Appendix GEO

Design Level Geotechnical Investigation

DESIGN LEVEL
GEOTECHNICAL INVESTIGATION
PROPOSED PITTSBURG SELF STORAGE
APN 074-100-018
PITTSBURG ANTIOCH HIGHWAY
PITTSBURG, CALIFORNIA

For

Pacific Property Advisors, Inc.

June 11, 2018

Job No. 3966.200

Via E-Mail

BERLOGAR STEVENS & ASSOCIATES

June 11, 2018
Job No. 3966.200

Mr. Chris Koenig
Pacific Property Advisors, Inc.
185 Front Street, Suite 207
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Subject: Design Level Geotechnical Investigation
Proposed Pittsburg Self Storage
APN 074-100-018
Pittsburg Antioch Highway
Pittsburg, California

Dear Mr. Koenig:

Berlogar Stevens & Associates (BSA) is pleased to present our Design Level Geotechnical Investigation report for the Proposed Pittsburg Self Storage project in Pittsburg, California. Berlogar Geotechnical Consultants (BGC), predecessor to BSA, previously completed a geotechnical investigation of the subject site. The subsurface and laboratory data collected during the 2006 investigation of the site was used in our geotechnical assessment of the site for this study. This report provides conclusions regarding potential impacts of regional geologic hazards, site surface and subsurface conditions on the proposed development and our recommendations for the design and construction aspects of site grading, underground utilities, building foundations and pavements on the subject project.

PROJECT UNDERSTANDING

The project site is located on the south side of Pittsburg Antioch Highway, west of Verne Roberts Circle, in Pittsburg, California. The irregular-shaped site occupies an area of about 12 acres. We understand that the current development concept is for grading and paving of approximately 8 of the 12 acres followed by placement of rows of shipping containers for use as self storage units. The development will be located in the central and western portions of the site. The eastern portion of the site will remain undeveloped. An office building with a footprint on the order of 1,500 square feet will be constructed at the site entry off of Pittsburg Antioch Highway. The building is anticipated to be a wood-frame structure or potentially a concrete masonry unit (CMU) structure founded on a shallow foundation with a non-structural concrete floor slab. Specific building load information was not available at the time this report was prepared. With consideration of the type of construction, we estimated line loads at 2,000 pounds per lineal foot for dead plus live loads. Grading is anticipated to be limited to cuts and fills of about 2 feet or less in depth.

PURPOSE AND SCOPE OF SERVICES

The purpose of this geotechnical investigation was to explore and evaluate the soil and groundwater conditions as well as potential geologic hazards to assess the potential impacts of those conditions on the proposed development of the site and to provide geotechnical recommendations for use in design and construction of the proposed project. The scope of services for this investigation was outlined in our proposal of May 17, 2018, and included the following:

- Review of readily available published geologic/geotechnical literature and maps pertinent to the area.
- Review of the Geotechnical Investigation report[1] prepared by Berlogar Geotechnical Consultants (BGC) in 2006.
- Site reconnaissance by a member of our engineering staff.
- Collection of one near-surface soil sample for determination of the expansion potential and corrosivity of the soil.
- Laboratory testing of selected soils samples.
- Engineering analyses.
- Preparation of this report presenting our findings, conclusions and recommendations.

FIELD EXPLORATION

A reconnaissance of the site was performed by a member of our staff on May 22, 2018 to observe the current conditions of the site. A bulk soil sample was collected from the upper 2 feet of the site at that time. The sample was collected in the general vicinity of the future office building along the Pittsburg Antioch Highway. The approximate sampling location is shown on the Site Plan, Plate 2.

As noted above, a geotechnical investigation of the site was conducted in 2006 by BGC. The subsurface exploration conducted by BGC consisting of drilling 13 borings. The borings were drilled on February 3, 5 and 6, 2006, using a truck-mounted drill rig with hollow stem auger. The borings varied in depths from about 20 to 50 feet below the existing ground surface. A member of the BGC staff visually classified the soils in the field as the drilling progressed and recorded a log of each boring. Visual classification of the soils was made in general accordance with the Unified Soil Classification System (ASTM D2487). Soil sampling was conducted as the borings were advanced using a 2.5-inch inside diameter Modified California sampler with liners and a 1⅜-inch inside diameter Standard Penetration Test (SPT) split-spoon sampler (smooth inside bore with no provisions for use of liners). The samplers were driven into the underlying soil to a depth of 18 inches with a 140-pound hammer falling 30 inches. The number of blows required to drive the samplers the last 12 inches of the 18-inch drive are shown as blows per foot on the boring logs. The boring logs are presented in Appendix A. As required by Contra Costa County, the boreholes

[1] "Geotechnical Investigation, Dow Parcel (APN 074-100-018), Pittsburg-Antioch Highway, Pittsburg, California," dated March 2, 2006, Job No. 2886.100.

were backfilled with neat cement grout after drilling and sampling. The grouting was performed with the supervision of a County inspector. The approximate locations of the borings are shown on the Site Plan, Plate 2. These locations are approximate and were determined based on pacing and orientation from existing features on the site.

LABORATORY TESTING

The soil sample collected on May 22, 2018 was returned to our geotechnical laboratory. Testing was performed to determine the Atterberg Limits (Plasticity Index) and gradation for use in evaluation of the expansion potential of the soil. A portion of the sample was submitted to CERCO Analytical for corrosivity testing. CERCO is a state-certified analytical laboratory for soil corrosivity testing.

Geotechnical and analytical laboratory testing of soil samples was performed in 2006 as well. Laboratory testing consisted of moisture content, dry density, Atterberg limits, unconfined compression and direct shear tests on selected samples. The results of the moisture content and dry density tests are presented on the individual boring logs.

Geotechnical laboratory test results are presented in Appendix B. The CERCO Analytical report is included in Appendix C.

PROJECT SITE

The subject parcel consists of a vacant, grass-covered, approximately 12-acre parcel which is bounded by the Pittsburg Antioch Highway along the north side, the Contra Costa Canal Spillway to the east, an abandoned railroad line to the south, and commercial property to the west. The westerly two-thirds+/- of the site is relatively level, with very low gradient sheet drainage towards the north. The site slopes down gently to the north with about 10 feet of topographic relief in a distance of about 730 feet. To the east of that portion, the ground slopes down at about 6 Horizontal: 1 Vertical (6H:1V) to an excavated basin with a length of about 400 feet and top width of about 160 to 180 feet, located on the site along the east side of the site. The basin area is separated by a berm from the spillway located along the easterly boundary of the site. A natural creek channel appears to have formerly been located along the currently closed drainage.

Surface elevations on the site range from about 50 feet at the southwest corner of the site to 36 feet on the west side of the basin at the Pittsburg Antioch Highway frontage. The bottom of the basin has approximate elevations of 18 to 21 feet. Surface elevations were obtained using Google Earth Pro. The site is about street level at the west end of the highway frontage and is elevated about 4 feet above the roadway at the east end of the frontage. The site is bounded by an open channel to the east-southeast side and railroad tracks to the south. The site is not presently developed. At the time of our site reconnaissance on May 22, 2018, the site was covered with dense grasses and weeds.

SUBSURFACE CONDITIONS

SOILS

The parcel is mapped as being underlain by late Pleistocene alluvial fan and fluvial deposits. These deposits are described as dense gravely and clayey sand or clayey gravel that fines upward to sandy clay. Maximum thickness is unknown but is at least 50 m.

The borings appear to indicate relatively uniform subsurface conditions across the flat portion of the parcel. The borings did not appear to encounter any significant fill deposits and typically encountered an upper soil consisting of several feet of very stiff to hard silty clay. The clay is moderately to highly expansive, with Plasticity Indexes ranging from 19 to 35. The underlying soils are predominately very stiff to hard silty to sandy clays and dense clayey sands. Minor lenses of dense sand and sandy silt were also encountered.

GROUNDWATER

Boring B-1 was the only boring to encounter groundwater and the level there was measured at about 35 feet bgs. The depth to groundwater should be expected to fluctuate both seasonally and from year to year. Fluctuations in the groundwater level may occur due to variations in precipitation, irrigation practices at the site and surrounding areas, climatic conditions, presence or absence of standing water in the on-site basin and the canal to the east, pumping from wells and other factors not evident at the time of our investigation. The evaluation of such factors and a detailed site groundwater evaluation are beyond the scope of this study.

The above is a general description of subsurface conditions encountered in the borings previously completed on the site. For a more detailed description of the soil conditions encountered, refer to the logs of borings in Appendix A.

GEOLOGIC AND SEISMIC HAZARDS

FAULTING AND SURFACE FAULT RUPTURE

The site is located in the seismically active eastern portion of the greater San Francisco Bay Area in Northern California. The seismicity of the area is dominated by the San Andreas, Hayward and Calaveras faults. We have reviewed the Alquist-Priolo Earthquake Fault Zone maps issued by the California Geological Survey (formerly the California Division of Mines and Geology). These maps were issued in response to the Alquist-Priolo Act. The site is not located within a designated State of California Alquist-Priolo Earthquake Fault Zone for active faults. According to the California Geological Survey (CGS), no known fault traces cross the site.

The closest fault included in an Alquist-Priolo Earthquake Fault Zone is the Concord–Green Valley fault, located at a distance of about 16-1/2 kilometers (10.3 miles) to the southwest.

Additional active faults in the area include but are not limited to the Mount Diablo Thrust fault located about 4-1/2 kilometers to the south and the Greenville fault located about 9 kilometers to the southwest. The San Andreas fault is located about 68 kilometers to the west and the Hayward fault is approximately 38 kilometers west of the parcel. It is our opinion that the potential for fault rupture at the site appears to be very low.

SEISMICITY AND SEISMIC GROUND SHAKING

The site is located in a region of high seismicity. As with all sites in the San Francisco Bay Area, the site should be expected to experience at least one moderate to large earthquake during the lifespan of the development. The site is located at approximately 38.0115 degrees North latitude and 121.84515 degrees West longitude. According to the USGS website, the peak ground acceleration (PGA) is 0.614 g. Some degree of structural damage due to strong seismic shaking should be expected at the site, but the risk can be reduced through adherence to seismic design codes. California Building Code seismic design parameters are discussed below.

SEISMIC HAZARD ZONES IN CALIFORNIA

Seismic Hazard Zone Maps are produced by the California Geologic Survey. The maps identify areas where soil liquefaction and earthquake-induced landslides are most likely to occur. The site is located outside of the area where maps have been completed. We reviewed Chapter 10 of the Contra Costa County General Plan, which addresses seismic hazards. Figure 10-5 shows the estimated liquefaction potential. The site is shown as having a "generally moderate to low" liquefaction potential. The site is not proximal to sloping ground or hillsides. Thus, the potential for earthquake-induced landsliding to occur on or in close proximity to the site is considered to be nil.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

Based on the information collected during this investigation and the results of our analyses, it is our opinion that development of the site is feasible from a Geotechnical Engineering perspective, provided that the recommendations contained in this report are incorporated into the design and construction of the project. The predominant geotechnical consideration for this project is the presence of moderately to highly expansive near-surface soils. Our opinions, conclusions and recommendations are based on our field and office studies, the properties of soils encountered in our borings, results of the laboratory testing program and our understanding of the proposed project.

EXPANSIVE SOILS

The near-surface soils are classified as moderately to highly expansive. Expansive soils are characterized by their ability to undergo significant volume change (shrink or swell) due to variations in moisture content. Changes in moisture content can result from rainfall, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors. Changes in soil moisture may result in unacceptable settlement or heave of structures, pavements and concrete slabs-on-grade supported over these materials. Moisture changes generally decrease with increasing depth of soil and the amount of volume change of expansive soils also decreases with increasing vertical stress at deeper depths.

Mitigation measures to reduce the potential detrimental effects of expansive soils on conventionally reinforced non-structural concrete slab-on-grade floors and pavements may include removal or over-excavation of the expansive soils and replacement of those soils with "non-expansive" soil. Chemical stabilization of expansive soils with the use of lime-treatment is an option to removal and replacement. The cost of mobilization and unit cost per square foot on projects less than 10,000 square feet generally preclude the use of lime treatment from an economical perspective. Where concrete floor slabs are designed as a structural element to resist the effects of expansive soils, such as post-tensioned concrete foundations, mitigation measures may be limited to the foundation design along with processing of subgrade soils to a higher moisture content and compaction to a lower relative compaction. Increased depth of embedment for shallow footings will aid in mitigating the potential effects of the expansive soils on the foundation.

Interior slabs (except for post-tensioned concrete foundations designed for expansive soils) should be founded on a minimum of 21-inches of "non-expansive" engineered fill. The placement of "non-expansive" fill soils over properly prepared expansive soil subgrade provides a protective soil layer that slows the evaporation rate and aids in distributing the local variation in soils with minor moisture changes. Based on the expansion potential of the soils encountered at the subject site, we recommend that interior concrete slab-on-grade floors and exterior concrete flatwork surrounding the buildings be supported by a 21-inch thick layer of "non-expansive fill," as discussed below. More detailed grading recommendations are provided in the following sections of this report.

The potential impacts of expansive soils on concrete flatwork should also be considered during project design and as the site is developed. Thicker concrete sections and steel reinforcement of concrete flatwork should be considered.

LIQUEFACTION

Liquefaction is a temporary transformation of saturated soil into a viscous liquid during strong to violent ground shaking associated with a major earthquake. Historically, the potential for liquefaction has been associated with cohesionless soil, such as sands and silty sands. Current practice in liquefaction evaluation now includes sands, silty sands and gravels, as well as silts and even some clay soils. While fine-grained soils (clays and silts) may not undergo complete liquefaction, these soils can be susceptible to cyclic softening. Liquefaction and cyclic softening both result in reduced soil shear strength. The loss of strength in both granular and fine-grained soils is a result of cyclically induced stresses which cause increased pore pressures within the soil matrix.

The sandy soils encountered in the borings were dense to very dense and were predominantly clayey sand. The clays are hard. Additionally, the depth to groundwater is on the order of 35 feet bgs. Due to the dense nature of the granular soils, the consistency of the clays and the lack of shallow groundwater, it is our opinion that the risk of having liquefaction or cyclic softening occur at the site is low.

Lateral spreading is a potential hazard commonly associated with liquefaction. This phenomenon typically occurs where the subject site is sloping or is adjacent to a descending slope or a free face, such as an open channel. The potential for lateral spreading at the site is judged to be low based on the density of the sands and consistency of the clays and the low potential for liquefaction to occur at the site.

SITE PREPARATION AND GRADING

"Non-Expansive" Fill

Where "non-expansive" fill is to be used as a mitigation measure for support of concrete slabs-on-grade, due to the presence of moderately to highly expansive surface soils at the site, the material used should be relatively impervious when compacted. Clean sand or very sandy soil is not acceptable for this purpose. Sandy soil will allow the surface water to drain into the expansive clayey soils below, which may result in swelling. The "non-expansive" fill should extend at least 5 feet beyond the perimeter of the building and adjoining concrete flatwork. Soil that meets the criteria listed below is considered to be "non-expansive."

NON-EXPANSIVE FILL PROPERTIES	
Percent Passing No. 200 Sieve	20 to 50
Plasticity Index (PI)	12 maximum
Liquid Limit	40 maximum
Expansion Index	20 maximum

General Site Preparation and Grading Recommendations

1. Vegetation at the site includes grasses and weeds. The above-ground portion of the vegetation should be cut off at ground surface and removed from the site. This can easily be accomplished by scraping of the site with grading equipment.

2. After the surface vegetation has been removed the required cuts and fills to establish design grades can be made. Exposed subgrade in areas that are at finished grade, have been cut to finished grade or that will receive fill should be scarified to a depth of 12 inches, moisture conditioned and compacted as discussed below.

3. If zones of soft or saturated soils are encountered during excavation and compaction, deeper excavations may be required to expose firm soils. This should be determined in the field by the Geotechnical Engineer.

4. Fill Soil

   - Import fill should meet the requirements for non-expansive fill as listed above. Fill materials should be subject to the evaluation of the Geotechnical Engineer prior to their use. Import fill should also be cleared of toxic or hazardous materials prior to importing to the site.
   - The onsite soil free of deleterious matter and rocks greater than 4 inches in largest dimension can be used as general engineered fill. If oversized particles are encountered, this material should be removed from the site.

5. Engineered fill is defined as material meeting the recommended soil properties that has been properly moisture conditioned, placed and compacted. Relative compaction or compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density determined by ASTM D1557 compaction test procedure. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

6. Fill should be placed in thin lifts (normally 6 to 9 inches in loose lift thickness depending on the compaction equipment), properly moisture conditioned, and compacted as specified below.

7. Soil Moisture Conditioning and Compaction

   a. Expansive on-site clayey soils – 85 to 90 percent relative compaction at no less than 5 percent over the optimum moisture content.

   b. Non-expansive import soils – at least 90 percent relative compaction at no less than 3 percent over the optimum moisture content.

   c. The top 12 inches of finished subgrade in pavement areas should be moisture conditioned to at least 3 percent above the optimum moisture content and compacted to at least 93 percent relative compaction.

   d. Aggregate base in pavement areas, including below concrete slabs for vehicle parking, should be moisture conditioned to at least 3 percent above the optimum moisture content and compacted to at least 95 percent relative compaction.

8. Observation and soil density tests should be performed during grading to assist the contractor in obtaining the required degree of compaction and proper moisture content. Where the soil moisture content and/or compaction is outside the range required, additional effort and adjustments to the moisture content should be made until the specified compaction and moisture conditioning is achieved.

9. The Geotechnical Engineer should be notified at least 48 hours prior to starting grading operations. The procedure and methods of grading may then be discussed between the contractor and the Geotechnical Engineer.

UTILITY TRENCH LOCATION AND CONSTRUCTION

Trenches Adjacent to Building Foundations

To maintain the desired support for foundations, utility trenches running parallel or near-parallel to building foundations should be located away from the foundation such that the base of the trench excavation is located above an imaginary plane having an inclination of 1 horizontal to 1 vertical (1H:1V), extending downward from the bottom edge of the foundation toward the trench location. Where trench locations are restricted and must be in close proximity to foundations, footings or slab edges located adjacent to utility trenches should be deepened during the design of the project as necessary so that their bearing surfaces are below an imaginary plane having an inclination of 1H:1V, extending upward from the bottom edge of the adjacent utility trench. As an option to the use of a deepened foundation, the trench can be backfilled with controlled low strength material (CLSM) (sand-cement slurry) unless the use of CLSM is prohibited by the City of Pittsburg or the utility company.

Excavation

All excavations should conform to applicable State and Federal industrial safety requirements. Safety in and around utility trenches is the responsibility of the general and underground contractors. Where necessary, trench excavations should be shored in accordance with current CAL-OSHA requirements.

The walls of trenches extending into the clayey soils will likely stand in vertical cuts in the upper 4 to 5 feet with appropriate shoring, provided proper moisture content in the soils is maintained and that the trench walls are not subjected to vibration or surcharge loads above the excavation. Where weaker soils are encountered in the upper 4 to 5 feet of the site or trenches will extend deeper than 5 feet, trench sidewalls should be sloped no steeper than 1H:1V in stiff cohesive soil. In the event that granular soils are encountered, trench sidewalls should be no steeper than 1.5H:1V in moist granular soils and no steeper than 2H:1V in dry granular soils. Flatter trench slopes may be required if seepage is encountered during construction or if exposed soil conditions differ from those encountered in our borings. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within 5 feet of the top (edge) of the excavation.

Backfill

Material types, quality and placement procedures for utility bedding and shading materials should meet local agency and/or other applicable utility providers' requirements. Where not otherwise precluded by the City of Pittsburg or utility company that will be responsible for the trenches after project completion, from a geotechnical perspective, utility trench backfill above the bedding and shading materials may consist of on-site soils that have been processed to remove rock fragments over 4 inches in largest dimension, rubbish, vegetation and other undesirable substances.

Backfill materials should be placed in level lifts about 4 to 12 inches in loose thickness, moisture conditioned and mechanically compacted. Lift thickness will be a function of the type of compaction equipment in use. Thinner lifts (4- to 6-inch lifts) will be required for manually operated equipment, such as wackers or vibratory plates, and thicker lifts possible where a sheepsfoot wheel is used on the stick of an excavator. Jetting should not be used for densification of backfill on this project.

Trench backfill consisting of on-site fine-grained soil (clays) should be moisture conditioned to about 5 percent above optimum and compacted to between 85 and 90 percent relative compaction. Where sand or well-graded gravel is used as backfill, it should be moisture conditioned to slightly above the optimum moisture content and compacted to at least 93 percent relative compaction.

PAVEMENT AREA SUBGRADE AND AGGREGATE BASE

Prior to subgrade preparation, utility trench backfill in the pavement areas should be properly placed and compacted as previously recommended. The top 12 inches of soils for pavement subgrade should be scarified, moisture conditioned to at least 3 percent above the optimum moisture content and compacted to at least 93 percent relative compaction to provide a smooth, unyielding surface. The compacted subgrade should be non-yielding when proof-rolled with a loaded ten-wheel truck, such as a water truck or dump truck, prior to pavement construction. Subgrade soils should be maintained in a moist and compacted condition until covered with the complete pavement section.

Class 2 aggregate base should conform to the requirements found in Caltrans Standard Specifications Section 26. The aggregate base should be placed in thin lifts in a manner to prevent segregation, uniformly moisture conditioned to slightly above the optimum moisture content and compacted to at least 95 percent relative compaction to provide a smooth, unyielding surface.

SURFACE DRAINAGE

Surface water should not be allowed to collect on or adjacent to structures or pavements. Final site grading should provide surface drainage away from structures, pavements and slabs-on-grade to reduce the percolation of water into the underlying soils. If recommended surface gradients cannot be met or where there are landscape areas around the structure that cannot drain freely through sheet flow, area drains should be considered. Even with the recommended gradients there is a potential that ponding conditions may develop adjacent to the building over time. Where positive drainage around building cannot be established and maintained as part of the site grading design, area drains should be provided.

Pavement areas should be sloped and drainage gradients maintained to carry surface water off the site. Typical pavement design includes surface gradients of 2 percent in asphalt concrete pavement areas to provide surface drainage and to reduce the potential for water to penetrate into the pavement structure. Current site gradient is about 1.4 percent. We recommend that the slope gradient not be creased, with increases for drainage where possible.

BIORETENTION AREAS

Bioretention swales and basins should be located at least 5 feet away from foundations, pavements and exterior concrete flatwork. Bioretention swales and basins in close proximity to foundations have the potential to undermine the foundation or cause a reduction in the soil bearing capacity. Bioretention swales and basins located in close proximity to pavements and exterior concrete flatwork can cause settlement of these structures as well as cracking associated with lateral extension of these structures with lateral movement of the supporting soils. Where a 5-foot separation is not practical or possible due to site constraints, bioretention areas located within 5 feet of foundations, pavements or concrete flatwork should be constructed with structural side walls capable of withstanding the loads from the adjacent improvements. In the case of a building foundation in close proximity to a bioretention area, a deepened foundation edge designed as a retaining structure may be an option. The Civil Engineer should coordinate their work with the foundation designer. The foundation or foundation slab edge section should extend 6 inches below a plane projected up from the base of the bioretention basin toward the foundation at a slope of 1 Horizontal to 1 Vertical (1H:1V). Lateral earth pressures on the foundation or down-turned slab edge will need to be considered by the foundation designer. Precast units may be an expedient method of installing bioretention facilities that are capable of supporting concrete flat work, roadways and foundations.

Bioretention areas located within 5 feet of building foundations or pavements should also be lined with impermeable liners. A perforated drain pipe should be provided within the basin when a liner is installed or where the site soils have a low permeability rate and infiltration capacity (i.e. the clay soils at the subject site). The perforated pipe should lead to a solid-wall pipe to convey accumulated water to a suitable point of discharge.

SOIL CORROSIVITY CONSIDERATIONS

Corrosivity analysis was performed by CERCO Analytical, Inc. of Concord, California on one sample of the near-surface soils. As reported by CERCO Analytical, the sample was determined to be "moderately corrosive" based on resistivity test results. CERCO Analytical's report (see Appendix C) included the following recommendation: "All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion." Chloride, sulfate and sulfide ion concentrations each reflect none detected. The soil pH was determined to be 5.97. CERCO Analytical reported that the pH "does present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures. Corrosion prevention measures should be considered; a corrosion engineer should be consulted. Please refer to the CERCO Analytical report included in Appendix C for more information regarding their test results and brief evaluation.

CALIFORNIA BUILDING CODE (CBC) SEISMIC DESIGN PARAMETERS

The following 2016 California Building Code seismic design criteria was obtained using the U.S. Geological Survey Earthquake Hazards Program, U.S. Seismic Design Maps application for determination of Design Ground Motions. The program is found online at https://earthquake.usgs.gov/hazards/designmaps/. Seismic design parameters were determined with consideration of the 2010 ASCE 7-10 (w/March 2013 errata) publication, site location of latitude: 38.0115 degrees North latitude and 121.84515 degrees West longitude, Site Class D (Stiff Soil), and risk category I/II/III.

2016 California Building Code Seismic Design Criteria	
Site Class	D
Mapped MCE_R Spectral Response Acceleration Parameter at Short Period[2], S_s	1.749
Mapped MCE_R Spectral Response Acceleration Parameter at 1-Second Period, S_1	0.593
Site Coefficient (Short Period) F_a	1.0
Site Coefficient (1-Second Period) F_v	1.5
Mapped MCE_R Spectral Response Acceleration Parameter at Short Period, S_{MS}	1.749
Mapped MCE_R Spectral Response Acceleration Parameter at 1-Sec. Period, S_{M1}	0.890
Design Spectral Acceleration Parameter, S_{DS}	1.166
Design Spectral Acceleration Parameter, S_{D1}	0.593
Design Response Spectrum Long-Period Transition Period, T_L	8
Seismic Design Category (When $S_1 \geq 0.75$ Seismic Design Category = E)	D
Additional Parameters for Sites with Site Design Categories D through F	
Peak Ground Acceleration, PGA	0.614
Site Coefficient, F_{PGA}	1.000
Peak Ground Acceleration – geometric mean, PGA_M	0.614
Risk Coefficient at 0.2 s Spectral Response Period, C_{RS}	1.036
Risk Coefficient at 1 s Spectral Response Period, C_{R1}	1.059

BUILDING FOUNDATIONS

The proposed building may be supported by conventional, relatively shallow continuous strip footings along the building perimeter and at interior load bearing walls, with spread footings for columns. All footings should be founded on engineered fill or undisturbed native soils. The footings may be designed using an allowable soil bearing pressure of 3,000 pounds per square foot (psf) for dead plus live loads. The allowable bearing pressure may be increased by one-third when considering the effects of short-term wind or seismic loads. Continuous footings should have a minimum width of 12 inches and should be embedded a minimum of 24 inches below the lowest adjacent exterior finish grade or pad grade for interior column footings. Continuous strip footings should be reinforced with a minimum of two number 5 deformed reinforcing steel bars at the top and two at the bottom to provide structural continuity, to permit spanning of local irregularities in

[2] For Site Class B, 5 percent damped. Adjustments for other Site Classes are made, as needed, within the program.

soil conditions and to aid in reducing the potential for abrupt differential settlement. A Structural Engineer should determine the actual width and reinforcement of the foundations.

Lateral loads may be resisted by friction between the base of the slab and the supporting subgrade, or by passive resistance acting against the vertical faces of the foundations. An allowable friction coefficient of 0.35 between the foundation and supporting subgrade may be used. For passive resistance, an allowable equivalent fluid weight of 250 pounds per cubic foot (pcf) acting against the perimeter of the foundation can be used for design purposes. The passive pressure can be assumed to act starting at the top of the lowest adjacent finish grade in paved areas and at a depth of 1 foot below finish grade in unpaved areas. The passive lateral load resistance value discussed above is only applicable where the concrete for the foundation is placed directly against either undisturbed or properly compacted soils.

We estimate that total post-construction settlement under static building loads will be less than 3/4-inch with differential settlement along perimeter walls estimated to be 1/2-inch in 40 feet. Should the bearing pressures exceed those discussed herein, there may be an impact on the estimated settlement. This settlement estimate is based on the assumption that the building area is properly compacted and that the foundation is designed and constructed in accordance with our recommendations.

We recommend that the footing excavations be observed by the Geotechnical Engineer prior to placement of rebar in the footings. This will allow for confirmation of compliance with minimum width and embedment recommendations, appropriate moisture control and to confirm that the bearing level soils are consistent with those contemplated in our preparation of this report. The soil in the footings should not be permitted to dry out during construction. The foundation excavations may need to be watered regularly during the hot summer months to prevent drying of the exposed soils in the footing excavation. Concrete for footings should be placed against undisturbed engineered fill soils.

CONCRETE FLOOR SLABS

All conventionally reinforced "non-structural" interior concrete floor slabs should be supported by non-expansive fill as discussed above. Where subgrade soils have lost moisture, the subgrade soils should be moisture conditioned through soaking to reestablish a soil moisture content of at least 3 percent above optimum within a few days of concrete placement.

The slabs should be designed for soils with high expansion potential. At a minimum, we recommend reinforcement consisting of No. 4 steel reinforcing bars (rebar) at 18 inches on center each way. General practice is to place the steel reinforcement at mid-height in the slab. Care must be taken during construction to keep the reinforcement from being pushed to the bottom of the slab. The actual required steel reinforcement and placement of the reinforcing steel should be determined by the project Structural Engineer. The minimum recommended steel will not prevent the development of slab cracks but will aid in keeping the construction joints and minor cracks associated with concrete shrinkage relatively tight and in reducing the potential for differential movement between adjacent panels.

Slab control joints should be spaced in accordance with the recommendations presented in the ACI Manual of Concrete Practice. For a 5-inch thick slab a maximum spacing of 12.5 feet each way is recommended. In the event that control or contraction joints are to be constructed by saw cutting of the slabs, saw cuts should be made by soff-cut sawing. Saw cuts for contraction joints are generally made within 4 to 12 hours after the initial hardening of the concrete, as required by atmospheric conditions. The contractor should be responsible for monitoring of the concrete during initial set or hardening and to determine the optimal timing for cutting of the slabs.

The use of low water/cement ratio concrete, water reducing agents, quality aggregates, limiting the amount of fine aggregates in the concrete mix and implementation of continuous curing as soon as the concrete is finished will all aid in reducing concrete shrinkage and cracking.

Moisture Vapor Transmission through Interior Slabs-On-Grade

A vapor retarder should be installed immediately below the concrete in accordance with Section 1907.1 of the 2016 California Building Code. Section 1907.1.1 stipulates that a capillary break should be provided where a vapor barrier is required. Requirements for the capillary break are presented in CalGreen 2013, Section 4.505. Sand should not be placed over the vapor retarder. Guidelines for capillary break installation and for installation of the vapor retarder are provided in ASTM E1745. A standard specification for the vapor retarder material is presented in ASTM E1643. The details of the materials and installation of a vapor retarder and capillary break should be determined by the project designers. A minimum 3-inch section of gravel is suggested for the capillary break.

EXTERIOR CONCRETE FLATWORK

Given the presence of expansive soils at the site, placement of non-expansive fill soils for support of exterior concrete should be considered. This is discussed in detail above. With the exception of slabs subject to vehicular loads, it is our opinion that, from a geotechnical engineering standpoint, exterior concrete flatwork such as on-site sidewalks can be placed directly on the prepared subgrade. The use of aggregate base as support for concrete flatwork should be avoided except in traffic areas where required as part of a structural section or where required for compliance with a City standard. A 6-inch section (minimum section) of Class 2 aggregate base is recommended for support of concrete slabs that will be subjected to vehicular traffic.

Where on-site exterior concrete slabs-on-grade are planned, we generally recommend that exterior slabs-on-grade (i.e. sidewalks) be cast free from adjacent footings or other edge restraint. Using a strip of ½-inch thick asphalt impregnated felt or other commercially available expansion joint material between the slab edges and the adjacent structure may accomplish this. Where there is a concern that a trip hazard could develop at doorways due to differential movement between the exterior slab-on-grade and the adjoining foundation, or where concrete flatwork abuts embedded curbs, consideration may be given to tying the slab to the foundation or curb with reinforcing steel (rebar) dowels. Frequent construction or crack control (contraction) joints should be provided in all concrete slabs where cracking is objectionable. Deep, scored joints spaced no more than 6 feet apart should be considered to control shrinkage cracking. Scoring of contraction joints should extend slightly deeper than one-quarter the slab thickness to be effective. Steel reinforcement (rebar as opposed to wire mesh) should also be considered to reduce cracking and the potential for tripping hazards to develop between adjacent concrete panels due to expansive soil movement and/or tree roots. Minimum recommended reinforcement consisting of No. 3 steel reinforcing bars at 18 inches on center each way is suggested. The minimum recommended steel will not prevent the development of slab cracks but will aid in keeping the construction joints relatively tight and in reducing the potential for differential movement between adjacent panels.

Subgrade soils should be properly moisture conditioned during grading operations and maintained until covered by concrete or restored prior to concrete placement if necessary. The moisture content of the subgrade soils should be checked several days prior to the placement of concrete or baserock where required. The subgrade should be wetted or presoaked to at least 5 percent over optimum moisture content prior to placing concrete. Even with proper site preparation there will be some effects of soil moisture change on concrete flatwork.

The above recommendations, including soil moisture conditioning, contraction joints and steel reinforcement are intended to help reduce the potential for distress in concrete flatwork, but may not totally eliminate distress.

MODULAR CONTAINER PADS

The modular containers that will be placed on the site as self storage units will be steel cargo containers (Conex boxes). These types of containers are commonly supported by compacted gravel fill, asphalt concrete and portland cement concrete pavements or pavers. Factors that influence the selection of the material that will be used as a support surface include but are not necessarily limited to: cost, type of facility, frequency and type of vehicle traffic, and effects of surface water infiltration into the site.

We understand that asphalt concrete paved roads are planned for all-weather access to the self-storage units. Recommendations for asphalt concrete pavements are provide below. With the future roadways expected to have relatively light pavement sections and with those sections constructed over moderate to high plasticity clay subgrade soils, surface water should not be allowed to infiltrate the pavement area or areas adjacent to the pavement that would allow water to move through the pavement. The introduction of water into the pavement where the subgrade soil is clay typically results in softening of the subgrade leading to premature pavement failure. With the flat nature of the site and the proposed installation of rows of containers with roadways in between, we recommend that consideration be given to paving the entire site followed by placement of the containers. This would provide a relatively impervious surface over the site. The continuous surface will reduce the potential for surface water to infiltrate the pavement areas causing pavement distress. It will also reduce the potential for shrinkage and swelling of the underlying clay soils associated with subgrade soil wetting and drying with seasonal changes, which can also cause significant pavement distress.

PAVEMENT RECOMMENDATIONS

Flexible Asphalt Concrete Pavement

The following are recommended structural pavement sections. With the presence of moderate to high plasticity clay soils at the site, we have developed pavement sections based upon an R-value of 5 for the subgrade soil. The Caltrans design method for flexible pavement design was used to develop the pavement sections presented below. The Traffic Indexes (TI) are representative of a range of load frequency and intensity. Selection of the TI should be made by the project Civil Engineer in consultation with Pacific Property Advisors, Inc.

Flexible Pavement Sections Subgrade R-Value = 5			
Traffic Index	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Total Section Thickness (inches)
4.5	2.5	9.5	12.0
	3.0	8.0	11.0
5.0	3.0	10.0	13.0
6.0	3.5	12.5	16.0

ADDITIONAL GEOTECHNICAL ENGINEERING SERVICES

Prior to construction, our firm should be provided the opportunity to review the grading and foundation plans and specifications to determine if the recommendations of this report have been implemented in those documents. We would appreciate the opportunity to meet with the contractors prior to the start of site grading, underground utility installation and pavement construction to discuss the procedures and methods of construction. This can facilitate the performance of the construction operation and minimize possible misunderstanding and construction delays.

To a degree, the performance of the proposed project is dependent on the procedures and quality of the construction. Therefore, we should provide observations of the contractor's procedures, the exposed soil conditions, and field and laboratory testing during site preparation and grading, placement and compaction of fill, underground utility installation, and foundation and pavement construction. These observations will allow us to check the contractor's work for conformance with the intent of our recommendations and to observe unanticipated soil conditions that could require modification of our recommendations.

LIMITATIONS

The conclusions and recommendations presented in this report are based upon the project information provided to us by Pacific Property Advisors, Inc., information obtained from published geologic reports, subsurface conditions encountered at the boring locations, the results of geotechnical laboratory testing and professional judgment. The information provided herein was developed for use by Pacific Property Advisors, Inc. for the project as described herein. In the event that changes in the nature, design or location of the proposed project are planned, or revisions are made to the Building Code that are related to Geotechnical Engineering, the conclusions and preliminary recommendations in this report shall be considered invalid, unless the changes are reviewed and the conclusions and recommendations are confirmed or modified in writing by BSA. In light of this, there is a practical limit to the usefulness of this report without critical review. Although the time limit for this review is strictly arbitrary, it is suggested that two years from the date of this report be considered a reasonable time for the usefulness of this report.

Site conditions described in this report are those existing at the times of our field explorations and are not necessarily representative of such conditions at other locations or times. The boring logs show subsurface conditions at the locations and on the dates indicated. It is not warranted that they are representative of such conditions elsewhere or at other times. The locations of the field explorations were estimated by pacing from existing surface features at the site; they should be considered approximate only. This geotechnical investigation has been conducted in accordance with professional Geotechnical Engineering standards current at the time of service and in the geographic area of the site; no other warranty, expressed or implied, is offered or made.

We trust that this report provides the information that you require at this time. If you have any questions, please contact the undersigned at (925) 484-0220.

Respectfully submitted,

BERLOGAR STEVENS & ASSOCIATES

DRAFT

Gregory J. Ruf, P.E., G.E.
Principal Engineer

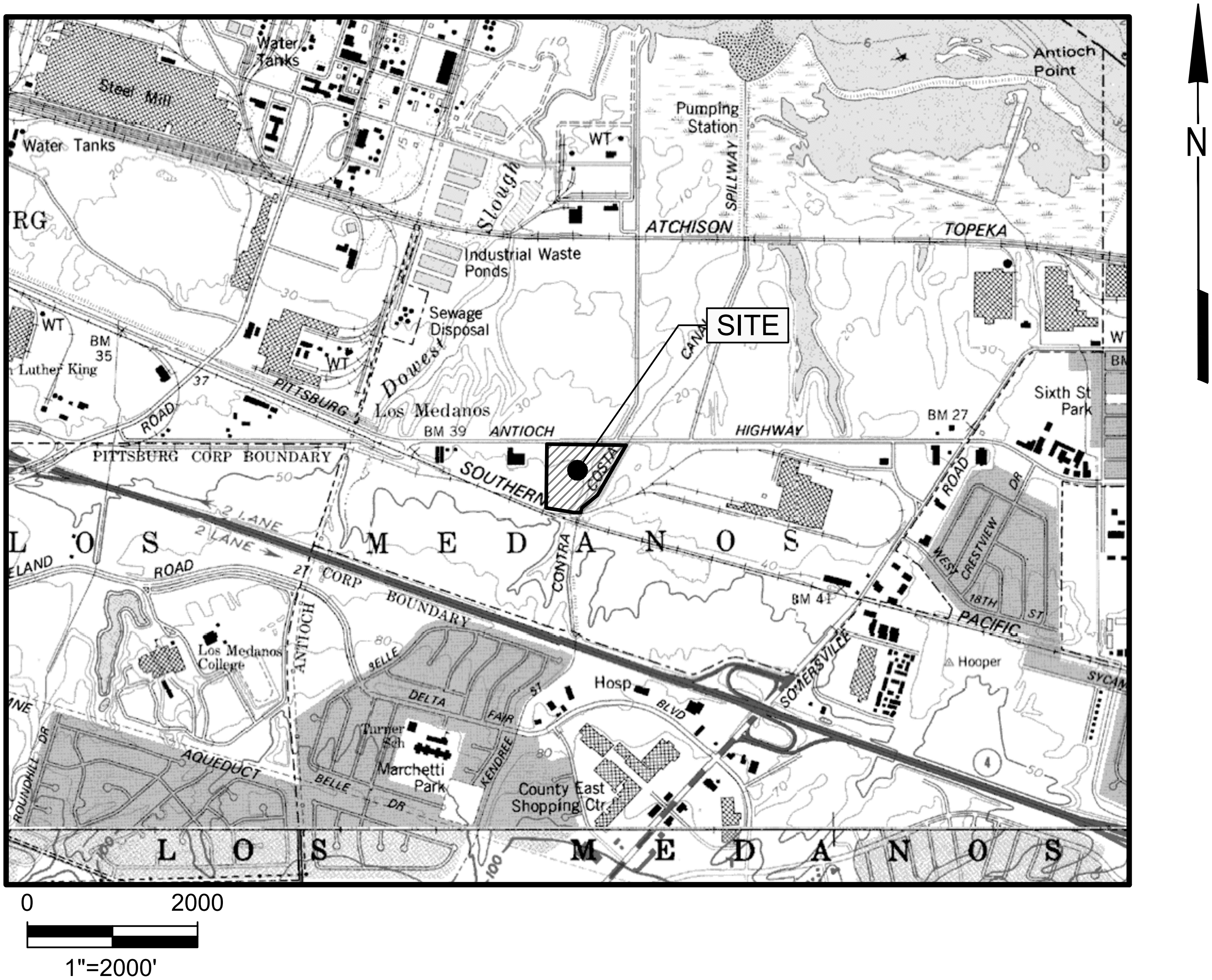
GJR:as

Attachments:
- Plate 1 – Vicinity Map
- Plate 2 – Site Plan
- Appendix A – 2006 Boring Logs
- Appendix B – Geotechnical Laboratory Test Results
- Appendix C – CERCO Analytical Report

Copies: Addressee (e-mail)

PLATES

JOB NUMBER: 3966.200 DATE: 6-11-18 BY: CC



VICINITY MAP

PITTSBURG SELF STORAGE

PITTSBURG ANTIOCH HIGHWAY

PITTSBURG, CALIFORNIA

FOR

PACIFIC PROPERTY ADVISORS, INC.

BASE: PORTION OF U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, ANTIOCH NORTH, CALIFORNIA, PHOTOREVISED 1983, AT A SCALE OF 1:24,000.

PLATE 1

JOB NUMBER: 3966.200 DATE: 6-11-18 DRAWN BY: CC

N

0 200

1"=200'

EXPLANATION

PROPERTY LINE

S-1 SOIL SAMPLE LOCATION (THIS STUDY)

B-13 BORING LOCATION (BGC, 2006)

SITE PLAN

PITTSBURG SELF STORAGE

PITTSBURG ANTIOCH HIGHWAY
PITTSBURG, CALIFORNIA
FOR
PACIFIC PROPERTY ADVISORS, INC.

Berlogar Stevens & Associates

SOIL ENGINEERS * ENGINEERING GEOLOGISTS

BASE: TOPO BASE, PROVIDED BY RBF VIA EMAIL, RECEIVED 2-21-06

APPENDIX A

2006 Boring Logs

BORING LOG B-1

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-3-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 43 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
■ 2.5 inch I.D. Split Barrel	140	30
▱ Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SILTY CLAY, dark gray-brown, moist, soft, trace fine-grained sand, rootlets
27	-	-			
				CL/ SC/ SP	ALTERNATING SANDY CLAY/CLAYEY SAND AND SAND, moist, hard to very dense, fine-grained sand
			5		
50/2"	17.7	100			
54	-	-			below 9 feet, more abundant carbonate veins
			10		
				CL	SANDY CLAY, yellow-brown, moist, hard, fine-grained sand, trace carbonate
50	-	-			
			15		
59	-	-			
			20		

BORING LOG B-1

JOB NUMBER: 2886.100 **SHEET:** 2 **OF:** 3

JOB NAME: Dow Parcel **DEPTH:** 20 feet **TO** 40 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SANDY CLAY, yellow-brown, moist, hard, fine-grained sand, trace carbonate
				SC	CLAYEY SAND, yellow-brown, moist, very dense, fine-grained sand, carbonate veins
40/5"	14.5	114			
			25		
				CL	SILTY CLAY, yellow-brown, moist, hard, organic black speckling, trace carbonate
35	-	-			
			30		
			35	▽	
45	-	-			
			40	CL	SANDY CLAY, yellow-brown with black spots, moist, hard, organic black spots, fine-grained sand

BORING LOG B-1

JOB NUMBER: 2886.100 **SHEET:** 3 **OF:** 3

JOB NAME: Dow Parcel **DEPTH:** 40 feet **TO** 50 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SANDY CLAY, yellow-brown with black spots, moist, hard, organic black spots, fine-grained sand
			45		
39	-	-			
			50		Boring terminated at 50 feet Groundwater encountered at 35 feet
			55		
			60		

BORING LOG B-2

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-6-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 39 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
■ 2.5 inch I.D. Split Barrel	140	30
▱ Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SILTY CLAY, dark gray-brown, moist, soft, trace fine-grained sand below 1 foot, very stiff
26	29.0	89			
				CL	SANDY CLAY, yellow-brown, moist, very stiff, fine-grained sand
			5		
24	13.0	91			
50/6"	-	-			
			10		
				SC	CLAYEY SAND, yellow-brown, moist, very dense, trace carbonate
50/6"	-	-			
			15		
50/6"	-	-			
			20		

BORING LOG B-2

JOB NUMBER: 2886.100 **SHEET:** 2 **OF:** 2

JOB NAME: Dow Parcel **DEPTH:** 20 feet **TO** 25 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				SC	CLAYEY SAND, yellow-brown, moist, very dense, trace carbonate
71	-	-			
			25		
					Boring terminated at 25 feet No groundwater encountered
			30		
			35		
			40		

BORING LOG B-3

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-6-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 47 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
2.5 inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
20	21.7	101		CL	SILTY CLAY, dark gray-brown, moist, very stiff, trace fine-grained sand
38	20.6	103	5	CL	SILTY CLAY with SAND, gray-brown, moist, hard, fine-grained sand
81	17.1	107	10	SC	CLAYEY SAND, yellow-brown, moist, very dense, fine-to medium-grained sand, trace lithic angular fragments up to 1/2 inch
35	-	-	15	CL	SANDY CLAY, yellow-brown, moist, hard, carbonate nodules, fine-grained sand
58	-	-	20	SC	CLAYEY SAND, yellow-brown, moist, very dense, fine-grained sand

BORING LOG B-3

JOB NUMBER: 2886.100 **SHEET:** 2 **OF:** 2

JOB NAME: Dow Parcel **DEPTH:** 20 feet **TO** 25 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				SC	CLAYEY SAND, yellow-brown, moist, very dense, fine-grained sand
				CL	SILTY CLAY with SAND, yellow-brown, moist, hard, fine-grained sand, trace carbonate
50/6"	-	-			
			25		Boring terminated at 25 feet No groundwater encountered
			30		
			35		
			40		

BORING LOG B-4

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-6-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 45 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
■ 2.5 inch I.D. Split Barrel	140	30
▨ Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSIFICATION	DESCRIPTION
				CH	SILTY CLAY, dark gray-brown, moist, stiff to very stiff, trace fine-grained sand, trace carbonate
16	19.6	99			
				CL	SANDY CLAY, yellow-brown, moist, hard, fine-grained sand
62	24.2	97	5		
50	16.4	99		ML	SANDY SILT with CLAY, yellow-brown, moist, hard, carbonate veins
			10		
				CL	SANDY CLAY, yellow-brown, moist, hard, fine-grained sand, carbonate nodules
53	-	-			
			15		
40	-	-			
			20		

BORING LOG B-4

JOB NUMBER: 2886.100 **SHEET:** 2 **OF:** 2

JOB NAME: Dow Parcel **DEPTH:** 20 feet **TO** 30 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SANDY CLAY, yellow-brown, moist, hard, fine-grained sand, carbonate nodules
50	-	-			
			25		
				CL	SILTY CLAY, yellow-brown, moist, hard, trace to some fine-grained sand
34	-	-			
			30		Boring terminated at 30 feet No groundwater encountered
			35		
			40		

BORING LOG B-5

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-6-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 40 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
■ 2.5 inch I.D. Split Barrel	140	30
◪ Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CH	SILTY CLAY, dark gray-brown, moist, medium stiff to stiff
11	20.2	97			
				CL	SANDY CLAY, yellow-brown, moist, hard, fine-grained sand
				ML	SANDY SILT, yellow-brown, moist, hard, carbonate
50/6"	18.0	108	5		
50/6"	13.9	106			below 9 feet, more carbonate
			10	SC	CLAYEY SAND, yellow-brown, moist, very dense, fine-to medium-grained sand, lithic angular fragments up to 1/2 inch
				ML	SANDY SILT, yellow-brown, moist, hard, fine-grained sand, carbonate nodules
49	-	-			
			15	CL	SANDY CLAY, yellow-brown, moist, hard, fine-grained sand, carbonate nodules
				CL	SILTY CLAY, yellow-brown, moist, hard, fine-grained sand, carbonate nodules
47	-	-			
			20		

BORING LOG B-5

JOB NUMBER: 2886.100 **SHEET:** 2 **OF:** 2

JOB NAME: Dow Parcel **DEPTH:** 20 feet **TO** 25 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SILTY CLAY, yellow-brown, moist, hard, fine-grained sand, carbonate nodules
26	-	-			below 24 feet, very stiff to hard
			25		
					Boring terminated at 25 feet No groundwater encountered
			30		
			35		
			40		

BORING LOG B-6

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-6-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 45 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
2.5 inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CH	SILTY CLAY, dark gray-brown, moist, stiff, trace fine-grained sand
				CL	SANDY CLAY, yellow-brown, moist, hard, fine-grained sand
34	18.4	108	5		
				ML/ SM/ CL	SANDY SILT/SILTY SAND/SANDY CLAY (alternating thin layers), yellow-brown, moist, very dense to hard, fine-grained sand
59	-	-	10		
				SW	GRAVELLY SAND, yellow-brown, moist, very dense, subrounded gravel up to 1 inch, well graded sand
63	-	-	15		
72	-	-			
			20		

BORING LOG B-6

JOB NUMBER: 2887.100 **SHEET:** 2 **OF:** 2

JOB NAME: Dow Parcel **DEPTH:** 20 feet **TO** 22-1/2 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
46	-	-		SW	GRAVELLY SAND, yellow-brown, moist, very dense, subrounded gravel up to 1 inch, well graded sand
				CL	SANDY CLAY, yellow-brown, moist,hard, carbonate nodules
					Boring terminated at 22-1/2 feet No groundwater encountered
			25		
			30		
			35		
			40		

BORING LOG B-7

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-6-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 43-1/2 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
2.5 inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSIFICATION	DESCRIPTION
				CH	SILTY CLAY, dark gray-brown, moist, stiff, trace fine-grained sand
				CL	SANDY CLAY, yellow-brown, moist, hard, fine-grained sand
51	-	-	5		
			10		
			15		
49	-	-			
			20		Boring terminated at 20 feet No groundwater encountered

BORING LOG B-8

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-7-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 39-1/2 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
2.5 inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSIFICATION	DESCRIPTION
				CL	SILTY CLAY, dark gray-brown to tan-brown, moist, stiff, fine-grained sand
20	25.3	91			
					below 4 feet, yellow-brown, very stiff
30	22.2	97			
			5		
				ML	CLAYEY SILT/SANDY SILT, yellow-brown, moist, hard, fine-grained sand, trace caliche
82/6"	16.1	103			
			10	SC	CLAYEY SAND, yellow-brown, moist, very dense, fine-grained sand
				SC/SL	CLAYEY SAND/SANDY CLAY, yellow-brown, moist, dense, hard, fine-grained sand
37	-	-			
			15		
				SM	SILTY SAND, yellow-brown, moist, dense, fine-grained sand
31	-	-			
			20		

BORING LOG B-8

JOB NUMBER: 2886.100 **SHEET:** 2 **OF:** 2

JOB NAME: Dow Parcel **DEPTH:** 20 feet **TO** 25-1/2 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				SM	SILTY SAND, yellow-brown, moist, dense, fine-grained sand
				ML	SANDY SILT, yellow-brown, moist, dense, fine-grained sand
				ML	CLAYEY SILT, yellow-brown, moist, hard
38	-	-	25	ML/SC	CLAYEY SILT/SILTY CLAY, brown, moist, hard
					Boring terminated at 25-1/2 feet No groundwater encountered
			30		
			35		
			40		

BORING LOG B-9

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-7-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 41 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
■ 2.5 inch I.D. Split Barrel	140	30
▱ Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SILTY CLAY TO SANDY CLAY, dark gray to dark gray-brown, moist, stiff to very stiff, fine-grained sand, trace rootlets
30	16.8	110			
			5	CL/ML	SANDY CLAY TO CLAYEY SILT, yellow-brown, moist, very stiff to hard, fine-grained sand
				ML	CLAYEY SILT/SANDY SILT, yellow-brown, moist, hard, dense, fine-grained sand
36	-	-	10		
				ML	CLAYEY SILT, yellow-brown, moist, hard, some fine-grained sand, trace carbonate
			15		
				SM	SILTY SAND, yellow-brown, moist, very dense, fine-grained sand
50	-	-		ML/CL	CLAYEY SILT/SILTY CLAY, yellow-brown, moist, hard, trace carbonate veins
			20		Boring terminated at 20-1/2 feet No groundwater encountered

BORING LOG B-10

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-7-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 39-1/2 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
2.5 inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSIFICATION	DESCRIPTION
				CL	SANDY CLAY, dark gray-brown, moist, stiff to very stiff, fine-grained sand, trace rootlets
31	21.7	100			
					below 3-1/2 feet, brown to dark brown
			5		
				ML	CLAYEY SILT/SANDY SILT, yellow-brown, moist, hard to very dense, fine-grained sand, trace carbonate veins
77	-	-			
			10		
			15		
				SM	SILTY SAND, yellow-brown, moist, dense, fine-grained sand
31	-	-		ML	CLAYEY SILT, yellow-brown, moist, very stiff
			20		Boring terminated at 20 feet No groundwater encountered

BORING LOG B-11

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-7-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 41 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
■ 2.5 inch I.D. Split Barrel	140	30
▨ Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SILTY CLAY TO SANDY CLAY, dark gray-brown to brown, moist, stiff to very stiff, fine-grained sand, trace fine gravel, trace rootlets
44	15.8	110			
			5		
				ML/CL	CLAYEY SILT/SILTY CLAY, yellow-brown, moist, very stiff to hard, some fine-grained sand
				ML/SM	SANDY SILT/SILTY SAND, yellow-brown, moist, dense, fine-grained sand, trace clay, trace coarse-grained sand
			10		
30	-	-			
			15		
59	-	-			
			20		Boring terminated at 20 feet No groundwater encountered

BORING LOG B-12

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-7-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 41 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
■ 2.5 inch I.D. Split Barrel	140	30
▯ Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SILTY CLAY, dark gray-brown to brown, moist, stiff, trace fine-grained sand, rootlets
18	19.7	98			
				CL/ML	SILTY CLAY/CLAYEY SILT, yellow-brown, moist, hard
83/6"	-	-			
			5		
					below 7 feet, some fine-grained sand
50/6"	-	-			
			10		
					below 12 feet, brown
33	-	-			
			15		
					below 18 feet, yellow-brown
46	-	-			
			20		
				CL	SILTY CLAY, yellow-brown, moist, hard, trace fine-grained sand

BORING LOG B-12

JOB NUMBER: 2886.100 **SHEET:** 2 **OF:** 2

JOB NAME: Dow Parcel **DEPTH:** 20 feet **TO** 25 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
61	-	-	25	CL	SILTY CLAY, yellow-brown, moist, hard, trace fine-grained sand
			30 35 40		Boring terminated at 25 feet No groundwater encountered

BORING LOG B-13

JOB NUMBER: 2886.100 **DATE DRILLED:** 2-7-06

JOB NAME: Dow Parcel **SURFACE ELEVATION:** 43 feet

DRILL RIG: Hollow stem Auger **DATUM:** Mean Sea Level

SAMPLER TYPE:	DRIVE WEIGHT - LB	HEIGHT OF FALL - IN
2.5 inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL	SILTY CLAY, dark gray-brown to brown, moist, stiff to very stiff
32	18.5	101		CL	SANDY CLAY with SAND SEAM, brown, moist, very stiff, fine-grained sand
			5		
50/6"	18.9	106		ML/CL	SILTY CLAY/CLAYEY SILT, yellow-brown moist, hard
				ML/SM	SANDY SILT/SILTY SAND, yellow-brown, dense, fine-grained sand
			10		
74	9.3	95			
				CL/SC	CLAYEY SAND/SANDY CLAY, yellow-brown, moist, hard, dense, fine-grained sand
63	13.3	107			
			15		
				CL/ML	CLAYEY SILT/SILTY CLAY, yellow-brown, moist,hard, trace carbonate veins
50/6"	18.1	103			
			20		

BORING LOG B-13

JOB NUMBER: 2886.100 **SHEET:** 2 **OF:** 2

JOB NAME: Dow Parcel **DEPTH:** 20 feet **TO** 25-1/2 feet

NOTES:

BLOWS PER FT.	MOISTURE CONTENT %	DRY UNIT WEIGHT p.c.f.	DEPTH IN FEET	USCS CLASSI-FICATION	DESCRIPTION
				CL/ML	CLAYEY SILT/SILTY CLAY, yellow-brown, moist,hard, trace carbonate veins
				ML/SM	SANDY SILT/SILTY SAND, yellow-brown, moist, very dense, fine-grained sand, some clay
55	-	-	25		
					Boring terminated at 25-1/2 feet No groundwater encountered
			30		
			35		
			40		

APPENDIX B

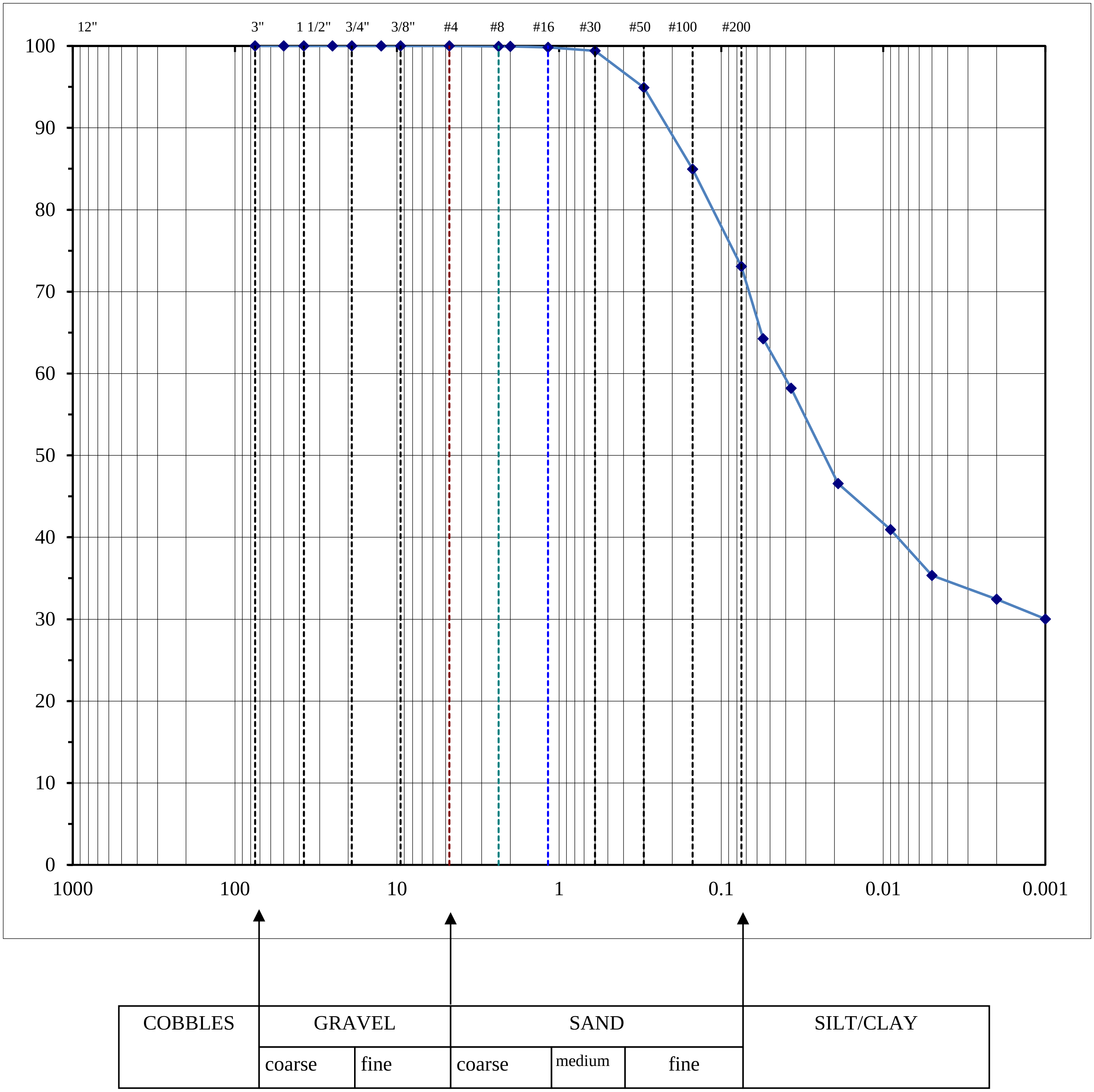
Geotechnical Laboratory Test Results

Gradation Test Data ASTM D 422

Project Name: Pittsburg Self Storage	**Project No: 3966.200**
Comments:	**Date:** 5/29/2018
	Invoice Number: 16140

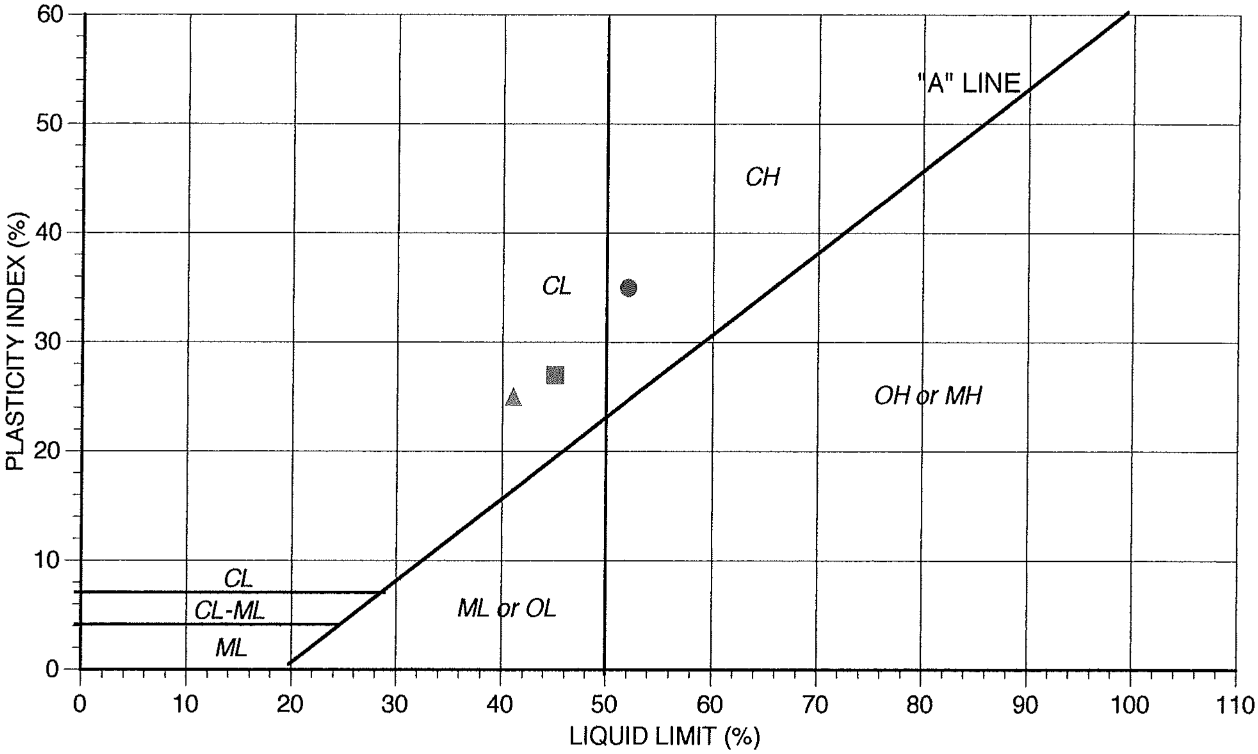
Tested By: gs

Reported By: G. Suckow



Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	Bulk Sample May 2018	CL Yellow Brown Sandy Clay, silty	19

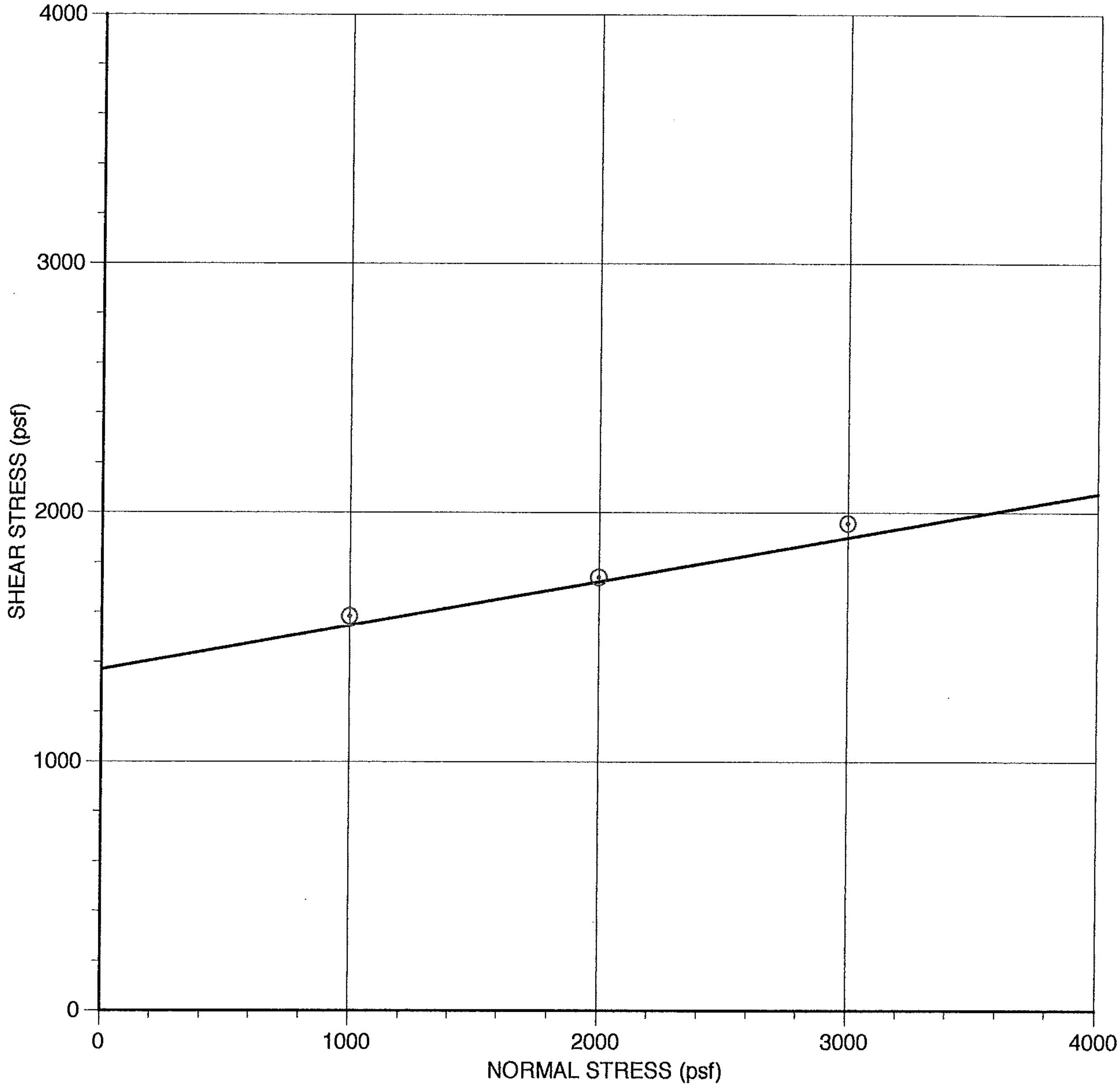
JOB NUMBER: 2886.100 DATE: 3-2-06 BY: CC



SYMBOLS	LOCATION	LIQUID LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION
●	B-4 at 1 foot	52	35	C H
■	B-8 at 1 foot	45	27	C L
▲	B-12 at 1 foot	41	25	C L

ATTERBERG LIMITS TEST DATA

JOB NUMBER: 2886.100 DATE: 3-2-06 BY: CC



LOCATION: B-4 at 2 feet

SAMPLE: SILTY CLAY WITH SAND, dark yellow-brown

TEST TYPE: Consolidated Undrained

RATE OF SHEAR (in/min): 0.005880

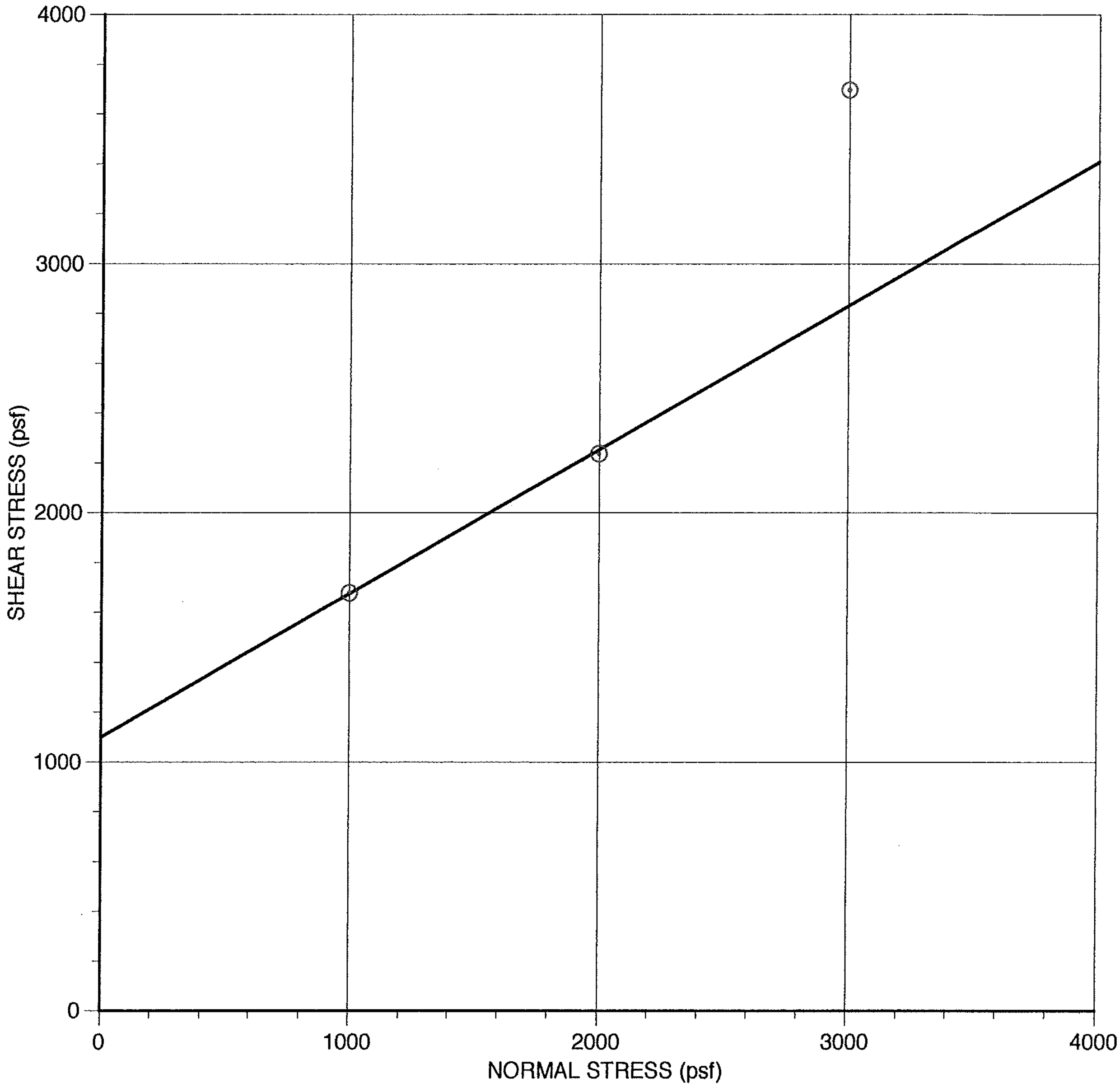
FRICTION ANGLE: 10°

COHESION: 1370 psf

SPECIMEN	A	B	C
DRY DENSITY (pcf)	104.6	99.4	99.1
INITIAL WATER CONTENT (%)	16.6	22.1	19.6
FINAL WATER CONTENT (%)	20.3	24.5	21.4
NORMAL STRESS (psf)	1000	2000	3000
MAXIMUM SHEAR (psf)	1584	1740	1957

DIRECT SHEAR TEST

JOB NUMBER: 2886.100 DATE: 3-2-06 BY: CC



LOCATION: B-5 at 5 feet

SAMPLE: SILTY CLAY, yellow-brown

TEST TYPE: Consolidated Undrained

RATE OF SHEAR (in/min): 0.005880

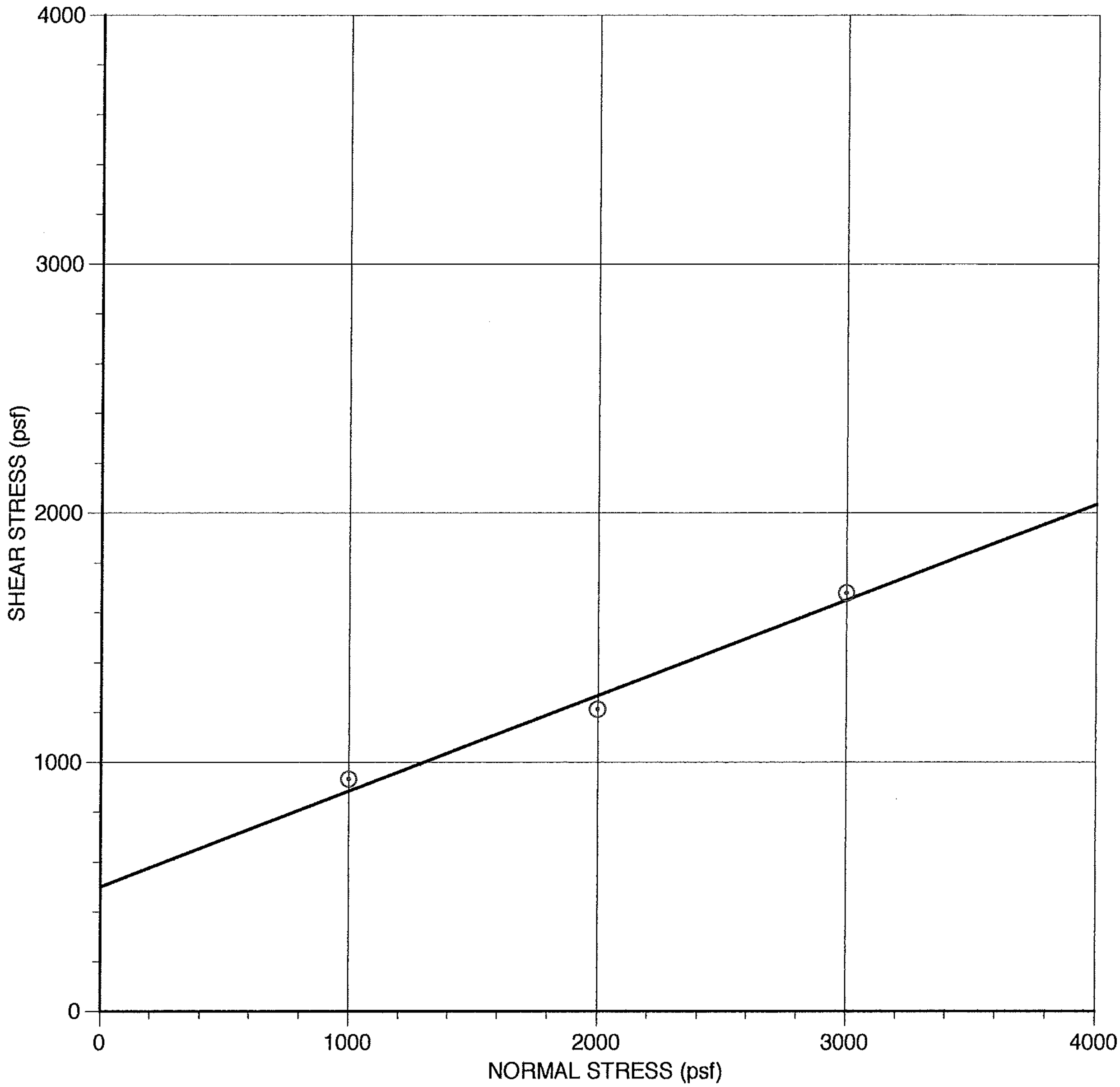
FRICTION ANGLE: 30°

COHESION: 1100 psf

SPECIMEN	A	B	C
DRY DENSITY (pcf)	109.3	100.0	108.2
INITIAL WATER CONTENT (%)	17.7	17.3	18.0
FINAL WATER CONTENT (%)	21.7	24.0	20.9
NORMAL STRESS (psf)	1000	2000	3000
MAXIMUM SHEAR (psf)	1678	2237	3697

DIRECT SHEAR TEST

JOB NUMBER: 2886.100 DATE: 3-2-06 BY: CC



LOCATION: B-8 at 1 foot

SAMPLE: SILTY CLAY, gray-brown

TEST TYPE: Consolidated Undrained

RATE OF SHEAR (in/min): 0.005880

FRICTION ANGLE: 21°

COHESION: 500 psf

SPECIMEN	A	B	C
DRY DENSITY (pcf)	92.8	90.7	88.8
INITIAL WATER CONTENT (%)	24.3	25.3	22.8
FINAL WATER CONTENT (%)	27.3	28.2	24.9
NORMAL STRESS (psf)	1000	2000	3000
MAXIMUM SHEAR (psf)	932	1212	1678

DIRECT SHEAR TEST

APPENDIX C

CERCO Analytical Report

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 **462 2771** Fax. 925 **462 2775**
www.cercoanalytical.com

6 June 2018

REVISED
Job No. 1805194
Cust. No. 10598

Mr. Greg Ruf
Berlogar Stevens & Associates
5587 Sunol Blvd.
Pleasanton, CA 94566

Subject: Project No.: 3966.200
Project Name: Pittsburg Self Storage
Corrosivity Analysis – ASTM Test Methods with Brief Evaluation

Dear Mr. Ruf:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on May 25, 2018. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the 100% saturated resistivity measurement, this sample is classified as "moderately corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration reflects none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentration reflects none detected with a reporting limit of 15 mg/kg.

The sulfide ion concentration reflects none detected with a detection limit of 50 mg/kg.

The pH of the soil is 5.97, which does present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures. Any soils with a pH of <6.0 is considered to be corrosive to buried iron, steel, mortar-coated steel and reinforced concrete structures. Therefore, corrosion prevention measures need to be considered for structures to be placed in this acidic soil.

The redox potential is 400-mV, which is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client:	Berlogar Stevens & Associates
Client's Project No.:	3966.200
Client's Project Name:	Pittsburg Self Storage
Date Sampled:	22-May-18
Date Received:	25-May-18
Matrix:	Soil
Authorization:	Signed Chain of Custody

REVISED
Date of Report: 6-Jun-2018

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Resistivity (As Received) (ohms-cm)	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1805194-001	Bulk #01	400	5.97	32,000	2,900	N.D.	N.D.	N.D.
Method:		ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:		-	-	10	-	50	15	15
Date Analyzed:		4-Jun-2018	4-Jun-2018	4-Jun-2018	4-Jun-2018	1-Jun-2018	4-Jun-2018	4-Jun-2018

* Results Reported on "As Received" Basis

N.D. - None Detected

Cheryl McMillen
Laboratory Director

Quality Control Summary - **All laboratory quality control parameters were found to be within established limits**