APPENDIX D1

Geotechnical Investigation

GeoFirm
801 Glenneyre St. • Suite F • Laguna Beach • CA 92651
(949) 494-2122 • FAX (949) 497-0270

April 30, 2018

Kreuzer Consulting Group
320 Main Street, Unit D
Seal Beach, CA 90740

Project No: 72311-00
Report No: 17-8153

Attention: Mr. Rick Kreuzer

Subject: **Geotechnical Investigation for Beach Access Rehabilitation**
Anita Street Beach Access
Laguna Beach, California

INTRODUCTION

This report presents findings and conclusions of a preliminary geotechnical investigation undertaken to relate onsite and certain regional geotechnical conditions to the proposed rehabilitation of the Anita Street beach access stairway in Laguna Beach, California. Analyses for this investigation are based upon conceptual landscape plans prepared by Clark & Green Associates.

The conclusions and recommendations of this report are considered preliminary due to the absence of finalized foundation and grading plans, the formulation of which are partially dependent upon the recommendations presented herein.

Scope of Investigation

The investigation included:

1. Review and analysis of pertinent reports, maps, and published literature pertaining to the subject site and adjacent areas in order to relate geotechnical data to existing conditions.

2. Site reconnaissance and the excavation and logging of five hand-auger borings to expose subsurface conditions and to evaluate the character and geometrical distribution of earth materials within and underlying the proposed foundation areas.

3. Preparation of two geotechnical cross sections through the site to relate geologic conditions to proposed construction in order to facilitate the development of appropriate foundation design criteria.

4. Geotechnical analysis of data and preparation of this geotechnical report presenting our conclusions and recommendations for the design and construction of the beach access

stairs in accordance with the 2016 California Building Code and for use by your design professional, contractors, and submittal to the City of Laguna Beach.

Accompanying Illustrations and Appendices

Figure 1	-	Geologic Location Map
Figure 2	-	Typical Retaining Wall Subdrain Detail
Appendix A	-	References
Appendix B	-	Boring Logs
Appendix C	-	Slope Stability Analyses
Appendix D	-	Standard Grading Guidelines
Plate 1	-	Geotechnical Plot Plan and Cross Sections

Proposed Construction

Based on a review of the conceptual landscape plans prepared by Clark & Green Associates, the proposed improvements generally include the replacement of the existing beach access stairway that descends from the upper terrace level, across the bluff face, and onto the beach. The plans indicate the proposed stairway will generally follow the existing alignments. As presented herein, the proposed stairway is recommended to consist of bridge structures supported on caissons constructed in bedrock.

GEOTECHNICAL CONDITIONS

Earth Materials

Based upon review of regional geologic mapping and onsite geologic reconnaissance, the project area is underlain by bedrock strata of the Topanga Formation, and overlying terrace deposits, beach deposits, slopewash, and artificial fill.

The Topanga Formation bedrock, as exposed in local bluff faces in the Laguna Beach area, and at shallow depth in borings, generally consists of tan, coarse, sandstone, with interbedded gray siltstone. Unweathered bedrock is considered to be a suitable bearing material for the support of foundations. The surface veneer of the bedrock was observed to be weathered and friable, but moderately hard to hard layers were encountered in the borings. Heavy equipment may be necessary to excavate bedrock.

Bedding planes in the Topanga Formation bedrock in the vicinity of the site generally strike to the northwest and dip moderately to the south-southwest. The geometric relationship between orientations of the bedding planes and the existing slope generally results in an overall neutral condition for slope stability. Signs of slope instability were not observed during our investigation.

Based on our onsite mapping and test borings excavated during previous nearby investigations, terrace deposits unconformably overlie the gently-inclined bedrock contact in the vicinity of the site. In general, terrace deposits consist of orange to light brown, moderately- to well-consolidated, fine to coarse sand. Undisturbed, competent terrace deposits are considered to be a suitable bearing material for the support of foundations.

Beach deposits are present at the base of the bluff along the shoreline. Beach deposits consist of loose, medium- to coarse-grained sand with scattered shell fragments. It was noted during our study that minor pockets of beach sand are deposited on the lower outcrops a few feet above the current beach level, indicating seasonally strong wave action. Beach deposits are not considered to be suitable as a bearing material.

Outcrops of Slopewash deposits are scattered on the slope. Slopewash deposits primarily consist of variably fractured, broken, and disturbed sandstone debris derived from bedrock. The debris varies from friable sand to locally cemented sandstone blocks. Slope wash deposits are not considered to be suitable as a bearing material.

Artificial fill materials are present in areas of existing walkways, in existing utility trenches, and likely also in other areas of the site. The existing fill is not considered to be suitable as a bearing material.

Groundwater

Groundwater will likely be present within the beach deposits at relatively shallow depth, depending on the tidal cycle. This groundwater level is anticipated to fluctuate under normal tidal and wave conditions. When present, groundwater will promote caving in excavations exposing beach sands.

Seasonal perched groundwater should be anticipated at the terrace-bedrock contact.

Slope Stability

Generalized engineering stability analyses were performed as part of this investigation to estimate the gross stability of the slope underlying the project area. The results, which are presented in Appendix C, indicate the site is adequately stable for the proposed improvements. Surficial instability, consisting of erosion and intermittent loss of non-bedrock earth materials underlying the project area should be expected especially during intense ground shaking, heavy rainfall, or during wave run-up due to storm surge. Surficial instability and erosion are not anticipated to negatively affect the proposed beach access stairway, however, provided new foundations are designed and constructed in accordance with the recommendations presented herein.

CONCLUSIONS

1. The construction of the proposed improvements at the subject site is considered geotechnically feasible provided the recommendations presented herein are integrated into the design, construction, and long-term maintenance of the property. Proposed construction should not affect or be affected by adjacent properties provided appropriate construction methods and care is utilized.

2. The site can be characterized with three distinct geomorphic surfaces; the upper terrace, the bluff face, and the beach shelf.

    a. The upper terrace surface is overlain with fill and non-marine terrace deposits. The fill materials are undocumented and likely from the early development of the community. As such, existing fill deposits should not be relied upon for support of improvements. Existing fill deposits may be removed and recompacted as engineered fill. Terrace materials, where undisturbed, may be utilized for foundation support.

    b. The bluffs are composed of siltstone and sandstone bedrock of the Topanga Formation. This formation is typically strong and resistant to erosion, as evidenced by the existence of the seabluff and similar coastline geomorphic features. Difficult excavating conditions in bedrock are anticipated due to the hard bedrock in the bluff.

    c. On the beach shelf directly below the bluff, the bedrock is mantled with less than four foot of beach sand. These materials may be difficult to excavate due to caving potential, specifically when wet.

3. Shallow groundwater conditions were observed in the beach shelf. Groundwater will promote caving in sandy or loose excavations. Designs and construction should consider tidal and wave activity on the lower shelf areas. Groundwater seepage should be anticipated during drilling near the terrace to bedrock contact.

4. The entry park areas may be supported on terrace deposits or recompacted fill. All undocumented fill should be removed to competent soils. Stairway transition areas near the sloping bluff should be supported by deepened foundations in bedrock.

5. The beach access stairs across the bluff and lower shelf should be supported by caissons embedded into competent bedrock at depth. Caissons are required to achieve bearing below the zone of active bedrock erosion on the lower shelf and base of the bluff.

RECOMMENDATIONS

Our recommendations are considered to be generally consistent with the standards of practice. They are based on both analytical methods and empirical methods derived from experience with similar geotechnical conditions. These recommendations are considered the minimum necessary for the likely site conditions and are not intended to supersede the design of the Structural Engineer or criteria of governing agencies.

Site Preparation and Grading

1. General

   Grading should be performed in accordance with the Standard Grading Specifications in Appendix D. Grading is anticipated to generally include minor cuts and fills to construct pads for the walkway and overlook areas.

2. Removal of Existing Improvements

   Existing vegetation and/or construction and irrigation debris should be removed from the areas of proposed construction and disposed of offsite. Debris encountered during remedial grading should also be disposed of offsite.

3. Remedial Grading

   We recommend that all structures be supported on caisson foundations embedded into competent terrace or bedrock materials. Remedial grading of the site may be performed for support of flatwork and similar landscape improvements. All existing fill soils should be removed to competent soils and re-compacted as recommended herein. The depths of existing fill overexcavation will require geotechnical evaluation during construction.

4. Compaction Standard

   Onsite soil materials are anticipated to be suitable for re-use as compacted fill in areas above the beach. Zones of very moist to wet soils are not likely to be encountered however; drying or blending with drier soils should be anticipated if wet soils are encountered during grading. Materials should be placed with at least 120 percent of optimum moisture content and compacted under the observation and testing of the soil engineer to at least 90 percent of the maximum dry density as determined by ASTM D 1557.

5. Import Soil

Import soil must be nonexpansive and should be approved by Geofirm prior to transport to the site.

6. Temporary Construction Slopes

A. Protection of Property

In order to reduce the risk to adjoining properties from temporary slope failures, temporary construction slopes exposing bedrock may be excavated vertically to a maximum height of 5 feet with higher portions laid-back no steeper than 1:1 (horizontal: vertical) pending field review by the geologist during grading. Flatter laybacks of 1.5:1 (horizontal to vertical) or flatter may be required if sandy or caving prone materials layers are encountered. Shoring should be anticipated where space limitations preclude temporary slope layback, or in locations where onsite personnel may be in close proximity to open excavations.

B. Worker Safety

As the safety of onsite personnel affected by the performance of temporary construction slopes is the responsibility of the general contractor, the contractor is recommended to implement the safety practices as defined in Section 1541, Subchapter 4, of Cal/OSHA T8 Regulations (2006). The materials exposed in temporary excavations should be evaluated by the contractor during construction.

Please note, Cal/OSHA temporary cut slope geometries are based on the materials encountered and may not coincide with the recommendations presented in Section A above.

Structural Design of Foundations

Our recommendations are considered to be generally consistent with the standards of practice. They are based on both analytical methods and empirical methods derived from experience with similar geotechnical conditions. These recommendations are considered the minimum necessary for the likely soil conditions and are not intended to supersede the design of the Structural Engineer or criteria of governing agencies.

1. Caisson Design Criteria, Bluff and Lower Shelf Areas

Caissons a minimum of 18 inches in diameter and embedded a minimum of 3 feet into competent bedrock as generally indicated on Plate 1 may be designed for an allowable

dead plus live load end bearing value of 6,000 pounds per square foot. A skin friction of 300 pounds per square foot may also by utilized for bedrock. One-third increases may also be utilized for short duration wind, wave, or seismic loading. Total and differential settlement of such caissons is expected to be negligible.

The passive pressure force may be computed using an equivalent fluid density of 300 pounds per cubic foot for competent bedrock below a depth of 3 feet, acting on a tributary area of twice the caisson diameter. The maximum passive pressure should not exceed 3,000 pounds per square foot. A coefficient of friction of 0.35 may be used in computing the frictional resistance.

Caisson excavations drilled through sand will require casing.

2. Shallow Foundation Design, Upper Terrace Areas

Spread footings which are founded in competent re-compacted fill or competent terrace sands may be designed for an allowable bearing value of 2,000 pounds per square foot assuming a minimum width of 15 inches and a minimum embedment of 24 inches below lowest adjacent grade. Design values may be increased one-third for short-term wind or seismic loading. Total and differential settlements are not anticipated to exceed one and one-half inch, respectively.

Lateral loads may be resisted by passive pressure forces and friction acting at the base of footings. Passive pressure forces may be computed using an equivalent fluid density of 200 pounds per cubic foot in re-compacted fill or competent terrace. Maximum passive pressures should not exceed 2,000 pounds per square foot. A coefficient of friction of 0.25 may be used in computing the frictional resistance. Passive pressure and friction values may be combined.

3. Foundation Setback

The bottom of foundations should be setback from the slope face a minimum distance of H/3, where H is the height of the slope measured from the toe of the slope. The setback distance should be at least 10 feet but not more than 40 feet.

Structural Design of Retaining Walls

1. Lateral Loads

Active pressure forces acting on walls retaining level or sloping 2:1 (horizontal:vertical) backfill may be designed using an equivalent fluid pressure of 35 or 50 pounds per cubic foot, respectively, if backfilled with geotechnically approved, granular non-cohesive soils

and free to rotate during backfilling. Possible topographic or structural surcharges should be addressed by the Structural Engineer. Restrained walls which support approved non-cohesive import material may be designed for an equivalent fluid density of 60 pounds per cubic foot. Limited wall deformations normally occur and should be considered in design of finished surfaces.

Seismic design of retaining walls may be based on the Mononobe-Okabe method, as updated by Atik and Sitar (2010), using an additional dynamic load of 15 pounds per cubic foot equivalent fluid pressure, acting at 1/3 H above the base of the wall. Final design requirements should be determined by the Structural Engineer.

2. Subdrains

It is recommended that the drainage scheme depicted on Figure 2, or an approved alternative be used to reduce the potential for seepage forces behind retaining walls.

3. Foundations

Retaining walls may be supported by caissons embedded into bedrock, or alternatively, if remedial grading is performed, on shallow foundations. Caissons or shallow foundations should be designed using the recommendations presented in the foundation section above.

Hardscape Design and Construction

Hardscape improvements may utilize deep foundations embedded into bedrock, or if designed for the anticipated settlement, conventional foundations embedded in terrace deposits or re-compacted fill. Improvements should be designed in accordance with the foundation recommendations presented above.

Concrete flatwork should be divided into as nearly square panels as possible. Joints should be provided at maximum 6 feet intervals to give articulation to the concrete panels. Landscaping and planters adjacent to concrete flatwork should be designed in such a manner as to direct drainage away from concrete areas to approved outlets.

Flatwork elements should be a minimum 5 inches thick (actual) and reinforced with No. 4 bars at 16 inches on center both ways. Pre-moistening of slab subgrades soils is recommended prior to construction of slabs.

Concrete

It is recommended that a concrete expert be retained to design an appropriate concrete mix to address the marine environment and the structural requirements. In lieu of retaining a concrete expert, it is conservatively recommended that the 2016 California Building Code, Section 1904.3 be utilized, which refers to ACI 318, Table 4.3.1., which specifies Type V cement, a maximum water cement ratio of 0.40, and a minimum compressive strength of 5,000 psi.

Finished Grade and Surface Drainage

Finished grades should be designed and constructed so that no water ponds in the vicinity of footings or drains over the slope. Drainage design in accordance with the California Building Code, Section 1804.4 is recommended. Proper interception and disposal of onsite surface discharge is presumed to be a matter of civil engineering or landscape architectural design. Concentrated surface discharge onto the bluff slope should be avoided.

The site is geotechnically unsuitable for the local onsite infiltration of storm water due to the sloping conditions and the high potential for perched groundwater to destabilize the near surface soils overlying impermeable bedrock. The discharge of storm water to the base of the slope or offsite is recommended.

Foundation Plan Formulation and Review

In order to help assure conformance with recommendations of this report and as a condition of the use of this report, the undersigned should review final foundation plans and specifications prior to submission of such to the building official for issuance of permits. Such review is to be performed only for the limited purpose of checking for conformance with the design concept and the information provided herein. This review shall not include review of the accuracy or completeness of details, such as quantities, dimensions, weights or gauges, fabrication processes, construction means or methods, coordination of the work with other trades or construction safety precautions, all of which are the sole responsibility of the Contractor. Geofirm's review shall be conducted with reasonable promptness while allowing sufficient time in our judgment to permit adequate review. Review of a specific item shall not indicate that Geofirm has reviewed the entire system of which the item is a component. Geofirm shall not be responsible for any deviation from the Construction Documents not brought to our attention in writing by the Contractor. Geofirm shall not be required to review partial submissions or those for which submissions of correlated items have not been received.

Observation and Testing

As a condition of the use of this report, it is required that geotechnical construction observation will be conducted by Geofirm to verify proper removal of unsuitable materials, that foundation

excavations are clean and founded in competent material, to test for proper moisture content and proper degree of compaction of fill, and to confirm design assumptions.

A Geofirm representative shall visit the site at intervals appropriate to the stage of construction, as notified by the Contractor, in order to observe the progress and quality of the work completed by the Contractor. Such visits and observation are not intended to be an exhaustive check or a detailed inspection of the Contractor's work but rather are to allow Geofirm, as an experienced professional, to become generally familiar with the work in progress and to determine, in general, if the work is proceeding in accordance with the recommendations of this report.

Geofirm shall not supervise, direct, or have control over the Contractor's work nor have any responsibility for the construction means, methods, techniques, sequences, or procedures selected by the Contractor nor the Contractor's safety precautions or programs in connection with the work. These rights and responsibilities are solely those of the Contractor.

Geofirm shall not be responsible for any acts or omission of the Contractor, subcontractor, any entity performing any portion of the work, or any agents or employees of any of them. Geofirm does not guarantee the performance of the Contractor and shall not be responsible for the Contractor's failure to perform its work in accordance with the Contractor documents or any applicable law, codes, rules or regulations.

These observations are beyond the scope of this investigation and budget and are conducted on a time and material basis. The responsibility for timely notification of the start of construction and ongoing geotechnically involved phases of construction is that of the City and the contractor. Typically, at least 24 hours notice is required.

Jobsite Safety

Neither the professional activities of Geofirm, nor the presence of Geofirm's employees and subconsultants at a construction/project site, shall relieve the General Contractor of its obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending and coordination the work in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. Geofirm and its personnel have no authority to exercise any control over any construction contractor or its employees in connection with their work or any health or safety programs or procedures. The General Contractor shall be solely responsible for jobsite safety.

Pre-Construction Meeting

A pre-construction conference should be held with representatives of the City, contractor, civil engineer, and soils engineer prior to commencement of construction to clarify any questions relating to the intent of these recommendations or additional recommendations.

LIMITATIONS

This investigation has been conducted in accordance with generally accepted practice in the engineering geologic and soils engineering field. No further warranty is offered or implied. Conclusions and recommendations presented are based on subsurface conditions encountered and are not meant to imply a control of nature. As site geotechnical conditions may alter with time, the recommendations presented herein are considered valid for a time period of one year from the report date. The recommendations are also specific to the current proposed development. Changes in proposed land use or development may require supplemental investigation or recommendations. Also, independent use of this report in any form cannot be approved unless specific written verification of the applicability of the recommendations is obtained from this firm.

Thank you for this opportunity to be of service. If you have any questions, please contact this office.

Respectfully submitted,

GEOFIRM

REGISTERED GEOLOGIST
KEVIN A. TRIGG
NO. 1619
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Kevin A. Trigg, R.G.
Chief Engineering Geologist, E.G. 1619
Registration Expires 12-31-18

REGISTERED PROFESSIONAL ENGINEER
RUSSELL C. LAMB
No. 2207
Exp. 03/31/19
GEOTECHNICAL
STATE OF CALIFORNIA

Russell C. Lamb, G.E. 2207
Chief Geotechnical Engineer
Registration Expires 3-31-19
Date Signed / /

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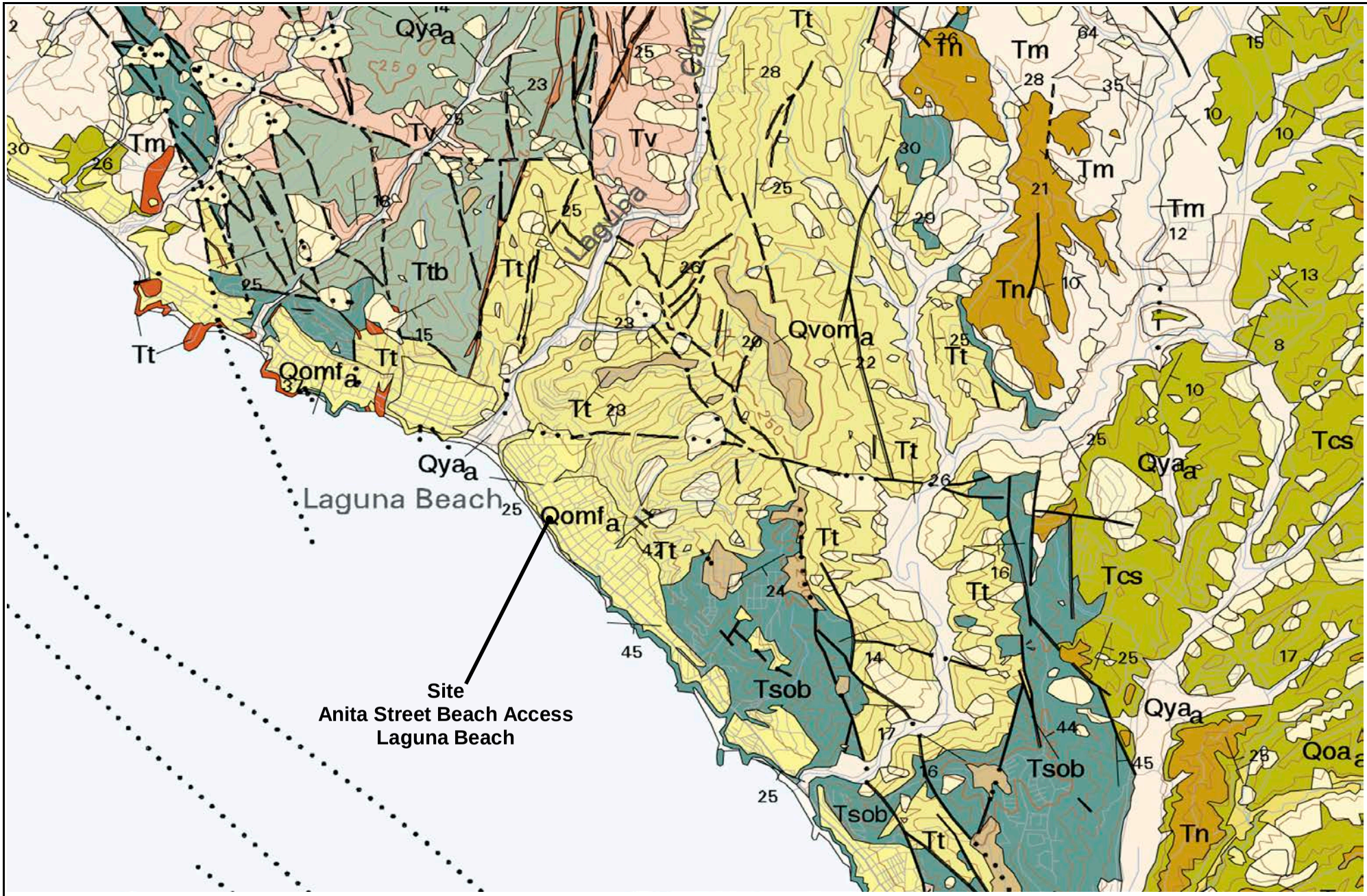
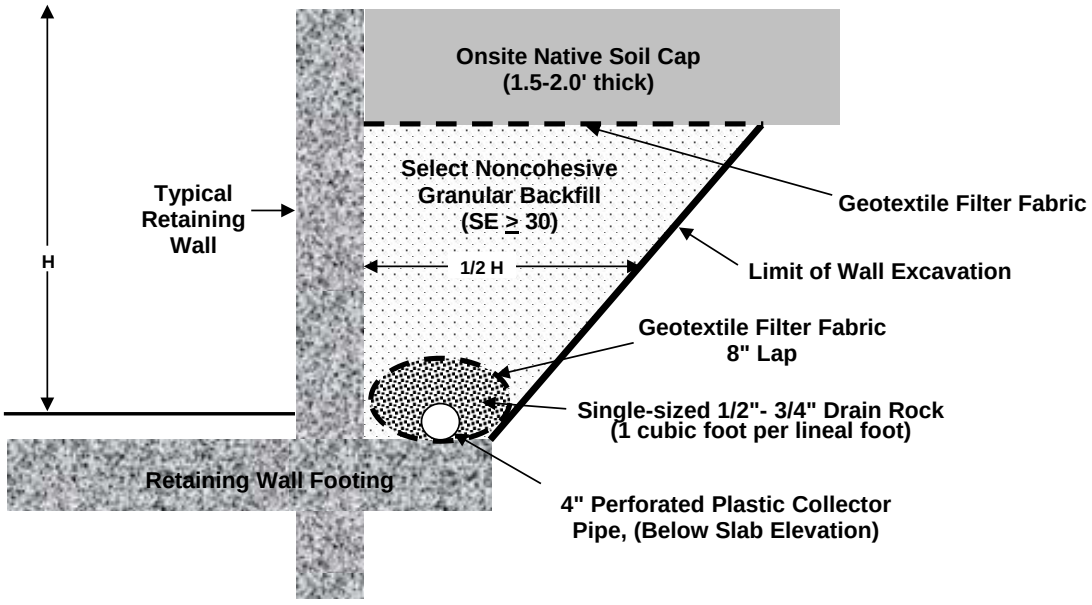


GeoFirm	USGS Geologic Location Map, Santa Ana 30' x 60' Quadrangle		
	JOB NO.: 72311-00	DATE: April 2018	FIGURE: 1



Notes: This system consists of a geotextile fabric-wrapped gravel envelope. Collection is with a 4-inch diameter perforated plastic pipe embedded in the gravel envelope and tied to a 4-inch diameter non-perforated plastic pipe which discharges at convenient locations. The outlet pipe should be placed such that the flow gradient is not less than 2.0 percent. The geotextile fabric-wrapped gravel envelope should be placed at a similar gradient

All drain pipes should be Schedule 40 PVC or ABS SDR-35. Perforations may be either bored 1/4-inch diameter holes or 3/16-inch slots placed on the bottom one-third of the pipe perimeter. If the pipe is to be bored, a minimum of 10 holes should be uniformly placed per foot of length. If slots are made, they should not exceed 2-1/2 inches in length and should not be closer than 2 inches. Total length of slots should not be less than 50 percent of the pipe length and should be uniformly spaced.

The fabric pore spaces should not exceed equivalent 30 mesh openings or be less than equivalent 100 mesh openings. The fabric should be placed such that a minimum lap of 8-inches exists at all splices.

GeoFirm	Typical Retaining Wall Subdrain Detail		
	JOB NO.: 72311-00	DATE: April 2018	FIGURE: 2

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

1. American Concrete Institute, 2011, “Building Code Requirements for Structural Concrete (ACI 318-11) and Commentary.

2. California Building Code (2016).

3. Geofirm, 2001, "Geotechnical Investigation for Proposed Anita Street Sewer Repair, Laguna Beach, California", Project No. 71145-01, Report No. 01-3807, dated September 25.

4. Geofirm, 2014, "Geotechnical Investigation for Stair Reconstruction for Thalia, Oak, Mountain, and Agate Streets Beach Access, Laguna Beach, California", Project No. 72120-00, Report No. 14-7518, dated July 25.

5. Geofirm, 2015, "Preliminary Geotechnical Investigation for Anita Street Storm Drain Improvements, Laguna Beach, California", Project No. 72211-00, Report No. 15-7755, dated October 30.

6. Tan. S.I. and Edgington, W., 1976, "Geology and Engineering Geologic Aspects of the Laguna Beach Quadrangle, Orange County, California", Special Report 127, California Division of Mines and Geology.

APPENDIX B

BORING LOGS

Date(s) Logged: 10/6/2017
Logged By: ZW/JPC
Address: Anita Street, Laguna Beach
Location: Beach

Method of Drilling: Hand Auger
Drilling Company: Geofirm
Drop: N/A
Weight(s): N/A

BORING NO.: HA-1

Depth (feet)	USCS	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitude	Depth (feet)
0	SP						**BEACH DEPOSITS (Qb):** - SAND, gray brown, medium-grained, moist to wet, loose		0
1									1
2									2
3							Groundwater		3
4	ML						**BEDROCK - TOPANGA FORMATION (Tt)** - Sandy SILTSTONE, olive gray, moderately hard to hard, wet		4
5							End of excavation at 5 feet. Backfilled with cuttings. Groundwater encountered at 3 feet.		5
6									6
7									7
8									8
9									9
10									10

Project No.: 72311-00

LOG OF BORING

Figure No.: B-1

Geofirm

Date(s) Logged: 10/6/2017
Logged By: ZW/JPC
Address: Anita Street, Laguna Beach
Location: Beach

Method of Drilling: Hand Auger
Drilling Company: Geofirm
Drop: N/A
Weight(s): N/A

BORING NO.: HA-2

Depth (feet)	USCS	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitude	Depth (feet)
0	SP						**BEACH DEPOSITS (Qb):** - SAND, gray brown, medium-grained, very moist, loose		0
1									1
	ML						**BEDROCK - TOPANGA FORMATION** - Sandy SILTSTONE, olive gray, moderately hard to hard, moist		
2							End of excavation at 2 feet. Backfilled with cuttings.		2
3									3
4									4
5									5
6									6
7									7
8									8
9									9
10									10

Project No.: 72311-00

LOG OF BORING

Figure No.: B-2

Geofirm

Date(s) Logged: 10/6/2017
Logged By: ZW/JPC
Address: Anita Street, Laguna Beach
Location: Beach

Method of Drilling: Hand Auger
Drilling Company: Geofirm
Drop: N/A
Weight(s): N/A

BORING NO.: HA-3

Depth (feet)	USCS	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitude	Depth (feet)
0	SP						**BEACH DEPOSITS (Qb)** - SAND, gray brown, medium-grained, very moist, loose		0
1									1
2	ML						**BEDROCK - TOPANGA FORMATION (Tt)** - Sandy SILTSTONE, olive gray, moderately hard to hard, moist		2
3							End of excavation at 2.5 feet. Backfilled with cuttings.		3
4									4
5									5
6									6
7									7
8									8
9									9
10									10

Project No.: 72311-00

LOG OF BORING

Figure No.: B-3

Geofirm

Date(s) Logged: 3/14/2018
Logged By: CWP/MEB
Address: Anita Street, Laguna Beach
Location: Top of Stairs

Method of Drilling: Hand Auger
Drilling Company: Geofirm
Drop: N/A
Weight(s): N/A

BORING NO.: HA-4

Depth (feet)	USCS	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitude	Depth (feet)
0	SM						**SLOPEWASH (Qsw)** - Grayish Medium Brown Sandy Silt/Silty Fine SAND, Moist, Medium Dense to Dense, Roots		0
1									1
2									2
3	ML						@3' **BEDROCK - TOPANGA FORMATION (Tt)** - Brownish Light to Medium Gray Fine Sandy SILTSTONE, Moist, Stiff to Very Stiff		3
							3.5-Feet = Bottom of Boring No Groundwater No Apparent Caving		
4									4
5									5
6									6
7									7
8									8
9									9
10									10

Project No.: 72311-00

LOG OF BORING

Figure No.: B-4

Geofirm

Date(s) Logged: 3/14/2018
Logged By: CWP/MEB
Address: Anita Street, Laguna Beach
Location: Off East End of Landing

Method of Drilling: Hand Auger
Drilling Company: Geofirm
Drop: N/A
Weight(s): N/A

BORING NO.: HA-5

Depth (feet)	USCS	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitude	Depth (feet)
0	SM						**SLOPEWASH (Qsw)** - Grayish Medium Brown Sandy Silt/Silty Fine SAND, Moist, Medium Dense @2.5-Feet: Refusal on Rock		0
1									1
2									2
3							2.5-Feet = Bottom of Boring No Groundwater No Apparent Caving		3
4									4
5									5
6									6
7									7
8									8
9									9
10									10

Project No.: 72311-00

LOG OF BORING

Figure No.: B-5

Geofirm

APPENDIX C

SLOPE STABILITY ANALYSES

APPENDIX C

SLOPE STABILITY ANALYSES

GENERAL

Engineering stability analyses were performed to assess the minimum Factors of Safety (FS) against future movement of the slope located within the subject property. The analyses were performed with the interpreted geologic conditions. The "Slide 7.0", 2D slope stability program was utilized for the stability analyses of the slope mass.

SHEAR STRENGTH PARAMETERS

The shear strength parameters utilized in our stability analyses are presented in Table C-1, below. These values were based on laboratory testing, local experience in similar soils and engineering judgment, and are considered reasonable and representative of the on-site materials.

TABLE C-1

SUMMARY OF STRENGTH PARAMETERS

Material Type	Bulk Density γ_m (pcf)	Bulk Density γ_s (pcf)	Cohesion C (psf)	Friction Angle ϕ(deg)
Fill Soil (Af or Ef)	115	115	200	30
Non-marine Terrace Deposits (Qtn)	115	115	200	25
Topanga Formation Bedrock (Tt) Along Bedding Across Bedding	120	120	 200 200	 25 35

ANALYSES

Slope stability analyses were performed using Cross Section A-A'. The analyses were conducted to simulate proposed site conditions.

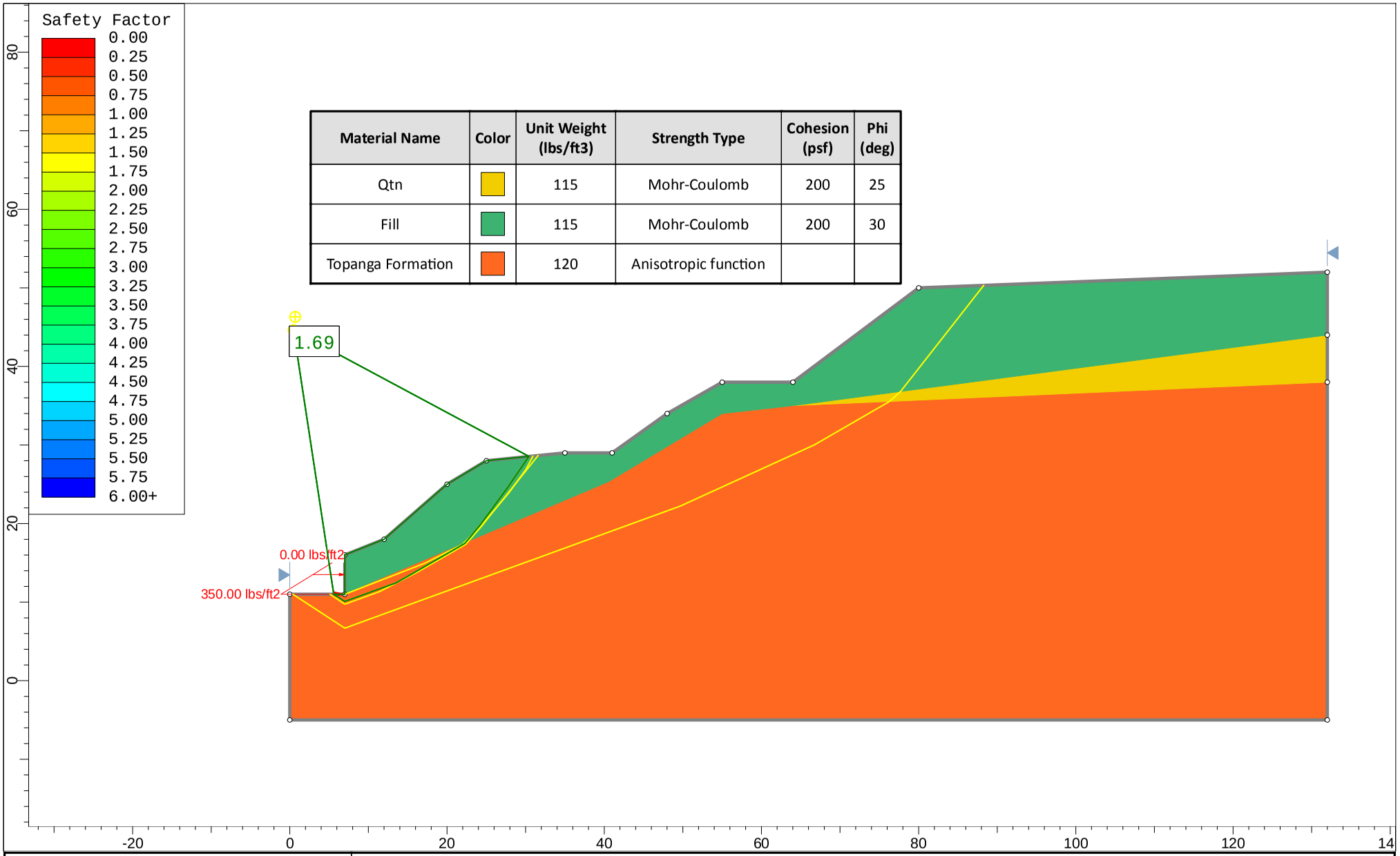
The FS criteria adopted for verifying the adequacy of the stability of the slope for the final design are as follows:

Static Conditions	–	FS≥1.5
Pseudostatic Conditions	–	FS≥1.1

The results of the analyses are presented in Table C-2 and Figures C-1 and C-2. Revisions to the proposed grading plans may require additional analyses and revisions to the recommendations presented herein.

TABLE C-2
SUMMARY OF STABILITY ANALYSES

Section	Static FOS	Seismic FOS	Figure No.	Comments
A-A'	1.69	1.24	C-1 C-2	**Proposed Condition**

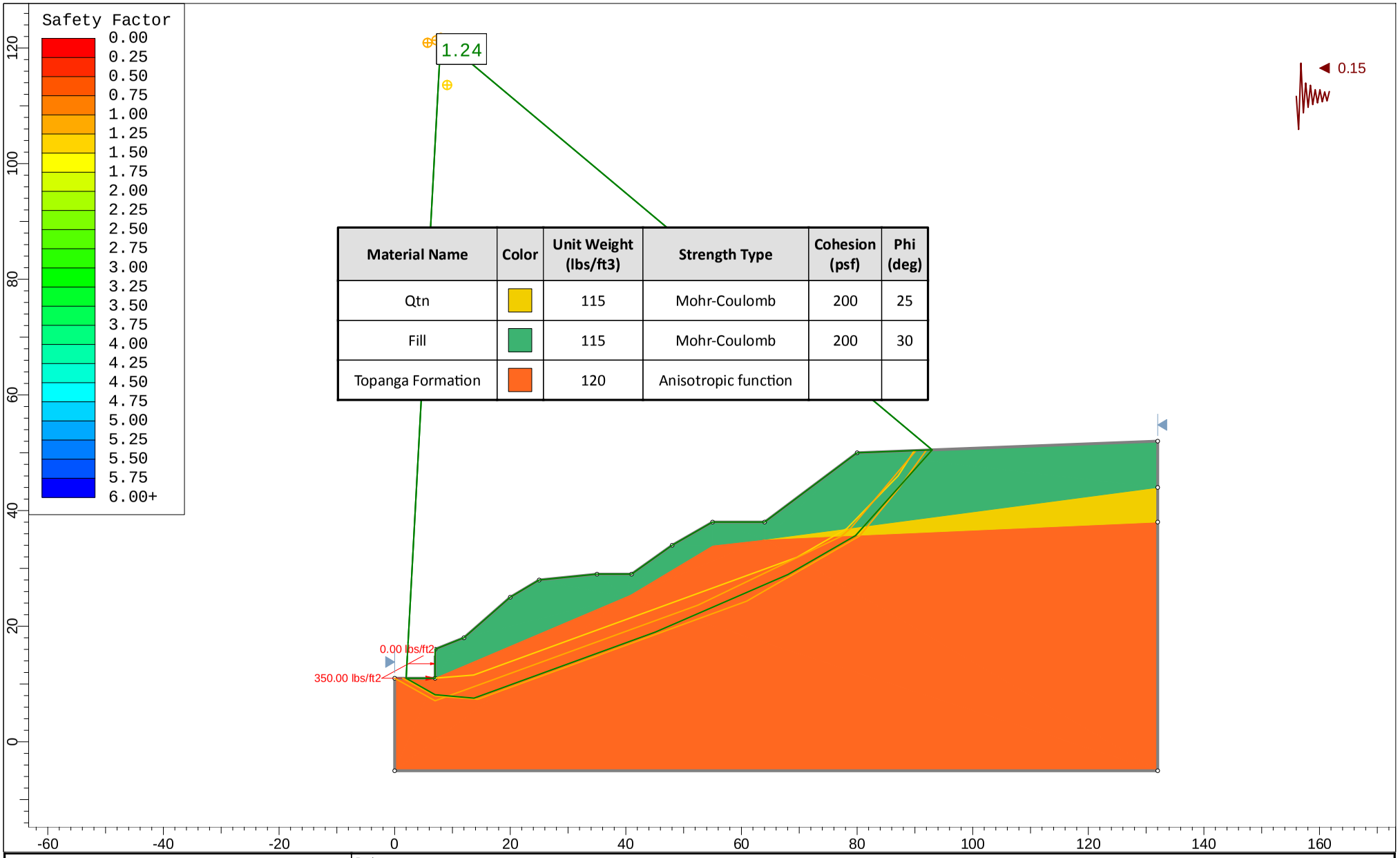


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Qtn		115	Mohr-Coulomb	200	25
Fill		115	Mohr-Coulomb	200	30
Topanga Formation		120	Anisotropic function		

Geofirm

SLIDEINTERPRET 7.031

Project	**Anita Street Beach Access Laguna Beach, California**		
Analysis Description	Sect. A-A' - Static		
Project Number	72311-00	*Company*	Geofirm
Date	3/20/2018	*Figure Number*	C-1



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Qtn		115	Mohr-Coulomb	200	25
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Geofirm

SLIDEINTERPRET 7.031

Project	**Anita Street Beach Access Laguna Beach, California**		
Analysis Description	Sect. A-A' - Seismic		
Project Number	72311-00	*Company*	Geofirm
Date	3/20/2018	*Figure Number*	C-2

APPENDIX D

STANDARD GRADING GUIDELINES

APPENDIX D

STANDARD GRADING GUIDELINES

GENERAL

These specifications present the usual and minimum requirements for grading operations observed by **Geofirm** or its designated representative. No deviation from these specifications will be allowed, except where specifically superseded in the geotechnical report signed by a registered geotechnical engineer.

The placement, spreading, mixing, watering, and compaction of the fills in strict accordance with these guidelines shall be the sole responsibility of the contractor. The construction, excavation, and placement of fill shall be under the direct observation of the soils engineer signing the soils report. If unsatisfactory soil-related conditions exist, the soils engineer shall have the authority to reject the compacted fill ground and, if necessary, excavation equipment will be shut down to permit completion of compaction. Conformance with these specifications will be discussed in the final report issued by the soils engineer.

SITE PREPARATION

All brush, vegetation and other deleterious material such as rubbish shall be collected, piled and removed from the site prior to placing fill, leaving the site clear and free from objectionable material.

Soil, alluvium, or rock materials determined by the soils engineer as being unsuitable for placement in compacted fills shall be removed from the site. Any material incorporated as part of a compacted fill must be approved by the soils engineer.

The surface shall then be plowed or scarified to a minimum depth of 6 inches until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment used. After the area to receive fill has been cleared and scarified, it shall be diced or bladed by the contractor until it is uniform and free from large clods, brought to the proper moisture content and compacted to minimum requirements. If the scarified zone is greater than 12 inches in depth, the excess shall be removed and placed in lifts restricted to 6 inches.

Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines or others not located prior to grading are to be removed or treated in a manner prescribed by the soils engineer.

MATERIALS

Materials for compacted fill shall consist of materials approved by the soils engineer. These materials may be excavated from the cut area or imported from other approved sources, and soils from one or more sources may be blended. Fill soils shall be free from organic vegetable matter and other unsuitable substances. Normally, the material shall contain no rocks or hard lumps greater than 6 inches in size and shall contain at least 50 percent of material smaller than 1/4-inch in size. Materials greater than 4 inches in size shall be placed so that they are completely

surrounded by compacted fines; no nesting of rocks shall be permitted. No material of a perishable, spongy, or otherwise of an unsuitable nature shall be used in the fill soils.

Representative samples of materials to be utilized as compacted fill shall be analyzed in the laboratory by the soils engineer to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the geotechnical engineer as soon as possible.

PLACING, SPREADING, AND COMPACTING FILL MATERIAL

The material used in the compacting process shall be evenly spread, watered, processed, and compacted in thin lifts not to exceed 6 inches in thickness to obtain a uniformly dense layer.

When the moisture content of the fill material is below that specified by the soils engineer, water shall be added by the contractor until the moisture content is near optimum as specified.

When the moisture content of the fill material is above that specified by the geotechnical engineer, the fill material shall be aerated by the contractor by blading, mixing, or other satisfactory methods until the moisture content is near optimum as specified.

After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to 90 percent of the maximum laboratory density in compliance with ASTM D: 1557-02 (five layers). Compaction shall be accomplished by sheepsfoot rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compacting equipment. Equipment shall be of such design that it will be able to compact the fill to the specified density. Compaction shall be continuous over the entire area and the equipment shall make sufficient passes to obtain the desired density uniformly.

A minimum relative compaction of 90 percent out to the finished slope face of all fill slopes will be required. Compacting of the slopes shall be accomplished by backrolling the slopes in increments of 2 to 5 feet in elevation gain or by overbuilding and cutting back to the compacted inner core, or by any other procedure which produces the required compaction.

GRADING OBSERVATIONS

The soils engineer shall observe the placement of fill during the grading process and will file a written report upon completion of grading stating his observations as to compliance with these specifications.

One density test shall be required for each 2 vertical feet of fill placed, or one for each 1,000 cubic yards of fill, whichever requires the greater number of tests.

Any cleanouts and processed ground to receive fill must be observed by the soils engineer and/or engineering geologist prior to any fill placement. The contractor shall notify the geotechnical engineer when these areas are ready for observation.

PROTECTION OF WORK

During the grading process and prior to the complete construction of permanent drainage controls, it shall be the responsibility of the contractor to provide good drainage and prevent ponding of water and damage to adjoining properties or to finished work on the site.

After the geotechnical engineer has terminated his observations of the completed grading, no further excavations and/or filling shall be performed without the approval of the soils engineer, if it is to be subject to the recommendations of this report.

EXISTING TRANSFORMER

BEACH INFORMATION SIGN

EXISTING PLANTS TO BE PRESERVED WHERE POSSIBLE

EXISTING LIFT STATION BUILDING

TRASH CONTAINER

REMOVE EXISTING STAIRS/PAVING

LANDSCAPE MAINTENANCE AGREEMENT AREA

EXISTING RETAINING WALL AT WESTERLY EDGE OF PROPERTY.

6' LONG BENCH

EXPAND DECK

8"" WIDE, LOW CURB ALONG STAIRS PER APWA STANDARD WITH ALUMINUM HANDRAILS, TYP

ANITA STREET

EXISTING ACCESS RAMP

TRASH & RECYCLE CONTAINER

5' WIDE CONSTRUCTION EASEMENT

ROW ACQUISITION 2,043 SF +/-

GAVIOTA DR

EXISTING PAVING

PROPOSED HOMEOWNER PROPERTY LINE, TYPICAL

NEW RETAINING WALL AS PART OF PUBLIC WORKS PROJECT TO REPLACE EXISTING WALL IN SAME LOCATION

BIKE RACK

EXISTING MELALEUCA TREE - PROTECT IN PLACE

LOW SEAT WALL

EXPLANATION

Af	ARTIFICAL FILL
Qb	BEACH DEPOSITS
Qsw	SLOPEWASH
Qtn	NON-MARINE TERRACE DEPOSITS
Tt	BEDROCK: TOPANGA FORMATION
HA-5	APPROXIMATE HAND AUGER LOCATION

ANITA STREET OPTION 2

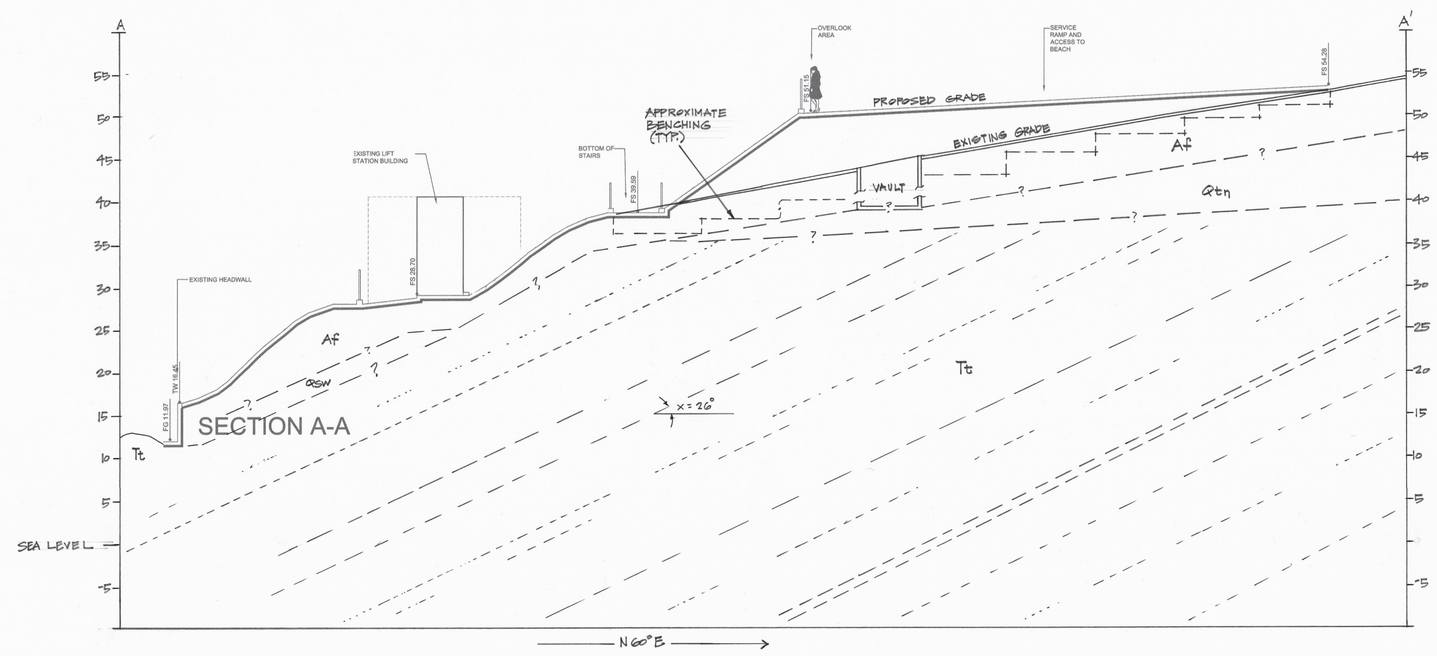
CONCEPT PLAN & GRADING STUDY

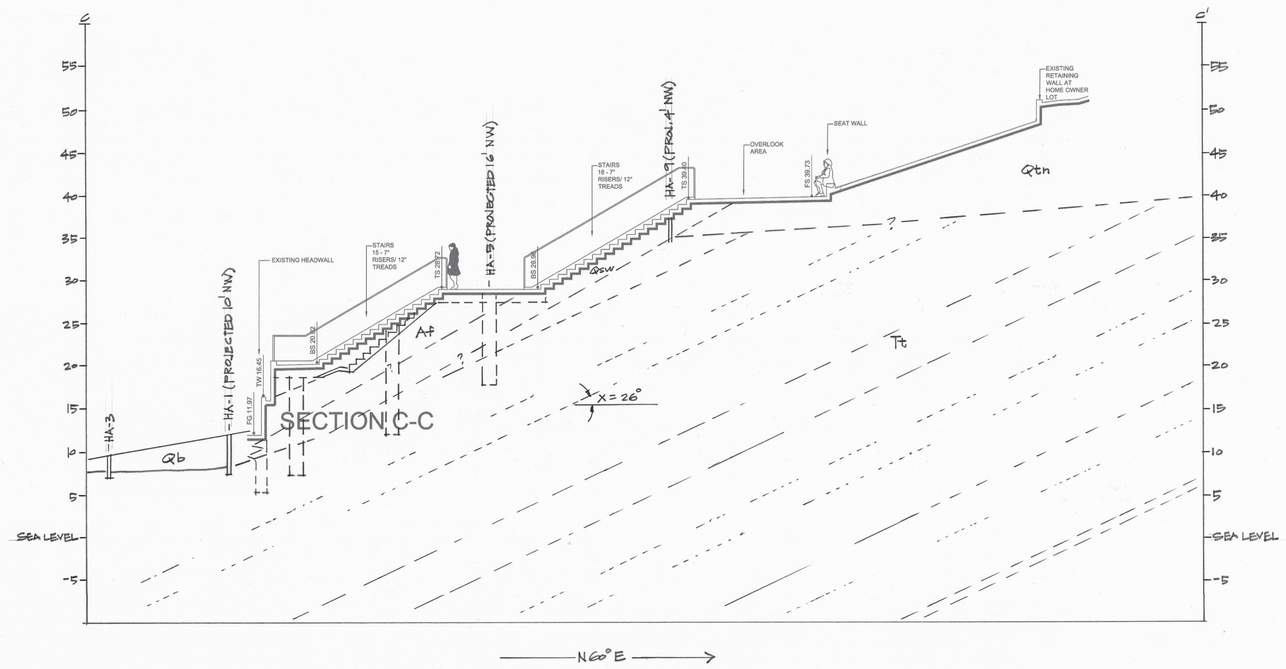
FEBRUARY 6, 2018

NORTH

SCALE: 1"=10'

0 4' 8' 16'





GEOTECHNICAL PLOT PLAN AND CROSS SECTIONS
ANITA STREET BEACH ACCESS REHABILITATION (CIP 175)
LAGUNA BEACH, CALIFORNIA

JOB NO.:	REPORT NO.:	DATE:	PLATE:
72311-00	17-8153	APRIL 2018	1