CHRISTIAN WHEELER
ENGINEERING

REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED CIELO MAR RESIDENTIAL SUBDIVISION
8303 LA JOLLA SHORES DRIVE
LA JOLLA, CALIFORNIA

PREPARED FOR

CIELO MAR LA JOLLA, LLC
7514 GIRARD AVENUE, SUITE 1315
LA JOLLA, CALIFORNIA 92037

PREPARED BY

CHRISTIAN WHEELER ENGINEERING
3980 HOME AVENUE
SAN DIEGO, CALIFORNIA 92105

CHRISTIAN WHEELER
ENGINEERING

September 29, 2023

Cielo Mar La Jolla, LLC
7514 Girard Avenue, Suite 1315
La Jolla, California 92037
Attention: Scott Sinnett, Managing Member

CWE 2220609.01

Subject: **Report of Preliminary Geotechnical Investigation**
Proposed Cielo Mar Residential Subdivision
8303 La Jolla Shores Drive, La Jolla, California

Ladies and Gentlemen:

In accordance with your request and our proposal dated November 17, 2022, we have completed a revised geotechnical investigation report for the subject project. We are presenting herewith a report of our findings and recommendations.

It is our professional opinion and judgment that no geotechnical conditions exist on the subject property that would preclude the construction of the proposed residential subdivision provided the recommendations presented herein are implemented.

If you have questions after reviewing this report, please do not hesitate to contact our office. This opportunity to be of professional service is sincerely appreciated.

Respectfully submitted,
CHRISTIAN WHEELER ENGINEERING

REGISTERED PROFESSIONAL ENGINEER DANIEL B. ADLER No. 36037 CIVIL STATE OF CALIFORNIA

CERTIFIED ENGINEERING GEOLOGIST DAVID R. RUSSELL No. 2215 STATE OF CALIFORNIA

Daniel B. Adler, RCE # 36037

David R. Russell, CEG #2215

DRR:dba
cc: srsinnett@gmail.com; andy@willandfotsch.com; taylor@willandfotsch.com; hallie@willandfotsch.com

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

Page

ATTACHMENTS

TABLES

FIGURES

PLATES

APPENDICES

CHRISTIAN WHEELER
ENGINEERING

REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED CIELO MAR RESIDENTIAL SUBDIVISION
8303 LA JOLLA SHORES DRIVE
LA JOLLA, CALIFORNIA

INTRODUCTION AND PROJECT DESCRIPTION

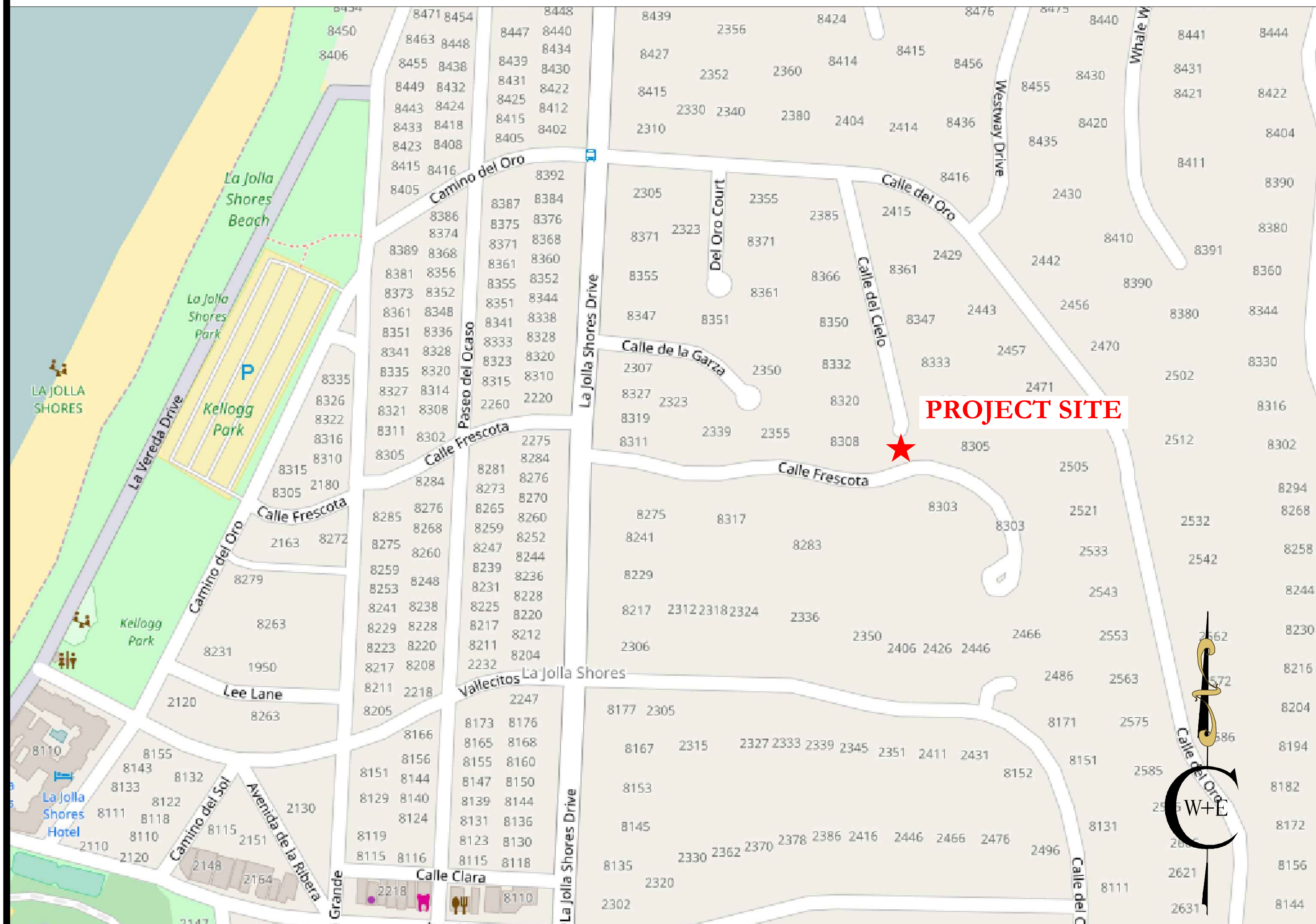
This report presents the results of a preliminary geotechnical investigation performed for a proposed residential subdivision to be located at 8303 La Jolla Shores Drive, La Jolla, California. The following Figure No. 1 presents a vicinity map showing the location of the property.

We understand that the three existing parcels that comprise the subject site are to be subdivided to create a total of 6 residential parcels. We anticipate that each of the parcels will be developed to receive one-to two-story single-family, split-level residences that are of conventional, wood-frame and masonry construction. The structures will be supported by shallow foundations and incorporate on-grade concrete floor slabs. All the lots will have swimming pools. Individual lots will also have a variety of accessory structures including garages, gyms, casitas, accessory dwelling units, and sports courts. Retaining walls up to about 19½ feet high are proposed. Access to the new lots will be afforded by a new cul-de-sac that connects to Calle Del Cielo. Grading to accommodate the proposed improvements is expected to consist of cuts and fills of less than about 20 and 10 feet from existing site grades, respectively. It is further anticipated that imported fill soils may be necessary to achieve proposed site grades.

To assist in the preparation of this report, we were provided with a Tentative Map and Proposed Grading and Drainage Plan prepared by Rancho Coastal Engineering and Surveying, dated February 16, 2023. A copy of the grading plan was used as a base map for our Site Plan and Geologic Map, and is included herein as Plate No. 1. In addition, we reviewed our previous geotechnical report prepared for the subject site titled "Report of Preliminary Geotechnical Investigation, Proposed 8-Lot Residential Subdivision", dated September 15, 2017 (CWE 2160564.04).

This report has been prepared for the exclusive use of Cielo Mar La Jolla, LLC, and their design consultants, for specific application to the project described herein. Should the project be modified, the conclusions and recommendations presented in this report should be reviewed by Christian Wheeler Engineering for conformance with our recommendations and to determine whether any additional subsurface investigation,

SITE VICINITY



CIELO MAR RESIDENTIAL SUBDIVISION 8280 CALLE DEL CIELO LA JOLLA, CALIFORNIA		CHRISTIAN WHEELER ENGINEERING
DATE: SEPTEMBER 2023	JOB NO.: 2220609.01	
BY: SRD	FIGURE NO.: 1	

laboratory testing and/or recommendations are necessary. Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, expressed or implied.

SCOPE OF SERVICES

Our preliminary geotechnical investigation was performed in 2017 and consisted of surface reconnaissance, subsurface exploration, obtaining soil samples, laboratory testing, analysis of the field and laboratory data, and review of relevant geologic literature. Our scope of service did not include assessment of hazardous substance contamination, recommendations to prevent floor slab moisture intrusion or the formation of mold within the structures, evaluation or design of storm water infiltration facilities, or any other services not specifically described in the scope of services presented below.

More specifically, the intent of our investigation was to review the previous investigation and prepare this geotechnical report for the currently proposed subdivision. The intent of the previous investigation was to:

- Obtain a waiver from the County of San Diego Department of Environmental Health to conduct the subsurface investigation.
- Drill 9 small-diameter borings at the site with a conventional truck-mounted drill rig to explore the subsurface conditions and to obtain samples for laboratory testing.
- Backfill the boring holes using a grout or a grout/bentonite mix as required by the County of San Diego Department of Environmental Health.
- Evaluate, by laboratory tests and our experience with similar soil types, the engineering properties of the various soil strata that may influence the proposed construction, including bearing capacities, expansive characteristics and settlement potential.
- Describe the general geology at the site including possible geologic hazards that could have an effect on the proposed construction, and provide the seismic design parameters as required by the current edition of the California Building Code.
- Address potential construction difficulties that may be encountered due to soil conditions, groundwater or geologic hazards, and provide geotechnical recommendations to deal with these difficulties.
- Provide site preparation and grading recommendations, as necessary, for the anticipated work.
- Provide preliminary pavement section design recommendations for the proposed private driveway that will connect to Calle del Cielo.

- Provide foundation recommendations for the proposed improvements and develop soil engineering design criteria for the recommended foundation designs.
- Provide recommendations for temporary cut slopes and shoring design, as necessary.
- Provide design parameters for restrained and unrestrained retaining walls.
- Provide a preliminary geotechnical report that presents the results of our investigation which includes a plot plan showing the location of our subsurface explorations, excavation logs, laboratory test results, and our conclusions and recommendations for the proposed project.

FINDINGS

SITE DESCRIPTION

The subject site is comprised of three adjacent residential lots identified as Assessor's Parcel Numbers 346-250-08 through -10. The lot is located adjacent to and east of Calle Frescota and south of Calle del Cielo in the La Jolla Shores area of San Diego, California. The site currently supports a single-story, single-family residence with a garage, storage structures and other normally associated improvements. Topographically, the site ascends gently from west to east with on-site elevations ranging from about 65 feet along the northwest corner of the site to 143 feet within the southeast corner of the site. From the eastern perimeter of the site an approximately 55-foot-high slope ascends at inclinations ranging from approximately 1.5:1 to 1.75:1 (H:V) to a series of level home pads.

GENERAL GEOLOGY AND SUBSURFACE CONDITIONS

GEOLOGIC SETTING AND SOIL DESCRIPTION: The subject site is located in the Coastal Plains Physiographic Province of San Diego County. Based upon the findings of our subsurface explorations and review of readily available, pertinent geologic and geotechnical literature, it was determined that the project area is generally underlain by artificial fill, topsoil, Quaternary-age old paralic deposits, and Tertiary age sedimentary deposits of the Ardath Shale. A site plan and geotechnical map, which depicts the location of our borings, is included herein as Plates No.1. The boring logs are provided in Appendix A of this report. The materials encountered in the subsurface explorations are described below:

ARTIFICIAL FILL (Qaf): A surficial veneer of man-placed fill caps much of the central and western portions of the site and also is present within the area of a relatively level, graded pad within the northeast portion of the site. As encountered in our exploratory borings, the artificial fill extended a maximum depth of about 9 feet from existing grade (Borings B-7 and B-8). Deeper fill soils may exist in areas of the site not investigated. The fill materials generally consisted of brown, loose to medium dense, dry to moist, clayey sand (SC). The artificial fill was judged to have a medium expansion potential (EI between 51 and 90), the tested fill materials had EI=58.

TOPSOIL (unmapped): An approximately 1-foot-thick layer of topsoil was encountered in Boring B-9. Where not removed by previous site grading, a similar veneer of topsoil is expected across other areas of the site not investigated. The encountered topsoil consisted of brown, dry, loose, silty sand (SM). The topsoil was judged to have a low expansion potential (EI between 21 and 50).

OLD PARALIC DEPOSITS (Qop): Quaternary-age old paralic deposits were encountered underlying the surficial soils (topsoil and artificial fill) or at grade throughout the site. These soils generally consisted of brown, orangish-brown, reddish-brown, light gray, and light brown, damp to moist, interbedded, stiff, sandy clay (CL), medium dense silty and sand (SM) and clayey sand (SC), and dense poorly graded sand with silt (SP-SM) and clayey sand/sandy clay (SC/CL). In addition, some of the near surface, old paralic deposits were found to be loose to medium dense. The sandy portions of the old paralic deposits (SM and SP-SM) were judged to have a very low to low expansion potential (EI between 0 and 50), whereas the clayey old paralic deposits (CL and SC/CL) were judged to have a low to medium expansion potential (EI between 51 and 90). The tested old paralic deposits had EI=36 and 82.

ARDATH SHALE (Ta): Tertiary-age sedimentary deposits of the Ardath Shale underlie the old paralic deposits across the site and crop out along the engineered slope adjacent to the site's eastern perimeter. These soils generally consisted of light yellowish-brown, greenish-gray and light gray, moist, very stiff to hard, silty clay (CL), clayey silt (ML), and clayey silt/silty clay (ML/CL). These formational deposits were judged to have a medium to high expansion potential (EI between 51 and 130).

GEOLOGIC STRUCTURE: Based on our review of the referenced geologic maps and our experience in the vicinity of the subject site, the old paralic deposits that underlie the site are expected to be generally massive, with faint bedding that dips gently (<5°) to the west-southwest. The Tertiary-age sediments of the Ardath Shale are expected to dip gently (<5°) to the east-northeast. Such bedding of the Ardath Shale is considered to be favorable with regards to the stability of the west facing slope along the eastern margin of the site.

GROUNDWATER: No groundwater or major seepage was encountered in our subsurface explorations. We do not expect any significant groundwater related conditions during or after the proposed construction.

However, it should be recognized that minor groundwater seepage problems might occur after construction and landscaping are completed, even at a site where none were present before construction. These are usually minor phenomena and are often the result of an alteration in drainage patterns and/or an increase in irrigation water. Based on the anticipated construction and the permeability of the on-site soils, it is our opinion that any seepage problems that may occur will be minor in extent. It is further our opinion that these problems can be most effectively corrected on an individual basis if and when they occur.

TECTONIC SETTING: Much of Southern California, including the San Diego County area, is characterized by a series of Quaternary-age fault zones that consist of several individual, en echelon faults that generally strike in a northerly to northwesterly direction. Some of these fault zones (and the individual faults within the zone) are classified as "active" according to the criteria of the California Division of Mines and Geology. Active fault zones are those that have shown conclusive evidence of faulting during the Holocene Epoch (the most recent 11,700 years). The Division of Mines and Geology used the term "potentially active" on Earthquake Fault Zone maps until 1988 to refer to all Quaternary-age (last 2.6 million years) faults for the purpose of evaluation for possible zonation in accordance with the Alquist-Priolo Earthquake Fault Zoning Act and identified all Quaternary-age faults as "potentially active" except for certain faults that were presumed to be inactive based on direct geologic evidence of inactivity during all of Holocene time or longer. Some faults considered to be "potentially active" would be considered to be "active" but lack specific criteria used by the State Geologist, such as *sufficiently active* and *well-defined*. Faults older than Quaternary-age are not specifically defined in Special Publication 42, Fault Rupture Hazard Zones in California, published by the California Division of Mines and Geology. However, it is generally accepted that faults showing no movement during the Quaternary period may be considered to be "inactive". The City of San Diego guidelines indicate that since the beginning of the Pleistocene Epoch marks the boundary between "potentially active" and "inactive" faults, unfaulted Pleistocene-age deposits are accepted as evidence that a fault may be considered to be "inactive".

A review of available geologic maps indicates that the nearest active fault is the Rose Canyon Fault Zone, located approximately ½ mile (¾ km) to the southwest. Other active fault zones in the region that could possibly affect the site include the Newport-Inglewood, Coronado Bank and the Palos Verde Fault Zones to the northwest; the Elsinore, San Jacinto, and San Andreas Fault Zones to the northeast; and the Earthquake Valley Fault to the east.

The Scripps Fault, which is a relatively small, southwest to northeast trending fault, has been mapped by others approximately 1,900 feet northwest of the site (Kennedy and Tan, 2008). Where exposed in the canyon approximately 2,500 feet to the north of the subject site, the Scripps Fault juxtaposes Tertiary-age sedimentary deposits of the Scripps Formation and Ardath Shale. The Scripps Fault has not been mapped as bisecting the middle to early Pleistocene-aged very old paralic deposits that crop out approximately 2,800 feet to the northeast of the subject site. As such, it is our professional opinion and judgment that the Scripps Fault may be considered inactive.

GENERAL GEOLOGIC HAZARDS

GENERAL: The site is located in an area where the risks due to significant geologic hazards are relatively low. No geologic hazards of sufficient magnitude to preclude the construction of the subject project are known to exist. In our professional opinion and to the best of our knowledge, the site is suitable for the proposed improvements. There does not appear to be any soil conditions within the area of the proposed tentative map which, if not corrected, would lead to structural defects of the proposed improvements. Additionally, provided the recommendations contained in this report as well as sound construction practices are followed, the proposed development should not destabilize or result in settlement of adjacent property of the public right of way.

CITY OF SAN DIEGO SEISMIC SAFETY STUDY: As part of our services, we have reviewed the City of San Diego Seismic Safety Study. This study is the result of a comprehensive investigation of the City that rates areas according to geological risk potential (nominal, low, moderate, and high) and identifies potential geotechnical hazards and/or describes geomorphic conditions.

According to the San Diego Seismic Safety Map No. 30, the central and western portions of the site are located within Geologic Hazard Category 52, which is assigned to level to sloping areas where the geologic structure is considered to be "favorable" and the level of geologic risk is generally considered to be "low." The eastern slope area within the eastern portion of the site is located within Hazard Category 26, which is assigned to areas underlain by "slide-prone" formations such as the Ardath Shale where the geologic structure is generally considered to be unfavorable. However, as described above in the Geologic Structure section of this report, the orientation of the bedding of the Ardath Shale along the east side of the slope is considered to be favorable with regards to the suitability of the site.

SURFACE RUPTURE: There are no known active faults that traverse the subject site; therefore, the risk for surface rupture at the subject site is considered low.

SLOPE STABILITY: The Relative Landslide Susceptibility and Landslide Distribution Map of the La Jolla Quadrangle prepared by the California Division of Mines and Geology indicated that the majority of the site is situated within Relative Landslide Susceptibility Area 2. Area 2 is considered to be "marginally susceptible" to slope failures. Based on the generally level area of the majority of the subject site, the risk of slope failures affecting the existing and proposed improvements within the western and central portions of the site is considered to be low. Off-site, the west to east ascending slope along the eastern margin of the site is situated within Relative Landslide Susceptibility Area 4-1. Sites within Area 4-1 are considered to be "most susceptible" to slope failures. However, based on our findings and the proposed construction, it is our opinion that the likelihood of deep-seated slope stability related problems at the site is low. The following presents descriptions of our global and surficial stability analyses.

SLOPE STABILITY ANALYSES: In consideration of the presence of the above described 1.5:1 to 1.75:1 (H:V) engineered slope along the eastern margin of the site (off-site), we have performed quantitative, global stability analyses to determine the minimum factors-of-safety against deep-seated slope failure of the that off-site slope. It is our professional opinion that the cross sections modeled in our stability analyses, oriented perpendicular to the slope, conservatively model the proposed site configuration. We have also performed a surficial stability analysis to determine the minimum factor-of-safety against surficial failure for the proposed on-site slope areas. Descriptions of our stability analyses are presented in the following "gross stability analyses" and "surficial stability analysis" sections of this report.

GROSS STABILITY ANALYSES

CROSS-SECTIONS: As presented on our Site Plan and Geotechnical Map, included herein as Plate No. 1, we have created three geologic cross sections to depict the proposed topography and subsurface conditions at the subject site. The geologic cross sections are included on Plate No. 2 of this report. The locations of the geologic cross sections were chosen to be oriented perpendicular to the topography of the off-site slope and included the steepest portions of the off-site slope.

To analyze the stability of the subject site and adjacent areas we have performed a series of quantitative slope stability analyses incorporating the topography and geologic conditions presented on our geologic cross sections A-A' and B-B'. The on-site earth materials incorporated in our stability analyses are described above in the "Geologic Setting and Soil Description" section of this report. Based on the composition of the underlying formational material and the geologic structure of the area circular- type failure mechanisms were modeled in our analyses. The results of our quantitative slope stability analyses are presented below in the results of Stability Analyses Section of this report.

STRENGTH PARAMETERS: The strength parameters for the earth materials underlying the subject site were estimated by the direct shear test method and our experience and judgment with similar soil types. The results of our direct shear testing are presented at the rear of this report. The unit weights of the earth materials that underlie the subject site and adjacent areas utilized in our stability analyses were chosen based on the results of our laboratory testing and our experience with similar materials in the vicinity of the subject site. It is our professional opinion that the strength parameters and unit weights presented below and utilized in our stability analyses provide for conservative slope stability analyses.

Soil Type	Unit Weight, γ	Phi, ϕ	Cohesion, c
Artificial Fill	120 pcf	30°	200 psf
Old Paralic Deposits	125 pcf	31°	200 psf
Ardath Shale	130 pcf	28°	400 psf

METHOD OF ANALYSES: The analyses of the gross stability of the proposed site topography were performed using Version 2 of the GSTABL7© computer program developed by Garry H. Gregory, PE. The program analyzes circular, block, specified, and randomly shaped failure surfaces using the Modified Bishop, Janbu, or Spencer's Methods. The STEDwin© computer program, developed by Harald W. Van Aller, P. E., was used in conjunction with this program for data entry and graphics display. The proposed topographies of the subject site along geologic cross sections A-A' and B-B' were analyzed for circular failures and each failure analysis was programmed to run at least 6,000 random failure surfaces. The most critical failure surfaces were then accumulated and sorted by value of the factor-of-safety. After the specified number of failure surfaces were successfully generated and analyzed, the ten most critical surfaces were plotted so that the pattern may be studied.

RESULTS OF STABILITY ANALYSES: Appendix E of this report presents the results of our gross stability analyses. As demonstrated on the printouts of these analyses (see Appendix E), the proposed site and off-site topographies along our geologic cross sections A-A' and B-B' demonstrate minimum factors-of-safety against static failure of 1.7 and 1.6, respectively. These values are in excess of the minimum that is generally considered to be stable of 1.5. As also included in Appendix E, our pseudo-static stability analyses, performed incorporating a kh value of 0.15g, demonstrate minimum factors-of-safety against pseudo-static failure of 1.3. This value is in excess of the minimum that is generally considered to be stable of 1.1 for pseudo-static analyses.

SURFICIAL SLOPE STABILITY

GENERAL: Appendix F of this report presents the results of our surficial slope stability analysis of the proposed on-site slopes. As demonstrated on the printout of this analysis, proposed on-site slopes will demonstrate a minimum factor-of-safety against surficial slope failure of 1.9, which is in excess of the minimum that is generally considered to be stable of 1.5. However, it should be recognized that the surficial stability of the proposed on-site slopes will be affected by future landscaping and irrigation practices. As such, care should be taken by the project contractor, landscapers, and homeowners to reduce the potential for over irrigation and excessive softening of the proposed slope faces.

LIQUEFACTION: The earth materials underlying the site are not considered subject to liquefaction due to such factors as soil density and grain-size distribution, and the absence of an unconfined, free groundwater table within the alluvium.

FLOODING: As delineated on the referenced Flood Insurance Rate Map (FIRM), panel 06073C1582H prepared by the Federal Emergency Management Agency, the site is not located within either the 100-year flood zone or the 500-year flood zone.

TSUNAMIS: Tsunamis are great sea waves produced by a submarine earthquake or volcanic eruption. Historically, the San Diego area has been free of tsunami-related hazards and tsunamis reaching San Diego have generally been well within the normal tidal range. The site is not mapped within a potential tsunami hazard area on the Tsunami Hazard Area Map, County of San Diego by the California Geological Survey, dated October 7, 2022.

SEICHES: Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays or reservoirs. Due to the site's location, it is considered to have a negligible risk potential for seiches.

CONCLUSIONS

In general, it is our professional opinion and judgment that the subject property is suitable for the construction of the proposed residential subdivision and associated improvements provided the recommendations presented herein are implemented. The main geotechnical conditions affecting the proposed project consist of potentially compressible artificial fill, topsoil, and portions of the upper, old paralic deposits, cut/fill transitions across proposed building pads, and expansive soils. These conditions are discussed hereinafter.

The site is underlain by potentially compressible artificial fill, topsoil, and old paralic deposits. As encountered in our borings the artificial fill underlies the west-central portion of the site, and extends to a maximum depth of about 9 feet from existing grade (Borings B-7 and B-8). Deeper fill soils may exist in areas of the site not investigated. Relatively shallow layers of potentially compressible topsoil and old paralic deposits were also encountered. It is estimated that these materials do not exceed about 2 feet in thickness. The fill soils, topsoil, and potentially compressible upper old paralic deposits are considered unsuitable, in their present condition, for the support of settlement sensitive improvements. It is recommended that these materials be removed and replaced as compacted fill in areas to receive settlement sensitive improvements and new fills.

The removal and recompaction of existing loose surficial soils as well as the proposed grading will result in cut/fill transition areas under some of the proposed structures and associated improvements. This configuration may result in differential settlements due to the potential of fill soils and native materials to settle differently. In order to mitigate this condition, it is recommended that the cut portions of the lots be undercut as described hereinafter.

Some of the anticipated foundation soils are moderately to highly expansive (EI between 51 and 130). Select grading is recommended to mitigate this condition.

The site is located in an area that is relatively free of geologic hazards that will have a significant effect on the proposed construction. The most likely geologic hazard that could affect the site is ground shaking due to seismic activity along one of the regional active faults. However, construction in accordance with the requirements of the most recent edition of the California Building Code and the local governmental agencies should provide a level of life-safety suitable for the type of development proposed.

RECOMMENDATIONS

GRADING AND EARTHWORK

GENERAL: All grading should conform to the guidelines presented in the current edition of the California Building Code, the minimum requirements of the City of San Diego, and the recommended Grading Specifications and Special Provisions attached hereto, except where specifically superseded in the text of this report or our Report of Preliminary Geotechnical Investigation, which will be provided under separate cover.

PREGRADE MEETING: It is recommended that a pregrade meeting including the grading contractor, the client, and a representative from Christian Wheeler Engineering be performed, to discuss the recommendations of this report and address any issues that may affect grading operations.

OBSERVATION OF GRADING: Continuous observation by the Geotechnical Consultant is essential during the grading operation to confirm conditions anticipated by our investigation, to allow adjustments in design criteria to reflect actual field conditions exposed, and to determine that the grading proceeds in general accordance with the recommendations contained herein.

CLEARING AND GRUBBING: Site preparation should begin with the removal of existing improvements slated for demolition. The resulting debris and any existing vegetation and other deleterious materials in areas to receive proposed improvements or new fill soils should be removed from the site.

SITE PREPARATION: It is recommended that existing potentially compressible soils underlying the proposed structures, associated improvements and new fills be removed in their entirety. Based on our findings, the maximum removal depth is about 9 feet below existing grade (Borings B-7 and B-8). Deeper removals may be necessary in areas of the site not investigated or due to unforeseen conditions. Lateral removals limits should extend at least 5 feet from the perimeter of the structures, associated improvements and new fills or equal to removal depth, whichever is more. No removals are recommended beyond property lines. All excavated areas should be approved by the geotechnical engineer or his representative prior to replacing any of the excavated soils. The excavated materials can be replaced as properly compacted fill.

UNDERCUT: Native soils within-4 feet from finish pad grade should be undercut. The undercut material may be replaced as compacted fill. In areas where footings deeper than the minimum recommended undercut are proposed, undercuts extending to a minimum depth of 1 foot below the bottom of the footing or retaining wall key are recommended. The removals and undercuts should be performed in such a way as to provide for a continuous contact between the fill and native soils that drains away from the proposed structures, and avoids adjacent zones with different undercut depths that may impair subsurface drainage.

SELECT GRADING: It is recommended that moderately to highly expansive soils (EI between 51 and 130) within 5 feet from finish pad grade or 10 feet from the face of fill slopes be mixed with low expansive on-site soil or imported (EI between 21 and 50) to create a low expansive mix for use as structural fill.

IMPORTED FILL SOILS: Imported fill soils should consist of clayey and/or silty sands that have a low expansion potential (EI between 21 and 50), relatively high strength, and relatively low permeability characteristics. At least 5 working days will be necessary to perform necessary laboratory test to approve an import source.

PROCESSING OF FILL AREAS: Prior to placing any new fill soils or constructing any new improvements in areas that have been cleaned out to receive fill, the exposed soils should be scarified to a depth of 12 inches, watered thoroughly, and compacted to at least 90 percent relative compaction. In areas to support fill slopes, keys should be cut into the competent supporting materials. The keys should be at least 10 feet wide, and be sloped back into the hillside at least 2 percent. The keys should extend at least 1 foot into the competent supporting materials. Where the existing ground has a slope of 5:1 (horizontal to vertical) or steeper, it should be benched into as the fill extends upward from the keyway.

FILL SLOPES: Fill slopes should be compacted by back-rolling with a sheepsfoot compactor at vertical intervals not exceeding four feet in vertical dimension as the fill is being placed. The face of fill slopes constructed at a 2:1 (horizontal to vertical) or flatter inclination should also be track-walked when the slope is completed. As an alternative, fill slopes can be overfilled by at least three feet and cut back to the compacted core at the design finish contour.

COMPACTION AND METHOD OF FILLING: In general, all structural fill placed at the site should be compacted to a relative compaction of at least 90 percent of its maximum laboratory dry density as determined by ASTM Laboratory Test D1557. Fills should be placed at or slightly above optimum moisture content, in lifts 6 to 8 inches thick, with each lift compacted by mechanical means. Fills should consist of approved earth material, free of trash or debris, roots, vegetation, or other materials determined to be unsuitable by the Geotechnical Consultant. Fill material should be free of rocks or lumps of soil in excess of 3 inches in maximum dimension.

Utility trench backfill within 5 feet of the proposed structure and beneath all concrete flatwork or pavements should be compacted to a minimum of 90 percent of its maximum dry density.

SURFACE DRAINAGE: The drainage around the proposed improvements should be designed to collect and direct surface water away from proposed improvements and the top of slopes toward appropriate drainage facilities. Rain gutters with downspouts that discharge runoff away from the structure and the top of slopes into controlled drainage devices are recommended.

The ground around the proposed improvements should be graded so that surface water flows rapidly away from the improvements without ponding. In general, we suggest that the ground adjacent to structures be sloped away at a minimum gradient of 2 percent. For densely vegetated areas where runoff can be impaired should have a minimum gradient of 5 percent for the first 5 feet from the structure is suggested. It is essential that new and existing drainage patterns be coordinated to produce proper drainage. Pervious hardscape surfaces adjacent to structures should be similarly graded.

Drainage patterns provided at the time of construction should be maintained throughout the life of the proposed improvements. Site irrigation should be limited to the minimum necessary to sustain landscape growth. Over watering should be avoided. Should excessive irrigation, impaired drainage, or unusually high rainfall occur, zones of wet or saturated soil may develop.

GRADING PLAN REVIEW: The final grading plans should be submitted to this office for review in order to ascertain that the recommendations of this report have been implemented, and that no additional recommendations are needed due to changes in the anticipated development plans.

TEMPORARY AND CONSTRUCTION SLOPES: All temporary slopes and construction slopes should be constructed in accordance with OSHA requirements. Unshored temporary slopes should be excavated at inclinations no steeper than 1.0:1.0 (horizontal: vertical). In areas where these minimum ratios cannot be maintained, temporary slopes will require shoring or other type of slope reinforcement designed by a qualified professional engineer.

The contractor is solely responsible for designing and constructing stable, temporary excavations and may need to shore, slope, or bench the sides of excavations as required to maintain the stability of the excavation sides. The contractor's "responsible person", as defined in the OSHA Construction Standards for Excavations, 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety process. In no case should slope heights, slope inclinations, or excavation depths, including utility trench excavation depths, exceed those specified in local, state, and federal safety regulations, unless otherwise addressed in this report.

Temporary cut slopes of up to approximately 20 feet in height are anticipated along the proposed lower level of improvements on Lot 6. Based upon the results of our subsurface explorations, it is anticipated that relatively competent formational material will be encountered at a relatively shallow depth within the temporary cut slopes. Some fill materials may, however, be encountered at the top of the excavations. If used, temporary cut slopes may be excavated at inclinations of 1.0: 1.0 or flatter. Due to the depth of the proposed excavations and constraints due to property lines, we anticipate that the construction of sloped temporary cut slopes more than about fifteen feet in height are unlikely. Temporary cut slopes, if constructed, should be observed by the Geotechnical Consultant during grading to ascertain that no unforeseen adverse conditions exist. No surcharge loads such as stockpiles, vehicles, etc. should be allowed within a distance from the top of temporary slopes equal to half the slope height.

TEMPORARY EXCAVATION STABILIZATION

GENERAL: Based on the anticipated depths of the excavations for some of the proposed structures and the close proximity of property lines and adjacent improvements, sufficient space for temporary sloped embankments will likely not be available on all lots. Therefore, alternative means of providing stability for temporary excavation slopes will likely be required. Temporary vertical excavations may be made if the excavations are "stabilized." For stabilizing methods, we considered the use of sheet or soldier pile walls with lagging using internal bracing (rakers), soldier pile walls using earth tieback anchors, and/or a system of soil nailing.

We recommend that a specialty contractor with experience in shoring and bracing and/or soil nailing provide the requisite recommendations and plan and be contracted for installation of anchors or soil nails. We strongly recommend that a survey be made of existing structures and improvements on the subject property and adjacent properties prior to any excavation or the installation of a shoring system in order to establish the current condition of these structures and other improvements and to preclude possible damage claims.
If used, tieback anchors and or soil nails may extend into the adjacent properties. As such, permits and letters of permission may be required from adjacent property owners. Therefore, we are presenting recommendations for cantilevered walls, internally braced shoring (adjacent to property lines), and tieback anchors (on-site use), and soil nails.

The following information on the design parameters and installation of a shoring system is conceptual at this time. The Geotechnical Consultant should be retained to review the shoring plans before submission to the reviewing agencies.

SOLDIER PILES WITH LAGGING: If the excavations are to be stabilized with a shoring system consisting of soldier piles and lagging with or without tieback anchors, the shoring and bracing may be designed using the following soil parameters for the formational materials:

TABLE I: SHORING DESIGN PARAMETERS

Angle of internal friction:	30 degrees
Apparent cohesion:	300 psf
Total Unit weight:	125 pcf

SHORING DESIGN AND LATERAL PRESSURES: For design of cantilevered shoring (non-tied back), a triangular distribution of lateral earth pressure may be used. It may be assumed that retained soils having a level surface behind the cantilevered shoring will exert a lateral pressure equal to that developed by a fluid with a density of 35 pounds per cubic foot. Cantilevered shoring is normally limited to excavations that do not exceed approximately 15 feet in depth in order to limit the deflection at the tops of the soldier piles. For heights of shoring greater than about 15 feet, the use of braced or tied-back shoring is recommended. For the design of braced shoring, we recommend the use of a trapezoidal distribution of earth pressure. The recommended pressure distribution for the case where the grade is level behind the shoring, is similar to that recommended for walls below grade except that the maximum lateral pressure should be taken as 22H pounds per square foot, where H is the height of the shoring in feet. For tied-back retaining walls, the recommended pressure distribution should consist of a trapezoidal distribution with a lateral pressure of 22H pounds per square foot, where H is the height of the shoring in feet.

Design of Soldier Piles: Soldier piles should be spaced no closer than 3 diameters, center to center. The allowable lateral bearing value (passive value) of the soils below the level of excavation may be assumed to be 700 pounds per square foot per foot of depth from the excavated surface and up to a maximum of 6,000 pounds per square foot. To develop the full lateral value, provisions should be taken to assure firm contact between the soldier piles and the undisturbed soils. The concrete placed in the soldier pile excavations may be a lean mix concrete. However, the concrete used in that portion of the soldier pile that is below the planned excavation level should be of sufficient strength to adequately transfer the imposed passive loads to the surrounding soils.

Difficult drilling conditions are not anticipated during the installation of the soldier piles. The frictional resistance between the soldier piles and the retained earth may be used in resisting the downward component of the anchor load. The coefficient of friction between the soldier piles and the retained earth may be taken as 0.50. This value is based on the assumption that uniform full bearing will be developed between the steel soldier beam and the lean-mix concrete, and between the lean-mix concrete and the retained earth. In addition, the soldier piles below the excavated level may be used to resist downward loads. The frictional resistance between the concrete soldier piles and the soils below the excavated level may be taken as equal to 600 pounds per square foot.

LAGGING: Continuous lagging will be required between the soldier piles. The soldier piles and anchors should be designed for the full anticipated lateral pressure. However, the pressure on the lagging will likely be less due to arching in the soils between the soldier piles. We recommend that the lagging be designed for a semi-circular distribution of earth pressure where the maximum pressure is 300 pounds per square foot at the mid-point between soldier piles, and negligible at the soldier piles.

Timber lagging may be used between the soldier piles to support the exposed soils. If lagging is to be left in-place, treated lumber should be used. If possible, permanent structural walls should be cast directly against the shoring to eliminate the need for backfilling of a narrow space. Special provisions for wall drainage, such as the use of a prefabricated composite drain, should be used where the structural walls are cast directly against the shoring.

TIE BACK ANCHOR DESIGN: Tieback friction anchors may be used to resist lateral loads. For preliminary design purposes, it may be assumed that the active wedge adjacent to the shoring is defined by a plane drawn at 35 degrees from the vertical extending up from the bottom of the excavation. The anchors should extend at least 20 feet beyond the potential active wedge; this provision is to provide global stability for the shored wall as opposed to adequate friction for the anchors.

Since the load-carrying capacity of tieback anchors will depend on various site-specific equipment and material related factors, tieback capacity should be established by load testing initial tiebacks to 150 percent of their design capacity. For preliminary design purposes, it may be estimated that if conventional drilled, post-grouted anchors are used, the average friction may be assumed to be 600 pounds per square foot. Only the frictional resistance developed beyond the active wedge should be used in resisting lateral loads. If the anchors are spaced at least 6 feet on centers, no reduction in the capacity of the anchors need be considered due to group action. In no event should the anchors extend less than the minimum length beyond the potential active wedge as given above. The designers should be aware that the vertical component of the total anchor capacity will act as a downward load on the shoring system.

ANCHOR INSTALLATION: The anchors should be installed at angles of approximately 15 to 25 degrees below the horizontal. This variation is provided in order to avoid conflicts with utility lines or other buried structures in adjacent properties. The angle of inclination should be as flat as practical to provide the maximum horizontal resistance. The anchors should be filled with concrete placed by pumping from the tip out, and the concrete should extend from the tip of the anchor to the active wedge. To minimize chances of caving, we suggest that the portion of anchor shaft within the active wedge be backfilled with sand before testing the anchor. This portion of the shaft should be filled tightly and flush with the face of the excavation. The sand backfill may contain a small amount of cement to allow the sand to be placed by pumping.

INTERNAL BRACING: Raker bracing may be used in lieu of tiebacks in order to brace the soldier piles completely onsite. If used, raker bracing may be supported laterally by temporary concrete footings (deadmen). For design of such temporary footings, poured with the bearing surface normal to the inclination rakers inclined at 45 to 60 degrees with the vertical, a bearing value of 4,000 pounds per square foot may be used, provided the shallowest point of the bearing surface of the footing is at least 1 foot below the lowest adjacent grade. To reduce the movement of the shoring, the rakers should be preloaded or at least tightly wedged between the footings and the soldier piles.

DEFLECTION: It is difficult to accurately predict the amount of deflection of a shored embankment. It should be realized, however, that some deflection will occur. We estimate that, with properly designed and installed shoring, deflections will be less than about 1 inch at the top of the shoring. If greater deflections occur during construction, additional bracing may be necessary to reduce movement of any adjacent structures or of utilities in the adjacent areas. If desired to reduce the deflection of the shoring, a greater lateral earth pressure may be used in the shoring design.

MONITORING: A means of monitoring the performance of the shoring system is recommended. The monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of all the soldier piles. We will be pleased to discuss this further with the design consultants and the contractor when the design of the shoring system has been finalized.

SOIL NAIL DESIGN CRITERIA: Soil nails may be considered for retention of temporary slopes in lieu of shoring. If used, we recommend that a soil nail system be designed using the Caltrans computer program SNAIL (Caltrans, 2020). Other methods for design of soil nails are also available and may be utilized. Table No. II presents parameters for use in the SNAIL soil nail design program.

TABLE II:

MATERIAL PROPERTIES FOR THE DESING OF SOIL NAIL LSOPE REINFORCING

Material	Unit Weight (pcf)	Angle of Internal Friction (Φ) (Degrees)	Apparent Cohesion (psf)	Bond Stress (psi)
Formational Material	125	30	300	10.0
Surficial Soils	115	10	200	3.0

FOUNDATIONS

GENERAL: Based on our findings and engineering judgment, the proposed structures and associated improvements may be supported by conventional shallow continuous and isolated spread footings. The following recommendations are considered the minimum based on the anticipated soil conditions, and are not intended to be lieu of structural considerations. All foundations should be designed by a qualified engineer.

DIMENSIONS: Spread footings supporting the proposed structures should be embedded at least 18 inches below lowest adjacent finish pad grade. Spread footings supporting the proposed light exterior improvements should be embedded at least 12 inches below lowest adjacent finish pad grade. Continuous and isolated footings should have a minimum width of 12 inches and 24 inches, respectively. Retaining wall footings should be at least 18 inches deep and 24 inches wide. Footings adjacent to the face of slopes should be extended to a depth such that a minimum 10-foot setback exists between the face of the slope and the lower leading footing edge .

BEARING CAPACITY: Spread footings supporting the proposed structures may be designed for an allowable soil bearing pressure of 2,500 pounds per square foot (psf). This value may be increased by 600 pounds per square foot for each additional foot of embedment and 400 pounds per square foot for each additional foot of width up to a maximum of 4,000 pounds per square foot. Spread footings supporting the proposed light exterior improvements may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf). These values may be increased by one-third for combinations of temporary loads such as those due to wind or seismic loads.

FOOTING REINFORCING: Reinforcement requirements for foundations should be provided by the structural designer. However, based on the expected soil conditions, we recommend that the minimum reinforcing for continuous footings consist of at least 2 No. 5 bars positioned near the bottom of the footing and 2 No. 5 bars positioned near the top of the footing.

LATERAL LOAD RESISTANCE: Lateral loads against foundations may be resisted by friction between the bottom of the footing and the supporting soil, and by the passive pressure against the footing. The coefficient of friction between concrete and soil may be considered to be 0.30. The passive resistance may be considered to be equal to an equivalent fluid weight of 300 pounds per cubic foot. These values are based on the assumption that the footings are poured tight against undisturbed soil. If a combination of the passive pressure and friction is used, the friction value should be reduced by one-third.

PROPOSED SWIMMING POOLS: Foundation recommendations for the proposed swimming pools will be provided on an individual basis after grading is performed. However, it is recommended that the proposed swimming pools be founded entirely on old paralic deposits or Ardath Shale.

FOUNDATION EXCAVATION OBSERVATION: All footing excavations should be observed by Christian Wheeler Engineering prior to placing of forms and reinforcing steel to determine whether the foundation recommendations presented herein are followed and that the foundation soils are as anticipated in the preparation of this report. All footing excavations should be excavated neat, level, and square. All loose or unsuitable material should be removed prior to the placement of concrete.

SETTLEMENT CHARACTERISTICS: The anticipated total and differential settlement is expected to be less than about 1 inch and 1 inch over 40 feet, respectively, provided the recommendations presented in this report are followed. It should be recognized that minor cracks normally occur in concrete slabs and foundations due to concrete shrinkage during curing or redistribution of stresses, therefore some cracks should be anticipated. Such cracks are not necessarily an indication of excessive vertical movements.

EXPANSIVE CHARACTERISTICS: Provided select grading as recommended herein is performed, the prevailing foundation soils are assumed to have a low expansive potential (EI between 21 and 50). The recommendations within this report reflect these conditions.

SOLUBLE SULFATES: The water-soluble sulfate content of selected soil samples from the site was determined in accordance with California Test Method 417. The results of the tests indicate that the soil sample had a soluble sulfate content of 0.038 and 0.081. A soluble sulfate content of less than 0.1 percent is considered to have a negligible potential for causing adverse effects on concrete and structural steel materials of the proposed footings. However, it should be recognized that the sulfate content of surficial soils may increase with time due to soluble sulfate in the irrigation water or fertilized use.

It should be understood Christian Wheeler Engineering does not practice corrosion engineering. If a corrosivity analysis is considered necessary, we recommend that the client retain an engineering firm that specializes in this field to consult with them on this matter. The results of our corrosion testing should only be used as a guideline to determine if additional testing and analysis is necessary.

FOUNDATION PLAN REVIEW: The final foundation plan and accompanying details and notes should be submitted to this office for review. The intent of our review will be to verify that the plans used for construction reflect the minimum dimensioning and reinforcing criteria presented in this section and that no additional criteria are required due to changes in the foundation type or layout. It is not our intent to review structural plans, notes, details, or calculations to verify that the design engineer has correctly applied the geotechnical design values. It is the responsibility of the design engineer to properly design/specify the foundations and other structural elements based on the requirements of the structure and considering the information presented in this report.

SEISMIC DESIGN FACTORS

The seismic design factors applicable to the subject site are provided below. The seismic design factors were determined in accordance with the 2022 California Building Code. The site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters are presented in the following Table I.

TABLE III: SEISMIC DESIGN FACTORS

Site Coordinates: Latitude Longitude	32.857° -117.251°
Site Class	D
Site Coefficient F_a	1.0
Site Coefficient F_v	1.803
Spectral Response Acceleration at Short Periods S_s	1.420 g
Spectral Response Acceleration at 1 Second Period S_1	0.497 g
$S_{MS}=F_aS_s$	1.420 g
$S_{M1}=F_vS_1$	0.896 g
$S_{DS}=2/3*S_{MS}$	0.947 g
$S_{D1}=2/3*S_{M1}$	0.597 g

Probable ground shaking levels at the site could range from slight to moderate, depending on such factors as the magnitude of the seismic event and the distance to the epicenter. It is likely that the site will experience the effects of at least one moderate to large earthquake during the life of the proposed improvements.

ON-GRADE SLABS

GENERAL: It is our understanding that the floor system of the proposed structures will consist of a concrete slab. The following recommendations are considered the minimum slab requirements based on the soil conditions and are not intended in lieu of structural considerations. These recommendations assume that the site preparation recommendations contained in this report are implemented.

INTERIOR FLOOR SLABS: The minimum slab thickness should be 4 inches (actual) and the slab should be reinforced with at least No. 3 bars spaced at 18 inches on center each way. Slab reinforcement should be supported on chairs such that the reinforcing bars are positioned at mid-height in the floor slab. The slab reinforcement should extend down into the perimeter footings at least 6 inches.

UNDER-SLAB VAPOR RETARDERS: Steps should be taken to minimize the transmission of moisture vapor from the subsoil through the interior slabs where it can potentially damage the interior floor coverings. Local industry standards typically include the placement of a vapor retarder, such as plastic, in a layer of coarse sand placed directly beneath the concrete slab. Two inches of sand are typically used above and below the plastic. The vapor retarder should be at least 15-mil Stegowrap® or similar material with sealed seams and should extend at least 12 inches down the sides of the interior and perimeter footings. The sand should have a sand equivalent of at least 30, and contain less than 10% passing the Number 100 sieve and less than 5% passing the Number 200 sieve. The membrane should be placed in accordance with the recommendation and consideration of ACI 302, "Guide for Concrete Floor and Slab Construction" and ASTM E1643, "Standards Practice for Installation of Water Vapor Retarder Used in Contact with Earth or Granular Fill Under Concrete Slabs." It is the flooring contractor's responsibility to place floor coverings in accordance with the flooring manufacturer specifications.

EXTERIOR CONCRETE FLATWORK: Exterior concrete slabs on grade should have a minimum thickness of 4 inches and be reinforced with at least No. 3 bars placed at 18 inches on center each way (ocew). Driveway slabs should have a minimum thickness of 5 inches and be reinforced with at least No. 4 bars placed at 12 inches ocew. Driveway slabs should be provided with a thickened edge a least 12 inches deep and 6 inches wide. All slabs should be provided with weakened plane joints in accordance with the American Concrete Institute (ACI) guidelines. Special attention should be paid to the method of concrete curing to reduce the potential for excessive shrinkage cracking. It should be recognized that minor cracks occur normally in concrete slabs due to shrinkage. Some shrinkage cracks should be expected and are not necessarily an indication of excessive movement or structural distress.

PRELIMINARY PAVEMENT SECTION

TRAFFIC INDEX: A traffic index of 6.0 was assumed for the proposed private driveway that will connect to Calle del Cielo. The assumed traffic index should be verified by the project civil engineer and City of San Diego based on anticipated traffic volumes.

R-VALUE: The following pavement section was calculated assuming an R-value of 15. This section should be considered preliminary, and should be used for planning purposes only. Final pavement design should be determined after R-value tests have been performed in the actual subgrade material.

PRELIMINARY PAVEMENT SECTION: Based on the above parameters, the following minimum preliminary pavement sections are recommended.

TABLE IV: PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTION

Proposed Use	R-Value	Traffic index	Asphalt Concrete	Base
Private Driveway	15	6.0	3.0 inches	11.5 inches

All paving methods and materials should conform to good engineering and paving practices, and comply with the requirements of the City of San Diego. Prior to placing the base material, the subgrade soils should be scarified to a depth of 12 inches, moisture conditioned and compacted to at least 95 percent of its maximum dry density.

The base material should be compacted to at least 95 percent of its maximum dry density. The base could consist of Crushed Aggregate Base (CAB) or Class II Aggregate Base. The Crushed Aggregate Base should conform to the requirements set forth in Section 200-2.2 of the Standard Specifications for Public Works Construction. The Class II Aggregate Base should conform to requirements set forth in Section 26-1.02A of the Standard Specifications for California Department of Transportation. As an alternate, the base material for the pavements may consist of Crushed Miscellaneous Base (recycled base material) which conforms to the requirements set forth in Section 200-2.4 of the Standard Specifications for Public Works Construction. It should be noted; however, that Crushed Miscellaneous Base material has lower durability characteristics than Crushed Aggregate Base or Class II Aggregate Base, which may result in a shorter pavement life. As such, the owner of the project should approve the use of this material for the pavement base.

EARTH RETAINING WALLS

FOUNDATIONS: Foundations for any proposed retaining walls should be constructed in accordance with the foundation recommendations presented previously in this report.

PASSIVE PRESSURE: The passive pressure for the anticipated foundation soils may be considered to be 300 pounds per square foot per foot of depth. The upper foot of embedment should be neglected when calculating passive pressures, unless the foundation abuts a hard surface such as a concrete slab. The passive pressure may be increased by one-third for seismic loading. The coefficient of friction for concrete to soil may be assumed to be 0.30 for the resistance to lateral movement. When combining frictional and passive resistance, the friction should be reduced by one-third.

ACTIVE PRESSURE: The active soil pressure for the design of "unrestrained" and "restrained" earth retaining structures with level backfill may be assumed to be equivalent to the pressure of a fluid weighing 43 and 62 pounds per cubic foot, respectively. These pressures do not consider any other surcharge. If any are anticipated, this office should be contacted for the necessary increase in soil pressure. These values are based on a drained backfill condition.

Seismic lateral earth pressures may be assumed to equal an inverted triangle starting at the bottom of the wall with the maximum pressure equal to 12H pounds per square foot (where H = wall height in feet) occurring at the top of the wall.

WATERPROOFING AND WALL DRAINAGE SYSTEMS: The need for waterproofing should be evaluated by others. If required, the project architect should provide (or coordinate) waterproofing details for the retaining walls. The design values presented above are based on a drained backfill condition and do not consider hydrostatic pressures. Unless hydrostatic pressures are incorporated into the design, the retaining wall designer should provide a detail for a wall drainage system. Typical retaining wall drain system details are presented in Plate No. 3 of this report for informational purposes. Additionally, outlets points for the retaining wall drain system should be coordinated with the project civil engineer.

BACKFILL: Retaining wall backfill soils should be compacted to at least 90 percent relative compaction. Expansive or clayey soils should not be used for backfill material. The wall should not be backfilled until the masonry has reached an adequate strength.

LIMITATIONS

REVIEW, OBSERVATION AND TESTING

The recommendations presented in this report are contingent upon our review of final plans and specifications. Such plans and specifications should be made available to the geotechnical engineer and engineering geologist so that they may review and verify their compliance with this report and with the California Building Code.

It is recommended that Christian Wheeler Engineering be retained to provide continuous soil engineering services during the earthwork operations. This is to verify compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

UNIFORMITY OF CONDITIONS

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on an evaluation of the subsurface soil conditions encountered at the subsurface exploration locations and on the assumption that the soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the foundations and/or cut and fill slopes may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the geotechnical engineer so that he may make modifications if necessary.

CHANGE IN SCOPE

This office should be advised of any changes in the project scope or proposed site grading so that we may determine if the recommendations contained herein are appropriate. This should be verified in writing or modified by a written addendum.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they be due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Government Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations.

PROFESSIONAL STANDARD

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the locations where our borings, surveys, and explorations are made, and that our data, interpretations, and recommendations be based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for the interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

CLIENT'S RESPONSIBILITY

It is the responsibility of the Clients, or their representatives, to ensure that the information and recommendations contained herein are brought to the attention of the structural engineer and architect for the project and incorporated into the project's plans and specifications. It is further their responsibility to take the necessary measures to insure that the contractor and his subcontractors carry out such recommendations during construction.

FIELD EXPLORATIONS

Nine subsurface explorations were made on May 11, 2017 at the locations indicated on the Site Plan and Geotechnical Map included herewith as Plate No. 1. These explorations consisted of small diameter borings drilled with a conventional, truck-mounted drill rig. The fieldwork was conducted under the observation and direction of our engineering geology personnel.

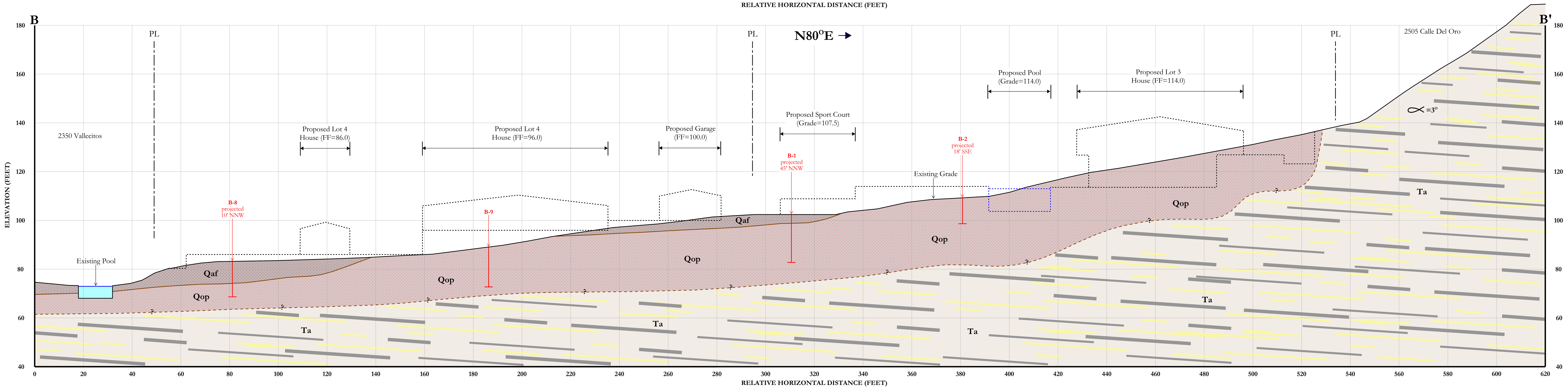
The explorations were carefully logged when made. The boring logs are presented on Appendix A. The soils are described in accordance with the Unified Soils Classification System. In addition, a verbal textural description, the wet color, the apparent moisture, and the density or consistency is provided. The density of granular soils is given as very loose, loose, medium dense, dense or very dense. The consistency of silts or clays is given as either very soft, soft, medium stiff, stiff, very stiff, or hard.

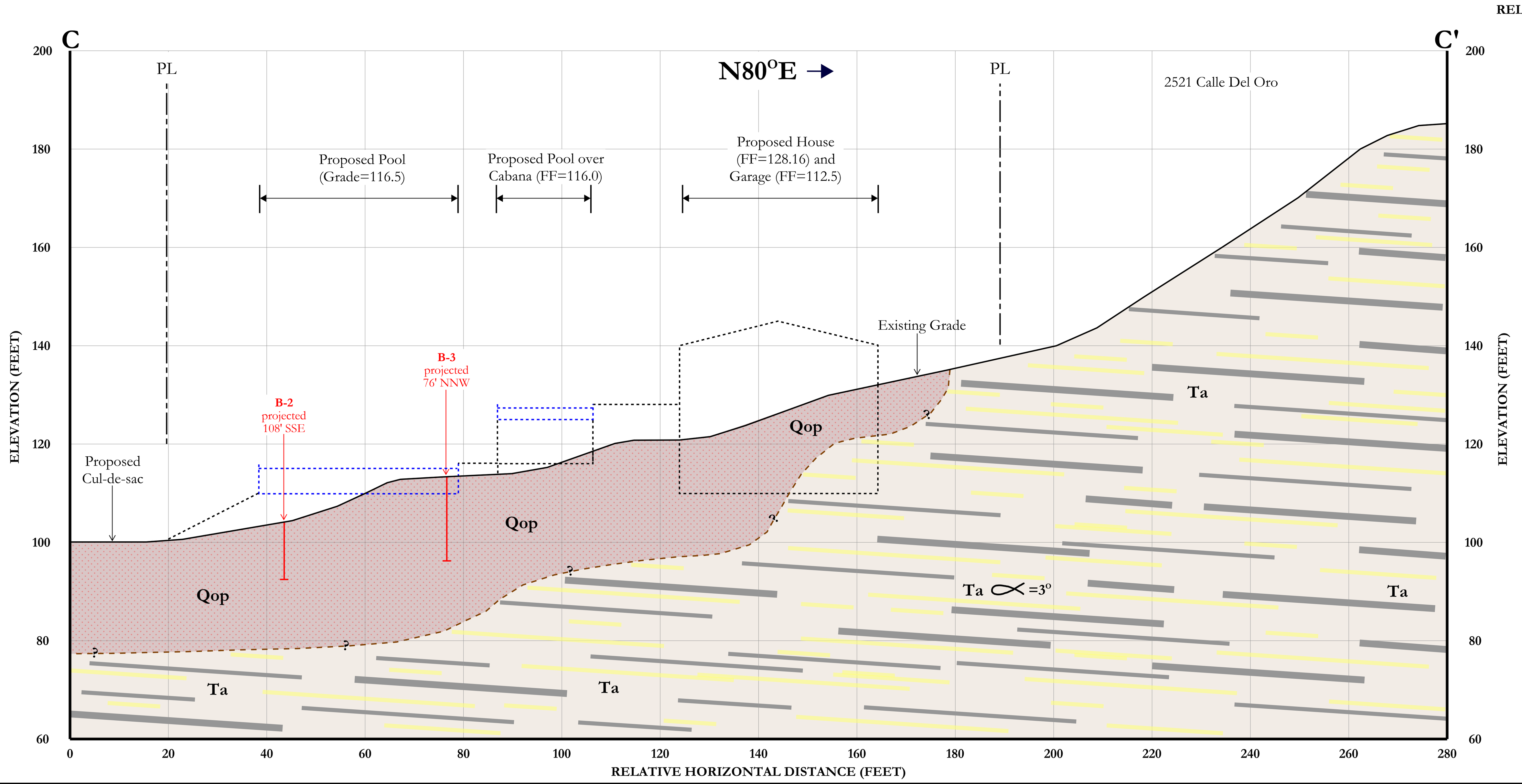
Bulk and relatively undisturbed samples of the earth materials encountered were collected and transported to our laboratory for testing.

LABORATORY TESTING

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. A brief description of the tests performed and the subsequent results are presented in Appendix B.

SITE PLAN AND GEOLOGIC MAP	PROPOSED CIELO MAR RESIDENTIAL SUBDIVISION 8303 LA JOLLA SHORES DRIVE LA JOLLA, CALIFORNIA				CHRISTIAN WHEELER ENGINEERING
	DATE: SEPTEMBER 2023		JOB NO.: 2220609.01		
	BY: SD		PLATE NO.: 1		





CWE LEGEND

Qaf	ARTIFICIAL FILL SOILS
Qop	OLD PARALIC DEPOSITS
Ta	ARDATH SHALE
=3°	APPARENT DIP
?-	GEOLOGIC CONTACT - QUERIED WHERE INFERRED

0 20 40

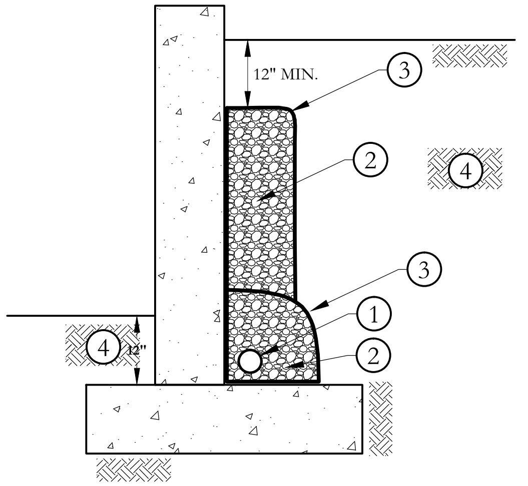
SCALE: 1" = 20'

GEOLOGIC CROSS-SECTIONS

PROPOSED CIELO MAR RESIDENTIAL SUBDIVISION
8303 LA JOLLA SHORES DRIVE
LA JOLLA, CA

DATE: SEPTEMBER 2023	REPORT NO.: 2220609.01
BY: JMM	PLATE NO.: 2

CHRISTIAN WHEELER ENGINEERING



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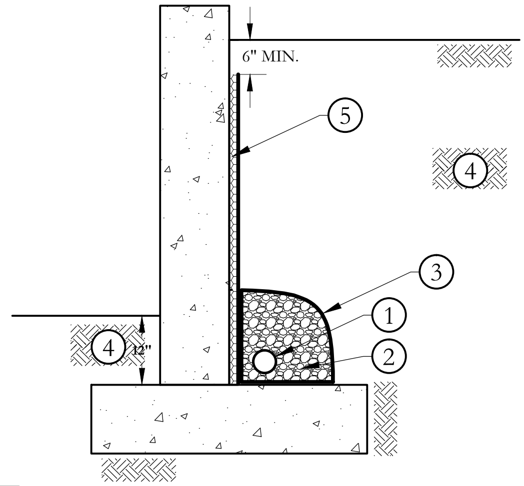

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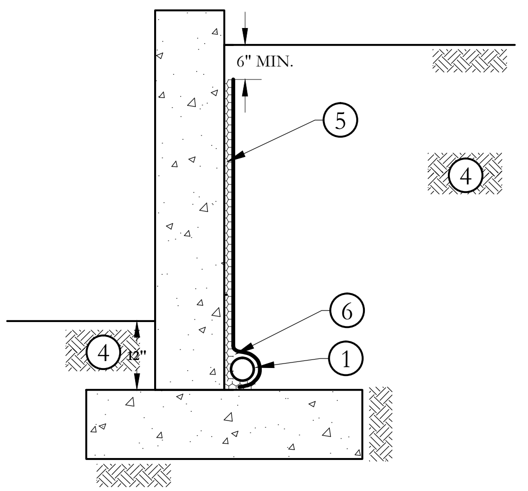
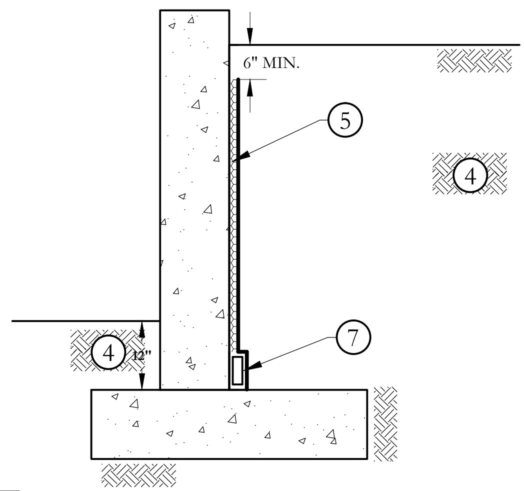


3 DETAIL



4 DETAIL

NOTES AND DETAILS

GENERAL NOTES:

1) THE NEED FOR WATERPROOFING SHOULD BE EVALUATED BY OTHERS.
2) WATERPROOFING TO BE DESIGNED BY OTHERS (CWE CAN PROVIDE A DESIGN IF REQUESTED).
3) EXTEND DRAIN TO SUITABLE DISCHARGE POINT PER CIVIL ENGINEER.
4) DO NOT CONNECT SURFACE DRAINS TO SUBDRAIN SYSTEM.

DETAILS:

(1) 4-INCH PERFORATED PVC PIPE ON TOP OF FOOTING, HOLES POSITIONED DOWNWARD (SDR 35, SCHEDULE 40, OR EQUIVALENT).

(2) ¾ INCH OPEN-GRADED CRUSHED AGGREGATE.

(3) GEOFARBRIC WRAPPED COMPLETELY AROUND ROCK.

(4) PROPERLY COMPACTED BACKFILL SOIL.

(5) WALL DRAINAGE PANELS (MIRADRAIN OR EQUIVALENT) PLACED PER MANUFACTURER'S REC'S.

(6) UNDERLAY SUBDRAIN WITH AND CUT FABRIC BACK FROM DRAINAGE PANELS AND WRAP FABRIC AROUND PIPE.

(7) COLLECTION DRAIN (TOTAL DRAIN OR EQUIVALENT) LOCATED AT BASE OF WALL DRAINAGE PANEL PER MANUFACTURER'S RECOMMENDATIONS.

CANTILEVER RETAINING WALL DRAINAGE SYSTEMS	**CIELO MAR RESIDENTIAL SUBDIVISION** **8280 CALLE DEL CIELO** **LA JOLLA, CALIFORNIA**				CHRISTIAN WHEELER ENGINEERING
	DATE:	OCTOBER 2023	JOB NO.:	2220609.01	
	BY:	SD	PLATE NO.:	3	

Appendix A

Subsurface Explorations
(CWE 2160564.04, dated September 15, 2017)

LOG OF TEST BORING B-1

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	100.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	110.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0				4" of AC.							
			CL	**Old Paralic Deposits (Qop):** Light brown to yellowish-brown, damp, stiff, SANDY CLAY, mottled, upper 3' moderately weathered, porous. Expansion Index of 82 (Medium).	18	Cal					SA EI SO4 DS
			CL	Brown to reddish-brown, moist.	14	SPT					
5					27	Cal		11.9	114.3		
10			SC	Light brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND with gravels.	16	Cal		11.9	105.9		
			SM	Light brown, moist, medium dense, very fine- to medium-grained, SILTY SAND with trace gravels, mottled.							
15					28	Cal					
			SM-SP	Light brown to black, moist, dense, very fine- to coarse-grained, POORLY GRADED SAND with silt.	57	Cal		6.7	128.0		
20				Boring terminated at 19.5 feet. No groundwater or seepage encountered.							
25											
30											

Notes:

Symbol Legend

- ∇ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	SEPTEMBER 2017	JOB NO.:	2160564.04
BY:	SRD	FIGURE NO.:	A-1

CHRISTIAN WHEELER
ENGINEERING

LOG OF TEST BORING B-2

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	108.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	111.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0				3" of AC.							
			CL	**Old Paralic Deposits (Qop):** Dark brown, moist, stiff, SANDY CLAY, mottled, upper 2' weathered with rootlets.							
					18	Cal					
			CL	Light orangish-brown to light gray.							
5					42	Cal					
					27	Cal					
			SC	Light brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND with trace gravels.							
10			SM	Light yellowish-brown, damp, medium dense, very fine- to medium-grained, VERY SILTY SAND with trace gravels.							
					28	Cal					
				Boring terminated at 11.5 feet. No groundwater or seepage encountered.							
15											
20											
25											
30											

Notes:

Symbol Legend

- Groundwater Level During Drilling
- Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	SEPTEMBER 2017	JOB NO.:	2160564.04
BY:	SRD	FIGURE NO.:	A-2

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-3

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	111.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	119.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			CL	**Old Paralic Deposits (Qop):** Dark brown, damp, loose, SANDY CLAY, mottled, upper 2' moderately weathered.							
					28	Cal					
5			SC	Light yellowish-brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND.	39	Cal	X	15.2	111.1		DS
			SM	Light yellowish-brown, moist, medium dense, very fine- to medium-grained, VERY SILTY SAND.							
10					25	Cal		13.9	106.1		
15			SP-SM	Light gray, damp, medium dense, very fine- to medium-grained, POORLY GRADED SAND with silt and gravels. Gravel/cobble bed at 16 to 17 feet.	50/5"	Cal**					
					50/1"	SPT*					
				Boring terminated at 17 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	SEPTEMBER 2017	JOB NO.:	2160564.04
BY:	SRD	FIGURE NO.:	A-3

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-4

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	82.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	74.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0				4" of AC.							
			SC	**Old Paralic Deposits (Qop):** Brown to reddish-brown, dry, loose to medium dense, very fine- to medium-grained, CLAYEY SAND, mottled, upper 2' highly weathered.	18	Cal					
				Moist, medium dense.							
5			SM	Light brown, moist, medium dense, very fine- to medium-grained, SILTY SAND.	13	Cal	X	8.8	116.1		
			SM	Light brown to light grayish-brown, dense, fine- to coarse-grained, SILTY SAND with clay, mottled.	41	Cal					
10											
					50/4"	Cal					
15			ML	**Ardath Shale (Ta):** Light yellowish-brown, moist, hard, CLAYEY SILT with sand.							
					50/5"	Cal		13.2	112.6		DS
				Boring terminated at 19 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- Groundwater Level During Drilling
- Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	SEPTEMBER 2017	JOB NO.:	2160564.04
BY:	SRD	FIGURE NO.:	A-4

CHRISTIAN WHEELER
ENGINEERING

LOG OF TEST BORING B-5

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	73.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	70.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SC	**Artificial Fill (Qaf):** Brown, damp, loose to medium dense, very fine- to medium-grained, SANDY CLAY.							
				Moist, medium dense.	19	Cal					
5			SC	**Old Paralic Deposits (Qop):** Orangish-brown to brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND, mottled.	21	Cal					
10					34	Cal					
			CL	**Ardath Shale (Ta):** Yellowish-brown, moist, very stiff, SILTY CLAY with sand, moderately weathered to 16 feet.							
15					25	SPT					
				Hard.							SA
					50/5"	SPT					PI
20				Boring terminated at 19 feet. No groundwater or seepage encountered.							
25											
30											

Notes:

Symbol Legend

- Groundwater Level During Drilling
- Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	SEPTEMBER 2017	JOB NO.:	2160564.04
BY:	SRD	FIGURE NO.:	A-5

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-6

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	79.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	93.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SC	**Artificial Fill (Qaf):** Brown, damp, loose to medium dense, very fine- to medium-grained, CLAYEY SAND with brick and concrete debris.							
			CL	**Old Paralic Deposits (Qop):** Brown to reddish-brown, moist, stiff to very stiff, SANDY CLAY. Expansion Index of 36 (Low).	32	Cal		10.9	115.2		SA EI
					24	Cal		15.4	112.6		CP
5											
				Fine- to coarse-grained at contact.							
			CH	**Ardath Shale (Ta):** Greenish-gray, moist, very stiff, SILTY CLAY, highly weathered.	19	SPT					SA PI
10											
			ML-CL	Light yellowish-brown to light gray, moist, very stiff, CLAYEY SILT/SILTY CLAY, slightly weathered.							
					28	SPT					
15				Boring terminated at 15 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

▽	Groundwater Level During Drilling
▼	Groundwater Level After Drilling
❜❜	Apparent Seepage
*	No Sample Recovery
**	Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	SEPTEMBER 2017	JOB NO.:	2160564.04
BY:	SRD	FIGURE NO.:	A-6

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-7

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	78.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	80.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			CL	**Artificial Fill (Qaf):** Brown, dry, medium stiff, SANDY CLAY with concrete debris in the upper 2 feet. Expansion Index of 58 (Medium).			0–5				SA EI SO4 DS
3				Stiff.	14	Cal					
6					14	Cal					
9			CL	**Old Paralic Deposits (Qop):** Reddish-brown to brown, moist, very stiff to stiff, SANDY CLAY, mottled.							
11					38	Cal		15.0	117.4		SA PI
18.5				Fine- to coarse-grained with gravels at contact.							
19			ML/CL	**Ardath Shale (Ta):** Yellowish-brown to light gray, moist, very stiff, CLAYEY SILT/SILTY CLAY.	26	SPT					
20				Boring terminated at 20 feet. No groundwater or seepage encountered.							

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	SEPTEMBER 2017	JOB NO.:	2160564.04
BY:	SRD	FIGURE NO.:	A-7

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-8

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	83.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	86.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SC	**Artificial Fill (Qaf):** Brown, dry, loose to medium dense, very fine- to medium-grained, CLAYEY SAND with gravels and concrete debris.							
				Moist, medium dense.	18	Cal					
5				Brick debris at 5 feet.	20	Cal					
			SC	**Old Paralic Deposits (Qop):** Reddish-brown to brown, moist, dense, very fine- to medium-grained, CLAYEY SAND/SANDY CLAY.	44	Cal					
10			SM	Light brown, moist, dense, very fine- to medium-grained, SILTY SAND.							
			SC	Reddish-brown to light gray, moist, dense, very fine- to medium-grained, CLAYEY SAND.	57	Cal					
15				Boring terminated at 14.5 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- ∇ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	SEPTEMBER 2017	JOB NO.:	2160564.04
BY:	SRD	FIGURE NO.:	A-8

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-9

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	89.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	93.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Topsoil:** Brown, dry, loose, very fine- to medium-grained, CLAYEY SAND, porous.							
			CL	**Old Paralic Deposits (Qop):** Brown, moist, very stiff, SANDY CLAY, upper 12" highly weathered, porous.	33	Cal	X				SA
				Very stiff..							
5			SC	Orangish-brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND.	20	Cal		8.1	117.3		
			SM	Light brown to light orangish-brown, moist, dense, very fine- to medium-grained, SILTY SAND.	38	Cal		9.2	111.9		
10			SP-SM	Light brown, moist, dense, fine- to coarse-grained, POORLY GRADED SAND with silt.							
15					64	Cal					
				Boring terminated at 16.5 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	SEPTEMBER 2017	JOB NO.:	2160564.04
BY:	SRD	FIGURE NO.:	A-9

CHRISTIAN WHEELER ENGINEERING

Appendix B

Laboratory Test Results

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

a) **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System and are presented on the exploration logs in Appendix A.

b) **MOISTURE-DENSITY: MOISTURE-DENSITY:** In-place moisture contents and dry densities were determined for selected soil samples in accordance with ATM D 2937. The results are summarized in the trench logs presented in Appendix A.

c) **MAXIMUM DRY DENSITY AND OPTIUM MOISTURE CONTENT TEST:** The maximum dry density and optimum moisture content of a selected soil samples were determined in the laboratory in accordance with ASTM D 1557, Method A.

d) **DIRECT SHEAR:** Direct shear tests were performed on selected samples of the on-site soils in accordance with ASTM D 3080.

e) **EXPANSION INDEX TEST:** Expansion index tests were performed on a selected remolded soil sample in accordance with ASTM D 4829.

f) **GRAIN SIZE DISTRIBUTION:** The grain size distribution of selected samples was determined in accordance with ASTM C136 and/or ASTM D 422.

g) **ATTERBERG LIMITS:** The Liquid Limit, Plastic Limit and Plastic Index of a selected soil sample was determined in accordance with ASTM D424.

h) **COLLAPSE POTENTIAL:** A collapse potential test was performed on a elected undisturbed soil sample in accordance with ASTM D 5333.

i) **SOLUBLE SULFATES:** The soluble sulfate content of selected soil samples were determined in accordance with California Test Method 417.

LABORATORY TEST RESULTS

PROPOSED CIELO MAR RESIDENTIAL SUBDIVISION

8303 LA JOLLA SHORES DRIVE

LA JOLLA, CALIFORNIA

MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557)

Sample Location	**Boring B-1 @ ½'-5'**	**Boring B-7 @ 0-5'**
Sample Description	Tan Silty Clay (CL)	Brown Sandy Clay (CL)
Maximum Density	120.0 pcf	122.0 pcf
Optimum Moisture	10.3 %	11.5 %

DIRECT SHEAR (ASTM D3080)

Sample Location	**Boring B-1 @ ½'-5'**	**Boring B-3 @ 5'**	**Boring B-4 @ 19'**	**Boring B-7 @ 0-5'**
Sample Type	Remolded to 90%	Undisturbed	Undisturbed	Remolded to 90%
Friction Angle	21°	29°	37°	16°
Cohesion	400 psf	400 psf	800 psf	500 psf

EXPANSION INDEX TESTS (ASTM D4829)

Sample Location	**Boring B-1 @ ½'-5'**	**Boring B-6 @ 2'-7'**	**Boring B-7 @ 0-5'**
Initial Moisture:	10.6 %	10.4 %	10.5 %
Initial Dry Density	106.1 pcf	106.5 pcf	108.8 pcf
Final Moisture:	24.0 %	20.9 %	21.4 %
Expansion Index:	82 (Medium)	36 (Low)	58 (Medium)

GRAIN SIZE DISTRIBUTION (ASTM D422)

Sample Location	**Boring B-1 @ ½'-5'**	**Boring B-5 @ 18'-19'**	**Boring B-6 @ 2'-7'**	**Boring B-6 @ 9'-10'**
Sieve Size	*Percent Passing*	*Percent Passing*	*Percent Passing*	*Percent Passing*
#4		100		
#8		98	100	100
#16	100	97	99	96
#30	99	94	94	85
#50	97	90	87	82
#100	95	86	80	79
#200	89	74	69	75
0.05 mm	80	63		70
0.005 mm	43	23		42
0.001 mm	30	5		28

LABORATORY TEST RESULTS (CONT.)

Sample Location	**Boring B-7 @ 0-5'**	**Boring B-7@ 11½'**	**Boring B-9 @ 1'-4½'**
Sieve Size	*Percent Passing*	*Percent Passing*	*Percent Passing*
#4	99		
#8	99	100	
#16	98	99	100
#30	94	98	97
#50	83	94	92
#100	74	89	87
#200	66	81	78
0.05 mm			64
0.005 mm			31
0.001 mm			23

ATTERBERG LIMITS (ASTM D424)

Sample Location	**Boring B-5 @ 18'-19'**	**Boring B-6 @ 9'-10'**	**Boring B-7 @ 11½'**
Liquid Limit	37	52	40
Plastic Limit	22	19	16
Plasticity Index	15	33	24

COLLAPSE POTENTIAL (ASTM D 5333)

Sample Location	**Boring B-6 @ 5'**
Initial Moisture Content	15.4%
Initial Density	112.6 pcf
Consolidation Before Water Added	2.7%
Consolidation After Water Added	4.1%
Final Moisture	15.7%

SOLUBLE SULFATES (CALIFORNIA TEST 417)

Sample Location	**Boring B-1 @ ½'-5'**	**Boring B-7 @ 0-5'**
Soluble Sulfate	0.038 % (SO_4)	0.081 % (SO_4)

Appendix C

References

REFERENCES

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Appendix D

Recommended Grading Specifications – General Provisions

RECOMMENDED GRADING SPECIFICATIONS - GENERAL PROVISIONS

PROPOSED CIELO MAR RESIDENTIAL SUBDIVISION
8303 LA JOLLA SHORES DRIVE
LA JOLLA, CALIFORNIA

GENERAL INTENT

The intent of these specifications is to establish procedures for clearing, compacting natural ground, preparing areas to be filled, and placing and compacting fill soils to the lines and grades shown on the accepted plans. The recommendations contained in the preliminary geotechnical investigation report and/or the attached Special Provisions are a part of the Recommended Grading Specifications and shall supersede the provisions contained hereinafter in the case of conflict. These specifications shall only be used in conjunction with the geotechnical report for which they are a part. No deviation from these specifications will be allowed, except where specified in the geotechnical report or in other written communication signed by the Geotechnical Engineer.

OBSERVATION AND TESTING

Christian Wheeler Engineering shall be retained as the Geotechnical Engineer to observe and test the earthwork in accordance with these specifications. It will be necessary that the Geotechnical Engineer or his representative provide adequate observation so that he may provide his opinion as to whether or not the work was accomplished as specified. It shall be the responsibility of the contractor to assist the Geotechnical Engineer and to keep him appraised of work schedules, changes and new information and data so that he may provide these opinions. In the event that any unusual conditions not covered by the special provisions or preliminary geotechnical report are encountered during the grading operations, the Geotechnical Engineer shall be contacted for further recommendations.

If, in the opinion of the Geotechnical Engineer, substandard conditions are encountered, such as questionable or unsuitable soil, unacceptable moisture content, inadequate compaction, adverse weather, etc., construction should be stopped until the conditions are remedied or corrected or he shall recommend rejection of this work.

Tests used to determine the degree of compaction should be performed in accordance with the following American Society for Testing and Materials test methods:

Maximum Density & Optimum Moisture Content - ASTM D1557
Density of Soil In-Place - ASTM D1556 or ASTM D6938

All densities shall be expressed in terms of Relative Compaction as determined by the foregoing ASTM testing procedures.

PREPARATION OF AREAS TO RECEIVE FILL

All vegetation, brush and debris derived from clearing operations shall be removed, and legally disposed of. All areas disturbed by site grading should be left in a neat and finished appearance, free from unsightly debris.

After clearing or benching the natural ground, the areas to be filled shall be scarified to a depth of 6 inches, brought to the proper moisture content, compacted and tested for the specified minimum degree of compaction. All loose soils in excess of 6 inches thick should be removed to firm natural ground which is defined as natural soil which possesses an in-situ density of at least 90 percent of its maximum dry density.

When the slope of the natural ground receiving fill exceeds 20 percent (5 horizontal units to 1 vertical unit), the original ground shall be stepped or benched. Benches shall be cut to a firm competent formational soil. The lower bench shall be at least 10 feet wide or 1-1/2 times the equipment width, whichever is greater, and shall be sloped back into the hillside at a gradient of not less than two (2) percent. All other benches should be at least 6 feet wide. The horizontal portion of each bench shall be compacted prior to receiving fill as specified herein for compacted natural ground. Ground slopes flatter than 20 percent shall be benched when considered necessary by the Geotechnical Engineer.

Any abandoned buried structures encountered during grading operations must be totally removed. All underground utilities to be abandoned beneath any proposed structure should be removed from within 10 feet of the structure and properly capped off. The resulting depressions from the above-described procedure should be backfilled with acceptable soil that is compacted to the requirements of the Geotechnical Engineer. This includes, but is not limited to, septic tanks, fuel tanks, sewer lines or leach lines, storm drains and water lines. Any buried structures or utilities not to be abandoned should be brought to the attention of the Geotechnical Engineer so that he may determine if any special recommendation will be necessary.

All water wells which will be abandoned should be backfilled and capped in accordance to the requirements set forth by the Geotechnical Engineer. The top of the cap should be at least 4 feet below finish grade or 3 feet below the bottom of footing whichever is greater. The type of cap will depend on the diameter of the well and should be determined by the Geotechnical Engineer and/or a qualified Structural Engineer.

FILL MATERIAL

Materials to be placed in the fill shall be approved by the Geotechnical Engineer and shall be free of vegetable matter and other deleterious substances. Granular soil shall contain sufficient fine material to fill the voids. The definition and disposition of oversized rocks and expansive or detrimental soils are covered in the geotechnical report or Special Provisions. Expansive soils, soils of poor gradation, or soils with low strength characteristics may be thoroughly mixed with other soils to provide satisfactory fill material, but only with the explicit consent of the Geotechnical Engineer. Any import material shall be approved by the Geotechnical Engineer before being brought to the site.

PLACING AND COMPACTION OF FILL

Approved fill material shall be placed in areas prepared to receive fill in layers not to exceed 6 inches in compacted thickness. Each layer shall have a uniform moisture content in the range that will allow the compaction effort to be efficiently applied to achieve the specified degree of compaction. Each layer shall be uniformly compacted to the specified minimum degree of compaction with equipment of adequate size to economically compact the layer. Compaction equipment should either be specifically designed for soil compaction or of proven reliability. The minimum degree of compaction to be achieved is specified in either the Special Provisions or the recommendations contained in the preliminary geotechnical investigation report. When the structural fill material includes rocks, no rocks will be allowed to nest and all voids must be carefully filled with soil such that the minimum degree of compaction recommended in the Special Provisions is achieved. The maximum size and spacing of rock permitted in structural fills and in non-structural fills is discussed in the geotechnical report, when applicable.

Field observation and compaction tests to estimate the degree of compaction of the fill will be taken by the Geotechnical Engineer or his representative. The location and frequency of the tests shall be at the Geotechnical Engineer's discretion. When the compaction test indicates that a particular layer is at less than the required degree of compaction, the layer shall be reworked to the satisfaction of the Geotechnical Engineer and until the desired relative compaction has been obtained.

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction by sheepsfoot roller shall be at vertical intervals of not greater than four feet. In addition, fill slopes at a ratio of two horizontal to one vertical or flatter, should be trackrolled. Steeper fill slopes shall be over-built and cut-back to finish contours after the slope has been constructed. Slope compaction operations shall result in all fill material six or more inches inward from the finished face of the slope having a relative compaction of at least 90 percent of maximum dry density or the degree of compaction specified in the Special Provisions section of this specification. The compaction operation on the slopes shall be continued until the Geotechnical Engineer is of the opinion that the slopes will be surficially stable.

Density tests in the slopes will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the Contractor will be notified that day of such conditions by written communication from the Geotechnical Engineer or his representative in the form of a daily field report.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no cost to the Owner or Geotechnical Engineer.

CUT SLOPES

The Engineering Geologist shall inspect cut slopes excavated in rock or lithified formational material during the grading operations at intervals determined at his discretion. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer to determine if mitigating measures are necessary.

Unless otherwise specified in the geotechnical report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of the controlling governmental agency.

ENGINEERING OBSERVATION

Field observation by the Geotechnical Engineer or his representative shall be made during the filling and compaction operations so that he can express his opinion regarding the conformance of the grading with acceptable standards of practice. Neither the presence of the Geotechnical Engineer or his representative or the observation and testing shall release the Grading Contractor from his duty to compact all fill material to the specified degree of compaction.

SEASON LIMITS

Fill shall not be placed during unfavorable weather conditions. When work is interrupted by heavy rain, filling operations shall not be resumed until the proper moisture content and density of the fill materials can be achieved. Damaged site conditions resulting from weather or acts of God shall be repaired before acceptance of work.

RECOMMENDED GRADING SPECIFICATIONS - SPECIAL PROVISIONS

RELATIVE COMPACTION: The minimum degree of compaction to be obtained in compacted natural ground, compacted fill, and compacted backfill shall be at least 90 percent. For street and parking lot subgrade, the upper six inches should be compacted to at least 95 percent relative compaction.

EXPANSIVE SOILS: Detrimentally expansive soil is defined as clayey soil which has an expansion index of 50 or greater when tested in accordance with the Uniform Building Code Standard 29-2.

OVERSIZED MATERIAL: Oversized fill material is generally defined herein as rocks or lumps of soil over 6 inches in diameter. Oversized materials should not be placed in fill unless recommendations of placement of such material are provided by the Geotechnical Engineer. At least 40 percent of the fill soils shall pass through a No. 4 U.S. Standard Sieve.

TRANSITION LOTS: Where transitions between cut and fill occur within the proposed building pad, the cut portion should be undercut a minimum of one foot below the base of the proposed footings and recompacted as structural backfill. In certain cases that would be addressed in the geotechnical report, special footing reinforcement or a combination of special footing reinforcement and undercutting may be required.

Appendix E

Global Stability Analyses
(CWE 2160564.04, dated September 15, 2017)

CWE 2160654.04 Cross Section A+400 - A'

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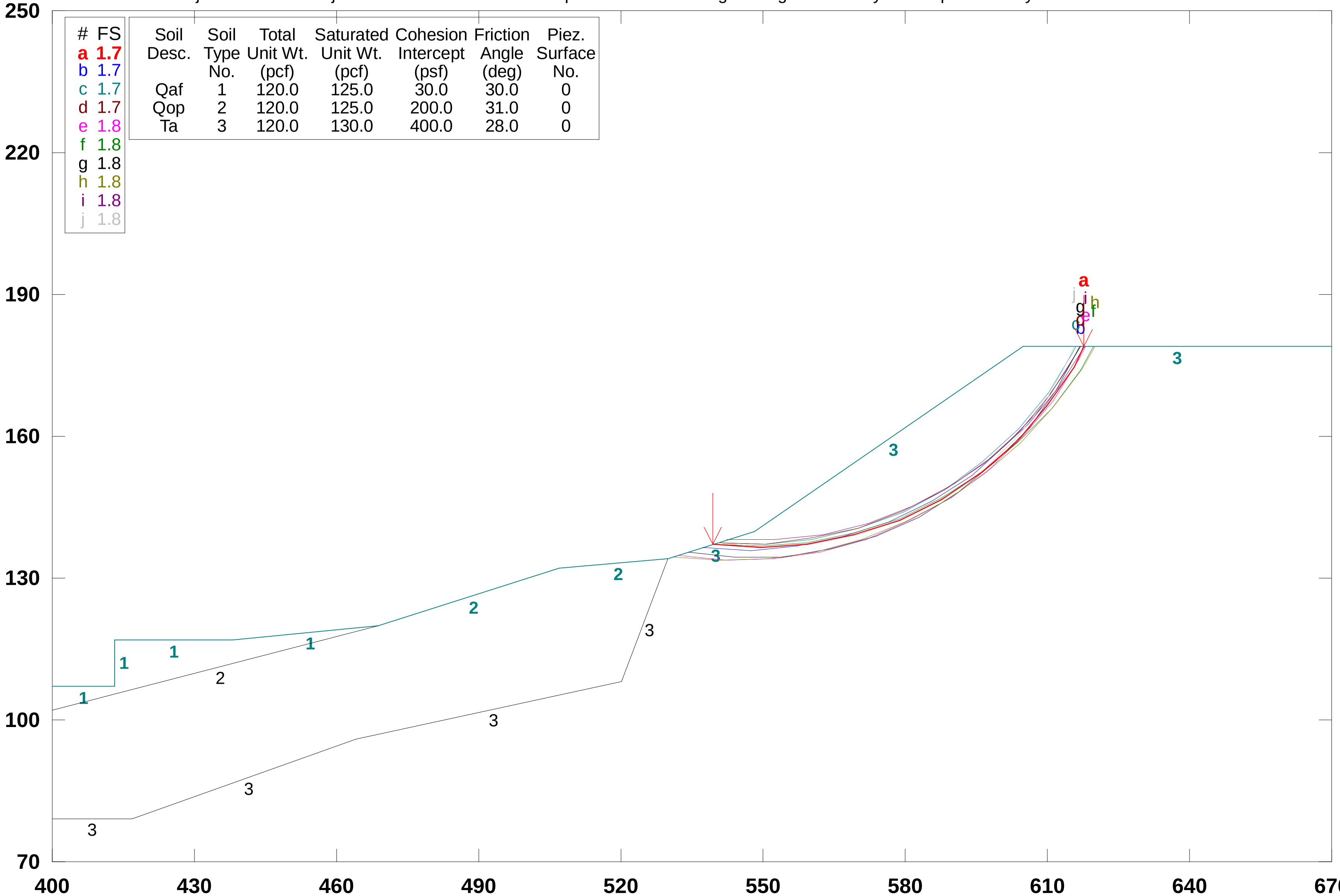

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Qaf	1	120.0	125.0	30.0	30.0	0
Qop	2	120.0	125.0	200.0	31.0	0
Ta	3	120.0	130.0	400.0	28.0	0

GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****
SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.
****

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Unit System: English
Plotted Output Filename: w:\2016 Jobs\2160564 - La Jolla es 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\astatic.PLT
PROBLEM DESCRIPTION: CWE 2160654.04
Cross Section A+400 - A'

BOUNDARY COORDINATES
9 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	400.00	107.00	413.00	107.00	1
2	413.00	107.00	413.10	117.00	1
3	413.10	117.00	438.00	117.00	1
4	438.00	117.00	469.00	120.00	1
5	469.00	120.00	507.00	132.00	2
6	507.00	132.00	530.00	134.00	2
7	530.00	134.00	548.00	140.00	3
8	548.00	140.00	605.00	179.00	3
9	605.00	179.00	670.00	179.00	3
10	520.00	108.00	530.00	134.00	3
11	400.00	102.00	469.00	120.00	2
12	464.00	96.00	520.00	108.00	3
13	417.00	79.00	464.00	96.00	3
14	400.00	79.00	417.00	79.00	3

User Specified Y-Origin = 70.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	30.0	30.0	0.00	0.0	0
2	120.0	125.0	200.0	31.0	0.00	0.0	0
3	120.0	130.0	400.0	28.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
6000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 525.00(ft)
and X = 555.00(ft)
Each Surface Terminates Between X = 610.00(ft)
and X = 670.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *

```
          Total Number of Trial Surfaces Evaluated =     0
          Statistical Data On All Valid FS Values:
             FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
             Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
          Failure Surface Specified By 11 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        539.48      137.16
              2        549.46      136.49
              3        559.44      137.14
              4        569.25      139.08
              5        578.72      142.29
              6        587.69      146.72
              7        596.00      152.28
              8        603.51      158.88
              9        610.09      166.41
             10        615.62      174.74
             11        617.71      179.00
          Circle Center At X =   549.56 ; Y =   212.67 ; and Radius =    76.18
                 Factor of Safety
                ***    1.748   ***
               Individual data on the     0  slices
                         Water  Water     Tie     Tie     Earthquake
                         Force  Force    Force   Force       Force   Surcharge
 Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver    Load
  No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
          Failure Surface Specified By 11 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        537.41      136.47
              2        547.40      135.97
              3        557.37      136.73
              4        567.17      138.74
              5        576.64      141.95
              6        585.63      146.33
              7        594.00      151.80
              8        601.62      158.28
              9        608.37      165.66
             10        614.13      173.83
             11        616.89      179.00
          Circle Center At X =   546.36 ; Y =   215.56 ; and Radius =    79.60
                 Factor of Safety
                ***    1.748   ***
          Failure Surface Specified By 11 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        540.52      137.51
              2        550.51      137.18
              3        560.46      138.17
              4        570.20      140.45
              5        579.55      143.98
              6        588.37      148.71
              7        596.49      154.55
              8        603.77      161.40
              9        610.10      169.14
             10        615.36      177.64
             11        615.97      179.00
          Circle Center At X =   547.97 ; Y =   213.45 ; and Radius =    76.31
                 Factor of Safety
                ***    1.749   ***
          Failure Surface Specified By 11 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        540.52      137.51
              2        550.52      137.30
              3        560.46      138.35
              4        570.19      140.64
              5        579.56      144.14
              6        588.42      148.79
              7        596.61      154.51
```

```
     8        604.03      161.22
     9        610.54      168.81
    10        616.05      177.16
    11        616.95      179.00
Circle Center At X =   547.16 ; Y =   216.62 ; and Radius =    79.39
       Factor of Safety
      ***    1.749   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        532.24      134.75
     2        542.20      133.80
     3        552.19      134.07
     4        562.08      135.57
     5        571.71      138.26
     6        580.94      142.11
     7        589.63      147.06
     8        597.65      153.03
     9        604.88      159.95
    10        611.20      167.69
    11        616.54      176.15
    12        617.88      179.00
Circle Center At X =   545.01 ; Y =   215.03 ; and Radius =    81.29
       Factor of Safety
      ***    1.750   ***
Failure Surface Specified By 11 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        539.48      137.16
     2        549.47      136.72
     3        559.44      137.49
     4        569.25      139.47
     5        578.73      142.63
     6        587.77      146.91
     7        596.22      152.26
     8        603.96      158.60
     9        610.87      165.82
    10        616.85      173.84
    11        619.80      179.00
Circle Center At X =   548.11 ; Y =   218.90 ; and Radius =    82.20
       Factor of Safety
      ***    1.751   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        534.31      135.44
     2        544.25      134.38
     3        554.25      134.63
     4        564.13      136.18
     5        573.72      139.00
     6        582.86      143.06
     7        591.40      148.27
     8        599.18      154.56
     9        606.07      161.80
    10        611.96      169.89
    11        616.74      178.67
    12        616.87      179.00
Circle Center At X =   547.37 ; Y =   210.69 ; and Radius =    76.38
       Factor of Safety
      ***    1.752   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        531.21      134.40
     2        541.18      133.67
     3        551.17      134.07
     4        561.06      135.58
     5        570.71      138.20
     6        580.01      141.87
     7        588.84      146.57
```

8	597.08	152.23
9	604.64	158.78
10	611.42	166.13
11	617.33	174.20
12	620.07	179.00

Circle Center At X = 542.72 ; Y = 222.29 ; and Radius = 88.64

Factor of Safety

*** 1.752 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	542.59	138.20
2	552.59	138.11
3	562.52	139.27
4	572.23	141.66
5	581.56	145.26
6	590.37	149.99
7	598.51	155.79
8	605.87	162.56
9	612.32	170.21
10	617.76	178.59
11	617.96	179.00

Circle Center At X = 548.30 ; Y = 217.71 ; and Radius = 79.72

Factor of Safety

*** 1.752 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	540.52	137.51
2	550.48	136.61
3	560.46	137.16
4	570.27	139.12
5	579.69	142.47
6	588.53	147.14
7	596.62	153.02
8	603.78	160.00
9	609.87	167.94
10	614.75	176.66
11	615.65	179.00

Circle Center At X = 551.70 ; Y = 206.26 ; and Radius = 69.66

Factor of Safety

*** 1.752 ***

**** END OF GSTABL7 OUTPUT ****

CWE 2160654.04 Cross Section A+400 - A'

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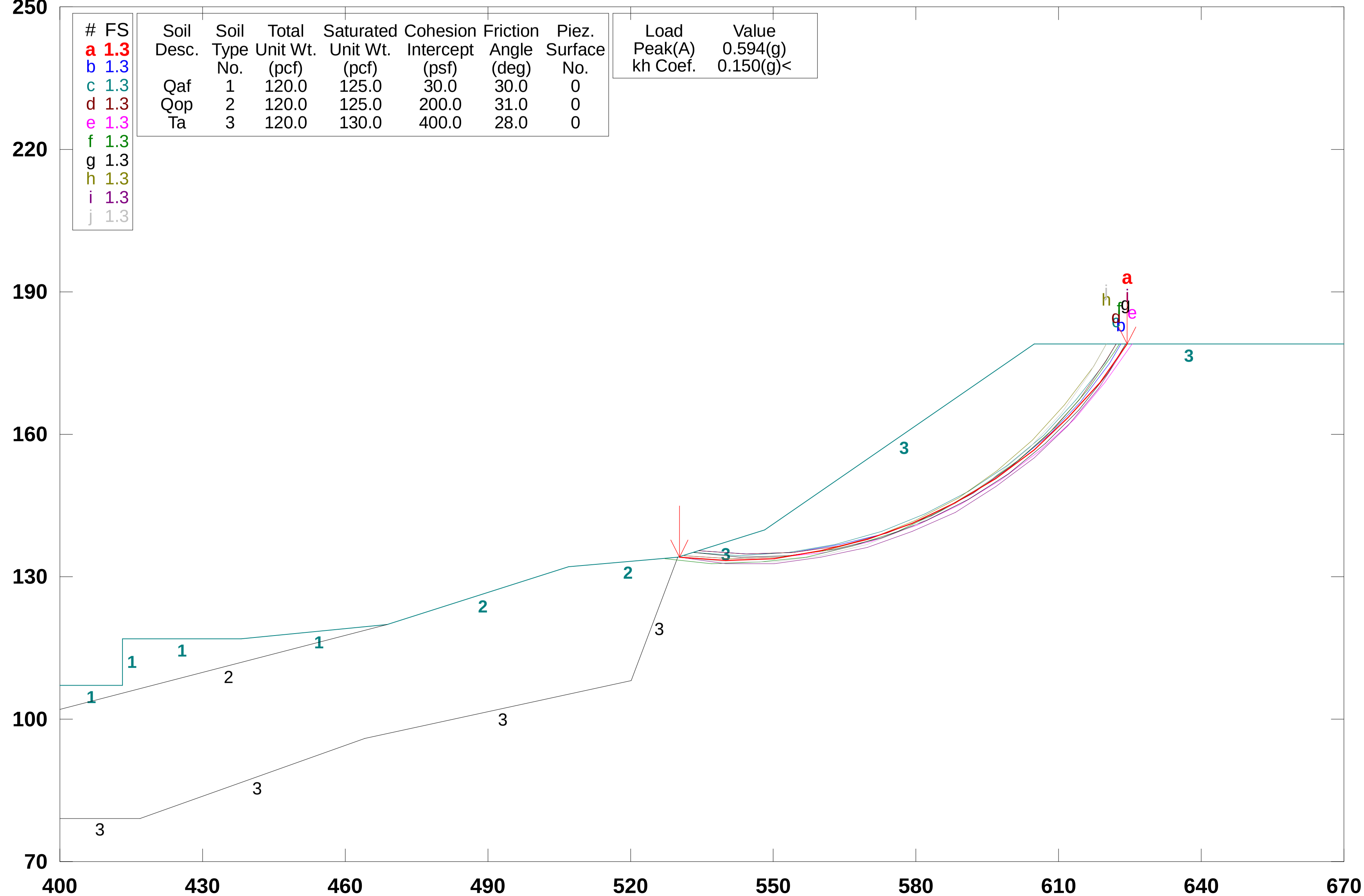

GSTABL7 v.2 FSmin=1.3

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

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Time of Run: 02:53PM
Run By: DRR
Input Data Filename: w:\2016 Jobs\2160564 - La Jolla Shores 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\apstatic.in
Output Filename: w:\2016 Jobs\2160564 - La Jolla Shores 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\apstatic.OUT
Unit System: English
Plotted Output Filename: w:\2016 Jobs\2160564 - La Jolla es 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\apstatic.PLT
PROBLEM DESCRIPTION: CWE 2160654.04
Cross Section A+400 - A’

BOUNDARY COORDINATES
9 Top Boundaries
14 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	400.00	107.00	413.00	107.00	1
2	413.00	107.00	413.10	117.00	1
3	413.10	117.00	438.00	117.00	1
4	438.00	117.00	469.00	120.00	1
5	469.00	120.00	507.00	132.00	2
6	507.00	132.00	530.00	134.00	2
7	530.00	134.00	548.00	140.00	3
8	548.00	140.00	605.00	179.00	3
9	605.00	179.00	670.00	179.00	3
10	520.00	108.00	530.00	134.00	3
11	400.00	102.00	469.00	120.00	2
12	464.00	96.00	520.00	108.00	3
13	417.00	79.00	464.00	96.00	3
14	400.00	79.00	417.00	79.00	3

User Specified Y-Origin = 70.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	30.0	30.0	0.00	0.0	0
2	120.0	125.0	200.0	31.0	0.00	0.0	0
3	120.0	130.0	400.0	28.0	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.594(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
6000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 525.00(ft)
and X = 555.00(ft)
Each Surface Terminates Between X = 610.00(ft)
and X = 670.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.

```
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Evaluated =     0
      Statistical Data On All Valid FS Values:
         FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
         Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
      Failure Surface Specified By 12 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        530.17      134.06
          2        540.16      133.50
          3        550.15      133.94
          4        560.04      135.37
          5        569.75      137.79
          6        579.16      141.17
          7        588.19      145.47
          8        596.74      150.65
          9        604.73      156.66
         10        612.09      163.44
         11        618.72      170.92
         12        624.56      179.00
      Circle Center At X =   540.76 ; Y =   233.42 ; and Radius =    99.92
             Factor of Safety
            ***    1.342   ***
           Individual data on the     0  slices
                     Water  Water     Tie     Tie     Earthquake
                     Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
      Failure Surface Specified By 12 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        534.31      135.44
          2        544.29      134.76
          3        554.28      135.19
          4        564.16      136.72
          5        573.81      139.33
          6        583.12      142.99
          7        591.97      147.65
          8        600.25      153.25
          9        607.86      159.74
         10        614.71      167.02
         11        620.72      175.02
         12        623.07      179.00
      Circle Center At X =   545.46 ; Y =   224.94 ; and Radius =    90.19
             Factor of Safety
            ***    1.342   ***
      Failure Surface Specified By 12 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        533.28      135.09
          2        543.26      134.59
          3        553.25      135.16
          4        563.11      136.80
          5        572.74      139.49
          6        582.03      143.20
          7        590.87      147.87
          8        599.15      153.47
          9        606.79      159.93
         10        613.69      167.17
         11        619.78      175.10
         12        622.15      179.00
      Circle Center At X =   543.00 ; Y =   227.29 ; and Radius =    92.71
             Factor of Safety
            ***    1.342   ***
      Failure Surface Specified By 12 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
```

1	534.31	135.44
2	544.28	134.65
3	554.27	135.01
4	564.16	136.51
5	573.81	139.13
6	583.10	142.84
7	591.90	147.59
8	600.10	153.31
9	607.59	159.93
10	614.28	167.37
11	620.07	175.52
12	621.99	179.00

Circle Center At X = 546.20 ; Y = 221.52 ; and Radius = 86.90
Factor of Safety
*** 1.343 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	531.21	134.40
2	541.18	133.67
3	551.18	133.97
4	561.09	135.29
5	570.81	137.62
6	580.24	140.94
7	589.29	145.21
8	597.84	150.39
9	605.82	156.42
10	613.14	163.24
11	619.71	170.77
12	625.48	178.94
13	625.51	179.00

Circle Center At X = 543.30 ; Y = 230.86 ; and Radius = 97.21
Factor of Safety
*** 1.343 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	527.07	133.75
2	537.03	132.86
3	547.03	133.01
4	556.96	134.20
5	566.71	136.41
6	576.18	139.61
7	585.27	143.79
8	593.87	148.88
9	601.90	154.84
10	609.27	161.60
11	615.90	169.09
12	621.72	177.22
13	622.73	179.00

Circle Center At X = 540.58 ; Y = 229.10 ; and Radius = 96.31
Factor of Safety
*** 1.343 ***

Failure Surface Specified By 12 Coordinate Points

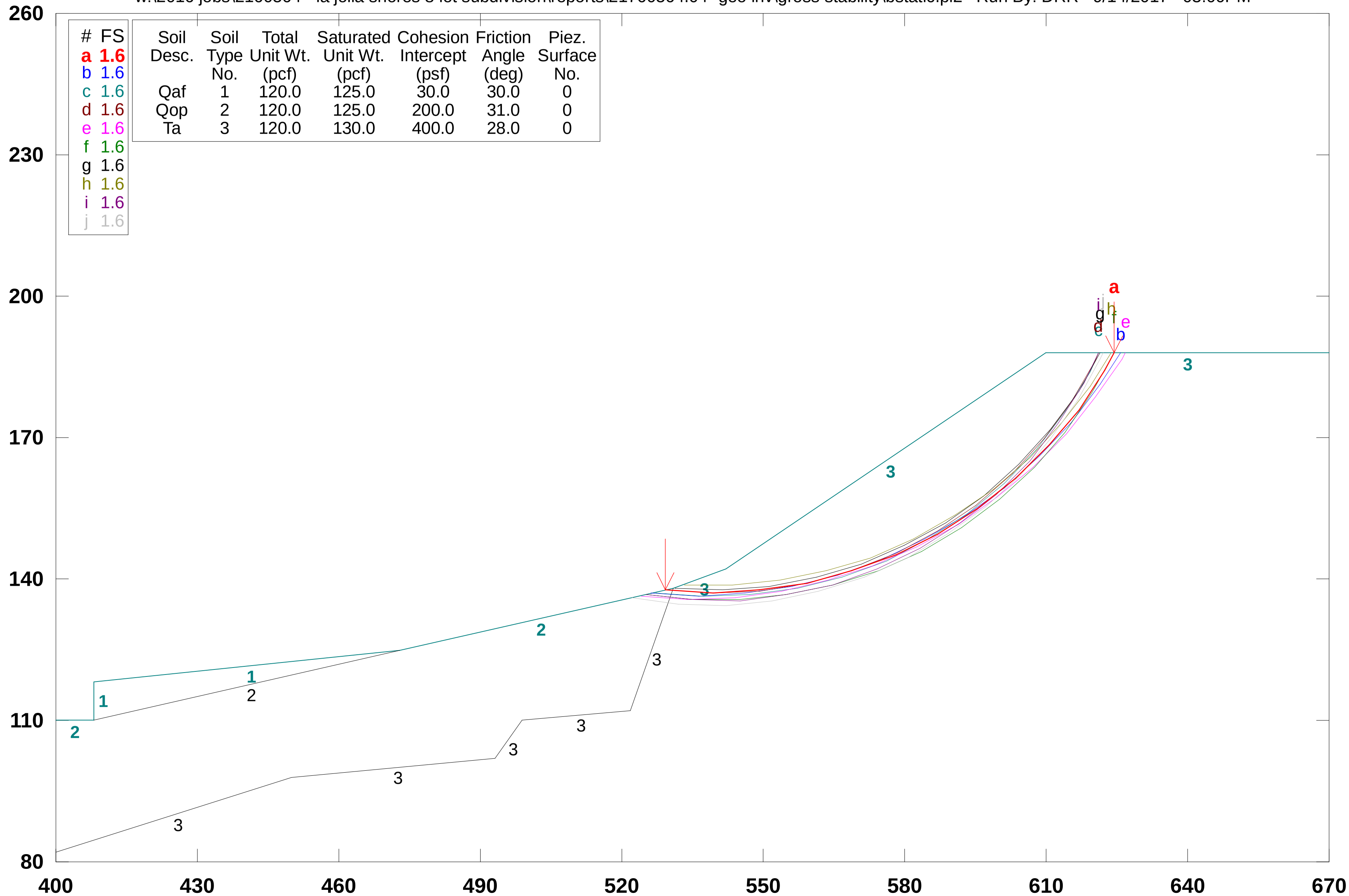
Point No.	X-Surf (ft)	Y-Surf (ft)
1	533.28	135.09
2	543.24	134.25
3	553.24	134.50
4	563.15	135.86
5	572.85	138.29
6	582.22	141.77
7	591.16	146.26
8	599.54	151.70
9	607.29	158.03
10	614.28	165.17
11	620.46	173.04
12	624.15	179.00

Circle Center At X = 545.96 ; Y = 224.83 ; and Radius = 90.64
Factor of Safety

```
      ***    1.343   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        531.21      134.40
    2        541.18      133.67
    3        551.17      134.07
    4        561.06      135.58
    5        570.71      138.20
    6        580.01      141.87
    7        588.84      146.57
    8        597.08      152.23
    9        604.64      158.78
   10        611.42      166.13
   11        617.33      174.20
   12        620.07      179.00
Circle Center At X =   542.72 ; Y =   222.29 ; and Radius =    88.64
       Factor of Safety
      ***    1.343   ***
Failure Surface Specified By 13 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        530.17      134.06
    2        540.11      132.94
    3        550.11      132.92
    4        560.05      134.00
    5        569.81      136.17
    6        579.28      139.40
    7        588.33      143.65
    8        596.86      148.87
    9        604.76      154.99
   10        611.94      161.95
   11        618.31      169.66
   12        623.80      178.02
   13        624.29      179.00
Circle Center At X =   545.29 ; Y =   223.54 ; and Radius =    90.75
       Factor of Safety
      ***    1.343   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        530.17      134.06
    2        540.12      133.05
    3        550.12      133.20
    4        560.03      134.51
    5        569.73      136.95
    6        579.08      140.50
    7        587.96      145.11
    8        596.24      150.71
    9        603.82      157.24
   10        610.59      164.59
   11        616.47      172.68
   12        620.02      179.00
Circle Center At X =   543.86 ; Y =   218.97 ; and Radius =    86.01
       Factor of Safety
      ***    1.344   ***
          **** END OF GSTABL7 OUTPUT ****
```

CWE 2160654.04 Cross Section B+400 - B'

w:\2016 jobs\2160564 - la jolla shores 8 lot subdivision\reports\21760564.04- geo inv\gross stability\bstatic.pl2 Run By: DRR 9/14/2017 03:00PM



GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

**** Original Version 1.0, January 1996; Current Version 2.003, June 2002 ****

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 9/14/2017
Time of Run: 03:00PM
Run By: DRR
Input Data Filename: w:\2016 Jobs\2160564 - La Jolla Shores 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\bstatic.in
Output Filename: w:\2016 Jobs\2160564 - La Jolla Shores 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\bstatic.OUT
Unit System: English
Plotted Output Filename: w:\2016 Jobs\2160564 - La Jolla es 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\bstatic.PLT
PROBLEM DESCRIPTION: CWE 2160654.04
Cross Section B+400 - B'

BOUNDARY COORDINATES
7 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	400.00	110.00	408.00	110.00	2
2	408.00	110.00	408.10	118.00	1
3	408.10	118.00	473.00	125.00	1
4	473.00	125.00	531.00	138.00	2
5	531.00	138.00	542.00	142.00	3
6	542.00	142.00	610.00	188.00	3
7	610.00	188.00	670.00	188.00	3
8	408.00	110.00	473.00	125.00	2
9	522.00	112.00	531.00	138.00	3
10	499.00	110.00	522.00	112.00	3
11	493.00	102.00	499.00	110.00	3
12	450.00	98.00	493.00	102.00	3
13	400.00	82.00	450.00	98.00	3

User Specified Y-Origin = 80.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	30.0	30.0	0.00	0.0	0
2	120.0	125.0	200.0	31.0	0.00	0.0	0
3	120.0	130.0	400.0	28.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
6000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 520.00(ft)
and X = 550.00(ft)
Each Surface Terminates Between X = 610.00(ft)
and X = 670.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *

```
          Total Number of Trial Surfaces Evaluated =     0
          Statistical Data On All Valid FS Values:
             FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
             Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
          Failure Surface Specified By 13 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        529.31      137.62
              2        539.30      137.08
              3        549.28      137.57
              4        559.17      139.10
              5        568.84      141.65
              6        578.19      145.18
              7        587.13      149.66
              8        595.56      155.05
              9        603.38      161.28
             10        610.51      168.29
             11        616.88      175.99
             12        622.42      184.32
             13        624.35      188.00
          Circle Center At X =   539.53 ; Y =   233.42 ; and Radius =    96.34
                 Factor of Safety
                ***    1.643   ***
               Individual data on the     0  slices
                         Water  Water     Tie     Tie     Earthquake
                         Force  Force    Force   Force       Force   Surcharge
 Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver    Load
  No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
          Failure Surface Specified By 13 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        526.21      136.93
              2        536.20      136.47
              3        546.18      136.98
              4        556.08      138.44
              5        565.78      140.84
              6        575.21      144.17
              7        584.28      148.39
              8        592.90      153.45
              9        601.00      159.32
             10        608.49      165.94
             11        615.32      173.25
             12        621.41      181.18
             13        625.67      188.00
          Circle Center At X =   535.93 ; Y =   240.54 ; and Radius =   104.07
                 Factor of Safety
                ***    1.643   ***
          Failure Surface Specified By 13 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        527.24      137.16
              2        537.20      136.29
              3        547.20      136.54
              4        557.11      137.91
              5        566.80      140.37
              6        576.16      143.89
              7        585.07      148.43
              8        593.41      153.94
              9        601.09      160.35
             10        608.01      167.57
             11        614.08      175.52
             12        619.22      184.09
             13        621.01      188.00
          Circle Center At X =   539.96 ; Y =   225.83 ; and Radius =    89.58
                 Factor of Safety
                ***    1.644   ***
          Failure Surface Specified By 13 Coordinate Points
            Point      X-Surf      Y-Surf
             No.        (ft)        (ft)
              1        529.31      137.62
```

2	539.29	136.97
3	549.28	137.44
4	559.15	139.01
5	568.80	141.66
6	578.08	145.37
7	586.90	150.08
8	595.14	155.75
9	602.70	162.29
10	609.49	169.64
11	615.42	177.69
12	620.43	186.34
13	621.15	188.00

Circle Center At X = 540.12 ; Y = 226.97 ; and Radius = 90.00

Factor of Safety

*** 1.644 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	524.14	136.46
2	534.12	135.84
3	544.11	136.16
4	554.03	137.42
5	563.79	139.62
6	573.29	142.73
7	582.46	146.72
8	591.21	151.56
9	599.47	157.20
10	607.15	163.60
11	614.20	170.70
12	620.54	178.43
13	626.13	186.73
14	626.82	188.00

Circle Center At X = 535.75 ; Y = 241.39 ; and Radius = 105.57

Factor of Safety

*** 1.644 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	525.17	136.69
2	535.11	135.58
3	545.11	135.54
4	555.06	136.57
5	564.84	138.66
6	574.34	141.78
7	583.45	145.91
8	592.06	150.98
9	600.09	156.95
10	607.43	163.74
11	614.00	171.28
12	619.72	179.48
13	624.40	188.00

Circle Center At X = 540.49 ; Y = 228.69 ; and Radius = 93.27

Factor of Safety

*** 1.645 ***

Failure Surface Specified By 12 Coordinate Points

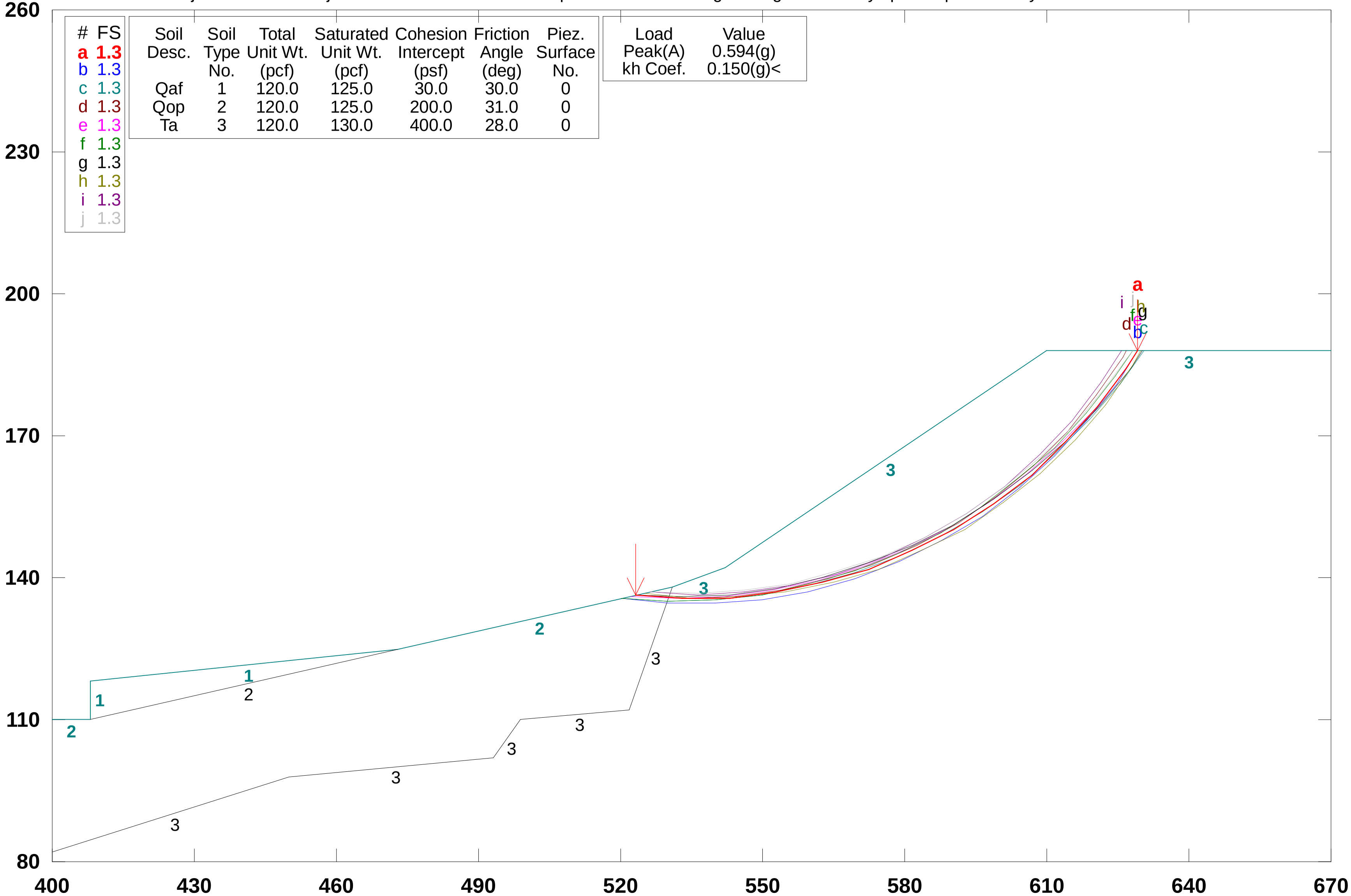
Point No.	X-Surf (ft)	Y-Surf (ft)
1	531.38	138.14
2	541.37	137.80
3	551.35	138.54
4	561.18	140.36
5	570.76	143.24
6	579.97	147.13
7	588.70	152.00
8	596.86	157.79
9	604.34	164.43
10	611.05	171.83
11	616.93	179.93
12	621.55	188.00

Circle Center At X = 539.53 ; Y = 229.86 ; and Radius = 92.09

```
       Factor of Safety
      ***    1.646   ***
Failure Surface Specified By 12 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        533.45      138.89
    2        543.45      138.78
    3        553.40      139.71
    4        563.21      141.67
    5        572.77      144.62
    6        581.96      148.55
    7        590.70      153.41
    8        598.89      159.14
    9        606.45      165.69
   10        613.29      172.99
   11        619.33      180.96
   12        623.61      188.00
Circle Center At X =   539.52 ; Y =   235.07 ; and Radius =    96.37
       Factor of Safety
      ***    1.646   ***
Failure Surface Specified By 13 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        525.17      136.69
    2        535.10      135.53
    3        545.10      135.50
    4        555.04      136.61
    5        564.79      138.83
    6        574.23      142.13
    7        583.23      146.49
    8        591.68      151.84
    9        599.48      158.10
   10        606.51      165.21
   11        612.69      173.07
   12        617.94      181.58
   13        620.96      188.00
Circle Center At X =   540.36 ; Y =   223.61 ; and Radius =    88.23
       Factor of Safety
      ***    1.646   ***
Failure Surface Specified By 14 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        522.07      136.00
    2        531.98      134.69
    3        541.98      134.47
    4        551.94      135.35
    5        561.75      137.31
    6        571.28      140.32
    7        580.43      144.36
    8        589.08      149.38
    9        597.13      155.31
   10        604.49      162.08
   11        611.06      169.62
   12        616.77      177.83
   13        621.55      186.62
   14        622.12      188.00
Circle Center At X =   538.99 ; Y =   225.68 ; and Radius =    91.27
       Factor of Safety
      ***    1.646   ***
          **** END OF GSTABL7 OUTPUT ****
```

CWE 2160654.04 Cross Section B+400 - B'

w:\2016 jobs\2160564 - la jolla shores 8 lot subdivision\reports\21760564.04- geo inv\gross stability\bpstaitc.pl2   Run By: DRR   9/14/2017   03:03PM



GSTABL7 v.2 FSmin=1.3

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM
Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 9/14/2017
Time of Run: 03:03PM
Run By: DRR
Input Data Filename: w:\2016 Jobs\2160564 - La Jolla Shores 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\bpstaitc.in
Output Filename: w:\2016 Jobs\2160564 - La Jolla Shores 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\bpstaitc.OUT
Unit System: English
Plotted Output Filename: w:\2016 Jobs\2160564 - La Jolla es 8 Lot Subdivision\Reports\21760564.04- Geo Inv\Gross Stability\bpstaitc.PLT
PROBLEM DESCRIPTION: CWE 2160654.04
Cross Section B+400 - B’

BOUNDARY COORDINATES
7 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	400.00	110.00	408.00	110.00	2
2	408.00	110.00	408.10	118.00	1
3	408.10	118.00	473.00	125.00	1
4	473.00	125.00	531.00	138.00	2
5	531.00	138.00	542.00	142.00	3
6	542.00	142.00	610.00	188.00	3
7	610.00	188.00	670.00	188.00	3
8	408.00	110.00	473.00	125.00	2
9	522.00	112.00	531.00	138.00	3
10	499.00	110.00	522.00	112.00	3
11	493.00	102.00	499.00	110.00	3
12	450.00	98.00	493.00	102.00	3
13	400.00	82.00	450.00	98.00	3

User Specified Y-Origin = 80.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	30.0	30.0	0.00	0.0	0
2	120.0	125.0	200.0	31.0	0.00	0.0	0
3	120.0	130.0	400.0	28.0	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.594(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
6000 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 30 Points Equally Spaced
Along The Ground Surface Between X = 520.00(ft)
and X = 550.00(ft)
Each Surface Terminates Between X = 610.00(ft)
and X = 670.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	523.10	136.23
2	533.08	135.54
3	543.08	135.77
4	553.01	136.91
5	562.80	138.95
6	572.37	141.87
7	581.62	145.65
8	590.50	150.26
9	598.92	155.65
10	606.81	161.80
11	614.11	168.63
12	620.75	176.11
13	626.69	184.15
14	629.01	188.00

Circle Center At X = 535.66 ; Y = 244.77 ; and Radius = 109.27
Factor of Safety
*** 1.256 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	520.00	135.53
2	529.95	134.57
3	539.95	134.52
4	549.92	135.40
5	559.75	137.18
6	569.39	139.86
7	578.74	143.41
8	587.72	147.81
9	596.26	153.01
10	604.28	158.98
11	611.73	165.65
12	618.53	172.98
13	624.63	180.91
14	629.11	188.00

Circle Center At X = 535.48 ; Y = 243.02 ; and Radius = 108.60
Factor of Safety
*** 1.256 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	520.00	135.53
2	529.98	134.94
3	539.98	135.20
4	549.92	136.30
5	559.73	138.24
6	569.34	141.00
7	578.68	144.57
8	587.69	148.91
9	596.29	154.01
10	604.43	159.81
11	612.06	166.29
12	619.10	173.38
13	625.52	181.05
14	630.40	188.00

Circle Center At X = 532.01 ; Y = 252.65 ; and Radius = 117.73
Factor of Safety
*** 1.257 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	524.14	136.46
2	534.12	135.84
3	544.11	136.16
4	554.03	137.42
5	563.79	139.62
6	573.29	142.73
7	582.46	146.72
8	591.21	151.56
9	599.47	157.20
10	607.15	163.60
11	614.20	170.70
12	620.54	178.43
13	626.13	186.73
14	626.82	188.00

Circle Center At X = 535.75 ; Y = 241.39 ; and Radius = 105.57
Factor of Safety
*** 1.257 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	522.07	136.00
2	532.06	135.56
3	542.05	135.99
4	551.97	137.27
5	561.74	139.40
6	571.29	142.36
7	580.55	146.13
8	589.46	150.68
9	597.94	155.98
10	605.93	161.99
11	613.38	168.66
12	620.22	175.95
13	626.42	183.80
14	629.18	188.00

Circle Center At X = 532.19 ; Y = 251.46 ; and Radius = 115.90
Factor of Safety
*** 1.257 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	520.00	135.53
2	529.99	134.99
3	539.98	135.32
4	549.91	136.51
5	559.70	138.56
6	569.27	141.45
7	578.56	145.16
8	587.49	149.66
9	596.00	154.91
10	604.02	160.88
11	611.49	167.53
12	618.36	174.80
13	624.57	182.63
14	628.12	188.00

Circle Center At X = 531.27 ; Y = 249.95 ; and Radius = 114.97
Factor of Safety
*** 1.257 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	523.10	136.23
2	533.10	135.92
3	543.08	136.45
4	552.99	137.81

5	562.75	140.00
6	572.29	143.00
7	581.55	146.78
8	590.46	151.32
9	598.95	156.60
10	606.98	162.56
11	614.48	169.18
12	621.39	176.40
13	627.68	184.17
14	630.28	188.00

Circle Center At X = 531.85 ; Y = 254.96 ; and Radius = 119.05

Factor of Safety

*** 1.259 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	525.17	136.69
2	535.14	135.85
3	545.14	135.96
4	555.08	137.01
5	564.88	139.00
6	574.45	141.91
7	583.70	145.70
8	592.55	150.36
9	600.92	155.84
10	608.73	162.08
11	615.92	169.03
12	622.42	176.63
13	628.17	184.81
14	629.98	188.00

Circle Center At X = 539.07 ; Y = 241.01 ; and Radius = 105.24

Factor of Safety

*** 1.259 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	526.21	136.93
2	536.20	136.47
3	546.18	136.98
4	556.08	138.44
5	565.78	140.84
6	575.21	144.17
7	584.28	148.39
8	592.90	153.45
9	601.00	159.32
10	608.49	165.94
11	615.32	173.25
12	621.41	181.18
13	625.67	188.00

Circle Center At X = 535.93 ; Y = 240.54 ; and Radius = 104.07

Factor of Safety

*** 1.259 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	526.21	136.93
2	536.20	136.69
3	546.18	137.34
4	556.06	138.88
5	565.77	141.30
6	575.22	144.57
7	584.34	148.67
8	593.06	153.56
9	601.30	159.22
10	609.01	165.59
11	616.12	172.62
12	622.58	180.26
13	628.02	188.00

Circle Center At X = 533.88 ; Y = 248.69 ; and Radius = 112.02

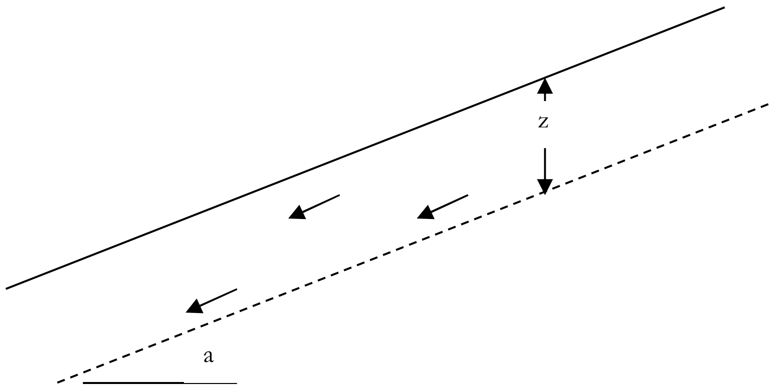
Factor of Safety

```
***    1.259   ***
    **** END OF GSTABL7 OUTPUT ****
```

Appendix F

Surficial Stability Analysis

SURFICIAL SLOPE STABILITY - 2:1 (H:V) Qaf



SEEPAGE PARALLEL TO SLOPE

ASSUMED PARAMETERS

z	Depth of Saturation (ft)	3
a	Slope Angle (H:1)	2
γ_W	Unit Weight of Water (pcf)	62.4
γ_T	Saturated Unit Weight of Soil (pcf)	125
ϕ	Angle of Internal Friction Along Plane of Failure (degrees)	28
c	Cohesion Along Plane of Failure (psf)	200

FACTOR OF SAFETY

$$FS = \frac{c + T(\tan\phi)}{T} \longrightarrow FS = \frac{c + (\gamma_T - \gamma_W)(z)(\cos^2 a)(\tan\phi)}{(\gamma_T)(z)(\sin a)(\cos a)}$$

FS = 1.9

CHRISTIAN WHEELER ENGINEERING	**PROPOSED CIELO MAR SUBDIVISION** 8303 La Jolla Shores Drive, La Jolla, CA 92037	
	BY: DRR	DATE: 9/29/2023
	JOB NO.: 2220609.01	Appendix F: F-1

Appendix G

Report of Geotechnical Infiltration Feasibility Study
CWE 2160564.03 - dated August 24, 2017

CHRISTIAN WHEELER
ENGINEERING

August 24, 2017

James and Tricia Riha
c/o Beacham Construction
405 Via Del Norte
La Jolla, California 92037

Report 2160564.03

Subject: **Report of Geotechnical Infiltration Feasibility Study**
Proposed Residential Subdivision, 8303 La Jolla Shores Drive, La Jolla, California

References: 1) Christian Wheeler Engineering, Report 2160564.01, Geologic Reconnaissance, 8303 La Jolla Shores Drive, dated January 9, 2017
2) Christensen Engineering & Surveying, Preliminary Grading Plan, 8303 La Jolla Shores Drive, dated February 3, 2017

Dear Mr. and Mrs. Riha:

In accordance with your request and our proposal dated April 28, 2017, we have prepared this report to present the results of our geotechnical infiltration feasibility study during the discretionary phase of the project. In general, the purpose of our investigation was to provide design infiltration rates based on percolation rates measured in the field. We understand that the subject site will be developed into an eight unit residential subdivision. We also understand that each lot will be designed to include a dedicated storm water basin, and two additional basins will be constructed to accommodate storm water runoff originating from the paved areas of the subdivision.

FINDINGS

SITE DESCRIPTION: The subject site is comprised of three adjacent residential lots identified as Assessor's Parcel Numbers 346-250-08 through -10. The lot is located adjacent to and east of Calle Frescota and south of Calle del Cielo in the La Jolla Shores area of San Diego, California. The site currently supports a single-story, single-family residence with a garage, storage structures and other normally associated improvements. Topographically, the site ascends gently from west to east with an approximately 50-foot-high slope along the eastern margin of the site.

FIELD INVESTIGATION: Our subsurface exploration of the site consisted of nine small-diameter, geotechnical borings that were advanced using a truck-mounted drill rig between May 11 and May 12, 2017. The borings were advanced to the depths ranging from 11½ feet to 19½ feet below existing grades. Eleven percolation test borings were also advanced with a truck-mounted drill rig on May 12, 2017, and were located in areas identified by the project civil engineer as potential storm water infiltration zones. The percolation test borings were advanced to depths ranging from 5 to 11 feet below existing grades. The approximate locations of the borings and percolation test borings are shown on Plate No. 1 of this report. Logs of the explorations are presented in Appendix A of this report. The borings were logged in detail with emphasis on describing the soil profile. No evidence of soil contamination was detected within the samples obtained.

GEOLOGIC SETTING AND SOIL DESCRIPTION: Based upon the findings of our subsurface explorations, it was determined that the proposed storm water basin locations are underlain by old paralic deposits, primarily consisting of sandy clays (CL) with lesser amounts of interbedded clayey sand lenses (SC).

INFILTRATION RATE DETERMINATION

FIELD MEASUREMENTS: Percolation testing was performed on May 15, 2017 in the eleven percolation test borings that were drilled at the locations of the proposed storm water basins, as directed by the project Civil Engineer. The seven-inch-diameter borings, designated as PT-1 through PT-11, were drilled to depths of 5 to 11 feet below existing grade, and cleaned of loose soils. The borings were drilled to the approximate bottom of the proposed storm water basins. Three-inch diameter perforated pipes were set in the holes and the pipes were surrounded by ¾-inch gravel to prevent caving. After pipe installation, the test holes were presoaked.

The field percolation rates were determined the following Monday (two days after pre-soaking) by using the falling head test method. It should be noted that the water placed within the percolation test borings on the day the subsurface exploration was conducted did not fully infiltrate by the time of the start of percolation testing. The initial water level was established by refilling the test holes to near the tops of the proposed storm water basins. Percolation rates were monitored and recorded every 30 minutes over a period of 6 hours until the infiltration rates stabilized. Measurements were taken using a water level meter (Solinst, Model 101) with an accuracy measured to 0.005 foot increments (0.06 inch increments). To account for the use of gravel placed around the perforated pipe, an adjustment factor of 0.47 was used in the calculation of the percolation and infiltration rates. The measured gravel adjusted percolation and calculated infiltration rates are presented in Table I.

TABLE I: PERCOLATION AND INFILTRATION RATES

Test No.	Location	Soil Underlying BMP	Depth of Testing	Gravel Adjusted Percolation Rate	Infiltration Rate
PT-1	West Side of Lot 5	Old Paralic Deposits	5 feet	0.24 inches per hour	0.00 inches per hour
PT-2	NW Corner of Lot 6	Old Paralic Deposits	5 feet	0.96 inches per hour	0.04 inches per hour
PT-3	NW Corner of Lot 7	Old Paralic Deposits	5 feet	0.24 inches per hour	0.01 inches per hour
PT-4	NW Corner of Lot 8	Old Paralic Deposits	5 feet	0.24 inches per hour	0.01 inches per hour
PT-5	NW Corner of Lot 8	Old Paralic Deposits	5 feet	0.24 inches per hour	0.01 inches per hour
PT-6	NE Corner of Lot 1	Old Paralic Deposits	5 feet	0.24 inches per hour	0.01 inches per hour
PT-7	NW Corner of Lot 2	Old Paralic Deposits	5 feet	0.24 inches per hour	0.01 inches per hour
PT-8	West Side of Lot 1	Old Paralic Deposits	5 feet	0.24 inches per hour	0.01 inches per hour
PT-9	NW Corner of Lot 3	Old Paralic Deposits	10 feet	0.48 inches per hour	0.01 inches per hour
PT-10	SW Corner of Lot 3	Old Paralic Deposits	10 feet	0.48 inches per hour	0.02 inches per hour
PT-11	West Side of Lot 4	Old Paralic Deposits	10.9 feet	1.44 inches per hour	0.03 inches per hour

Infiltration and percolation are two related but different processes describing the movement of moisture through soil. Infiltration is the downward entry of water into the soil or rock surface and percolation is the flow (lateral and vertical) of water through soil and porous or fractured rock. The direct measurement yielded by a percolation test tends to overestimate the infiltration rate, except in cases where a storm water basin or a dry well is similarly dimensioned to the borehole. As such, the measured percolation rates were converted into infiltration rates using the Porchet Method. The spreadsheet used for the conversion is included in Appendix C of this report.

The average infiltration rate for the natural soils at a depth of 5 feet below existing grades at locations PT-1 through PT-9 and at depths of 10 and 11 feet below existing grade at locations PT-10 and PT-11 was approximately 0.01 inches per hour.

FACTOR OF SAFETY: The City of San Diego Storm Water Standards Design Manual states that "a maximum factor of safety of 2.0 is recommended for infiltration feasibility screening such that an artificially high factor of safety cannot be used to inappropriately rule out infiltration, unless justified. If the site passes the feasibility analysis at a factor of safety of 2.0, then infiltration must be investigated, but a higher factor of safety may be selected at the discretion of the design engineer. Using a FOS of 2.0, an infiltration rate of 0.005 inches per hour can be used for the feasibility analysis for the proposed storm water basins.

The infiltration rate calculated based on the results of the percolation testing is not considered an appreciable rate of infiltration, which indicates a No Infiltration Condition as an appropriate characterization for the project site. Also, based on our professional opinion and the findings of the site investigation, the soil infiltration properties across the areas of the site available for the storm water infiltration are likely to be uniform.

GEOTECHNICAL CRITERIA FOR STORM WATER BASINS

GENERAL: Based on the current Storm Water Standards, BMP Design Manual, certain geotechnical criteria need to be addressed when assessing the feasibility and desirability of the use of storm water basins for a project site. Those criteria, Per Section C.2 of the manual, are addressed below.

C2.1 SOIL AND GEOLOGIC CONDITIONS: Site soil and geologic conditions influence the rate at which water can physically enter the soils. Based on the conditions observed in our exploratory borings, the site is underlain by artificial fill and old paralic deposits. As observed within our borings, the artificial fill consisted of clayey sand/sandy clay (SC/CL) and the old paralic deposits consisted of sandy clay and clayey sand (CL/SC). Groundwater was not encountered within our subsurface investigation.

C2.2 SETTLEMENT AND VOLUME CHANGE: Settlement and volume change can occur when water is introduced below grade. Based upon the soil conditions observed in our borings the artificial fill is subject to a higher potential for hydro collapse upon wetting, while the potential for hydro-collapse within the underlying old paralic deposits is considered to be relatively low. This can be mitigated by a combination of remedial grading and incorporating impermeable liners or cut-off walls. The artificial fill is comprised of clayey sand/sandy clay (SC/CL) which we believe to have a low to moderate expansive potential. There is a potential for heaving within the fill when water is introduced.

C2.3 SLOPE STABILITY: Infiltration of water has the potential to increase the risk of failure to nearby slopes. However, the underlying old paralic deposits are not expected to be prone to slope stability issues provided sound engineering recommendations and construction practices are followed.

C2.4 UTILITY CONSIDERATIONS: Utilities are either public or private infrastructure components that include underground pipelines, vaults, and wires/conduit, and above ground wiring and associated structures. Infiltration of water can pose a risk to subsurface utilities, or geotechnical hazards can occur within the utility trenches when water is introduced. However, based on the infeasibility of infiltration within the approximate boundaries of the site, no further utility considerations in relation to storm water infiltration can be advised at this time.

C2.5 GROUNDWATER MOUNDING: Groundwater mounding occurs when infiltrated water creates a rise in the groundwater table beneath the facility. Groundwater mounding can affect nearby subterranean structures and utilities. Based on the anticipated depth to groundwater, the potential for groundwater mounding is low.

C2.6 RETAINING WALL AND FOUNDATIONS: Infiltration of water can result in potential increases in lateral pressures and potential reduction in soil strength. Retaining walls and foundations can be negatively impacted by these changes in soil conditions. This should be taken into account when designing the storm water basins, retaining walls and foundations for the site. Based on the currently existing project site conditions and the No Infiltration Condition characterization, no negative impacts associated with storm water infiltration are anticipated to effect proposed retaining walls and foundations.

CONCLUSIONS AND RECOMMENDATIONS

Field infiltration rates within the soils below the proposed storm water basins were very low. Using a factor of safety of 2.0, infiltration rates of 0.005 inches per hour can be used. The infiltration rate of 0.005 inches per hour is not considered an appreciable rate of infiltration, which indicates a No Infiltration Condition existing at the project site. Based on our professional opinion and the findings of the site investigation, the soil infiltration properties across the areas of the site available for the storm water infiltration are likely to be uniform, and as such on-site storm water infiltration should not be considered under the currently existing site conditions.

It is our professional opinion and judgment that our recommendation that infiltration facilities not be used to manage storm water discharge is consistent and in accordance with Appendices C and D of the Model BMP Design Manual San Diego Region (2015). Worksheet C.4-1: Categorization of Infiltration Feasibility Criteria has been completed and signed for the subject project, and is included in Appendix B of this report.

It should be noted that it is not our intent to review the civil engineering plans, notes, details, or calculations, when prepared, to verify that the engineer has complied with any particular storm water design standards. It is the responsibility of the designer to properly prepare the storm water plan based on the municipal requirements considering the planned site development and infiltration rates.

LIMITATIONS

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on our limited percolation testing, an evaluation of the subsurface soil conditions encountered at our subsurface exploration locations and the assumption that the infiltration rates and soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the infiltration basins may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the soils engineer so that they may make modifications if necessary. In addition, this office should be advised of any changes in the project scope, proposed site grading or storm water basins design so that it may be determined if the recommendations contained herein are appropriate. This should be verified in writing or modified by a written addendum.

If you should have any questions regarding this report, please do not hesitate to contact this office. This opportunity to be of professional service is sincerely appreciated.

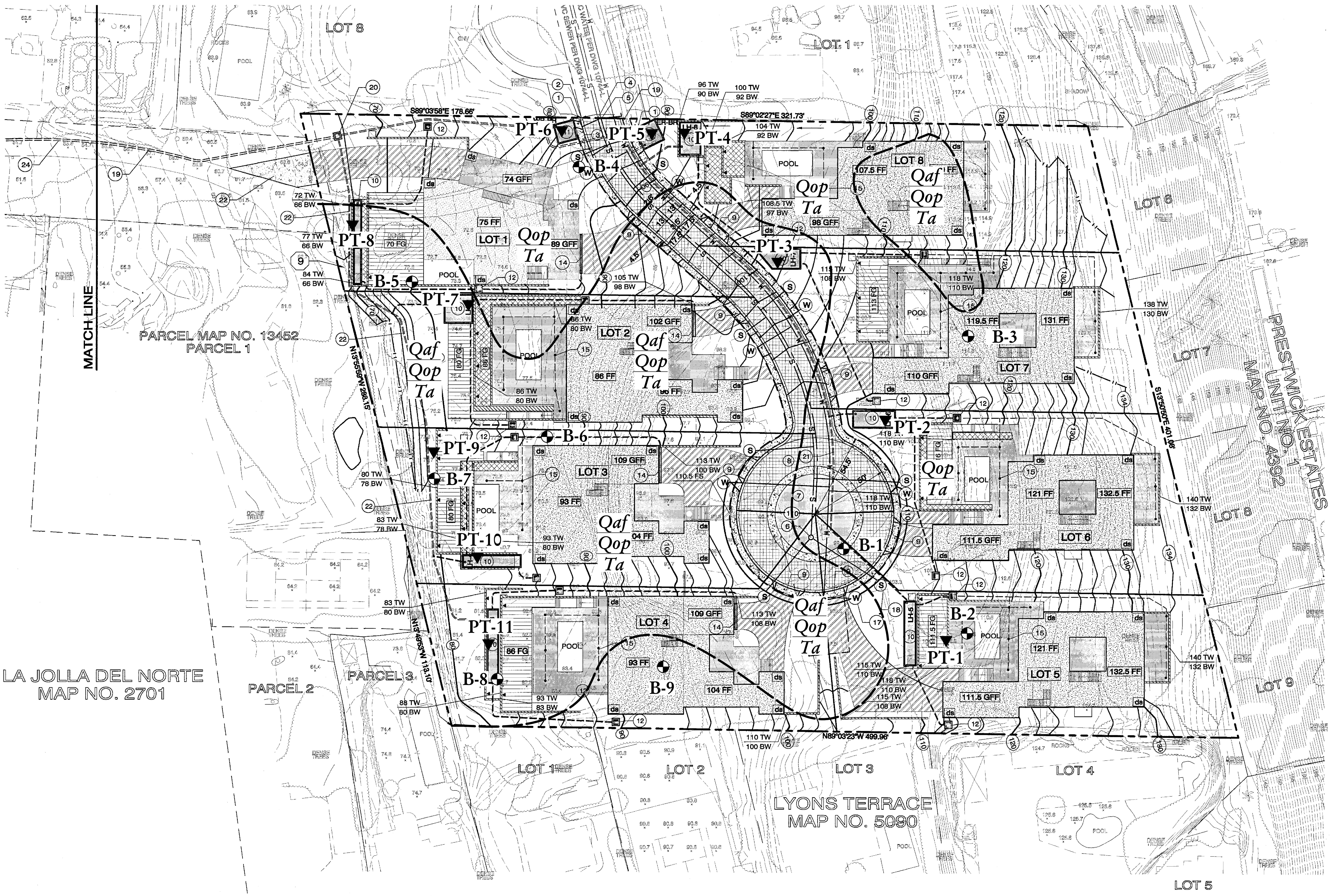
Respectfully submitted,

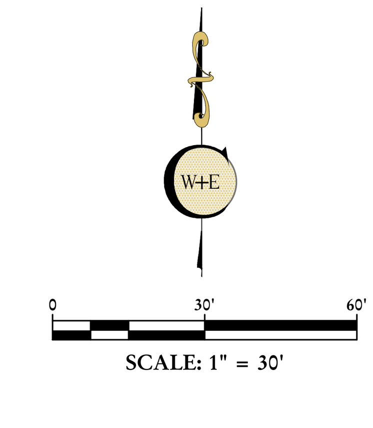
CHRISTIAN WHEELER ENGINEERING

Daniel B. Adler, RCE #36037

David R. Russell, CEG #2215

ec: : lb@beachamconstruction.com; paul@alcornbenton.com; ceands@aol.com





CWE LEGEND	
B-9	APPROXIMATE BORING LOCATION
PT-11	APPROXIMATE PERCOLATION TEST LOCATION
	GEOLOGIC CONTACT
Qaf / Qop / Ta	ARTIFICIAL FILL OVER OLD PARALIC DEPOSITS
Qop / Ta	OLD PARALIC DEPOSITS OVER ARDATH SHALE
NOTE: TOPSOILS/SUBSOILS NOT MAPPED	

Prepared By:
CHRISTENSEN ENGINEERING & SURVEYING
7888 SILVERTON AVENUE, SUITE "J"
SAN DIEGO, CA 92126
PHONE (858)271-9901 FAX (858)271-8912

Project Address:
8280 CALLE DEL CIELO
LA JOLLA, CA 92037.

Revision 5:
Revision 4:
Revision 3:
Revision 2:
Revision 1:

Project Name:
CIELO TENTATIVE MAP

Original Date: FEBRUARY 03, 2017

Sheet Title:
Sheet
DEP#
PRELIMINARY GRADING PLAN
C-3
JN A2015-50

SITE PLAN AND GEOTECHNICAL MAP

LA JOLLA 8-LOT SUBDIVISION 8280 CALLE DEL CIELO LA JOLLA, CALIFORNIA	
DATE: JUNE 2017	JOB NO.: 2160564.02
BY: SRD	PLATE NO.: 1

CHRISTIAN WHEELER ENGINEERING

Appendix A

Boring Logs

LOG OF TEST BORING B-1

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	100.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	110.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0				4" of AC.							
			CL	**Old Paralic Deposits (Qop):** Light brown to yellowish-brown, damp, stiff, SANDY CLAY, mottled, upper 3' moderately weathered, porous. Expansion Index of 82 (Medium).	18	Cal					SA EI SO4 DS
			CL	Brown to reddish-brown, moist.	14	SPT					
5											
					27	Cal		11.9	114.3		
10			SC	Light brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND with gravels.	16	Cal		11.9	105.9		
			SM	Light brown, moist, medium dense, very fine- to medium-grained, SILTY SAND with trace gravels, mottled.							
15					28	Cal					
			SM-SP	Light brown to black, moist, dense, very fine- to coarse-grained, POORLY GRADED SAND with silt.	57	Cal		6.7	128.0		
20				Boring terminated at 19.5 feet. No groundwater or seepage encountered.							
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	AUGUST 2017	JOB NO.:	2160564.03
BY:	SRD	FIGURE NO.:	A-1

CHRISTIAN WHEELER
ENGINEERING

LOG OF TEST BORING B-2

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	108.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	111.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0				3" of AC.							
			CL	**Old Paralic Deposits (Qop):** Dark brown, moist, stiff, SANDY CLAY, mottled, upper 2' weathered with rootlets.							
					18	Cal					
			CL	Light orangish-brown to light gray.							
5					42	Cal					
					27	Cal					
			SC	Light brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND with trace gravels.							
10			SM	Light yellowish-brown, damp, medium dense, very fine- to medium-grained, VERY SILTY SAND with trace gravels.							
					28	Cal					
				Boring terminated at 11.5 feet. No groundwater or seepage encountered.							
15											
20											
25											
30											

Notes:

Symbol Legend

- ∇ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	AUGUST 2017	JOB NO.:	2160564.03
BY:	SRD	FIGURE NO.:	A-2

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-3

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	111.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	119.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			CL	Old Paralic Deposits (Qop): Dark brown, damp, loose, SANDY CLAY, mottled, upper 2' moderately weathered.	28	Cal					
5			SC	Light yellowish-brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND.	39	Cal	■	15.2	111.1		DS
10			SM	Light yellowish-brown, moist, medium dense, very fine- to medium-grained, VERY SILTY SAND.	25	Cal		13.9	106.1		
15			SP-SM	Light gray, damp, medium dense, very fine- to medium-grained, POORLY GRADED SAND with silt and gravels. Gravel/cobble bed at 16 to 17 feet.	50/5"	Cal**					
					50/1"	SPT*					
20				Boring terminated at 17 feet. No groundwater or seepage encountered.							
25											
30											

Notes:

Symbol Legend

- ∇ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	AUGUST 2017	JOB NO.:	2160564.03
BY:	SRD	FIGURE NO.:	A-3

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-4

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	82.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	74.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0				4" of AC.							
			SC	**Old Paralic Deposits (Qop):** Brown to reddish-brown, dry, loose to medium dense, very fine- to medium-grained, CLAYEY SAND, mottled, upper 2' highly weathered.							
				Moist, medium dense.	18	Cal					
5			SM	Light brown, moist, medium dense, very fine- to medium-grained, SILTY SAND.	13	Cal	X	8.8	116.1		
			SM	Light brown to light grayish-brown, dense, fine- to coarse-grained, SILTY SAND with clay, mottled.							
10					41	Cal					
					50/4"	Cal					
15			ML	**Ardath Shale (Ta):** Light yellowish-brown, moist, hard, CLAYEY SILT with sand.							
					50/5"	Cal		13.2	112.6		DS
				Boring terminated at 19 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- ∇ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	AUGUST 2017	JOB NO.:	2160564.03
BY:	SRD	FIGURE NO.:	A-4

CHRISTIAN WHEELER
ENGINEERING

LOG OF TEST BORING B-5

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	73.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	70.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SC	**Artificial Fill (Qaf):** Brown, damp, loose to medium dense, very fine- to medium-grained, SANDY CLAY.							
				Moist, medium dense.	19	Cal					
5			SC	**Old Paralic Deposits (Qop):** Orangish-brown to brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND, mottled.	21	Cal					
10					34	Cal					
			CL	**Ardath Shale (Ta):** Yellowish-brown, moist, very stiff, SILTY CLAY with sand, moderately weathered to 16 feet.							
15					25	SPT					
				Hard.							SA
					50/5"	SPT					PI
20				Boring terminated at 19 feet. No groundwater or seepage encountered.							
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	AUGUST 2017	JOB NO.:	2160564.03
BY:	SRD	FIGURE NO.:	A-5

CHRISTIAN WHEELER
ENGINEERING

LOG OF TEST BORING B-6

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	79.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	93.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SC	**Artificial Fill (Qaf):** Brown, damp, loose to medium dense, very fine- to medium-grained, CLAYEY SAND with brick and concrete debris.							
			CL	**Old Paralic Deposits (Qop):** Brown to reddish-brown, moist, stiff to very stiff, SANDY CLAY. Expansion Index of 36 (Low).	32	Cal		10.9	115.2		SA EI
5					24	Cal		15.4	112.6		CP
				Fine- to coarse-grained at contact.							
10			CH	**Ardath Shale (Ta):** Greenish-gray, moist, very stiff, SILTY CLAY, highly weathered.	19	SPT					SA PI
			ML-CL	Light yellowish-brown to light gray, moist, very stiff, CLAYEY SILT/SILTY CLAY, slightly weathered.							
15					28	SPT					
				Boring terminated at 15 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- Groundwater Level During Drilling
- Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	AUGUST 2017	JOB NO.:	2160564.03
BY:	SRD	FIGURE NO.:	A-6

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-7

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	78.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	80.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			CL	**Artificial Fill (Qaf):** Brown, dry, medium stiff, SANDY CLAY with concrete debris in the upper 2 feet. Expansion Index of 58 (Medium).							SA EI SO4 DS
				Stiff.	14	Cal					
5											
					14	Cal					
10			CL	**Old Paralic Deposits (Qop):** Reddish-brown to brown, moist, very stiff to stiff, SANDY CLAY, mottled.							
					38	Cal		15.0	117.4		SA PI
15											
				Fine- to coarse-grained with gravels at contact.							
			ML/ CL	**Ardath Shale (Ta):** Yellowish-brown to light gray, moist, very stiff, CLAYEY SILT/SILTY CLAY.	26	SPT					
20				Boring terminated at 20 feet. No groundwater or seepage encountered.							
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	AUGUST 2017	JOB NO.:	2160564.03
BY:	SRD	FIGURE NO.:	A-7

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-8

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	83.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	86.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SC	**Artificial Fill (Qaf):** Brown, dry, loose to medium dense, very fine- to medium-grained, CLAYEY SAND with gravels and concrete debris.							
				Moist, medium dense.	18	Cal					
5				Brick debris at 5 feet.	20	Cal					
10			SC	**Old Paralic Deposits (Qop):** Reddish-brown to brown, moist, dense, very fine- to medium-grained, CLAYEY SAND/SANDY CLAY.	44	Cal					
			SM	Light brown, moist, dense, very fine- to medium-grained, SILTY SAND.							
			SC	Reddish-brown to light gray, moist, dense, very fine- to medium-grained, CLAYEY SAND.	57	Cal					
15				Boring terminated at 14.5 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- Groundwater Level During Drilling
- Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	AUGUST 2017	JOB NO.:	2160564.03
BY:	SRD	FIGURE NO.:	A-8

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-9

Date Logged:	5/11/2017	Equipment:	Diedrich D-50
Logged By:	DJF	Auger Type:	7 inch Hollow Stem
Existing Elevation:	89.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	93.0 feet	Depth to Water:	Unknown

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk
SPT	Standard Penetration Test	DR	Drive Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential	SD	Sample Density

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Topsoil:** Brown, dry, loose, very fine- to medium-grained, CLAYEY SAND, porous.							
			CL	**Old Paralic Deposits (Qop):** Brown, moist, very stiff, SANDY CLAY, upper 12" highly weathered, porous.	33	Cal	X				SA
				Very stiff..							
5			SC	Orangish-brown, moist, medium dense, very fine- to medium-grained, CLAYEY SAND.	20	Cal		8.1	117.3		
			SM	Light brown to light orangish-brown, moist, dense, very fine- to medium-grained, SILTY SAND.	38	Cal		9.2	111.9		
10			SP-SM	Light brown, moist, dense, fine- to coarse-grained, POORLY GRADED SAND with silt.							
15					64	Cal					
				Boring terminated at 16.5 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- ∇ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

LA JOLLA 8-LOT SUBDIVISION
8280 CALLE DEL CIELO
LA JOLLA, CALIFORNIA

DATE:	AUGUST 2017	JOB NO.:	2160564.03
BY:	SRD	FIGURE NO.:	A-9

CHRISTIAN WHEELER
ENGINEERING

Appendix B

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

Categorization of Infiltration Feasibility Condition		Worksheet C.4-1	
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: An infiltration rate assessment has been performed for the soils beneath the area of the proposed on-site storm water infiltration basins as presented in the Report of Geotechnical Infiltration Feasibility Study (CWE 2160564.03). The measured percolation rates were converted to infiltration rates using the Porchet Method. The City of San Diego Storm Water Standards BMP Design Manual states that "a maximum factor of safety (FOS) of 2.0 is recommended for infiltration feasibility screening such that an artificially high factor of safety cannot be used to inappropriately rule out infiltration, unless justified." Using a FOS of 2.0, the average infiltration rate for the soils below the proposed storm water basins was 0.006 inches per hour.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: An infiltration rate assessment has been performed for the subject site. Based on the underlying soil conditions and our recommendations presented in our report, we anticipate that infiltration greater than 0.5 inches per hour can be allowed without increasing risk of geologic hazards that cannot be mitigated to an acceptable level.			

Worksheet C.4-1 Page 2 of			
Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: An infiltration rate assessment has been performed for the subject site. Based on the underlying soil conditions and our recommendations presented in our report, we anticipate that infiltration greater than 0.5 inches per hour can be allowed without increasing risk of groundwater contamination that cannot be mitigated to an acceptable level. The seasonal high groundwater table is estimated to be at greater than 30 feet below existing grades.			
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: There does not appear to be a high risk of causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters by allowing infiltration greater than 0.5 inches per hour.			
Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Worksheet C.4-1 Page 3 of			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
Provide basis: An infiltration rate assessment has been performed for the soils beneath the area of the proposed biofiltration basins as presented in the Report of Geotechnical Infiltration Feasibility Study (CWE 2160564.03). The measured percolation rates were converted to infiltration rates using the Porchet Method. The City of San Diego Storm Water Standards BMP Design Manual states that "a maximum factor of safety (FOS) of 2.0 is recommended for infiltration feasibility screening such that an artificially high factor of safety cannot be used to inappropriately rule out infiltration, unless justified." Using a FOS of 2.0, an infiltration rate of 0.006 inches per hour can be used for the feasibility analysis for the proposed biofiltration basins. The estimated design infiltration rate is less than 0.01 inches per hour, which is not considered an appreciable rate or volume.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: An infiltration rate assessment has been performed for the subject site. Based on the underlying soil conditions and our recommendations presented in our report, we anticipate that infiltration in any appreciable quantity can be allowed without increasing risk of geologic hazards that cannot be mitigated to an acceptable level. C.2.2 The underlying old paralic deposits are not expected to be prone to hydro collapse, consolidation or heave to a degree that cannot be mitigated. C.2.3 The underlying old paralic deposits are not expected to be prone to slope stability issues provided sound engineering recommendations and construction practices are followed. C.2.4 Vertical liners could be used to prevent lateral migration into nearby utility trenches. C.2.5 Groundwater mounding is not expected to be a concern. C.2.6 Where biofiltration basins are located within 10 feet of a structure or retaining walls cut-off wall could be constructed around the perimeter of the basins.			

Worksheet C.4-1 Page 4 of			
Criteria	Screening Question	Yes	No
7	Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: An infiltration rate assessment has been performed for the subject site. Based on the underlying soil conditions and our recommendations presented in our report, we anticipate that an infiltration rate of 0.006 inches per hour can be allowed without increasing risk of groundwater contamination that cannot be mitigated to an acceptable level. The seasonal high groundwater table is estimated to be at greater than 30 feet below existing grades. C.3.1 We have no knowledge of groundwater or soil contamination onsite or down-gradient from the site. C.3.2 The seasonal high groundwater table is estimated to be at greater than 30 feet below existing grade. C.3.3 No existing wellheads are known within the vicinity of the subject site. C.3.4 We have no knowledge of a previous industrial use.			
8	Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: We did not perform a study regarding water rights. However, these rights are not typical in the San Diego area.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration. If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.		No Infiltration

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings

Appendix C

Porchet Method- Percolation to Infiltration Conversion Spreadsheet

Percolation to Infiltration Rate Conversion (Porchet Method)

La Jolla Shores Drive

CWE 2160564.03

Perc Test #	Gravel Adjustment Factor	Effective Radius (inches) r	Depth of Hole Below Existing Grade (inches)	Time Interval (min.) Δt	Height of pipe above surface (feet)	Initial Water Depth without correction (feet)	Final Water Depth without correction (feet)	Initial Water Height with correction (inches) H_o	Final Water Height with correction (inches) H_f	Change in head (inches) ΔH	Average Head Height (inches) H_{avg}	Tested Infiltration Rate (inch/hour) I_t
1	0.47	3.5	60	30	0.25	1.88	1.89	40.44	40.32	0.12	40.38	0.00
2	0.47	3.5	60	30	0.00	3.32	3.36	20.16	19.68	0.48	19.92	0.04
3	0.47	3.5	60	30	0.33	3.71	3.72	19.44	19.32	0.12	19.38	0.01
4	0.47	3.5	60	30	0.00	2.63	2.64	28.44	28.32	0.12	28.38	0.01
5	0.47	3.5	60	30	0.00	2.78	2.79	26.64	26.52	0.12	26.58	0.01
6	0.47	3.5	60	30	0.00	3.11	3.12	22.68	22.56	0.12	22.62	0.01
7	0.47	3.5	60	30	0.00	3.64	3.65	16.32	16.20	0.12	16.26	0.01
8	0.47	3.5	60	30	0.00	2.67	2.68	27.96	27.84	0.12	27.90	0.01
9	0.47	3.5	120	30	0.00	6.21	6.23	45.48	45.24	0.24	45.36	0.01
10	0.47	3.5	120	30	0.00	8.10	8.12	22.80	22.56	0.24	22.68	0.02
11	0.47	3.5	131	30	3.00	10.60	10.66	39.80	39.08	0.72	39.44	0.03

"Initial and final water depth without correction" are measurements taken from top of pipe if pipe is sticking out of ground (most cases)
"Initial and final water height with correction" factors in the height of pipe above surface, and provides measurement of water above bottom of pipe
If measurements are taken from grade "Height of pipe above surface" = 0

Gravel Adjustment Factor:

4-inch Diameter Pipe: 1.00 - No Gravel Used (No Caving)
0.51 - 3/4 inch gravel with 8 inch diameter hole
0.56 - 3/4 inch gravel with 7 inch diameter hole
0.64 - 3/4 inch gravel with 6 inch diameter hole

3-inch Diameter Pipe: 1.00 - No Gravel Used (No Caving)
0.44 - 3/4 inch gravel with 8 inch diameter hole
0.47 - 3/4 inch gravel with 7 inch diameter hole
0.51 - 3/4 inch gravel with 6 inch diameter hole

Porchet Method - Tested Percolation Rate Conversion to Tested Infiltration Rate

$$I_t = \frac{\Delta H \; 60 \; r}{\Delta t \; (r + 2H_{avg})}$$

I_t = tested infiltration rate, inches per hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
r = effective radius of test hole
H_{avg} = average head over the time interval, inches