11.5 Geotechnical Reports

Terracon GeoReport

Geotechnical Engineering Report

First Citizen's Bank – Long Beach
Long Beach, Los Angeles County, CA
November 2, 2022
Terracon Project No. 60225117

Prepared for:
Kimley-Horn & Associates
Raleigh, North Carolina

Prepared by:
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November 2, 2022

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Attn: Mr. Andrew Plato
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Re: Geotechnical Engineering Report
First Citizen's Bank – Long Beach
3450-3470 Long Beach Boulevard
Long Beach, Los Angeles County, CA
Terracon Project No. 60225117

Dear Mr. Plato:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Kimley-Horn IPO No. 011737402-03 dated August 19, 2022. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Victor V. Nguyen, E.I.T.
Senior Staff Engineer

Keith P. Askew, P.E., G.E.
Geotechnical Department Manager

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Note: This report was originally delivered in a web-based format. Orange Bold text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the *GeoReport* logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
SUPPORTING INFORMATION

Geotechnical Engineering Report

First Citizen's Bank – Long Beach
3450-3470 Long Beach Boulevard
Long Beach, Los Angeles County, CA

Terracon Project No. 60225117
November 2, 2022

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed First Citizen's Bank to be located at 3450-3470 Long Beach Boulevard in Long Beach, Los Angeles County, CA. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Pavement design and construction
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per CBC

The geotechnical engineering Scope of Services for this project included the advancement of nine test borings to depths ranging from approximately 6½ to 21½ feet below existing site grade, laboratory testing, and preparing this report.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project site is located at 3450-3470 Long Beach Boulevard in Long Beach, Los Angeles County, CA. Approximate coordinates for the center of the addition are 33.8199°N, 118.1889°W

Item	Description
Existing Improvements	Based on review of historical imagery, the site appears to have previously been used as an oil and gas well site. The structures, including oil and gas well, as well as pavements have since been demolished and the site has been enclosed in chainlink fencing.
Current Ground Cover	Crushed gravel and earthen cover.
Existing Topography (from client provided plans)	Based on review of the *FCB – Long Beach Borings Exhibit* provided by the client dated August 9, 2022, we understand that the project site is relatively flat with approximate elevations ranging from 98 to 100 feet.

PROJECT DESCRIPTION

Item	Description
Proposed Structure	The project includes construction of an approximately 13,000 square-foot 2-story building with associated parking and drive areas. Appurtenant structures include a ± 320 square-foot mechanical courtyard and trash enclosure.
Building Construction	Concrete or wood-framed structure supported on reinforced concrete foundation with concrete slabs on grade.
Finished Floor Elevation	Assumed to be within one foot of existing grade.
Maximum Loads (assumed)	■ Columns: 40-80 kips ■ Walls: 1 to 2 kips per linear foot (klf) ■ Slabs: 150 to 300 pounds per square foot (psf)
Grading	Minimal cut/fill – assumed to be less than one foot excluding remedial grading.
Pavements	We understand that both rigid (concrete) and flexible (asphalt) pavement sections should be considered. Anticipated traffic is as follows: ■ Automobile Parking Area: Traffic Index of 5.0 ■ Driving Lanes: Traffic Index of 6.0 Traffic indices should be verified by the Civil Engineer based on anticipated traffic loading during operation of the facility.
Infiltration Systems	Based on discussion with the client, on-site infiltration systems are not anticipated as part of the site developments.
Retaining Wall	Based on discussion with the client, a free-standing masonry screen wall is proposed on site.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Subsurface soils generally consisted of loose to dense sand with varying amounts of silt and clay with interbedded layers medium stiff to hard sandy silt and sandy lean clay to a maximum explored depth of 21½ feet bgs.

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Lab Results

Laboratory tests were conducted on selected soil samples and the test results are presented in the **Exploration Results** section and on the boring logs. Atterberg limit test results indicate that the on-site soils generally have low plasticity or are non-plastic with the exception of the soil sample recovered in P-3 at an approximate depth of 5 feet which indicated high plasticity. Consolidation tests indicate that the silty sand soils encountered at an approximate depth of 2½ and 5 feet bgs have a slight collapse/swell potential when saturated under normal footing loads of 2,000 psf. Expansion index testing indicated that the near surface soils encountered in boring B-4 have an expansion index of 0 correlating to "very low" expansion potential as determined by ASTM D4829.

Groundwater Conditions

Groundwater was not observed in the borings while drilling, or for the short duration the boring remained open. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the level indicated below. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

According to data collected from the Los Angeles County Public Works Water Data Library for the State of California from well number 906D (approximate site elevation of 95 feet), located

approximately 1.25 miles northwest of the site, the highest groundwater elevation level, between 2000 and 2022, was recorded at greater than 50 feet deep.[1]

SEISMIC CONSIDERATIONS

The 2019 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16 and 2019 CBC. The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than or equal 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.8.4 applies to the proposed structure. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

Description	Value
2019 California Building Code Site Classification (CBC) [1]	D[2]
Site Latitude (°N)	33.8199
Site Longitude (°W)	118.1889
S_s Spectral Acceleration for a 0.2-Second Period	1.665
S_1 Spectral Acceleration for a 1-Second Period	0.600
F_a Site Coefficient for a 0.2-Second Period	1.0
F_v Site Coefficient for a 1-Second Period	1.7

1. Seismic site classification in general accordance with the *2019 California Building Code*.
2. The 2019 California Building Code (CBC) requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope does not include the required 100-foot soil profile determination. Borings were extended to a maximum depth of 21½ feet, and this seismic site class definition considers that similar or denser soils continue below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

[1] *Groundwater elevation was obtained from a monitoring well (well id: 906D) located at a distance of approximately 1.25 miles northwest of the project site (www.dpw.lacounty.gov/general/wells#).*

A site-specific ground motion study may reduce design values and consequently construction costs. We recommend consulting with a structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

Faulting and Estimated Ground Motions

The site is located in Southern California, which is a seismically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As calculated using the USGS Unified Hazard Tool, the Newport-Inglewood Fault, which is considered to have the most significant effect at the site from a design standpoint, has a maximum credible earthquake magnitude of 7.4 and is located approximately 1.59 kilometers from the site.

Based on the USGS Design Maps Summary Report, using the American Society of Civil Engineers (ASCE 7-16) standard, the modified peak ground acceleration (PGA_M) at the project site is expected to be 0.801 g. Based on the USGS Unified Hazard Tool, the project site has a mean magnitude of 6.84. Furthermore, the site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.[2]

LIQUEFACTION

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils exist below groundwater. The California Geological Survey (CGS) has designated certain areas as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table.

The project site is not located within a liquefaction hazard zone as designated by the CGS. Based on CGS maps and the anticipated depth to groundwater, liquefaction hazard potential at the site is considered low. Other geologic hazards related to liquefaction, such as lateral spreading, are therefore also considered low.

CORROSIVITY

The results of laboratory sulfides, soluble sulfate, soluble chloride, electrical resistivity, redox potential, total salts, and pH testing are presented in our appendix within the **Exploration Results**

[2] California Department of Conservation Division of Mines and Geology (CDMG), *"Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region"*, CDMG Compact Disc 2000-003, 2000.

section. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Resistivity

The laboratory resistivity value indicates the sample tested exhibits moderate corrosive potential to buried metal pipes. Evaluation of the test results is based upon the guidelines of J.F. Palmer, "Soil Resistivity Measurements and Analysis", Materials Performance, Volume 13, January 1974. The following table outlines the guidelines for soil resistivity for corrosion potential.

Corrosion Potential of Soil on Steel	
Soil Resistivity (ohm-cm)	**Corrosion Potential**
0 to 1,000	Very High
1,000 to 2,000	High
2,000 to 5,000	Moderate
> 5,000	Mild

We recommend consulting with a corrosion engineer for the design and protection of buried ferrous materials and pipes.

Sulfates

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 19.3.1.1 of the ACI Design Manual. Concrete should be designed in accordance with the exposure class S0 provisions of the ACI Design Manual, Section 318, Chapter 19.

GEOTECHNICAL OVERVIEW

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

Due to the low bearing capacity of on-site soils, we recommend that proposed shallow foundations supporting new structures bear on engineered fill extending to a minimum depth of 2 feet below the bottom of foundations, or 4 feet below existing grades, whichever is greater. Grading for the proposed structure should incorporate the limits of the footings plus a lateral distance of 4 feet beyond the outside edge of perimeter footings, where space is available.

Based on the findings summarized in this report, it is our professional opinion that the proposed construction will not be subjected to a hazard from settlement, slippage, or landslide, provided

the recommendations of our report are incorporated into the proposed construction. It is also our opinion that the proposed construction will not adversely affect the geologic stability of the site or adjacent properties provided the recommendations contained in our report are incorporated into the proposed construction.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results** section), engineering analyses, and our current understanding of the proposed project.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

The following recommendations include site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs, and pavements are contingent upon following the recommendations outlined in this section.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Strip and remove existing vegetation, debris, and other deleterious materials from proposed building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded to create a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building.

Based on discussion with the client and review of historical imagery, we understand that the site was previously used as an oil and gas well site. Evidence of buried structures associated with the previous site developments was not observed during subsurface exploration and site reconnaissance.

Although no evidence of fills and underground facilities such as septic tanks, well heads, cesspools, basements, and utilities was observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Subgrade Preparation

Due to the low bearing capacity of on-site soils, we recommend that proposed shallow foundations supporting new structures (including buildings and masonry sound walls) bear on engineered fill extending to a minimum depth of 2 feet below the bottom of foundations, or 4 feet below existing grades, whichever is greater. Grading for the proposed structure should incorporate the limits of the footings plus a lateral distance of 4 feet beyond the outside edge of perimeter footings for the buildings, and 2 feet beyond the outside edge of footings for sound walls, where space is available.

Subgrade soils beneath exterior slabs and pavements should be scarified, moisture conditioned, and compacted to a minimum depth of 12 inches. The moisture content and compaction of subgrade soils should be maintained until slab or pavement construction.

Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted per the compaction requirements in this report.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable. However, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Excavation

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Materials and Placement

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than 6 inches in size. Pea gravel or other similar non-cementatious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site soils or approved imported materials may be used as fill material for the following:

- general site grading
- foundation areas
- foundation backfill
- pavement areas

- interior floor slab areas
- exterior slab areas

Imported soils for use as fill material within proposed building and structure areas should conform to low volume change materials as indicated in the following specifications:

Gradation	Percent Finer by Weight (ASTM C 136)
3"	100
No. 4 Sieve	50-100
No. 200 Sieve	10-40

- Liquid Limit ..... 30 (max)
- Plasticity Index ..... 15 (max)
- Maximum expansion index* ..... 20 (max)

*ASTM D 4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current ACI criteria and is "mildly corrosive" to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
On-site soils and/or low volume change imported fill:			
Beneath foundations:	90%	0%	+3%
Beneath interior slabs:	90%	0%	+3%
Fill greater than 5 feet in depth	95%	0%	+3%
Miscellaneous backfill:	90%	0%	+3%
Beneath pavements:	95%	0%	+3%

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
Utility Trenches*:	90%	0%	+3%
Bottom of excavation receiving fill:	90%	0%	+3%
Aggregate base (beneath pavements):	95%	0%	+3%

* Upper 12 inches should be compacted to 95% within pavement and structural areas.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

Roof drainage should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems and landscaped irrigation should not be installed within 5 feet of foundation walls.

Exterior Slab Design and Construction

Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some movement due to the volume change of the backfill. To reduce the potential for damage caused by movement, we recommend:

- minimizing moisture increases in the backfill;
- controlling moisture-density during placement of backfill;
- using designs which allow vertical movement between the exterior features and adjoining structural elements;
- placing effective control joints on relatively close centers

Utility Trenches

It is anticipated that the on-site soils will provide suitable support for underground utilities and piping that may be installed. Any soft and/or unsuitable material encountered at the bottom of excavations should be removed and be replaced with an adequate bedding material. A non-expansive granular material with a sand equivalent greater than 30 should be used for bedding and shading of utilities, unless allowed or specified otherwise by the utility manufacturer.

On-site materials are considered suitable for backfill of utility and pipe trenches from one foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed, or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction.

On-site silt soils may pump and unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. The use of light construction equipment would aid in reducing subgrade disturbance. The use of remotely operated equipment, such as a backhoe, would be beneficial to perform cuts and reduce subgrade disturbance.

Should unstable subgrade conditions develop stabilization measures will need to be employed. Stabilization measures may include placement of aggregate base and multi-axial geogrid. Use of lime, fly ash, kiln dust or cement could also be considered as a stabilization technique. Laboratory evaluation is recommended to determine the effect of chemical stabilization on subgrade soils prior to construction.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigative measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. Excavations should be sloped or shored in the interest of safety following local, and federal regulations,

including current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards.

Construction Observation and Testing

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade.

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. One density and water content test for every 50 linear feet of compacted utility trench backfill. This testing frequency criteria may be adjusted during construction as specified by the geotechnical engineer of record.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

Provided the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Shallow Foundation Design Recommendations

DESCRIPTION	RECOMENDATION
Foundation Type – Buildings and Sound Walls	Conventional strip and spread footings
Bearing Material	Engineered fill extending a minimum depth of 2 feet below the bottom of foundations, or 4 feet below existing grades, whichever is greater.
Allowable Bearing Pressure	2,500 psf
Minimum Dimensions	Columns: 24 inches Walls: 18 inches

DESCRIPTION	RECOMENDATION
Minimum Embedment Depth Below Finished Grade	18 inches
Total Estimated Settlement	1 inch
Estimated Differential Settlement	½ to ¾ inches

Finished grade is defined as the lowest adjacent grade within five feet of the foundation for perimeter (or exterior) footings.

The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

Foundations should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

FLOOR SLABS

DESCRIPTION	RECOMMENDATION
Interior floor system	Slab-on-grade concrete
Floor slab support	Engineered fill extending a minimum depth of 2 feet below the bottom of foundations, or 4 feet below existing grades, whichever is greater.
Subbase	Minimum 4-inches of Aggregate Base
Modulus of subgrade reaction	160 pounds per square inch per inch (psi/in) (The modulus was obtained based on estimates obtained from NAVFAC 7.1 design charts). This value is for a small loaded area (1 Sq. ft or less) such as for forklift wheel loads or point loads and should be adjusted for larger loaded areas.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

LATERAL EARTH PRESSURES

Design Parameters

For engineered fill comprised of on-site soils or imported low volume change materials above any free water surface, recommended equivalent fluid pressures for unrestrained foundation elements are:

ITEM	VALUE[a][b]
Active Case	39 psf/ft
Passive Case	400 psf/ft
At-Rest Case	59 psf/ft
Coefficient of Friction	0.35

[a]Note: The values are based on engineered fill materials used as backfill.
[b]Note: Uniform, horizontal backfill, compacted to at least 90% of the ASTM D 1557 maximum dry density, rendering a maximum unit weight of 125 pcf.

The lateral earth pressures herein do not include any factor of safety and are not applicable for submerged soils/hydrostatic loading. Additional recommendations may be necessary if such conditions are to be included in the design.

Passive pressure and sliding friction may be combined to resist sliding provided that either the passive pressure or friction is reduced by 50 percent.

Fill against foundation should be compacted to densities specified in the Earthwork section of this report. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Pavement Design Parameters

An estimated design R-value was used to calculate the asphalt concrete pavement thickness sections and the Portland cement concrete pavement sections. The sections provided below are preliminary and R-value testing should be completed prior to pavement construction to verify the design R-value.

Assuming the pavement subgrades will be prepared as recommended within this report, the following pavement sections should be considered minimums for this project for the traffic indices assumed in the table below. As more specific traffic information becomes available, we should be contacted to reevaluate the pavement calculations.

Pavement Section Thicknesses

The following table provides options for AC and PCC Sections:

	Recommended Pavement Section Thickness (inches) [1]	
	Light (Automobile) Parking Assumed Traffic Index (TI) = 5.0	**On-site Driveways and Delivery Areas Assumed (TI) = 6.0**
Section I Portland Cement Concrete (600 psi Flexural Strength)	5.0-inches PCC over 4-inches Class II Aggregate Base	6.0-inches PCC over 4-inches Class II Aggregate Base
Section II Asphalt Concrete	3-inches AC over 6-inches Class II Aggregate Base	3-inches AC over 9-inches Class II Aggregate Base

1. All materials should meet the Caltrans Standard Specifications for Highway Construction.

These pavement sections are considered minimal sections based upon the expected traffic and the existing subgrade conditions. However, they are expected to function with periodic maintenance and overlays if good drainage is provided and maintained.

Subsequent to clearing, grubbing, and removal of topsoil, subgrade soils beneath all pavements should be scarified, moisture conditioned, and compacted to a minimum depth of 12 inches. All materials should meet the California Department of Transportation (Caltrans) Standard Specifications for Highway Construction. Aggregate base materials should meet the gradation and quality requirement of Class 2 Aggregate Base (¾ inch maximum) in Caltrans Standard Specifications, latest edition, Sections 25 through 29.

All concrete for rigid pavements should have a minimum flexural strength of 600 psi (4,250 psi Compressive Strength) and be placed with a maximum slump of four inches. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Preventative maintenance should be planned and provided for through an on-going pavement management program in order to enhance future pavement performance. Preventative

maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment.

Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

Pavement Construction Considerations

Materials and construction of pavements for the project should be in accordance with the requirements and specifications of the State of California Department of Transportation, or other approved local governing specifications.

Base course or pavement materials should not be placed when the surface is wet. Surface drainage should be provided away from the edge of paved areas to minimize lateral moisture transmission into the subgrade.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. The findings and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of its profession completing similar studies and practicing under similar conditions in the geographic vicinity and at the time these services have been performed. No warranty or guarantee, express or implied, is made. Any third-party access to services or correspondence is

solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
6	21½	Structures Area
3	6½	Pavement Area

Boring Layout and Elevations: Boring locations were determined by the client and shifted (where necessary) by Terracon based on accessibility during site reconnaissance. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by interpolation from google earth. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted drill rig using continuous hollow stem flight augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Test samples were collected during drilling in general accordance with the appropriate ASTM methods using Standard Penetration Testing (SPT) and sampling using either standard split-spoon or Modified California samplers. A sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration was recorded as the Standard Penetration Test (SPT) resistance value, also referred to as N-values. The N-values are indicated on the boring logs at the test depths. The samples were placed in appropriate containers, taken to our soil laboratory for testing, and classified by a geotechnical engineer. In addition, we observed and recorded groundwater levels during drilling and sampling. All borings extending beyond 10 feet were backfilled with cement grout slurry. Other borings were backfilled with soil cuttings.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural

standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D7263 Standard Test Methods for Laboratory Determination of Dry Density (Unit Weight) of Soil Specimens
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D1140 Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing
- ASTM D4546 Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading
- ASTM D4829 Standard Test Method for Expansion Index of Soils
- Corrosivity Testing will include pH, chlorides, sulfates, sulfides, Redox potential, and electrical lab resistivity

The laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

SITE LOCATION

First Citizen's Bank Long Beach ■ Long Beach, CA
September 29, 2022 ■ Terracon Project No. 60225117

Terracon GeoReport

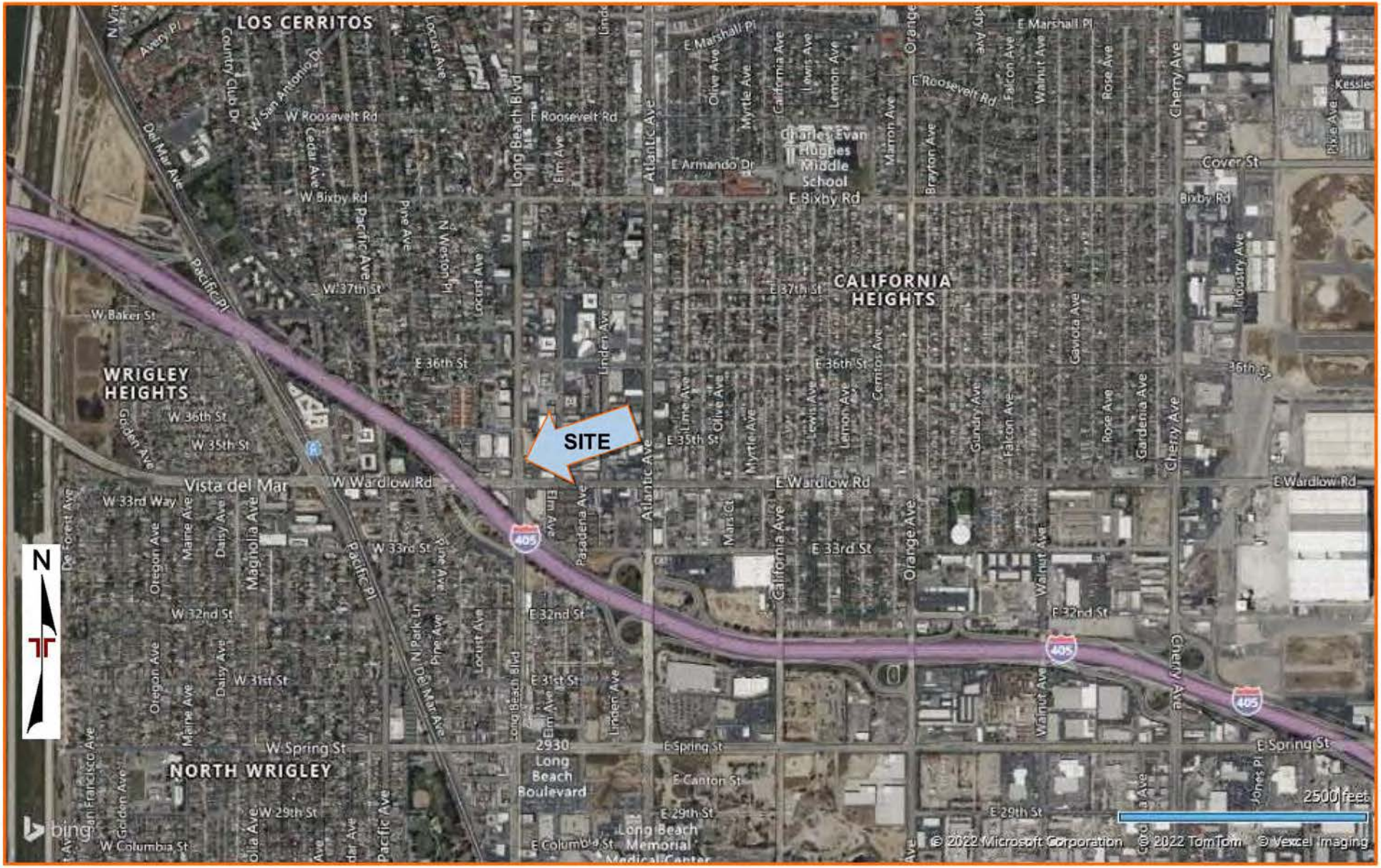


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

EXPLORATION PLAN

First Citizen's Bank Long Beach ■ Long Beach, CA
September 29, 2022 ■ Terracon Project No. 60225117

Terracon GeoReport



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Overlay Provided by the client

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: First Citizen's Bank Long Beach

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

SITE: 3450 Long Beach Blvd
Long Beach, CA

LOCATION See Exploration Plan

Latitude: 33.8199° Longitude: -118.1889°

Approximate Surface Elev.: 88 (Ft.) +/-

DEPTH	ELEVATION (Ft.)		FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), reddish brown					
		trace clay, very loose	4-3-3				46
		olive brown, medium dense	6-19-16	11.2	120		
			7-12-16	12.2	109		
10.0	78+/-						
		POORLY GRADED SAND WITH SILT (SP), olive brown, loose	5-7-10	9.7	93		
15.0	73+/-						
		SILTY SAND (SM), dark olive brown, hard	7-17-17 N=34			NP	
		medium dense	3-4-9 N=13				
21.5	66.5+/-						
		Boring Terminated at 21.5 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-09-2022 | Boring Completed: 09-09-2022

Drill Rig: CME 75 | Driller: 2R

Project No.: 60225117

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 10/26/22

BORING LOG NO. B-2

PROJECT: First Citizen's Bank Long Beach

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

SITE: 3450 Long Beach Blvd
Long Beach, CA

LOCATION See Exploration Plan

Latitude: 33.8201° Longitude: -118.1889°

Approximate Surface Elev.: 88 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDY SILT (ML), reddish brown							
		trace clay, very stiff			8-14-20				54
		olive brown, hard	5		8-22-28	11.9	120		
					11-26-29	10.8	119		
10.0	78+/-								
		POORLY GRADED SAND WITH SILT (SP-SM), olive brown, medium dense	10		8-12-20				9
		dense	15		5-17-24 N=41				
20.0	68+/-								
		SANDY SILT (ML), dark olive brown, hard	20		5-27-29 N=56				
21.5	66.5+/-								
		Boring Terminated at 21.5 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-09-2022 | Boring Completed: 09-09-2022

Drill Rig: CME 75 | Driller: 2R

Project No.: 60225117

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 10/26/22

BORING LOG NO. B-3

PROJECT: First Citizen's Bank Long Beach

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

SITE: 3450 Long Beach Blvd
Long Beach, CA

LOCATION See Exploration Plan

Latitude: 33.8200° Longitude: -118.1888°

Approximate Surface Elev.: 87 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), reddish brown							
		trace clay, loose			4-3-4	9.4	111		
		olive brown, medium dense	5		5-10-20				
					8-13-14	14.4	113		
10.0	77+/-		10						
		POORLY GRADED SAND (SP), trace silt, olive brown, loose			2-4-7	4.6	94		
15.0	72+/-		15						
		SILTY SAND (SM), dark olive brown, dense			11-17-22 N=39			NP	
		medium dense	20		4-7-9 N=16				
21.5	65.5+/-								
		Boring Terminated at 21.5 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-09-2022 | Boring Completed: 09-09-2022

Drill Rig: CME 75 | Driller: 2R

Project No.: 60225117

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 10/26/22

BORING LOG NO. B-4

PROJECT: First Citizen's Bank Long Beach

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

SITE: 3450 Long Beach Blvd
Long Beach, CA

LOCATION See Exploration Plan

Latitude: 33.8199° Longitude: -118.1888°

Approximate Surface Elev.: 87 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SANDY SILT (ML), reddish brown					
		trace clay, very stiff	5-11-13				57
		olive brown	6-11-19	12.9	120		
		hard	8-17-27	13.5	116		
10.0	77+/-						
		SILTY SAND (SM), olive brown, medium dense	6-9-12				18
		dark olive brown	9-14-13 N=27			NP	
21.5	65.5+/-		3-5-7 N=12				
		Boring Terminated at 21.5 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-09-2022 | Boring Completed: 09-09-2022

Drill Rig: CME 75 | Driller: 2R

Project No.: 60225117

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 10/26/22

BORING LOG NO. B-5

PROJECT: First Citizen's Bank Long Beach

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

SITE: 3450 Long Beach Blvd
Long Beach, CA

LOCATION See Exploration Plan

Latitude: 33.8201° Longitude: -118.1888°

Approximate Surface Elev.: 88 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), reddish brown							
		trace clay, loose			3-4-4	6.4	105		
		olive brown, medium dense	5		9-18-25	12.0	113		
					8-10-17	7.2	107		
10.0	78+/-		10						
		POORLY GRADED SAND WITH SILT (SP-SM), olive brown, medium dense			8-14-14			NP	
		dense	15		5-15-21 N=36				
20.0	68+/-		20						
		SANDY SILT (ML), dark olive brown, very stiff			5-7-17 N=24				
21.5	66.5+/-								
		Boring Terminated at 21.5 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-09-2022 | Boring Completed: 09-09-2022

Drill Rig: CME 75 | Driller: 2R

Project No.: 60225117

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 10/26/22

BORING LOG NO. B-6

PROJECT: First Citizen's Bank Long Beach

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

SITE: 3450 Long Beach Blvd
Long Beach, CA

LOCATION See Exploration Plan

Latitude: 33.8198° Longitude: -118.1887°

Approximate Surface Elev.: 87 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		SILTY SAND (SM), reddish brown								
		trace clay, loose				3-6-8	8.7	116		
		olive brown, medium dense	5			6-10-18	14.5	117		
7.5	79.5+/-									
		POORLY GRADED SAND WITH SILT (SP-SM), olive brown, medium dense				7-12-10	9.7	117		
		loose	10			3-4-6	5.0	92		
11.5	75.5+/-									
		Boring Terminated at 11.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-09-2022 | Boring Completed: 09-09-2022

Drill Rig: CME 75 | Driller: 2R

Project No.: 60225117

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 10/26/22

BORING LOG NO. P-1

PROJECT: First Citizen's Bank Long Beach

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

SITE: 3450 Long Beach Blvd
Long Beach, CA

LOCATION See Exploration Plan

Latitude: 33.8197° Longitude: -118.1891°

Approximate Surface Elev.: 90 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	PERCENT FINES
SILTY SAND (SM), reddish brown				
loose			3-3-3 N=6	47
medium dense			4-9-8 N=17	
6.5	83.5+/-			
Boring Terminated at 6.5 Feet				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-09-2022 | Boring Completed: 09-09-2022

Drill Rig: CME 75 | Driller: 2R

Project No.: 60225117

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 10/26/22

BORING LOG NO. P-2

PROJECT: First Citizen's Bank Long Beach

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

SITE: 3450 Long Beach Blvd
Long Beach, CA

LOCATION See Exploration Plan

Latitude: 33.8200° Longitude: -118.1891°

Approximate Surface Elev.: 88 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	FIELD TEST RESULTS	PERCENT FINES
		SANDY SILT (SM), reddish brown	
		medium stiff	3-3-3 N=6	50
5		brown, very stiff	4-9-8 N=17	
6.5	81.5+/-	***Boring Terminated at 6.5 Feet***	

GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-09-2022 | Boring Completed: 09-09-2022

Drill Rig: CME 75 | Driller: 2R

Project No.: 60225117

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 10/26/22

BORING LOG NO. P-3

PROJECT: First Citizen's Bank Long Beach

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

SITE: 3450 Long Beach Blvd
Long Beach, CA

LOCATION See Exploration Plan

Latitude: 33.8197° Longitude: -118.1888°

Approximate Surface Elev.: 87 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	LL-PL-PI
SILTY SAND (SM)					
trace clay, reddish brown				3-5-6 N=11	
5.0	82+/-	5			
SANDY LEAN CLAY (CL), brown, stiff				3-4-6 N=10	49-15-34
6.5	80.5+/-				
Boring Terminated at 6.5 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with soil cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
23041 Avenida De La Carlota Ste 350
Laguna Hills, CA

Boring Started: 09-09-2022 | Boring Completed: 09-09-2022

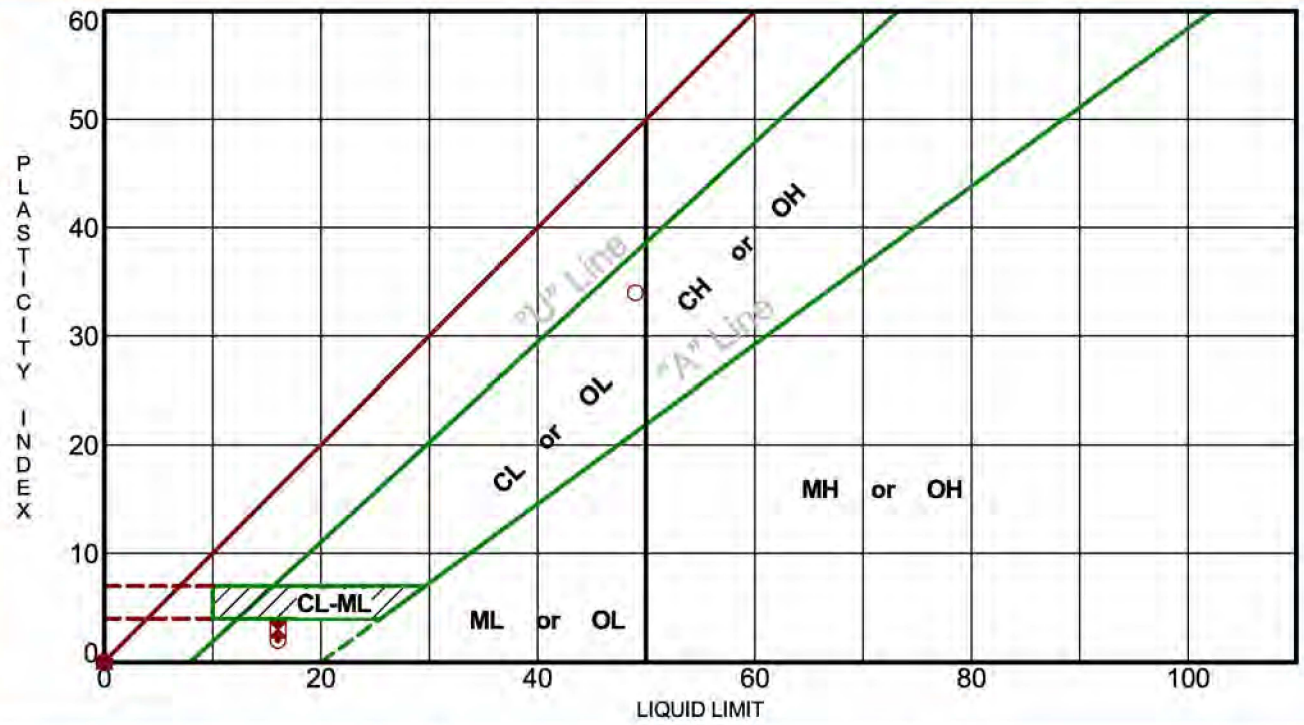
Drill Rig: CME 75 | Driller: 2R

Project No.: 60225117

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 10/26/22

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth	LL	PL	PI	Fines	USCS	Description
●	B-1	15 - 16.5	NP	NP	NP		SM	SILTY SAND
⊠	B-3	2.5 - 4	16	13	3		SM	SILTY SAND
▲	B-3	15 - 16.5	NP	NP	NP		SM	SILTY SAND
★	B-4	15 - 16.5	NP	NP	NP		SM	SILTY SAND
⊙	B-5	2.5 - 4	16	14	2		SM	SILTY SAND
✿	B-5	10 - 11.5	NP	NP	NP		SP-SM	POORLY GRADED SAND WITH SILT
○	P-3	5 - 6.5	49	15	34		CL	SANDY LEAN CLAY

PROJECT: First Citizen's Bank Long Beach

PROJECT NUMBER: 60225117

SITE: 3450-3470 Long Beach Blvd
Long Beach, CA

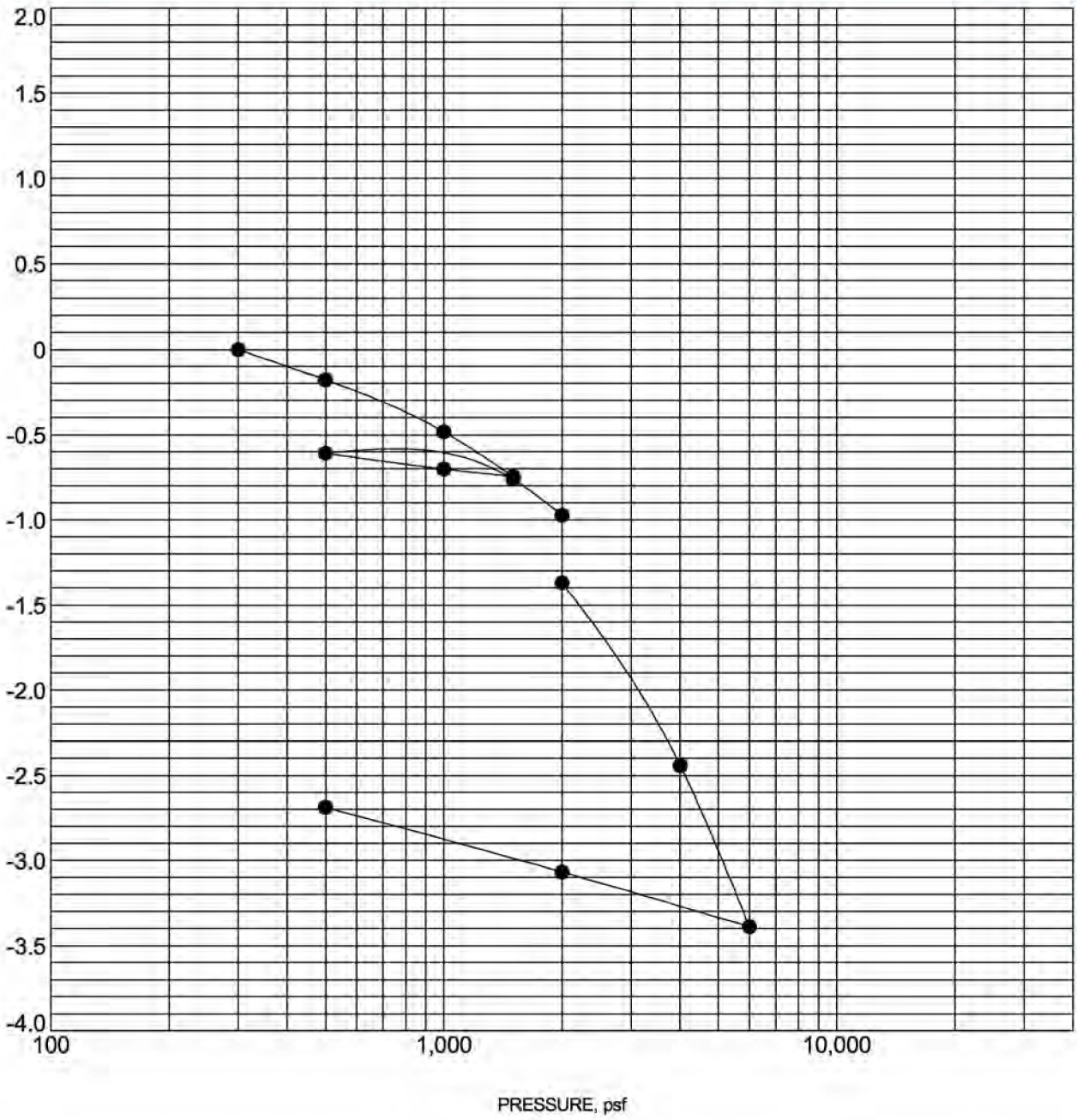
Terracon
1421 Edinger Ave, Ste C
Tustin, CA

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 9/29/22

SWELL CONSOLIDATION TEST

ASTM D4546



Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-1	2.5 - 4 ft	SILTY SAND	105	10.7

NOTES: Water added at 2,000 psf

PROJECT: First Citizen's Bank Long Beach

SITE: 3450-3470 Long Beach Blvd
Long Beach, CA

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

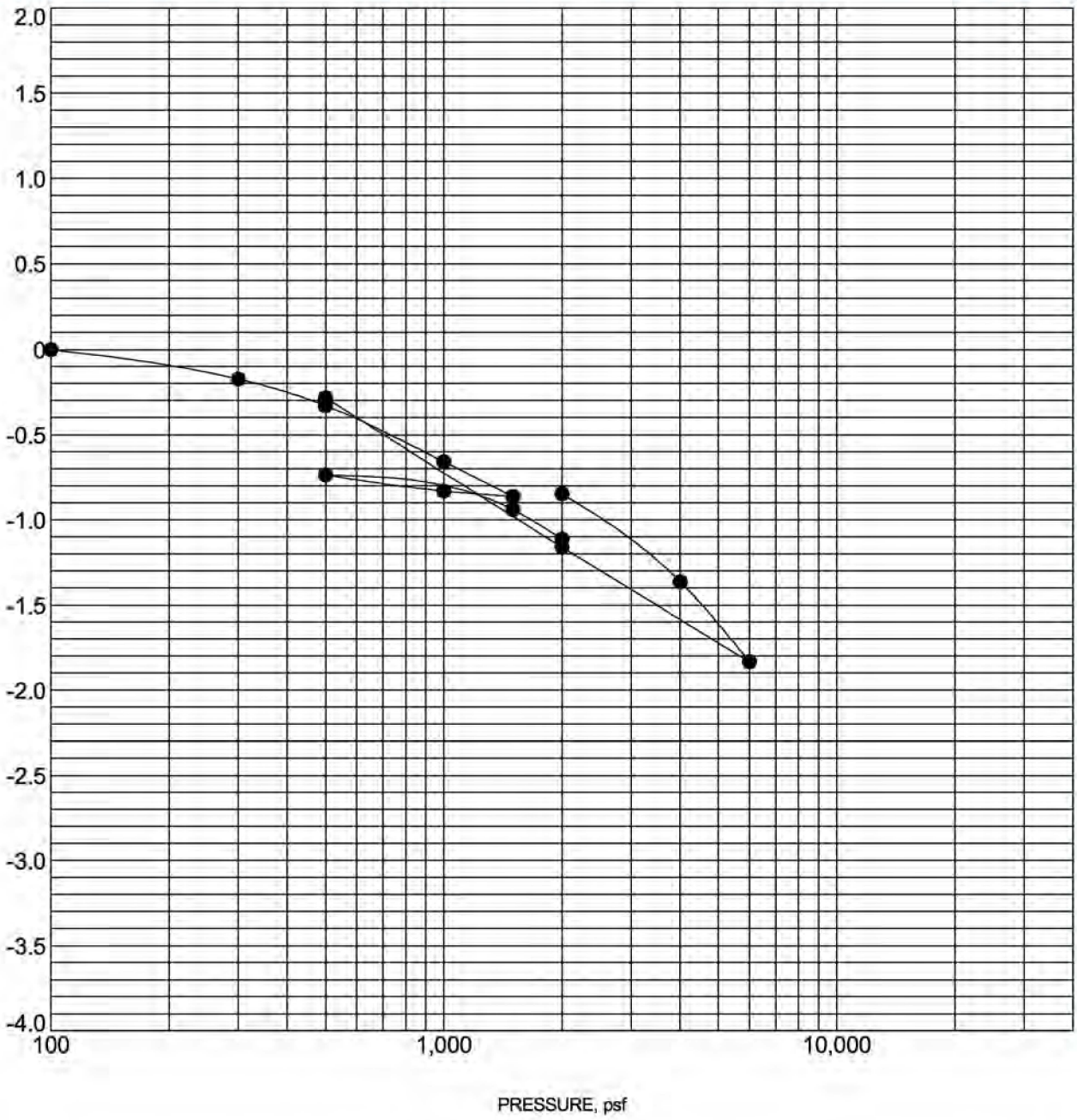
PROJECT NUMBER: 60225117

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 9/29/22

SWELL CONSOLIDATION TEST

ASTM D4546



Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-3	5 - 6.5 ft	SILTY SAND	111	15.9

NOTES: Water added at 2,000 psf

PROJECT: First Citizen's Bank Long Beach

SITE: 3450-3470 Long Beach Blvd
Long Beach, CA

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

PROJECT NUMBER: 60225117

CLIENT: Kimley-Horn and Associates Inc
Raleigh, NC

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. TC_CONSOL_STRAIN-USCS 60225117 FIRST CITIZEN'S B.GPJ TERRACON_DATATEMPLATE.GDT 9/29/22

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Terracon GeoReport

Client
Kimley-Horn and Associates Inc

Project
First Citizen's Bank
Long Beach, CA

Sample Submitted By: Terracon (60) **Date Received:** 9/21/2022 **Lab No.: 22-0657**

Results of Corrosion Analysis

Sample Number	--
Sample Location	B-4
Sample Depth (ft.)	0.0-5.0
pH Analysis, ASTM G 51	9.42
Water Soluble Sulfate (SO4), ASTM C 1580 (percent %)	0.02
Sulfides, AWWA 4500-S D, (mg/kg)	Nil
Chlorides, ASTM D 512, (mg/kg)	55
Red-Ox, ASTM G 200, (mV)	+722
Total Salts, AWWA 2540, (mg/kg)	995
Resistivity, ASTM G 57, (ohm-cm)	2037

Analyzed By: N. Campo

Nathan Campo
Engineering Technician II

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

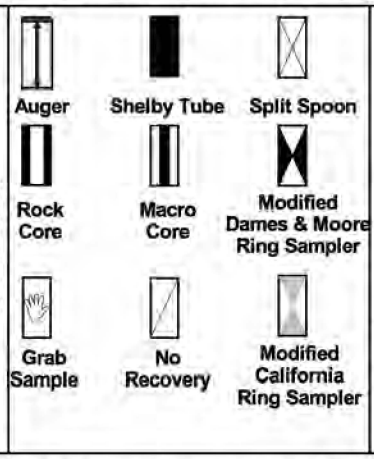
SUPPORTING INFORMATION

GENERAL NOTES

Terracon GeoReport

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL



Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
N	N value
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer
(WOH)	Weight of Hammer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Terracon GeoReport

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu ≥ 4 and 1 ≤ Cc ≤ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or [Cc<1 or Cc>3.0] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or [Cc<1 or Cc>3.0] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K, L, M, N] / Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K, L, M, P] / Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

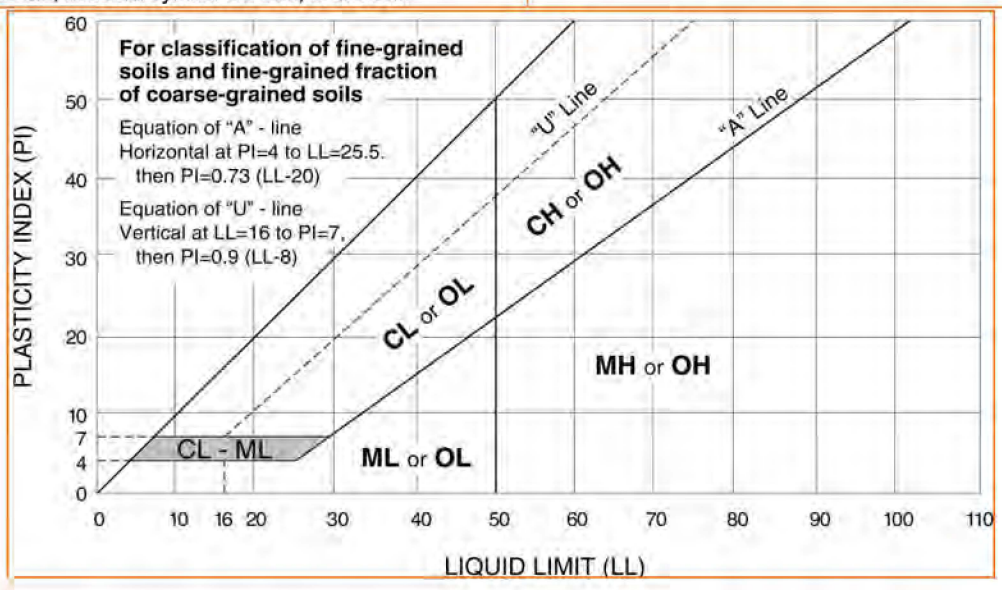
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



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June 7, 2024

Kimley-Horn & Associates
421 Fayetteville Street, Suite 600
Raleigh, North Carolina 27601

Attn: Mr. Andrew Plato
P: (919) 653-5857
E: Andrew.Plato@Kimley-horn.com

Re: Geotechnical Report Addendum No. 1
2022 CBC Seismic Design Parameters
First Citizen's Bank – Long Beach
3450-3470 Long Beach Boulevard
Long Beach, Los Angeles County, CA
Terracon Project No. 60225117

Dear Mr. Plato,

This letter shall serve as a response to the review comments prepared by Michael Baker International (On behalf of City of Long Beach). Terracon's original report for the project, and referenced as part of the review by Michael Baker International, is dated November 2, 2022 (Terracon Project No. 60225117).Our report provided recommendations for seismic design parameters based on the 2019 California Building Code (CBC). We understand seismic design parameters per the 2022 CBC are required for the project. We are providing this report Addendum No. 1 which serves as an update to our original geotechnical report for the project and provides updated seismic design parameters in accordance with the 2022 California Building Code

The 2022 CBC Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16 and 2022 CBC. The 2022 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than or equal 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structure. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were calculated using the site coefficients (Fa and Fv) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2022 CBC.

Description	Value
2022 California Building Code Site Classification (CBC) [1]	D [2]
Site Latitude (°N)	33.8199
Site Longitude (°W)	118.1889
S_s Spectral Acceleration for a 0.2-Second Period	1.665 g
S_1 Spectral Acceleration for a 1-Second Period	0.6 g
F_a Site Coefficient for a 0.2-Second Period	1.0
F_v Site Coefficient for a 1-Second Period	1.7

1. Seismic site classification in general accordance with the *2022 California Building Code.*
2. The 2022 California Building Code (CBC) requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The previous scope did not include the required 100-foot soil profile determination. Borings were extended to a maximum depth of 21½ feet, and the seismic site class definition considered that similar or denser soils continued below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

Based on the similarity in the seismic parameters from the 2019 and 2022 CBC codes, it is our opinion that the recommendations and conclusions in our original report shall remain applicable to the proposed project.

Closure

The conclusions, recommendations, and limitations presented in our November 2, 2022; report remain valid unless superseded herein. We appreciate being of service to you in the geotechnical engineering phase of this project. If you have any questions concerning this report, please contact us.

Sincerely,
Terracon Consultants, Inc.

स्मृति धिताल

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Senior Staff Engineer
*Registered in North Carolina

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