GARCREST
ENGINEERING AND CONSTRUCTION, INC

REPORT OF GEOTECHNICAL INVESTIGATION

PROPOSED BUILDING AND IMPROVEMENTS

813 N. Euclid Street

Santa Ana, California

Prepared for:

NA & ASSOCIATES, INC.

Lake Forest, California

April 2, 2018

G18-003/1

GARCREST
ENGINEERING AND CONSTRUCTION, INC

126 S. Jackson Street, Suite 300 - Glendale, California 91205
Telephone: 818-241-2408 - Facsimile: 818-241-2282

April 2, 2018

Mr. Nick Ayoub
NA & Associates, Inc.
22672 Lambert St, #606
Lake Forest, CA 92630

Subject: **Report of Geotechnical Investigation**
Proposed Buildings and Improvements
813 N. Euclid Street
Santa Ana, California
Project Number: G18-003/1

Dear Mr. Ayoub:

We are pleased to present the results of our geotechnical investigation for the proposed buildings and improvements located at the subject site. Our scope of services was performed in general accordance with our proposal dated January 19, 2018.

The onsite fill soils are not considered suitable for the support of the proposed building and improvements and should be overexcavated to the native soils, approximately 4½ feet below existing grade. The onsite soils are susceptible to seismically induced liquefaction settlement and consequently, to provide a uniform support the upper 5 feet below the building footing should be overexcavated and recompacted as properly compacted engineered fill. The proposed building should be supported on a mat foundation established on properly compacted engineered fill. Given the close proximity of the historical high groundwater to the surface, we recommend the mat to be underlain by a subfloor drain zone. The recommendations presented in this report should be incorporated into the design and construction of the proposed project.

The results of our investigation, our conclusions, and recommendations are presented in this report. The conclusions and recommendations presented in this report are subject to the limitations presented in Section 9 of this report. Part of obtaining a building permit for the project involves the submittal of this report by you or your representative to the appropriate government agencies.

We appreciate the opportunity to be of services to you. Please feel free to contact us should you have any further questions or if we can be of further service.

Respectfully submitted,
GARCREST Engineering and Construction, Inc.

REGISTERED PROFESSIONAL ENGINEER
ARMEN GAPRELIAN
No. 2868
Exp. 12/31/18
GEOTECHNICAL
STATE OF CALIFORNIA

Armen Gaprelian, PE, GE
Principal Engineer

Path: F:\GARCREST\Projects\2018 Projects\G18-003/1 - Santa Ana 7-11\report\Santa Ana 7-11 report.docx

TABLE OF CONTENT

PLATES

APPENDICES

1.0 - SCOPE

This report provides foundation design recommendations for the proposed building and improvements located at 813 N. Euclid Street, in Santa Ana, California. The site location is shown on Plate 1, Site Location Map. The proposed building and improvements footprint is shown on Plate 2, Plot Plan.

The site investigation was authorized to evaluate the subsurface conditions at the site, and to provide geotechnical recommendations for the design and construction of the proposed buildings and improvements. Our scope of services was performed in general accordance with our proposal dated January 19, 2018 and included performing a field investigation, laboratory testing, and preparing a geotechnical report including the following items and recommendations:

- Vicinity map and plot plan showing approximate field exploration locations;
- Logs of borings;
- Discussion of the scope of work;
- Discussion of field exploration methods;
- Results of laboratory testing;
- Discussion of subsurface conditions, as encountered in our field exploration;
- Discussion of liquefaction potentials.
- Recommendations for grading and site preparation;
- Recommendations for temporary excavations;
- Recommendations for utility trench backfill;
- Recommendations for seismic near-source factors;
- Recommendations for spread foundations, foundation settlement, and lateral resistance;
- Recommendations for support of minor foundations;
- Recommendations for slabs on grade;

The assessment of general site environmental conditions for the presence of the contamination in the soils and groundwater was beyond the scope of this investigation.

Our recommendations are based on the results of our field exploration, laboratory testing, and appropriate engineering analyses. Our analyses are based on the ultimate soil strength properties.

2.0 - PROJECT DESCRIPTION

We understand that a new 7-11 facility is proposed for the subject site that will include a new building approximately 3,000 square feet in size and associated parking and gas station. The proposed building is anticipated to be a single story structure. Subterranean construction is not anticipated. The proposed 7-11 convenience store building is located along the east side of the site and the remainder of the site is anticipated to consist of parking and associated gas station. Structural loads are not yet available but are anticipated to be relatively light. Although the site is vacant, we understand that prior use for the site may also have consisted of a gas station

The proposed building location is shown on Plate 2, Plot Plan.

3.0 - FIELD EXPLORATION AND LABORATORY TESTING

The subsurface soil conditions at the site were explored by performing three hollow-stem-auger borings within the site. The borings were performed to a depth of approximately 51½ feet below existing grade. Our field representative supervised the fieldwork, logged the borings, and collected relatively undisturbed and disturbed samples for further evaluation and laboratory testing. The borings were performed at the locations indicated on Plate 2, Plot Plan. Details of the field investigation and the Log of Borings are presented in Appendix A, Field Exploration.

Laboratory testing was performed on selected relatively undisturbed and disturbed samples collected during the investigation to aid in the classification of the soils and to determine pertinent engineering properties used for the development of geotechnical recommendations. The following tests were performed:

- In situ moisture and dry density determination
- Direct shear test
- Consolidation
- Atterberg Limits
- Percent Passing No. 200 Sieve

- Preliminary corrosivity test

Laboratory testing was performed by AP Engineering and Testing, Inc. of Pomona, California. All testing was performed in accordance with the latest versions of applicable ASTM methods. We have reviewed, approve, and concur with the results of the laboratory testing. Details of the laboratory testing and test results are presented in Appendix B, Laboratory Testing.

4.0 - SITE CONDITIONS

The site is located at 819 Euclid Street, in Santa Ana, California. In general, the site is relatively flat and undeveloped. As mentioned earlier, we understand that prior use for the site may also have consisted a gas station. Various utilities may cross the site.

5.0 – SUBSURFACE SOIL CONDITIONS

Fill soils to a depth of approximately 3 to 4 feet below grade were encountered within two of our borings at the site. Boring No.3 encountered up to 12 feet of fill, but it is anticipated that this may be local, perhaps associated with the previously existing gas station and associated tanks. . Deeper fill soils may be present beyond and between our borings. The onsite fill soils consist of sandy soils.

The native soils encountered at the site generally consist of medium dense silty sand soils and medium stiff to stiff sandy and clayey silts and silty clays. Insitu moisture contents vary between 1.5 and 31.5 percent and the dry density vary between 92 and 107 pounds per cubic foot.

Groundwater was encountered in one of the borings at a depth of approximately 26 feet below grade. According to the State (CGS, 1997), historical high groundwater is anticipated to be less than 5 feet below grade.

6.0 - LIQUEFACTION AND SEISMIC SETTLEMENT EVALUATION

Liquefaction is a phenomenon associated with shallow groundwater combined with the presence of loose, fine sands and/or silts within a depth of 50 feet below grade or less. Liquefaction occurs when saturated, loose, fine sands and/or silts are subjected to strong ground shaking resulting from an earthquake event. Liquefaction has the potential to result in the soil temporarily losing part or all of its shear strength. Part of this strength may return sometime after shaking ceases.

Liquefaction potential decreases with an increase in grain size, and clay and gravel content. Increasing duration of the ground shaking during a seismic event can also increase the potential for liquefaction.

As previously stated, groundwater was encountered in one of the borings at a depth of approximately 26 feet below grade. Historical high groundwater at the site is reported to be less than 5 feet below grade. Further, the site is located within a State of California designated liquefaction hazard zone and consequently a detailed liquefaction evaluation was performed as part of our scope of work.

We have selected the estimated magnitude and acceleration for the site in accordance with the National Earthquake Source Database provided on the USGS website. The ground acceleration used was estimated at two-thirds of the PGA_M for the site. The result of the evaluation is attached, and is summarized as a Magnitude 6.63 and a ground acceleration of 0.35g. Our liquefaction analysis has been performed using these values.

Liquefaction analyses based on the simplified procedures developed by Seed and Idriss (1971), with modifications suggested by NCEER (1997) were performed for the design basis earthquake (DBE). Seismically induced settlement of the non-saturated soils due to seismic ground shaking has been evaluated based on field data and using the Tokimatsu and Seed (1987) procedures. The results of our analyses are presented in Appendix C, Liquefaction Analysis.

Based on the results of our field investigation and laboratory testing, certain layers of the subsurface materials were evaluated for susceptibility for liquefaction using the requirements from Special Publication 117A - Guidelines for Evaluating and Mitigating Seismic Hazards in California dated 2008 (Page 35).

The results of our liquefaction analyses estimate the seismically induced liquefaction settlements at the site following the site improvements as recommended in our report to be on the order of 2½-inches. Differential settlement is anticipated to be on the order of one-inch.

Seismically induced settlement of the non-saturated soils due to seismic ground shaking has been evaluated based on field data and using the Tokimatsu and Seed (1987) procedures. We estimate the seismically induced dry settlements to be on the order of ¼-inch. Differential settlements are estimated to be less than ¼-inch.

7.0 - CONCLUSIONS AND RECOMMENDATIONS

7.1 - GENERAL

Based on our field exploration, the results of our laboratory testing, and our geotechnical analyses, it is our professional opinion that the proposed project may be constructed and is feasible from a geotechnical perspective. The recommendations presented in this report should be incorporated into the design and construction aspects of the proposed project.

As discussed earlier, fill soils were encountered within our borings to a depth of approximately 3 to 4 feet below existing grade and in at least one location near Boring B-3, up to 12 feet below grade. Deeper fill soils may be present between and beyond our borings. The onsite fill soils are not considered suitable for support of structures. The native soils generally consist of medium dense silty sand soils and medium stiff sandy and clayey silts and silty clay soils.

Based on the results of our field investigation and a depth to historically high groundwater level as shallow as approximately 5 feet below grade, the results of our liquefaction evaluation appear to indicate that some of the onsite soils may have susceptibility to seismically induced liquefaction settlement. The analysis evaluated seismically induced settlements on the order of 2½ inches for the site which exceed tolerable limits of conventional spread foundations. The zones of settlement are evaluated to be at depths that are not practical for surficial site improvement. To provide a uniform support however, we recommend that at least the upper 5 feet of the onsite soils below the bottom of the mat be overexcavated and recompacted as properly compacted engineered fill.

Given the potential for liquefaction settlement at the site, we recommend that the proposed building be supported on a mat foundation established in the properly compacted engineered fill soils as summarized above and discussed in this report. The proposed excavation bottom should also extend laterally a distance of at least 5 feet beyond the edge of the proposed foundations.

The extent of removal and recompaction below the proposed pavement areas may be reduced to approximately 2 feet below existing grade.

Deeper fill soils were encountered at the northwest corner of the site near Boring B-3. It is likely that this fill is undocumented and a remnant of backfill from a removal of a prior tank for the original gas station. The fill should be overexcavated to the native soils and backfill as properly compacted engineered fill prior to support of foundations or improvements.

Mat foundations established as recommended in the Foundations section of this report may be designed for an allowable bearing value of 2,000 pounds per square foot.

Slabs on grade, where required, may be supported on the properly compacted soils as recommended herein.

Given the potential for shallow historical high groundwater, we recommend a subfloor drainage system be installed below the mat foundation. Recommendations for a subfloor drain are presented in this report.

The proposed project will also include a gas station and potential below grade fuel tanks. To reduce the potential for uplift pressures on the tanks should the groundwater rise, we recommend that the tanks be anchored to the supporting subgrade using helical type of similar type anchors attached to straps preventing the tank uplift. The depth of embedment of the anchor systems should be evaluated by the tank designer in order to provide sufficient restraining capacity.

7.2 - EARTHWORK

7.2.1 - Site Preparation

As discussed earlier, the proposed building may be supported on a mat foundations established in the properly compacted engineered fill. Following the overexcavation of the existing fill and portion of upper native soils to a depth of at least 5 feet below the bottom of the proposed mat, the exposed subgrade should be observed by a Garcrest representative for unsuitable soils and debris and the excavation deepened as necessary. The excavation should extend at least 5 feet laterally beyond the edge of the proposed foundations.

The extent of removal and recompaction below the proposed pavement areas may be reduced to approximately 2 feet below existing grade. The exposed subgrade should then be scarified to a depth of 8-inches, brought to 3 percent of the optimum moisture and compacted to a minimum of 90 percent relative compaction as obtainable by ASTM Designation D-1557.

7.2.2 – Excavation Conditions

The borings were performed using a truck mounted hollow stem auger drilling equipment. Drilling was completed using moderate effort through the onsite soils. Conventional earthmoving equipment should be capable of performing the anticipated excavations required. The onsite soils consist of silty sands, and sands.

7.2.3 - Compaction

Engineered fill soils should be placed in loose lifts of no more than 8-inches, brought to a moisture content of within 3 percent of the optimum moisture content, and mechanically compacted using heavy roller and/or vibratory equipment. The fill soils should be compacted to at least 95 percent of maximum dry density.

7.2.4 - Material for Fill

The onsite soils less any debris or organic matter, may be used as fill soils. Import soils should be granular in nature and be relatively non-expansive. Import fill soils should have a minimum sand equivalent of 30, and an expansion index of less than 35. The import soils should contain sufficient fines to provide a stable subgrade and maintain low to medium permeability. All import materials should be approved by our personnel prior to import onto the site.

7.2.5 - Trench Backfill

All required trench backfill should be mechanically compacted to a minimum of 90 percent relative compaction. Trench backfill should be placed in loose lifts of 8-inches or less, brought to within 3 percent of the optimum moisture content, and compacted with mechanical equipment. Jetting or flooding is not permitted. Some settlement of the backfill may occur and utilities within the trench should be designed to accept some differential settlement.

7.2.6 - Excavation and Temporary Slopes

Excavations deeper than 4 feet should be slopped back at 1:1 (H:V) or be shored for safety. Unshored excavations should not extend below a 1½:1 (H:V) plane drawn downward from the bottom of adjacent existing foundations.

Earthen berms or other methods should be used during wet weather construction in order to prevent runoff water from entering the excavations. All runoff water should be collected and disposed of outside the construction limits.

Excavations should be observed by a representative from our firm so that modifications as a result of varying soil conditions may be facilitated.

All excavations must comply with applicable local, state, and federal safety regulations including the current OSHA Excavation and Trench Safety Standards. Construction site safety is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. Excavations and temporary slopes should be protected from surficial erosion and the effects of inclement weather by the project contractor. Protective measures such as plastic or jute mesh may be used to protect against the potential for surficial sloughing.

7.3 - FOUNDATIONS

The proposed buildings may be supported on a mat foundation established in the properly compacted fill soils prepared as recommended in the Earthwork section above. Foundation systems may not be established in a combination of engineered fill and native, or straddle cut/fill transitions.

Prior to placement of steel reinforcement, the foundation excavations should be cleaned of debris and loose soils and water. The footing excavations should be observed by a Garcrest representative just prior to steel and concrete placement to verify the implementation of the recommendations made herein.

7.3.1 - Bearing Value

Mat foundations established at least 12-inches below the lowest adjacent grade may be designed for a net dead-plus-live allowable pressure of 2,000 pounds per square foot.

A one-third increase may be used for wind and seismic loading conditions. The recommended bearing value is a net value. The weight of the concrete in the footing may be taken as 50 pounds per cubic foot and the weight of the soil backfill may be neglected when determining the downward loads.

Footings may experience an overall loss in bearing capacity or an increased potential to settle where located above and in close proximity to existing or future utility trenches. Furthermore, stresses imposed by the footings on the utility lines may cause the utilities to crack, collapse and/or lose serviceability. To reduce this risk, footings should extend below a 1:1 plane projected upward from the closest bottom corner of utility trenches.

7.3.2 - Settlement

Structural loads are anticipated to be relatively light. Based on the type of materials at the site, the anticipated loads, and the results of our laboratory testing, we anticipate the total static settlement of the proposed foundations to be on the order of ½ to ¾ of inch for a mat foundation. Differential settlements are anticipated to be less than ½-inch.

7.3.3 - Lateral Resistance

Resistance to lateral loads may be provided by friction between the soil and the foundation, and by the passive resistance of the soil against the vertical face of the foundation. A coefficient of friction of 0.4 may be used between the foundation and underlying soil. The passive resistance of the soil may be taken as equivalent to the pressure developed by a fluid with a density of 300 pounds per cubic foot. A one-third increase may be used for wind and seismic loading conditions and the passive and sliding values may be combined without reduction.

Sloughing, caving, or over widening of trench sidewalls during or following excavations may reduce or eliminate the passive resistance of the subgrade soils against foundations. In the event such conditions are encountered, our firm should be notified to review the condition and provide remedial recommendations, if necessary.

7.3.4 - Minor Foundations

Footings for minor structures, such as small retaining walls, that are structurally separate from buildings may be supported on shallow spread footings, established at least 18-inches below the lowest adjacent grade, and be designed for a bearing capacity of 1,500 pounds per square foot.

Such footings may be supported on properly compacted engineered fill or undisturbed native soils.

7.4 - SEISMIC CONSIDERATIONS

The site is located within the seismically active Southern California region. As a minimum, we recommend that the proposed buildings be designed in accordance with the requirements of the latest edition of the California Building Code (CBC).

The structure may be designed to resist earthquake forces following the 2016 edition of California Building Code (CBC), which is based on the 2015 edition of the International Building Code (IBC). The Site Classification, as defined in Section 1613.3.2 of the CBC, may be assumed to be a Site Class D, Stiff Soil Profile.

The mapped maximum considered earthquake spectral response accelerations, Ss and S1, are obtained from Figures 1613.3.3(1) and 1613.3.3(2) from the CBC. Using site coefficients Fa and Fv of 1.0 and 1.5 respectively, spectral response accelerations $\mathbf{S_{MS}}$ and $\mathbf{S_{M1}}$ of 1.450g and 0.0.798g and $\mathbf{S_{DS}}$ and $\mathbf{S_{D1}}$ of 0.967 g and 0.532g may be used for a Site Class D.

7.5 - FLOOR SLAB SUPPORT

Prior to placement of slabs on grade, the subgrade beneath slabs on grade should be prepared as recommended in the Earthwork section of this report.

Following the preparation of the subgrade as recommended above, concrete floor slabs and walks may be supported on grade. The concrete slab on grade should have a minimum thickness of 5-inches and a structural engineer should design the minimum reinforcement requirements. We recommend minimum reinforcement of No.4 at 18-inches on center for the design of the slab.

Construction activities and exposure to the elements may cause deterioration of the prepared subgrade. We recommend that the exposed subgrade be inspected by our representative and that the subgrade be moisture conditioned and compacted, if necessary, prior to placement of the concrete floor slab.

The proposed floor slab on grade may be designed for a modulus of subgrade reaction of 120 pounds per cubic inch.

To reduce the impact of subsurface moisture and upward moisture migration on vinyl or other moisture sensitive flooring where such floor covering is planned, we recommend that the floor slab be underlain by a vapor retarder and a layer of compacted crushed rock, as is the current industry standard.

The rock typically consists of a minimum of 4 inches of crushed rock or aggregate base material compacted to a minimum of 95 percent relative compaction.The vapor retarding membrane should consist of visqueen or poly-vinyl sheeting with a thickness of at least 15mils. We recommend a low slump concrete with a slump not exceeding 3-inches be used to reduce possible curling of the slab.

It should be noted that these vapor barriers, although currently the industry standard, may not completely inhibit the upward migration of subsurface moisture. Other factors such as the moisture transmission rates to meet for specific floor coverings and interior humidity levels that could induce mold growth may still be beyond the prevention capabilities of the current standard. The effectiveness of the industry standard system is highly dependent on the ultimate use and design of the proposed building, its ventilation, and the indoor moisture levels.

Various factors such as surface grades, the presence of adjacent planters, the quality of the concrete placed, and permeability of the supporting soils will affect future performance. We recommend that the manufacturer for the specific flooring used be contacted for additional consultation specific to their product. The quality of the concrete slab, including the water/cement ratio and curing practices can also affect the ultimate performance of the slab. All concrete placement and curing should be performed in accordance with applicable American Concrete Institute (ACI) methods.

We are not moisture proofing experts and therefore make no guarantees or provide assurances that the use of a capillary break/vapor retarding system will reduce infiltration of subsurface moisture through the floor slab in accordance with any specific flooring material performance specifications.

7.6 - SUBDRAIN

For a subfloor drain system, we recommend that the proposed mat be underlain by a layer of filter material at least 12-inches in thickness. The filter material should be drained by perforated subdrain pipes leading to a sump and automatic pumps or be connected to a suitable drainage system. The filter should conform to the requirement of a Class 2 permeable base material as defined by the most current State Specifications. The drain lines should consist of perforated pipes, placed with the perforations down, in trenches extending at least one foot below the filter material. The trenches should be backfilled with materials meeting the requirements of Class 2 permeable base material. The drain lines should extend around the perimeter of the lowest level and should be spaced approximately 25 to 30 feet apart within the interior of the building.

As discussed above, if a subdrain is not provided, the proposed structure should be designed for hydrostatic and buoyant pressures.

A permit from the Regional Water Quality Control Board may have to be obtained to discharge the subdrain water into the storm drain system. To obtain such a permit, chemical testing will have to be performed on groundwater samples obtained from the site to verify that chemicals and pollutants within the water do not exceed allowable limits for discharging into storm drains.

7.7 - PAVEMENT DESIGN

To provide support for paving, the subgrade soils should be prepared as recommended in the Earthwork Section of this report. Our pavement recommendations are based on our findings and observations during our field investigation. For the purposes of design, we have assumed an R-value representative of the onsite soils. Confirmatory testing may be required during the grading and earthwork. We have assumed an R-value of 25 for design.

The required pavement thicknesses are based on expected wheel loads and the volume of traffic (TI or Traffic Index). Anticipated traffic indices of 4 through 7 have been used to develop pavement recommendations as presented in the tables below.

Asphalt Concrete Pavement

Traffic Usage	Traffic Index	AsphalticConcrete (inches)	Base Course (inches)
Automobile Parking Areas	4	3	5
Automobile Traffic	5	3	7
Truck Traffic	6	3½	9
Heavy Truck Traffic	7	4	11

Portland Cement Concrete Pavement

Traffic Usage	Traffic Index	Portland Cement Concrete (inches)	Base Course (inches)
Automobile Parking Areas	4	6½	4
Automobile Traffic	5	6½	4
Truck Traffic	6	7	4
Heavy Truck Traffic	7	7½	4

The above sections have been derived based on the following assumptions.

- The subgrade soils below pavements should be overexcavated to a depth of 2 feet below the pavement section, brought to within 3 percent of the optimum moisture content, and compacted to a minimum of 90 percent relative compaction in accordance with the recommendations in the Earthwork section of this report

- The upper 6-inches of the prepared subgrade should be compacted to a minimum of 95 percent relative compaction.

- The aggregate base is brought to within 2 percent of the optimum moisture content and compacted to a minimum of 95 percent relative compaction.

- The subgrade is stable and non-pumping.

- Adequate drainage is provided to reduce the potential of water migration and ponding under the pavement section.

- Planter curbs and gutters extend at least 4-inches into the subgrade level and below the base course to reduce the migration of water into the pavement base course.

- Minimum Portland cement concrete compressive strengths of 4,000 pounds per square inch have been used for design.

- Base courses should conform to Caltrans or Standard Specification for Public Works Construction (Green Book) specifications.

- Asphalt pavement materials and placement methods should be in accordance with Caltrans methods.

7.8 - SITE DRAINAGE

Ponding and saturation of the soils in the vicinity of the proposed foundations should be avoided. To reduce this potential, we recommend that positive drainage be provided for the site, in both improvement and landscaping areas, to carry surface water away from the building foundations and slabs on grade and towards appropriate drop inlets or other surface drainage devices. Site grading adjacent to structures and foundations should be slopped away a minimum of 5 percent for a minimum distance of 10 feet away from the face of wall. Impervious surfaces within 10 feet of structures should be sloped a minimum of 2 percent away from the building. These grades should be maintained for the life of the structure. We also recommend that roof runoff be connected to a suitable collection and discharge system to avoid surface discharge and potential saturating the soils near foundations. Poor perimeter and surface drainage may result in water migration beneath building foundations, and may result in potential distress to the proposed improvements.

Planter areas adjacent to the building and foundations should be lined to reduce the infiltration of irrigation water beneath the building. Care should also be taken to maintain a leak-free irrigation system.

7.9 - EXPANSIVE SOILS

Soils that have the potential for volume change (shrinkage and swelling) caused by moisture variations or drying and wetting cycles are classified as expansive soils. Soil moisture variations are typically a result of rainfall, irrigation, poor drainage, roof drains discharging surficially, and exposure to heat and drought conditions. This shrinkage and swelling action can potentially result in distress to pavements, floor slabs-on-grade, and foundations and grade beams.

Based on the results of our field investigation, the site is underlain by relatively granular soils that are anticipated to have very low to negligible expansion potentials.

7.10 – COLLAPSIBLE SOILS

Collapsible soils are defined as soils with a potential for a significant decrease in strength and increase in compressibility when wet or saturated (hydro-collapse). Collapsible soils typically consist of relatively sandy soils that exhibit a degree of cementation.

Based on the results of our laboratory testing, the onsite soils do not exhibit a significant collapse potential.

7.11 - CORROSIVITY

Selected samples of the near surface soils were collected and tested for corrosivity potential. The samples were tested for pH, resistivity, soluble chlorides, and soluble sulfates in general accordance with California Test Methods 643, 422, and 417 respectively. The results of the tests are presented in Appendix B. Preliminary corrosivity testing indicates that the soils have a moderate to high corrosivity potential to buried ferrous metals and a moderate potential to buried concrete structures. Based on the preliminary corrosivity results, concrete structures should comply with cement type, minimum compressive strength, and minimum water/cement ratio requirements as specified in ACI guidelines 318, Section 4.3.

These tests are only an indicator of the soil corrosivity at the site. A competent corrosion engineer should be consulted to further evaluate the corrosion potential for the onsite soils, suggest additional testing if needed, and to provide further recommendations for corrosion mitigation as applicable to the specific project and improvements.

8.0 - ADDITIONAL SERVICES

We recommend that Garcrest perform a review of the project specifications and plans to evaluate the correct interpretation and incorporation of the recommendations presented in this report into the project design. We will assume no responsibility for incorrect or inadequate interpretation of the recommendations herein should we not be retained for the review of the project plans and specifications.

We also recommend that our firm be retained to perform the geotechnical observation and testing services for the earthwork operations at the site. The services may include the following:

- Observation of cleaning and excavating operations,
- Observation and inspection of the exposed subgrades to receive fill,
- Evaluation of the suitability of import soils,
- Observation and testing of fill placed,
- Observation and probing of foundation excavations prior to placement of concrete.

This service allows us the opportunity to evaluate the applicability of the recommendations presented herein during the construction phase and allows us to make additional recommendations, if necessary. If another firm is retained to provide geotechnical observation services, our professional liability and responsibility would be limited to the extent that we would no longer be the geotechnical engineer of record.

9.0 - LIMITATIONS

The recommendations presented herein are based on our understanding of the described project information and our interpretation of the data collected during our field investigation. The findings, conclusions, and recommendations presented in this report have been prepared in accordance with the accepted geotechnical practices. Our services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made to the professional advice included in this report.

This report has been prepared exclusively for Nick Ayoub and ASI Developments and their design consultants for the specific application of their project located 813 N. Euclid Street in

Santa Ana, California. This report has not been prepared for other parties and may contain insufficient information for the purpose of other parties and other uses.

The client is responsible for the distribution of this report to all parties associated with the project, including design consultants, contractors, subcontractors. This report may be used to prepare project specifications but is not intended to be used as a specification document.

This report is intended for the sole use of the Client for this specific project within a reasonable time from its issuance. Regulatory and site condition changes may result in the additional information to be incorporated into the report and additional work to be performed by Garcrest prior to the issuance of an update. Non-compliance with these limitations releases Garcrest from any liability resulting from the use of this report by other unauthorized parties

PLATES

SCALE: Not to Scale

REFERENCE: GoogleMaps (2018)

NORTH

GARCREST

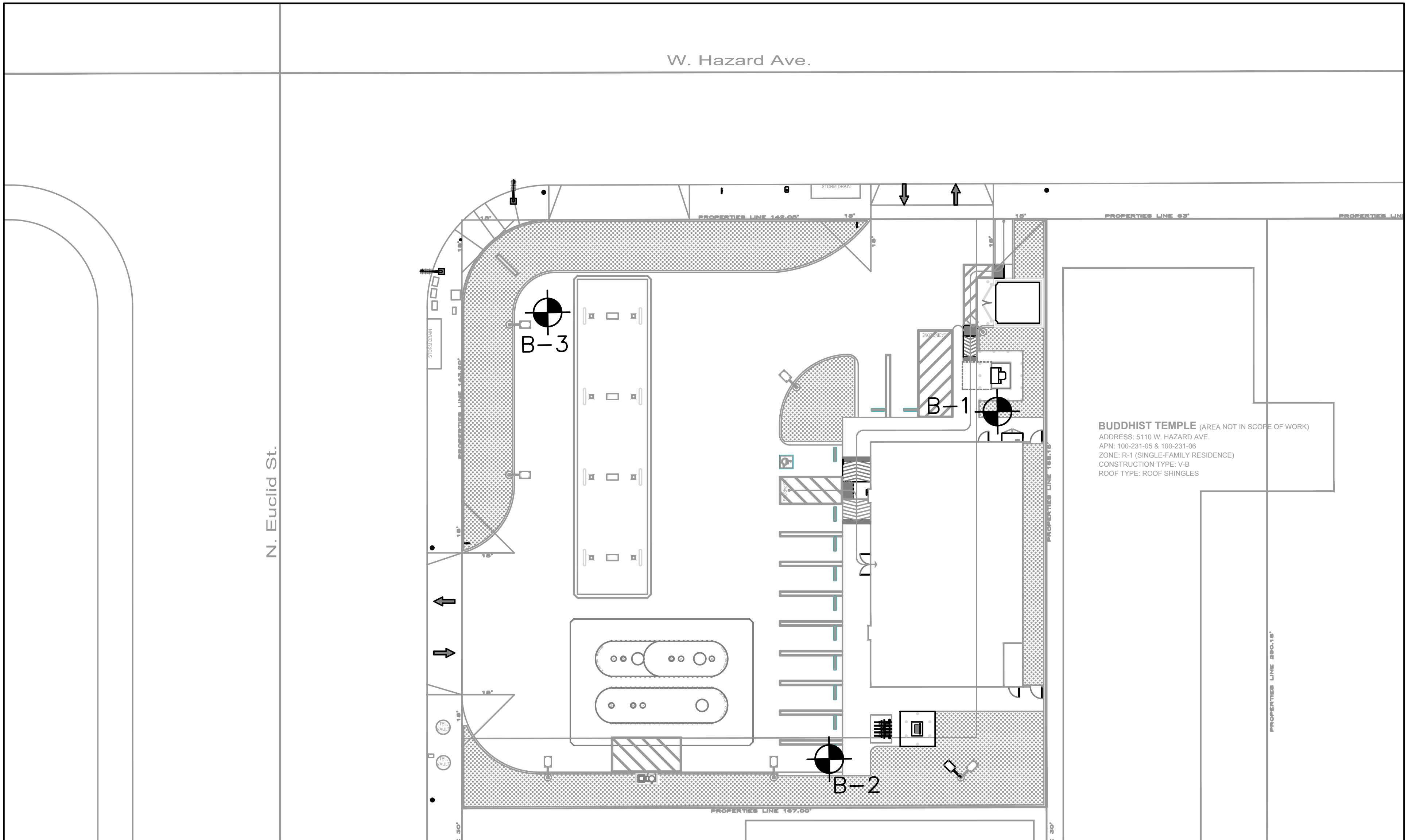
ENGINEERING AND CONSTRUCTION, INC.

SITE LOCATION MAP

Proposed Building and Improvements
813 N. Euclid Street, Santa Ana, California
Project No. G18-003/1

PLATE

1



KEY — Approximate Boring Location

REFERENCE: Base plan provided by NA and Associates

SCALE

1 40

NORTH

GARCREST

ENGINEERING AND CONSTRUCTION, INC.

PLOT PLAN

Proposed Retail Building
813 N. Euclid Street, Santa Ana, California
Project No. G18-003/1

PLATE

2

APPENDIX A – FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

The soil conditions at the site were explored by drilling two borings using a truck-mounted hollow stem auger type drilling equipment provided by 2R Drilling of Chino, California. The borings were performed on February 2, 2018. The borings were advanced to a depth of 51½ feet below the existing grade. The boring locations are shown on Plate 2, Plot Plan. The borings were backfilled using the excavated cuttings and tamped.

The soils encountered were logged by our field engineer and relatively undisturbed and bulk samples were collected for laboratory inspection and testing. The logs of our borings are presented on Figure A-1 through A-3, Log of Borings. The samples were classified in accordance with the Uniform Soil Classification Method (USCS).

A California-type ring sampler was used to collect the relatively undisturbed samples. The sampler was driven a total of 18-inches. The number of blows required to drive the sampler the final 12-inches was recorded on the borings logs. The hammer weight and drop height are also indicated on the boring logs.

Disturbed samples were also collected using a Standard Penetration Test (SPT) sampler. The sampler was driven a total of 18-inches and a number of blows required to drive the final 12-inches were recorder and are presented on the boring logs. The SPT was driven using a 140-pound automatic trip hammer falling a drop height of 30 inches.

Garcrest Engineering & Construction, Inc.
LOG OF BORING

PROJECT NO.:	G18-003/1	**DRILLER:**	2R Drilling	**LOGGED BY:**	EH
PROJECT NAME:	Santa Ana 7-11	**DRILL METHOD:**	8" Hollow Stem Auger	**OPERATOR:**	
LOCATION:	813 N. Euclid Street	**HAMMER:**	140 pound Auto/30 inches	**RIG TYPE:**	CME55
ELEVATION:				**DATE:**	2/2/2018

BORING NO.: *B-1*

Depth (ft)	Sample Type	Blows/ 6"	Blows/Foot	Sample Number	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Moisture Content (%)	Dry Density (pcf)	Others
					SM	**FILL** **SILTY SAND -** grayish tan, slightly moist, fine to medium grained			
						--tan brown			
					SP	**NATIVE** **SAND -** light tan brown, slightly moist, fine to medium grained, medium dense			
5	Ring	10, 14, 6	24	1		--3.1% passing No. 200 sieve	3.7	98	DS
	SPT	8, 9	17						
	Ring	9, 10	19	2	SM	**SILTY SAND** - dark grayish brown, moist, fine grained, medium dense --24.1% passing No. 200 sieve	1.5	107	CONS
	SPT	3, 3, 6	9	3		-- loose			
10	SPT	3, 5, 7	12	4		--48.2% passing No 200 sieve, medium dense			
					ML	**SANDY SILT** - gray, moist, very fine to fine, medium stiff			
15	Ring	5, 11	16	6		--82.7% passing No. 200 sieve	31.5	92	
20	SPT	2, 2, 3	5	7		--56.0% passing No. 200 sieve, very moist	27.9		
					SM	**SILTY SAND** - dark gray, very moist, very fine grained, medium dense			
25	SPT	4, 6, 4	10	9		Water Table			

Legend: --Ring ---SPT ---Bulk ---No Recovery ---Water Table

chk: AG 04/02/18

PLATE A-1a

Garcrest Engineering & Construction, Inc.
LOG OF BORING

PROJECT NO.:	G18-003/1	**DRILLER:**	2R Drilling	**LOGGED BY:**	EH
PROJECT NAME:	Santa Ana 7-11	**DRILL METHOD:**	8" Hollow Stem Auger	**OPERATOR:**	
LOCATION:	813 N. Euclid Street	**HAMMER:**	140 pound Auto/30 inches	**RIG TYPE:**	CME55
ELEVATION:				**DATE:**	2/2/2018

BORING NO.: *B-1 (cont.)*

Depth (ft)	Sample Type	Blows/ 6"	Blows/Foot	Sample Number	Graphical Log	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Moisture Content (%)	Dry Density (pcf)	Others
30		5 4 4	13	10		**SM**	**SILTY SAND -** gray, wet, fine grained, medium dense --11.2% passing No. 200 sieve			WASH
35		3 4 6	13	11		**CL**	**SANDY CLAY** - gray, wet, fine grained, stiff -- LL=31, PI=13	29.1		PI
40		5 9 10	24	12		**SM**	**SILTY SAND** - gray, wet, fine grained, nedium dense --39.3 passing No. 200 sieve			
45		6 5 8	19	13		**CL**	**SANDY CLAY** - gray, wet, fine grained, very stiff --LL=35, PI=14	31.1		PI
50		5 7 9	21	14		**ML**	**SANDY SILT** - gray, wet, fine grained, very stiff -- LL=32, PI=7	27.3		PI

NOTES:
BORING TERMINATED AT 51½ -feet.
Groundwater encountered at 26.5 feet below grade
Boring backfilled with cuttings and tamped

Legend: --Ring ---SPT ---Bulk ---No Recovery ---Water Table

chk: AG 04/02/18

PLATE A-1b

Garcrest Engineering & Construction, Inc.
LOG OF BORING

PROJECT NO.:	G18-003/1	**DRILLER:**	2R Drilling	**LOGGED BY:**	EH
PROJECT NAME:	Santa Ana 7-11	**DRILL METHOD:**	8" Hollow Stem Auger	**OPERATOR:**	
LOCATION:	813 N. Euclid Street	**HAMMER:**	140 pound Auto/30 inches	**RIG TYPE:**	CME55
ELEVATION:				**DATE:**	2/2/2018

BORING NO.: *B-2*

Depth (ft)	SAMPLES: Sample Type	Blows/ 6"	Blows/Foot	Sample Number	Graphical Log	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Moisture Content (%)	Dry Density (pcf)	Others
0						**SM**	**FILL** **SILTY SAND -** dull gray to brown, dry to slight moist, fine grained			
4						**SM**	**NATIVE** **SILTY SAND** - beige tan, slightly moist, medium dense, medium grained, nedium dense			
5		5 9 11	20	1						
7		5 6 7	13	2						CORR
10		2 3 5	8	3			-- loose			
15		7 7 9	16	4			-- medium dense			
17						**ML**	**SANDY SILT** - gray, moist, very fine to fine, stiff			
20		2 3 5	8	5						
							NOTES: BORING TERMINATED AT 21½ -feet No Groundwater encountered Boring backfilled with cuttings and tamped			

Legend: --Ring -SPT ---Bulk ---No Recovery ---Water Table

chk: AG 04/02/18

PLATE A-2

Garcrest Engineering & Construction, Inc.
LOG OF BORING

PROJECT NO.:	G18-003/1	**DRILLER:**	2R Drilling	**LOGGED BY:**	EH
PROJECT NAME:	Santa Ana 7-11	**DRILL METHOD:**	8" Hollow Stem Auger	**OPERATOR:**	
LOCATION:	813 N. Euclid Street	**HAMMER:**	140 pound Auto/30 inches	**RIG TYPE:**	CME55
ELEVATION:				**DATE:**	2/2/2018

BORING NO.: *B-3*

Depth (ft)	SAMPLES: Sample Type	Blows/ 6"	Blows/Foot	Sample Number	Graphical Log	USCS Symbol	MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing: Moisture Content (%)	Dry Density (pcf)	Others
0						SP	**FILL** **SAND with Gravel** - beige gray, dry, coarse			
4.5						SM	**SILTY SAND -** gray/brown, moist, fine to medium grained, gravel fragments			
5		7 13 26	39	1						
7		6 6 7	13	2						
10		5 7 11	18	3			-- petroleum odor			
						SM	**NATIVE** **SILTY SAND** - gray/brown, moist, fine to med. grained, medium dense			
15		3 2 6	8	4		ML	**SANDY SILT** - dark gray, very moist, very fine to fine, stiff			
20		5 7 8	15	5						

NOTES:
BORING TERMINATED AT 21½ -feet
No Groundwater encountered
Boring backfilled with cuttings and tamped

Legend: --Ring --SPT ---Bulk ---No Recovery ---Water Table

chk: AG 04/02/18

PLATE A-3

APPENDIX B – LABORATORY TESTING

APPENDIX B

LABORATORY TESTS

Laboratory tests were performed on selected samples to aid in the classification of the soils encountered and to determine engineering properties for the onsite soils. The laboratory tests were performed by AP Engineering and Testing, Inc. of Pomona, California.

Field moisture content and dry densities of the soils were determined by performing tests on relatively undisturbed samples collected. The results are presented on the boring logs and Figure B-1, Moisture and Density Test Results.

Direct Shear tests were performed on selected samples to evaluate the strength parameters of the soils. The tests were conducted on samples after soaking to near-saturated moisture content at various surcharges. The tests were performed in general accordance with ASTM Standard Test Method D-3080. The tests were performed at a strain rate of 0.005 inches per minute under soaked conditions. The results of the tests are shown on Figure B-2, Direct Shear Test Results.

A Consolidation test was performed on a selected sample to evaluate the compressibility of the soils. The test was conducted in general accordance with ASTM Standard Test Method D-2435. Water was added to the sample to illustrate the effect of moisture on compressibility. The results are presented on Figure B-3, Consolidation Curve.

The percent passing the No. 200 sieve of selected samples was performed by wash sieving in accordance with ASTM Standard Test Method D-1140. The results are presented on Figure B-4, Percent Passing No. 200 Sieve.

Plasticity index testing was performed on selected samples of the soils to evaluate the plasticity characteristics and to aid in classification. The tests were performed in general accordance with ASTM Standard Test Method D 4318. The results are presented on Figure B-5, Atterberg Limits.

A series of corrosivity tests were performed on selected samples of the soils encountered at the site. The tests included pH, resistivity, soluble chlorides and soluble sulfates. The tests were performed in general accordance with California Test Methods 643, 422, and 417 respectively. The results are presented on Figure B-65, Corrosion Test Results

AP Engineering & Testing, Inc.

A Certified DBE/MBE/SBE Company

February 15, 2018

To: Garcrest Engineering and Construction, Inc.
126 S. Jackson Street, Suite 300
Glendale, California 91205

Attention: Armen Gaprelian, P.E., G.E.

Subject: Laboratory Test Report
Project Name: Euclid/Hazard
Project No.: G18-003/1

Dear Armen,

This letter is to certify that AP Engineering and Testing has performed laboratory soil tests for the subject project. The laboratory testing program as requested by you consisted of:

- 1 Moisture Content & Density (ASTM D 2216 & D 2937)
- 4 Moisture Content Only (ASTM D 2216)
- 4 Atterberg Limits (ASTM D 4318)
- 7 Percent Passing #200 Sieve (ASTM D 1140)
- 1 Corrosion Suite (CTM 417, 422 & 643)
- 1 Consolidation (ASTM D 2435)
- 1 Direct Shear (ASTM D 3080)

All tests were performed in accordance with the applicable standards as indicated above under the supervision of a registered geotechnical engineer. Attached please find the test results.

We appreciate the opportunity to be of service to you. Should you have any questions, please call our office at your convenience.

Respectfully submitted,

AP Engineering and Testing, Inc.
Certificate No. 10130

Apichart Phukunhaphan, P.E., G.E.
Principal Engineer

Distribution: 1 Addressee

Attachments: Laboratory Test Results

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

MOISTURE AND DENSITY TEST RESULTS

Client: Garcrest Engineering
Project Name: Euclid/Hazard
Project No.: G18-003/1

AP Lab No.: 18-0216
Date: 02/12/18

Boring No.	Sample No.	Sample Depth (ft.)	Moisture Content (%)	Dry Density (pcf)
B1	-	15	31.5	92.1
B1	-	20	27.9	NA
B1	-	35	29.1	NA
B1	-	45	31.1	NA
B1	-	50	27.3	NA

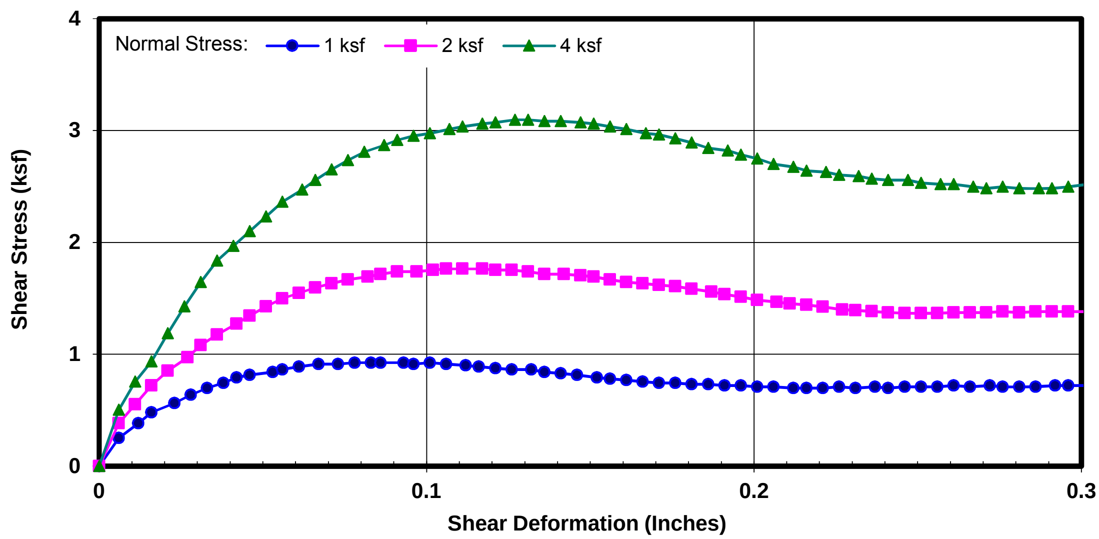
AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

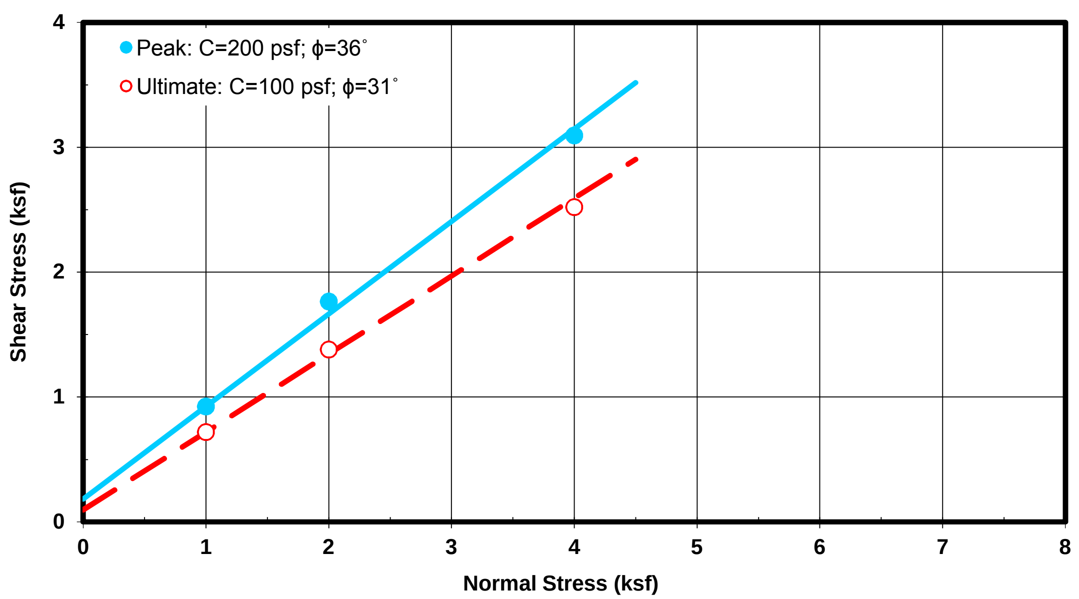
DIRECT SHEAR TEST RESULTS
ASTM D 3080

Project Name: Euclid/Hazard
Project No.: G18-003/1
Boring No.: B1
Sample No.: - **Depth (ft):** 5
Sample Type: Mod. Cal.
Soil Description: Poorly-Graded Sand w/silt
Test Condition: Inundated **Shear Type:** Regular

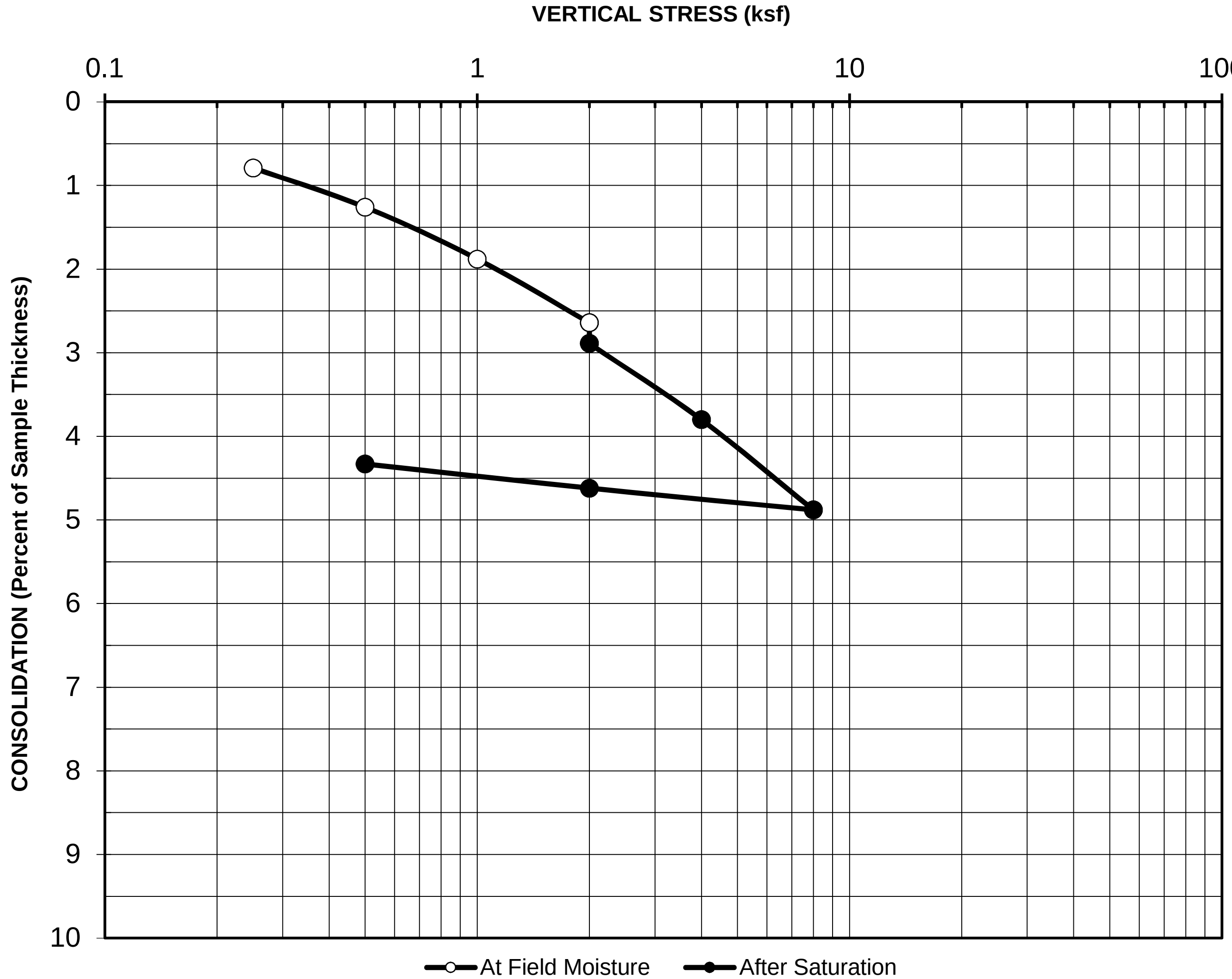
Tested By: ST **Date:** 02/13/18
Computed By: JP **Date:** 02/15/18
Checked by: AP **Date:** 02/15/18

Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)	Initial Degree Saturation (%)	Final Degree Saturation (%)	Normal Stress (ksf)	Peak Shear Stress (ksf)	Ultimate Shear Stress (ksf)
101.8	98.2	3.7	23.8	14	90	1	0.924	0.720
						2	1.764	1.380
						4	3.096	2.520





AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com



Boring No. :	B1	Initial Dry Unit Weight (pcf):	107.0
Sample No.:	-	Initial Moisture Content (%):	1.5
Depth (feet):	7.5	Final Moisture Content (%):	18.2
Sample Type:	Mod Cal	Assumed Specific Gravity:	2.7
Soil Description:	Poorly-Graded Sand w/silt	Initial Void Ratio:	0.57
Remarks:	Collapse= 1.98% upon inundation		

CONSOLIDATION CURVE
ASTM D 2435

Project Name:	Euclid/Hazard
Project No.:	G18-003/1
Date:	8/31/2015
AP No:	15-0863 **Figure No:** 1

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

PERCENT PASSING NO. 200 SIEVE

ASTM D1140

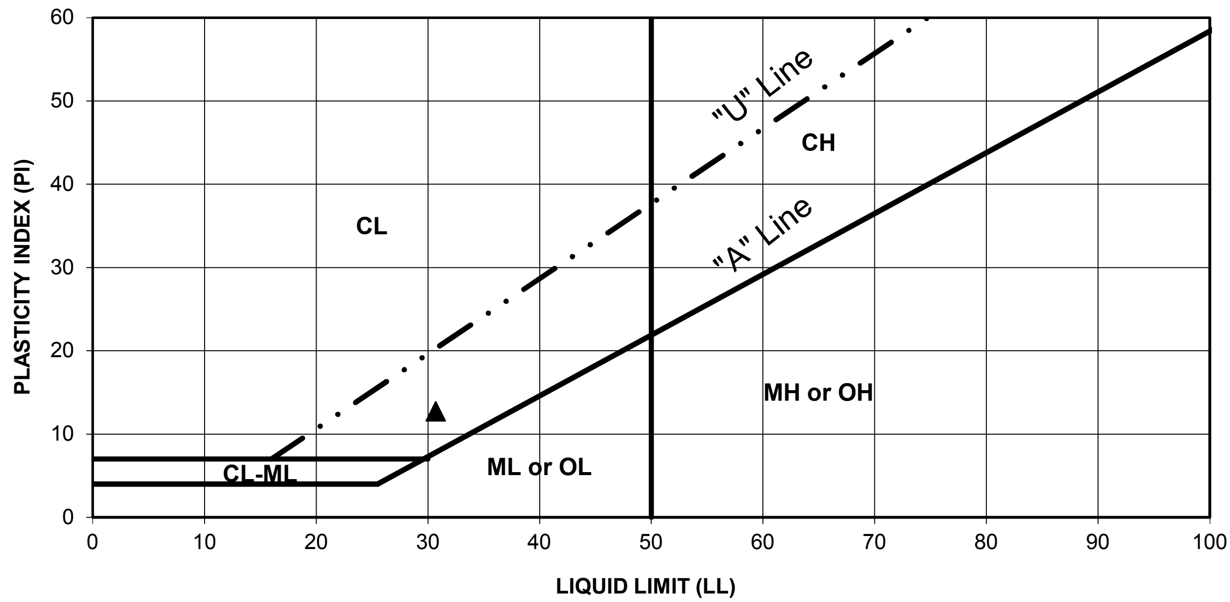
Client: Garcrest Engineering
AP Lab No.: 18-0216
Project Name: Euclid/Hazard
Test Date: 02/12/18
Project Number: G18-003/1

Boring No.	Sample No.	Depth (ft)	Percent Fines (%)
B1	-	6	3.1
B1	-	8	24.1
B1	-	10	48.2
B1	-	15	82.7
B1	-	20	56.0
B1	-	30	11.2
B1	-	40	39.3

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

ATTERBERG LIMITS
ASTM D 4318

Project Name: Euclid/Hazard **Tested By:** LS Date: 02/13/18
Project No.: G18-003/1 **Checked By:** AP Date: 02/15/18



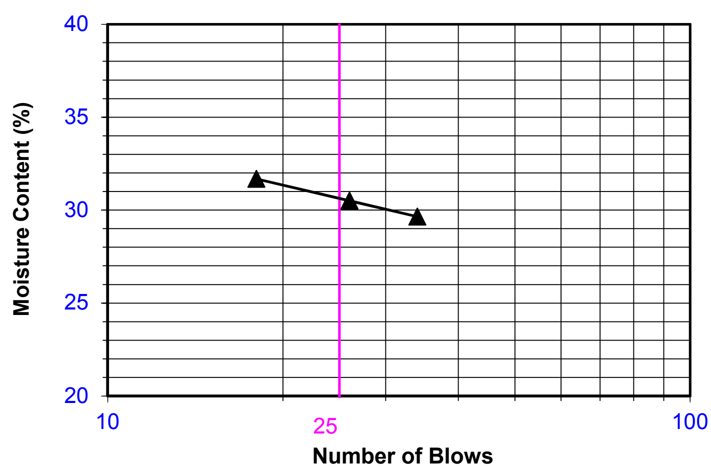
PROCEDURE USED

☐ Wet Preparation

☒ Dry Preparation

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



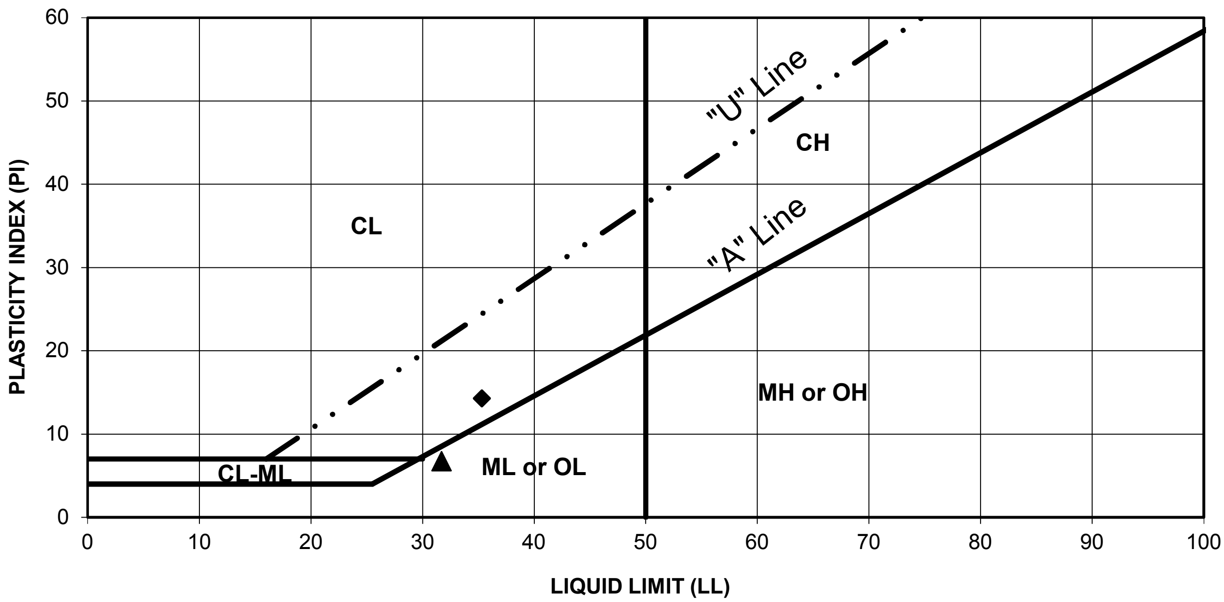
Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
	B1	-	15	NP	NP	NP	
▲	B1	-	35	31	18	13	CL

* NP denotes "non-plastic"

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

ATTERBERG LIMITS
ASTM D 4318

Project Name: Euclid/Hazard **Tested By:** LS Date: 02/13/18
Project No.: G18-003/1 **Checked By:** AP Date: 02/15/18



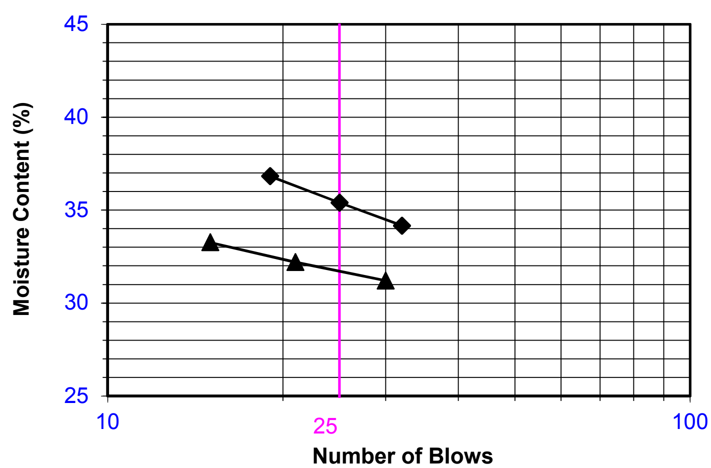
PROCEDURE USED

☐ Wet Preparation

☒ Dry Preparation

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



Symbol	Boring Number	Sample Number	Depth (feet)	LL	PL	PI	Plasticity Chart Symbol
♦	B1	-	45	35	21	14	CL
▲	B1	-	50	32	25	7	ML

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

CORROSION TEST RESULTS

Client Name: Garcrest Engineering
Project Name: Euclid/Hazard
Project No.: G18-003/1

AP Job No.: 18-0216
Date: 02/12/18

Boring No.	Sample No.	Depth (feet)	Soil Type	Minimum Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
B2	-	7	SM	2850	8.9	81	43

NOTES:
Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

APPENDIX C– LIQUEFACTION ANALYSIS

Garcrest Engineering and Construction, Inc.

Summary Sheet

Project Name	Santa Ana 7-11
Project No.	G18/003.1
Location	Santa Ana
Boring	B1
GW depth during test	26
Historic High GW depth	5
Design mag	6.63
Design Accel	0.35

Settlement due to dry seismic compaction	0.00
Settlement due to seismically induced liquefaction	2.61
Total seismically induced settlement	2.61

Garcrest Engineering and Construction, Inc.

Seismically Induced Dry Settlement (Tokimatsu Seed, 1987/Pradel, 1998)

Project Name	Santa Ana 7-11
Project No.	G18/003.1
Location	Santa Ana
Boring	B1
Design mag	6.63
Design Accel	0.35
Hammer Energy Ce	1.25
Borehole diameter Cb	1.15
Sampling Method Cs	1.25

Depth to top	Depth to bottom	Unit Weight	SPT	Fine Content		Layer Thickness	Effective Depth	Total Stress	Overburden Correction factor	Rod Length Correction factor	N160	Stress reduction Coefficient	K2max	Sig m	tau	Gmax	geff(Geff/Gmax)	geff	e15	Nc	enc	Delta S
(feet)	(feet)	(pcf)		(%)		(feet)	(feet)	(psf)	Cn	Cr		rd		(psf)	(psf)	(psf)		(%)	(%)		(%)	(inches)
0	5	105	35	30		5	2.5	262.5	1.66	0.75	78.37	0.996	85.59	175.0	59.489	1132236	0.0000525	0.0001	0.0000	8.153	0.00001	0.001
																					Total	0.001

Garcrest Engineering and Construction, Inc.

Seismically Induced Liquefaction Settlement (NCEER, 1997)

Project Name	Santa Ana 7-11
Project No.	G18/003.1
Location	Santa Ana
Boring	B1
GW depth during test	26
Historic High GW depth	5
Design mag	6.63
Design Accel	0.35
Hammer Energy Ce	1.25
Borehole diameter Cb	1.15
Sampling Method Cs	1.25

Depth to top (feet)	Depth to bottom (feet)	Unit Weight (pcf)	SPT	Fine Content (%)		Effective Depth (feet)	Total Stress (psf)	Eff. Stress (test) (psf)	Eff Stress (Des) (psf)	Overburden Correction factor Cn	Rod Length Correction factor Cr	N160	alpha	Beta	N160 cs	Stress reduction Coefficient rd	CSR	CRR 7.5	MSF	FS	Remark	Volumetric strain (%)	Settlement (inches)
5	8	105	17	3		6.5	682.5	682.5	588.9	1.44	0.75	33.10	0.000	1.000	33.10	0.987	0.260	HIGH	1.37	HIGH	not Liquefiable		0
8	10	105	9	24		9	945	945	695.4	1.34	0.75	16.21	4.179	1.108	22.13	0.981	0.303	0.244	1.37	1.102	not Liquefiable		0
10	14	105	12	48		12	1260	1260	823.2	1.23	0.8	21.14	5.000	1.200	30.36	0.975	0.339	HIGH	1.37	HIGH	not Liquefiable		0
14	18	105	12	83		16	1680	1680	993.6	1.10	0.85	20.22	5.000	1.200	29.27	0.966	0.372	0.423	1.37	1.562	not Liquefiable		0
18	24	105	5	56		21	2205	2205	1206.6	0.98	0.95	8.38	5.000	1.200	15.05	0.954	0.397	0.161	1.37	0.555	Liquefiable	1.9	1.368
24	28	105	10	25		26	2730	2730	1419.6	0.88	0.95	15.08	4.289	1.115	21.10	0.938	0.410	0.230	1.37	0.767	Liquefiable	1.15	0.552
28	33	105	13	11		30.5	3202.5	2921.7	1611.3	0.85	1	19.91	1.209	1.026	21.65	0.918	0.415	0.237	1.37	0.783	Liquefiable	1.15	0.69
39	43	105	24	39		41	4305	3369	2058.6	0.79	1	33.98	5.000	1.200	45.77	0.842	0.401	HIGH	1.37	HIGH	not Liquefiable		0
49	51	105	21	50		50	5250	3752.4	2442	0.74	1	27.92	5.000	1.200	38.50	0.752	0.368	HIGH	1.37	HIGH	not Liquefiable		0
																						Total	2.61