60-2.80):	2.70
Pan + Wet Soil, gms.	786.8	3/8"	100.0	Temp.,(18-23) °C:	21
Pan + Dry Soil, gms.	659.0	D_{60}	0.248	Zero Correction	5.0
Wt. of Pan, gms.	89.2	D_{30}	0.161	Miniscus Correction:	0.5
Wt. of Dry Soil, gms.	569.8	D_{10}	0.012	Liquid Limit:	
Wt. of Water, gms.	127.8	C_U	20.27	Plasticity Index:	
Water content, %.	22.4	C_C	8.56	High; Mod.; Low; NP:	NP

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	PARTICLES DIAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	569.8	100.0
3"	3.000	76.20		0	569.8	100.0
1 1/2"	1.500	38.10		0	569.8	100.0
3/4"	0.750	18.90		0	569.8	100.0
3/8"	0.375	9.52	0.0	0	569.8	100.0
#4	0.185	4.70	4.2	4.2	565.6	99.3
#8	0.093	2.36	4.4	8.6	561.2	98.5
#16	0.046	1.17	4.9	13.5	556.3	97.6
#30	0.023	0.59	4.4	17.9	551.9	96.9
#50	0.012	0.30	134.2	152.1	417.7	73.3
#100	0.006	0.15	274.7	426.8	143	25.1
#200	0.003	0.07	40.9	467.7	102.1	17.9
		0.0389	1 min.		47	13.6
Bulb 152H HYDROMETER TEST WITH DISPERSING AGENT		0.0206	4 min.		41	11.7
		0.0100	19 min.		34	9.4
		0.0057	60 min.		31	8.4
		0.0022	7hr., 15min.		27	7.1
		0.0012	25hr., 45min.		25	6.4



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GRAIN SIZE DISTRIBUTION

ASTM D422

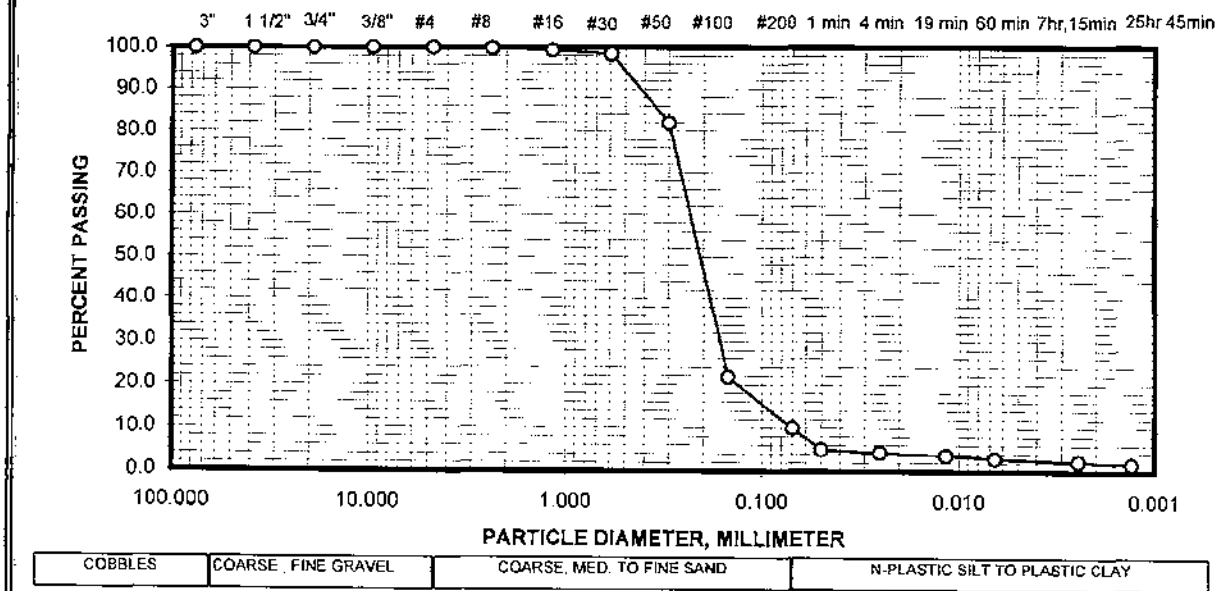
Shaw™ EMCON/OWT, Inc.

A Shaw Group Company

PROJECT NAME:	BRISBANE LANDFILL	PROJECT NO.:	837998
SAMPLE NO.:	GT05-10 @125-126.5'	DATE:	09/15/05
DESCRIPTION:	POORLY-GRADED SAND WITH SILT, BROWN.	TECH.:	DGC

UNIFIED SOIL CLASSIFICATION:	SP-SM	CORRECTIONS:			
Moisture Content Determination:		1 1/2"	100.0	Dry Wt Used, Hydrom:	14.8
Pan Number:	#86	3/4"	100.0	Est. Sp. Gr., (2.60-2.80):	2.70
Pan + Wet Soil, gms.	224.1	3/8"	100.0	Temp.,(18-23) °C:	21
Pan + Dry Soil, gms.	199.0	D_{60}	0.233	Zero Correction	5.0
Wt. of Pan, gms.	78.1	D_{30}	0.165	Miniscus Correction:	0.5
Wt. of Dry Soil, gms.	120.9	D_{10}	0.070	Liquid Limit:	
Wt. of Water, gms.	25.1	C_U	3.33	Plasticity Index:	
Water content, %.	20.8	C_C	1.66	High; Mod.; Low; NP:	NP

SIEVE SIZE (U.S. STANDARD)	PARTICLE SIZE, (inches)	PARTICLES DIAMETER, (mm)	WEIGHT RETAINED (gms)	ACCUMULATED WEIGHT RETAINED (gms)	WEIGHT PASSING (gms)	PERCENT PASSING (%)
5"	5.000	127.00		0	120.9	100.0
3"	3.000	76.20		0	120.9	100.0
1 1/2"	1.500	38.10		0	120.9	100.0
3/4"	0.750	18.90		0	120.9	100.0
3/8"	0.375	9.52	0.0	0	120.9	100.0
#4	0.185	4.70	0.0	0	120.9	100.0
#8	0.093	2.36	0.3	0.3	120.6	99.8
#16	0.046	1.17	0.5	0.8	120.1	99.3
#30	0.023	0.59	1.0	1.8	119.1	98.5
#50	0.012	0.30	20.1	21.9	99	81.9
#100	0.006	0.15	72.5	94.4	26.5	21.9
#200	0.003	0.07	14.4	108.8	12.1	10.0
		0.0500	1 min.		13	5.1
Bulb 152H		0.0251	4 min.		12	4.4
HYDROMETER TEST		0.0116	19 min.		11	3.7
WITH DISPERSING AGENT		0.0066	60 min.		10	3.0
		0.0024	7hr., 15min.		9	2.4
		0.0013	25hr., 45min.		8	1.7



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ATTERBERG LIMITS

ASTM D4318

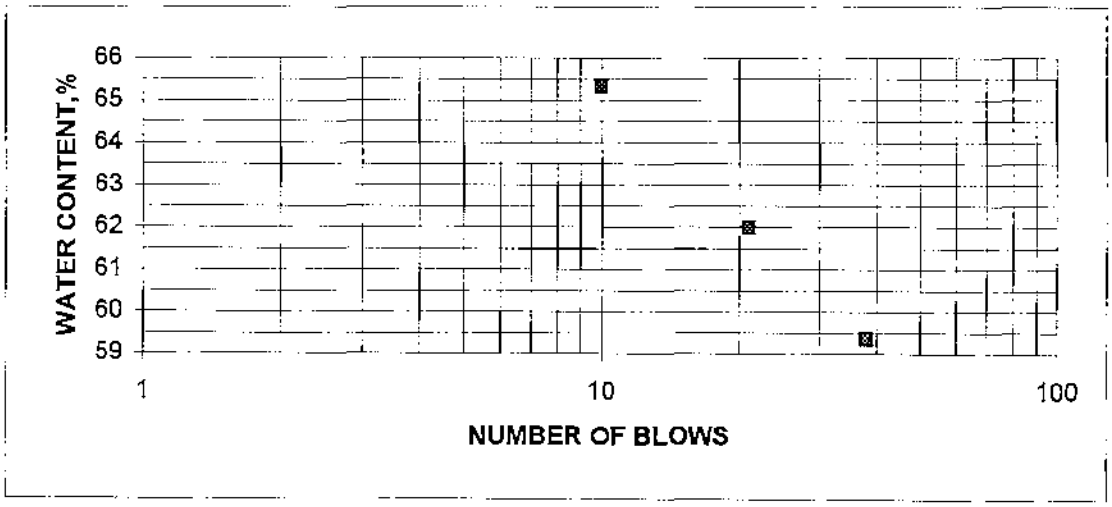
Shaw EMCON/OWT, Inc.

A Shaw Group Company

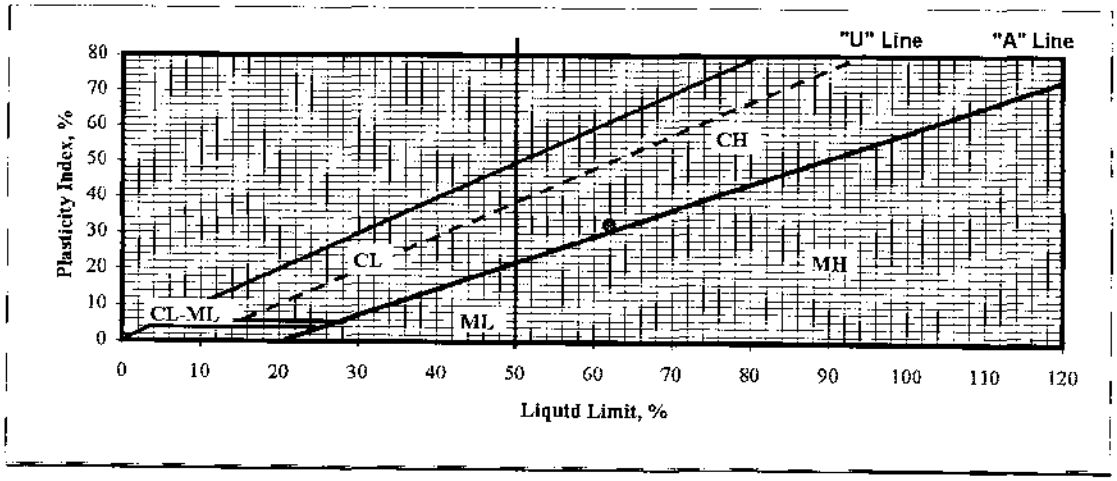
Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-074	**Proj. No.:**	837998
Sample No.:	GT05-11	**Depth, ft.:**	90-92.5'	**Date:**	09/21/05
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	A-3	O-6	A-7	O-4	B-5	
Weight of Can + Wet Soil, gms.	66.04	66.33	66.63	45.95	44.78	
Weight of Can + Dry Soil, gms.	53.38	53.18	52.88	42.67	41.95	
Weight of Can, gms.	32.05	31.96	31.83	31.56	32.35	
Weight of Dry Soil, gms.	21.33	21.22	21.05	11.11	9.60	
Weight of Water, gms.	12.66	13.15	13.75	3.28	2.83	
Water Content, %	59.4	62.0	65.3	29.5	29.5	
Number of Blows	38	21	10			

Unified Soil Classification CH



LL=	62	PL=	30	PI=	32



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U.U TRIAXIAL TEST

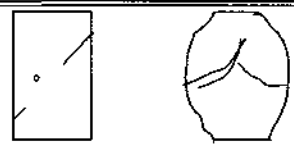
ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	05-074
Sample No.:	GT05-11	**Depth, ft.:**	90-92.5'	**Date:**	09/20/05
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC

Total Wet Wt., gms.	1040.5
Total Dry Wt., gms.	668.8
Height, in.	6.00
Diameter, in.	2.87
Area, in.^{2}	6.4693
Volume, cf.	0.0225
Dry Density, pcf.	65.6
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



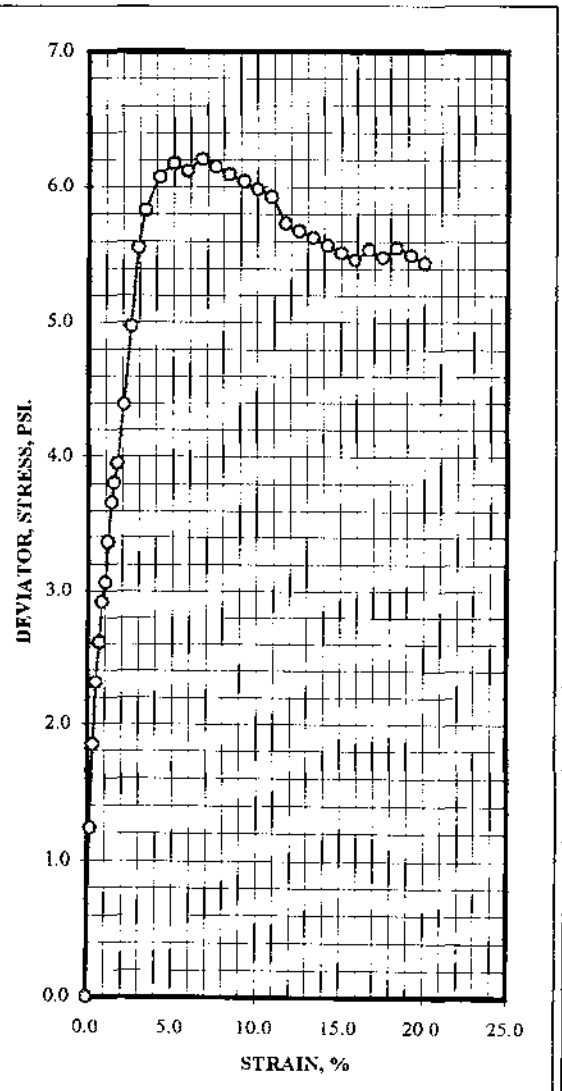
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.00

Tare Number	#90
Wet Soil + Tare, gms.	1232.8
Dry Soil + Tare, gms.	845.5
Tare Weights, gms.	176.7
Weight of Water, gms.	387.3
Wt. of Dry Soil, gms.	668.8
Water Content, %	57.9
Initial Water Content, %	55.6
Saturation	99.8
Confin. Pressure, psi.	33.0

STRAIN, .0001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.47	0	0.00
10	0.17	6.48	8	1.23
20	0.33	6.49	12	1.85
30	0.50	6.50	15	2.31
40	0.67	6.51	17	2.61
50	0.83	6.52	19	2.91
60	1.00	6.53	20	3.06
70	1.17	6.55	22	3.36
80	1.33	6.56	24	3.66
90	1.50	6.57	25	3.81
100	1.67	6.58	26	3.95
125	2.08	6.61	29	4.39
150	2.50	6.64	33	4.97
175	2.92	6.66	37	5.55
200	3.33	6.69	39	5.83
250	4.17	6.75	41	6.07
300	5.00	6.81	42	6.17
350	5.83	6.87	42	6.11
400	6.67	6.93	43	6.20
450	7.50	6.99	43	6.15
500	8.33	7.06	43	6.09
550	9.17	7.12	43	6.04
600	10.00	7.19	43	5.98
650	10.83	7.26	43	5.93
700	11.67	7.32	42	5.73
750	12.50	7.39	42	5.68
800	13.33	7.46	42	5.63
850	14.17	7.54	42	5.57
900	15.00	7.61	42	5.52
950	15.83	7.69	42	5.46
1000	16.67	7.76	43	5.54
1050	17.50	7.84	43	5.48
1100	18.33	7.92	44	5.55
1150	19.17	8.00	44	5.50
1200	20.00	8.09	44	5.44

DEVIATOR VS. STRAIN GRAPH



Shaw EMCON/OWT, Inc.
A Shaw Group Company

CONSOLIDATION

ASTM D2435

Project Name: BRISBANE LANDFILL
Proj. No.: 837998.00
Sample No.: GT05-11 @ 90-92.5'
Tested By: DGC.
Description: FAT CLAY, GRAY.
Date: 09/19/05

* Flooded with water at the beginning of test.

Consol. No.:	#321
Diameter, in.	2.40
Thickness, in.	1.00
Soil Wet Wt., gms.	125.42
Water Content, %	53.2
Dry Density, pcf.	68.9
Initial Sat.	99.5
Final Sat.	100.0

Tare Number	D-1
Wet Wt. of Soil + Tare, gms.	186.72
Dry Wt. of Soil + Tare, gms.	162.65
Weight of Tare, gms.	80.80
Weight of Water, gms.	24.07
Weight of Dry Soil, gms.	81.85
Final Water Content, %	29.4
Est. Specific Gravity	2.70

LOAD ksf.	DIAL .0001 in.	APPLIED CORRECTIONS	HEIGHT, inches.	CONSOL %	DENSITY pcf.	VOID RATIO
0.000	0.0000	0.0000	1.0000	0.00	68.9	1.4444
0.125	0.0007	0.0000	0.9993	0.07	69.0	1.4427
0.250	0.0107	0.0000	0.9893	1.07	69.7	1.4182
0.500	0.0313	0.0000	0.9687	3.13	71.2	1.3679
1.000	0.0590	0.0000	0.9410	5.90	73.2	1.3002
2.000	0.1072	0.0000	0.8928	10.72	77.2	1.1824
4.000	0.1615	0.0000	0.8385	16.15	82.2	1.0496
8.000	0.2139	0.0000	0.7861	21.39	87.7	0.9215
2.000	0.2021	0.0000	0.7979	20.21	86.4	0.9504
1.000	0.1937	0.0000	0.8063	19.37	85.5	0.9709
4.000	0.2047	0.0000	0.7953	20.47	86.7	0.9440
8.000	0.2186	0.0000	0.7814	21.86	88.2	0.9101
16.000	0.2660	0.0000	0.7340	26.60	93.9	0.7942
			0.0000	0.00	0.0	0.0000
			0.0000	0.00	0.0	0.0000

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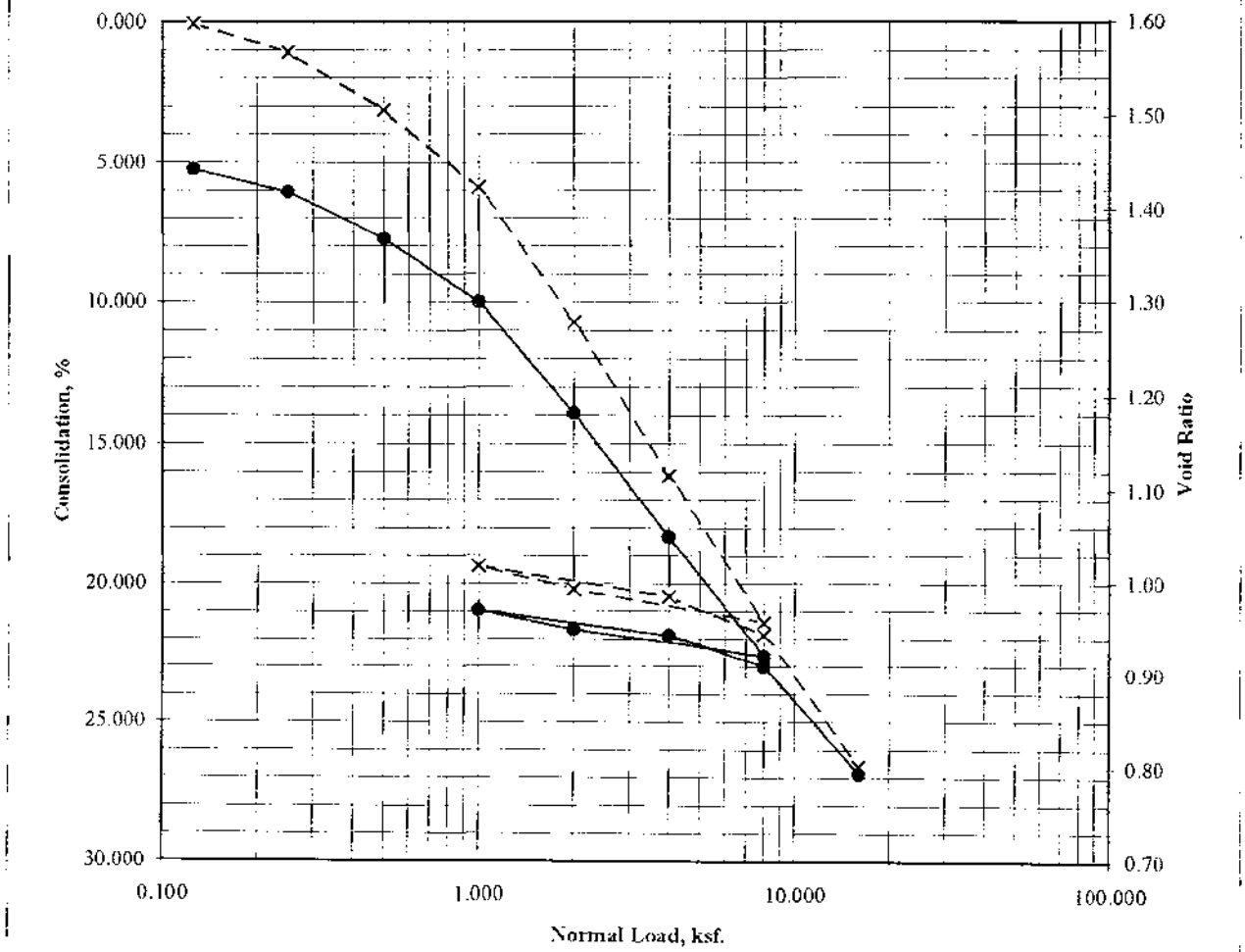
CONSOLIDATION

EMCON/OWT, Inc.
A Shaw Group Company

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998.00
Sample No.:	GT05-11 @ 90-92.5'	**Tested By:**	DGC.
Description:	FAT CLAY, GRAY.	**Date:**	09/19/05

x **Consolidation vs. Load** ● **Void Ratio vs. Load**



* Flooded with water at the beginning of test.

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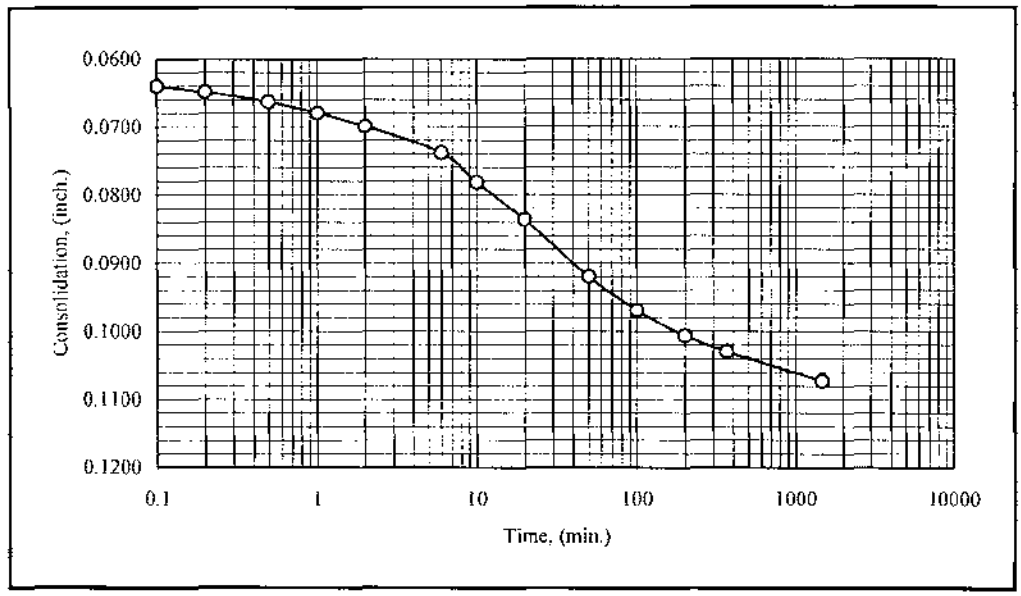
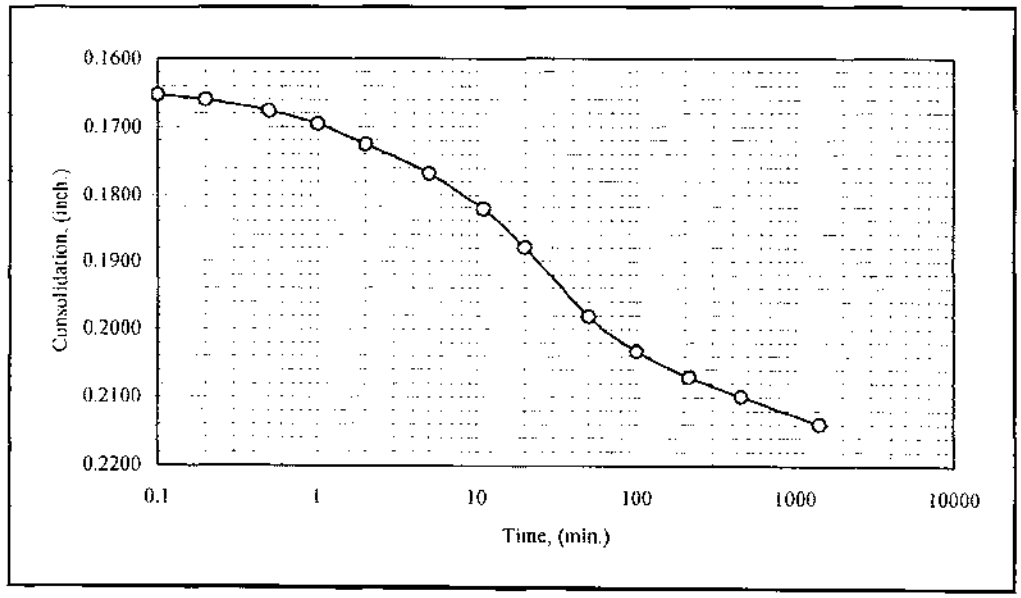
CONSOLIDATION
TIME - COMPRESSION CURVES

Project Name: BRISBANE LANDFILL **Proj. Number:** 837998
Sample No. GT05-11 @ 90-92.5' **Date:** 09/22/05
Sampel Description: FAT CLAY, GRAY.

Load:	2 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0640
0.2	0.0648
0.5	0.0663
1	0.0679
2	0.0699
6	0.0738
10	0.0781
20	0.0836
50	0.0919
100	0.0969
200	0.1006
365	0.1029
1472	0.1072



Load	8 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.1652
0.2	0.1660
0.5	0.1676
1	0.1695
2	0.1725
5	0.1768
11	0.1822
20	0.1879
50	0.1981
100	0.2032
213	0.2070
454	0.2099
1424	0.2139



ATTERBERG LIMITS

ASTM D4318

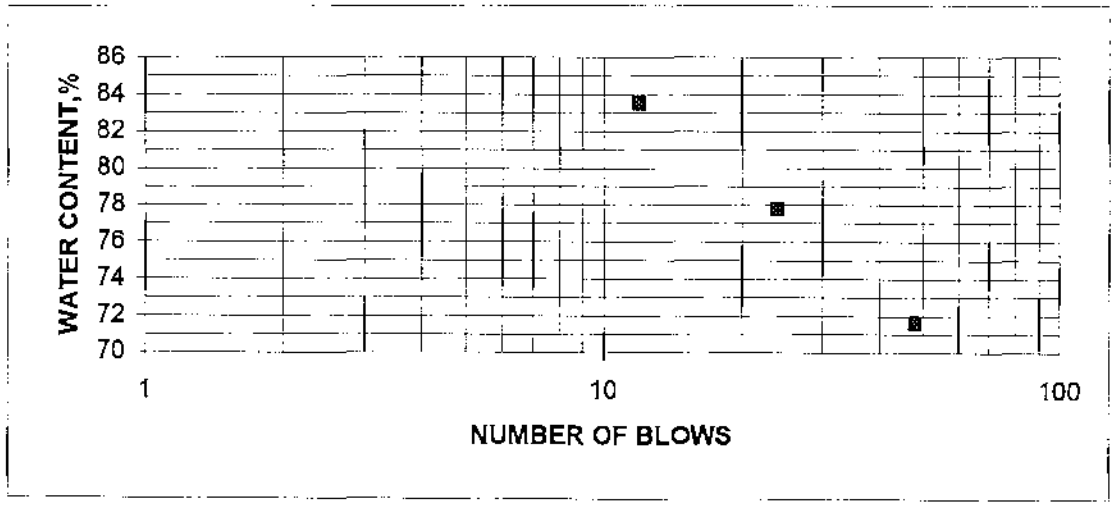
Shaw™ EMCON/OWT, Inc.

A Shaw Group Company

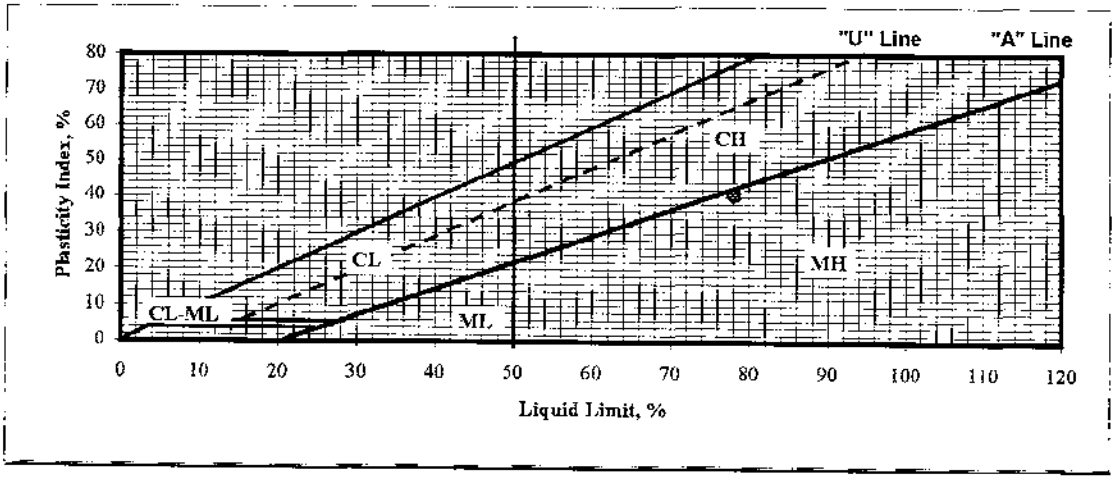
Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-074	**Proj. No.:**	837998
Sample No.:	GT05-12	**Depth, ft.:**	50-52.5'	**Date:**	09/20/05
Description:	ELASTIC SILT, DARK GRAY.			**Tested By:**	DGC
				Checked By:	

/*	Liquid Limit			Plastic Limit		
Can Number	B-7	B-8	M-4	F-6	E-4	
Weight of Can + Wet Soil, gms.	63.81	64.93	67.45	46.65	46.44	
Weight of Can + Dry Soil, gms.	50.47	50.56	51.24	42.62	42.44	
Weight of Can, gms.	31.84	32.09	31.83	31.93	31.79	
Weight of Dry Soil, gms.	18.63	18.47	19.41	10.69	10.65	
Weight of Water, gms.	13.34	14.37	16.21	4.03	4.00	
Water Content, %	71.6	77.8	83.5	37.7	37.6	
Number of Blows	48	24	12			

Unified Soil Classification **MH**



LL=	78	PL=	38	PI=	40



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U.U TRIAXIAL TEST

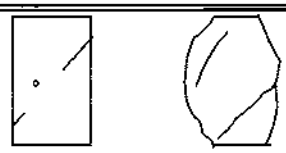
ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	05-074
Sample No.:	GT05-12	**Depth, ft.:**	50-52.5'	**Date:**	09/15/05
Description:	ELASTIC SILT, DARK GRAY.			**Tested By:**	DGC

Total Wet Wt., gms.	929.6
Total Dry Wt., gms.	520.8
Height, in.	6.00
Diameter, in.	2.87
Area, in.^{2}	6.4693
Volume, cf.	0.0225
Dry Density, pcf.	51.1
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



SHEARED ☐ BULGING ■

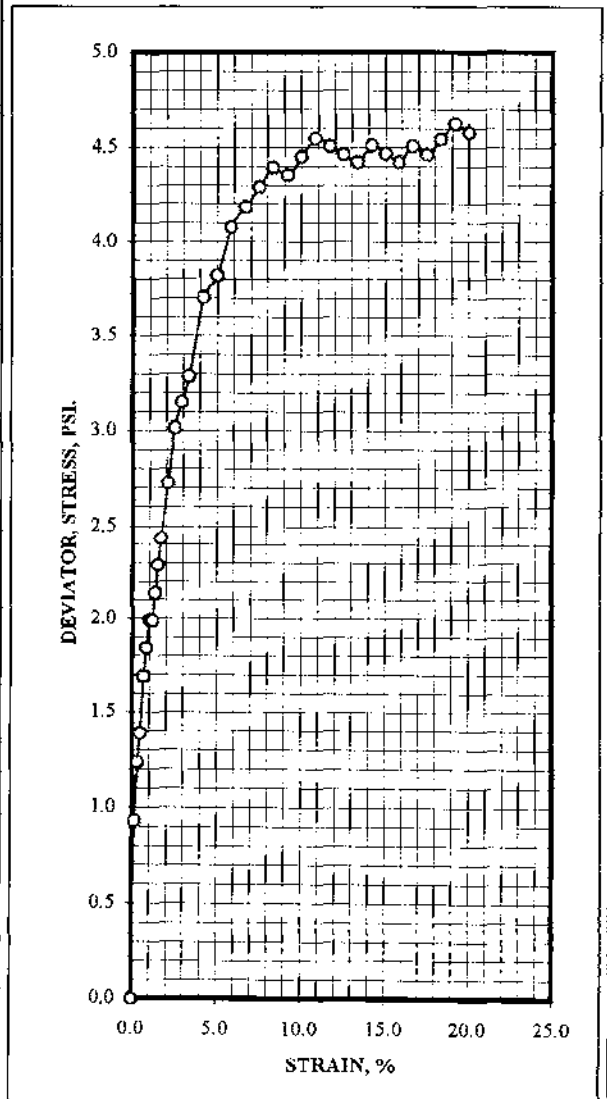
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, % /min.:	1.00

Tare Number	#6
Wet Soil + Tare, gms.	1148.8
Dry Soil + Tare, gms.	725.0
Tare Weights, gms.	204.2
Weight of Water, gms.	423.8
Wt. of Dry Soil, gms.	520.8
Water Content, %	81.4
Initial Water Content, %	78.5
Saturation	95.7
Confin. Pressure, psi.	21.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	6.47	0	0.00
10	0.17	6.48	6	0.93
20	0.33	6.49	8	1.23
30	0.50	6.50	9	1.38
40	0.67	6.51	11	1.69
50	0.83	6.52	12	1.84
60	1.00	6.53	13	1.99
70	1.17	6.55	13	1.99
80	1.33	6.56	14	2.14
90	1.50	6.57	15	2.28
100	1.67	6.58	16	2.43
125	2.08	6.61	18	2.72
150	2.50	6.64	20	3.01
175	2.92	6.66	21	3.15
200	3.33	6.69	22	3.29
250	4.17	6.75	25	3.70
300	5.00	6.81	26	3.82
350	5.83	6.87	28	4.08
400	6.67	6.93	29	4.18
450	7.50	6.99	30	4.29
500	8.33	7.06	31	4.39
550	9.17	7.12	31	4.35
600	10.00	7.19	32	4.45
650	10.83	7.26	33	4.55
700	11.67	7.32	33	4.51
750	12.50	7.39	33	4.46
800	13.33	7.46	33	4.42
850	14.17	7.54	34	4.51
900	15.00	7.61	34	4.47
950	15.83	7.69	34	4.42
1000	16.67	7.76	35	4.51
1050	17.50	7.84	35	4.46
1100	18.33	7.92	36	4.54
1150	19.17	8.00	37	4.62
1200	20.00	8.09	37	4.58

DEVIATOR VS. STRAIN GRAPH



Shaw EMCON/OWT, Inc.
A Shaw Group Company

CONSOLIDATION

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998.00
Sample No.:	GT05-12 @ 50-52.5'	**Tested By:**	DGC.
Description:	ELASTIC SILT, DARK GRAY.	**Date:**	09/19/05

* Flooded with water at the beginning of test.

Consol. No.:	#2
Diameter, in.	2.40
Thickness, in.	1.00
Soil Wet Wt., gms.	113.90
Water Content, %	75.6
Dry Density, pcf.	54.6
Initial Sat.	97.9
Final Sat.	100.3

Tare Number	V-7
Wet Wt. of Soil +Tare, gms.	176.00
Dry Wt. of Soil + Tare, gms.	150.48
Weight of Tare, gms.	85.63
Weight of Water, gms.	25.52
Weight of Dry Soil, gms.	64.85
Final Water Content, %	39.4
Est. Specific Gravity	2.70

LOAD ksf.	DIAL .0001 in.	APPLIED CORRECTIONS	HEIGHT, inches.	CONSOL %	DENSITY pcf.	VOID RATIO
0.000	0.0000	0.0000	1.0000	0.00	54.6	2.0852
0.125	0.0056	0.0002	0.9946	0.54	54.9	2.0684
0.250	0.0146	0.0002	0.9856	1.44	55.4	2.0408
0.500	0.0371	0.0005	0.9634	3.66	56.7	1.9722
1.000	0.0725	0.0015	0.9290	7.10	58.8	1.8662
2.000	0.1232	0.0023	0.8791	12.09	62.1	1.7121
4.000	0.2009	0.0032	0.8023	19.77	68.1	1.4752
8.000	0.2717	0.0050	0.7333	26.67	74.5	1.2623
2.000	0.2556	0.0051	0.7495	25.05	72.9	1.3124
1.000	0.2436	0.0044	0.7608	23.92	71.8	1.3473
2.000	0.2470	0.0023	0.7553	24.47	72.3	1.3302
8.000	0.2798	0.0050	0.7252	27.48	75.3	1.2373
16.000	0.3389	0.0063	0.6674	33.26	81.8	1.0591
			0.0000	0.00	0.0	0.0000
			0.0000	0.00	0.0	0.0000

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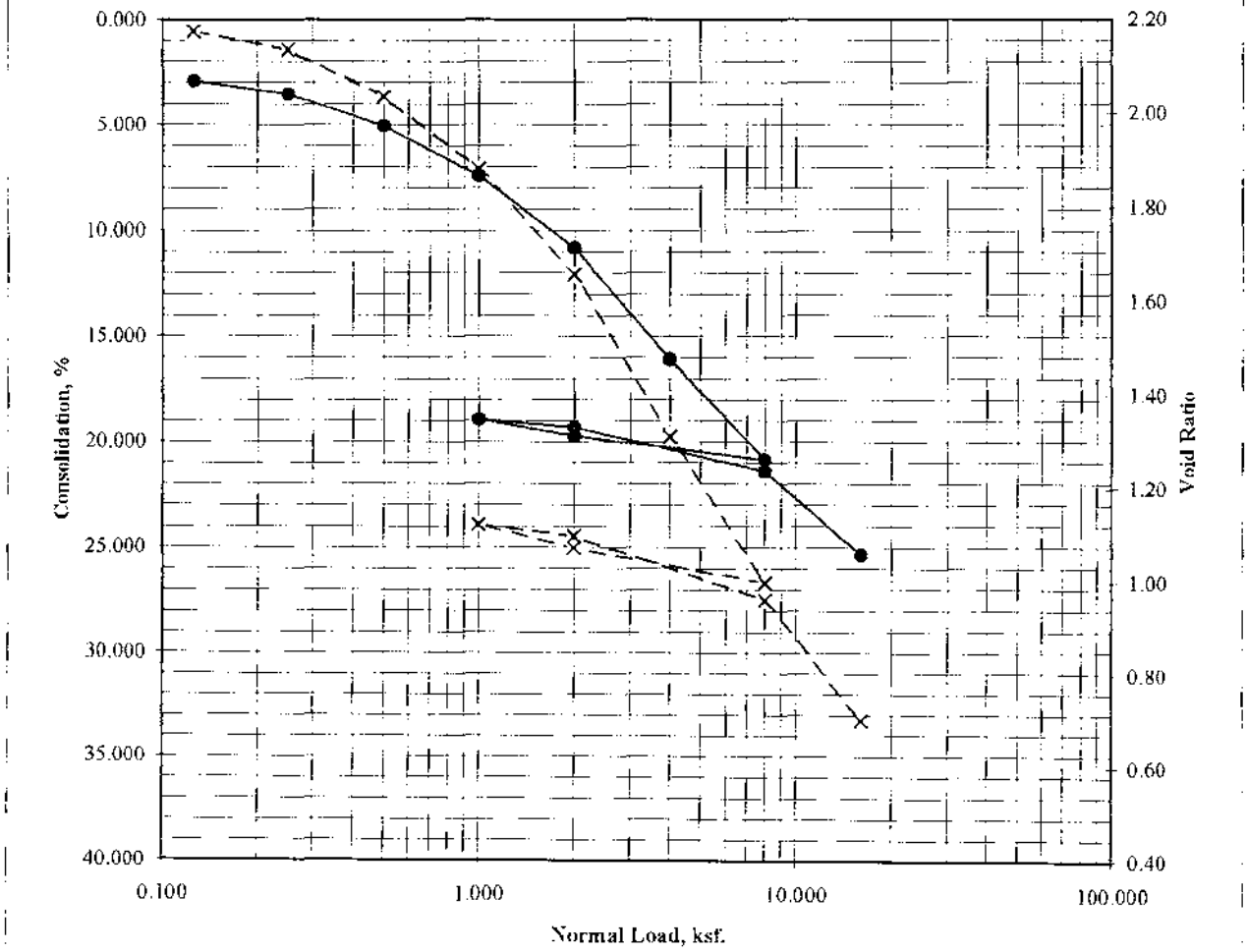
CONSOLIDATION

EMCON/OWT, Inc.
A Shaw Group Company

ASTM D2435

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998.00
Sample No.:	GT05-12 @ 50-52.5'	**Tested By:**	DGC.
Description:	ELASTIC SILT, DARK GRAY.	**Date:**	09/19/05

x Consolidation vs. Load ● Void Ratio vs. Load



* Flooded with water at the beginning of test.

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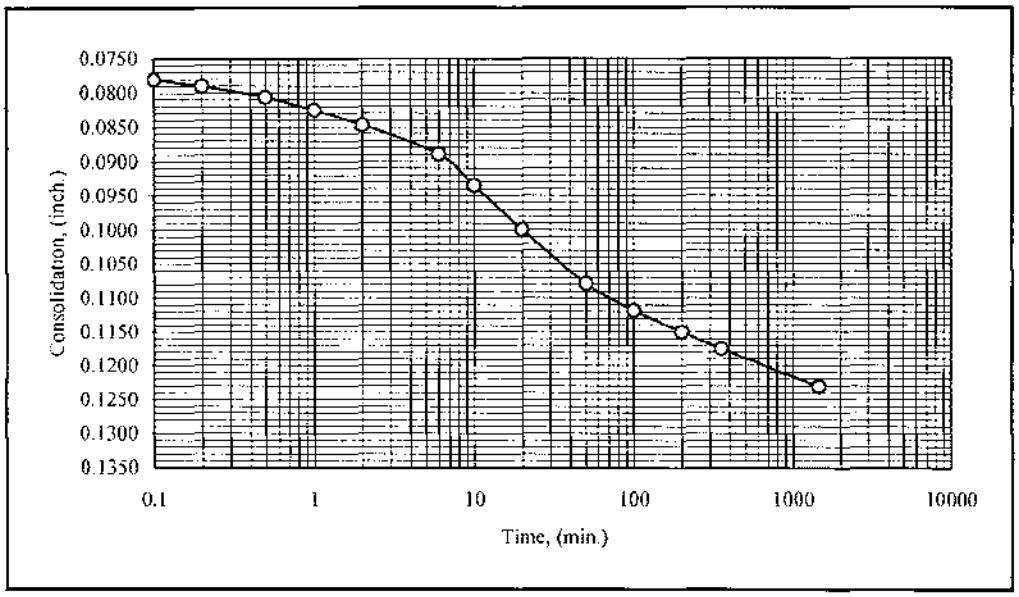
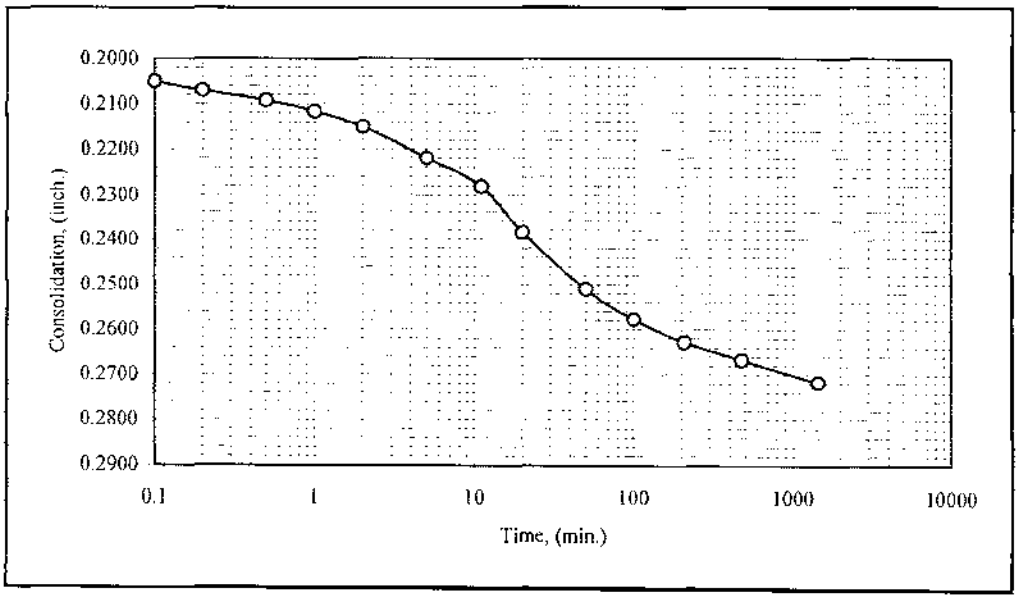
CONSOLIDATION
TIME - COMPRESSION CURVES

Project Name: BRISBANE LANDFILL **Proj. Number:** 837998
Sample No. GT05-12 @ 50-52.5' **Date:** 09/22/05
Sampel Description: ELASTIC SILT, DARK GRAY.

Load:	2 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.0780
0.2	0.0790
0.5	0.0806
1	0.0825
2	0.0847
6	0.0889
10	0.0935
20	0.0999
50	0.1078
100	0.1118
200	0.1150
354	0.1175
1461	0.1231



Load	8 ksf.
Time, (min.)	Consol. (inch.)
0.1	0.2050
0.2	0.2070
0.5	0.2092
1	0.2116
2	0.2150
5	0.2219
11	0.2281
20	0.2384
50	0.2510
100	0.2577
208	0.2627
476	0.2667
1447	0.2717



ATTERBERG LIMITS

ASTM D4318

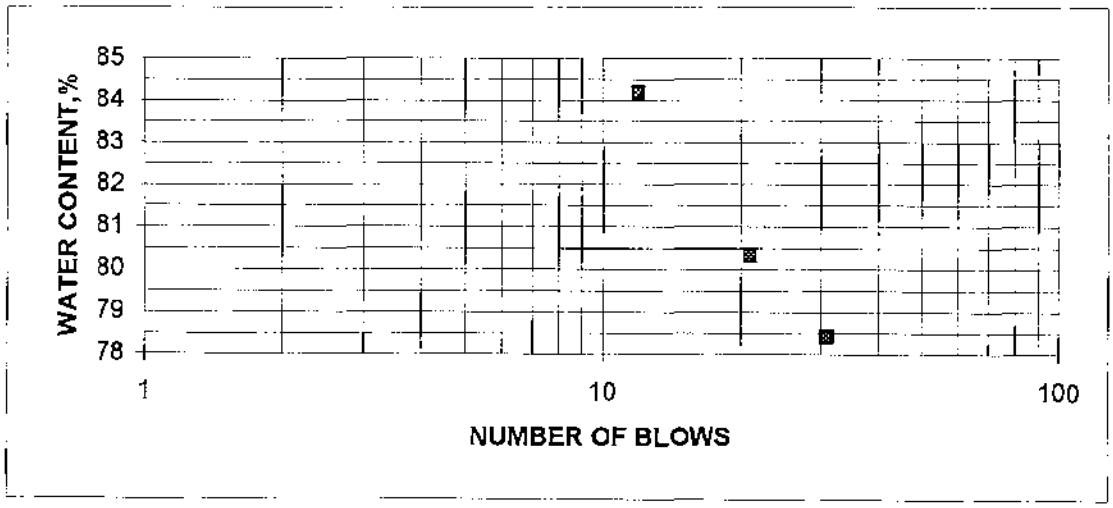
Shaw EMCON/OWT, Inc.

A Shaw Group Company

Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-074	**Proj. No.:**	837998
Sample No.:	GT05-12	**Depth, ft.:**	110-110.5'	**Date:**	09/19/05
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	A-3	B-5	O-4	A-7	O-6	
Weight of Can + Wet Soil, gms.	66.37	66.83	67.06	47.35	47.35	
Weight of Can + Dry Soil, gms.	51.29	51.47	50.84	43.74	43.81	
Weight of Can, gms.	32.06	32.35	31.57	31.86	31.97	
Weight of Dry Soil, gms.	19.23	19.12	19.27	11.88	11.84	
Weight of Water, gms.	15.08	15.36	16.22	3.61	3.54	
Water Content, %	78.4	80.3	84.2	30.4	29.9	
Number of Blows	31	21	12			

Unified Soil Classification **CH**



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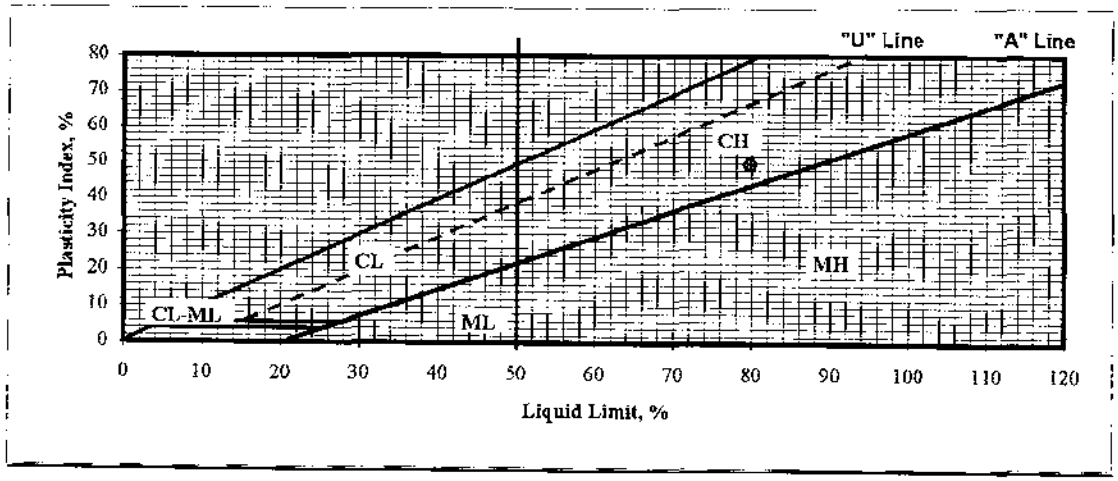


δγχ93ατ

MOISTURE - DENSITY TEST

ASTM D2216

Shaw EMCON/OWT, Inc.
A Shaw Group Company

PROJECT NAME: BRISBANE LANDFILL **DATE:** 9/16/2005
PROJ. NUMBER: 837998 **TESTED BY:** DGC **CORRECTED BY:**

REFERENCE NUMBER:		1	2					
SAMPLE NUMBER:		GT05-12	GT05-12					
SPECIFIC GRAVITY, EST.		2.70	2.70					
DEPTH,	(feet)	110-110.5'	155.5-156'					
DIAMETER,	(inches)	2.42	2.42					
LENGHT,	(inches)	5.95	5.99					
VOLUME,	(cu. feet)	0.015838	0.015944					
WATER CONTENT DETERMINATION:								
TARE NUMBER:		M-18	M-48					
WET WT. + TARE,	(gms.)	391.20	461.20					
DRY WT. + TARE,	(gms.)	271.40	334.70					
WT. OF TARE,	(gms.)	83.90	85.10					
WT. OF WATER,	(gms.)	119.80	126.50					
WT. OF DRY SOIL,	(gms.)	187.50	249.60					
WATER CONTENT,	(%)	63.9	50.7					
DENSITY DETERMINATION:								
TOTAL WET WT.,	(gms.)	728.90	775.10					
WET DENSITY	(pcf.)	101.5	107.2					
DRY DENSITY,	(pcf.)	61.9	71.1					
VOID RATIO,	(e)	1.7215	1.3688					
POROSITY,	(η)	0.6326	0.5778					
SATURATION		100	100					

USCS and or Visual Classification:

1	CLAYEY SAND / SANDY CLAY, BROWN. (ROCK ON TOP OF SAMPLE).
2	CLAYEY SAND / SANDY CLAY, BROWN.

NOTE:

δγχ93μχδδ

U.U TRIAXIAL TEST

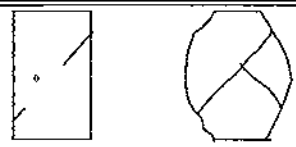
ASTM D2850

Shaw™ EMCON/OWT, Inc.
A Shaw Group Company

☐ Unsaturated
■ Saturated

Project Name:	BRISBANE LANDFILL	**Proj. No.:**	837998	**Lab. No.:**	05-084
Sample No.:	GT05-12	**Depth, ft.:**	110.5-111'	**Date:**	10/14/05
Description:	ELASTIC SILT, DARK GRAY.			**Tested By:**	DGC

Total Wet Wt., gms.	698.1
Total Dry Wt., gms.	427.6
Height, in.	5.68
Diameter, in.	2.42
Area, in.^{2}	4.5996
Volume, cf.	0.0151
Dry Density, pcf.	62.4
Est. Spec. Gravity	2.7
Max. Dry Density, pcf.	
Opt. Water Content, %.	



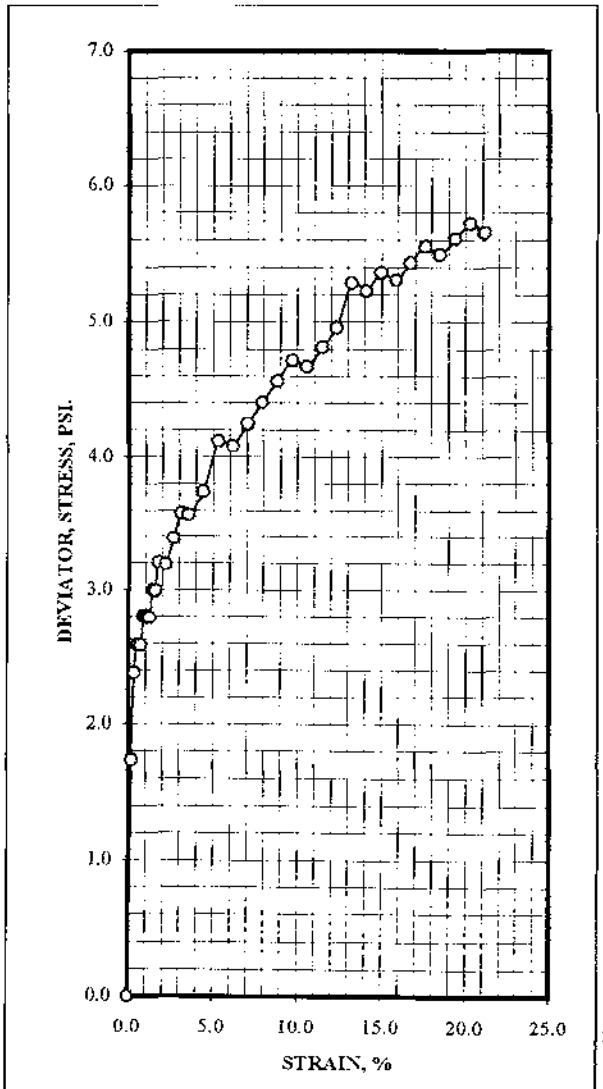
SKETCH AT FAILURE

L.C. Cal. lbs./div.	1.00
Strain Rate, %/min.:	1.00

Tare Number	#6
Wet Soil + Tare, gms.	902.3
Dry Soil + Tare, gms.	631.8
Tare Weights, gms.	204.2
Weight of Water, gms.	270.5
Wt. of Dry Soil, gms.	427.6
Water Content, %	63.3
Initial Water Content, %	63.3
Saturation	100.3
Confin. Pressure, psi.	35.0

STRAIN, .001in./div.	STRAIN, %	AREA, in.^{2}	LOAD, lbs.	DEVIATOR, psi.
0	0.00	4.60	0	0.00
10	0.18	4.61	8	1.74
20	0.35	4.62	11	2.38
30	0.53	4.62	12	2.60
40	0.70	4.63	12	2.59
50	0.88	4.64	13	2.80
60	1.06	4.65	13	2.80
70	1.23	4.66	13	2.79
80	1.41	4.67	14	3.00
90	1.58	4.67	14	3.00
100	1.76	4.68	15	3.20
125	2.20	4.70	15	3.19
150	2.64	4.72	16	3.39
175	3.08	4.75	17	3.58
200	3.52	4.77	17	3.57
250	4.40	4.81	18	3.74
300	5.28	4.86	20	4.12
350	6.16	4.90	20	4.08
400	7.04	4.95	21	4.24
450	7.92	5.00	22	4.40
500	8.80	5.04	23	4.56
550	9.68	5.09	24	4.71
600	10.56	5.14	24	4.67
650	11.44	5.19	25	4.81
700	12.32	5.25	26	4.96
750	13.20	5.30	28	5.28
800	14.08	5.35	28	5.23
850	14.96	5.41	29	5.36
900	15.85	5.47	29	5.31
950	16.73	5.52	30	5.43
1000	17.61	5.58	31	5.55
1050	18.49	5.64	31	5.49
1100	19.37	5.70	32	5.61
1150	20.25	5.77	33	5.72
1200	21.13	5.83	33	5.66

DEVIATOR VS. STRAIN GRAPH



ATTERBERG LIMITS

ASTM D4318

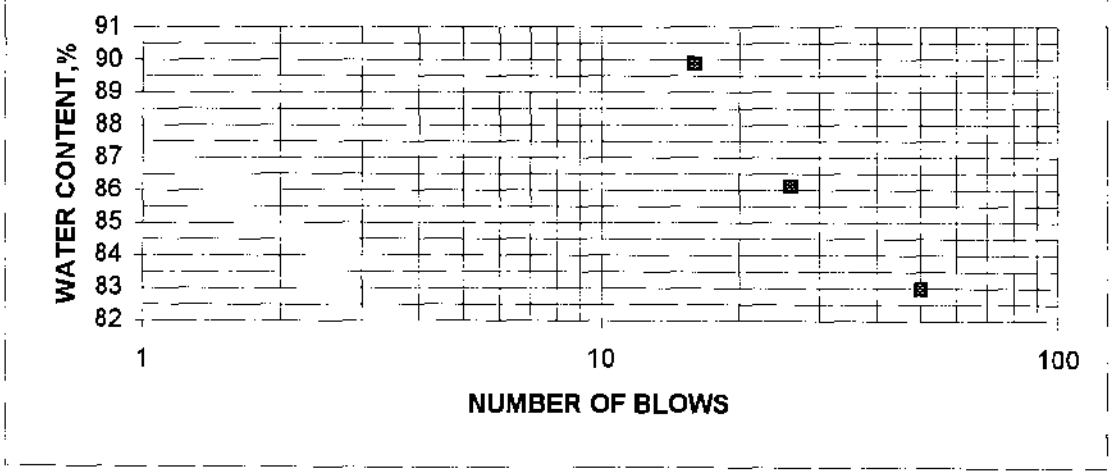
Shaw EMCON/OWT, Inc.

A Shaw Group Company

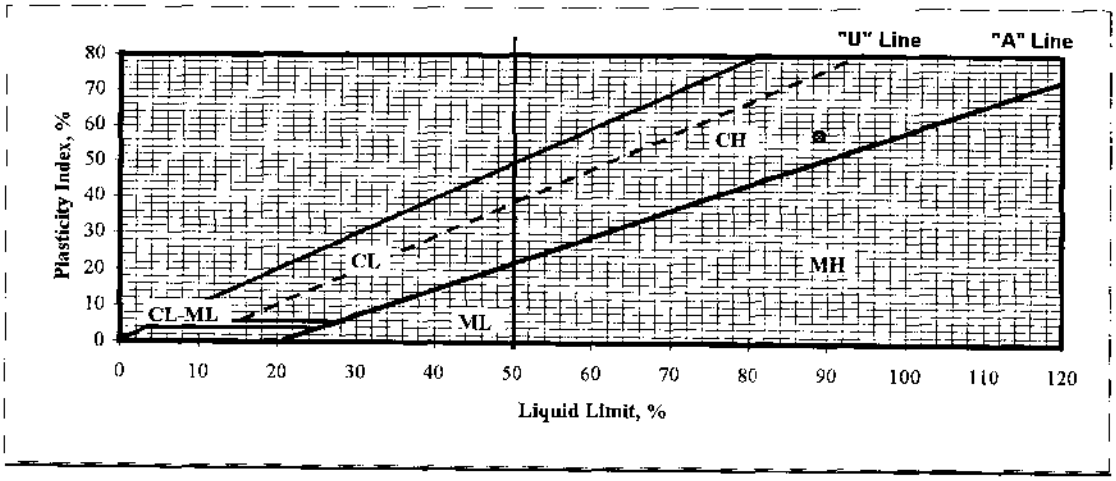
Project Name:	BRISBANE LANDFILL	**Lab. No.:**	05-074	**Proj. No.:**	837998
Sample No.:	GT05-12	**Depth, ft.:**	155.5-156'	**Date:**	09/19/05
Description:	FAT CLAY, GRAY.			**Tested By:**	DGC
				Checked By:	

*/	Liquid Limit			Plastic Limit		
Can Number	B-7	B-8	E-4	M-4	F-6	
Weight of Can + Wet Soil, gms.	66.79	67.72	64.76	48.76	48.28	
Weight of Can + Dry Soil, gms.	50.94	51.23	49.16	44.74	44.35	
Weight of Can, gms.	31.84	32.08	31.80	31.81	31.90	
Weight of Dry Soil, gms.	19.10	19.15	17.36	12.93	12.45	
Weight of Water, gms.	15.85	16.49	15.60	4.02	3.93	
Water Content, %	83.0	86.1	89.9	31.1	31.6	
Number of Blows	50	26	16			

Unified Soil Classification **CH**



LL=	89	PL=	31	PI=	58



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COOPER

Specific Gravity by Pycnometer

ASTM D 854m

CTL Job#:	461-072	**Project Name:**	Bribane Project	**Date:** 07/02/08
Client:	Geosyntec Consultants	**Project No.:**		**Run By:** MD
				Checked DC

Boring:	GS08-1	GS08-1						
Sample:								
Depth, ft.:	83-86	129-132						
Pan No.:								
Soil Description (visual)	Mottled Olive Gray & Reddish Brown Clayey SAND	Gray CLAY						
Dish No.								
Air-Dry Weight, gm	42.67	32.49						
Oven-Dry Weight., gm	42.13	31.93						
Dish Weight, gm	11.72	11.45						
Hydroscopic MC, %	1.8	2.7						
Pycnometer No.:								
Wt Pycn., Soil & H2O (Wb), g	710.4	705.1						
Test Temp. (T), °C	22.0	22.2						
Wt Pycn. & H2O @ T (Wa), g	662.7	671.3						
Wt of Air-Dried Soil (Wm), g	76.33	54.67						
Wt of Oven-Dried Soil (Wo), g	75.00	53.21						
Temp. Corr. Factor (K)	0.99957	0.99952						
Specific Gravity (20°C) $Gs = \frac{K\ Wo}{Wo+Wa-Wb}$	**2.75**	**2.73**						

Organic Content Test
ASTM D 2974-00 (Method C - 440 °C)

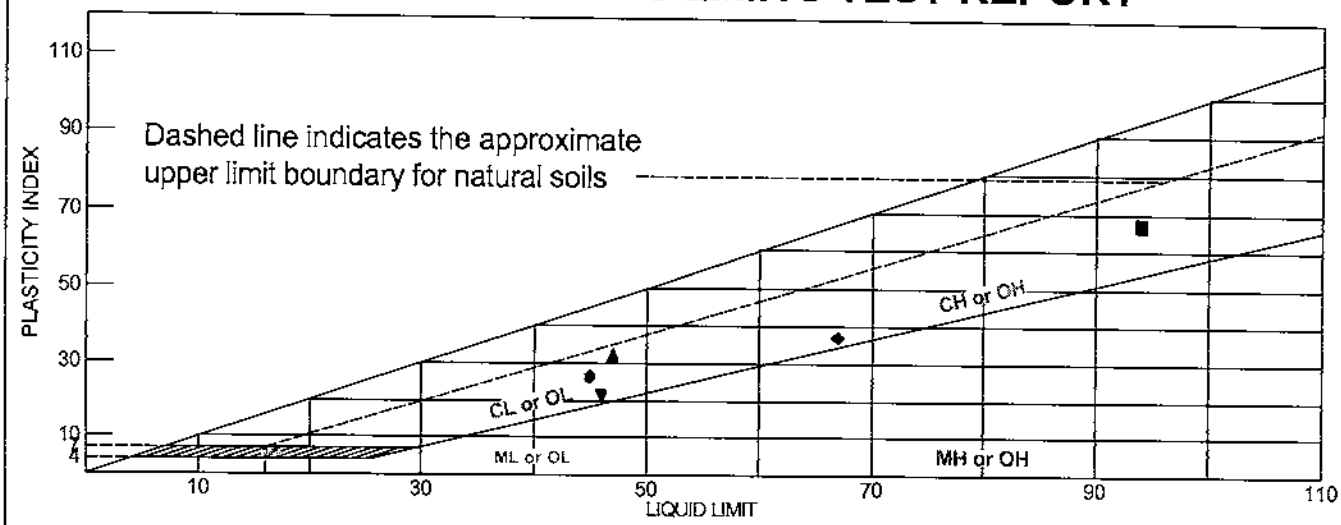
CTL JOB NO.:	461-072			**PROJECT:**	Brisbane Project		**DATE:**	6/30/2008
CLIENT :	Geosyntec Consultants			**PROJECT NO.:**			**BY:**	RU

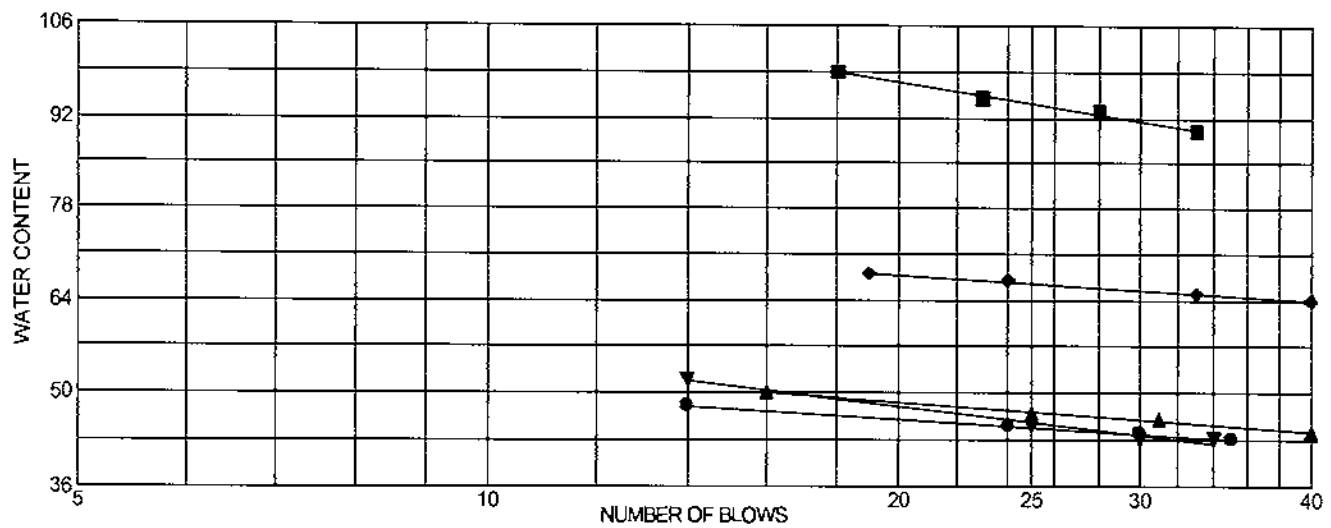
Boring :	GS08-1	GS08-3	GS08-1	GS08-4				
Sample :								
Depth (ft.):	83-86	45-48	129-132	49-52				
Visual Description:	Mottled Olive Gray & Reddish Brown Clayey SAND	Dark Gray CLAY	Gray CLAY	Gray CLAY				
Dish No.								
Dish wt., gm	82.72	81.63	75.53	80.94				
Soil, Org, Dish & H_2O, gm	139.40	141.40	128.22	151.05				
Oven Dry wt (105°C), gm	126.03	114.31	108.41	123.24				
Furnace Dry wt. (440°C), gm	125.25	112.68	107.33	121.96				
Moisture Content, % of Oven Dry Mass	30.9	82.9	60.2	65.7				
Organic Matter, %	1.8	5.0	3.3	3.0				

Note: When describing soils where we know the % organic matter and the wet/dry liquid limit data is not available, we use the following guidelines:

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".

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Mottled Yellowish Brown Lean CLAY w/ Sand	45	19	26			
■	Gray Fat CLAY	94	27	67			
▲	Olive Gray Sandy Lean CLAY/ Lean Clayey SAND	47	15	32			
◆	Dark Gray Fat CLAY, trace shell fragments (Bay Mud)	67	30	37			
▼	Gray Lean CLAY, trace shell fragments (Bay Mud)	46	25	21			

Project No. 461-063 **Client:** Geosyntec Consultants

Project: Bribane - WG1099-02

●	**Source:** GS08-1	**Sample No.:** S1-2	**Elev./Depth:** 83-86'
■	**Source:** GS08-1	**Sample No.:** S1-5	**Elev./Depth:** 129-132'
▲	**Source:** GS08-1	**Sample No.:** S1-6	**Elev./Depth:** ~~138-141'~~ 139-142'
◆	**Source:** GS08-3	**Sample No.:** S3-1	**Elev./Depth:** 45-48'
▼	**Source:** GS08-3	**Sample No.:** S3-2	**Elev./Depth:** 55-58'

LIQUID AND PLASTIC LIMITS TEST REPORT

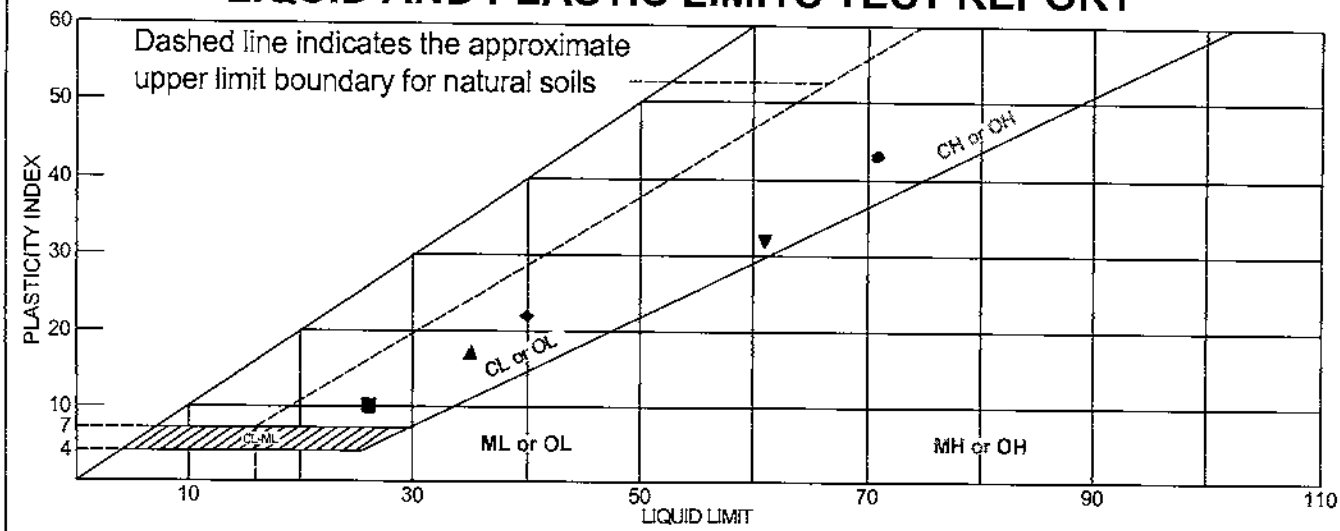
COOPER TESTING LABORATORY

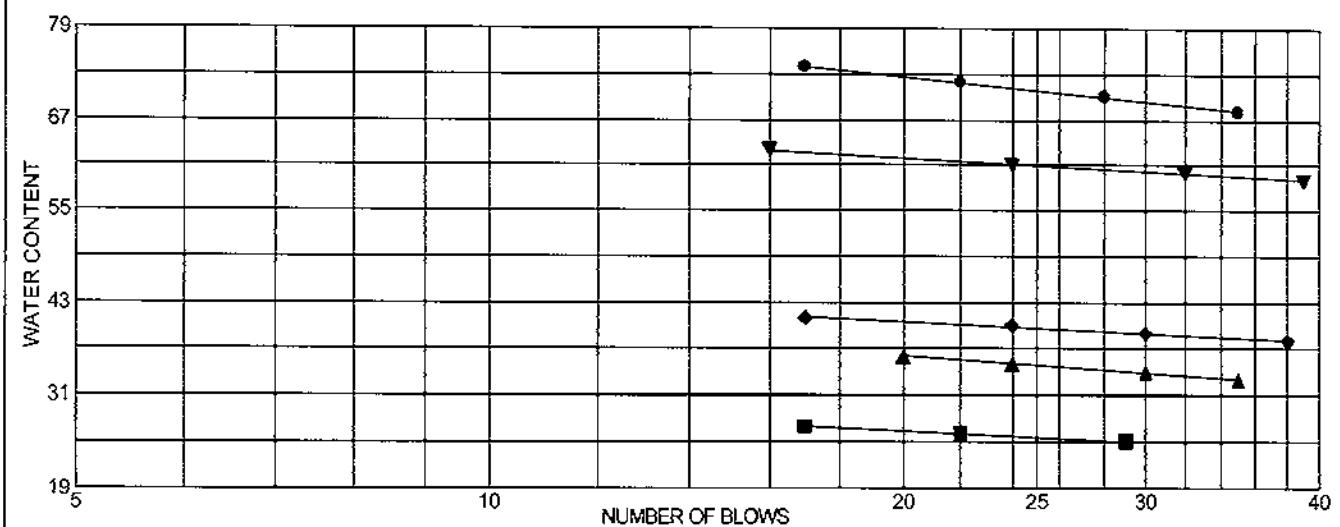
Remarks:

●
■
▲
◆
▼

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray Fat CLAY	71	28	43			
■	Gray Lean Clayey SAND w/pockets of Lean Clay & Silty Sand	26	16	10			
▲	Gray Sandy Lean CLAY (upper sample)	35	18	17	88.7	65.8	CL
◆	Brown Lean Clayey SAND, trace Gravel	40	18	22			
▼	Gray Fat CLAY w/ shell fragments (Bay Mud)	61	29	32			

Project No. 461-063 **Client:** Geosyntec Consultants

Project: Brisbane - WG1099-02

● **Source:** GS08-3	**Sample No.:** S3-6	**Elev./Depth:** 109-112'
■ **Source:** GS08-3	**Sample No.:** S3-7	**Elev./Depth:** 114-117'
▲ **Source:** GS08-3	**Sample No.:** S3-10 (upper)	**Elev./Depth:** 229-232'
◆ **Source:** GS08-3	**Sample No.:** S3-10	**Elev./Depth:** 229-232'
▼ **Source:** GS08-4	**Sample No.:** S4-1	**Elev./Depth:** 45-48'

LIQUID AND PLASTIC LIMITS TEST REPORT

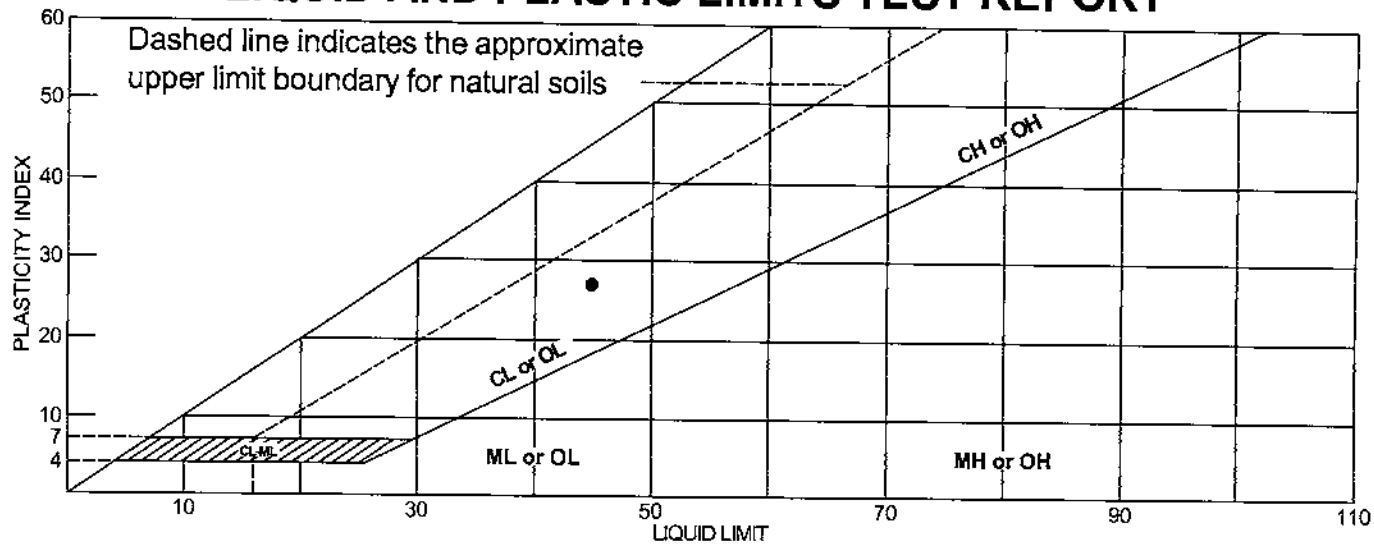
COOPER TESTING LABORATORY

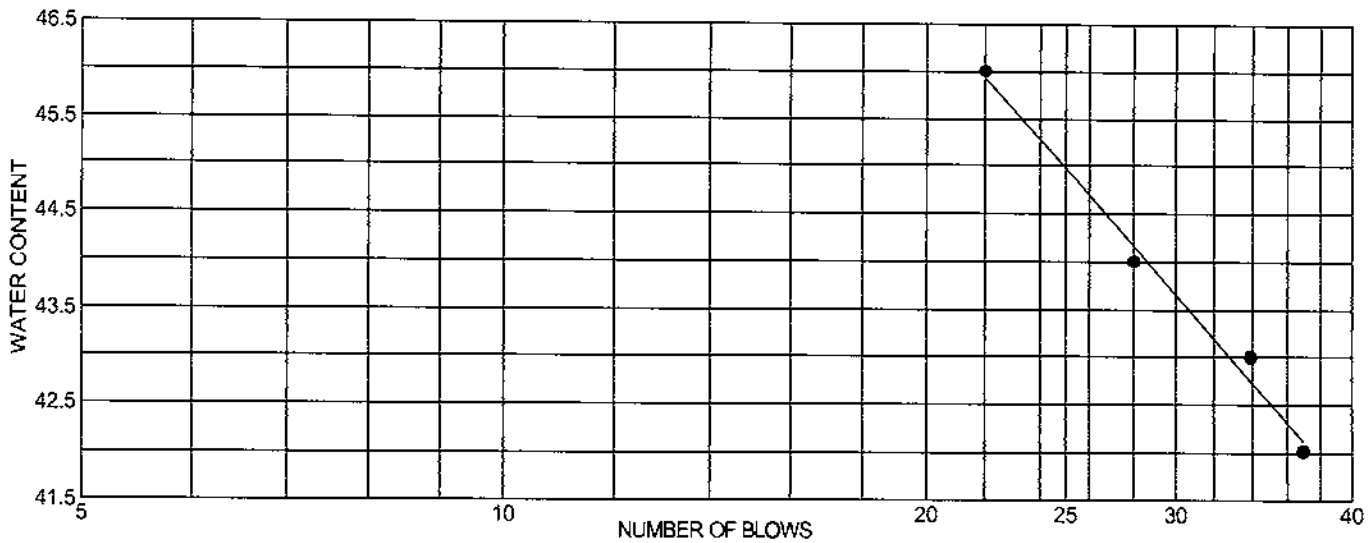
Remarks:

● ■ ▲ ◆ ▼

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Greenish Gray Lean CLAY	45	18	27			

Project No. 461-066 **Client:** Geosyntec Consultants

Project: Brisbane - WG1099-02

● **Source:** GS08-3 **Elev./Depth:** 249-252'

Remarks:

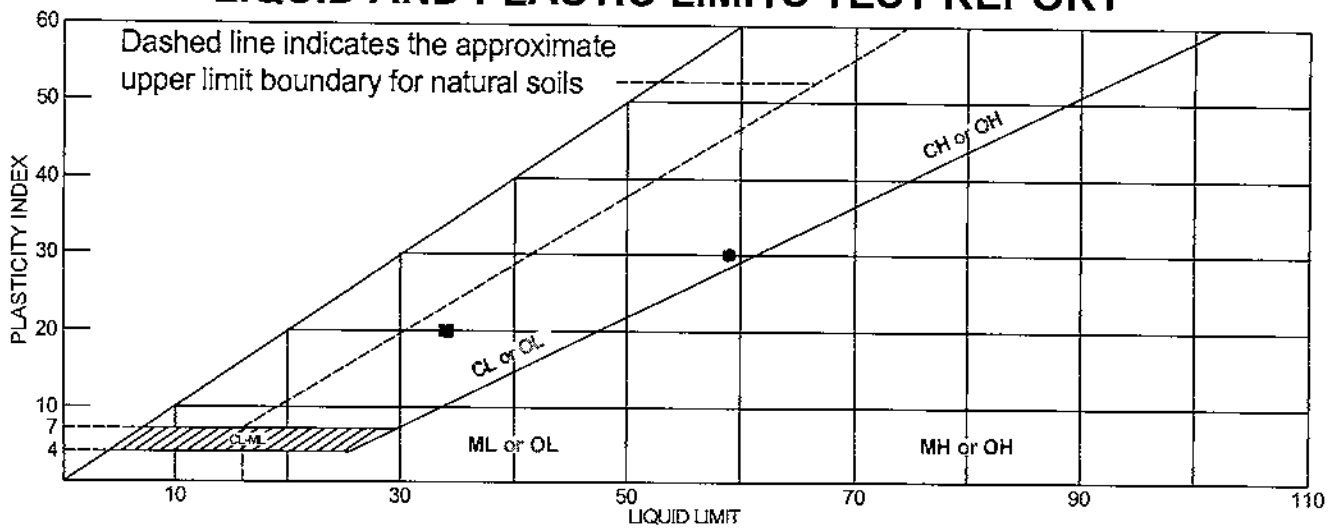
●

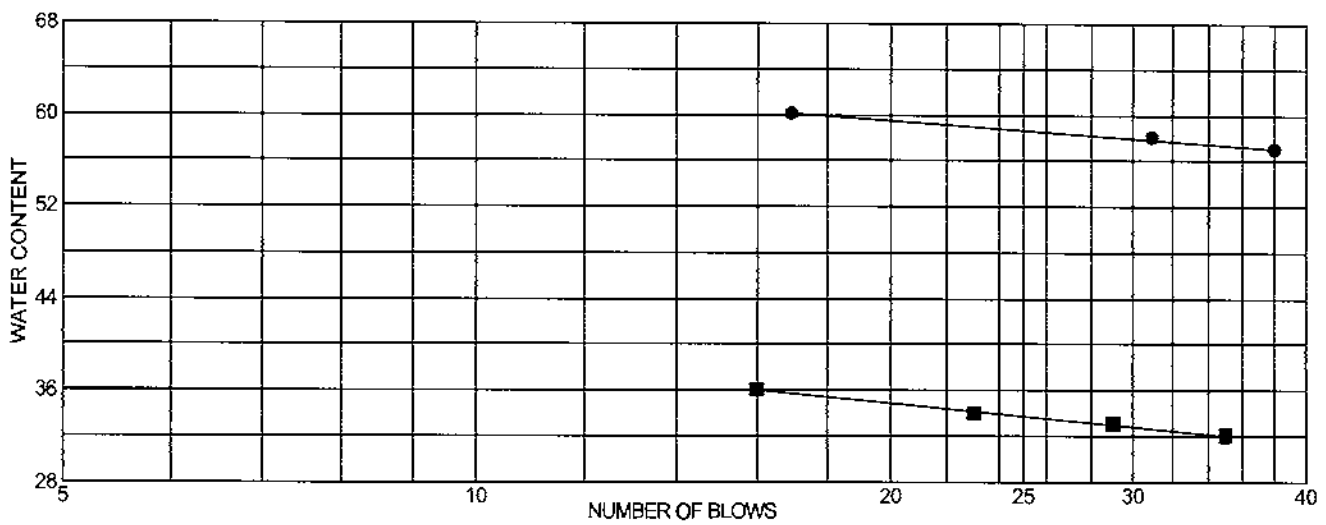
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray Fat CLAY, trace shell fragments (Bay Mud)	59	29	30			
■	Olive Gray Sandy Lean CLAY	34	14	20	96.3	61.0	CL

Project No. 461-063 **Client:** Geosyntec Consultants

Project: Bribane - WG1099-02

● **Source:** GS08-4 **Sample No.:** S4-2 **Elev./Depth:** 49-52'

■ **Source:** GS08-4 **Sample No.:** S4-4 **Elev./Depth:** 175-178'

Remarks:

●

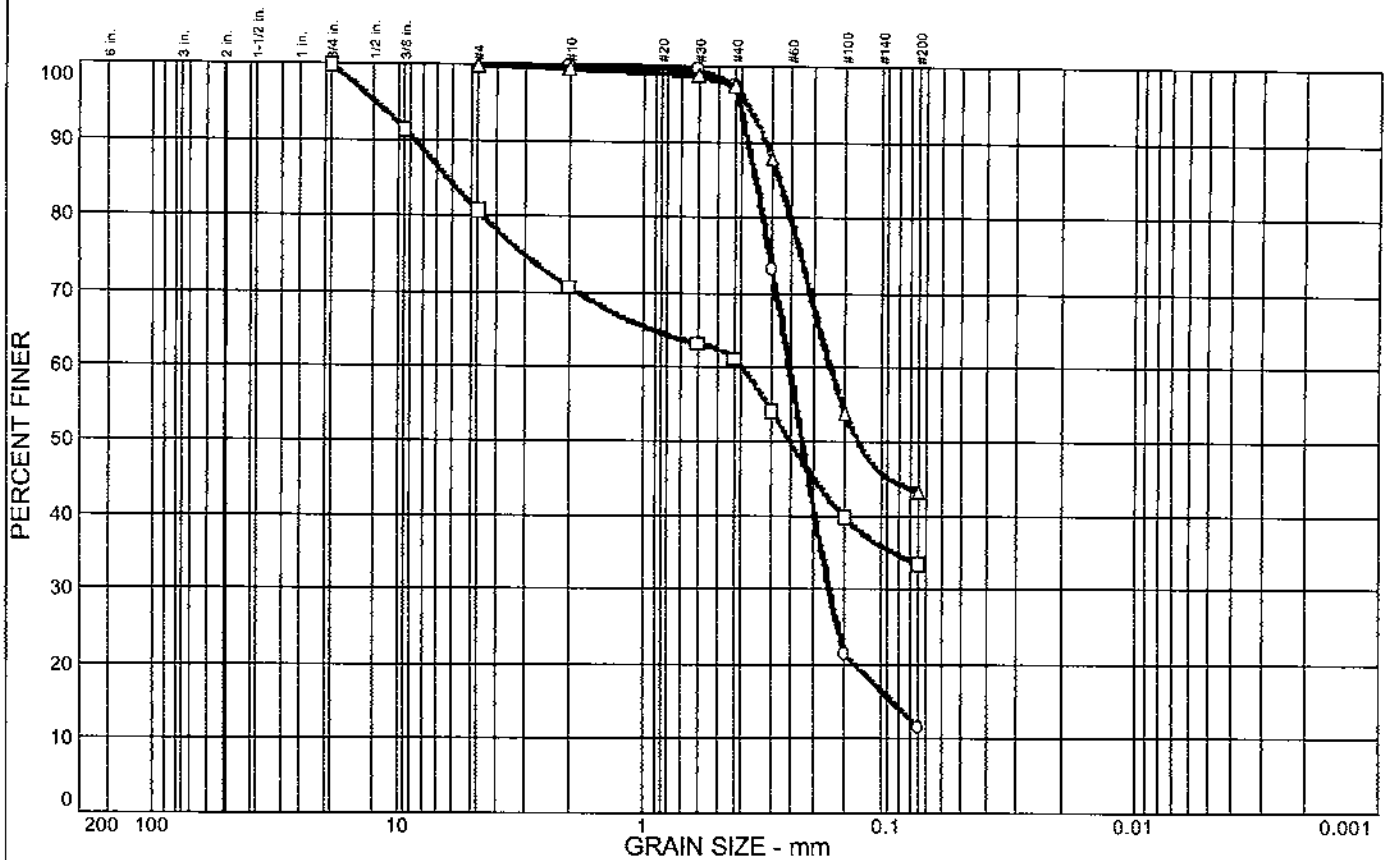
■

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			88.4	11.6					
□		19.3	47.4	33.3					
△			56.7	43.3					

SIEVE inches size	PERCENT FINER ○	□	△
3/4		100.0	
3/8		91.4	
	GRAIN SIZE		
D_{60}	0.255	0.393	0.173
D_{30}	0.174		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4		80.7	100.0
#10	100.0	70.8	99.6
#30	99.7	63.3	98.8
#40	97.6	61.2	97.5
#50	73.3	54.1	87.8
#100	21.4	39.8	53.9
#200	11.6	33.3	43.3

SOIL DESCRIPTION

○ Olive Poorly Graded SAND w/ Silt

□ Olive Brown Claycy SAND w/ Gravel

△ Yellowish Brown Claycy SAND

REMARKS:

○

□

△

○ Source: GS08-1 Elev./Depth: 48-49.5'

□ Source: GS08-1 Elev./Depth: 78-79.5'

△ Source: GS08-2 Elev./Depth: 84-85.5'

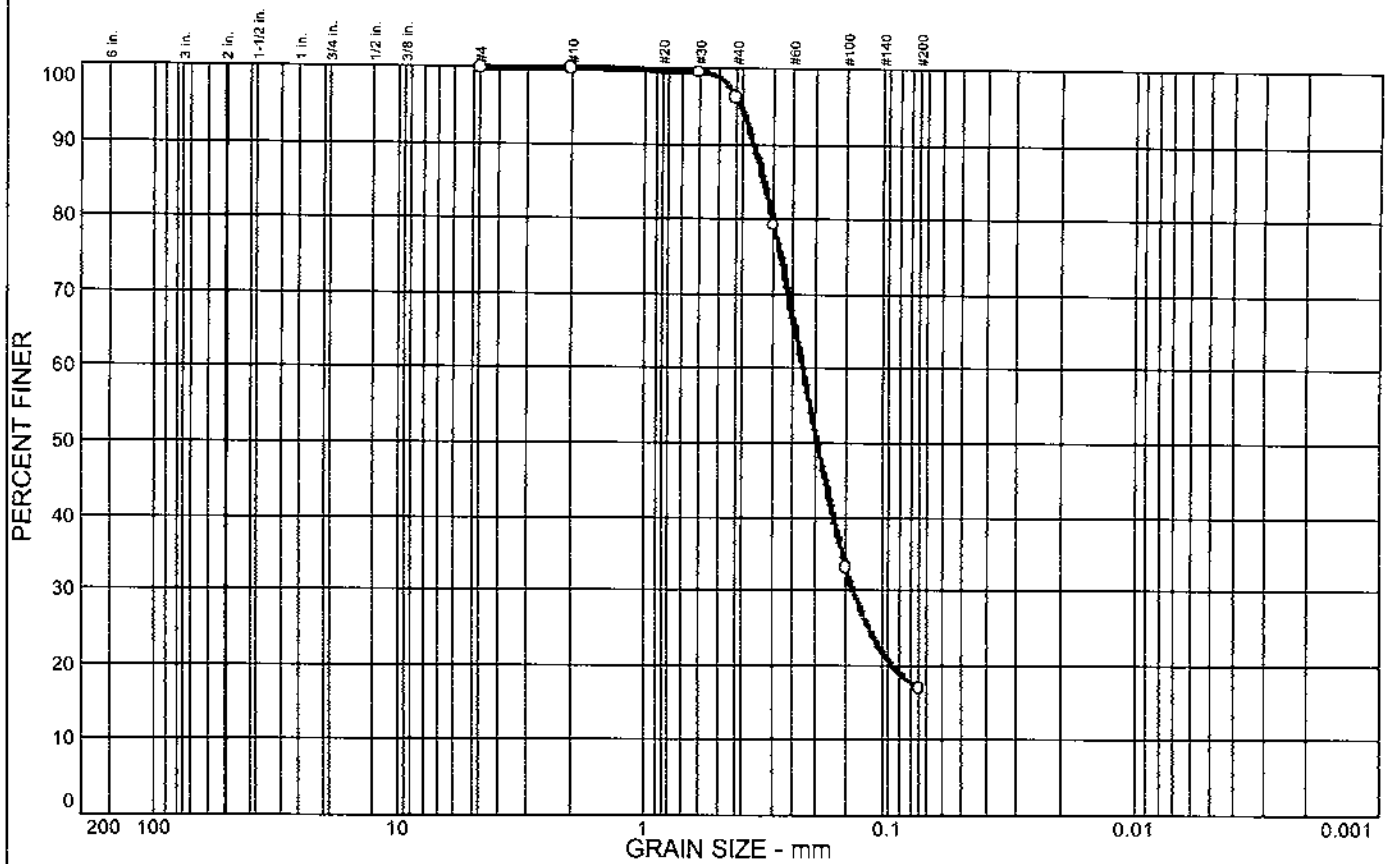
COOPER TESTING LABORATORY

Client: Geosyntec Consultants

Project: Brisbane - WG1099-02

Project No.: 461-066 Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
o			83.2	16.8					

SIEVE inches size	PERCENT FINER o		
GRAIN SIZE			
D_{60}	0.228		
D_{30}	0.140		
D_{10}			
COEFFICIENTS			
C_C			
C_U			

SIEVE number size	PERCENT FINER o		
#4	100.0		
#10	100.0		
#30	99.5		
#40	96.2		
#50	79.3		
#100	33.1		
#200	16.8		

SOIL DESCRIPTION

o Gray Silty SAND (slightly plastic)

REMARKS:

o

o Source: GS08-2 Sample No.: S2-4 Elev./Depth: 74-77'

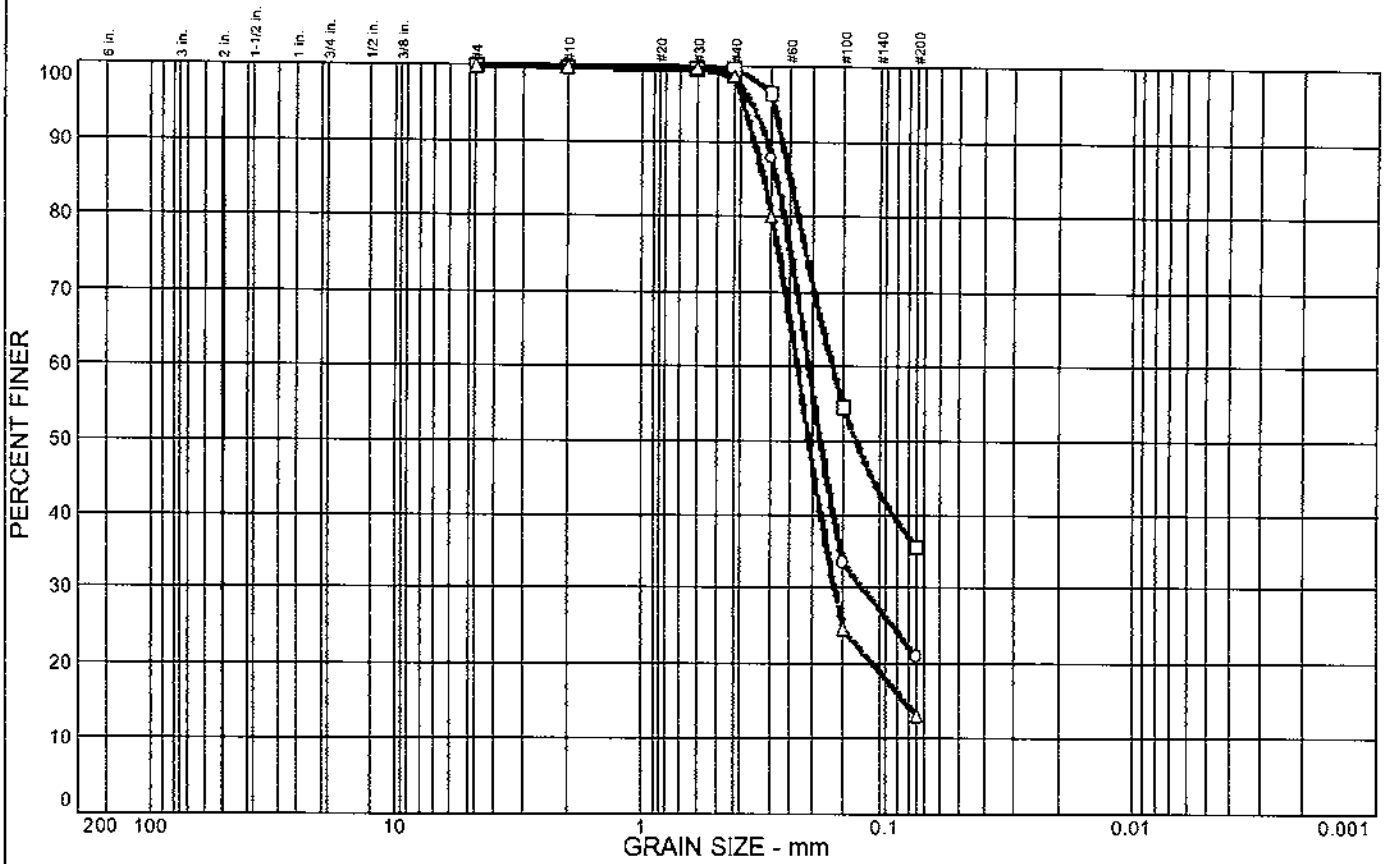
COOPER TESTING LABORATORY

Client: Geosyntec Consultants

Project: Bribane - WG1099-02

Project No.: 461-063 Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			79.1	20.9					
□			64.4	35.6					
△			86.9	13.1					

SIEVE inches size	PERCENT FINER ○	□	△
	GRAIN SIZE		
D_{60}	0.210	0.167	0.234
D_{30}	0.125		0.164
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	100.0	100.0
#10	100.0	99.8	100.0
#30	99.8	99.7	99.8
#40	98.6	99.6	98.7
#50	87.8	96.5	80.1
#100	33.3	54.7	24.5
#200	20.9	35.6	13.1

SOIL DESCRIPTION

○ Pale Green Silty SAND

□ Gray Clayey SAND

△ Yellow Clayey SAND

REMARKS:

○

□

△

○ Source: GS08-3 Elev./Depth: 74-75.5'

□ Source: GS08-3 Elev./Depth: 84-85.5'

△ Source: GS08-4 Elev./Depth: 80-81.5'

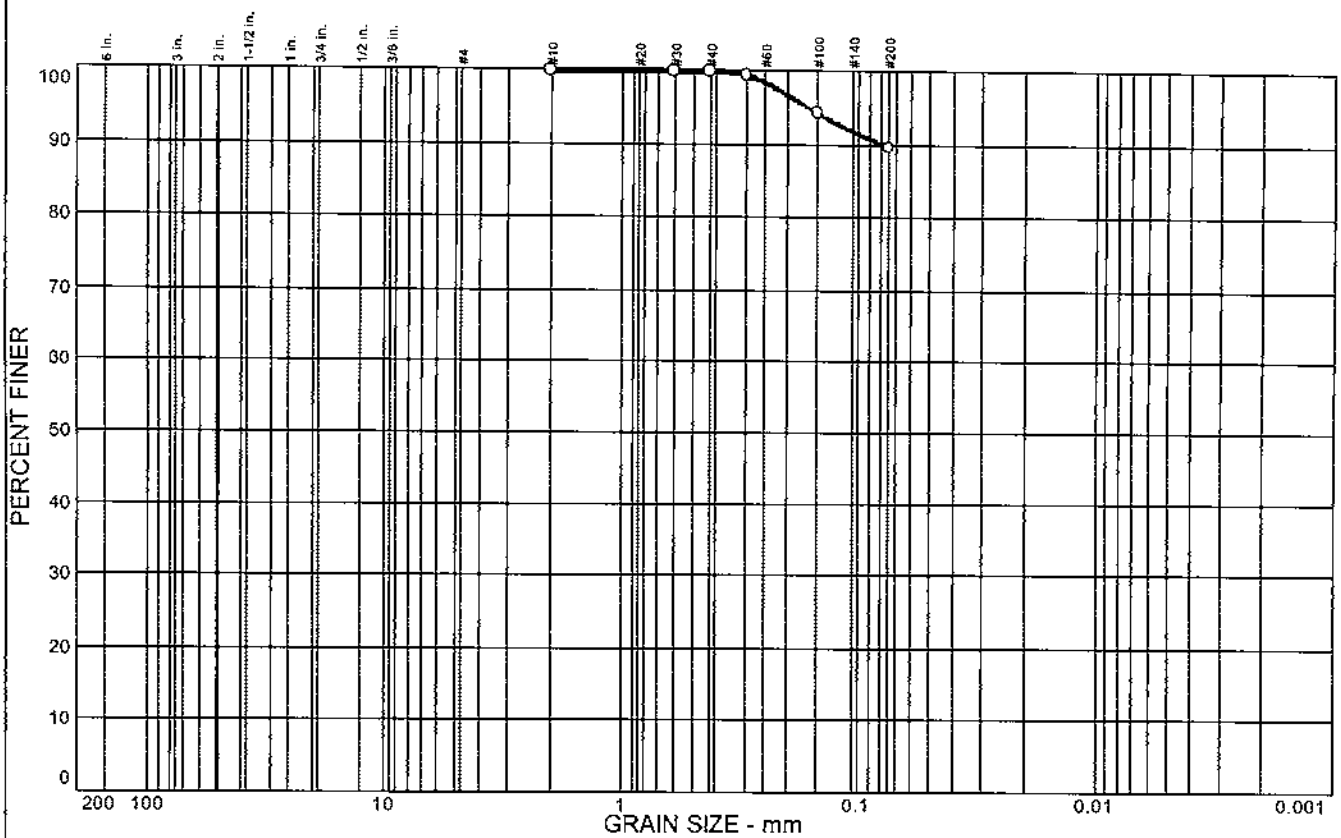
COOPER TESTING LABORATORY

Client: Geosyntec Consultants

Project: Brisbane - WG1099-02

Project No.: 461-066 Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
o			10.3	89.7					

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

SIEVE number size	PERCENT FINER o
#10	100.0
#30	99.9
#40	99.9
#50	99.4
#100	94.3
#200	89.7

SOIL DESCRIPTION
o Gray CLAY

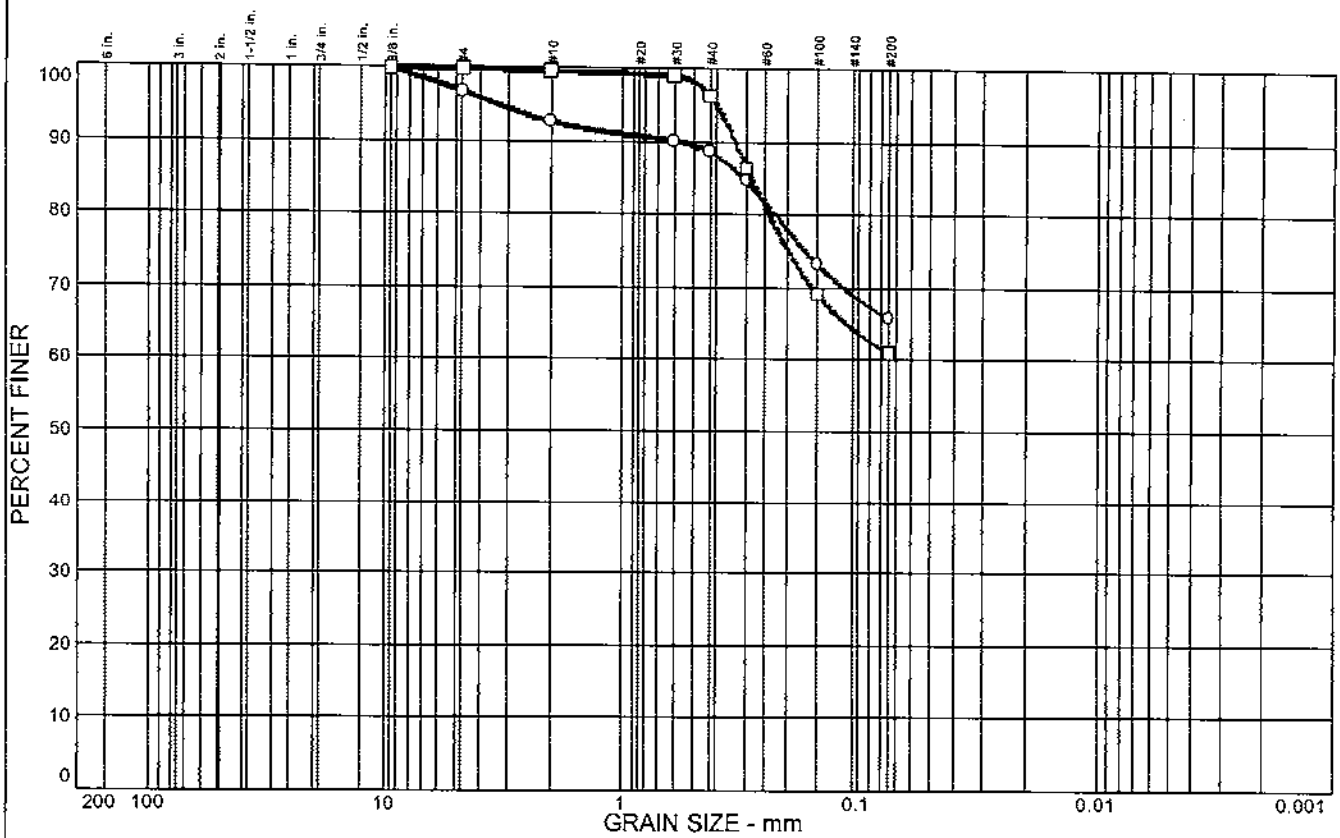
REMARKS:
o

o Source: GS08-3 Sample No.: S3-7 Elev./Depth: 114-117'

COOPER TESTING LABORATORY

Client: Geosyntec Consultants
Project: Brisbane
Project No.: 461-075 Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○		3.2	31.0	65.8					
□		0.1	38.9	61.0					

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □
3/8	100.0	100.0
GRAIN SIZE		
D_{60}		
D_{30}		
D_{10}		
COEFFICIENTS		
C_C		
C_U		

SIEVE number size	PERCENT FINER ○	PERCENT FINER □
#4	96.8	99.9
#10	92.7	99.6
#30	90.1	99.1
#40	88.7	96.3
#50	84.7	86.5
#100	73.3	69.2
#200	65.8	61.0

SOIL DESCRIPTION

○ Gray Sandy Lean CLAY

□ Olive Gray Sandy Lean CLAY

REMARKS:

○

□

○ Source: GS08-3 Elev./Depth: 229-232'

□ Source: GS08-04 Elev./Depth: 175-178'

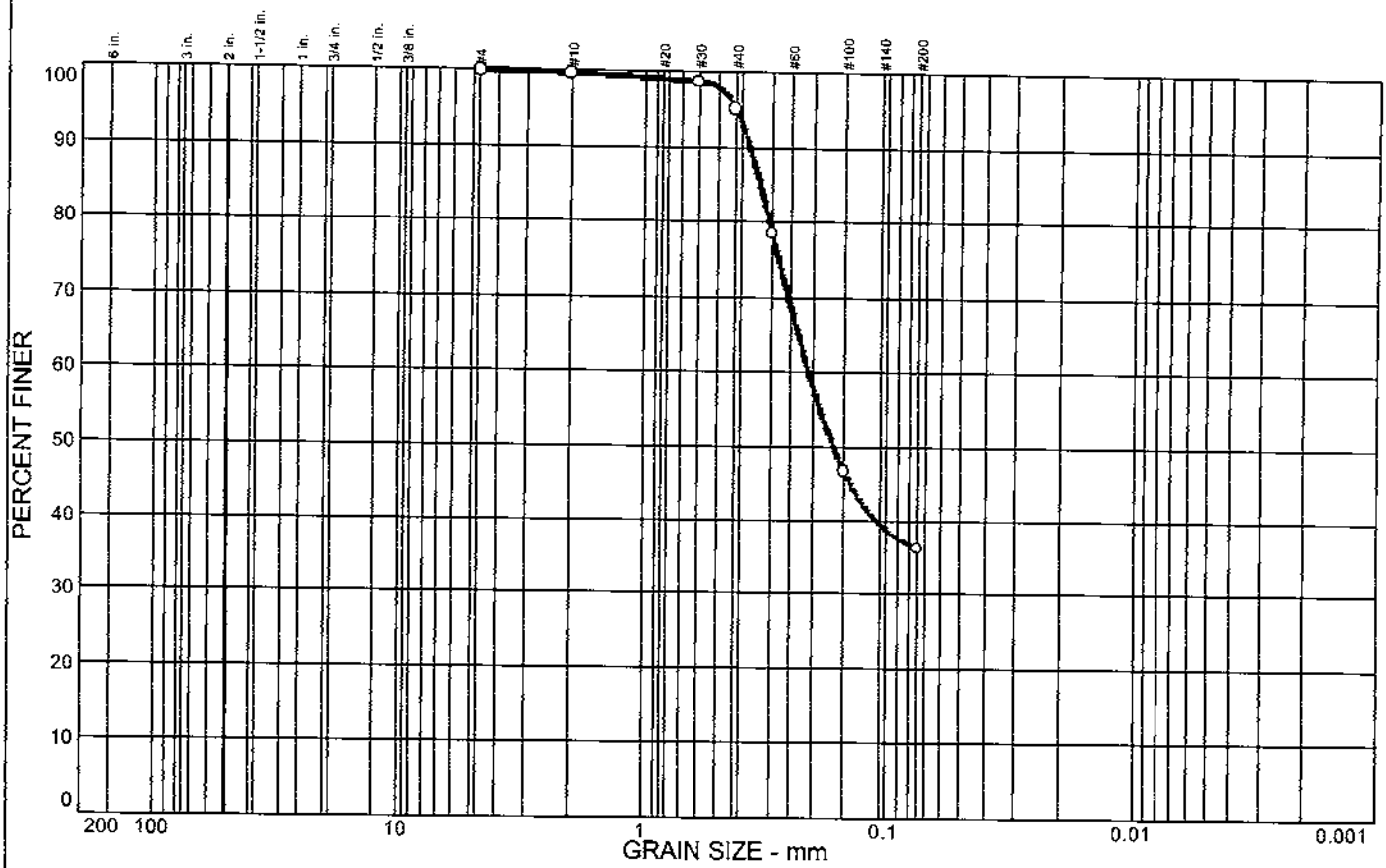
COOPER TESTING LABORATORY

Client: Geosyntec Consultants

Project: Brisbane Project

Project No.: 461-072 Figure

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
o			63.8	36.2					

SIEVE inches size	PERCENT FINER o		
	GRAIN SIZE		
D_{60}	0.211		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

SIEVE number size	PERCENT FINER o		
#4	100.0		
#10	99.7		
#30	98.7		
#40	95.1		
#50	78.5		
#100	46.6		
#200	36.2		

SOIL DESCRIPTION

o Olive Silty SAND

REMARKS:

o

o Source: GS08-4

Elev./Depth: 110-111.5'

COOPER TESTING LABORATORY

Client: Geosyntec Consultants

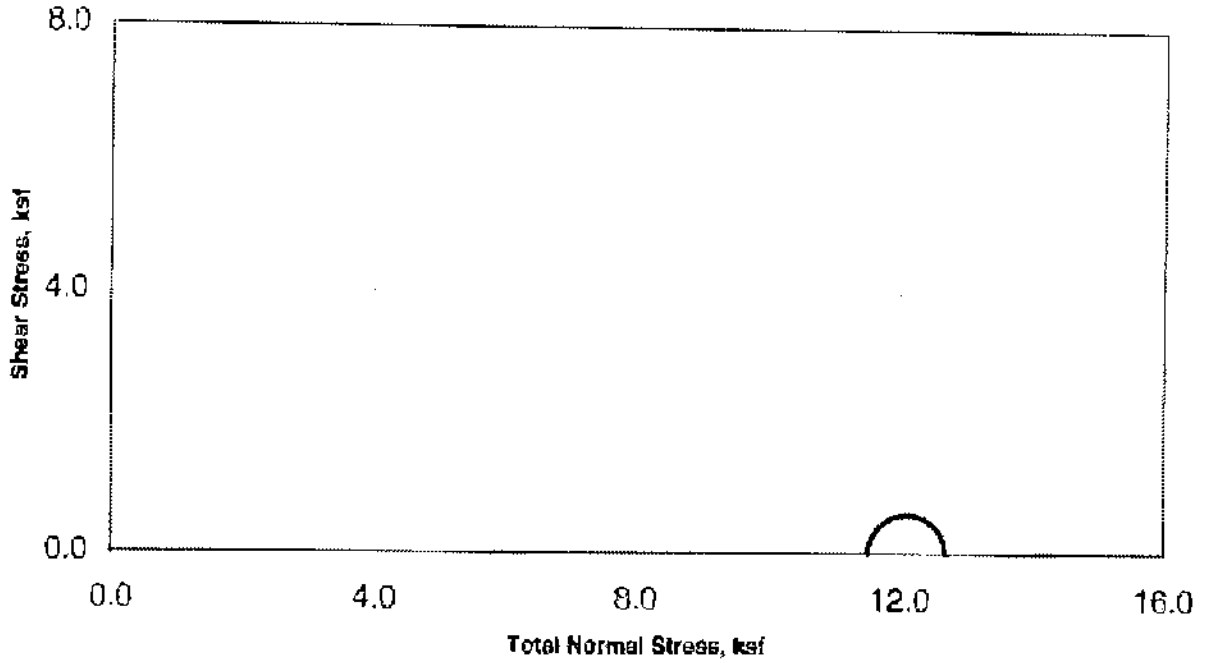
Project: Brisbane - WG1099-02

Project No.: 461-066

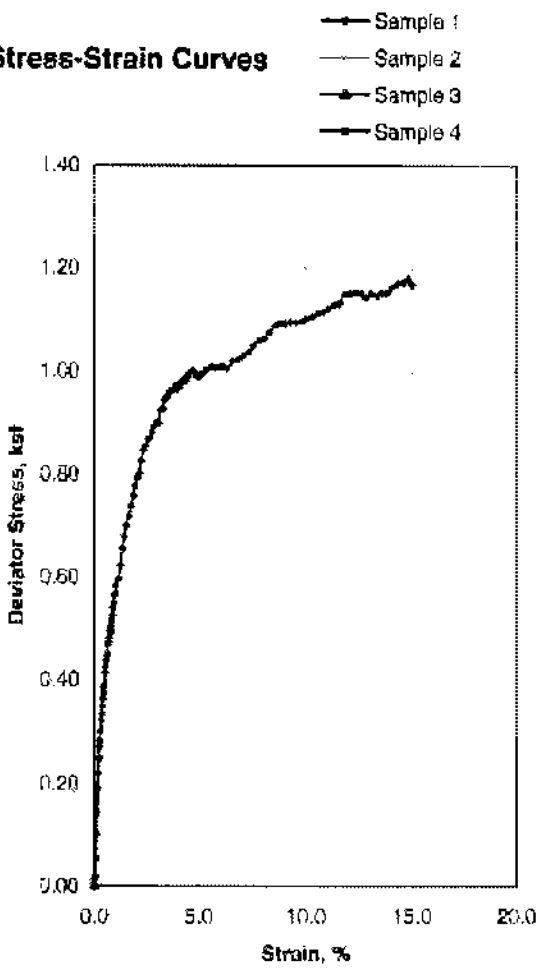
Figure

Unconsolidated-Undrained Triaxial Test

ASTM D-2850



Stress-Strain Curves



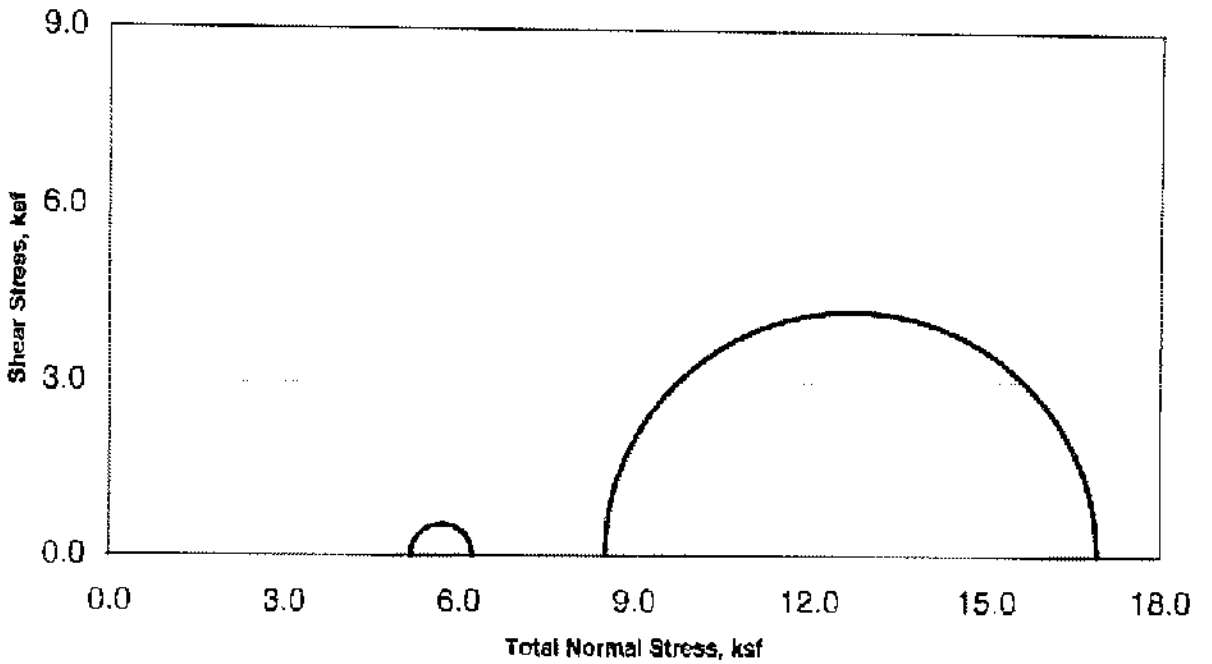
Sample Data	1	2	3	4
Moisture %	44.6			
Dry Den,pcf	76.5			
Void Ratio	1.204			
Saturation %	100.0			
Height in	6.00			
Diameter in	2.88			
Cell psi	80.0			
Strain %	14.80			
Deviator, ksf	1.179			
Rate %/min	1.00			
in/min	0.060			
Job No.:	461-066			
Client:	Geosyntec Consultants			
Project:	Brisbane - WG1099-02			
Boring:	GS08-3			
Sample:				
Depth ft:	249-252 (Tip)			

Visual Soil Description	
Sample #	
1	Greenish Gray CLAY
2	
3	
4	

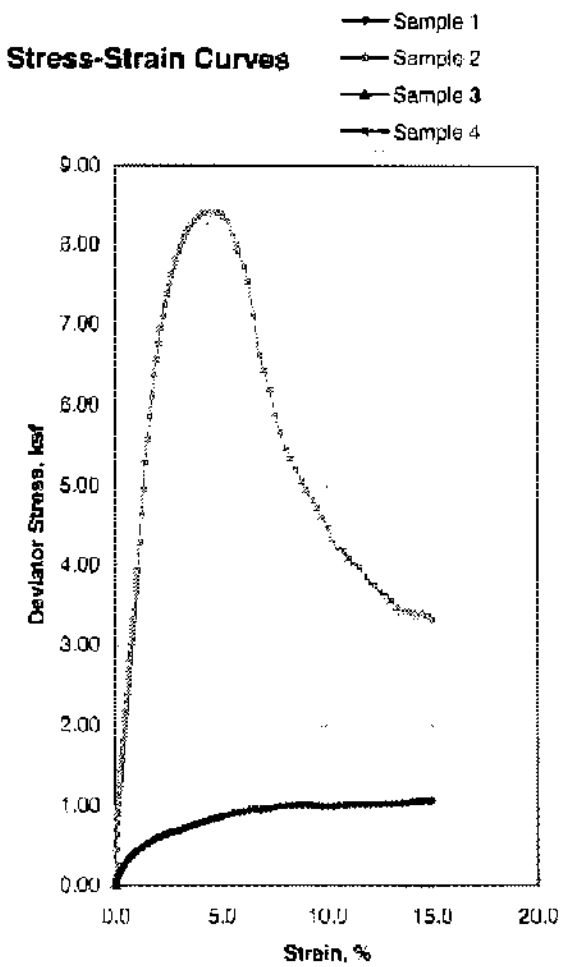
Remarks:

Unconsolidated-Undrained Triaxial Test

ASTM D-2850



Stress-Strain Curves



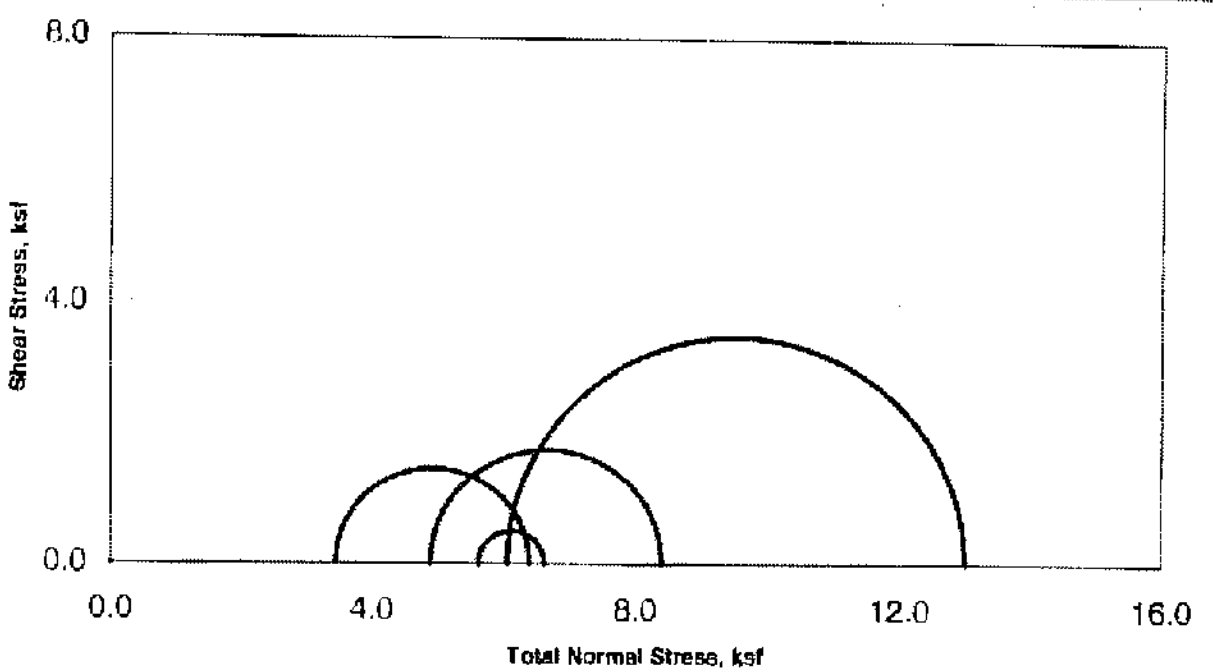
Sample Data				
	1	2	3	4
Moisture %	27.7	18.7		
Dry Den,pcf	94.9	111.7		
Void Ratio	0.778	0.509		
Saturation %	96.3	99.1		
Height in	6.00	6.01		
Diameter in	2.87	2.88		
Cell psi	36.0	59.0		
Strain %	14.60	4.40		
Deviator, ksf	1.057	8.426		
Rate %/min	1.00	1.00		
in/min	0.060	0.060		
Job No.:	461-063b			
Client:	Geosyntec Consultants			
Project:	Brisbane Project			
Boring:	GS08-3	GS08-4		
Sample:	S3-7	S4-4		
Depth ft:	114-117 (Tip-16")	175-178 (Tip-4")		

Visual Soil Description	
Sample #	
1	Gray Lean Cl SAND w/po of Lean Cl & Si Sa
2	Ol Gr Lean Cl SAND change to Bl Gr Le Cl SAND
3	
4	

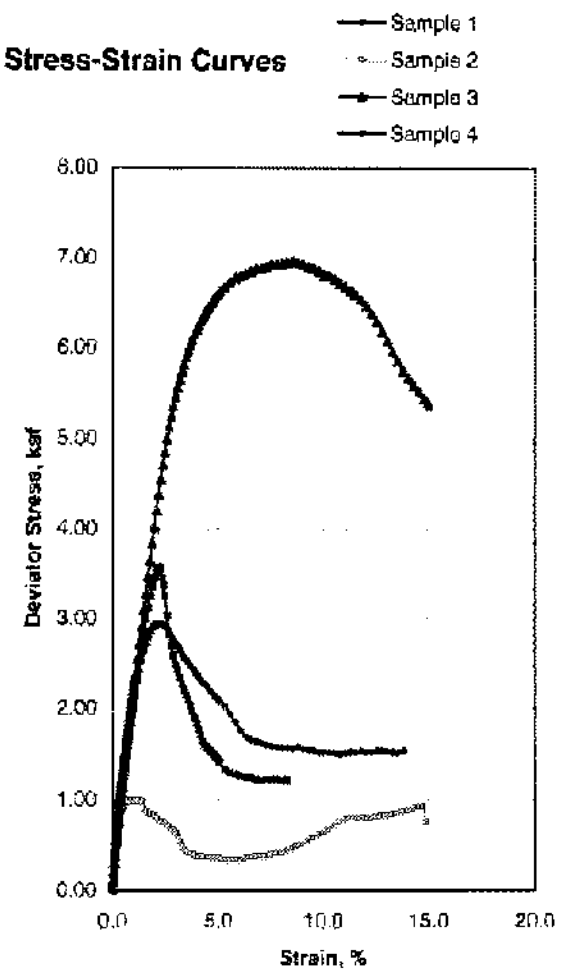
Remarks:

Unconsolidated-Undrained Triaxial Test

ASTM D-2850



Stress-Strain Curves



Sample Data				
	1	2	3	4
Moisture %	32.8	56.9	24.0	48.2
Dry Den,pcf	89.0	66.4	102.2	73.1
Void Ratio	0.893	1.538	0.650	1.306
Saturation %	99.2	99.9	99.9	99.7
Height in	6.00	6.03	6.00	6.01
Diameter in	2.88	2.89	2.87	2.88
Cell psi	24.0	39.0	42.0	34.0
Strain %	2.00	0.80	8.60	2.10
Deviator, ksf	2.935	1.003	6.956	3.565
Rate %/min	1.00	1.00	1.00	1.00
in/min	0.060	0.060	0.060	0.060
Job No.:	461-063a			
Client:	Geosyntec Consultants			
Project:	Brisbane Project			
Boring:	GS08-1	GS08-1	GS08-1	GS08-3
Sample:	S1-2	S1-5	S1-6	S3-6
Depth ft:	83-86 (Tip-4")	129-132 (Tip-4")	138-141 (Tip-4")	109-112 (Tip-4")

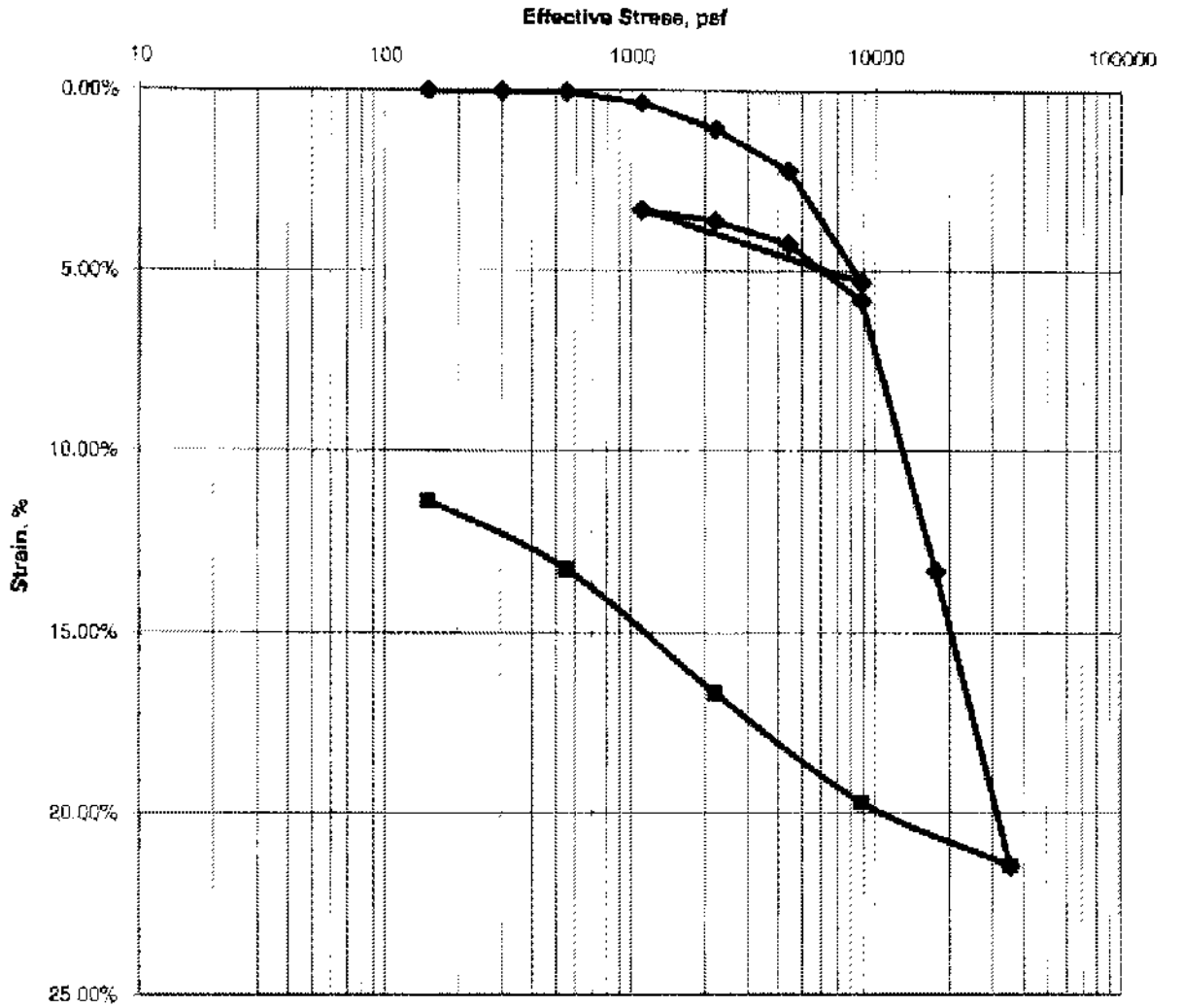
Visual Soil Description	
Sample #	
1	Mottled Yellowish Br Lean CLAY w/Sa
2	Gray Fat CLAY
3	Olive Gray Sa Lean CLAY/Lean Cl Sa
4	Gray Fat CLAY

Remarks:

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-1	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S1-2	**Reduced:**	PJ
Project:	Brisbane - WG1099-02	**Depth, ft.:**	83-86	**Checked:**	PJ/DC
Soil Type:	Mottled Yellowish Brown Lean CLAY w/ Sand			**Date:**	6/9/2008

Strain-Log-P Curve



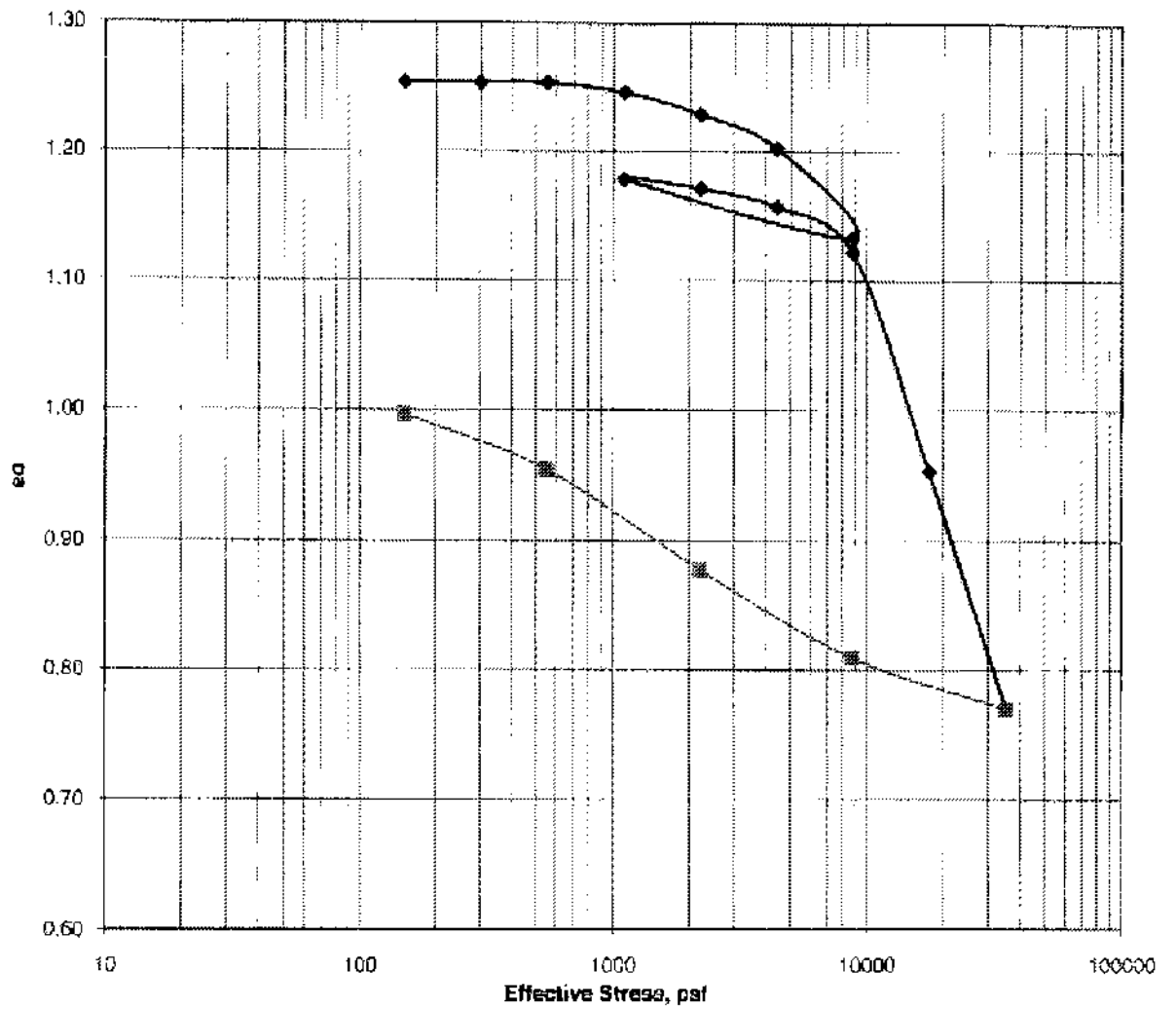
Ass. Gs = 2.75	Initial	Final
Moisture %:	44.7	37.3
Dry Density, pcf:	76.2	84.8
Void Ratio:	1.252	1.026
% Saturation:	98.2	100

Remarks:

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-1	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S1-2	**Reduced:**	PJ
Project:	Brisbane - WG1099-02	**Depth, ft.:**	83-86	**Checked:**	PJ/DC
Soil Type:	Mottled Yellowish Brown Lean CLAY w/ Sand			**Date:**	6/9/2008

eo-Log P Curve



Ass. Gs = 2.75	Initial	Final
Moisture %:	44.7	37.3
Dry Density, pcf:	76.2	84.8
Void Ratio:	1.252	1.026
% Saturation:	98.2	100

Remarks:

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane - WG1099-02
Boring	GS08-1
Sample:	S1-2
Depth, ft.:	83-86
Date:	6/9/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Description:	Mottled Yellowish Brown Lean CLAY w/ Sand

Moisture Density Data Entry Screen

	Initial	Final
Height	1.00	0.8796
Diameter	2.41	2.41
Total Wet Weight	132.1	125.4
Wt of Wet Soil & Dish		191.8
Wt of Dry Soil & Dish		157.8
Wt. Of Dish		45.9
Wt of Ring		20.6
Moisture %	44.7	37.0
Wet Density, pcf	110.3	116.4
Dry Density, pcf	76.2	84.9
Specific Gravity	2.75	2.75
Area	4.6	4.6
V ft3	0.0	0.0
Vt, cc	74.8	67.2
Vs, cc	33.2	33.2
Vv, cc	41.6	34.0
e	1.3	1.0
porosity, %	55.6	50.6
S, %	98.2	100

Loading Increments — **Void Ratio**

Increment #	Load, psf psf	Dial .0001"	Load psf	Height Delta h	Volume Vt cc	Voids Vv	Void Ratio e
1	150	0.0001	150	0.9999	74.80	41.604	1.253
2	300	0.0002	300	0.9998	74.80	41.596	1.253
3	550	0.0004	550	0.9996	74.78	41.581	1.252
4	1100	0.0008	1100	0.9992	74.75	41.549	1.251
5	2200	0.0011	2200	0.9989	74.73	41.526	1.250
6	4400	0.0026	4400	0.9974	74.61	41.411	1.246
7	8800	0.0032	8800	0.9968	74.56	41.365	1.245
8	1100	0.0029	1100	0.9971	74.58	41.388	1.246
9	2200	0.0024	2200	0.9976	74.62	41.426	1.247
10	4400	0.0042	4400	0.9958	74.49	41.287	1.243
11	8800	0.0054	8800	0.9946	74.40	41.196	1.240
12	17600	0.0132	17600	0.9868	73.81	40.610	1.222
13	35200	0.2148	35200	0.7852	58.74	25.5419	0.768335
14		0.2148	#N/A	0.7852	58.74	25.5419	0.768335
15		0.2148	#N/A	0.7852	58.74	25.5419	0.768335
16		0.2148	#N/A	0.7852	58.74	25.5419	0.768335
17		0.2148	#N/A	0.7852	58.74	25.5419	0.768335
18		0.2148	#N/A	0.7852	58.74	25.5419	0.768335
19		0.2148	#N/A	0.7852	58.74	25.5419	0.768335

Rebound Increments — **Void Ratio**

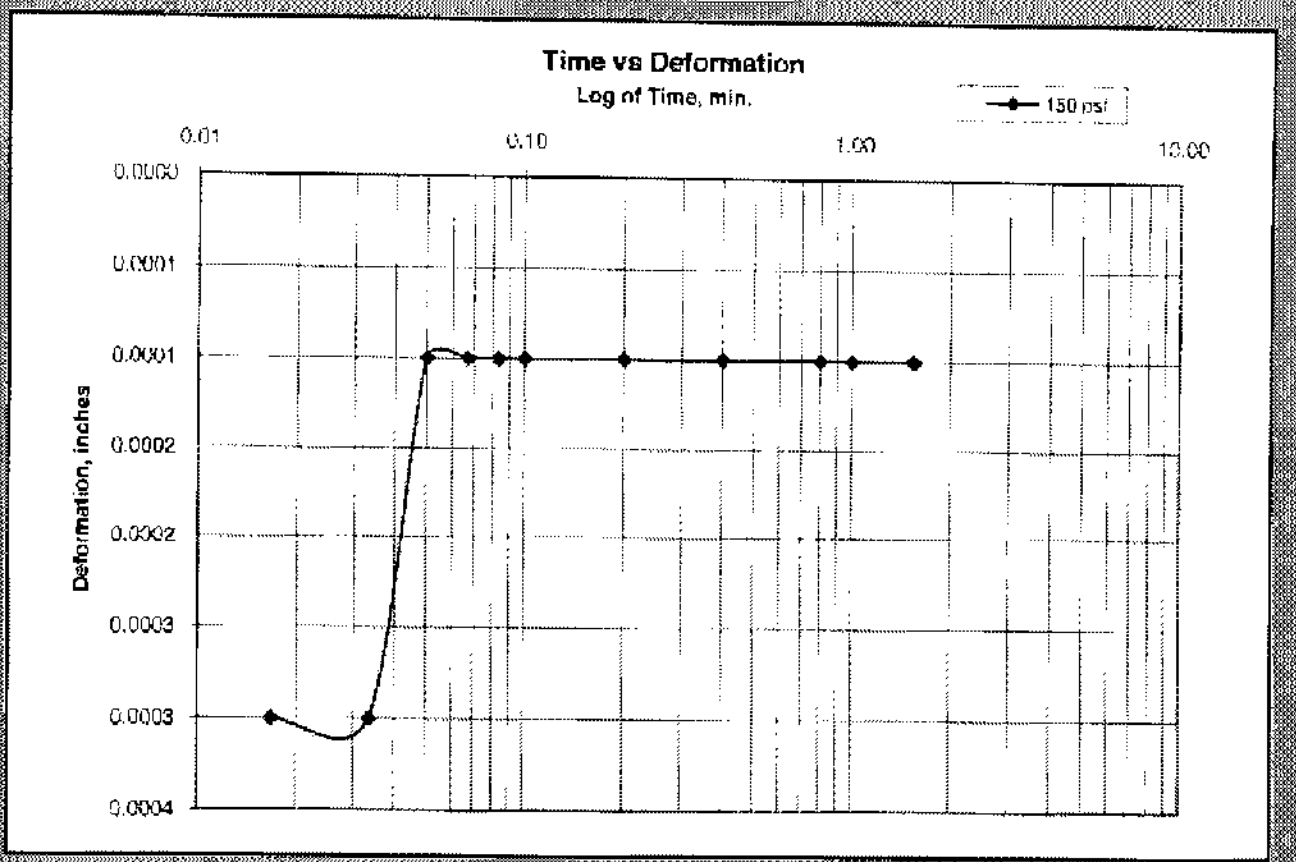
15	35200	0.2148	35200	0.7852	58.74	25.5419	0.768335
16	8800	0.1972	8800	0.8028	60.04	26.1585	0.800091
17	2200	0.1668	2200	0.8332	62.33	27.1029	0.827466
18	550	0.1327	550	0.8673	64.88	28.0880	0.854536
19	150	0.1139	150	0.8861	66.29	28.6501	0.869966
20			#N/A	1.0000	74.81	41.6114	1.253366
	Tot Dry Wt	91.3000					

The data to the left is used to determine the theoretical

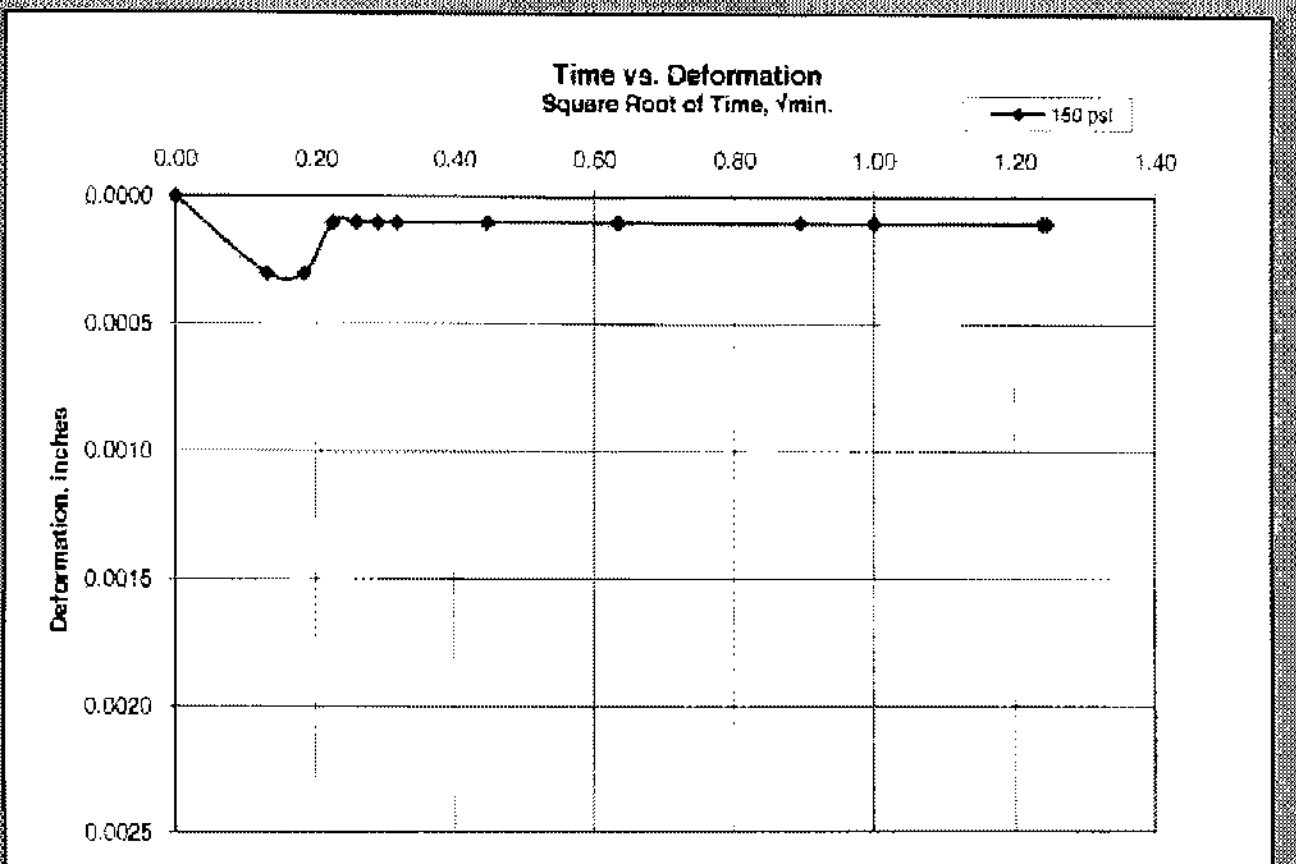
Cooper Testing Labs, Inc.

Load 1

150 PSF



150 PSF



Cooper Testing Labs, Inc.

Load 2

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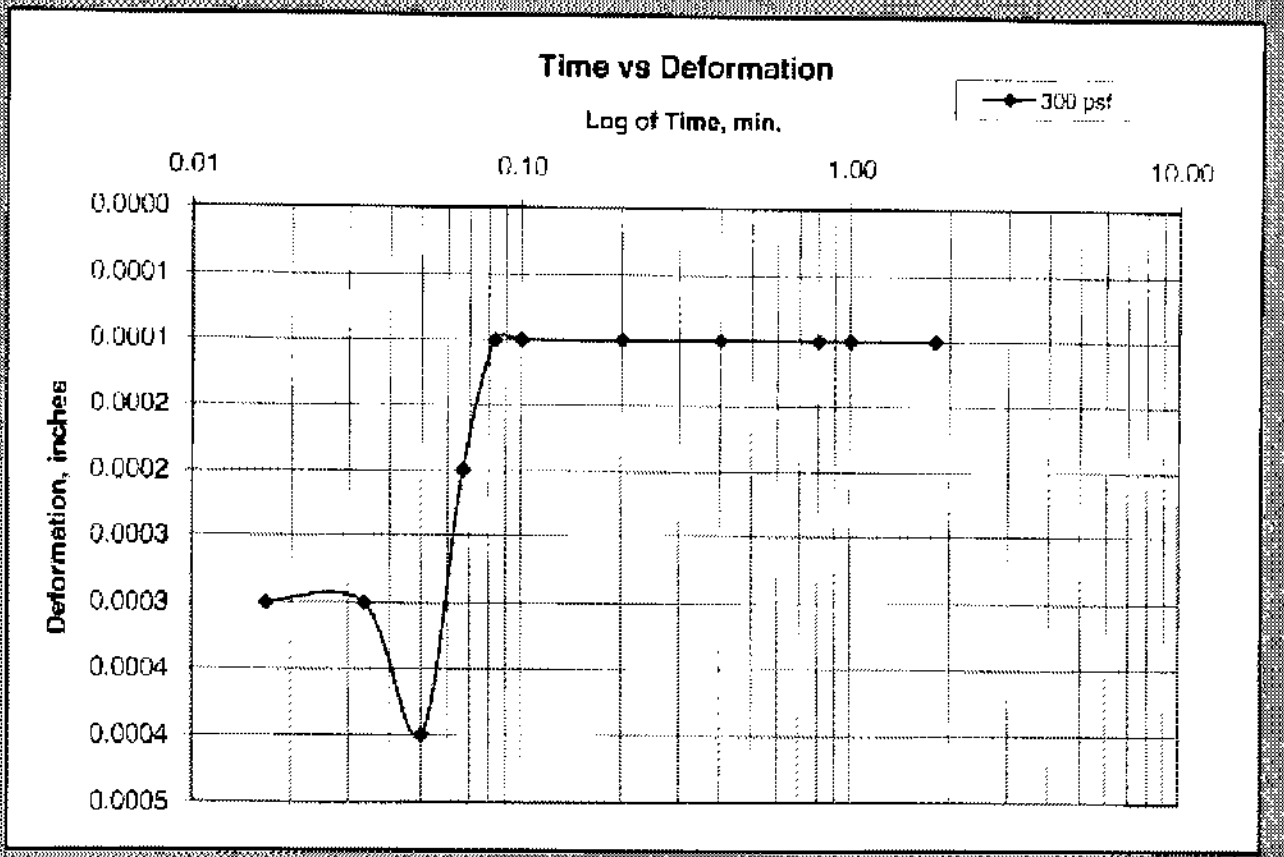
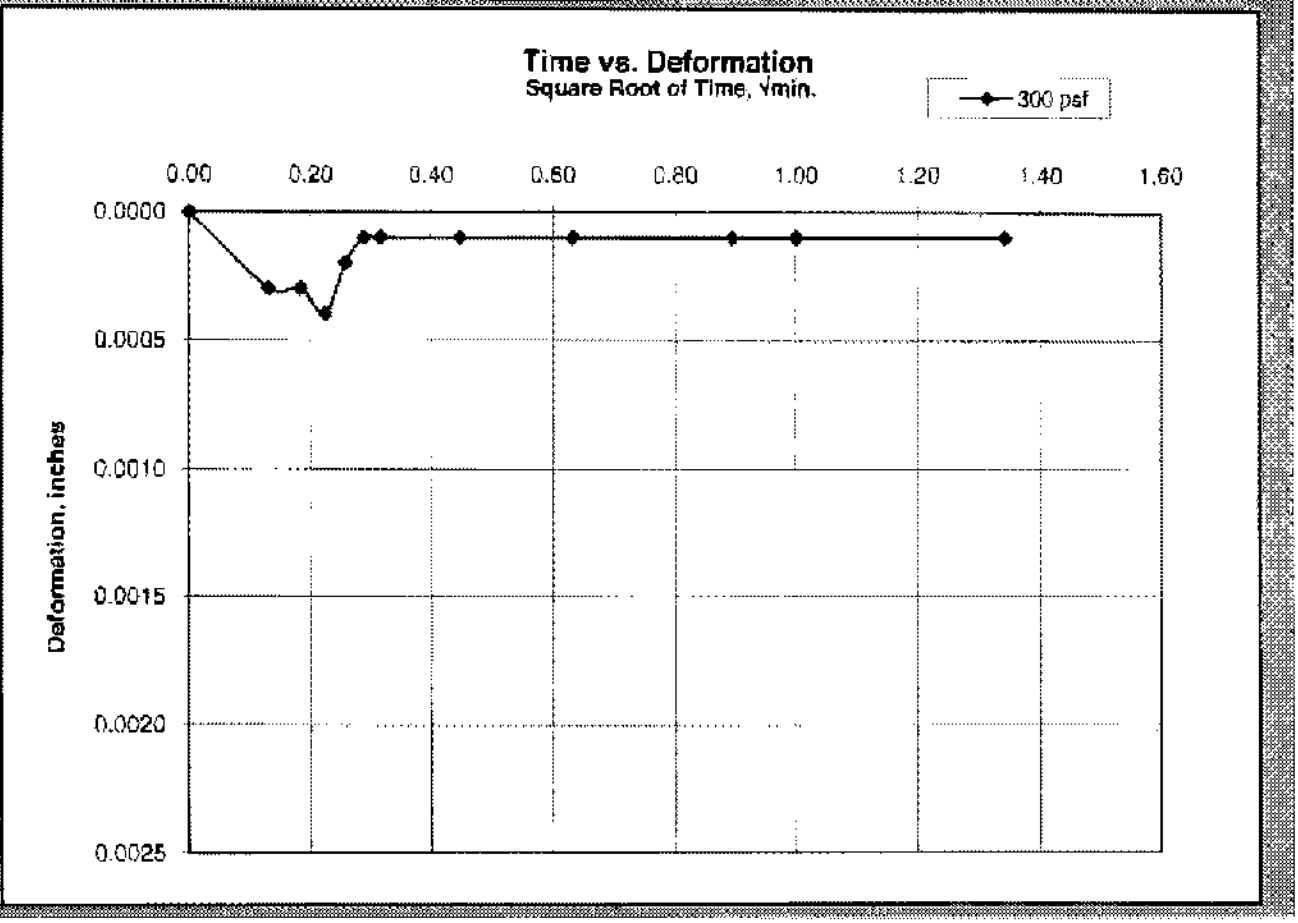


300 PSF



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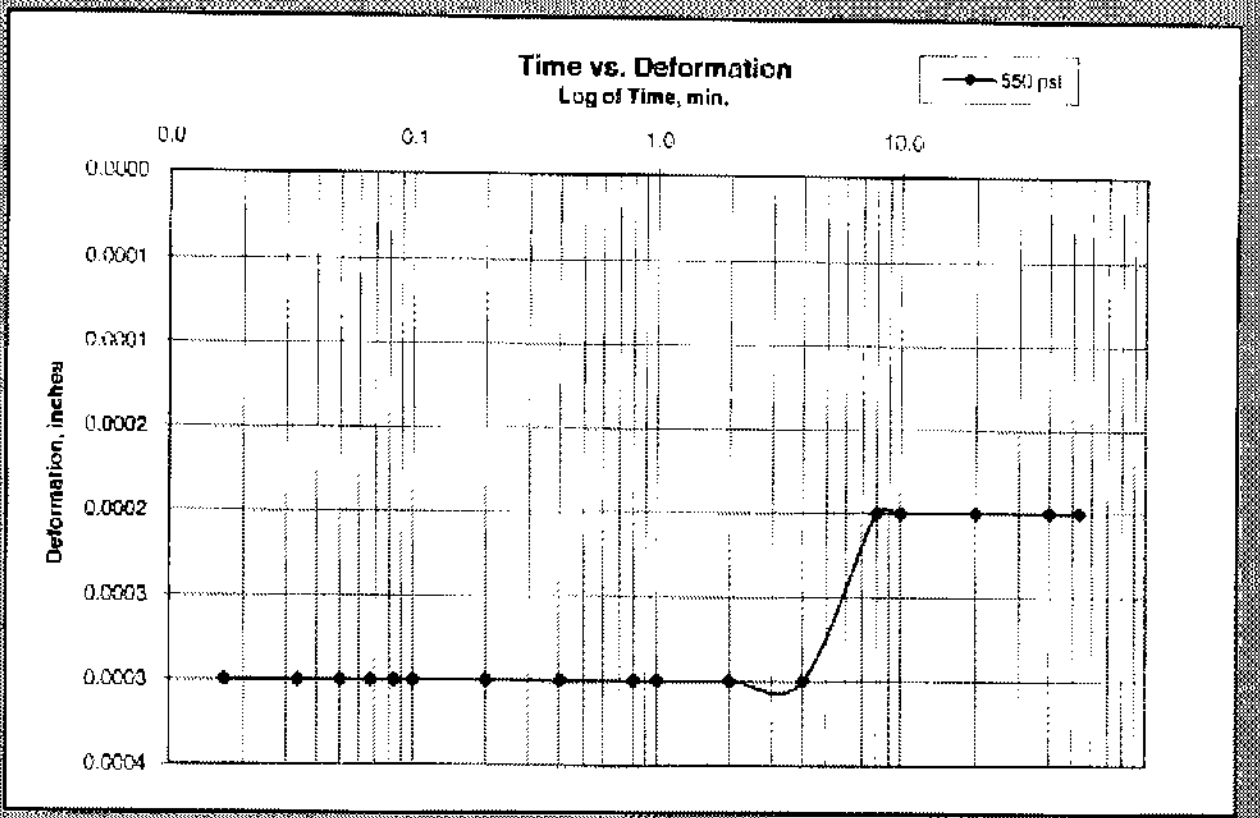
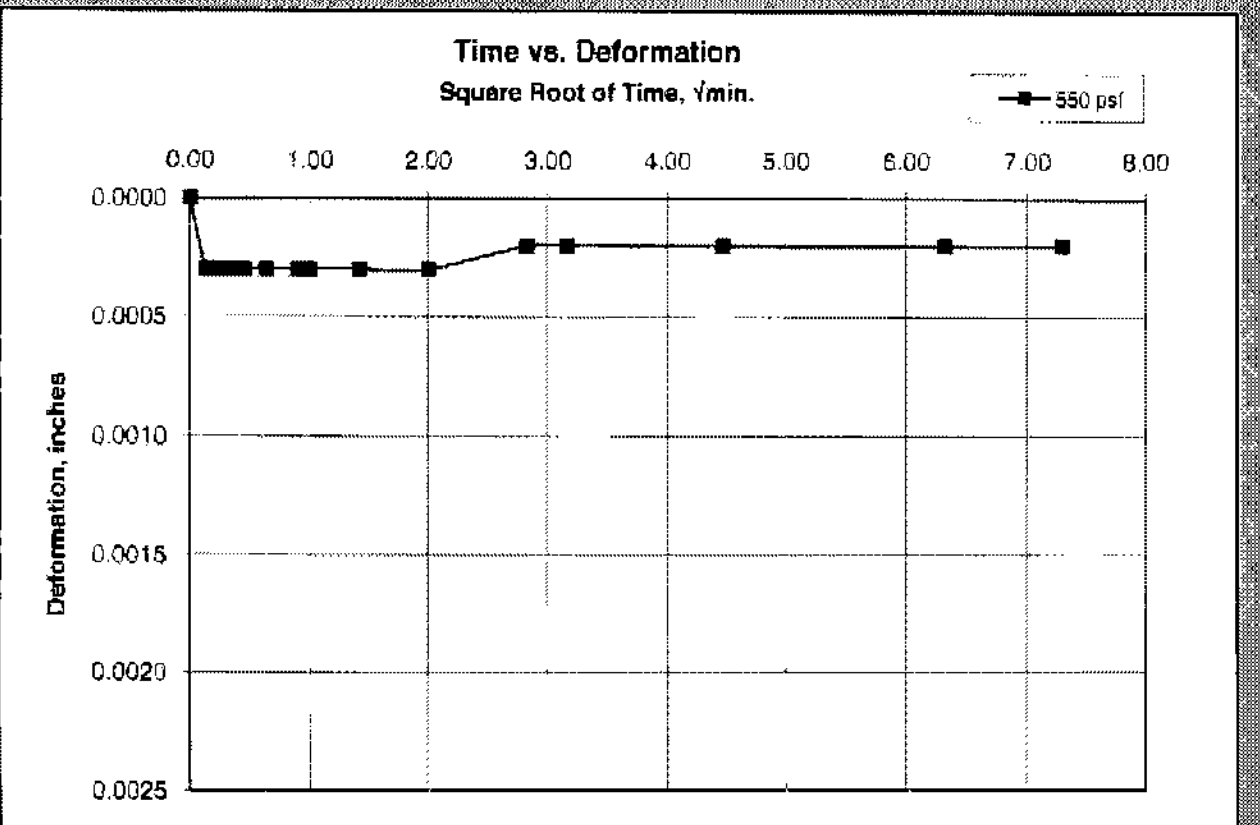
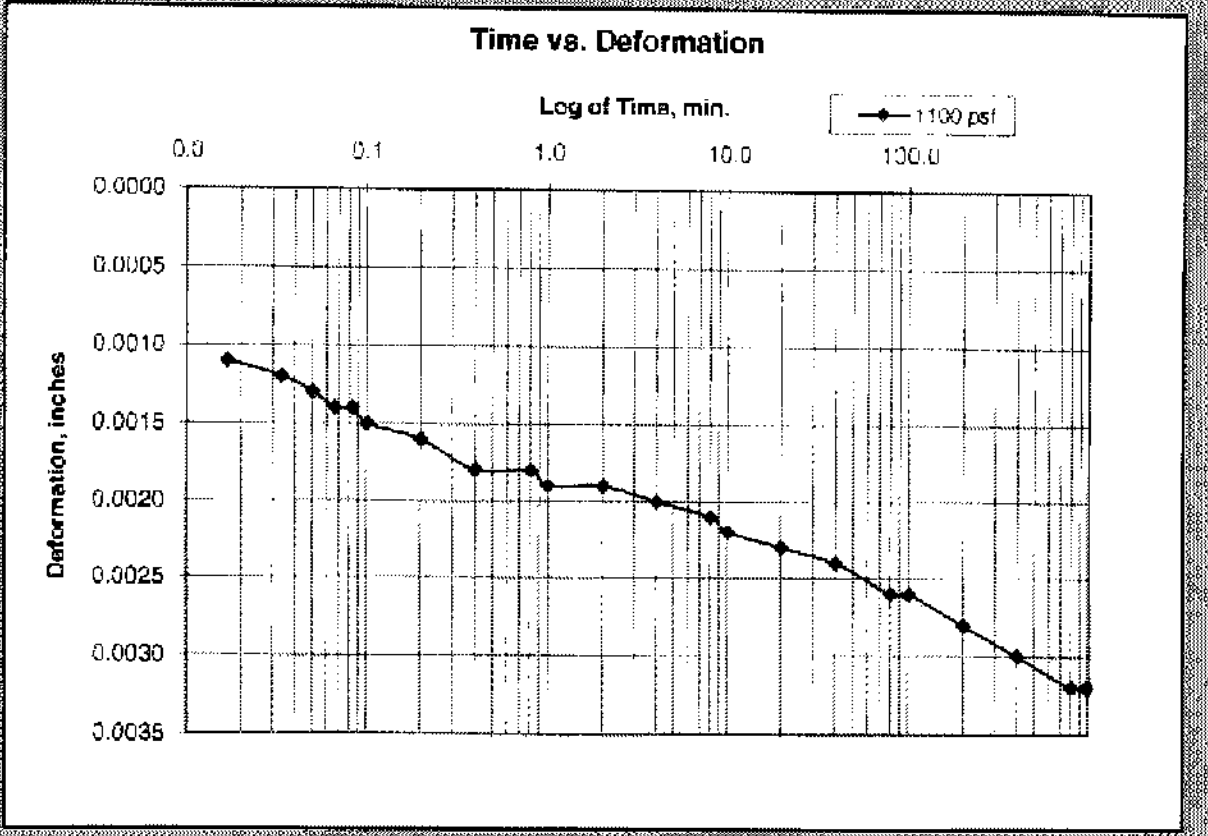


550 PSF

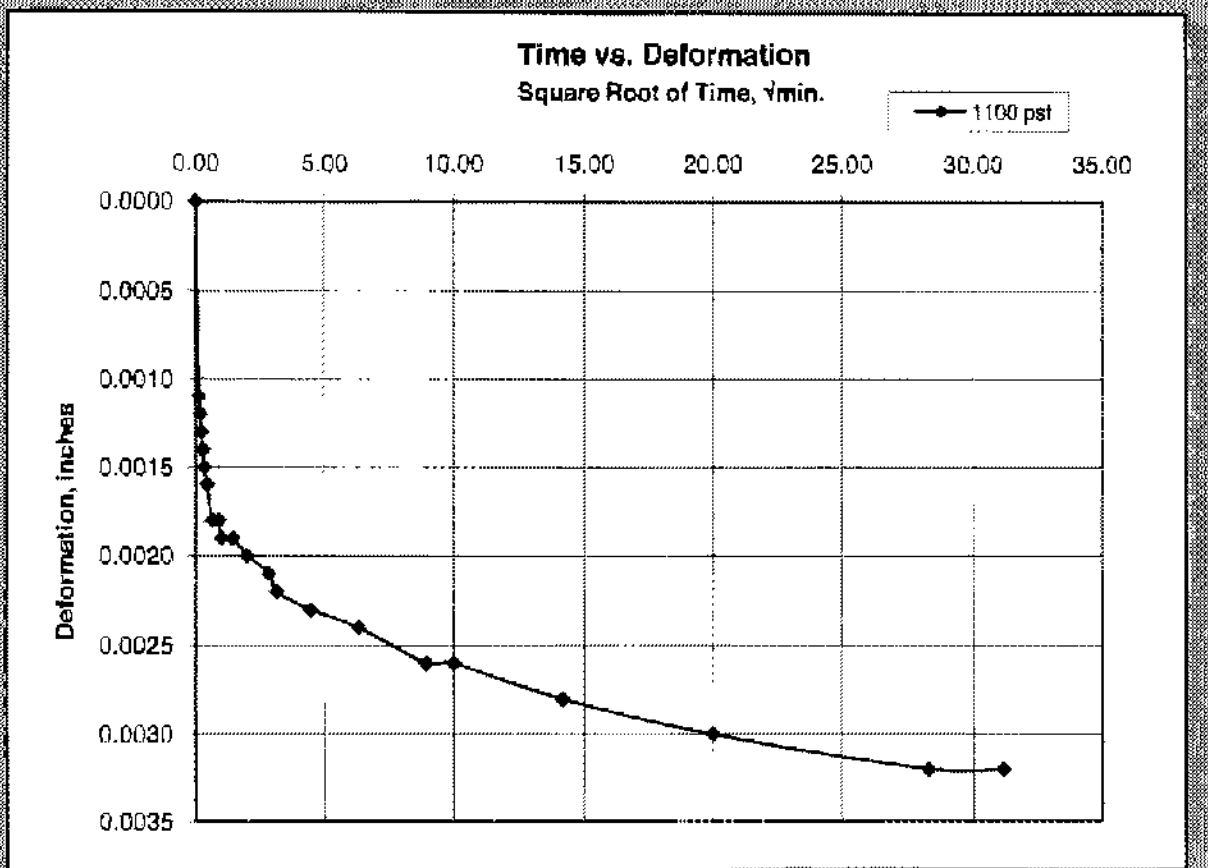


Load 4

1100 PSF



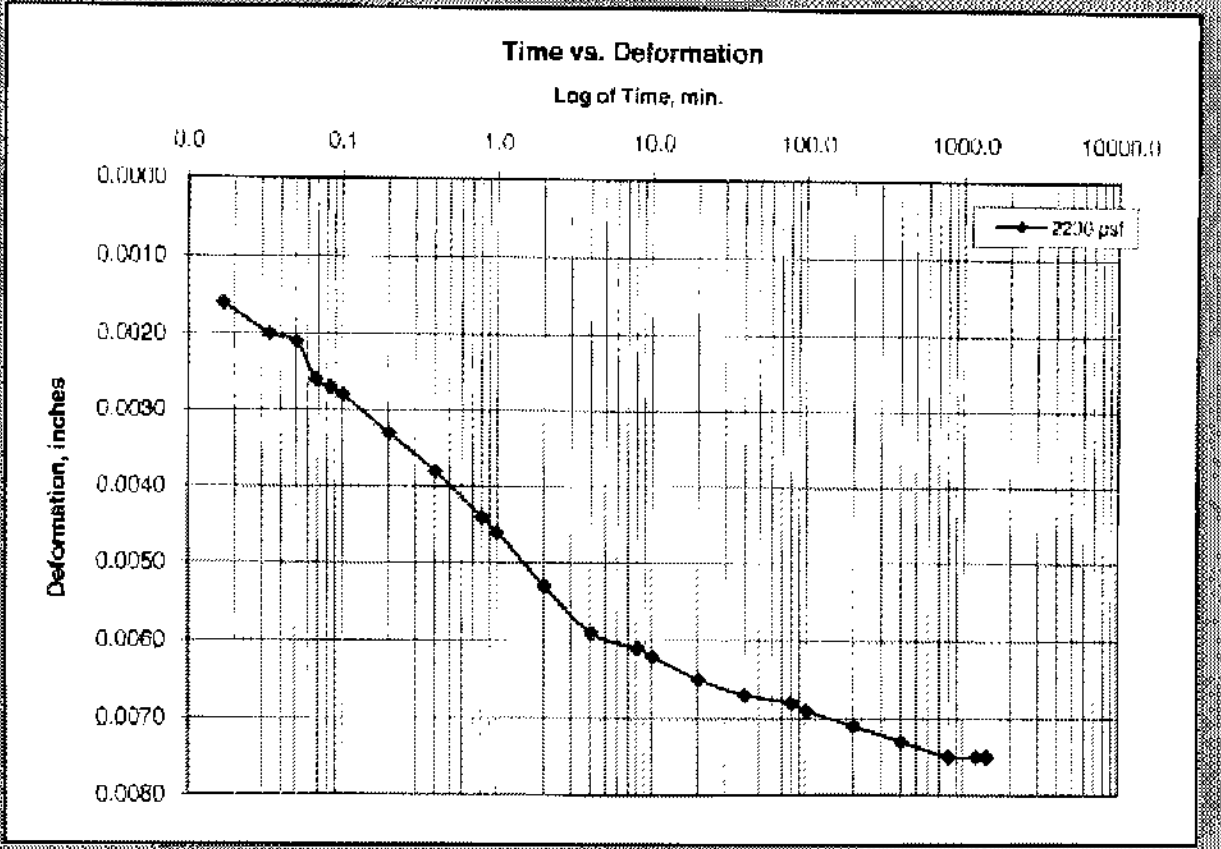
1100 PSF



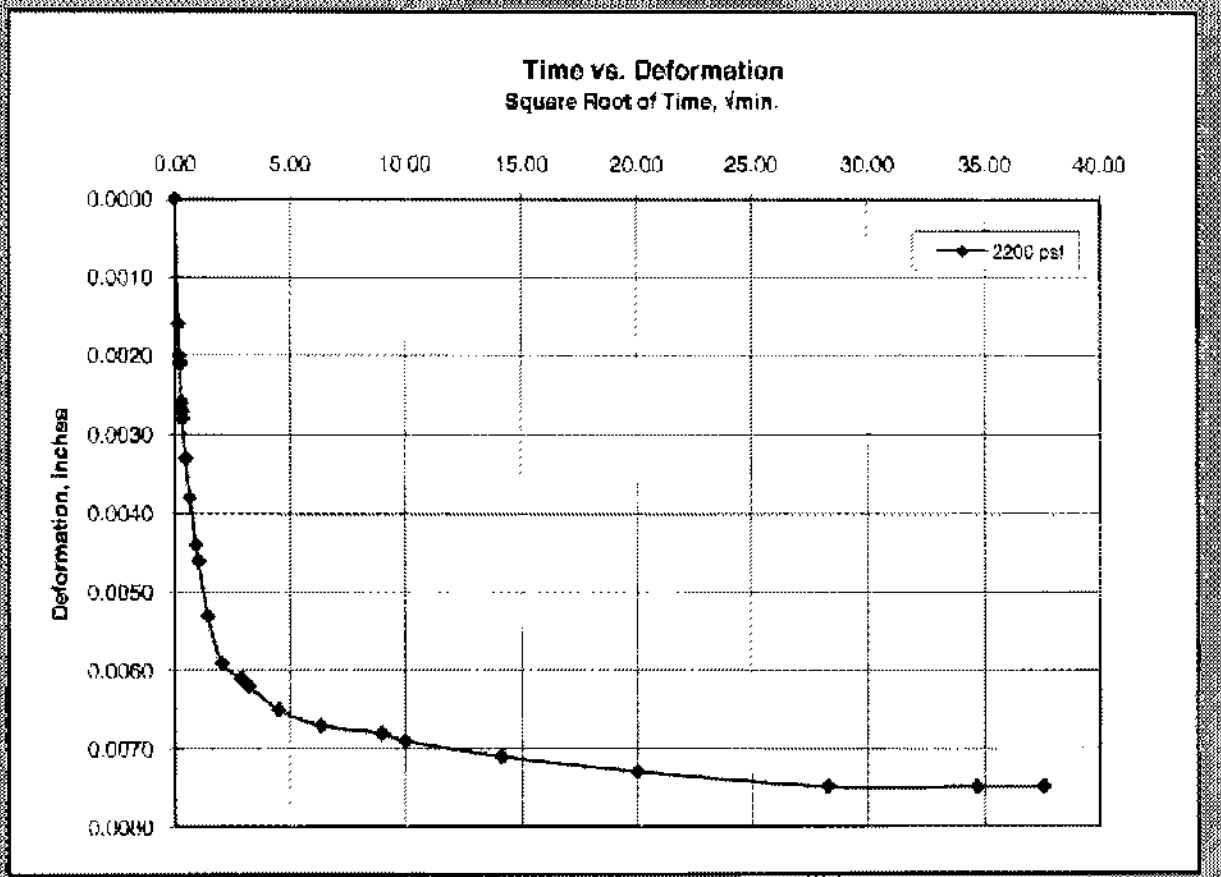
Cooper Testing Labs, Inc.

Load 5

2200 PSF

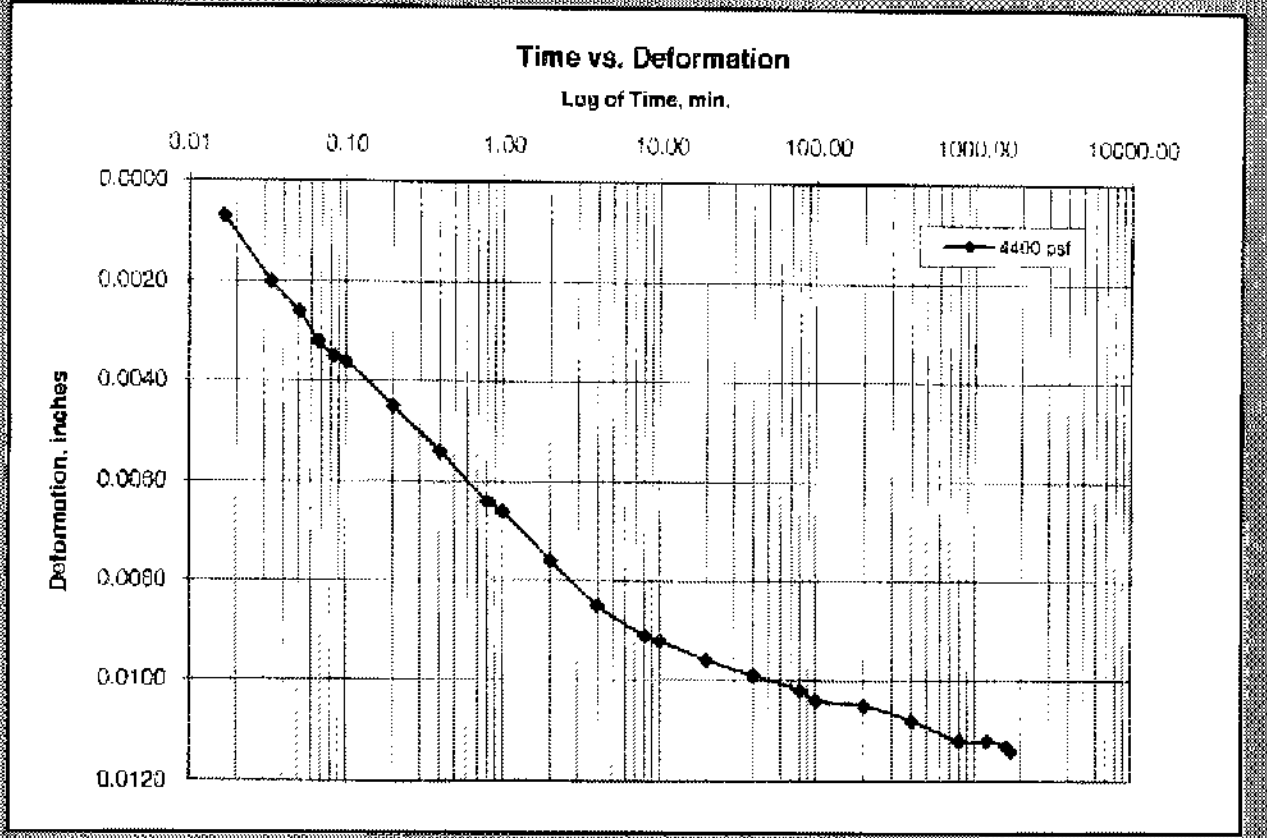


2200 PSF

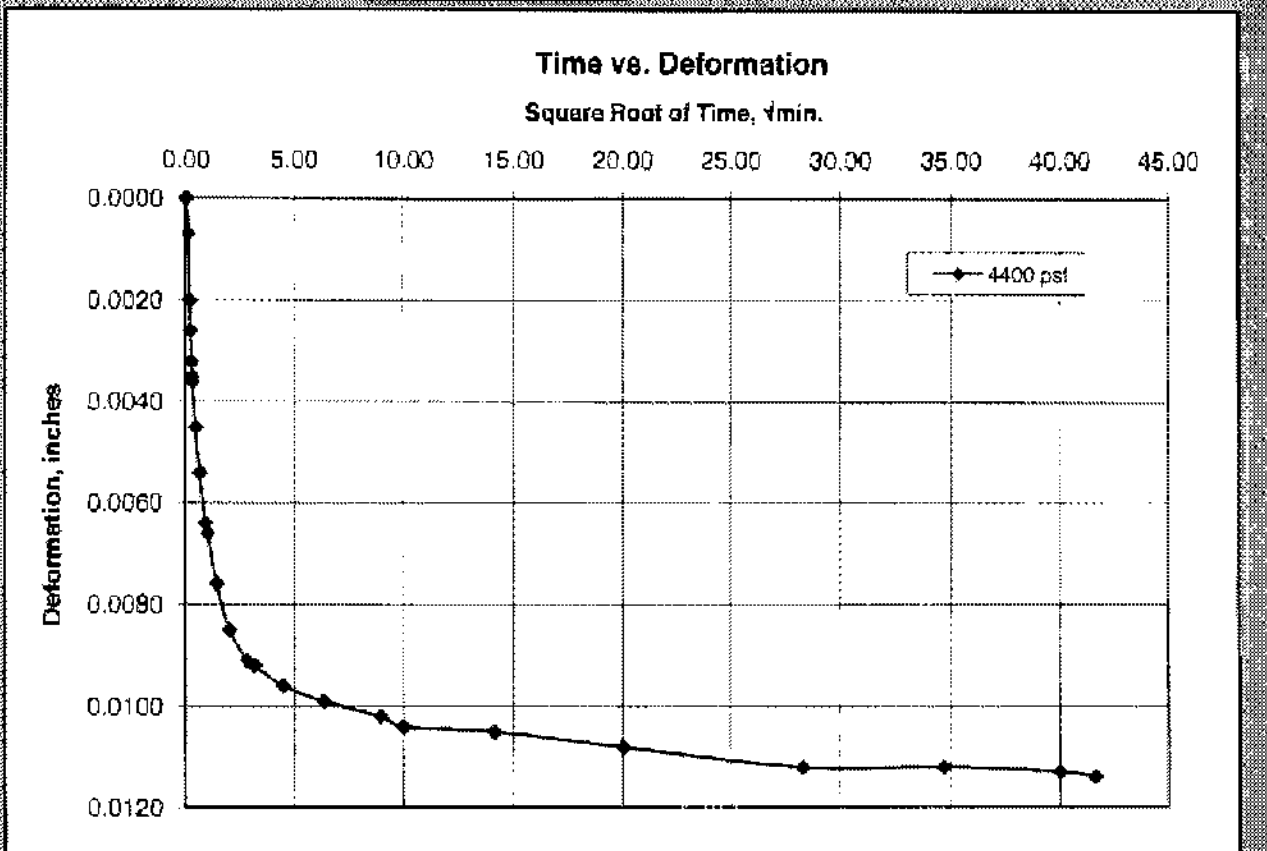


Cooper Testing Labs, Inc.

Load 5 | 4400 PSF



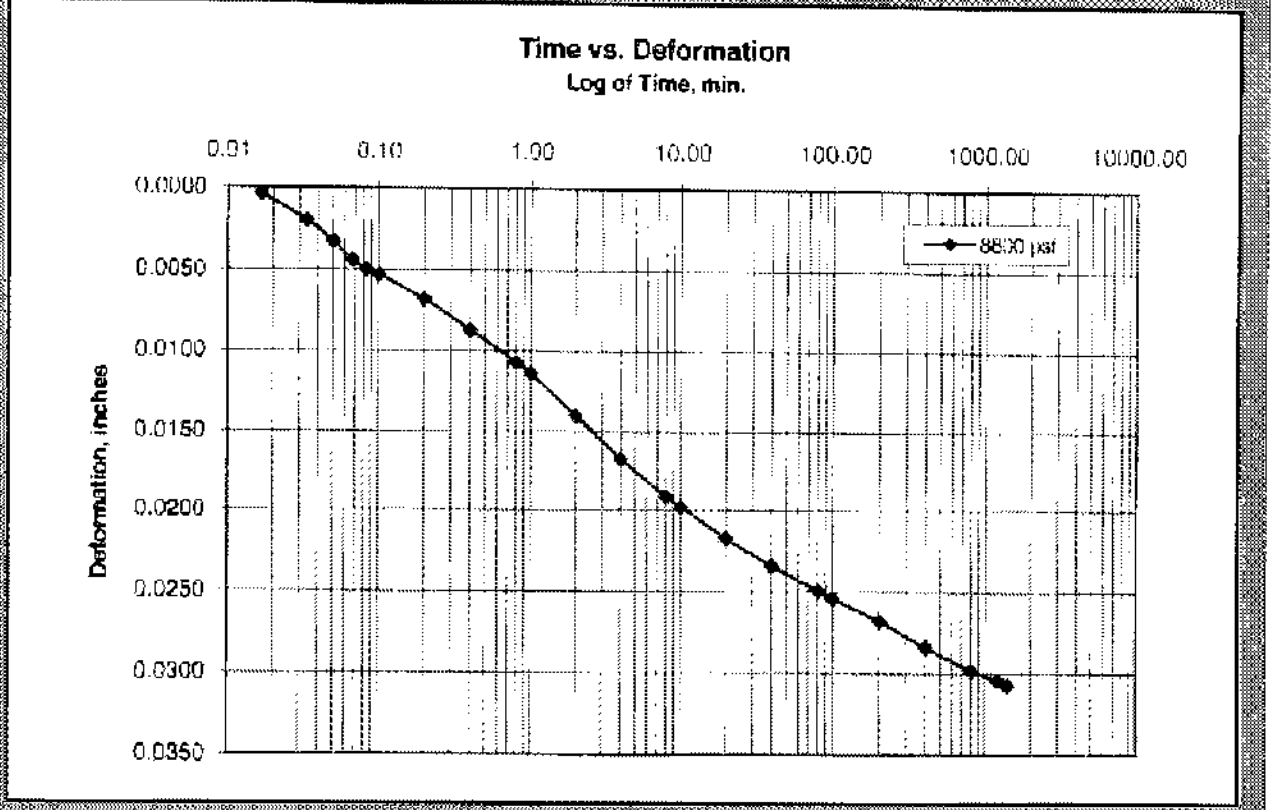
4400 PSF



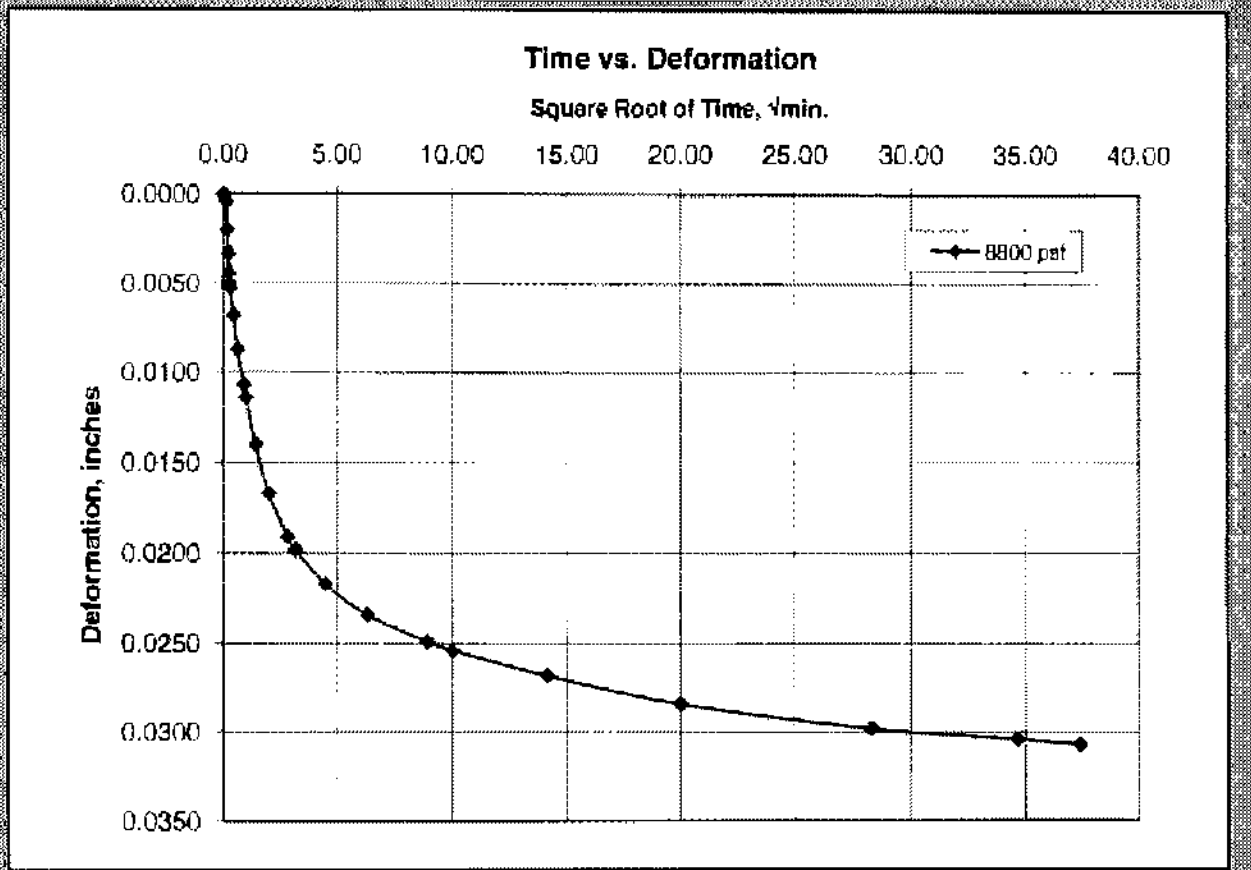
Cooper Testing Labs, Inc.

Load 7

8800 PSF

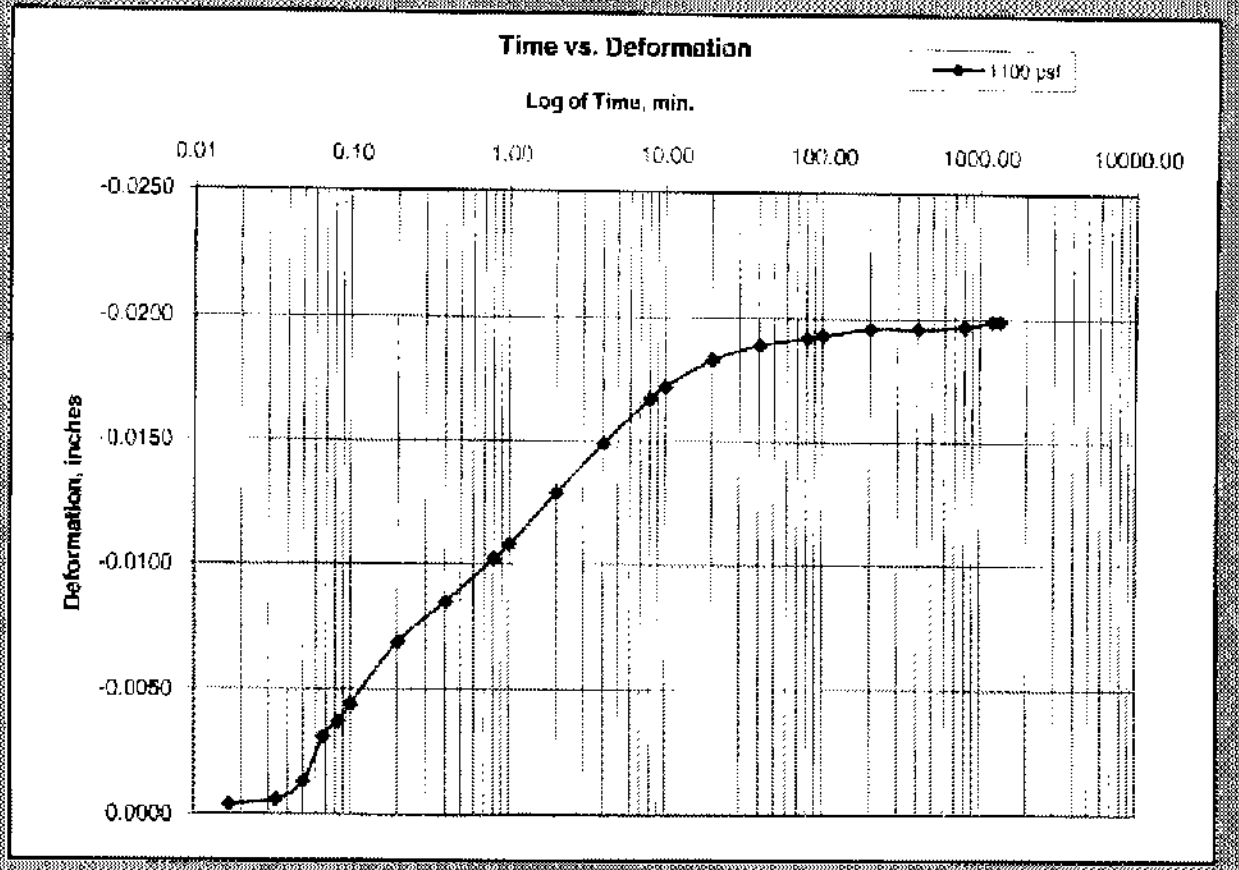


8800 PSF

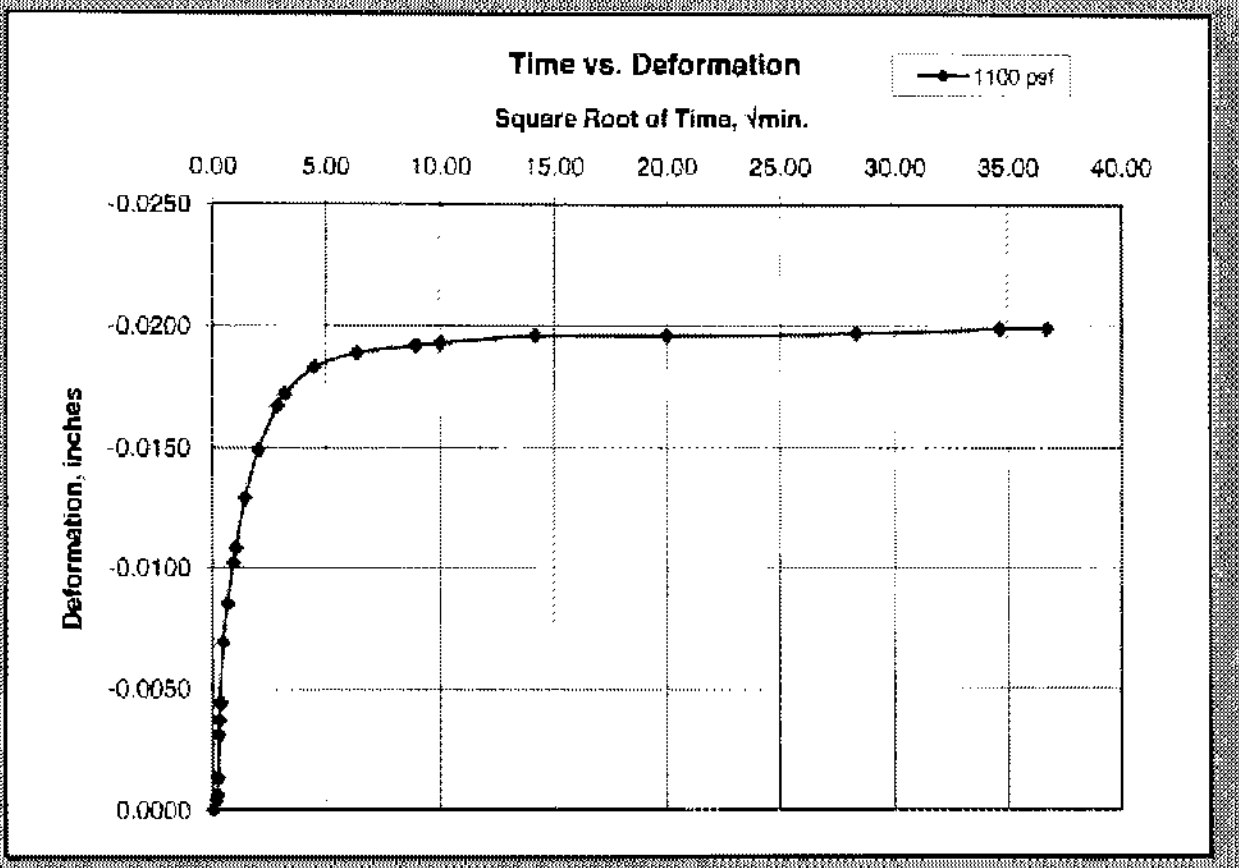


Cooper Testing Labs, Inc.

Load 8 — 1100 PSF

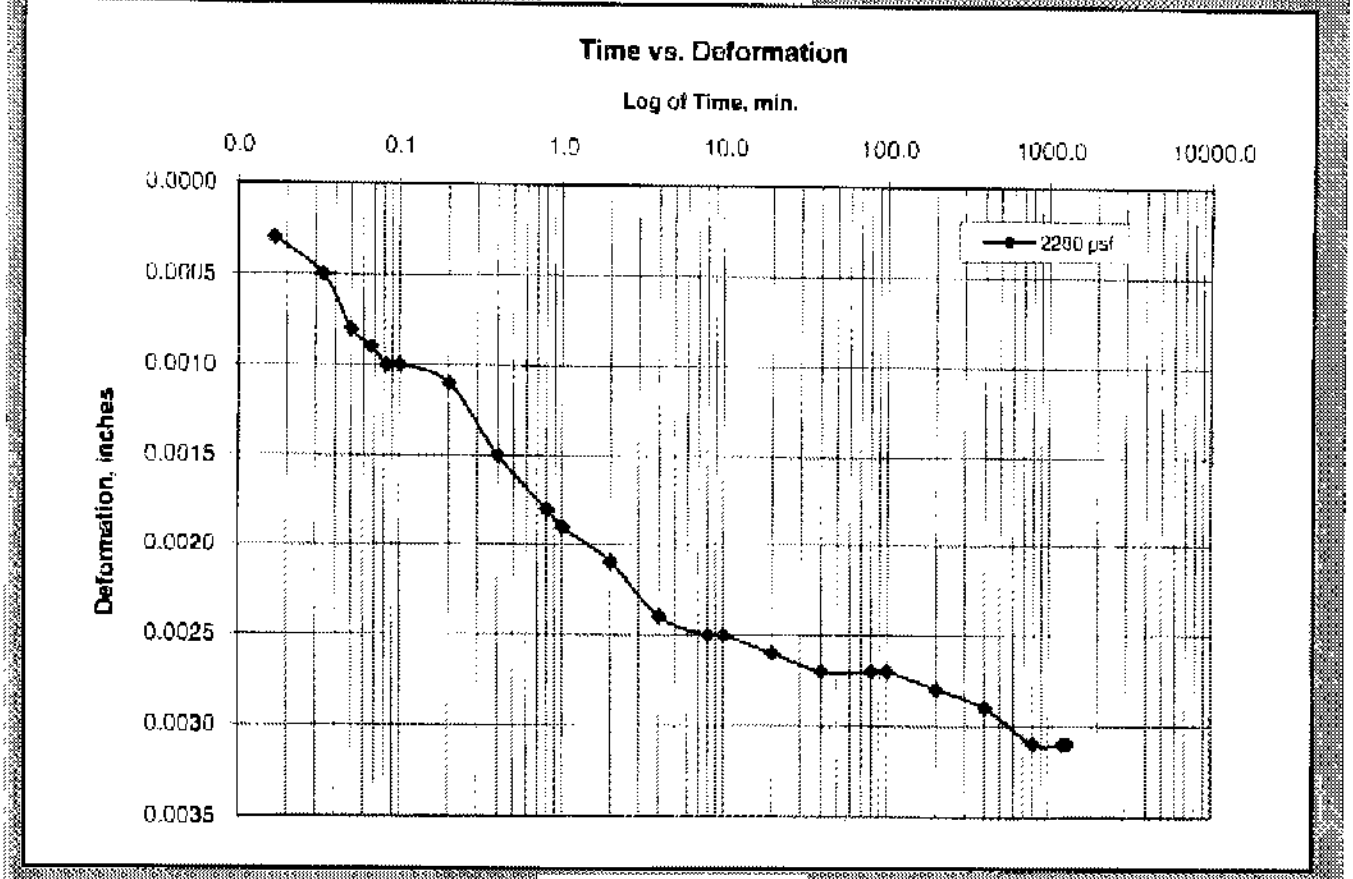


1100 PSF

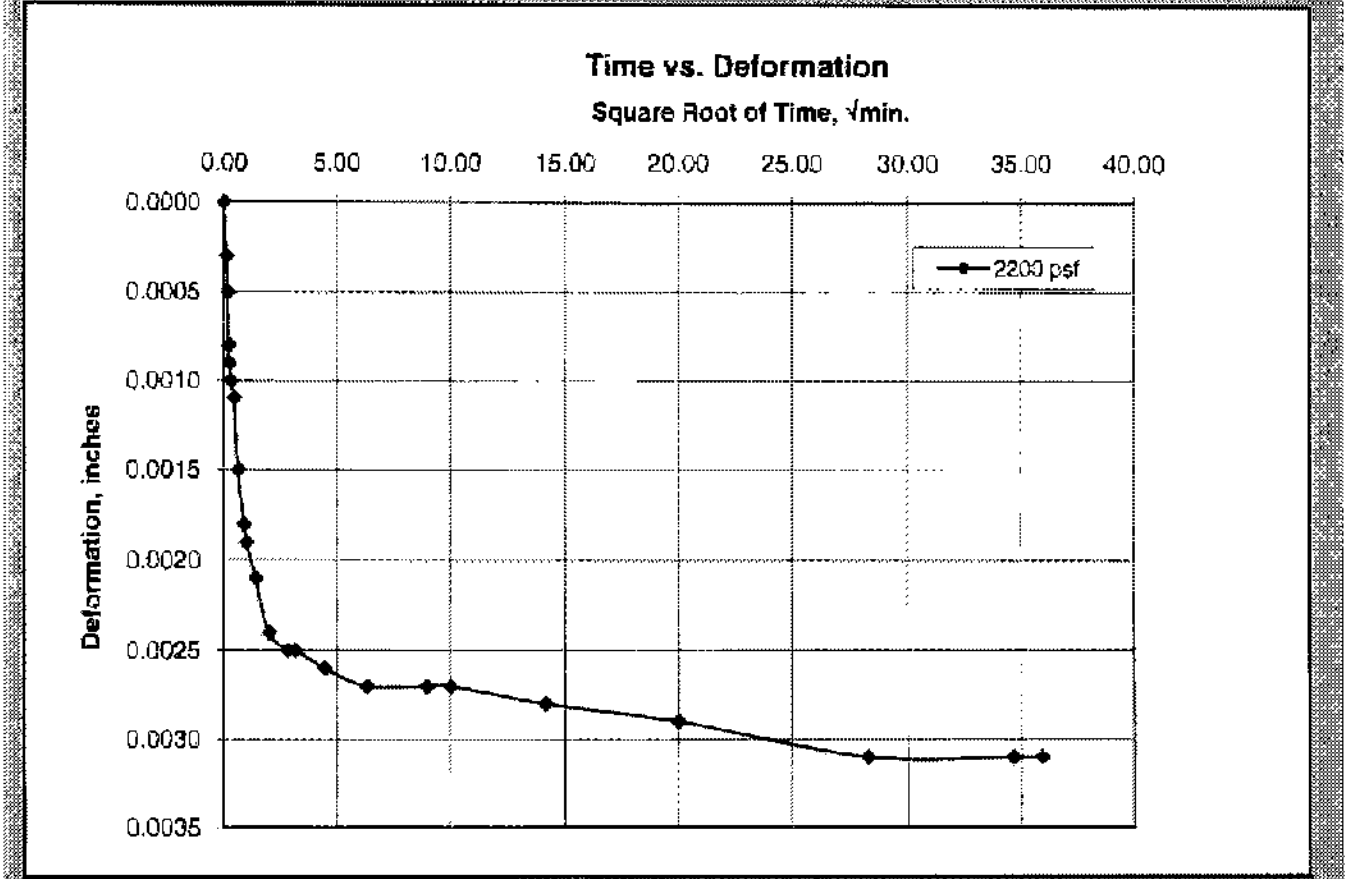


Cooper Testing Labs, Inc.

Load 9 — 2200 PSF

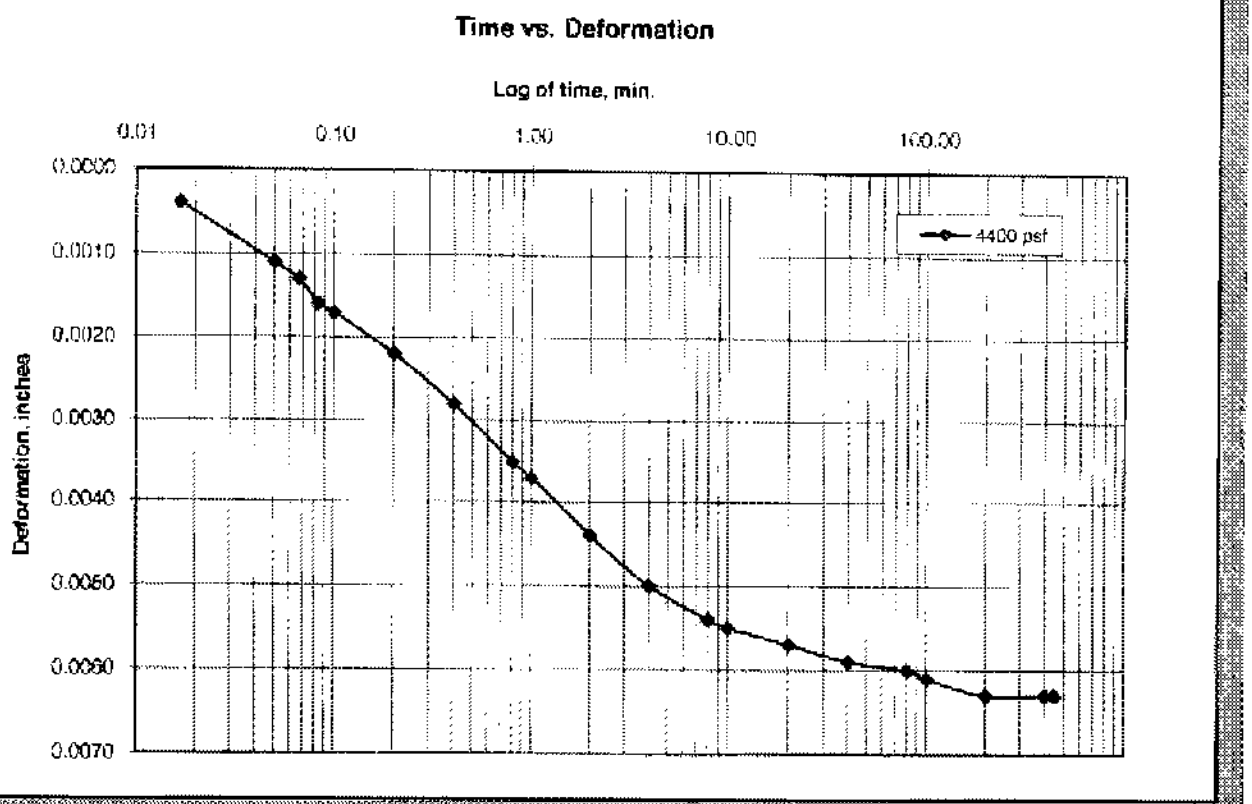


2200 PSF

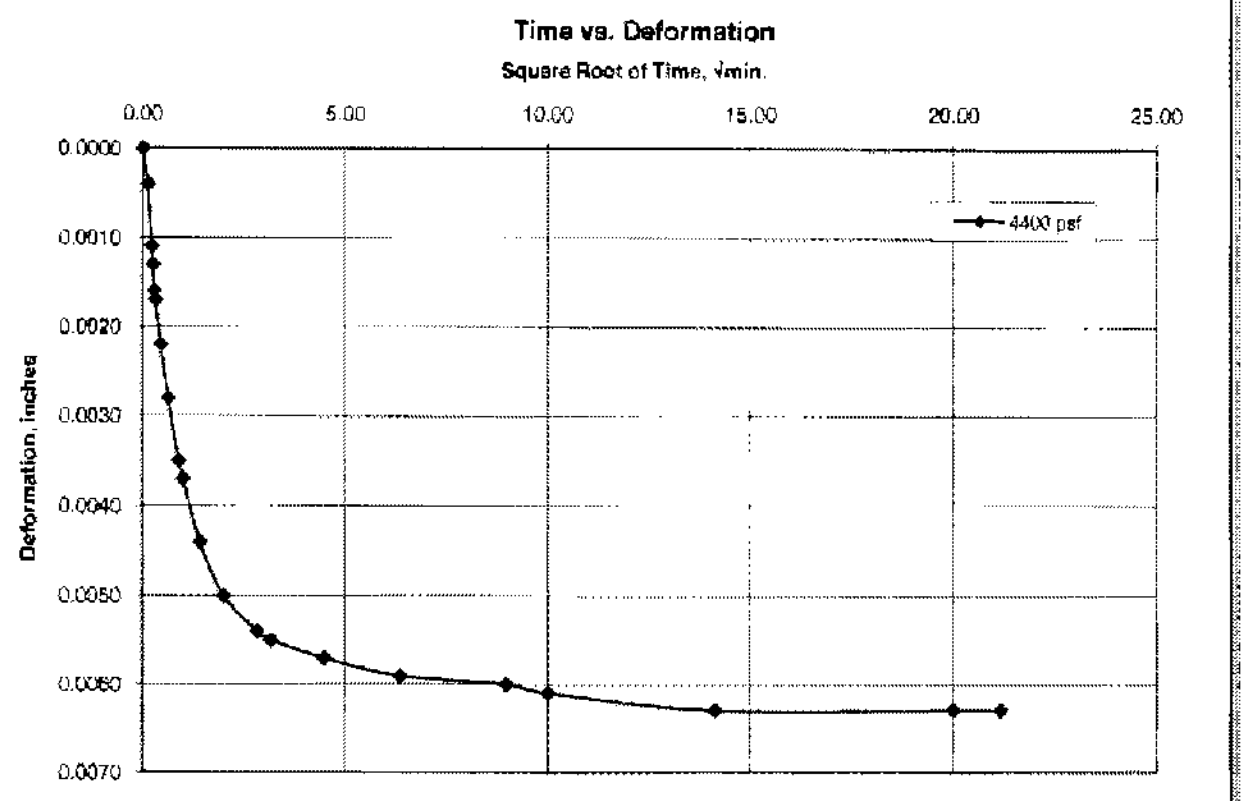


Cooper Testing Labs, Inc.

Load 10 | 4400 PSF



4400 PSF



Cooper Testing Labs, Inc.

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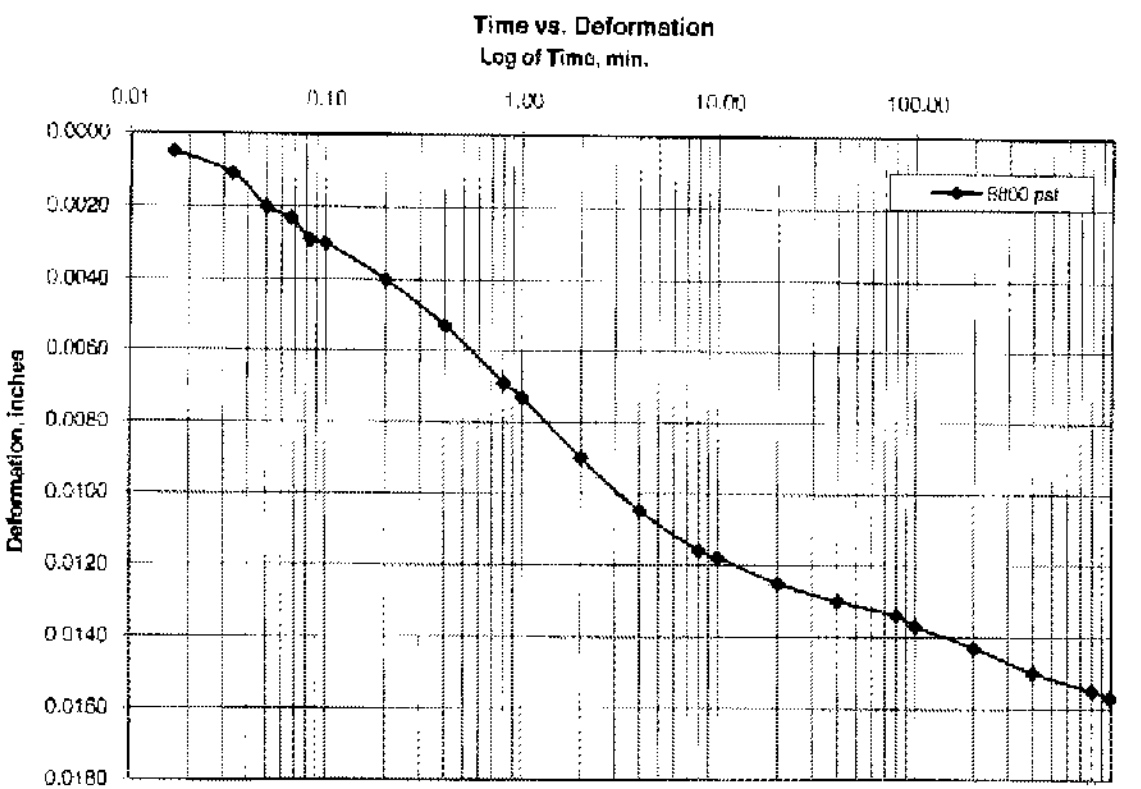

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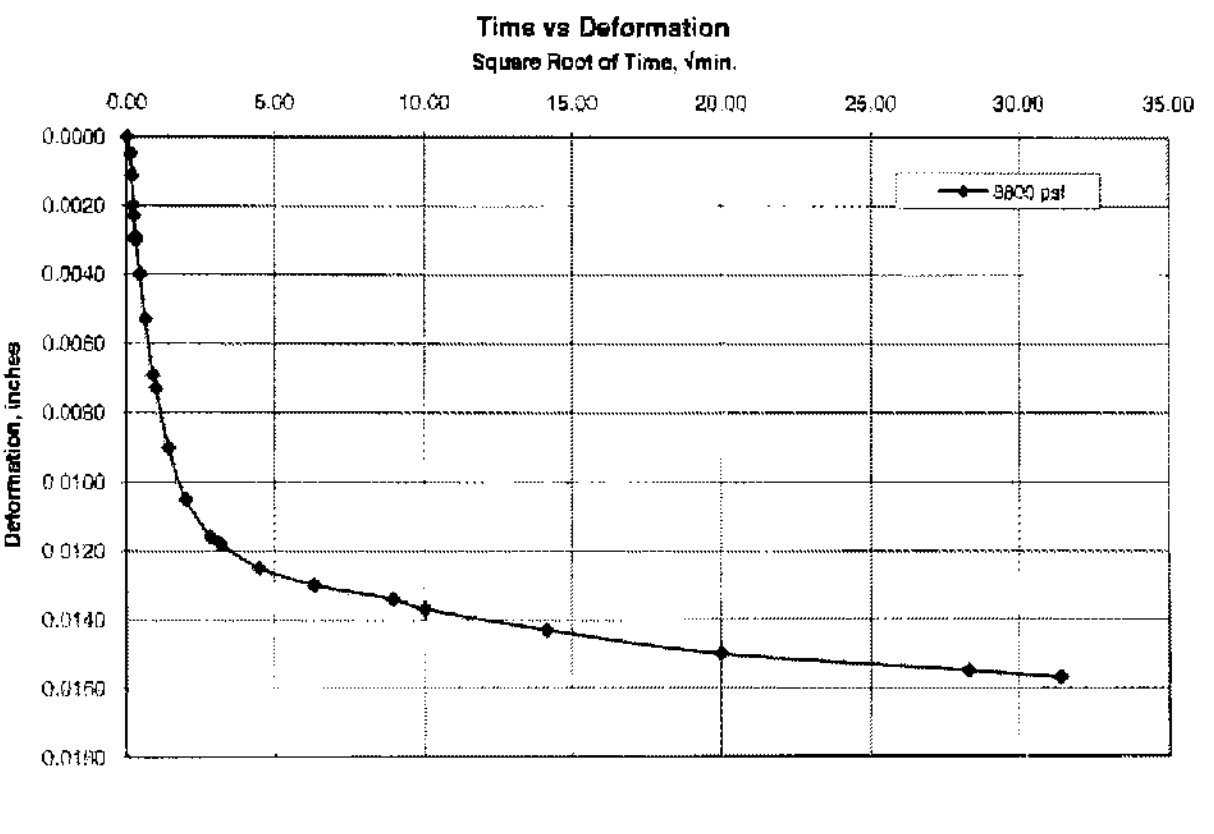
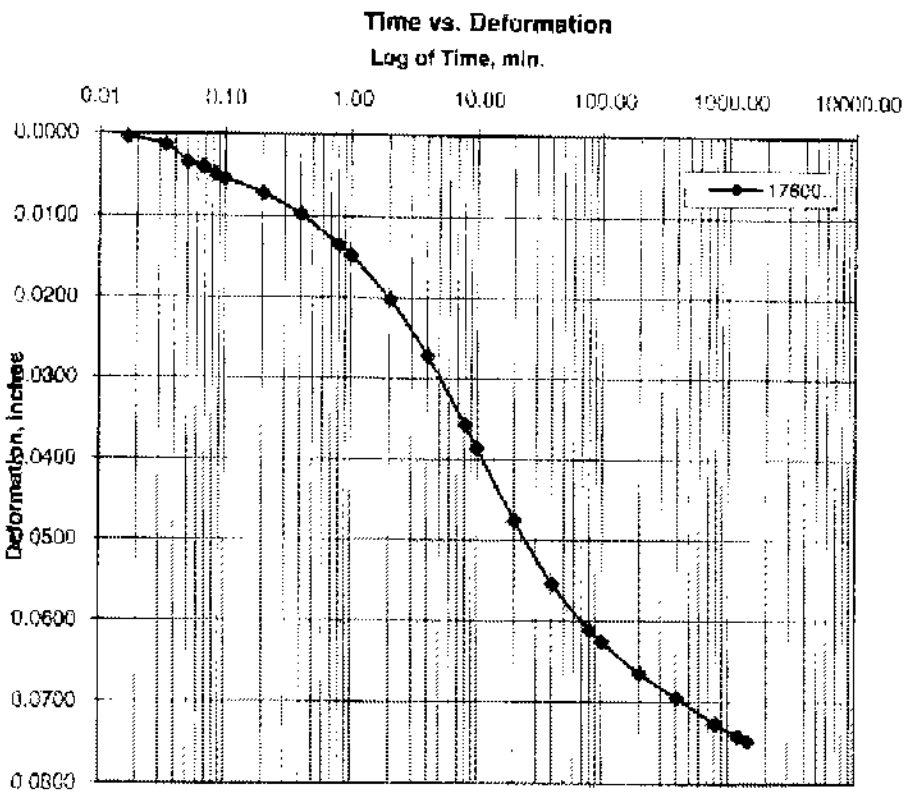


Cooper Testing Labs, Inc.

Load 12 — 17600 PSF



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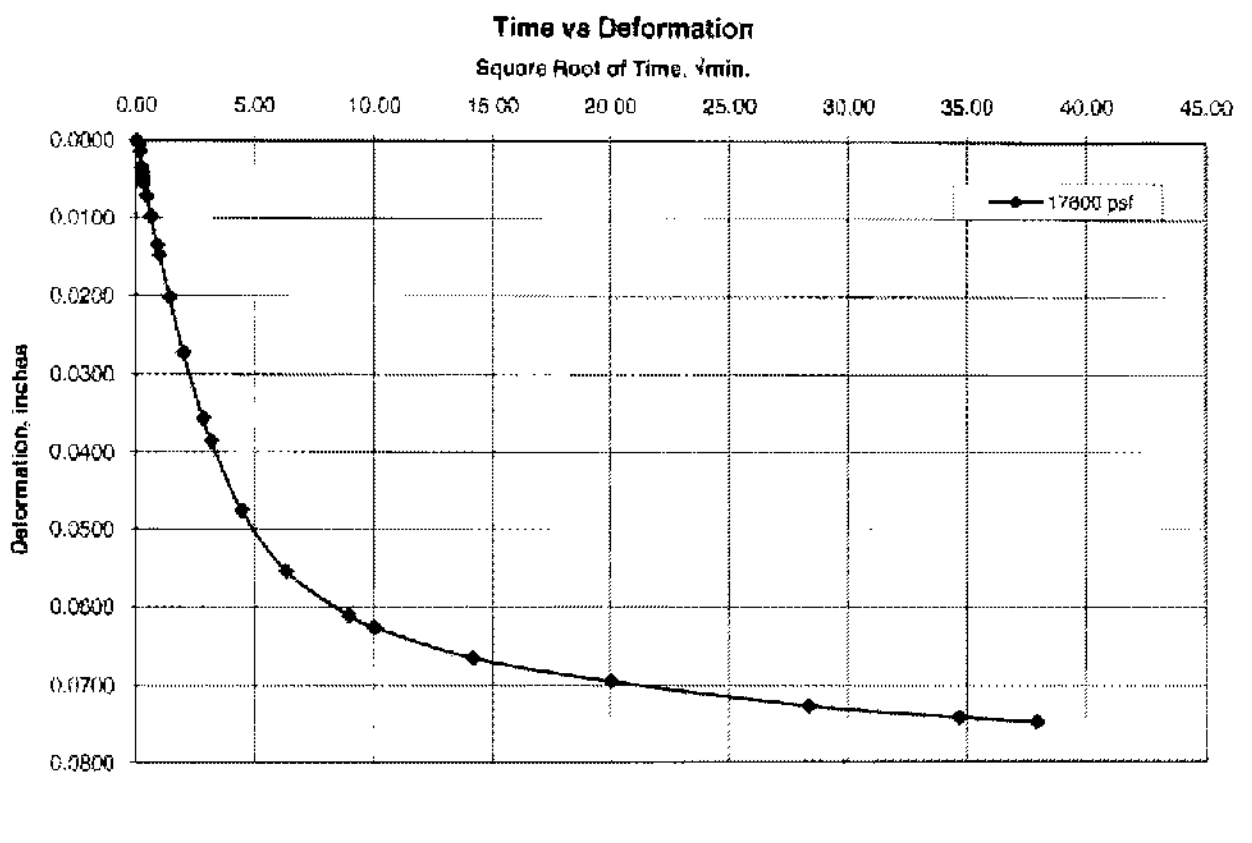

Cooper Testing Labs, Inc.

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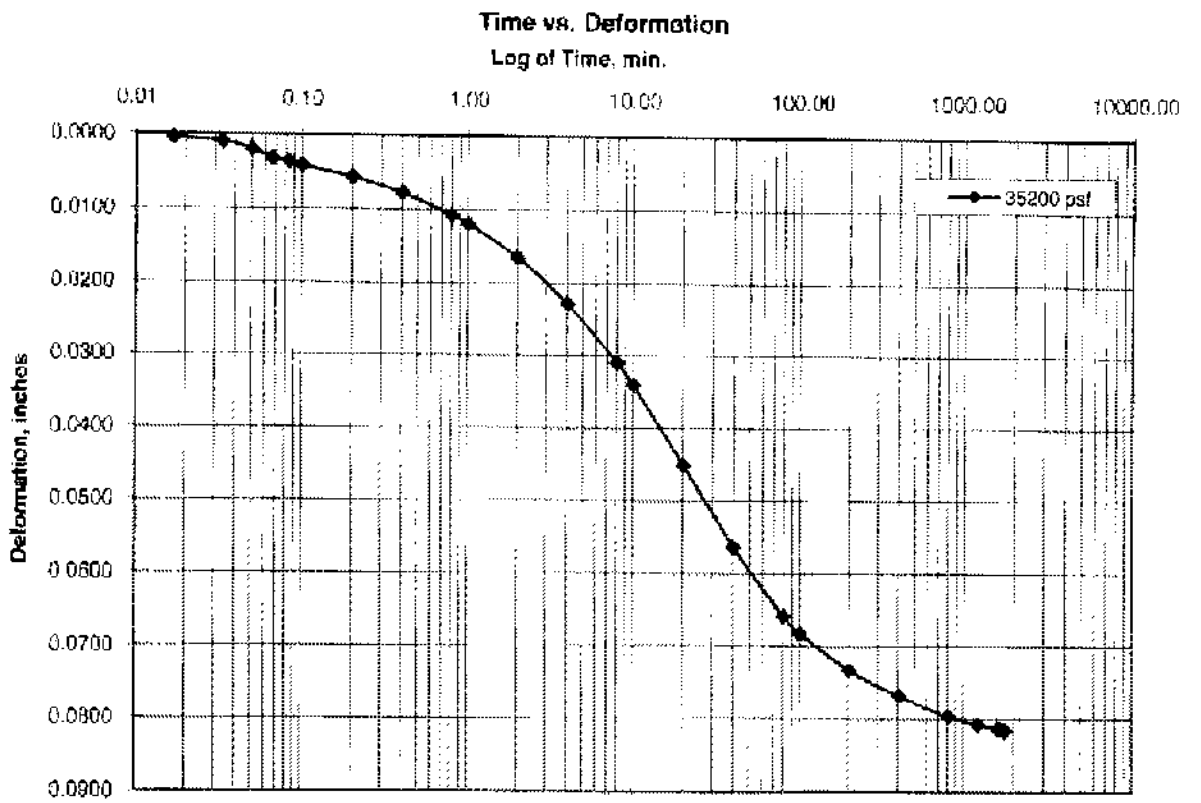

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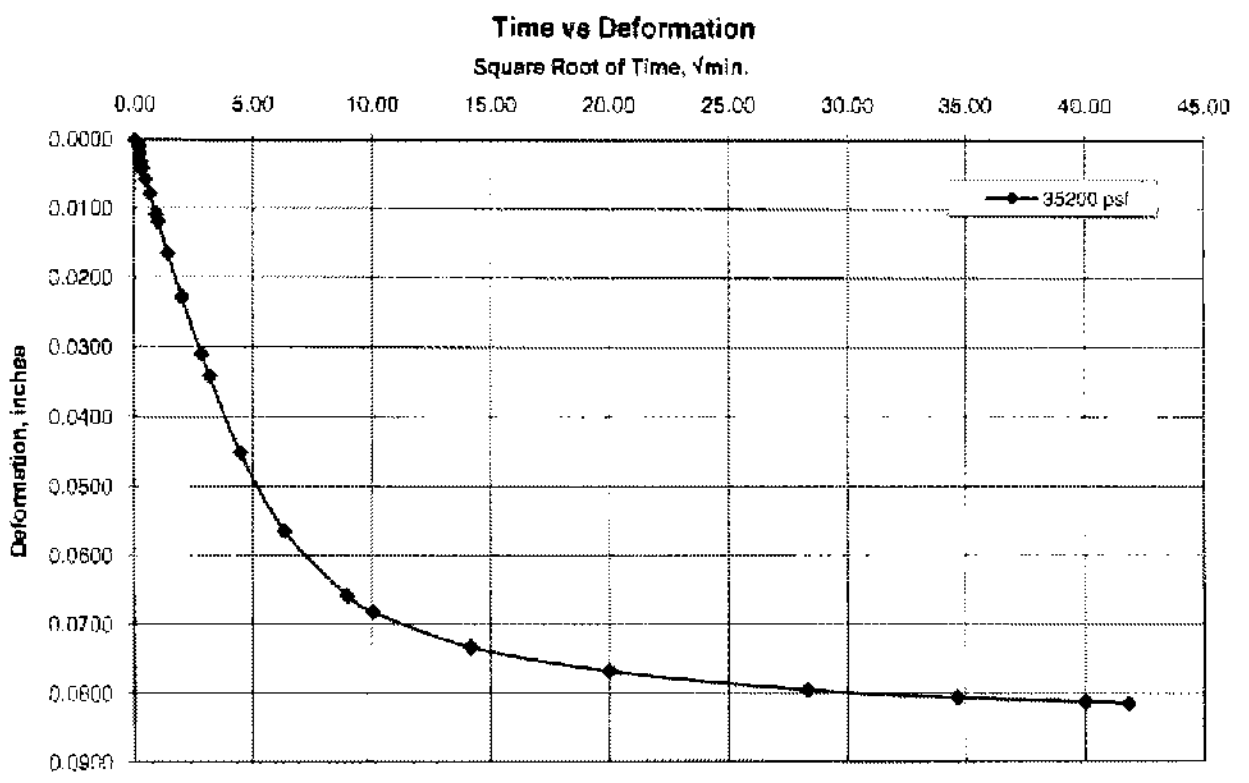
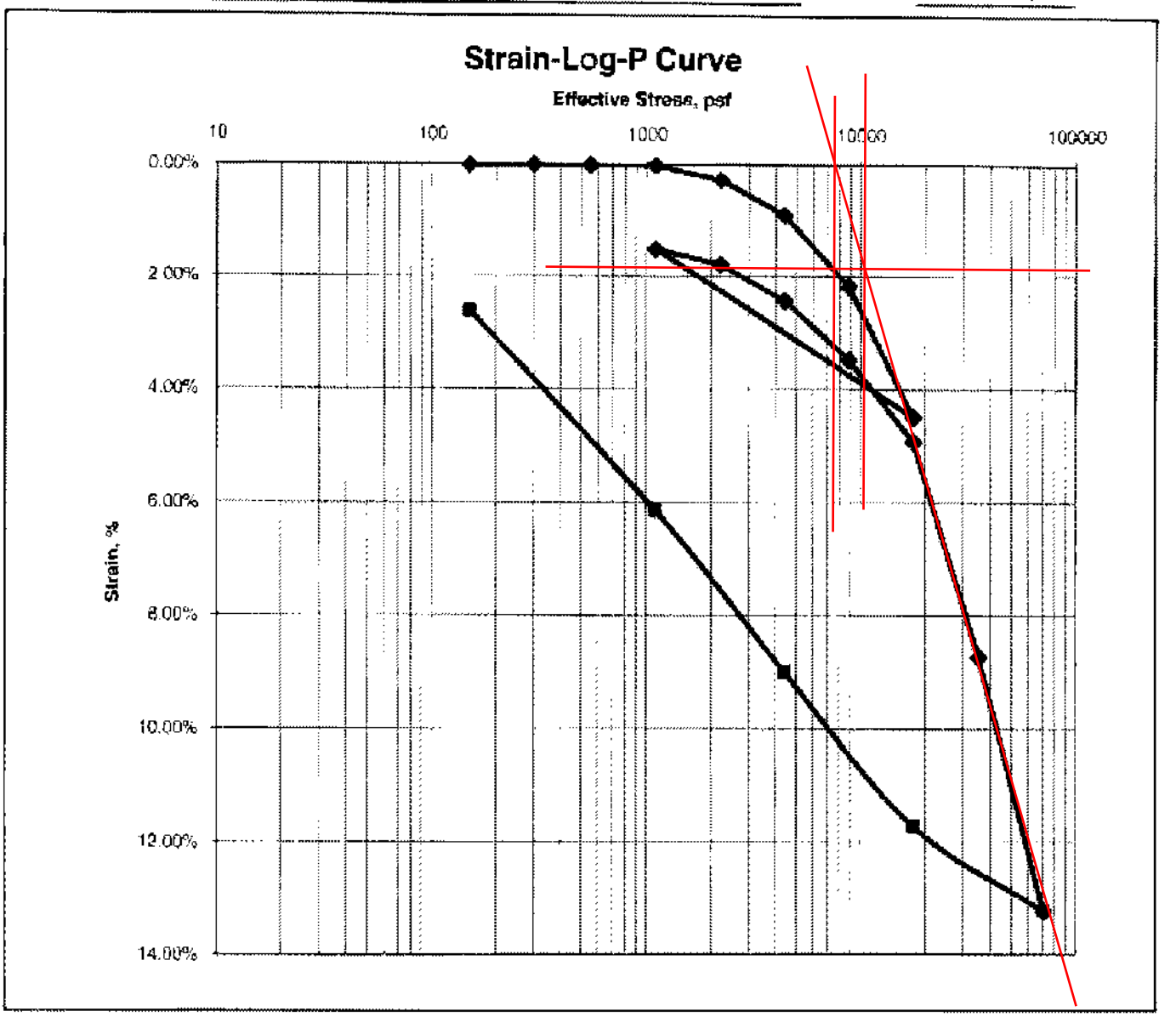


Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-1	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S1-6	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	138-141	**Checked:**	PJ/DC
Soil Type:	Olive Gray Sandy Lean CLAY/ Lean Clayey SAND			**Date:**	6/9/2008



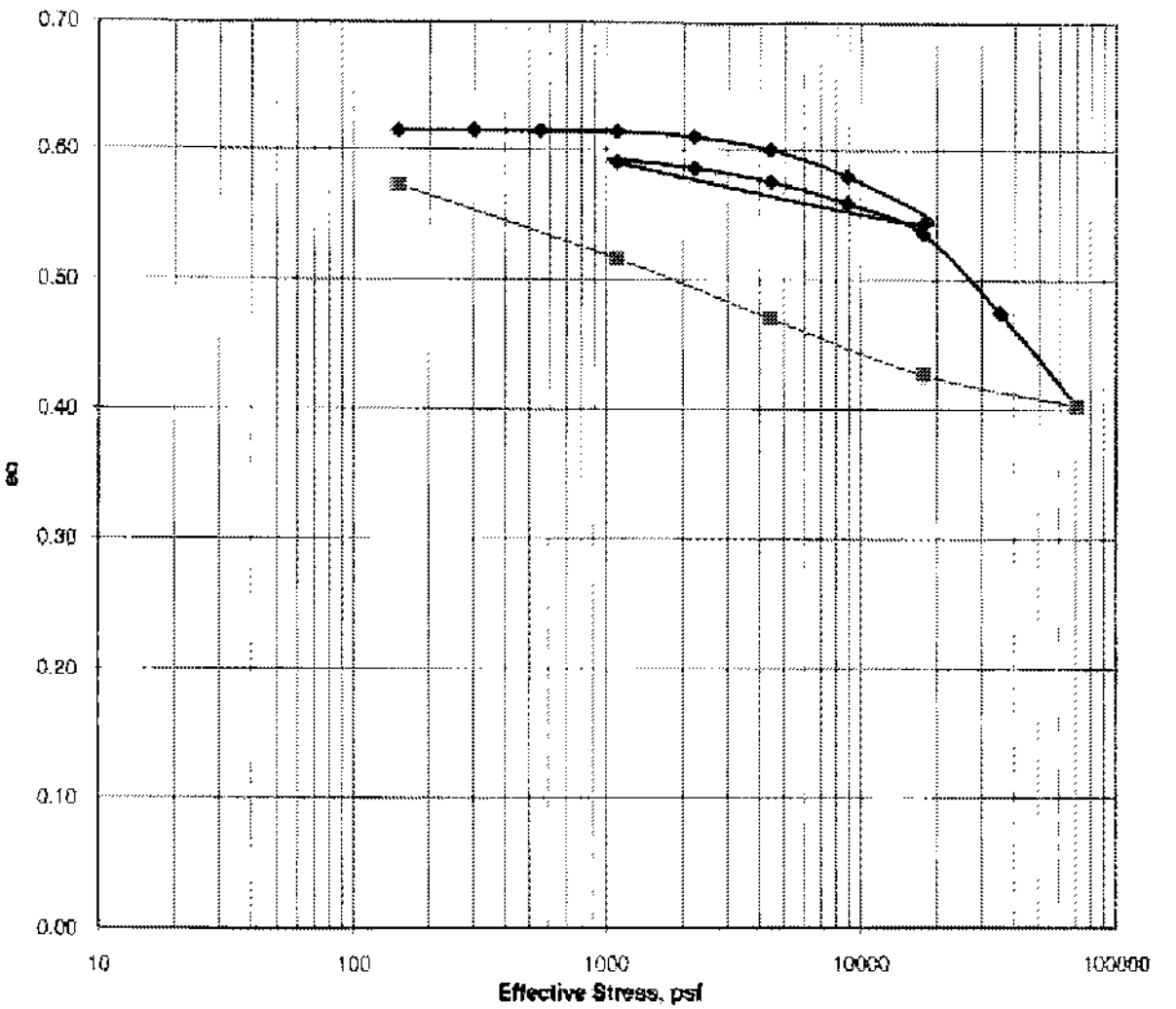
Ass. Gs = 2.75	Initial	Final
Moisture %:	21.5	21.3
Dry Density, pcf:	106.4	108.4
Void Ratio:	0.613	0.584
% Saturation:	96.5	100

Remarks:

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-1	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S1-6	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	138-141	**Checked:**	PJ/DC
Soil Type:	Olive Gray Sandy Lean CLAY/ Lean Clayey SAND			**Date:**	6/9/2008

eo-Log-P Curve



Ass. Gs = 2.75	Initial	Final
Moisture %:	21.5	21.3
Dry Density, pcf:	106.4	108.4
Void Ratio:	0.613	0.584
% Saturation:	96.5	100

Remarks:

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane Project
Boring	GS08-1
Sample:	S1-6
Depth, ft.:	138-141
Date:	6/9/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Description:	Olive Gray Sandy Lean CLAY/ Lean Clayey SAND

Moisture Density Data Entry Screen

	Initial	Final
Height	1.01	0.9016
Diameter	2.41	2.41
Total Wet Weight	156.4	156.1
Wt of Wet Soil & Dish		220.6
Wt of Dry Soil & Dish		193.4
Wt. Of Dish		20.5
Wt of Ring		44.2
Moisture %	21.6	21.3
Wet Density, pcf	129.3	131.4
Dry Density, pcf	106.4	108.4
Specific Gravity	2.75	2.75
Area	4.6	4.6
V ft3	0.0	0.0
Vt, cc	75.5	74.1
Vs, cc	46.8	46.8
Vv, cc	28.7	27.3
e	0.6	0.6
porosity, %	38.0	36.8
S, %	96.5	100

Loading Increments — **Void Ratio**

Increment #	Load, psf psf	Dial .0001"	Load psf	Height Delta in	Volume Vt cc	Voids Vv	Void Ratio e
1	150	0.0001	150	1.0000	75.55	28.762	0.614
2	300	0.0000	300	1.0100	75.26	28.760	0.615
3	550	0.0020	550	1.0059	75.55	28.762	0.614
4	1100	0.0008	1100	1.0056	75.54	28.745	0.614
5	2200	0.0028	2200	1.0072	75.35	28.650	0.610
6	4400	0.0091	4400	1.0005	74.80	28.079	0.600
7	8800	0.0218	8800	0.9882	73.93	27.129	0.580
8	17600	0.0449	17600	0.9651	72.20	25.400	0.543
9	1100	0.0152	1100	0.9948	74.46	27.622	0.590
10	2200	0.0173	2200	0.9927	74.28	27.4304	0.586906
11	4400	0.0244	4400	0.9856	73.79	26.9341	0.576515
12	8800	0.0349	8800	0.9752	72.99	26.1661	0.559997
13	17600	0.0553	17600	0.9607	71.87	25.0713	0.536712
14	35200	0.0874	35200	0.9286	69.55	22.9210	0.490600
15	70400	0.1324	70400	0.8776	65.65	18.8545	0.403674
16		0.1324	#N/A	0.8776	65.65	18.8545	0.403674
17		0.1324	#N/A	0.8776	65.65	18.8545	0.403674
18		0.1324	#N/A	0.8776	65.65	18.8545	0.403674
19		0.1324	#N/A	0.8776	65.65	18.8545	0.403674

Rebound Increments — **Void Ratio**

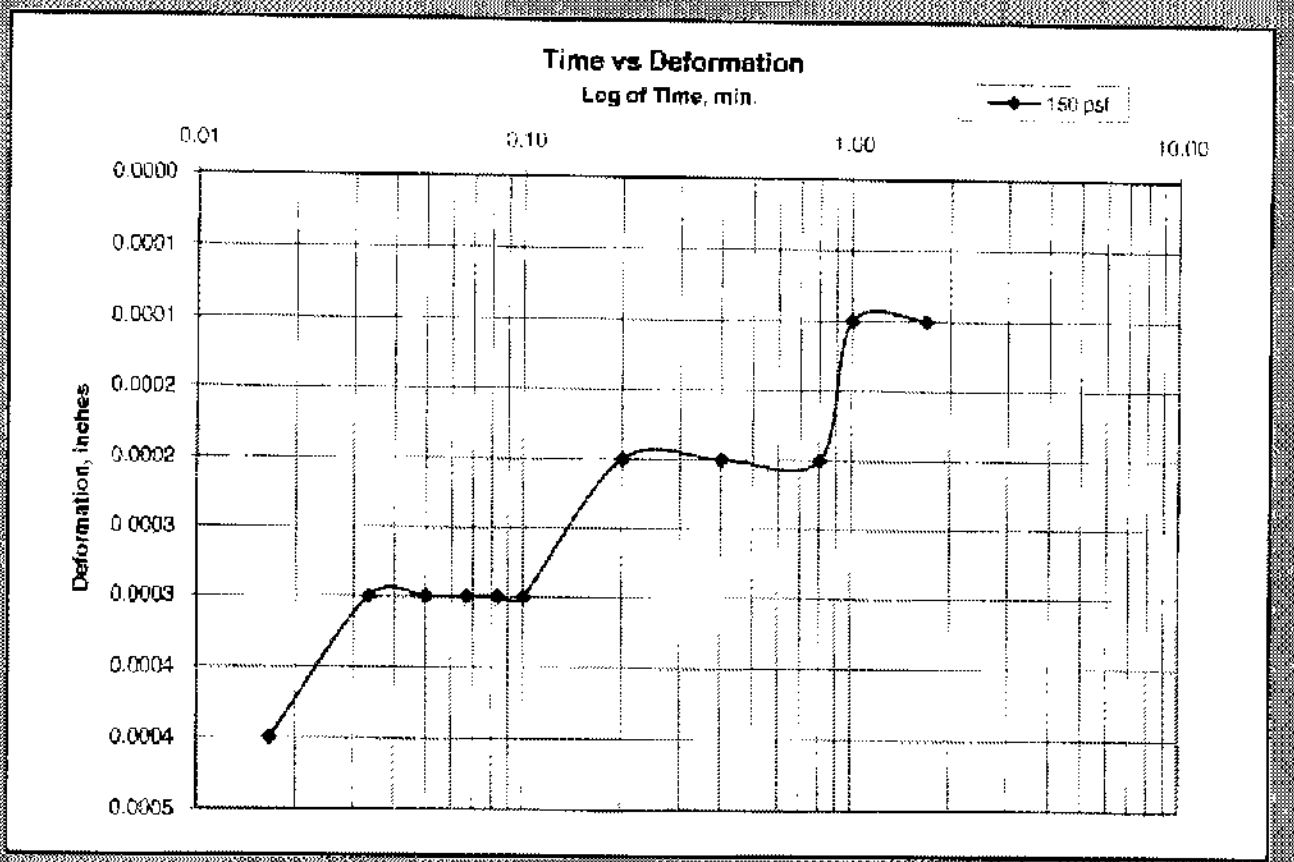
15	70400	0.1324	70400	0.8776	65.65	18.8545	0.403674
16	17600	0.1173	17600	0.8927	66.78	19.9641	0.427012
17	4400	0.0901	4400	0.9199	68.82	22.0180	0.470462
18	1100	0.0614	1100	0.9486	70.97	24.1561	0.516477
19	150	0.0262	150	0.9838	73.60	26.7385	0.572635
20			#N/A	1.0100	75.59	28.7595	0.61432
	Tot Dry Wt	129.7000					

The data to the left is used to determine the theoretical

Cooper Testing Labs, Inc.

Load 1

150 PSF



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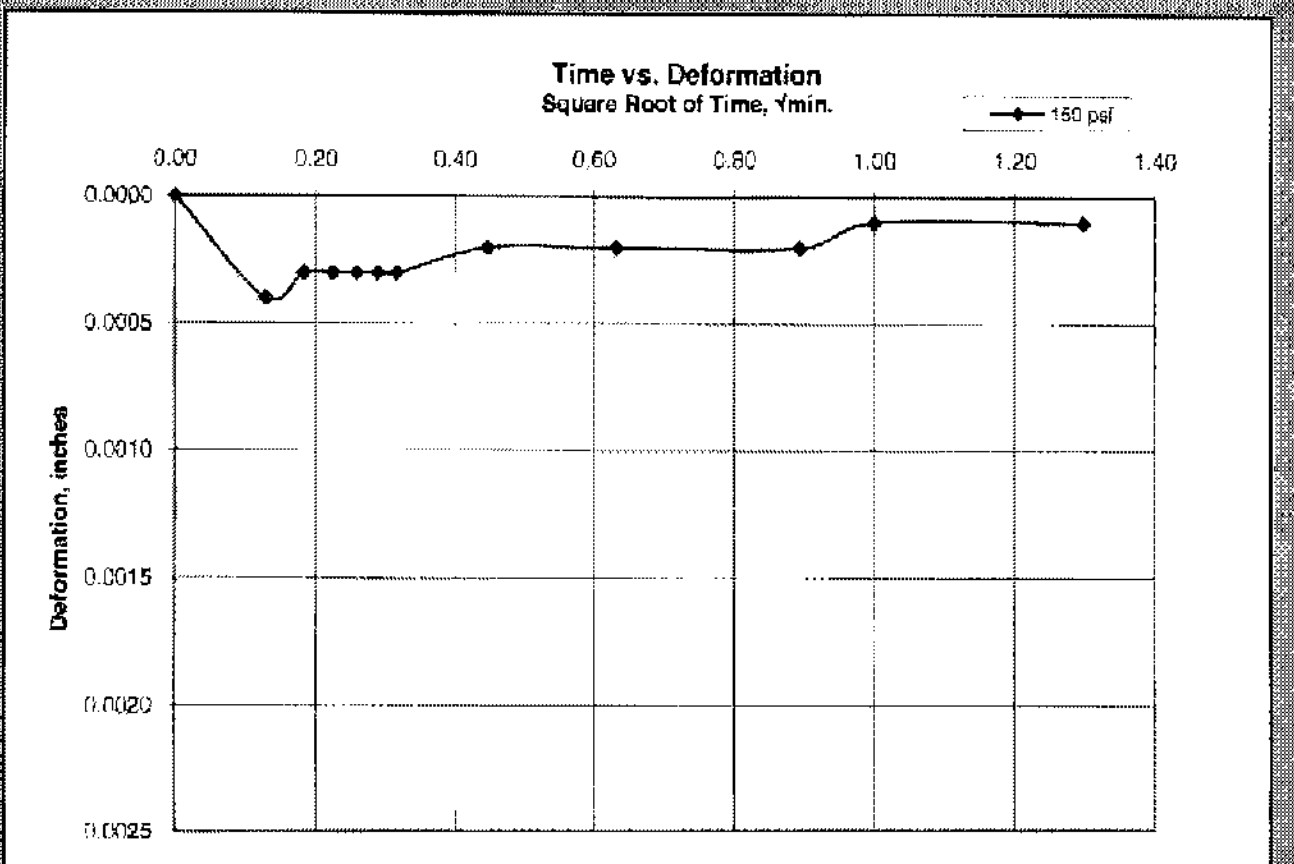

Cooper Testing Labs, Inc.

Load 2

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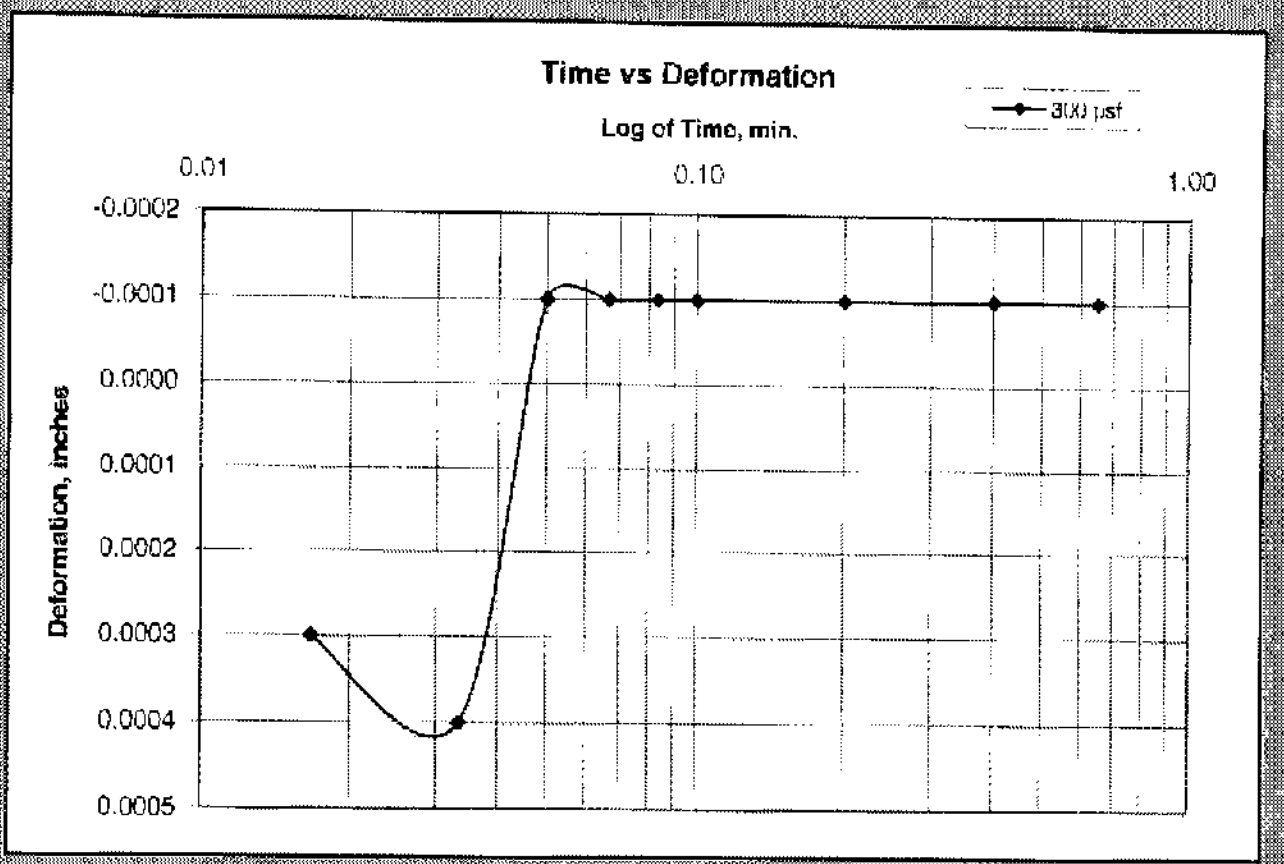
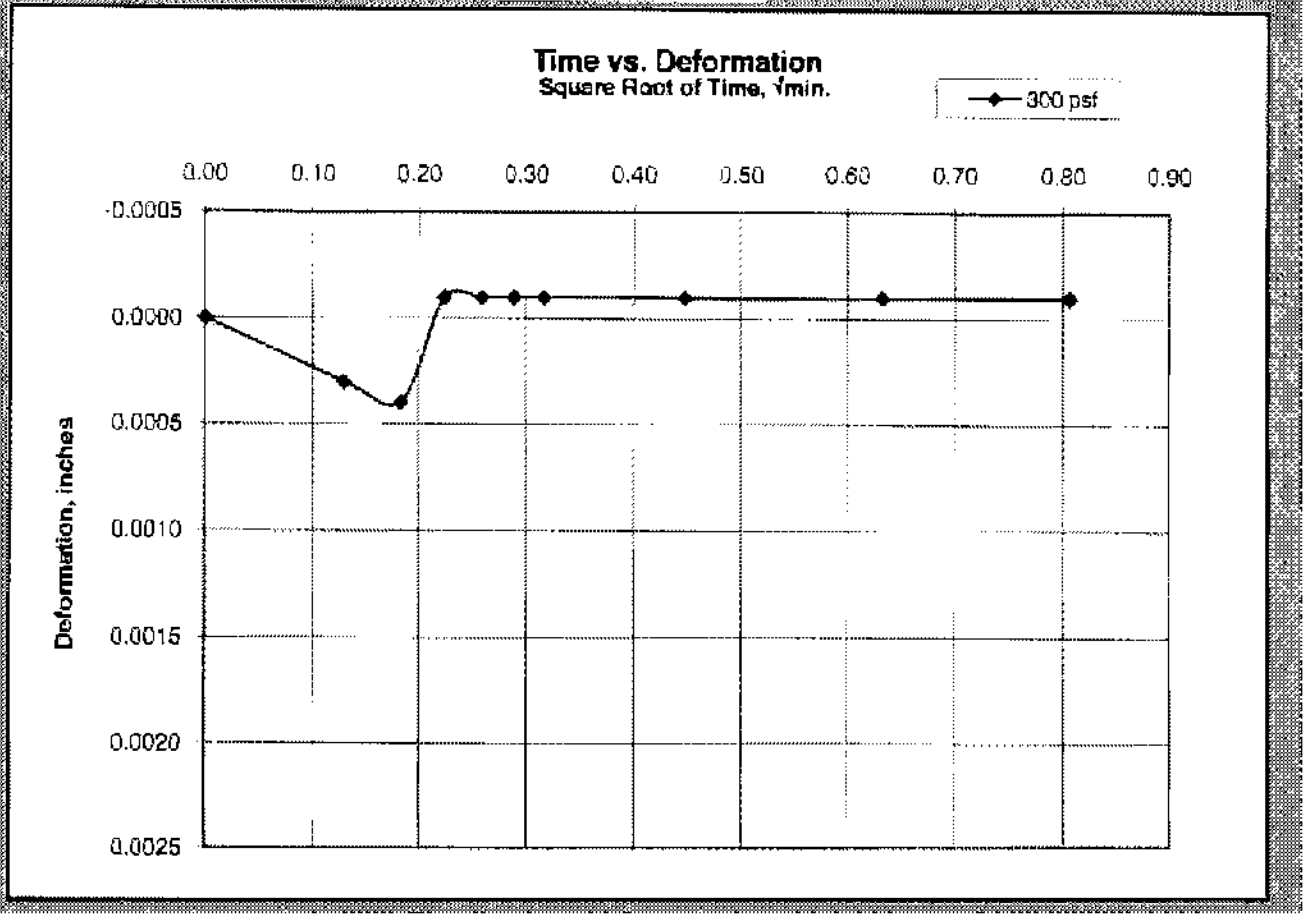


300 PSF



Load 3

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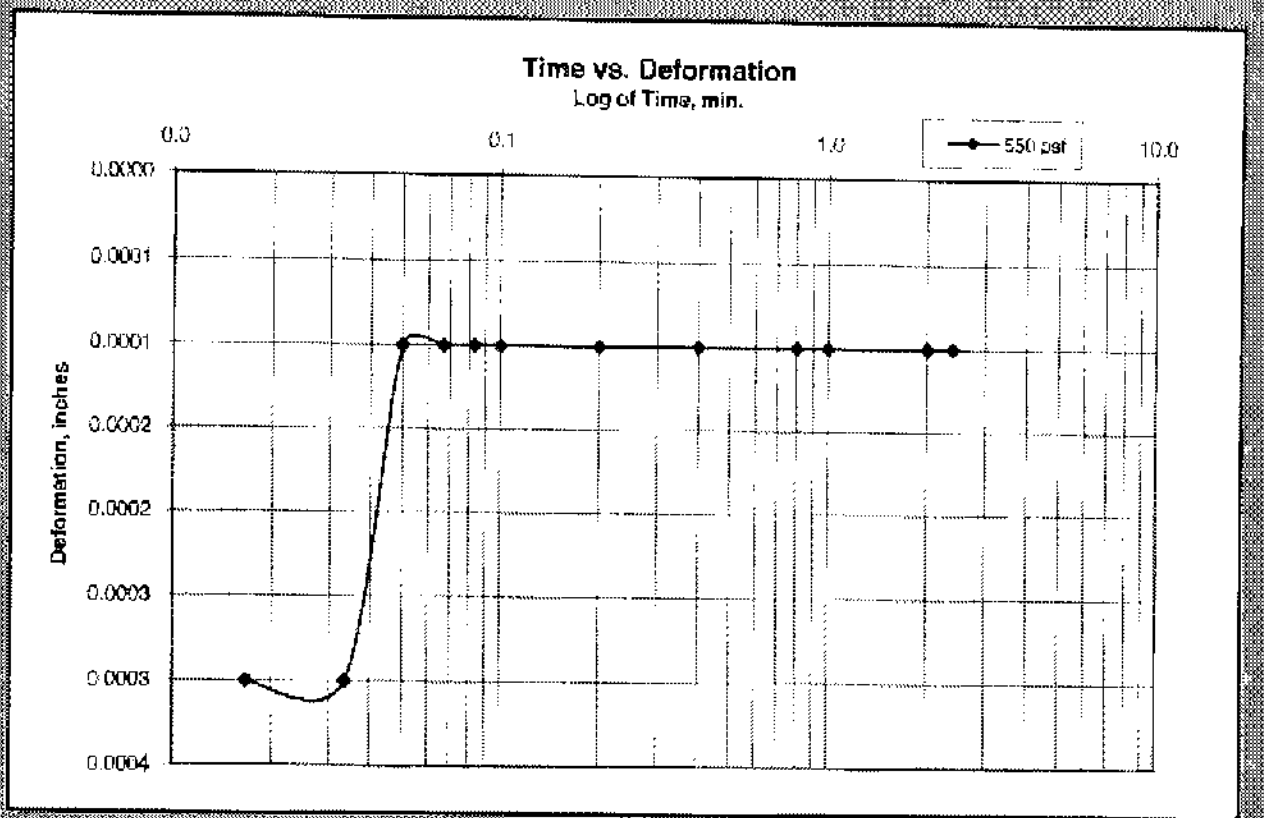

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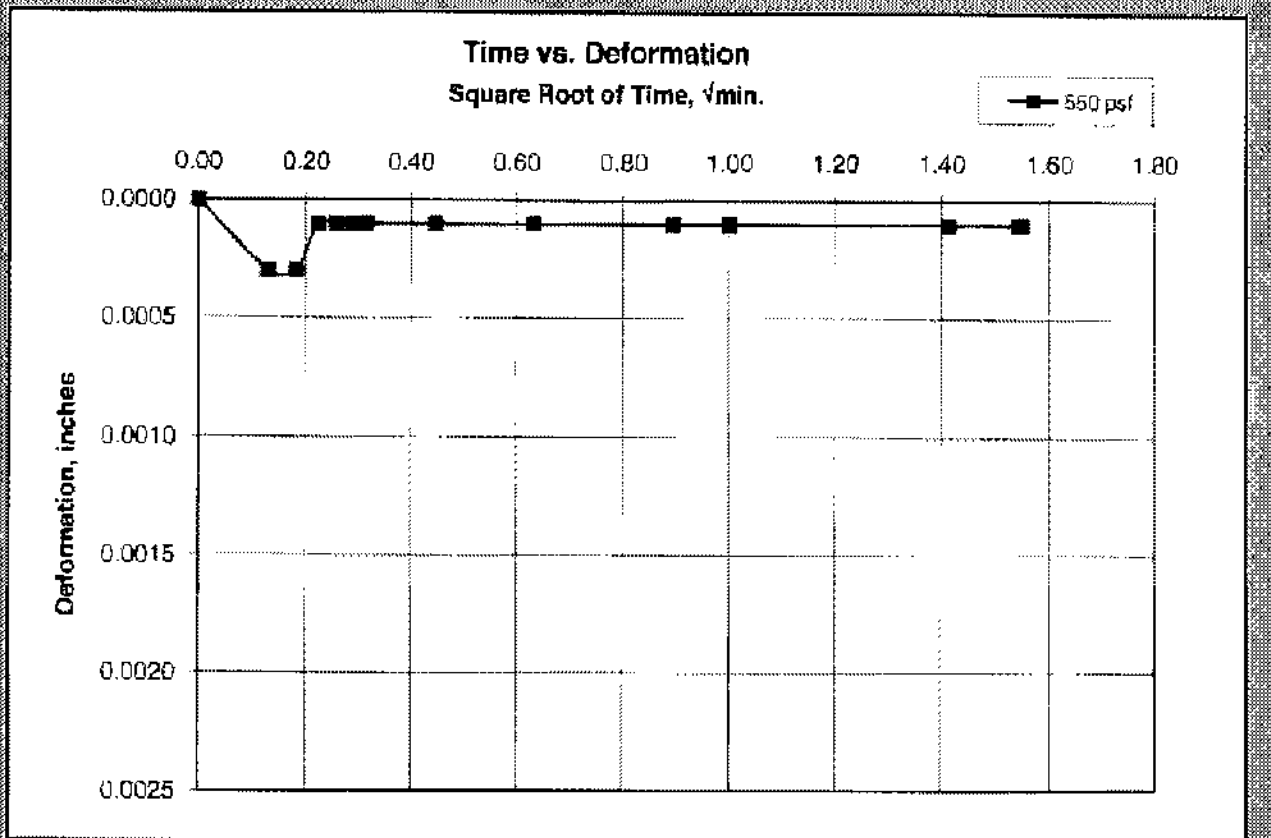
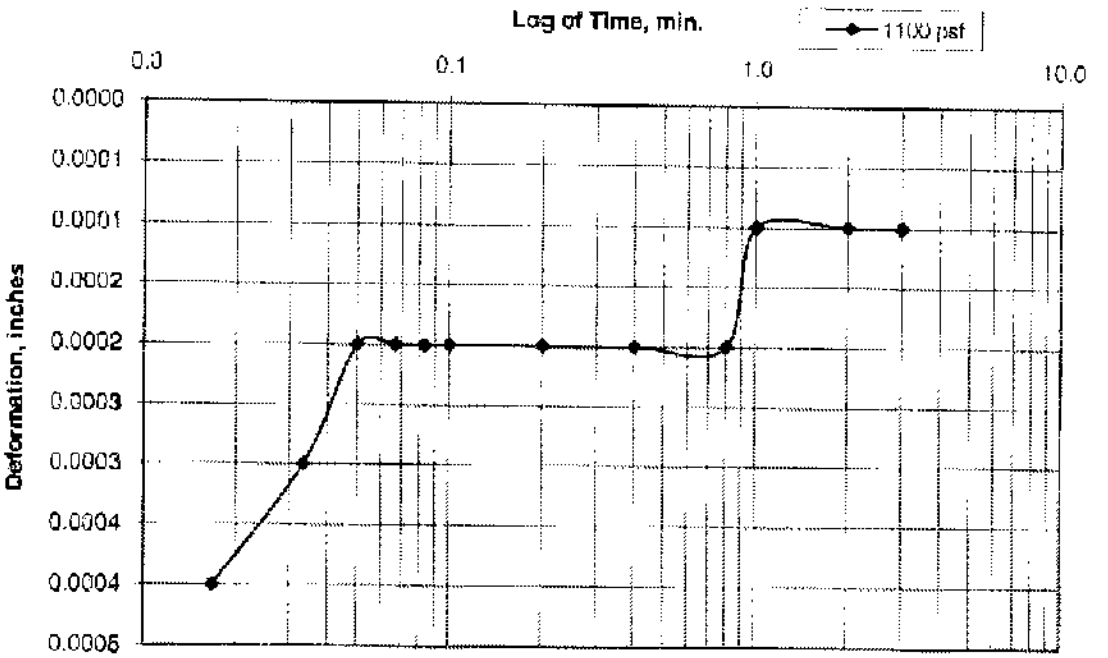


Cooper Testing Labs, Inc.

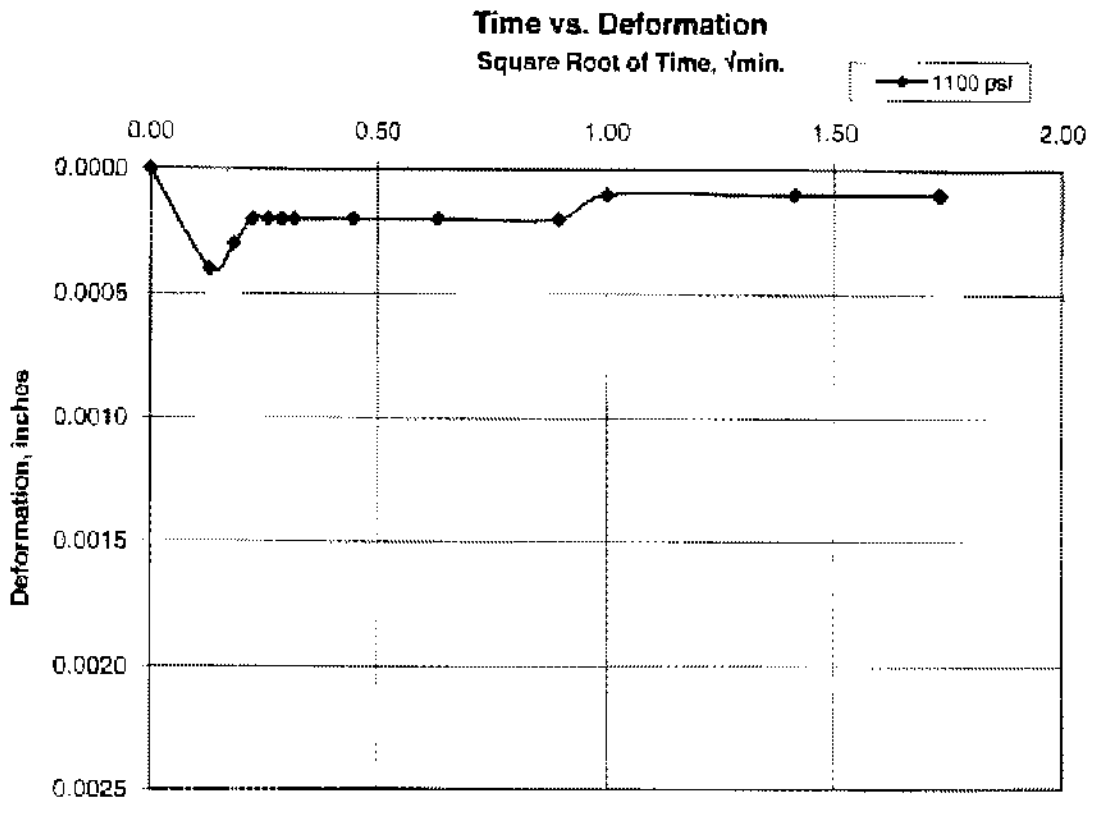
Load 4 — 1100 PSF

Time vs. Deformation



1100 PSF

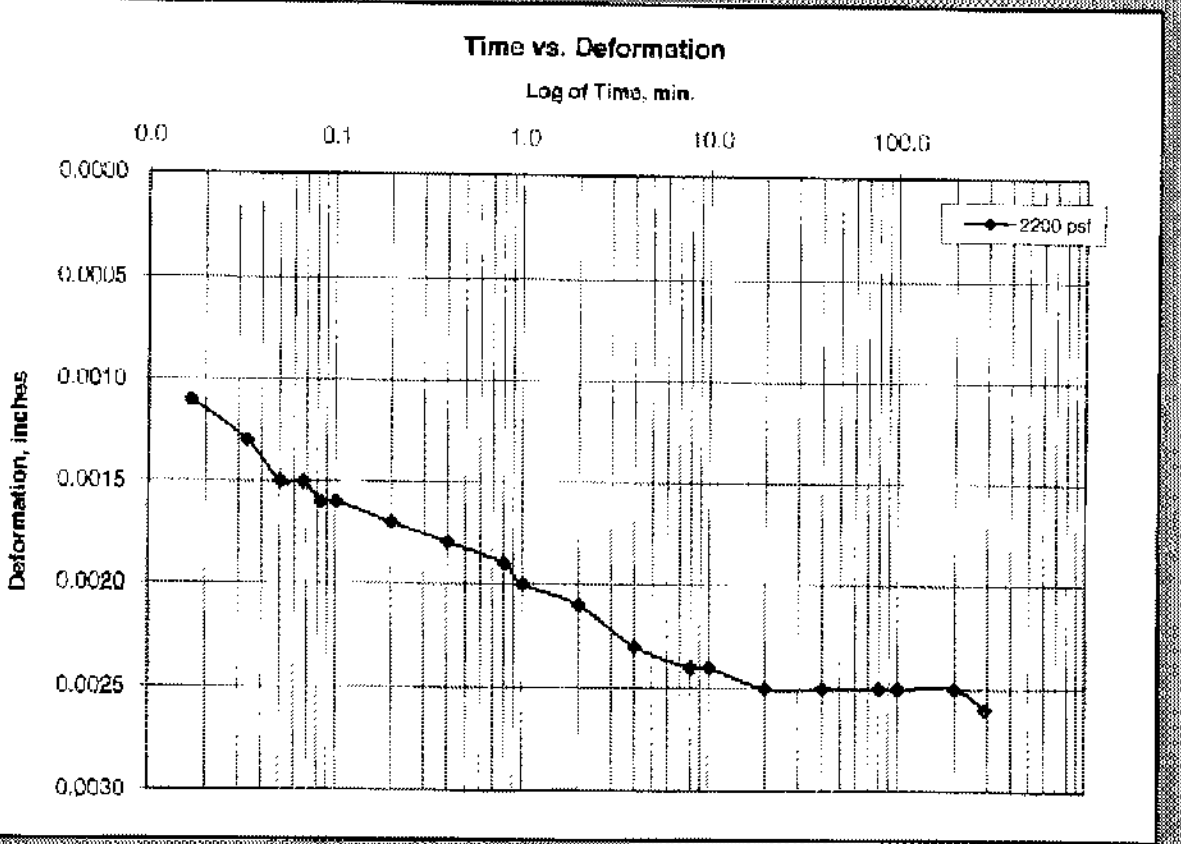
Time vs. Deformation



Cooper Testing Labs, Inc.

Load 5

2200 PSF



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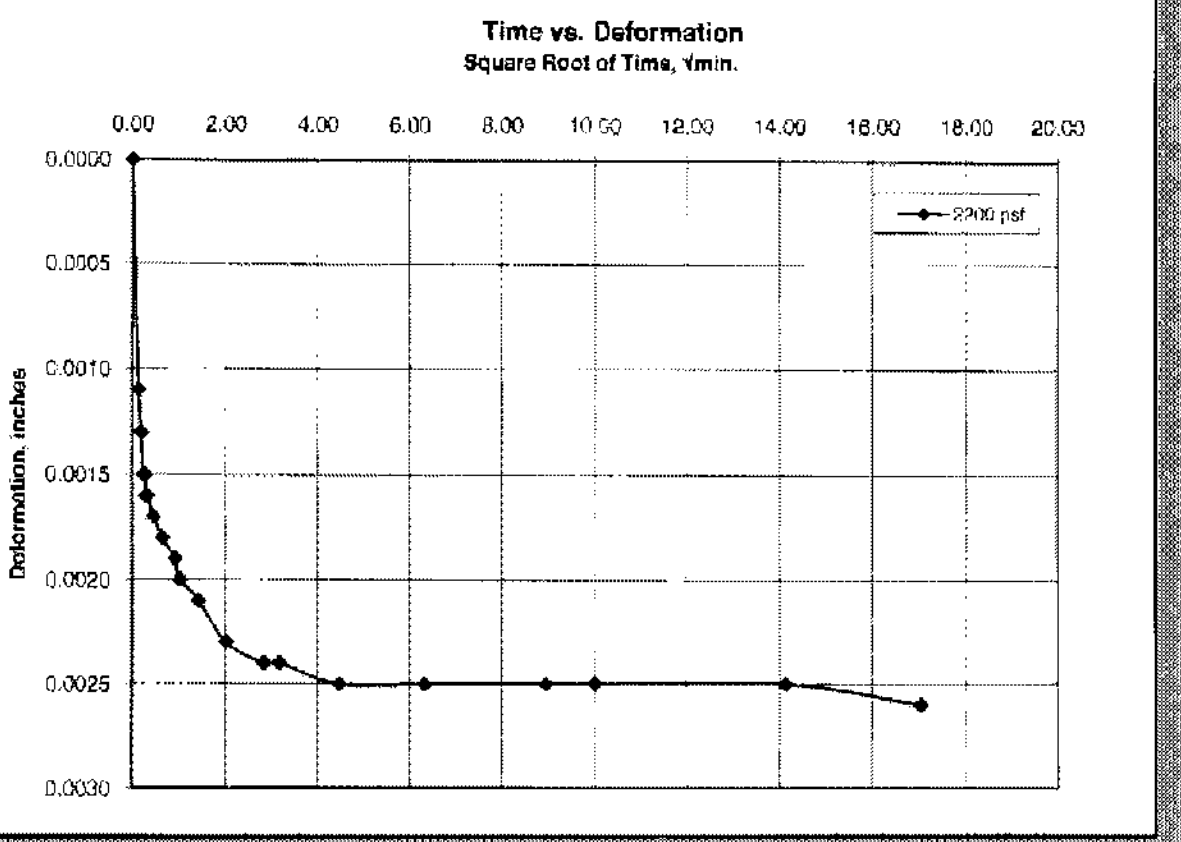

Cooper Testing Labs, Inc.

Load 6

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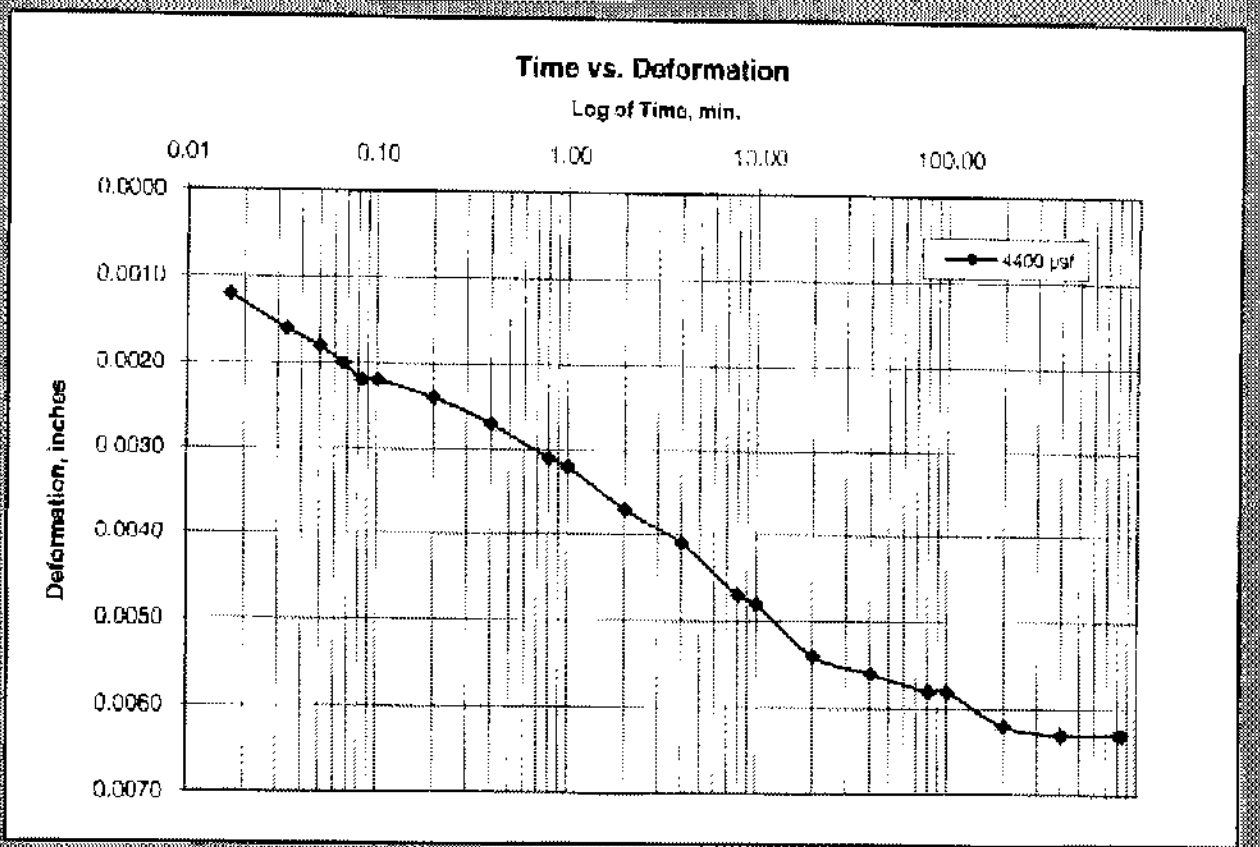

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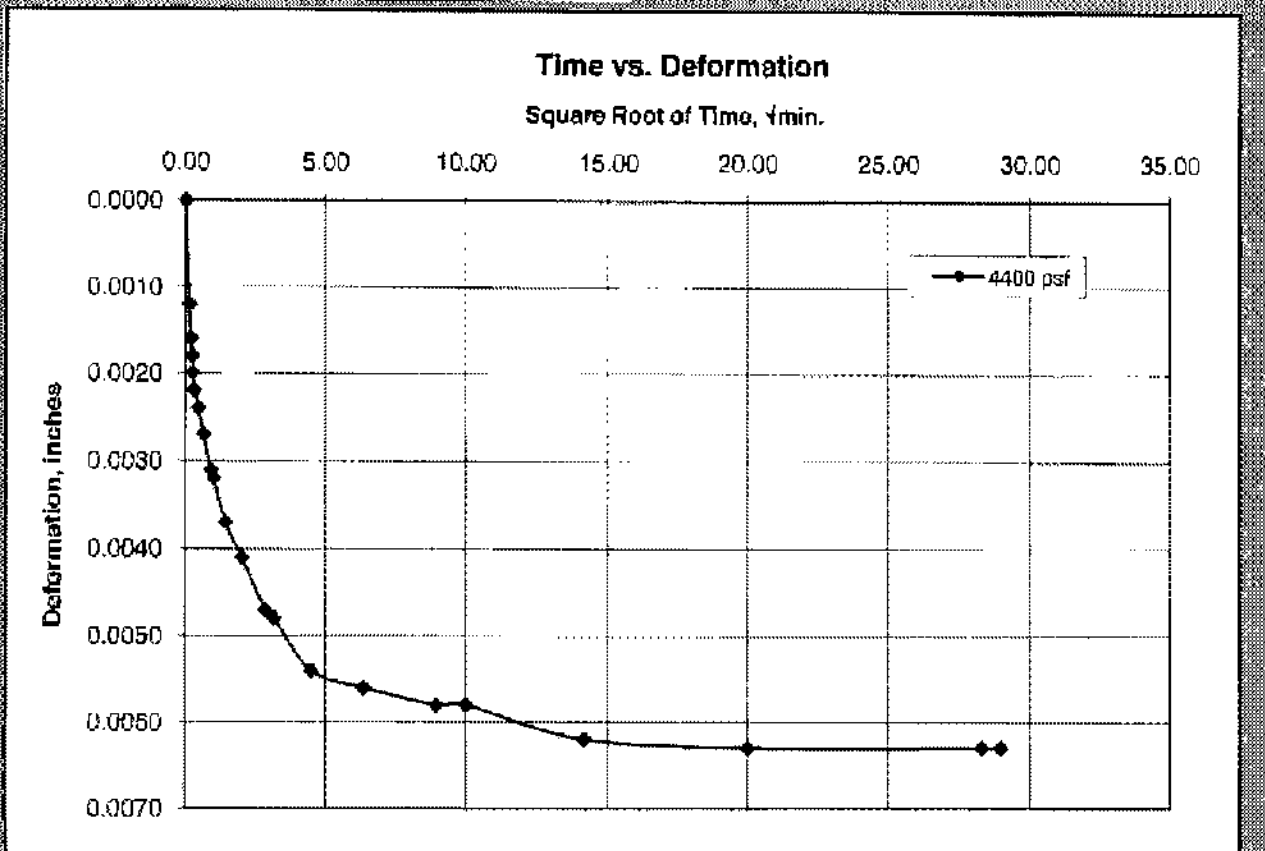
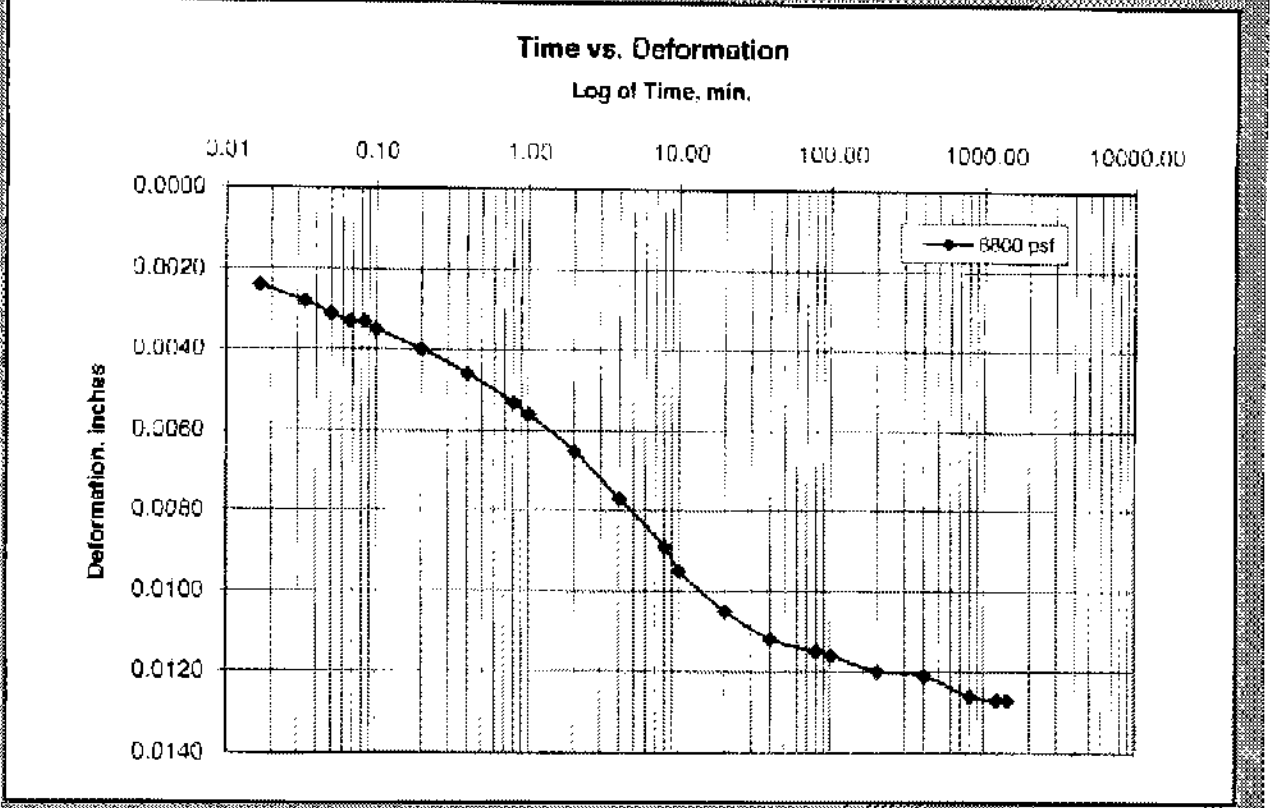


Load 7

8800 PSF



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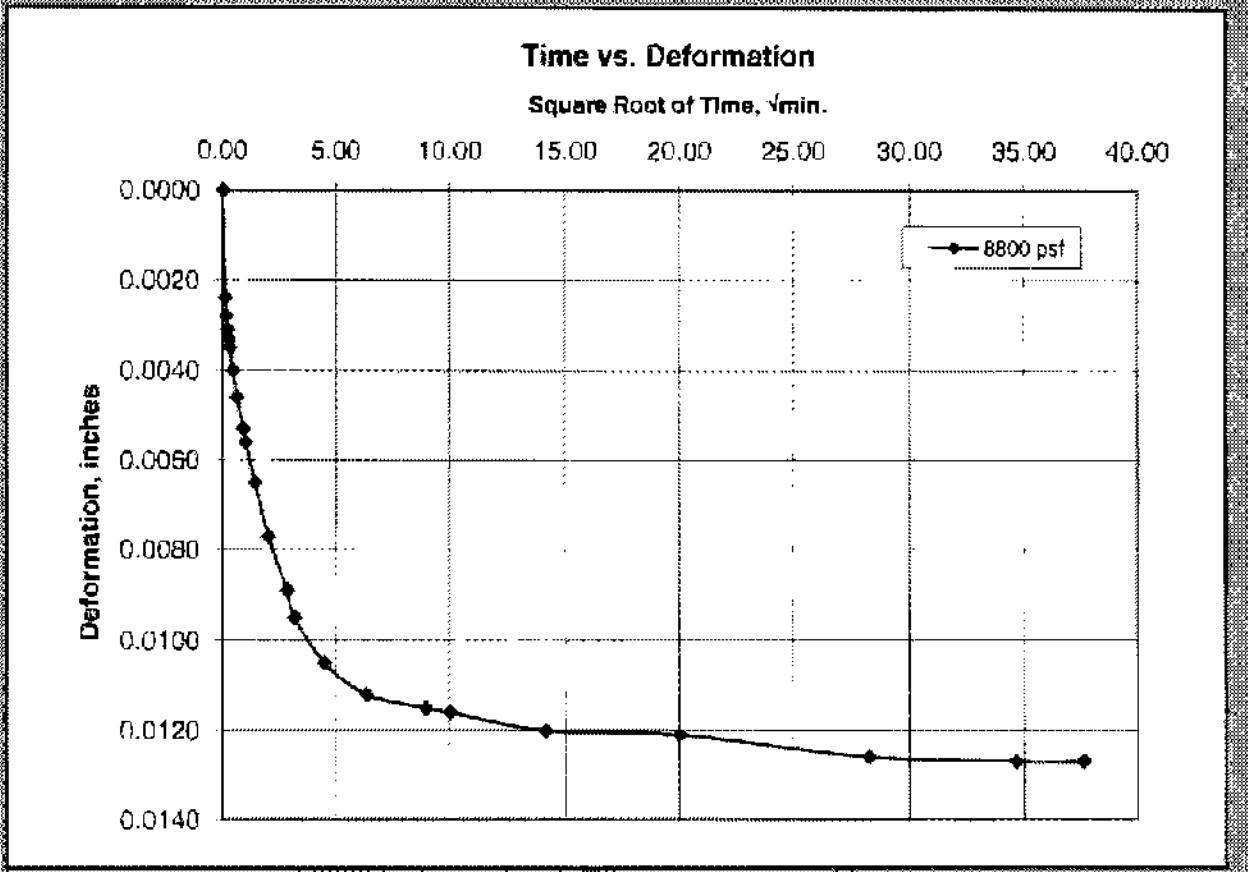

Cooper Testing Labs, Inc.

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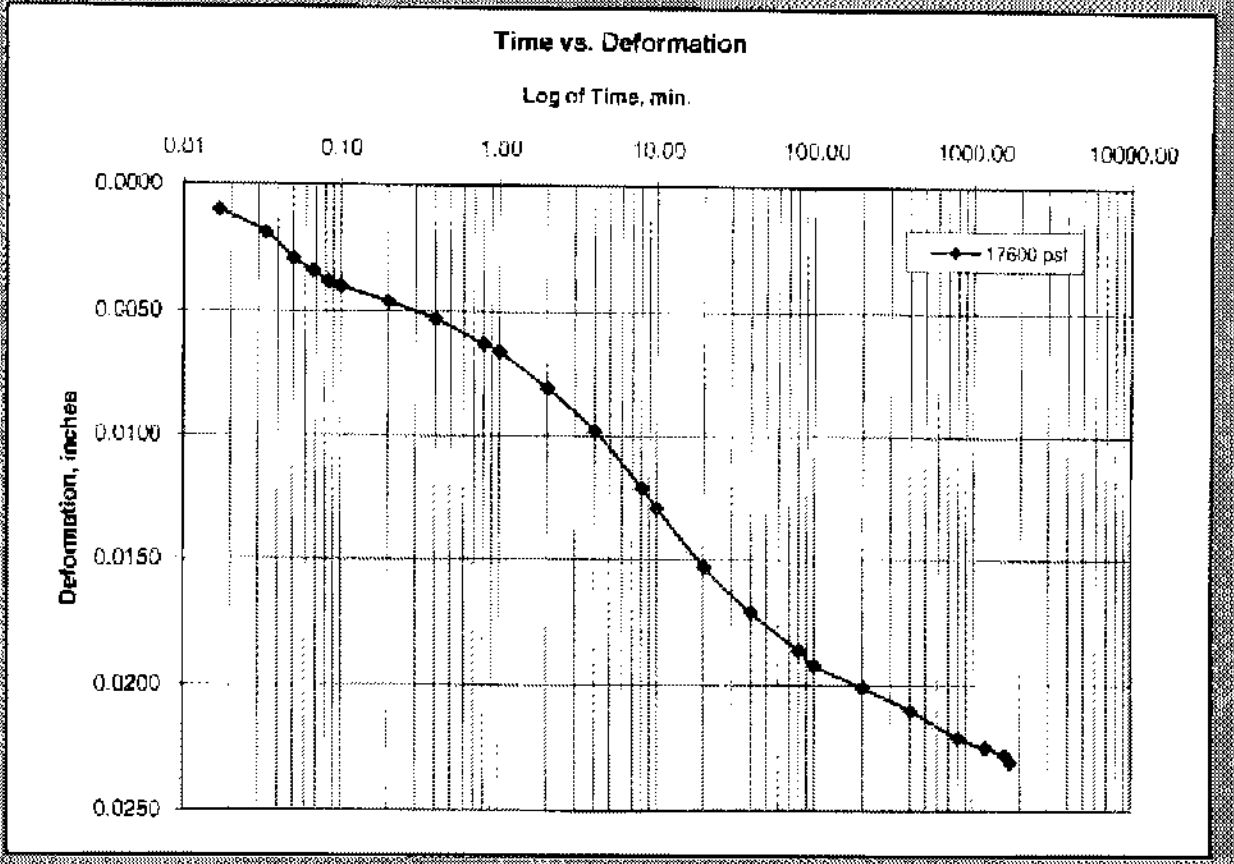

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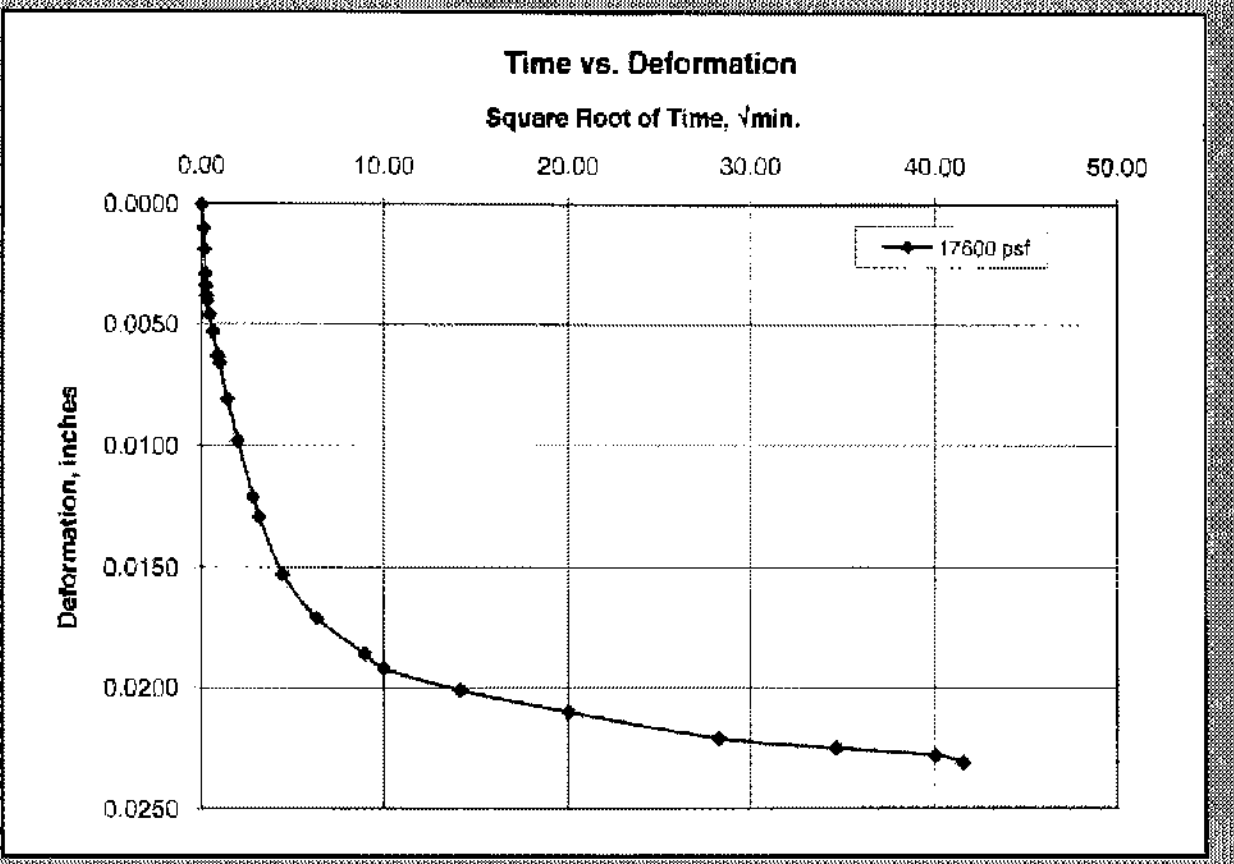

Cooper Testing Labs, Inc.

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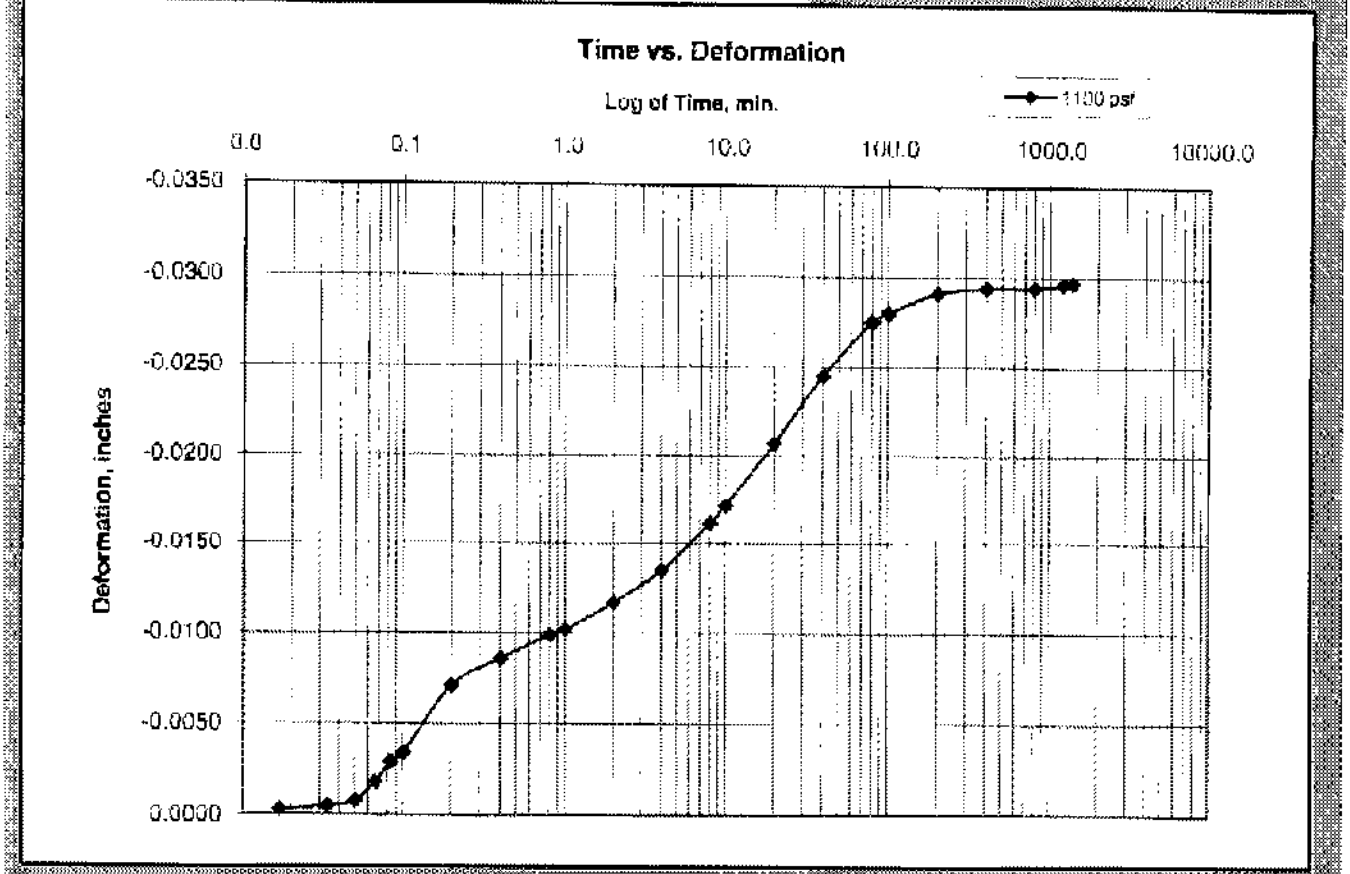

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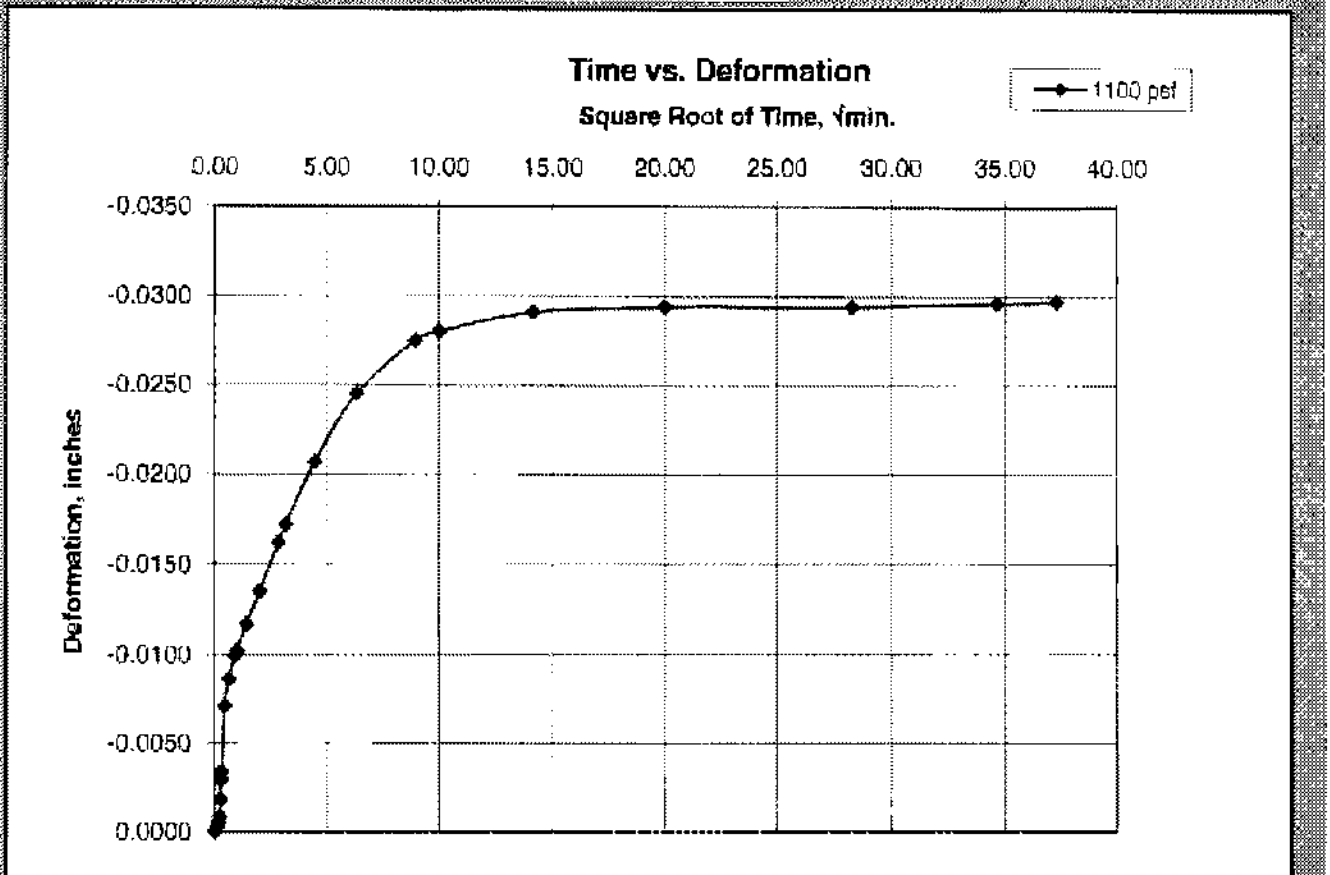
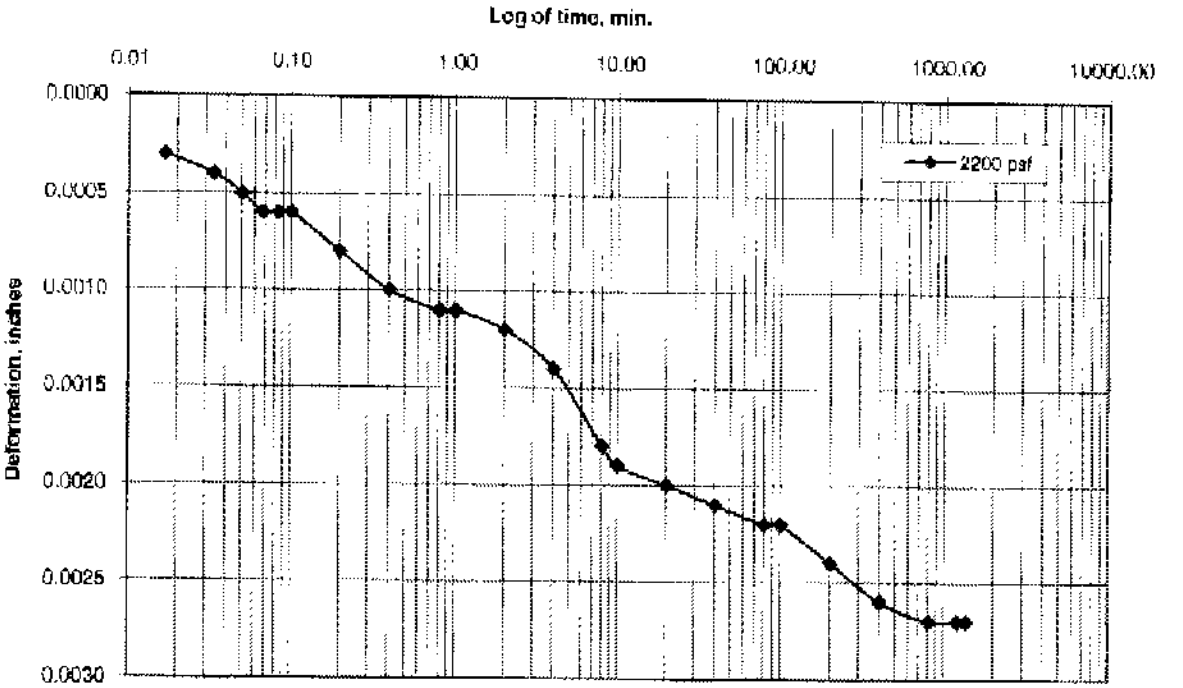


Cooper Testing Labs, Inc.

Load 10

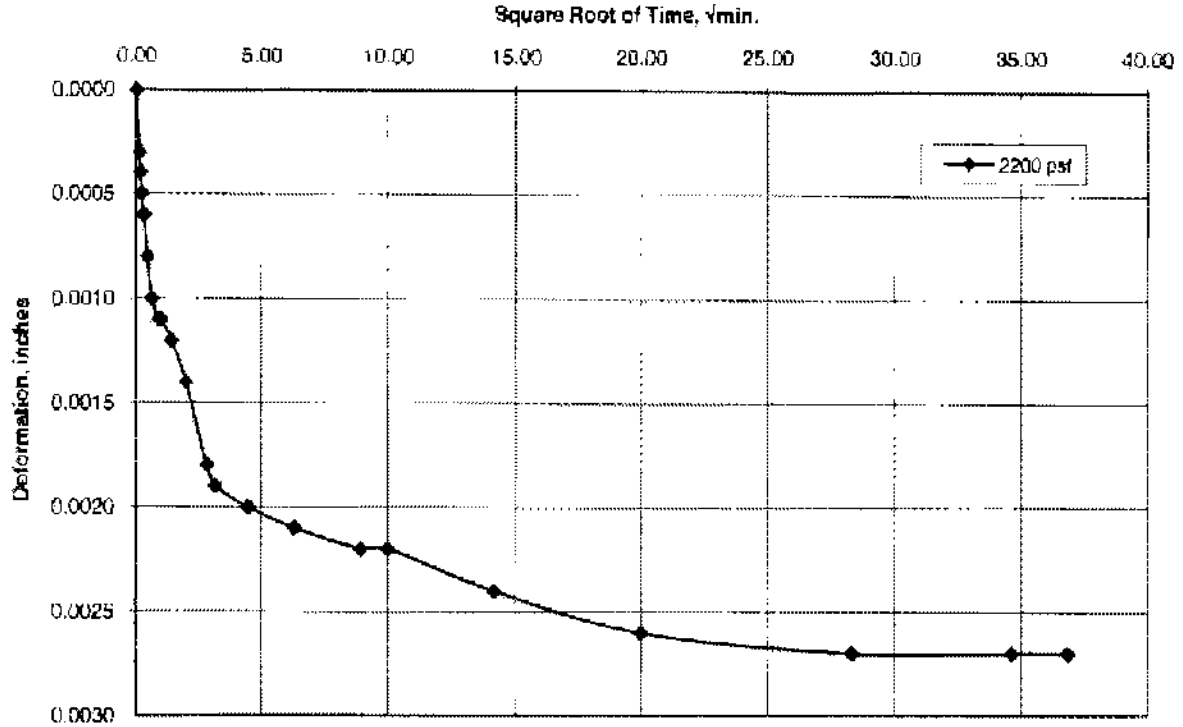
2200 PSF

Time vs. Deformation



2200 PSF

Time vs. Deformation



Cooper Testing Labs, Inc.

Load 11

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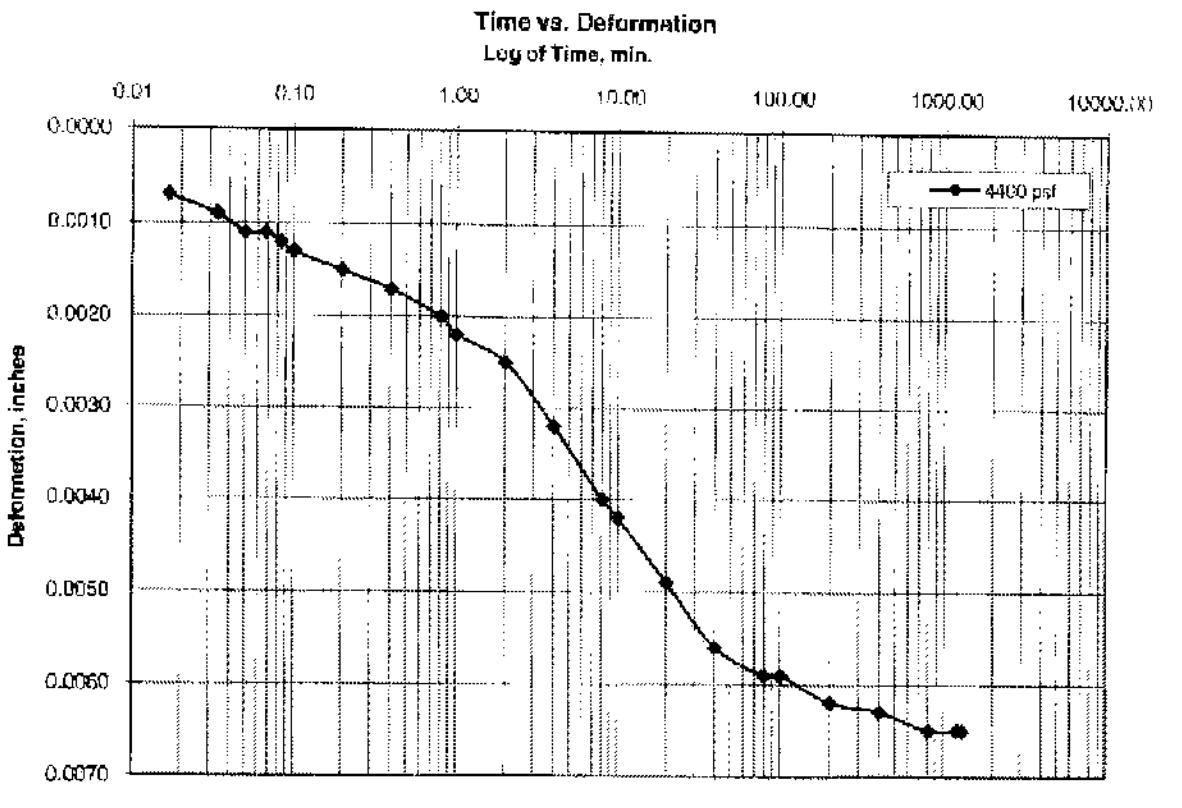

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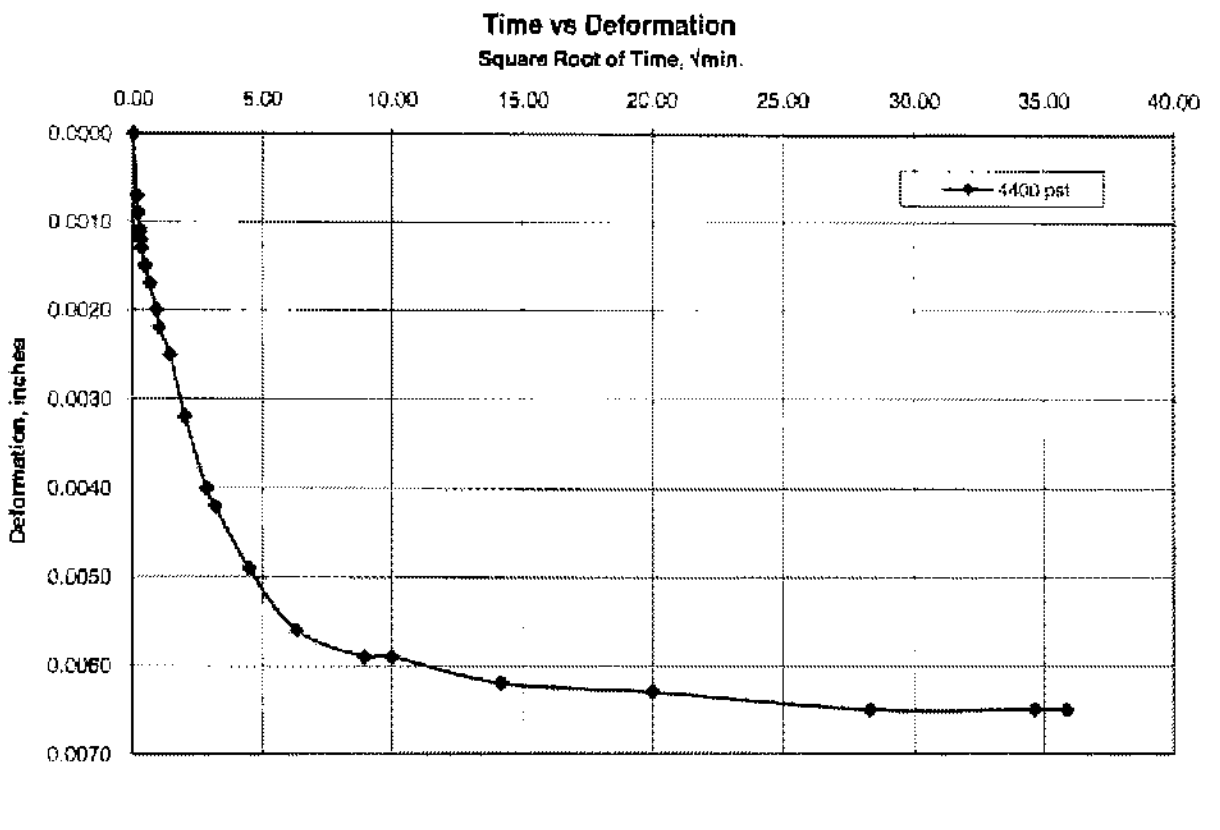
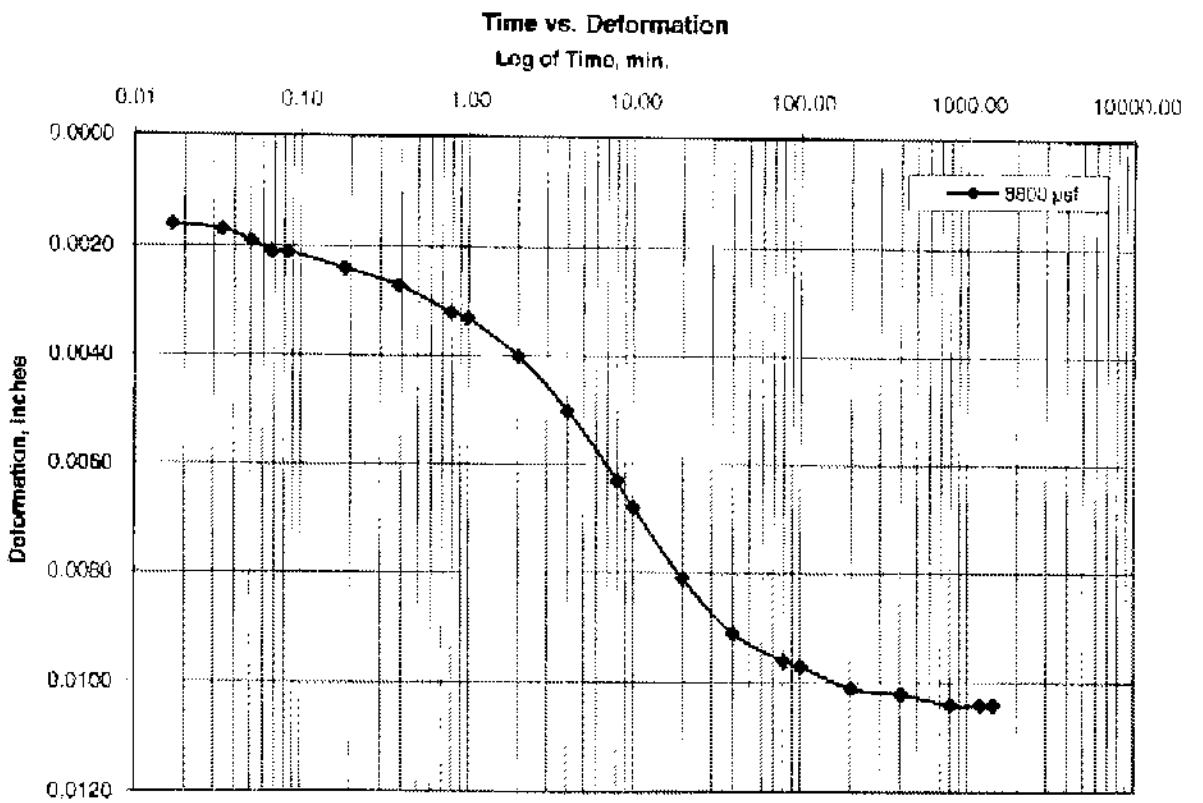
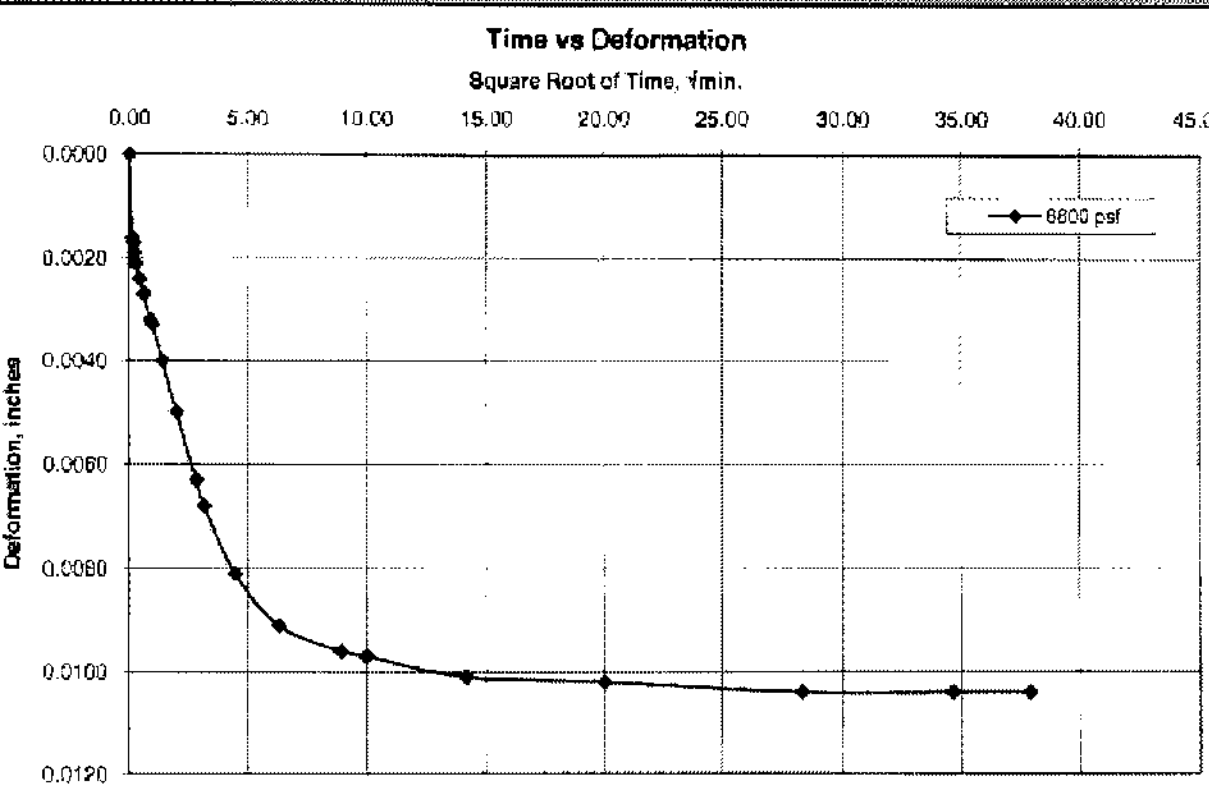


Cooper Testing Labs, Inc.

Load 12 — 8800 PSF

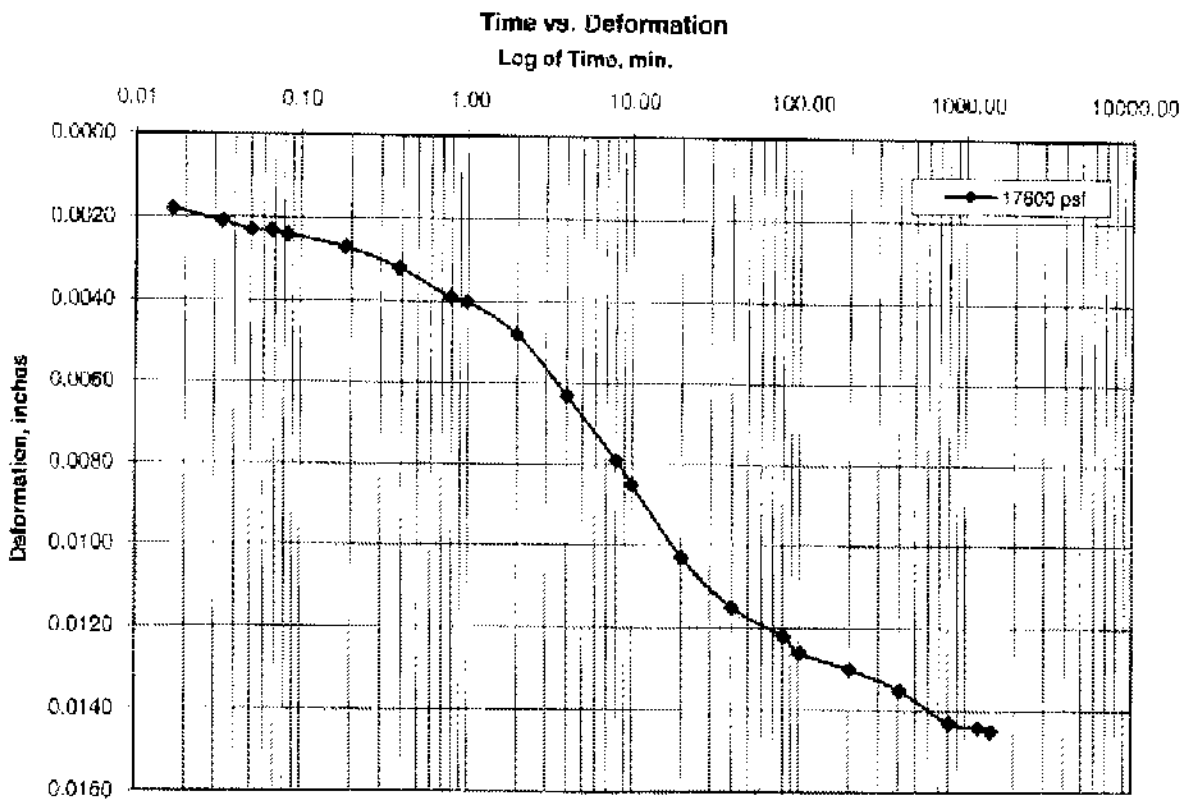


8800 PSF



Cooper Testing Labs, Inc.

Load 13 | 17600 PSF



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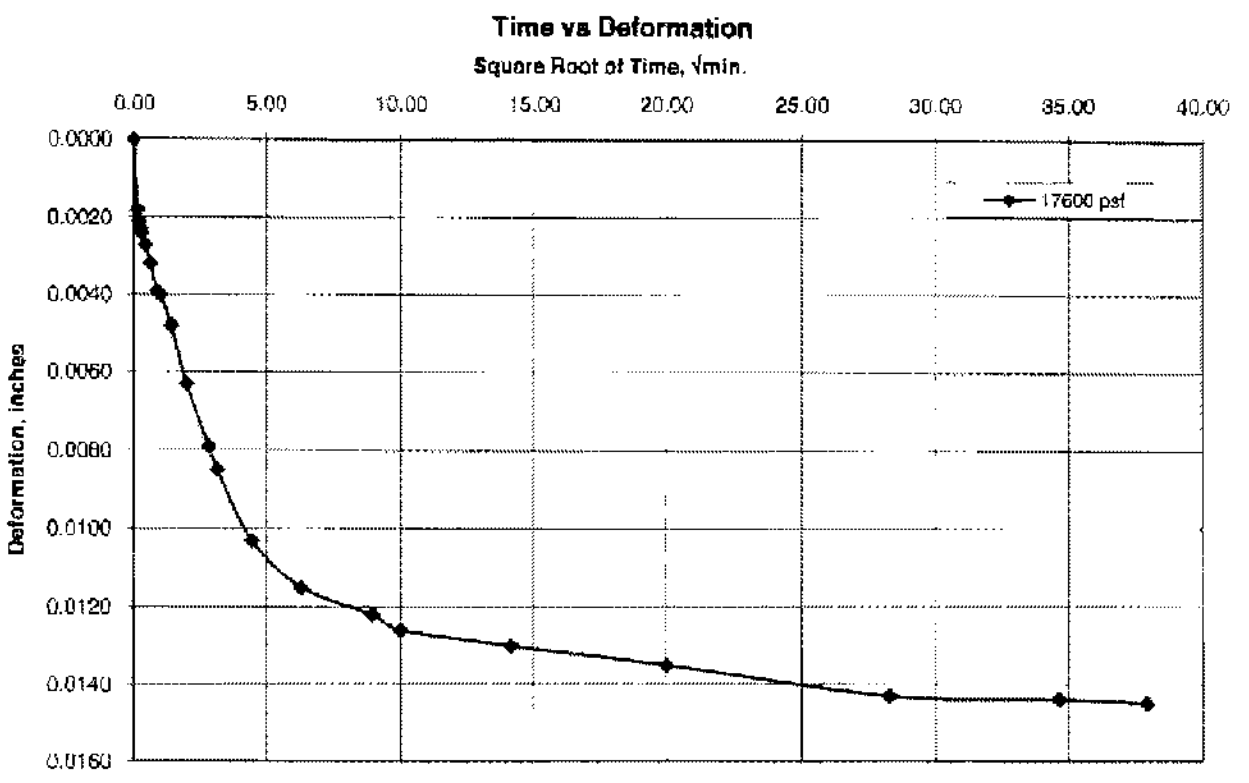
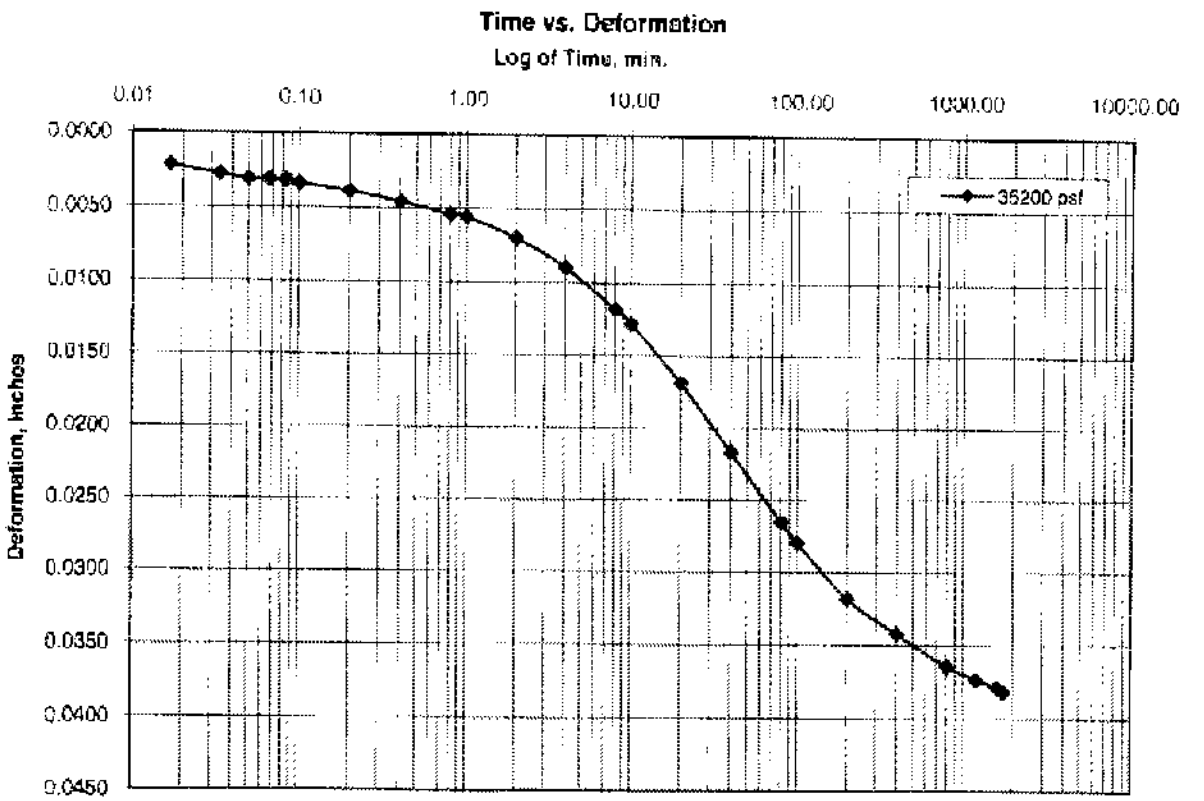


Cooper Testing Labs, Inc.

Load 14 35200 PSF



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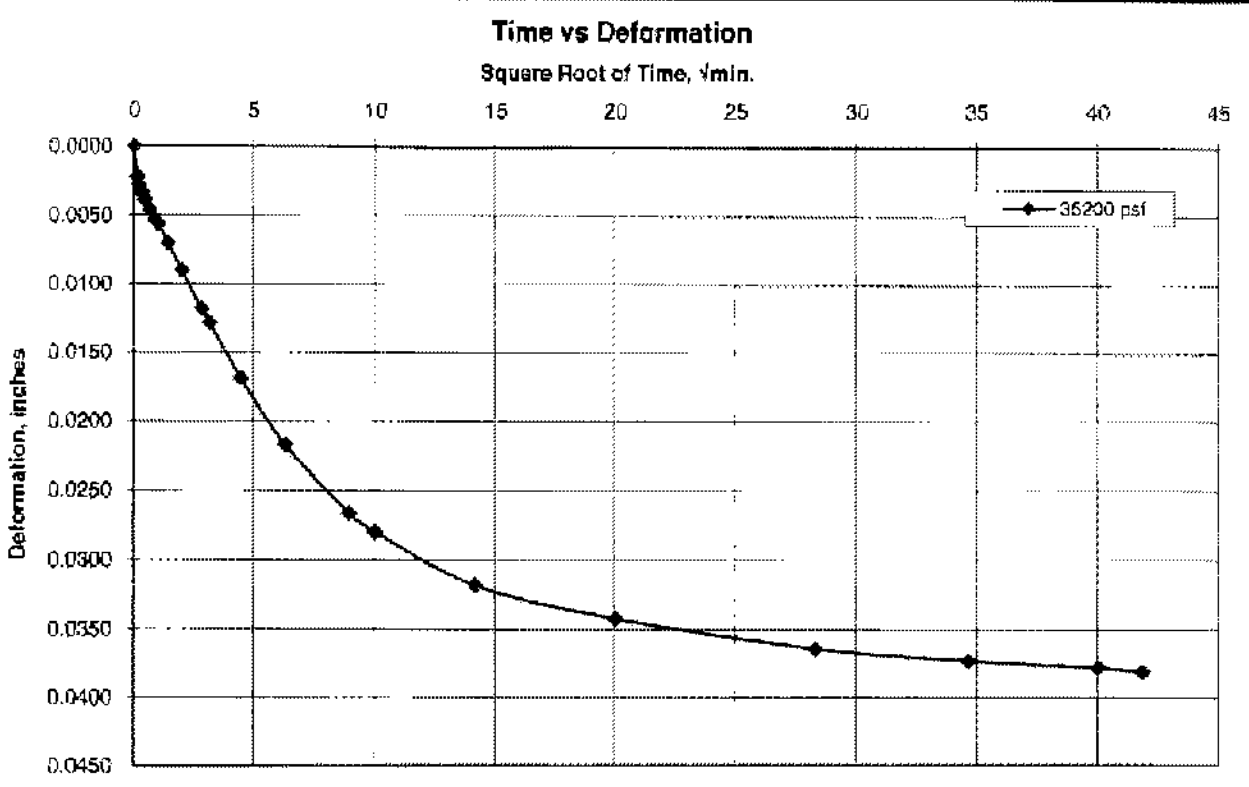
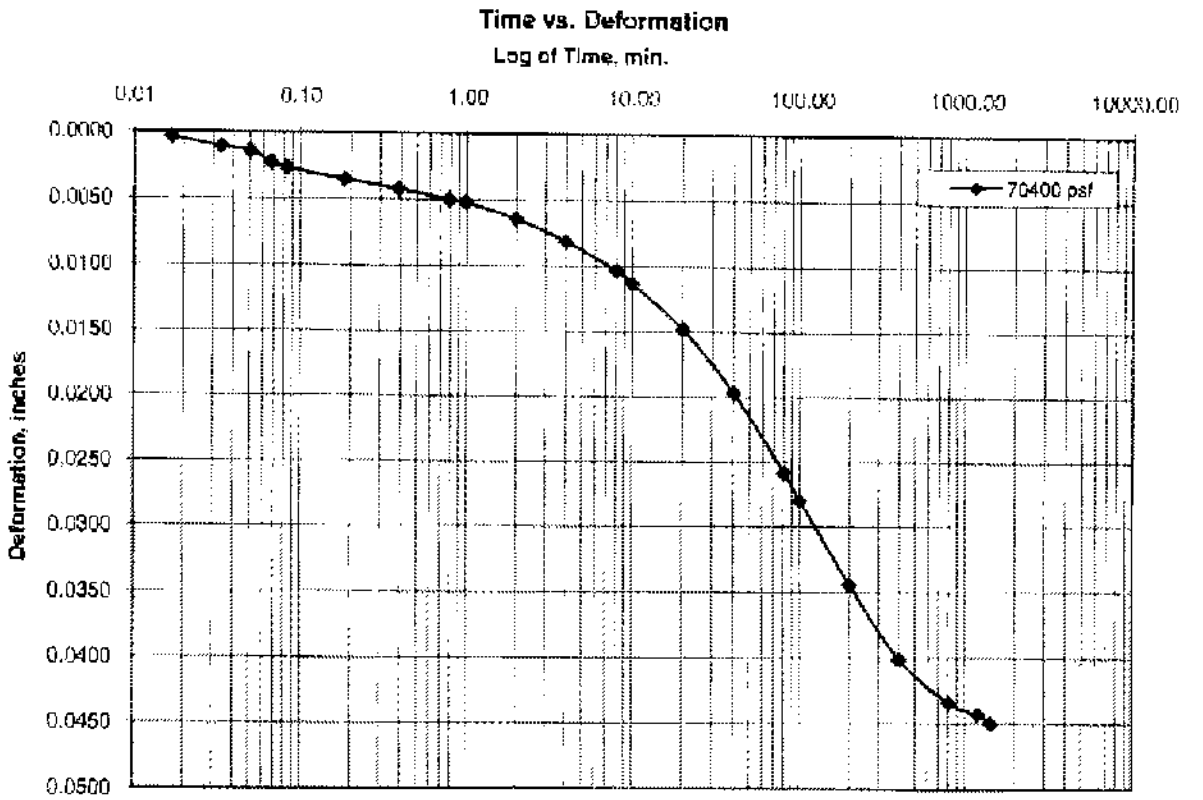
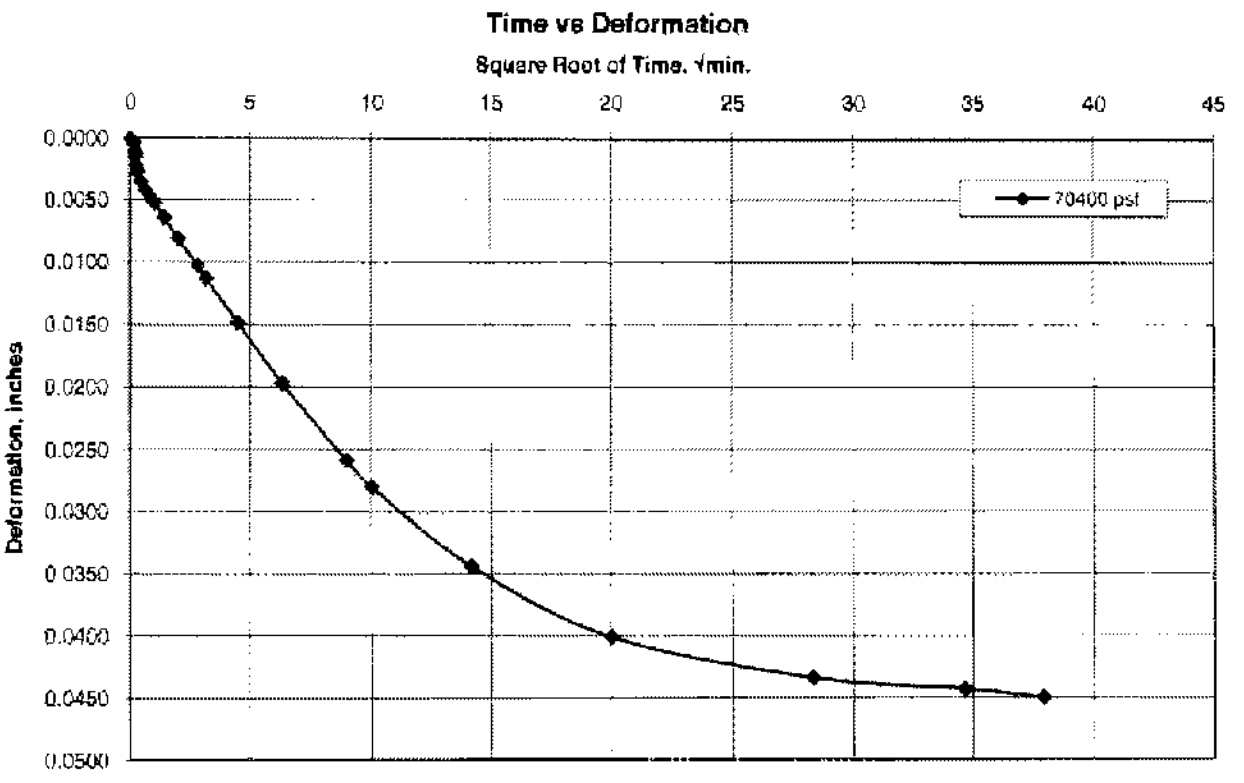


Cooper Testing Labs, Inc.

Load 15 — 70400 PSF



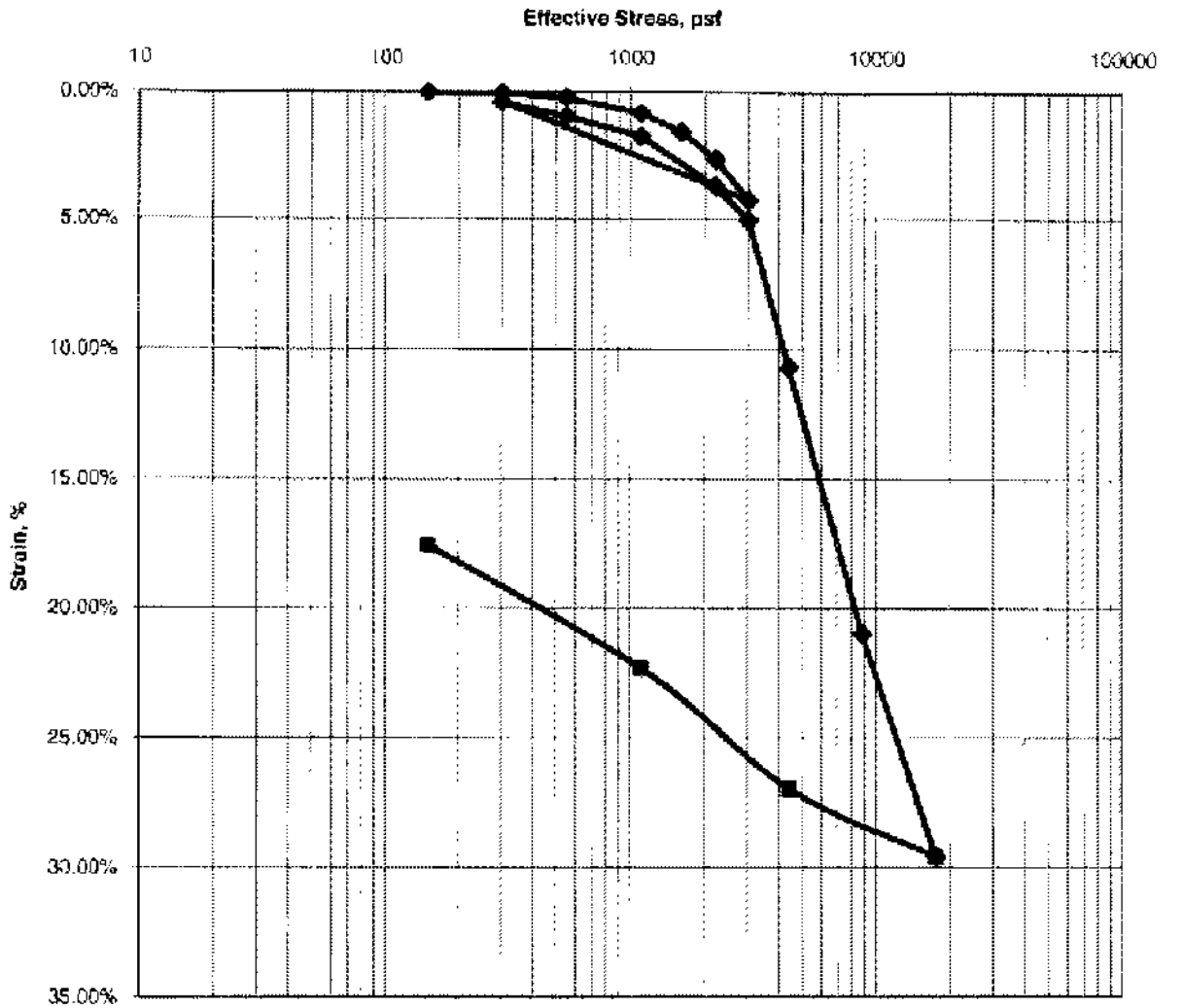
70400 PSF



Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-03	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-1	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	45-48	**Checked:**	PJ/DC
Soil Type:	Dark Gray Fat CLAY, trace shell fragments (Bay Mud)			**Date:**	6/17/2008

Strain-Log-P Curve



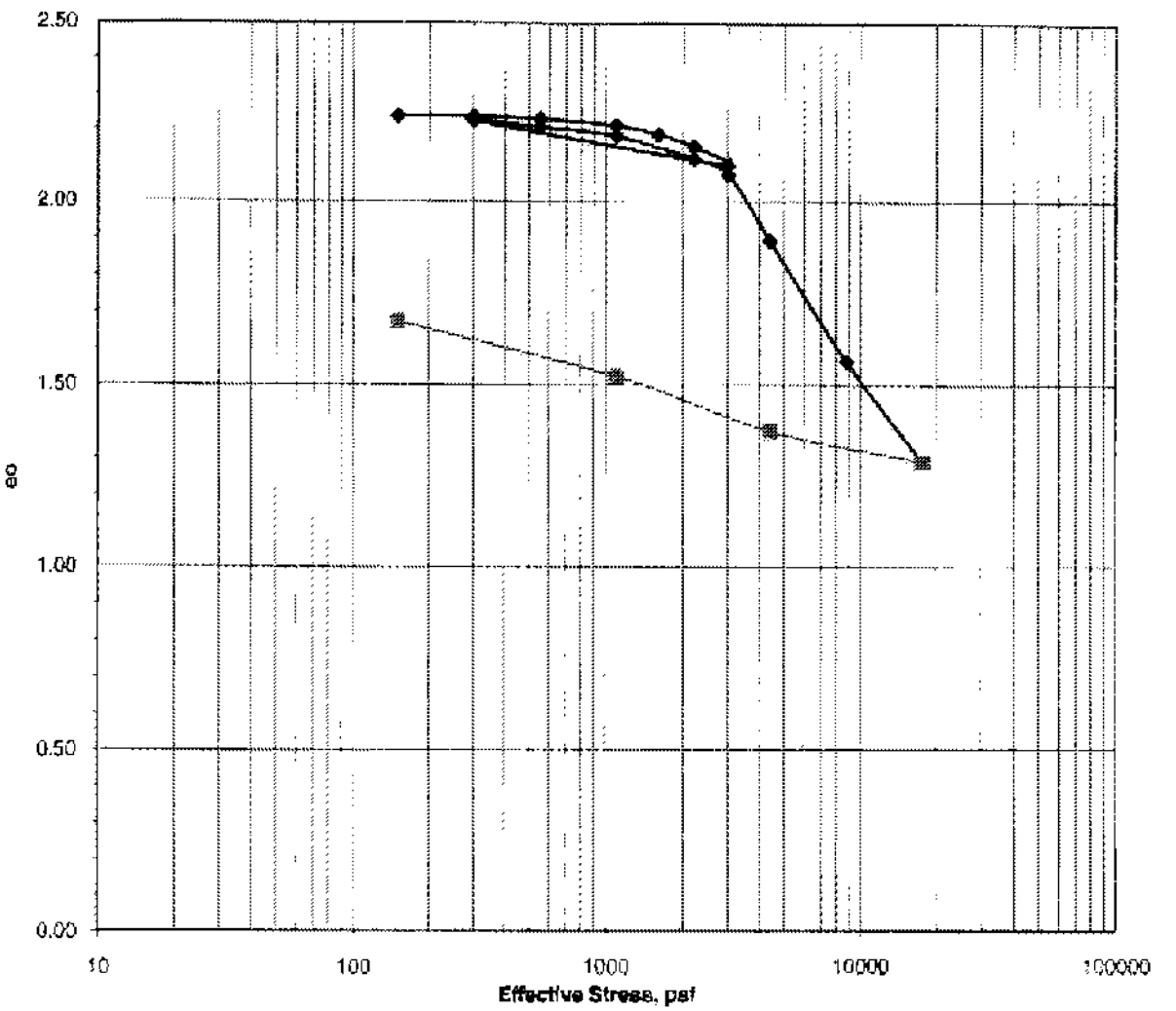
Ass. Gs = 2.7	Initial	Final
Moisture %:	82.4	63.2
Dry Density, pcf:	52.1	62.3
Void Ratio:	2.236	1.704
% Saturation:	99.5	100

Remarks:

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-03	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-1	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	45-48	**Checked:**	PJ/DC
Soil Type:	Dark Gray Fat CLAY, trace shell fragments (Bay Mud)			**Date:**	8/17/2008

Strain-Log-P Curve



Ass. Gs = 2.7	Initial	Final
Moisture %:	82.4	63.2
Dry Density, pcf:	52.1	62.3
Void Ratio:	2.236	1.704
% Saturation:	99.5	100

Remarks:

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane Project
Boring	GS08-03
Sample:	S3-1
Depth, ft.:	45-48
Date:	6/17/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Description:	Dark Gray Fat CLAY, trace shell fragments (Bay Mud)

Moisture Density Data Entry Screen

	Initial	Final
Height	1.01	0.9438
Diameter	2.41	2.41
Total Wet Weight	114.9	102.8
Wt of Wet Soil & Dish		166.4
Wt of Dry Soil & Dish		126.7
Wt. Of Dish		21.4
Wt of Ring		42.3
Moisture %	62.4	63.2
Wet Density, pcf	96.0	101.7
Dry Density, pcf	59.1	62.3
Specific Gravity	2.7	2.7
Area	4.6	4.6
V fill	0.0	0.0
Vt, cc	75.5	69.1
Vs, cc	23.3	23.3
Vv, cc	52.2	39.8
e	2.2	1.7
porosity, %	69.1	63.0
S, %	90.6	100

Loading Increments

Void Ratio

Increment #	Load, psf psf	Dial .0001"	Load psf	Height Delta h	Volume Vt cc	Voids Vv	Void Ratio e
1	150	0.0002	150	1.0098	75.54	52.211	2.240
2	300	0.0003	300	1.0097	75.54	52.204	2.240
3	550	0.0029	550	1.0077	75.39	52.054	2.231
4	1100	0.0035	1100	1.0016	74.92	51.590	2.211
5	1600	0.0150	1600	0.9941	74.37	51.037	2.187
6	2200	0.0264	2200	0.9856	73.73	50.401	2.161
7	3000	0.0425	3000	0.9675	72.38	49.047	2.102
8	300	0.0040	300	1.0060	75.26	51.927	2.225
9	550	0.0060	550	1.0002	74.83	51.493	2.207
10	1100	0.0176	1100	0.9924	74.24	50.9055	2.181896
11	2200	0.0371	2200	0.9729	72.78	49.4567	2.119315
12	3000	0.0505	3000	0.9595	71.78	48.4562	2.076392
13	4400	0.1071	4400	0.9029	67.55	44.2139	1.894881
14	8800	0.2264	8800	0.8001	59.86	36.5233	1.565503
15	17600	0.2960	17600	0.7140	53.42	30.0820	1.289229
16		0.2960	#N/A	0.7140	53.42	30.0820	1.289229
17		0.2960	#N/A	0.7140	53.42	30.0820	1.289229
18		0.2960	#N/A	0.7140	53.42	30.0820	1.289229
19		0.2960	#N/A	0.7140	53.42	30.0820	1.289229

Rebound Increments

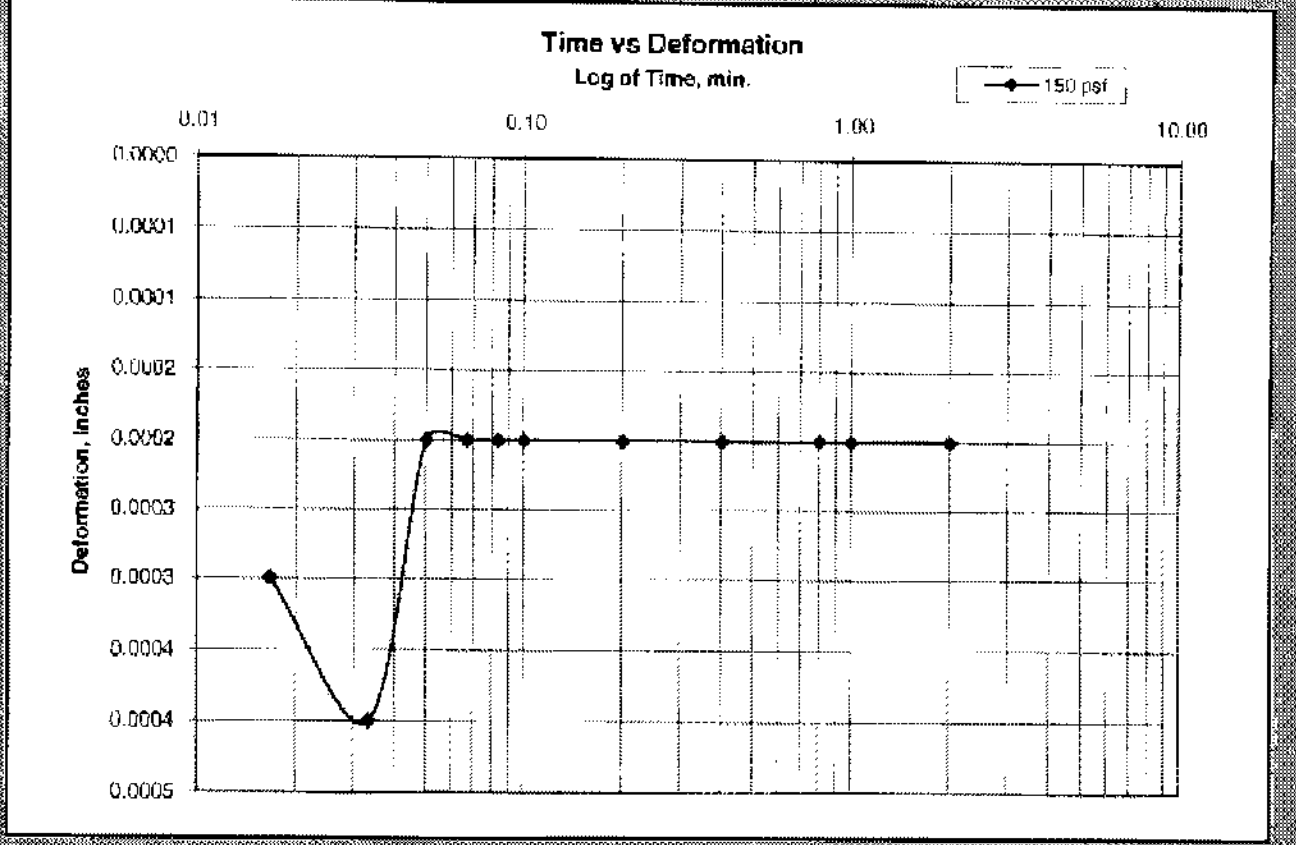
Void Ratio

16	17600	0.2960	17600	0.7140	53.42	30.0820	1.289229
16	4400	0.2696	4400	0.7404	55.39	32.0570	1.373873
17	1100	0.2231	1100	0.7869	58.87	35.5350	1.522931
18	150	0.1759	150	0.8341	62.40	39.0660	1.674004
19			#N/A	1.0100	75.56	52.2262	2.238265
20			#N/A	1.0100	75.56	52.2262	2.238265
	Tot Dry Wt	53.0000					

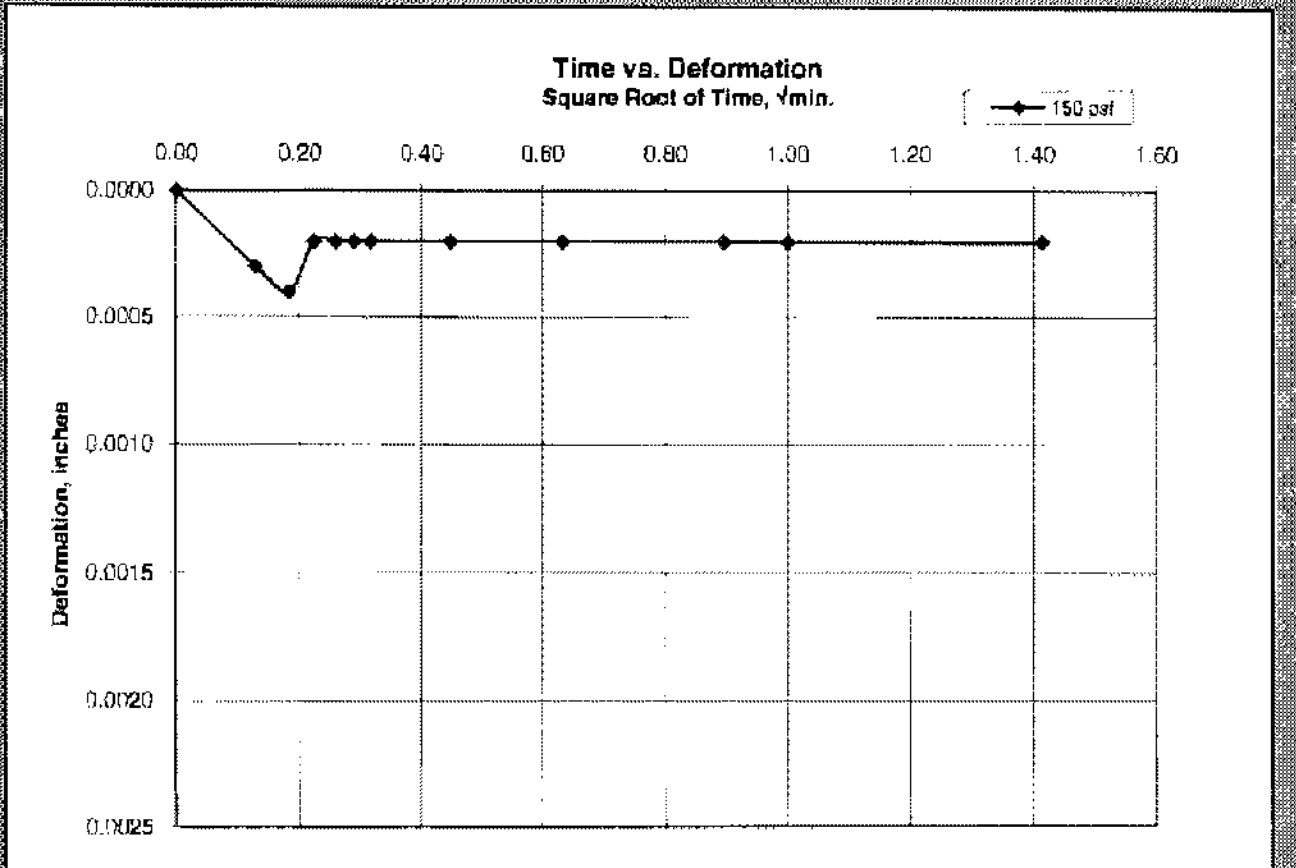
The data to the left is used to determine the theoretical

Cooper Testing Labs, Inc.

Load 1 — 150 PSF



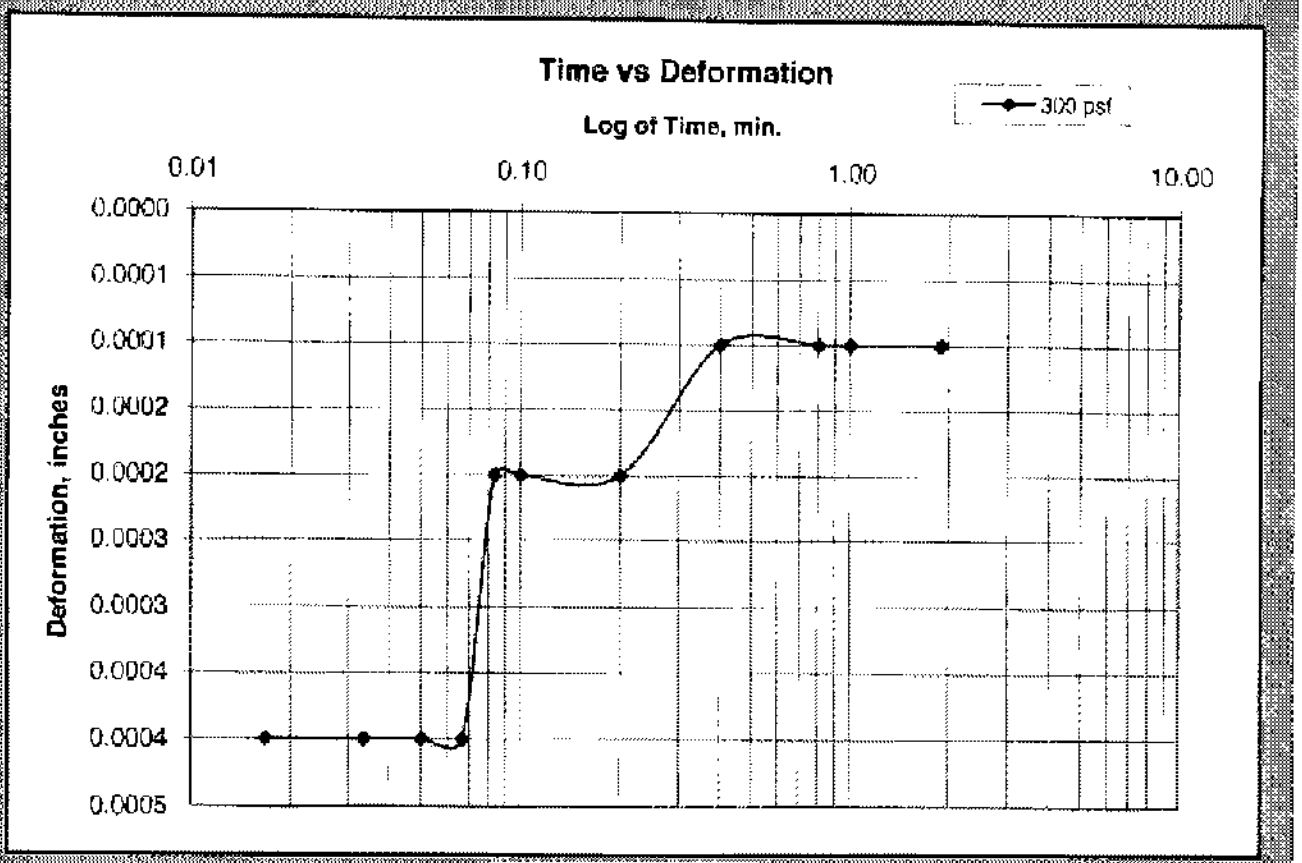
150 PSF



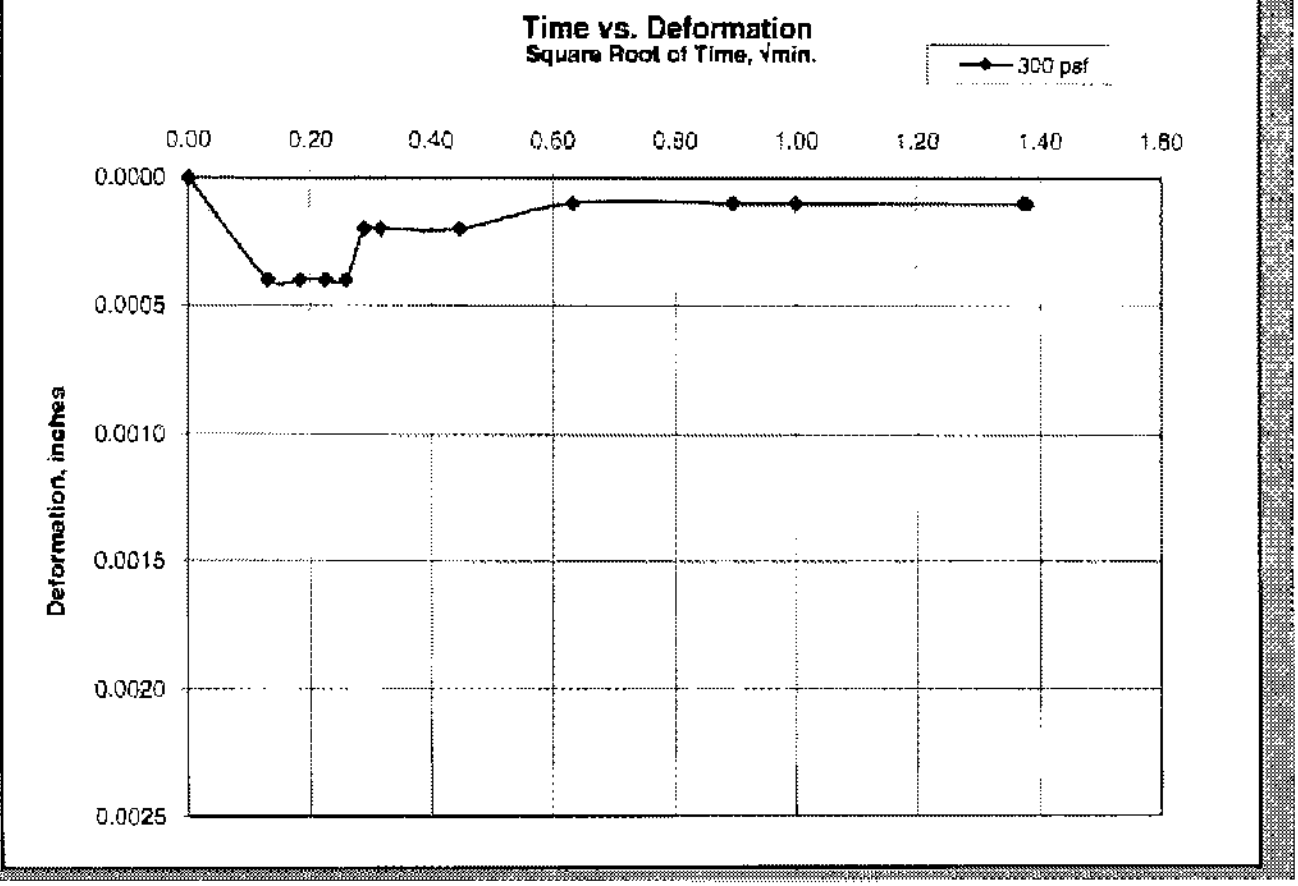
Cooper Testing Labs, Inc.

Load 2

300 PSF



300 PSF



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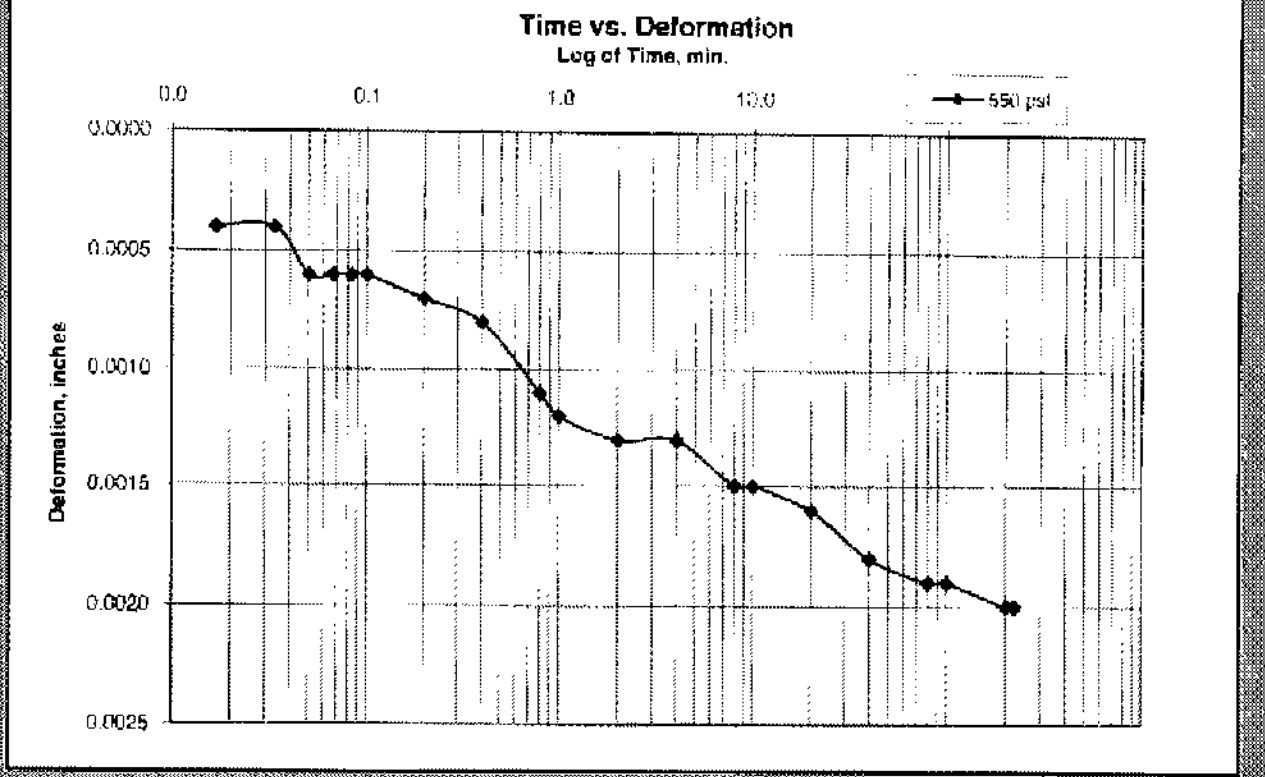

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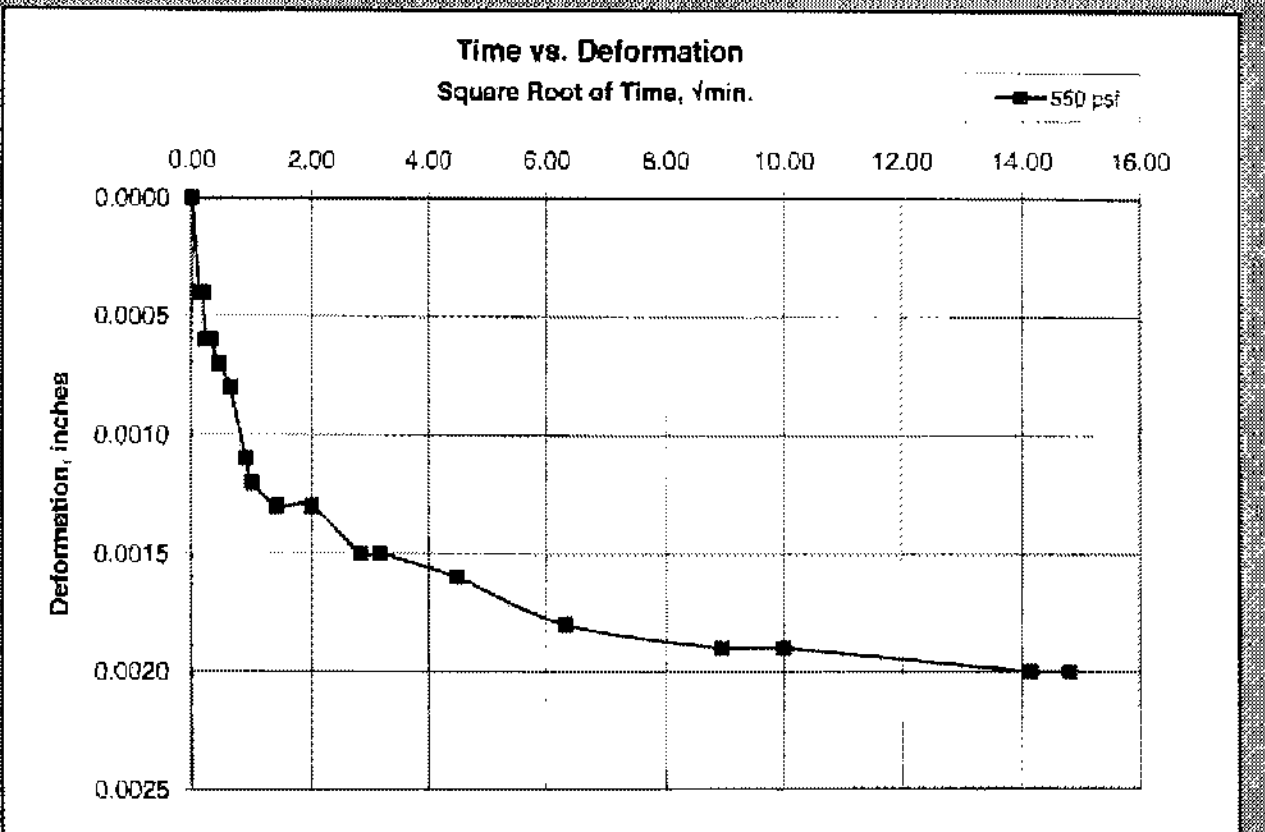

Load 4

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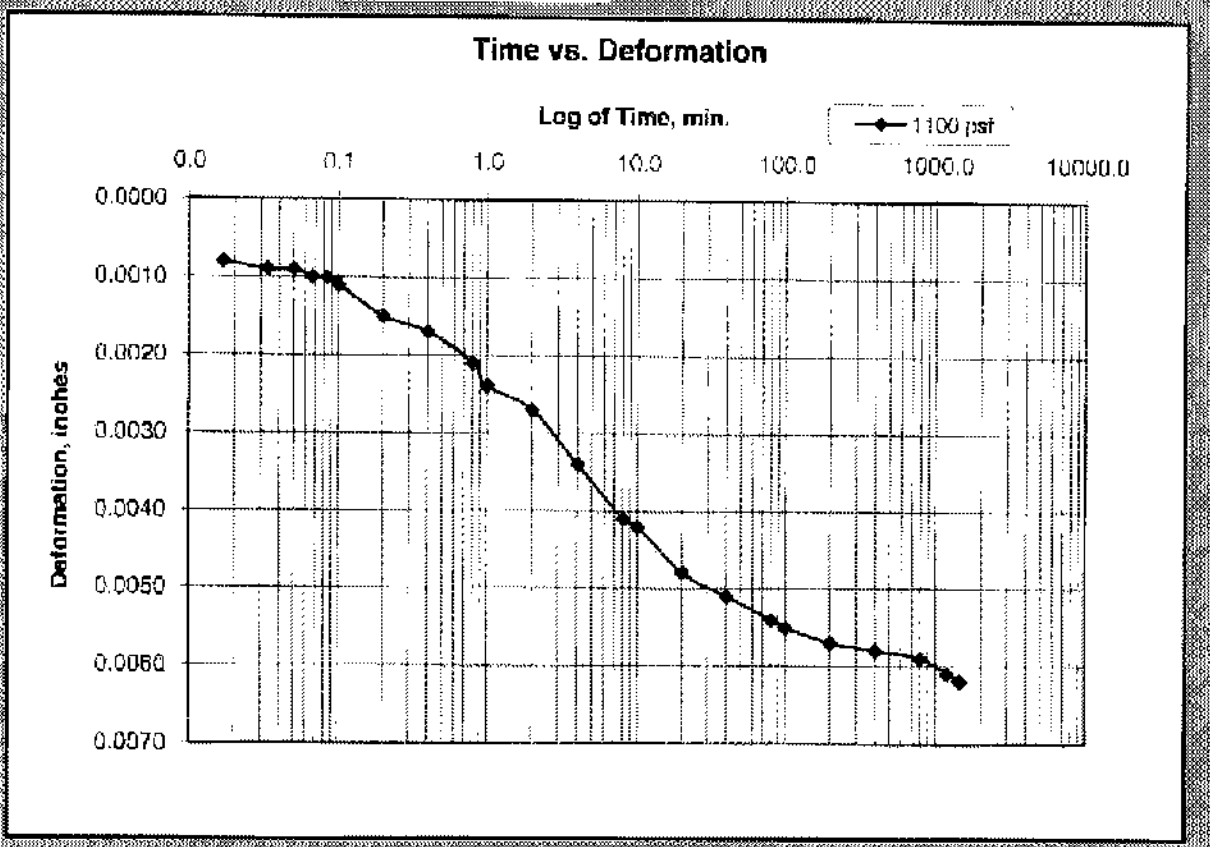

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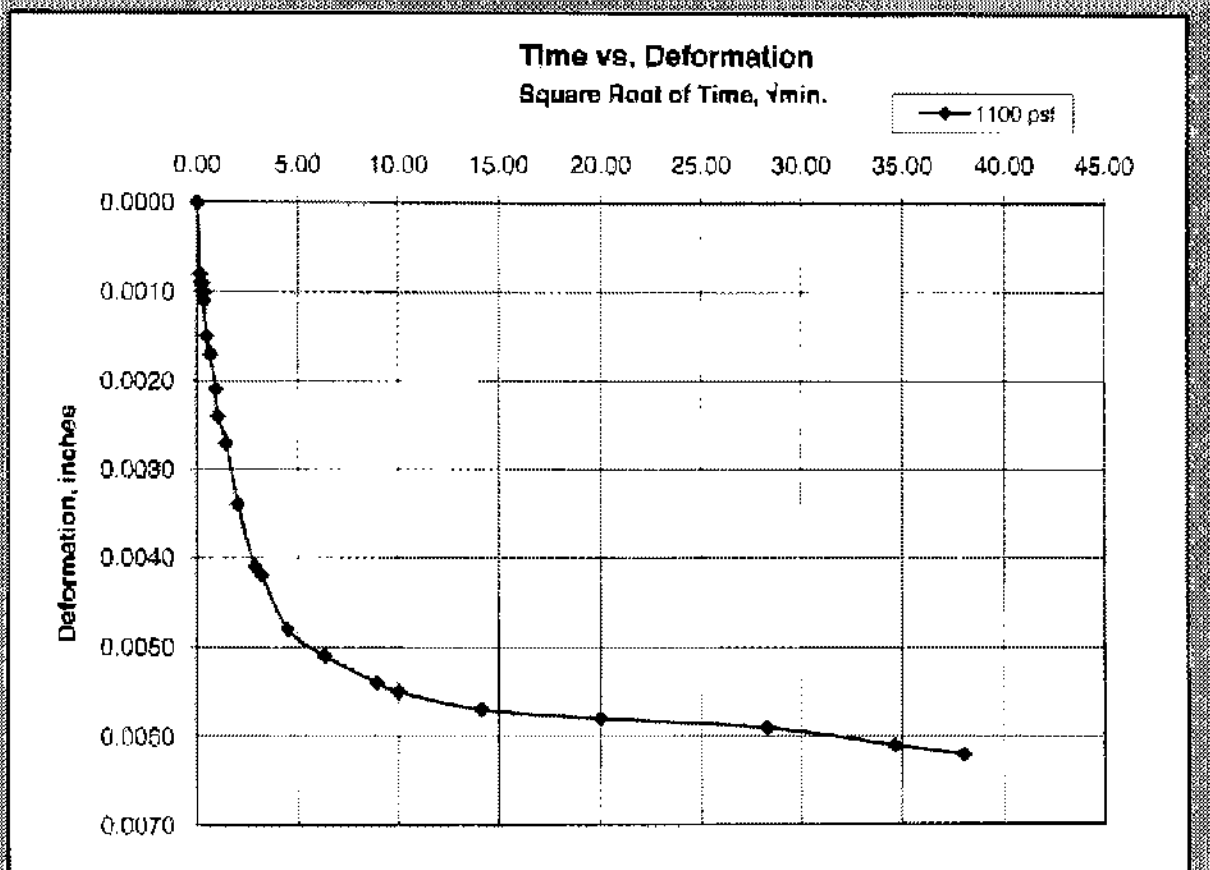
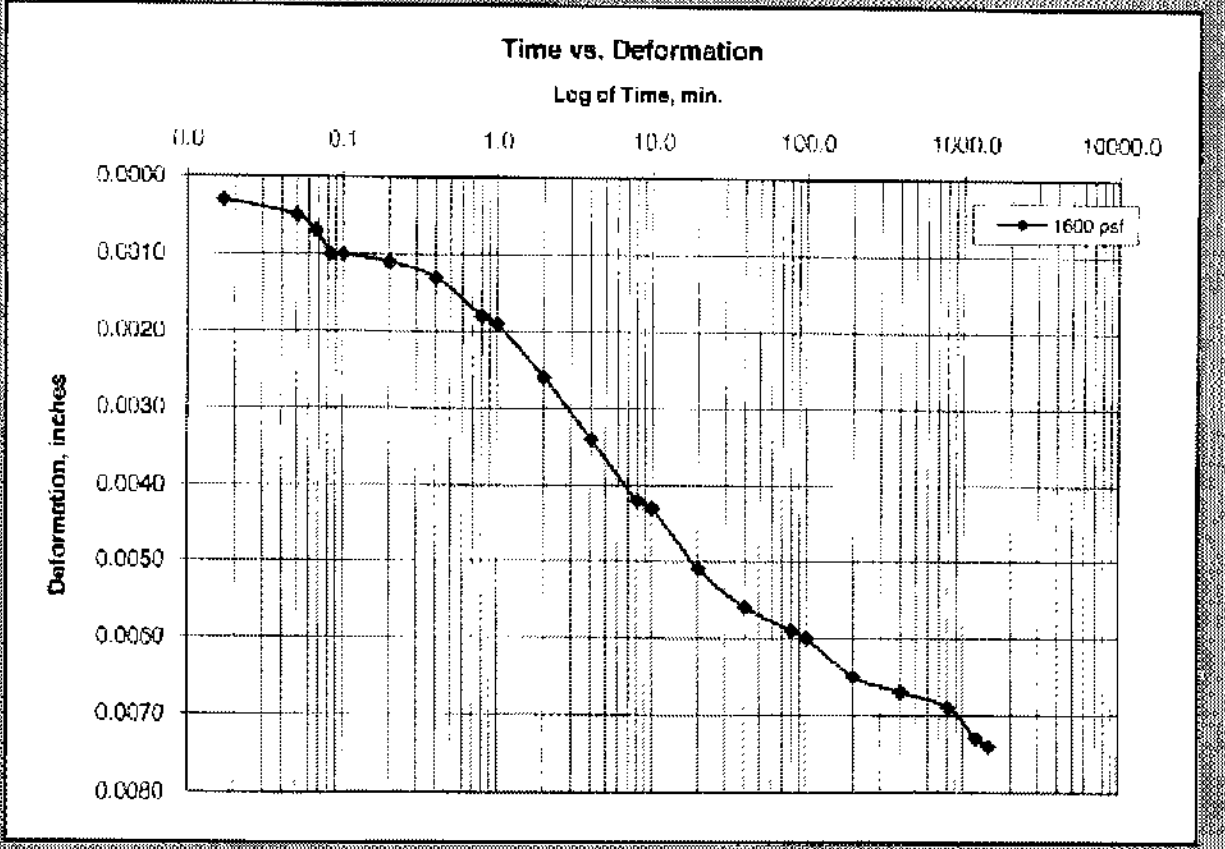


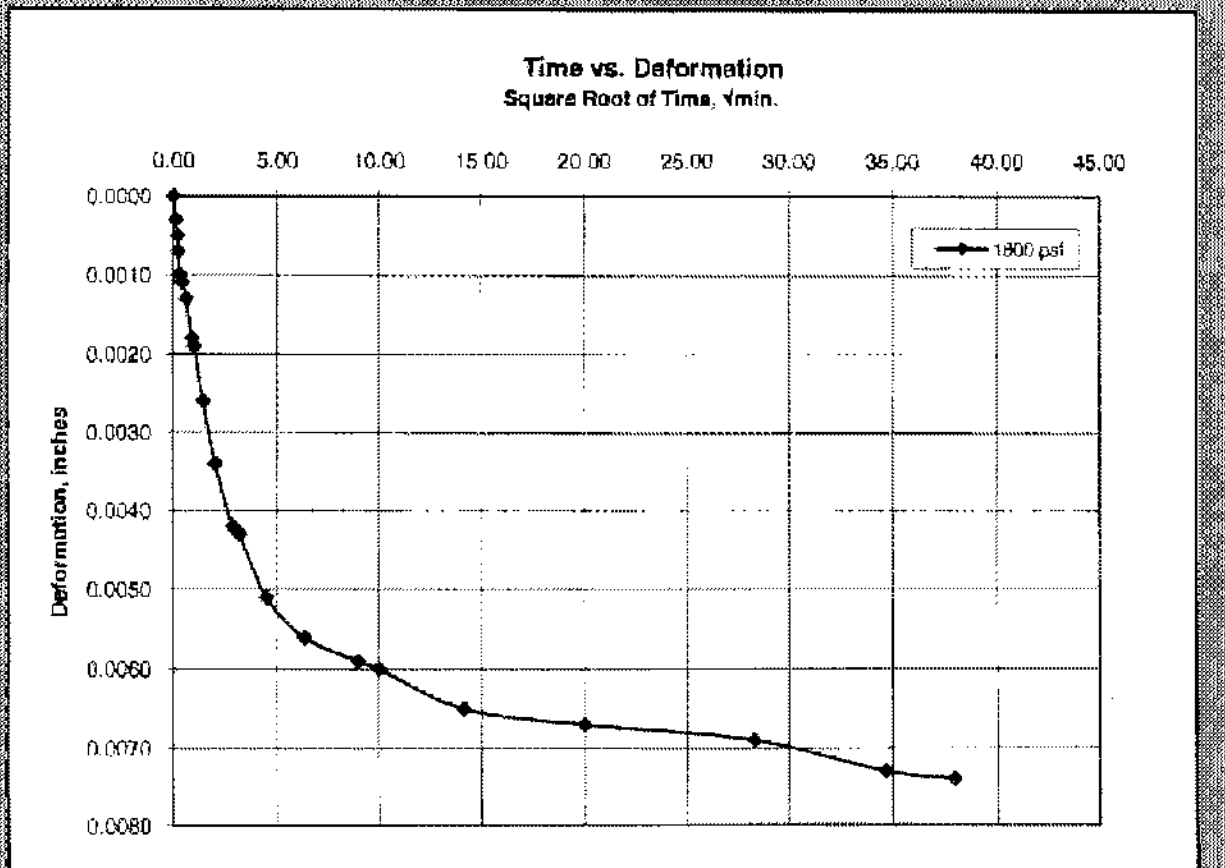
Cooper Testing Labs, Inc.

Load 5

1600 PSF

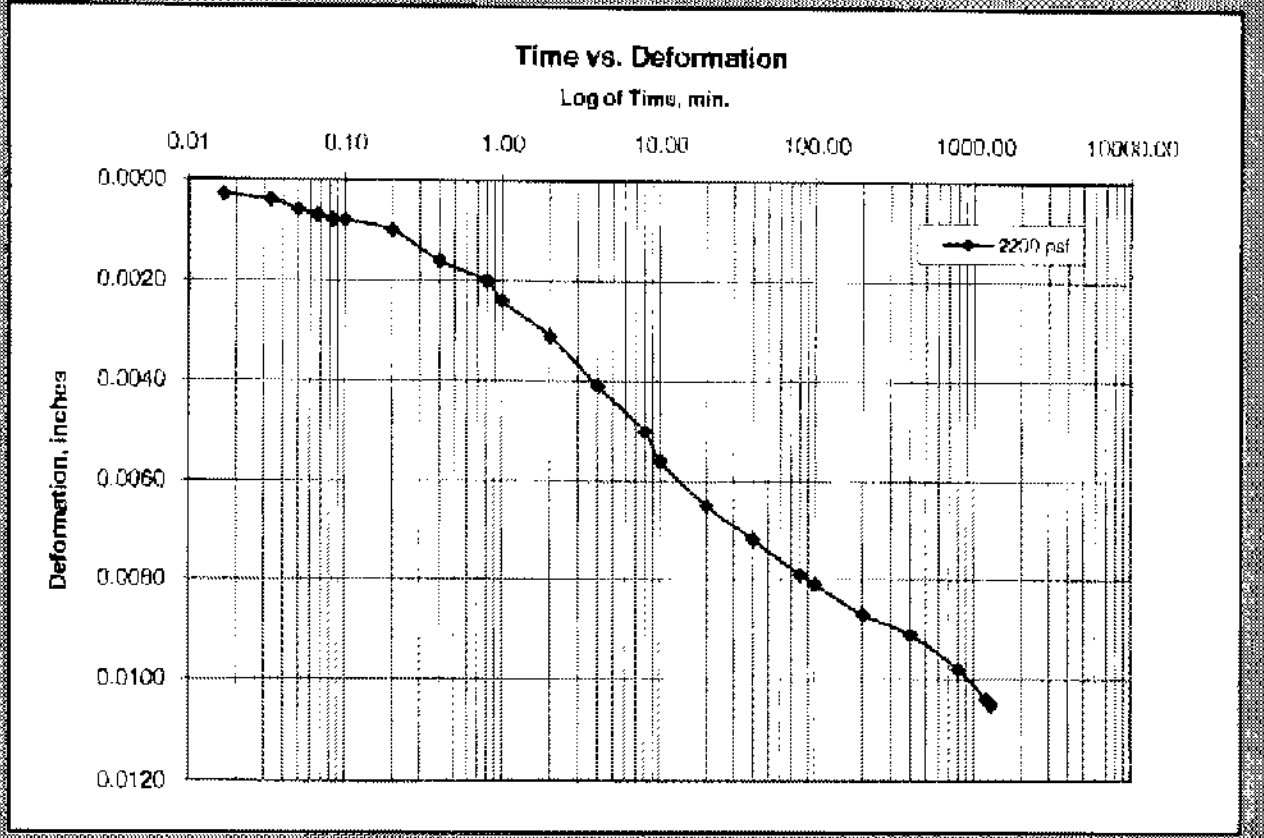


1600 PSF

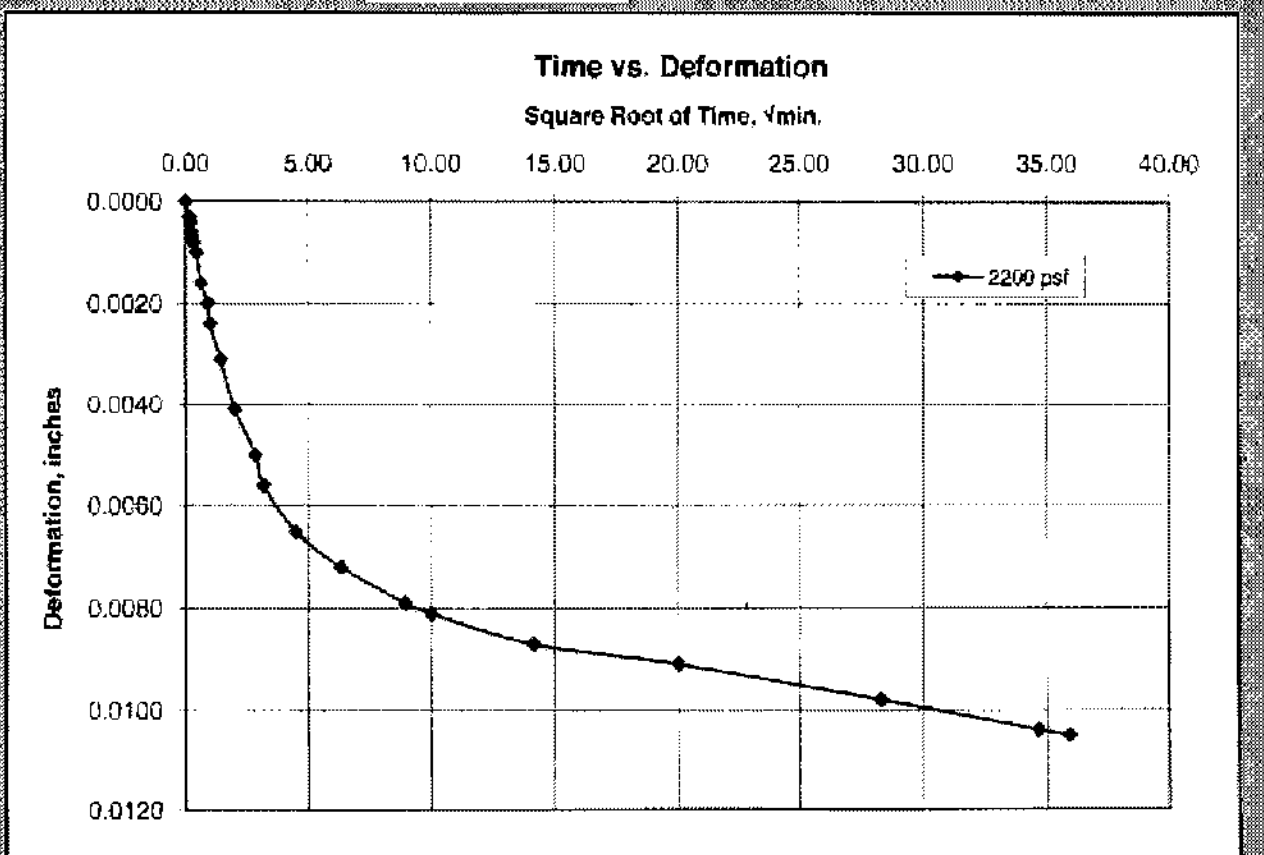


Load 6

2200 PSF



2200 PSF



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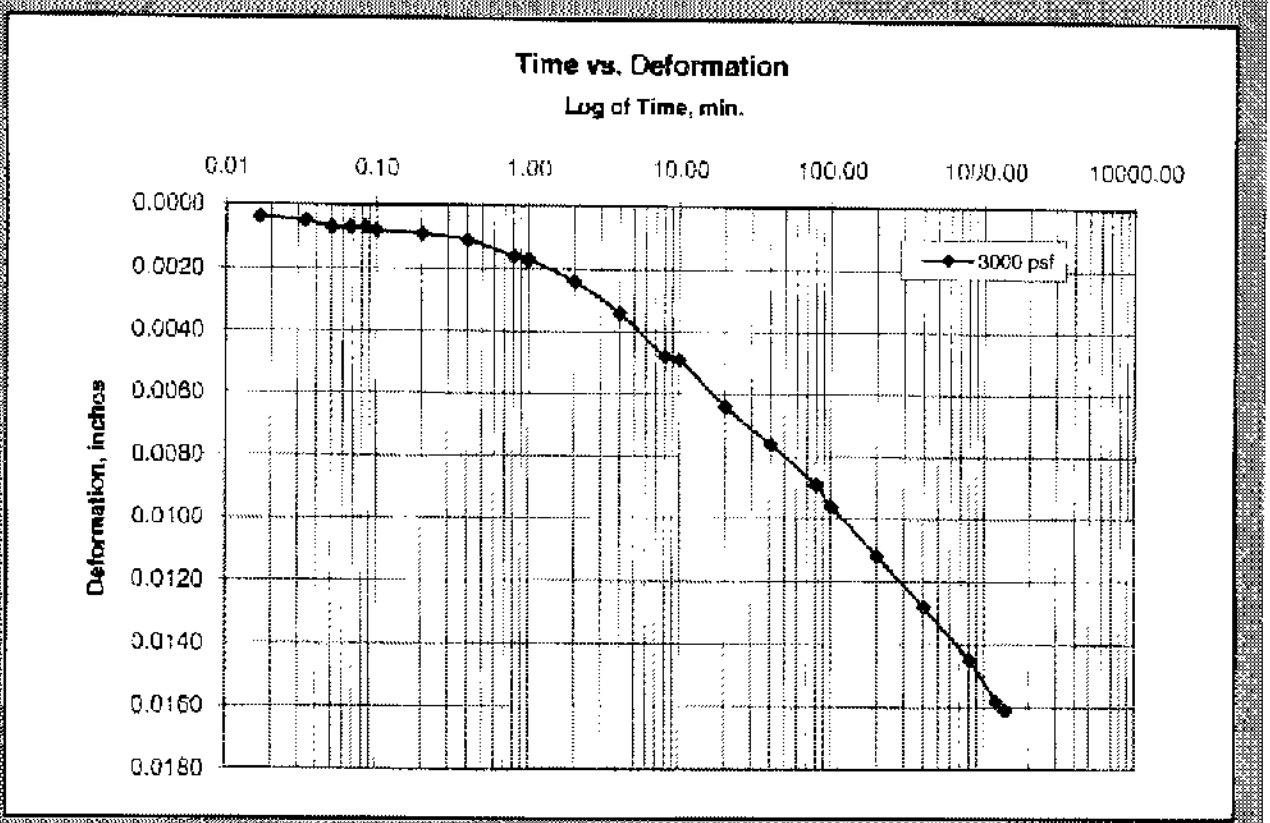

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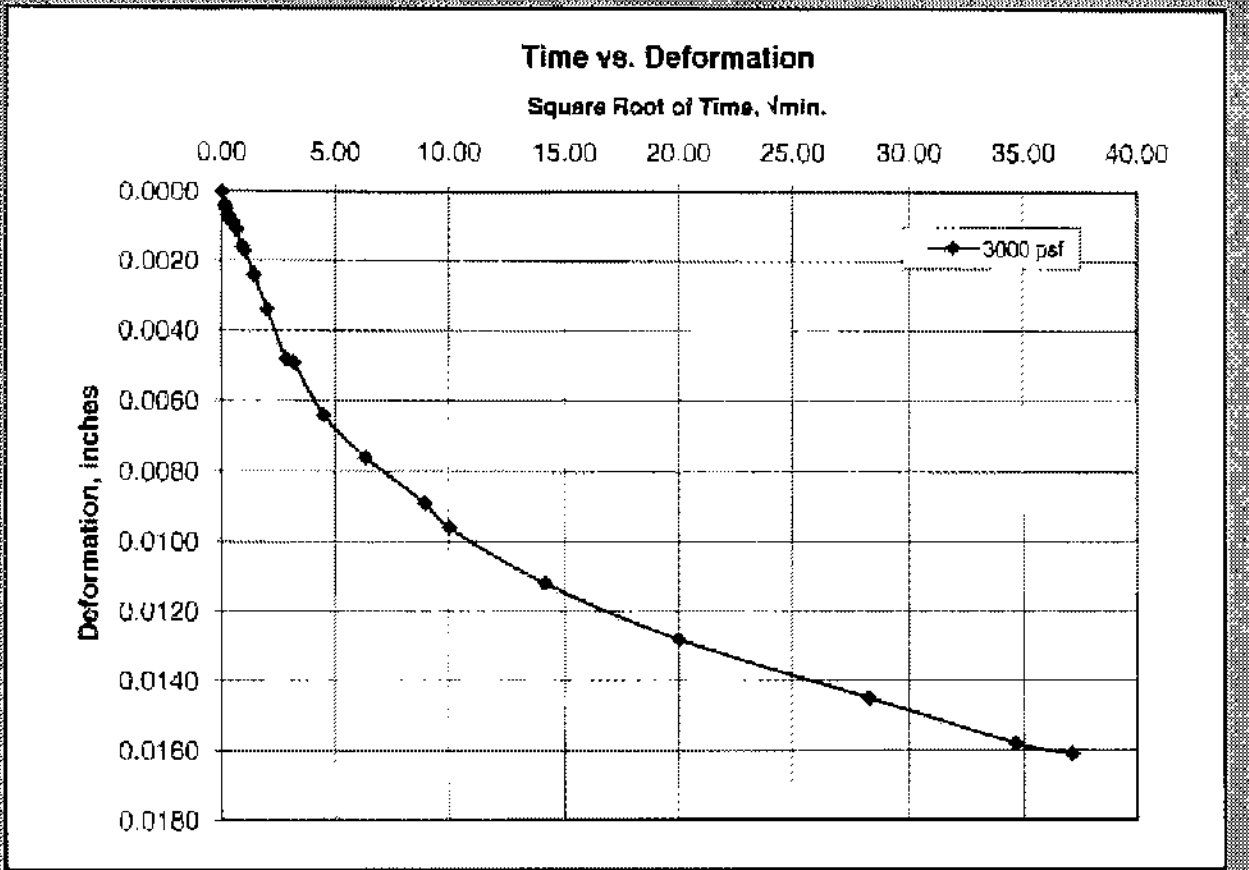

Cooper Testing Labs, Inc.

Load 8

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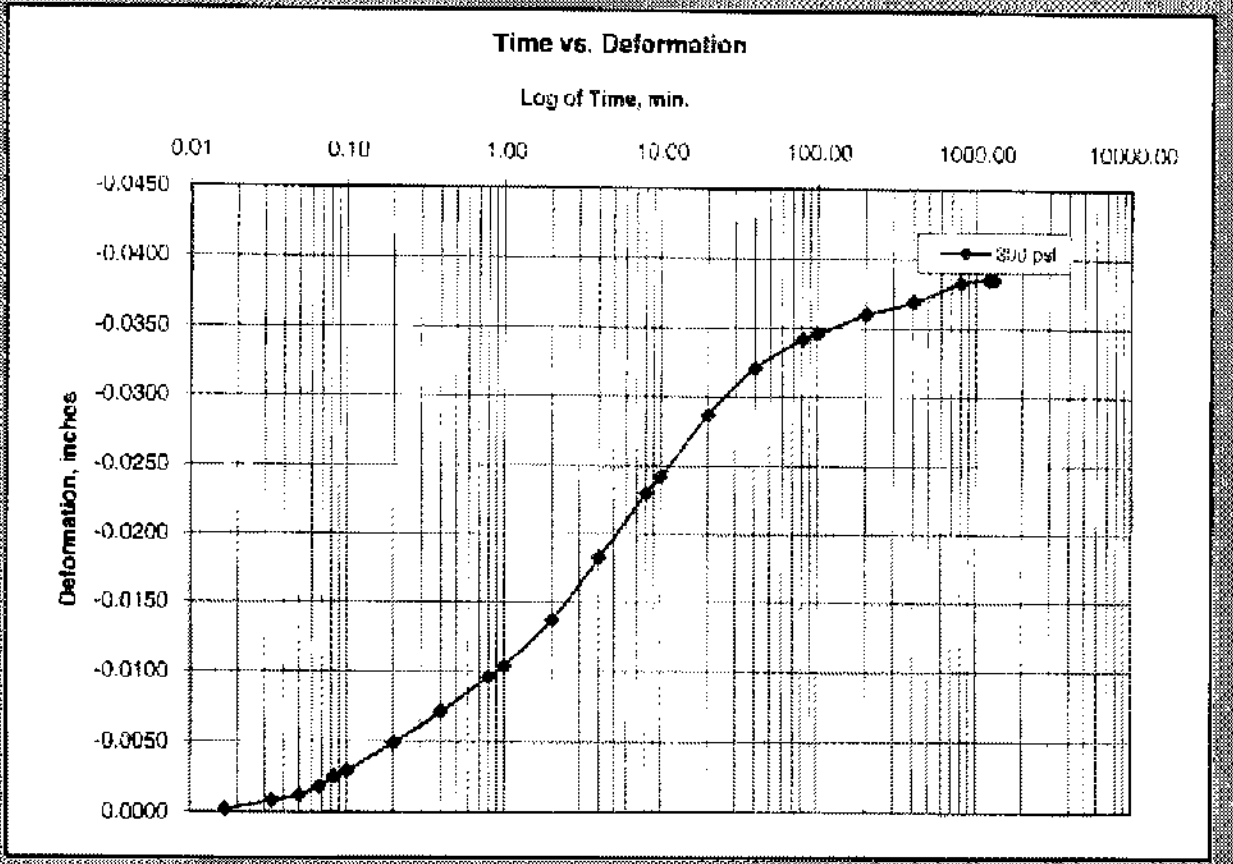
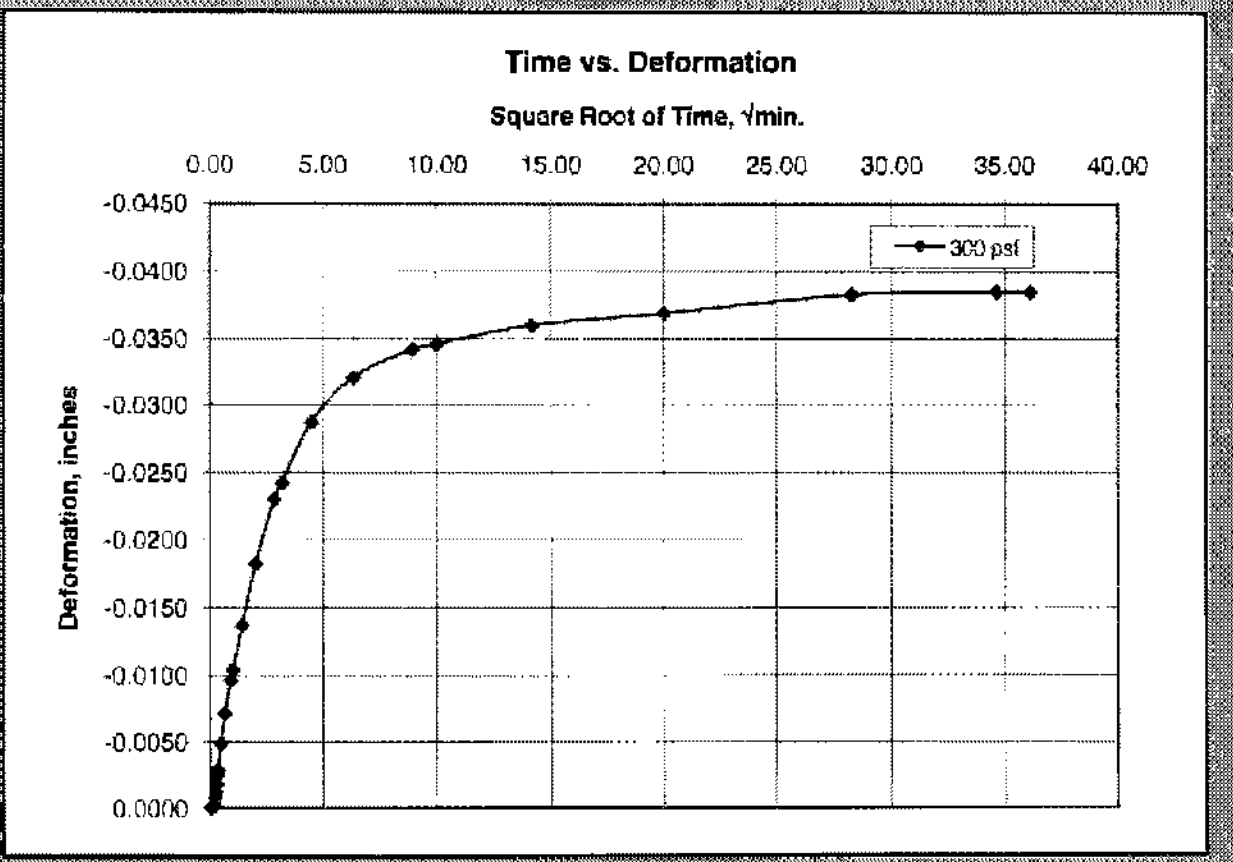
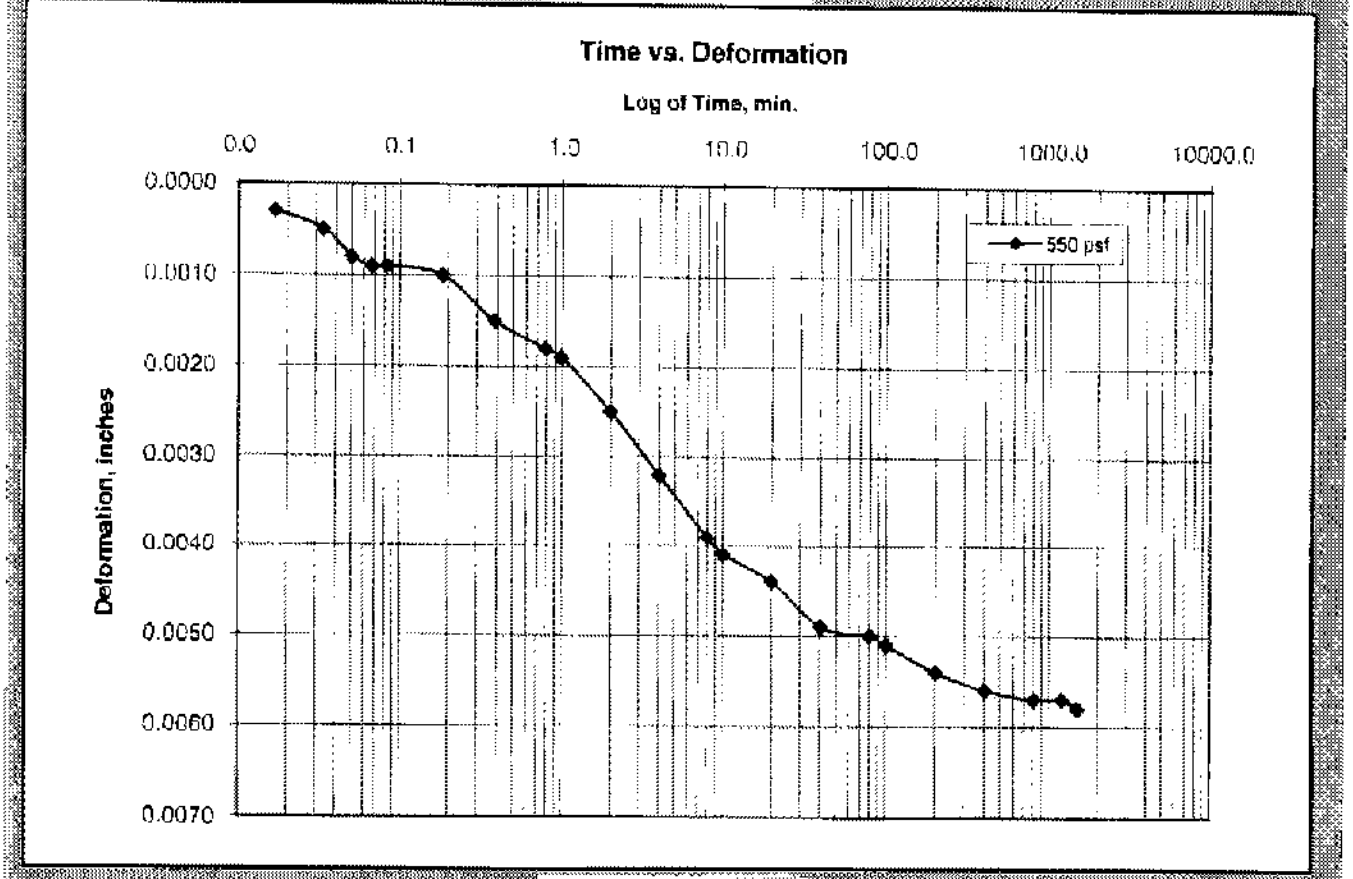


300 PSF

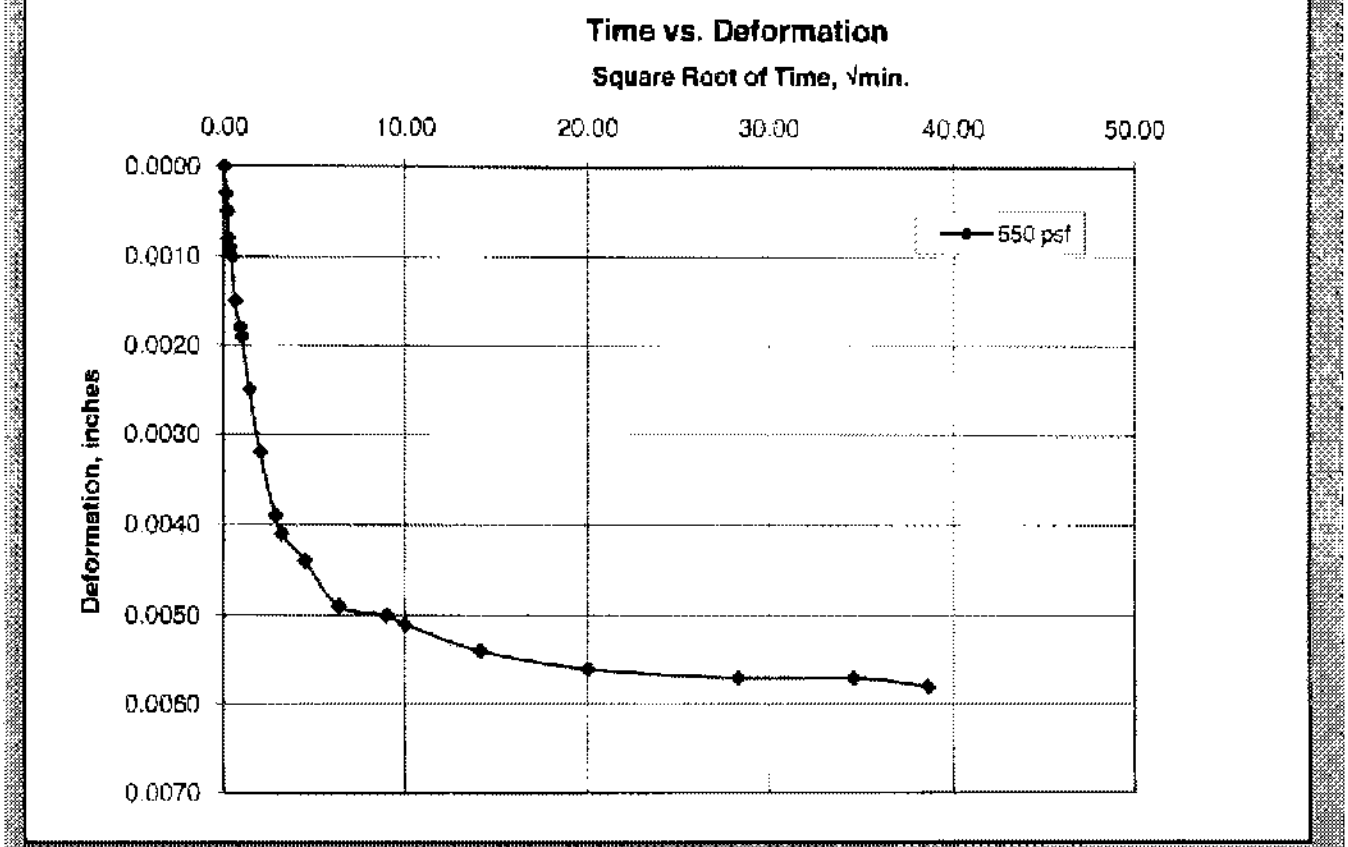


Cooper Testing Labs, Inc.

Load 9 — 550 PSF

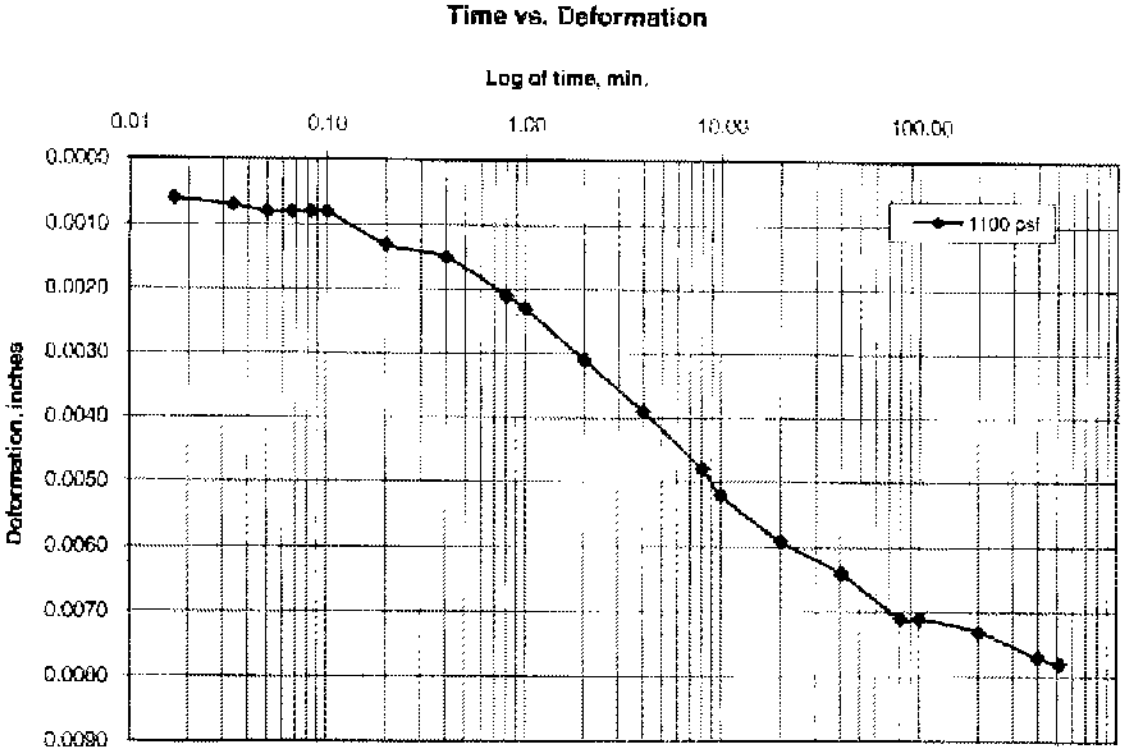


550 PSF

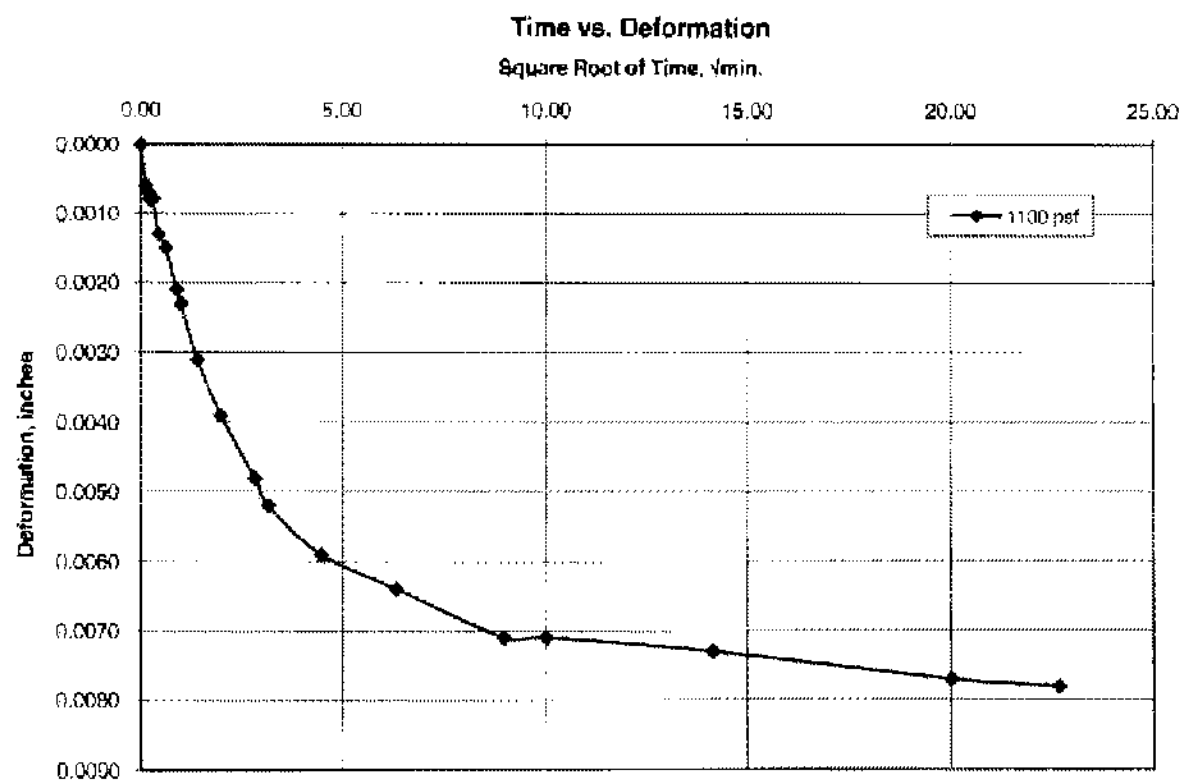


Cooper Testing Labs, Inc.

Load 10 | 1100 PSF



1100 PSF



Cooper Testing Labs, Inc.

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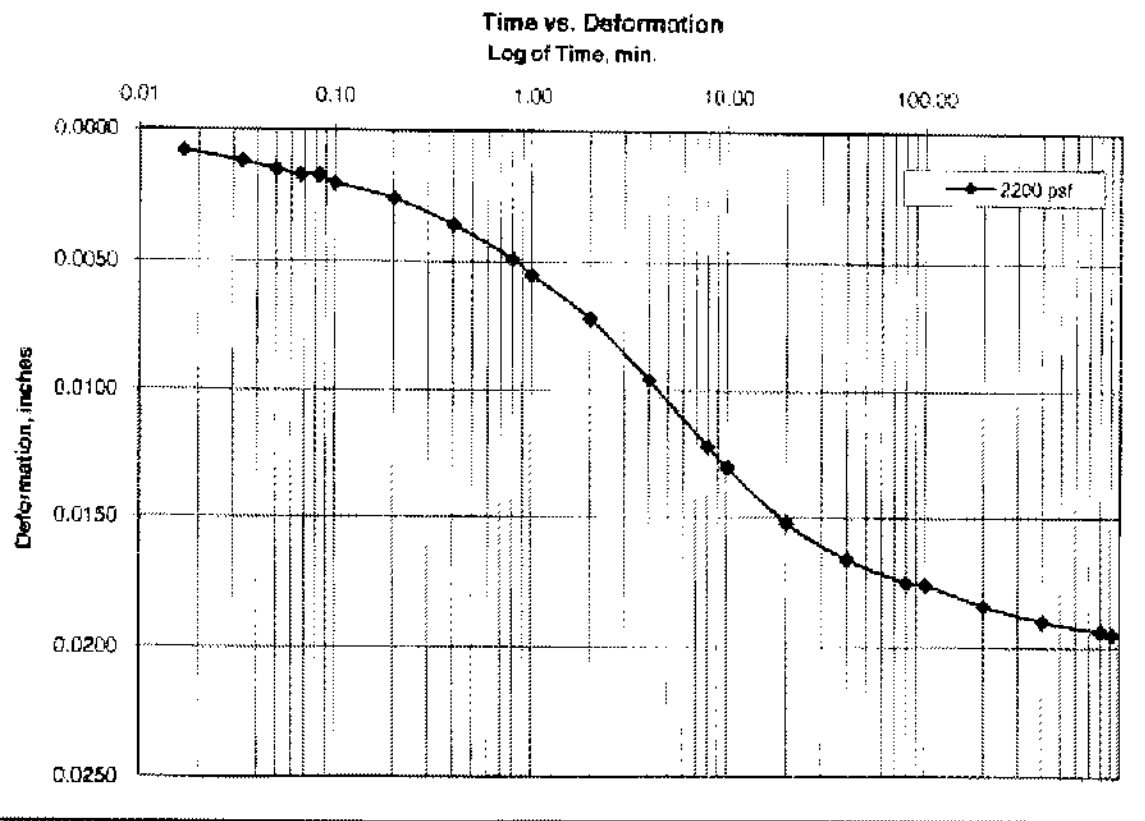
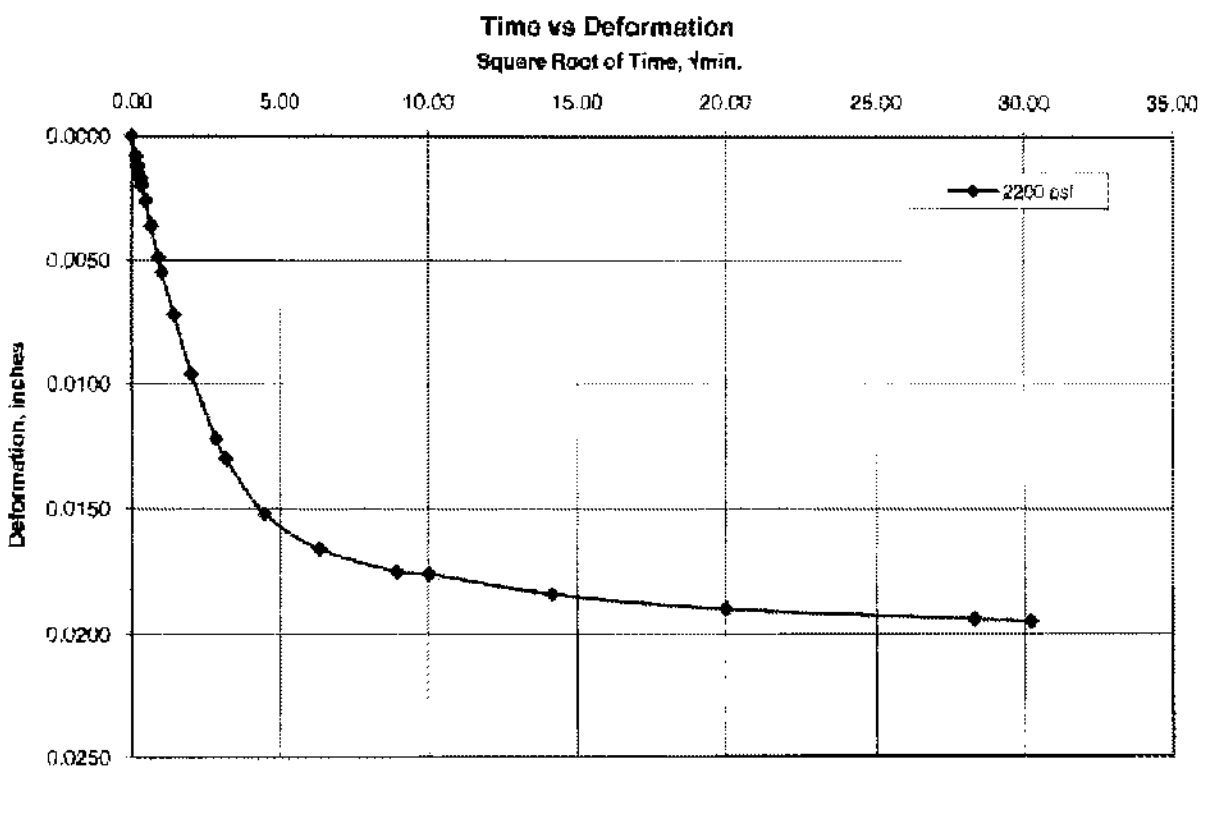
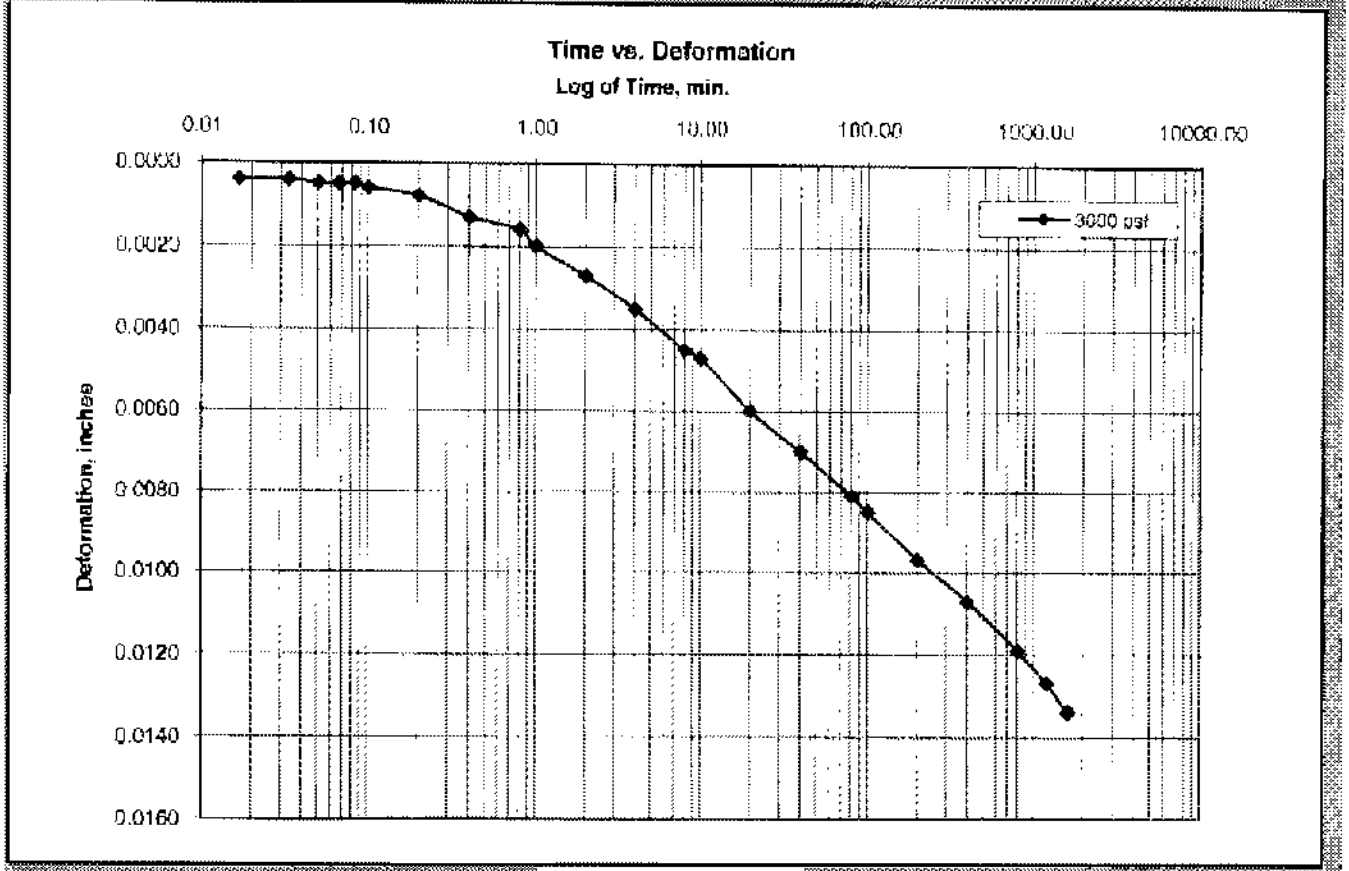


2200 PSF

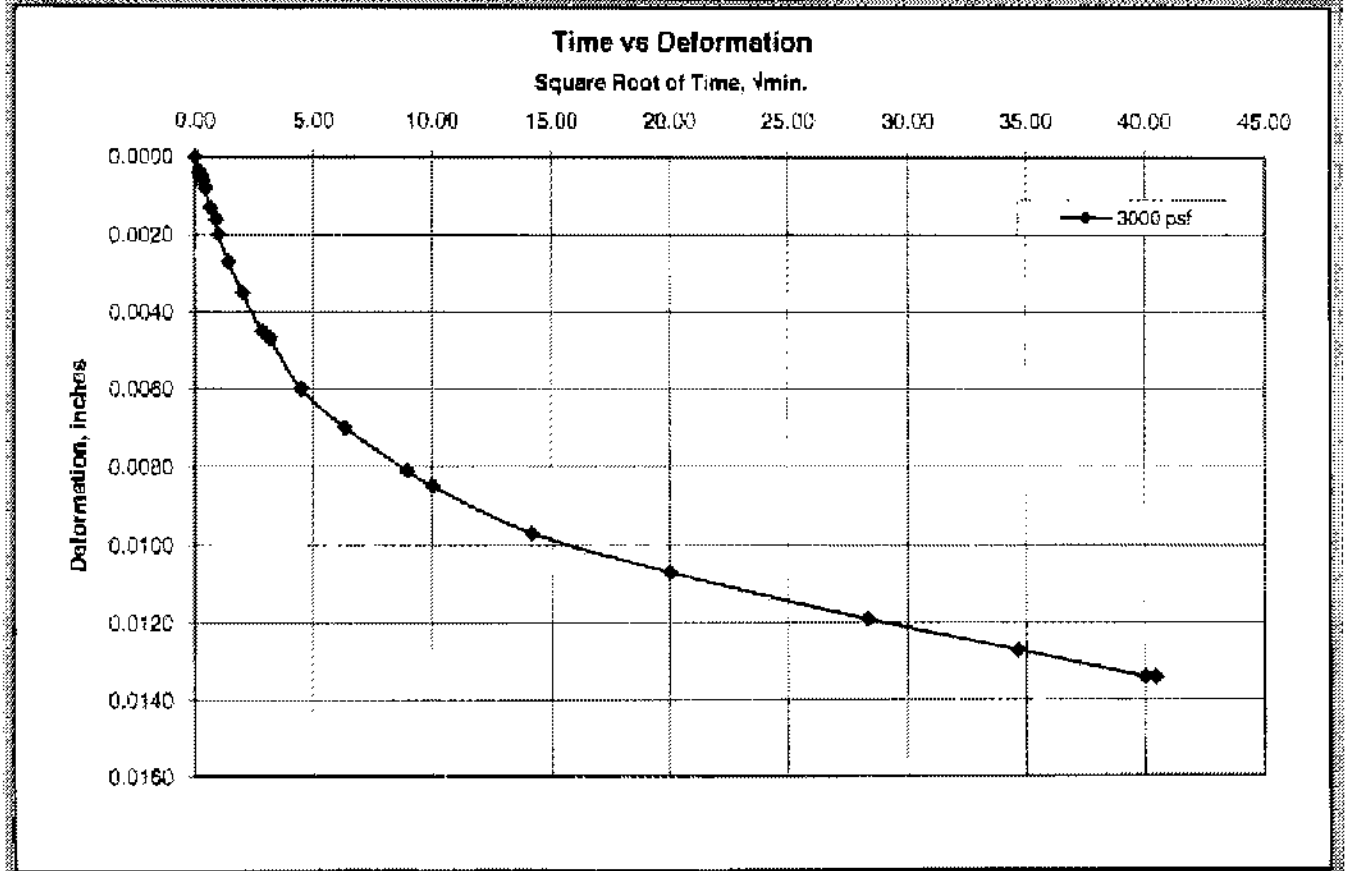


Cooper Testing Labs, Inc.

Load 12 | 3000 PSF

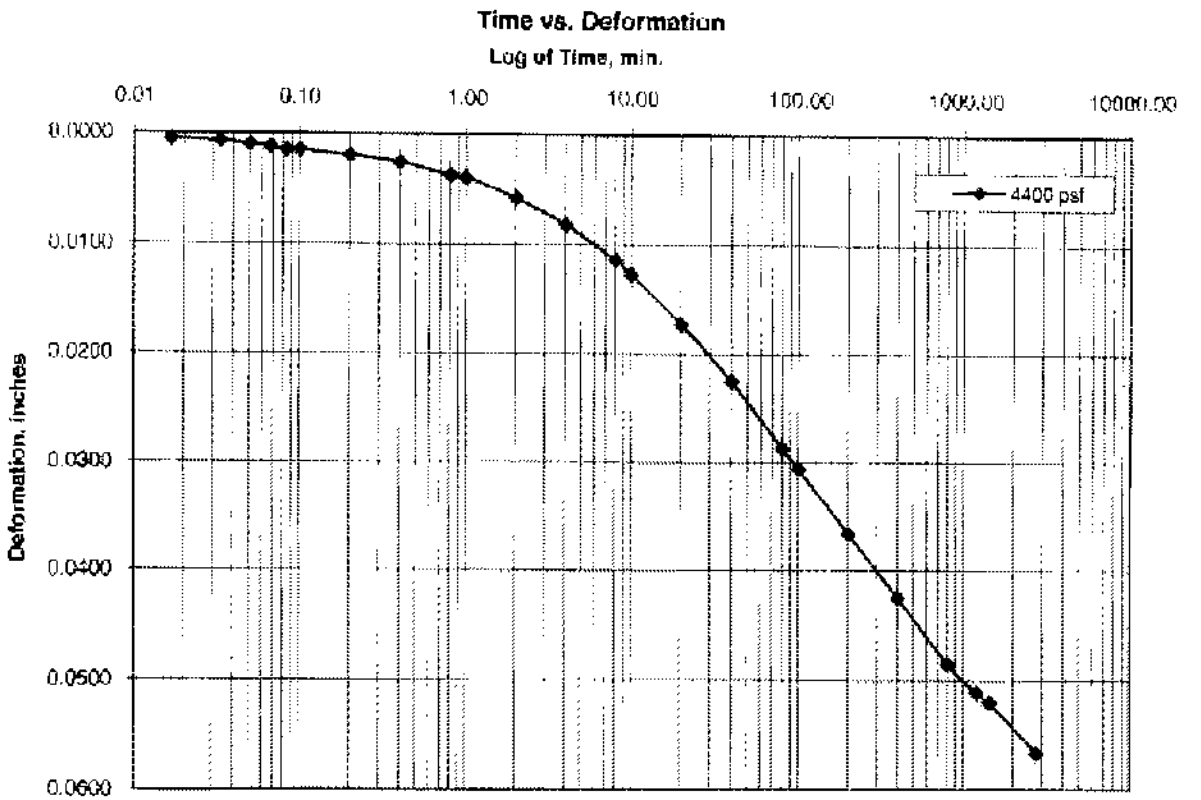


3000 PSF

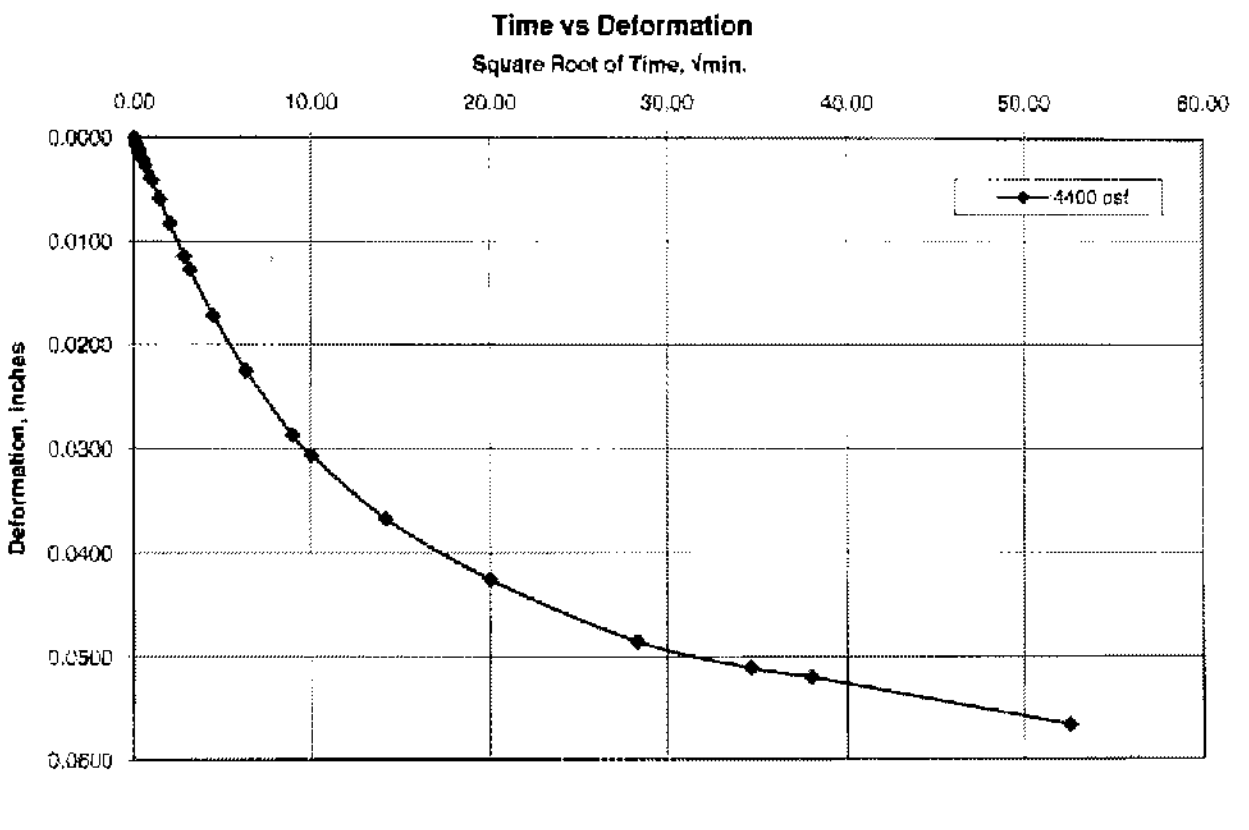


Cooper Testing Labs, Inc.

Load 13 — 4400 PSF

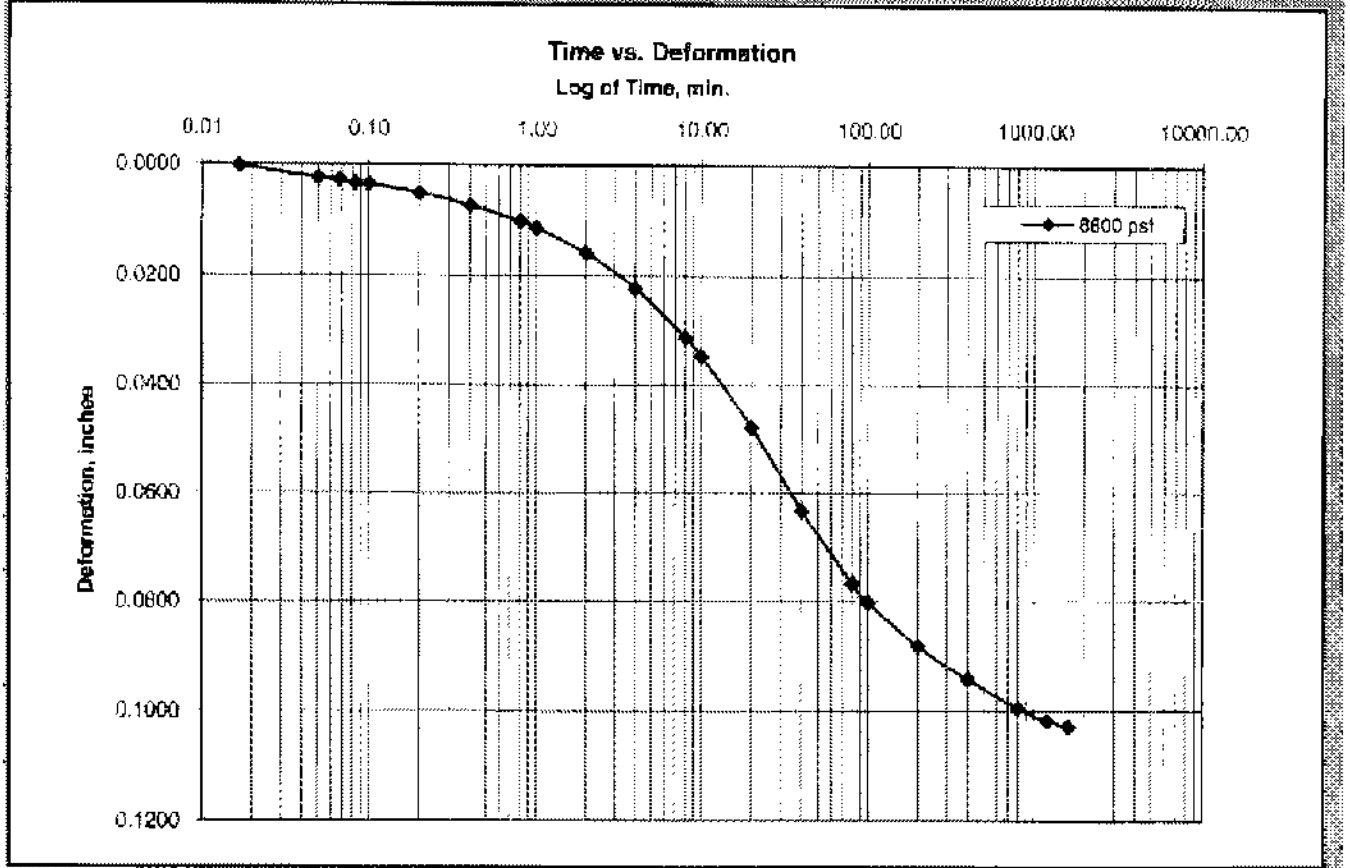


4400 PSF

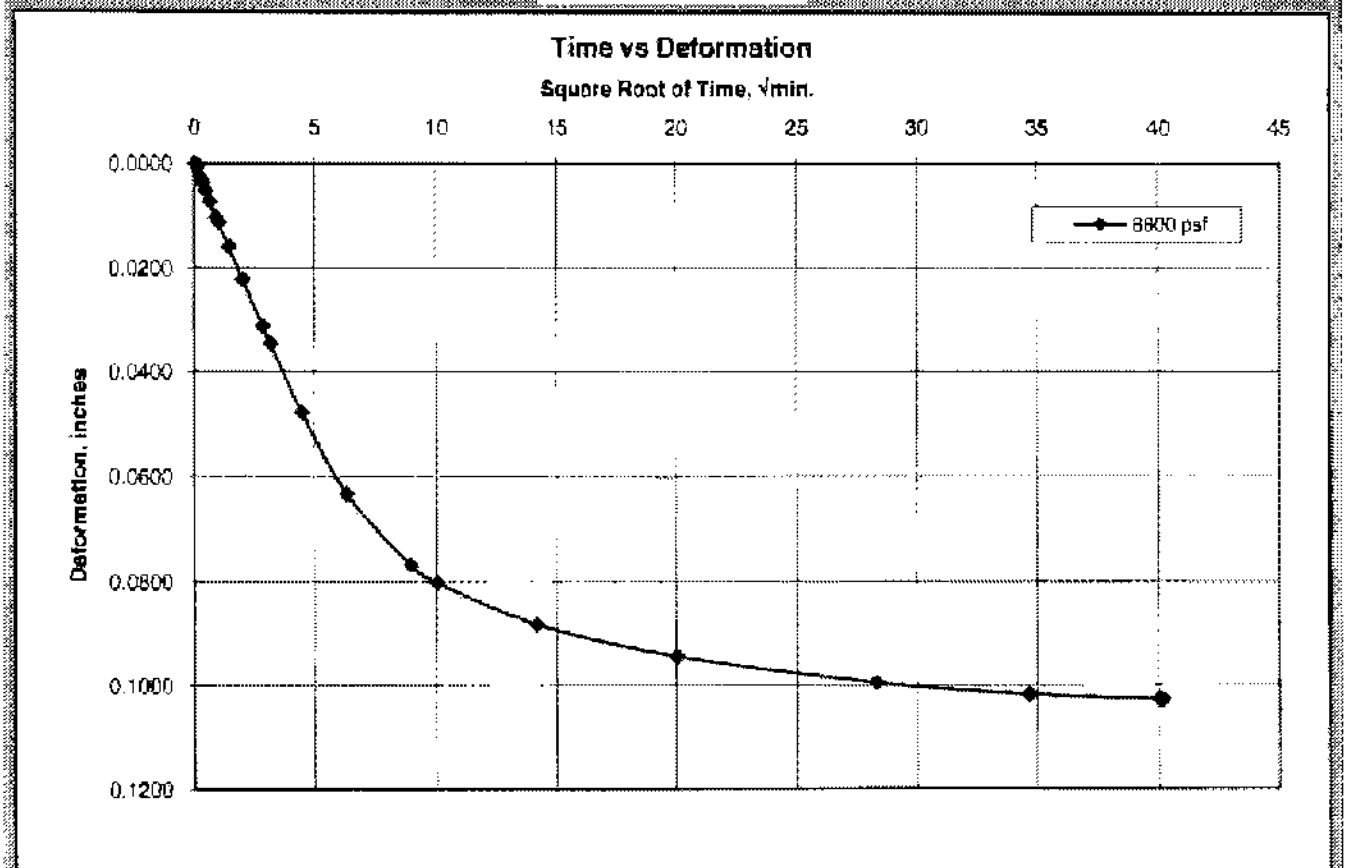


Cooper Testing Labs, Inc.

Load 14 — 8800 PSF

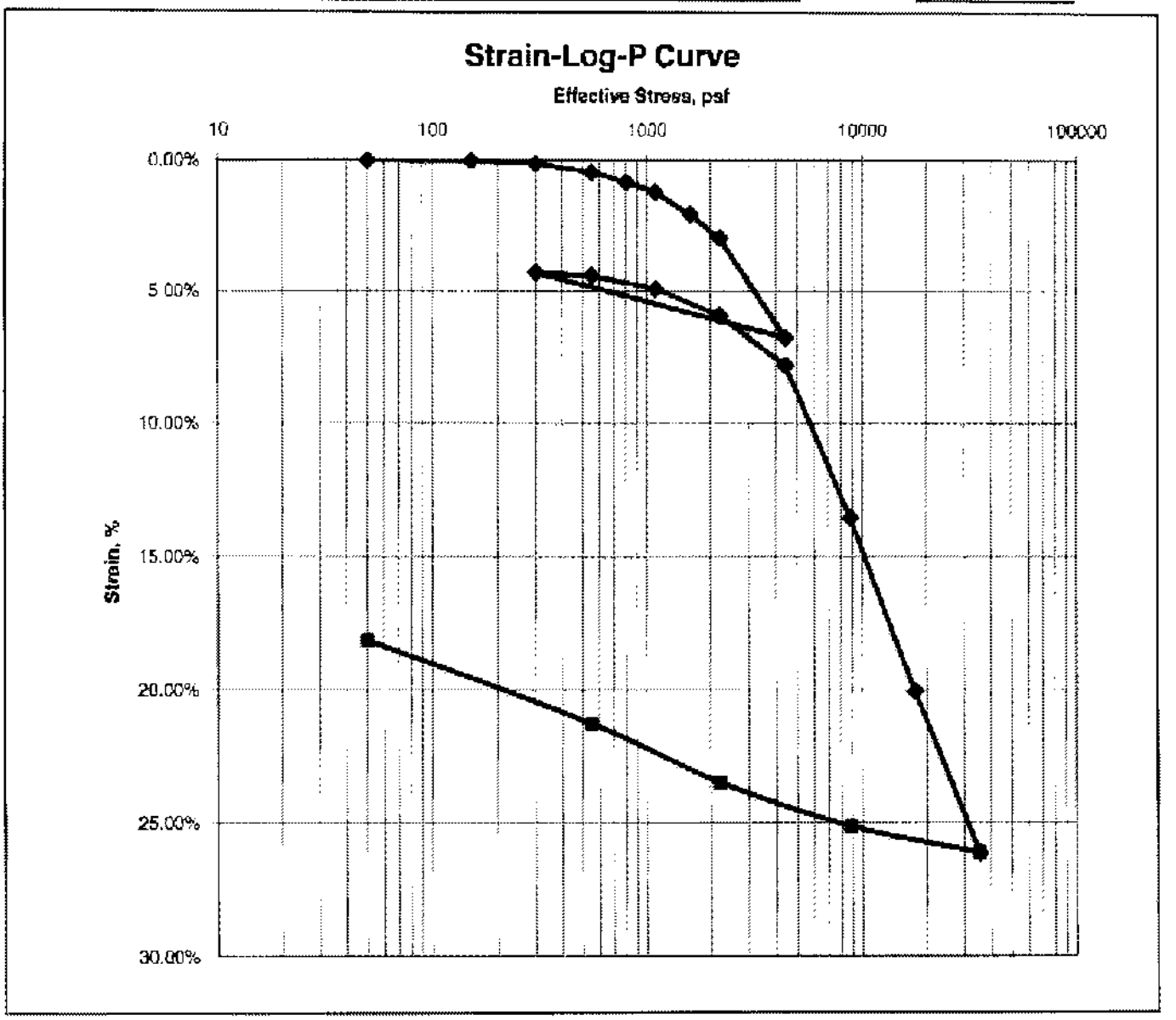


8800 PSF



Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-3	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-2	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	55-58	**Checked:**	PJ/DC
Soil Type:	Gray Lean CLAY, trace shell fragments (Bay Mud)			**Date:**	6/17/2008



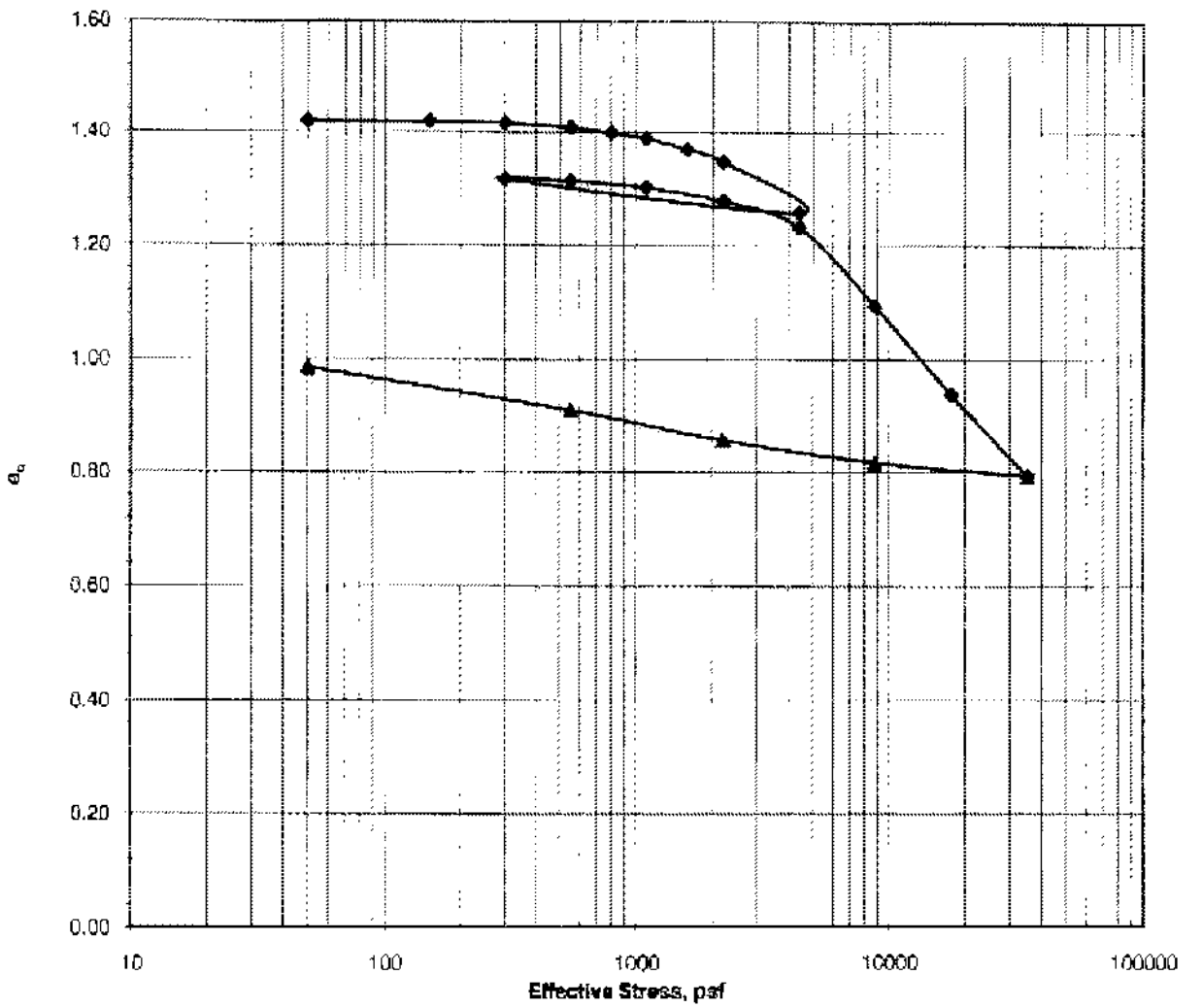
Ass. Gs = 2.75	Initial	Final
Moisture %:	50.5	36.2
Dry Density, pcf:	71.0	86.1
Void Ratio:	1.417	0.994
% Saturation:	98.0	100

Remarks:

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-3	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-2	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	55-58	**Checked:**	PJ/DC
Soil Type:	Gray Lean CLAY, trace shell fragments (Bay Mud)			**Date:**	6/17/2008

eo-Log-P Curve



Ass. Gs = 2.75	Initial	Final
Moisture %:	50.5	36.2
Dry Density, pcf:	71.0	86.1
Void Ratio:	1.417	0.994
% Saturation:	98.0	100

Remarks:

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane Project
Boring	GS08-3
Sample:	S3-2
Depth, ft.:	55-58
Date:	6/17/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Description:	Gray Lean CLAY, trace shell fragments (Bay Mud)

Moisture Density Data Entry Screen

	Initial	Final
Height	1.01	0.8332
Diameter	2.41	2.41
Total Wet Weight	129.3	117
Wt of Wet Soil & Dish		181.5
Wt of Dry Soil & Dish		150.3
Wt. Of Dish		19.4
Wt of Ring		45
Moisture %	50.5	36.2
Wet Density, pcf	106.9	117.3
Dry Density, pcf	71.0	86.1
Specific Gravity	2.75	2.75
Area	4.6	4.6
V fill	0.0	0.0
Vt, cc	75.5	62.3
Vs, cc	31.2	31.2
Vv, cc	44.3	31.1
e	1.4	1.0
porosity, %	58.6	49.9
S, %	99.0	100

Loading Increments — **Void Ratio**

Increment #	Load, psf	Dial .0001"	Load psf	Height Delta h	Volume Vt cc	Voids Vv	Void Ratio e
1	50	0.0001	50	1.0099	75.55	44.316	1.419
2	150	0.0002	150	1.0098	75.54	44.308	1.418
3	300	0.0013	300	1.0087	75.46	44.228	1.415
4	550	0.0047	550	1.0053	75.21	43.972	1.408
5	800	0.0086	800	1.0014	74.92	43.680	1.398
6	1100	0.0125	1100	0.9975	74.62	43.388	1.389
7	1600	0.0205	1600	0.9895	74.00	42.767	1.369
8	2200	0.0297	2200	0.9803	73.34	42.101	1.348
9	4400	0.0675	4400	0.9425	70.51	39.273	1.257
10	300	0.0428	300	0.9672	72.36	41.1212	1.316454
11	550	0.0440	550	0.9660	72.27	41.0315	1.313589
12	1100	0.0491	1100	0.9609	71.89	40.6499	1.301365
13	2200	0.0591	2200	0.9509	71.14	39.9018	1.277415
14	4400	0.0701	4400	0.9319	69.72	38.4804	1.23191
15	8800	0.1356	8800	0.8744	65.42	34.1787	1.094197
16	17600	0.2007	17600	0.8093	60.54	29.3085	0.938282
17	35200	0.2613	35200	0.7487	56.01	24.7749	0.793144
18		0.2613	#N/A	0.7487	56.01	24.7749	0.793144
19		0.2613	#N/A	0.7487	56.01	24.7749	0.793144

Rebound Increments — **Void Ratio**

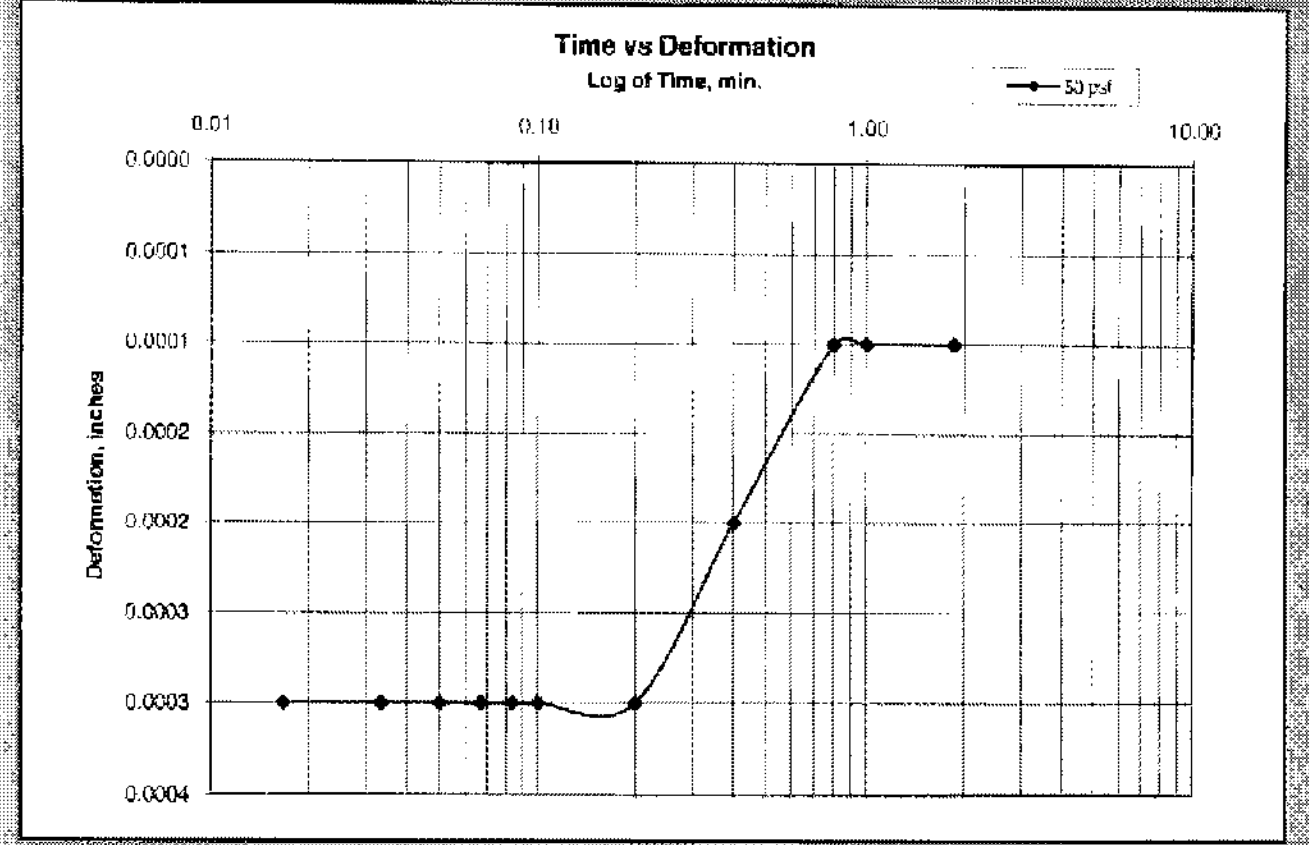
15	35200	0.2613	35200	0.7487	56.01	24.7749	0.793144
16	8800	0.2514	8800	0.7586	56.75	25.5156	0.816855
17	2200	0.2350	2200	0.7750	57.98	26.7425	0.856139
18	550	0.2129	550	0.7971	59.63	28.3958	0.909063
19	50	0.1812	50	0.8286	62.00	30.7676	0.984984
20			#N/A	1.0100	75.56	44.3232	1.41866
	Tot Dry Wt	65.5000					

The data to the left is used to determine the theoretical

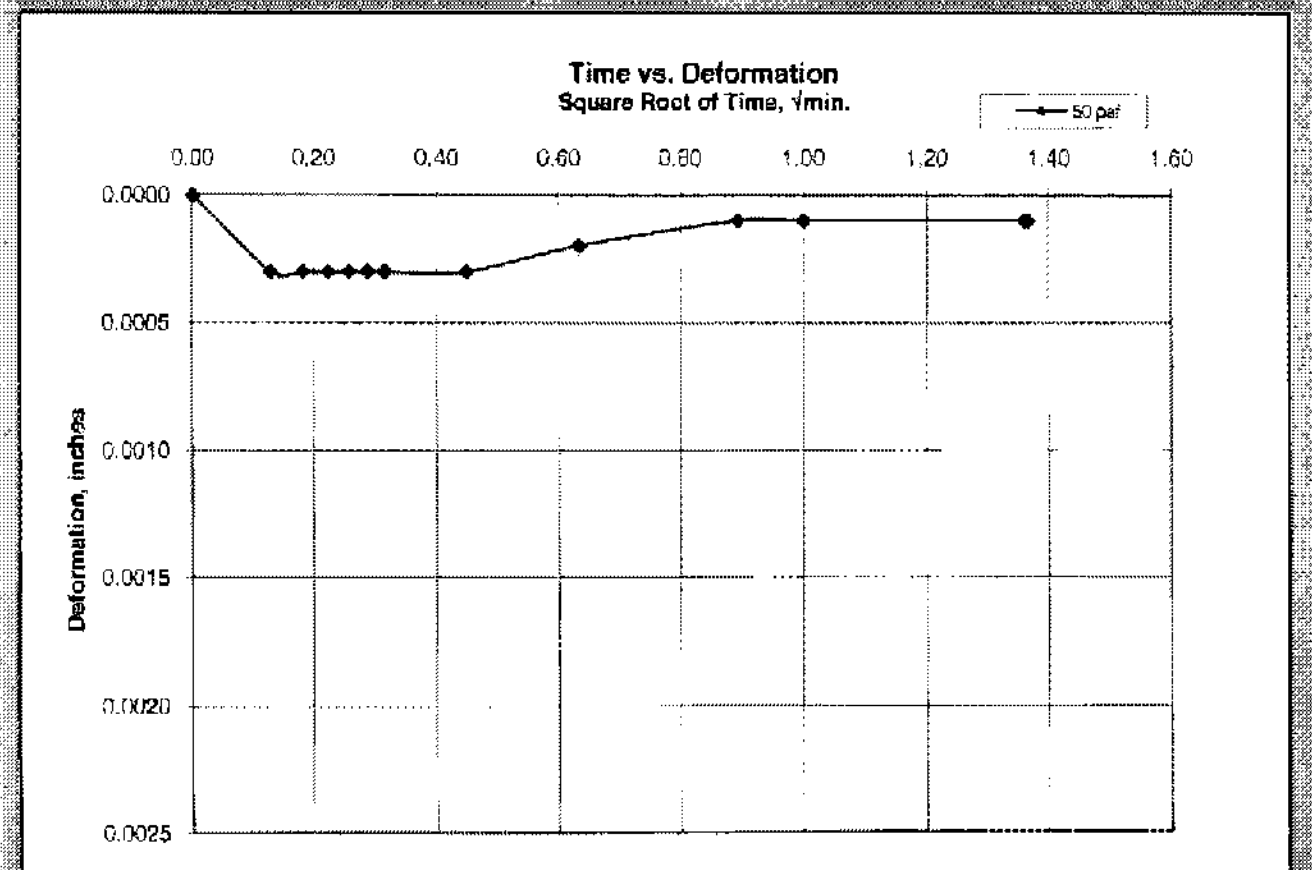
Cooper Testing Labs, Inc.

Load 1

50 PSF

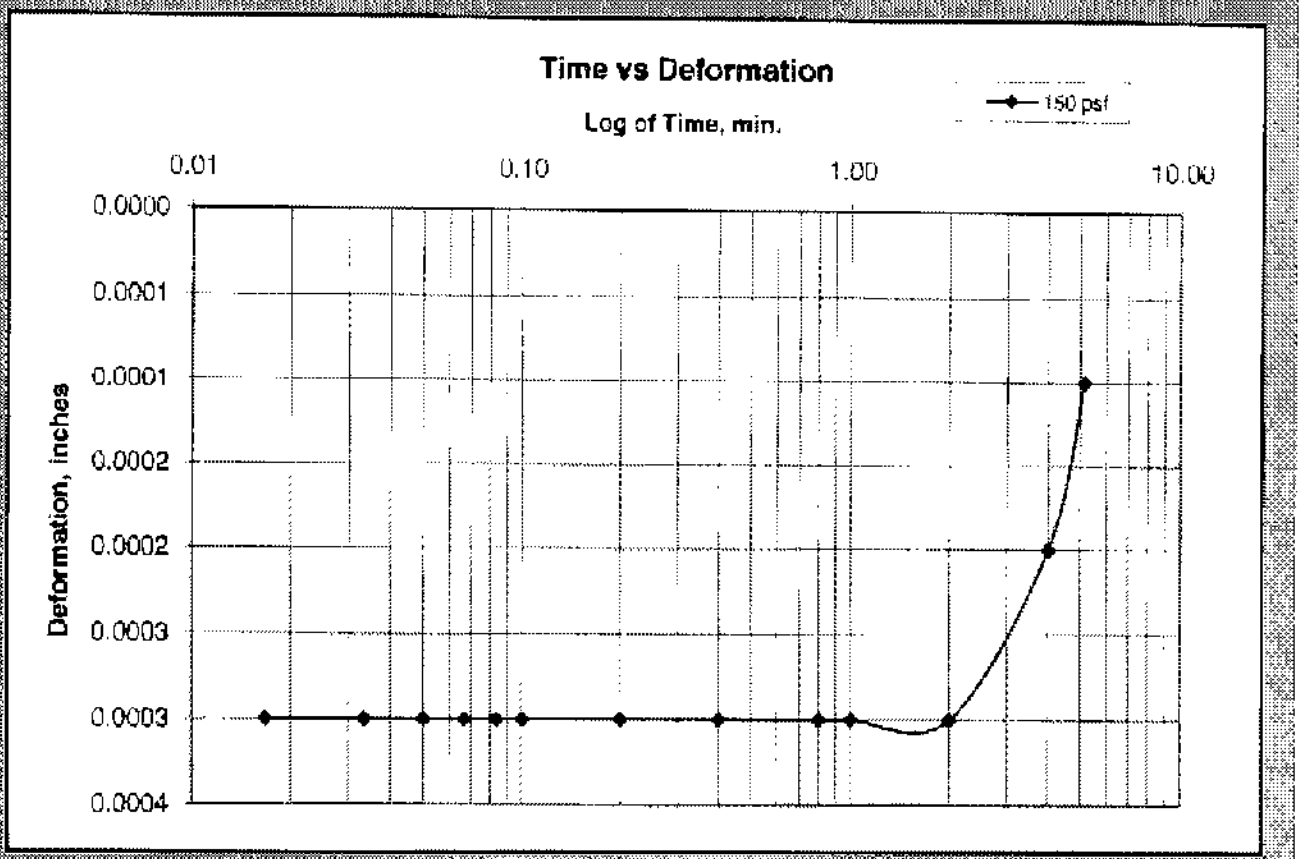


50 PSF

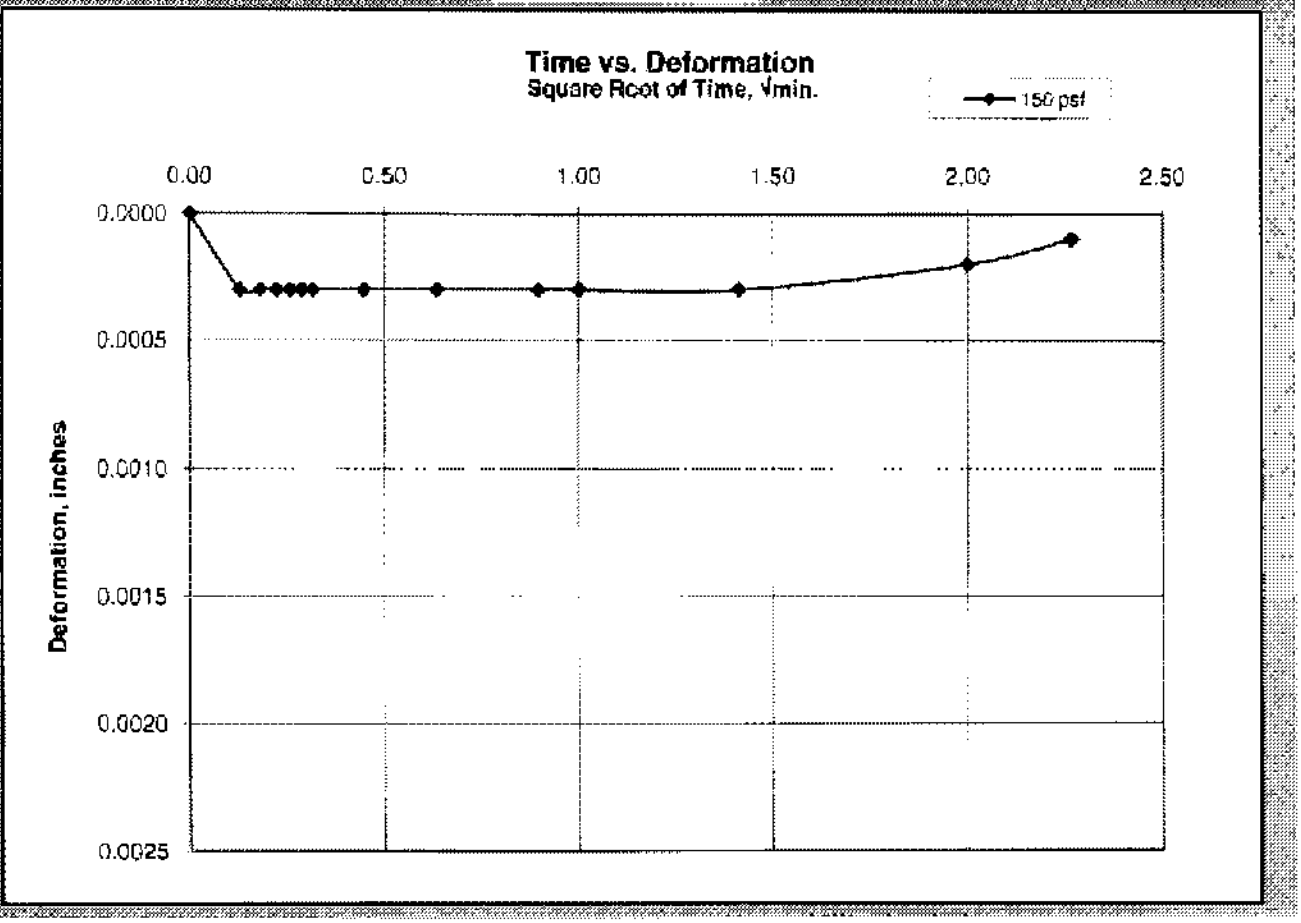


Cooper Testing Labs, Inc.

Load 2 — 150 PSF



150 PSF



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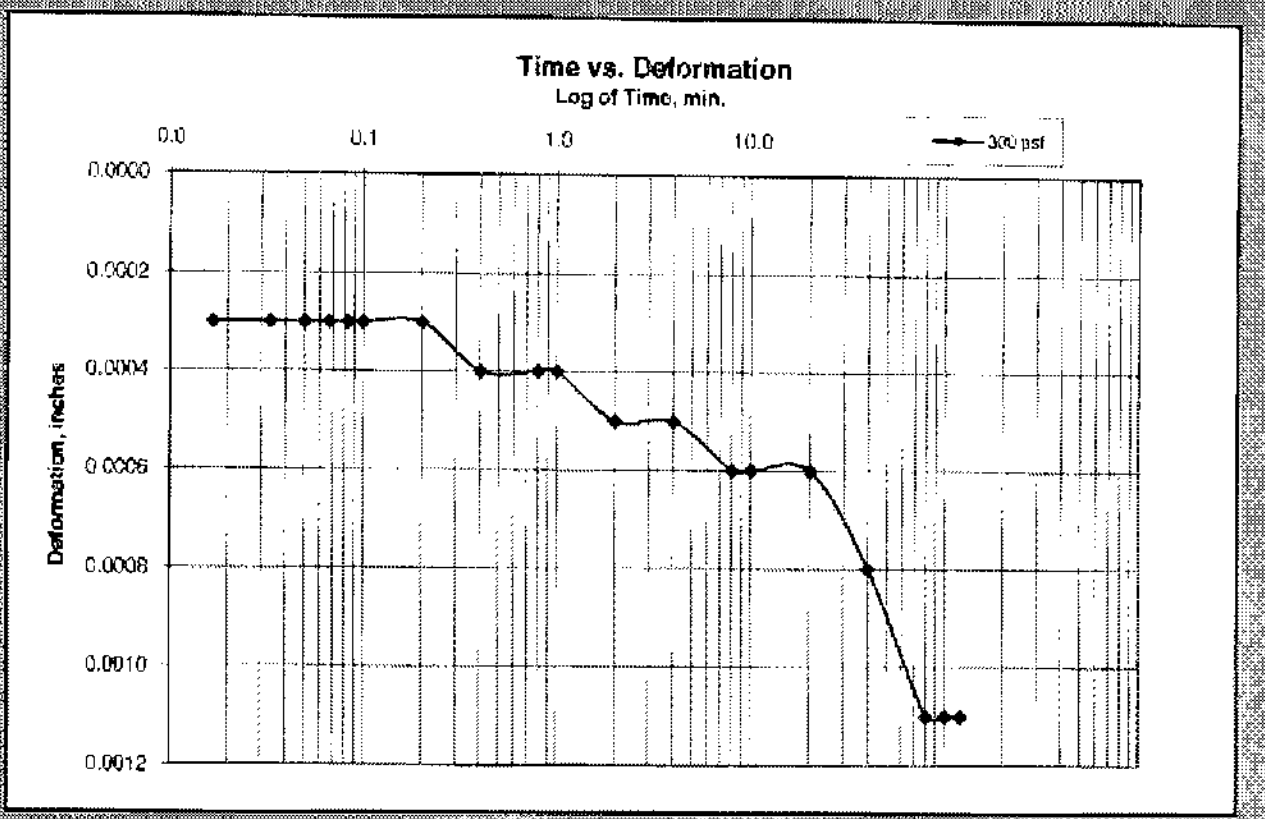
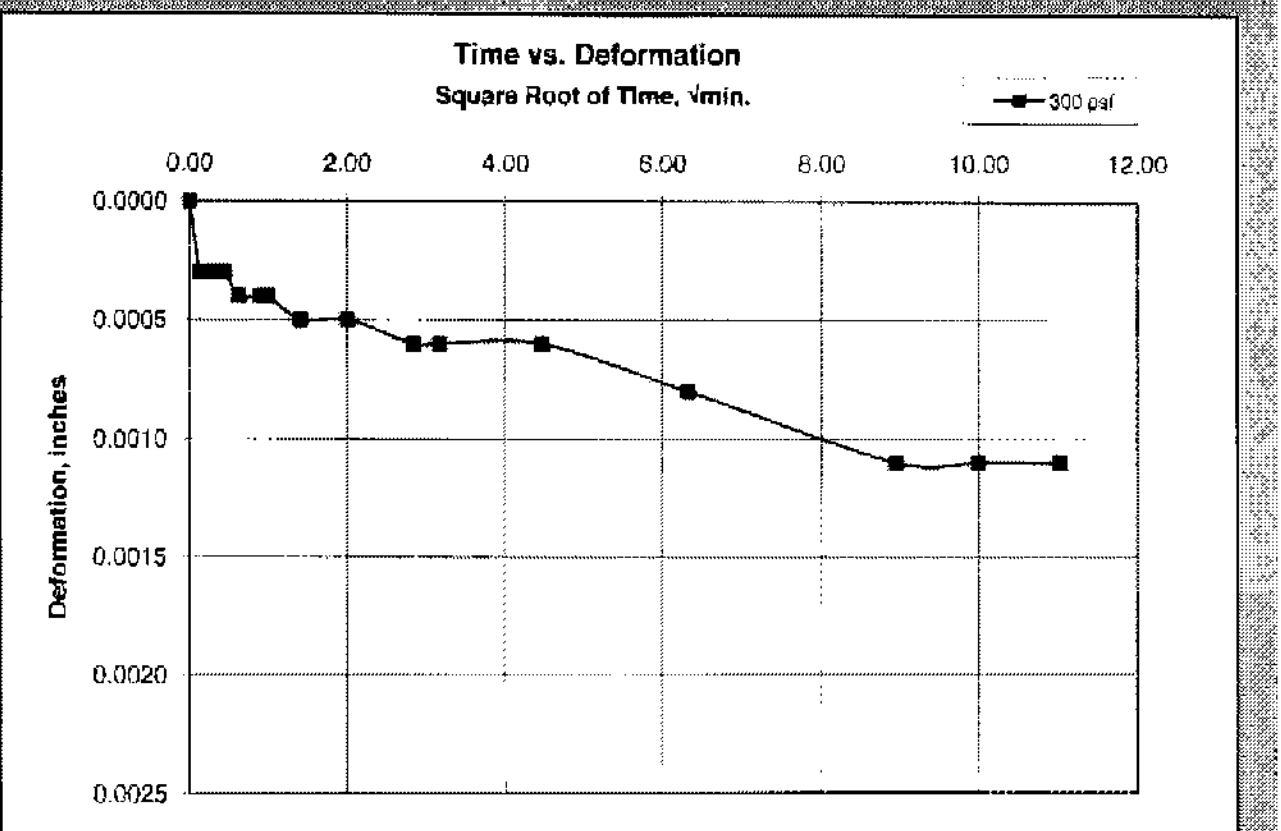


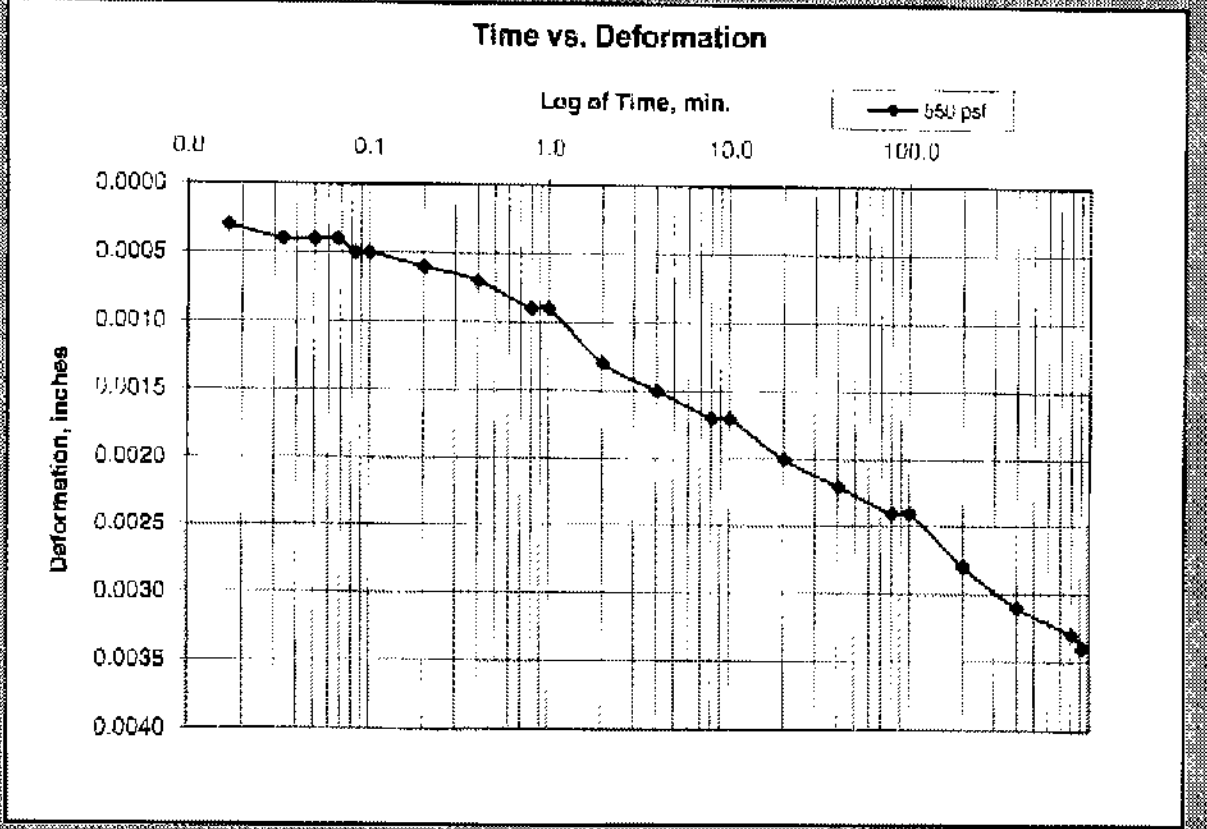
300 PSF



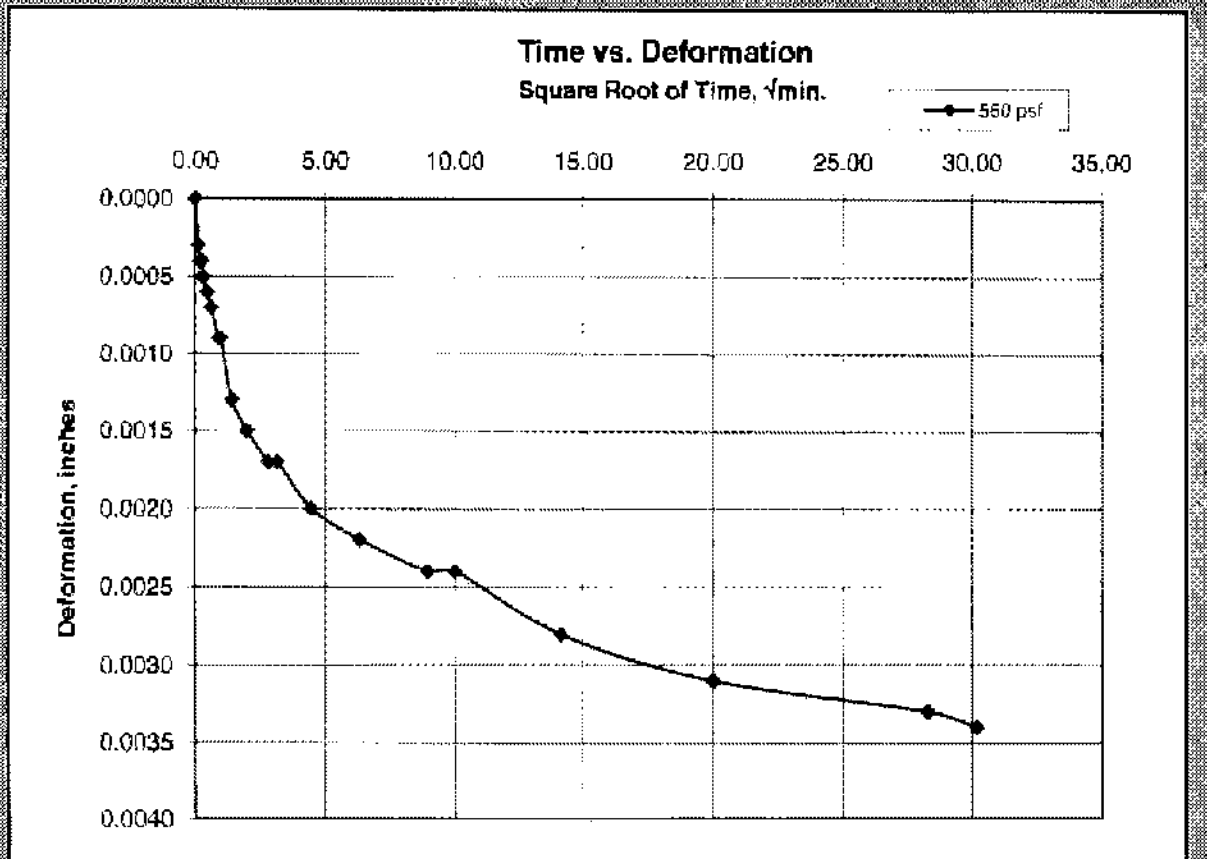
Cooper Testing Labs, Inc.

Load 4

550 PSF

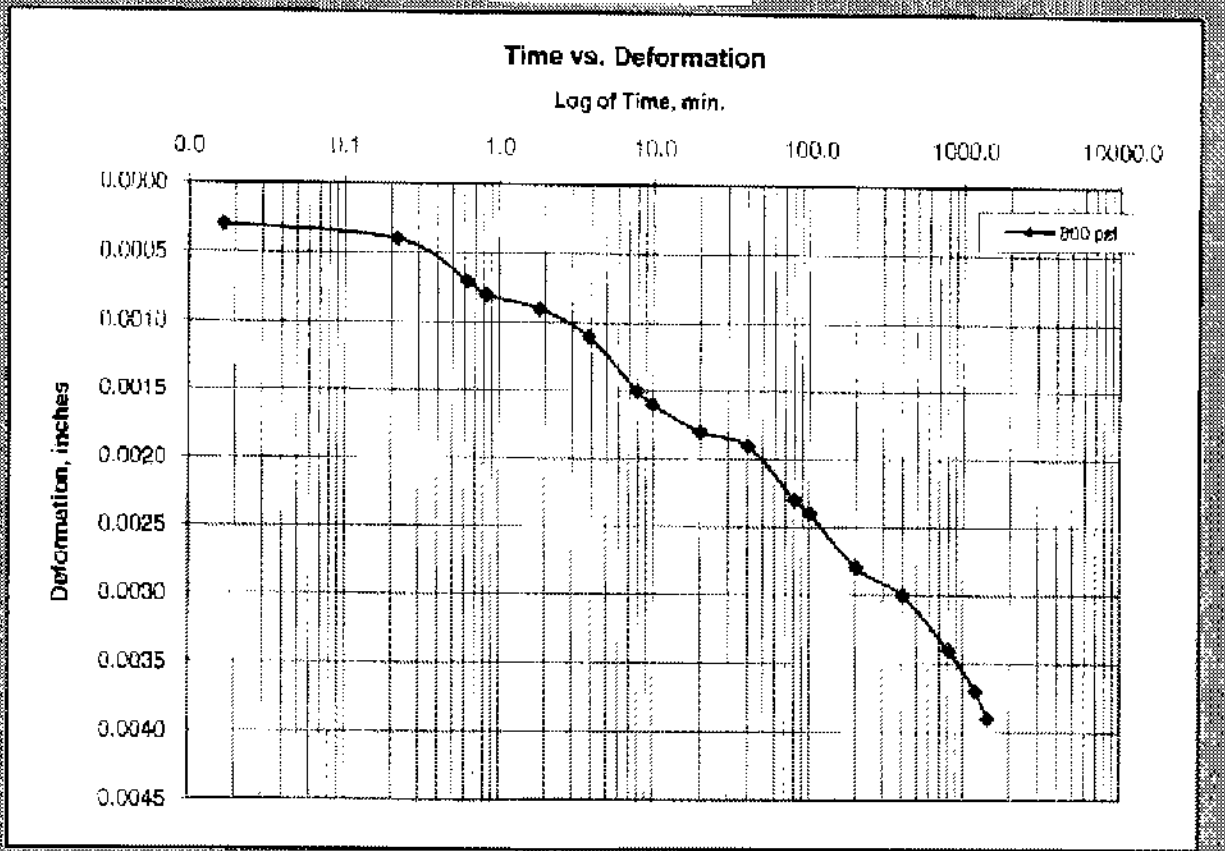


550 PSF

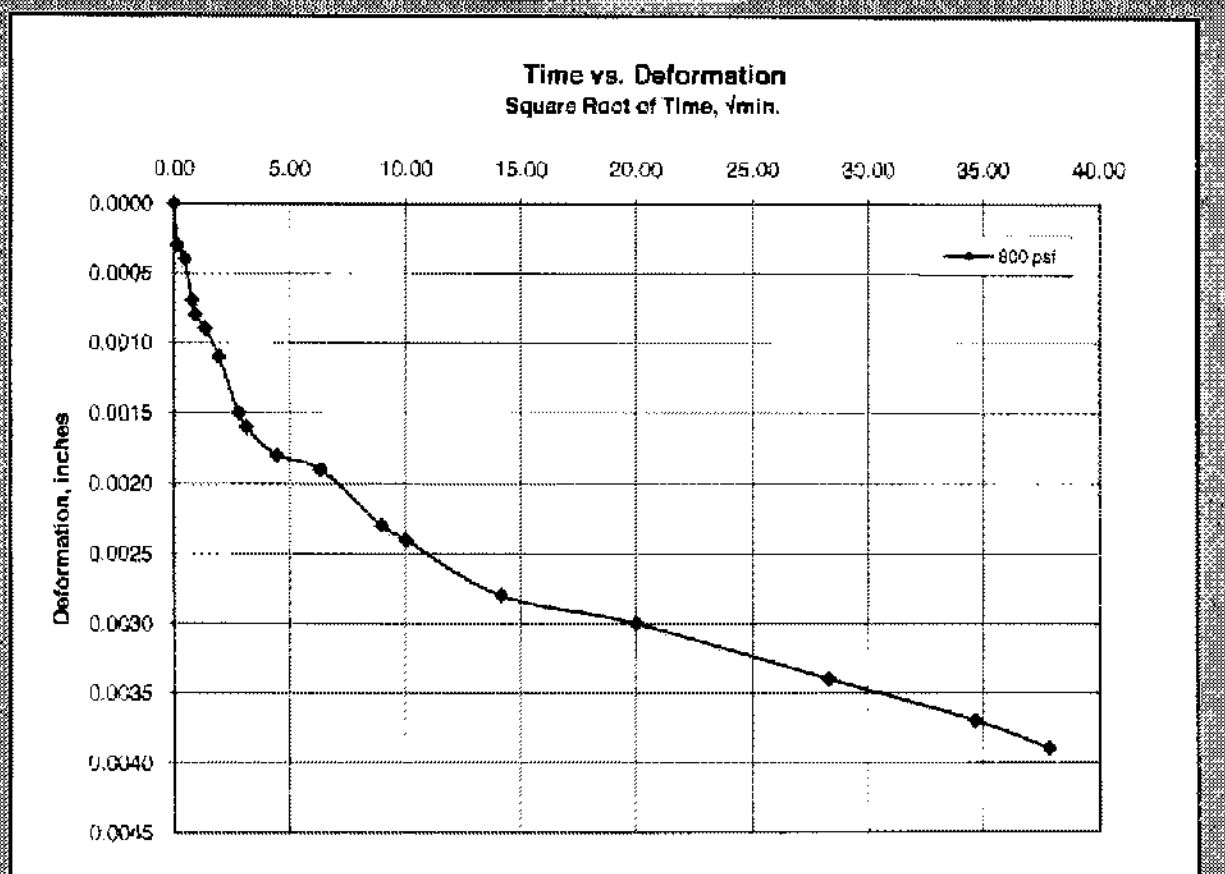


Cooper Testing Labs, Inc.

Load 5 800 PSF

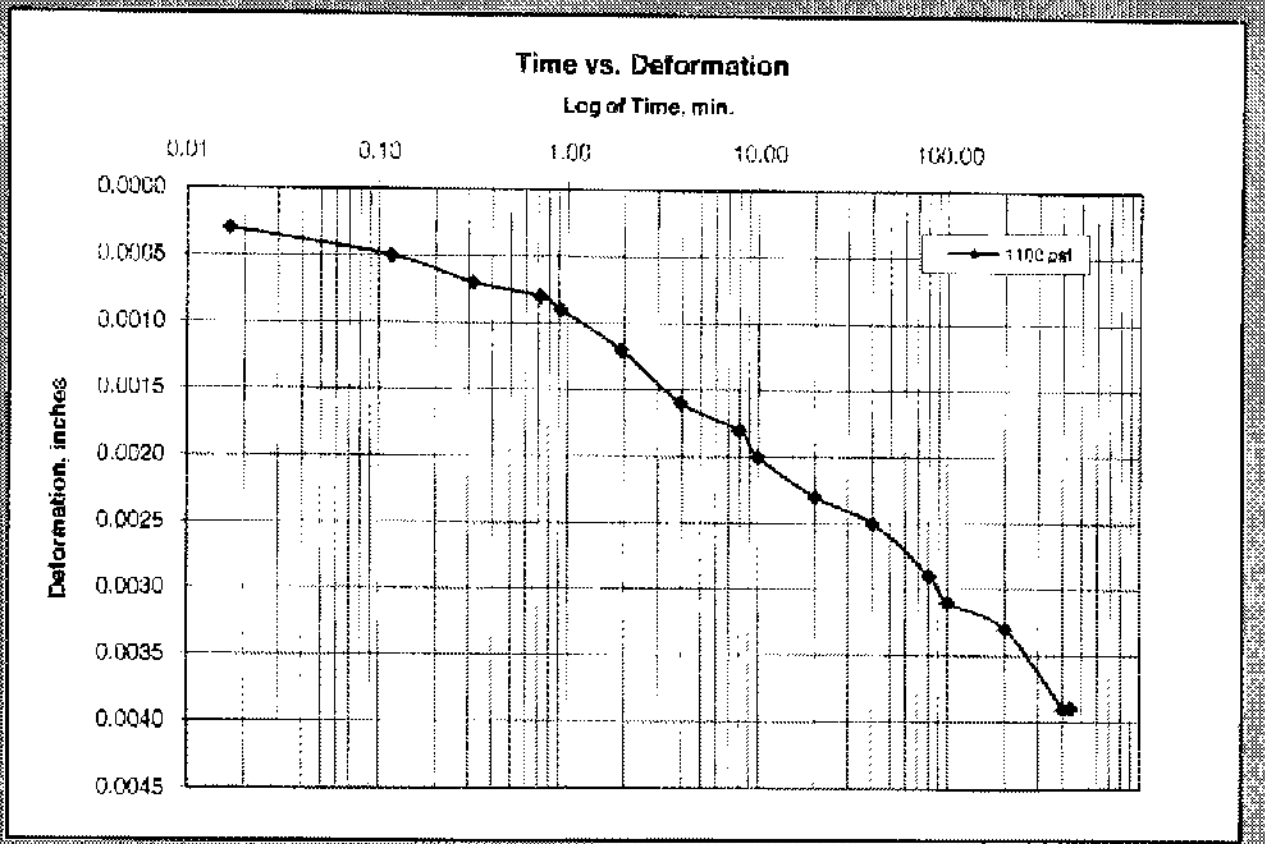


800 PSF

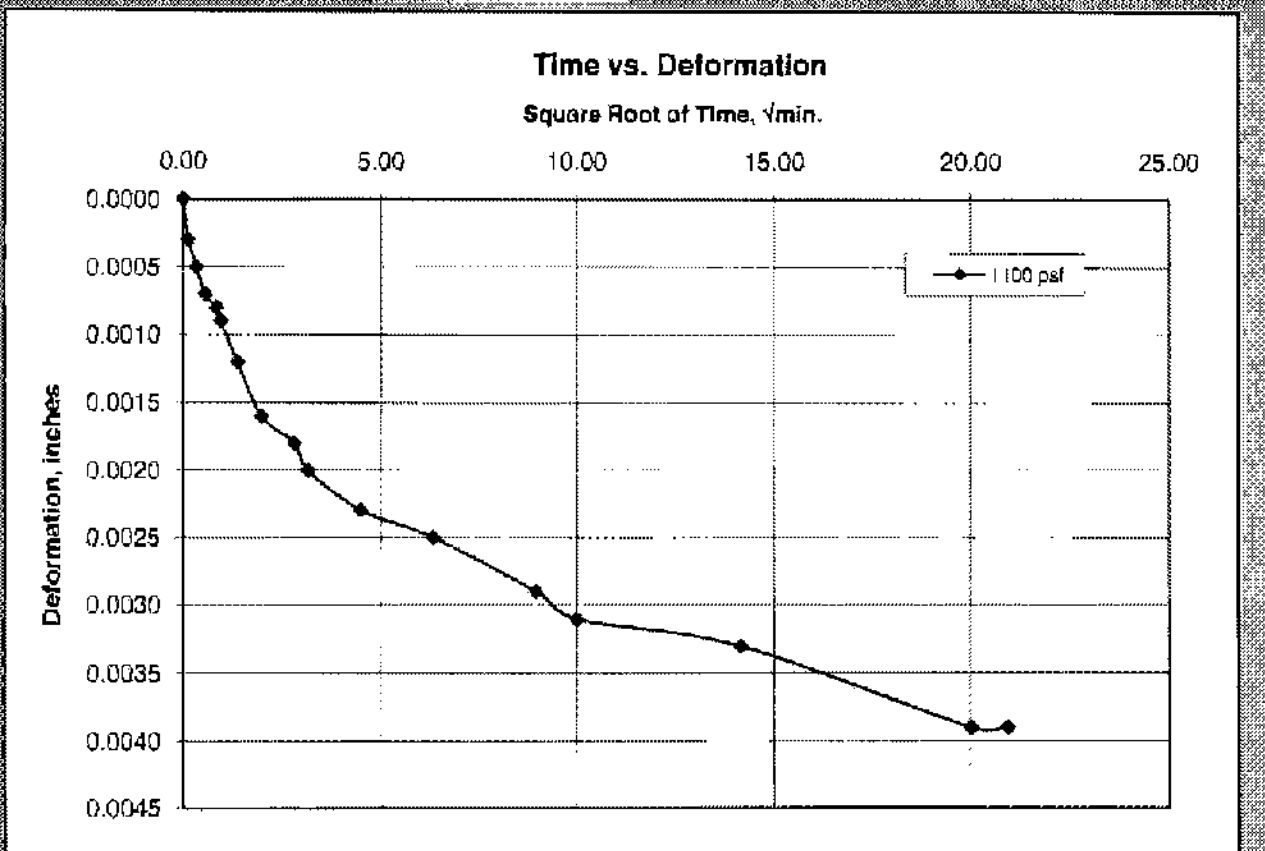


Load 6

1100 PSF

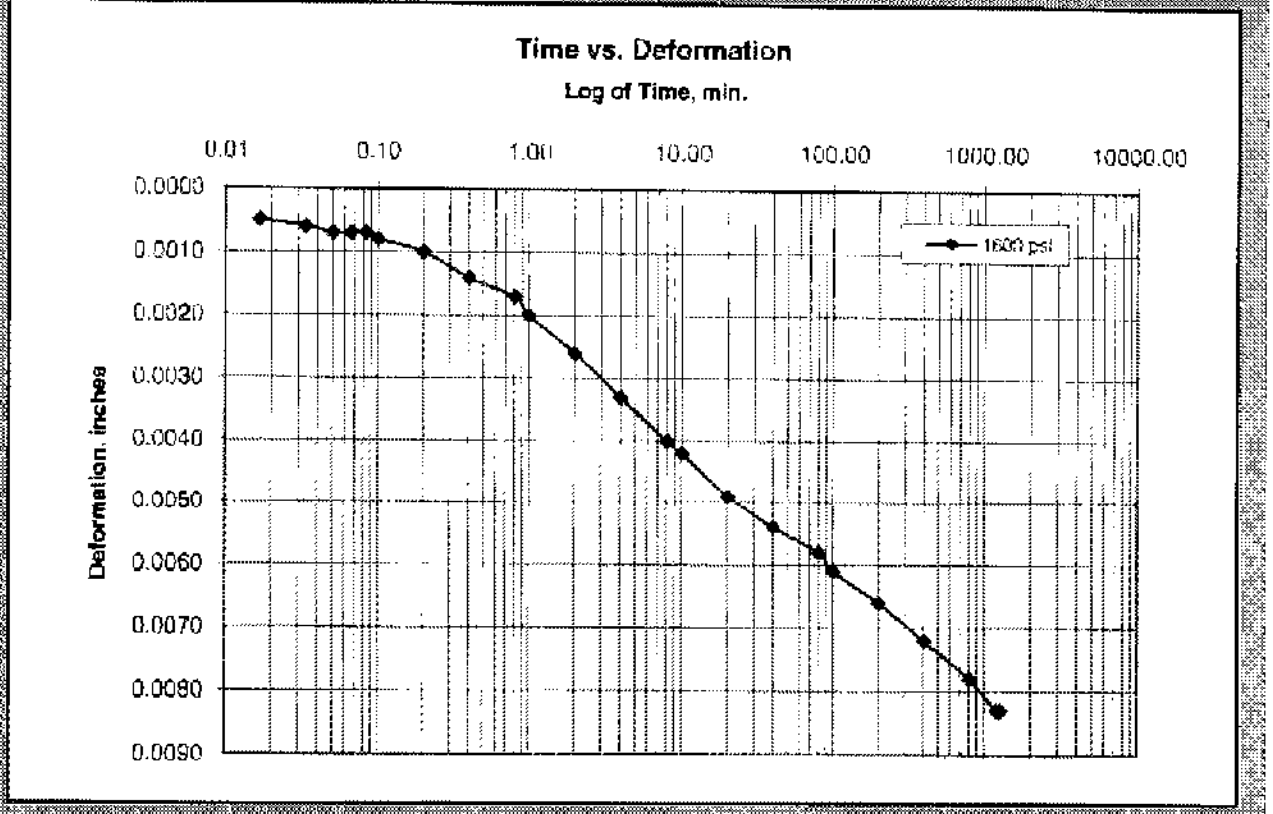


1100 PSF

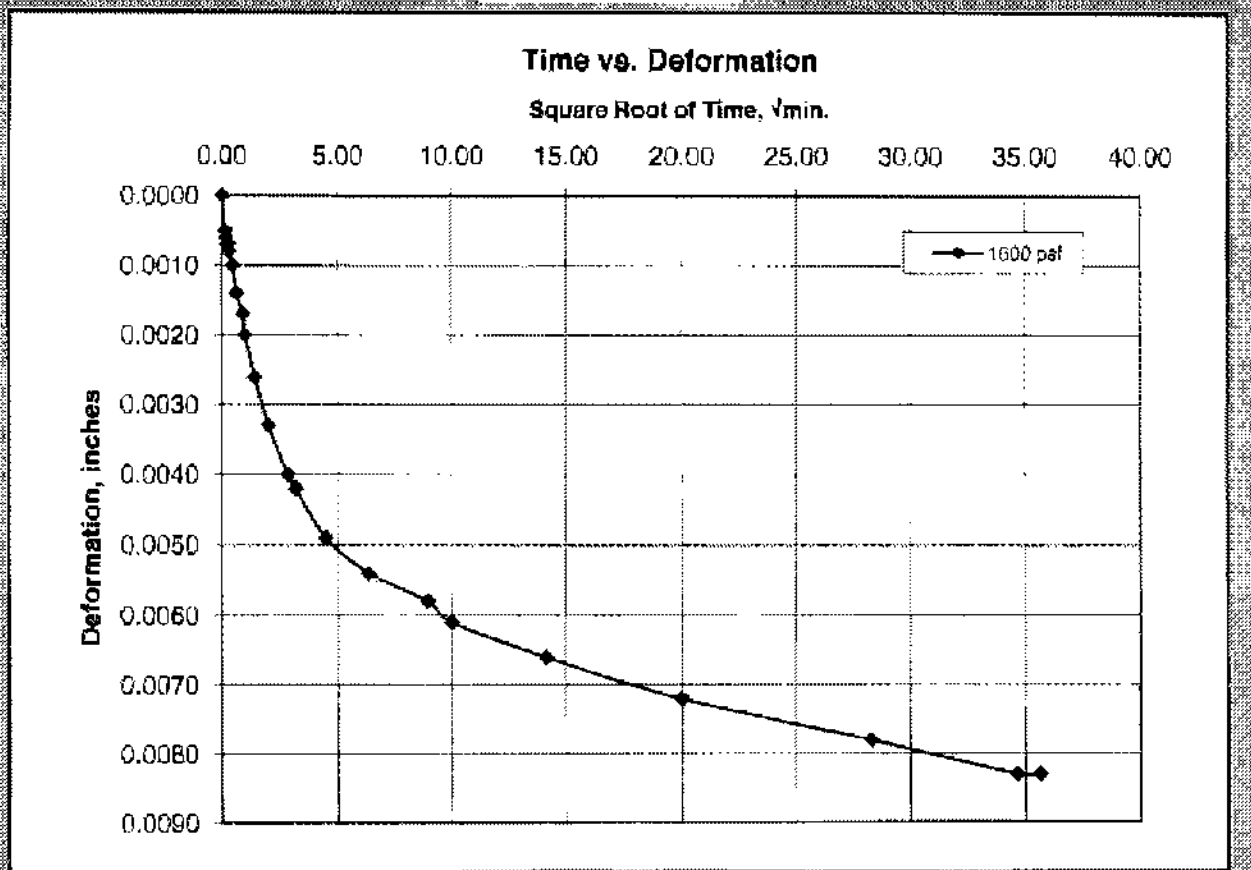


Cooper Testing Labs, Inc.

Load 7 | 1600 PSF

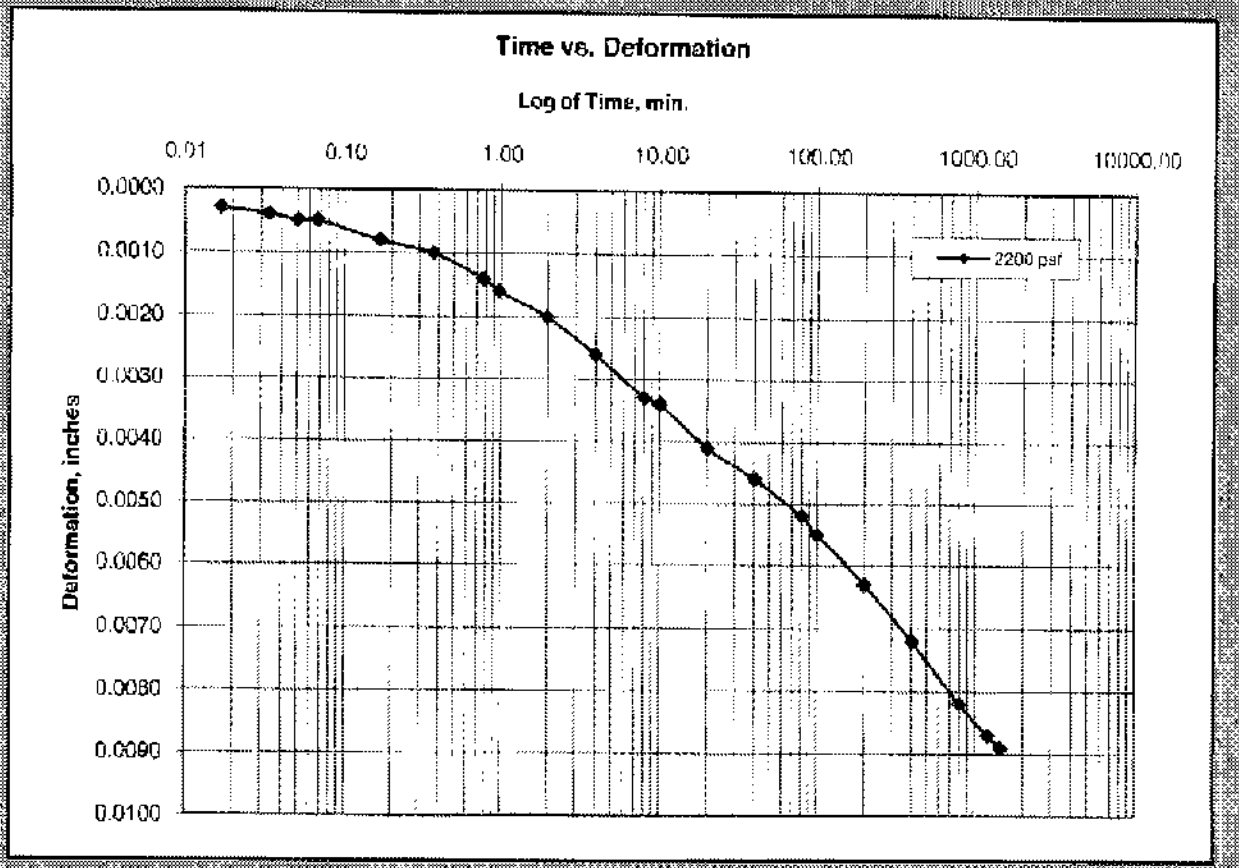


1600 PSF

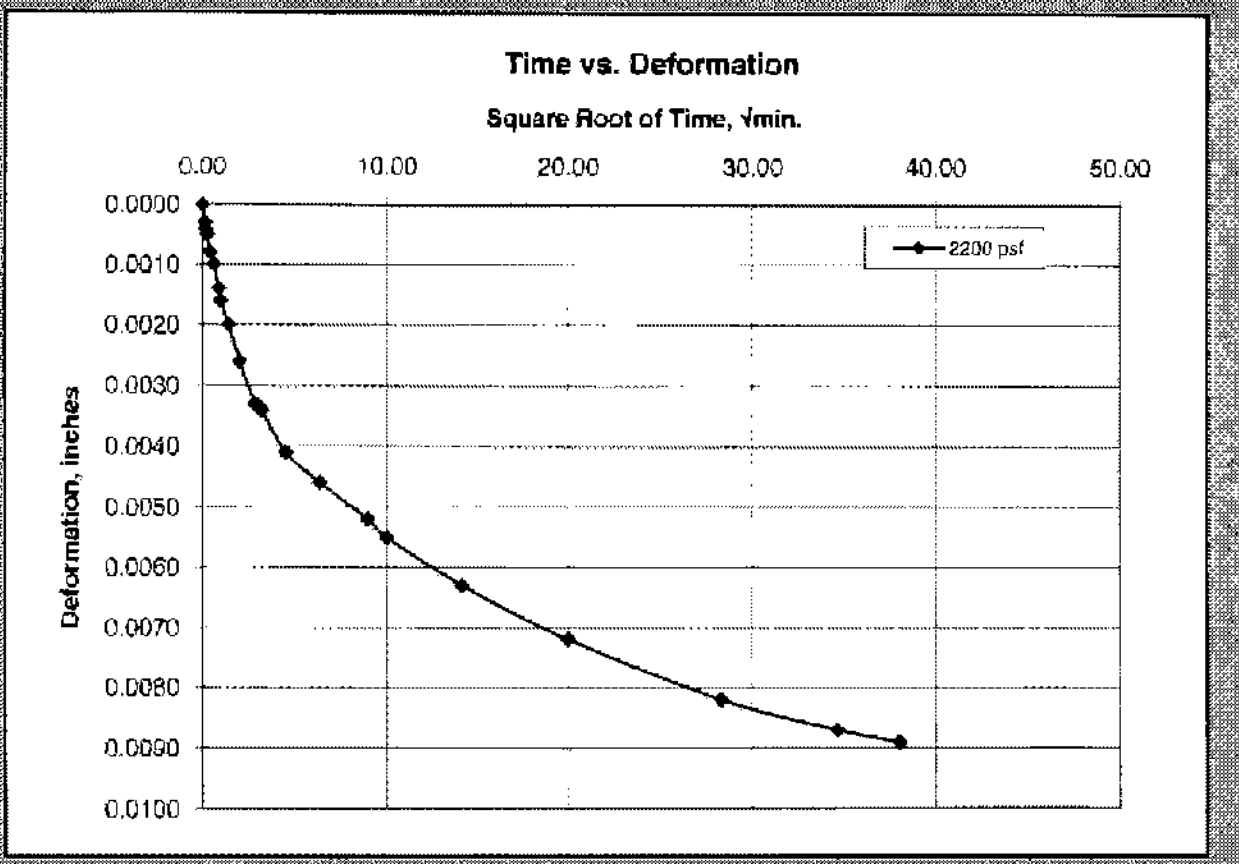


Cooper Testing Labs, Inc.

Load 8 — 2200 PSF

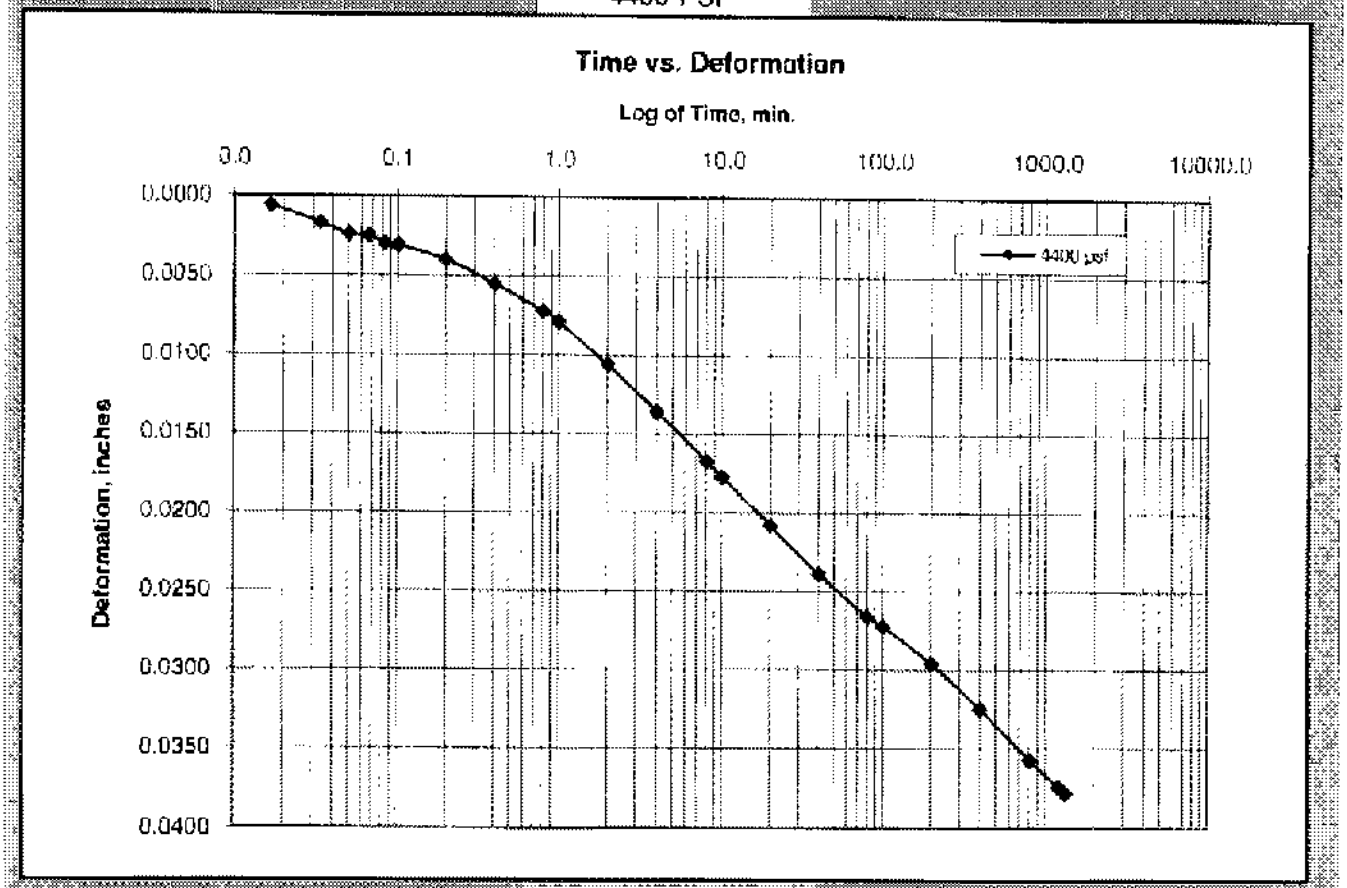


2200 PSF

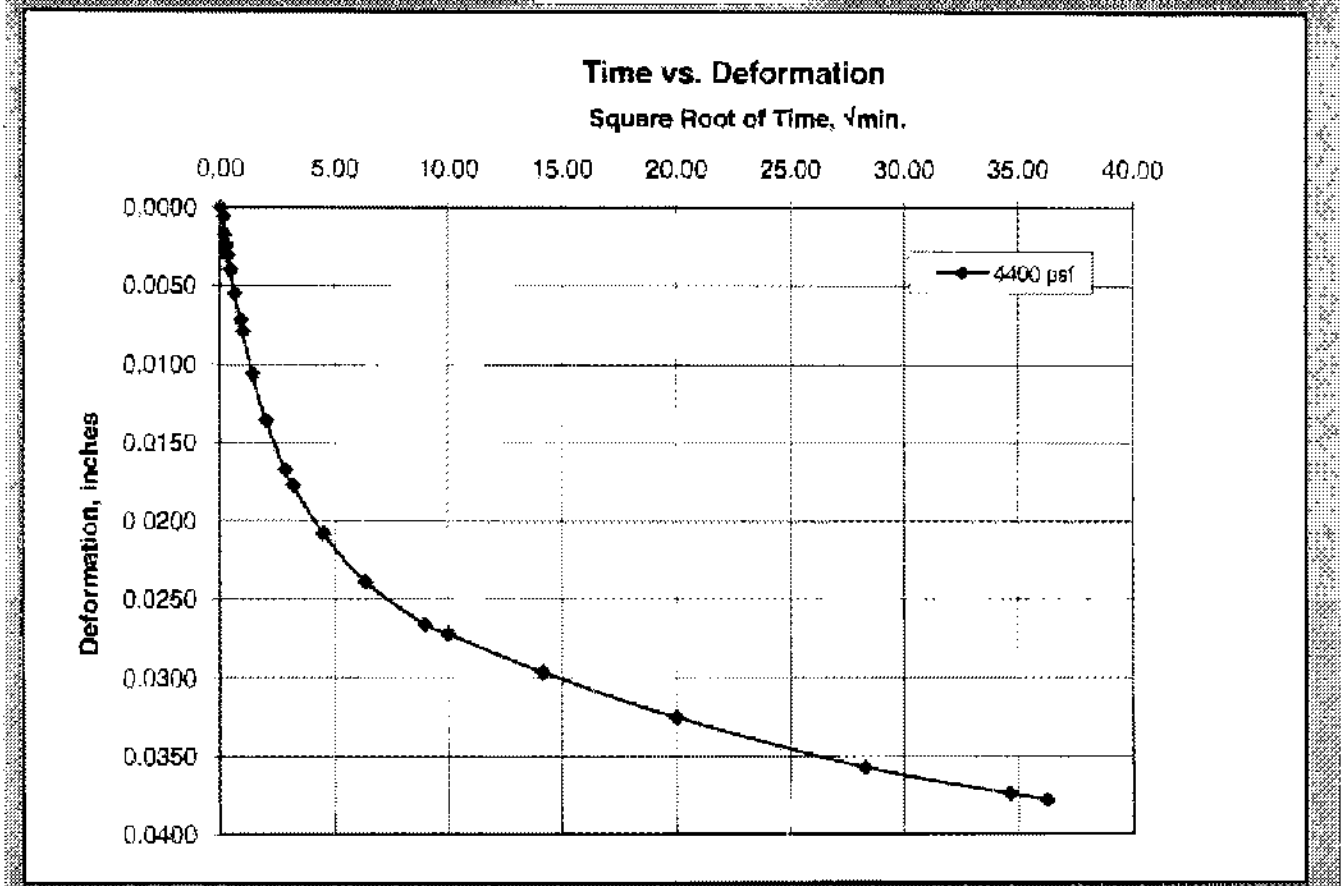


Cooper Testing Labs, Inc.

Load 9 | 4400 PSF



4400 PSF



Cooper Testing Labs, Inc.

Load 10

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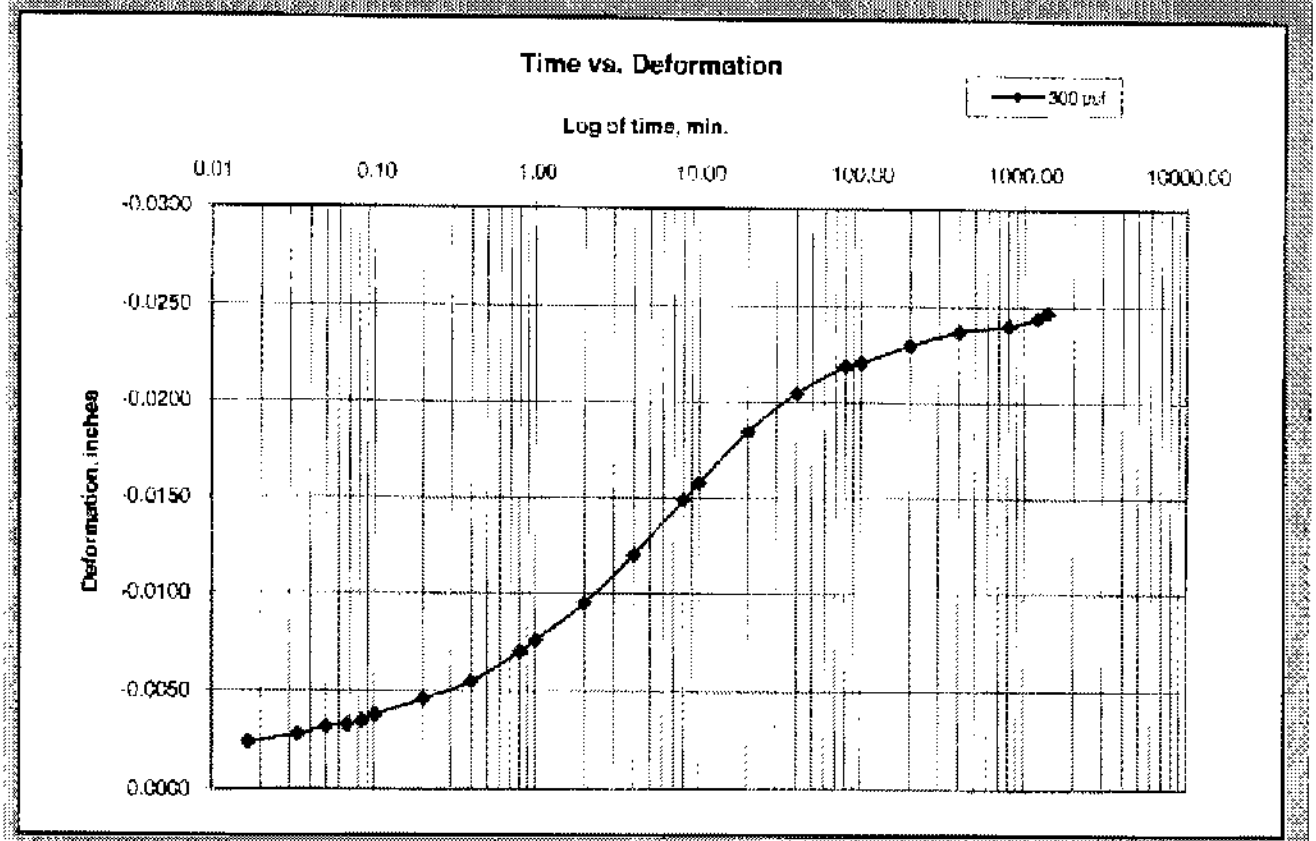
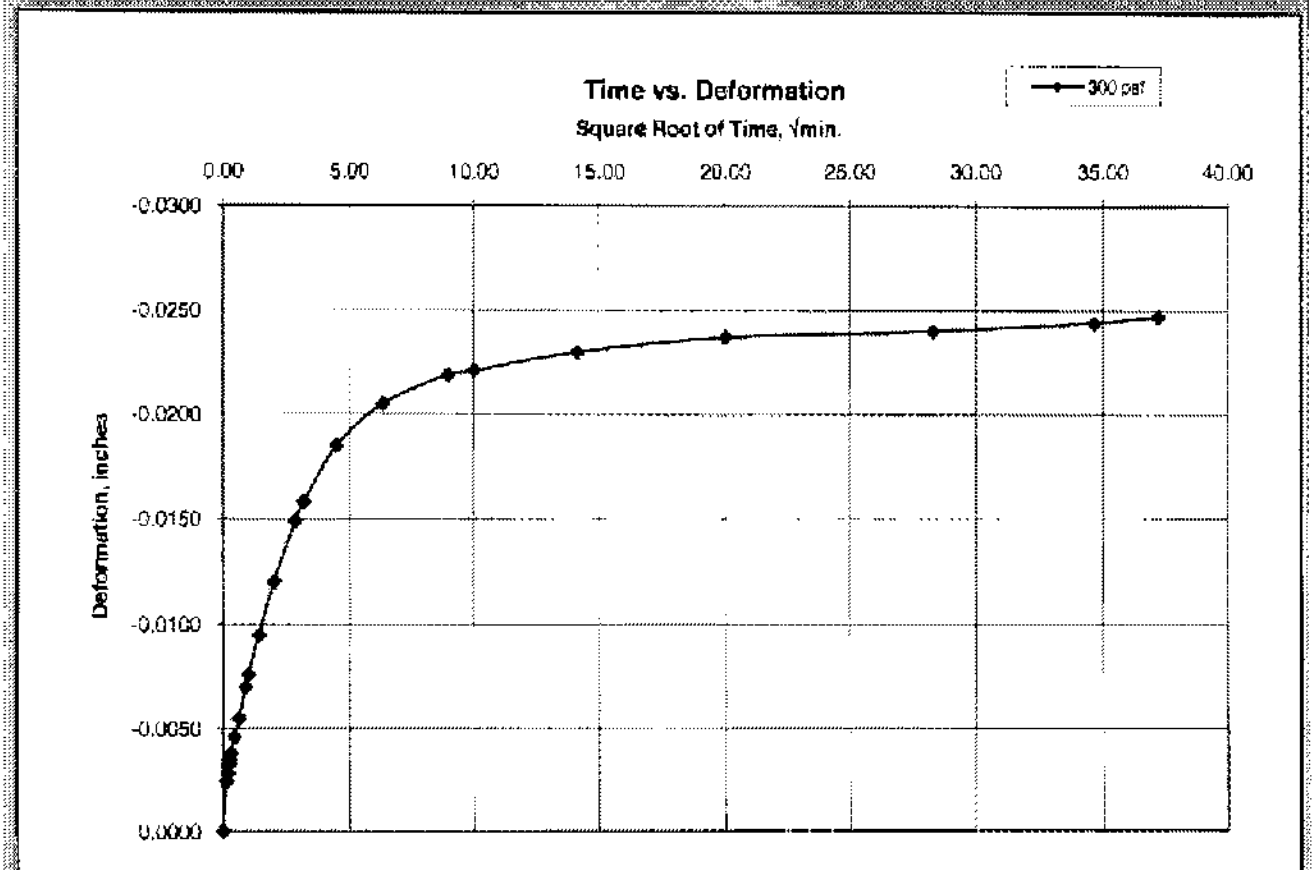
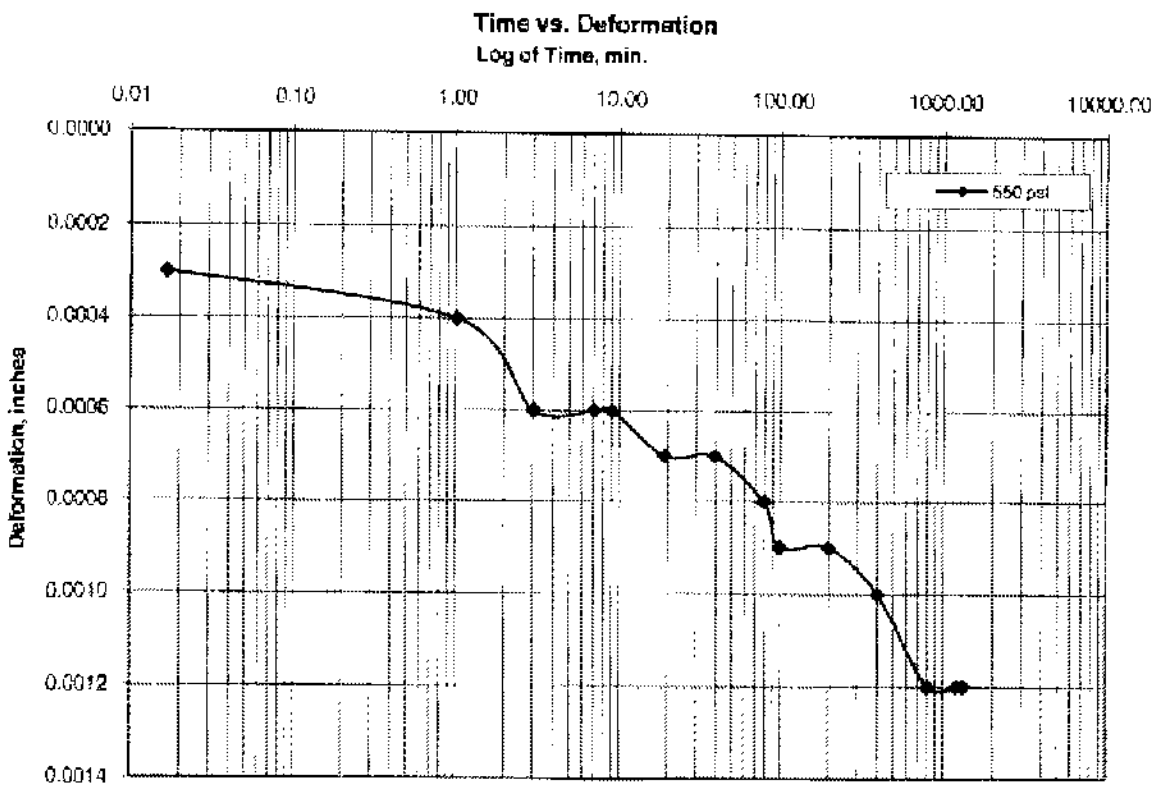


300 PSF

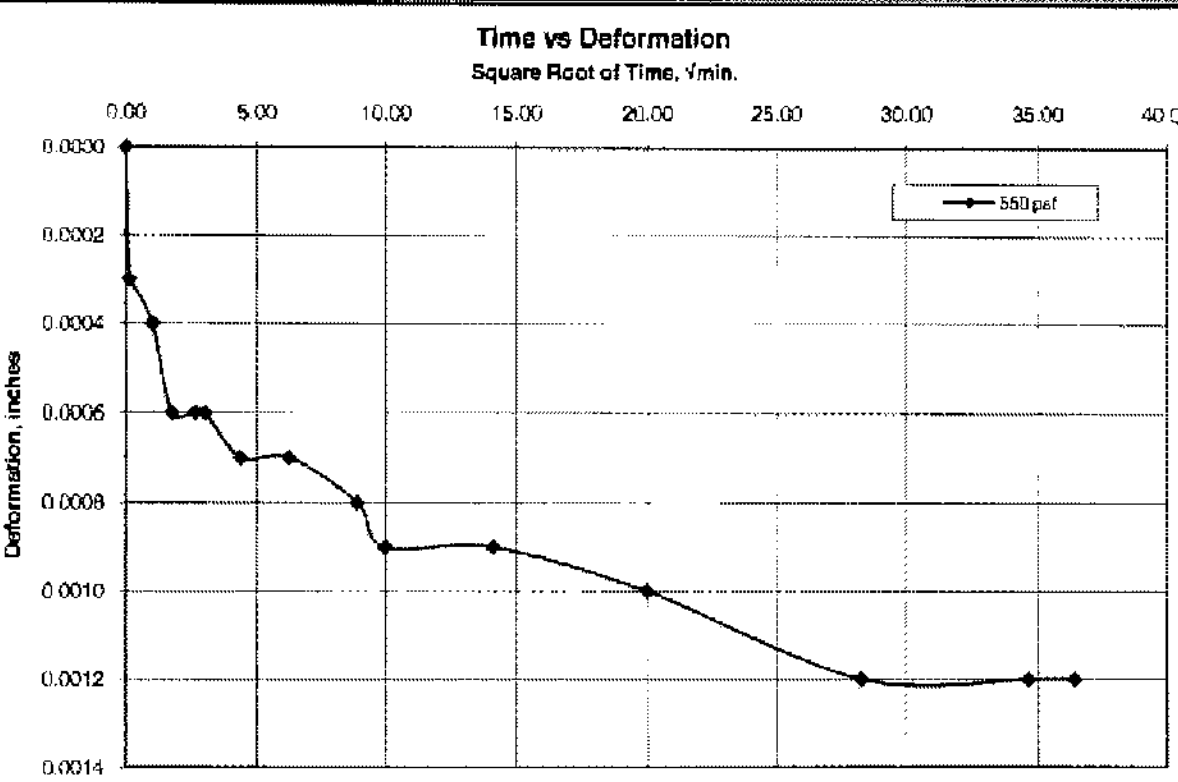


Cooper Testing Labs, Inc.

Load 11 — 550 PSF

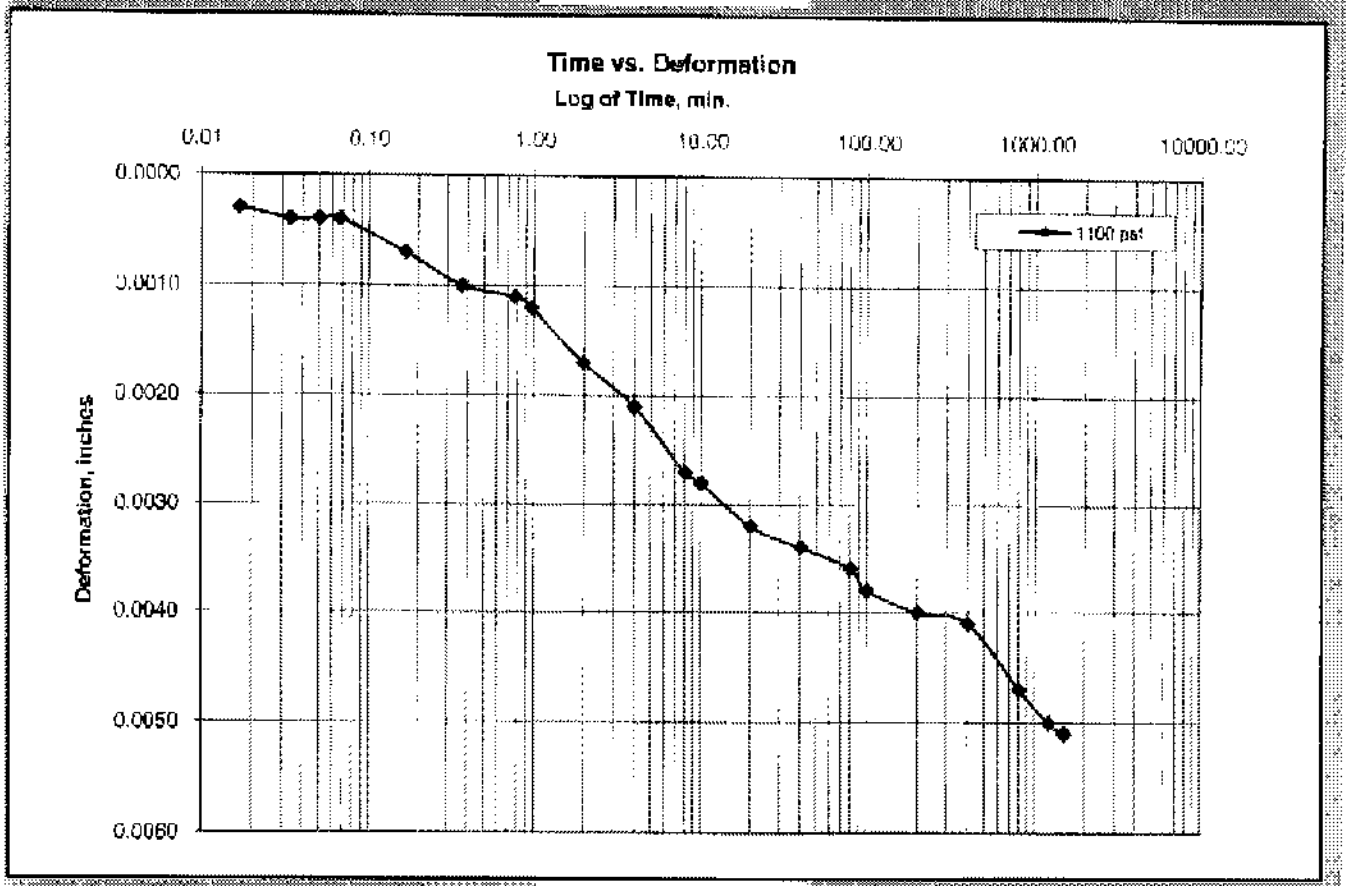


550 PSF

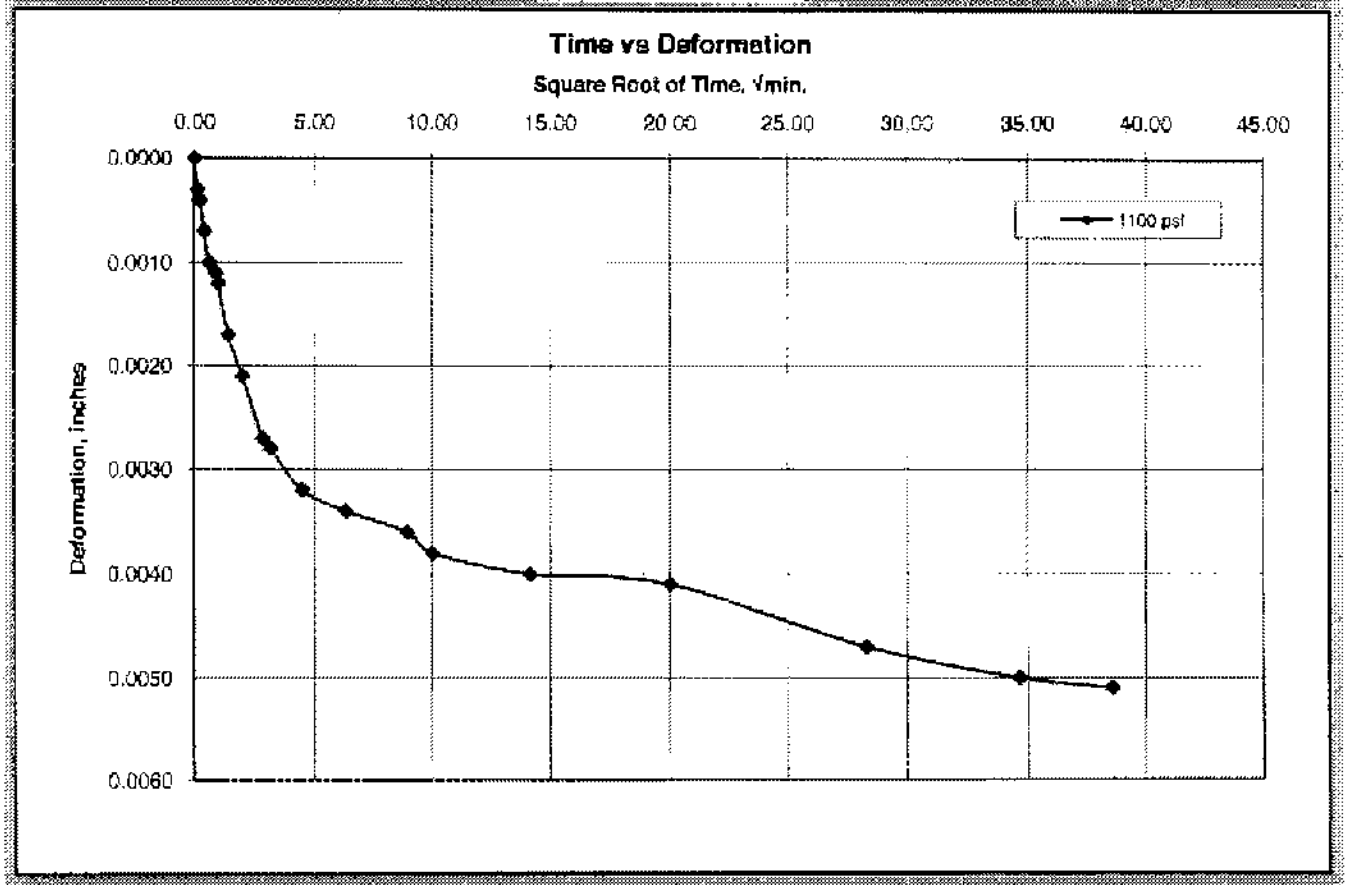


Cooper Testing Labs, Inc.

Load 12 | 1100 PSF

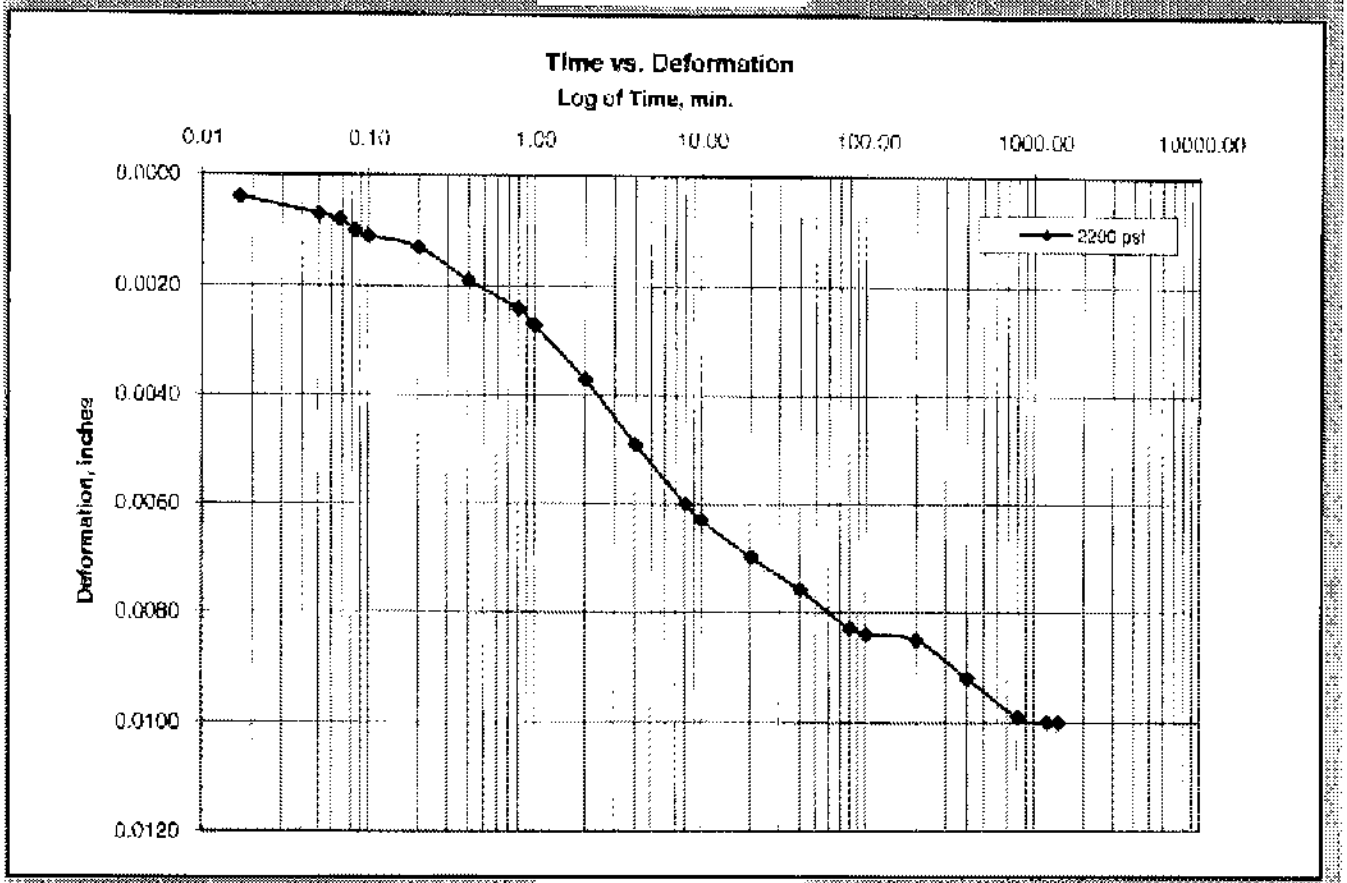


1100 PSF

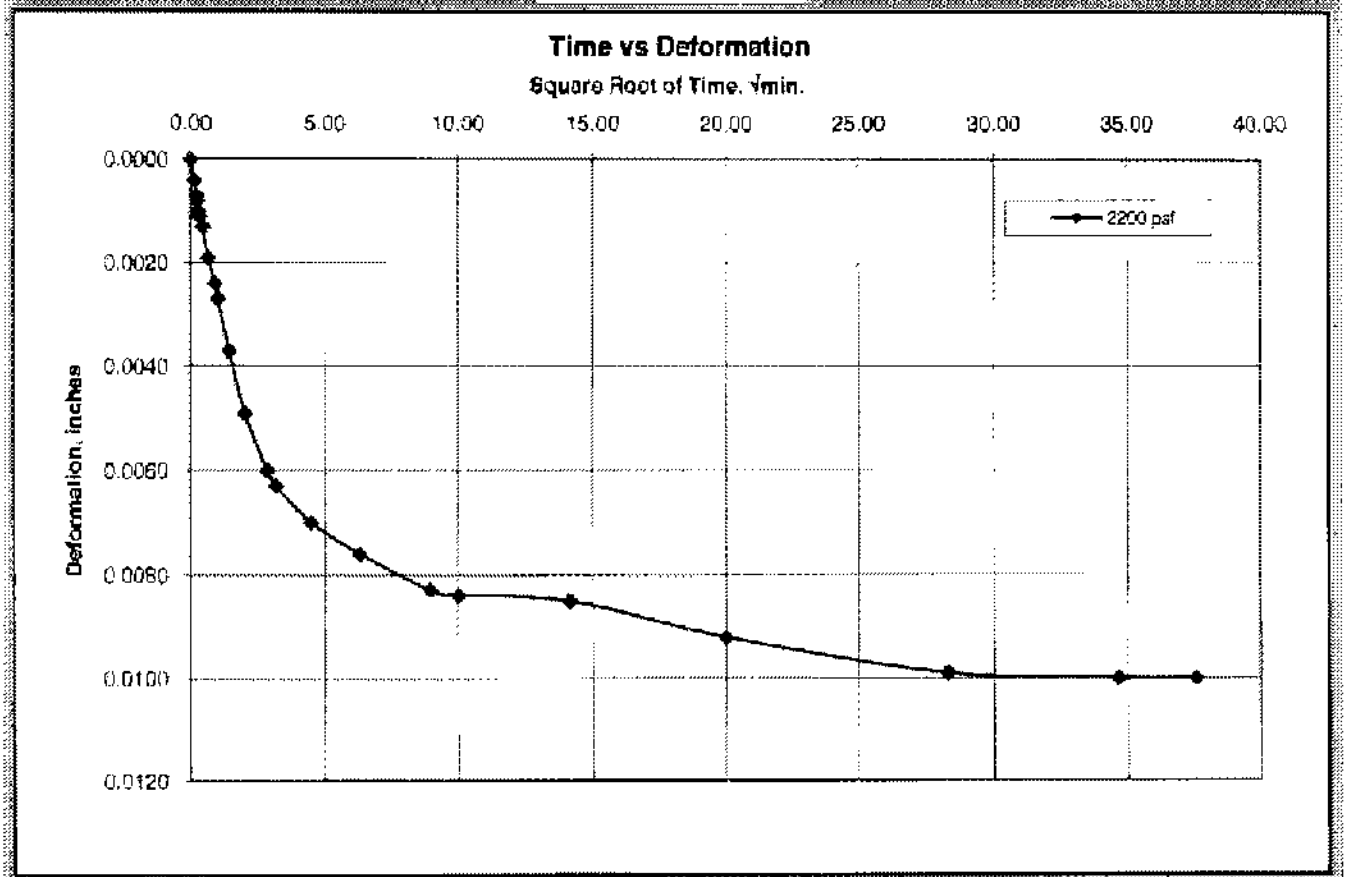


Cooper Testing Labs, Inc.

Load 13 — 2200 PSF

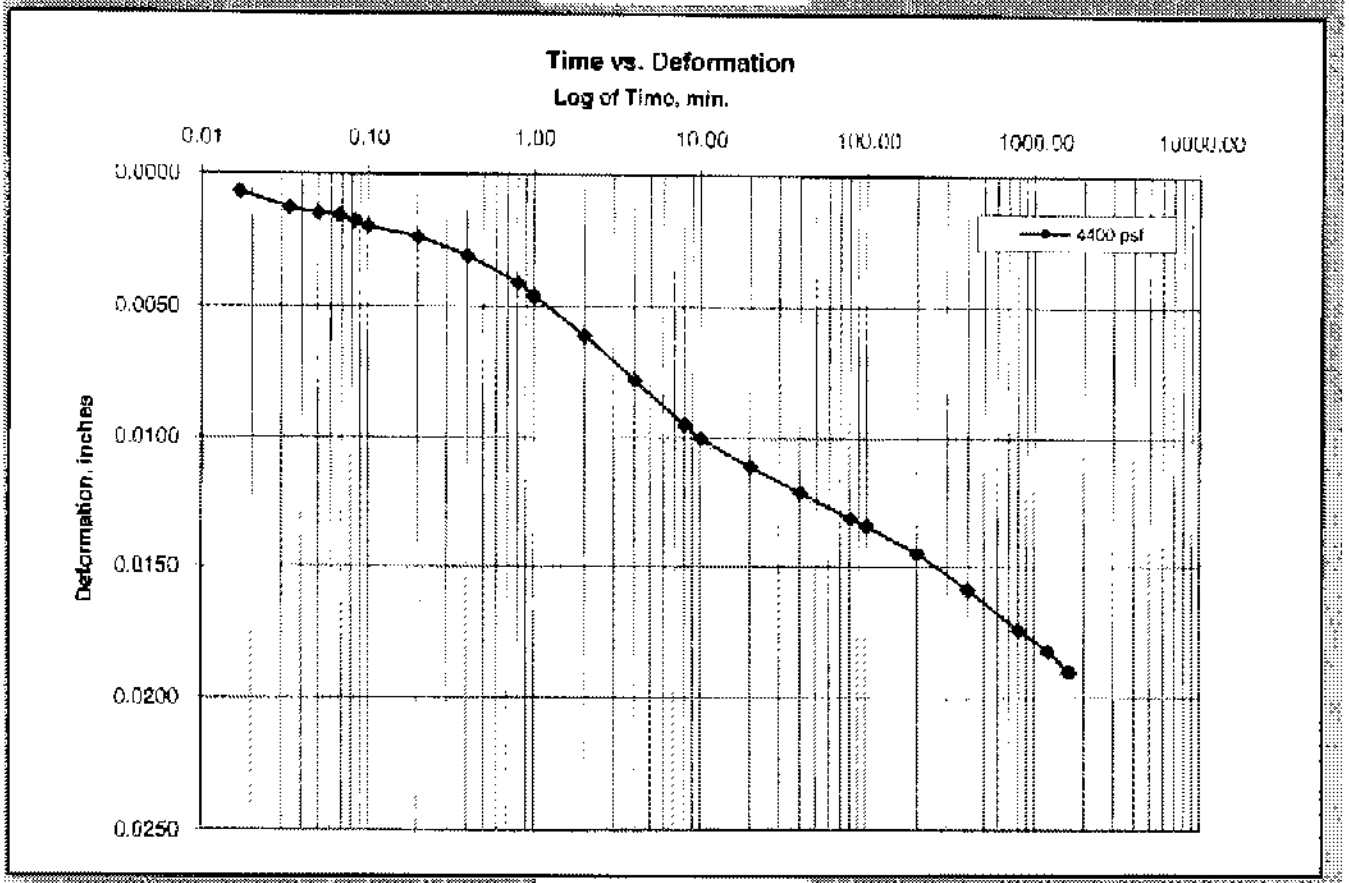


2200 PSF

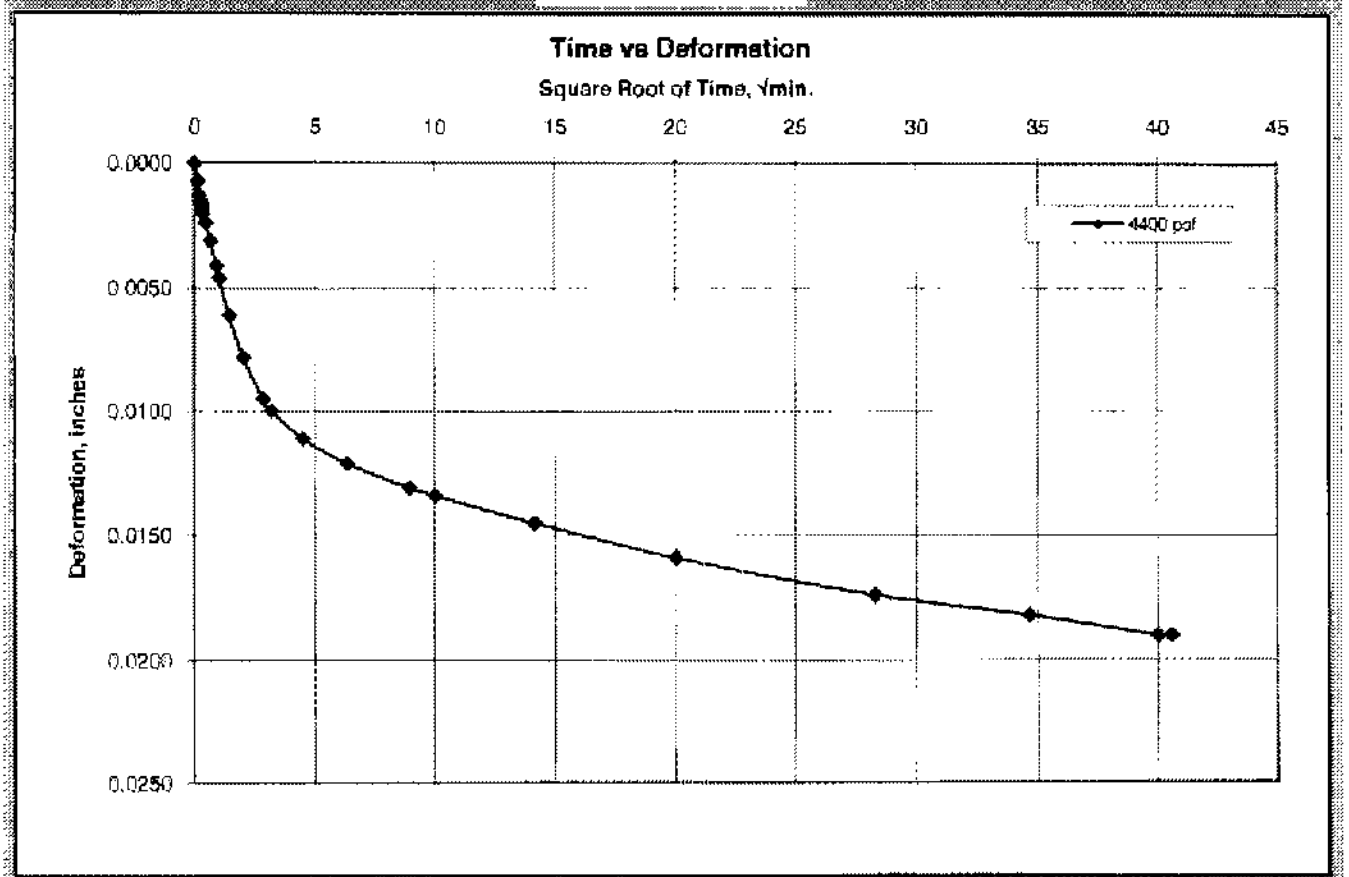


Cooper Testing Labs, Inc.

Load 14 — 4400 PSF

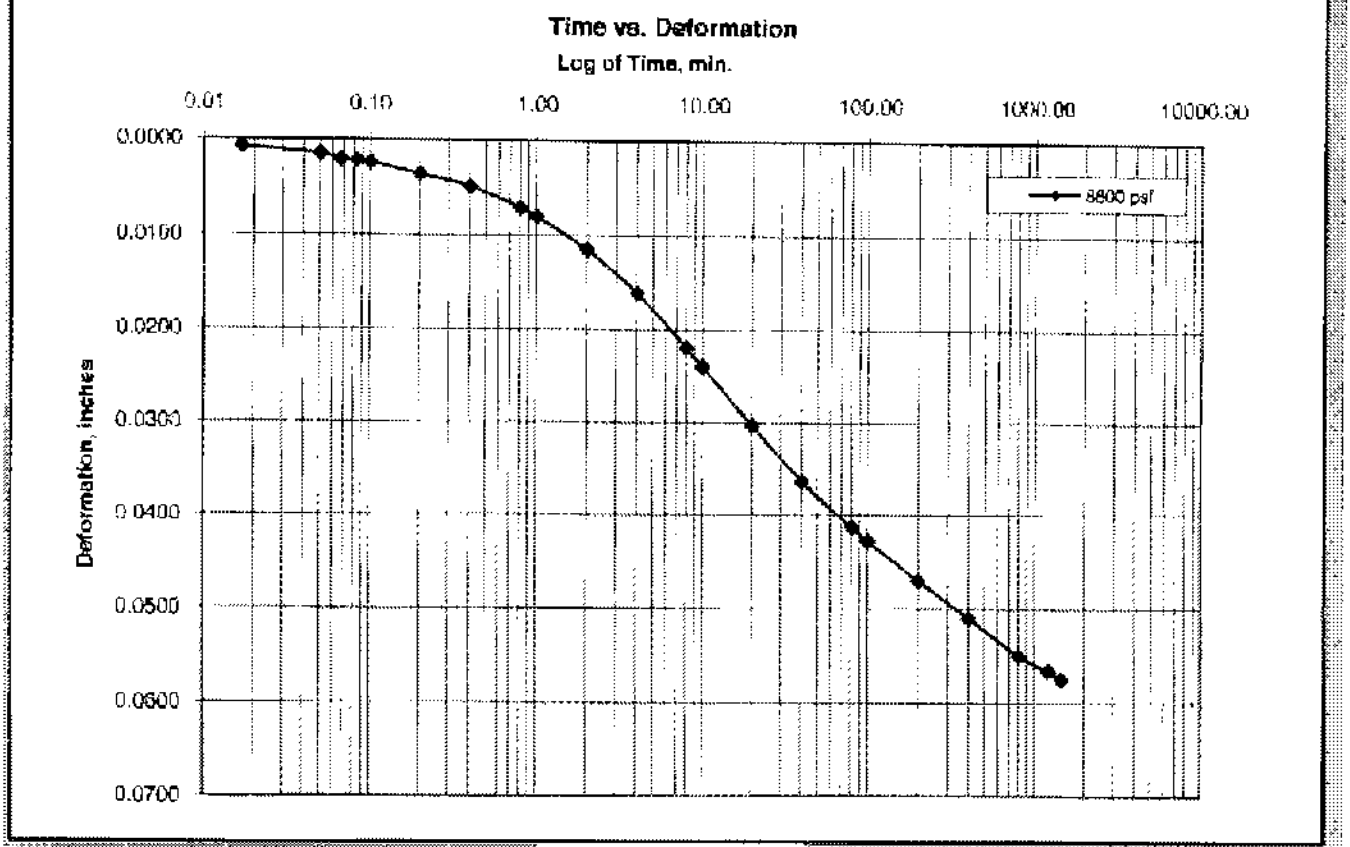


4400 PSF

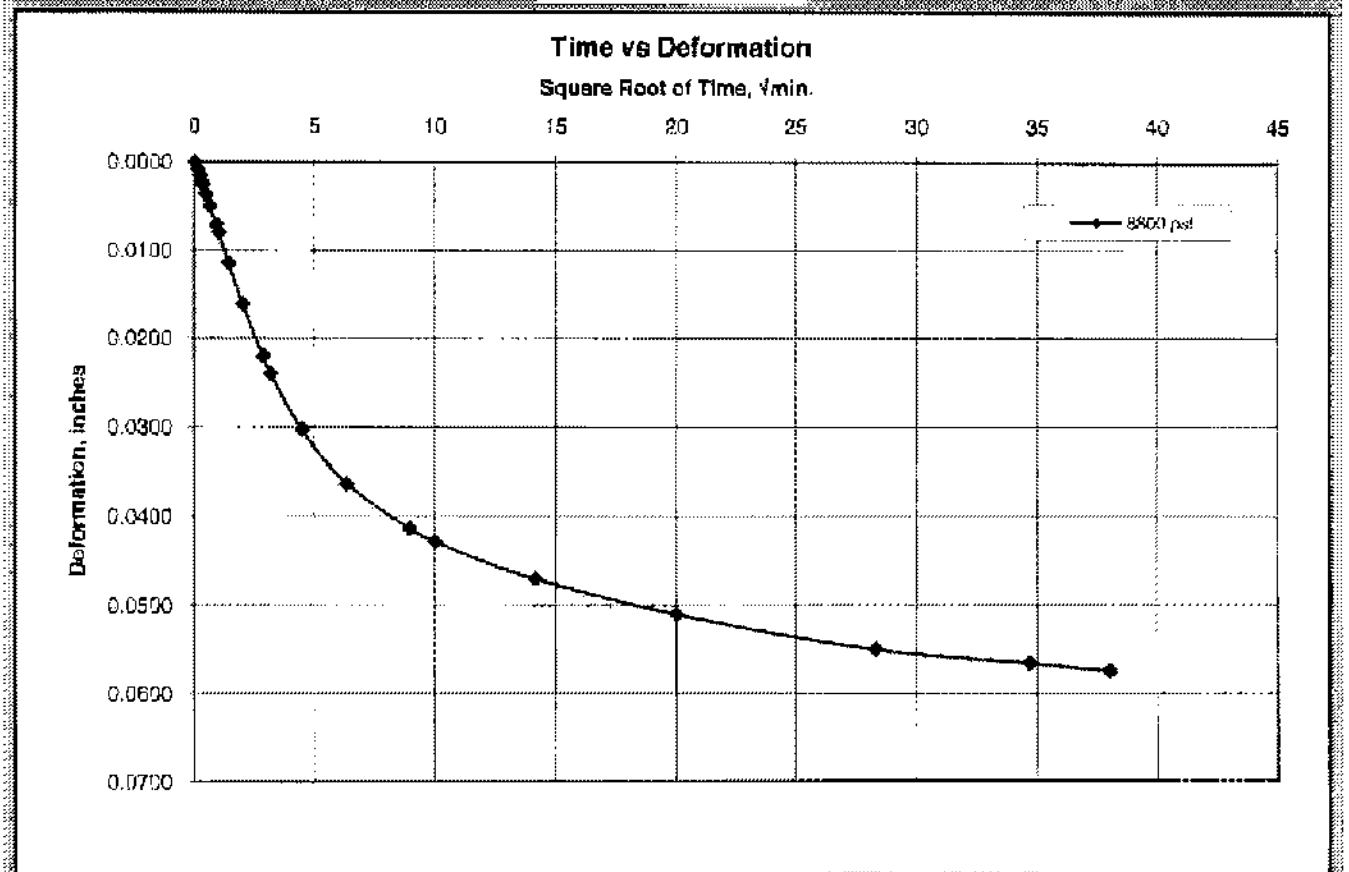


Cooper Testing Labs, Inc.

Load 15 — 8800 PSF

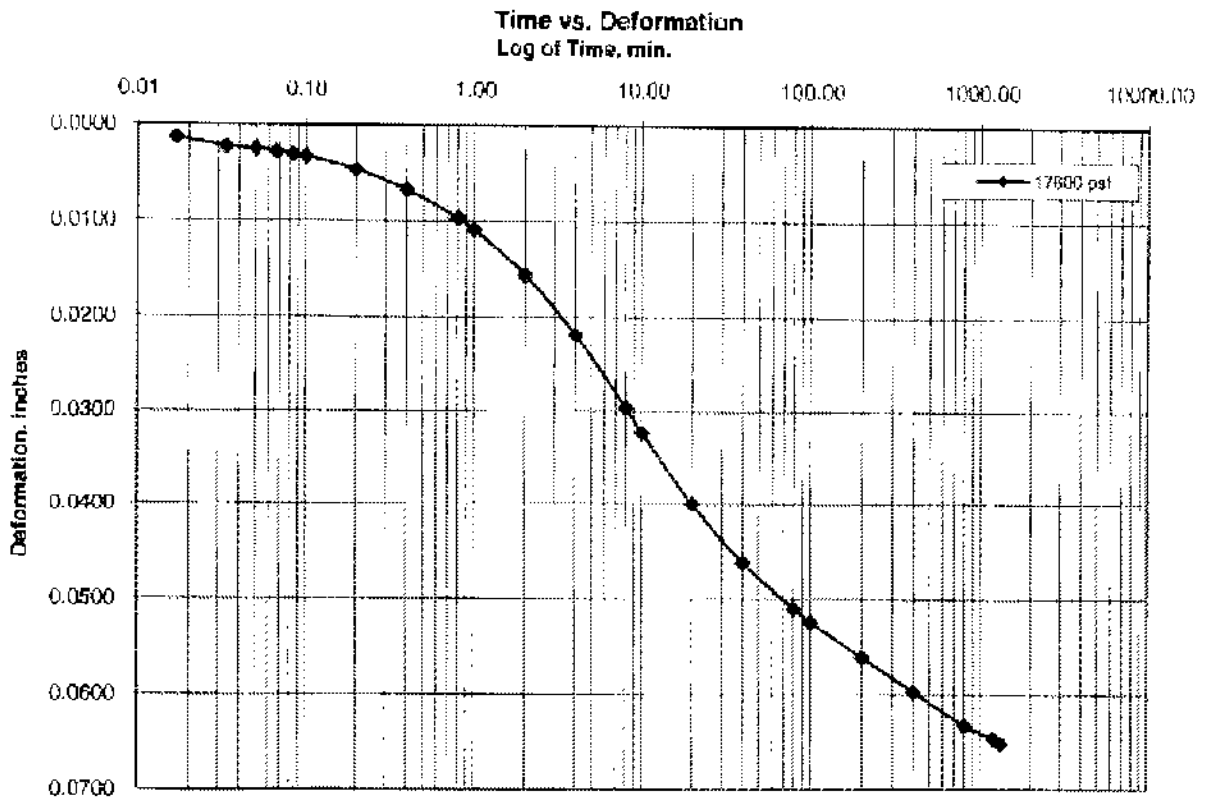


8800 PSF

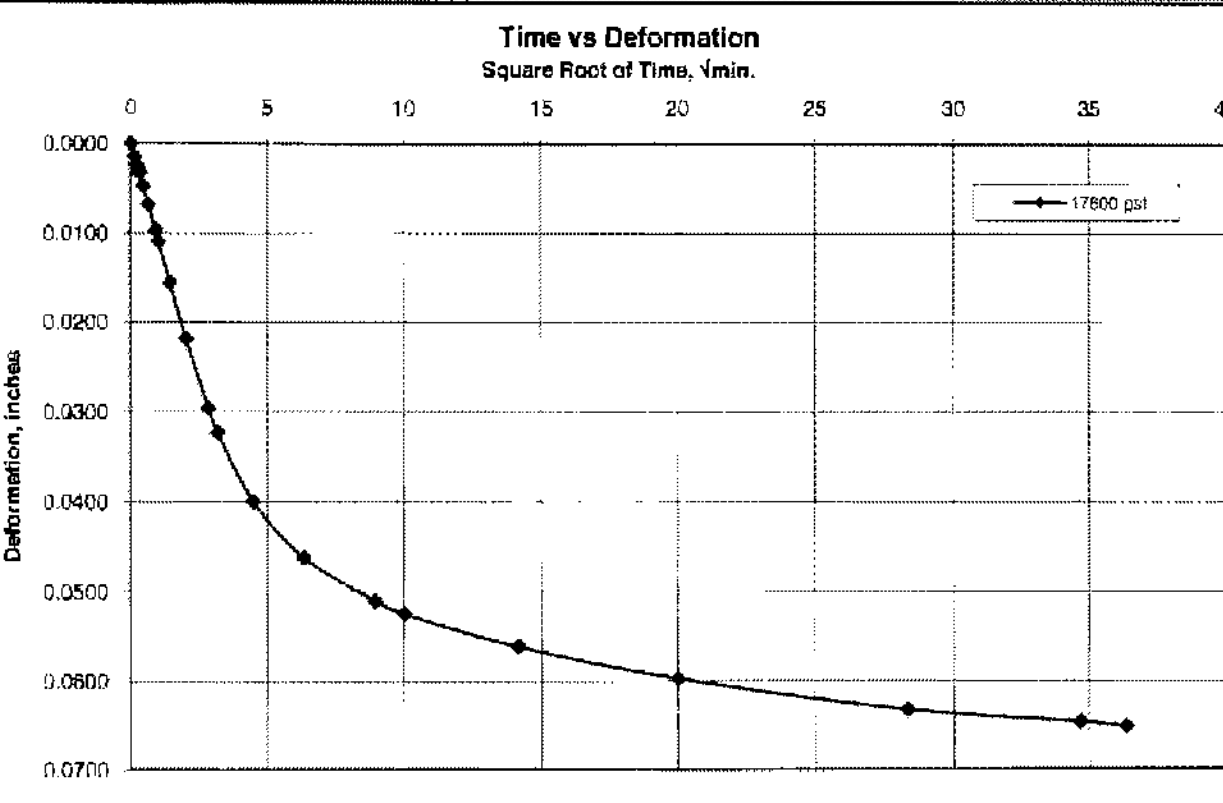


Cooper Testing Labs, Inc.

Load 16 — 17600 PSF

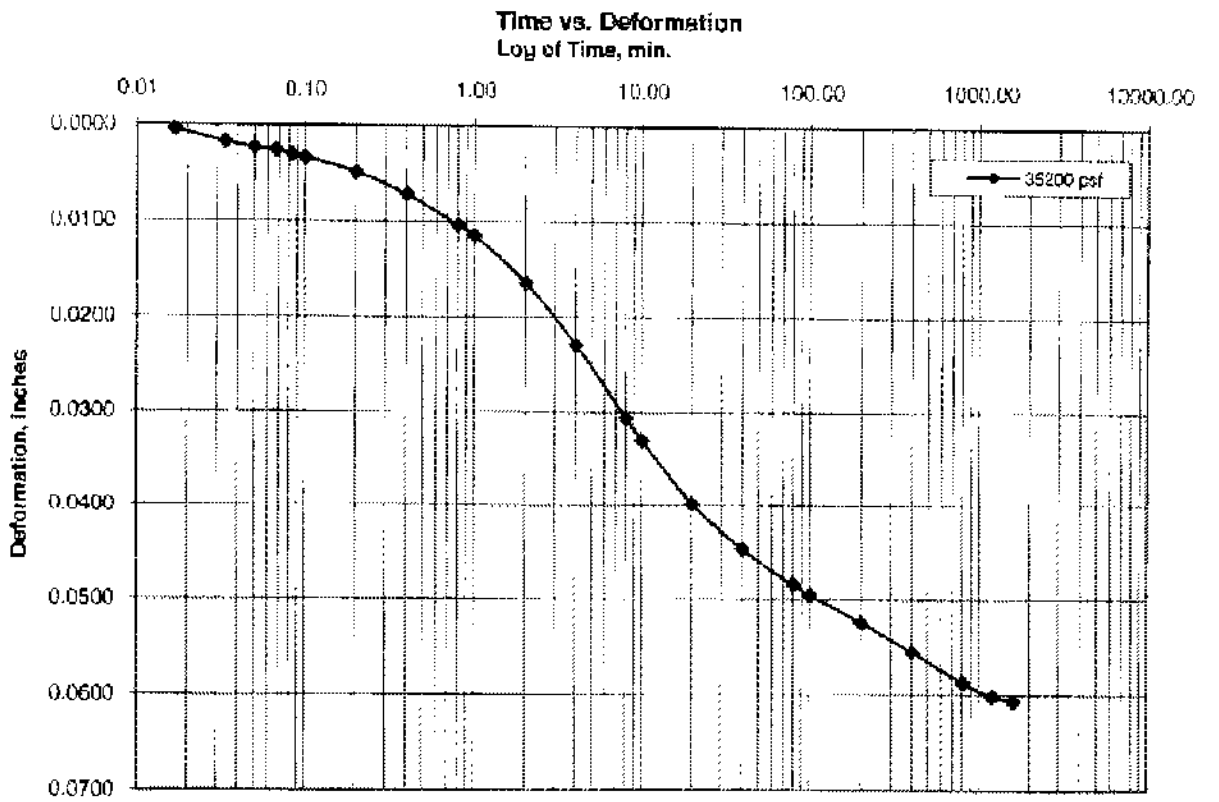


17600 PSF

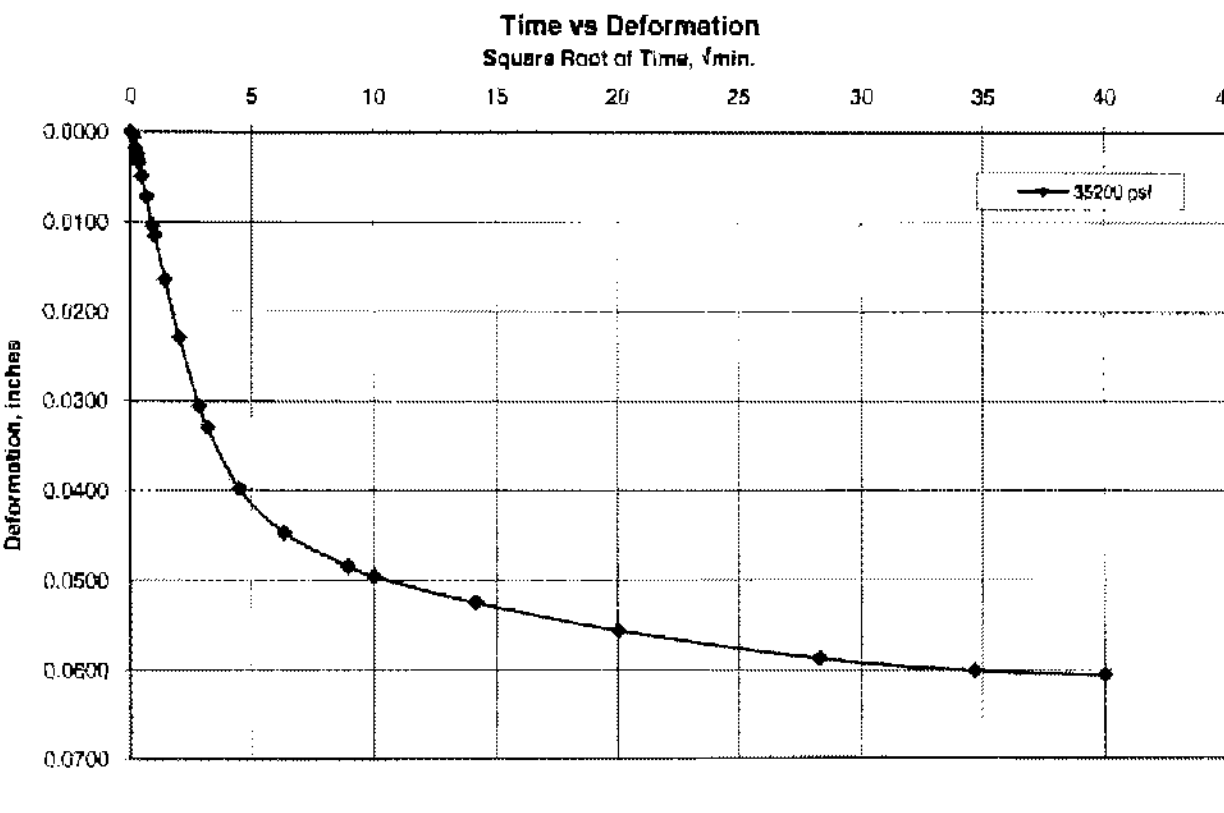


Cooper Testing Labs, Inc.

Load 17 | 35200 PSF



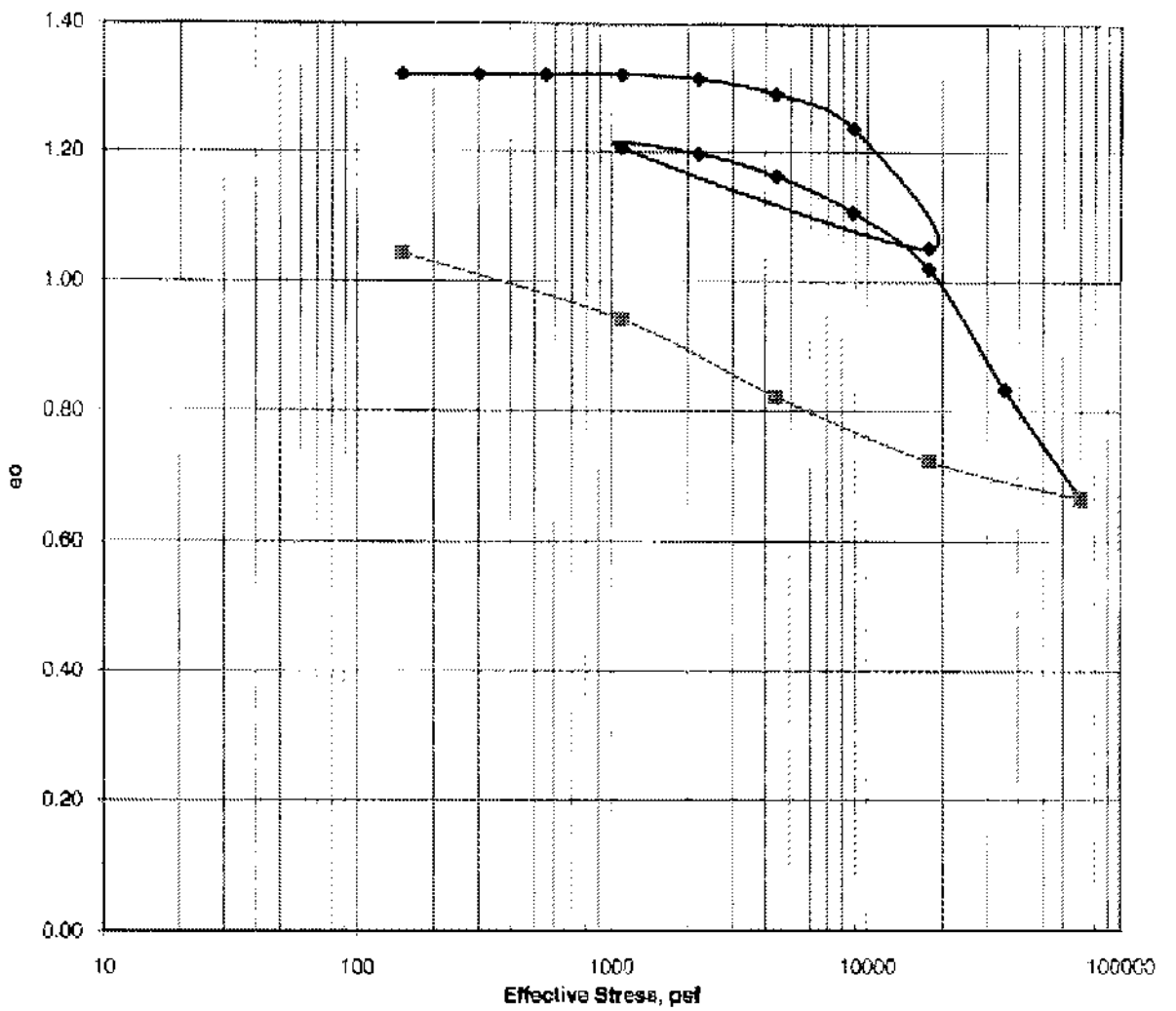
35200 PSF



Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-3	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-6	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	109-112	**Checked:**	PJ/DC
Soil Type:	Gray Fat CLAY			**Date:**	6/9/2008

eo-Log-P Curve

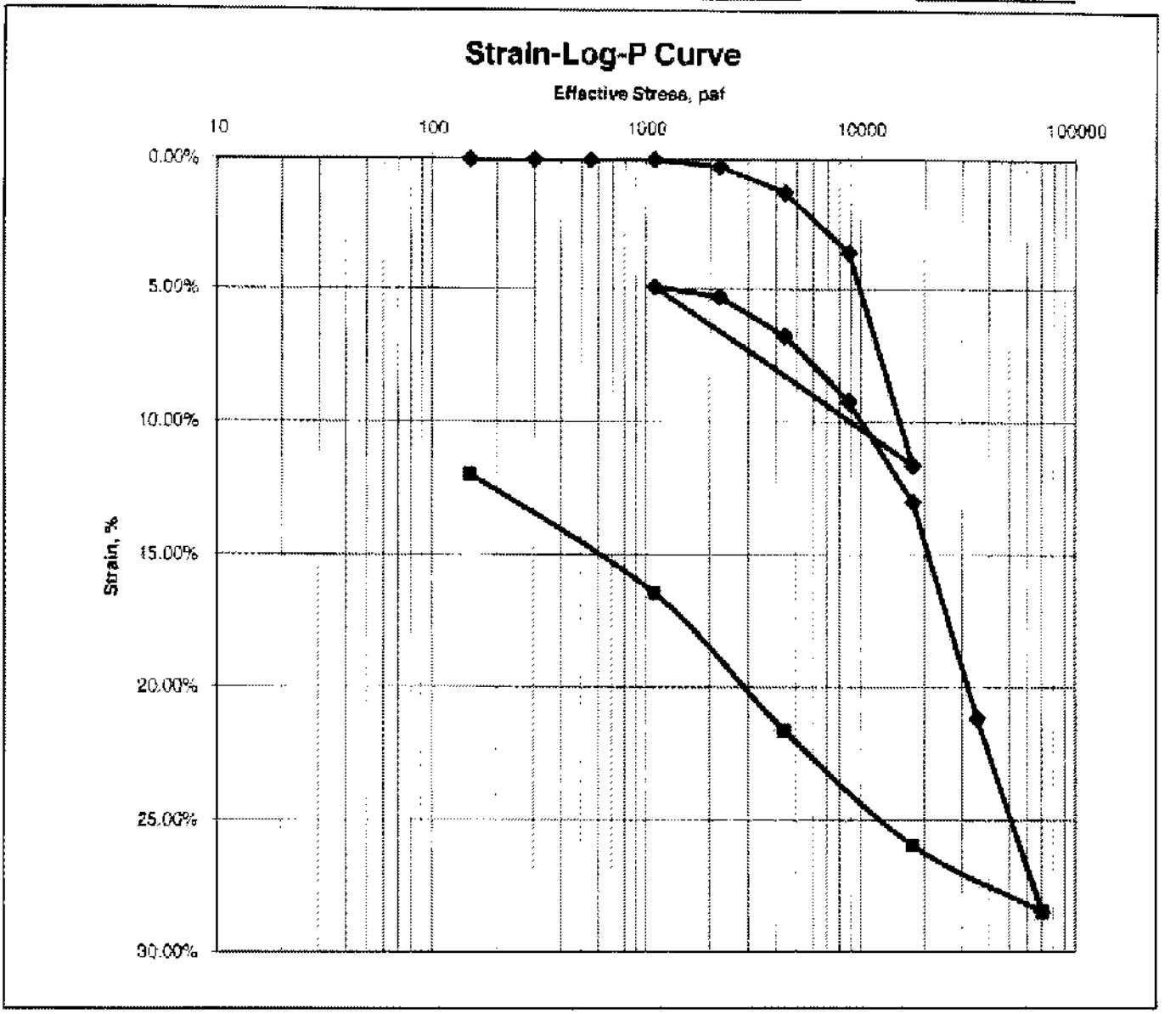


Ass. Gs = 2.7	Initial	Final
Moisture %:	48.4	39.6
Dry Density, pcf:	72.7	81.6
Void Ratio:	1.317	1.067
% Saturation:	99.1	100

Remarks:

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-3	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-6	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	109-112	**Checked:**	PJ/DC
Soil Type:	Gray Fat CLAY			**Date:**	6/9/2008



Ass. Gs = 2.7	Initial	Final
Moisture %:	48.4	39.6
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% Saturation:	99.1	100

Remarks:

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane Project
Boring	GS08-3
Sample:	S3-6
Depth, ft.:	109-112
Date:	6/9/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Description:	Gray Fat CLAY

Moisture Density Data Entry Screen

	Initial	Final
Height	1.01	0.9008
Diameter	2.42	2.42
Total Wet Weight	131.6	123.8
Wt of Wet Soil & Dish		170.7
Wt of Dry Soil & Dish		155.6
Wt. Of Dish		22.3
Wt of Ring		44.6
Moisture %	40.4	39.6
Wet Density, pcf	107.9	113.8
Dry Density, pcf	72.7	81.6
Specific Gravity	2.7	2.7
Area	4.6	4.6
V ft3	0.0	0.0
Vt, cc	76.1	67.9
Vs, cc	32.8	32.8
Vv, cc	43.3	35.0
e	1.3	1.1
porosity, %	56.8	51.6
S, %	99.1	100

Loading Increments — **Void Ratio**

Increment #	Load, psf	Dial .0001"	Load psf	Height Delta h	Volume Vt cc	Volds Vv	Void Ratio e
1	150	0.0001	150	1.0099	76.18	43.328	1.319
2	300	0.0002	300	1.0098	76.17	43.321	1.319
3	550	0.0003	550	1.0097	76.17	43.313	1.318
4	1100	0.0001	1100	1.0099	76.18	43.328	1.319
5	2200	0.0029	2200	1.0071	75.97	43.117	1.312
6	4400	0.0130	4400	0.9970	75.21	42.355	1.289
7	8800	0.0360	8800	0.9740	73.47	40.620	1.236
8	17600	0.1163	17600	0.8937	67.41	34.563	1.052
9	1100	0.0393	1100	0.9607	72.47	39.617	1.206
10	2200	0.0530	2200	0.9570	72.19	39.3390	1.197436
11	4400	0.0879	4400	0.9421	71.07	38.2141	1.163225
12	8800	0.0924	8800	0.9176	69.22	36.3690	1.106966
13	17600	0.1301	17600	0.8799	66.37	33.5221	1.020403
14	35200	0.2110	35200	0.7982	60.21	27.3592	0.832805
15	70400	0.2846	70400	0.7252	54.70	21.8525	0.665186
16		0.2846	#N/A	0.7252	54.70	21.8525	0.665186
17		0.2846	#N/A	0.7252	54.70	21.8525	0.665186
18		0.2846	#N/A	0.7252	54.70	21.8525	0.665186
19		0.2846	#N/A	0.7252	54.70	21.8525	0.665186

Rebound Increments — **Void Ratio**

15	70400	0.2846	70400	0.7252	54.70	21.8525	0.665185
16	17600	0.2597	17600	0.7503	56.60	23.7459	0.722810
17	4400	0.2165	4400	0.7935	59.86	27.0047	0.822013
18	1100	0.1646	1100	0.8454	63.77	30.9197	0.941185
19	150	0.1198	150	0.8902	67.15	34.2991	1.044053
20			#N/A	1.0100	76.19	43.3360	1.319135

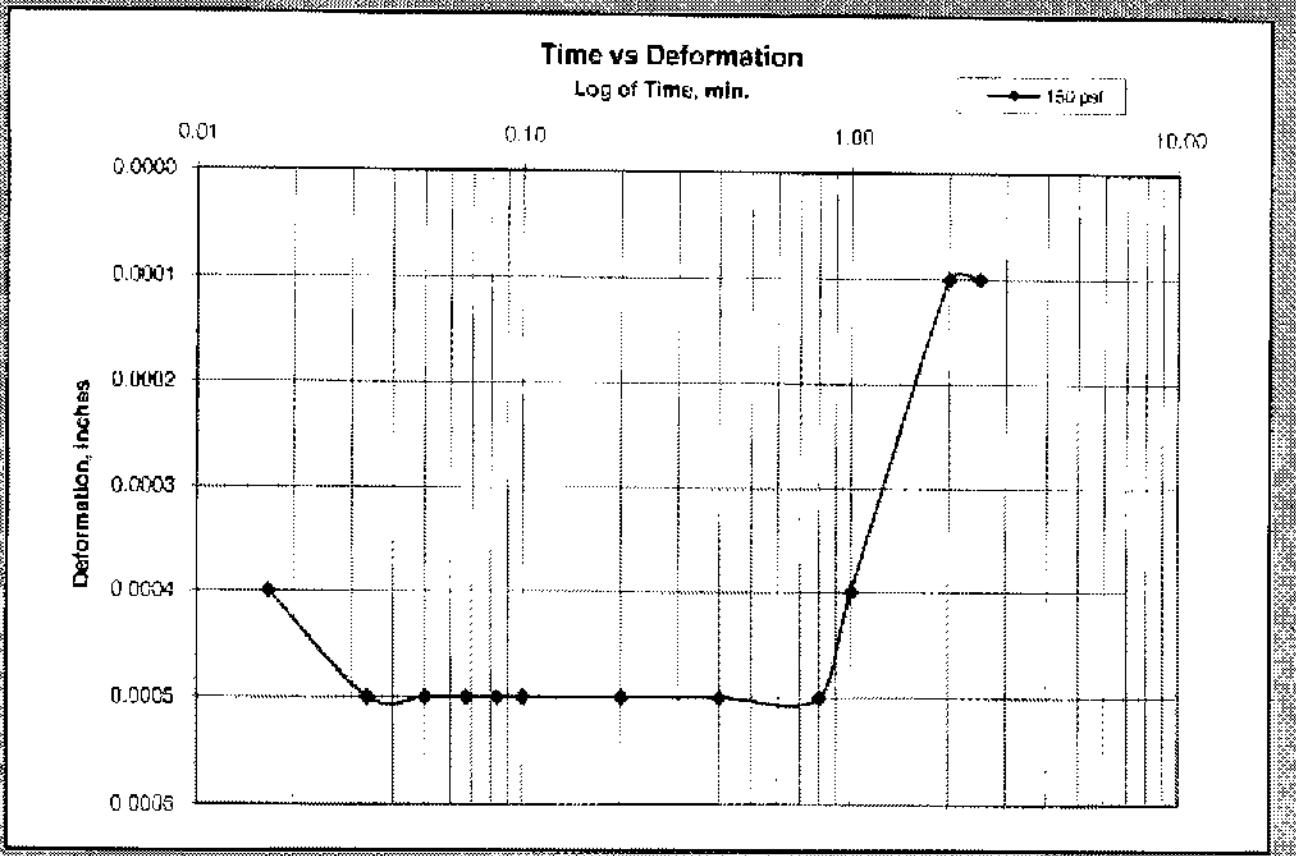
Tot Dry Wt 88.7000

The data to the left is used to determine the theoretical

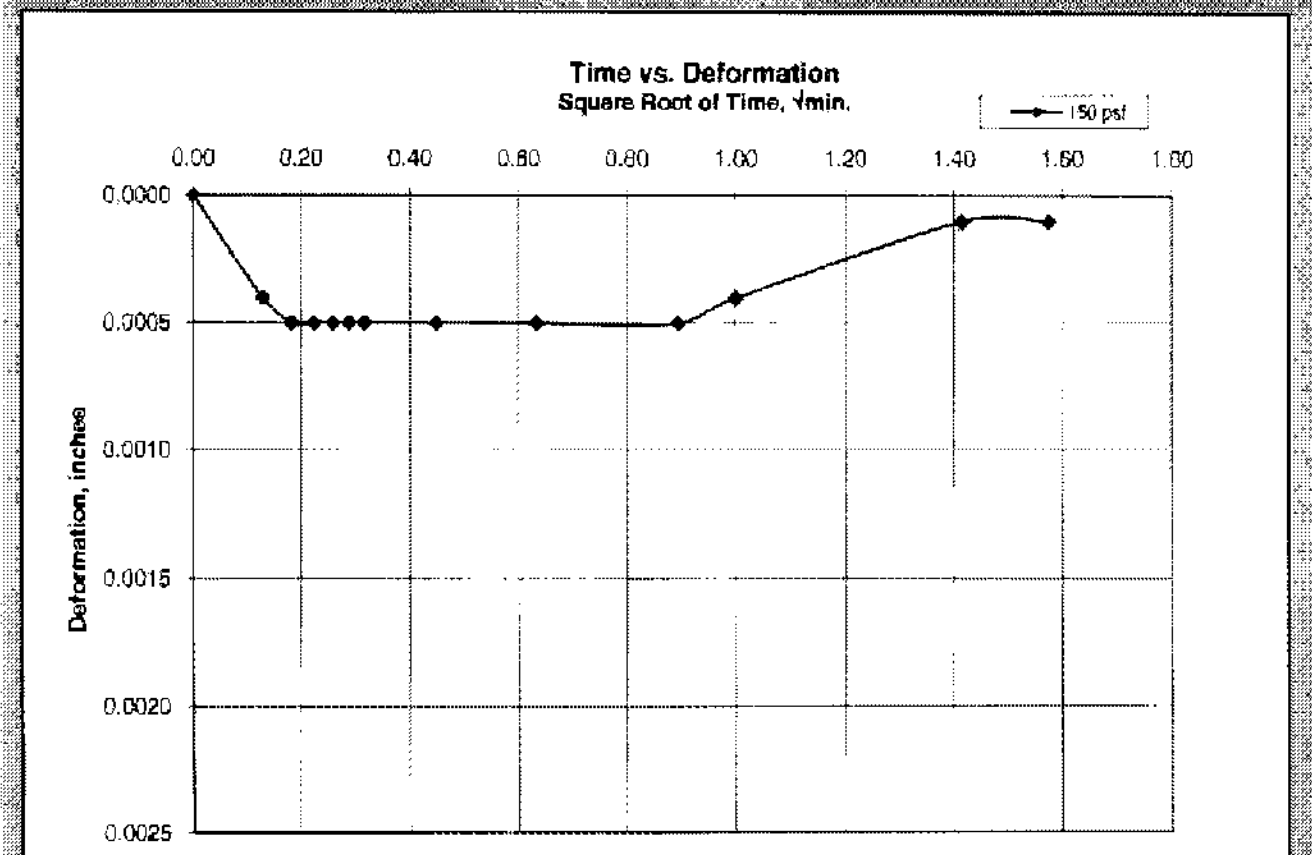
Cooper Testing Labs, Inc.

Load 1

150 PSF



150 PSF



Cooper Testing Labs, Inc.

Load 2

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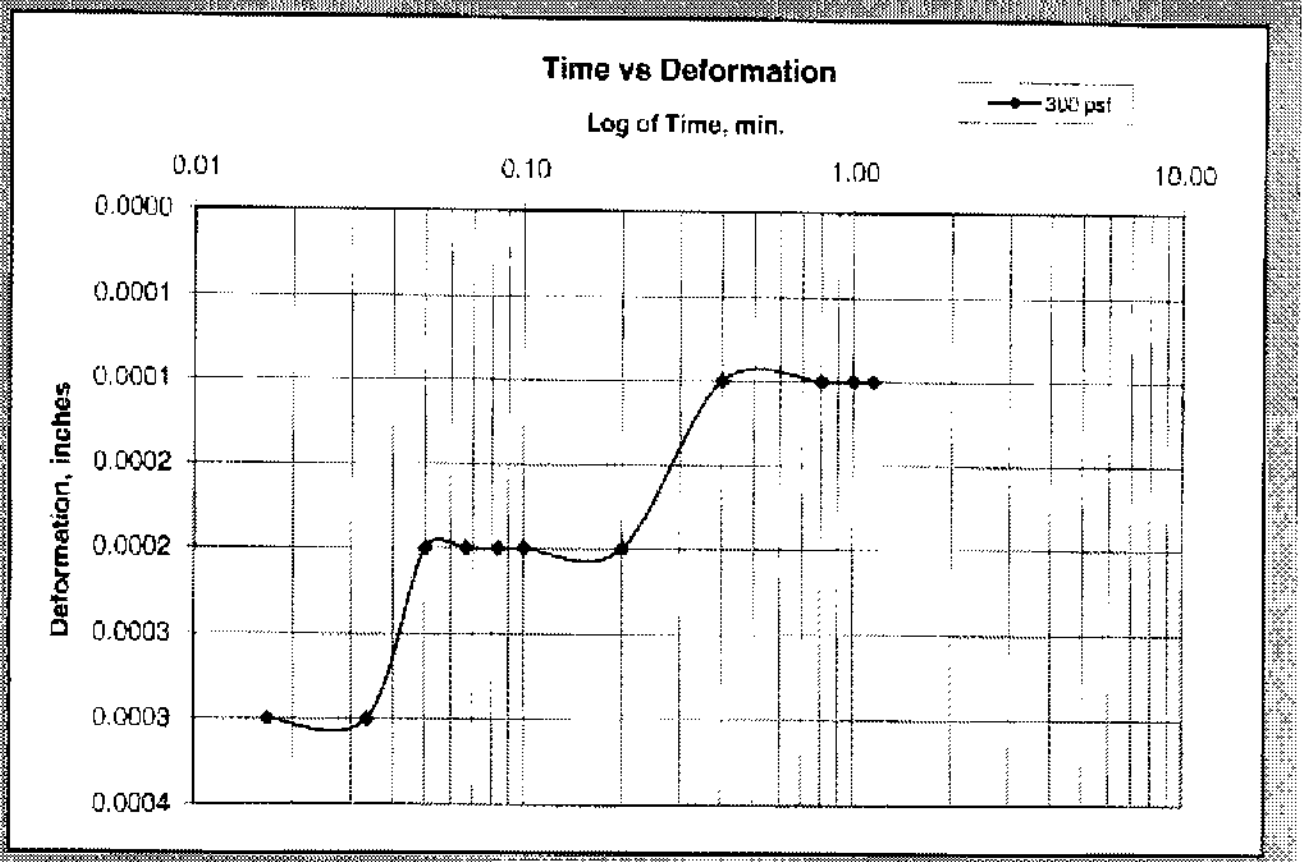
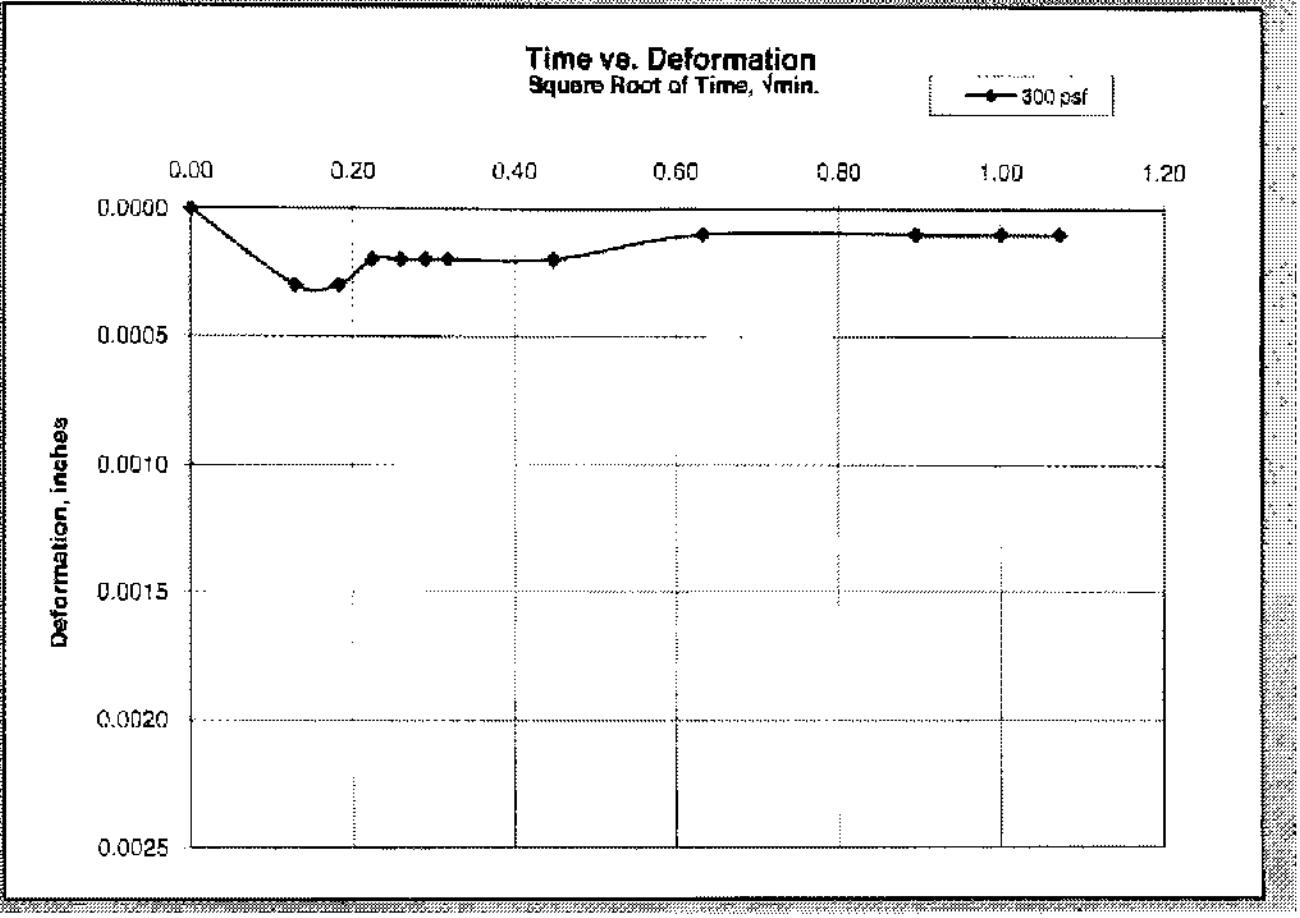
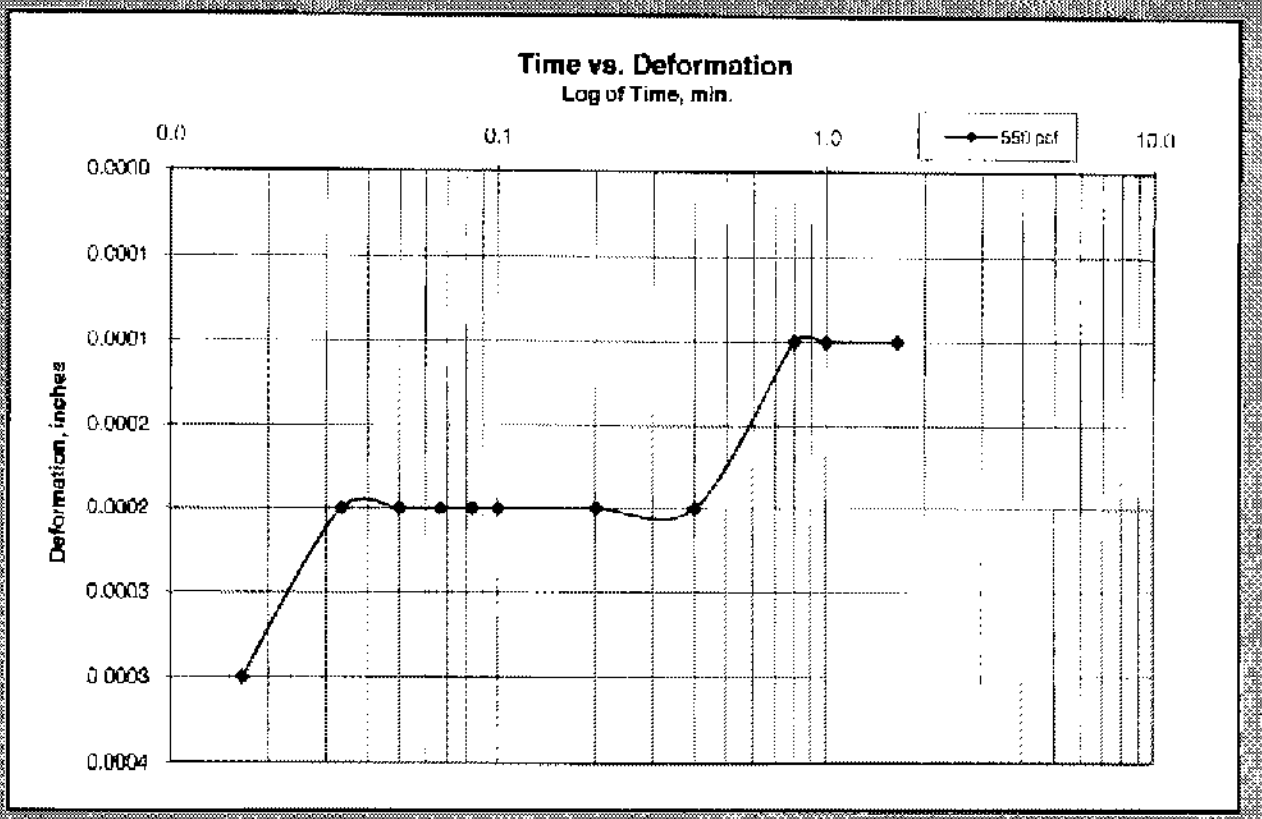


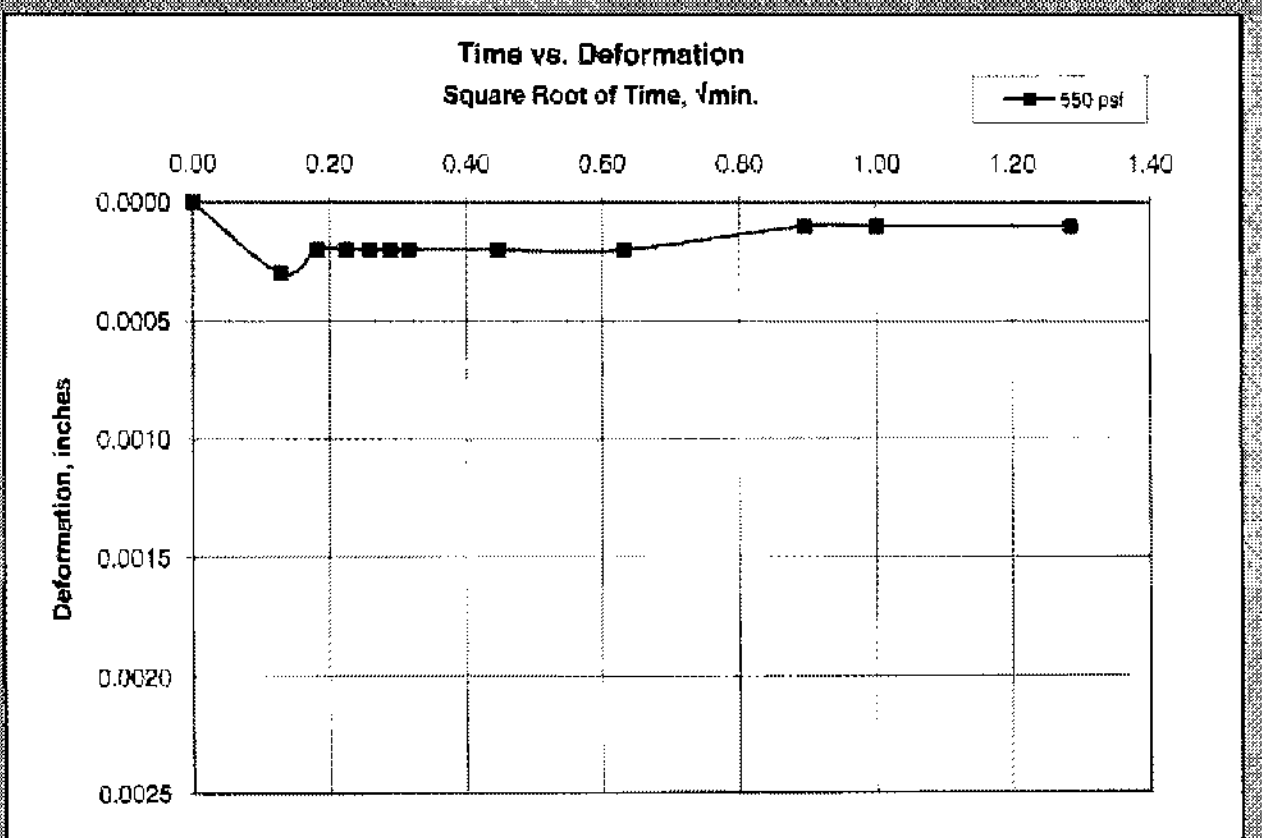
300 PSF



Load 3 — 550 PSF

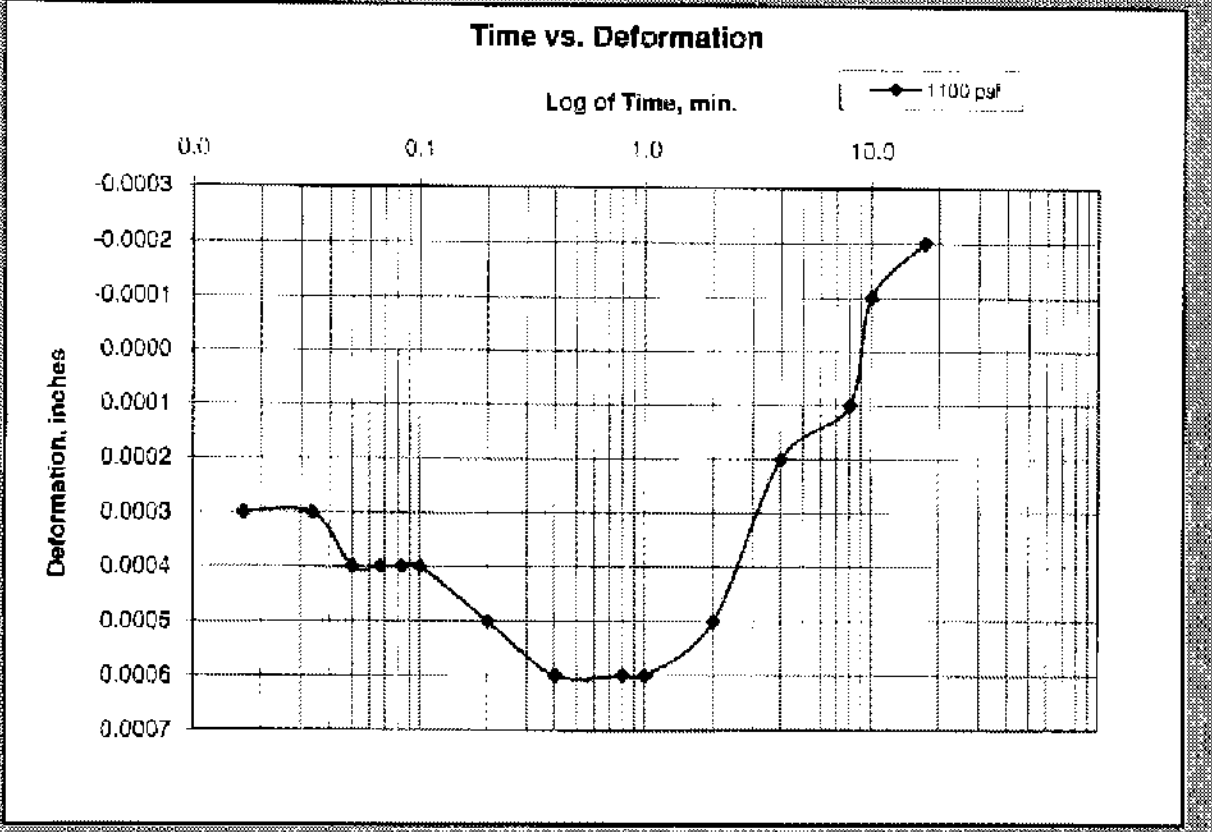


550 PSF

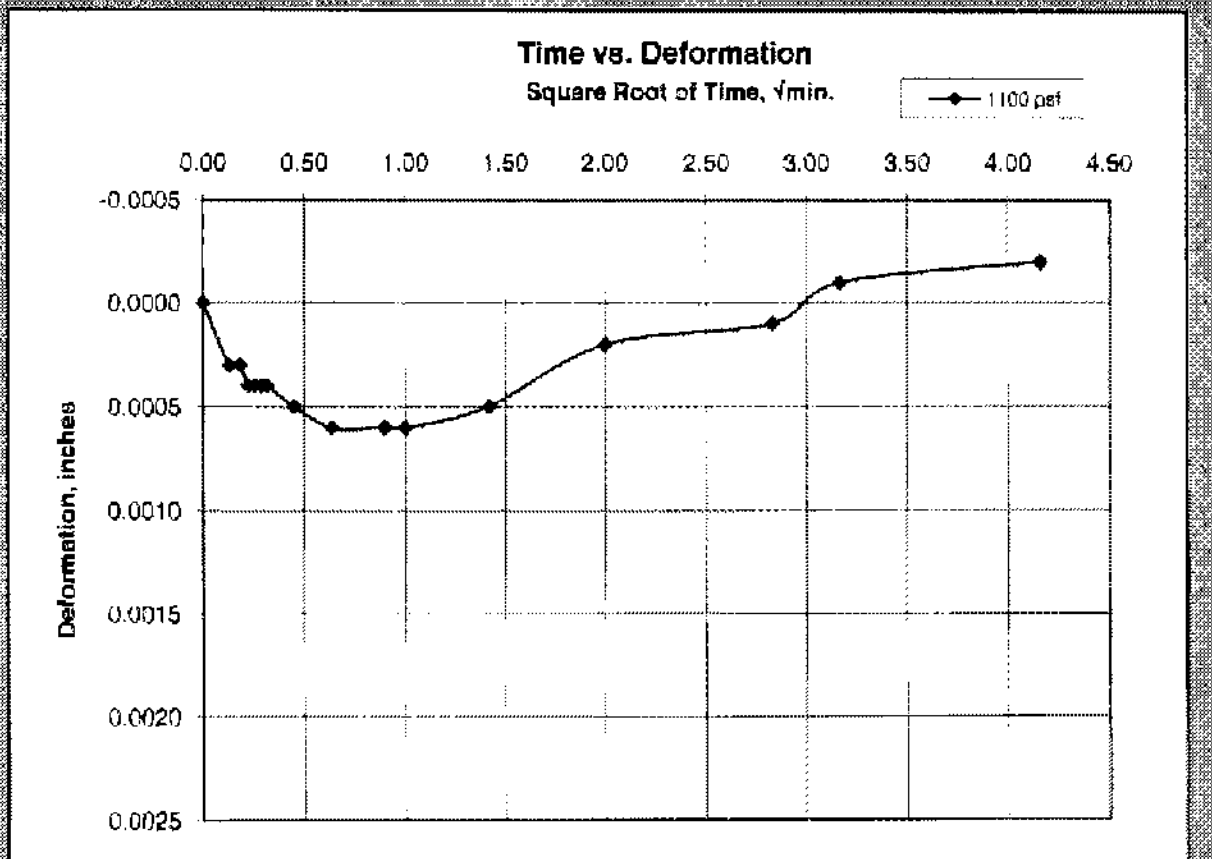


Load 4

1100 PSF



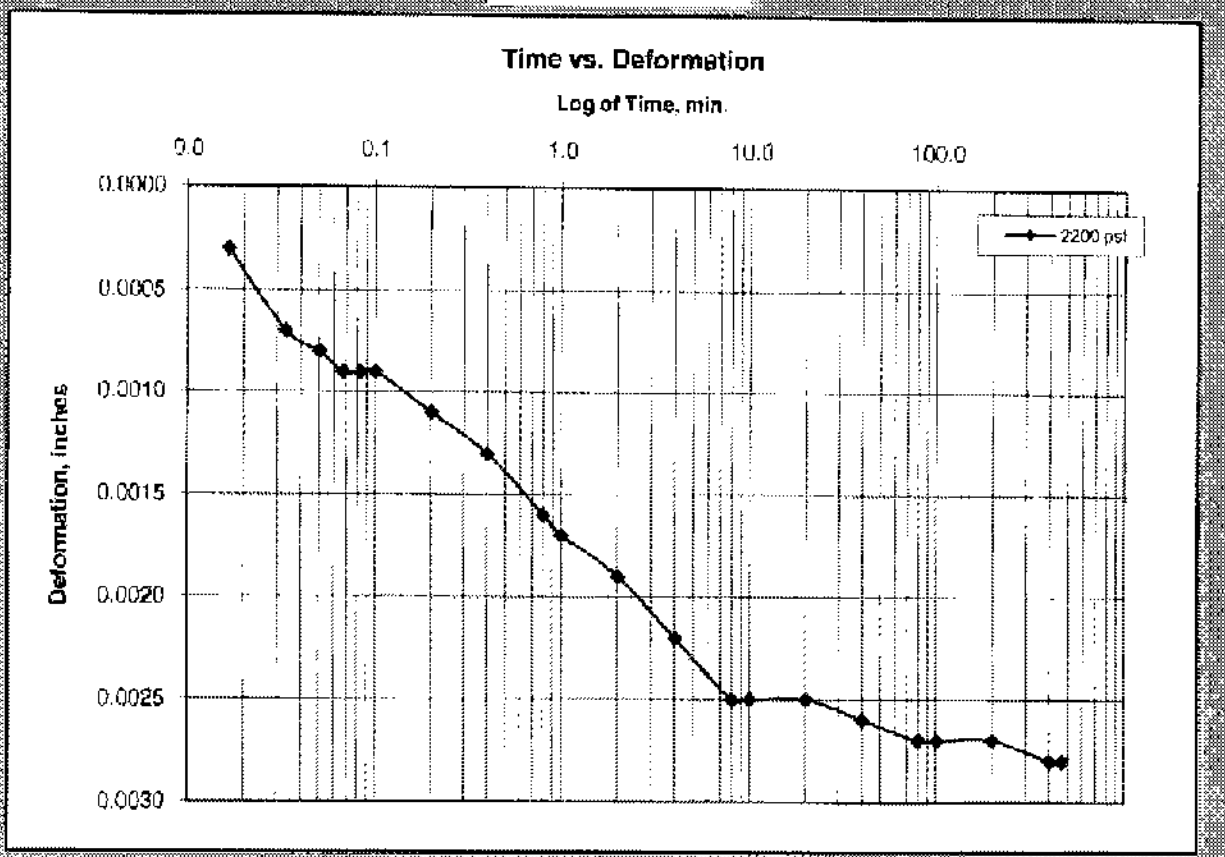
1100 PSF



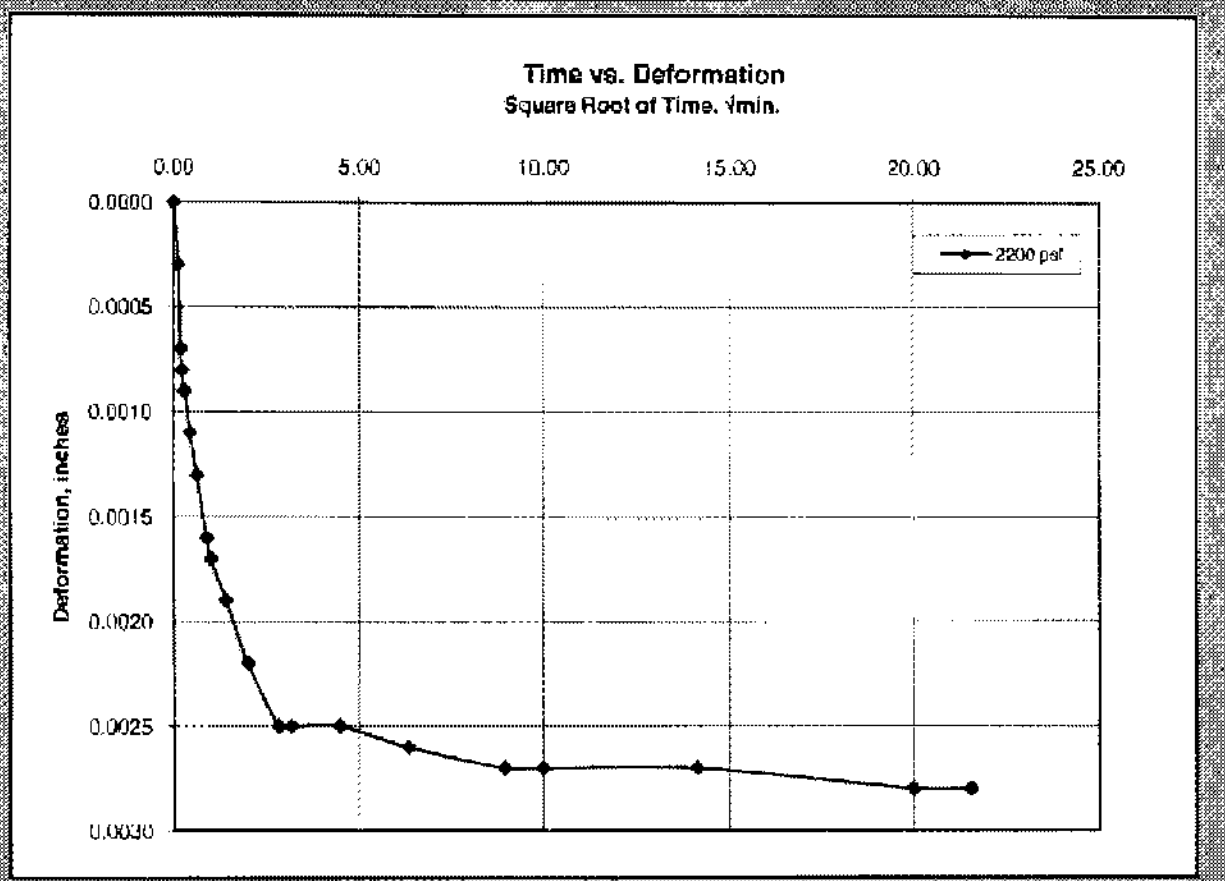
Cooper Testing Labs, Inc.

Load 5

2200 PSF

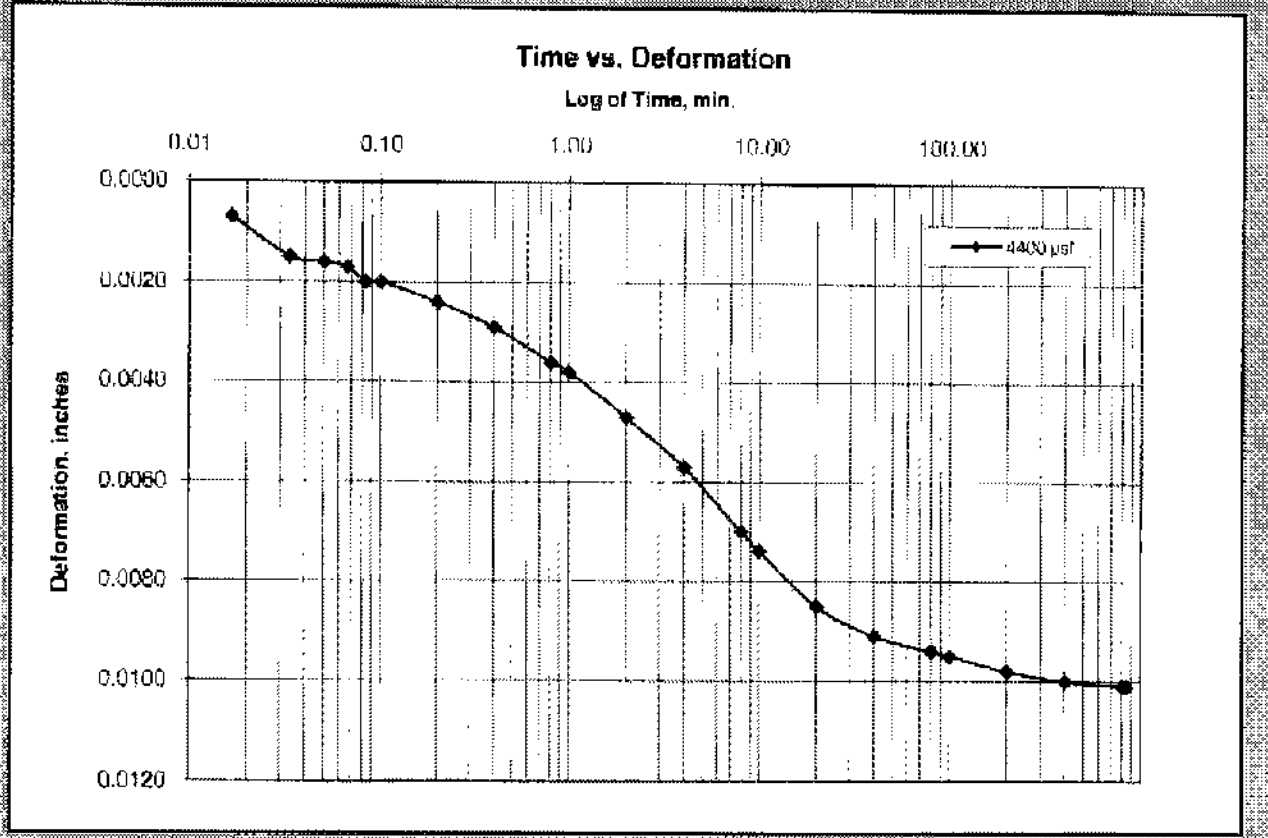


2200 PSF

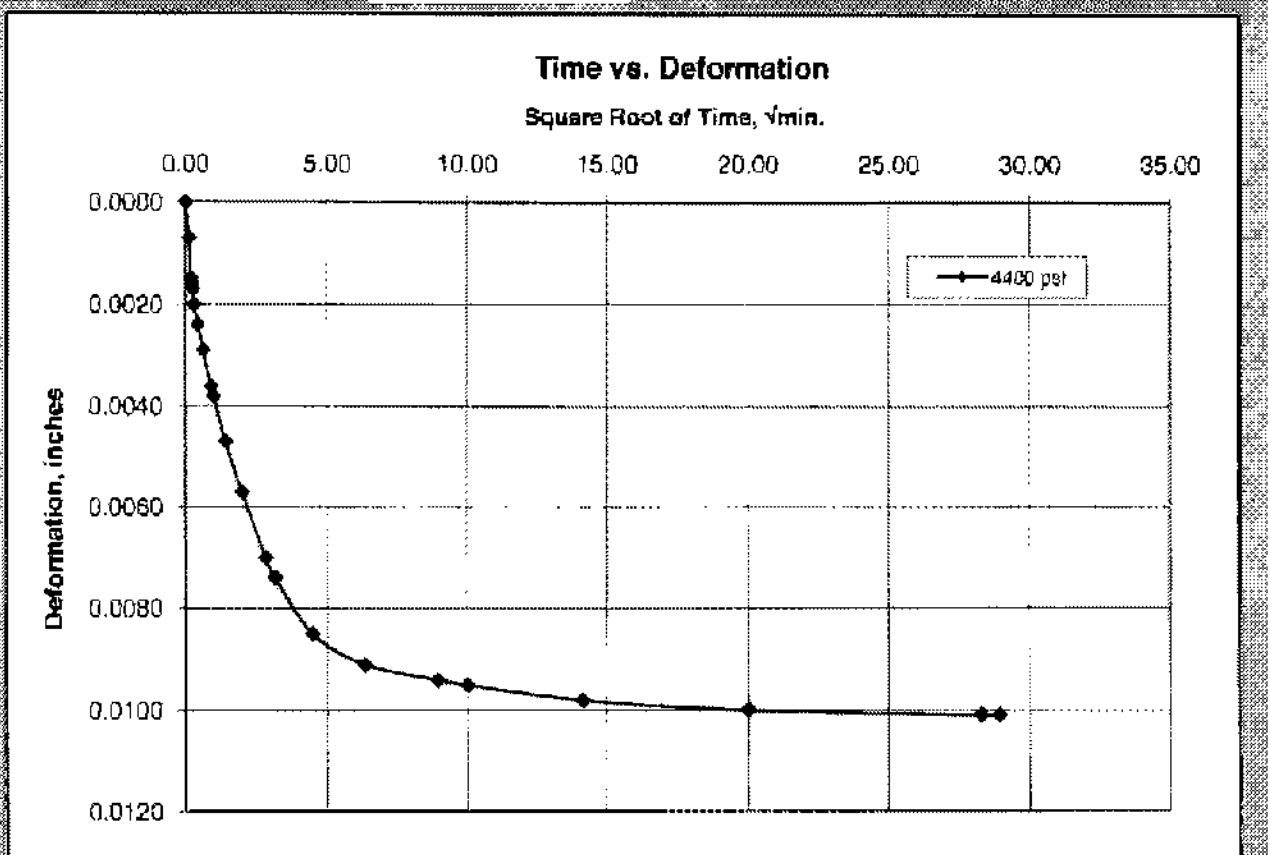


Cooper Testing Labs, Inc.

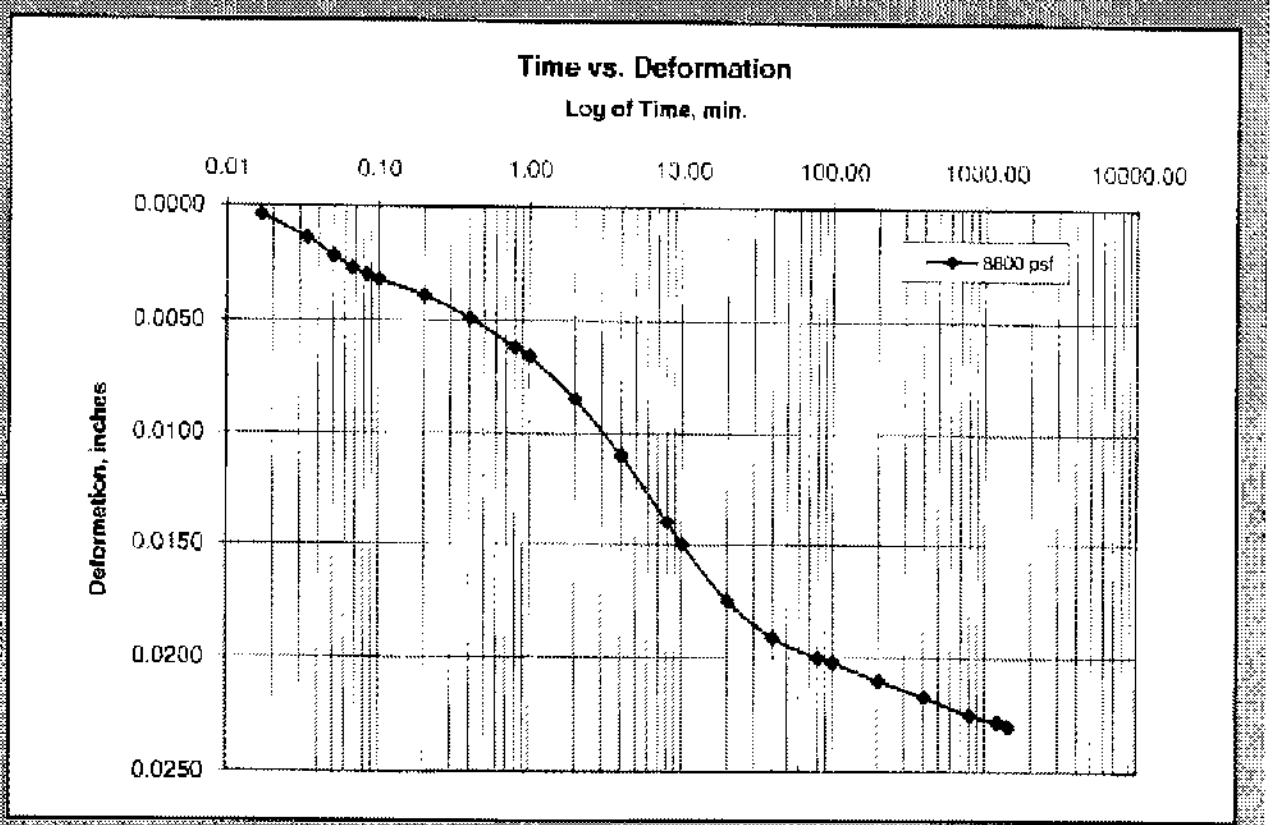
Load 6 — 4400 PSF



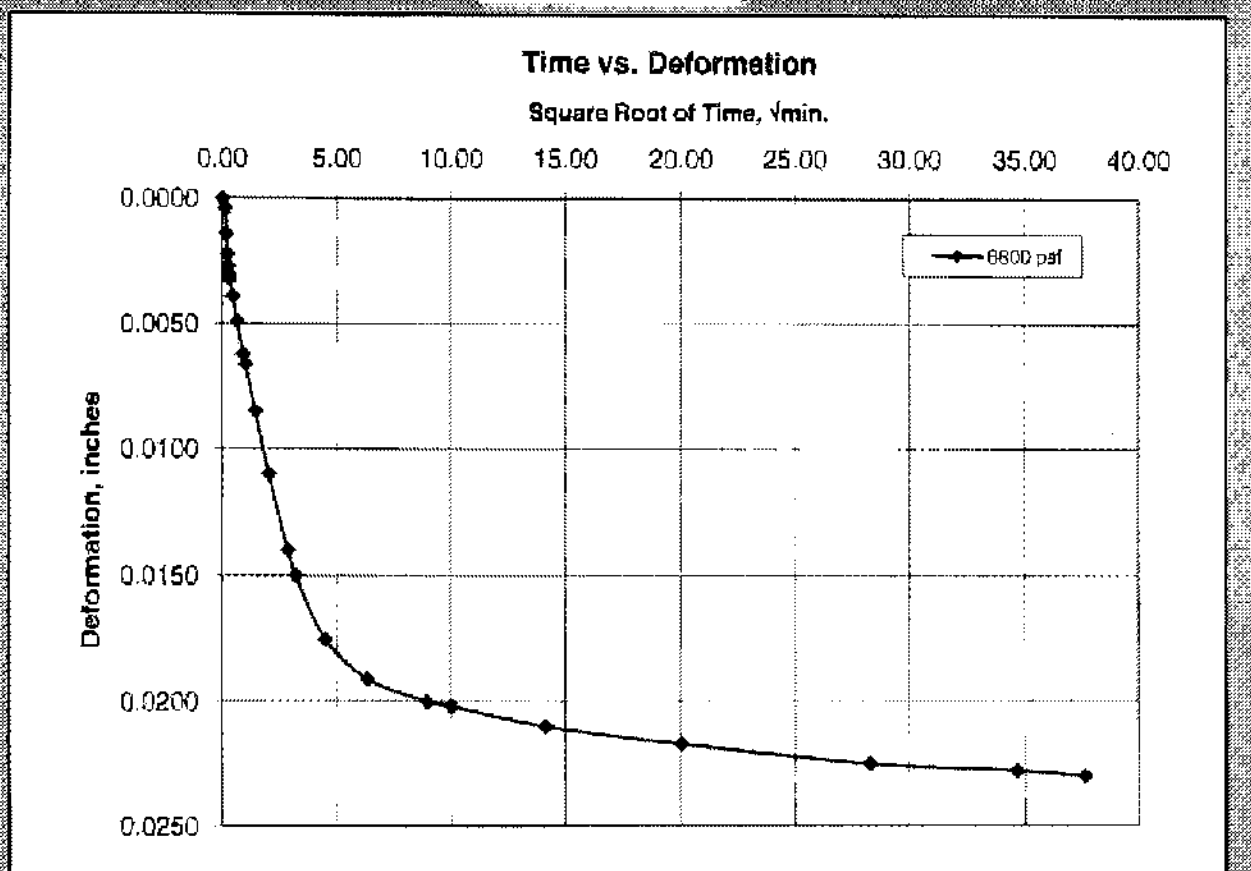
4400 PSF



Load 7 — 8800 PSF

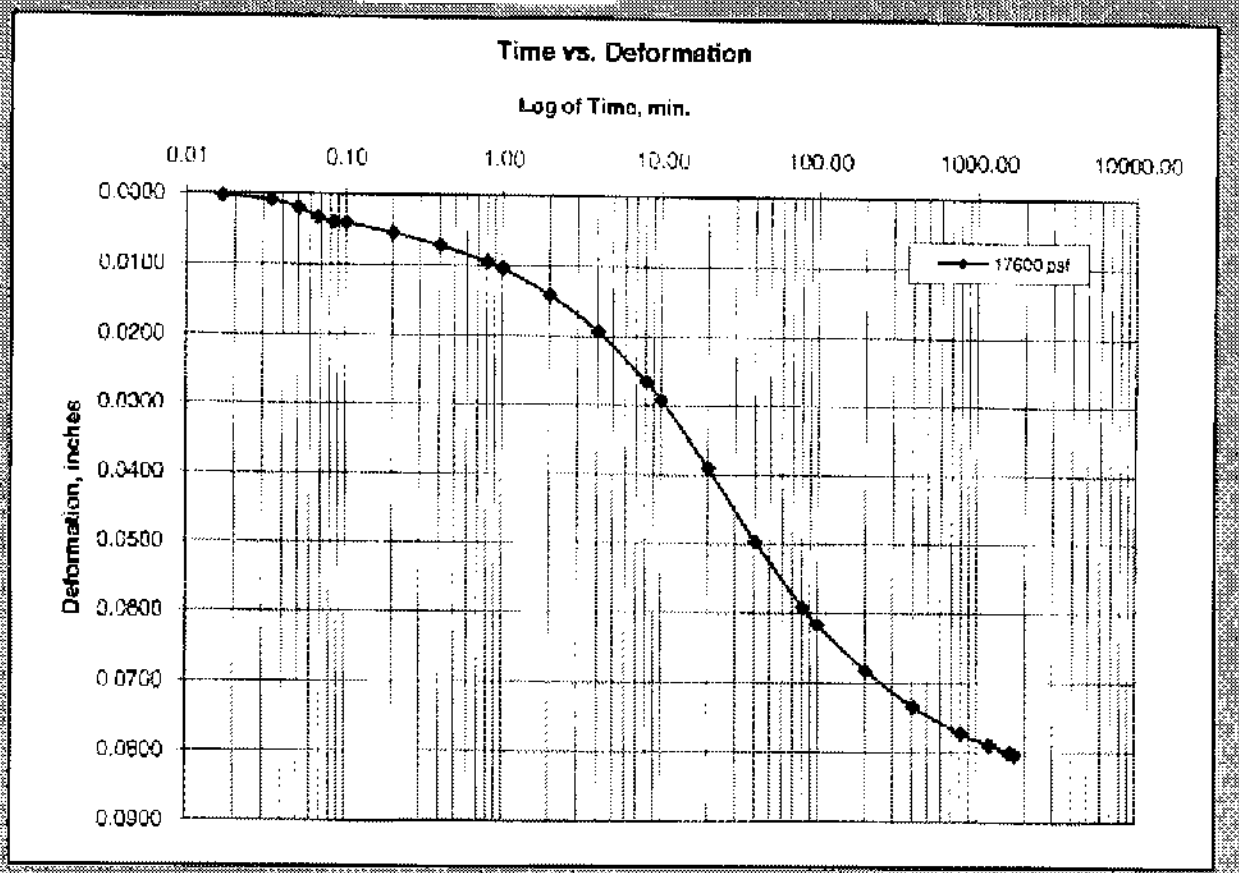


8800 PSF

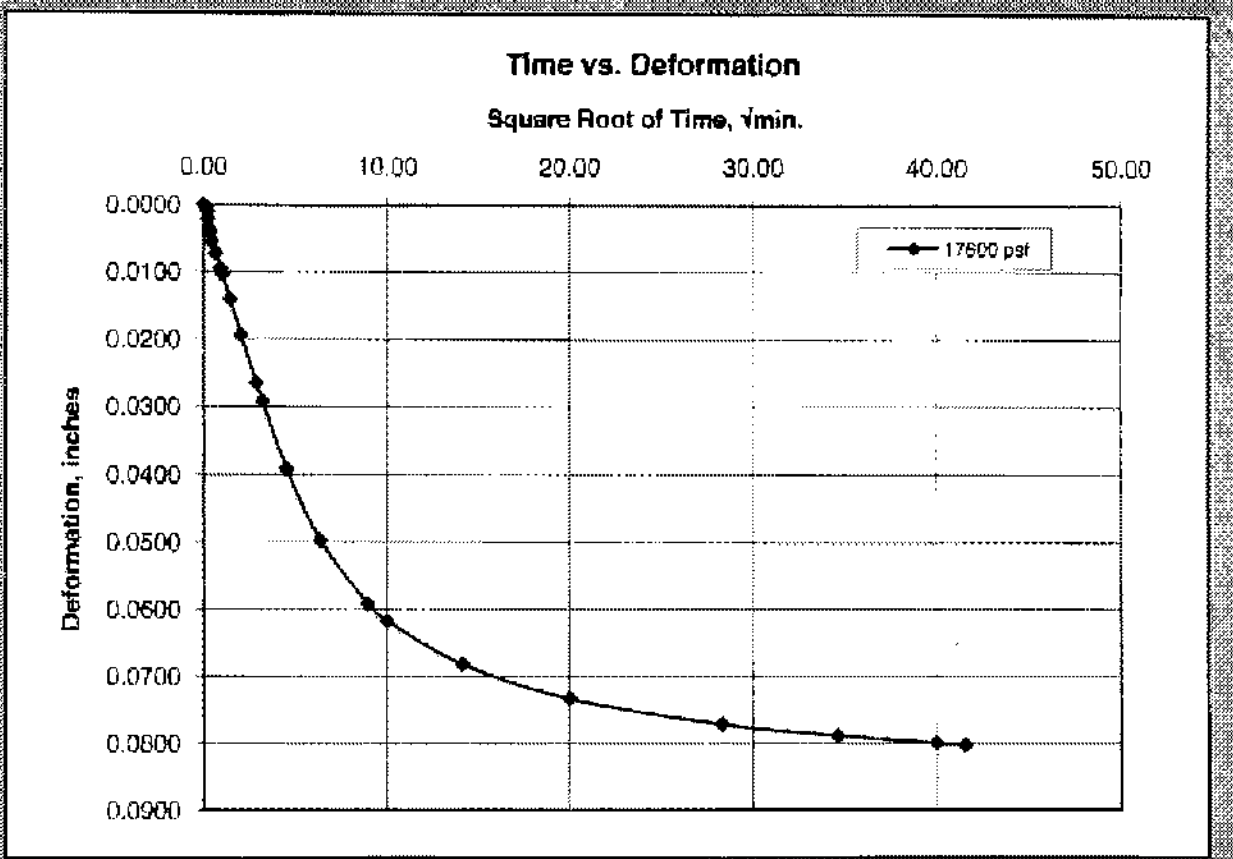


Cooper Testing Labs, Inc.

Load 6 | 17600 PSF

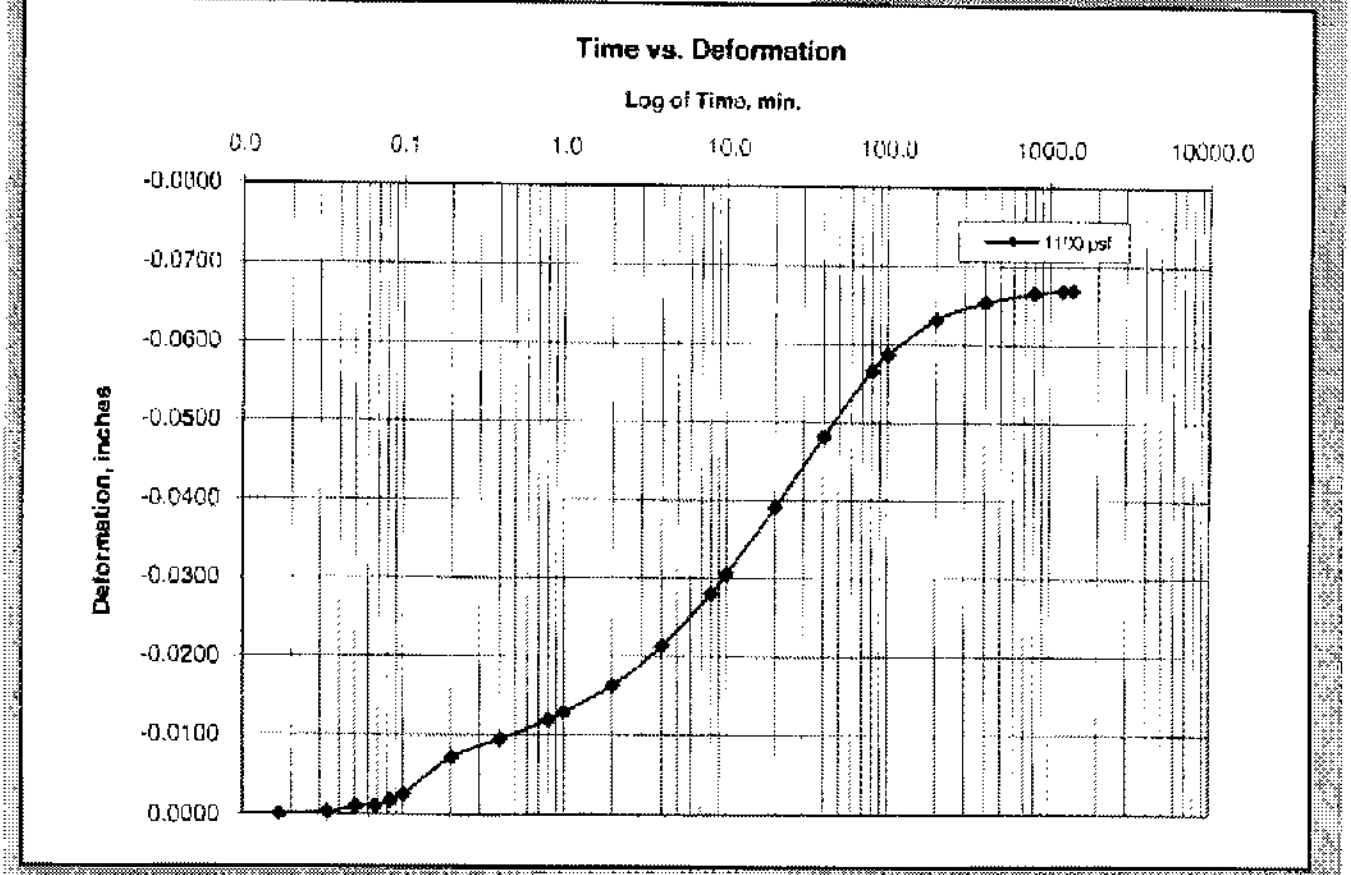


17600 PSF

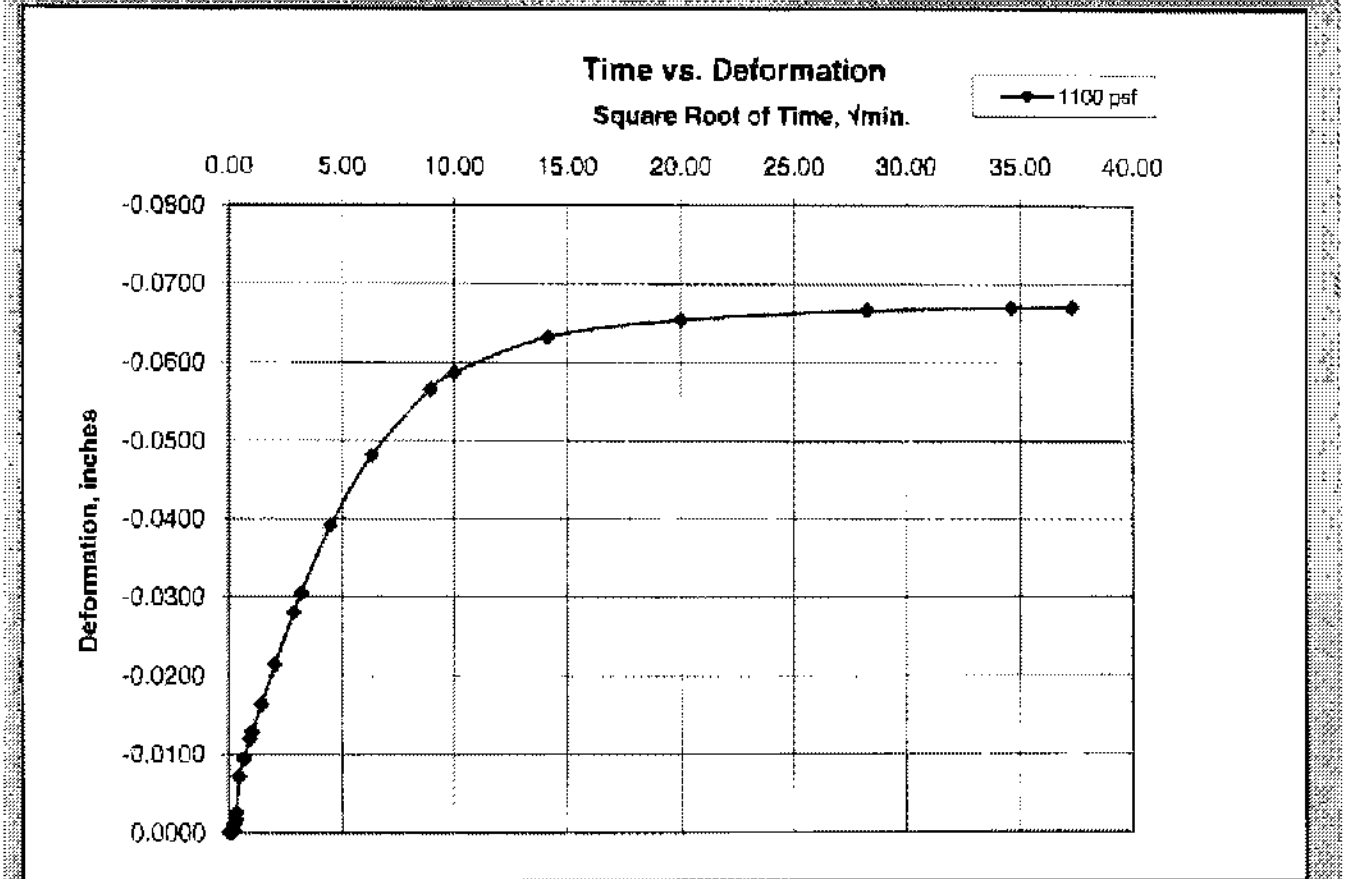


Cooper Testing Labs, Inc.

Load 9 — 1100 PSF



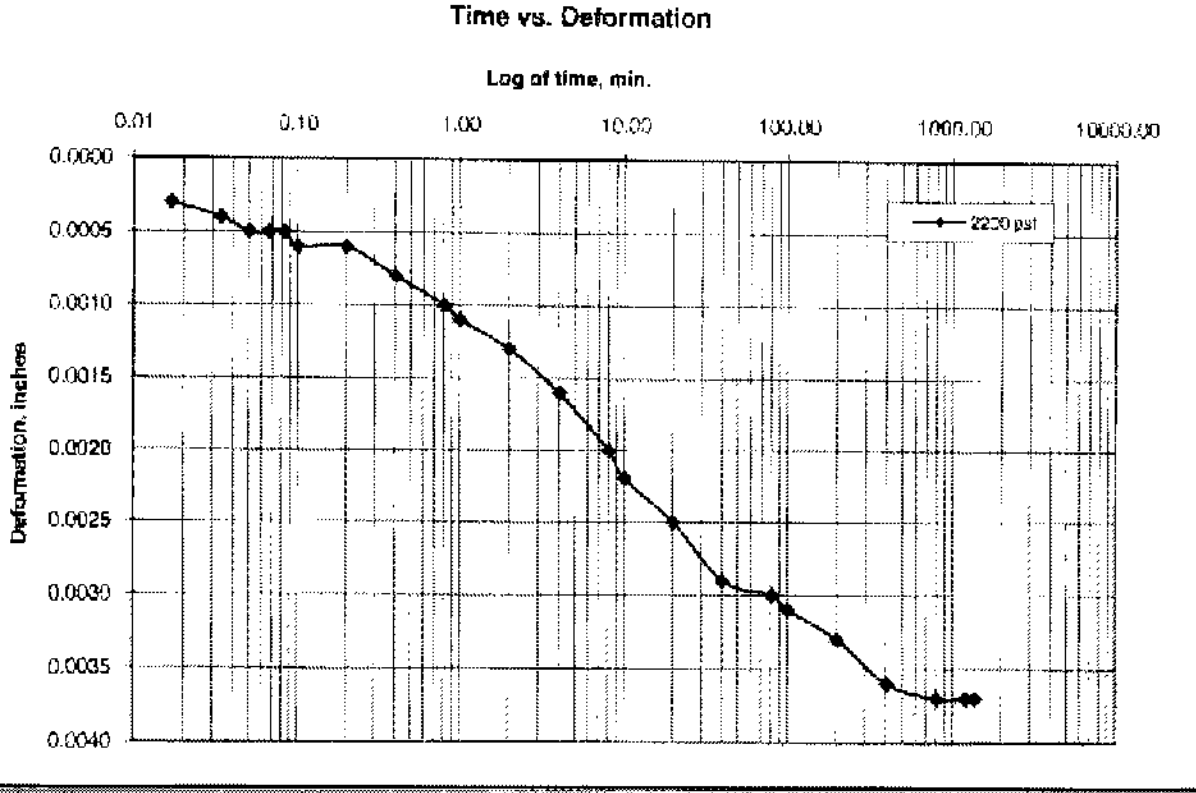
1100 PSF



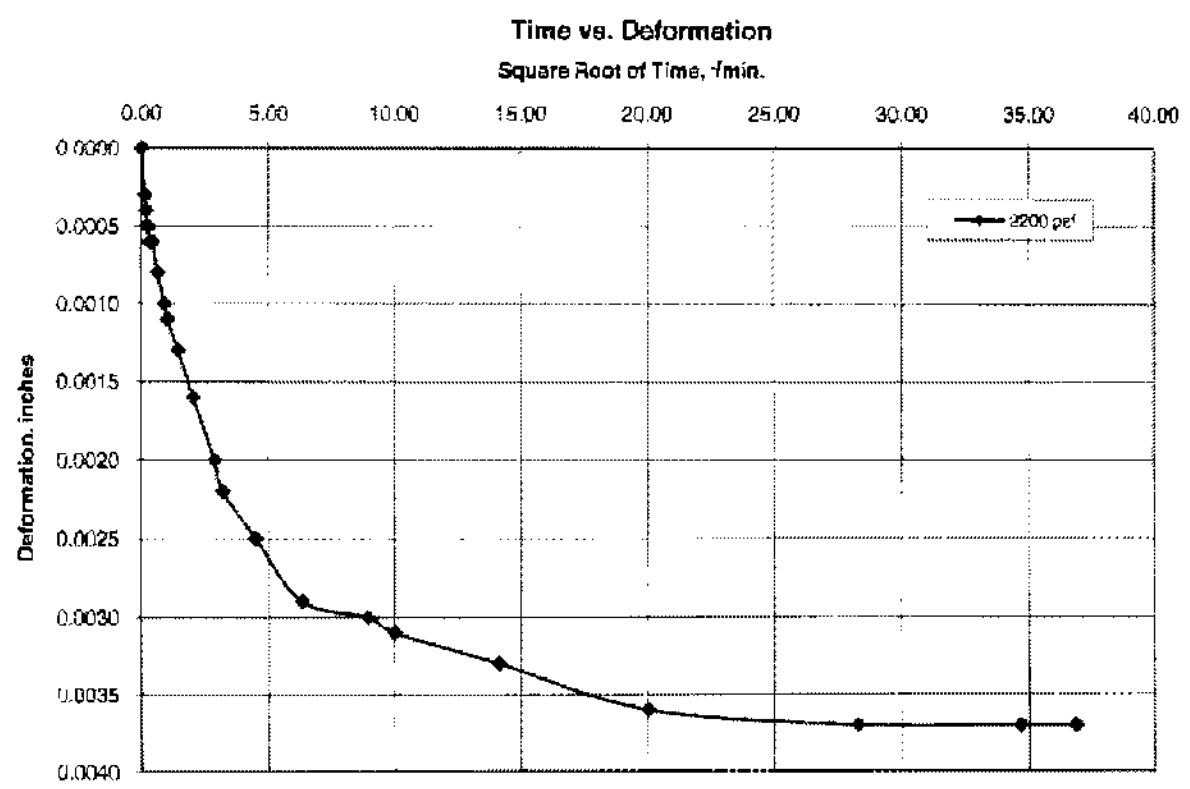
Cooper Testing Labs, Inc.

Load 10

2200 PSF

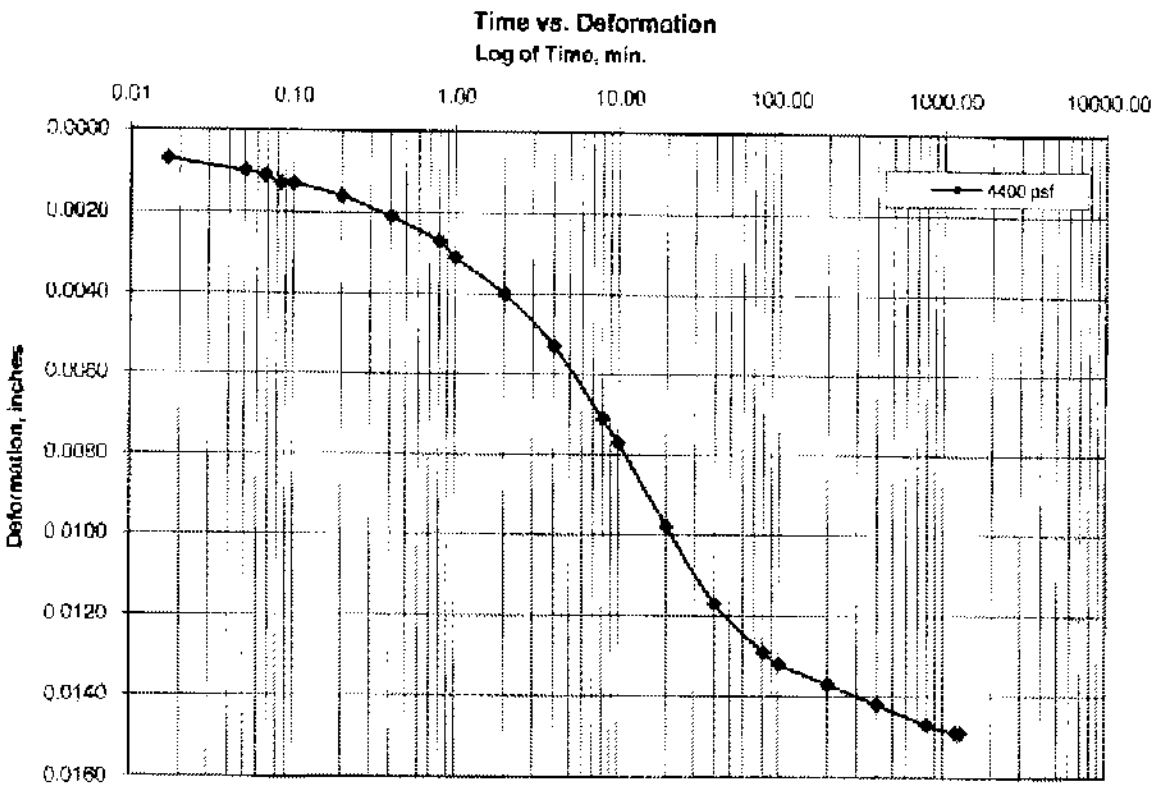


2200 PSF

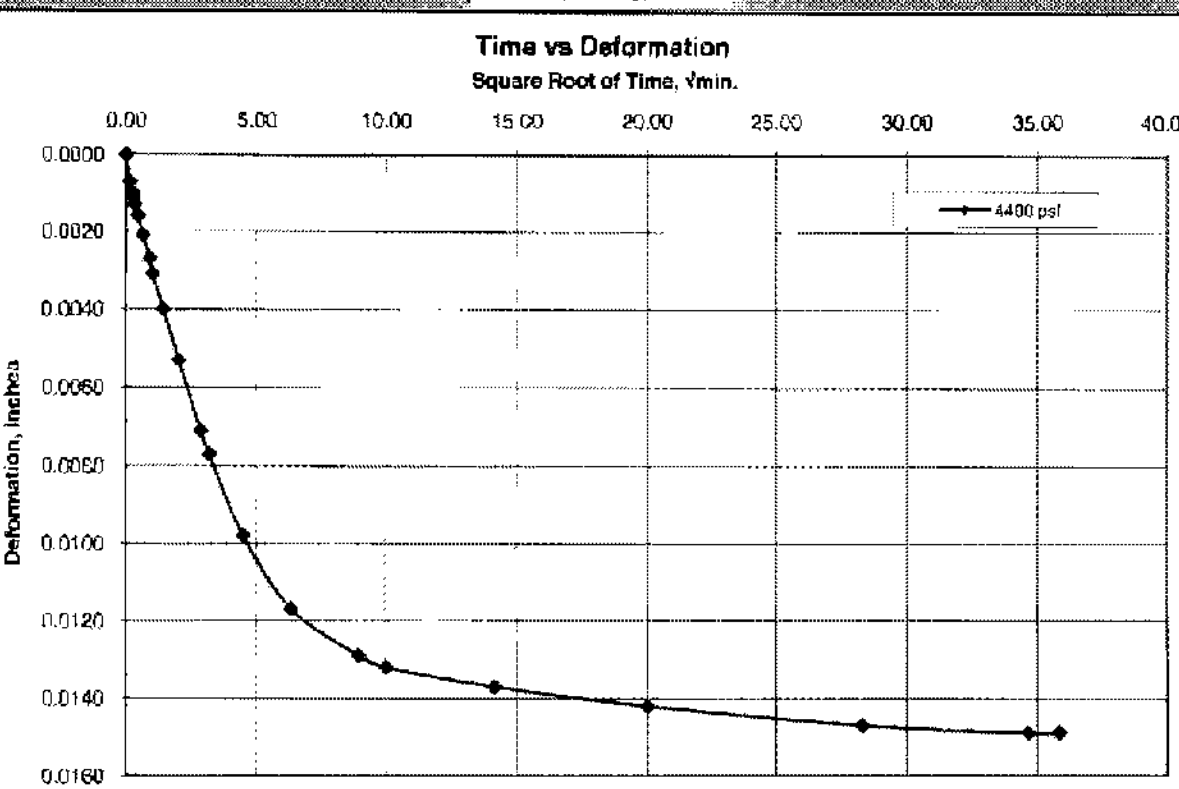


Cooper Testing Labs, Inc.

Load 11 — 4400 PSF

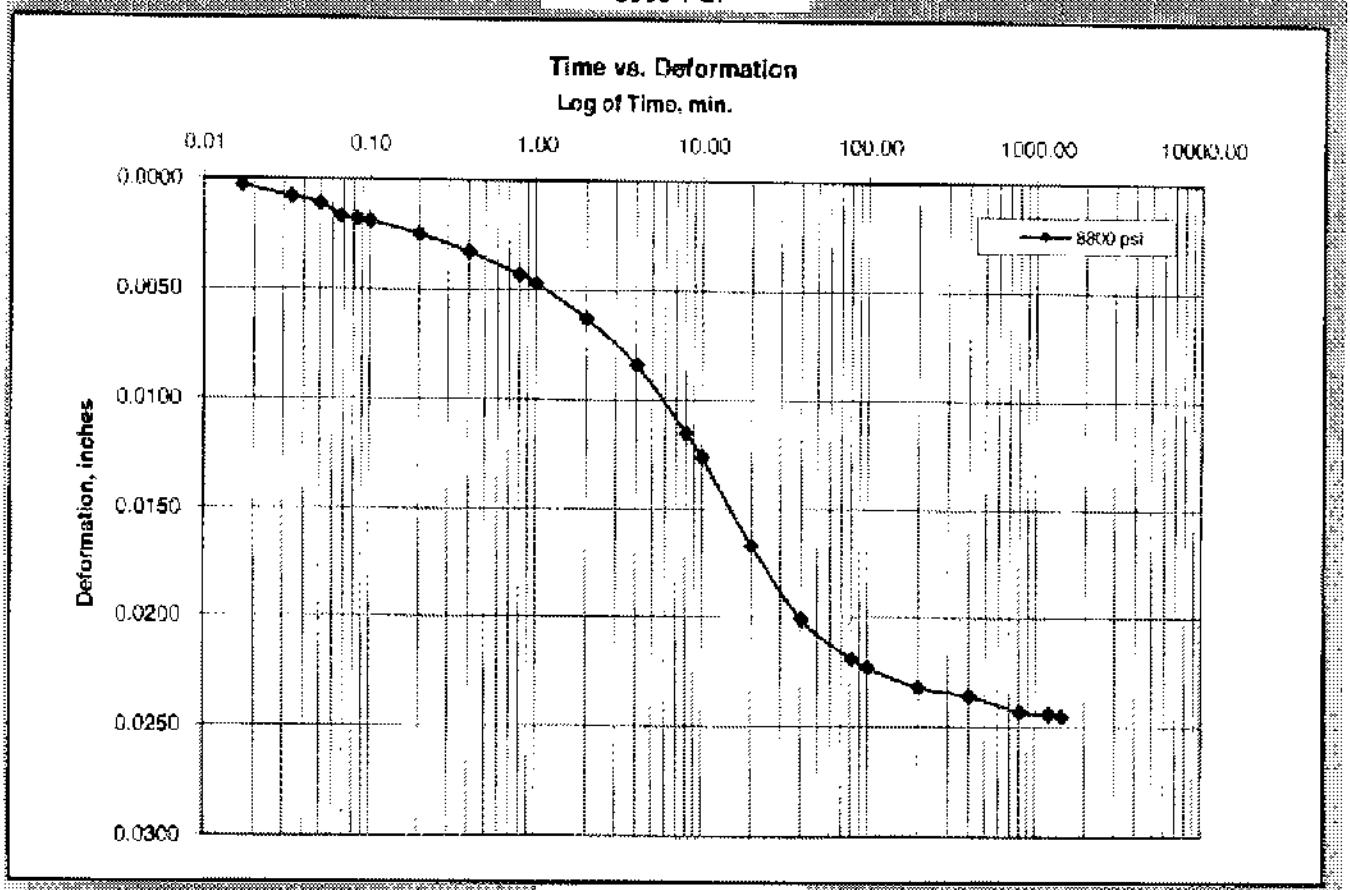


4400 PSF

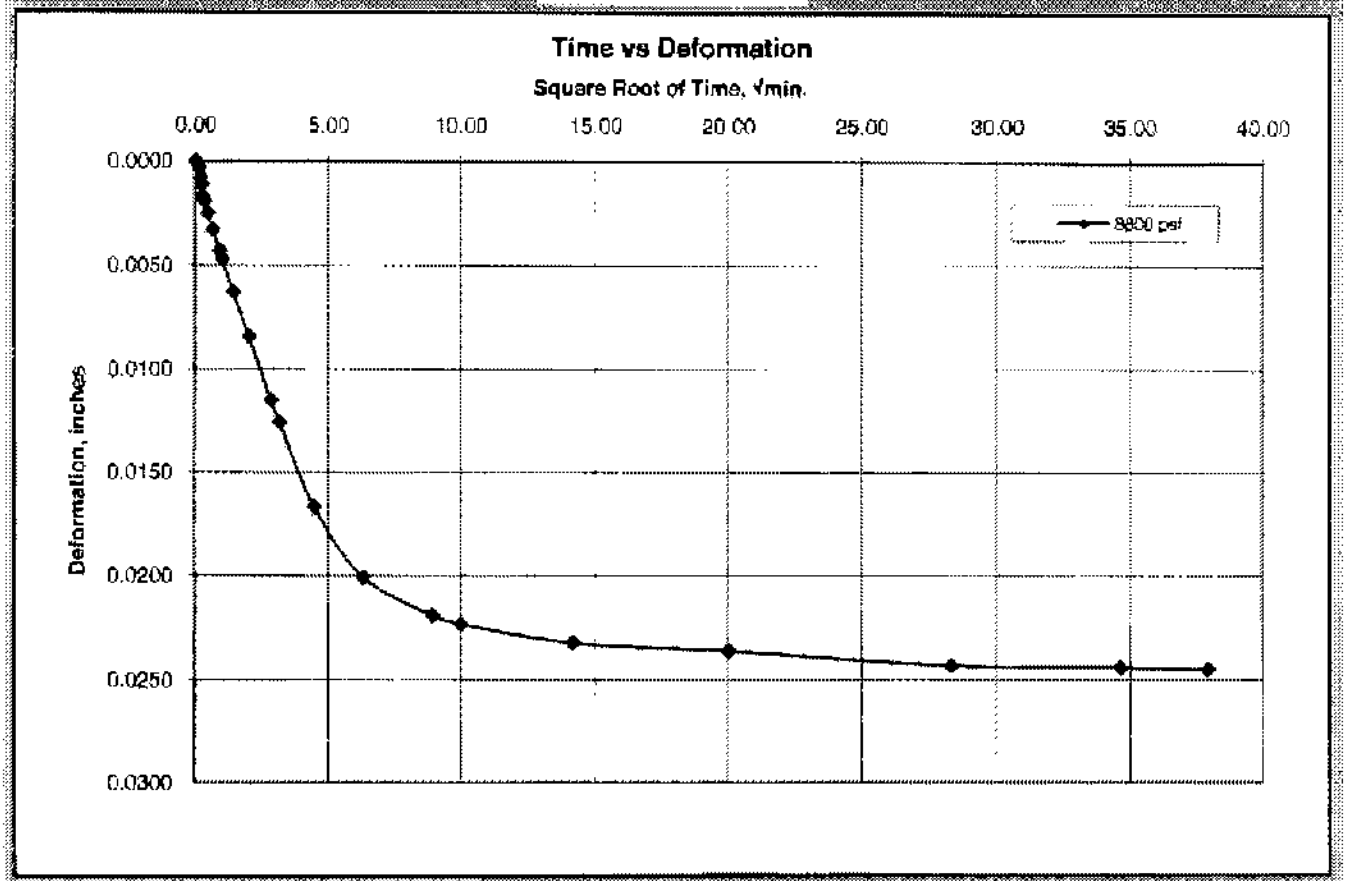


Cooper Testing Labs, Inc.

Load 12 — 8800 PSF

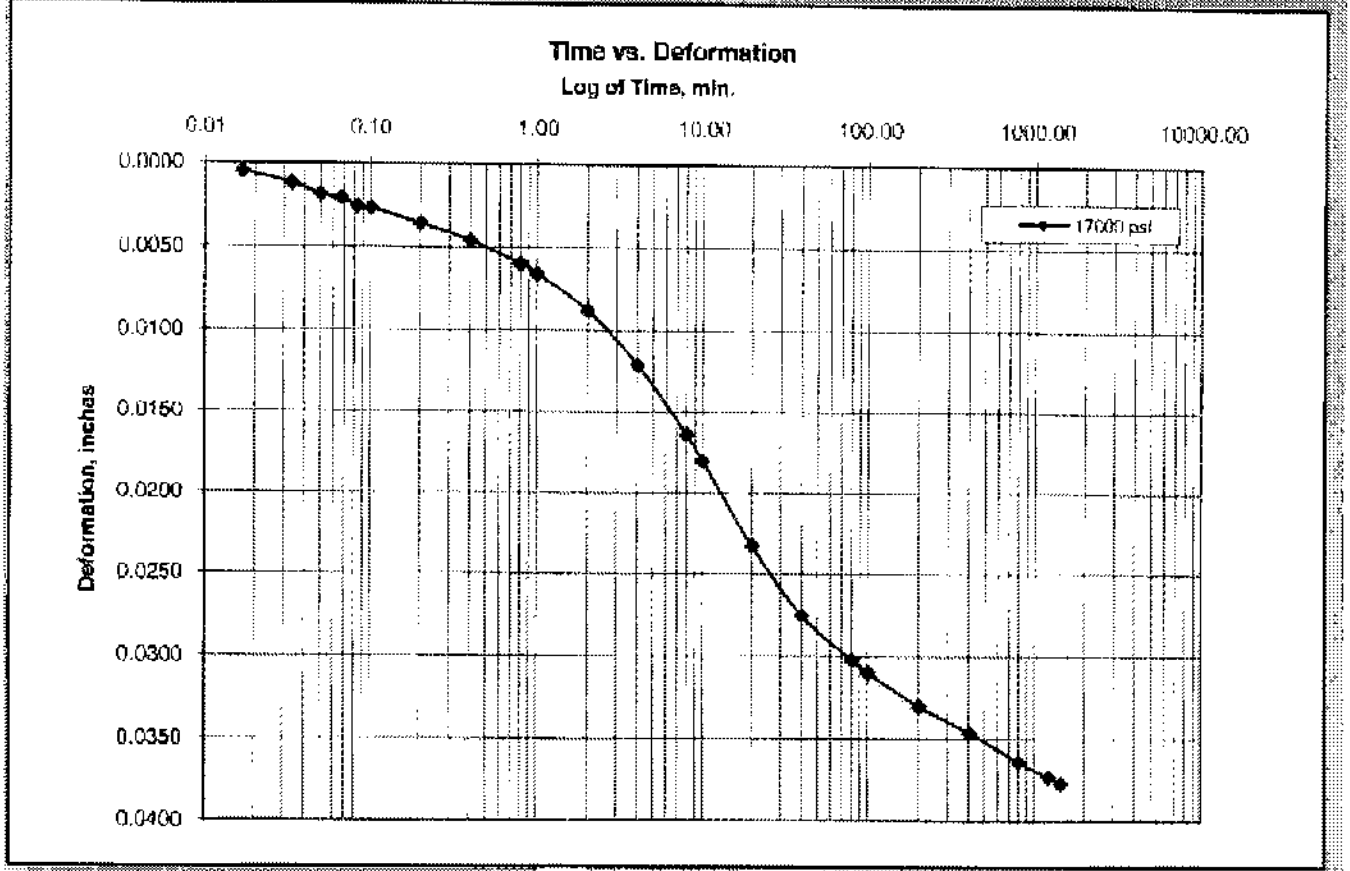


8800 PSF

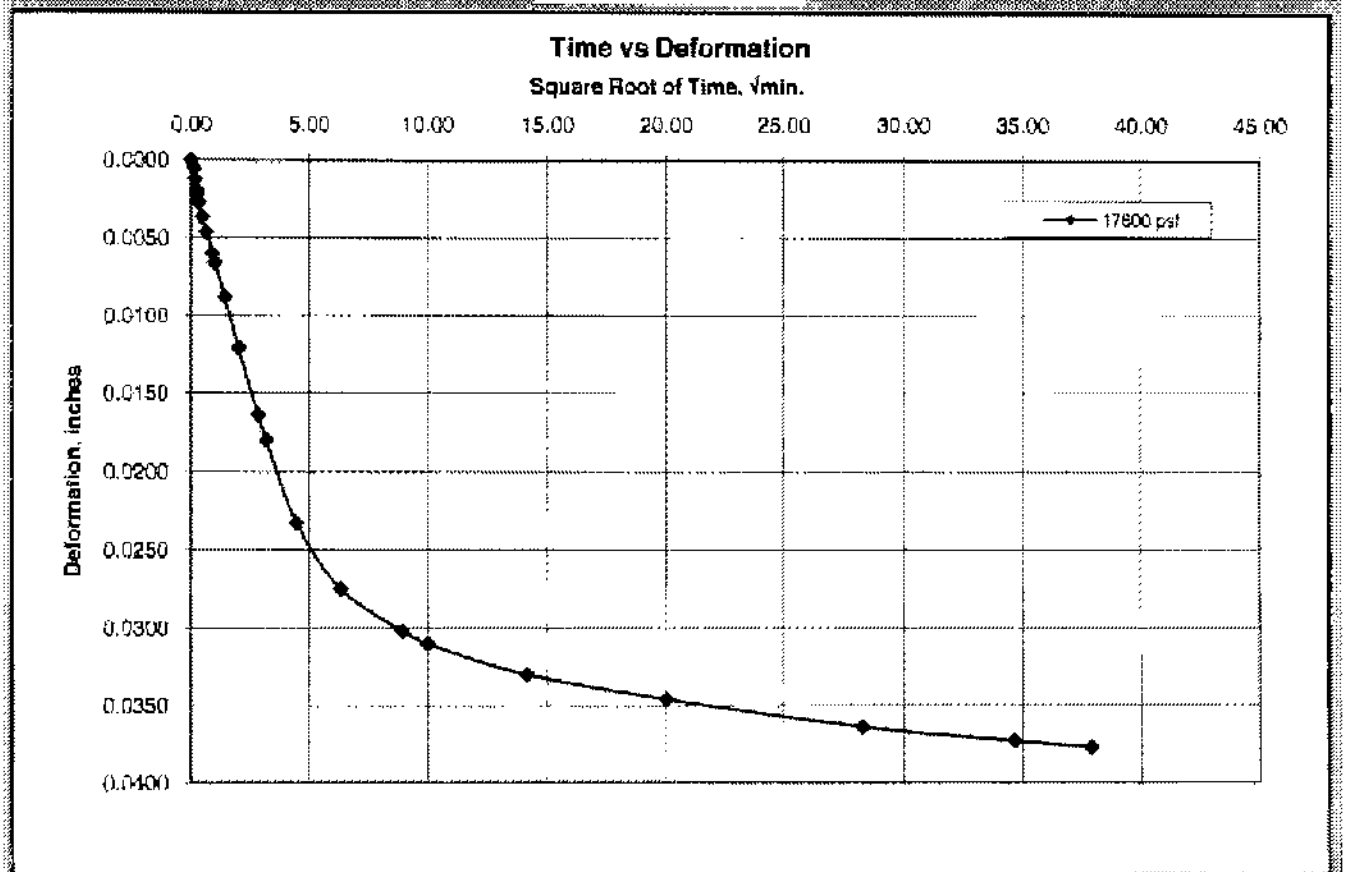


Cooper Testing Labs, Inc.

Load 13 — 17600 PSF

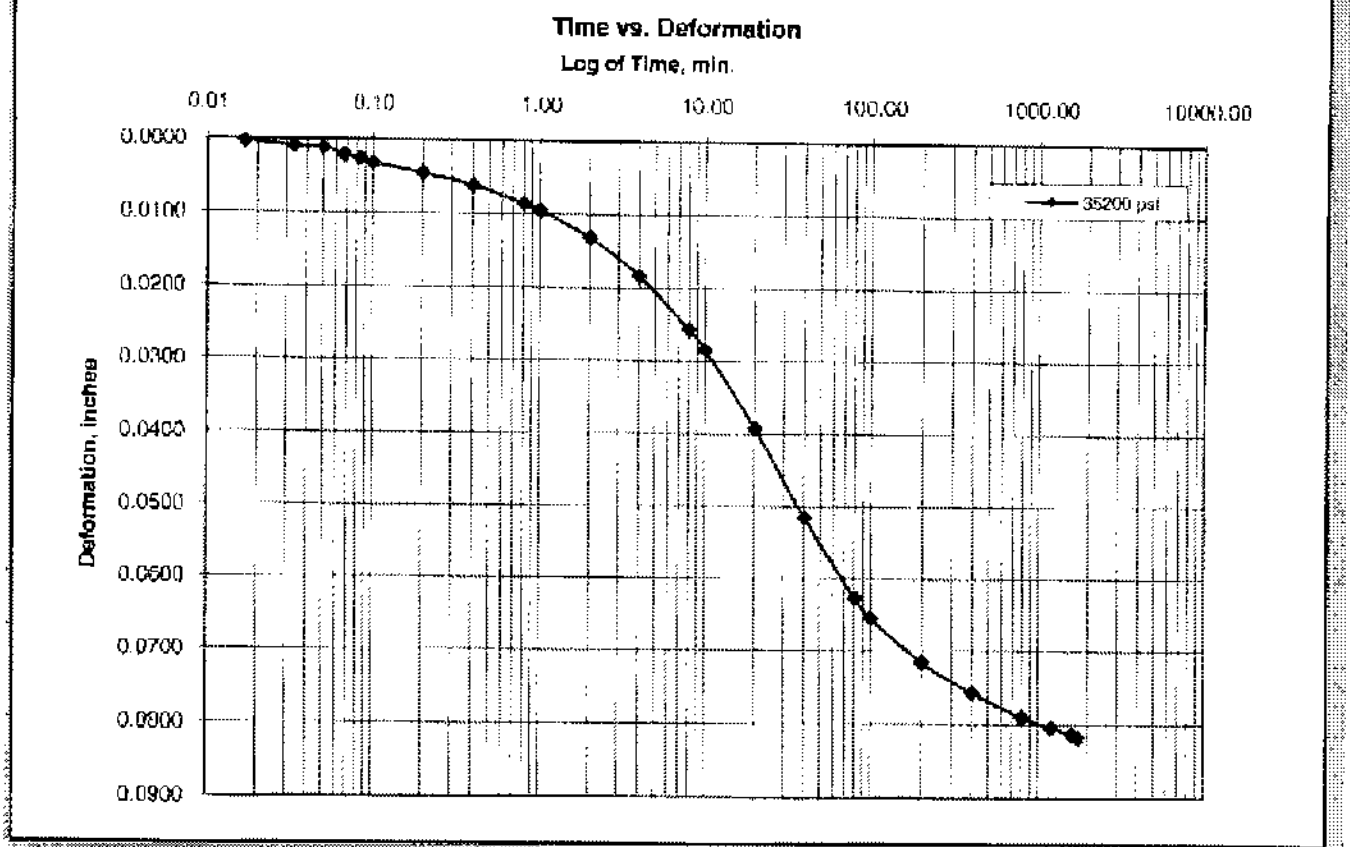


17600 PSF

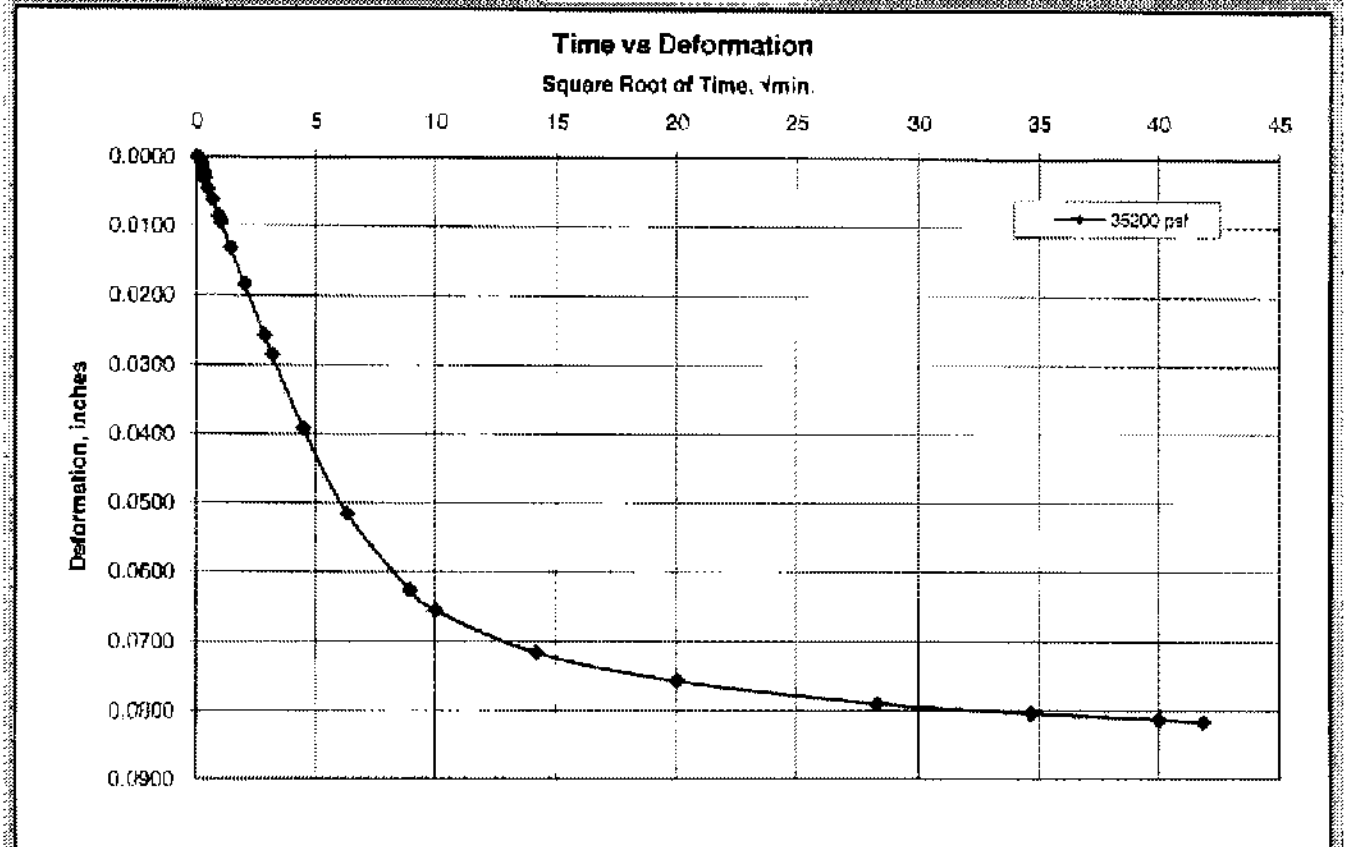


Cooper Testing Labs, Inc.

Load 14 — 35200 PSF

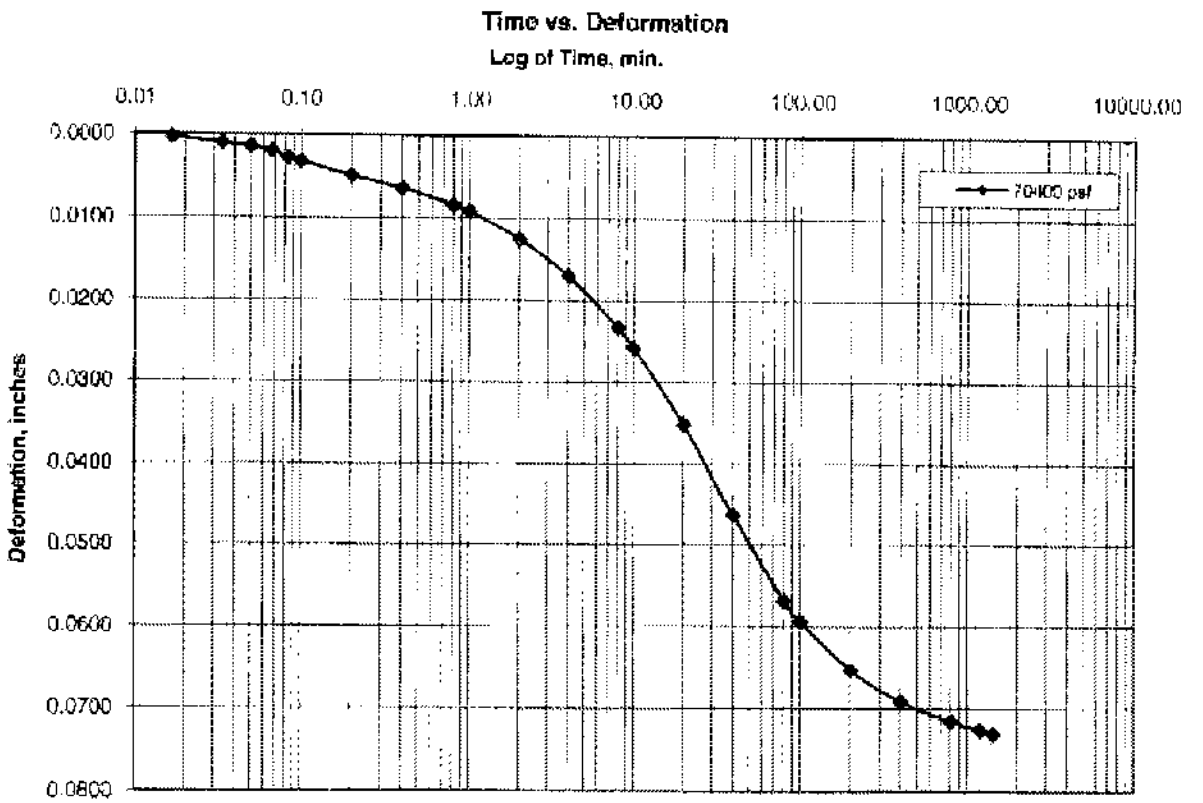


35200 PSF

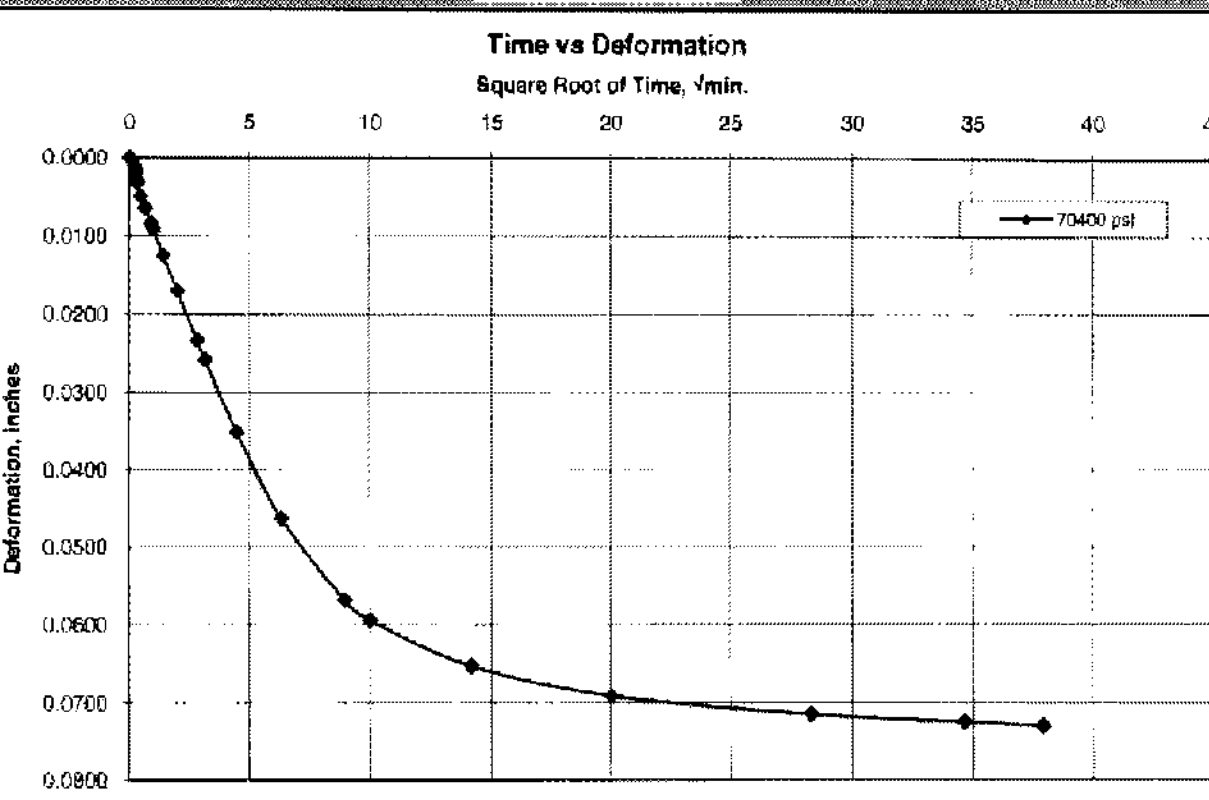


Cooper Testing Labs, Inc.

Load 15 — 70400 PSF



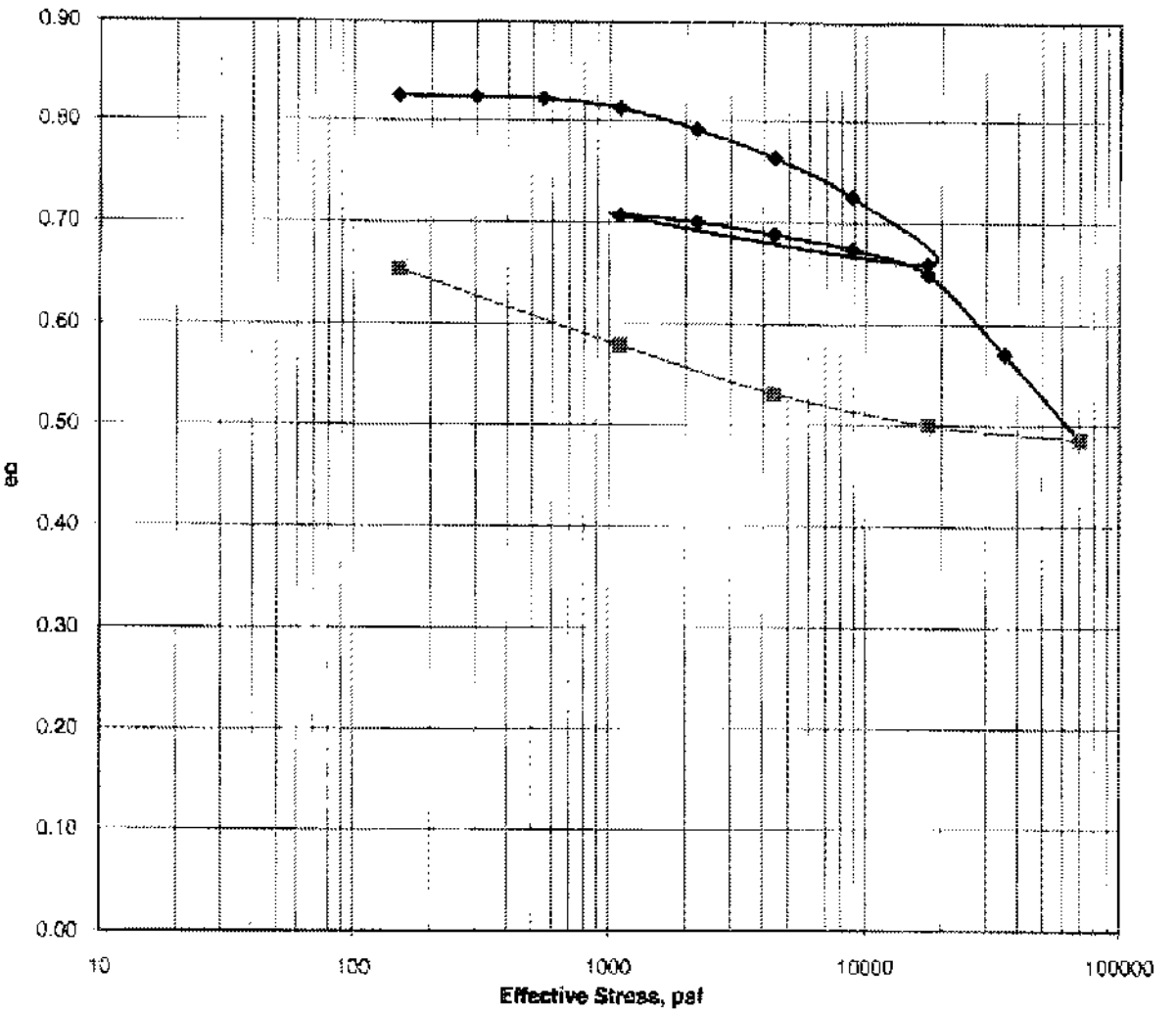
70400 PSF



Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-3	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-7	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	114-117	**Checked:**	PJ/DC
Soil Type:	Gray Lean CLAY			**Date:**	6/9/2008

eo-Log-P Curve



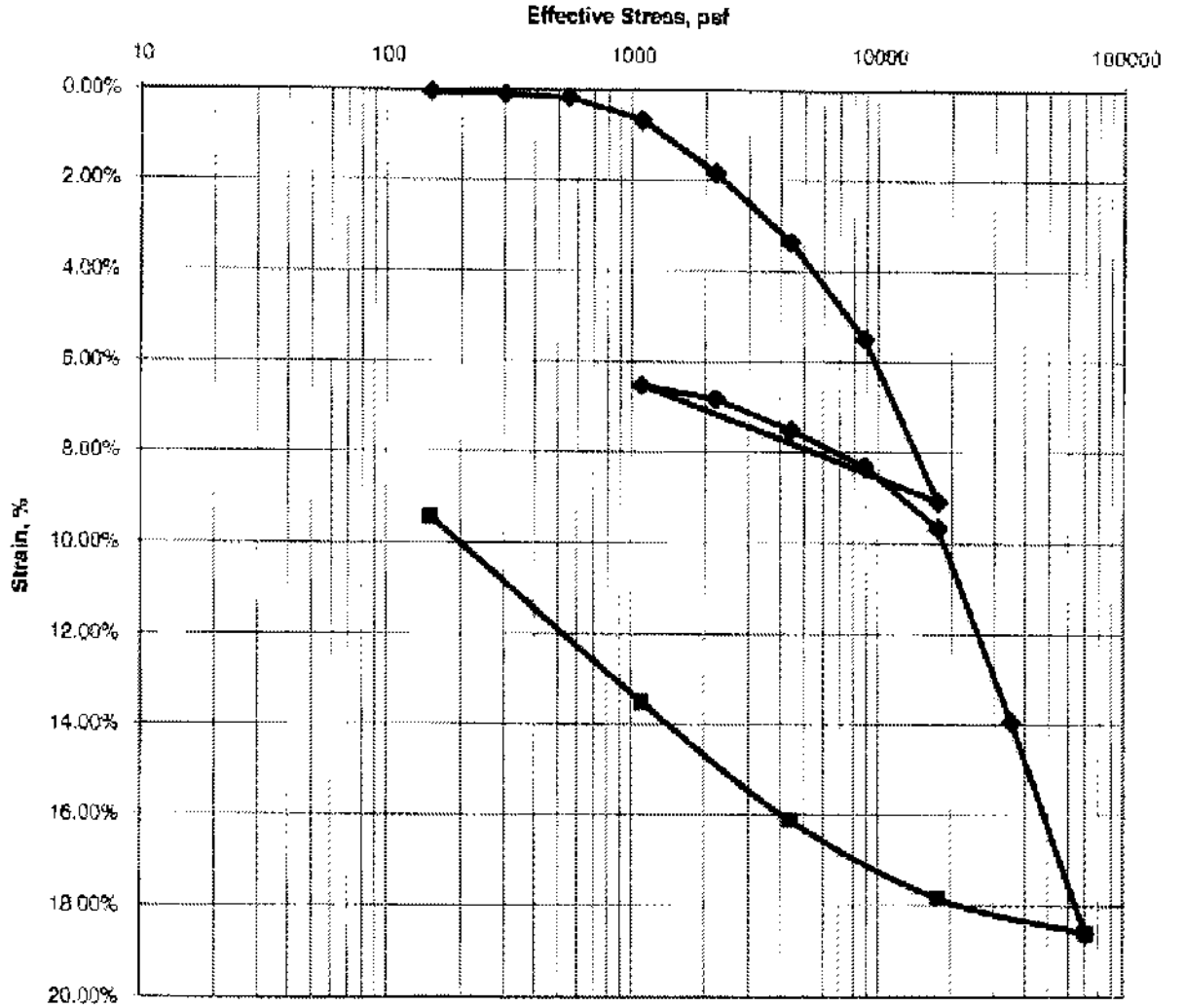
Ass. Gs = 2.75	Initial	Final
Moisture %:	28.9	24.4
Dry Density, pcf:	94.1	102.8
Void Ratio:	0.824	0.670
% Saturation:	96.5	100

Remarks:

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-3	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-7	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	114-117	**Checked:**	PJ/DC
Soil Type:	Gray Lean CLAY			**Date:**	6/9/2008

Strain-Log-P Curve



Ass. Gs = 2.75	Initial	Final
Moisture %:	28.9	24.4
Dry Density, pcf:	94.1	102.8
Void Ratio:	0.824	0.670
% Saturation:	96.5	100

Remarks:

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane Project
Boring	GS08-3
Sample:	S3-7
Depth, ft.:	114-117
Date:	6/9/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Description:	Gray Lean CLAY

Moisture Density Data Entry Screen

	Initial	Final
Height	1.00	0.9154
Diameter	2.41	2.41
Total Wet Weight	145.3	140.2
Wt of Wet Soil & Dish		205.3
Wt of Dry Soil & Dish		177.8
Wt. Of Dish		21.6
Wt of Ring		43.5
Moisture %	28.9	24.4
Wet Density, pcf	121.3	127.9
Dry Density, pcf	94.1	102.8
Specific Gravity	2.75	2.75
Area	4.6	4.6
V ft3	0.0	0.0
Vt, cc	74.0	68.4
Vs, cc	41.0	41.0
Vv, cc	33.8	27.4
e	0.8	0.7
porosity, %	45.2	40.1
S, %	96.5	100

Loading Increments — **Void Ratio**

Increment #	Load, psf psf	Dial .0001"	Load psf	Height Delta h	Volume Vt cc	Voids Vv	Void Ratio e
1	150	0.0006	150	0.9965	74.77	33.792	0.826
2	300	0.0010	300	0.9950	74.74	33.765	0.824
3	550	0.0018	550	0.9902	74.68	33.696	0.822
4	1100	0.0069	1100	0.9901	74.60	33.619	0.813
5	2200	0.0144	2200	0.9816	73.43	32.453	0.792
6	4400	0.0336	4400	0.9664	72.90	31.916	0.764
7	8800	0.0549	8800	0.9451	70.70	29.722	0.725
8	17600	0.0909	17600	0.9091	68.01	27.029	0.660
9	1100	0.0653	1100	0.9347	69.93	28.944	0.706
10	2200	0.0663	2200	0.9337	69.70	28.7200	0.700789
11	4400	0.0752	4400	0.9248	69.19	28.2038	0.688202
12	8800	0.0831	8800	0.9169	68.59	27.6128	0.673781
13	17600	0.0967	17600	0.9033	67.58	26.5963	0.648954
14	35200	0.1304	35200	0.8696	64.38	23.4009	0.571006
15	70400	0.1861	70400	0.8139	60.80	19.8072	0.483757
16		0.1861	#N/A	0.8139	60.80	19.8072	0.483757
17		0.1861	#N/A	0.8139	60.80	19.8072	0.483757
18		0.1861	#N/A	0.8139	60.80	19.8072	0.483757
19		0.1861	#N/A	0.8139	60.80	19.8072	0.483757

Rebound Increments — **Void Ratio**

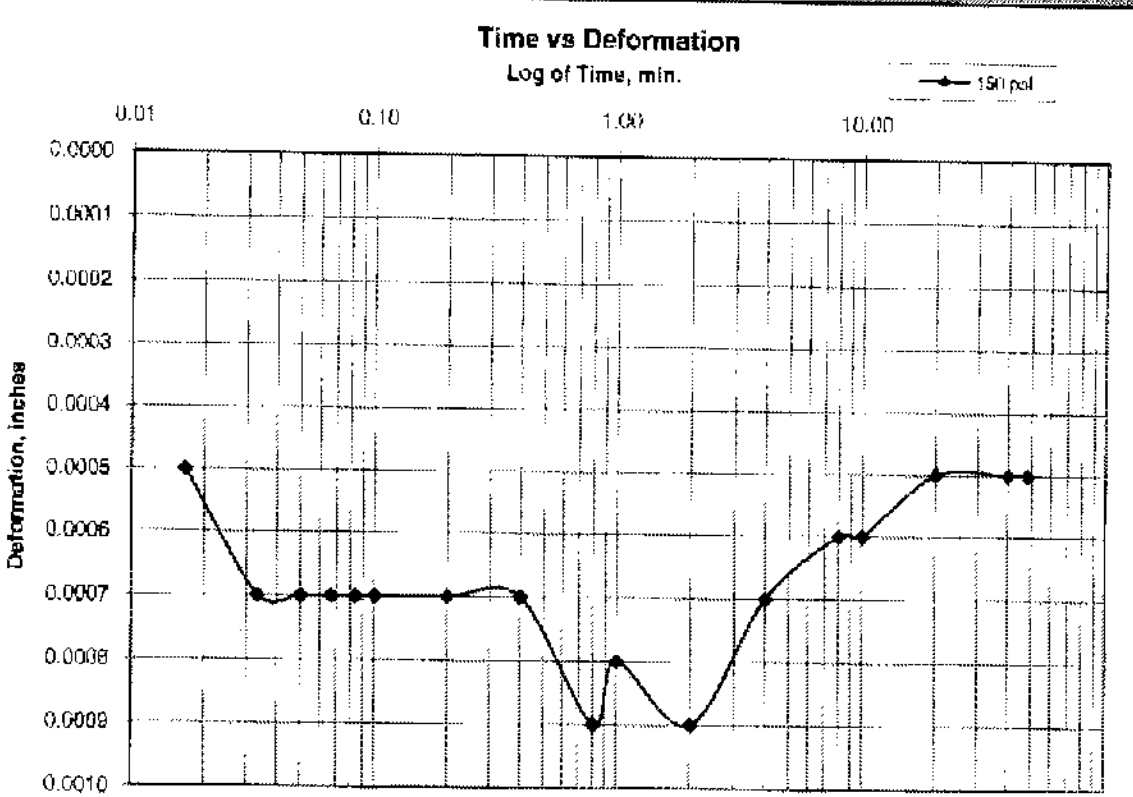
15	70400	0.1861	70400	0.8139	60.80	19.8072	0.483757
16	17600	0.1784	17600	0.8216	61.47	20.4632	0.499813
17	4400	0.1613	4400	0.8387	62.74	21.7626	0.531625
18	1100	0.1350	1100	0.8650	64.71	23.7300	0.579838
19	150	0.0943	150	0.9057	67.76	26.7749	0.653936
20			#N/A	1.0000	74.81	33.8296	0.825472
	Tot Dry Wt	112.7000					

The data to the left is used to determine the theoretical

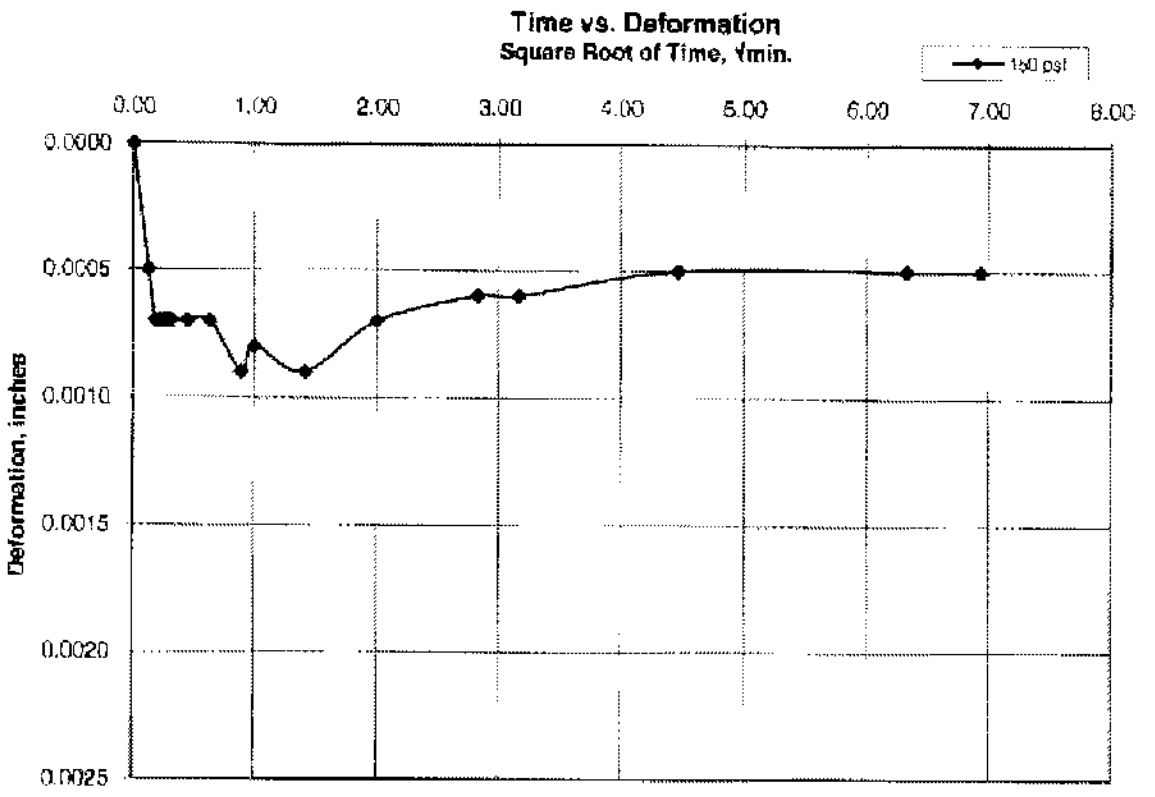
Cooper Testing Labs, Inc.

Load 1

150 PSF



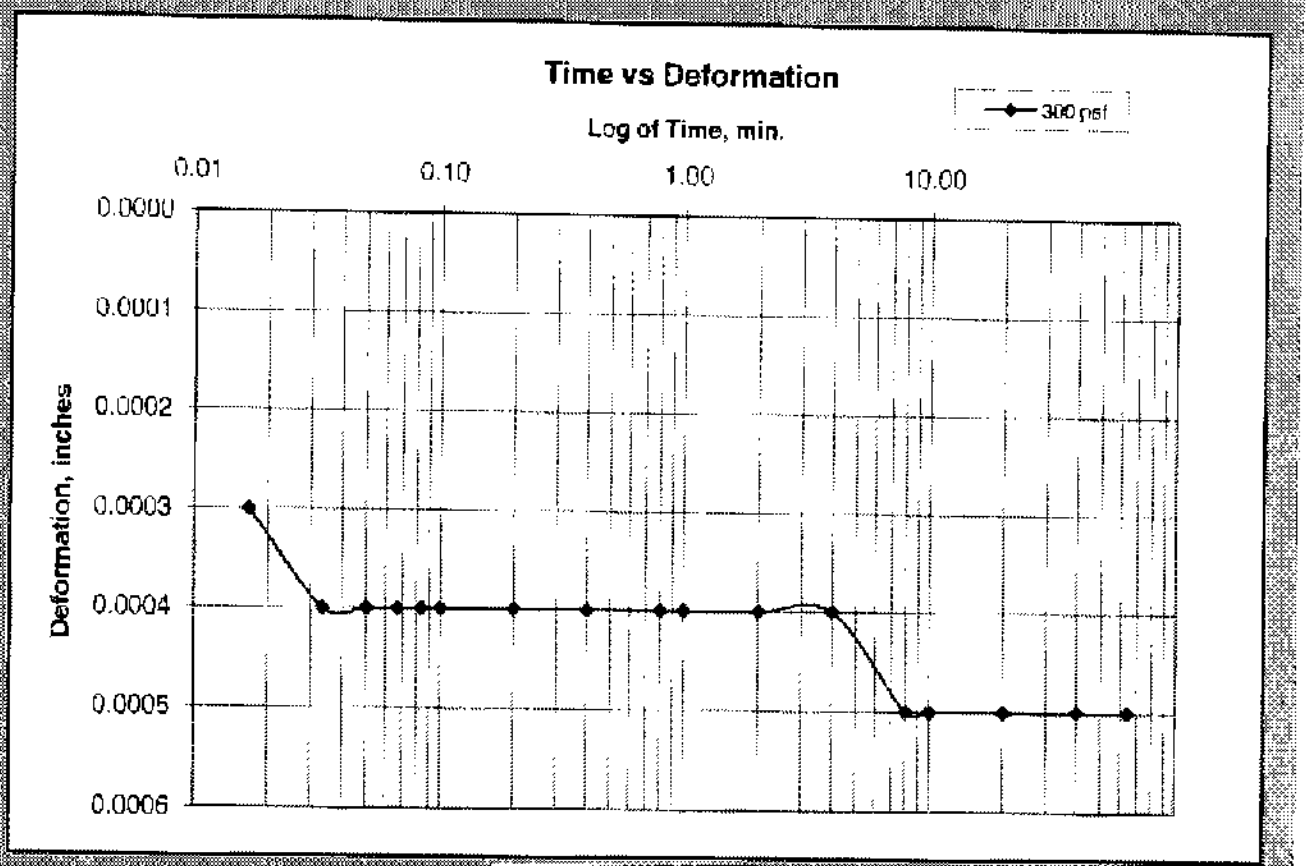
150 PSF



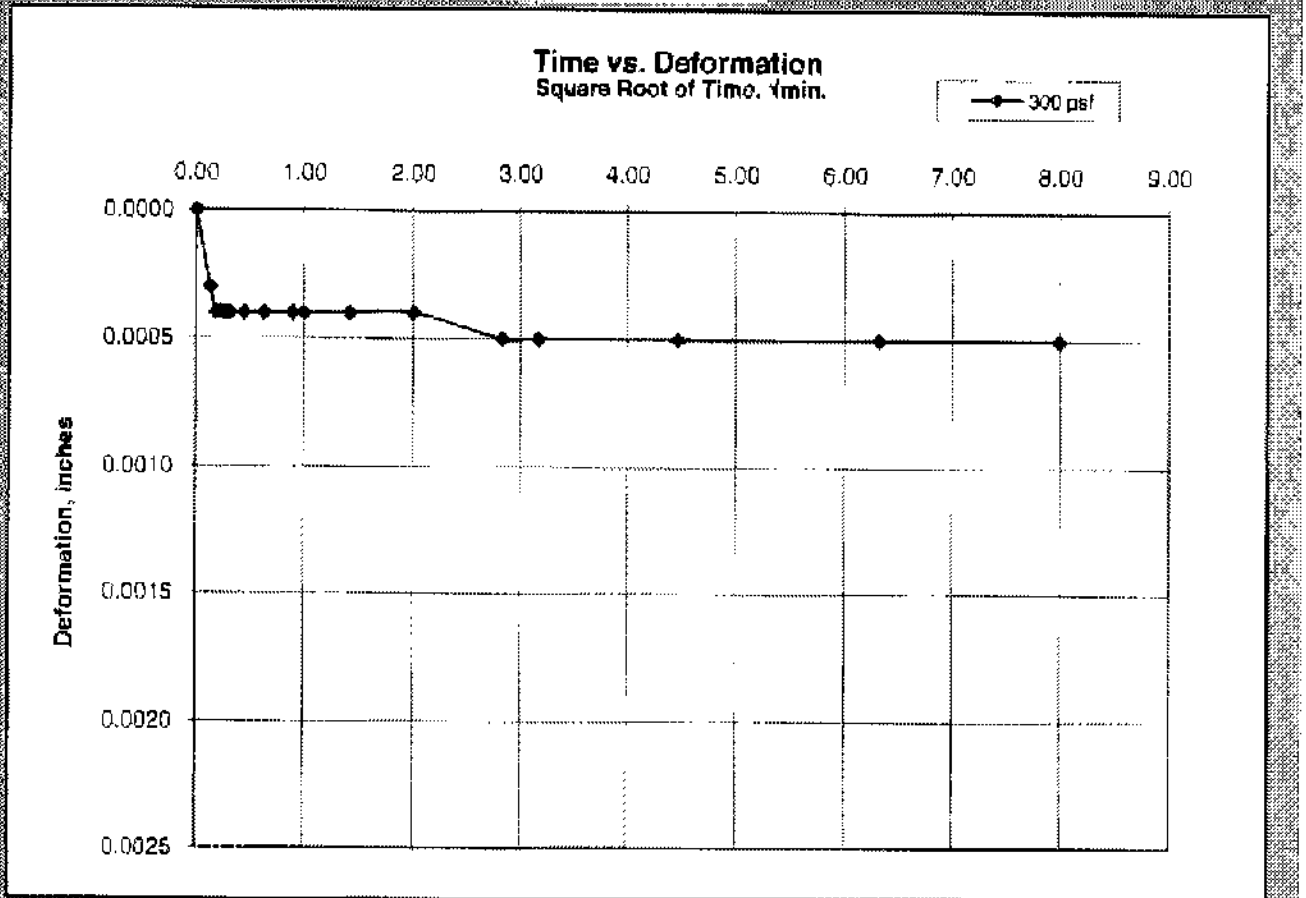
Cooper Testing Labs, Inc.

Load 2

300 PSF



300 PSF



Load 3

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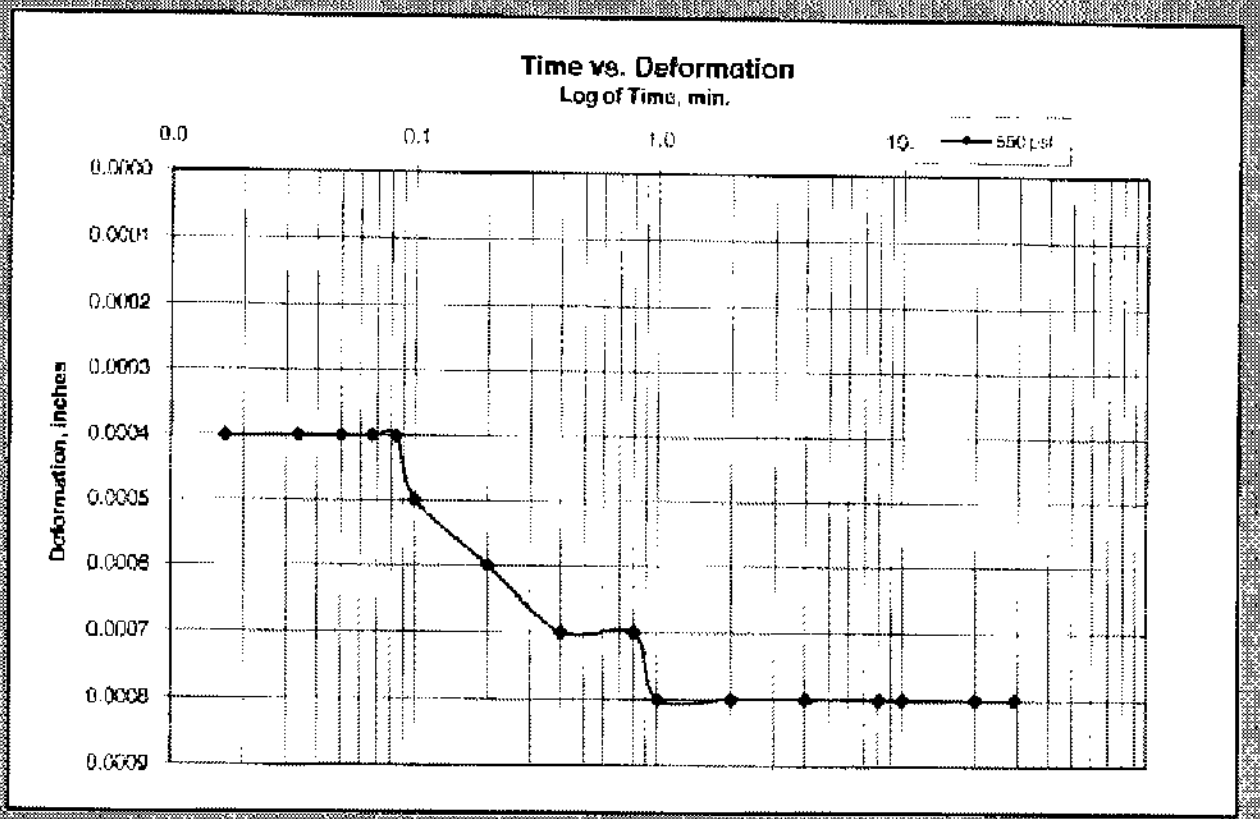
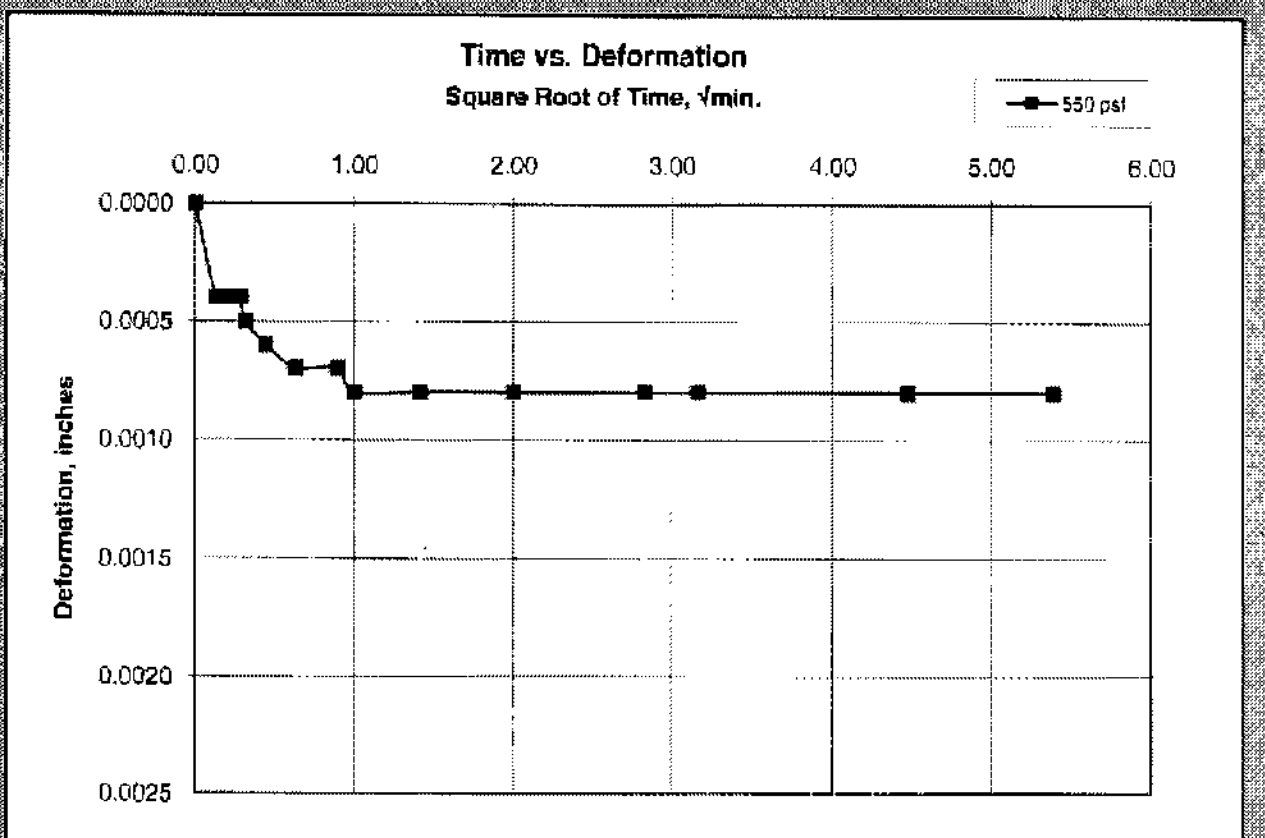


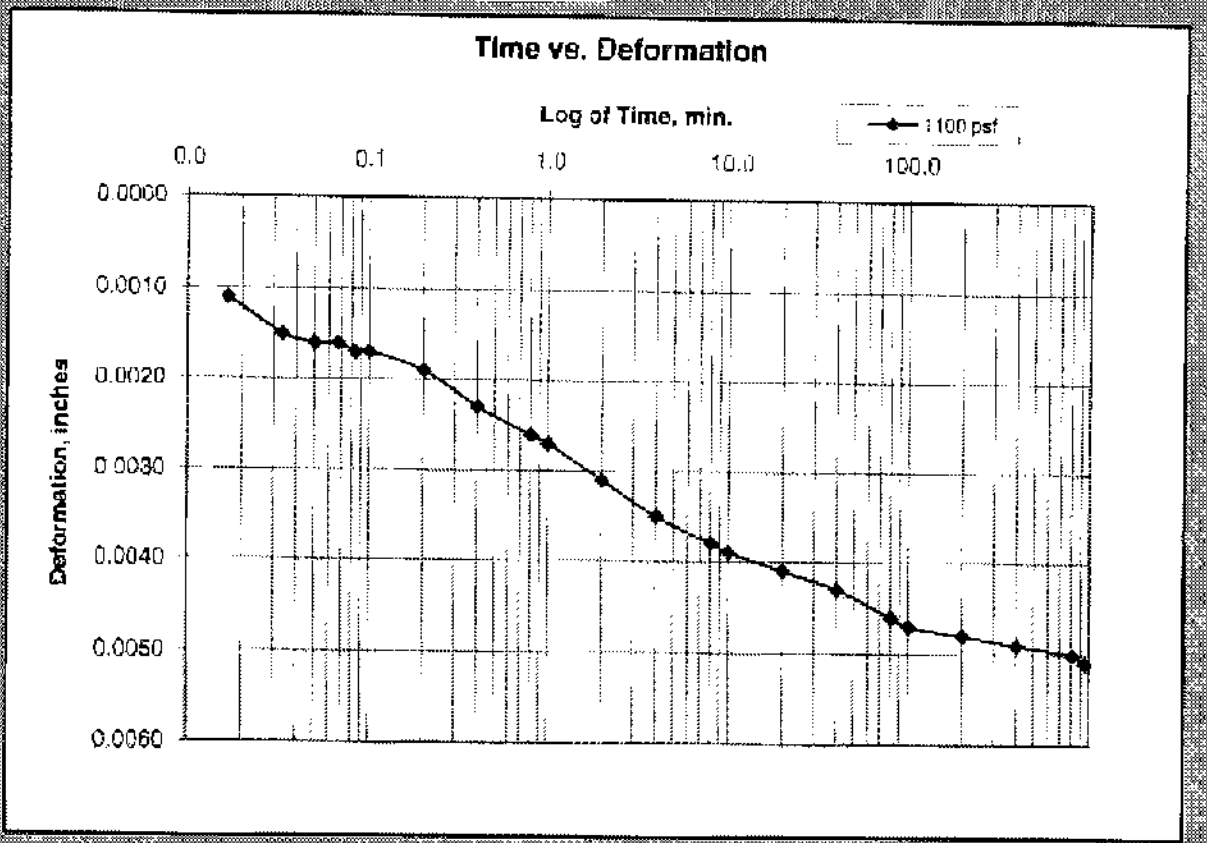
550 PSF



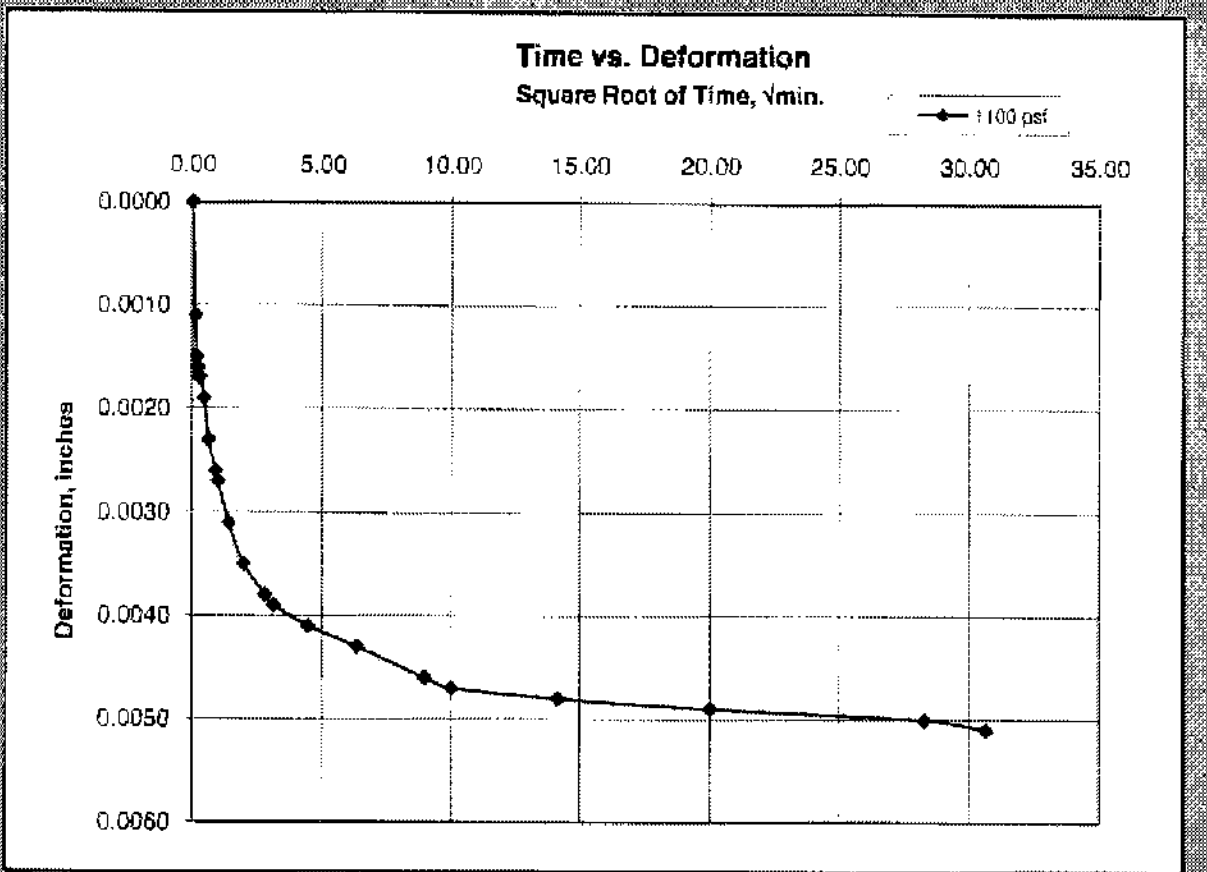
Cooper Testing Labs, Inc.

Load 4

1100 PSF



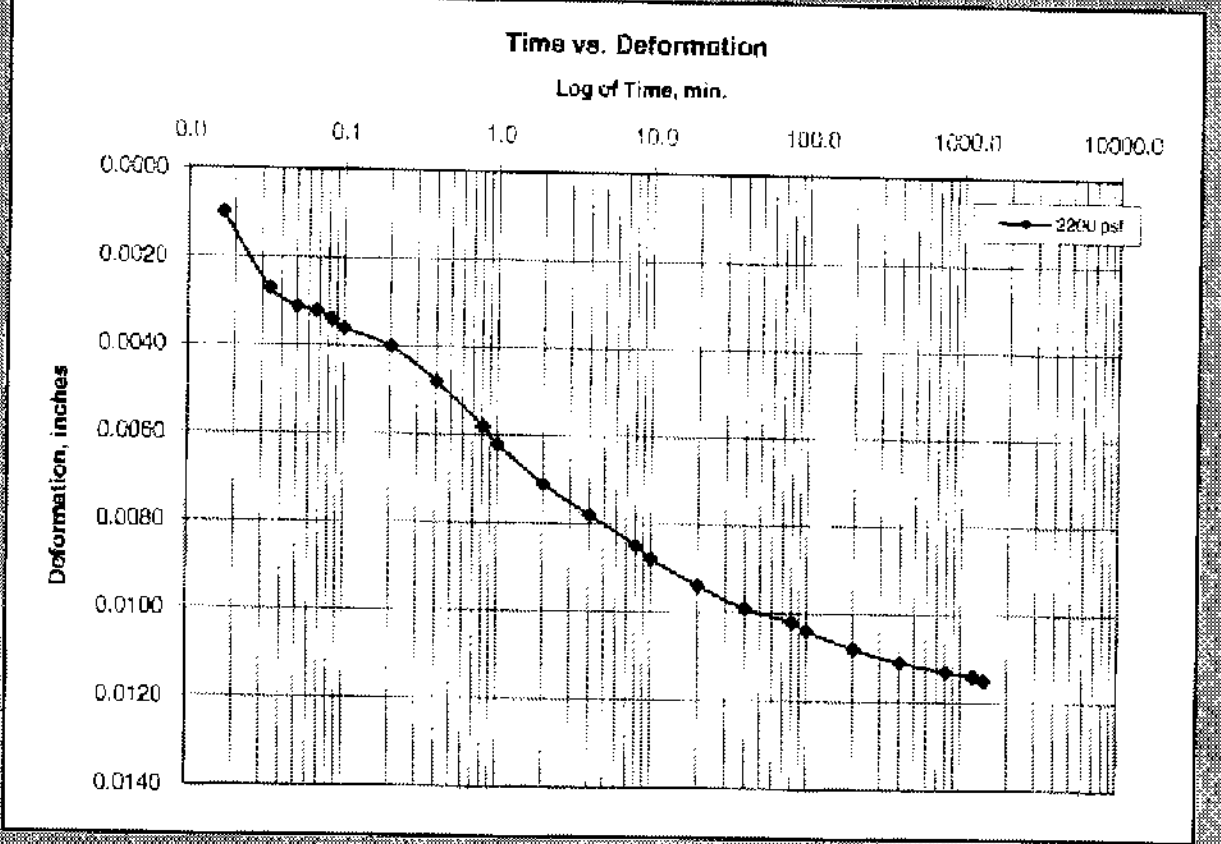
1100 PSF



Cooper Testing Labs, Inc.

Load 5

2200 PSF



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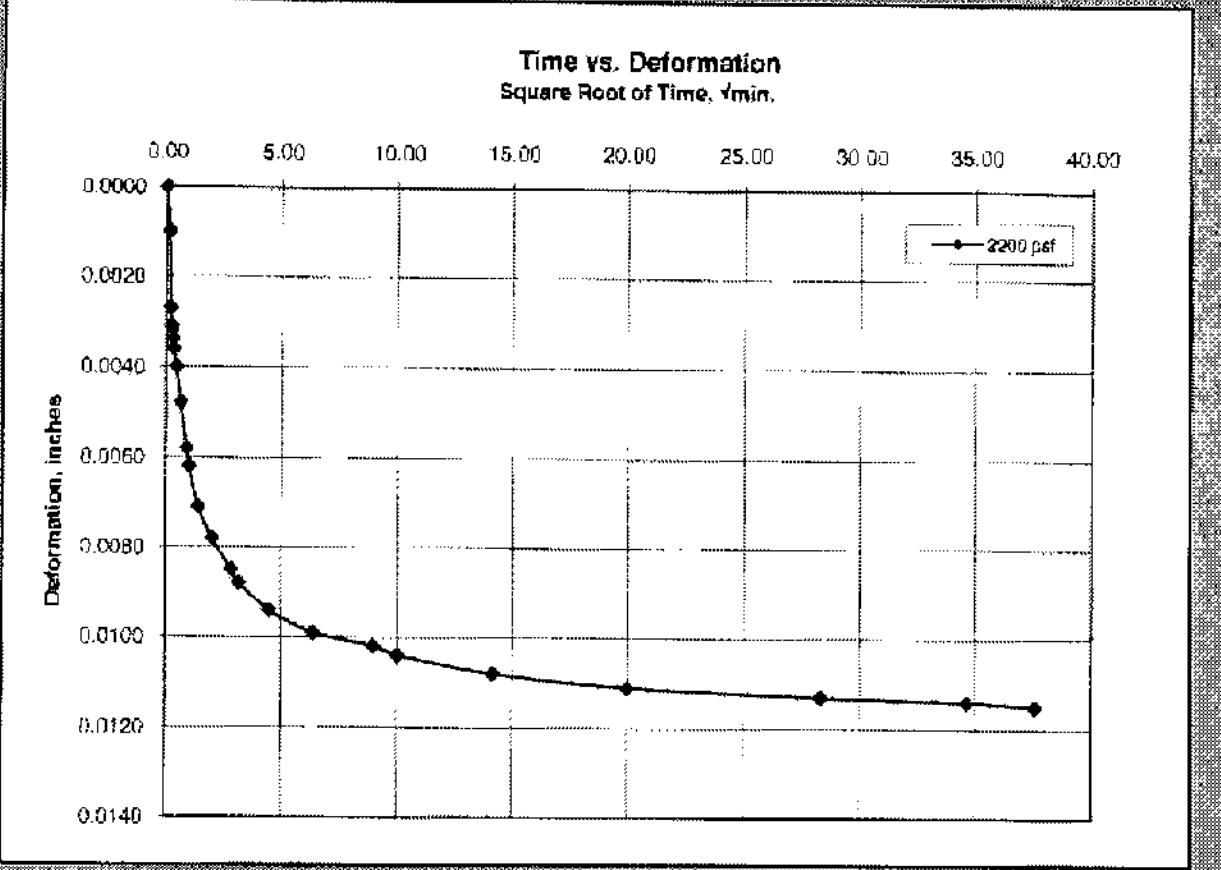
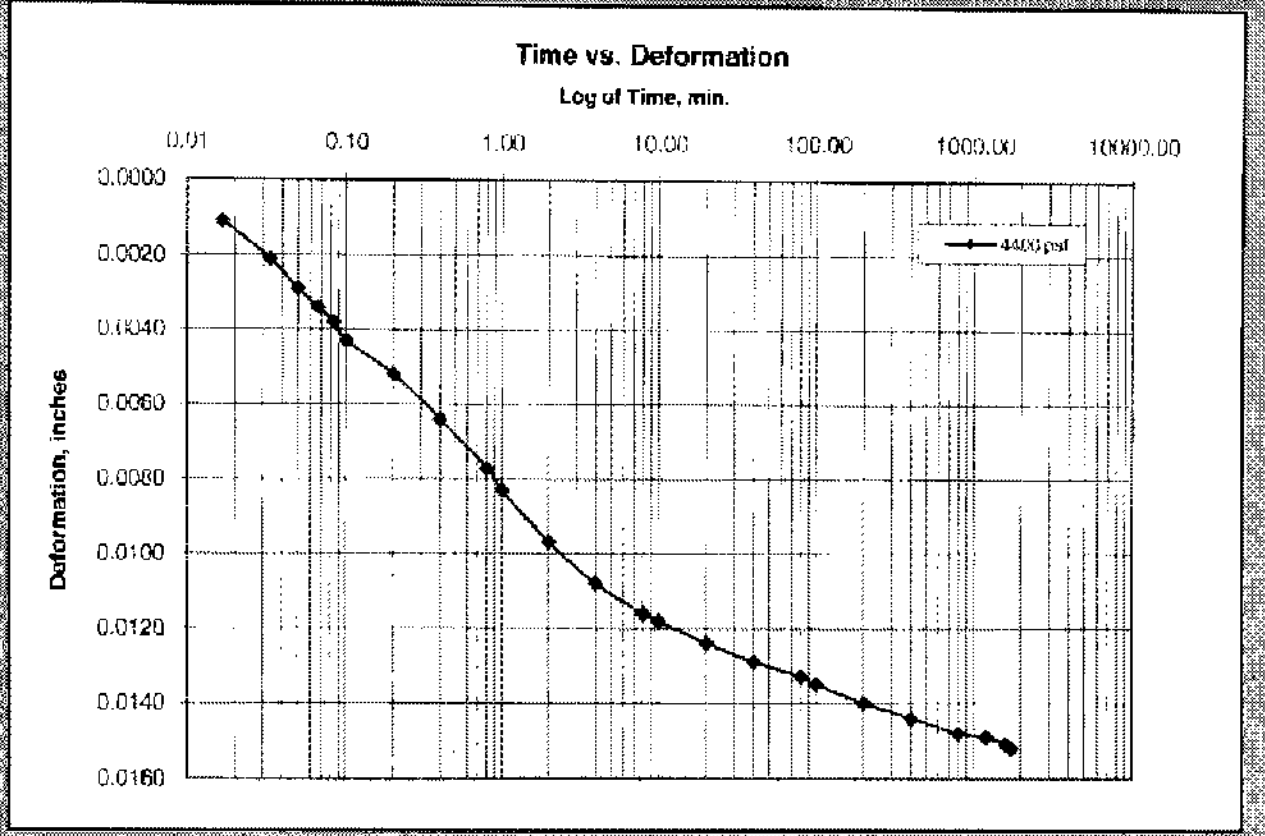


Cooper Testing Labs, Inc.

Load 6

4400 PSF



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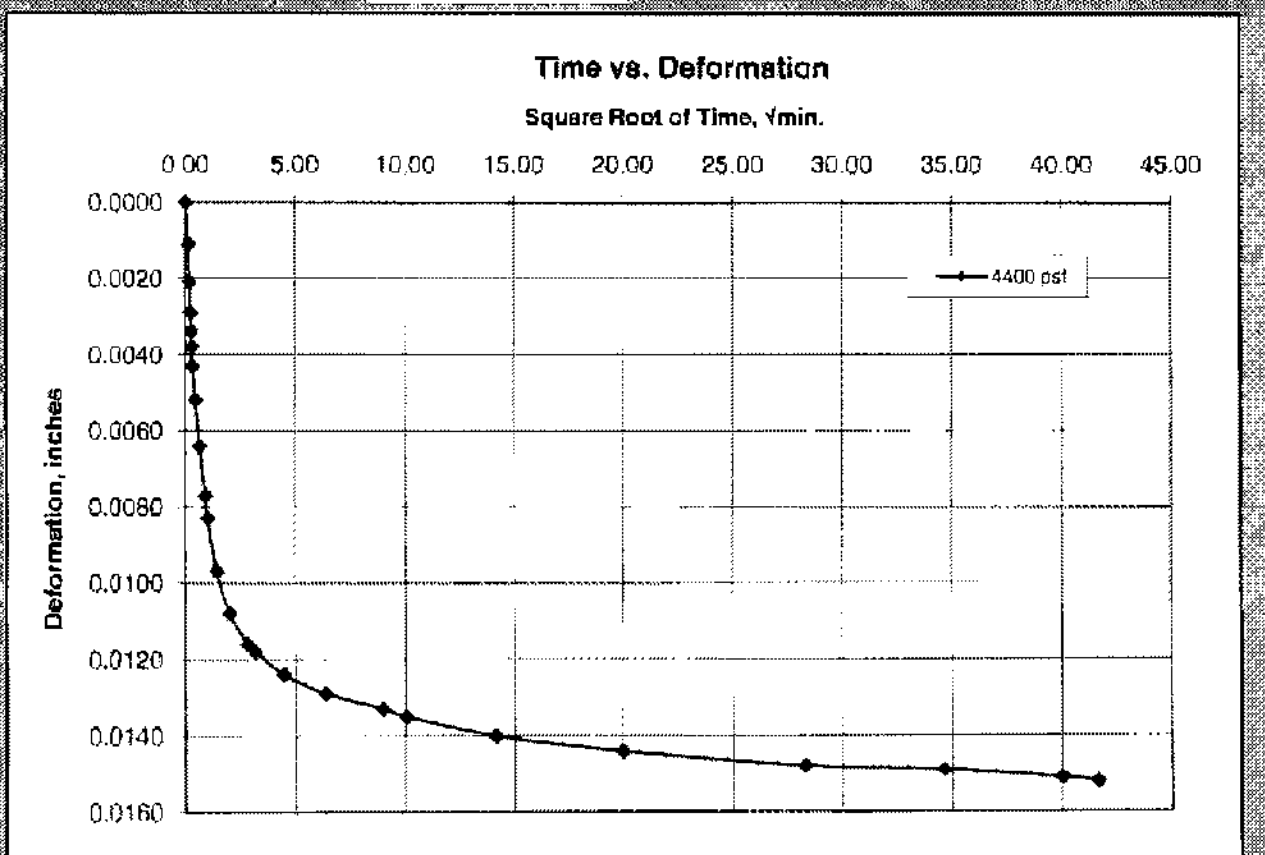
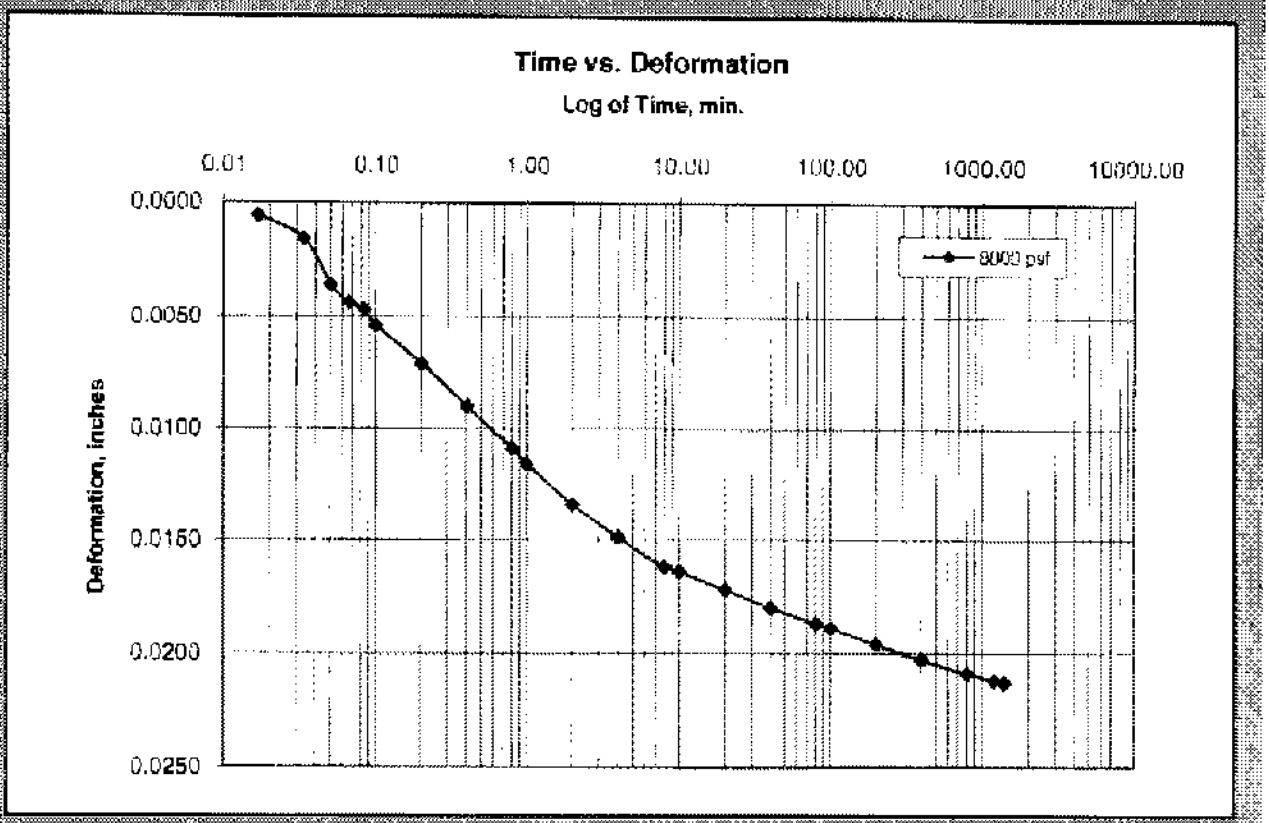
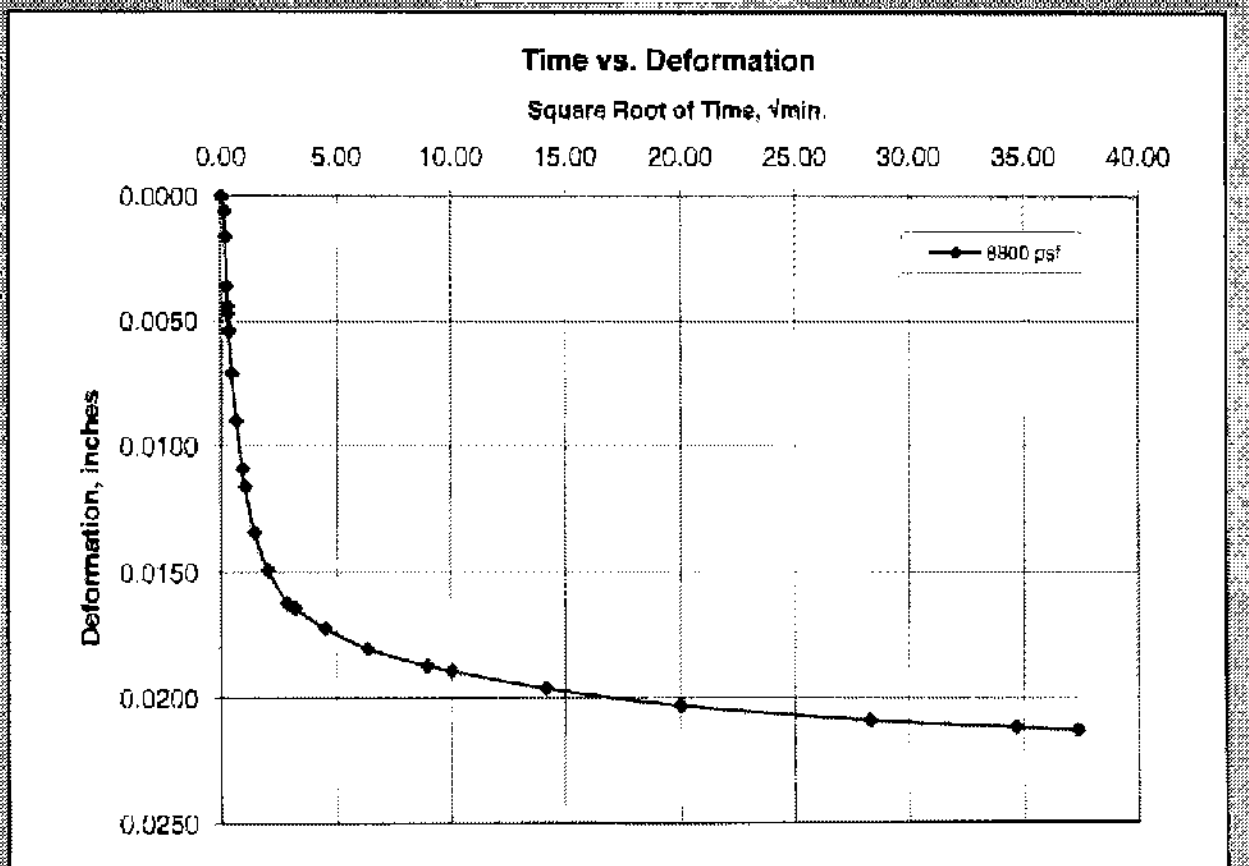


Cooper Testing Labs, Inc.

Load 7 — 8800 PSF



8800 PSF



Cooper Testing Labs, Inc.

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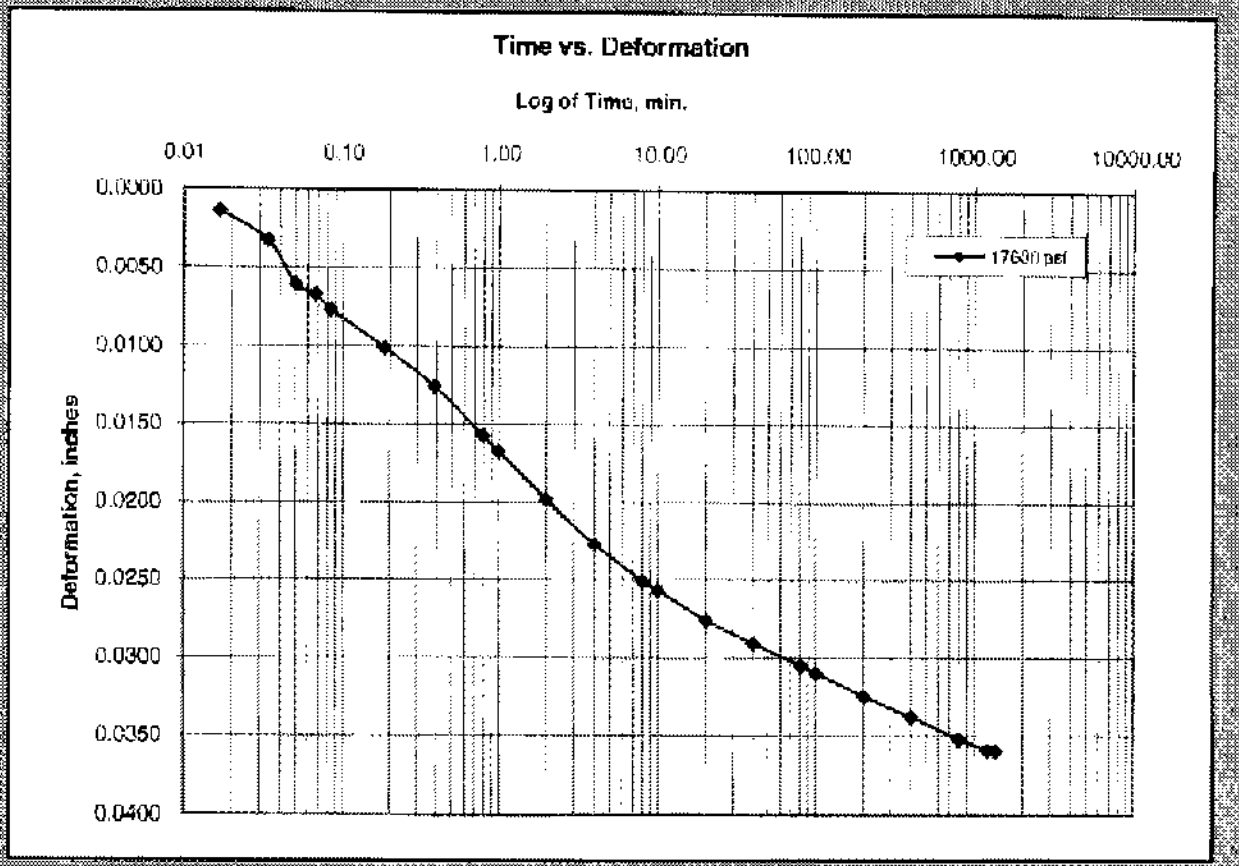
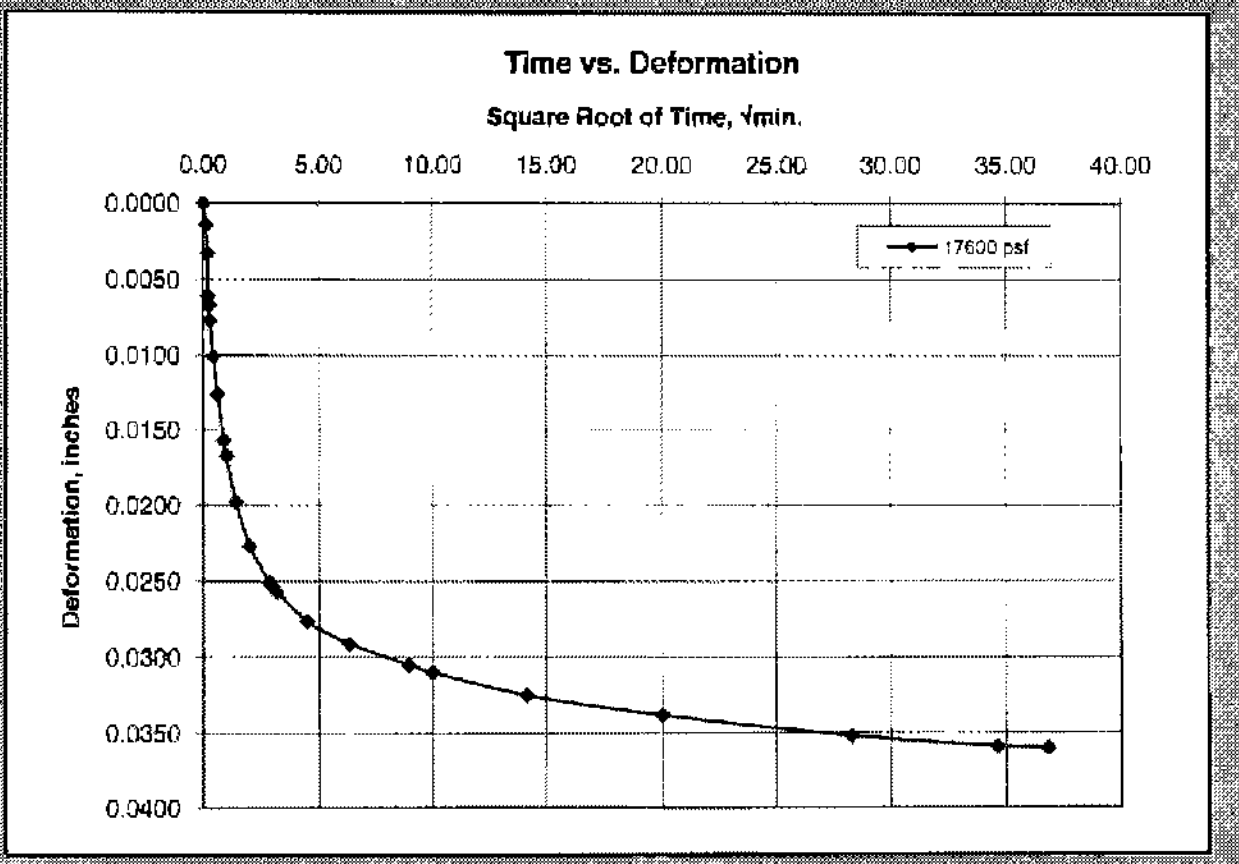


17600 PSF



Cooper Testing Labs, Inc.

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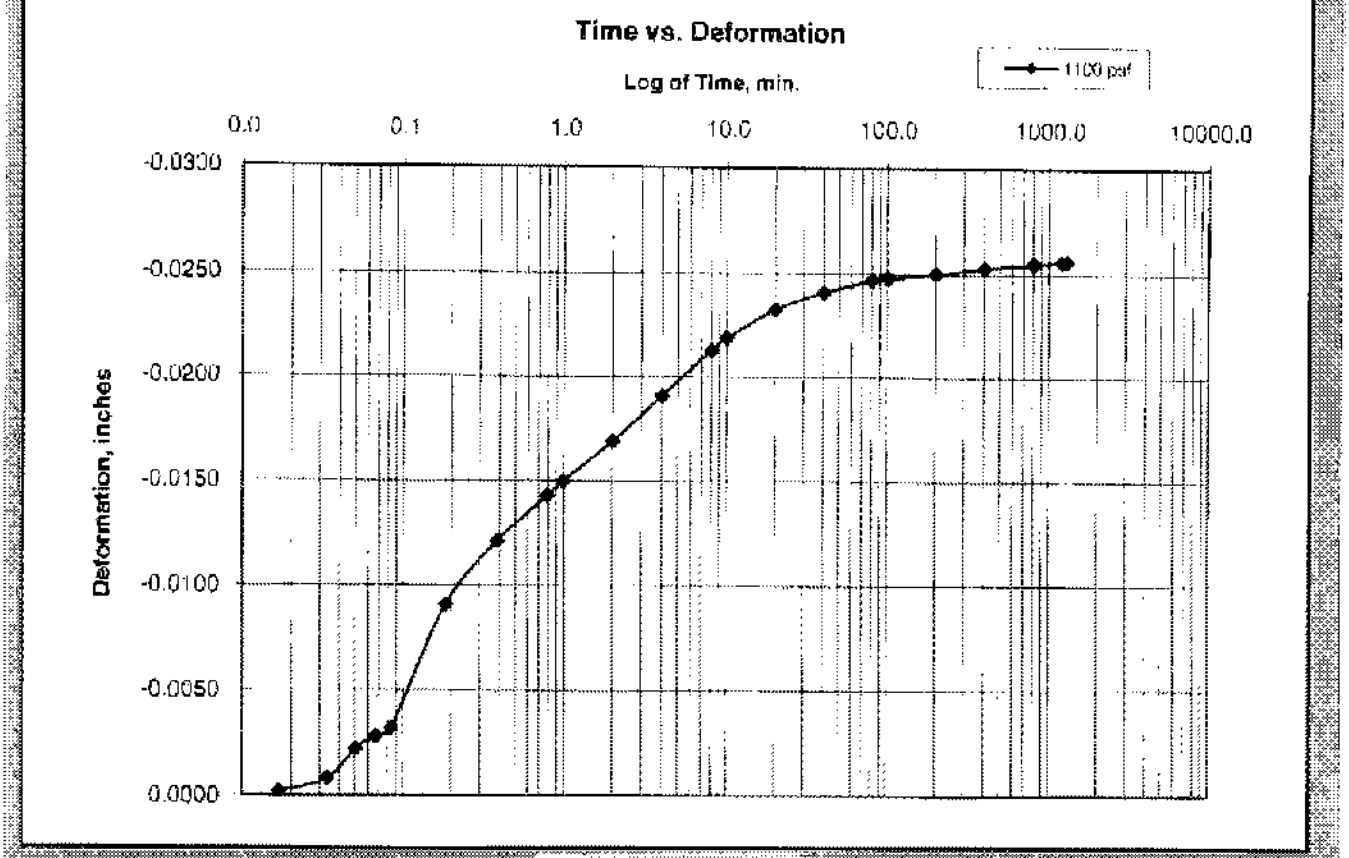
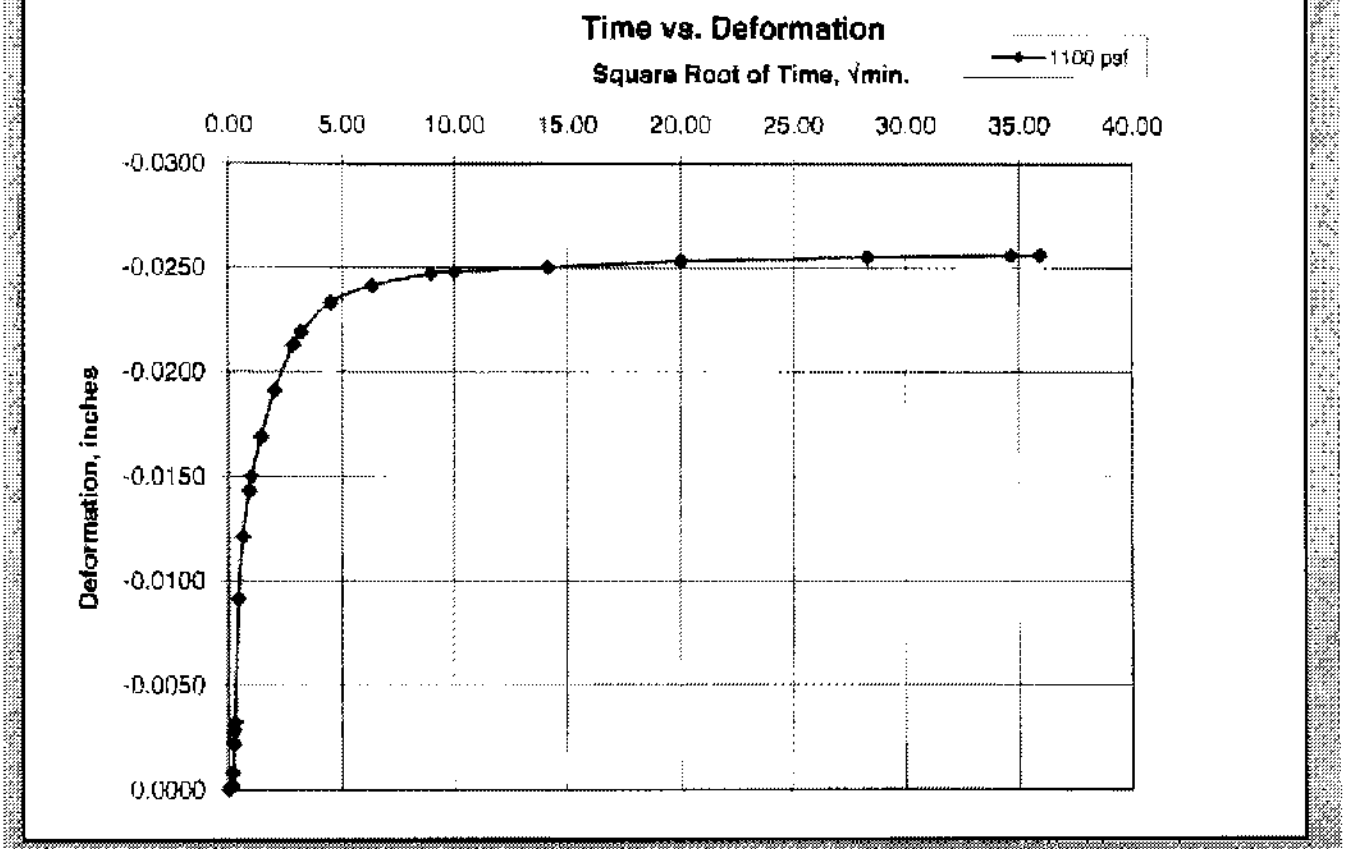


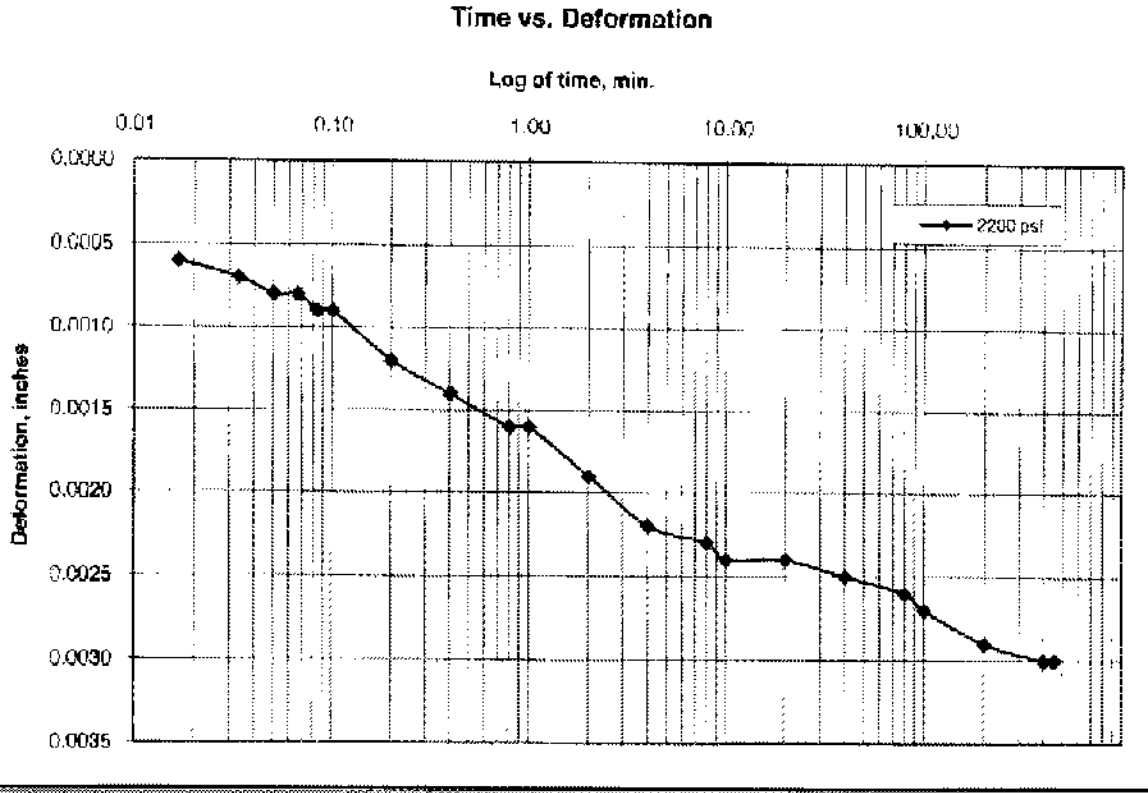
1100 PSF



Cooper Testing Labs, Inc.

Load 10

2200 PSF



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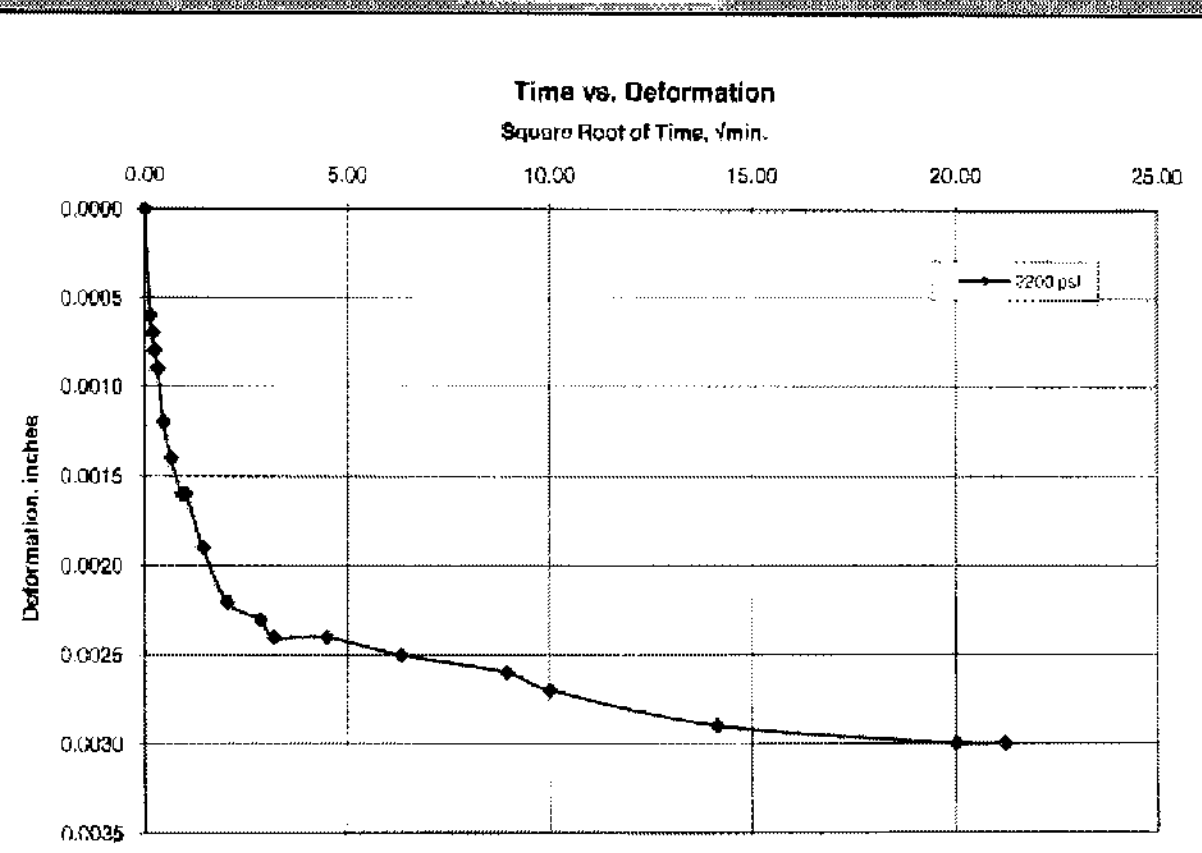
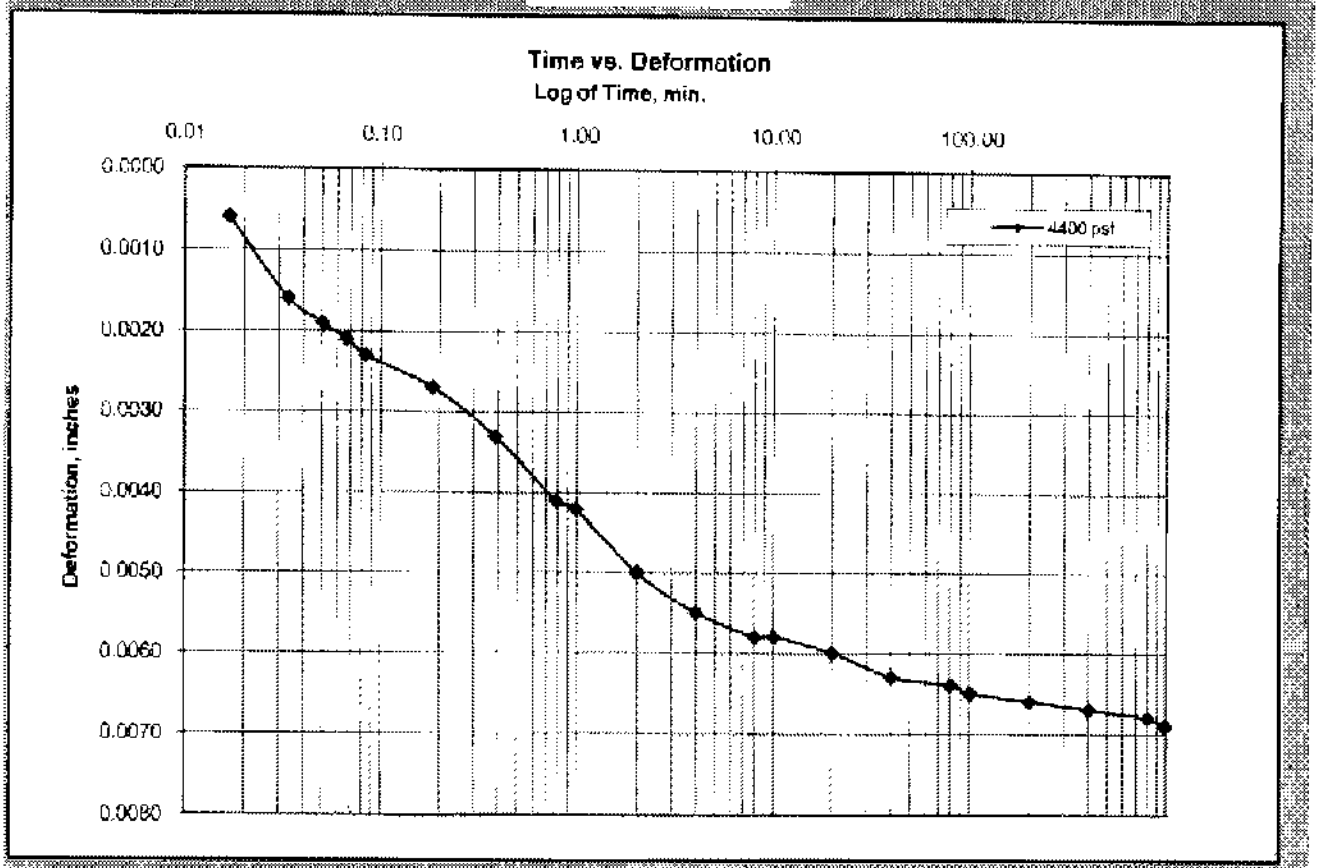
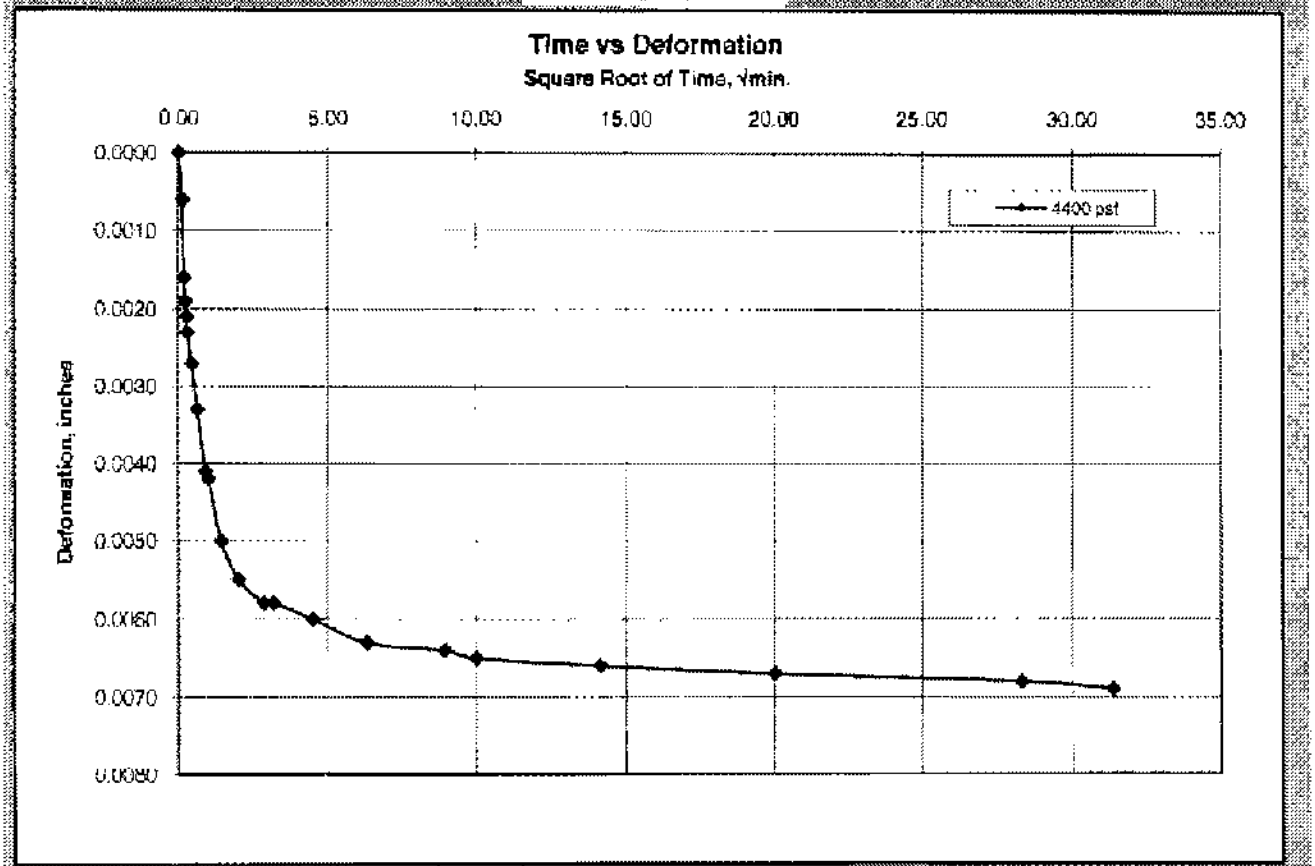


Cooper Testing Labs, Inc.

Load 11 — 4400 PSF

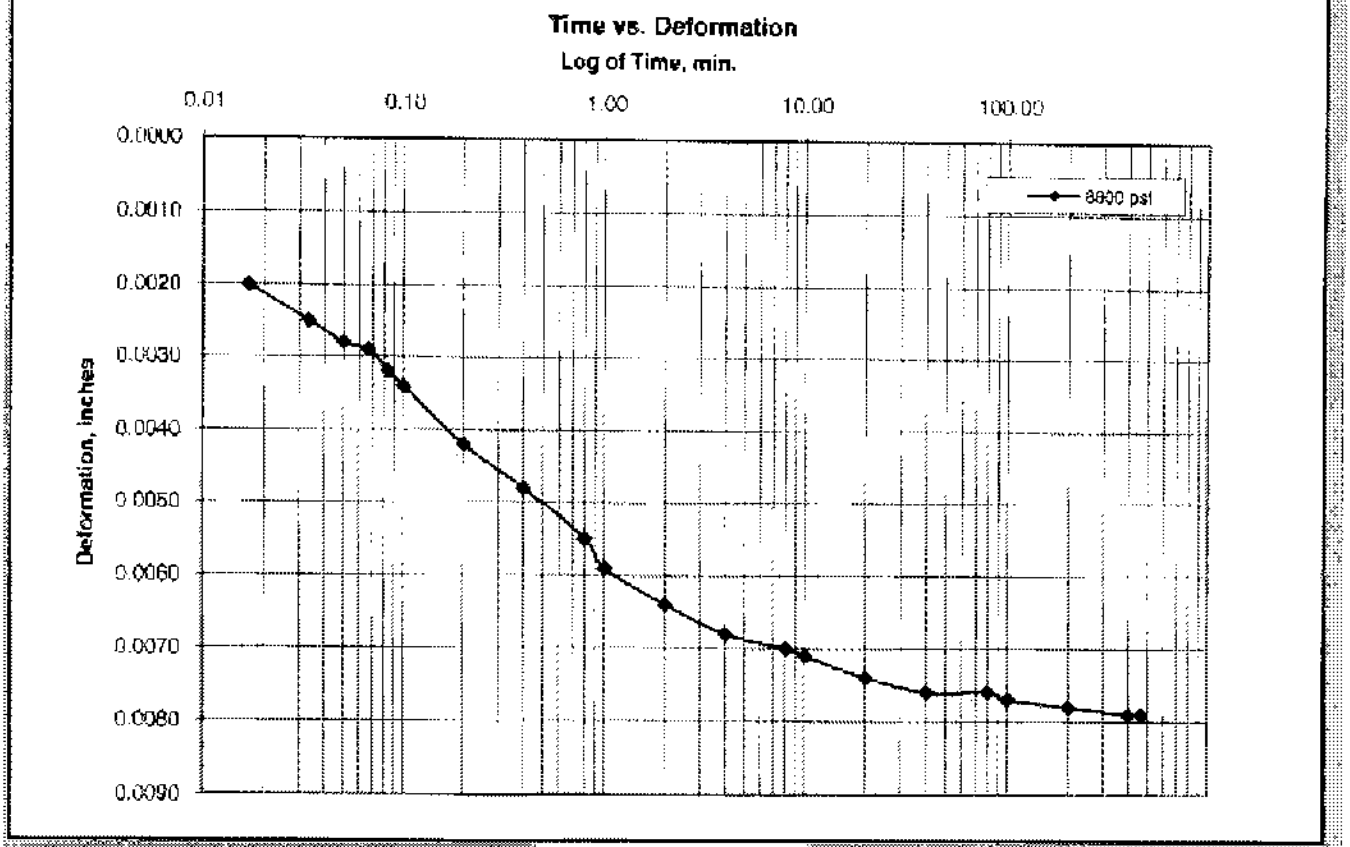


4400 PSF

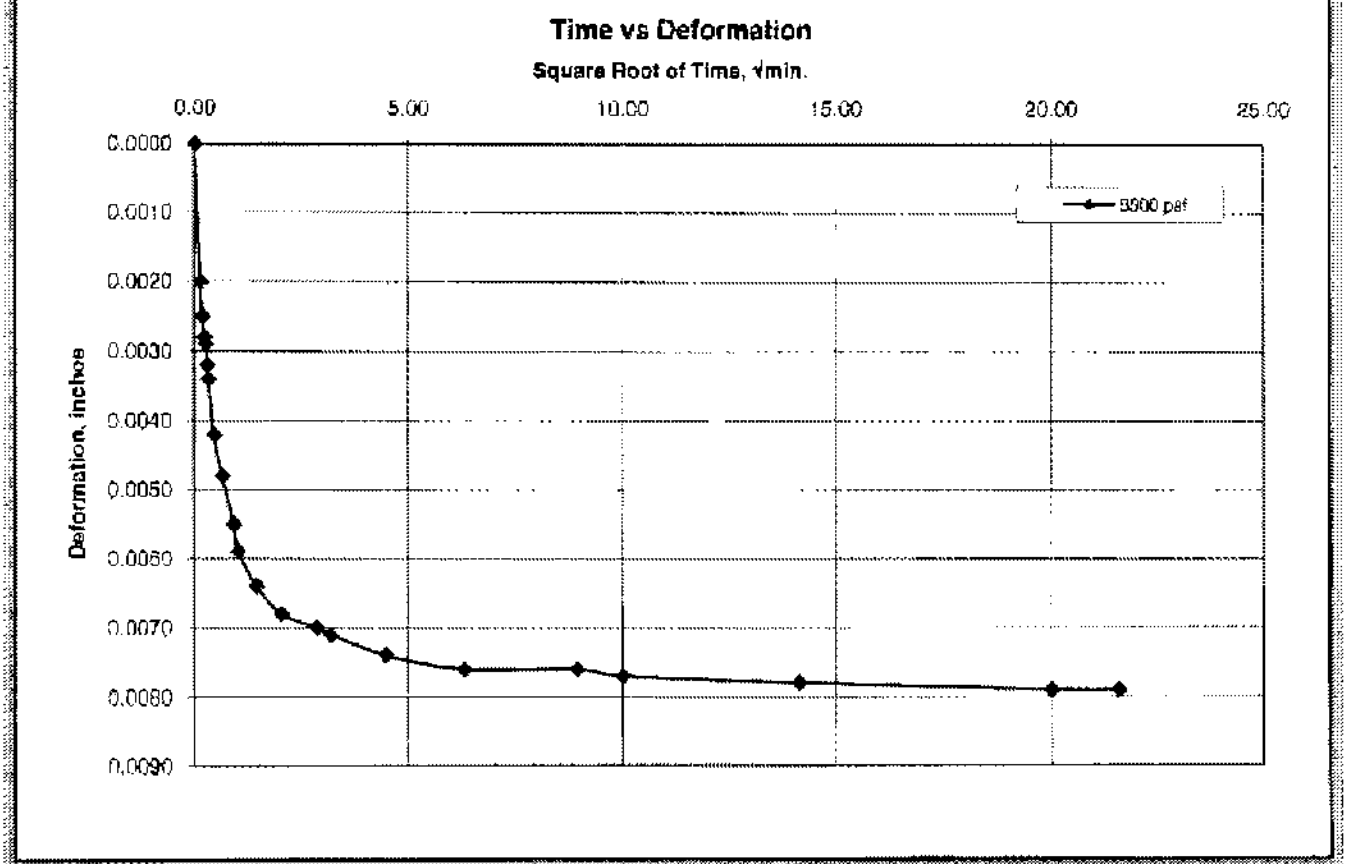


Cooper Testing Labs, Inc.

Load 12 — 8800 PSF

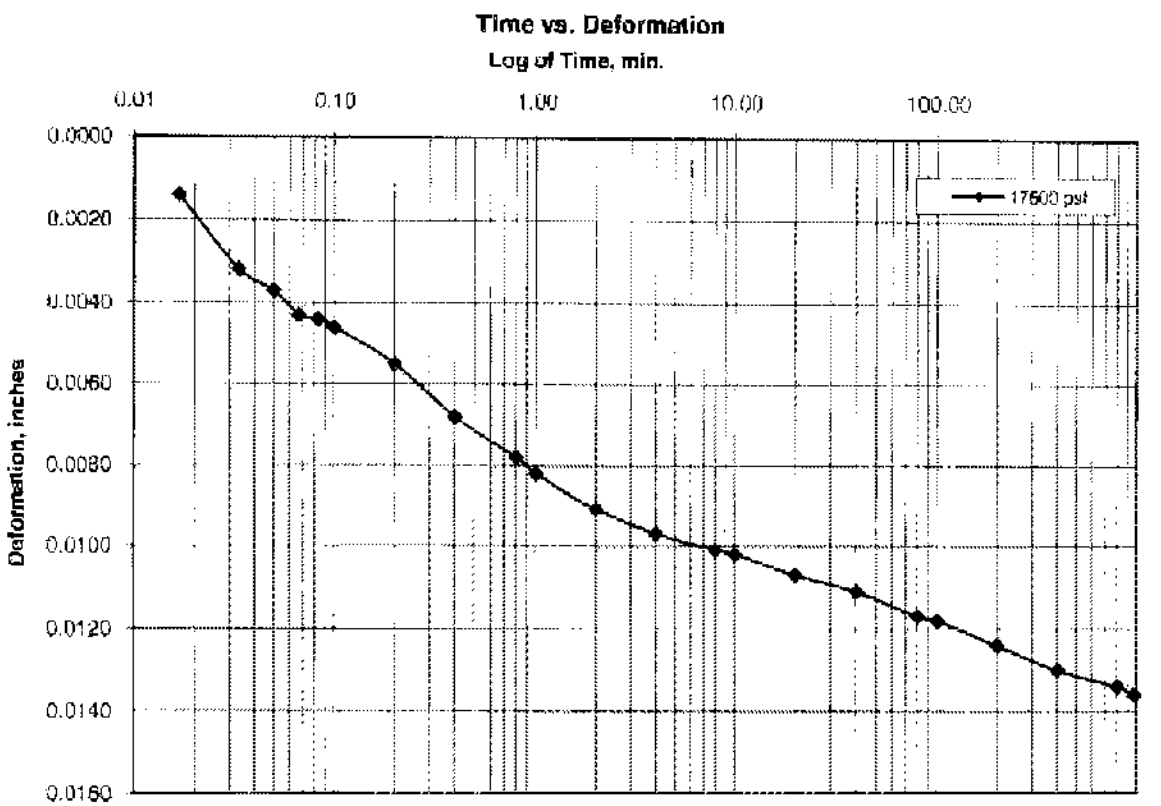


8800 PSF



Cooper Testing Labs, Inc.

Load 13 | 17600 PSF



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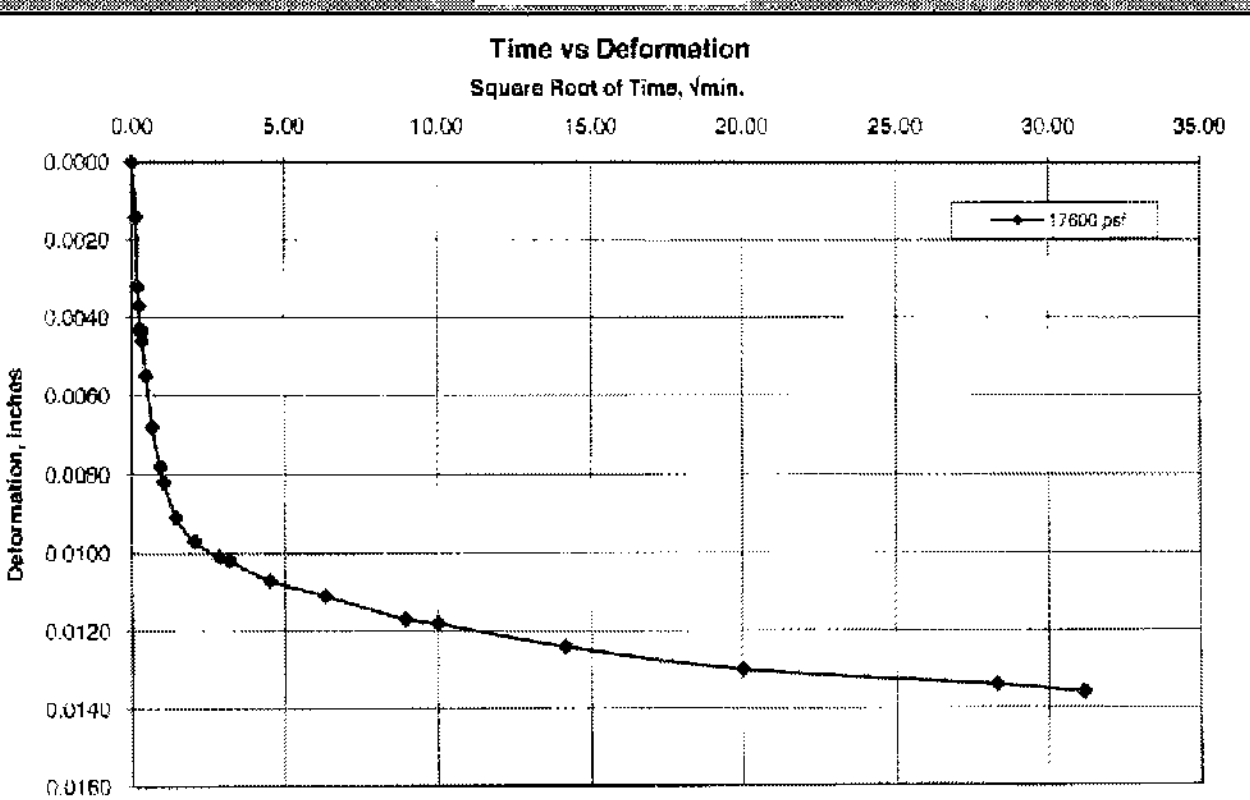
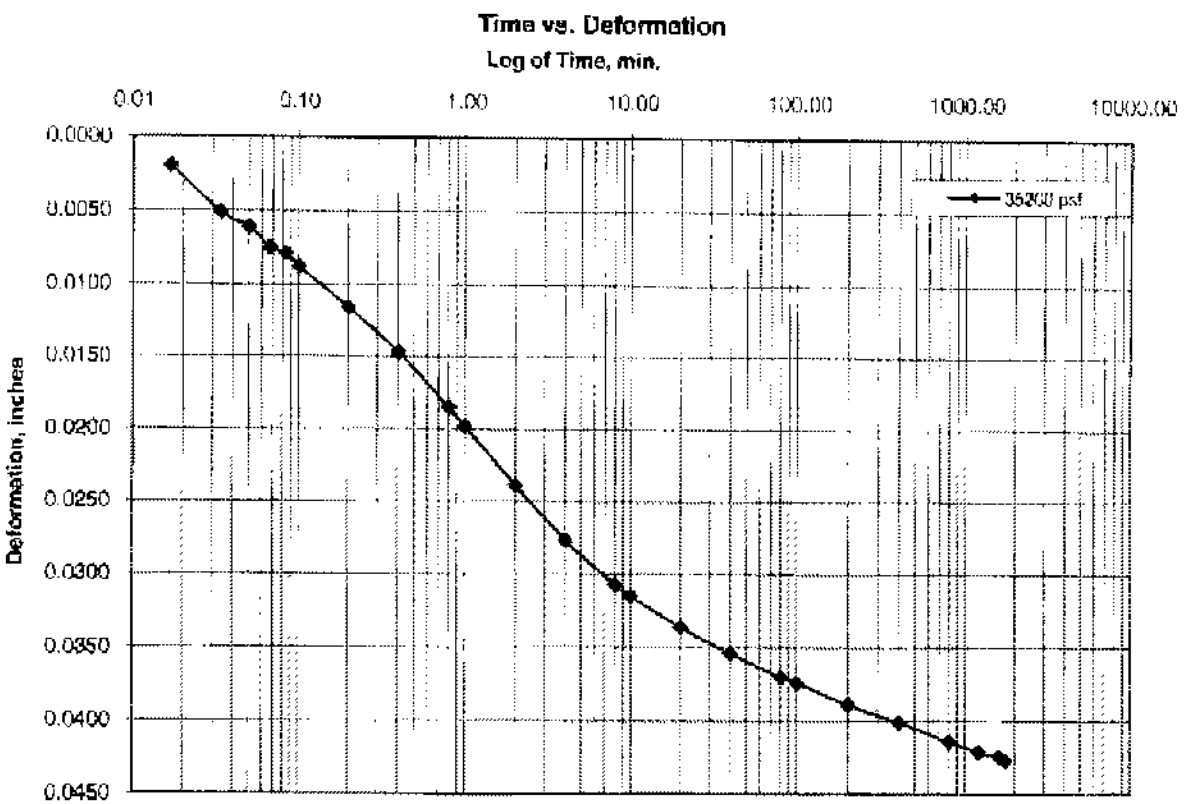
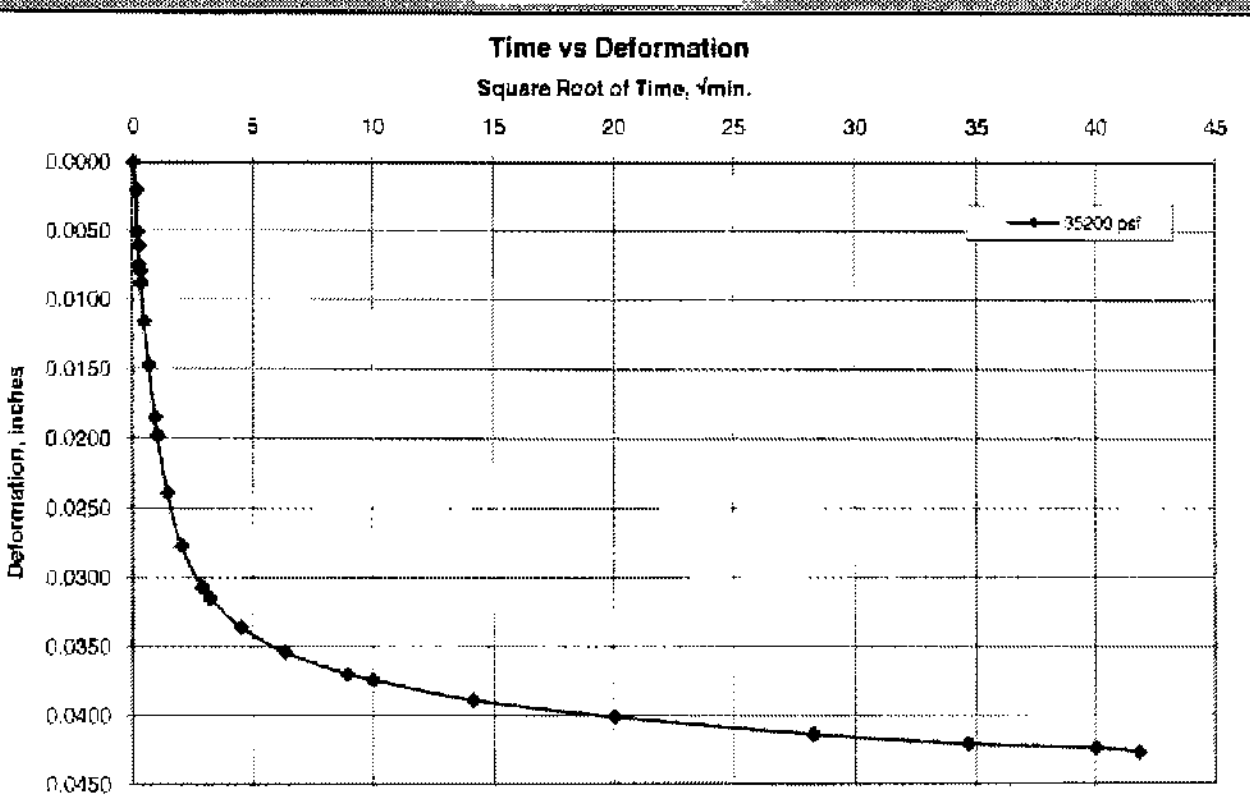


Cooper Testing Labs, Inc.

Load 14 — 35200 PSF

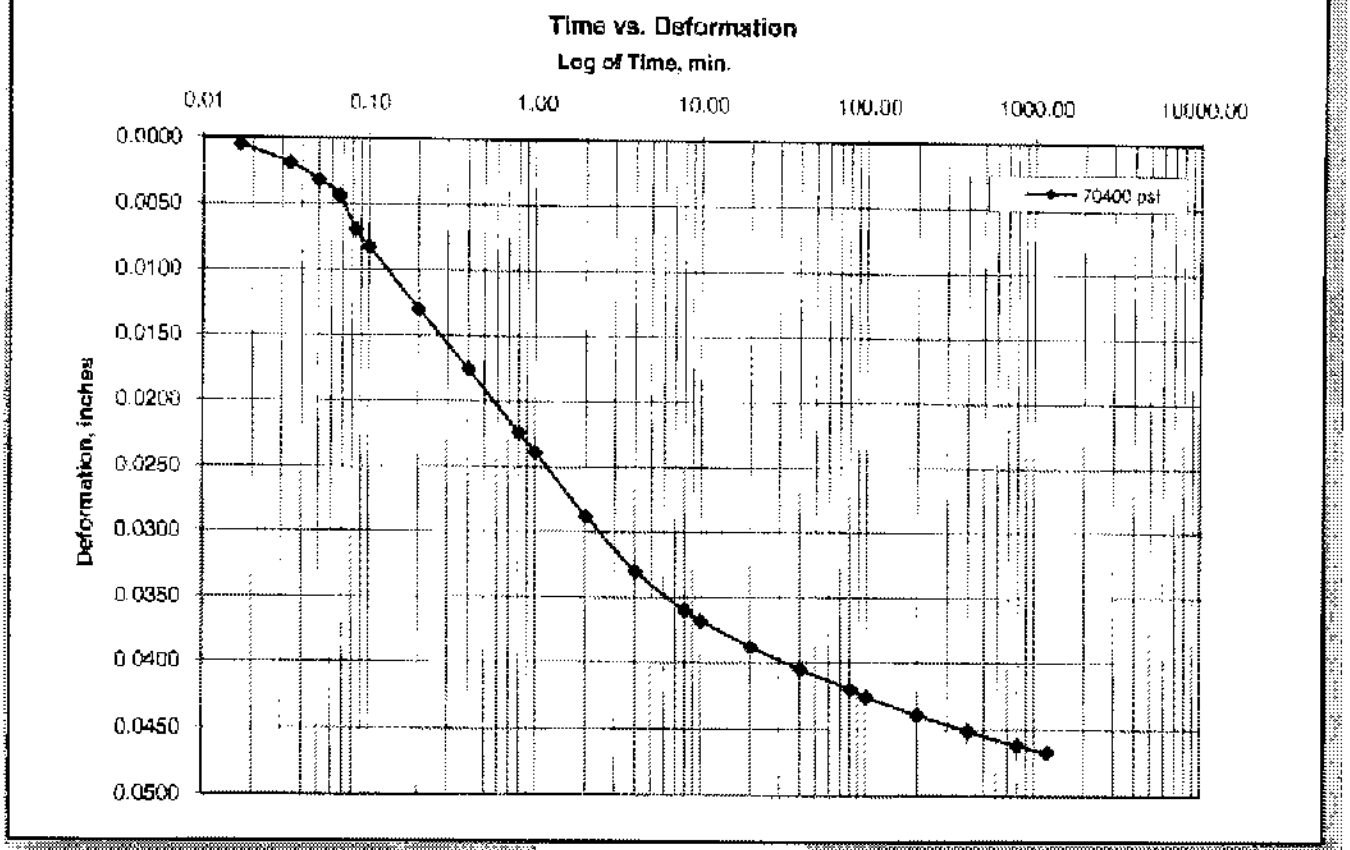


35200 PSF

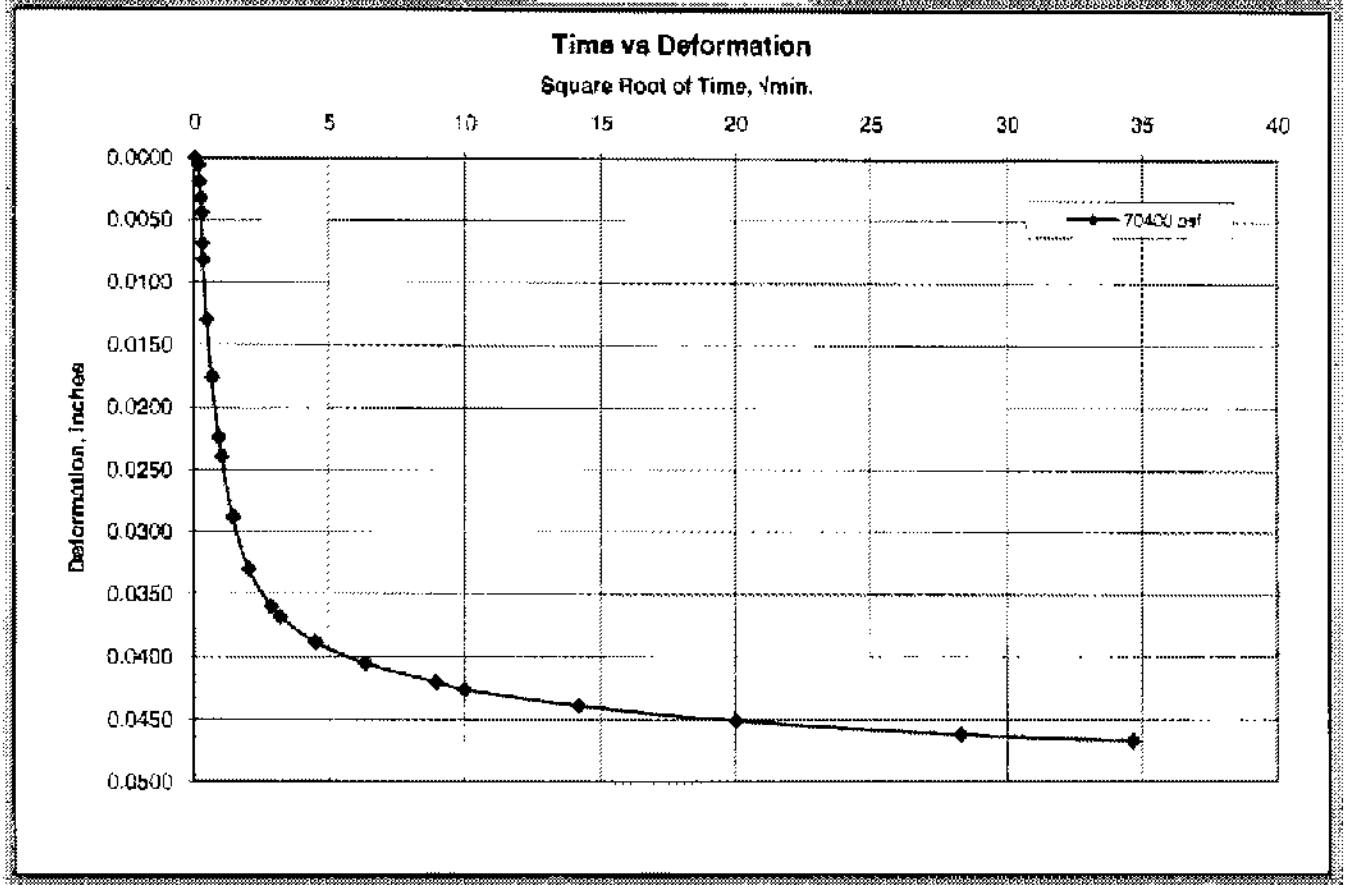


Cooper Testing Labs, Inc.

Load 15 — 70400 PSF



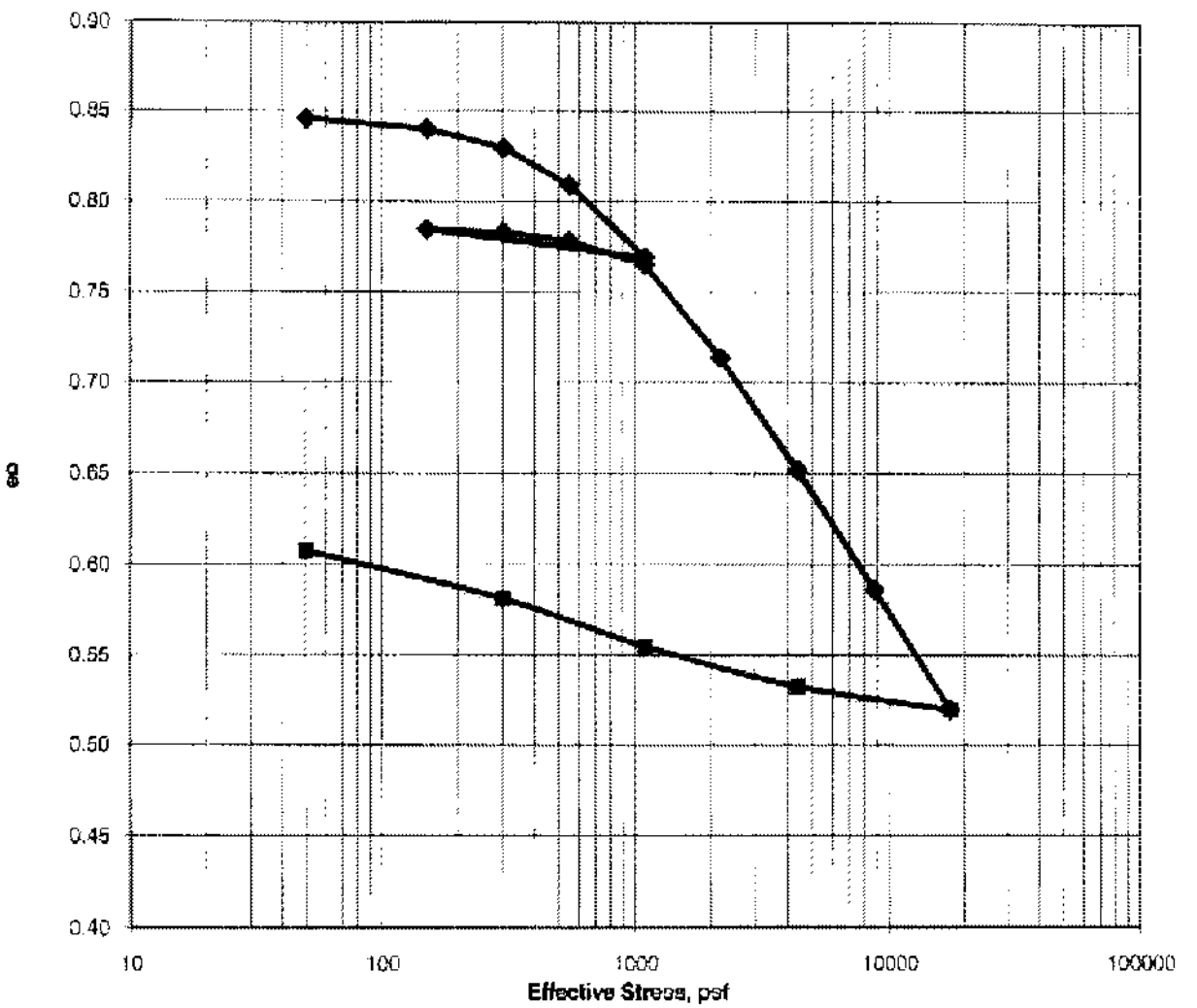
70400 PSF



Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-3	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-10 (upper)	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	229-232	**Checked:**	PJ/DC
Soil Type:	Gray Sandy Lean CLAY			**Date:**	6/19/2008

eo-Log-P Curve



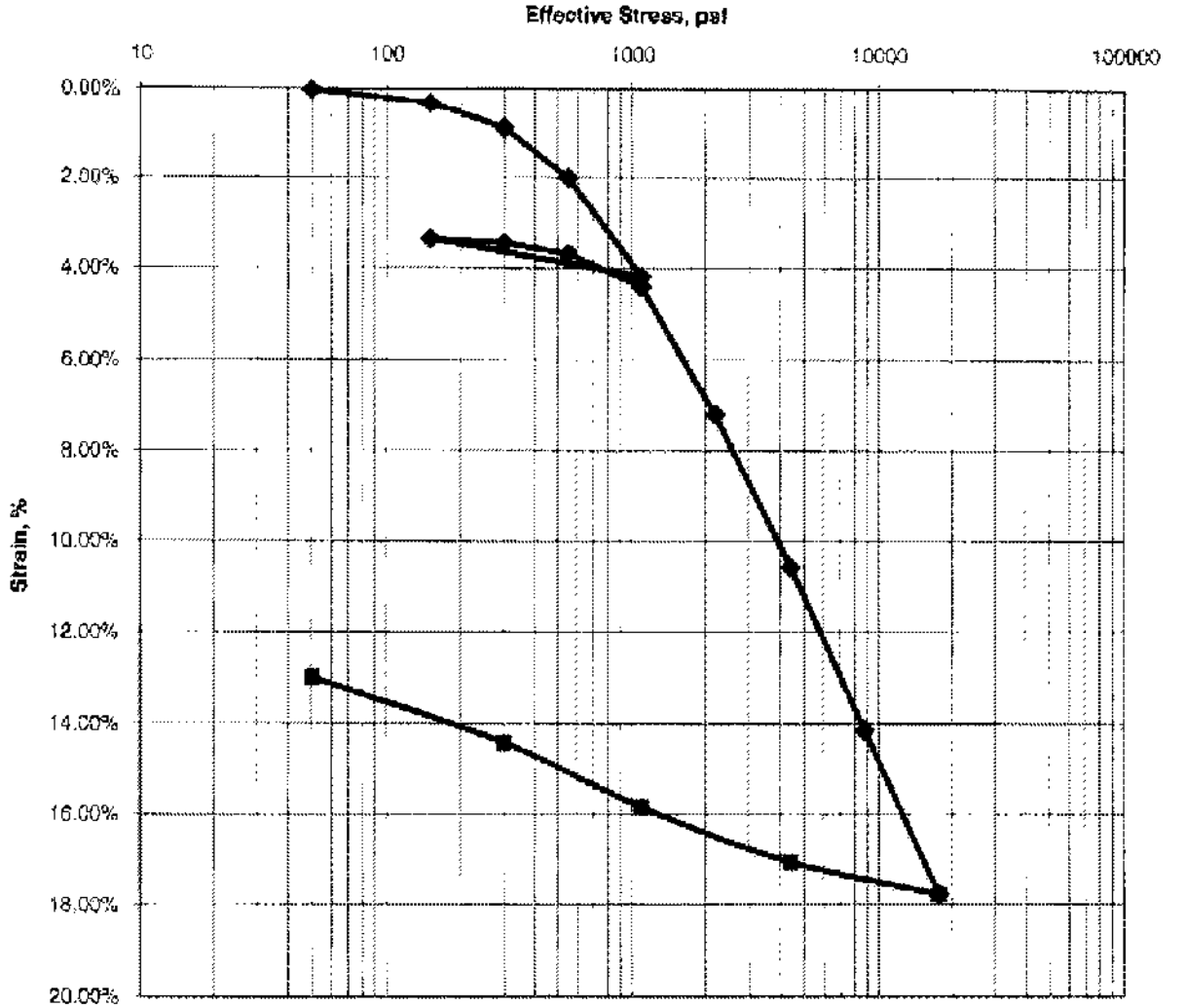
Ass. Gs = 2.75	Initial	Final
Moisture %:	29.7	22.7
Dry Density, pcf:	93.1	105.8
Void Ratio:	0.845	0.622
% Saturation:	96.8	100

Remarks: Sample possibly disturbed. Moderate patching required. Material above this sample in the tube was definitely disturbed.

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-3	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-10 (upper)	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	229-232	**Checked:**	PJ/DC
Soil Type:	Gray Sandy Lean CLAY			**Date:**	6/19/2008

Strain-Log-P Curve



Ass. Gs = 2.75	Initial	Final
Moisture %:	29.7	22.7
Dry Density, pcf:	93.1	105.8
Void Ratio:	0.845	0.622
% Saturation:	96.8	100

Remarks: Sample possibly disturbed. Moderate patching required. Material above this sample in the tube was definitely disturbed.

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane Project
Boring	GS08-3
Sample:	S3-10 (upper)
Depth, ft.:	229-232
Date:	6/19/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Description:	Gray Sandy Lean CLAY

Moisture Density Data Entry Screen

	Initial	Final
Height	1.01	0.8839
Diameter	2.41	2.41
Total Wet Weight	145.3	137.4
Wt of Wet Soil & Dish		202.1
Wt of Dry Soil & Dish		176.7
Wt. Of Dish		20.3
Wt of Ring		44.4
Moisture %	29.7	24.7
Wet Density, pcf	120.7	129.8
Dry Density, pcf	93.1	105.8
Specific Gravity	2.75	2.75
Area	4.6	4.6
V ft3	0.0	0.0
Vt, cc	75.1	66.1
Vs, cc	40.7	40.7
Vv, cc	34.4	25.3
e	0.8	0.6
porosity, %	45.8	38.4
S, %	96.6	100

Loading Increments — **Void Ratio**

Increment #	Load, psf psf	Dial .0001"	Load psf	Height Delta h	Volume Vt cc	Voids Vv	Void Ratio e
1	50	0.0002	50	1.0048	75.17	34.443	0.846
2	150	0.0033	150	1.0017	74.94	34.211	0.840
3	300	0.0089	300	0.9961	74.52	33.792	0.830
4	550	0.0200	550	0.9850	73.69	32.962	0.809
5	1100	0.0418	1,100	0.9632	72.06	31.331	0.769
6	150	0.0335	150	0.9715	72.68	31.952	0.785
7	300	0.0344	300	0.9706	72.61	31.885	0.783
8	550	0.0368	550	0.9682	72.43	31.705	0.778
9	1100	0.0440	1100	0.9610	71.89	31.166	0.765
10	2200	0.0720	2200	0.9330	69.80	29.0718	0.713816
11	4400	0.1058	4400	0.8992	67.27	26.5431	0.651724
12	8800	0.1418	8800	0.8635	64.60	23.8724	0.586152
13	17600	0.1778	17600	0.8272	61.88	21.1567	0.519473
14		0.1778	#N/A	0.8272	61.88	21.1567	0.519473
15		0.1778	#N/A	0.8272	61.88	21.1567	0.519473
16		0.1778	#N/A	0.8272	61.88	21.1567	0.519473
17		0.1778	#N/A	0.8272	61.88	21.1567	0.519473
18		0.1778	#N/A	0.8272	61.88	21.1567	0.519473
19		0.1778	#N/A	0.8272	61.88	21.1567	0.519473

Rebound Increments — **Void Ratio**

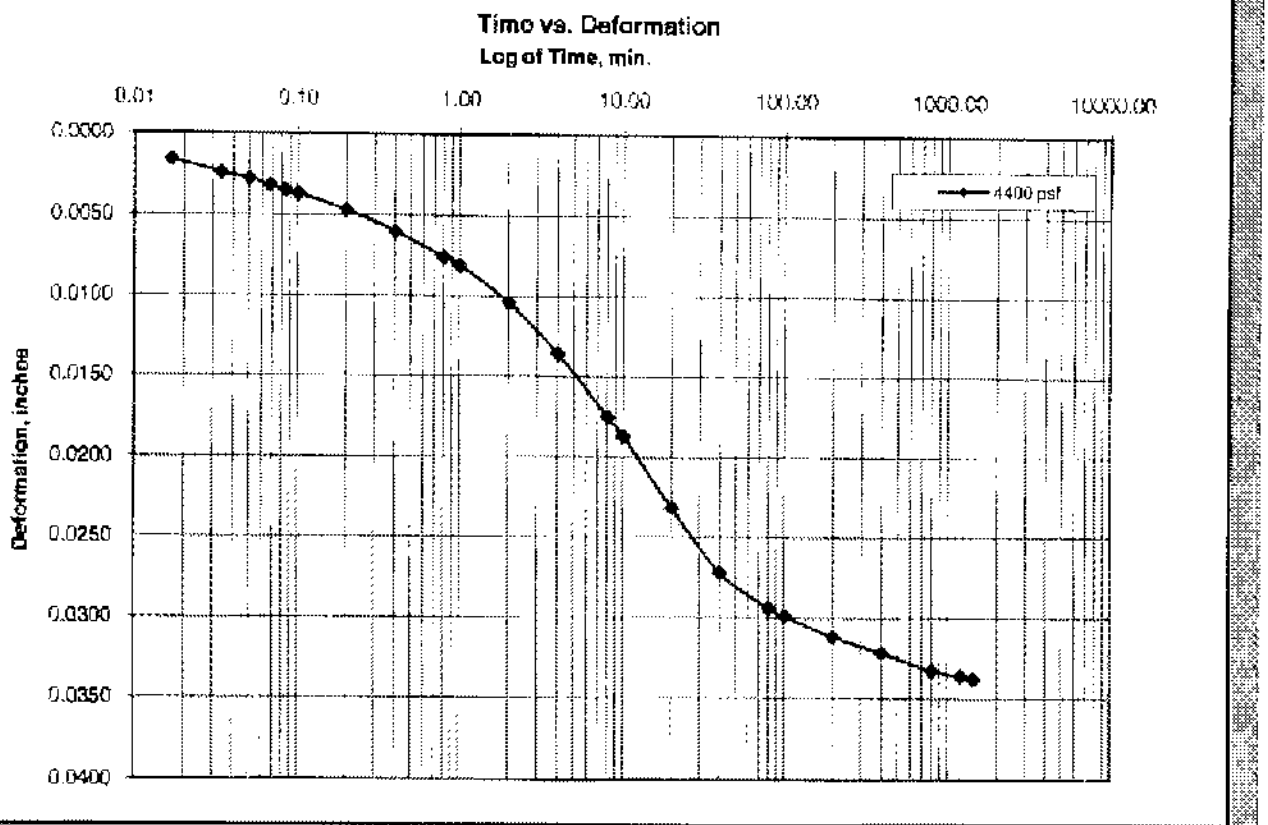
15	17600	0.1778	17600	0.8272	61.88	21.1567	0.519473
16	4400	0.1707	4400	0.8343	62.42	21.6879	0.532516
17	1100	0.1585	1100	0.8465	63.33	22.6006	0.554925
18	300	0.1442	300	0.8608	64.40	23.6704	0.581192
19	50	0.1299	50	0.8751	65.47	24.7402	0.60746
20			#N/A	1.0050	75.19	34.4592	0.846072
	Tot Dry Wt	112.0000					

The data to the left is used to determine the theoretical

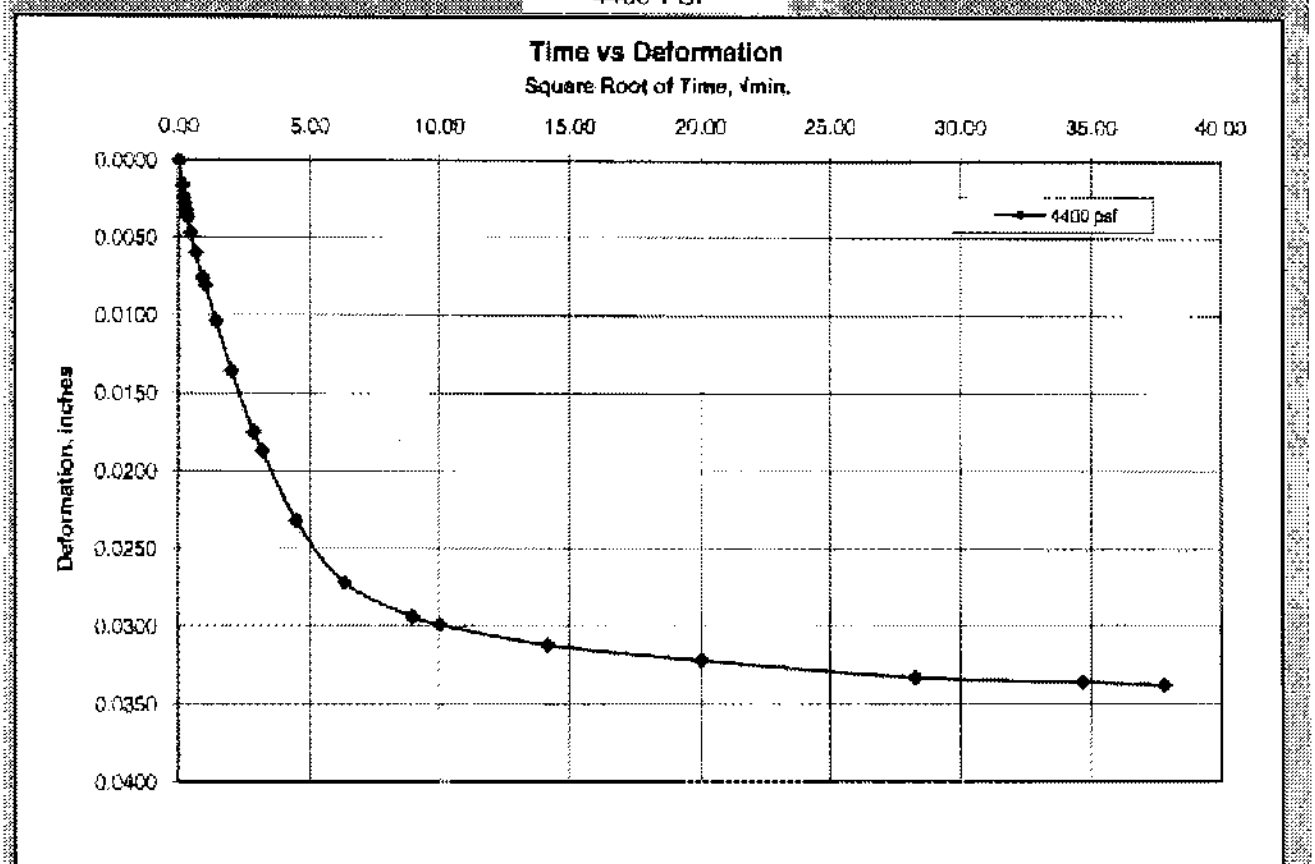
Cooper Testing Labs, Inc.

Load 11

4400 PSF



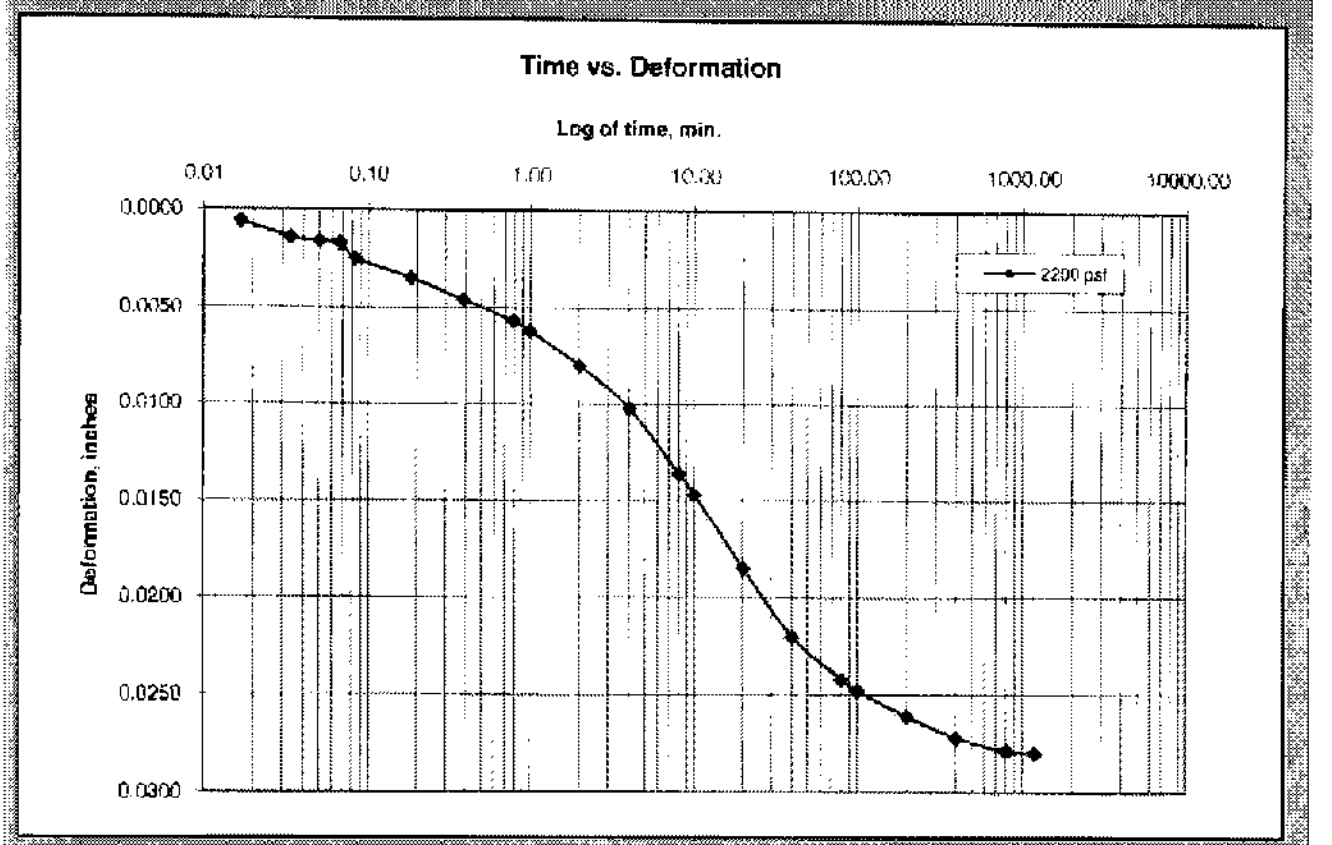
4400 PSF



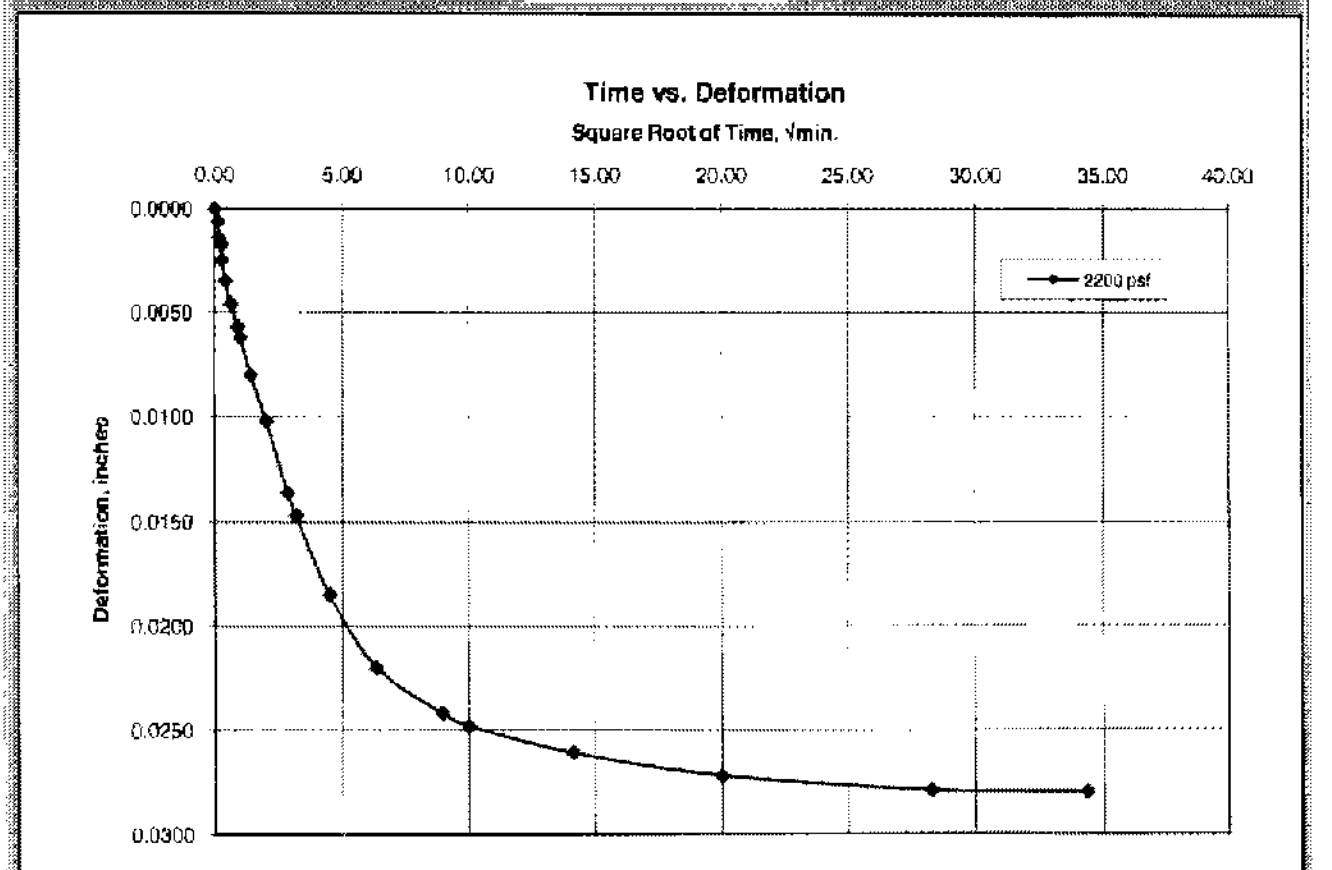
Cooper Testing Labs, Inc.

Load 10

2200 PSF

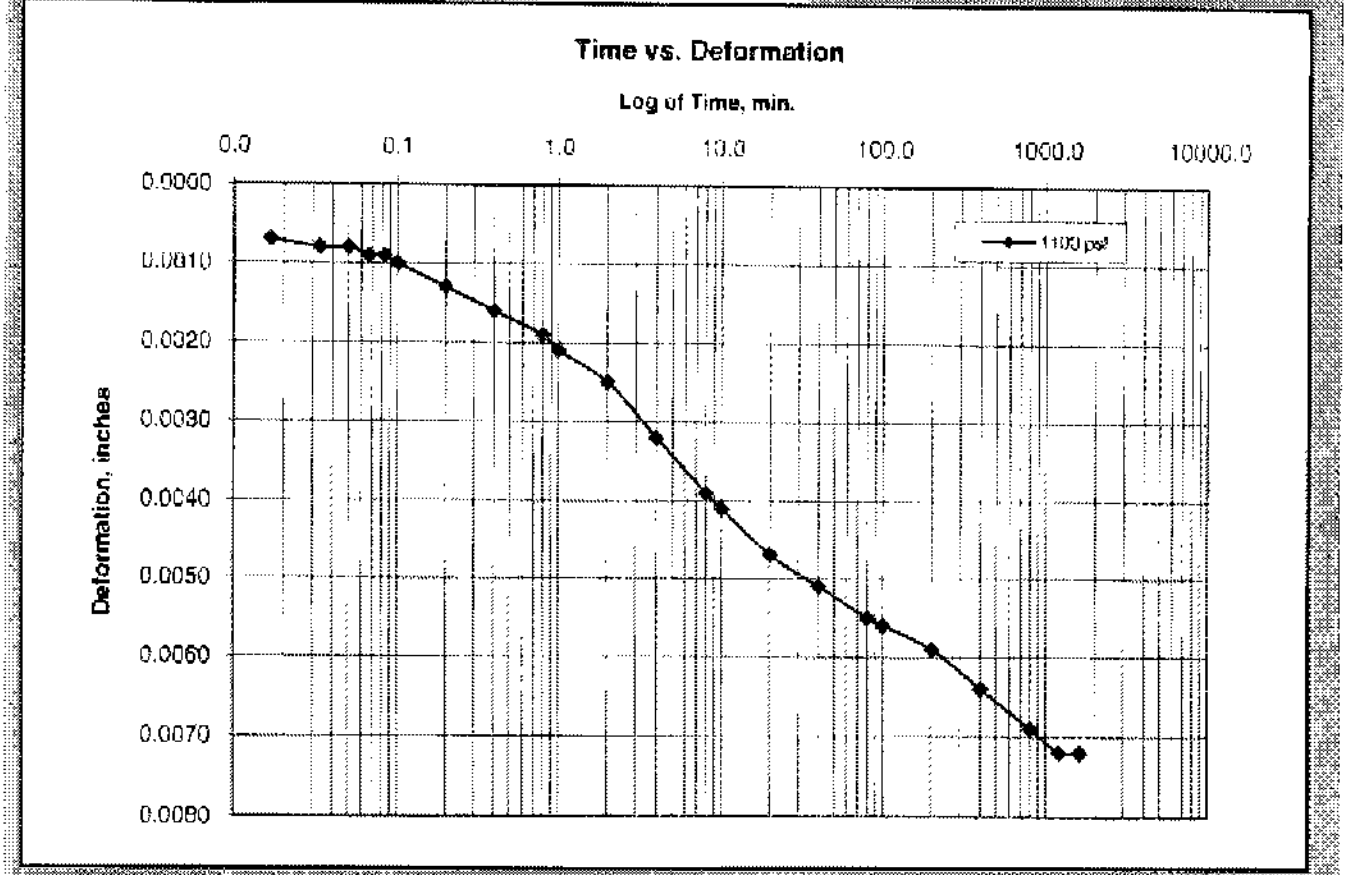


2200 PSF

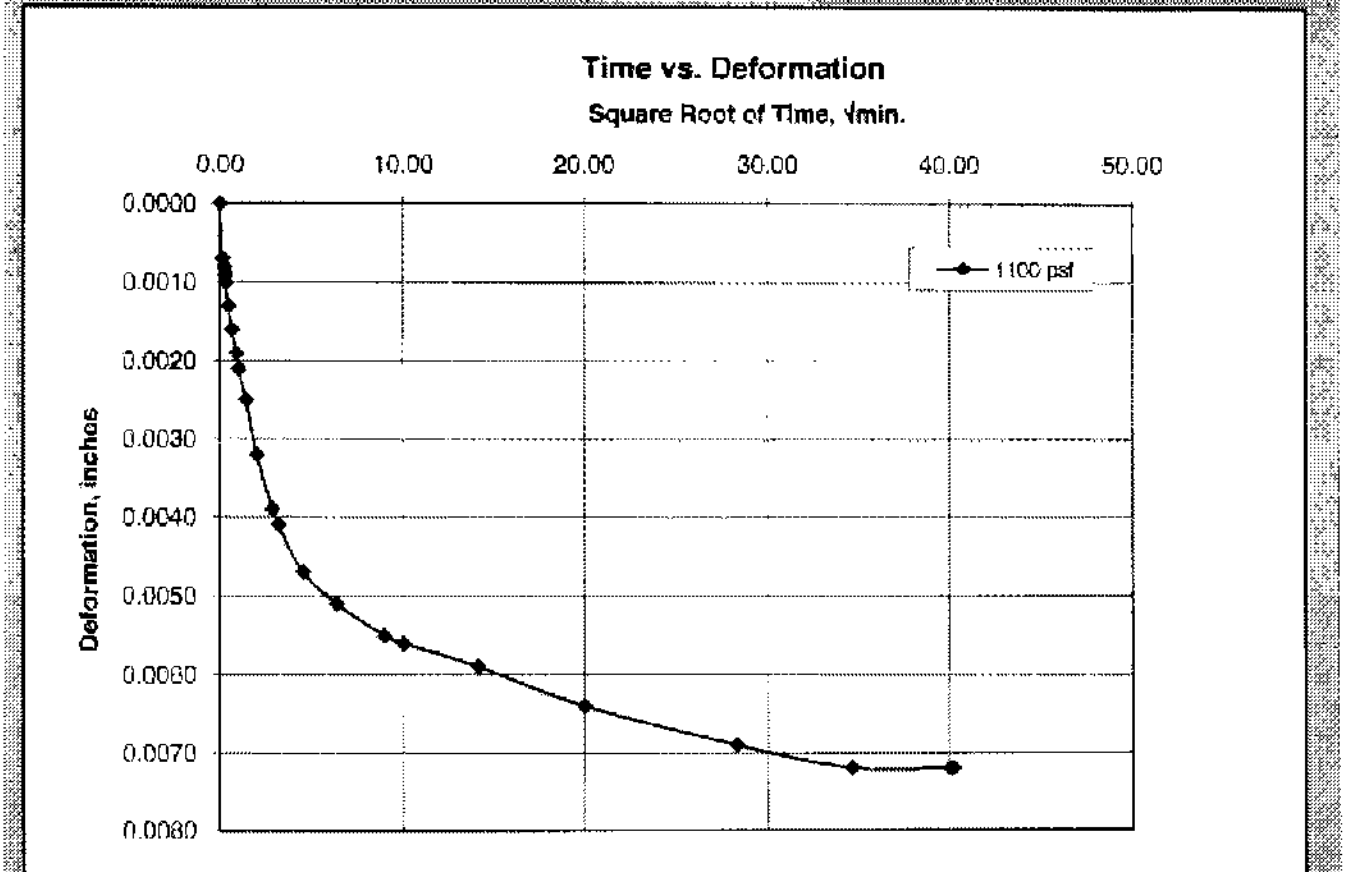


Cooper Testing Labs, Inc.

Load 9 — 1100 PSF

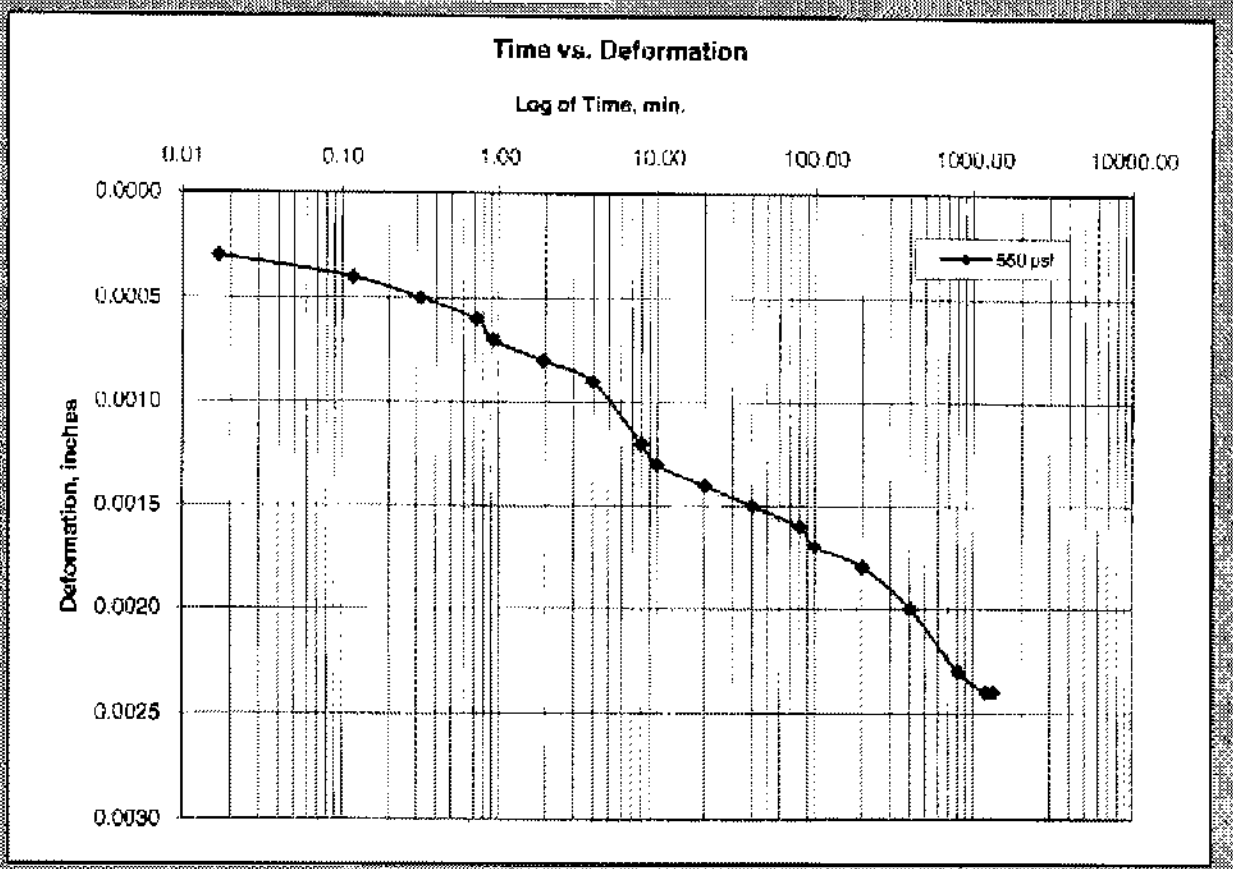


1100 PSF

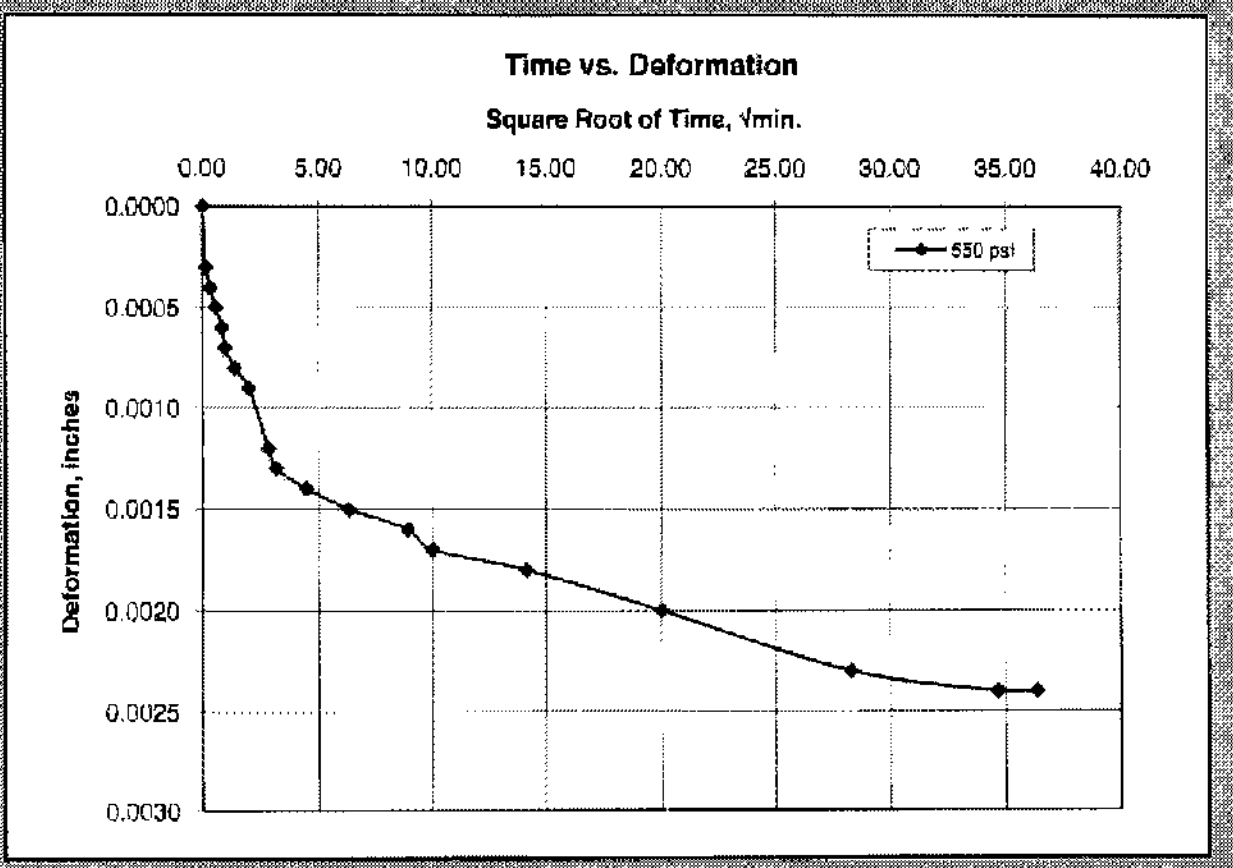


Cooper Testing Labs, Inc.

Load 8 — 550 PSF



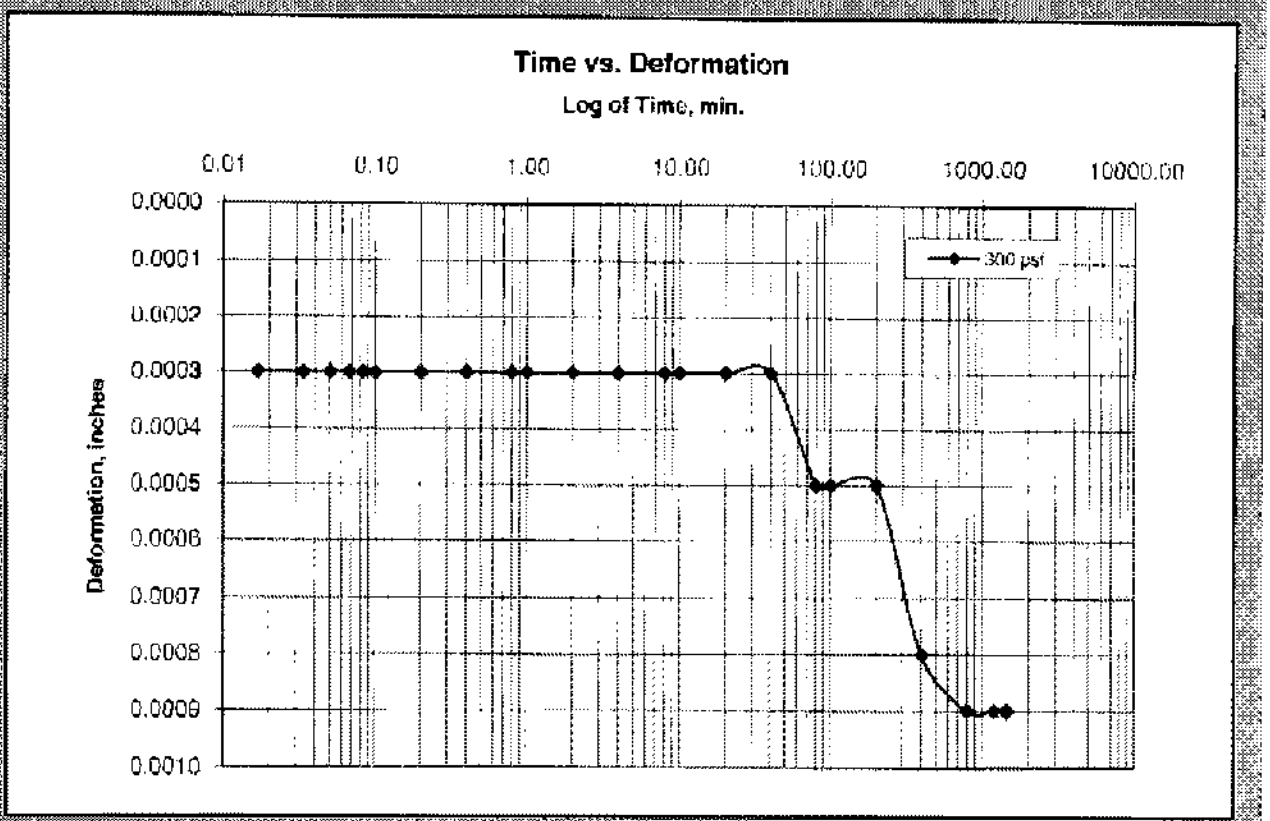
550 PSF



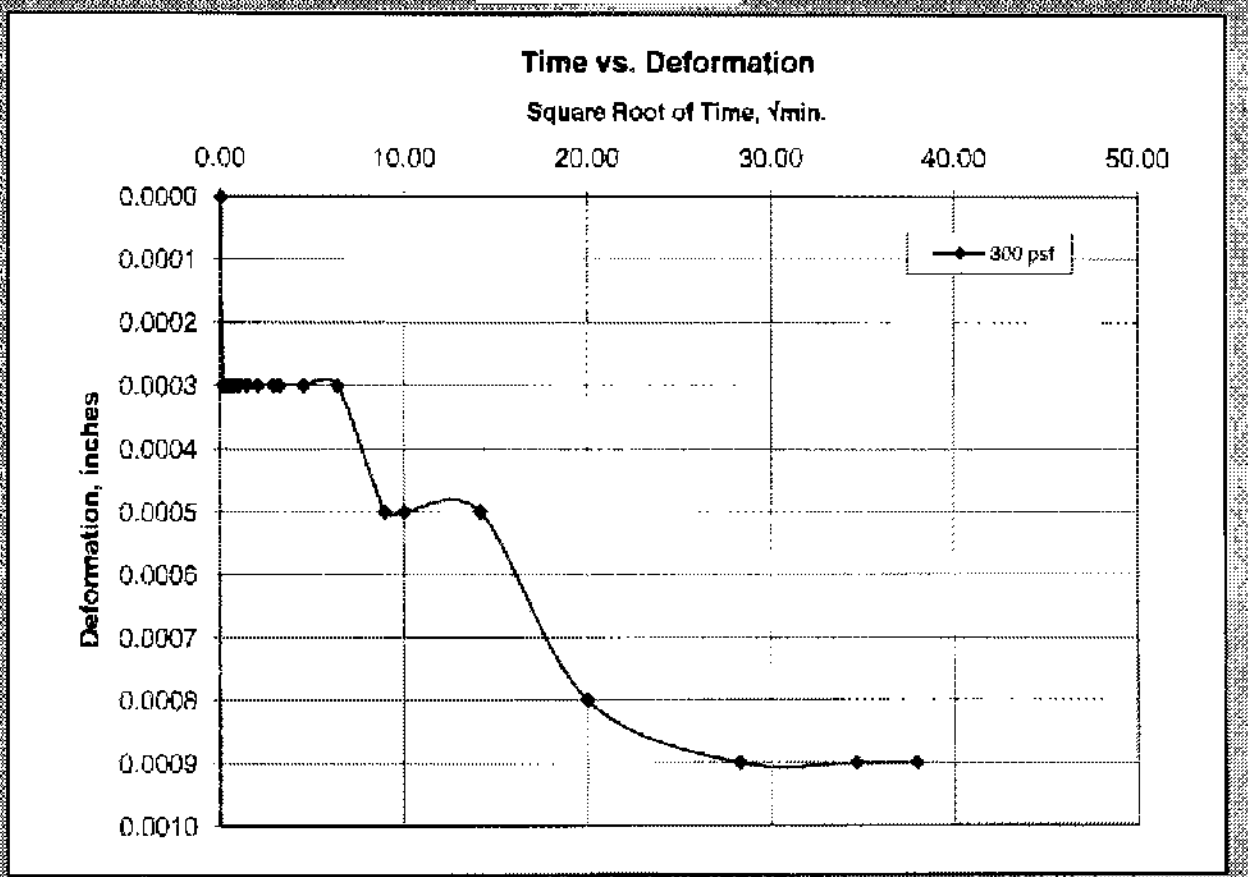
Cooper Testing Labs, Inc.

Load 7

300 PSF



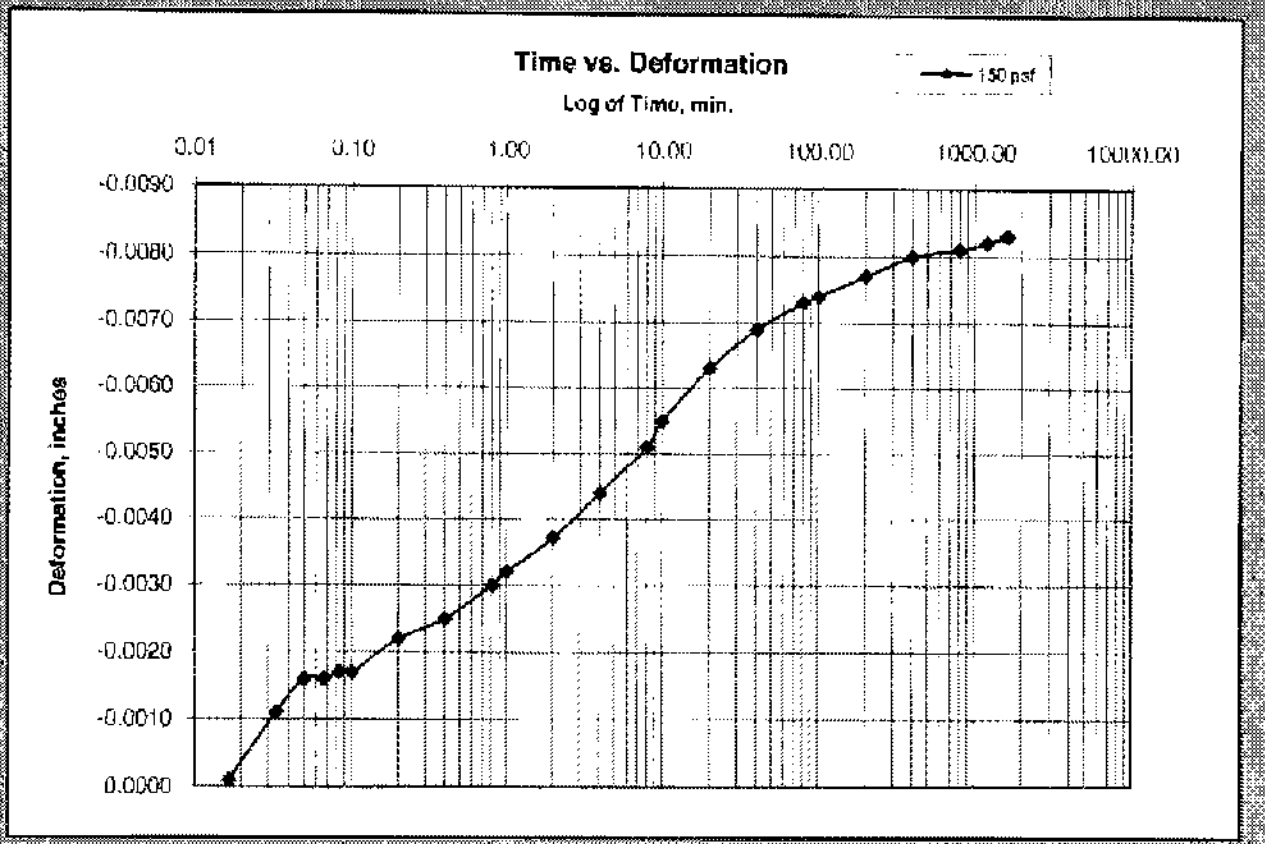
300 PSF



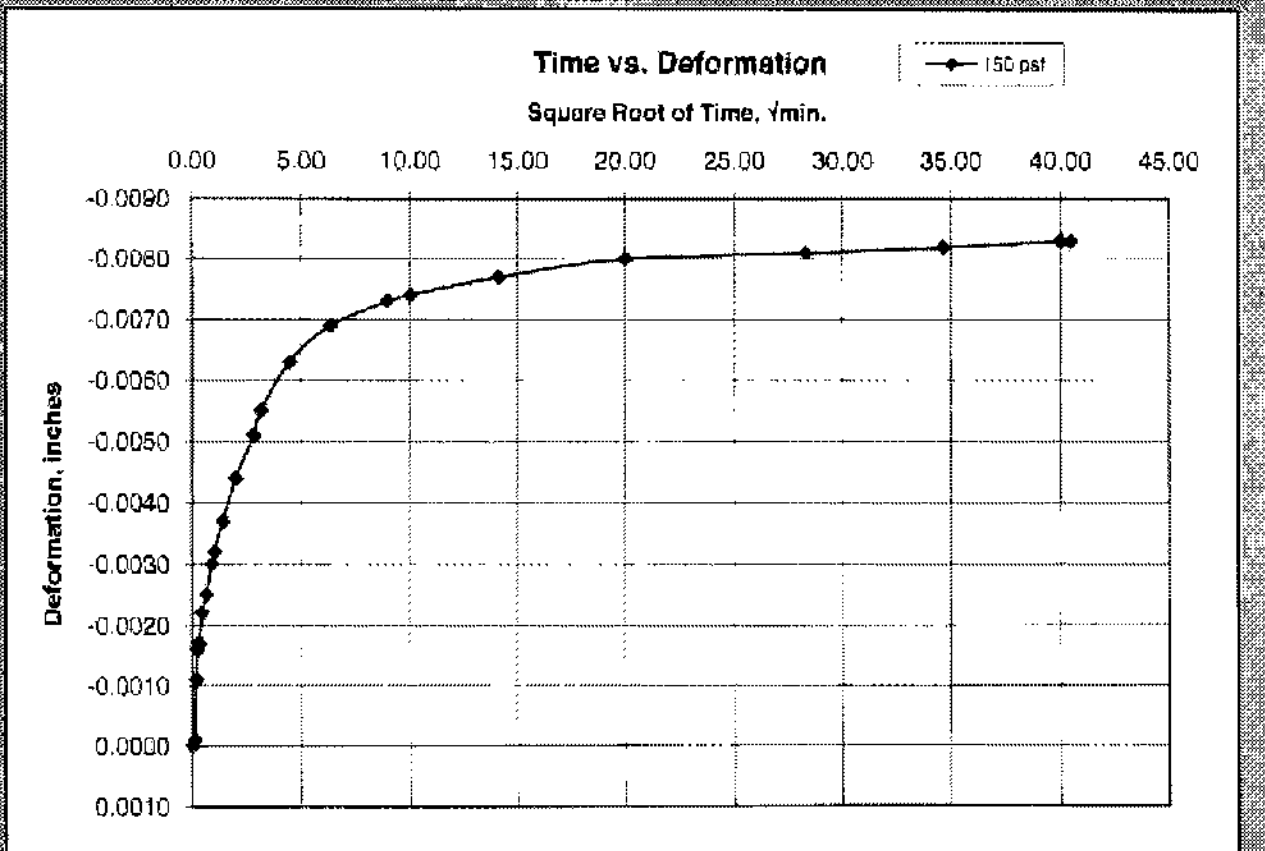
Cooper Testing Labs, Inc.

Load 6

150 PSF



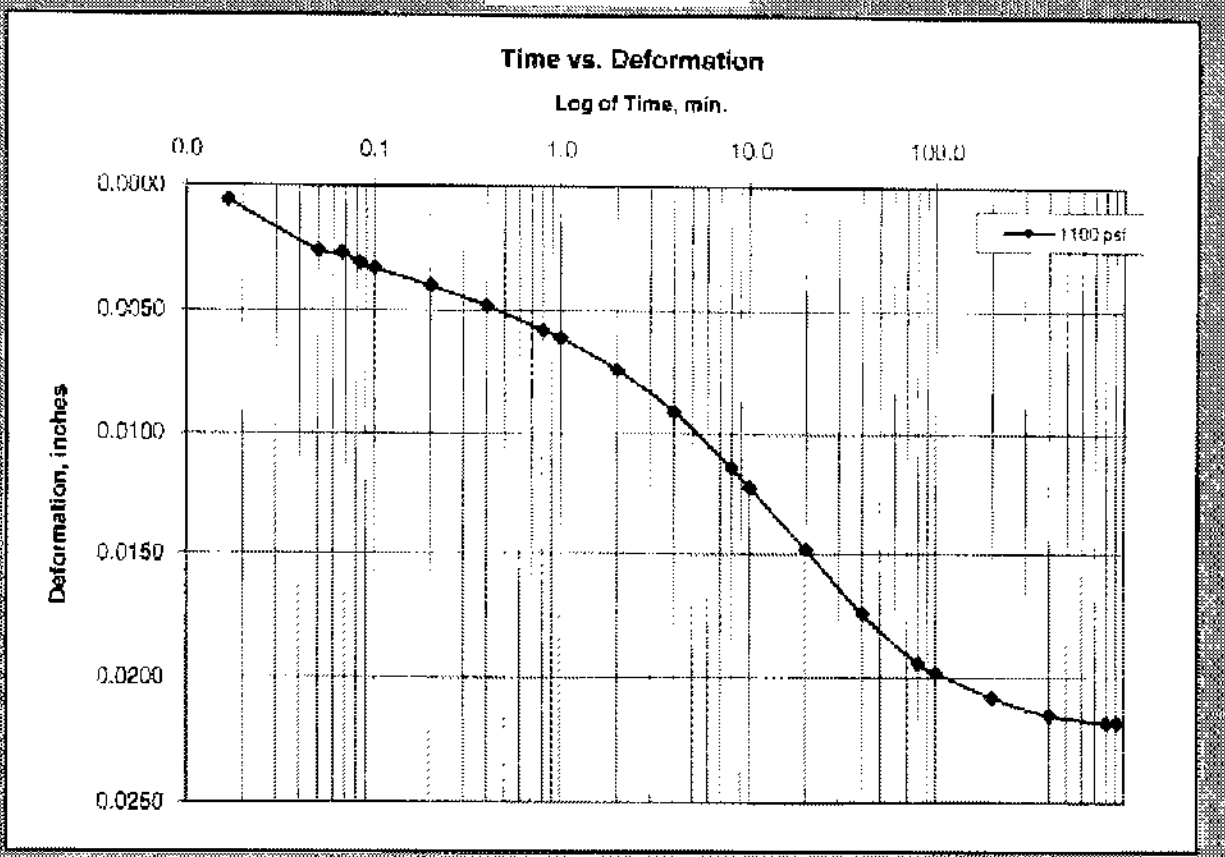
150 PSF



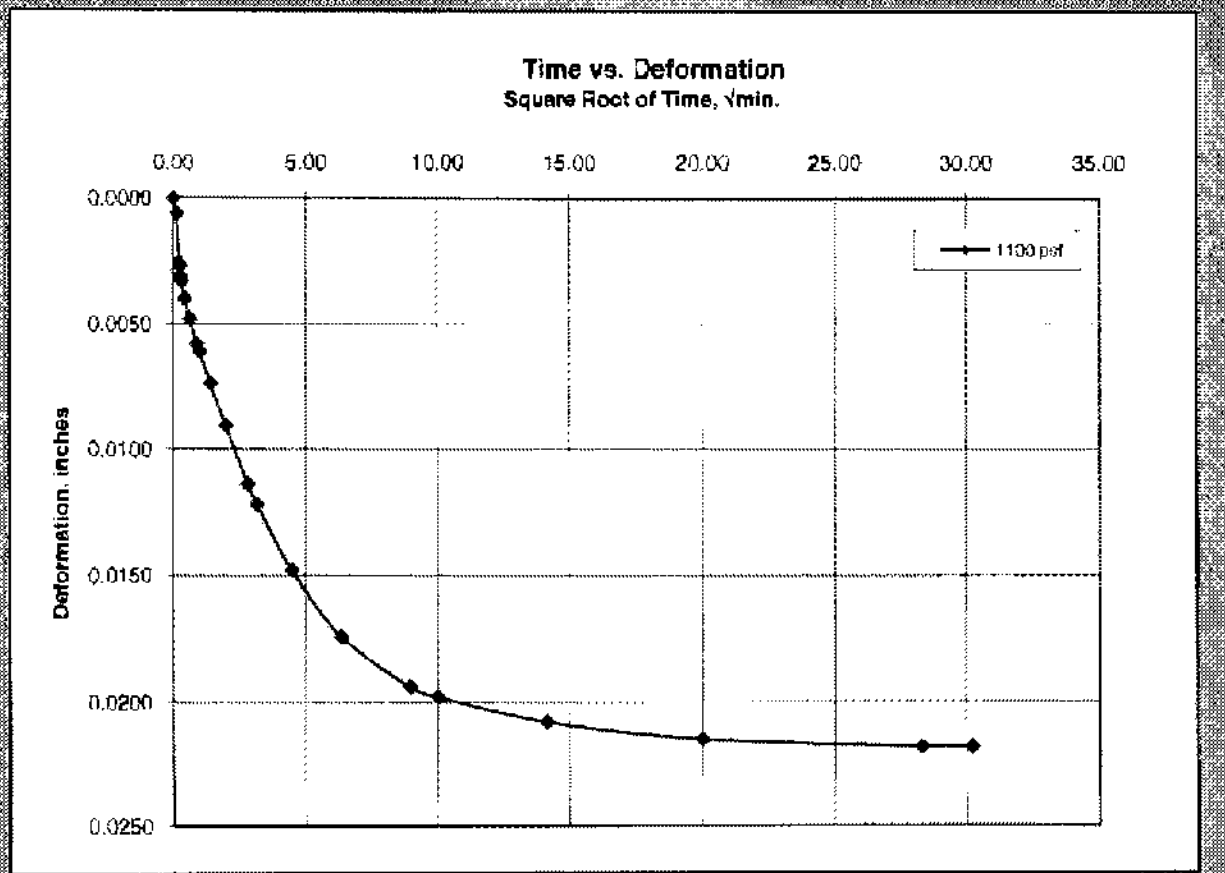
Cooper Testing Labs, Inc.

Load 5

1100 PSF

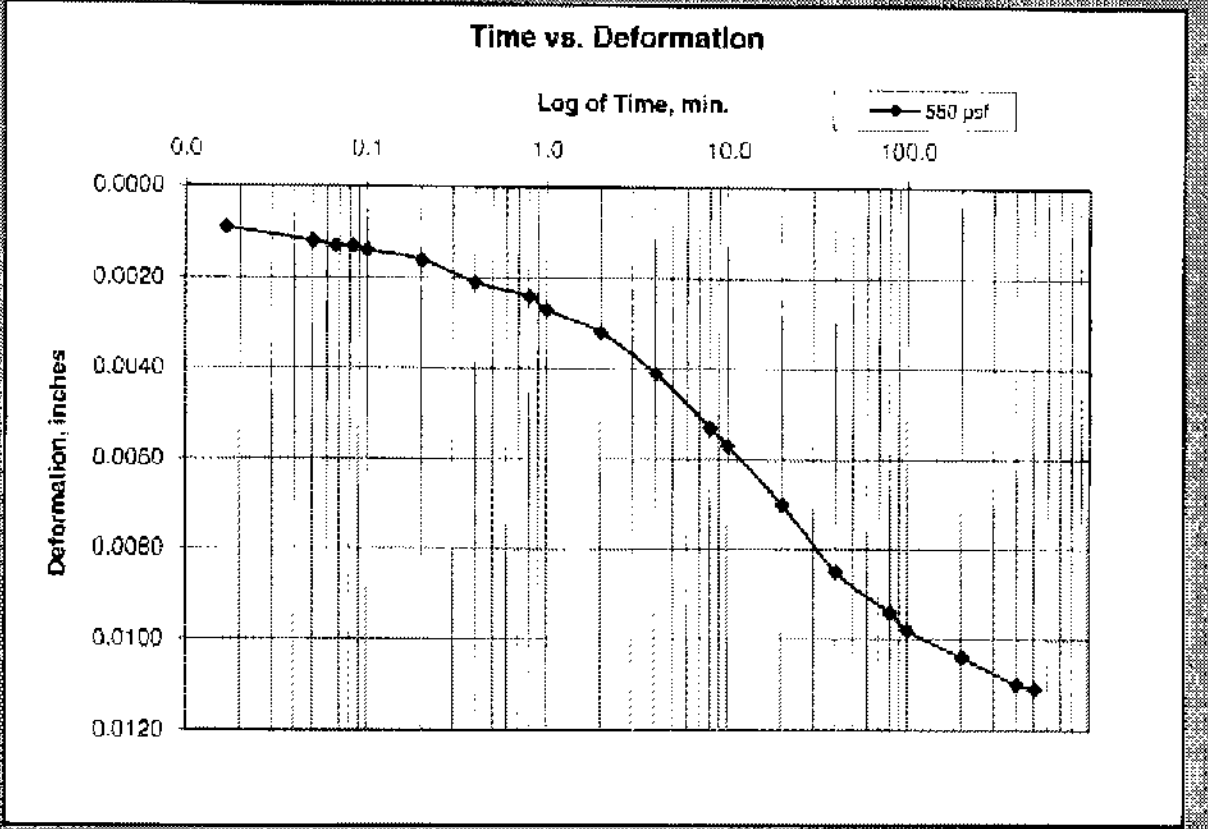


1100 PSF

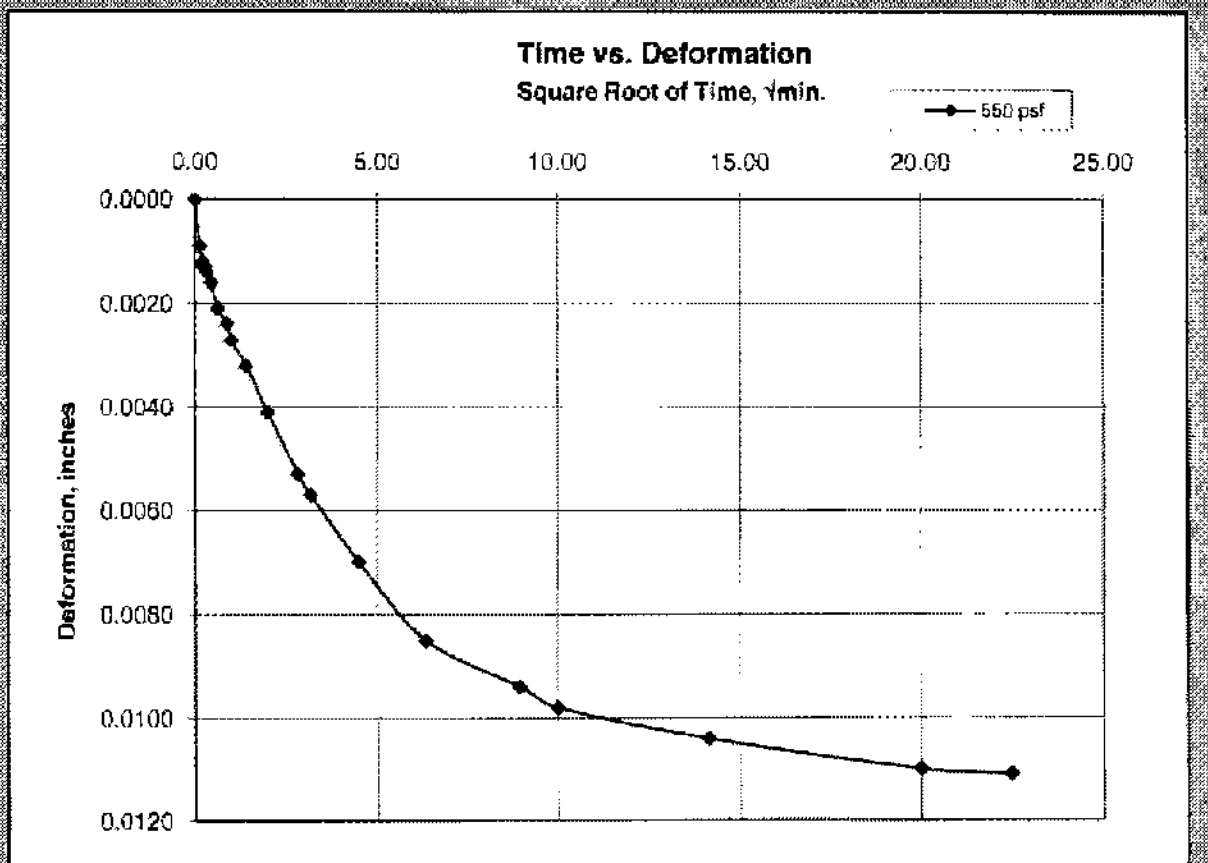


Cooper Testing Labs, Inc.

Load 4 — 550 PSF

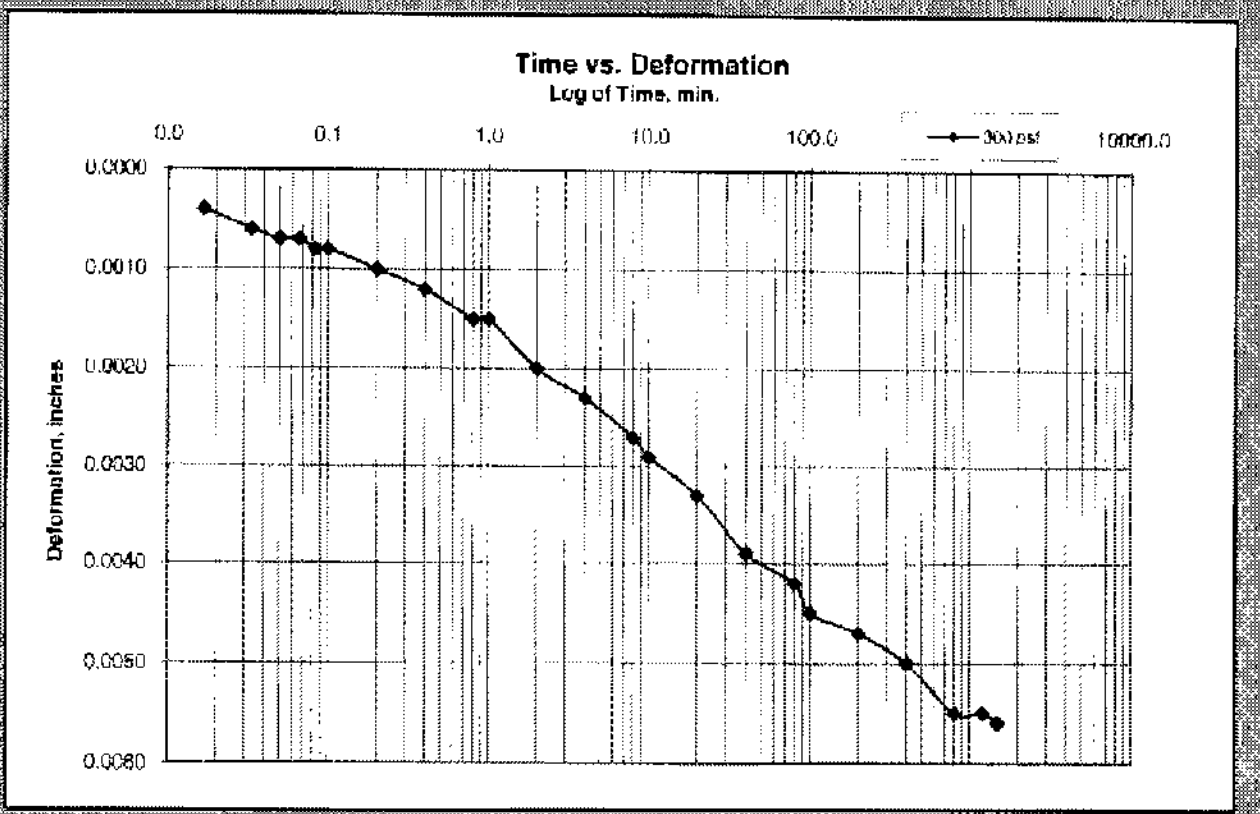


550 PSF

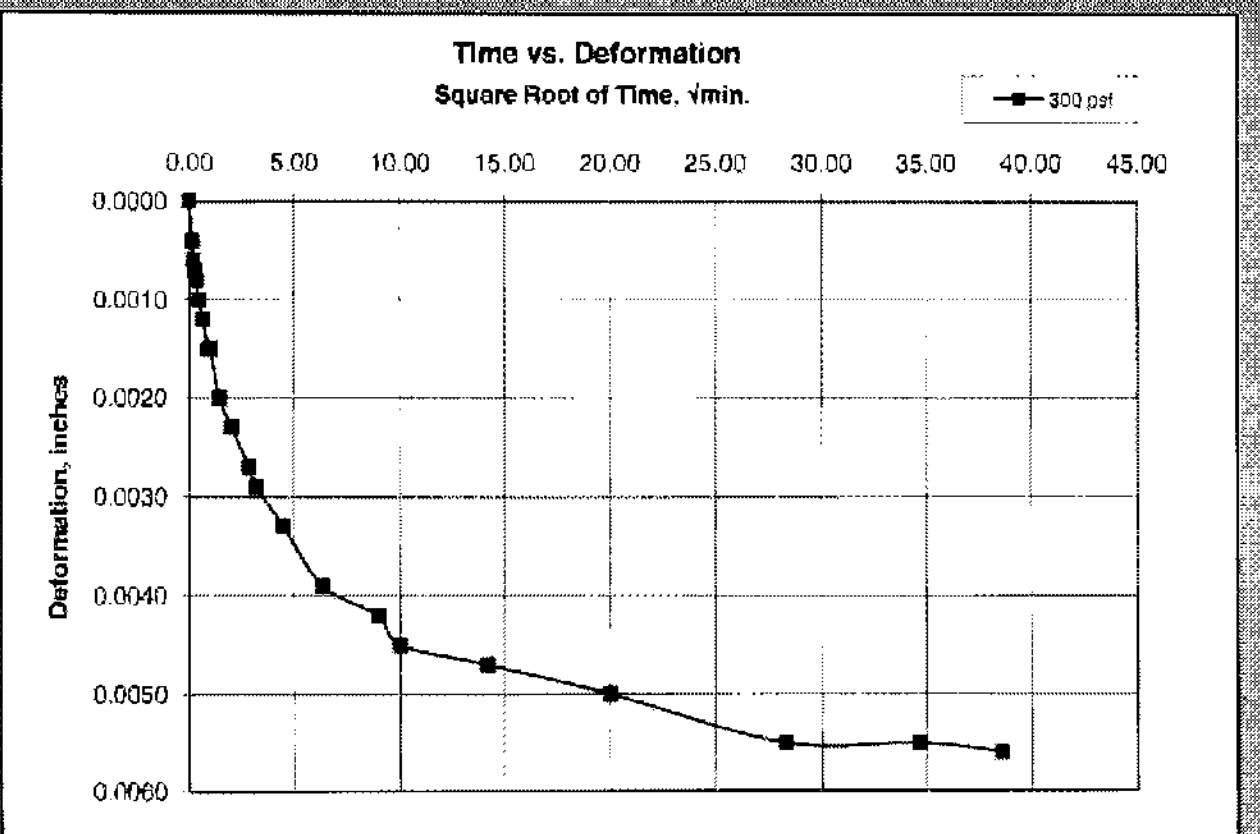


Cooper Testing Labs, Inc.

Load 3 | 300 PSF

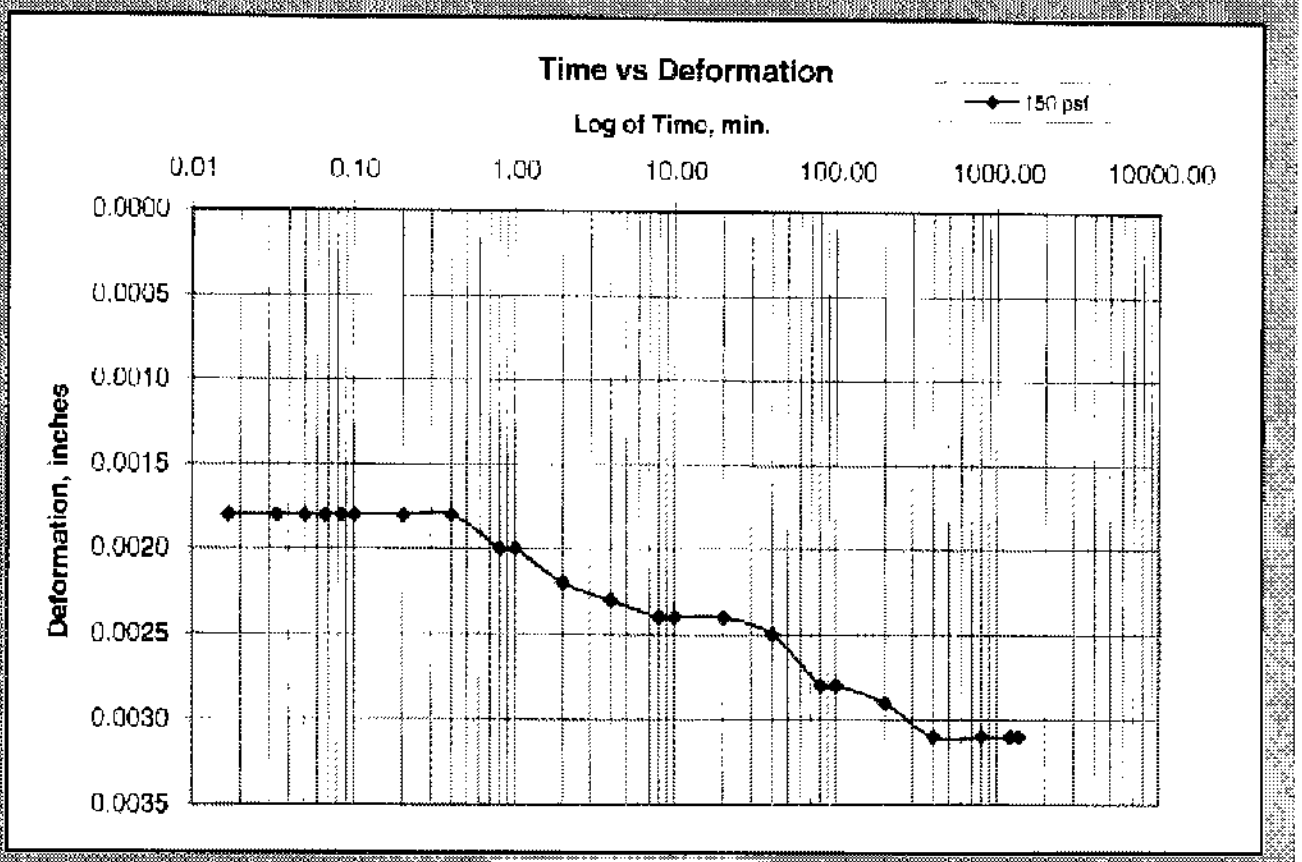


300 PSF

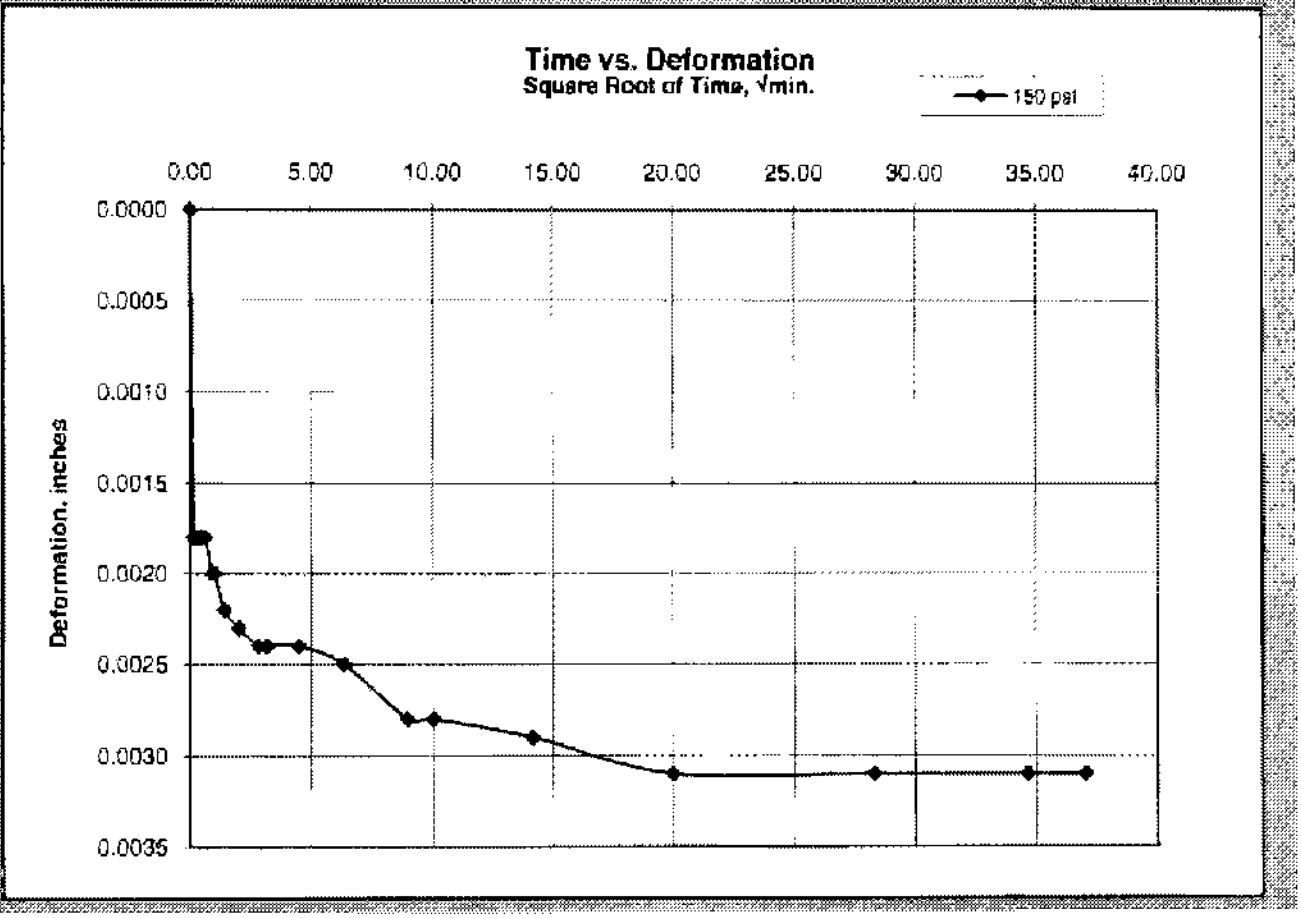


Cooper Testing Labs, Inc.

Load 2 — 150 PSF



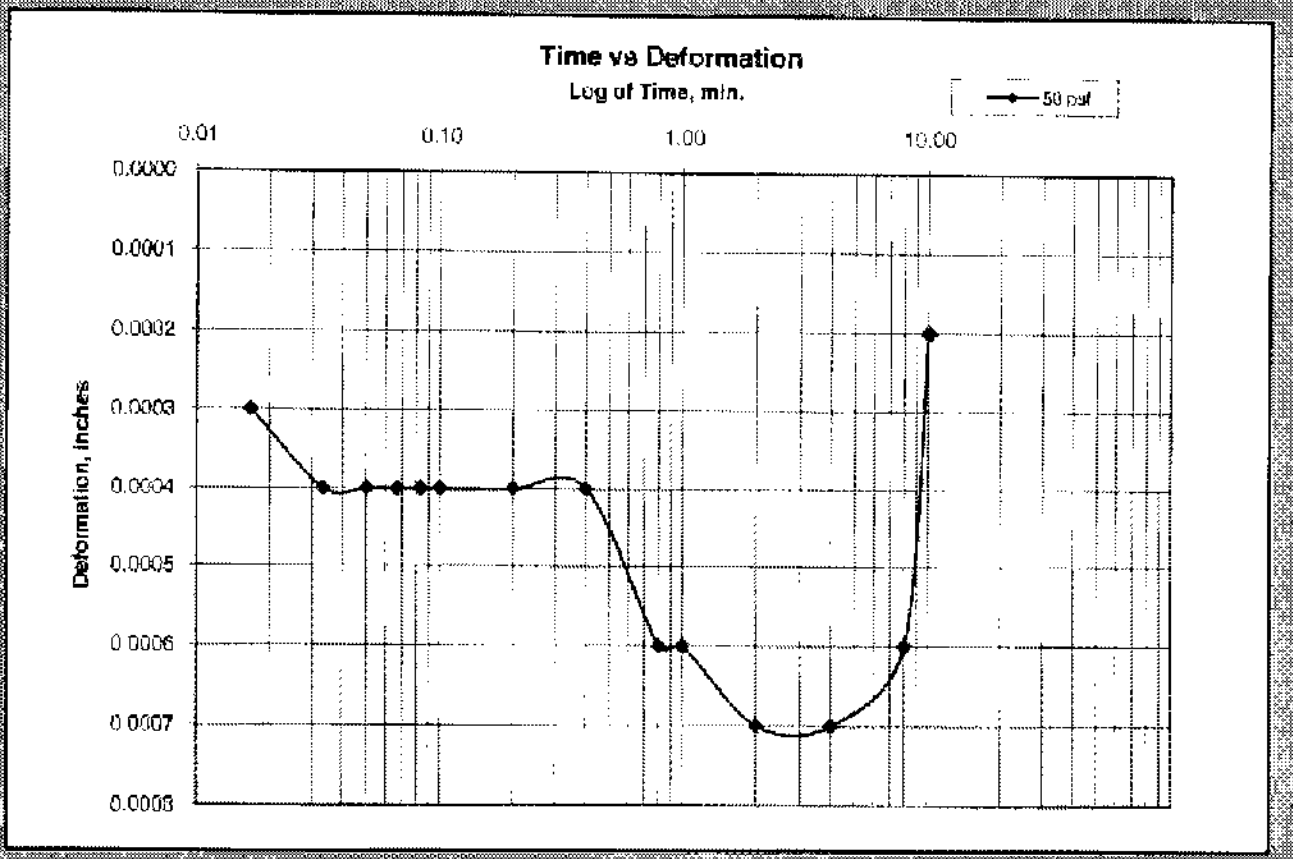
150 PSF



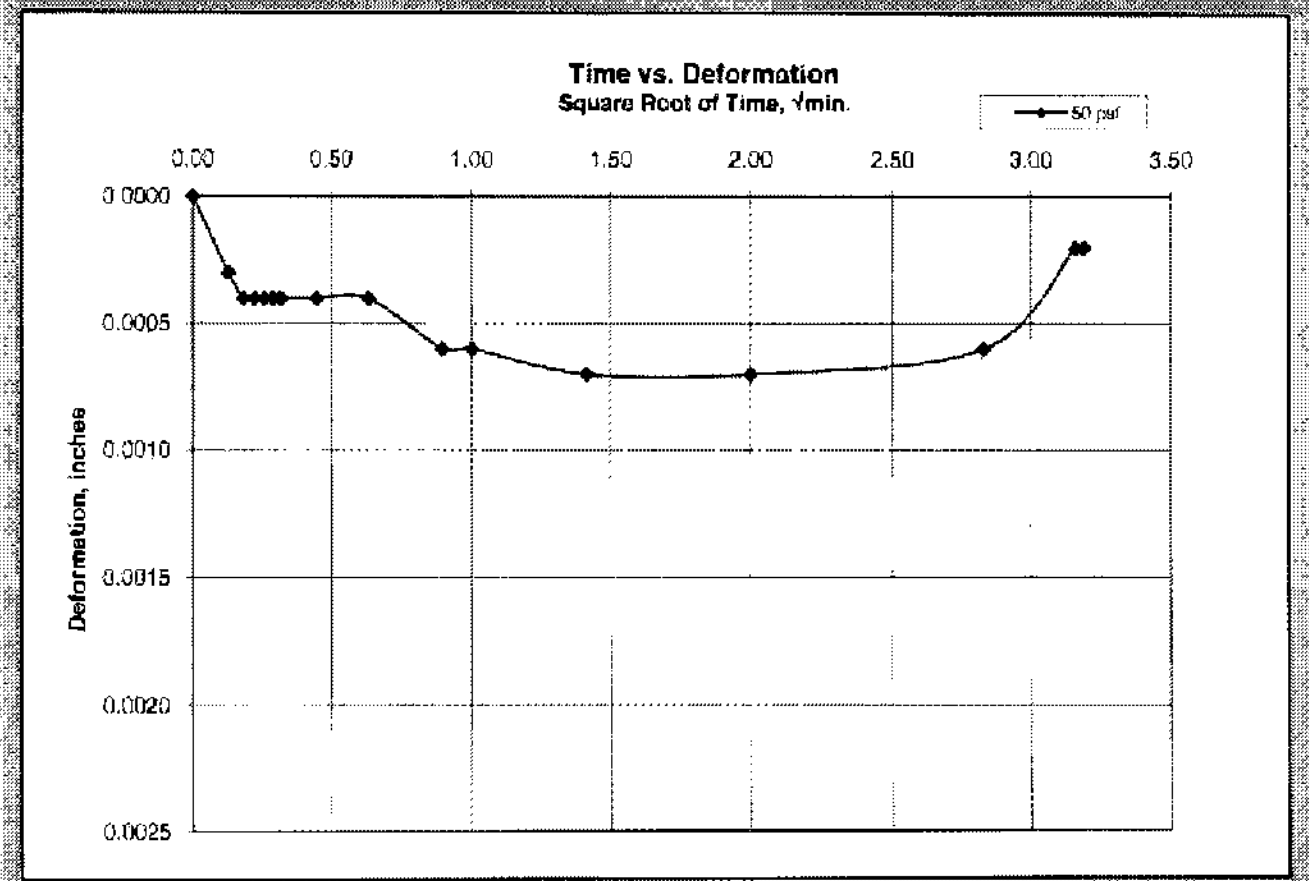
Cooper Testing Labs, Inc.

Load 1

50 PSF

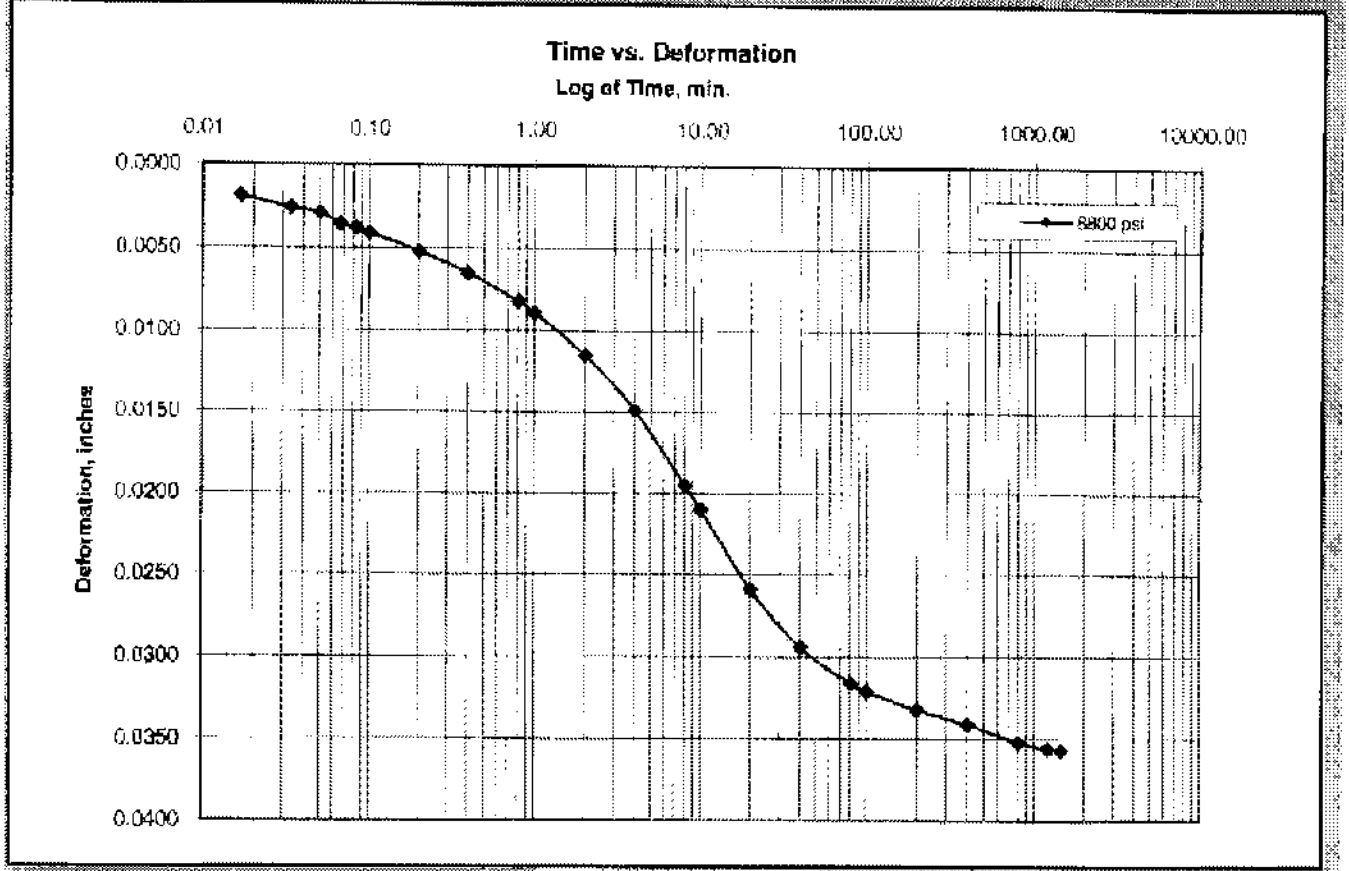


50 PSF

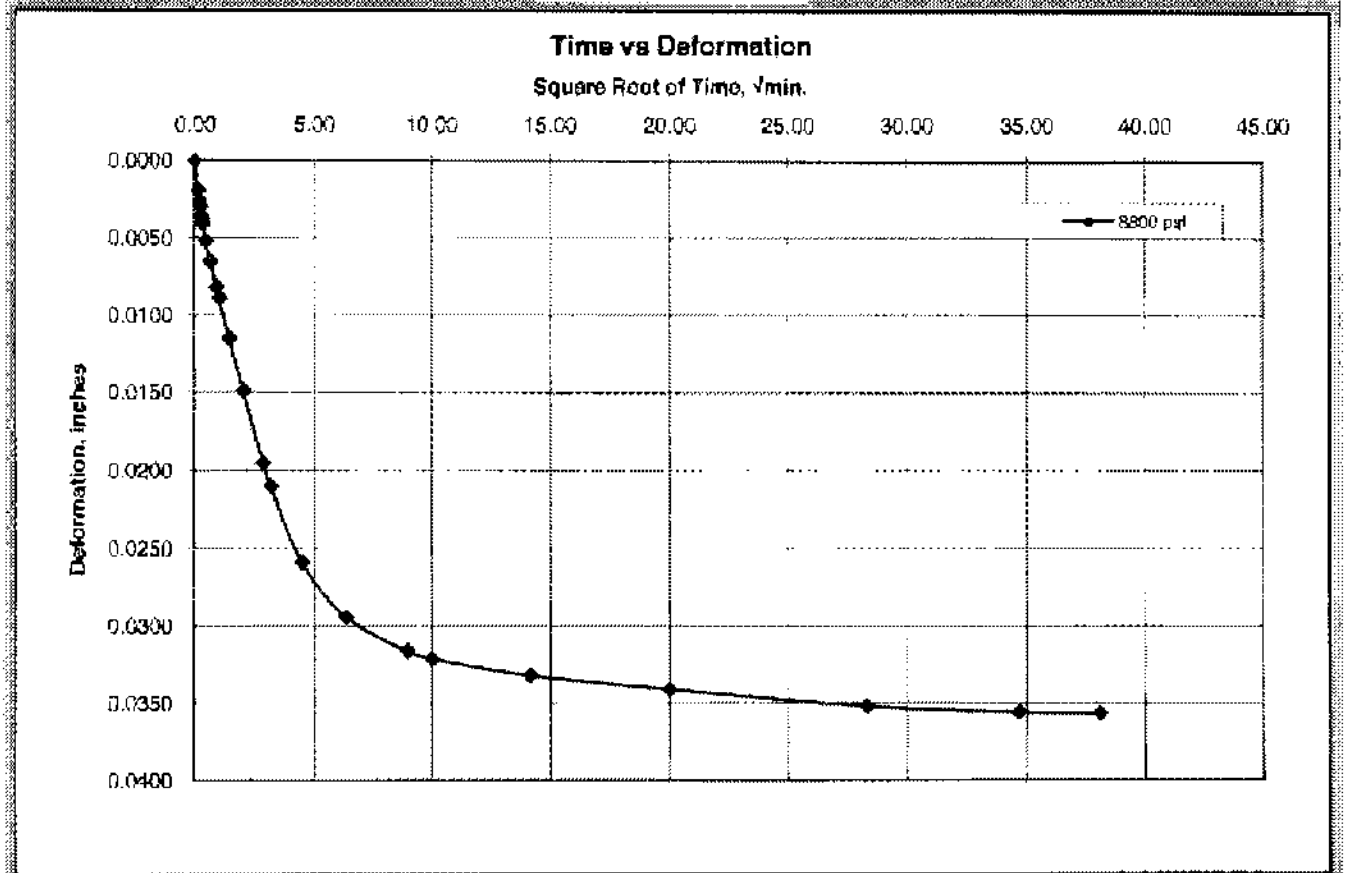


Cooper Testing Labs, Inc.

Load 12 — 8800 PSF

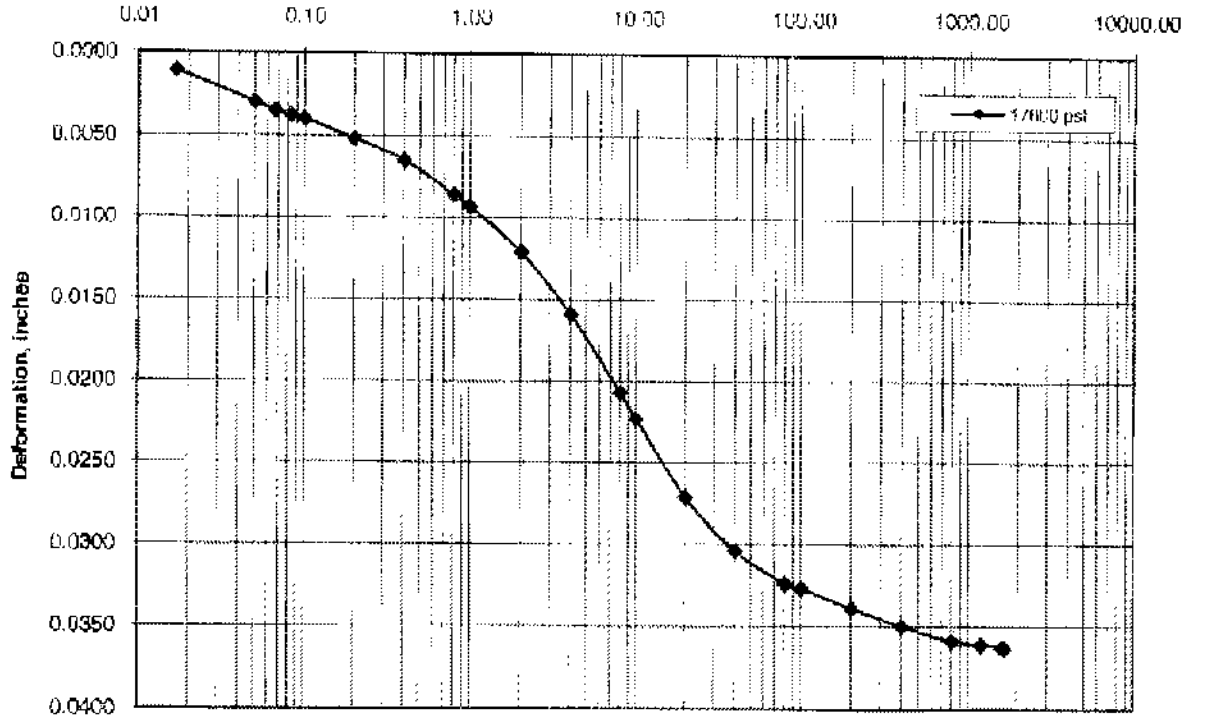


8800 PSF

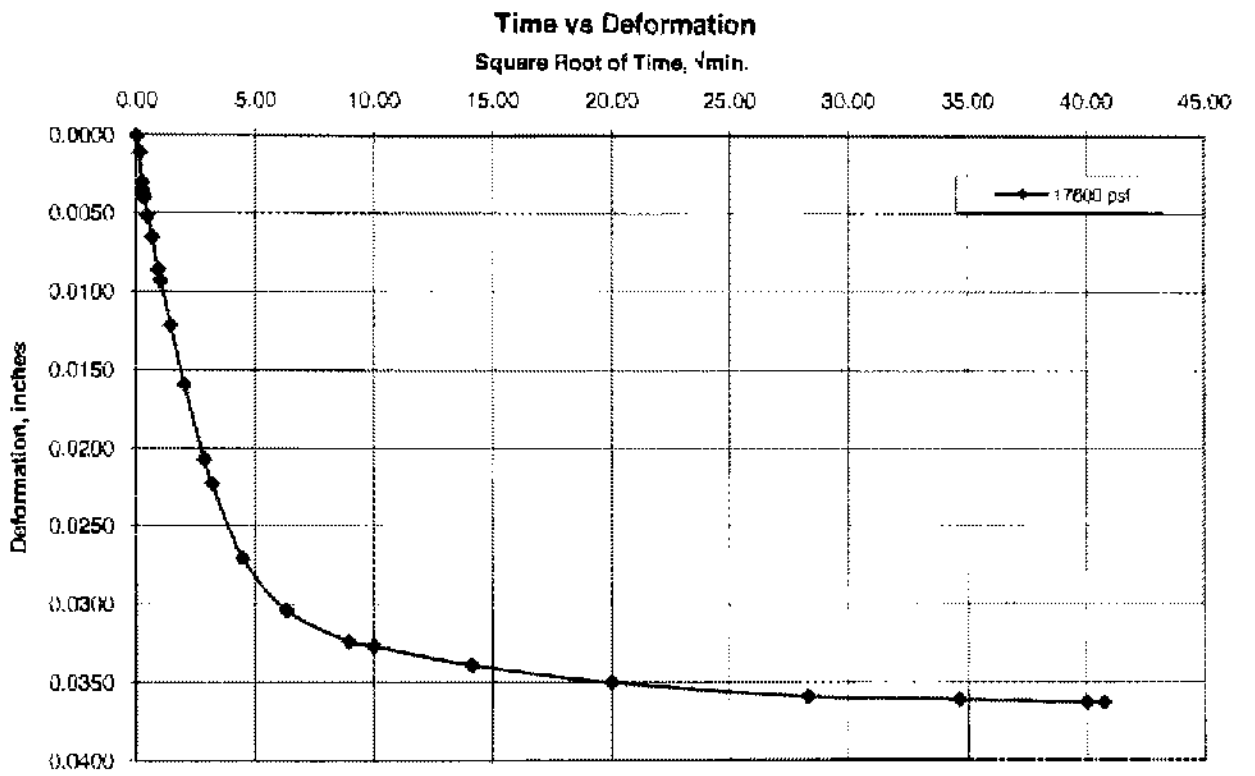


Cooper Testing Labs, Inc.

Load 13 | 17600 PSF



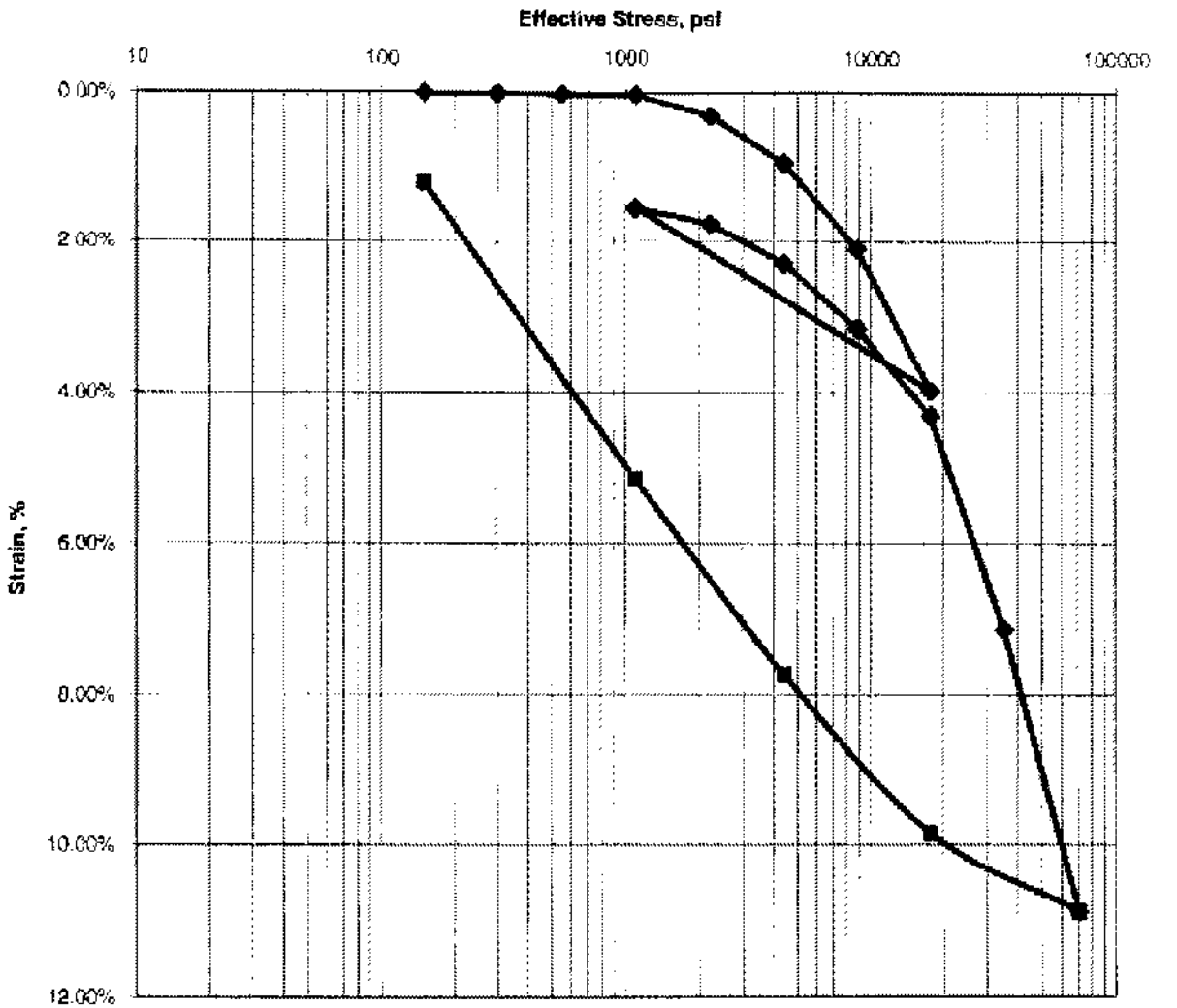
17600 PSF



Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-3	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S3-10	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	229-232	**Checked:**	PJ/DC
Soil Type:	Brown Lean Clayey SAND, trace Gravel			**Date:**	6/9/2008

Strain-Log-P Curve



Ass. Gs = 2.8	Initial	Final
Moisture %:	19.4	20.3
Dry Density, pcf:	110.4	111.6
Void Ratio:	0.584	0.566
% Saturation:	93.1	100

Remarks:

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane Project
Boring	GS08-3
Sample:	S3-10
Depth, ft.:	229-232
Date:	6/9/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Deecription:	Brown Lean Clayey SAND, trace Gravel

Moisture Density Data Entry Screen

	Initial	Final
Height	1.01	0.9946
Diameter	2.41	2.41
Total Wet Weight	158.6	159.7
Wt of Wet Soil & Dish		227.1
Wt of Dry Soil & Dish		200.2
Wt. Of Dish		21.5
Wt of Ring		45.9
Moisture %	19.4	20.3
Wet Density, pcf	131.8	134.2
Dry Density, pcf	110.4	111.6
Specific Gravity	2.8	2.8
Area	4.6	4.6
V ft3	0.0	0.0
Vt, cc	75.1	74.3
Vs, cc	47.4	47.4
Vv, cc	27.7	26.8
e	0.6	0.6
porosity, %	36.9	36.1
S, %	93.1	100

Loading Increments — **Void Ratio**

Increment #	Load, psf	Dial .0001"	Load psf	Height Delta h	Volume Vt cc	Voids Vv	Void Ratio e
1	150	0.0001	150	1.0049	75.13	27.749	0.585
2	300	0.0002	300	1.0048	75.17	27.742	0.585
3	550	0.0003	550	1.0047	75.16	27.734	0.585
4	1100	0.0004	1100	1.0046	75.16	27.727	0.586
5	2200	0.0033	2200	1.0017	74.94	27.610	0.580
6	4400	0.0068	4400	0.9954	74.47	27.039	0.570
7	8800	0.0210	8800	0.9840	73.61	26.186	0.552
8	17600	0.0397	17600	0.9653	72.22	24.787	0.523
9	1100	0.0156	1100	0.9864	74.02	26.590	0.561
10	2200	0.0177	2200	0.9879	73.86	26.4327	0.557317
11	4400	0.0229	4400	0.9821	73.47	26.0497	0.549114
12	8800	0.0314	8800	0.9736	72.84	25.4078	0.535707
13	17600	0.0431	17600	0.9619	71.98	24.5325	0.517252
14	35200	0.0714	35200	0.9336	69.84	22.4154	0.472613
15	70400	0.1059	70400	0.8992	67.05	19.6174	0.41362
16		0.1088	#N/A	0.8962	67.05	19.6174	0.41362
17		0.1088	#N/A	0.8962	67.05	19.6174	0.41362
18		0.1088	#N/A	0.8962	67.05	19.6174	0.41362
19		0.1088	#N/A	0.8962	67.05	19.6174	0.41362

Rebound Increments — **Void Ratio**

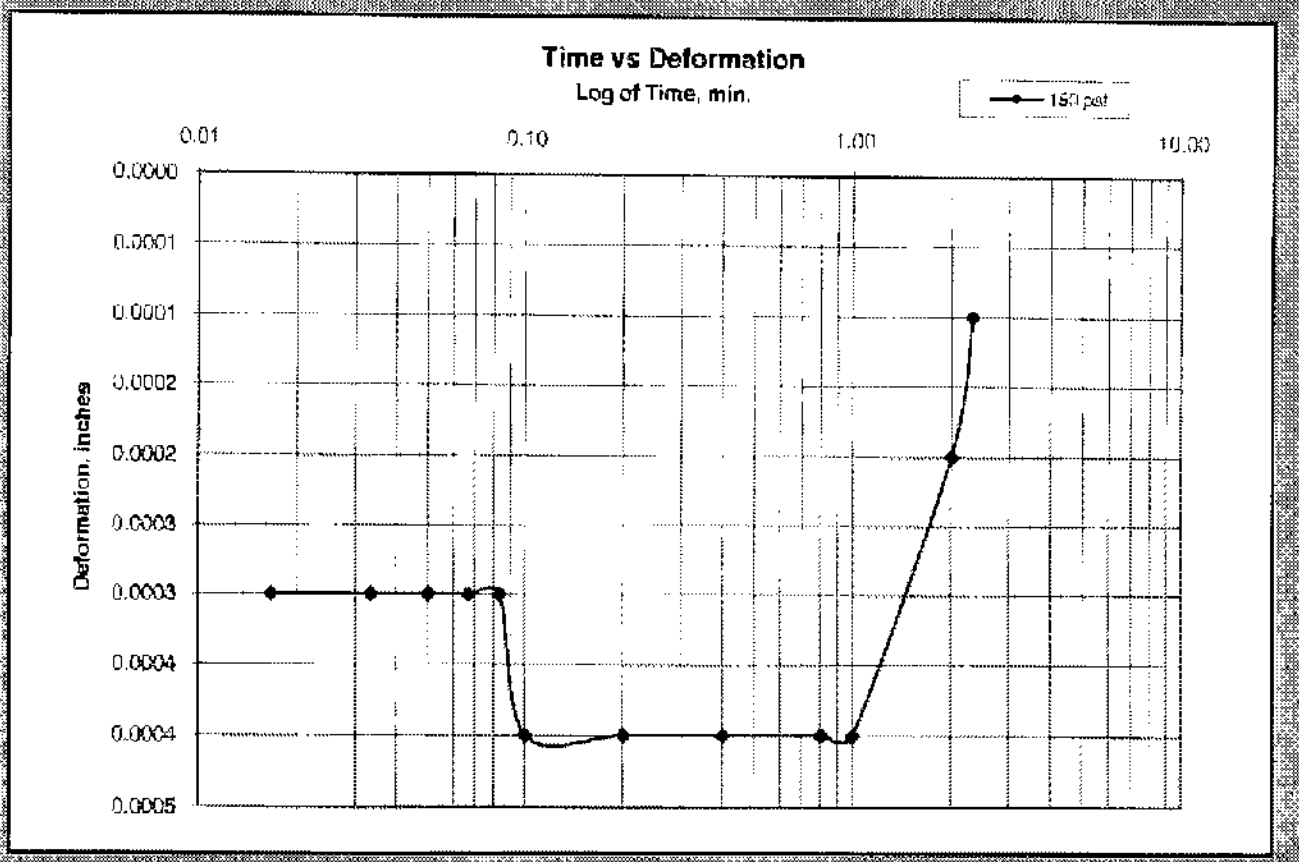
15	70400	0.1088	70400	0.8962	67.05	19.6174	0.41362
16	17600	0.0985	17600	0.9065	67.82	20.3980	0.429467
17	4400	0.0773	4400	0.9277	69.40	21.9740	0.463307
18	1100	0.0515	1100	0.9535	71.33	23.9041	0.504002
19	150	0.0122	150	0.9928	74.27	26.8442	0.565992
20			#N/A	1.0050	75.19	27.7569	0.585236
	Tot Dry Wt	132.8000					

The data to the left is used to determine the theoretical

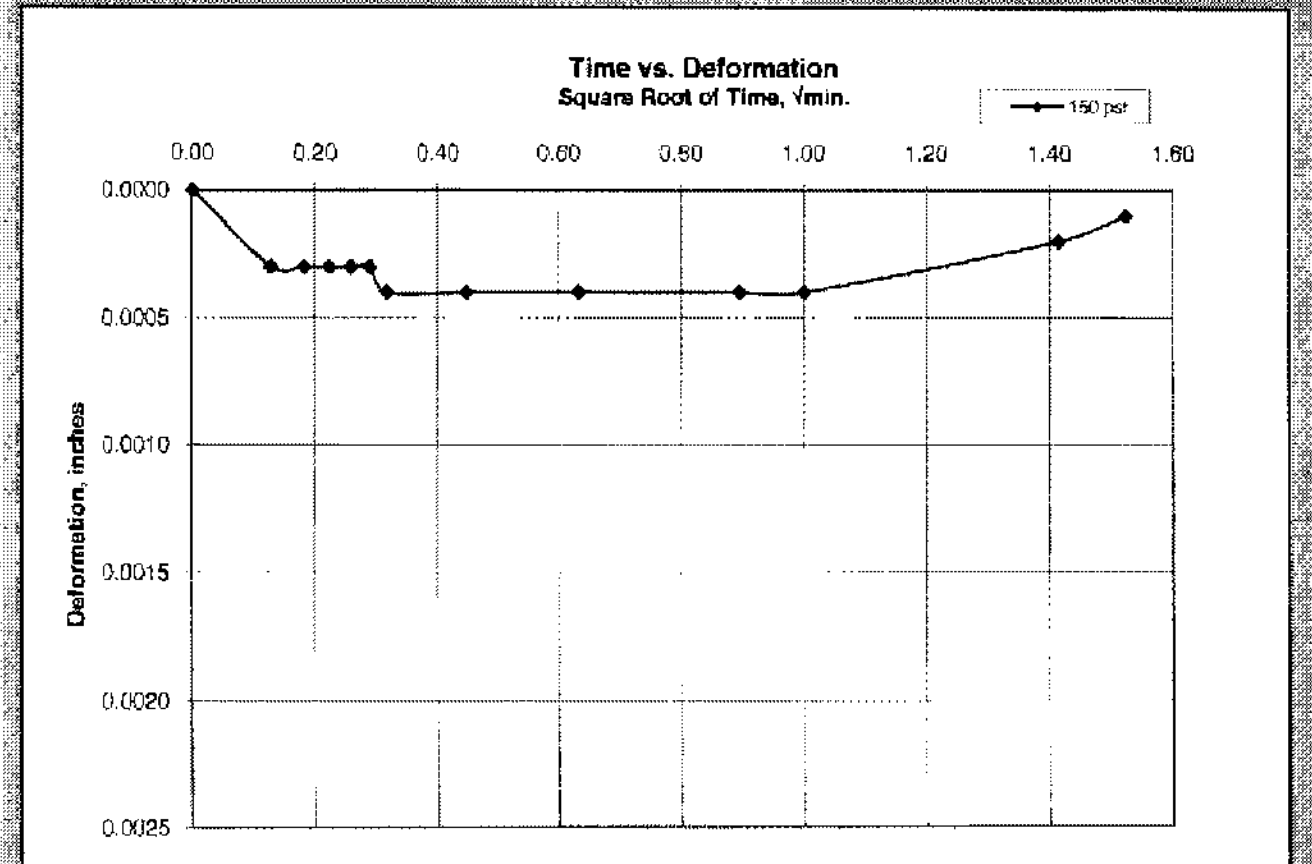
Cooper Testing Labs, Inc.

Load 1

150 PSF



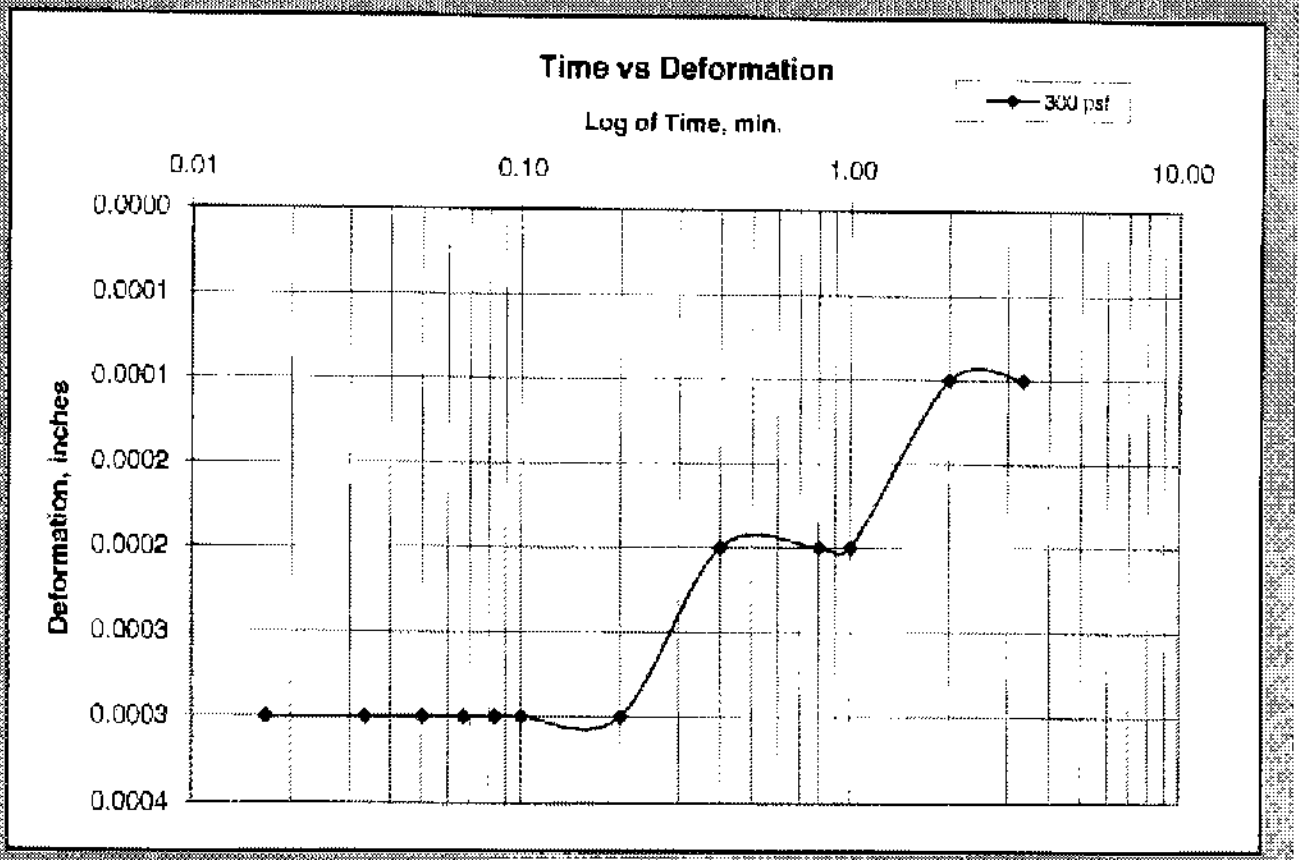
150 PSF



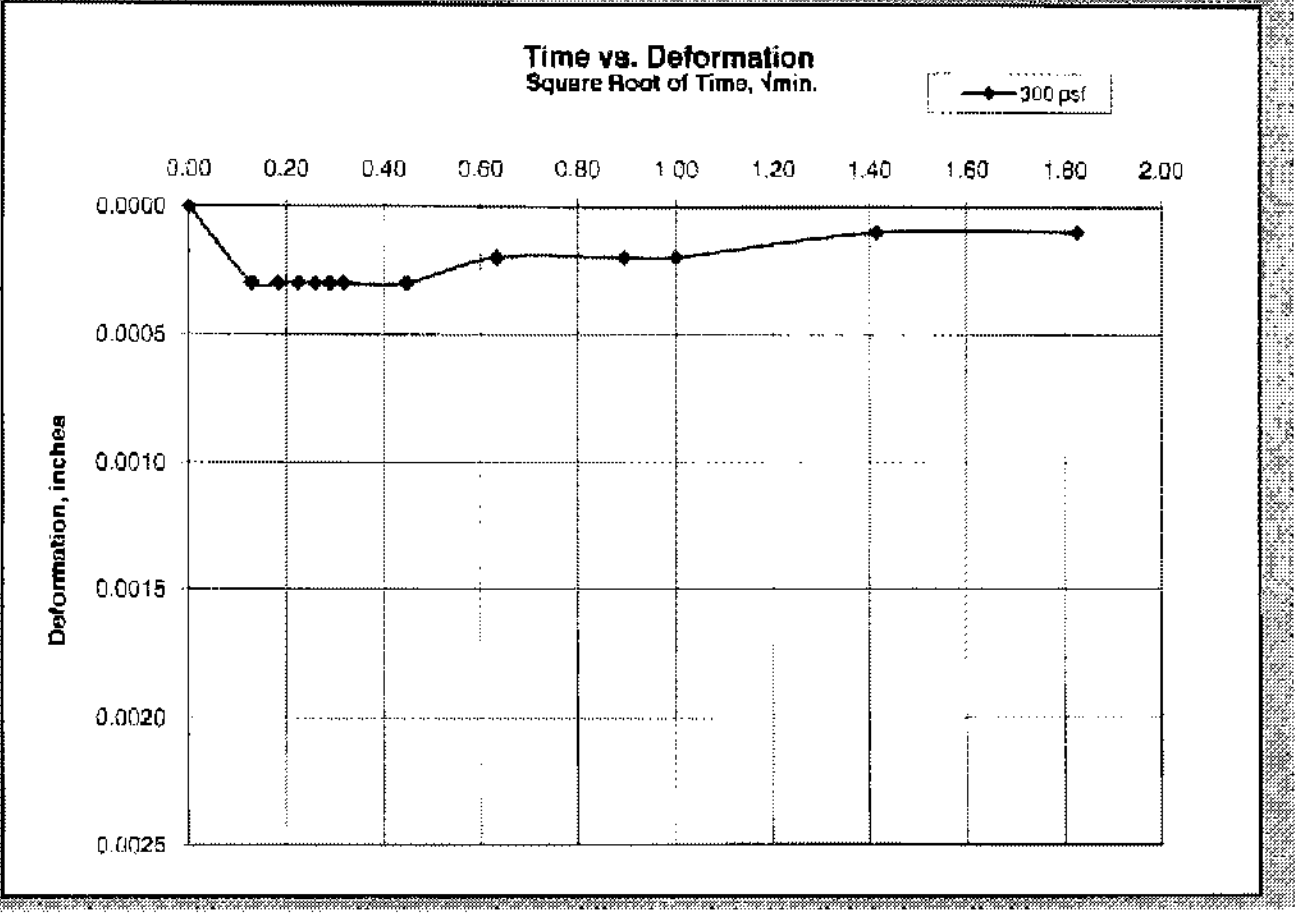
Cooper Testing Labs, Inc.

Load 2

300 PSF

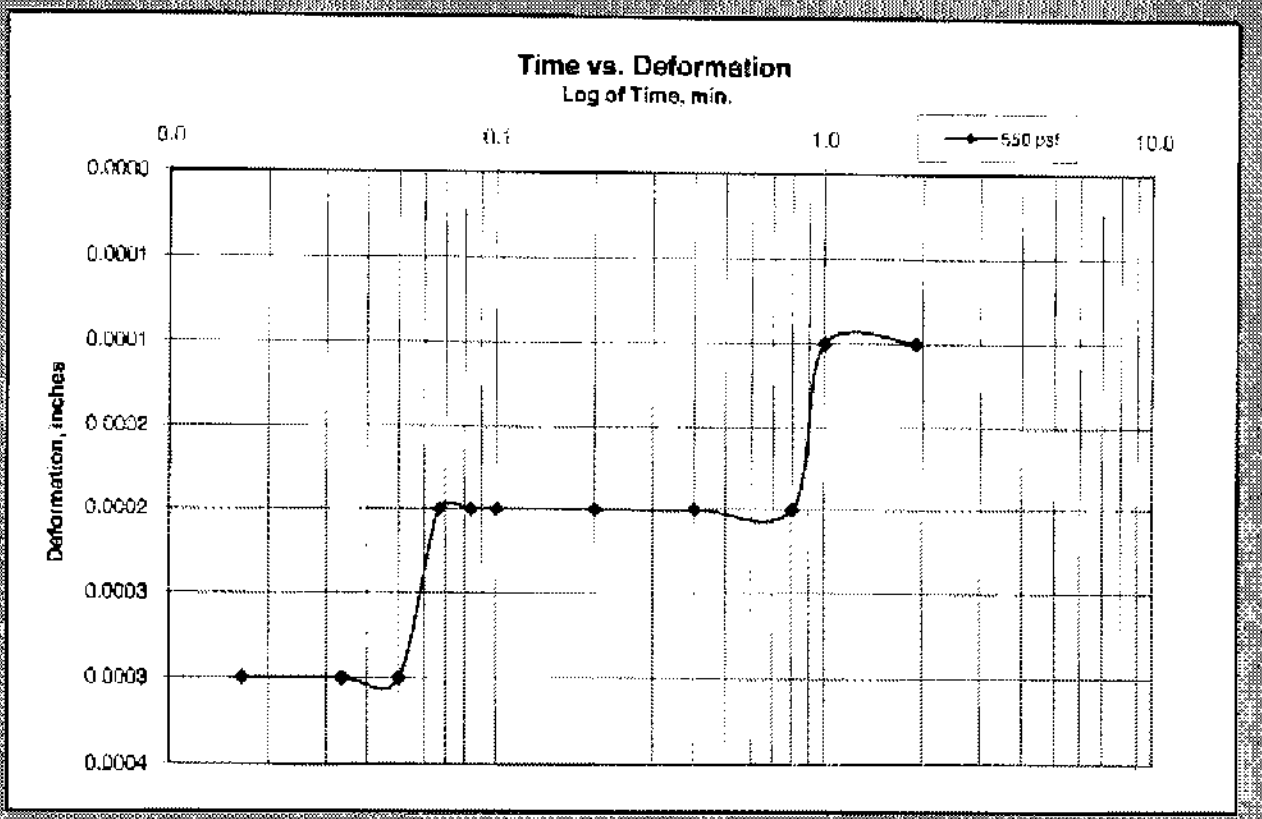


300 PSF

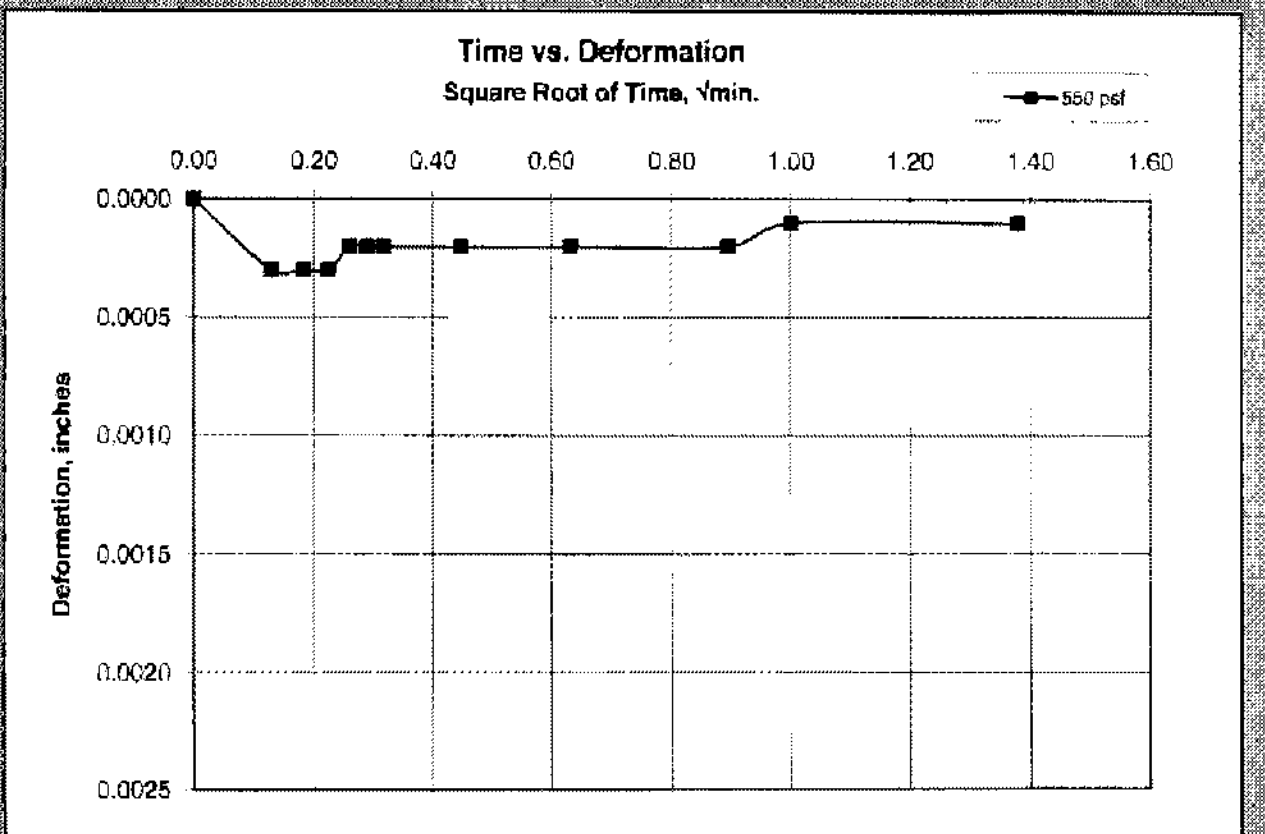


Cooper Testing Labs, Inc.

Load 3 — 550 PSF

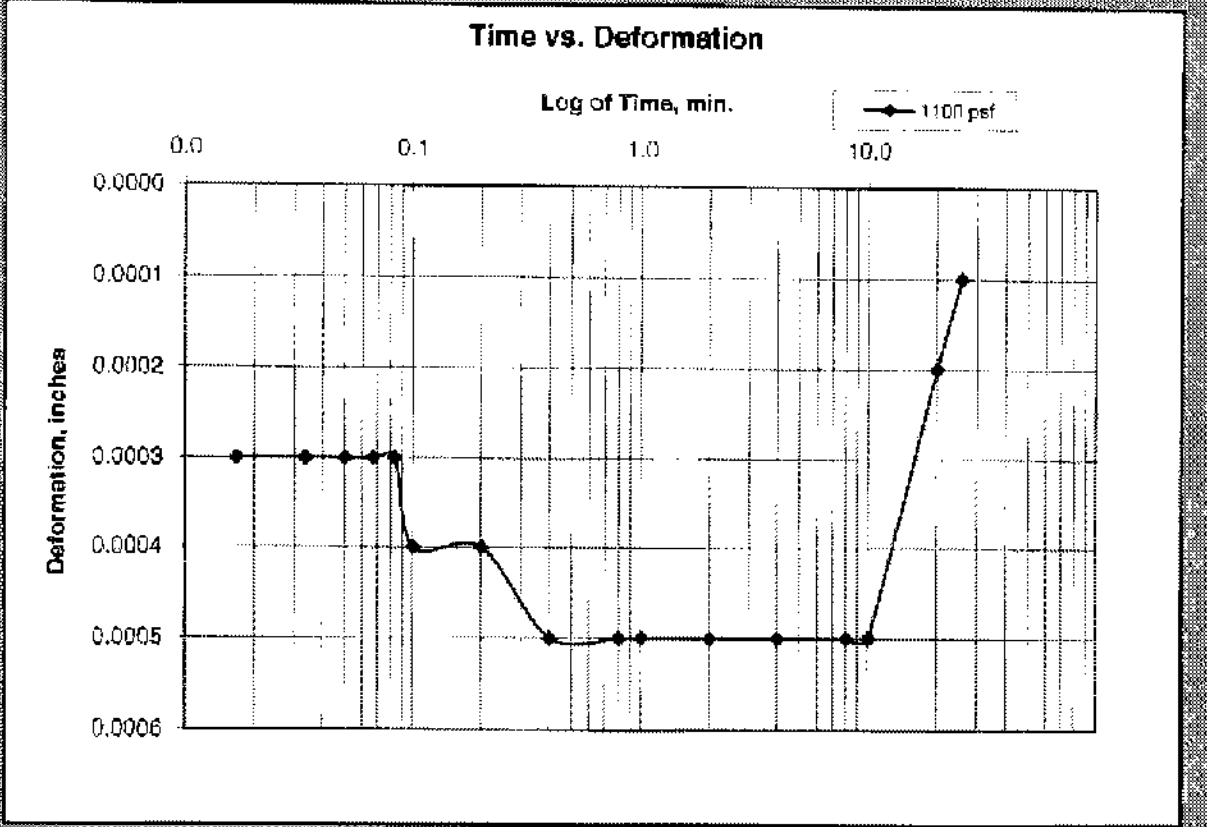


550 PSF

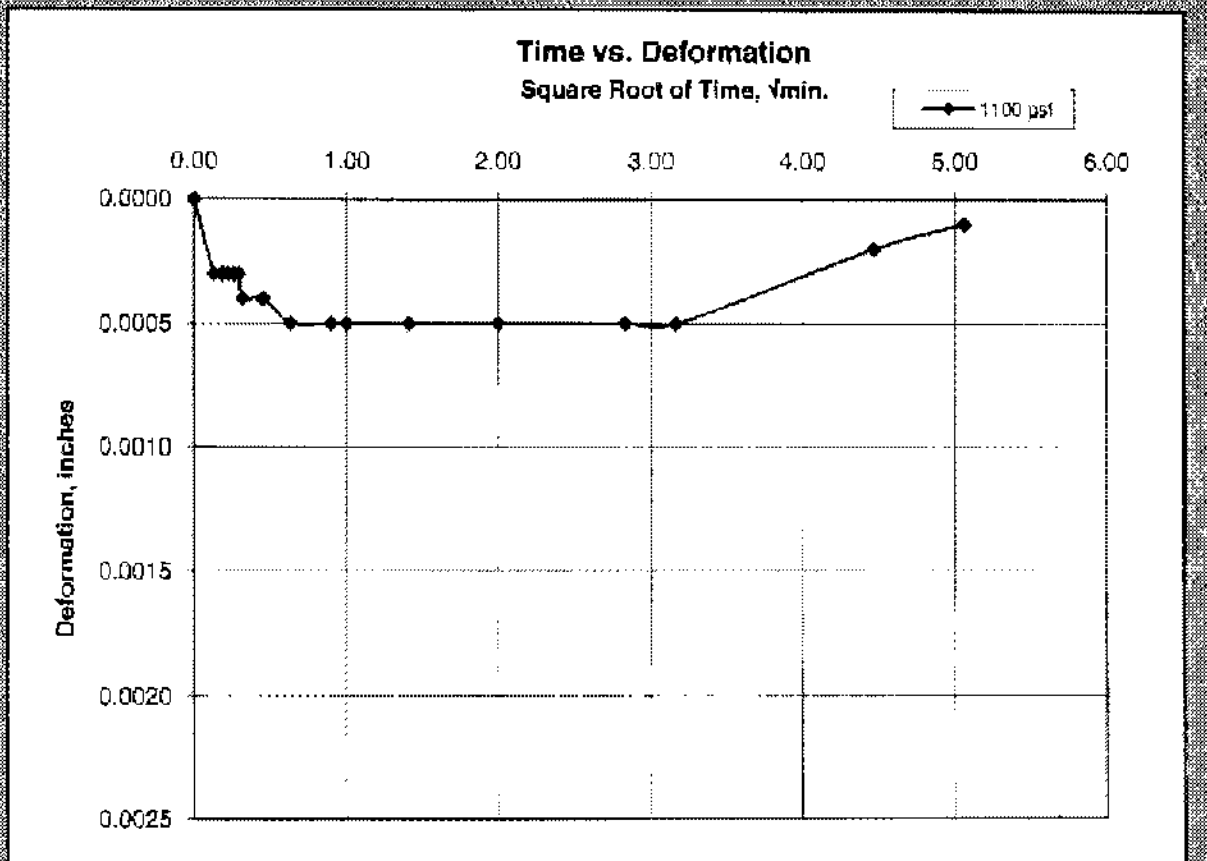


Cooper Testing Labs, Inc.

Load 4 — 1100 PSF

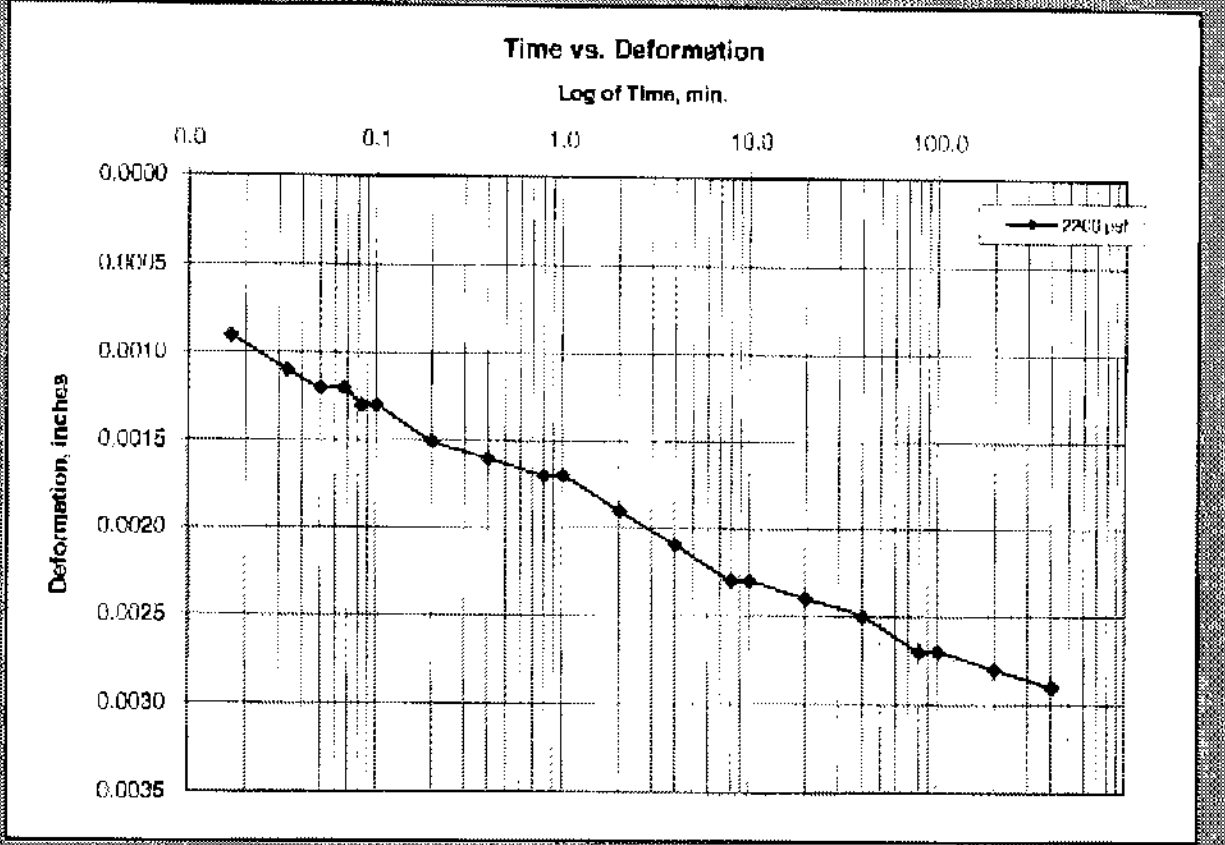


1100 PSF

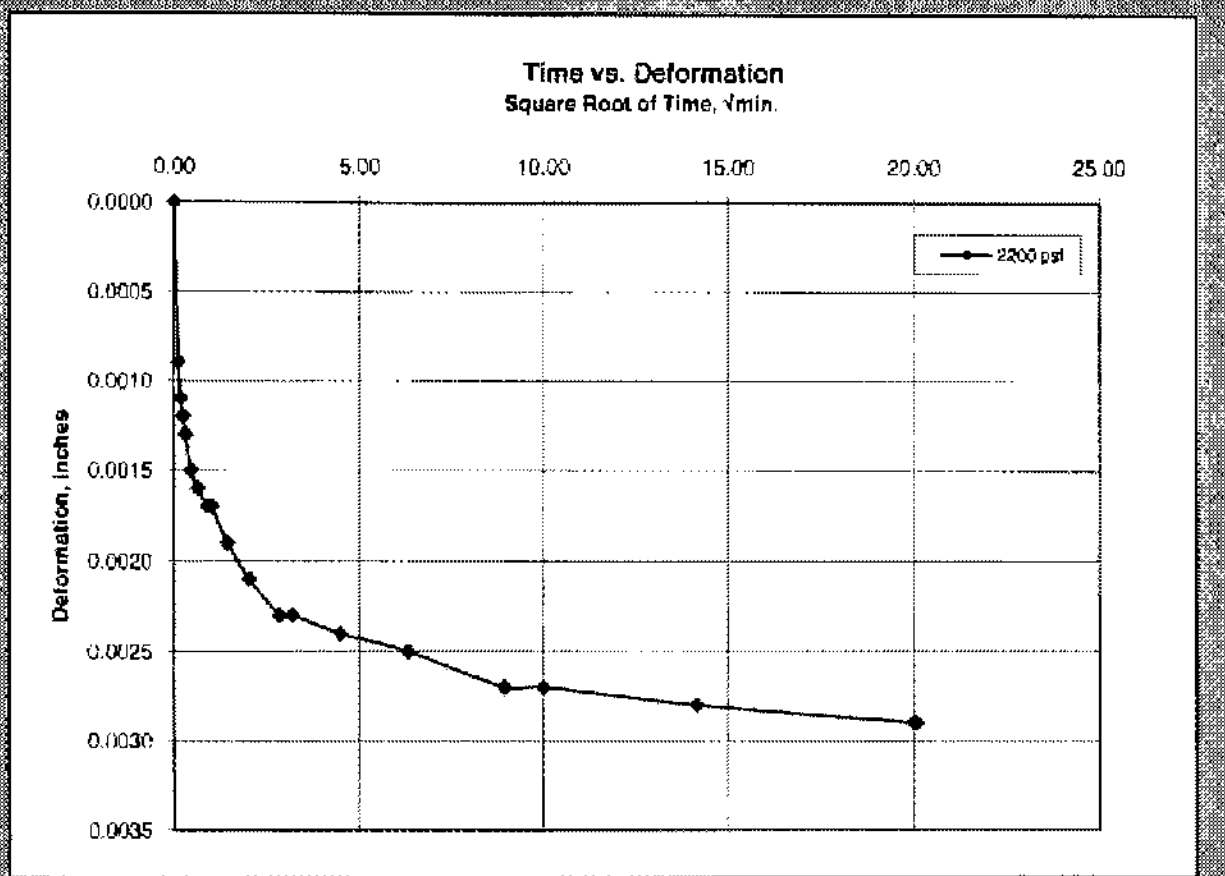


Cooper Testing Labs, Inc.

Load 5 — 2200 PSF

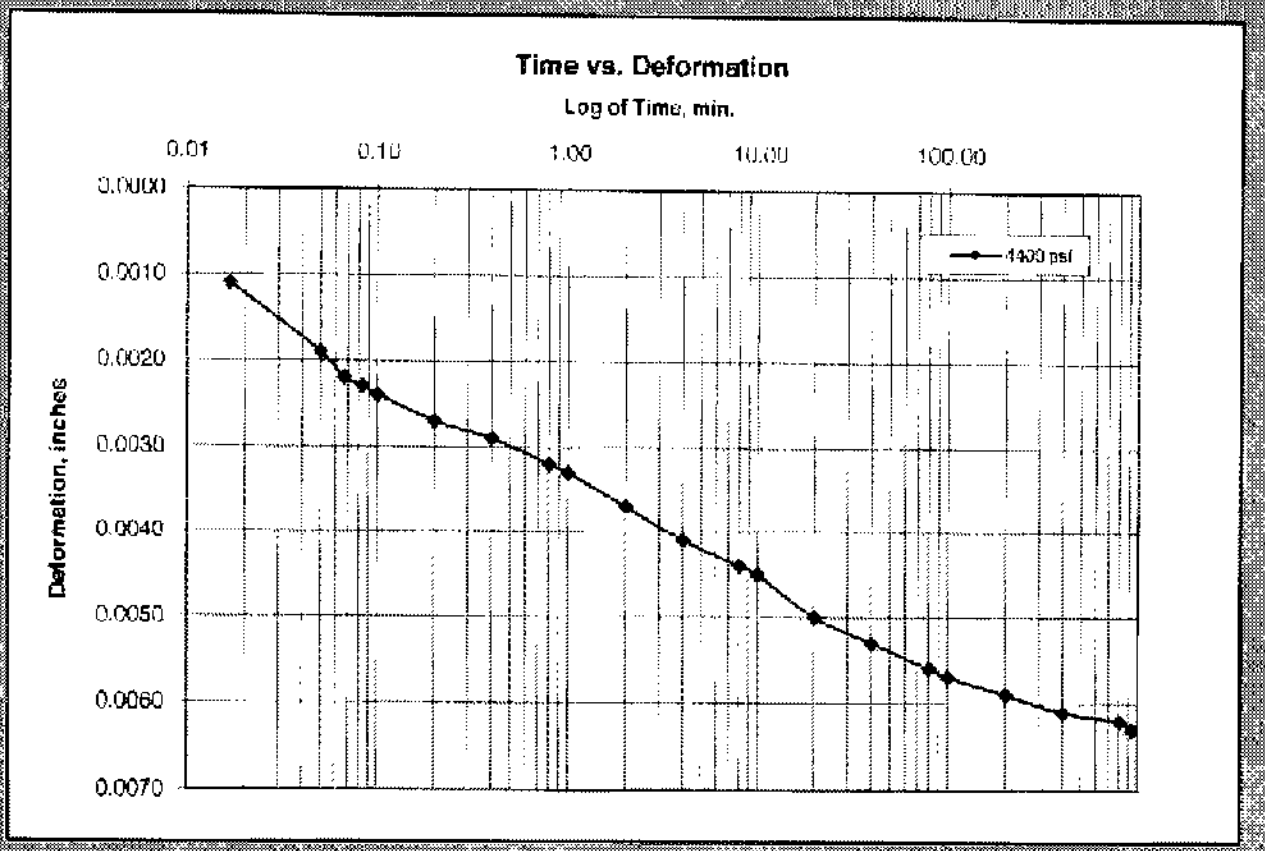


2200 PSF

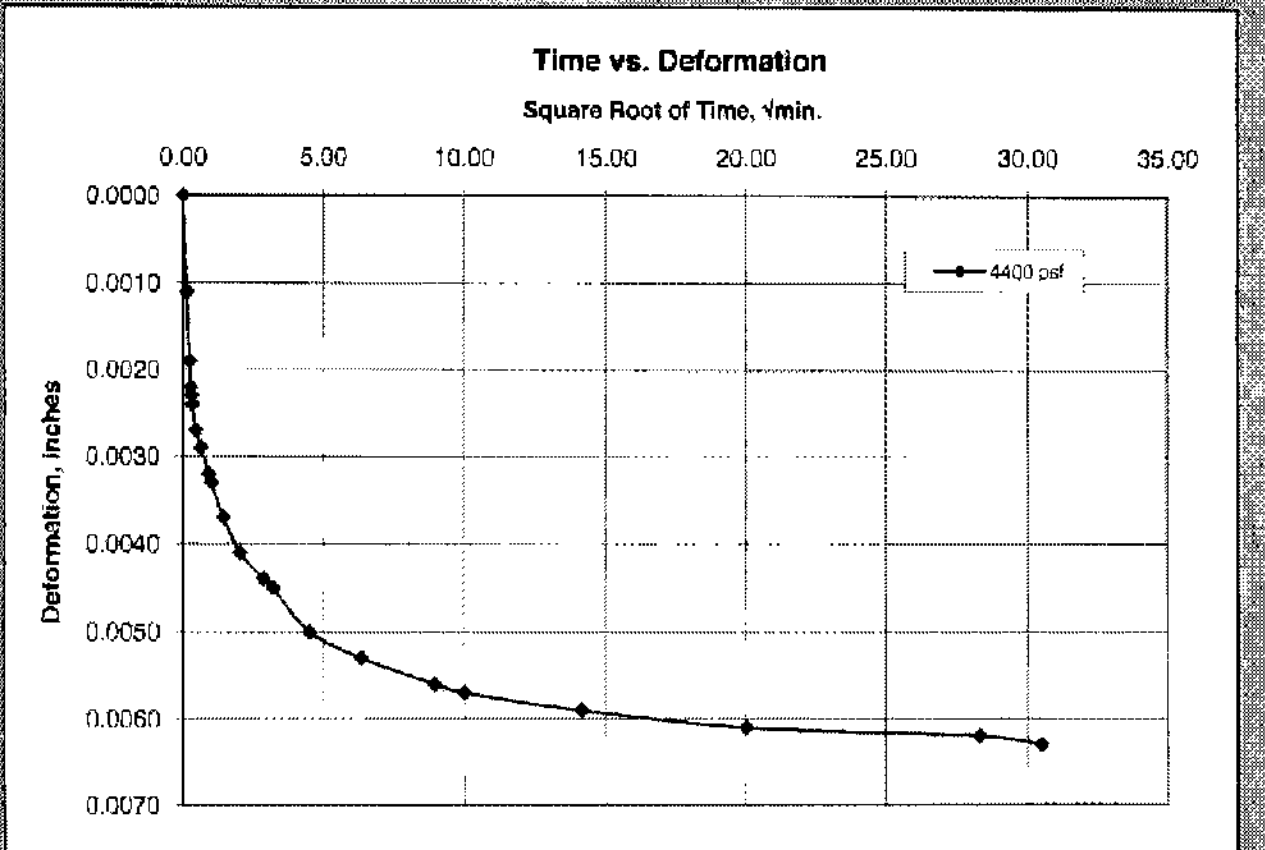


Cooper Testing Labs, Inc.

Load 6 — 4400 PSF

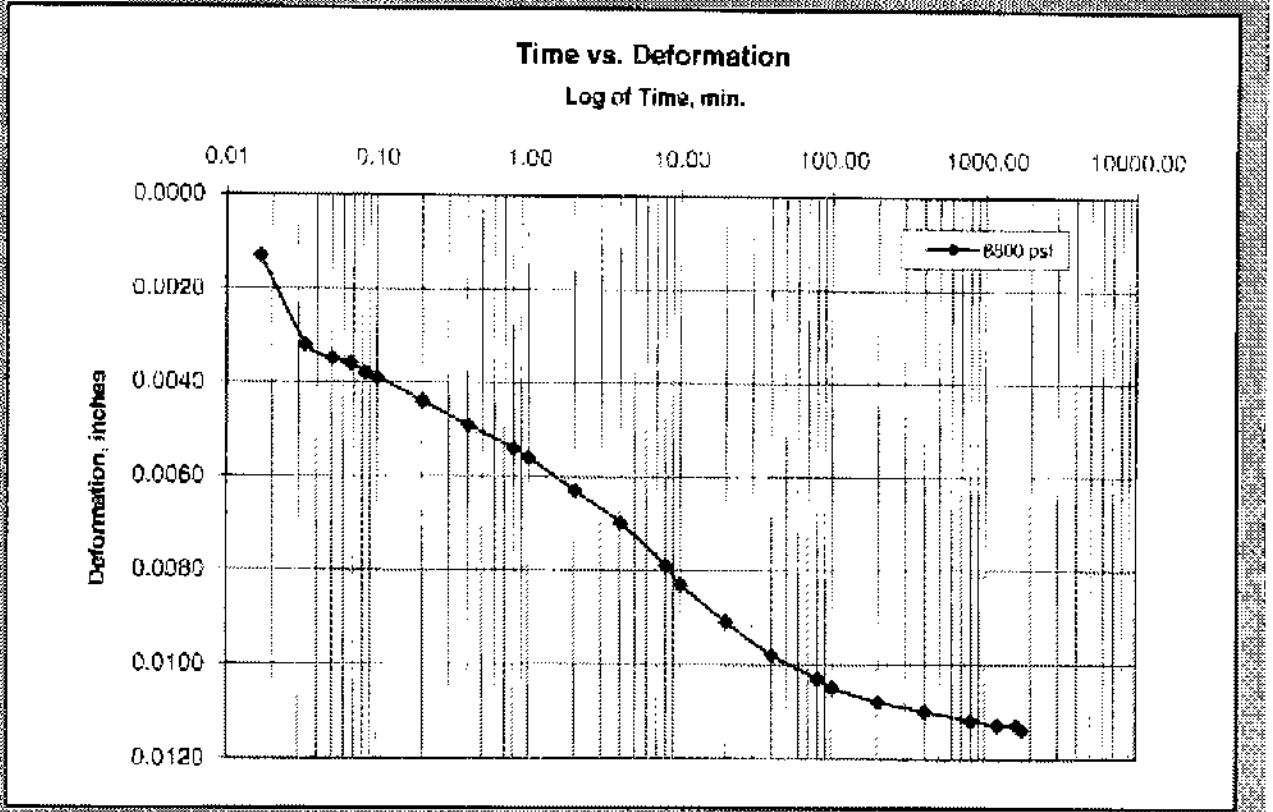


4400 PSF



Logs 7

8800 PSF



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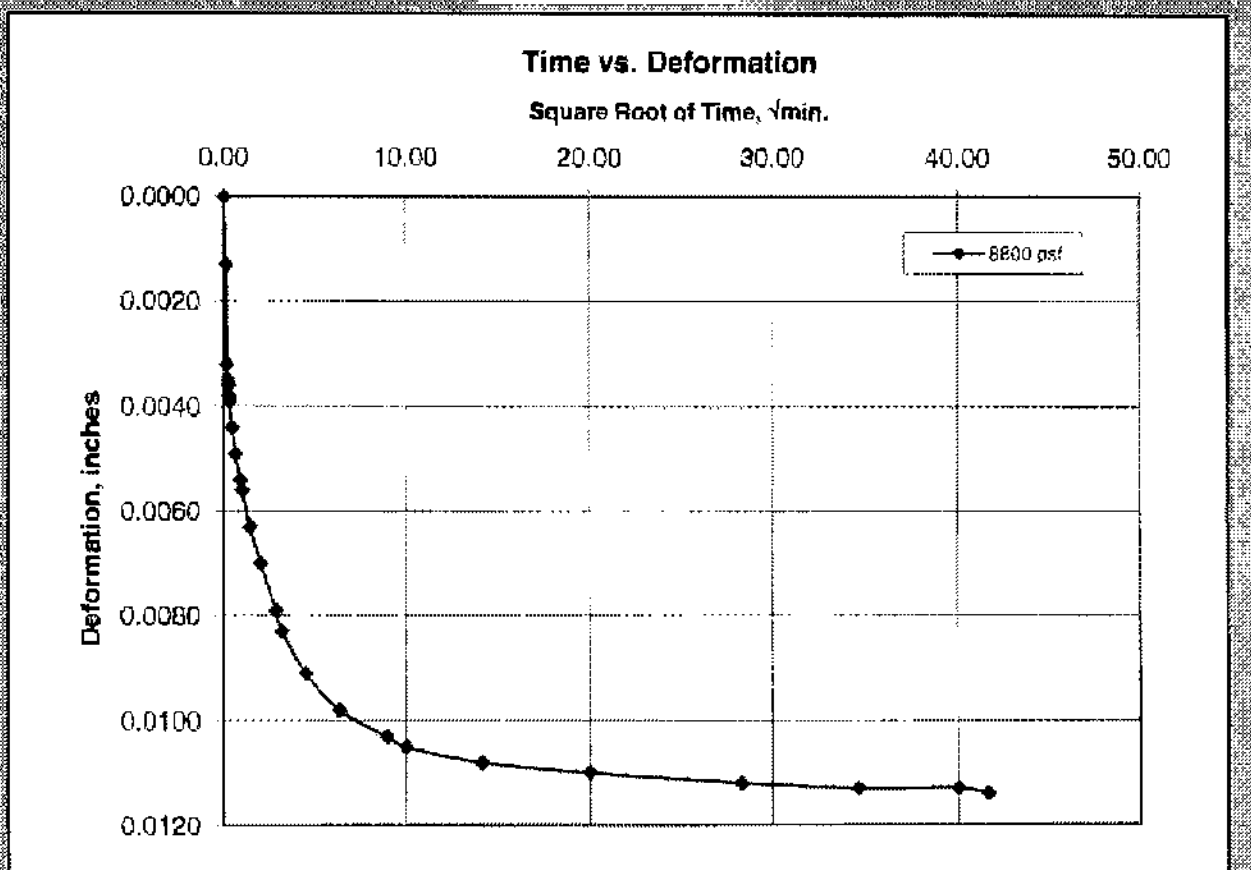
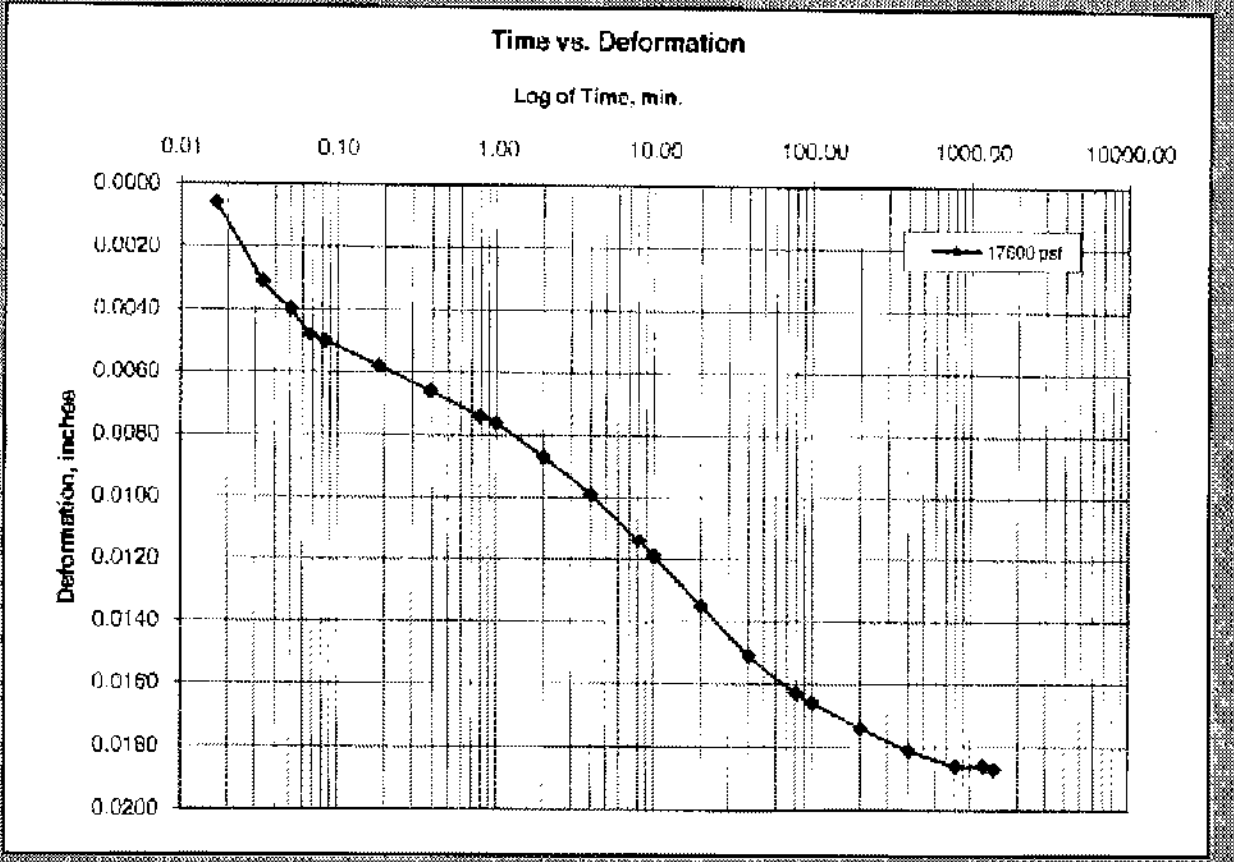
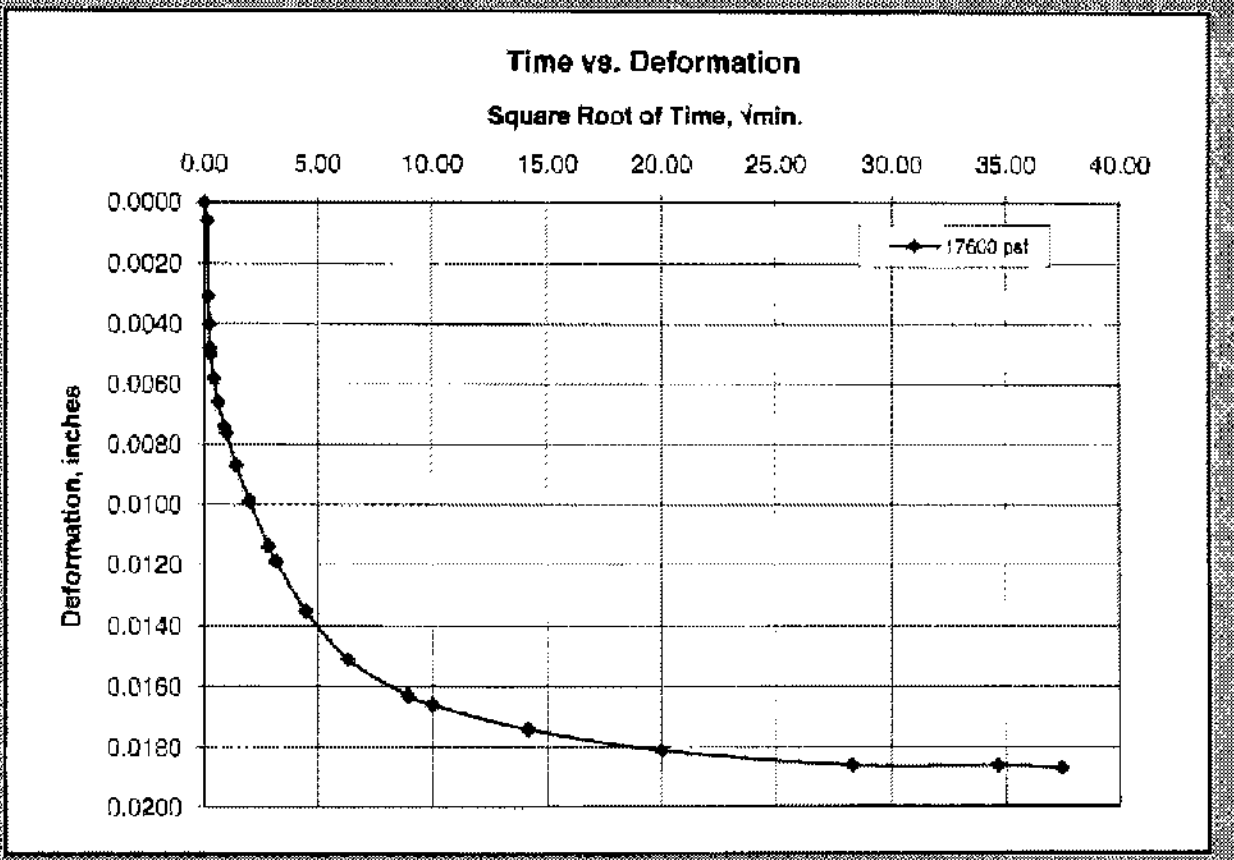


Cooper Testing Labs, Inc.

Load 8 — 17600 PSF



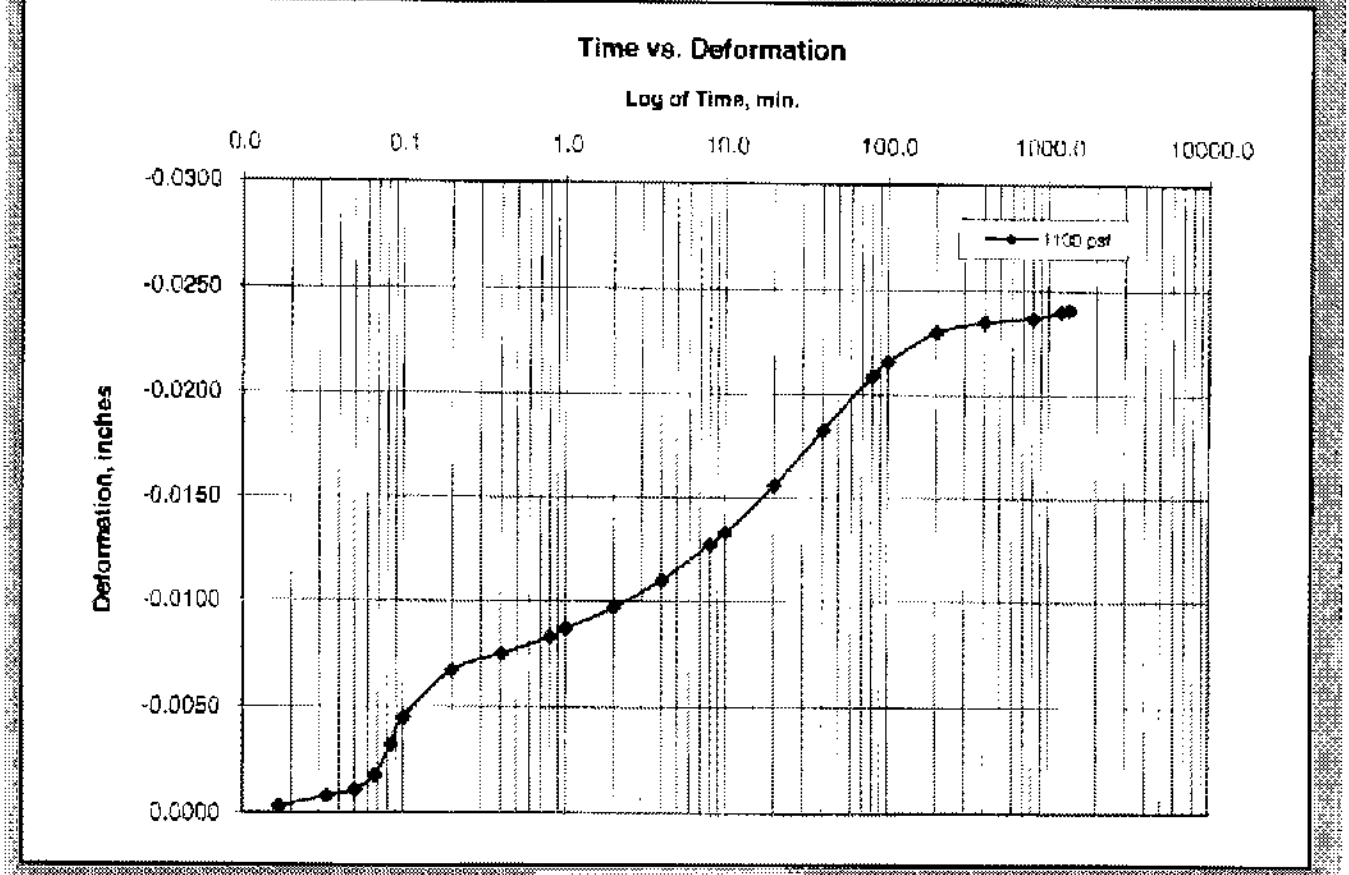
17600 PSF



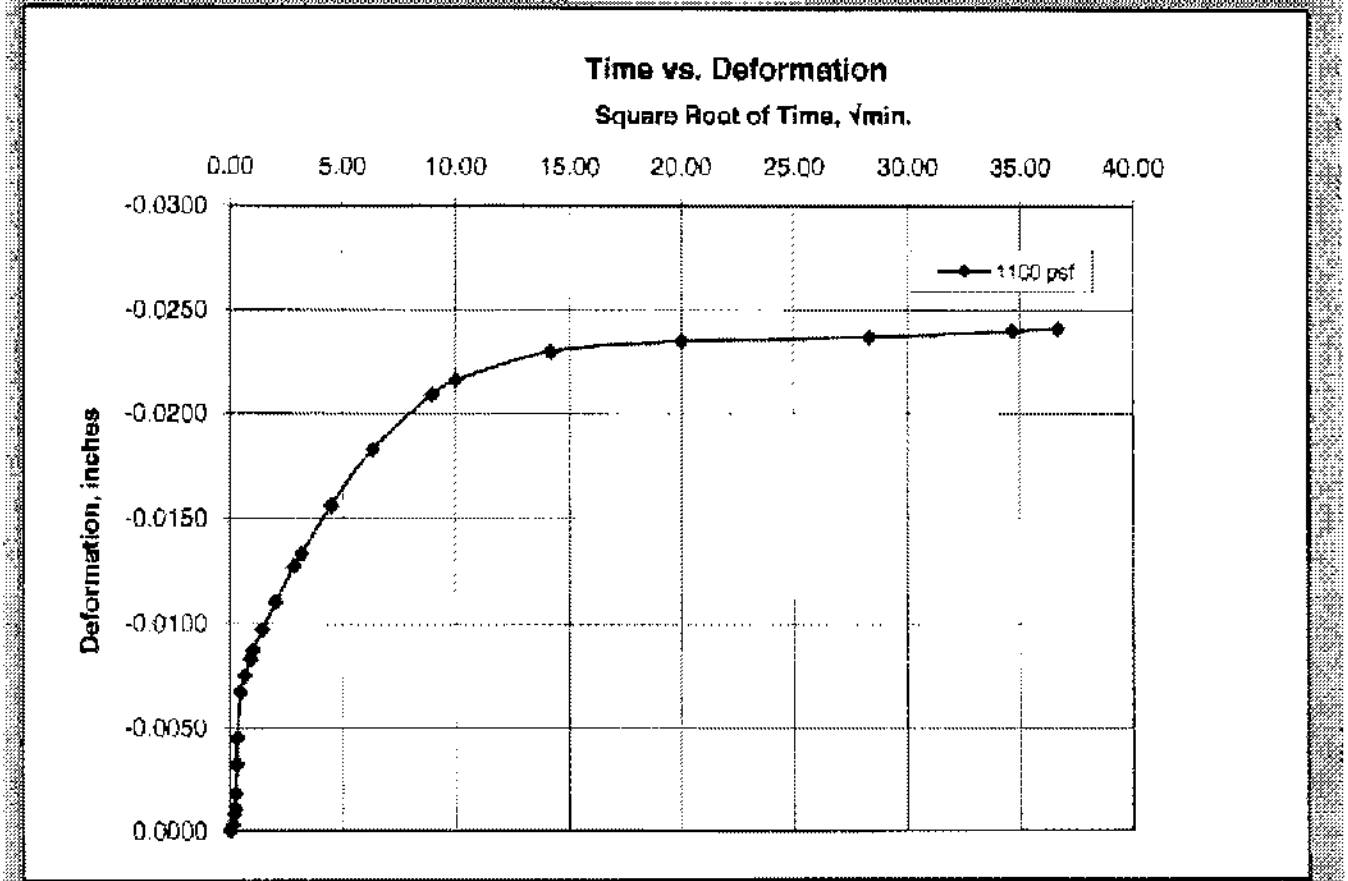
Cooper Testing Labs, Inc.

Load 9

1100 PSF



1100 PSF



Cooper Testing Labs, Inc.

Load 10

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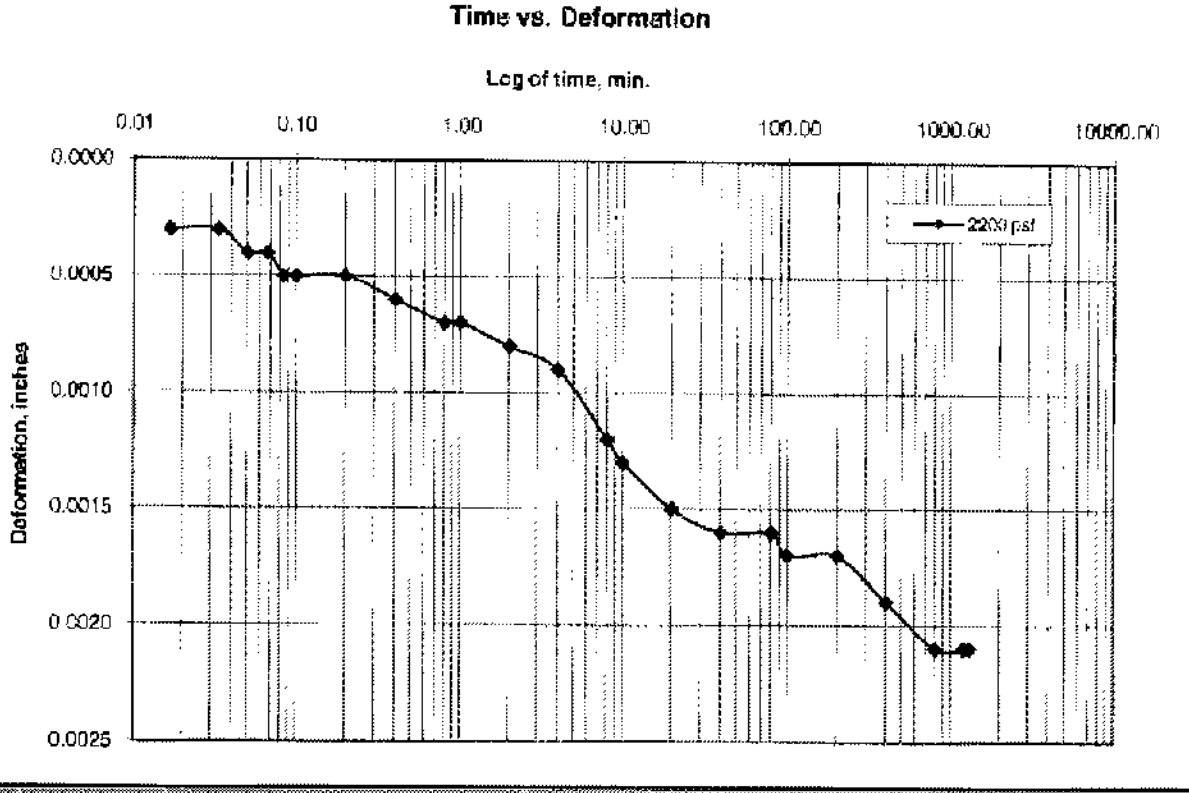

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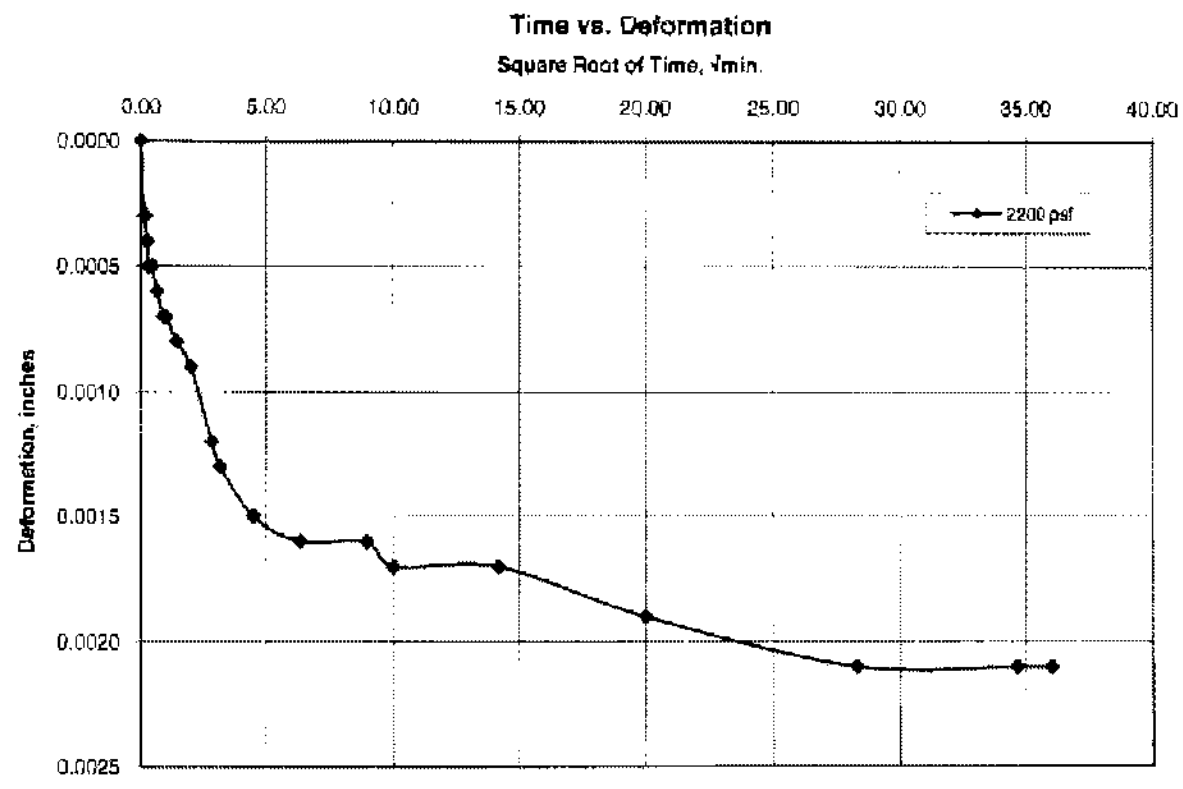
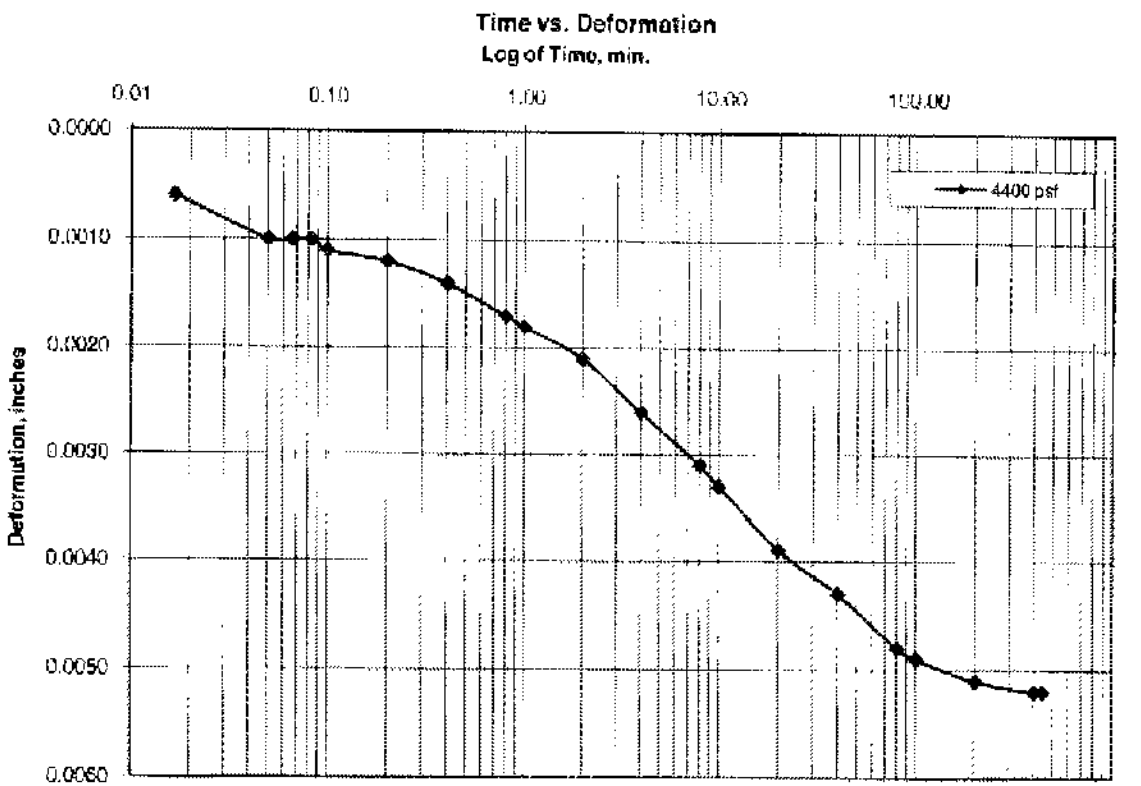
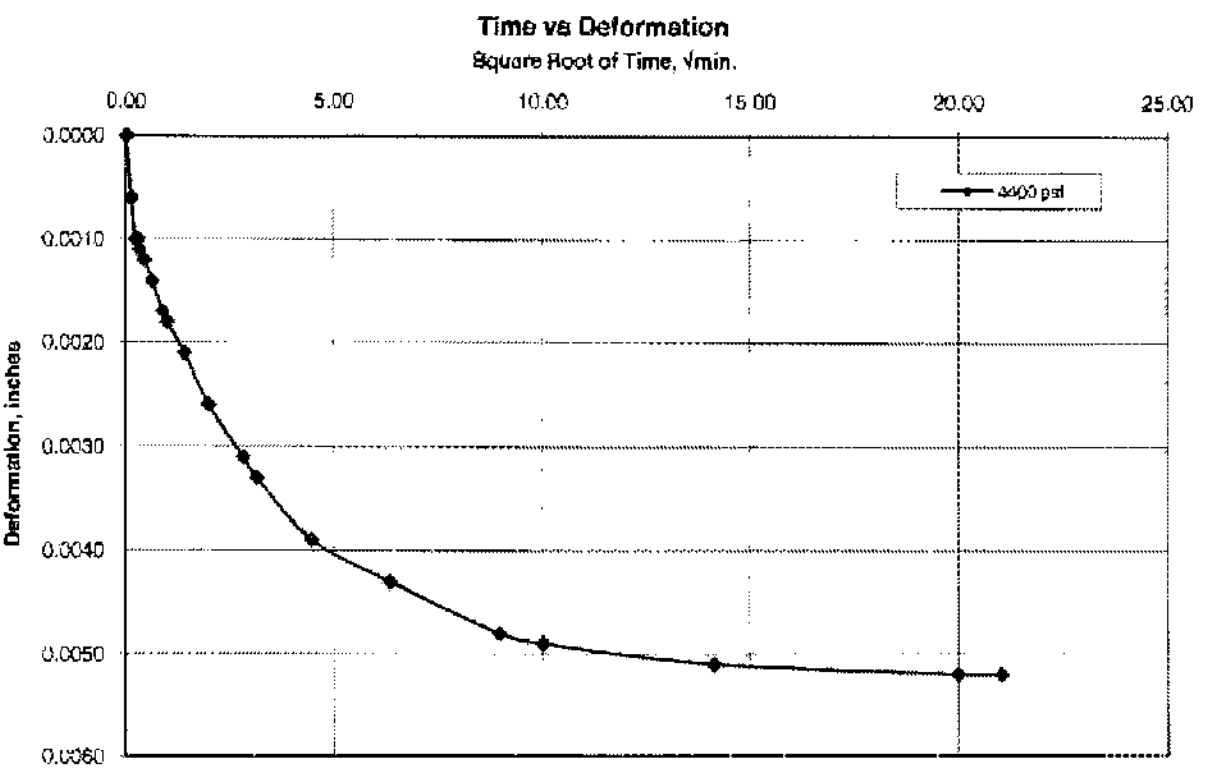


Cooper Testing Labs, Inc.

Load 11 — 4400 PSF

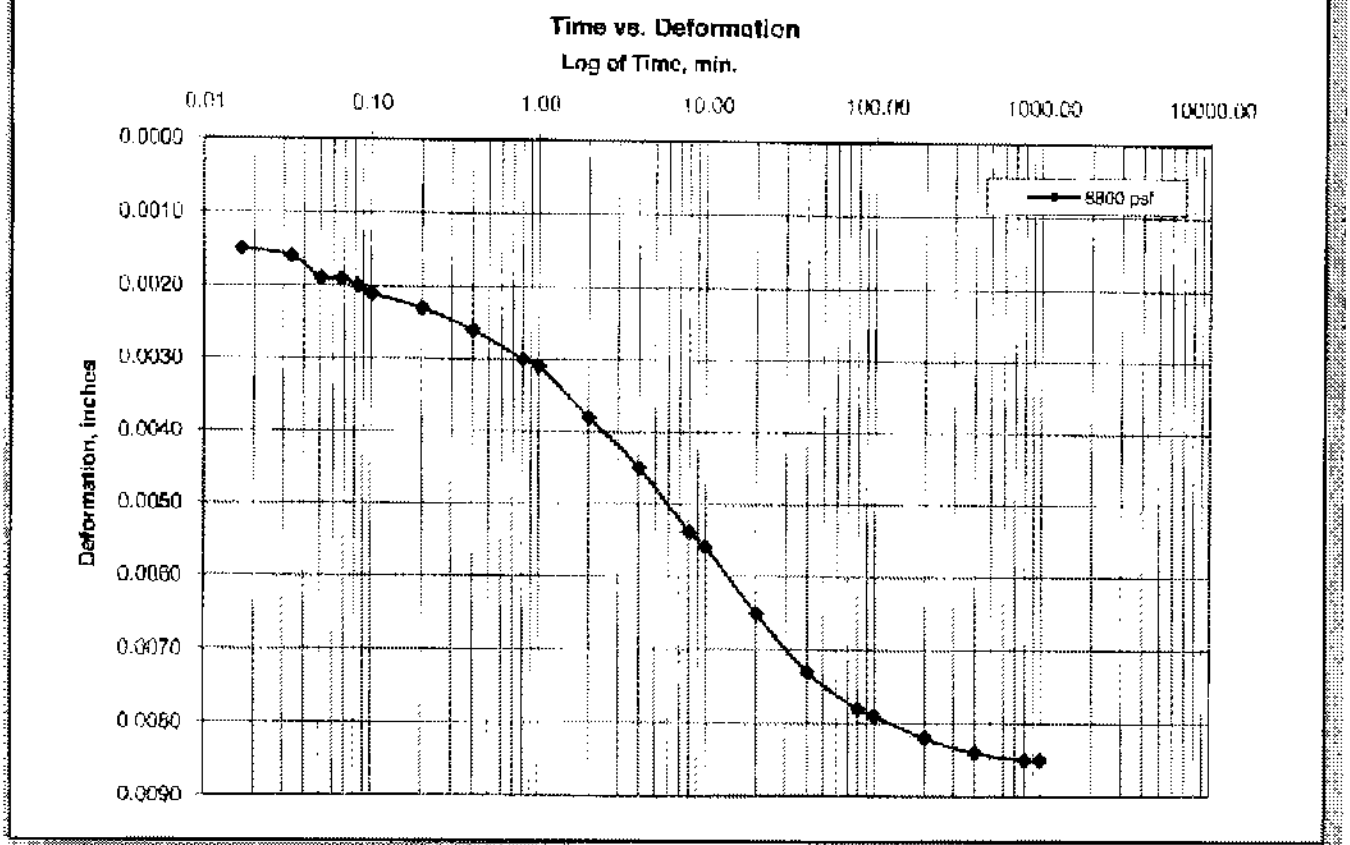


4400 PSF

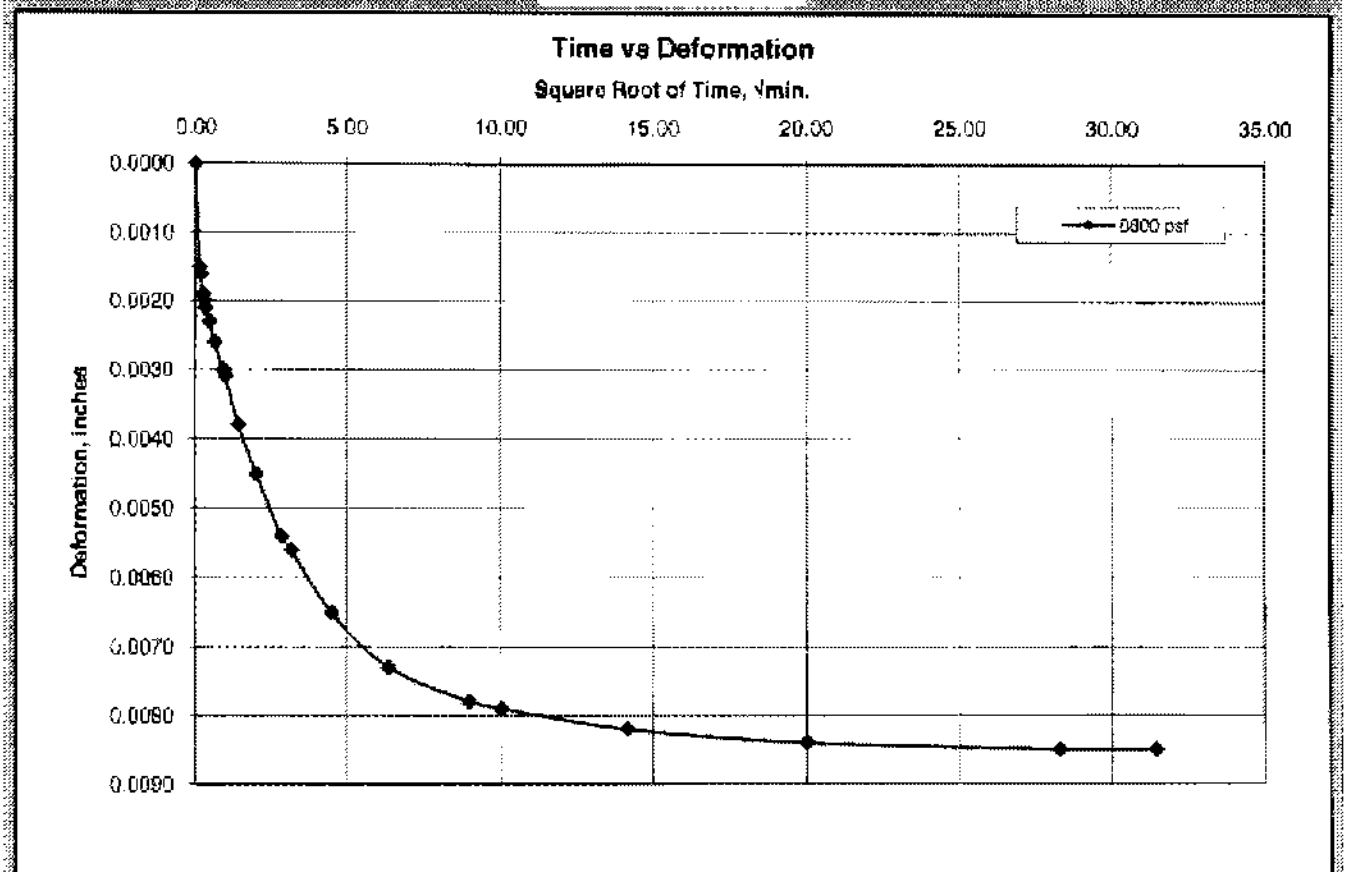


Cooper Testing Labs, Inc.

Load 12 — 8800 PSF

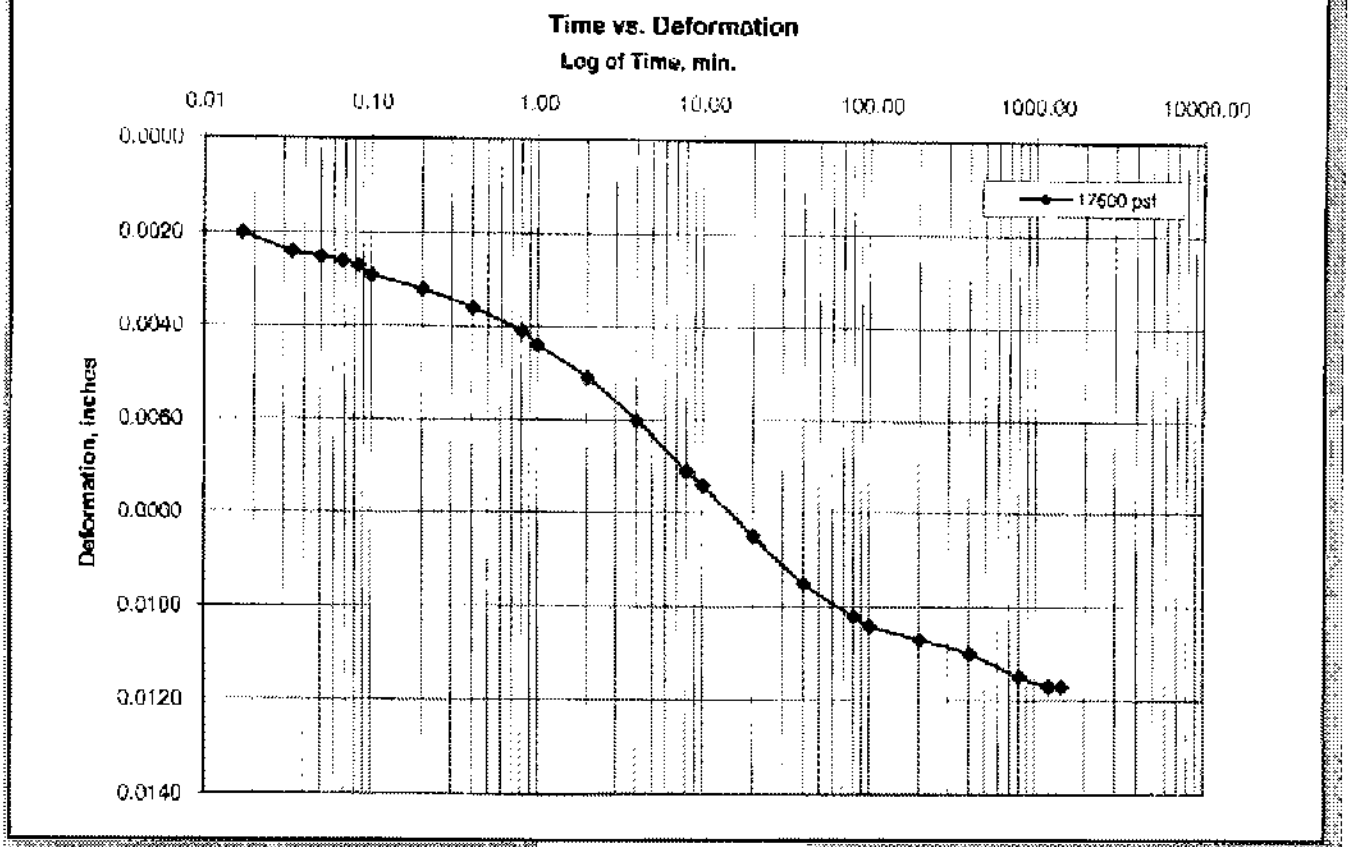


8800 PSF

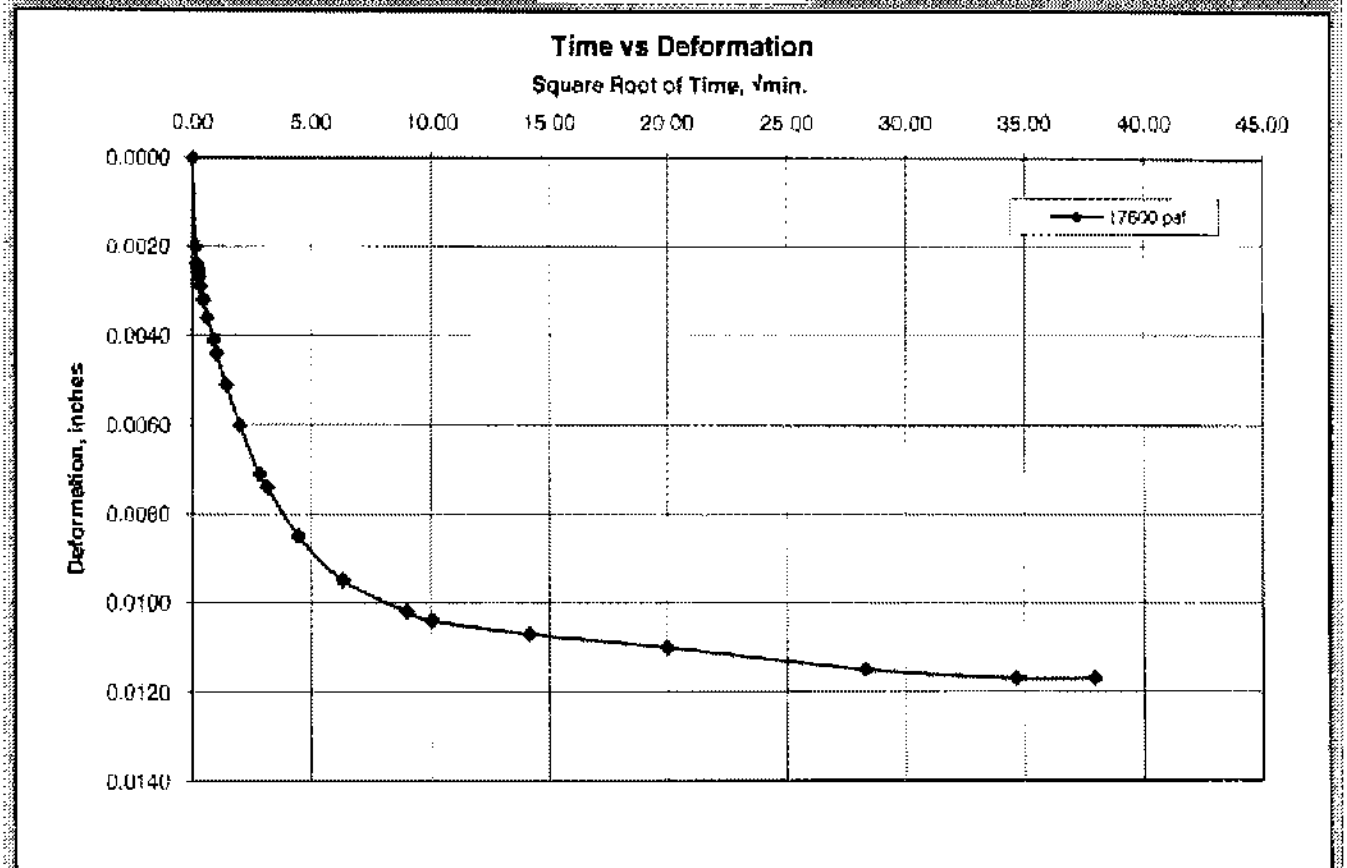


Cooper Testing Labs, Inc.

Load 13 — 17600 PSF



17600 PSF



Cooper Testing Labs, Inc.

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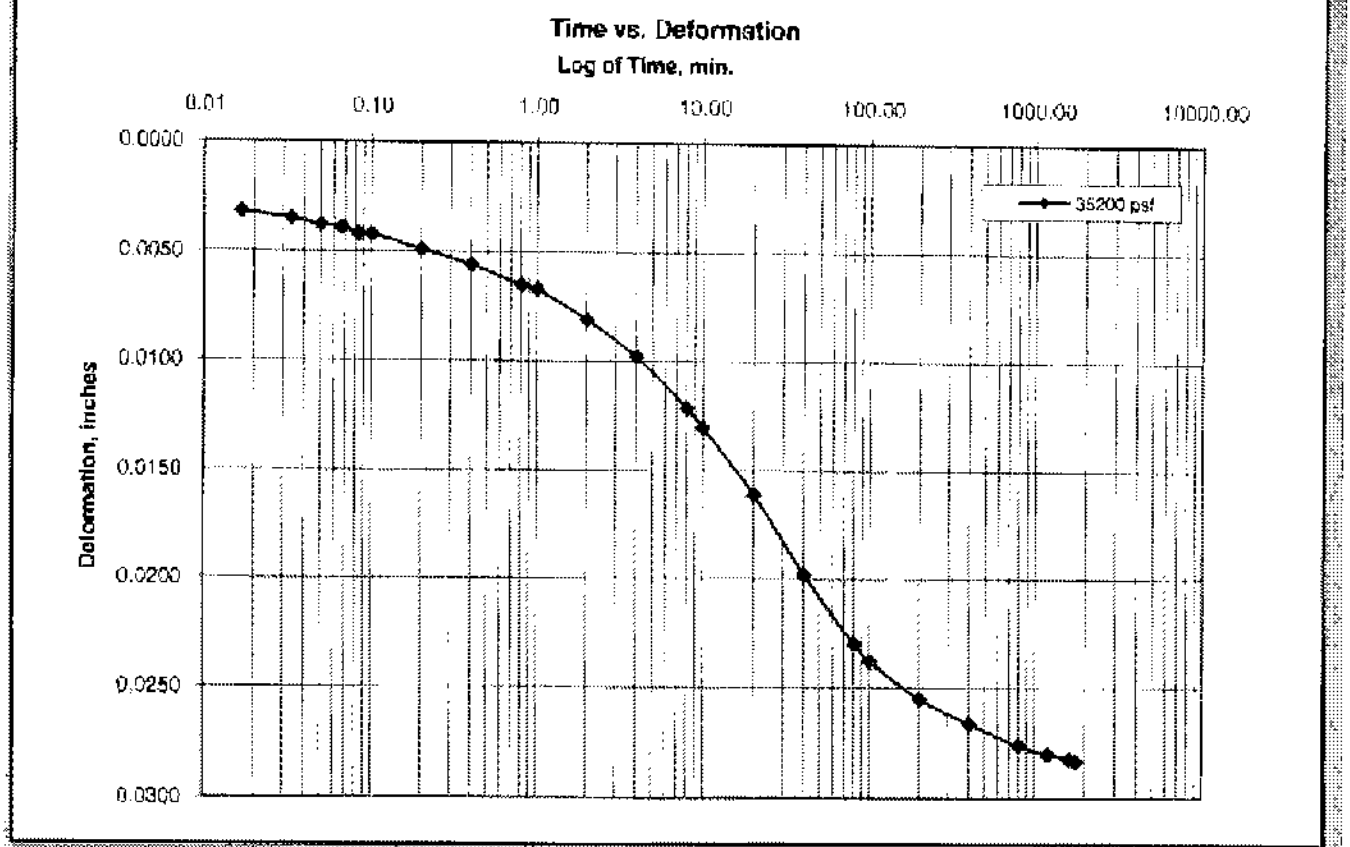
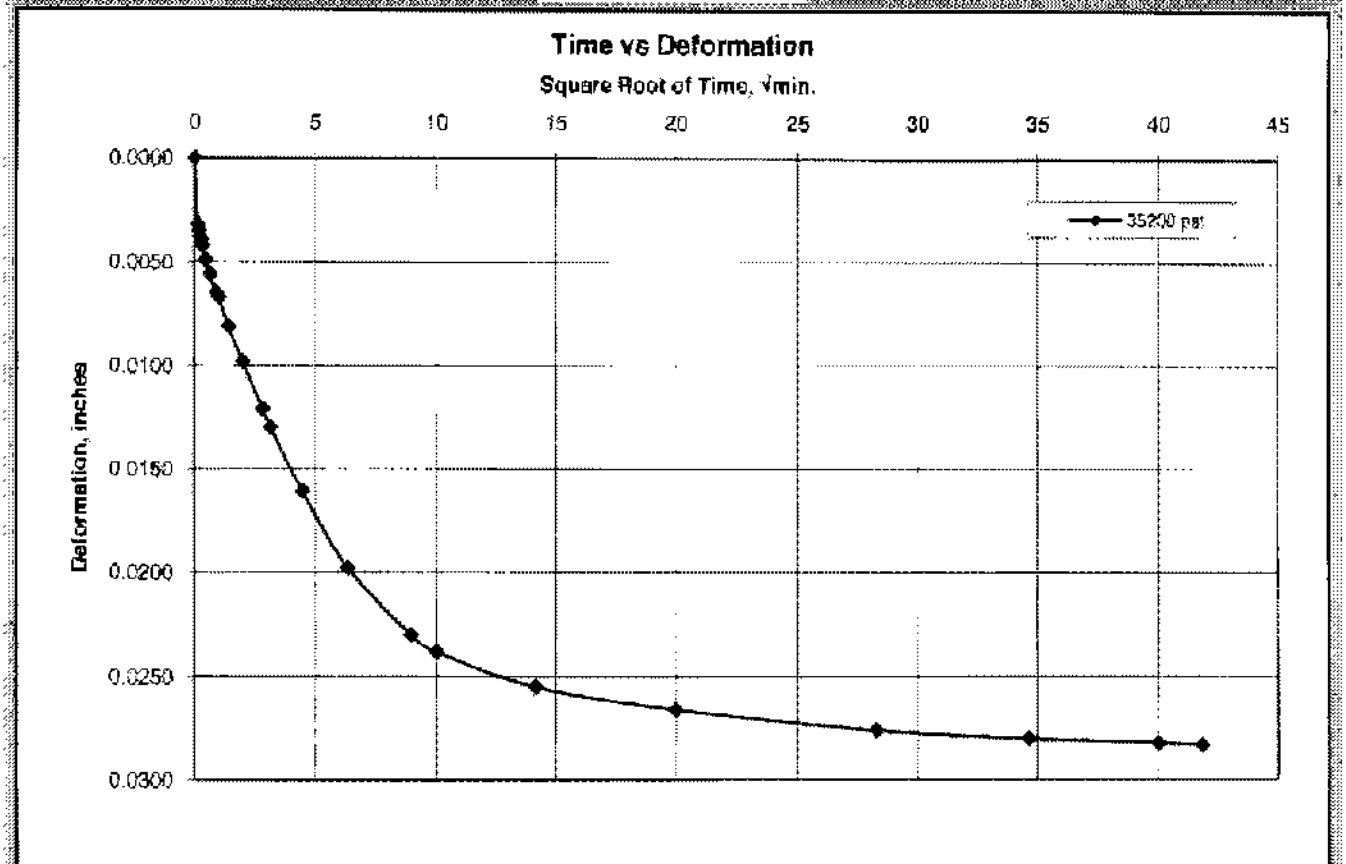
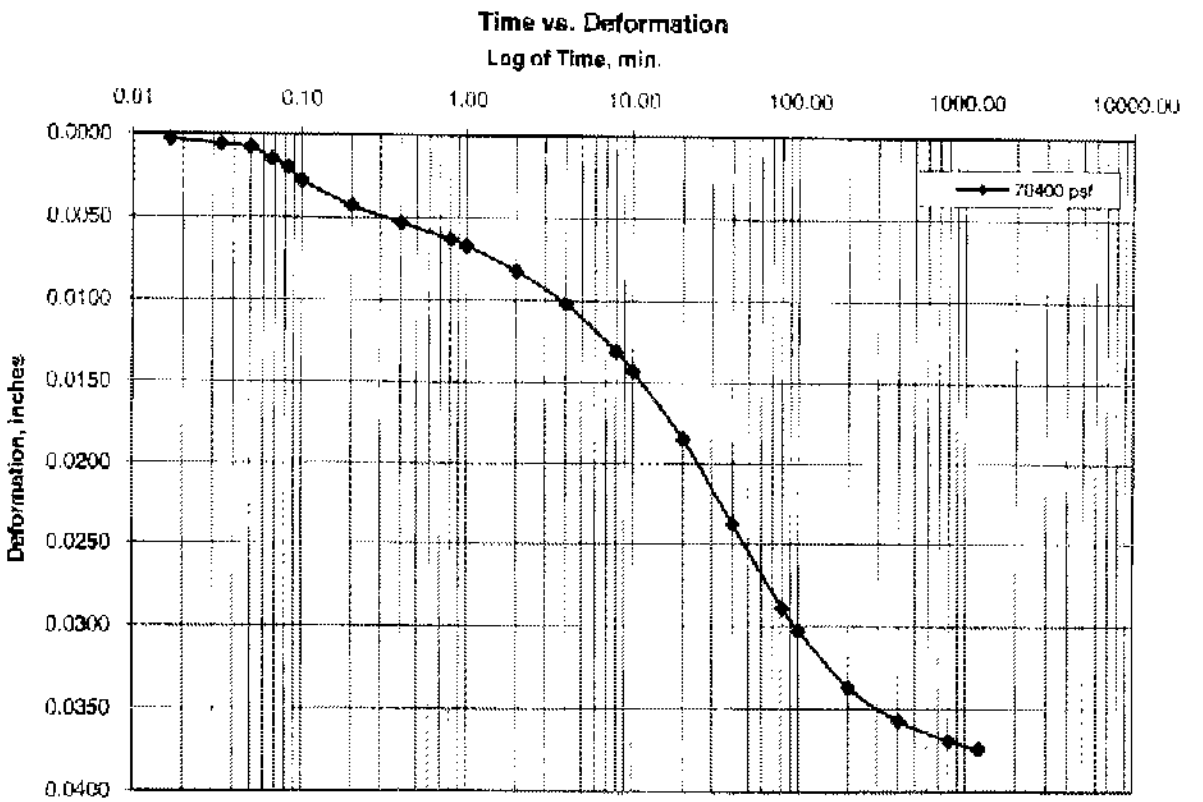


35200 PSF

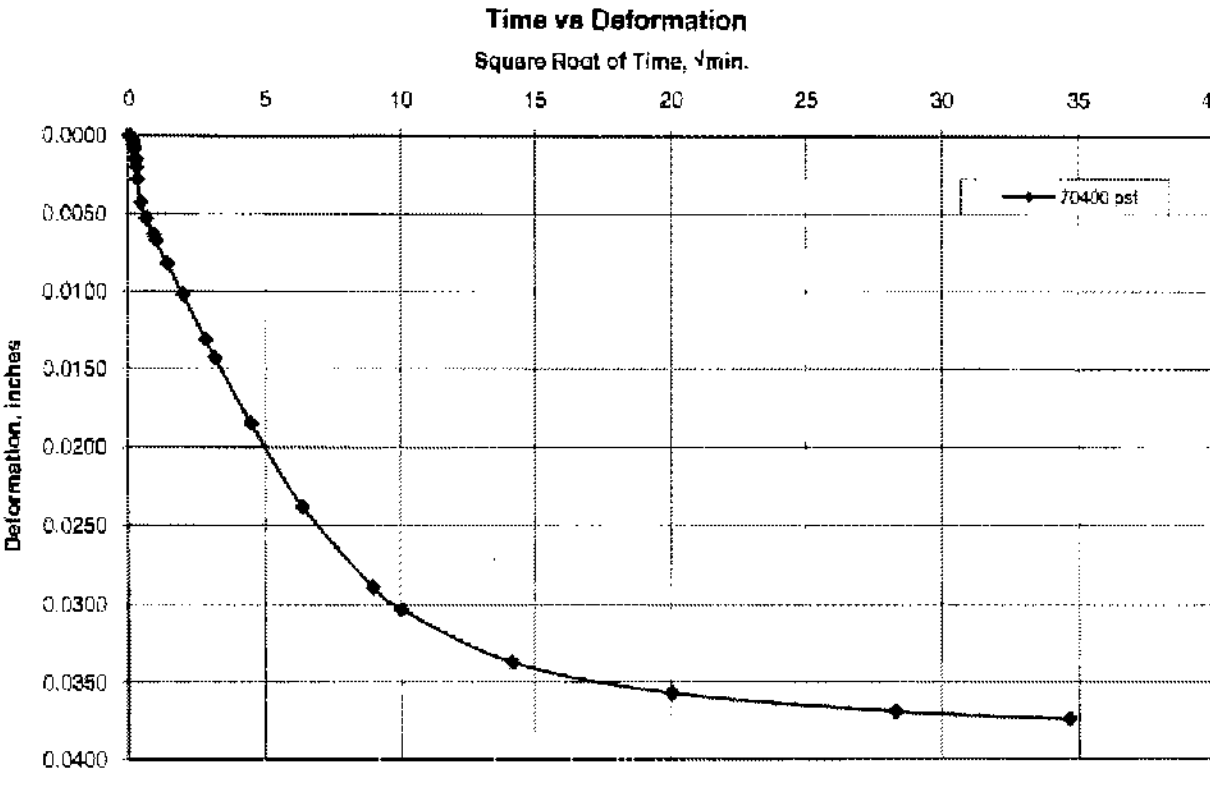


Cooper Testing Labs, Inc.

Load 15 — 70400 PSF



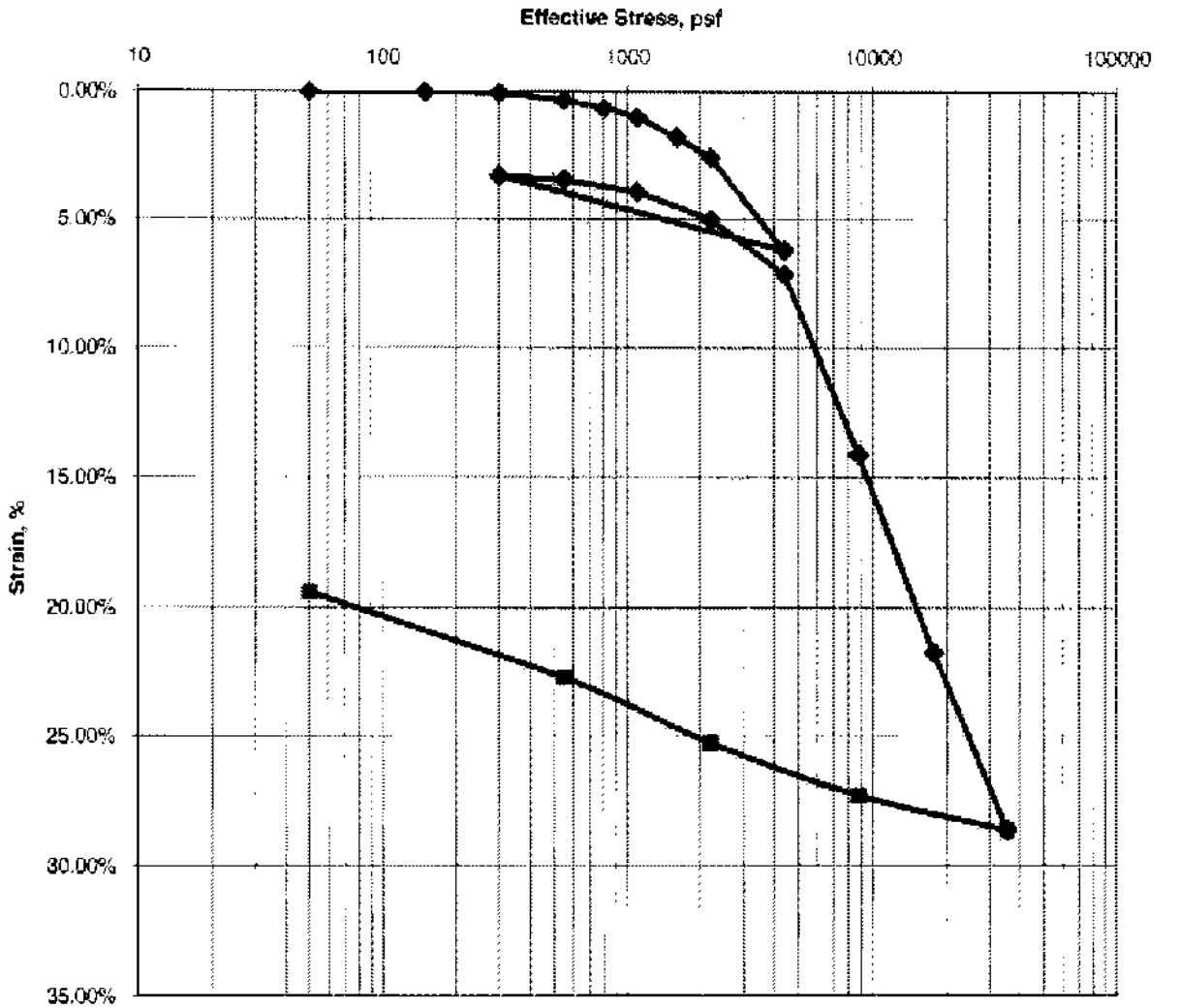
70400 PSF



Consolidation Test
ASTM D2435

Job No.:	461-083	**Boring:**	GS08-4	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S4-2	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	49-52	**Checked:**	PJ/DC
Soil Type:	Gray Fat CLAY, trace shell fragments (Bay Mud)			**Date:**	6/17/2008

Strain-Log-P Curve



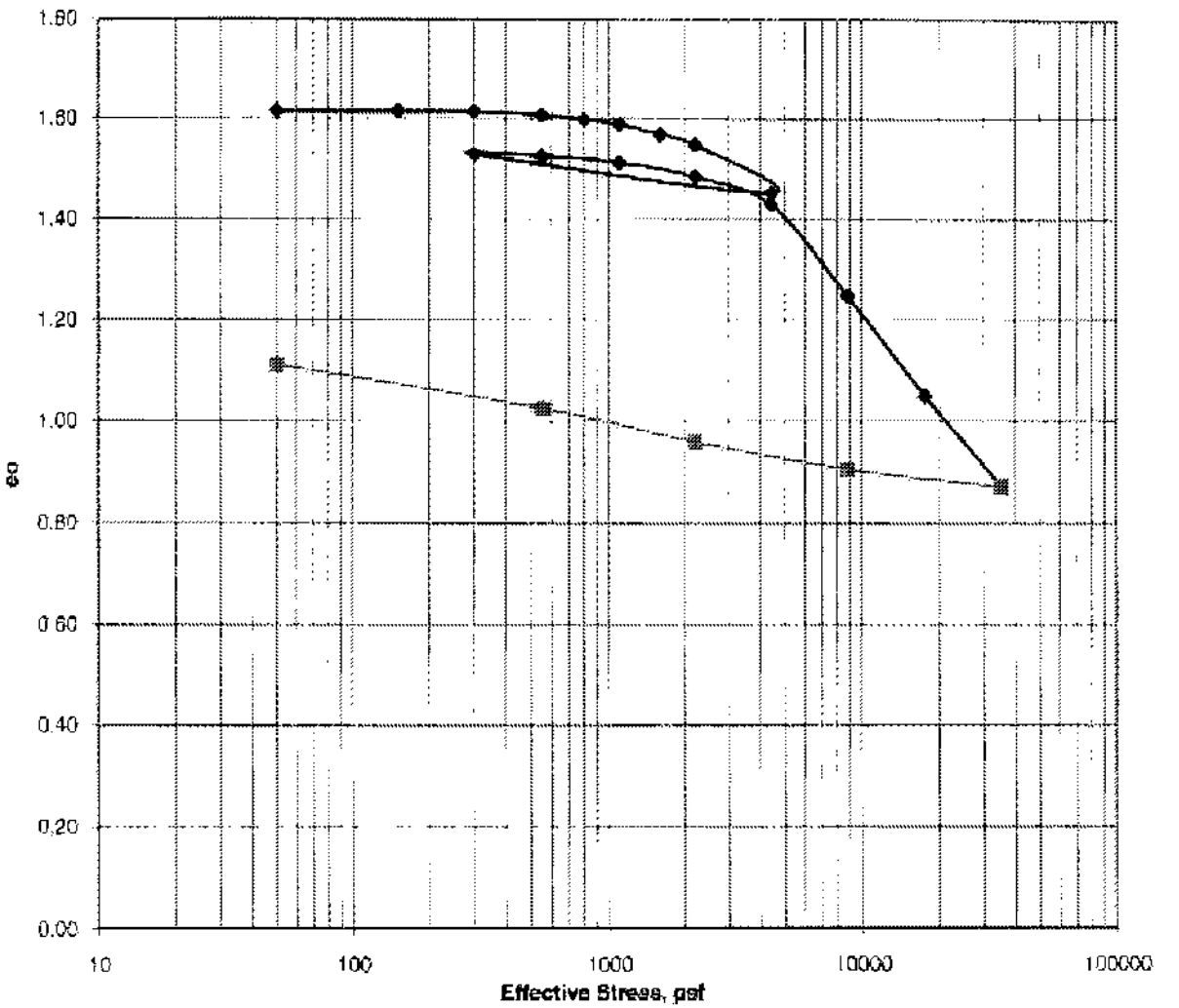
Ass. Gs = 2.7	Initial	Final
Moisture %:	59.5	41.8
Dry Density, pcf:	64.5	79.3
Void Ratio:	1.614	1.126
% Saturation:	99.6	100

Remarks:

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-4	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S4-2	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	49-52	**Checked:**	PJ/DC
Soil Type:	Gray Fat CLAY, trace shell fragments (Bay Mud)			**Date:**	6/17/2008

eo-Log-P Curve



Ass. Gs = 2.7	Initial	Final
Moisture %:	59.5	41.8
Dry Density, pcf:	64.5	79.3
Void Ratio:	1.614	1.126
% Saturation:	99.6	100

Remarks:

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane Project
Boring	GS08-4
Sample:	S4-2
Depth, ft.:	49-52
Date:	6/17/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Description:	Gray Fat CLAY, trace shell fragments (Bay Mud)

Moisture Density Data Entry Screen

	Initial	Final
Height	1.01	0.8173
Diameter	2.41	2.41
Total Wet Weight	123.8	110
Wt of Wet Soil & Dish		178.3
Wt of Dry Soil & Dish		146
Wt. Of Dish		22.4
Wt of Ring		46
Moisture %	59.5	41.0
Wet Density, pcf	102.0	112.4
Dry Density, pcf	64.5	79.3
Specific Gravity	2.7	2.7
Area	4.6	4.6
V ft3	0.0	0.0
Vt, cc	75.1	61.1
Vs, cc	28.7	28.7
Vv, cc	46.4	32.4
e	1.6	1.1
porosity, %	61.7	53.0
S, %	99.6	100

Loading Increments — **Void Ratio**

Increment #	Load, psf	Dial .0001"	Load psf	Height Delta h	Volume Vt cc	Voids Vv	Void Ratio e
1	50	0.0001	50	1.0019	75.13	46.437	1.610
2	150	0.0002	150	1.0048	75.17	46.430	1.615
3	300	0.0005	300	1.0045	75.15	46.407	1.615
4	550	0.0034	550	1.0016	74.93	46.150	1.607
5	800	0.0067	800	0.9983	74.68	45.943	1.599
6	1100	0.0104	1100	0.9946	74.41	45.687	1.589
7	1600	0.0161	1600	0.9889	73.98	45.091	1.569
8	2200	0.0259	2200	0.9791	73.25	44.507	1.549
9	4400	0.0623	4400	0.9427	70.52	41.784	1.454
10	300	0.0330	300	0.9720	72.72	43.9769	1.530091
11	550	0.0348	550	0.9705	72.60	43.6687	1.520166
12	1100	0.0393	1100	0.9657	72.25	43.5046	1.513602
13	2200	0.0500	2200	0.9550	71.44	42.7042	1.48684
14	4400	0.0716	4400	0.9334	69.83	41.0082	1.426616
15	8800	0.1413	8800	0.8637	64.61	35.8739	1.248180
16	17600	0.2178	17600	0.7872	58.89	30.1508	1.049031
17	35200	0.2864	35200	0.7186	53.76	25.0187	0.870497
18		0.2864	#N/A	0.7186	53.76	25.0187	0.870497
19		0.2864	#N/A	0.7186	53.76	25.0187	0.870497

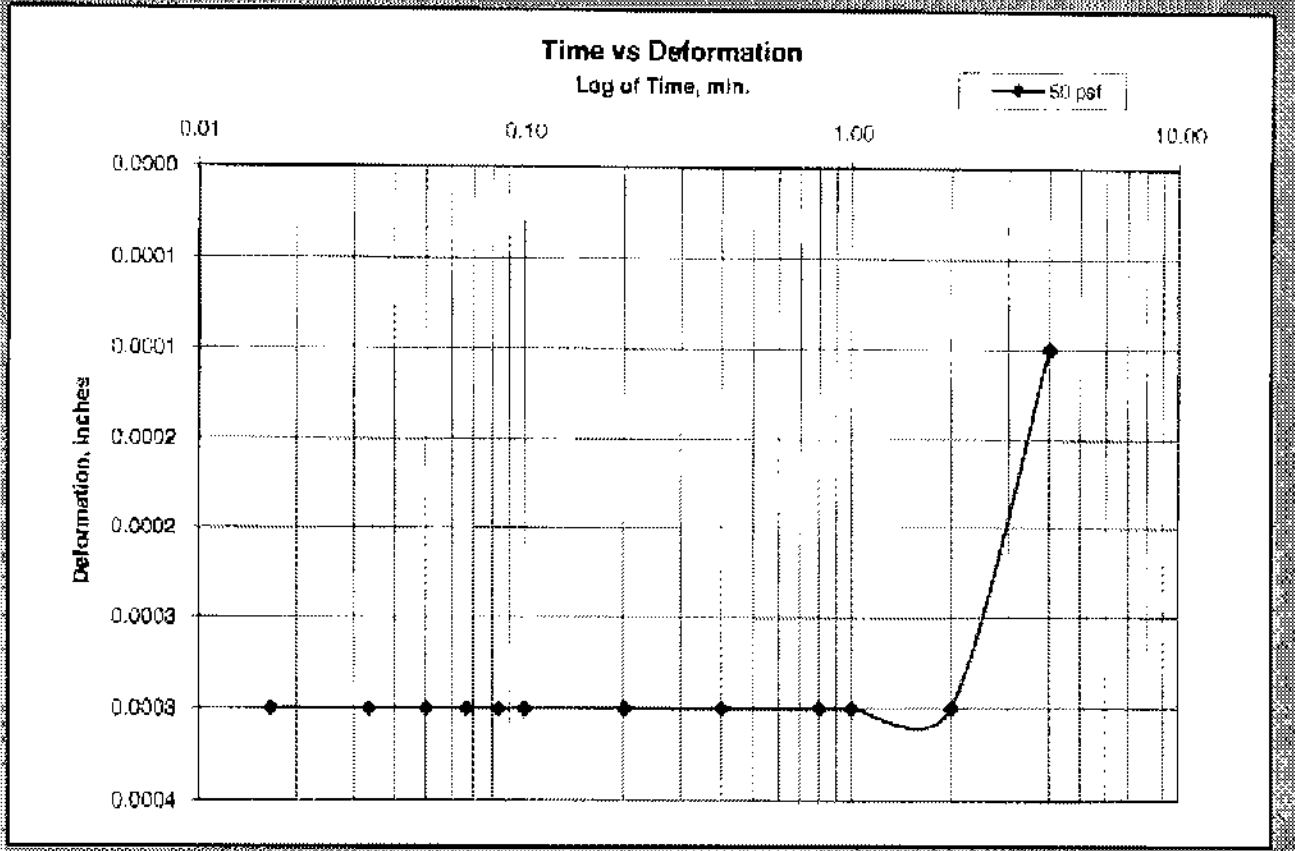
Rebound Increments — **Void Ratio**

15	35200	0.2864	35200	0.7186	53.76	25.0187	0.870497
16	8800	0.2731	8800	0.7319	54.76	26.0137	0.905117
17	2200	0.2527	2200	0.7523	56.28	27.5399	0.958217
18	550	0.2274	550	0.7776	58.17	29.4358	1.024073
19	50	0.1940	50	0.8110	60.67	31.9313	1.111012
20			#N/A	1.0050	75.19	46.4447	1.615969
	Tot Dry Wt	77.8000					

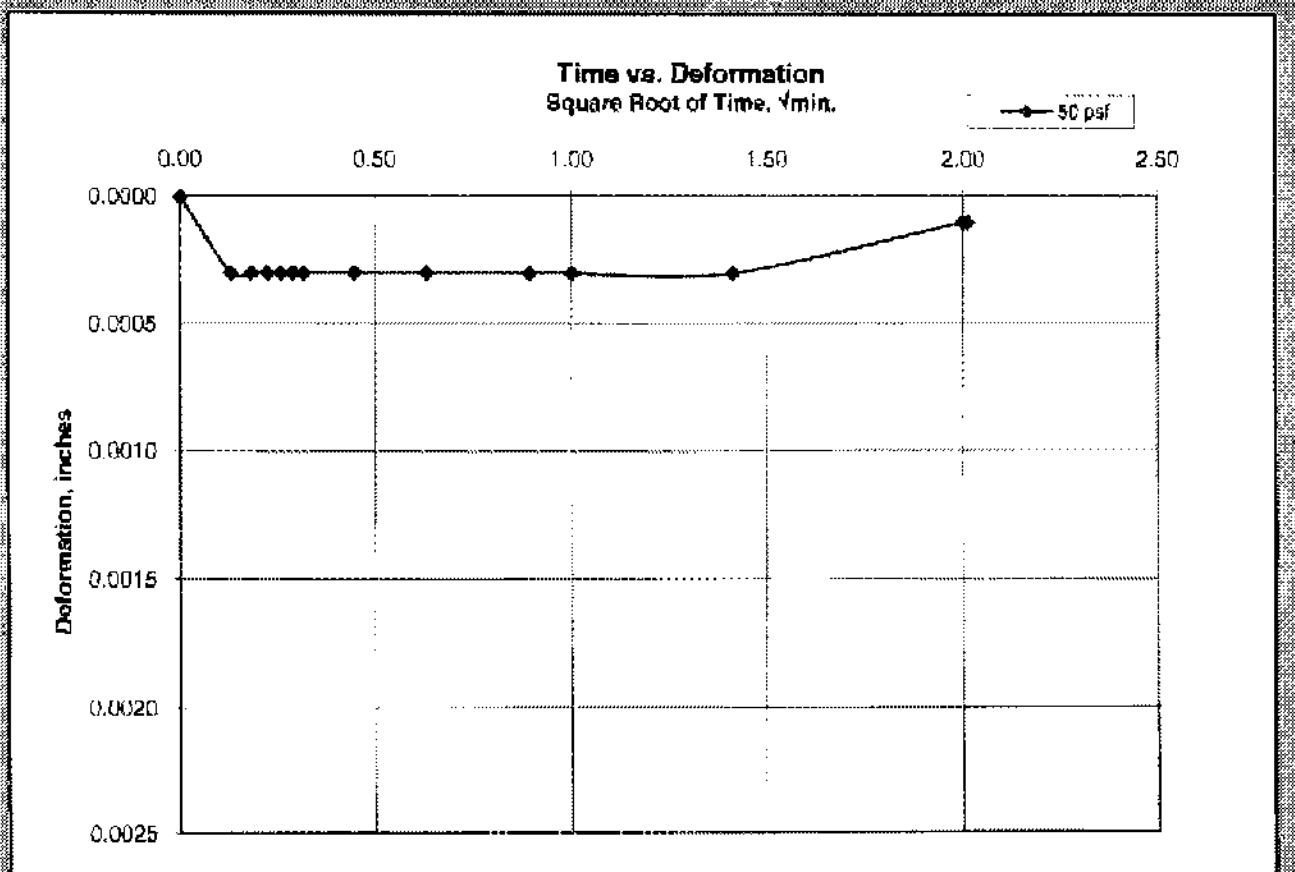
The data to the left is used to determine the theoretical

Cooper Testing Labs, Inc.

Load 1 — 50 PSF



50 PSF



Cooper Testing Labs, Inc.

Load 2

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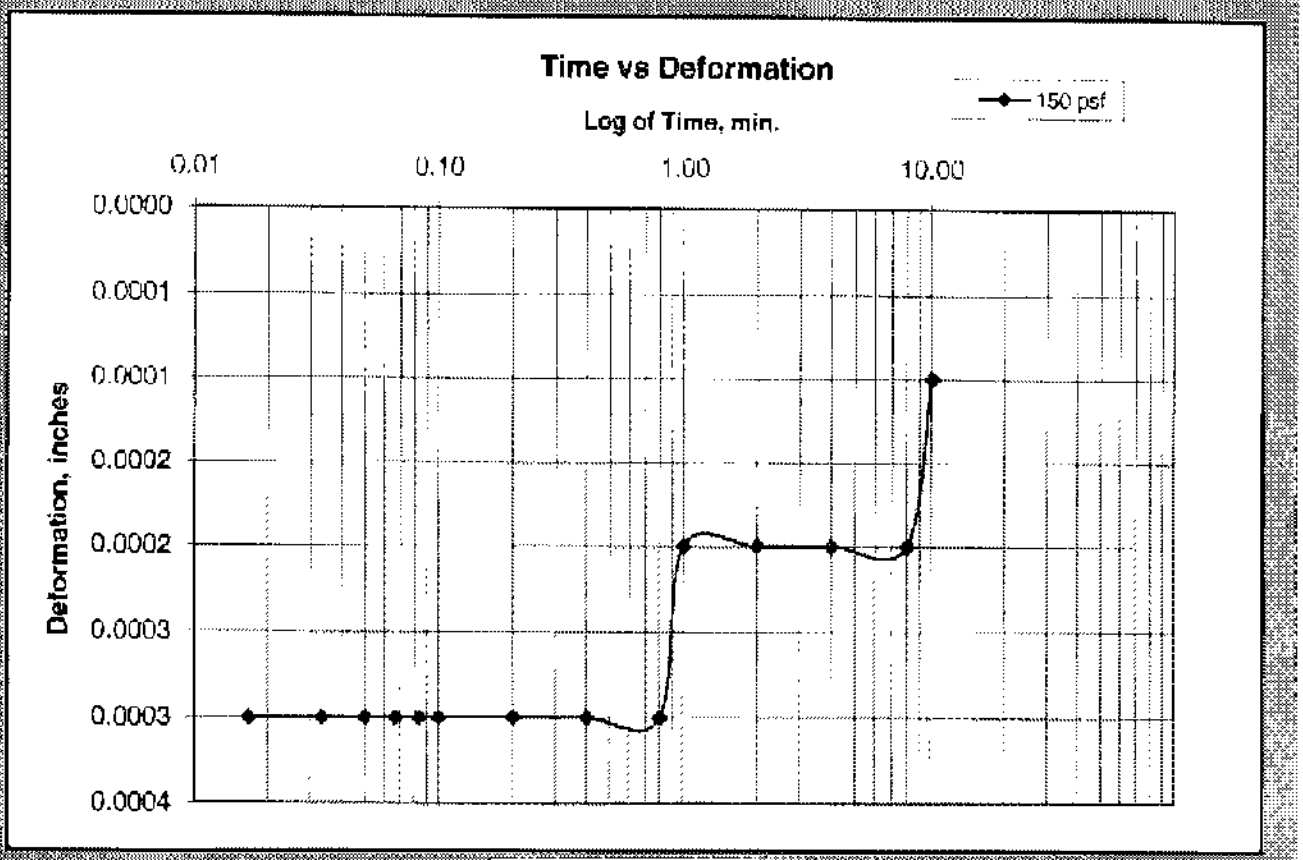
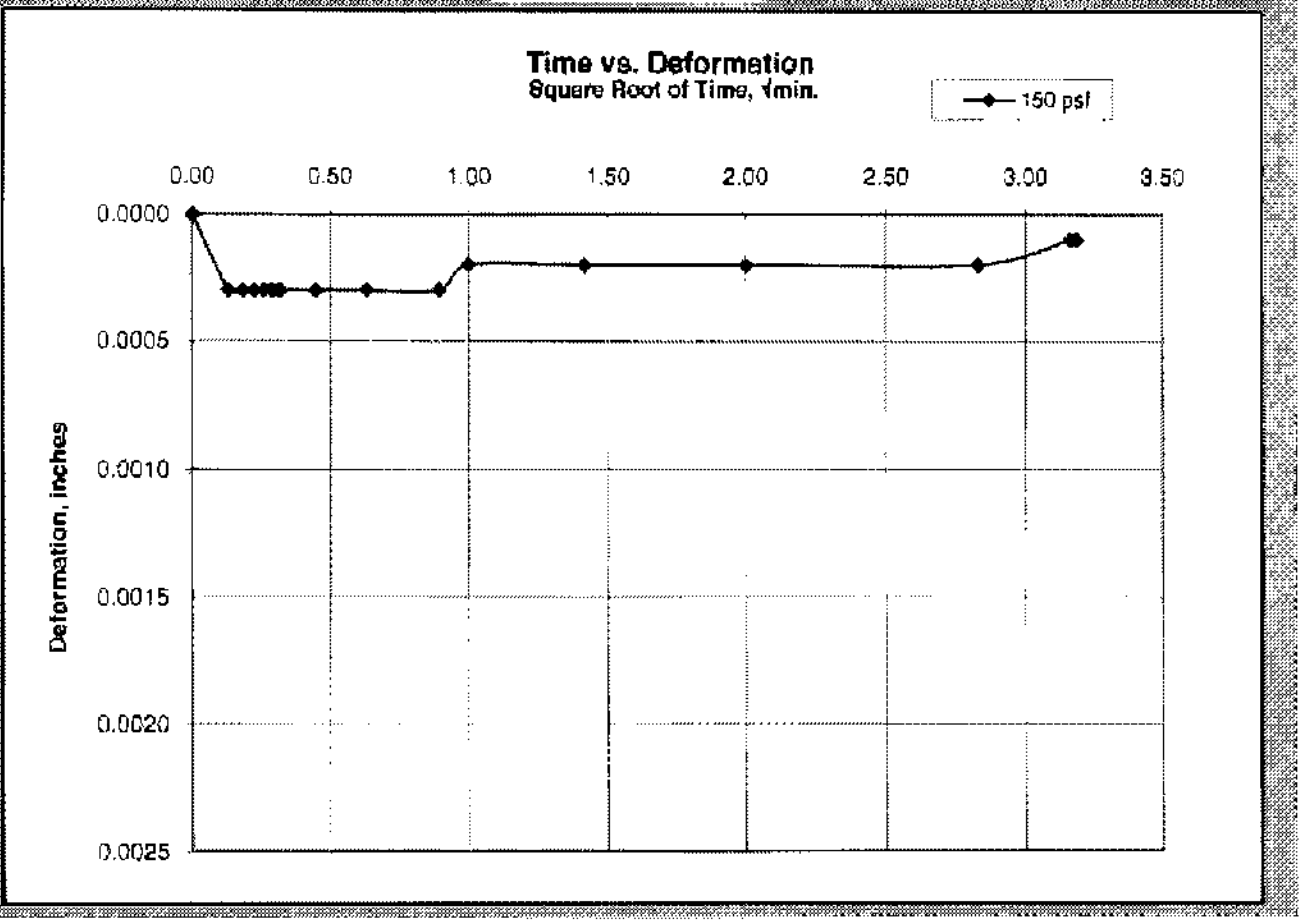


150 PSF



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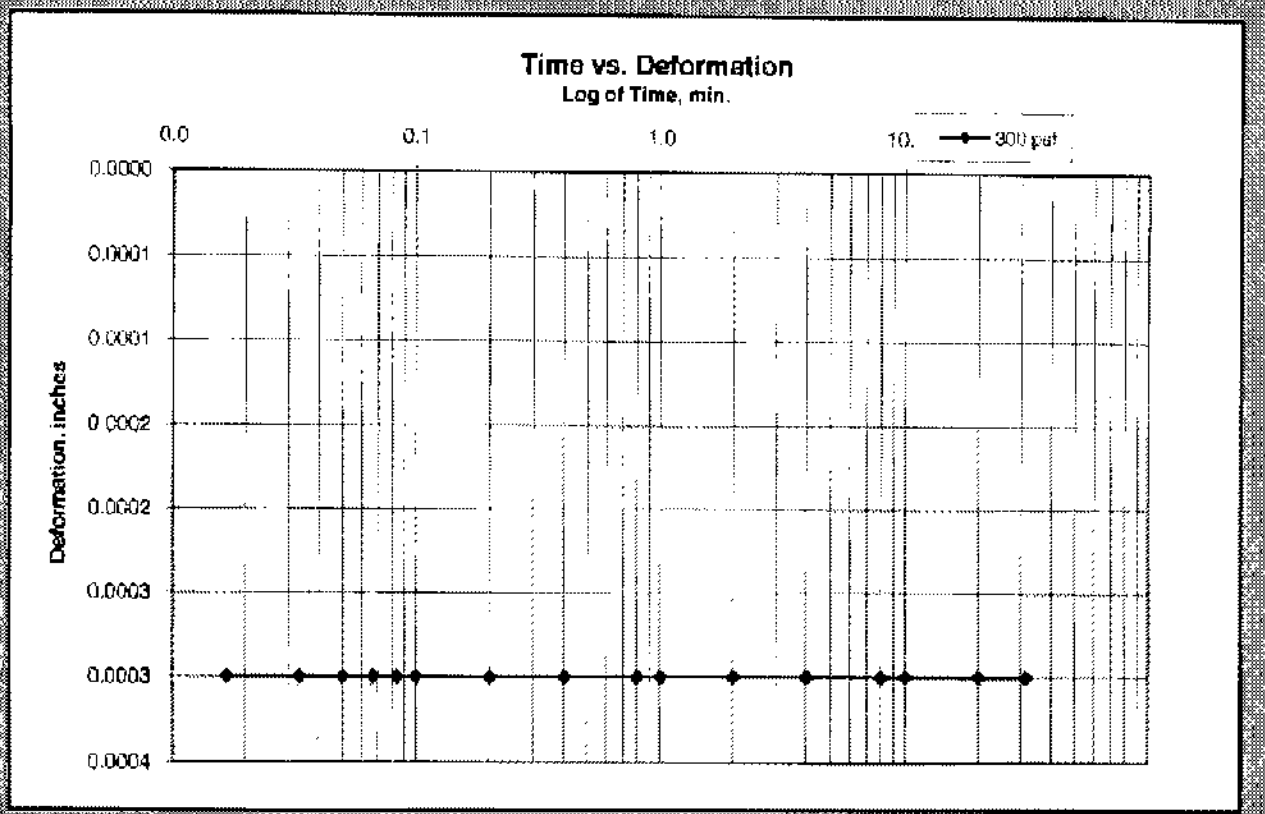
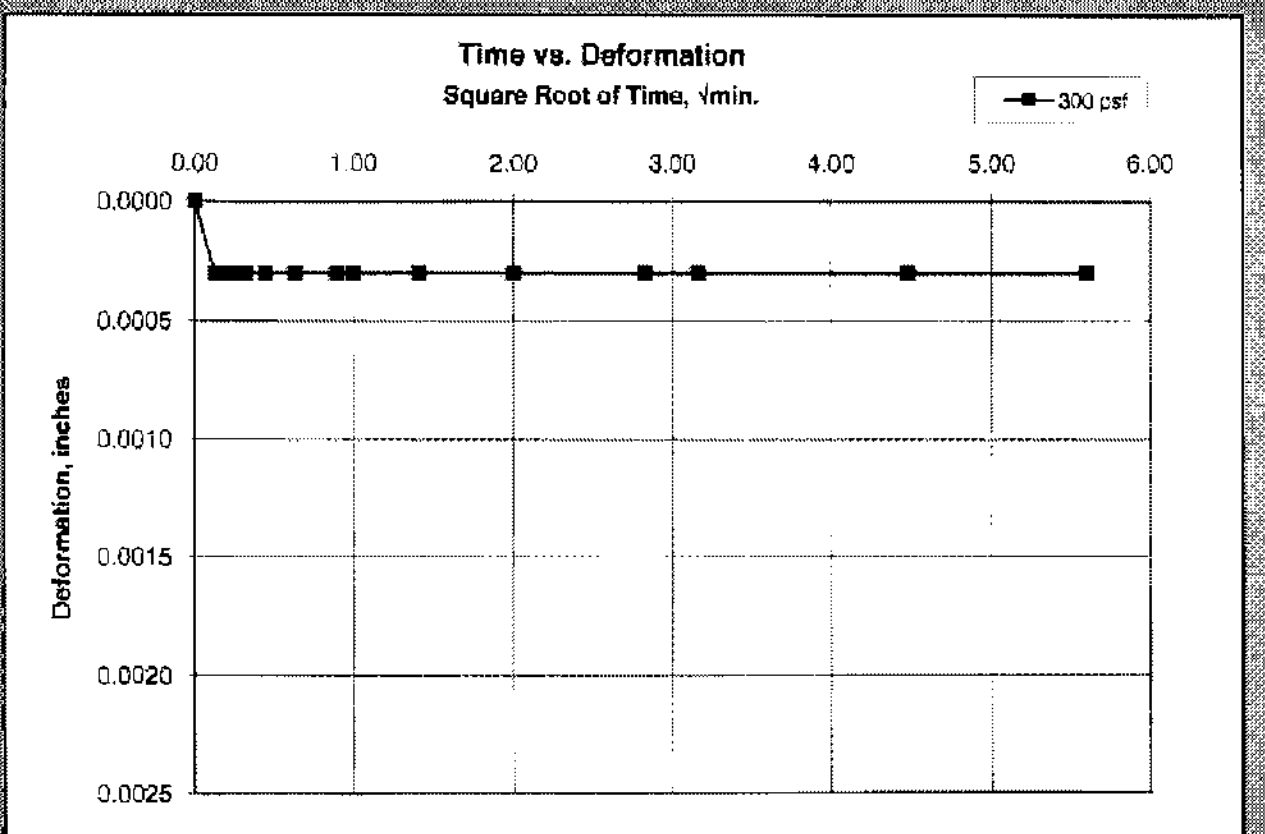
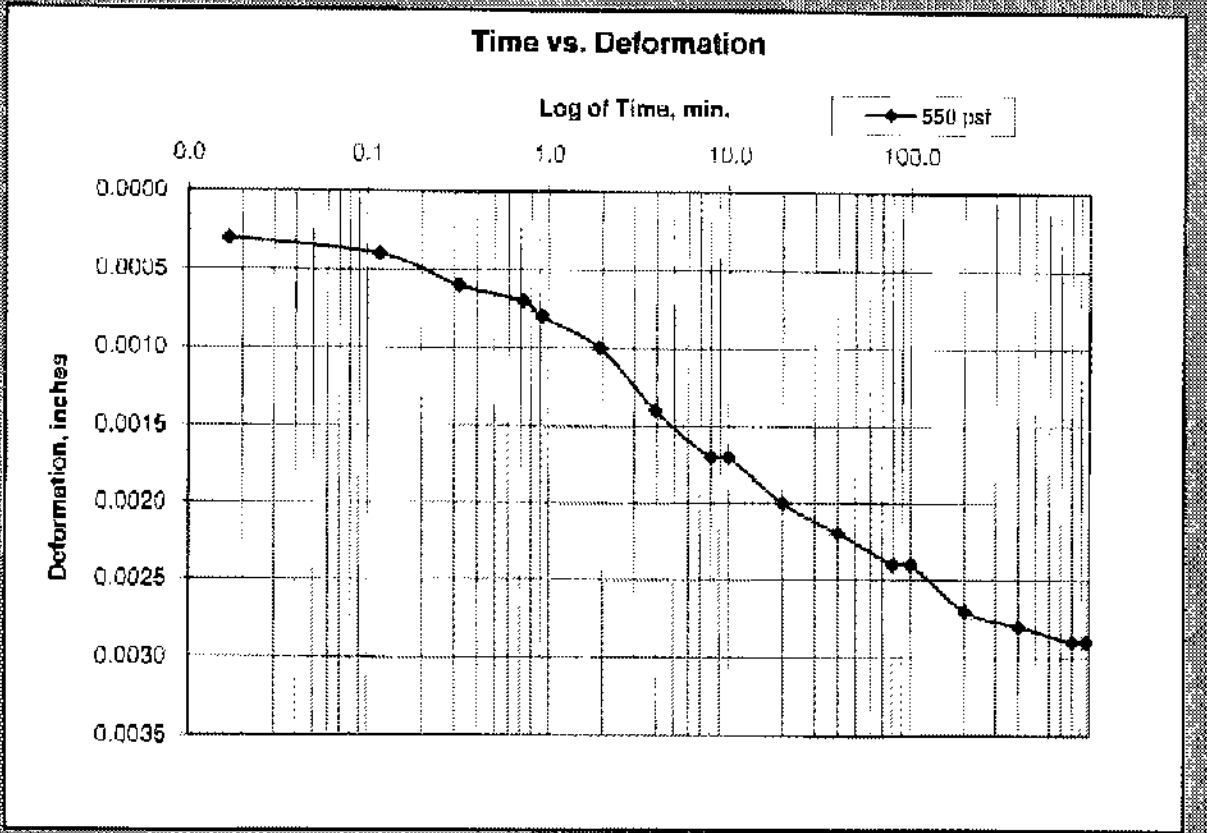


300 PSF



Load 4

550 PSF



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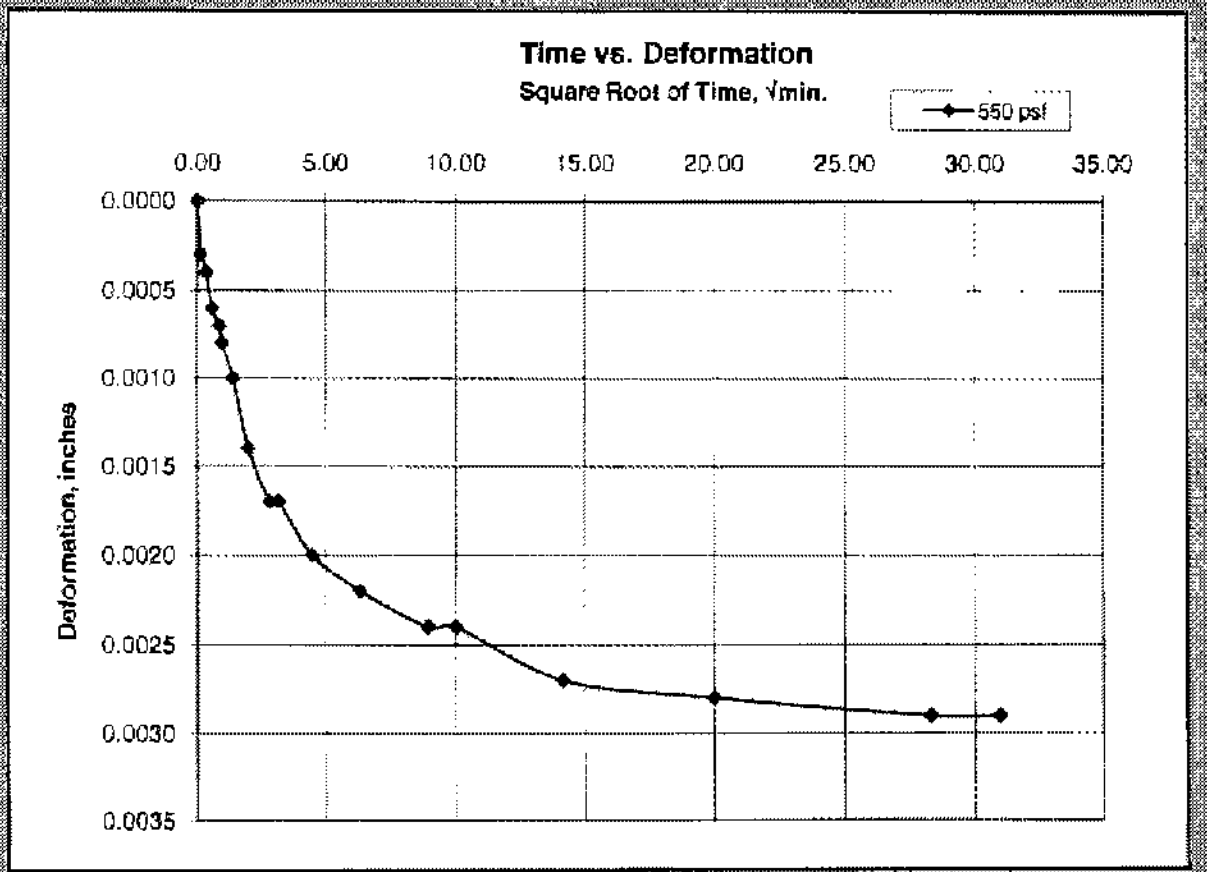

Cooper Testing Labs, Inc.

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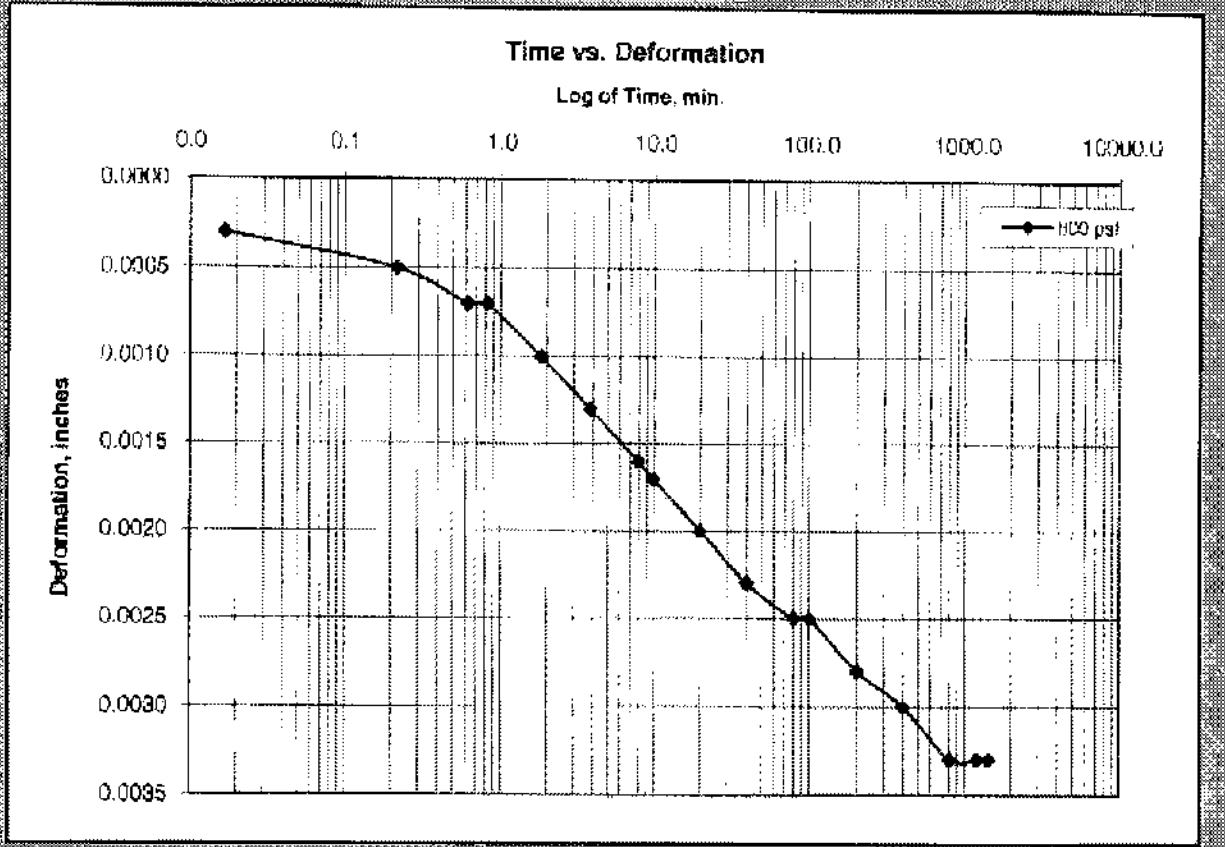
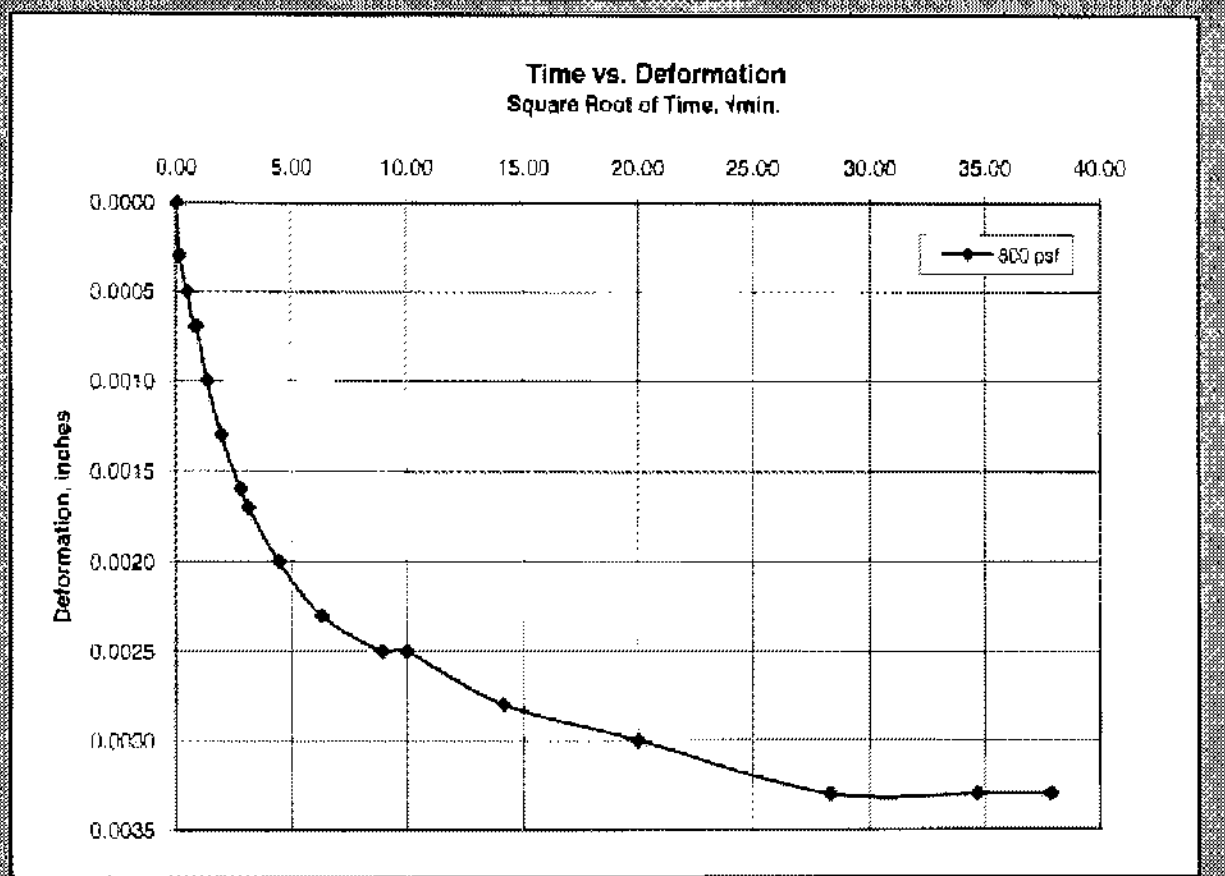


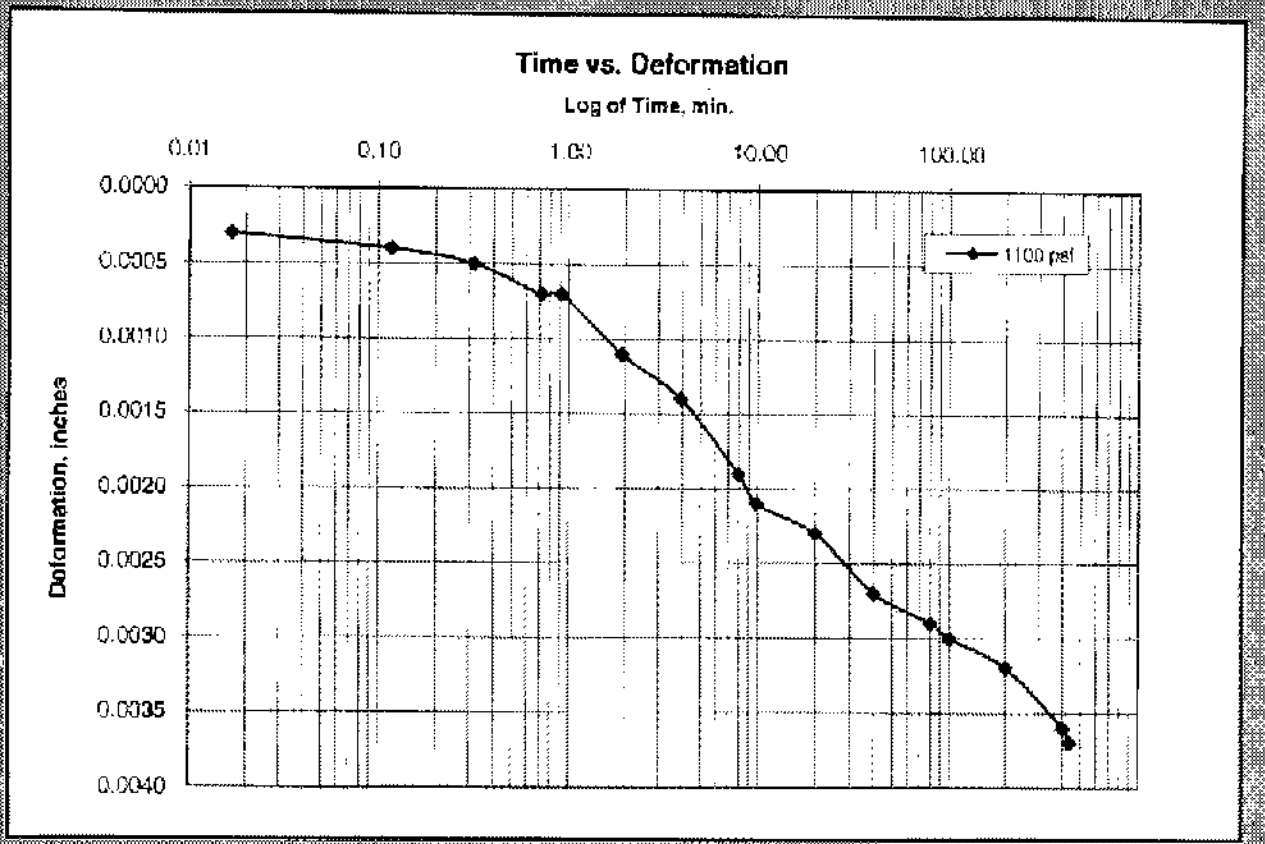
800 PSF



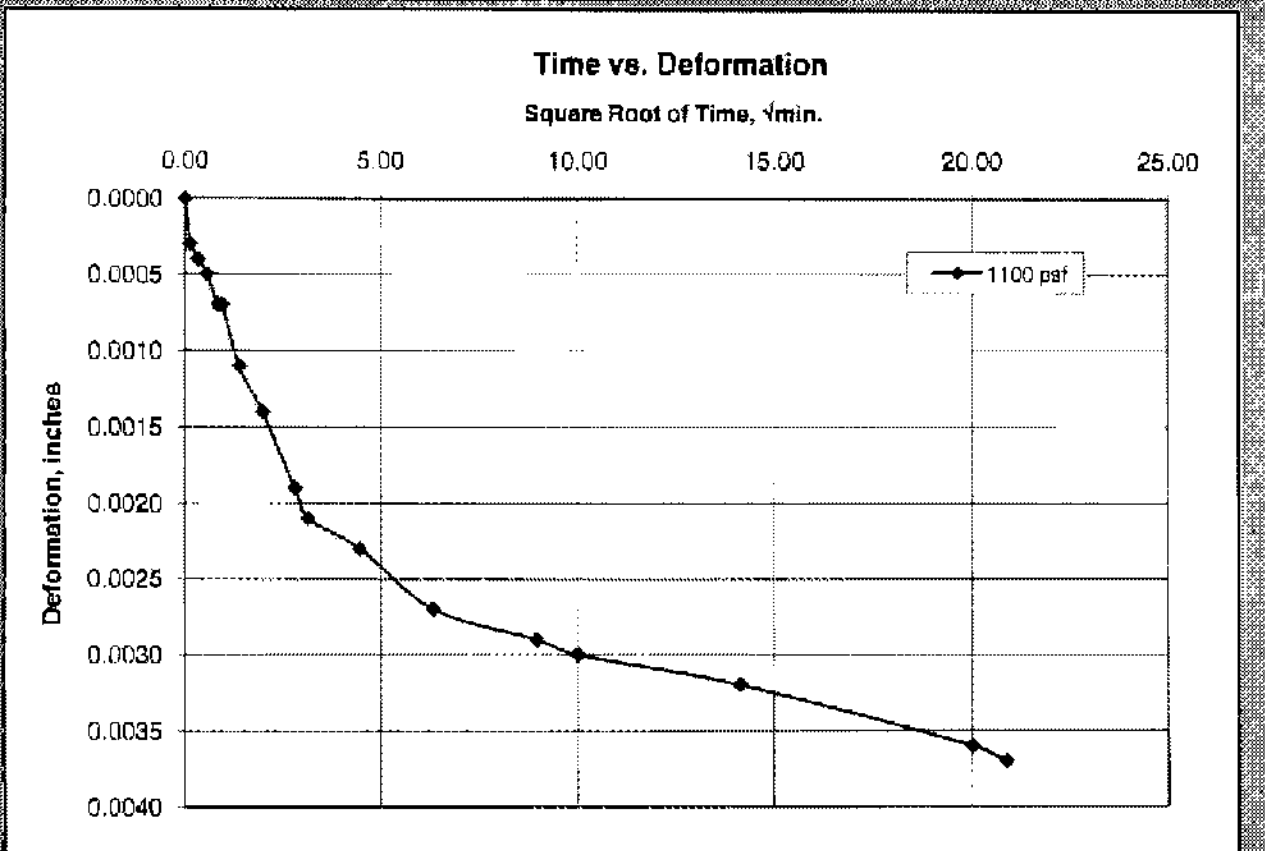
Cooper Testing Labs, Inc.

Load 6

1100 PSF

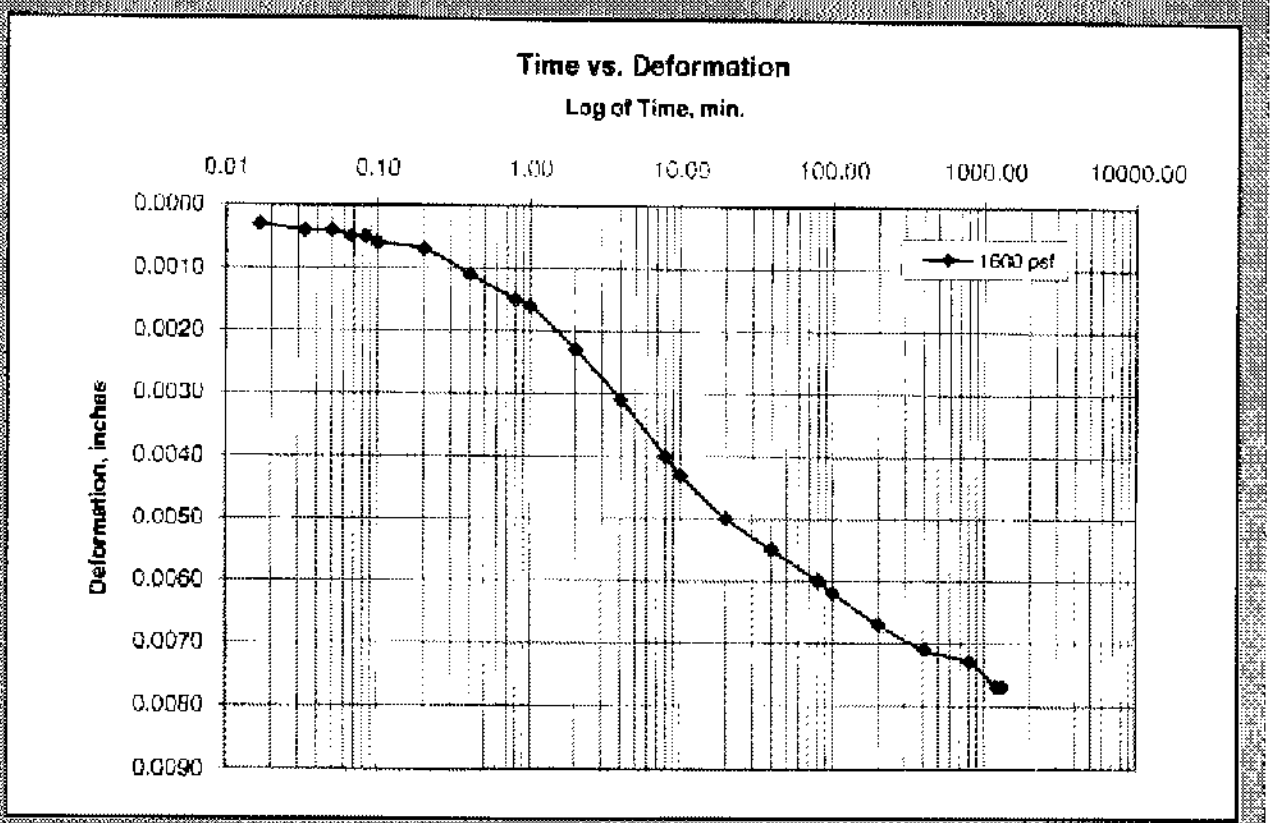


1100 PSF

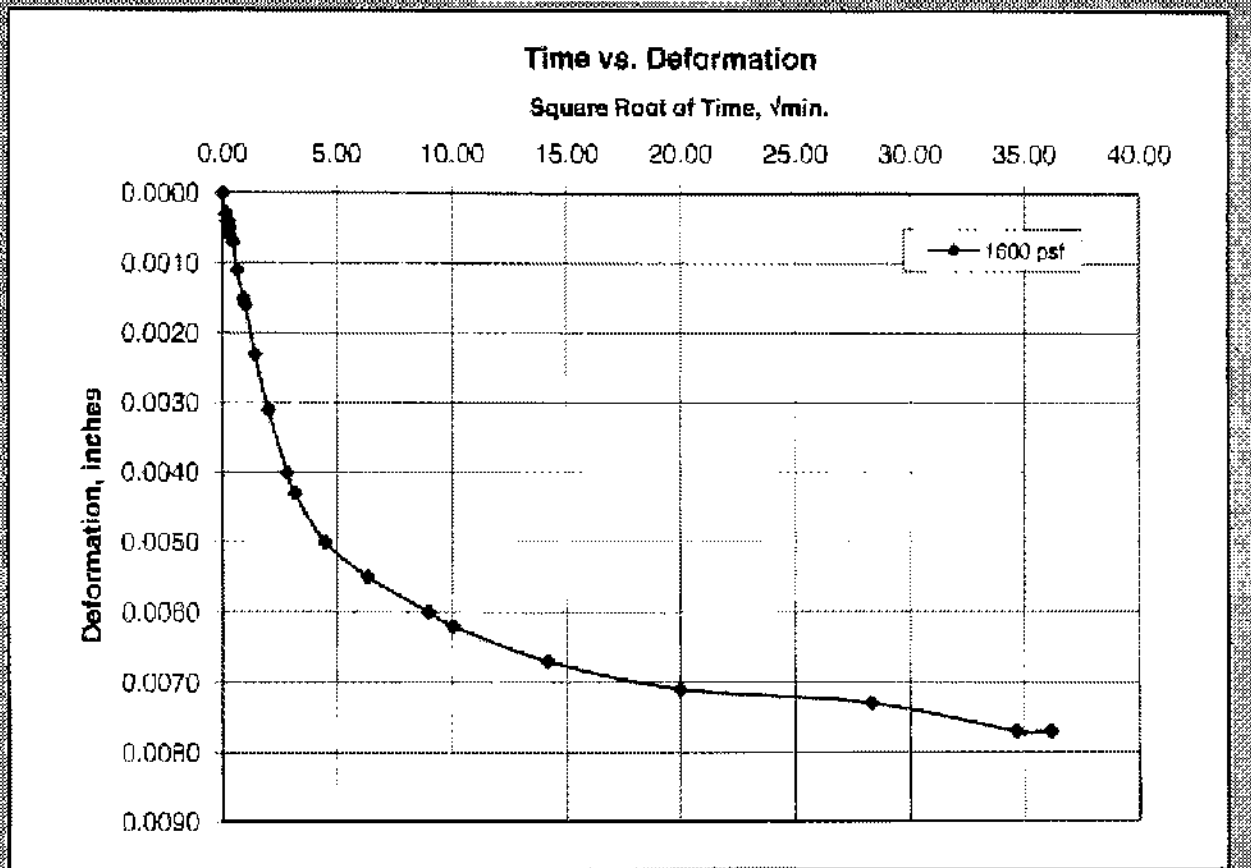


Load 7

1600 PSF

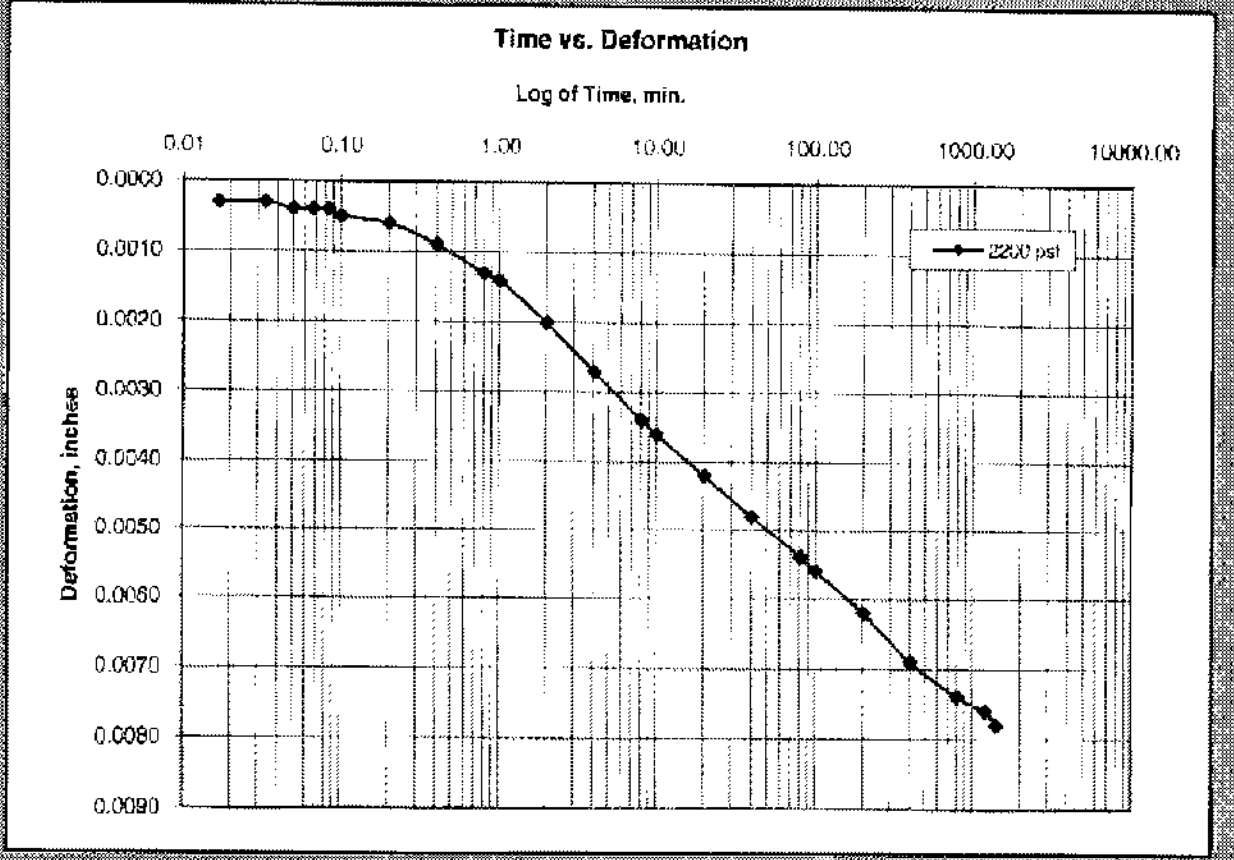


1600 PSF

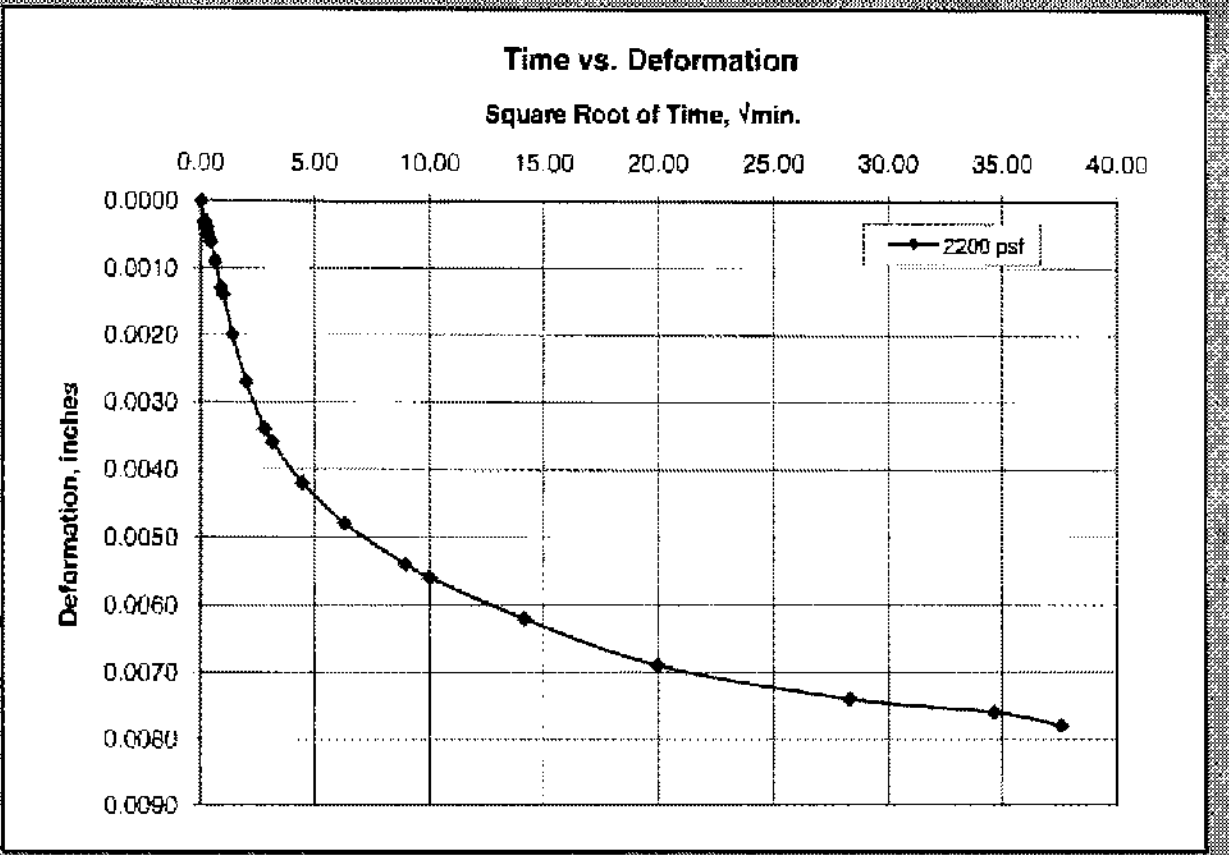


Cooper Testing Labs, Inc.

Load 8 — 2200 PSF

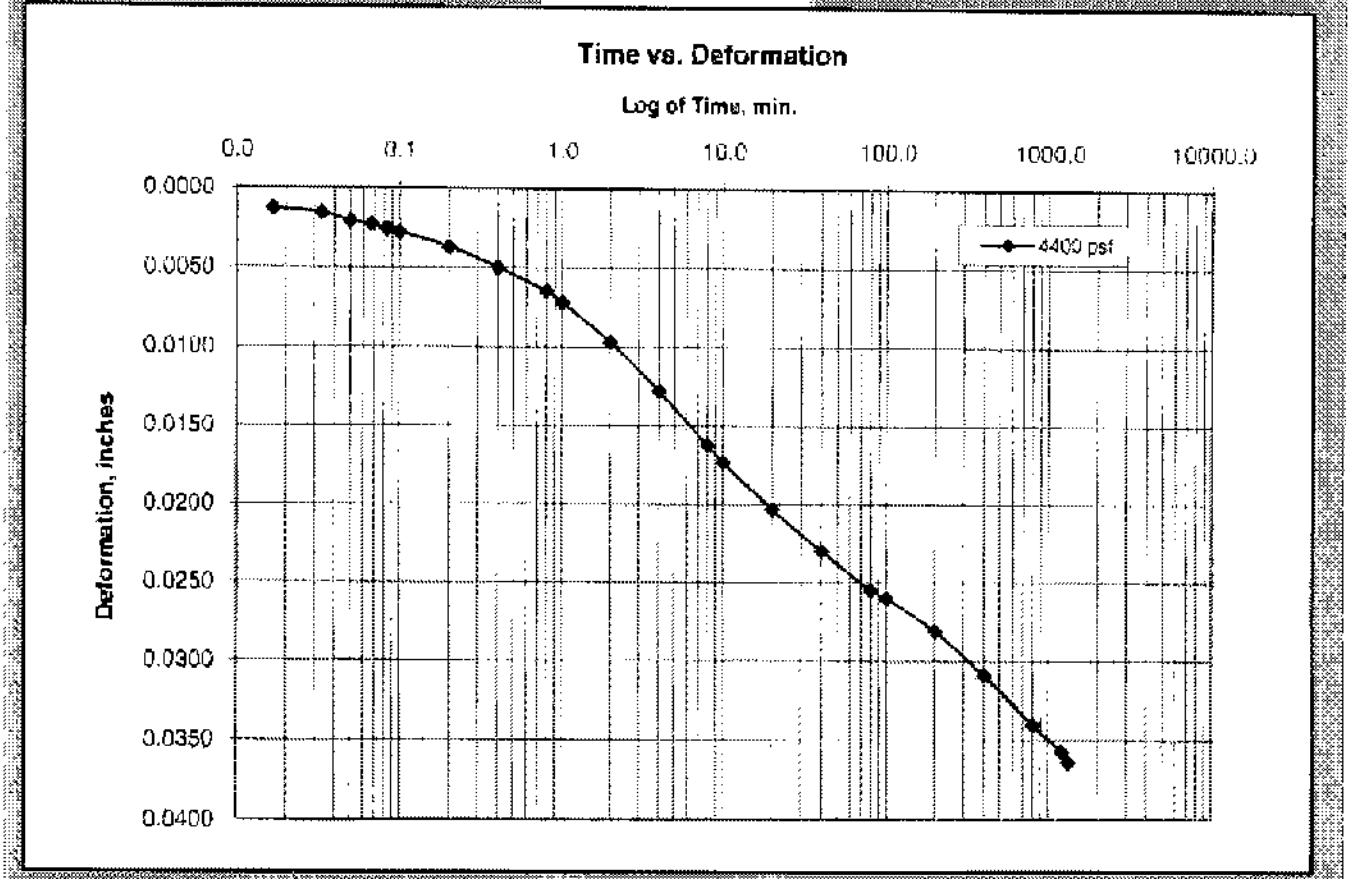


2200 PSF

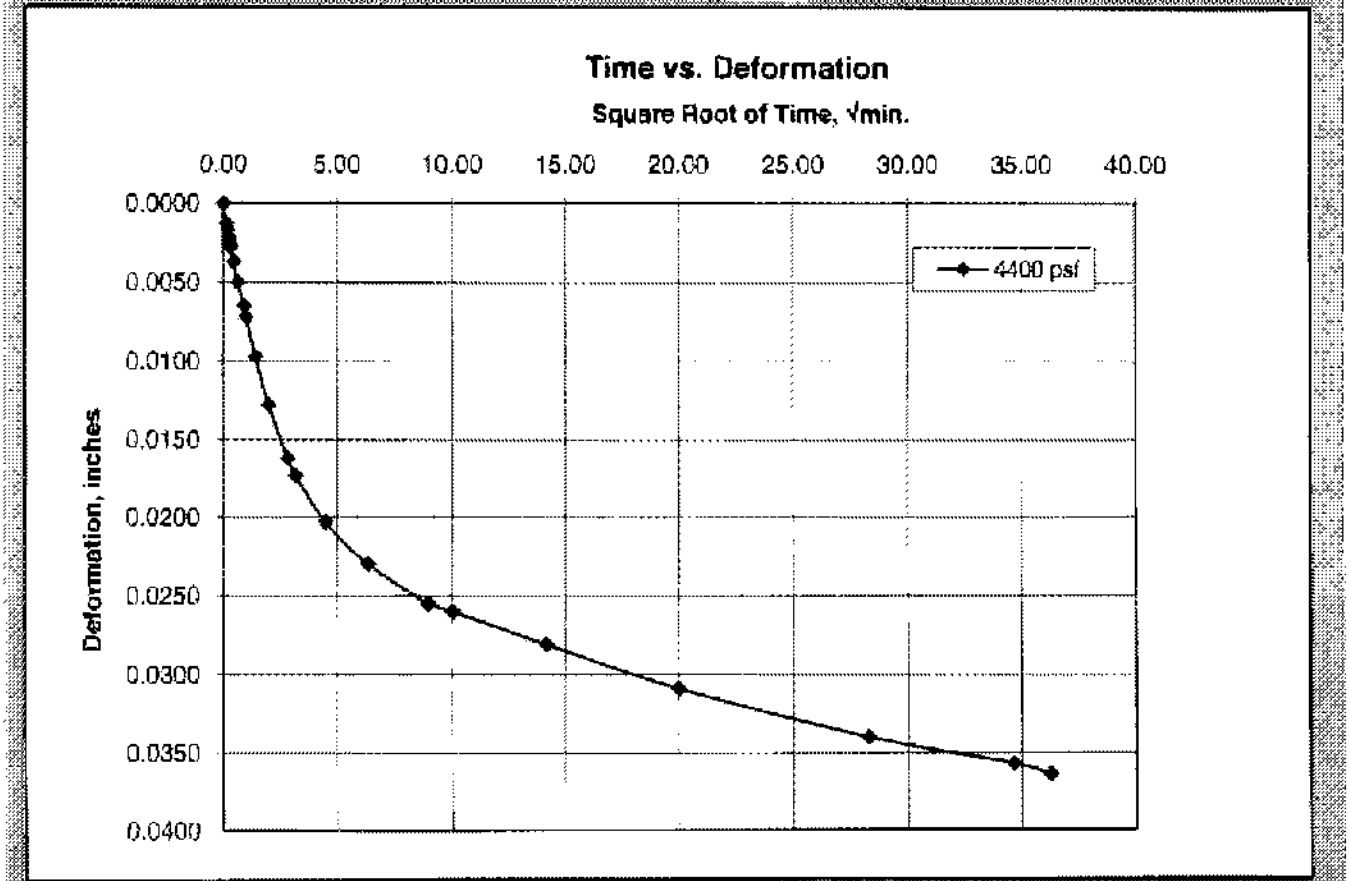


Cooper Testing Labs, Inc.

Load 9 — 4400 PSF



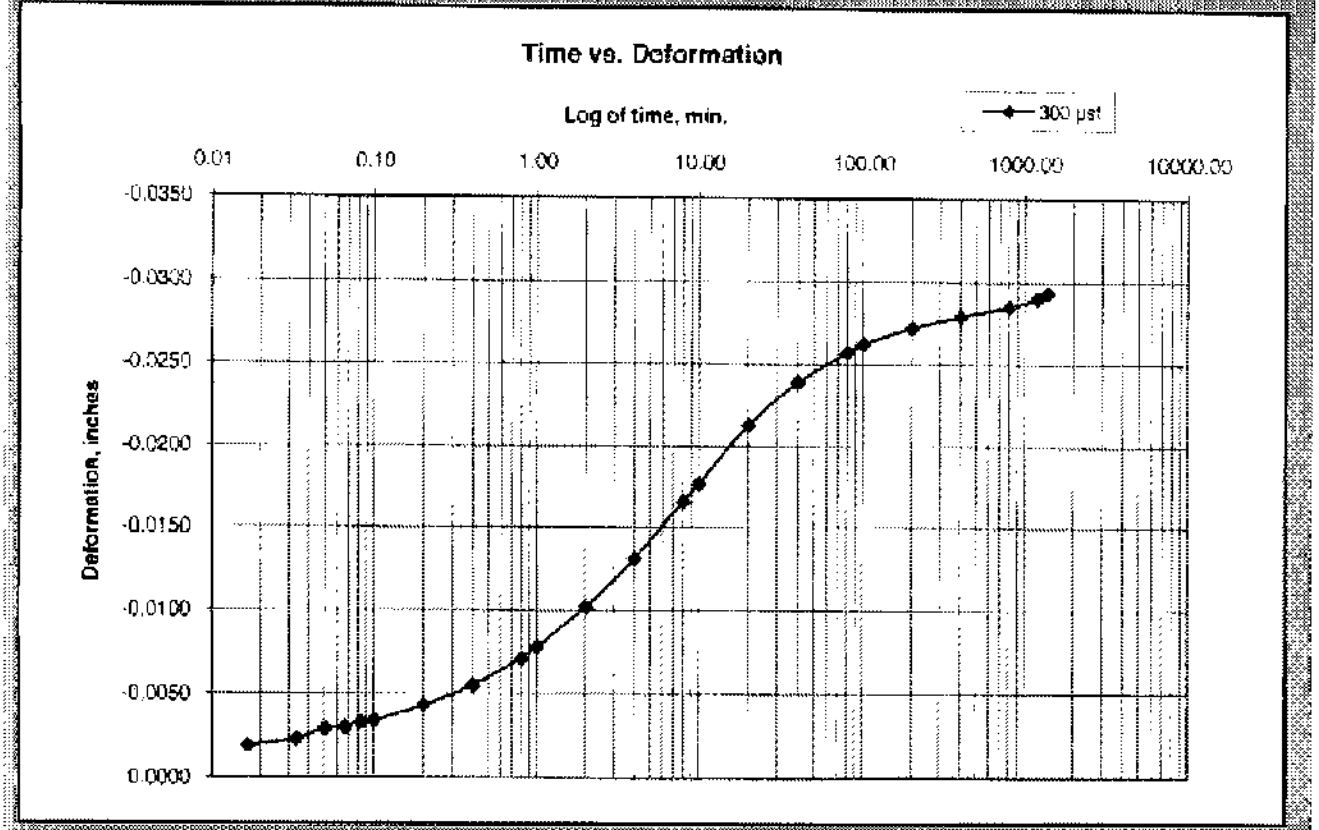
4400 PSF



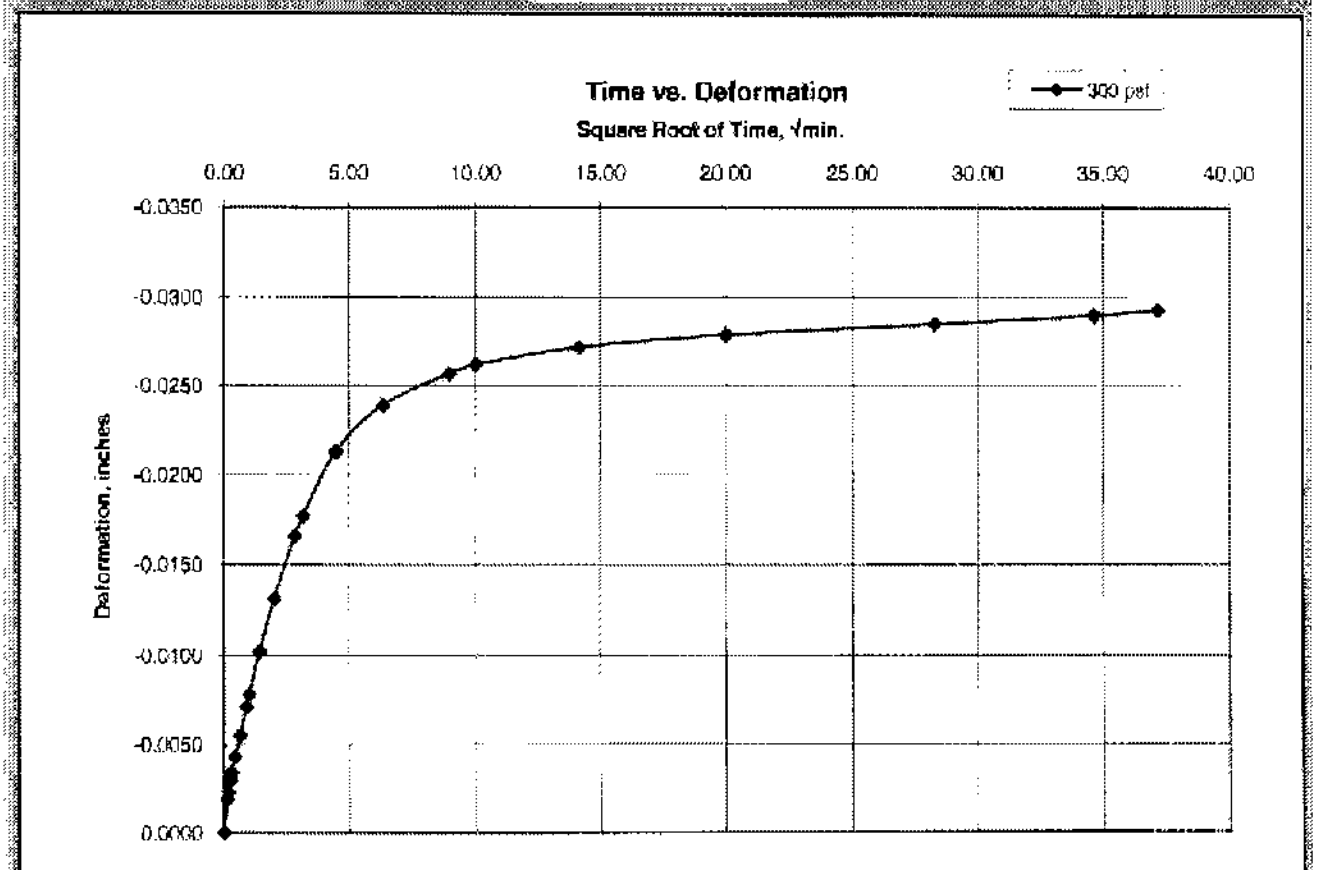
Cooper Testing Labs, Inc.

Load 10

300 PSF



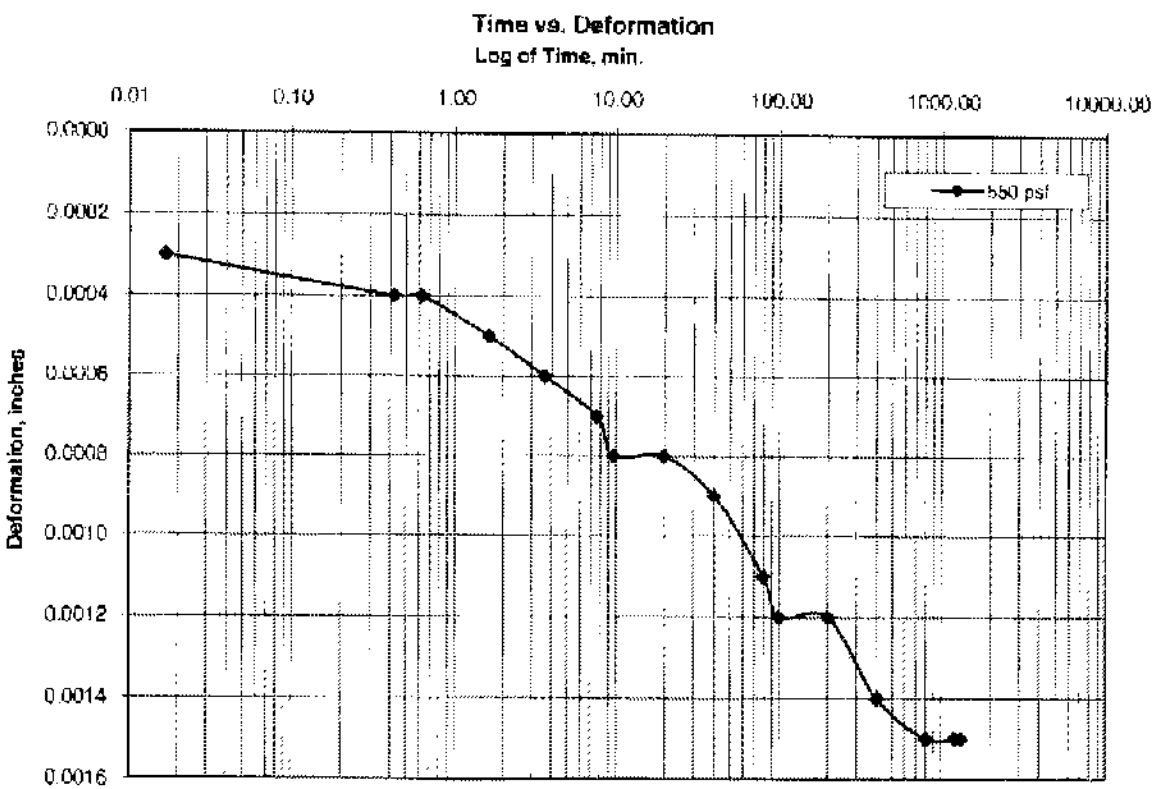
300 PSF



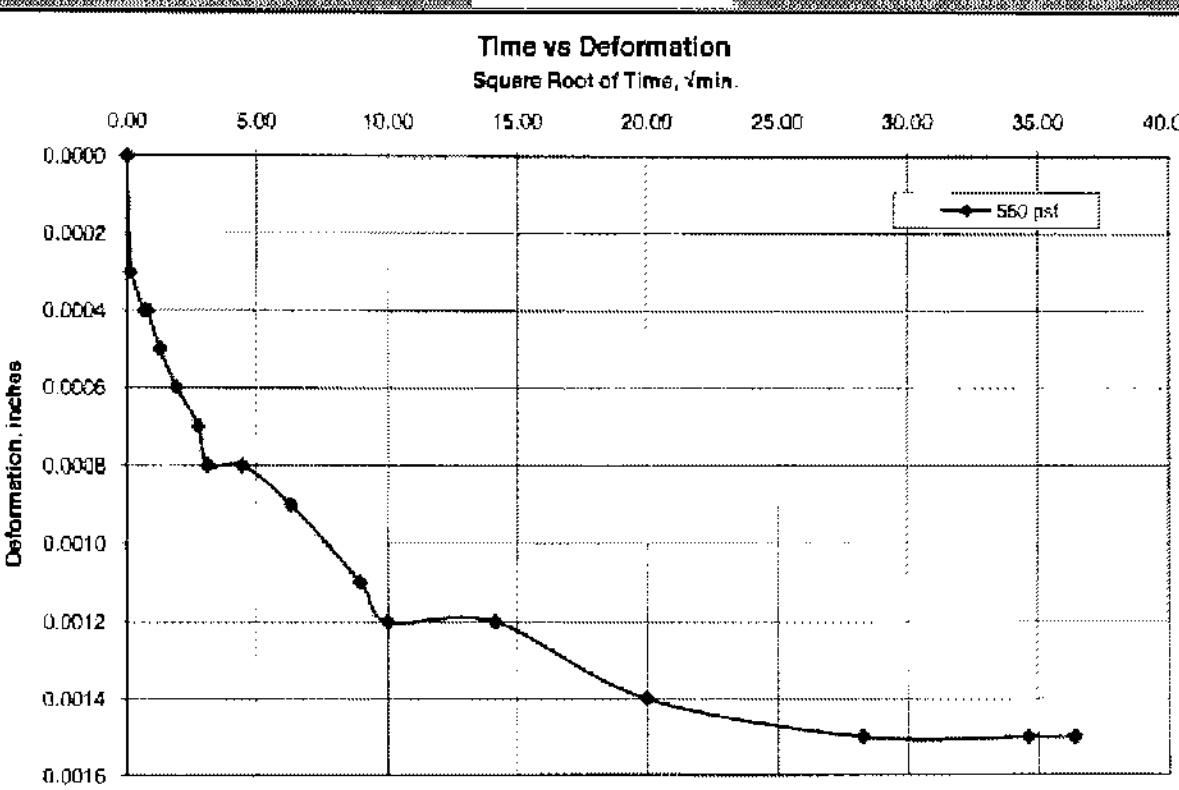
Cooper Testing Labs, Inc.

Load 11

550 PSF

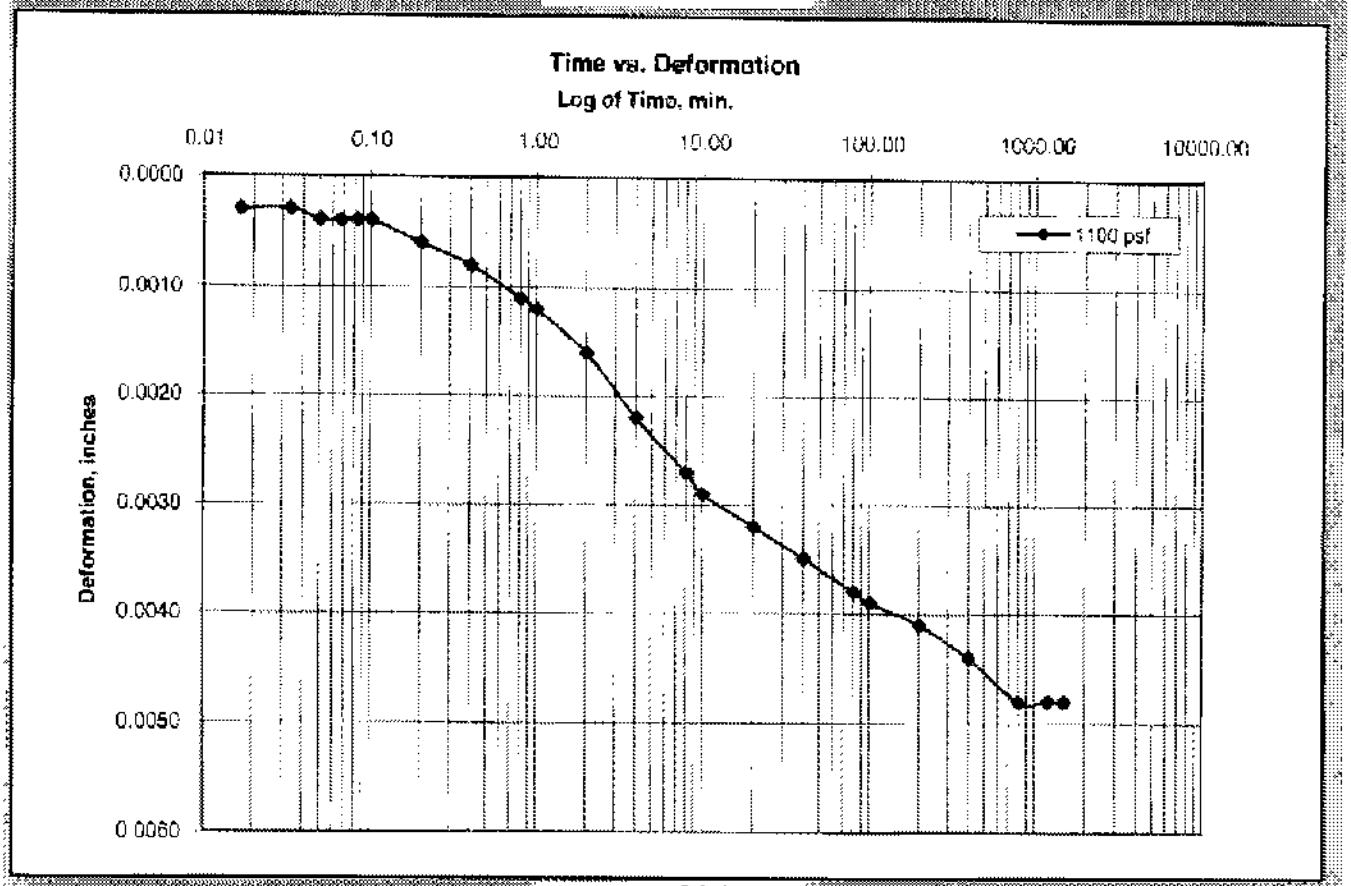


550 PSF

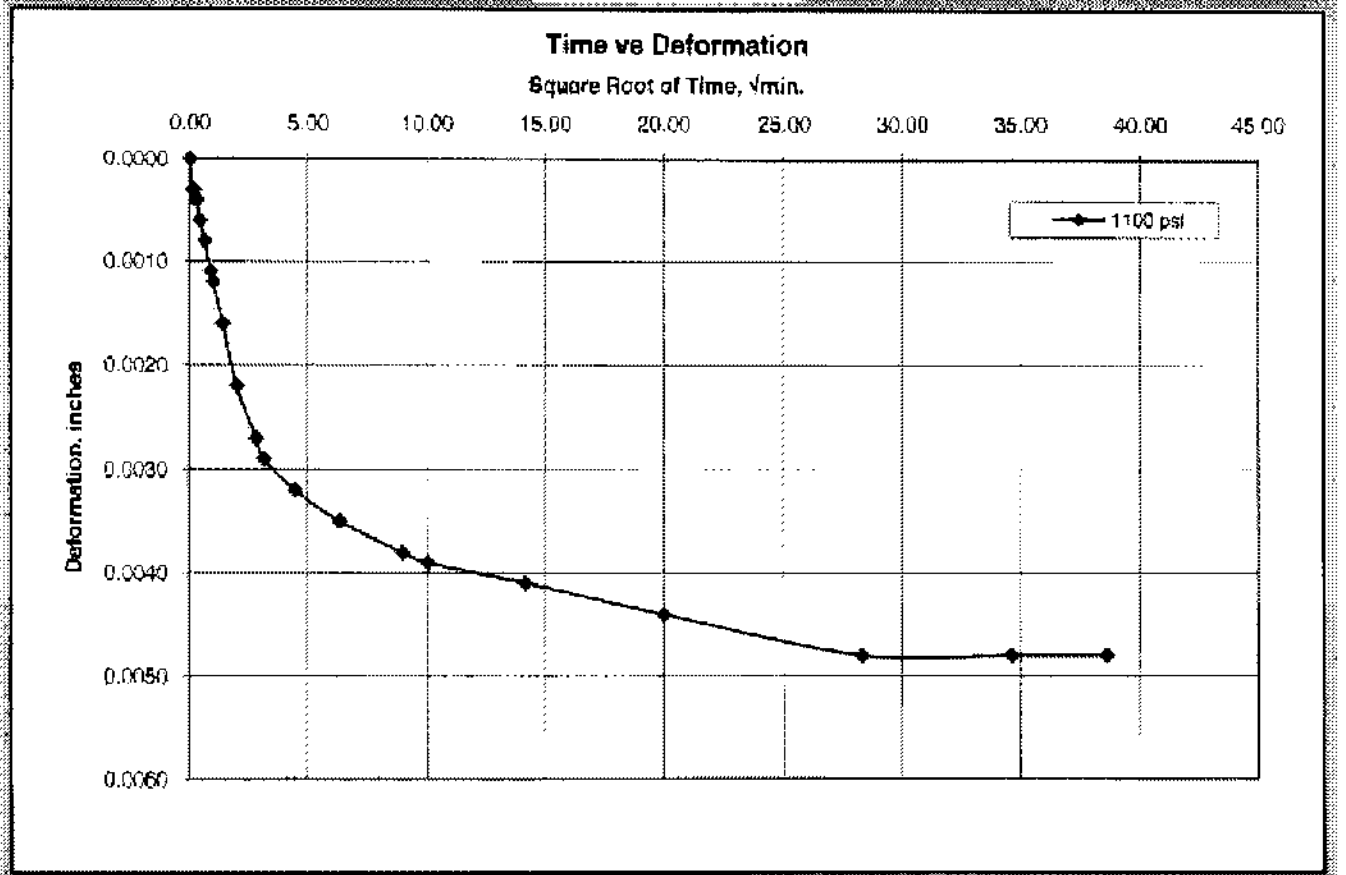


Cooper Testing Labs, Inc.

Load 12 — 1100 PSF

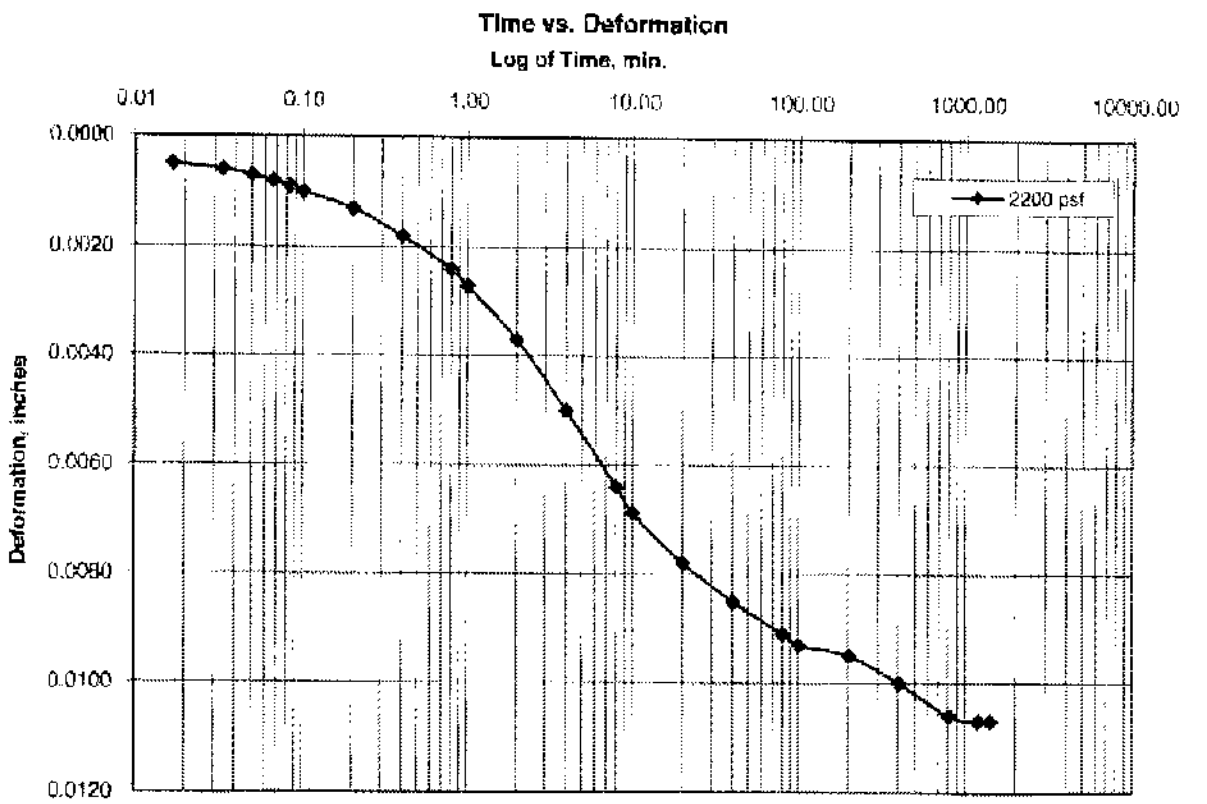


1100 PSF

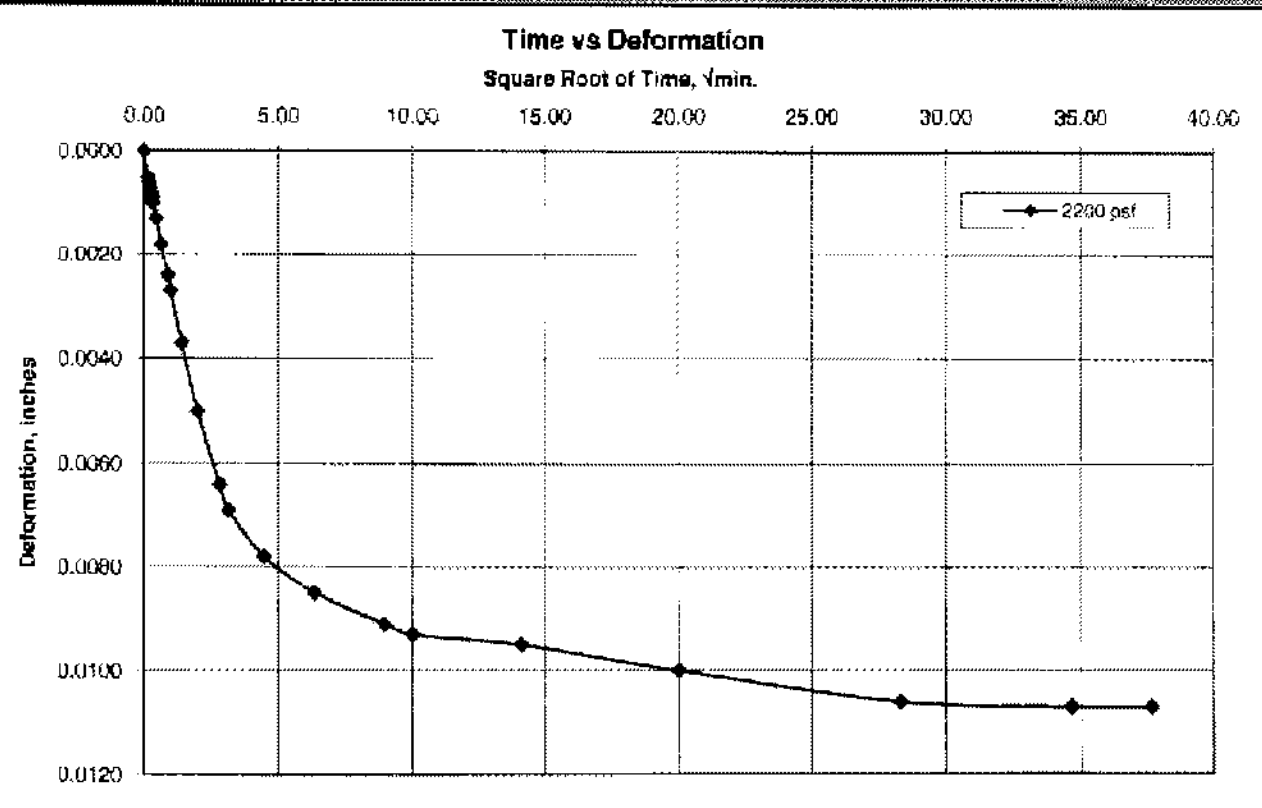


Cooper Testing Labs, Inc.

Load 13 — 2200 PSF

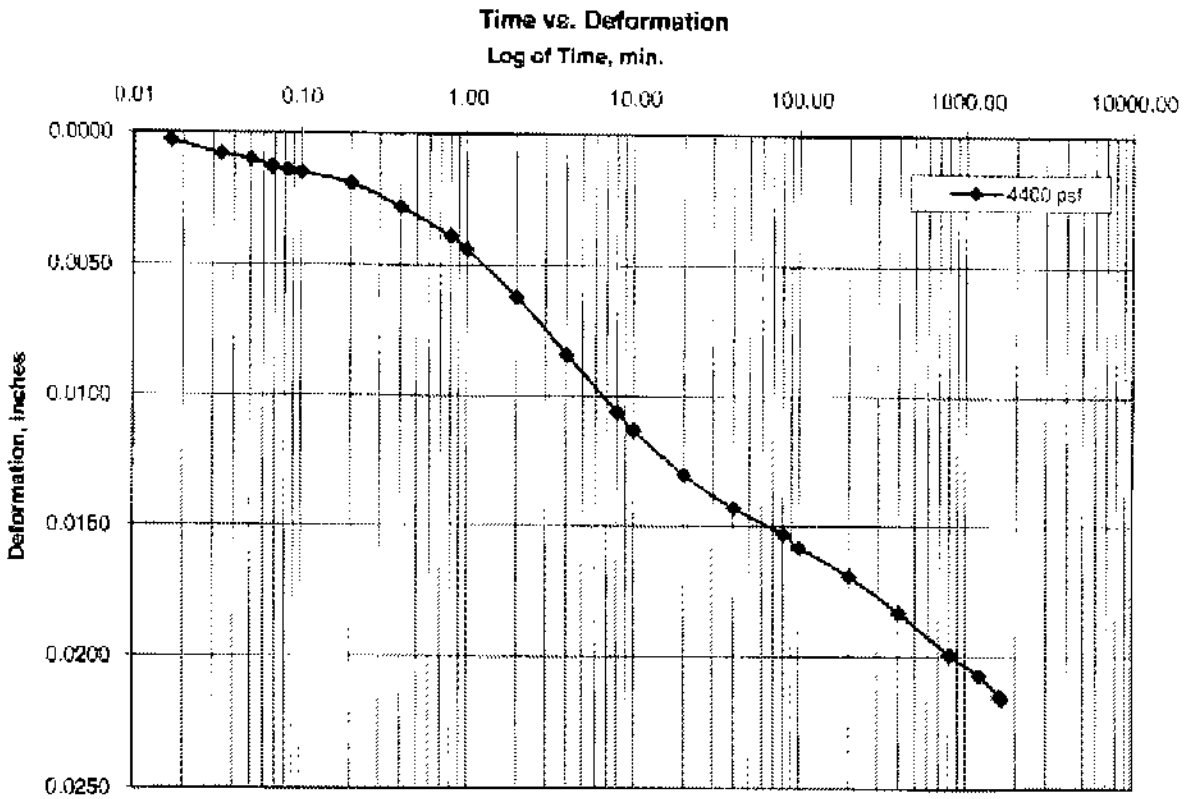


2200 PSF

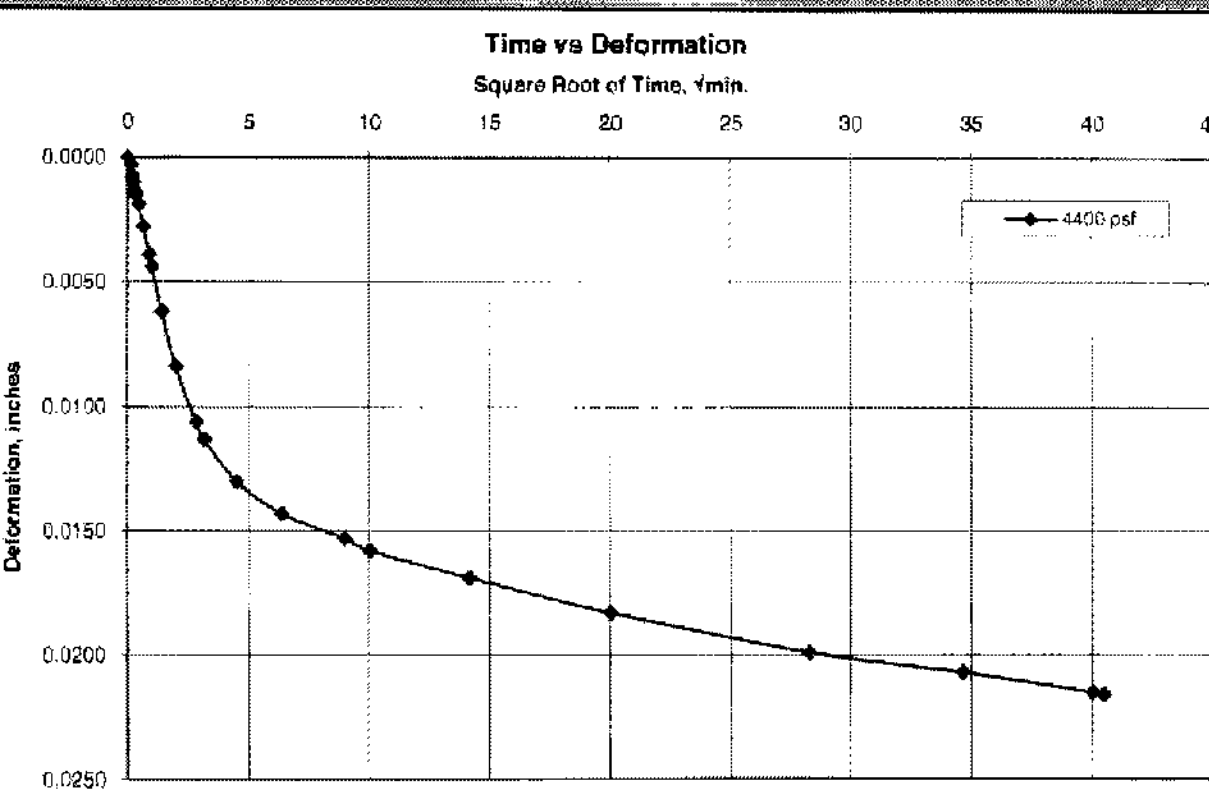


Cooper Testing Labs, Inc.

Load 14 — 4400 PSF



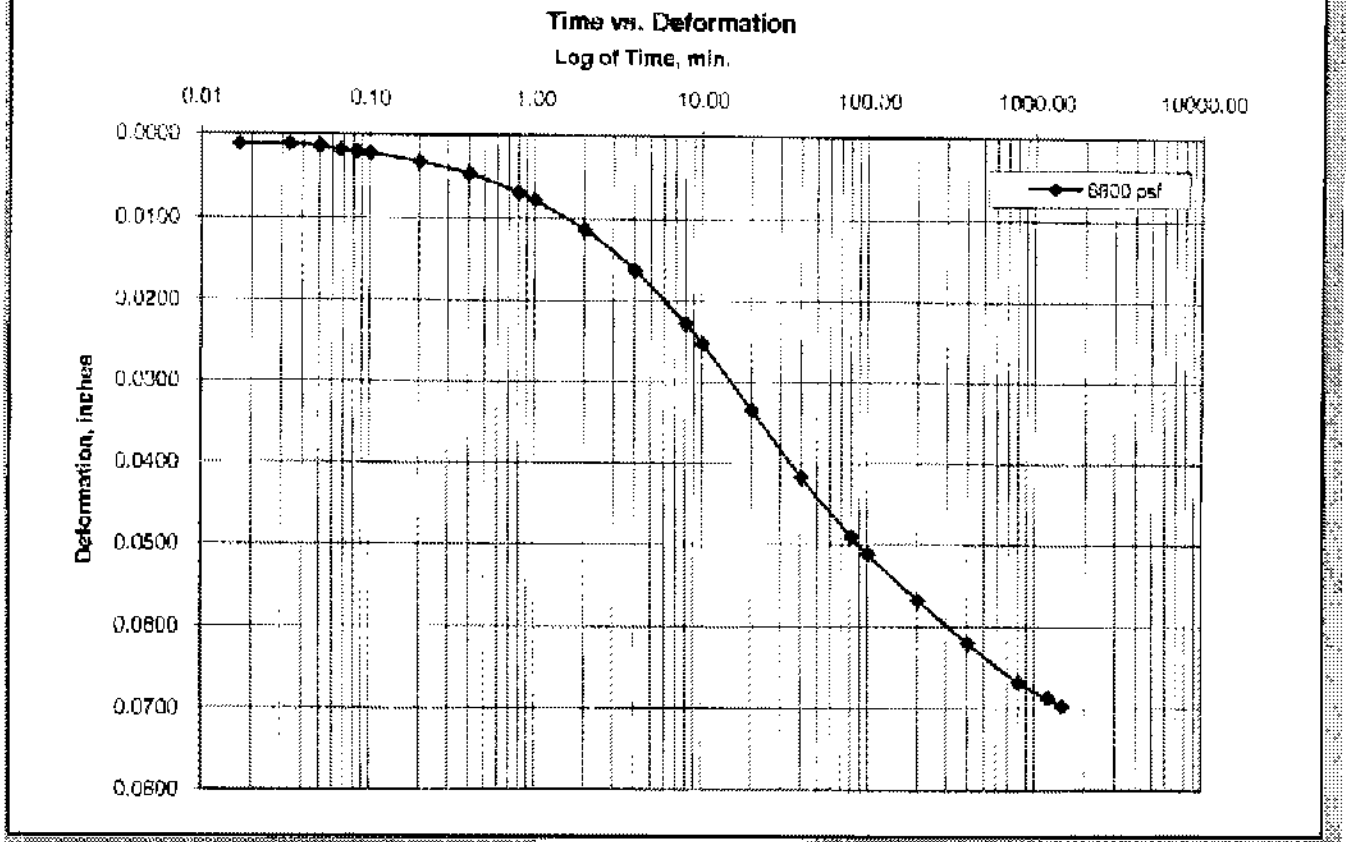
4400 PSF



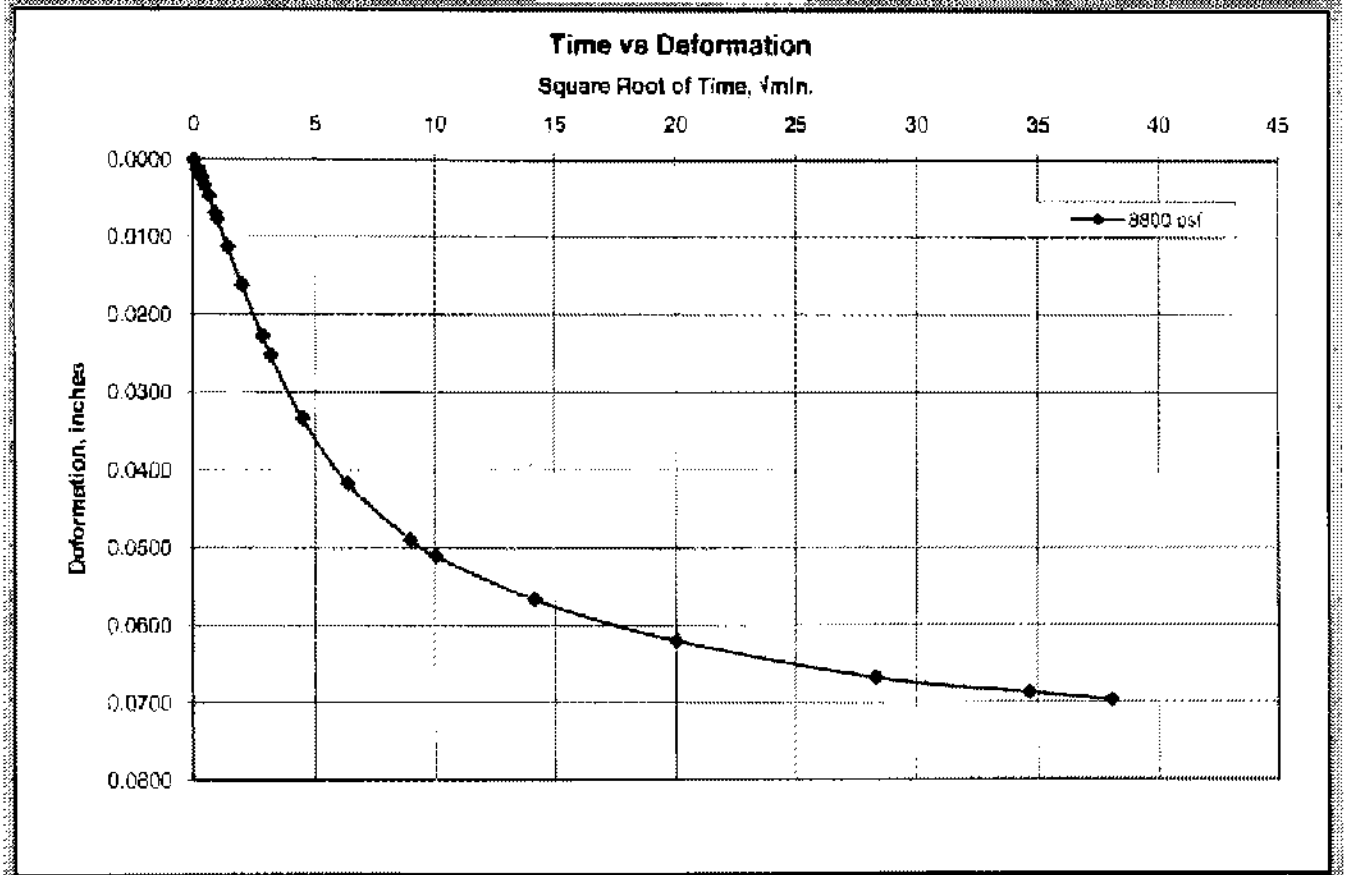
Cooper Testing Labs, Inc.

Load 15

8800 PSF

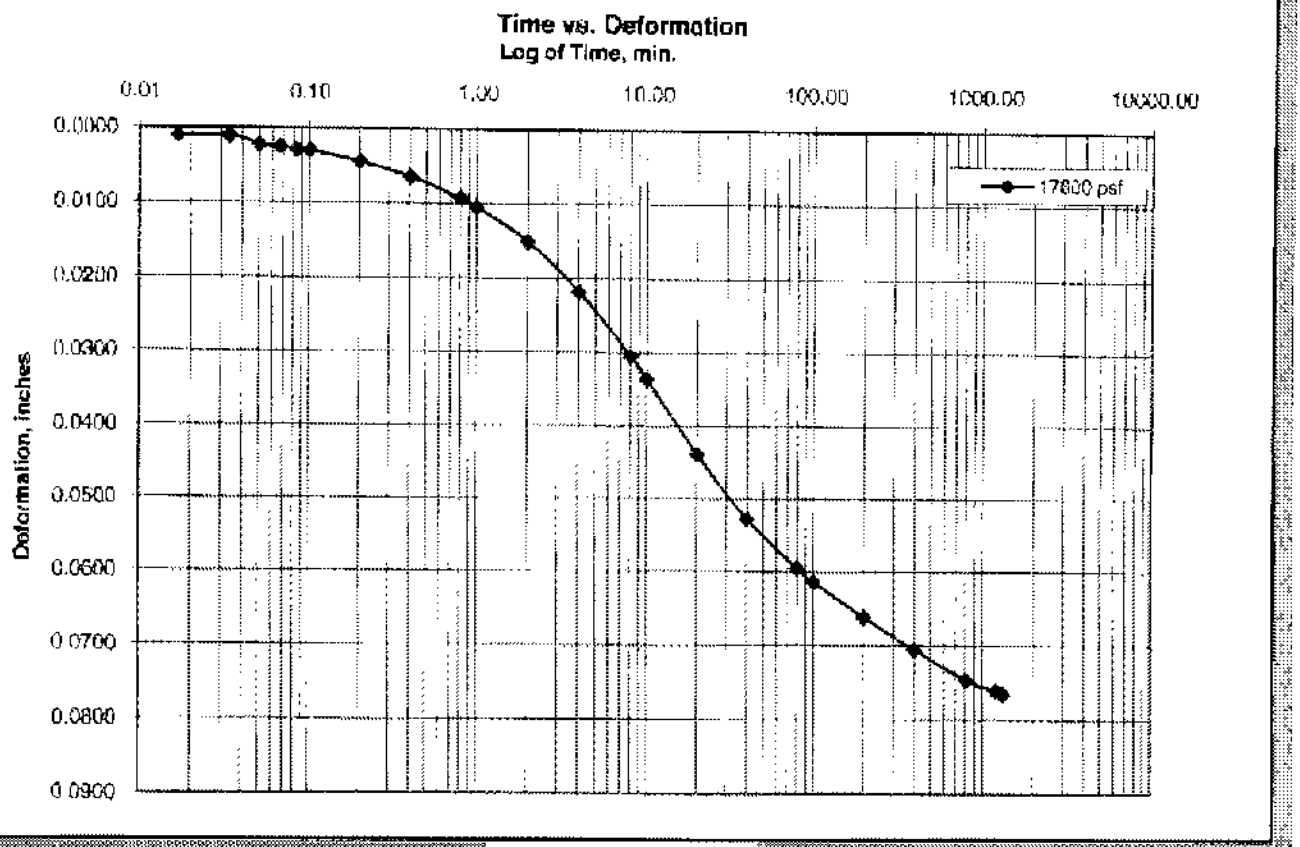


8800 PSF

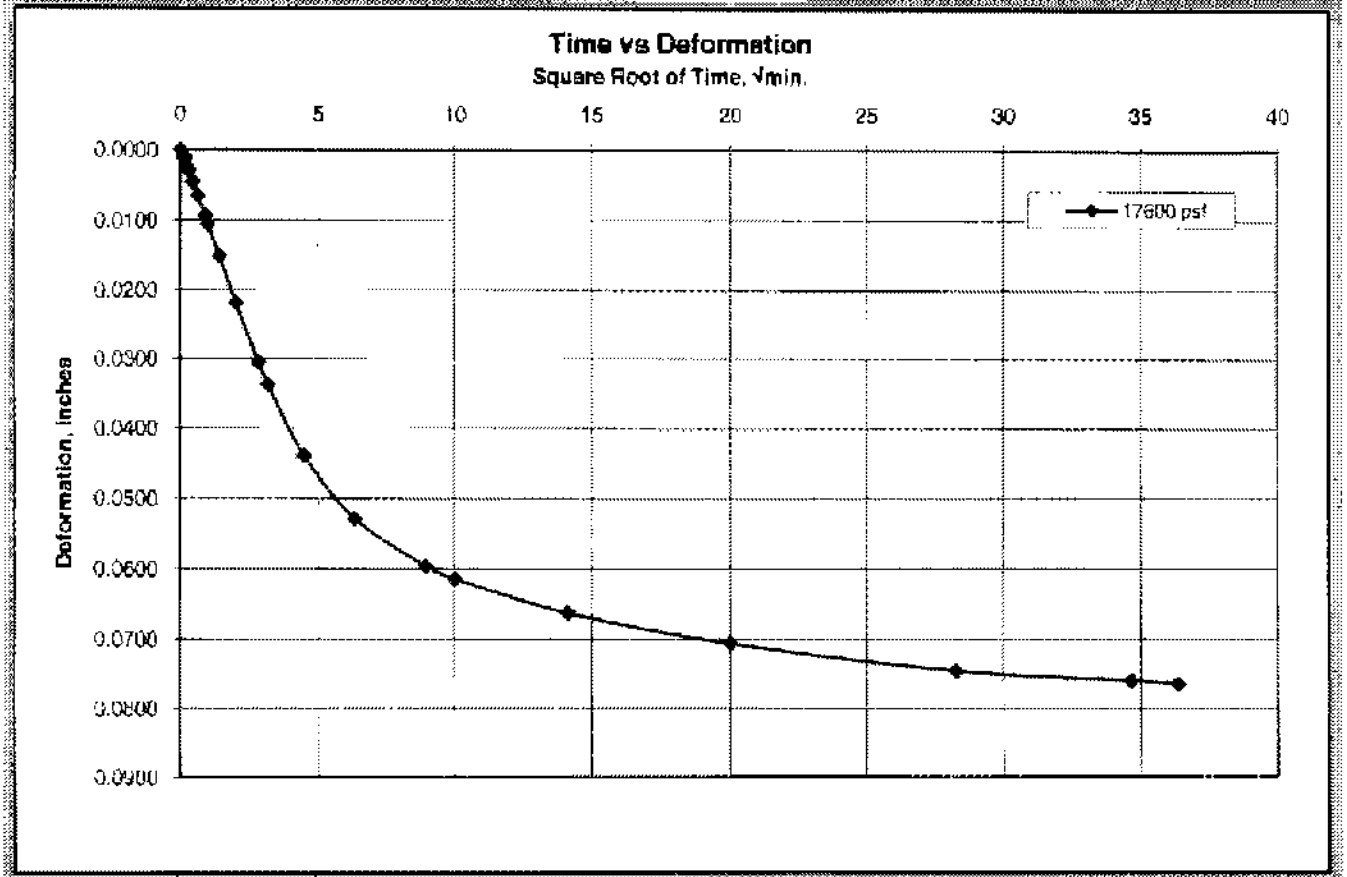


Cooper Testing Labs, Inc.

Load 16 — 17600 PSF

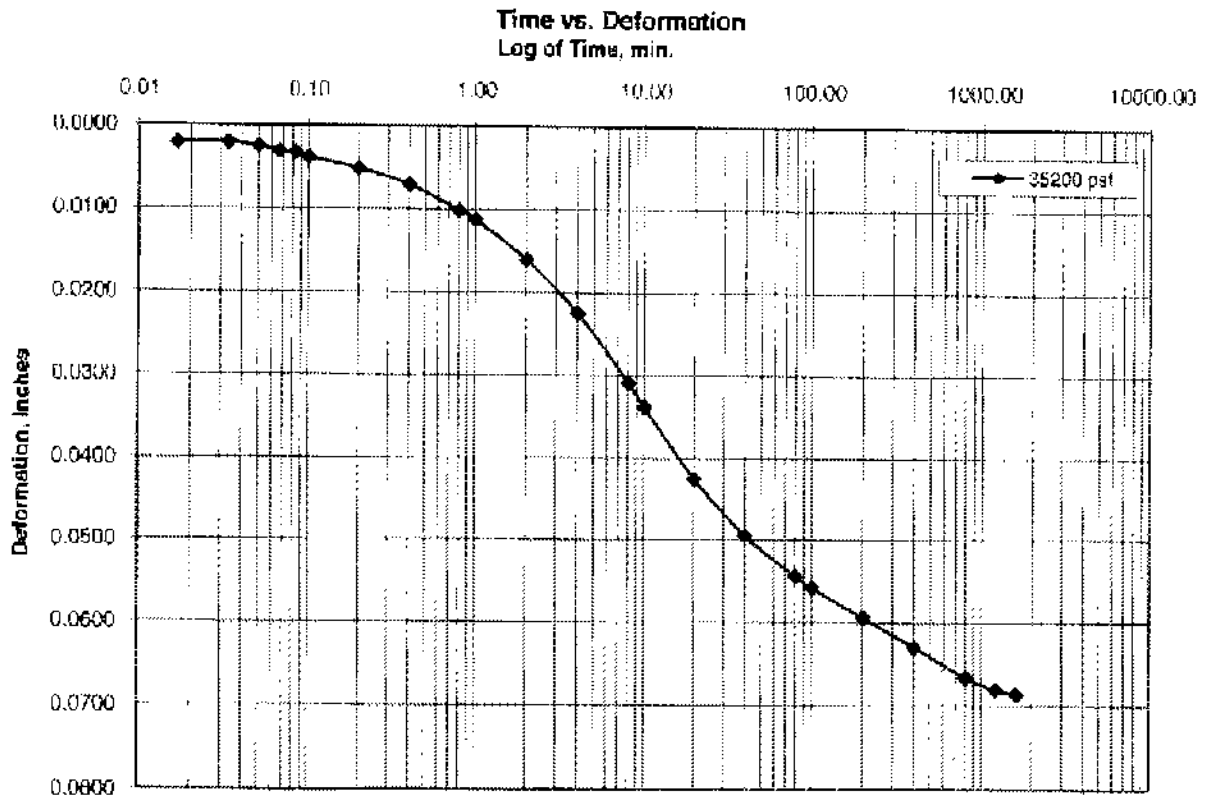


17600 PSF

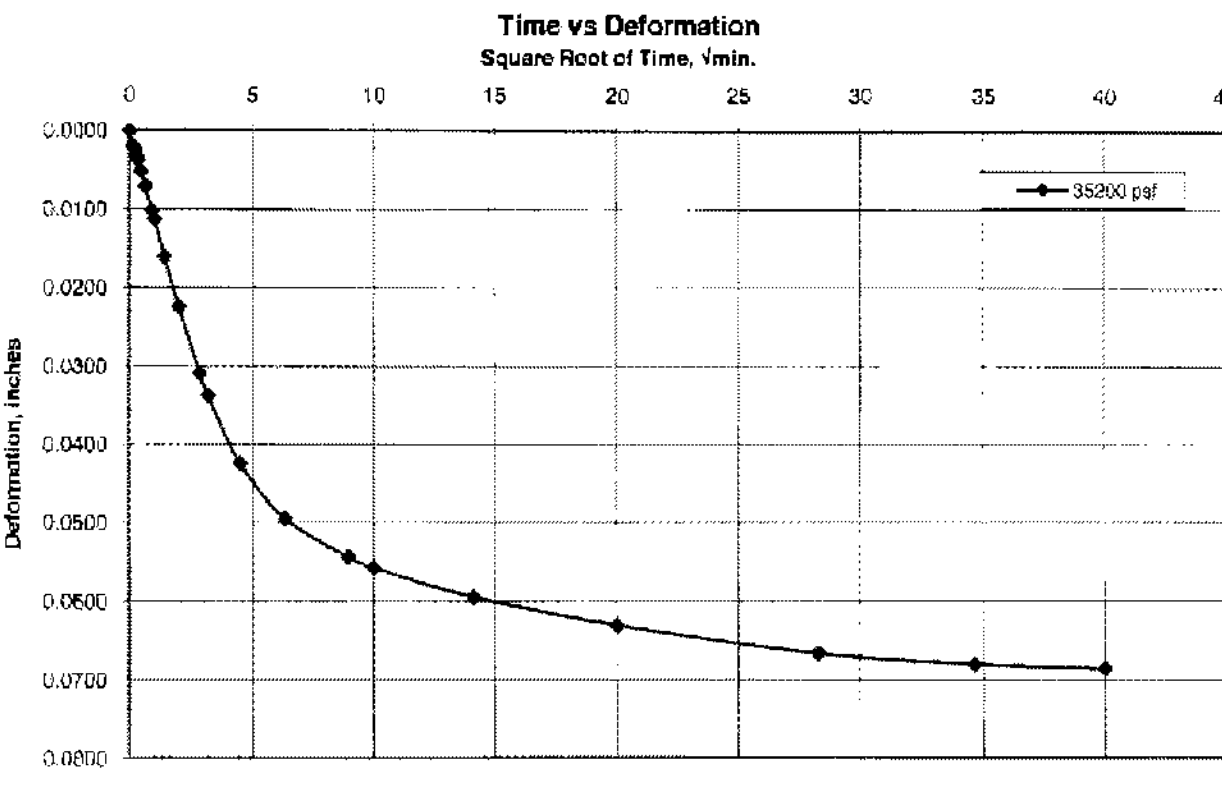


Cooper Testing Labs, Inc.

Load 17 — 35200 PSF

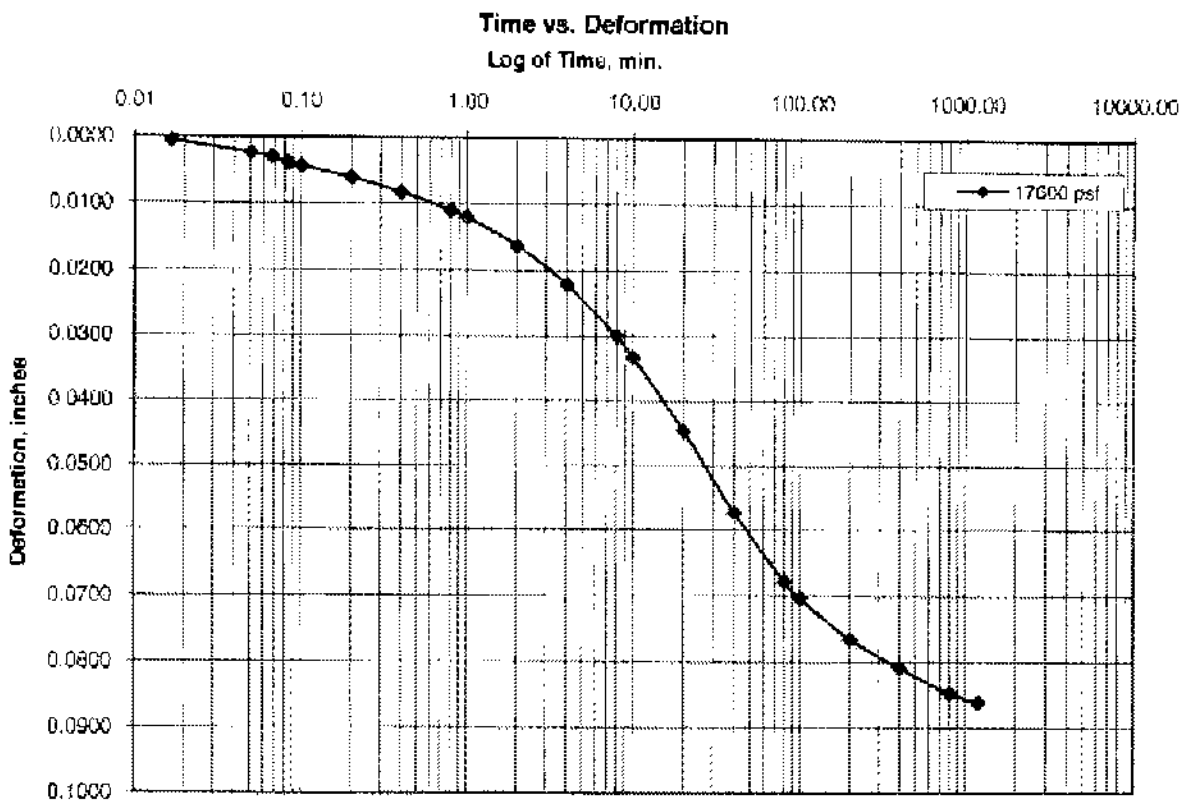


35200 PSF

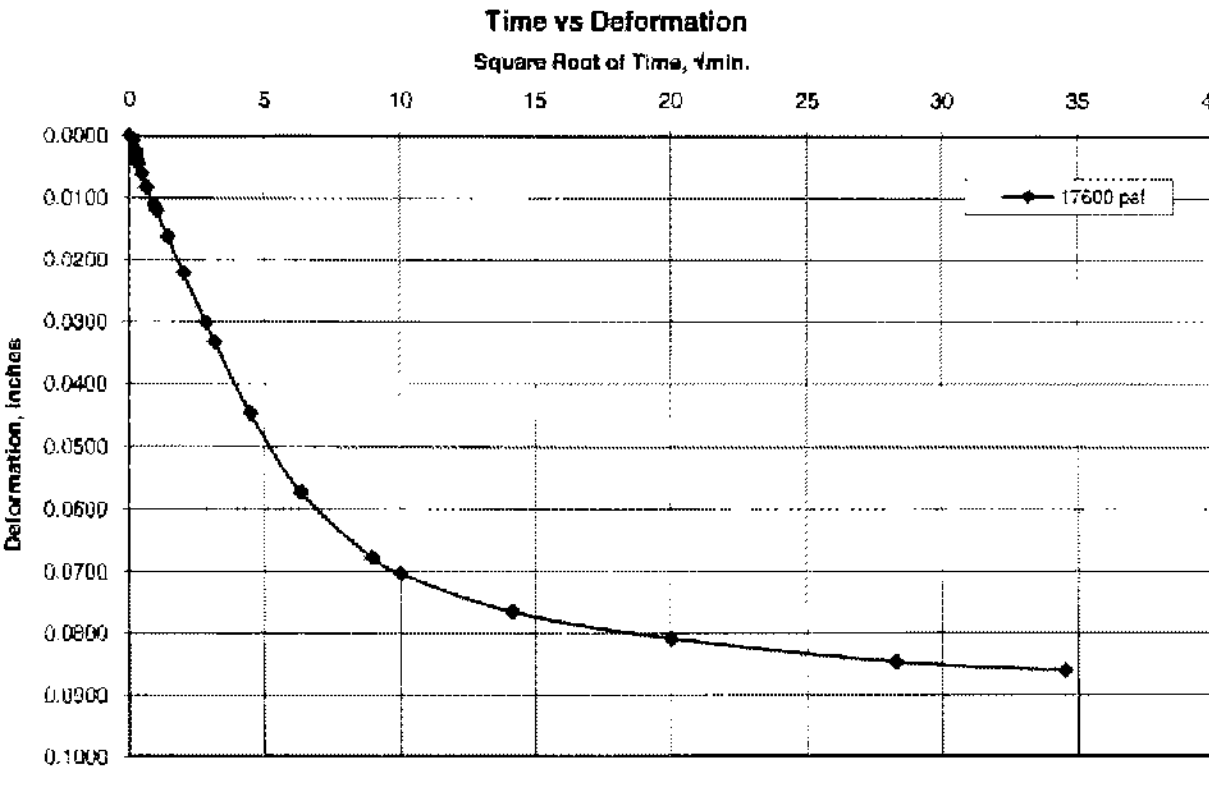


Cooper Testing Labs, Inc.

Load 16 — 17600 PSF



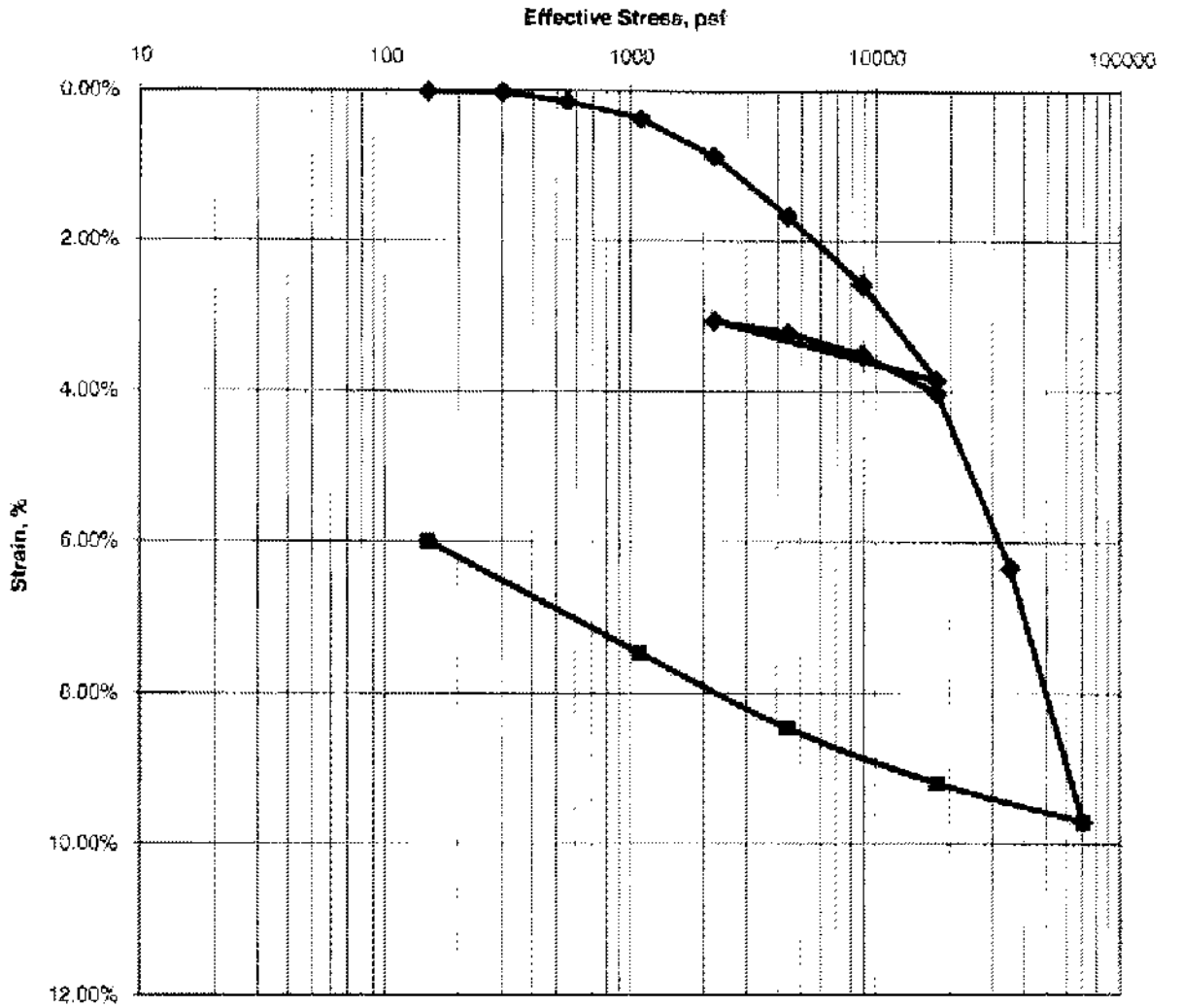
17600 PSF



Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-04	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S4-4	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	175-178	**Checked:**	PJ/DC
Soil Type:	Olive Gray Sandy Lean CLAY			**Date:**	6/26/2008

Strain-Log-P Curve



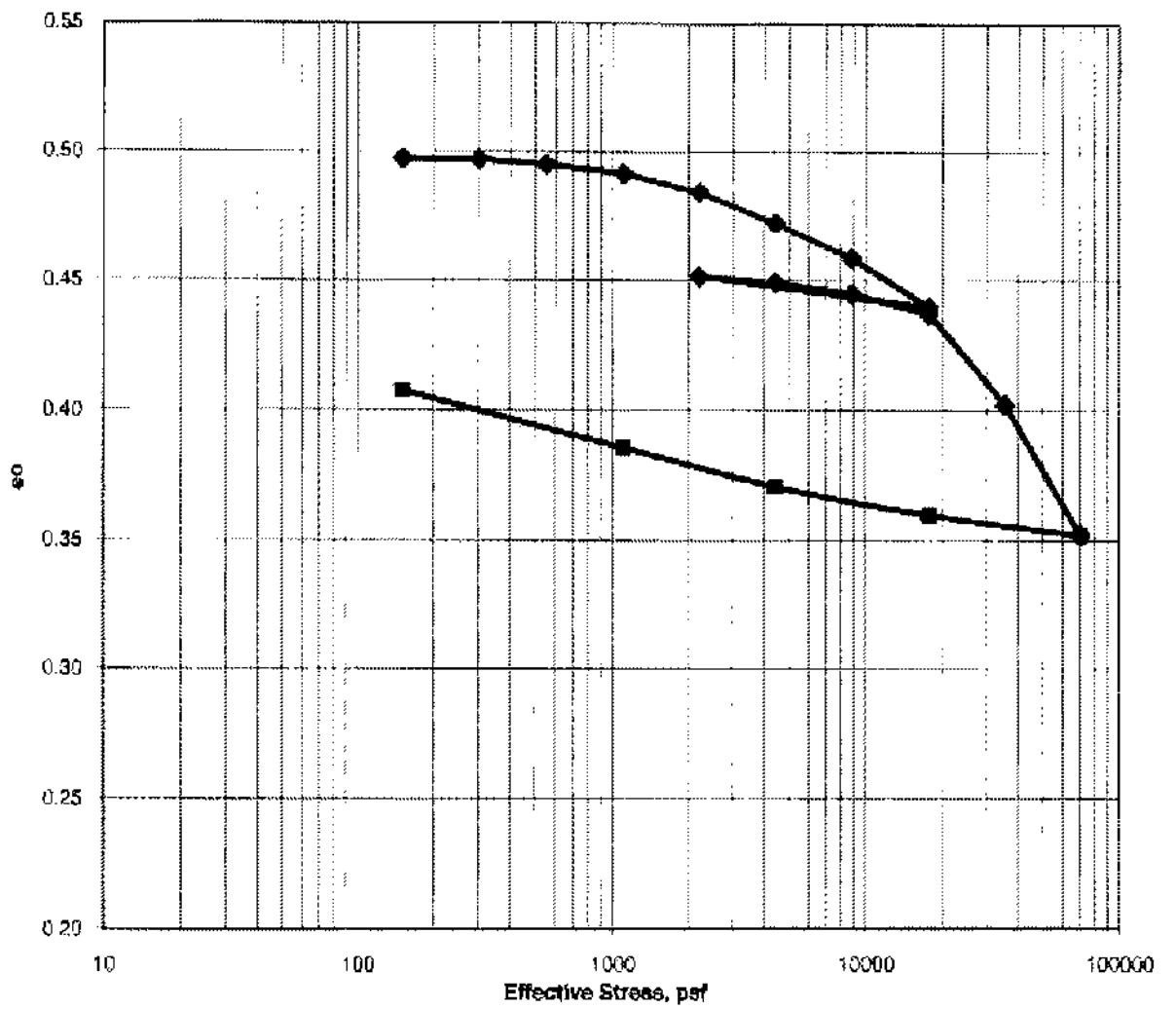
Ass. Gs = 2.75	Initial	Final
Moisture %:	16.9	15.5
Dry Density, pcf:	114.7	120.5
Void Ratio:	0.496	0.425
% Saturation:	93.6	100

Remarks:

Consolidation Test
ASTM D2435

Job No.:	461-063	**Boring:**	GS08-04	**Run By:**	MD
Client:	Geosyntec Consultants	**Sample:**	S4-4	**Reduced:**	PJ
Project:	Brisbane Project	**Depth, ft.:**	175-178	**Checked:**	PJ/DC
Soil Type:	Olive Gray Sandy Lean CLAY			**Date:**	6/26/2008

eo-Log-P Curve



Ass. Gs = 2.75	Initial	Final
Moisture %:	16.9	15.5
Dry Density, pcf:	114.7	120.5
Void Ratio:	0.496	0.425
% Saturation:	93.6	100

Remarks:

CTL Job No.:	461-063
Client:	Geosyntec Consultants
Client Project:	Brisbane Project
Boring	GS08-04
Sample:	S4-4
Depth, ft.:	175-178
Date:	6/26/2008
Run By:	MD
Reduced By:	PJ
Checked By:	PJ/DC
Soil Description:	Olive Gray Sandy Lean CLAY

Moisture Density Data Entry Screen

	Initial	Final
Height	1.00	0.9529
Diameter	2.41	2.41
Total Wet Weight	160.6	158.7
Wt of Wet Soil & Dish		225
Wt of Dry Soil & Dish		203.7
Wt. Of Dish		21.7
Wt of Ring		44.6
Moisture %	16.9	15.5
Wet Density, pcf	134.1	139.1
Dry Density, pcf	114.7	120.5
Specific Gravity	2.75	2.75
Area	4.6	4.6
V ft3	0.0	0.0
Vt, cc	74.8	71.3
Vs, cc	50.0	50.0
Vv, cc	24.8	21.3
e	0.5	0.4
porosity, %	33.2	29.8
S, %	93.8	100

Loading Increments — **Void Ratio**

Increment #	Load, psf psf	Dial .0001"	Load psf	Height Delta h	Volume Vt cc	Voids Vv	Void Ratio e
1	150	0.0001	150	0.9999	74.80	24.840	0.497
2	300	0.0002	300	0.9998	74.80	24.833	0.497
3	550	0.0015	550	0.9985	74.70	24.736	0.495
4	1100	0.0039	1100	0.9961	74.52	24.556	0.491
5	2200	0.0088	2200	0.9912	74.15	24.189	0.484
6	4400	0.0168	4400	0.9832	73.55	23.591	0.472
7	8800	0.0258	8800	0.9742	72.88	22.918	0.459
8	17600	0.0385	17600	0.9615	71.93	21.966	0.440
9	2200	0.0306	2200	0.9694	72.52	22.559	0.451
10	4400	0.0322	4400	0.9678	72.40	22.4383	0.449103
11	8800	0.0351	8800	0.9649	72.19	22.2219	0.444761
12	17600	0.0402	17600	0.9598	71.80	21.8404	0.437125
13	35200	0.0695	35200	0.9305	70.06	20.0072	0.402237
14	70400	0.0971	70400	0.9029	67.55	17.5936	0.351928
15		0.0971	#N/A	0.9029	67.55	17.5936	0.351928
16		0.0971	#N/A	0.9029	67.55	17.5936	0.351928
17		0.0971	#N/A	0.9029	67.55	17.5936	0.351928
18		0.0971	#N/A	0.9029	67.55	17.5936	0.351928
19		0.0971	#N/A	0.9029	67.55	17.5936	0.351928

Rebound Increments — **Void Ratio**

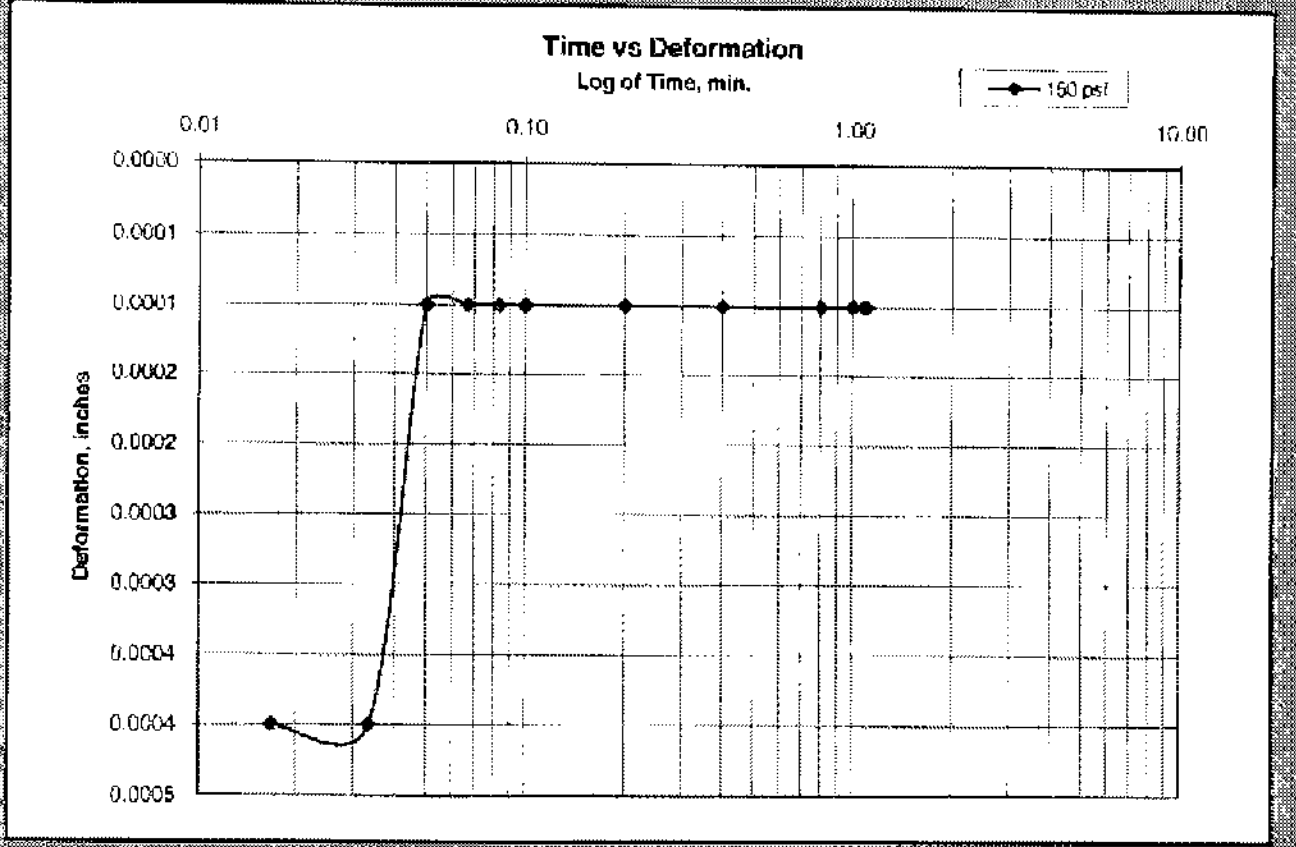
15	70400	0.0971	70400	0.9029	67.55	17.5936	0.351928
16	17600	0.0919	17600	0.9081	67.94	17.9726	0.359514
17	4400	0.0846	4400	0.9154	68.49	18.5167	0.370434
18	1100	0.0747	1100	0.9253	69.22	19.2984	0.386067
19	150	0.0600	150	0.9400	70.32	20.3591	0.407278
20			#N/A	1.0000	74.81	24.8479	0.497317
	Tot Dry Wt	137.4000					

The data to the left is used to determine the theoretical

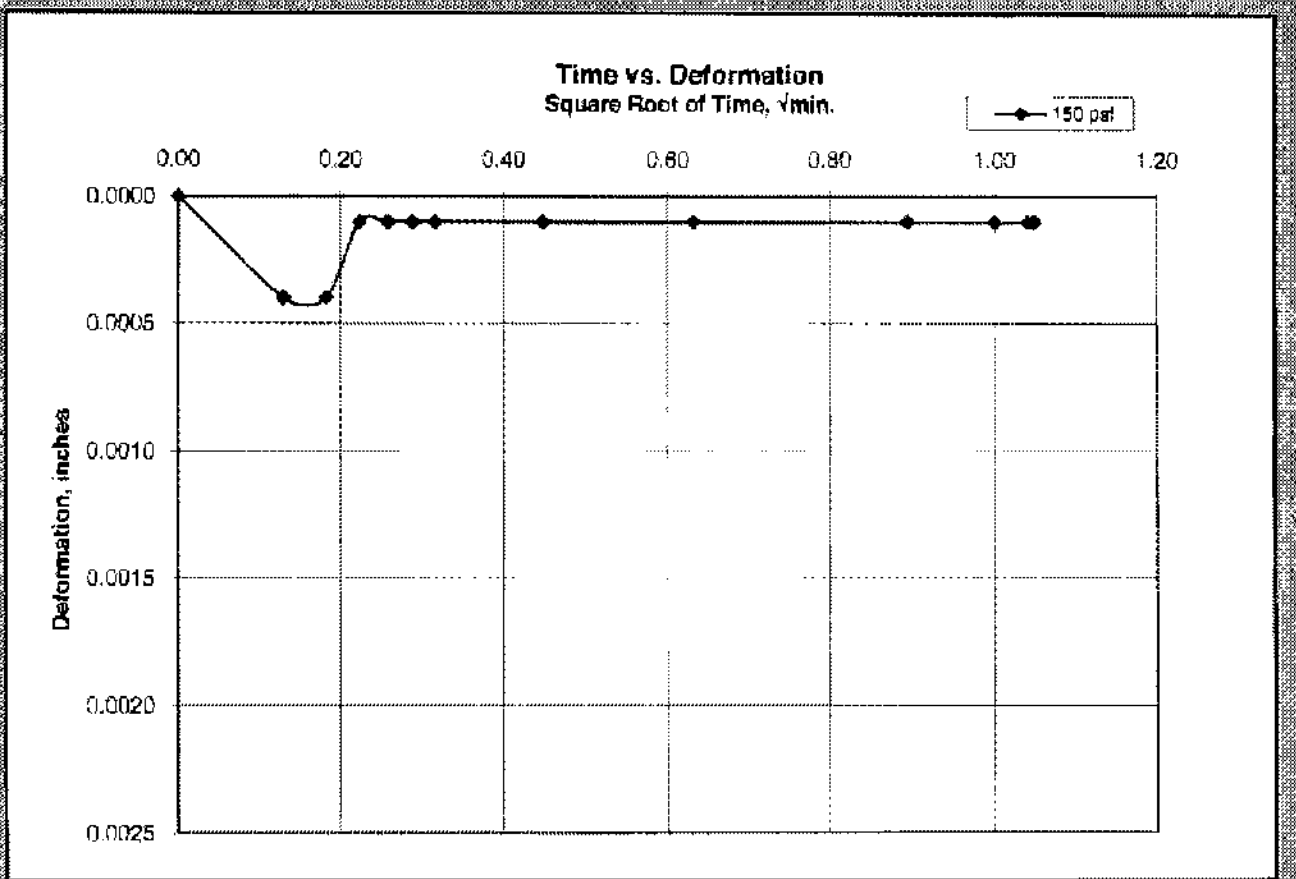
Cooper Testing Labs, Inc.

Load 1

150 PSF



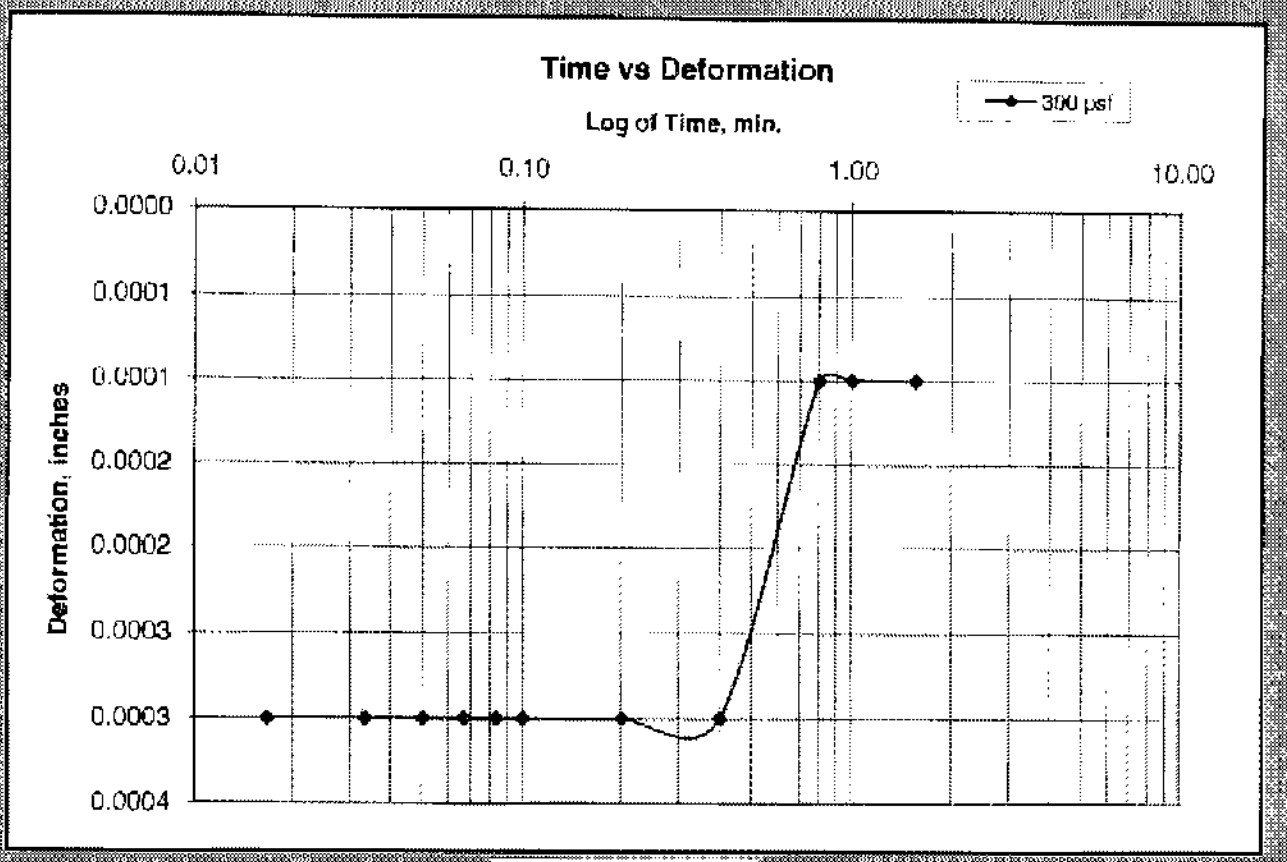
150 PSF



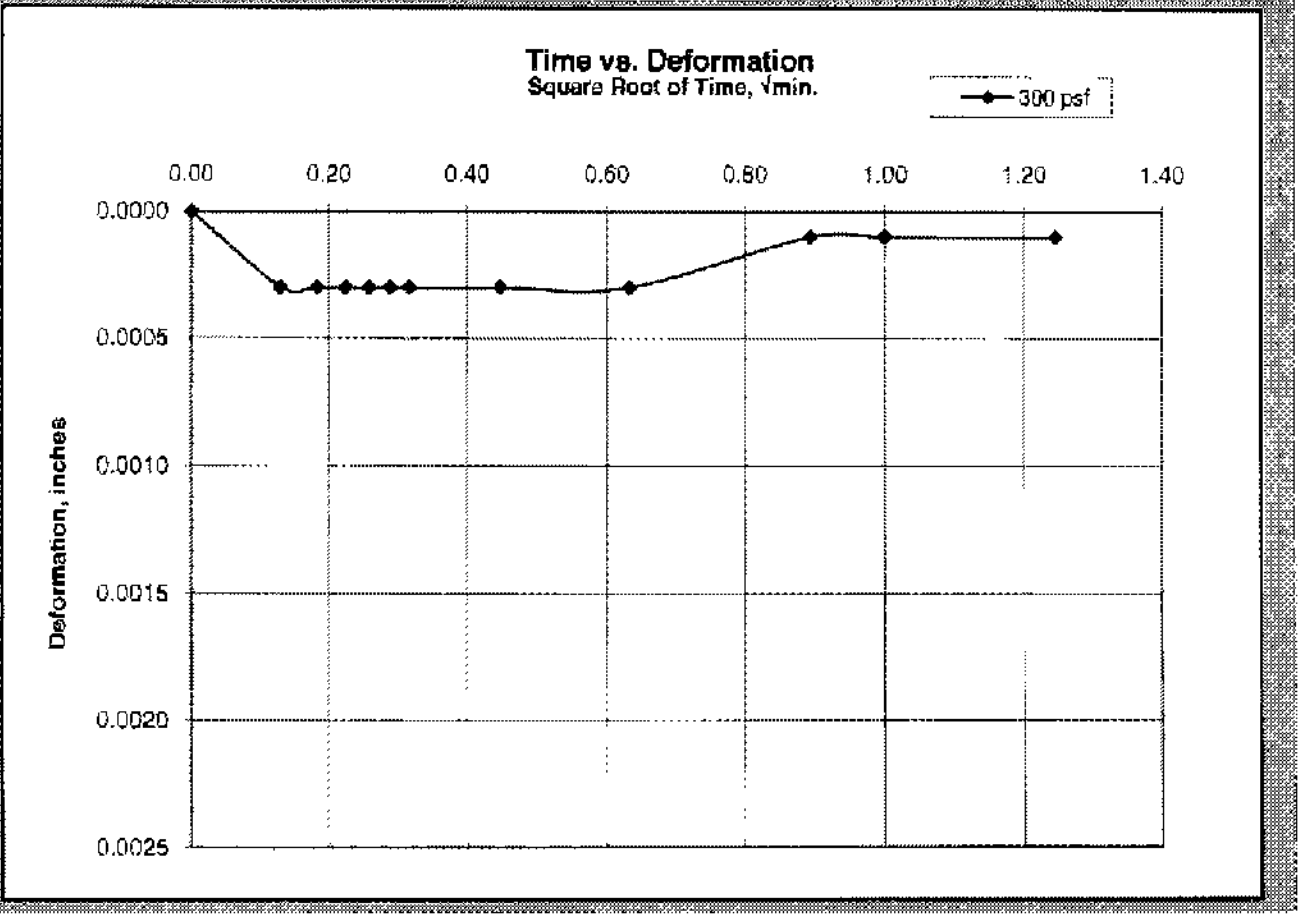
Cooper Testing Labs, Inc.

Load 2

300 PSF



300 PSF



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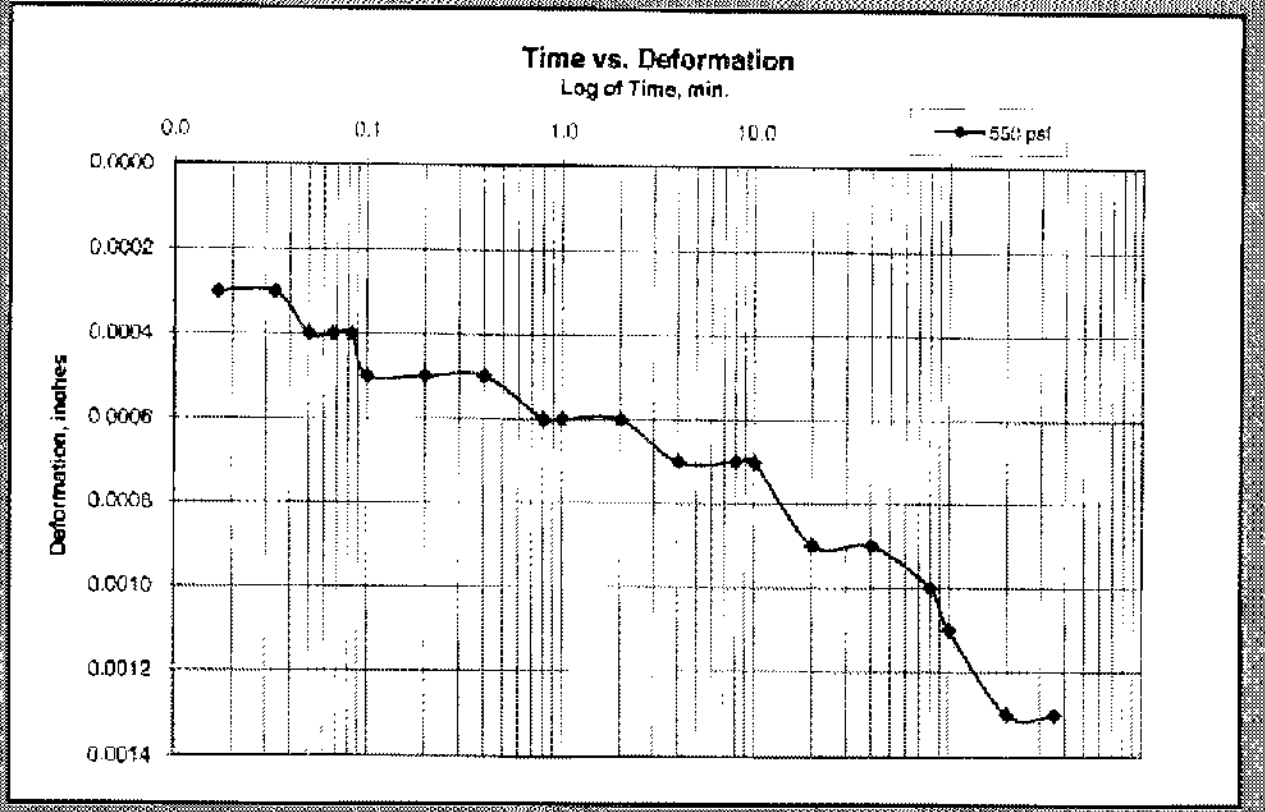
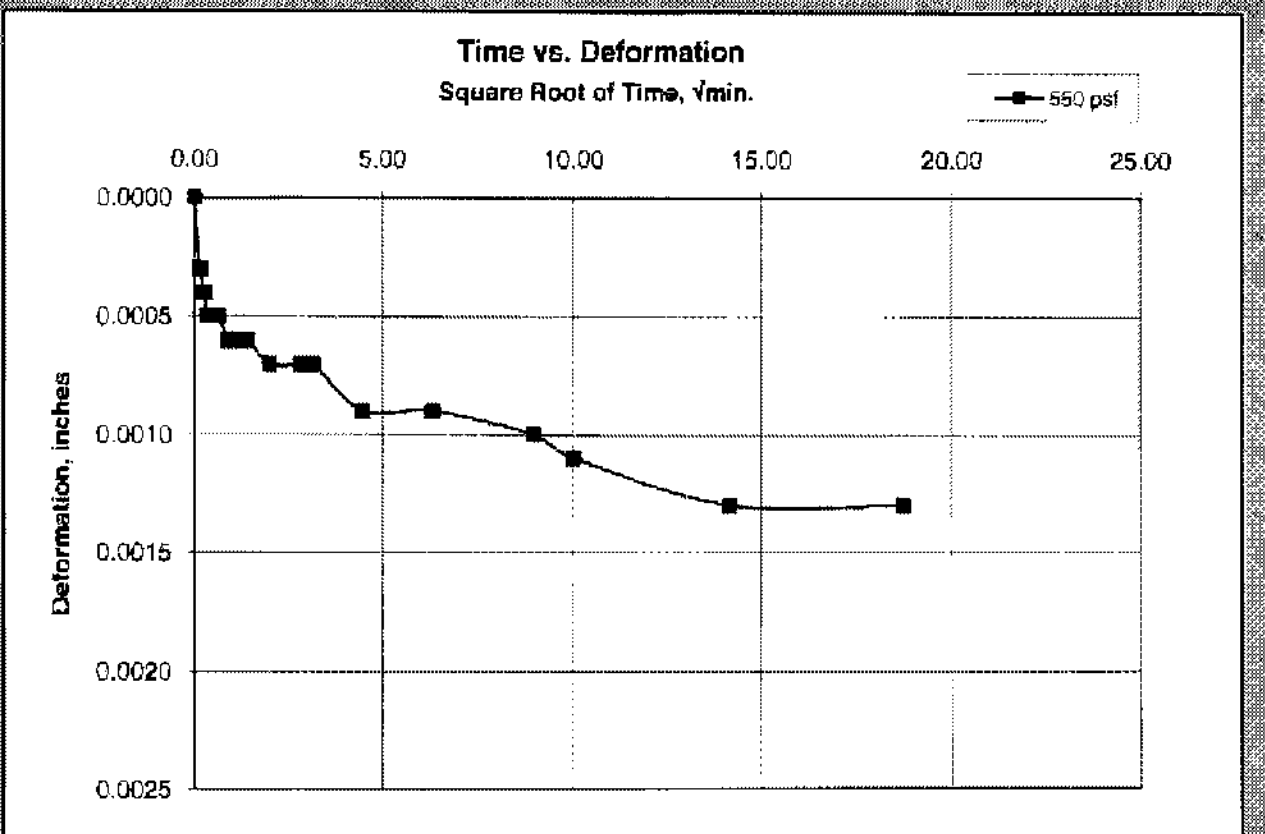


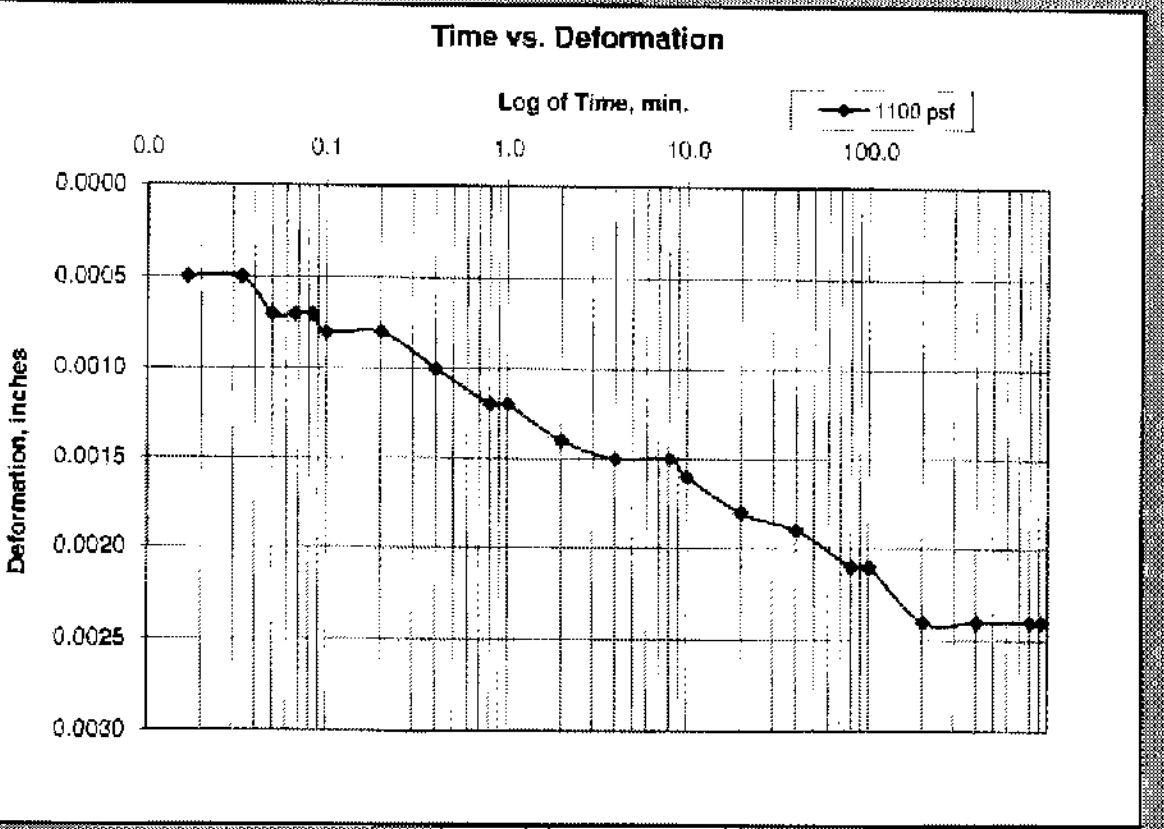
550 PSF



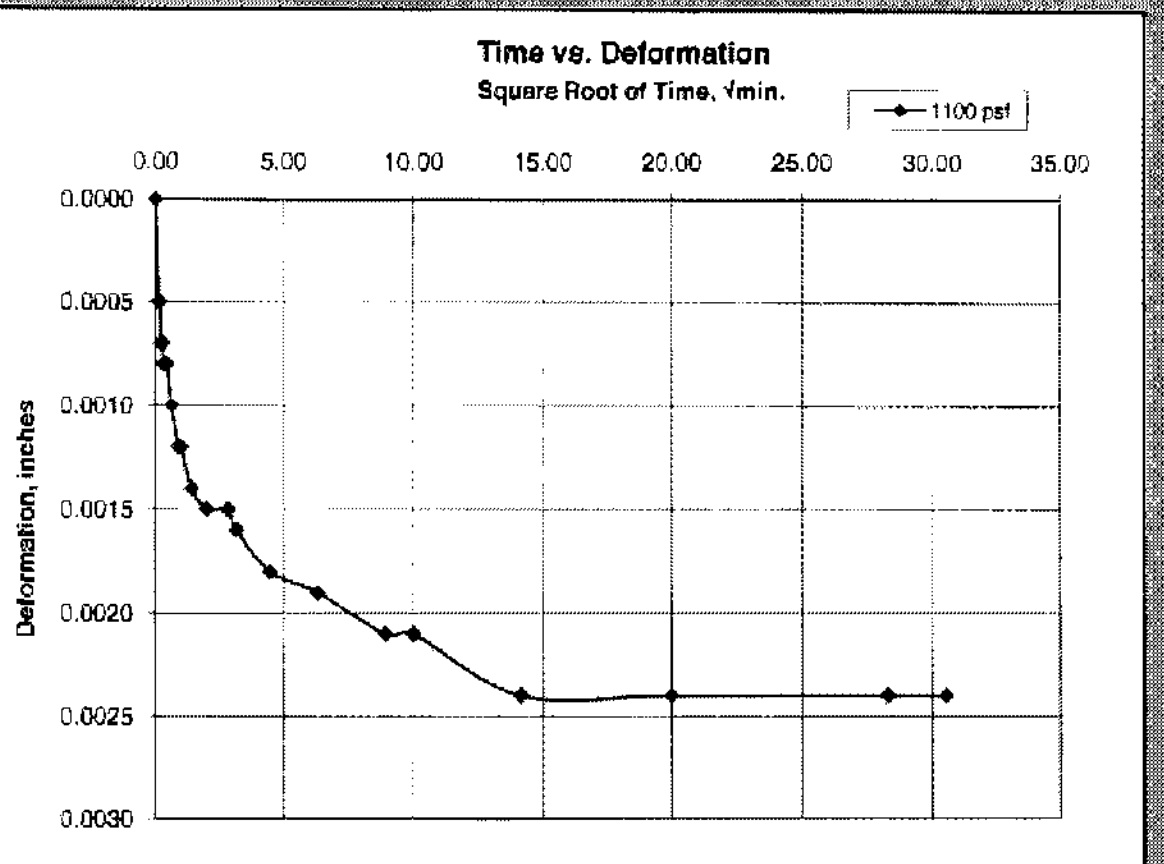
Cooper Testing Labs, Inc.

Load 4

1100 PSF

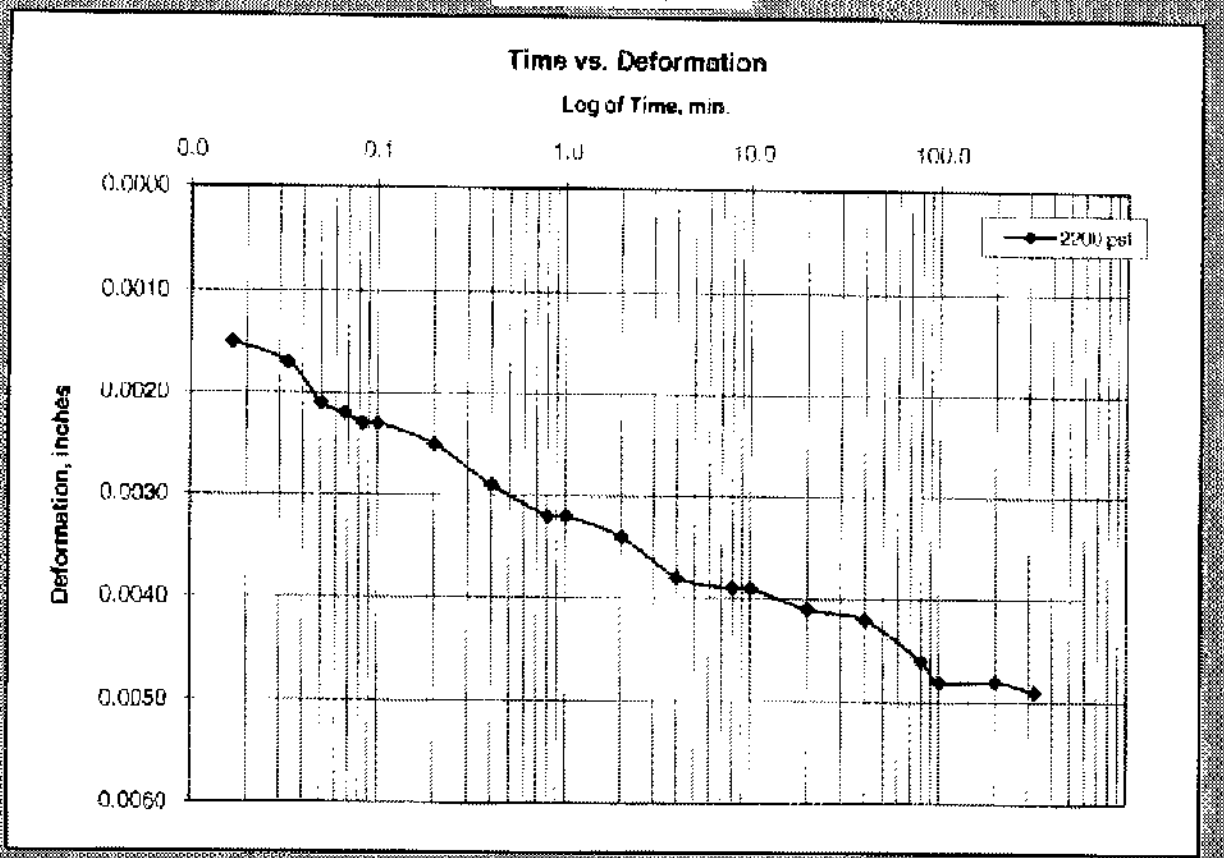


1100 PSF

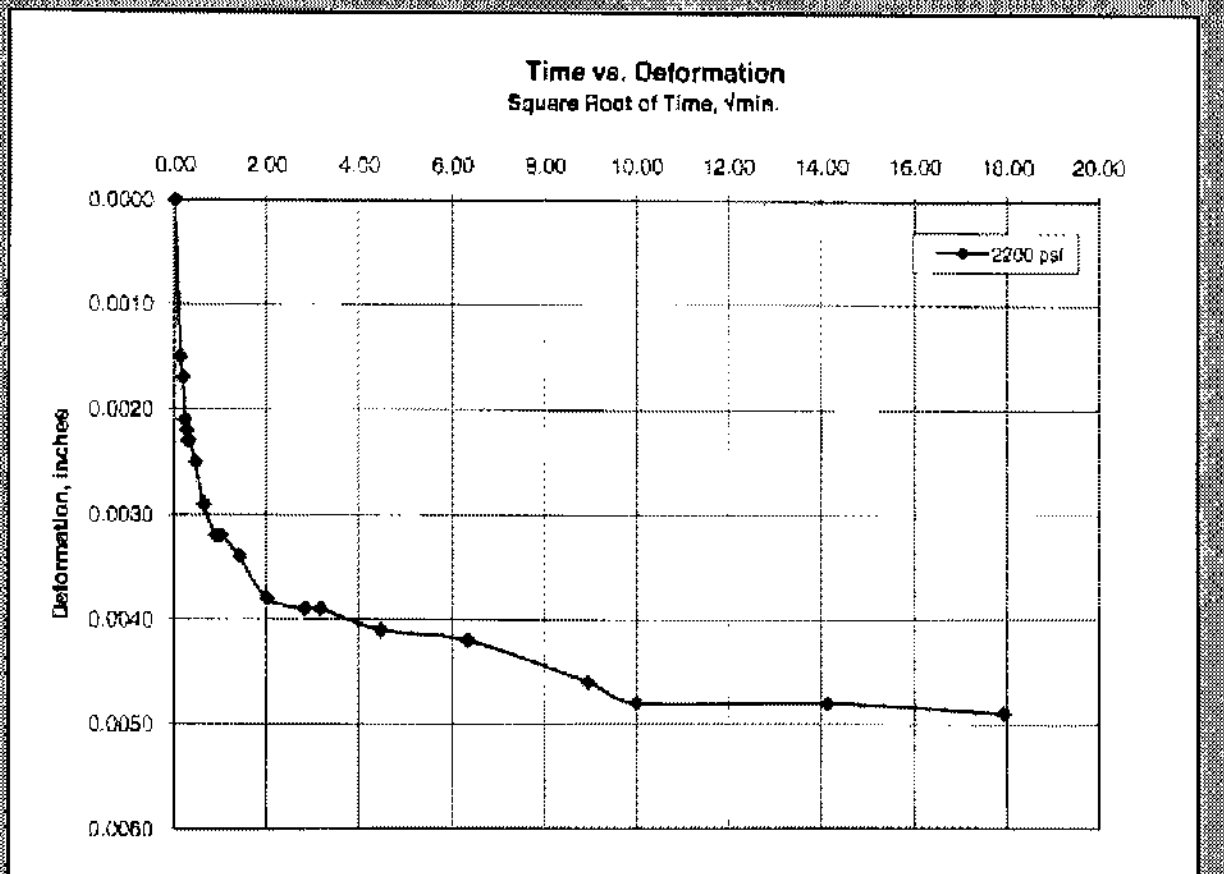


Cooper Testing Labs, Inc.

Load 5 — 2200 PSF

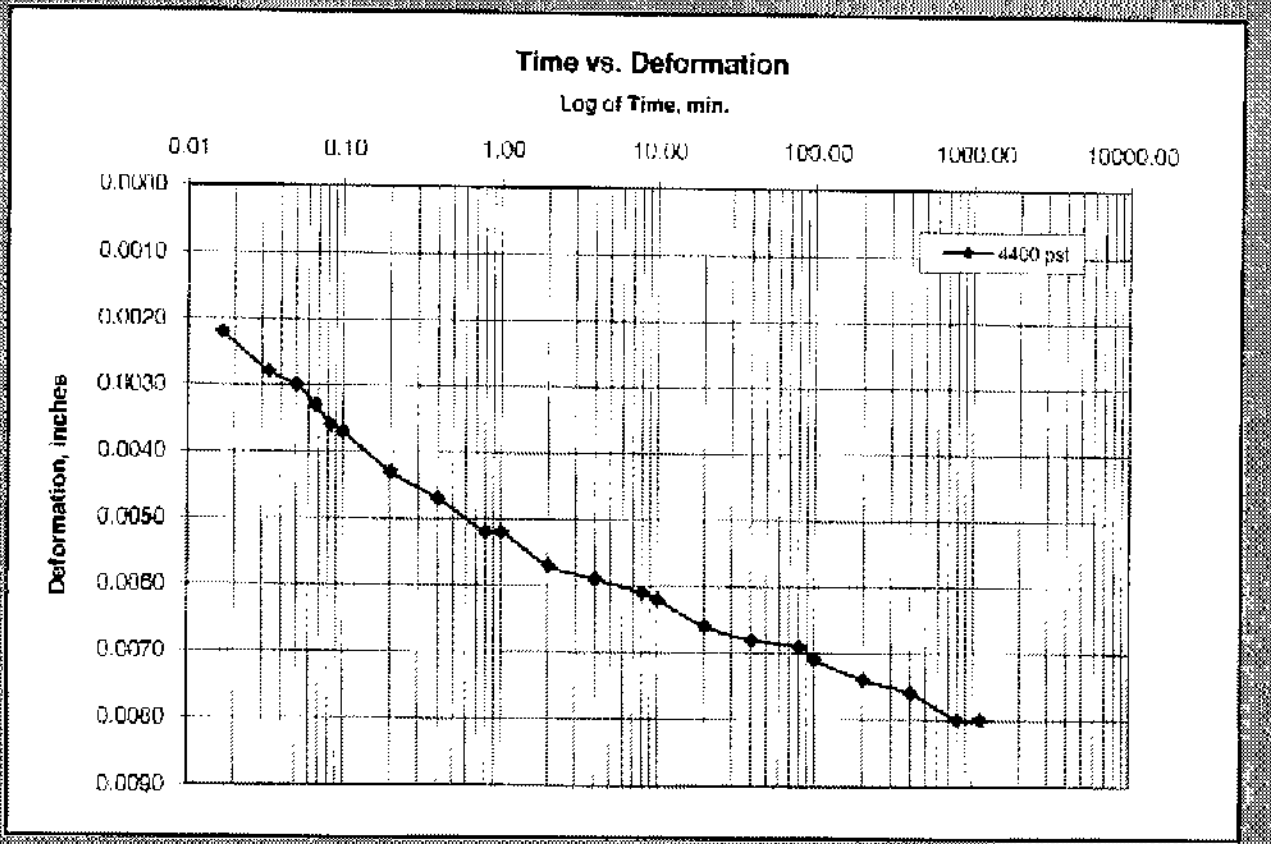


2200 PSF

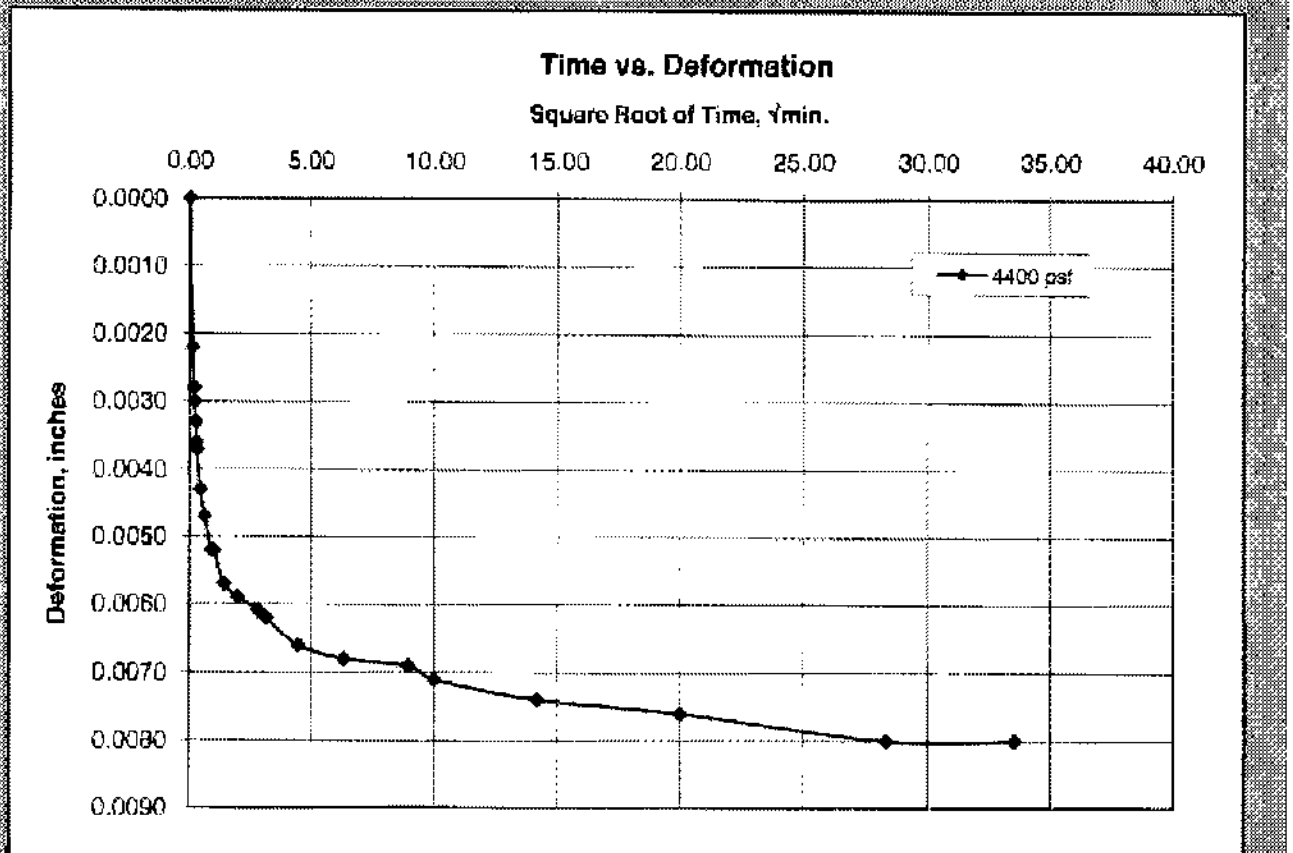


Cooper Testing Labs, Inc.

Load 6 — 4400 PSF



4400 PSF

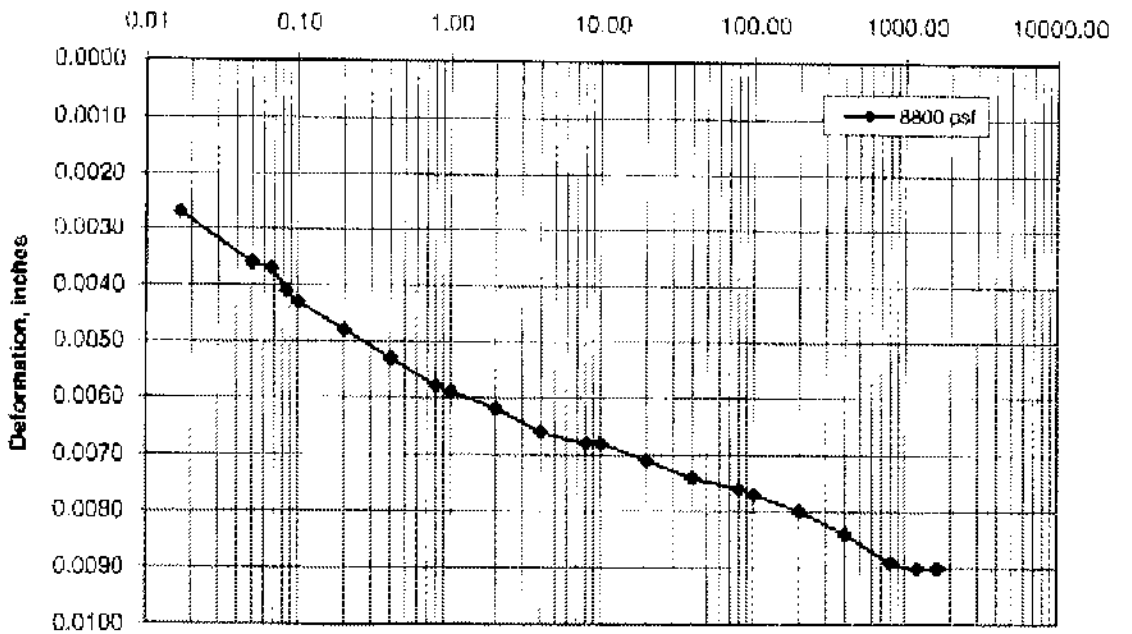


Cooper Testing Labs, Inc.

Load 7 — 8800 PSF

Time vs. Deformation

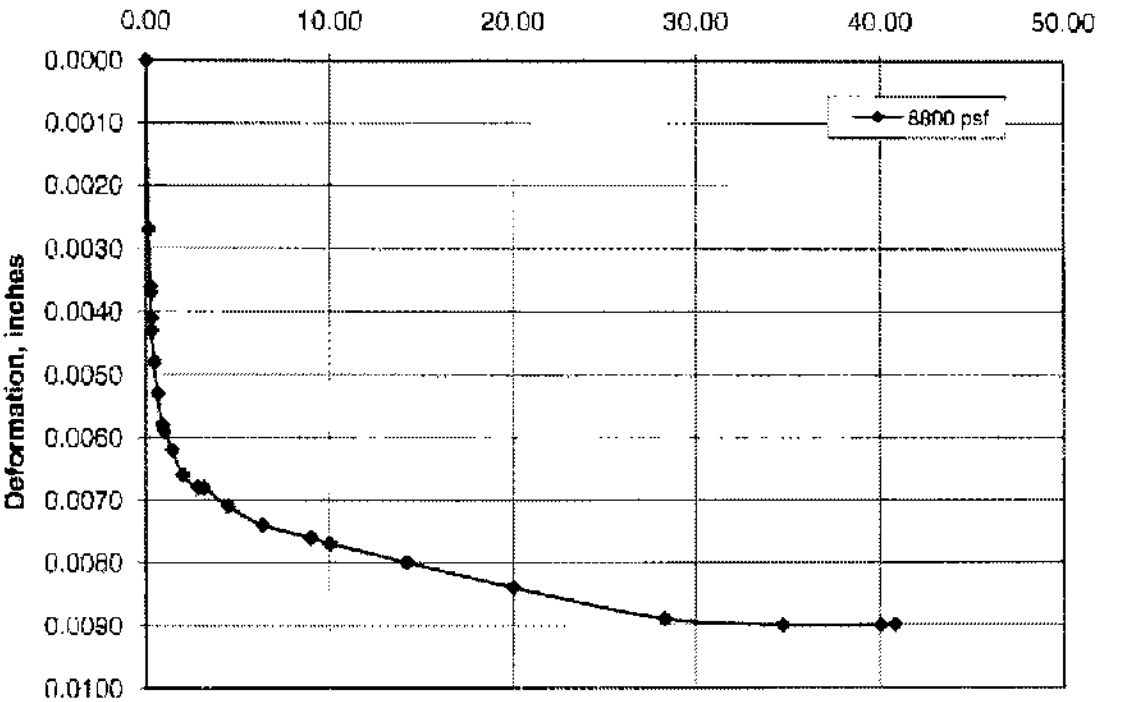
Log of Time, min.



8800 PSF

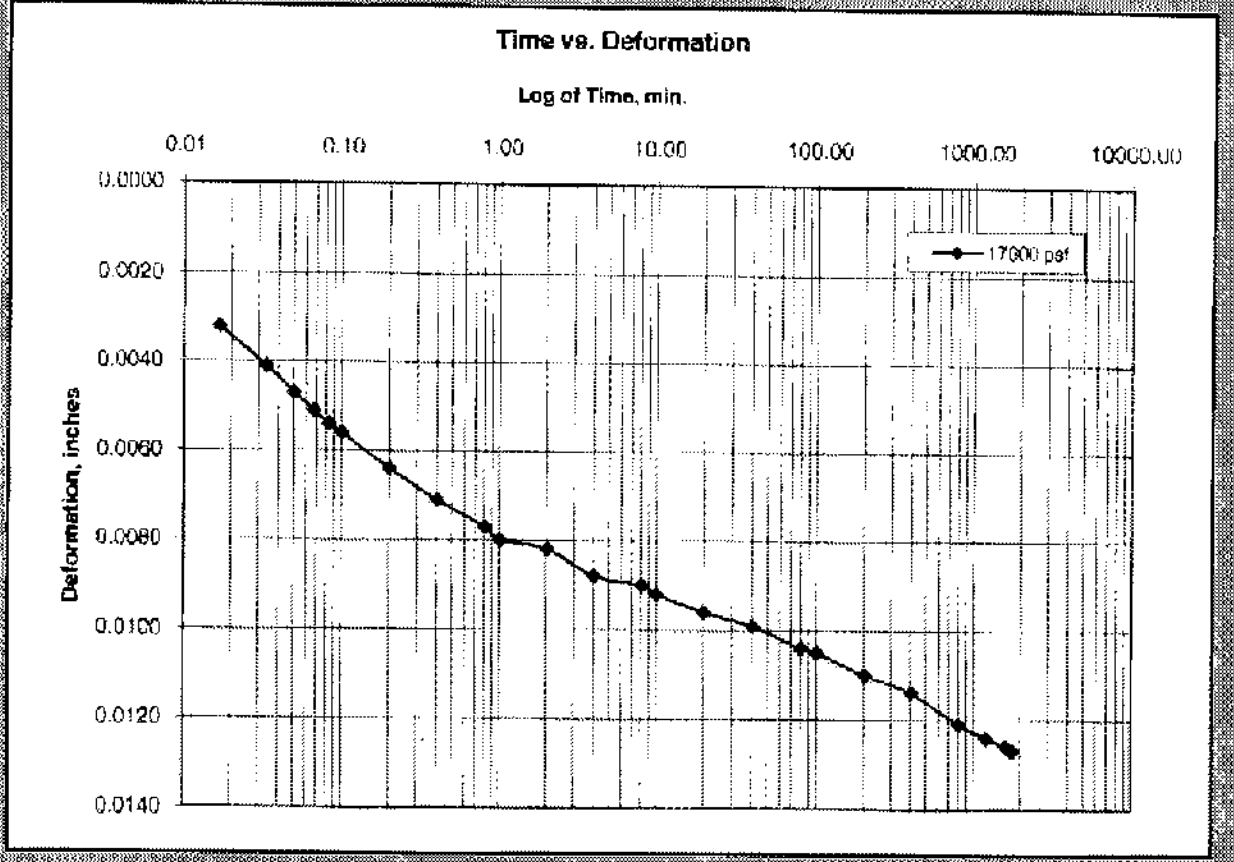
Time vs. Deformation

Square Root of Time, √min.

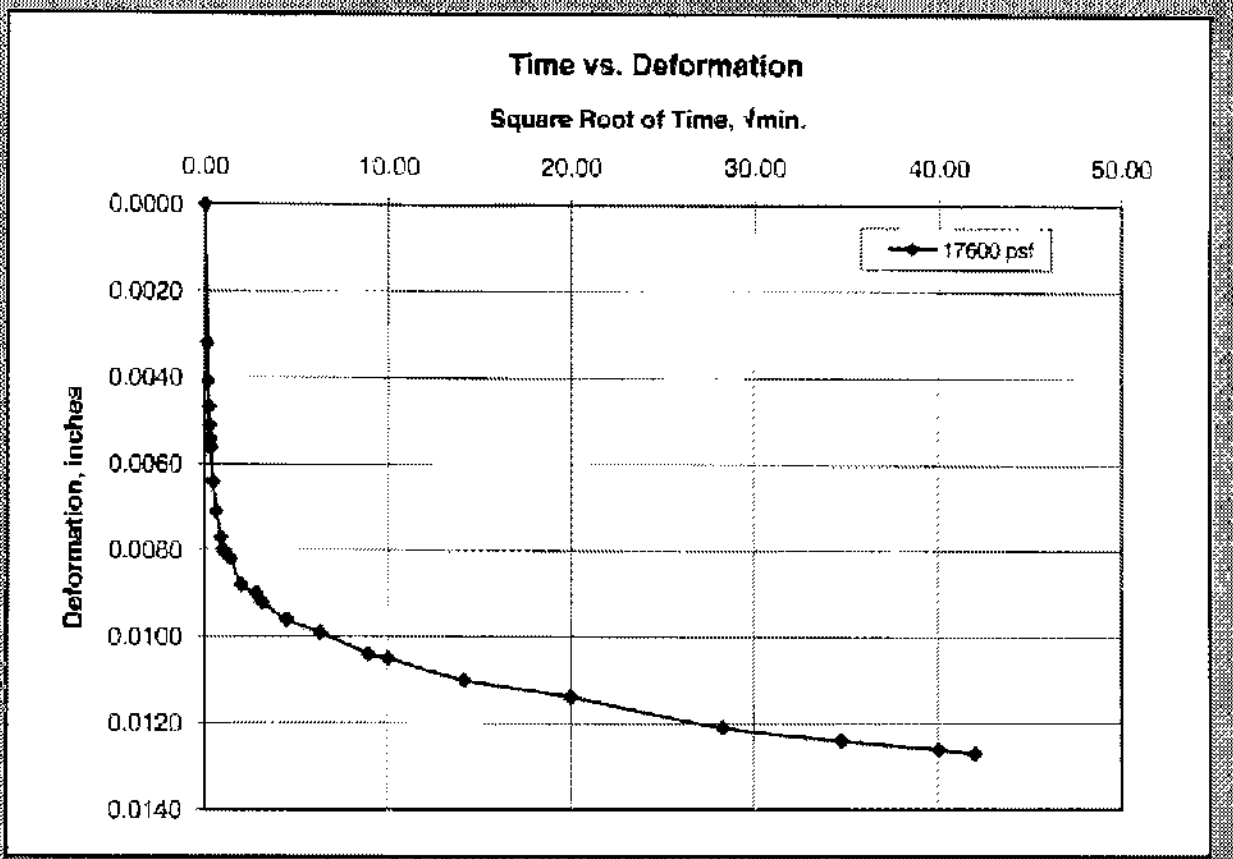


Cooper Testing Labs, Inc.

Load 8 — 17600 PSF

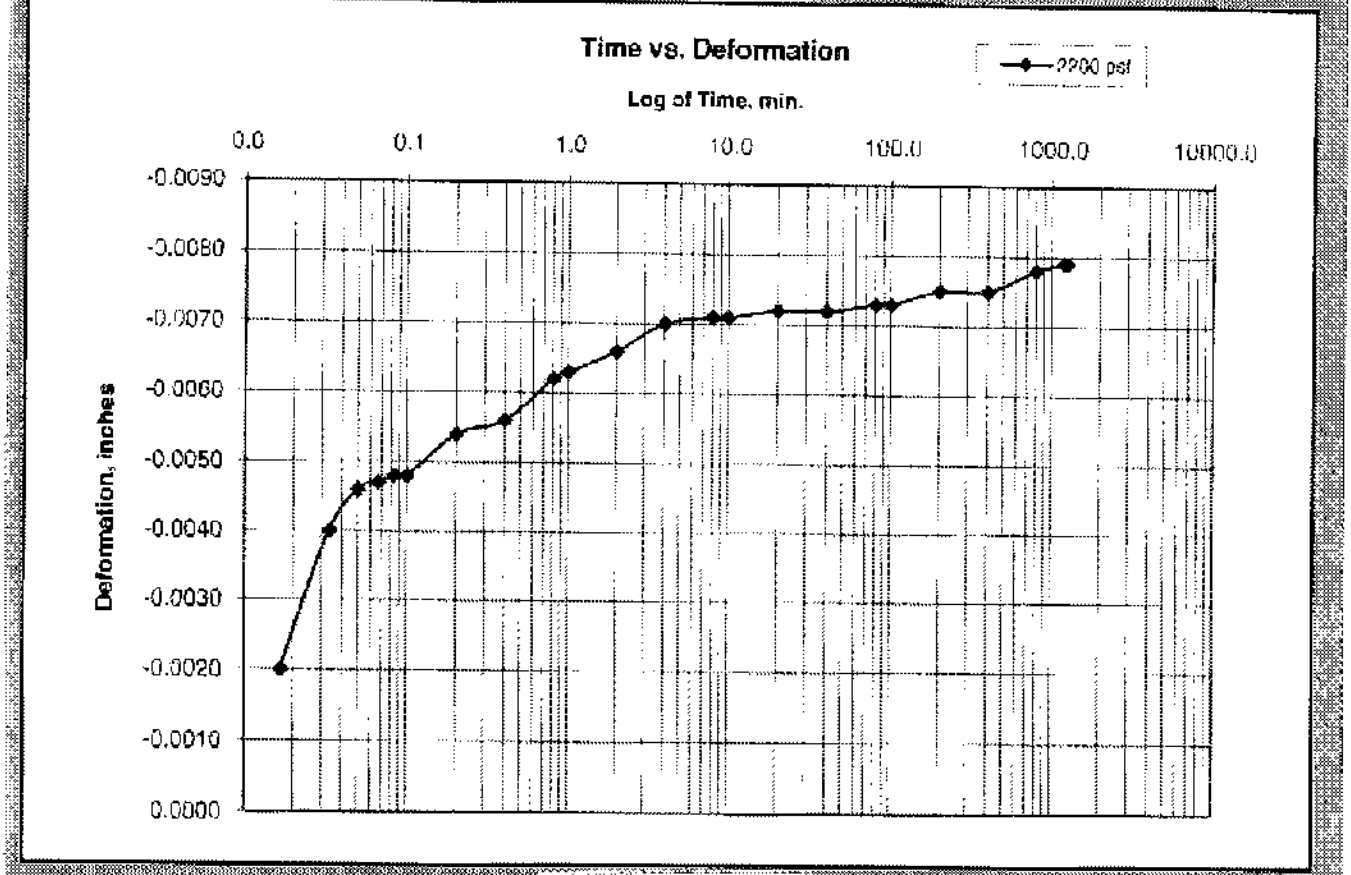


17600 PSF

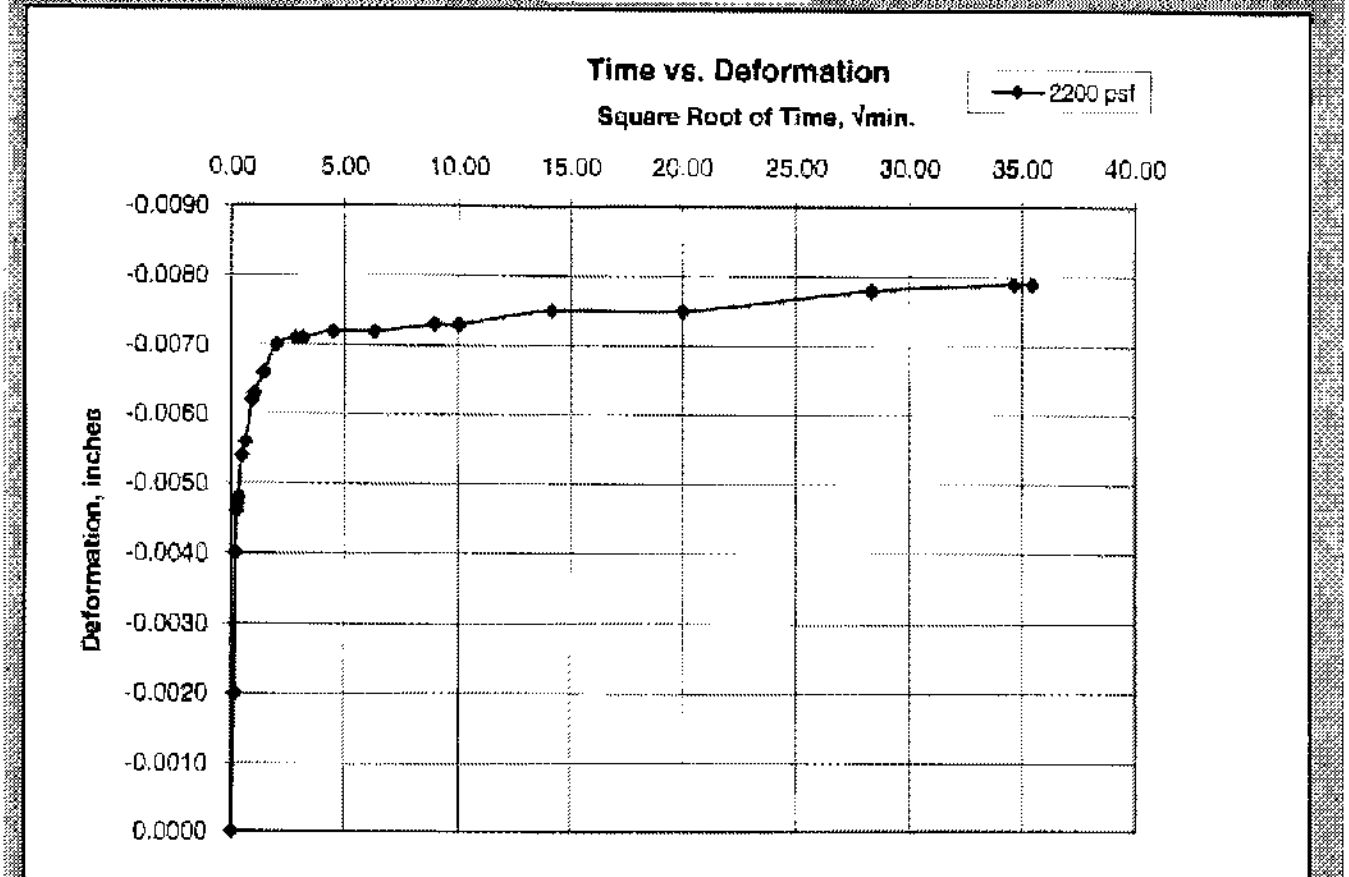


Cooper Testing Labs, Inc.

Load 9 — 2200 PSF



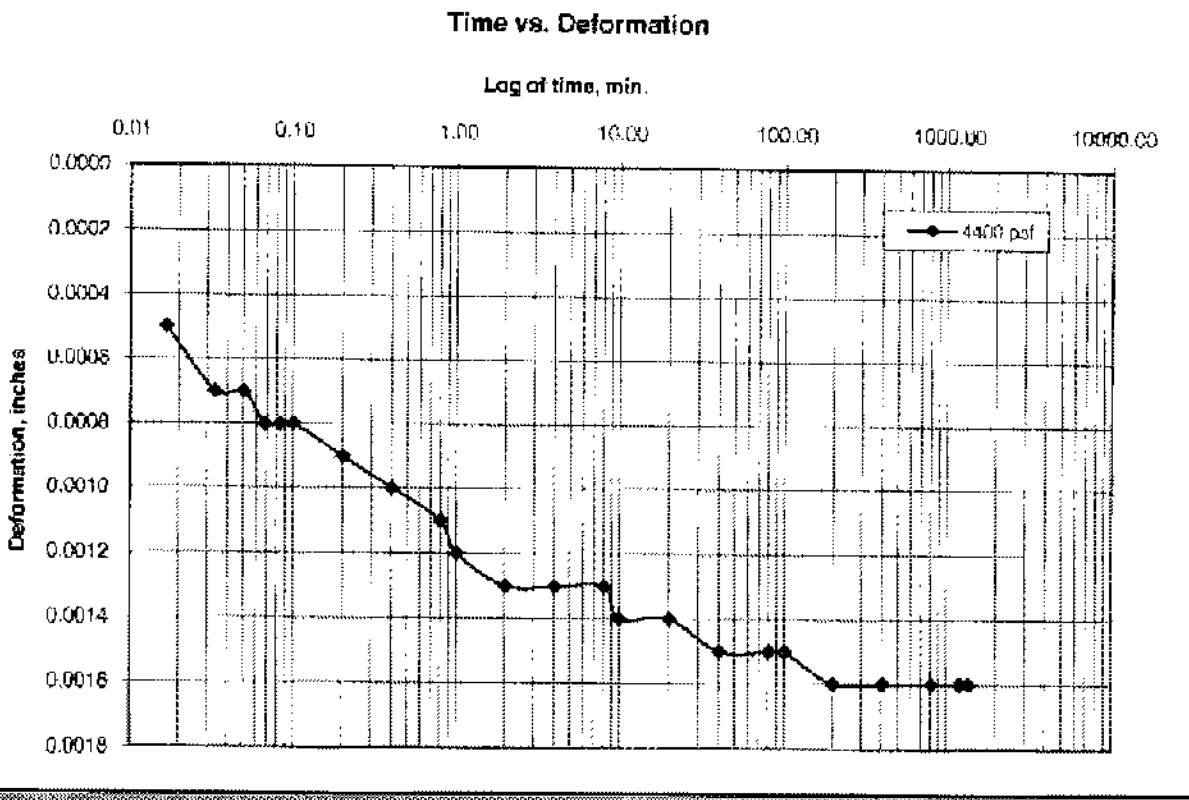
2200 PSF



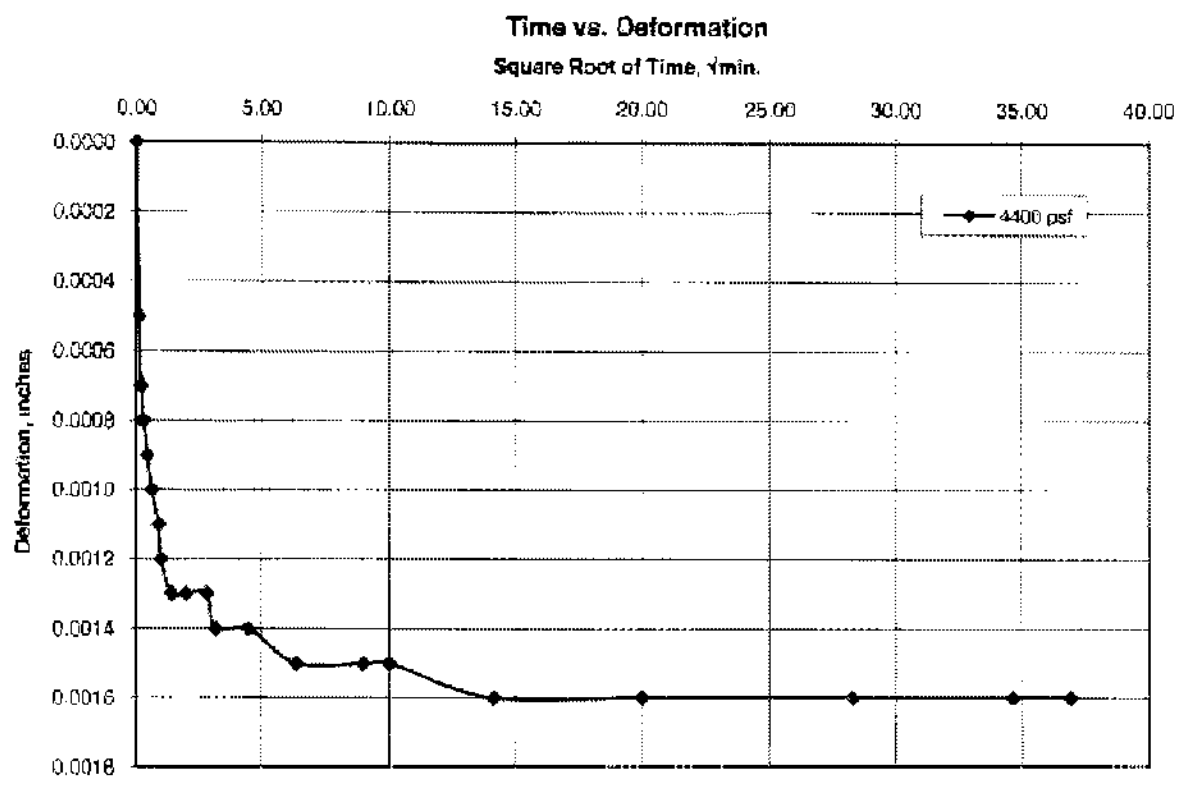
Cooper Testing Labs, Inc.

Load 10

4400 PSF



4400 PSF



Cooper Testing Labs, Inc.

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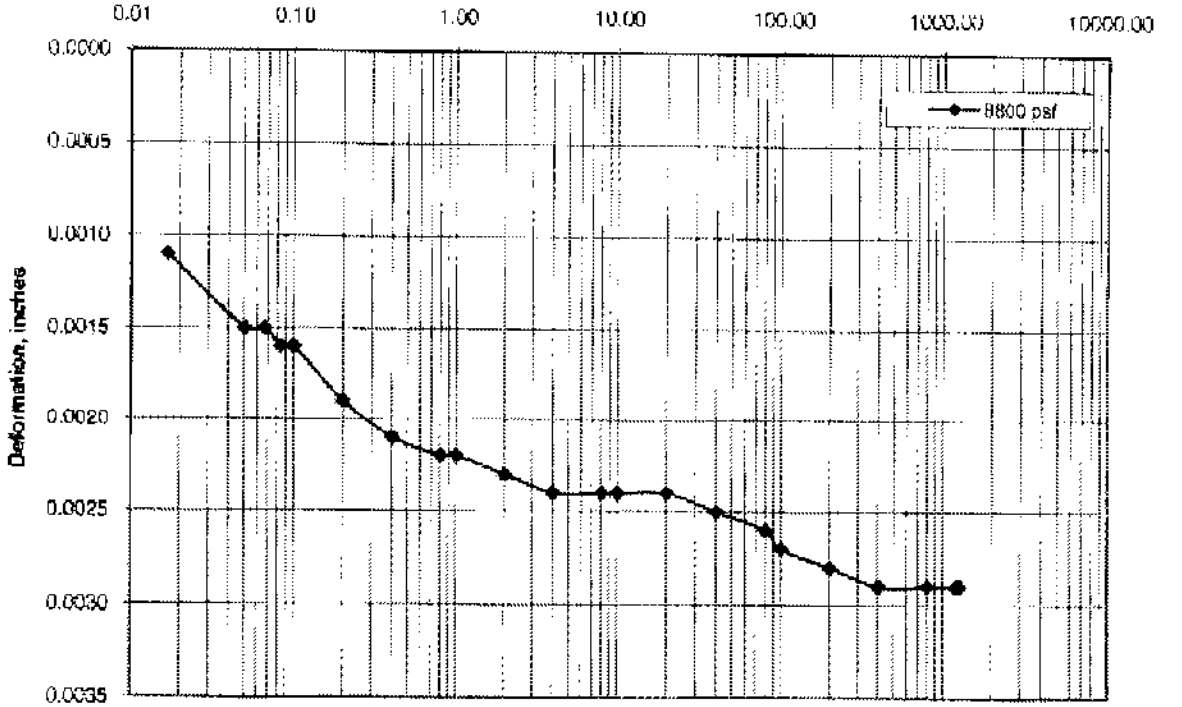
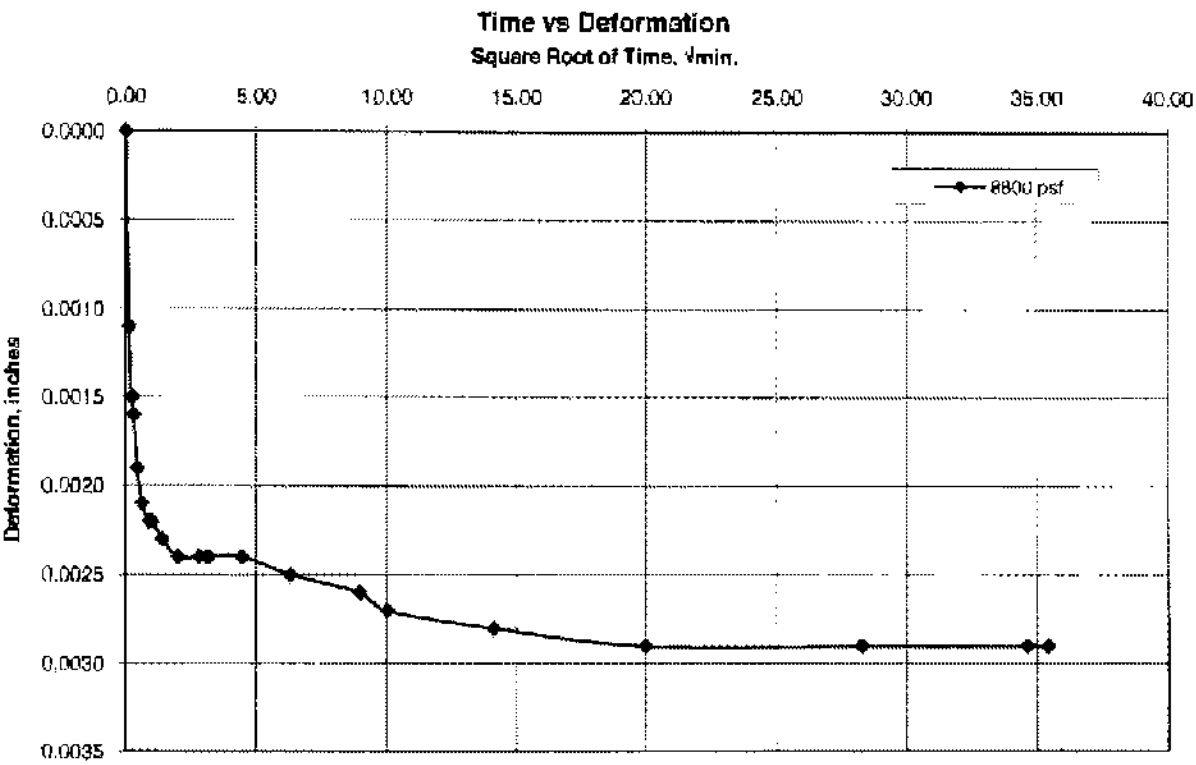
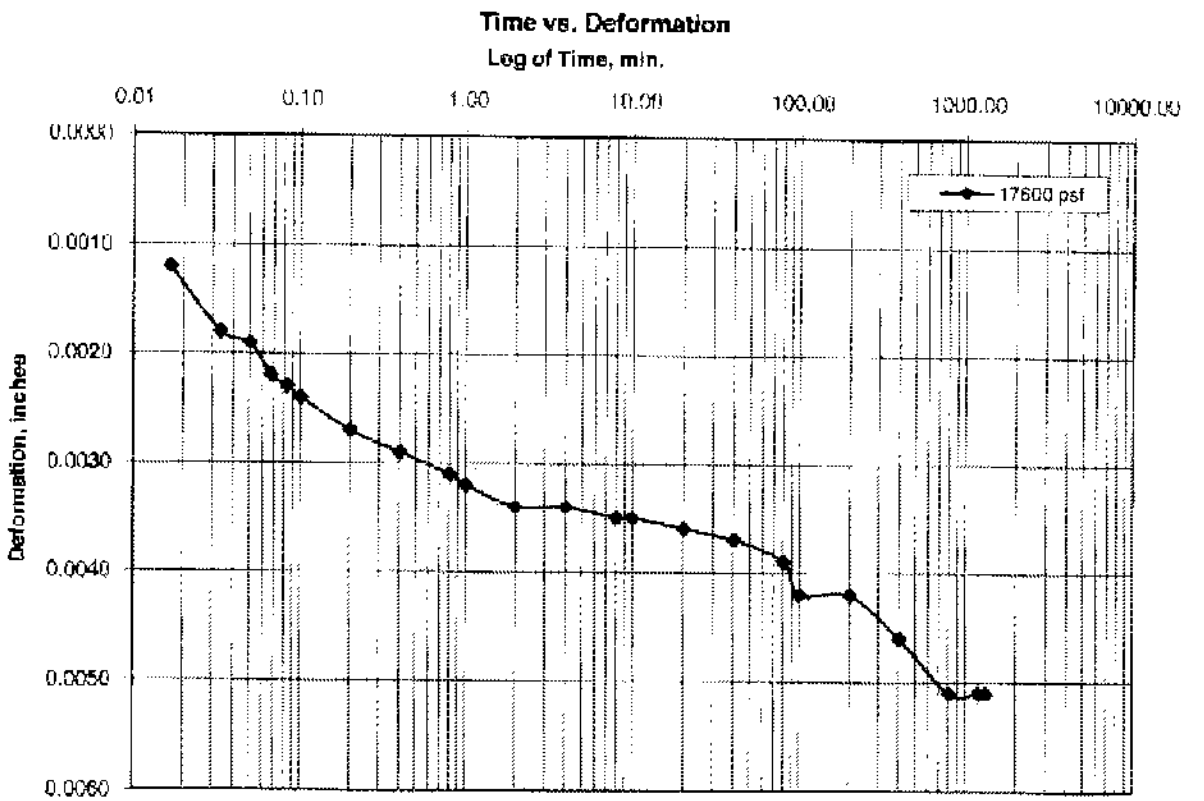


8800 PSF

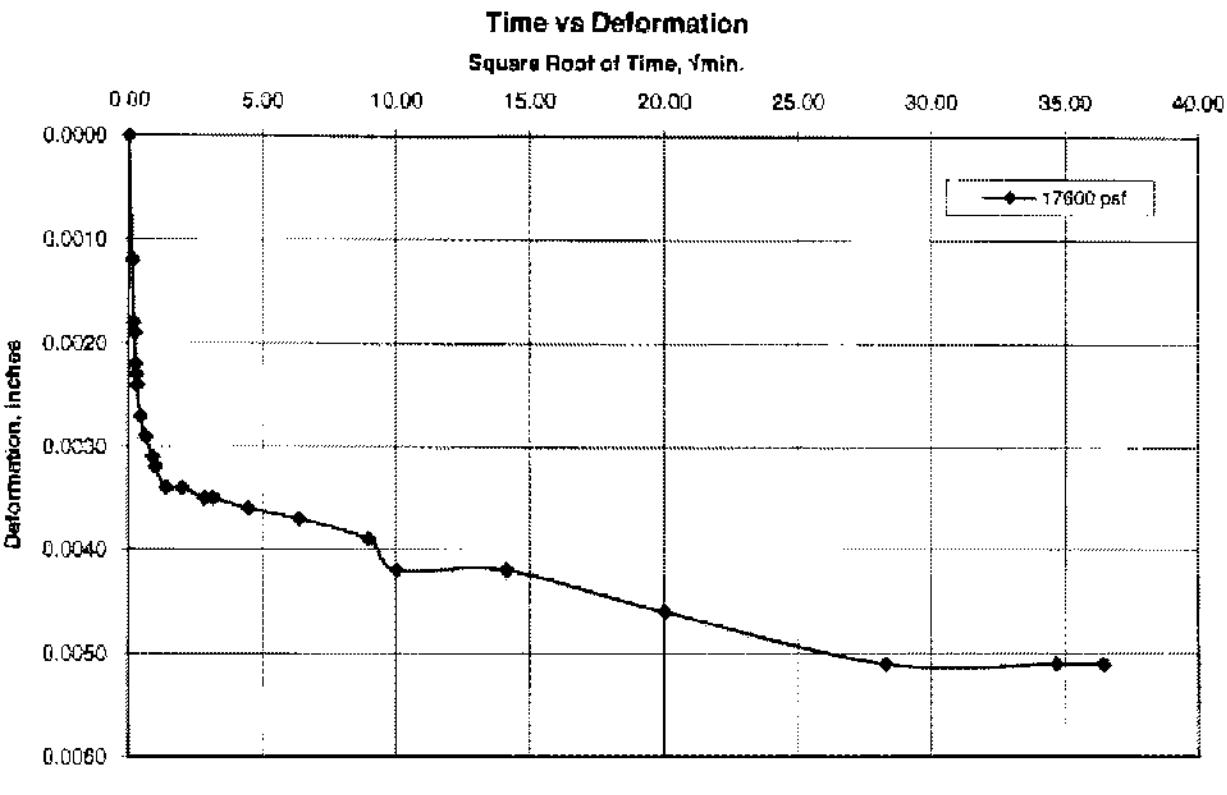


Cooper Testing Labs, Inc.

Load 12 — 17600 PSF

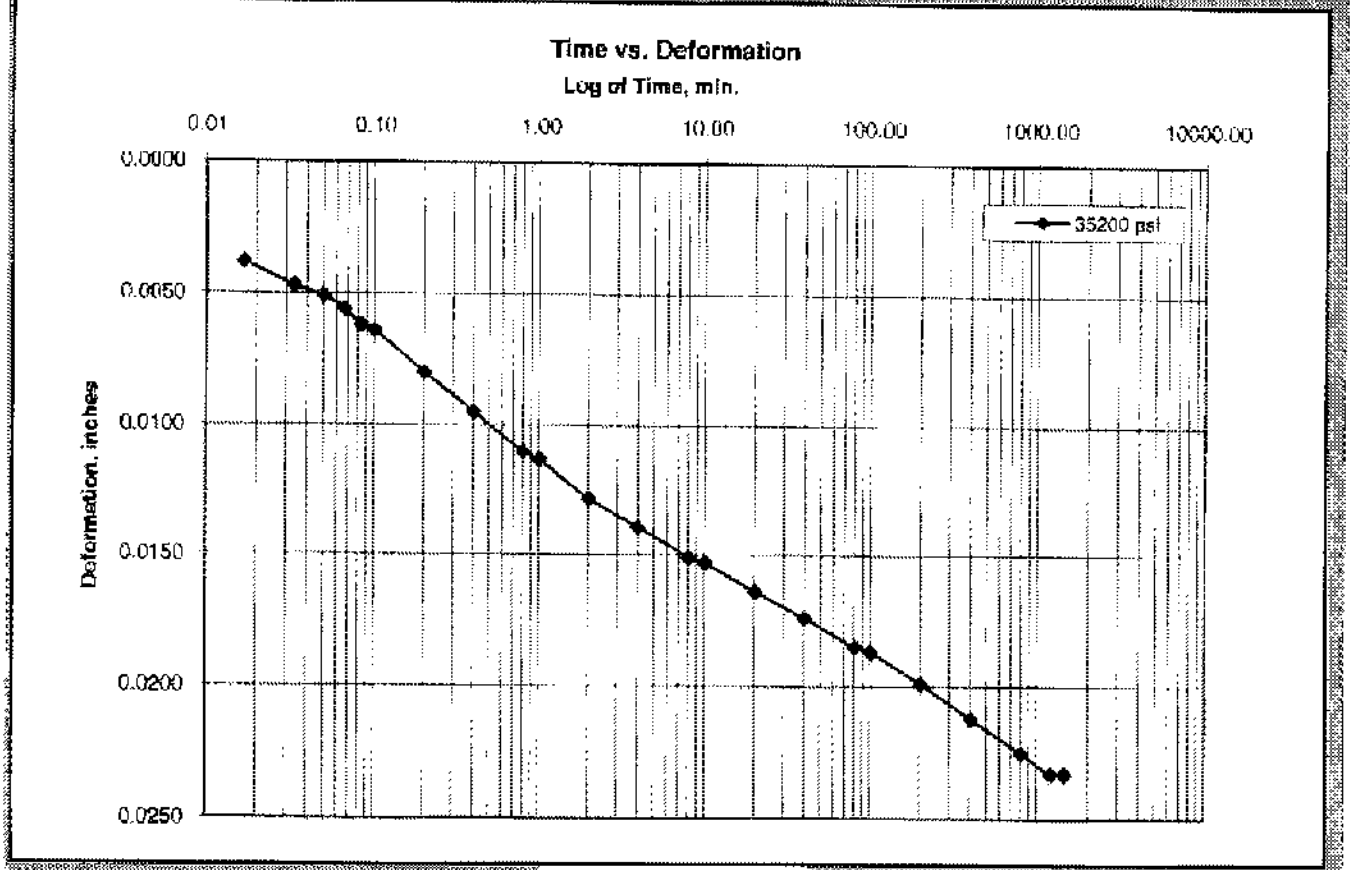


17600 PSF

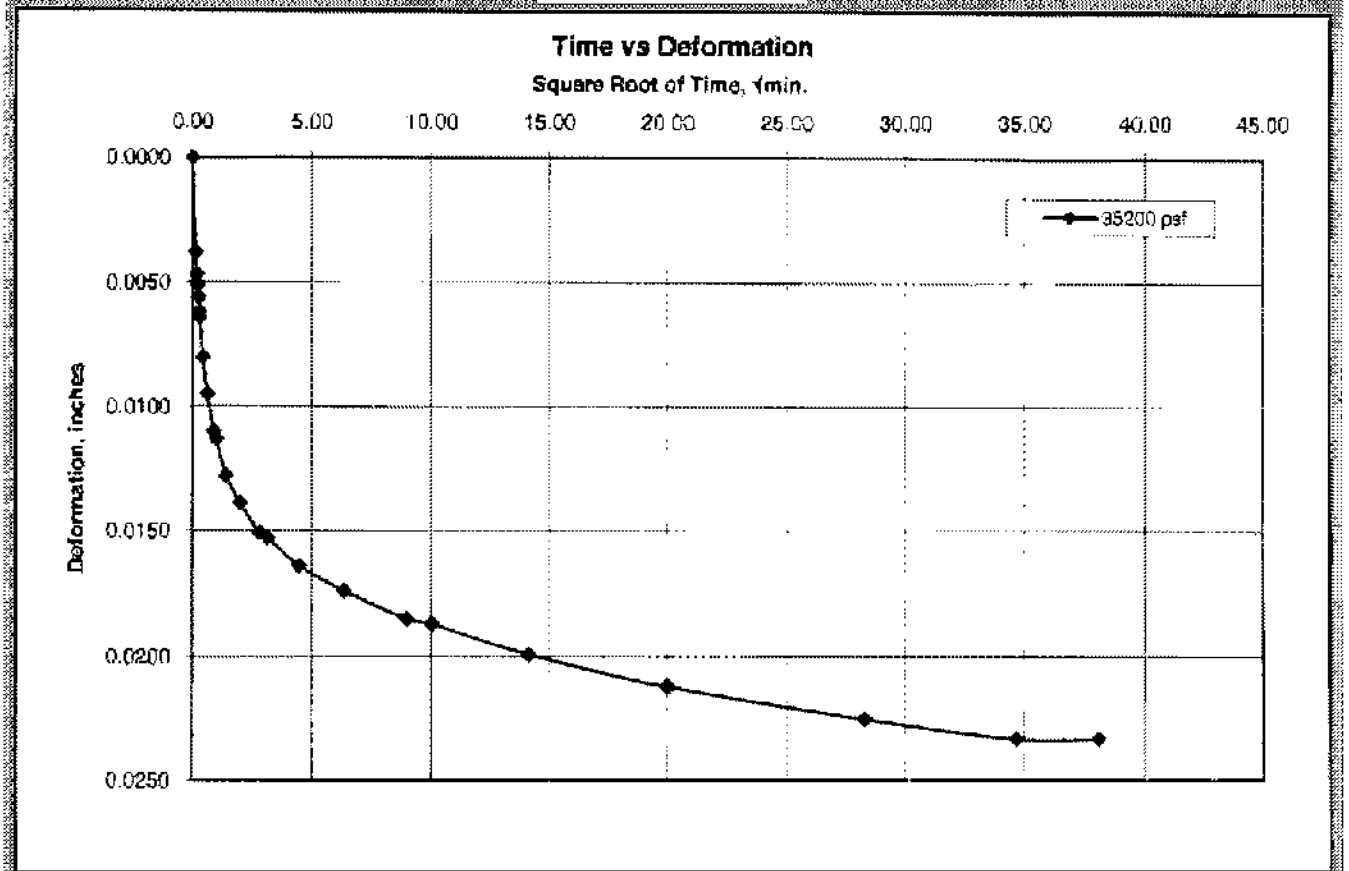


Cooper Testing Labs, Inc.

Load 13 — 35200 PSF

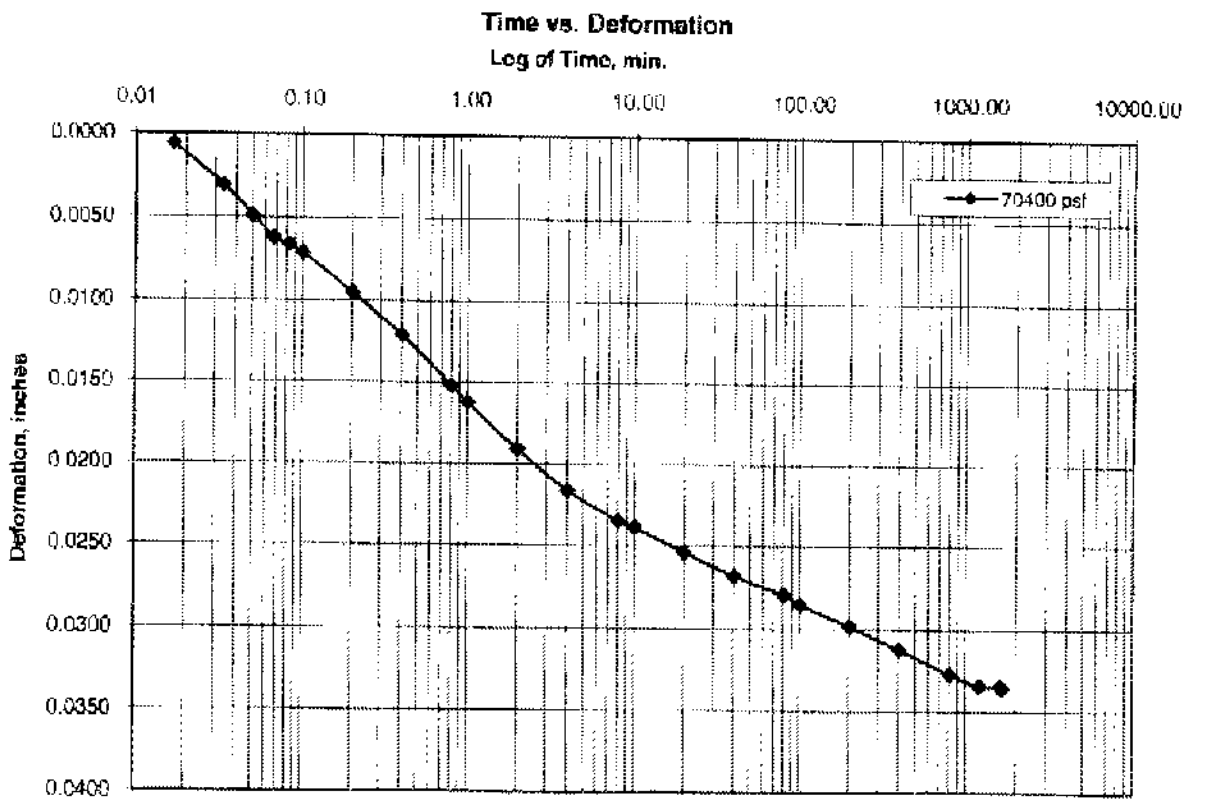


35200 PSF

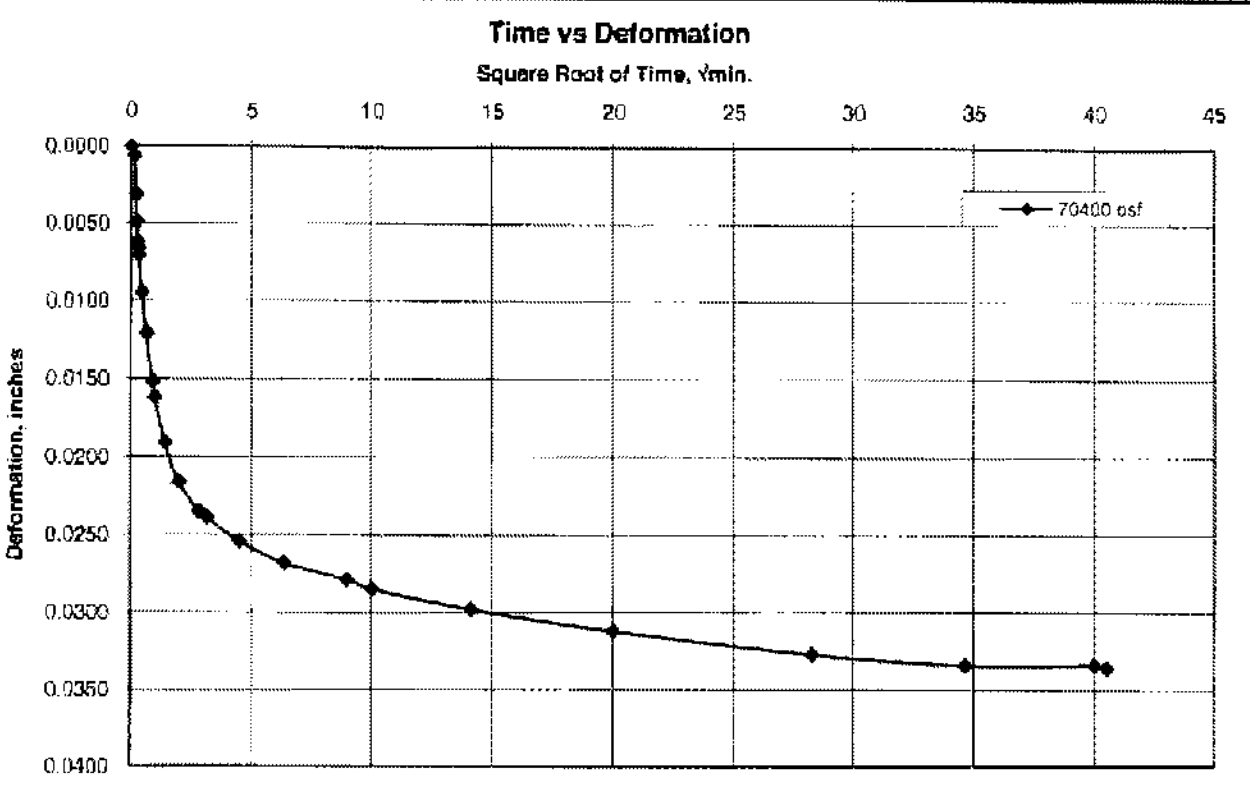


Cooper Testing Labs, Inc.

Load 14 — 70400 PSF



70400 PSF





APPENDIX F

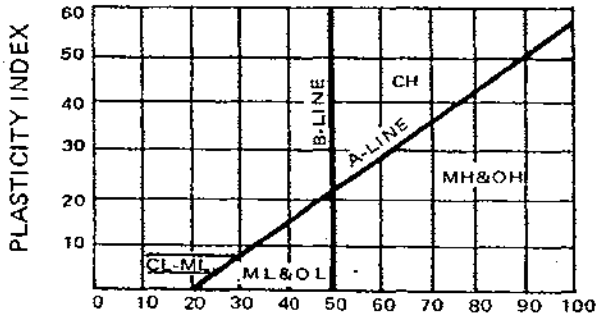
PREVIOUS ENVIRONMENTAL BORING LOGS
Burns & McDonnell Engineering Company, 2001

Burns & McDonnell

Unified Soil Classification System

MAJOR DIVISIONS			LETTER SYMBOL	DESCRIPTION
COARSE-GRAINED SOILS MORE THAN 50% LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS	GW	WELL-GRADED GRAVEL, GRAVEL-SAND MIXTURE
		LITTLE OR NO FINES	GP	POORLY-GRADED GRAVEL, GRAVEL-SAND MIXTURE
		GRAVELS WITH FINES	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
		APPRECIABLE FINES	GC	CLAYEY-GRAVEL, GRAVEL-SAND-CLAY MIXTURE
	SAND AND SANDY SOILS	CLEAN SANDS	SW	WELL-GRADED SAND, GRAVELLY SAND
		LITTLE OR NO FINES	SP	POORLY-GRADED SAND, GRAVELLY SAND
		SANDS WITH FINES	SM	SILTY SAND, SAND-SILT MIXTURE
		APPRECIABLE FINES	SC	CLAYEY SAND, SAND-CLAY MIXTURE
FINE-GRAINED SOILS MORE THAN 50% SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	SILT, CLAYEY SILT, SILTY OR CLAYEY VERY FINE SAND, SLIGHT PLASTICITY
			CL	CLAY, SANDY CLAY, SILTY CLAY, LOW TO MEDIUM PLASTICITY
			OL	ORGANIC SILTS OR SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT MORE THAN 50	MH	SILT, FINE SANDY OR SILTY SOIL WITH HIGH PLASTICITY
			CH	CLAY, HIGH PLASTICITY
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOIL

PLASTICITY CHART



FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS

RELATIVE PARTICLE SIZE	
BOULDER	LARGER THAN 12"
COBBLE	3" TO 12"
GRAVEL COARSE	3/4" TO 3"
FINE	4.76MM TO 3/4"
SAND COARSE	2MM TO 4.76MM
MEDIUM	0.42MM TO 2MM
FINE	0.074MM TO 0.42MM
SILTS AND CLAY	SMALLER THAN 0.074MM

RELATIVE PLASTICITY	
NONPLASTIC	CANNOT ROLL INTO BALL
TRACE PLASTICITY	BARELY ROLL INTO BALL
MEDIUM PLASTIC	CAN BE ROLLED INTO BALL
HIGHLY PLASTIC	NO RUPTURE BY KNEADING

RELATIVE COMPOSITION	
TRACE	0-10%
SOME	11-35%
AND/WITH	36-50%

RELATIVE MOISTURE	
DRY	POWDERY
DAMP	BELOW PLASTIC LIMIT
MOIST	PL TO LL RANGE
WET	ABOVE LIQUID LIMIT

DENSITY	N-VALUE
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM	11-30
DENSE	31-50
VERY DENSE	>50

RELATIVE CONSISTENCY	
VERY SOFT	< 1/4 TSF
SOFT	1/4-1/2 TSF
MEDIUM	1/2-1 TSF
STIFF	1-2 TSF
VERY STIFF	2-4 TSF
HARD	> 4 TSF

N-VALUE (BLOW COUNT) IS THE STANDARD PENETRATION RESISTANCE BASED ON THE TOTAL NUMBER OF BLOWS, USING A 140 LB HAMMER WITH 30 INCH FREE FALL, REQUIRED TO DRIVE A SPLIT SPOON THE LAST TWO OF THREE 6-INCH DRIVE INCREMENTS. (EXAMPLE: 4/7/9, N = 7+9=16)

Drilling Log

Project Name: BRISBANE LANDFILL	Project Number: 00 8804 003	Boring Number: BMC G-1
Ground Elevation:	Location: BRISBANE LANDFILL	Page: 1 of 4
Air Monitoring Equipment: GASTECH	LAND SURVEYOR	Total Footage: 54.5

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6" DIA	—	—	3	—

Drilling Company: GREGG	Driller (s): TREVOR
Drilling Rig: MOBILE B61 HDX	Type of Sampler: SHELBY
Date: 8-9-00 To 8-9-00	Field Observer (s): GABE STIVALA

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL: GRAVELLY SAND: MED SAND WITH COARSE GRAVEL AND SOME FINES; LIGHT BROWN, DRY	GP			0915					
5							0	0	—	
7	FILL: CLAYEY SAND: MED SAND (CLAY AND SOME GRAVEL; BROWN, DRY	SC		0920						
10							0	0	—	

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

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Form WCI-OP2-1

Drilling Log Continuation

Boring Number: BMC G-1
Project Name: BRISBANE LANDFILL
Page: 2 of 4
Project Number: 00 280 4 003
Date: 8-9-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15					0930		0	0	—	
16	FILL: GRAVELLY CLAY: CLAY WITH SILT AND FINE	CL								
17	GRAVEL; BROWN, DRY,									
18	MEDIUM PLASTICITY.									
19										
20	FILL: REFUSE AND SOIL:	SC			0935		0	0	—	
21	PAPER, PLASTIC, WOOD, FIBROUS									
22	MATERIAL DRY, MOSTLY REFUSE. SOIL IS FINE SAND AND SILT.									
23	SAME BUT SATURATED									▽ WATER
24	WATER IS GREY BROWN.									DARK
25					0940		0	1	—	
26										
27										
28										
29										
30					0945		0	0	—	

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-2

Drilling Log Continuation

Boring Number BTC G-1
Project Name BRISBANE LANDFILL
Page 3 of 4
Project Number 002804 003
Date 8-9-00

Depth (feet) 31	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SAME AS PREVIOUS									
32										
33										
34										
35					0950		0	5	—	
36										
37										
38										
39										
40					0955		0	21	—	
41				0%						SPLITSPOON FOR LITH VERIFICATION (NO RECOVERY)
42										
43										
44	SILTY CLAY (BAYMUD): CLAY WITH SILT, BLUE GREY,	CH								
45	WET, HIGH PLASTICITY				1010		0	0	—	
				75%						SPT FOR LITH VERIFICATION
47					1040					
				0%						SHELBY TUBE

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

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Form WCI-OP2-2

Drilling Log Continuation

Boring Number BHC Gr-1
Project Name BRISBANE LANDFILL
Page 4 of 4
Project Number 00 2804 005
Date 8-7-00

Depth (feet) 48	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
49	SAME AS PREVIOUS BAY MUD			0	—		0	0	—	SHELBY TUBE
50	POCKET PENETROMETER READINGS ATTEMPTED BUT CLAY IS TO SOFT. NO READING REGISTERS AT 51' + 53'					BHC Gr-1 49-51				SHELBY TUBE
51					1100		0	0	—	
52				75%						SHELBY TUBE
53					1130					
54			3 5 9		1135					SPT
55	END OF BORING (54.5') GROUTED TO 18' BGS.									

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-2

Drilling Log

Project Name: BRISBANE LANDFILL	Project Number: 00 2804 003	Boring Number: BMC GT-2
Ground Elevation:	Location: BRISBANE LANDFILL	Page: 1 of 2
Air Monitoring Equipment: GASTECH LAND SURVEYOR		Total Footage: 30.5

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6" DIA.	—	—	3	

Drilling Company: GREGG		Driller (s): TREVOR	
Drilling Rig: MOBILE B61 HDX		Type of Sampler: SHELBY	
Date: 8-10-00	To: 8-10-00	Field Observer (s): GABE STIVALA	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL. SILTY SAND: FINE SAND AND SILT, SOME TRACES OF GLASS; TAN, DRY. SOME GRAVEL.	SM			1204		0	0	—	
2										
3										
4	FILL: SOIL AND REFUSE SILTY SAND WITH REFUSE; PIECES OF RUBBER, METAL, GLASS; BROWN, DRY EQUAL PARTS OF SOIL AND REFUSE	SM				BMC GT-2 3-4'				
5					1210		0	0	—	
6										
7										
8	SAME BUT SATURATED AND DARK GREY.									▽ DARK GREY WATER
9										
10					1215		0	0	—	
11										
12	SANDY SILT: SILT WITH SOME FINE SAND, DARK GREY SATURATED	SM								
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

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11/11/1992

Form WCI-OP2-1

Drilling Log Continuation

Boring Number BMC G-2
Project Name BRISBANE LANDFILL — Page 2 of 2
Project Number 00 280 4 003 — Date 8-10-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	SAME AS PREVIOUS				1220		0	0	-	
16										
17										
18										
19										
20					1223		0	0	-	
21										
22	SILTY CLAY (BAY MUD): CLAY WITH SILT, BLUE GREY,	CH								
23	WET, HIGH PLASTICITY, SOME SHELLS									
24										
25	→				1225		0	0		
26				80%						SHELBY TUBE
27	→ PP = 0				1230					
28	SANDY CLAY (BAY MUD) CLAY WITH FINE SAND, SOME SHELLS SATURATED, BLUE GREY. (SANDY LENSE)	CL		90%						SHELBY TUBE
29	→ P.P. = .60				1235					
30	SILTY CLAY (BAY MUD) SAME AS (27.0) LESS SHELLS	CH	5 / 10 / 21	100%	1245					SPT (CA MOD)
	END OF BOREHOLE									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
BRISBANE LANDFILL	00 2804 003	BMC G-3
Ground Elevation	**Location**	**Page**
	BRISBANE LANDFILL	1 of 3
Air Monitoring Equipment		**Total Footage**
GASTECH LANDSURVEYOR		31.5'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	—	—	3	

Drilling Company: GREGG DRILLING	Driller (s): TREVOR
Drilling Rig: MOBILE B 61 HDX	Type of Sampler: SHELBY TUBE
Date: 8/10/00 To 8/10/00	Field Observer (s): GABE STIVALA

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1–2	FILL: SOIL AND REFUSE: SILT WITH GRAVEL, SOME REFUSE - MOSTLY SOIL, LIGHT BROWN, DRY, REFUSE CONSISTS OF GLASS AND PIECES OF RUBBER	GM			0920	BMC G3				SAMPLE COLLECTED FOR SIEVE
3–5	FILL; COBBLES AND REFUSE: COBBLES, LARGE GRAVEL AND TIMES MIXED WITH REFUSE. REFUSE CONSISTS OF GLASS, PAPER, RUBBER DRY, LIGHT BROWN	GM			0925 0930		0	0	—	
10–11	CLAYEY GRAVEL: GRAVEL WITH CLAY, SOME PEAT MATERIAL, ROOTS (OR WOOD FIBERS); DARK GREY, WET.	GM			0932		0	0	—	∇ WATER Δ TABLE DARK BROWN WATER

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-1

Drilling Log Continuation

Boring Number BHC G-3
Project Name BRISBANE LANDFILL
Page 2 of 3
Project Number 00 280 4 003
Date 8-10-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	CLAYEY SILT: SILT WITH CLAY, DARK BROWN, SATURATED	ML			0935		0	0	–	
16										
17										
18										
19										
20					0938		0	0	–	
21										
22										
23					0940					
24	SILTY CLAY BAYMUD: CLAY WITH SILT, SOME SHELLS BLUE GREY, WET.	CH								
25							0	0	–	
26										
27				100%		BHC G-3 26-28				SHELBY TUBE
28	→ PP: 0				0950					
29						BHC G-3 28-30				SHELBY TUBE
30	→ PP: 0.75				1010		0	0	–	
31			3 / 5	0% / 0						

BZ=Breathing Zone BH=Bore Hole S=Sample

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11/11/1992

Form WCI-OP2-2

Drilling Log Continuation

Project Name: BRISBANE LANDFILL
Project Number: 00-280-H-003
Boring Number: BML G-3
Page: 3 of 3
Date: 8-10-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
31	SAME AS PREVIOUS		9	0%	1015		0	0	—	
	(BAY MUD)									
32	END OF BORING 31.5'									

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-2

Drilling Log

Project Name: BRISBANE LANDFILL	Project Number: 00.280-4-003	Boring Number: BMC G-4
Ground Elevation: —	Location: BRISBANE LANDFILL	Page: 1 of 5
Air Monitoring Equipment: GAS TECH LANDSURVEYOR		Total Footage: 75'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	—	—	0	—

Drilling Company: GREGG	Driller (s): TREVOR
Drilling Rig: MOBILE B61 HDX	Type of Sampler: SHELBY TUBE
Date: 8-8-00 To 8-8-00	Field Observer (s): GABE STIVALA

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL: CLAYEY SAND: MEDIUM TO FINE SAND WITH CLAY; LIGHT BROWN, MOIST SOME GRAVEL.	SC								
8	FILL: SILTY CLAY: CLAY WITH SILT, SOME SAND AND GRAVEL; DARK GREY, MOIST, MED PLAST.	CL								

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Project Name: BRISBANE LANDFILL
Project Number: 00 220 4 003
Boring Number: BMC 6-4
Page: 2 of 5
Date: 8-8-06

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15							0	0	—	
16	FILL: CLAYEY SAND: FINE SAND WITH CLAY AND SILT, SOME PIECES OF BRICK; DARK BROWN, MOIST, LOW PLASTICITY.	SC								
17										
18										
19										
20							0	0	—	
21										
22										
23	FILL: SILTY SAND; MEDIUM SAND WITH SILT, SOME SMALL GRAVEL; DARK GREY, MOIST, MED PLASTICITY	SM								
24										
25							0	0	—	
26										
27										
28										
29										
30	FILL: SILTY CLAY; CLAY WITH GRAVEL BRICK AND WOOD; V/ERY DARK BROWN	CH				SPT	0	0	—	

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-2

Drilling Log Continuation

Boring Number BMC G-4
Project Name BRISBANE LANDFILL
Page 3 of 5
Project Number 00 280 4003
Date 8-8-00

Depth (feet) 31	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32	SAME AS PREVIOUS. HIGH PLASTICITY!					SPT				
33										
34										
35							0	0	—	▽
36	SAME AS PREVIOUS WITH FREE PRODUCT. DARK BROWN OILY PRODUCT, WATER TABLE?									▽
37										
38										
39										
40										
41										
42										
43										
44										
45	FILL: GRAVELLY CLAY:	GC								
46	CLAY WITH COARSE SAND AND GRAVEL; DARK BROWN-BLACK.									
47	PETROLEUM ODOR. GLASS PRESENT. MOSTLY GRAVELLY CLAY TRACE AMOUNTS OF GLASS. SATURATED									

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

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Form WCI-OP2-2

Drilling Log Continuation

Project Name: BRISBANE LANDFILL
Project Number: 002804 003
Boring Number: BMC G-4
Page: 4 of 5
Date: 8-8-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
48	SAME AS PREVIOUS									
49										
50										
51										
52										
53	FILL: CLAYEY SILT: SILT WITH CLAY, SOME GRAVEL SATURATED. PETROLEUM ODOR LOW PLASTICITY	ML								
54										
55										
56										
57										
58										
59										
60	→ BAYMUD? UNABLE TO RECOVER SAMPLES FOR IDENTIFICATION	CH			1300		0	45%	—	HALTED WORK DUE TO HIGH LEL
61										
62										
63										
64										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log Continuation

Boring Number BMC G-4
Project Name BRISBANE LANDFILL
Page 5 of 5
Project Number 00 280 M 003
Date 8-8-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
65	UNABLE TO RECOVER SAMPLE WITH SHELBY TUBE. WOOD PLUG IS IN THE WAY. DISCONTINUE BORING.			0%						SHELBY TUBE
66										
67				0%						SHELBY TUBE
68										
69										
70										
71										
72										
73										SHELBY TUBE
74				0%						
75										

BZ=Breathing Zone BH=Bore Hole S=Sample

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11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMC-G-4b
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 5
Air Monitoring Equipment: LEL/O_2		Total Footage: 70.5'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	70.5'	N/A	2	N/A

Drilling Company: Gregg Drilling & Testing Inc.		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-61		Type of Sampler: Shelby tube	
Date: 8/16/00	To: 8/16/00	Field Observer (s): Ron Elden	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL (%)) BZ	BH	S	Remarks/ Water Levels
1	Fill; silty clay, trace sand and gravel, dark gray, medium consistency, medium plasticity, dry	CH			0827					
2										
3	- trace organics (roots)									
4										
5					0829		0	0	-	O_2 = 20.9%
6	Fill; silt and clay, some gravel, trace brick fragments Very dark gray, trace plasticity, medium consistency dry				0838					
7										
8		ML								
9										
10					0844		0	0	-	O_2 = 20.9%
					0845					
11										
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

11/8/1992

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Form WCI-OP2-1

Drilling Log Continuation

Boring Number BMC-6-4b
Project Name SUNQUEST
Page 2 of 5
Project Number 00-780-4-003
Date 8/16/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEVEL(0) BZ	PID (ppm) LEVEL(0) BH	PID (ppm) LEVEL(0) S	Remarks/ Water Levels
15	Fill; silt and clay, some gravel, trace brick fragments dark gray, medium plasticity, medium consistency, dry.	ML			0847		0	0	-	O_2 = 20.9%
16					0848					
17										
18										
19	Fill; silt and sand, some clay, very dark gray, trace brick fragments, loose, non plastic, dry.	ML								
20					0851		0	0	-	O_2 = 20.9%
21					0854					
22										
23	Fill, clayey sand, dark brownish gray, fine to medium grained, trace plasticity, moist	SC								
24										
25					0857		0	0	-	O_2 = 20.1%
26	soil damp at 26' bgs				0858					
27										
28										
29										visible product & H-C odor
30	soil wet at 30' bgs				0901		0	0	-	▽ wet at ≅ 30' bgs
					0902					

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants Inc.

Form WCHOP2-2

Drilling Log Continuation

Boring Number BMC-6-46
Project Name SUNQUEST
Page 3 of 5
Project Number 00-180-4-003
Date 8/16/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / EL (%) BZ	BH	S	Remarks/ Water Levels
32	Fill; clayey sand, dark brownish gray, fine to medium grained, dense trace plasticity, wet	SC								Hydrocarbon odor & sheen
33										
34										
35	Refuse; glass, metal, plastic, (~30%), Fill; silty clay, trace sand, trace organics (roots), black, wet, medium to high plasticity (~70%)				0910		0	1%	–	O_2 = 20.1%
36					0911					
37										
38										
39										20% gas
40					0914		0	>100%	–	O_2 = 18.2%
41					0915					
42										
43										
44										
45					0919		0	>100%	–	32% gas O_2 = 17.4%
46					0920					
47										
49										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log Continuation

Boring Number BMR-G-46
Project Name SUNQUEST
Page 4 of 5
Project Number 00-280-4-003
Date 8/16/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL %) BZ	BH	S	Remarks/ Water Levels
49	Refuse, glass, metal, plastic (~30%) Fill; silty clay trace sand, black, wet med. to high plasticity (~70%).				0925		0	>100%	-	O_2 = 17.2%
50					0927					
51										
52										
53										
54										
55					0934		0	>100%	-	O_2 = 17.4%
56					0935					
57										
58										
59										
60					0942		0	7100%	-	O_2 = 17.8%
61					0943					
62										
63										
64	Clay, dark blueish gray, very soft, high plasticity, wet (Bay Mud).	CH								
65					0949					

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log Continuation

Project Name	SUNQUEST
Project Number	00-280-4-003
Boring Number	BMC-6-46
Page	5 of 5
Date	8/16/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
66	Clay, dark bluish gray, very soft, high plasticity, wet (Bay Mud)				1015	BMC-6-4 SS-1 65-67'				unconfined strength = 0 tsf/qz
67		CH			1035					
68						BMC-6-4 SS-2 67-69'				unconfined strength avg. = 0.3 tsf/qz
69					1048					
70			N=4 N=5 N=9		1050					Blow counts 4,5,9 18-inches
71	Bottom of Hole - 70.5' bgs									
72										
73										
74										
75										
76										
77										
78										
79										
80										
81										
82										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
BRISBANE LANDFILL	00280-4-003	BMC G-5
Ground Elevation	**Location**	**Page**
	BRISBANE LANDFILL	1 of 4
Air Monitoring Equipment		**Total Footage**
GASTECH LANDSURVEYOR		51'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6" DIA	—	—	3	

Drilling Company GREGG	Driller (s) TREVOR
Drilling Rig MOBILE B-61 HDX	Type of Sampler SHELBY TUBES
Date 8-8-00 To 8-8-00	Field Observer (s) GABE STIVALA

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL: GRAVELLY SAND: MEDIUM SAND WITH GRAVEL AND GRAVEL SIZED PIECES OF BRICK; BROWN, DRY	GM			0830		0	0	—	
5					0835		0	0	—	
10					0240	BMC G-5 11'	0	0	—	FOR SIEVE
12	FILL: SILTY CLAY WITH REFUSE: CLAY WITH SOME SILT, SOME GRAVEL AND WOOD; DARK BROWN, MOIST MOSTLY SILTY CLAY	GC								

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-1

Drilling Log Continuation

Boring Number BMC G-5
Project Name BRISBANE LANDFILL
Page 2 of 4
Project Number 00 280 4 003
Date 8-8-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15							0	0	—	
16	FILL: SOIL WITH REFUSE: MEDIUM SAND WITH PAPER AND WOOD; DARK BROWN, DRY EQUAL PARTS OF REFUSE AND SOIL	SP								
17										
18										
19										
20					0845		0	0	—	
21	FILL: GRAVEL WITH REFUSE: PIECES OF GLASS. MOSTLY GRAVEL	GC								
22										
23										
24										
25					0855	0	0	0	—	
26										
27	FILL: SOIL AND REFUSE: MOSTLY REFUSE, PAPER, WOOD, GLASS. SOIL IS SILTY SAND	SP								
28										
29										
30					0900		0	0	—	

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-2

Drilling Log Continuation

Project Name BRISBANE LANDFILL
Project Number 00 230 4003
Boring Number BMCG-5
Page 3 of 4
Date 8-8-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL BZ	PID (ppm) LEL BH	PID (ppm) O2 S	Remarks/ Water Levels
31	SAME AS PREVIOUS									
32										
33	FILL: SILTY CLAY WITH REFUSE. CLAY WITH SILT, PIECES OF GLASS, WOOD AND ROOT MATERIAL. DARK BROWN, WET. MOSTLY SILTY CLAY	SM								▽ WATER TABLE
34										
35					0905		0	>50%	—	HALTED WORK
36										
37										
38					0910		0	0	—	
39	FILL: REFUSE, WOOD, GLASS, PAPER SATURATED.	SP		20%		SPT ↓				SPT - FOR LITH DESCRIP. ONLY
40										
41										
42										
43										
44	SILTY CLAY/FILL: SILTY CLAY WITH SOME REFUSE. MOSTLY CLAY	CH			0920					
45	SILTY CLAY (BAYMUD): CLAY WITH SILT, FIRM, SOME SHELLS, BLUE GREY, MOIST, MED PLASTICITY						0	0	—	SPT FOR LITH DESCRIP ONLY
46	(FILL/BAYMUD INTERFACE IS 44.5) OBSERVED WITH SPLIT SPOON SAMPLE.									

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants Inc.

Form WCI-OP2-2

Drilling Log Continuation

Boring Number BMC G-5
Project Name BRISBANE LANDFILL
Page 4 of 4
Project Number 00-280-4003
Date 8-8-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
47	SAME AS PREVIOUS				0943					
48		CH		100%		BMC G-5 (47'-49')				
49	→ PP = 0									
50		CH			0955	BMC G-5 (49'-51')				
51	→ PP = 0									
52	END OF BORING 8 Bags of Grout GROUTED TO 10' BLS									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name: BRISBANE LANDFILL	Project Number: 00 2804 003	Boring Number: BMC G-6
Ground Elevation:	Location: BRISBANE LANDFILL	Page: 1 of 3
Air Monitoring Equipment: GASTECH	LANDSURVEYOR	Total Footage: 43.5'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6" DIA	—	—	3	—

Drilling Company: GREGG		Driller (s): TREVOR	
Drilling Rig: MOBILE B61 HDX		Type of Sampler: SHELBY TUBE	
Date: 8-10-00	To: 8-10-00	Field Observer (s): GABE STIVALA	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL; GRAVELLY SILT; SILT WITH COARSE GRAVEL, SOME FINE SAND; LIGHT BROWN, DRY	GM			1330		0	0	—	
5	FILL; SILTY CLAY; CLAY WITH SILT AND SOME FINE SAND; BROWN, MOIST	CL			1335		0	0	—	
8	NO REFUSE OBSERVED									
10					1340		0	0	—	
12	SILTY CLAY; CLAY WITH SILT, DARK GREY SATURATED	CL								WATER TABLE ▽ Δ DARK BROWN WATER

BZ=Breathing Zone BH=Bore Hole S=Sample

Blume & McDonnell Waste Consultants, Inc.
Form WCI-OP2-1

Drilling Log Continuation

Boring Number BMC G-6
Project Name BRISBANE LANDFILL
Page 2 of 3
Project Number 00-220-4.003
Date 8-10-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	SAME AS PREVIOUS				1355		.0	0	-	
16	NO REFUSE OBSERVED									
17										
18										
19										
20					1400		0	0	-	
21										
22										
23										
24										
25					1400					
26	SILTY CLAY (BAY MUD): CLAY WITH SILT, SOME SHELLS, BLUE GREY, SATURATED.	CH		80%						SPT FOR VERIFICATION
27										
28										
29				0%						SHELBY TUBE (No RECOVERY)
30					1415					
31				100%		BMG G-2 30-32				SHELBY TUBE

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-2

Drilling Log Continuation

Boring Number BMC G-6
Project Name BRISBANE LANDFILL
Page 3 of 3
Project Number 00 2804 003
Date 8-10-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32	SAME AS PREVIOUS (BAY MUD) → PP = 0	CH		100%	1430	BMC G-32 30-32	0	0	→	SHELBY TUBE
33				0%						SHELBY TUBE
34			2							
35			3	0%						
36			4							
37				0%						
38										
39				0%						
40										
41				100%	1510	CH-01 9-9.7HS				
42	→ PP = 0		2							
43			3	0%						
44	END OF BORING 43.5'		4		1515					

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-2

Drilling Log

Project Name: BRISBANE LANDFILL	Project Number: 00 280 4 003	Boring Number: BMC G-7
Ground Elevation: —	Location: BRISBANE LANDFILL	Page: 1 of 4
Air Monitoring Equipment: GASTECH	LANDSURVEYOR	Total Footage: 56.5'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	8" DIA	—	—	2	—

Drilling Company: GREGG		Driller (s): TREVOR	
Drilling Rig: MOBILE B61 HDX		Type of Sampler: SHELBY	
Date: 8-9-00	To: 8-9-00	Field Observer (s): GABE STIVALA	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
0	FILL: GRAVELLY SAND MED SAND WITH LARGE GRAVEL AND SOME CLAY; LIGHT BROWN, DRY	GP			1310					
3	FILL: CLAYEY SAND; MED SAND WITH CLAY AND SOME GRAVEL; BROWN, DRY	SC								
10					1320		0	0	—	

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Boring Number BHC Gr-7
Project Name BRISBANE LANDFILL
Page 2 of 4
Project Number 00 2804 003
Date 8-9-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	FILL; SANDY GRAVEL: COARSE GRAVEL WITH MEDIUM SAND, GREY, DRY	GP								
16										
17										
18										
19	FILL: SAND: MEDIUM SAND WITH SOME CLAY AND FINE	SW								
20	GRAVEL; DARK BROWN, DRY									
21										
22										
23										
24										
25										
26										
27										
28	SAME AS PREVIOUS BUT INCREASING CLAY AND									
29	MOISTURE.									
30	SAME BUT SATURATED				1340		0	0	—	▽ / △

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log Continuation

Project Name: BRISBANE LANDFILL
Project Number: 00 280 4 003
Boring Number: BMC G-7
Page: 3 of 4
Date: 8-9-00

Depth (feet) 3/	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32										
33										
34	FILL: SAND: MED TO COARSE SAND, MODERATELY SORTED,	SW								
35	SOME SMALL GRAVEL, SOME FINES; DARK BROWN,				1343		0	0	—	
36	SATURATED.									
37										
38										
39										
40	SANDY SILT: SILT WITH MED TO FINE SAND, DARK GREY,	ML			1350		0	0	—	
41	SATURATED.									
42										
43										
44										
45										
46										
47	SILTY CLAY (BAY MUD): CLAY WITH SILT, SOME SHELLS, SATURATED HIGH PLASTICITY: BLUE GREY	CH			1355		0	0	—	SPT FOR LITH VERIF

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log Continuation

Project Name: BRISBANE LANDFILL
Project Number: 00 280 4 003
Boring Number: BMC G-7
Page: 4 of 4
Date: 8-9-00

Depth (feet) 48	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SAME AS PREVIOUS (BAYMUD)	CH								
49										
50							0	0	—	
51										
52				100%		BMC G-7 51-53				SHELBY TUBE
53	→ POCKET PENETROMETER = 1.0 TONS/FT² (53')				1420					
54						BMC G-7 53-55				SHELBY TUBE
55	→ = 0.75 TONS/FT² (55')				1430					
			10							SPT FOR BLOWCTS
			7							
			7		1440					
	NOTE: NO TRACES OF REFUSE THROUGHOUT BORING									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCHOP2-2

Drilling Log

Project Name	Project Number	Boring Number
BRISBANE LANDFILL	00 280 4 003	BMC G-8
Ground Elevation —	**Location** BRISBANE LANDFILL	**Page** 1 of 3
Air Monitoring Equipment GASTECH LANDSURVEYOR		**Total Footage** 32.5

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	—	—	2	—

Drilling Company	GREGG	**Driller (s)**	TREVOR
Drilling Rig	MOBILE B61 HDX	**Type of Sampler**	SHELBY TUBES
Date 8/11/00	**To** 8/11/00	**Field Observer (s)**	GABE STIVALA

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL: SILTY GRAVEL: LARGE GRAVEL WITH SILT, SOME SAND	GM			0900	BMC G-8 1.5-2				
2	FILL: REFUSE AND SILTY SAND. REFUSE CONSISTING OF PAPER, PLASTIC, PORCELIAN; SILTY SAND IS DARK BROWN EQUAL PARTS REFUSE AND SOIL DRY.	SM								
3										
4										
5										
6										
7										
8										
9										
10					0920		0	D	—	
11	FILL: REFUSE AND SILT; REFUSE CONSISTING OF PAPER	ML								
12	AND PLASTIC; SILT IS DARK									
13	GREY, MOIST MOSTLY REFUSE									
14					1105		0	8	—	

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Project Name: BRISBANE LANDFILL
Project Number: 00-280-4-003
Boring Number: BMC G-8
Page: 2 of
Date: 8-11-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	SAME AS PREVIOUS (WET SATURATED)									& WATER DARK GREY (14')
15	FILL: SILTY GRAVEL; MED GRAVEL WITH SILT AND FINE SAND; DARK GREY, SATURATED)	GM								NOTE: TIDE IS LOW.
16										
17										
18										
19	FILL: GRAVELLY SILT: SILT WITH SMALL GRAVEL, DARK GREY, SATURATED	GM								
20					0930		0	9	—	
21										
22										
23										
24	SILTY CLAY (BAY MUD): CLAY WITH SILT; BLUE GREY, HIGH PLASTICITY, WET, SOME SHELLS	CH								
25					0935		0	11	—	
26				0%						SHELBY TUBE NO RECOVERY
27										
28				80%		BMC G-8 27-29				SHELBY TUBE
29	→ PP = 0				1010					
30	→ PP = 0			100%	1030	BMC G-8 29-31				SHELBY TUBE

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-2

11/11/1992

Drilling Log Continuation

Boring Number BMC 6-8
Project Name BRISBANE LANDFILL
Page 3 of 3
Project Number 00 2804 003
Date 8-11-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
31			1							SPT FOR BLAN CT.
			2							
32			2		1030					
	END OF BORING 32.5									

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-2

Drilling Log

Project Name: BRISBANE LANDFILL	Project Number: 00 2804 003		Boring Number: BMC G-9
Ground Elevation: —	Location: BRISBANE LANDFILL		Page: 1 of 2
Air Monitoring Equipment: GASTECH	LAND SURVEYOR		Total Footage: 23.5

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	-	-	—	2	-

Drilling Company: GREGG		Driller (s): TREVOR	
Drilling Rig: MOBILE B61 HDX		Type of Sampler: SHELBY TUBE	
Date: 8-11-00	To:	Field Observer (s): GABE STIVALA	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL: SILTY SAND: FINE SAND WITH SILT AND SOME SMALL GRAVEL/COARSE SAND; BROWN, DRY.	SM			1210					
5	FILL: REFUSE AND SILTY SAND REFUSE CONSISTS OF PLASTIC, PAPER, RUBBER. SOME SILTY SAND (BROWN-SAME AS PREVIOUS) MOSTLY REFUSE. DRY.	SM			1220		0	0	-	
10					1225		0	0	-	

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-1

Drilling Log Continuation

Boring Number BMC G-10
Project Name BRISBANE LAND FILL
Page 2 of 2
Project Number 002804 003
Date 8-11-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
14	SILTY CLAY (BAY MUD);									
15	CLAY WITH SILT, BLUE-GREY, SATURATED. SOME SHELLS,				1412		0	0	—	
16										
17										
18										
19				90%		BMC G-10 18-20				SHELBY TUBE
20	→ PP = 0				1420					
21				100%		BMC G-10 20-22				SHELBY TUBE
22	→ PP = 0		2		1435					
23			4 4	100%	1445					SPT FOR BLOW CT.
	END OF BORING 23.5									
	PP = POCKET PENETROMETER									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: RMC - P-1
Ground Elevation: —	Location: Brisbane Landfill	Page: 1 of 2
Air Monitoring Equipment: LEL / O2		Total Footage: 15'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	15'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing Inc.		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-61		Type of Sampler: HSA	
Date: 8/17/00	To: 8/17/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / LEL (%) BZ	BH	S	Remarks/ Water Levels
1–4	Fill; silt and sand, some gravel, trace clay, trace brick, loose, dry.	SM			1254					
4–5	Fill, clayey sand, trace brick, trace gravel, black, poorly sorted, dry.	SC			1256		0	0	-	O_2 = 20.9%
5–10					1257					
10					1258		0	0	-	O_2 = 20.9%
10–12					1259	BMC-P-1 SB-1 10'-12'				
12–14	Refuse; glass, metal, plastic, fabric, (~70%); Fill, clayey sand, dark greenish gray, poorly sorted, moist. (~30%)									

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-QP2-1

Drilling Log Continuation

Boring Number: BMC-P-1
Project Name: Brisbane Landfill
Page: 2 of 2
Project Number: 00-280-4-003
Date: 9/17/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	Refuse, glass, metal, plastic (~70%) Fill clayey sand, dark greenish gray, poorly sorted, moist ~30%				1500		0	29.1	-	O_2 = 20.8%
	Bottom of Hole - 15' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

9/11/99

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003			Boring Number: BMC-P-2	
Ground Elevation:	Location: Brisbane Landfill			Page: 1 of 1	
Air Monitoring Equipment: LEL/O2				Total Footage: 10'	
Drilling Type: HSA	Hole Size: 6"	Overburden Footage: 10'	Bedrock Footage: N/A	No. Of Samples: 1	No. Of Core Boxes: N/A
Drilling Company: Gregg Drilling & Testing Inc.			Driller (s): Trevor Joyner		
Drilling Rig: Mobile B-61			Type of Sampler: HSA		
Date: 8/17/00	To: 8/17/00		Field Observer (s): Ron Elder		

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	BZ (ppm)	BH (LEL %)	S	Remarks/ Water Levels
1	Fill; silt and sand, some gravel, brown, poorly sorted, dry loose	SM			1328					
2										
3	color becomes dark yellowish brown									
4	color becomes greenish gray.					BMC P-2 SB-1 3'-5'				
5					1332		0	0	-	O_2 = 20.9%
6					1331					
7	Refuse; glass, metal, wood, plastic, rubber (~80%)									organic odor
8	Fill, silty clay, black, soft, med. plasticity, moist. (~20%)									
9										20% gas
10					1333		D	>100%	-	O_2 = 19.2%
11	Bottom of Hole - 10' bgs									
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-1

Drilling Log

Project Name	Project Number	Boring Number
BRISBANE LANDFILL	00-280-4-003	BMCP-3

Ground Elevation	Location	Page
—	BRISBANE LANDFILL	1 of 3

Air Monitoring Equipment	Total Footage
GASTECH LANDSURVEYOR	45'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6" augers	—	—	0	—

Drilling Company: GREGG	Driller (s): TREVOR
Drilling Rig: MOBILE B-61 HDX	Type of Sampler: CUTTINGS
Date: 8-7-00 To: 8-7-00	Field Observer (s): GABE STIVALA

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL: Gravelly Sand: Dark Brown gravelly sand with some pieces of Brick and wood; coarse gravel to fine sand. Predominantly med sand. Dry	SP			1040					
2										
3										
4										
5					1055		0	0	—	
6			50 x 6"						—	
7										
8										
9			7" 50(4")							
10					1150		0	0	—	
11	FILL: SANDY GRAVEL! Dark Brown Same as above but more gravel. Dry	SP								
12										
13										
14			31							

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-1

Drilling Log Continuation

Boring Number BMC P-3
Project Name BRISBANE LANDFILL
Page 2 of 3
Project Number 00-280-4.003
Date 8-7-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL / H_2S / O_2 BZ	BH	S	Remarks/ Water Levels
15	FILL: SANDY GRAVEL, same as previous	SP	50 X				0%	0	20%	
16										
17										
18										
19			40 50		1115					
20			X				0	1	—	
21										
22										
23	FILL: REFUSE AND SOIL: DARK BROWN Fine sand with some Gravel. SOME REFUSE: paper and metal. Root fibers present.	SP					0%	73	—	HALTED UNTIL LEL LOWERED TO 20%
24			12		1130					
25			17 16							
26										
27										
28										
29										
30										

BZ=Breathing Zone BH=Bore Hole S=Sample

Drilling Log Continuation

Boring Number BMC P-3
Project Name BRISBANE LANDFILL
Page 3 of 3
Project Number 00-290-4003
Date 8-7-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL H_2S CO_2 BZ	BH	S	Remarks/ Water Levels
31	FILL: Refuse and Soil: silty sand with fibrous refuse and wood DARK GREY, saturated.	SM			1230					▽ WATER TABLE
32										
33										
34										
35	SAME AS PREVIOUS	SM			1240		0	6	—	
36										
37										
38										
39	FILL: METAL, GLASS, PLASTIC with silty sand. Dark grey, SATURATED. MOSTLY REFUSE	SM			1250		0	0	—	
40										
41										
42										
43										
44										
45	SAME + RUBBER, GLASS METAL (END OF BORING, 45') SATURATED				1305	13	0	20%	—	
	NO SAMPLES COLLECTED									

BZ=Breathing Zone BH=Bore Hole S=Sample

11/8/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-2

Drilling Log

Project Name: SUN QUEST	Project Number: 00-280-4-003	Boring Number: BMC-P-4
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 1
Air Monitoring Equipment: LEL/O_2		Total Footage: 9'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	9'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing Inc		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-53		Type of Sampler: HSA	
Date: 8/15/00	To: 8/15/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	~~PID (ppm)~~ LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill, silt and gravel, trace fine sand, brown, loose, dry	GM			1413					Begin drilling
5	Fill; sand and clay, trace brick and gravel, dark gray, loose, dry.	SC			1415		0	0	-	O_2 = 20.8%
6					1416	BMC-P-4 SB-1 5'-7'				
9	Refuse; metal, glass, fabric, plastic (~60%) Fill; clay and sand, trace silt & gravel, V. dark gray; loose, dry				1419		0	0	-	O_2 = 20.8%
	Bottom of Hole - 9' bgs.									

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants Inc.

Form WCI-OP2-1

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	BMC-P-5
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 2
Air Monitoring Equipment	CEL/O_2	**Total Footage** 25'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	25'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing, Inc.	**Driller (s)**	Trevor Joyner
Drilling Rig	Mobile B-53	**Type of Sampler**	HSA
Date	8/15/00 **To** 8/15/00	**Field Observer (s)**	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) CEL/O_2 BZ	BH	S	Remarks/ Water Levels
1	Fill; silt and gravel, trace sand and clay, brown, loose, dry	GM			1457					Begin drilling
5	Fill; silty clay, some sand, trace gravel, nonplastic, soft, dry, grayish brown	CL			1458		0	0	-	O_2 = 20.8%
					1459					
10					1501		0	0	-	O_2 = 20.8%
11	Fill; sandy clay, trace silt, trace brick fragments, very dark grey, trace plasticity, medium consistency, moist.	CL			1502					
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-1

Drilling Log Continuation

Boring Number: BMC-P-5
Project Name: SUNQUEST
Page: 2 of 2
Project Number: 00-280-4-003
Date: 8/15/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
15	Fill; sandy clay, trace silt, trace brick fragments, V. dark gray, trace plasticity, med. consistency, moist.	CL			1504		0	0	-	
16					1505					
17										
18										
19										
20	Fill; silty clay, some sand, trace brick fragments, dark greenish gray, med. plasticity med. consistency, moist.	CH			1507		0	0	-	
21					1508	BMC-P-5 (SB-1) 20'-22'				
22										
23	Refuse; metal, glass, plastic, wood, fabric. (~70%) Fill; silty clay, trace sand, black, med. to high plasticity, soft, damp. (~30%)									
24										
25					1511					
	Bottom of Hole - 25' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

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Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	BMC-P-6
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 2
Air Monitoring Equipment		**Total Footage**
LEL / O_2		15'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	15'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing, Inc.	Driller (s)	Trevor Joyner
Drilling Rig	Mobile B-61	Type of Sampler	HSA
Date	8/17/00 To 8/17/00	Field Observer (s)	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill; silt and sand, some gravel, dark gray, loose dry.	SM			1122					Begin drilling
2										
3										
4										
5					1124		0	0	-	O_2 = 20.9%
6	Fill; sand, trace clay, trace silt, dark greenish gray, poorly sorted, quartz rich, moist,	SC			1125					
7										
8										
9										
10					1126		0	0	-	O_2 = 20.9%
11					1127	BMC-P-6 SB-1 10'-12'				
12										
13	Refuse, wood, metal, nails, rubber (~60%); fill, clayey sand, black, poorly sorted, moist (~20%)									
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell | Waste Consultants, Inc.

Form WCI-OP2-1

Drilling Log Continuation

Boring Number BMC-P-6
Project Name SUNQUEST
Page 2 of 2
Project Number 00-280-4-003
Date 8/17/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	Refuse, wood, metal, nails, rubber (~80%), Fill, clayey, sand, black poorly sorted, moist (~20%)				1119		0	0	–	O2 = 20.8%
	Bottom of Hole – 15' bgs									
16										
17										
18										
19										
20										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Drilling Log

Project Name	Project Number	Boring Number
BRISBANE LANDFILL	00-280-4-003	BMC P-7
Ground Elevation	**Location**	**Page**
	BRISBANE LANDFILL	1 of 2
Air Monitoring Equipment		**Total Footage**
GAS TECH LAND SURVEYOR		25'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6" DIA	—	—	1	—

Drilling Company: GREGG	Driller (s): TREVOR
Drilling Rig: MOBILE B 61 HDX	Type of Sampler: (LOGGING CUTTINGS)
Date: 8-7-00 To 8-7-00	Field Observer (s): GABE STIVALA

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1–5	FILL: GRAVELLY SAND: Medium sand with coarse gravel and some cobbles. Pieces of brick. Light brown	SP			1355		0.0		—	
6–9	FILL: SILTY CLAY: clay with silt, some gravel size brick pieces and gravel; brown, moist high plasticity.	CL								
10					1400		0.4		—	
11–14	FILL: SILTY CLAY: clay with silt, no gravel or brick; color change. Dark brown, moist med. plasticity.	CL								

BZ=Breathing Zone BH=Bore Hole S=Sample

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Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-1

Drilling Log Continuation

Boring Number BMC P-7
Project Name BRISBANE LANDFILL
Page 2 of 2
Project Number 00-280-4-003
Date 8-7-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	SAME AS PREVIOUS	CL			1410		0	6		
16										
17										
18										
19										SAMPLE FOR SEIVE BMCP-7(19')
20					1420		0	23%	—	
21	FILL: CLAY WITH REFUSE Dark Brown, moist. Paper and Metal.	CL								
22	FILL; REFUSE WITH SILTY CLAY: Dark Brown PAPER, METAL WOOD, SATURATED	CL								▽
23										
24										
25					1430		0	50%	—	HALTED WORK
	END OF BOREHOLE									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMC-P-8
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 1
Air Monitoring Equipment: LEL/O2		Total Footage: 10'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	10'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing Inc.		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-61		Type of Sampler: HSA	
Date: 8/17/00	To: 8/17/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill, silt and sand, some gravel, brown, loose, dry.	SM			1502					
2										
3	becomes dark brown at 3' bgs.									
4										
5					1504		0	0	-	O_2 = 20.9%
6	color becomes reddish brown at 6' bgs.				1505	BMC-P-8 <8-1 5'-7'				
7										
8	Refuse, glass, plastic, rubber (~50%) Fill, silt, some sand and clay, reddish brown, loose, dry. (~50%)									
9										
10					1506		0	0	-	O_2 = 20.9%
11	Bottom of Hole - 10' bgs									
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

11/11/1992

Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-1

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003			Boring Number: BMC-P-9	
Ground Elevation:	Location: Knisbane Landfill			Page: 1 of 1	
Air Monitoring Equipment: LEL/O2				Total Footage: 10'	
Drilling Type: HSA	Hole Size: 6"	Overburden Footage: 10'	Bedrock Footage: N/A	No. Of Samples: 1	No. Of Core Boxes: N/A
Drilling Company: Gregg Drilling & Testing Inc.			Driller (s): Trevor Joyner		
Drilling Rig: Mobile B-61			Type of Sampler: HSA		
Date: 8/17/00	To: 8/17/00		Field Observer (s): Ron Elder		

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill; silt, some gravel, trace sand, brown, loose, dry.	SM			1425					
2										
3										
4										
5					1427		0	0	-	O_2 = 20.9%
6					1428	BMC-P-9 SB-1 5'-7'				
7										
8	Refuse, wood, glass, paper, plastic (~50%) Fill, silt and clay, very dark gray, organics, nonplastic, dry. (~50%)									organic odor
9										
10					1430		0	0	-	O_2 = 20.9%
11	Bottom of Hole - 10' bgs									
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

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Burns & McDonnell Waste Consultants Inc.

Form WCI-OP2-1

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003				Boring Number: BMC-P-10
Ground Elevation:	Location: Brisbane Landfill				Page: 1 of 2
Air Monitoring Equipment: LEL/O_2					Total Footage: 15'
Drilling Type: HSA	Hole Size: 6"	Overburden Footage: 15'	Bedrock Footage: N/A	No. Of Samples: 1	No. Of Core Boxes: N/A
Drilling Company: Gregg Drilling & Testing, Inc.			Driller (s): Trevor Joyner		
Drilling Rig: Mobile B-61 HDX			Type of Sampler: HSA		
Date: 8/14/00	To: 8/14/00		Field Observer (s): Ron Elder		

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill; Silt, some clay and gravel, brown, loose, trace organics (roots), non plastic, dry.	ML			1002					Begin drilling at 1002.
2										
3										
4										
5					1004		0	0	—	
6	Fill, silt and clay, some debris (brick), some gravel loose, nonplastic, dry med. consistency, dark brownish gray.	ML			1005					
7										
8						BMC-P-10 SB-1 8'-10'				
9										
10	Refuse (metal, glass, plastic, paper, etc), silty clay Refuse ~50%, soil ~50% V. dark grayish brown, med plasticity, moist				1007		0	0	—	
11					1009					
12										
13										
14					1010		0	0	—	

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Boring Number BMC-P-10
Project Name SUNQUEST
Page 2 of 2
Project Number 00-280-4-003
Date 8/14/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
	Refuse; metal, glass, plastic, paper (~50%) Fill (~50%) v. dark grayish brown med. plasticity, moist.						0	0	-	
15	Bottom of Hole - 15' bgs									Did not encounter water to 15' bgs.

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMC P-11
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 3
Air Monitoring Equipment: LEL/O2		Total Footage: 40'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	40'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing Inc.		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-61 HDX		Type of Sampler: HSA	
Date: 8/14/00	To: 8/14/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (O2) BZ	BH	S	Remarks/ Water Levels
1	Fill; silty clay, trace sand and gravel, medium consistency, grayish brown, dry, low plasticity	CL			0820					
5	Fill; silty clay, some sand and gravel, grayish brown, dry, med. consistency low plasticity	CL			0833		0	0	–	
10					0840		0	0	–	
					0841					

BZ=Breathing Zone BH=Bore Hole S=Sample

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Burns & McDonnell Waste Consultants, Inc.

Form WCI-OP2-1

Drilling Log Continuation

Boring Number BMC A-11
Project Name SUNQUEST
Page 2 of 3
Project Number 00-250-4-003
Date 8/14/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
15	Fill; coarse gravel, some silt and clay, brown dry.	GM			0848		0	0	-	
16					0849					
17	Fill; silty clay, some sand trace gravel, low plasticity dry, brown	CL								
18										
19										
20	Fill; gravel coarse, some clay and sand, brown trace wood fragments	GC			0855		0	0	-	
21					0856					
22										
23										
24	Fill; coarse gravel, debris including rubber, wood, paper etc., moist, grayish brown.	GW								▽ water at 24'
25					0900		0	0	-	
26					0901					
27										
28	Fill, silt, some sand and clay, moist, dark grayish brown, low plasticity medium consistency.	ML								
29										
30					0905					
31					0906					

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BMC P-11
Page: 3 of 3
Date: 8/14/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / LEL (%) BZ	PID (ppm) / LEL (%) BH	PID (ppm) / LEL (%) S	Remarks/ Water Levels
32	Fill; silty clay, trace sand and gravel, some debris (asphalt), med. consistency, low plasticity, moist, dark gray	CL								
33										
34										
35							0	0	-	▽ water at 35' bgs
36	Fill, silty clay, v. dark gray, some organics (roots), trace fine sand	CL				BMC-P-11 SB-1 35'-37' bgs				
37										
38	Refuse, metal, paper, glass, wood fragments, etc. / some silty clay, v. dark gray, Refuse approx. 50%.									
39										
40							0	0	-	
41	Bottom of Hole - 40' bgs									
42										
43										
44										
45										
46										
47										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	SMC-P-12
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 2
Air Monitoring Equipment		**Total Footage**
LEL/O_2		25'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	25'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing Inc.	Driller (s)	Trevor Joyner
Drilling Rig	Mobile B-61	Type of Sampler	HSA
Date	8/17/00 To 8/17/00	Field Observer (s)	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill; silt and gravel, some sand, brown, loose, dry	GM			1043					Begin drilling
5	Fill; silt and gravel, some clay, trace sand, gray, nonplastic, loose, dry				1045		0	0	–	O_2 = 20.9%
7	becomes dark gray at 8' bgs.	GM			1046					
10					1048		0	0	–	O_2 = 20.9%
11					1049					
12	Fill; silt and clay, some fine sand and gravel, dark grayish brown, trace plasticity, medium consistency, moist.	CL								
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-1

Drilling Log Continuation

Project Name: Brisbane Landfill
Project Number: 20-780-4-003
Boring Number: BMC-P-12
Page: 2 of 2
Date: 8/17/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	Fill; silt and clay, some fine sand and gravel, dark grayish brown, fair plasticity, med consistency, moist.	CL			1051		0	0	-	O_2 = 20.9%
16					1052					
17										
18	Fill, sandy clay, some organic material, very dark gray, soft, medium plasticity, damp.									organic odor
19										
20		CL			1054		0	0	-	O_2 = 20.9%
21					1055	BMC-P-12 SB-1 20'-22'				
22										▽ wet @ 22' bgs.
23	Refuse; paper, plastic, wood, metal (~70%) Fill, sandy clay, organics, black, soft, medium plasticity, wet. (~30%).									
24										
25					1252		0	3%	-	O_2 = 20.8%
26	Bottom of Hole - 25' bgs									
27										
28										
29										
30										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMK-P-13
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 2
Air Monitoring Equipment: CL/O2		Total Footage: 30'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	30'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing Inc.		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-61 HDX		Type of Sampler: HSA	
Date: 8/14/00	To: 8/14/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (CL (%)) BZ	BH	S	Remarks/ Water Levels
1	Fill; silt and clay, trace sand and gravel, trace bricks, brown, nonplastic, dry.	CL			1041					1041 - Begin drilling.
5					1043		0	0	-	
6	Fill; silty clay, some gravel, brick, grayish brown, med. plasticity, med. consistency, moist.				1044					
10					1046		0	0	-	
					1047					

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

11/11/1992

Form WCI-OP2-1

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BML-P-13
Page: 1 of 2
Date: 8/14/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / LEL (O_2) BZ	BH	S	Remarks/ Water Levels
15	Fill; silt, clay and sand dark grayish brown, trace brick and gravel moist, trace plasticity med. consistency.	CL			1049		0	0	–	
16					1050					
17										
18										
19										
20					1053		0	0	–	
21					1054					
22										
23										
24										
25					1057		0	0	–	O_2 = 20.9%
26	Fill; silty clay, some sand, some organics (roots) very dark gray, medium plasticity, soft, wet.	CH			1058					▽ wet at 26' bgs
27						BML-P-13 SB-1 26-28'				
28										
29	Refuse; plastic, wood, paper, glass (~60%) soil ~ 40% silty clay, V. dark gray				1059		0	2	–	O_2 = 20.5%
30	Bottom of Hole - 30' bgs.									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

11/18/1992

Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	BMC-P-14
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 2
Air Monitoring Equipment		**Total Footage**
LEL/O_2		15'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	15'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing Inc.	**Driller (s)**	Trevor Joyner
Drilling Rig	Mobile B-61	**Type of Sampler**	HSA
Date	8/17/00 **To** 8/17/00	**Field Observer (s)**	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
0	Fill; silt, some clay and gravel, brown, nonplastic, dry.	ML			0950					Begin drilling
5					0951		0	0	–	O_2 = 20.9%
5	Fill; silty clay, trace brick fragments, trace sand, dark grayish brown, medium consistency, trace plasticity, dry.	CL			0952					
10					0953		0	0	–	O_2 = 20.9%
10					0954					
11						BMC-P-14 SO-1 11'-13' bgs				
12	Refuse; glass, rubber, wood, (~60%), Fill, silt and clay, trace fine sand, V. dark gray, nonplastic dry. (~40%									
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-1

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-230-4-003
Boring Number: BMC-P-15
Page: 2 of 2
Date: 8/17/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	Refuse; glass, rubber, wood (~60%) Fill; silt and clay, trace fine sand, V. dark gray, nonplastic, dry (~40%)				0956		0	1%	—	O2 = 20.7%
	Bottom of hole - 15' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

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Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMC-P-15
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 1
Air Monitoring Equipment: LEL/O2		Total Footage: 10'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	10'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing Inc.		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-61		Type of Sampler: HSA	
Date: 8/17/00	To: 8/17/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL/O2 BZ	BH	S	Remarks/ Water Levels
1	Fill; silt and clay, some sand and gravel, trace brick, nonplastic, dry.	CL			1020					Begin drilling
2										
3										
4										
5					1022		0	0	-	O2 = 20.9%
6					1023	BMC-P-15 SB-1 5'-7'				
7	Refuse; Rubber, glass, metal, wood (~65%) fill; silty clay, trace fine sand; V. dark grey, medium consistency, medium plasticity, moist, (~35%)									Organic odor in soil.
8										
9										
10					1025		0	0	-	O2 = 20.8%
11	Bottom of Hole - 10' bgs									
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMC-P-16
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 2
Air Monitoring Equipment: LEL / O_2		Total Footage: 15'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	15'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing, Inc.		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-53		Type of Sampler: HSA	
Date: 8/15/00	To: 8/15/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL %) BZ	BH	S	Remarks/ Water Levels
1	Fill, Silt and fine sand, trace gravel, trace organics, very dark gray, loose, dry	ML			0837					0837 - Begin drilling.
2										
3										
4										O_2 = 20.9%
5	Fill, clay, some organics, trace silt, trace fine sand, black, med. plasticity, soft, moist.				0840		0	0	–	Strong organic odor
6		OH			0841					
7						BMC-P-16 SB-1, 7-9' bgs				
8										
9										
10	Refuse; Wood, paper, glass, metal (~70%); Fill; silty clay, v. dark gray; med. plasticity, soft (~30%)				0843		0	0	–	O_2 = 20.9%
11					0844					organic odor
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BMC P-16
Page: 2 of 2
Date: 8/15/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15	Rdusc (~70%) (Wood, paper, metal, glass, Fill; silty clay, v. dark gray, med. plasticity, soft.				0847		0	11%	-	D_2 = 20.6%
	Bottom of Hole - 15' bgs									
16										
17										
18										
19										
20										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1997

Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	BMC-P-17
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 2
Air Monitoring Equipment		**Total Footage**
LEL/O_2		25'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	26'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing Inc.	Driller (s)	Trevor Joyner
Drilling Rig	Mobile B-61	Type of Sampler	HSA
Date	8/17/00 To 8/17/00	Field Observer (s)	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	~~PID (ppm)~~ LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill; clay and fine sand, dark grey, medium to soft, medium plasticity, dry.	CH			0849					Begin drilling
5	Fill; clay and fine sand, trace gravel, trace brick fragments, brown, medium consistency, med. plasticity dry.	CH			0850		0	0	-	O_2 = 20.9%
					0853					
10					0854		0	0	-	O_2 = 20.9%
					0855					

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

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Form WCI-OP2-1

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BMC-P-17
Page: 2 of 2
Date: 8/17/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
15	Fill; clay and fine sand, trace gravel, trace brick fragments, dark brownish gray, medium consistency medium plasticity, moist.	CH			0857		0	0	-	O_2 = 20.9%
16					0858					
17										
18	Fill, silt and sand, wood, brick and trace glass, V. dark gray, loose, dry.	SM								
19										
20					0900		0	3%	-	O_2 = 20.4%
21					0903	BMC-P-17 6B-1 20'-22'				
22										
23	Refuse; wood, plastic, glass, metal (~80%), Fill; silt and sand, trace clay, black, loose, moist. (~20%)									
24										75% gas outside of augers
25							>100%	>100%	-	O_2 = 4.2%
26	Bottom of Hole - 25' bgs									
27										
28										
29										
30										
31										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

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Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	BMC-P-18
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 1
Air Monitoring Equipment		**Total Footage**
LEL/O2		5'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	5'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing Inc.	Driller (s)	Trevor Joyner
Drilling Rig	Mobile B-61	Type of Sampler	HSA
Date	8/17/00 To 8/17/00	Field Observer (s)	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill, silt and gravel, brown, loose, dry.	SM		1401		BMC-P-18 SB-1 0'-2'				Begin drilling
2										
3	Refuse, paper, wood, rubber metal (~50%) Fill, silty clay, very dark gray, med. consistency, med. plasticity, moist. (~50%)									
4										
5				1403			0 1% -			O_2: 20.9%
6	Bottom of Hole - 5' bgs									
7										
8										
9										
10										
11										
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-1

Drilling Log

Project Name	Project Number	Boring Number
BRISBANE LANDFILL	00 280 4 003	BHC P-19
Ground Elevation	**Location**	**Page**
	BRISBANE LANDFILL	1 of 3
Air Monitoring Equipment		**Total Footage**
GASTECH LANDSURVEYOR		36.5

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA					

Drilling Company: GREGG	Driller (s): TREVOR
Drilling Rig: MOBILE B61 HDX	Type of Sampler:
Date: 8-9-00 To:	Field Observer (s): GABESTIVALA

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL: GRAVELLY SAND; MED SAND WITH LARGE GRAVEL; LIGHT BROWN, DRY	SW			1520					
2										
3										
4	FILL: CLAYEY SAND: MED SAND WITH CLAY AND	SC								
5	SOME SMALL GRAVEL; LIGHT BROWN DRY				1525		0	0	–	
6						BHC BP19' 5-6'				SAMPLE FOR SIEVE ANALYSIS
7	FILL: GRAVEL: MED GRAVEL WITH SOME FINES; GREY, DRY									
8										
9										
10					1530		0	0	–	
11	FILL: GRAVELLY SAND: MOSTLY MED SAND WITH SMALL GRAVEL AND FINES; BROWN, DRY	SW								
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Project Name: BRISBANE LANDFILL
Project Number: 00 2804 003
Boring Number: BMC P-19
Page: 2 of 3
Date: 3-9-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
15					1535		0	0	–	
16										
17	FILL: GRAVELLY SAND; FINE SAND WITH SILT AND GRAVEL; DARK BROWN DRY	SW								
18										SAMPLE FOR SIEVE ANALYSIS
19						BMC P-19 19-20				
20					1540					
21	CLAYEY SAND: MED SAND WITH CLAY, TRACES OF BRICK AND GLASS; DARK BROWN, MOIST.	SC								
22										
23										
24										
25	SAME BUT SATURATED									▽ WATER TABLE
26										WATER IS DARK GREY
27										
28										
29	CLAYEY SILT: SILT WITH CLAY, DARK GREY, SATURATED, LOW PLASTICITY	ML								
30										
31										

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-2

Drilling Log Continuation

Project Name: BRISBANE LANDFILL
Project Number: 00 280 4 003
Boring Number: BMC P-19
Page: 3 of 3
Date: 8-9-00

Depth (feet) 31	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
32	SAME AS PREVIOUS	ML								
33										
34										
35					1415		0	0	—	
	FILL: REFUSE AND SILT: NEWSPAPERS, RUBBER, GLASS									SPLIT SPOON
	END OF BORING (36.5)									

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	BMC-P-20
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 2
Air Monitoring Equipment		**Total Footage**
LEL/O2		30'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	30'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing Inc.	Driller (s)	Trevor Joyner
Drilling Rig	Mobile B-61	Type of Sampler	HSA
Date	8/16/00 To 8/16/00	Field Observer (s)	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL/%) BZ	BH	S	Remarks/ Water Levels
1	Fill; silt and sand, some gravel, brown, loose, dry.	ML			1454					Begin drilling
2										
3										
4										
5					1459		0	0	–	O_2: 20.9%
6	Fill; brick, some gravel, coarse, dry.	GW			1500					
7	Fill; silt and clay, some sand and brick fragments, dark brownish gray, nonplastic, soft, dry.	ML								
8										
9										
10					1502		0	0	–	O_2: 20.9%
11					1503					
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-1

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 20-280-4-003
Boring Number: BMC-P-20
Page: 2 of 2
Date: 8/16/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL%) BZ	BH	S	Remarks/ Water Levels
15	Fill, silt and clay, some sand and brick fragments, dark brownish gray, nonplastic soft, dry.				1506		0	0	-	O_2 = 20.9%
16					1507					
17		ML								
18	- trace plasticity, medium consistency at 18' bgs.									
19										
20	- moist at 20' bgs.				1520		0	2%	-	O_2 = 20.1 %
21					1521					
22	Fill; silt and clay, some sand, trace brick, black medium plasticity, soft to med. consistency, organic odor, damp									organic odor at 21' bgs
23		MH				BMC-P-20 SB-1 23'-25'				
24										77% gas
25					1513		0	>100%	-	O_2 = 1.5%
26					1525		wet at 26' ▽			wait 1/1' O_2 + gas stabilize in hole.
27	Refuse, plastic, wire, metal, wood, glass (~50%); Fill; silt and clay, black, soft, med to high plasticity, (~50%)									
28										
29										
30					1530		0	>100%	-	O_2 = 12.1%
	Bottom of Hole - 30' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-2

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMC-P-21
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 2
Air Monitoring Equipment: LEL/O2		Total Footage: 20'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	20'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing, Inc		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-53		Type of Sampler: HSA	
Date: 8/15/00	To: 8/15/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL (%)) BZ	BH	S	Remarks/ Water Levels
1	Fill; silt and fine sand, trace clay and gravel, very dark gray, trace glass, wood & brick fragments, loose, dry.	ML			1011					1010 - Pre-drill hole w/split spoon
2										
3										
4	large chunks of wood at 4' bgs									
5					1012		0	0	-	O_2 = 20.9%
6					1013					
7	Fill; clayey sand, fine, v. dark gray, trace silt and gravel, trace brick, moist, soft,	CL								
8										
9										
10					1015		0	0	-	O_2 = 20.9%
11					1016					
12	Fill, coarse gravel, some sand and clay, dark gray, loose, moist.	GC								
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-1

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BMC-P-21
Page: 2 of 2
Date: 8/15/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL %) BZ	BH	S	Remarks/ Water Levels
15	Fill, clay and fine sand, trace gravel, v. dark gray, moist, loose, soft.				1017		0	16%	-	O_2 = 20.9%
16					1018					
17						BMC-P-21 SG-1 16'-18'				
18										
19	Refuse; glass, metal, paper, wood, fabric (~70%); Fill, silty clay, v. dark gray, soft, damp (~30%)									11% gas
20					1022		0	>100%	-	O_2 = 18.0%
	Bottom of Hole - 20' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

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Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	BMC-P-22
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 2
Air Monitoring Equipment		**Total Footage**
LEL/O2		20'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	20'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing	Driller (s)	Trevor Joyner
Drilling Rig	Mobile B-53	Type of Sampler	HSA
Date	8/15/00 To 8/15/00	Field Observer (s)	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill; Silt and gravel, coarse, brown, trace clay and sand loose, dry	GM			1034					
2										
3										
4										
5					1041		0	0	—	O_2 = 20.9%
6	Fill; sand and clay, trace gravel, trace brick fragments, loose, dry, v. dark gray	SC			1042					
7										
8										
9										
10					1044		0	0	—	O_2 = 20.8%
11					1045					
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

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Form WCI-OP2-1

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BMC-P-22
Page: 2 of 2
Date: 8/15/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	~~PID (ppm)~~ EL (%) BZ	BH	S	Remarks/ Water Levels
15	Fill; sand & clay, trace gravel, trace brick, loose, dry very dark gray.	SC			1047 1050	BMC-P-22 SB-1 14'-16'	0	0	-	O_2 = 20.8%
16										
17	Refuse; wood, glass, metal, fabric (~40%), Fill, silt and sand, fine grained, trace gravel, loose, dry									
18										
19										
20					1100		0	2	-	O_2 = 20.6%
	Bottom of Hole - 20' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

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Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	BMC-P-23
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 2
Air Monitoring Equipment		**Total Footage**
LEL/O2		25'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	25'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing Inc.	Driller (s)	Trevor Joyner
Drilling Rig	Mobile B-61	Type of Sampler	HSA
Date	8/16/00 To 8/16/00	Field Observer (s)	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / LEL (%) BZ	BH	S	Remarks/ Water Levels
1–4	Fill; sand and clay; fine, dark brown, some gravel, soft, dry	SC			1230					
5	Fill; sandy clay, trace gravel, trace organics (roots, wood) very dark gray, soft, medium plasticity, dry.	CL			1231		0	0	-	O_2 = 20.8%
6–9					1232					
10					1234		0	0	-	O_2 = 20.8%
11–14	Fill; silt and clay, trace fine sand, trace brick fragments, very dark gray, loose, nonplastic, medium to soft, dry. - plastic at 12' bgs (minor amt.)	ML			1235					

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 21-280-4-003
Boring Number: BMC-P-23
Page: 2 of 2
Date: 8/16/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / LEL (%) BZ	PID (ppm) / LEL (%) BH	PID (ppm) / LEL (%) S	Remarks/ Water Levels
15	Fill; silt and clay, trace fine sand, trace brick, v. dark gray, nonplastic, med. to soft, dry.	ML			1237		0	0	-	O_2 = 20.8%
16					1238					
17	Fill; sand, some silt, trace gravel, trace brick, fine to medium grained, loose, moist.	SM								
18										
19										
20					1240		0	2%	-	O_2 = 20.2%
21					1245	BMC-P-23 SB-1 21'-23'				Take split spoon at 20' bgs - no refuse present
22	- visible roots, organics material									
23										
24	Refuse; metal, rubber, & glass, (~50%) Fill; sand and silt, fine grained, trace gravel, v. dark gray, moist (~50%)									55% gas
25					1249		0	>100%	-	O_2 = 13.0%
	Bottom of Hole - 25' bgs				1250					
26										
27										
28										
29										
30										
31										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMC-P-24
Ground Elevation	Location: Brisbane Landfill	Page: 1 of 2
Air Monitoring Equipment: LEL/O_2		Total Footage: 25'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	25'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing, Inc.		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-53		Type of Sampler: HSA	
Date: 8/15/00	To: 8/15/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL %) BZ	BH	S	Remarks/ Water Levels
1	Fill; silt, clay and sand, some gravel, brown, loose, nonplastic, dry	ML			1230					1230 - Pre-drill hole w/ split spoon
4	Fill; silt and sand, some gravel, very dark gray, loose, dry. trace wood and brick fragments at 6' bgs	ML			1232		0	0	-	O_2 = 20.9%
5					1233					organic odor in soil
10					1236		0	0	-	O_2 = 20.9%
10					1237					
13	Fill; silty clay, some fine sand, trace brick, metal, v. dark gray, loose, dry	CL								

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-1

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BMC-P-24
Page: 2 of 2
Date: 8/15/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / LEL (%) BZ	BH	S	Remarks/ Water Levels
15	Fill; silty clay, some fine sand, trace brick & metal fragments, v. dark gray, loose, dry	CL			1240		0	0	-	O_2 = 20.9%
16					1241					
17	Fill, Sand, trace silt and clay, trace brick and wood fragments, loose, moist, v. dark gray	SM								
18										
19										
20					1244		0	2%	-	O_2 = 20.8%
21					1245	BMC-P-24 SB-1 20'-22'				
22										
23	Refuse, metal, plastic, rubber, glass, fabric (~80%); fill silty clay, v. dark gray loose, damp (~20%)									
24										
25					1249		0	20%	-	O_2 = 20.2%
	Bottom of Hole - 25' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name	Project Number	Boring Number
SUNQUEST	00-280-4-003	BMC-P-25
Ground Elevation	**Location**	**Page**
	Brisbane Landfill	1 of 2
Air Monitoring Equipment		**Total Footage**
LEL/O_2		25'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	25'	N/A	1	N/A

Drilling Company	Gregg Drilling & Testing Inc.	Driller (s)	Trevor Joyner
Drilling Rig	Mobile B-53	Type of Sampler	HSA
Date	8/15/00 To 8/15/00	Field Observer (s)	Ron Elder

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL mg.) BZ	BH	S	Remarks/ Water Levels
1	Fill; Silt and gravel, some clay, trace sand, trace brick fragments, brown, loose, dry.	GM			1321					1321 - Predrill with split spoon
2										
3										
4										
5					1323		0	0	-	O_2 = 20.9%
6	Fill; clayey sand, some gravel, trace brick, v. dark gray, loose, dry, trace wood fragment @ 7' bgs	SC			1324					
7										
8										
9										
10					1325		0	0	-	O_2 = 20.9%
11					1326					
12	Fill; coarse gravel, trace fine sand and clay, loose, dry, v. dark gray	GW								
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BMC-P-25
Page: 2 of 2
Date: 8/15/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / LEL (%) BZ	BH	S	Remarks/ Water Levels
15	Fill; clay and fine sand, very dark gray, moist, trace gravel and brick, medium plasticity, soft.	CL			1350		0	0	-	O_2 = 20.9%
16					1331					
17	Fill; gravel, trace clay and fine sand, V. dark gray, loose.	GW								
18										
19	Fill; sand and clay, some gravel and brick fragments, loose, moist, soft, nonplastic	SC								
20					1337		0	5%	-	O_2 = 20.8%
21					1338	BMC-P 25 SB-1 20'-22'				organic odor
22										
23	Refuse; metal, brick, wood, plastic, rubber (~10%); fill sand and clay, V. dark gray, loose, damp, nonplastic.									
24										
25					1343		0	55%	-	O_2 = 20.0%
	Bottom of Hole - 25' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMC-P-26
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 2
Air Monitoring Equipment: LEL/O_2		Total Footage: 30'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	30'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing Inc.		Driller (s): Trevor Joyner	
Drilling Rig: Mobile B-61		Type of Sampler: HSA	
Date: 8/16/00	To: 8/16/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) / LEL (%) BZ	BH	S	Remarks/ Water Levels
1	Fill; silt and clay, some sand, trace gravel & brick, trace plasticity, medium consistency, dry, dark brown.	ML			1327					Begin drilling
2										
3										
4										
5					1328		0	0	-	O_2 = 20.9%
					1329					
6	Fill; silt and fine sand, some gravel, trace brick fragments, loose, dry.	ML								
7										
8										
9										
10					1331		0	0	-	O_2 = 20.9%
					1332					
11										
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-1

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BMC-P-26
Page: 2 of 2
Date: 8/16/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL%) BZ	PID (ppm) (LEL%) BH	PID (ppm) (LEL%) S	Remarks/ Water Levels
15	Fill, silt and fine sand, some gravel, trace brick, fragments, loose, dry, V. dark gray.	ML			1335		0	0	-	O_2 = 20.9%
16					1336					
17										
18										
19	Fill; silt, trace sand, trace gravel & brick, V. dark gray, loose, soft, dry.	ML			1339		0	0	-	O_2 = 20.9%
20					1340					
21										
22										
23	Fill; coarse gravel, some silt, V. dark gray	GM								
24	Fill; silt, trace sand, trace gravel & brick, v. dark gray, loose, dry.	ML			1343		0	3%	-	O_2: 19.5%
25					1344	BMC-A26 SB-1 25'-27'				
26	dump at 26' bgs									
27										▽ wet at ≈ 27' bgs
28	Refuse; metal, plastic, glass, fabric (~70%); Fill, silty clay, black, soft, med. to high plasticity, wet									
29										
30					1349		0	15%		O_2 = 17%
	Bottom of Hole - 30' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCHOP2-2

Drilling Log

Project Name: SUNQUEST	Project Number: 00-280-4-003	Boring Number: BMC-P-27
Ground Elevation:	Location: Brisbane Landfill	Page: 1 of 2
Air Monitoring Equipment: CEL/O2		Total Footage: 25'

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	25'	N/A	1	N/A

Drilling Company: Gregg Drilling & Testing, Inc.		Driller (s): Trevor Joyner, Lu	
Drilling Rig: Mobile B-53		Type of Sampler: HSA	
Date: 8/15/00	To: 8/15/00	Field Observer (s): Ron Elder	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL %) BZ	BH	S	Remarks/ Water Levels
1	Fill; silt, sand, and gravel, brown, loose, dry	SM			0914					0914 - Begin drilling
2										
3	Fill; silty clay, some sand (med. grainsize), medium to stiff consistency, med. plasticity, dry, light brownish gray.	CL								
4										
5					0915		0	0	-	O_2 = 20.9%
6					0916					
7	Fill; very fine sand & silt, very dark gray, loose, trace brick fragments, dry	SM								
8										
9										
10	trace refuse (rubber, plastic) at 10' bgs.				0918		0	0	-	O_2 = 20.9%
11	color becomes dark gray trace gravel.				0921					
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Project Name: SUNQUEST
Project Number: 00-280-4-003
Boring Number: BMC-P-27
Page: 2 of 2
Date: 8/15/00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) (LEL/O2) BZ	BH	S	Remarks/ Water Levels
15	Fill; v. fine sand & silt, very dark gray, loose, moist, trace gravel and brick	SM			0923		0	0	—	O_2 = 20.9%
					0924					
16										
17	Fill; silty clay, some sand and coarse gravel, gray, soft, damp, med. plasticity	CL								
18						BMC-P-27 SB-1 17'-19'				
19	Refuse (metal, wood, plastic fabric, paper) (~60%), Fill; silty clay, trace sand & gravel, brown, soft, wet (~40%)									
20					0927		0	10%	-	O_2 = 20.9%
					0928					▽ = wet at 20.5' bgs
21										
22										
23										
24										
25					0932		0	66%	-	O_2 = 17.2%
	Bottom of Hole - 25' bgs									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name: BRISBANE LANDFILL	Project Number: 00-280-4-005		Boring Number: BMC P-28
Ground Elevation:	Location: BRISBANE LANDFILL		Page: 1 of 2
Air Monitoring Equipment: GAS TECH LAND SURVEYOR			Total Footage: 20

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes
HSA	6"	—	—	0	—

Drilling Company: GREGG		Driller (s): TREVOR	
Drilling Rig: MOBILE B61 HDX		Type of Sampler: N/A	
Date: 8-7-00	To: 8-7-00	Field Observer (s): GABE STIVALA	

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL: GRAVELLY SAND: MED SAND with GRAVEL. LIGHT BROWN, DRY.	SP			1510					
2	FILL: GRAVELLY SAND: SAME AS PREVIOUS BUT DARK BROWN	SP								
3										
4										
5					1520		0	0	—	
6										
7										
8										
9										
10					1530		0	0	—	
11										
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

Drilling Log Continuation

Project Name: BRISBANE LANDFILL
Project Number: 00-280-4-003
Boring Number: BMC P-28
Page: 2 of 2
Date: 8-7-00

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) LEL H2S O2 BZ	BH	S	Remarks/ Water Levels
15							0	4	—	
16	FILL: REFUSE AND SOIL: MED SAND WITH GARBAGE. PAPER, PLASTIC, METAL, DRY	SP								
17										
18										
19										
20	FILL: SAME AS PREVIOUS (DRY)	SP				1535	0	>70%		HALTED WORK
	END OF BORING (20')									
21	NO SAMPLES									
22										
23										
24										
25										
26										
27										
28										
29										
30										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.

11/11/1992

Form WCI-OP2-2

Drilling Log

Project Name: BRISBANE LANDFILL	Project Number: 00 280 4 003			Boring Number: BMC P-29	
Ground Elevation:	Location: BRISBANE LANDFILL			Page: 1 of 1	
Air Monitoring Equipment: GASTECH LANDSURVEYOR				Total Footage: 9'	
Drilling Type: HSA	Hole Size: 6" DIA	Overburden Footage: —	Bedrock Footage: —	No. Of Samples: 0	No. Of Core Boxes:
Drilling Company: GREGG			Driller (s): TREVOR		
Drilling Rig: MOBILE B61 HDX			Type of Sampler: —		
Date: 8-11-00	To: 8-11-00		Field Observer (s): GABE STIVALA		

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1–4	FILL: SILTY GRAVEL: MED GRAVEL WITH SILT AND SAND, LIGHT GREY TO LIGHT BROWN DRY				1155	BMC P-29 2-4'				
4–9	FILL: REFUSE WITH SILTY SAND: REFUSE CONSISTING OF METAL, PAPER, PLASTIC, WOOD, GLASS WITH LIGHT BROWN SILTY SAND DRY, MOSTLY REFUSE				1157		0	0	—	
					1200		0	12	—	
9–14	END OF BORING (DRY)									

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants Inc.

11/11/1992

Form WCI-OP2-1

Drilling Log

Project Name	Project Number	Boring Number
BRISBANE LANDFILL		B7C P-30
Ground Elevation	**Location**	**Page**
		of
Air Monitoring Equipment		**Total Footage**

Drilling Type	Hole Size	Overburden Footage	Bedrock Footage	No. Of Samples	No. Of Core Boxes

Drilling Company	Driller (s)
Drilling Rig	Type of Sampler
Date 8-11-00 To 9-11-00	Field Observer (s)

Depth (feet)	Description	Class	Blow Count	Recov.	Run/ Time	Sample Desig.	PID (ppm) BZ	PID (ppm) BH	PID (ppm) S	Remarks/ Water Levels
1	FILL: GRAVELLY SAND: RED SAND WITH GRAVEL, some silt DRY									UNSTABLE GROUND. UNABLE TO SET UP RIG.
2	~~FILL-REFUSE AND SOIL.~~ PAPER, RUBBER, GLASS. DRY									
3	END OF BORING (3')									
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										

BZ=Breathing Zone BH=Bore Hole S=Sample

Burns & McDonnell Waste Consultants, Inc.



APPENDIX G

STATIC SETTLEMENT ANALYSIS

Zone	Refuse Secondary Settlement			Consolidation Settlement			Total Pre-Improvement Settlement (inches)	Total Post-Improvement Settlement (inches)
	Settlement due to Self Weight (inches)	Settlement due to External Loads (inches)	Total Refuse Settlement (inches)	YBM Settlement (inches)	OBC Settlement (inches)	Total Consolidation Settlement (inches)		
Zone 1	11	1	12	0	0	0	12	3
Zone 2	11	1	12	0	0	0	12	3
Zone 3	11	7	18	7	1	8	26	12
Zone 4	20	9	29	10	1	11	40	18
Zone 5	19	9	27	29	3	33	60	17
Zone 6	15	6	21	22	1	23	44	9
Zone 7	19	7	26	24	3	27	53	14
Zone 8	19	7	26	13	2	15	41	14
Zone 9	26	10	36	17	3	19	56	24
Zone 10	26	2	28	0	0	0	28	16
Zone 11	19	7	26	8	1	10	36	14
Zone 12	19	1	20	0	0	0	20	8
Zone 13	22	2	24	0	0	0	24	12
Zone 14	19	1	20	0	0	0	20	8
Zone 15	27	2	29	0	0	0	29	14
Zone 16	27	9	36	10	1	11	47	21
Zone 17	27	2	29	0	0	0	29	14
Zone 18	18	1	19	0	0	0	19	4
Zone 19	26	1	27	0	0	0	27	10
Zone 20	26	1	27	0	0	0	27	10
Zone 21	26	7	33	36	2	38	71	16
Zone 22	26	1	27	0	0	0	27	10

Zone 1 Settlement Calculation

Ground Surface Elevation (ft)	29
Ground Water Depth (ft)	19
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	25
MSW Layer Thickness (ft)	15
YBM Layer Thickness (ft)	15
OBC Layer Thickness (ft)	80

Total MSW Settlement (in)	12
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	3

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	29	-25	-13	0	25	13	25	125	1.6	0.0	1.6											
MSW	4	-40	-33	25	40	33	15	100	3.3	0.8	2.4											
YBM Layer 1	-11	-43	-42	40	43	42	3	100	4.2	1.4	2.7	1.00	2.7	0.00	2.75	2.7	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-14	-46	-45	43	46	45	3	100	4.5	1.6	2.9	1.00	2.9	0.00	2.86	2.9	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-17	-49	-48	46	49	48	3	100	4.8	1.8	3.0	1.00	3.0	0.00	2.97	3.0	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-20	-52	-51	49	52	51	3	100	5.1	2.0	3.1	1.00	3.1	0.00	3.08	3.1	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-23	-55	-54	52	55	54	3	100	5.4	2.2	3.2	1.00	3.2	0.00	3.20	3.2	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-26	-125	-90	55	125	90	70	125	11.3	4.4	6.8											
OBC Layer 1	-96	-141	-133	125	141	133	16	110	14.6	7.1	7.5	1.45	10.9	0.00	7.52	10.9	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-112	-157	-149	141	157	149	16	110	16.4	8.1	8.3	1.45	12.0	0.00	8.28	12.0	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-128	-173	-165	157	173	165	16	110	18.2	9.1	9.0	1.45	13.1	0.00	9.04	13.1	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-144	-189	-181	173	189	181	16	110	19.9	10.1	9.8	1.45	14.2	0.00	9.80	14.2	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-160	-205	-197	189	205	197	16	110	21.7	11.1	10.6	1.45	15.3	0.00	10.56	15.3	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**11.2**
	Unimproved Zone	1956	65	50	115	0.25	**0.0**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**2.2**
	Unimproved Zone	1956	65	50	115	0.25	**0.0**
Percent Strain							

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	3.2	4.0	**0.8**	**0.0**

Zone 2 Settlement Calculation

Ground Surface Elevation (ft)	30
Ground Water Depth (ft)	20
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	25
MSW Layer Thickness (ft)	15
YBM Layer Thickness (ft)	25
OBC Layer Thickness (ft)	60

Total MSW Settlement (in)	12
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	3

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	30	-25	-13	0	25	13	25	125	1.6	0.0	1.6											
MSW	5	-40	-33	25	40	33	15	100	3.3	0.8	2.5											
YBM Layer 1	-10	-45	-43	40	45	43	5	100	4.3	1.4	2.8	1.00	2.8	0.00	2.85	2.8	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-15	-50	-48	45	50	48	5	100	4.8	1.7	3.0	1.00	3.0	0.00	3.03	3.0	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-20	-55	-53	50	55	53	5	100	5.3	2.0	3.2	1.00	3.2	0.00	3.22	3.2	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-25	-60	-58	55	60	58	5	100	5.8	2.3	3.4	1.00	3.4	0.00	3.41	3.4	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-30	-65	-63	60	65	63	5	100	6.3	2.7	3.6	1.00	3.6	0.00	3.60	3.6	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-35	-145	-105	65	145	105	80	125	13.1	5.3	7.8											
OBC Layer 1	-115	-157	-151	145	157	151	12	110	16.6	8.2	8.4	1.45	12.2	0.00	8.44	12.2	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-127	-169	-163	157	169	163	12	110	17.9	8.9	9.0	1.45	13.1	0.00	9.01	13.1	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-139	-181	-175	169	181	175	12	110	19.3	9.7	9.6	1.45	13.9	0.00	9.58	13.9	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-151	-193	-187	181	193	187	12	110	20.6	10.4	10.1	1.45	14.7	0.00	10.15	14.7	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-163	-205	-199	193	205	199	12	110	21.9	11.2	10.7	1.45	15.5	0.00	10.72	15.5	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**11.2**
	Unimproved Zone	1956	65	50	115	0.25	**0.0**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**2.2**
	Unimproved Zone	1956	65	50	115	0.25	**0.0**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	3.2	4.0	**0.8**	**0.0**

Zone 3 Settlement Calculation

Ground Surface Elevation (ft)	17
Ground Water Depth (ft)	7
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	5
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	5
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	15
OBC Layer Thickness (ft)	80

Total MSW Settlement (in)	18
Total YBM Settlement (in)	7
Total OBC Settlement (in)	1
Total Post-Impovement MSW Settlement (in)	12

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	17	-5	-3	0	5	3	5	125	0.3	0.0	0.3											
MSW	12	-30	-18	5	30	18	25	100	1.8	0.7	1.1											
YBM Layer 1	-13	-33	-32	30	33	32	3	100	3.2	1.5	1.6	1.00	1.6	0.63	2.25	2.2	1.0	2	0.030	0.30	0.042	**1.5**
YBM Layer 2	-16	-36	-35	33	36	35	3	100	3.5	1.7	1.7	1.00	1.7	0.63	2.36	2.4	1.0	2	0.030	0.30	0.040	**1.4**
YBM Layer 3	-19	-39	-38	36	39	38	3	100	3.8	1.9	1.8	1.00	1.8	0.63	2.47	2.5	1.0	2	0.030	0.30	0.038	**1.4**
YBM Layer 4	-22	-42	-41	39	42	41	3	100	4.1	2.1	2.0	1.00	2.0	0.63	2.58	2.6	1.0	2	0.030	0.30	0.036	**1.3**
YBM Layer 5	-25	-45	-44	42	45	44	3	100	4.4	2.3	2.1	1.00	2.1	0.63	2.70	2.7	1.0	2	0.030	0.30	0.034	**1.2**
Sand	-28	-117	-81	45	117	81	72	125	10.1	4.6	5.5											
OBC Layer 1	-100	-133	-125	117	133	125	16	110	13.8	7.4	6.4	1.45	9.3	0.63	7.01	9.3	1.3	1	0.030	0.30	0.001	**0.2**
OBC Layer 2	-116	-149	-141	133	149	141	16	110	15.5	8.4	7.1	1.45	10.4	0.63	7.77	10.4	1.3	1	0.030	0.30	0.001	**0.2**
OBC Layer 3	-132	-165	-157	149	165	157	16	110	17.3	9.4	7.9	1.45	11.5	0.63	8.54	11.5	1.3	1	0.030	0.30	0.001	**0.2**
OBC Layer 4	-148	-181	-173	165	181	173	16	110	19.0	10.4	8.7	1.45	12.6	0.63	9.30	12.6	1.4	1	0.030	0.30	0.001	**0.2**
OBC Layer 5	-164	-197	-189	181	197	189	16	110	20.8	11.4	9.4	1.45	13.7	0.63	10.06	13.7	1.4	1	0.030	0.30	0.001	**0.2**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1939	82	50	132	0.17	**8.4**
	Unimproved Zone	1939	82	50	132	0.17	**2.1**
Post-Improvement	**Improved Zone**	1939	82	50	132	0.05	**2.5**
	Unimproved Zone	1939	82	50	132	0.17	**2.1**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**6.0**

Zone 4 Settlement Calculation

Ground Surface Elevation (ft)	17
Ground Water Depth (ft)	7
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	5
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	3
MSW Layer Thickness (ft)	30
YBM Layer Thickness (ft)	25
OBC Layer Thickness (ft)	80

Total MSW Settlement (in)	29
Total YBM Settlement (in)	10
Total OBC Settlement (in)	1
Total Post-Impovement MSW Settlement (in)	18

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	17	-3	-2	0	3	2	3	125	0.2	0.0	0.2											
MSW	14	-33	-18	3	33	18	30	100	1.8	0.7	1.1											
YBM Layer 1	-16	-38	-36	33	38	36	5	100	3.6	1.8	1.8	1.00	1.8	0.63	2.40	2.4	1.0	2	0.030	0.30	0.039	**2.4**
YBM Layer 2	-21	-43	-41	38	43	41	5	100	4.1	2.1	2.0	1.00	2.0	0.63	2.58	2.6	1.0	2	0.030	0.30	0.036	**2.2**
YBM Layer 3	-26	-48	-46	43	48	46	5	100	4.6	2.4	2.1	1.00	2.1	0.63	2.77	2.8	1.0	2	0.030	0.30	0.033	**2.0**
YBM Layer 4	-31	-53	-51	48	53	51	5	100	5.1	2.7	2.3	1.00	2.3	0.63	2.96	3.0	1.0	2	0.030	0.30	0.031	**1.9**
YBM Layer 5	-36	-58	-56	53	58	56	5	100	5.6	3.0	2.5	1.00	2.5	0.63	3.15	3.1	1.0	2	0.030	0.30	0.029	**1.7**
Sand	-41	-128	-93	58	128	93	70	125	11.6	5.4	6.3											
OBC Layer 1	-111	-144	-136	128	144	136	16	110	15.0	8.0	6.9	1.45	10.0	0.63	7.54	10.0	1.3	1	0.030	0.30	0.001	**0.2**
OBC Layer 2	-127	-160	-152	144	160	152	16	110	16.7	9.0	7.7	1.45	11.1	0.63	8.30	11.1	1.3	1	0.030	0.30	0.001	**0.2**
OBC Layer 3	-143	-176	-168	160	176	168	16	110	18.5	10.0	8.4	1.45	12.2	0.63	9.06	12.2	1.3	1	0.030	0.30	0.001	**0.2**
OBC Layer 4	-159	-192	-184	176	192	184	16	110	20.2	11.0	9.2	1.45	13.3	0.63	9.82	13.3	1.4	1	0.030	0.30	0.001	**0.2**
OBC Layer 5	-175	-208	-200	192	208	200	16	110	22.0	12.0	10.0	1.45	14.4	0.63	10.58	14.4	1.4	1	0.030	0.30	0.001	**0.2**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1946	75	50	125	0.25	**13.3**
	Unimproved Zone	1946	75	50	125	0.25	**6.7**
Post-Improvement	**Improved Zone**	1946	75	50	125	0.05	**2.7**
	Unimproved Zone	1946	75	50	125	0.25	**6.7**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	6.3	7.9	**1.6**	**7.2**

Zone 5 Settlement Calculation

Ground Surface Elevation (ft)	29
Ground Water Depth (ft)	19
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	30
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	15
MSW Layer Thickness (ft)	30
YBM Layer Thickness (ft)	25
OBC Layer Thickness (ft)	60

Total MSW Settlement (in)	27
Total YBM Settlement (in)	29
Total OBC Settlement (in)	3

Total Post-Impovement MSW Settlement (in)	17

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	29	-15	-8	0	15	8	15	125	0.9	0.0	0.9											
MSW	14	-45	-30	15	45	30	30	100	3.0	0.7	2.3											
YBM Layer 1	-16	-50	-48	45	50	48	5	100	4.8	1.8	3.0	1.00	3.0	3.75	6.72	6.7	1.0	2	0.030	0.30	0.106	**6.4**
YBM Layer 2	-21	-55	-53	50	55	53	5	100	5.3	2.1	3.2	1.00	3.2	3.75	6.91	6.9	1.0	2	0.030	0.30	0.102	**6.1**
YBM Layer 3	-26	-60	-58	55	60	58	5	100	5.8	2.4	3.3	1.00	3.3	3.75	7.10	7.1	1.0	2	0.030	0.30	0.098	**5.9**
YBM Layer 4	-31	-65	-63	60	65	63	5	100	6.3	2.7	3.5	1.00	3.5	3.75	7.29	7.3	1.0	2	0.030	0.30	0.094	**5.7**
YBM Layer 5	-36	-70	-68	65	70	68	5	100	6.8	3.0	3.7	1.00	3.7	3.75	7.47	7.5	1.0	2	0.030	0.30	0.091	**5.4**
Sand	-41	-150	-110	70	150	110	80	125	13.8	5.7	8.1											
OBC Layer 1	-121	-162	-156	150	162	156	12	110	17.2	8.5	8.6	1.45	12.5	3.75	12.36	12.5	1.0	1	0.030	0.30	0.005	**0.7**
OBC Layer 2	-133	-174	-168	162	174	168	12	110	18.5	9.3	9.2	1.45	13.3	3.75	12.93	13.3	1.0	1	0.030	0.30	0.004	**0.6**
OBC Layer 3	-145	-186	-180	174	186	180	12	110	19.8	10.0	9.8	1.45	14.1	3.75	13.50	14.1	1.0	1	0.030	0.30	0.004	**0.6**
OBC Layer 4	-157	-198	-192	186	198	192	12	110	21.1	10.8	10.3	1.45	15.0	3.75	14.07	15.0	1.1	1	0.030	0.30	0.004	**0.6**
OBC Layer 5	-169	-210	-204	198	210	204	12	110	22.4	11.5	10.9	1.45	15.8	3.75	14.65	15.8	1.1	1	0.030	0.30	0.004	**0.6**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1939	82	50	132	0.25	**12.4**
	Unimproved Zone	1939	82	50	132	0.25	**6.2**
Post-Improvement	**Improved Zone**	1939	82	50	132	0.05	**2.5**
	Unimproved Zone	1939	82	50	132	0.25	**6.2**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	6.3	7.9	**1.6**	**7.2**

Zone 6 Settlement Calculation

Ground Surface Elevation (ft)	17
Ground Water Depth (ft)	7
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	10
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	10
MSW Layer Thickness (ft)	20
YBM Layer Thickness (ft)	30
OBC Layer Thickness (ft)	60

Total MSW Settlement (in)	21
Total YBM Settlement (in)	22
Total OBC Settlement (in)	1

Total Post-Impovement MSW Settlement (in)	9

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	17	-10	-5	0	10	5	10	125	0.6	0.0	0.6											
MSW	7	-30	-20	10	30	20	20	100	2.0	0.8	1.2											
YBM Layer 1	-13	-36	-33	30	36	33	6	100	3.3	1.6	1.7	1.00	1.7	1.25	2.93	2.9	1.0	2	0.030	0.30	0.073	**5.2**
YBM Layer 2	-19	-42	-39	36	42	39	6	100	3.9	2.0	1.9	1.00	1.9	1.25	3.15	3.2	1.0	2	0.030	0.30	0.066	**4.7**
YBM Layer 3	-25	-48	-45	42	48	45	6	100	4.5	2.4	2.1	1.00	2.1	1.25	3.38	3.4	1.0	2	0.030	0.30	0.060	**4.3**
YBM Layer 4	-31	-54	-51	48	54	51	6	100	5.1	2.7	2.4	1.00	2.4	1.25	3.60	3.6	1.0	2	0.030	0.30	0.055	**4.0**
YBM Layer 5	-37	-60	-57	54	60	57	6	100	5.7	3.1	2.6	1.00	2.6	1.25	3.83	3.8	1.0	2	0.030	0.30	0.051	**3.7**
Sand	-43	-140	-100	60	140	100	80	125	12.5	5.8	6.7											
OBC Layer 1	-123	-152	-146	140	152	146	12	110	16.1	8.7	7.4	1.45	10.7	1.25	8.64	10.7	1.2	1	0.030	0.30	0.002	**0.3**
OBC Layer 2	-135	-164	-158	152	164	158	12	110	17.4	9.4	8.0	1.45	11.5	1.25	9.21	11.5	1.3	1	0.030	0.30	0.002	**0.3**
OBC Layer 3	-147	-176	-170	164	176	170	12	110	18.7	10.2	8.5	1.45	12.4	1.25	9.78	12.4	1.3	1	0.030	0.30	0.002	**0.3**
OBC Layer 4	-159	-188	-182	176	188	182	12	110	20.0	10.9	9.1	1.45	13.2	1.25	10.35	13.2	1.3	1	0.030	0.30	0.002	**0.2**
OBC Layer 5	-171	-200	-194	188	200	194	12	110	21.3	11.7	9.7	1.45	14.0	1.25	10.92	14.0	1.3	1	0.030	0.30	0.002	**0.2**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**14.9**
	Unimproved Zone	1956	65	50	115	0.25	**0.0**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**3.0**
	Unimproved Zone	1956	65	50	115	0.25	**0.0**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	4.2	5.3	**1.0**	**4.8**

Zone 7 Settlement Calculation

Ground Surface Elevation (ft)	22
Ground Water Depth (ft)	12
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	15
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	15
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	30
OBC Layer Thickness (ft)	90

Total MSW Settlement (in)	26
Total YBM Settlement (in)	24
Total OBC Settlement (in)	3

Total Post-Impovement MSW Settlement (in)	14

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	22	-15	-8	0	15	8	15	125	0.9	0.0	0.9											
MSW	7	-40	-28	15	40	28	25	100	2.8	1.0	1.8											
YBM Layer 1	-18	-46	-43	40	46	43	6	100	4.3	1.9	2.4	1.00	2.4	1.88	4.24	4.2	1.0	2	0.030	0.30	0.076	**5.5**
YBM Layer 2	-24	-52	-49	46	52	49	6	100	4.9	2.3	2.6	1.00	2.6	1.88	4.47	4.5	1.0	2	0.030	0.30	0.071	**5.1**
YBM Layer 3	-30	-58	-55	52	58	55	6	100	5.5	2.7	2.8	1.00	2.8	1.88	4.69	4.7	1.0	2	0.030	0.30	0.066	**4.8**
YBM Layer 4	-36	-64	-61	58	64	61	6	100	6.1	3.1	3.0	1.00	3.0	1.88	4.92	4.9	1.0	2	0.030	0.30	0.063	**4.5**
YBM Layer 5	-42	-70	-67	64	70	67	6	100	6.7	3.4	3.3	1.00	3.3	1.88	5.14	5.1	1.0	2	0.030	0.30	0.059	**4.3**
Sand	-48	-110	-90	70	110	90	40	125	11.3	4.9	6.4											
OBC Layer 1	-88	-128	-119	110	128	119	18	110	13.1	6.7	6.4	1.45	9.3	1.88	8.29	9.3	1.1	1	0.030	0.30	0.003	**0.7**
OBC Layer 2	-106	-146	-137	128	146	137	18	110	15.1	7.8	7.3	1.45	10.5	1.88	9.15	10.5	1.2	1	0.030	0.30	0.003	**0.6**
OBC Layer 3	-124	-164	-155	146	164	155	18	110	17.1	8.9	8.1	1.45	11.8	1.88	10.00	11.8	1.2	1	0.030	0.30	0.003	**0.6**
OBC Layer 4	-142	-182	-173	164	182	173	18	110	19.0	10.0	9.0	1.45	13.0	1.88	10.86	13.0	1.2	1	0.030	0.30	0.002	**0.5**
OBC Layer 5	-160	-200	-191	182	200	191	18	110	21.0	11.2	9.8	1.45	14.3	1.88	11.72	14.3	1.2	1	0.030	0.30	0.002	**0.5**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**14.9**
	Unimproved Zone	1956	65	50	115	0.25	**3.7**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**3.0**
	Unimproved Zone	1956	65	50	115	0.25	**3.7**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**6.0**

Zone 8 Settlement Calculation

Ground Surface Elevation (ft)	29
Ground Water Depth (ft)	19
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	10
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	15
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	25
OBC Layer Thickness (ft)	90

Total MSW Settlement (in)	26
Total YBM Settlement (in)	13
Total OBC Settlement (in)	2

Total Post-Impovement MSW Settlement (in)	14

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	29	-15	-8	0	15	8	15	125	0.9	0.0	0.9											
MSW	14	-40	-28	15	40	28	25	100	2.8	0.5	2.2											
YBM Layer 1	-11	-45	-43	40	45	43	5	100	4.3	1.5	2.8	1.00	2.8	1.25	4.03	4.0	1.0	2	0.030	0.30	0.048	**2.9**
YBM Layer 2	-16	-50	-48	45	50	48	5	100	4.8	1.8	3.0	1.00	3.0	1.25	4.22	4.2	1.0	2	0.030	0.30	0.046	**2.7**
YBM Layer 3	-21	-55	-53	50	55	53	5	100	5.3	2.1	3.2	1.00	3.2	1.25	4.41	4.4	1.0	2	0.030	0.30	0.043	**2.6**
YBM Layer 4	-26	-60	-58	55	60	58	5	100	5.8	2.4	3.3	1.00	3.3	1.25	4.60	4.6	1.0	2	0.030	0.30	0.041	**2.5**
YBM Layer 5	-31	-65	-63	60	65	63	5	100	6.3	2.7	3.5	1.00	3.5	1.25	4.79	4.8	1.0	2	0.030	0.30	0.039	**2.4**
Sand	-36	-105	-85	65	105	85	40	125	10.6	4.1	6.5											
OBC Layer 1	-76	-123	-114	105	123	114	18	110	12.5	5.9	6.6	1.45	9.6	1.25	7.86	9.6	1.2	1	0.030	0.30	0.002	**0.5**
OBC Layer 2	-94	-141	-132	123	141	132	18	110	14.5	7.1	7.5	1.45	10.8	1.25	8.72	10.8	1.2	1	0.030	0.30	0.002	**0.4**
OBC Layer 3	-112	-159	-150	141	159	150	18	110	16.5	8.2	8.3	1.45	12.1	1.25	9.58	12.1	1.3	1	0.030	0.30	0.002	**0.4**
OBC Layer 4	-130	-177	-168	159	177	168	18	110	18.5	9.3	9.2	1.45	13.3	1.25	10.43	13.3	1.3	1	0.030	0.30	0.002	**0.4**
OBC Layer 5	-148	-195	-186	177	195	186	18	110	20.5	10.4	10.0	1.45	14.6	1.25	11.29	14.6	1.3	1	0.030	0.30	0.002	**0.3**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**14.9**
	Unimproved Zone	1956	65	50	115	0.25	**3.7**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**3.0**
	Unimproved Zone	1956	65	50	115	0.25	**3.7**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**6.0**

Zone 9 Settlement Calculation

Ground Surface Elevation (ft)	29
Ground Water Depth (ft)	19
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	15
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	15
MSW Layer Thickness (ft)	35
YBM Layer Thickness (ft)	25
OBC Layer Thickness (ft)	90

Total MSW Settlement (in)	36
Total YBM Settlement (in)	17
Total OBC Settlement (in)	3

Total Post-Impovement MSW Settlement (in)	24

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	29	-15	-8	0	15	8	15	125	0.9	0.0	0.9											
MSW	14	-50	-33	15	50	33	35	100	3.3	0.8	2.4											
YBM Layer 1	-21	-55	-53	50	55	53	5	100	5.3	2.1	3.2	1.00	3.2	1.88	5.03	5.0	1.0	2	0.030	0.30	0.061	**3.6**
YBM Layer 2	-26	-60	-58	55	60	58	5	100	5.8	2.4	3.3	1.00	3.3	1.88	5.22	5.2	1.0	2	0.030	0.30	0.058	**3.5**
YBM Layer 3	-31	-65	-63	60	65	63	5	100	6.3	2.7	3.5	1.00	3.5	1.88	5.41	5.4	1.0	2	0.030	0.30	0.055	**3.3**
YBM Layer 4	-36	-70	-68	65	70	68	5	100	6.8	3.0	3.7	1.00	3.7	1.88	5.60	5.6	1.0	2	0.030	0.30	0.053	**3.2**
YBM Layer 5	-41	-75	-73	70	75	73	5	100	7.3	3.3	3.9	1.00	3.9	1.88	5.79	5.8	1.0	2	0.030	0.30	0.051	**3.1**
Sand	-46	-115	-95	75	115	95	40	125	11.9	4.7	7.1											
OBC Layer 1	-86	-133	-124	115	133	124	18	110	13.6	6.6	7.1	1.45	10.3	1.88	8.96	10.3	1.1	1	0.030	0.30	0.003	**0.7**
OBC Layer 2	-104	-151	-142	133	151	142	18	110	15.6	7.7	7.9	1.45	11.5	1.88	9.82	11.5	1.2	1	0.030	0.30	0.003	**0.6**
OBC Layer 3	-122	-169	-160	151	169	160	18	110	17.6	8.8	8.8	1.45	12.8	1.88	10.68	12.8	1.2	1	0.030	0.30	0.003	**0.5**
OBC Layer 4	-140	-187	-178	169	187	178	18	110	19.6	9.9	9.7	1.45	14.0	1.88	11.53	14.0	1.2	1	0.030	0.30	0.002	**0.5**
OBC Layer 5	-158	-205	-196	187	205	196	18	110	21.6	11.0	10.5	1.45	15.2	1.88	12.39	15.2	1.2	1	0.030	0.30	0.002	**0.5**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**14.9**
	Unimproved Zone	1956	65	50	115	0.25	**11.2**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**3.0**
	Unimproved Zone	1956	65	50	115	0.25	**11.2**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	7.4	9.2	**1.8**	**8.4**

Zone 10 Settlement Calculation

Ground Surface Elevation (ft)	40
Ground Water Depth (ft)	30
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	38
MSW Layer Thickness (ft)	35
YBM Layer Thickness (ft)	25
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	28
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0
Total Post-Impovement MSW Settlement (in)	16

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	40	-38	-19	0	38	19	38	125	2.4	0.0	2.4											
MSW	2	-73	-56	38	73	56	35	100	5.6	1.6	4.0											
YBM Layer 1	-33	-78	-76	73	78	76	5	100	7.6	2.8	4.7	1.00	4.7	0.00	4.71	4.7	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-38	-83	-81	78	83	81	5	100	8.1	3.2	4.9	1.00	4.9	0.00	4.90	4.9	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-43	-88	-86	83	88	86	5	100	8.6	3.5	5.1	1.00	5.1	0.00	5.09	5.1	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-48	-93	-91	88	93	91	5	100	9.1	3.8	5.3	1.00	5.3	0.00	5.27	5.3	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-53	-98	-96	93	98	96	5	100	9.6	4.1	5.5	1.00	5.5	0.00	5.46	5.5	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-58	-118	-108	98	118	108	20	125	13.5	4.9	8.6											
OBC Layer 1	-78	-138	-128	118	138	128	20	110	14.1	6.1	8.0	1.45	11.5	0.00	7.96	11.5	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-98	-158	-148	138	158	148	20	110	16.3	7.4	8.9	1.45	12.9	0.00	8.92	12.9	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-118	-178	-168	158	178	168	20	110	18.5	8.6	9.9	1.45	14.3	0.00	9.87	14.3	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-138	-198	-188	178	198	188	20	110	20.7	9.9	10.8	1.45	15.7	0.00	10.82	15.7	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-158	-218	-208	198	218	208	20	110	22.9	11.1	11.8	1.45	17.1	0.00	11.77	17.1	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**14.9**
	Unimproved Zone	1956	65	50	115	0.25	**11.2**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**3.0**
	Unimproved Zone	1956	65	50	115	0.25	**11.2**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	7.4	9.2	**1.8**	**0.0**

Zone 11 Settlement Calculation

Ground Surface Elevation (ft)	22
Ground Water Depth (ft)	12
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	5
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	12
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	25
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	26
Total YBM Settlement (in)	8
Total OBC Settlement (in)	1
Total Post-Impovement MSW Settlement (in)	14

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	22	-12	-6	0	12	6	12	125	0.8	0.0	0.8											
MSW	10	-37	-25	12	37	25	25	100	2.5	0.8	1.7											
YBM Layer 1	-15	-42	-40	37	42	40	5	100	4.0	1.7	2.2	1.00	2.2	0.63	2.86	2.9	1.0	2	0.030	0.30	0.032	**1.9**
YBM Layer 2	-20	-47	-45	42	47	45	5	100	4.5	2.0	2.4	1.00	2.4	0.63	3.05	3.0	1.0	2	0.030	0.30	0.030	**1.8**
YBM Layer 3	-25	-52	-50	47	52	50	5	100	5.0	2.3	2.6	1.00	2.6	0.63	3.24	3.2	1.0	2	0.030	0.30	0.028	**1.7**
YBM Layer 4	-30	-57	-55	52	57	55	5	100	5.5	2.7	2.8	1.00	2.8	0.63	3.42	3.4	1.0	2	0.030	0.30	0.026	**1.6**
YBM Layer 5	-35	-62	-60	57	62	60	5	100	6.0	3.0	3.0	1.00	3.0	0.63	3.61	3.6	1.0	2	0.030	0.30	0.025	**1.5**
Sand	-40	-82	-72	62	82	72	20	125	9.0	3.7	5.3											
OBC Layer 1	-60	-102	-92	82	102	92	20	110	10.1	5.0	5.1	1.45	7.4	0.63	5.75	7.4	1.3	1	0.030	0.30	0.001	**0.4**
OBC Layer 2	-80	-122	-112	102	122	112	20	110	12.3	6.2	6.1	1.45	8.8	0.63	6.71	8.8	1.3	1	0.030	0.30	0.001	**0.3**
OBC Layer 3	-100	-142	-132	122	142	132	20	110	14.5	7.5	7.0	1.45	10.2	0.63	7.66	10.2	1.3	1	0.030	0.30	0.001	**0.3**
OBC Layer 4	-120	-162	-152	142	162	152	20	110	16.7	8.7	8.0	1.45	11.6	0.63	8.61	11.6	1.3	1	0.030	0.30	0.001	**0.2**
OBC Layer 5	-140	-182	-172	162	182	172	20	110	18.9	10.0	8.9	1.45	13.0	0.63	9.56	13.0	1.4	1	0.030	0.30	0.001	**0.2**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**14.9**
	Unimproved Zone	1956	65	50	115	0.25	**3.7**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**3.0**
	Unimproved Zone	1956	65	50	115	0.25	**3.7**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**6.0**

Zone 12 Settlement Calculation

Ground Surface Elevation (ft)	22
Ground Water Depth (ft)	12
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	2
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	35
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	20
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	8

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	22	-2	-1	0	2	1	2	125	0.1	0.0	0.1											
MSW	20	-27	-15	2	27	15	25	100	1.5	0.2	1.3											
YBM Layer 1	-5	-34	-31	27	34	31	7	100	3.1	1.2	1.9	1.00	1.9	0.00	1.90	1.9	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-12	-41	-38	34	41	38	7	100	3.8	1.6	2.2	1.00	2.2	0.00	2.16	2.2	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-19	-48	-45	41	48	45	7	100	4.5	2.0	2.4	1.00	2.4	0.00	2.42	2.4	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-26	-55	-52	48	55	52	7	100	5.2	2.5	2.7	1.00	2.7	0.00	2.69	2.7	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-33	-62	-59	55	62	59	7	100	5.9	2.9	2.9	1.00	2.9	0.00	2.95	2.9	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-40	-82	-72	62	82	72	20	125	9.0	3.7	5.3											
OBC Layer 1	-60	-102	-92	82	102	92	20	110	10.1	5.0	5.1	1.45	7.4	0.00	5.13	7.4	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-80	-122	-112	102	122	112	20	110	12.3	6.2	6.1	1.45	8.8	0.00	6.08	8.8	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-100	-142	-132	122	142	132	20	110	14.5	7.5	7.0	1.45	10.2	0.00	7.03	10.2	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-120	-162	-152	142	162	152	20	110	16.7	8.7	8.0	1.45	11.6	0.00	7.98	11.6	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-140	-182	-172	162	182	172	20	110	18.9	10.0	8.9	1.45	13.0	0.00	8.94	13.0	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**14.9**
	Unimproved Zone	1956	65	50	115	0.25	**3.7**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**3.0**
	Unimproved Zone	1956	65	50	115	0.25	**3.7**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**0.0**

Zone 13 Settlement Calculation

Ground Surface Elevation (ft)	24
Ground Water Depth (ft)	14
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	2
MSW Layer Thickness (ft)	30
YBM Layer Thickness (ft)	35
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	24
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	12

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	24	-2	-1	0	2	1	2	125	0.1	0.0	0.1											
MSW	22	-32	-17	2	32	17	30	100	1.7	0.2	1.5											
YBM Layer 1	-8	-39	-36	32	39	36	7	100	3.6	1.3	2.2	1.00	2.2	0.00	2.21	2.2	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-15	-46	-43	39	46	43	7	100	4.3	1.8	2.5	1.00	2.5	0.00	2.47	2.5	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-22	-53	-50	46	53	50	7	100	5.0	2.2	2.7	1.00	2.7	0.00	2.73	2.7	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-29	-60	-57	53	60	57	7	100	5.7	2.7	3.0	1.00	3.0	0.00	3.00	3.0	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-36	-67	-64	60	67	64	7	100	6.4	3.1	3.3	1.00	3.3	0.00	3.26	3.3	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-43	-87	-77	67	87	77	20	125	9.6	3.9	5.7											
OBC Layer 1	-63	-107	-97	87	107	97	20	110	10.7	5.2	5.5	1.45	8.0	0.00	5.49	8.0	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-83	-127	-117	107	127	117	20	110	12.9	6.4	6.4	1.45	9.3	0.00	6.44	9.3	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-103	-147	-137	127	147	137	20	110	15.1	7.7	7.4	1.45	10.7	0.00	7.39	10.7	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-123	-167	-157	147	167	157	20	110	17.3	8.9	8.3	1.45	12.1	0.00	8.35	12.1	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-143	-187	-177	167	187	177	20	110	19.5	10.2	9.3	1.45	13.5	0.00	9.30	13.5	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1956	65	50	115	0.25	**14.9**
	Unimproved Zone	1956	65	50	115	0.25	**7.4**
Post-Improvement	**Improved Zone**	1956	65	50	115	0.05	**3.0**
	Unimproved Zone	1956	65	50	115	0.25	**7.4**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	6.3	7.9	**1.6**	**0.0**

Zone 14 Settlement Calculation

Ground Surface Elevation (ft)	40
Ground Water Depth (ft)	30
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	40
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	40
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	20
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	8

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	40	-40	-20	0	40	20	40	125	2.5	0.0	2.5											
MSW	0	-65	-53	40	65	53	25	100	5.3	1.4	3.8											
YBM Layer 1	-25	-73	-69	65	73	69	8	100	6.9	2.4	4.5	1.00	4.5	0.00	4.47	4.5	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-33	-81	-77	73	81	77	8	100	7.7	2.9	4.8	1.00	4.8	0.00	4.77	4.8	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-41	-89	-85	81	89	85	8	100	8.5	3.4	5.1	1.00	5.1	0.00	5.07	5.1	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-49	-97	-93	89	97	93	8	100	9.3	3.9	5.4	1.00	5.4	0.00	5.37	5.4	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-57	-105	-101	97	105	101	8	100	10.1	4.4	5.7	1.00	5.7	0.00	5.67	5.7	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-65	-125	-115	105	125	115	20	125	14.4	5.3	9.1											
OBC Layer 1	-85	-145	-135	125	145	135	20	110	14.9	6.6	8.3	1.45	12.0	0.00	8.30	12.0	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-105	-165	-155	145	165	155	20	110	17.1	7.8	9.3	1.45	13.4	0.00	9.25	13.4	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-125	-185	-175	165	185	175	20	110	19.3	9.0	10.2	1.45	14.8	0.00	10.20	14.8	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-145	-205	-195	185	205	195	20	110	21.5	10.3	11.2	1.45	16.2	0.00	11.15	16.2	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-165	-225	-215	205	225	215	20	110	23.7	11.5	12.1	1.45	17.6	0.00	12.11	17.6	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1958	63	50	113	0.25	**15.2**
	Unimproved Zone	1958	63	50	113	0.25	**3.8**
Post-Improvement	**Improved Zone**	1958	63	50	113	0.05	**3.0**
	Unimproved Zone	1958	63	50	113	0.25	**3.8**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**0.0**

Zone 15 Settlement Calculation

Ground Surface Elevation (ft)	22
Ground Water Depth (ft)	12
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	14
MSW Layer Thickness (ft)	30
YBM Layer Thickness (ft)	50
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	29
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	14

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	22	-14	-7	0	14	7	14	125	0.9	0.0	0.9											
MSW	8	-44	-29	14	44	29	30	100	2.9	1.1	1.8											
YBM Layer 1	-22	-54	-49	44	54	49	10	100	4.9	2.3	2.6	1.00	2.6	0.00	2.59	2.6	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-32	-64	-59	54	64	59	10	100	5.9	2.9	3.0	1.00	3.0	0.00	2.97	3.0	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-42	-74	-69	64	74	69	10	100	6.9	3.6	3.3	1.00	3.3	0.00	3.34	3.3	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-52	-84	-79	74	84	79	10	100	7.9	4.2	3.7	1.00	3.7	0.00	3.72	3.7	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-62	-94	-89	84	94	89	10	100	8.9	4.8	4.1	1.00	4.1	0.00	4.10	4.1	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-72	-114	-104	94	114	104	20	125	13.0	5.7	7.3											
OBC Layer 1	-92	-134	-124	114	134	124	20	110	13.6	7.0	6.7	1.45	9.6	0.00	6.65	9.6	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-112	-154	-144	134	154	144	20	110	15.8	8.2	7.6	1.45	11.0	0.00	7.60	11.0	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-132	-174	-164	154	174	164	20	110	18.0	9.5	8.6	1.45	12.4	0.00	8.56	12.4	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-152	-194	-184	174	194	184	20	110	20.2	10.7	9.5	1.45	13.8	0.00	9.51	13.8	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-172	-214	-204	194	214	204	20	110	22.4	12.0	10.5	1.45	15.2	0.00	10.46	15.2	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1958	63	50	113	0.3	**18.3**
	Unimproved Zone	1958	63	50	113	0.3	**9.1**
Post-Improvement	**Improved Zone**	1958	63	50	113	0.05	**3.0**
	Unimproved Zone	1958	63	50	113	0.3	**9.1**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	6.3	7.9	**1.6**	**0.0**

Zone 16 Settlement Calculation

Ground Surface Elevation (ft)	43
Ground Water Depth (ft)	33
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	5
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	30
MSW Layer Thickness (ft)	30
YBM Layer Thickness (ft)	60
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	36
Total YBM Settlement (in)	10
Total OBC Settlement (in)	1
Total Post-Impovement MSW Settlement (in)	21

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	43	-30	-15	0	30	15	30	125	1.9	0.0	1.9											
MSW	13	-60	-45	30	60	45	30	100	4.5	0.7	3.8											
YBM Layer 1	-17	-72	-66	60	72	66	12	100	6.6	2.1	4.5	1.00	4.5	0.63	5.17	5.2	1.0	2	0.030	0.30	0.017	**2.4**
YBM Layer 2	-29	-84	-78	72	84	78	12	100	7.8	2.8	5.0	1.00	5.0	0.63	5.62	5.6	1.0	2	0.030	0.30	0.015	**2.2**
YBM Layer 3	-41	-96	-90	84	96	90	12	100	9.0	3.6	5.4	1.00	5.4	0.63	6.07	6.1	1.0	2	0.030	0.30	0.014	**2.0**
YBM Layer 4	-53	-108	-102	96	108	102	12	100	10.2	4.3	5.9	1.00	5.9	0.63	6.52	6.5	1.0	2	0.030	0.30	0.013	**1.9**
YBM Layer 5	-65	-120	-114	108	120	114	12	100	11.4	5.1	6.3	1.00	6.3	0.63	6.97	7.0	1.0	2	0.030	0.30	0.012	**1.8**
Sand	-77	-140	-130	120	140	130	20	125	16.3	6.1	10.2											
OBC Layer 1	-97	-160	-150	140	160	150	20	110	16.5	7.3	9.2	1.45	13.3	0.63	9.82	13.3	1.4	1	0.030	0.30	0.001	**0.2**
OBC Layer 2	-117	-180	-170	160	180	170	20	110	18.7	8.5	10.2	1.45	14.7	0.63	10.78	14.7	1.4	1	0.030	0.30	0.001	**0.2**
OBC Layer 3	-137	-200	-190	180	200	190	20	110	20.9	9.8	11.1	1.45	16.1	0.63	11.73	16.1	1.4	1	0.030	0.30	0.001	**0.2**
OBC Layer 4	-157	-220	-210	200	220	210	20	110	23.1	11.0	12.1	1.45	17.5	0.63	12.68	17.5	1.4	1	0.030	0.30	0.001	**0.2**
OBC Layer 5	-177	-240	-230	220	240	230	20	110	25.3	12.3	13.0	1.45	18.9	0.63	13.63	18.9	1.4	1	0.030	0.30	0.001	**0.1**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1958	63	50	113	0.3	**18.3**
	Unimproved Zone	1958	63	50	113	0.3	**9.1**
Post-Improvement	**Improved Zone**	1958	63	50	113	0.05	**3.0**
	Unimproved Zone	1958	63	50	113	0.3	**9.1**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	6.3	7.9	**1.6**	**7.2**

Zone 17 Settlement Calculation

Ground Surface Elevation (ft)	35
Ground Water Depth (ft)	25
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	36
MSW Layer Thickness (ft)	30
YBM Layer Thickness (ft)	30
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	29
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	14

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	35	-36	-18	0	36	18	36	125	2.3	0.0	2.3											
MSW	-1	-66	-51	36	66	51	30	100	5.1	1.6	3.5											
YBM Layer 1	-31	-72	-69	66	72	69	6	100	6.9	2.7	4.2	1.00	4.2	0.00	4.15	4.2	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-37	-78	-75	72	78	75	6	100	7.5	3.1	4.4	1.00	4.4	0.00	4.38	4.4	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-43	-84	-81	78	84	81	6	100	8.1	3.5	4.6	1.00	4.6	0.00	4.61	4.6	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-49	-90	-87	84	90	87	6	100	8.7	3.9	4.8	1.00	4.8	0.00	4.83	4.8	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-55	-96	-93	90	96	93	6	100	9.3	4.2	5.1	1.00	5.1	0.00	5.06	5.1	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-61	-116	-106	96	116	106	20	125	13.3	5.1	8.2											
OBC Layer 1	-81	-136	-126	116	136	126	20	110	13.9	6.3	7.6	1.45	11.0	0.00	7.56	11.0	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-101	-156	-146	136	156	146	20	110	16.1	7.6	8.5	1.45	12.3	0.00	8.51	12.3	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-121	-176	-166	156	176	166	20	110	18.3	8.8	9.5	1.45	13.7	0.00	9.46	13.7	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-141	-196	-186	176	196	186	20	110	20.5	10.0	10.4	1.45	15.1	0.00	10.41	15.1	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-161	-216	-206	196	216	206	20	110	22.7	11.3	11.4	1.45	16.5	0.00	11.37	16.5	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1958	63	50	113	0.3	**18.3**
	Unimproved Zone	1958	63	50	113	0.3	**9.1**
Post-Improvement	**Improved Zone**	1958	63	50	113	0.05	**3.0**
	Unimproved Zone	1958	63	50	113	0.3	**9.1**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	6.3	7.9	**1.6**	**0.0**

Zone 18 Settlement Calculation

Ground Surface Elevation (ft)	42
Ground Water Depth (ft)	32
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	39
MSW Layer Thickness (ft)	20
YBM Layer Thickness (ft)	30
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	19
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	4

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	42	-39	-20	0	39	20	39	125	2.4	0.0	2.4											
MSW	3	-59	-49	39	59	49	20	100	4.9	1.1	3.8											
YBM Layer 1	-17	-65	-62	59	65	62	6	100	6.2	1.9	4.3	1.00	4.3	0.00	4.33	4.3	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-23	-71	-68	65	71	68	6	100	6.8	2.2	4.6	1.00	4.6	0.00	4.55	4.6	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-29	-77	-74	71	77	74	6	100	7.4	2.6	4.8	1.00	4.8	0.00	4.78	4.8	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-35	-83	-80	77	83	80	6	100	8.0	3.0	5.0	1.00	5.0	0.00	5.00	5.0	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-41	-89	-86	83	89	86	6	100	8.6	3.4	5.2	1.00	5.2	0.00	5.23	5.2	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-47	-109	-99	89	109	99	20	125	12.4	4.2	8.2											
OBC Layer 1	-67	-129	-119	109	129	119	20	110	13.1	5.4	7.7	1.45	11.1	0.00	7.66	11.1	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-87	-149	-139	129	149	139	20	110	15.3	6.7	8.6	1.45	12.5	0.00	8.61	12.5	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-107	-169	-159	149	169	159	20	110	17.5	7.9	9.6	1.45	13.9	0.00	9.57	13.9	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-127	-189	-179	169	189	179	20	110	19.7	9.2	10.5	1.45	15.2	0.00	10.52	15.2	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-147	-209	-199	189	209	199	20	110	21.9	10.4	11.5	1.45	16.6	0.00	11.47	16.6	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1958	63	50	113	0.3	**18.3**
	Unimproved Zone	1958	63	50	113	0.3	**0.0**
Post-Improvement	**Improved Zone**	1958	63	50	113	0.05	**3.0**
	Unimproved Zone	1958	63	50	113	0.3	**0.0**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	4.2	5.3	**1.0**	**0.0**

Zone 19 Settlement Calculation

Ground Surface Elevation (ft)	18
Ground Water Depth (ft)	8
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	2
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	45
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	27
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0
Total Post-Impovement MSW Settlement (in)	10

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	18	-2	-1	0	2	1	2	125	0.1	0.0	0.1											
MSW	16	-27	-15	2	27	15	25	100	1.5	0.4	1.0											
YBM Layer 1	-9	-36	-32	27	36	32	9	100	3.2	1.5	1.7	1.00	1.7	0.00	1.68	1.7	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-18	-45	-41	36	45	41	9	100	4.1	2.0	2.0	1.00	2.0	0.00	2.02	2.0	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-27	-54	-50	45	54	50	9	100	5.0	2.6	2.4	1.00	2.4	0.00	2.36	2.4	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-36	-63	-59	54	63	59	9	100	5.9	3.2	2.7	1.00	2.7	0.00	2.70	2.7	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-45	-72	-68	63	72	68	9	100	6.8	3.7	3.0	1.00	3.0	0.00	3.04	3.0	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-54	-92	-82	72	92	82	20	125	10.3	4.6	5.6											
OBC Layer 1	-74	-112	-102	92	112	102	20	110	11.2	5.9	5.4	1.45	7.8	0.00	5.35	7.8	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-94	-132	-122	112	132	122	20	110	13.4	7.1	6.3	1.45	9.1	0.00	6.31	9.1	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-114	-152	-142	132	152	142	20	110	15.6	8.4	7.3	1.45	10.5	0.00	7.26	10.5	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-134	-172	-162	152	172	162	20	110	17.8	9.6	8.2	1.45	11.9	0.00	8.21	11.9	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-154	-192	-182	172	192	182	20	110	20.0	10.9	9.2	1.45	13.3	0.00	9.16	13.3	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1967	54	50	104	0.3	**20.5**
	Unimproved Zone	1967	54	50	104	0.3	**5.1**
Post-Improvement	**Improved Zone**	1967	54	50	104	0.05	**3.4**
	Unimproved Zone	1967	54	50	104	0.3	**5.1**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**0.0**

Zone 20 Settlement Calculation

Ground Surface Elevation (ft)	18
Ground Water Depth (ft)	8
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	2
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	55
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	27
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	10

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	18	-2	-1	0	2	1	2	125	0.1	0.0	0.1											
MSW	16	-27	-15	2	27	15	25	100	1.5	0.4	1.0											
YBM Layer 1	-9	-38	-33	27	38	33	11	100	3.3	1.5	1.7	1.00	1.7	0.00	1.72	1.7	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-20	-49	-44	38	49	44	11	100	4.4	2.2	2.1	1.00	2.1	0.00	2.13	2.1	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-31	-60	-55	49	60	55	11	100	5.5	2.9	2.5	1.00	2.5	0.00	2.55	2.5	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-42	-71	-66	60	71	66	11	100	6.6	3.6	3.0	1.00	3.0	0.00	2.96	3.0	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-53	-82	-77	71	82	77	11	100	7.7	4.3	3.4	1.00	3.4	0.00	3.38	3.4	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-64	-102	-92	82	102	92	20	125	11.5	5.2	6.3											
OBC Layer 1	-84	-122	-112	102	122	112	20	110	12.3	6.5	5.8	1.45	8.5	0.00	5.83	8.5	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-104	-142	-132	122	142	132	20	110	14.5	7.7	6.8	1.45	9.8	0.00	6.78	9.8	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-124	-162	-152	142	162	152	20	110	16.7	9.0	7.7	1.45	11.2	0.00	7.73	11.2	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-144	-182	-172	162	182	172	20	110	18.9	10.2	8.7	1.45	12.6	0.00	8.69	12.6	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-164	-202	-192	182	202	192	20	110	21.1	11.5	9.6	1.45	14.0	0.00	9.64	14.0	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1967	54	50	104	0.3	**20.5**
	Unimproved Zone	1967	54	50	104	0.3	**5.1**
Post-Improvement	**Improved Zone**	1967	54	50	104	0.05	**3.4**
	Unimproved Zone	1967	54	50	104	0.3	**5.1**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**0.0**

Zone 21 Settlement Calculation

Ground Surface Elevation (ft)	18
Ground Water Depth (ft)	8
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	10
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	2
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	55
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	33
Total YBM Settlement (in)	36
Total OBC Settlement (in)	2

Total Post-Impovement MSW Settlement (in)	16

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	18	-2	-1	0	2	1	2	125	0.1	0.0	0.1											
MSW	16	-27	-15	2	27	15	25	100	1.5	0.4	1.0											
YBM Layer 1	-9	-38	-33	27	38	33	11	100	3.3	1.5	1.7	1.00	1.7	1.25	2.97	3.0	1.0	2	0.030	0.30	0.071	**9.4**
YBM Layer 2	-20	-49	-44	38	49	44	11	100	4.4	2.2	2.1	1.00	2.1	1.25	3.38	3.4	1.0	2	0.030	0.30	0.060	**7.9**
YBM Layer 3	-31	-60	-55	49	60	55	11	100	5.5	2.9	2.5	1.00	2.5	1.25	3.80	3.8	1.0	2	0.030	0.30	0.052	**6.9**
YBM Layer 4	-42	-71	-66	60	71	66	11	100	6.6	3.6	3.0	1.00	3.0	1.25	4.21	4.2	1.0	2	0.030	0.30	0.046	**6.1**
YBM Layer 5	-53	-82	-77	71	82	77	11	100	7.7	4.3	3.4	1.00	3.4	1.25	4.63	4.6	1.0	2	0.030	0.30	0.041	**5.4**
Sand	-64	-102	-92	82	102	92	20	125	11.5	5.2	6.3											
OBC Layer 1	-84	-122	-112	102	122	112	20	110	12.3	6.5	5.8	1.45	8.5	1.25	7.08	8.5	1.2	1	0.030	0.30	0.003	**0.6**
OBC Layer 2	-104	-142	-132	122	142	132	20	110	14.5	7.7	6.8	1.45	9.8	1.25	8.03	9.8	1.2	1	0.030	0.30	0.002	**0.5**
OBC Layer 3	-124	-162	-152	142	162	152	20	110	16.7	9.0	7.7	1.45	11.2	1.25	8.98	11.2	1.2	1	0.030	0.30	0.002	**0.5**
OBC Layer 4	-144	-182	-172	162	182	172	20	110	18.9	10.2	8.7	1.45	12.6	1.25	9.94	12.6	1.3	1	0.030	0.30	0.002	**0.4**
OBC Layer 5	-164	-202	-192	182	202	192	20	110	21.1	11.5	9.6	1.45	14.0	1.25	10.89	14.0	1.3	1	0.030	0.30	0.002	**0.4**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1967	54	50	104	0.3	**20.5**
	Unimproved Zone	1967	54	50	104	0.3	**5.1**
Post-Improvement	**Improved Zone**	1967	54	50	104	0.05	**3.4**
	Unimproved Zone	1967	54	50	104	0.3	**5.1**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**6.0**

Zone 22 Settlement Calculation

Ground Surface Elevation (ft)	18
Ground Water Depth (ft)	8
Ground Water Elevation NAVD88 (ft)	10
New Fill Height (ft)	0
New Fill Unit Weight (pcf)	125
Existing Fill Thickness (ft)	2
MSW Layer Thickness (ft)	25
YBM Layer Thickness (ft)	25
OBC Layer Thickness (ft)	100

Total MSW Settlement (in)	27
Total YBM Settlement (in)	0
Total OBC Settlement (in)	0

Total Post-Impovement MSW Settlement (in)	10

Soil Layer	Elevation (ft)			Depth Below Ground Surface (ft)			Layer Height (ft)	γ (pcf)	$\sigma_{v\text{-initial}}$ (ksf)	u (ksf)	$\sigma'_{v\text{-initial}}$ (ksf)	$OCR_{initial}$	$\sigma'_{p\text{-initial}}$ (psf)	Mid-Layer $\Delta\sigma'_v$ (ksf)	$\sigma'_{v\text{-final}}$ (ksf)	$\sigma'_{p\text{-final}}$ (psf)	OCR_{final}	OCR Case	C_{re}	$C_{c\varepsilon}$	Strain (in/in)	Settlement (in)
	top	bottom	center	top	bottom	center																
Existing Fill	18	-2	-1	0	2	1	2	125	0.1	0.0	0.1											
MSW	16	-27	-15	2	27	15	25	100	1.5	0.4	1.0											
YBM Layer 1	-9	-32	-30	27	32	30	5	100	3.0	1.3	1.6	1.00	1.6	0.00	1.61	1.6	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 2	-14	-37	-35	32	37	35	5	100	3.5	1.7	1.8	1.00	1.8	0.00	1.80	1.8	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 3	-19	-42	-40	37	42	40	5	100	4.0	2.0	2.0	1.00	2.0	0.00	1.98	2.0	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 4	-24	-47	-45	42	47	45	5	100	4.5	2.3	2.2	1.00	2.2	0.00	2.17	2.2	1.0	2	0.030	0.30	0.000	**0.0**
YBM Layer 5	-29	-52	-50	47	52	50	5	100	5.0	2.6	2.4	1.00	2.4	0.00	2.36	2.4	1.0	2	0.030	0.30	0.000	**0.0**
Sand	-34	-72	-62	52	72	62	20	125	7.8	3.4	4.4											
OBC Layer 1	-54	-92	-82	72	92	82	20	110	9.0	4.6	4.4	1.45	6.4	0.00	4.40	6.4	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 2	-74	-112	-102	92	112	102	20	110	11.2	5.9	5.4	1.45	7.8	0.00	5.35	7.8	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 3	-94	-132	-122	112	132	122	20	110	13.4	7.1	6.3	1.45	9.1	0.00	6.31	9.1	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 4	-114	-152	-142	132	152	142	20	110	15.6	8.4	7.3	1.45	10.5	0.00	7.26	10.5	1.5	1	0.030	0.30	0.000	**0.0**
OBC Layer 5	-134	-172	-162	152	172	162	20	110	17.8	9.6	8.2	1.45	11.9	0.00	8.21	11.9	1.5	1	0.030	0.30	0.000	**0.0**

Self Weight

Improvement		Year Placed (Garbage)	Garbage Age (yr)	Design Life (yr)	Time of Interest (yr)	Self-Weight C_α	Settlement (in)
Pre-Improvement	**Improved Zone**	1967	54	50	104	0.3	**20.5**
	Unimproved Zone	1967	54	50	104	0.3	**5.1**
Post-Improvement	**Improved Zone**	1967	54	50	104	0.05	**3.4**
	Unimproved Zone	1967	54	50	104	0.3	**5.1**

External Load

Year Placed (Existing Fill)	Closure Year	Primary Settlement Time (yr)	Design Life (yr)	Time of Interest (yr)	External Load C_α	Exisitng Fill			New Fill
						Settlement in 2029 (in)	Settlement in 2079 (in)	Post-Closure Settlement (in)	Settlement (in)
2000	2029	0.5	50	79	0.01	5.3	6.6	**1.3**	**0.0**



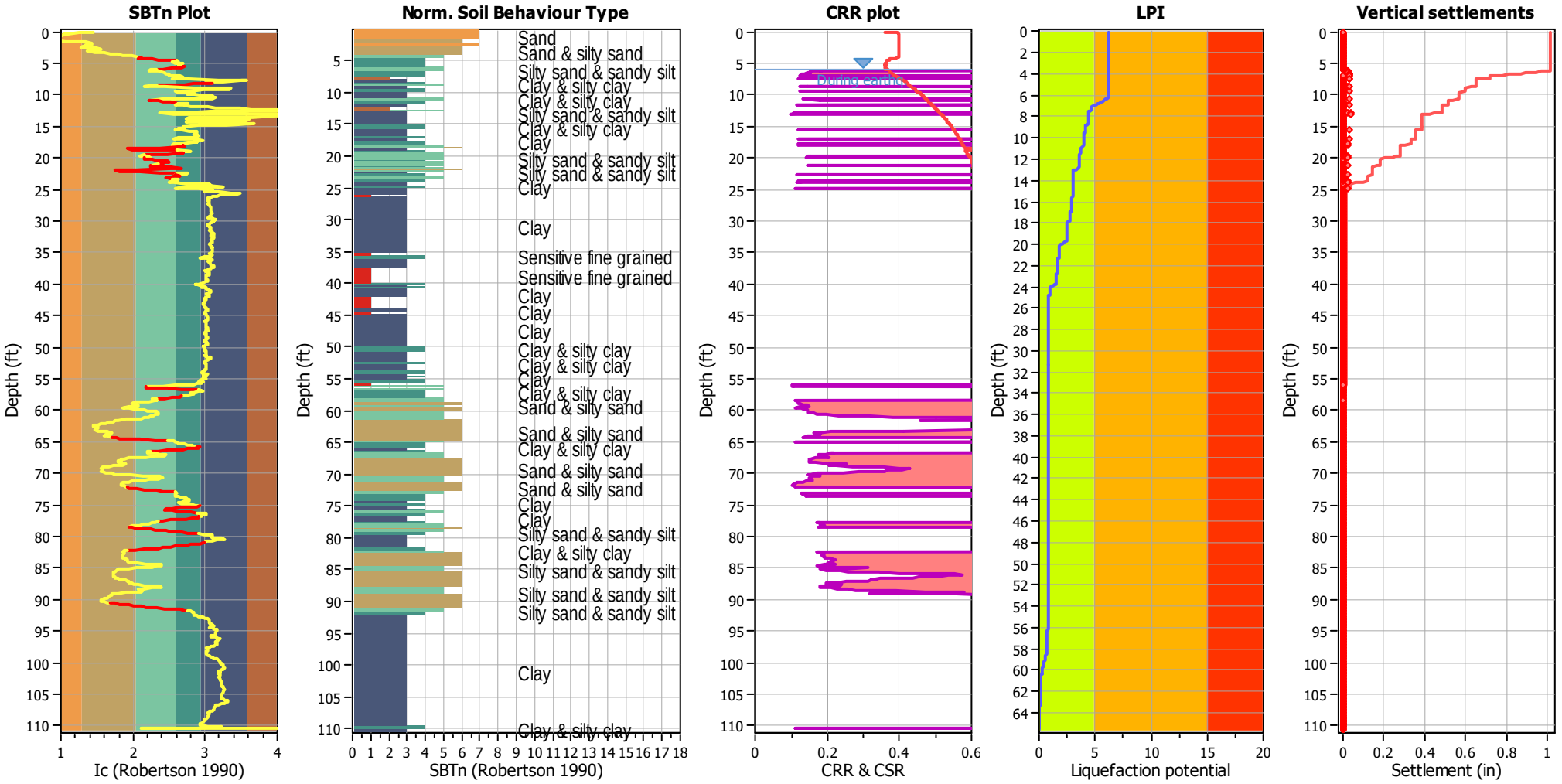
APPENDIX H

LIQUEFACTION ANALYSIS

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT02
Total depth: 110.65 ft

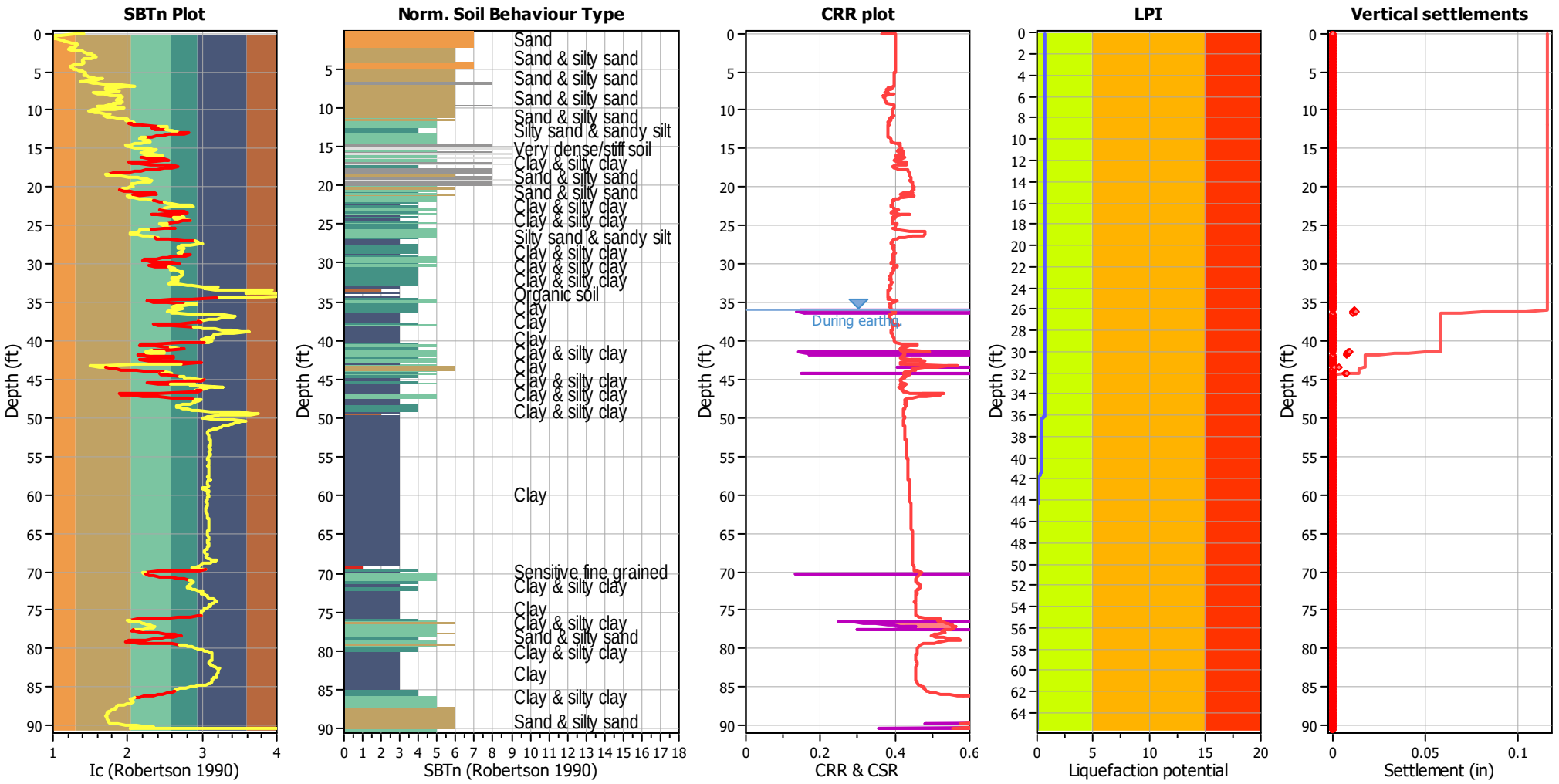


Analysis method:	B&I (2014)	G.W.T. (in-situ):	6.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	6.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT03
Total depth: 90.55 ft

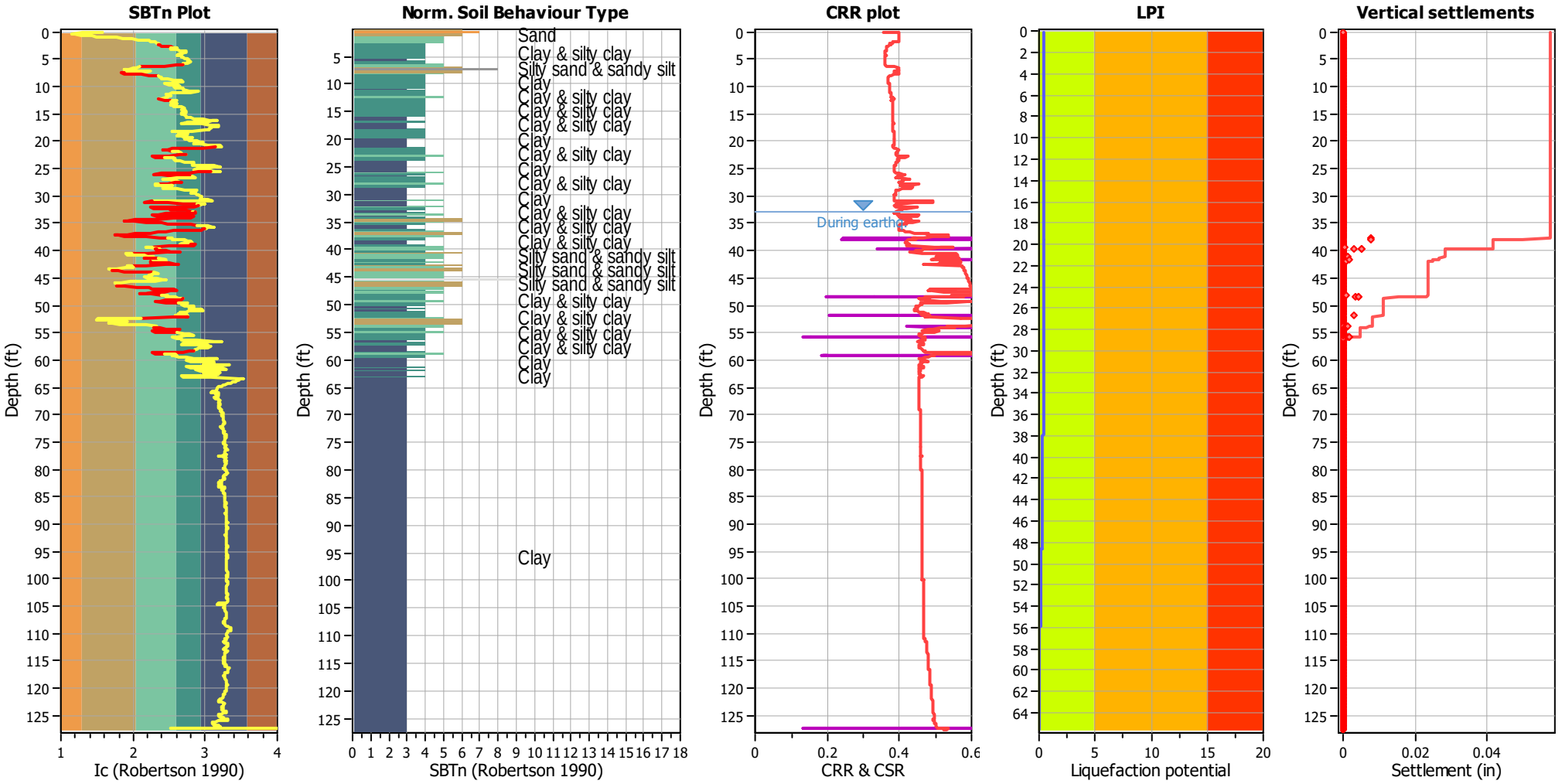


Analysis method:	B&I (2014)	G.W.T. (in-situ):	36.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	36.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT04
Total depth: 127.62 ft

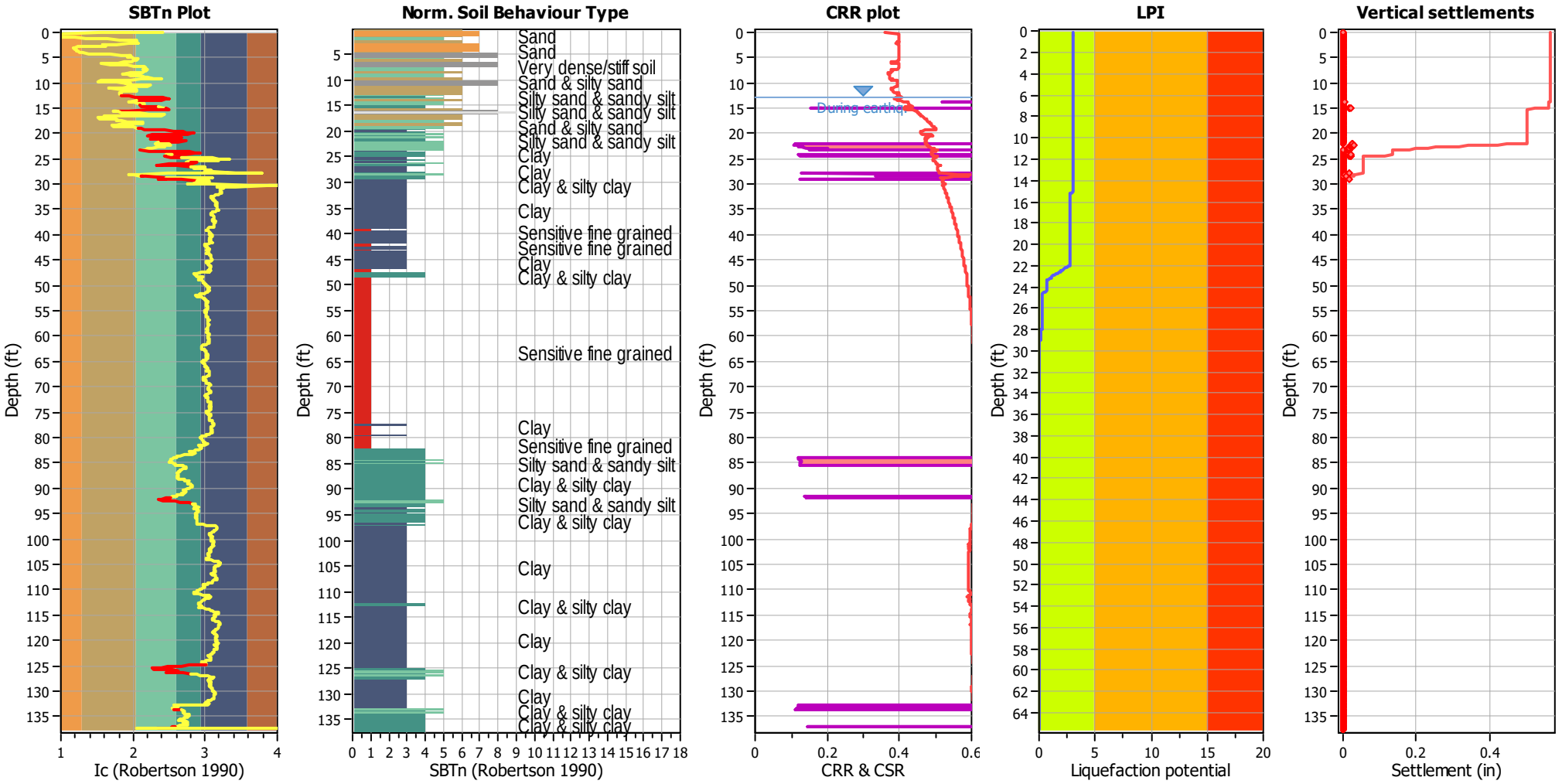


Analysis method:	B&I (2014)	G.W.T. (in-situ):	33.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	33.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT05
Total depth: 137.63 ft

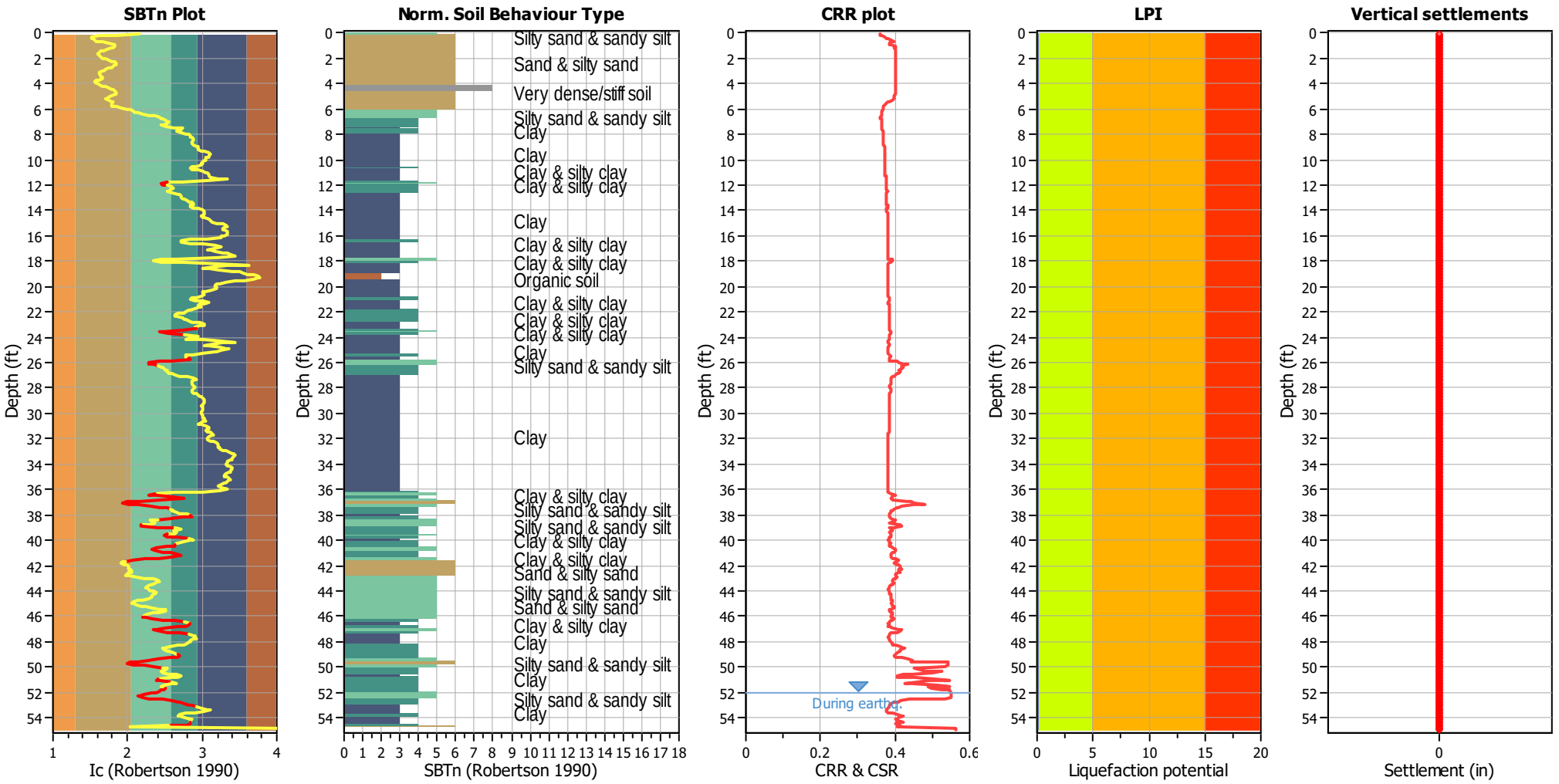


Analysis method:	B&I (2014)	G.W.T. (in-situ):	13.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	13.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT06A
Total depth: 54.95 ft

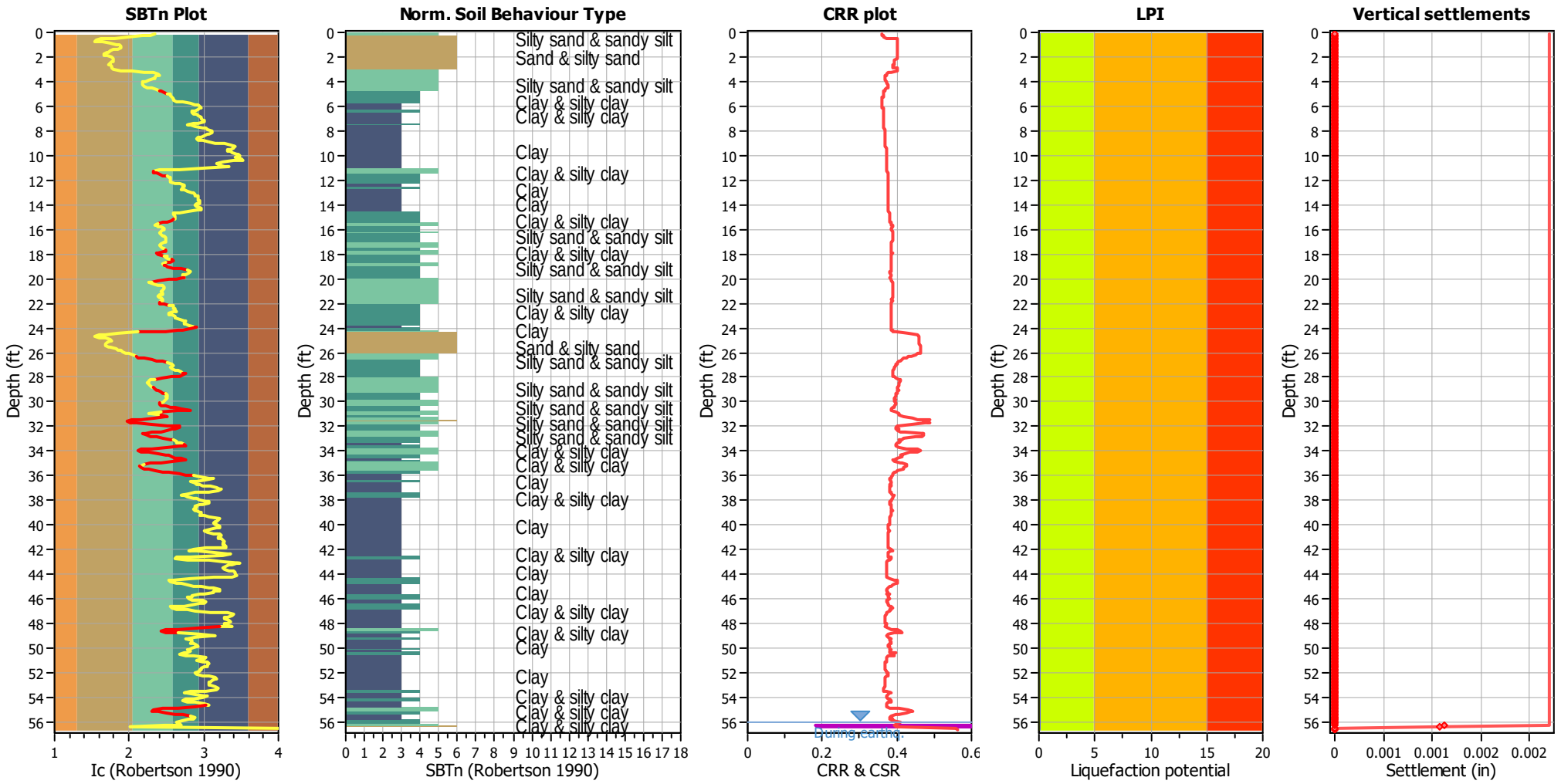


Analysis method:	B&I (2014)	G.W.T. (in-situ):	52.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	52.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

ENGEO
751 13th Street
San Francisco, CA 94130

Project: **Baylands Landfill**
Location: **Brisbane, California**

CPT: 1-CPT06B
Total depth: 56.68 ft



Analysis method:	B&I (2014)	G.W.T. (in-situ):	56.00 ft	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	56.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.80	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.60	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

GT04-1 Liquefaction Evaluation

Calculation
Input

Water Table depth at time of Exploration	Water Table depth at time of Liquefaction	amax/g	Mw
22	22	0.60	7.8

					At time of Exploration		At time of Liquefaction	
Boring Designation	Depth [ft]	Soil Type	N_m [Blows/ft]	FC	Total Stress [psf]	Effective Stress [psf]	Total Stress [psf]	Effective Stress [psf]
GT04-1	74	SC	19	30	8,880	5,635	8,880	5,635

N_m = Measured SPT Blow Count

FC - Fines Content

Idriss & Boulanger 2008 Methodology Results

Boring Designation	Depth	CRR	CSR	FS
GT04-1	74	0.21	0.57	0.38

GS08-1 Liquefaction Evaluation

Calculation
Input

Water Table depth at time of Exploration	Water Table depth at time of Liquefaction	amax/g	Mw
10	10	0.60	7.8

					At time of Exploration		At time of Liquefaction	
Boring Designation	Depth [ft]	Soil Type	N_m [Blows/ft]	FC	Total Stress [psf]	Effective Stress [psf]	Total Stress [psf]	Effective Stress [psf]
GS08-1	43	SM	11	12	5,160	3,101	5,160	3,101
GS08-1	48	SM	21	12	5,760	3,389	5,760	3,389

N_m = Measured SPT Blow Count

FC - Fines Content

Idriss & Boulanger 2008 Methodology Results

Boring Designation	Depth	CRR	CSR	FS
GS08-1	43	0.14	0.64	0.23
GS08-1	48	0.27	0.66	0.41

1-B1 Liquefaction Evaluation

Calculation
Input

Water Table depth at time of Exploration	Water Table depth at time of Liquefaction	amax/g	Mw
12	12	0.60	7.8

					At time of Exploration		At time of Liquefaction	
Boring Designation	Depth [ft]	Soil Type	N_m [Blows/ft]	FC	Total Stress [psf]	Effective Stress [psf]	Total Stress [psf]	Effective Stress [psf]
1-B1	93.5	SC	23	20	11,220	6,134	11,220	6,134

N_m = Measured SPT Blow Count

FC - Fines Content

Idriss & Boulanger 2008 Methodology Results

Boring Designation	Depth	CRR	CSR	FS
1-B1	93.5	0.25	0.62	0.40

GT04-1 Liquefaction Settlement

				From Liquefaction Potential Spreadsheet					Liquefaction									
									Ishiara & Yoshimine (1990)				Tokimatsu & Seed (1984)					
Boring #	Depth (ft)	USCS	Layer Height (ft)	σ_{vo} (psf)	σ'_{vo} (psf)	$(N_1)_{60\text{-}CS}$	CSR	FS	FS	$(N_1)_{55\text{-}CS}$	$\varepsilon_{v,max}$ (%)	ρ_s (in)	M_w	MSF	$(N_1)_{60\text{-}CS}$	$CSR_{M\text{-}7.5}$	$\varepsilon_{v,max}$ (%)	ρ_s (in)
GT04-1	74	SC	15	8,880	5,635	21	0.57	0.38	0.38	23	1.9	3.42	7.8	0.90	21	0.63	1.5	2.70
								Total I&Y Liquefaction Settlement				3.42		Total T&S Liquefaction Settlement				2.70

GS08-1 Liquefaction Settlement

				From Liquefaction Potential Spreadsheet					Liquefaction									
									Ishiara & Yoshimine (1990)				Tokimatsu & Seed (1984)					
Boring #	Depth (ft)	USCS	Layer Height (ft)	σ_{vo} (psf)	σ'_{vo} (psf)	$(N_1)_{60\text{-}CS}$	CSR	FS	FS	$(N_1)_{55\text{-}CS}$	$\varepsilon_{v,max}$ (%)	ρ_s (in)	M_w	MSF	$(N_1)_{60\text{-}CS}$	$CSR_{M\text{-}7.5}$	$\varepsilon_{v,max}$ (%)	ρ_s (in)
GS08-1	43	SM	7.5	5,160	3,101	14	0.64	0.23	0.23	15	2.6	2.34	7.8	0.90	14	0.71	2.0	1.80
GS08-1	48	SM	7.5	5,760	3,389	24	0.66	0.41	0.41	26	1.6	1.44	7.8	0.90	24	0.74	1.3	1.13
								Total I&Y Liquefaction Settlement				3.78		Total T&S Liquefaction Settlement				2.93

1-B1 Liquefaction Settlement

				From Liquefaction Potential Spreadsheet					Liquefaction									
									Ishiara & Yoshimine (1990)				Tokimatsu & Seed (1984)					
Boring #	Depth (ft)	USCS	Layer Height (ft)	σ_{vo} (psf)	σ'_{vo} (psf)	$(N_1)_{60\text{-}CS}$	CSR	FS	FS	$(N_1)_{55\text{-}CS}$	$\varepsilon_{v,max}$ (%)	ρ_s (in)	M_w	MSF	$(N_1)_{60\text{-}CS}$	$CSR_{M\text{-}7.5}$	$\varepsilon_{v,max}$ (%)	ρ_s (in)
1-B1	93.5	SC	7.5	11,220	6,134	23	0.62	0.40	0.40	25	1.7	1.53	7.8	0.90	23	0.69	1.3	1.17
								Total I&Y Liquefaction Settlement				1.53		Total T&S Liquefaction Settlement				1.17

Input
Calculation



APPENDIX I

SEISMIC HAZARD DISAGGREGATION

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

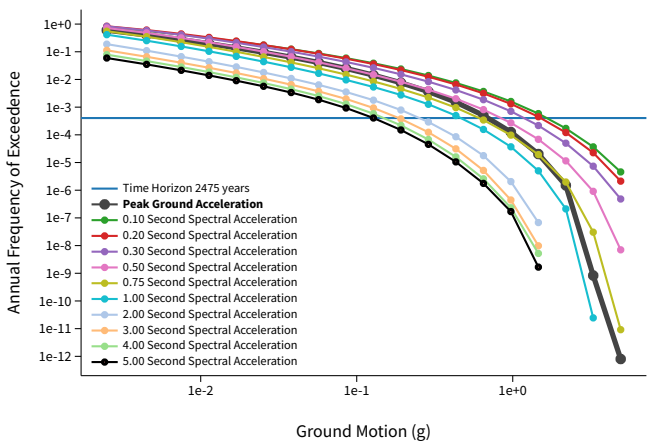
-122.396454

Site Class

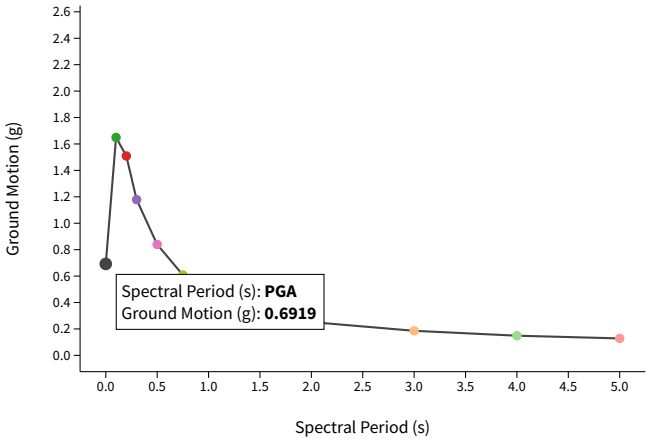
1150 m/s (Site class B)

Hazard Curve

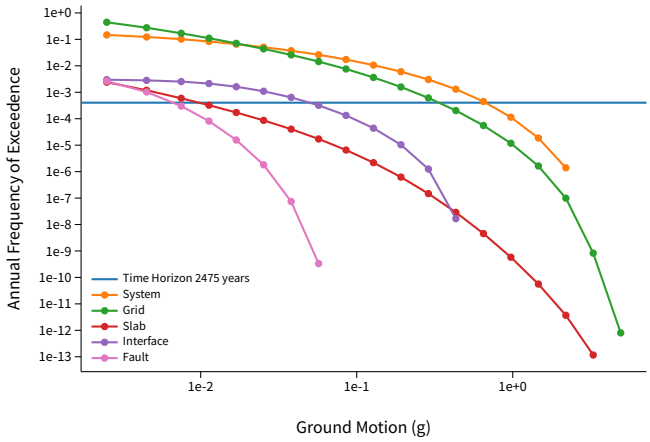
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for Peak Ground Acceleration

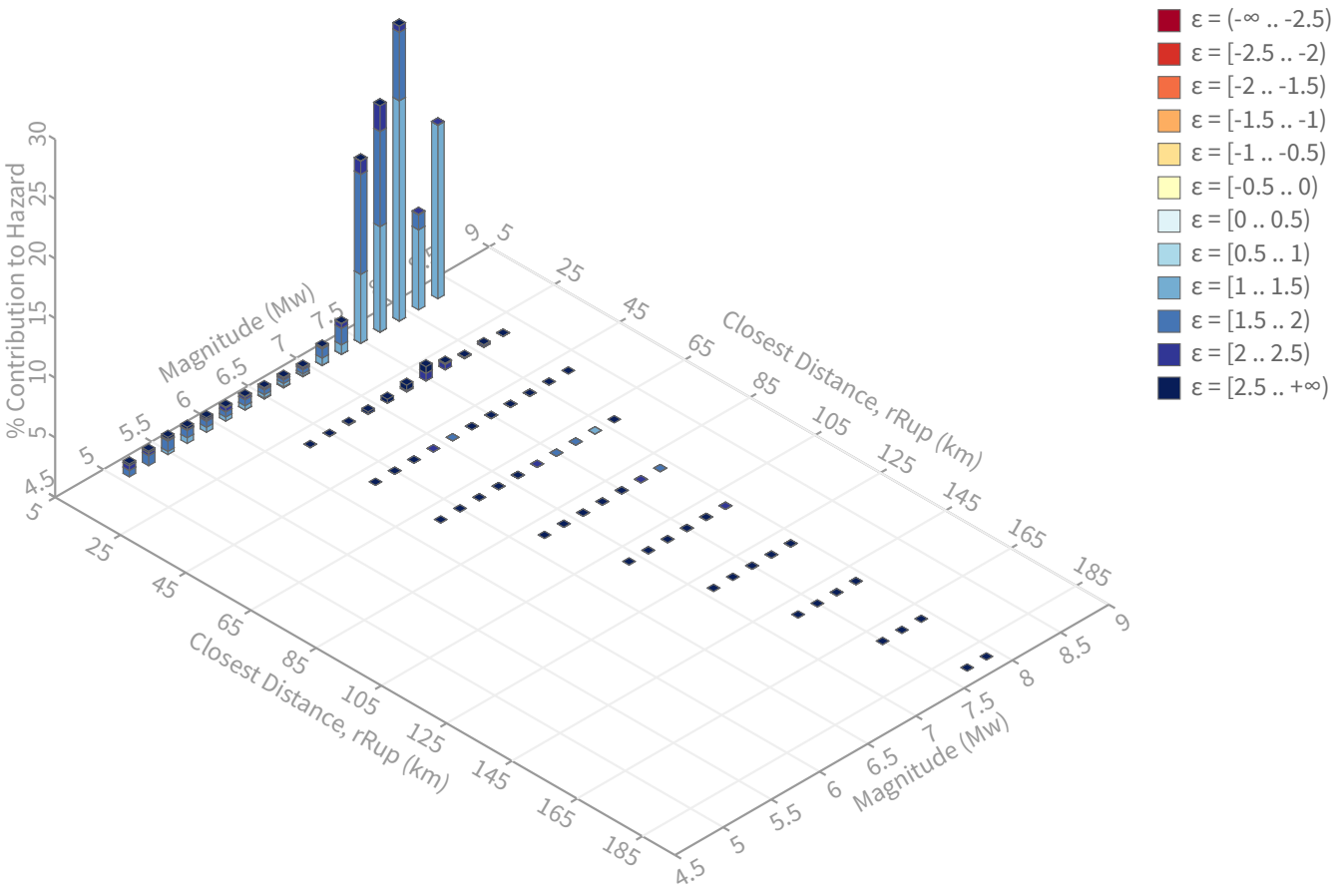


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.69194991 g

Recovered targets

Return period: 3049.0345 yrs
Exceedance rate: 0.00032797268 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.04 %

Mean (over all sources)

m: 7.61
r: 9.42 km
ε_0: 1.55 σ

Mode (largest m-r bin)

m: 7.86
r: 9.24 km
ε_0: 1.47 σ
Contribution: 24.71 %

Mode (largest m-r-ε_0 bin)

m: 7.86
r: 8.63 km
ε_0: 1.38 σ
Contribution: 18.46 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							44.85
San Andreas (Peninsula) [10]		8.63	7.84	1.43	122.475°W	37.652°N	233.17	37.81
San Gregorio (North) [5]		15.96	7.72	2.07	122.569°W	37.655°N	252.60	2.47
Hayward (No) [0]		21.57	7.43	2.50	122.186°W	37.797°N	59.23	1.19
UC33brAvg_FM31	System							44.37
San Andreas (Peninsula) [10]		8.63	7.84	1.43	122.475°W	37.652°N	233.17	37.51
San Gregorio (North) [5]		15.96	7.72	2.07	122.569°W	37.655°N	252.60	2.58
Hayward (No) [0]		21.70	7.43	2.51	122.185°W	37.797°N	59.24	1.15
UC33brAvg_FM31 (opt)	Grid							5.39
PointSourceFinite: -122.396, 37.703		4.96	5.63	1.64	122.396°W	37.703°N	0.00	1.57
PointSourceFinite: -122.396, 37.703		4.96	5.63	1.64	122.396°W	37.703°N	0.00	1.57
UC33brAvg_FM32 (opt)	Grid							5.39
PointSourceFinite: -122.396, 37.703		4.96	5.63	1.64	122.396°W	37.703°N	0.00	1.57
PointSourceFinite: -122.396, 37.703		4.96	5.63	1.64	122.396°W	37.703°N	0.00	1.57

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

0.10 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

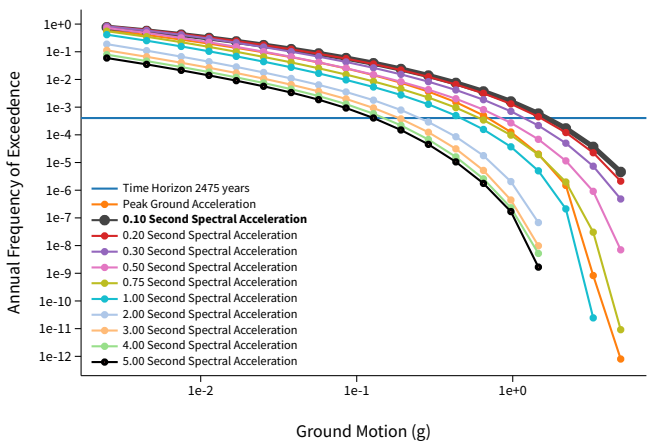
-122.396454

Site Class

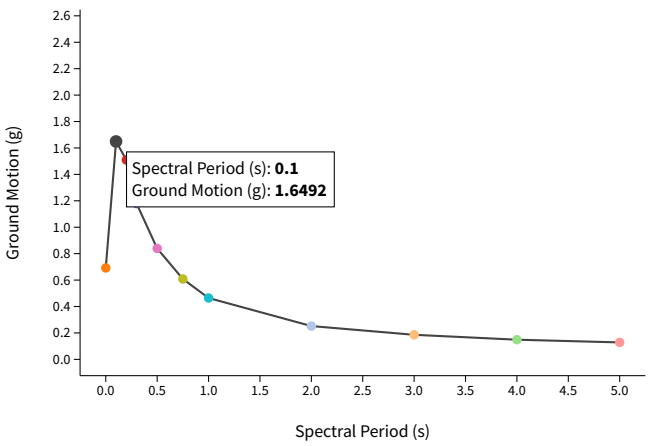
1150 m/s (Site class B)

Hazard Curve

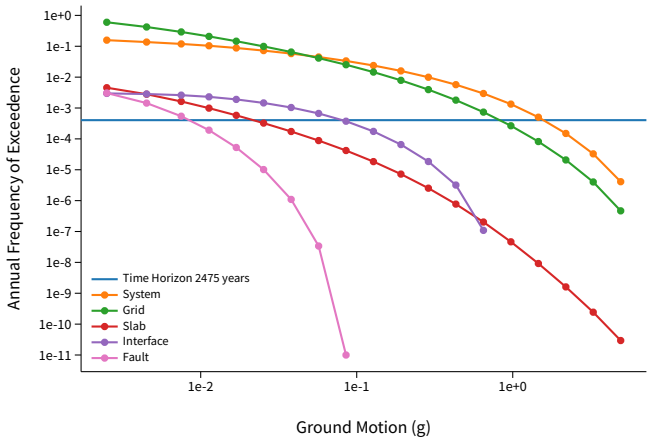
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for 0.10 Second Spectral Acceleration

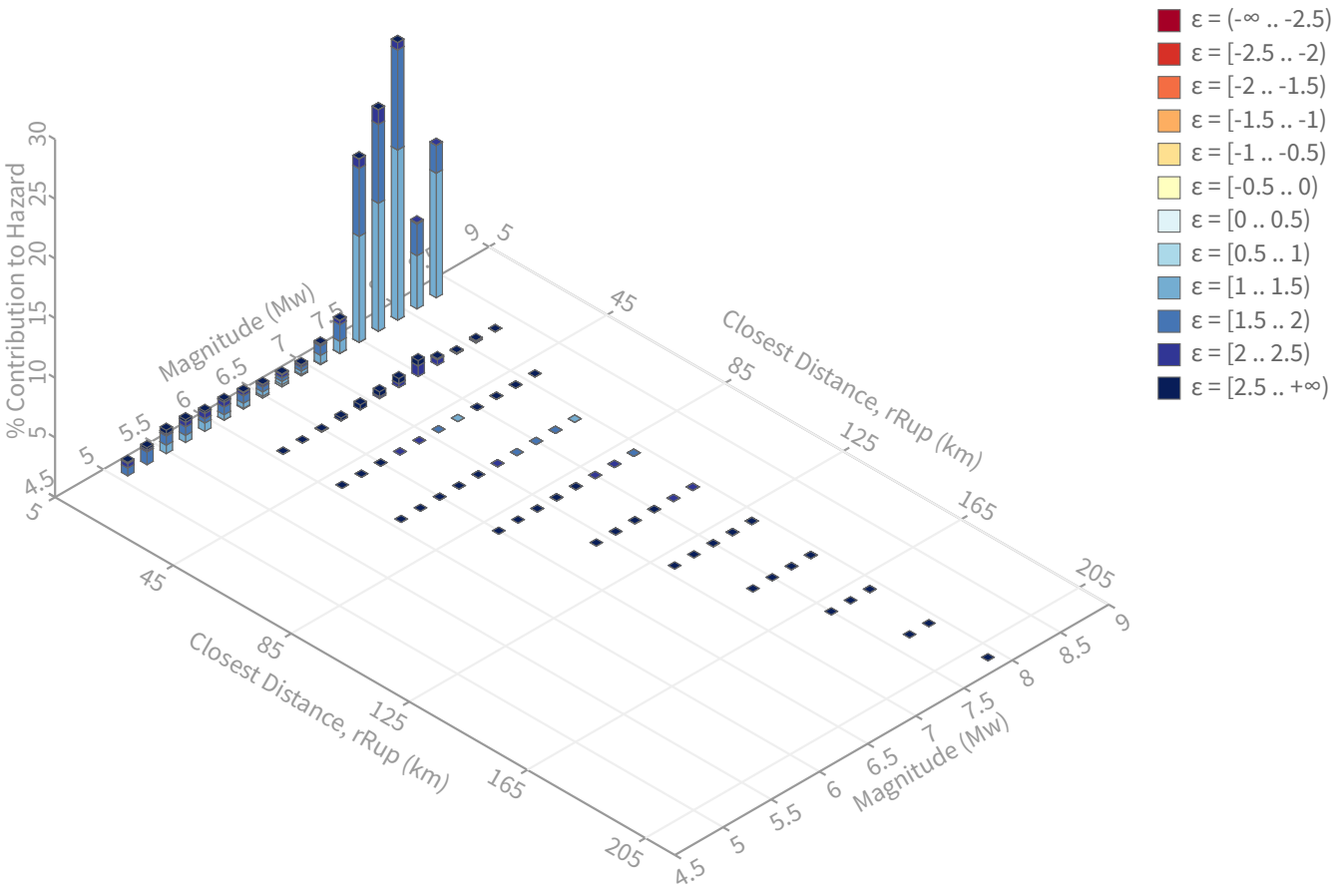


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
0.1 s SA ground motion: 1.649195 g

Recovered targets

Return period: 2911.1024 yrs
Exceedance rate: 0.00034351248 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.04 %

Mean (over all sources)

m: 7.53
r: 9.6 km
ε_0: 1.55 σ

Mode (largest m-r bin)

m: 7.86
r: 9.26 km
ε_0: 1.45 σ
Contribution: 23.26 %

Mode (largest m-r-ε_0 bin)

m: 7.86
r: 8.65 km
ε_0: 1.28 σ
Contribution: 14.26 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							43.52
San Andreas (Peninsula) [10]		8.63	7.83	1.41	122.475°W	37.652°N	233.17	35.74
San Gregorio (North) [5]		15.96	7.69	2.03	122.569°W	37.655°N	252.60	2.58
Hayward (No) [0]		21.57	7.37	2.48	122.186°W	37.797°N	59.23	1.47
UC33brAvg_FM31	System							43.00
San Andreas (Peninsula) [10]		8.63	7.83	1.41	122.475°W	37.652°N	233.17	35.45
San Gregorio (North) [5]		15.96	7.69	2.03	122.569°W	37.655°N	252.60	2.70
Hayward (No) [0]		21.70	7.37	2.49	122.185°W	37.797°N	59.24	1.42
UC33brAvg_FM31 (opt)	Grid							6.74
PointSourceFinite: -122.396, 37.703		4.98	5.62	1.55	122.396°W	37.703°N	0.00	1.79
PointSourceFinite: -122.396, 37.703		4.98	5.62	1.55	122.396°W	37.703°N	0.00	1.79
UC33brAvg_FM32 (opt)	Grid							6.73
PointSourceFinite: -122.396, 37.703		4.98	5.62	1.55	122.396°W	37.703°N	0.00	1.79
PointSourceFinite: -122.396, 37.703		4.98	5.62	1.55	122.396°W	37.703°N	0.00	1.79

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

0.20 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

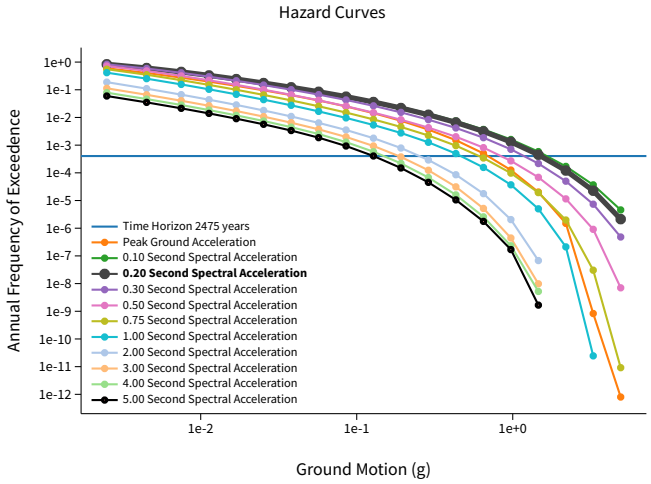
Decimal degrees, negative values for western longitudes

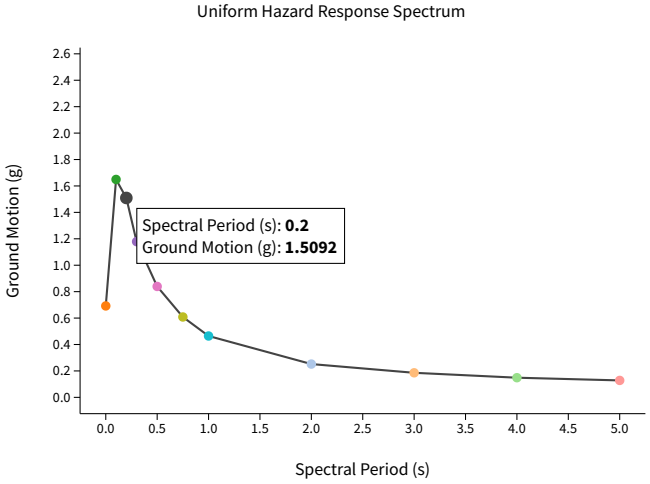
-122.396454

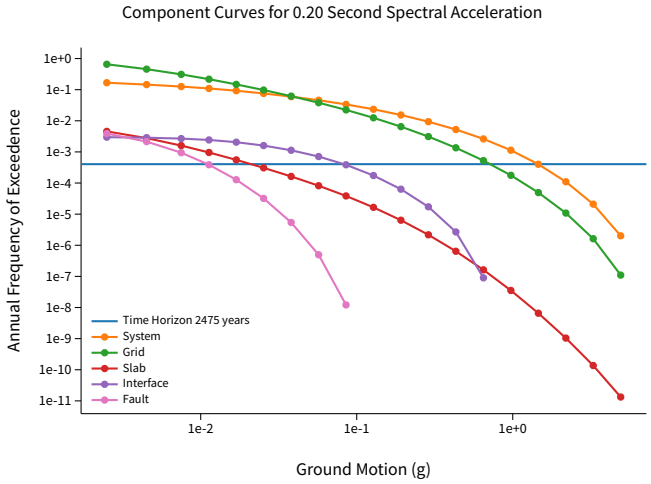
Site Class

1150 m/s (Site class B)

Hazard Curve





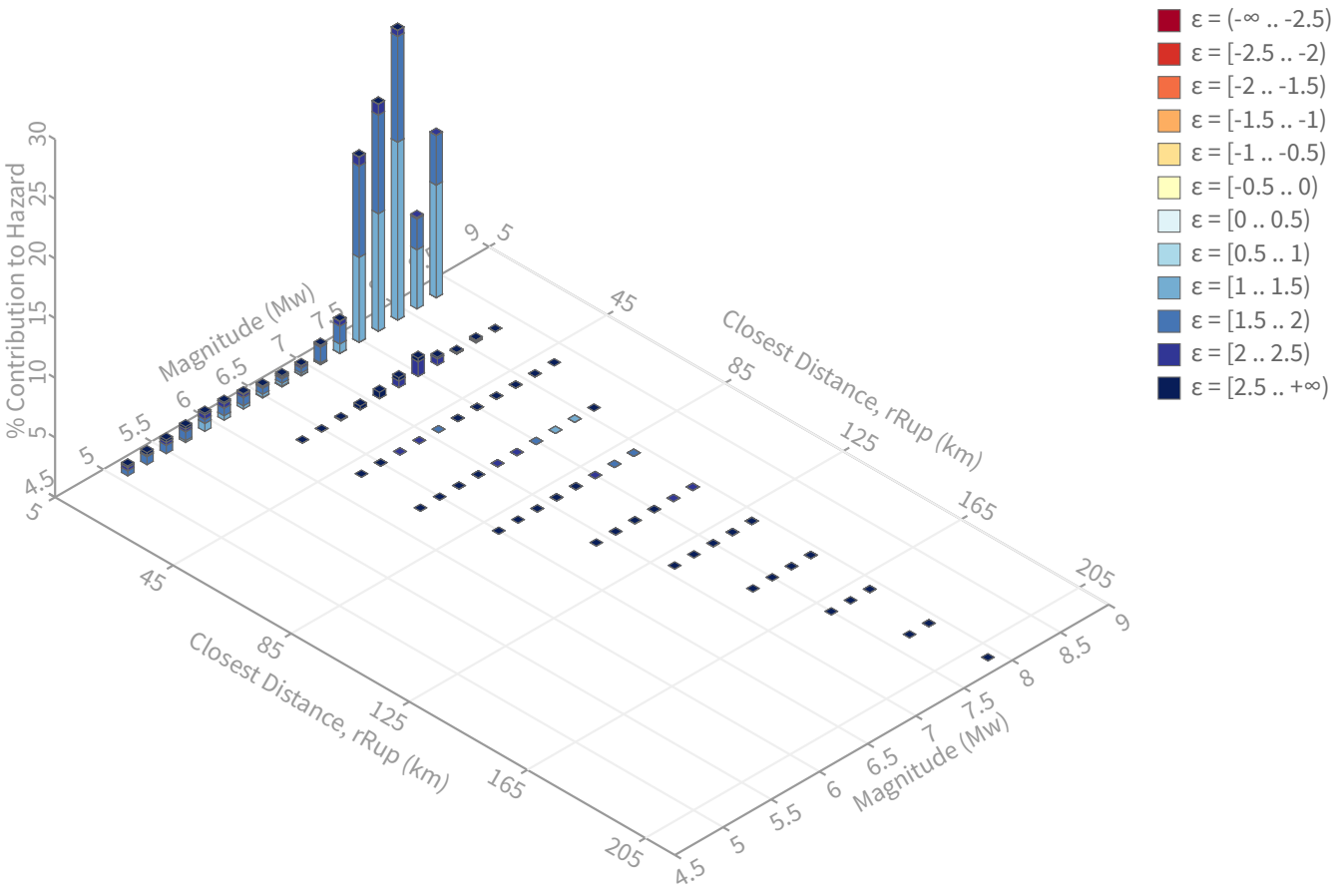


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
0.2 s SA ground motion: 1.5091693 g

Recovered targets

Return period: 2987.7797 yrs
Exceedance rate: 0.0003346967 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.06 %

Mean (over all sources)

m: 7.6
r: 9.69 km
ε_0: 1.54 σ

Mode (largest m-r bin)

m: 7.86
r: 9.28 km
ε_0: 1.43 σ
Contribution: 24.28 %

Mode (largest m-r-ε_0 bin)

m: 7.86
r: 8.65 km
ε_0: 1.26 σ
Contribution: 14.91 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							44.86
San Andreas (Peninsula) [10]		8.63	7.84	1.40	122.475°W	37.652°N	233.17	36.90
San Gregorio (North) [5]		15.96	7.71	1.99	122.569°W	37.655°N	252.60	2.68
Hayward (No) [0]		21.57	7.41	2.39	122.186°W	37.797°N	59.23	1.56
UC33brAvg_FM31	System							44.35
San Andreas (Peninsula) [10]		8.63	7.84	1.40	122.475°W	37.652°N	233.17	36.60
San Gregorio (North) [5]		15.96	7.71	1.99	122.569°W	37.655°N	252.60	2.80
Hayward (No) [0]		21.70	7.41	2.40	122.185°W	37.797°N	59.24	1.51
UC33brAvg_FM31 (opt)	Grid							5.40
PointSourceFinite: -122.396, 37.703		4.98	5.68	1.63	122.396°W	37.703°N	0.00	1.33
PointSourceFinite: -122.396, 37.703		4.98	5.68	1.63	122.396°W	37.703°N	0.00	1.33
UC33brAvg_FM32 (opt)	Grid							5.39
PointSourceFinite: -122.396, 37.703		4.98	5.68	1.63	122.396°W	37.703°N	0.00	1.33
PointSourceFinite: -122.396, 37.703		4.98	5.68	1.63	122.396°W	37.703°N	0.00	1.33

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

0.30 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

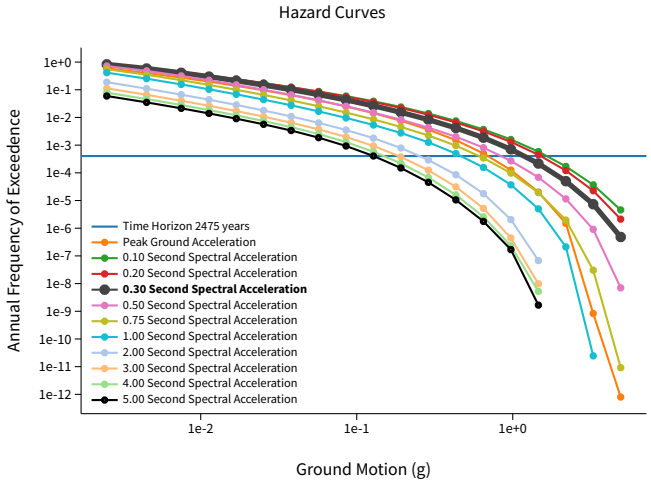
Decimal degrees, negative values for western longitudes

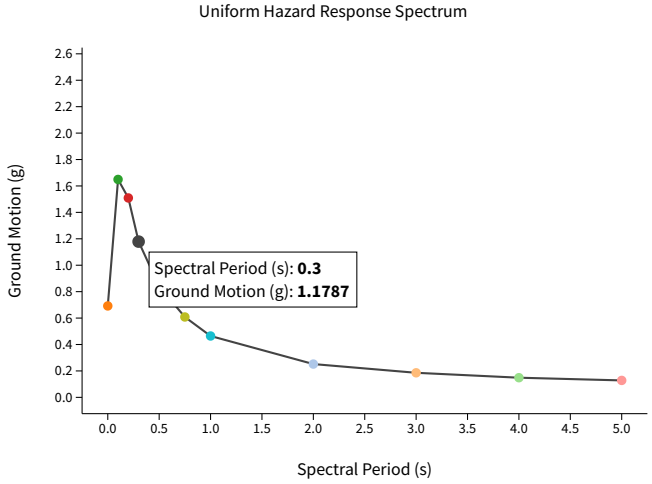
-122.396454

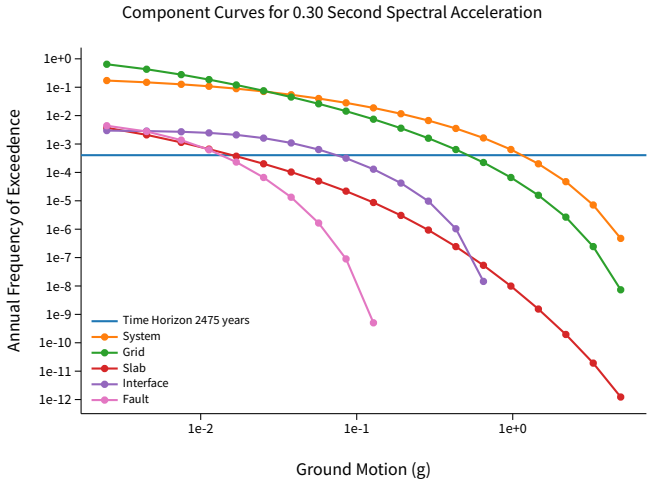
Site Class

1150 m/s (Site class B)

Hazard Curve





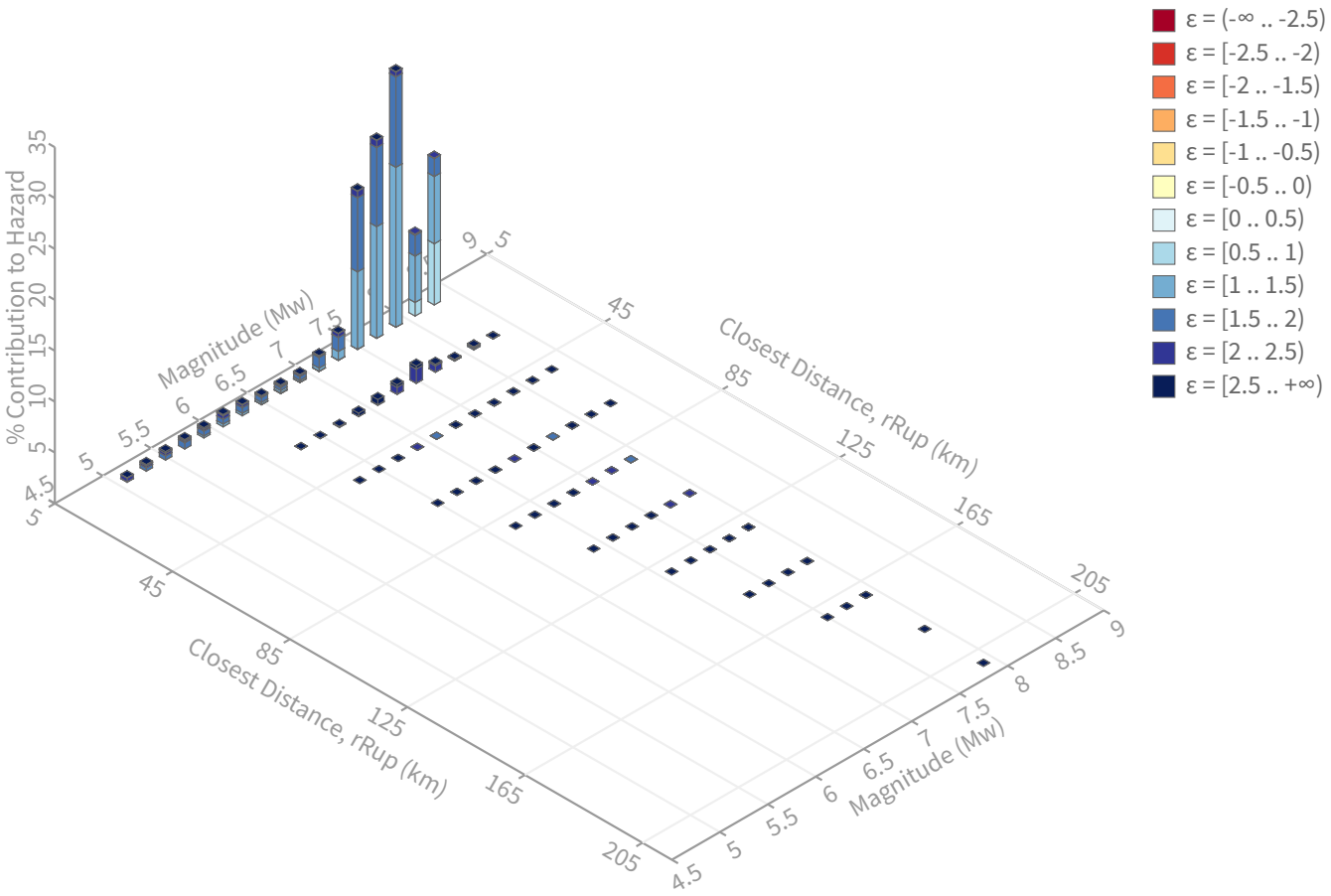


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
0.3 s SA ground motion: 1.1787338 g

Recovered targets

Return period: 2907.376 yrs
Exceedance rate: 0.00034395276 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.08 %

Mean (over all sources)

m: 7.66
r: 9.84 km
ε_0: 1.5 σ

Mode (largest m-r bin)

m: 7.86
r: 9.31 km
ε_0: 1.39 σ
Contribution: 25.07 %

Mode (largest m-r-ε_0 bin)

m: 7.86
r: 8.66 km
ε_0: 1.21 σ
Contribution: 15.71 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							46.16
San Andreas (Peninsula) [10]		8.63	7.84	1.36	122.475°W	37.652°N	233.17	37.80
San Gregorio (North) [5]		15.96	7.72	1.93	122.569°W	37.655°N	252.60	2.81
Hayward (No) [0]		21.57	7.42	2.33	122.186°W	37.797°N	59.23	1.67
UC33brAvg_FM31	System							45.65
San Andreas (Peninsula) [10]		8.63	7.84	1.35	122.475°W	37.652°N	233.17	37.49
San Gregorio (North) [5]		15.96	7.72	1.94	122.569°W	37.655°N	252.60	2.94
Hayward (No) [0]		21.70	7.41	2.34	122.185°W	37.797°N	59.24	1.62
UC33brAvg_FM31 (opt)	Grid							4.10
UC33brAvg_FM32 (opt)	Grid							4.09

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

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Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

0.50 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

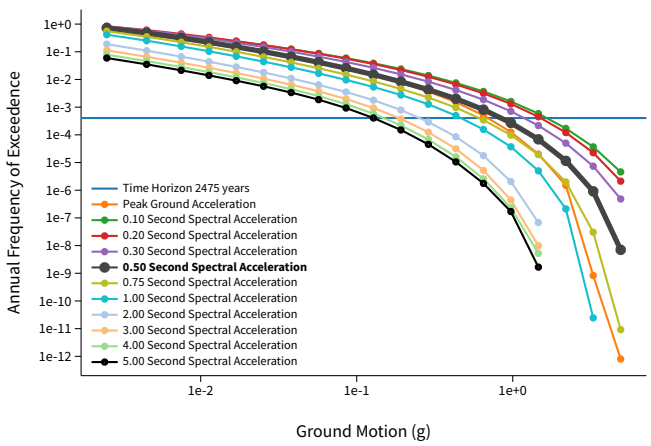
-122.396454

Site Class

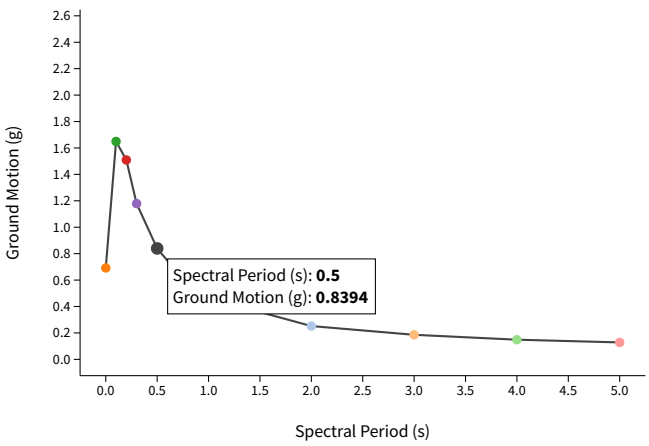
1150 m/s (Site class B)

Hazard Curve

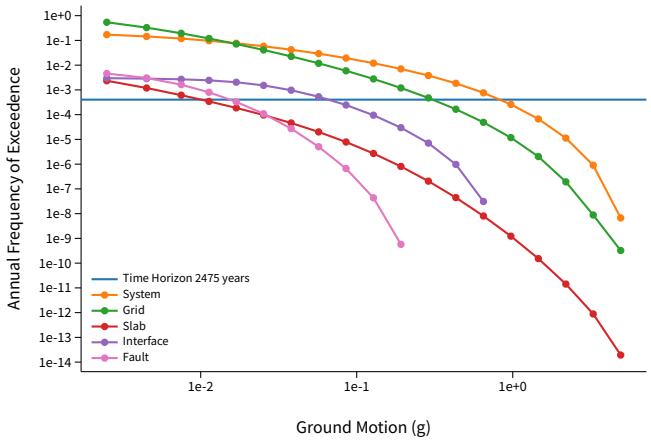
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for 0.50 Second Spectral Acceleration

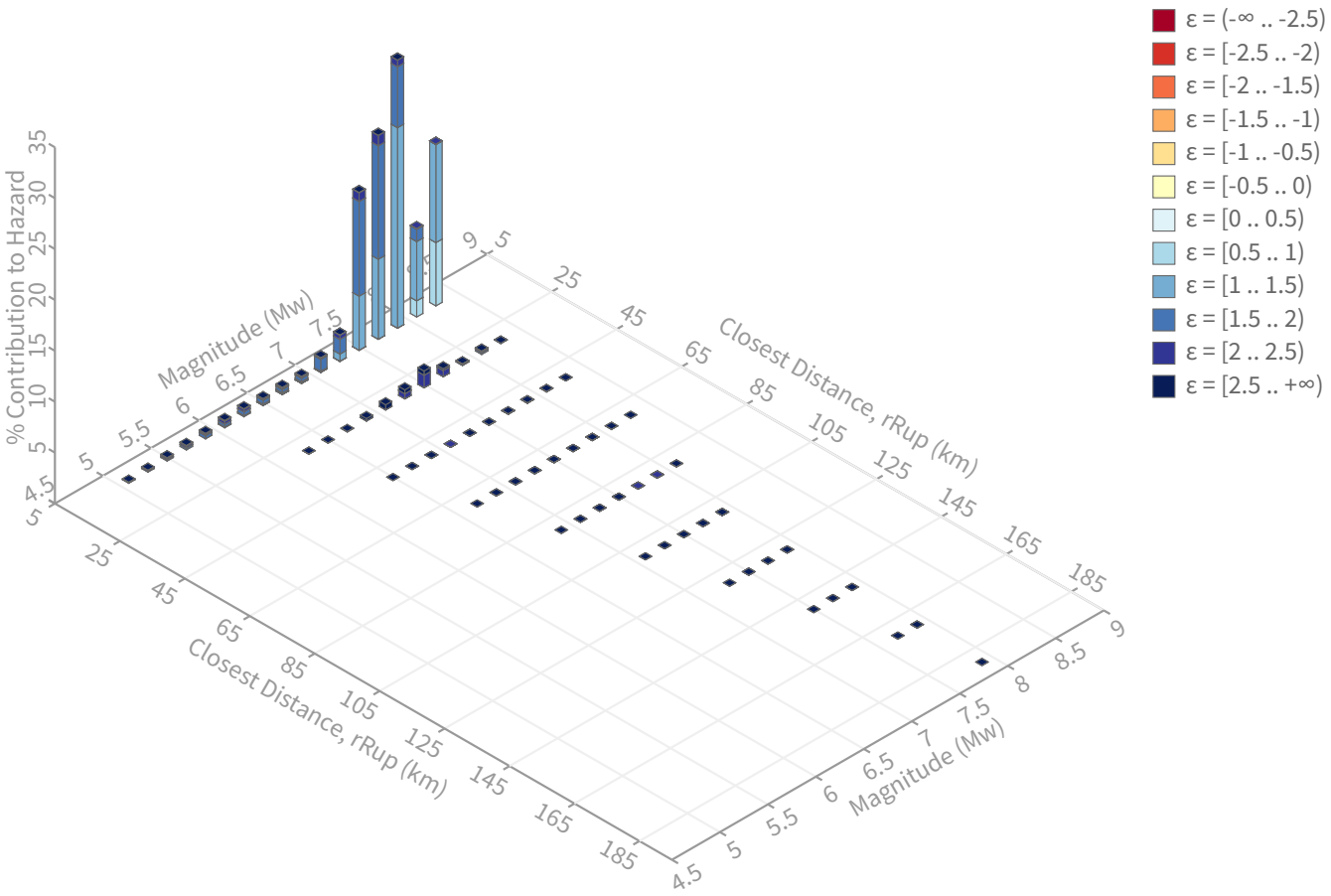


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
0.5 s SA ground motion: 0.83939916 g

Recovered targets

Return period: 2880.0147 yrs
Exceedance rate: 0.00034722045 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.06 %

Mean (over all sources)

m: 7.74
r: 9.88 km
ε_0: 1.48 σ

Mode (largest m-r bin)

m: 7.86
r: 9.31 km
ε_0: 1.39 σ
Contribution: 26.32 %

Mode (largest m-r-ε_0 bin)

m: 7.86
r: 8.65 km
ε_0: 1.29 σ
Contribution: 19.69 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							47.86
San Andreas (Peninsula) [10]		8.63	7.86	1.35	122.475°W	37.652°N	233.17	39.50
San Gregorio (North) [5]		15.96	7.73	1.95	122.569°W	37.655°N	252.60	2.90
Hayward (No) [0]		21.57	7.43	2.38	122.186°W	37.797°N	59.23	1.58
UC33brAvg_FM31	System							47.34
San Andreas (Peninsula) [10]		8.63	7.85	1.35	122.475°W	37.652°N	233.17	39.16
San Gregorio (North) [5]		15.96	7.72	1.96	122.569°W	37.655°N	252.60	3.03
Hayward (No) [0]		21.70	7.43	2.39	122.185°W	37.797°N	59.24	1.52
UC33brAvg_FM31 (opt)	Grid							2.40
UC33brAvg_FM32 (opt)	Grid							2.40

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

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Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

0.75 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

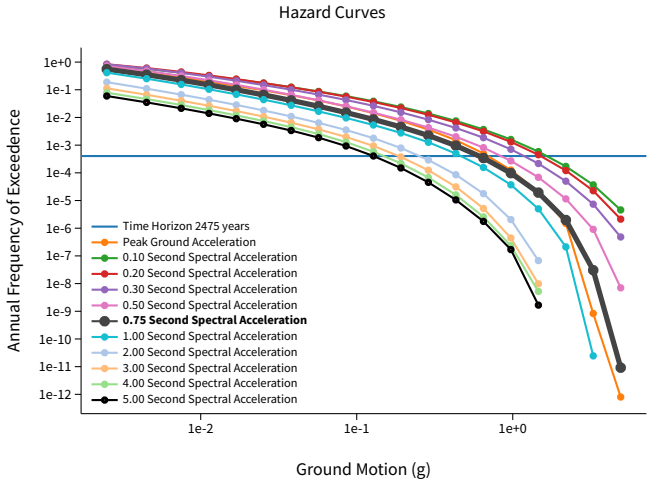
Decimal degrees, negative values for western longitudes

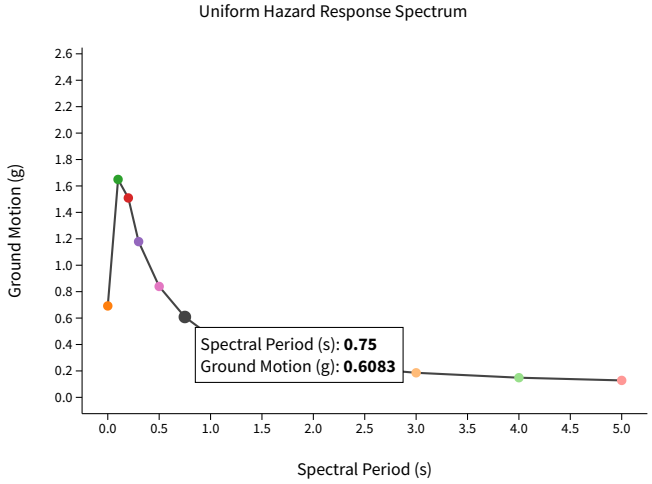
-122.396454

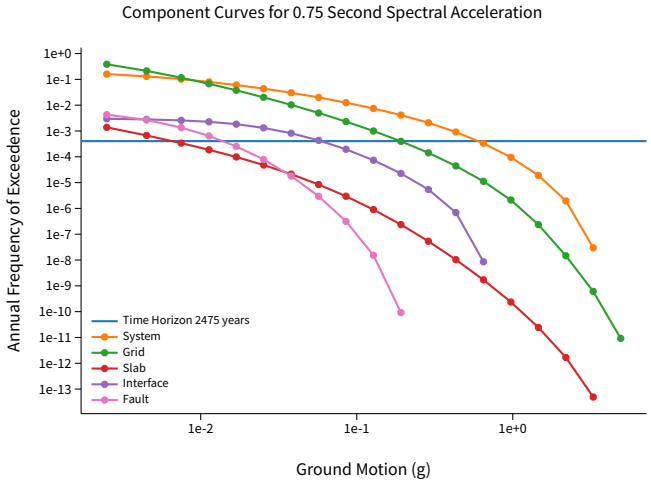
Site Class

1150 m/s (Site class B)

Hazard Curve





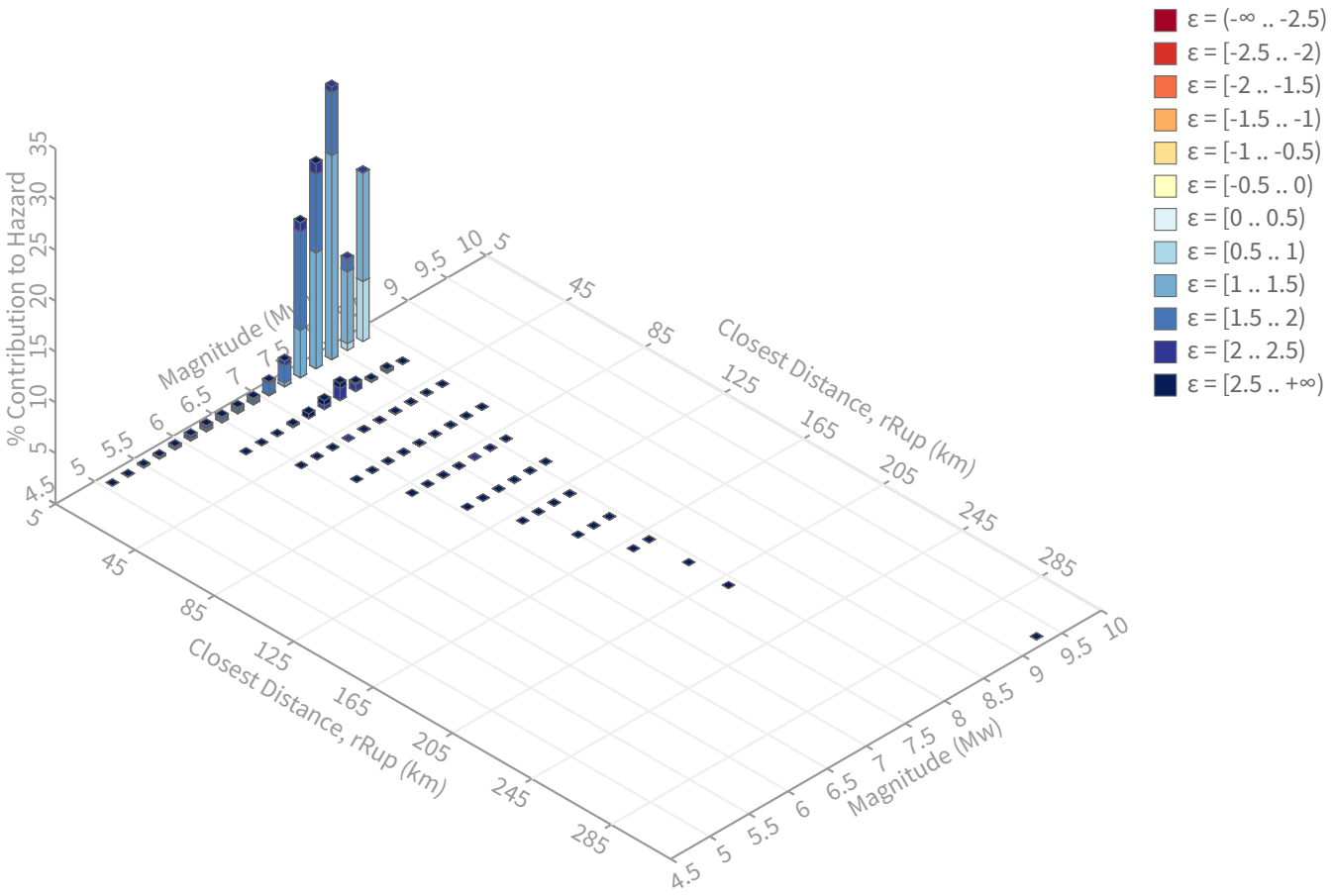


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
0.75 s SA ground motion: 0.60829308 g

Recovered targets

Return period: 2880.7754 yrs
Exceedance rate: 0.00034712876 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.07 %

Mean (over all sources)

m: 7.77
r: 9.98 km
ε_0: 1.47 σ

Mode (largest m-r bin)

m: 7.86
r: 9.32 km
ε_0: 1.39 σ
Contribution: 26.84 %

Mode (largest m-r-ε_0 bin)

m: 7.86
r: 8.65 km
ε_0: 1.3 σ
Contribution: 20.1 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							48.57
San Andreas (Peninsula) [10]		8.63	7.86	1.35	122.475°W	37.652°N	233.17	40.09
San Gregorio (North) [5]		15.96	7.73	1.95	122.569°W	37.655°N	252.60	2.98
Hayward (No) [0]		21.57	7.45	2.40	122.186°W	37.797°N	59.23	1.57
UC33brAvg_FM31	System							48.05
San Andreas (Peninsula) [10]		8.63	7.86	1.35	122.475°W	37.652°N	233.17	39.73
San Gregorio (North) [5]		15.96	7.73	1.96	122.569°W	37.655°N	252.60	3.11
Hayward (No) [0]		21.70	7.44	2.40	122.185°W	37.797°N	59.24	1.52
UC33brAvg_FM31 (opt)	Grid							1.68
UC33brAvg_FM32 (opt)	Grid							1.68

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

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Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

1.00 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

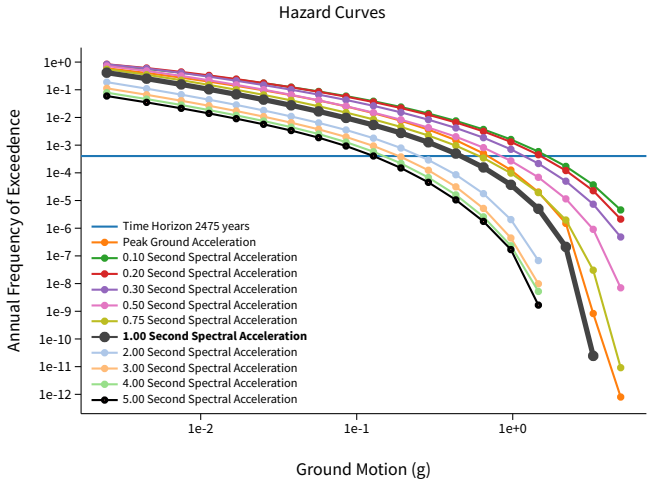
Decimal degrees, negative values for western longitudes

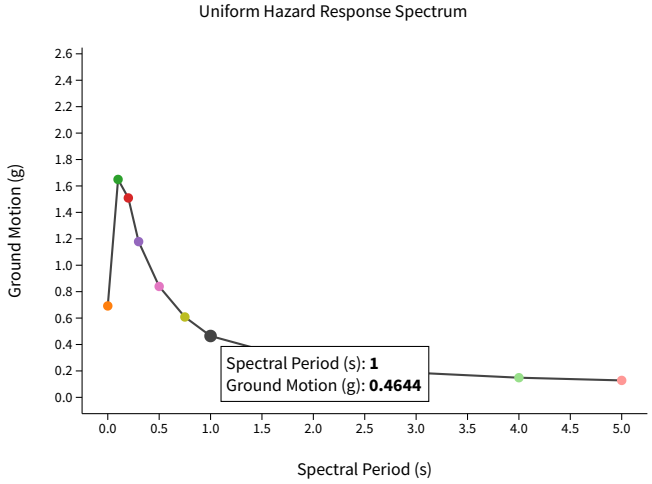
-122.396454

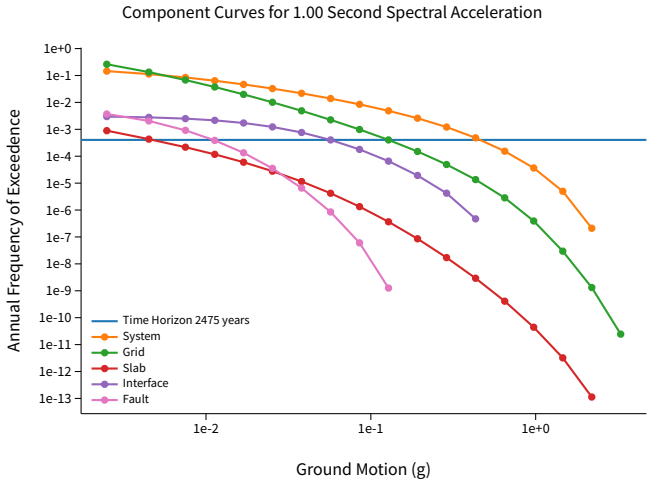
Site Class

1150 m/s (Site class B)

Hazard Curve





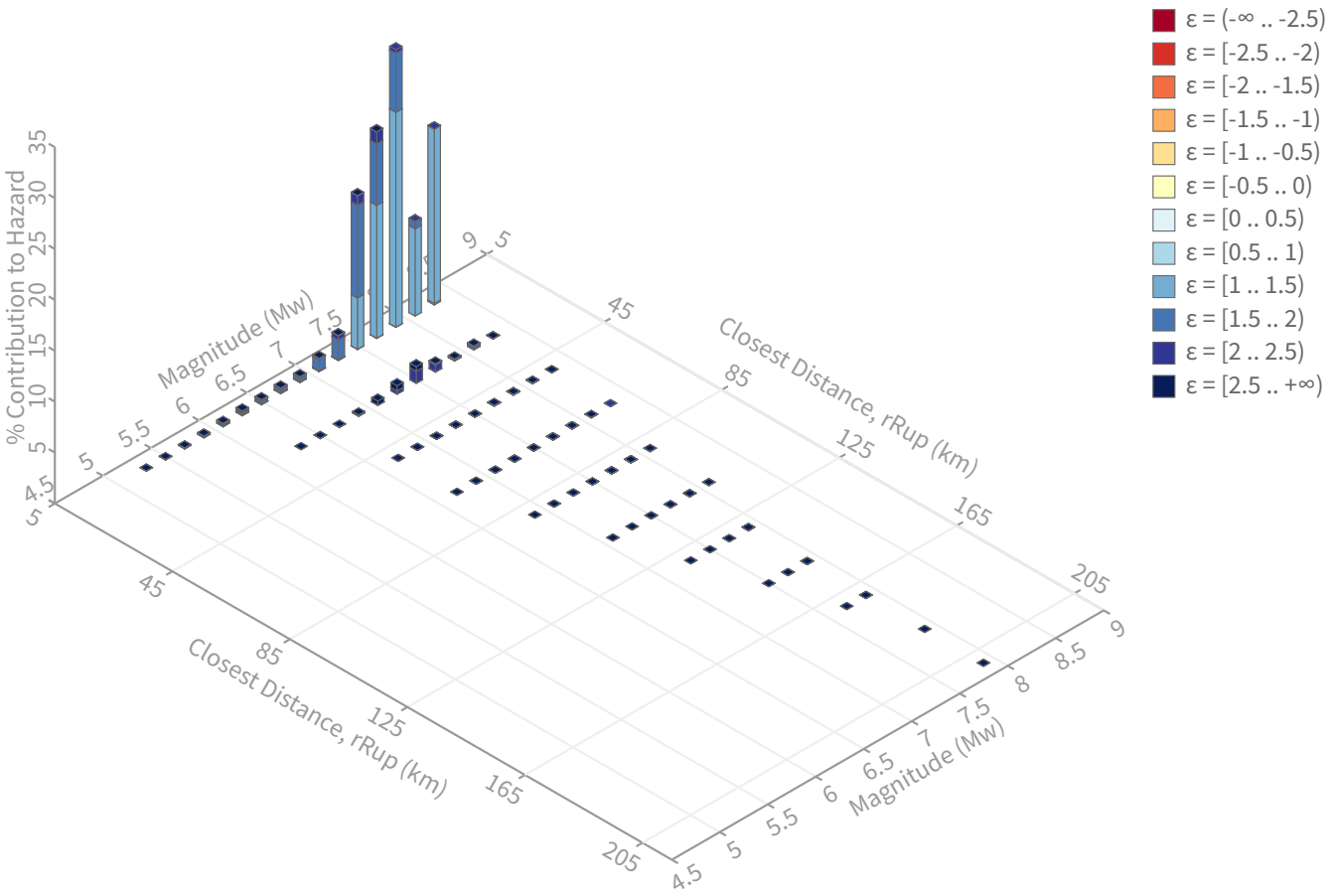


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
1.0 s SA ground motion: 0.4644073 g

Recovered targets

Return period: 2855.1951 yrs
Exceedance rate: 0.00035023877 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.07 %

Mean (over all sources)

m: 7.8
r: 9.95 km
ε_0: 1.46 σ

Mode (largest m-r bin)

m: 7.86
r: 9.32 km
ε_0: 1.39 σ
Contribution: 27.24 %

Mode (largest m-r-ε_0 bin)

m: 7.87
r: 8.64 km
ε_0: 1.31 σ
Contribution: 21.1 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							49.01
San Andreas (Peninsula) [10]		8.63	7.87	1.34	122.475°W	37.652°N	233.17	40.62
San Gregorio (North) [5]		15.96	7.74	1.95	122.569°W	37.655°N	252.60	2.98
Hayward (No) [0]		21.57	7.46	2.39	122.186°W	37.797°N	59.23	1.49
UC33brAvg_FM31	System							48.49
San Andreas (Peninsula) [10]		8.63	7.87	1.34	122.475°W	37.652°N	233.17	40.26
San Gregorio (North) [5]		15.96	7.73	1.96	122.569°W	37.655°N	252.60	3.11
Hayward (No) [0]		21.70	7.46	2.40	122.185°W	37.797°N	59.24	1.44
UC33brAvg_FM31 (opt)	Grid							1.25
UC33brAvg_FM32 (opt)	Grid							1.25

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

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Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

2.00 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

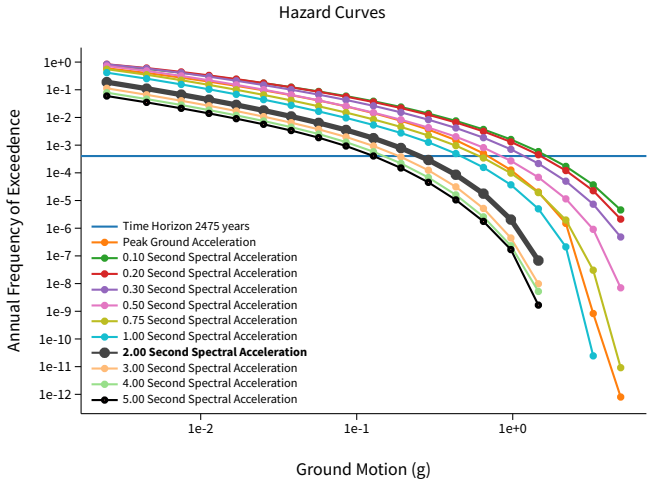
Decimal degrees, negative values for western longitudes

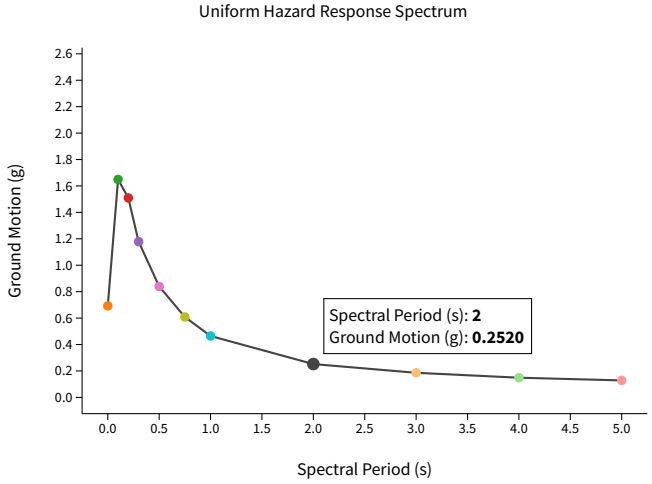
-122.396454

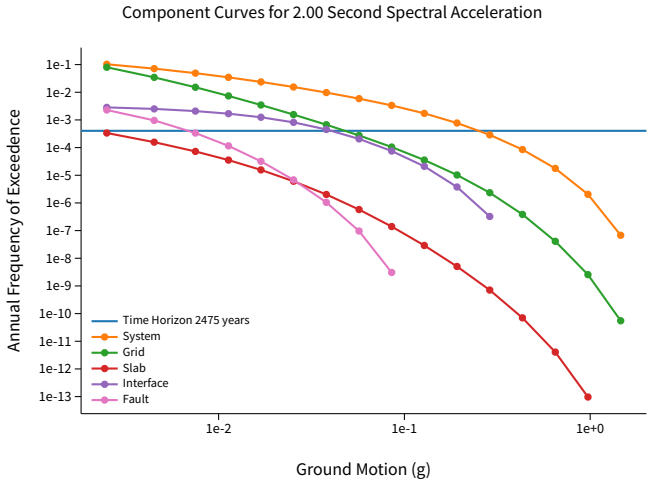
Site Class

1150 m/s (Site class B)

Hazard Curve





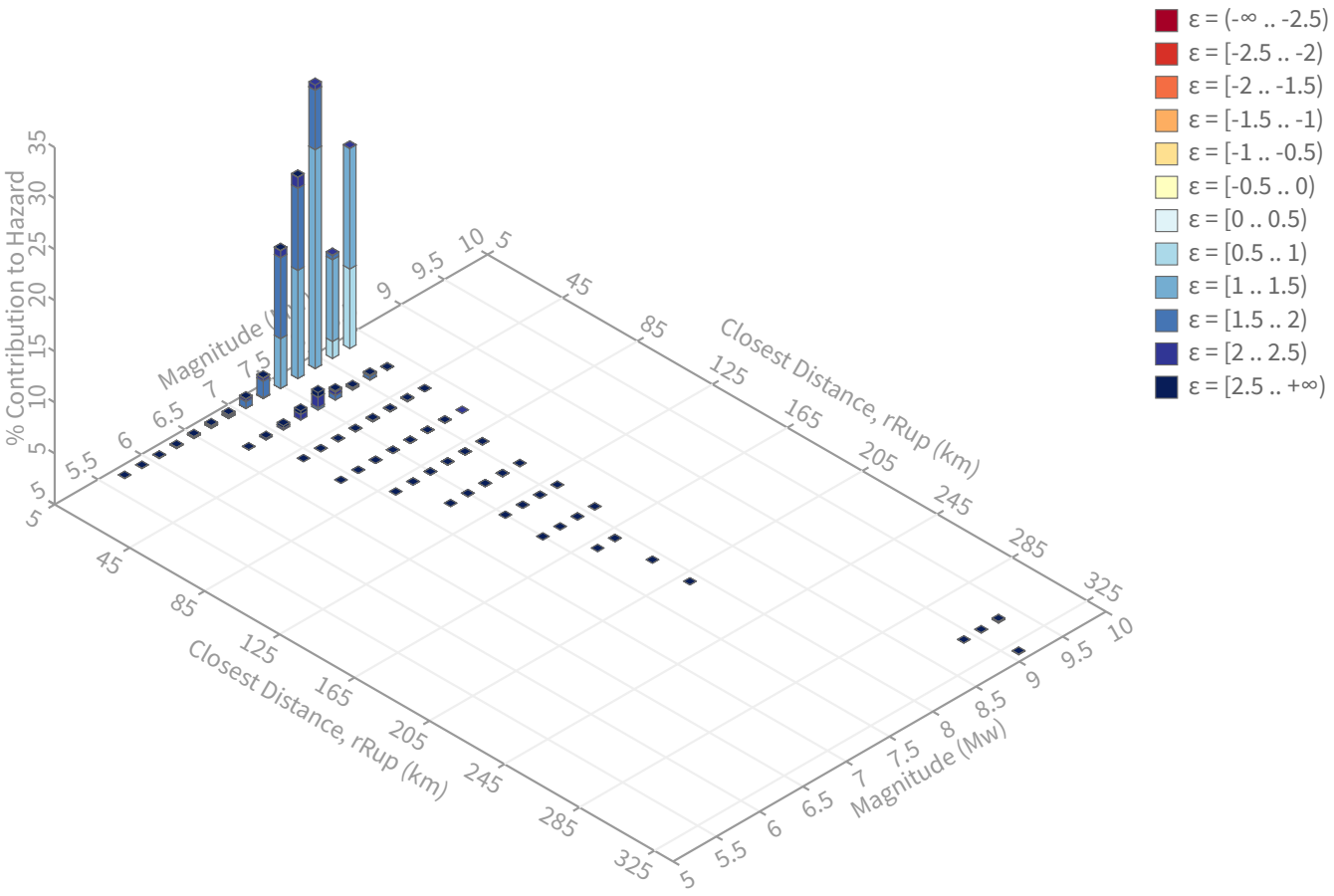


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
2.0 s SA ground motion: 0.25196922 g

Recovered targets

Return period: 2802.6424 yrs
Exceedance rate: 0.00035680614 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.1 %

Mean (over all sources)

m: 7.85
r: 10.86 km
ε_0: 1.41 σ

Mode (largest m-r bin)

m: 7.87
r: 9.37 km
ε_0: 1.35 σ
Contribution: 27.76 %

Mode (largest m-r-ε_0 bin)

m: 7.87
r: 8.7 km
ε_0: 1.27 σ
Contribution: 21.45 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							49.68
San Andreas (Peninsula) [10]		8.63	7.89	1.29	122.475°W	37.652°N	233.17	40.92
San Gregorio (North) [5]		15.96	7.75	1.86	122.569°W	37.655°N	252.60	3.15
Hayward (No) [0]		21.57	7.47	2.26	122.186°W	37.797°N	59.23	1.49
UC33brAvg_FM31	System							49.18
San Andreas (Peninsula) [10]		8.63	7.89	1.29	122.475°W	37.652°N	233.17	40.52
San Gregorio (North) [5]		15.96	7.75	1.86	122.569°W	37.655°N	252.60	3.28
Hayward (No) [0]		21.70	7.47	2.26	122.185°W	37.797°N	59.24	1.44

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

3.00 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

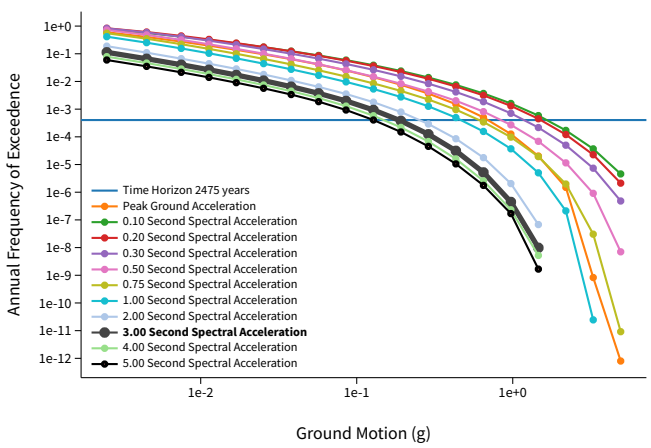
-122.396454

Site Class

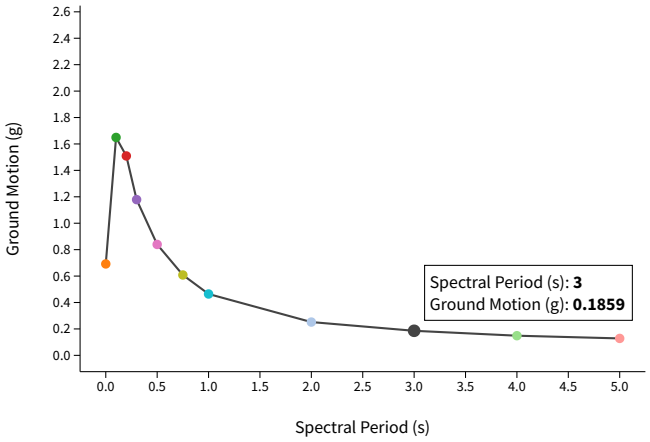
1150 m/s (Site class B)

Hazard Curve

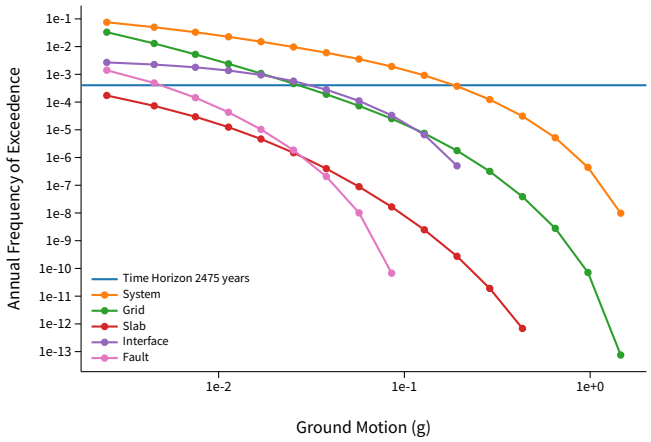
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for 3.00 Second Spectral Acceleration

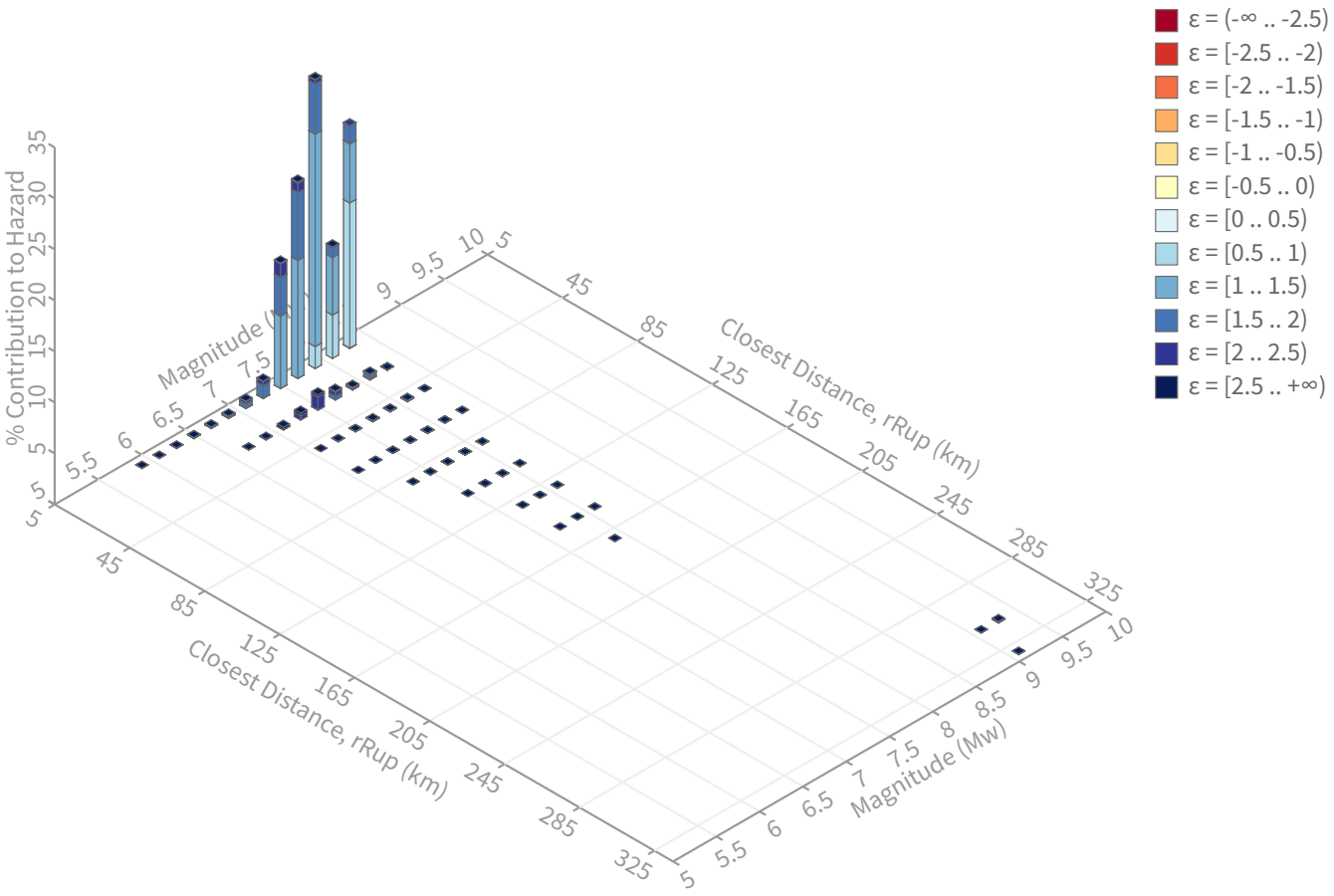


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
3.0 s SA ground motion: 0.18588886 g

Recovered targets

Return period: 2815.0752 yrs
Exceedance rate: 0.0003552303 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.1 %

Mean (over all sources)

m: 7.88
r: 10.65 km
ε_0: 1.31 σ

Mode (largest m-r bin)

m: 7.87
r: 9.39 km
ε_0: 1.29 σ
Contribution: 28.29 %

Mode (largest m-r-ε_0 bin)

m: 7.86
r: 8.79 km
ε_0: 1.21 σ
Contribution: 20.83 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							49.93
San Andreas (Peninsula) [10]		8.63	7.92	1.20	122.475°W	37.652°N	233.17	41.57
San Gregorio (North) [5]		15.96	7.77	1.79	122.569°W	37.655°N	252.60	3.17
Hayward (No) [0]		21.57	7.50	2.24	122.186°W	37.797°N	59.23	1.25
UC33brAvg_FM31	System							49.42
San Andreas (Peninsula) [10]		8.63	7.91	1.20	122.475°W	37.652°N	233.17	41.15
San Gregorio (North) [5]		15.96	7.76	1.79	122.569°W	37.655°N	252.60	3.30
Hayward (No) [0]		21.70	7.50	2.25	122.185°W	37.797°N	59.24	1.21

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

4.00 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

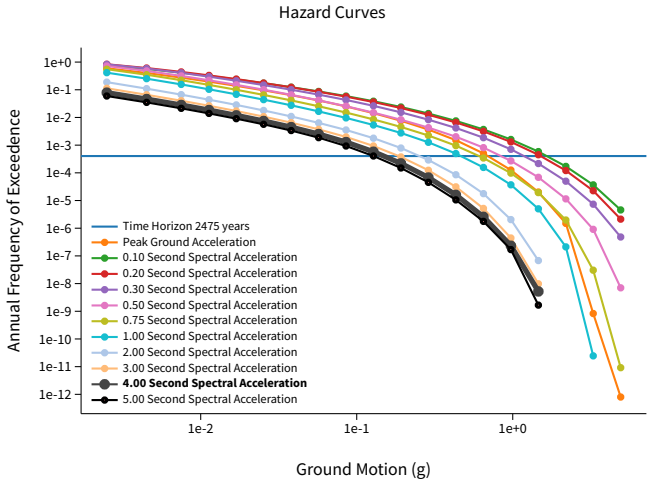
Decimal degrees, negative values for western longitudes

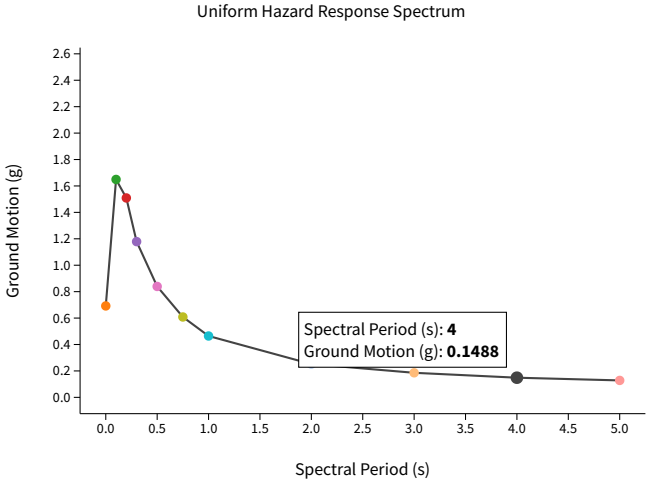
-122.396454

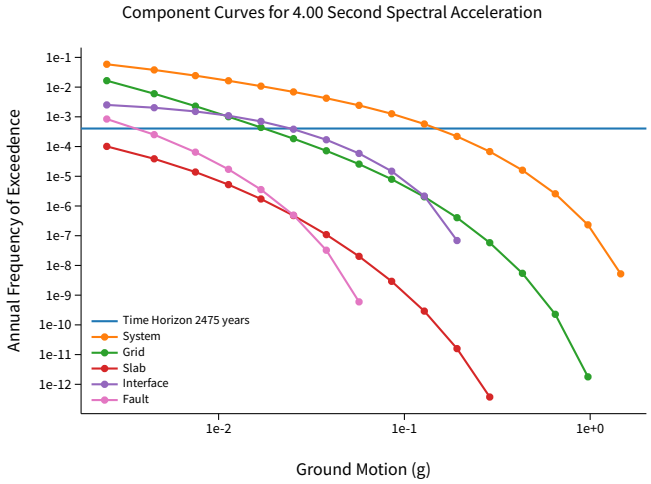
Site Class

1150 m/s (Site class B)

Hazard Curve





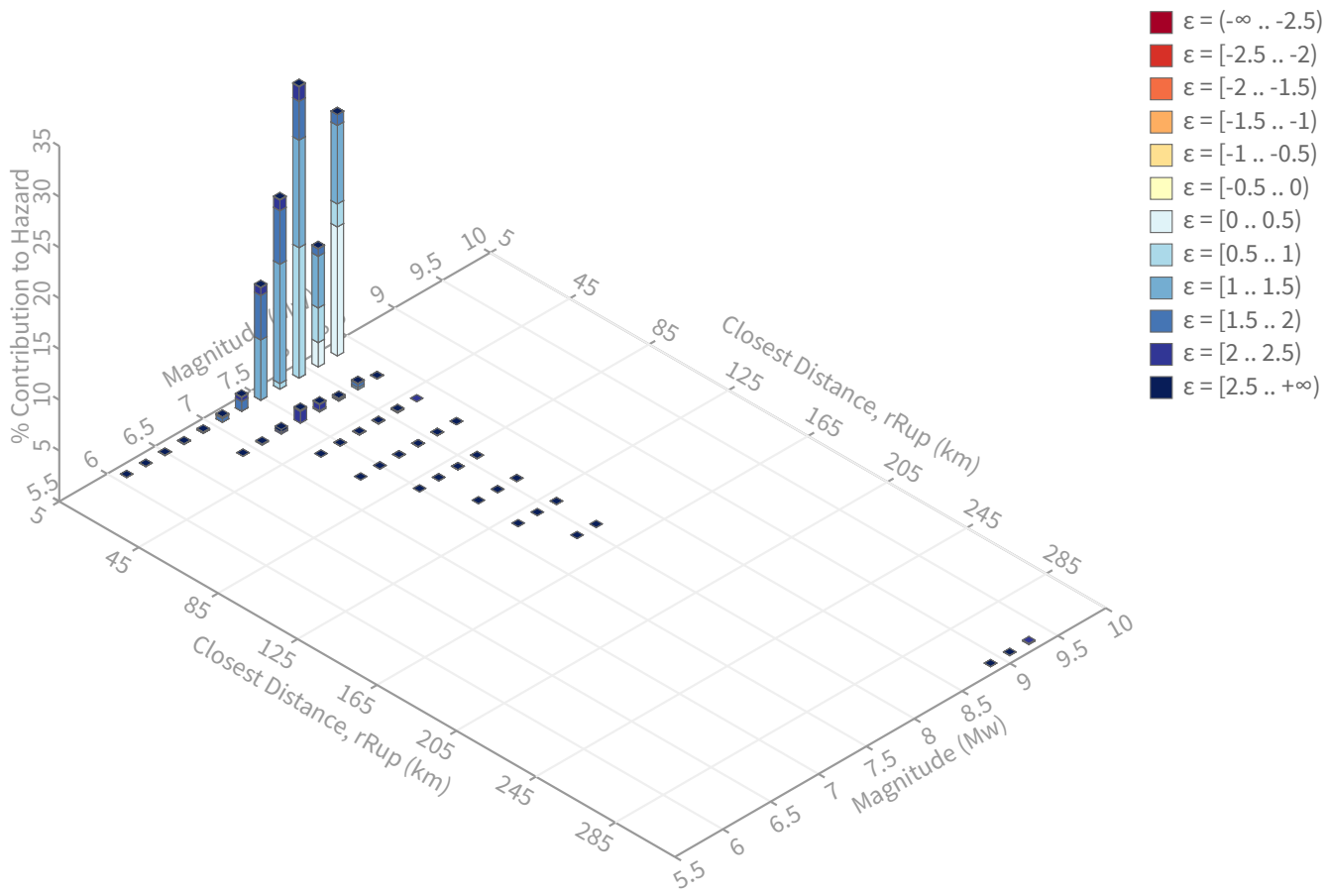


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
4.0 s SA ground motion: 0.14877211 g

Recovered targets

Return period: 2745.7489 yrs
Exceedance rate: 0.00036419936 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.08 %

Mean (over all sources)

m: 7.9
r: 10.37 km
ε_0: 1.17 σ

Mode (largest m-r bin)

m: 7.87
r: 9.42 km
ε_0: 1.19 σ
Contribution: 28.73 %

Mode (largest m-r-ε_0 bin)

m: 7.87
r: 8.63 km
ε_0: 0.87 σ
Contribution: 12.84 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							50.07
San Andreas (Peninsula) [10]		8.63	7.93	1.06	122.475°W	37.652°N	233.17	42.07
San Gregorio (North) [5]		15.96	7.78	1.70	122.569°W	37.655°N	252.60	3.20
Hayward (No) [0]		21.57	7.53	2.25	122.186°W	37.797°N	59.23	1.05
UC33brAvg_FM31	System							49.54
San Andreas (Peninsula) [10]		8.63	7.93	1.06	122.475°W	37.652°N	233.17	41.62
San Gregorio (North) [5]		15.96	7.78	1.71	122.569°W	37.655°N	252.60	3.32
Hayward (No) [0]		21.70	7.53	2.26	122.185°W	37.797°N	59.24	1.02

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (u…

Spectral Period

5.00 Second Spectral Acceleration

Latitude

Decimal degrees

37.698275

Time Horizon

Return period in years

2475

Longitude

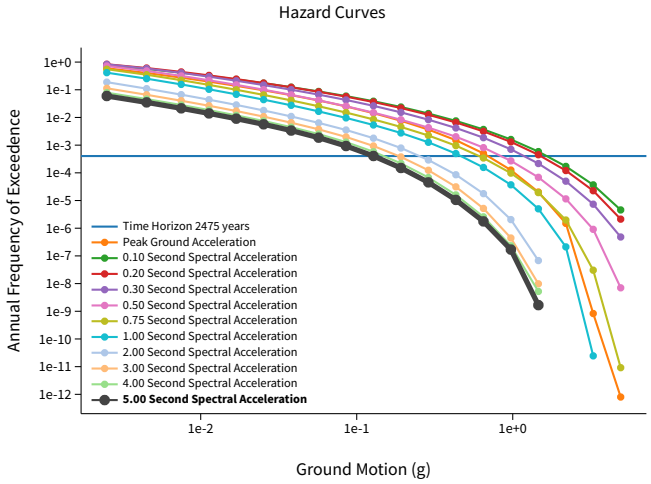
Decimal degrees, negative values for western longitudes

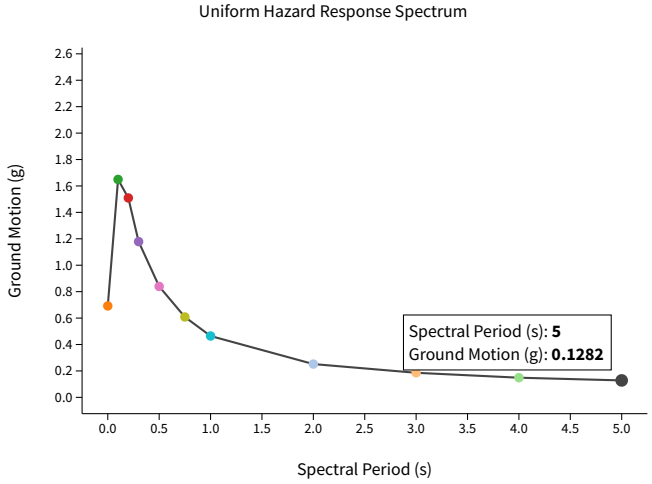
-122.396454

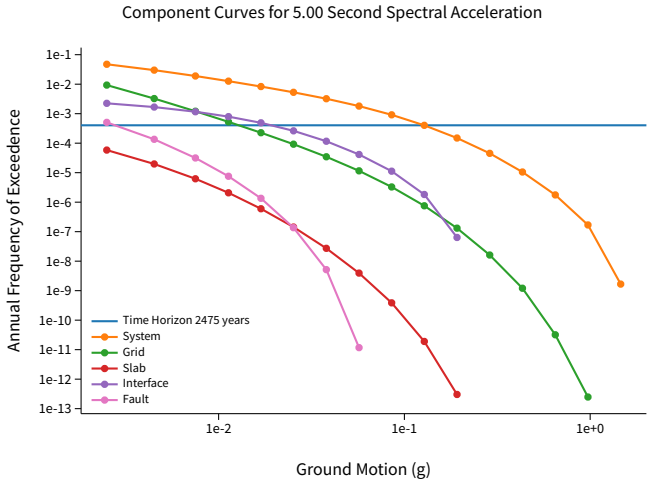
Site Class

1150 m/s (Site class B)

Hazard Curve





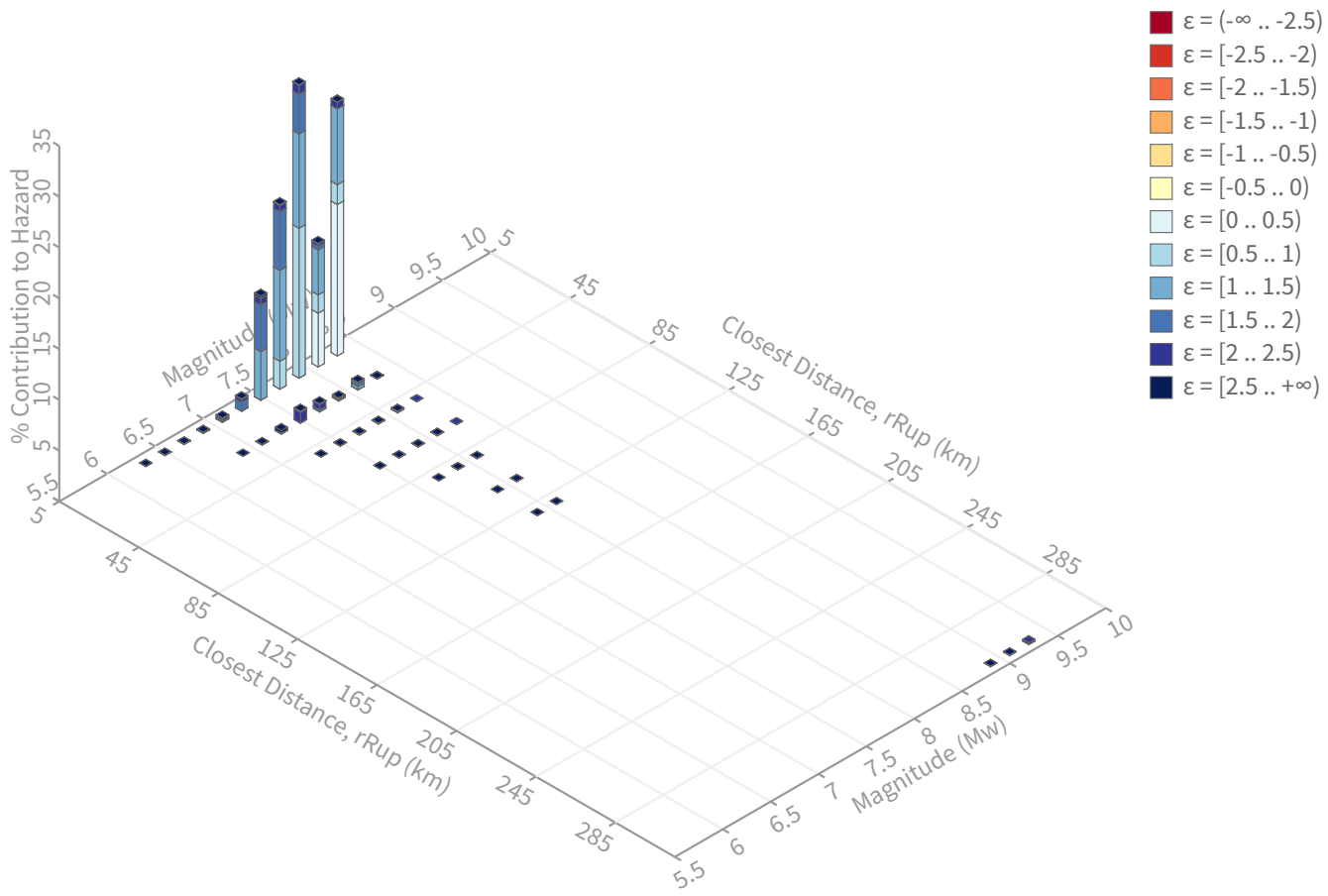


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
5.0 s SA ground motion: 0.12819729 g

Recovered targets

Return period: 2780.296 yrs
Exceedance rate: 0.00035967393 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.07 %

Mean (over all sources)

m: 7.92
r: 10.78 km
ε_0: 1.08 σ

Mode (largest m-r bin)

m: 7.87
r: 9.45 km
ε_0: 1.12 σ
Contribution: 28.85 %

Mode (largest m-r-ε_0 bin)

m: 8.27
r: 8.63 km
ε_0: 0.14 σ
Contribution: 14.91 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							50.05
San Andreas (Peninsula) [10]		8.63	7.95	0.97	122.475°W	37.652°N	233.17	42.08
San Gregorio (North) [5]		15.96	7.79	1.62	122.569°W	37.655°N	252.60	3.26
UC33brAvg_FM31	System							49.52
San Andreas (Peninsula) [10]		8.63	7.95	0.97	122.475°W	37.652°N	233.17	41.62
San Gregorio (North) [5]		15.96	7.78	1.63	122.569°W	37.655°N	252.60	3.39



APPENDIX J

INITIAL SCALED AND MATCHED GROUND MOTIONS

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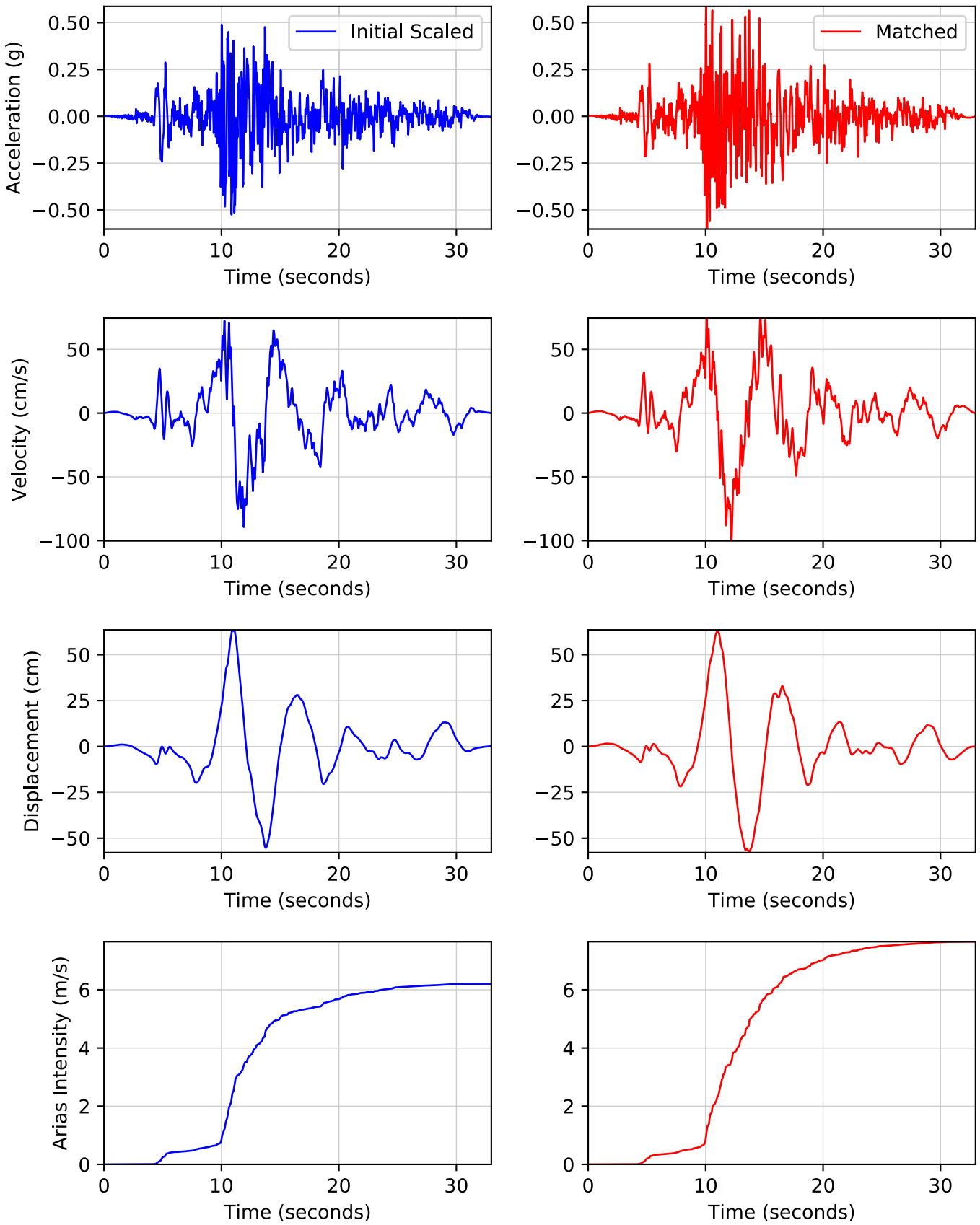

GROUND-MOTION…TIME…HISTORIES…-…RSN143
BRISBANE…BAYLANDS…LANDFILL…SITE
BRISBANE,…CALIFORNIA

PROJECT NO: 17270.000.002
SCALE: AS…SHOWN
DRAWN BY: DPT
CHECKED BY: JAF

FIGURE NO.
J-1

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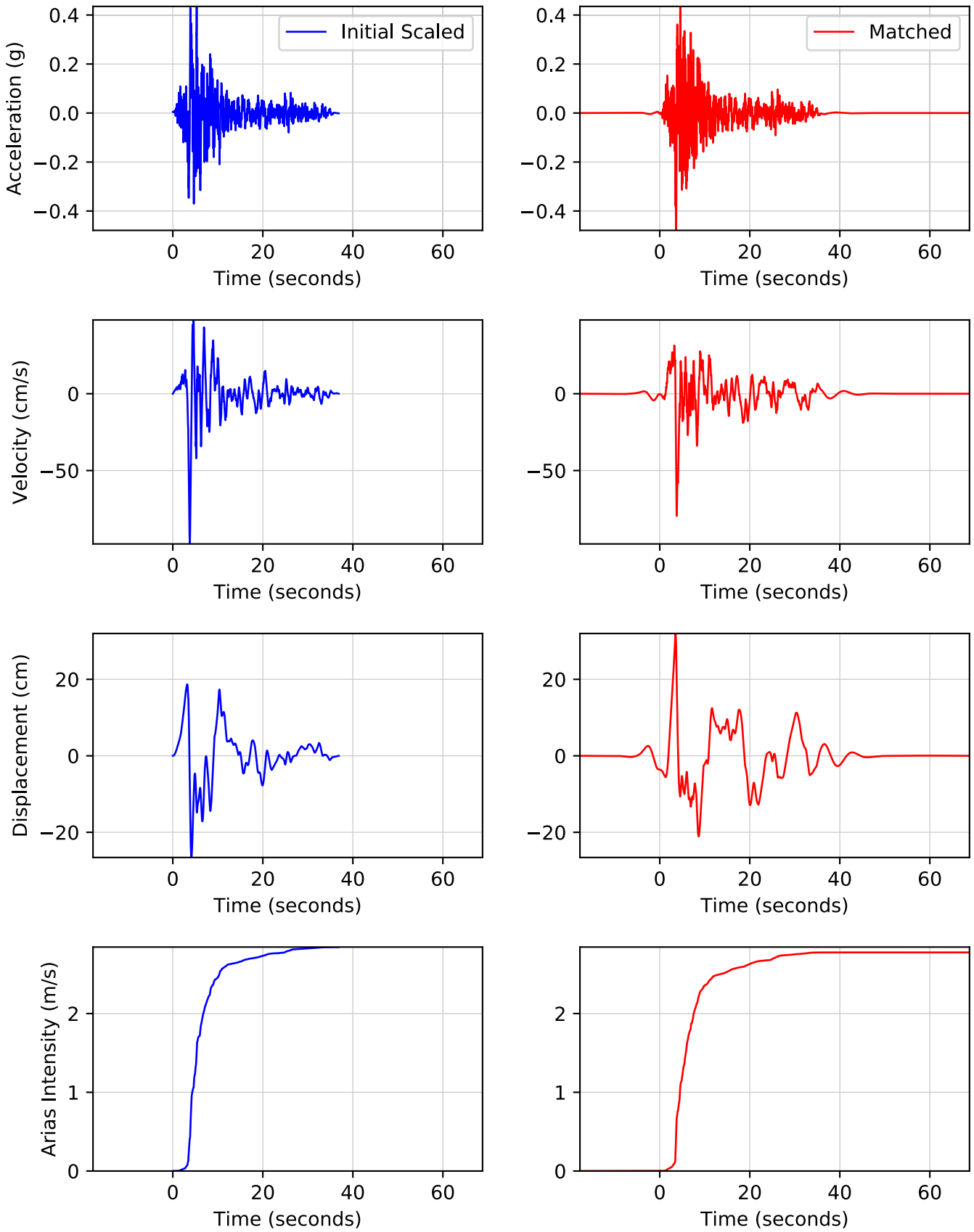

GROUND-MOTION…TIME…HISTORIES…-…RSN285

BRISBANE…BAYLANDS…LANDFILL…SITE

BRISBANE,…CALIFORNIA

PROJECT NO:	17270.000.002
SCALE:	AS…SHOWN
DRAWN BY:	DPT
CHECKED BY:	JAF

FIGURE NO.

J-2

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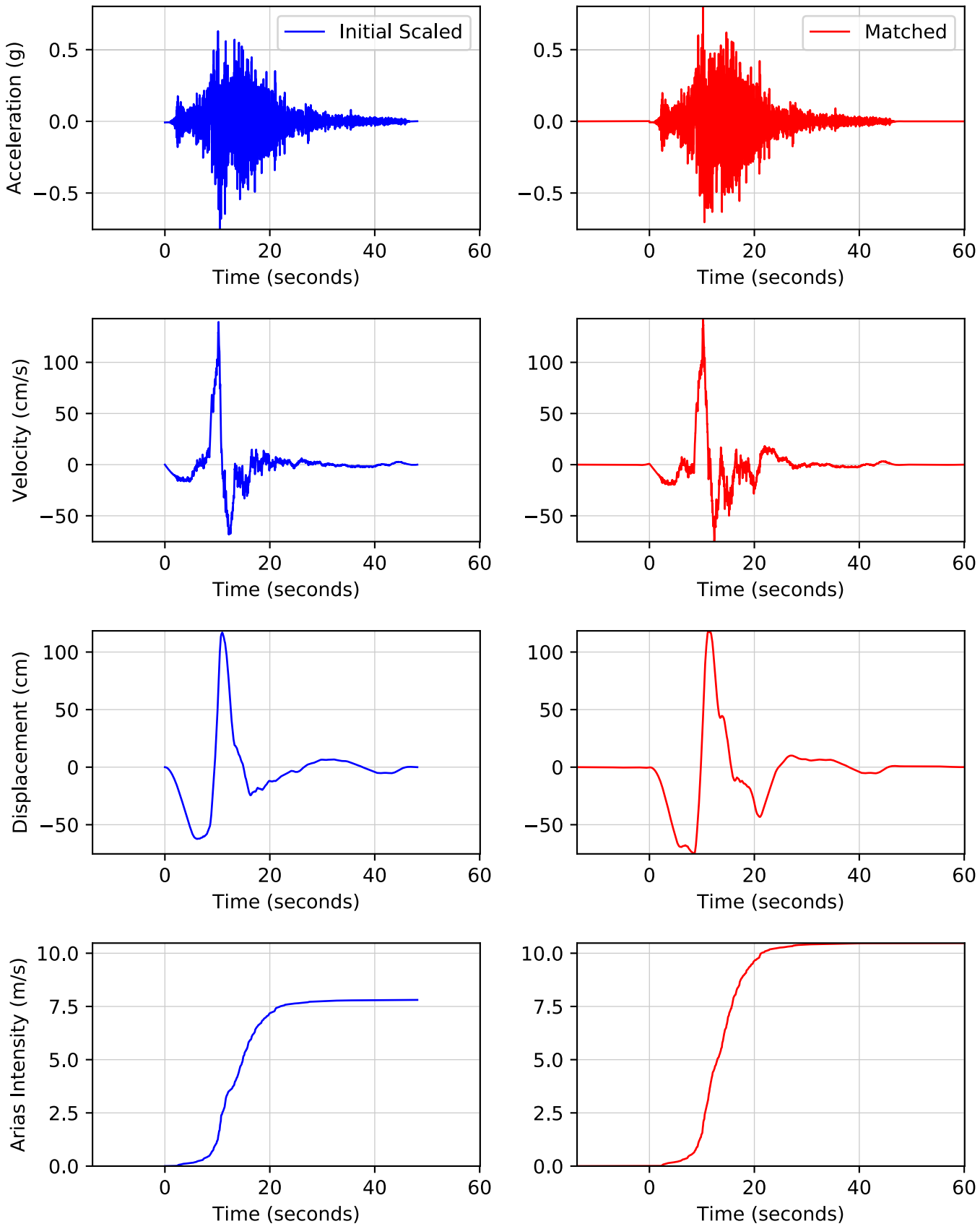

GROUND-MOTION…TIME…HISTORIES…-…RSN879
BRISBANE…BAYLANDS…LANDFILL…SITE
BRISBANE,…CALIFORNIA

PROJECT NO: 17270.000.002
SCALE: AS…SHOWN
DRAWN BY: DPT
CHECKED BY: JAF

FIGURE NO.
J-3

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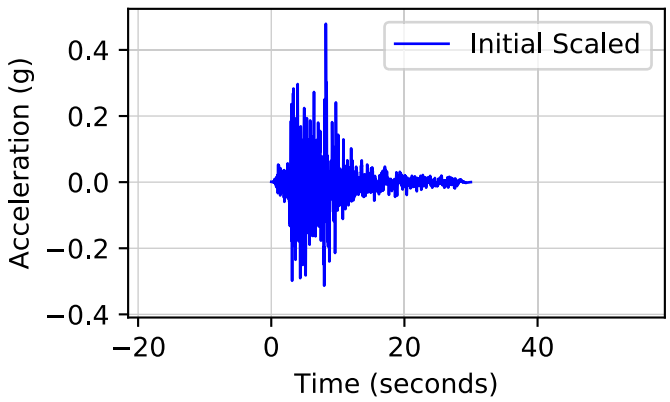

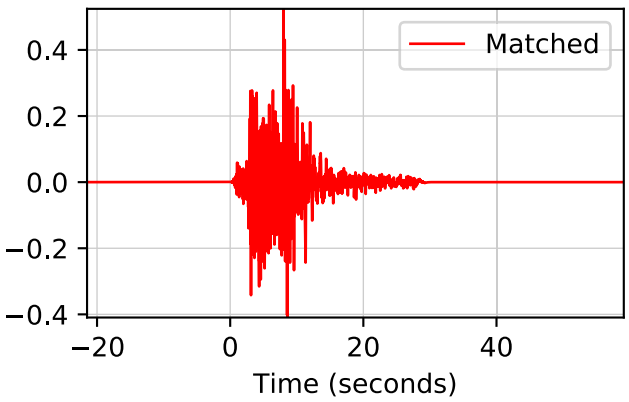

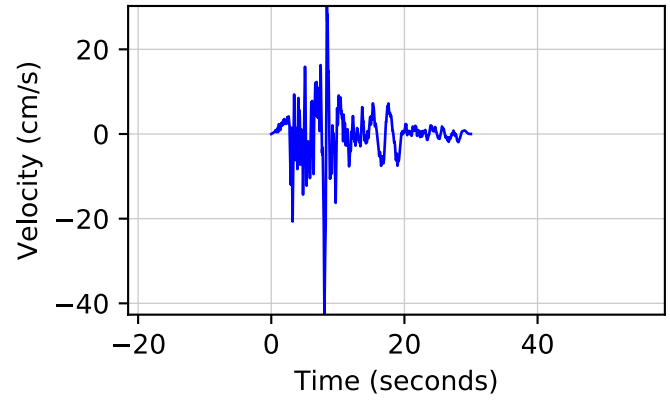

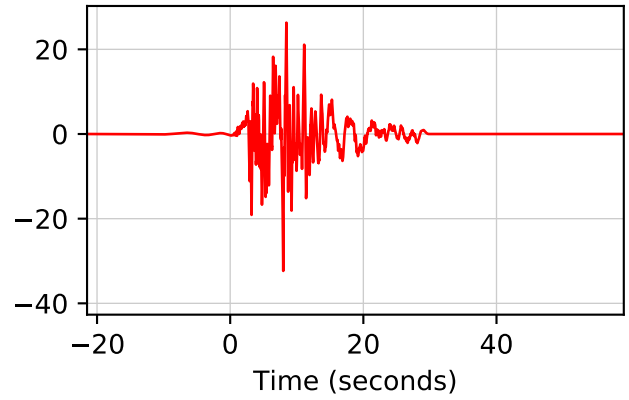

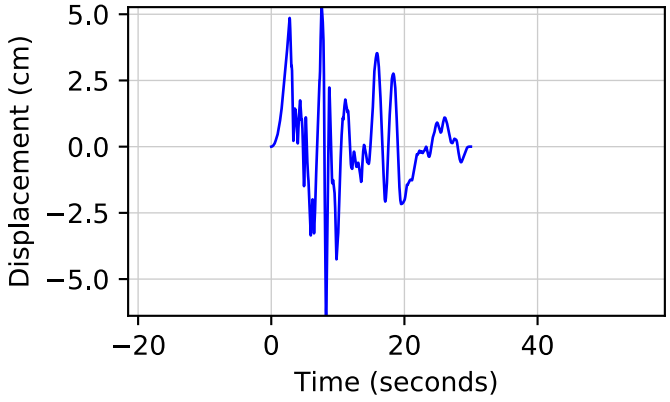

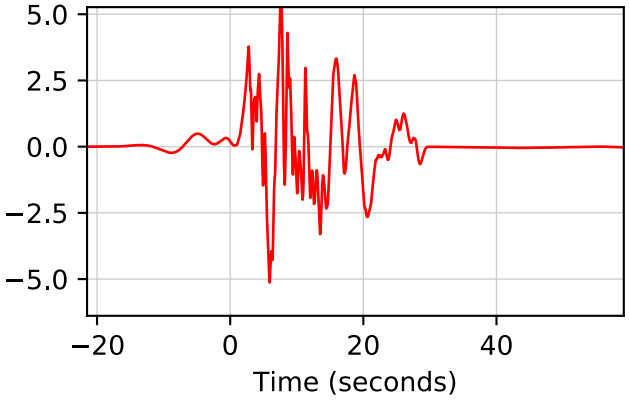

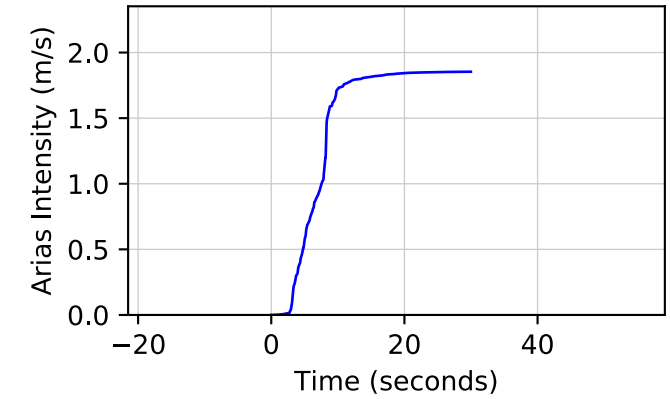

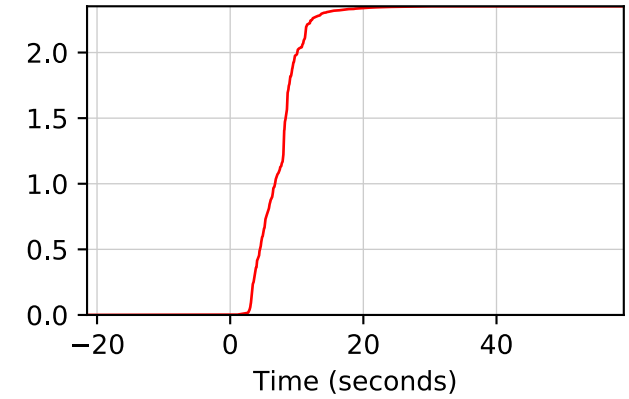

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Expect Excellence

GROUND-MOTION…TIME…HISTORIES…-…RSN1011

BRISBANE…BAYLANDS…LANDFILL…SITE
BRISBANE,…CALIFORNIA

PROJECT NO:	17270.000.002		FIGURE NO.
SCALE:	AS…SHOWN		J-4
DRAWN BY:	DPT	CHECKED BY: JAF	

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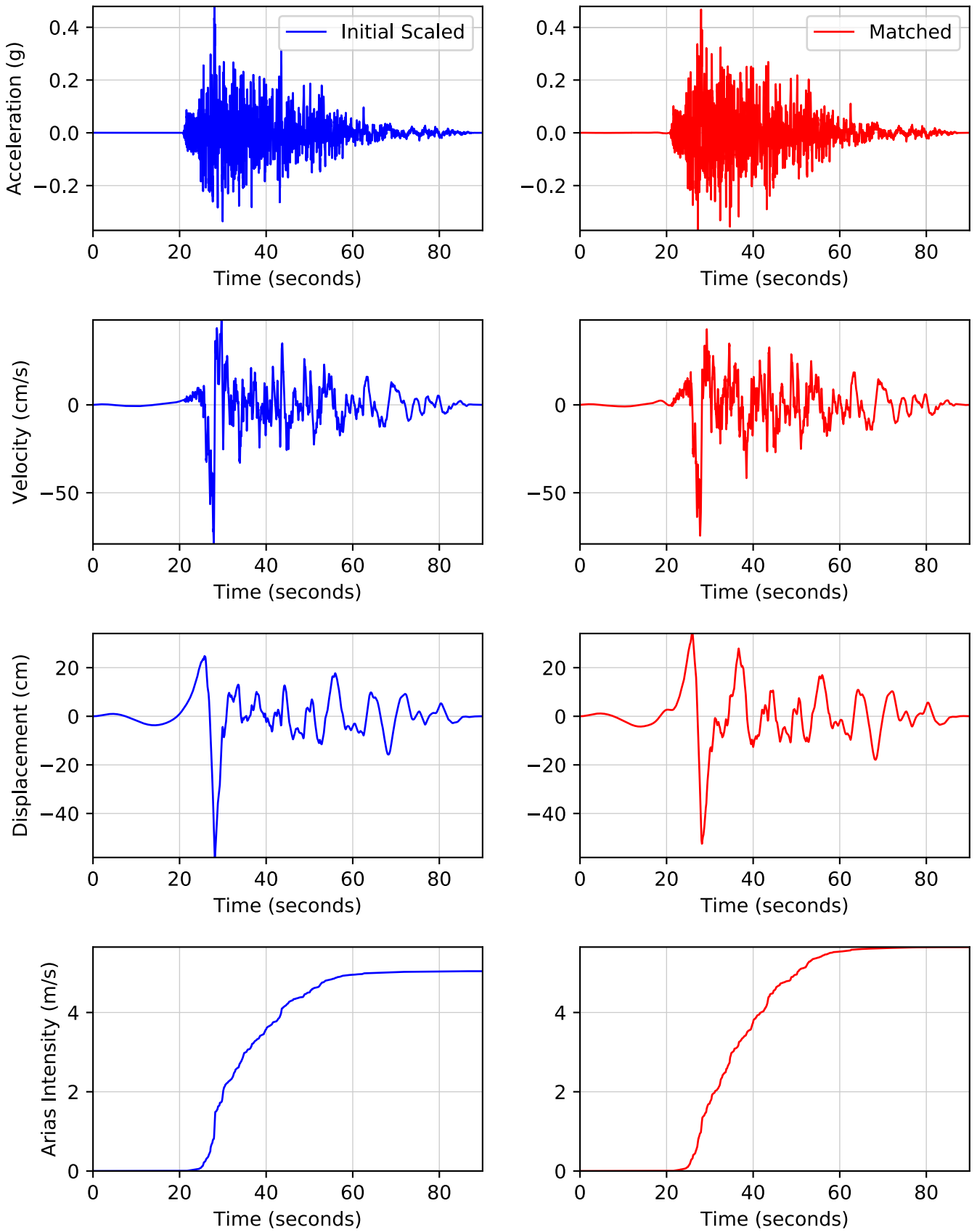

GROUND-MOTION…TIME…HISTORIES…-…RSN151

BRISBANE…BAYLANDS…LANDFILL…SITE

BRISBANE,…CALIFORNIA

PROJECT NO:	17270.000.002
SCALE:	AS…SHOWN
DRAWN BY:	DPT
CHECKED BY:	JAF

FIGURE NO.

J-5

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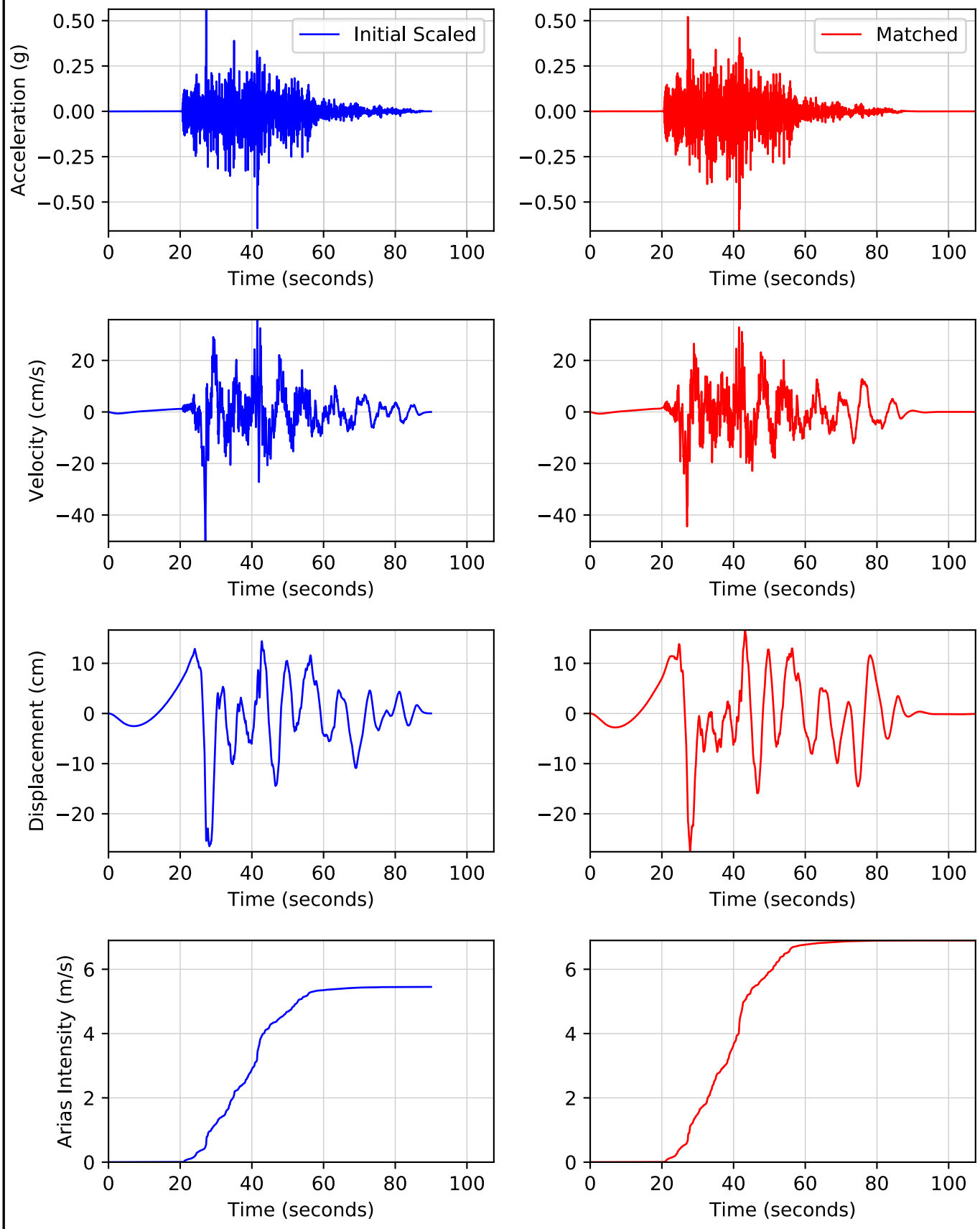

GROUND-MOTION…TIME…HISTORIES…-…RSN1549
BRISBANE…BAYLANDS…LANDFILL…SITE
BRISBANE,…CALIFORNIA

PROJECT NO: 17270.000.002
SCALE: AS…SHOWN
DRAWN BY: DPT
CHECKED BY: JAF

FIGURE NO.
J-6

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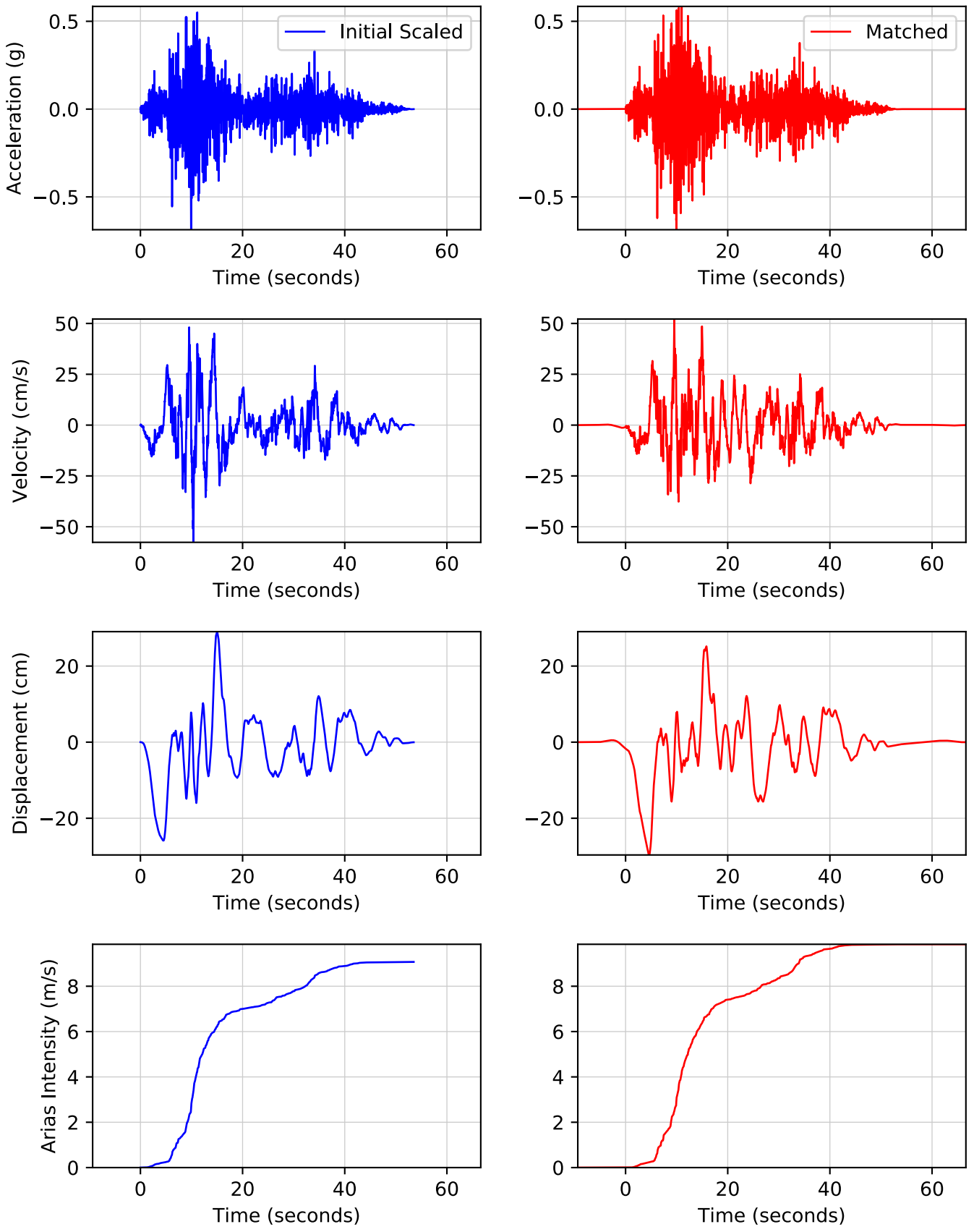

GROUND-MOTION…TIME…HISTORIES…-…RSN1633
BRISBANE…BAYLANDS…LANDFILL…SITE
BRISBANE,…CALIFORNIA

PROJECT NO: 17270.000.002
SCALE: AS…SHOWN
DRAWN BY: DPT
CHECKED BY: JAF

FIGURE NO.
J-7

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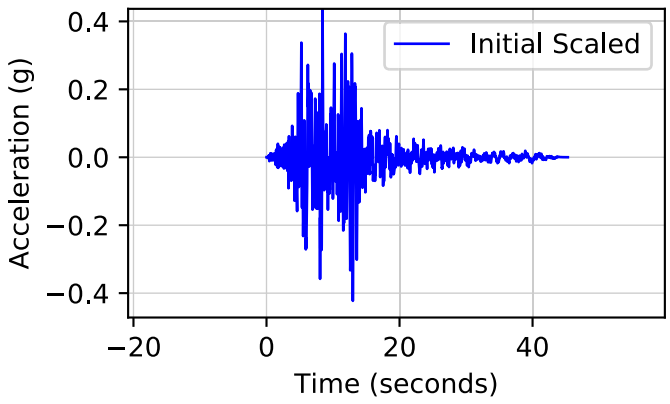

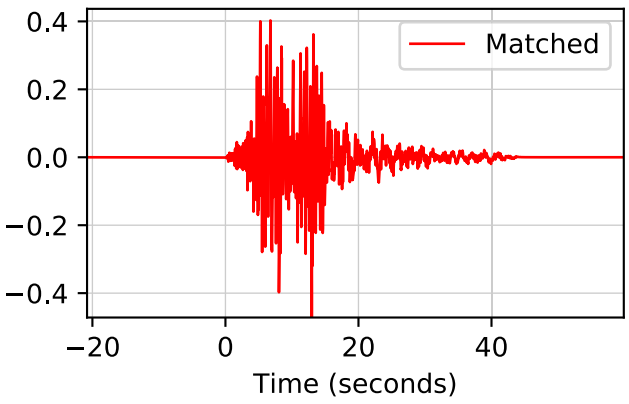

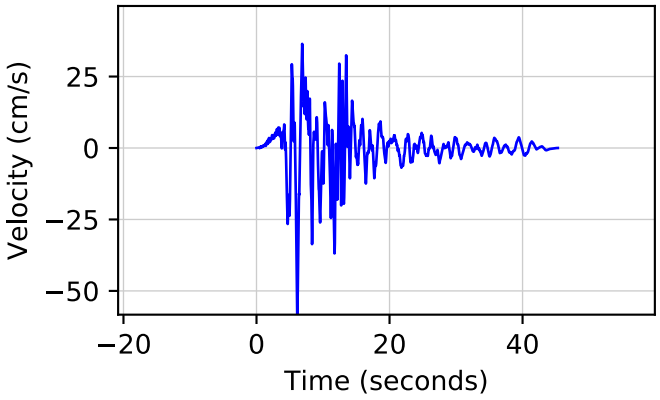

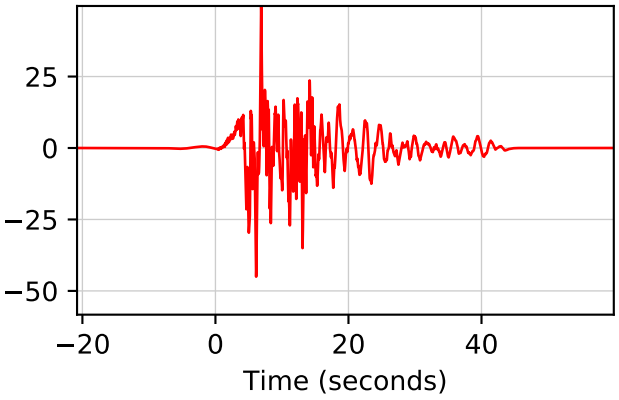

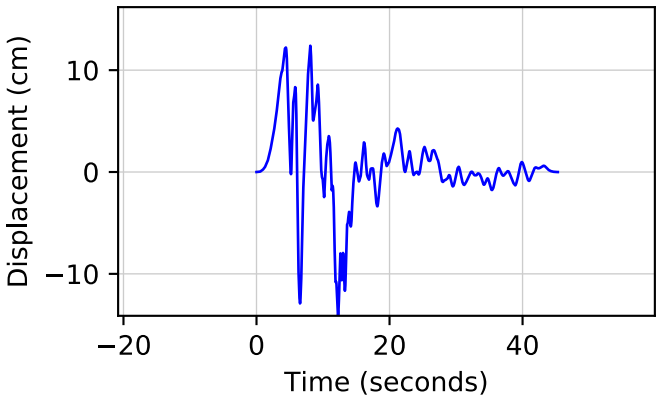

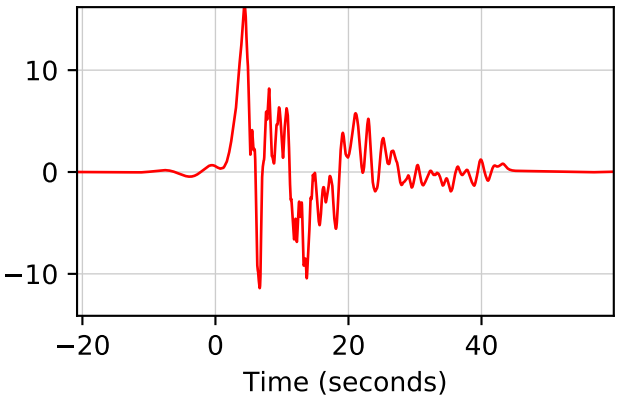

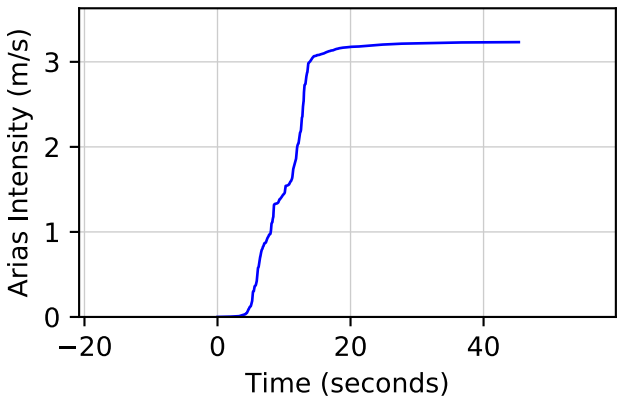

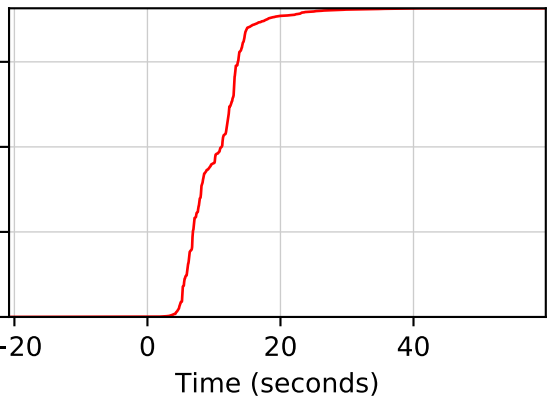

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GROUND-MOTION…TIME…HISTORIES…-…RSN1787
BRISBANE…BAYLANDS…LANDFILL…SITE
BRISBANE,…CALIFORNIA

PROJECT NO:	17270.000.002		FIGURE NO.
SCALE:	AS…SHOWN		J-8
DRAWN BY:	DPT	CHECKED BY: JAF	

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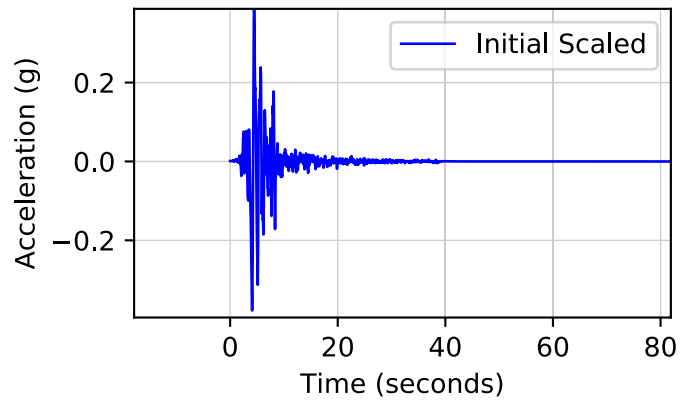

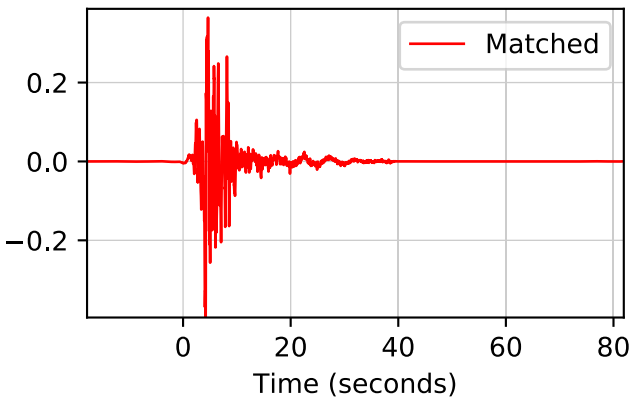

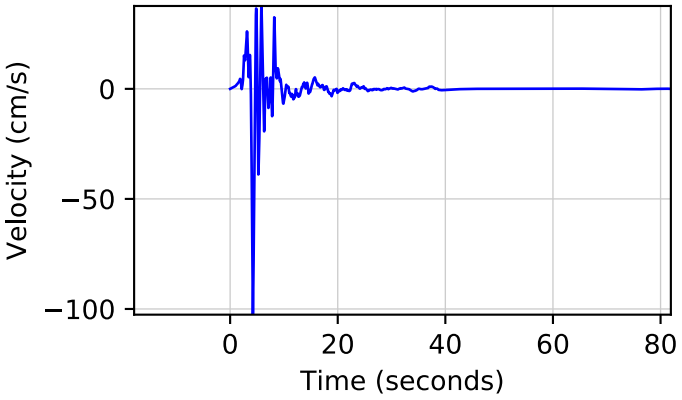

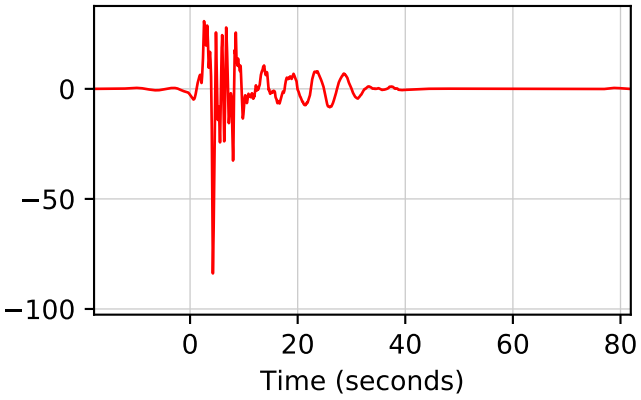

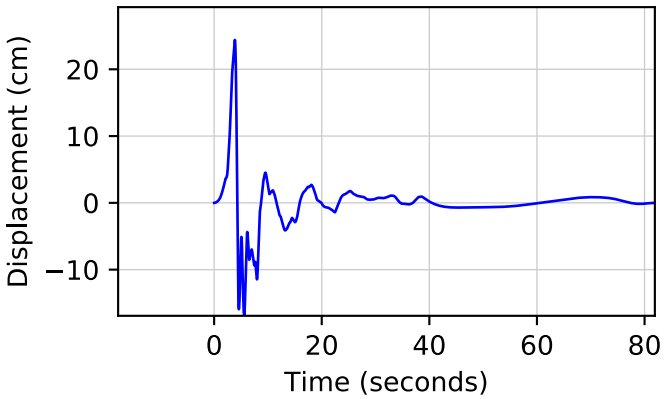

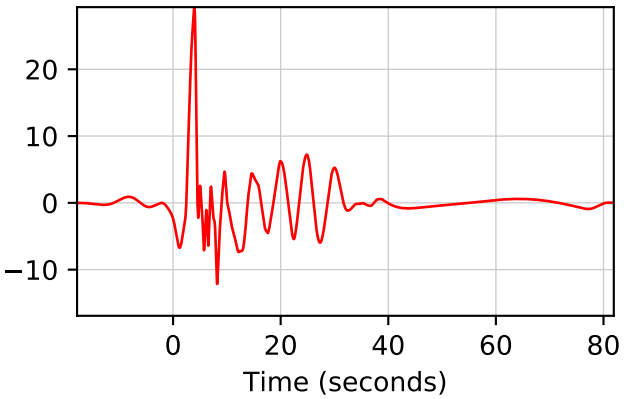

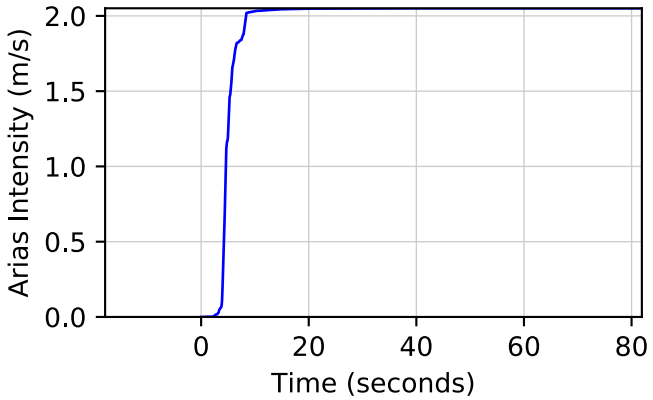

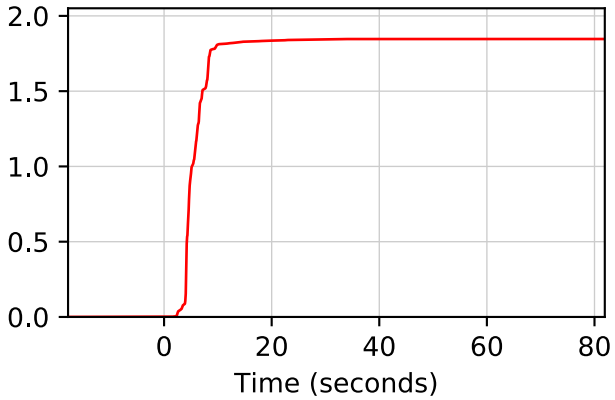

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GROUND-MOTION…TIME…HISTORIES…-…RSN3548
BRISBANE…BAYLANDS…LANDFILL…SITE
BRISBANE,…CALIFORNIA

PROJECT NO:	17270.000.002
SCALE:	AS…SHOWN
DRAWN BY:	DPT
CHECKED BY:	JAF

FIGURE NO.
J-9

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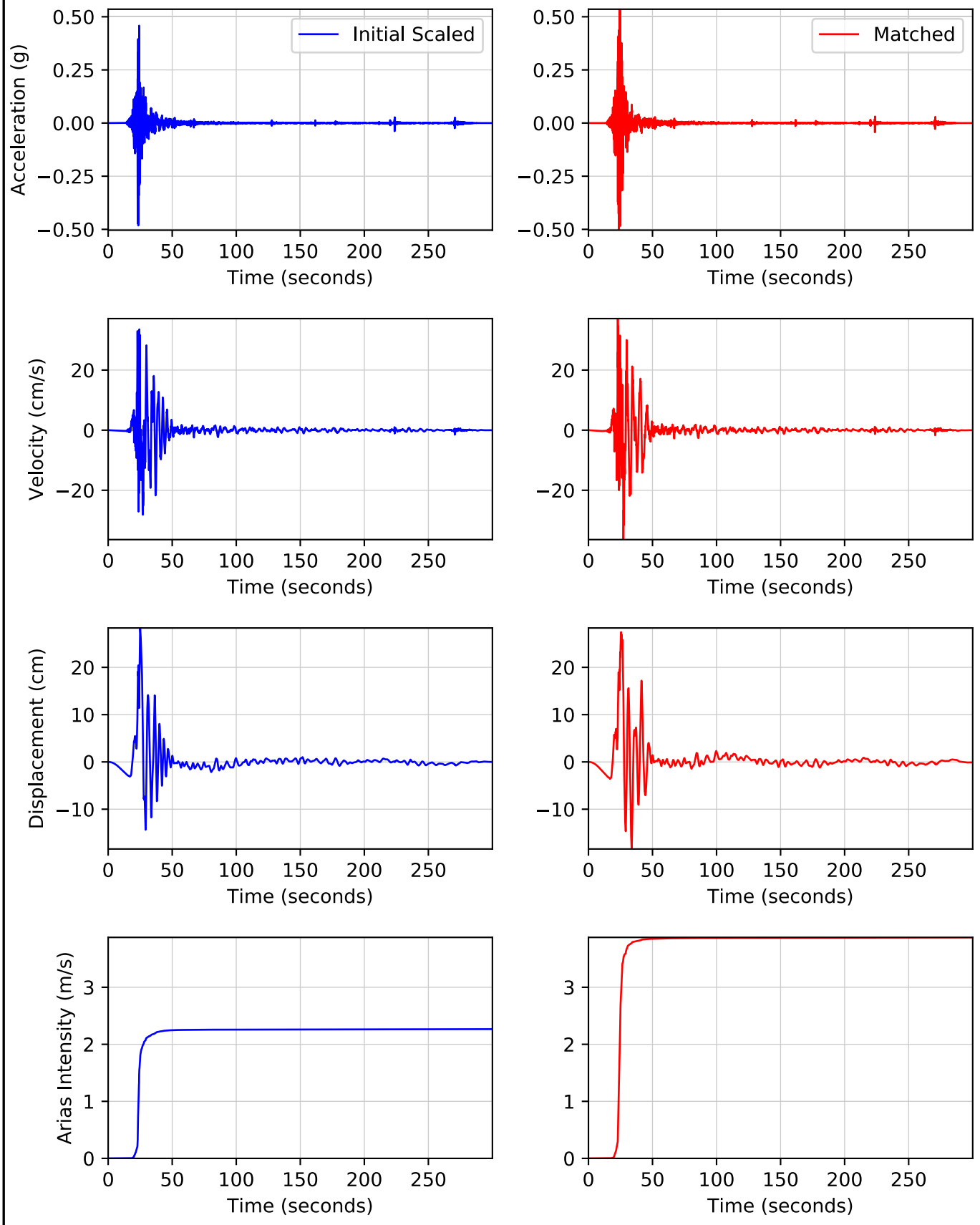

GROUND-MOTION…TIME…HISTORIES…-…RSN3964
BRISBANE…BAYLANDS…LANDFILL…SITE
BRISBANE,…CALIFORNIA

PROJECT NO: 17270.000.002
SCALE: AS…SHOWN
DRAWN BY: DPT
CHECKED BY: JAF

FIGURE NO.
J-10

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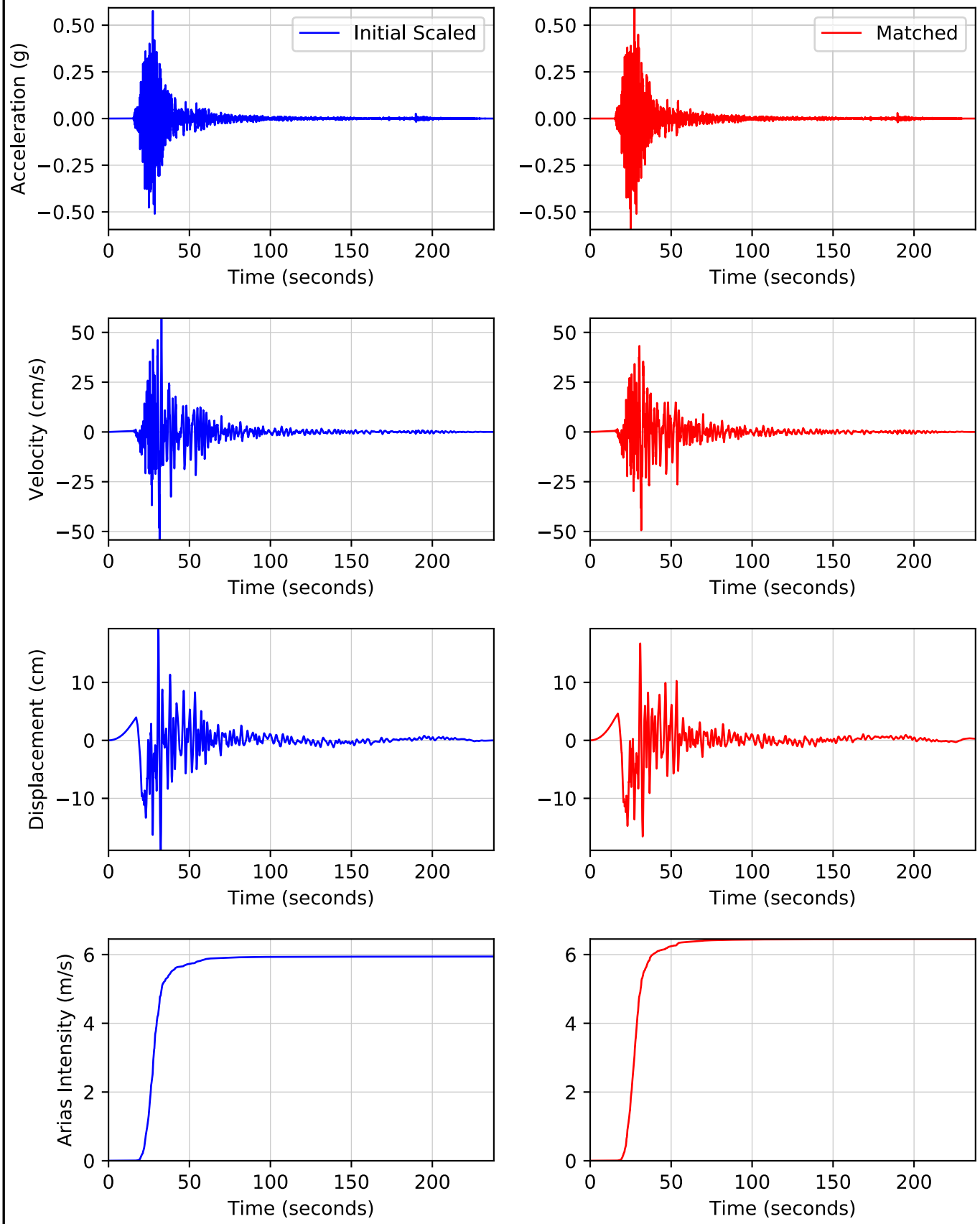


GROUND-MOTION…TIME…HISTORIES…-…RSN5618
BRISBANE…BAYLANDS…LANDFILL…SITE
BRISBANE,…CALIFORNIA

PROJECT NO: 17270.000.002
SCALE: AS…SHOWN
DRAWN BY: DPT
CHECKED BY: JAF

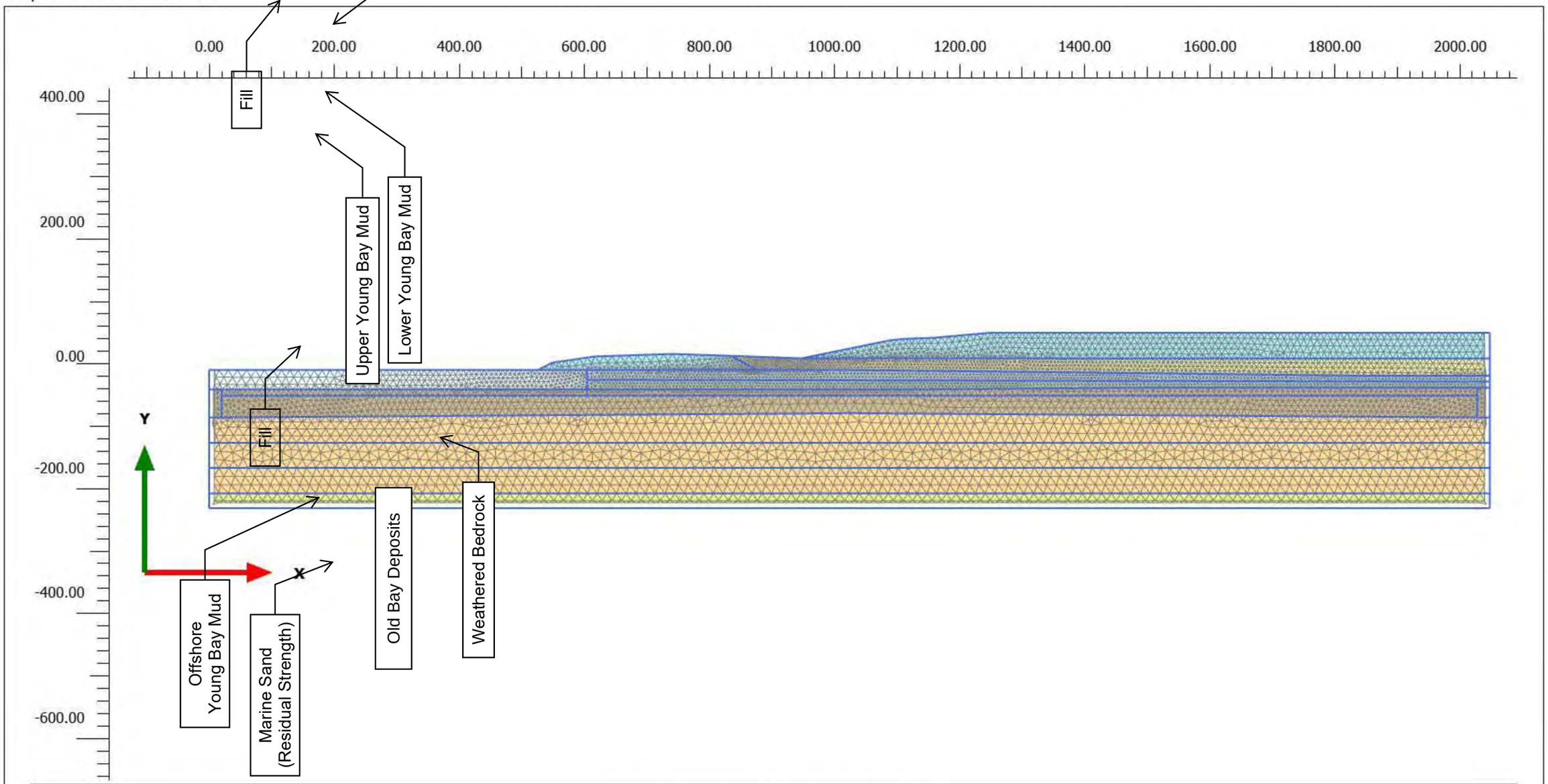
FIGURE NO.
J-11



APPENDIX K

FINITE ELEMENT DEFORMATION ANALYSIS

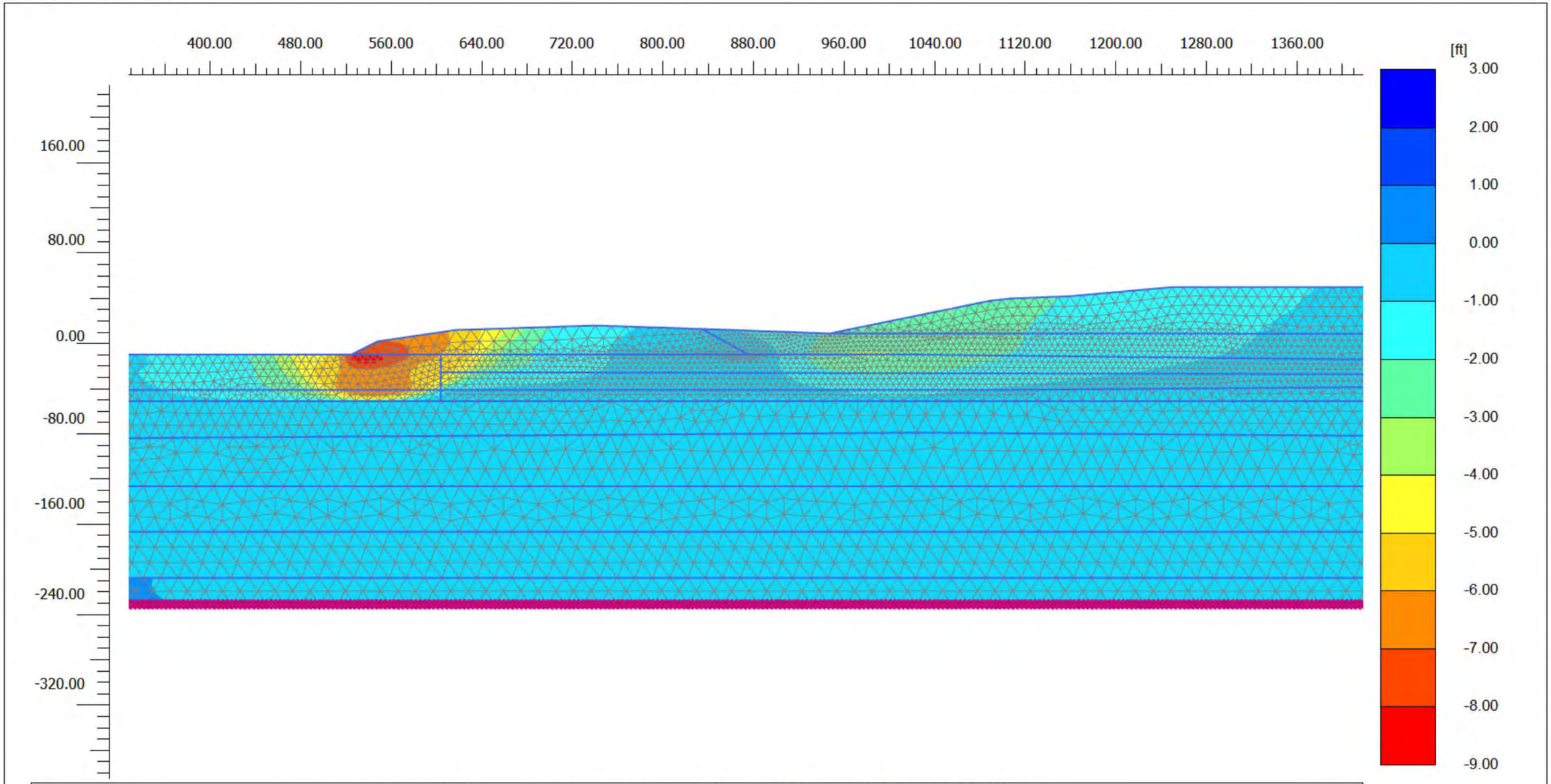
Output Version 21.1.0.479



Connectivity plot

ENGEO Expect Excellence	*Project description* Section A-A' - Connectivity Plot		*Date* 11/22/2021
	Project filename Baylands Section A_DE_Lef ...	*Step* 8644	*Company* ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 32.97 s)

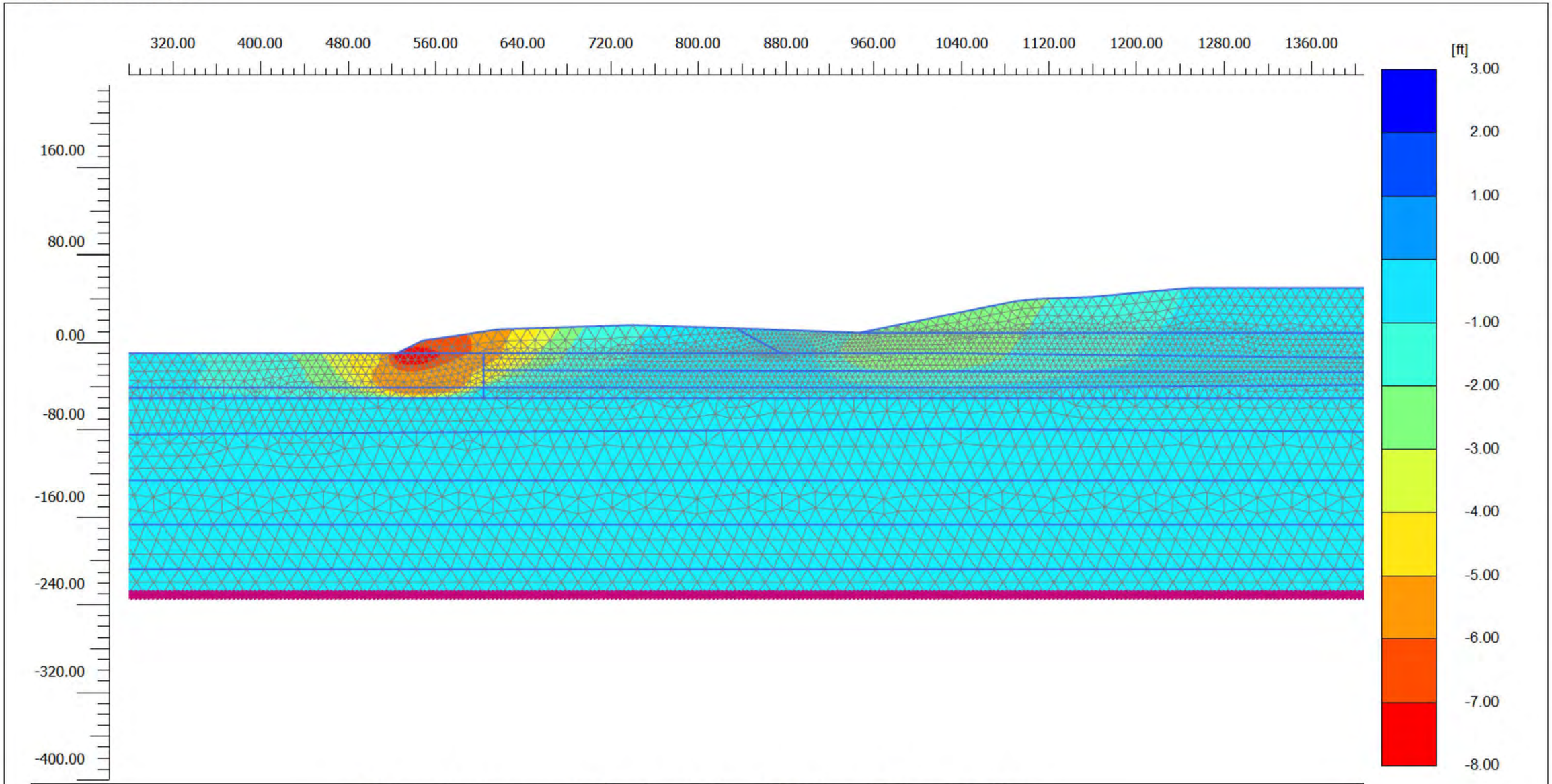
Maximum value = 2.377 ft (Element 133 at Node 85)

Minimum value = -8.342 ft (Element 5107 at Node 80551)

ENGEO
Expect Excellence

Project description Section A-A' - RSN 143 (Left) Lateral Phase Displacements			*Date* 11/22/2021
Project filename Baylands Section A_DE_Lef ...	*Step* 3297	*Company* ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 32.97 s)

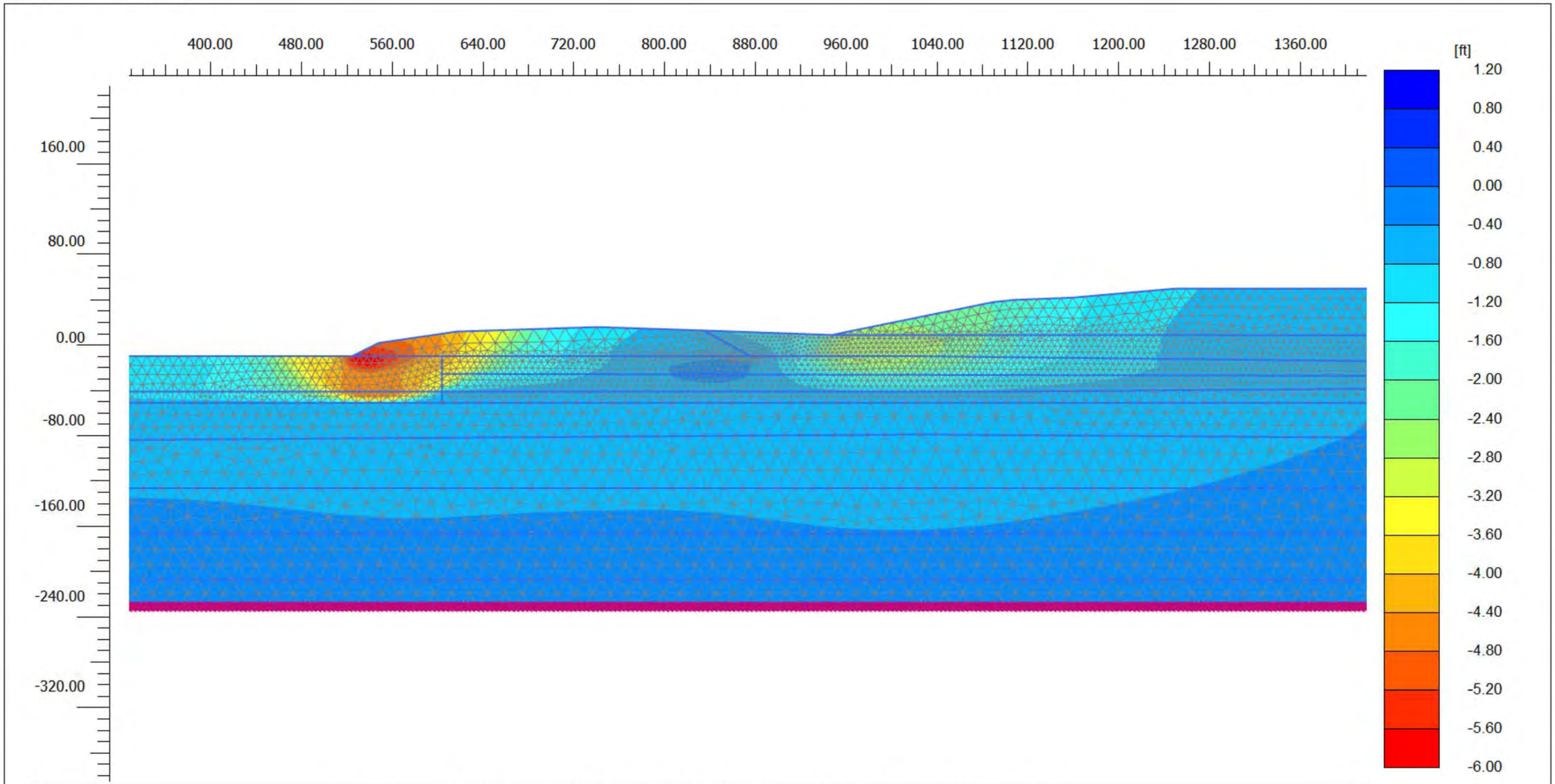
Maximum value = 2.400 ft (Element 133 at Node 80)

Minimum value = -7.739 ft (Element 5107 at Node 80390)

ENGEO
Expect Excellence

Project description		Date
Section A-A' - RSN 143 (Right) Lateral Phase Displacements		11/22/2021
Project filename	**Step**	**Company**
Baylands Section A_DE_Rig ...	3297	ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 45.91 s)

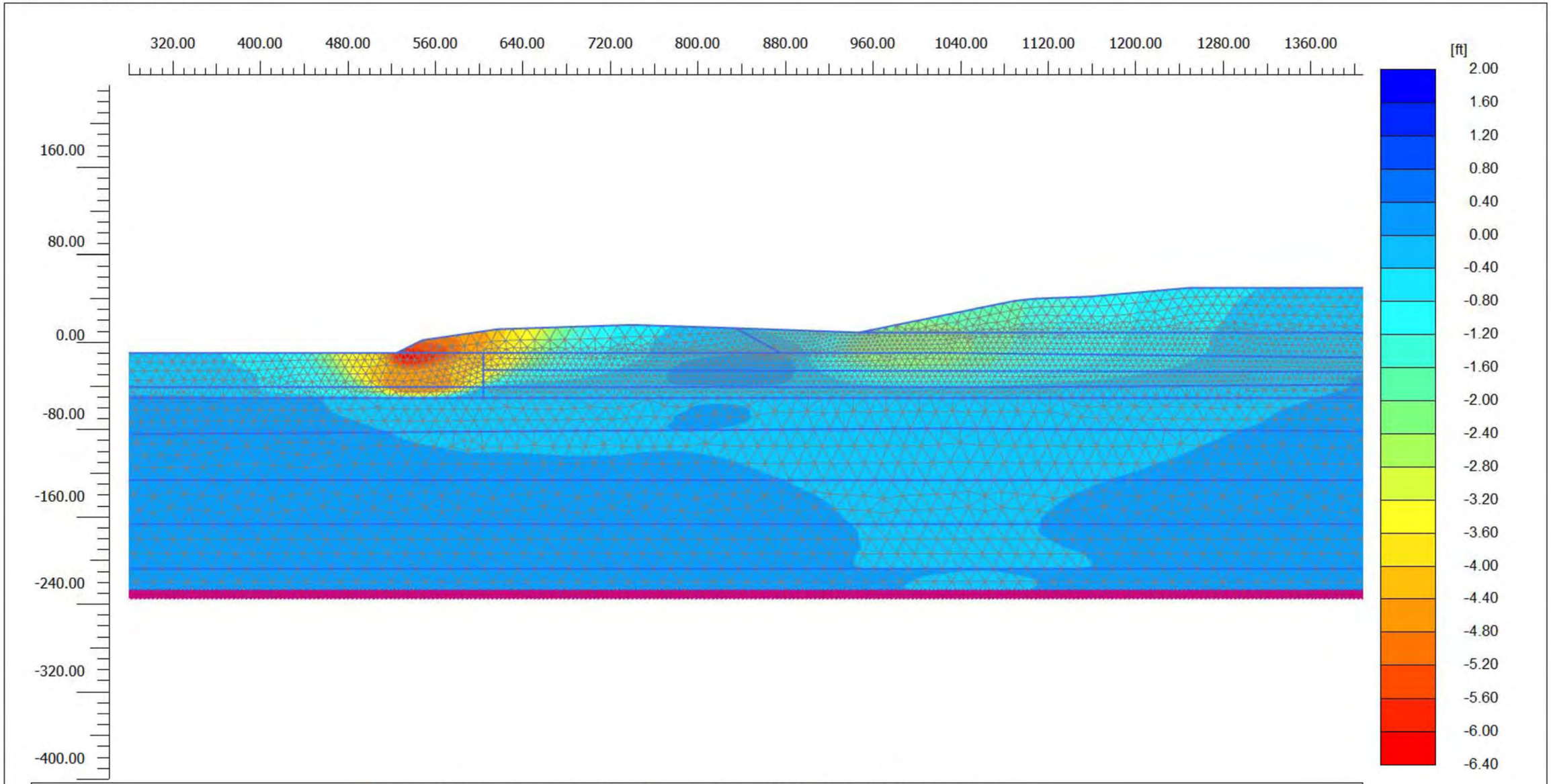
Maximum value = 1.113 ft (Element 133 at Node 81)

Minimum value = -5.889 ft (Element 5107 at Node 80551)

ENGEO Expect Excellence

Project description			Date
Section A-A' - RSN 285 (Left) Lateral Phase Displacements			11/22/2021
Project filename	Step	Company	
Baylands Section A_DE_Lef ...	8575	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 45.91 s)

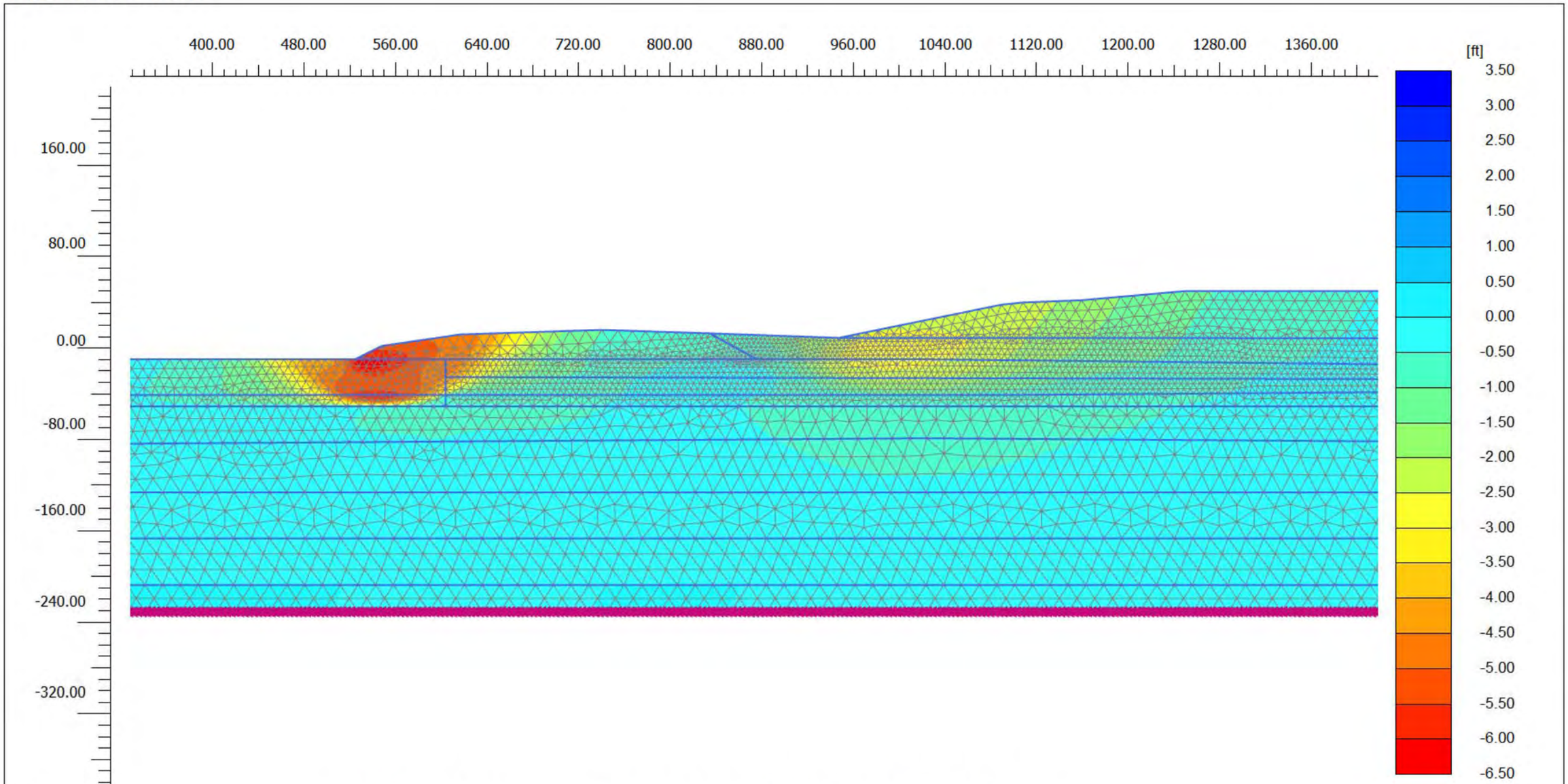
Maximum value = 1.734 ft (Element 22 at Node 79)

Minimum value = -6.071 ft (Element 5107 at Node 80390)

ENGEO
Expect Excellence

Project description			Date
Section A-A' - RSN 285 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section A_DE_Rig ...	8575	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 58.32 s)

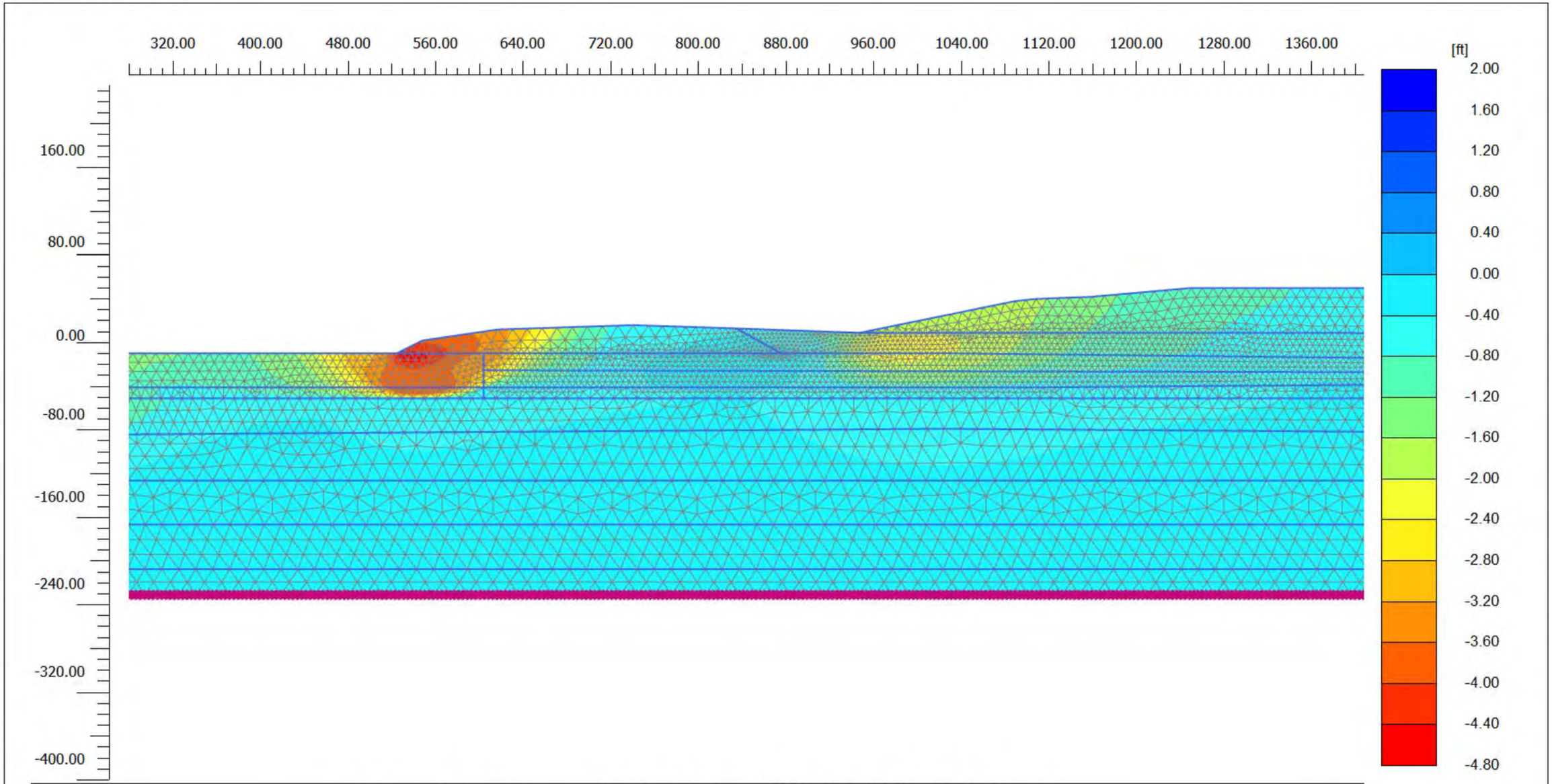
Maximum value = 3.156 ft (Element 4234 at Node 445)

Minimum value = -6.216 ft (Element 5107 at Node 80390)

ENGEO
Expect Excellence

Project description			Date
Section A-A' - RSN 897 (Left) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section A_DE_Lef ...	14477	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 58.32 s)

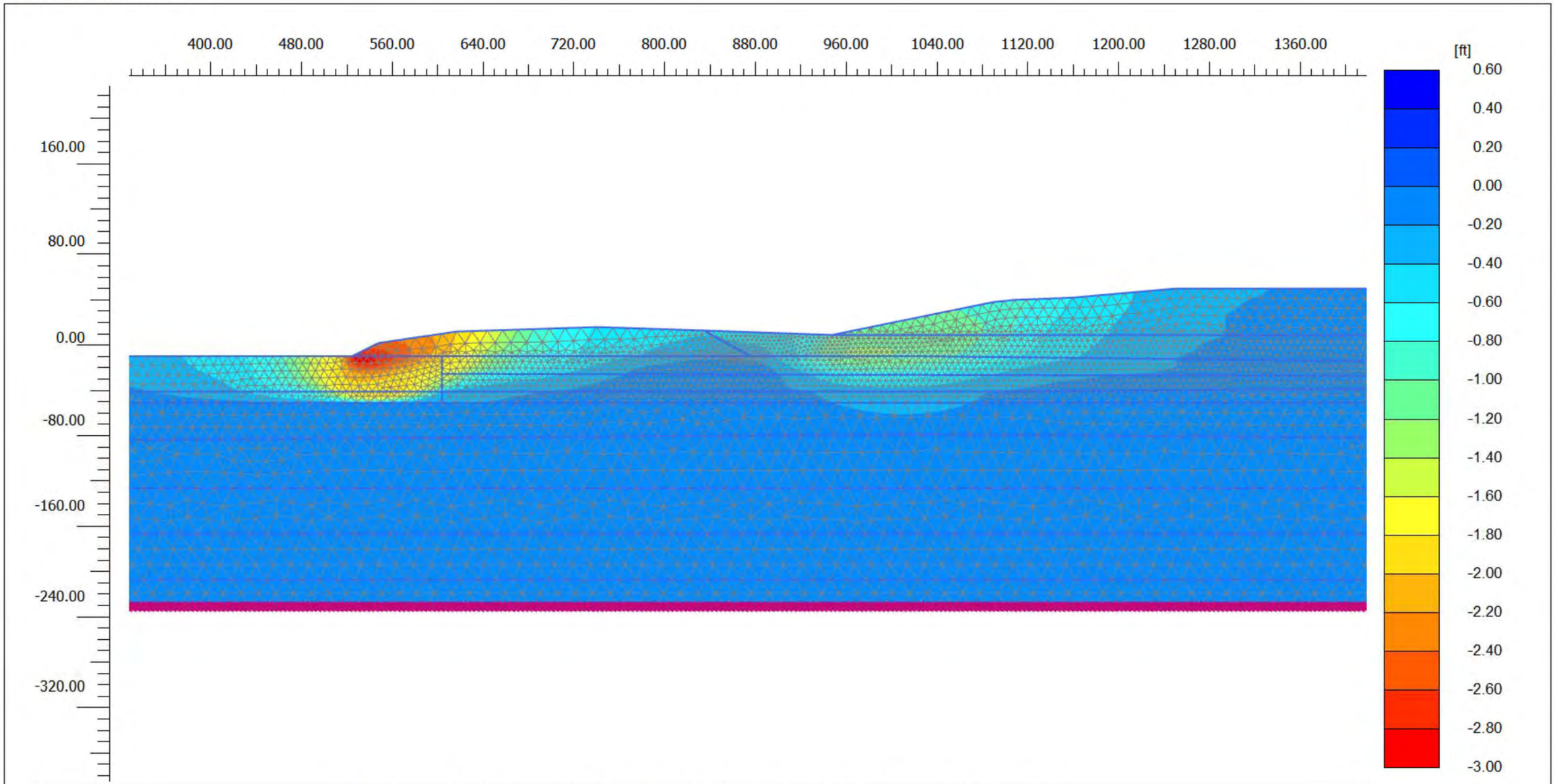
Maximum value = 1.698 ft (Element 1446 at Node 172)

Minimum value = -4.579 ft (Element 5107 at Node 80395)

ENGEO
Expect Excellence

Project description			Date
Section A-A' - RSN 897 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section A_DE_Rig ...	14477	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 49.81 s)

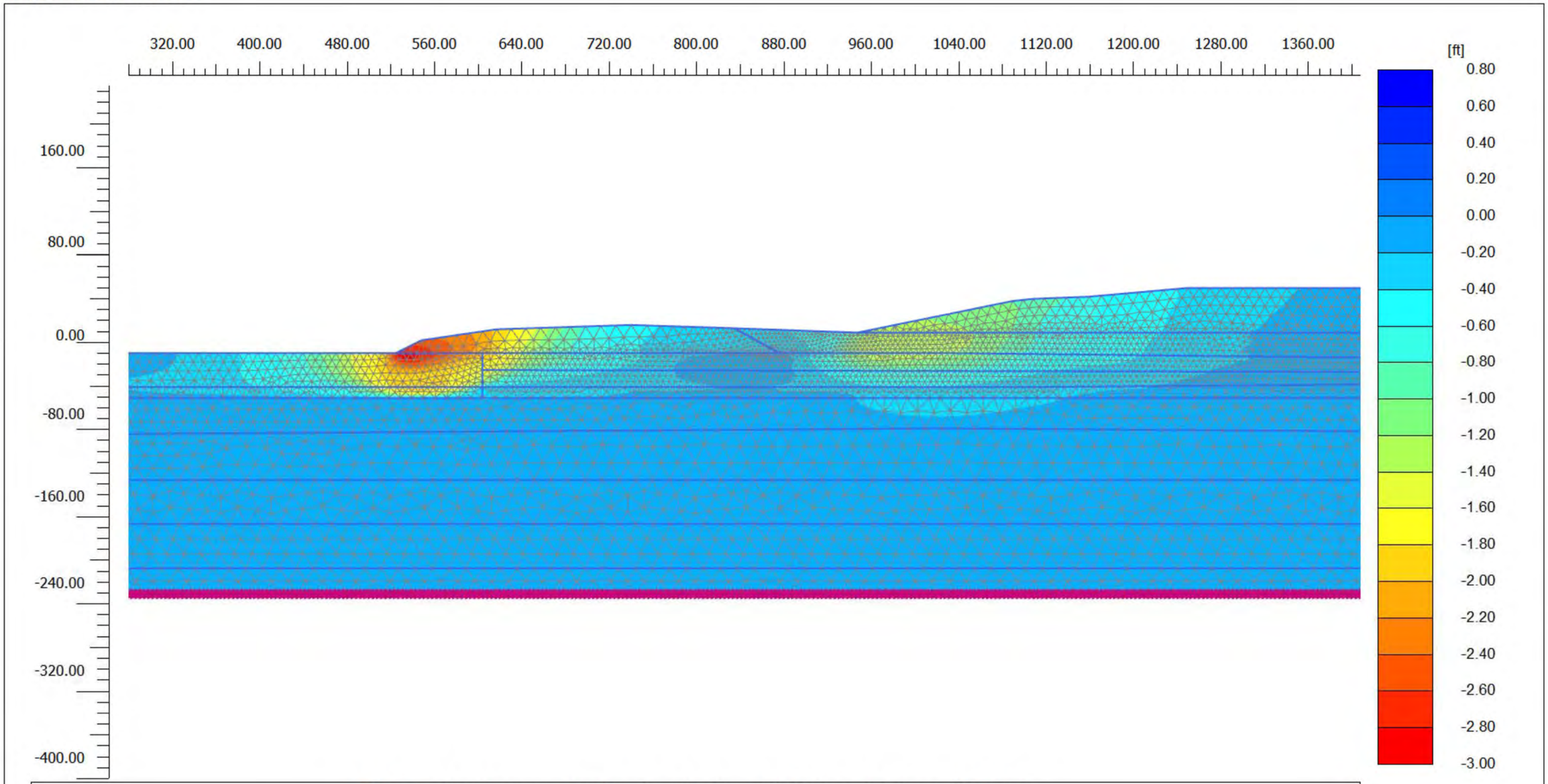
Maximum value = 0.5288 ft (Element 26 at Node 40)

Minimum value = -2.919 ft (Element 1189 at Node 80557)

ENGEO Expect Excellence

Project description			Date
Section A-A' - RSN 1011 (Left) Lateral Phase Displacements			11/22/2021
Project filename	Step	Company	
Baylands Section A_DE_Lef ...	19459	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 49.81 s)

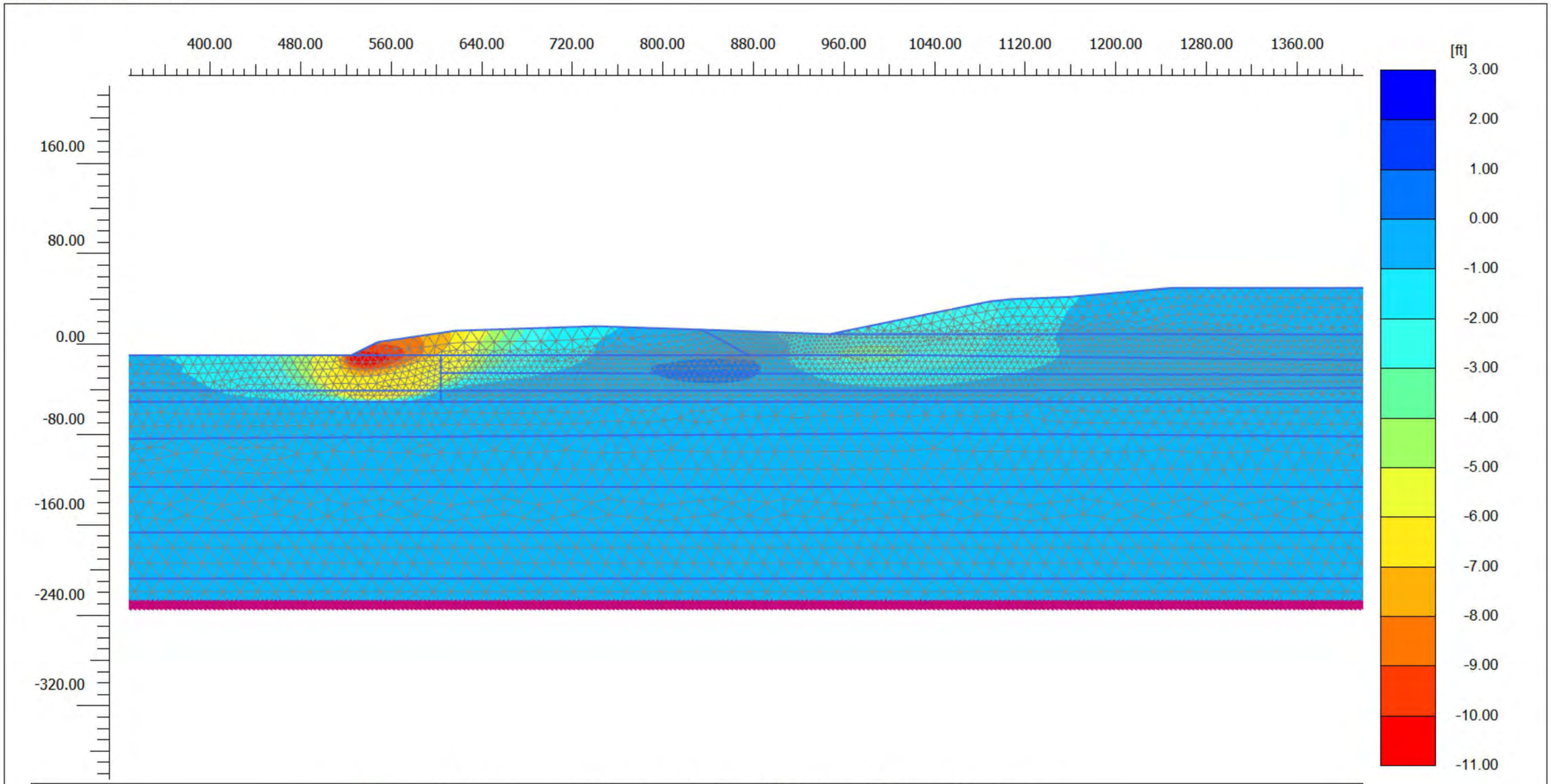
Maximum value = 0.6482 ft (Element 26 at Node 46)

Minimum value = -2.902 ft (Element 1189 at Node 80557)

ENGEO
Expect Excellence

Project description		Date
Section A-A' - RSN 1011 (Right) Lateral Phase Displacements		11/22/2021
Project filename	**Step**	**Company**
Baylands Section A_DE_Rig ...	19459	ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 89.98 s)

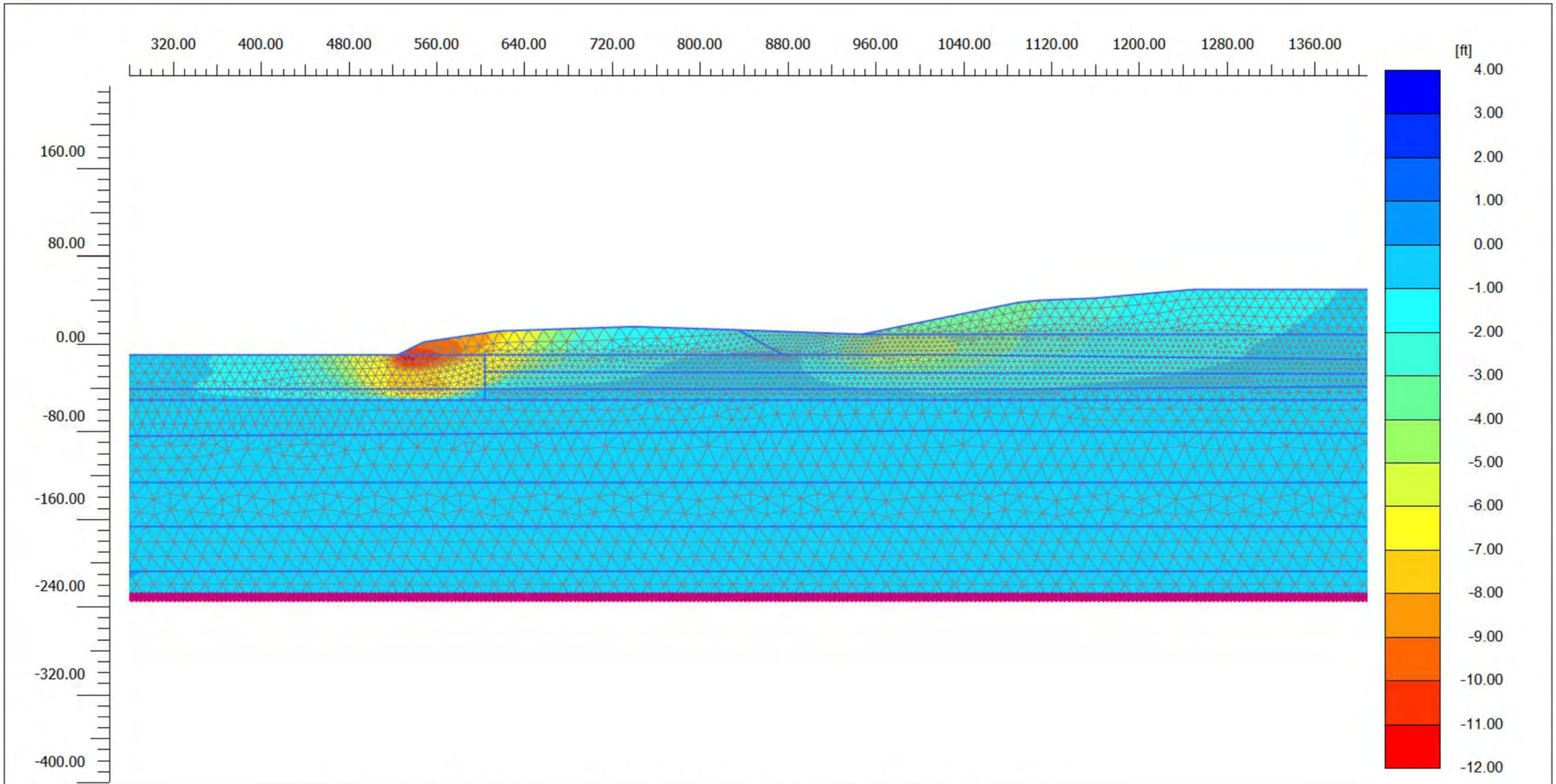
Maximum value = 2.401 ft (Element 133 at Node 82)

Minimum value = -10.85 ft (Element 5107 at Node 80551)

ENGEO Expect Excellence

Project description Section A-A' - RSN 1511 (Left) Lateral Phase Displacements			*Date* 11/22/2021
Project filename Baylands Section A_DE_Lef ...	*Step* 28458	*Company* ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 89.98 s)

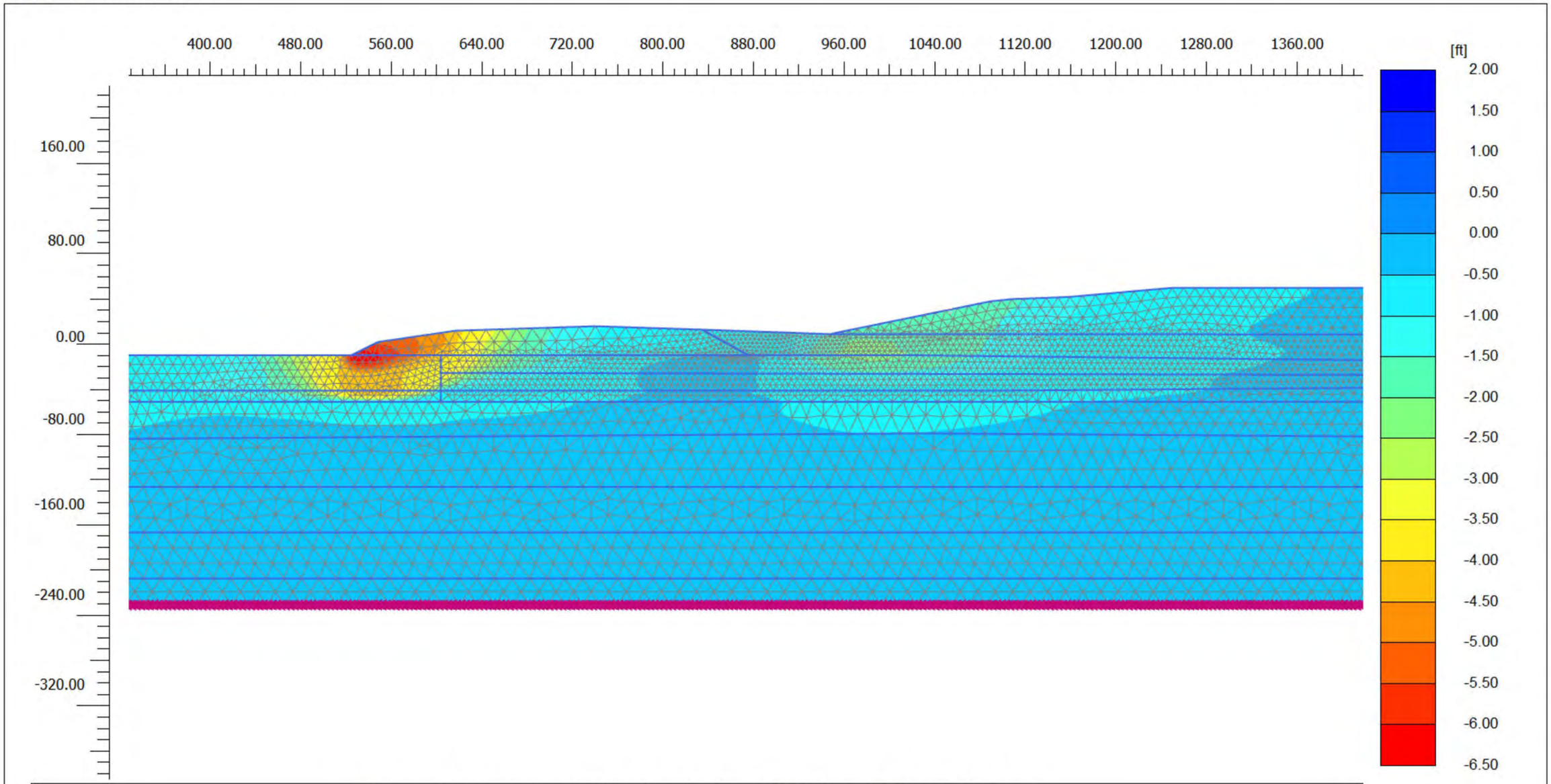
Maximum value = 3.109 ft (Element 22 at Node 79)

Minimum value = -11.09 ft (Element 5107 at Node 80551)

ENGEO Expect Excellence

Project description			Date
Section A-A' - RSN 1511 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section A_DE_Rig ...	28458	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 94.82 s)

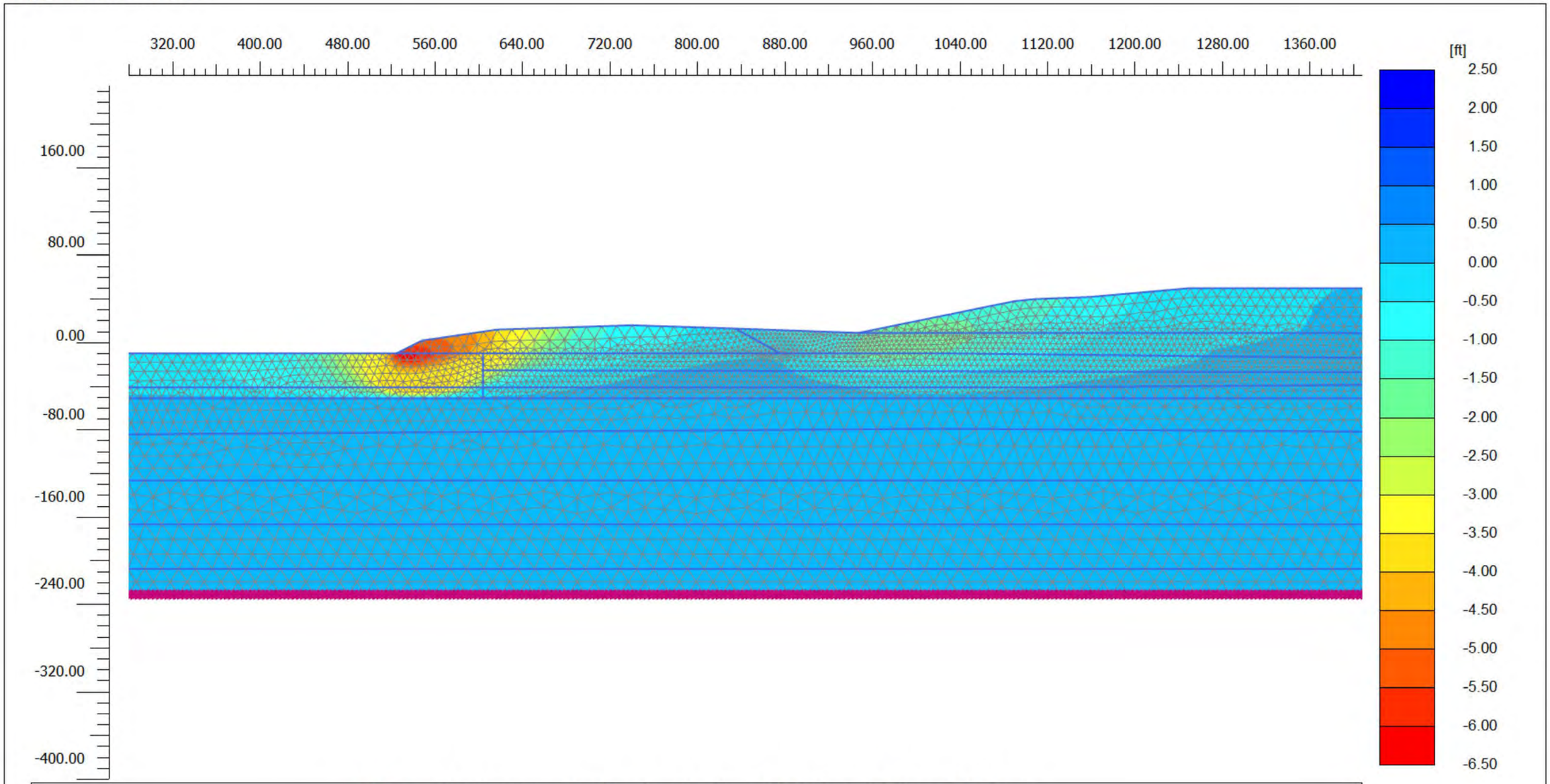
Maximum value = 1.556 ft (Element 22 at Node 79)

Minimum value = -6.484 ft (Element 5107 at Node 80550)

ENGEO
Expect Excellence

Project description		Date
Section A-A' - RSN 1549 (Left) Lateral Phase Displacements		11/22/2021
Project filename	*Step*	*Company*
Baylands Section A_DE_Lef ...	33200	ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 94.82 s)

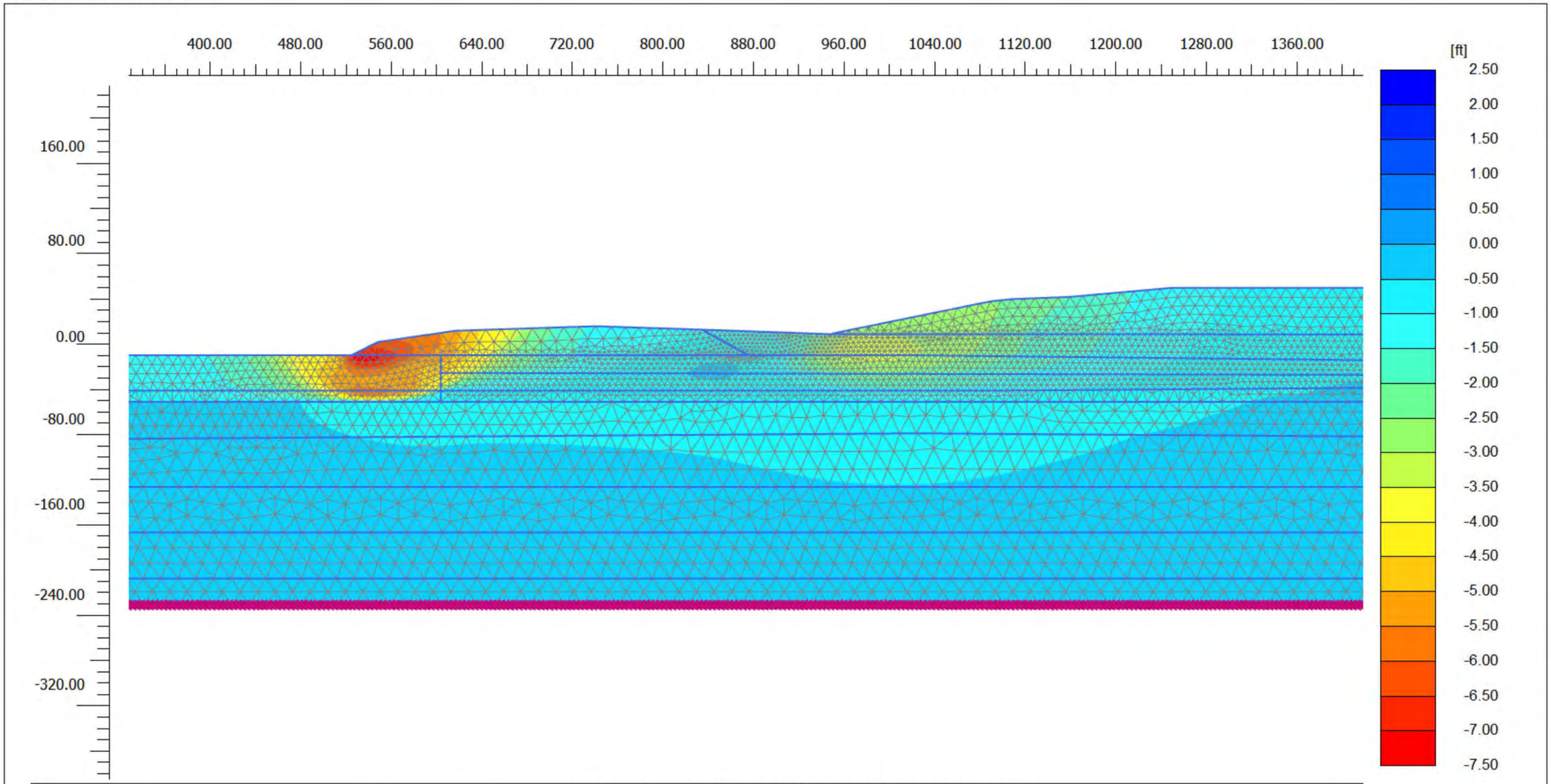
Maximum value = 2.170 ft (Element 26 at Node 37)

Minimum value = -6.231 ft (Element 1189 at Node 80557)

ENGEO
Expect Excellence

Project description			Date
Section A-A' - RSN 1549 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section A_DE_Rig ...	33200	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 59.31 s)

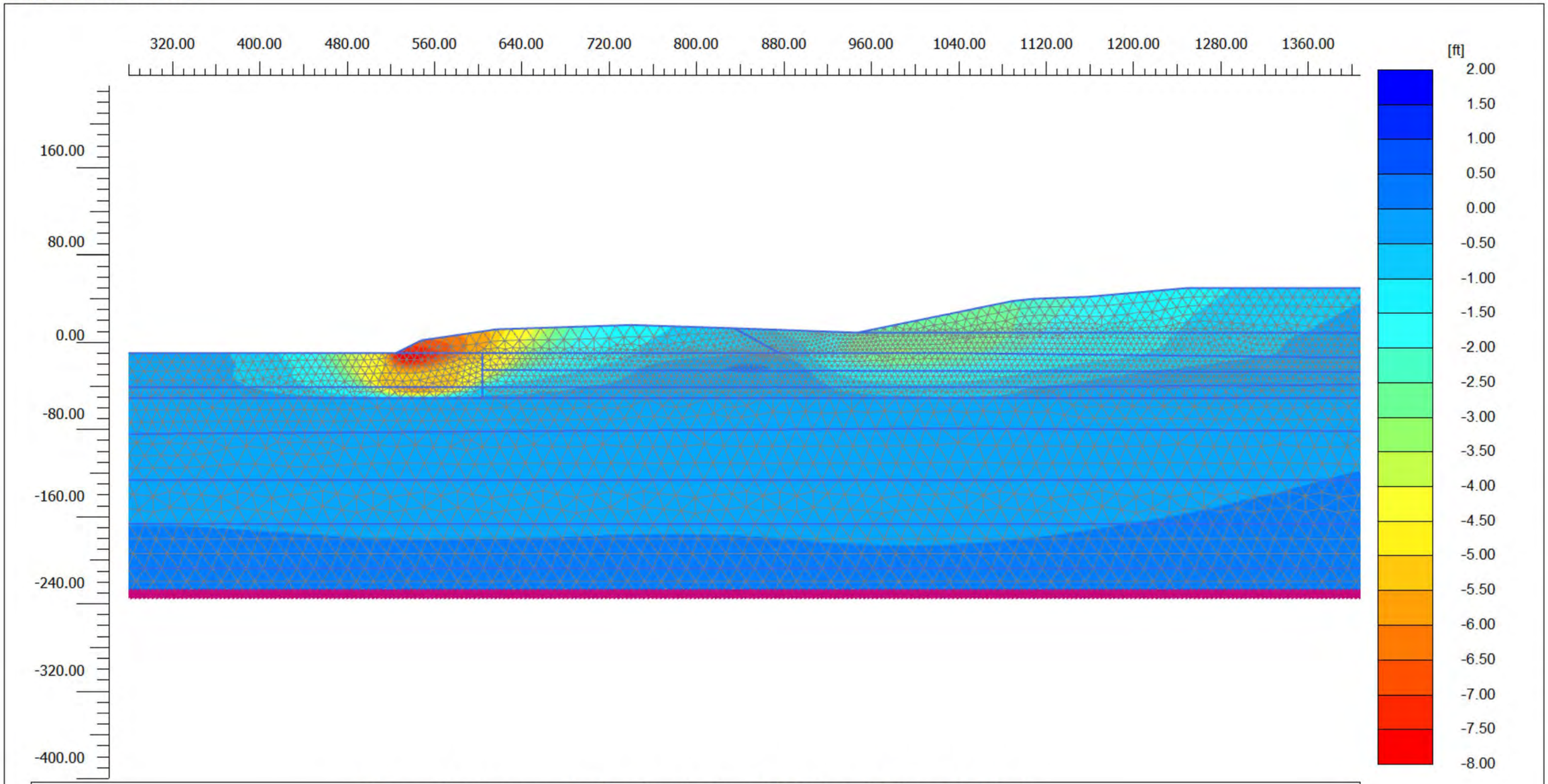
Maximum value = 2.479 ft (Element 22 at Node 79)

Minimum value = -7.238 ft (Element 5107 at Node 80395)

ENGEO Expect Excellence

Project description		Date
Section A-A' - RSN 1633 (Left) Lateral Phase Displacements		11/22/2021
Project filename	*Step*	*Company*
Baylands Section A_DE_Lef ...	36166	ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 59.31 s)

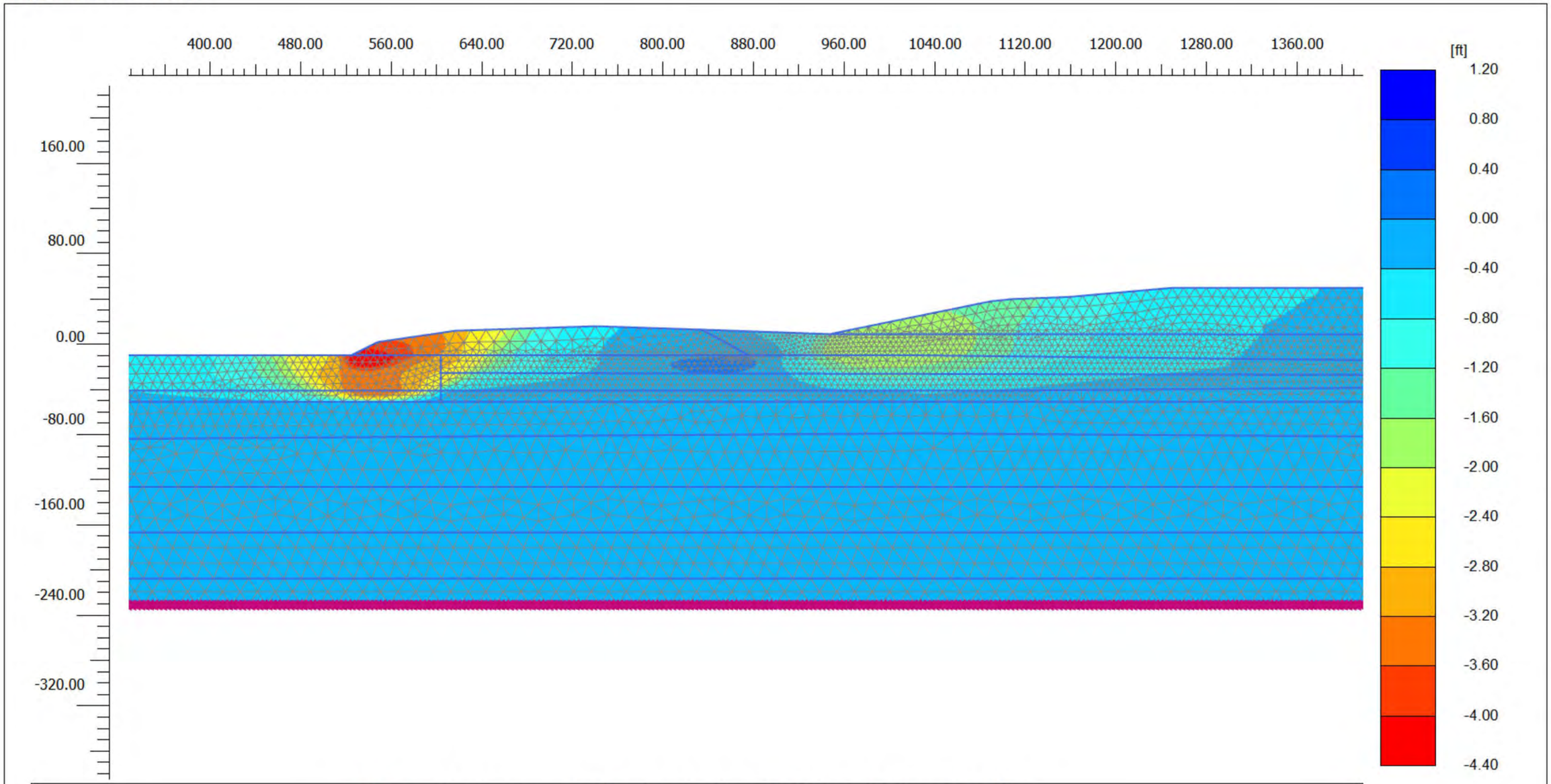
Maximum value = 1.956 ft (Element 133 at Node 80)

Minimum value = -7.844 ft (Element 5107 at Node 80551)

ENGEO
Expect Excellence

Project description			Date
Section A-A' - RSN 1633 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section A_DE_Rig ...	36166	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 55.64 s)

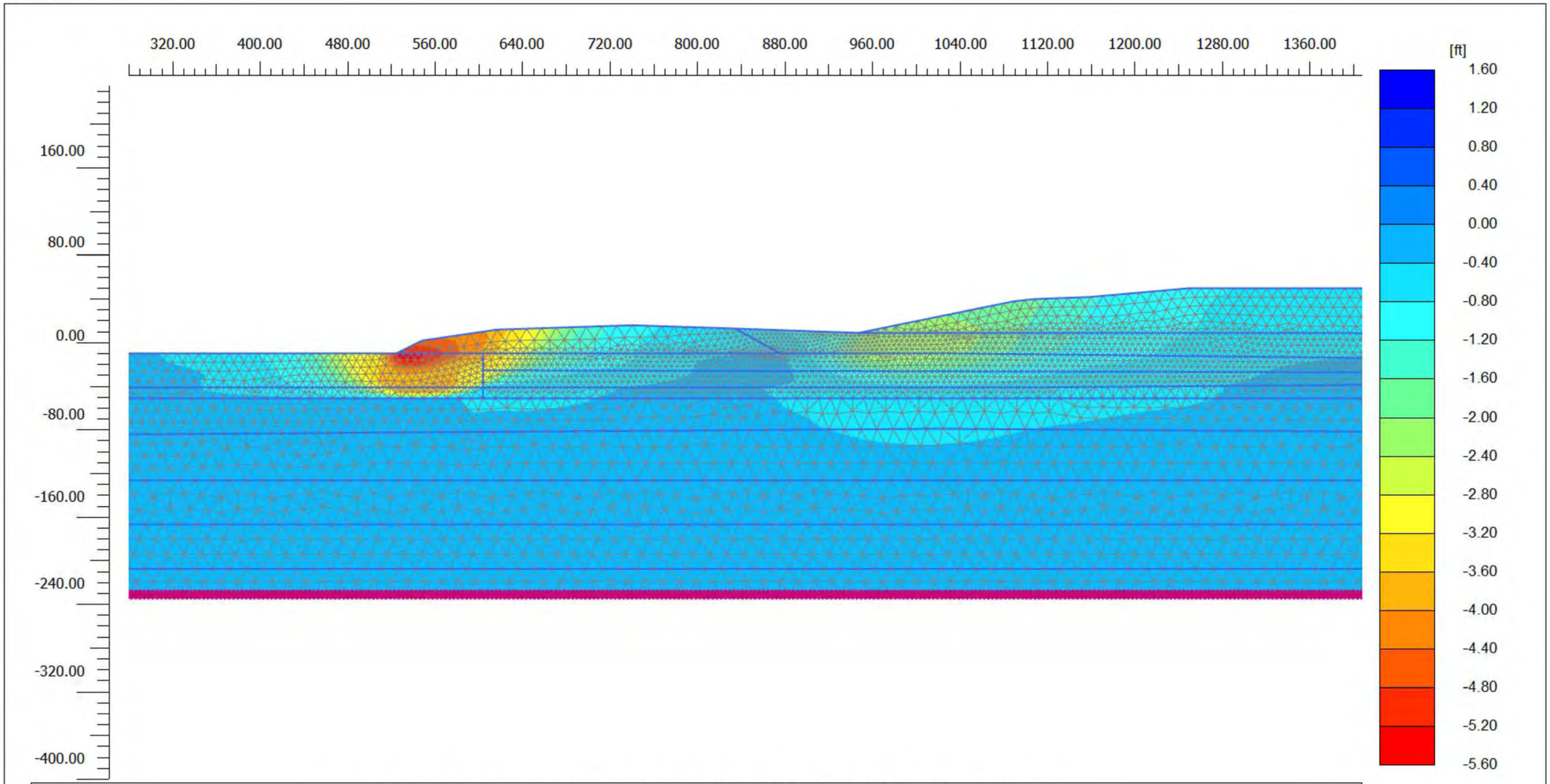
Maximum value = 0.8691 ft (Element 22 at Node 79)

Minimum value = -4.390 ft (Element 5107 at Node 80395)

ENGEO Expect Excellence

Project description		Date
Section A-A' - RSN 1787 (Left) Lateral Phase Displacements		11/22/2021
Project filename	**Step**	**Company**
Baylands Section A_DE_Lef ...	41731	ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 55.64 s)

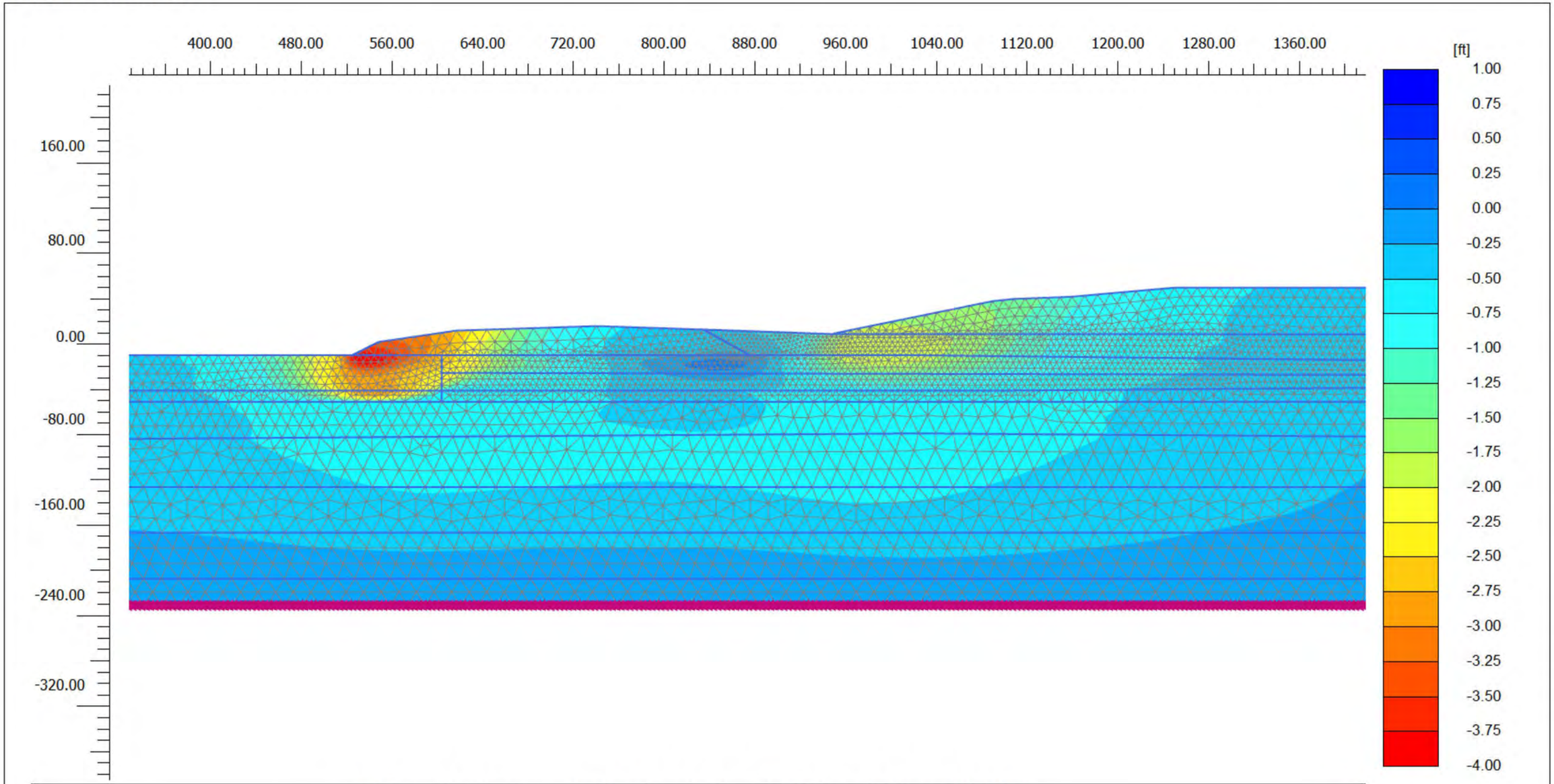
Maximum value = 1.206 ft (Element 22 at Node 79)

Minimum value = -5.341 ft (Element 5107 at Node 80390)

ENGEO Expect Excellence

Project description		Date
Section A-A' - RSN 1787 (Right) Lateral Phase Displacements		11/22/2021
Project filename	*Step*	*Company*
Baylands Section A_DE_Rig ...	41731	ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 56.44 s)

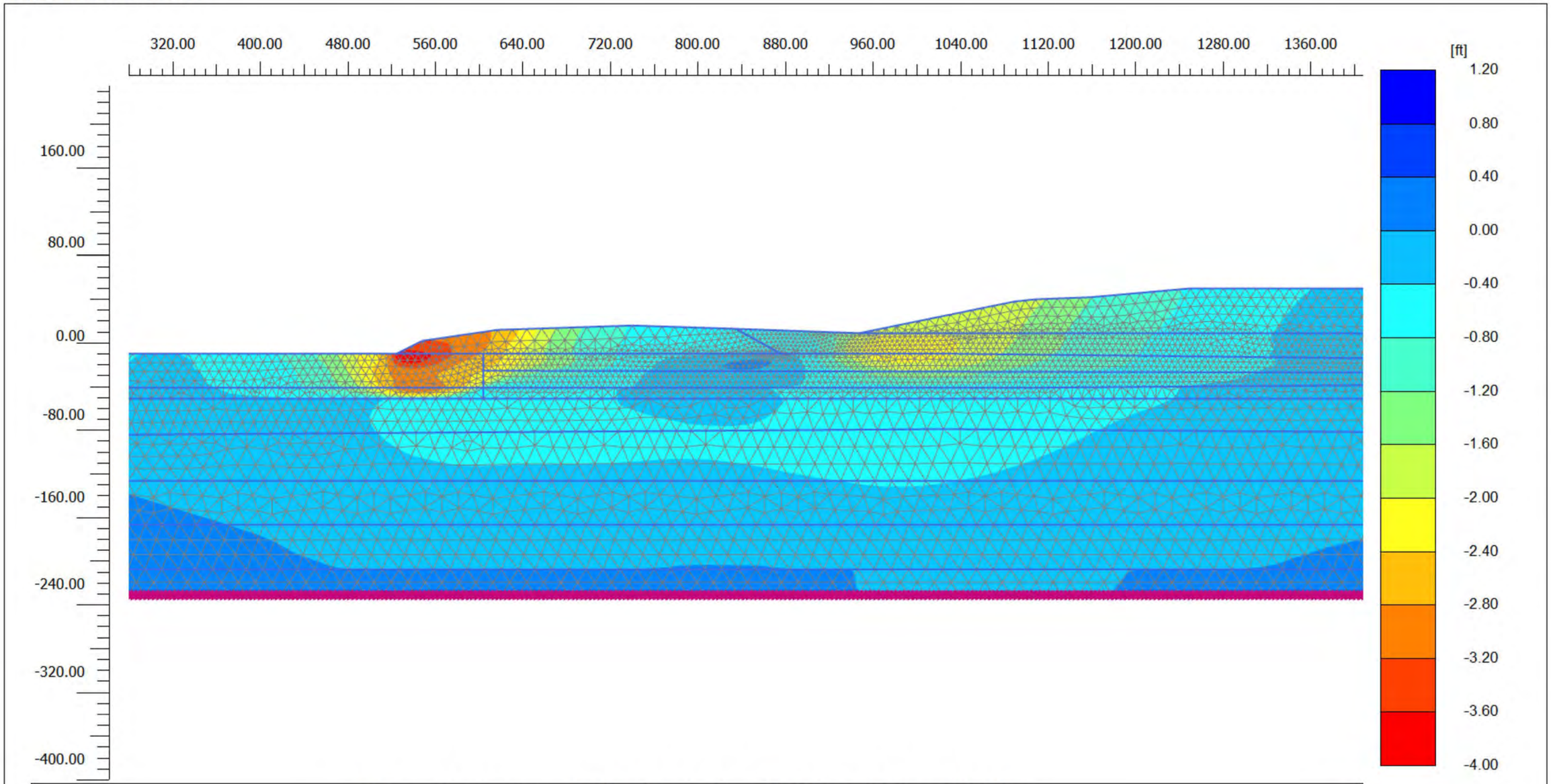
Maximum value = 0.9822 ft (Element 77 at Node 75)

Minimum value = -3.967 ft (Element 5107 at Node 80395)

ENGEO
Expect Excellence

Project description Section A-A' - RSN 3548 (Left) Lateral Phase Displacements			*Date* 11/22/2021
Project filename Baylands Section A_DE_Lef ...	*Step* 47376	*Company* ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 56.44 s)

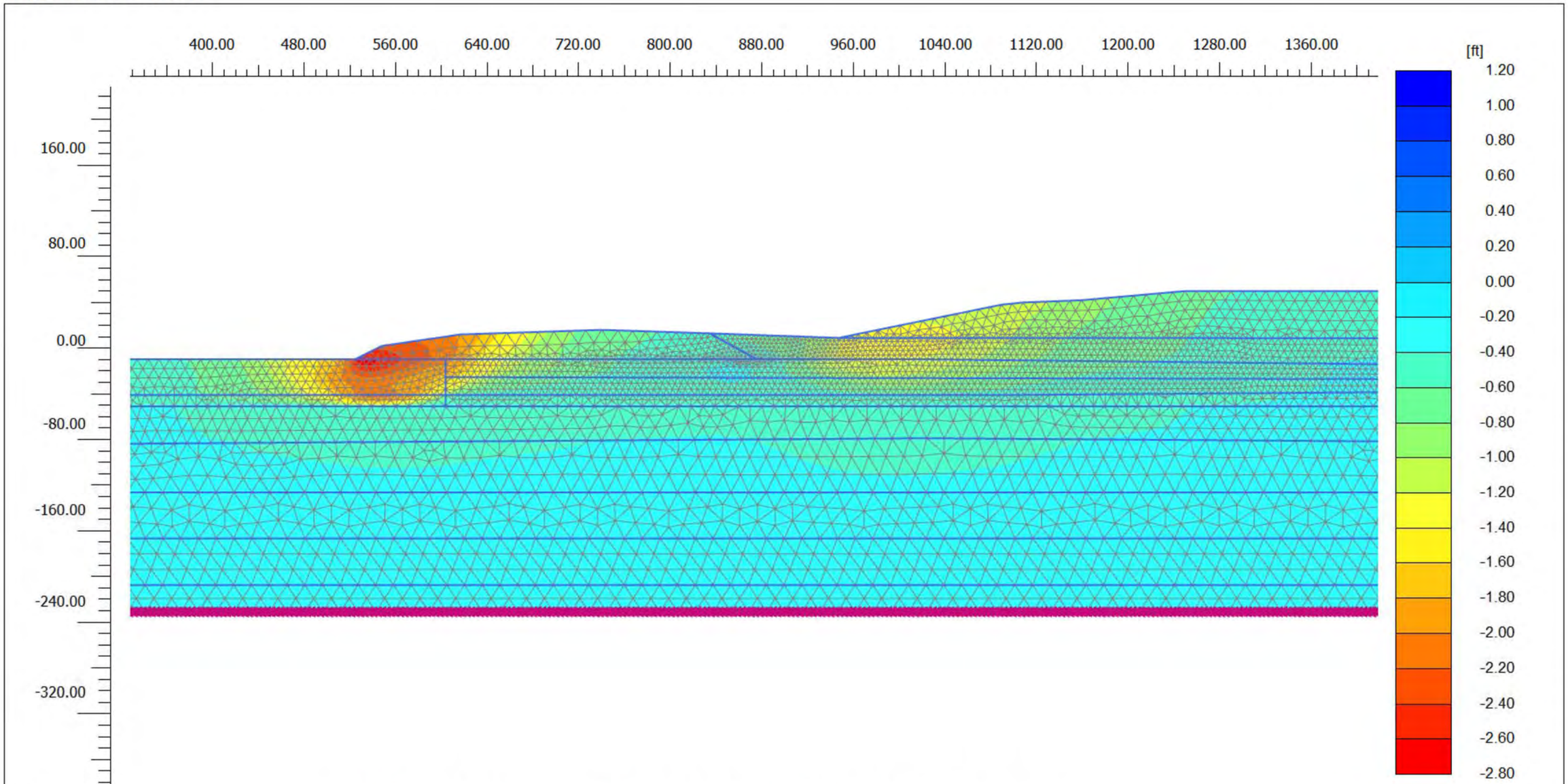
Maximum value = 1.185 ft (Element 77 at Node 75)

Minimum value = -3.862 ft (Element 5107 at Node 80395)

ENGEO
Expect Excellence

Project description		Date
Section A-A' - RSN 3548 (Right) Lateral Phase Displacements		11/22/2021
Project filename	Step	Company
Baylands Section A_DE_Rig ...	47376	ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 98.19 s)

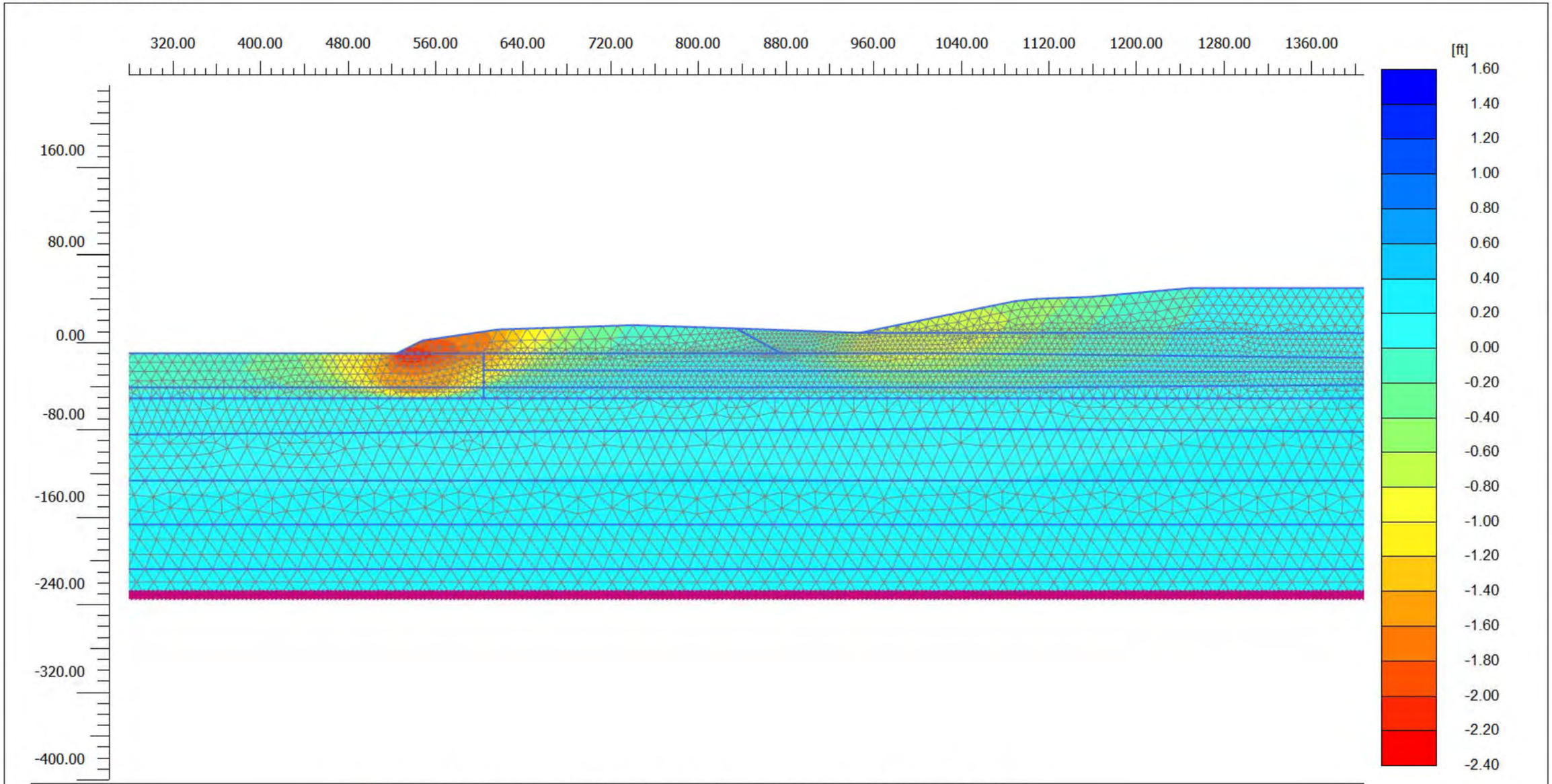
Maximum value = 1.072 ft (Element 3972 at Node 451)

Minimum value = -2.682 ft (Element 1189 at Node 80557)

ENGEO
Expect Excellence

Project description			Date
Section A-A' - RSN 3954 (Left) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section A_DE_Lef ...	52286	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 98.19 s)

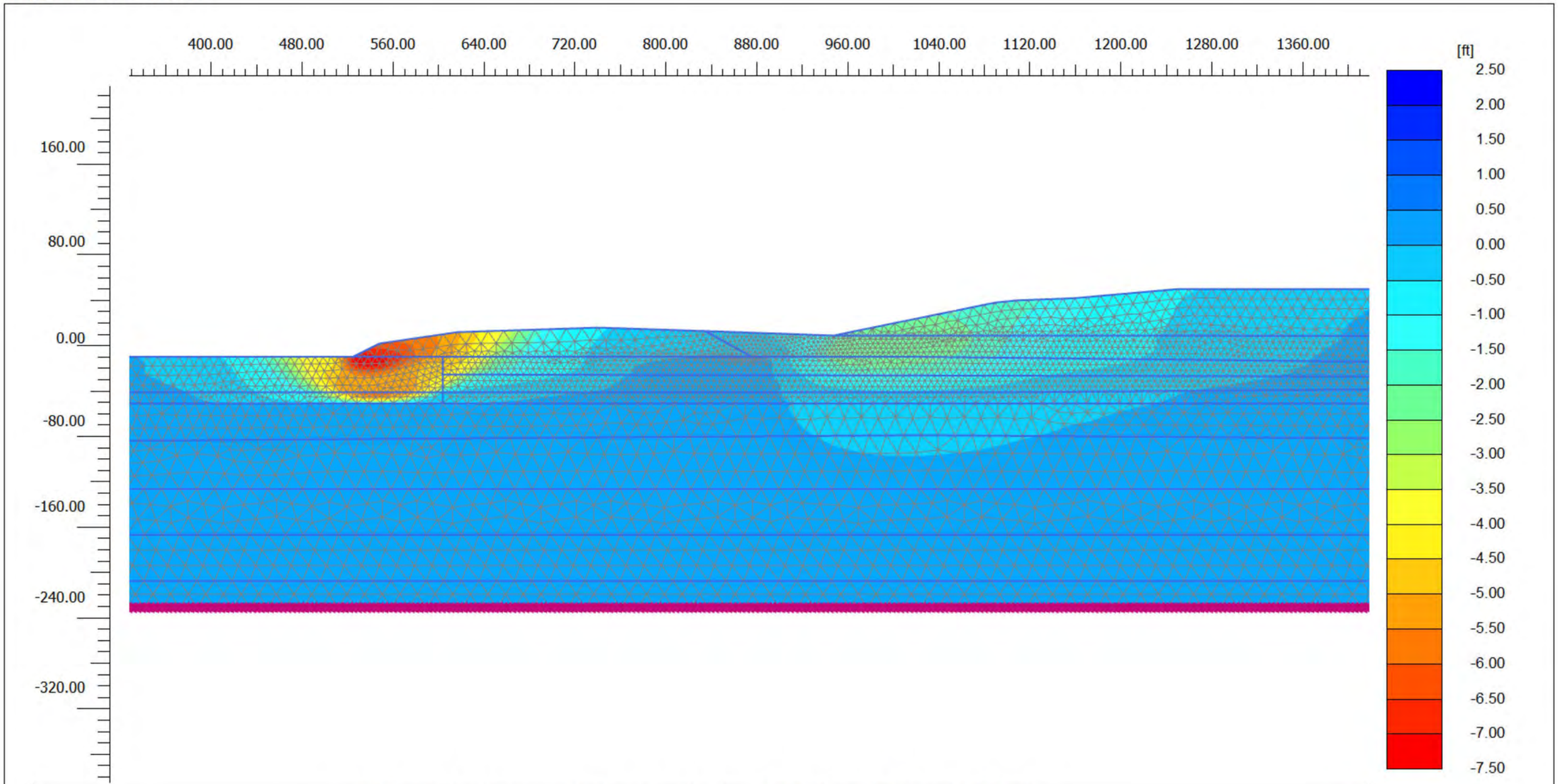
Maximum value = 1.566 ft (Element 22 at Node 79)

Minimum value = -2.208 ft (Element 1189 at Node 80557)

ENGEO
Expect Excellence

Project description			Date
Section A-A' - RSN 3954 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section A_DE_Rig ...	52286	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 98.03 s)

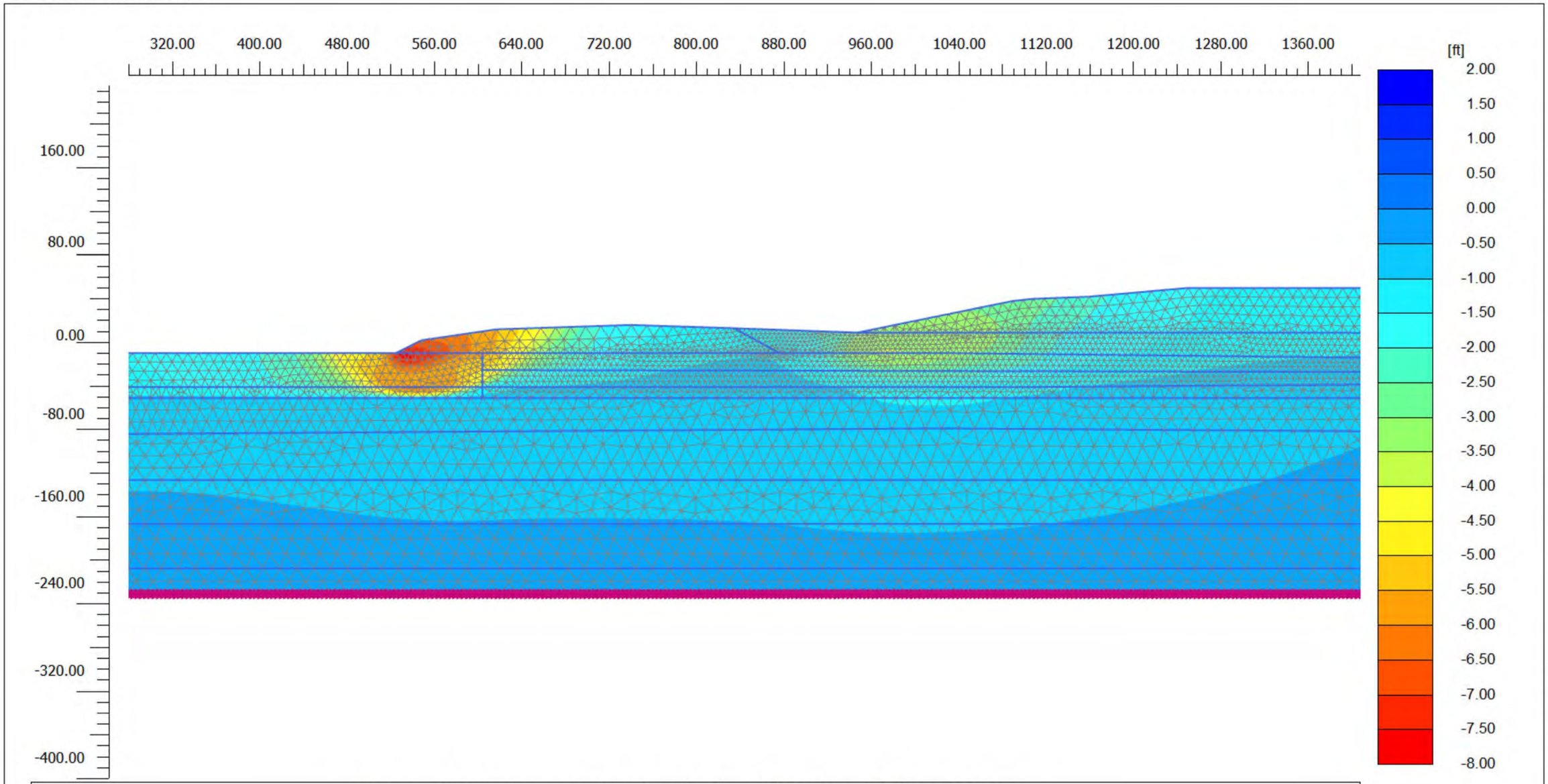
Maximum value = 2.110 ft (Element 77 at Node 75)

Minimum value = -7.373 ft (Element 5107 at Node 80551)

ENGEO
Expect Excellence

Project description			Date
Section A-A' - RSN 5618 (Left) Lateral Phase Displacements			11/22/2021
Project filename	Step	Company	
Baylands Section A_DE_Lef ...	57188	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 98.03 s)

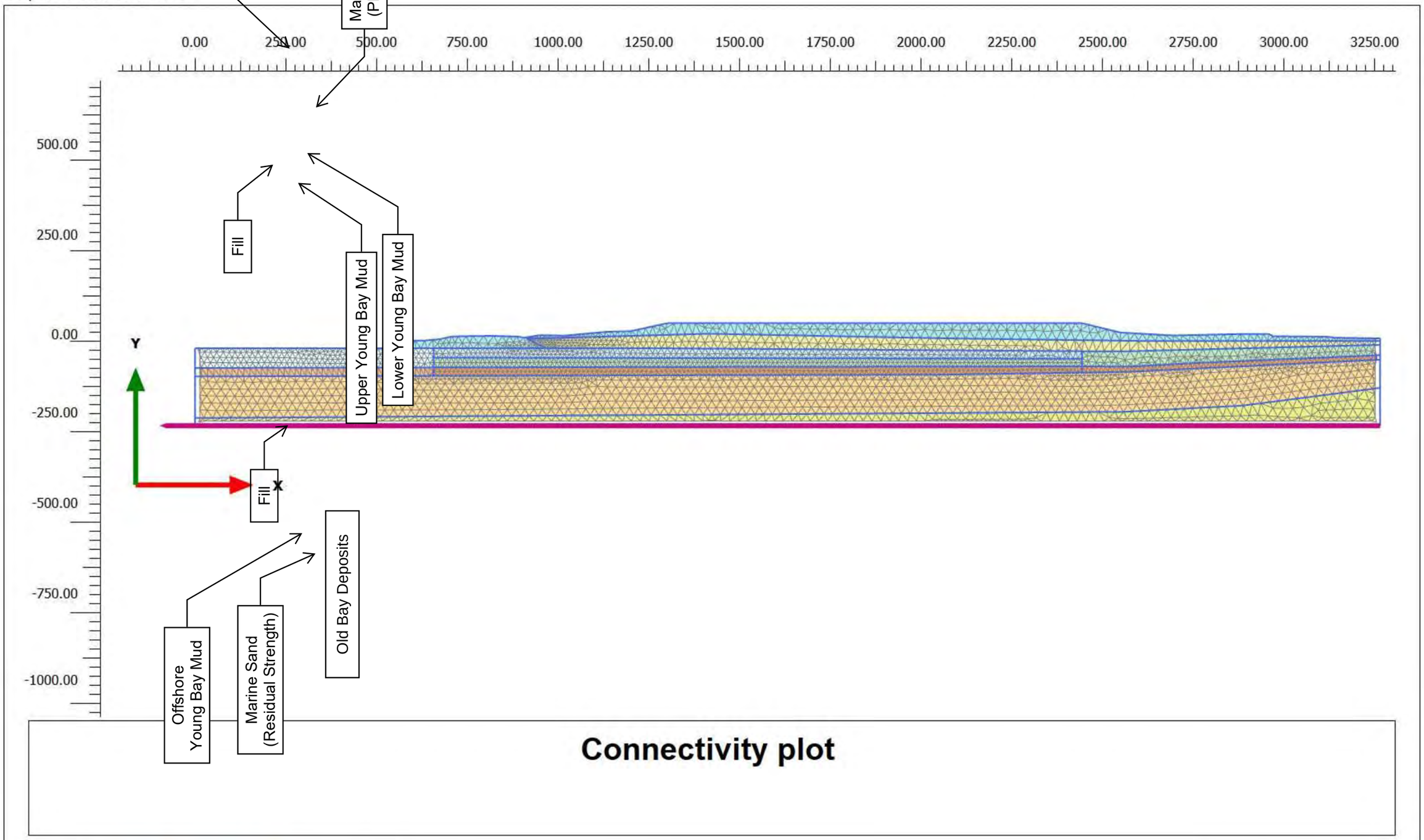
Maximum value = 1.872 ft (Element 22 at Node 79)

Minimum value = -7.564 ft (Element 5107 at Node 80395)

ENGEO
Expect Excellence

Project description			Date
Section A-A' - RSN 5618 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section A_DE_Rig ...	57188	ENGEO	

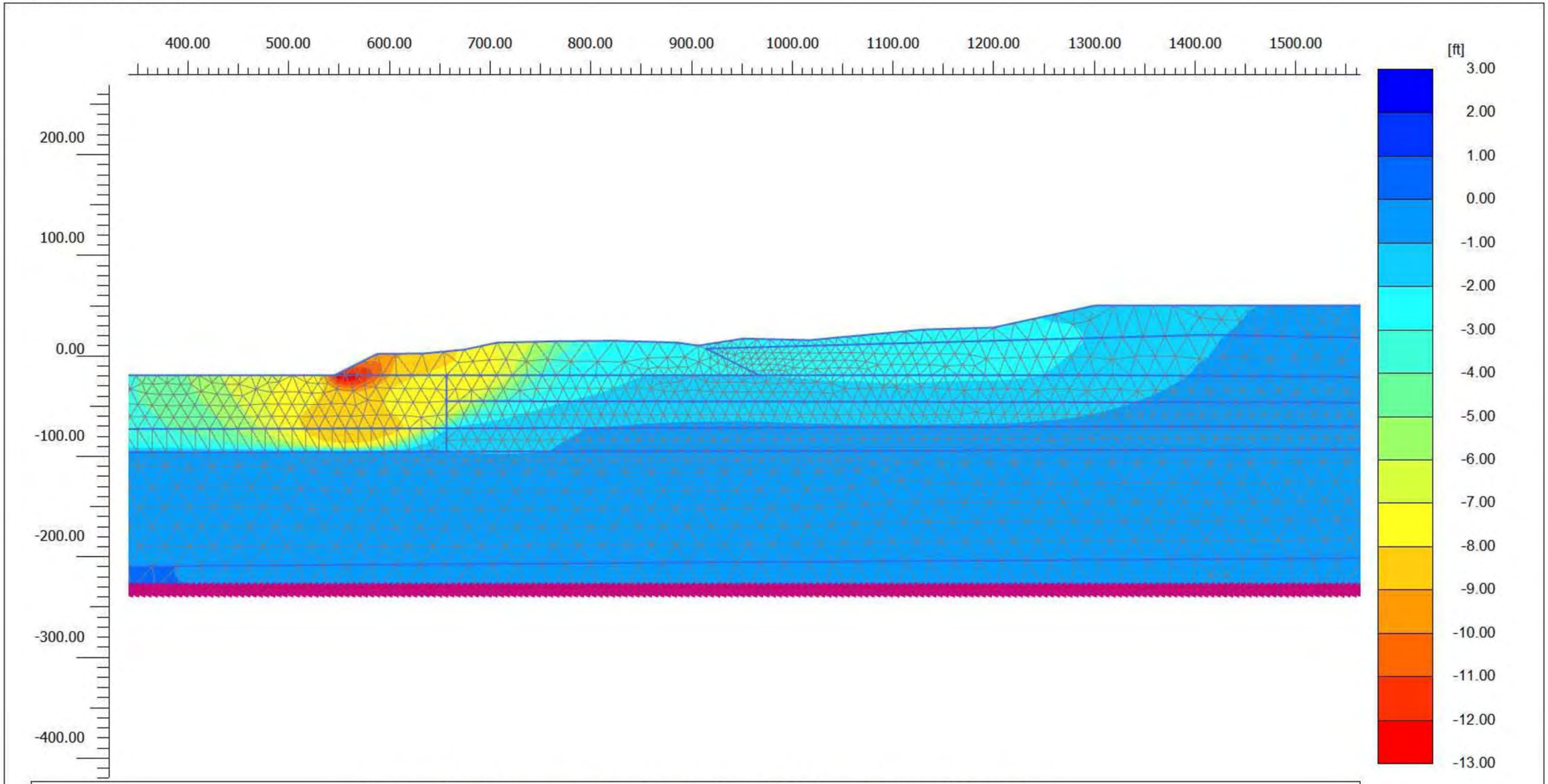
Output Version 21.1.0.479



Connectivity plot

ENGEO Expect Excellence	*Project description* Section B-B' Connectivity Plot		*Date* 11/22/2021
	Project filename Baylands Section B_DE	*Step* 3332	*Company* ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 32.97 s)

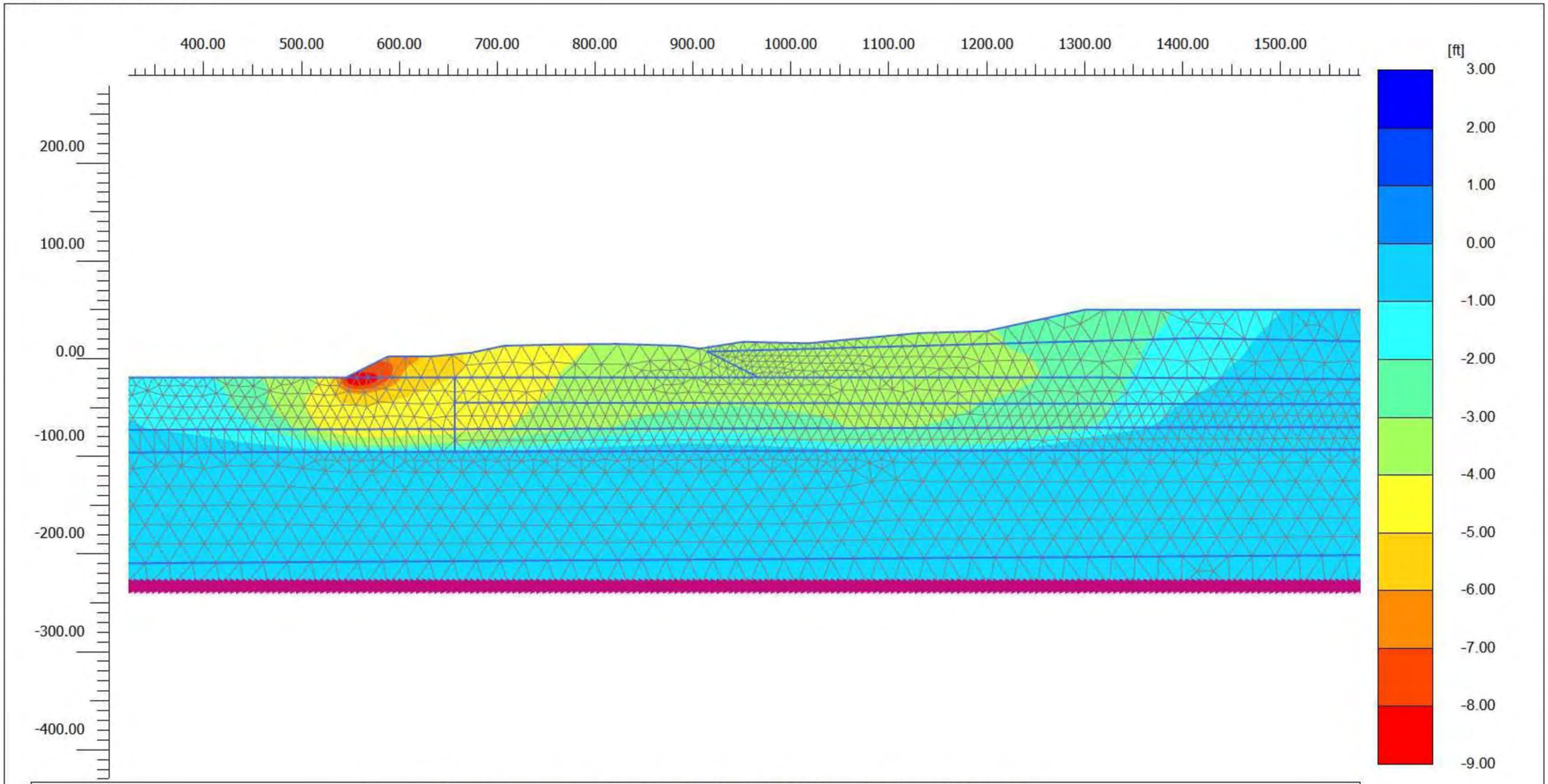
Maximum value = 2.732 ft (Element 269 at Node 943)

Minimum value = -12.44 ft (Element 1990 at Node 40930)

ENGEO
Expect Excellence

Project description			Date
Section B-B' - RSN 143 (Left) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	3332	ENGEO	

Output Version 21.1.0.479



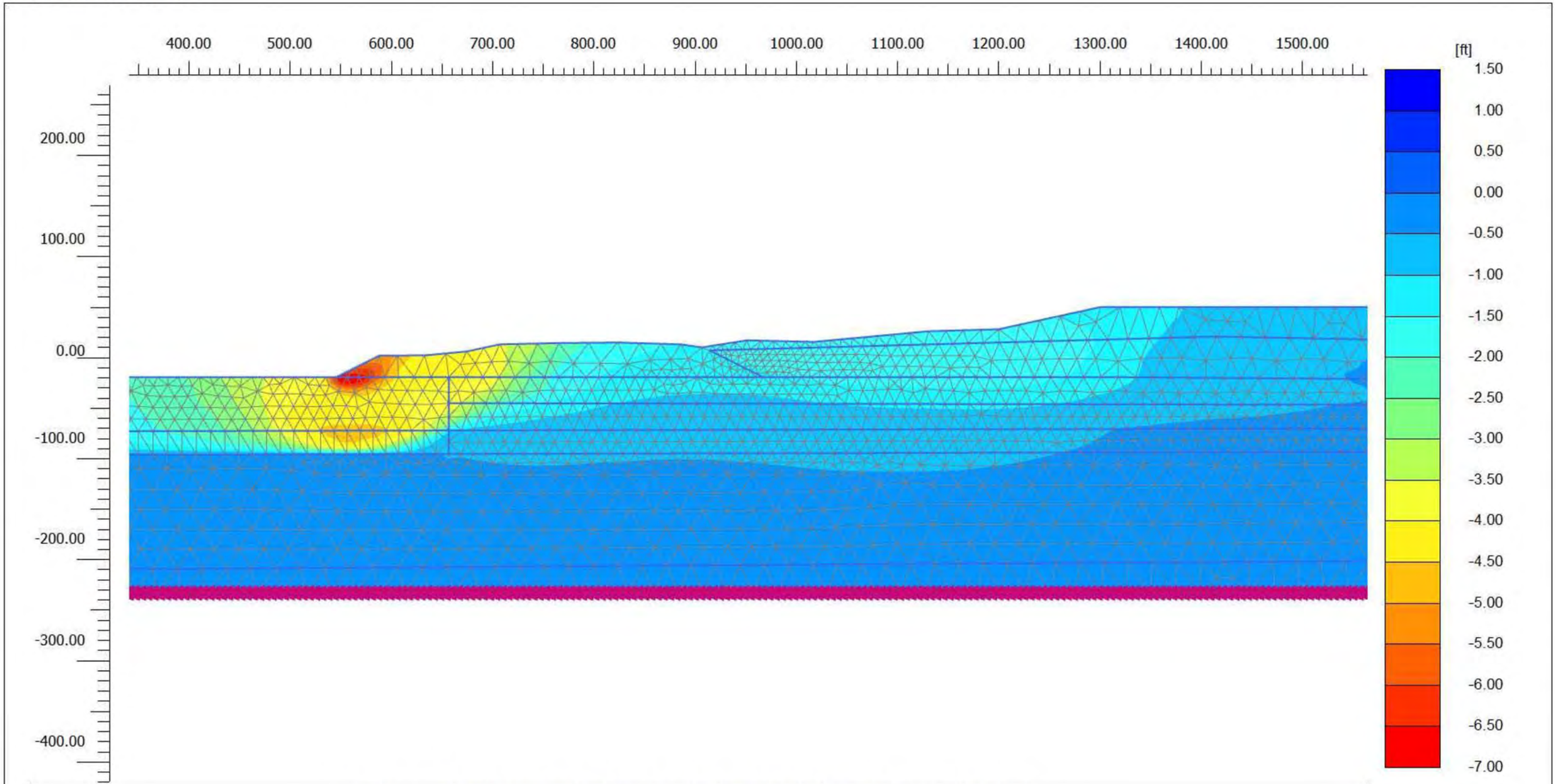
Phase displacements Pu_x (scaled up 5.00 times) (Time 32.97 s)

Maximum value = 2.934 ft (Element 269 at Node 943)

Minimum value = -8.797 ft (Element 394 at Node 40937)

ENGEO Expect Excellence	*Project description* Section B-B' - RSN 143 (Right) Lateral Phase Displacements		*Date* 11/22/2021
	Project filename Baylands Section B_DE	*Step* 117677	*Company* ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 45.91 s)

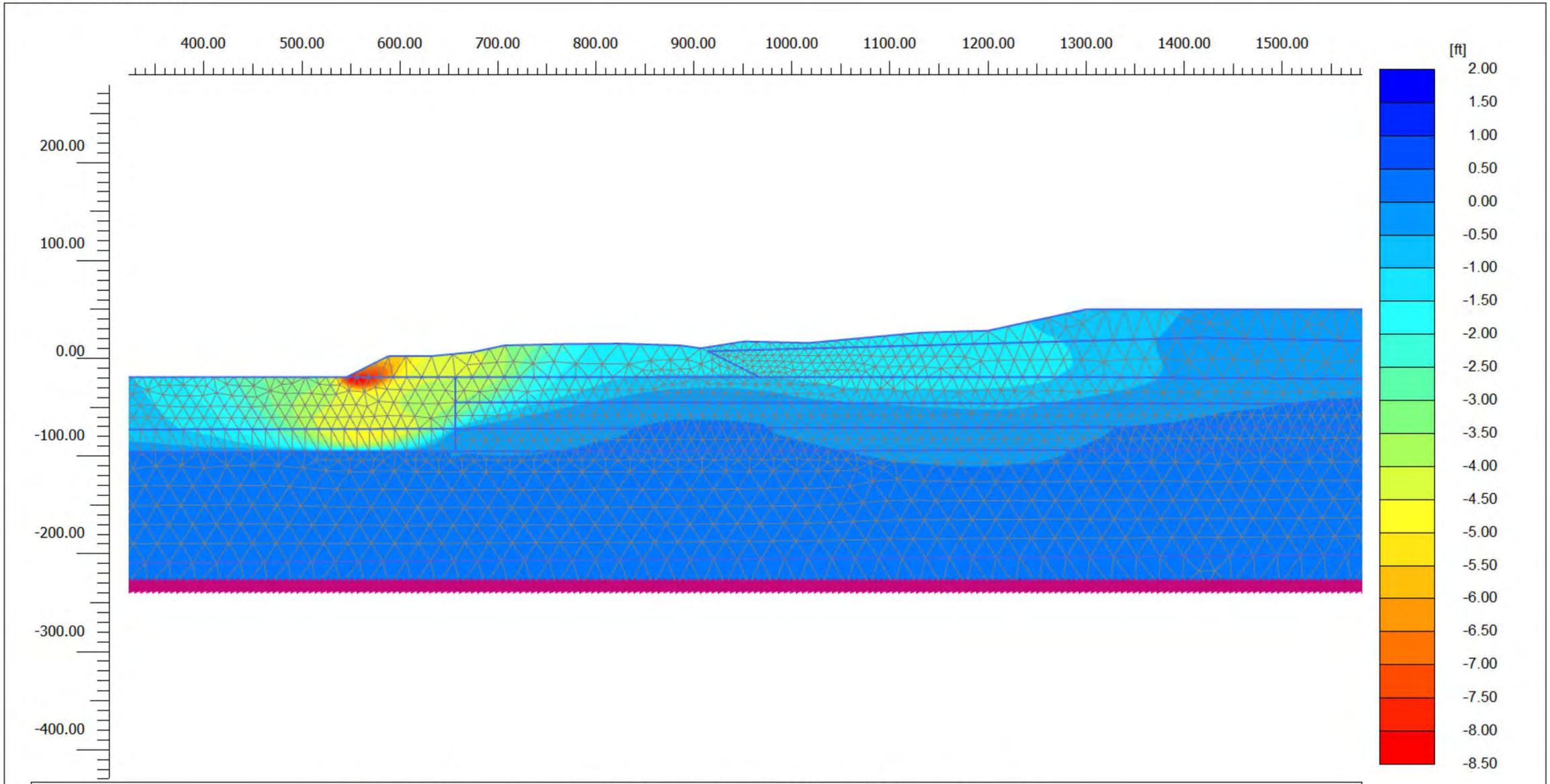
Maximum value = 1.106 ft (Element 354 at Node 654)

Minimum value = -6.915 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description Section B-B' - RSN 285 (Left) Lateral Phase Displacements		*Date* 11/22/2021
Project filename Baylands Section B_DE	*Step* 9894	*Company* ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 45.91 s)

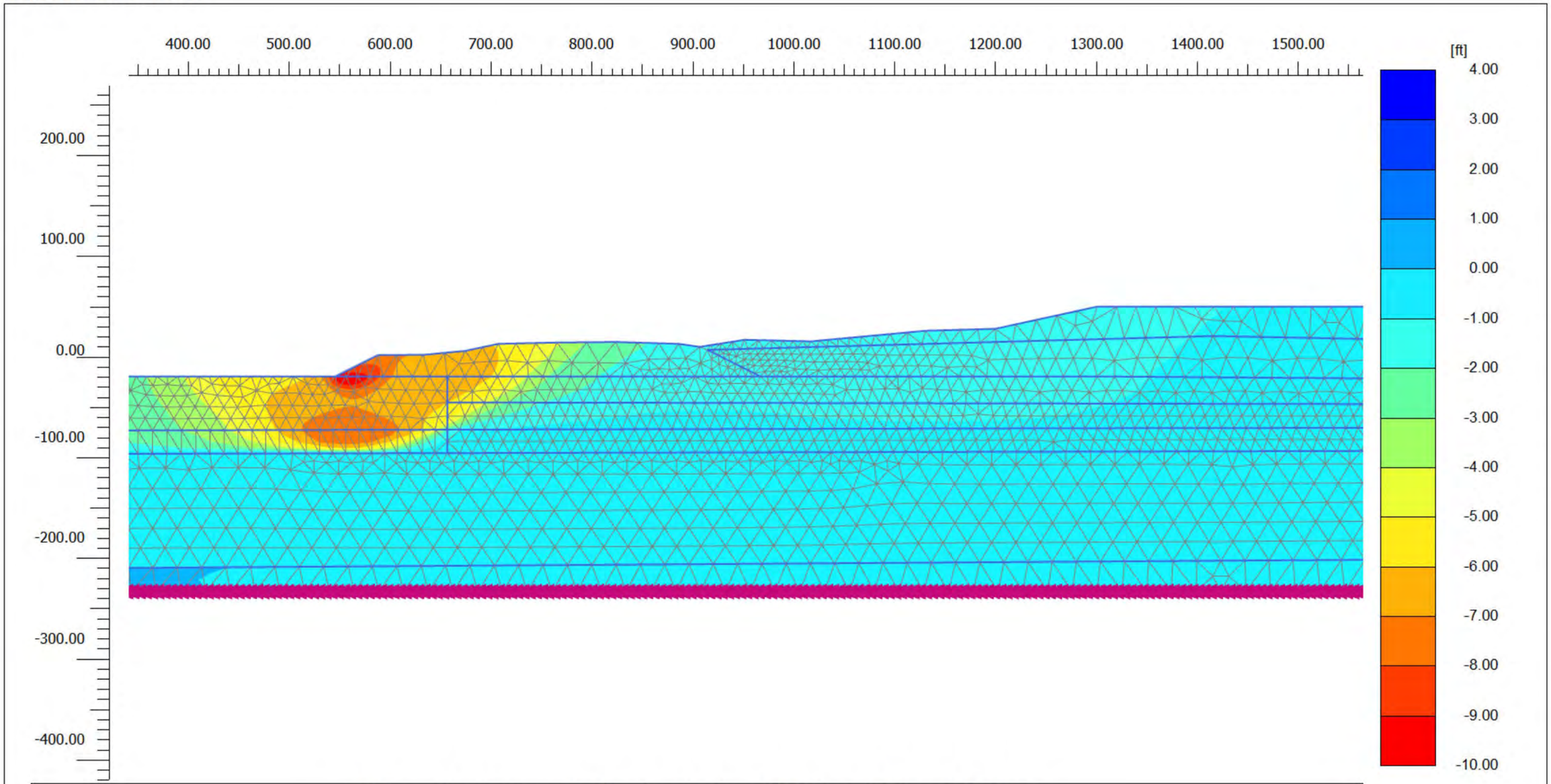
Maximum value = 1.576 ft (Element 128 at Node 8003)

Minimum value = -8.121 ft (Element 1990 at Node 40930)

ENGEO Expect Excellence

Project description			Date
Section B-B' - RSN 285 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	15172	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 58.32 s)

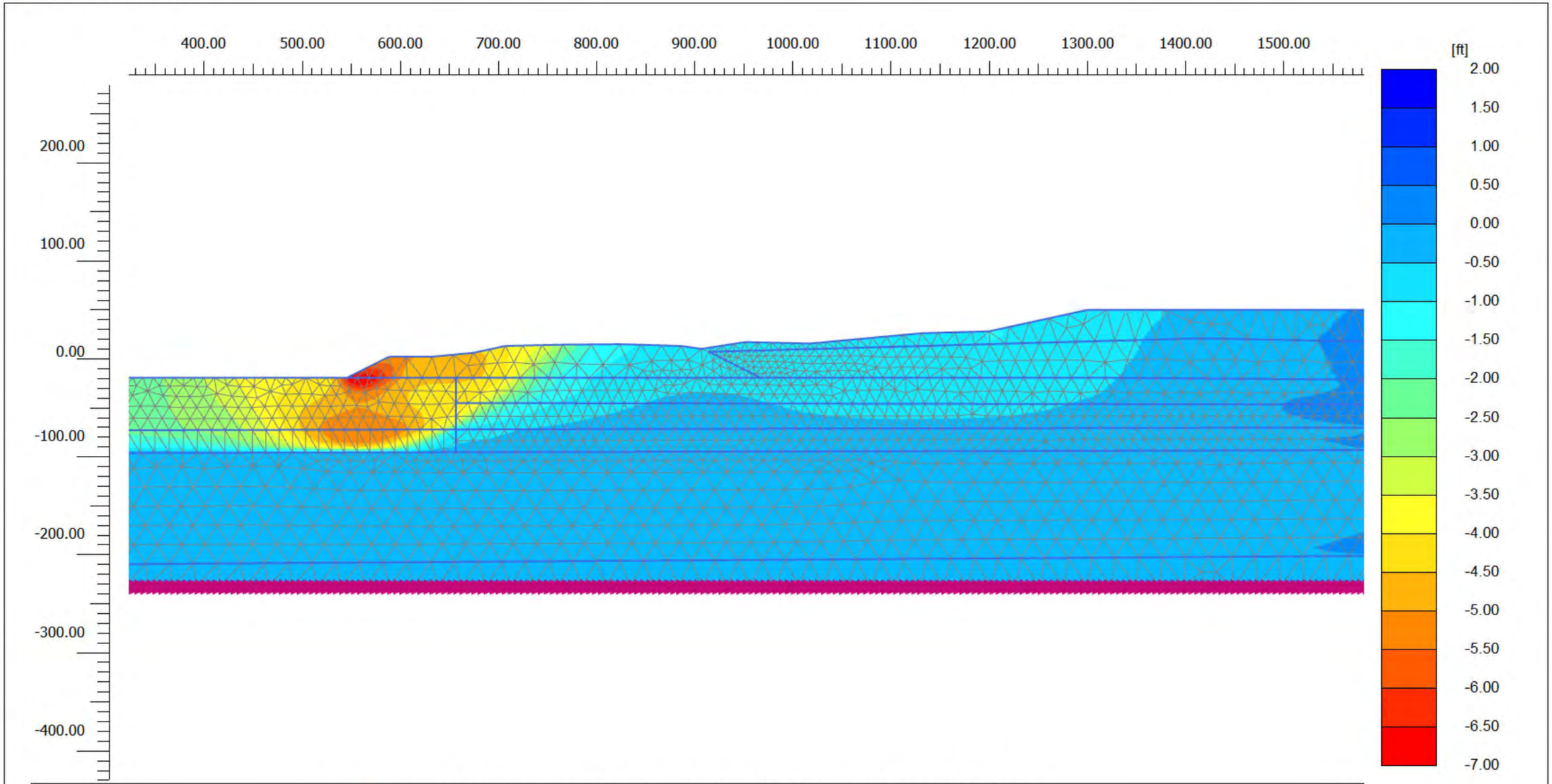
Maximum value = 3.132 ft (Element 269 at Node 943)

Minimum value = -9.623 ft (Element 1990 at Node 40930)

ENGEO
Expect Excellence

Project description Section B-B' - RSN 897 (Left) Lateral Phase Displacements			*Date* 11/22/2021
Project filename Baylands Section B_DE	*Step* 21005	*Company* ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 58.32 s)

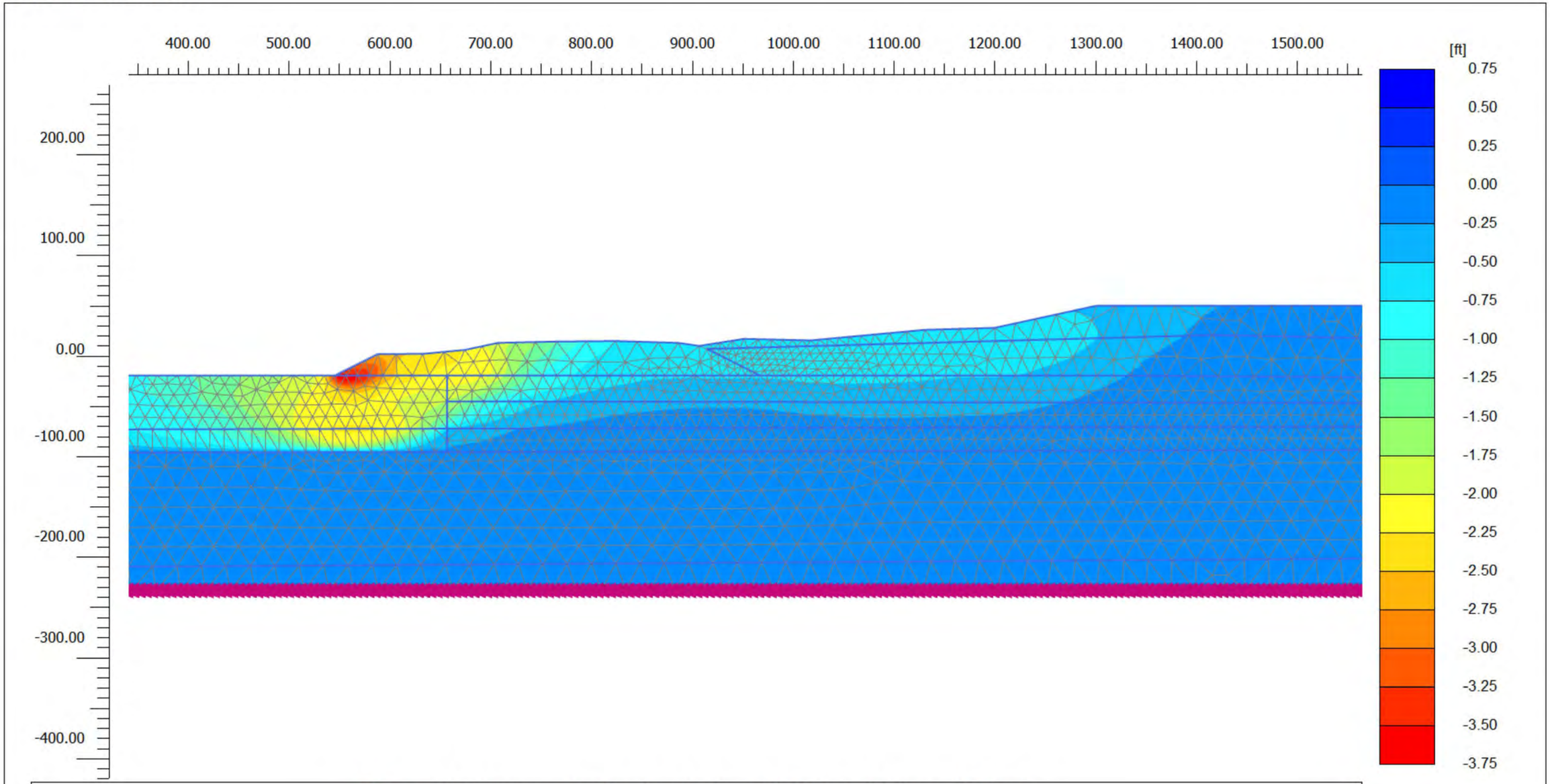
Maximum value = 1.974 ft (Element 736 at Node 1122)

Minimum value = -6.960 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description			Date
Section B-B' - RSN 897 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	26838	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 49.81 s)

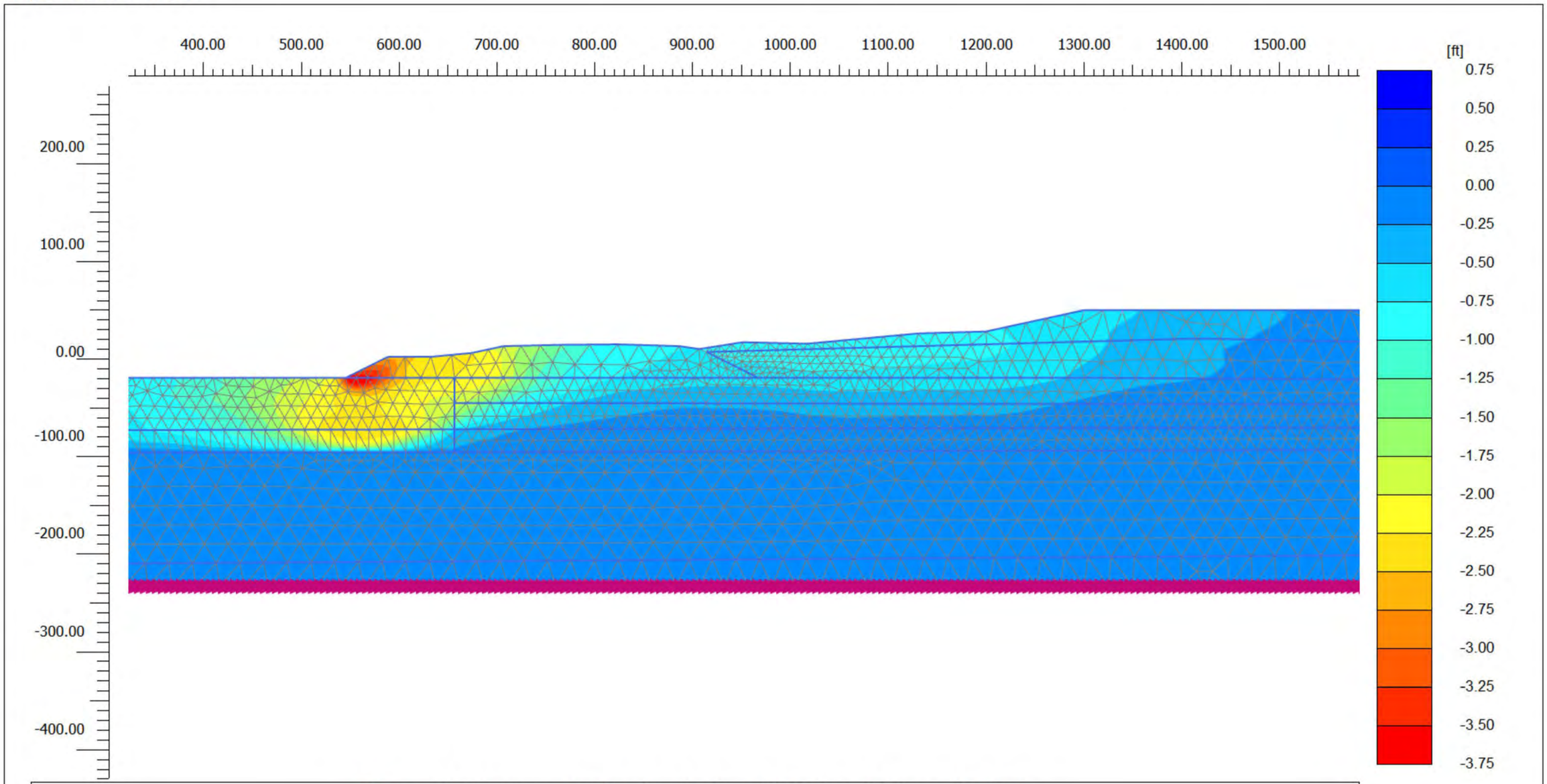
Maximum value = 0.6347 ft (Element 22 at Node 7825)

Minimum value = -3.636 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description			Date
Section B-B' - RSN 1011 (Left) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	31820	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 49.81 s)

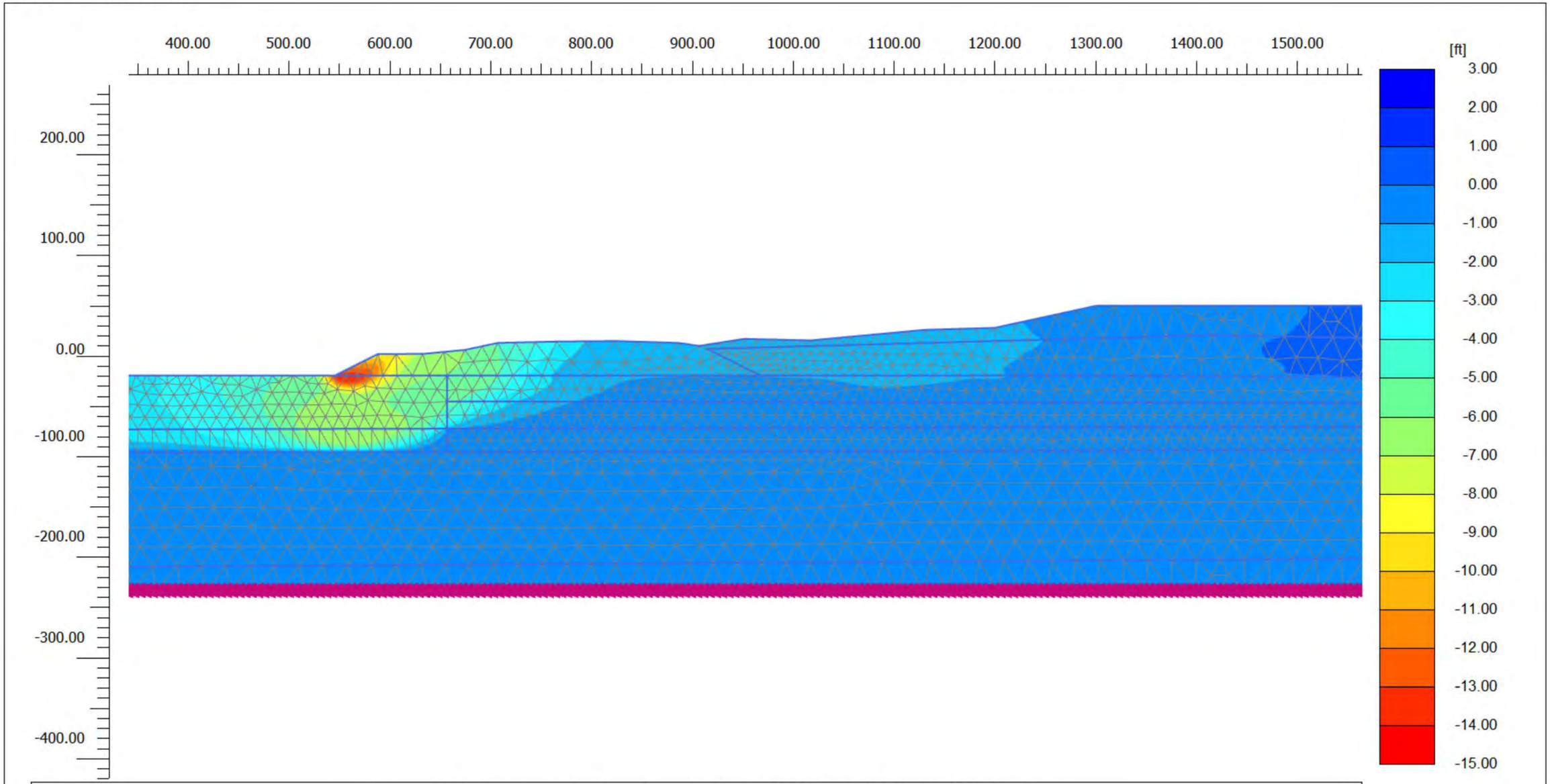
Maximum value = 0.6238 ft (Element 269 at Node 941)

Minimum value = -3.733 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description		Step	Company	Date
Section B-B' - RSN 1011 (Right) Lateral Phase Displacements				11/22/2021
Project filename	Baylands Section B_DE	36802	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 89.98 s)

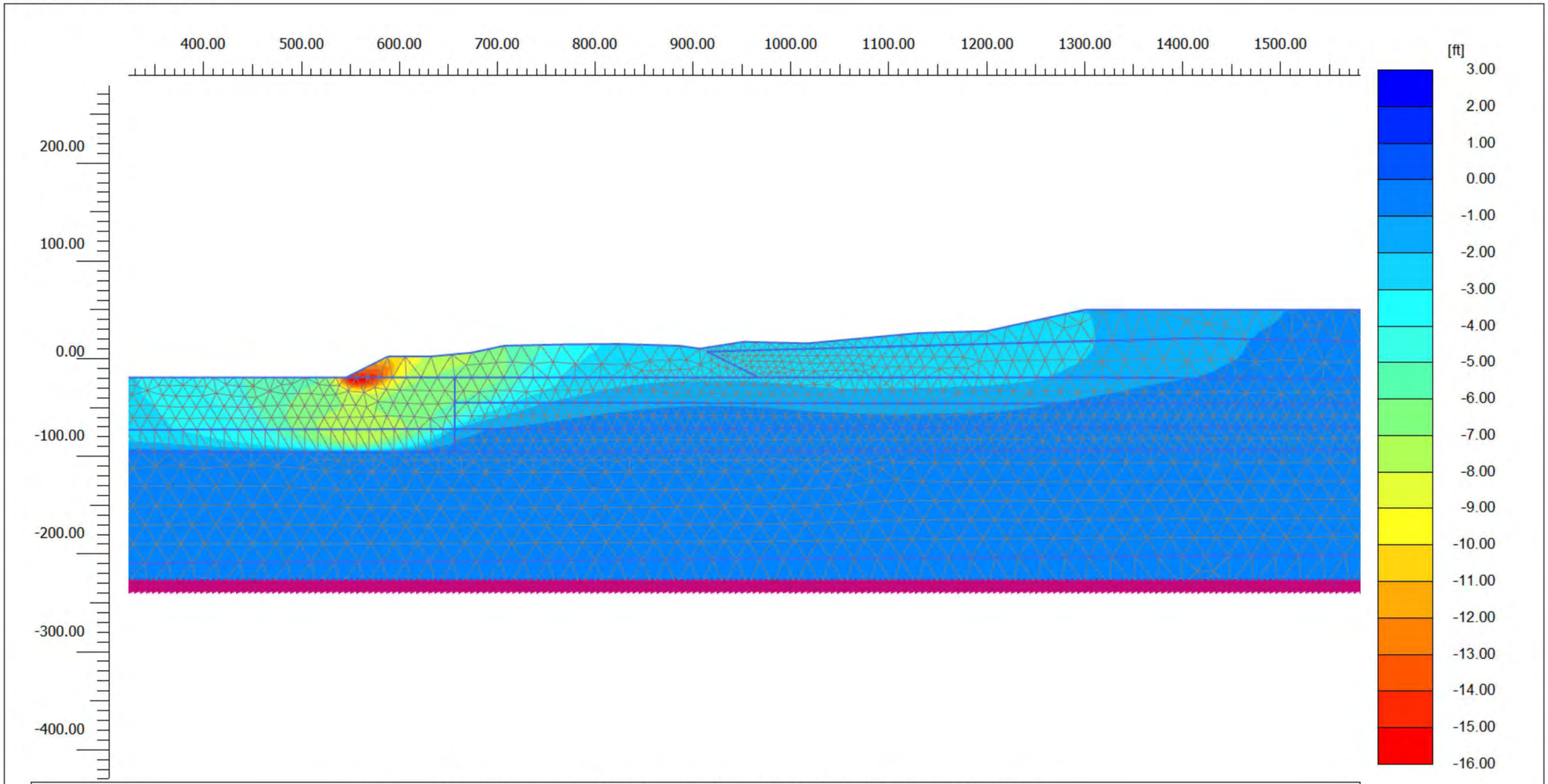
Maximum value = 2.254 ft (Element 269 at Node 942)

Minimum value = -14.00 ft (Element 1990 at Node 40930)

ENGEO
Expect Excellence

Project description			Date
Section B-B' - RSN 1511 (Left) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	45801	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 89.98 s)

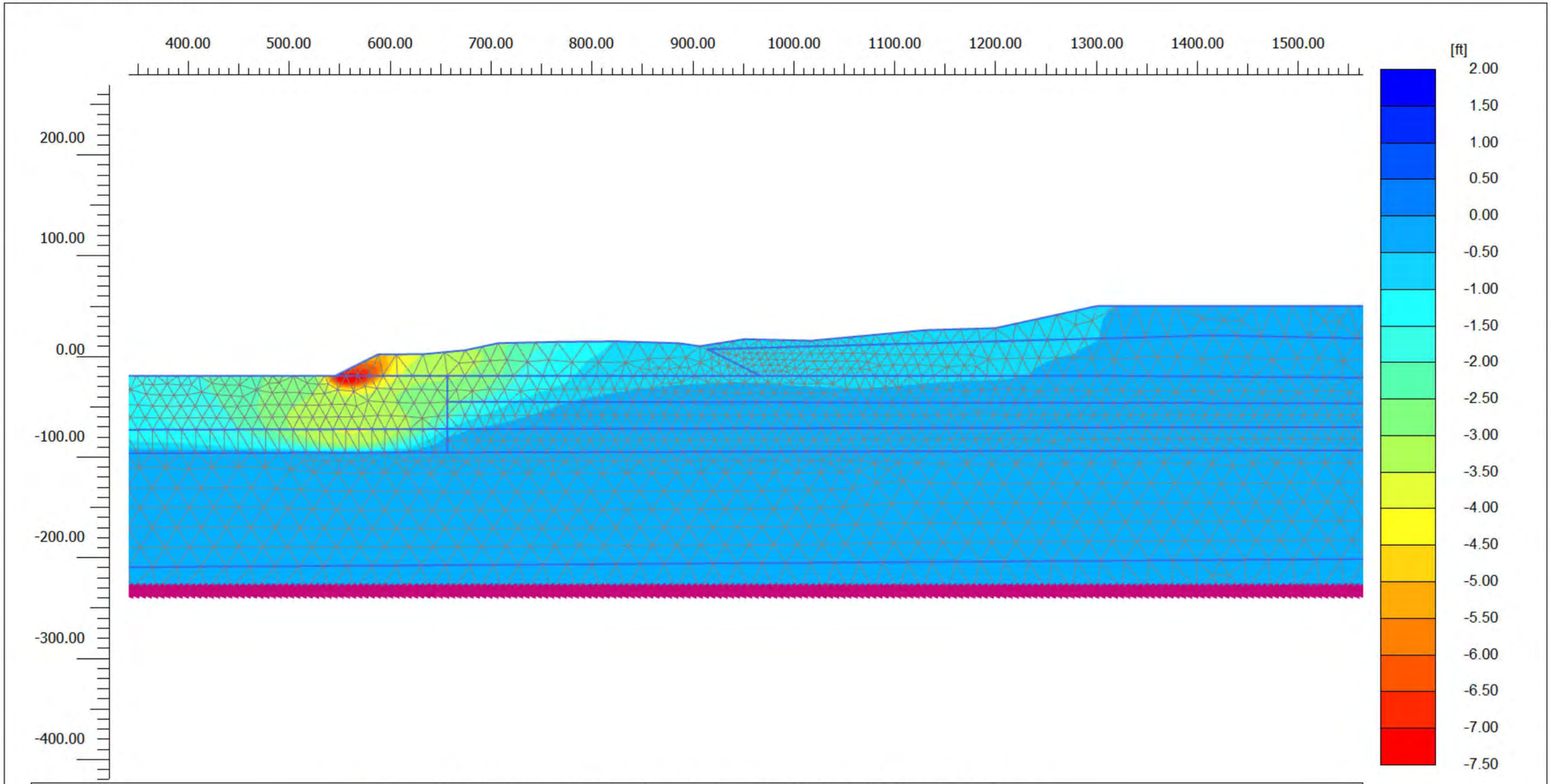
Maximum value = 2.747 ft (Element 269 at Node 942)

Minimum value = -15.36 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description			Date
Section B-B' - RSN 1511 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	54800	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 94.82 s)

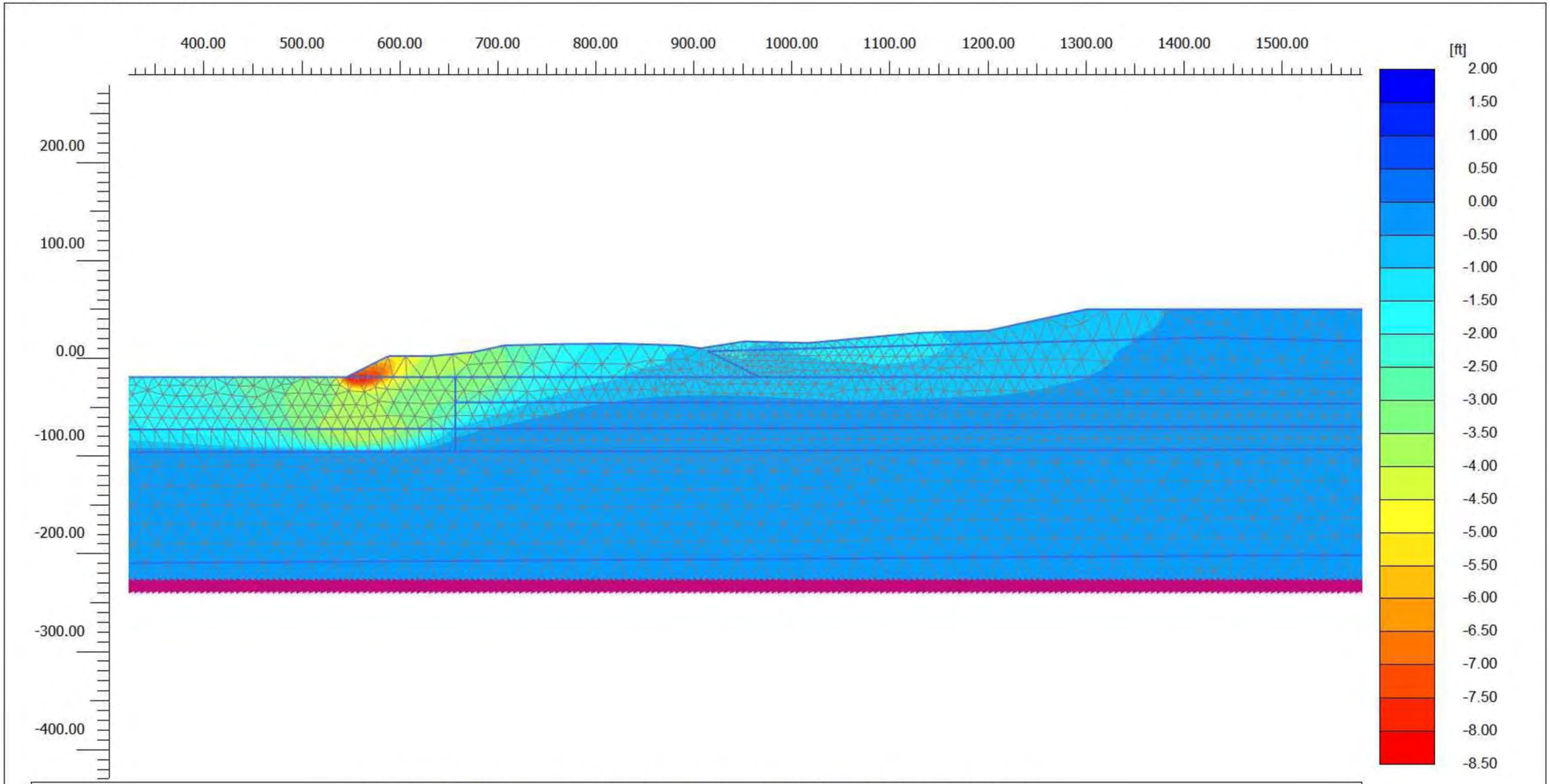
Maximum value = 1.638 ft (Element 361 at Node 434)

Minimum value = -7.462 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description Section B-B' - RSN 1549 (Left) Lateral Phase Displacements			*Date* 11/22/2021
Project filename Baylands Section B_DE	*Step* 64283	*Company* ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 94.82 s)

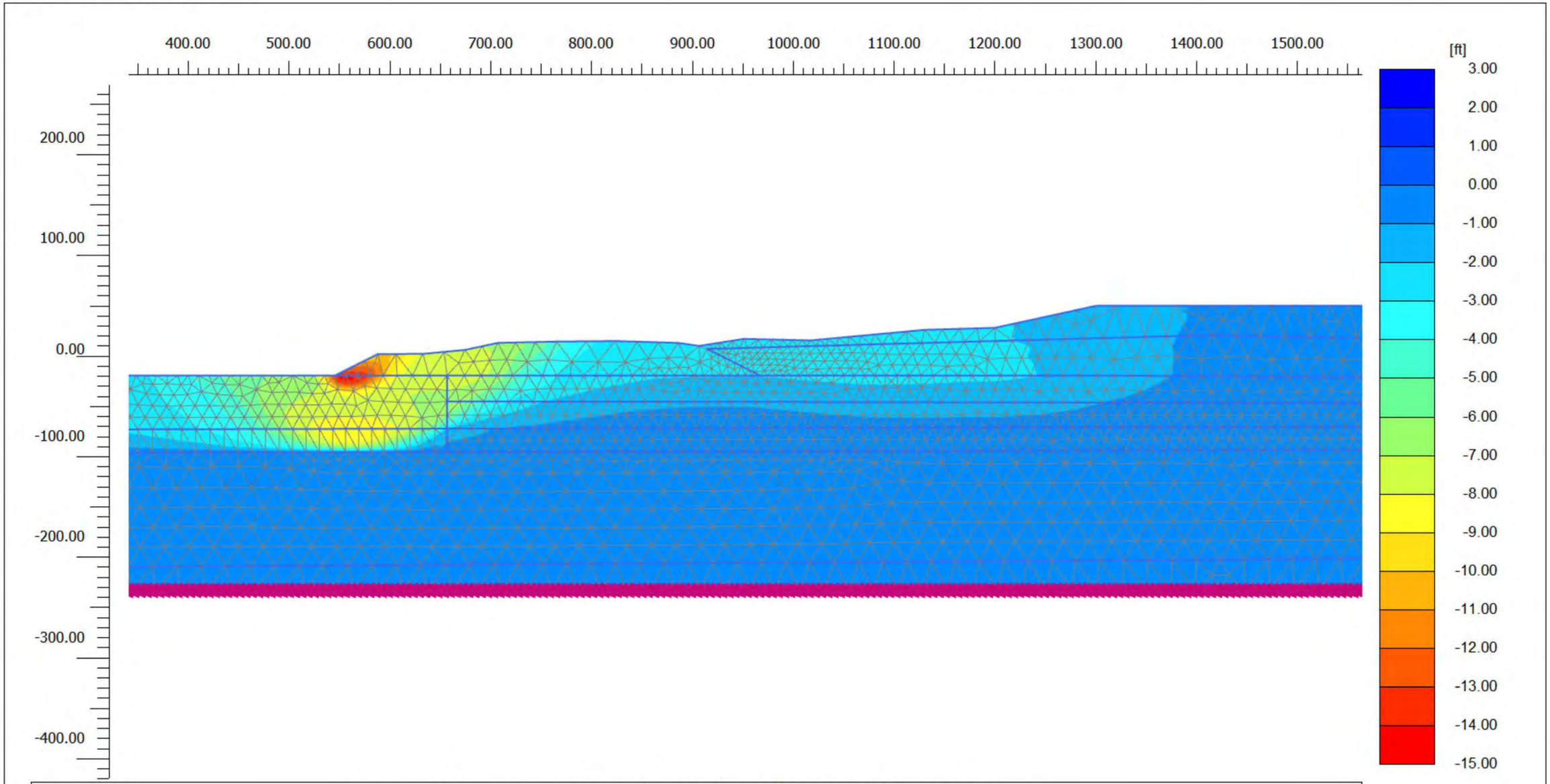
Maximum value = 1.796 ft (Element 368 at Node 302)

Minimum value = -8.029 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description			Date
Section B-B' - RSN 1549 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	73766	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 59.31 s)

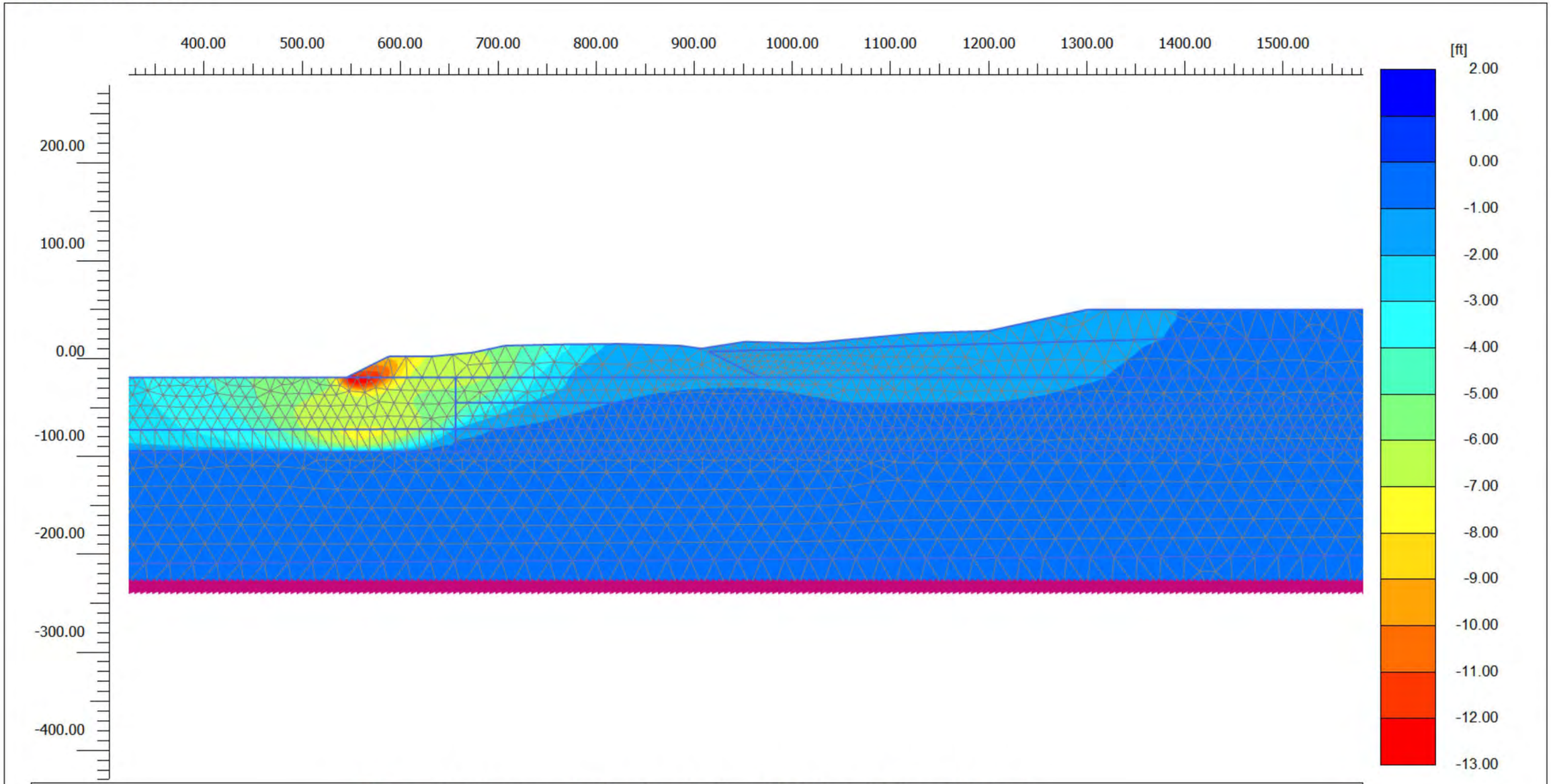
Maximum value = 2.196 ft (Element 269 at Node 942)

Minimum value = -14.22 ft (Element 1993 at Node 40940)

ENGEO
Expect Excellence

Project description Section B-B' - RSN 1633 (Left) Lateral Phase Displacements			*Date* 11/22/2021
Project filename Baylands Section B_DE	*Step* 79698	*Company* ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 59.31 s)

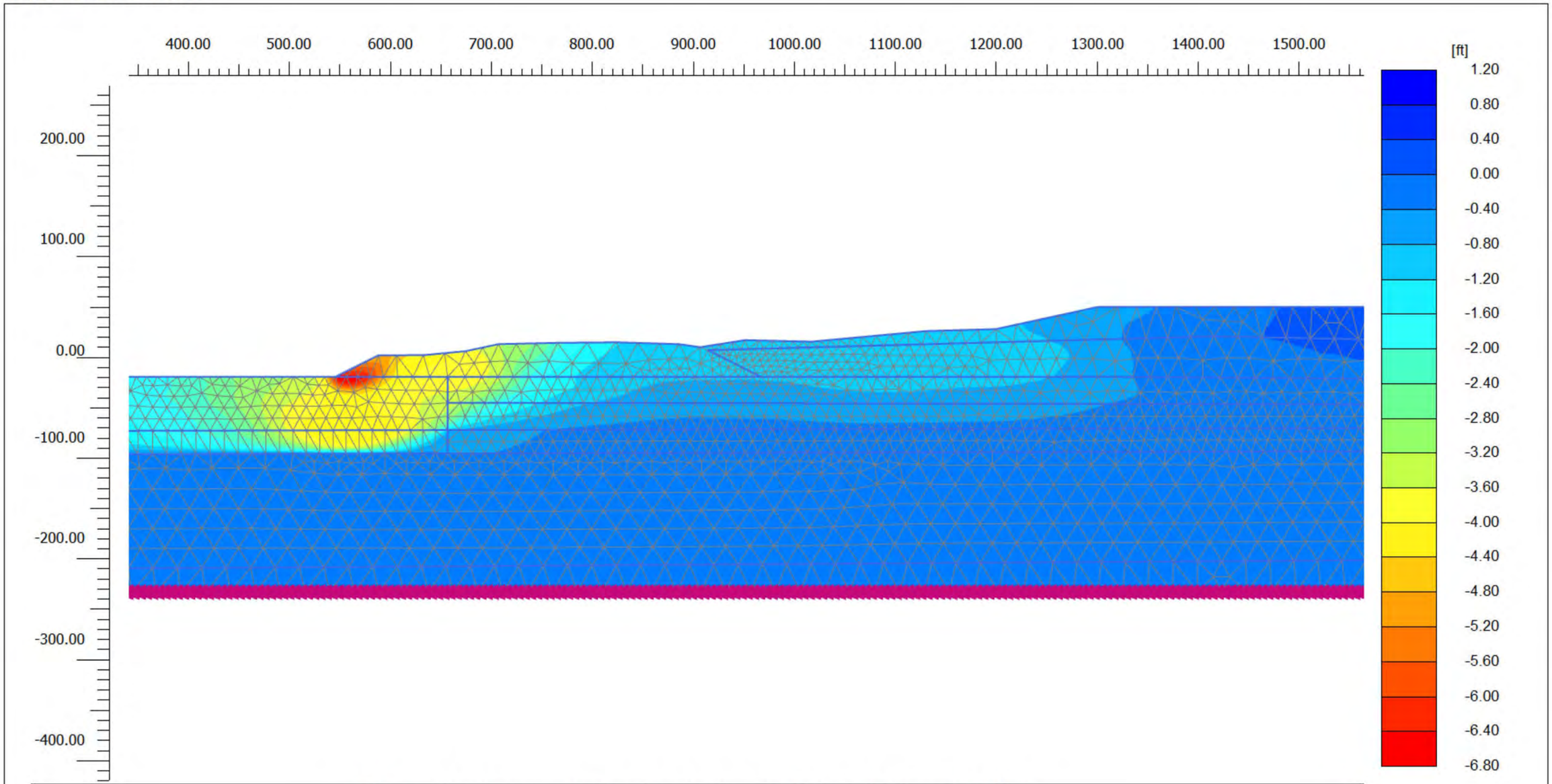
Maximum value = 1.935 ft (Element 128 at Node 8003)

Minimum value = -12.54 ft (Element 1990 at Node 40930)

ENGEO Expect Excellence

Project description			Date
Section B-B' - RSN 1633 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	85630	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 55.64 s)

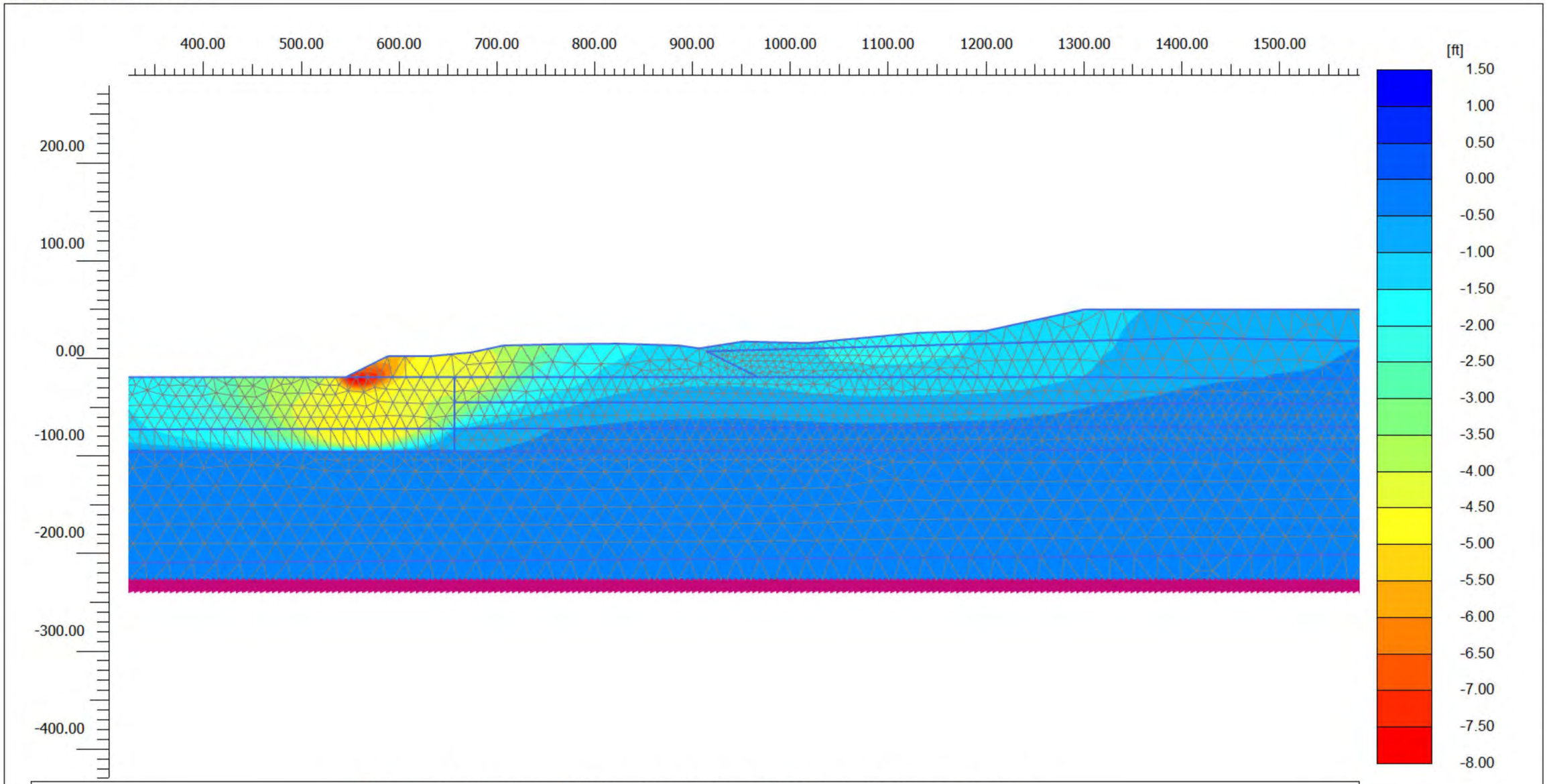
Maximum value = 1.133 ft (Element 20 at Node 8253)

Minimum value = -6.651 ft (Element 1993 at Node 40940)

ENGEO
Expect Excellence

Project description Section B-B' - RSN 1787 (Left) Lateral Phase Displacements			*Date* 11/22/2021
Project filename Baylands Section B_DE	*Step* 91195	*Company* ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 10.0 times) (Time 55.64 s)

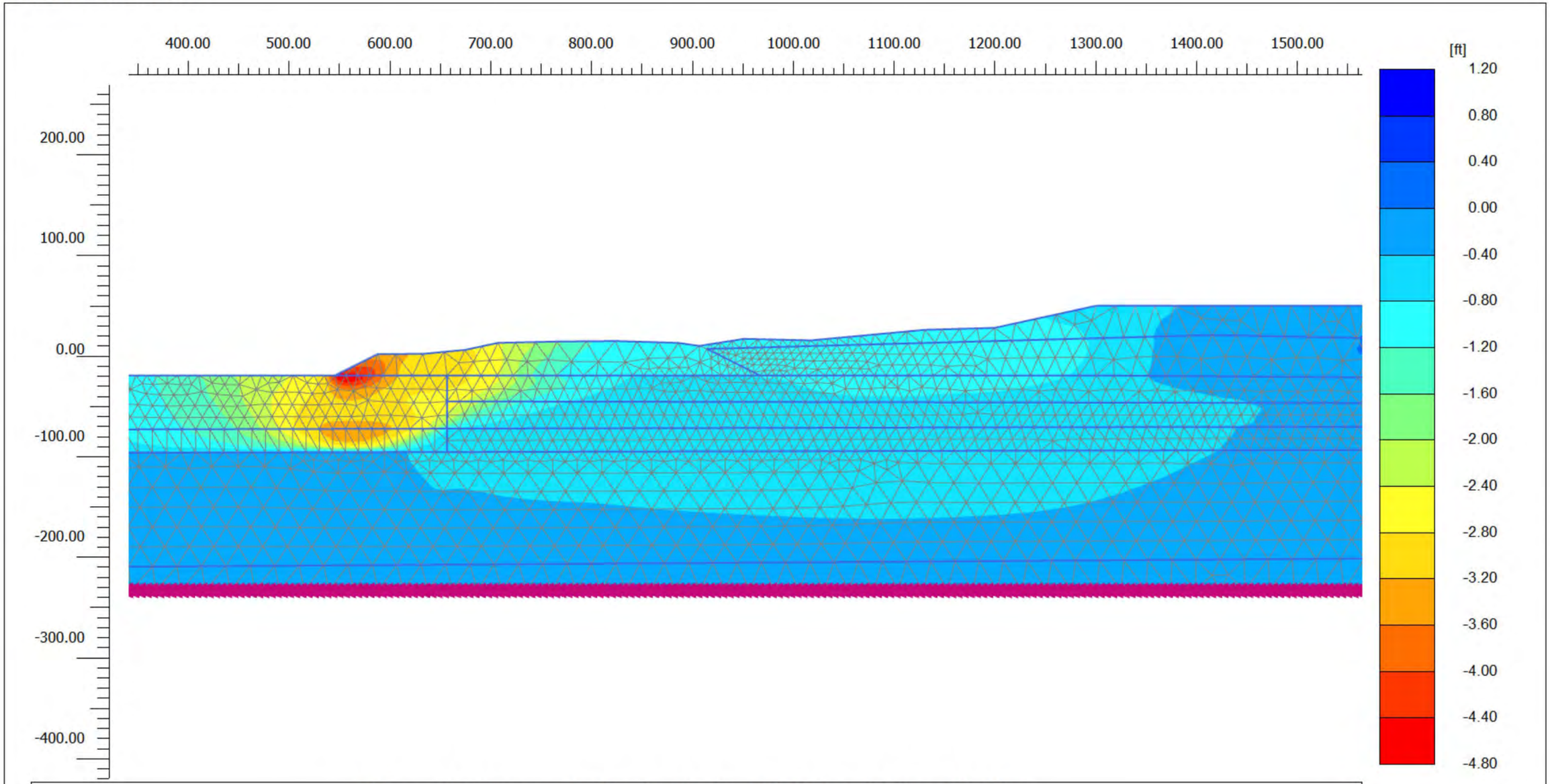
Maximum value = 1.103 ft (Element 331 at Node 927)

Minimum value = -7.641 ft (Element 1990 at Node 40930)

ENGEO
Expect Excellence

Project description			Date
Section B-B' - RSN 1787 (Right) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	96760	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 56.44 s)

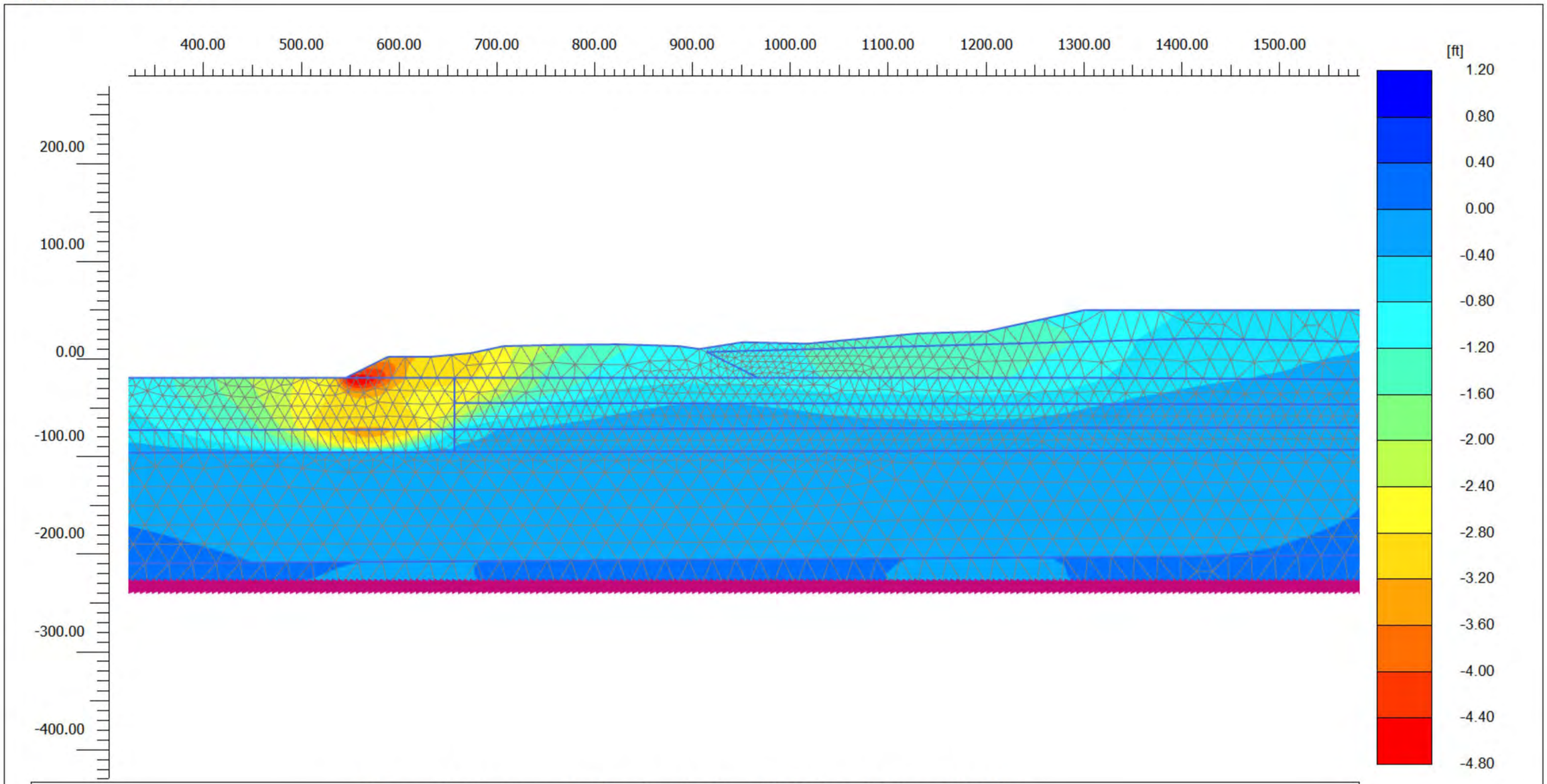
Maximum value = 1.149 ft (Element 354 at Node 654)

Minimum value = -4.612 ft (Element 394 at Node 40937)

ENGEO Expect Excellence

Project description			Date
Section B-B' - RSN 3548 (Left) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	102405	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 56.44 s)

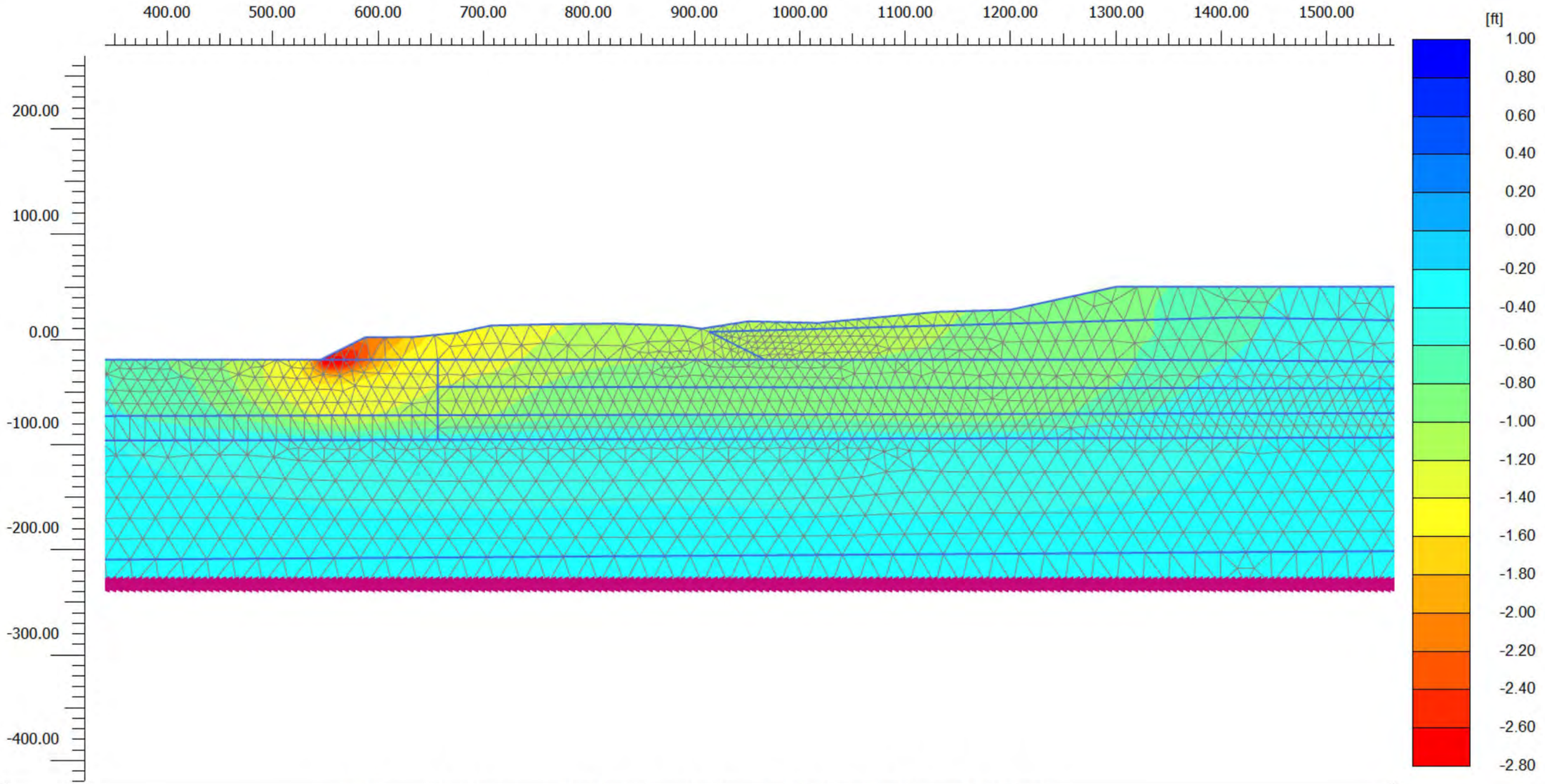
Maximum value = 0.9164 ft (Element 361 at Node 436)

Minimum value = -4.665 ft (Element 394 at Node 40937)

ENGEO Expect Excellence

Project description		Date
Section B-B' - RSN 3548 (Right) Lateral Phase Displacements		11/22/2021
Project filename	**Step**	**Company**
Baylands Section B_DE	108050	ENGEO

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 98.19 s)

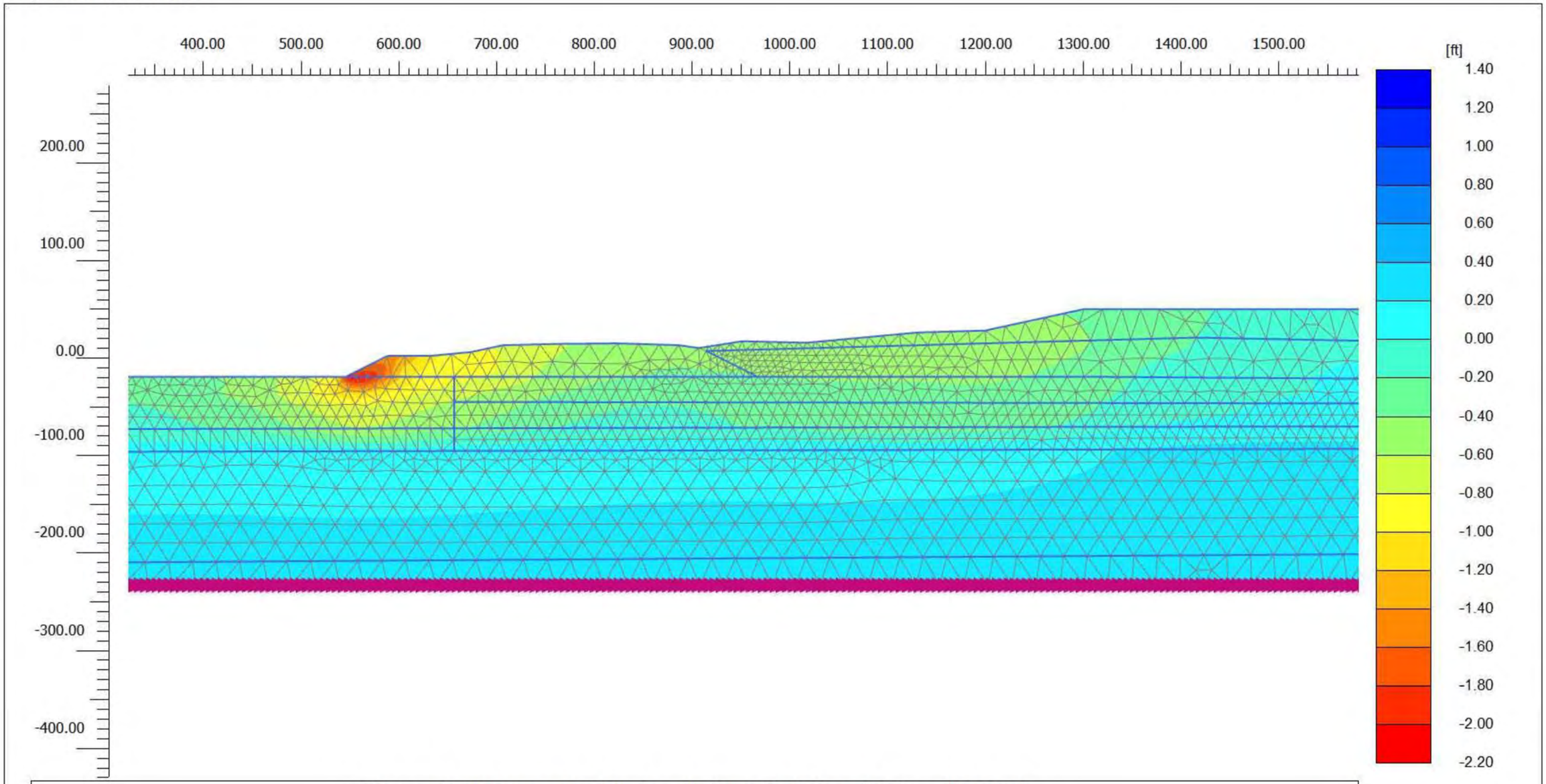
Maximum value = 0.9058 ft (Element 354 at Node 654)

Minimum value = -2.795 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description Section B-B' - RSN 3954 (Left) Lateral Phase Displacements			*Date* 11/22/2021
Project filename Baylands Section B_DE	*Step* 122587	*Company* ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 20.0 times) (Time 98.19 s)

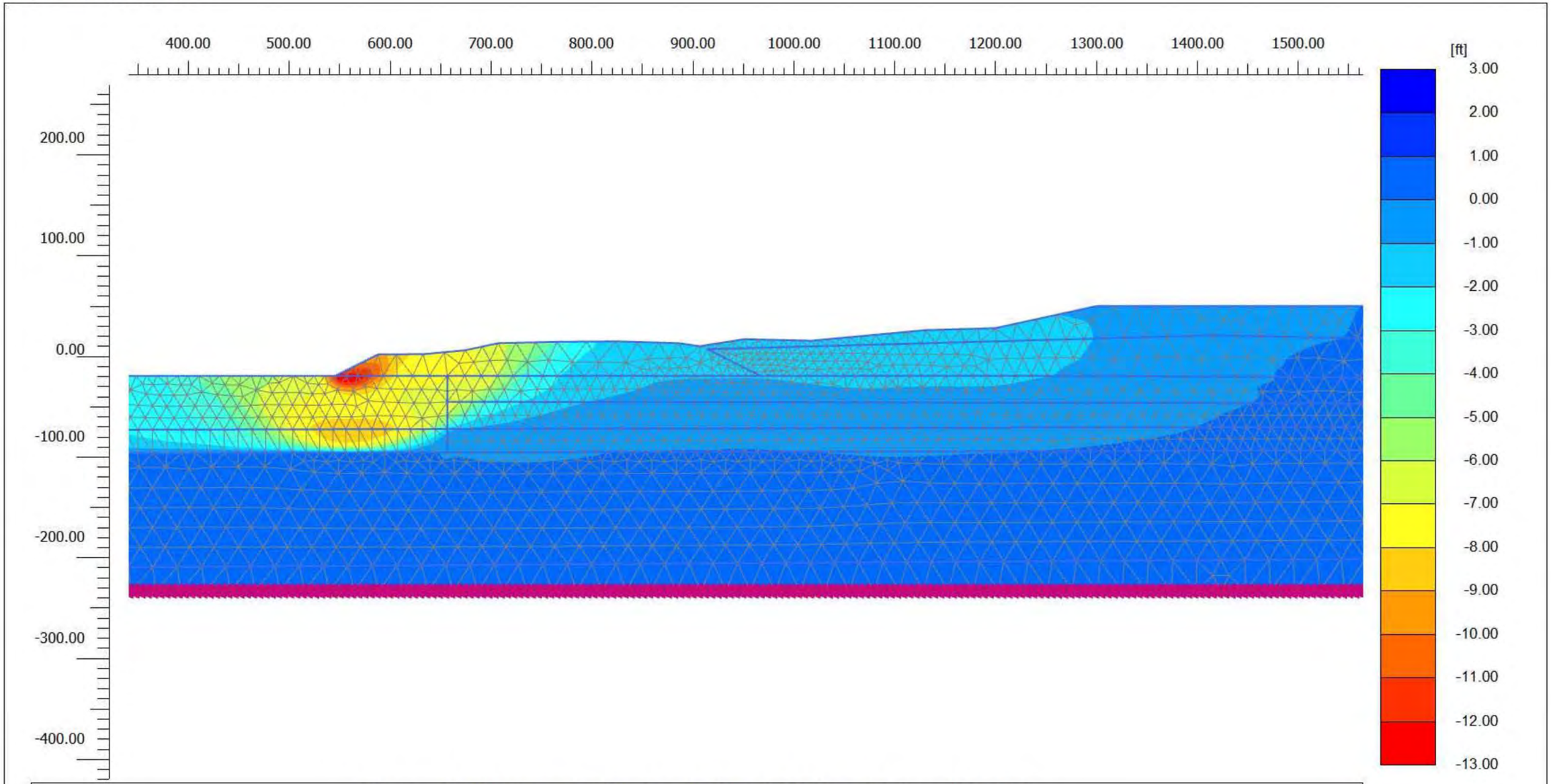
Maximum value = 1.354 ft (Element 269 at Node 941)

Minimum value = -2.082 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description			Date
Section B-B' - RSN 3954 (Right) Lateral Phase Displacements			11/22/2021
Project filename	Step	Company	
Baylands Section B_DE	127497	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 98.03 s)

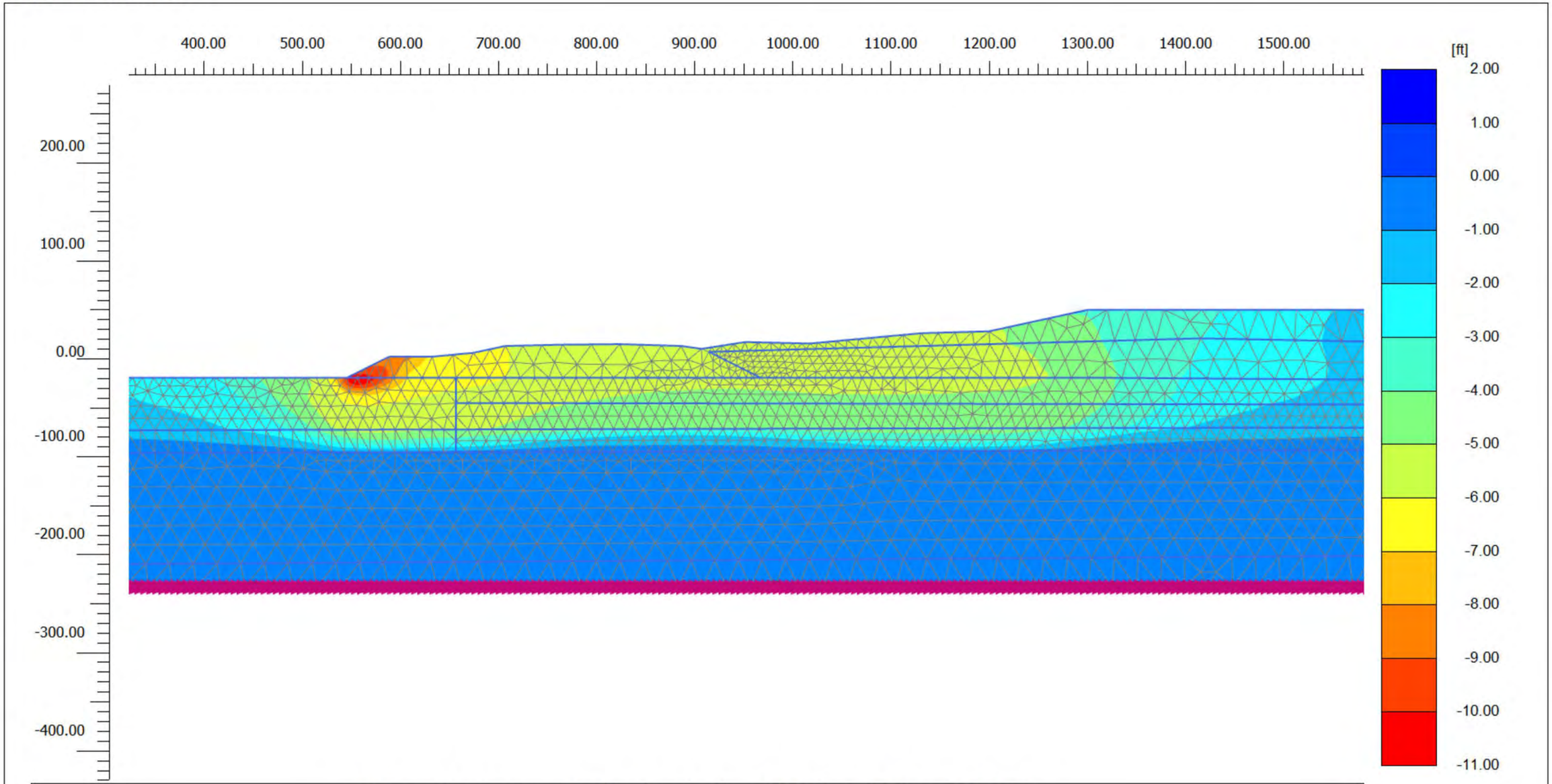
Maximum value = 2.173 ft (Element 269 at Node 942)

Minimum value = -12.66 ft (Element 1990 at Node 40930)

ENGEO
Expect Excellence

Project description			Date
Section B-B' - RSN 5618 (Left) Lateral Phase Displacements			11/22/2021
Project filename	*Step*	*Company*	
Baylands Section B_DE	114379	ENGEO	

Output Version 21.1.0.479



Phase displacements Pu_x (scaled up 5.00 times) (Time 98.03 s)

Maximum value = 1.598 ft (Element 354 at Node 652)

Minimum value = -10.77 ft (Element 394 at Node 40937)

ENGEO
Expect Excellence

Project description		Date
Section B-B' - RSN 5618 (Right) Lateral Phase Displacements		11/22/2021
Project filename	Step	Company
Baylands Section B_DE	133702	ENGEO

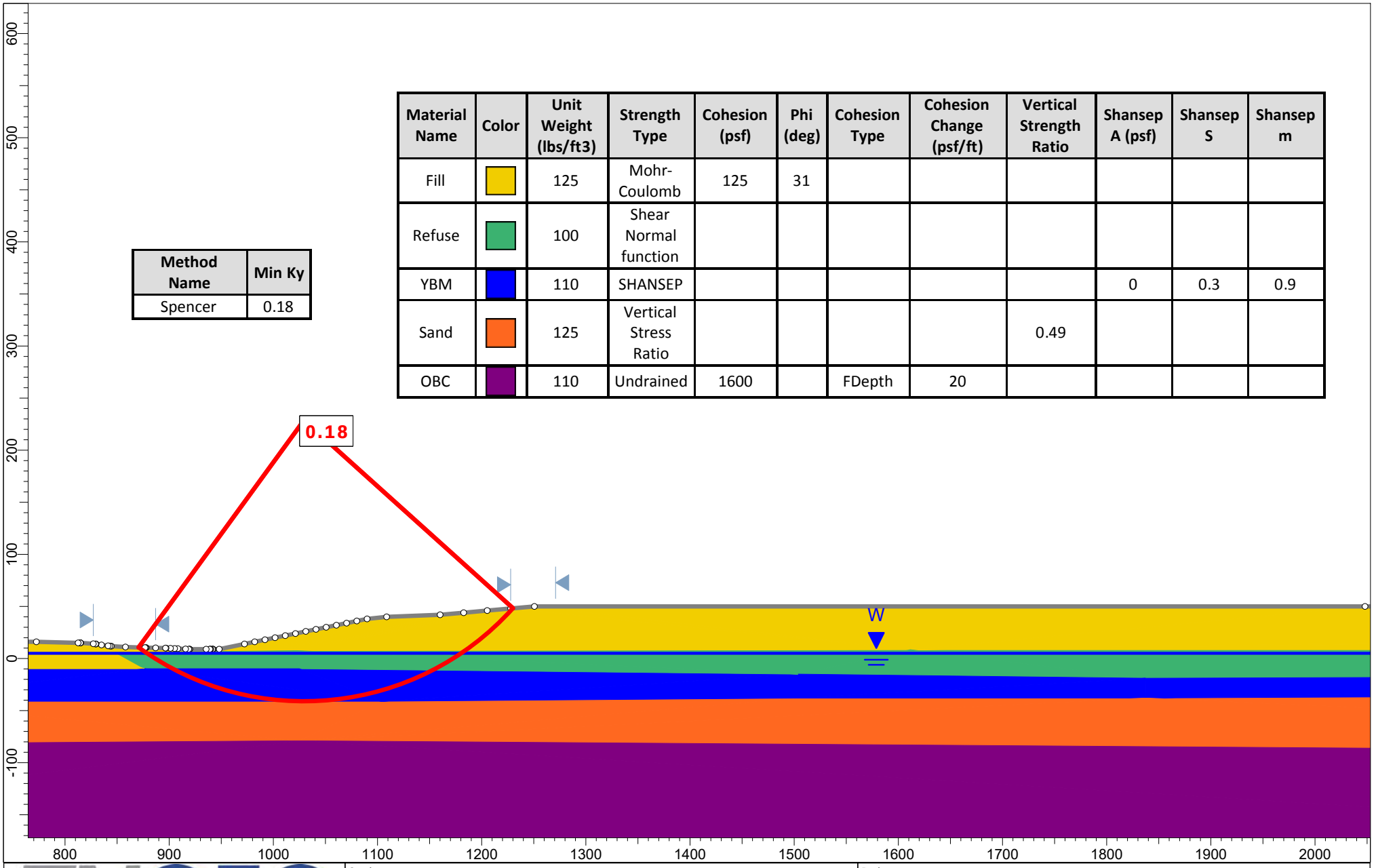


APPENDIX L

PSEUDOSTATIC DEFORMATION ANALYSIS

Method Name	Min Ky
Spencer	0.18

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Vertical Strength Ratio	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31						
Refuse		100	Shear Normal function								
YBM		110	SHANSEP						0	0.3	0.9
Sand		125	Vertical Stress Ratio					0.49			
OBC		110	Undrained	1600		FDepth	20				

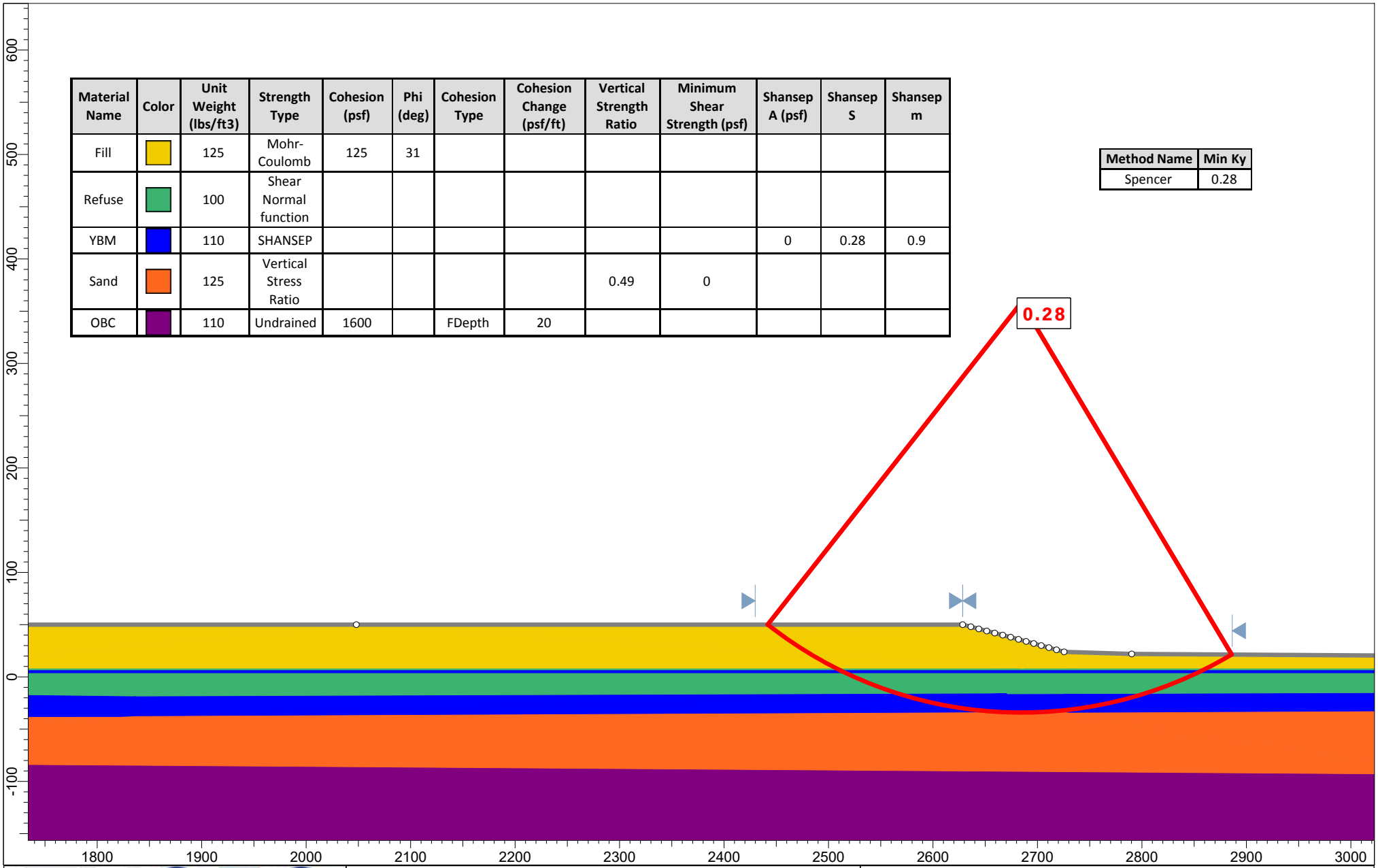


ENGEO Expect Excellence

Section	Cross Section A-A' (East Side)	Project	Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition	Proposed Grade
Author	SOS	Method	Spencer
Date	11/2021	Scale	1:1500
		Project No.	17270.000.002

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Vertical Strength Ratio	Minimum Shear Strength (psf)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31							
Refuse		100	Shear Normal function									
YBM		110	SHANSEP							0	0.28	0.9
Sand		125	Vertical Stress Ratio					0.49	0			
OBC		110	Undrained	1600		FDepth	20					

Method Name	Min Ky
Spencer	0.28

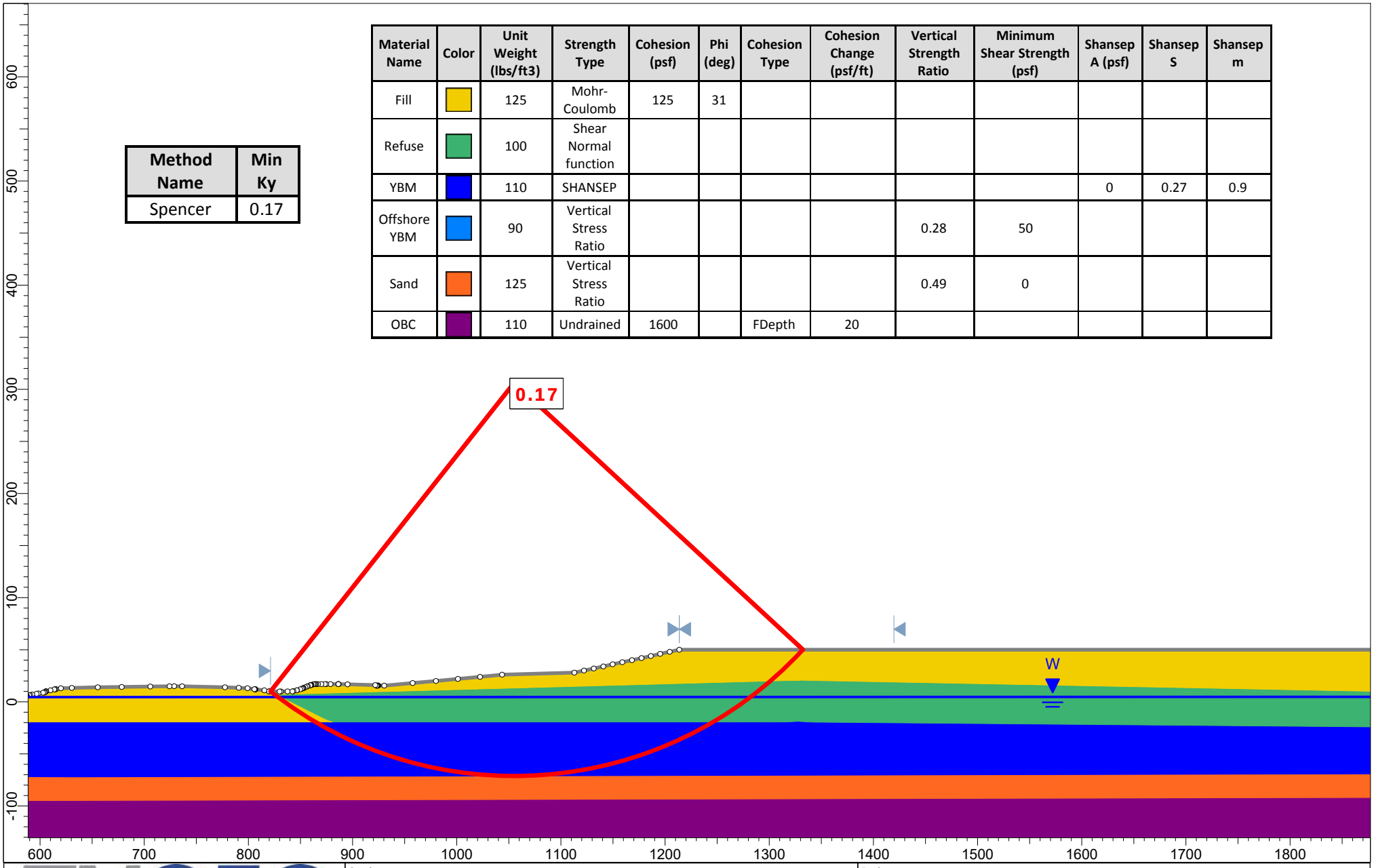


ENGEO Expect Excellence

Section	Cross Section A-A' (West Side)		Project: Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Method Name	Min Ky
Spencer	0.17

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Vertical Strength Ratio	Minimum Shear Strength (psf)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31							
Refuse		100	Shear Normal function									
YBM		110	SHANSEP							0	0.27	0.9
Offshore YBM		90	Vertical Stress Ratio					0.28	50			
Sand		125	Vertical Stress Ratio					0.49	0			
OBC		110	Undrained	1600		FDepth	20					

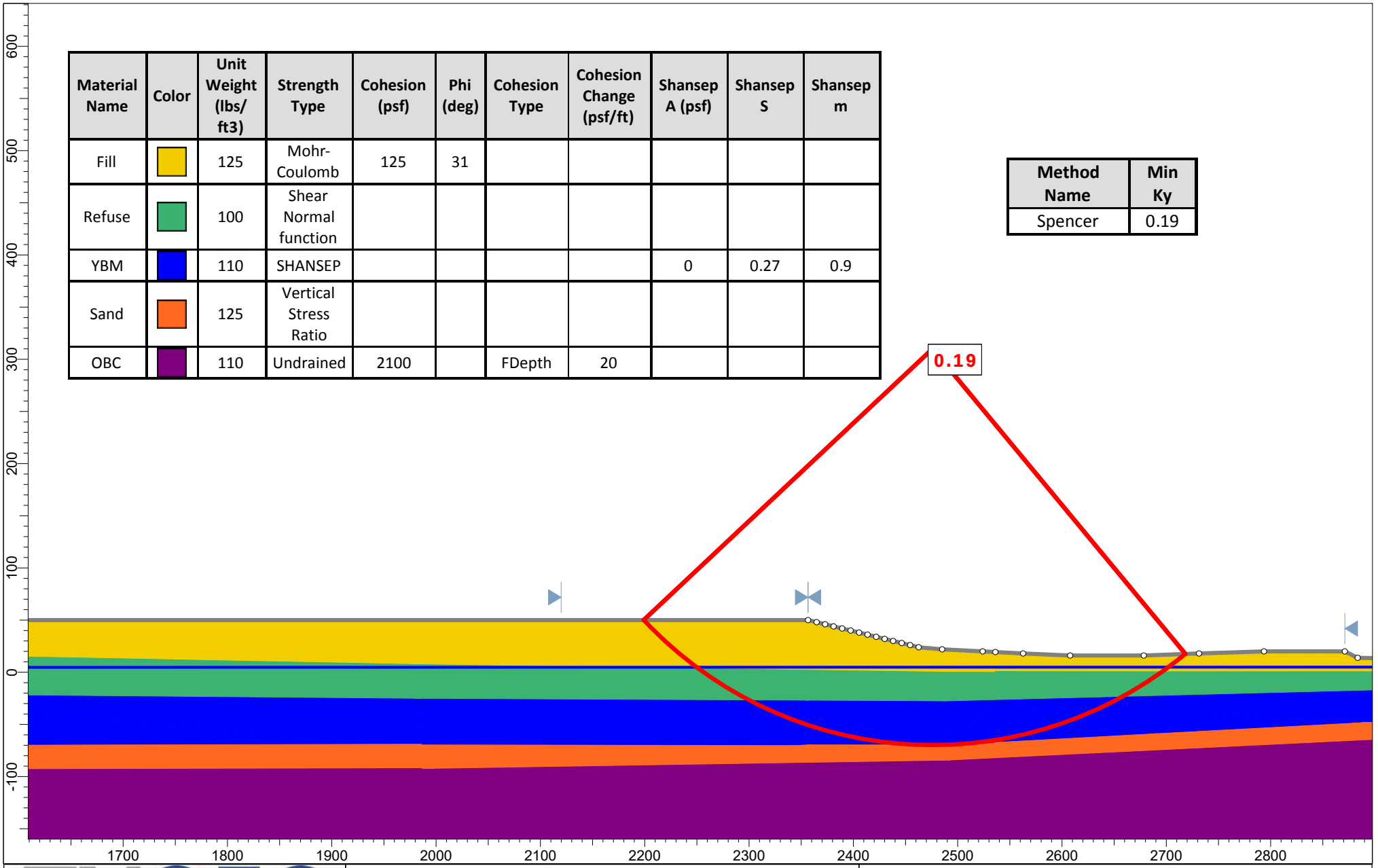


ENGEO Expect Excellence

Section	Cross Section B-B' (East Side)		Project: Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.27	0.9
Sand		125	Vertical Stress Ratio							
OBC		110	Undrained	2100		FDepth	20			

Method Name	Min Ky
Spencer	0.19

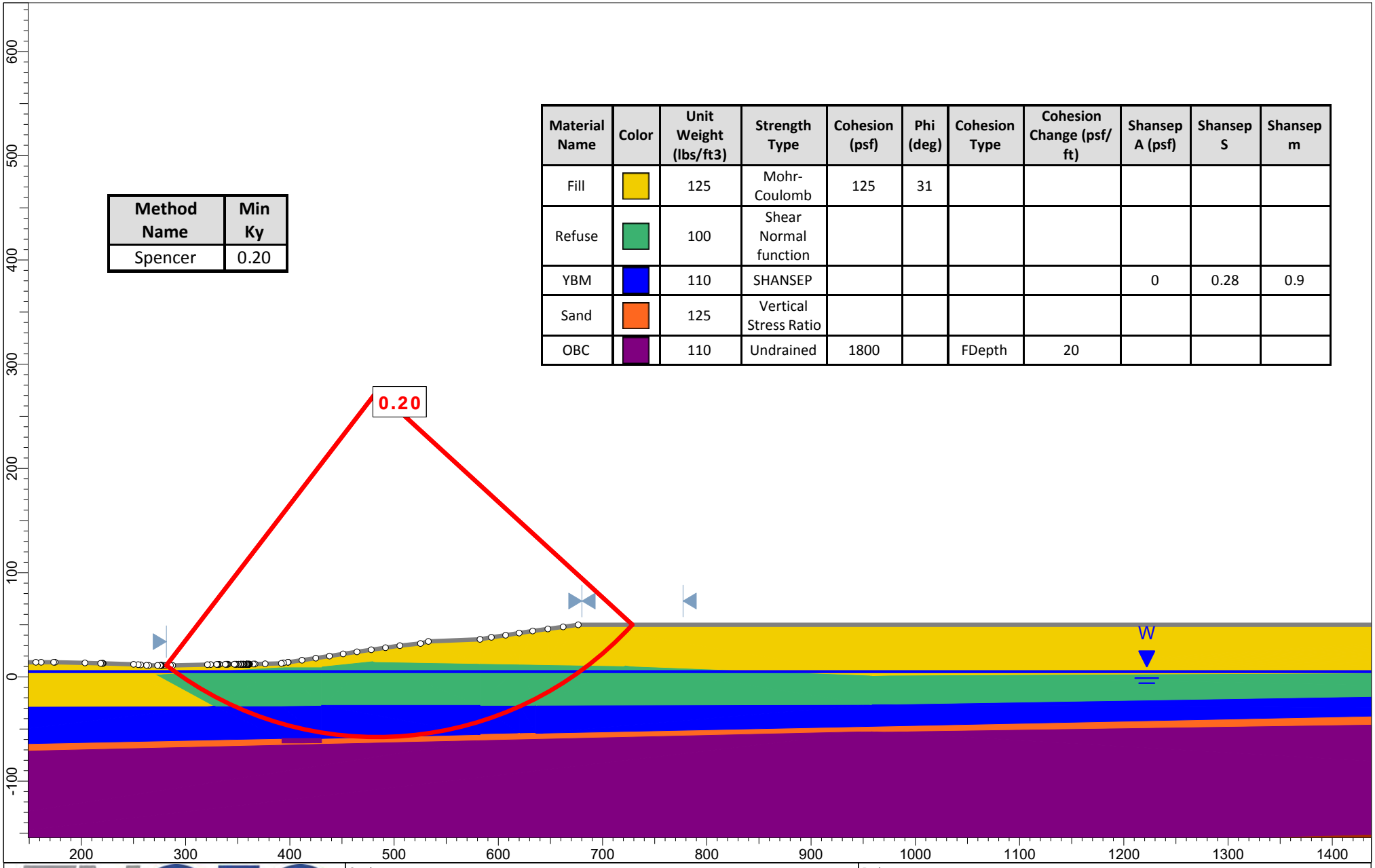


ENGEO Expect Excellence

Section	Cross Section B-B' (West Side)		Project: Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	8/13/2021	Scale: 1:1500	

Method Name	Min Ky
Spencer	0.20

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.28	0.9
Sand		125	Vertical Stress Ratio							
OBC		110	Undrained	1800		FDepth	20			

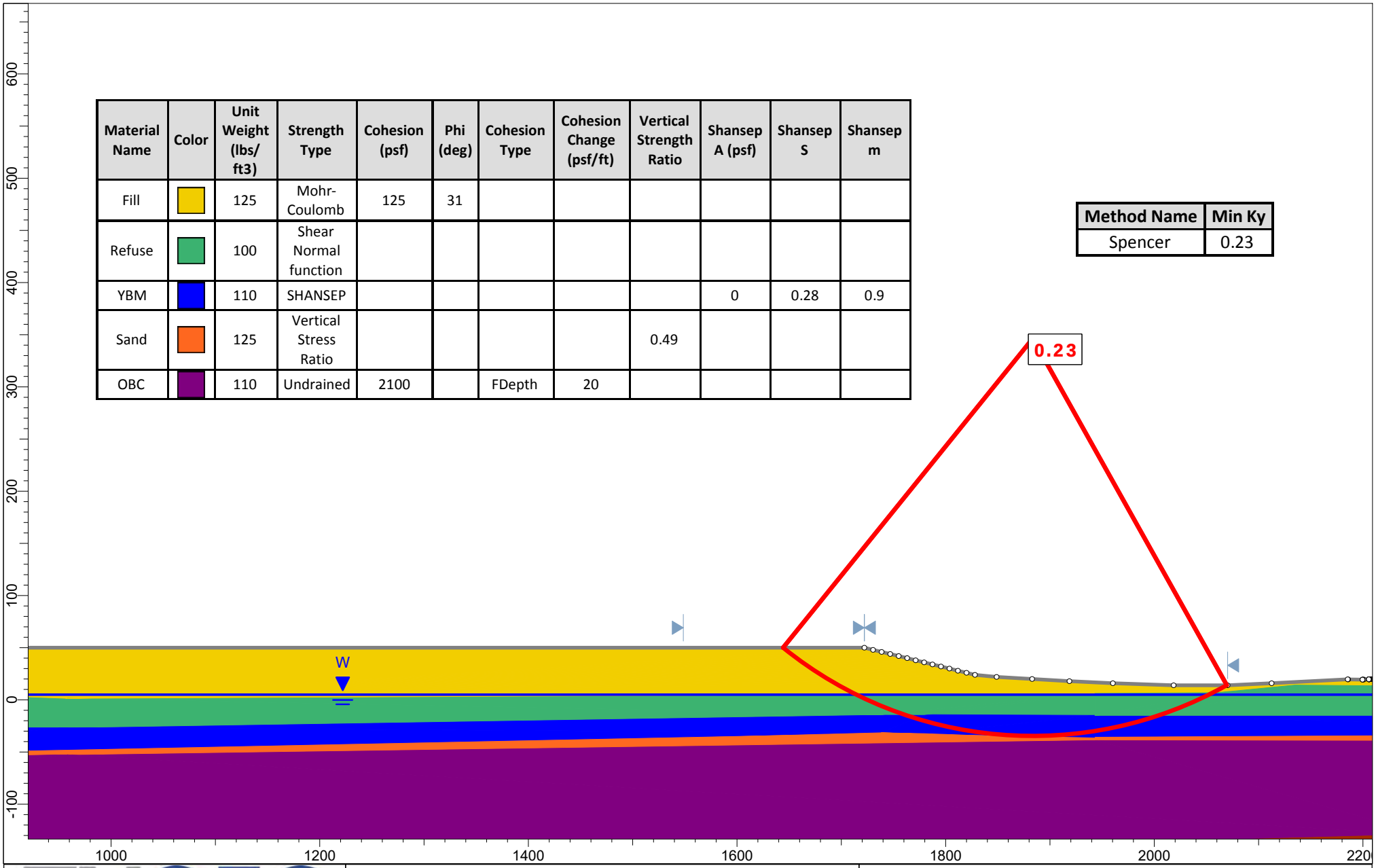


ENGEO Expect Excellence

Section	Cross Section C-C' (East Side)	Project	Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition	Proposed Grade
Author	SOS	Method	Spencer
Date	11/2021	Scale	1:1500
		Project No.	17270.000.002

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Vertical Strength Ratio	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31						
Refuse		100	Shear Normal function								
YBM		110	SHANSEP						0	0.28	0.9
Sand		125	Vertical Stress Ratio					0.49			
OBC		110	Undrained	2100		FDepth	20				

Method Name	Min Ky
Spencer	0.23

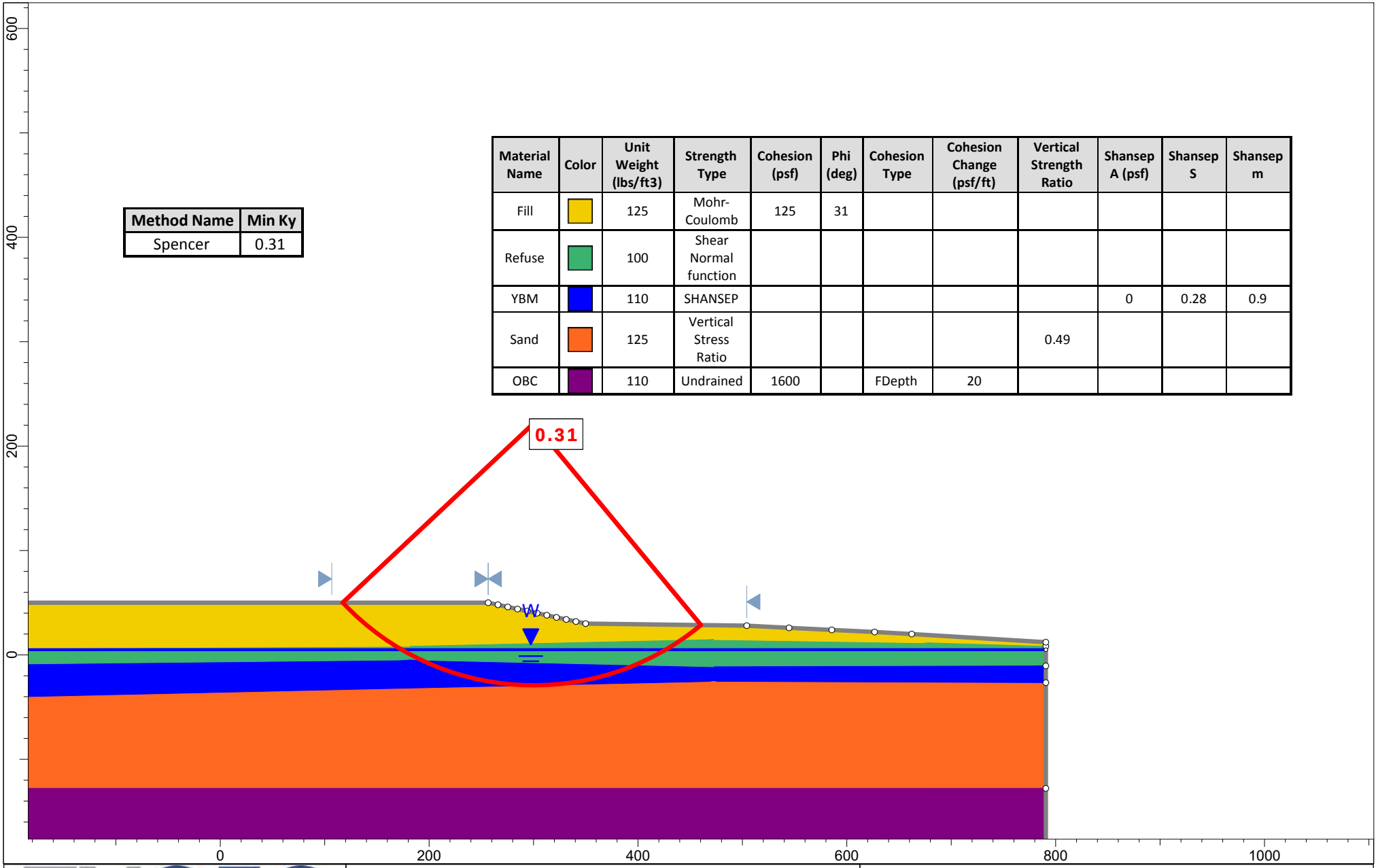


ENGEO Expect Excellence

Section	Cross Section C-C' (West Side)		Project: Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Method Name	Min Ky
Spencer	0.31

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Vertical Strength Ratio	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31						
Refuse		100	Shear Normal function								
YBM		110	SHANSEP						0	0.28	0.9
Sand		125	Vertical Stress Ratio					0.49			
OBC		110	Undrained	1600		FDepth	20				

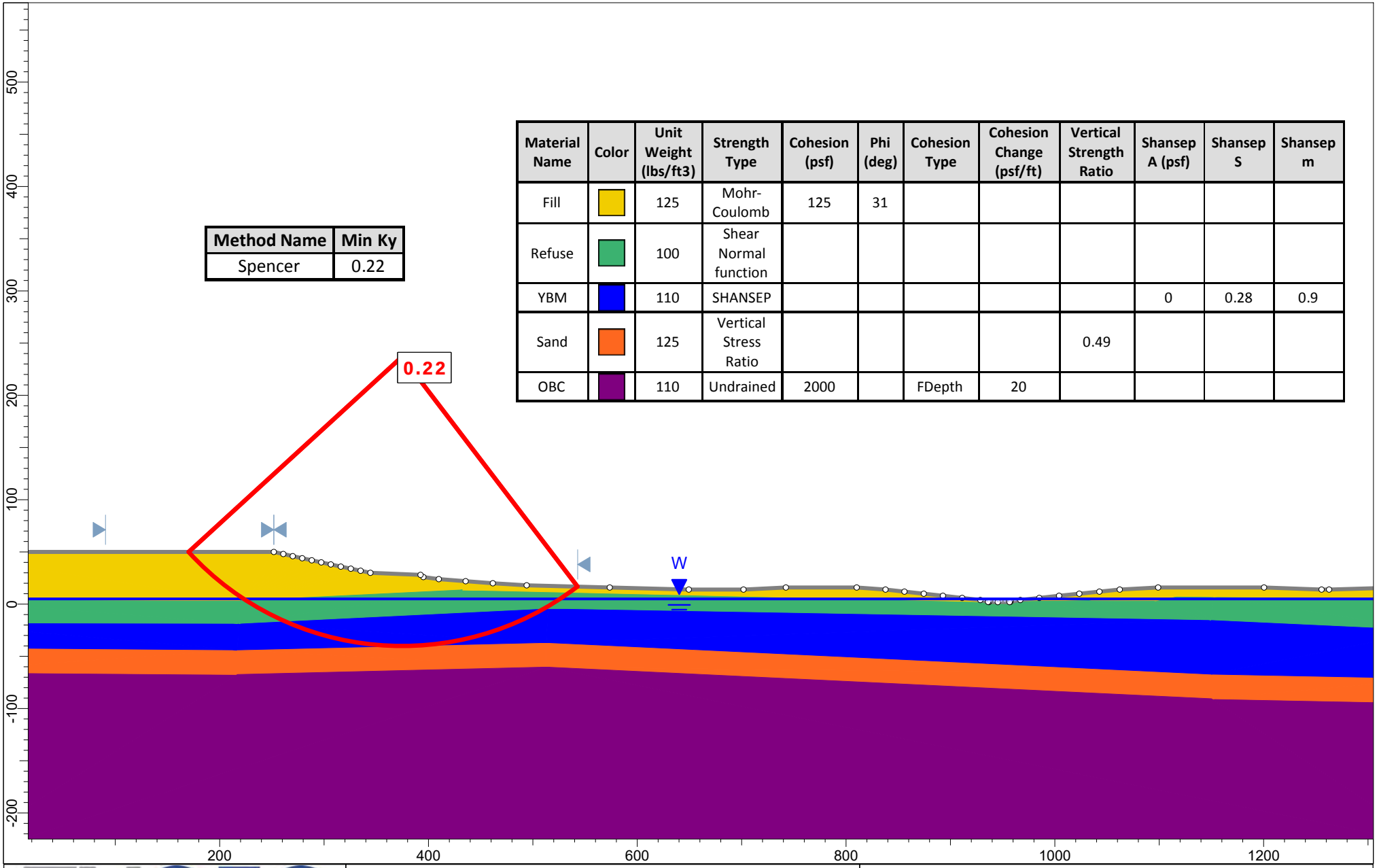


ENGEO Expect Excellence

Section	Cross Section D-D'		Project: Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Method Name	Min Ky
Spencer	0.22

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Vertical Strength Ratio	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31						
Refuse		100	Shear Normal function								
YBM		110	SHANSEP						0	0.28	0.9
Sand		125	Vertical Stress Ratio					0.49			
OBC		110	Undrained	2000		FDepth	20				

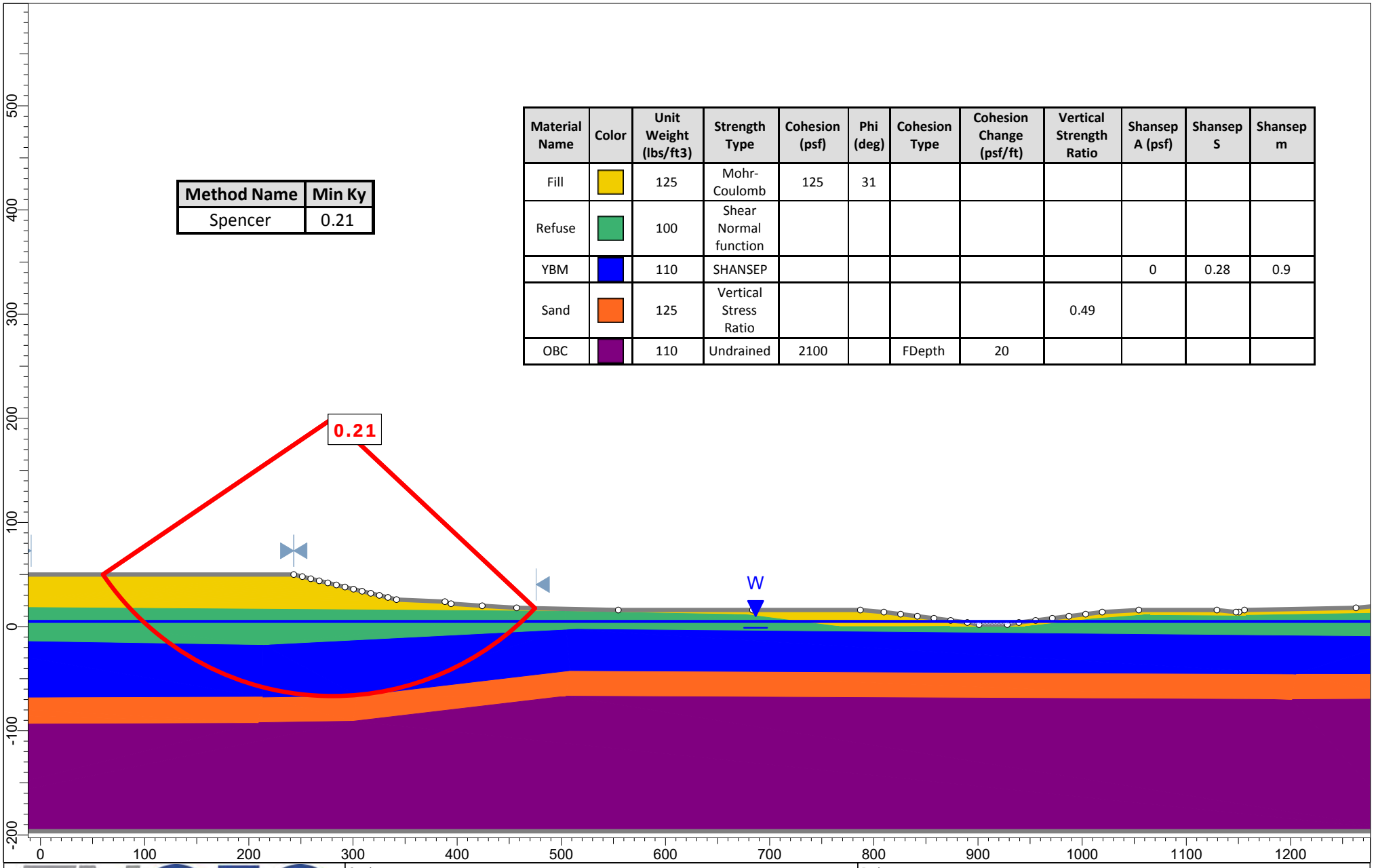


ENGEO Expect Excellence

Section	Cross Section E-E'	Project	Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition	Proposed Grade
Author	SOS	Method	Spencer
Date	11/2021	Scale	1:1500
		Project No.	17270.000.002

Method Name	Min Ky
Spencer	0.21

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Vertical Strength Ratio	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31						
Refuse		100	Shear Normal function								
YBM		110	SHANSEP						0	0.28	0.9
Sand		125	Vertical Stress Ratio					0.49			
OBC		110	Undrained	2100		FDepth	20				

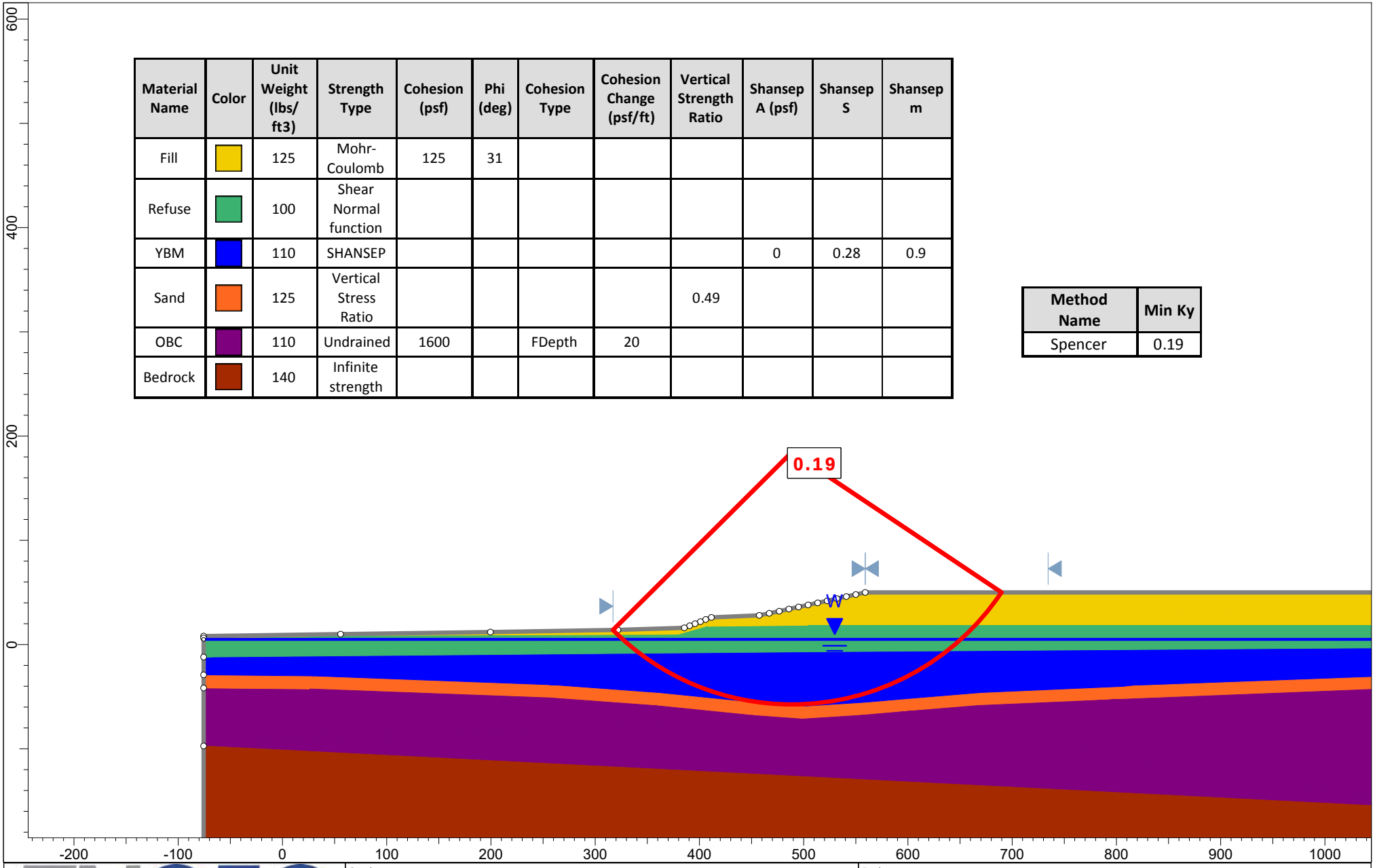


ENGEO Expect Excellence

Section	Cross Section F-F'		Project: Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Vertical Strength Ratio	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31						
Refuse		100	Shear Normal function								
YBM		110	SHANSEP						0	0.28	0.9
Sand		125	Vertical Stress Ratio					0.49			
OBC		110	Undrained	1600		FDepth	20				
Bedrock		140	Infinite strength								

Method Name	Min Ky
Spencer	0.19



ENGEO Expect Excellence

Section	Cross Section G-G'		Project: Brisbane Baylands Landfill
Analysis	Pseudo-Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

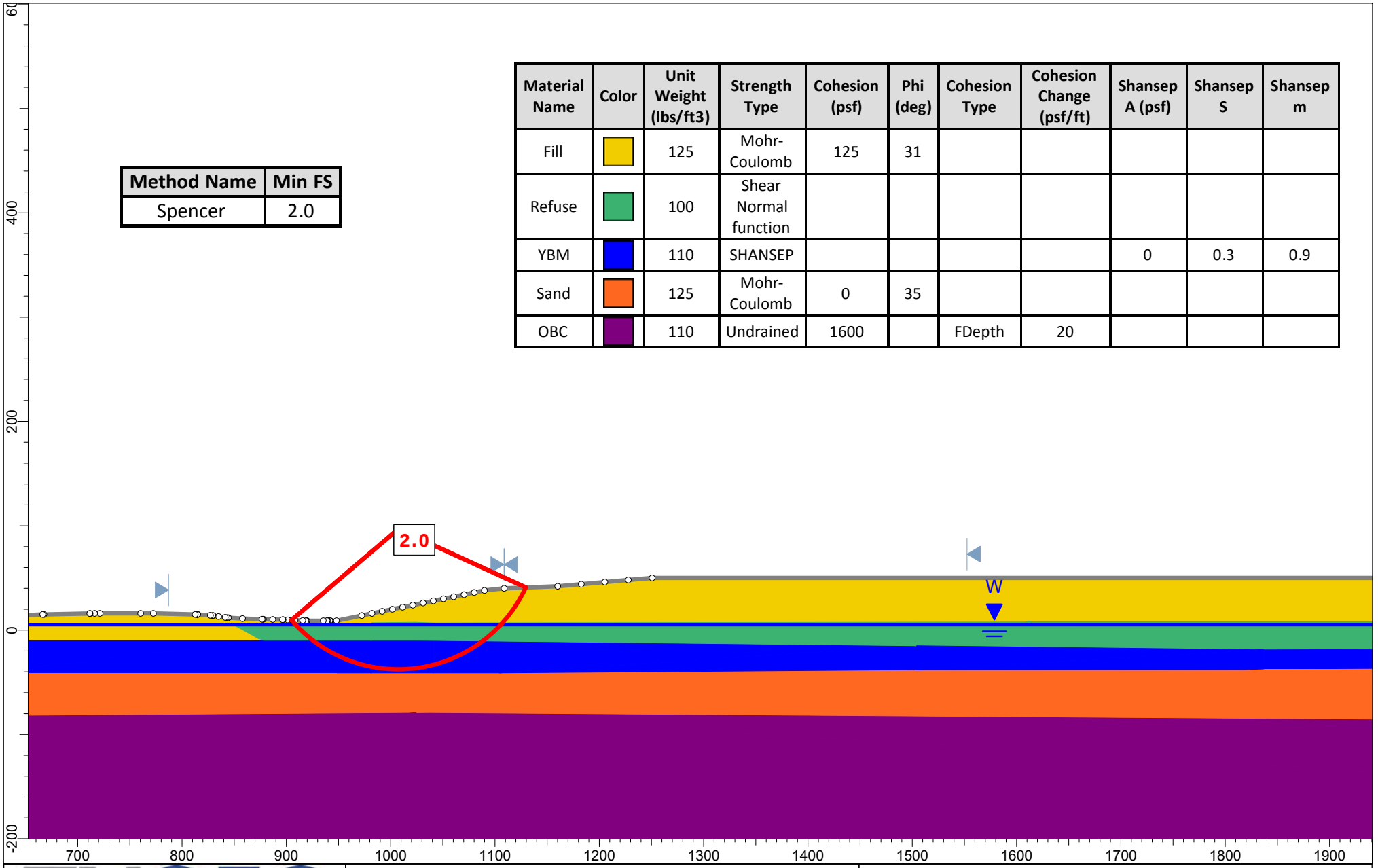


APPENDIX M

STATIC DEFORMATION ANALYSIS

Method Name	Min FS
Spencer	2.0

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.3	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	1600		FDepth	20			

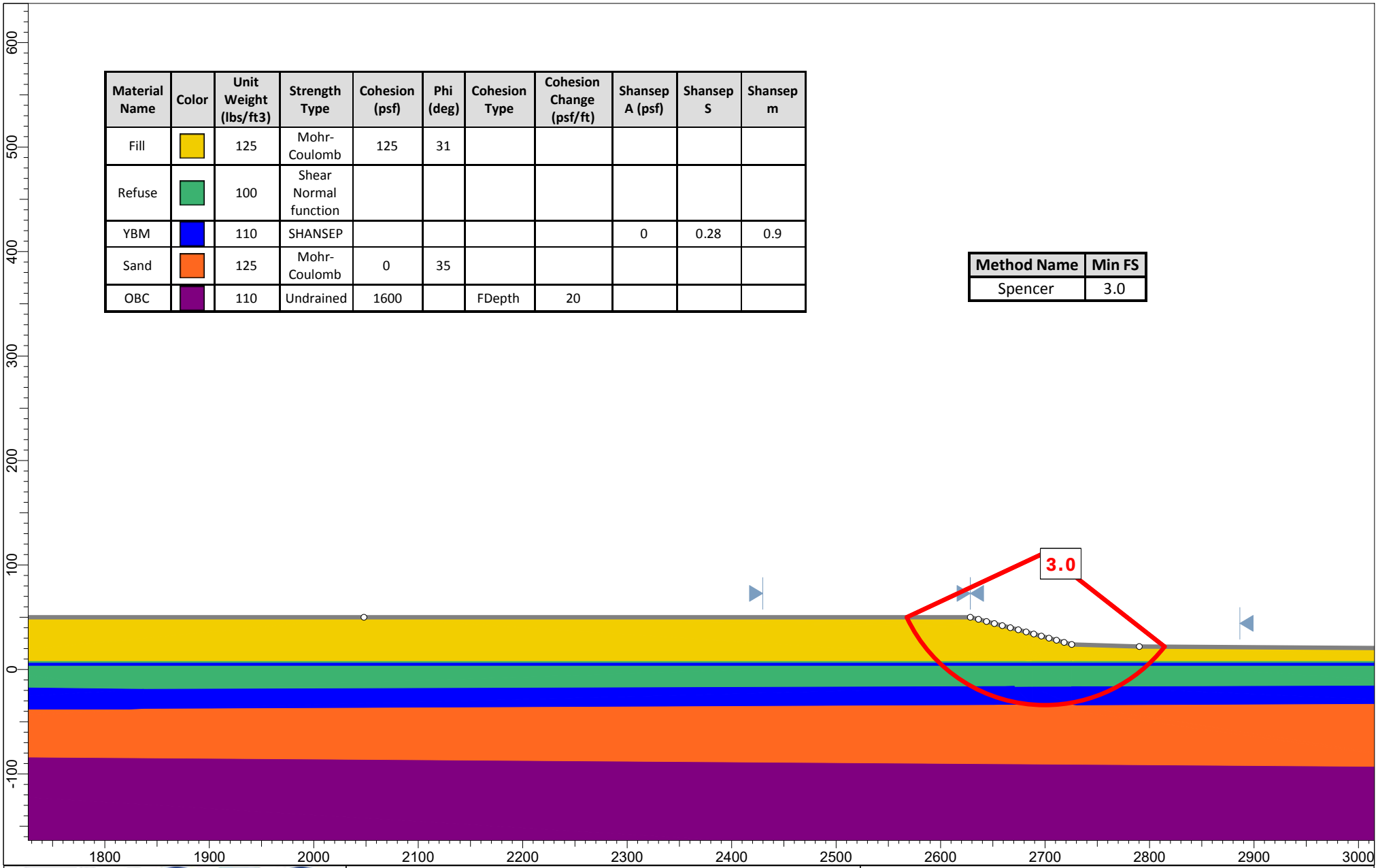


ENGEO Expect Excellence

Section	Cross Section A-A' (East Side)	Project	Brisbane Baylands Landfill
Analysis	Static	Condition	Proposed Grade
Author	SOS	Method	Spencer
Date	11/2021	Scale	1:1500
		Project No.	17270.000.002

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.28	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	1600		FDepth	20			

Method Name	Min FS
Spencer	3.0

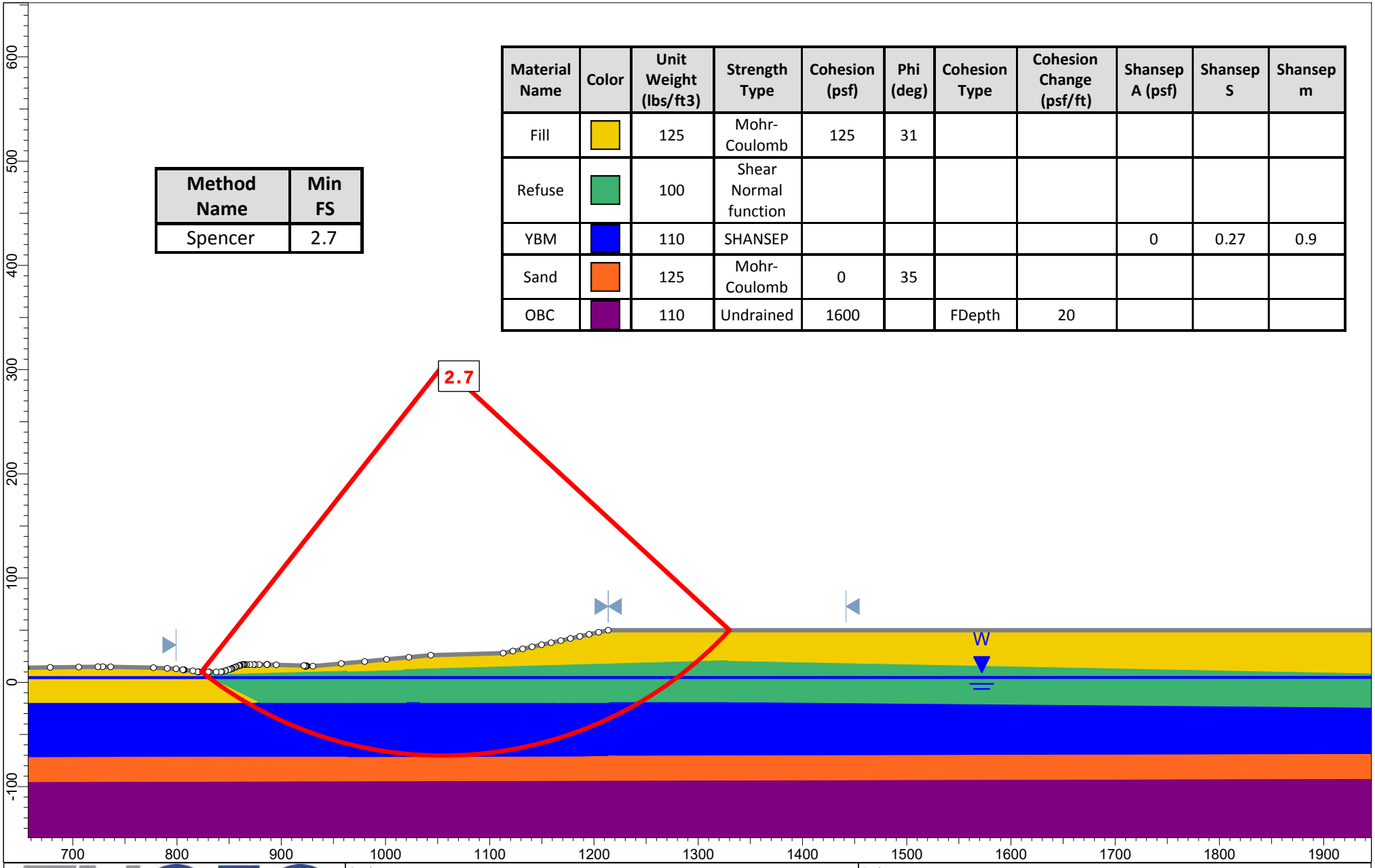


ENGEO Expect Excellence

Section	Cross Section A-A' (West Side)	Project	Brisbane Baylands Landfill
Analysis	Static	Condition	Proposed Grade
Author	SOS	Method	Spencer
Date	11/2021	Scale	1:1500
		Project No.	17270.000.002

Method Name	Min FS
Spencer	2.7

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.27	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	1600		FDepth	20			

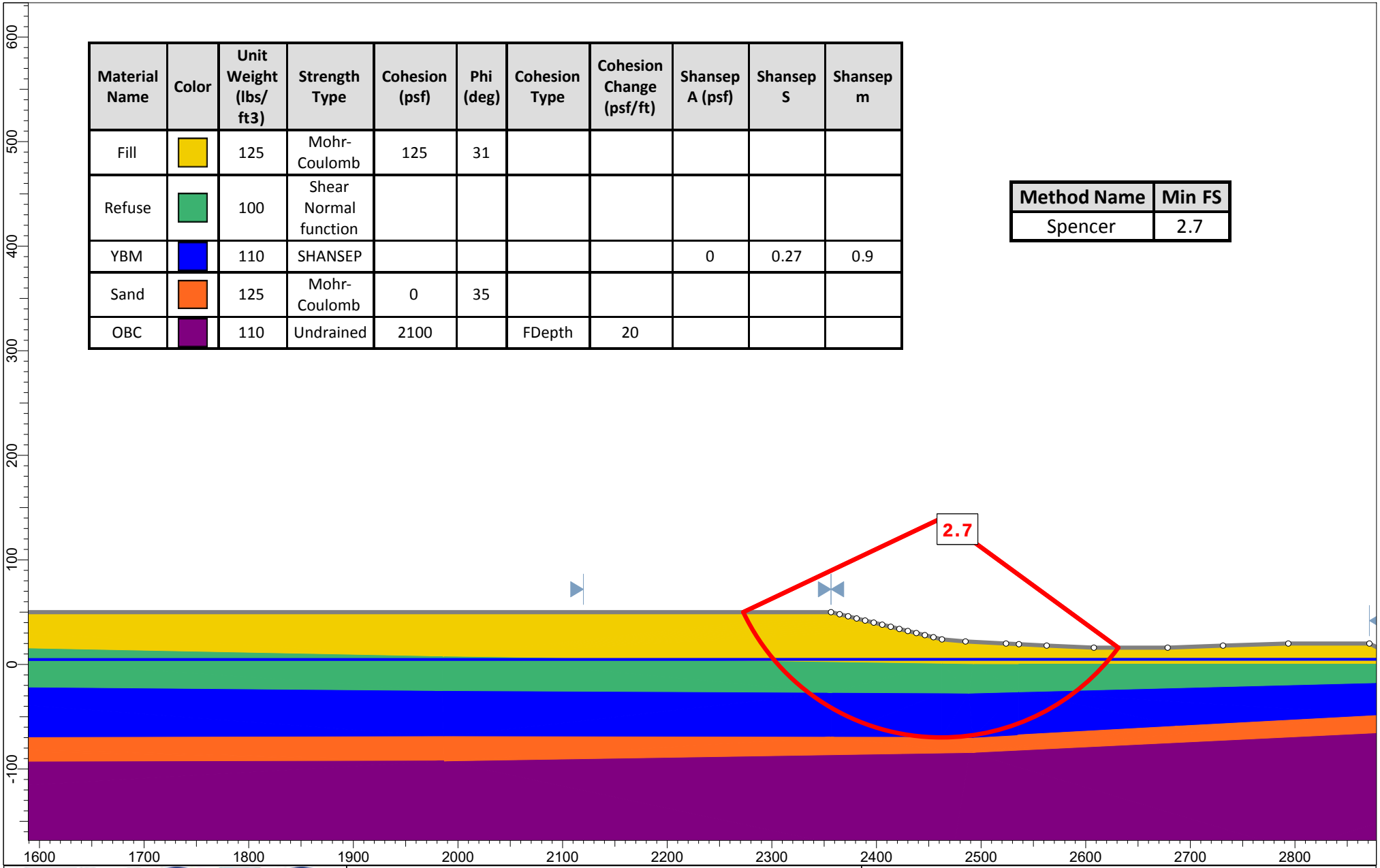


ENGEO Expect Excellence

Section	Cross Section B-B' (East Side)	Project	Brisbane Baylands Landfill
Analysis	Static	Condition	Proposed Grade
Author	SOS	Method	Spencer
Date	11/2021	Scale	1:1500
		Project No.	17270.000.002

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.27	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	2100		FDepth	20			

Method Name	Min FS
Spencer	2.7

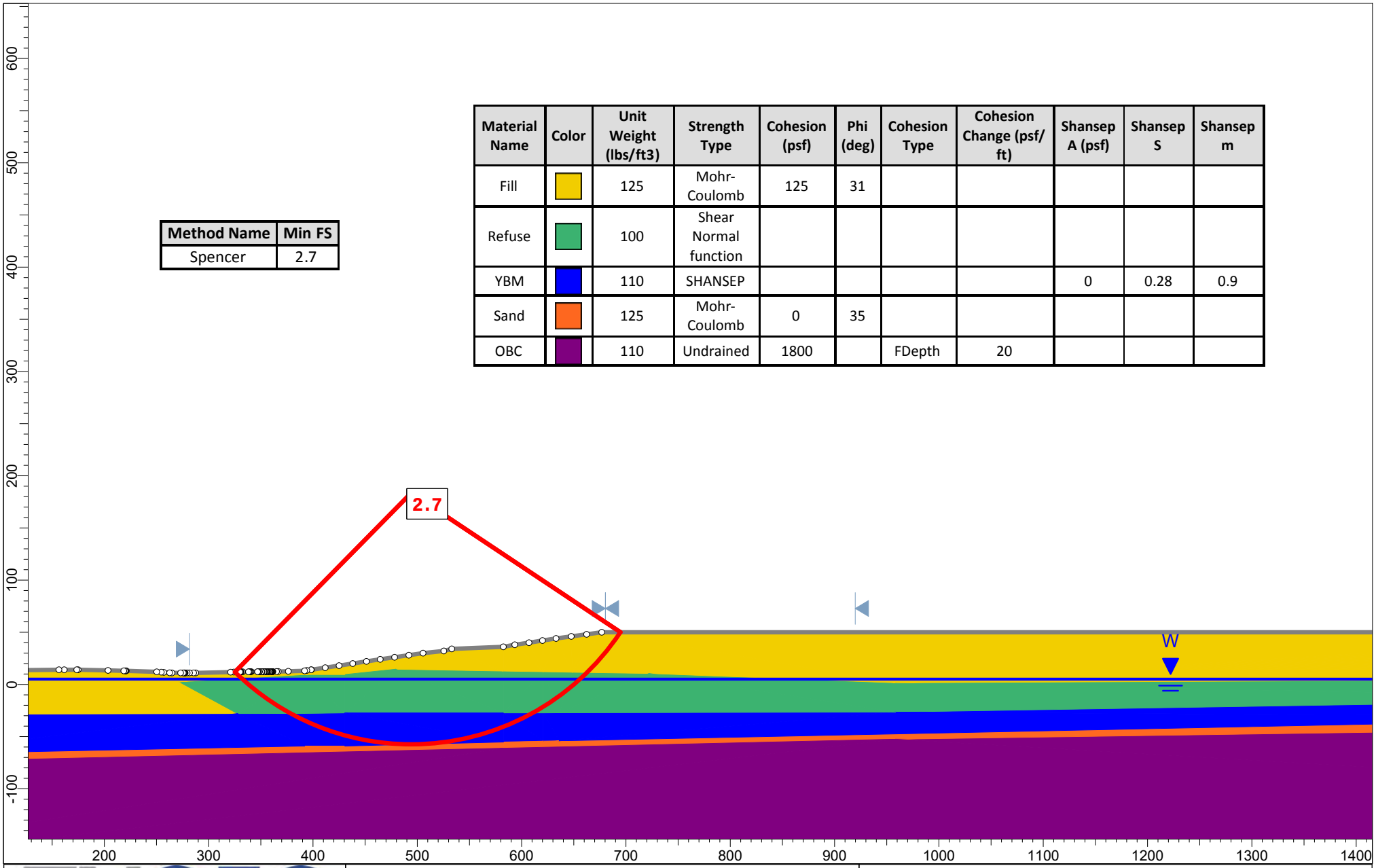


ENGEO Expect Excellence

Section	Cross Section B-B' (West Side)		Project: Brisbane Baylands Landfill
Analysis	Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Method Name	Min FS
Spencer	2.7

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.28	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	1800		FDepth	20			

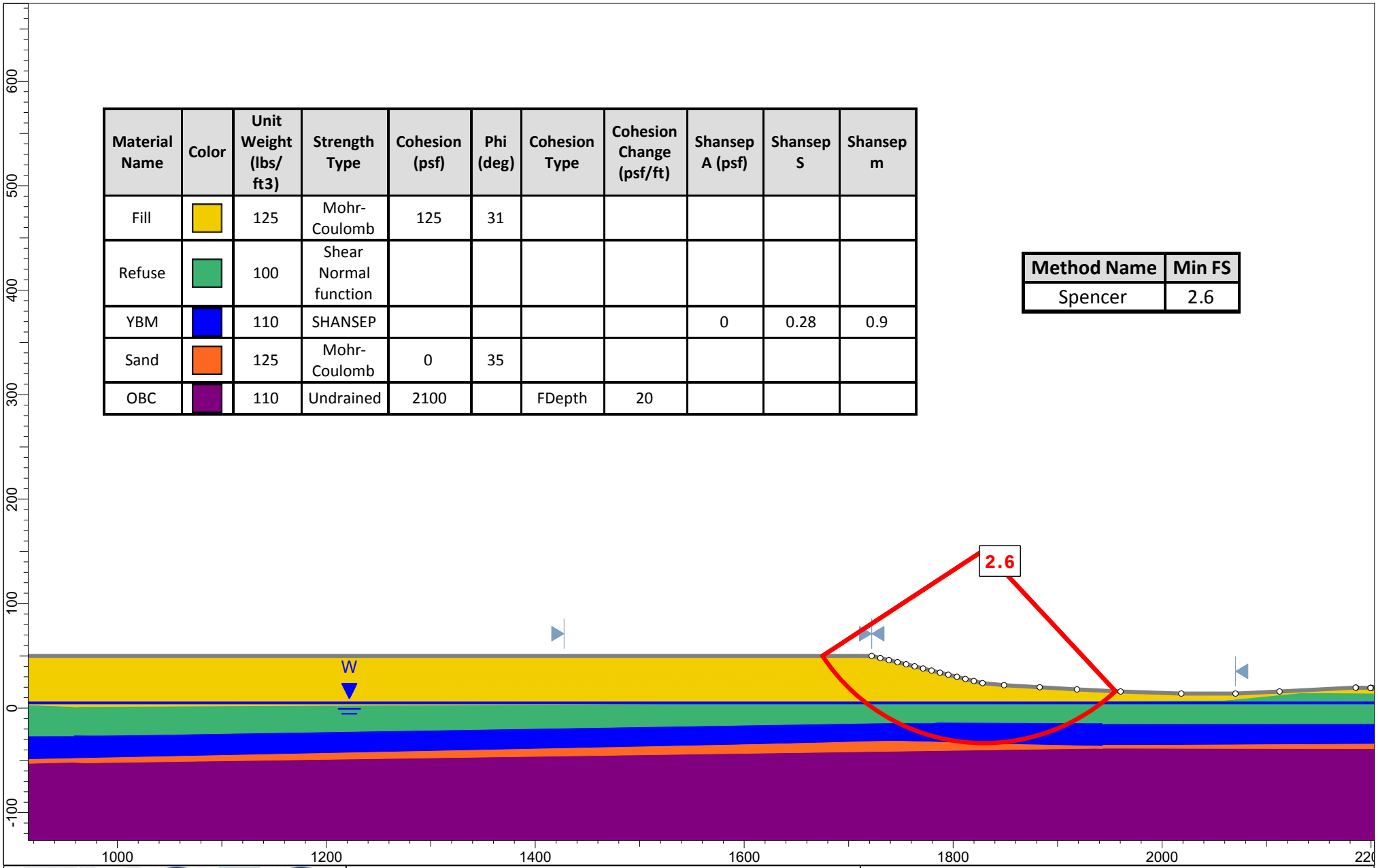


ENGEO Expect Excellence

Section	Cross Section C-C' (East Side)	Project	Brisbane Baylands Landfill
Analysis	Static	Condition	Proposed Grade
Author	SOS	Method	Spencer
Date	11/2021	Scale	1:1500
		Project No.	17270.000.002

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.28	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	2100		FDepth	20			

Method Name	Min FS
Spencer	2.6

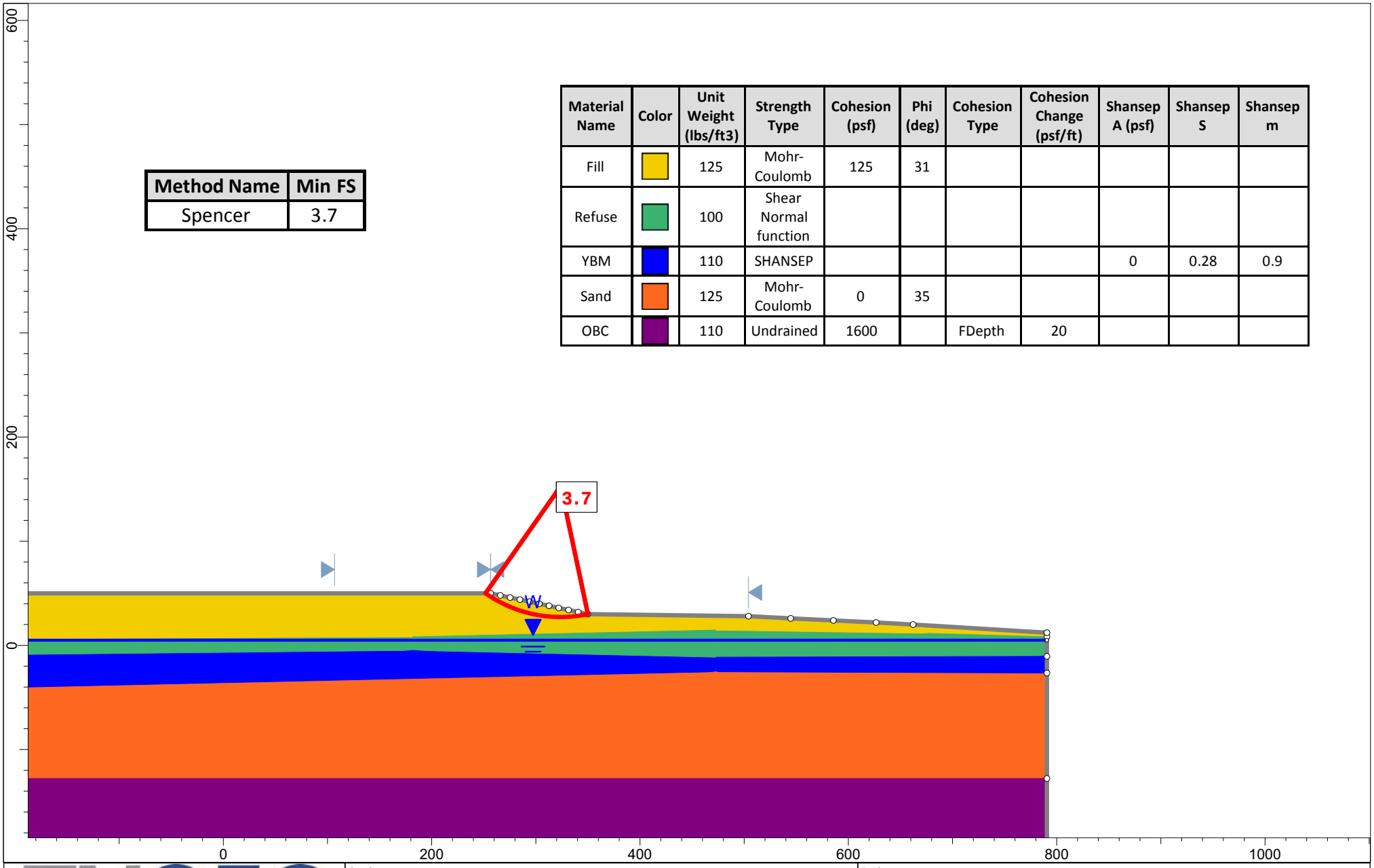


ENGEO Expect Excellence

Section	Cross Section C-C' (West Side)		Project: Brisbane Baylands Landfill
Analysis	Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Method Name	Min FS
Spencer	3.7

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.28	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	1600		FDepth	20			

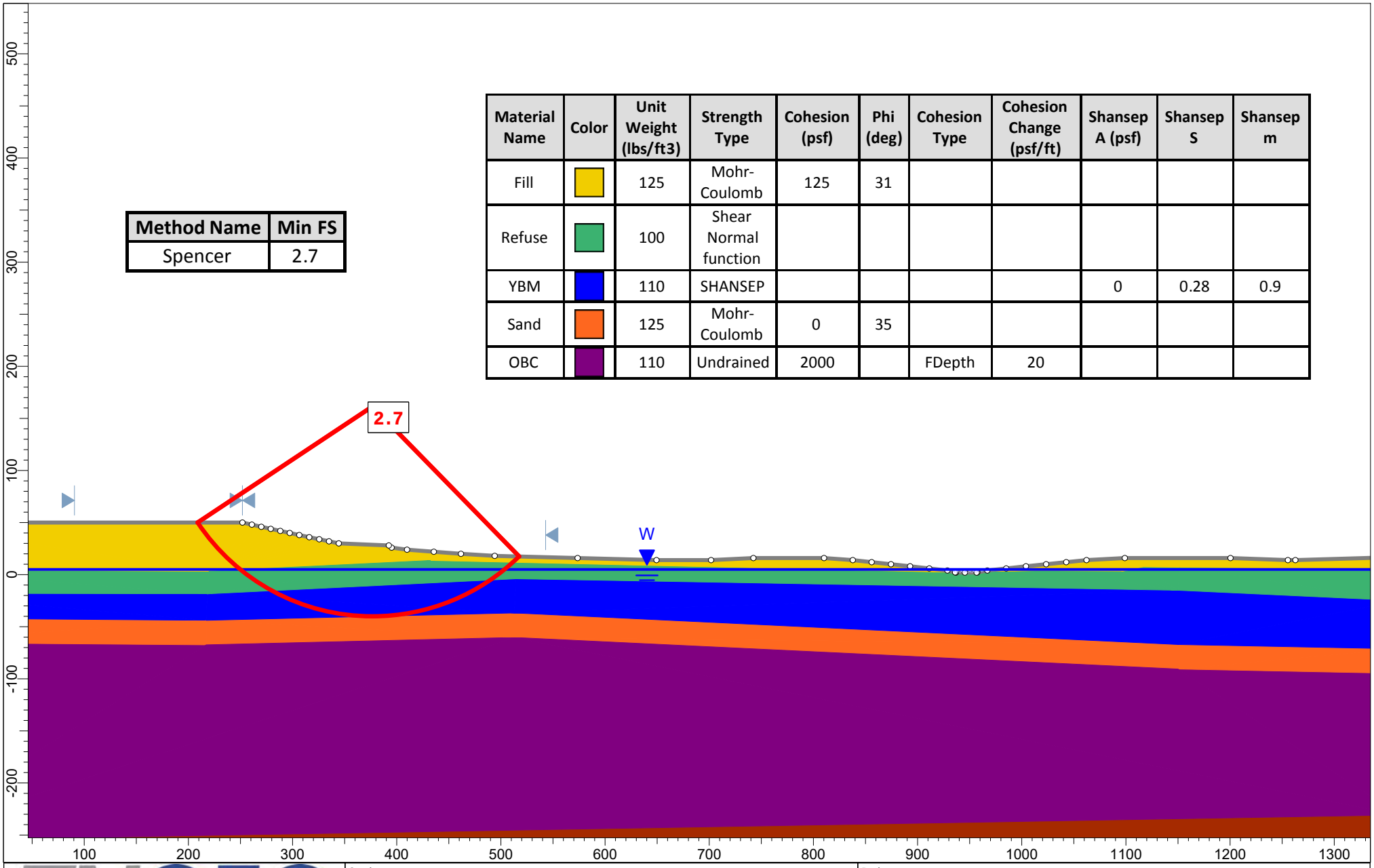


ENGEO Expect Excellence

Section	Cross Section D-D'		Project: Brisbane Baylands Landfill
Analysis	Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Method Name	Min FS
Spencer	2.7

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.28	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	2000		FDepth	20			

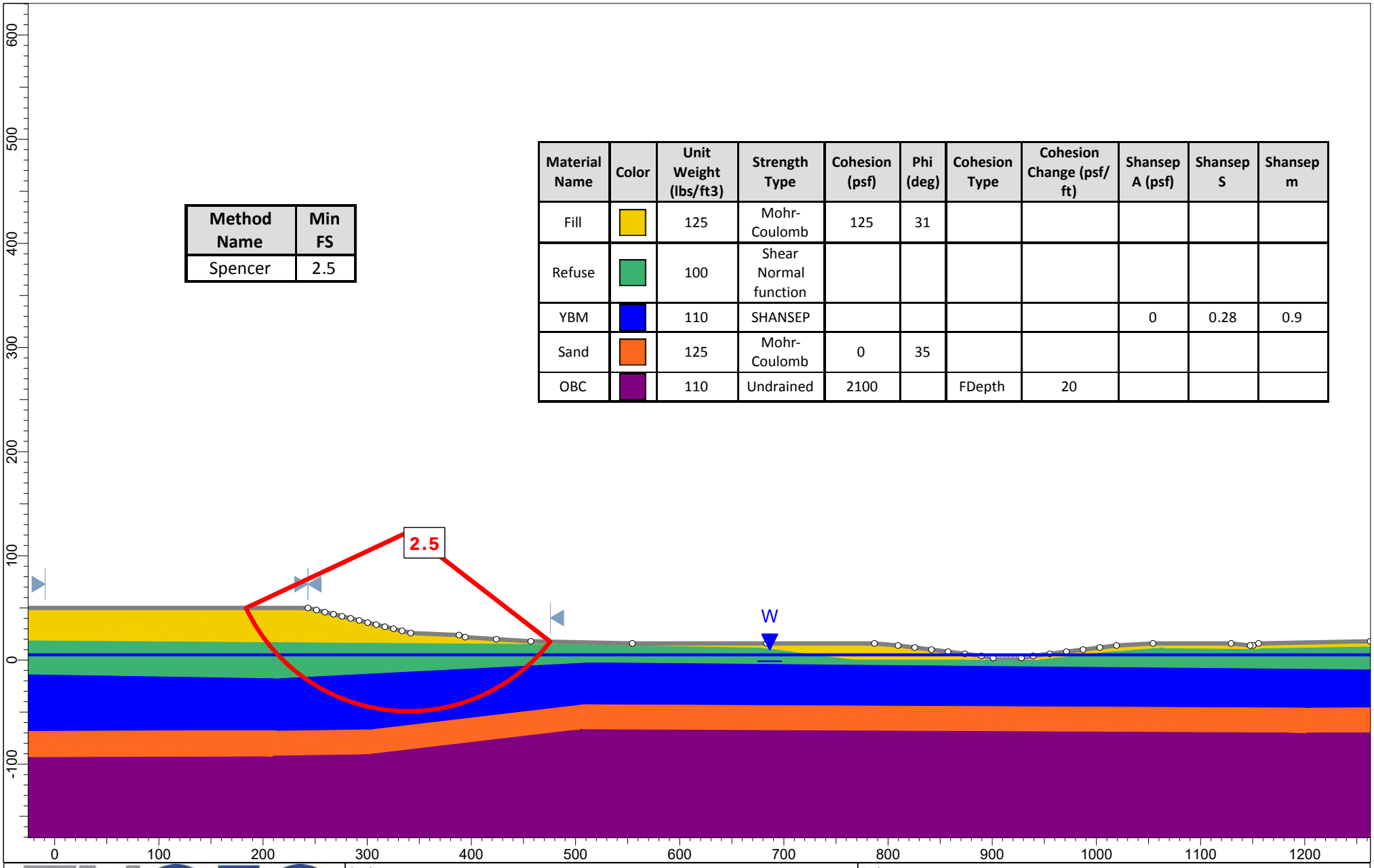


ENGEO Expect Excellence

Section	Cross Section E-E'		Project: Brisbane Baylands Landfill
Analysis	Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Method Name	Min FS
Spencer	2.5

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.28	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	2100		FDepth	20			

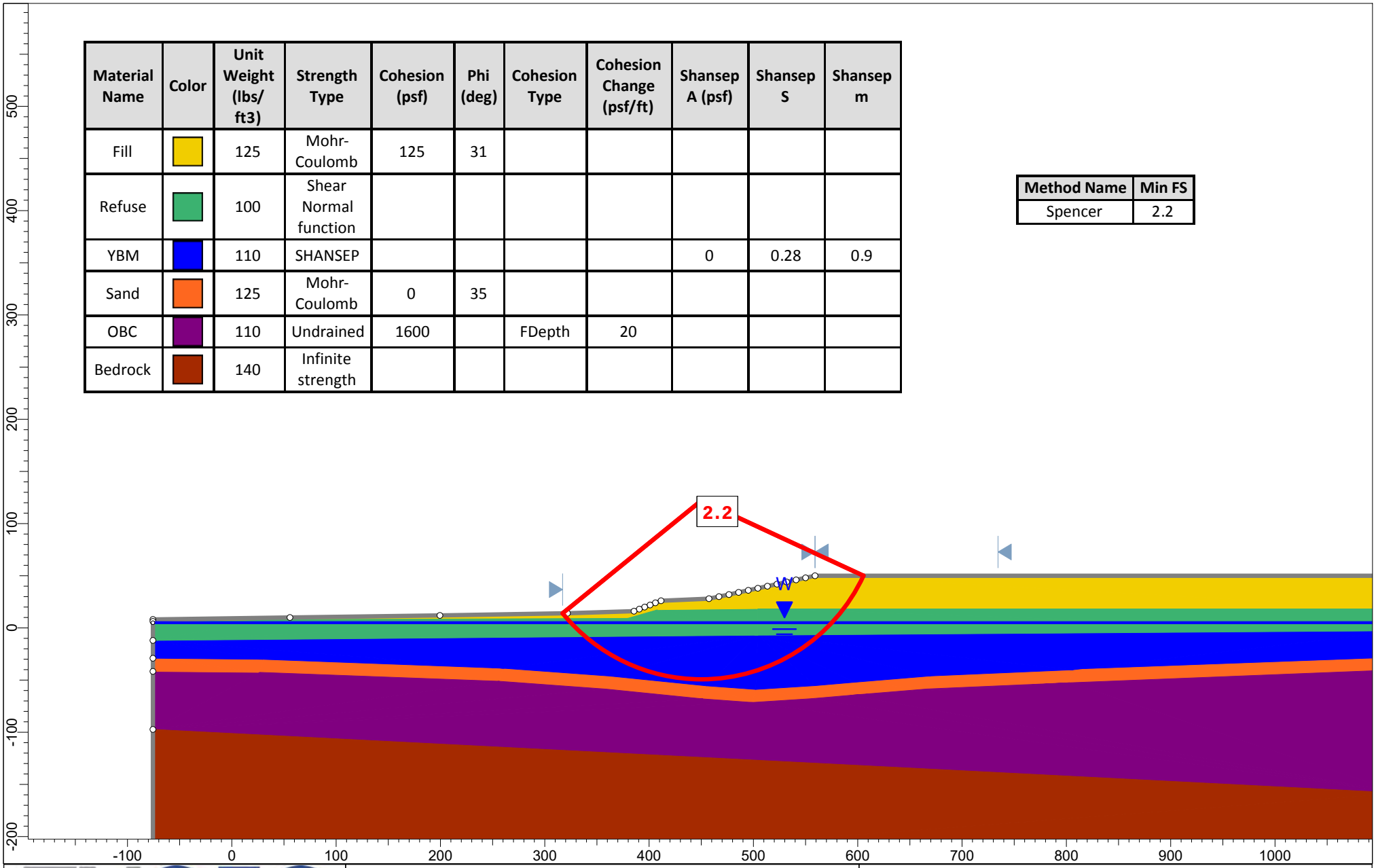


ENGEO Expect Excellence

Section	Cross Section F-F'		Project: Brisbane Baylands Landfill
Analysis	Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Cohesion Change (psf/ft)	Shansep A (psf)	Shansep S	Shansep m
Fill		125	Mohr-Coulomb	125	31					
Refuse		100	Shear Normal function							
YBM		110	SHANSEP					0	0.28	0.9
Sand		125	Mohr-Coulomb	0	35					
OBC		110	Undrained	1600		FDepth	20			
Bedrock		140	Infinite strength							

Method Name	Min FS
Spencer	2.2



ENGEO Expect Excellence

Section	Cross Section G-G'		Project: Brisbane Baylands Landfill
Analysis	Static	Condition: Proposed Grade	
Author	SOS	Method: Spencer	Project No.: 17270.000.002
Date	11/2021	Scale: 1:1500	



APPENDIX N

FINAL COVER STABILITY ANALYSIS

Final Cover Analysis
5:1 (horizontal:vertical) Slopes

Geomaterials - Static Long Term	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.020
Slope Angle (degrees)	11.3
Yeild Acceleration (g)	0.00
Cohesion (pcf)	10
Friction Angle (degrees)	22
Depth to Water Table (ft)	1.020
Factor of Safety	**2.4**

Soil Materials - Static Long Term	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.020
Slope Angle (degrees)	11.3
Yeild Acceleration (g)	0.00
Cohesion (pcf)	10
Friction Angle (degrees)	28
Depth to Water Table (ft)	1.020
Factor of Safety	**3.1**

Geomaterials - Static Short Term	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.020
Slope Angle (degrees)	11.3
Yeild Acceleration (g)	0.00
Cohesion (pcf)	10
Friction Angle (degrees)	22
Depth to Water Table (ft)	0.000
Factor of Safety	**1.4**

Soil Materials - Static Short Term	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.020
Slope Angle (degrees)	11.3
Yeild Acceleration (g)	0.00
Cohesion (pcf)	10
Friction Angle (degrees)	28
Depth to Water Table (ft)	0.000
Factor of Safety	**1.6**

Geomaterials - Seismic	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.020
Slope Angle (degrees)	11.3
Yeild Acceleration (g)	0.17
Cohesion (pcf)	10
Friction Angle (degrees)	22
Depth to Water Table (ft)	0.000
Factor of Safety	**0.7**

Soil Materials - Seismic	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.020
Slope Angle (degrees)	11.3
Yeild Acceleration (g)	0.17
Cohesion (pcf)	10
Friction Angle (degrees)	28
Depth to Water Table (ft)	0.000
Factor of Safety	**0.8**

Final Cover Analysis
3:1 (horizontal:vertical) Slopes

Geomaterials - Static Long Term	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.054
Slope Angle (degrees)	18.4
Yeild Acceleration (g)	0.00
Cohesion (pcf)	10
Friction Angle (degrees)	22
Depth to Water Table (ft)	1.054
Factor of Safety	**1.5**

Soil Materials - Static Long Term	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.054
Slope Angle (degrees)	18.4
Yeild Acceleration (g)	0.00
Cohesion (pcf)	10
Friction Angle (degrees)	28
Depth to Water Table (ft)	1.054
Factor of Safety	**1.9**

Geomaterials - Static Short Term	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.054
Slope Angle (degrees)	18.4
Yeild Acceleration (g)	0.00
Cohesion (pcf)	10
Friction Angle (degrees)	22
Depth to Water Table (ft)	0.000
Factor of Safety	**0.8**

Soil Materials - Static Short Term	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.054
Slope Angle (degrees)	18.4
Yeild Acceleration (g)	0.00
Cohesion (pcf)	10
Friction Angle (degrees)	28
Depth to Water Table (ft)	0.000
Factor of Safety	**1.0**

Geomaterials - Seismic	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.054
Slope Angle (degrees)	18.4
Yeild Acceleration (g)	0.17
Cohesion (pcf)	10
Friction Angle (degrees)	22
Depth to Water Table (ft)	0.000
Factor of Safety	**0.5**

Soil Materials - Seismic	
Final CoverU nit Weight (pcf)	120
Water Unit Weight (pcf)	62.4
Height (ft)	1
Vertical Thickness (ft)	1.054
Slope Angle (degrees)	18.4
Yeild Acceleration (g)	0.17
Cohesion (pcf)	10
Friction Angle (degrees)	28
Depth to Water Table (ft)	0.000
Factor of Safety	**0.6**



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APPENDIX C

HYDROLOGIC ANALYSIS
(BKF ENGINEERS, 2021)

TECHNICAL MEMORANDUM

Date: November 19, 2021 **BKF Job Number:** 20190615

Deliver To: Howard Pearce
Baylands Development, Inc.
150 Executive Park Blvd., Suite 4000
San Francisco, CA 94134

From: Ramon Alvarez-Muro, P.E.

Subject: Brisbane Baylands – Landfill Closure Drainage System Calculations

Introduction/Description

Brisbane Landfill is an inactive solid waste disposal site and an active soil recycling facility located about 2 miles southwest of Candlestick Point in the City of Brisbane, San Mateo County, California. The landfill is bound to the east by U.S. Highway 101, to the west by the Caltrain/Joint Powers Board railway tracks, to the north by Beatty Avenue, and to the south by the Guadalupe Lagoon.

Calculations followed the criteria outlined in the City of Brisabne Storm Drain Master Plan and the Class III waste management unit surface water design requirements outlined in Title 27 CCR. Table 4.1 of Section 20320 of Title 27, which sets forth construction standards for landfills, states that Class III landfills are to be designed for the 100-year, 24-hour storm event. Specification 2 of the WDRs requires that hydraulic calculations and flow rates for a 100-year, 24-hour storm should be performed "… to ensure that the landfill is protected from any washout or erosion of waste or cover material and from inundation that could occur as a result of a 100-year, 24-hour precipitation event, or as the result of flooding with a return frequency of 100 years."" Additionally on-site grades are set 1-foot above the 100-year storm with year 2100 Sea Level Rise (SLR).

Storm Drain Model Parameters

Modeling Platform

As described in the November 2003 "City of Brisbane Storm Drainage Master Plan" (SDMP) by RBF Consulting, the computer program XP-SWMM is used to evaluate the performance of the proposed system. For the purposes of storm drainage analysis, the program is divided into a runoff and a hydraulics module. The runoff module is used to calculate the runoff hydrographs at system nodes, while the hydraulics module defines the physical infrastructure of the system and routes the runoff module through the system. Per the SDMP, tidal conditions have been included in developing the storm drain model. BKF has used the storm drain model and runoff module assumptions developed by RBF as a baseline for this model, and supplemented information like SLR.

Drainage Areas Delineation

Drainage areas were developed based on Figure 1 Brisbane Baylands Landfill – Preliminary Grading and Tributary Areas prepared by BKF Engineers, dated November 2021.

Many of the drainage areas encompass more than one type of land use. Drainage areas with more than one type of land use were assigned an average composite curve number.

Precipitation Data & Design Storm Data

As described in the SDMP, precipitation distributions and design rainfall intensities were developed in accordance with the Return Period-Duration Specific Regional Equation described in the Santa Clara Valley Water District "Hydrology Procedures" handbook. Rainfall distributions were taken over a 24-hour period and developed for 2-yr, 10-yr, 25-yr, and 100-yr storm events. The 100-yr, 24-hour storm modeled has a total rainfall depth of 5.92-inches.

Runoff Coefficient

The runoff coefficient is a measure of the amount of rainfall that runs off from the site at the storm peak. The Soil Conservation Service (SCS) curve number method is used to determine the portion of rainfall that becomes storm water runoff. The SCS method combines land use classifications and soil types to develop a curve number (CN). Since the project site infiltrates at a slow rate due to the presence of bay mud deposits, on-site soils are classified as either Type C or D per the SDMP. The following CN for different land uses shown on the Infrastructure Plan were used.

- 60 for Hillsides
- 84 for Streets + Hillsides
- 95 for Streets
- 89 for Parcels (Residential, Office/Hotel, Bio-Tech, Community, Commercial)
- 60 for Wetlands
- 60 for Parks

For purposes of these calculation the full built out land uses are used and not land uses as they will exist only after the landfill closure is complete.

Time of Concentration

As described in the SDMP, the SCS watershed lag method is used to develop values for the time of concentration. The equation uses the longest runoff flow path, the slope of the watershed and the SCS curve number to develop the values for time of concentration.

Tidal Conditions

Per the SDMP, recent studies have shown that high tidal levels can be expected during large storm events due to the presence of powerful off-shore winds and low atmospheric pressure. BKF has maintained the storm drain model tidal conditions developed by RBF; thus, the model assumes a

maximum stage tidal cycle elevation of 5.99-feet (NGVD 29). For SLR the 2100 Medium-High Risk Aversion with 83" SLR was also studied by increasing the stage tidal cycle elevations.

Headloss Coefficient for Cross Culverts

Culvert headlosses (hL) are computed as hL=K V2/2g, where K is the entrance/exist loss coefficient, V is the velocity entering/exiting the culvert and g is the gravitational constant. All cross culverts were modeled with an entrance loss coefficient of 0.5, and an exit loss coefficient of 1.

Freeboard

The project freeboard criterion is based on the guidelines defined by the SDMP. These guidelines establish that projects "design drainage facilities to provide a minimum of one-foot from the calculated 100-year peak stage where ponding may occur to the lowest adjacent finished floor." The 100-year storm event is contained within the system to ensure that runoff from the project site does not flow to off-site drainage systems.

Proposed Storm Drain System

The proposed Baylands storm drainage collection system will be designed in compliance with the City of Brisbane requirements, the SDMP and supplemental project specific storm drainage reports. Portions of the existing Beatty Avenue watershed and Brisbane Lagoon watershed have been routed to the Bayshore Drainage Area. A combination of pipes, culverts, and conveyance and catchment structures will direct the storm water runoff from the on-site streets and buildings discharging to Visitation Creek and the San Francisco Bay. Existing upstream off-site conditions and flows that discharge through the site and used in the RBF model are included in the proposed storm drain system model as well to model Visitation Creek correctly.

The proposed storm drain piping system for the storm drain system will consist of fusion High-Density Polyethylene (HDPE) pipe or Reinforced Concrete Box (RCB) culverts modeled with a Manning's Roughness of n = 0.013. The proposed system model pipe and node layout configuration is shown on Figure 2 Brisbane Baylands Landfill – SD Pipe and Nodes. Preliminary line sizing shown in layout format are also shown on Figure 1 Brisbane Baylands Landfill – Preliminary Grading and Tributary Areas.

Results

On-site storm drainage collection facilities are sized to convey the peak flow rate from a 100-year storm event without SLR entirely within the storm drain pipe system. The 100-year peak storm hydraulic grade line for the on-site piping system is below the rim elevations of the storm drain structures. The 100-year storm event with SLR utilizes overland release for conveyance since overland release is through the public street rights-of-way, surcharging of the on-site infrastructure is acceptable and anticipated during the 100-year peak storm event with and without SLR. To accommodate the 100-year peak storm event, building finished floors will be set to provide a minimum of 1-foot of freeboard above the 100-year storm with SLR event HGL.

The model results for the proposed system are included in the Node and Pipe output tables.

Conclusions

As a result of the modeled preliminary improvements, the proposed infrastructure is capable of supporting the on-site 100-year design storm event without sending water to off-site drainage systems, conveying the 100-year peak storm event water elevation. Infrastructure extents, alignments and sizes are subject to change and will be finalized during the Civil Improvement Plan process

STORM WATER DETENTION AREA
FG 1.5

INFRASTRUCTURE DEVELOPMENT AND WATER RECYCLING FACILITY
FG 20.0

LUMBAR YARD TO COLLECT RUNOFF AND DISCHARGE TO DETENTION AREA

LUMBER YARD
FG 20.0

KINDER ENERGY
TANK FARM
EG 9.0 – 20.0

TUNNEL AVE

TUNNEL BRIDGE CROSSING
FG 21.0

FG 29.6

FG 30.7

FG 14.3

FG 12.8

FG 23.8

FG 16.4

STORM WATER TREATMENT AREA
FG 13.0

ROAD 20

VISITACION CREEK

WETLANDS
FG 13.0

30' WIDE BERM
FG 17.0

CAMPUS ROAD

LOW POINT TO COLLECT RUNOFF AND DISCHARGE TO TREATMENT AREA

FG 25.9

LOW POINT TO COLLECT RUNOFF AND DISCHARGE TO TREATMENT AREA

FG 28.0

FG 26.6

FG 47.0 – 53.5

LAGOON ROAD

WETLANDS
FG 13.0

FG 24.7

SIERRA POINT BRIDGE CROSSING
FG 26.9

SIERRA POINT PARKWAY

BAY TRAIL

FG 24.2

FG 25.8

FG 23.7

FG 40.0

FG 25.3

FG 23.4 – FG 19.9

FG 15.8

FG 12.0

FG 13.9

EXISTING 10' x 10'
RECTANGULAR CULVERT

LOW POINT TO COLLECT RUNOFF AND DISCHARGE TO SD SYSTEM

FG 47.0 – 53.5

FG 32.1

FG 48.5

FG 47.0 – 53.5

FG 50.0

ROAD 21

LOW POINT TO COLLECT RUNOFF AND DISCHARGE TO SD SYSTEM

FG 26.5

LOW POINT TO COLLECT RUNOFF AND DISCHARGE TO SD SYSTEM

FG 43.6

FG 40.5

FG 22.9

FG 19.8

FG 20.7

FG 17.8

FG 18.7

FG 20.8

FG 18.4

FG 20.0

FG 16.3

EG 17.9 – 22.2

ROAD 22

GENEVA AVE

APPROXIMATELY 440' TO EX 78" SFPUC COMBINED SEWER LINE

APPROXIMATELY 240' TO EX 78" SFPUC COMBINED SEWER LINE

NOTES

1. THE EXISTING GRADE USED FOR THIS EARTHWORK ANALYSIS IS BASED ON THE AERIAL SURVEY DONE BY BKF ENGINEERS IN 2021.
2. THE EARTHWORK ESTIMATE DOES NOT ACCOUNT FOR COMPACTION, SHRINKAGE, SWELL, LOSS DURING TRANSPORT, SUBSIDENCE, FOUNDATIONS AND BELOW GRADE STRUCTURES.
3. ELEVATIONS SHOWN ARE BASED ON THE NAVD 88 VERTICAL DATUM.

LEGEND

- OUTFALL LOCATION
- INLET LOCATION
- PROJECT BOUNDARY
- 18" STORM DRAIN
- 24" STORM DRAIN
- 30" STORM DRAIN
- 36" STORM DRAIN
- 42" STORM DRAIN
- 48" STORM DRAIN
- 54" STORM DRAIN
- 60" STORM DRAIN
- 66" STORM DRAIN
- CUSTOM SIZE STORM DRAIN
- SHEET FLOW
- TRIBUTARY AREA

GRAPHIC SCALE
200 0 200 400

DRAWING NAME: J:\2019\190615_Brisbane_Baylands_R\ENG\EXHIBITS\Landfill Closure\LANDFILL CLOSURE DRAINAGE STUDY.dwg
PLOT DATE: 11-18-21 PLOTTED BY: chuk

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www.bkf.com

BRISBANE BAYLANDS LANDFILL – PRELIMINARY GRADING AND TRIBUTARY AREAS

BRISBANE, CA

FIGURE 1



GRAPHIC SCALE
200 0 200 400

DRAWING NAME: J:\2019\190615_Brisbane_Baylands_R\ENG\EXHIBITS\Landfill Closure\Model Schematic.dwg
PLOT DATE: 11-18-21 PLOTTED BY: chuk

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BRISBANE BAYLANDS LANDFILL - SD PIPE AND NODES

BRISBANE, CA

FIGURE 2

Brisbane Baylands Landfill Closure
Storm Drain System: 100-Year Storm with 100-Year Tide
Proposed Project
Node Results

Name	Sub-catch-ments	Invert Elev ft	EGL Elev ft	Max Water Elev ft	Free-board ft	Area ac	Volume of Ponded Flow Stored ft^3	Duration of Flooding (min)	Duration of Surcharge (min)	Time of Max HGL hr	Sur-charge at Max HGL ft
251001		**-6.0**	**6.3**	**6.0**	**6.0**		151	**0**	**550**	14.0	2.0
251002		-5.7	6.6	6.6	5.4		154	0	0	13.8	0.0
251003		-4.0	6.8	6.6	5.4		133	0	0	13.8	0.0
251004	1	-4.0	6.9	6.9	6.1	13.9	137	0	0	13.1	0.0
251005	1	-1.4	6.9	6.9	7.1	4.1	104	0	0	13.5	0.0
251007	1	-1.0	7.0	7.0	7.0	5.1	102	0	0	13.5	0.0
251007.1		-1.0	9.0	8.8	3.2		126	0	94	13.3	2.0
LA-N01		10.5	16.3	15.1	8.3		58	0	714	12.4	1.1
LA-N02	1	10.6	17.2	16.1	7.6	11.6	68	0	715	12.3	2.0
LA-N02.1	1	13.0	16.2	16.2	4.9	1.5	44	0	46	12.2	1.5
LA-N02.1	2					1.8					
LA-N03	1	11.9	19.6	18.9	11.8	1.5	88	0	42	12.3	3.5
LA-N03.1	1	13.7	22.3	22.3	24.8	10.0	107	0	43	12.2	6.6
LA-N04	1	13.9	22.2	21.6	16.7	2.4	97	0	23	12.3	4.2
LA-N05	1	15.3	25.0	23.3	17.6	1.4	100	0	19	12.3	4.5
LA-N06	1	18.8	24.4	24.4	0.1	4.1	963	0	14	12.3	3.7
LA-N06	2					6.2					
LB-N02	1	10.5	15.3	15.0	5.9	1.0	57	0	910	12.2	2.5
LB-N03		11.6	16.5	16.3	6.6		59	0	822	12.2	2.7
LB-N03.1	1	15.0	17.2	17.2	7.9	2.2	29	0	6	12.2	0.8
LB-N04		14.0	18.0	17.6	17.4		45	0	14	12.2	1.6
LB-N05	1	16.0	22.7	22.7	3.3	5.6	84	0	18	12.2	5.2
LC-N01	1	14.1	20.1	19.7	8.7	1.4	70	0	26	12.2	3.6
LC-N02	1	15.9	23.3	23.3	23.7	10.6	93	0	20	12.2	5.4
LD-N01	1	16.7	31.8	30.8	16.2	3.1	177	0	6	12.3	1.2
LD-N01.1	1	29.4	34.6	34.6	12.4	10.4	65	0	16	12.3	3.2
LD-N01.2	1	29.4	38.3	38.3	8.7	17.1	111	0	34	12.3	6.9
LD-N02	1	18.3	31.0	31.0	4.6	3.1	160	0	26	12.3	10.8
LE-N01	1	10.5	15.6	14.8	9.9	0.3	54	0	729	12.3	1.3
LE-N02	1	11.6	16.7	16.1	9.5	2.9	58	0	88	12.2	1.6
LE-N03	1	14.1	20.5	20.1	3.3	2.3	77	0	17	12.2	3.6
LE-N03	2					3.9					
LE-N04	1	15.9	23.6	23.6	23.4	10.6	96	0	19	12.2	5.7
LF-N02		10.5	16.2	15.3	4.9		60	0	30	12.3	0.3
LF-N02.1	1	12.3	15.9	15.9	7.2	2.0	45	0	809	12.1	2.0
LF-N02.2	1	13.1	15.3	15.3	3.7	1.3	28	0	0	12.3	0.0
LF-N03	1	10.9	18.0	17.4	3.2	8.0	82	0	297	12.3	3.0
LF-N03	2					4.0					
LF-N04	1	11.8	18.9	18.9	0.0	10.5	234	10	65	12.4	3.6
LF-N04	2					41.2					
LR-N01	1	10.0	15.6	14.7	6.3	18.6	608,355	0	726	12.7	1.2
LS-N01	1	10.0	15.7	14.7	6.3	14.1	294,344	0	829	12.5	1.2

Brisbane Baylands Landfill Closure
Storm Drain System: 100-Year Storm with 100-Year Tide
Proposed Project
Pipe Results

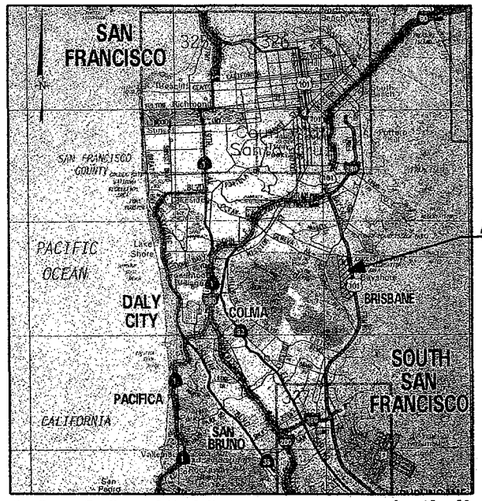
Name	Max Flow cfs	Max Velocity ft/s	Upstream Node Name	Down-stream Node Name	Upstream Invert Elevation ft	Down-stream Invert Elevation ft	Shape	Length ft	Dia- meter (Height) ft	Bottom Width ft	Side Slope ft/ft	Number of Barrels
151001	**474**	**5.5**	251002	251001	-5.7	-6.0	Rectangular	341	10.0	10.0		1
151002	474	2.6	251003	251002	-4.0	-5.7	Trapezoidal	60	14.0	20.0		1
151003	474	4.2	251004	251003	-4.0	-4.0	Rectangular	120	8.0	14.0		1
151004	512	1.9	251005	251004	-1.4	-4.0	Natural	965	14.0	12.0	12.0	1
151006	455	2.6	251007	251005	-1.0	-1.4	Natural	896	14.0	12.0	12.0	1
151007	547	5.0	251008	251007	-0.9	-1.0	Rectangular	112	8.0	14.0		1
LA-P01	90	9.2	LA-N01	LR-N01	10.5	10.0	Circular	100	3.5			1
LA-P02	90	9.3	LA-N02	LA-N01	10.6	10.5	Circular	143	3.5			1
LA-P02.1	7	2.1	LA-N02.1	LA-N02	13.0	10.6	Circular	582	2.0			1
LA-P03	83	8.6	LA-N03	LA-N02	11.9	10.6	Circular	422	3.5			1
LA-P03.1	18	5.6	LA-N03.1	LA-N03	13.7	11.9	Circular	600	2.0			1
LA-P04	64	6.6	LA-N04	LA-N03	13.9	11.9	Circular	665	3.5			1
LA-P05	61	6.3	LA-N05	LA-N04	15.3	13.9	Circular	464	3.5			1
LA-P06	12	3.7	LA-N06	LA-N05	18.8	15.3	Circular	1159	2.0			1
LB-P02	14	4.6	LB-N02	LS-N01	10.5	10.0	Circular	100	2.0			1
LB-P03	13	4.2	LB-N03	LB-N02	11.6	10.5	Circular	378	2.0			1
LB-P03.1	4	2.6	LB-N03.1	LB-N03	15.0	11.6	Circular	475	1.5			1
LB-P04	9	3.0	LB-N04	LB-N03	14.0	11.6	Circular	801	2.0			1
LB-P05	9	5.2	LB-N05	LB-N04	16.0	14.0	Circular	658	1.5			1
LC-P01	19	6.1	LC-N01	LE-N02	14.1	11.6	Circular	491	2.0			1
LC-P02	18	5.6	LC-N02	LC-N01	15.9	14.1	Circular	600	2.0			1
LD-P01	52	10.5	LD-N01	LA-N05	16.7	15.3	Circular	481	2.5			1
LD-P01.1	18	6.2	LD-N01.1	LD-N01	29.4	27.6	Circular	600	2.0			1
LD-P01.2	26	8.3	LD-N01.2	LD-N01	29.4	27.6	Circular	600	2.0			1
LD-P02	7	2.0	LD-N02	LD-N01	18.3	16.7	Circular	509	2.0			1
LE-P01	53	7.6	LE-N01	LR-N01	10.5	10.0	Circular	100	3.0			1
LE-P02	53	7.5	LE-N02	LE-N01	11.6	10.5	Circular	225	3.0			1
LE-P03	28	5.8	LE-N03	LE-N02	14.1	11.6	Circular	819	2.5			1
LE-P04	18	5.7	LE-N04	LE-N03	15.9	14.1	Circular	600	2.0			1
LF-P02	77	8.0	LF-N02	LS-N01	10.5	10.0	Circular	100	3.5			1
LF-P02.1	4	2.4	LF-N02.1	LF-N02	12.3	10.5	Circular	603	1.5			1
LF-P02.2	4	1.8	LF-N02.2	LF-N02	13.1	12.0	Circular	210	3.0			1
LF-P03	74	7.7	LF-N03	LF-N02	10.9	10.5	Circular	387	3.5			1
LF-P04	62	6.4	LF-N04	LF-N03	11.8	10.9	Circular	445	3.5			1
LR-W01	73	0.0	LR-N01	251005	0.0	0.0	0	0	0.0			0
LS-W01	**85**	**0.0**	LS-N01	251005	0.0	0.0	0	0	0.0			0



APPENDIX D

EXISTING LEACHATE COLLECTION SYSTEM CONSTRUCTION DRAWINGS (GEOSYNTEC, 2007)

CONSTRUCTION DRAWINGS
LEACHATE SEEP COLLECTION AND TRANSMISSION SYSTEM
BRISBANE LANDFILL
BRISBANE, CALIFORNIA
OCTOBER 2007



Map Source: The Thomas Guide, California Road Atlas and Driver's Guide, 2000

SITE LOCATION MAP

5 BEATTY ROAD, BRISBANE, CALIFORNIA 94005

LIST OF DRAWINGS

	DRAWING	DESCRIPTION
GENERAL	1	COVER AND INDEX SHEET
CIVIL	C-1	SITE PLAN
	C-2	DETAILS
ELECTRICAL	E-1	LEGEND AND SYMBOLS, NOTES
	E-2	SITE PLAN
	E-3	PUMP STATION AND LEACHATE BOXES ENLARGED PLANS
	E-4	SINGLE-LINE AND CONTROL SCHEMATIC DIAGRAMS
	E-5	CONTROL PANEL ELEVATION AND DETAILS
	E-6	CONSTRUCTION AND TYPICAL DETAILS
	E-7	CONSTRUCTION AND TYPICAL DETAILS
	E-8	CONSTRUCTION AND TYPICAL DETAILS

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Geosyntec consultants

engineers | scientists | innovators

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Project No.: WG1042.02
Document: C

ENGINEERS, INC.
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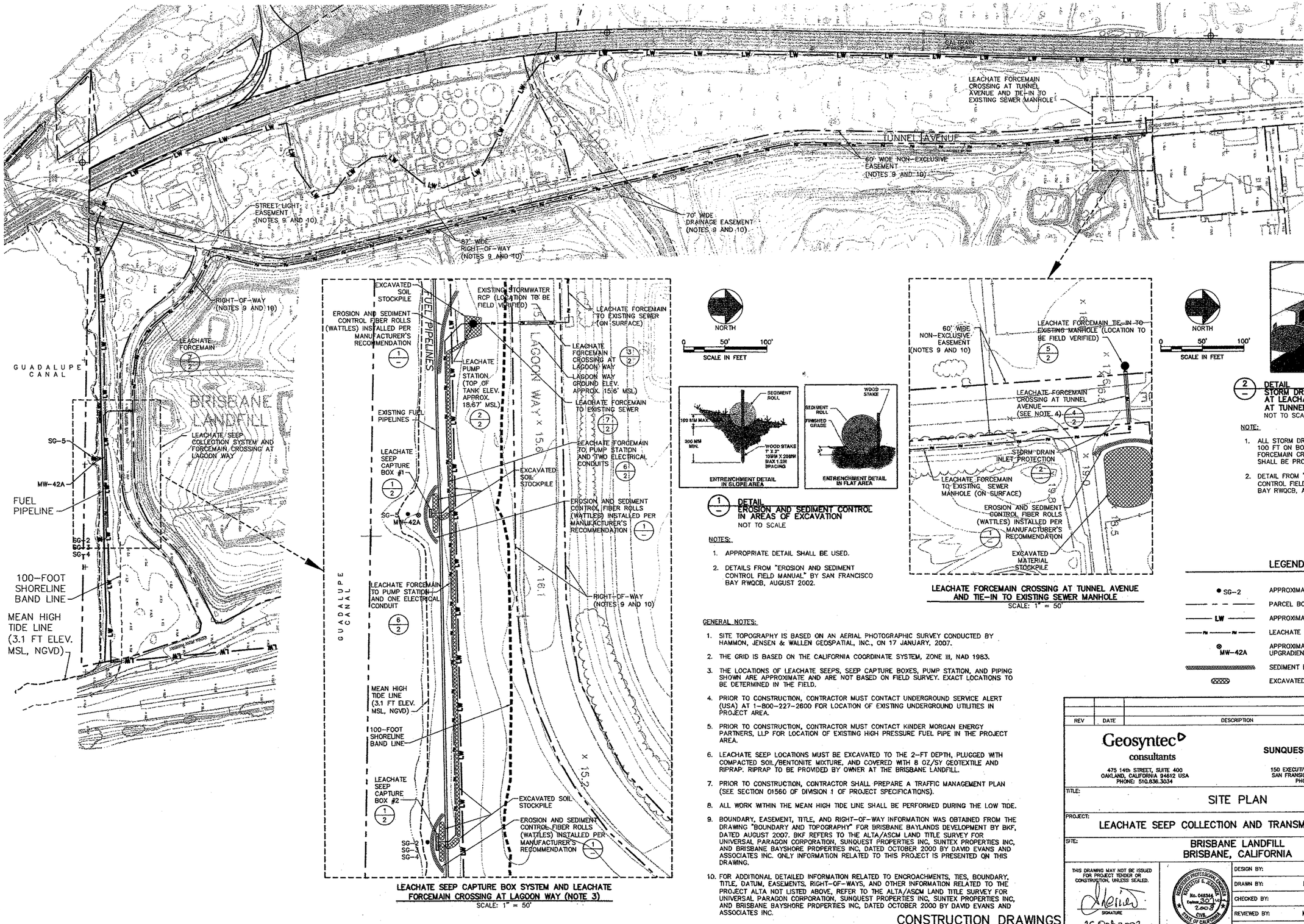
Phone 510.267.0441 Fax 510.267.0443

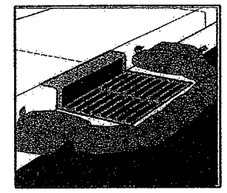
REGISTERED PROFESSIONAL ENGINEER No. 018584 Exp. 30 Jun 2008 CIVIL STATE OF CALIFORNIA

26 Oct 2007

DRAWING NO. 1

P:\CAD\Sunquest\WG1042-Leachate Seep Collection\Cover Sheet-2008.dwg 11-15-07 02:21:04 PM Shiddemyer





(2) DETAIL
STORM DRAIN INLET PROTECTION AT LEACHATE FORCEMAIN CROSSING AT TUNNEL AVENUE
NOT TO SCALE

NOTE:

1. ALL STORM DRAIN INLETS LOCATED WITHIN 100 FT ON BOTH SIDES OF LEACHATE FORCEMAIN CROSSING AT TUNNEL AVENUE SHALL BE PROTECTED.
2. DETAIL FROM "EROSION AND SEDIMENT CONTROL FIELD MANUAL" BY SAN FRANCISCO BAY RWQCB, AUGUST 2002.

(1) DETAIL
EROSION AND SEDIMENT CONTROL IN AREAS OF EXCAVATION
NOT TO SCALE

NOTES:

1. APPROPRIATE DETAIL SHALL BE USED.
2. DETAILS FROM "EROSION AND SEDIMENT CONTROL FIELD MANUAL" BY SAN FRANCISCO BAY RWQCB, AUGUST 2002.

LEACHATE FORCEMAIN CROSSING AT TUNNEL AVENUE AND TIE-IN TO EXISTING SEWER MANHOLE
SCALE: 1" = 50'

LEACHATE SEEP CAPTURE BOX SYSTEM AND LEACHATE FORCEMAIN CROSSING AT LAGOON WAY (NOTE 3)
SCALE: 1" = 50'

GENERAL NOTES:

1. SITE TOPOGRAPHY IS BASED ON AN AERIAL PHOTOGRAPHIC SURVEY CONDUCTED BY HAMMON, JENSEN & WALLEN GEOSPATIAL, INC., ON 17 JANUARY, 2007.
2. THE GRID IS BASED ON THE CALIFORNIA COORDINATE SYSTEM, ZONE III, NAD 1983.
3. THE LOCATIONS OF LEACHATE SEEPS, SEEP CAPTURE BOXES, PUMP STATION, AND PIPING SHOWN ARE APPROXIMATE AND ARE NOT BASED ON FIELD SURVEY. EXACT LOCATIONS TO BE DETERMINED IN THE FIELD.
4. PRIOR TO CONSTRUCTION, CONTRACTOR MUST CONTACT UNDERGROUND SERVICE ALERT (USA) AT 1-800-227-2600 FOR LOCATION OF EXISTING UNDERGROUND UTILITIES IN PROJECT AREA.
5. PRIOR TO CONSTRUCTION, CONTRACTOR MUST CONTACT KINDER MORGAN ENERGY PARTNERS, LLP FOR LOCATION OF EXISTING HIGH PRESSURE FUEL PIPE IN THE PROJECT AREA.
6. LEACHATE SEEP LOCATIONS MUST BE EXCAVATED TO THE 2-FT DEPTH, PLUGGED WITH COMPACTED SOIL/BENTONITE MIXTURE, AND COVERED WITH 8 OZ/SY GEOTEXTILE AND RIPRAP. RIPRAP TO BE PROVIDED BY OWNER AT THE BRISBANE LANDFILL.
7. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PREPARE A TRAFFIC MANAGEMENT PLAN (SEE SECTION 01560 OF DIVISION 1 OF PROJECT SPECIFICATIONS).
8. ALL WORK WITHIN THE MEAN HIGH TIDE LINE SHALL BE PERFORMED DURING THE LOW TIDE.
9. BOUNDARY, EASEMENT, TITLE, AND RIGHT-OF-WAY INFORMATION WAS OBTAINED FROM THE DRAWING "BOUNDARY AND TOPOGRAPHY" FOR BRISBANE BAYLANDS DEVELOPMENT BY BKF, DATED AUGUST 2007. BKF REFERS TO THE ALTA/ASCM LAND TITLE SURVEY FOR UNIVERSAL PARAGON CORPORATION, SUNQUEST PROPERTIES INC, SUNTEX PROPERTIES INC, AND BRISBANE BAYSHORE PROPERTIES INC, DATED OCTOBER 2000 BY DAVID EVANS AND ASSOCIATES INC. ONLY INFORMATION RELATED TO THIS PROJECT IS PRESENTED ON THIS DRAWING.
10. FOR ADDITIONAL DETAILED INFORMATION RELATED TO ENCROACHMENTS, TIES, BOUNDARY, TITLE, DATUM, EASEMENTS, RIGHT-OF-WAYS, AND OTHER INFORMATION RELATED TO THE PROJECT ALTA NOT LISTED ABOVE, REFER TO THE ALTA/ASCM LAND TITLE SURVEY FOR UNIVERSAL PARAGON CORPORATION, SUNQUEST PROPERTIES INC, SUNTEX PROPERTIES INC, AND BRISBANE BAYSHORE PROPERTIES INC, DATED OCTOBER 2000 BY DAVID EVANS AND ASSOCIATES INC.

LEGEND

• SG-2	APPROXIMATE LEACHATE SEEP LOCATION
———	PARCEL BOUNDARY
LW	APPROXIMATE EXTENT OF REFUSE
FM FM	LEACHATE FORCEMAIN
⊗ MW-42A	APPROXIMATE LOCATION OF SHALLOW UPGRADIENT MONITORING WELL
	SEDIMENT ROLL LOCATION
	EXCAVATED SOIL STOCKPILE

CONSTRUCTION DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
475 14th STREET, SUITE 400
OAKLAND, CALIFORNIA 94612 USA
PHONE: 510.836.3034

SUNQUEST PROPERTIES, INC.
150 EXECUTIVE PARK BLVD., SUITE 4200
SAN FRANSICO, CALIFORNIA, 94134 USA
PHONE: 415.468.6676

TITLE: SITE PLAN

PROJECT: LEACHATE SEEP COLLECTION AND TRANSMISSION SYSTEM

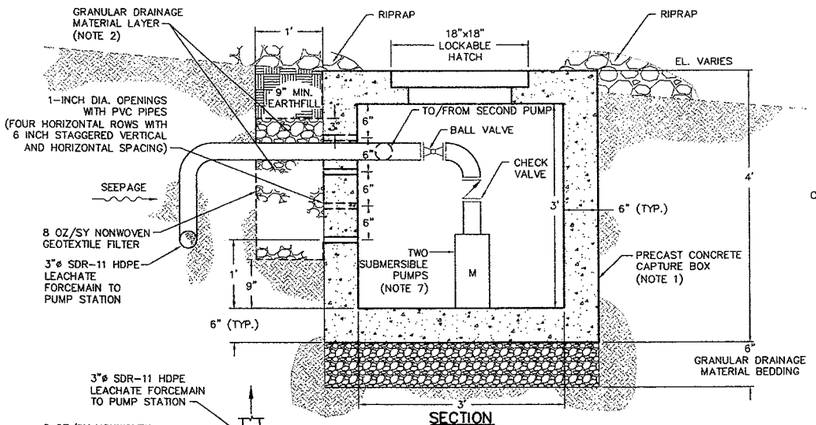
SITE: BRISBANE LANDFILL
BRISBANE, CALIFORNIA

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

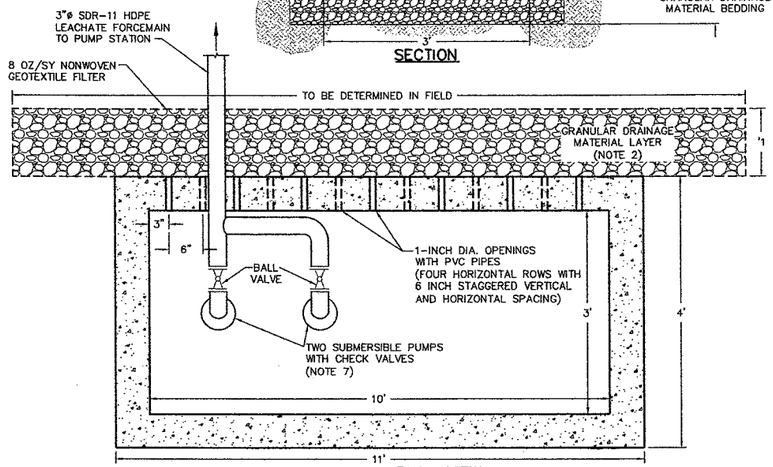
SIGNATURE
26 Oct 2007
DATE

REGISTERED PROFESSIONAL ENGINEER KRISTOFER S. JENSEN No. 048344 Exp. 3-31-09 CIVIL STATE OF CALIFORNIA

DESIGN BY:	SB	DATE:	OCTOBER 2007
DRAWN BY:	RWL	PROJECT NO.:	WG1042.02
CHECKED BY:	SB	FILE:	WG1042.02-01001
REVIEWED BY:	MAO	DRAWING NO.:	C-1
APPROVED BY:	KSJ		

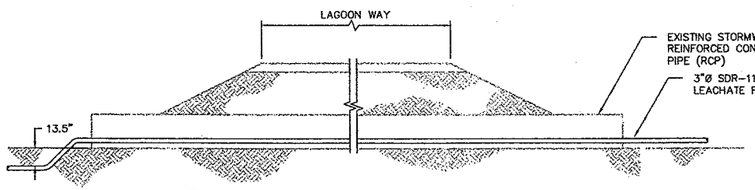


SECTION

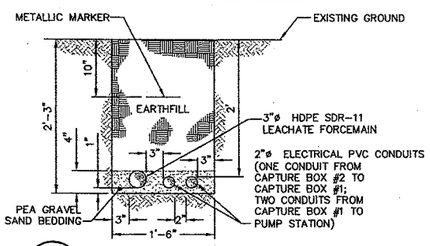


PLAN VIEW

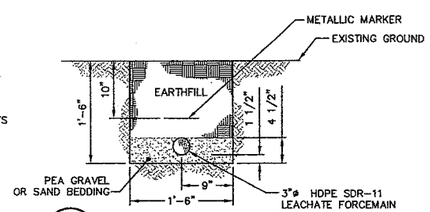
1/1 DETAIL
LEACHATE SEEP CAPTURE BOX (TYP) (NOTES 1, 2, 3)
NOT TO SCALE
XREF: WG1042.02X01004



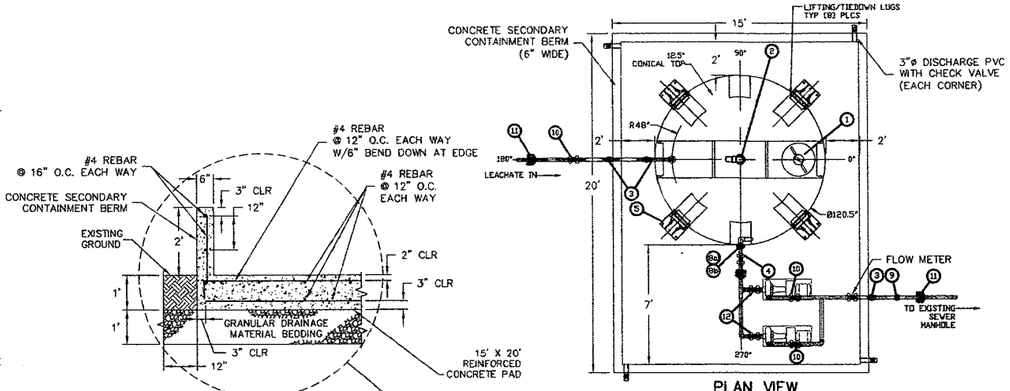
3/1 DETAIL
LEACHATE FORCEMAIN CROSSING AT LAGOON WAY (TYP)
SCALE: NTS
XREF: WG1042.02X01005



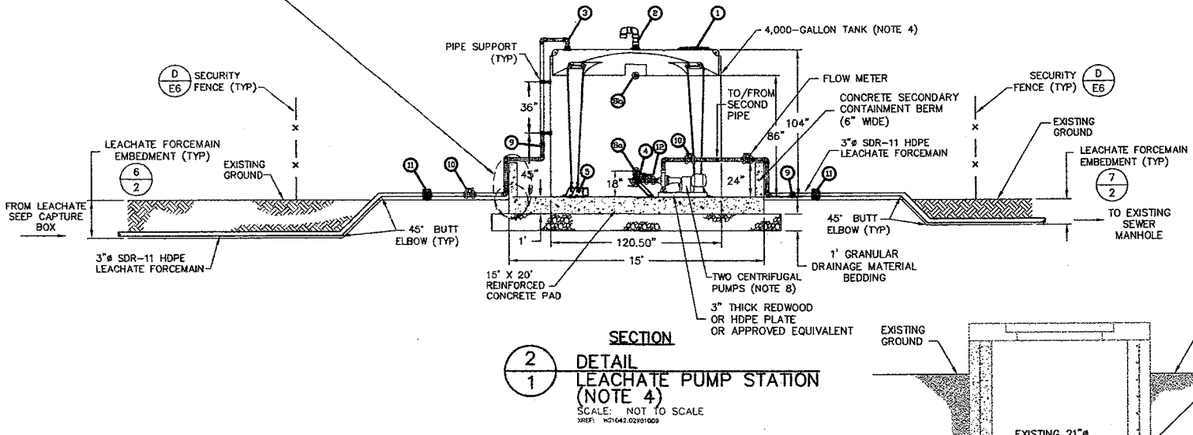
6/1 DETAIL
LEACHATE FORCEMAIN EMBEDMENT
SCALE: 1" = 1'
XREF: WG1042.02X01007



7/1 DETAIL
LEACHATE FORCEMAIN EMBEDMENT
SCALE: 1" = 1'
XREF: WG1042.02X01007

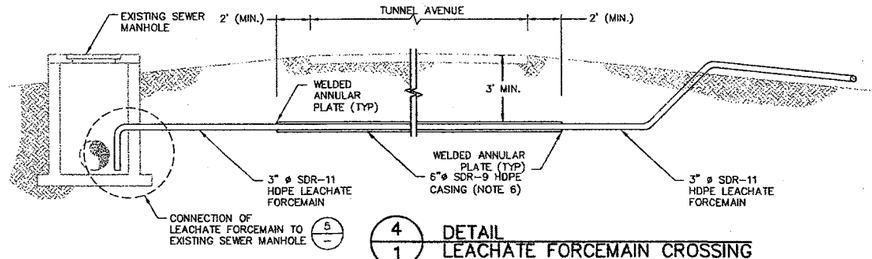


PLAN VIEW

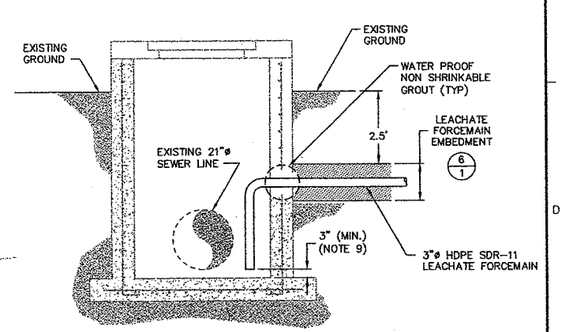


SECTION

2/1 DETAIL
LEACHATE PUMP STATION (NOTE 4)
SCALE: NOT TO SCALE
XREF: WG1042.02X01009



4/1 DETAIL
LEACHATE FORCEMAIN CROSSING AT TUNNEL AVENUE
SCALE: NOT TO SCALE
XREF: WG1042.02X01011



5/1 DETAIL
CONNECTION OF LEACHATE FORCEMAIN TO EXISTING SEWER MANHOLE (NOTE 5)
SCALE: 1" = 2'
XREF: WG1042.02X01008

NOTES FOR TANK AND PIPING:

1. 24" PE MANWAY, THREADED & VENTED, BLACK
2. FNPT BHF W/EPDM GASKETS & U-VENT ASS'Y
3. FNPT BHF W/EPDM GASKETS & EXT FILL PIPE ASS'Y, [2] TANK MTD 1" BHF, EPDM GASKET & PVC SADDLE SUPTS (FILL)
4. DOUB FLG FTG W/PE ENCAP 316 SS BOLTS, EPDM GASKETS, FLANGE ADAPTOR & SIPHON TUBE (DRAIN/PROCESS)
5. CABLE TIEDOWN SYSTEM, UBC 1997 SEISMIC ZONE 4, TYP [4] PLCS
6. GALLONAGE TAPE, VINYL SELF-ADHESIVE, FIELD APPLIED "NOT SHOWN"
7. WRAP, PROTECTIVE PACKAGING FOR SHIPMENT "NOT SHOWN"
- 8a. FNPT BHF W/EPDM GASKET (LOW LEVEL SWITCH)
- 8b. FNPT BHF W/EPDM GASKET (HIGH LEVEL SWITCH)

SEE ELECTRICAL DRAWINGS FOR DETAILS

9. PIPE JOINT.
10. BALL VALVE
11. EXPANSION JOINT (TO BE APPROVED BY OWNER)
12. CHECK VALVE

HDLPE, 1.5 S.G., NATURAL COLOR
MANUFACTURED ASTM D1998-06
OR APPROVED EQUIVALENT

NOTES FOR CONCRETE PAD:

A. ALL CONSTRUCTION TECHNIQUES SHALL CONFORM TO UBC 1997, CBC 2001, AND IBC 2003.
B. CONCRETE SHALL OBTAIN A MINIMUM ULTIMATE 28 DAY COMPRESSIVE STRENGTH OF Fc = 4000 PSI.
C. REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615 GRADE 60, Fy = 60,000 PSI.
D. MINIMUM COVER FOR REINFORCING BARS SHALL BE 2" ON THE TOP, 3" ON THE SIDES AND BOTTOM OF THE PAD AS SHOWN.

GENERAL NOTES:

1. THE LEACHATE SEEP CAPTURE BOXES MAY BE CONSTRUCTED OF PRE-CAST CONCRETE OR 1/2" THICK HDPE. THE LEACHATE SEEP CAPTURE BOXES SHALL HAVE INSIDE DIMENSIONS OF 3 FT (WIDTH) x 10 FT (LENGTH).
2. THE LENGTH OF THE GRANULAR DRAINAGE MATERIAL LAYER WILL BE DETERMINED DURING CONSTRUCTION/EXCAVATION BASED ON FIELD OBSERVATION OF SEEP LOCATIONS.
3. STORMWATER SHALL BE DIVERTED AWAY FROM THE LEACHATE SEEP CAPTURE BOXES AND THE PUMP STATION.
4. THE CONTRACTOR TO INSTALL THE TANK SO IT RESISTS SEISMIC AND WIND LOADS.
5. DIMENSIONS OF THE EXISTING SEWER MANHOLE ARE NOT KNOWN AND SHALL BE DETERMINED BY FIELD MEASUREMENTS.
6. INSTALL LEACHATE FORCEMAIN HDPE CASING UNDER TUNNEL AVENUE USING DIRECTIONAL DRILLING, JACK AND BORE METHOD, OR OTHER SUITABLE METHOD SELECTED BY CONTRACTOR.
7. SUBMERSIBLE PUMPS IN LEACHATE SEEP CAPTURE BOXES #1 AND #2 SHALL HAVE 0.33 AND 0.5 HORSEPOWER MOTORS CAPABLE OF DELIVERING 30 FT OF HEAD AT 10 AND 20 GPM, RESPECTIVELY. THERE SHALL BE TWO IDENTICAL PUMPS INSTALLED IN EACH BOX AND CONNECTED IN PARALLEL WITH CHECK VALVES.
8. TWO CENTRIFUGAL PUMPS IN LEACHATE PUMP STATION SHALL HAVE 1.5 HORSEPOWER MOTORS CAPABLE OF DELIVERING 40 FT OF HEAD AT 40 GPM EACH. PUMPS SHALL BE CONNECTED IN PARALLEL WITH CHECK VALVES.
9. THE LEACHATE FORCEMAIN SHALL TERMINATE AT THE 21" DIAMETER SEWER LINE INVERT ELEVATION (BUT NOT LESS THAN 3" ABOVE MANHOLE BOTTOM).
10. RIPRAP TO BE PROVIDED BY OWNER AT BRISBANE LANDFILL FREE OF CHARGE.
11. PVC AND HDPE PIPES TO BE CONNECTED PER MANUFACTURER'S RECOMMENDATION.

CONSTRUCTION DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
475 14th STREET, SUITE 400
OAKLAND, CALIFORNIA 94612 USA
PHONE: 510.836.3034

SUNQUEST PROPERTIES, INC.
150 EXECUTIVE PARK BLVD., SUITE 4200
SAN FRANSICO, CALIFORNIA, 94134 USA
PHONE: 415.468.6676

TITLE: DETAILS

PROJECT: LEACHATE SEEP COLLECTION AND TRANSMISSION SYSTEM

SITE: BRISBANE LANDFILL
BRISBANE, CALIFORNIA

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

26 Oct 2007
DATE

REGISTERED PROFESSIONAL ENGINEER — KEVIN S. JOHNSON — No. 048334 — Exp. 3-31-2009 — CIVIL — STATE OF CALIFORNIA

DESIGN BY:	SB	DATE:	OCTOBER 2007
DRAWN BY:	RWL	PROJECT NO.:	WG1042.02
CHECKED BY:	SB	FILE:	WG1042.02-01002
REVIEWED BY:	MAO	DRAWING NO.:	C-2
APPROVED BY:	KSJ		

CONTROL DIAGRAM SYMBOLS

120V / 120V — CONTROL TRANSFORMER, PRIMARY AND SECONDARY VOLTAGES SHOWN, SIZE AS SHOWN OR SPECIFIED

40A — CIRCUIT BREAKER, THERMAL-MAGNETIC, 3 POLE, UON, RATING IN AMPS

DESIGNATES PLC INPUT TERMINATION OR CONTROL PANEL TERMINATION

ID — FUSE

MODIFIERS:
- CLF = CURRENT LIMITING FUSE
- DE = DUAL ELEMENT
- F = CLASS F

ID / DESCPTN — PUSHBUTTON, MOMENTARY CONTACT, NORMALLY OPEN

ID / DESCPTN — PUSHBUTTON, MOMENTARY CONTACT, NORMALLY CLOSED

ID / DESCPTN — STOP PUSHBUTTON WITH LOCKOUT

ID — SELECTOR SWITCH (H, O, A)
3 POSITION MAINTAINED CONTACT
X = CONTACTS CLOSED

LINE — L — LEGEND — INDICATING LIGHT
PUSH TO TEST, TEST VOLTAGE TERMINAL SHOWN

L = LENS COLOR:
- A = AMBER
- B = BLUE
- G = GREEN
- R = RED
- W = WHITE

2 CR — FUNCTION — CONTROL RELAY OPERATING COIL

CR = CONTROL RELAY
U = UNLATCH
L = LATCH

OL — THERMAL OVERLOAD RELAY

2CR 2CR — OUTPUT CONTACTS

2 TR — TIMING RELAY OPERATING COIL

ON or OFF DELAY
RANGE:SEC/MIN
SET:SEC/MIN

NORMALLY OPEN	NORMALLY CLOSE	
2TR OR TC	2TR OR TD	DELAY ON COIL ENERGIZATION (ON DELAY)
		POSITION (LIMIT) SWITCH
		TEMPERATURE SWITCH
		PRESSURE SWITCH
		FLOAT SWITCH

STANDARD ABBREVIATIONS

A	AMMETER
ATS	AUTOMATIC TRANSFER SWITCH
BCW	BARE COPPER WIRE
C	CONDUIT
C.O.	CONDUIT ONLY (EMPTY CONDUIT)
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CS	CONTROL SWITCH
CT	CONTACTOR (HEAVY DUTY)
FS	FLOAT SWITCH
G	GROUND
HZ	HERTZ
KVAR	REACTIVE POWER
KW	KILOWATT
KWHR	KILOWATTHOUR
I/O	INPUT/OUTPUT
LOS	LOCKOUT STOP
MTS	MANUAL TRANSFER SWITCH
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MF	MULTI-FUNCTION METER DISPLAY
MIN	MINIMUM
MSGR	MAIN SWITCHGEAR
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
PAIR OR PR	TWISTED, SHIELDED PAIRS
PB	PULL BOX
PLC	PROGRAMMABLE LOGIC CONTROLLER
QUAD	TWISTED, SHIELDED 4-CONDUCTOR CABLE
PP	POWER POLE
RTD	RESISTANCE THERMAL DETECTOR
RTU	REMOTE TERMINAL UNIT
SCADA	SUPERVISORY CONTROL & DATA ACQUISITION
SSRS	SOLID STATE REDUCED VOLTAGE STARTER
SWGR	SWITCHGEAR
THD	HARMONIC DISTORTION
TS	TEMPERATURE SWITCH
UON	UNLESS OTHERWISE NOTED
V	VOLTMETER
VFD	VARIABLE FREQUENCY DRIVE
WP	WEATHER PROOF (NEMA 4X)
XFMR	TRANSFORMER

LIGHTING

FIXTURE IDENTIFIER:

5 — XX — 2/40 — R — 8'-6

- NUMBER OF FIXTURES (SHOWN ONLY WHEN REQUIRED FOR CLARITY)
- FIXTURE TYPE REFER TO FIXTURE SCHEDULE TYPE APPLIES TO ALL FIXTURES OF THE SAME SHAPE WITHIN A ROOM OR AREA.
- MOUNTING:
  - C = CEILING
  - PP = POLE
  - P = PENDANT
  - R = RECESSED
  - S = STANCHION
  - W = WALL
- MOUNTING HEIGHT, FLOOR TO BOTTOM OF FIXTURE UON. AHAP = AS HIGH AS POSSIBLE.
- NUMBER OF LAMPS/LAMP WATTAGE

LIGHTING FIXTURE SHAPES AND SCALE ARE REPRESENTED WHERE POSSIBLE. THE EXAMPLES SHOWN BELOW ARE TYPICAL APPLICATIONS.

- FLUORESCENT FIXTURE
- WALL MOUNTED FIXTURE
- EMERGENCY LIGHTING UNIT. SELF CONTAINED.
- POLE MTD LIGHT FIXTURE

WIRING DEVICES

SWITCHES:

UNLESS OTHERWISE SPECIFIED, ALL SWITCHES ARE WALL MOUNTED.

- TOGGLE SWITCH, SINGLE POLE, 20 AMP
- GANGED SWITCHES IN COMMON BOX WITH COMMON WALL PLATE
- SUPERSCRIPT INDICATES CIRCUIT CONTROLLED: a, b, c, ETC. MAY BE COMBINED WITH CIRCUIT NUMBER. EXAMPLE: 1a, 4b, ETC.
- SUBSCRIPT MODIFIER INDICATES:
  - 2 = DOUBLE POLE
  - 3 = THREE WAY
  - 4 = FOUR WAY
  - K = KEY OPERATED
  - MC = MOMENTARY CONTACT, THREE POSITION
  - MS = MANUAL (MOTOR) STARTER OR SWITCH
  - R = RHEOSTAT (DIMMER, SPEED CONTROL)

RECEPTACLES:

UNLESS OTHERWISE SPECIFIED, ALL RECEPTACLES ARE 125 VOLT, SINGLE PHASE, STRAIGHT BLADE, NON LOCKING, GROUNDING STYLE.

- DUPLEX RECEPTACLE, 20 AMP, 3 WIRE

RECEPTACLE MODIFIERS:

- WP = WEATHER PROOF
- GF = GROUND FAULT CIRCUIT INTERRUPTER
- H = HAZARDOUS AREA-EXPLOSION PROOF

- DOUBLE DUPLEX RECEPTACLE,

CIRCUITS AND RACEWAYS

- RACEWAY EXPOSED
- DIRECT BURIED CONDUIT
- RACEWAY CONCEALED
- RACEWAY TURNED TOWARD THE VIEWER.
- RACEWAY TURNED DOWN

HH23 — MANHOLE (MH) OR HANDHOLE (HH),

J — JUNCTION BOX.

TB — TERMINAL BOX.

3#10 AWG, #10 AWG G, 1"C — RACEWAY SIZE WITH CONDUCTOR CONTENTS AND SIZES.

LP-1 — CIRCUIT HOMERUN W/ DESTINATION NOTED (2#12, #12 GND MIN.)

T — TELEPHONE SYSTEM CONDUIT WITH PULLING NYLON ROPE

LIGHT CIRCUIT W/ CONDUCTOR QUANTITY INDICATED

LSC-2XX — 240V CIRCUIT DESIGNATION

LSC-1XX — 120V CIRCUIT DESIGNATION

MOTORS AND EQUIPMENT

- DISCONNECT SWITCH, NON-FUSED
- M — MOT=MOTOR; SV=SOLENOID VALVE; CV=CONTROL VALVE; A=ADJUSTABLE SPEED DRIVE; 125 = 125HP
- FIELD INSTRUMENT
- CONTROL STATION. SEE CONTROL DIAGRAMS FOR DEVICES REQUIRED

TELEPHONE & COMMUNICATION SYSTEMS

UNLESS OTHERWISE SPECIFIED, TELEPHONE OUTLETS SHALL BE MOUNTED AT SAME HEIGHT AS THE RECEPTACLES. VERIFY.

- EXTERNAL LINE OR PLANT PHONE SYSTEM OUTLET

MODIFIERS:

- T — TELEPHONE

GROUNDING

- GROUND ROD
- GROUND ROD WITH GROUND WELL
- GROUND CONNECTION, BOLTED TYPE
- GROUND CONNECTION, COMPRESSION TYPE
- G — GROUNDING CONDUCTOR, MINIMUM #2/0 BARE COPPER
- INSTRUMENT CABLE SHIELD GROUND

MISCELLANEOUS

- E150 / TYP — TYPICAL DETAIL DESIGNATION
- GROUND CONNECTION
- RTU OUTPUT
- T — THERMOSTAT
- 5 — NOTE DESIGNATION
- DESIGNATES EQUIPMENT OR DEVICE LOCATED AT LOAD IN THE FIELD
- DESIGNATES EQUIPMENT OR DEVICES LOCATED IN MCC
- DESIGNATES EQUIPMENT OR DEVICES LOCATED IN CONTROL PANEL
- RTU I/O TERMINATION
- IONIZATION SMOKE DETECTOR
- E — END-OF-LINE DEVICE
- F — FIRE ALARM PULLSTATION
- F — COMBINATION STROBE LIGHT/HORN
- FIREALARM CONTROL PANEL
- SPACE HEATER
- FS — FLOAT SWITCH
- PUSHBUTTON (STOP)
- SELECTOR SWITCH
- PILOT LIGHT
- PUSHBUTTON (START)

ONE-LINE DIAGRAM SYMBOLS

- SIZE 2 COMBINATION FULL VOLTAGE NON-REVERSING MAGNETIC STARTER MCP SIZED BY MANUFACTURER (OVERLOAD RELAY NOT SHOWN) RV = REDUCED VOLTAGE 2S2W = TWO-SPEED TWO-WINDING 2 = SIZE 2
- POWER TRANSFORMER. IMPEDANCE SHOWN
- 5.75% Z 480/277V
- 480V, 3Ø, 4W; 600KW 60HZ — GENERATOR. POWER RATING, FREQUENCY, VOLTAGE.
- SHOWN
- 400/3 — CURRENT TRANSFORMER WITH RATIO AND NUMBER OF UNITS
- 200A — 200 AMP SHOWN
- MAIN SERVICE METER (BY UTILITY COMPANY)
- FU — FUSE WITH BLOWN INDICATOR
- MF — MULTI-FUNCTION ELECTRONIC METER
- K — KIRK-KEY INTERLOCK
- PORTABLE GENERATOR

GENERAL NOTES

1. THIS DRAWING IS GENERAL IN NATURE. SOME SYMBOLS SHOWN HEREON MAY NOT BE USED ON THE CONTRACT DRAWINGS.
2. IDENTIFICATIONS (ID), SIZES, RATINGS, LOCATIONS AND SIMILAR INFORMATION SHOWN ASSOCIATED WITH SYMBOLS ARE OPTIONAL; EXAMPLES OF SUCH INFORMATION ARE SHOWN WITH SOME SYMBOLS FOR CLARITY.
3. THE ELECTRICAL DRAWINGS USE THE ONE-LINE DIAGRAMS AND PANEL SCHEDULES IN CONJUNCTION WITH SHOWING THE LOCATION OF THE ELECTRICAL/INSTRUMENTATION SOURCES AND LOADS/DEVICES SHOWN ON THE PLAN DRAWINGS TO DEPICT THE WORK. THE CONTRACTOR SHALL USE THESE DOCUMENTS TO DETERMINE AND PROVIDE THE NECESSARY RACEWAY AND WIRING SYSTEM FOR EACH CIRCUIT. ALL INDOOR RACEWAY SHALL BE RUN EXPOSED, AND ROUTED BY THE CONTRACTOR, UNLESS OTHERWISE NOTED. THE TYPE OF RACEWAY AND WIRE USED SHALL BE AS SPECIFIED IN THE SPECIFICATIONS UNLESS OTHERWISE NOTED.
4. THE LOCATION OF THE CONTROL STATIONS SHOWN ON THE PLAN DRAWINGS ARE DIAGRAMMATIC AND THE ACTUAL LOCATION SHALL BE COORDINATED IN THE FIELD WITH THE CONSTRUCTION MANAGER.
5. THE EXACT LOCATION OF THE MOTORS AND ACCESSORIES ARE NOT SHOWN. THE CONTRACTOR SHALL COORDINATE THE CIVIL AND OR MECHANICAL DRAWINGS FOR CONDUIT STUBOUT AND TERMINATION LOCATIONS.
6. ALL EQUIPMENT SHALL BE LABELED WITH NAMEPLATES. DESCRIPTION OF EQUIPMENT SHALL BE IN ACCORDANCE WITH THE ONE-LINE DIAGRAM DESCRIPTION . A LIST OF THE NAMEPLATES SHALL BE SUBMITTED TO THE CONSTRUCTION MANAGER PRIOR TO ENGRAVING.
7. UNLESS OTHERWISE NOTED, ALL CONVENIENCE OUTLETS SHALL BE MOUNTED AT 48-INCHES ABOVE FINISHED FLOOR. ALL LIGHT SWITCHES SHALL BE MOUNTED AT 54-INCHES ABOVE FINISHED FLOOR.
8. EACH CONVENIENCE OUTLET AND LIGHTING CIRCUIT SHALL BE PROVIDED WITH A #12AWG GREEN GROUNDING CONDUCTOR
9. FOR SPARE CONDUCTORS, AT EACH END, TAPE & COIL UP AND PROVIDE ENGRAVED TAG IDENTIFYING 'FROM AND TO' DESTINATION.
10. ALL DIRECT BURIED CONDUITS IN CHEMICAL TANK AREA SHALL BE PVC COATED RIGID GALVANIZED STEEL.
11. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING UNDERGROUND UTILITIES PRIOR TO PERFORMING ANY TRENCHING OPERATIONS.

REGISTERED PROFESSIONAL ENGINEER — STEP TAN NGUYEN — No. E-10689 Exp. 6/30/09 — ELECTRICAL — STATE OF CALIFORNIA

10-26-2007

REV	DATE	DESCRIPTION	DRN	APP

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310C01H
SUNQUEST PROPERTIES, INC.
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PHONE: 415.468.6676

TITLE: ELECTRICAL LEGEND AND SYMBOLS, NOTES

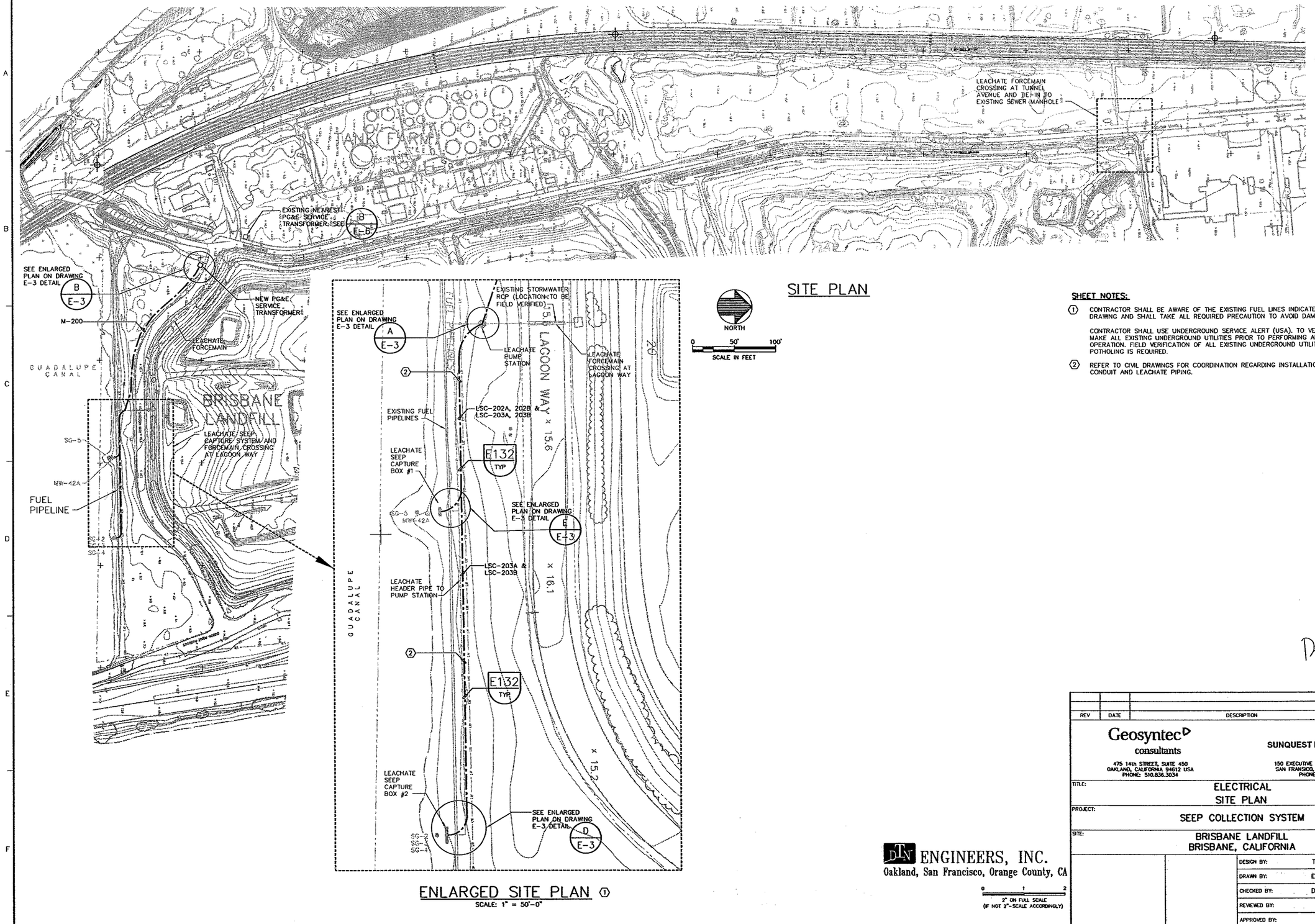
PROJECT: SEEP COLLECTION SYSTEM

SITE: BRISBANE LANDFILL, BRISBANE, CALIFORNIA

DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

0 1 2
2" ON FULL SCALE
(IF NOT 2"-SCALE ACCORDINGLY)

DESIGN BY:	TP	DATE:	SEPTEMBER 2007
DRAWN BY:	EA	PROJECT NO.:	WG1042.02
CHECKED BY:	DN	FILE:	250_E01
REVIEWED BY:		DRAWING NO.:	E-1
APPROVED BY:		SHEET	1 OF 8



ENLARGED SITE PLAN ①

SCALE: 1" = 50'-0"

SITE PLAN

NORTH

0 50' 100'

SCALE IN FEET

SHEET NOTES:

① CONTRACTOR SHALL BE AWARE OF THE EXISTING FUEL LINES INDICATED ON THIS DRAWING AND SHALL TAKE ALL REQUIRED PRECAUTION TO AVOID DAMAGING THEM.

CONTRACTOR SHALL USE UNDERGROUND SERVICE ALERT (USA). TO VERIFY AND MAKE ALL EXISTING UNDERGROUND UTILITIES PRIOR TO PERFORMING ANY TRENCHING OPERATION. FIELD VERIFICATION OF ALL EXISTING UNDERGROUND UTILITIES INCLUDING POTHOLING IS REQUIRED.

② REFER TO CIVIL DRAWINGS FOR COORDINATION REGARDING INSTALLATION OF CONDUIT AND LEACHATE PIPING.

REGISTERED PROFESSIONAL ENGINEER
DEEP TAN NGUYEN
No. E-10689
Exp. 6/30/09
ELECTRICAL
STATE OF CALIFORNIA

10-26-2007

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
475 14th STREET, SUITE 450
OAKLAND, CALIFORNIA 94612 USA
PHONE: 510.836.3034

SUNQUEST PROPERTIES, INC.
150 EXECUTIVE PARK BLVD., SUITE 4200
SAN FRANSICO, CALIFORNIA, 94134 USA
PHONE: 415.468.6676

TITLE: ELECTRICAL SITE PLAN

PROJECT: SEEP COLLECTION SYSTEM

SITE: BRISBANE LANDFILL
BRISBANE, CALIFORNIA

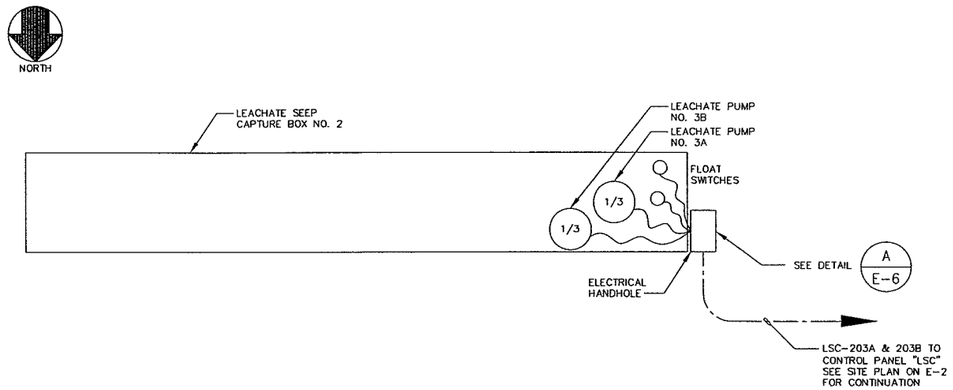
DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

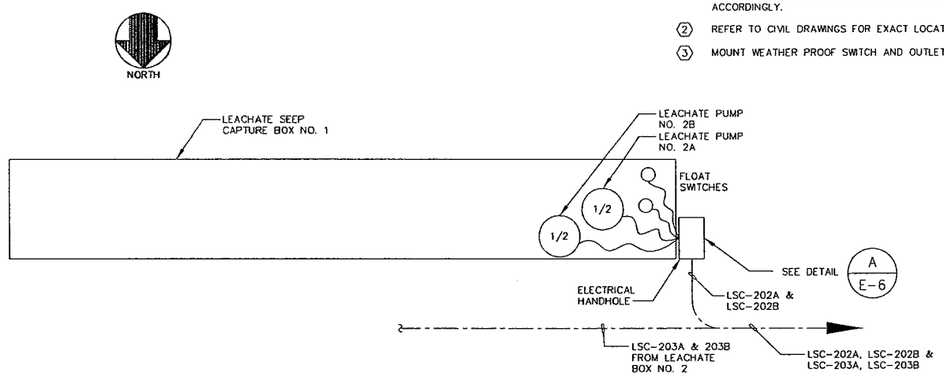
0 1 2
2" ON FULL SCALE
(IF NOT 2"-SCALE ACCORDINGLY)

DESIGN BY:	TP	DATE:	SEPTEMBER 2007
DRAWN BY:	EA	PROJECT NO.:	WG1042.02
CHECKED BY:	DN	FILE:	250_E02
REVIEWED BY:		DRAWING NO.:	SHEET
APPROVED BY:		E-2	2 OF 8

SHEET NOTES:

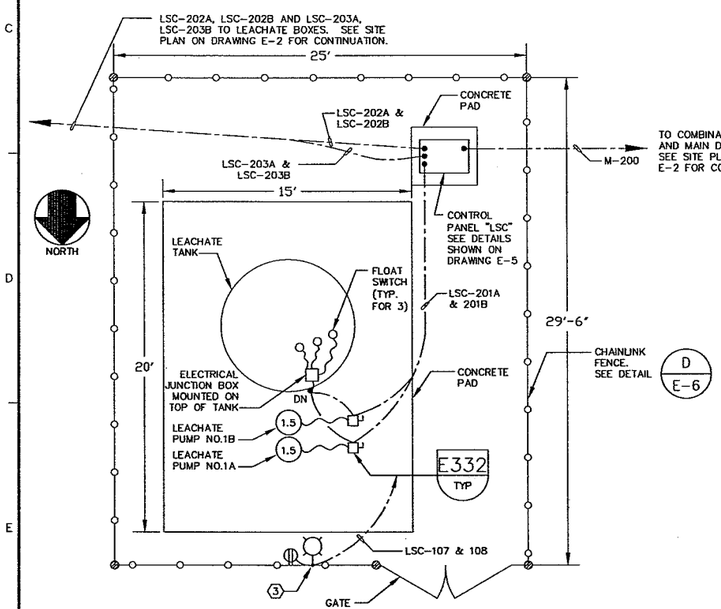
1. MINIMUM CONCRETE PAD DIMENSION IS SHOWN, CONTRACTOR TO VERIFY WITH PG&E FOR EXACT TRANSFORMER'S DIMENSION AND THE CONCRETE PAD'S DIMENSION AND PROVIDE ACCORDINGLY.
2. REFER TO CIVIL DRAWINGS FOR EXACT LOCATIONS OF THE LEACHATE BOXES AND TANK.
3. MOUNT WEATHER PROOF SWITCH AND OUTLET AT 48" ABOVE GRADE ON LIGHT POLE.





D — CAPTURE BOX NO. 2 — PLAN ②

SCALE: 1/2" = 1'-0"



A — PUMP STATION — PLAN ②

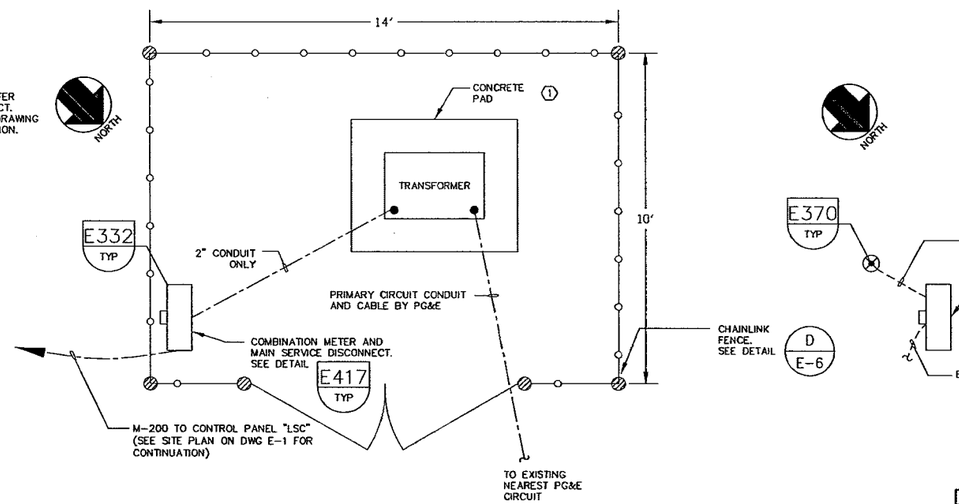
SCALE: 1/4" = 1' - 0"

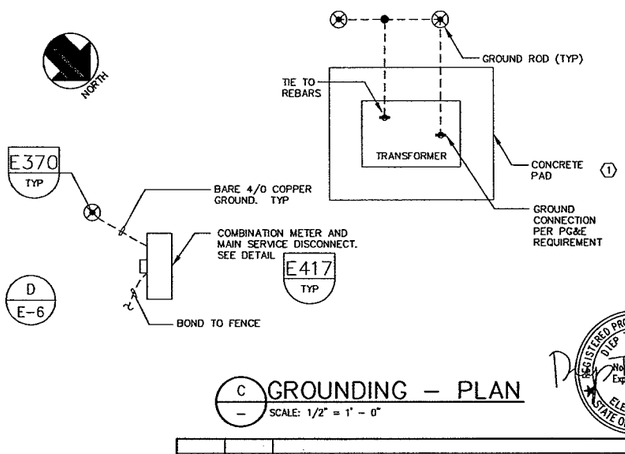
E — CAPTURE BOX NO. 1 — PLAN ②

SCALE: 1/2" = 1'-0"

B — PG&E SERVICE TRANSFORMER — PLAN

SCALE: 1/2" = 1' - 0"





C — GROUNDING — PLAN

SCALE: 1/2" = 1' - 0"

REGISTERED PROFESSIONAL ENGINEER — DIEP TAN NGUYEN — No. E-10687 Exp. 5/30/09 — ELECTRICAL — STATE OF CALIFORNIA

10-26-2007

REV	DATE	DESCRIPTION	DRN	APP

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310C01H
SUNQUEST PROPERTIES, INC.
150 EXECUTIVE PARK BLVD., SUITE 4200
SAN FRANSICO, CALIFORNIA, 94134 USA
PHONE: 415.468.6676

TITLE: ELECTRICAL
PUMP STATION AND LEACHATE BOXES ENLARGED PLANS

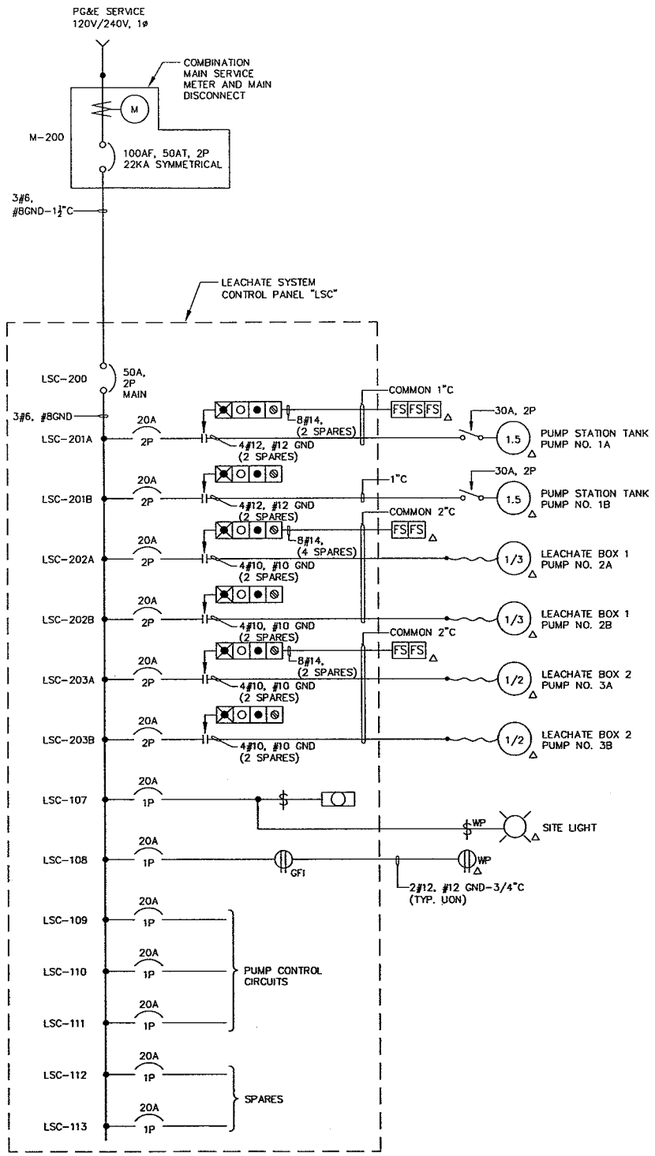
PROJECT: SEEP COLLECTION SYSTEM

SITE: BRISBANE LANDFILL
BRISBANE, CALIFORNIA

DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

0 1 2
2" ON FULL SCALE
(IF NOT 2"-SCALE ACCORDINGLY)

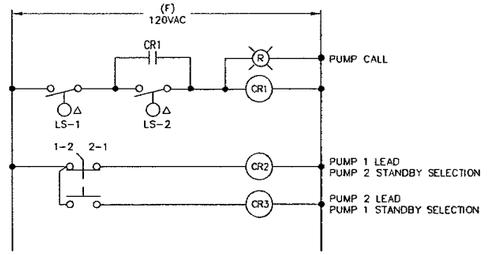
DESIGN BY:	TP	DATE:	SEPTEMBER 2007
DRAWN BY:	EA	PROJECT NO.:	WG1042.02
CHECKED BY:	DN	FILE:	250_E03
REVIEWED BY:		DRAWING NO.:	E-3
APPROVED BY:		SHEET	3 OF 8



NOTES:

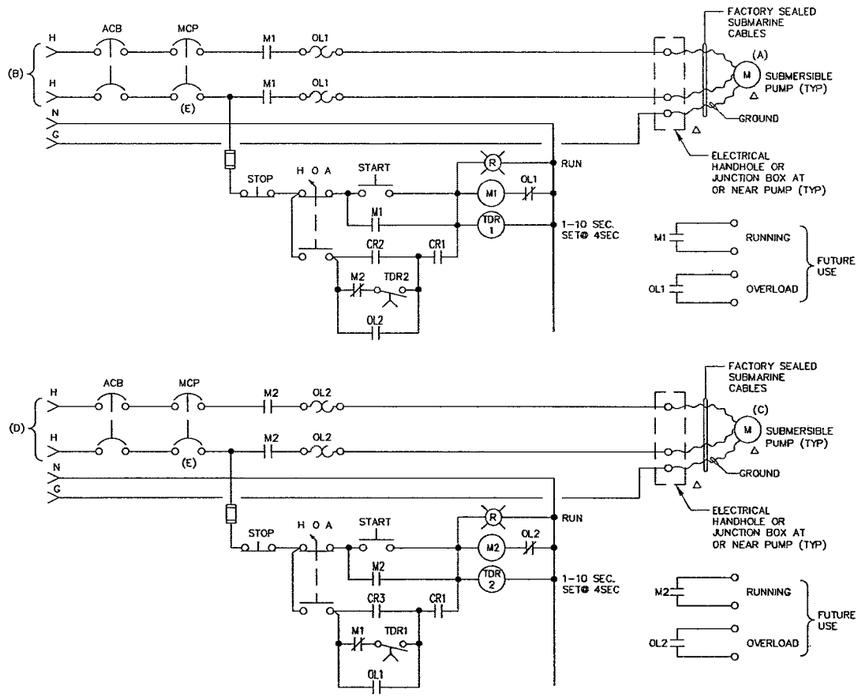
1. UNLESS OTHERWISE NOTED, ALL 20A, 1P CIRCUITS SHALL BE 2#12, #12 GND-3/4"C EACH.
2. SEE SPECIFICATIONS (DIV 16) FOR TYPES OF CONDUITS ROUTED EXPOSED AND UNDERGROUND.
3. PROVIDE PADLOCKABLE, METAL MECHANISM FOR 20A, 2P CIRCUIT BREAKERS FEEDING STARTER FOR PUMPS NO. 1A, 1B, 2A, 2B, 3A & 3B.
4. THE COMBINATION MAIN SERVICE METER AND MAIN DISCONNECT SHALL BE SUITABLE FOR USE WITH PG&E SERVICE. METER SOCKET SHALL BE PG&E APPROVED TYPE (PG&E WILL PROVIDE AND INSTALL ENERGY METER) SUITABLE FOR 120/240V SINGLE-PHASE, THREEE-WIRE SERVICE. IT SHALL BE NEMA 4X, CORROSIVE RESISTANT TYPE, COMPLETE WITH REQUIRED CURRENT AND VOLTAGE TRANSFORMERS AND MAIN CIRCUIT BREAKER WITH RATING AS SHOWN. DISCONNECT SHALL BE PADLOCKABLE. PROVIDE NAMEPLATE "LEACHATE FACILITY MAIN SERVICE DISCNNECT

A — SINGLE-LINE DIAGRAM
SCALE: NTS



NOTES:

1. LS-1 SHALL OPEN WITH FALLING LEVEL.
2. LS-2 SHALL CLOSE WITH RISING LEVEL.
3. BOTH LS-1 & LS-2 SHALL BE CONNECTED TO INTRINSICALLY SAFE RELAY PER SPECS.



(A)	(B)	(C)	(D)	(E)	(F)	FLOAT SWITCH SETTINGS
BOX NO. 1 LEACHATE PUMP NO. 2A	LSC-202A	BOX NO. 1 LEACHATE PUMP NO. 2B	LSC-202B	MOTOR CIRCUIT PROTECTOR MCP	LSC-109	LS-1: 18" LS-2: 36"
BOX NO. 2 LEACHATE PUMP NO. 3A	LSC-203A	BOX NO. 2 LEACHATE PUMP NO. 3B	LSC-203B	MOTOR CIRCUIT PROTECTOR MCP	LSC-110	LS-1: 18" LS-2: 36"

B — LEACHATE PUMPS (2A&2B) & (3A&3B) CONTROL SCHEMATIC ①
SCALE: NTS

SHEET NOTES:

① UNLESS OTHERWISE NOTED ON THIS CONTROL SCHEMATIC, ALL DEVICES SHOWN ARE LOCATED AT CONTROL PANEL "LSC".

ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

0 1 2
2" ON FULL SCALE
(IF NOT 2"-SCALE ACCORDINGLY)

REGISTERED PROFESSIONAL ENGINEER — DEEP TAN NGUYEN — No. E-10687 Exp. 5/30/09 — ELECTRICAL — STATE OF CALIFORNIA
10-26-2007

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants
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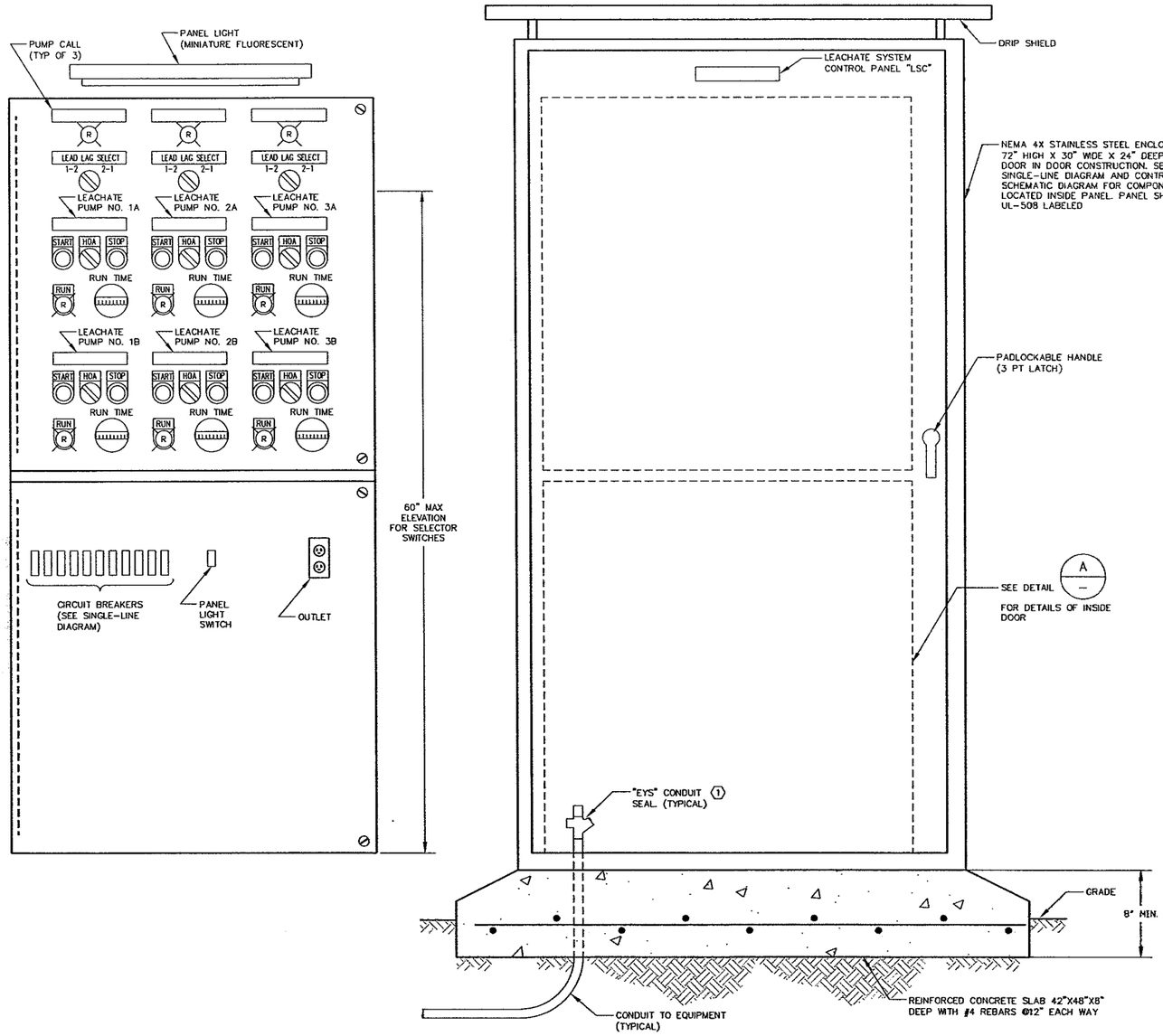
310C01H
SUNQUEST PROPERTIES, INC.
150 EXECUTIVE PARK BLVD., SUITE 4200
SAN FRANCISCO, CALIFORNIA 94134 USA
PHONE: 415.468.6676

TITLE: ELECTRICAL SINGLE-LINE AND CONTROL SCHEMATIC DIAGRAMS

PROJECT: SEEP COLLECTION SYSTEM

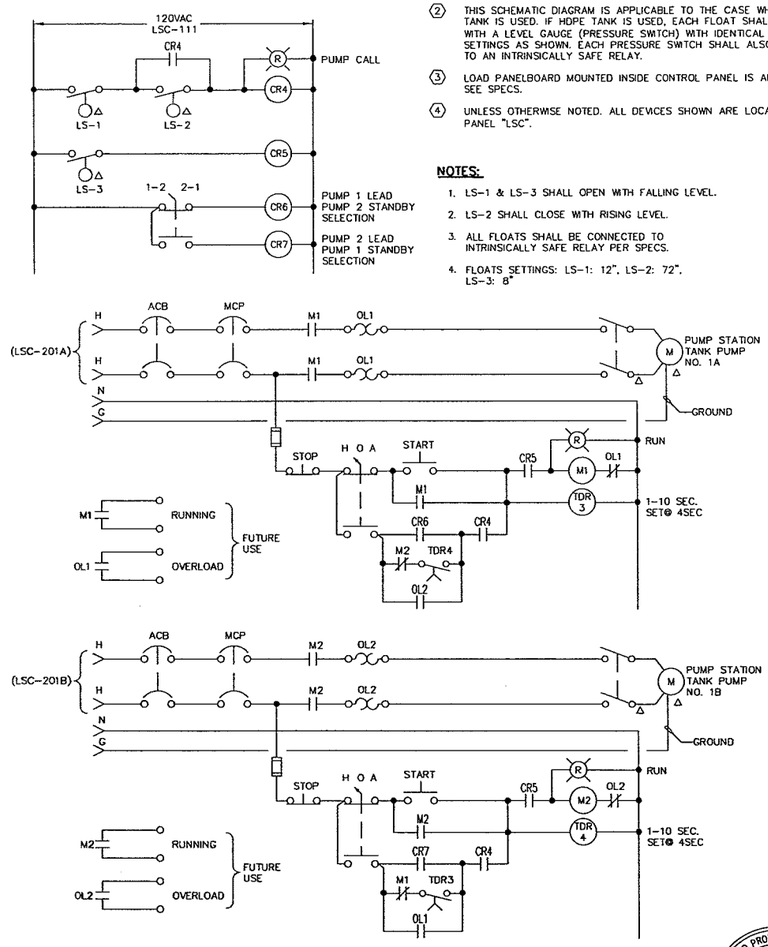
SITE: BRISBANE LANDFILL BRISBANE, CALIFORNIA

DESIGN BY:	TP	DATE:	SEPTEMBER 2007
DRAWN BY:	EA	PROJECT NO.:	WG1042.02
CHECKED BY:	DN	FILE:	250_E04
REVIEWED BY:		DRAWING NO.:	E-4
APPROVED BY:		SHEET	4 OF 8



A PANEL "LSC" INSIDE DOOR DETAIL
SCALE: NTS

B CONTROL PANEL "LSC" ELEVATION
SCALE: NTS



C LEACHATE PUMPS (1A&1B) CONTROL SCHEMATIC 2 4
SCALE: NTS

SHEET NOTES:

1. ALL UNDERGROUND CONDUITS ENTERING OR LEAVING THIS PANEL SHALL BE PROVIDED WITH "EYS" SEAL AS SHOWN.
2. THIS SCHEMATIC DIAGRAM IS APPLICABLE TO THE CASE WHERE A STEEL TANK IS USED. IF HDPE TANK IS USED, EACH FLOAT SHALL BE REPLACED WITH A LEVEL GAUGE (PRESSURE SWITCH) WITH IDENTICAL LEVEL ELEVATION SETTINGS AS SHOWN. EACH PRESSURE SWITCH SHALL ALSO BE CONNECTED TO AN INTRINSICALLY SAFE RELAY.
3. LOAD PANELBOARD MOUNTED INSIDE CONTROL PANEL IS ALSO ACCEPTABLE. SEE SPECS.
4. UNLESS OTHERWISE NOTED. ALL DEVICES SHOWN ARE LOCATED AT CONTROL PANEL "LSC".

NOTES:

1. LS-1 & LS-3 SHALL OPEN WITH FALLING LEVEL.
2. LS-2 SHALL CLOSE WITH RISING LEVEL.
3. ALL FLOATS SHALL BE CONNECTED TO INTRINSICALLY SAFE RELAY PER SPECS.
4. FLOATS SETTINGS: LS-1: 12", LS-2: 72", LS-3: 8"

REGISTERED PROFESSIONAL ENGINEER DILIP TAN NGUYEN No. E-10687 Exp. 5/30/09 ELECTRICAL STATE OF CALIFORNIA
10-26-2007

REV	DATE	DESCRIPTION	DRN	APP

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310C01H
SUNQUEST PROPERTIES, INC.
150 EXECUTIVE PARK BLVD., SUITE 4200
SAN FRANCISCO, CALIFORNIA, 94134 USA
PHONE: 415.468.6676

TITLE: ELECTRICAL
CONTROL PANEL ELEVATION AND DETAILS

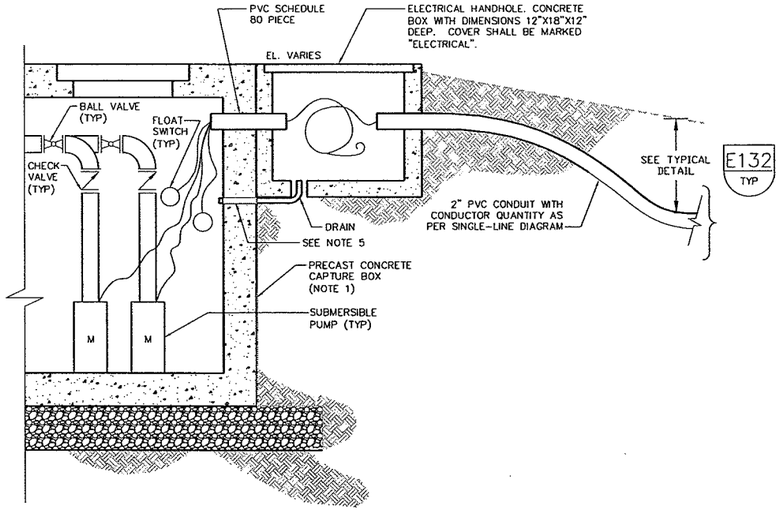
PROJECT: SEEP COLLECTION SYSTEM

SITE: BRISBANE LANDFILL
BRISBANE, CALIFORNIA

DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

0 1 2
2" ON FULL SCALE
(IF NOT 2"-SCALE ACCORDINGLY)

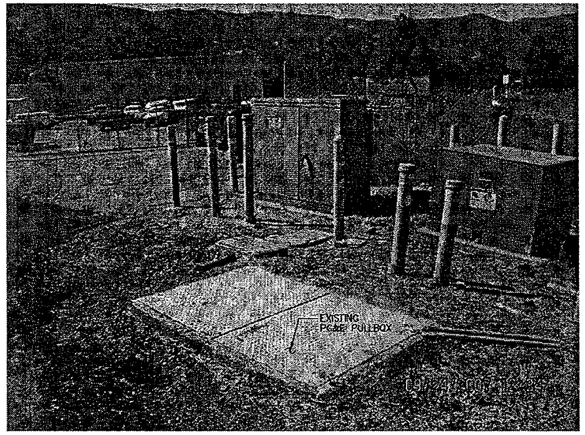
DESIGN BY:	TP	DATE:	SEPTEMBER 2007
DRAWN BY:	EA	PROJECT NO.:	WC1042.02
CHECKED BY:	DN	FILE:	250_E05
REVIEWED BY:		DRAWING NO.:	E-5
APPROVED BY:		SHEET	5 OF 8



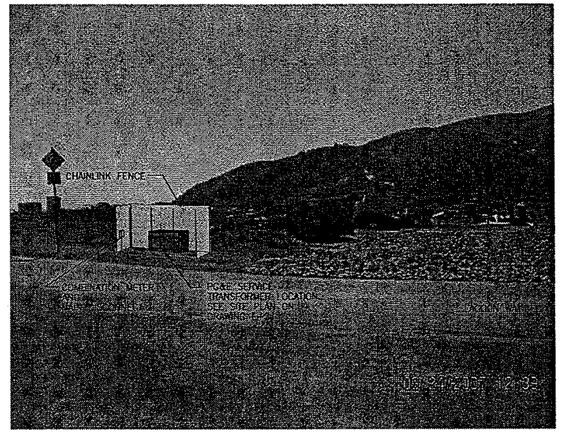
NOTES

1. PROVIDE EXTRA LENGTH OF FACTORY-SEALED POWER CABLE FOR PUMP INSIDE HANDHOLE BEFORE MAKING SPLICES.
2. SIMILARLY, PROVIDE EXTRA LENGTH OF FACTORY-SEALED CABLE FOR EACH FLOAT INSIDE HANDHOLE BEFORE MAKING SPLICES.
3. ALL SPLICES SHALL BE PROPERLY MADE WITH WATER-PROOF SPLICING KITS MADE BY RAYCHEM, 3M OR APPROVED EQUAL.
4. SEE DETAIL E335/TYP. ON DRAWING E-7 FOR FLOAT SWITCH INSTALLATION REQUIREMENTS.
5. DRAIN FOR HANDHOLE SHALL BE AS HIGH AS POSSIBLE.
6. ALL CABLES SHALL BE NEATLY TIED WITH NON-CORROSIVE CABLE TIES.

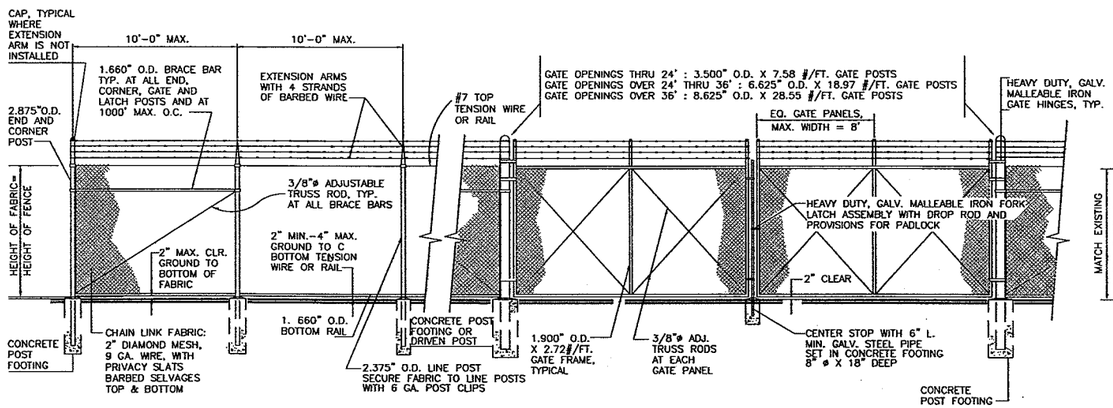
A / — LEACHATE BOX – ELEVATION DETAIL
SCALE: NTS — TYPICAL FOR BOXES 1 AND 2



B / — EXSITING NEAREST PG&E SERVICE
SCALE: NTS — (THIS DETAIL IS FOR REFERENCE ONLY)



C / — NEW PG&E SERVICE LOCATION
SCALE: NTS — SEE DRAWING E-3 FOR PLAN



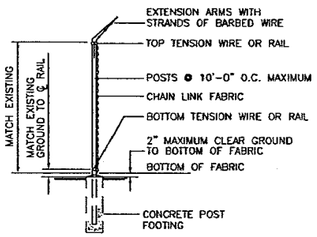
NOTES:
1. WHERE POSSIBLE, AVOID LOCATING POSTS OVER UTILITY LINES BY ADJUSTING POST SPACING.
2. ALL FENCE AND GATE FABRIC SHALL BE PROVIDED WITH FULL LENGTH PRIVACY SLATS. SEE SPECS.

TYPICAL ELEVATION

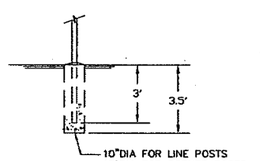
NOTES:
1. INSTALL HEAVY DUTY GALV. MALLEABLE IRON KEEPER FOR EACH GATE LEAF.
2. SINGLE LEAF SWING GATE IS SIMILAR.

DOUBLE LEAF SWING GATE

D / — TYPICAL NEW CHAIN LINK FENCE
SCALE: NTS



E / — SECTION
NTS



F / — FOOTING DETAIL
NTS

DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

0 1 2
2" ON FULL SCALE
(IF NOT 2"-SCALE ACCORDINGLY)

REGISTERED PROFESSIONAL ENGINEER DIEP TAN NGUYEN No. E-10689 Exp. 5/30/09 ELECTRICAL STATE OF CALIFORNIA
10-26-2007

REV	DATE	DESCRIPTION	DRN	APP

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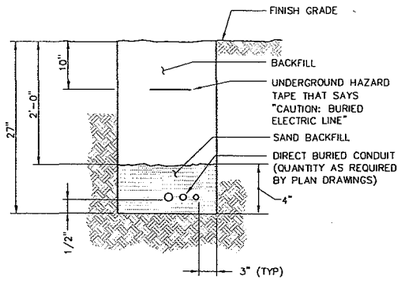
SAN FRANCISCO, CALIFORNIA, 94134 USA
PHONE: 415.468.6676

TITLE: ELECTRICAL CONSTRUCTION AND TYPICAL DETAILS
PROJECT: SEEP COLLECTION SYSTEM
SITE: BRISBANE LANDFILL, BRISBANE, CALIFORNIA

DESIGN BY:	TP	DATE:	SEPTEMBER 2007
DRAWN BY:	EA	PROJECT NO.:	WG1042.02
CHECKED BY:	DN	FILE:	250_E06
REVIEWED BY:		DRAWING NO.:	E-6
APPROVED BY:		SHEET	6 OF 8

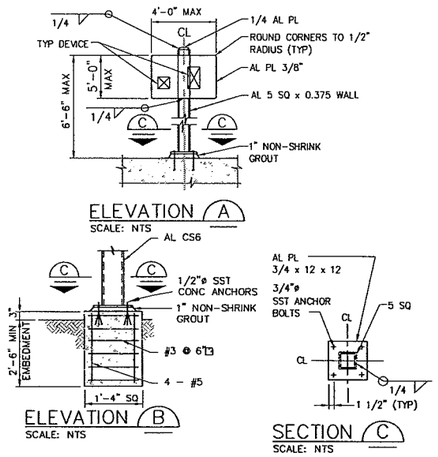


NOTES:

1. ALL DIMENSIONS ARE MINIMUM UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
2. REFER TO SPECIFICATIONS FOR TRENCH BACKFILL REQUIREMENTS.

E132 DIRECT BURIED CONDUIT

TYP SCALE: NTS

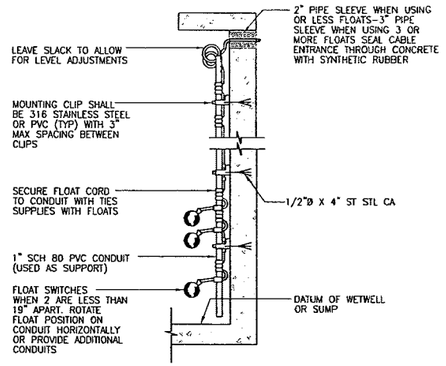


NOTES:

1. WHERE SEPARATE FOUNDATION IS REQD, SEE (B).
2. COAT ALUMINUM SURFACES IN CONTACT W/CONCRETE PER SPECS.
3. USE SST FASTENERS FOR MOUNTING DEVICES.
4. WEIGHT OF DEVICE(S) SHALL NOT EXCEED 100 POUNDS.

E332 DEVICE SUPPORT AND MOUNTING

TYP

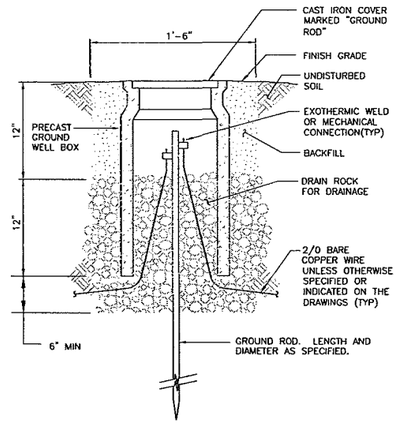


NOTES:

1. SEE CONTROL SCHEMATIC DIAGRAM FOR EXACT ELEVATION SET POINT OF EACH FLOAT SWITCH.
2. LEAVE ADDITIONAL CABLE SLACK IN NEAREST ELECTRICAL JUNCTION BOX OR HANDHOLE.

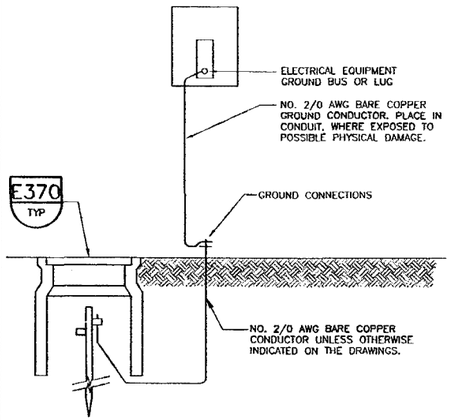
E335 FLOAT SWITCH MOUNTING

TYP



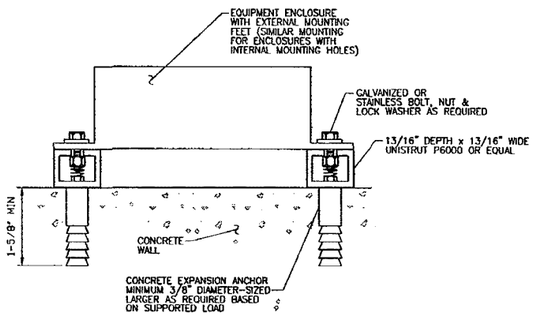
E370 GROUND ROD INSTALLATION

TYP SCALE: NTS



E372 GROUNDING (PANEL GROUND) DETAIL

TYP SCALE: NTS

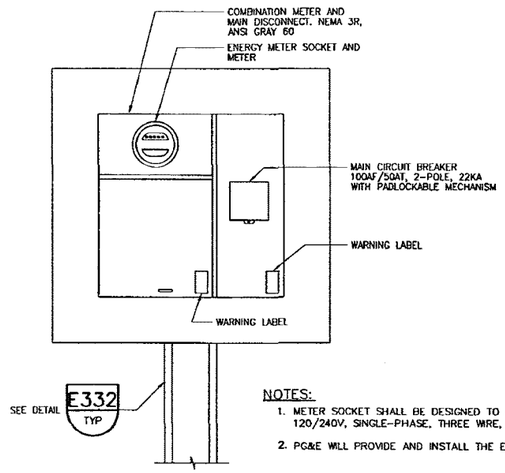


NOTE:

APPLICABLE FOR ALL NON CAST-IRON ENCLOSURES OR BOXES

E416 SEISMIC ANCHOR FOR PANEL DETAIL

TYP SCALE: NTS



NOTES:

1. METER SOCKET SHALL BE DESIGNED TO ACCOMMODATE 120/240V, SINGLE-PHASE, THREE WIRE, PG&E SERVICE.
2. PG&E WILL PROVIDE AND INSTALL THE ENERGY METER.

E417 COMBINATION METER AND MAIN DISCONNECT

TYP SCALE: NTS

DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

0 1 2
2" ON FULL SCALE
(IF NOT 2"-SCALE ACCORDINGLY)

REGISTERED PROFESSIONAL ENGINEER — DIEP TAN NGUYEN — No. E-10687 Exp. 6/30/08 — ELECTRICAL — STATE OF CALIFORNIA

10-26-2007

REV	DATE	DESCRIPTION	DRN	APP

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310C01H
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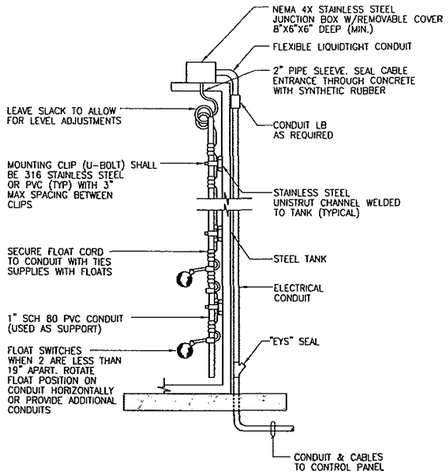
SAN FRANCISCO, CALIFORNIA, 94134 USA
PHONE: 415.468.6676

TITLE: ELECTRICAL CONSTRUCTION AND TYPICAL DETAILS

PROJECT: SEEP COLLECTION SYSTEM

SITE: BRISBANE LANDFILL
BRISBANE, CALIFORNIA

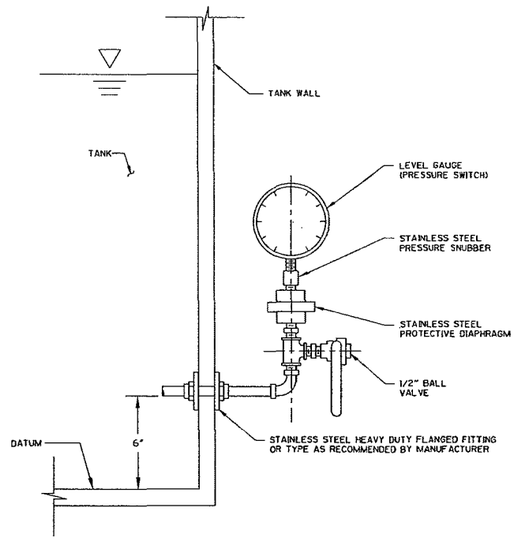
DESIGN BY:	TP	DATE:	SEPTEMBER 2007
DRAWN BY:	EA	PROJECT NO.:	WG1042.02
CHECKED BY:	DN	FILE:	250_E07
REVIEWED BY:		DRAWING NO.:	E-7
APPROVED BY:		SHEET	7 OF 8



NOTES:

1. FOR PLASTIC TANK, IN LIEU OF THE FLOAT SWITCHES, CONTRACTOR SHALL FURNISH AND INSTALL LEVEL GAUGE TYPE (PRESSURE SWITCH) AS PER DETAIL E419.

E418 TYP — FLOAT SWITCH MOUNTING ON STEEL TANK



E419 TYP — LEVEL GAUGE (PRESSURE SWITCH) ON HDPE TANK

REGISTERED PROFESSIONAL ENGINEER — DEP TAN NGUYEN — No. E-10687 Exp. 5/30/09 — ELECTRICAL — STATE OF CALIFORNIA

10-26-2007

REV	DATE	DESCRIPTION	DRN	APP

Geosyntec consultants

475 14th STREET, SUITE 450
OAKLAND, CALIFORNIA 94612 USA
PHONE: 510.836.3034

310C01H

SUNQUEST PROPERTIES, INC.

150 EXECUTIVE PARK BLVD., SUITE 4200
SAN FRANSICO, CALIFORNIA, 94134 USA
PHONE: 415.468.6676

TITLE: ELECTRICAL CONSTRUCTION AND TYPICAL DETAILS

PROJECT: SEEP COLLECTION SYSTEM

SITE: BRISBANE LANDFILL
BRISBANE, CALIFORNIA

DTN ENGINEERS, INC.
Oakland, San Francisco, Orange County, CA

0 1 2
2" ON FULL SCALE
(IF NOT 2"-SCALE ACCORDINGLY)

DESIGN BY:	TP	DATE:	SEPTEMBER 2007
DRAWN BY:	EA	PROJECT NO.:	WG1042.02
CHECKED BY:	DN	FILE:	250_E08
REVIEWED BY:		DRAWING NO.:	SHEET
APPROVED BY:		E-8	8 OF 8



APPENDIX E

EXISTING LANDFILL GAS COLLECTION SYSTEM AS-BUILTS (MONTROSE ENVIRONMENTAL, 2019)



SITE MAP 1
SCALE: 1”=250’ FIG-1

NOTE:
1. WELL IDs FOR MISSING/INACCESSIBLE WELL LOCATIONS HAVE BEEN GREYED OUT ON THE SITE MAP.
2. SURVEY DATA AND LOCATIONS OF OBJECTS BASED ON MULTIPLE SOURCES INCLUDING SURVEYS BY BURNS & MCDONNEL (2000), SURVEY AND AERIAL SURVEY BY DAVIS EVANS & ASSOCIATES (1997 & 2000), AND INFORMATION FOUND IN REPORTS AND DRAWINGS FROM PREVIOUS CONSULTANTS. MONTROSE ENVIRONMENTAL, LLC HAS RELIED ON THE ACCURACY OF THESE SOURCES TO CREATE THIS DRAWING AND SOME OBJECTS AND LOCATIONS ARE APPROXIMATE.

MONTROSE ENVIRONMENTAL
MONTROSE ENVIRONMENTAL, LLC
1 PARK PLAZA, #1000
IRVINE, CA 92614
www.montrose-env.com

FLARE STATION ISO

REV.	DATE	DESCRIPTION

STATUS: DRAFT

PLOT DATE: 3/13/2019 3:50 PM

CLIENT: UNIVERSAL PARAGON CORPORATION
150 EXECUTIVE PARK DRIVE, SUITE 1180
SAN FRANCISCO, CA 94134

PROJECT LOCATION: BRISBANE LANDFILL
601 TUNNEL AVENUE
BRISBANE, CA 94005

DESCRIPTION: SITE MAP

PROJECT NO. 110727

SHEET: FIG-1

FILE: S:\UPC-BRISBANE_C100137\CAD\FIGURE 1 - SITE MAP.DWG



APPENDIX F

GROUNDWATER ABD SEA-LEVEL RISE EVALUATION (GEOSYNTEC, 2022)

Geosyntec consultants

engineers | scientists | innovators

GROUNDWATER MODELING TO EVALUATE POTENTIAL INFLUENCE OF SEA LEVEL RISE ON GROUNDWATER LEVELS

THE BAYLANDS, SAN MATEO COUNTY, CALIFORNIA

Prepared for

Baylands Development, Inc.
150 Executive Park Boulevard, Suite 4000
San Francisco, California 94134

Prepared by

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

Project Number: WG2871

March 23, 2022

Groundwater Modeling to Evaluate Potential Influence of Sea Level Rise on Groundwater Levels

The Baylands

Brisbane, San Mateo County, California

Prepared for

Baylands Development, Inc.
150 Executive Park Boulevard, Suite 4000
San Francisco, California 94134

Prepared by

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1111 Broadway, 6th Floor
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Project Number: WG2871

March 23, 2022

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CERTIFICATION

Hydrogeologic and geologic information and findings presented in this document have been prepared under the supervision of and reviewed by a California Registered Professional Geologist and a Certified Hydrogeologist, and a California Licensed Professional Engineer.



23 March 2022

Gordon Thrupp, PhD, PG, CHG
Senior Consultant
Geosyntec Consultants, Inc.



23 March 2022

Krzysztof S. Jesionek, P.E.
Principal Engineer
Geosyntec Consultants, Inc.

1. INTRODUCTION

Geosyntec Consultants, Inc. (Geosyntec) has prepared this report on behalf of Baylands Development, Inc. to present its evaluation using numerical modeling of the influence that projected sea level rise (SLR) could have on groundwater elevations within the Baylands project area, known as the Specific Plan area, in Brisbane, San Mateo County, California (**Figure 1**). The Specific Plan area is located along the margin of the San Francisco Bay (SF Bay) northeast of the central portion of the City of Brisbane. Most of the project area lies on reclaimed baylands that are part of an infilled broad embayment at the mouth of Visitacion Valley. The Specific Plan area consists of three operable units (OUs): UPC OU-SM, UPC OU-2, and the Brisbane Landfill (**Figure 2**).

The conceptual design for the final closure of the Brisbane Landfill includes a cover system with a low hydraulic conductivity soil or geosynthetic layer, and a leachate collection and recovery system (LCRS). Trenches are planned for the LCRS along the eastern and southern margins of the landfill with geosynthetic barriers on the outer trench walls. Geosyntec has assumed that additional engineering measures will be implemented, such as eventually raising the elevation of Highway 101, to maintain the approximate location of the Bay margin adjacent to the Brisbane Baylands.

The San Francisco Bay Region of the California Regional Water Quality Control Board (e.g. RWQCB, 2019) requires developments and landfills subject to potential influence of future SLR to propose adaptive management strategies that provide for protection of SLR as well as tides, potential storm surges, flooding, and inundation predictions associated with climate change projections. Protective management strategies are required for both 2050 and 2100 projections.

The evaluation of projected SLR on groundwater conditions for the Specific Plan area presented in this report, assumes 6.9 feet (ft) of SLR by 2100, which is the high end of the range for medium to high risk aversion based on projections published by the California Natural Resources Agency and the Ocean Protection Council (CNRA, 2018). Evaluation for SLR projections for 2050 are not included because as discussed below, a central drain and a LCRS at the perimeter of the landfill, which are included in the conceptual design for the final closure of the Brisbane Landfill, control influence on groundwater of projected SLR in 2100 and therefore will also control influence of SLR on groundwater conditions in 2050.

Flooding associated with storms is not addressed in this evaluation because the design of the Specific Plan area and the final closure of the Landfill include infrastructure for storm-water management, which will be addresses in subsequent documents that also will be submitted for regulatory review. Surface water management design will also take into account potential plans to raise the Caltrain tracks.

This report describes the Specific Plan area setting, the conceptual model for SLR and groundwater conditions, design elements of the conceptual final closure plan for the landfill that influence groundwater conditions, the numerical model design, and findings.

2. SITE SETTING AND CONCEPTUAL MODEL

Geosyntec's conceptual model of the hydrogeology and groundwater conditions in the vicinity of the Specific Plan area is based on a synthesis of the geologic and hydrogeologic setting in Specific Plan area vicinity. The conceptual model includes continuing SLR in the future, which will influence groundwater conditions near the margin of SF Bay where the SF Bay and tidally influenced tributaries have some degree of hydraulic connection with groundwater.

2.1 Projected Sea Level Rise

For design and planning of coastal margin developments, for which medium to high risk aversion (i.e., 0.5% probability = 1 in 200 chance) is appropriate, the RWQCB (2019) is promulgating projected SLR in the range of 5.7 to 6.9 ft in the SF Bay by the year 2100. The source of the probabilistic projections of SLR is California's official Sea Level Rise Guidance (CNRA, 2018), which utilizes the framework of Kopp et al. (2014). The low end of the range (5.7 ft) of projected SLR by 2100 for medium to high risk aversion is for low carbon emissions, and the high end (6.9 ft) is for continued status quo high carbon emissions on earth[1].

2.2 Geologic Setting

Most of the Brisbane Baylands are reclaimed former Bay margin. Filling of the Bay began in the mid-1800s, and by the late 1900s the extent of the Bay was reduced to about two thirds of its size 100 years before. The landfill was operated as a solid waste disposal site from 1932 to 1967. During landfill operations, refuse was placed directly into SF Bay from west to east across the northern portion of the Specific Plan area and then from north to south. The landfill stopped receiving municipal waste materials in 1967 (Kleinfelder, 1987). Beginning in 1967, refuse fill materials were covered with earth fill and other inert debris. These materials have been placed on large portions of the Specific Plan area to accelerate consolidation of the refuse and to provide bearing capacity for future development. The upper few feet of much of the UPC OU-SM and UPC OU-2 also consist of imported fill (e.g. Geosyntec 2018, 2020a, 2020b, 2020c).

The bedrock knob that borders Visitacion Valley on the south and separates it from Guadalupe Valley extends into the southwestern margin of the project area at Visitacion Point. Similarly, the

[1] The projected range of emissions included in the California SLR Guidance Document are the same as those used by the Intergovernmental Panel on Climate Change's Fifth Assessment Report (IPCC Fifth Assessment) and are called Representative Concentration Pathways (RCPs). Calculations in the guidance documents are projected for four RCPs, which are the calculated radiative forcing levels in 2100, in watts per square meter: RCP 8.5, 6.0, 4.5 and 2.6. End-members RCPs of 2.6 and 8.5 are used for the ranges of SLR presented in the California guidance and RWQCB policy.
For reference, the explanation of RCP range described in the CA SLR guidance document (2018) is quoted below: "RCP 8.5, often referred to as a "business-as-usual" scenario, is consistent with a future where there are few global efforts to limit or reduce emissions. Under RCP 8.5, global CO2 emissions nearly double between years 2015 and 2050. At the other end of the spectrum, RCP 2.6 is an aggressive emissions reduction scenario that assumes global greenhouse gas emissions will be significantly curtailed. Under this scenario, global CO2 emissions decline by about 70% between 2015 and 2050, to zero by 2080, and below zero thereafter. Though more aggressive, RCP 2.6 most closely corresponds to the aspirational goals of the United Nations Framework Convention on Climate Change (UNFCCC) 2015 Paris Agreement, which calls for limiting global mean warming to less than 2°C and achieving net-zero greenhouse gas emissions in the second half of this century."

northern portion of the Specific Plan area is close to the northern edge of Visitacion Valley and bedrock occurs at shallow depths. The bedrock is composed of the Franciscan Complex[2], which occurs at variable depths in the area, but generally deepens toward the Bay to the east and is deeper than 50 ft beneath most of the landfill area (e.g. CA DWR, 2003; Phillips et al., 1993).

The bedrock is overlain by marine and estuarine sediments, alluvium, colluvium, eolian deposits, and artificial fill that vary in thickness. Old Bay mud (OBM), which typically is in contact with the bedrock, consists of marine deposits of bluish-gray, stiff to very stiff silty clay with lenses of sandy clay, sand, and gravel. The OBM thickness is variable due to upper and lower erosional surfaces but can be up to 200 ft thick in the Bay area. Eolian and alluvial sediments deposited during a low stands of sea level overlie the OBM and occur as local and discontinuous lenses within the OBM.

The youngest and shallowest estuarine deposit is a dark greenish-gray, highly plastic silty clay known as the Young Bay Mud (YBM). It consists of silty clay and includes considerable amounts of organic materials and lenses of shells, silt and sand. Generally, the consistency of the YBM varies from very soft to medium stiff. The YBM deposits form a laterally extensive layer that extends westward from under the bay to just west of the study area, where it pinches out. Based on borings in logs from the landfill area, the YBM ranges in thickness from approximately 10 to more than 40 ft. The YBM has been buried and locally eroded by subsequent alluvial deposits and artificial fill. Under the SF Bay, the YBM is underlain by the OBM.

The valley fill and bay margin deposits (in addition to the YBM) include a mix of unconsolidated sediment, ranging from sand to clay, and including alluvial sediments that were deposited by the ancestral Visitacion and Guadalupe Creeks and locally overlie or have eroded the YBM, and imported fill that was placed on top of the YBM or alluvium (CA DWR, 2003; Phillips et al., 1993). Within the landfill and in portions of UPC OU-SM, UPC OU-2, refuse or soil fill directly overlie the YBM. At the landfill the soil fill and refuse vary in thickness, extending to a depth of approximately 35 to 40 ft below the surface. The landfill consists of soil intermixed with household waste and rubble. At the landfill a surficial soil cover, ranging in thickness from approximately 1 to 15 ft, typically overlies refuse (Kleinfelder, 1992, Geosyntec, 2020b).

2.3 Hydrogeologic Setting

Groundwater flow to the Specific Plan area is generally west to east from Visitacion Valley, Guadalupe Creek Valley and from bedrock highlands such as San Bruno Mountain (**Figure 2**).

Mean annual precipitation within Visitacion Valley in the 1990s was reported to range from 20 to 24 inches (United States Department of Agriculture, 1999). Groundwater recharge in 1987 – 1988 was estimated by Phillips et al. (1993) to be 269 acre-feet per year (AFY), which equates to approximately 4 inches per year (CA DWR, 2003).

Inflow to the basin and bay margin sediments and fill is provided by areal recharge from precipitation and seepage from the underlying and adjacent bedrock. In addition, along some of

[2] Franciscan Complex or Franciscan Assemblage is a geologic term for a late Mesozoic terrane of heterogeneous rocks found throughout the California Coast Ranges, and particularly on the San Francisco Peninsula.

the filled portions of the Bay margin, water in the pore space within the YBM is squeezed out with compression caused by the weight of the fill, which contributes to the upward gradient that causes upward flow of groundwater into the overlying fill.

Outflow of groundwater from the basin and bay margin sediments occurs as seasonal discharge to creeks and drains, direct discharge to the Bay, and as evapotranspiration. The Interior Drainage Channel (IDC), is a ditch that routes Visitation Creek across the landfill to the Bay. The IDC also functions as a drain at the approximate elevation of the current mean sea level, and therefore collects fluid (leachate and groundwater) and influences proximal fluid levels flow directions. Tidal fluctuation in the Bay and Brisbane Lagoon (sometimes referred to as Guadalupe Lagoon) also influence water levels in the IDC as well as most of the shallow monitoring wells close to the Bay or Brisbane Lagoon. Consequently, tidal conditions influence the groundwater level measurements, contours of the water table, and inferred groundwater flow directions close to the Bay and Lagoon (Geosyntec, 2020b).

Measurements of depth to groundwater in monitoring wells screened in the surficial fill (including the landfill) and alluvial deposits (Geosyntec, 2018, 2020a, 2020b), were used to estimate a current water table elevation for the Specific Plan area and Visitacion Valley[3]. Because strong upward hydraulic gradients from deeper to shallower groundwater is typical of the Baylands area, groundwater levels were screened to check that they represent water table conditions.

As documented in the monitoring reports for the landfill (e.g., Figure 3 and 5, Geosyntec 2020b, which are provided in **Appendix A** to this report), liquid levels in the landfill show mounding in central portions of the landfill. The build-up of fluid in the central portions of the landfill, which are thickest and away from the influence of the IDC, is attributed to infiltration of precipitation and compression that squeezes out pore water from the YBM under the weight of stockpiled soils. Although liquid in landfills commonly occurs in compartments that are not hydraulically contiguous, the liquid levels measured at the two monitoring wells in the landfill (LW-1 and LW-2) are assumed to be representative of the shallow groundwater conditions. Moreover, the elevated fluid levels in the landfill are believed to be mostly from infiltration of rain and upward flow of pore water squeezed out of the YBM with little contribution from generation of leachate because the landfill stopped receiving municipal waste materials in 1967 (Kleinfelder, 1987; Geosyntec, 2020b).

3. NUMERICAL MODEL DESIGN

The three-dimensional (3D) groundwater flow model was constructed using Aquaveo GMS, a pre- and post-processor and GIS system for MODFLOW, which is widely used groundwater modeling software developed and supported by the United States Geological Survey (USGS). This section summarizes the design of two versions of the numerical model: (1) the baseline model, which

[3] Groundwater elevations presented in the groundwater monitoring reports are relative to the NGVD29 vertical datum. For this report and numerical modeling, the groundwater elevations were converted to the NAVD88 vertical datum for internal consistency between model input data and engineering design. The design established that 2.33 ft should be added to NGVD29 elevations to convert to NAVD88 for the Brisbane Landfill vicinity. Groundwater elevations and the SF Bay have been adjusted accordingly in the groundwater model as presented in this report.

approximates present-day conditions, and (2) the year 2100 model. The year 2100 version of the model includes changes in conditions that include an increase of 6.9 ft in the average water level in the SF Bay and Brisbane Lagoon (also called the Guadalupe Lagoon), and LCRS trenches along the eastern and southern margins of the landfill that are components of the conceptual final closure plan for the Brisbane Landfill that will influence groundwater conditions.

3.1 Model Domain and Discretization

The model domain encompasses the study area, extending inland (westward) to include the Visitacion Valley sedimentary basin and a portion of Guadalupe Creek Valley, and eastward into the SF Bay (**Figure 2**).

The model grid consists of four layers of 100-foot by 100-foot cells, covering a maximum east-west distance of 18,200 feet and maximum north-south distance of 16,500 feet (**Figure 2**). A cross-section through the model, which shows the four layers, is presented in **Figure 3**.

The first (uppermost) layer represents the water in the Bay and Brisbane Lagoon and is inactive over the land. The second, third, and fourth layers represent generalized hydrostratigraphic units within the model domain that include alluvium, refuse, YBM and OBM (see **Table 1** for assigned material properties).

As illustrated by the cross section through the model domain (**Figure 3)**, where present under the present SF Bay and beneath the bay margin, the YBM and OBM are represented by low hydraulic conductivity assigned to Layers 3 and 4, respectively. Under the Bay, the YBM directly overlies the OBM, but inland beneath the Specific Plan area the YBM is sandwiched between underlying and overlying alluvium or refuse. Beyond the inland extent of the YBM and OBM, Layers 3 and 4 are assigned higher hydraulic conductivity to represent alluvial sediments. A separate area is delineated within Layer 2 (green area shown on the cross-section, **Figure 3)**; this facilitates assigning different hydraulic properties for the alluvium and the Brisbane Landfill. The hydraulic conductivity values assigned to the model are presented in Section 3.2 below.

The model layer geometry was interpolated from available data and maps, including depth-to-bedrock, YBM thickness, and YBM elevations under the landfill, boring logs, and ground surface topography (Phillips et al., 1993; McDonald et al., 1978; J.H. Kleinfelder & Associates, 1987). The bottom of layer one, which represents the ground surface and bottom of SF Bay, was generated from a 30-foot digital elevation map. The upper surface of Layer 1 represents the water surface for the Bay and Brisbane Lagoon (sea level) and the inland of the present-day bay margin Layer 1 is inactive (not included in the numerical model solution).

The inland extent of the active model domain is based on the delineation of the approximate location of the contact between bedrock and alluvium shown on geologic maps (Plate 2, Phillips et al., 1993).

3.2 Assigned Model Properties

Initial values assigned for model parameters including hydraulic conductivity, recharge, and conductance of drains were based on boring logs, hydraulic testing results, and available information from published regional studies such other groundwater models of the Bay area (e.g. Hanson et al., 2004), and hydrogeological professional judgement based on familiarity with the

location. The Specific Plan area model was not formally calibrated, but the values assigned to hydraulic parameters and boundary conditions were tuned (adjusted) so that the model provides a reasonable representation of groundwater level data reported in recent investigations and monitoring reports for UPC OU-SM, UPC OU-2, and the landfill (Burns and McDonnell Engineering Company, Inc., 2020; Geosyntec, 2020b -- see **Appendix A** to this report). The simulated water table surface of the tuned model provides a baseline condition for comparison to the simulated water table for a version of the model that includes a conservative projection of SLR in 2100. The tuned values of hydraulic conductivity assigned to the model are presented in **Table 1** below.

Table 1. Assigned Values of Hydraulic Conductivity

Material	Horizontal Conductivity (ft/d)	Vertical Anisotropy (Kh/Kv)
Water	1,000	1
Refuse	28	10
Alluvium	28	10
Young Bay Mud	0.1	10
Old Bay Mud	0.03	10

Abbreviations:
ft/d: feet per day (units of conductivity)
Kh/Kv: ratio of horizontal and vertical conductivity

3.3 Model Boundaries Conditions

The boundary conditions for the model domain are displayed in **Figure 2** and summarized in **Table 2** at the end of this section.

The western boundary of the model domain, which approximates the inland limit of basin sediment, is a specified-flow boundary with an assigned nominal flux of 5,000 cubic feet per day (26 gpm) along the total length of this boundary to simulate groundwater inflow to the alluvial basin from the surrounding bedrock (**Figure 2**). The total length of the specified flux boundary of the model is approximately 57,500 ft, so the inflow is approximately 0.087 ft^3/d per foot or 0.45 gpm per 1000 ft. The specified flux rate was adjusted so that the model provides a reasonable representation of current groundwater elevations in the alluvial basins and adjacent Specific Plan area. A small section of the southern model boundary between bedrock outcrop and the SF Bay where groundwater flow is approximately parallel to the boundary is a no-flow boundary. And an area of exposed bedrock north of the landfill is an inactive portion of the model domain, which is surrounded by a no flow boundary (**Figure 2).**

3.3.1 SF Bay and Brisbane Lagoon

To simulate the influence on groundwater of the SF Bay, grid cells in portions of Layer 1 that extend into the Bay and the Brisbane Lagoon are assigned as a general-head boundary condition with a reference elevation for the average water level of the San Francisco Bay adjacent to Brisbane

of 3.22 ft (NAVD88) for the baseline "present-day" model and 6.9 ft higher (10.12 ft NAVD88) for year 2100.[4] A high conductance, 1,000 feet^2 per day (ft^2/day), was assigned for the Layer 1 general head cells that represent the bay or lagoon. The same general head boundary condition was assigned to Layers 2, 3, and 4 at the eastern margin of the model domain under the Bay for the two versions of the model.

3.3.2 Recharge

For the baseline (present-day) model, areal recharge was assigned at 1.3 inches per year (in/yr) over the entire inland portion of the model domain. To account for the low-hydraulic conductivity soil and geosynthetic cover that is planned for the final closure of the landfill, areal recharge was not included for most of the landfill in the year 2100 version of the model. The assigned recharge rates were adjusted so that the model provides a reasonable representation of current groundwater elevations in the alluvial basins, the adjacent Specific Plan area, and the Landfill.

Two areas within the landfill where mounding of fluid is documented (e.g. Geosyntec, 2020b, and Appendix A to this report) were assigned higher recharge rates of 26 and 13 in/yr for the baseline (present-day) and 2100 SLR models, respectively. The mounding of fluid in the landfill occurs where the landfill is thickest and is attributed mainly to upward flow of pore water that is squeezed out of the YBM with compression due to the weight of the fill. Residual leachate generation may also contribute. The assigned recharge of 13 in/yr for the year 2100 model is conservatively high because no significant additional loading is planned with the landfill final closure.

Although evapotranspiration was not explicitly included in either version of the model, functionally the values of recharge assigned to the model include an approximation of the average evapotranspiration.

3.3.3 Interior Drainage Channel and Future LCRS Trenches

The Interior Drainage Channel (IDC) is a ditch that routes Visitacion Creek across the landfill to the Bay. With final closure of the landfill, the current IDC ditch will be replaced by an engineered channel or conduit beneath the low permeability cover. The new engineered IDC will discharge to a trench at the east margin of the landfill that, along with a trench along the southern margin of the landfill, will be a component of a LCRS to intercept leachate seeps for final closure of the landfill (**Figure 2**). In the model, the IDC is represented as a drain with an assigned elevation of 3.22 ft NAVD88 and a conductance of 2 ft^3/day per linear foot in both the baseline (present-day) and the year 2100 SLR models.

The design for the LCRS trenches includes an impermeable barrier on the outer wall of the trench adjacent to the Bay or Lagoon. These trenches are represented in the year 2100 SLR model by drains with a conductance of 2 ft^3/day per linear foot and an elevation of 3.22 ft NAVD88 which is 6.9 ft below the assigned water level in the Bay and Brisbane Lagoon for the year 2100 model.

[4] Sea level elevations within the numerical model and presented here are given in the NAVD88 vertical datum. An elevation of 3.22 ft for the modern mean sea level elevation is used (AECOM, 2016). The resultant mean sea level elevation for the year 2100 scenario is 10.12 feet.

The low-permeability barrier on the trench wall away from the landfill, which will minimize horizontal subsurface inflow of water from the Bay into the LCRS, is represented in the year 2100 version of the model with the MODFLOW Horizontal Flow Barrier package (Harbaugh et al., 2000) that simulates barriers to groundwater flow by reducing the conductance between individual pairs of cells. The flow barrier is assigned a leakance value of 0.001 1/d, which corresponds to a Kv of 3.3×10^{-5} ft/d (1.2×10^{-8} cm/sec) for a barrier thickness of 0.4 inches, as described in **Table 2** below. This is a conservatively high leakance value because the actual permeability of the liner that will be installed on the inside of the outer wall of the LCRS trenches will be lower.

The design of the year 2100 version of the model assumes that the current box culvert beneath Hwy 101 that connects the IDC to SF Bay will be modified so that IDC no longer is in direct communication with the SF Bay. And, the 2100 version of the model design also is based on the assumption that the LCRS will include one or more pumping stations or another method to remove the groundwater and leachate that accumulates in the trenches, so the fluid level is maintained at an approximate elevation of 3.22 ft NAVD88.

Table 2. Summary of Model Boundary Conditions

Boundary Condition	Model Component	Layers	Properties
General Head	Eastern Model Boundary Bay Water	2, 3, 4 1	Head: 3.22 or 10.12 ft NAVD88 (1) Conductance (2): 1,000 (ft/d)(ft^2)/ft = ft^2/d
Specified Flow	Western Model Boundary	4	5,000 ft^3/day (26 gpm)
No Flow	Western Model Boundary	2, 3	- -
Drain (3)	Visitacion Creek/IDC LCRS Trenches	2	Elevation: 3.22 ft NAVD88 Conductance: 2 ft^2/day
Horizontal Flow Barrier	Assigned along margin of grid cells on the outer wall of the LCRS Trenches	2	Leakance Value (K/b): 0.001 1/d (for a liner thickness of 0.4 in (0.03 ft), K would be 3.3x10^{-5} ft/d (1.2x10^{-8}cm/sec)
Recharge (4)	Land surface	2	Areal Recharge: 1.3 in/yr

Symbols, Abbreviations, and Notes

- -: not applicable

ft = feet; in = inch; d = day; yr = year; gpm = gallons per minute

Leakance = K/b (ft/d)(1/ft) = 1/d; K = hydraulic conductivity (ft/d); b = thickness (ft)

IDC = Interior Drainage Channel; LCRS = Leachate Collection and Removal System

(1) Assigned heads are relative to the NAVD88 vertical datum and are based on current mean elevation of the San Francisco Bay adjacent to Brisbane: 3.22 ft NAVD88 for the baseline (present-day) model, and 6.9 ft higher (10.12 ft NAVD88) for the 2100 SLR model.

(2) Conductance = KA/L, where K is hydraulic conductivity (ft/d), A is area (ft^2), and L is length of flow (ft).

(3) The IDC was included in both the present-day and 2100 SLR models; the LCRS trenches were included in the 2100 SLR model along the eastern and southern sides of the landfill.

(4) Some of the landfill was excluded from areal recharge in the 2100 SLR scenario to simulate the planned installation of an impermeable cover. However, two areas with higher recharge rate were included within the landfill where mounding of fluid is documented. In these areas, which is where the landfill is thickest, local recharge rates of 26 and 13 in/yr were assigned for the baseline (present-day) and year 2100 SLR models, respectively. The mounding of fluid is attributed mainly to upward flow of pore water that is squeezed out of the YBM with compression due to the weight of the fill. Residual leachate generation may also contribute.

4. MODEL RESULTS AND CONCLUSIONS

The simulated water table elevations for the baseline (present-day) model, which is represented by a contour map (**Figure 4)**, compare reasonably well with the water level contours interpolated from monitoring data (e.g. Geosyntec, 2020a, 2020b, and **Appendix A** to this report).

Figure 5 is a contour map of the modeled change in water table elevations due to 6.9 ft of SLR, which is assigned to the SF Bay and Brisbane Lagoon for the year 2100 version of the model. The 3-D numerical groundwater modeling shows decreases in the water table elevation (negative change) across the majority of Specific Plan area. The decrease in the calculated water table elevations for the year 2100 model in comparison to the baseline conditions model calculated with baseline (present-day) model are due to the LCRS trenches along the Landfill portion and southern margins of the landfill, which are planned for installation as a component of the final closure of the landfill.

As is also shown by **Figure 5**, the modeling with 6.9 ft of SLR shows increases in water table elevations of approximately 2 ft in the central portions of UPC OU-2 and UPC OU-SM and west of the landfill. The modeling also indicates increases in the water table elevation of up to a few feet in the Baylands and Guadalupe Creek valley west of the Brisbane Lagoon, and in the Visitacion Valley north and west of the northern portion of the Specific Plan area.

In conclusion, evaluation using groundwater modeling of the influence on groundwater conditions of 6.9 ft of SLR in the SF Bay and Brisbane Lagoon indicates a maximum increase in the water table elevation of approximately 2 ft beneath the Specific Plan area. As a consequence of the trenches that are a component of the LCRS that is planned for final closure of the Brisbane Landfill, groundwater modeling indicates that despite 6.9 ft of SLR the water table elevation beneath landfill will be lower than it is today.

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FIGURES



Legend

Evaluation_Area

N

0 3 Miles

Regional Setting

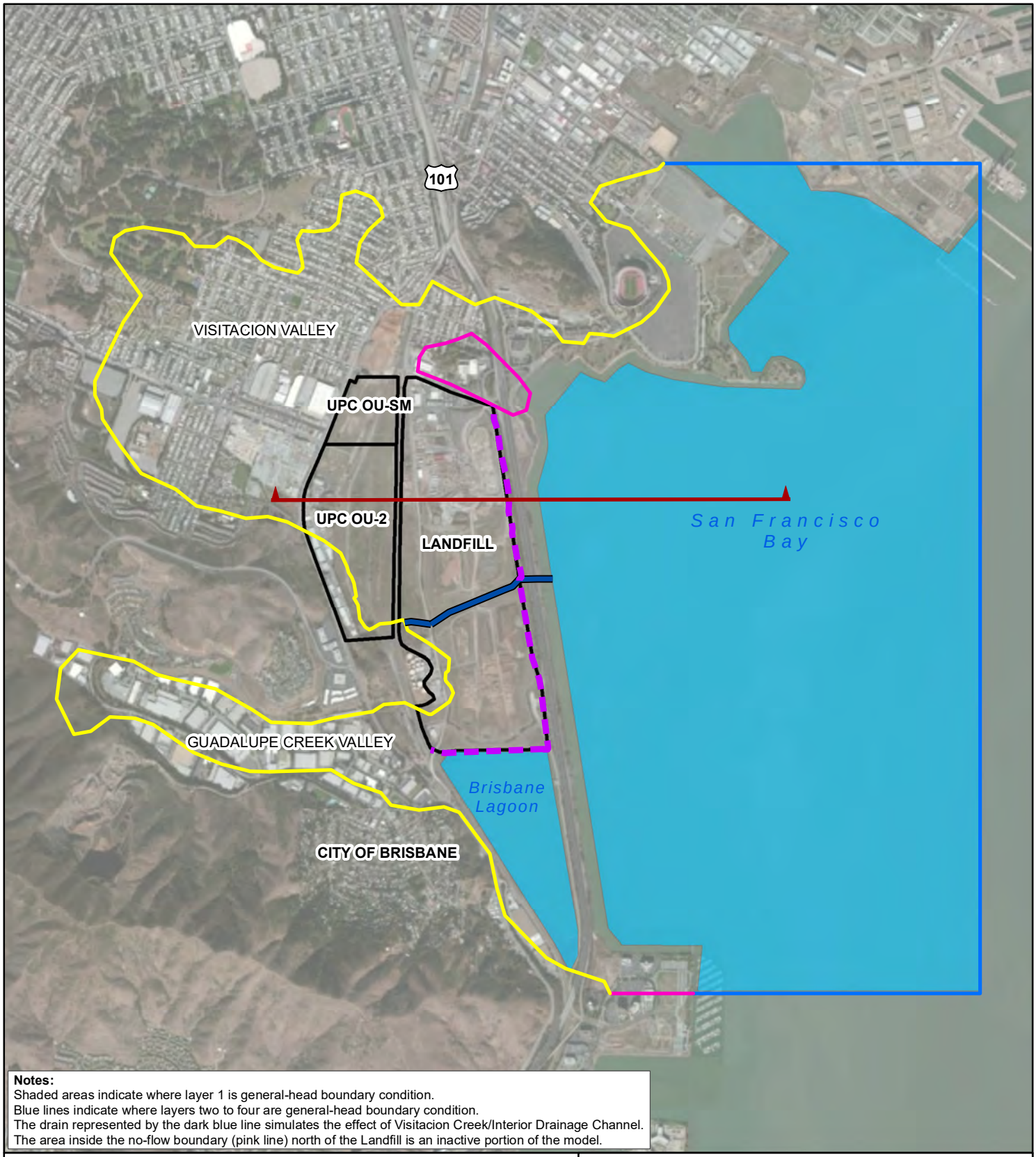
Brisbane Baylands
Brisbane, California

Geosyntec consultants

WG2871 | March 2022

Figure 1

D:\GIS\UPC\Brisbane\Project\2020_GDW_SLR\MXD\Fig01_RegionalSetting.mxd 5/11/2020 2:22:12 PM



Notes:
Shaded areas indicate where layer 1 is general-head boundary condition.
Blue lines indicate where layers two to four are general-head boundary condition.
The drain represented by the dark blue line simulates the effect of Visitacion Creek/Interior Drainage Channel.
The area inside the no-flow boundary (pink line) north of the Landfill is an inactive portion of the model.

Legend

- General Head Boundary
- No-flow Boundary
- Specified-flow Boundary
- Interior Drainage Canal (IDC)
- LCRS Trench (Post-Closure)
- Cross Section Location
- Operable Unit (OU) Boundary

N

0 0.5 Miles

Model Domain and Setting
Brisbane Baylands
Brisbane, California

Geosyntec consultants

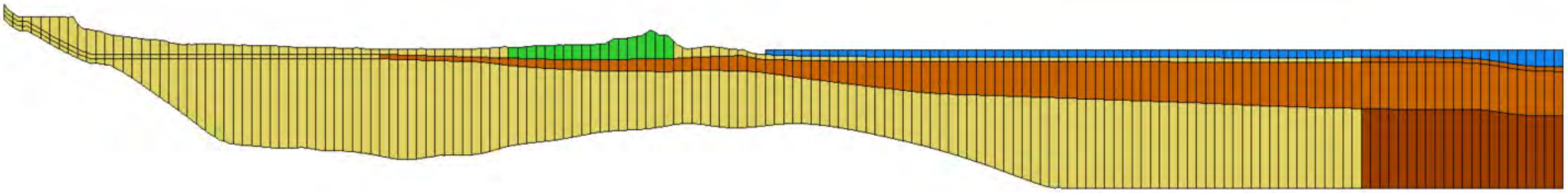
WG2871 | March 2022

Figure 2

D:\GIS\UPC\Brisbane\Project\2020_GDW_SLR\MXD\Fig02_ModelDomain.mxd 5/27/2020 4:06:08 PM

W

E



Vertical Exaggeraton = 5X

Legend

- Water/Bay
- Refuse or Fill
- Alluvium or Fill
- Young Bay Mud
- Old Bay Mud

0 1,000 Feet

Representative Cross Section Showing Model Layers

Brisbane Baylands
Brisbane, California

Geosyntec consultants

WG2871 | March 2022

Figure 3

P:\GIS\UPC\Brisbane\Project\2020_GDW_SLR\MXD\Fig03_CrossSection.ai



Legend

Modeled water table elevation under current conditions (1 ft contour interval)

Operable Unit (OU) Boundary

0 1,400 Feet

N

Note:
Horizontal datum - NAD83 CA SP Zone 3
Vertical datum - NAVD88

Modeled Water Table Elevations for Present-Day Model
Brisbane Baylands
Brisbane, California

Geosyntec consultants

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Figure 4

P:\GIS\UPC\Brisbane\Project\2022_GDW_SLR\Fig04_BaselineContour.mxd 3/23/2022 4:16:38 PM



Legend

Contours of Change in Water Table (0.5 ft contour interval) with 6.9 ft Increase in Water Level in the SF Bay and Brisbane Lagoon

Operable Unit (OU) Boundary

0 1,400 Feet

N

Note:
Positive numbers are increases in groundwater level, and negative are decreases.
The decreases in groundwater levels are a consequence of interception trenches along the eastern and southern margins of the landfill (see Figure 2) that are planned as part of a leachate collection and recovery system with the final closure of the landfill.
Horizontal datum - NAD83 CA SP Zone 3

Modeled Change in Water Table Elevation with 6.9 Increase in Water Level in the Bay
Brisbane Baylands
Brisbane, California

Geosyntec consultants

WG2871	March 2022

Figure 5

P:\GIS\UPC\Brisbane\Project\2022_GDW_SLR\Fig05_HeadContours.mxd 3/23/2022 4:16:33 PM

APPENDIX A

Shallow Groundwater Elevation Contour Maps from the Winter-Spring 2020 Semiannual Discharge Monitoring Report (Figures 3 and 5, Geosyntec, 2020b)

Note:

Groundwater elevations presented in the groundwater monitoring reports are relative to the NGVD29 vertical datum. For this report and numerical modeling, the groundwater elevations were converted to the NAVD88 vertical datum for internal consistency between model input data and engineering design. The design established that 2.33 ft should be added to NGVD29 elevations to convert to NAVD88 for the Brisbane Landfill vicinity.

MW-6 (SFC)
16.60*

MW-31A
4.42

MW-33A
4.24

MW-4A
4.06

MW-34A
4.39

LW-2
7.80

MW-36A
2.34

MW-7A
4.18

MW-37A
3.83

LW-1
10.18

MW-16
6.15

MW-15
9.61

MW-14R
9.69

MW-1
6.32

MW-12
6.29

MW-2
6.33

MW-39A
6.12

MW-19
12.60

MW-20
10.27

MW-3R
6.43

MW-8
5.95

MW-5
6.15

MW-6
5.16

MW-22
5.67

MW-40A
2.45

MW-23
5.60

MW-10A
2.68

MW-44A
2.01

MW-42A
1.70

Bayshore Blvd

Tunnel Ave

Caltrain

101

Interior Drainage Channel

Brisbane Lagoon

Groundwater elevation data presented in this figure and in the Semiannual Discharge Monitoring Report are relative to the NGVD29 vertical datum. These plots are included for general comparison purposes with the groundwater model results, which are given relative to the NAVD88. A correction factor of 2.33 ft was added to the NGVD29 elevations to convert into NAVD88.

Legend

- Groundwater Monitoring Well Location
- Leachate Well Location
- Groundwater Elevation Contour (ft msl)
- General Direction of Inferred Groundwater Flow
- Site Boundary

Notes:
* = value not used in contouring
ft msl = feet above mean sea level
- Groundwater elevations are in ft msl.
- The Interior Drainage Channel (IDC) functions as a drain that routes Visitacion Creek across the landfill to the Bay. The elevation of the bottom of the IDC is approximately 0 ft MSL.

N

0 600 Feet

Shallow Groundwater Contours
12 November 2019

Brisbane Landfill
Brisbane, California

Geosyntec consultants

WG2687 | May 2020

Figure A-1

\\Oakland-01\data\GIS\UPC\Brisbane\Project\2020-05_LandfillGWMRFigureSetup\Fig03_Nov_ShallowGWE.mxd 5/21/2020 10:26:35 AM (Author: kwalton)

MW-6 (SFC)
19.15*

MW-31A
5.59

MW-33A
5.89

MW-34A
5.92

MW-36A
3.12

MW-37A
4.53

MW-39A
8.06

MW-40A
3.10

MW-42A
2.25

MW-44A
2.72

MW-11AR
5.78

LF-3A
6.27

MW-4A
6.32

MW-15A
6.23

MW-17A
6.23

LF-4A
6.10

KMW-4A
6.20

MW-13A
6.30

LF-5A
6.06

LF-8A
5.38

MK-7A
5.19

MW-10AR
5.67

MK-8A
4.77

MW-7A
6.32

LW-2
9.22

LW-1
11.11

MW-16
7.37

MW-15
11.65

MW-14R
11.44

MW-1
7.60

MW-12
7.40

MW-2
7.75

MW-20
12.10

MW-19
14.25

MW-3R
8.08

MW-8
7.12

MW-5
7.79

MW-6
6.47

MW-22
7.16

MW-23
7.05

MW-10A
4.10

Bayshore Blvd

Tunnel Ave

Caltrain

101

Interior Drainage Channel

Brisbane Lagoon

Groundwater elevation data presented in this figure and in the Semiannual Discharge Monitoring Report are relative to the NGVD29 vertical datum. These plots are included for general comparison purposes with the groundwater model results, which are given relative to the NAVD88. A correction factor of 2.33 ft was added to the NGVD29 elevations to convert into NAVD88.

Legend

- Groundwater Monitoring Well Location
- Leachate Well Location
- Groundwater Elevation Contour (ft msl)
- General Direction of Inferred Groundwater Flow
- Site Boundary

Notes:
* = value not used in contouring
ft msl = feet above mean sea level
- Groundwater elevations are in ft msl.
- The Interior Drainage Channel (IDC) functions as a drain that routes Visitacion Creek across the landfill to the Bay. The elevation of the bottom of the IDC is approximately 0 ft MSL.

N

0 600 Feet

Shallow Groundwater Contours
11 February 2020

Brisbane Landfill
Brisbane, California

Geosyntec consultants

WG2687 | May 2020

Figure A-2

\\Oakland-01\data\GIS\UPC\Brisbane\Project\2020-05_LandfillGWMRFigureSetup\Fig05_Feb_ShallowGWE.mxd 5/21/2020 10:52:04 AM (Author: kwalton)

Geosyntec consultants

engineers | scientists | innovators

INTERIM REPORT – 100-YEAR TOTAL WATER LEVEL SCENARIOS SEA LEVEL RISE VULNERABILITY ASSESSMENT

THE BAYLANDS
BRISBANE, CALIFORNIA

Prepared for

Baylands Development, Inc.
150 Executive Park Boulevard, Suite 400
San Francisco, California 94134

Prepared by

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

Project Number: WR2891

March 24, 2022

INTERIM REPORT – 100-Year Total Water Level Scenarios Sea Level Rise Vulnerability Assessment

The Baylands
Brisbane, California

Prepared for

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San Francisco, California 94134

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Project Number: WR2891

March 24, 2022

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Figure 7: Flooding for the High-End of Medium-High-Risk Aversion for The Baylands

ACRONYMS AND ABBREVIATIONS

BCDC	San Francisco Bay Conservation and Development Commission
BFEs	base flood elevations
COPC	California Ocean Protection Council
DEM	Digital Elevation Model
extreme tide	temporary, short- to medium-term increases in sea level above the predicted astronomical tide levels as a result of changes in atmospheric pressure, wind, or freshwater inflows
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
Geosyntec	Geosyntec Consultants, Inc.
GEV	Generalized Extreme Value
KMEP	Kinder Morgan Energy Partners
IDC	interior drainage channel
LCRS	leachate collection and recovery system
MHHW	Mean Higher High Water; the average of the higher high-water elevation of each tidal day observed over the National Tidal Datum Epoch
MHW	Mean High Water; the average of all the high water heights observed over the National Tidal Datum Epoch
MLLW	Mean Lower Low Water; the average of the lower low-water elevation of each tidal day observed over the National Tidal Datum Epoch
MLW	Mean Low Water; the average of all the low water heights observed over the National Tidal Datum Epoch
MSL	Mean Sea Level; the arithmetic mean of hourly heights observed over the National Tidal Datum Epoch
MTL	Mean Tide Level; the arithmetic mean of the mean high water and mean low water
NAVD88	North American Vertical Datum of 1988
NED	National Elevation Dataset
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council

Regional Water Board	California Regional Water Quality Control Board – San Francisco Bay Region
SLR	sea level rise
TWL	total water level
UPC	Universal Paragon Corporation
USGS	United States Geological Survey
WGS84	World Geodetic System of 1984

1. INTRODUCTION

The Baylands consists of approximately 684 acres adjacent to the shoreline of the west side of San Francisco Bay in Brisbane, California, directly south of San Francisco, California, situated between Highway 101 to the east and Bayshore Boulevard to the west. Due to the proximity of the development to the shoreline margin of San Francisco Bay, proposed and existing Baylands infrastructure and assets may be damaged by encroaching sea level rise (SLR) and/or major storm events in the foreseeable future. Prediction of the future total water level (TWL) in response to SLR and other climate related factors, identification of the future potential vulnerabilities to the proposed development, and development of an adaptive strategy to protect against potential damage will be a permit condition of the development.

Geosyntec Consultants, Inc. (Geosyntec) has been tasked by Baylands Development, Inc. with preparing a Sea Level Rise Vulnerability Assessment to evaluate the potential impacts of climate change and associated SLR to critical planned development assets at The Baylands. The findings of the Sea Level Rise Vulnerability Assessment will provide the basis for development of an adaptive management strategy to ensure the long-term protection of The Baylands assets and public safety.

This Interim Report documents the development of the 100-year TWL scenarios in support of this overall effort. The 100-year TWL scenarios were then used to identify if and where areas of the future development may be vulnerable to surface water inundation. As more details of the Specific Plan area development plans are finalized (utility infrastructure), Geosyntec will re-evaluate and update this Sea Level Rise Vulnerability Assessment.

2. BACKGROUND AND SPECIFIC PLAN AREA LOCATION

Evaluating and managing impacts on structures at shoreline developments from future SLR and other climate-related extreme flood events is important for maintaining operational viability for critical infrastructure, developed assets, and public safety into the future. In response, regulatory agencies require new development projects on or in close proximity to the San Francisco Bay shoreline to conduct vulnerability assessments to identify potential risks as a result of SLR and other climate-related extreme flood events. Risks that may be identified are to be mitigated using an adaptive management strategy to monitor, protect, and maintain vulnerable components of a shoreline development.

The Baylands is located along the western margin of the San Francisco Bay shoreline and has the potential to be impacted by SLR and other climate and physiographic conditions. Figure 1 shows the regional setting of The Baylands within San Francisco Bay.



Figure 1: Regional Setting of The Baylands

Due to this proximity to the San Francisco Bay shoreline, regulatory agencies involved with issuing permits for the development now require consideration of SLR and extreme flood events. Anticipated permitting agencies and associated permit conditions relative to SLR are as follows:

- City of Brisbane, General Plan Amendment No. GP-1-18, Section 3J states: *"Development shall be designed to protect uses from the 100-year flood, including 100 years of projected sea level rise as determined based on regulatory standards or guidelines in effect at the time of project construction, with the reference to guidelines and sea level rise projections approved by the Director of Public Works/City Engineer based on context-specific considerations of risk tolerance and adaptive capacity."*
- The Bay Conservation and Development Commission (BCDC) San Francisco Bay Plan (May 5, 2020; Part IV, Policy 2) states: *"When planning shoreline areas or designing larger shoreline projects, a risk assessment should be prepared by a qualified engineer and should be based on the estimated 100-year flood elevation that takes into account the best estimates of future sea level rise and current flood protection and planned flood protection that will be funded and constructed when needed to provide protection for the proposed project or shoreline area. A range of sea level rise projections for mid-century and end of century based on the best scientific data available should be used in the risk assessment. Inundation maps used for the risk assessment should be prepared under the direction of a qualified engineer. The risk assessment should identify all types of potential flooding, degrees of uncertainty, consequences of defense failure, and risks to existing habitat from proposed flood protection devices."*
- The California Regional Water Quality Control Board – San Francisco Bay Region (Regional Water Board) through its authority under Title 27 of the California Code of Regulations and the California Water Code, Section 13267 requires that: *"The Discharger shall submit a report consistent with State of California Sea-Level Rise Guidance and BCDC's Bay Plan, acceptable to the Executive Officer, which proposes strategies for the long-term protection of the [site or landfill] from flooding and inundation due to sea level rise (SLR) and extreme climate/weather events. This report shall be prepared by a qualified engineer and be based on providing protection from the estimated 100-year total water level (TWL) on top of [1.1-feet (low risk) or 1.9-feet (medium to high risk)] of SLR by 2050. The 100-year TWL shall take into account astronomical tides and storm surge as well as Pacific swell, wind waves, and wave run-up. The report shall propose an adaptive management strategy that provides for protection from [2.4- to 3.4-feet (low risk) or 5.7- to 6.9-feet (medium to high risk)] of SLR by 2100, or the most recent 0.5% probability scenario as determined by the official state of California sea level rise guidance (e.g., 2018 State of California Sea Level Rise Guidance). This report shall provide technical justification for the selection of both the 2050 and 2100 protective strategies. The report shall be updated and submitted every five years throughout the operational life of the site with the most recently available and credible information and climate change adaptation guidance at the time of the update."*

3. OBJECTIVES AND SCOPE OF WORK

The overall objectives of this study are to establish 100-year TWL (including considerations of SLR) at the San Francisco Bay shoreline adjacent to the project, identify potential vulnerabilities to The Baylands assets from the TWL, and provide a qualitative risk ranking for vulnerable assets. The findings of the Sea Level Rise Vulnerability Assessment will provide the basis for development of an adaptive management strategy to ensure the long-term protection of The Baylands assets and public safety.

This Interim Report documents the development of the 100-year TWL scenarios and identifies if and where areas of the future development may be vulnerable to surface water inundation. As more details of the site development plans are finalized, Geosyntec will re-evaluate and update potential vulnerabilities to The Baylands assets from the TWL and provide a qualitative risk ranking for vulnerable assets.

3.1 100-Year Total Water Level Scenarios

This first task involved estimating future TWL conditions, considering SLR, astronomical tides, storm surge, wind waves, and wave run-up. This study developed possible impact scenarios using the 2050 SLR projections and a range of scenarios using the 2100 SLR projections. This involved a review of published literature on SLR and return-interval storm events, as well as a review of state guidance, regional guidance, and policy documents to develop future predicted inundation and flooding levels. In addition to SLR, the following direct and consequential effects were considered: a) inundation by increased tide levels in San Francisco Bay (i.e., nuisance flooding); b) increased storm flooding from Guadalupe Valley Creek (i.e., backwater effects); c) flooding from increased groundwater levels; and d) flooding from extreme storm events (i.e., 100-year magnitude events). Using the findings of the literature review, the scenarios examined were established as a combination of storm surge, tide level, and sea level elevation. The scenarios were then analyzed to develop future predicted inundation and flooding levels at The Baylands.

Specific tasks included:

- Conducting a literature review, including Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS; San Mateo County) and National Research Council (NRC) guidance for California/Washington/Oregon SLR;
- Gathering current data including local SLR rates, National Oceanic and Atmospheric Administration (NOAA) tide gage information, topography, and site plan;
- Developing TWL scenarios for time horizons 2050 and 2100;
- Evaluating changes in groundwater elevation across the Specific Plan area; and
- Evaluating FEMA flood elevations along Visitation and Guadalupe Valley Creeks and changes due to predicted TWL.

3.2 Sea Level Rise Vulnerability Assessment

Geosyntec conducted a vulnerability assessment of the final grade elevation as presented in the Grading Plan (BKF, 2022) using the estimated 100-year TWL. This vulnerability assessment will be updated after the development plans for Specific Plan area grade and infrastructure are more finalized. As these plans are developing, Geosyntec will advise and inform the design team on the implications of the TWL on the conceptual and final designs so that future impacts from the TWL projections can be minimized. The goal of this task will be to coalesce the TWL with the most up-to-date version of the Specific Plan area development plans and generate a list of infrastructure and assets that fall within the 2050 and 2100 TWL flood areas. Such infrastructure may include landfill closure components, sub-grade utilities, roads/streets, stormwater facilities, Visitation Creek and its associated outfall, buildings, bridge abutments, and components of the environmental remediation program. Geosyntec will review the existing design, preliminary design, or conceptual design concepts for each element of the proposed infrastructure systems, as available and provided by the design team.

This future task will include a field reconnaissance of the Specific Plan area to validate current conditions. The outcome of the assessment will be a synthesized summary of the specific vulnerabilities at The Baylands under each of the TWL scenarios.

4. ASSESSMENT RESULTS

4.1 Total Water Level

TWL is defined in this analysis as an additive combination of SLR, astronomical tides, storm surge, wind waves, and wave run-up. Geosyntec evaluated astronomical tides, storm surge, wind waves, and wave run-up based on a recent study of tidal datums and extreme flood conditions in the San Francisco Bay (AECOM, 2016). The study was conducted in support of FEMA's ongoing San Francisco Bay Area Coastal Study and released by AECOM in February 2016. In the report, extreme flood elevations are estimated for a number of locations around San Francisco Bay, including the area around the The Baylands. The study used a numerical model, Mike21, developed for the entire bay by DHI for the 30-year hindcast period of 1973 to 2003 for the north and central bay. Return period extreme water levels were then derived from the hindcast model by fitting a Generalized Extreme Value (GEV) probability distribution to the annual maxima water levels at over 900 locations in San Francisco Bay. In addition to extremal analysis, the report provides an update to tidal statistics around San Francisco Bay using water level results from the model for the most recent tidal epoch, 1983 through 2001.

Extreme return level statistics were calculated for the 2-, 5-, 10-, 25-, 50-, 100-, and 500-year return periods. The 1-year return level was extrapolated from the above calculated return levels. The period of interest in this report is the 100-year return period event. The extreme statistics take into account astronomical tides, storm surge, wind waves, and wave run-up. Table 1 shows the tidal statistics and Table 2 shows the extreme statistics for the The Baylands. The reported values are in feet and referenced to the vertical datum of North American Vertical Datum of 1988 (NAVD88). The only component of the TWL that the extreme statistics do not account for is SLR. The 100-year extreme water level is 10.18 feet NAVD88.

Table 1: Tidal Statistics for The Baylands [feet, NAVD88]

MLLW	MLW	MTL	MSL	MHW	MHHW
-0.6	0.57	3.28	3.31	6.05	6.66

Abbreviations:
MHHW: Mean Higher High Water
MHW: Mean High Water
MLLW: Mean Lower Low Water
MLW: Mean Low Water
MSL: Mean Sea Level
MTL: Mean Tide Level

Table 2: Extreme Water Level Statistics for The Baylands by Return Period [feet, NAVD88]

1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
7.92	8.26	8.63	8.92	9.36	9.74	10.18	11.46

For the SLR component of the TWL, Geosyntec evaluated local SLR elevations based on California Natural Resources Agency and the Ocean Protection Council (COPC) projections for SLR for the State of California (California Natural Resources Agency and the Ocean Protection Council, 2018). Based on guidance from the Regional Water Board and 2018 State of California Sea Level Rise Guidance, SLR scenarios for a site are selected based on the following steps:

1. Identify the nearest tide gauge.
2. Evaluate project lifespan.
3. For the nearest tide gauge and project lifespan, identify range of SLR projections.
4. Evaluate potential impacts and adaptive capacity across a range of sea-level projections and emission scenarios.
5. Select SLR projections based on risk tolerance and, if necessary, develop adaptation pathways that increase resiliency to SLR and include contingency plans if projections are exceeded.

The nearest tide gauge to the Specific Plan area presented in the 2018 State of California Sea Level Rise Guidance (COPC, 2018) is San Francisco, located on the south side of the Golden Gate Bridge approximately 9 miles northwest of The Baylands. Two lifespans were chosen for the study: 2050 and 2100. 2050 was chosen to evaluate existing or proposed Baylands infrastructure that needs to be protected in response to near-term changes in TWL and SLR. 2100 was chosen to evaluate the need for a long-term adaptive management strategy that provides protection to key Baylands infrastructure and assets.

A range of different SLR projections were evaluated to understand the potential impacts of SLR on Baylands infrastructure. Projections for both low and medium-high risk aversion scenarios were evaluated.

Table 3 shows the projected ranges of SLR for 2050 and 2100.

Table 3: Projected SLR Ranges for 2050 and 2100

Risk Aversion Scenario	2050 SLR [feet]	2100 SLR [feet]
Low	1.1	2.4 to 3.4
Medium-high	1.9	5.7 to 6.9

Based on guidance established by the Regional Water Board and the BCDC, the TWL is shown in Table 4 for 2050 and 2100, taking into account SLR and extreme flood events. The values shown in Table 4 were derived by placing the 100-year TWL from extreme events on top of SLR for low and medium to high-risk scenarios. The range of TWLs for 2050 between low and medium to high risk aversion is relatively small – less than a foot. The range of TWLs for 2100 between low and medium to high risk aversion is larger – a little less than 5 feet between the low end of the low range and the high end of the high range.

Table 4: Projected TWL Ranges for SLR and Extreme Events for 2050 and 2100

Risk Aversion	2050 SLR [feet]	2100 SLR [feet]
Low	11.28	12.58 to 13.58
Medium-high	12.08	15.88 to 17.08

4.2 Groundwater

A study commissioned by Universal Paragon Corporation (UPC) and conducted by Geosyntec in 2020 evaluated the potential impacts of SLR on groundwater at The Baylands (Geosyntec, 2020). The study included the development of a numerical groundwater model to consider the impacts of the medium-high risk 2100 SLR (6.9 feet above datum) and proposed Specific Plan area improvements on groundwater. Specific Plan area improvements included a leachate collection and recovery system (LCRS) and an interior drainage channel (IDC) running along the length of Visitation Creek through the landfill. Despite SLR, the model shows groundwater levels decreasing through the Landfill portion of The Baylands up to the western edge of Highway 101. This is due to the LCRS and IDC directing groundwater flow away from the landfill and toward either the recovery system or the Bay. Groundwater levels, however, increase toward the Railyard portion of the landfill due to the effects of SLR. The increase in upland groundwater levels on the Railyard portion of the project Specific Plan area are, at most, 2 feet, bringing the groundwater elevations to about 8 feet MSL, or 11.31 feet NAVD88 (see Table 2 for vertical datum conversions). The proposed improvements involve filling in the Railyard portion of the Specific Plan area where groundwater levels increase. Given that existing ground elevations in that area are already above future groundwater elevations following Specific Plan area improvements, it is not expected that future groundwater elevations will have adverse effects on the TWL at the The Baylands.

4.3 FEMA Flood Insurance Rate Maps

In addition to potential for future flooding to occur due to extreme events, SLR, and changes in groundwater levels, current FEMA Flood Insurance Rate Maps (FIRMs) were considered to determine the potential for a 1% annual chance flood (FEMA, 2019). The City of Brisbane contains four flood zone designations: A, AE, VE, and X. Designation A refers to a flood insurance rate zone that corresponds to the 1% annual chance floodplains where no base flood elevations (BFEs) or depths are shown; designation AE refers the flood insurance rate zone that corresponds to the 1% annual chance floodplains where base flood elevations derived from the hydraulic analyses are shown; designation zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves; and designation X refers to areas of 0.2% annual chance flood hazards and areas of 1% annual chance flood hazards with average depths of less than 1 foot or with drainage areas less than 1 square mile. Figure 2 shows the FIRM for the northern half of the The Baylands area. Figure 3 shows the FIRM for the southern half of the The Baylands area. Zone VE exists entirely in the bay in this area, so it is not of concern for this study. The semi-transparent orange area in Figure 2 represents zone X. The Baylands entails filling in the area that is currently designated zone X with well over 1 foot of fill, as well as stormwater improvements that would provide drainage for the area. The

zone X area, post-development, therefore, may not be of concern relative to flooding potential as identified in the FIRMs. Zone AE designations are all 10 feet NAVD88 within the project area. These BFEs agree with the 100-year extreme water levels shown in Table 2, which follows given the FIRMs were developed based on the DHI model used to update tidal and extreme water level statistics for the bay.



Figure 2: FIRM for the Northern Half of the The Baylands Area



Figure 3: FIRM for the Southern Half of the The Baylands Area

4.4 100-Year Total Water Level Maps

The extent of inundation from the TWL calculated above was determined by applying passive flood mapping (the "bathtub" approach) over the Specific Plan area and the surrounding areas. The bathtub maps were developed by comparing Specific Plan area elevations to TWL – if the elevation at a location in or around the Specific Plan area is below the water level and the location is hydraulically connected to the bay, the location is flooded.

The site civil engineer, BKF Engineers, provided the most recent Specific Plan area grading plan. Discussions with the design team indicate that the Specific Plan area grading plan is currently under consideration for future updates. Inundation maps produced under the current iteration of this document, therefore, are subject to future change, depending on the status of the Specific Plan area grading plan. The Specific Plan area grading plan used for inundation map production in this report is titled "22_0210 Brisbane Baylands_Latest Grading Contours.dwg." The drawing file contains six surfaces that were merged to create one site-wide surface for export to a digital elevation model (DEM). The surfaces included the Landfill portion of the development including UPC OU-SM and UPC OU-2, the Railyard portion of the development, the Corridor/TUNL, Beatty Parking Lot, a water detention area between the Corridor/TUNL and UPC OU-2, and the Lumber Yard between the Corridor and the Railyard portion of the development. Based on discussions with the site engineer, it was determined that the vertical datum for the grading plan is NAVD88 [feet]. The horizontal coordinate system is NAD_1983_StatePlane_California_III_FIPS_0403_Feet. The surfaces were combined and exported to a DEM for production of the TWL maps.

The grading plan only included The Baylands. To evaluate the impact of changing water levels adjacent to the Specific Plan area, a DEM of the San Francisco Bay Area developed by the United States Geological Survey (USGS) was acquired and processed for inclusion in the bathtub maps (USGS, 2017). The DEM consists of a 1/9th arcsecond (approximately 10 feet) National Elevation Dataset (NED). The NED is derived from diverse source data and processed to a common coordinate system and vertical datum. The NED DEM used in this study is reference to the World Geodetic System of 1984 (WGS84). The vertical datum is the NAVD88 [m].

The Specific Plan area grading plan was combined with the NED DEM to produce a contiguous DEM of the Specific Plan area and surrounding areas. The NED DEM was re-projected from WGS84 to NAD_1983_StatePlane_California_III_FIPS_0403_Feet and its vertical datum was scaled from NAVD88 [meters] to NAVD88 [feet]. The area of the grading plan boundary (buffered by 10 feet) was removed from the NED DEM, and the two DEMs were combined to produce a site-wide and adjacent area DEM for creation of the TWL flooding maps.

Four TWL scenarios were evaluated for TWL map production: the low and high ends of the 2100 projections for both the low- and medium to high-risk scenarios, shown in Table 4. Figure 4, Figure 5, Figure 6, and Figure 7 show the inundation areas for the four scenarios. Hydraulically connected portions of Visitation and Guadalupe Valley Creeks were included in the flooded areas, e.g., the west side of Bayshore Boulevard from Brisbane Lagoon. For both low-risk scenarios, Highway 101 acts as a levee against inland flooding. For the medium to high-risk scenarios, however, the water levels exceed the highway's current elevation.

4.5 TWL Vulnerability Assessment

Geosyntec conducted a vulnerability assessment of the final grade elevation as presented in the Grading Plan (BKF, 2022) using the estimated 100-year TWL. The degree of inundation for each of the TWL scenarios in the year 2100 is presented in Figure 4, Figure 5, Figure 6, and Figure 7, below. These figures show the following:

- **Low End of Low Risk Assessment (Figure 4)**: Some inundation is apparent in the lowlands that exist between Highway 101 and the eastern edge of the Brisbane Landfill. The low-lying area north of the Kinder Morgan Energy Partners (KMEP) tank farm area is inundated as compared to the less prominent seasonal flooding that exists under current conditions. All of the development area in UPC OU-SM and UPC OU-2 and all of the Landfill area outside of Visitation Creek are dry.

- **High End of Low Risk Assessment (Figure 5)**: The inundation in the lowlands that exist between Highway 101 and the eastern edge of the Brisbane Landfill is more prominent and extends further to the north and south of Visitation Creek. The inundation in the low-lying area north of the KMEP tank farm area now extends north along a narrow drainage channel adjacent to the active rail line. All of the development area in UPC OU-SM and UPC OU-2 and all of the Landfill area outside of Visitation Creek are dry.

- **Low End of Medium-High Risk Assessment (Figure 6)**: The inundation in the lowlands that exist between Highway 101 and the eastern edge of the Brisbane Landfill is more prominent and submerges a portion of Highway 101. The inundation in the low-lying area north of the KMEP tank farm area now extends southward and connects the low-lying area with the Brisbane Lagoon. All of the development area in UPC OU-SM and UPC OU-2 and all of the Landfill area outside of Visitation Creek are dry.

- **High End of Medium-High Risk Assessment (Figure 7)**: The inundation on the eastern border of the landfill now almost completely submerges Highway 101 but only marginally encroaches into the eastern boundary of the landfill. The inundation in the low-lying area north of the KMEP tank farm area now extends into a portion of the tank farm area and connects Visitation Creek with the Brisbane Lagoon. The existing rail line is completely submerged along the southern portion of the project area. The Brisbane Lagoon is now completely connected to and is a part of San Francisco Bay. The inundation extends only marginally along a narrow band adjacent to the rail line along the eastern border of UPC OU-2. Almost all of the development area in UPC OU-SM, most of the area in UPC OU-2, and most of the Landfill area outside of Visitation Creek are dry. The berms between Visitation Creek and the two surrounding water detention facilities are barely overtopped and result in the appearance of flooding in the water detention facilities.

The assessment will be updated and re-evaluated as future refinements to the grading and infrastructure plans are made.



Figure 4: Flooding for the Low-End of Low-Risk Aversion for The Baylands



Figure 5: Flooding for the High-End of Low-Risk Aversion for The Baylands



Figure 6: Flooding for the Low-End of Medium-High-Risk Aversion for The Baylands

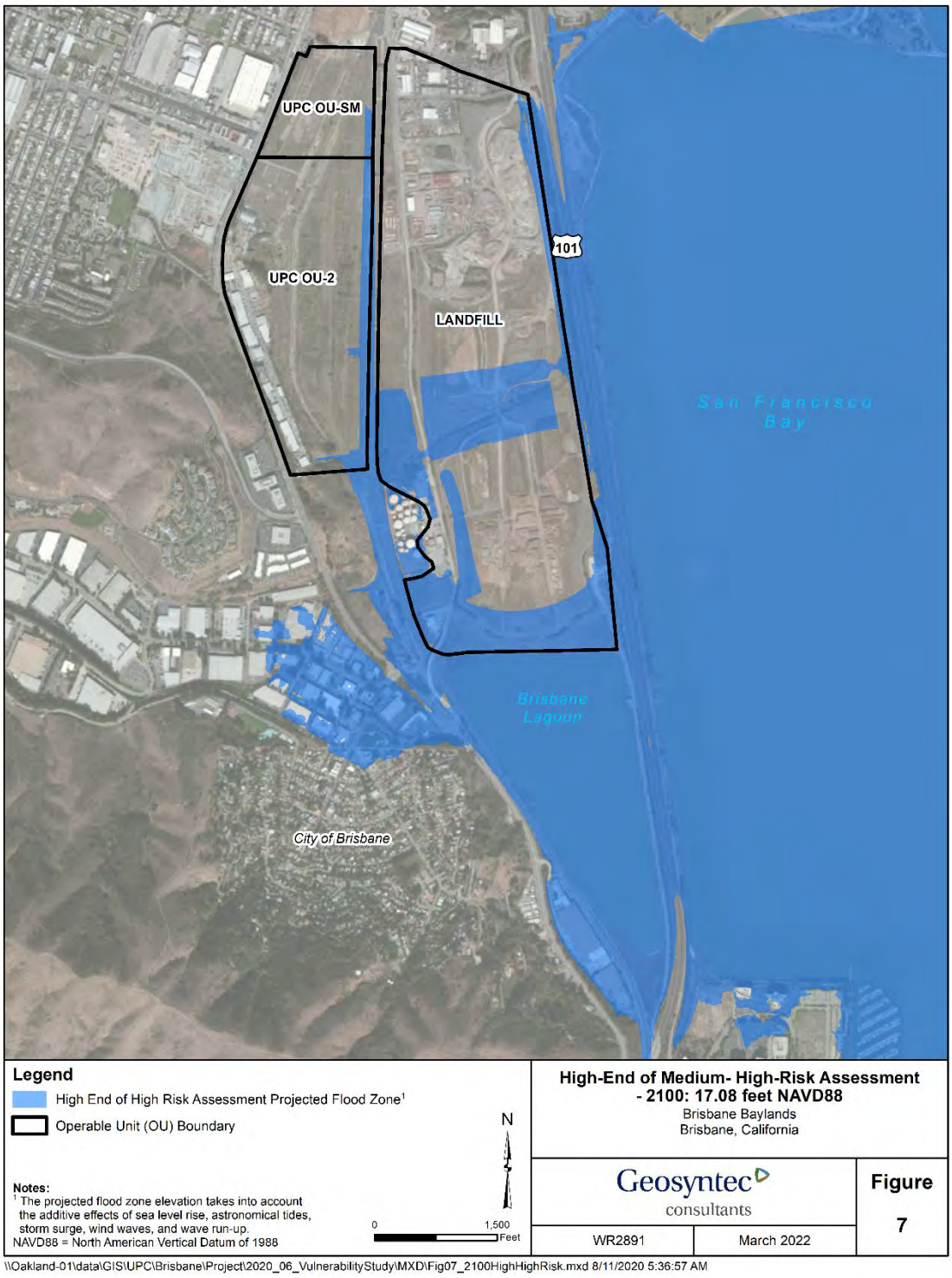

Figure 7: Flooding for the High-End of Medium-High-Risk Aversion for The Baylands

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APPENDIX G

CLOSURE AND POST-CLOSURE COST ESTIMATES

APPENDIX G
Baylands Landfill - Closure Cost Estimates

TABLE 1 - Summary of Estimated Annual Budget - December 2021

ITEM		TOTAL
Final Cover	$	222,813,100
Perimeter LCRS Trench	$	8,620,900
LFG Management System	$	2,911,400
Groundwater Monitoring System	$	377,000
Stormwater Management System	$	19,366,700

Cost are in current dollars 2021

TOTAL (INCLUDING 20% CONTINGENCY)	**$**	**304,907,000**

APPENDIX G
Baylands Landfill - Closure Cost Estimates

TABLE 2 - Itemized Budget - December 2021

PROJECTED EXPENSES

ITEM	CATEGORY	TASK	Unit	Quanity	Unit Cost	Cost
Final Cover	Mob/Demob	Mobilization	ls[17]	1	$500,000	$500,000
		Demoblization	ls[17]	1	$300,000	$300,000
					Subtotal	**$800,000**
	Soil Relocation	Site Clearing & Grubbing	sf	13,716,400	$0.10	$1,371,700
					Subtotal	**$1,371,700**
	Geotechnical Mitigation	DDC Test Sections[2]	ls[17]	4	$170,000	$680,000
		DDC Production	sf	14,000,000	$3.03	$42,413,400
		Pre- & Post-DDC Testing	ls[17]	4	$290,000	$1,160,000
		Wick Drains and Predrill[3]	sf	14,000,000	$2.35	$32,900,000
		Surcharge Fill Placement	cy	3,100,000	$5.50	$17,050,000
					Subtotal	**$94,203,400**
	Soil Layers	Foundation Layer[4]	cy	508,015	$5.50	$2,794,100
		Compacted Clay Liner[5,6,8]	cy	402,724	$33.75	$13,592,000
		Erosion-Resistant Layer(Fill)[4]	cy	16,200,000	$5.50	$89,100,000
		Erosion-Resistant Layer (Bay Mud within Wetlands)	cy	61000	$10.00	$610,000
		Erosion-Resistant Layer (Clean Fill within Wetlands)	cy	131000	$5.50	$720,500
		Erosion-Resistant Layer (Topsoil within Wetlands)	cy	48000	$5.5	$264,000
					Subtotal	**$107,080,600**
	Geosynthetics	40-mil HDPE Geomembrane and Installation[6,7,8]	sf	10,873,560	$0.81	$8,807,600
		Geosynthetic Clay Liner/40-mil LLDPE Geomembrane and Installation[7,9]	sf	2,842,840	$1.03	$2,916,800
		Drainage Geocomposite and Installation[7]	sf	3,982,065	$0.97	$3,870,600
					Subtotal	**$15,595,000**
		Geotechnical Ground Improvement Design and Specifications	ls[17]	4	$100,000	$400,000
		30, 60, 90, 100% Landfill Closure Construction Documents and Specifications[10]	ls	1	$4,500,000	$4,500,000
		Construction Quality Assurance Plan	ls[17]	4	$25,000	$100,000
		Construction Management[11]	yr	10	$813,995	$8,140,000
		Ground Improvment QA Testing and Inspection	yr	7	$395,200	$2,766,400
		Grading QA Testing and Inspection	yr	4	$312,000	$1,248,000
		Surveying and As-Builts	ls	1	$200,000	$200,000
					Subtotal	**$17,354,400**
Perimeter LCRS Trench	Perimeter LCRS Trench	Demolition of existing LCRS system	ls	1	$33,750	$33,800
		LCRS Design and Permitting	ls	1	$350,000	$350,000
		Collection Piping	ls	1	$1,442,610	$1,442,700
		Conveyance, Controls, and Completion	ls	1	$1,094,310	$1,094,400
		Perimeter Cut-Off Wall	ls	1	$5,500,000	$5,500,000
		Construction QA Testing and Inspection	ls	1	$200,000	$200,000
					Subtotal	**$8,620,900**
LFG Management System	LFG Management System	LFGS Design and Permitting	ls	1	$350,000	$350,000
		Recovery Wells	ls	1	$148,905	$149,000
		Well Completion Components	ls	1	$55,890	$55,900
		Headers and Lateral Piping	ls	1	$956,454	$956,500
		LFG Control Systems	ls	1	$1,199,961	$1,200,000
		Construction QA Testing and Inspection	ls	1	$200,000	$200,000
					Subtotal	**$2,911,400**
Groundwater Monitoring System	Groundwater Monitoring System	Exiting Monitoring Well Destruction	ea	12	$11,000	$132,000
		Groundwater/Leachate Monitoring Well Installation	ea	7	$35,000	$245,000
					Subtotal	**$377,000**
Stormwater Management System	Stormwater Management System[13,15]	Erosion Control BMPs (hydroseeding, straw wattles, silt fences, etc.)	ac	10,000	$320	$3,200,000
		Bioswales/Bioretention Areas[14]	sf	17,820	$160	$2,851,200
		Conveyance Piping[15]	lf	20,500	$530	$10,865,000
		Inlets and Culverts[16]	ls	1	$2,000,000	$2,000,000
		Stormwater Control Plan	ls	1	$150,500	$150,500
		Construction QA Testing and Inspection	ls	1	$300,000	$300,000
					Subtotal	**$19,366,700**
					TOTAL[8]	**$254,089,100**

Notes/Assumptions:

Costs are provided in 2021 dollars based on CPCMP.

[1]Conventional trucking method with haul no more than 4 miles and stockpile at import site.

[2]Two passes of Deep Dynamic Compaction

[3]5-ft triangular spacing wick drain pattern (Average 60 feet deep)

[4]Will use on-site materials with the exception of the wetland areas. Includes soil placement and compaction.

[5]Will use on-site materials reconditioned with bentonite.

[6]Portions of site to use compacted clay liner versus geomembrane to be determined as part of final design. For cost estimation purposes, we have conservatively assumed a CCL would be used Site given its higher unit cost.

[7]Based on rates provided in November 2021 by Solmax with tax included.

[8]Compacted clay liner (CCL) excluded from total due to assuming final cap for solar array and commercial area will consist of a geomembrane instead of a CCL based on lower unit cost.

[9]Proposed wetland area. Based on rates provided in November 2021 by Solmax with tax included.

[10]Includes final cover, wetlands, and drainage designs. Exclude streets and utilities, Geneva Bridge, and site development.

[11]Assumes 5% of Construction Cost.

[12]Includes SSV equipment, sub-slab piping, risers, sampling ports, liquid boot liner, etc.

[13]Excludes hardscaped areas where stormwater improvements will be implemented.

[14]Includes subdrain, 40-mil geomembrane, biosoil mix, mulch, and landscaping.

[15]30" Fusion Welded SDR 17 HDPE Pipe w/ 8-10 feet of cover.

[15]Construction of wetland excluded.

[16]Assuming 2 catch-basins, 250-liner feet of piping, 2/3 small Catch Basins @ 8-10 feet, 1/3 large Catch Basins @5-8 feet). Does not include bridges at Tunnel nor Sierra Point Parkway.

[17]Site developed will be continuous.

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APPENDIX G
Baylands Landfill - Post-Closure Maintenance Cost Estimates

TABLE 3 - Summary of Estimated Post-Closure Annual Budget - December 2021

PROJECTED EXPENSES

CATEGORY	TOTAL[1]
Final Cover	$194,100
Leachate Management System	$227,900
Landfill Gas Management System	$284,700
Stormwater Management System	$458,000
Groundwater Monitoring System	$75,800

[1]Cost are in current dollars 2021

TOTAL (INCLUDING 20% CONTINGENCY)	**$1,488,600**

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APPENDIX G
Baylands Landfill - Post-Closure Maintenance Cost Estimates

TABLE 4 - Final Cover
Itemized Estimated Post-Closure Annual Budget - December 2021

PROJECTED EXPENSES

WORK ELEMENT	COST CATEGORY	DESCRIPTION	NOTES/ASSUMPTIONS	QUANTITY	UNIT	UNIT RATE	TOTAL
Inspections	Labor	Project Manager	Inspection management and coordination.	10	hr	$230	$2,300
		Environmental Technician	Annual inspection and reporting.	50	hr	$210	$10,500
		Project Assistant		5	hr	$123	$615
						Subtotal	**$13,500**
	Equipment	Field Truck		2	day	$200	$400
		Mileage		400	mi	$0.78	$312
						Subtotal	**$27,700**
Maintenance (As-Needed)	Labor	Equipment Operators/Laborers		200	hr	$140	$28,000
						Subtotal	**$28,000**
	Equipment	Earthworking Equipment		10	day	$2,500	$25,000
		Maintenance Truck		10	day	$200	$2,000
		Truck Mileage		4000	mi	$0.78	$3,120
						Subtotal	**$30,200**
	Materials	Final Cover Repair/Replacement	Assumes 0.5-acres of final cover (Geomembrane/GCL/Drainage Geocomposite) is repaired annual for 30 years, for a total of 15 acres. Includes tax	25,000	sf	$1	$25,000
		Soil Replacement	Erosion-resistant layer within wetlands.	500	cy	$50	$25,000
		Tax		1	yr	9.25%	$4,625
						Subtotal	**$54,700**
Iso-Settlment Survey	Labor/Equipment	5-year Settlement Tracking	Survey and analysis performed every five years.	1	yr	$40,000	$40,000
						Subtotal	**$40,000**

ANNUAL TOTAL	**$194,100**

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APPENDIX G
Baylands Landfill - Post-Closure Maintenance Cost Estimates

TABLE 5 - Leachate Management System
Itemized Estimated Post-Closure Annual Budget - December 2021

PROJECTED EXPENSES

ITEM	CATEGORY	DESCRIPTION	NOTES/ASSUMPTIONS	QUANTITY	UNIT	UNIT RATE	TOTAL
Operation, Maintenance, and Repair	Labor	Project Manager		104	hr	$230	$23,920
		Equipment Operator	Equipment operator - 2 days/qtr	80	hr	$140	$11,200
		Laborer	Assumes 2 laborers - each 2 days/month	480	hr	$140	$67,200
		Electrician	Assumes one electrician - 1 day/quarter	40	hr	$210	$8,400
						Subtotal	**$110,800**
	Materials	Electricity	Assumes LMS consists of LCRS Collection Trench and associated facilities (sumps, compressor, pumps, controls, risers, etc).	1	yr	$6,000	$6,000
		Offsite Leachate Treatment	Assumes a leachate generation rate of 3.2 million gallons per year.	3,200,000	gal	$0.01	$47,572
		Pump Replacement	Assumes 2 pumps replaced every 5 yrs at $10,000 per pump. There are 11 sumps each with a dedicated pump. So a total of up to 12 replacement pumps over 30 yrs. Annual cost = 12 pumps x $10,000/pump / 30 yrs = $4,000.	1	yr	$4,000	$4,000
		Miscelleneous	Includes, as appropriate, piping, other replacement parts, etc.	1	yr	$2,000	$2,000
		Tax	Sales taxes not applicable to electricty. Utility fees and taxes are included in the base unit rate.	1	yr	9.25%	$4,955
						Subtotal	**$64,600**
	Equipment	Backhoe		5	day	$1,500	$7,500
		Vacuum Truck		4	day	$3,500	$14,000
		Maintenance Truck		24	day	$200	$4,800
		Mileage		1,000	mi	$0.78	$780
						Subtotal	**$27,100**
Monitoring	Labor	Project Manager	Assumes 2 leachate wells sampled semiannually, landfill perimeter inspected for seeps per WDRs, and inspection of the LCRS collection trench sumps and cleanouts (siltation, etc.). Including coordination, scheduling, laboratory communication, etc. Data reported in semiannual groundwater monitoring report.	15	hr	$230	$3,450
		Environmental Technician	Assumes 10 hrs per event, includes travel and sample delivery, for a total of 20 hrs per year.	20	hr	$210	$4,200
		Project Assistant		8	hr	$123	$984
						Subtotal	**$8,700**
	Materials	Analytical Laboratory	Undiscounted unit prices by Torrent Laboratories, Inc., of Milpitas, California. Includes VOCs, Alkalinity, Calcium, Sodium, Potasium, Magnesium, Nitrate, Chloride, Sulfate, TDS, TOC, TKN, Cyanide, Sulfide, SVOC, TPH, Pesticides, Herbicides, PCBs, 18 Trace Metals.	4	samples/yr	$2,124	$8,496
		Sampling - Miscellaneous	Includes field supplies (i.e., pumps, tubing, ice, ice cooler, paper towel, gloves, etc.).	1	yr	$1,000	$1,000
		Well Replacement	Assumes the 2 leachate wells will be replaced once during post-closure at $35,000 per well (including salestax on materials). Total replacement cost = 2 x $35,000 = $70,000 over 30 years, or annualized cost of $70,000/30 = $2,335. Includes permitting, reporting, consulting/supervision costs.	1	yr	$2,635	$2,635
		Well Repair Materials	Well regular maintenance and repair include casing, well head, vault, etc.	1	yr	$500	$500
		Pump Replacement	Assumes each pump replaced every 10 yrs at $4,500/each (4" 1.5 HP submersible pump); so 3 pumps for each well over 30 yrs, or a total of 18 pumps at $4,500 in 30 yrs - annualized cost = $2700.	1	yr	$2,700	$2,700
		Tax	Sales taxes not applicable to well replacement/repair and pump replacement.	1	yr	9.25%	$925
						Subtotal	**$16,300**
	Equipment	Field Truck		1	day	$200	$200
		Mileage		200	mi	$0.78	$156
						Subtotal	**$400**

ANNUAL TOTAL	**$227,900**

Assumptions:
Sales taxes not applicable to electricty. Utility fees and taxes are included in the base unit rate.
Assumes semiannual sampling of 2 leachate wells, landfill perimeter inspected for seeps per WDRs, and inspection of the LCRS collection trench sumps and cleanouts (siltation, etc.).

APPENDIX G
Baylands Landfill - Post-Closure Maintenance Cost Estimates

TABLE 6 - Landfill Gas Management System
Summary of Estimated Post-Closure Annual Budget - December 2021

PROJECTED EXPENSES

ITEM	CATEGORY	DESCRIPTION	NOTES/ASSUMPTIONS	QUANTITY	UNIT	UNIT RATE	TOTAL
Operation, Maintenance, and Repair	Labor	Project Manager	Includes monthly GCCS O&M, monitoring, data review and reporting. Annual report included in LFG Monitoring.	20	hr	$230	$4,600
		Staff Engineer	Includes monthly GCCS O&M, monitoring, data review and reporting. Annual report included in LFG Monitoring.	30	hr	$188	$5,640
		Operation/Maintenenance Technician	Assumes 1 day/week. Also includes pump replacement, wellhead maintenance, sampling, and other activities, as needed (80 hrs/yr).	496	hr	$210	$104,160
		Project Administration		12	hr	$123	$1,476
						Subtotal	**$115,900**
	Materials	Condensate Disposal	Cost included in Leachate Management System Operation, Maintenance, and Repair.	1	yr	$0	$0
		LFG Well Replacement	Assumes that 15 LFG wells will be replaced once during the 30-yr postclosure period or approximately 1 wells per 2 years. Well replacement unit cost of $25,000 includes: (i) drilling, material and completion; (ii) an average well depth - 65 ft; (iii) new wellhead and installation - $1,000 / well; (iv) abandoning an existing well - $4,000 / well; (v) reconnecting lateral piping - $1,000 / well; (vi) pipe boots - $350 / well; and (vii) geomembrane and soil cover restoration - $1,000 / well.	0.5	yr	$25,000	$12,500
		LFG Pipeline	Assumes pipe replacement (both header and lateral) of 300 ft/yr at an average price of $100/ft.	300	lf	$100	$30,000
		Extraction System Electricity	Sales taxes not applicable to flare electricty. Utility fees and taxes are included in the base unit rate.	1	yr	$6,000	$6,000
		GAC Replacement	Assumes 2,000 pound GAC replacement once per year	1	yr	$15,000	$15,000
		GAC and Blower Repair or Replacement	Assumes 2 blowers will be replaced twice during 30-yr postclosure perod: 2 blowers x 2 times x $50k/blower = $200,000. Annualized cost is $200,000 / 30 yrs = $6,670/yr.	1	yr	$6,670	$6,670
		Tax	Sales taxes not applicable to flare electricty. Utility fees and taxes are included in the base unit rate.	1	yr	9.25%	$5,936
						Subtotal	**$76,200**
	Equipment	Maintenance Truck		67	day	$200	$13,400
		Mileage		2,000	mi	$0.78	$1,560
						Subtotal	**$15,000**
Monitoring	Labor	Project Manager	Includes NSPS / Title V monitoring, compliance, and annual reporting. 10 hrs/qtr, including annual reporting.	40	hr	$230	$9,200
		Staff Engineer	20 hrs/qtr, including annual reporting.	80	hr	$188	$15,040
		Environmental Technician	40 hrs/qtr, including Title V surface monitoring and sampling.	160	hr	$210	$33,600
		Project Assistant		12	hr	$123	$1,476
						Subtotal	**$59,400**
	Materials	Analytical Cost	Assumes that an average of 1 sample per month or 12 LFG samples per year will be analyzed for total non-methane organic compounds (TNMOC) ($150/sample) and VOCs ($330/sample) = $480/sample.	12	samples/yr	$480	$5,760
		Sampling - Miscellaneous	Includes field supplies (i.e., pumps, tubing, ice, ice cooler, paper towel, gloves, etc.).	12	well	$50	$600
		Tax		1	yr	9.25%	$588
						Subtotal	**$7,000**
	Equipment	Field LFG Analyzer		20	day	$300	$6,000
		Field Truck		20	day	$200	$4,000
		Mileage		1,500	mi	$0.78	$1,170
						Subtotal	**$11,200**
						ANNUAL TOTAL	**$284,700**

Assumptions:
Sales taxes not applicable to electricty. Utility fees and taxes are included in the base unit rate.

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APPENDIX G
Baylands Landfill - Post-Closure Maintenance Cost Estimates

TABLE 7 - Stormwater Management System
Summary of Estimated Post-Closure Annual Budget - December 2021

PROJECTED EXPENSES

ITEM	CATEGORY	DESCRIPTION	NOTES/ASSUMPTIONS	QUANTITY	UNIT	UNIT RATE	TOTAL
Inspections and Maintenance	Labor	Project Manager	Reporting included within final cap and system annual reports.	16	hr	$230	$3,680
		Laborer	Includes quarterly inspections, removing obstructions from inlets/outlets, replacing biotreatment soil, replanting, underdrain cleaning, irrigation system maintenance, overflow pipe inspection and repair/replacement of damage piping.	900,000	sf	$0.25	$225,000
		Project Assistant		2	hr	$125	$250
						Subtotal	**$229,000**
	Equipment	Vacuum Truck		8	day	$3,500	$28,000
		Field Truck		12	day	$200	$2,400
		Mileage		2,400	mi	$0.78	$1,872
						Subtotal	**$32,300**
	Materials	Biotreatment Soil Replacement	Class 2 Permeable Rock Replacement, Functional Plant Replacement	900,000	sf	$0.20	$180,000
		Tax		1	yr	9.25%	$16,650
						Subtotal	**$196,700**

ANNUAL TOTAL	**$458,000**

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APPENDIX G
Baylands Landfill - Post-Closure Maintenance Cost Estimates

TABLE 8 - Groundwater Monitoring System
Summary of Estimated Post-Closure Annual Budget - December 2021

PROJECTED EXPENSES

ITEM	CATEGORY	DESCRIPTION	NOTES/ASSUMPTIONS	QUANTITY	UNIT	UNIT RATE	TOTAL
Monitoring, Maintenance, and Repair	Labor	Project Manager	Includes semi-annual groundwater report. Leachate will be reported within groundwater report.	100	hr	$230	$23,000
		Environmental Technician	Includes 2 sampling events per year for five groundwater, well maintenance and repair (as needed), and inspections.	100	hr	$210	$21,000
		Project Assistant		20	hr	$125	$2,500
						Subtotal	**$46,500**
	Equipment	Well Replacement and Replacement	Assumes two wells replaced during the 30-yr postclosure period at $35,000 each.	1	yr	$1,167	$1,167
		Analytical Laboratory	Unit prices based on Enthalpy 2021 Fee Schedule for 2 sampling events per year with 2 samples groundwater monitoring well (5 wells total). Sampling includes VOCs, SVOCs, PCBs, OCPs, CAM 17, TOC, TNK, TDS, and general minerals	20	yr	$1,200	$24,000
		Supplies	Pump, containers, sampling equipment, etc.	1	yr	$500	$500
		Field Truck		10	day	$200	$2,000
		Mileage		2000	mi	$0.78	$1,560
						Subtotal	**$29,300**

ANNUAL TOTAL	**$75,800**

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APPENDIX H

BRISBANE LANDFILL IMPORT FILL CRITERIA

Date: September 14, 2017
CWIQS Place ID: 210442

Sent Via Email

Sunquest Properties
Attn: Mr. Howard Pearce
150 Executive Park Blvd., Suite 4000
San Francisco, CA 94134-3309

Subject: Concurrence with Proposed Revisions to the Baylands Soil Processing Acceptance Criteria, Brisbane Landfill, San Mateo County

Dear Mr. Pearce:

This letter grants your formal request dated August 23, 2017 to amend the Fill Soil Criteria for Brisbane Landfill in Brisbane, California. These revised criteria will be used to update the existing criteria listed in the Baylands Soil Processing *Submittal Guidelines for Imported Soil*, which was last updated in 2011.The revised criteria follow the Revision 3 ESLs of June 2016 with exceptions for background concentrations and laboratory detection limits for standard analyses. The revisions to the criteria were coordinated and reviewed by Water Board Region 2 staff.

In conclusion, the changes to the criteria list are as follows:

Pesticides
The Tier 1 ESLs (formerly used as acceptance criteria) are below the standard laboratory detection limits for dieldrin, endosulfan I and II, endosulfan sulfate, endrin, endrin aldehyde, endrin ketone, heptachlor, and heptachlor epoxide. The detection limit of 0.002 mg/kg is now used as the acceptance limit for these pesticide chemicals.

Background Concentrations
The following regional background concentrations are adopted:

- Arsenic: 11mg/kg
- Cobalt: 25mg/kg
- Nickel: 145 mg/kg and
- benzo(a)pyrene: 0.4 mg/kg.
- 1,2-dibromoethane: 0.004 mg/kg

If you have any questions, please contact Vic Pal at (510) 622-2403 or by email at VPal@waterboards.ca.gov.

Sincerely,

Keith E. Roberson
Senior Engineering Geologist
Land Disposal Program Manager

Cc: William Gilmartin - Bill@provenmanagement.com
Howard Pearce - hpearce@upcsf.com
Tom Graf - tom@grafcon.us
John Mahoney - john@thebaylands.com
Clara Johnson - clara-a-johnson@sbcglobal.net
Greg Schirle – gschirle@smcgov.org

DEFINITIONS OF FILL MATERIAL TYPES

Clean Soil – Natural materials (e.g., topsoil, clay, silt, sand, gravel, rock, or a mixture or combination of such materials) that have concentrations of naturally occurring chemicals (e.g., metals) at or below background levels at the receiving site while concentrations of man-made chemicals are absent. Clean soil is also free of trash, debris, and construction material. Clean soil does not include coal or other carbonaceous material.

Acceptable Soil – Material acceptable for the defined use(s) considering the following:

- consists of natural materials (e.g., soil, clay, silt, sand, gravel, rock, or a mixture or combination of such materials) free of visible signs of trash, debris, staining, liquids, or construction material
- concentrations of naturally occurring chemicals (e.g., metals) do not exceed regional background levels
- concentrations of anthropogenic chemicals (man-made or derived from human activity) do not present significant threats for relevant ecological and human exposure pathways (e.g. ingestion, inhalation, dermal contact, or nuisance) or concerns given the soil placement location and the potential for chemical migration (e.g. leaching/erosion into surface water, leaching into groundwater, or vapor intrusion into buildings, generation of transformation products).

Unacceptable Soil – Material with any of the following characteristics will be deemed unacceptable for import by the Regional Water Board:

- meets the definition of a hazardous waste (state or federal)
- contains free anthropogenic liquids based on visual inspection
- includes trash or debris
- contains concentrations of naturally occurring chemicals (e.g., metals) above relevant background levels
- contains chemicals from human activity at concentrations that present significant threats for relevant ecological and human exposure pathways or concerns.



APPENDIX I

WASTE DISCHARGE REQUIREMENTS FOR THE BRISBANE LANDFILL (RWQCB, 2001)

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

ORDER NO. 01-041
WASTE DISCHARGE REQUIREMENTS AND
RECISION OF RESOLUTION 58-278 AND
CLEANUP AND ABATMENT ORDER 94-134:

SUNQUEST PROPERTIES, INC., OYSTER POINT PROPERTIES, INC., TUNTEX (USA), INC., SUNSET PROPERTIES, INC., SANITARY FILL COMPANY, SUNSET SCAVENGER COMPANY, MACOR, INC., THE CITY OF BRISBANE, BRISBANE PROPERTIES, LLC, DOUGLAS H. AND DIANE A. GALTEN, VAN ARSDALE-HARRIS LUMBER CO., ROBERT E. AND DOROTHY D. FEWER, AND, BRUCE R. AND KURT PAPENHAUSE

BRISBANE CLASS III LANDFILL
BRISBANE, SAN MATEO COUNTY

The California Regional Water Quality Control Board, San Francisco Bay Region, (hereinafter called the Board), finds that:

SITE OWNER AND LOCATION

1. Sunquest Properties, Inc., Oyster Point Properties, Inc., Tuntex (USA), Inc., Sunset Properties, Inc., Sanitary Fill Company, Sunset Scavenger Company, Macor, Inc., The City of Brisbane, Brisbane Properties, LLC, Douglas H. and Diane A. Galten, Van Arsdale-Harris Lumber Co., Robert E. and Dorothy D. Fewer, and, Bruce R. and Kurt Papenhause, hereinafter referred to as the Dischargers, currently own the Brisbane Landfill.

2. Potential refuse underlying approximately 4.55 and 0.26 acres of land located along the southeastern and northwestern portions of the site **(Figure - 3)** has not been delineated. The California Department of Transportation has been potentially identified as owning the southeastern (4.55 acres) easement while the City of San Francisco potentially owns the lot located along the northwestern terminus of the site (0.26 acres). Upon confirmation of the existence of waste debris, the owners of these properties shall comply with all of the provisions, specifications, and prohibitions of this Order.

3. The site encompasses an area of approximately 364 acres and is located in the City of Brisbane, as shown on **Figure 1**. The site is bounded on the east by U.S. Highway 101, on the west by the Caltrain/Joint Powers Board railroad tracks, and the south by the Guadalupe Lagoon. The northern edge of the site lies approximately midway between a row of properties located directly north of Beatty Avenue. Tunnel Avenue bisects the

western portion of the site. **Figure 2** illustrates the location of the site and the proximity of the adjacent properties.

PURPOSE OF ORDER UPDATE

4. The primary purposes of this order are to bring the landfill into compliance with the appropriate portions of Title 27 of the California Code of Regulations (formerly known as Chapter 15, Title 23), referred to hereinafter as Title 27 and to establish a discharge monitoring program for the site.

SITE DESCRIPTION

5. The Brisbane Landfill is a closed, unlined Class III landfill. The landfill operated between 1932 and 1967, and was used for the disposal of primarily non-hazardous solid wastes composed principally of domestic, industrial, and shipyard waste, sewage, and rubble. No waste has been disposed of at the site since 1967. Prior to 1932, the area now occupied by the Brisbane Landfill consisted of a low-lying tidal marshland. Consistent with landfill practices at that time, no liner was installed at the site. Instead, the waste materials were placed directly into the water on top of a compressible silty clay unit (i.e., the Young Bay Mud).

6. Southern Pacific Transportation Company (SPTC) purchased the site in 1896 and by 1914 had filled and constructed a railroad along the western perimeter of the present day fill. In 1932, Sanitary Fill Company leased the property from SPTC and by the mid 1930s had subcontracted the day-to-day filling operations to the Easly and Brassy Company. Following the completion of land filling activities in 1967, Easly and Brassy ceased to operate at the landfill.

7. Upon completion of filling operations in each of the three disposal areas, the Brisbane Landfill was subdivided into multiple parcels currently owned by the Dischargers named above. Sunquest Properties, Inc., Oyster Point Properties, Inc., and Tuntex (USA), Inc., purchased the largest portion of the landfill from SPTC in 1989 and currently lease the corresponding land to Ryan Engineering, Inc., and Brisbane Recycling Co., Inc., for use as a stockpile yard for clean soil and crushed rock. The other identified Dischargers: Sunset Properties, Inc., Sanitary Fill Company, Sunset Scavenger Company, Macor, Inc., The City of Brisbane, Brisbane Properties, LLC, Douglas H. and Diane A. Galten, Van Arsdale-Harris Lumber Co., Robert E. and Dorothy D. Fewer, and, Bruce R. and Kurt Papenhause, are named due to the ownership of parcels on which the landfill exists. **Figure 3** shows the location and Assessors Parcel Numbers for the properties located on the landfill. **Table 1** includes ownership information for the parcels identified on **Figure 3**.

8. Current uses of the site include but are not limited to the following: lumberyards, office space, warehouses, stockyards, parking lots, vehicle repair facilities, a solid and a hazardous waste transfer station, a recycling facility, and an aboveground petroleum storage tank farm.

REGULATORY HISTORY

9. In 1958, the Regional Board adopted Resolution 58-278. The Resolution prohibited the discharge of waste directly to surface water and set criteria for sulfide, dissolved oxygen, and pH. The resolution called for the elimination of odors, unsightly floating or suspended solids, prevention of adverse effects on sport fishing, pleasure boating, and/or navigation at all points easterly of the James Lick Freeway (Highway 101), and called for the elimination of unsightly discoloration and adverse effects on fish and/or water fowl propagation in the waters of the State. The Resolution also required that a monitoring program be established and that periodic reports be submitted to the Board for review. This Order rescinds Resolution 58-278.

10. In 1992, a Solid Waste Water Quality Assessment Test (SWAT) was prepared for the Brisbane Landfill as required by Section 13273 of the California Water Code. The purpose of this statutory requirement was to rank all solid waste disposal sites in California by their potential adverse effects on water quality. The Brisbane Landfill was classified in the sixth rank and was thus required to submit a SWAT report to the RWQCB by July 1, 1992. The report concluded that there is evidence that constituents of concern may be leaving the site, particularly along the eastern and southern perimeters of the landfill, however, materials classified as hazardous did not appear to be present.

11. In 1994, the Board issued Cleanup and Abatement Order (CAO) No. 94-134. The CAO required that Tuntex Properties maintain a two-foot minimum cover of clean soil over the refuse and retain a positive drainage gradient to promote lateral runoff and to prevent ponding. Furthermore, CAO No. 94-134 required that the landfill comply with State Board Order 92-08, which required a Storm Water Pollution Prevention Plan for the site. This Order incorporates and rescinds CAO No. 94-134.

LANDFILL CONSTRUCTION HISTORY

12. The Brisbane Landfill operated and closed before either modern waste disposal practices were developed or formal regulatory designs for closure were required. Waste disposal design features such as liners, segregation of waste into disposal cells, and leachate collection systems were not components at the site. Waste containment was consistent with practices in the industry at that time where waste fill was placed directly on native soils.

13. In 1948, Highway 101 was constructed immediately to the east of the landfill. According to records, the highway was not constructed on refuse material but on constructed fill

derived from the Candlestick Point area. Following the completion of the highway, the Brisbane Landfill was isolated from the direct wave action from the San Francisco Bay.

14. Upon completion of disposal operations in each fill area, a soil cover of unknown hydraulic conductivity and thickness was installed covering the various fill areas. Clean cover materials continue to be added by the current operations of Ryan Engineering and Brisbane Recycling Co., Inc., who stockpile soil that surcharges the refuse on the largest portion of the site.

15. A monitoring well network was installed between 1988 and 1992 on the portion of the landfill owned by Sunquest Properties, Inc. Between 1990 and 1991 an active gas extraction system was installed which consisted of perimeter horizontal headers with vertical extraction wells and horizontal "finger" wells encircling Sunquest's portion of the site.

SITE WASTE DISPOSAL HISTORY

16. The landfill was filled in three areas with refuse composed of primarily non-hazardous solid wastes such as rubble, municipal, and shipyard waste. The total volume of waste disposed of at the landfill is estimated to be 12.5 million cubic yards. Of this volume an estimated 73 percent was produced by residential and commercial activities, with inert fill accounting for approximately 25 percent, and the remaining 2 percent was assumed to be liquid waste.

17. Fill Area I occupies the northwest portion of the site and was used for waste placement from 1932 until 1952. This fill area extended eastward about 1,000 feet into the San Francisco Bay from the area near Southern Pacific's railroad tracks. Fill Area II was used for waste disposal from 1953 to 1959 and extended the landfill an additional 600 feet eastward into the Bay and completed filling of the northern portion of the site. An access road built during the construction of Highway 101 (The Old Bayshore Freeway) defined the landfill's southern boundary and was located slightly north of the present location of the central drainage canal, which currently bisects the site. Fill Area III was created in 1959 when the landfill's southern boundary was extended to the south to its present location by construction of an earth fill dike. This area was used for waste placement from 1959 until the landfill stopped receiving waste in 1967.

SITE GEOLOGIC SETTING

18. The site is a relatively flat to slightly domed, artificial fill area, which overlies alluvium consisting of estuarine deposits referred to as the Young Bay Mud. The Young Bay Mud deposits are found throughout the San Francisco Bay region and generally consist of plastic, silty marine clays with high organic content and can range in thickness of up to approximately 120 feet. The Young Bay Mud typically has localized lenticular deposits

of poorly graded sand, silt, peat beds, and fossiliferous horizons. Beneath the Young Bay Mud, in the site vicinity, lies a group of young sedimentary units deposited in former topographic lows such as the Visitacion and Guadalupe Valley. This alluvium consists of dense silts, clays, and fine- to medium-grained sands, with occasional gravels and is likely representative of alluvial fan deposits which prograded during periods of glaciation that lowered sea level. These deposits can range in thickness up to approximately 50 feet. Underlying the unconsolidated alluvial material is the Old Bay Mud, which is compositionally similar to the Young Bay Bud with the exception that the Old Bay Mud is generally stiff to very stiff and overconsolidated. The Old Bay Mud can range in thickness up to approximately 200 feet, however due to erosion of its surface and/or irregularities on top of the underlying bedrock (Franciscan Complex) the Old Bay Mud can have highly variable stratigraphic thickness. Franciscan Complex bedrock, which underlies the young alluvial deposits near the landfill, is composed of sandstone, shale, conglomerate, chert, greenstone and serpentinite and is approximately Upper Jurassic to Lower Cretaceous in age and can be found to the west and north at ground surface and at depths greater than 250 feet towards the eastern extent of the landfill. All of the aforementioned geologic units are not present throughout the site. This is especially true in the northern portion of the landfill. In some areas, the Young Bay Mud immediately overlies Franciscan bedrock. At other locations in the northern portion of the site landfill materials are in direct contact with Franciscan bedrock.

19. There are four known faults located within 5 miles of the site. These faults include the San Andreas, Sierra, City College, and the Hillside. The San Andreas Fault is an active fault located approximately 5 miles to the southwest of the landfill and would likely represent the most concern for the site. This fault has a maximum expected Richter magnitude of 8.25 and was the source of historic earthquakes including the 1906 San Francisco Earthquake and the 17 October 1989 Loma Prieta Earthquake. The Sierra Fault was active in the Pleistocene (i.e., displacement < 1,800,000 years before present (bp)) and is located approximately 4 miles from the site. The City College and the Hillside Faults are both Pre-Quaternary (i.e., displacement > 1,800,000 years bp) in age. The City College Fault is inferred to transect the northern portion of the landfill while the Hillside Fault is located approximately 1.5 miles away to the southwest.

20. The Hayward and Calvaras Faults are located greater than 5 miles from the site. Both faults are considered active with an expected maximum Richter magnitude of 7.25, which could subsequently have a significant seismological impact on the site. The maximum credible bedrock acceleration from an earthquake on one of these faults would be in excess of 0.5 times the acceleration of gravity, which would be capable of extensive damage to improperly engineered structures.

SITE HYDROGEOLOGIC SETTING

21. The hydrogeologic units in the vicinity of the site include the Franciscan Complex, Old Bay Mud, alluvial fan deposits, Young Bay Mud, and the landfill itself. The landfill is an unconfined, water table, hydrostratigraphic unit. The landfill is located in a discharge area, an area, which is generally characterized by upward groundwater vertical hydraulic gradients. Groundwater above the Young Bay Mud is referred herein as "shallow groundwater" and in alluvial materials between the Young Bay Mud and the Old Bay Mud as "deep groundwater." Groundwater found in bedrock is also considered "deep groundwater."

22. A variable thickness of the Young Bay Mud, where present at the site, acts as a confining layer between the underlying alluvial deposits and Franciscan Complex bedrock and the landfill refuse. Wells, screened in the alluvial deposits below the Young Bay Mud, exhibit higher potentiometric surfaces than wells screened directly in refuse (i.e., vertical upward gradient). Although, one well pair MW-6B/MW-7A exhibits a vertical downward gradient, this well pair is located upgradient of the landfill and northwest of the aboveground petroleum tank farm. In addition well MW-6B is screened in alluvial materials and bedrock, and does not appear to be in close hydraulic connection with other deep wells at the site.

23. The regional upward vertical gradient, owing to recharge under confined conditions, is enhanced in some portions of the site by soil loading. Surcharging of the Young Bay Mud by soil loading can cause locally high pore pressure, which dissipates slowly because of the low hydraulic conductivity of the Young Bay Mud. High pore pressures of the Young Bay Mud would subsequently cause locally higher potentiometric surface of groundwater.

24. Water elevations that increase with depth, generally, are expected in the vicinity of groundwater discharge areas, such as the San Francisco Bay. The thick sequence of the Young Bay Mud and the observed upward vertical groundwater gradient likely act to prevent the downward migration of contaminants at the site.

25. Leachate flow south of the central drainage canal, which bisects the site, is generally towards the south (i.e., towards the Guadalupe Lagoon) or the southeast (i.e., towards the San Francisco Bay). Although leachate flow patterns north of the central drainage canal appear to be more complex, they are generally to the east, towards the San Francisco Bay. Leachate flow patterns in this northern area also exhibit complex mounding in the vicinity of former monitoring wells MW-17A and MW-18A.

26. Leachate hydraulic gradients within the landfill range from 0.0001 to 0.012 ft/ft. Leachate recharge appears to result from direct infiltration of precipitation, upward movement of deep groundwater into the Young Bay Mud and landfill, and from

infiltration from the central drainage canal. Tidal influence is not likely a significant contributor to recharge of leachate in the landfill.

27. Deep groundwater (i.e., below the Young Bay Mud) appears to be less complex than that observed in the overlying Young Bay Mud. Deep groundwater appears to be mounded in the vicinity of MW-35B and generally flows away from the mound towards the north and south during the dry season. Conversely, during the wet season the mound is less apparent and groundwater flows to the southeast towards the Guadalupe Lagoon and the San Francisco Bay. Groundwater gradients in the deeper zone have ranged from between 0.0006 to 0.0027 ft/ft. Recharge to groundwater in the deep zone appears to result from upward movement of groundwater from underlying geologic deposits.

GROUNDWATER CONTAMINATION AND WATER QUALITY

28. Landfill leachate contains dissolved metals, elevated ammonia, volatile organic compounds (VOCs), and semi volatile organic compounds (SVOCs). Landfill leachate is brackish to saline.

29. Shallow groundwater along the perimeter of the landfill indicates the presence of VOCs, SVOCs, metals, and elevated ammonia. The following are the maximum detected concentrations of organic compounds observed during the December 1995 monitoring event: Total petroleum hydrocarbons (TPH) as gasoline at 400 micrograms per liter (µg/L) detected in monitoring well MW-43A; TPH as motor oil at 1,130 µg/L detected in monitoring well MW-2A; TPH as diesel at 3,000 µg/L, TPH as bunker-C oil at 12,000 µg/L, and benzene at 6.2 µg/L detected in monitoring well MW-33A; and, ethyl-benzene, toluene, and total xylenes at 1.8, 3.9, and 10.3 µ/l, respectively, detected in monitoring well MW-10A. Total dissolved solids (TDS) within perimeter monitoring wells indicate that groundwater quality is fresh (i.e., TDS concentration ≤1,000 milligrams per liter (mg/L)) to brackish (i.e., TDS concentration from 1,000 to 20,000 mg/L) along the perimeter of the site. Furthermore, data from perimeter wells potentially indicates that constituents of concern may be leaving the site, particularly along the eastern and southern perimeter.

CURRENT AND FUTURE LAND USES

30. Current land use at the landfill is a mixture of open, industrial, and commercial space. Industrial land use includes stockpiling of soil and rock aggregate, warehouses, stockyards, parking lots, vehicle repair/maintenance facilities, a solid waste transfer station, a household hazardous waste collection facility, a recycling facility, and an aboveground petroleum storage tank facility. Commercial land use includes office space and a lumberyard.

31. Currently Sunquest Properties, Inc., plans to develop the largest portion of the site with a mixture of commercial and light industrial properties.

SITE INVESTIGATIONS

32. In 1977, John V. Lowney & Associates completed a preliminary geotechnical investigation for the landfill. The purpose of the investigation was to assess geotechnical issues associated with the development of the site for commercial and industrial use. The report concluded that development of the site for use as commercial and industrial land use was feasible. The primary concerns identified in the report for construction were to control methane gas, which had been measured at explosive levels within the landfill and to account for differential settlement.

33. In 1990, Kleinfelder, Inc., conducted a geotechnical investigation for the purpose of evaluating foundation requirements for future developments. They also conducted an evaluation of the extent of refuse at the site and installed soil gas and gas pressure probes to provide additional information for design of a landfill gas extraction system. In 1991, following the previous investigations, an active landfill gas extraction system was installed, the main header of which surrounds the 240 acre plot located east of Tunnel Avenue and west of Highway 101.

34. In 1992, Kleinfelder, Inc., conducted a Solid Waste Water Quality Assessment Test (SWAT) investigation to determine if the landfill had an adverse effect on water quality. The report concluded that organic compounds have been detected and have impacted the shallow water-bearing zone (i.e., above the Young Bay Mud). The report also concluded that the Young Bay Mud is an effective barrier and coupled with the observed upward vertical groundwater gradient, should prevent the downward migration of contaminants. Furthermore, the report concluded that the refuse layer of the landfill did not appear to be tidally influenced and that contamination at the site could not be classified as a hazardous waste under California State regulations.

35. In 2000, GeoSyntec Consultants, Inc., on behalf of Sunquest Properties, Inc., performed two investigations to identify property owners and to delineate the footprint of the Brisbane Landfill. Subsurface Consultants, Inc., on behalf of Sunset Properties, Inc., also completed in 2000 a technical review of geologic information to delineate the northern extent of the landfill.

MONITORING PROGRAMS

36. **Groundwater Monitoring** – There are a number of groundwater monitoring wells within the Brisbane Landfill. No formal groundwater-monitoring program exists, however, Provision 7 requires that the Dischargers develop a groundwater Detection

Monitoring Plan and establish an effective Detection Monitoring Program for groundwater monitoring. General groundwater monitoring program requirements are outlined in the Discharge Monitoring Program attached to this Order (Attachment A).

37. **Leachate Monitoring** - The leachate-monitoring program is outlined in the Discharge Monitoring Program attached to this Order (Attachment A). The Dischargers are required to analyze for the monitoring parameters as presented in the Discharge Monitoring Program.

38. **Surface Water Monitoring** – Surface water monitoring will be conducted as part of a General Industrial Storm Water Discharge Permit and through approved Industrial and Construction Storm Water Monitoring Plans.

39. **Vadose Zone Monitoring** – Vadose zone monitoring is not conducted at the site due to the presence of shallow groundwater.

40. **Basin Plan** - The Regional Board adopted a revised Water Quality Plan for the San Francisco Bay Basin (Basin Plan) in June 21, 1995. This updated and consolidated plan represents the Board's master water quality control planning document. The State Water Resources Control Board and the Office of the Administrative Law approved the revised Basin Plan on July 20 and November 13, respectively, of 1995. A summary of regulatory provisions is contained in Title 23 of the California Code of Regulations at Section 3912. The Basin Plan defines beneficial uses and water quality objectives for waters of the State, including surface waters and groundwaters.

41. **Beneficial Uses** - The beneficial uses of the South San Francisco Bay include:

    a. Ocean, Commercial, and Sport Fishing;
    b. Estuarine Habitat;
    c. Industrial Service Supply;
    d. Fish Migration;
    e. Navigation;
    f. Preservation of Rare and Endangered Species;
    g. Water Contact Recreation;
    h. Noncontact Water Recreation;
    i. Shellfish Harvesting; and,
    j. Wildlife Habitat.

The present and potential beneficial uses of the shallow groundwater are as follows:

a. Agricultural Supply;
b. Industrial Service Supply;
c. Municipal and Domestic Supply; and,
d. Industrial Process Supply.

The present and potential beneficial uses of the deeper groundwater are as follows:

a. Agricultural Supply;
b. Freshwater Replenishment;
c. Industrial Service Supply;
d. Municipal and Domestic Supply; and,
e. Industrial Process Supply.

42. Board Resolution No. 89-39, "Sources of Drinking Water," defines potential sources of drinking water to include all groundwater in the region, with limited exceptions for areas containing high TDS (i.e., >3,000 mg/L), high background contaminant levels, or those areas with a low-yield. In general, shallow and deep groundwater underlying the western perimeter of the site qualifies as a potential source of drinking water. Shallow groundwater underlying much of the remainder of the site has historically exhibited TDS in excess of 3,000 mg/L and/or electrical conductivity in excess of 5,000 micro-mhos per centimeter. Presently, there is no current use of the site's groundwater, nor any anticipated plans for its use.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

43. The Regional Board finds that this site is exempt from the provisions of the California Environmental Quality Act (CEQA) pursuant to §15308, Title 14 of the California Code of Regulations.

NOTIFICATION AND MEETINGS

44. The Board has notified the Dischargers and interested agencies and persons of its intent to issue waste discharge requirements for the Dischargers and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

45. The Board, in a public meeting heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that the Dischargers, its agents, successors and assigns shall meet the applicable provisions contained in Title 27, Division 2, Subdivision 1 of the California Code of Regulations and Division 7 of the California Water Code and shall comply with the following:

A. PROHIBITIONS

1. Waste shall not be in contact with ponded water from any source, to the extent that all jurisdictional agency requirements for existing ponded areas are attained.

2. No further waste shall be disposed at this landfill with the exception of properly approved and/or permitted facilities.

3. Leachate from waste and ponded water containing leachate or in contact with solid wastes shall not be discharged to waters of the State or of the United States.

4. Neither the treatment nor the discharge of waste shall create a condition of pollution, contamination or nuisance, as defined by Section 13050 of the California Water Code (CWC) (H & SC Section 5411, CWC Section 13263).

5. The Dischargers, or any future owners of the site, shall not cause the following conditions to exist in waters of the State at any place outside the waste management facility:

   a. Surface Waters

      1. Floating, suspended, or deposited macroscopic particulate matter or foam.

      2. Bottom deposits or aquatic growths.

      3. Alteration of temperature, turbidity, or apparent color beyond natural background levels.

      4. Visible, floating, suspended or deposited oil or other products of petroleum origin.

      5. Toxic or other deleterious substances to be present in concentrations or quantities that may cause deleterious effects on aquatic biota, wildlife or waterfowl, or that render any of these unfit for human consumption either at levels created in the receiving waters or as a result of biological concentrations.

   b. Groundwater

      Groundwater shall not be impacted as a result of the waste discharge.

a. SPECIFICATIONS

1. All reports pursuant to this order shall be prepared under the supervision of a California registered civil engineer, California registered geologist or California certified engineering geologist.

2. The site shall be protected from any washout or erosion of wastes or cover material and from inundation that could occur as a result of a 100-year, 24-hour precipitation event, or as the result of flooding with a return frequency of 100 years.

3. Surface drainage from tributary areas and internal site drainage from surface or subsurface sources shall not contact or percolate through wastes during the life of the site.

4. Any containment, drainage, monitoring systems and other environmental control facilities at the landfill, shall be maintained as long as leachate is present and poses a threat to water quality.

5. The Dischargers shall assure that existing and future structures, which control leachate, surface drainage, erosion, and gas, are constructed and/or maintained to withstand conditions generated during the maximum probable earthquake.

6. The final cover system shall be graded and maintained to promote lateral runoff and prevent ponding and infiltration of water.

7. The Dischargers shall analyze the samples from the groundwater wells included in the approved Detection Monitoring Plan (see Provision 7) as outlined in the Discharge Monitoring Program (Attachment A).

8. In the event of a release of a constituent of concern beyond the Point of Compliance (Section 20405, Title 27), the site begins a Compliance Period (Section 20410, Title 27). During the Compliance Period, the Dischargers shall perform an Evaluation Monitoring Program and a Corrective Action Program. The Point of Compliance is defined as the vertical surface located along the outer edge of the waste management unit and extending through the uppermost aquifer underlying the unit.

9. The Dischargers shall install any reasonable additional groundwater and leachate monitoring devices required to fulfill the terms of any future Discharge Monitoring Program issued by the Executive Officer.

10. Landfill gases shall be adequately vented, removed from the landfill, or otherwise controlled to minimize the danger of explosion, adverse health effects, nuisance conditions, or the impairment of beneficial uses of water.

11. The Dischargers shall maintain all devices or designed features installed in accordance with this order, such that they continue to operate as intended without interruption as

provided for by the performance standards adopted by the California Integrated Waste Management Board.

12. The Dischargers shall provide a minimum of two surveyed permanent monuments near the landfill from which the location and elevation of wastes, containment structures, and monitoring facilities can be determined throughout the post-closure maintenance period. A California licensed land surveyor or California registered civil engineer shall install these monuments.

13. The Regional Board shall be notified immediately of any failure occurring in the waste management unit. Any failure that threatens the integrity of containment features or the landfill shall be promptly corrected after approval of the method and schedule by the Executive Officer.

14. The Dischargers shall comply with all applicable provisions of Title 27 that are not specifically referred to in this Order.

15. The Dischargers shall maintain the facility so as to prevent a significant reduction in water quality at all points of compliance.

C. PROVISIONS

1. The Dischargers shall comply with all Prohibitions, Specifications and Provisions of this Order. All required submittals must be acceptable to the Executive Officer. The Dischargers must also comply with all conditions of these Waste Discharge Requirements. Violations may result in enforcement actions, including Regional Board orders or court orders requiring corrective action or imposing civil monetary liability, or in modification or revocation of these waste discharge requirements by the Regional Board. (CWC Section 13261, 13263, 13265, 13267, 13268, 13300, 13301, 13304, 13340, 13350).

2. All technical and monitoring reports required to be submitted pursuant to this Order are being requested pursuant to Section 13267 of the California Water Code. Failure to submit reports in accordance with schedules established by this Order or failure to submit a report of sufficient technical quality to be acceptable to the Executive Officer may subject the Dischargers to enforcement action pursuant to Section 13268 of the California Water Code.

3. The Dischargers shall submit **Semiannual and Annual Monitoring Reports**, acceptable to the Executive Officer, and in accordance with the attached Discharge Monitoring Program (Attachment A). The annual report shall be due no later than **April 30** of each year and shall cover the previous calendar year as described in Part A of the Discharge Monitoring Program. In addition to the requirements outlined in Attachment A, this report shall also include the following: location and operational condition of all leachate and groundwater monitoring wells; and groundwater and leachate contours for each

monitoring event. Additionally, the Dischargers shall submit semi-annual monitoring reports, to be submitted no later than **October 30** and **April 30** of each year; the April 30 semi-annual report may be combined with the annual report. The first semi-annual monitoring report shall be due following the issuance of a Revised Discharge Monitoring Program. The Revised Discharge Monitoring Program will be issued following review of the Detection Monitoring Plan and Monitoring Well Evaluation Report described in Provision 7.

REPORT DUE DATES:

ANNUAL REPORT– APRIL 30 (EACH YEAR)
SEMI-ANNUAL REPORTS – OCTOBER 31 AND APRIL 30 (EACH YEAR)

4. The Dischargers shall submit a letter report to the Board, acceptable to the Executive Officer, detailing the repair and maintenance activities that need to be completed prior to the commencement of the next rainy season (prior to October 15th of each year). This letter report shall also include a schedule for repair and maintenance activities, and a cost analysis detailing the anticipated expense for all repairs, maintenance and monitoring during the upcoming 12 months. Repair and maintenance estimates shall be based on rainy season inspections conducted throughout the winter as required in the Discharge Monitoring Plan. The report shall also contain a demonstration of the adequacy of the funds needed for the site repair and maintenance.

REPORT DUE DATE: JULY 31 OF EACH YEAR.

5. The Dischargers shall submit an **Emergency Response Contingency Plan**, acceptable to the Executive Officer, intended to stop and contain the migration of pollutants to receiving waters as the result of earthquakes, excessive rainfall, tidal action, or other significant events. The contingency plan shall describe the containment features, and groundwater monitoring and leachate monitoring facilities potentially impacted by such events. The plan shall also include methods of containment and cleanup of waste exposed or displaced at the site. Immediately after an event causing damage to the landfill structures, the corrective action plan shall be implemented and the Dischargers shall give immediate notification to the Regional Board as well as the Local Enforcement Agency (LEA) of any damage, including corrective actions and cleanup activities, and the environmental impacts of such. The plan shall also include a demonstration of the adequacy of the funds needed for the site contingency actions.

PLAN DUE DATE: October 31, 2001

6. The Dischargers shall submit a detailed **Post Earthquake Inspection and Corrective Action Plan** acceptable to the Executive officer to be implemented in the event of any earthquake generating ground shaking of Richter Magnitude 7 or greater at or within 60 miles of the landfill. The report shall describe the containment features, and groundwater monitoring and leachate control facilities potentially impacted by the static and seismic

deformations of the landfill. The plan shall provide for reporting results of the post earthquake inspection to the Board within 72 hours of the occurrence of the earthquake. Immediately after an earthquake event causing damage to the landfill structures, the corrective action plan shall be implemented and this Board shall be notified of any damage.

REPORT DUE DATE: October 31, 2001

7. The Dischargers shall submit a **Detection Monitoring Plan and Monitoring Well Evaluation Report**, acceptable to the Executive Officer, which shall include a description of each well and contain but not be limited to the following:

    1. The type of monitoring well (leachate or groundwater);
    2. The hydrological zone monitored (shallow or deep);
    3. Location with respect to groundwater flow direction (up-gradient, down-gradient, cross-gradient, interior);
    4. Depth, screened interval, casing material, diameter, survey coordinates, and top of casing elevation with respect to mean sea level;
    5. Well location map;
    6. Identification of well pairs that have the potential to monitor vertical gradient; and,
    7. An evaluation of each monitoring well's integrity.

    In addition to the above requirements, all data for wells that contain hydrological information such as hydraulic conductivity, porosity, storativity, and transmissivity shall be included in the report. The report shall propose a Detection Monitoring Plan and present recommendations for the removal and/or replacement of wells found to be in poor working order and for the installation of new wells where data gaps are found to exist.

    REPORT DUE DATE: July 31, 2001

8. For all new development within the landfill, the Dischargers shall assure that:

    - A cap that is in compliance with the intent of Title 27 shall be placed within the entire development area and shall consist of no less than 2 feet of a foundation layer overlain by at least 1 foot of compacted clay liner, with a hydraulic conductivity of 10^{-6} cm/s or less, or alternative barrier layer design, which provides a corresponding low through-flow rate throughout the post-closure maintenance period. A minimum of 1-foot thick erosion resistant layer shall be installed on top of the clay liner, or equivalent barrier layer. The Regional Board must approve all proposed alternative barrier layers prior to their subsequent installation;

    - A **Cap QA/QC Report** shall be submitted **30 days** following the completion of any developing parcels cap reconstruction activities.

The report shall verify that the installed cap meets the requirements of this provision;

- Reconstructed clay caps that are neither irrigated nor paved shall be developed with a sufficient erosion resistant layer and/or engineering controls designed to maintain clay cap hydration;

- The cap integrity shall be maintained during and after construction;

- Any penetrations of the cap, such as from piles, utility pipes, foundations, plants, etc., shall be adequately sealed to prevent infiltration of water;

- The cap shall be graded with a slope of at least 2% to promote run off of storm and irrigated water;

- All irrigated portions of the landfill shall contain a sub-drain installed beneath the vegetative layer of the cap;

- Stormwater run-on and run-off shall be adequately controlled to prevent excessive erosion and damage to the cap. Any applied irrigation water shall likewise be controlled;

- All constructed buildings and utilities shall be built to accommodate the maximum anticipated settlement without structural damage; and

- New construction shall not promote additional standing water on top of the landfill with the exception of properly approved water features. All constructed water features shall contain a minimum of the following:

    - an impermeable layer, in addition to the cap barrier layer, to isolate ponded water from buried refuse; and
    - a sub-drain system designed to remove potential water leaks from the cap and the site.

  Plans for water features and sub-drains shall be submitted to the Regional Board for approval, prior to their construction.

9. All undeveloped (open space), non-irrigated, land shall contain a cap composed of at least 2 feet clean fill material with a graded slope of 2%.

10. The Dischargers are required to monitor leachate levels over time and implement a **Leachate Management Plan**, acceptable to the Executive Officer, to contain leachate within the waste management unit. Upon the detection of leachate buildup within the

waste unit, the Dischargers shall submit a schedule acceptable to the Executive Officer, to install a leachate collection, extraction, and disposal system.

REPORT DUE DATE: November 30, 2001

11. The Dischargers shall prepare and submit a **Development Proposal,** acceptable to the Executive Officer, for each individual development proposed for the landfill.

REPORT DUE DATE: 60 days prior to commencement of construction

12. The Dischargers shall propose appropriate water quality criteria, acceptable to the Executive Officer, based on ecological protection of salt water where leachate is in contact with the Bay and no dilution is considered. If there are impacts to other beneficial uses, appropriate water quality criteria must be established.

REPORT DUE DATE: October 31, 2001

13. The Dischargers shall file with the Regional Board **Discharge Monitoring Reports** performed according to any Discharge Monitoring Program issued by the Executive Officer.

14. The Dischargers shall immediately notify the Board of any flooding, equipment failure, slope failure, or other change in site conditions that could impair the integrity of waste or leachate containment facilities or precipitation and drainage control structures.

REPORT DUE DATE: Immediately following Changes in Site Conditions

15. The Dischargers shall submit a **Water Quality Sampling and Analysis Plan** (SAP), acceptable to the Executive Officer, which gives a complete and detailed description of the physical process of obtaining field information, measurements, and water quality samples. The SAP should be usable as a stand-alone document and a copy of the current SAP must be available to each member of the sampling team. The SAP must contain sufficient detail for a sampler with limited experience to understand and follow to insure that sampling will be conducted in the same manner by different samplers.

REPORT DUE DATE: June 30, 2001

16. The Dischargers shall submit a work plan, acceptable to the Executive Officer, for the mitigation and long-term containment of the southern perimeter leachate seeps (Guadalupe Lagoon).

REPORT DUE DATE: July 31, 2001

17. The Dischargers shall submit a work plan, acceptable to the Executive Officer, for the mitigation of the central drainage canal.

REPORT DUE DATE : October 31, 2001

18. The Dischargers shall prepare, implement, and submit a **Storm Water Pollution Prevention Plan** for their associated properties in accordance with requirements specified in State Water Resources Control Board General Permit for Storm Water Discharges Associated with Industrial Activities (NPDES Permit No. CAS000001).

COMPLIANCE DUE DATE: August 31, 2001

19. For each proposed development, the Dischargers shall prepare, implement, and submit a **Storm Water Pollution Prevention Plan** in accordance with requirements specified in State Water Resources Control Board General Permit for Storm Water Discharges Associated with Construction Activities (NPDES Permit No. CAS000002).

COMPLIANCE DUE DATE: 45 days prior to commencement of construction

20. The Dischargers shall submit a **Well Installation Report**, acceptable to the Executive Officer, that provides well construction details, geologic boring logs, and well development logs for all new wells installed as part of the attached Discharge Monitoring Program (Attachment A).

COMPLIANCE DUE DATE: 45 days following completion of well installation activities

21. The Dischargers shall maintain a copy of these waste discharge requirements and these requirements shall be available to operating personnel at the facility at all times. (CWC Section 13263).

22. This Board considers the property owners to have continuing responsibility for correcting any problems that arise in the future as a result of the waste discharged or related operations.

23. In the event that the Dischargers-owned property adjacent to the landfill is developed into residential dwellings, the Dischargers will notify perspective home purchasers of the presence of the landfill.

24. The Dischargers shall permit the Regional Board or its authorized representative, upon presentation of credentials:

    a. Immediate entry upon the premises on which wastes are located or in which any required records are kept.
    b. Access to copy any records required to be kept under the terms and conditions of this order.

c. Inspection of any treatment equipment, monitoring equipment, or monitoring methods required by this order or by any other California State Agency.
d. Sampling of any discharge or groundwater governed by this Order.

25. The Dischargers shall notify the succeeding owners or operators of this Order by letter in the event of any change in control, ownership of land, or waste discharge facilities presently owned or controlled by the Dischargers. The Dischargers must notify the Executive Officer, in writing at least 30 days in advance of any proposed transfer of this Order's responsibility and coverage to a new discharger. The notice must include a written agreement between the existing and new dischargers containing a specific date for the transfer of this order's responsibility and coverage between the current Dischargers and the new dischargers. This agreement shall include an acknowledgment that the existing Dischargers are liable for violations up to the transfer date and that the new dischargers are liable from the transfer date on. (CWC Sections 13267 and 13263). The request must contain the requesting entity's full legal name, and the address and telephone number of the persons responsible for contact with the Board. Failure to submit the request shall be considered a discharge without requirements, a violation of the California Water Code.

26. This Order is subject to Board review and updating, as necessary, to comply with changing State and Federal laws, regulations, policies, or guidelines; changes in the Board's Basin Plan; or changes in the discharge characteristics (CWC Section 13263).

27. When the Dischargers becomes aware that they failed to submit any relevant facts in a Report of Waste Discharge or submitted incorrect information in a Report of Waste Discharge or in any report to the Regional Board, it shall promptly submit such facts or information (CWC Sections 13260 and 13267).

28. This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, do not protect the Dischargers from his liability under Federal, State or local laws, nor do they create a vested right for the Dischargers to continue the waste discharge [CWC Section 13263(g)].

29. Provisions of these waste discharge requirements are severable. If any provision of these requirements is found invalid, the remainder of these requirements shall not be affected.

30. The Dischargers shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Dischargers to achieve compliance with conditions of this Order. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this order [CWC Section 13263(f)].

31. Except for a discharge that is in compliance with these waste discharge requirements, any person who, without regard to intent or negligence, causes or permits any hazardous substance or sewage to be discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, shall, as soon as (a) that person has knowledge of the discharge, (b) notification is possible, and (c) notification can be provided without substantially impeding cleanup or other emergency measures, immediately notify the office of Emergency Services of the discharge in accordance with the spill reporting provision of the state toxic disaster contingency plan adopted pursuant to Article 3.7 (commencing with Section 8574.7) of Chapter 7 of Division 1 of Title 2 of the Government Code, and immediately notify the State Board or the appropriate Regional Board of the discharge. This provision does not require reporting of any discharge of less than a reportable quantity as provided for under subdivisions (f) and (g) of Section 13271 of the Water Code unless the discharger is in violation of a prohibition in the applicable water Quality Control Plan [CWC Section 13271(a)].

32. The Dischargers shall report any noncompliance that may endanger health or the environment. Any such information shall be provided orally to the Executive officer within 24 hours from the time the Dischargers become aware of the circumstances. A written submission shall also be provided within five days of the time the Dischargers become aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected; the anticipated time it is expected to continue and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Executive Officer, or an authorized representative, may waive the written report on a case-by-case basis if the oral report has been received within 24 hours [CWC Sections 13263 and 13267].

33. All monitoring instruments and devices used by the Dischargers to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy.

34. Unless otherwise permitted by the Regional Board Executive Officer, all analyses shall be conducted at a laboratory certified for such analyses by the State Department of Health Services. The Executive Officer may allow use of an uncertified laboratory under exceptional circumstances, such as when the closest laboratory to the monitoring location is outside the State boundaries and therefore not subject to certification. All analyses shall be required to be conducted in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants" (40 CFR, Part 1360) promulgated by the U.S. Environmental Protection Agency (CCR Title 23, Section 2230).

35. This Board's Resolution 58-278 and Cleanup and Abatement Order No. 94-134 are hereby rescinded.

I, Loretta K. Barsamian, Executive Officer, do hereby certify that the foregoing is a full, complete, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on April 18, 2001.

Loretta K. Barsamian
Executive Officer

Figures: Figure 1 - Site Location Map
Figure 2 - Landfill Map
Figure 3 - Parcel Location Map

Table: Table 1 - Parcel Ownership Information

Attachment: Attachment A - Discharge Monitoring Program

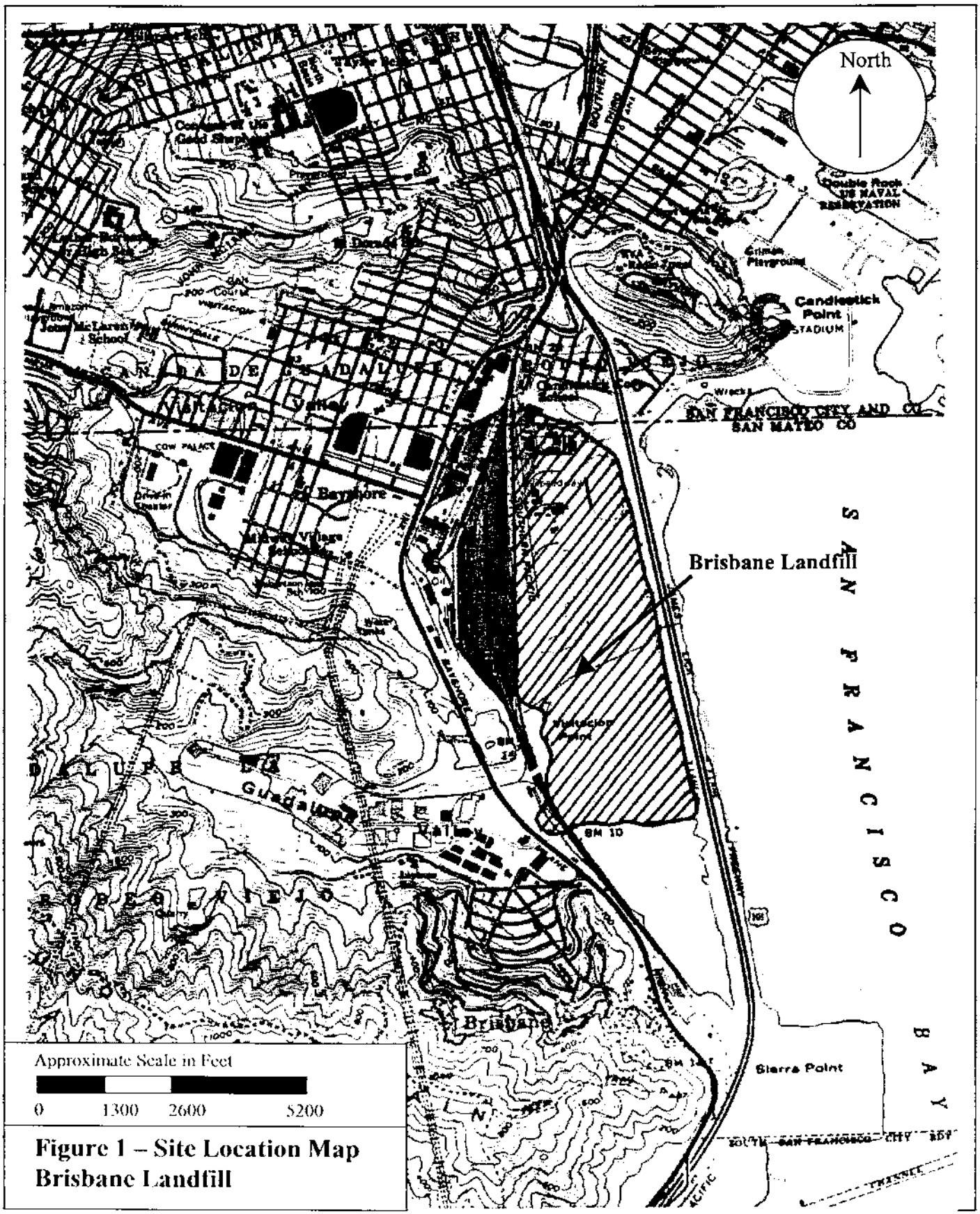

Figure 1 – Site Location Map
Brisbane Landfill

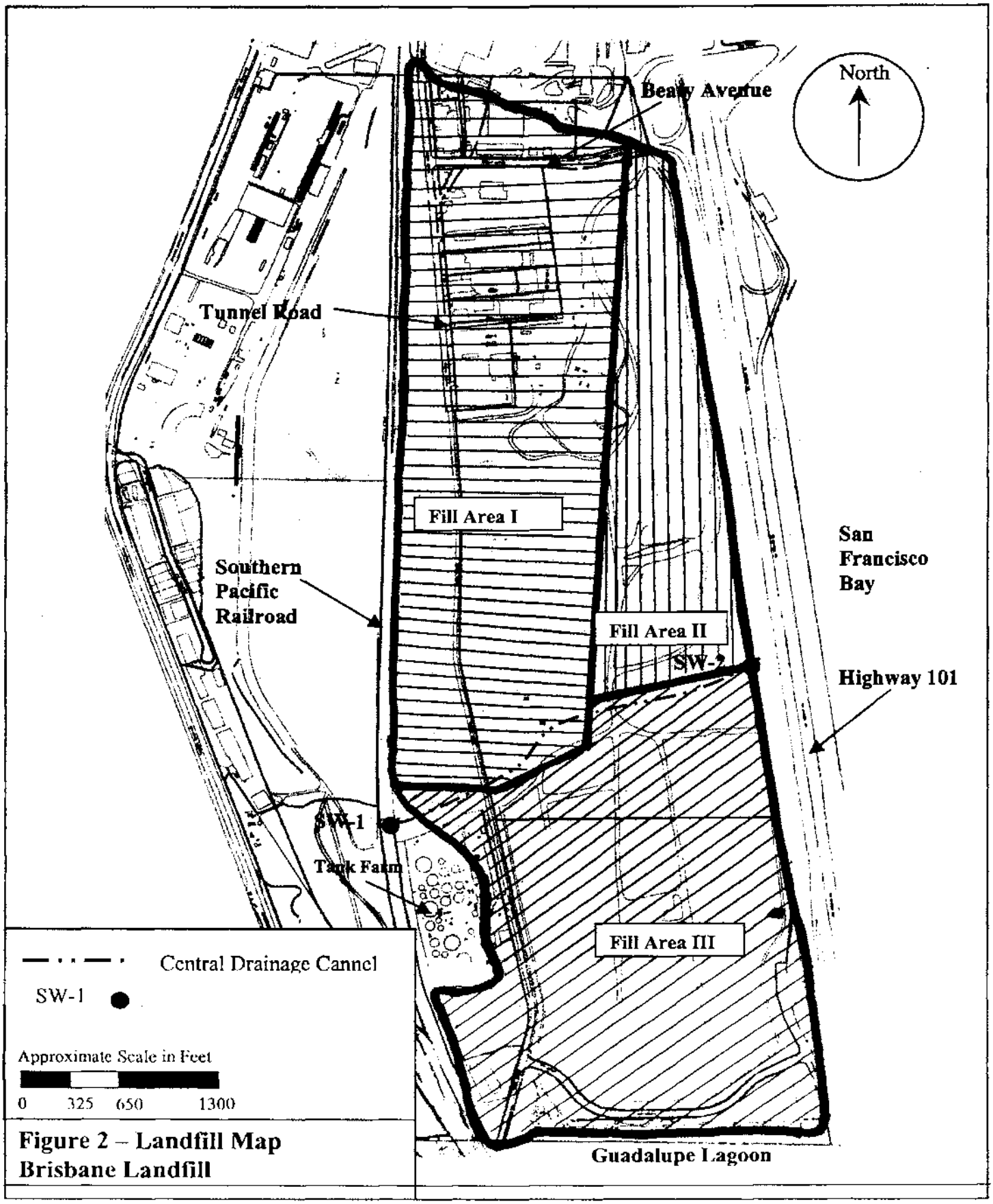

Figure 2 – Landfill Map
Brisbane Landfill

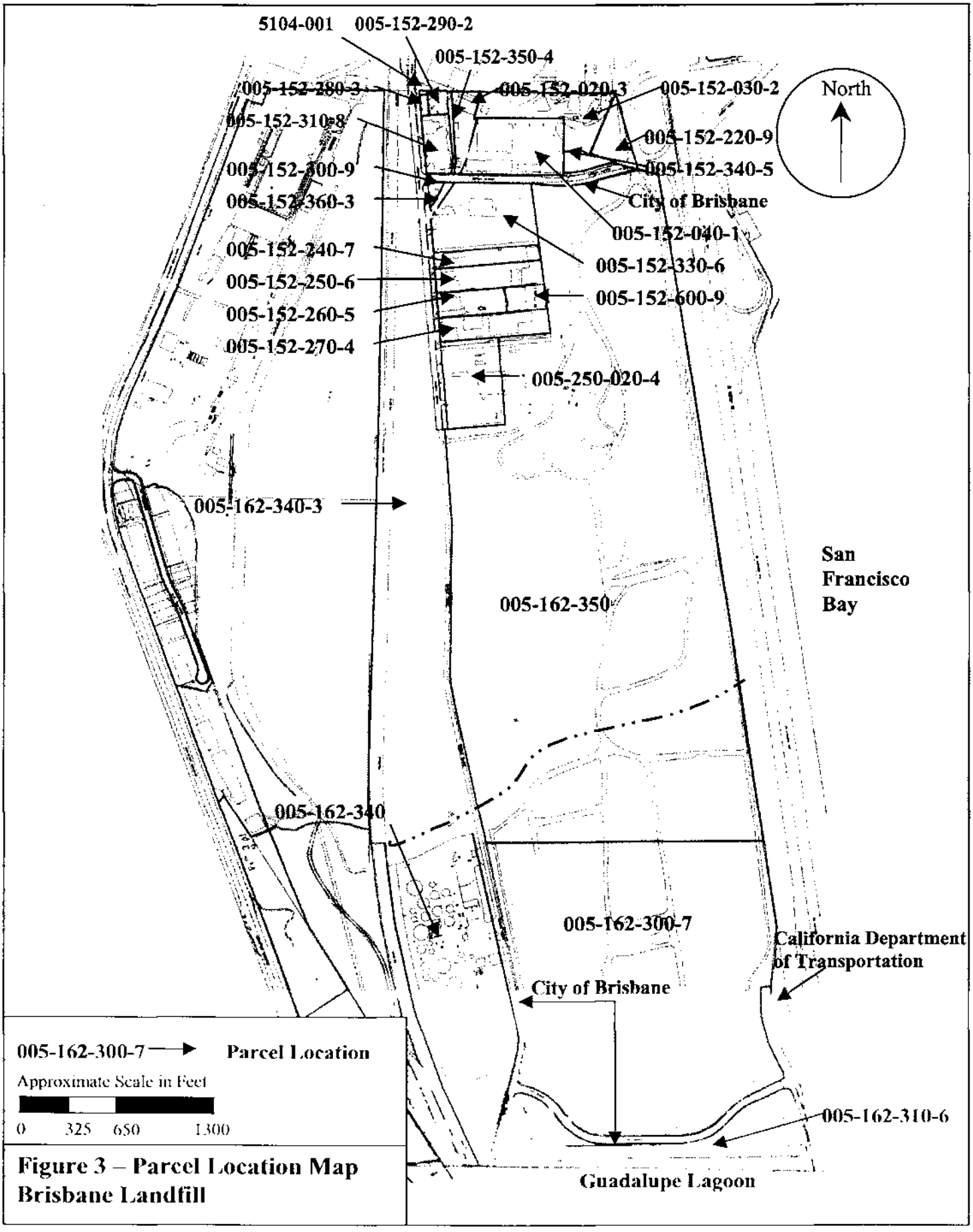

Figure 3 – Parcel Location Map
Brisbane Landfill

Table 1 - Parcel Ownership Information

Assessor's Parcel Number(s)	Owner's Name
005-152-020-3	Sanitary Fill Company
005-152-030-2	Sanitary Fill Company
005-152-290-2	Sanitary Fill Company
005-152-280-3	Sanitary Fill Company
005-152-330-6	Sanitary Fill Company
005-152-340-5	Sanitary Fill Company
005-152-040-1	Sunset Properties, Inc.
005-152-220-9	Sunset Scavenger Company & Macor, Inc.
5104-001	Macor, Inc.
005-152-310-8	Fewer, Robert E., and Dorthy D., TRS
005-152-300-9	Papenhause, Bruce R. and SM TRS & Kurt Papenhause
005-152-350-4	Papenhause, Bruce R. and SM TRS & Kurt Papenhause
005-152-360-3	Papenhause, Bruce R. and SM TRS & Kurt Papenhause
005-152-270-4	Van Arsdale-Harris Lumber Co.
005-250-020-4	Brisbane Properties, LLC, and Douglas H. and Diane A. Galten
005-162-350	Oyster Point Properties, Inc. (Sunquest Properties, Inc.)
005-162-300-7	Oyster Point Properties, Inc. (Sunquest Properties, Inc.)
005-162-310-6	Oyster Point Properties, Inc. (Sunquest Properties, Inc.)
005-162-340-3	Oyster Point Properties, Inc. (Sunquest Properties, Inc.)
005-152-260-5	Tuntex (USA), Inc.
005-152-250-6	Tuntex (USA), Inc.
005-152-600-9	Tuntex (USA), Inc.
005-152-240-7	Tuntex (USA), Inc.
005-162-340	Tuntex (USA), Inc.
	City of Brisbane
	California Department of Transportation

ATTACHMENT A

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

DISCHARGE MONITORING PROGRAM

FOR

BRISBANE LANDFILL
CITY OF BRISBANE, SAN MATEO COUNTY

ORDER NO. 01-041

CONSISTS OF

PART A

AND

PART B

PART A

A. GENERAL

Reporting responsibilities of waste discharger are specified in Sections 13225(a), 13267(b), 13383, and 13387(b) of the California Water Code and this Regional Board's Resolution No. 73-16. This Discharge Monitoring Program is issued in accordance with Title 27.

The principal purposes of a discharge monitoring program are: (1) to document compliance with waste discharge requirements and prohibitions established by the Board, (2) to facilitate self-policing by the waste Dischargers in the prevention and abatement of pollution arising from waste discharge, (3) to develop or assist in the development of standards of performance, and toxicity standards, (4) to assist the Dischargers in complying with the requirements of Title 27.

B. SAMPLING AND ANALYTICAL METHODS

Sample collection, storage, and analyses shall be performed according to the most recent version of EPA Standard Methods and in accordance with an approved sampling and analysis plan.

Water and waste analysis shall be performed by a laboratory approved for these analyses by the State of California. The director of the laboratory whose name appears on the certification shall supervise all analytical work in his/her laboratory and shall sign all reports of such work submitted to the Regional Board.

All monitoring instruments and equipment shall be properly calibrated and maintained to ensure accuracy of measurements.

C. DEFINITION OF TERMS

1. A grab sample is a discrete sample collected at any time.

2. Receiving waters refers to any surface water, which actually or potentially receives surface or groundwaters, which pass over, through, or under waste materials or contaminated soils. In this case the groundwater beneath and adjacent to the landfill areas, the surface runoff from the site, the Guadalupe Lagoon, and the San Francisco Bay are considered receiving waters.

3. Standard observations refer to:

a. Receiving Waters:

1) Floating and suspended materials of waste origin: presence or absence, source, and size of affected area;
2) Discoloration and turbidity: description of color, source, and size of affected area;
3) Evidence of odors, presence or absence, characterization, source, and distance of travel from source;
4) Evidence of beneficial use: presence of water associated wildlife;
5) Flow rate; and
6) Weather conditions: wind direction and estimated velocity, total precipitation during the previous five days and on the day of observation.

b. Perimeter of the waste management unit:

1) Evidence of liquid leaving or entering the waste management unit, estimated size of affected area and flow rate (show affected area on map);
2) Evidence of odors, presence or absence, characterization, source, and distance of travel from source; and
3) Evidence of erosion and/or daylighted refuse.

c. The waste management unit:

1) Evidence of ponded water at any point on the waste management facility;
2) Evidence of odors, presence or absence, characterization, source, and distance of travel from source;
3) Evidence of erosion, slope or ground movement, and/or daylighted refuse;
4) Adequacy of access road;
5) Condition of site drains, silt basin capacity; and
6) Standard Analysis and measurements (listed in the attached Table A).

D. SAMPLING, ANALYSIS, AND OBSERVATIONS

The Dischargers are required to perform sampling, analyses, and observations in the following media:

1. Storm drain discharges per Section 20415; and,
2. Groundwater and leachate per Section 20415.

E. RECORDS TO BE MAINTAINED

Written reports shall be maintained by the Dischargers or laboratory, and shall be retained for a minimum of five years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge or when requested by the Board. Such records shall show the following for each sample:

1. Identity of sample and sample station number;

2. Date and time of sampling;

3. Date and time that analyses are started and completed, and name of the personnel performing the analyses;

4. Complete procedure used, including method of preserving the sample, and the identity and volumes of reagents used;

5. Calculation of results; and

6. Results of analyses, and detection limits for each analysis.

F. REPORTS TO BE FILED WITH THE BOARD

1. Written detection monitoring reports shall be filed by **October 30** and **April 30** of each year. In addition an annual report shall be filed by **April 30** of each year. The reports shall be comprised of the following:

   a. Letter of Transmittal:

      A letter transmitting the essential points in each report should accompany each report. Such a letter shall include a discussion of any requirement violations found during the last report period, and actions taken or planned for correcting the violations. If the Dischargers have previously submitted a detailed time schedule for correcting requirement violations, a reference to the correspondence transmitting such schedule will be satisfactory. If no violations have occurred in the last report period this shall be stated in the letter of transmittal. Monitoring reports and the letter transmitting the monitoring reports shall be signed by a principal executive officer at the level of vice president or his duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge originates. The letter shall contain a statement by the official, under penalty of perjury, that to the best of the signer's knowledge the report is true, complete, and correct.

b. Each monitoring report shall include a compliance evaluation summary. The summary shall contain:

1) A graphic description of the velocity and direction of groundwater flow under/around the waste management unit, based upon the past and present water level elevations and pertinent visual observations.

2) The method and time of water level measurement, the type of pump used for purging, pump placement in the well; method of purging, pumping rate, equipment and methods used to monitor field pH, temperature, and conductivity during purging, calibration of the field equipment, results of the pH, temperature conductivity and turbidity testing, well recovery time, and method of disposing of the purge water.

3) Type of pump used, pump placement for sampling, a detailed description of the sampling procedure; number and description of equipment, field and travel blanks; number and description of duplicate samples; type of sample containers and preservatives used, the date and time of sampling, the name and qualifications of the person actually taking the samples, and any other observations.

c. A map or aerial photograph shall accompany each report showing observation and monitoring station locations.

d. Laboratory statements of results of analyses specified in Part B must be included in each report. The director of the laboratory whose name appears on the laboratory certification shall supervise all analytical work in his/her laboratory and shall sign all reports of such work submitted to the Board.

1) The methods of analyses and detection limits must be appropriate for the expected concentrations. Specific methods of analyses must be identified. If methods other than EPA approved methods or Standard Methods are used, the exact methodology must be submitted for review and approved by the Executive Officer prior to use.

2) In addition to the results of the analyses, laboratory quality assurance/quality control (QA/QC) information must be included in the monitoring report. The laboratory QA/QC information shall include the method, equipment and analytical detection limits; the recovery rates; an explanation for any recovery rate that is less than 80%; the results of equipment and method blanks; the results

of spiked and surrogate samples; the frequency of quality control analysis; and the name and qualifications of the person(s) performing the analyses.

e. An evaluation of the effectiveness of the leachate monitoring facilities, which includes an evaluation of leachate buildup within the disposal units.

f. A summary and certification of completion of all standard observations for the waste management unit, the perimeter of the waste management unit, and the receiving waters.

2. CONTINGENCY REPORTING

A report shall be made by telephone of any **seepage** from the disposal area immediately after it is discovered. A written report shall be filed with the Board within **five days** thereafter. This report shall contain the following information:

1) a map showing the location(s) of discharge if any;
2) approximate flow rate;
3) nature of effects, i.e., all pertinent observations and analyses; and
4) corrective measures underway, proposed, or as specified in the Waste Discharge Requirements.

3. REPORTING

By **April 30** of each year the Dischargers shall submit an annual report to the Board covering the previous calendar year. The annual report may incorporate the second semi-annual report of the previous year. The annual report shall contain:

a. Tabular and graphical summaries of the monitoring data obtained during the previous year; the report should be accompanied by a computer data disk, tabulating the year's data in Microsoft Excel.

b. A comprehensive discussion of the compliance record, and the corrective actions taken or planned which may be needed to bring the discharger into full compliance with the waste discharge requirements.

c. A written summary of the groundwater analyses indicating any change in the quality of the groundwater.

d. An evaluation of the effectiveness of the leachate monitoring/control facilities, which includes an evaluation of leachate buildup within the disposal units.

4. WELL LOGS

A boring log and a monitoring well construction log shall be submitted for each new sampling well established for this monitoring program, as well as a report of inspection or certification that each well has been constructed in accordance with the construction standards of the Department of Water Resources. These shall be submitted within 45 days after well installation.

Part B

1. DESCRIPTION OF OBSERVATION STATIONS AND SCHEDULE OF OBSERVATIONS

A. ON-SITE OBSERVATIONS – Observe Quarterly, Report Semi-annually

STATION	DESCRIPTION	OBSERVATIONS	FREQUENCY
Standard Observations:			
A-1 to A-'n'	Located on the area as deli-neated by a 500 foot grid network.	Standard observations for the waste management unit as defined in Part A, Section C	Quarterly
Interior Seeps:			
L-1 thru L-'n'	At each point of discharge. Include a map indicating locations of discharge(s)	All Parameters as outlined in Table A (perform analysis once per seep)	Weekly until remedial action is taken and seepage ceases.
Perimeter Observations:			
P-1 thru P-'n'	Located at equidistant intervals not exceeding 1000 feet around the perimeter of the waste management unit.	Standard observations for the waste management unit perimeter as defined in Part A, Section C	Quarterly
Perimeter Seeps:			
S-1 thru S-'n'	At any point(s) at which seepage is found occurring from the disposal area. Include a map indicating locations of discharge(s)	All Parameters as outlined in Table A (perform analysis once per seep)	Weekly until remedial action is taken and seepage ceases.

B. SURFACE, GROUNDWATER AND LEACHATE MONITORING -
Report Semi-annually

i. Surface and Stormwater: Surface water shall be monitored as outlined below and in Table A (Attached). These monitoring points are also shown on Figure 2 (Attached). The results of the additional monitoring conducted as part of the General Permit for stormwater discharge shall be submitted as part of the annual report.

Monitoring Points:

Surface Water	Comply with the requirements of the General Industrial Storm Water Runoff Program

ii. Groundwater: Groundwater samples shall be analyzed as outlined below in accordance with Table A (Attached).

Monitoring Points:

Groundwater	Will be established following receipt of the **Monitoring Well Evaluation Report**

iii. Leachate: Leachate samples shall be analyzed as outlined below in accordance with Table A (Attached).

Monitoring Points:

Leachate	Will be established following receipt of the **Monitoring Well Evaluation Report**

C. **FACILITIES MONITORING**

The Dischargers shall inspect all environmental control facilities to ensure proper and safe operation once per quarter and report semi-annually.

D. Reports shall be due on the following schedule:

First semi-annual report:	**October 30 of each year**
Second semi-annual Report:	**April 30 of each year**
Annual Report:	**Combined with the second semi-annual report, due April 30 of each year**

I, Loretta K. Barsamian, Executive Officer, hereby certify that the foregoing Discharge Monitoring Program:

1. Has been developed in accordance with the procedures set forth in this Board's Resolution No. 73-16 in order to obtain data and document compliance with waste discharge requirements established in this Board's Order No. 01-041.

2. Is effective on the date shown below.

3. May be reviewed or modified at any time subsequent to the effective date, upon written notice from the Executive Officer.

Loretta K. Barsamian
Executive Officer

Date Ordered: April 18, 2001

Attachment: Table A – Discharge Monitoring Plan, List of Analytical Parameters, Surface, Stormwater, Leachate and Groundwater

Table A - Discharge Monitoring Plan, List of Analytical Parameters, Surface, Stormwater, Leachate and Groundwater

Field/Inorganic Parameters	Method[1]	Frequency
pH	Field	Semi-Annual
Electrical conductivity	Field	Semi-Annual
Leachate Elevation	Field	Quarterly
Groundwater Elevation	Field	Quarterly
Sulfate	300.0	Semi-Annual
Total Dissolved Solids	160.1	Semi-Annual
Ammonia (un-ionized)	350.1	Semi-Annual
Total organic carbon	415.1	Semi-Annual
Nitrate	9200	Semi-Annual

Organics/Pesticides/PCBs	Method[1]	Frequency
Volatile Organic Compounds (including MTBE)	8260	Semi-Annual[2]
Semi-volatile Organic Compounds	8270	Semi-Annual[3]
Organochlorine Pesticides & PCBs	8080	Semi-Annual[3]

Metals	Method[1]	Frequency
Arsenic	7060	Semi-Annual
Barium	6010	Semi-Annual
Lead	7421	Semi-Annual
Nickel	6010	Semi-Annual
Selenium	7740	Semi-Annual

Notes:

1 Test methods per Methods for Chemical Analysis of Water and Waste, USEPA 600/4/79/029, revised March 1983, or Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods, USEPA SW-846, 3rd edition, November 1986 and revisions. The Board staff can consider alternative EPA and/or Standard Methods, with comparable MDLs and PQLs, for use at the Brisbane Landfill.

2. Analysis of groundwater and leachate shall be conducted during the October 2001 sampling event. Any identified impacted monitoring wells shall be analyzed semi-annually, thereafter. All other monitoring wells shall be monitored, annually.

3. Analysis of groundwater and leachate shall be conducted during the October 2001 sampling event. Any identified impacted monitoring wells shall be analyzed semi-annually, thereafter. All other monitoring wells shall be monitored once every 5 years.



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