Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

GMU

September 10, 2020

Mr. Bryon Ward, President
DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES
1100 Newport Center Drive, Suite 200
Newport Beach, CA 92660

GMU Project 17-206-02

Subject: Geotechnical Review of Precise Grading Plans, Dana Point Harbor Parking Structure, 24650 Dana Point Harbor Drive, City of Dana Point, California

References:

(1) Dana Point Harbor Parking Structure Precise Grading Plans, prepared by Tait Engineers, dated September 10, 2020.

(2) Our "Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California," dated December 4, 2019 (GMU 17-206-02).

Dear Mr. Ward:

INTRODUCTION

The purpose of this correspondence is to confirm in writing that that GMU Geotechnical, Inc. (GMU) has performed a geotechnical review of the reference (1) precise grading plans, which included the latest Submittal 3 Geopier plans, for the subject site. The precise grading is to support site grading and design and construction of the proposed parking structure, the adjacent boater services building, and other site improvements (i.e. Golden Lantern private street, roadways, parking lots, site walls, exterior concrete flatwork, etc.). The subject site is bounded by Dana Point Harbor Drive on the north, the Dry Stack Storage component site on the east, and Golden Lantern on the west and south. It is our understanding that the proposed development will consist of a 3-story on-grade cast-in-place concrete parking structure, supported on Geopiers, and an adjacent 1-story boater services building at its southeast corner with surface parking at the east and south ends of the site, located south of existing of Dana Point Harbor Drive and east of existing Golden Lantern. We also understand that 2H:1V fill slopes are planned to be placed against the northerly and western sides of the parking structure and supporting site retaining wall on the north side.

Our review of the Tait Engineering precise grading plans (reference (1)) presented herein provides recommendations specific to the precise grading shown on these plans only for final construction. To support the precise grading plans and Geopier plans, GMU previously performed a geotechnical foundation investigation and compiled our detailed site recommendations in our reference (2) report. The subject supporting geotechnical foundation investigation report contains:

- Geotechnical Map and Cross Sections
- Drill Hole and CPT logs
- Laboratory testing
- Infiltration test results
- Geotechnical engineering analyses, and
- Project recommendations

REVIEW OF PRECISE GRADING PLANS

The precise grading reflected on the reference (1) plans consist mainly of minor cuts and fills of up to 3-feet on the parking structure pad and the boater services building pad, along with adjacent roadway and site work. The planned precise grading also reflects fills into the 2:1 descending slope below both Dana Point Harbor Drive on the north and Golden Lantern on the west. We have attached a grading exhibit, Plate 1 – Benched Fill Over Existing Engineered Fill, to illustrate our recommended keyway and benching requirements for those slopes. This exhibit is also shown on sheet 13 of the reference (1) precise grading plans.

SLOPE STABILITY

It is our opinion that the permanent 2:1 slopes shown on sections X-X and Y-Y, shown on sheet 7 of the reference (1) precise grading plans, Dana Point Harbor Drive on the north side and Golden Lantern on the west side, respectively, will be grossly and surficially stable during the construction of the parking structure and should be periodically monitored by GMU personnel during construction and the owner after completion of construction.

TEMPORARY EXCAVATIONS

Temporary excavations for during construction are expected. We anticipate that unsurcharged excavations with vertical side slopes less than 4 feet high will generally be stable; however, all temporary excavations should be observed by a representative of GMU to evaluate their stability. Our recommendations for temporary excavations are as follows:

- Temporary, unsurcharged excavation sides within artificial fill material over 4 feet in height should be sloped no steeper than 1.5H:1V (horizontal: vertical).
- Temporary, unsurcharged excavation sides within bedrock material over 4 feet in height should be sloped no steeper than 1H:1V (horizontal: vertical).
- The tops of the excavations should be barricaded so that vehicles and storage loads do not encroach within 10 feet of the excavations. A greater setback may be necessary for heavy vehicles, such as concrete trucks and cranes. GMU should be advised of such heavy vehicle loadings so that specific setback requirements can be established.
- If the temporary construction excavations are to be maintained during the rainy season, berms are recommended to be graded along the tops of the excavations in order to prevent runoff water from entering the excavation and eroding the slope faces.

Our temporary excavation recommendations are provided only as **minimum** guidelines. All work associated with temporary excavations should meet the minimal safety requirements as set forth by CAL-OSHA and temporary slope construction, maintenance, and safety are the responsibility of the contractor.

Shoring may be required where the sides of the excavation cannot be sloped to the requirements provided in this report or as required by OSHA for the given soil types. Shoring design performed by others should be reviewed by this office.

LIMITATIONS

All parties reviewing or utilizing this letter should recognize that the findings, conclusions, and recommendations presented represent the results of our professional geological and geotechnical engineering efforts and judgements. Due to the inexact nature of the state of the art of these professions and the possible occurrence of undetected variables in subsurface conditions, we cannot guarantee that the conditions actually encountered during grading and foundation installation will be identical to those observed and sampled during our study or that there are no unknown subsurface conditions which could have an adverse effect on the use of the property. We have exercised a degree of care comparable to the standard of practice presently maintained by other professionals in the fields of geotechnical engineering and engineering geology, and believe that our findings present a reasonably representative description of geotechnical conditions and their probable influence on the grading and use of the property.

Because our conclusions and recommendations are based on a limited amount of current and previous geotechnical exploration and analysis, all parties should recognize the need for possible revisions to our conclusions and recommendations during grading of the project. Additionally, our conclusions and recommendations are based on the assumption that our firm will act as the geotechnical engineer of record during grading of the project to observe the actual conditions exposed, to verify our design concepts and the grading contractor's general compliance with the project geotechnical specifications, and to provide our revised conclusions and recommendations should subsurface conditions differ significantly from those used as the basis for our conclusions and recommendations presented in this report.

This letter has not been prepared for use by other parties or projects other than those named or described herein. This letter may not contain sufficient information for other parties or other purposes.

CLOSURE

Based on our review, the reference (1) precise grading plans, which include the latest Submittal 3 Geopier plans, have been prepared in general accordance with the parameters and recommendations contained in this correspondence and in our reference (2) report. Therefore, the subject precise grading plans are considered acceptable from a geotechnical point of view and additional or revised geotechnical recommendations are not considered necessary.

Should you require further assistance, please do not hesitate to call.

Respectfully submitted,

REGISTERED PROFESSIONAL ENGINEER
NADIM T. SUNNA
C84197
CIVIL
STATE OF CALIFORNIA

Nadim Sunna, M.Sc., QSP, PE 84197
Senior Engineer

David R. Atkinson
Project Manager / Senior Engineer

Attachment
Plate 1- Benched Fill over Existing Engineered Fill

(Two (2) wet signature copies and electronic copy)

cc: Tait Engineering
Attn: Mr. Jacob Vandervis and Ms. Daniela Malott (electronic copies)

Tindall Consulting
Attn: Mr. John Tindall (electronic copy)

Westling and Associates.
Attn: Mr. Joshua Westling (electronic copy)

dra/17-206-02L Precise Grading Plan Review for DP Harbor Parking Structure (9-10-20)

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
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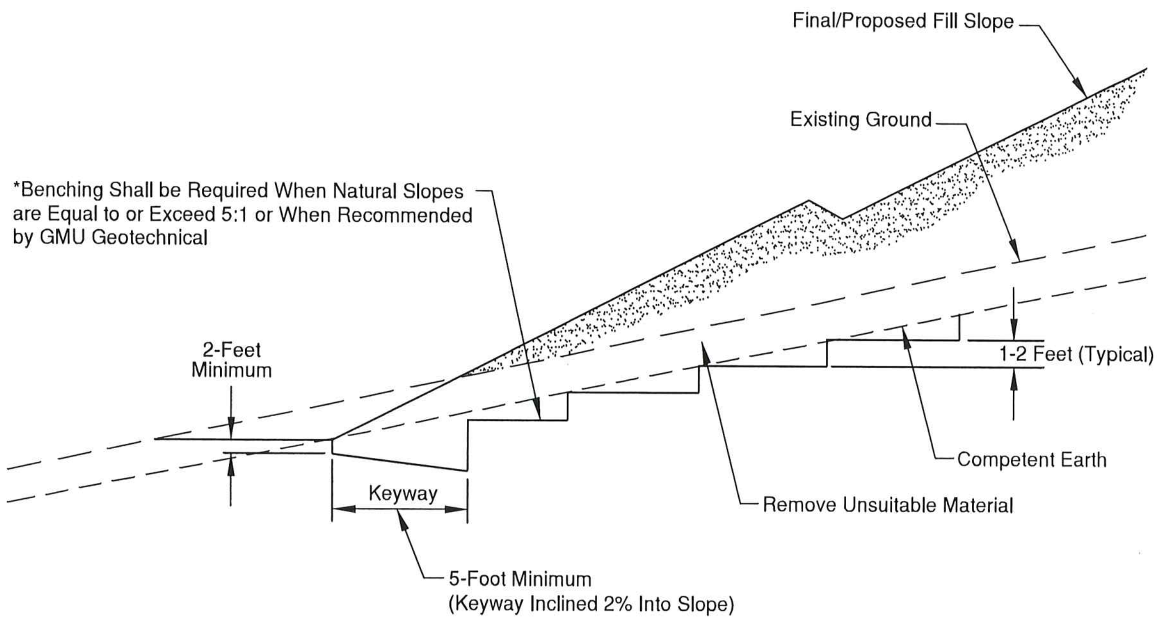
Hadi Tabatabaee
BUILDING OFFICIAL



BENCHED FILL OVER EXISTING ENGINEERED FILL

GMU	BENCHED FILL OVER EXISTING ENGINEERED FILL	Plate 1

GMU

August 31, 2020

Mr. Bryon Ward, President
DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES
1100 Newport Center Drive, Suite 200
Newport Beach, CA 92660

GMU Project 17-206-02
Permit No. PKG19-1202

Subject: Response to County of Orange Geotechnical Review Comments Pertaining to Building Plan Check, Parking Structure, and Boater Services Development Buildings, Dana Point Harbor Revitalization, City of Dana Point, California

References: Listed on Page 3

Dear Mr. Ward:

This correspondence presents our response to the reference (1) County of Orange Review Comments, attached to this response as Appendix A, pertaining to the submittal of the building plans and details for the subject site.

RESPONSES TO GEOTECHNICAL COMMENTS

RESPONSE TO COMMENT 2.001

Acknowledged. GMU has reviewed the reference (2) 3rd submittal foundation plans and finds then in conformance with the recommendations in our reference (3) report. Approved project building foundation plans and applicable details will be signed/stamped by GMU prior to permit issuance.

RESPONSE TO COMMENT 2.015

GMU has reviewed the reference (4) WGI Design Submittal for a Geopier Foundation System and Calculation Package, 3rd Submittal, design submittal plans and finds then in conformance with the recommendations in our reference (3) report. The following is a summary of the changes to the subject plans and pages of the reference (4) WGI submittal package:

1. Sheet GP0.1, Detail #4: Added footing details for F8A-3 and F9A-3 to F8A-4 and F9A-4
2. Sheet GP0.2: Added Detail #4 to include footing details for F24x32, F10x30, and F5-29.
3. All GP Sheets are dated August 31, 2020 in the lower righthand corner for the 3rd submittal.
4. All letterhead pages are dated August 31, 2020 for the 3rd submittal.

Please see Appendix B for the reference (4) WGI Geopier 3rd submittal package.

RESPONSE TO COMMENT 20.017

Acknowledged. During construction, it will be confirmed by GMU that the Geopiers will extend down to competent bedrock (i.e., through soft, weathered bedrock).

RESPONSE TO COMMENT 2.018

The 120 pcf soil unit weight value used in the WGI calculations has been increased to 125 pcf to match GMU's recommendation in our reference (3) report. Please see the corrected unit weight value of 125 pcf on the WGI Geopier 3rd submittal Sheet GP0.1 and calculation pages in the attached Appendix B.

Please do not hesitate to contact us if you have any questions regarding this response.

REGISTERED PROFESSIONAL ENGINEER NADIM T. SUNNA C84197 CIVIL STATE OF CALIFORNIA

Respectfully submitted,

Nadim Sunna, M.Sc., QSP, PE 84197
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER GREGORY P. SILVER GE 2336 GEOTECHNICAL STATE OF CALIFORNIA

Gregory P. Silver, M.Sc., PE, GE 2336
President / CEO
Principal Geotechnical Engineer

Attachments
- Appendix A – County of Orange Building Plan Geotechnical Review Comments
- Appendix B – Design Resubmittal (Submittal 3) for a Geopier Foundation System by WGI

(Two (2) wet signature copies and electronic copy submitted)

cc: SMS Architects
Attn: Mr. Brandon Dedmon (electronic copy)

Tindall Consulting
Attn: Mr. John Tindall (electronic copy)

Tait Engineering
Attn: Mr. Jake Vandervis (electronic copy)

Choate Parking Consultants
Attn: Mr. Rick Choate (electronic copy) and Mr. Emerson Flint (electronic copy)

dra/17-206-02L PKG19-1202 3rd submittal D.P. Harbor P. Structure Geotechnical Building Plan Check Response Letter (8-31-20)

REFERENCES

(1) County of Orange Geotechnical Comments, PKG19-1202 – Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California, Second Submittal, submittal date February 18, 2019, plan check date March 3, 2020, prepared by Ryan Rose of OC Public Works.

(2) "Dana Point Harbor Parking Building" – 3rd Submittal Foundation Plans, 24650 Dana Point Harbor Drive, Dana Point, California 92629," prepared by Culp & Tanner Structural Engineers, dated August 31, 2020.

(3) Our "Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California," dated December 4, 2019 (GMU Project 17-206-02).

(4) Design Submittal for a Geopier Foundation System and Calculation Package, 3rd Submittal, Dana Point Harbor Parking Structure, Dana Point, California, prepared by Western Ground Improvement, Inc., dated August 31, 2020.

(5) Our "Response to County of Orange Geotechnical Review Comments Pertaining to Building Plan Check, Parking Structure, and Boater Services Development Buildings, Dana Point Harbor Revitalization, City of Dana Point, California," dated February 11, 2020 (GMU Project 17-206-02).

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Hadi Tabatabaee
BUILDING OFFICIAL

APPENDIX A

County of Orange Geotechnical Report Review Comments

GMU

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Building Plan Check Comments

It is the responsibility of the applicant to satisfy the requirements and comments listed in this document. Corrections shall be made on the original plans. If you make changes to the original plan other than or in addition to what Plan Check has requested, yellow highlight the changes on the re-submitted plans.

Payment of a new plan check deposit may be required for all plans on which no action is taken by the applicant for a period of 180 days. Applications for which no permit is issued within 180 days following the date of submittal shall expire by limitation and shall be discarded.

To view your project status and the latest comments list, please visit: **myOCeServices.ocgov.com.**

Please note that the OC Development Services Public Counter Hours are open Monday through Friday from 8:00 a.m. to 4:00 p.m. except holidays.

Project Number:
Permit Number: PKG19-1202
Description: Dana Point Harbor Parking Building Structure and Boater Services Building
Code Year:
Job Address:

Owner Address:

Architect of Record:

Engineer of Record:

Project Manager:
Peter Liu
, ,

peter.liu@ocpw.ocgov.com

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Other Reviewers:

Review Name	Review Owner	Status	Due Date	Completed Date
Building & Safety Review-PKG19-1202	Peter Liu	Corrections Required	03-03-2020	03-03-2020
Geotechnical Review-PKG19-1202	Ryan Rose	Corrections Required	03-03-2020	03-03-2020

GENERAL INFORMATION

- Plans will not be rechecked at the counter, allow a minimum of ten (10) working days for recheck.
- Application for which no permit is issued within 180 days following the date of application shall expire by limitation.
- An extension of 180 days may be granted upon written request showing circumstances beyond the control of the applicant have prevented action being taken. In order to renew action for an application after expiration, the applicant shall resubmit plans and pay a new plan check fee.
- Valid Worker's Compensation Certificate or Owner-Builder Verification is required prior to issuance of building permits.
- Authorized agents for owner-builders must have a **notarized** statement from the owner authorizing the agent to act on behalf of the owner. A copy of the form may be obtained from http://www.ocgov.com/gov/pw/ds/.
- Obtain all clearances as noted on the MyOCeServices permit portal. Prompt attention is suggested as there can be delays from other departments reviewing the project.
- Upon receiving the inspection report from grading inspection and based on the determination made by the Building Official, a grading permit and rough grading approval may be required.
- Building permit will not be issued until Rough Grading approval is obtained from the grading inspector. Contact the plan checker for additional information.

It is the contractor or owner-builder's responsibility to provide one hard copy set of plans with the County approval stamp in the field for the inspector to view.

HOW TO RESUBMIT ONLINE

1. Log into www.myOCeServices.ocgov.com.
2. Select the "myOC eServices Account" tile on the homepage or click "Dashboard" at the top of page.
3. Use the left-hand menu bar to locate the application in question, either under "Permit Applications" or "Projects and Packages".
4. Once on the Permit or Package detail page, select the "Resubmittals" tab.
5. Attach* all submittal requirements identified by selecting the "Add Attachment" button. Provide a comment in the "Applicant Comment" field, if applicable.

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6. Respond to all comments on the "Comments & Responses" tab.
7. Once steps 5 and 6 are complete, click "Submit". Please verify that your resubmittal is complete, as all incomplete resubmittals will not be accepted for plan check review.
8. Note that you can save your work at any time by clicking "Save" at the bottom, to resume at a later time.

* The PDF files submitted must be stamped and signed by the responsible registered professional (e.g. civil engineer, architect, engineering geologist, etc.).
* A 4"X4" space located 1" from the top paper edge and 5" from the right paper edge of all full sized plan sheets, either 24"x36" or 30"x42", shall be left blank to receive the County's electronic approval stamp. Other page sizes shall be scaled accordingly.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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NPDES Notes

Notes must be shown as worded, on the title sheet of the plan.

1. In the case of emergency, call _
at Work Phone #
or Home Phone #

2. Sediment from areas disturbed by construction shall be retained on site using structural controls to the maximum extent practicable.
3. Stockpiles of soil shall be properly contained to minimize sediment transport from the site to streets, drainage facilities or adjacent properties via runoff, vehicle tacking, or wind.
4. Appropriate BMP's for construction-related materials, wastes, spills shall be implemented to minimize transport from the site to streets, drainage facilities, or adjoining properties by wind or runoff.
5. Runoff from equipment and vehicle washing shall be contained at construction sites unless treated to reduce or remove sediment and other pollutants.
6. All construction contractor and subcontractor personnel are to be made aware or the required best management practices and good housekeeping measures for the project site and any associated construction staging areas.
7. At the end of each day of construction activity all construction debris and waste materials shall be collected and properly disposed in trash or recycle bins.
8. Construction sites shall be maintained in such a condition that an anticipated storm does not carry wastes or pollutants off the site. Discharges of material other than stormwater only when necessary for performance and completion of construction practices and where they do not: cause or contribute to a violation of any water quality standard; cause or threaten to cause pollution, contamination, or nuisance; or contain a hazardous substance in a quantity reportable under Federal Regulations 40 CFR Parts 117 and 302.
9. Potential pollutants include but are not limited to: solid or liquid chemical spills; wastes from paints, stains, sealants, glues, limes, pesticides, herbicides, wood preservatives and solvents; asbestos fibers, paint flakes or stucco fragments; fuels, oils, lubricants, and hydraulic, radiator or battery fluids; fertilizers, vehicle/equipment wash water and concrete wash water; concrete, detergent or floatable wastes; wastes from any engine/equipment steam cleaning or chemical degreasing and super chlorinated potable water line flushing. During construction, permittee shall dispose of such materials in a specified and controlled temporary area on-site, physically separated from potential stormwater runoff, with ultimate disposal in accordance with local, state and federal requirements.
10. Dewatering of contaminated groundwater, or discharging contaminated soils via surface erosion is prohibited. Dewatering of non-contaminated groundwater requires a National Pollutant Discharge Elimination System Permit from the respective State Regional Water Quality Control Board.
11. Graded areas on the permitted area perimeter must drain away from the face of slopes at the conclusion of each working day. Drainage is to be directed toward desilting facilities.
12. The permittee and contractor shall be responsible and shall take necessary precautions to prevent public trespass onto areas where impounded water creates a hazardous condition.
13. The permittee and contractor shall inspect the erosion control work and insure that the work is in accordance with the approved plans.
14. The permittee shall notify all general contractors, subcontractors, material suppliers, lessees, and property owners: that dumping of chemicals into the storm drain system or the watershed is prohibited.
15. Equipment and workers for emergency work shall be made available at all times during the rainy season. Necessary materials shall be available on site and stockpiled at convenient locations to facilitate rapid construction of temporary devices when rain is imminent.
16. All removable erosion protective devices shall be in place at the end of each working day when the 5-Day Rain Probability Forecast exceeds 40%.
17. Sediments from areas disturbed by construction shall be retained on site using an effective combination of erosion and sediment controls to the maximum extent practicable, and stockpiles of soil shall be properly contained to minimize sediment transport from the site to streets, drainage facilities or adjacent properties via runoff, vehicle tracking, or wind.
18. Appropriate BMPs for construction-related materials, wastes, spills or residues shall be implemented and retained on site to minimize transport from the site to streets, drainage facilities, or adjoining property by wind or runoff.

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Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

PLAN CHECK COMMENTS	
Permit Application No.	PKG19-1202
Plan Check No.	Second Submittal-PKG19-1202
Plan Check Date	03-04-2020
Applicant	Junior Mazariegos
Submittal Date	02-18-2020

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.047	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Required OCFA, zoning and grading and soil report review approval, prior to issuance of building permit.		Not Satisfied	
1.048	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Please provide grading plans in separate pdf for reference only at bldg submittal set or show big fat note on grading plans each sheet with " for reference only"		Not Satisfied	
1.049	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Required soil engineer review stamps & sigantures on foundation plans and foundation detail sheets		Not Satisfied	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.05	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Require stamps and signatures for all plans and clacs i.e. sheet G000 missing signature		Not Satisfied	
1.051	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments dwg sheet G000, provide complete list of defferred permit item. i.e. sign, electrical & mechanical euipment support and equipment restraint & seismic anchors design.		Not Satisfied	
1.052	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet G001, A230, clarify site retaining wall whict detatched from parking structure req'd separate permit		Required	
1.053	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet G001, A230, provide and show calcs of number and location for short term and long term bike rack		Required	

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.054	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet A410 detail 1 & 2, show or provide cross reference of elevator manufacturer model number, power phase, signage and elevator accessibility compliance including communication DAS device, ADA signs and evacuate path map sign		Not Satisfied	
1.055	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet A512, provide enlarged plan to show accessible shower, male and female bath room and diaper changing station and drinking fountain including regular & accessible		Not Satisfied	
1.056	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet A512, please show req'd min 60" net from insude walls to wall at both dimensions of entrance retreat area for male & female rest room		Not Satisfied	
1.057	Building & Safety Review-PKG19-1202	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet A230, A415, A514 thru A518, A812, A814,A815 wood side on key		Not Satisfied	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
	Peter Liu		Note#406, please provide siding requirements notes per CBC 1405.2 & 1406.2 and incate thickness, calcs of code allowable area etc.			
1.058	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet S1.05 OC standard special inspection form, show owner 's signature		Not Satisfied	
1.059	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet S2.01 thru S2.03, show room names on plans i.e. electrical room, mechanical room, elevator etc.		Not Satisfied	
1.06	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet S5.03 detail F & J, clarify why rebars are located at inside edge, clarify seismic load will applied to both sides and show calc page number to justify load from out side to inside & wall is atill adequate		Not Satisfied	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.061	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	2nd Submittal bldg plan check review comments Dwg sheet S5.10 detail J, show rebar clearance against soil side		Not Satisfied	
2.001	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The approved project building foundation plans and applicable details must be signed/stamped by the geotechnical consultant prior to permit issuance. *** 2nd Submittal Response is acceptable. Comment will be marked as satisfied upon receipt of the signed and stamped plans.		Not Satisfied	
2.015	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	Footing details for the F8A-3, F9A-3, F10x30 and F24x32 should be provided on the plans by WGI. *** 2nd Submittal - Response is not acceptable. The WGI plans in the second submittal have the same date as t he plans that were in the first submittal. Details were not added to Sheet GP0.1 for F8A-3, FA9S-3 F10X30		Not Satisfied	

9

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			and F24x32.			
2.017	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	Note 1 below the table on Sheet GP0.1 of the WGI plans states that the Geopier shall reach bedrock. The geotechnical report states that the Geopier should extend a minimum of 12 inches into bedrock and be verified by the project geotechnical engineer. The note should be revised per the geotechnical consultant's recommendation. *** 2nd Submittal - Comment will be marked as satisfied upon confirmation the Geopiers will extend down to competent bedrock, i.e. through any soft, weathered bedrock.		Not Satisfied	
2.018	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The 120 pcf soil unit weight value used in the WGI calculations should be increased to 125 pcf to match the geotechnical consultant's recommendation.		Not Satisfied	

OC Public Works
Integrity, Accountability, Service, Trust

OC DEVELOPMENT SERVICES

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			*** 2nd Submittal: The response is not acceptable. The WGI calculations there were included in the 2nd submittal do not increase the soil unit weight.			

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED 11

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Hadi Tabatabaee
BUILDING OFFICIAL

APPENDIX B

Submittal 3 for a Geopier Foundation System by WGI

GMU

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

WGI | GEOPIER® FOUNDATIONS

Western Ground Improvement, Inc.
2372 Morse Ave
Suite 504
Irvine, CA 92614

www.westerngroundimprovement.com

County of Orange - OC Public Works
OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

August 31, 2020

Mr. Dave Atkinson
GMU Geotechnical, Inc.
23241 Arroyo Vista
Rancho Santa Margarita, California 92688

Re: Design Submittal for a *Geopier*® Foundation System
Dana Point Harbor Parking Structure
Dana Point, California
GFC Project No.: GLA-113

Dear Mr. Atkinson,

Geopier Foundation Company, Inc. has completed the Geopier® foundation design for the above project. The following documents are included herein:

- Geopier Design Drawing GP0.1: Geopier Notes & Details
- Geopier Design Drawing GP0.2: Geopier Schedules
- Geopier Design Drawing GP0.1 - GP1.4: Geopier Location Plans

We are pleased to have provided you with our design services. If you have any questions, please contact this office.

Sincerely,
Western Ground Improvement, Inc.

REGISTERED PROFESSIONAL ENGINEER
KENNETH K. HOEVELKAMP
C 67415
EXP. 12/20
CIVIL
STATE OF CALIFORNIA

8/31/20

Ken Hoevelkamp, P.E.
Principal Engineer

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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OC Development Services
APPROVED
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Hadi Tabatabaee
BUILDING OFFICIAL

GEOPIER DESIGN NOTES:

1. GEOPIER FOUNDATION SUPPORT IS AS DESIGNED BY WESTERN GROUND IMPROVEMENT, INC., IRVINE, CALIFORNIA (DESIGNER).
2. THESE DESIGN DRAWINGS ARE PREPARED BY THE DESIGNER FOR USE IN GEOPIER CONSTRUCTION. THE GEOPIER SYSTEM SHALL BE INSTALLED BY APPROVED INSTALLERS LICENSED BY GEOPIER FOUNDATION COMPANY. UNAUTHORIZED USE OF THESE DRAWINGS IS PROHIBITED.
3. THE GEOPIER FOUNDATION DESIGN IS BASED ON THE GEOTECHNICAL INFORMATION PROVIDED IN THE SUBSURFACE EXPLORATION BY GMU GEOTECHNICAL, INC. WESTERN GROUND IMPROVEMENT, INC., HAS RELIED ON THIS INFORMATION AND WE HAVE NO REASON TO SUSPECT ANY OF THE INFORMATION IN THE REPORT IS IN ERROR. WESTERN GROUND IMPROVEMENT, INC. IS NOT RESPONSIBLE FOR ERRORS OR OMISSIONS IN THE REPORT THAT MAY AFFECT THE PARAMETER VALUES IN OUR DESIGN. IF THE SUBSURFACE OR SITE CONDITIONS DIFFER FROM THOSE UTILIZED IN THE DESIGN THE DESIGNER SHALL BE NOTIFIED IMMEDIATELY.
4. THE ALLOWABLE BEARING PRESSURE FOR FOUNDATIONS SUPPORTED BY GEOPIER ELEMENTS IS AS REFERENCED IN DETAIL 1/GP0.1. THE GEOPIER LAYOUT IS DESIGNED TO PROVIDE SETTLEMENT CONTROL BASED ON SERVICE LOADS PROVIDED BY CULP AND TANNER. IN THE EVENT THE STRUCTURAL LOADS VARY, THE DESIGNER SHALL BE NOTIFIED IMMEDIATELY.
5. FOOTING ELEVATIONS ARE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND SHALL BE REPORTED IN WRITING TO THE INSTALLER'S QC REPRESENTATIVE PRIOR TO INSTALLING GEOPIER ELEMENTS.

GEOPIER LAYOUT NOTES:

1. GEOPIER ELEMENT LAYOUT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR. GEOPIER ELEMENTS SHALL BE INSTALLED IN THE FIELD WITHIN 6 INCHES OF LOCATIONS SHOWN ON THESE PLANS.
2. GEOPIER ELEMENTS ARE LOCATED RELATIVE TO THE INTERSECTION OF REFERENCE GRID LINES OR AT THE CENTERLINE OF STRIP FOOTINGS, UNLESS DIMENSIONED OTHERWISE. PLEASE REFER TO THE "FOOTING DETAILS" ON THIS SHEET FOR SPECIFIC PIER LOCATIONS AND DIMENSIONS RELATIVE TO THE FOOTING.
3. THE "GEOPIER LOCATION PLAN" AND "FOOTING DETAILS" PROVIDE GEOPIER ELEMENT NUMBER, LOCATION, AND LAYOUT ONLY. FOOTING LOCATIONS, SIZES, AND ORIENTATION SHOWN ON THESE PLANS ARE FOR INFORMATION ONLY. PLEASE REFER TO THE STRUCTURAL PLANS FOR SPECIFIC FOUNDATION DIMENSIONS AND LOCATIONS. THE DESIGNER ACCEPTS NO RESPONSIBILITY FOR THE LOCATION OF FOOTINGS SHOWN ON THESE PLANS. THE DESIGNER SHALL BE NOTIFIED IMMEDIATELY IF INFORMATION ON THESE PLANS CONFLICTS WITH STRUCTURAL OR ARCHITECTURAL DRAWINGS.

UTILITIES/OBSTRUCTION NOTES:

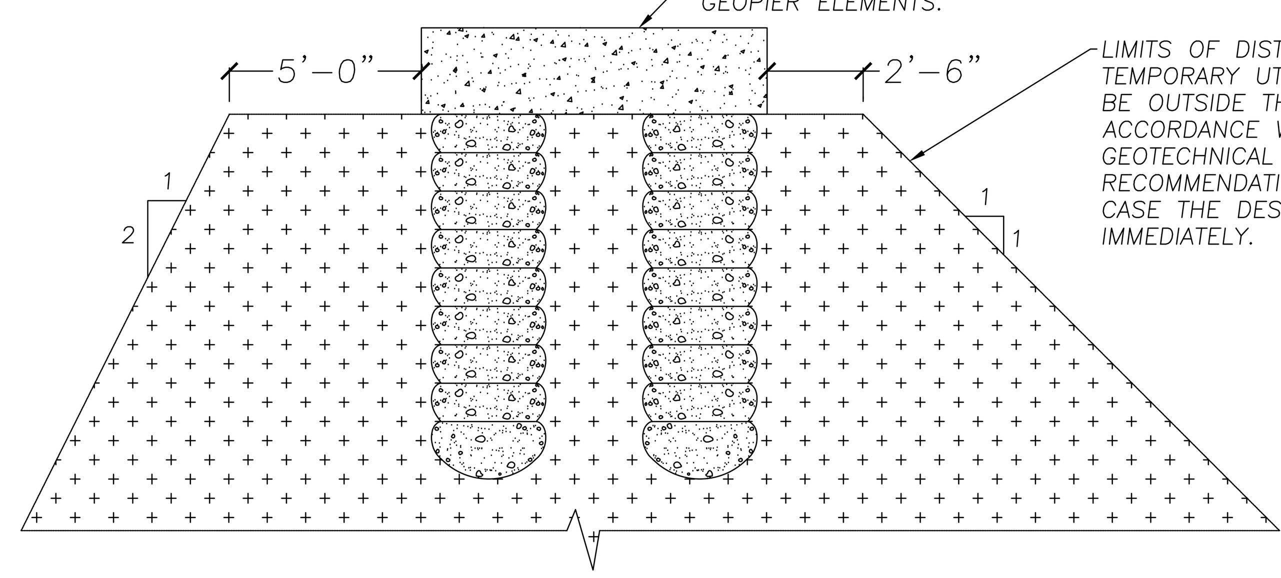
1. UTILITY LOCATIONS ARE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR. THE DESIGNER SHALL BE NOTIFIED OF ANY CONFLICTS WITH GEOPIER LOCATIONS SHOWN ON THE PLANS. NEW TEMPORARY UTILITY EXCAVATIONS SHALL BE LIMITED TO THE ZONE DEPICTED ON DETAIL 2 OF THIS SHEET. IF EXCAVATIONS ARE PLANNED WITHIN THE GEOPIER "NO DIG" ZONE, THE DESIGNER SHALL BE NOTIFIED IMMEDIATELY TO DISCUSS EXCAVATION OPTIONS.
2. IF OBSTRUCTIONS ARE ENCOUNTERED DURING GEOPIER INSTALLATION THAT CANNOT BE REMOVED WITH CONVENTIONAL GEOPIER INSTALLATION EQUIPMENT, THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING THE OBSTRUCTIONS. IF THE GENERAL CONTRACTOR DOES NOT DO SO IN A TIMELY MANNER THAT DOES NOT INTERRUPT GEOPIER PRODUCTION, THE INSTALLER MAY REMOVE OBSTRUCTIONS(S) AND SHALL BE REIMBURSED FOR COSTS INCURRED, INCLUDING LABOR, EQUIPMENT, AND MATERIALS. IN THE EVENT OBSTRUCTIONS ARE ENCOUNTERED BELOW THE DESIGNED BOTTOM OF FOOTING ELEVATION THE OBSTRUCTION SHALL BE REMOVED AS OUTLINED ABOVE. THE RESULTING EXCAVATION SHALL THEN BE BACKFILLED AND COMPACTED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS FOR STRUCTURAL FILL. THE AREA SHALL BE TESTED BY THE OWNER'S TESTING AGENCY AND THE COMPACTION TEST RESULTS SHALL BE SUBMITTED TO THE INSTALLER AND THE DESIGNER.

GEOPIER TESTING NOTES:

1. A QUALIFIED, FULL-TIME QUALITY CONTROL (QC) REPRESENTATIVE PROVIDED BY THE GEOPIER INSTALLER (INSTALLER) SHALL BE RESPONSIBLE FOR INSTALLATION OF THE GEOPIER ELEMENTS IN ACCORDANCE WITH THE DESIGN AND SHALL REPORT ALL GEOPIER FOUNDATION CONSTRUCTION ACTIVITIES TO THE DESIGNER. IF AUTHORIZED BY THE OWNER, THE QC REPRESENTATIVE SHALL COORDINATE QC ACTIVITIES WITH THE TESTING AGENCY HIRED BY THE OWNER. UNDER NO CIRCUMSTANCES SHALL THE TESTING AGENCY DIRECT GEOPIER INSTALLATION PROCEDURES.
2. GEOPIER ELEMENT DESIGN SHALL BE CONFIRMED BY A MODULUS TEST PERFORMED AT THE SITE. PLEASE REFER TO THE DESIGN SUBMITTAL FOR TEST LOCATION AND SPECIFICATIONS.
3. GEOPIER ELEMENTS SHALL BE BASED ON THE FOLLOWING CRITERIA UNLESS OTHERWISE APPROVED IN WRITING BY THE DESIGNER:
   A. INSTALLATION DEPTHS SHALL BE WITHIN 3 INCHES OR DEEPER THAN THE DEPTHS SHOWN ON THE PLANS.
   B. THE AVERAGE COMPACTED LIFT THICKNESS DURING EACH DAY'S PRODUCTION SHALL BY APPROXIMATELY 12 TO 24 INCHES.
   C. GEOPIER ELEMENT DISPLACEMENT MEASURED DURING BOTTOM STABILIZATION TESTS (BST) SHALL BE WITHIN 150% OF THE BST VALUE ACHIEVED IN THE MODULUS TEST PIER. BSTS SHALL BE PERFORMED IN AT LEAST 10% OF THE DAY'S PRODUCTION PIERS.
   D. GEOPIER ELEMENT AGGREGATE RELATIVE DENSITY SHALL BE RECORDED PERIODICALLY THROUGHOUT THE DAY. THE AVERAGE BLOW COUNTS OBTAINED UTILIZING A DYNAMIC CONE PENETROMETER (DCP) IN ACCORDANCE WITH ASTM STP-399, SHALL BE GREATER THAN 15 BLOWS FOR 1.75 INCHES OF PENETRATION (BPI). NO MORE THAN 10% OF DCP TESTS CONDUCTED ON EACH DAY SHALL BE BELOW 15 BPI. NOTE: USE OF DCP TESTS ARE NOT APPROPRIATE FOR OPEN GRADED AGGREGATE SUCH AS #57 STONE OR SAND.
   E. GEOPIER ELEMENT AGGREGATE SHALL BE APPROVED BY THE DESIGNER AND SHALL BE THE SAME AS USED IN A SUCCESSFUL MODULUS TEST, UNLESS OTHERWISE APPROVED IN WRITING BY THE DESIGNER.
   F. THE AGGREGATE SHALL BE TAMPED IN A MANNER CONSISTENT WITH THE MODULUS TEST PIER BUT FOR NO LESS THAN 10 SECONDS PER LIFT.
   G. IF CAVE-INS OCCUR ON TOP OF A LIFT OF AGGREGATE SUCH THAT THE VOLUME OF CAVED SOIL IS GREATER THAN APPROXIMATELY 10% OF THE VOLUME OF THE AGGREGATE IN THE LIFT, THEN THE AGGREGATE SHALL BE CONSIDERED CONTAMINATED, AND SHALL BE REMOVED AND REPLACED WITH UNCONTAMINATED AGGREGATE.
4. GEOPIER ELEMENTS NOT MEETING DESIGN REQUIREMENTS SHALL BE REINSTALLED UNLESS OTHERWISE APPROVED IN WRITING BY THE DESIGNER.

CONSTRUCTION NOTES FOR CONCRETE FOUNDATIONS SUPPORTED BY GEOPIER® ELEMENTS:

1. ALL EXCAVATIONS FOR FOUNDATIONS SUPPORTED BY GEOPIER ELEMENTS SHALL BE PREPARED IN THE FOLLOWING MANNER BY THE GENERAL CONTRACTOR: OVEREXCAVATION BELOW THE BOTTOM OF FOUNDATION SHALL BE LIMITED TO THREE INCHES. THIS INCLUDES LIMITING THE TEETH OF EXCAVATORS FROM OVEREXCAVATION BEYOND THREE INCHES BELOW THE FOUNDATION ELEVATION.
2. FOUNDATION CONCRETE SHALL BE PLACED IMMEDIATELY FOLLOWING FOUNDATION EXCAVATION AND APPROVAL, PREFERABLY THE SAME DAY AS THE EXCAVATION. FOUNDATION CONCRETE SHALL BE PLACED ON THE SAME DAY IF THE FOUNDATION IS BEARING ON MOISTURE-SENSITIVE SOILS. IF SAME DAY PLACEMENT OF FOUNDATION CONCRETE IS NOT POSSIBLE, OPEN EXCAVATIONS SHALL BE PROTECTED FROM SURFACE WATER ACCUMULATION. A LEAN CONCRETE MUD-MAT MAY BE USED TO ACCOMPLISH THIS. OTHER METHODS MUST BE PRE-APPROVED BY THE DESIGNER.
3. PRIOR TO CONCRETE OR MUD MAT PLACEMENT, THE TOP OF THE EXCAVATED SOIL AND GEOPIER ELEMENTS SHALL BE COMPACTED WITH A STANDARD, HAND-OPERATED IMPACT COMPACTOR (I.E. JUMPING JACK COMPACTOR). COMPACTION SHALL BE PERFORMED OVER THE ENTIRE FOUNDATION SUBGRADE TO COMPACT ANY LOOSE SURFACE SOIL AND LOOSE SURFACE GEOPIER AGGREGATE.
4. WATER SHALL NOT BE ALLOWED TO ACCUMULATE IN THE FOUNDATION EXCAVATIONS PRIOR TO CONCRETE PLACEMENT OR ALLOWED TO ACCUMULATE OVER THE POURED FOUNDATION.
5. EXCAVATION AND SURFACE COMPACTION OF ALL FOUNDATION SUBGRADES SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
6. THE TESTING AGENCY SHALL INSPECT EACH FOUNDATION AND APPROVE IT IN WRITING ON THE SAME DAY THAT THE CONCRETE OR MUD MAT IS PLACED IN THE FOUNDATION EXCAVATION. THE APPROVAL SHALL STATE THAT ALL FOUNDATION SUBGRADE, INCLUDING MATRIX SOILS AND GEOPIER TOPS, HAVE NOT BEEN OVEREXCAVATED MORE THAN THREE-INCHES BELOW THE BOTTOM OF THE FOUNDATION, HAVE BEEN KEPT FREE OF WATER ACCUMULATION, AND HAVE BEEN REASONABLY COMPACTED WITH A HAND-HELD MECHANICAL IMPACT COMPACTOR ON THE SAME DAY THAT THE CONCRETE WAS PLACED.
7. IN THE EVENT THAT FOUNDATION BOTTOM PREPARATIONS, AS DESCRIBED ABOVE, ARE NOT PERFORMED OR DOCUMENTED IN ACCORDANCE WITH THIS SECTION, ANY WRITTEN OR IMPLIED WARRANTY WITH RESPECT TO GEOPIER FOUNDATION PERFORMANCE CAN BY CONSIDERED VOID.



2 ADJACENT TEMPORARY UTILITY EXCAVATION DETAIL
NOT TO SCALE

ADJACENT TEMPORARY UTILITY EXCAVATION NOTES:

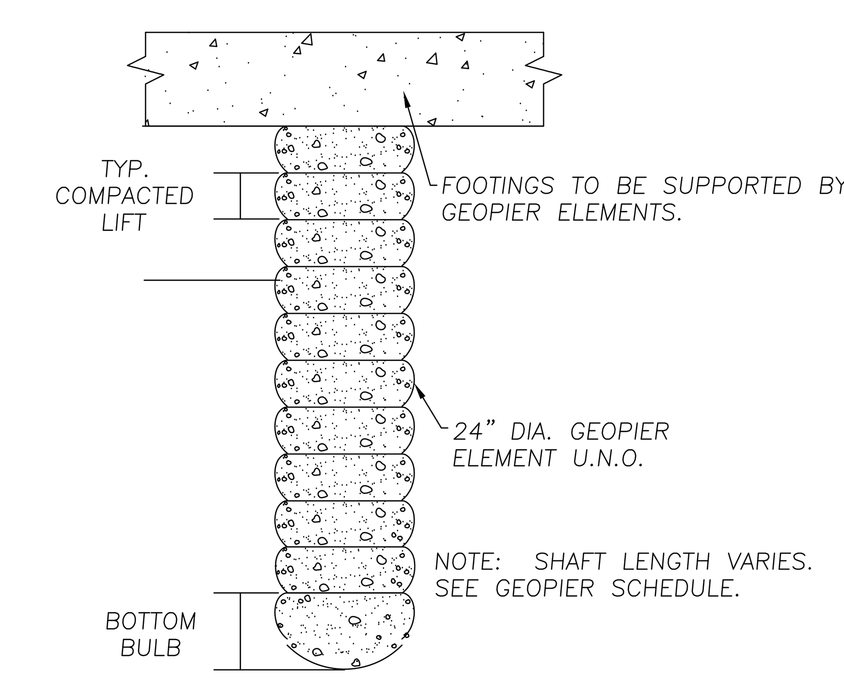
1. DETAIL 1 DOES NOT APPLY TO MASS EXCAVATION OR SITE GRADING.
2. THE PROJECT GEOTECHNICAL ENGINEER'S RECOMMENDATIONS SHALL BE FOLLOWED FOR TEMPORARY OR PERMANANT SLOPES.
3. WHERE PROPOSED EXCAVATIONS EXTEND INTO THE ZONE OF INFLUENCE, DISTURBANCE SHALL BE MINIMIZED AS MUCH AS POSSIBLE. DISTURBED PORTIONS OF GEOPIER ELEMENTS SHALL BE REMOVED AND THE EXCAVATIONS SHALL BE BACKFILLED WITH GRANULAR FILL COMPACTED IN ACCORDANCE WITH THE PROJECT REQUIREMENTS FOR STRUCTURAL FILL. AS AN ALTERNATE, EXCAVATIONS MAY BE BACKFILLED WITH FLOWABLE FILL OR LEAN CONCRETE.

Design Parameter	Value
Allowable bearing pressure (ksf)	7
Depth to groundwater (ft)	5
Total unit weight of soil (pcf)	125
Soil friction angle (degrees)	26
Geopier stiffness modulus (pci)	300
Soil stiffness modulus (pci)	38

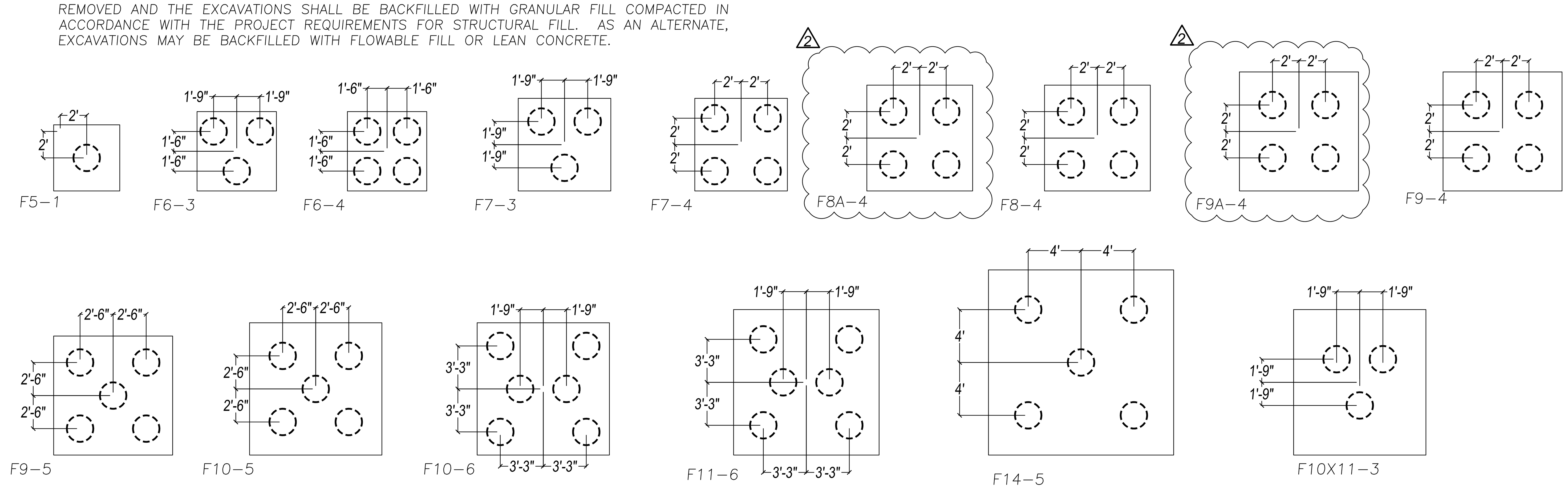
Type / Mark	Maximum Load, (kips, klf)	Width, (ft)	Length, (ft)	Thickness, (in)	Geopier Diameter, (in)	Number of Geopier Elements per Footing	Minimum Design Shaft Length, (ft) (1)	Anticipated Settlement, (in) (2)	Notes
F5-1	100	5.0	5.0	18	24	1	9.0	1/2	
F6-3	252	6.0	6.0	24	24	3	9.0	1/2	
F6-4	252	6.0	6.0	24	24	4	9.0	1/2	
F7-3	315	7.0	7.0	24	24	3	9.0	1/2	
F7-4	343	7.0	7.0	24	24	4	9.0	1/2	
F8A-4	315	8.0	8.0	36	24	4	9.0	1/2	
F8-4	420	8.0	8.0	24	24	4	9.0	1/2	
F9A-4	315	9.0	9.0	48	24	4	9.0	1/2	
F9-4	420	9.0	9.0	30	24	4	9.0	1/2	
F9-5	525	9.0	9.0	30	24	5	9.0	1/2	
F10-5	525	10.0	10.0	30	24	5	9.0	1/2	
F10-6	630	10.0	10.0	30	24	6	9.0	1/2	
F11-6	630	11.0	11.0	36	24	6	9.0	1/2	
F14-5	525	14.0	14.0	48	24	5	9.0	1/2	
F10-11	315	10.0	11.0	48	24	3	9.0	1/2	
F10x30	1050	10.0	30.0	36	24	10	9.0	1/2	
F24x32	2685	24.0	32.0	30	24	30	9.0	3/4	

NOTES: (1) Geopier elements shall penetrate fill and reach bedrock.
(2) Anticipated settlement is estimated to the nearest 1/4 inch.

1 GEOPIER® DESIGN PARAMETERS AND ESTIMATED SETTLEMENT



3 TYPICAL GEOPIER® ELEMENT
NOT TO SCALE



4 FOOTING DETAILS
NOT TO SCALE

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	
	2	3RD SUBMITTAL	08/31/2020	

REVISIONS

GEOPIER® NOTES AND DETAILS

REGISTERED PROFESSIONAL ENGINEER KENNETH H. HOEVELKAMP C 67415 EXP. 12/20 STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 8-31-20
SHEET NUMBER
GP0.1

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED
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Hadi Tabatabaee
BUILDING OFFICIAL

GEOPIER® Foundation Company GEOPIER®

Project Name: Dana Point Harbor Parking Structure
Project Location: Dana Point, Ca
Project Number: GLA-113

GEOPIER® SCHEDULE

Column Line	Geopier® Number(s)	Type / Mark	Top of Footing Elevation, (ft)	Width, (ft)	Length, (ft)	Thickness, (in)	Geopier Shaft Length, (ft) (1)	Finish Floor Elevation, (ft) (2)	Top of Geopier® Elevation, (ft)	Notes
A-2	1	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
	2 - 3	**NOT USED**								
A-3	4 - 6	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-4	7 - 9	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-5	10 - 12	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-6	13 - 15	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-7	16 - 18	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-8	19 - 21	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-9	22 - 24	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-10	25 - 27	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-11	28 - 30	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-12	31 - 33	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
	34	**NOT USED**								
A-13	35 - 37	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
	38	**NOT USED**								
A-14	39 - 42	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
A-15	43 - 45	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	46	**NOT USED**								
A-16	47 - 49	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	50	**NOT USED**								
A-17	51 - 53	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	54	**NOT USED**								
A-18	55 - 57	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	58	**NOT USED**								
A-19	59 - 61	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	62	**NOT USED**								
A-20	63 - 65	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	66	**NOT USED**								
A-21	67 - 69	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	70	**NOT USED**								
A-22	71 - 73	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	74	**NOT USED**								
A-23	75 - 77	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
A-24	78 - 80	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
A-25	81 - 83	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
A-26.5	84	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
A-27	85 - 87	F9A	-1.00	9.0	9.0	48	9	0.00	-5.00	
A.4-1.5	88	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
A.4-1	89 - 91	F10x11	-1.00	10.0	10.0	48	9	0.00	-5.00	
A.4-2	92 - 94	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.3-27	95 - 97	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.5-1	98 - 100	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.5-5	101	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
A.7-27	102 - 104	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.8-1	105 - 107	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.9-7	108 - 110	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
B-2	111 - 115	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
B-4	116 - 120	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
B-5	121 - 124	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-6	125 - 127	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
B-7	128 - 130	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
B-8	131 - 133	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
B-9	134 - 136	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
B-10	137 - 139	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-11	140 - 143	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-12	144 - 148	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
B-14	149 - 153	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
B-15	154 - 157	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-16	158 - 161	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-17	162 - 165	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-18	166 - 169	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-19	170 - 173	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-20	174 - 177	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-21	178 - 181	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-22	182 - 185	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-23	186 - 189	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-24	190 - 195	F10	-1.00	10.0	10.0	30	9	0.00	-3.50	
B-26	196 - 201	F10	-1.00	10.0	10.0	30	9	0.00	-3.50	
B.2-1	202 - 204	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
B.3-27	205 - 207	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
B.5-1	208 - 210	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
B.8-1	211 - 213	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-2	214 - 216	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
C-4	217 - 219	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
C-5	220 - 222	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-6	223 - 225	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-7	226 - 228	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-8	229 - 231	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-9	232 - 234	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-10	235 - 237	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-11	238 - 240	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-12	241 - 243	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	244	**NOT USED**								
C-13	245	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
C-14	246 - 248	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	249	**NOT USED**								
C-15	250 - 252	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-16	253 - 255	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-17	256 - 258	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-18	259 - 261	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-19	262 - 264	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-20	265 - 267	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-21	268 - 270	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-22	271 - 273	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-23	274 - 276	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-24	277 - 280	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	

1 GEOPIER® SCHEDULE

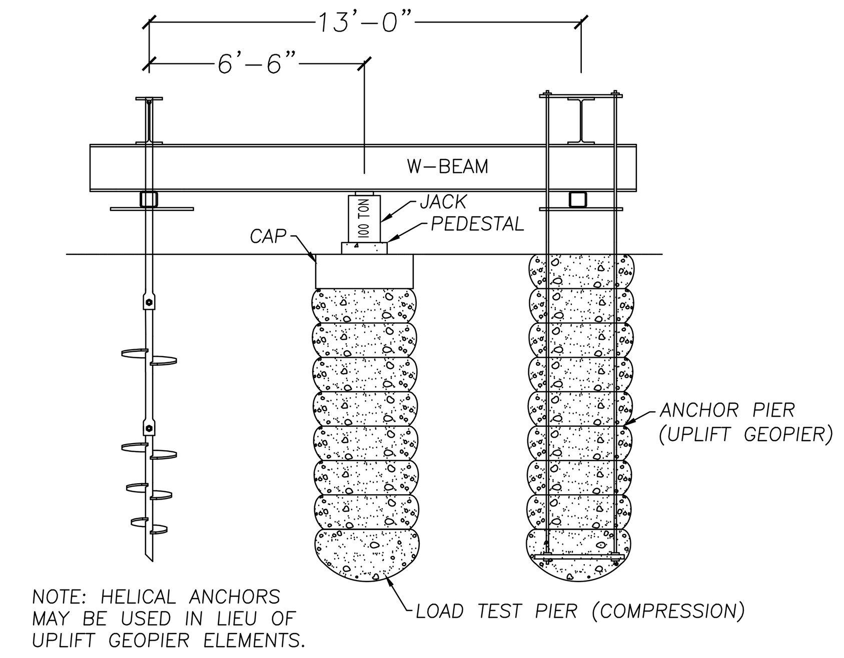
GEOPIER® Foundation Company GEOPIER®

Project Name: Dana Point Harbor Parking Structure
Project Location: Dana Point, Ca
Project Number: GLA-113

GEOPIER® SCHEDULE

Column Line	Geopier® Number(s)	Type / Mark	Top of Footing Elevation, (ft)	Width, (ft)	Length, (ft)	Thickness, (in)	Geopier Shaft Length, (ft) (1)	Finish Floor Elevation, (ft) (2)	Top of Geopier® Elevation, (ft)	Notes
D-1	281 - 284	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
D-4	285 - 288	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
D-5	289 - 291	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-6	292 - 294	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-7	295 - 297	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-8	298 - 300	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-9	301 - 303	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-10	304 - 306	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-11	307 - 309	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-12	310 - 312	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	313	**NOT USED**								
D-13	314	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
D-14	315 - 317	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	318	**NOT USED**								
D-15	319 - 321	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-16	322 - 324	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-17	325 - 327	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-18	328 - 330	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-19	331 - 333	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-20	334 - 336	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-21	337 - 339	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-22	340 - 342	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-23	343 - 345	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-24	346 - 349	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
D-25.6/D-27	350 - 353	F5x29	-1.00	5.0	29.0	18	9	0.00	-2.50	
	354 - 355	**NOT USED**								
D.1-1	356 - 358	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D.6-1	359 - 361	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D.7-27	362 - 364	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
E-1	365 - 367	F10x11	-1.00	10.0	10.0	48	9	0.00	-5.00	
E-2	368 - 370	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E-3	371 - 373	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
E-4	374 - 378	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
E-6	379 - 383	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
	384	**NOT USED**								
E-7	385 - 388	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-8	389 - 392	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-9	393 - 396	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-10	397 - 400	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-11	401 - 404	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-12	405 - 409	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
E-14	410 - 414	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
E-15	415 - 418	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-16	419 - 422	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-17	423 - 426	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-18	427 - 430	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-19	431 - 434	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-20	435 - 438	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-21	439 - 442	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-22	443 - 446	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-23	447 - 450	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-24	451 - 455	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
	456	**NOT USED**								
E-26	457 - 461	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
E.1-27	462 - 464	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.5-27	465 - 467	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-3	468 - 470	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-4	471 - 473	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-5	474 - 476	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-24	477 - 479	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-25	480 - 482	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-26	483 - 485	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-27	486 - 490	F14	-1.00	14.0	14.0	48	9	0.00	-5.00	
F-4	491	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
F-24	492	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
	493 - 533	**NOT USED**								
F-17	534 - 536	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	537	**NOT USED**								
F-18	538 - 540	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	541	**NOT USED**								
F-19	542 - 544	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	545	**NOT USED**								
F-20	546 - 549	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
F-21	550 - 552	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
F-22	553 - 555	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
F-23	556 - 558	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
F-24	559	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
B.7-25.6	560 - 589	F24x32	-1.00	24.0	32.0	30	9	0.00	-3.50	
D.2-25.6	590 - 599	F10x30	-1.00	10.0	30.0	36	9	0.00	-4.00	
A-24	600	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
A-25	601	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
A-27	602	F9A	-1.00	9.0	9.0	48	9	0.00	-5.00	
B-10	603	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B.3-27	604	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
D.7-27	605	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
F-4/F-16	606 - 655	CONT	-1.00	VARIES	223.5	24	9	0.00	-3.00	

NOTES:
(1) Geopier elements shall completely penetrate the fill and reach bedrock.
(2) Structure FFE=0.00 ft is equivalent to Site Civil Elevation XX.XX ft.



2 GEOPIER® MODULUS TEST SETUP
NOT TO SCALE

GEOPIER® Foundation Company GEOPIER®

Project Name: Dana Point Harbor Parking Structure
Project Location: Dana Point, Ca
Project Number: GLA-113

Geopier® Modulus Test Schedule

Maximum Geopier Design Stress: 22,010 psf
Geopier Element Diameter: 24 in.
Design Modulus: 300 pci

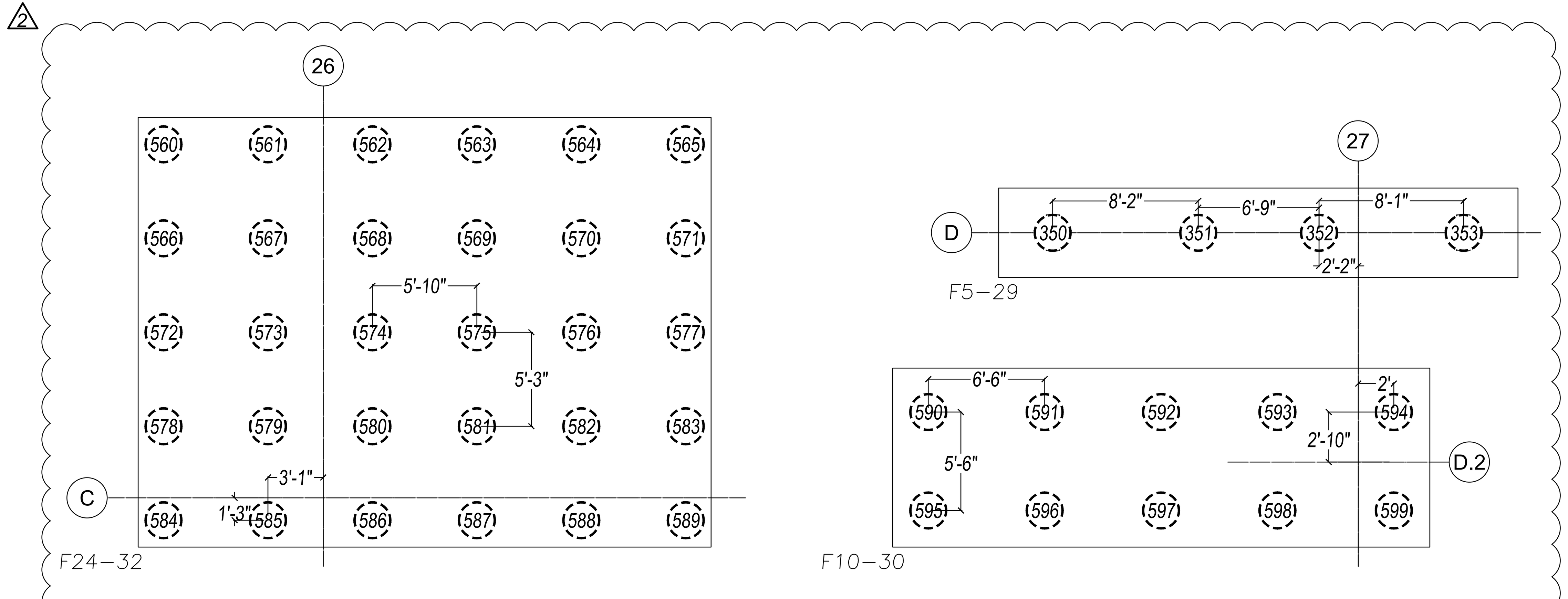
Modulus Test Location: Near Boring DH-35
Test Geopier Element Shaft Length: 9 ft
Concrete Cap Thickness: 2 ft
Total Drill Depth 11 ft

Load No.	Ram Load, (kips)	Geopier Element Stress, (psf)	Percent of Design Stress	Minimum Duration	Maximum Duration	Remarks
	3.46	1,101	5.0%	N/A	N/A	seating load
1	11.53	3,669	16.7%	15 min	60 min	
2	23.05	7,336	33.3%	15 min	60 min	
3	34.57	11,005	50.0%	15 min	60 min	
4	46.10	14,674	66.7%	15 min	60 min	
5	57.62	18,341	83.3%	15 min	60 min	
6	69.15	22,010	100.0%	15 min	60 min	
7	80.65	25,672	116.6%	60 min	240 min	
8	92.19	29,346	133.3%	15 min	60 min	
9	103.72	33,015	150.0%	15 min	60 min	
10	69.15	22,010	100.0%	N/A	N/A	rebound, unload
11	45.64	14,527	66.0%	N/A	N/A	rebound, unload
12	22.82	7,263	33.0%	N/A	N/A	rebound, unload
13	3.46	1,101	5.0%	N/A	N/A	rebound, unload

Notes:
1 - The Geopier element to be used in the modulus load testing should be installed in a manner similar to production, at least 4 days prior to testing, so that pore-pressures have adequate time to dissipate.
2 - The modulus load test shall be performed to a stress not less than 150% of the design maximum top-of-pier stress indicated in the Geopier Design Calculations.
3 - The modulus load test Geopier element shall be installed to a depth of 11 feet below the ground surface with a 2-foot thick unreinforced concrete leveling pad. The modulus load test Geopier shall penetrate fill.
4 - A telltale shall be installed in the bottom one-third of the tested Geopier element. Telltale deflections shall be monitored concurrent with top of Geopier deflections during the modulus load test.
5 - The modulus load test setup shall be as shown on Geopier Construction Drawing GP0.1. Helical anchors should be installed in accordance with manufacturers specifications.
6 - A representative of the owner's geotechnical consultant should be present to witness the load test.

3 GEOPIER® MODULUS TEST SCHEDULE

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA



4 FOOTING DETAILS
NOT TO SCALE

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	
	2	3RD SUBMITTAL	08/31/2020	

REVISIONS

GEOPIER® SCHEDULES

DANA POINT HARBOR PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

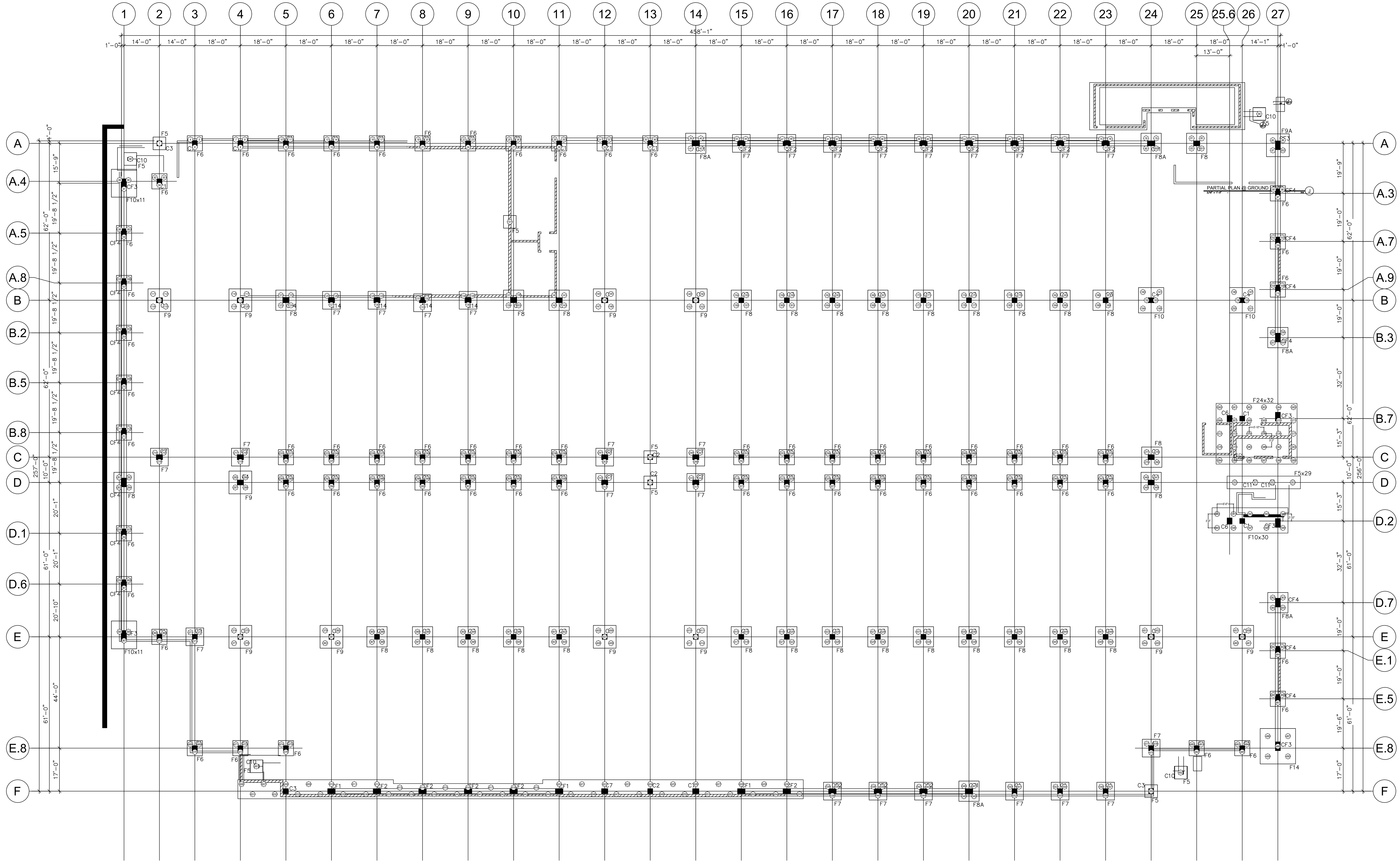
PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 8-31-20
SHEET NUMBER
GP0.2

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.

Hadi Tabatabaee
BUILDING OFFICIAL



NORTH

1 OVERALL GEOPIER® LOCATION PLAN
1/16" = 1'-0"

LEGEND

TYP. 24" GEOPIER ELEMENT

1 TYP. GEOPIER ELEMENT NUMBER

GEOPIER® LOCATION PLAN NOTES

1. FOOTING CONCRETE SHALL BE PLACED DIRECTLY ON TOP OF EXPOSED GEOPIER ELEMENTS.
2. ALL EXISTING AND PROPOSED UTILITIES WITHIN AND ADJACENT TO THE PROPOSED BUILDING FOOTPRINT SHALL BE FIELD VERIFIED BY THE GENERAL CONTRACTOR AND COORDINATED WITH THE GEOPIER INSTALLER BEFORE GEOPIER ELEMENT INSTALLATION SHALL PROCEED.
3. THESE DRAWINGS ARE FOR GEOPIER LOCATION ONLY, AND ARE BASED ON THE STRUCTURAL DRAWINGS PROVIDED BY CULP AND TANNER ON SHEET S2.01 DATED 12/03/19. REFER TO CULP AND TANNER DRAWINGS FOR FOOTING LAYOUT AND ORIENTATION.
4. GEOPIER ELEMENTS SHALL BE LOCATED IN THE FIELD AS SHOWN, DIMENSIONED FROM CONTROL POINTS ESTABLISHED FROM STRUCTURAL AND/OR ARCHITECTURAL PLANS.

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	
	2	3RD SUBMITTAL	08/31/2020	

GEOPIER® LOCATION PLAN

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 8-31-20
SHEET NUMBER
GP1.0

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

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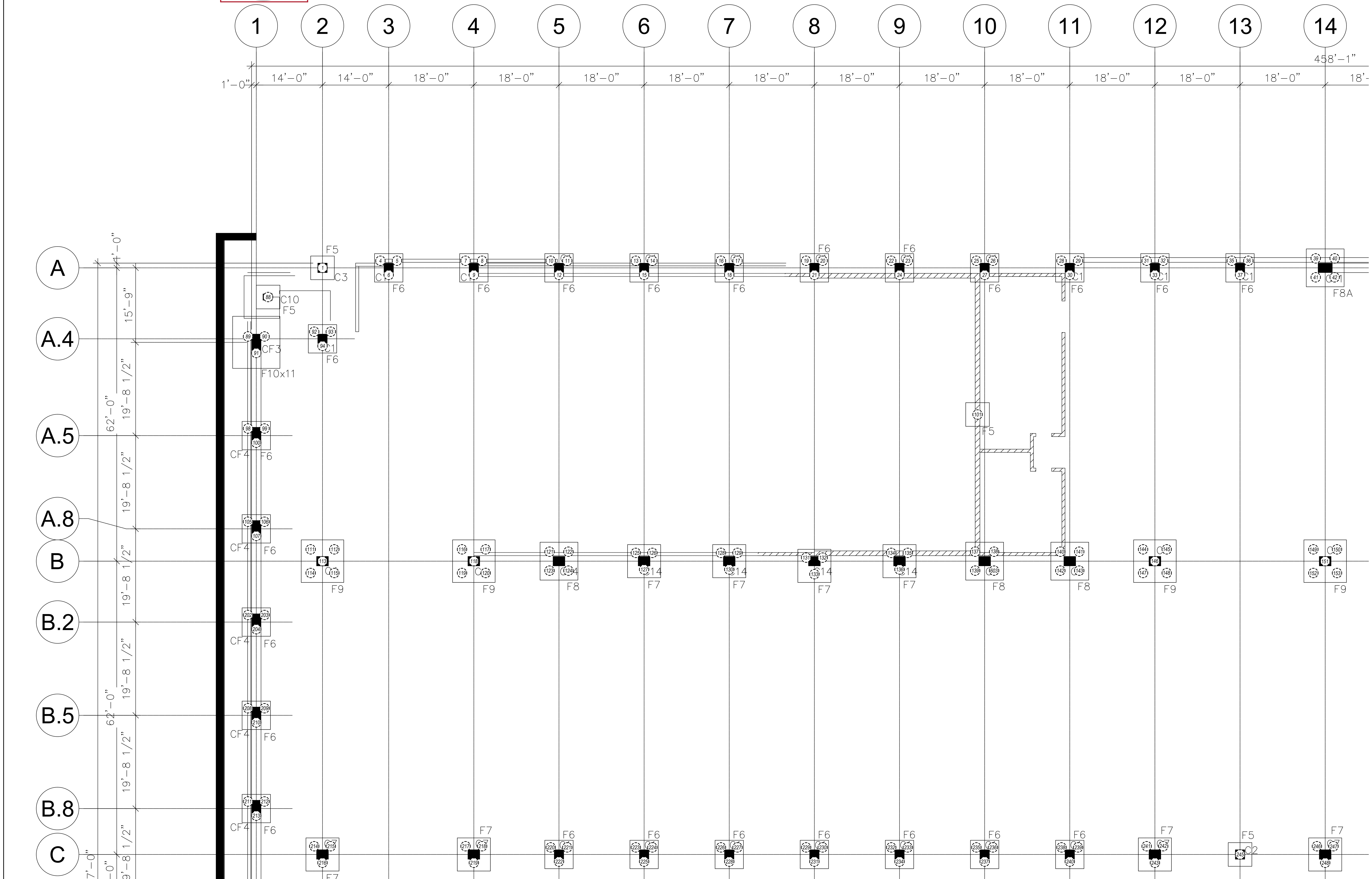
Hadi Tabatabaee
BUILDING OFFICIAL



NORTH

1 GEOPIER® LOCATION PLAN
1/16" = 1'-0"

LEGEND

TYP. 24" GEOPIER ELEMENT

1 TYP. GEOPIER ELEMENT NUMBER

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GEOPIER®

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	
	2	3RD SUBMITTAL	08/31/2020	

REVISIONS

GEOPIER® LOCATION PLAN

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI | GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 8-31-20
SHEET NUMBER GP1.1

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

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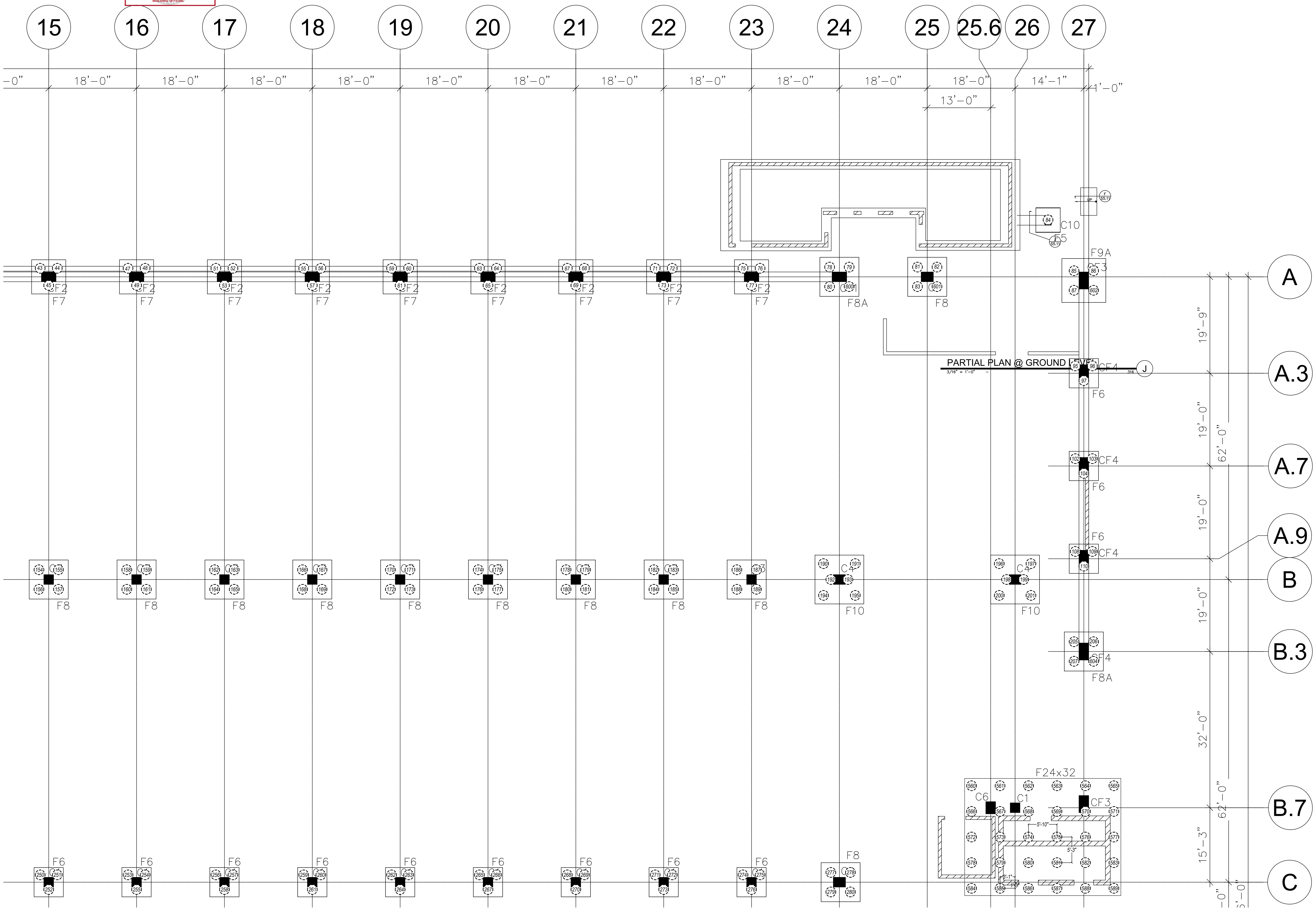
BUILDING OFFICIAL



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GEOPIER®

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	
	2	3RD SUBMITTAL	08/31/2020	

GEOPIER® LOCATION PLAN

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

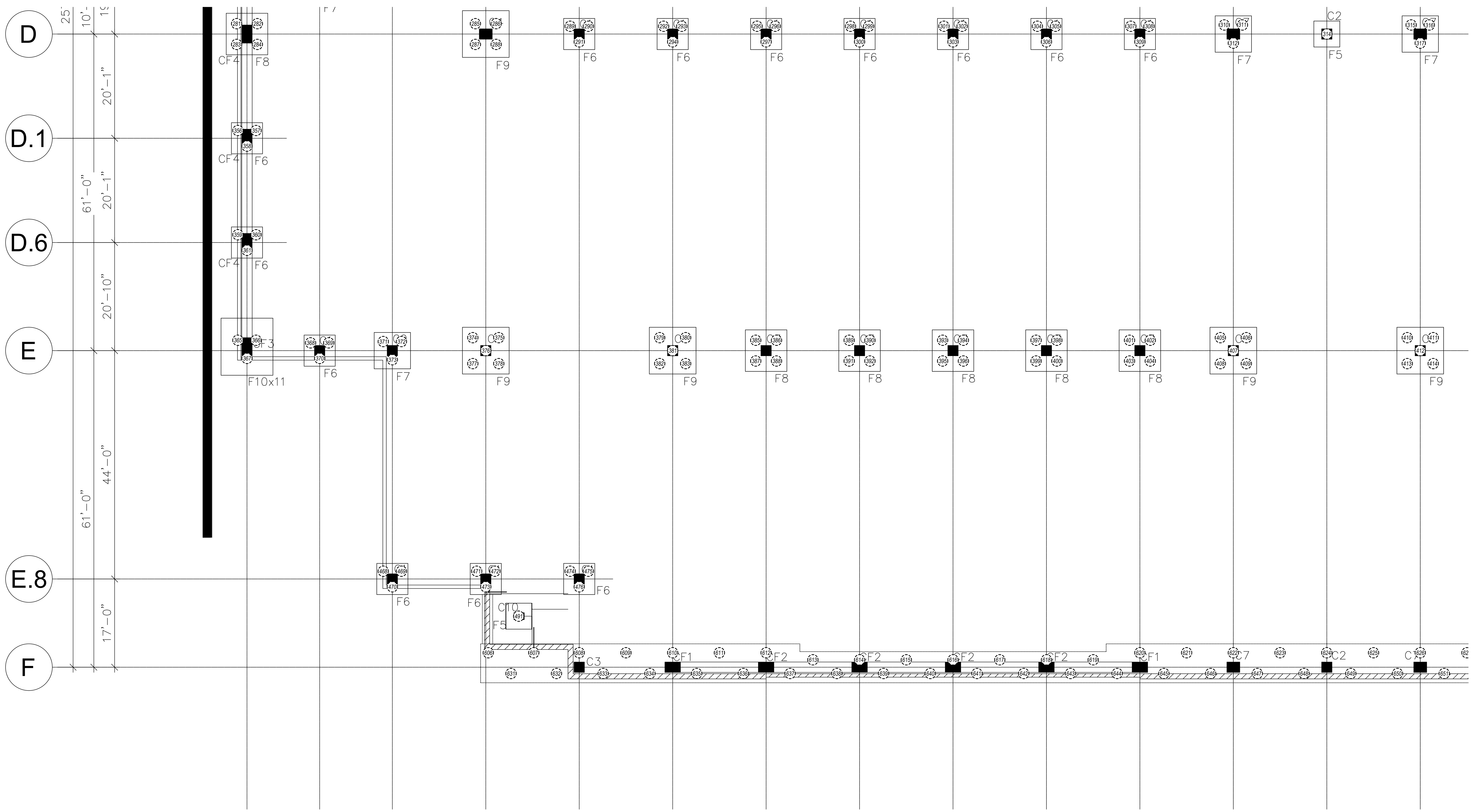
PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 8-31-20
SHEET NUMBER GP1.2

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.

Hadi Tabatabaee
BUILDING OFFICIAL



NORTH

1 GEOPIER® LOCATION PLAN
1/16" = 1'-0"

LEGEND

TYP. 24" GEOPIER ELEMENT

1 TYP. GEOPIER ELEMENT NUMBER

GEOPIER® LOCATION PLAN NOTES

1. FOOTING CONCRETE SHALL BE PLACED DIRECTLY ON TOP OF EXPOSED GEOPIER ELEMENTS.
2. ALL EXISTING AND PROPOSED UTILITIES WITHIN AND ADJACENT TO THE PROPOSED BUILDING FOOTPRINT SHALL BE FIELD VERIFIED BY THE GENERAL CONTRACTOR AND COORDINATED WITH THE GEOPIER INSTALLER BEFORE GEOPIER ELEMENT INSTALLATION SHALL PROCEED.
3. THESE DRAWINGS ARE FOR GEOPIER LOCATION ONLY, AND ARE BASED ON THE STRUCTURAL DRAWINGS PROVIDED BY CULP AND TANNER ON SHEET S2.01 DATED 12/03/19. REFER TO CULP AND TANNER DRAWINGS FOR FOOTING LAYOUT AND ORIENTATION.
4. GEOPIER ELEMENTS SHALL BE LOCATED IN THE FIELD AS SHOWN, DIMENSIONED FROM CONTROL POINTS ESTABLISHED FROM STRUCTURAL AND/OR ARCHITECTURAL PLANS.

GEOPIER®

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	
	2	3RD SUBMITTAL	08/31/2020	

GEOPIER® LOCATION PLAN

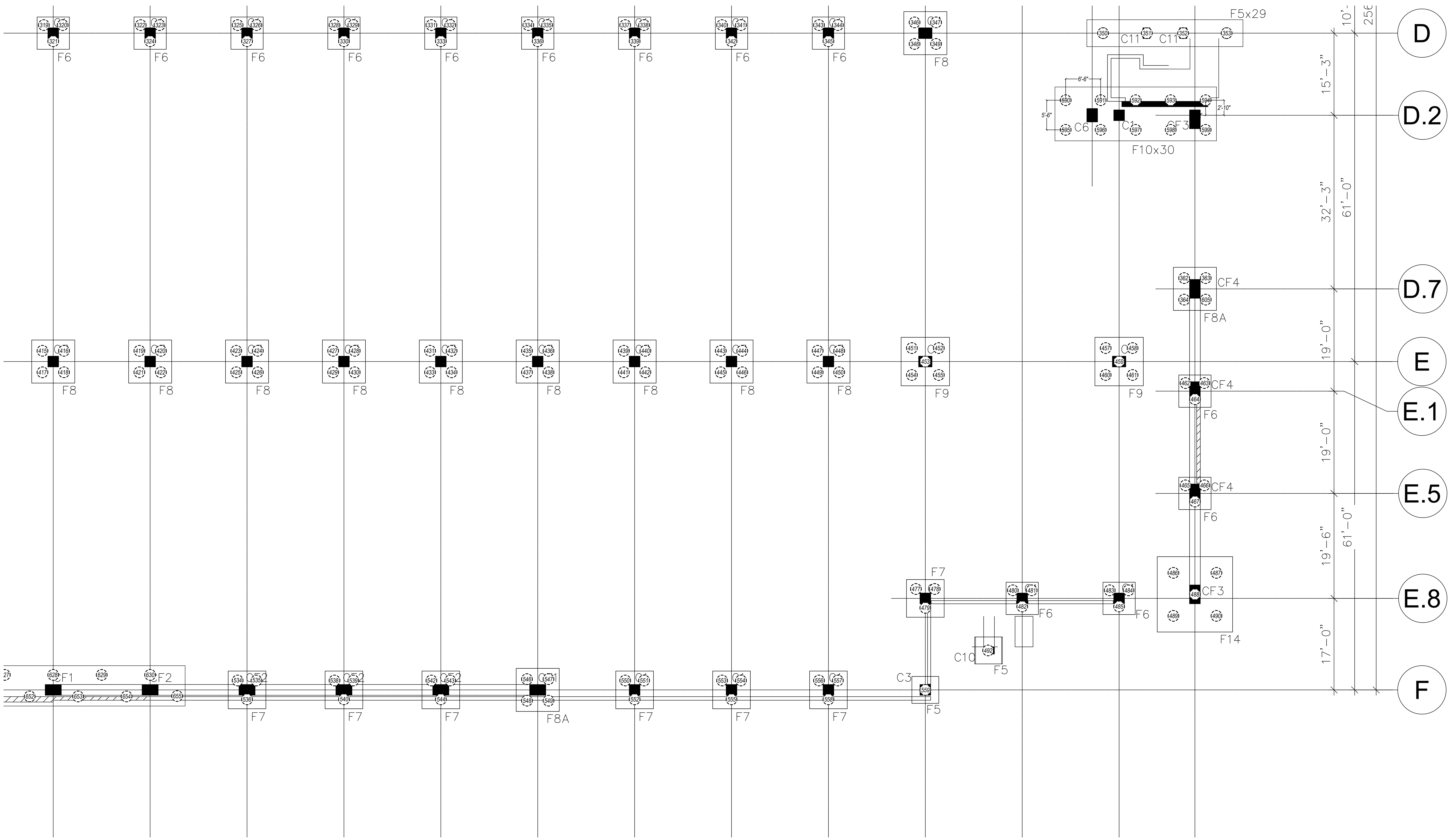
REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI | GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 8-31-20
SHEET NUMBER

GP1.3



NORTH

1 GEOPIER® LOCATION PLAN
1/16" = 1'-0"

LEGEND

- TYP. 24" GEOPIER ELEMENT
- 1 TYP. GEOPIER ELEMENT NUMBER

GEOPIER® LOCATION PLAN NOTES

1. FOOTING CONCRETE SHALL BE PLACED DIRECTLY ON TOP OF EXPOSED GEOPIER ELEMENTS.
2. ALL EXISTING AND PROPOSED UTILITIES WITHIN AND ADJACENT TO THE PROPOSED BUILDING FOOTPRINT SHALL BE FIELD VERIFIED BY THE GENERAL CONTRACTOR AND COORDINATED WITH THE GEOPIER INSTALLER BEFORE GEOPIER ELEMENT INSTALLATION SHALL PROCEED.
3. THESE DRAWINGS ARE FOR GEOPIER LOCATION ONLY, AND ARE BASED ON THE STRUCTURAL DRAWINGS PROVIDED BY CULP AND TANNER ON SHEET S2.01 DATED 12/03/19. REFER TO CULP AND TANNER DRAWINGS FOR FOOTING LAYOUT AND ORIENTATION.
4. GEOPIER ELEMENTS SHALL BE LOCATED IN THE FIELD AS SHOWN, DIMENSIONED FROM CONTROL POINTS ESTABLISHED FROM STRUCTURAL AND/OR ARCHITECTURAL PLANS.

GEOPIER®

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	
	2	3RD SUBMITTAL	08/31/2020	

GEOPIER® LOCATION PLAN

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 8-31-20
SHEET NUMBER
GP1.4

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

WGI | GEOPIER® FOUNDATIONS

Western Ground Improvement, Inc.
2372 Morse Ave
Suite 504
Irvine, CA 92614

www.westerngroundimprovement.com

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Hadi Tabatabaee
BUILDING OFFICIAL

August 31, 2020

Mr. Dave Atkinson
GMU Geotechnical, Inc.
23241 Arroyo Vista
Rancho Santa Margarita, California 92688

Re: Calculations Package for a *Geopier*® Foundation System
Dana Point Harbor Parking Structure
Dana Point, California
GFC Project No.: GLA-113

Dear Mr. Atkinson,

Geopier Foundation Company, Inc. has completed the Geopier® foundation design for the above project. The design is based on geotechnical information provided by «GE» in the report dated «GEreportdateTEXT». Structural design loads are as provided by «SE». The following documents are included herein:

- Geopier settlement calculations for square footings
- Geopier settlement calculations for rectangular footings

We are pleased to have provided you with our design services. If you have any questions, please contact this office.

Sincerely,
Western Ground Improvement, Inc.

REGISTERED PROFESSIONAL ENGINEER
KENNETH K. HOEVELKAMP
C 67415
EXP. 12/20
CIVIL
STATE OF CALIFORNIA

8/31/20

Ken Hoevelkamp, P.E.
Principal Engineer

GEOPIER® **Foundation Company**

GEOPIER®

SQUARE FOOTINGS

Version 3.0.6 August 2013

Project:	**Dana Point Harbor Parking Structure**
No.:	GLA-113
Engnr:	AMB
Date:	12/11/2019

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
RAP diameter (in)	d	24
Depth to groundwater (ft)	dgw	5
Total unit weight of soil (pcf)	g	125
Soil frict. angle (degr)	f	26
Max. hor. pressure (psf)	pmax	2500
From Table 4.2:		
RAP cell cap. (kips)	Qcell	105
Footing bearing press. (ksf)	qall	7
RAP stiffn. modulus (pci)	kg	300
Soil stiffness modulus (pci)	km	38

TOP OF PIER STRESS - SQUARE FOOTINGS

Parameter	Symb	Equation	F5-1	F6-3	F6-4	F7-3	F7-4	F8A-4	F8-4
Max Column load (kips)	P		100	252	252	315	343	315	420
Required footing width (ft)	Br	sqrt(P/qall)	3.78	6.00	6.00	6.71	7.00	6.71	7.75
Selected footing width (ft)	B		5	6	6	7	7	8	8
Footing bearing pressure	q	P/(B*B)	4.00	7.00	7.00	6.43	7.00	4.92	6.56
Required No. RAP elems	Nr	P/Qcell	1.0	2.4	2.4	3.0	3.3	3.0	4.0
Selected No. RAP elems	N		1	3	4	3	4	4	4
Area replacement ratio	Ra	N*Ag/(B*B)	0.126	0.262	0.349	0.192	0.256	0.196	0.196
Stiffness ratio	Rs	kg/km	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Stress at top of GP (ksf)	qg	q*Rs/(Rs*Ra-Ra+1)	16.92	19.70	16.22	21.82	19.96	16.51	22.01
Load at top of GP (kips)	Qg	qg*Ag	53.2	61.9	51.0	68.5	62.7	51.9	69.1

SHAFT LENGTH REQUIREMENTS

Depth of Embedment	Df		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Trial shaft length (ft)	Hs		9.0	9.0	9.0	9.0	9.0	9.0	9.0
Drill depth (ft)	Hdrill	Df+Hs	12	12	12	12	12	12	12

INPUT PARAMETER VALUES:

Upper Zone Elastic Parameters		
Parameter	Sym	Val
Pier Modulus Layer 1 (ksf)	Eg1	
Pier Modulus Layer 2 (ksf)	Eg2	
Pier Modulus Layer 3 (ksf)	Eg3	
Pier Modulus Layer 4 (ksf)	Eg4	
Pier Modulus Layer 5 (ksf)	Eg5	
Soil Modulus Layer 1 (ksf)	Em1	
Soil Modulus Layer 2 (ksf)	Em2	
Soil Modulus Layer 3 (ksf)	Em3	
Soil Modulus Layer 4 (ksf)	Em4	
Soil Modulus Layer 5 (ksf)	Em5	

UPPER ZONE SETTLEMENT - SQUARE FOOTINGS

Parameter	**Symb**	Equation							
UZ Settlement Approach		1-Stiffness, 2-Modulus	1	1	1	1	1	1	1
Thickness of UZ sublayer 1(ft)	H_{uz1}								
Thickness of UZ sublayer 2 (ft)	H_{uz2}								
Thickness of UZ sublayer 3 (ft)	H_{uz3}								
Thickness of UZ sublayer 4 (ft)	H_{uz4}								
Thickness of UZ sublayer 5 (ft)	H_{uz5}								
Total UZ Thickness OK?		Huz = Hs + d							
Composite Modulus Layer 1 (ksf)	E_{comp1}	Eg1Ra + Em1(1-Ra)							
Composite Modulus Layer 2 (ksf)	E_{comp2}	Eg2Ra + Em2(1-Ra)							
Composite Modulus Layer 3 (ksf)	E_{comp3}	Eg3Ra + Em3(1-Ra)							
Composite Modulus Layer 4 (ksf)	E_{comp4}	Eg4Ra + Em4(1-Ra)							
Composite Modulus Layer 5 (ksf)	E_{comp5}	Eg5Ra + Em5(1-Ra)							
Sett. of UZ sublayer 1 (in)	S_{uz1}	qg/kg or q*Iσ-vag*H/Ecomp	0.39	0.46	0.38	0.51	0.46	0.38	0.51
Sett. of UZ sublayer 2 (in)	S_{uz2}	$q*I\sigma\text{-}2*H_{uz2}/E_{comp2}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 3 (in)	S_{uz3}	$q*I\sigma\text{-}3*H_{uz3}/E_{comp3}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 4 (in)	S_{uz4}	$q*I\sigma\text{-}4*H_{uz4}/E_{comp4}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 5 (in)	S_{uz5}	$q*I\sigma\text{-}5*H_{uz5}/E_{comp5}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Upper Zone Settlement (in)	S_{uz}	$S_{uz1}+S_{uz2}+S_{uz3}+S_{uz4}+S_{uz5}$	0.39	0.46	0.38	0.51	0.46	0.38	0.51

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
Allowable end-bearing (kips)	Qeb	0.0
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon 1}$	800
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon 2}$	2000
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon 3}$	2000
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon 4}$	2000
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon 5}$	2000
Calc. settlement to X*B	X	2

LOWER ZONE SETTLEMENTS - SQUARE FOOTINGS

Parameter	Symb	Equation	F5-1	F6-3	F6-4	F7-3	F7-4	F8A-4	F8-4
Dpth to bottm of LZ from ftg (ft)	X*B	X*B	10	12	12	14	14	16	16
Upper zone thickness (ft)	H_{uz}	Hs+d	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Lower zone thickness (ft)	H_{lz}	H2b-Hlz	-1	1	1	3	3	5	5
Thickness of LZ sublayer 1(ft)	H_{lz1}		0	1	1	3	3	5	5
Thickness of LZ sublayer 2 (ft)	H_{lz2}								
Thickness of LZ sublayer 3 (ft)	H_{lz3}								
Thickness of LZ sublayer 4 (ft)	H_{lz4}								
Thickness of LZ sublayer 5 (ft)	H_{lz5}								
Total LZ thickness ok?			**No LZ**	**ok**	**ok**	**ok**	**ok**	**ok**	**ok**
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon 1}$	E (ksf) or c_ε	800	800	800	800	800	800	800
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon 2}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon 3}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon 4}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon 5}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
Initial stress for sublyr 1 (ksf)	P'_{o1}		1.188	1.220	1.220	1.282	1.282	1.345	1.345
Initial stress for sublyr 2 (ksf)	P'_{o2}		1.188	1.251	1.251	1.376	1.376	1.501	1.501
Initial stress for sublyr 3 (ksf)	P'_{o3}		1.188	1.251	1.251	1.376	1.376	1.501	1.501
Initial stress for sublyr 4 (ksf)	P'_{o4}		1.188	1.251	1.251	1.376	1.376	1.501	1.501
Initial stress for sublyr 5 (ksf)	P'_{o5}		1.188	1.251	1.251	1.376	1.376	1.501	1.501
Ftg stress on sublyr 1 (ksf)	ΔP1	q*I	0.36	0.82	0.82	0.85	0.93	0.72	0.96
Ftg stress on sublyr 2 (ksf)	ΔP2	q*I	0.36	0.76	0.76	0.69	0.76	0.53	0.71
Ftg stress on sublyr 3 (ksf)	ΔP3	q*I	0.36	0.76	0.76	0.69	0.76	0.53	0.71
Ftg stress on sublyr 4 (ksf)	ΔP4	q*I	0.36	0.76	0.76	0.69	0.76	0.53	0.71
Ftg stress on sublyr 5 (ksf)	ΔP5	q*I	0.36	0.76	0.76	0.69	0.76	0.53	0.71
Sett. of LZ sublayer 1 (in)	S_{lz1}	DP1*Hlz1/E1	0.00	0.01	0.01	0.04	0.04	0.05	0.07
Sett. of LZ sublayer 2 (in)	S_{lz2}	DP2*Hlz2/E2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sett. of LZ sublayer 3 (in)	S_{lz3}	DP3*Hlz3/E3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sett. of LZ sublayer 4 (in)	S_{lz4}	DP4*Hlz4/E4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sett. of LZ sublayer 5 (in)	S_{lz5}	DP5*Hlz5/E5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total lower zone sett. (in)	S_{lz}	$S_{lz1}+S_{lz2}+S_{lz3}+S_{lz4}+S_{lz5}$	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total UZ + LZ settlement (in)	s		0.4	0.5	0.4	0.5	0.5	0.4	0.6

GEOPIER® Foundation Company

GEOPIER®

SQUARE FOOTINGS

Version 3.0.6 August 2013

Project:	**Dana Point Harbor Parking Structure**
No.:	GLA-113
Engnr:	AMB
Date:	12/11/2019

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
RAP diameter (in)	d	24
Depth to groundwater (ft)	dgw	5
Total unit weight of soil (pcf)	g	125
Soil frict. angle (degr)	f	26
Max. hor. pressure (psf)	pmax	2500
From Table 4.2:		
RAP cell cap. (kips)	Qcell	105
Footing bearing press. (ksf)	qall	7
RAP stiffn. modulus (pci)	kg	300
Soil stiffness modulus (pci)	km	38

TOP OF PIER STRESS - SQUARE FOOTINGS

Parameter	Symb	Equation	F9A-4	F9-4	F9-5	F10-5	F10-6	F11-6	F14-5
Max Column load (kips)	P		315	420	525	525	630	630	525
Required footing width (ft)	Br	sqrt(P/qall)	6.71	7.75	8.66	8.66	9.49	9.49	8.66
Selected footing width (ft)	B		9	9	9	10	10	11	14
Footing bearing pressure	q	P/(B*B)	3.89	5.19	6.48	5.25	6.30	5.21	2.68
Required No. RAP elems	Nr	P/Qcell	3.0	4.0	5.0	5.0	6.0	6.0	5.0
Selected No. RAP elems	N		4	4	5	5	6	6	5
Area replacement ratio	Ra	N*Ag/(B*B)	0.155	0.155	0.194	0.157	0.188	0.156	0.080
Stiffness ratio	Rs	kg/km	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Stress at top of GP (ksf)	qg	q*Rs/(Rs*Ra-Ra+1)	14.83	19.78	21.89	19.90	21.63	19.82	13.62
Load at top of GP (kips)	Qg	qg*Ag	46.6	62.1	68.8	62.5	67.9	62.3	42.8

SHAFT LENGTH REQUIREMENTS

Parameter	Symb	Equation	F9A-4	F9-4	F9-5	F10-5	F10-6	F11-6	F14-5
Depth of Embedment	Df		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Trial shaft length (ft)	Hs		9.0	9.0	9.0	9.0	9.0	9.0	9.0
Drill depth (ft)	Hdrill	Df+Hs	12	12	12	12	12	12	12

INPUT PARAMETER VALUES:

Upper Zone Elastic Parameters		
Parameter	Sym	Val
Pier Modulus Layer 1 (ksf)	Eg1	
Pier Modulus Layer 2 (ksf)	Eg2	
Pier Modulus Layer 3 (ksf)	Eg3	
Pier Modulus Layer 4 (ksf)	Eg4	
Pier Modulus Layer 5 (ksf)	Eg5	
Soil Modulus Layer 1 (ksf)	Em1	
Soil Modulus Layer 2 (ksf)	Em2	
Soil Modulus Layer 3 (ksf)	Em3	
Soil Modulus Layer 4 (ksf)	Em4	
Soil Modulus Layer 5 (ksf)	Em5	

UPPER ZONE SETTLEMENT - SQUARE FOOTINGS

Parameter	**Symb**	Equation							
UZ Settlement Approach		1-Stiffness, 2-Modulus	1	1	1	1	1	1	1
Thickness of UZ sublayer 1(ft)	H_{uz1}								
Thickness of UZ sublayer 2 (ft)	H_{uz2}								
Thickness of UZ sublayer 3 (ft)	H_{uz3}								
Thickness of UZ sublayer 4 (ft)	H_{uz4}								
Thickness of UZ sublayer 5 (ft)	H_{uz5}								
Total UZ Thickness OK?		Huz = Hs + d							
Composite Modulus Layer 1 (ksf)	E_{comp1}	Eg1Ra + Em1(1-Ra)							
Composite Modulus Layer 2 (ksf)	E_{comp2}	Eg2Ra + Em2(1-Ra)							
Composite Modulus Layer 3 (ksf)	E_{comp3}	Eg3Ra + Em3(1-Ra)							
Composite Modulus Layer 4 (ksf)	E_{comp4}	Eg4Ra + Em4(1-Ra)							
Composite Modulus Layer 5 (ksf)	E_{comp5}	Eg5Ra + Em5(1-Ra)							
Sett. of UZ sublayer 1 (in)	S_{uz1}	qg/kg or q*Iσ-vag*H/Ecomp	0.34	0.46	0.51	0.46	0.50	0.46	0.32
Sett. of UZ sublayer 2 (in)	S_{uz2}	q*Iσ-2*H_{uz2}/E_{comp2}	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 3 (in)	S_{uz3}	q*Iσ-3*H_{uz3}/E_{comp3}	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 4 (in)	S_{uz4}	q*Iσ-4*H_{uz4}/E_{comp4}	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 5 (in)	S_{uz5}	q*Iσ-5*H_{uz5}/E_{comp5}	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Upper Zone Settlement (in)	S_{uz}	$S_{uz1}+S_{uz2}+S_{uz3}+S_{uz4}+S_{uz5}$	0.34	0.46	0.51	0.46	0.50	0.46	0.32

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
Allowable end-bearing (kips)	Qeb	0.0
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon1}$	800
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon2}$	2000
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon3}$	2000
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon4}$	2000
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon5}$	2000
Calc. settlement to X*B	X	2

LOWER ZONE SETTLEMENTS - SQUARE FOOTINGS

Parameter	Symb	Equation	F9A-4	F9-4	F9-5	F10-5	F10-6	F11-6	F14-5
Dpth to bottm of LZ from ftg (ft)	X*B	X*B	18	18	18	20	20	22	28
Upper zone thickness (ft)	H_{uz}	Hs+d	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Lower zone thickness (ft)	H_{lz}	H2b-Hlz	7	7	7	9	9	11	17
Thickness of LZ sublayer 1(ft)	H_{lz1}		5	5	5	5	5	5	5
Thickness of LZ sublayer 2 (ft)	H_{lz2}		2	2	2	4	4	5	5
Thickness of LZ sublayer 3 (ft)	H_{lz3}							1	5
Thickness of LZ sublayer 4 (ft)	H_{lz4}								2
Thickness of LZ sublayer 5 (ft)	H_{lz5}								
Total LZ thickness ok?			**ok**	**ok**	**ok**	**ok**	**ok**	**ok**	**ok**
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon1}$	E (ksf) or c_ε	800	800	800	800	800	800	800
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon2}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon3}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon4}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon5}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
Initial stress for sublyr 1 (ksf)	P'_{o1}		1.345	1.345	1.345	1.345	1.345	1.345	1.345
Initial stress for sublyr 2 (ksf)	P'_{o2}		1.564	1.564	1.564	1.627	1.627	1.658	1.658
Initial stress for sublyr 3 (ksf)	P'_{o3}		1.627	1.627	1.627	1.752	1.752	1.846	1.971
Initial stress for sublyr 4 (ksf)	P'_{o4}		1.627	1.627	1.627	1.752	1.752	1.877	2.190
Initial stress for sublyr 5 (ksf)	P'_{o5}		1.627	1.627	1.627	1.752	1.752	1.877	2.253
Ftg stress on sublyr 1 (ksf)	ΔP1	q*I	0.70	0.93	1.16	1.12	1.34	1.29	0.95
Ftg stress on sublyr 2 (ksf)	ΔP2	q*I	0.47	0.62	0.78	0.69	0.82	0.77	0.59
Ftg stress on sublyr 3 (ksf)	ΔP3	q*I	0.42	0.56	0.70	0.57	0.68	0.59	0.40
Ftg stress on sublyr 4 (ksf)	ΔP4	q*I	0.42	0.56	0.70	0.57	0.68	0.56	0.31
Ftg stress on sublyr 5 (ksf)	ΔP5	q*I	0.42	0.56	0.70	0.57	0.68	0.56	0.29
Sett. of LZ sublayer 1 (in)	S_{lz1}	DP1*Hlz1/E1	0.05	0.07	0.09	0.08	0.10	0.10	0.07
Sett. of LZ sublayer 2 (in)	S_{lz2}	DP2*Hlz2/E2	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Sett. of LZ sublayer 3 (in)	S_{lz3}	DP3*Hlz3/E3	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Sett. of LZ sublayer 4 (in)	S_{lz4}	DP4*Hlz4/E4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sett. of LZ sublayer 5 (in)	S_{lz5}	DP5*Hlz5/E5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total lower zone sett. (in)	S_{lz}	$S_{lz1}+S_{lz2}+S_{lz3}+S_{lz4}+S_{lz5}$	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total UZ + LZ settlement (in)	s		0.4	0.5	0.6	0.6	0.6	0.6	0.4

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

GEOPIER® Foundation Company

GEOPIER®

RECTANGULAR FOOTINGS

Version 3.0.6 August 2013

Project: Dana Point Harbor Parking Structure
No.: GLA-113
Engnr: AMB
Date: 12/11/2019

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
RAP diameter (in)	d	24
~~Depth to groundwater (ft)~~	~~dgw~~	~~5~~
Total unit weight of soil (pcf)	g	125
~~Soil frict. angle (degr)~~	~~f~~	~~26~~
Max. hor. pressure (psf)	pmax	2500
From Table 4.2:		
RAP cell cap. (kips)	Qcell	105
Footing bearing press. (ksf)	qall	7
RAP stiffn. modulus (pci)	kg	300
Soil stiffness modulus (pci)	km	38

TOP OF PIER STRESS - RECTANGULAR FOOTINGS

Parameter	Symb	Equation	F10x11	F10x30	F24x32				
Max Column load (kips)	P		315	1050	2685				
Selected footing width (ft)	B		10.00	10.00	24.00				
Required footing length (ft)	Lr		4.50	15.00	15.98				
Selected footing length (ft)	L		11.00	30.00	32.00				
Footing bearing pressure	q	P/(B*L)	2.86	3.50	3.50				
Required No. RAP elems	Nr	P/Qcell	3.0	10.0	25.6				
Selected No. RAP elems	N		3	10	30				
Area replacement ratio	Ra	N*Ag/(B*L)	0.086	0.105	0.123				
Stiffness ratio	Rs	kg/km	7.9	7.9	7.9				
Stress at top of GP (ksf)	qg	q*Rs/(Rs*Ra-Ra+1)	14.21	16.05	14.95				
Load at top of GP (kips)	Qg	qg*Ag	44.6	50.4	47.0				

SHAFT LENGTH REQUIREMENTS

Parameter	Symb	Equation	F10x11	F10x30	F24x32				
Depth of Embedment	Df		3.0	3.0	3.0				
Trial shaft length (ft)	Hs		9.0	9.0	9.0				
Drill depth (ft)	Hdrill	Df+Hs	12	12	12				

INPUT PARAMETER VALUES:

Upper Zone Elastic Parameters		
Parameter	Sym	Val
Pier Modulus Layer 1 (ksf)	Eg1	
Pier Modulus Layer 2 (ksf)	Eg2	
Pier Modulus Layer 3 (ksf)	Eg3	
Pier Modulus Layer 4 (ksf)	Eg4	
Pier Modulus Layer 5 (ksf)	Eg5	
Soil Modulus Layer 1 (ksf)	Em1	
Soil Modulus Layer 2 (ksf)	Em2	
Soil Modulus Layer 3 (ksf)	Em3	
Soil Modulus Layer 4 (ksf)	Em4	
Soil Modulus Layer 5 (ksf)	Em5	

UPPER ZONE SETTLEMENT - RECTANGULAR FOOTINGS

Parameter	**Symb**	Equation							
UZ Settlement Approach		1-Stiffness, 2-Modulus	1	1	1	1	1	1	1
Thickness of UZ sublayer 1(ft)	H_{uz1}								
Thickness of UZ sublayer 2 (ft)	H_{uz2}								
Thickness of UZ sublayer 3 (ft)	H_{uz3}								
Thickness of UZ sublayer 4 (ft)	H_{uz4}								
Thickness of UZ sublayer 5 (ft)	H_{uz5}								
Total UZ Thickness OK?		Huz = Hs +d							
Composite Modulus Layer 1 (ksf)	E_{comp1}	Eg1Ra + Em1(1-Ra)							
Composite Modulus Layer 2 (ksf)	E_{comp2}	Eg2Ra + Em2(1-Ra)							
Composite Modulus Layer 3 (ksf)	E_{comp3}	Eg3Ra + Em3(1-Ra)							
Composite Modulus Layer 4 (ksf)	E_{comp4}	Eg4Ra + Em4(1-Ra)							
Composite Modulus Layer 5 (ksf)	E_{comp5}	Eg5Ra + Em5(1-Ra)							
Sett. of UZ sublayer 1 (in)	s_{uz1}	qg/kg or q*Iσ-vag*H/Ecomp	0.33	0.37	0.35				
Sett. of UZ sublayer 2 (in)	s_{uz2}	$q*I\sigma\text{-}2*H_{uz2}/E_{comp2}$	N/A	N/A	N/A				
Sett. of UZ sublayer 3 (in)	s_{uz3}	$q*I\sigma\text{-}3*H_{uz3}/E_{comp3}$	N/A	N/A	N/A				
Sett. of UZ sublayer 4 (in)	s_{uz4}	$q*I\sigma\text{-}4*H_{uz4}/E_{comp4}$	N/A	N/A	N/A				
Sett. of UZ sublayer 5 (in)	s_{uz5}	$q*I\sigma\text{-}5*H_{uz5}/E_{comp5}$	N/A	N/A	N/A				
Total Upper Zone Settlement (in)	s_{uz}	$s_{uz1}+s_{uz2}+s_{uz3}+s_{uz4}+s_{uz5}$	0.33	0.37	0.35				

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
Allowable end-bearing (kips)	Qeb	0.0
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon 1}$	800
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon 2}$	2000
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon 3}$	2000
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon 4}$	2000
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon 5}$	2000
Calc. settlement to X*B	X	2

LOWER ZONE SETTLEMENTS

Parameter	Symb	Equation	F10x11	F10x30	F24x32				
Dpth to bottm of LZ from ftg (ft)	X*B	X*Beq	21.0	34.6	55.4				
Upper zone thickness (ft)	H_{uz}	Hs+d	11.00	11.00	11.00				
Lower zone thickness (ft)	H_{lz}	H2b-Hlz	10	23.7	44.5				
Thickness of LZ sublayer 1(ft)	H_{lz1}		5	5	5				
Thickness of LZ sublayer 2 (ft)	H_{lz2}		5	5	20				
Thickness of LZ sublayer 3 (ft)	H_{lz3}			5	19.5				
Thickness of LZ sublayer 4 (ft)	H_{lz4}			5					
Thickness of LZ sublayer 5 (ft)	H_{lz5}			3.7					
Total thickness ok?			**ok**	**ok**	**ok**				
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon 1}$	E (ksf) or c_ε	800	800	800				
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon 2}$	E (ksf) or c_ε	2000	2000	2000				
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon 3}$	E (ksf) or c_ε	2000	2000	2000				
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon 4}$	E (ksf) or c_ε	2000	2000	2000				
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon 5}$	E (ksf) or c_ε	2000	2000	2000				
Initial stress for sublyr 1 (ksf)	P'_{o1}		1.345	1.345	1.345				
Initial stress for sublyr 2 (ksf)	P'_{o2}		1.658	1.658	2.127				
Initial stress for sublyr 3 (ksf)	P'_{o3}		1.814	1.971	3.364				
Initial stress for sublyr 4 (ksf)	P'_{o4}		1.814	2.284	3.974				
Initial stress for sublyr 5 (ksf)	P'_{o5}		1.814	2.556	3.974				
Ftg stress on sublyr 1 (ksf)	ΔP1	q*I	0.66	1.63	2.50				
Ftg stress on sublyr 2 (ksf)	ΔP2	q*I	0.39	1.08	1.29				
Ftg stress on sublyr 3 (ksf)	ΔP3	q*I	0.31	0.74	0.53				
Ftg stress on sublyr 4 (ksf)	ΔP4	q*I	0.31	0.53	0.38				
Ftg stress on sublyr 5 (ksf)	ΔP5	q*I	0.31	0.42	0.38				
Sett. of LZ sublayer 1 (in)	s_{lz1}	DP1*Hlz1/E1	0.05	0.12	0.19				
Sett. of LZ sublayer 2 (in)	s_{lz2}	DP2*Hlz2/E2	0.01	0.03	0.15				
Sett. of LZ sublayer 3 (in)	s_{lz3}	DP3*Hlz3/E3	0.00	0.02	0.06				
Sett. of LZ sublayer 4 (in)	s_{lz4}	DP4*Hlz4/E4	0.00	0.02	0.00				
Sett. of LZ sublayer 5 (in)	s_{lz5}	DP5*Hlz5/E5	0.00	0.01	0.00				
Total lower zone sett. (in)	s_{lz}	$s_{lz1}+s_{lz2}+s_{lz3}+s_{lz4}+s_{lz5}$	0.1	0.2	0.4				
Total UZ + LZ settlement (in)	s		0.4	0.6	0.8				

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

WGI | GEOPIER® FOUNDATIONS

Western Ground Improvement, Inc.
2372 Morse Ave
Suite 504
Irvine, CA 92614

www.westerngroundimprovement.com

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OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

August 31, 2020

Mr. Dave Atkinson
GMU Geotechnical, Inc.
23241 Arroyo Vista
Rancho Santa Margarita, California 92688

Re: Quality Control Package for a *Geopier®* Foundation System
Dana Point Harbor Parking Structure
Dana Point, California
GFC Project No.: GLA-113

Dear Mr. Atkinson,

Geopier Foundation Company, Inc. has completed the Geopier® foundation design for the above project. The following documents are included herein:

- Geopier Quality Control Package

We are pleased to have provided you with our design services. If you have any questions, please contact this office.

Sincerely,
Western Ground Improvement, Inc.

REGISTERED PROFESSIONAL ENGINEER
KENNETH K. HOEVELKAMP
C 67415
EXP. 12/20
CIVIL
STATE OF CALIFORNIA

8/31/20

Ken Hoevelkamp, P.E.
Principal Engineer

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Hadi Tabatabaee
BUILDING OFFICIAL

WGI | GEOPIER® FOUNDATIONS

QUALITY CONTROL PACKAGE FOR GEOPIER FOUNDATIONS
(Copy to be provided to Owner's QA Representative)

Project:	**Dana Point Harbor Parking Structure** **Dana Point, California**
Project Number:	**GLA-113**
Geopier Designer:	**Ken Hoevelkamp, P.E.**
Mobile:	**949.677.6553**
E-Mail:	**ken@westerngroundimprovement.com**
Geotechnical Engineer:	**GMU Geotechnical, Inc.**
Contact:	**Dave Atkinson**
Phone:	**949.546.0085**
Structural Engineer:	**Culp and Tanner**
Contact:	**Rory Rottshalk**
Phone:	**530.895.3518**
Referenced Drawings:	**S2.01**
Date of Drawings:	**12/03/19**

Anticipated Geotechnical Conditions:

The subsurface conditions generally consist of soft to very stiff lean clay fill and medium dense to very dense silty sand fill underlain by medium stiff to very stiff lean clay and medium dense to very dense sand overlying sandstone and siltstone (Capistrano Formation). Groundwater was encountered 12 to 17 feet below existing grade.

Potential Anomalies:

None.

Materials to be Encountered at Bottom of Shaft:

Medium stiff to very stiff clay and/or medium dense to very dense sand.

Other Items:

Piers should completely penetrate the fill and reach bedrock

ATTACHMENTS – **GEOTECHNICAL INFORMATION**
GEOPIER TEST SCHEDULES

GEOTECHNICAL INFORMATION

The attached boring logs have been prepared by others and are included solely for reference purposes. The boring logs should be used for information only and are not intended to represent geotechnical recommendations for this project. The project geotechnical report should be reviewed in its entirety for more information.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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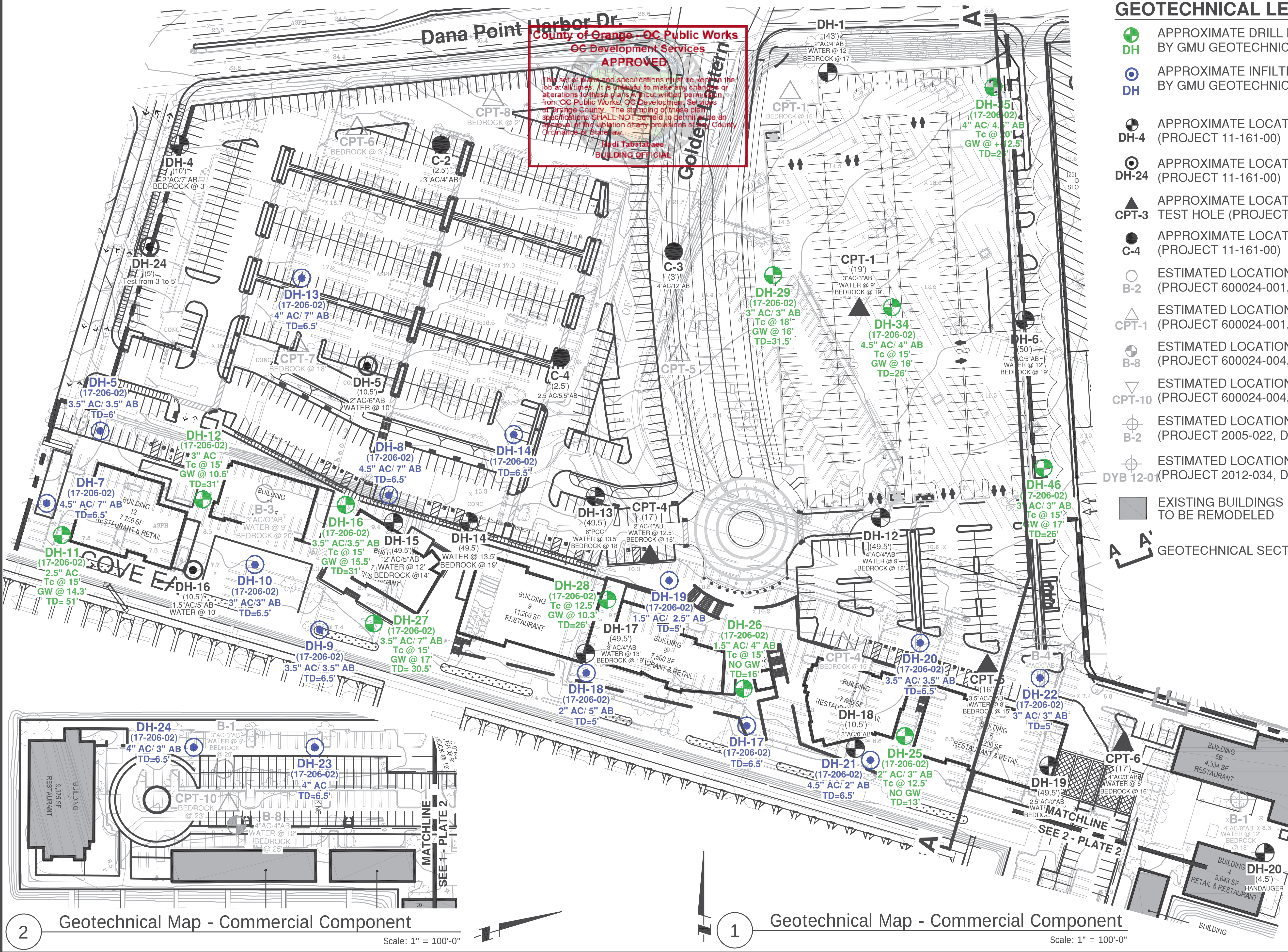


2 Geotechnical Map - Commercial Component
Scale: 1" = 100'-0"

1 Geotechnical Map - Commercial Component
Scale: 1" = 100'-0"

GEOTECHNICAL LEGEND

- DH — APPROXIMATE DRILL HOLE TEST LOCATIONS BY GMU GEOTECHNICAL, INC., PROJECT 17-206-02
- DH — APPROXIMATE INFILTRATION TEST LOCATIONS BY GMU GEOTECHNICAL, INC., PROJECT NO. 17-206-02
- DH-4 — APPROXIMATE LOCATION OF GMU AUGER DRILL HOLE (PROJECT 11-161-00)
- DH-24 — APPROXIMATE LOCATION OF GMU INFILTRATION TESTS (PROJECT 11-161-00)
- CPT-3 — APPROXIMATE LOCATION OF GMU CONE PENETRATION TEST HOLE (PROJECT 11-161-00)
- C-4 — APPROXIMATE LOCATION OF GMU ASPHALT CORE HOLE (PROJECT 11-161-00)
- B-2 — ESTIMATED LOCATION OF PREVIOUS BORING BY LEIGHTON (PROJECT 600024-001, DATED 12/3/02)
- CPT-1 — ESTIMATED LOCATION OF PREVIOUS CPT BY LEIGHTON (PROJECT 600024-001, DATED 12/3/02)
- B-8 — ESTIMATED LOCATION OF PREVIOUS BORING BY LEIGHTON (PROJECT 600024-004, DATED 12/6/07)
- CPT-10 — ESTIMATED LOCATION OF PREVIOUS CPT BY LEIGHTON (PROJECT 600024-004, DATED 12/6/07)
- B-2 — ESTIMATED LOCATION OF PREVIOUS BORING BY DIAZ YOURMAN (PROJECT 2005-022, DATED 11/29/05)
- DYB 12-01 — ESTIMATED LOCATION OF PREVIOUS BORING BY DIAZ YOURMAN (PROJECT 2012-034, DATED 10/05/12)
- EXISTING BUILDINGS TO BE REMODELED
- A A' — GEOTECHNICAL SECTION

Geotechnical Map
Commercial Component
Dana Point Harbor Partners, LLC.

GMU GEOTECHNICAL, INC.	Date: December 13, 2018	Plate 2
	Project No.: 17-206-02	

DRAWING: q:\2017\17-206-02\dwg\1720602_plate 2_geo map.dwg PLOTTED: 12/12/2018 4:08 PM BY: Jmeza

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-29

Date(s) Drilled	9/13/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	31.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	13.3
Groundwater Depth [Elevation], feet	16.0 [-2.7]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0			Asphalt Concrete (approximately 3 inches)					
		ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 3 inches)					
				SILTY SAND (SM), brown gray, yellowish brown, slightly moist, medium dense, medium grained, some gravel					
10		Subrounded gravel up to 4"			5 10 12	140			
	5	Subrounded gravel 1 to 6"		SANDY CLAY (CL), dark brown, moist, hard, fine to medium grained, some gravel	50/0.5"	140	6	108	
5		Rounded to subrounded gravel and cobbles up to 7"		brownish gray, moist, stiff	3 4 5	140			
	10	Minor fine grained sand			4 6 7	140	29	92	
0		Scattered gravel		gray and orange brown, moist, firm to stiff, fine grained sand	3 4 4	140			
		MARINE DEPOSITS (Qm)		SANDY CLAY (CL); gray, moist, firm, medium grained sand					
	15	Rounded to subrounded gravel up to 3"		▽	2 3 4	140	23	100	
-5		**CAPISTRANO FORMATION (Tc)**		SILTSTONE (ML), gray, moist, hard overlying SANDSTONE (SP), orange brown and dark orange brown, wet, very dense, fine to medium grained					

GMU GEOTECHNICAL, INC.

Drill Hole DH-29

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-29

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
							12 31 50/5"	140			
-10											
	25				Interbedded SILTSTONE and SANDSTONE (SP and ML), pale brown, dark grayish brown and gray, moist, very dense/hard, fine grained		50/4"	140	21	106	
-15											
	30		Siltstone is thinly bedded with white mottles,		SANDSTONE (SP), gray, wet, dense, fine grained, overlying SILTSTONE (ML), dark brownish black, moist, very stiff		16 16 21	140			
					Total Depth = 31.5 feet Groundwater encountered at 16 feet						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

GMU GEOTECHNICAL, INC.

Drill Hole DH-29

Project: Dana Point Harbor, Commercial Component **Project Location:** Dana Point Harbor Drive **Project Number:** 17-206-02	**Log of Drill Hole DH-34** Sheet 1 of 2

Date(s) Drilled	9/14/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	26.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	11.3
Groundwater Depth [Elevation], feet	18.0 [-6.7]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 4.5 inches)						
10			**ARTIFICIAL FILL (Qaf)**		Aggregate Base (approximately 4 inches) SILTY SAND with GRAVEL (SM), brown, moist, medium dense, fine grained	Bulk					
							3 6 6	140			
5	5				SANDY CLAY (CL), grayish brown, moist, very stiff		20 26 12	140	19		
			Scattered gravel up to 4"		brown, moist, fine to medium grained sand		3 8 9	140			
0	10		**MARINE DEPOSITS (Qm)** orange brown staining		SANDY CLAY (CL); gray, slightly moist, stiff to very stiff, medium grained sand		8 11 14	140	13		
					moist, very stiff, fine grained sand		6 8 10	140			
-5	15		**CAPISTRANO FORMATION (Tc)** Scattered subrounded gravel up to 4"		SANDSTONE (SP), gray, wet, medium dense, medium to fine grained		3 6 8	140			
					∇						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

GMU GEOTECHNICAL, INC.

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-34

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Gray and yellowish gray				24 60	140			
-10											
	25		Sand is fine grained				30 50/4"	140	23	101	
					Total Depth = 26 feet Groundwater encountered at 18 feet						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

GMU GEOTECHNICAL, INC.

Drill Hole DH-34

Project: Dana Point Harbor, Commercial Component	# Log of Drill Hole DH-35
Project Location: Dana Point Harbor Drive	
Project Number: 17-206-02	

Date(s) Drilled	**9/14/2018**	Logged By	**WD**	Checked By	**KMF**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**26.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**11.3**
Groundwater Depth [Elevation], feet	**12.5 [-1.2]**	Sampling Method(s)	**Cal-mod sampler with 6-inch sleeve, SPT, and bulk**	Drill Hole Backfill	**Native and Quickrete**
Remarks				Driving Method and Drop	**Autohammer**

ELEVATION, feet	DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
				Asphalt Concrete (approximately 4 inches)					
10		**ARTIFICIAL FILL (Qaf)**		Aggregate Base (approximately 4.5 inches) SANDY CLAY (CL), brown and grayish brown, moist, stiff, fine grained, some gravel	3 5 12	140			
5	5	Gravel up to 4"		brownish gray, moist, stiff	3 6 9	140	27	92	
		Orange brown staining, sand is fine grained		gray	3 4 6	140			
0	10			gray and brown, moist, fine grained sand	5 7 11	140	22	102	
				gray, wet, soft to firm, fine grained sand ▽	1 2 2	140			
-5	15	**MARINE DEPOSITS (Qm)**		SAND (SP), gray and pale gray, wet, dense, coarse to medium grained overlying SILT (ML), dark gray, very stiff	5 11 16	140	13	113	

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-35

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-10			**CAPISTRANO FORMATION (Tc)**		Interbedded SILTSTONE and SANDSTONE (SP and ML), gray and dark gray, moist, very dense/hard, fine grained		7 22 22	140			
	25		Thinly bedded, rare white mottles		SILTSTONE (ML), dark gray, moist, very dense/hard		17 50/4"	140	21	105	
					Total Depth = 26 feet Groundwater encountered at 12.5 feet						

GMU GEOTECHNICAL, INC.

Drill Hole DH-35

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-46

Date(s) Drilled	9/18/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	26.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	8.3
Groundwater Depth [Elevation], feet	17.0 [-8.7]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0				Asphalt Concrete (approximately 3 inches)						
			ARTIFICIAL FILL (Qaf) Cobbles up to 8" in spoils pile		Aggregate Base (approximately 3 inches) SILTY SAND (SM), brown and pale brown, moist, medium dense, fine grained	Bulk					
5			Scattered gravel			SPT	5 7 11	140			
	5					Cal-mod	5 14 20	140	11	118	
					CLAYEY SAND (SC), brown, moist, dense, fine to medium grained						
0			Rare gravel up to 1"		brown and orange brown, moist, medium dense, fine grained	SPT	9 9 9	140			
	10				brownish gray, wet, dense, fine grained	Cal-mod	7 11 17	140	14	114	
-5			**MARINE DEPOSITS (Qm)**		SAND (SP), gray, brownish gray and orange brown, moist, very dense, fine grained	SPT	4 23 35	140			
	15		**CAPISTRANO FORMATION (Tc)** Minor siltstone, subtle bedding		SANDSTONE (SP), grayish brown, wet, very dense, medium to fine grained	Cal-mod	33 50/4"	140	16	116	
-10					∇						

GMU GEOTECHNICAL, INC.

Drill Hole DH-46

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-46

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					SANDSTONE (SP), pale gray and pale yellowish gray, wet, very dense, fine to medium grained		16 37 50	140			
-15											
	25						50/5"	140			
					Total Depth = 26 feet Groundwater encountered at 17 feet						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

GMU GEOTECHNICAL, INC.

GEOPIER TEST SCHEDULES

GEOPIER® Foundation Company

GEOPIER®

Project Name: Dana Point Harbor Parking Structure
Project Location: Dana Point, Ca
Project Number: GLA-113

Geopier® Modulus Test Schedule

Maximum Geopier Design Stress: 22,010 psf
Geopier Element Diameter: 24 in.
Design Modulus: 300 pci

Modulus Test Location: Near Boring DH-35
Test Geopier Element Shaft Length: 9 ft
Concrete Cap Thickness: 2 ft
Total Drill Depth 11 ft

Load No.	Ram Load, (kips)	Geopier Element Stress, (psf)	Percent of Design Stress	Minimum Duration	Maximum Duration	Remarks
	3.46	1,101	5.0%	N/A	N/A	seating load
1	11.53	3,669	16.7%	15 min	60 min	
2	23.05	7,336	33.3%	15 min	60 min	
3	34.57	11,005	50.0%	15 min	60 min	
4	46.10	14,674	66.7%	15 min	60 min	
5	57.62	18,341	83.3%	15 min	60 min	
6	69.15	22,010	100.0%	15 min	60 min	
7	80.65	25,672	116.6%	60 min	240 min	
8	92.19	29,346	133.3%	15 min	60 min	
9	103.72	33,015	150.0%	15 min	60 min	
10	69.15	22,010	100.0%	N/A	N/A	rebound, unload
11	45.64	14,527	66.0%	N/A	N/A	rebound, unload
12	22.82	7,263	33.0%	N/A	N/A	rebound, unload
13	3.46	1,101	5.0%	N/A	N/A	rebound, unload

Notes:

1 - The Geopier element to be used in the modulus load testing should be installed in a manner similar to production, at least 4 days prior to testing, so that pore-pressures have adequate time to dissipate.

2 - The modulus load test shall be performed to a stress not less than 150% of the design maximum top-of-pier stress indicated in the Geopier Design Calculations.

3 - The modulus load test Geopier element shall be installed to a depth of 11 feet below the ground surface with a 2-foot thick unreinforced concrete leveling pad. The modulus load test Geopier shall penetrate fill.

4 - A telltale shall be installed in the bottom one-third of the tested Geopier element. Telltale deflections shall be monitored concurrent with top of Geopier deflections during the modulus load test.

5 - The modulus load test setup shall be as shown on Geopier Construction Drawing GP0.1. Helical anchors should be installed in accordance with manufacturers specifications.

6 - A representative of the owner's geotechnical consultant should be present to witness the load test.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

GMU

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Hadi Tabatabaee
BUILDING OFFICIAL

February 14, 2020

Mr. Bryon Ward, President
DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES
1100 Newport Center Drive, Suite 200
Newport Beach, CA 92660

GMU Project 17-206-02

Subject: Geotechnical Review of Precise Grading Plans, Dana Point Harbor Parking Structure, 24650 Dana Point Harbor Drive, City of Dana Point, California

References: (1) Dana Point Harbor Parking Structure Precise Grading Plans, prepared by Tait Engineers, dated February 14, 2020.

(2) Our "Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California," dated December 4, 2019 (GMU 17-206-02).

Dear Mr. Ward:

INTRODUCTION

The purpose of this correspondence is to confirm in writing that that GMU Geotechnical, Inc. (GMU) has performed a geotechnical review of the reference (1) precise grading plans for the subject site. The precise grading is to support site grading and design and construction of the proposed parking structure, the adjacent boater services building, and other site improvements (i.e. roadways, parking lots, site walls, exterior concrete flatwork, etc.). The subject site is bounded by Dana Point Harbor Drive on the north, the Dry Stack Storage component site on the east, and Golden Lantern on the west and south. It is our understanding that the proposed development will consist of a 3-story on-grade cast-in-place concrete parking structure and an adjacent 1-story boater services building at its southeast corner with surface parking at the east and south ends of the site, located south of existing of Dana Point Harbor Drive and east of existing Golden Lantern. We also understand that 2H:1V fill slopes are planned to be placed against the northerly and western sides of the parking structure and supporting site retaining wall on the north side.

Our review of the Tait Engineering precise grading plans (reference (1)) presented herein provides recommendations specific to the precise grading shown on these plans only for final construction. To support the precise grading plans, GMU previously performed a geotechnical foundation investigation and compiled our detailed site recommendations in our reference (2) report. The subject supporting geotechnical foundation investigation report contains:

- Geotechnical Map and Cross Sections
- Drill Hole and CPT logs
- Laboratory testing
- Infiltration test results
- Geotechnical engineering analyses, and
- Project recommendations

REVIEW OF PRECISE GRADING PLANS

The precise grading reflected on the reference (1) plans consist mainly of minor cuts and fills of up to 1-foot on the parking structure pad and the boater services building pad, along with adjacent site work. The planned precise grading also reflects fills into the 2:1 descending slope below both Dana Point Harbor Drive on the north and Golden Lantern on the west. We have attached a grading exhibit, Plate 1 – Benched Fill Over Existing Engineered Fill, to illustrate our recommended keyway and benching requirements for those slopes. This exhibit is also shown on sheet 8 of the reference (1) precise grading plans.

SLOPE STABILITY

It is our opinion that the permanent 2:1 slopes shown on sections A-A and F-F below Dana Point Harbor Drive on the north side and Golden Lantern on the west side, respectively, will be grossly and surficially stable during the construction of the parking structure and should be periodically monitored by GMU personnel during construction and the owner after completion of construction.

TEMPORARY EXCAVATIONS

Temporary excavations for during construction are expected. We anticipate that unsurcharged excavations with vertical side slopes less than 4 feet high will generally be stable; however, all temporary excavations should be observed by a representative of GMU to evaluate their stability. Our recommendations for temporary excavations are as follows:

- Temporary, unsurcharged excavation sides within artificial fill material over 4 feet in height should be sloped no steeper than 1.5H:1V (horizontal: vertical).
- Temporary, unsurcharged excavation sides within bedrock material over 4 feet in height should be sloped no steeper than 1H:1V (horizontal: vertical).
- The tops of the excavations should be barricaded so that vehicles and storage loads do not encroach within 10 feet of the excavations. A greater setback may be necessary for heavy vehicles, such as concrete trucks and cranes. GMU should be advised of such heavy vehicle loadings so that specific setback requirements can be established.
- If the temporary construction excavations are to be maintained during the rainy season, berms are recommended to be graded along the tops of the excavations in order to prevent runoff water from entering the excavation and eroding the slope faces.

Our temporary excavation recommendations are provided only as **minimum** guidelines. All work associated with temporary excavations should meet the minimal safety requirements as set forth by CAL-OSHA and temporary slope construction, maintenance, and safety are the responsibility of the contractor.

Shoring may be required where the sides of the excavation cannot be sloped to the requirements provided in this report or as required by OSHA for the given soil types. Shoring design performed by others should be reviewed by this office.

LIMITATIONS

All parties reviewing or utilizing this letter should recognize that the findings, conclusions, and recommendations presented represent the results of our professional geological and geotechnical engineering efforts and judgements. Due to the inexact nature of the state of the art of these professions and the possible occurrence of undetected variables in subsurface conditions, we cannot guarantee that the conditions actually encountered during grading and foundation installation will be identical to those observed and sampled during our study or that there are no unknown subsurface conditions which could have an adverse effect on the use of the property. We have exercised a degree of care comparable to the standard of practice presently maintained by other professionals in the fields of geotechnical engineering and engineering geology, and believe that our findings present a reasonably representative description of geotechnical conditions and their probable influence on the grading and use of the property.

Because our conclusions and recommendations are based on a limited amount of current and previous geotechnical exploration and analysis, all parties should recognize the need for possible revisions to our conclusions and recommendations during grading of the project. Additionally, our conclusions and recommendations are based on the assumption that our firm will act as the geotechnical engineer of record during grading of the project to observe the actual conditions exposed, to verify our design concepts and the grading contractor's general compliance with the project geotechnical specifications, and to provide our revised conclusions and recommendations should subsurface conditions differ significantly from those used as the basis for our conclusions and recommendations presented in this report.

This letter has not been prepared for use by other parties or projects other than those named or described herein. This letter may not contain sufficient information for other parties or other purposes.

CLOSURE

Based on our review, the reference (1) precise grading plans have been prepared in general accordance with the parameters and recommendations contained in this correspondence and in our reference (2) report. Therefore, the subject precise grading plans are considered acceptable from a geotechnical point of view and additional or revised geotechnical recommendations are not considered necessary.

Should you require further assistance, please do not hesitate to call.

Respectfully submitted,

REGISTERED PROFESSIONAL ENGINEER
NADIM T. SUNNA
C84197
CIVIL
STATE OF CALIFORNIA

Nadim Sunna, M.Sc., QSP, PE 84197
Senior Engineer

David R. Atkinson
Project Manager / Senior Engineer

Attachment
Plate 1- Benched Fill over Existing Engineered Fill

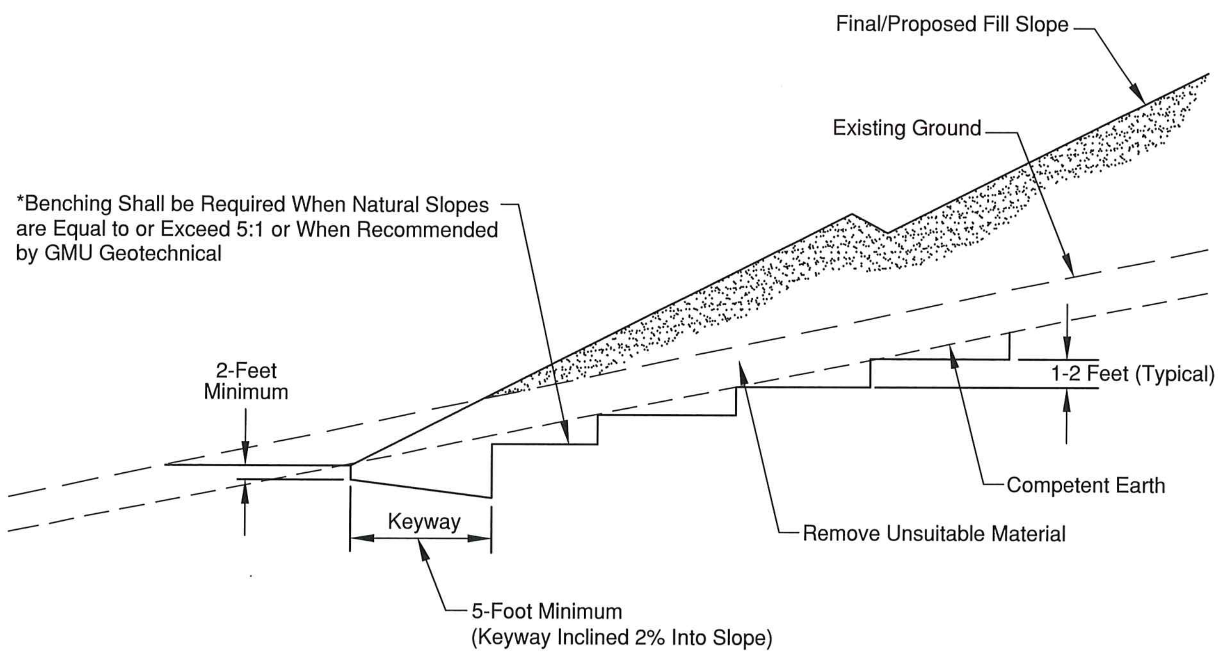
(Two (2) wet signature copies and electronic copy)

cc: Tait Engineering
Attn: Mr. Jacob Vandervis and Ms. Daniela Malott (electronic copies)

Tindall Consulting
Attn: Mr. John Tindall (electronic copy)

Westling and Associates.
Attn: Mr. Joshua Westling (electronic copy)

dra/17-206-02L Precise Grading Plan Review for DP Harbor Parking Structure (2-14-20)



BENCHED FILL OVER EXISTING ENGINEERED FILL

GMU	BENCHED FILL OVER EXISTING ENGINEERED FILL	Plate 1

GMU

February 11, 2020

Mr. Bryon Ward, President
DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES
1100 Newport Center Drive, Suite 200
Newport Beach, CA 92660

GMU Project 17-206-02

Subject: Geotechnical Review of Geopier Submittal No. 2, Dana Point Harbor Revitalization: Parking Structure – Commercial Component, City of Dana Point, California

References:

(1) Design Submittal for a Geopier Foundation System, Submittal No. 2, Dana Point Harbor Parking Structure, Dana Point, California, prepared by Western Ground Improvement, Inc., dated February 11, 2020.

(2) Our "Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California," dated December 4, 2019 (GMU 17-206-02).

Dear Mr. Ward:

The purpose of this correspondence is to confirm in writing that that GMU Geotechnical, Inc. (GMU) has performed a geotechnical review of the reference (1) Geopier submittal No. 2 for the subject project. This Geopier submittal No. 2 is to support the foundation design of the proposed parking structure. The subject site is bounded by Dana Point Harbor Drive on the north, the Dry Stack Storage component site on the east, and Golden Lantern on the west and south.

As is standard of practice, Quality Control (QC) for Geopier installations will performed by both the Geopier designer/contractor (WGI) and the Geotechnical engineer of Record (GMU). The QC requirements to be completed by WGI are contained on Sheet GP0.1 of the Reference (1) Geopier plans under "Geopier Testing Notes". Note 1 also refers to supplemental testing by a "testing agency hired by the owner". This testing is the supplemental Geopier testing GMU will be performing. The supplemental testing will be performed by one of GMU's Senior Engineering Technicians reporting directly to the Geotechnical Engineer-of-Record (GE) on a full-time basis.

GMU's QC testing will include:

- Observation, documentation and verification of geotechnical conditions
- Determination/verification that bedrock has been reached/tagged at each Geopier location.
- Depth and diameter of each Geopier
- Verification of installation per design.
- Observation and documentation of load testing.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.

Hadi Tabatabaee
BUILDING OFFICIAL

It should be further noted that all the above QC test results will be submitted to the GE of record at GMU for his review and acceptance from a geotechnical engineering perspective.

Based on our review, the reference (1) Geopier design submittal No. 2 has been prepared in general accordance with the parameters and recommendations of our reference (2) report. All the recommendations included herein and in our reference (2) report remain applicable to the site improvements. Therefore, the Geopier design submittal is considered acceptable from a geotechnical point of view.

Should you require further assistance, please do not hesitate to call.

Respectfully submitted,

David R. Atkinson

David R. Atkinson
Project Manager / Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
GREGORY P. SILVER
GE 2336
GEOTECHNICAL
STATE OF CALIFORNIA

Gregory P. Silver, M.Sc., PE, GE 2336
President / CEO
Principal Geotechnical Engineer

(Two (2) wet signature copies and electronic copy)

cc: SMS Architects
Attn: Mr. Brandon Dedmon (electronic copy)

Choate Parking Design
Attn: Mr. Rick Choate and Mr. Emerson Flint Schmieder (electronic copies)

Culp & Tanner Structural Engineers
Attn: Mr. Rory Rottschalk and Mr. Calvin Jackson (electronic copies)

Tindall Consulting
Attn: Mr. John Tindall (electronic copy)

dra/17-206-02L Geotechnical Review of Geopier Submittal No. 2 for DPHP, LLC P.S. and Boater Services Building (2-11-20)

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
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Hadi Tabatabaee
BUILDING OFFICIAL

February 11, 2020

Mr. Bryon Ward, President
DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES
1100 Newport Center Drive, Suite 200
Newport Beach, CA 92660

GMU Project 17-206-02
Permit No. PKG19-1202

Subject: Response to County of Orange Geotechnical Review Comments Pertaining to Building Plan Check, Parking Structure, and Boater Services Development Buildings, Dana Point Harbor Revitalization, City of Dana Point, California

References: Listed on Page 7

Dear Mr. Ward:

This correspondence presents our response to the reference (1) County of Orange Review Comments pertaining to the submittal of the rough grading plans and details for the subject site. A copy of County's Building Plan Check Comments is included in this response as Appendix A for ease of reference.

RESPONSES TO GEOTECHNICAL COMMENTS

RESPONSE TO COMMENT 2.001

Acknowledged. The approved project building foundation plans and applicable details will be signed/stamped by GMU prior to permit issuance.

RESPONSE TO COMMENT 2.002

Acknowledged. GMU is coordinating with the project team to ensure that the geotechnical ground improvement recommendations/details for the Geopiers are included on the project precise grading plans and on the 2nd submittal Geopier plans with the 2nd submittal building/structural plans.

RESPONSE TO COMMENT 2.003

Acknowledged. The previously issued review comments for GRD19-0177 that are related to the proposed Geopier construction are addressed as part of our following responses for this submittal.

RESPONSE TO COMMENT 2.004

Acknowledged. GMU is coordinating with the project team to ensure that the geotechnical ground improvement recommendations/details for the Geopiers are included on the project precise grading plans and on the 2nd submittal Geopier plans with the 2nd submittal building/structural plans.

RESPONSE TO COMMENT 2.005

The Capistrano Formation has properties that act more as a stiff soil rather than a bedrock material. Due to these properties, it was determined that using a "soil density/consistency" descriptor was more accurate than using the "bedrock hardness" descriptor. The drilling conditions can be inferred from the material descriptions, boring logs, groundwater discussion, and geotechnical cross sections. All of these have been reviewed and discussed with WGI, and they have been incorporated into the Geopier design.

It should also be noted that after consultation with the Geopier designer (WGI), the Geopier will only extend to, and not into, the bedrock (see Response to Comment 2.017). Once the bedrock is tagged, which will be confirmed and documented by a GMU representative, the Geopier will be deemed complete and drilling operations will cease.

Additionally, it is noted that although not anticipated on a widespread basis, there may be a single local Geopier in which caving may occur. In this case, WGI will provide casing such that the casing will be filled with rock and then withdrawn as the rock is placed.

RESPONSE TO COMMENT 2.006

The imported rock material to be utilized by Geopier, including in the top of the Geopiers, will consist of CMB/CalTrans Class II base (1-inch minus) with no "oversize" material present (i.e., GMU does not consider 1-inch minus to be oversize). Consequently, the waste CMB materials from the footings will be easily blended in with other precise fills. If, for some reason, it becomes difficult to utilize the waste CMB materials onsite, they will be exported off site or stockpiled for future use. Whichever the case, this will be observed and documented by a GMU field representative.

RESPONSE TO COMMENT 2.007

Given that the potential for lateral spreading to affect this site is low, as determined in our reference (2) report, and that the calculated seismic settlements are small, Geopiers are only needed for vertical support to minimize the potential effects of the existing fill variability relative to the proposed foundation loads (i.e., heavier than for a standard commercial structure). Hence there is <u>no need for Geopiers outside the footprint of the future parking structure</u>. Consequently, recommendations for the lateral extent of Geopier improvements beyond the perimeter of the Parking Structure footprint are not required.

RESPONSE TO COMMENT 2.008

7 ksf is appropriate for the existing soil consistency and amount of ground improvement planned, based on empirical design charts and result in tolerable settlements. 7 ksf bearing capacity for the Parking Structure footings was determined by Western Ground Improvement, Inc/Geopier Foundation (WGI). The value considers the effect of the Geopiers as well as settlement of the foundations. Calculations are contained in the reference (5) Geopier 2nd submittal and are included as Appendix C of this response. These calculations have been reviewed by GMU and deemed acceptable. Load testing will also be performed to confirm the bearing vs. settlement design assumptions.

RESPONSE TO COMMENT 2.009

For a "calculation and diagram" based explanation of how the seismic earth pressure was derived, please see the attached calculations contained in Appendix B.

RESPONSE TO COMMENT 2.01

In the submitted reference (2) report, Item 8 on Page 13 contains a typographical error. The final statement "*will need to be founded on Geopiers, the Boater services Building*" should be eliminated. The Geopiers will be constructed directly beneath the Parking Structure foundations only, not under the structurally separate Boater Services Building. The Boater Services Building will be founded on engineered fill per the recommendation shown on Pages 15, 21, and 22 of our reference (2) report. There is a separation of 5-feet minimum between the Parking Structure and the Boater Services Building. No additional recommendations are necessary.

RESPONSE TO COMMENT 2.011

GMU confirms that our complete geotechnical recommendations for design and construction of the proposed ground improvement/Geopier system at the subject site are contained in our reference (2) report. Based upon our review of the currently submitted reference (5) 2nd submittal Geopier project plans, included as Appendix C of this response, our recommendations have been incorporated into the design. The designer of the ground improvement/Geopier system is Western Ground Improvement (WGI).

We have included an updated Geotechnical Map Plate 2, as Appendix D of this response, to indicate the location of the proposed Geopiers beneath the footings of the parking structure building pad. No additional recommendations are necessary.

RESPONSE TO COMMENT 2.012

The Geotechnical Sections shown on Plate 3 from our reference (2) report have been updated to include the recommended Geopiers by both location and estimated depth of installation based on our review of the currently submitted reference (5) 2nd submittal Geopier plans. Please see Appendix D for the updated Geotechnical Sections. No additional recommendations are necessary.

RESPONSE TO COMMENT 2.013

As is standard of practice, QC for Geopier installations will be performed by both the Geopier designer/contractor (WGI) and the Geotechnical engineer of Record (GMU). The QC requirements to be completed by WGI are contained on Sheet GP0.1 of the Reference (5) Geopier plans under “Geopier Testing Notes” (see Appendix C). Note 1 also refers to supplemental testing by a “testing agency hired by the owner”. This testing is the supplemental Geopier testing GMU will be performing by one of GMU’s Senior Engineering Technician reporting directly to the GE of record on a full-time basis. Post-construction CPT verification is not required per the rationale provided in response to Item 2.007.

GMU’s QC testing will include:

- Observation, documentation, and verification of geotechnical conditions
- Determination and verification that bedrock has been reached/tagged at each Geopier location.
- Depth and diameter of each Geopier
- Verification of installation per design.
- Observation and documentation of load testing.

It is further noted that all of the above QC test results will be submitted to the GE of record at GMU for his review and acceptance from a geotechnical engineering perspective.

RESPONSE TO COMMENT 2.014

Acknowledged. GMU has reviewed the reference (3) 2nd submittal structural foundation plans and calculations by Culp & Tanner and has confirmed that the geotechnical recommendations contained in our reference (2) report have been adequately incorporated into the foundation and building/retaining wall designs.

RESPONSE TO COMMENT 2.015

We confirm that the footing details for the F8A-3, F9A-3, F10x30 and F24x32 have been provided on the reference (5) resubmittal plans by WGI. See Appendix C for the WGI Geopier resubmittal.

RESPONSE TO COMMENT 2.016

Given that the potential for lateral spreading to affect this site is low as determined in our reference (2) report, and that the calculated seismic settlements are small, Geopiers are only needed for vertical support to minimize the potential effects of the existing fill variability relative to the proposed foundation loads (i.e., heavier than for a standard commercial structure). We do not anticipate any significant bearing loss due to settlement occurring adjacent the Geopier-supported foundations. Consequently, adding additional Geopiers is not required. GMU's opinion in this regard has been discussed with WGI and they are in complete concurrence.

RESPONSE TO COMMENT 2.017

Our recommendations with regard to Geopier bedrock requirements have been modified. After consultation with the Geopier designer (WGI), ***all Geopiers will only extend "to" and not into the bedrock***. Once the bedrock is tagged, which will be confirmed and documented by a GMU representative, the Geopier will be deemed complete and drilling operations will cease.

RESPONSE TO COMMENT 2.018

The 120 pcf soil unit weight value used in the WGI calculations has been increased to 125 pcf to match GMU's recommendation in our reference (2) report. Please see the WGI Geopier 2nd submittal, Appendix C.

RESPONSE TO COMMENT 2.019

Page 20 of GMU's reference (2) geotechnical report states that the "Final bearing value to be provided by Geopier". 7 ksf is appropriate for the existing soil consistency and amount of ground improvement planned, based on empirical design charts and result in tolerable settlements. The 7 ksf bearing capacity for the Parking Structure footings was determined by Western Ground Improvement, Inc/Geopier Foundation (WGI). The value considers the effect of the Geopiers as well as settlement of the foundations. Calculations are contained in the reference (5) Geopier 2nd submittal and are included as Appendix C of this response.

There is no need to confirm the design bearing value based on precise grading. The only geotechnical engineering issue that could affect the design bearing value would be if extreme anomalous geotechnical conditions are encountered during rough grading that can't be appropriately mitigated via corrective grading. However, given the amount of data and our overall familiarity with the site, this occurrence is deemed extremely low. We feel that the bearing value determined from WGI is based on sufficient subsurface data and laboratory testing. If extreme geotechnical conditions are noted during rough grading that would change the assumptions made by WGI in their calculations, this would be discussed in our rough grading report, and new recommendations for design would be developed. This, however, is highly unlikely.

RESPONSE TO COMMENT 2.02

Acknowledged. GMU will confirm the bearing capacity for the Boater Services Building in the as-graded report that will be prepared at the completion of precise grading. The as-graded report will be submitted to the County for review and approval prior to building permit issuance.

Please do not hesitate to contact us if you have any questions regarding this response.

Respectfully submitted,

David R. Atkinson
Project Manager / Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
GREGORY P. SILVER
GE 2336
GEOTECHNICAL
STATE OF CALIFORNIA

Gregory P. Silver, M.Sc., PE, GE 2336
Principal Geotechnical Engineer

Attachments:

- Appendix A – County of Orange Building Plan Geotechnical Review Comments
- Appendix B – Earth Pressure Distribution Seismic Loads – Plate 1
- Appendix C - Submittal 2 for a Geopier Foundation System by WGI
- Appendix D – Updated GMU Geotechnical Map – Plate 2
- Appendix E – Updated GMU Geotechnical Sections – Plate 3

(Two (2) wet signature copies and electronic copy submitted)

cc: SMS Architects
Attn: Mr. Brandon Dedmon (electronic copy)

Tindall Consulting
Attn: Mr. John Tindall (electronic copy)

Tait Engineering
Attn: Mr. Jake Vandervis (electronic copy)

Choate Parking Consultants
Attn: Mr. Rick Choate (electronic copy) and Mr. Emerson Flint (electronic copy)

REFERENCES

(1) County of Orange Geotechnical Comments, PKG19-1202 – Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California, First Submittal, submittal date December 17, 2019, plan check date January 23, 2020, prepared by Ryan Rose of OC Public Works.

(2) Our "Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California," dated December 4, 2019 (GMU Project 17-206-02).

(3) "Dana Point Harbor Parking Building" – 2nd Submittal Foundation Plans and Volume 4 2nd Submittal Structural Calculations Package, 24650 Dana Point Harbor Drive, Dana Point, California 92629," prepared by Culp & Tanner Structural Engineers, dated February 11, 2020.

(4) Our "Geotechnical Review of Geopier Submittal, Dana Point Harbor Revitalization: Parking Structure – Commercial Component, City of Dana Point, California," dated December 11, 2019 (GMU 17-206-02).

(5) Design Submittal for a Geopier Foundation System, and Calculation Package, 2nd Submittal, Dana Point Harbor Parking Structure, Dana Point, California, prepared by Western Ground Improvement, Inc., dated February 11, 2019.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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APPENDIX A

County of Orange Geotechnical Report Review Comments

Integrity, Accountability, Service, Trust

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Permits: GRD20-0024

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Building Plan Check Comments

It is the responsibility of the applicant to satisfy the requirements and comments listed in this document. Corrections shall be made on the original plans. If you make changes to the original plan other than or in addition to what Plan Check has requested, yellow highlight the changes on the re-submitted plans.

Payment of a new plan check deposit may be required for all plans on which no action is taken by the applicant for a period of 180 days. Applications for which no permit is issued within 180 days following the date of submittal shall expire by limitation and shall be discarded.

To view your project status and the latest comments list, please visit: **myOCeServices.ocgov.com.**

Please note that the OC Development Services Public Counter Hours are open Monday through Friday from 8:00 a.m. to 4:00 p.m. except holidays.

Project Number:
Permit Number: PKG19-1202
Description: Dana Point Harbor Parking Building Structure and Boater Services Building
Code Year:
Job Address:
Owner Address:

Architect of Record:

Engineer of Record:

Project Manager:
Dev Admin2
300 North Flower, Suite 800 Santa Ana ,CA ,92703

priya.subbaraj@ocit.ocgov.com

Other Reviewers:

Review Name	Review Owner	Status	Due Date	Completed Date
Building & Safety Review-PKG19-1202	Peter Liu	Corrections Required	01-09-2020	01-09-2020
Geotechnical Review-PKG19-1202	Ryan Rose	Corrections Required	01-09-2020	01-22-2020
Planning Review-PKG19-1202	Ilene Lundfelt	Not Required	01-09-2020	12-17-2019

GENERAL INFORMATION

- Plans will not be rechecked at the counter, allow a minimum of ten (10) working days for recheck.
- Application for which no permit is issued within 180 days following the date of application shall expire by limitation.
- An extension of 180 days may be granted upon written request showing circumstances beyond the control of the applicant have prevented action being taken. In order to renew action for an application after expiration, the applicant shall resubmit plans and pay a new plan check fee.
- Valid Worker's Compensation Certificate or Owner-Builder Verification is required prior to issuance of building permits.
- Authorized agents for owner-builders must have a **notarized** statement from the owner authorizing the agent to act on behalf of the owner. A copy of the form may be obtained from http://www.ocgov.com/gov/pw/ds/.
- Obtain all clearances as noted on the MyOCeServices permit portal. Prompt attention is suggested as there can be delays from other departments reviewing the project.
- Upon receiving the inspection report from grading inspection and based on the determination made by the Building Official, a grading permit and rough grading approval may be required.
- Building permit will not be issued until Rough Grading approval is obtained from the grading inspector. Contact the plan checker for additional information.

It is the contractor or owner-builder's responsibility to provide one hard copy set of plans with the County approval stamp in the field for the inspector to view.

HOW TO RESUBMIT ONLINE

1. Log into www.myOCeServices.ocgov.com.
2. Select the "myOC eServices Account" tile on the homepage or click "Dashboard" at the top of page.

3. Use the left-hand menu bar to locate the application in question, either under "Permit Applications" or "Projects and Packages".
4. Once on the Permit or Package detail page, select the "Resubmittals" tab.
5. Attach* all submittal requirements identified by selecting the "Add Attachment" button. Provide a comment in the "Applicant Comment" field, if applicable.
6. Respond to all comments on the "Comments & Responses" tab.
7. Once steps 5 and 6 are complete, click "Submit". Please verify that your resubmittal is complete, as all incomplete resubmittals will not be accepted for plan check review.
8. Note that you can save your work at any time by clicking "Save" at the bottom, to resume at a later time.

***** The PDF files submitted must be stamped and signed by the responsible registered professional (e.g. civil engineer, architect, engineering geologist, etc.).
* A 4"X4" space located 1" from the top paper edge and 5" from the right paper edge of all full sized plan sheets, either 24"x36" or 30"x42", shall be left blank to receive the County's electronic approval stamp. Other page sizes shall be scaled accordingly.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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NPDES Notes

Notes must be shown as worded, on the title sheet of the plan.

1. In the case of emergency, call _
   at Work Phone #
   or Home Phone #
2. Sediment from areas disturbed by construction shall be retained on site using structural controls to the maximum extent practicable.
3. Stockpiles of soil shall be properly contained to minimize sediment transport from the site to streets, drainage facilities or adjacent properties via runoff, vehicle tacking, or wind.
4. Appropriate BMP's for construction-related materials, wastes, spills shall be implemented to minimize transport from the site to streets, drainage facilities, or adjoining properties by wind or runoff.
5. Runoff from equipment and vehicle washing shall be contained at construction sites unless treated to reduce or remove sediment and other pollutants.
6. All construction contractor and subcontractor personnel are to be made aware or the required best management practices and good housekeeping measures for the project site and any associated construction staging areas.
7. At the end of each day of construction activity all construction debris and waste materials shall be collected and properly disposed in trash or recycle bins.
8. Construction sites shall be maintained in such a condition that an anticipated storm does not carry wastes or pollutants off the site. Discharges of material other than stormwater only when necessary for performance and completion of construction practices and where they do not: cause or contribute to a violation of any water quality standard; cause or threaten to cause po llution, contamination, or nuisance; or contain a hazardous substance in a quantity reportable under Federal Regulations 40 CFR Parts 117 and 302.
9. Potential pollutants include but are not limited to: solid or liquid chemical spills; wastes from paints, stains, sealants, glues, limes, pesticides, herbicides, wood preservatives and solvents; asbestos fibers, paint flakes or stucco fragments; fuels, oils, lubricants, and hydraulic, radiator or battery fluids; fertilizers, vehicle/equipment wash water and concrete wash water; concrete, detergent or floatable wastes; wastes from any engine/equipment steam cleaning or chemical degreasing and super chlorinated potable water line flushing. During construction, permittee shall dispose of such materials in a specified and controlled temporary area on-site, physically separated from potential stormwater runoff, with ultimate disposal in accordance with local, state and federal requirements.
10. Dewatering of contaminated groundwater, or discharging contaminated soils via surface erosion is prohibited. Dewatering of non-contaminated groundwater requires a National Pollutant Discharge Elimination System Permit from the respective State Regional Water Quality Control Board.
11. Graded areas on the permitted area perimeter must drain away from the face of slopes at the conclusion of each working day. Drainage is to be directed toward desilting facilities.
12. The permittee and contractor shall be responsible and shall take necessary precautions to prevent public trespass onto areas where impounded water creates a hazardous condition.
13. The permittee and contractor shall inspect the erosion control work and insure that the work is in accordance with the approved plans.
14. The permittee shall notify all general contractors, subcontractors, material suppliers, lessees, and property owners: that dumping of chemicals into the storm drain system or the watershed is prohibited.
15. Equipment and workers for emergency work shall be made available at all times during the rainy season. Necessary materials s hall be available on site and stockpiled at convenient locations to facilitate rapid construction of temporary devices when rain is imminent.
16. All removable erosion protective devices shall be in place at the end of each working day when the 5-Day Rain Probability Forecast exceeds 40%.
17. Sediments from areas disturbed by construction shall be retained on site using an effective combination of erosion and sediment controls to the maximum extent practicable, and stockpiles of soil shall be properly contained to minimize sediment transport from the site to streets, drainage facilities or adjacent properties via runoff, vehicle tracking, or wind.
18. Appropriate BMPs for construction-related materials, wastes, spills or residues shall be implemented and retained on site to minimize transport from the site to streets, drainage facilities, or adjoining property by wind or runoff.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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PLAN CHECK COMMENTS	
Permit Application No.	**PKG19-1202**
Plan Check No.	**First Submittal-PKG19-1202**
Plan Check Date	**01-23-2020**
Applicant	**Junior Mazariegos**
Submittal Date	**12-17-2019**

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.001	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements .Required to submit signed pdf of dwg & calcs for re-submittal thru OC portal "myOCeServices.ocgov.com"		Required	
1.002	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements A 4"X4" blank space shall be provide on the upper right corner of all sheets of plans. Space shall be 1" below the top and 5" from the right edge of all sheets. This space is intended for County of Orange electronic approval stamp.		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.003	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements File naming convention examples: File naming convention examples: PKG19-xxxx, BLD19-xxxx- Plans.pdf ; PKG19-xxxx, BLD19-xxxx-Structural Calcs.pdf; PKG19-xxxx, BLD19-xxxx-Soil Report.pdf		Required	
1.004	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements It is the responsibility of the Owner, Owner/Contractor to make available a copy of the County approved plans for inspector´s review		Required	
1.005	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements . Req'd submit written response to 1st submittal correction list, without written response at re-submittal review may delay plan check process and increase numbers of submittal, County will charge additional plan check fee based on time & material basis starting 4th submittal.		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.006	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements Do not use delta 123 at resubmittal plans & calcs, you may use cloud with delta ABC to identify difference per submittal. County considers delta 123 is used only for field revision after permit is issued.		Required	
1.007	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements Exterior wall and site freestanding signs req'd separate permit.		Required	
1.008	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements Site freestanding or wall mount signs req'd separate permit		Required	
1.009	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements Required OCFA, zoning and grading and soil report review approval, prior to issuance of building permit.		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.01	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements Req'd stamp and signature on all plans and structural calcs		Required	
1.011	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal bldg general requirements Required soil engineer review stamps and signatures on foundation plans, retaining wall and shoring plans and detail sheets with date		Required	
1.012	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Gwg sheet G001 deferred permit items, add sign as deferred permit items.		Required	
1.013	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet A120, provide ADA site plan to indicate complete accessibility path starting from street right of way, to accessible parking, to accessible rest room and office		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.014	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet A410 detail 1 & 2, show or provide cross reference of elevator manufacturer model number, power phase, signage and elevator accessibility compliance including communication DAS device, ADA signs and evacuate path map sign		Required	
1.015	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet A460 detail 2, clarify grove is used and all stair tread surface shall provide strip 11B-504.4 and contracting stripe shall comply with 11B-504.4.1		Required	
1.016	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet A512, provide enlarged plan to show accessible shower, male and female bath room and diaper changing station and drinking fountain including regular & accessible		Required	
1.017	Building & Safety Review-PKG19-1202	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S1.01 notes 20.2, clarify parking load, use 50 psf with moving load		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
	Peter Liu		in lieu of static 40 psf			
1.018	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S1.01 notes 20.3, clarify wind load formula, it shall use open structure formula in lieu of closed structure		Required	
1.019	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S1.05, provide OC standard special inspection form with owner 's signature and req'd inspection items i.e. concrete, filed weld, CMU, moment frame, high strength bolting etc.		Required	
1.02	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S1.05, povide OC standard structural observation form with engineer's signature and req'd observed items.		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.021	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S2.01 thru S2.03, show room names on plans i.e. electrical room, mechanical room, elevator etc.		Required	
1.022	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S2.01 thru S2.03, clarify requirements of pour joints and expansion joints		Required	
1.023	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S3.09 section B, clarify and show girder tie bars required hook at ends as shown as detail G & F on sheet S3.85,		Required	
1.024	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S3.10 detail C, S3.15 detail H, show column & beam tie special requirement at frame column & beam joint and rigid zone		Required	
1.025	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S4.02 detail D, show metail deck shear stud size and spacing at connecting supporting angle		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.026	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet A4.21 &A4.51 detail 1 & 2 , clarify stair height and mid landing may be required and clarify and show horizontal rail extend dimension.		Required	
1.027	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S5.01 detail H, clarify and show footing double layer(top & bot) in lieu of one layer of rebars		Required	
1.028	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S5.02 detail J, clarify and show diagonal rebars at (4) corners		Required	
1.029	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S5.03 detail F, show seismic top wall restraint detail		Required	
1.03	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S5.03 detail F & J, show rebar edge clearance		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.031	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S5.03 detail M, clarify and show rebar edge clearnce and located at mid layer		Required	
1.032	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet S5.10 & S5.11, show all rebar locations and edge clearance for all CMU wall details		Required	
1.033	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet M003 equipment schedule, show equipment platform wt and show isolator structural calcs for vertical & horizontal loads		Required	
1.034	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet M003 T-24, show signature of design responsible person		Required	
1.035	Building & Safety Review- PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet M500 detail 5 & 11, provide structural calcs of roof and ground mount mechanical equipment support and		Required	

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			isolator seismic restraint & base anchor design.			
1.036	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet M500, show seismic anchor design for suspended mechanical equipment and suspended duct.		Required	
1.037	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet E001, add note to indicate all electrical design based on year of electrical codes		Required	
1.038	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet E230P, clarify electrical room fire rate requirements and clearly show door and transformer and main panel working clearance and sign requirements		Required	
1.039	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet E260, provide elevator model number and specifications, power phase and clarify is it tie to any emergency		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			generator?			
1.04	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet E401, provide will serve electricity letter from utility company.		Required	
1.041	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet E602, show seismic anchor design for suspended electrical conduit or cable tray		Required	
1.042	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet E701 detail 2, provide sign structural details and structural calculations for light pole and foundation design,		Required	
1.043	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet P001, show max. water flow rate per green bldg code.		Required	

OC Public Works

Integrity, Accountability, Service, Trust

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

OC DEVELOPMENT SERVICES

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.044	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal drawing plan check review comments Dwg sheet P401, specify where does condensate pipe waste water drain to?		Required	
1.045	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal structural calcs review comments Provide a sheet before table of content to indicate design applicable codes, design criteria, design loads including vertical and horizontal, traffic moving loads etc, design material, specify concrete strength at metal deck, PT slab, column, footings etc locations		Required	
1.046	Building & Safety Review-PKG19-1202 Peter Liu	Non-Residential Plan Check List	1st Submittal structural calcs review comments Provide design sketches before table of content to indicate grid lines with column& beam numbers, frame numbers & frame elevations		Required	
2.001	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The approved project building foundation plans and applicable details must be signed/stamped by the geotechnical consultant prior to permit issuance.		Required	

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2.002	Geotechnical Review- PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	During review of the 1st submittal for the project rough grading permit GRD19-0177, it was not-ed that the proposed Geopier construction was to be reviewed and included on the rough grading plans. Subsequent to that, it was determined that the proposed Geopier construction will be reviewed and approved as part of the project precise grading and building submittals. Please coordinate w/project team to ensure the geotechnical ground improvement recom-mendations/details are included on the project precise grading and building/structural plans.		Required	
2.003	Geotechnical Review- PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	There are outstanding geotechnical review comments on the project rough grading submittal, GRD19-0177. Approval of this submittal is contingent upon review and approval of the rough grading package. For your convenience, the previously issued review comments for GRD19-0177 that are related to the proposed Geopier construction have been repeated herein and should be addressed as part of your response for this submittal.		Required	

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Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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2.004	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	During the 1st submittal review of the project rough grading permit, GRD19-0177, it was noted that the proposed Geopier construction was to be included on the rough grading plans. Sub-sequent to that, it was determined that the proposed Geopier construction will be reviewed and approved as part of the project precise grading and building submittals. Please coordinate w/project team to ensure the geotechnical ground improvement recommendations/details are included on the project precise grading and building/structural plans.		Required	
2.005	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The consultant should describe the anticipated drilling conditions that will be encountered dur-ing construction of the Geopiers. Geotechnical considerations should be provided for the Ge-opier construction including drilling difficulty based on bedrock described as hard to very hard, mitigating caving, handling groundwater, casing withdrawal (if used) during ramming, etc.		Required	

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2.006	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The consultant recommends that the top of the Geopiers extend about 6 inches above the Parking Structure spread footing bottom elevations. The consultant also recommends that the subject spread footings be supported on the Geopiers. That means that during the foundation subgrade preparation, considerable amount of coarse aggregates including unknown quanti-ties of oversize rocks will be generated while removing the tops of the Geopiers across the Parking Structure pad. The consultant must address how such oversize materials should be handled during construction - whether these should be blended into the excavated soil or discarded offsite based on their size.		Required	
2.007	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The consultant should recommend the lateral extent of Geopier improvements beyond the perimeter of the Parking Structure footprint.		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
2.008	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The consultant should justify the use of a preliminary bearing capacity of 7 ksf for the Parking Structure footings. What is this preliminary value based on? The consultant should provide jus-tifications for this value.		Required	
2.009	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The consultant recommends a seismic earth pressure of 17 pcf for the site retaining walls. The consultant should explain how they arrived at this earth pressure magnitude.		Required	
2.01	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The submitted report dated 12/4/19 (Page 13) states "Based on Conclusions 3-6 above, the fol-lowing remediation will be required: 1) corrective grading beneath the entire site, 2) Geopier ground improvement below the parking structure foundations and 3) use of a WRI foundation system for the Boater Services Building, will need to be founded on Geopiers, the Boater Ser-vices Building". Please provide additional comment/discussion to confirm if the Boater Ser-vices Building is to be founded		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			on Geopiers or not. If so, please provide comment/discussion to confirm the lateral extent of Geopiers beyond the outside edge(s) of the proposed Boater Services Building. Please also provide additional comment/discussion to on the differential settlement potential between Parking Structure and Boaters Service Building for proposed construction method (i.e. with or without Geopiers). Provide additional recommendations as necessary.			
2.011	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	Provide additional comment/discussion to confirm your complete geotechnical recommenda-tions for design and construction of the proposed ground improvement/Geopier system at the subject site based on your review of the currently submitted project plans. Specifically, please address who will be the designer of the ground improvement/Geopier system (i.e. your firm or a specialty contractor). Include updated plot plan/map to indicate the location of the proposed Geopiers (i.e. entire building pad w/lateral extension beyond building edges or isolated to		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			foundation elements only). Provide additional recommendations as necessary.			
2.012	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The Geotechnical Sections in your submitted report(s) should be updated to include the rec-ommended Geopiers (location and depth of installation). Additional Geotechnical Section(s) should also be provided as necessary based on your review of the currently submitted project plans. Provide additional recommendations as necessary.		Required	
2.013	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	Provide additional comment/discussion to confirm your geotechnical QA/QC recommenda-tions for the proposed Geopier construction based on your review of the currently submitted (and forthcoming) project plans. Include confirmation of your recommendations for QA/QC during construction (e.g. full-time observation/testing, material quality/spec. confirmation testing, etc.) and post-construction (e.g. CPT soundings, field		Required	

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Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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			testing, etc.) prior to pad release for building construction. Provide additional recommendations as necessary.			
2.014	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The geotechnical consultant shall review the structural foundation plans and calculations by Culp & Tanner to confirm that their geotechnical recommendations were adequately incorpo-rated into the foundation and retaining wall designs.		Required	
2.015	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	Footing details for the F8A-3, F9A-3, F10x30 and F24x32 should be provided on the plans by WGI.		Required	
2.016	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The proposed Geopier layout for each footing consists of Geopiers that are to be placed only within the footprint area of the footing. Placement of Geopiers has not been proposed out-side the footing. Liquefiable soils occurring outside the limits of the Geopiers and along the pe-rimeter of the footing will not be densified adequately, and will lose shear strength following the liquefaction event. This will		Required	

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			lead to loss of bearing capacity of the improved foundation zone underneath the footing and cause additional settlement. WGI should evaluate the im-pact of not placing Geopiers outside the footing and modify their Geopier placement plan, as needed.			
2.017	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	Note 1 below the table on Sheet GP0.1 of the WGI plans states that the Geopier shall reach bedrock. The geotechnical report states that the Geopier should extend a minimum of 12 inches into bedrock and be verified by the project geotechnical engineer. The note should be revised per the geotechnical consultant's recommendation.		Required	
2.018	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The 120 pcf soil unit weight value used in the WGI calculations should be increased to 125 pcf to match the geotechnical consultant's recommendation.		Required	
2.019	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	Page 20 of the geotechnical report states that the "Final bearing value to be provided by the Geopier". On Sheet		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			GP0.1, WGI lists an allowable bearing pressure of 7 ksf. WGI does not, however, state how they arrived at that value. There is no indication on Sheet GP0.1 how this value will be verified. It's worth noting that an allowable bearing pressure of 6 ksf was used in the structural calculations by Culp & Tanner. Note – "Final bearing value" for garage structure must be confirmed by geotechnical consultant and Geopier in their report(s) that will be pre-pared at the completion of precise grading/Geopier construction. The as-graded report(s) must be submitted to the County for review and approval prior to building permit issuance.			
2.02	Geotechnical Review-PKG19-1202 Ryan Rose	Geotechnical/Geology Check List	The geotechnical consultant shall confirm the bearing capacity for the Boater Services Building in their report that will be prepared at the completion of precise grading. The as-graded report should be submitted to the County for review and approval prior to building permit issuance.		Required	

APPENDIX B

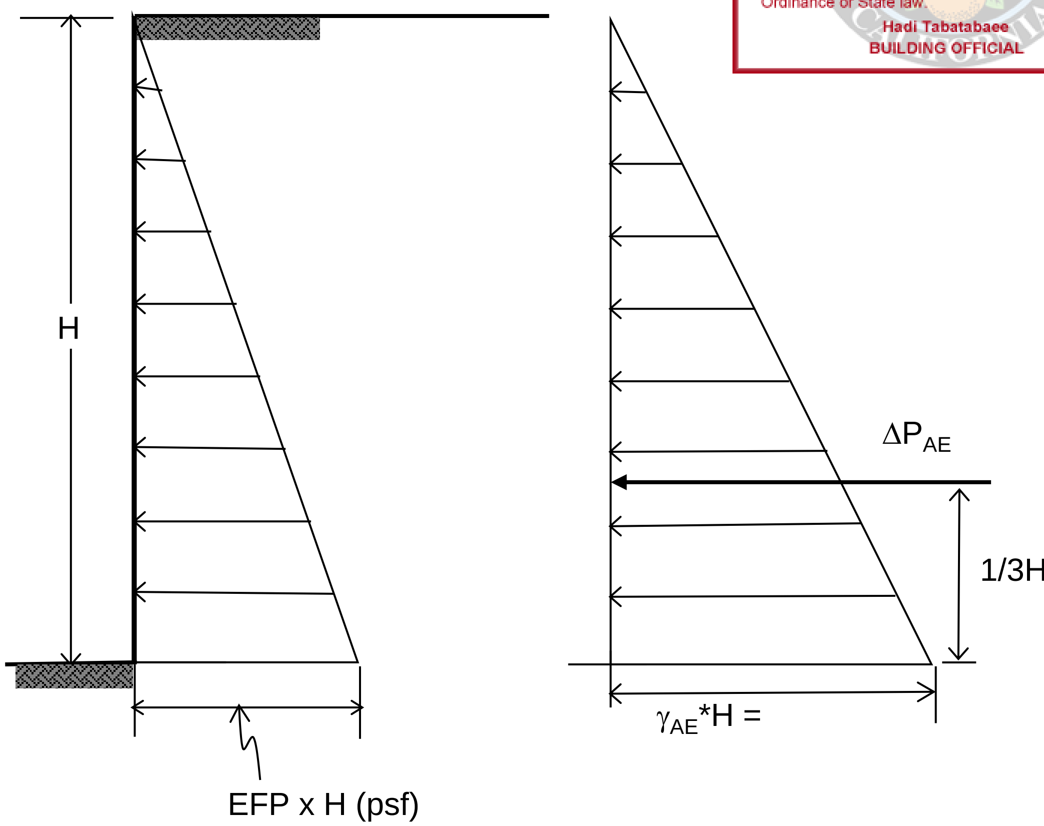
Earth Pressure Distribution
Seismic Loads

EARTH PRESSURE DISTRIBUTION OF RETAINING WALL

Free Standing (Yielding) Wall

Static Pressure

Seismic Earth Pressure



Seismic Earth Pressure Calculations

γ =	**115.0**	**pcf**
PGA_M =	**0.591**	**g**
PGA = SDS/2.5 =	***0.39***	**g**
k_h = PGA/2* =	***0.20***	**(k_h >= 0.15)**
$\Delta P_{AE} = 3/8\ k_h\ \gamma\ H^2$ =	***8.5***	**H^2**
Seismic Pressure, γ_{AE} =	***17.0***	**pcf**

Reference: Lew et al. (2010) Seismic Earth Pressures on Deep Building Basements.
*Per AASHTO Seismic Design for Highway Bridges and Standard of Practice

GMU

EARTH PRESSURE DISTRIBUTION
SEISMIC LOADS

Dana Point Harbor Revitalization

Parking Structure and Boater Services Building

DATE: 02/11/20	**17-206-02**	**PLATE**	**1**

APPENDIX C

Submittal 2 for a Geopier Foundation System by WGI

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

WGI | GEOPIER® FOUNDATIONS

Western Ground Improvement, Inc.
2372 Morse Ave
Suite 504
Irvine, CA 92614

www.westerngroundimprovement.com

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OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

February 11, 2020

Mr. Dave Atkinson
GMU Geotechnical, Inc.
23241 Arroyo Vista
Rancho Santa Margarita, California 92688

Re: Design Submittal for a *Geopier*® Foundation System
Dana Point Harbor Parking Structure
Dana Point, California
GFC Project No.: GLA-113

Dear Mr. Atkinson,

Geopier Foundation Company, Inc. has completed the Geopier® foundation design for the above project. The following documents are included herein:

- Geopier Design Drawing GP0.1: Geopier Notes & Details
- Geopier Design Drawing GP0.2: Geopier Schedules
- Geopier Design Drawing GP0.1 - GP1.4: Geopier Location Plans

We are pleased to have provided you with our design services. If you have any questions, please contact this office.

Sincerely,
Western Ground Improvement, Inc.

REGISTERED PROFESSIONAL ENGINEER
KENNETH K. HOEVELKAMP
C 67415
EXP. 12/20
CIVIL
STATE OF CALIFORNIA

2/11/20

Ken Hoevelkamp, P.E.
Principal Engineer

GEOPIER DESIGN NOTES:

1. GEOPIER FOUNDATION SUPPORT IS AS DESIGNED BY WESTERN GROUND IMPROVEMENT, INC., IRVINE, CALIFORNIA (DESIGNER).
2. THESE DESIGN DRAWINGS ARE PREPARED BY THE DESIGNER FOR USE IN GEOPIER CONSTRUCTION. THE GEOPIER SYSTEM SHALL BE INSTALLED BY APPROVED INSTALLERS LICENSED BY GEOPIER FOUNDATION COMPANY. UNAUTHORIZED USE OF THESE DRAWINGS IS PROHIBITED.
3. THE GEOPIER FOUNDATION DESIGN IS BASED ON THE GEOTECHNICAL INFORMATION PROVIDED IN THE SUBSURFACE EXPLORATION BY GMU GEOTECHNICAL, INC. WESTERN GROUND IMPROVEMENT, INC., HAS RELIED ON THIS INFORMATION AND WE HAVE NO REASON TO SUSPECT ANY OF THE INFORMATION IN THE REPORT IS IN ERROR. WESTERN GROUND IMPROVEMENT, INC. IS NOT RESPONSIBLE FOR ERRORS OR OMISSIONS IN THE REPORT THAT MAY AFFECT THE PARAMETER VALUES IN OUR DESIGN. IF THE SUBSURFACE OR SITE CONDITIONS DIFFER FROM THOSE UTILIZED IN THE DESIGN THE DESIGNER SHALL BE NOTIFIED IMMEDIATELY.
4. THE ALLOWABLE BEARING PRESSURE FOR FOUNDATIONS SUPPORTED BY GEOPIER ELEMENTS IS AS REFERENCED IN DETAIL 1/GP0.1. THE GEOPIER LAYOUT IS DESIGNED TO PROVIDE SETTLEMENT CONTROL BASED ON SERVICE LOADS PROVIDED BY CULP AND TANNER. IN THE EVENT THE STRUCTURAL LOADS VARY, THE DESIGNER SHALL BE NOTIFIED IMMEDIATELY.
5. FOOTING ELEVATIONS ARE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR AND SHALL BE REPORTED IN WRITING TO THE INSTALLER'S QC REPRESENTATIVE PRIOR TO INSTALLING GEOPIER ELEMENTS.

GEOPIER LAYOUT NOTES:

1. GEOPIER ELEMENT LAYOUT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR. GEOPIER ELEMENTS SHALL BE INSTALLED IN THE FIELD WITHIN 6 INCHES OF LOCATIONS SHOWN ON THESE PLANS.
2. GEOPIER ELEMENTS ARE LOCATED RELATIVE TO THE INTERSECTION OF REFERENCE GRID LINES OR AT THE CENTERLINE OF STRIP FOOTINGS, UNLESS DIMENSIONED OTHERWISE. PLEASE REFER TO THE "FOOTING DETAILS" ON THIS SHEET FOR SPECIFIC PIER LOCATIONS AND DIMENSIONS RELATIVE TO THE FOOTING.
3. THE "GEOPIER LOCATION PLAN" AND "FOOTING DETAILS" PROVIDE GEOPIER ELEMENT NUMBER, LOCATION, AND LAYOUT ONLY. FOOTING LOCATIONS, SIZES, AND ORIENTATION SHOWN ON THESE PLANS ARE FOR INFORMATION ONLY. PLEASE REFER TO THE STRUCTURAL PLANS FOR SPECIFIC FOUNDATION DIMENSIONS AND LOCATIONS. THE DESIGNER ACCEPTS NO RESPONSIBILITY FOR THE LOCATION OF FOOTINGS SHOWN ON THESE PLANS. THE DESIGNER SHALL BE NOTIFIED IMMEDIATELY IF INFORMATION ON THESE PLANS CONFLICTS WITH STRUCTURAL OR ARCHITECTURAL DRAWINGS.

UTILITIES/OBSTRUCTION NOTES:

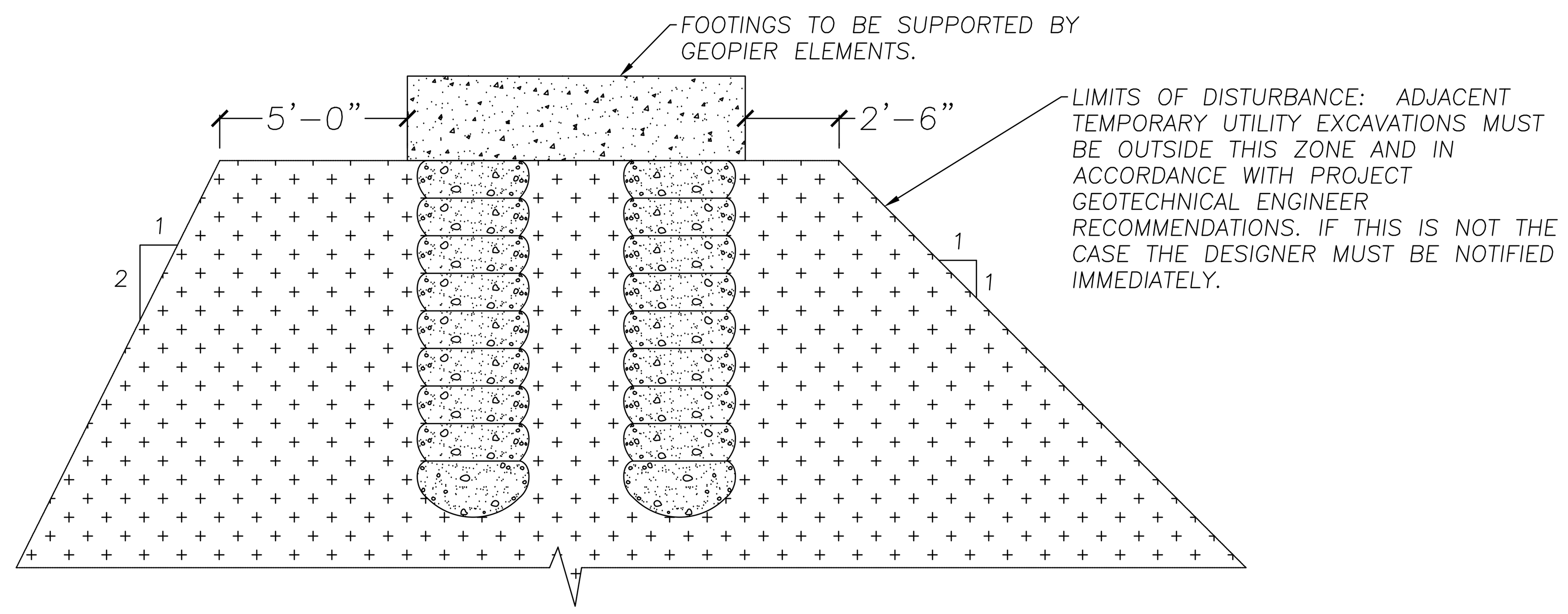
1. UTILITY LOCATIONS ARE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR. THE DESIGNER SHALL BE NOTIFIED OF ANY CONFLICTS WITH GEOPIER LOCATIONS SHOWN ON THE PLANS. NEW TEMPORARY UTILITY EXCAVATIONS SHALL BE LIMITED TO THE ZONE DEPICTED ON DETAIL 2 OF THIS SHEET. IF EXCAVATIONS ARE PLANNED WITHIN THE GEOPIER "NO DIG" ZONE, THE DESIGNER SHALL BE NOTIFIED IMMEDIATELY TO DISCUSS EXCAVATION OPTIONS.
2. IF OBSTRUCTIONS ARE ENCOUNTERED DURING GEOPIER INSTALLATION THAT CANNOT BE REMOVED WITH CONVENTIONAL GEOPIER INSTALLATION EQUIPMENT, THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING THE OBSTRUCTIONS. IF THE GENERAL CONTRACTOR DOES NOT DO SO IN A TIMELY MANNER THAT DOES NOT INTERRUPT GEOPIER PRODUCTION, THE INSTALLER MAY REMOVE OBSTRUCTIONS(S) AND SHALL BE REIMBURSED FOR COSTS INCURRED, INCLUDING LABOR, EQUIPMENT, AND MATERIALS. IN THE EVENT OBSTRUCTIONS ARE ENCOUNTERED BELOW THE DESIGNED BOTTOM OF FOOTING ELEVATION THE OBSTRUCTION SHALL BE REMOVED AS OUTLINED ABOVE. THE RESULTING EXCAVATION SHALL THEN BE BACKFILLED AND COMPACTED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS FOR STRUCTURAL FILL. THE AREA SHALL BE TESTED BY THE OWNER'S TESTING AGENCY AND THE COMPACTION TEST RESULTS SHALL BE SUBMITTED TO THE INSTALLER AND THE DESIGNER.

GEOPIER TESTING NOTES:

1. A QUALIFIED, FULL-TIME QUALITY CONTROL (QC) REPRESENTATIVE PROVIDED BY THE GEOPIER INSTALLER (INSTALLER) SHALL BE RESPONSIBLE FOR INSTALLATION OF THE GEOPIER ELEMENTS IN ACCORDANCE WITH THE DESIGN AND SHALL REPORT ALL GEOPIER FOUNDATION CONSTRUCTION ACTIVITIES TO THE DESIGNER. IF AUTHORIZED BY THE OWNER, THE QC REPRESENTATIVE SHALL COORDINATE QC ACTIVITIES WITH THE TESTING AGENCY HIRED BY THE OWNER. UNDER NO CIRCUMSTANCES SHALL THE TESTING AGENCY DIRECT GEOPIER INSTALLATION PROCEDURES.
2. GEOPIER ELEMENT DESIGN SHALL BE CONFIRMED BY A MODULUS TEST PERFORMED AT THE SITE. PLEASE REFER TO THE DESIGN SUBMITTAL FOR TEST LOCATION AND SPECIFICATIONS.
3. GEOPIER ELEMENTS SHALL BE BASED ON THE FOLLOWING CRITERIA UNLESS OTHERWISE APPROVED IN WRITING BY THE DESIGNER:
   A. INSTALLATION DEPTHS SHALL BE WITHIN 3 INCHES OR DEEPER THAN THE DEPTHS SHOWN ON THE PLANS.
   B. THE AVERAGE COMPACTED LIFT THICKNESS DURING EACH DAY'S PRODUCTION SHALL BY APPROXIMATELY 12 TO 24 INCHES.
   C. GEOPIER ELEMENT DISPLACEMENT MEASURED DURING BOTTOM STABILIZATION TESTS (BST) SHALL BE WITHIN 150% OF THE BST VALUE ACHIEVED IN THE MODULUS TEST PIER. BSTS SHALL BE PERFORMED IN AT LEAST 10% OF THE DAY'S PRODUCTION PIERS.
   D. GEOPIER ELEMENT AGGREGATE RELATIVE DENSITY SHALL BE RECORDED PERIODICALLY THROUGHOUT THE DAY. THE AVERAGE BLOW COUNTS OBTAINED UTILIZING A DYNAMIC CONE PENETROMETER (DCP) IN ACCORDANCE WITH ASTM STP-399, SHALL BE GREATER THAN 15 BLOWS FOR 1.75 INCHES OF PENETRATION (BPI). NO MORE THAN 10% OF DCP TESTS CONDUCTED ON EACH DAY SHALL BE BELOW 15 BPI. NOTE: USE OF DCP TESTS ARE NOT APPROPRIATE FOR OPEN GRADED AGGREGATE SUCH AS #57 STONE OR SAND.
   E. GEOPIER ELEMENT AGGREGATE SHALL BE APPROVED BY THE DESIGNER AND SHALL BE THE SAME AS USED IN A SUCCESSFUL MODULUS TEST, UNLESS OTHERWISE APPROVED IN WRITING BY THE DESIGNER.
   F. THE AGGREGATE SHALL BE TAMPED IN A MANNER CONSISTENT WITH THE MODULUS TEST PIER BUT FOR NO LESS THAN 10 SECONDS PER LIFT.
   G. IF CAVE-INS OCCUR ON TOP OF A LIFT OF AGGREGATE SUCH THAT THE VOLUME OF CAVED SOIL IS GREATER THAN APPROXIMATELY 10% OF THE VOLUME OF THE AGGREGATE IN THE LIFT, THEN THE AGGREGATE SHALL BE CONSIDERED CONTAMINATED, AND SHALL BE REMOVED AND REPLACED WITH UNCONTAMINATED AGGREGATE.
4. GEOPIER ELEMENTS NOT MEETING DESIGN REQUIREMENTS SHALL BE REINSTALLED UNLESS OTHERWISE APPROVED IN WRITING BY THE DESIGNER.

CONSTRUCTION NOTES FOR CONCRETE FOUNDATIONS SUPPORTED BY GEOPIER® ELEMENTS:

1. ALL EXCAVATIONS FOR FOUNDATIONS SUPPORTED BY GEOPIER ELEMENTS SHALL BE PREPARED IN THE FOLLOWING MANNER BY THE GENERAL CONTRACTOR: OVEREXCAVATION BELOW THE BOTTOM OF FOUNDATION SHALL BE LIMITED TO THREE INCHES. THIS INCLUDES LIMITING THE TEETH OF EXCAVATORS FROM OVEREXCAVATION BEYOND THREE INCHES BELOW THE FOUNDATION ELEVATION.
2. FOUNDATION CONCRETE SHALL BE PLACED IMMEDIATELY FOLLOWING FOUNDATION EXCAVATION AND APPROVAL, PREFERABLY THE SAME DAY AS THE EXCAVATION. FOUNDATION CONCRETE SHALL BE PLACED ON THE SAME DAY IF THE FOUNDATION IS BEARING ON MOISTURE-SENSITIVE SOILS. IF SAME DAY PLACEMENT OF FOUNDATION CONCRETE IS NOT POSSIBLE, OPEN EXCAVATIONS SHALL BE PROTECTED FROM SURFACE WATER ACCUMULATION. A LEAN CONCRETE MUD-MAT MAY BE USED TO ACCOMPLISH THIS. OTHER METHODS MUST BE PRE-APPROVED BY THE DESIGNER.
3. PRIOR TO CONCRETE OR MUD MAT PLACEMENT, THE TOP OF THE EXCAVATED SOIL AND GEOPIER ELEMENTS SHALL BE COMPACTED WITH A STANDARD, HAND-OPERATED IMPACT COMPACTOR (I.E. JUMPING JACK COMPACTOR). COMPACTION SHALL BE PERFORMED OVER THE ENTIRE FOUNDATION SUBGRADE TO COMPACT ANY LOOSE SURFACE SOIL AND LOOSE SURFACE GEOPIER AGGREGATE.
4. WATER SHALL NOT BE ALLOWED TO ACCUMULATE IN THE FOUNDATION EXCAVATIONS PRIOR TO CONCRETE PLACEMENT OR ALLOWED TO ACCUMULATE OVER THE POURED FOUNDATION.
5. EXCAVATION AND SURFACE COMPACTION OF ALL FOUNDATION SUBGRADES SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
6. THE TESTING AGENCY SHALL INSPECT EACH FOUNDATION AND APPROVE IT IN WRITING ON THE SAME DAY THAT THE CONCRETE OR MUD MAT IS PLACED IN THE FOUNDATION EXCAVATION. THE APPROVAL SHALL STATE THAT ALL FOUNDATION SUBGRADE, INCLUDING MATRIX SOILS AND GEOPIER TOPS, HAVE NOT BEEN OVEREXCAVATED MORE THAN THREE-INCHES BELOW THE BOTTOM OF THE FOUNDATION, HAVE BEEN KEPT FREE OF WATER ACCUMULATION, AND HAVE BEEN REASONABLY COMPACTED WITH A HAND-HELD MECHANICAL IMPACT COMPACTOR ON THE SAME DAY THAT THE CONCRETE WAS PLACED.
7. IN THE EVENT THAT FOUNDATION BOTTOM PREPARATIONS, AS DESCRIBED ABOVE, ARE NOT PERFORMED OR DOCUMENTED IN ACCORDANCE WITH THIS SECTION, ANY WRITTEN OR IMPLIED WARRANTY WITH RESPECT TO GEOPIER FOUNDATION PERFORMANCE CAN BY CONSIDERED VOID.



2 ADJACENT TEMPORARY UTILITY EXCAVATION DETAIL
NOT TO SCALE

ADJACENT TEMPORARY UTILITY EXCAVATION NOTES:

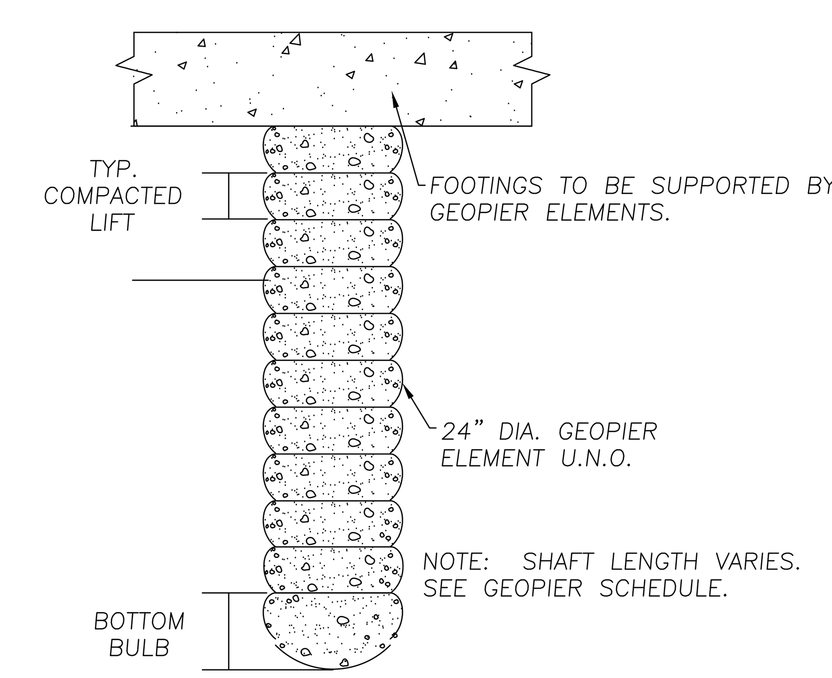
1. DETAIL 1 DOES NOT APPLY TO MASS EXCAVATION OR SITE GRADING.
2. THE PROJECT GEOTECHNICAL ENGINEER'S RECOMMENDATIONS SHALL BE FOLLOWED FOR TEMPORARY OR PERMANANT SLOPES.
3. WHERE PROPOSED EXCAVATIONS EXTEND INTO THE ZONE OF INFLUENCE, DISTURBANCE SHALL BE MINIMIZED AS MUCH AS POSSIBLE. DISTURBED PORTIONS OF GEOPIER ELEMENTS SHALL BE REMOVED AND THE EXCAVATIONS SHALL BE BACKFILLED WITH GRANULAR FILL COMPACTED IN ACCORDANCE WITH THE PROJECT REQUIREMENTS FOR STRUCTURAL FILL. AS AN ALTERNATE, EXCAVATIONS MAY BE BACKFILLED WITH FLOWABLE FILL OR LEAN CONCRETE.

Design Parameter	Value
Allowable bearing pressure (ksf)	7
Depth to groundwater (ft)	5
Total unit weight of soil (pcf)	120
Soil friction angle (degrees)	26
Geopier stiffness modulus (pci)	300
Soil stiffness modulus (pci)	38

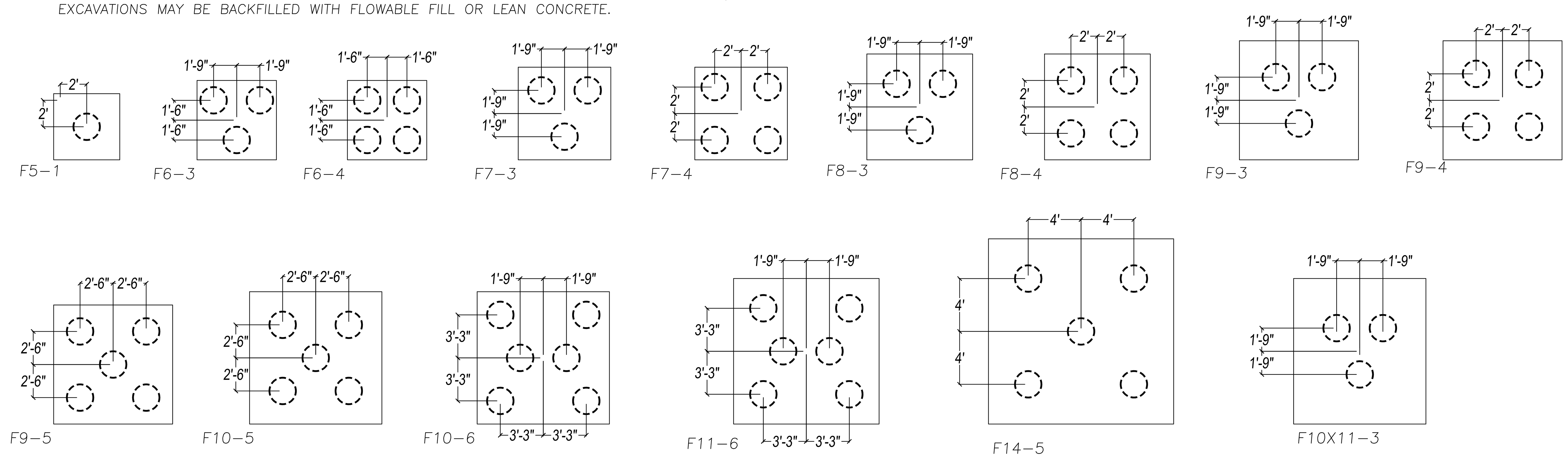
Type / Mark	Maximum Load, (kips, klf)	Width, (ft)	Length, (ft)	Thickness, (in)	Geopier Diameter, (in)	Number of Geopier Elements per Footing	Minimum Design Shaft Length, (ft) (1)	Anticipated Settlement, (in) (2)	Notes
F5-1	100	5.0	5.0	18	24	1	9.0	1/2	
F6-3	252	6.0	6.0	24	24	3	9.0	1/2	
F6-4	252	6.0	6.0	24	24	4	9.0	1/2	
F7-3	315	7.0	7.0	24	24	3	9.0	1/2	
F7-4	343	7.0	7.0	24	24	4	9.0	1/2	
F8A-3	315	8.0	8.0	36	24	3	9.0	1/2	
F8-4	420	8.0	8.0	24	24	4	9.0	1/2	
F9A-3	315	9.0	9.0	48	24	3	9.0	1/2	
F9-4	420	9.0	9.0	30	24	4	9.0	1/2	
F9-5	525	9.0	9.0	30	24	5	9.0	1/2	
F10-5	525	10.0	10.0	30	24	5	9.0	1/2	
F10-6	630	10.0	10.0	30	24	6	9.0	1/2	
F11-6	630	11.0	11.0	36	24	6	9.0	1/2	
F14-5	525	14.0	14.0	48	24	5	9.0	1/2	
F10-11	315	10.0	11.0	48	24	3	9.0	1/2	
F10x30	1050	10.0	30.0	36	24	10	9.0	1/2	
F24x32	2685	24.0	32.0	30	24	30	9.0	3/4	

NOTES: (1) Geopier elements shall penetrate fill and reach bedrock.
(2) Anticipated settlement is estimated to the nearest 1/4 inch.

1 GEOPIER® DESIGN PARAMETERS AND ESTIMATED SETTLEMENT



3 TYPICAL GEOPIER® ELEMENT
NOT TO SCALE



4 FOOTING DETAILS
NOT TO SCALE

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	

REVISIONS

GEOPIER® NOTES AND DETAILS

REGISTERED PROFESSIONAL ENGINEER KENNETH H. HOEVELKAMP C 67415 EXP. 12/20 CIVIL STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 12-11-19
SHEET NUMBER

GP0.1

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Hadi Tabatabaee
BUILDING OFFICIAL

GEOPIER® **Foundation Company** — **GEOPIER®**

Project Name: Dana Point Harbor Parking Structure
Project Location: Dana Point, Ca
Project Number: GLA-113

GEOPIER® SCHEDULE

Column Line	Geopier® Number(s)	Type / Mark	Top of Footing Elevation, (ft)	Width, (ft)	Length, (ft)	Thickness, (in)	Geopier Shaft Length, (ft) (1)	Finish Floor Elevation, (ft) (2)	Top of Geopier® Elevation, (ft)	Notes
A-2	1	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
	2 - 3	**NOT USED**								
A-3	4 - 6	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-4	7 - 9	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-5	10 - 12	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-6	13 - 15	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-7	16 - 18	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-8	19 - 21	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-9	22 - 24	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-10	25 - 27	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-11	28 - 30	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A-12	31 - 33	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
	34	**NOT USED**								
A-13	35 - 37	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
	38	**NOT USED**								
A-14	39 - 42	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
A-15	43 - 45	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	46	**NOT USED**								
A-16	47 - 49	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	50	**NOT USED**								
A-17	51 - 53	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	54	**NOT USED**								
A-18	55 - 57	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	58	**NOT USED**								
A-19	59 - 61	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	62	**NOT USED**								
A-20	63 - 65	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	66	**NOT USED**								
A-21	67 - 69	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	70	**NOT USED**								
A-22	71 - 73	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	74	**NOT USED**								
A-23	75 - 77	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
A-24	78 - 80	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
A-25	81 - 83	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
A-26.5	84	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
A-27	85 - 87	F9A	-1.00	9.0	9.0	48	9	0.00	-5.00	
A.4-1.5	88	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
A.4-1	89 - 91	F10x11	-1.00	10.0	10.0	48	9	0.00	-5.00	
A.4-2	92 - 94	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.3-27	95 - 97	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.5-1	98 - 100	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.5-5	101	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
A.7-27	102 - 104	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.8-1	105 - 107	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
A.9-7	108 - 110	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
B-2	111 - 115	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
B-4	116 - 120	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
B-5	121 - 124	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-6	125 - 127	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
B-7	128 - 130	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
B-8	131 - 133	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
B-9	134 - 136	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
B-10	137 - 139	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-11	140 - 143	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-12	144 - 148	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
B-14	149 - 153	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
B-15	154 - 157	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-16	158 - 161	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-17	162 - 165	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-18	166 - 169	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-19	170 - 173	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-20	174 - 177	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-21	178 - 181	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-22	182 - 185	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-23	186 - 189	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B-24	190 - 195	F10	-1.00	10.0	10.0	30	9	0.00	-3.50	
B-26	196 - 201	F10	-1.00	10.0	10.0	30	9	0.00	-3.50	
B.2-1	202 - 204	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
B.3-27	205 - 207	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
B.5-1	208 - 210	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
B.8-1	211 - 213	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-2	214 - 216	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
C-4	217 - 219	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
C-5	220 - 222	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-6	223 - 225	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-7	226 - 228	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-8	229 - 231	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-9	232 - 234	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-10	235 - 237	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-11	238 - 240	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-12	241 - 242	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	243 - 244	**NOT USED**								
C-13	245	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
C-14	246 - 248	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	249	**NOT USED**								
C-15	250 - 252	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-16	253 - 255	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-17	256 - 258	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-18	259 - 261	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-19	262 - 264	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-20	265 - 267	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-21	268 - 270	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-22	271 - 273	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-23	274 - 276	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
C-24	277 - 280	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	

GEOPIER® **Foundation Company** — **GEOPIER®**

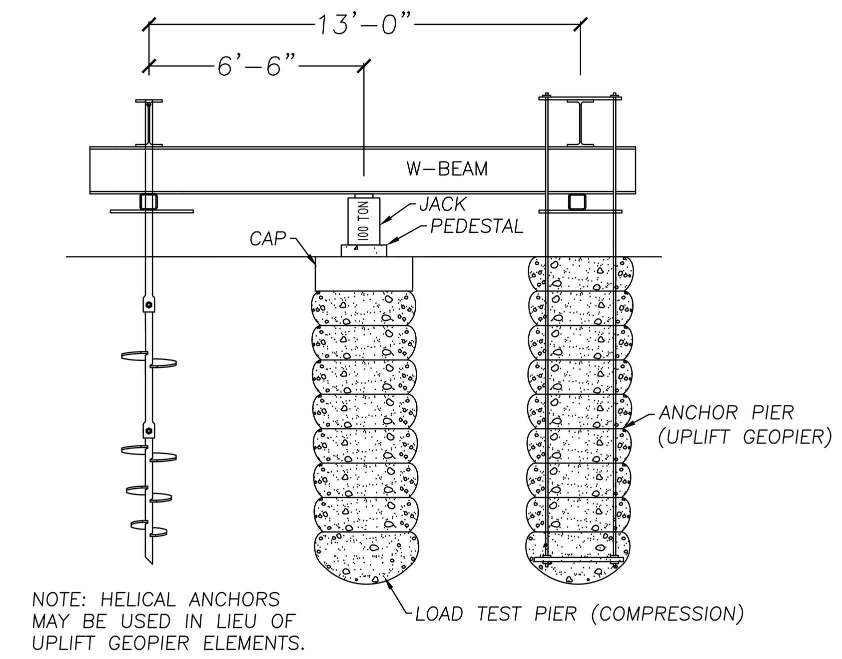
Project Name: Dana Point Harbor Parking Structure
Project Location: Dana Point, Ca
Project Number: GLA-113

GEOPIER® SCHEDULE

Column Line	Geopier® Number(s)	Type / Mark	Top of Footing Elevation, (ft)	Width, (ft)	Length, (ft)	Thickness, (in)	Geopier Shaft Length, (ft) (1)	Finish Floor Elevation, (ft) (2)	Top of Geopier® Elevation, (ft)	Notes
D-1	281 - 284	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
D-4	285 - 288	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
D-5	289 - 291	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-6	292 - 294	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-7	295 - 297	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-8	298 - 300	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-9	301 - 303	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-10	304 - 306	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-11	307 - 309	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-12	310 - 312	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	313	**NOT USED**								
D-13	314	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
D-14	315 - 317	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	318	**NOT USED**								
D-15	319 - 321	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-16	322 - 324	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-17	325 - 327	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-18	328 - 330	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-19	331 - 333	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-20	334 - 336	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-21	337 - 339	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-22	340 - 342	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-23	343 - 345	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D-24	346 - 349	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
D-25.6/D-27	350 - 353	F5x29	-1.00	5.0	29.0	18	9	0.00	-2.50	
	354 - 355	**NOT USED**								
D.1-1	356 - 358	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D.6-1	359 - 361	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
D.7-27	362 - 364	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
E-1	365 - 367	F10x11	-1.00	10.0	10.0	48	9	0.00	-5.00	
E-2	368 - 370	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E-3	371 - 373	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
E-4	374 - 378	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
E-6	379 - 383	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
	384	**NOT USED**								
E-7	385 - 388	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-8	389 - 392	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-9	393 - 396	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-10	397 - 400	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-11	401 - 404	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-12	405 - 409	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
E-14	410 - 414	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
E-15	415 - 418	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-16	419 - 422	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-17	423 - 426	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-18	427 - 430	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-19	431 - 434	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-20	435 - 438	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-21	439 - 442	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-22	443 - 446	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-23	447 - 450	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
E-24	451 - 455	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
	456	**NOT USED**								
E-26	457 - 461	F9	-1.00	9.0	9.0	30	9	0.00	-3.50	
E.1-27	462 - 464	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.5-27	465 - 467	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-3	468 - 470	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-4	471 - 473	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-5	474 - 476	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-24	477 - 479	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-25	480 - 482	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-26	483 - 485	F6	-1.00	6.0	6.0	24	9	0.00	-3.00	
E.8-27	486 - 490	F14	-1.00	14.0	14.0	48	9	0.00	-5.00	
F-4	491	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
F-24	492	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
	493 - 533	**NOT USED**								
F-17	534 - 536	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	537	**NOT USED**								
F-18	538 - 540	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	541	**NOT USED**								
F-19	542 - 544	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
	545	**NOT USED**								
F-20	546 - 549	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
F-21	550 - 552	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
F-22	553 - 555	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
F-23	556 - 558	F7	-1.00	7.0	7.0	24	9	0.00	-3.00	
F-24	559	F5	-1.00	5.0	5.0	18	9	0.00	-2.50	
B.7-25.6	560 - 589	F24x32	-1.00	24.0	32.0	30	9	0.00	-3.50	
D.2-25.6	590 - 599	F10x30	-1.00	10.0	30.0	36	9	0.00	-4.00	
A-24	600	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
A-25	601	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
A-27	602	F9A	-1.00	9.0	9.0	48	9	0.00	-5.00	
B-10	603	F8	-1.00	8.0	8.0	24	9	0.00	-3.00	
B.3-27	604	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
D.7-27	605	F8A	-1.00	8.0	8.0	36	9	0.00	-4.00	
F-4/F-16	606 - 655	CONT	-1.00	VARIES	223.5	24	9	0.00	-3.00	

NOTES:
(1) Geopier elements shall completely penetrate the fill and reach bedrock.
(2) Structure FFE=0.00 ft is equivalent to Site Civil Elevation XX.XX ft.

(1) GEOPIER® SCHEDULE



(2) GEOPIER® MODULUS TEST SETUP
NOT TO SCALE

GEOPIER® **Foundation Company** — **GEOPIER®**

Project Name: Dana Point Harbor Parking Structure
Project Location: Dana Point, Ca
Project Number: GLA-113

Geopier® Modulus Test Schedule

Maximum Geopier Design Stress: 22,010 psf
Geopier Element Diameter: 24 in.
Design Modulus: 300 pci
Modulus Test Location: Near Boring DH-35
Test Geopier Element Shaft Length: 9 ft
Concrete Cap Thickness: 2 ft
Total Drill Depth 11 ft

Load No.	Ram Load, (kips)	Geopier Element Stress, (psf)	Percent of Design Stress	Minimum Duration	Maximum Duration	Remarks
	3.46	1,101	5.0%	N/A	N/A	seating load
1	11.53	3,669	16.7%	15 min	60 min	
2	23.05	7,336	33.3%	15 min	60 min	
3	34.57	11,005	50.0%	15 min	60 min	
4	46.10	14,674	66.7%	15 min	60 min	
5	57.62	18,341	83.3%	15 min	60 min	
6	69.15	22,010	100.0%	15 min	60 min	
7	80.65	25,672	116.6%	60 min	240 min	
8	92.19	29,346	133.3%	15 min	60 min	
9	103.72	33,015	150.0%	15 min	60 min	
10	69.15	22,010	100.0%	N/A	N/A	rebound, unload
11	45.64	14,527	66.0%	N/A	N/A	rebound, unload
12	22.82	7,263	33.0%	N/A	N/A	rebound, unload
13	3.46	1,101	5.0%	N/A	N/A	rebound, unload

Notes:
1 - The Geopier element to be used in the modulus load testing should be installed in a manner similar to production, at least 4 days prior to testing, so that pore-pressures have adequate time to dissipate.
2 - The modulus load test shall be performed to a stress not less than 150% of the design maximum top-of-pier stress indicated in the Geopier Design Calculations.
3 - The modulus load test Geopier element shall be installed to a depth of 11 feet below the ground surface with a 2-foot thick unreinforced concrete leveling pad. The modulus load test Geopier shall penetrate fill.
4 - A telltale shall be installed in the bottom one-third of the tested Geopier element. Telltale deflections shall be monitored concurrent with top of Geopier deflections during the modulus load test.
5 - The modulus load test setup shall be as shown on Geopier Construction Drawing GP0.1. Helical anchors should be installed in accordance with manufacturers specifications.
6 - A representative of the owner's geotechnical consultant should be present to witness the load test.

(2) GEOPIER® MODULUS TEST SCHEDULE

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	

REVISIONS

GEOPIER® SCHEDULES

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 12-11-19
SHEET NUMBER
GP0.2

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

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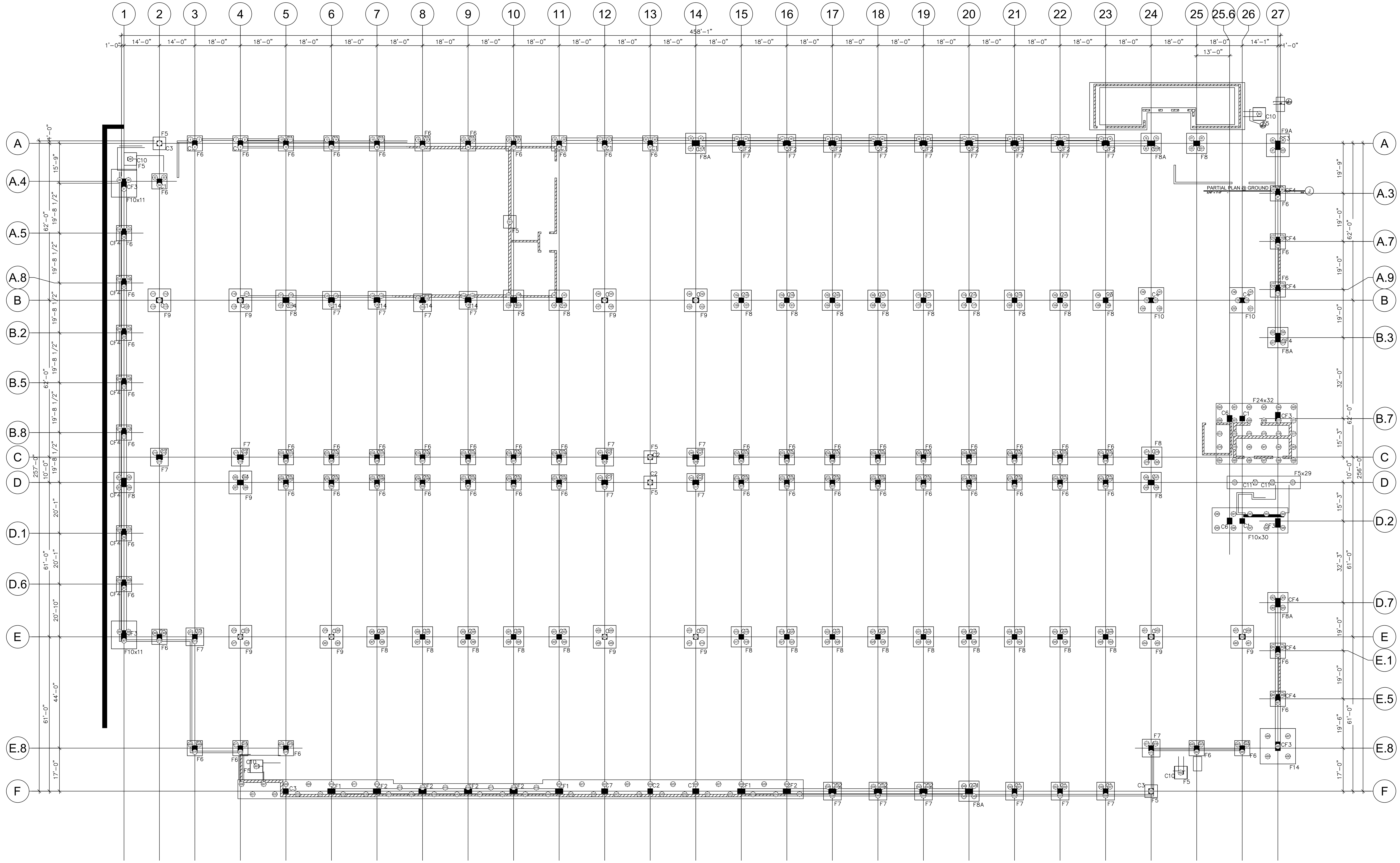
Hadi Tabatabaee
BUILDING OFFICIAL



NORTH

1 OVERALL GEOPIER® LOCATION PLAN
1/16" = 1'-0"

LEGEND

TYP. 24" GEOPIER ELEMENT

TYP. GEOPIER ELEMENT NUMBER

GEOPIER® LOCATION PLAN NOTES

1. FOOTING CONCRETE SHALL BE PLACED DIRECTLY ON TOP OF EXPOSED GEOPIER ELEMENTS.
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GEOPIER®

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	

GEOPIER® LOCATION PLAN

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 12-11-19
SHEET NUMBER GP1.0

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
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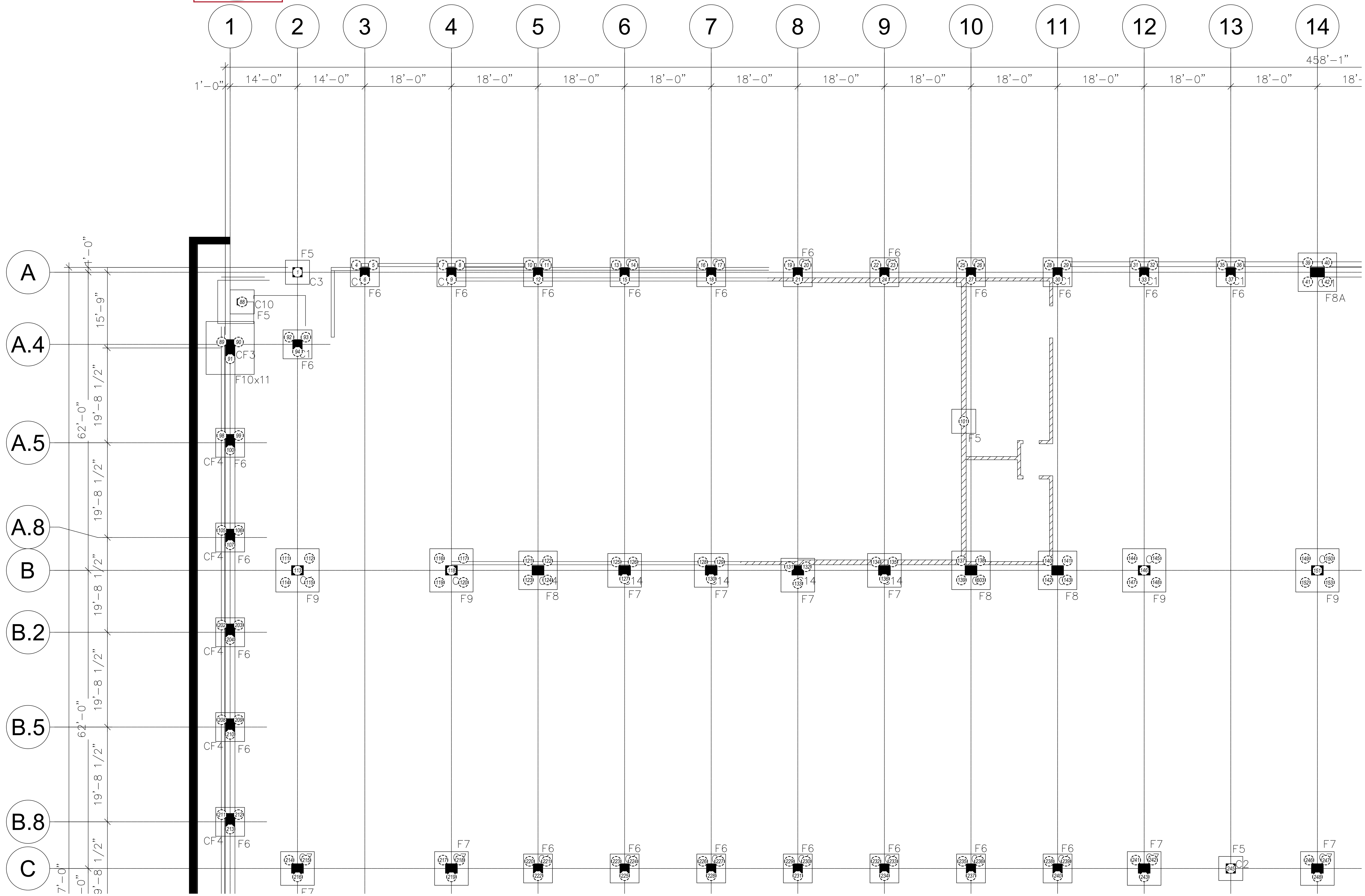
Hadi Tabatabaee
BUILDING OFFICIAL



NORTH

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LEGEND

TYP. 24" GEOPIER ELEMENT

1 TYP. GEOPIER ELEMENT NUMBER

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ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	

REVISIONS

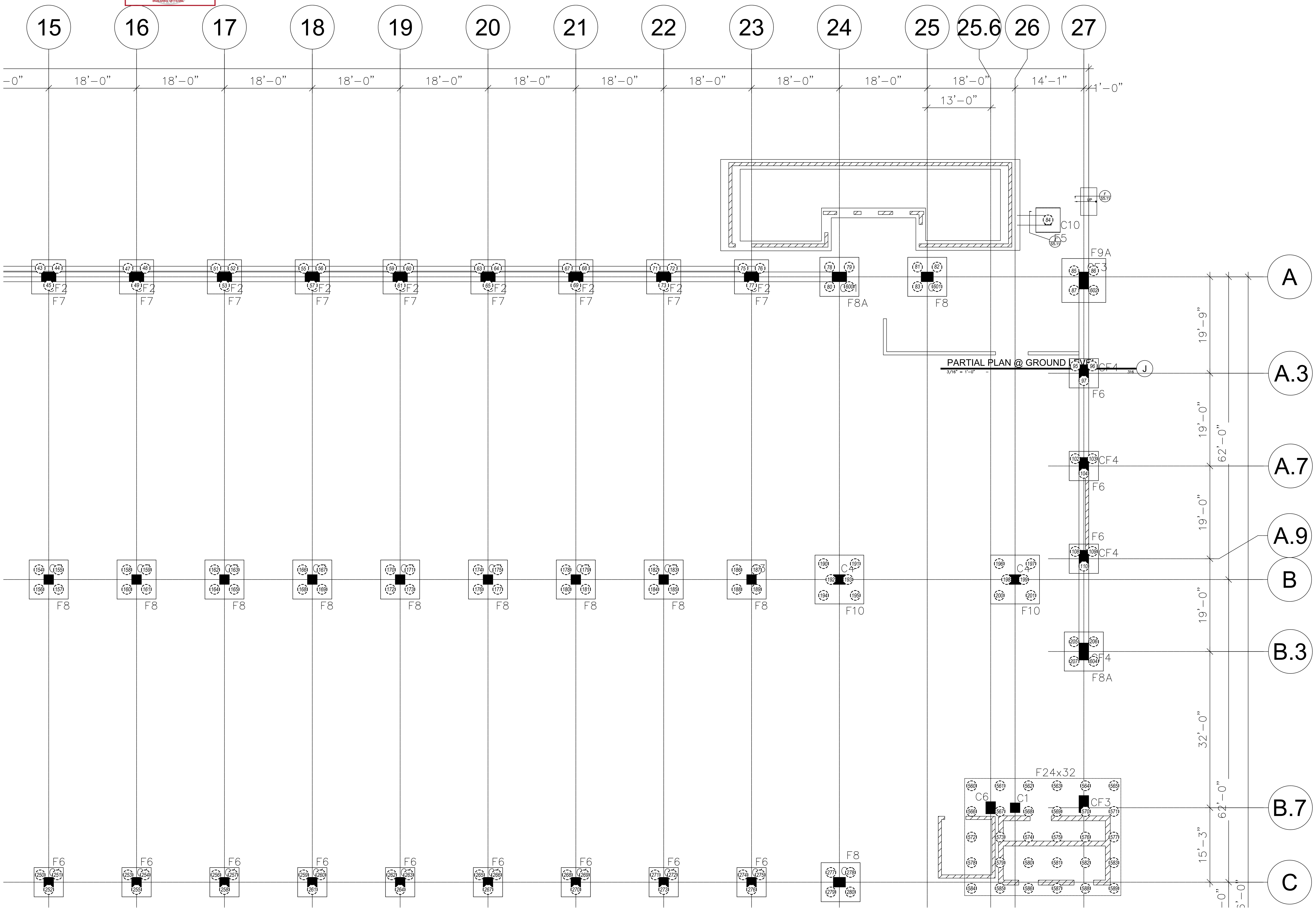
GEOPIER® LOCATION PLAN

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 12-11-19
SHEET NUMBER GP1.1



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LEGEND

TYP. 24" GEOPIER ELEMENT

1 TYP. GEOPIER ELEMENT NUMBER

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GEOPIER®

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	

GEOPIER® LOCATION PLAN

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA–113
DRAWN BY AB
CHECK BY KH
DATE 12–11–19
SHEET NUMBER GP1.2

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

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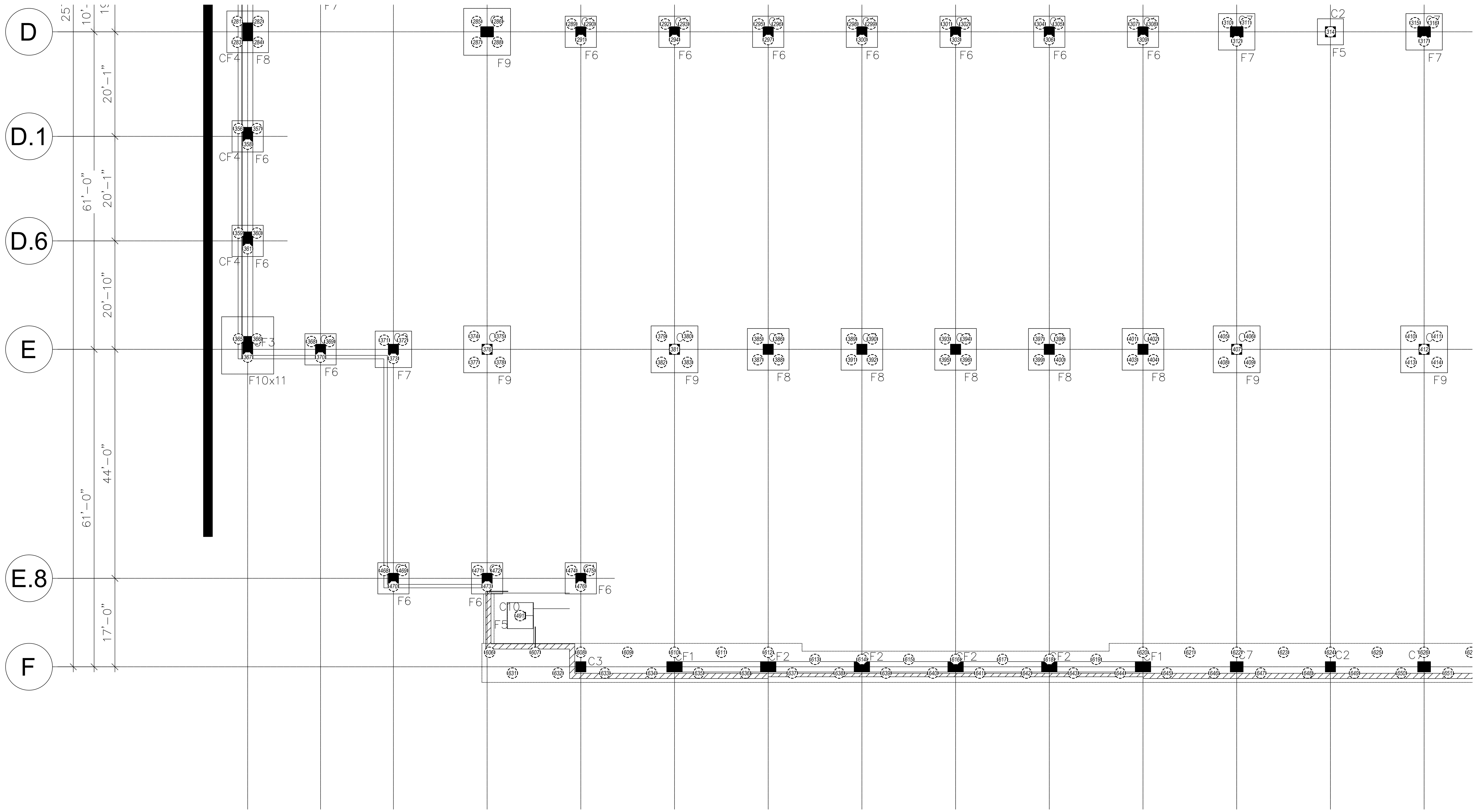
Hadi Tabatabaee
BUILDING OFFICIAL



NORTH

1 GEOPIER® LOCATION PLAN
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LEGEND

○	TYP. 24" GEOPIER ELEMENT
①	TYP. GEOPIER ELEMENT NUMBER

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GEOPIER®

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ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	

GEOPIER® LOCATION PLAN

REGISTERED PROFESSIONAL ENGINEER
KENNETH H. HOEVELKAMP
C 67415
EXP. 12/20
STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI | GEOPIER® FOUNDATIONS

PROJECT NUMBER	GLA-113
DRAWN BY	AB
CHECK BY	KH
DATE	12-11-19
SHEET NUMBER	GP1.3

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

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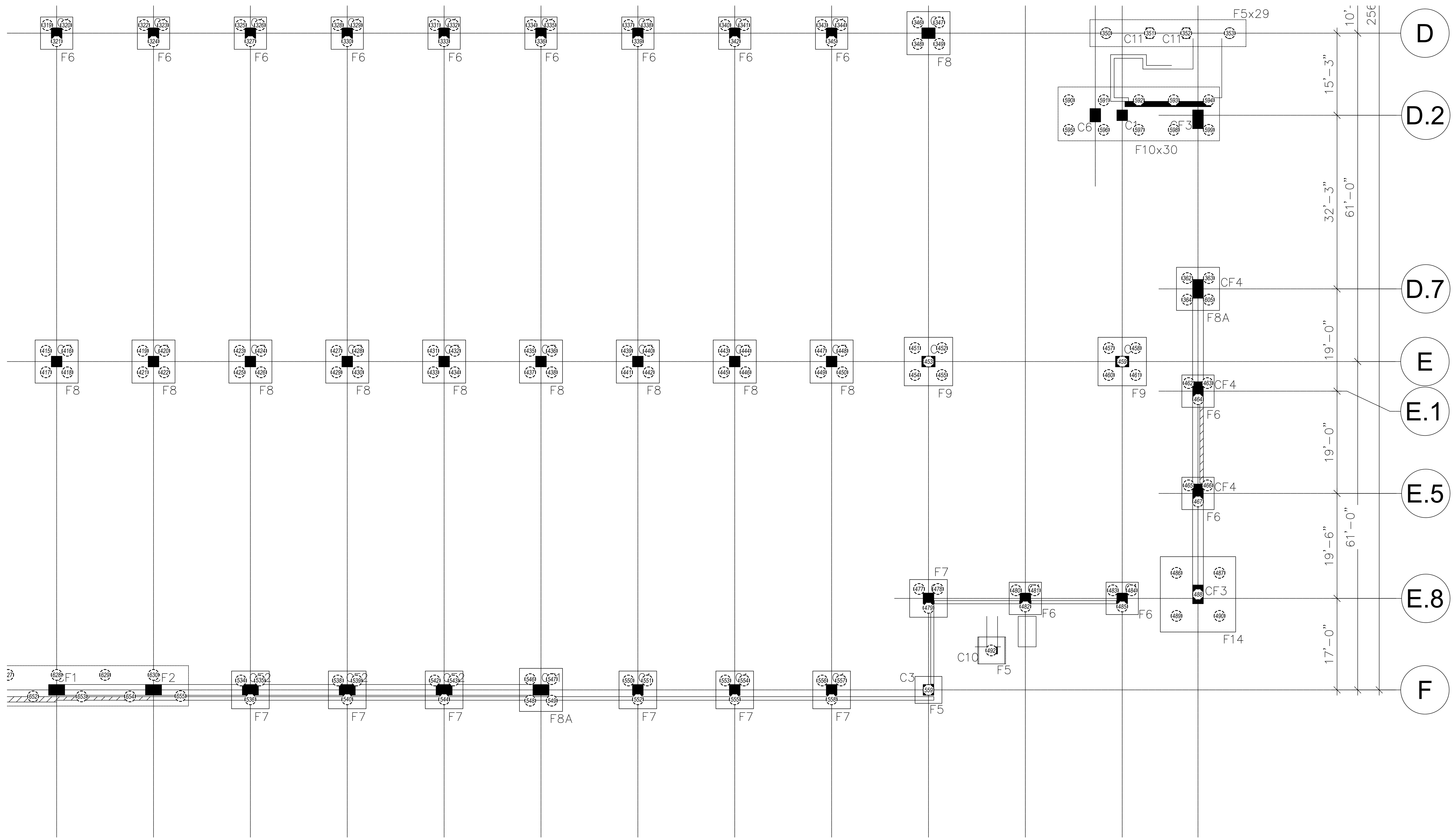
BUILDING OFFICIAL



NORTH

GEOPIER® LOCATION PLAN

1 — 1/16" = 1'-0"

LEGEND

TYP. 24" GEOPIER ELEMENT

TYP. GEOPIER ELEMENT NUMBER

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GEOPIER®

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	2ND SUBMITTAL	02/11/2020	

GEOPIER® LOCATION PLAN

REGISTERED PROFESSIONAL ENGINEER ★ KENNETH H. HOEVELKAMP C 67415 EXP. 12/20 ★ STATE OF CALIFORNIA

DANA POINT HARBOR
PARKING STRUCTURE
DANA POINT, CALIFORNIA

WGI | GEOPIER® FOUNDATIONS

PROJECT NUMBER GLA-113
DRAWN BY AB
CHECK BY KH
DATE 12-11-19
SHEET NUMBER GP1.4

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

WGI | GEOPIER® FOUNDATIONS

Western Ground Improvement, Inc.
2372 Morse Ave
Suite 504
Irvine, CA 92614

www.westerngroundimprovement.com

County of Orange - OC Public Works
OC Development Services
APPROVED
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Hadi Tabatabaee
BUILDING OFFICIAL

February 11, 2020

Mr. Dave Atkinson
GMU Geotechnical, Inc.
23241 Arroyo Vista
Rancho Santa Margarita, California 92688

Re: Calculations Package for a *Geopier*® Foundation System
Dana Point Harbor Parking Structure
Dana Point, California
GFC Project No.: GLA-113

Dear Mr. Atkinson,

Geopier Foundation Company, Inc. has completed the Geopier® foundation design for the above project. The design is based on geotechnical information provided by «GE» in the report dated «GEreportdateTEXT». Structural design loads are as provided by «SE». The following documents are included herein:

- Geopier settlement calculations for square footings
- Geopier settlement calculations for rectangular footings

We are pleased to have provided you with our design services. If you have any questions, please contact this office.

Sincerely,
Western Ground Improvement, Inc.

REGISTERED PROFESSIONAL ENGINEER
KENNETH K. HOEVELKAMP
C 67415
EXP. 12/20
CIVIL
STATE OF CALIFORNIA

2/11/20

Ken Hoevelkamp, P.E.
Principal Engineer

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

***GEOPIER*® Foundation Company**

GEOPIER®

SQUARE FOOTINGS

Version 3.0 6 August 2013

County of Orange - OC Public Works
OC Development Services
APPROVED

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Hadi Tabatabaee
BUILDING OFFICIAL

Project:	**Dana Point Harbor Parking Structure**
No.:	GLA-113
Engnr:	AMB
Date:	12/6/2019

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
RAP diameter (in)	d	24
Depth to groundwater (ft)	dgw	5
Total unit weight of soil (pcf)	g	120
Soil frict. angle (degr)	f	26
Max. hor. pressure (psf)	pmax	2500
From Table 4.2:		
RAP cell cap. (kips)	Qcell	105
Footing bearing press. (ksf)	qall	7
RAP stiffn. modulus (pci)	kg	300
Soil stiffness modulus (pci)	km	38

TOP OF PIER STRESS - SQUARE FOOTINGS

Parameter	Symb	Equation	F5-1	F6-3	F6-4	F7-3	F7-4	F8A-3	F8-4
Max Column load (kips)	P		100	252	252	315	343	315	420
Required footing width (ft)	Br	sqrt(P/qall)	3.78	6.00	6.00	6.71	7.00	6.71	7.75
Selected footing width (ft)	B		5	6	6	7	7	8	8
Footing bearing pressure	q	P/(B*B)	4.00	7.00	7.00	6.43	7.00	4.92	6.56
Required No. RAP elems	Nr	P/Qcell	1.0	2.4	2.4	3.0	3.3	3.0	4.0
Selected No. RAP elems	N		1	3	4	3	4	3	4
Area replacement ratio	Ra	N*Ag/(B*B)	0.126	0.262	0.349	0.192	0.256	0.147	0.196
Stiffness ratio	Rs	kg/km	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Stress at top of GP (ksf)	qg	q*Rs/(Rs*Ra-Ra+1)	16.92	19.70	16.22	21.82	19.96	19.28	22.01
Load at top of GP (kips)	Qg	qg*Ag	53.2	61.9	51.0	68.5	62.7	60.6	69.1

SHAFT LENGTH REQUIREMENTS

Parameter	Symb	Equation	F5-1	F6-3	F6-4	F7-3	F7-4	F8A-3	F8-4
Depth of Embedment	Df		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Trial shaft length (ft)	Hs		9.0	9.0	9.0	9.0	9.0	9.0	9.0
Drill depth (ft)	Hdrill	Df+Hs	12	12	12	12	12	12	12

INPUT PARAMETER VALUES:

Upper Zone Elastic Parameters		
Parameter	Sym	Val
Pier Modulus Layer 1 (ksf)	Eg1	
Pier Modulus Layer 2 (ksf)	Eg2	
Pier Modulus Layer 3 (ksf)	Eg3	
Pier Modulus Layer 4 (ksf)	Eg4	
Pier Modulus Layer 5 (ksf)	Eg5	
Soil Modulus Layer 1 (ksf)	Em1	
Soil Modulus Layer 2 (ksf)	Em2	
Soil Modulus Layer 3 (ksf)	Em3	
Soil Modulus Layer 4 (ksf)	Em4	
Soil Modulus Layer 5 (ksf)	Em5	

UPPER ZONE SETTLEMENT - SQUARE FOOTINGS

Parameter	**Symb**	Equation							
UZ Settlement Approach		1-Stiffness, 2-Modulus	1	1	1	1	1	1	1
Thickness of UZ sublayer 1(ft)	H_{uz1}								
Thickness of UZ sublayer 2 (ft)	H_{uz2}								
Thickness of UZ sublayer 3 (ft)	H_{uz3}								
Thickness of UZ sublayer 4 (ft)	H_{uz4}								
Thickness of UZ sublayer 5 (ft)	H_{uz5}								
Total UZ Thickness OK?		Huz = Hs + d							
Composite Modulus Layer 1 (ksf)	E_{comp1}	Eg1Ra + Em1(1-Ra)							
Composite Modulus Layer 2 (ksf)	E_{comp2}	Eg2Ra + Em2(1-Ra)							
Composite Modulus Layer 3 (ksf)	E_{comp3}	Eg3Ra + Em3(1-Ra)							
Composite Modulus Layer 4 (ksf)	E_{comp4}	Eg4Ra + Em4(1-Ra)							
Composite Modulus Layer 5 (ksf)	E_{comp5}	Eg5Ra + Em5(1-Ra)							
Sett. of UZ sublayer 1 (in)	s_{uz1}	qg/kg or q*Iσ-vag*H/Ecomp	0.39	0.46	0.38	0.51	0.46	0.45	0.51
Sett. of UZ sublayer 2 (in)	s_{uz2}	$q^*I\sigma\text{-}2^*H_{uz2}/E_{comp2}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 3 (in)	s_{uz3}	$q^*I\sigma\text{-}3^*H_{uz3}/E_{comp3}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 4 (in)	s_{uz4}	$q^*I\sigma\text{-}4^*H_{uz4}/E_{comp4}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 5 (in)	s_{uz5}	$q^*I\sigma\text{-}5^*H_{uz5}/E_{comp5}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Upper Zone Settlement (in)	s_{uz}	$s_{uz1}+s_{uz2}+s_{uz3}+s_{uz4}+s_{uz5}$	0.39	0.46	0.38	0.51	0.46	0.45	0.51

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
Allowable end-bearing (kips)	Qeb	0.0
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon1}$	800
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon2}$	2000
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon3}$	2000
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon4}$	2000
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon5}$	2000
Calc. settlement to X*B	X	2

LOWER ZONE SETTLEMENTS - SQUARE FOOTINGS

Parameter	Symb	Equation	F5-1	F6-3	F6-4	F7-3	F7-4	F8A-3	F8-4
Dpth to bottm of LZ from ftg (ft)	X*B	X*B	10	12	12	14	14	16	16
Upper zone thickness (ft)	H_{uz}	Hs+d	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Lower zone thickness (ft)	H_{lz}	H2b-Hlz	-1	1	1	3	3	5	5
Thickness of LZ sublayer 1(ft)	H_{lz1}		0	1	1	3	3	5	5
Thickness of LZ sublayer 2 (ft)	H_{lz2}								
Thickness of LZ sublayer 3 (ft)	H_{lz3}								
Thickness of LZ sublayer 4 (ft)	H_{lz4}								
Thickness of LZ sublayer 5 (ft)	H_{lz5}								
Total LZ thickness ok?			**No LZ**	**ok**	**ok**	**ok**	**ok**	**ok**	**ok**
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon1}$	E (ksf) or c_ε	800	800	800	800	800	800	800
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon2}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon3}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon4}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon5}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
Initial stress for sublyr 1 (ksf)	P'_{o1}		1.118	1.147	1.147	1.205	1.205	1.262	1.262
Initial stress for sublyr 2 (ksf)	P'_{o2}		1.118	1.176	1.176	1.291	1.291	1.406	1.406
Initial stress for sublyr 3 (ksf)	P'_{o3}		1.118	1.176	1.176	1.291	1.291	1.406	1.406
Initial stress for sublyr 4 (ksf)	P'_{o4}		1.118	1.176	1.176	1.291	1.291	1.406	1.406
Initial stress for sublyr 5 (ksf)	P'_{o5}		1.118	1.176	1.176	1.291	1.291	1.406	1.406
Ftg stress on sublyr 1 (ksf)	ΔP1	q*I	0.36	0.82	0.82	0.85	0.93	0.72	0.96
Ftg stress on sublyr 2 (ksf)	ΔP2	q*I	0.36	0.76	0.76	0.69	0.76	0.53	0.71
Ftg stress on sublyr 3 (ksf)	ΔP3	q*I	0.36	0.76	0.76	0.69	0.76	0.53	0.71
Ftg stress on sublyr 4 (ksf)	ΔP4	q*I	0.36	0.76	0.76	0.69	0.76	0.53	0.71
Ftg stress on sublyr 5 (ksf)	ΔP5	q*I	0.36	0.76	0.76	0.69	0.76	0.53	0.71
Sett. of LZ sublayer 1 (in)	s_{lz1}	DP1*Hlz1/E1	0.00	0.01	0.01	0.04	0.04	0.05	0.07
Sett. of LZ sublayer 2 (in)	s_{lz2}	DP2*Hlz2/E2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sett. of LZ sublayer 3 (in)	s_{lz3}	DP3*Hlz3/E3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sett. of LZ sublayer 4 (in)	s_{lz4}	DP4*Hlz4/E4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sett. of LZ sublayer 5 (in)	s_{lz5}	DP5*Hlz5/E5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total lower zone sett. (in)	s_{lz}	$s_{lz1}+s_{lz2}+s_{lz3}+s_{lz4}+s_{lz5}$	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total UZ + LZ settlement (in)	s		0.4	0.5	0.4	0.5	0.5	0.5	0.6

GEOPIER® **Foundation Company**

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SQUARE FOOTINGS

Version 3.0.6 August 2013

Project:	**Dana Point Harbor Parking Structure**
No.:	GLA-113
Engnr:	AMB
Date:	12/6/2019

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
RAP diameter (in)	d	24
Depth to groundwater (ft)	dgw	5
Total unit weight of soil (pcf)	g	120
Soil frict. angle (degr)	f	26
Max. hor. pressure (psf)	pmax	2500
From Table 4.2:		
RAP cell cap. (kips)	Qcell	105
Footing bearing press. (ksf)	qall	7
RAP stiffn. modulus (pci)	kg	300
Soil stiffness modulus (pci)	km	38

TOP OF PIER STRESS - SQUARE FOOTINGS

Parameter	Symb	Equation	F9A-3	F9-4	F9-5	F10-5	F10-6	F11-6	F14-5
Max Column load (kips)	P		315	420	525	525	630	630	525
Required footing width (ft)	Br	sqrt(P/qall)	6.71	7.75	8.66	8.66	9.49	9.49	8.66
Selected footing width (ft)	B		9	9	9	10	10	11	14
Footing bearing pressure	q	P/(B*B)	3.89	5.19	6.48	5.25	6.30	5.21	2.68
Required No. RAP elems	Nr	P/Qcell	3.0	4.0	5.0	5.0	6.0	6.0	5.0
Selected No. RAP elems	N		3	4	5	5	6	6	5
Area replacement ratio	Ra	N*Ag/(B*B)	0.116	0.155	0.194	0.157	0.188	0.156	0.080
Stiffness ratio	Rs	kg/km	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Stress at top of GP (ksf)	qg	q*Rs/(Rs*Ra-Ra+1)	17.04	19.78	21.89	19.90	21.63	19.82	13.62
Load at top of GP (kips)	Qg	qg*Ag	53.5	62.1	68.8	62.5	67.9	62.3	42.8

SHAFT LENGTH REQUIREMENTS

Depth of Embedment	Df		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Trial shaft length (ft)	Hs		9.0	9.0	9.0	9.0	9.0	9.0	9.0
Drill depth (ft)	Hdrill	Df+Hs	12	12	12	12	12	12	12

INPUT PARAMETER VALUES:

Upper Zone Elastic Parameters		
Parameter	Sym	Val
Pier Modulus Layer 1 (ksf)	Eg1	
Pier Modulus Layer 2 (ksf)	Eg2	
Pier Modulus Layer 3 (ksf)	Eg3	
Pier Modulus Layer 4 (ksf)	Eg4	
Pier Modulus Layer 5 (ksf)	Eg5	
Soil Modulus Layer 1 (ksf)	Em1	
Soil Modulus Layer 2 (ksf)	Em2	
Soil Modulus Layer 3 (ksf)	Em3	
Soil Modulus Layer 4 (ksf)	Em4	
Soil Modulus Layer 5 (ksf)	Em5	

UPPER ZONE SETTLEMENT - SQUARE FOOTINGS

Parameter	**Symb**	Equation							
UZ Settlement Approach		1-Stiffness, 2-Modulus	1	1	1	1	1	1	1
Thickness of UZ sublayer 1(ft)	H_{uz1}								
Thickness of UZ sublayer 2 (ft)	H_{uz2}								
Thickness of UZ sublayer 3 (ft)	H_{uz3}								
Thickness of UZ sublayer 4 (ft)	H_{uz4}								
Thickness of UZ sublayer 5 (ft)	H_{uz5}								
Total UZ Thickness OK?		Huz = Hs + d							
Composite Modulus Layer 1 (ksf)	E_{comp1}	Eg1Ra + Em1(1-Ra)							
Composite Modulus Layer 2 (ksf)	E_{comp2}	Eg2Ra + Em2(1-Ra)							
Composite Modulus Layer 3 (ksf)	E_{comp3}	Eg3Ra + Em3(1-Ra)							
Composite Modulus Layer 4 (ksf)	E_{comp4}	Eg4Ra + Em4(1-Ra)							
Composite Modulus Layer 5 (ksf)	E_{comp5}	Eg5Ra + Em5(1-Ra)							
Sett. of UZ sublayer 1 (in)	s_{uz1}	qg/kg or q*Iσ-vag*H/Ecomp	0.39	0.46	0.51	0.46	0.50	0.46	0.32
Sett. of UZ sublayer 2 (in)	s_{uz2}	$q{*}I\sigma\text{-}2{*}H_{uz2}/E_{comp2}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 3 (in)	s_{uz3}	$q{*}I\sigma\text{-}3{*}H_{uz3}/E_{comp3}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 4 (in)	s_{uz4}	$q{*}I\sigma\text{-}4{*}H_{uz4}/E_{comp4}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sett. of UZ sublayer 5 (in)	s_{uz5}	$q{*}I\sigma\text{-}5{*}H_{uz5}/E_{comp5}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Upper Zone Settlement (in)	s_{uz}	$s_{uz1}+s_{uz2}+s_{uz3}+s_{uz4}+s_{uz5}$	0.39	0.46	0.51	0.46	0.50	0.46	0.32

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
Allowable end-bearing (kips)	Qeb	0.0
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon 1}$	800
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon 2}$	2000
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon 3}$	2000
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon 4}$	2000
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon 5}$	2000
Calc. settlement to X*B	X	2

LOWER ZONE SETTLEMENTS - SQUARE FOOTINGS

Parameter	Symb	Equation	F9A-3	F9-4	F9-5	F10-5	F10-6	F11-6	F14-5
Dpth to bottm of LZ from ftg (ft)	X*B	X*B	18	18	18	20	20	22	28
Upper zone thickness (ft)	H_{uz}	Hs+d	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Lower zone thickness (ft)	H_{lz}	H2b-Hlz	7	7	7	9	9	11	17
Thickness of LZ sublayer 1(ft)	H_{lz1}		5	5	5	5	5	5	5
Thickness of LZ sublayer 2 (ft)	H_{lz2}		2	2	2	4	4	5	5
Thickness of LZ sublayer 3 (ft)	H_{lz3}							1	5
Thickness of LZ sublayer 4 (ft)	H_{lz4}								2
Thickness of LZ sublayer 5 (ft)	H_{lz5}								
Total LZ thickness ok?			**ok**	**ok**	**ok**	**ok**	**ok**	**ok**	**ok**
E or c_ε for LZ sublyr 1	E_1 / $c_{\varepsilon 1}$	E (ksf) or c_ε	800	800	800	800	800	800	800
E or c_ε for LZ sublyr 2	E_2 / $c_{\varepsilon 2}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 3	E_3 / $c_{\varepsilon 3}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 4	E_4 / $c_{\varepsilon 4}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
E or c_ε for LZ sublyr 5	E_5 / $c_{\varepsilon 5}$	E (ksf) or c_ε	2000	2000	2000	2000	2000	2000	2000
Initial stress for sublyr 1 (ksf)	P'_{o1}		1.262	1.262	1.262	1.262	1.262	1.262	1.262
Initial stress for sublyr 2 (ksf)	P'_{o2}		1.464	1.464	1.464	1.522	1.522	1.550	1.550
Initial stress for sublyr 3 (ksf)	P'_{o3}		1.522	1.522	1.522	1.637	1.637	1.723	1.838
Initial stress for sublyr 4 (ksf)	P'_{o4}		1.522	1.522	1.522	1.637	1.637	1.752	2.040
Initial stress for sublyr 5 (ksf)	P'_{o5}		1.522	1.522	1.522	1.637	1.637	1.752	2.098
Ftg stress on sublyr 1 (ksf)	ΔP1	q*I	0.70	0.93	1.16	1.12	1.34	1.29	0.95
Ftg stress on sublyr 2 (ksf)	ΔP2	q*I	0.47	0.62	0.78	0.69	0.82	0.77	0.59
Ftg stress on sublyr 3 (ksf)	ΔP3	q*I	0.42	0.56	0.70	0.57	0.68	0.59	0.40
Ftg stress on sublyr 4 (ksf)	ΔP4	q*I	0.42	0.56	0.70	0.57	0.68	0.56	0.31
Ftg stress on sublyr 5 (ksf)	ΔP5	q*I	0.42	0.56	0.70	0.57	0.68	0.56	0.29
Sett. of LZ sublayer 1 (in)	s_{lz1}	DP1*Hlz1/E1	0.05	0.07	0.09	0.08	0.10	0.10	0.07
Sett. of LZ sublayer 2 (in)	s_{lz2}	DP2*Hlz2/E2	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Sett. of LZ sublayer 3 (in)	s_{lz3}	DP3*Hlz3/E3	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Sett. of LZ sublayer 4 (in)	s_{lz4}	DP4*Hlz4/E4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sett. of LZ sublayer 5 (in)	s_{lz5}	DP5*Hlz5/E5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total lower zone sett. (in)	s_{lz}	$s_{lz1}+s_{lz2}+s_{lz3}+s_{lz4}+s_{lz5}$	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total UZ + LZ settlement (in)	s		0.5	0.5	0.6	0.6	0.6	0.6	0.4

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Hadi Tabatabaee
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GEOPIER® Foundation Company

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RECTANGULAR FOOTINGS
Version 3.0.6 August 2013

Project: **Dana Point Harbor Parking Structure**
No.: GLA-113
Engnr: AMB
Date: 12/6/2019

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
RAP diameter (in)	d	24
Depth to groundwater (ft)	dgw	5
Total unit weight of soil (pcf)	g	120
Soil frict. angle (degr)	f	26
Max. hor. pressure (psf)	pmax	2500
From Table 4.2:		
RAP cell cap. (kips)	Qcell	105
Footing bearing press. (ksf)	qall	7
RAP stiffn. modulus (pci)	kg	300
Soil stiffness modulus (pci)	km	38

TOP OF PIER STRESS - RECTANGULAR FOOTINGS

Parameter	Symb	Equation	F10x11	F10x30	F24x32				
Max Column load (kips)	P		93	1050	3150				
Selected footing width (ft)	B		10.00	10.00	24.00				
Required footing length (ft)	Lr		1.33	15.00	18.75				
Selected footing length (ft)	L		11.00	30.00	32.00				
Footing bearing pressure	q	P/(B*L)	0.85	3.50	4.10				
Required No. RAP elems	Nr	P/Qcell	0.9	10.0	30.0				
Selected No. RAP elems	N		3	10	30				
Area replacement ratio	Ra	N*Ag/(B*L)	0.086	0.105	0.123				
Stiffness ratio	Rs	kg/km	7.9	7.9	7.9				
Stress at top of GP (ksf)	qg	q*Rs/(Rs*Ra-Ra+1)	4.20	16.05	17.54				
Load at top of GP (kips)	Qg	qg*Ag	13.2	50.4	55.1				

SHAFT LENGTH REQUIREMENTS

Parameter	Symb	Equation	F10x11	F10x30	F24x32				
Depth of Embedment	Df		3.0	3.0	3.0				
Trial shaft length (ft)	Hs		9.0	9.0	9.0				
Drill depth (ft)	Hdrill	Df+Hs	12	12	12				

INPUT PARAMETER VALUES:

Upper Zone Elastic Parameters		
Parameter	Sym	Val
Pier Modulus Layer 1 (ksf)	Eg1	
Pier Modulus Layer 2 (ksf)	Eg2	
Pier Modulus Layer 3 (ksf)	Eg3	
Pier Modulus Layer 4 (ksf)	Eg4	
Pier Modulus Layer 5 (ksf)	Eg5	
Soil Modulus Layer 1 (ksf)	Em1	
Soil Modulus Layer 2 (ksf)	Em2	
Soil Modulus Layer 3 (ksf)	Em3	
Soil Modulus Layer 4 (ksf)	Em4	
Soil Modulus Layer 5 (ksf)	Em5	

UPPER ZONE SETTLEMENT - RECTANGULAR FOOTINGS

Parameter	**Symb**	Equation							
UZ Settlement Approach		1-Stiffness, 2-Modulus	1	1	1	1	1	1	1
Thickness of UZ sublayer 1(ft)	H_{uz1}								
Thickness of UZ sublayer 2 (ft)	H_{uz2}								
Thickness of UZ sublayer 3 (ft)	H_{uz3}								
Thickness of UZ sublayer 4 (ft)	H_{uz4}								
Thickness of UZ sublayer 5 (ft)	H_{uz5}								
Total UZ Thickness OK?		Huz = Hs +d							
Composite Modulus Layer 1 (ksf)	E_{comp1}	Eg1Ra + Em1(1-Ra)							
Composite Modulus Layer 2 (ksf)	E_{comp2}	Eg2Ra + Em2(1-Ra)							
Composite Modulus Layer 3 (ksf)	E_{comp3}	Eg3Ra + Em3(1-Ra)							
Composite Modulus Layer 4 (ksf)	E_{comp4}	Eg4Ra + Em4(1-Ra)							
Composite Modulus Layer 5 (ksf)	E_{comp5}	Eg5Ra + Em5(1-Ra)							
Sett. of UZ sublayer 1 (in)	s_{uz1}	qg/kg or $q^*I\sigma$-vag*H/Ecomp	0.10	0.37	0.41				
Sett. of UZ sublayer 2 (in)	s_{uz2}	$q^*I\sigma\text{-}2^*H_{uz2}/E_{comp2}$	N/A	N/A	N/A				
Sett. of UZ sublayer 3 (in)	s_{uz3}	$q^*I\sigma\text{-}3^*H_{uz3}/E_{comp3}$	N/A	N/A	N/A				
Sett. of UZ sublayer 4 (in)	s_{uz4}	$q^*I\sigma\text{-}4^*H_{uz4}/E_{comp4}$	N/A	N/A	N/A				
Sett. of UZ sublayer 5 (in)	s_{uz5}	$q^*I\sigma\text{-}5^*H_{uz5}/E_{comp5}$	N/A	N/A	N/A				
Total Upper Zone Settlement (in)	s_{uz}	$s_{uz1}+s_{uz2}+s_{uz3}+s_{uz4}+s_{uz5}$	0.10	0.37	0.41				

INPUT PARAMETER VALUES:

Parameter	Symb	Val.
Allowable end-bearing (kips)	Qeb	0.0
E or c_ε for LZ sublyr 1	$E_1 / c_{\varepsilon1}$	800
E or c_ε for LZ sublyr 2	$E_2 / c_{\varepsilon2}$	2000
E or c_ε for LZ sublyr 3	$E_3 / c_{\varepsilon3}$	2000
E or c_ε for LZ sublyr 4	$E_4 / c_{\varepsilon4}$	2000
E or c_ε for LZ sublyr 5	$E_5 / c_{\varepsilon5}$	2000
Calc. settlement to X*B	X	2

LOWER ZONE SETTLEMENTS

Parameter	Symb	Equation	F10x11	F10x30	F24x32				
Dpth to bottm of LZ from ftg (ft)	X*B	X*Beq	21.0	34.6	55.4				
Upper zone thickness (ft)	H_{uz}	Hs+d	11.00	11.00	11.00				
Lower zone thickness (ft)	H_{lz}	H2b-Hlz	10	23.7	44.5				
Thickness of LZ sublayer 1(ft)	H_{lz1}		5	5	5				
Thickness of LZ sublayer 2 (ft)	H_{lz2}		5	5	20				
Thickness of LZ sublayer 3 (ft)	H_{lz3}			5	19.5				
Thickness of LZ sublayer 4 (ft)	H_{lz4}			5					
Thickness of LZ sublayer 5 (ft)	H_{lz5}			3.7					
Total thickness ok?			**ok**	**ok**	**ok**				
E or c_ε for LZ sublyr 1	$E_1 / c_{\varepsilon1}$	E (ksf) or c_ε	800	800	800				
E or c_ε for LZ sublyr 2	$E_2 / c_{\varepsilon2}$	E (ksf) or c_ε	2000	2000	2000				
E or c_ε for LZ sublyr 3	$E_3 / c_{\varepsilon3}$	E (ksf) or c_ε	2000	2000	2000				
E or c_ε for LZ sublyr 4	$E_4 / c_{\varepsilon4}$	E (ksf) or c_ε	2000	2000	2000				
E or c_ε for LZ sublyr 5	$E_5 / c_{\varepsilon5}$	E (ksf) or c_ε	2000	2000	2000				
Initial stress for sublyr 1 (ksf)	P'_{o1}		1.262	1.262	1.262				
Initial stress for sublyr 2 (ksf)	P'_{o2}		1.550	1.550	1.982				
Initial stress for sublyr 3 (ksf)	P'_{o3}		1.694	1.838	3.120				
Initial stress for sublyr 4 (ksf)	P'_{o4}		1.694	2.126	3.682				
Initial stress for sublyr 5 (ksf)	P'_{o5}		1.694	2.377	3.682				
Ftg stress on sublyr 1 (ksf)	$\Delta P1$	q*I	0.19	1.63	2.94				
Ftg stress on sublyr 2 (ksf)	$\Delta P2$	q*I	0.11	1.08	1.51				
Ftg stress on sublyr 3 (ksf)	$\Delta P3$	q*I	0.09	0.74	0.62				
Ftg stress on sublyr 4 (ksf)	$\Delta P4$	q*I	0.09	0.53	0.44				
Ftg stress on sublyr 5 (ksf)	$\Delta P5$	q*I	0.09	0.42	0.44				
Sett. of LZ sublayer 1 (in)	s_{lz1}	DP1*Hlz1/E1	0.01	0.12	0.22				
Sett. of LZ sublayer 2 (in)	s_{lz2}	DP2*Hlz2/E2	0.00	0.03	0.18				
Sett. of LZ sublayer 3 (in)	s_{lz3}	DP3*Hlz3/E3	0.00	0.02	0.07				
Sett. of LZ sublayer 4 (in)	s_{lz4}	DP4*Hlz4/E4	0.00	0.02	0.00				
Sett. of LZ sublayer 5 (in)	s_{lz5}	DP5*Hlz5/E5	0.00	0.01	0.00				
Total lower zone sett. (in)	s_{lz}	$s_{lz1}+s_{lz2}+s_{lz3}+s_{lz4}+s_{lz5}$	0.0	0.2	0.5				
Total UZ + LZ settlement (in)	s		0.1	0.6	0.9				

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Western Ground Improvement, Inc.
2372 Morse Ave
Suite 504
Irvine, CA 92614

www.westerngroundimprovement.com

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Hadi Tabatabaee
BUILDING OFFICIAL

February 11, 2020

Mr. Dave Atkinson
GMU Geotechnical, Inc.
23241 Arroyo Vista
Rancho Santa Margarita, California 92688

Re: Quality Control Package for a *Geopier®* Foundation System
Dana Point Harbor Parking Structure
Dana Point, California
GFC Project No.: GLA-113

Dear Mr. Atkinson,

Geopier Foundation Company, Inc. has completed the Geopier® foundation design for the above project. The following documents are included herein:

- Geopier Quality Control Package

We are pleased to have provided you with our design services. If you have any questions, please contact this office.

Sincerely,
Western Ground Improvement, Inc.

REGISTERED PROFESSIONAL ENGINEER
KENNETH K. HOEVELKAMP
C 67415
EXP. 12/20
CIVIL
STATE OF CALIFORNIA

2/11/20

Ken Hoevelkamp, P.E.
Principal Engineer

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Hadi Tabatabaee
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QUALITY CONTROL PACKAGE FOR GEOPIER FOUNDATIONS
(Copy to be provided to Owner's QA Representative)

Project:	**Dana Point Harbor Parking Structure** **Dana Point, California**
Project Number:	**GLA-113**
Geopier Designer:	**Ken Hoevelkamp, P.E.**
Mobile:	**949.677.6553**
E-Mail:	**ken@westerngroundimprovement.com**
Geotechnical Engineer:	**GMU Geotechnical, Inc.**
Contact:	**Dave Atkinson**
Phone:	**949.546.0085**
Structural Engineer:	**Culp and Tanner**
Contact:	**Rory Rottshalk**
Phone:	**530.895.3518**
Referenced Drawings:	**S2.01**
Date of Drawings:	**12/03/19**

Anticipated Geotechnical Conditions:

The subsurface conditions generally consist of soft to very stiff lean clay fill and medium dense to very dense silty sand fill underlain by medium stiff to very stiff lean clay and medium dense to very dense sand overlying sandstone and siltstone (Capistrano Formation). Groundwater was encountered 12 to 17 feet below existing grade.

Potential Anomalies:

None.

Materials to be Encountered at Bottom of Shaft:

Medium stiff to very stiff clay and/or medium dense to very dense sand.

Other Items:

Piers should completely penetrate the fill.

ATTACHMENTS – **GEOTECHNICAL INFORMATION**
GEOPIER TEST SCHEDULES

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

GEOTECHNICAL INFORMATION

The attached boring logs have been prepared by others and are included solely for reference purposes. The boring logs should be used for information only and are not intended to represent geotechnical recommendations for this project. The project geotechnical report should be reviewed in its entirety for more information.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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OC Development Services
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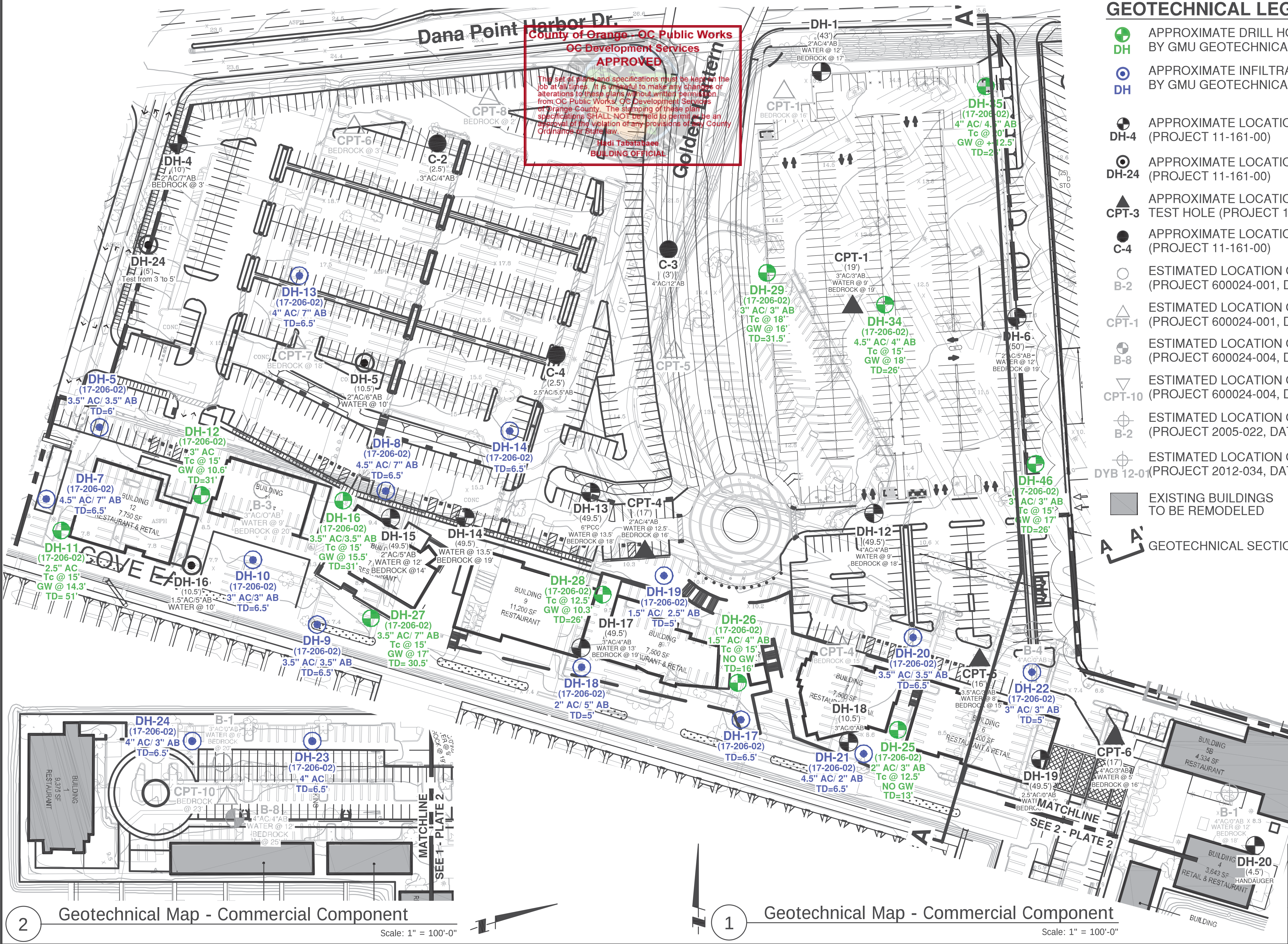
Hadi Tabatabaee
BUILDING OFFICIAL



2 Geotechnical Map - Commercial Component
Scale: 1" = 100'-0"

1 Geotechnical Map - Commercial Component
Scale: 1" = 100'-0"

GEOTECHNICAL LEGEND

DH	APPROXIMATE DRILL HOLE TEST LOCATIONS BY GMU GEOTECHNICAL, INC., PROJECT 17-206-02
DH	APPROXIMATE INFILTRATION TEST LOCATIONS BY GMU GEOTECHNICAL, INC., PROJECT NO. 17-206-02
DH-4	APPROXIMATE LOCATION OF GMU AUGER DRILL HOLE (PROJECT 11-161-00)
DH-24	APPROXIMATE LOCATION OF GMU INFILTRATION TESTS (PROJECT 11-161-00)
CPT-3	APPROXIMATE LOCATION OF GMU CONE PENETRATION TEST HOLE (PROJECT 11-161-00)
C-4	APPROXIMATE LOCATION OF GMU ASPHALT CORE HOLE (PROJECT 11-161-00)
B-2	ESTIMATED LOCATION OF PREVIOUS BORING BY LEIGHTON (PROJECT 600024-001, DATED 12/3/02)
CPT-1	ESTIMATED LOCATION OF PREVIOUS CPT BY LEIGHTON (PROJECT 600024-001, DATED 12/3/02)
B-8	ESTIMATED LOCATION OF PREVIOUS BORING BY LEIGHTON (PROJECT 600024-004, DATED 12/6/07)
CPT-10	ESTIMATED LOCATION OF PREVIOUS CPT BY LEIGHTON (PROJECT 600024-004, DATED 12/6/07)
B-2	ESTIMATED LOCATION OF PREVIOUS BORING BY DIAZ YOURMAN (PROJECT 2005-022, DATED 11/29/05)
DYB 12-01	ESTIMATED LOCATION OF PREVIOUS BORING BY DIAZ YOURMAN (PROJECT 2012-034, DATED 10/05/12)
	EXISTING BUILDINGS TO BE REMODELED
A A'	GEOTECHNICAL SECTION

0 100'

Geotechnical Map
Commercial Component
Dana Point Harbor Partners, LLC.

GMU GEOTECHNICAL, INC.

Date:	December 13, 2018	Plate
Project No.:	17-206-02	2

DRAWING: q:\2017\17-206-02\dwg\1720602_plate 2_geo map.dwg PLOTTED: 12/12/2018 4:08 PM BY: Jmeza

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-29

Date(s) Drilled	9/13/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	31.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation (ft MSL)	13.3
Groundwater Depth [Elevation], feet	16.0 [-2.7]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 3 inches)						
			ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 3 inches)						
					SILTY SAND (SM), brown gray, yellowish brown, slightly moist, medium dense, medium grained, some gravel						
10			Subrounded gravel up to 4"				5 10 12	140			
	5		Subrounded gravel 1 to 6"		SANDY CLAY (CL), dark brown, moist, hard, fine to medium grained, some gravel		50/0.5"	140	6	108	
5			Rounded to subrounded gravel and cobbles up to 7"		brownish gray, moist, stiff		3 4 5	140			
	10		Minor fine grained sand				4 6 7	140	29	92	
0			Scattered gravel		gray and orange brown, moist, firm to stiff, fine grained sand		3 4 4	140			
			MARINE DEPOSITS (Qm)		SANDY CLAY (CL); gray, moist, firm, medium grained sand						
	15		Rounded to subrounded gravel up to 3"		∇		2 3 4	140	23	100	
-5			CAPISTRANO FORMATION (Tc)		SILTSTONE (ML), gray, moist, hard overlying SANDSTONE (SP), orange brown and dark orange brown, wet, very dense, fine to medium grained						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

GMU GEOTECHNICAL, INC.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

Project: Dana Point Harbor, Commercial Component	# Log of Drill Hole DH-29
Project Location: Dana Point Harbor Drive	
Project Number: 17-206-02	Sheet 2 of 2

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BUILDING OFFICIAL

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
							12 31 50/5"	140			
-10											
	25				Interbedded SILTSTONE and SANDSTONE (SP and ML), pale brown, dark grayish brown and gray, moist, very dense/hard, fine grained		50/4"	140	21	106	
-15											
	30		Siltstone is thinly bedded with white mottles,		SANDSTONE (SP), gray, wet, dense, fine grained, overlying SILTSTONE (ML), dark brownish black, moist, very stiff		16 16 21	140			
					Total Depth = 31.5 feet Groundwater encountered at 16 feet						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

GMU GEOTECHNICAL, INC.

Drill Hole DH-29

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-34

Date(s) Drilled	9/14/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	26.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	11.3
Groundwater Depth [Elevation], feet	18.0 [-6.7]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE (SAMPLE DATA)	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	MOISTURE CONTENT, % (TEST DATA)	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0				Asphalt Concrete (approximately 4.5 inches)						
10			**ARTIFICIAL FILL (Qaf)**		Aggregate Base (approximately 4 inches) SILTY SAND with GRAVEL (SM), brown, moist, medium dense, fine grained						
							3 6 6	140			
	5				SANDY CLAY (CL), grayish brown, moist, very stiff		20 26 12	140	19		
5											
			Scattered gravel up to 4"		brown, moist, fine to medium grained sand		3 8 9	140			
	10		**MARINE DEPOSITS (Qm)** orange brown staining		SANDY CLAY (CL); gray, slightly moist, stiff to very stiff, medium grained sand		8 11 14	140	13		
0											
					moist, very stiff, fine grained sand		6 8 10	140			
	15		**CAPISTRANO FORMATION (Tc)** Scattered subrounded gravel up to 4"		SANDSTONE (SP), gray, wet, medium dense, medium to fine grained		3 6 8	140			
-5											
					∇						

GMU GEOTECHNICAL, INC.

Drill Hole DH-34

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-34

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Gray and yellowish gray				24 60	140			
-10											
	25		Sand is fine grained				30 50/4"	140	23	101	
					Total Depth = 26 feet Groundwater encountered at 18 feet						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

GMU GEOTECHNICAL, INC.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-35

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OC Development Services
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BUILDING OFFICIAL

Date(s) Drilled	9/14/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	26.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation (ft MSL)	11.3
Groundwater Depth [Elevation], feet	12.5 [-1.2]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 4 inches)						
10			**ARTIFICIAL FILL (Qaf)**		Aggregate Base (approximately 4.5 inches) SANDY CLAY (CL), brown and grayish brown, moist, stiff, fine grained, some gravel		3 5 12	140			
	5		Gravel up to 4"		brownish gray, moist, stiff		3 6 9	140	27	92	
5			Orange brown staining, sand is fine grained		gray		3 4 6	140			
	10				gray and brown, moist, fine grained sand		5 7 11	140	22	102	
0					gray, wet, soft to firm, fine grained sand ▽		1 2 2	140			
-5	15		**MARINE DEPOSITS (Qm)**		SAND (SP), gray and pale gray, wet, dense, coarse to medium grained overlying SILT (ML), dark gray, very stiff		5 11 16	140	13	113	

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

GMU GEOTECHNICAL, INC.

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-35

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-10			**CAPISTRANO FORMATION (Tc)**		Interbedded SILTSTONE and SANDSTONE (SP and ML), gray and dark gray, moist, very dense/hard, fine grained		7 22 22	140			
	25		Thinly bedded, rare white mottles		SILTSTONE (ML), dark gray, moist, very dense/hard		17 50/4"	140	21	105	
					Total Depth = 26 feet Groundwater encountered at 12.5 feet						

GMU GEOTECHNICAL, INC.

Drill Hole DH-35

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-46

Date(s) Drilled	9/18/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	26.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	8.3
Groundwater Depth [Elevation], feet	17.0 [-8.7]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0				Asphalt Concrete (approximately 3 inches)						
			ARTIFICIAL FILL (Qaf) Cobbles up to 8" in spoils pile		Aggregate Base (approximately 3 inches) SILTY SAND (SM), brown and pale brown, moist, medium dense, fine grained	Bulk					
5			Scattered gravel			SPT	5 7 11	140			
	5					Cal-mod	5 14 20	140	11	118	
					CLAYEY SAND (SC), brown, moist, dense, fine to medium grained						
0			Rare gravel up to 1"		brown and orange brown, moist, medium dense, fine grained	SPT	9 9 9	140			
	10				brownish gray, wet, dense, fine grained	Cal-mod	7 11 17	140	14	114	
-5			**MARINE DEPOSITS (Qm)**		SAND (SP), gray, brownish gray and orange brown, moist, very dense, fine grained	SPT	4 23 35	140			
	15		**CAPISTRANO FORMATION (Tc)** Minor siltstone, subtle bedding		SANDSTONE (SP), grayish brown, wet, very dense, medium to fine grained	Cal-mod	33 50/4"	140	16	116	
-10					∇						

GMU GEOTECHNICAL, INC.

Drill Hole DH-46

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-46

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
					SANDSTONE (SP), pale gray and pale yellowish gray, wet, very dense, fine to medium grained		16 37 50	140			
-15	25						50/5"	140			
					Total Depth = 26 feet Groundwater encountered at 17 feet						

Drill Hole DH-46

GMU GEOTECHNICAL, INC.

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 4/4/19

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

GEOPIER TEST SCHEDULES

GEOPIER® **Foundation Company**

GEOPIER®

Project Name: Dana Point Harbor Parking Structure
Project Location: Dana Point, Ca
Project Number: GLA-113

Geopier® Modulus Test Schedule

Maximum Geopier Design Stress: 22,010 psf
Geopier Element Diameter: 24 in.
Design Modulus: 300 pci

Modulus Test Location: Near Boring DH-35
Test Geopier Element Shaft Length: 9 ft
Concrete Cap Thickness: 2 ft
Total Drill Depth 11 ft

Load No.	Ram Load, (kips)	Geopier Element Stress, (psf)	Percent of Design Stress	Minimum Duration	Maximum Duration	Remarks
	3.46	1,101	5.0%	N/A	N/A	seating load
1	11.53	3,669	16.7%	15 min	60 min	
2	23.05	7,336	33.3%	15 min	60 min	
3	34.57	11,005	50.0%	15 min	60 min	
4	46.10	14,674	66.7%	15 min	60 min	
5	57.62	18,341	83.3%	15 min	60 min	
6	69.15	22,010	100.0%	15 min	60 min	
7	80.65	25,672	116.6%	60 min	240 min	
8	92.19	29,346	133.3%	15 min	60 min	
9	103.72	33,015	150.0%	15 min	60 min	
10	69.15	22,010	100.0%	N/A	N/A	rebound, unload
11	45.64	14,527	66.0%	N/A	N/A	rebound, unload
12	22.82	7,263	33.0%	N/A	N/A	rebound, unload
13	3.46	1,101	5.0%	N/A	N/A	rebound, unload

Notes:

1 - The Geopier element to be used in the modulus load testing should be installed in a manner similar to production, at least 4 days prior to testing, so that pore-pressures have adequate time to dissipate.

2 - The modulus load test shall be performed to a stress not less than 150% of the design maximum top-of-pier stress indicated in the Geopier Design Calculations.

3 - The modulus load test Geopier element shall be installed to a depth of 11 feet below the ground surface with a 2-foot thick unreinforced concrete leveling pad. The modulus load test Geopier shall penetrate fill.

4 - A telltale shall be installed in the bottom one-third of the tested Geopier element. Telltale deflections shall be monitored concurrent with top of Geopier deflections during the modulus load test.

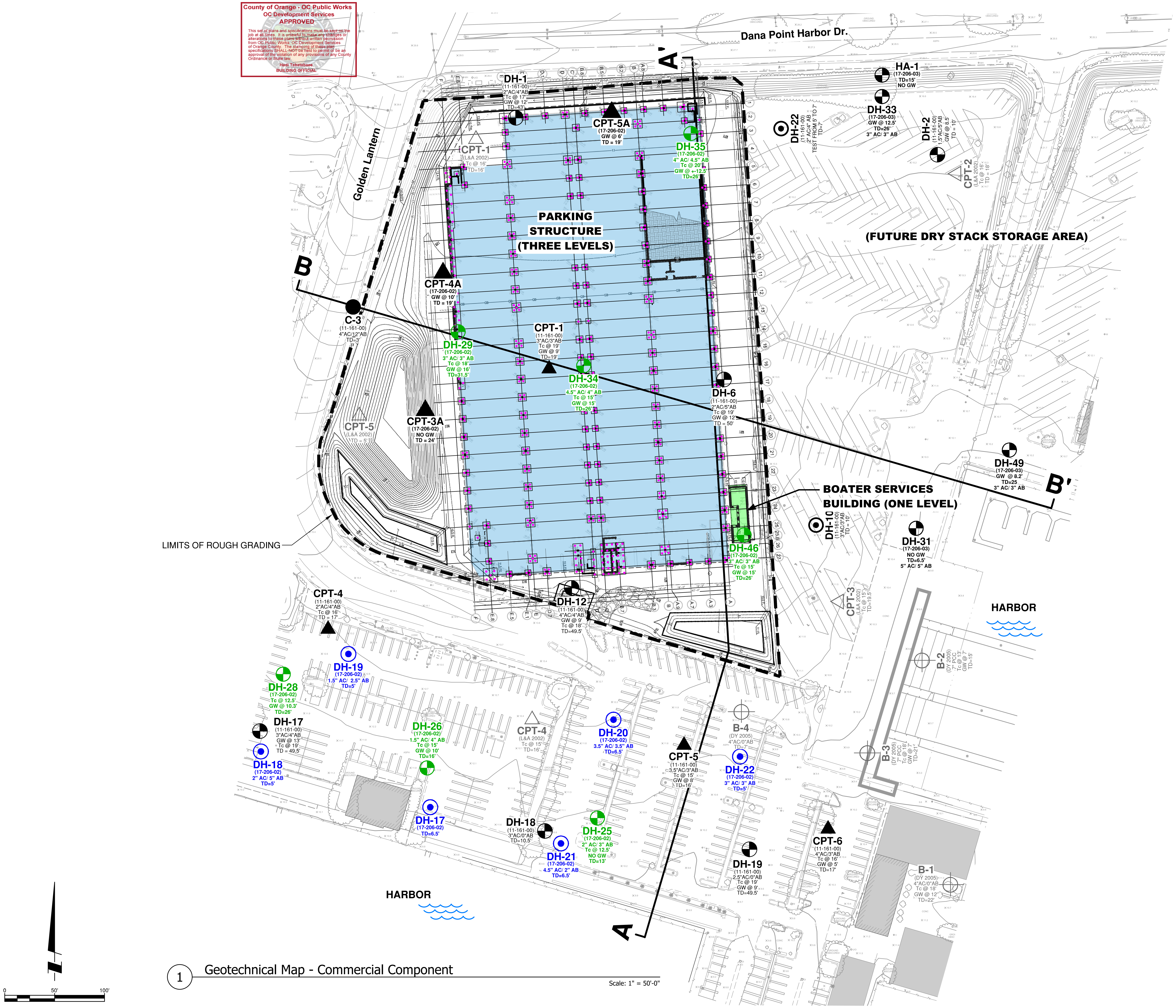
5 - The modulus load test setup shall be as shown on Geopier Construction Drawing GP0.1. Helical anchors should be installed in accordance with manufacturers specifications.

6 - A representative of the owner's geotechnical consultant should be present to witness the load test.

APPENDIX D

Updated GMU Geotechnical Map – Plate 2

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021



1 Geotechnical Map - Commercial Component

Scale: 1" = 50'-0"

GEOTECHNICAL LEGEND

- DH — APPROXIMATE DRILL HOLE LOCATIONS BY GMU GEOTECHNICAL, INC., PROJECT 17-206-02 AND 17-206-03
- HA-1 — APPROXIMATE LOCATION OF GMU HAND AUGER LOCATION (PROJECT 17-206-03)
- DH — APPROXIMATE INFILTRATION TEST LOCATIONS BY GMU GEOTECHNICAL, INC., PROJECT NO. 17-206-02
- DH-4 — APPROXIMATE LOCATION OF GMU DRILL HOLE LOCATIONS (PROJECT 11-161-00)
- DH-24 — APPROXIMATE LOCATION OF GMU INFILTRATION TESTS (PROJECT 11-161-00)
- CPT-3 — APPROXIMATE LOCATION OF GMU CONE PENETRATION TEST HOLE (PROJECT 11-161-00)
- C-4 — APPROXIMATE LOCATION OF GMU ASPHALT CORE HOLE (PROJECT 11-161-00)
- CPT-1 — ESTIMATED LOCATION OF PREVIOUS CPT BY LEIGHTON (PROJECT 600024-001, DATED 12/3/02)
- B-2 — ESTIMATED LOCATION OF PREVIOUS BORING BY DIAZ YOURMAN (PROJECT 2005-022, DATED 11/29/05)
- PROPOSED THREE LEVEL PARKING STRUCTURE
- PROPOSED ONE LEVEL BOATER SERVICE BUILDING
- EXISTING BUILDINGS
- PROPOSED GEOPIER COLUMNS
- B B' — GEOTECHNICAL SECTION
- LIMITS OF ROUGH GRADING

GW — DEPTH BELOW GROUND SURFACE MEASURED AT TIME OF DRILLING

Geotechnical Map
Parking Structure for Commercial Component
Dana Point Harbor Partners, LLC.

GMU	Date: February 11, 2020	Plate 2
	Project No.: 17-206-02	

APPENDIX E

Updated GMU Geotechnical Sections – Plate 3

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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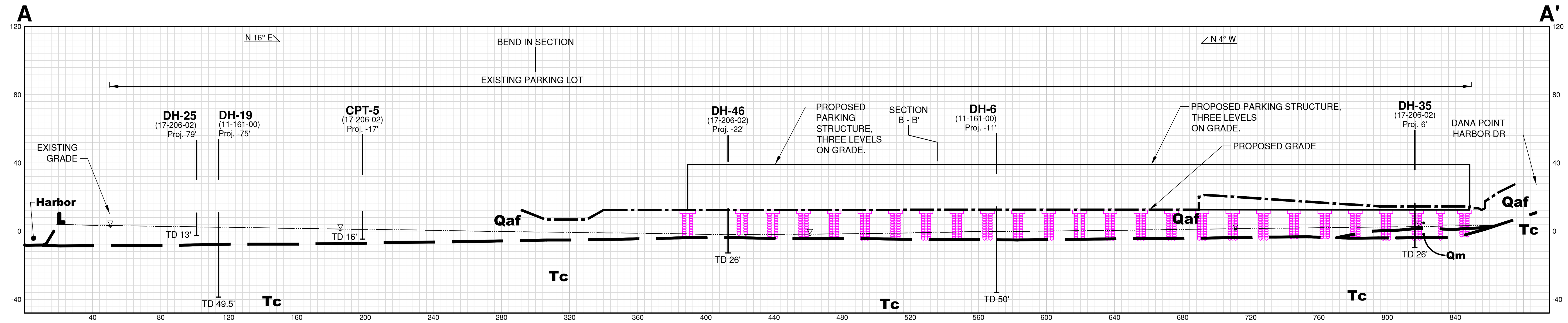
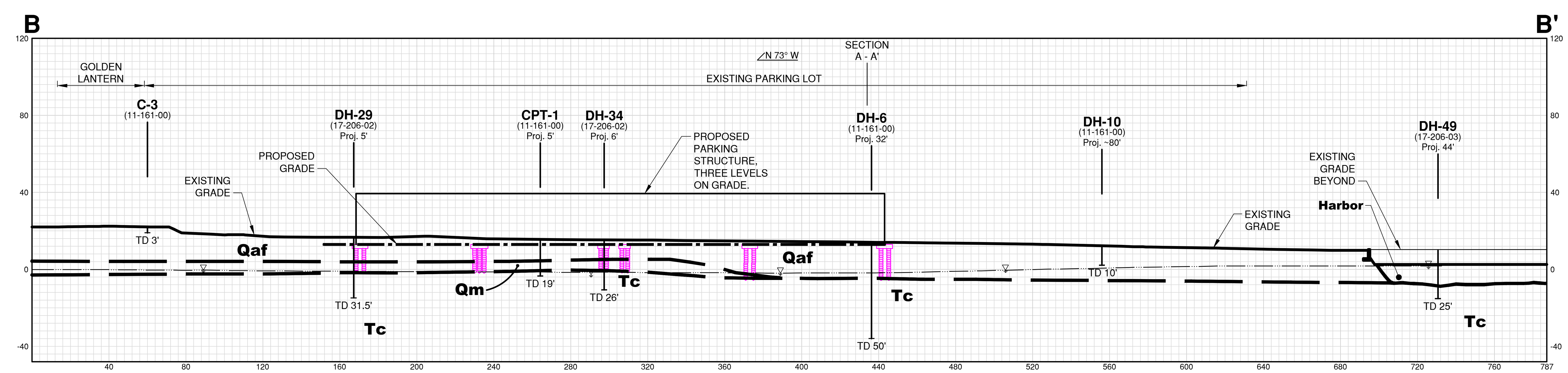
Hadi Tabatabaee
BUILDING OFFICIAL





LEGEND

▽ INTERPRETED GROUNDWATER LEVELS CONSIDERING GEOLOGIC MATERIALS AND GEOTECHNICAL LAB DATA

PROPOSED GEOPIER ELEMENTS

0 40' 80'

DRAWING: q:\2017\17-206-02\dwg\1720602_plate 3_geo section.dwg PLOTTED: 2/10/2020 10:44 AM BY: Jmezo

Geotechnical Sections

Date:	February 10, 2020	Plate 3
Project No.:	17-206-02	

January 22, 2020

Mr. Bryon Ward, President
DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES
1100 Newport Center Drive, Suite 200
Newport Beach, CA 92660

GMU Project 17-206-02
Permit No. GRD19-0177

Subject: Response to County of Orange Geotechnical Review Comments Pertaining to Rough Grading, Parking Structure, and Boater Services Development Buildings, Dana Point Harbor Revitalization, City of Dana Point, California

References: Listed on Page 7

Dear Mr. Ward:

This correspondence presents our response to the reference (1) County of Orange Review Comments, attached to this response as Appendix A, pertaining to the submittal of the rough grading plans and details for the subject site.

RESPONSES TO GEOTECHNICAL COMMENTS

RESPONSE TO COMMENT 1.001

We have reviewed the latest reference (3) Submittal No. 2 rough grading plans and details for the subject site prepared by Tait Engineering. Based on our review, the subject rough grading plans and details have been prepared in accordance with the parameters and recommendations of our reference (2) geotechnical foundation investigation report and are considered acceptable from a geotechnical point of view. Therefore, no additional recommendations are required from a geotechnical perspective. The finalized plans will be signed/stamped by the geotechnical consultant prior to permit issuance.

RESPONSE TO COMMENT 1.002

Acknowledged. The precise grading plans and building plans will be reviewed from a geotechnical perspective and signed. Additional comments will be provided as necessary.

RESPONSE TO COMMENT 1.003

Questions with regards to the buildings are deferred to the building plan review. However, for clarification, the following explanation is provided:

In the submitted reference (2) report, Item 8 on Page 13 contains a typographical error. The final statement "*will need to be founded on Geopiers, the Boater services Building*" should be eliminated. The Geopiers will be constructed directly beneath the Parking Structure foundations only, not under the structurally separate Boater Services Building. There is a separation of 5-feet minimum between the Parking Structure and the Boater Services Building shown on Section F-F of Sheet 4 of 6 of the reference (2) rough grading plans.

RESPONSE TO COMMENT 1.004

Questions with regards to the proposed Geopiers are related to foundation support for the parking structure building and hence are deferred to the building plan review. However, the following should be noted:

The Geopier design submittal consisting of calculations and plans as well as our geotechnical review of the Geopier submittal were submitted separately to the County of Orange Building Department in December 2019. We understand that these are yet to be reviewed and separate review comments will be developed by the County. Additional comments or discussion will be provided in a separate response to those comments.

RESPONSE TO COMMENT 1.005

Questions with regards to the proposed Geopiers are related to foundation support for the parking structure building and hence are deferred to the building plan review. However, the following should be noted:

Because Geopier construction will not be done as part of the rough grading, the cross sections do not need to be updated at this time. However, a note has been added to Sheet 3 of 6 of the reference (3) Submittal No. 2 rough grading plans that Geopiers will be required for parking structure building support.

RESPONSE TO COMMENT 1.006

Questions with regards to the proposed Geopiers are related to foundation support for the parking structure building and hence are deferred to the building plan review. However, the following should be noted:

Geopier QA/QC will be performed by Geopier as well as GMU. The Geopier requirements are shown on the Geopier plans. GMU's separate requirements will be addressed as part of the Building plan submittal (i.e., either in the review or as a response to comments).

RESPONSE TO COMMENT 1.007

Questions with regards to the proposed Geopiers are related to foundation support for the parking structure building and hence are deferred to the building plan review. However, the following should be noted:

The Geopier material will consist of CMB and hence should be easily integrated into miscellaneous fills required for precise grading. Alternatively, these materials will be exported off site or stockpiled for future use.

RESPONSE TO COMMENT 1.008

Questions with regards to the proposed Geopiers are related to foundation support for the parking structure building and hence are deferred to the building plan review. However, the following should be noted:

Geopiers are required beneath the parking structure foundations only. Hence there will be no Geopiers outside the footprint of the future parking structure.

RESPONSE TO COMMENT 1.009

Questions with regards to the proposed Geopiers are related to foundation support for the parking structure building and hence are deferred to the building plan review. However, the following should be noted:

The 7 ksf bearing capacity for the Parking Structure footings was determined by Western Ground Improvement, Inc/Geopier Foundation (WGI). The value considers the effect of the Geopiers as well as settlement of the foundations. Calculations are contained in the Geopier submittal.

RESPONSE TO COMMENT 1.010

The site retaining walls are part of the precise grading plans. No walls are planned as part of the rough grading. Consequently, comments for proposed retaining walls are deferred to the precise grading plan review. However, the following should be noted.

See attached the Appendix C for the calculation of the seismic coefficient.

RESPONSE TO COMMENT 1.011

Questions with regards to the proposed Geopiers are related to foundation support for the parking structure building and hence are deferred to the building plan review. However, the following should be noted:

The drilling conditions can be inferred from the material descriptions, boring logs, groundwater discussion, and geotechnical cross sections. All of these have been reviewed and discussed with WGI and they have been incorporated into the Geopier design.

RESPONSE TO COMMENT 1.012

The Capistrano Formation has properties that act more as a stiff soil rather than a bedrock material. Due to these properties, it was determined that using a “soil density/consistency” descriptor was more accurate than using the “bedrock hardness” descriptor. Therefore, the bedrock description on page 5 should have stated that the density/consistency of the bedrock is generally hard to very dense as defined in our soil density/consistency chart included on Plate A-2 (i.e., blow counts greater than 50). It is our opinion that the drill hole logs using the soil density/consistency descriptor is a more accurate depiction of the materials onsite and should not be changed. Additionally, it should be noted that during drilling, discontinuous zones of concreted bedrock were encountered; however, in our experience, these zones will not impact the proposed grading and drilling within the site.

RESPONSE TO COMMENT 1.013

The intention of this recommendation was that all temporary excavations anticipated at this time and shown on the rough grading plans can be made in accordance with Type B soils, but that unanticipated excavations should proceed assuming Type “C” soils until GMU has had the chance to review. It is anticipated that Type “B” soils will be the governing OSHA soil type. It should be noted that our recommendations in our report are a minimum only, and all excavations should meet the minimal safety requirements as set forth by CAL-OSHA.

RESPONSE TO COMMENT 1.014

The description of the proposed Parking Structure on Page 1 of our reference (2) report should have stated that the proposed parking structure is “*partially on-grade*” with the northern half of the structure excavated to 1 level below grade.

RESPONSE TO COMMENT 1.015

Light poles are not a part of rough grading and hence are deferred to the review of the precise grading plans. However, the following should be noted:

The entire site will be removed and recompacted down to a depth of 2 feet below pad grade. This includes the ripping and recompacted surface which typically increases the engineered fill by another 8-12 inches. Given this and the conservativeness of our recommendations for the light poles, it is our opinion that our recommendations do not need to be modified. In addition, additional safety factors are typically added by the structural engineer for the light poles. Following grading, we will review the structural calculations and modify the soils parameters if necessary, based on grading observations.

RESPONSE TO COMMENT 1.016

Page 27 of our reference (2) report under "Additional Considerations" for the Utility Design, typographic errors in the first sentence where it states "*pool improvements*" and in the fourth sentence where it states "utilities connected to the hotel building" are to be corrected to read simply "*improvements" and "utilities connected to the buildings*," respectively.

RESPONSE TO COMMENT 1.017

Cross Section A-A' has been revised to delete the commercial building shown and the proposed desilting basin near the bend in the section has been added. Please see the attached Appendix B for the revised Cross Section A-A'.

Please do not hesitate to contact us if you have any questions regarding this response.

Respectfully submitted,

David R. Atkinson

David R. Atkinson
Project Manager / Senior Engineer

PROFESSIONAL GEOLOGIST KATHRYN M. FARRINGTON No. 2611 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

Katie Farrington, M.Sc., PG, CEG 2611
Senior Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER GREGORY P. SILVER GE 2336 GEOTECHNICAL STATE OF CALIFORNIA

Gregory P. Silver, M.Sc., PE, GE 2336
President / CEO
Principal Geotechnical Engineer

Attachments
- Appendix A – County of Orange Geotechnical Report Review Comments
- Appendix B – Revised Cross Section A-A'
- Appendix C – Earth Pressure Distribution Seismic Loads

(Two (2) wet signature copies and electronic copy submitted)

cc: SMS Architects
Attn: Mr. Brandon Dedmon (electronic copy)

Tindall Consulting
Attn: Mr. John Tindall (electronic copy)

Tait Engineering
Attn: Mr. Jake Vandervis (electronic copy)

Choate Parking Consultants
Attn: Mr. Rick Choate (electronic copy)

dra/17-206-02L GRD19-0177 Dana Point Harbor Parking Structure Geotechnical Report Review Response Letter (1-22-20)

REFERENCES

(1) County of Orange Geotechnical Comments, GRD19-0177 – Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California, First Submittal, submittal date December 6, 2019, plan check date January 6, 2020, prepared by Ryan Rose of OC Public Works.

(2) Our "Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California," dated December 4, 2019 (GMU Project 17-206-02).

(3) "Dana Point Harbor Commercial Core Parking Structure – Submittal No. 2 Rough Grading Plans, 24650 Dana Point Harbor Drive, Dana Point, California 92629," prepared by Tait Engineering, dated January 22, 2020.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Hadi Tabatabaee
BUILDING OFFICIAL

APPENDIX A

County of Orange Geotechnical Report Review Comments

GMU

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Integrity, Accountability, Service, Trust

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PLAN CHECK COMMENTS	
Permit Application No.	GRD19-0177
Plan Check No.	First Submittal-GRD19-0177
Plan Check Date	01-06-2020
Applicant	Erick Marroquin
Submittal Date	12-06-2019

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.001	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	Review the Rough Grading Plans and applicable details submitted to the County that will be utilized during construction of the project. Provide additional recommendations as necessary. The approved grading plans and applicable details must be reviewed and signed/stamped by the geotechnical consultant prior to permit issuance. Note – The currently submitted rough grading plans are incomplete and do not include the recommended ground improvement plans/details. Please coordinate w/project team to ensure the geotechnical ground improve-ment recommendations/details are included on the project grading plans.	Response	Required	
1.002	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	A Precise Grading Permit and Plan and Multiple Building Permits and Plans are required for completion of this project (e.g. parking structure, boater service building, site walls, etc.). Please review when available and provide additional recommendations as necessary. The ap-		Required	

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#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			proved precise grading and building plans and applicable details must be reviewed and signed/stamped by the geotechnical consultant prior to permit issuance.			
1.003	Geotechnical Review- GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	The submitted report dated 12/4/19 (Page 13) states "Based on Conclusions 3-6 above, the fol-lowing remediation will be required: 1) corrective grading beneath the entire site, 2) Geopier ground improvement below the parking structure foundations and 3) use of a WRI foundation system for the Boater Services Building, will need to be founded on Geopiers, the Boater Ser-vices Building". Please provide additional comment/discussion to confirm if the Boater Ser-vices Building is to be founded on Geopiers or not. If so, please provide comment/discussion to confirm the lateral extent of Geopiers beyond the outside edge(s) of the proposed Boater Services Building. Please also provide additional comment/discussion to on the differential settlement potential between Parking Structure and Boaters Service Building for proposed construction method (i.e. with or without Geopiers). Provide additional recommendations as necessary.		Required	
1.004	Geotechnical Review- GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	Provide additional comment/discussion to confirm your complete geotechnical recommenda-tions for design and construction of the proposed ground improvement/Geopier system at the subject site based on your review of the currently submitted project plans. Specifically, please address who will be the designer of the ground improvement/Geopier system (i.e. your		Required	

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			firm or a specialty contractor). Include updated plot plan/map to indicate the location of the proposed Geopiers (i.e. entire building pad w/lateral extension beyond building edges or isolated to foundation elements only). Provide additional recommendations as necessary.	County of Orange - OC Public Works OC Development Services APPROVED This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law. Hadi Tabatabaee BUILDING OFFICIAL		
1.005	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	The Geotechnical Sections in your submitted report(s) should be updated to include the rec-ommended Geopiers (location and depth of installation). Additional Geotechnical Section(s) should also be provided as necessary based on your review of the currently submitted project plans. Provide additional recommendations as necessary.		Required	
1.006	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	Provide additional comment/discussion to confirm your geotechnical QA/QC recommenda-tions for the proposed geopier construction based on your review of the currently submitted (and forthcoming) project plans. Include confirmation of your recommendations for QA/QC during construction (e.g. full-time observation/testing, material quality/spec. confirmation testing, etc.) and post-construction (e.g. CPT soundings, field testing, etc.) prior to pad release for building construction. Provide additional recommendations as necessary.		Required	
1.007	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	The consultant recommends that the top of the Geopiers extend about 6 inches above the Parking Structure spread footing bottom elevations. The consultant also recommends that the subject spread footings be supported on the Geopiers. That means that during the foundation		Required	

#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			subgrade preparation, considerable amount of coarse aggregates including unknown quanti-ties of oversize rocks will be generated while removing the tops of the Geopiers across the Parking Structure pad. The consultant must address how such oversize materials should be handled during construction - whether these should be blended into the excavated soil or dis-carded offsite based on their size.	County of Orange - OC Public Works OC Development Services APPROVED This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law. Hadi Tabatabaee BUILDING OFFICIAL		
1.008	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	The consultant should recommend the lateral extent of Geopier improvements beyond the perimeter of the Parking Structure footprint.		Required	
1.009	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	The consultant should justify the use of a preliminary bearing capacity of 7 ksf for the Parking Structure footings. What is this preliminary value based on? The consultant should provide jus-tifications for this value.		Required	
1.01	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	The consultant recommends a seismic earth pressure of 17 pcf for the site retaining walls. The consultant should explain how they arrived at this earth pressure magnitude.		Required	
1.011	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	The consultant should describe the anticipated drilling conditions that will be encountered during construction of the Geopiers. Geotechnical considerations should be provided for the Geopier construction including drilling difficulty based on bedrock described as hard to very hard, mitigating caving, handling groundwater, casing withdrawal (if used) during ramming, etc.		Required	

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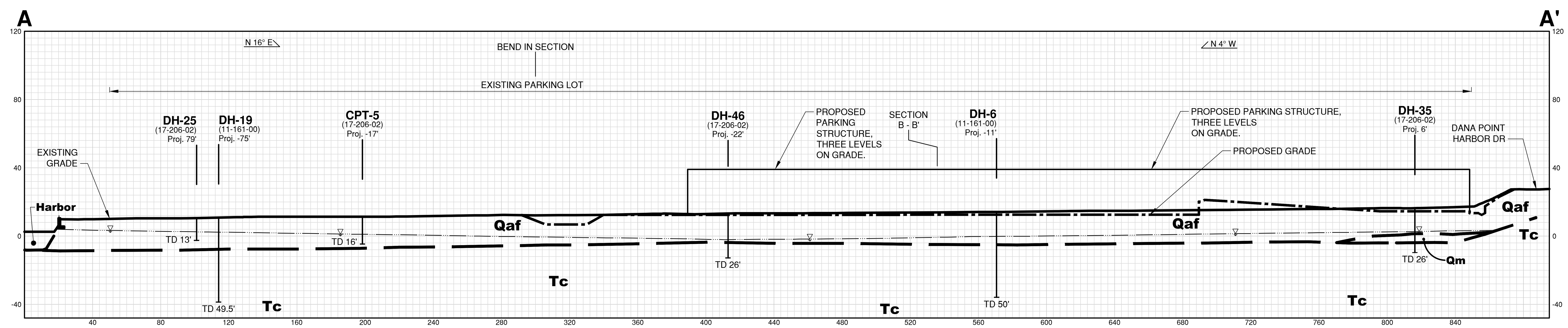
#	Review	Category	Comment	Applicant Response	Status	File Name & Page
1.012	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	On page 12 of the report, the consultant states that soil and bedrock materials can be easily excavated. This is inconsistent with bedrock described as hard to very hard on page 5 of the report, and as defined on Plate A-2, Legend to Logs, for bedrock hardness. Furthermore, the descriptions on the boring logs appear to be using soil density descriptors and not bedrock hardness descriptors in accordance with Plate A-2. Very hard bedrock that scratches with a knife and chips with hammer blows would generally not be drillable by a CME 75 hollow-stem auger drill rig. The logs should be corrected and the bedrock description in the report should be revised, as appropriate.		Required	
1.013	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	The consultant should clarify their recommendations for temporary excavations. On page 17 of the report they state that vertical excavations up to 4 feet are anticipated to be stable. Ver-tical excavations are not allowed for Type C soils per OSHA guidelines.		Required	
1.014	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	On page 1 of the report, the consultant describes the proposed parking structure as an on-grade structure. However, recommendations are provided for parking structure basement re-taining walls, please clarify.		Required	
1.015	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	On page 23 of the report, the consultant states that pole foundations should be at least 4 feet deep. On page 24 they indicate that bearing materials consist of engineered fill approved by GMU. The recommended remedial grading depths for		Required	

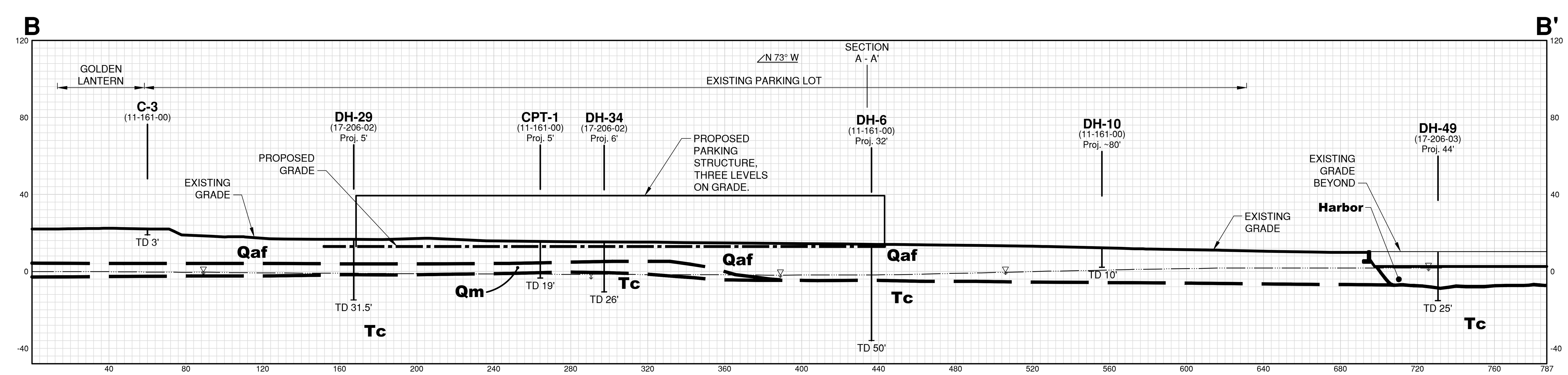
#	Review	Category	Comment	Applicant Response	Status	File Name & Page
			parking areas will not provide 4 feet of engineered fill. Please clarify if deeper localized remedial grading will be performed to the planned depths of the light pole foundations.	County of Orange - OC Public Works OC Development Services APPROVED This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law. Hadi Tabatabaee BUILDING OFFICIAL		
1.016	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	On page 27 of the report, under Additional Considerations for Utility Design, the consultant mentions improvements that are not part of the project (pool, hotel building).		Required	
1.017	Geotechnical Review-GRD19-0177 Ryan Rose	Geotechnical/Geology Check List	Cross Section A-A' depicts a commercial building near projected borings DH-19 and DH-25 that is not shown on the grading plans or Plate 2. The proposed grade line also does not reflect the proposed desilting basin near the bend in section. The cross section should be revised.		Required	
2.001	MPD & C-WQMP Review-GRD19-0177 Jung-Tsun Yean		Show Grading Permit No. GRD19-0177 on the cover page		Required	/GRD19-0177 MPD & C-WQMP (Redlined 12-12-2019).pdf 1.0
2.002	MPD & C-WQMP Review-GRD19-0177 Jung-Tsun Yean		Stamped and singed by the engineer.		Required	/GRD19-0177 MPD & C-WQMP (Redlined 12-12-2019).pdf 1.0
2.003	MPD & C-WQMP Review-GRD19-0177 Jung-Tsun Yean		Submit all Appendixes		Required	/GRD19-0177 MPD & C-WQMP (Redlined 12-12-2019).pdf 4.0

APPENDIX B

Revised Cross Section A-A’

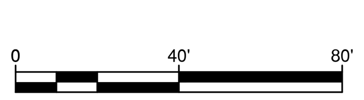
Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021





LEGEND

▽ INTERPRETED GROUNDWATER LEVELS CONSIDERING GEOLOGIC MATERIALS AND GEOTECHNICAL LAB DATA



Geotechnical Sections

Date:	January 22, 2020	Plate
Project No.:	17-206-02	3

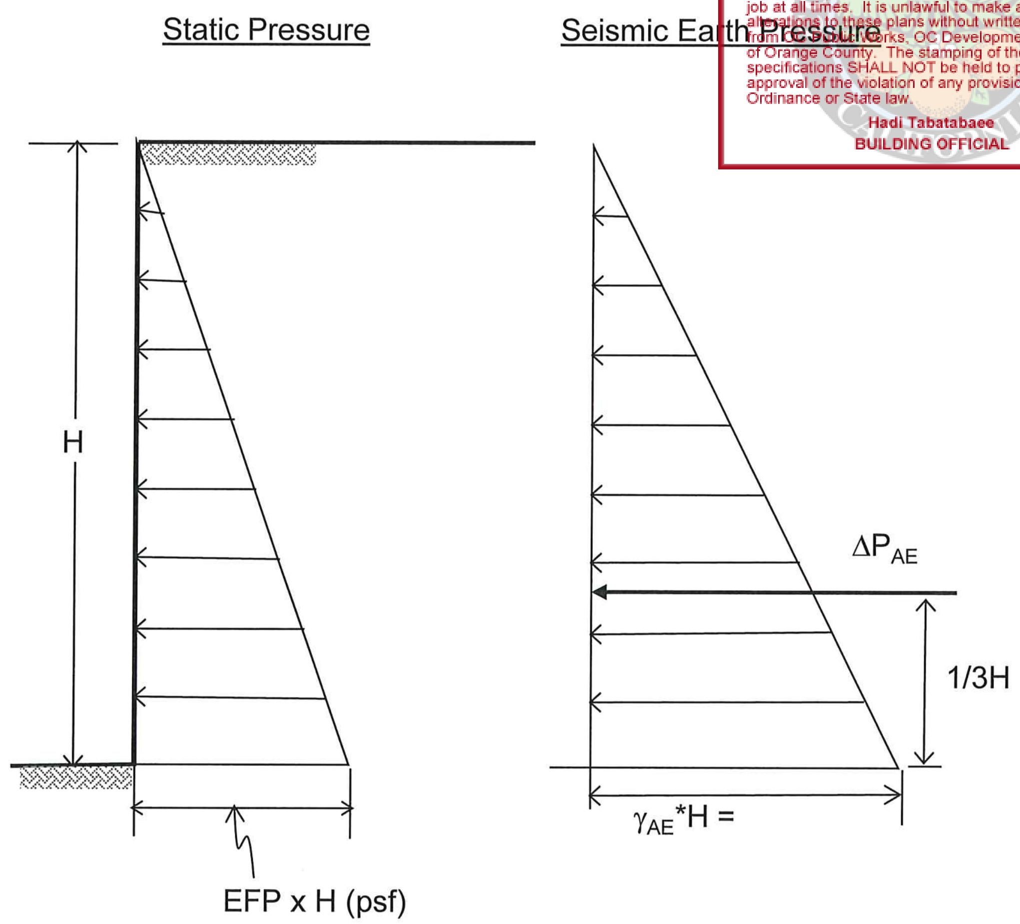
DRAWING: q:\2017\17-206-02\dwg\1720602_plate 3_geo section.dwg PLOTTED: 1/21/2020 9:07 AM BY: Jmeza

APPENDIX C

Earth Pressure Distribution
Seismic Loads

EARTH PRESSURE DISTRIBUTION OF RETAINING WALL

Free Standing (Yielding) Wall



Seismic Earth Pressure Calculations

$\gamma =$	115.0	pcf
$PGA_M =$	0.591	g
$PGA = 2/3 * PGA_M =$	*0.39*	g
$k_h = PGA/2 =$	*0.20*	($k_h >= 0.15$)
$\Delta P_{AE} = 3/8\ k_h\ \gamma\ H^2 =$	*8.5*	H^2
Seismic Pressure, $\gamma_{AE} =$	*17.0*	pcf

Reference: Lew et al. (2010) Seismic Earth Pressures on Deep Building Basements.

GMU

EARTH PRESSURE DISTRIBUTION
SEISMIC LOADS

Dana Point Harbor Revitalization

Parking Structure and Boater Services Building

DATE: 01/04/19	17-206-02	PLATE 1

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

December 11, 2019

Mr. Bryon Ward, President
DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES
1100 Newport Center Drive, Suite 200
Newport Beach, CA 92660

GMU Project 17-206-02

Subject: Geotechnical Review of Geopier Submittal, Dana Point Harbor Revitalization: Parking Structure – Commercial Component, City of Dana Point, California

References: (1) Design Submittal for a Geopier Foundation System, Dana Point Harbor Parking Structure, Dana Point, California, prepared by Western Ground Improvement, Inc., dated December 11, 2019.

(2) Our "Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California," dated December 4, 2019 (GMU 17-206-02).

Dear Mr. Ward:

The purpose of this correspondence is to confirm in writing that that GMU Geotechnical, Inc. (GMU) has performed a geotechnical review of the reference (1) Geopier submittal for the subject project. The Geopier submittal is to support the foundation design of the proposed parking structure. The subject site is bounded by Dana Point Harbor Drive on the north, the Dry Stack Storage component site on the east, and Golden Lantern on the west and south.

Based on our review, the reference (1) Geopier design submittal has been prepared in general accordance with the parameters and recommendations of our reference (2) report. All the recommendations included in our reference (2) report remain applicable to the site improvements. Therefore, the Geopier design submittal is considered acceptable from a geotechnical point of view.

Should you require further assistance, please do not hesitate to call.

Respectfully submitted,

David R. Atkinson
Project Manager / Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
NADIM T. SUNNA
C84197
CIVIL
STATE OF CALIFORNIA

Nadim Sunna, M.Sc., QSP, PE 84197
Senior Engineer

Reviewed by:

Gregory P. Silver, M.Sc., PE, GE 2336
President / CEO
Principal Geotechnical Engineer

(Two (2) wet signature copies and electronic copy)

cc: Choate Parking Design
Attn: Mr. Rick Choate and Mr. Emerson Flint Schmieder (electronic copies)

Tindall Consulting
Attn: Mr. John Tindall (electronic copy)

dra/17-206-02L Rough Grading Plan Review for DPHP, LLC P.S. and Boater Services Building (12-6-19)

December 6, 2019

Mr. Bryon Ward, President
DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES
1100 Newport Center Drive, Suite 200
Newport Beach, CA 92660

GMU Project 17-206-02

Subject: Geotechnical Review of Rough Grading Plans, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, 24650 Dana Point Harbor Drive, City of Dana Point, California

References:

(1) Dana Point Harbor Commercial Core Area Parking Structure - Rough Grading Plans, prepared by Tait Engineers, dated December 6, 2019.

(2) Our "Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California," dated December 4, 2019 (GMU 17-206-02).

Dear Mr. Ward:

INTRODUCTION

The purpose of this correspondence is to confirm in writing that that GMU Geotechnical, Inc. (GMU) has performed a geotechnical review of the reference (1) rough grading plans for the subject site. The rough grading is to support site grading and construction of the proposed parking structure, the adjacent boater services building, and other site improvements (i.e. roadways, parking lots, site walls, exterior concrete flatwork, etc.). The subject site is bounded by Dana Point Harbor Drive on the north, the Dry Stack Storage component site on the east, and Golden Lantern on the west and south.

Future development will consist of an on-grade 3 story parking structure, a boater service building, a realignment of Golden Lantern Drive, parking and drive aisles as well as landscaping and flatwork. Detailed recommendations for all these improvements along with an overall geotechnical site assessment are contained in our Reference (2) report discussed below.

Our review of the Tait Engineering rough grading plans (reference (1)) presented herein provides recommendations specific to the rough grading shown on these plans only. To support the rough grading plans, GMU previously performed a geotechnical foundation investigation and compiled our detailed site recommendations for all of the above described future improvements in our reference (2) report. The subject supporting geotechnical foundation investigation report contains:

- Geotechnical Map and Cross Sections
- Drill Hole and CPT logs
- Laboratory testing
- Infiltration test results
- Geotechnical engineering analyses including liquefaction and lateral spreading, and
- Detailed recommendations for the design of all proposed future improvements.

REVIEW OF ROUGH GRADING PLANS

The rough grading consists of:

- Cuts to create flat pad areas ranging from approximately a few inches to approximately 6-feet. The largest cuts are along the north side of the parking structure pad.

- A large temporary soil stockpile area of up to 20-feet in height with 1.5:1 slopes is also shown along the west side of the proposed parking structure pad between the planned parking structure and existing Golden Lantern.

- Two temporary desilting basins are reflected on the rough grading plans at the southeast and southwest corners of the project site, along with a desilting trap located at the center of the south side of the site. The desilting basins and trap are all approximately 3-feet in depth.

- Temporary Cut Slopes and Excavations and Temporary Stockpile Slopes consist of the following:
  - <u>Temporary 1 ½ :1 and 2:1 Slopes Below Gold Lantern</u>
    - A temporary stockpile fill slope will be created with 1 ½:1 side slopes. (see Section B-B' on grading plans). The temporary stockpile slope will be placed over a 1 ½:1 temporary cut slope. The overall height of the temporary stockpile slopes ranges from approximately 12'-20' in height
    - Temporary 4' high 2:1 cut slopes are planned in portions of the slope to create temporary surface drainage facilities.
  - <u>Temporary 2:1 Cut Slopes Along the South and Est Site Boundaries</u>
    - Approximately 1-3' high temporary slopes will be created along the south and east boundaries for temporary drainage swales and desilting basins (See sections B-B' and D-D' on the grading plans).
  - <u>Temporary 2' high 1 ½:1 cut slope below Dana Point Harbor Drive above a temporary 4' high vertical excavation.</u>
    - see Section A-A on grading plans.

GEOTECHNICAL FINDINGS

Geotechnical Materials

The following items summarize the geotechnical materials and groundwater conditions that will be encountered during rough grading. The support for the following items is contained in our Reference (2) report.

- The proposed grading including all cut slopes will expose existing engineered fill soils.
- The fill soils should be suitable with regard to slope stability. However, the fill soils on the pad are anticipated to be disturbed from demolition of the existing parking lot and posses differing compressibility and expansion characteristics.

Groundwater and Dewatering

Groundwater is not anticipated to be encountered during grading and hence dewatering is not anticipated to be required.

Shrinkage/Bulking

Soil materials encountered during rough grading are anticipated to shrink on the order of 5-10%. For rough planning purposes a volume loss of 7.5% may be assumed.

Subsidence

Significant subsidence due to the planned grading is not anticipated.

Slope Stability of Temporary Slopes and Excavations

All of the proposed slopes and excavations shown on the rough grading plans are temporary. Final slopes will be shown on a future precise grading plan. All of the temporary slopes and excavations are anticipated to be stable during the course of construction subject to the recommendations contained herein (See "Recommendations").

RECOMMENDATIONS

Corrective Grading

Corrective grading will be required for the 2 building pads and the remainder of the flat portion of the site. Detailed corrective grading recommendations are contained in our Reference (2) report and have been incorporated into corrective grading for the rough grading for the site as shown in Sections A-A' through E-E' on Sheet 4 of 6 of the reference (1) rough grading plans. Corrective grading recommendations are summarized as follows:

Parking Structure Pad

Corrective grading should consist of the following:

- The parking structure pad should be excavated to a depth of at least 24 inches below the bottom of the proposed pad grade shown via elevations on Sheet 3 of 6 of the grading plans and is also reflected on the cross sections shown on Grading Plan Sheet 4 of 6.
- The lateral extent of the parking structure pad over-excavation shown extend a minimum of 5 feet away from the outside edge of the future building as shown on the grading plans.
- The bottom of the excavation should then be scarified to a depth of at least 6 inches, moisture conditioned to 2% above optimum moisture content, and recompacted to at least 92% relative compaction.
- The onsite material may then be used as fill material to achieve the planned SOG subgrade elevation. The fill material should be placed in 6- to 8-inch-thick lifts, moisture conditioned to 2% above optimum moisture content, and compacted to achieve 92% relative compaction.

Boater Services Building Pad

Corrective grading should consist of the following:

- The building pad should be excavated to a depth of at least 4 feet below the bottom of the proposed pad grade shown on sheets 3 and 4 of 6 of the rough grading plans.
- The lateral extent of the over-excavation should be at least 5 feet beyond the edge of the building envelope.
- The bottom of the excavation should then be scarified to a depth of at least 6 inches, moisture conditioned to 2% above optimum moisture content, and recompacted to at least 92% relative compaction.
- The onsite material may then be used as fill material to achieve the planned slab-on-grade bottom elevation. The fill material should be placed in 6- to 8-inch-thick lifts, moisture conditioned to 2% above optimum moisture content, and compacted to achieve 92% relative compaction.

Grading Outside the Building Pads

Outside the corrective grading for the building pads, the site area subgrade should be excavated to a depth of at least 24 inches below the bottom of the planned top of rough grade. This over-excavation will be sufficient to meet the improvement specific requirements contained in our reference (2) report.

General (applicable to all corrective grading)

- Loose materials
    - If existing loose fill materials are found to be disturbed to depths greater than the proposed remedial grading, the depth of excavation, scarification, and re-compaction should be increased accordingly in local areas as recommended by

GMU personnel as the Geotechnical Engineer of Record. GMU will need to provide site-specific recommendations based on their observations in the field.

Slopes

- Cut Slopes
  - All of the temporary cut slopes shall be evaluated in the field by a representative of GMU to confirm that the geotechnical conditions are as anticipated.
- 4' Vertical Excavation Below Temporary 1 ½:1/2:1 Slope
  - This excavation will be monitored by a representative of GMU to confirm that the geotechnical conditions are as anticipated and consistent with temporary stability.
    - Should the vertical face exhibit minor sloughing it will be laid back to "limit of grading"
- Temporary Stockpile Fill Slopes
  - The fill materials shall be placed in a controlled manner in loose lifts not exceeding 12-inches in thickness.
  - The fill materials shall be mechanically compacted as the materials are placed.
  - The slope surface of the stockpile shall be mechanically compacted to minimize the potential for sloughing and/or erosion.
  - All of the fill placement shall be observed by a representative of GMU.

Miscellaneous Temporary Excavation Recommendations

All other temporary excavations required for the rough grading not shown on the grading plans shall be completed with full compliance with OSHA assuming Class "C" soils.

Additional temporary excavation recommendations include:

- The tops of the excavations should be barricaded so that vehicles and storage loads do not encroach within 10 feet of the excavations. A greater setback may be necessary for heavy vehicles, such as concrete trucks and cranes. GMU should be advised of such heavy vehicle loadings so that specific setback requirements can be established.
- If the temporary construction excavations are to be maintained during the rainy season, berms are recommended to be graded along the tops of the excavations in order to prevent runoff water from entering the excavations resulting in sloughing and/or erosion of the slope faces.

Our temporary excavation recommendations are provided only as **minimum** guidelines. All work associated with temporary excavations should meet the minimal safety requirements as set forth by CAL-OSHA and temporary slope construction, maintenance, and safety are the responsibility of the contractor.

Although not anticipated shoring may be required where the sides of the excavation cannot be sloped to the requirements provided in this report or as required by OSHA for the given soil types. Shoring design performed by others should be reviewed by this office.

LIMITATIONS

All parties reviewing or utilizing this letter should recognize that the findings, conclusions, and recommendations presented represent the results of our professional geological and geotechnical engineering efforts and judgements. Due to the inexact nature of the state of the art of these professions and the possible occurrence of undetected variables in subsurface conditions, we cannot guarantee that the conditions actually encountered during grading and foundation installation will be identical to those observed and sampled during our study or that there are no unknown subsurface conditions which could have an adverse effect on the use of the property. We have exercised a degree of care comparable to the standard of practice presently maintained by other professionals in the fields of geotechnical engineering and engineering geology, and believe that our findings present a reasonably representative description of geotechnical conditions and their probable influence on the grading and use of the property.

Because our conclusions and recommendations are based on a limited amount of current and previous geotechnical exploration and analysis, all parties should recognize the need for possible revisions to our conclusions and recommendations during grading of the project. Additionally, our conclusions and recommendations are based on the assumption that our firm will act as the geotechnical engineer of record during grading of the project to observe the actual conditions exposed, to verify our design concepts and the grading contractor's general compliance with the project geotechnical specifications, and to provide our revised conclusions and recommendations should subsurface conditions differ significantly from those used as the basis for our conclusions and recommendations presented in this report.

This letter has not been prepared for use by other parties or projects other than those named or described herein. This letter may not contain sufficient information for other parties or other purposes.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.

Hadi Tabatabaee
BUILDING OFFICIAL

CLOSURE/ROUGH GRADING PLAN APPROVAL

Based on our review, the reference (1) rough grading plans have been prepared in general accordance with the parameters and recommendations of our reference (2) report and specific rough grading recommendations contained herein. Therefore, the rough grading plans are considered acceptable from a geotechnical point of view.

Should you require further assistance, please do not hesitate to call.

Respectfully submitted,

David R. Atkinson
Project Manager / Senior Engineer

PROFESSIONAL GEOLOGIST
ALAN B. MUTCHNICK
No. 1789
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Alan B. Mutchnick, PG, CEG 1789
Associate Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER
GREGORY P. SILVER
GE 2336
GEOTECHNICAL
STATE OF CALIFORNIA

Gregory P. Silver, M.Sc., PE, GE 2336
President / CEO
Principal Geotechnical Engineer

(Two (2) wet signature copies and electronic copy)

cc: Tait Engineering
Attn: Mr. Todd Schmieder (electronic copy)

Tindall Consulting
Attn: Mr. John Tindall (electronic copy)

dra/17-206-02L Rough Grading Plan Review for DPHP, LLC P.S. and Boater Services Building (12-6-19)

Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California

Prepared For
DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES

December 4, 2019

GMU Project No. 17-206-02

23241 Arroyo Vista
Rancho Santa Margarita | CA 92688
949.888.6513 | FX: 949.888.1380 | www.gmugeo.com

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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APPROVED
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Hadi Tabatabaee
BUILDING OFFICIAL

TRANSMITTAL

DANA POINT HARBOR PARTNERS, LLC
c/o BURNHAM-WARD PROPERTIES
1100 Newport Center Drive, Suite 200
Newport Beach, CA 92660

DATE: December 4, 2019

PROJECT: 17-206-02

ATTENTION: Mr. Bryon Ward, President

SUBJECT: Geotechnical Foundation Investigation Report, Dana Point Harbor Revitalization: Parking Structure and Boater Services Building – Commercial Component, City of Dana Point, California

DISTRIBUTION:

Addressee: (3 wet signature copies + electronic copy)

SMS Architects
Attn: Mr. Brandon Dedmon (electronic copy)

Tindall Consulting
Attn: Mr. John Tindall (electronic copy)

Tait Engineering
Attn: Mr. Todd Schmieder (electronic copy)

Choate Parking Consultants
Attn: Mr. Rick Choate (electronic copy)

TABLE OF CONTENTS

PLATES

APPENDICES A through E

PURPOSE

This report presents the results of our geotechnical investigation for the Parking Structure portion of the "Commercial" component of the Dana Point Harbor Revitalization Project. The purpose of our investigation was to develop geotechnical recommendations pertaining to site grading and design and construction of the proposed parking structure, the adjacent boater services building, and other site improvements (i.e. roadways, parking lots, site walls, exterior concrete flatwork, etc.). Our investigation included performing laboratory testing and data analysis.

PROPOSED IMPROVEMENTS

It is our understanding that the proposed development will consist of a 3-story on-grade cast-in-place concrete parking structure, an adjacent 1-story boater services building along with a re-alignment of Golden Lantern, parking, landscaping, small retaining walls, flatwork and other appurtenant structures. Plate 2 included herein shows the location of the structures. Parking areas will be located south and east of the parking structure while the realignment of Golden Lantern will occur on the west side of the structure.

SITE LOCATION AND DESCRIPTION

The subject site is bounded by Dana Point Harbor Drive on the north, the Dry Stack Storage component site on the east, and Golden Lantern on the west and south (see Plate 1 – Location Map).

The majority of the site is relatively flat and drains by sheet flow towards the south to existing storm drain catch basins. However, there is an approximately up to 16-foot-high, 2:1 (horizontal to vertical) slope along the north side of the site below Dana Point Harbor Drive and an up to 14-foot-high, 2:1 (horizontal to vertical) slope along the west side of the site below Golden Lantern. In the flat portion of the site, elevations range from a high of approximately 13.5 feet above mean sea level in the northern portion of the site to a low of approximately 11 feet above mean sea level in the southern portion of the site. The majority of the site is covered by either asphalt pavement or concrete flatwork with some planters and landscape areas with flowers, groundcover, shrubs and occasional trees.

BACKGROUND HISTORY AND PREVIOUS REPORTS

In order to research the site history and geologic conditions, we reviewed published geologic maps and reports, previous geotechnical reports by other geotechnical consultants for the subject site and entire harbor area, and a previous report for the existing seawalls.

Based on our research, Dana Point Harbor is located within a cove (Dana Cove) that is bordered on the north by cliffs or bluffs that are approximately 100 to 200 feet high, and on the west by a hard, resistant promontory of land known as The Headlands. Prior to the construction of the harbor, the cove was bordered by a rocky shoreline along the base of the cliffs; however, due to the protection provided by the headland, a sandy shore was able to develop toward San Juan Creek.

Dana Point Harbor was constructed in the late 1960s and early 1970s by the County of Orange and the United States Army Corps of Engineers. It is our understanding that the harbor was constructed by excavating the native soils after the cove was dewatered through the construction of a coffer dam. The construction of the coffer dam included the installation of sheet piling and the placement of fill in a wet condition. The harbor was then de-watered, and the water basins were excavated to maximum depths of approximately 10 to 12 feet below sea level with the exception of local areas within the northern portion of the harbor where hard bedrock materials were encountered. Artificial fill was then placed in a relatively dry condition up to existing grades, and the seawalls, boat ramps, docks, and buildings were then constructed. In addition, a rubble breakwater was constructed along the south side of the harbor to protect it from wave action.

In order to provide access to the harbor, the shoreline cliffs were cut back to construct Dana Point Harbor Drive and Street of the Golden Lantern. These slopes were cut to gradients ranging from 1:1 (horizontal to vertical) to 2:1, depending on their geologic structure and material type.

An evaluation of the existing seawalls was performed by Bluewater Design Group in December of 2003. Their evaluation indicated that most of the existing seawalls are "Quay" walls which consist of slightly battered, cantilevered, reinforced-concrete gravity walls constructed directly above 1.5H:1V slopes. The slopes are either covered by concrete panels or are constructed with rock riprap. As a result, the wall footings are supported on either fill materials or rock riprap. The walls are not embedded into the ground and thus rely on their own weight, the weight of the soil over the heel, and the friction between the bottom of the footings and the underlying soil or riprap to prevent overturning and resist sliding forces. Most of the Quay walls are 5 feet in height; however, some local sections are 9 feet in height.

The report by Bluewater Design group also indicated that the north and south sides of the public boat launch ramp are supported by conventional cantilever retaining walls that range from 2 to 15 feet in height with footings founded into fill materials.

AERIAL PHOTOGRAPHY REVIEW

An aerial photo review was performed for the subject site in order to assess historical land use and site development. Continental Aerial Photo provided 20 sets of stereo-paired air photos spanning from 1952 through 1999. Photos taken prior to development of the harbor area show an undeveloped cliff bordered by a rocky shoreline and a relatively natural cove. In 1967, two jetties were constructed on the east and west sides of the cove. By 1970, the alteration of the cove into a man-made harbor was nearing completion and the roadways had been graded. The photos indicate that Dana Point Harbor Drive and the northerly areas of the harbor (generally parking lot and boat storage) are likely underlain by bedrock from the cut operation of the shoreline cliff. By 1975, the harbor appears to be in essentially the same condition as it is currently, with all existing buildings constructed and paved areas completed. Photos reviewed after 1975 show no significant changes to the area.

SUBSURFACE EXPLORATION

GMU conducted a subsurface exploration program to evaluate the soil conditions within the project area. A total of eighteen (18) deep exploratory drill holes, eight (8) shallow exploratory drill hole for infiltration testing, and seven (7) cone penetration test (CPT) soundings were performed by GMU which consisted of the following:

- Eighteen (18) hollow-stem-auger exploratory drill holes by GMU to a maximum depth of 50 feet below the existing ground surface in order to determine site-specific subsurface geologic and groundwater conditions and to obtain bulk and drive samples for geotechnical testing.
- Eight (8) hollow-stem-auger exploratory drill holes by GMU to a depth of up to approximately 10.0 feet below the existing ground surface in order to perform preliminary infiltration testing.
- Seven (7) CPT soundings by GMU to a maximum depth of 24 feet below the existing ground surface.

The drill holes were logged by our Staff Geologist and samples were collected and transported to our facility for observation and testing. The drill holes and CPT locations are shown on Plate 2 – Geotechnical Map. Drill hole logs are contained in Appendix A and CPT reports are presented in Appendix A-1.

GEOLOGIC FINDINGS

GENERAL GEOLOGY AND SUBSURFACE CONDITIONS

Regional Geology

Published geologic maps indicate that prior to development, the site consisted of a natural cove that was protected by a hard, resistant promontory of land to the west known as The Headlands. The cove was bordered by a rocky shoreline along the base of steep sea cliffs. The sea cliffs are comprised of marine sedimentary rocks of the Capistrano Formation that are capped by marine and non-marine terrace deposits. The base of the sea cliffs was mantled by talus deposits and local deposits of artificial fill while the bottom of the cove was covered by marine deposits. The harbor was constructed by dewatering the cove, partially excavating the native soils along the base of the cliffs and within the cove, and then replacing the excavated materials as compacted fill and creating cut slopes to create roadways to the harbor.

Site Specific Conditions

The subject site and proposed parking structure, adjacent boater services building, and other site improvements are within the cove area of the harbor and is underlain by artificial fills and marine deposits which in turn overlie bedrock of the Capistrano Formation. These materials are described in more detail in subsequent sections of this report.

Artificial Fill (Qaf)

The artificial fill materials within the site originated from both the marine deposits and bedrock within the cove, and the talus deposits and bedrock materials along the base of the sea cliffs. As a result of the fill materials being comprised of a variety of different geologic units, the fill materials are highly variable and consist of frequently alternating layers of clayey sands, silty sands, sands, sandy clays, and sandy silts with gravel, isolated cobbles and some scattered rock fragments greater than 6 inches in diameter. In general, the granular sand materials were found to be medium dense to dense while the fine-grained clay and silt materials were found to be predominantly firm to very firm. In addition, our laboratory testing indicates that the fill materials have varying degrees of compressibility and hydro-collapse.

Marine Deposits (Qm)

The marine deposit materials within the site are comprised of materials deposited in beach and submarine environments and, where encountered, generally consist of wet, loose to medium dense, silty sands to sands. Marine deposits were encountered underlying the artificial fill within five of our current drill holes (DH-26, DH-29, DH-34, DH-35, and DH-46).

Capistrano Formation (Tc)

Capistrano Formation bedrock was encountered below the fill and/or marine deposits in all our deeper drill holes and in all our CPT soundings. The bedrock was observed to consist predominantly of hard to very hard, fine- to coarse-grained, massive sandstones with occasional beds of moderately hard to hard, gray to very dark gray claystones and siltstones.

Summary of Subsurface Conditions

Based on the results of past and recent subsurface explorations, the geo-materials underlying the proposed parking structure and the adjacent boater services building are summarized as follows:

- The planned parking structure, the adjacent boater services building, and other site improvements are underlain by approximately 15 to 20 feet of surficial soils consisting of artificial fill and marine deposits which in turn overlie Capistrano Formation bedrock (see Plate 3 – Geotechnical Sections). Fill depths appear to range from 15 to 19 feet and the thickness of the marine deposits appear to range from approximately 0 to 5 feet. In general, the depths of the surficial soils are relatively consistent across the site.

GROUNDWATER

Groundwater is present at shallow depths below the subject site. Review of the Seismic Hazard Zone Report for the Dana Pont Quadrangle indicates that the historic high groundwater level 5 feet below the existing grade at the project site. In addition, Groundwater was encountered within our recent and previous subsurface exploration at depths ranging from 5 to 16 feet below the existing grade. Groundwater levels were measured during our subsurface exploration utilizing a measuring tape or groundwater sounder within the boring during drilling, however, drill holes were not left open for extended periods of time to allow the groundwater to come to equilibrium within the drill hole. In order to determine more accurate groundwater levels, laboratory testing was performed on samples collected during drilling in order to obtain the in-situ saturation levels of the onsite soils. The groundwater levels indicated on the drill hole logs are based on field observations combined with results from our laboratory testing. The groundwater levels shown on the cross sections represent a rough average of the groundwater levels shown on the boring logs and represent a best fit geologic model.

To aid in the interpretation of groundwater levels for use in the design of underground utilities and groundwater levels that may be encountered by contractors, groundwater levels, as shown on the cross sections, were then adjusted to account for average high tide conditions. These "estimated high tide" groundwater levels are shown on Plate 5. It should be noted these groundwater levels should be used with caution as they do not account for: 1) King tides, Maximum High Tides, and effects due to climate change.

The following summarizes groundwater levels at the site:

Groundwater Condition	Basis	Use	Reference/ Value
Average Groundwater Levels	Groundwater levels encountered during exploration and adjusted for saturation and geologic model	General	Boring logs, Plates 2&3
Groundwater Levels adjusted for Daily High Tides	Average groundwater levels adjusted for daily high tides	Underground utility design and likely high tide levels that may be encountered by contractors	Plate 5
Groundwater levels to be used for Liquefaction and Lateral Spreading Analyses	Boring logs, Plates 2&3, CGS Historic High GW Level	Geotechnical Engineering Design (i.e. Liquefaction, Lateral Spreading, etc.)	5' bgs

Any construction extending below the depths shown on Plate 5 may be saturated. Consequently, appropriate construction precautions should be utilized (i.e. casing for geo-piers, etc.). It is further noted that the groundwater levels represent our best interpretation of the information available at the time of this report. Consequently, groundwater levels at the time of construction may exceed the levels contained in any of the above references. It is up to the contractor to determine applicable groundwater levels at the time of construction. The contractor is encouraged to directly determine groundwater levels immediately prior to construction.

GEOLOGIC HAZARDS

FAULTING AND SEISMICITY

The site is not located within a published Alquist-Priolo Earthquake Fault Zone, and no known active faults are shown on current geologic maps for the site. The nearest known active fault is the offshore segment of the Newport-Inglewood fault, which is located approximately 3.9 kilometers southwest of the site and is capable of generating a maximum earthquake magnitude (M_w) of 7.1. The site is also located within 11.3 kilometers of the surface projection of the San Joaquin Hills Blind Thrust, which is capable of generating a maximum earthquake magnitude (M_w) of 6.6. Given the proximity of the site to these and numerous other active and potentially active faults, the site will likely be subject to earthquake ground motions in the future.

LIQUEFACTION

The site is located within a zone of required investigation for liquefaction as shown on the Seismic Hazard Zone Map for the Dana Point Quadrangle (CGS, 2001). Consequently, and also based on conditions encountered in the subsurface explorations for this project, the building sites may potentially be subject to significant amounts of seismic settlement and lateral spreading related to liquefaction. Liquefaction, seismic settlement, and lateral spreading were quantitively analyzed, and the results are discussed under "Geotechnical Engineering Findings" (Page 9).

LANDSLIDES

Based on our review of available geologic maps, literature, topographic maps, aerial photographs, and our subsurface evaluation, no landslides or related features underlie the site; however, an earthquake-induced landslide is mapped adjacent to the proposed development. The adjacent mapped areas are within the existing bluffs where surficial instability and cracking may occur. However, based on the distance between the bluffs and the project site, there is no potential for landslides to impact the proposed development.

TSUNAMI, SEICHE, AND FLOODING

Tsunamis

Tsunamis or seismic sea waves that have affected coastal southern California are generally produced by submarine fault rupture. Historical records indicate that the coast, from San Pedro to Newport Bay, has been affected by six significant tsunamis since 1868 (Vasily Tito, National Oceanographic and Atmospheric Administration, Personal Communication, June 1998). The largest waves were on the order of 6 to 8 feet. The most extensive recent damage occurred in harbor areas such as Los Angeles (Alaska - 1964, Chile - 1960).

Legg, et al. (2004) investigated the tsunami hazard associated with the Catalina fault offshore of Southern California. They simulated tsunamis based on coseismic deformation of the sea floor and estimated that coastal run-up values are 5 to 13 feet, although run-up could exceed 23 feet depending upon amplification due to bathymetry and coastal configuration. Large earthquakes on the Catalina fault are relatively infrequent, with recurrence intervals of several hundred to thousands of years (Legg, et al., 2004).

Tsunami Inundation Maps

In 2009, the California Emergency Management Agency, California Geological Survey, and University of Southern California partnered in an effort to create tsunami inundation maps for California. The tsunami inundation maps were generated through a modeling process that utilizes the Method of Splitting Tsunamis (MOST). This computational program models tsunami evolution and inundation based on bathymetry and topography. The modeling also utilizes a variety of tsunami source events, including "realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides" (California Emergency Management Agency et al., 2009). Using the source, bathymetry, and topography, the tsunami modeling yields a maximum inundation line. It is important to note that the published map does not represent inundation from a single event. Rather, it is the result of combining inundation lines from multiple source events. Therefore, the entire inundation region will not likely be inundated during a single tsunami event (California Emergency Management Agency, et al., 2009).

The Tsunami Inundation Map states that the "tsunami inundation map was prepared to assist cities and counties in identifying their tsunami hazard. It is intended for local jurisdictional, coastal evacuation planning uses only." Furthermore, the map conveys that it is not intended for regulatory purposes. With respect to probability, the map states that it contains "no information about the probability of any tsunami affecting any area within a specific period of time."

A Tsunami Inundation Map for Emergency Planning was published for the Dana Point Quadrangle (California Emergency Management Agency, et al., 2009). In considering the Tsunami Inundation Map with respect to the proposed development, it is critical to note three points: (1) the map is only intended for emergency planning and evacuation planning; (2) the map does not convey any information with respect to probability or timing of tsunami events; and (3) the inundation line is a conservative combination of multiple source events.

Tsunami Hazard Assessment

As shown on the attached Plate 4 – Tsunami Inundation Map for Emergency Planning, the proposed site is located within a tsunami inundation area. Therefore, it should be anticipated that the site will be directly affected by a tsunami. In addition, it should also be noted that the probability and severity of tsunami inundation in the lowland areas cannot be estimated based on current available information.

Seiches

The potential for the site to be adversely impacted by earthquake-induced seiches is considered to be high due to the presence of significant enclosed bodies of water located in the vicinity of the site.

Flooding

According to the County of Orange FEMA Flood Insurance Rate Map, the proposed Boaters Services Buildings are located within “Zone X”, an area of 0.2% annual chance flood, 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and protected by levees from 1% annual chance flood. The potential for the site to be adversely impacted by significant flooding is considered low.

GEOTECHNICAL ENGINEERING FINDINGS and ANALYSES

LIQUEFACTION ANALYSES

Seismic Input

Seismic input values for numerical analyses were based on ASCE 7-10 and the 2016 CBC for an MCE event (Magnitude 6.8 and PGA = 0.60).

Liquefaction Evaluation and Seismic Settlement

The site is located within a zone of required investigation for liquefaction as shown on the Seismic Hazard Zone Map for the Dana Point Quadrangle (CGS, 2001).

A liquefaction evaluation was performed on each CPT by means of CLiq, v.1.7.6.49 software and the Robertson (2009) methodology. In addition, SPT data obtained from our drill holes were also utilized to perform liquefaction analysis using Youd and Idriss et al . (2001). The analysis was based on the 2016 CBC and ASCE 7-10 criteria. A historic high groundwater depth of 5 feet was used in the analysis. Our CPT liquefaction analysis is presented in Appendix D, and our SPT liquefaction analysis is presented in Appendix D-1.

Based on our seismic settlement analysis and review of overall soil conditions, the earthquake-induced (EQ-induced) settlement is estimated to be 0.75 inches for the MCE event. A differential EQ-induced settlement of 0.5 inches over a span of 40 feet should be prudently considered in the design.

LATERAL SPREAD ANALYSES

Lateral Spreading and Cyclic Mobility

The proposed development is located within the vicinity of the existing sea wall and harbor, where free face geometry and localized areas of shallow liquefiable soils exist. As a result, lateral spread analyses were performed to determine the potential of flow failure to occur during the MCE event. The lateral displacement was analyzed utilizing Cross Sections A-A' and B-B' for the MCE seismic loading. Our analyses revealed that the post-earthquake slope stability safety factors with liquefied residual shear strengths were greater than 3.4, indicating a very low potential for earthquake-induced flow failure.

Both sections exhibited a post-earthquake safety factor greater than 1.6 with an inertia acceleration of 0.15. Therefore, potential for lateral spreading to affect the subject site after liquefaction of the soils during the design earthquake is considered very low.

SOIL EXPANSION

Surficial Soils

The expansion potentials of the artificial fills mantling the site are highly variable ranging from very low to medium. Consequently, the design of parking structure and boater service building slabs and exterior hardscape features should consider a medium expansion potential.

SOIL CORROSION

Based on the test results for pH, soluble chlorides, sulfate, and minimum resistivity of the site soils obtained during our subsurface investigation, the on-site soils should be considered to have:

- A moderate to severe sulfate content or "S1" sulfate exposure to concrete per ACI 318, Table 19.3.1.1.
- A low minimum resistivity indicating conditions that are severely corrosive to ferrous metals.
- A moderate to high chloride content (corrosive to severely corrosive ferrous metals).

The results of the laboratory chemical tests performed within the site are included in Appendix B.

STATIC SETTLEMENT / COMPRESSIBLITY

Grading

As final grades for the site are not anticipated to significantly change, loading from grading is not expected to be significant. In addition, any settlement will be complete at the completion of load application.

Buildings

Static settlement will be induced by the introduction of new building loads. The underlying artificial fill and bedrock soils encountered are moderately to slightly compressible under static loading. However, the geotechnical engineering characteristics of the underlying surficial soils are highly variable. Given this variability and the high building loads from the parking structure, it was decided that ground improvement – specifically Geopiers – would be required beneath the parking structure foundations. The boater serves building is anticipated to be lightly loaded and thus the building can be founded on a shallow footing system with local over-excavation and recompaction.

The static settlement of the parking structure was analyzed with our recommended bearing capacity utilizing assumed building foundation loads, the construction of Geo-piers and based on project experience. The estimated total static settlement for the parking structure is anticipated to be less than 1 inch, with differential settlement of approximately 0.5 inches over a span of 40 feet, however, final settlement estimates will be provided by Geopier as part of their design, and will be reviewed by this office.

The estimated static settlement for the boater's service building is estimated to be less than 0.5 inch with different settlement of approximately 0.25 inches over a span of 30 feet.

PRELIMINARY INFILTRATION TESTING

Eight (8) preliminary infiltration tests were performed in general conformance with the County of Orange Technical Guidance Document (TGD). The drill holes, shown on the attached Plate 2 – Geotechnical Map, were excavated to depths of from approximately 3.25 to 7.0 feet below the existing grade using a hollow-stem-auger drill rig. The calculated unfactored raw observed infiltration rates are presented in the following table:

Infiltration Rates Results Summary

Drill Hole	Depth Below Finish Grade (feet)	Unfactored Raw Observed Infiltration Rates (inches/hour) *
GMU 17-206-02		
DH-17	5.0	1.19
DH-18	5.0	0.28
DH-19	4.0	0.01
DH-20	5.0	0.07
DH-21	5.0	0.05
DH-22	5.0	0.11
GMU 11-161-00		
DH-10	3.25	0.35
DH-22	7.0	0.04

**Rates do not incorporate a factor of safety.*

The results of the infiltration testing indicate that the unfactored raw observed infiltration rates within the southern side of the development range from 0.01 to 1.19 inches per hour, with an average unfactored infiltration of 0.28 inches per hour. The northern side of the development revealed an unfactored infiltration rates ranging from 0.04 to 0.35 inches per hour with an average unfactored infiltration rate of 0.20 inches per hour. ***Thus, we conclude for the entire site that infiltration rates <u>do not meet</u> the minimum requirement of 0.3 inch/hour when a minimum factor of safety of 2 is applied per the County of Orange TGD manual.*** The preliminary infiltration test hole locations are shown on the attached Geotechnical Map, Plate 2. The results of the infiltration testing are contained in Appendix C of this report.

EXCAVATION CHARACTERISTICS

The artificial fill soils and bedrock materials underlying the site can be easily excavated with conventional grading equipment such as dozers, loaders, excavators, and backhoes. We expect that excavation of new utility trenches can be accomplished utilizing conventional trenching machines and backhoes. Furthermore, groundwater may be encountered (See Plate 5).

CONCLUSIONS

Based on the geologic and geotechnical findings, it is our opinion that the proposed development is feasible and practical from a geotechnical standpoint if accomplished in accordance with the County of Orange grading and building requirements and the recommendations presented herein. It is also the opinion of GMU Geotechnical that proposed grading and construction will not adversely affect the geologic stability of adjoining properties provided grading and construction are performed in accordance with the recommendations provided in this report. A summary of conclusions is as follows:

1. The project area is not underlain by any known active faults. Seismic structure design should be in accordance with the 2016 CBC based on ASCE 7-10.

2. As described in detail in the “Groundwater” section of this report, groundwater may be as high as five feet bgs and is anticipated to impact construction of the Geopiers. It is not anticipated to impact corrective grading.

3. The potential for lateral spreading is considered very low within the limits of the proposed development. Therefore, mitigation for lateral spreading is not required.

4. The site will be subject to seismic settlement and settlements should be incorporated into the structure design.

5. The parking structure foundations may be subject to significant differential static settlements due to compression variability.

6. Site soils within the foundation influence zone are anticipated to have a low to medium expansion potential based on our recent laboratory test results and local experience.

7. Corrosion testing indicates that the on-site soils have a moderate sulfate exposure level and are corrosive to buried ferrous metals and reinforcing steel. Consequently, any metal exposed to the soil will need protection.

8. Based on Conclusions 3-6 above, the following remediation will be required: 1) corrective grading beneath the entire site, 2) Geopier ground improvement below the parking structure foundations and 3) use of a WRI foundation system for the Boater Services Building. will need to be founded on Geopiers, the Boater services Building.

9. Based on our infiltration testing, infiltration of water into the subsurface soils is deemed not feasible in accordance with the County of Orange TGD manual.

RECOMMENDATIONS

REQUIRE GEOTECHNICAL MITIGATION

The following summarizes the required geotechnical mitigation for the site improvements:

- Parking Structure
  - Foundations to be supported on Geopiers due to:1) fill variability and related differential movements (both expansion and settlement), and 2) seismic settlement.
  - Slab on grade to be supported on removed and recompacted engineered fill
- Boater Services Building
  - WRI foundation system
  - Removed and recompacted fill below the foundations
- Flatwork, Pavements
  - Supported by removed and recompacted engineered fill

GENERAL SITE PREPARATION AND GRADING

General

The following recommendations pertain to any required grading associated with the proposed improvements and corrective grading needed to support the proposed improvements. All site preparation and grading should be performed in accordance with the County of Orange grading code requirements and the recommendations presented in this report.

Clearing and Grubbing

All significant organic material such as weeds, brush, tree branches, or roots, or construction debris such as old irrigation lines, asphalt concrete, and other decomposable material should be removed from the areas to be graded. No rock or broken concrete greater than 6 inches in diameter should be utilized in the fills.

Corrective Grading

Parking Structure

The 3-level on-grade parking structure may be founded on shallow spread footings supported on Geopiers or equivalent gravel piers. The slab-on-grade (SOG) subgrade will require corrective grading prior to construction of the slab structural section. Grading should consist of the following:

- The SOG subgrade should be excavated to a depth of at least 24 inches below the bottom of the slab section (i.e., below the bottom of the aggregate base section).
- The bottom of the excavation should then be scarified to a depth of at least 6 inches, moisture conditioned to 2% above optimum moisture content, and recompacted to at least 92% relative compaction.
- The onsite material may then be used as fill material to achieve the planned SOG subgrade elevation. The fill material should be placed in 6- to 8-inch-thick lifts, moisture conditioned to 2% above optimum moisture content, and compacted to achieve 92% relative compaction.

<u>Boater Services Building</u>

The 1-level boater services building may be founded on shallow spread footings supported on a minimum of 2 feet of engineered fill. Grading should consist of the following:

- The building pad should be excavated to a depth of at least 4 feet below the bottom of the slab-on-grade or 2 feet below the bottom of the spread footings, whichever is lower below finish grade. The lateral extent of the over-excavation should be at least 4 feet beyond the edge of the building envelope.
- The bottom of the excavation should then be scarified to a depth of at least 6 inches, moisture conditioned to 2% above optimum moisture content, and recompacted to at least 92% relative compaction.
- The onsite material may then be used as fill material to achieve the planned slab-on-grade bottom elevation. The fill material should be placed in 6- to 8-inch-thick lifts, moisture conditioned to 2% above optimum moisture content, and compacted to achieve 92% relative compaction.

<u>Appurtenant Structures / Site Retaining Walls</u>

Grading recommendations for the appurtenant structures and site retaining walls should consist of the following:

- The appurtenant structures should be over-excavated to a depth of at least 24 inches below the bottom of the foundations.
- The bottom of the over-excavation should then be scarified to a depth of at least 6 inches, moisture conditioned to least 2% above optimum moisture content, and recompacted to at least 92% relative compaction.
- Following the approval of the over-excavation bottom by a representative of GMU, the onsite material may be used as fill material to achieve the planned foundation bottom elevation.
- The fill material should be placed in 6- to 8-inch-thick lifts, moisture conditioned to 2% above optimum moisture content, and compacted to achieve 92% relative compaction.

Vehicular Pavement

Grading recommendations for the new vehicular pavement areas should consist of the following:

- The vehicular pavement section should be over-excavated to a depth of at least 12 inches below the bottom of the pavement section (i.e., 12 inches below the bottom of the aggregate base).
- The bottom of the over-excavation should then be scarified to a depth of at least 6 inches, moisture conditioned to least 2% above optimum moisture content, and recompacted to at least 92% relative compaction.
- Following the approval of the over-excavation bottom by a representative of GMU, the onsite material may be used as fill material to achieve the planned subgrade elevation.
- The fill material should then be placed in 6- to- 8-inch-thick lifts, moisture conditioned to at least 2% above optimum moisture content, and compacted to achieve 92% relative compaction.

Flatwork/Hardscape/Pedestrian Pavers

Grading recommendations for the new concrete flatwork/hardscape/pedestrian pavers areas should consist of the following:

- The flatwork/hardscape/pedestrian pavers section should be over-excavated to a depth of at least 12 inches below the bottom of the pavers sections (i.e., 12 inches below the bottom of the aggregate base).
- The bottom of the over-excavation should then be scarified to a depth of at least 6 inches, moisture conditioned to least 2% above optimum moisture content, and recompacted to at least 92% relative compaction.
- Following the approval of the over-excavation bottom by a representative of GMU, the onsite material may be used as fill material to achieve the planned subgrade elevation.
- The fill material should then be placed in 6- to- 8-inch-thick lifts, moisture conditioned to at least 2% above optimum moisture content, and compacted to achieve 92% relative compaction.

Additional Grading Recommendations

If the existing loose fill materials are found to be disturbed to depths greater than the proposed remedial grading, the depth of excavation, scarification, and re-compaction should be increased accordingly in local areas as recommended by the Geotechnical Engineer of Record. The Geotechnical Engineer of Record will need to provide site-specific recommendations based on their observations in the field.

Dewatering

Groundwater is not anticipated to be encountered during corrective grading. Consequently, dewatering is not anticipated. Final evaluation as to the need for dewatering should be made by the contractor immediately prior to grading.

VOLUME CHANGE

In order to aid in planning for the anticipated grading, we estimate that the change in volume of on-site disturbed surficial fills that are excavated and placed as new compacted fill at an average relative compaction of 92% will result in volume losses ranging from approximately 5 to 10%. For rough planning purposes only, an average volume loss of 7.5% may be assumed.

TEMPORARY EXCAVATIONS

Temporary excavations for demolitions, earthwork, footings, and utility trenches are expected. We anticipate that unsurcharged excavations with vertical side slopes less or equal to 4 feet high will generally be stable; however, all temporary excavations should be observed by a representative of GMU to evaluate their stability. Our recommendations for temporary excavations are as follows:

- OSHA Soil Types for Excavation Requirements:
  - Artificial Fill: Type C
  - Bedrock: Type B
- Additional Recommendations:
  - The tops of the excavations should be barricaded so that vehicles and storage loads do not encroach within 10 feet of the excavations. A greater setback may be necessary for heavy vehicles, such as concrete trucks and cranes. GMU should be advised of such heavy vehicle loadings so that specific setback requirements can be established.
  - If the temporary construction excavations are to be maintained during the rainy season, berms are recommended to be graded along the tops of the excavations in order to prevent runoff water from entering the excavation and eroding the slope faces.

Our temporary excavation recommendations are provided only as **minimum** guidelines. All work associated with temporary excavations should meet the minimal safety requirements as set forth by CAL-OSHA. Temporary slope construction, maintenance, and safety are the responsibility of the contractor.

Although not anticipated, shoring may be required where the sides of the excavation cannot be sloped to the requirements provided in this report or as required by OSHA for the given soil types. Shoring design (if required) should be based on our geotechnical maps, cross sections, boring logs, and laboratory testing provided in this report. Shoring design performed by others should be reviewed by this office.

PARKING STRUCTURE AND BOATER SERVICES BUILDING DESIGN

No active or potentially active faults are known to cross the site, therefore, the potential for primary ground rupture due to faulting on-site is very low. However, the site will likely be subject to seismic shaking at some time in the future.

Seismic Design Parameters (2016 CBC Table)

Site-specific seismic design parameters were determined using the USGS computer program title ASCE 7 Hazard Tool. The site coordinates used in the analysis were 33.46085° North Latitude and 117.69342° West Longitude. Based on our field exploration and the site soil profile, the site is designated as Site Class C. Seismic design coefficients based on ASCE 7-10 and 2016 CBC are listed in table below.

Parameter	Factor	Value
Mapped Spectral Response Acceleration (0.2 sec Period)	S_S	1.452g
Mapped Spectral Response Acceleration (1.0 sec Period)	S_1	0.547g
Site Class	Site Class	C
Site Coefficient	F_a	1.0
Site Coefficient	F_v	1.5
Maximum Considered Earthquake Spectral Response Acceleration (0.2 sec Period)	S_{MS}	1.452g
Maximum Considered Earthquake Spectral Response Acceleration (1.0 sec Period)	S_{M1}	0.821g
Design Spectral Response Acceleration (0.2 sec Period)	S_{DS}	0.968g
Design Spectral Response Acceleration (1.0 sec Period)	S_{D1}	0.547g
MCE Peak Ground Acceleration*	PGA	0.591
Site Coefficient (Table 11.8-1)	F_{PGA}	1.000
MCE Peak Ground Acceleration*	PGA_M	0.591

*MCE: Maximum Considered Earthquake

It should be recognized that much of southern California is subject to some level of damaging ground shaking as a result of movement along the major active (and potentially active) fault zones that characterize this region. Design utilizing the 2016 CBC is not meant to completely protect against damage or loss of function. Therefore, the preceding parameters should be considered as minimum design criteria.

Parking Structure - Geotechnical Slab and Foundation Recommendations

General

The parking structure will be founded on conventional foundations supported on Geopiers or equivalent gravel piers and a slab-on-grade supported on a blanket of removed and recompacted engineered fill.

Slab Design

- Slab Support
  - Minimum 2-foot-thick section of removed and recompacted subgrade, overlain by 6 inches of CMB
    - Subgrade compaction
      - 92% relative compaction
      - 2% over optimum moisture content
    - CMB Compaction
      - 95% relative compaction
      - Optimum moisture content
- Slab Type
  - Conventional
  - Minimum Thickness
    - 6 inches
    - Final thickness to be determined by SE
  - Minimum Reinforcement
    - #4 bars at 24 inches o.c.
    - Final reinforcement to be specified by SE
- Moisture Retarder/Barrier
  - Not required from a geotechnical standpoint

Foundation Design

- Footing Type
  - Conventional spread and continuous footings
- Footing Support - Geopiers
  - Geopier or equivalent gravel piers extended into bedrock
  - Minimum 12 inches into bedrock as verified by the project geotechnical engineer
  - The top of the Geopier or equivalent gravel piers should be at a minimum depth of 6 inches above bottom elevation of foundations

    - Note: Groundwater is anticipated to be encountered during construction of the Geopiers.
- Minimum Footing Size
    - Minimum dimensions
        - Width: 24 inches
        - Depth: 24 inches below lowest adjacent grade
- Preliminary Bearing Value
    - 7ksf
    - Final bearing value to be provided by the Geopier
- Preliminary Settlement Estimate
    - Geopiers
        - Static Total: 1 inch
        - Static Differential: ½-inch over a span of 40 feet
        - Final settlement estimate to be provided by the Geopier engineer
    - Seismic Settlement (will only impact slab-on-grade)
        - Total: 0.75 inches
        - Differential: 0.5 inches over a span of 40 feet
- Passive Resistance and Preliminary Friction Coefficient:
    - Passive resistance: 300 psf/ft (engineered fill)
        - Disregard upper 6 inches
    - Friction coefficient: 0.45 (Combination rock and soil)
        - Final friction value to be provided by Geopier engineer.
    - 1/3 increase for wind or seismic
- Concrete (Foundation and Slab)*
        - Type: II/V
        - Maximum water/cement ratio: 0.5

*See "Structural Concrete" section of this report.

Parking Structure Basement Retaining Wall Design and Construction

<u>General</u>

The recommendations for parking structure basement walls provided herein assumes that the walls will be incorporated into the overall design of the structure. Thus, the foundations for support of these walls should in accordance with the building foundation recommendations provided in this report.

<u>Foundation Design Type</u>

Geopier supported conventional foundations (see previous section)

<u>Wall Design Parameters</u>

- At-Rest Earth Pressure: 60 pcf.
  Assumptions: 1) level backfill; 2) select backfill; 3) backdrainage
- Waterproofing: The back side of all retaining walls should be waterproofed down to the top of the foundation prior to placing subdrains or backfill. The design and selection of the waterproofing system is outside the scope of our report and is outside our purview.
- Concrete*: Type II/V cement, 0.50 w/c ratio (geotechnical perspective only)
- Backfill and Drainage: See attached Plate 6
- Select Backfill: Low expansion;
  Subject to geotechnical approval;
  On-site materials anticipated to meet this criterion.

*See "Structural Concrete" section of this report.

Boater Services Building – Geotechnical Foundation and Slab Recommendations

<u>Foundation/Slab Design</u>

- Footing Type and Minimum Reinforcement:
  - Conventional slab-on-grade foundation system designed per WRI
  - Minimum reinforcement as per WRI
- Bearing Material: Certified Engineered Fill
- WRI Design
  - Expansion
    - PI = 20
  - Settlement:
    - Static + Seismic:
      - Total: 1.25"
      - Differential: 0.75" over a span of 30 feet
  - Allowable Bearing Capacity: 2,500 psf
    - Above value may be increased by 1/3 for temporary loads such as wind or seismic

- Lateral Foundation Resistance:
  - Allowable passive resistance: 300 psf/ft (disregard upper 6 inches)
  - Allowable friction coefficient: 0.35
  - Above values may be combined without reduction and may be increased by 1/3 for temporary loads such as wind or seismic
- Minimum Slab Thickness: 5 inches
  - Final thickness to be determined by the structural engineer
- Minimum Slab Reinforcement: As per WRI design
  - Minimum reinforcement consisting of No. 4 bars placed 18 inches on center.

- Slab Subgrade
  - Certified Engineering Fill moisture conditioned to a minimum of 2% over optimum moisture content (see "Corrective Grading" section of this report)
- Moisture Vapor Barrier
  - A moisture vapor barrier in minimum conformance with Stego 15 Mil Class A or equivalent should be utilized over properly compacted subgrade.
  - Sand above or below the vapor barrier is not required from a geotechnical perspective.
- Concrete*
  - Structural Elements
    - Cement Type: II/V
    - Maximum w/c ratio: 0.50 (geotechnical perspective only)

*See "Structural Concrete" section of this report.

Site Retaining Walls Design and Construction

- Foundation Design
  - Minimum Foundation Width: 24 inches
  - Minimum Foundation Depth: Depth below lowest adjacent grade to bottom of footing: 24 inches
  - Bearing Materials: Minimum of 2 feet of engineered fill
  - Allowable Bearing Capacity: 2,000 psf for footing on level ground; may be increased 750 psf for each additional foot of width or depth to a maximum of 4,000 psf. (1/3 increase for wind or seismic)
  - Unit Weight of Backfill: 125 pcf
  - Lateral Foundation Resistance:
    - Allowable Passive Earth Pressure: 300 psf/ft of depth (static)
    - Coefficient of Friction: 0.35
    - Disregard upper 6 inches
    - May be increased 1/3 for seismic conditions
    - May be combined without resistance

- Wall Design Parameters
  - Active Earth Pressure: 40 pcf – Assumptions: 1) level backfill; 2) select backfill; 3) back-drainage; and 4) wall moment > 0.01 H allowed.
  - Seismic Earth Pressure Walls > 6 feet: 17 pcf -triangular distribution
  - Weight of Backfill: 125 pcf
  - Control/Construction Joints: As a minimum, maximum spacing of 15 feet and at angle points (non-basement walls)
  - Waterproofing: The back side of all retaining walls should be waterproofed down to the top of the foundation prior to placing subdrains or backfill. The design and selection of the waterproofing system is outside the scope of our report and is outside our purview.

- Concrete*: Type II/V cement (geotechnical perspective only). 0.50 w/c ratio

*See “Structural Concrete” section of this report.

- Wall Backfill and Drainage: See Attached Plate 6
- Select backfill
  - Low expansion
  - Subject to geotechnical approval.
  - On-site materials are anticipated to meet this criterion.

Screen Wall Design Parameters

For standard screen walls on flat ground, footings should be a minimum of 24 inches deep below the lowest outside adjacent grade. Wall foundations should be reinforced with two #4 bars top and bottom, and joints in the wall should be placed at regular intervals on the order of 10 to 20 feet. The wall foundation shall be underlain by at least a 2-foot-thick section of engineered fill.

Pole Foundations

Pole foundations will be required for the light bollards for the new parking areas. As a minimum, the pole foundations should be at least 18 inches in diameter and at least 4 feet deep; however, the actual dimensions should be determined by the project structural engineer based on the following design parameters.

- Bearing Materials: Engineered fill approved by a representative from GMU.
- Bearing Values: End-bearing capacity and skin friction may be combined. Allowable bearing pressure of 2,000 pounds per square foot (psf). At least 18 inches in diameter and embedded a minimum of 4 feet below the lowest adjacent grade. Skin Friction of 20 pounds per square foot may be used.
- Lateral Load: Passive resistance of 300 pounds per foot of pile diameter per foot of depth into competent bearing material.

  Passive resistance should be ignored within the upper foot due to possible disturbance during drilling. The passive resistance may be assumed to be acting over an area equivalent to two pile diameters.

STRUCTURAL CONCRETE

Laboratory tests indicate that the onsite soils in the general area of the site possess moderate levels of sulfate content or "S1" exposure per ACI 318-14, Table 19.3.1.1. Therefore, any structural features which will be in direct contact with the site soils at depth will have restrictions on the type of Portland cement, water to cement ratio, and the concrete compressive strength per ACI 318-14, Table 19.3.2.1 as follows:

- Type II/V cement with a maximum water to cement ratio of 0.50, and a minimum compressive strength of 4,000 psi (from a geotechnical perspective only).
- NOTE: Any reinforced concrete elements that extend below the water table should be designed for C2 (Severe) exposure to moisture and chlorides.

Wet curing of the concrete per ACI Publication 308 is also recommended. The aforementioned recommendations regarding concrete are made from a soils perspective only. Final concrete mix design is beyond our purview. All applicable codes, ordinances, regulations, and guidelines should be followed regarding the designing a durable concrete with respect to the potential for sulfate exposure from the on-site soils and/or changes in the environment.

FERROUS METAL CORROSION

The results of the laboratory chemical tests performed on a sample of soil collected within the site indicate that the on-site soils are severely corrosive to ferrous metals. Consequently, metal structures which will be in direct contact with the soil (i.e., underground metal conduits, pipelines, metal signposts, etc.) and/or in close proximity to the soil (wrought iron fencing, etc.)

may be subject to corrosion. The use of special coatings or cathodic protection around buried metal structures has been shown to be beneficial in reducing corrosion potential. Additional provisions will be required to address high chloride contents of the soil per the 2019 CBC to protect the concrete reinforcement. The laboratory testing program performed for this project does not address the potential for corrosion to copper piping. In this regard, a corrosion engineer should be consulted to perform more detailed testing and develop appropriate mitigation measures (if necessary).

The above discussion is provided for general guidance regarding the corrosiveness of the on-site soils to typical metal structures used for construction. Detailed corrosion testing and recommendations for protecting buried ferrous metal and/or copper elements are beyond our purview. If detailed testing is required, a corrosion engineer should be consulted to perform the testing and develop appropriate mitigation measures.

MOISTURE VAPOR TRANSMISSION

Moisture Vapor Retarder

A vapor retarder or barrier such as Stego 15 Mil Class A or equivalent should be utilized beneath the boater service building slab. The retarder/barrier should be installed as follows:

- Below moisture-sensitive floor areas.
- Installed per manufacture's specifications as well as with all applicable recognized installation procedures such as ASTM E1643-98.
- Joints between the sheets and the openings for utility piping should be lapped and taped. If the barrier is not continuously placed across footings/ribs, the barrier should, as a minimum, be lapped into the sides of the footings/rib trenches down to the bottom of the trench.
- Punctures in the vapor barrier should be repaired prior to concrete placement.

A capillary break is not required. Also, sand and/or the amount of sand above the moisture vapor retarder should be specified by the owner. The selection of sand above the retarder is not a geotechnical engineering issue and is hence outside our purview.

Water Vapor Transmission Discussion

The placement of a moisture vapor retarder below all slab areas is recommended where moisture sensitive flooring will be placed. It should be noted that the moisture retarder is intended only to reduce moisture vapor transmissions from the soil beneath the concrete and is consistent with the current standard of the industry in building construction in Southern California. It is not intended to provide a "waterproof" or "vapor proof" barrier or reduce vapor transmission from sources above the retarder (i.e., concrete). Sources above the retarder include any sand placed on top of the retarder (i.e., to be determined by the project structural designer) and from the concrete itself (i.e., vapor emitted during the curing process). The evaluation of water vapor from any source and its effect on any aspect of the proposed building space above the slab (i.e., floor covering applicability, mold growth, etc.) is outside our purview and the scope of this report.

Floor Coverings

Prior to the placement of flooring, the floor slabs should be properly cured and tested to verify that the water vapor transmission rate (WVTR) is compatible with the flooring requirements.

SURFACE DRAINAGE

Surface drainage should be carefully controlled during and after grading to prevent ponding and uncontrolled runoff adjacent to building structures and/or other properties. Care will be required during grading to maintain slopes, swales, and other erosion control measures needed to direct runoff toward permanent surface drainage facilities. Positive drainage of at least 2% away from the perimeters of the structures and site pavements should be incorporated into the design. In addition, it is recommended that nuisance water be directed away from the perimeters of the structures using area drains in adjacent landscape and flatwork areas and roof drains tied into the site storm drain system.

INFILTRATION DESIGN

Based on our infiltration testing as discussed earlier in this text and geologic findings, we note that the installation of an infiltration facility such as an infiltration basin or trench within the subject property is not feasible from a geotechnical standpoint. On this basis, we recommend that one of more of the following BMP's be considered:

- Rain gardens and dispersion trenches
- Bioretention and planters
- Permeable pavement
- Similar BMP's infiltrating over an extensive surface area and providing robust pretreatment or embedded treatment process

Final selection of the type and location of BMP should be provided by the project civil engineer.

BIORETENTION AREAS

If bioretention features are installed, we recommend that an impermeable liner be installed at the bottom and sides of all bioretention areas at the subject site to prevent vertical and lateral water migration into the adjacent structures and pavements. The design of bioretention basins above the liner is beyond our purview.

UTILITY DESIGN AND BACKFILL CONSIDERATIONS

Utility Design

<u>Buoyancy</u>

Utilities may be subject to buoyancy uplift forces. As a minimum groundwater levels contained on Plate 5 should be assumed subject to the “notes” contained therein.

<u>Additional Considerations</u>

The site liquefaction may also affect the utilities, pavements, and pool improvements at the site. These improvements will be affected by total, regional differential, and local differential seismic settlements. In this regard, wherever possible, utilities should not be located under building slabs. We also recommend flexible connections for the utilities connecting to the hotel buildings, and earthquake shut off valves for pressured utilities at their entrance to the site. Significant repair and/or replacement will likely be required for all appurtenant structures and utilities in areas not mitigated for liquefaction, in the event of the design level earthquake. Building mat slabs may require repair and re-leveling after a significant earthquake.

Utility Backfill

<u>General</u>

New utility line pipeline trenches should be backfilled with select bedding materials beneath and around the pipes and compacted soil above the pipe bedding. Recommendations for the types of the materials to be used and the proper placement of these materials are provided in the following sections.

<u>Pipe Bedding</u>

The pipe bedding materials should extend from at least 6 inches below the pipes to at least 12 inches above the crown of the pipes. Pipe bedding should consist of either clean sand with a sand equivalent (SE) of at least 30, or crushed rock. If crushed rock is used, it should consist of ¾-inch crushed rock that conforms to Table 200-1.2.1 (A) of the 2018 “Greenbook.” Pipe bedding should also meet the minimum requirements of the County of Orange. If the requirements of the County are more stringent, they should take precedence over the geotechnical recommendations. Sufficient laboratory testing should be performed to verify the bedding meets the minimum requirements of the Greenbook and City of Dana Point grading code.

Based on our subsurface exploration and knowledge of the onsite materials, the soils that will be excavated from the pipeline trenches will not meet the recommendations for pipe bedding materials; therefore, imported materials will be required for pipe bedding.

Granular pipe bedding material having a sand equivalent of 30 or greater should be properly placed in thicknesses not exceeding 3 feet, and then sufficiently flooded or jetted in place.

Crushed rock, if used, should be capped with filter fabric (Mirafi 140N, or equivalent) to prevent the migration of fines into the rock.

Trench Backfill

All existing soil material within the limits of the pipeline alignment is considered suitable for use as trench backfill above the pipe bedding zone if care is taken to remove all significant organic and other decomposable debris, and moisture condition the soil materials as necessary.

Imported soils are not anticipated for backfill since the on-site soils are suitable. However, if imported soils are used, the soils should consist of clean, granular materials with physical and chemical characteristics similar to those described herein for on-site soils. Any imported soils to be used as backfill should be evaluated and approved by GMU prior to placement.

Soils to be used as trench backfill should be moistened, dried, or blended as necessary to achieve a minimum of 2% over optimum moisture content for compaction, placed in loose lifts no greater than 8 inches thick, and mechanically compacted/densified to at least 90% relative compaction as determined by ASTM Test Method D 1557. Jetting is not permitted in this trench zone.

No rock or broken concrete greater than 6 inches in maximum diameter should be utilized in the trench backfills.

DEWATERING

PAVEMENT DESIGN RECOMMENDATIONS

General

It is expected that the driveways within the site will be constructed with both asphalt pavement and Portland cement concrete. Therefore, recommendations for both types of pavement areas are provided in the following sections. In order to accommodate fire truck and trash truck loading, a traffic index (T.I.) of 5.5 has been assumed for the drive areas.

Asphalt Pavement Design

Based on an anticipated R-value of 10 to be obtained after precise grading of asphalt pavement subgrade in the commercial area, the following pavement thicknesses should be anticipated:

Location	R-Value	Traffic Index	Asphalt Concrete (in.)	Aggregate Base (in.)
Car Parking Stalls	10	4.0	4.0	4.0
Drive Aisles	10	5.5	4.0	9.5

Asphalt pavement structural sections should consist of:

- Crushed miscellaneous base (CMB) or crushed aggregate base (CAB) materials meeting the minimum County of Orange requirements.
- Asphalt concrete (AC) materials of a type meeting the minimum County of Orange requirements.
- The subgrade soils should be moisture conditioned to a minimum 2% above the optimum moisture content to a depth of at least 6 inches and compacted to at least 92% relative compaction (per ASTM 1557).
- The CMB or CAB and AC should be compacted to at least 95% relative compaction (per ASTM 1557).

Portland Cement Concrete Pavement Design

Driveways, vehicular drives, and appurtenant concrete paving, such as trash receptacle bays, will require Portland cement concrete (PCC) pavement. Assuming a T.I. of 6 to 7, a design section of 8 inches of PCC over 6 inches AB should be adequate. PCC vehicular pavement should be designed in accordance with the County of Orange standards.

- The subgrade soils should be moisture conditioned to a minimum 2% above the optimum moisture content to a depth of at least 6 inches and compacted to at least 92% relative compaction (per ASTM 1557).
- The CMB or CAB and AC should be compacted to at least 95% relative compaction (per ASTM 1557).

Permeable Interlocking Concrete Paver Design

We understand that the designated parking areas of the Commercial Component may utilize permeable interlocking concrete pavers (PICP) and will assume subgrade soil conditions (R-value) of at least 10, according to the "Design Manual for Permeable Interlocking Concrete Pavements" by ICPI (2011). The final structural base and subbase thicknesses will need to be designed by the project civil engineer in order to meet storage requirements. This minimum section assumes a T.I. of up to 6.3 (GMU assumes a T.I. of 5.5 for the mixed use of parking and drives in this parking lot) and calls for a 3⅛-inch-thick (80 mm) concrete paver, over compacted layers of 2" of bedding course sand (ASTM No. 8 aggregate), over 4" of ASTM No. 57 stone as open-graded base, over 6" of ASTM No. 2 stone as open-graded sub base, over a Class 1 geotextile fabric* (highest strength) per AASHTO M-288.

*Due to the presence of gravel and some rock in the existing fill soils that will likely function as subgrade support for the PICP, GMU recommends using a Class 1 geotextile fabric (highest strength) placed both vertically at the sides of all PICP excavations and on top of the compacted subgrade soil below the stone sub base layer in order to protect the bottom and sides of the open-graded base and sub base. This geotextile fabric must meet AASHTO M-288 Class 1 geotextile strength property and subsurface drainage requirements (per Table 3-3 and Table 3-4 from Page 31 of the ICPI Design Manual (2011) for AASHTO M-288 requirements).

RECYCLED AC MATERIAL

The use of stockpiled in-place recycled AC and crushed miscellaneous base (CMB) for new engineered fill subgrade, and CMB outside building and landscaped areas and under new asphalt concrete pavement and hardscape, will require GMU to conduct conformance laboratory testing on representative samples of the pulverized recycled asphalt pavement to confirm that the samples meet the 2019 Greenbook Section 200-2.4 standards for Crushed Miscellaneous Base (CMB). GMU recommends that this recycled CMB may be used as engineered fill for exterior subgrade structural support of new asphalt concrete and hardscape improvements outside of the building envelopes. The recycled concrete pavement is not to be used as compacted fill for support under any of the building areas or in the planters on the subject site.

FLATWORK DESIGN RECOMMENDATIONS

We anticipate that the proposed improvements will be constructed on previously placed compacted fill material and will require minimum processing prior to construction of the improvements. The following recommendations are for integration of flatwork grades into the grading plans.

Flatwork Table

Description	Subgrade Preparation (1)	Minimum Concrete Thickness	Reinforcement (2)	Expansion Joint Spacing (3) (Minimum)	Concrete (4)
Concrete Paving (Sidewalk) (5)	1) 2% over optimum to 8-inches at 92% relative compaction 2) *4-inches of CAB or CMB compacted to a minimum of 95% relative compaction	4-inches	No. 3 bars @ 18" o.c. and dowel into existing flatwork, doorways and, curbs using No. 3 bars @ 18"o.c	6-foot x 6-foot using 9-inch speed dowels with No. 3 bars @ 18" o.c.	Type II/V 3,250 psi min.
Concrete Paving (Patio) (5)	1) 2% over optimum to 8-inches at 92% relative compaction 2) *4-inches of CAB or CMB compacted to a minimum of 95% relative compaction	5-inches	No. 3 bars @ 18" o.c. and dowel into existing flatwork, doorways, and curbs existing paving using No. 3 bars @ 18"o.c	10-foot x 10-foot using 9-inch speed dowels with No. 3 bars @ 18" o.c.	Type II/V 3,250 psi min.
Concrete Interlocking Pavers underlain by 1" of sand (non-vehicular) (6)	1) 2% over optimum to 8-inches at 92% relative compaction; 2) 4-inches of CAB or CMB compacted to a minimum of 95% relative compaction or concrete sub slab may be used in lieu of base section (see adjacent column).	4-inch concrete sub slab if 4-inch CMB base section not used	1) Slab – No. 3 bars @ 18" o.c. and dowel into existing flatwork, doorways and, curbs using No. 3 bars @ 18"o.c; 2) where adjacent to structures, curbs, etc. and at cold joints - use dowels: No. 3 @ 18" o.c	10-foot x 10-foot using 9-inch speed dowels with No. 3 bars @ 18" o.c.	Type II/V 3,250 psi min.
Concrete Interlocking Pavers underlain by 1" of sand (vehicular) (6) (7)	1) 2% over optimum to 8-inches at 92% relative compaction; 2) 12 inches of CAB or CMB compacted to a minimum of 95% relative compaction over Mirafi 600X or equivalent fabric or concrete sub slab may be used in lieu of base/fabric section (see adjacent column)	6-inch concrete sub slab if 12-inch CMB base section not used	1) Slab – No. 3 bars @ 18" o.c. and dowel into existing flatwork, doorways and, curbs using No. 3 bars @ 18"o.c.; 2) where adjacent to curbs and at cold joints - use dowels: No. 3 bars @ 18" o.c.	10-foot x 10-foot using 9-inch speed dowels with No. 3 bars @ 18" o.c.	Type II/V 3,250 pi min.

****Recommended 4" of AB/CMB under pedestrian concrete pavement to be confirmed by project design team.***

(1) The moisture content and compaction of the subgrade must be verified by the geotechnical consultant prior to base placement.
(2) Reinforcement to be placed in the middle of the recommended concrete section.
(3) Control Joints: Suggested spacing of sidewalk areas at 6-foot square and patio areas at 10-foot square.
(4) Final concrete mix design to be supplied by others.
(5) Where new trees or large shrubs are to be located in close proximity of new concrete flatwork, rigid moisture/root barriers should be placed around the perimeter of the flatwork to least 2 feet deep in order to offer protection to the adjacent flatwork against potential root and moisture damage. Existing mature trees near flatwork areas should also incorporate a rigid moisture/root barrier placed to at least 2 feet below the top of the flatwork.
(6) The minimum thickness of pavers should be 2 3/8" for pedestrian application and 3 1/8" for vehicular application, and should be installed per minimum manufacturer's recommendations, including min. 1" sand bedding. It is highly recommended that if vehicular pavers are to be constructed, they should maintain an aspect ratio of 3 to 1 or less (where the length of the paver is 3 times the thickness of the paver or less) in order to minimize edge cracking.
(7) Concrete bands adjacent to the vehicular interlocking pavers should consist of a design section of 8 inches of PCC over at least 6 inches of AB or equivalent, moisture conditioned to at least optimum moisture, and compacted to at least 95% relative compaction.

General Note: *Minor deviations to the above recommendations may be required at the discretion of the soils engineer or his representative.*

Root Barriers

Where new trees or large shrubs are to be located in close proximity to new concrete flatwork, rigid moisture/root barriers should be placed around the perimeter of the flatwork to at least 12 inches in depth in order to offer protection to the adjacent flatwork against potential root and moisture damage. Flatwork areas with existing mature trees should also incorporate a rigid moisture/root barrier placed at least 2 feet in depth below the top of the flatwork.

PLAN REVIEW / GEOTECHNICAL TESTING DURING GRADING / FUTURE REPORTS

Plan Review

Our office should review the final approved precise grading plans, Geopier/aggregate pier, and landscape plans for the site and comment on the anticipated effects of any major changes from the plan reviewed for this report. In addition, the final parking structure and boater service building foundation plans and final foundation loads will need to be reviewed to confirm that settlements are within tolerable limits.

FUTURE SERVICES

GMU should review the final construction plans to confirm they are consistent with our recommendations provided in this report.

Geotechnical Testing

It is recommended that geotechnical observation and testing be performed by GMU during the following stages of precise grading and construction:

- During site clearing and grubbing.
- During removal of any buried irrigation lines or other subsurface structures.
- During all phases of precise grading including over-excavation, temporary excavations, removals, scarification, ground preparation, moisture conditioning, proof-rolling, and placement and compaction of all fill materials.
- During installation of Geopiers or aggregate piers.
- During installation of all foundations and floor slab elements.
- During backfill of underground utilities.
- During flatwork and paver section placement and compaction.
- During pavement section placement and compaction.
- When any unusual conditions are encountered.

LIMITATIONS

All parties reviewing or utilizing this report should recognize that the findings, conclusions, and recommendations presented represent the results of our professional geological and geotechnical engineering efforts and judgements. Due to the inexact nature of the state of the art of these professions and the possible occurrence of undetected variables in subsurface conditions, we cannot guarantee that the conditions actually encountered during grading and foundation installation will be identical to those observed and sampled during our study or that there are no unknown subsurface conditions which could have an adverse effect on the use of the property. We have exercised a degree of care comparable to the standard of practice presently maintained by other professionals in the fields of geotechnical engineering and engineering geology, and believe that our findings present a reasonably representative description of geotechnical conditions and their probable influence on the grading and use of the property.

Because our conclusions and recommendations are based on a limited amount of current and previous geotechnical exploration and analysis, all parties should recognize the need for possible revisions to our conclusions and recommendations during grading of the project. Additionally, our conclusions and recommendations are based on the assumption that our firm will act as the geotechnical engineer of record during grading of the project to observe the actual conditions exposed, to verify our design concepts and the grading contractor's general compliance with the project geotechnical specifications, and to provide our revised conclusions and recommendations should subsurface conditions differ significantly from those used as the basis for our conclusions and recommendations presented in this report.

Detailed corrosion testing and recommendations for protecting buried ferrous metal and/or copper elements are beyond our purview.

This report has not been prepared for use by other parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

CLOSURE

If you have any questions concerning our findings or recommendations, please do not hesitate to contact us and we will be happy to discuss them with you. The Plates and Appendices that complete this report are listed in the Table of Contents.

Respectfully submitted,

David R. Atkinson

David R. Atkinson
Project Manager / Senior Engineer

PROFESSIONAL GEOLOGIST
KATHRYN M. FARRINGTON
No. 2611
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Katie Farrington, M.Sc., PG, CEG 2611
Senior Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER
GREGORY P. SILVER
GE 2336
GEOTECHNICAL
STATE OF CALIFORNIA

Gregory P. Silver, M.Sc., PE, GE 2336
President / CEO
Principal Geotechnical Engineer

dra/17-206-02 (12-4-19)

SITE-SPECIFIC REFERENCES

Bluewater Design Group, 2003, "Dana Point Marina Redevelopment, Bulkhead Structural Evaluation," December 17, 2003.

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AERIAL PHOTOGRAPHS

DATE	FLIGHT	PHOTO
4-19-99	C136-45	170-171
10-15-97	C117-45	118-119
1-2-95	C101-45	10-11
1-14-92	C85-18	2-3
1-9-92	C-7	112-113-114
11-14-87	C-1	0012-0013
1-9-87	F	294-295
5-18-83	218-11	32-33
1-31-81	211-11	24-25
2-26-80	80033	268-269
12-13-78	203-11	43-44
1-24-77	181-11	31
1-13-75	157-11	27-28
10-29-73	132-10	20-21
1-31-70	61-10	223-224-225
3-30-67	2	94-95-96
9-20-65	1FF	86-87
3-28-59	261-R25	77-78
12-12-52	3K	49-50

TECHNICAL REFERENCES

Boore, D.M. and Atkinson, G.M., 2008, Ground-Motion Prediction Equations for the Average Horizontal Component of PGA, PGV, and 5%-Damped PSA at Spectral Periods between 0.01 s and 10 s: Earthquake Spectra, Vol. 24, No. 1, p. 99-138.

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Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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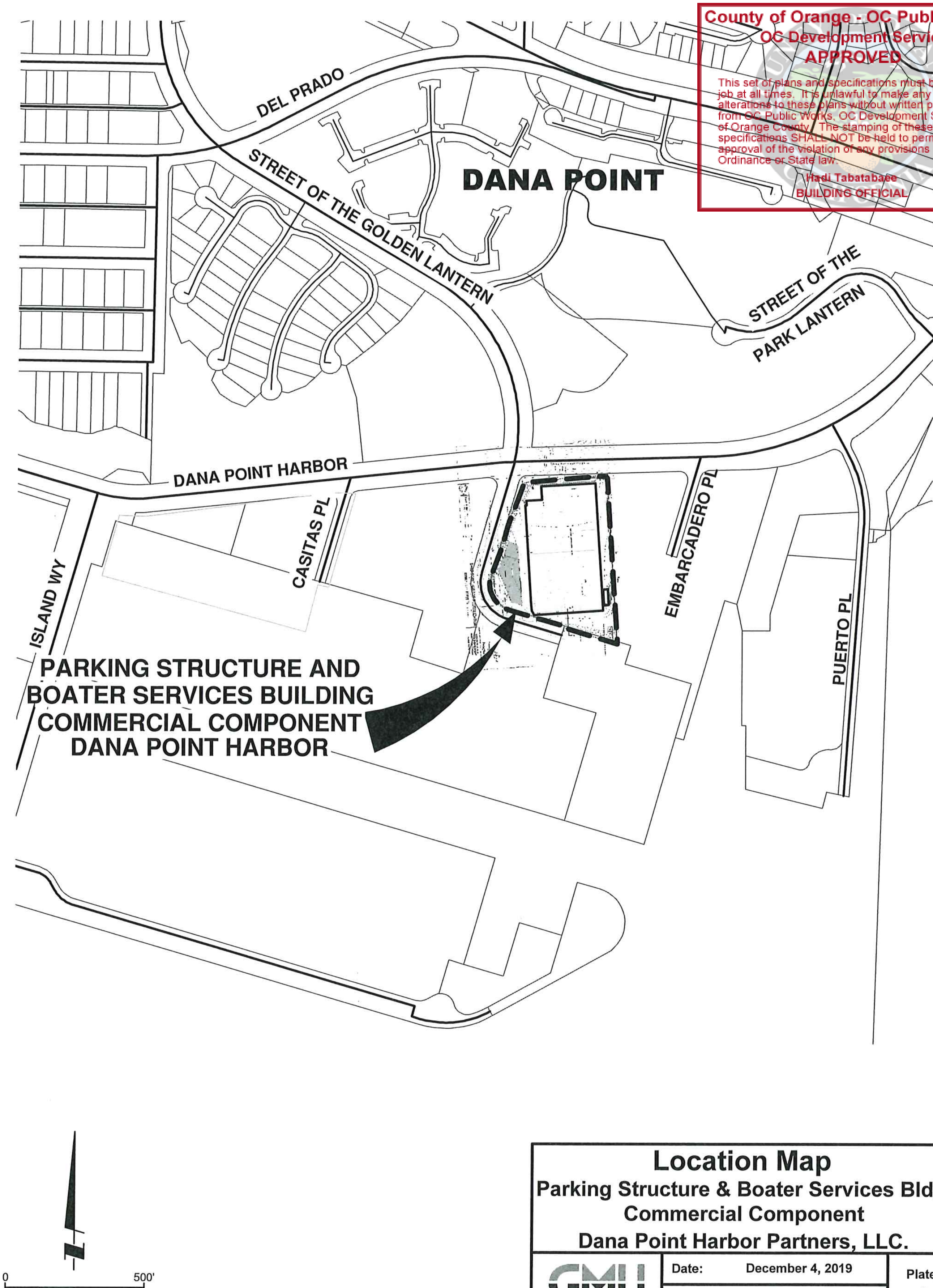

Location Map

Parking Structure & Boater Services Bldg.
Commercial Component
Dana Point Harbor Partners, LLC.

GMU	Date: December 4, 2019	Plate 1
	Project No.: 17-206-02	

DRAWING: q:\2017\17-206-02\dwg\1720602_plate 1_location map.dwg PLOTTED: 12/4/2019 10:02 AM BY: Jmeza

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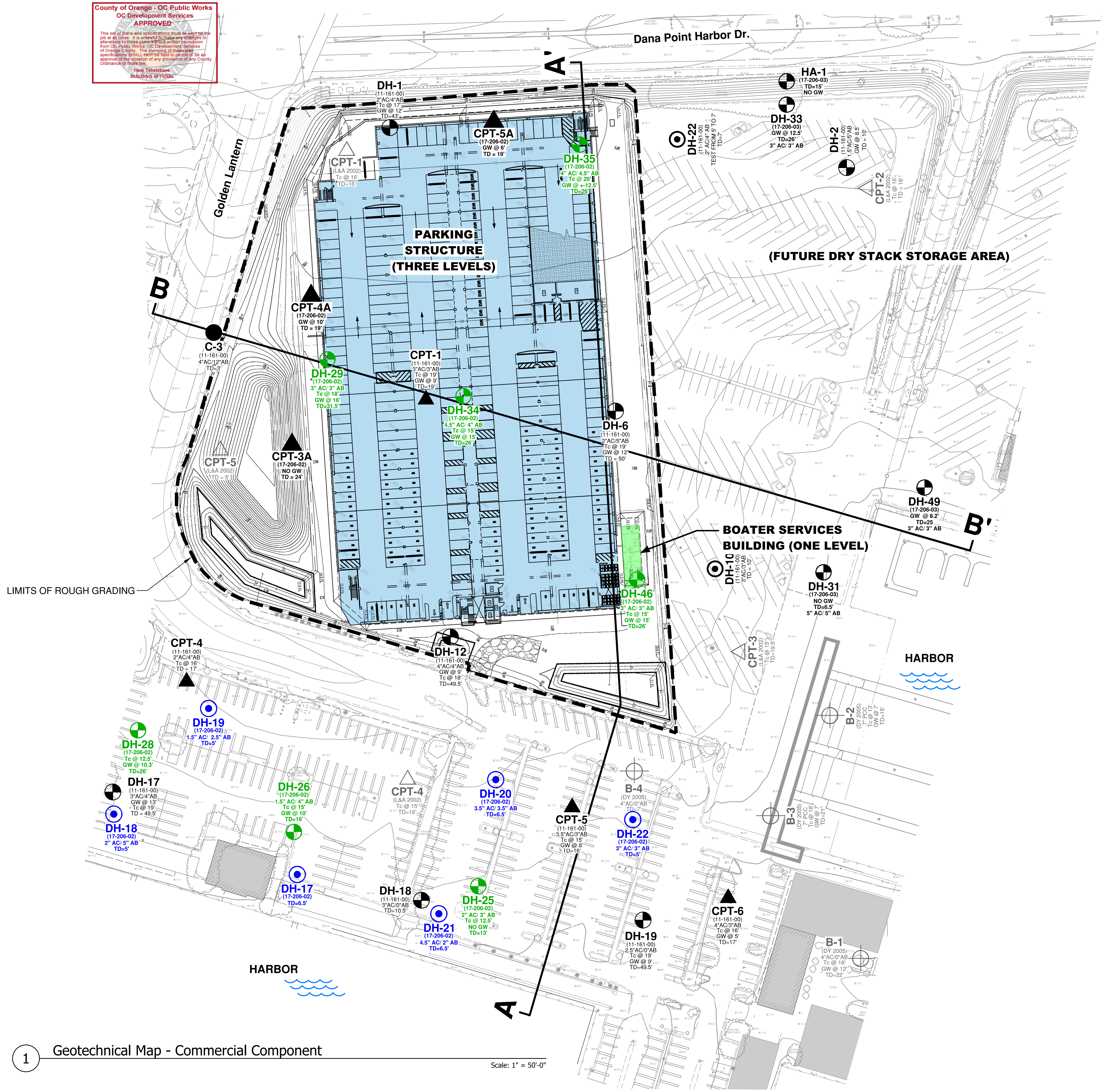

1 Geotechnical Map - Commercial Component

Scale: 1" = 50'-0"

0 50' 100'

GEOTECHNICAL LEGEND

DH	APPROXIMATE DRILL HOLE LOCATIONS BY GMU GEOTECHNICAL, INC., PROJECT 17-206-02 AND 17-206-03
HA-1	APPROXIMATE LOCATION OF GMU HAND AUGER LOCATION (PROJECT 17-206-03)
DH	APPROXIMATE INFILTRATION TEST LOCATIONS BY GMU GEOTECHNICAL, INC., PROJECT NO. 17-206-02
DH-4	APPROXIMATE LOCATION OF GMU DRILL HOLE LOCATIONS (PROJECT 11-161-00)
DH-24	APPROXIMATE LOCATION OF GMU INFILTRATION TESTS (PROJECT 11-161-00)
CPT-3	APPROXIMATE LOCATION OF GMU CONE PENETRATION TEST HOLE (PROJECT 11-161-00)
C-4	APPROXIMATE LOCATION OF GMU ASPHALT CORE HOLE (PROJECT 11-161-00)
CPT-1	ESTIMATED LOCATION OF PREVIOUS CPT BY LEIGHTON (PROJECT 600024-001, DATED 12/3/02)
B-2	ESTIMATED LOCATION OF PREVIOUS BORING BY DIAZ YOURMAN (PROJECT 2005-022, DATED 11/29/05)
	PROPOSED THREE LEVEL PARKING STRUCTURE
	PROPOSED ONE LEVEL BOATER SERVICE BUILDING
	EXISTING BUILDINGS
B B'	GEOTECHNICAL SECTION
	LIMITS OF ROUGH GRADING
GW	DEPTH BELOW GROUND SURFACE MEASURED AT TIME OF DRILLING

Geotechnical Map
Parking Structure for Commercial Component
Dana Point Harbor Partners, LLC.

GMU	Date: December 4, 2016	Plate 2
	Project No.: 17-206-02	

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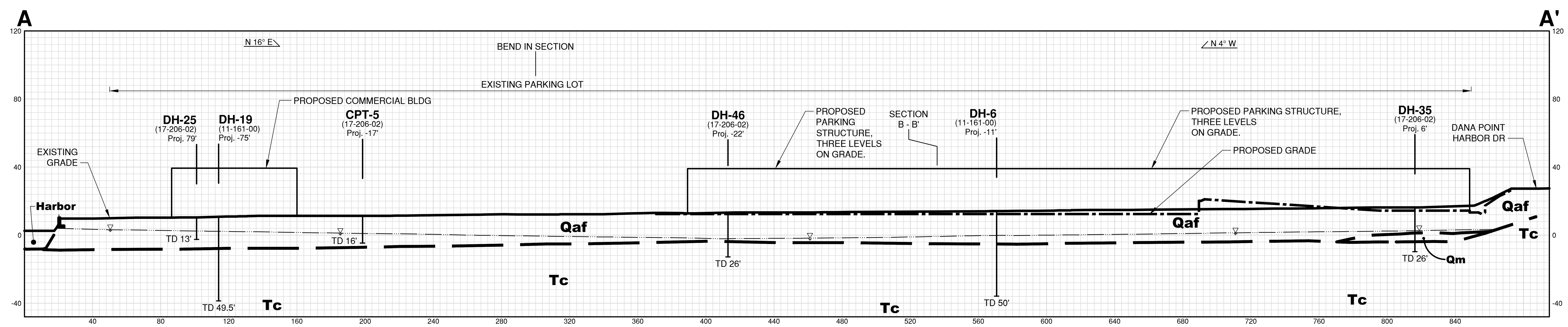

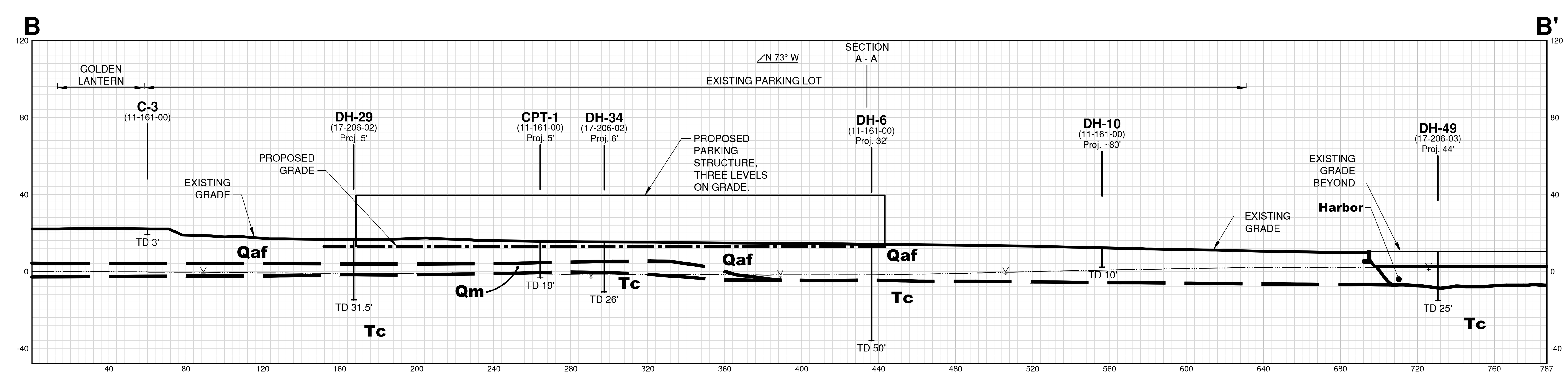

LEGEND

▽ INTERPRETED GROUNDWATER LEVELS CONSIDERING GEOLOGIC MATERIALS AND GEOTECHNICAL LAB DATA

0 40' 80'

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Geotechnical Sections

GMU

Date:	December 4, 2019	Plate 3
Project No.:	17-206-02	

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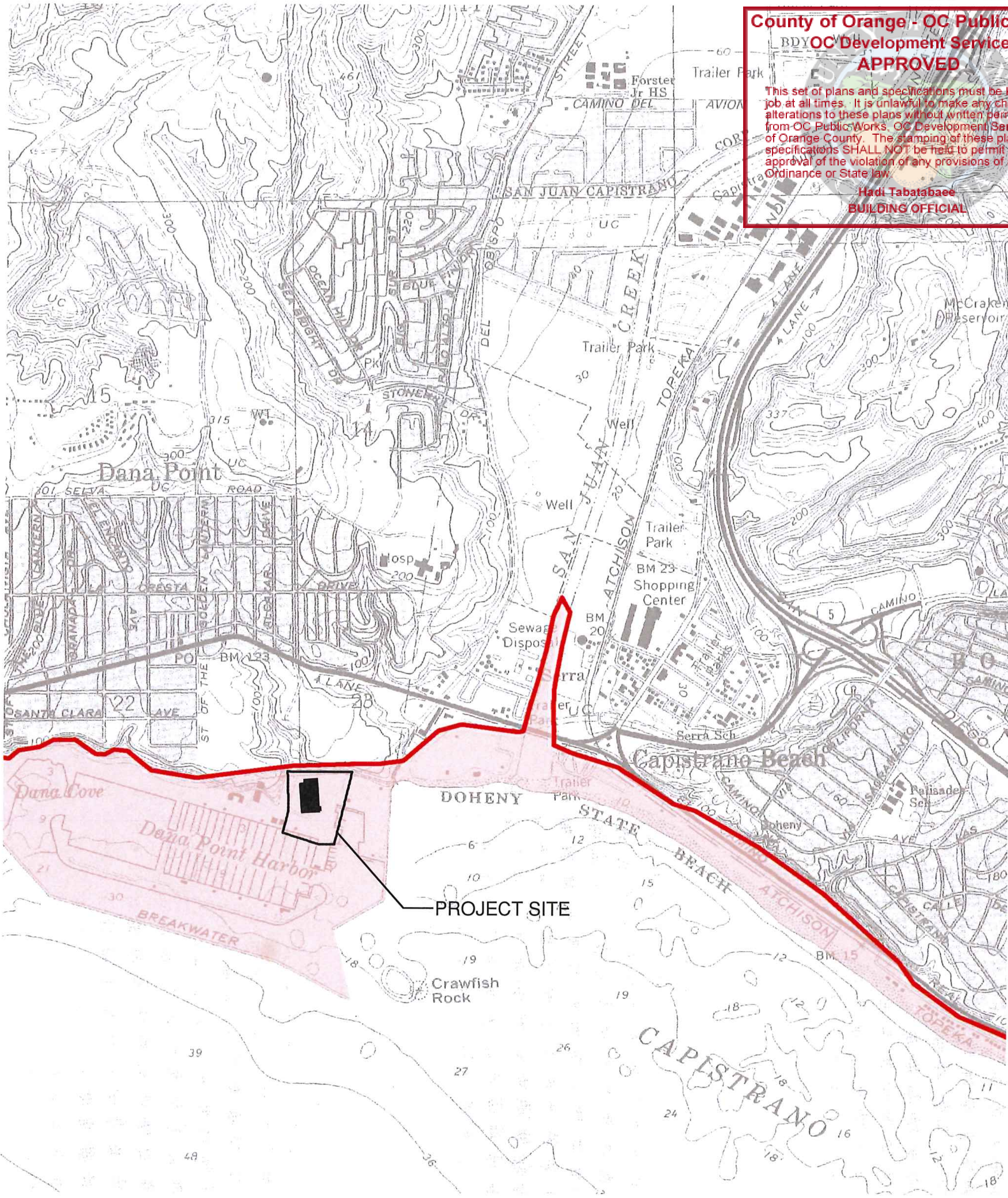

MAP EXPLANATION

Tsunami Inundation Line

Tsunami Inundation Area

TSUNAMI INUNDATION MAP FOR EMERGENCY PLANNING

GMU	Date: December 4, 2019	Plate 4
	Project No.: 17-206-02	

DRAWING: q:\2017\17-206-02\dwg\1720602_plate 4_tsunami inundation map.dwg PLOTTED: 11/26/2019 12:19 PM BY: Jmeza

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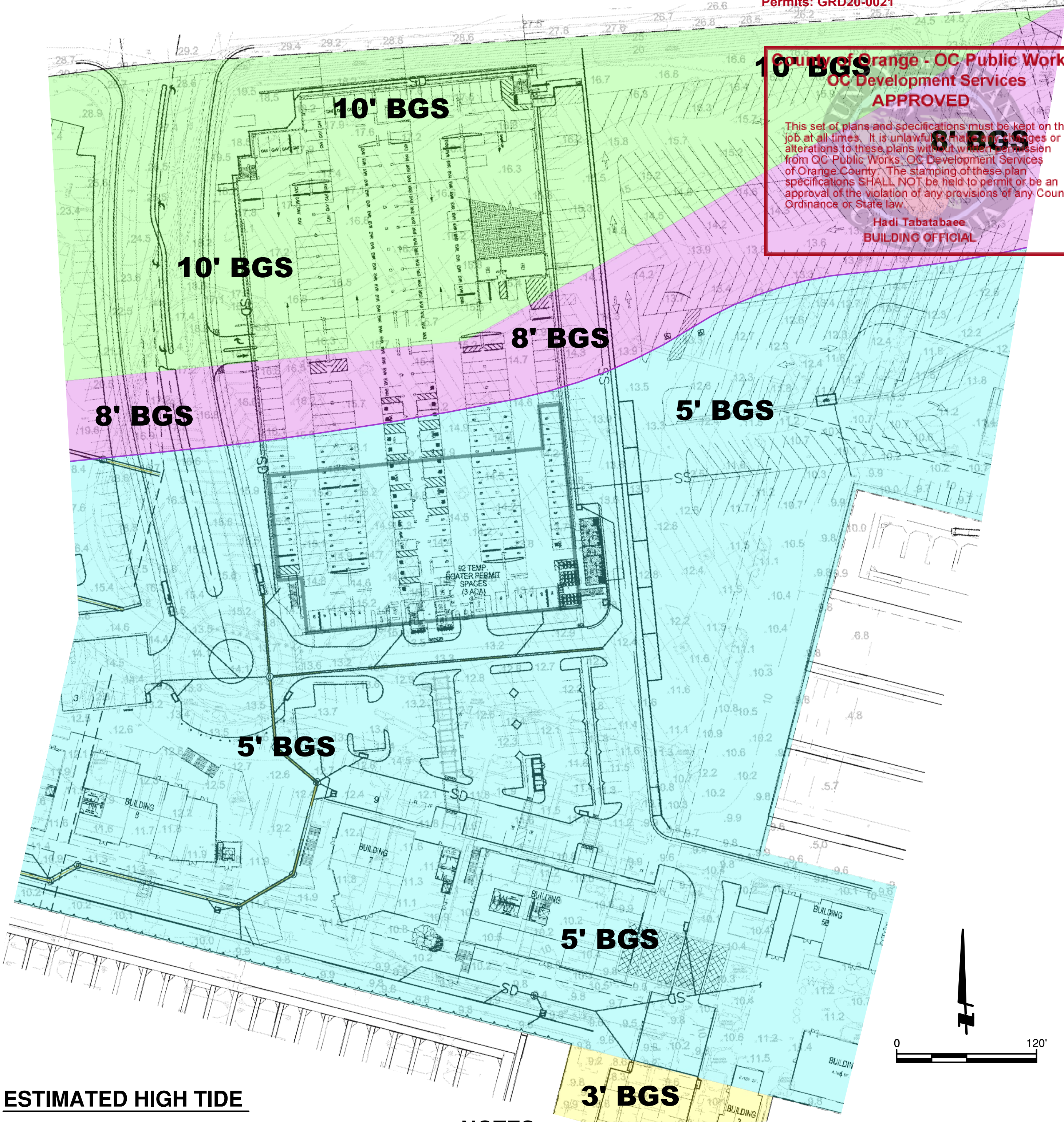

ESTIMATED HIGH TIDE GROUNDWATER LEVELS ZONES

- 3' BGS (BELOW EXISTING GROUND SURFACE)
- 5' BGS
- 8' BGS
- 10' BGS
- 15' BGS

NOTES

1. EXISTING GROUND SURFACE IS NOTED BY SPOT ELEVATIONS ABOVE AS SURVEYED BY TAIT AND ASSOCIATES, INC. DATED NOVEMBER 2018.
2. DESIGN GROUND WATER LEVELS DETERMINED FROM GROUNDWATER MEASUREMENT ON THE DAY OF DRILLING AND ADJUSTED TO DAILY HIGH TIDE CONDITIONS. DOES NOT CONSIDER KING TIDES, MAXIMUM HIGH TIDES, AND EFFECTS TO TIDES DUE TO CLIMATE CHANGE.

Estimated High Tide Groundwater Levels Plan

GMU

Date:	December 4, 2019	Plate 5
Project No.:	17-206-02	

DRAWING: q:\2017\17-206-02\dwg\1720602_plate 5_est ht gw levels plan.dwg PLOTTED: 12/5/2019 1:11 PM BY: Jmeza

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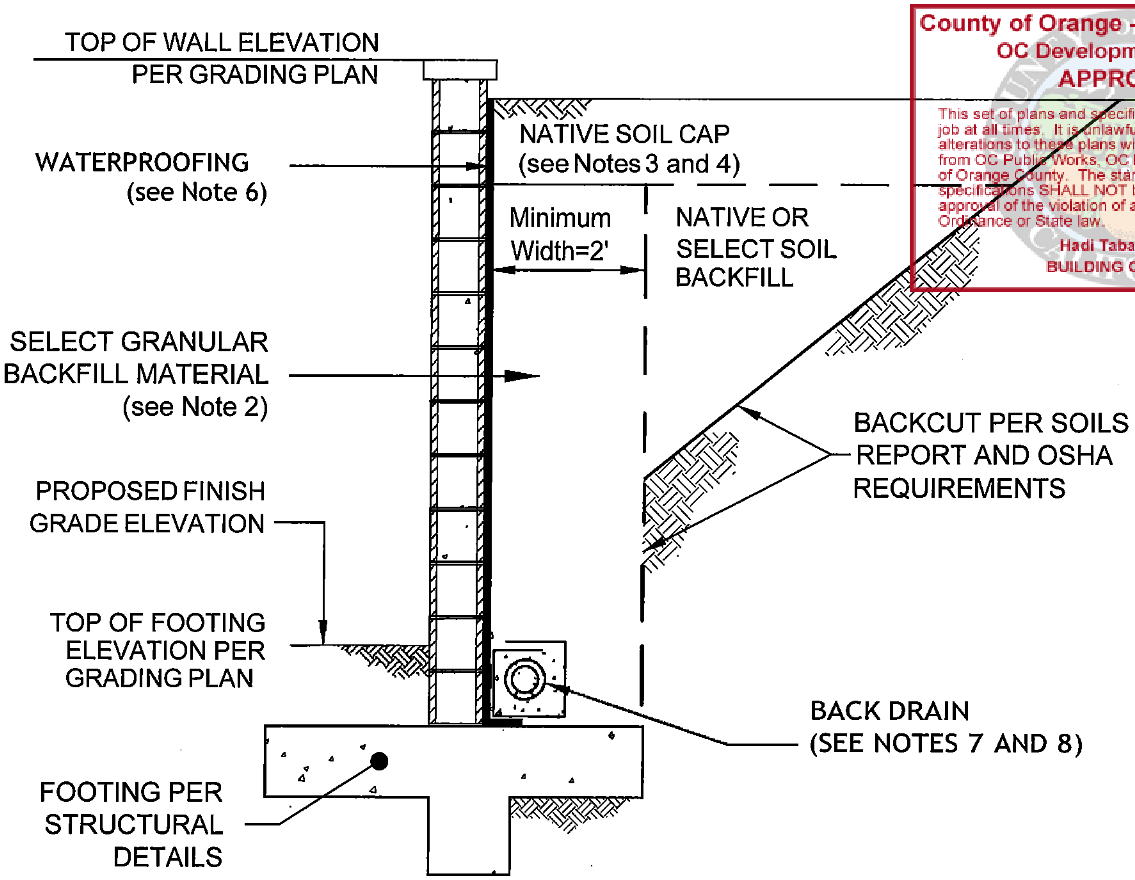

RETAINING WALL DETAIL
NOT TO SCALE

1. FINAL DETERMINATION OF THE MATERIAL TO BE USED FOR BACKFILL SHALL BE MADE BY GMU.
2. ALL SELECT BACKFILL TO WITHIN 1 TO 2 FEET OF FINAL GRADE SHOULD CONSIST OF FREE-DRAINING GRANULAR MATERIAL (I.E. SE 30 SAND, PEA GRAVEL, OR CRUSHED ROCK). CRUSHED ROCK, IF USED, SHOULD BE WRAPPED IN FILTER FABRIC (MIRAFI 140N OR EQUIVALENT) TO MINIMIZE THE POTENTIAL FOR MIGRATION OF FINES INTO THE ROCK. THE SELECT BACKFILL SHOULD BE MOISTURE CONDITIONED TO ACHIEVE OVER OPTIMUM MOISTURE CONTENT PER THE SOILS REPORT AND COMPACTED TO AT LEAST 90% RELATIVE COMPACTION AS DETERMINED BY ASTM TEST METHOD D 1557.
3. FINE-GRAINED NATIVE SOILS SHOULD BE USED TO CAP THE SELECT BACKFILL ZONE.
4. ALL NATIVE OR SELECT SOIL WALL BACKFILL SHOULD BE MOISTURE CONDITIONED AS NECESSARY TO OVER OPTIMUM MOISTURE CONTENT PER THE SOILS REPORT AND COMPACTED TO AT LEAST 90% RELATIVE COMPACTION AS DETERMINED BY ASTM TEST METHOD D 1557.
5. THE BACKSIDE OF THE WALLS SHOULD BE WATERPROOFED DOWN TO AND ACROSS THE TOP OF THE FOOTING. THE DESIGN AND SELECTION OF THE WATERPROOFING SYSTEM IS OUTSIDE OF THE PURVIEW OF GMU.
6. THE WATERPROOFING SYSTEM AND ANY DRAIN BOARDS SHOULD BE PROTECTED FROM DAMAGE BY CONSTRUCTION ACTIVITIES. THE TOP EDGE OF THE WATERPROOFING AND ANY DRAIN BOARDS SHOULD BE PROPERLY ADHERED TO THE WALL AND SEALED TO PREVENT THE POSSIBLE ACCUMULATION OF DEBRIS BETWEEN THE DRAINAGE/WATERPROOFING SYSTEM AND THE WALL.
7. THE BACKDRAIN SYSTEM SHOULD CONSIST OF 4" PERFORATED PIPE SURROUNDED BY AT LEAST ONE CUBIC FOOT OF 3/4"-1.5" OPEN GRADED GRAVEL WRAPPED IN MIRAFI 140N FILTER FABRIC (OR EQUIVALENT). THE PERFORATED PIPE SHOULD CONSIST OF SDR-35 OR SCHEDULE 40 PVC PIPE (OR APPROVED EQUIVALENT) LAID ON AT LEAST 2" OF CRUSHED ROCK WITH THE PERFORATIONS LAID DOWN. THE BACKDRAIN GRADIENT SHOULD NOT BE LESS THAN 1% WHEN POSSIBLE. THE PERFORATED PIPE SHOULD OUTLET INTO AREA DRAINS OR OTHER SUITABLE OUTLET POINTS AT RUNS OF 200 FEET OR LESS, IF PRACTICAL. IF THE BACKDRAINS CANNOT BE OUTLETED BY GRAVITY FLOW, A SUMP PUMP SYSTEM WILL NEED TO BE DESIGNED AND CONSTRUCTED. REDUNDANT BACK-UP PUMPS OR COMPONENTS ARE RECOMMENDED. DESIGN OF THIS SYSTEM IS OUTSIDE OF THE PURVIEW OF GMU.
8. THE TIE-IN LOCATIONS FOR BACKDRAIN OUTLETS SHOULD BE SHOWN ON THE PRECISE GRADING, SITE WALL, AND/OR LANDSCAPE PLANS.

GMU	RETAINING WALL CONSTRUCTION DETAIL	PLATE 6

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Approval: Geotechnical Reports
Permits: GRD20-0021

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BUILDING OFFICIAL

APPENDIX A-1

GMU Geotechnical Exploration Procedures and Logs

GMU

APPENDIX A-1

GMU GEOTECHNICAL EXPLORATION PROCEDURES AND LOGS

Our exploration at the subject site consisted of twenty (18) drill holes to a maximum depth of 50 feet below the existing grade, one (1) hand auger to a depth of 15 feet below existing grade, eight (8) shallow drill holes for infiltration testing, and seven (7) Cone Penetration Testing (CPT) soundings to a maximum depth of 24 feet below the existing grade. Our drill holes were logged by a Certified Engineering Geologist or Engineer, and drive, bulk, and SPT samples of the excavated soils were collected. The logs of each drill hole are contained in this Appendix A-1, and the Legend to Logs is presented as Plates A-1 and A-2. The CPT data are presented in Appendix A-2. The approximate locations of the drill holes and CPT's are shown on Plate 2 – Geotechnical Map.

"Undisturbed" samples were taken using a 3.25-inch outside-diameter drive sampler which contains a 2.416-inch-diameter brass sample sleeve 6 inches in length. Standard penetration testing (SPT) with a 2.0-inch outside diameter split spoon sampler without liners was performed in the borings during advancement. Blow counts recorded during sampling from the drive sampler and SPT are shown on the drill hole logs.

The geologic and engineering field descriptions and classifications that appear on these logs are prepared according to Corps of Engineers and Bureau of Reclamation standards. Major soil classifications are prepared according to the Unified Soil Classification System as modified by ASTM Standard No. 2487. Since the descriptions and classifications that appear on the Log of Borings are intended to be that which most accurately describe a given interval of a boring (frequently an interval of several feet), discrepancies do occur in the Unified Soil Classification System nomenclature between that interval and a particular sample in that interval. For example, an 8-foot-thick interval in a log may be identified as silty sand (SM) while one sample taken within the interval may have individually been identified as sandy silt (ML). This discrepancy is frequently allowed to remain to emphasize the occurrence of local textural variations in the interval.

MAJOR DIVISIONS			Group Letter	Symbol	TYPICAL NAMES
COARSE-GRAINED SOILS More Than 50% Retained On No.200 Sieve Based on The Material Passing The 3-Inch (75mm) Sieve. Reference: ASTM Standard D2487	**GRAVELS** 50% or More of Coarse Fraction Retained on No.4 Sieve	Clean Gravels	GW		Well Graded Gravels and Gravel-Sand Mixtures, Little or No Fines.
			GP		Poorly Graded Gravels and Gravel-Sand Mixtures, Little or No Fines.
		Gravels With Fines	GM		Silty Gravels, Gravel-Sand-Silt Mixtures.
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures.
	SANDS More Than 50% of Coarse Fraction Passes No.4 Sieve	Clean Sands	SW		Well Graded Sands and Gravelly Sands, Little or No Fines.
			SP		Poorly Graded Sands and Gravelly Sands, Little or No Fines.
		Sands With Fines	SM		Silty Sands, Sand-Silt Mixtures.
			SC		Clayey Sands, Sand-Clay Mixtures.
FINE-GRAINED SOILS 50% or More Passe The No.200 Sieve Based on The Material Passing The 3-Inch (75mm) Sieve. Reference: ASTM Standard D2487	**SILTS AND CLAYS** Liquid Limit Less Than 50%		ML		Inorganic Silts, Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts With Slight Plasticity.
			CL		Inorganic Clays of Low To Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
			OL		Organic Silts and Organic Silty Clays of Low Plasticity
	SILTS AND CLAYS Liquid Limit 50% or Greater		MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silts.
			CH		Inorganic Clays of High Plasticity, Fat Clays.
			OH		Organic Clays of Medium To High Plasticity, Organic Silts.
HIGHLY ORGANIC SOILS			PT		Peat and Other Highly Organic Soils.

The descriptive terminology of the logs is modified from current ASTM Standards to suit the purposes of this study

ADDITIONAL TESTS

DS = Direct Shear
HY = Hydrometer Test
TC = Triaxial Compression Test
UC = Unconfined Compression
CN = Consolidation Test
(T) = Time Rate
EX = Expansion Test
CP = Compaction Test
PS = Particle Size Distribution
EI = Expansion Index
SE = Sand Equivalent Test
AL = Atterberg Limits
FC = Chemical Tests
RV = Resistance Value
SG = Specific Gravity
SU = Sulfates
CH = Chlorides
MR = Minimum Resistivity
pH
(N) = Natural Undisturbed Sample
(R) = Remolded Sample
CS = Collapse Test/Swell-Settlement

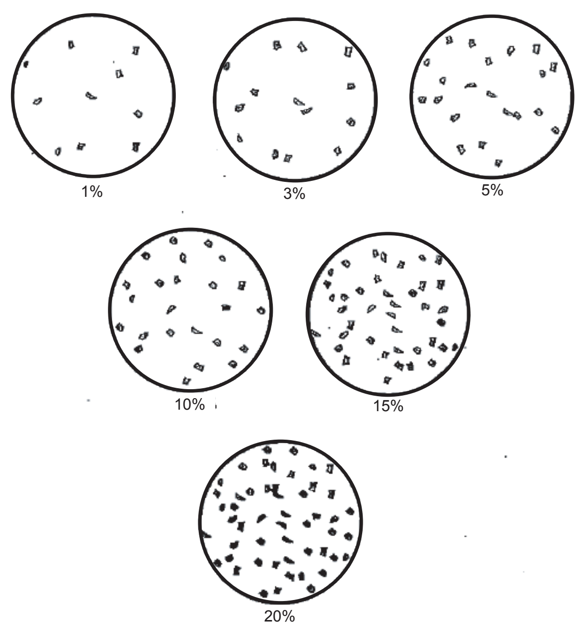
GEOLOGIC NOMENCLATURE

B = Bedding C = Contact J = Joint
F = Fracture Flt = Fault S = Shear
RS = Rupture Surface = Seepage
= Groundwater

SAMPLE SYMBOLS

Undisturbed Sample (California Sample)
Undisturbed Sample (Shelby Tube)
Bulk Sample
Unsuccessful Sampling Attempt
SPT Sample

10: 10 Blows for 12-Inches Penetration
6/4: 6 Blows Per 4-Inches Penetration
P: Push
(13): Uncorrected Blow Counts ("N" Values) for 12-Inches Penetration- Standard Penetration Test (SPT)



GMU

LEGEND TO LOGS

ASTM Designation: D 2487
(Based on Unified Soil Classification System)

Plate
A-1

SOIL DENSITY/CONSISTENCY

FINE GRAINED

Consistency	Field Test	SPT (#blows/foot)	Mod (#blows/foot)
Very Soft	Easily penetrated by thumb, exudes between fingers	<2	<3
Soft	Easily penetrated one inch by thumb, molded by fingers	2-4	3-6
Firm	Penetrated over 1/2 inch by thumb with moderate effort	4-8	6-12
Stiff	Penetrated about 1/2 inch by thumb with great effort	8-15	12-25
Very Stiff	Readily indented by thumbnail	15-30	25-50
Hard	Indented with difficulty by thumbnail	>30	>50

COARSE GRAINED

Density	Field Test	SPT (#blows/foot)	Mod (#blows/foot)
Very Loose	Easily penetrated with 0.5" rod pushed by hand	<4	<5
Loose	Easily penetrated with 0.5" rod pushed by hand	4-10	5-12
Medium Dense	Easily penetrated 1' with 0.5" rod driven by 5lb hammer	10-30	12-35
Dense	Dificult to penetrat 1' with 0.5" rod driven by 5lb hammer	31-50	35-60
Very Dense	Penetrated few inches with 0.5" rod driven by 5lb hammer	>50	>60

BEDROCK HARDNESS

Density	Field Test	SPT (#blows/foot)
Soft	Can be crushed by hand, soil like and structureless	1-30
Moderately Hard	Can be grooved with fingernails, crumbles with hammer	30-50
Hard	Can't break by hand, can be grooved with knife	50-100
Very Hard	Scratches with knife, chips with hammer blows	>100

MODIFIERS

Trace	1%
Few	1-5%
Some	5-12%
Numerous	12-20%
Abundant	>20%

GRAIN SIZE

Description		Sieve Size	Grain Size	Approximate Size
Boulders		>12"	>12"	Larger than a basketball
Cobbles		3-12"	3-12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4-3"	3/4-3"	Thumb-sized to fist-sized
	Fine	#4-3/4"	0.19-0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10-#4	0.079-0.19"	Rock-salt-sized to pea-sized
	Medium	#40-#10	0.017-0.079"	Sugar-sized to rock salt-sized
	Fine	#200-#40	0.0029-0.017"	Flour-sized to sugar-sized
Fines		passing #200	<0.0029"	Flour-sized and smaller

MOISTURE CONTENT

Dry- Very little or no moisture
Damp- Some moisture but less than optimum
Moist- Near optimum
Very Moist- Above optimum
Wet/Saturated- Contains free moisture

GMU

LEGEND TO LOGS
ASTM Designation: D 2487
(Based on Unified Soil Classification System)

Plate
A-2

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.

Hadi Tabatabaee
BUILDING OFFICIAL

GMU Project 17-206-02

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-17

Date(s) Drilled	9/12/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	6.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	11.6
Groundwater Depth [Elevation], feet	NA []	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 3 inches)						
			ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 3 inches)						
10					CLAYEY SAND (SC), grayish brown, brown and orange brown, slightly moist, loose, fine grained						
			Abundant gravel up to 1"				4 4 4	140			
	5		Scattered gravel up to 0.5"		pale grayish brown and brown, moist, dense, fine grained		11 10 12	140			
					Total Depth = 6.5 feet Groundwater Not Encountered						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Project: Dana Point Harbor, Commercial Component **Project Location:** Dana Point Harbor Drive **Project Number:** 17-206-02	# Log of Drill Hole DH-18 Sheet 1 of 1

Date(s) Drilled	**9/12/2018**	Logged By	**WD**	Checked By	**KMF**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**5.1 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**11.3**
Groundwater Depth [Elevation], feet	**NA []**	Sampling Method(s)	**Cal-mod sampler with 6-inch sleeve, SPT, and bulk**	Drill Hole Backfill	**Native and Quickrete**
Remarks				Driving Method and Drop	**Autohammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 2 inches)						
10			**ARTIFICIAL FILL (Qaf)**		Aggregate Base (approximately 5 inches)						
					CLAYEY SAND (SC), brown, gray brown, slightly moist, medium dense, fine to medium grained, some gravel						
			Possibly highly weathered bedrock (inconclusive)				8 7 8	140			
	5						50/1"	140	15	111	
					Total Depth = 5.1 feet Groundwater Not Encountered						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Project: Dana Point Harbor, Commercial Component **Project Location:** Dana Point Harbor Drive **Project Number:** 17-206-02	# Log of Drill Hole DH-19 Sheet 1 of 1

Date(s) Drilled	**9/12/2018**	Logged By	**WD**	Checked By	**KMF**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**6.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**12.6**
Groundwater Depth [Elevation], feet	**NA**	Sampling Method(s)	**Cal-mod sampler with 6-inch sleeve, SPT, and bulk**	Drill Hole Backfill	**Native and Quickrete**
Remarks				Driving Method and Drop	**Autohammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
					Asphalt Concrete (Approximately 1.5 inches)						
			ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 2.5 inches)						
10			Scattered gravel up to 1", possibly highly weathered bedrock (inconclusive)		CLAYEY SAND (SC), brown and yellowish brown, moist, loose, fine grained		5 2 4	140			
	5		Gravel up to 4"		SAND (SP), pale yellowish brown, moist, dense, fine to medium grained		15 18 8	140			
					Total Depth = 6.5 feet Groundwater Not Encountered						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Drill Hole DH-19

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-20

Date(s) Drilled	9/12/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	6.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	12.0
Groundwater Depth [Elevation], feet	NA []	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
					Asphalt Concrete (Approximately 3.5 inches)						
			ARTIFICIAL FILL (Qaf)		Aggregate Base (Approximately 3.5 inches)						
10					CLAYEY SAND (SC), brown and grayish brown, slightly moist, medium dense, fine grained						
			Scattered gravel up to 2"				7 12 12	140			
	5		Possibly highly weathered bedrock (inconclusive)		pale yellowish brown and grayish brown, fine to medium grained		4 6 8	140	19	107	
					Total Depth = 6.5 feet Groundwater Not Encountered						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Project: Dana Point Harbor, Commercial Component **Project Location:** Dana Point Harbor Drive **Project Number:** 17-206-02	# Log of Drill Hole DH-21 Sheet 1 of 1

Date(s) Drilled	9/12/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	6.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	11.8
Groundwater Depth [Elevation], feet	NA []	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 4.5 inches)						
10			**ARTIFICIAL FILL (Qaf)**		Aggregate Base (approximately 2 inches) CLAYEY SAND (SC), brown and grayish brown, moist, loose, fine grained						
			Orange brown mottles				3 3 4	140			
	5		Orange brown mottles, gravel up to 2". Possibly highly weathered bedrock (inconclusive)		grayish brown, medium dense, fine to medium grained, some gravel		9 6 9	140	15	111	
					Total Depth = 6.5 feet Groundwater Not Encountered						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-22

Sheet 1 of 1

County of Orange - OC Public Works
OC Development Services
APPROVED
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BUILDING OFFICIAL

Date(s) Drilled	9/12/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	6.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	11.0
Groundwater Depth [Elevation], feet	NA ▯	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 3 inches)						
10			**ARTIFICIAL FILL (Qaf)**		Aggregate Base (approximately 3 inches)						
					CLAYEY SAND (SC), pale yellowish gray and orange brown, moist, medium dense, fine grained, some gravel						
			Gravel up to 2". Possibly highly weathered bedrock (inconclusive)				5 6 7	140			
	5		Scattered rounded gravel up to 2"		pale yellowish gray and brown, moist, dense, fine grained		8 9 20	140	12	118	
5											
					Total Depth = 6.5 feet Groundwater Not Encountered						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Drill Hole DH-22

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-25

Date(s) Drilled	9/12/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	13.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	10.8
Groundwater Depth [Elevation], feet	NA []	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0			Asphalt Concrete (approximately 2 inches)					
10		**ARTIFICIAL FILL (Qaf)**		Aggregate Base (approximately 3 inches)					
				CLAYEY SAND (SC), brown and brownish gray, moist, medium dense, fine to medium grained, some gravel					
		Gravel up to 3"			4 7 11	140			
	5			dark brown, moist, dense, medium to fine grained	24 15 11	140			
5									
		Possibly highly weathered bedrock (inconclusive)		SANDY FAT CLAY (CH), dark gray and gray, moist, medium dense, fine grained	4 5 5	140	13		
	10	Scattered rounded gravel up to 2", minor fine grained sand			2 4 4	140	18	109	
0									
		bedrock fragment in sampler		Fragment of bedrock composed of SILTSTONE, CLAYEY SILTSTONE and SANDSTONE with GRAVEL (ML), dark gray and pale brown, slightly moist, hard, fine grained	50/5"	140			
		Weakly bedded							
				Total Depth = 13 feet Groundwater Not Encountered					

GMU

Project: Dana Point Harbor, Commercial Component	Log of Drill Hole DH-26
Project Location: Dana Point Harbor Drive	
Project Number: 17-206-02	Sheet 1 of 1

Date(s) Drilled	9/12/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	16.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	11.8
Groundwater Depth [Elevation], feet	10.0 [1.8]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
				Asphalt Concrete (approximately 1.5 inches)					
		ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 4 inches)					
10				CLAYEY SAND (SC), pale brownish gray, moist, medium dense, fine grained					
		Scattered gravel and cobbles up to 6". Rare orange brown mottles.			5 8 16	140			
	5	Rounded gravel up to 4", interbeds of clayey siltstone with gravel, dark gray		very dense, coarse to medium grained, some gravel	8 16 25	140	10	128	
5		Minor fine sand, rare orange brown staining, scattered gravel		loose	2 3 4	140			
	10			olive brown, wet, dense, fine grained	5 9 12	140	14	113	
		MARINE DEPOSITS (Qm)		SANDY CLAY (CL), very dark gray, wet, very stiff					
0		Minor fine to medium grained sand, gravel is sub-rounded up to 1"			4 9 15	140			
	15	**CAPISTRANO FORMATION (Tc)** Gravel is sub-rounded to rounded up to 4"		SILTSTONE with SAND (ML), very dark gray, moist, hard, some clay and gravel	30 50/4"	140			
				Total Depth = 16 feet Groundwater at 10'					

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GMU

Drill Hole DH-26

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-28

Date(s) Drilled	9/13/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	26.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	9.3
Groundwater Depth [Elevation], feet	10.3 [-1.0]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 3 inches)						
					Aggregate Base (approximately 7 inches)						
			ARTIFICIAL FILL (Qaf)		CLAYEY SAND (SC), pale brownish gray, moist, medium dense, fine grained						
			Scattered gravel to 1".				5 6 5	140			
5	5				pale brown and brown, moist, medium dense, fine grained		9 11 6	140	14	113	
			Rare siltstone interbeds. Highly weathered.		pale grayish brown and pale gray, wet, medium dense, fine to medium grained		11 6 5	140			
0	10		Sub rounded gravel up to 2"		brownish gray, moist to wet, very dense, ▽ fine to medium grained		7 19 21	140	14	121	
			CAPISTRANO FORMATION (Tc)		SANDSTONE with Gravel (SP), orange brown and brown, moist to wet, very dense		14 30 50/3"	140			
-5	15		Sub rounded gravel and cobbles up to 4"				50/1"	140	10	122	
-10											

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-28

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS/6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					SANDSTONE (SP), pale yellowish gray and pale gray, wet, medium dense, fine to medium grained		21 50/6"	140			
-15	25		Pale gray				50/4.5"	140	9	124	
					Total Depth = 26 feet Groundwater encountered at 10.3 feet						

GMU

Project: Dana Point Harbor, Commercial Component **Project Location: Dana Point Harbor Drive** **Project Number: 17-206-02**	# Log of Drill Hole DH-29 Sheet 1 of 2

Date(s) Drilled	**9/13/2018**	Logged By	**WD**	Checked By	**KMF**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**31.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**16.7**
Groundwater Depth [Elevation], feet	**16.0 [0.7]**	Sampling Method(s)	**Cal-mod sampler with 6-inch sleeve, SPT, and bulk**	Drill Hole Backfill	**Native and Quickrete**
Remarks				Driving Method and Drop	**Autohammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
					Asphalt Concrete (approximately 3 inches)						
			ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 3 inches)						
15					SILTY SAND (SM), brown gray, yellowish brown, slightly moist, medium dense, medium grained, some gravel						
			Subrounded gravel up to 4"				5 10 12	140			
	5		Subrounded gravel 1 to 6"		SANDY CLAY (CL), dark brown, moist, hard, fine to medium grained, some gravel		50/0.5"	140	6	108	
10											
			Rounded to subrounded gravel and cobbles up to 7"		brownish gray, moist, stiff		3 4 5	140			
	10		Minor fine grained sand				4 6 7	140	29	92	
5											
			Scattered gravel		gray and orange brown, moist, firm to stiff, fine grained sand		3 4 4	140			
			MARINE DEPOSITS (Qm)		SANDY CLAY (CL); gray, moist, firm, medium grained sand						
	15		Rounded to subrounded gravel up to 3"		∇		2 3 4	140	23	100	
0											
			CAPISTRANO FORMATION (Tc)		SILTSTONE (ML), gray, moist, hard overlying SANDSTONE (SP), orange brown and dark orange brown, wet, very dense, fine to medium grained						

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-29

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLES	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
							12 31 50/5"	140			
-5											
	25				Interbedded SILTSTONE and SANDSTONE (SP and ML), pale brown, dark grayish brown and gray, moist, very dense/hard, fine grained		50/4"	140	21	106	
-10											
	30		Siltstone is thinly bedded with white mottles,		SANDSTONE (SP), gray, wet, dense, fine grained, overlying SILTSTONE (ML), dark brownish black, moist, very stiff		16 16 21	140			
					Total Depth = 31.5 feet Groundwater encountered at 16 feet						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Project: Dana Point Harbor, Commercial Component **Project Location: Dana Point Harbor Drive** **Project Number: 17-206-02**	# Log of Drill Hole DH-34 Sheet 1 of 2

Date(s) Drilled	9/14/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	26.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	15.4
Groundwater Depth [Elevation], feet	15.0 [0.4]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
15					Asphalt Concrete (approximately 4.5 inches)						
			ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 4 inches)						
					SILTY SAND with GRAVEL (SM), brown, moist, medium dense, fine grained		3 6 6	140			
10	5				SANDY CLAY (CL), grayish brown, moist, very stiff		20 26 12	140	19		
			Scattered gravel up to 4"		brown, moist, fine to medium grained sand		3 8 9	140			
5	10		MARINE DEPOSITS (Qm) orange brown staining		SANDY CLAY (CL); gray, slightly moist, stiff to very stiff, medium grained sand		8 11 14	140	13		
					moist, very stiff, fine grained sand		6 8 10	140			
0	15		CAPISTRANO FORMATION (Tc) Scattered subrounded gravel up to 4"		SANDSTONE (SP), gray, wet, medium dense, medium to fine grained		3 6 8	140			

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

Project: Dana Point Harbor, Commercial Component	Log of Drill Hole DH-34
Project Location: Dana Point Harbor Drive	Sheet 2 of 2
Project Number: 17-206-02	

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OC Development Services
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ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-5			Gray and yellowish gray				24 50	140			
-10	25		Sand is fine grained				30 50/4"	140	23	101	
					Total Depth = 26 feet Groundwater at 15 feet						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Drill Hole DH-34

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-35

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Date(s) Drilled	9/14/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	26.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	16.8
Groundwater Depth [Elevation], feet	12.5 [4.3]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 4 inches)						
			ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 4.5 inches)						
15					SANDY CLAY (CL), brown and grayish brown, moist, stiff, fine grained, some gravel						
							3 5 12	140			
	5		Gravel up to 4"		brownish gray, moist, stiff		3 6 9	140	27	92	
10											
			Orange brown staining, sand is fine grained		gray		3 4 6	140			
	10				gray and brown, moist, fine grained sand		5 7 11	140	22	102	
5											
					gray, wet, soft to firm, fine grained sand ▽		1 2 2	140			
	15		**MARINE DEPOSITS (Qm)**		SAND (SP), gray and pale gray, wet, dense, coarse to medium grained overlying SILT (ML), dark gray, very stiff		5 11 16	140	13	113	
0											

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-35

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS/6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-5			**CAPISTRANO FORMATION (Tc)**		Interbedded SILTSTONE and SANDSTONE (SP and ML), gray and dark gray, moist, very dense/hard, fine grained		7 22 22	140			
	25		Thinly bedded, rare white mottles		SILTSTONE (ML), dark gray, moist, very dense/hard		17 50/4"	140	21	105	
					Total Depth = 26 feet Groundwater encountered at 12.5 feet						

DH_REV3 17-206-02 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

Project: Dana Point Harbor, Commercial Component
Project Location: Dana Point Harbor Drive
Project Number: 17-206-02

Log of Drill Hole DH-46

Date(s) Drilled	**9/18/2018**	Logged By	**WD**	Checked By	**KMF**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**26.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**13.0**
Groundwater Depth [Elevation], feet	**15.0 [-2.0]**	Sampling Method(s)	**Cal-mod sampler with 6-inch sleeve, SPT, and bulk**	Drill Hole Backfill	**Native and Quickrete**
Remarks				Driving Method and Drop	**Autohammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 3 inches)						
			ARTIFICIAL FILL (Qaf) Cobbles up to 8" in spoils pile		Aggregate Base (approximately 3 inches)						
					SILTY SAND (SM), brown and pale brown, moist, medium dense, fine grained						
10			Scattered gravel				5 7 11	140			
	5						5 14 20	140	11	118	
					CLAYEY SAND (SC), brown, moist, dense, fine to medium grained						
5			Rare gravel up to 1"		brown and orange brown, moist, medium dense, fine grained		9 9 9	140			
	10				brownish gray, wet, dense, fine grained		7 11 17	140	14	114	
0			**MARINE DEPOSITS (Qm)**		SAND (SP), gray, brownish gray and orange brown, moist, very dense, fine grained		4 23 35	140			
	15		**CAPISTRANO FORMATION (Tc)** Minor siltstone, subtle bedding		SANDSTONE (SP), grayish brown, wet, very dense, medium to fine grained		33 50/4"	140	16	116	
-5											

Project: Dana Point Harbor, Commercial Component	**Log of Drill Hole DH-46**
Project Location: Dana Point Harbor Drive	Sheet 2 of 2
Project Number: 17-206-02	

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					SANDSTONE (SP), pale gray and pale yellowish gray, wet, very dense, fine to medium grained		16 37 50	140			
-10											
	25						50/5"	140			
					Total Depth = 26 feet Groundwater at 15 feet						

GMU

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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GMU Project 17-206-03

GMU

Project: Dana Point Harbor Partners, LLC Dry Stack Storage
Project Location: Dana Point Harbor, City of Dana Point
Project Number: 17-206-03

Log of Drill Hole DH-31

Date(s) Drilled	9/13/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	6.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	10.0
Groundwater Depth [Elevation], feet	NA []	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
					Asphalt Concrete (approximately 5 inches)						
			ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 6 inches)						
					CLAYEY SAND (SC), brown and gray, moist, loose, fine grained.						
			Orange brown mottles, rootlets				3 4 4	140			
5	5				CLAYEY SAND (SC), grayish brown, moist, loose, fine grained.		3 4 5	140	22	104	
					Total Depth = 6.5 feet Groundwater not encountered						

GMU

Project:	**Dana Point Harbor Partners, LLC Dry Stack Storage**
Project Location:	**Dana Point Harbor, City of Dana Point**
Project Number:	**17-206-03**

Log of Drill Hole DH-33

Date(s) Drilled	**9/13/2018**	Logged By	**WD**	Checked By	**KMF**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**26.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**16.6**
Groundwater Depth [Elevation], feet	**12.5 [4.1]**	Sampling Method(s)	**Cal-mod sampler with 6-inch sleeve, SPT, and bulk**	Drill Hole Backfill	**Native and Quickrete**
Remarks				Driving Method and Drop	**Autohammer**

ELEVATION, feet	DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0			Asphalt Concrete (approximately 3 inches)						
		ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 3 inches)	Bulk					
15				SILTY SAND (SM), brown, dry, medium dense, fine grained						
		Scattered gravel			SPT	7 7 11	140			
	5	Scattered gravel up to 1". Orange brown and white mottles.		SILTY SAND to CLAYEY SAND (SM to SC), brown and gray, moist, medium dense, fine grained	Cal-mod	7 11 13	140	10	117	
10		Possibly highly weathered bedrock (inconclusive)		brownish gray, moist, loose, fine grained	SPT	3 4 5	140			
	10			SILTY SAND, CLAYEY SAND, and SAND (SM, SC, and SP), gray and brownish gray, wet, medium dense, fine to medium grained.	Cal-mod	6 7 8	140	19	106	
5		**CAPISTRANO FORMATION (Tc)**		SANDSTONE (SW), gray, wet, medium dense, fine to coarse grained	SPT	5 7 9	140			
	15			SILTSTONE (ML), very dark gray, slightly moist, hard	Cal-mod	11 23 40	140	29	93	
0		Thinly bedded, white mottles on bedding planes								

GMU

Project: Dana Point Harbor Partners, LLC Dry Stack Storage
Project Location: Dana Point Harbor, City of Dana Point
Project Number: 17-206-03

Log of Drill Hole DH-33

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Interbeds of fine grained sandstone, orange brown		CLAYEY SILTSTONE (ML), very dark gray, slightly moist, hard		10 18 40	140			
-5											
	25						12 26 45	140	30	92	
					Total Depth = 26 feet Groundwater not encountered						

DH_REV3 17-206-03 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Project: Dana Point Harbor Partners, LLC Dry Stack Storage
Project Location: Dana Point Harbor, City of Dana Point
Project Number: 17-206-03

Log of Drill Hole DH-49

Date(s) Drilled	4/5/2019	Logged By	MTF	Checked By	DA
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	25.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	11.0
Groundwater Depth [Elevation], feet	8.2 [2.8]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0	**ARTIFICIAL FILL (Qaf)**		3" Section of Asphalt		NA	NA			EI
10				SILTY SAND (SM); light brown, moist, medium dense, fine to coarse grained sand						
	2			CLAYEY SAND (SC); light gray and white with orange staining, moist, medium dense, fine to coarse grained sand		11 14 14	140	17	102	
5	5			becomes light gray and greenish gray, with fine to coarse grained gravel. fine to medium grained sand, free water on sampler		7 11 15	140	14	114	DS
	10					4 5 12	140	14	111	AL, PS
0	11	**CAPISTRANO FORMATION (Tc)**		SILTSTONE (ML); dark gray, very moist, stiff, fine to medium grained sand						
-5	15			SANDSTONE (SM); light gray and light brown with grayish orange staining, very moist to saturated, very dense		6 30 50/4"	140	21	107	

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Project: Dana Point Harbor Partners, LLC Dry Stack Storage
Project Location: Dana Point Harbor, City of Dana Point
Project Number: 17-206-03

Log of Drill Hole DH-49

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS/ 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-10					becomes gray, orange, and dark gray		18 16 50/5"	140	23		PS
	25				SANDSTONE (SM); light gray with yellow staining, saturated, very dense, fine to medium grained sand, with trace coarse grained sand		50/5"	140	21	105	
					becomes gray		27 50/6"	140			
					becomes dark gray, strong organic smell		33 50/4"	140			
							46 50/5"	140			

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Project: Dana Point Harbor Partners, LLC Dry Stack Storage
Project Location: Dana Point Harbor, City of Dana Point
Project Number: 17-206-03

Log of Drill Hole DH-49

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					SANDSTONE (SW); light gray, with yellow, saturated, very dense, with fine to coarse grained sand		33 50/5"	140			
					Total Depth = 50.0' GWT @ 8'-2" No Caving		35 50/5"	140			

Project: Dana Point Harbor Partners, LLC Dry Stack Storage
Project Location: Dana Point Harbor, City of Dana Point
Project Number: 17-206-03

Log of Drill Hole HA-1

Date(s) Drilled	9/11/2018	Logged By	MTF	Checked By	DA
Drilling Method	Hand Auger	Drilling Contractor	Mikes Excavation	Total Depth of Drill Hole	15.0 feet
Drill Rig Type	NA	Diameter(s) of Hole, inches	4"	Approx. Surface Elevation, ft MSL	25.3
Groundwater Depth [Elevation], feet	NA	Sampling Method(s)	Bulk and California Modified Sampler	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	Hand Sampler

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
25			**ARTIFICIAL FILL (Qaf)**		SILTY SAND (SM); with numerous roots upper 6", and some DG, light brown, dry to damp, medium grained sand with some fine gravel						
					CLAYEY SAND (SC); light yellowish brown, damp, fine to medium grained sand		40/6"		10	100	
					POORLY GRADED SAND (SP); light gray, dry, fine grained sand						
20	5						55/6"		6	112	
					CLAYEY SAND (SC); light brown, dry to damp, fine to medium grained sand with some fine grained gravel						
					SILTY SAND (SM); light yellowish brown, damp, fine to coarse grained sand		92/6"		4	117	
15	10				with numerous coarse gravel						
					SANDY CLAY (CL); grayish brown, moist, with some medium grained sand				6	114	
	15				Total Depth = 15 feet Groundwater Not Encountered						

Project: Dana Point Harbor Partners, LLC Dry Stack Storage **Project Location:** Dana Point Harbor, City of Dana Point **Project Number:** 17-206-03	# Log of Drill Hole DH-33 Sheet 1 of 2

Date(s) Drilled	9/13/2018	Logged By	WD	Checked By	KMF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	26.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	16.6
Groundwater Depth [Elevation], feet	12.5 [4.1]	Sampling Method(s)	Cal-mod sampler with 6-inch sleeve, SPT, and bulk	Drill Hole Backfill	Native and Quickrete
Remarks				Driving Method and Drop	Autohammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					Asphalt Concrete (approximately 3 inches)						
			ARTIFICIAL FILL (Qaf)		Aggregate Base (approximately 3 inches)						
					SILTY SAND (SM), brown, dry, medium dense, fine grained						
15											
			Scattered gravel				7 7 11	140			
	5		Scattered gravel up to 1". Orange brown and white mottles.		SILTY SAND to CLAYEY SAND (SM to SC), brown and gray, moist, medium dense, fine grained		7 11 13	140	10	117	
10											
			Possibly highly weathered bedrock (inconclusive)		brownish gray, moist, loose, fine grained		3 4 5	140			
	10				SILTY SAND, CLAYEY SAND, and SAND (SM, SC, and SP), gray and brownish gray, wet, medium dense, fine to medium grained.		6 7 8	140	19	106	
5											
			CAPISTRANO FORMATION (Tc)		SANDSTONE (SW), gray, wet, medium dense, fine to coarse grained		5 7 9	140			
	15				SILTSTONE (ML), very dark gray, slightly moist, hard		11 23 40	140	29	93	
			Thinly bedded, white mottles on bedding planes								
0											

GMU

Project: Dana Point Harbor Partners, LLC Dry Stack Storage
Project Location: Dana Point Harbor, City of Dana Point
Project Number: 17-206-03

Log of Drill Hole DH-33

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Interbeds of fine grained sandstone, orange brown		CLAYEY SILTSTONE (ML), very dark gray, slightly moist, hard		10 18 40	140			
-5											
	25						12 26 45	140	30	92	
					Total Depth = 26 feet Groundwater not encountered						

DH_REV3 17-206-03 (UPDATED ELEV.).GPJ GMULAB.GPJ 12/3/19

GMU

Drill Hole DH-33

GMU Project 11-161-00

GMU

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole C-3

Date(s) Drilled	8-28-12	Logged By	LLB	Checked By	DH
Drilling Method	Hand Auger	Drilling Contractor	Earthworks Techniques	Total Depth of Drill Hole	3.0 feet
Drill Rig Type	N/A	Diameter(s) of Hole, inches	5	Approx. Surface Elevation, ft MSL	22.3
Groundwater Depth [Elevation], feet	N/A []	Sampling Method(s)	Bulk samples only	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
20			**ARTIFICIAL FILL (Qaf)** 4 inches AC over 12 inches AB		Sandy Clay (CL), brown, damp to moist, firm to very firm	Bulk					CP EI RV
					Total depth 3 feet. No groundwater.						

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH- 1

Date(s) Drilled	8-29-12	Logged By	LLB	Checked By	DH
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling, Inc	Total Depth of Drill Hole	43.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	17.3
Groundwater Depth [Elevation], feet	12.0 [5.3]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	Auto Hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf) 2 inches AC over 4 inches AB		SANDY CLAY (CL), brown to dark brown, moist, firm						EI
15							5 6 4	140	14	112	
					CLAYEY SAND (SC), brown to dark brown, moist, medium dense		3 5 9	140	16	115	CN
	5										
10											
					SANDY CLAY (CL), brown to gray brown, damp to moist, firm		5 5 8	140	21		PS AL
	10										
5					Groundwater at 12 feet.						
					SAND (SP), gray, wet, dense, coarse grained		6 9 23	140	16	107	
	15										
0			**CAPISTRANO FORMATION (Tc)** Massively bedded sandstone with some claystone interbeds, hard to very hard		SAND (SP), gray, wet, very dense, medium to coarse grained		8 18 28	140			

GMU

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH- 1

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS/6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Sample is unoxidized claystone at 20 feet		CLAY (CL), very dark gray, moist, very firm						
-5											
			Becomes very hard below 24 feet		SAND (SP), gray, wet, very dense, medium grained, some clay		50/6"	140	22	107	
	25										
-10											
					Becomes coarse to very coarse grained		35 50/3"	140			
	30										
-15											
							50/5"	140			
	35										
-20											
					Becomes very coarse grained with some pebbles		19 50/4"	140			
	40										
-25			Refusal at 43 feet on very hard bedrock, unable to make forward progress								
					Total Depth 43 feet Groundwater at 12 feet						

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH- 2

Date(s) Drilled	8-29-12	Logged By	LLB	Checked By	DH
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling, Inc	Total Depth of Drill Hole	10.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	15.3
Groundwater Depth [Elevation], feet	8.5 [6.8]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	Auto Hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
15			**ARTIFICIAL FILL (Qaf)** 1.5 inches AC over 5 inches AB		CLAYEY SAND (SC), brown to gray, moist, medium dense to dense						
							7 7 23	140	15	115	
					SANDY CLAY (CL), brown to gray, moist, firm		9 9 16	140	20	106	
10	5										
			Very rocky at 8 feet		Groundwater at 8.5 feet.						
					CLAYEY SAND (SC), brownish gray to gray, wet, dense, scattered pebbles		5 18 25	140	8	128	
5	10										
					Total Depth 10.5 feet. Groundwater at 8.5 feet.						

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Project: Dana Point Harbor Revitalization **Project Location:** Dana Point, CA **Project Number:** 11-161-00	# Log of Drill Hole DH- 6 Sheet 1 of 3

Date(s) Drilled	8-29-12	Logged By	LLB	Checked By	DH
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling, Inc	Total Depth of Drill Hole	50.0 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	13.8
Groundwater Depth [Elevation], feet	12.0 [1.8]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	Auto Hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
	0		**ARTIFICIAL FILL (Qaf)** 2 inches AC over 5 inches AB		SAND (SM), brown, moist, medium dense, medium to coarse grained, minor silt						
							5 13 15	140	9	102	
10											
					SANDY CLAY (CL), brown to dark brown, moist, firm, medium grained		5 8 18	140	20	101	DS
	5										
5											
					Scattered pebbles at 9 feet		14 8 11	140	13	114	CN
	10										
					Groundwater at 12 feet. ▽						
0											
					Some black and orange staining, wet at 14 feet		4 5 4	140	26		PS AL
	15										
					Groundwater at 12 feet.						
-5											
			CAPISTRANO FORMATION (Tc) Massively bedded sandstone and silty		SILTY SAND (SM), light brown to brown, wet, fine to medium grained		21 50	140	23	103	

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH- 6

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS/6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			sandstone with some claystone interbeds, hard to very hard								
-10	25		Some bedding within unoxidized claystone, dipping 0 to 10 degrees at 24 feet		CLAY (CL/CH), dark gray, moist, very firm to hard		17 22 27	140			
-15	30		Interbedded claystone and sandstone at 29 feet		CLAY (CL/CH), and SAND (SP), dark gray and brown, moist, hard, medium to coarse grained		20 50/3"	140	17	118	DS
-20	35				SAND (SP), light gray to gray, wet, very dense, medium to very coarse grained		20 30 40	140			
-25	40						50/5"	140	20	113	
-30					SILTY SAND (SM), gray to dark gray, wet, very dense, fine to medium grained		16 27 50	140			

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH- 6

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLES	SAMPLE DATA: NUMBER OF BLOWS/ft	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-35											
					SAND (SP), gray, wet, very dense, coarse grained		37 50/6"	140	20	112	
	50				Total Depth 50 feet. Groundwater at 12 feet.						

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Drill Hole DH- 6

Project: Dana Point Harbor Revitalization	# Log of Drill Hole DH-10
Project Location: Dana Point, CA	
Project Number: 11-161-00	Sheet 1 of 1

Date(s) Drilled	**8-27-12**	Logged By	**LLB**	Checked By	**DH**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling, Inc**	Total Depth of Drill Hole	**10.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**12.3**
Groundwater Depth [Elevation], feet	**N/A []**	Sampling Method(s)	**Open drive sampler with 6-inch sleeve/SPT**	Drill Hole Backfill	**Native**
Remarks				Driving Method and Drop	**Auto Hammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf) 3 inches AC over 3 inches AB		SANDY CLAY (CL), dark gray, moist, firm, scattered rock fragments, roots, pockets of coarse sand						
10							7 10 15	140	13	107	
							14 18 22	140	13	114	
	5										
5					Abundant rock fragments below 8 feet						
							34 50/3"	140			
	10				Total Depth 10 feet. No groundwater.						

GMU

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-12

Date(s) Drilled	8-27-12	Logged By	LLB	Checked By	DH
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling, Inc	Total Depth of Drill Hole	49.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	13.3
Groundwater Depth [Elevation], feet	9.0 [4.3]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	Auto Hammer

ELEVATION, feet	DEPTH, feet	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
		ARTIFICIAL FILL (Qaf) 4 inches AC over 4 inches AB. Difficult drilling, probable boulders and cobbles below 0 feet		SANDY GRAVEL (GP), light brown to brown, damp to moist, medium dense					
				Some clay at 2 feet	8 8 11	140	14	109	
10									
	5	Very poorly consolidated material, falling out of sampler, appears very loose with abundant mechanically fractured rock fragments		SANDY CLAY (CL), dark gray, damp, loose, abundant rock fragments, organics	9 21 21	140	17	105	PS AL
5				Groundwater at 9 feet.					
	10			CLAYEY SAND (SC), dark gray, wet, loose to medium dense, abundant rock fragments	4 4 4	140	17		CN PS AL
0									
	15	Unconsolidated material, falling out of sampler, appears extremely loose with abundant mechanically fractured rock fragments		Sample contains rock fragments, black unoxidized shale, in dense, very wet, clayey sand, very little fines	19 22 21	140	13		
-5		**CAPISTRANO FORMATION (Tc)** Massively bedded sandstone, hard to very hard		SAND (SP), yellow brown to gray, wet, dense to very dense, medium to coarse grained	18 30 38	140			

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-12

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLES	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-10											
							30 50/2.5"	140	19	108	DS
	25										
-15											
					Becomes coarse grained at 29 feet		22 33 40	140			
	30										
-20							50/4"	140			
	35		Very difficult drilling, vary hard material, 1 foot thick, probable very dense sand, no rock fragments in cuttings at 35 feet								
-25											
					Becomes brown to yellow brown, some pebbles at 39 feet		(50/5")	140			
	40										
-30											
					Some manganese oxide staining at 44 feet		50/6"	140	14	122	

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-12

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-35											
					Becomes medium to coarse grained		(50/5")	140			
					Total Depth 49.5 feet. Groundwater at 9 feet.						

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-17

Date(s) Drilled	8-28-12	Logged By	LLB	Checked By	DH
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling, Inc	Total Depth of Drill Hole	49.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	11.3
Groundwater Depth [Elevation], feet	13.0 [-1.7]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	Auto Hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf) 3 inches AC over 4 inches AB		CLAYEY SAND (SC), brown, dark brown, and orange brown, damp to moist, dense						
10											
							9 12 14	140			
			Becomes rocky at 3 feet								
					Scattered rock fragments at 4 feet		5 10 16	140	11	113	CN
	5										
5											
					Sample not recovered.		6 7 8	140			
	10										
0											
			Becomes rocky at 12 feet								
					Groundwater at 13 feet. ⊻						
					SAND (SP), brown, light gray, dark gray mottled, moist to wet, loose, abundant rock fragments and gravels, scattered clayey sand pockets		50/5"	140	11	128	
	15		Very difficult drilling due to rocks between 15 and 18 feet								
-5											
			CAPISTRANO FORMATION (Tc) Massively bedded sandstone, hard to very		SAND (SP), brown to light brown, wet, very dense, coarse grained		25 45 46	140			

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Drill Hole DH-17

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-17

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLES	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			hard								
-10											
							50/5"	140	17		
	25										
-15											
					Scattered orange staining at 29 feet		(50/6")	140			
	30										
-20											
					Minor clay at 34 feet		50/1.5"	140			
	35								13	127	
-25											
					Becomes medium to coarse grained at 39 feet		(50/6")	140			
	40										
-30											
							50/4"	140	16	116	

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Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-17

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-35											
					SAND (SM), brown, wet, very dense, fine grained		(50/5")	140			
					Total Depth 49.5 feet. Groundwater at 13 feet. Caving at 3 feet.						

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-18

Date(s) Drilled	8-27-12	Logged By	LLB	Checked By	DH
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling, Inc	Total Depth of Drill Hole	10.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	11.3
Groundwater Depth [Elevation], feet	N/A []	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	Auto Hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
10			**ARTIFICIAL FILL (Qaf)** 3 inches of AC, no AB		CLAYEY SAND (SC), light brown to gray, moist, dense, fine grained		7 12 14	140	12	112	CP EI DS(R) SU CH pH MR
					SAND (SM), light brown to gray, moist, dense, coarse grained						
5	5		Difficult drilling, probable boulders at 5 feet		CLAYEY SAND (SC), gray to dark gray, moist, dense to very dense, medium to coarse grained		20 27 50/2"	140	15	101	
	10		Fragments of unoxidized bedrock within the fill at 9 feet				14 20 22	140	11	121	
					Total depth 10.5 feet. No groundwater.						

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Drill Hole DH-18

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-19

Date(s) Drilled	8-27-12	Logged By	LLB	Checked By	DH
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling, Inc	Total Depth of Drill Hole	49.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	10.3
Groundwater Depth [Elevation], feet	9.0 [1.3]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	Auto Hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
10			**ARTIFICIAL FILL (Qaf)** 2.5 inches AC		CLAYEY SAND (SC), brown to dark brown, moist, dense, fine to medium grained						
							6 14 17	140			
					SAND (SM), brown to dark brown, moist, medium dense, fine to coarse grained		9 10 11	140	13	112	
5	5										
					Groundwater at 9 feet.						
					CLAYEY SAND (SC), brown to light gray, moist to wet, loose, medium to coarse grained		3 4 5	140	25	95	CN
0	10										
					SILTY SAND (SM), brown to light gray, wet, loose, coarse grained		2 3 3	140			
-5	15										
			Difficult drilling, probable boulders, at 17 feet								
			CAPISTRANO FORMATION (Tc) Massively bedded sandstone, hard to very		SAND (SP), brown to gray, wet, very dense, coarse grained		50/5"	140	15	116	

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

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Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-19

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS/6"	DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
-10			hard								
	25		Abundant orange and yellow staining along laminations below 24 feet		SAND (SM), light gray, moist, very dense, coarse grained		14 27 37	140			
-15											
							50/5"	140	21	108	
-20	30										
							25 45 50/3"	140			
-25	35										
							50/3"	140	15	122	
-30	40										
							36 50/3"	140			

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

Project: Dana Point Harbor Revitalization	Log of Drill Hole DH-19
Project Location: Dana Point, CA	
Project Number: 11-161-00	Sheet 3 of 3

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works/OC Development Services of Orange County. The stamping of these plans and specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State Law.
Hadi Tabatabaee
BUILDING OFFICIAL

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS/6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
-35							50/4"	140	18	117	
					Total Depth 49.5 feet. Groundwater at 9 feet. Caving at 3 feet.						

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

Project: Dana Point Harbor Revitalization
Project Location: Dana Point, CA
Project Number: 11-161-00

Log of Drill Hole DH-22

Date(s) Drilled	4-8-15	Logged By	DRW	Checked By	DRA
Drilling Method	Hand Auger	Drilling Contractor	JES Engineering	Total Depth of Drill Hole	7.0 feet
Drill Rig Type	N/A	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	16.3
Groundwater Depth [Elevation], feet	N/A []	Sampling Method(s)		Drill Hole Backfill	Native
Remarks	Infiltration Test Hole			Driving Method and Drop	

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			ASPHALT		2" of AC 4" of AB						
15			**ARTIFICIAL FILL (Qaf)**		SILTY SAND (SM); brown, moist, dense, fine to coarse grained sand, rare cobble						
					SILTY CLAY (CL); brown, moist, dense, some large rounded cobble						
10	5				CLAYEY SILT (ML); tannish brown, moist, dense, some large rounded cobble						

DH_REV3 11-161-00 (UPDATED ELEV.).GPJ GMULAB.GPJ 11/21/19

GMU

APPENDIX A-2

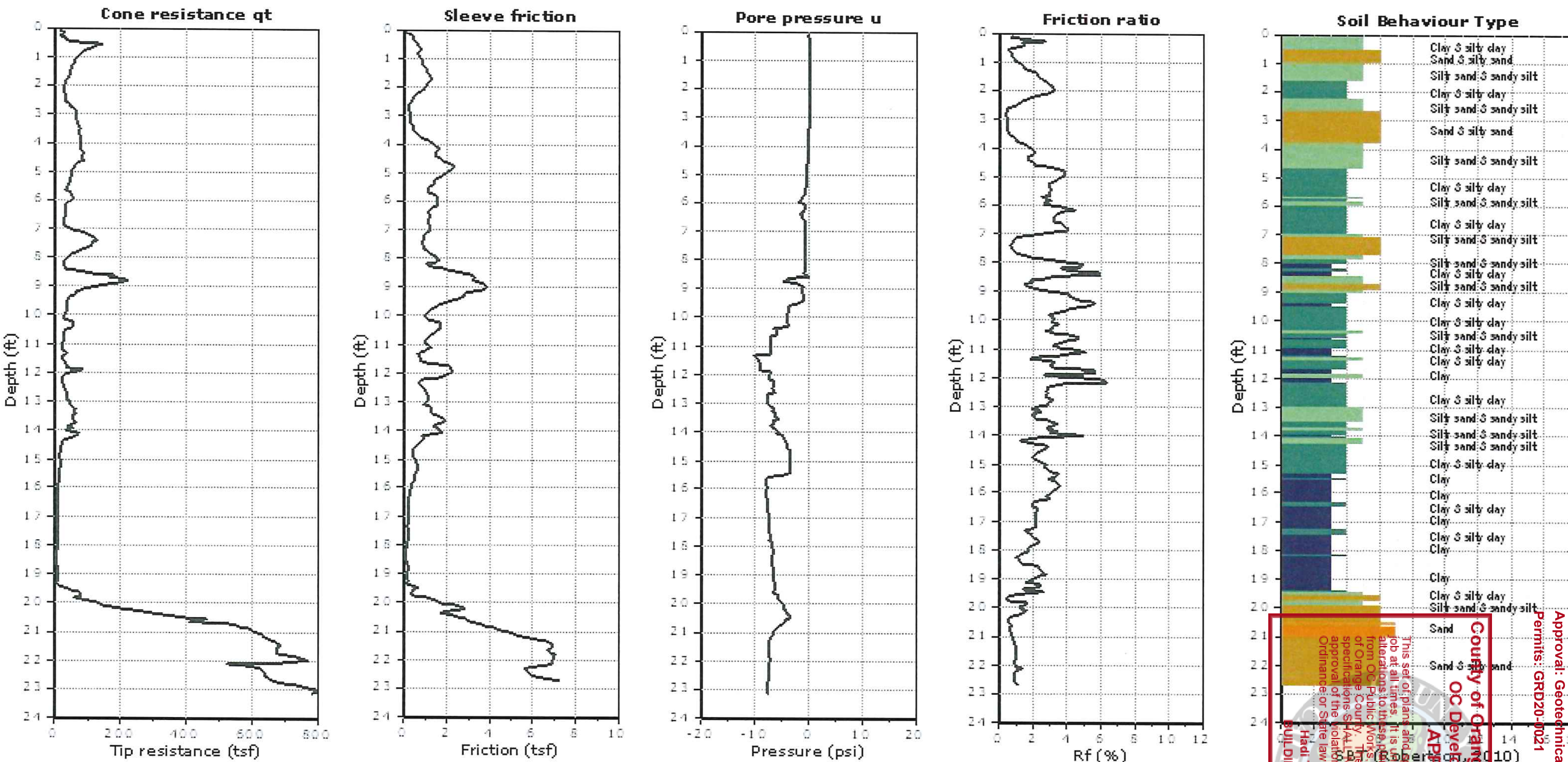
GMU CPT Logs

GMU

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: GMU Geotechnical
Location: 34571 Golden Lantern, Dana Point, CA

CPT-3A
Total depth: 23.11 ft, Date: 7/12/2019

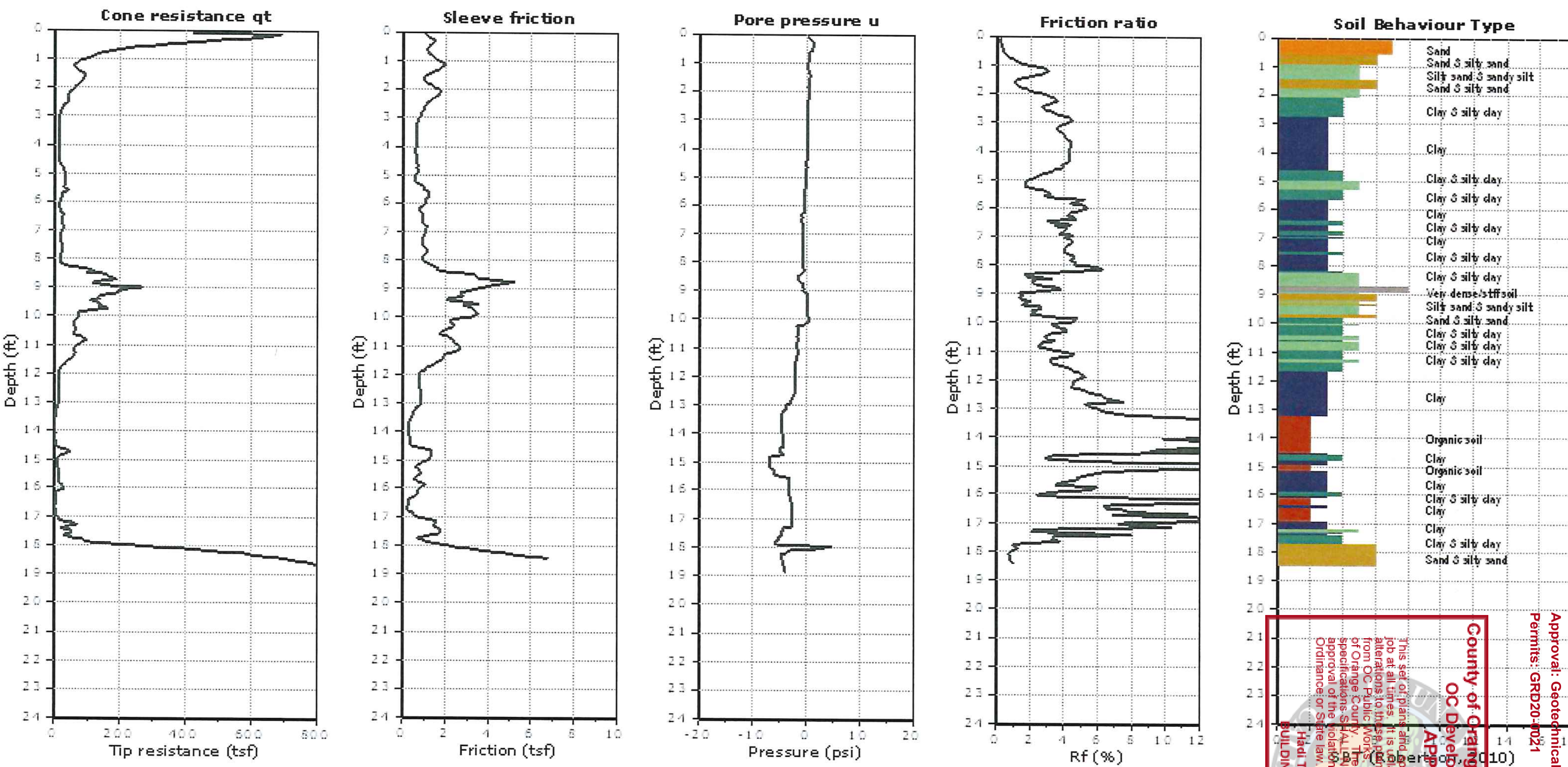


CPeT-IT v.2.3.1.8 - CPTU data presentation & interpretation software - Report created on: 7/15/2019, 2:25:44 PM
Project file: C:\CPT Project Data\GMU-DanaPoint7-19\CPT Report\Plots.cpt

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: GMU Geotechnical
Location: 34571 Golden Lantern, Dana Point, CA

CPT-4A
Total depth: 18.83 ft, Date: 7/12/2019



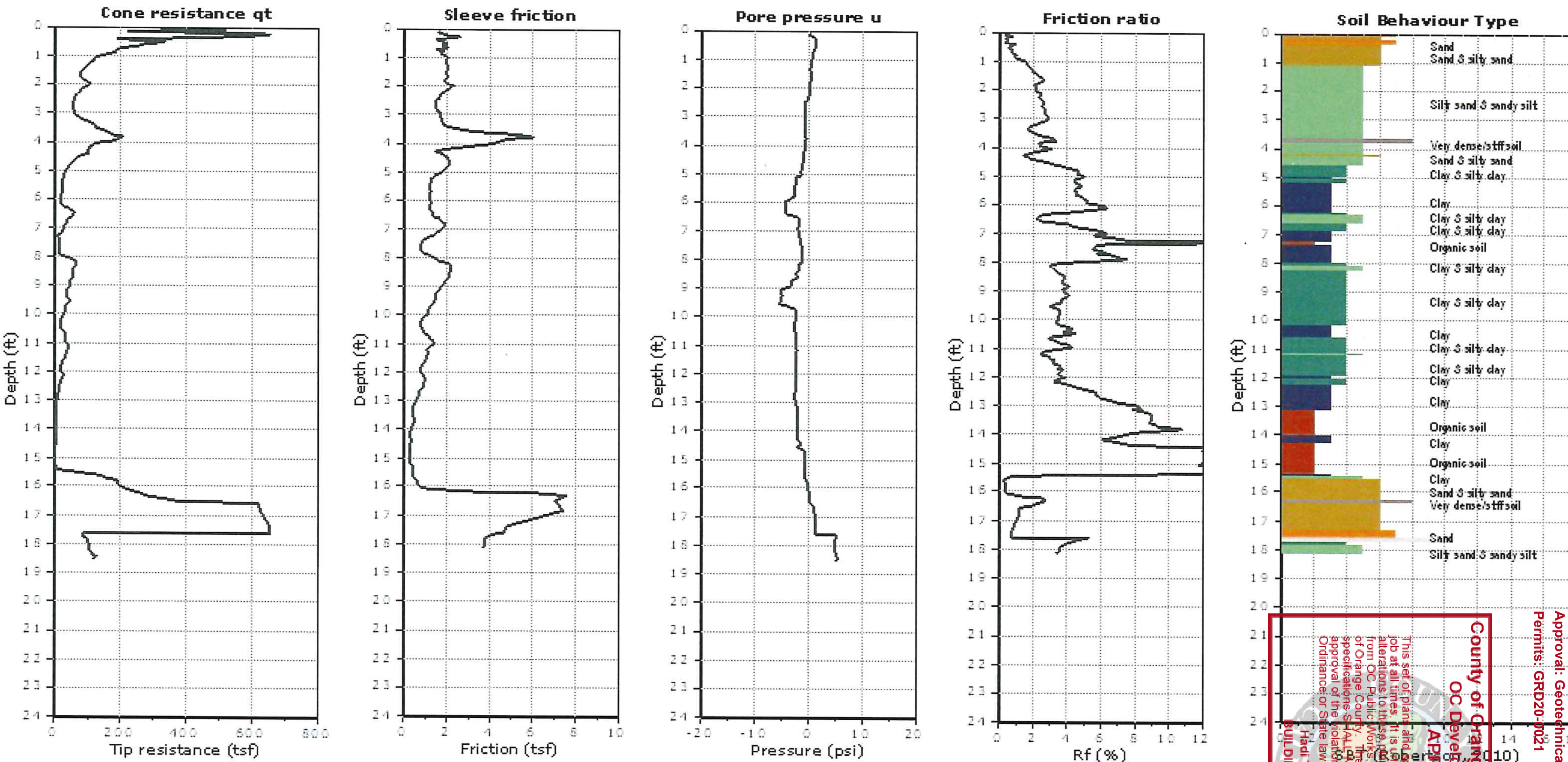
Building&Safety: Ryan Rose
Approval: Geotechnical Reports
Permits: GRD20-0021
1/8/2021

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Hadi Tabatabaee
BUILDING OFFICIAL

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: GMU Geotechnical
Location: 34571 Golden Lantern, Dana Point, CA

CPT-5A
Total depth: 18.52 ft, Date: 7/12/2019



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

CPeT-IT v.2.3.1.8 - CPTU data presentation & interpretation software - Report created on: 7/15/2019, 2:26:33 PM
Project file: C:\CPT Project Data\GMU-DanaPoint7-19\CPT Report\Plots.cpt

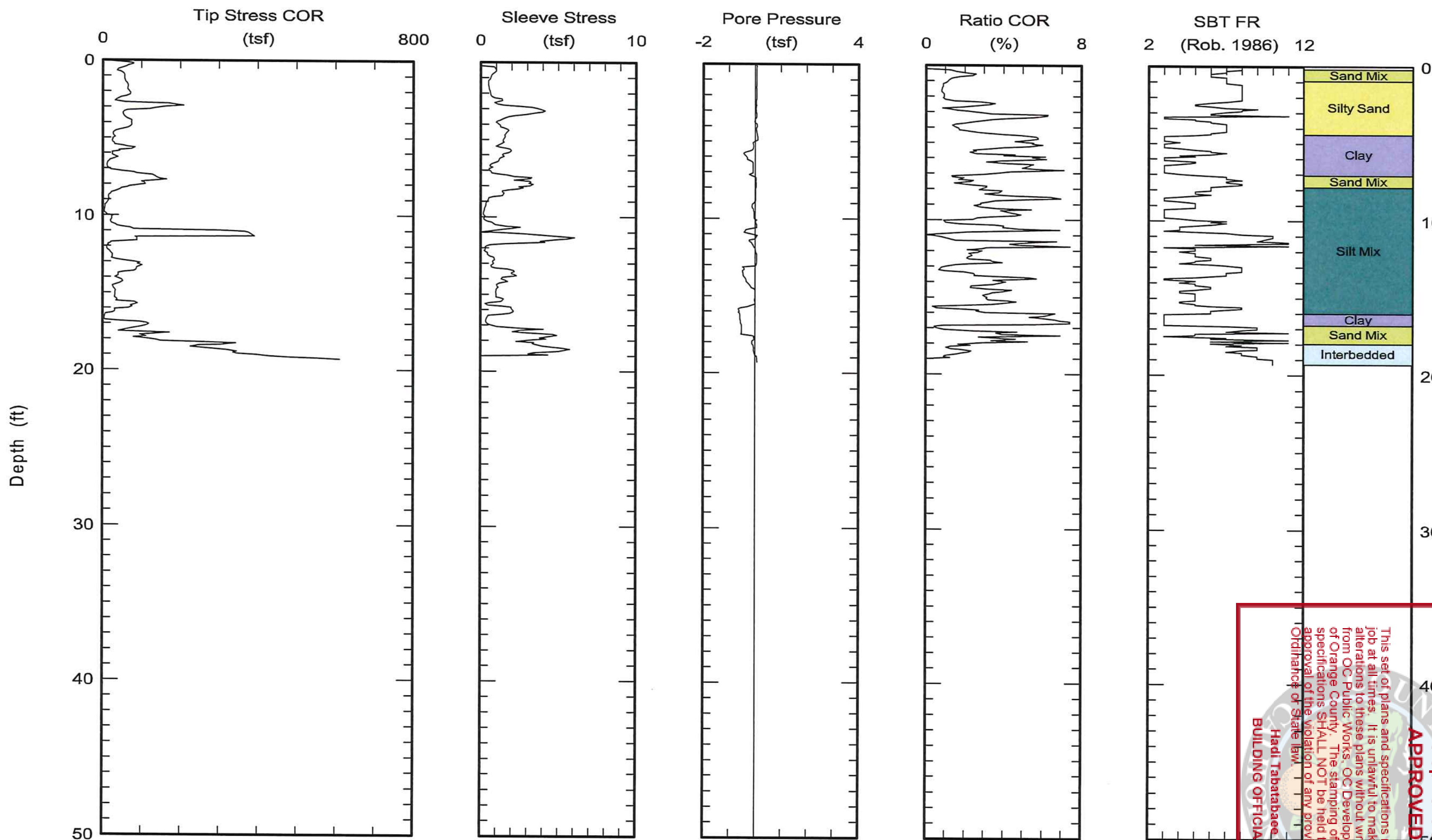
Building&Safety: Ryan Rose 1/8/2024
Approval: Geotechnical Reports
Permits: GRD20-0021

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
rich@kehoetesting.com
www.kehoetesting.com

CPT Data
30 ton rig

Date: 29/Aug/2012
Test ID: CPT-1
Project: DanaPoint

Customer: GMU Geotechnical, Inc.
Job Site: OCDPH Revitalization



Maximum depth: 19.32 (ft)

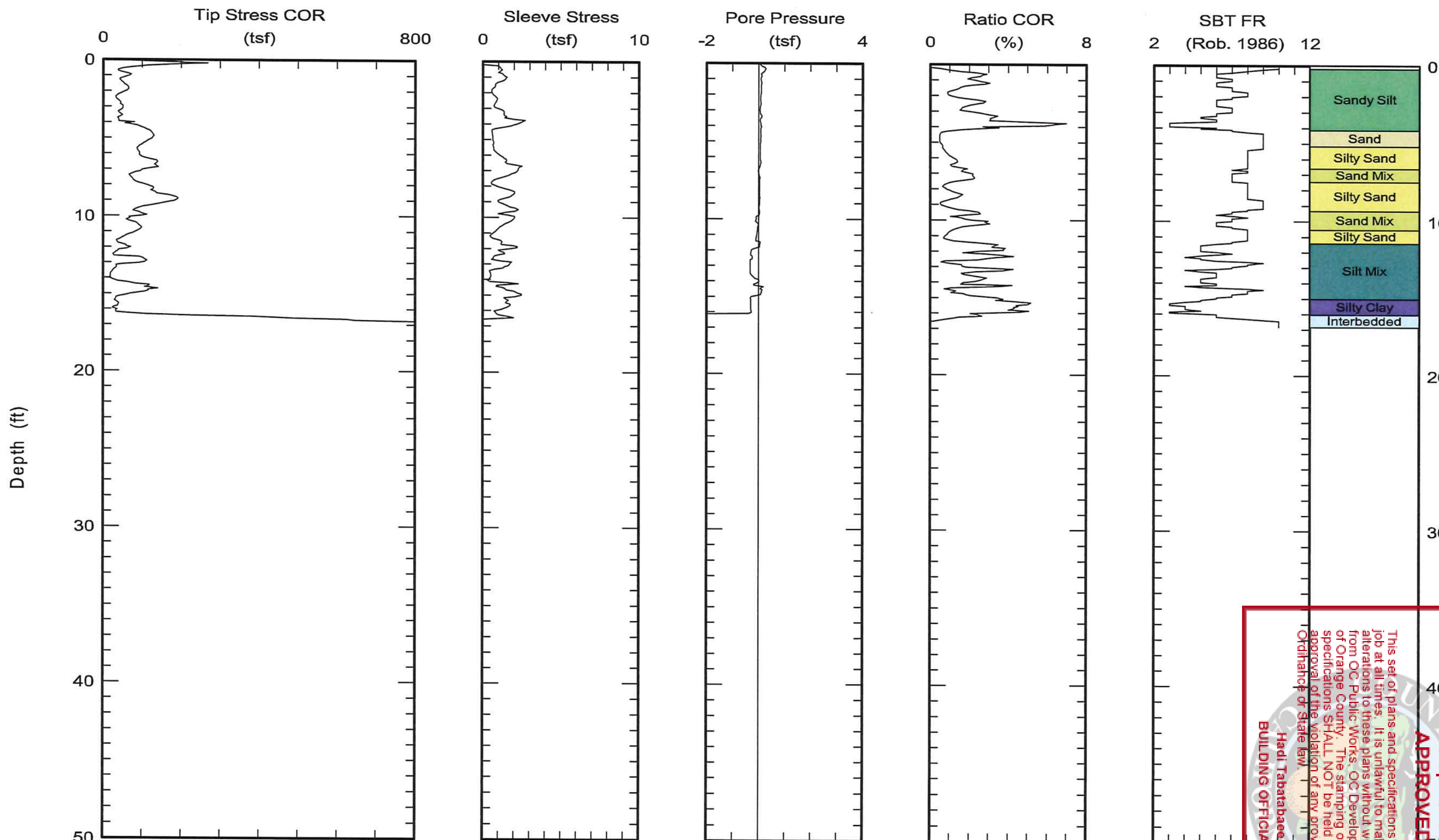
Test ID: CPT-1

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
rich@kehoetesting.com
www.kehoetesting.com

CPT Data
30 ton rig

Date: 29/Aug/2012
Test ID: CPT-4
Project: DanaPoint

Customer: GMU Geotechnical, Inc.
Job Site: OCDPH Revitalization



Maximum depth: 16.85 (ft)

Building&Safety: Ryan Rose
Approval: Geotechnical Reports
Permits: GRD20-0021
1/8/2021

County of Orange - OC Public Works
OC Development Services
APPROVED

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Hadi Tabatabaee
BUILDING OFFICIAL

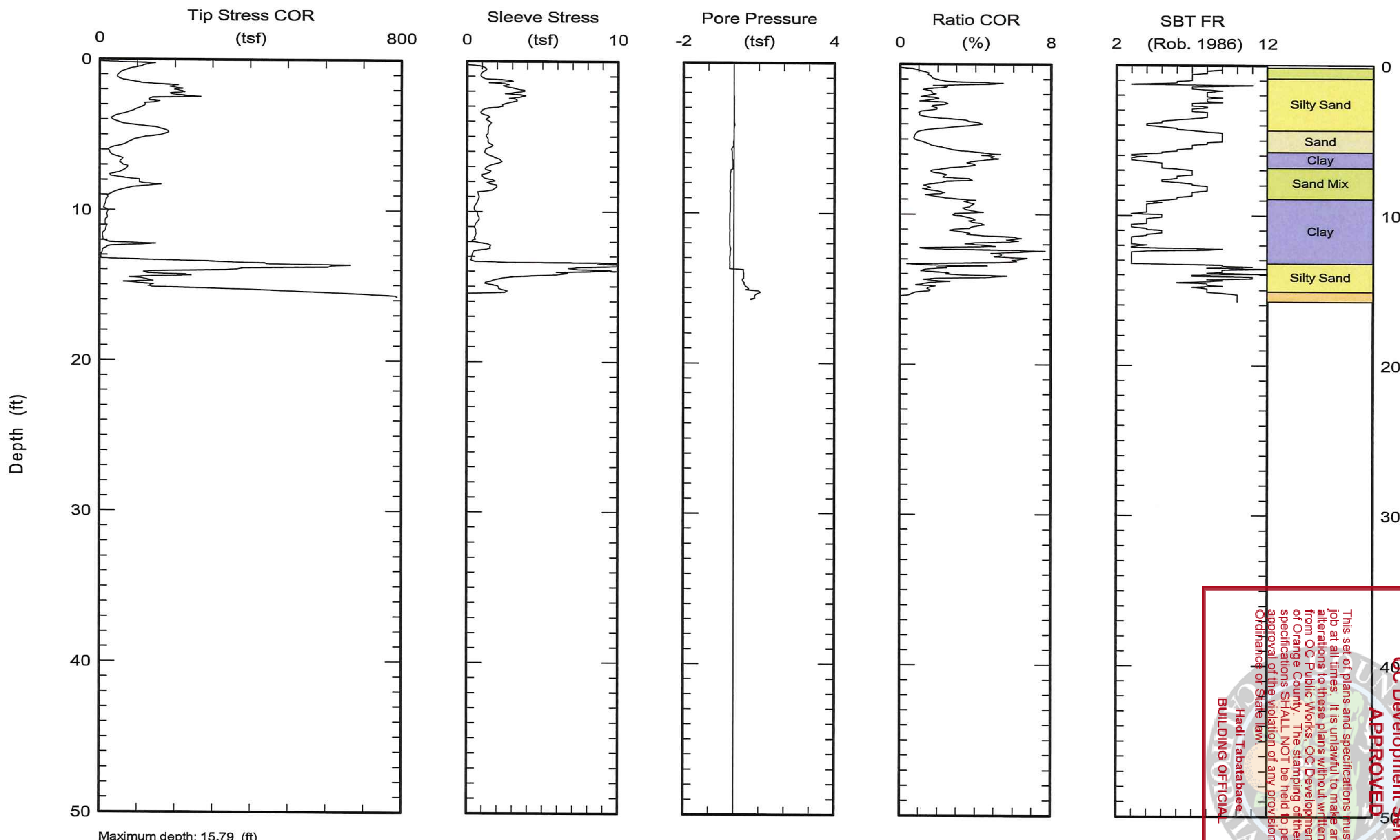
Test ID: CPT-4

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
rich@kehoetesting.com
www.kehoetesting.com

CPT Data
30 ton rig

Date: 29/Aug/2012
Test ID: CPT-5
Project: DanaPoint

Customer: GMU Geotechnical, Inc.
Job Site: OCDPH Revitalization



Maximum depth: 15.79 (ft)

Building&Safety: Ryan Rose 1/8/2024
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

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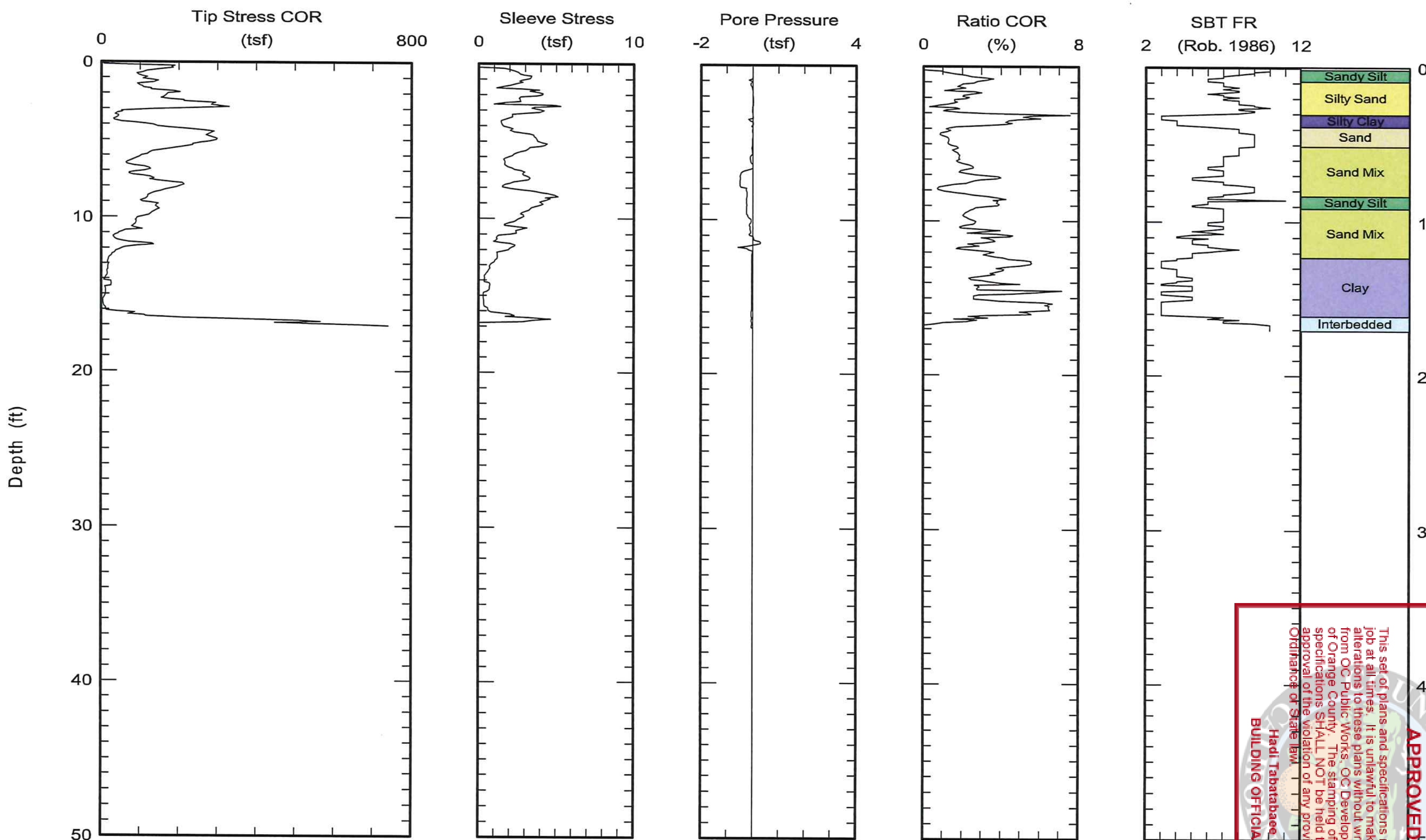
Hadi Tabatabaee
BUILDING OFFICIAL

Test ID: CPT-5

Kehoe Testing & Engineering Office: (714) 901-7270 Fax: (714) 901-7289 rich@kehoetesting.com www.kehoetesting.com	CPT Data 30 ton rig	Date: 29/Aug/2012 Test ID: CPT-6 Project: DanaPoint
	Customer: GMU Geotechnical, Inc. Job Site: OCDPH Revitalization	



Maximum depth: 17.07 (ft)

Building&Safety: Ryan Rose 1/8/2024
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.

Hadi Tabatabaee
BUILDING OFFICIAL

Test ID: CPT-6

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

APPENDIX A-3

Previous Boring Logs by Others

BORING LOCATION: See Figure 2		**ELEVATION AND DATUM (feet):** 7 MSL	
LATITUDE: 33° 27' 39.8" N		**LONGITUDE:** 117° 41' 31.4" W	
DRILLING EQUIPMENT: Mayhew 1000		**DRILLING METHOD:** Rotary Wash	
BORING DIAMETER (inches): 5		**BORING DEPTH (feet):** 15	
DATE STARTED: 6/2/05		**DATE COMPLETED:** 6/2/05	
SPT HAMMER DROP: 30 inches **WT:** 140 lbs		**DRIVE HAMMER DROP:** 30 inches **WT:** 140 lbs	
LOGGED BY: JL	**CHECKED BY:** QL	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							CONCRETE - 7 inches SILTY SAND (SM); olive, moist, medium dense, fine-grained sand - FILL						
5													
				9 16 25	20			91	10			31	CA RV
	5												
				9 9 20	14			109	20				DS
0							wet						
							SILTY GRAVEL with SAND (GM); dark gray, wet, medium dense, fine to coarse gravel, fine-grained sand						
	10			6 7 17	12								
-5							SILTSTONE (Capistrano Formation); dark gray, wet, very dense, nonplastic						
	15			15 27/3 inches	100		Boring terminated at 14.75 feet due to refusal. Groundwater encountered at 7 feet during drilling. Boring backfilled with cement/bentonite grout. Surface patched with rapid set concrete.						
-10													
	20												
-15													
	25												
-20													

LOG OF BORING B-2

Page 1 of 1
Dana Point Boat Launch
Project No. 2005-022

PLATE
A3

Template: DYLG1; Prj ID: 2005-022.GPJ

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	7 MSL
LATITUDE:	33° 27' 38.7" N	**LONGITUDE:**	117° 41' 32.0" W
DRILLING EQUIPMENT:	Mayhew 1000	**DRILLING METHOD:**	Rotary Wash
BORING DIAMETER (inches):	5	**BORING DEPTH (feet):**	21
DATE STARTED:	6/2/05	**DATE COMPLETED:**	6/2/05
SPT HAMMER DROP: 30 inches **WT:** 140 lbs		**DRIVE HAMMER DROP:** 30 inches **WT:** 140 lbs	
LOGGED BY: JL	**CHECKED BY:** QL	**DRIVE SAMPLER DIAMETER (inches)**	ID: 2.4 OD: 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							CONCRETE - 7 inches						
							SILTY SAND (SM); olive, moist, medium dense, fine-grained sand, trace fine gravel - FILL						
5										NP	NP	17	CA COMP RV
	5			7 8 11	9								
0							wet						
							SILTY GRAVEL with SAND (GM); dark greenish gray, wet, medium dense to dense, fine to coarse gravel, fine-grained sand						
	10			6 9 21	30								
-5													
	15			27/1 Inch 75/6 inches	100 100								
-10													
							SANDSTONE (Capistrano Formation); olive, wet, very dense, fine-grained sand						
	20			20 50/6 inches	100								
-15							Boring terminated at 21 feet due to refusal. Groundwater encountered at 7 feet during drilling. Boring backfilled with cement/bentonite grout. Surface patched with rapid set concrete.						
	25												
-20													

LOG OF BORING B- 3

Page 1 of 1
Dana Point Boat Launch
Project No. 2005-022

PLATE

A4

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	10 MSL
LATITUDE:	33° 27' 39.2" N	**LONGITUDE:**	117° 41' 33.4" W
DRILLING EQUIPMENT:	Mayhew 1000	**DRILLING METHOD:**	Rotary Wash
BORING DIAMETER (inches):	5	**BORING DEPTH (feet):**	7
DATE STARTED:	6/2/05	**DATE COMPLETED:**	6/2/05
SPT HAMMER DROP: 30 inches	**WT:** 140 lbs	**DRIVE HAMMER DROP:** 30 inches	**WT:** 140 lbs
LOGGED BY: JL	**CHECKED BY:** QL	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							ASPHALT CONCRETE - 4 inches						
							SILTY GRAVEL with SAND (GM); brown, moist, medium dense, fine to coarse gravel, fine-grained sand, few cobbles - FILL						
				6 9 18	13		CLAYEY SAND (SC); olive, moist, medium dense, fine-to coarse-grained sand, trace coarse gravel - FILL	104 104	8 10	30	10	18	CA COMP RV
5	5												
				8 15 15	15		Increased fines, brown, few SANDY SILT (ML)	111 119	13 14				
							Boring terminated at 6.5 feet. No groundwater encountered during drilling. Boring backfilled with cement/bentonite grout. Surface patched with cold patch asphalt.						
0	10												
-5	15												
-10	20												
-15	25												
-20													

LOG OF BORING B-4

Page 1 of 1
Dana Point Boat Launch
Project No. 2005-022

PLATE
A5

Template: DYLG1; Prj ID: 2005-022.GPJ

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	7 MSL
LATITUDE:	33° 27' 38.0" N	**LONGITUDE:**	117° 41' 31.4" W
DRILLING EQUIPMENT:	Mayhew 1000	**DRILLING METHOD:**	Rotary Wash
BORING DIAMETER (inches):	5	**BORING DEPTH (feet):**	22
DATE STARTED:	6/2/05	**DATE COMPLETED:**	6/2/05
SPT HAMMER DROP:	30 inches **WT:** 140 lbs	**DRIVE HAMMER DROP:**	30 inches **WT:** 140 lbs
LOGGED BY: JL	**CHECKED BY:** QL	**DRIVE SAMPLER DIAMETER (inches)**	ID: 2.4 OD: 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							ASPHALT CONCRETE - 4 inches SILTY SAND (SM); olive, moist, medium dense, fine-grained sand, trace fine gravel - FILL						
5													
													CA
	5			11 20 23	21			103	17	NP	NP	16	DS
0													
	10			3 3 3	6		light brown, loose, trace corase gravel						
-5							wet						
	15			11 25 50/3 inches	62		dark brown, very dense, fine- to coarse-grained sand, trace fine to coarse gravel	108	19				
-10													
							SANDSTONE (Capistrano Formation); olive, wet, very dense, fine-to coarse-grained sand, trace fine gravel						
	20			50/6 inches	100								
-15							Boring terminated at 22 feet due to refusal. Groundwater encountered at 12 feet during drilling. Boring backfilled with cement/bentonite grout. Surface patched with cold patch asphalt.						
	25												
-20													

LOG OF BORING B- 1

Page 1 of 1
Dana Point Boat Launch
Project No. 2005-022

PLATE
A2

Template: DYLG1; Prj ID: 2005-022.GPJ

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	7 MSL
LATITUDE:	33° 27' 38.0" N	**LONGITUDE:**	117° 41' 31.4" W
DRILLING EQUIPMENT:	Mayhew 1000	**DRILLING METHOD:**	Rotary Wash
BORING DIAMETER (inches):	5	**BORING DEPTH (feet):**	22
DATE STARTED:	6/2/05	**DATE COMPLETED:**	6/2/05
SPT HAMMER DROP:	30 inches **WT:** 140 lbs	**DRIVE HAMMER DROP:**	30 inches **WT:** 140 lbs
LOGGED BY: JL	**CHECKED BY:** QL	**DRIVE SAMPLER DIAMETER (inches)**	ID: 2.4 OD: 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							ASPHALT CONCRETE - 4 inches SILTY SAND (SM); olive, moist, medium dense, fine-grained sand, trace fine gravel - FILL						
5													
													CA
	5			11 20 23	21			103	17	NP	NP	16	DS
0													
	10			3 3 3	6		light brown, loose, trace corase gravel						
-5							wet						
	15			11 25 50/3 inches	62		dark brown, very dense, fine- to coarse-grained sand, trace fine to coarse gravel	108	19				
-10													
							SANDSTONE (Capistrano Formation); olive, wet, very dense, fine-to coarse-grained sand, trace fine gravel						
	20			50/6 inches	100								
-15							Boring terminated at 22 feet due to refusal. Groundwater encountered at 12 feet during drilling. Boring backfilled with cement/bentonite grout. Surface patched with cold patch asphalt.						
	25												
-20													

LOG OF BORING B-1

Page 1 of 1
Dana Point Boat Launch
Project No. 2005-022

PLATE
A2

BORING LOCATION:	See Figure 2	ELEVATION AND DATUM (feet):	7 MSL
LATITUDE:	33° 27' 39.8" N	LONGITUDE:	117° 41' 31.4" W
DRILLING EQUIPMENT:	Mayhew 1000	DRILLING METHOD:	Rotary Wash
BORING DIAMETER (inches):	5	BORING DEPTH (feet):	15
DATE STARTED:	6/2/05	DATE COMPLETED:	6/2/05
SPT HAMMER DROP:	30 inches WT: 140 lbs	DRIVE HAMMER DROP:	30 inches WT: 140 lbs
LOGGED BY: JL	CHECKED BY: QL	DRIVE SAMPLER DIAMETER (inches)	ID: 2.4 OD: 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							CONCRETE - 7 inches						
							SILTY SAND (SM); olive, moist, medium dense, fine-grained sand - FILL						
5													CA RV
				9 16 25	20			91	10			31	
	5												
				9 9 20	14			109	20				DS
0							wet						
							SILTY GRAVEL with SAND (GM); dark gray, wet, medium dense, fine to coarse gravel, fine-grained sand						
	10			6 7 17	12								
-5							SILTSTONE (Capistrano Formation); dark gray, wet, very dense, nonplastic						
	15			16 27/3 inches	100		Boring terminated at 14.75 feet due to refusal. Groundwater encountered at 7 feet during drilling. Boring backfilled with cement/bentonite grout. Surface patched with rapid set concrete.						
-10													
	20												
-15													
	25												
-20													

LOG OF BORING B-2

Page 1 of 1
Dana Point Boat Launch
Project No. 2005-022

PLATE
A3

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	7 MSL
LATITUDE:	33° 27' 38.7" N	**LONGITUDE:**	117° 41' 32.0" W
DRILLING EQUIPMENT:	Mayhew 1000	**DRILLING METHOD:**	Rotary Wash
BORING DIAMETER (inches):	5	**BORING DEPTH (feet):**	21
DATE STARTED:	6/2/05	**DATE COMPLETED:**	6/2/05
SPT HAMMER DROP: 30 inches **WT:** 140 lbs		**DRIVE HAMMER DROP:** 30 inches **WT:** 140 lbs	
LOGGED BY: JL	**CHECKED BY:** QL	**DRIVE SAMPLER DIAMETER (inches)**	**ID:** 2.4 **OD:** 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							CONCRETE - 7 inches SILTY SAND (SM); olive, moist, medium dense, fine-grained sand, trace fine gravel - FILL						
5										NP	NP	17	CA COMP RV
	5			7 8 11	9								
0							wet						
	10			6 9 21	30		SILTY GRAVEL with SAND (GM); dark greenish gray, wet, medium dense to dense, fine to coarse gravel, fine-grained sand						
-5													
	15			27/1 inch 75/6 inches	100 100								
-10													
							SANDSTONE (Capistrano Formation); olive, wet, very dense, fine-grained sand						
	20			20 50/6 inches	100								
-15							Boring terminated at 21 feet due to refusal. Groundwater encountered at 7 feet during drilling. Boring backfilled with cement/bentonite grout. Surface patched with rapid set concrete.						
	25												
-20													

LOG OF BORING B- 3

Page 1 of 1
Dana Point Boat Launch
Project No. 2005-022

PLATE
A4

Template: DYLG1; Prj ID: 2005-022.GPJ

BORING LOCATION:	See Figure 2	**ELEVATION AND DATUM (feet):**	10 MSL
LATITUDE:	33° 27' 39.2" N	**LONGITUDE:**	117° 41' 33.4" W
DRILLING EQUIPMENT:	Mayhew 1000	**DRILLING METHOD:**	Rotary Wash
BORING DIAMETER (inches):	5	**BORING DEPTH (feet):**	7
DATE STARTED:	6/2/05	**DATE COMPLETED:**	6/2/05
SPT HAMMER DROP: 30 inches	**WT:** 140 lbs	**DRIVE HAMMER DROP:** 30 inches	**WT:** 140 lbs
LOGGED BY: JL	**CHECKED BY:** QL	**DRIVE SAMPLER DIAMETER (inches)**	ID: 2.4 OD: 3

Elevation (feet)	Depth (feet)	Sampler	Symbol	Blows per 6 Inches	SPT N Blows per Foot	Field Unc. Comp. Str. (tsf)	DESCRIPTION	Dry Density (pcf)	Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Percent Passing #200 Sieve	Other Tests [PID]
							ASPHALT CONCRETE - 4 inches						
							SILTY GRAVEL with SAND (GM); brown, moist, medium dense, fine to coarse gravel, fine-grained sand, few cobbles - FILL						
				6 9 18	13		CLAYEY SAND (SC); olive, moist, medium dense, fine-to coarse-grained sand, trace coarse gravel - FILL	104 104	8 10	30	10	18	CA COMP RV
5	5			8 15 15	15		Increased fines, brown, few SANDY SILT (ML)	111 119	13 14				
							Boring terminated at 6.5 feet. No groundwater encountered during drilling. Boring backfilled with cement/bentonite grout. Surface patched with cold patch asphalt.						
0	10												
-5	15												
-10	20												
-15	25												
-20													

LOG OF BORING B- 4

Page 1 of 1

Dana Point Boat Launch

Project No. 2005-022

PLATE

A5

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

APPENDIX A-4

Previous CPT Logs by Others

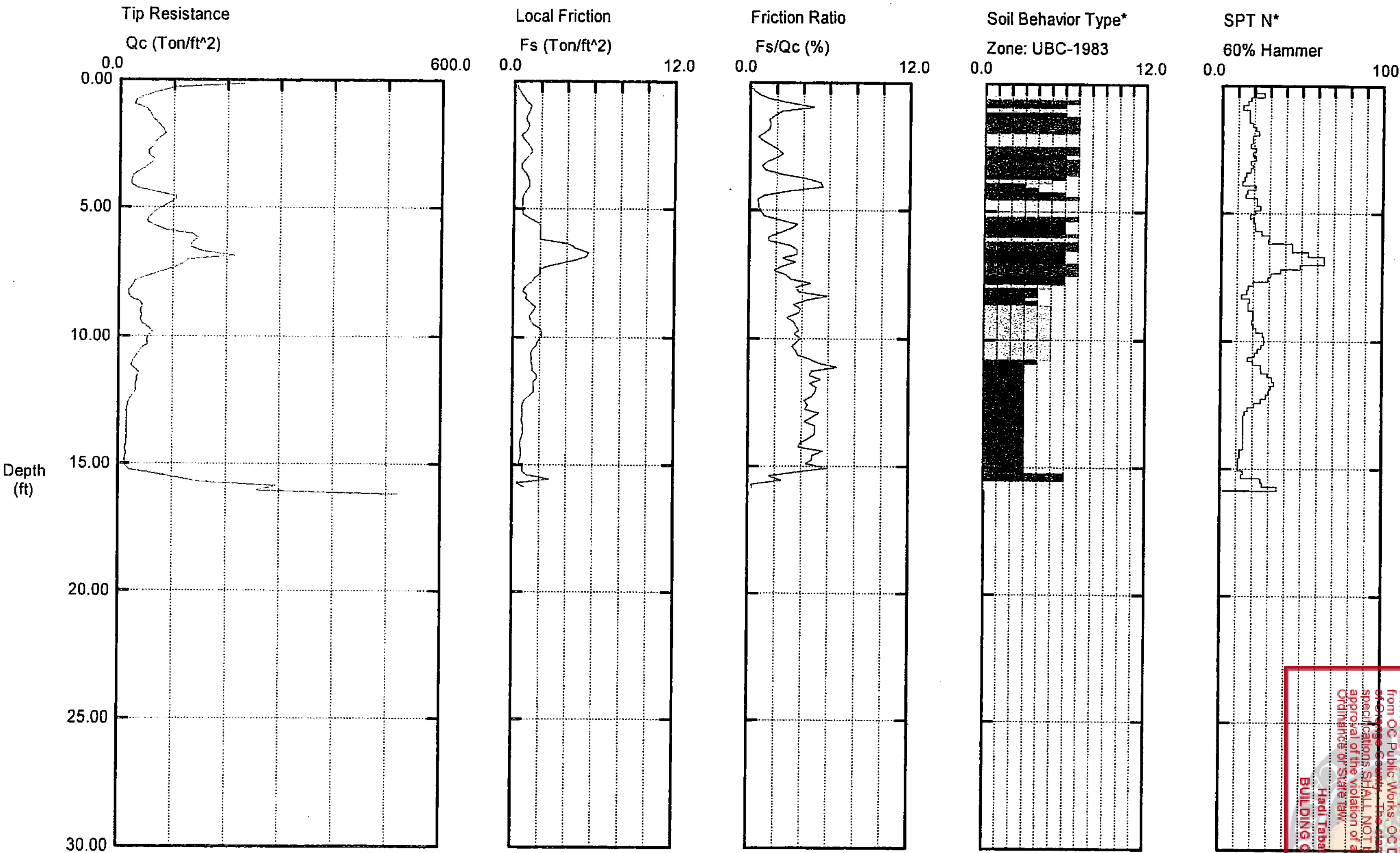
Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

ɔil behavior type and SPT b· ·n data from UBC-1983

Leighton Consu .ng, Inc.

Operator: Bobby-Victor
Sounding: CPT-01
Cone Used: 468/BH-VO/R#3

CPT Date/Time: 11-15-02 08:31
Location: WRT/Dana Point
Job Number: 600027-001



Maximum Depth = 16.24 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

sdf-500

CPT INTERPRETATIONS

SOUNDING : CPT-01
PROJECT : WRT/Dana Point
DATE/TIME: 11-15-02 08:31

PROJECT No.: 600027-001
CONE/RIG : 468/BH-VC/R#3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	69.68	.69	SAND to SILTY SAND	17	28	66		
.300	.98	25.85	4.76	CLAY	26	41		1.5	
.450	1.48	58.64	1.41	SILTY SAND to SANDY SILT	20	31	61		48.5
.600	1.97	80.67	1.07	SAND to SILTY SAND	20	32	70		48.5
.750	2.46	64.03	1.59	SILTY SAND to SANDY SILT	21	34	64		46.5
.900	2.95	53.11	1.94	SILTY SAND to SANDY SILT	18	28	58		45.5
1.050	3.44	48.65	1.16	SILTY SAND to SANDY SILT	16	26	56		44.5
1.200	3.94	21.10	5.31	CLAY	21	34		1.2	
1.350	4.43	68.77	1.08	SILTY SAND to SANDY SILT	23	37	66		44.5
1.500	4.92	87.40	.66	SAND to SILTY SAND	22	35	72		45.5
1.650	5.41	54.62	2.33	SANDY SILT to CLAYEY SILT	22	35		3.6	
1.800	5.91	85.98	2.29	SILTY SAND to SANDY SILT	29	46	72		44.5
1.950	6.40	135.24	3.04	SANDY SILT to CLAYEY SILT	54	87		7.9	
2.100	6.89	214.64	2.50	SILTY SAND to SANDY SILT	72	100	98		47.5
2.250	7.38	100.72	1.88	SILTY SAND to SANDY SILT	34	51	77		44.5
2.400	7.87	29.06	4.59	CLAY to SILTY CLAY	19	29		1.7	
2.550	8.37	17.19	5.84	CLAY	17	25		1.1	
2.700	8.86	43.89	3.83	CLAYEY SILT to SILTY CLAY	22	32		2.6	
2.850	9.35	39.24	3.35	CLAYEY SILT to SILTY CLAY	20	28		2.6	
3.000	9.84	62.35	3.39	CLAYEY SILT to SILTY CLAY	31	44		3.6	
3.150	10.33	53.71	3.26	CLAYEY SILT to SILTY CLAY	27	37		3.1	
3.300	10.83	30.72	4.55	CLAY to SILTY CLAY	20	28		1.8	
3.450	11.32	30.02	4.74	CLAY	30	41		1.7	
3.600	11.81	32.29	4.59	CLAY to SILTY CLAY	22	29		1.9	
3.750	12.30	26.45	4.70	CLAY	26	35		1.5	
3.900	12.80	15.44	4.21	CLAY	15	20		1.0	
4.050	13.29	15.21	4.18	CLAY	15	20		1.0	
4.200	13.78	14.77	4.94	CLAY	15	19		.9	
4.350	14.27	13.40	3.73	CLAY to SILTY CLAY	9	11		.8	
4.500	14.76	11.45	4.77	CLAY	11	14		.7	
4.650	15.26	19.78	3.62	CLAY to SILTY CLAY	13	16		1.3	
4.800	15.75	150.77	.20	SAND	30	37	84		44.0

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 7.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

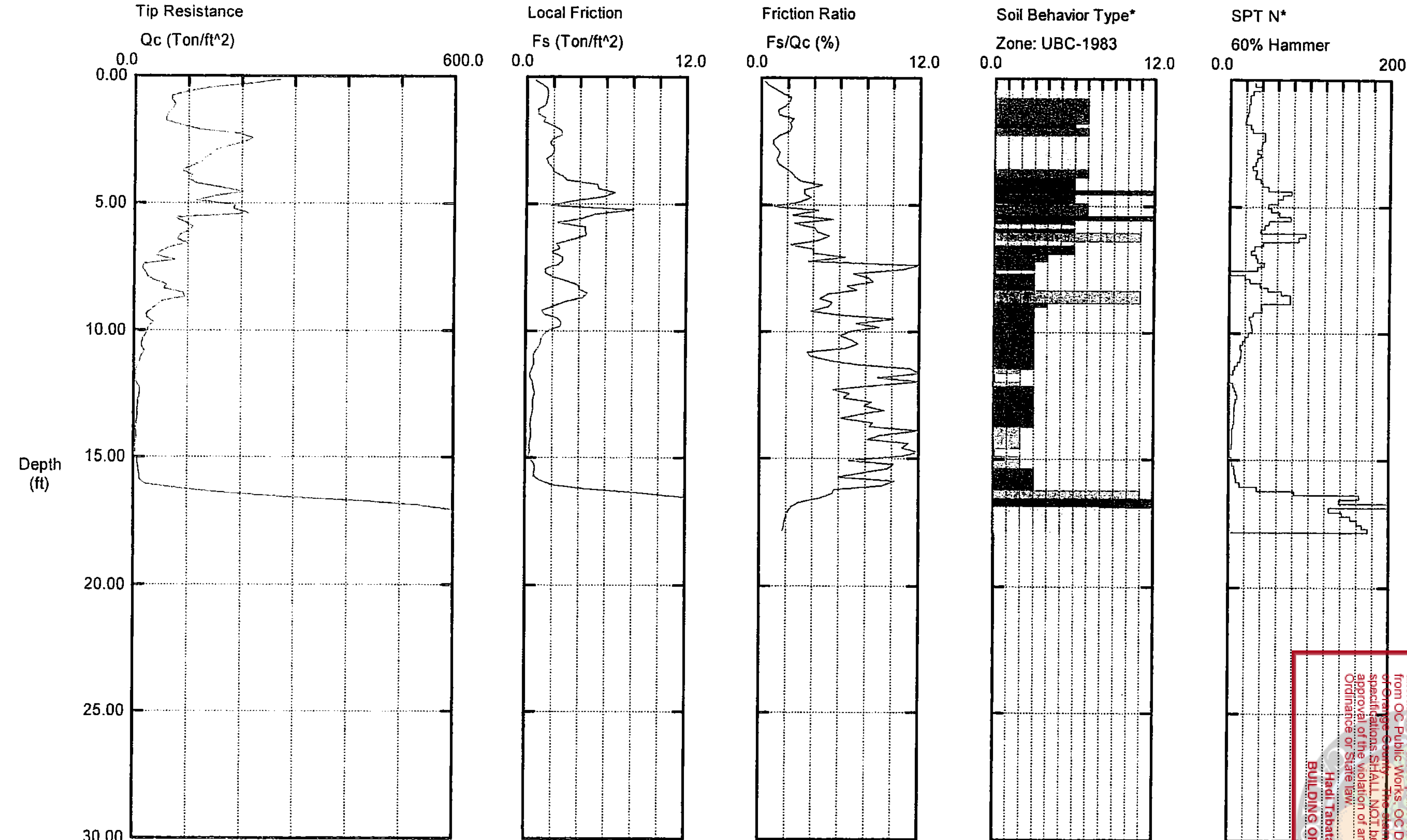
Interpretations based on: Robertson and Campanella, 1989.

HOLGUIN, FAHAN & ASSOCIATES, INC.

Leighton Consu...ng, Inc.

Operator: Bobby-Victor
Sounding: CPT-02
Cone Used: 468/BH-VO/R#3

CPT Date/Time: 11-15-02 09:05
Location: WRT/Dana Point
Job Number: 600027-001



Maximum Depth = 18.21 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

sdf-501

CPT INTERPRETATIONS

SOUNDING : CPT-02
PROJECT : WRT/Dana Point
DATE/TIME: 11-15-02 09:05

PROJECT No.: 600027-001
CONE/RIG : 468/BH-VO/R#3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	140.58	1.06	SAND to SILTY SAND	35	56	86		
.300	.98	68.92	2.11	SILTY SAND to SANDY SILT	23	37	66		
.450	1.48	62.97	1.34	SILTY SAND to SANDY SILT	21	34	63		48.5
.600	1.97	88.17	2.28	SILTY SAND to SANDY SILT	29	47	73		49.0
.750	2.46	220.35	.87	SAND	44	70	99		
.900	2.95	149.35	1.38	SAND to SILTY SAND	37	60	88		49.5
1.050	3.44	122.24	1.32	SAND to SILTY SAND	31	49	82		48.0
1.200	3.94	106.35	2.53	SILTY SAND to SANDY SILT	35	57	78		47.0
1.350	4.43	163.84	3.28	SANDY SILT to CLAYEY SILT	66	100		9.6	
1.500	4.92	114.89	2.83	SANDY SILT to CLAYEY SILT	46	73		6.7	
1.650	5.41	213.72	2.38	SILTY SAND to SANDY SILT	71	100	98		48.5
1.800	5.91	108.58	4.05	CLAYEY SILT to SILTY CLAY	54	87		6.4	
1.950	6.40	78.63	4.28	CLAYEY SILT to SILTY CLAY	39	63		4.6	
2.100	6.89	47.44	3.99	CLAYEY SILT to SILTY CLAY	24	37		2.8	
2.250	7.38	18.48	12.85	CLAY	18	28		1.2	
2.400	7.87	24.58	8.15	CLAY	25	37		1.6	
2.550	8.37	54.79	7.25	CLAY	55	81		3.2	
2.700	8.86	54.37	5.41	CLAY	54	79		3.2	
2.850	9.35	22.84	5.80	CLAY	23	33		1.3	
3.000	9.84	28.30	8.99	CLAY	28	40		1.8	
3.150	10.33	16.19	6.89	CLAY	16	23		1.0	
3.300	10.83	19.40	3.56	CLAY to SILTY CLAY	13	18		1.3	
3.450	11.32	8.24	7.44	CLAY	8	11		.5	
3.600	11.81	3.63	8.90	ORGANIC MATERIAL	4	5		.3	
3.750	12.30	10.96	5.51	CLAY	11	14		.7	
3.900	12.80	6.31	8.40	CLAY	6	8		.4	
4.050	13.29	6.40	7.64	CLAY	6	8		.4	
4.200	13.78	3.72	8.25	ORGANIC MATERIAL	4	5		.3	
4.350	14.27	4.38	8.13	ORGANIC MATERIAL	4	6		.4	
4.500	14.76	2.12	15.80	ORGANIC MATERIAL	2	3		.1	
4.650	15.26	6.12	10.07	CLAY	6	8		.3	
4.800	15.75	10.52	5.91	CLAY	11	13		.6	
4.950	16.24	78.54	5.59	*VERY STIFF FINE GRAINED	79	95			
5.100	16.73	431.48	2.94	*SAND to CLAYEY SAND	100	100			
5.250	17.22	635.82	1.99	SAND to SILTY SAND	100	100	100		
5.400	17.72	717.88	1.76	SAND to SILTY SAND	100	100	100		

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 7.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

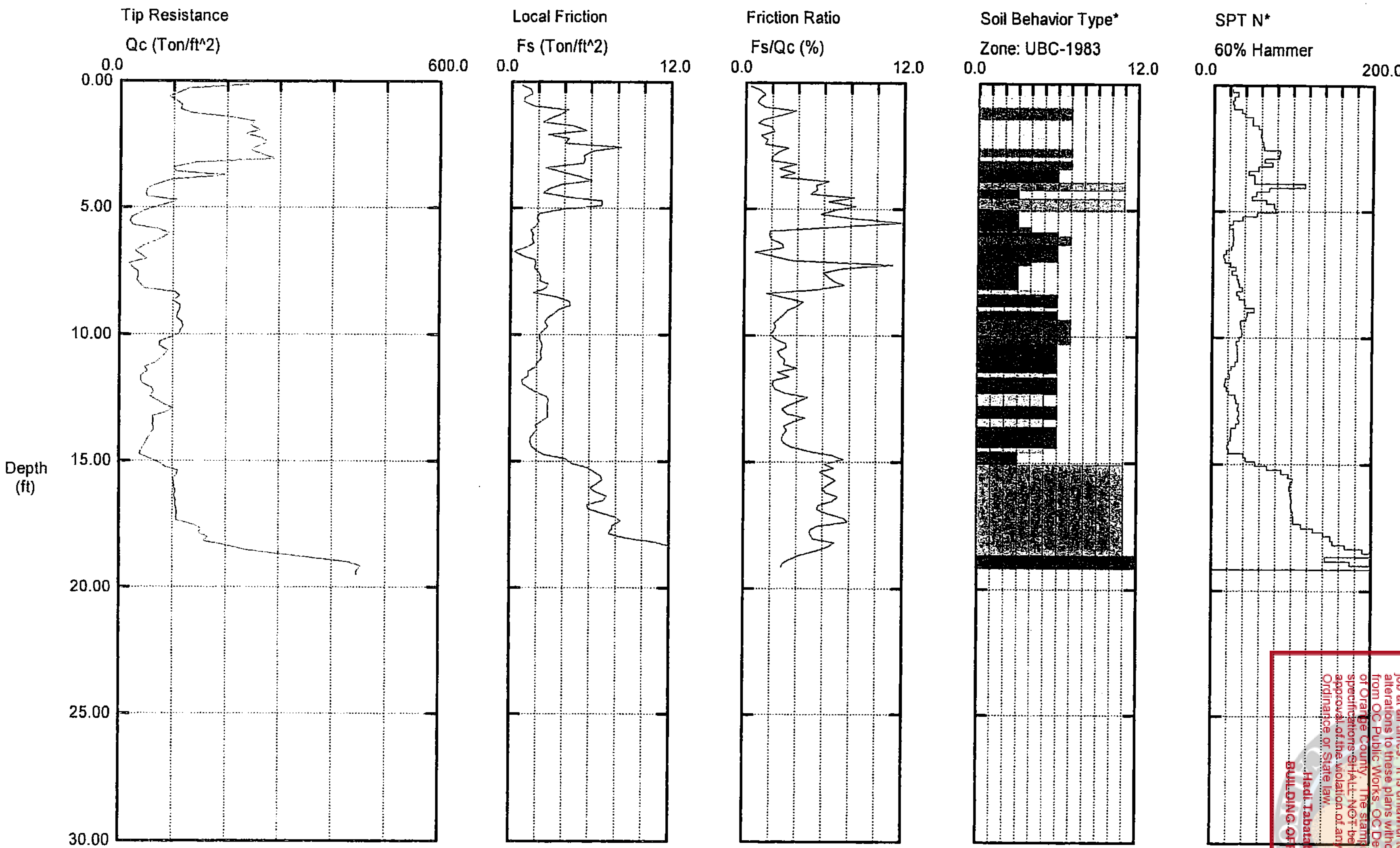
HOLGUIN, FAHAN & ASSOCIATES, INC.

ɔil behavior type and SPT t n data from UBC-1983

Leighton Consu..ing, Inc.

Operator: Bobby-Victor
Sounding: CPT-03
Cone Used: 468/BH-VO/R#3

CPT Date/Time: 11-15-02 09:35
Location: WRT/Dana Point
Job Number: 600027-001



Maximum Depth = 19.52 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

sdf-502

CPT INTERPRETATIONS

SOUNDING : CPT-03
PROJECT : WRT/Dana Point
DATE/TIME: 11-15-02 09:35

PROJECT No.: 600027-001
CONE/RIG : 468/BH-VO/R#3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	109.92	1.43	SAND to SILTY SAND	27	44	79		
.300	.98	115.47	1.42	SAND to SILTY SAND	29	46	80		
.450	1.48	212.00	1.35	SAND to SILTY SAND	53	85	98		
.600	1.97	260.31	2.16	SILTY SAND to SANDY SILT	87	100	100		
.750	2.46	276.73	1.44	SAND to SILTY SAND	69	100	100		
.900	2.95	267.41	2.02	SAND to SILTY SAND	67	100	100		
1.050	3.44	99.96	2.52	SILTY SAND to SANDY SILT	33	53	76		47.0
1.200	3.94	95.79	6.27	*VERY STIFF FINE GRAINED	96	100			
1.350	4.43	47.99	4.94	CLAY to SILTY CLAY	32	51		2.8	
1.500	4.92	81.26	8.34	*VERY STIFF FINE GRAINED	81	100			
1.650	5.41	22.65	8.32	CLAY	23	36		1.5	
1.800	5.91	76.06	1.88	SILTY SAND to SANDY SILT	25	41	68		44.0
1.950	6.40	61.33	2.78	SANDY SILT to CLAYEY SILT	25	39		4.1	
2.100	6.89	39.39	2.18	SANDY SILT to CLAYEY SILT	16	25		2.6	
2.250	7.38	23.67	7.37	CLAY	24	36		1.4	
2.400	7.87	31.93	6.74	CLAY	32	48		1.9	
2.550	8.37	104.38	1.64	SILTY SAND to SANDY SILT	35	51	78		44.0
2.700	8.86	113.49	3.95	CLAYEY SILT to SILTY CLAY	57	82		6.6	
2.850	9.35	106.82	2.58	SILTY SAND to SANDY SILT	36	51	78		44.0
3.000	9.84	114.47	2.15	SILTY SAND to SANDY SILT	38	54	80		44.0
3.150	10.33	74.87	3.09	SANDY SILT to CLAYEY SILT	30	42		4.4	
3.300	10.83	84.66	2.68	SANDY SILT to CLAYEY SILT	34	47		5.6	
3.450	11.32	46.93	3.97	CLAYEY SILT to SILTY CLAY	23	32		2.7	
3.600	11.81	39.69	2.18	SANDY SILT to CLAYEY SILT	16	21		2.6	
3.750	12.30	63.61	3.09	SANDY SILT to CLAYEY SILT	25	34		3.7	
3.900	12.80	82.22	3.37	SANDY SILT to CLAYEY SILT	33	43		4.8	
4.050	13.29	61.93	4.58	CLAY to SILTY CLAY	41	53		3.6	
4.200	13.78	64.07	3.20	SANDY SILT to CLAYEY SILT	26	33		3.7	
4.350	14.27	49.63	3.00	SANDY SILT to CLAYEY SILT	20	25		3.3	
4.500	14.76	37.43	6.74	CLAY	37	47		2.1	
4.650	15.26	85.49	6.77	*VERY STIFF FINE GRAINED	85	100			
4.800	15.75	100.57	6.94	*VERY STIFF FINE GRAINED	100	100			
4.950	16.24	104.48	6.20	*VERY STIFF FINE GRAINED	100	100			
5.100	16.73	103.48	5.61	*VERY STIFF FINE GRAINED	100	100			
5.250	17.22	105.86	7.52	*VERY STIFF FINE GRAINED	100	100			
5.400	17.72	153.09	5.01	*VERY STIFF FINE GRAINED	100	100			
5.550	18.21	158.61	6.85	*VERY STIFF FINE GRAINED	100	100			
5.700	18.70	293.07	4.33	*VERY STIFF FINE GRAINED	100	100			
5.850	19.19	453.64	2.80	*SAND to CLAYEY SAND	100	100			

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 7.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

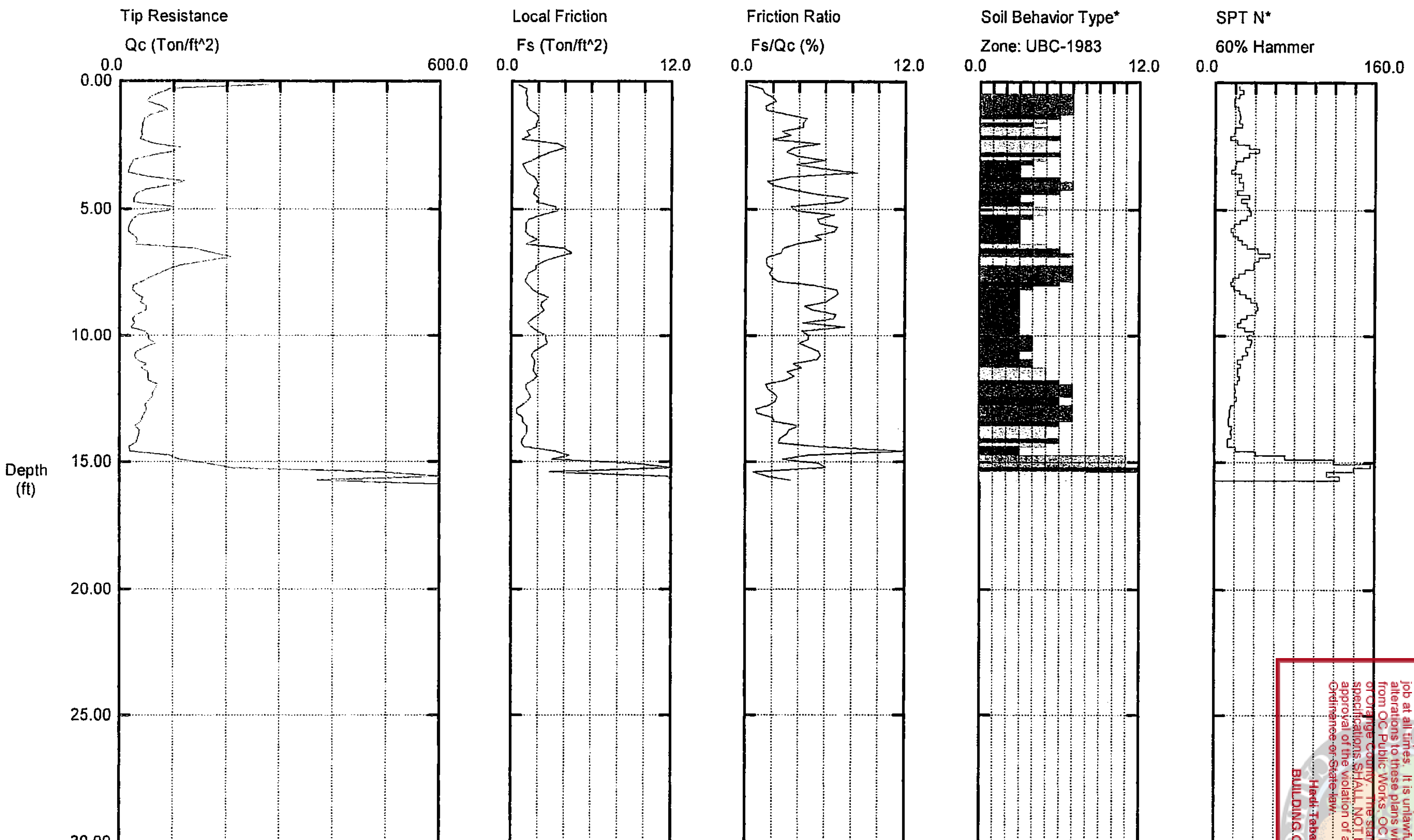
HOLGUIN, FAHAN & ASSOCIATES, INC.

il behavior type and SPT b... n data from UBC-1983

Leighton Consu..ng, Inc.

Operator: Bobby-Victor
Sounding: CPT-04A
Cone Used: 468/BH-VO/R#3

CPT Date/Time: 11-15-02 10:28
Location: WRT/Dana Point
Job Number: 600027-001



Maximum Depth = 16.08 feet

Depth Increment = 0.16 feet

1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

sdf-504

CPT INTERPRETATIONS

SOUNDING : CPT-04A
PROJECT : WRT/Dana Point
DATE/TIME: 11-15-02 10:28

PROJECT No.: 600027-001
CONE/RIG : 468/Bh-VO/R#3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	73.04	1.37	SILTY SAND to SANDY SILT	24	39	67		
.300	.98	75.89	1.46	SILTY SAND to SANDY SILT	25	40	68		
.450	1.48	44.55	4.55	CLAY to SILTY CLAY	30	47		2.6	
.600	1.97	39.56	2.69	SANDY SILT to CLAYEY SILT	16	25		2.6	
.750	2.46	62.14	5.52	CLAY	62	99		3.6	
.900	2.95	54.60	3.87	CLAYEY SILT to SILTY CLAY	27	44		3.2	
1.050	3.44	16.42	5.99	CLAY	16	26		1.1	
1.200	3.94	120.33	1.59	SAND to SILTY SAND	30	48	82		47.5
1.350	4.43	30.51	5.28	CLAY	31	49		1.8	
1.500	4.92	97.68	3.35	SANDY SILT to CLAYEY SILT	39	62		5.7	
1.650	5.41	23.71	5.37	CLAY	24	38		1.4	
1.800	5.91	15.38	6.61	CLAY	15	25		1.0	
1.950	6.40	28.00	3.84	CLAY to SILTY CLAY	19	30		1.8	
2.100	6.89	209.09	1.64	SAND to SILTY SAND	52	81	97		47.5
2.250	7.38	90.42	2.00	SILTY SAND to SANDY SILT	30	46	73		44.0
2.400	7.87	40.94	2.44	SANDY SILT to CLAYEY SILT	16	25		2.7	
2.550	8.37	30.59	6.95	CLAY	31	45		1.8	
2.700	8.86	49.56	4.40	CLAY to SILTY CLAY	33	48		2.9	
2.850	9.35	23.48	6.62	CLAY	23	34		1.3	
3.000	9.84	46.65	4.21	CLAYEY SILT to SILTY CLAY	23	33		2.7	
3.150	10.33	67.07	4.05	CLAYEY SILT to SILTY CLAY	34	47		3.9	
3.300	10.83	26.56	5.63	CLAY	27	36		1.5	
3.450	11.32	39.92	4.23	CLAY to SILTY CLAY	27	36		2.3	
3.600	11.81	53.43	3.04	SANDY SILT to CLAYEY SILT	21	29		3.5	
3.750	12.30	61.55	2.09	SILTY SAND to SANDY SILT	21	27	61		40.5
3.900	12.80	47.04	1.78	SILTY SAND to SANDY SILT	16	20	53		39.0
4.050	13.29	42.21	2.04	SANDY SILT to CLAYEY SILT	17	22		2.8	
4.200	13.78	36.46	3.30	CLAYEY SILT to SILTY CLAY	18	23		2.4	
4.350	14.27	29.59	2.47	SANDY SILT to CLAYEY SILT	12	15		1.9	
4.500	14.76	92.86	4.67	*VERY STIFF FINE GRAINED	93	100			
4.650	15.26	210.96	6.01	*VERY STIFF FINE GRAINED	100	100			
4.800	15.75	369.07	3.44	*SAND to CLAYEY SAND	100	100			

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 7.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

Interpretations based on: Robertson and Campanella, 1989.

HOLGUIN, FAHAN & ASSOCIATES, INC.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

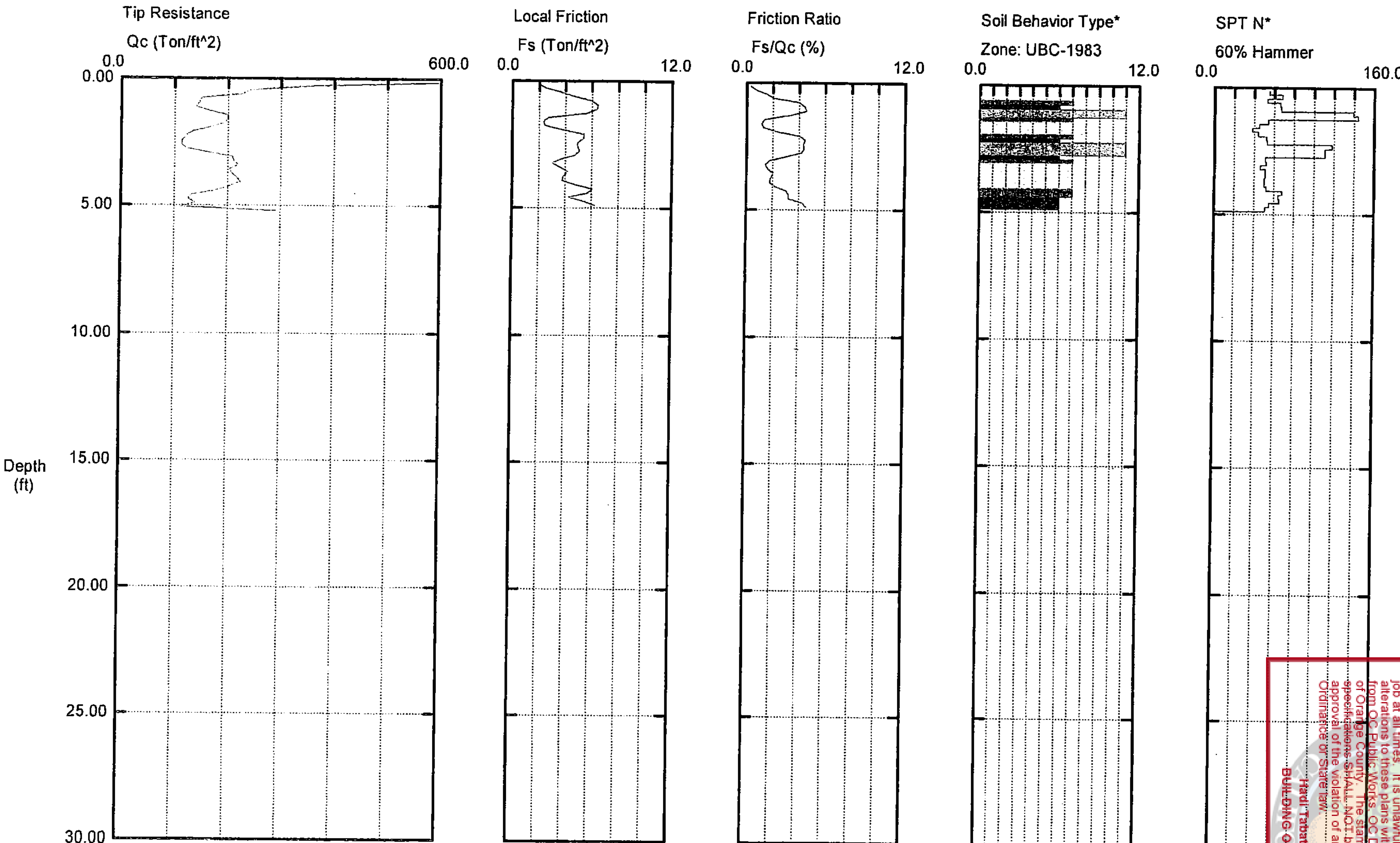
County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provision of any County Ordinance or State law.
Hadi Tabatabaee
BUILDING OFFICIAL

ioil behavior type and SPT ŀ on data from UBC-1983

Leighton Consu..ing, Inc.

Operator: Bobby-Victor
Sounding: CPT-05A
Cone Used: 468/BH-VO/R#3

CPT Date/Time: 11-15-02 11:16
Location: WRT/Dana Point
Job Number: 600027-001



Maximum Depth = 5.25 feet

Depth Increment = 0.16 feet

1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

sdf-506

CPT INTERPRETATIONS

SOUNDING : CPT-05A
PROJECT : WRT/Dana Point
DATE/TIME: 11-15-02 11:16
PROJECT No.: 00027-001
CONE/RIG : 468/BH-VO/R#3

DEPTH (m)	DEPTH (ft)	TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N(60)	N1(60)	Dr (%)	Su (tsf)	PHI (Degrees)
.150	.49	243.76	1.52	SAND to SILTY SAND	61	97	100		
.300	.98	145.80	4.42	*VERY STIFF FINE GRAINED	100	100			
.450	1.48	199.15	1.33	SAND to SILTY SAND	50	80	96		
.600	1.97	163.88	2.43	SILTY SAND to SANDY SILT	55	87	90		
.750	2.46	113.81	4.32	*VERY STIFF FINE GRAINED	100	100			
.900	2.95	164.07	2.86	SILTY SAND to SANDY SILT	55	87	91		
1.050	3.44	219.03	1.65	SAND to SILTY SAND	55	88	99		
1.200	3.94	215.85	1.74	SAND to SILTY SAND	54	86	98		
1.350	4.43	175.63	3.20	SANDY SILT to CLAYEY SILT	70	100		10.3	
1.500	4.92	138.32	4.52	*VERY STIFF FINE GRAINED	100	100			

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 7.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

HOLGUIN, FAHAN & ASSOCIATES, INC.

Interpretations based on: Robertson and Campanella, 1989.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

APPENDIX B-1

Geotechnical Laboratory Procedures and Test Results

GMU

APPENDIX B-1

GMU GEOTECHNICAL LABORATORY PROCEDURES AND TEST RESULTS

MOISTURE AND DENSITY

Field moisture content and in-place density were determined for each 6-inch sample sleeve of undisturbed soil material obtained from the drill holes. The field moisture content was determined in general accordance with ASTM Test Method D 2216 by obtaining one-half the moisture sample from each end of the 6-inch sleeve. The in-place dry density of the sample was determined by using the wet weight of the entire sample.

At the same time the field moisture content and in-place density were determined, the soil material at each end of the sleeve was classified according to the Unified Soil Classification System. The results of the field moisture content and in-place density determinations are presented on the right-hand column of the Log of Drill Hole and are summarized on Table B-1. The results of the visual classifications were used for general reference.

PARTICLE SIZE DISTRIBUTION

As part of the engineering classification of the materials underlying the site, samples were tested to determine the distribution of particle sizes. The distribution was determined in general accordance with ASTM Test Method D 422 using U.S. Standard Sieve Openings 3", 1.5", 3/4, 3/8, and U.S. Standard Sieve Nos. 4, 10, 20, 40, 60, 100, and 200. In addition, on some samples a standard hydrometer test was performed to determine the distribution of particle sizes passing the No. 200 sieve (i.e., silt and clay-size particles). The results of the tests are contained in this Appendix B. Key distribution categories (% gravel; % sand, etc.) are contained on Table B-1.

ATTERBERG LIMITS

As part of the engineering classification of the soil material, a representative sample of the on-site soil material was tested to determine relative plasticity. This relative plasticity is based on the Atterberg limits determined in general accordance with ASTM Test Method D 4318. The results of these tests are contained in this Appendix B and also on Table B-1.

EXPANSION TESTS

To provide a standard definition of one-dimensional expansion, a test was performed on typical on-site materials in general accordance with ASTM Test Method D 4829. The result from this test procedure is reported as an "expansion index". The results of this test are contained in this Appendix B and also on Table B-1.

CHEMICAL TESTS

The corrosion potential of typical on-site materials under long-term contact with both metal and concrete was determined by chemical and electrical resistance tests. The soluble sulfate test for potential concrete corrosion was performed in general accordance with California Test Method 417, the minimum resistivity test for potential metal corrosion was performed in general accordance with California Test Method 643, and the concentration of soluble chlorides was determined in general accordance with California Test Method 422. The results of these tests are contained in this Appendix B and also on Table B-1.

COMPACTION TESTS

Bulk samples representative of the on-site materials were tested to determine the maximum dry density and optimum moisture content of the soil. These compactive characteristics were determined in general accordance with ASTM Test Method D 1557. The results of this test are contained in this Appendix B and also on Table B-1.

DIRECT SHEAR STRENGTH TESTS

Direct shear tests were performed on typical on-site materials. The general philosophy and procedure of the tests were in accord with ASTM Test Method D 3080 - “Direct Shear Tests for Soils Under Consolidated Drained Conditions”.

The tests are single shear tests and are performed using a sample diameter of 2.416 inches and a height of 1.00 inch. The normal load is applied by a vertical dead load system. A constant rate of strain is applied to the upper one-half of the sample until failure occurs. Shear stress is monitored by a strain gauge-type precision load cell and deflection is measured with a digital dial indicator. This data is transferred electronically to data acquisition software which plots shear strength vs. deflection. The shear strength plots are then interpreted to determine either peak or ultimate shear strengths. Residual strengths were obtained through multiple shear box reversals. A strain rate compatible with the grain size distribution of the soils was utilized. The interpreted results of these tests are shown in this Appendix B.

R-VALUE TESTS

Bulk samples representative of the underlying on-site materials were tested to measure the response of a compacted sample to a vertically applied pressure under specific conditions. The R-value of a material is determined when the material is in a state of saturation such that water will be exuded from the compacted test specimen when a 16.8 kN load (2.07 MPa) is applied. The results from these test procedures are reported in Appendix B-1.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

GMU Project 17-206-02

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Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

TABLE B-1
SUMMARY OF SOIL LABORATORY DATA

Sample Information			Geologic Unit	USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	In Situ Satur-ation, %	Sieve/Hydrometer				Atterberg Limits			Compaction		Expansion Index	R-Value	Chemical Test Results			
Boring Number	Depth, feet	Elevation, feet						Gravel, %	Sand, %	<#200, %	<2μ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %			pH	Sulfate (ppm)	Chloride (ppm)	Min. Resistivity (ohm/cm)
DH-18	5	6.3	Af	SC	14.8	111	81															
DH-20	5	7.0	Af	SC	19.1	107	92											16				
DH-21	5	6.8	Af	SC	14.9	111	79															
DH-22	5	6.0	Tc	SC	12.1	118	81															
DH-25	2.5	8.3	Af	SC				3	61	36												
DH-25	7.5	3.3	Af	CH	13.3			1	45	53	16	50	25	25								
DH-25	10	0.8	Af	CH	17.9	109	92															
DH-26	5	6.8	Af	SC	10.0	128	89															
DH-26	10	1.8	Af	SC	14.0	113	81															
DH-29	0	16.7	Af	CL											126.0	10.0			8.7	365	1272	439
DH-29	5	11.7	Af	CL	6.5	108	32															
DH-29	7.5	9.2	Af	CL				7	36	57												
DH-29	10	6.7	Af	CL	29.5	92	97															
DH-29	12.5	4.2	Af	CL								44	22	22								
DH-29	15	1.7	Tc	ML	22.6	100	90															
DH-29	25	-8.3	Tc	ML	20.9	106	99															
DH-34	0	15.4	Af	SM											127.5	10.0						
DH-34	5	10.4	Af	CL	18.7																	
DH-34	10	5.4	Af	CL	12.7																	
DH-34	25	-9.6	Tc	SP	22.8	101	95															
DH-35	0	16.8	Af	CL											129.5	9.0	29		7.9	1763	792	457
DH-35	5	11.8	Af	CL	27.4	92	92															
DH-35	10	6.8	Af	CL	22.4	102	95															
DH-35	15	1.8	Tc	SP	13.1	113	76															
DH-35	25	-8.2	Tc	ML	21.4	105	99															

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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TABLE B-1
SUMMARY OF SOIL LABORATORY DATA

Sample Information			Geologic Unit	USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	In Situ Satur-ation, %	Sieve/Hydrometer				Atterberg Limits			Compaction		Expansion Index	R-Value	Chemical Test Results			
Boring Number	Depth, feet	Elevation, feet						Gravel, %	Sand, %	<#200, %	<2μ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %			pH	Sulfate (ppm)	Chloride (ppm)	Min. Resistivity (ohm/cm)
DH-46	5	8.0	Af	SM	11.1	118	73															
DH-46	10	3.0	Af	SC	13.9	114	81															
DH-46	15	-2.0	Tc	SP	16.2	116	99															

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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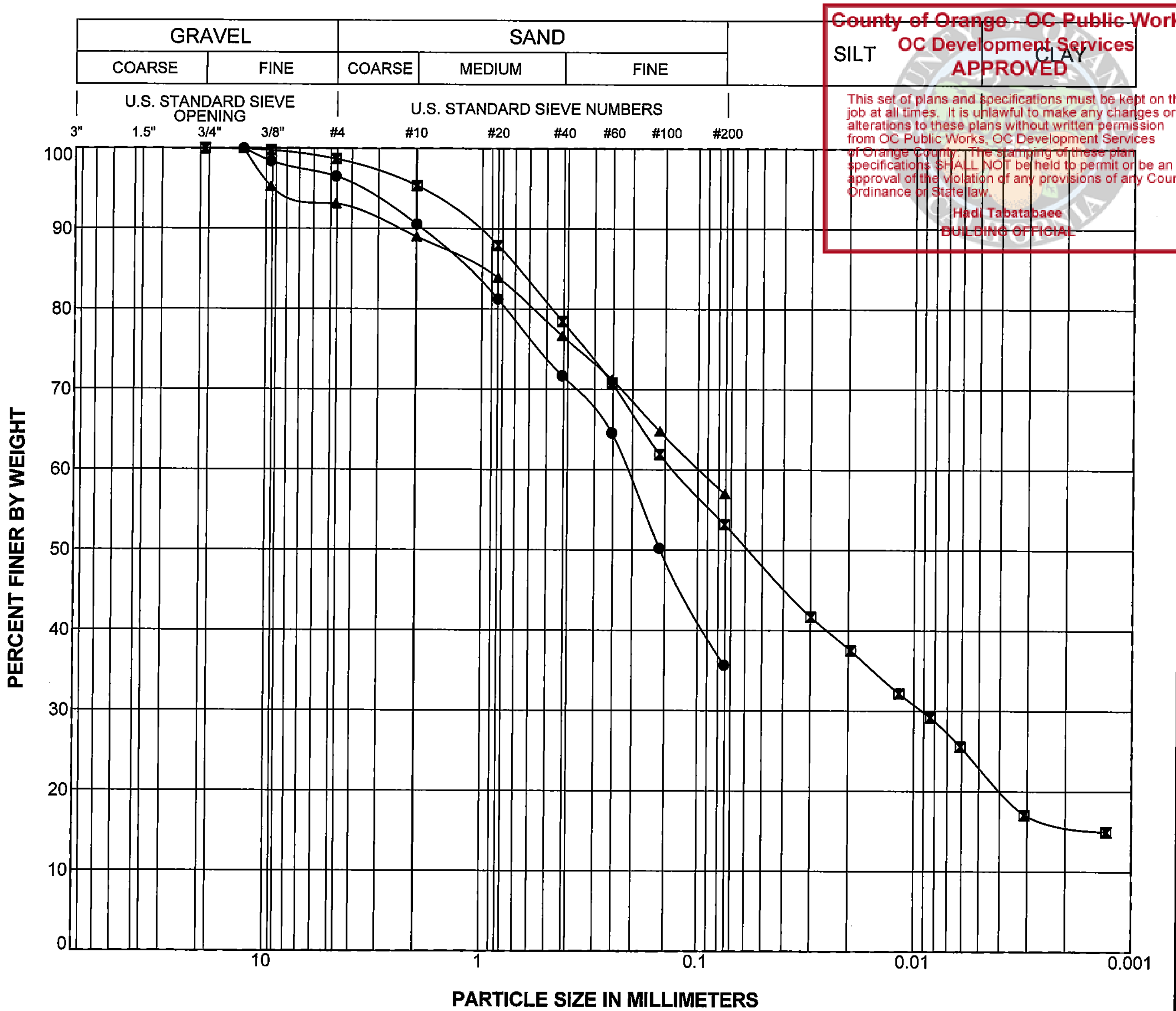

Boring Number	Depth (feet)	Geologic Unit	Symbol	LL	PI	Classification
DH-25	2.5	Af	●			CLAYEY SAND (SC)
DH-25	7.5	Af	⊠	50	25	SANDY FAT CLAY (CH)
DH-29	7.5	Af	▲			SANDY CLAY (CL)

GMU_GRAIN_SIZE 17-206-02 (UPDATED ELEV.).GPJ 11/26/19

PARTICLE SIZE DISTRIBUTION

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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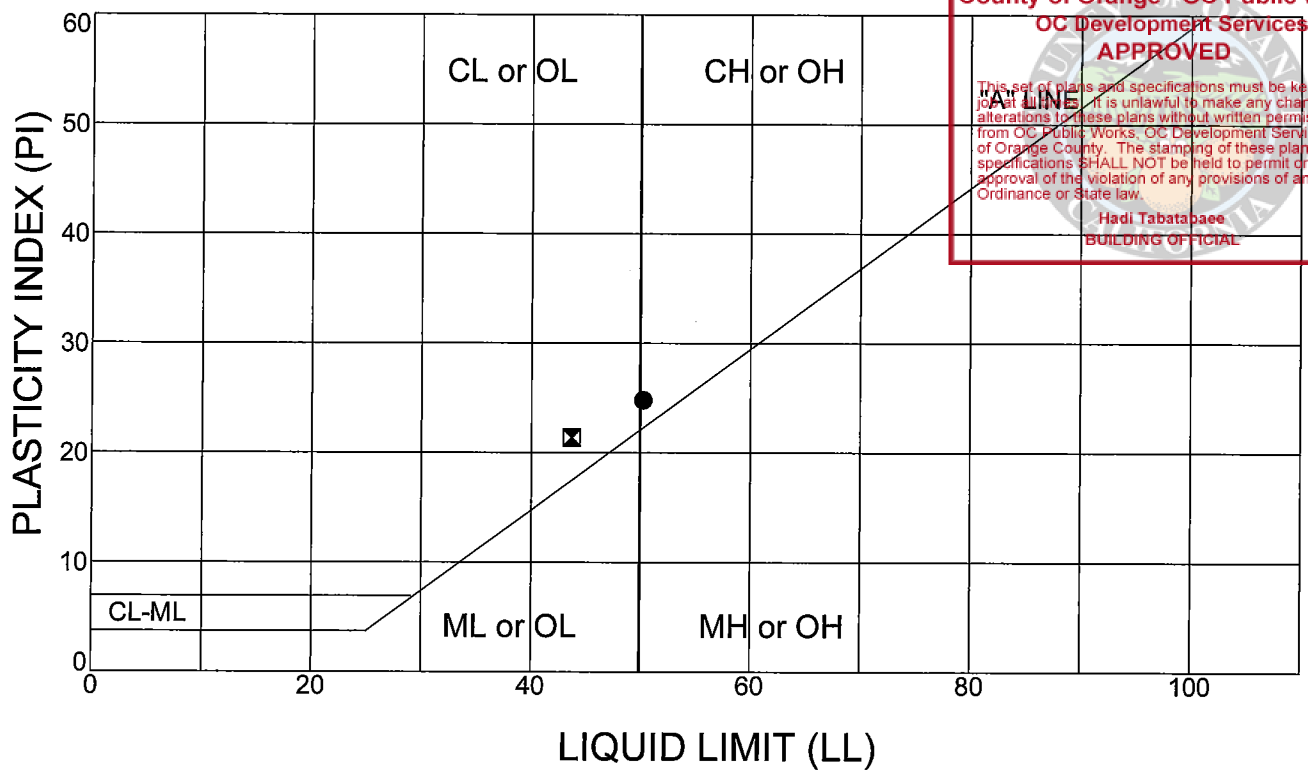

Boring Number	Depth (feet)	Geologic Unit	Test Symbol	Insitu Water Content (%)	LL	PL	PI	Classification
DH-25	7.5	Af	●	13	50	25	25	SANDY FAT CLAY (CH)
DH-29	12.5	Af	⊠		44	22	22	SANDY CLAY (CL)

LIMITS 17-206-02 (UPDATED ELEV.).GPJ 11/26/19

ATTERBERG LIMITS

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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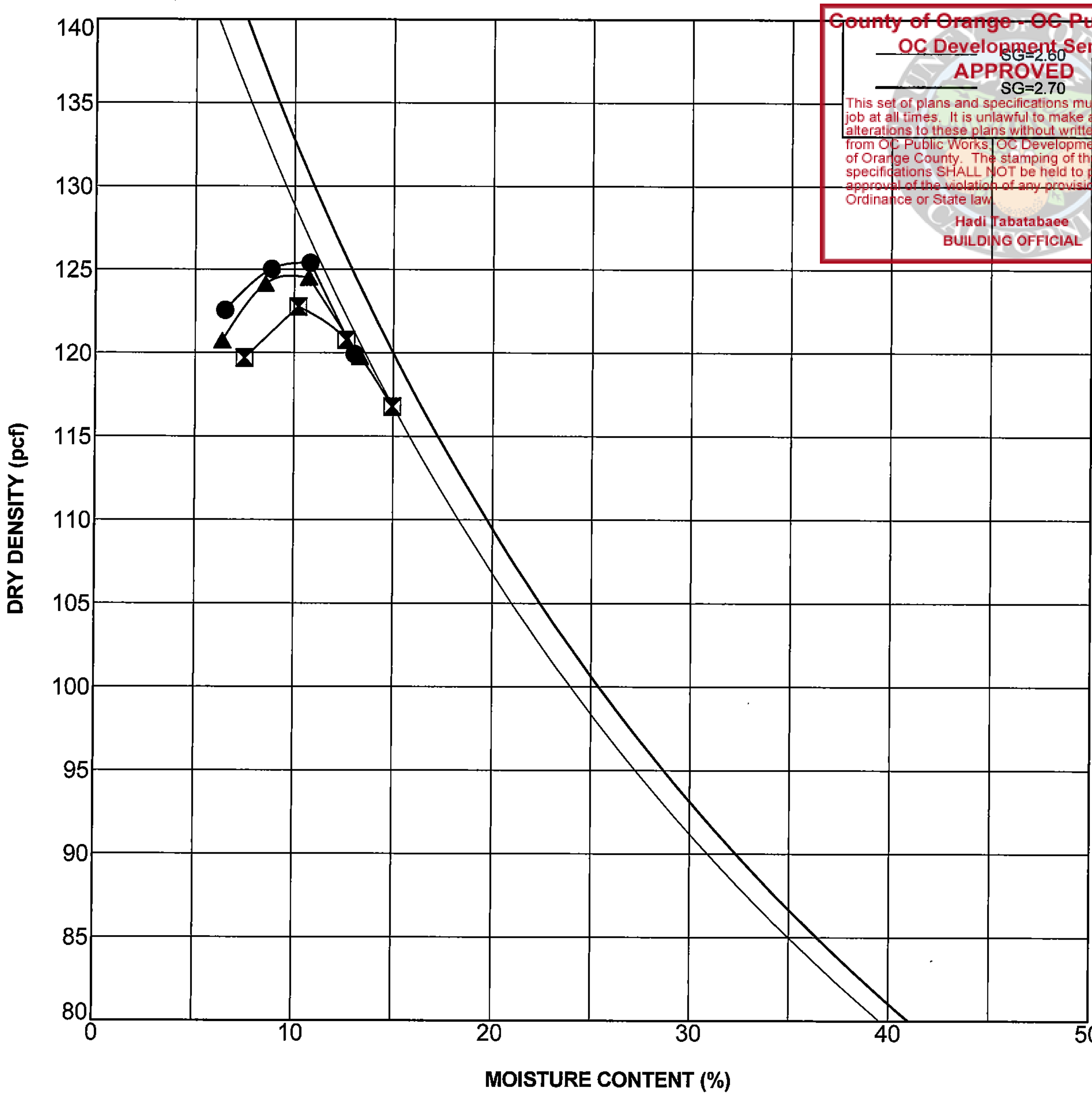

Boring Number	Depth (feet)	Geologic Unit	Symbol	Maximum Dry Density, pcf	Optimum Moisture Content, %	Classification
DH-29	0.0	Af	●	126	10	SANDY CLAY (CL)
DH-34	0.0	Af	⊠	127.5	10	SILTY SAND (SM)
DH-35	0.0	Af	▲	129.5	9	SANDY CLAY (CL)

COMPACTION TEST DATA

Project: Dana Point Harbor, Commercial Component

Project No. 17-206-02

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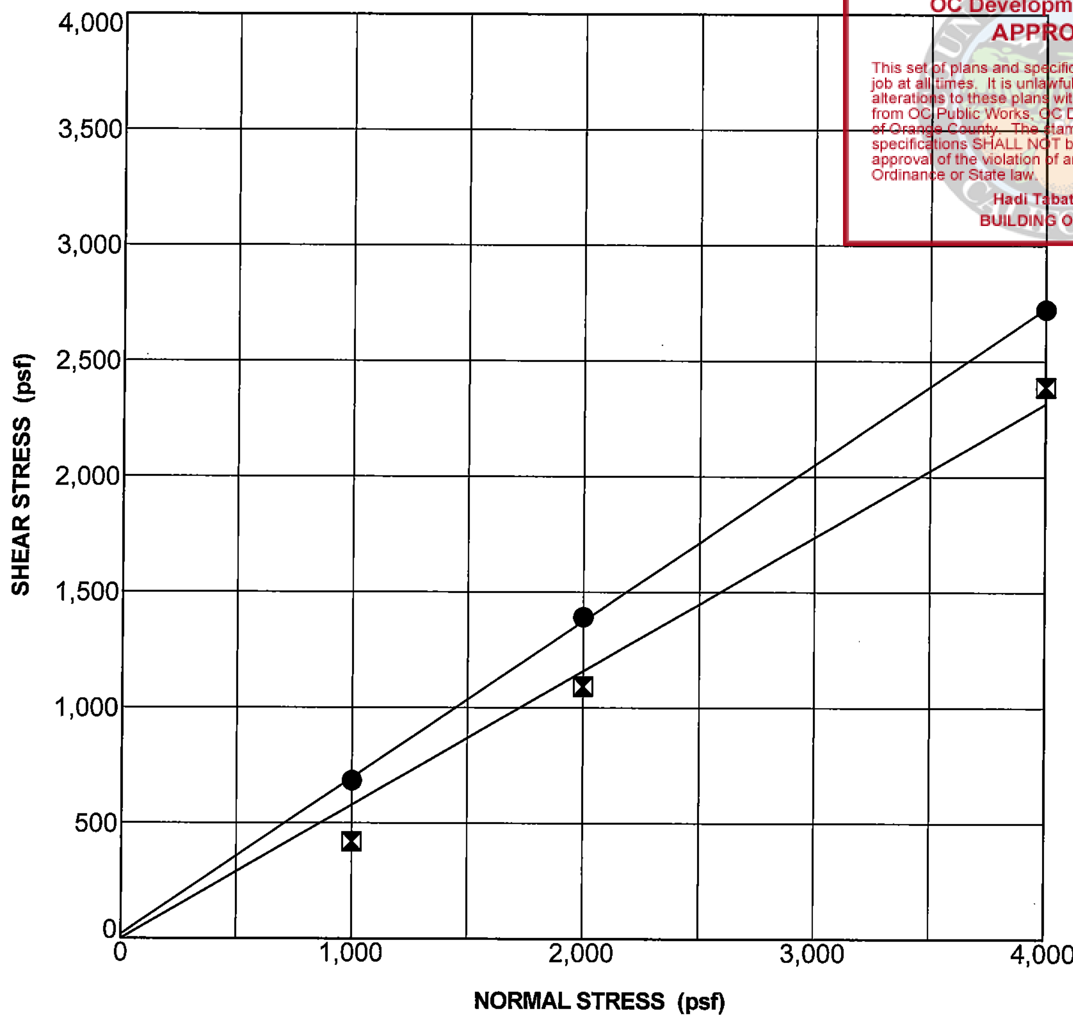
DVTCOMP 17-206-02 (UPDATED ELEV.).GPJ 11/26/19



SAMPLE AND TEST DESCRIPTION
Sample Location: DH-21 @ 5.0 ft **Geologic Unit:** Af **Classification:** CLAYEY SAND (SC)
Strain Rate (in/min): 0.005 **Sample Preparation:** Undisturbed
Notes: Sample saturated prior and during shearing

STRENGTH PARAMETERS		
STRENGTH TYPE	COHESION (psf)	FRICTION ANGLE (degrees)
● Peak Strength	18	34.0
⊠ Ultimate Strength	0	30.0

SHEAR TEST DATA

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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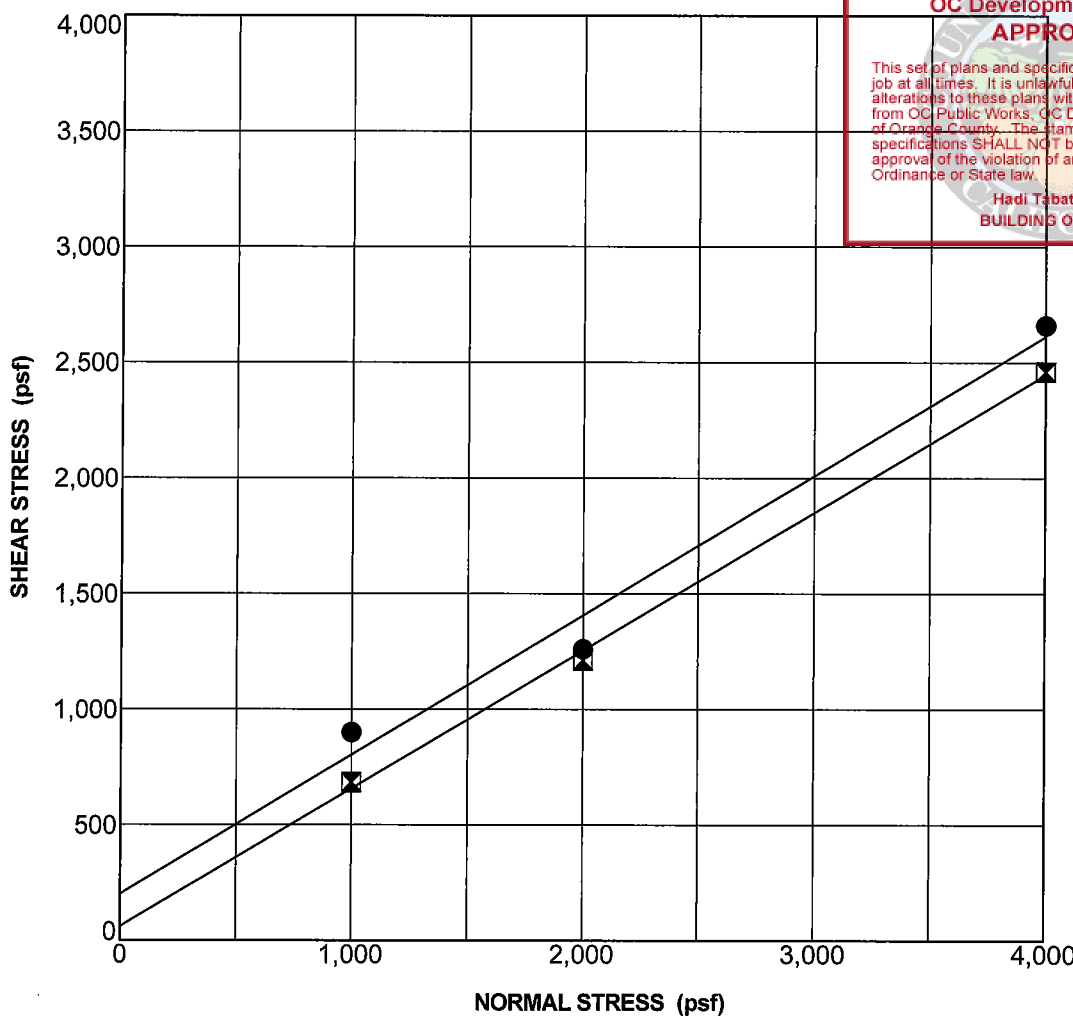

SAMPLE AND TEST DESCRIPTION		
Sample Location: DH-29 @ 0.0 ft	**Geologic Unit:** Af	**Classification:** SANDY CLAY (CL)
Strain Rate (in/min): 0.005	**Sample Preparation:** Remolded	
Notes: 90% Compaction at optimum		

STRENGTH PARAMETERS		
STRENGTH TYPE	**COHESION (psf)**	**FRICTION ANGLE (degrees)**
● Peak Strength	200	31.0
⊠ Ultimate Strength	60	30.8

SHEAR TEST DATA

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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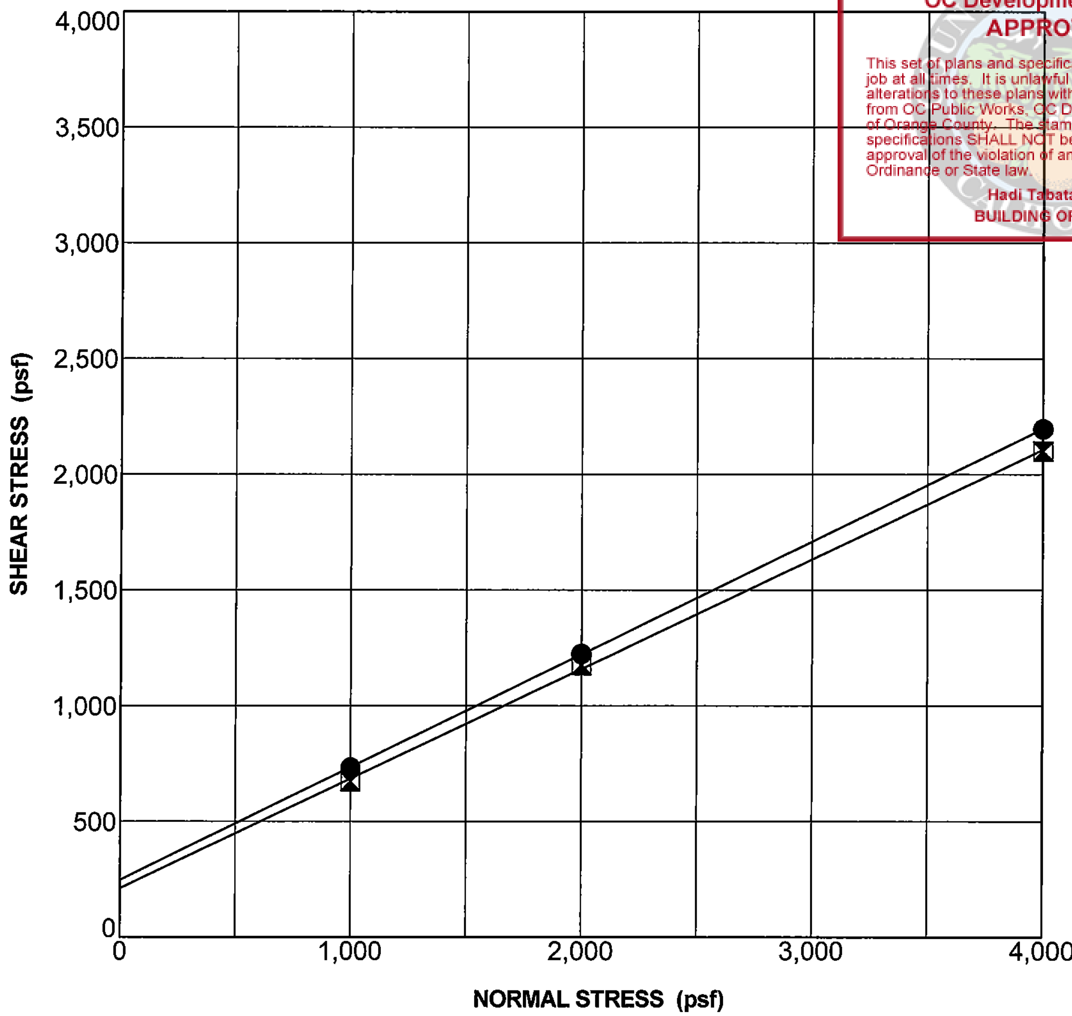
GMU_DIRECT_SHEAR 17-206-02 (UPDATED ELEV.).GPJ GM&U.GDT 11/25/19



SAMPLE AND TEST DESCRIPTION
Sample Location: DH-34 @ 0.0 ft **Geologic Unit:** Af **Classification:** SILTY SAND (SM)
Strain Rate (in/min): 0.005 **Sample Preparation:** Remolded
Notes: 90% Compaction at optimum

STRENGTH PARAMETERS

STRENGTH TYPE	COHESION (psf)	FRICTION ANGLE (degrees)
● Peak Strength	246	26.0
⊠ Ultimate Strength	210	25.0

SHEAR TEST DATA

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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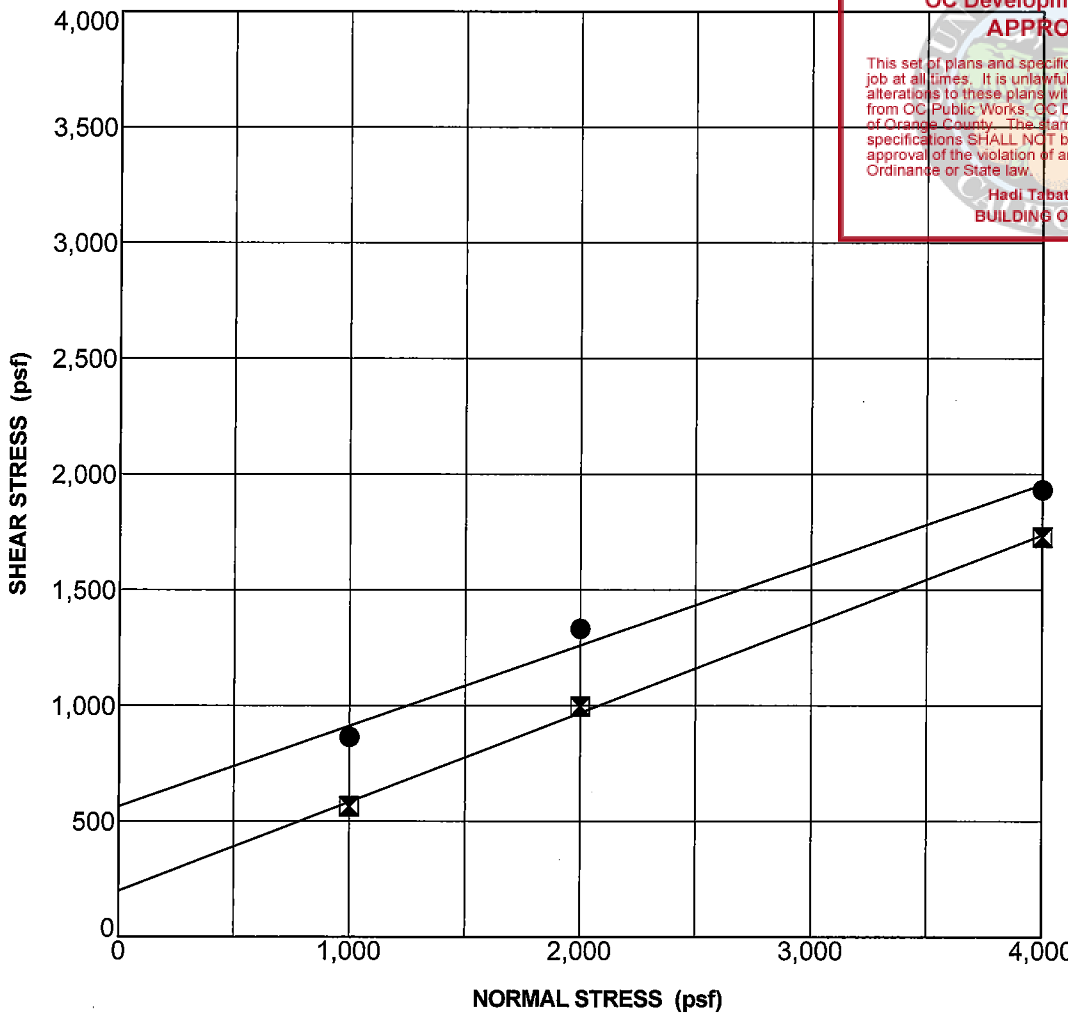

SAMPLE AND TEST DESCRIPTION
Sample Location: DH-35 @ 5.0 ft **Geologic Unit:** Af **Classification:** SANDY CLAY (CL)
Strain Rate (in/min): 0.005 **Sample Preparation:** Undisturbed
Notes: Sample saturated prior and during shearing

STRENGTH PARAMETERS		
STRENGTH TYPE	COHESION (psf)	FRICTION ANGLE (degrees)
● Peak Strength	564	19.0
⊠ Ultimate Strength	198	21.0

SHEAR TEST DATA

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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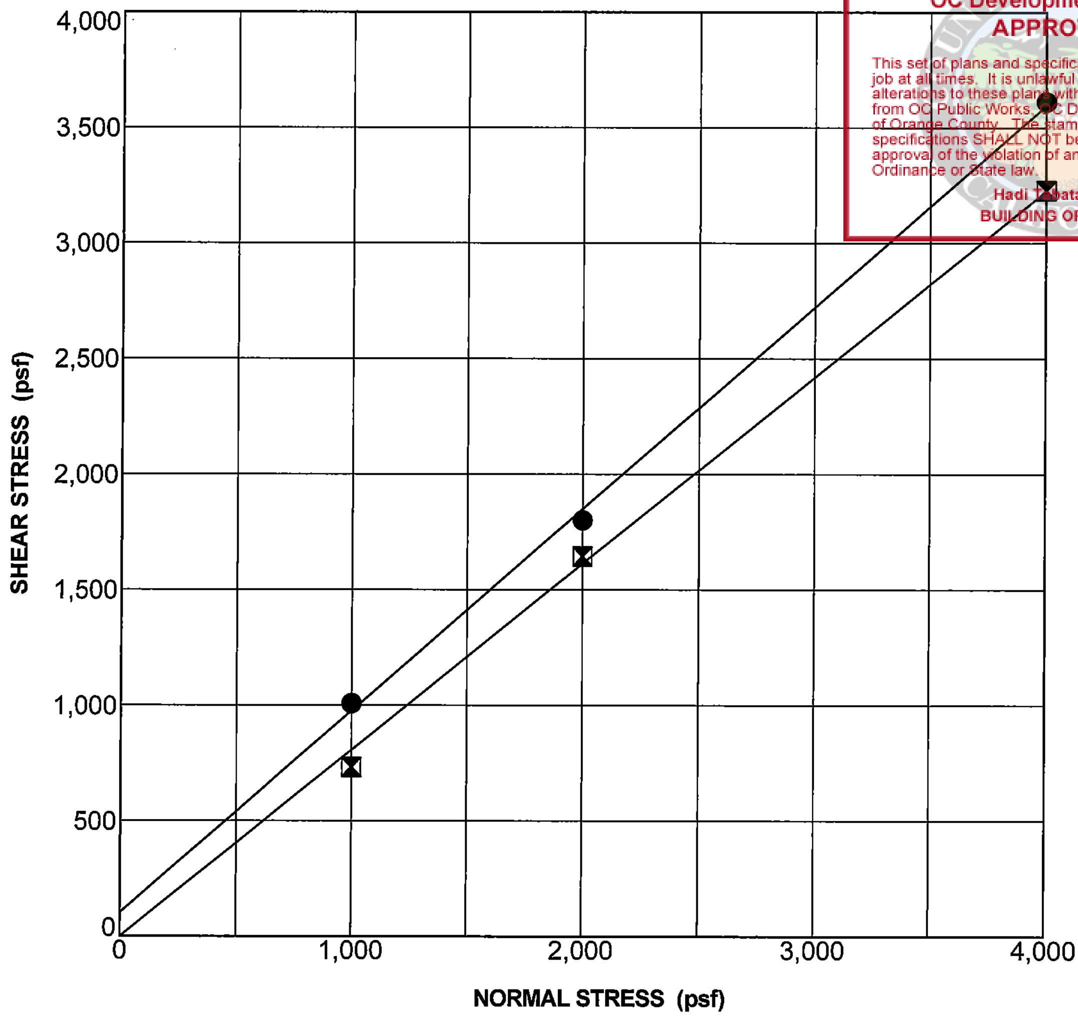
GMU_DIRECT_SHEAR 17-206-02 (UPDATED ELEV.).GPJ GM&U.GDT 11/25/19



SAMPLE AND TEST DESCRIPTION
Sample Location: DH-46 @ 5.0 ft **Geologic Unit:** Af **Classification:** SILTY SAND (SM)
Strain Rate (in/min): 0.005 **Sample Preparation:** Undisturbed
Notes: Sample saturated prior and during shearing

STRENGTH PARAMETERS		
STRENGTH TYPE	**COHESION (psf)**	**FRICTION ANGLE (degrees)**
● Peak Strength	102	41.0
☒ Ultimate Strength	0	39.0

SHEAR TEST DATA

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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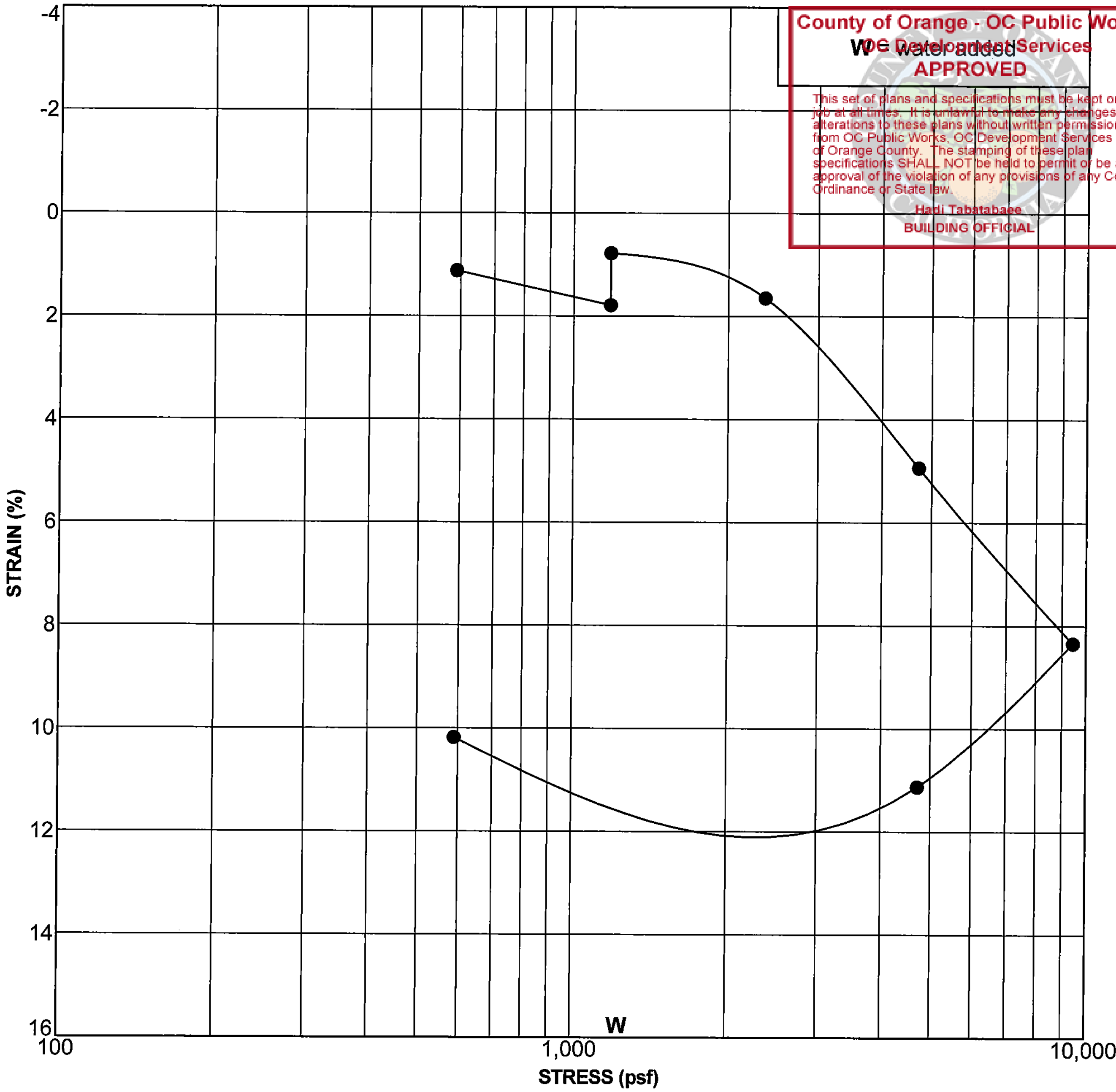

Boring Number	Depth (feet)	Geologic Unit	Symbol	In Situ or Remolded Sample	% Hydro-Collapse	Classification
DH-25	10.0	Af	●	In Situ	-1.01	SANDY FAT CLAY (CH)

GMU_CONSOL 17-206-02 (UPDATED ELEV.).GPJ GM&U.GDT 11/25/19

CONSOLIDATION TEST DATA

Project: Dana Point Harbor, Commercial Component
Project No. 17-206-02

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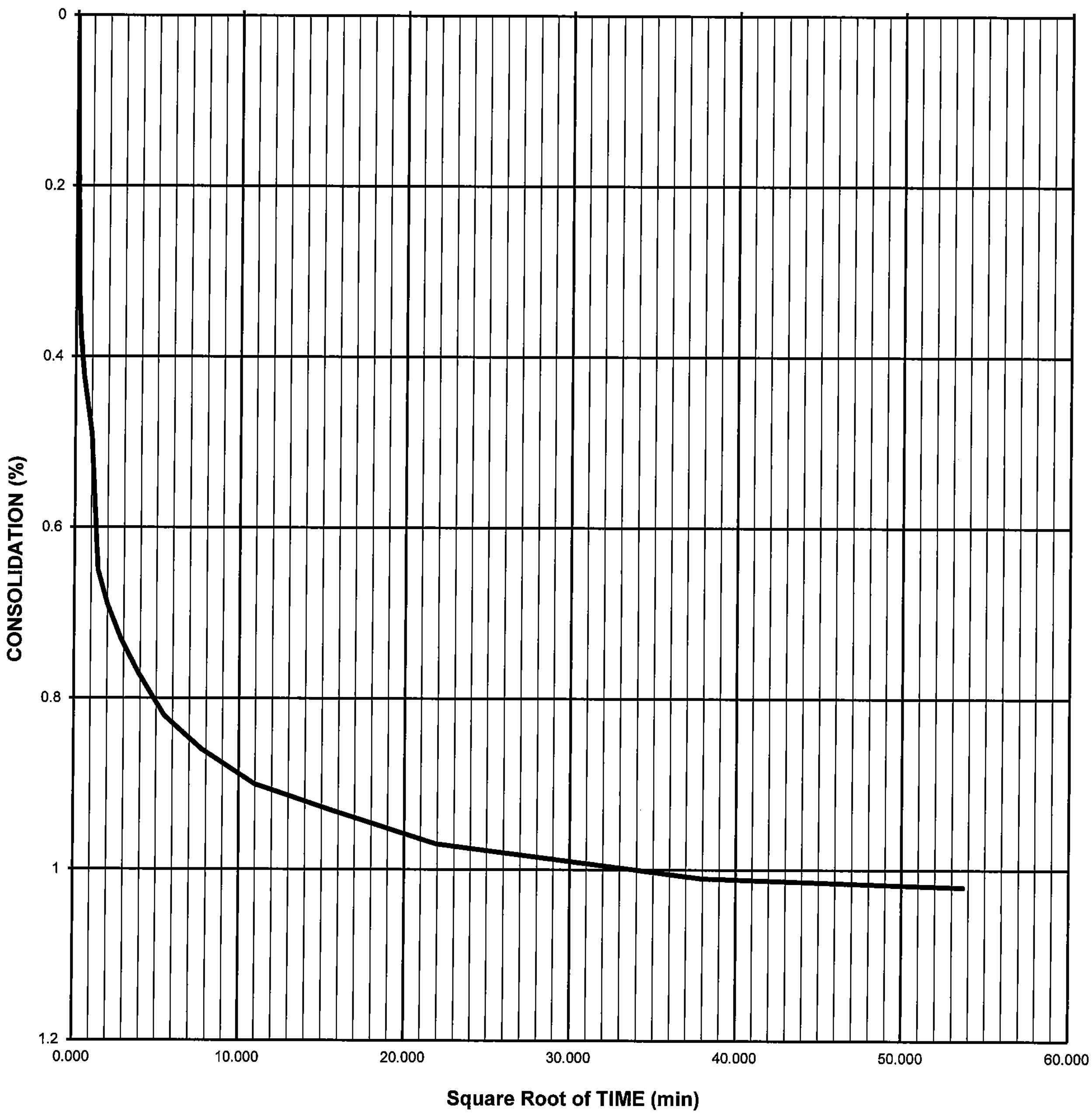
TIME RATE CONSOLIDATION RESULTS

PROJECT NAME:	Dana Point Harbor	PROJECT NUMBER:	17-206-02
SAMPLE LOCATION:	DH-25	SAMPLE DEPTH	10
SAMPLE DESCRIPTION:	Sandy Clay with Gravel (CL)	LOAD (PSF)	2380



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
APPROVED

This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.

Hadi Tabatabaee
BUILDING OFFICIAL

GMU Project 17-206-03

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TABLE B-1
SUMMARY OF SOIL LABORATORY DATA

Sample Information			Geologic Unit	USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	In Situ Saturation, %	Sieve/Hydrometer				Atterberg Limits			Compaction		Expansion Index	R-Value	Chemical Test Results			
Boring Number	Depth, feet	Elevation, feet						Gravel, %	Sand, %	<#200, %	<2μ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %			pH	Sulfate (ppm)	Chloride (ppm)	Min. Resistivity (ohm/cm)
DH-31	5	5.0	Af	CL	22.0	104	98															
DH-33	5	11.6	Af	SM	10.1	117	64															
DH-33	10	6.6	Af	CL	18.9	106	89															
DH-33	15	1.6	Tc	CL	28.6	93	98															
DH-33	25	-8.4	Tc	CL	29.9	92	100															
DH-49	0	11.0	Qaf	SC													32					
DH-49	2	9.0	Qaf	ML/SP	17.3	102	74															
DH-49	5	6.0	Qaf	SM	14.2	114	82															
DH-49	10	1.0	Qaf	SM	14.2	111	77					27	21	6								
DH-49	15	-4.0	Tc	ML	20.8	107	101															
DH-49	20	-9.0	Tc	ML	23.3																	
DH-49	25	-14.0	Tc	SC	21.3	105	98															

Project: Dana Point Harbor Partners, LLC Dry Stack Storage
Project No. 17-206-03

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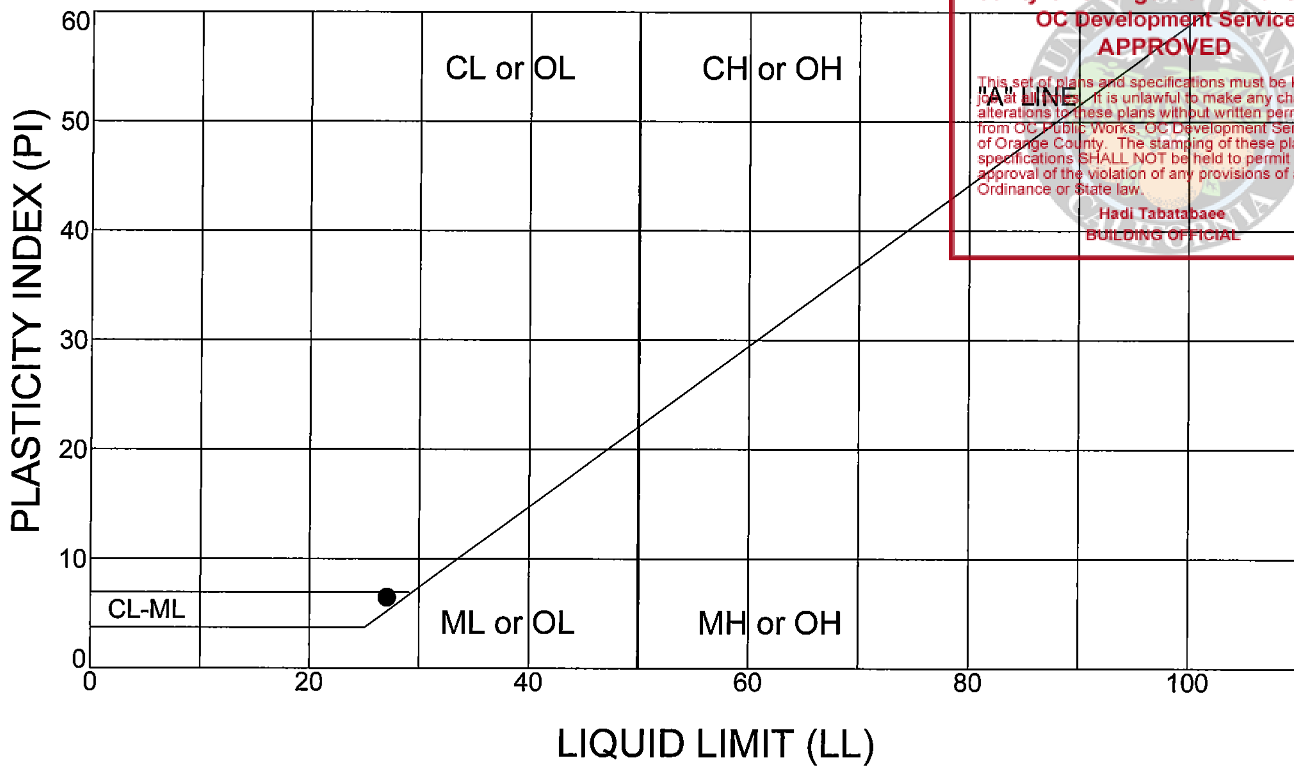


Boring Number	Depth (feet)	Geologic Unit	Test Symbol	Insitu Water Content (%)	LL	PL	PI	Classification
DH-49	10.0	Qaf	●	14	27	21	6	SILTY, CLAYEY SAND (SC-SM)

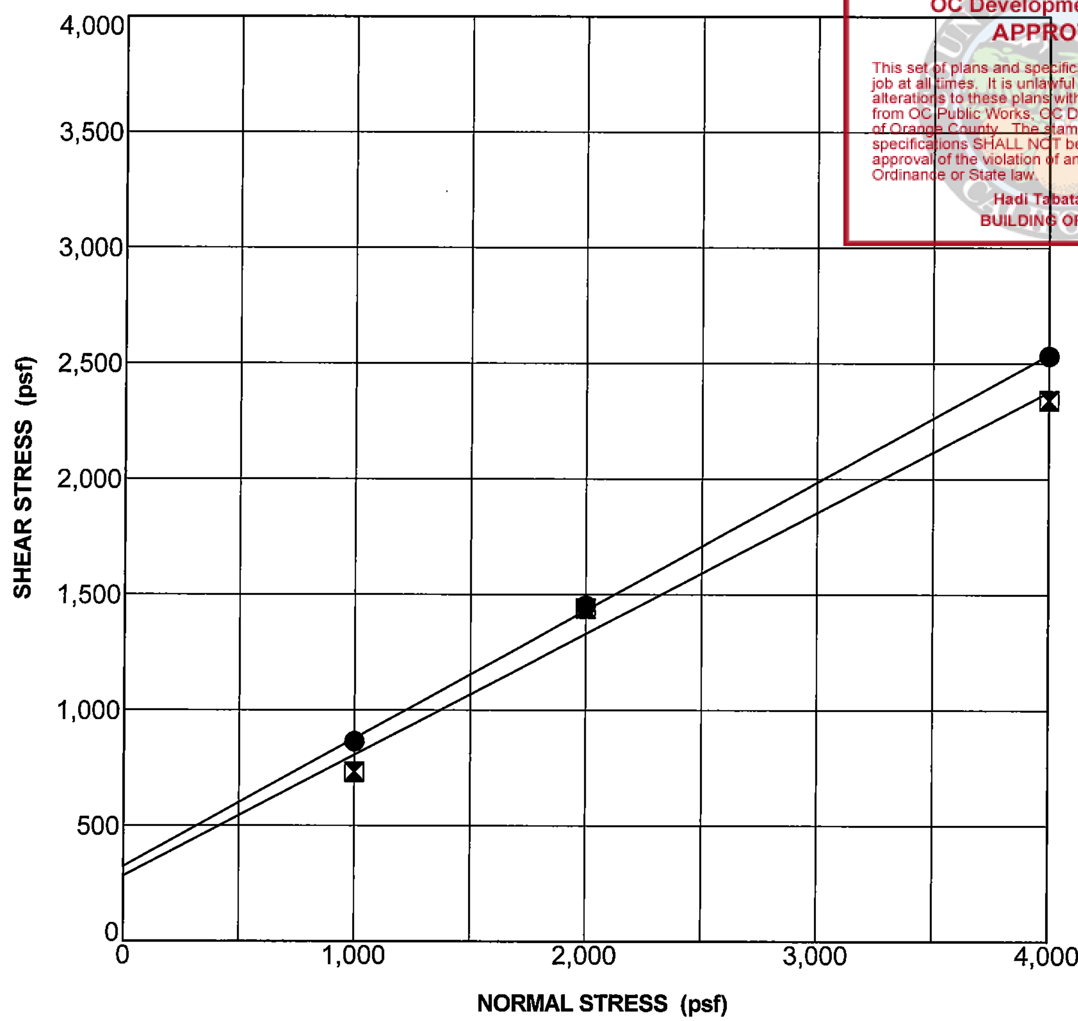
LIMITS 17-206-03 (UPDATED ELEV.).GPJ 11/26/19

ATTERBERG LIMITS

Project: Dana Point Harbor Partners, LLC Dry Stack Storage

Project No. 17-206-03

GMU



SAMPLE AND TEST DESCRIPTION
Sample Location: DH-33 @ 5.0 ft **Geologic Unit:** Af **Classification:** SILTY SAND (SM)
Strain Rate (in/min): 0.005 **Sample Preparation:** Undisturbed
Notes: Sample saturated prior and during shearing

STRENGTH PARAMETERS		
STRENGTH TYPE	COHESION (psf)	FRICTION ANGLE (degrees)
● Peak Strength	324	29.0
⊠ Ultimate Strength	282	28.0

SHEAR TEST DATA

Project: Dana Point Harbor Partners, LLC Dry Stack Storage
Project No. 17-206-03

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GMU_DIRECT_SHEAR 17-206-03 (UPDATED ELEV.).GPJ GM&U.GDT 11/26/19

GMU Project 11-161-00

GMU

TABLE B-1
SUMMARY OF SOIL LABORATORY DATA

Sample Information			Geologic Unit	USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	In Situ Satur-ation, %	Sieve/Hydrometer				Atterberg Limits			Compaction		Expansion Index	R-Value	Chemical Test Results			
Boring Number	Depth, feet	Elevation, feet						Gravel, %	Sand, %	<#200, %	<2μ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %			pH	Sulfate (ppm)	Chloride (ppm)	Min. Resistivity (ohm/cm)
C-3	1.5	20.8	Qaf	CL-ML											115.5	13.5	84	12				
DH- 1	0	17.3		SC-CL													55					
DH- 1	2	15.3		SC	14.3	112	80															
DH- 1	4	13.3	Qaf	SC	15.9	115	96															
DH- 1	9	8.3	Qaf	CL	21.2			2	46	52	24	41	23	18								
DH- 1	14	3.3		SP	16.2	107	78															
DH- 1	24	-6.7		SP	22.2	107	108															
DH- 2	2	13.3		SC	14.6	115	87															
DH- 2	4	11.3		CL	19.6	106	93															
DH- 2	9	6.3		GC	7.6	128	69															
DH- 6	2	11.8		SC/SP	9.3	102	40															
DH- 6	4	9.8	Qaf	ML	20.4	101	86															
DH- 6	9	4.8	Qaf	CL-SC	13.2	114	77															
DH- 6	14	-0.2	Qaf	CL	26.4			6	41	53	25	38	21	17								
DH- 6	19	-5.2		SP	22.6	103	99															
DH- 6	29	-15.2	Tc	SP/CL	16.6	118	111															
DH- 6	39	-25.2		SC	19.7	113	112															
DH- 6	49	-35.2		SP	20.3	112	114															
DH-10	2	10.3		SM/SC	12.5	107	61															
DH-10	4	8.3		SP-SM	13.5	114	80															
DH-12	2	11.3		SC	14.3	109	73															
DH-12	4	9.3	Qaf	SM/CL	16.8	105	78	12	62	26	8	39	21	18								
DH-12	9	4.3	Qaf	SC	16.6			9	46	45	22	33	20	13								
DH-12	14	-0.7		GC	12.7																	
DH-12	24	-10.7	Tc	SP-SM/SC	18.6	108	93															

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

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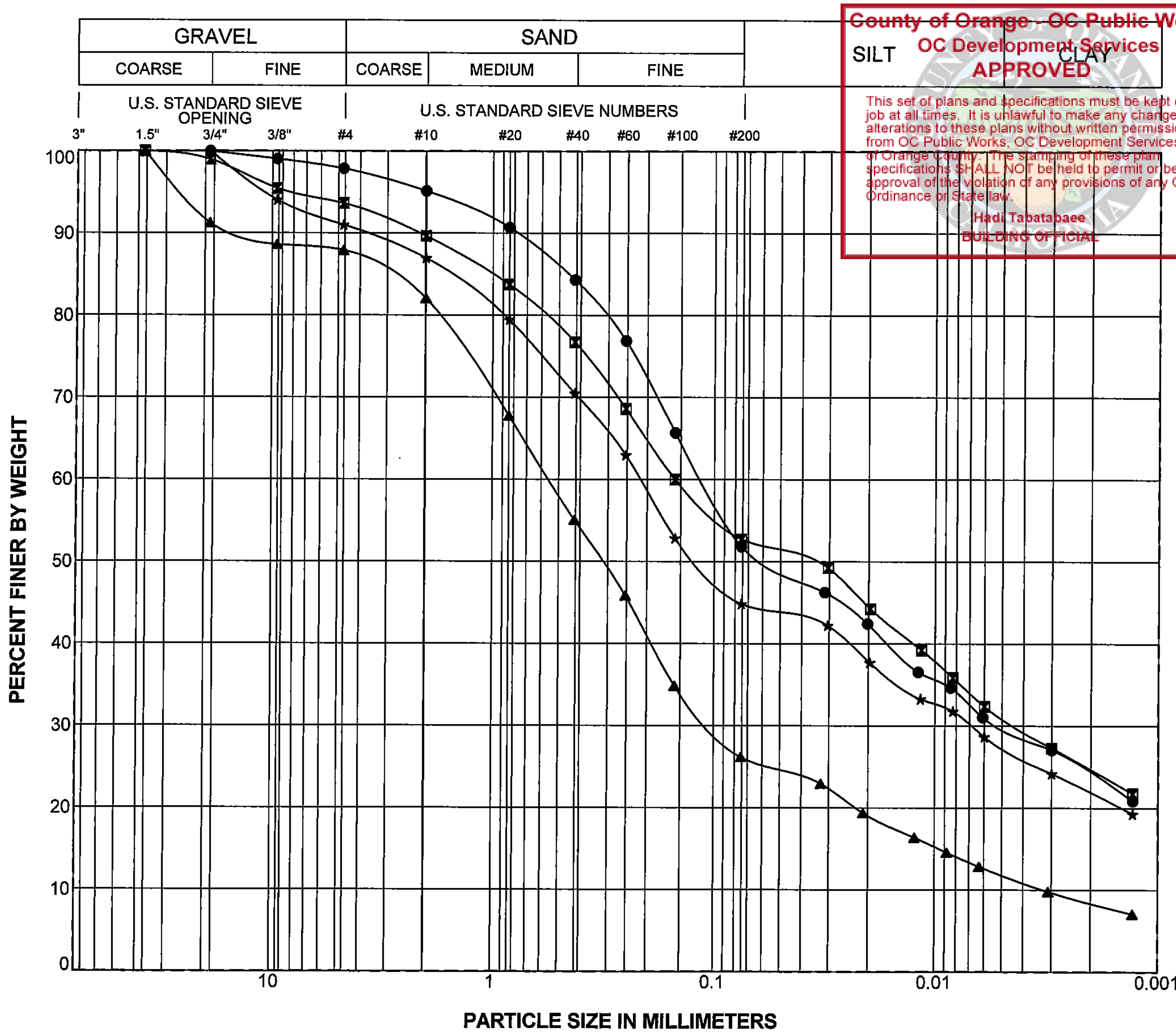
TABLE B-1
SUMMARY OF SOIL LABORATORY DATA

Sample Information			Geologic Unit	USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	In Situ Saturation, %	Sieve/Hydrometer				Atterberg Limits			Compaction		Expansion Index	R-Value	Chemical Test Results			
Boring Number	Depth, feet	Elevation, feet						Gravel, %	Sand, %	<#200, %	<2μ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %			pH	Sulfate (ppm)	Chloride (ppm)	Min. Resistivity (ohm/cm)
DH-12	44	-30.7		SP-SM/ML	14.4	122	108															
DH-17	4	7.3	Qaf	SP-SM	10.8	113	63															
DH-17	14	-2.7		GM	11.3	128	103															
DH-17	24	-12.7		SP-SM	16.6																	
DH-17	35	-23.7		SC	13.2	127	114															
DH-17	44	-32.7		SP-SM	15.6	116	97															
DH-18	0	11.3	Qaf	SC											127.5	10.0	19		8.3	635	264	820
DH-18	2	9.3		SM/CL	11.8	112	65															
DH-18	4	7.3		CL-CH	15.1	101	62															
DH-18	9	2.3		CL	11.3	121	82															
DH-19	4	6.3		SP-SM	12.9	112	72															
DH-19	9	1.3	Qaf	CL/SP-SM	25.5	95	91															
DH-19	19	-8.7		SP-SM	15.3	116	94															
DH-19	29	-18.7		SP-SM	21.0	108	104															
DH-19	39	-28.7		SP	14.8	122	111															
DH-19	49	-38.7		SP	17.8	117	115															

GMU_TABLE_SOIL_LAB_DATA 11-161-00 (UPDATED ELEV.).GPJ FNC AB GWGN01.GDT 11/26/19

GMU

Project: Dana Point Harbor Revitalization
Project No. 11-161-00



Boring Number	Depth (feet)	Geologic Unit	Symbol	LL	PI	Classification
DH- 1	9.0	Qaf	●	41	18	Sandy Lean Clay (CL)
DH- 6	14.0	Qaf	⧗	38	17	Sandy Lean Clay (CL)
DH-12	4.0	Qaf	▲	39	18	Silty Sand and Silty Clay (SM/CL)
DH-12	9.0	Qaf	★	33	13	Clayey Sand (SC)

GMU_GRAIN_SIZE 11-161-00 (UPDATED ELEV.).GPJ 11/26/19

PARTICLE SIZE DISTRIBUTION

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

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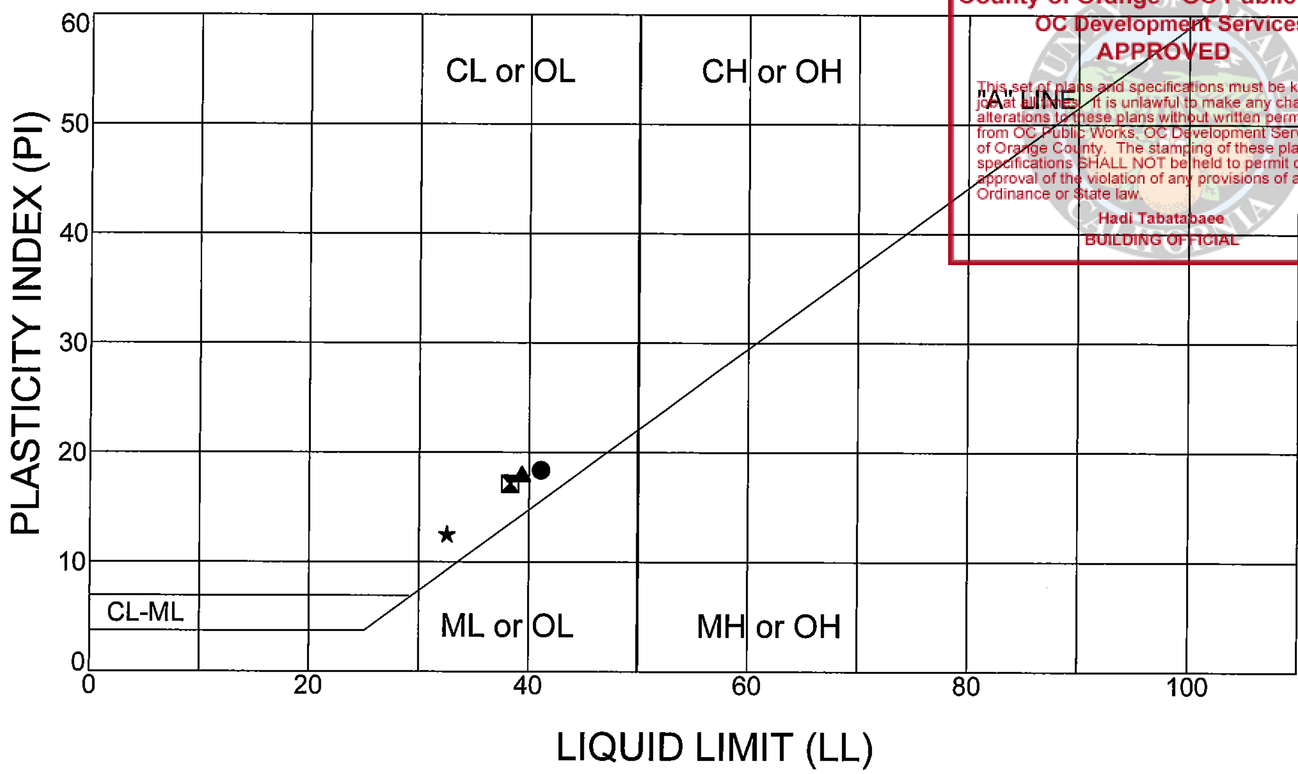


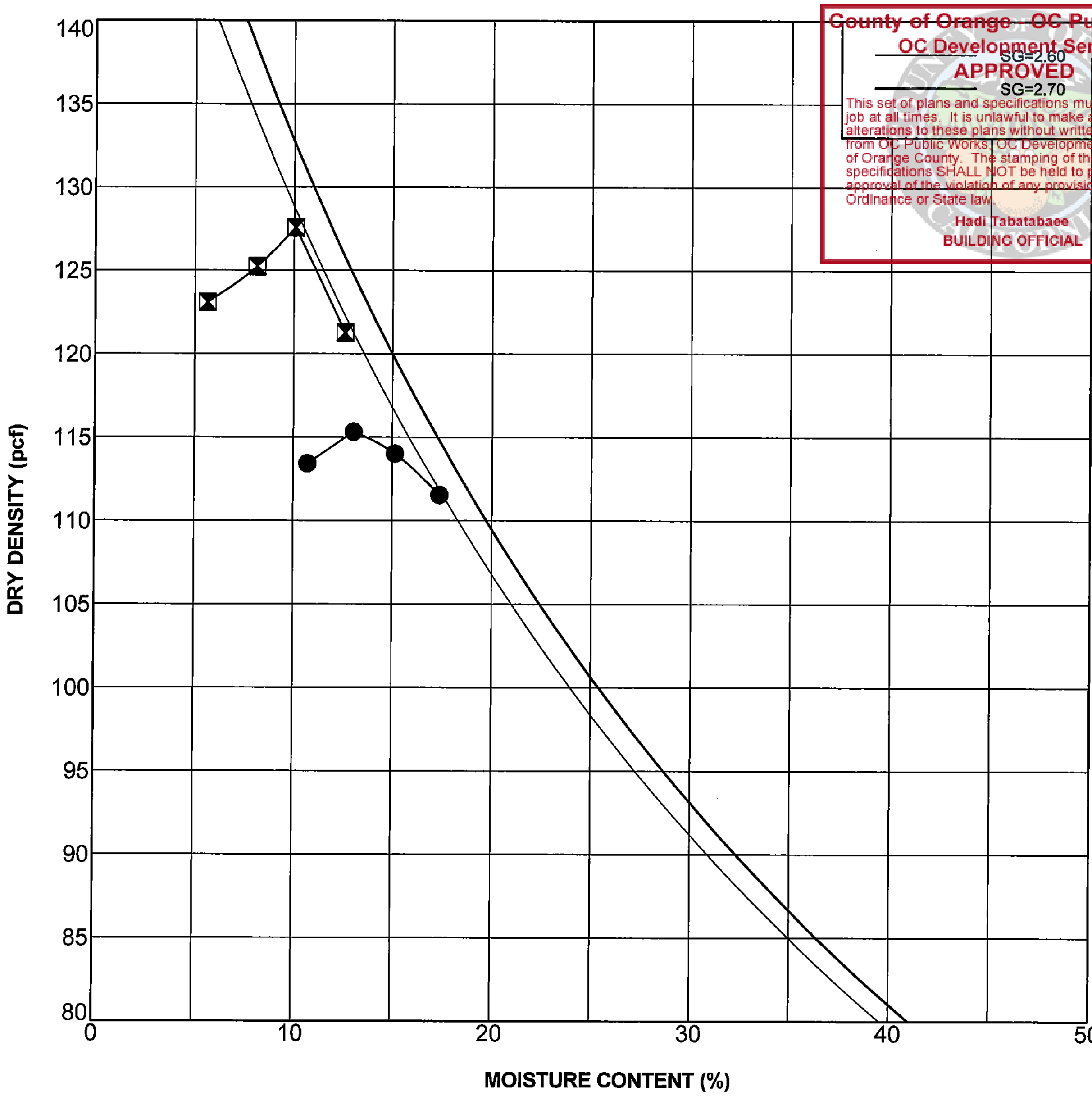
Boring Number	Depth (feet)	Geologic Unit	Test Symbol	Insitu Water Content (%)	LL	PL	PI	Classification
DH- 1	9.0	Qaf	●	21	41	23	18	Sandy Lean Clay (CL)
DH- 6	14.0	Qaf	⊠	26	38	21	17	Sandy Lean Clay (CL)
DH-12	4.0	Qaf	▲	17	39	21	18	Silty Sand and Silty Clay (SM/CL)
DH-12	9.0	Qaf	★	17	33	20	13	Clayey Sand (SC)

LIMITS 11-161-00 (UPDATED ELEV.).GPJ 11/26/19

ATTERBERG LIMITS

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

GMU



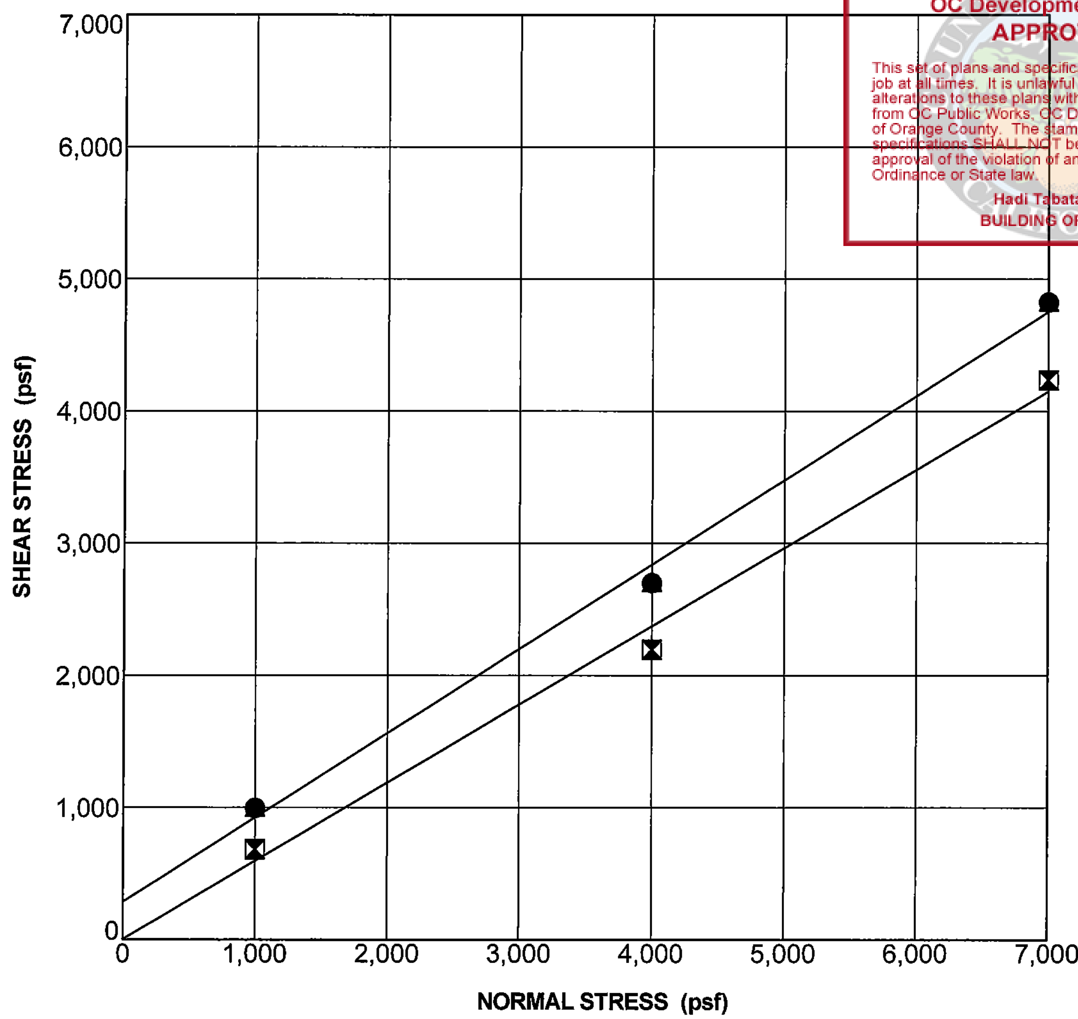
Boring Number	Depth (feet)	Geologic Unit	Symbol	Maximum Dry Density, pcf	Optimum Moisture Content, %	Classification
C-3	1.5	Qaf	●	115.5	13.5	Sandy Silty Clay (CL-ML)
DH-18	0.0	Qaf	⊠	127.5	10	Clayey Sand (SC)

DVTCOMP 11-161-00 (UPDATED ELEV.).GPJ 11/26/19

COMPACTION TEST DATA

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

GMU



SAMPLE AND TEST DESCRIPTION
Sample Location: DH- 6 @ 4.0 ft **Geologic Unit:** Qaf **Classification:** Sandy Silty Clay (ML-CL)
Strain Rate (in/min): 0.005 **Sample Preparation:** Undisturbed
Notes:

STRENGTH PARAMETERS

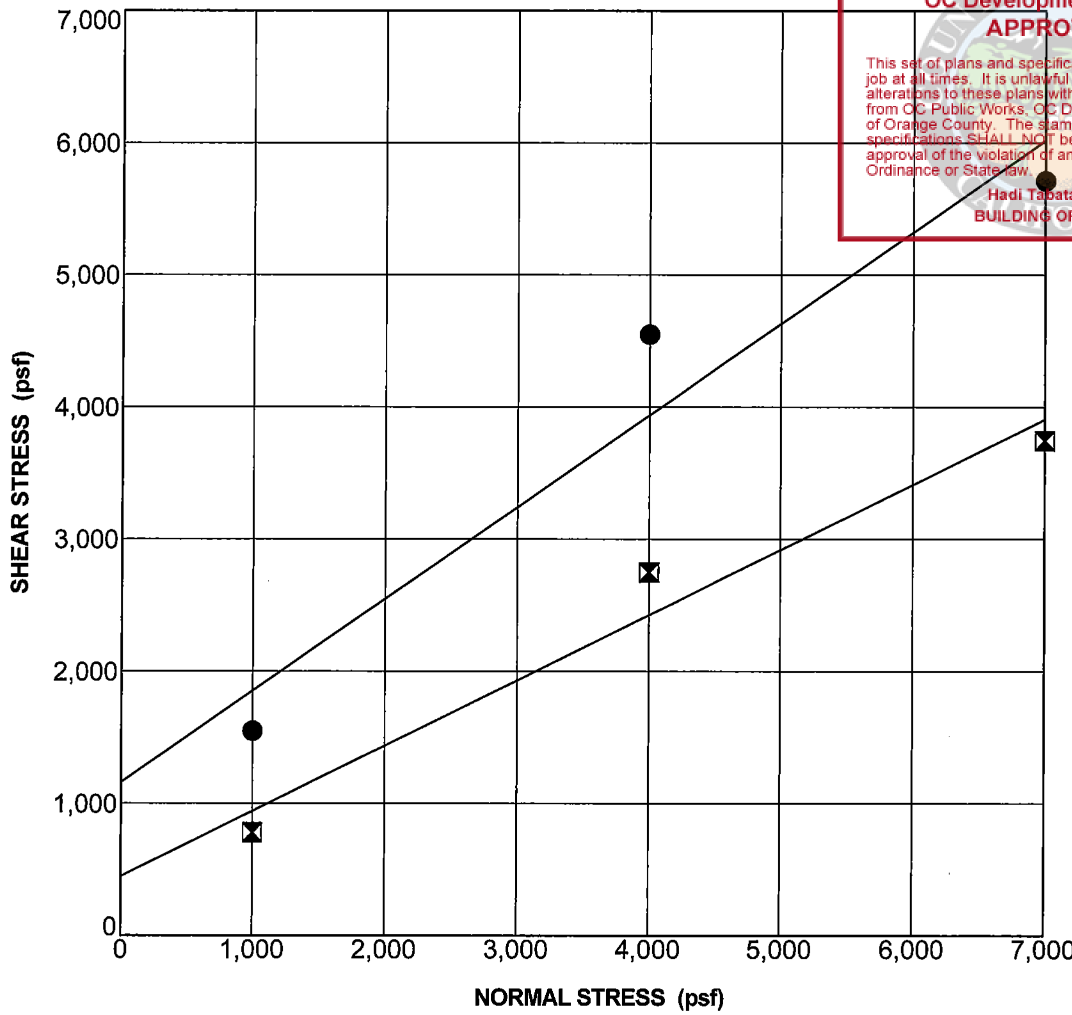
STRENGTH TYPE	COHESION (psf)	FRICTION ANGLE (degrees)
● Peak Strength	290	32.0
⊠ Ultimate Strength	100	29.0

GMU_DIRECT_SHEAR 11-161-00 (UPDATED ELEV).GPJ GM&U.GDT 11/26/19

SHEAR TEST DATA

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

GMU



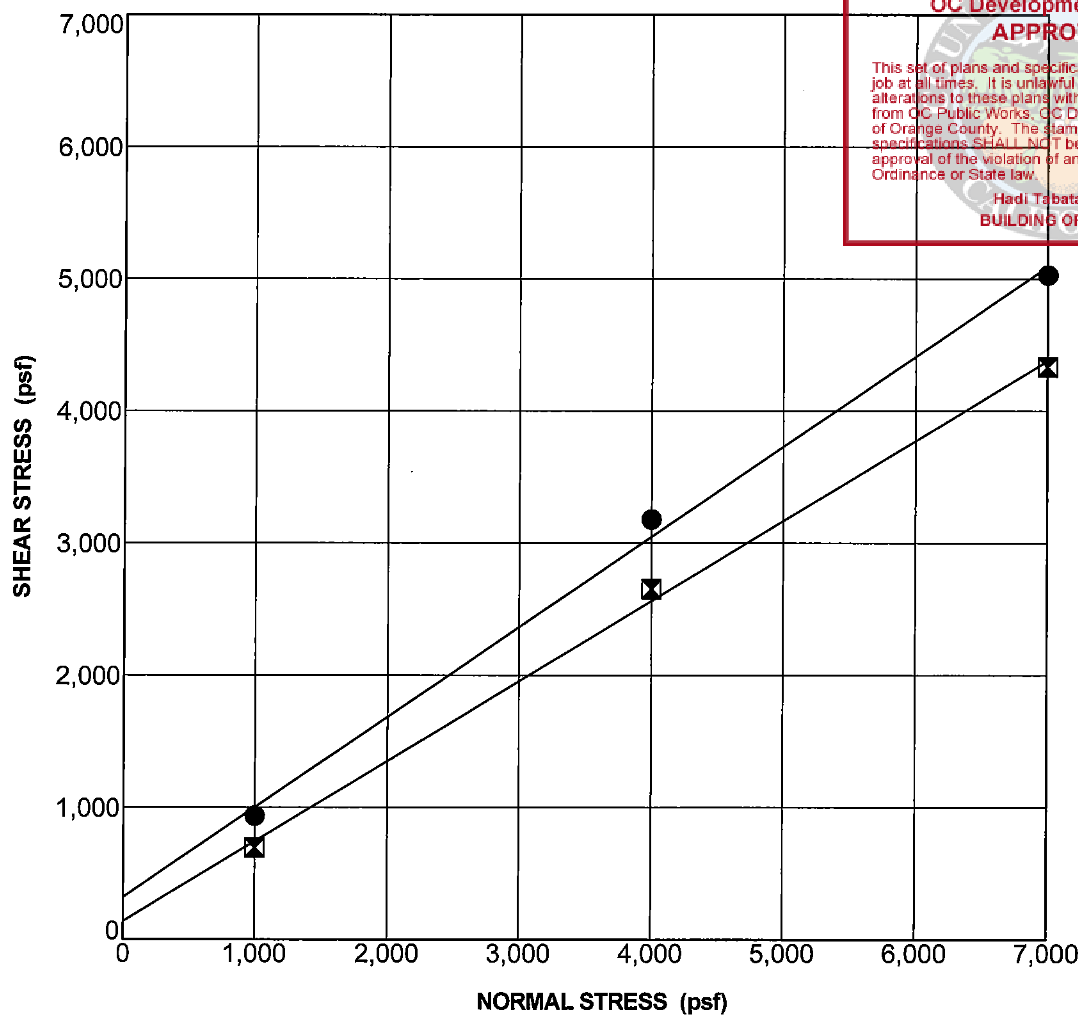
SAMPLE AND TEST DESCRIPTION
Sample Location: DH- 6 @ 29.0 ft **Geologic Unit:** Tc **Classification:** Sity Clay and Silty Sand (CL/SM-SP)
Strain Rate (in/min): 0.005 **Sample Preparation:** Undisturbed
Notes:

STRENGTH PARAMETERS		
STRENGTH TYPE	COHESION (psf)	FRICTION ANGLE (degrees)
● Peak Strength	1160	35.0
⊠ Ultimate Strength	210	29.0

SHEAR TEST DATA

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

GMU



SAMPLE AND TEST DESCRIPTION
Sample Location: DH-12 @ 24.0 ft **Geologic Unit:** Tc **Classification:** Poorly Graded Sand with some Clay (SP)
Strain Rate (in/min): 0.01 **Sample Preparation:** Undisturbed
Notes:

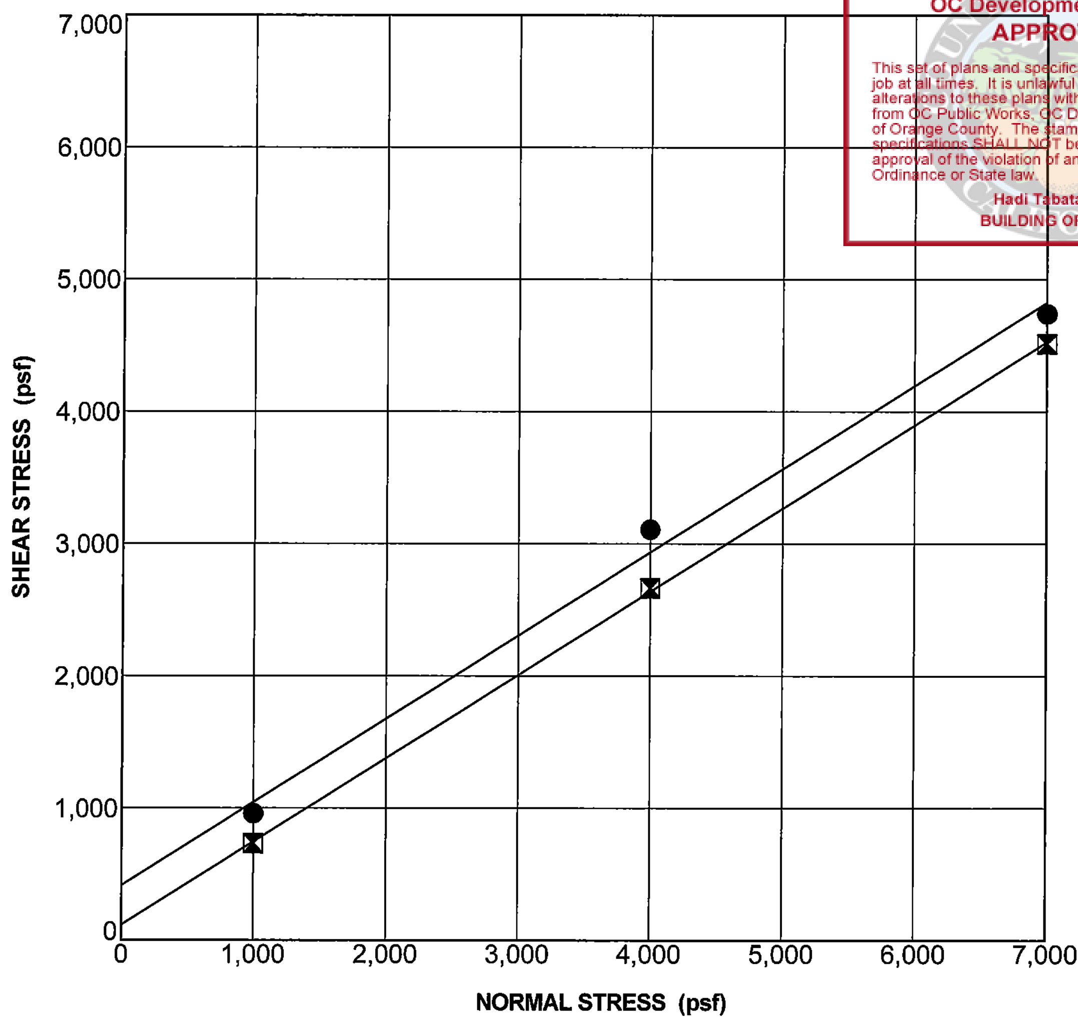
STRENGTH PARAMETERS

STRENGTH TYPE	COHESION (psf)	FRICTION ANGLE (degrees)
● Peak Strength	320	34.0
⊠ Ultimate Strength	137	31.0

SHEAR TEST DATA

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

GMU



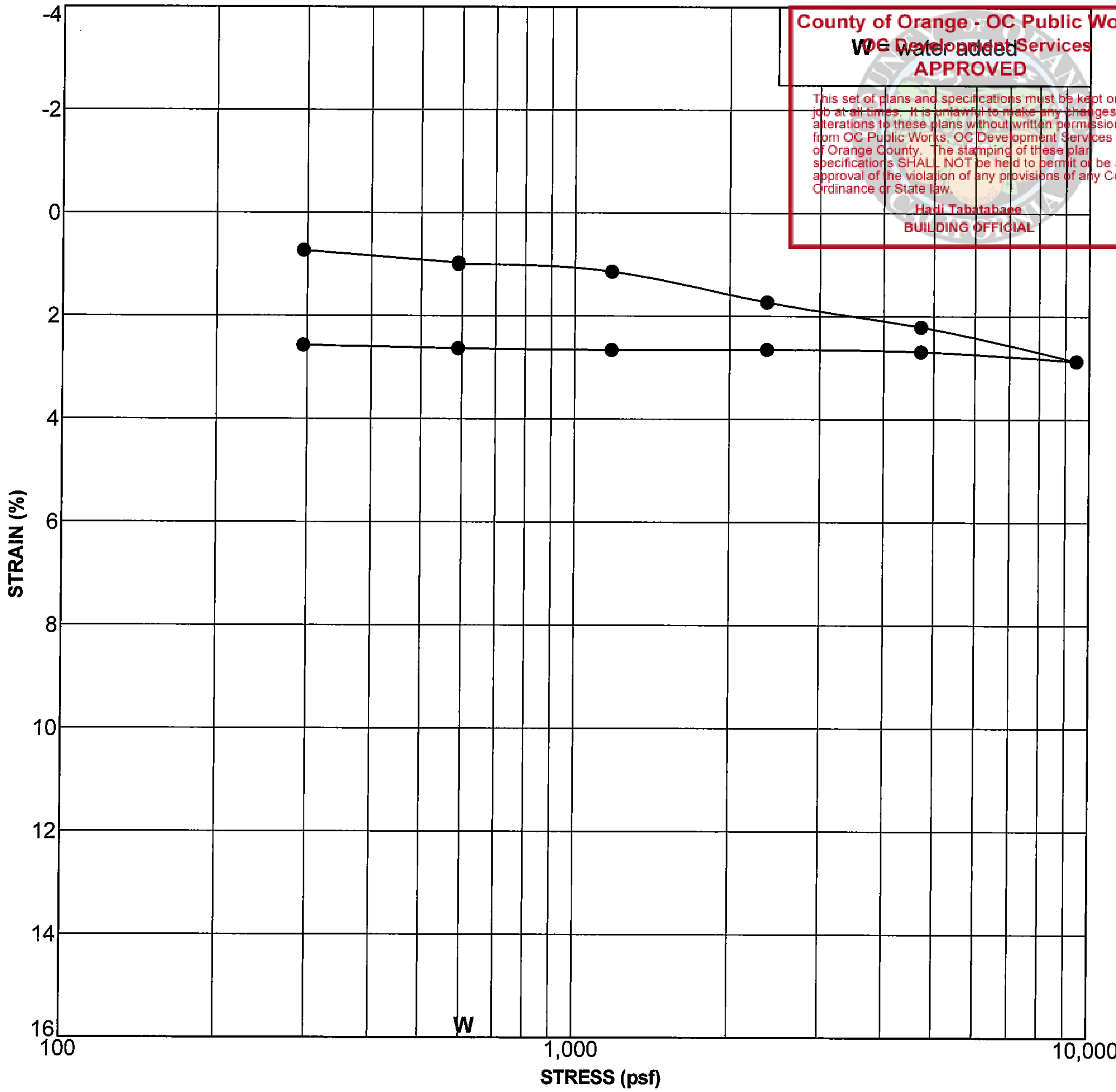
SAMPLE AND TEST DESCRIPTION
Sample Location: DH-18 @ 0.0 ft **Geologic Unit:** Qaf **Classification:** Clayey Sand (SC)
Strain Rate (in/min): 0.005 **Sample Preparation:** Remolded
Notes: 90 % Compaction at Optimum

STRENGTH PARAMETERS		
STRENGTH TYPE	COHESION (psf)	FRICTION ANGLE (degrees)
● Peak Strength	416	32.0
⊠ Ultimate Strength	116	32.0

SHEAR TEST DATA

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

GMU



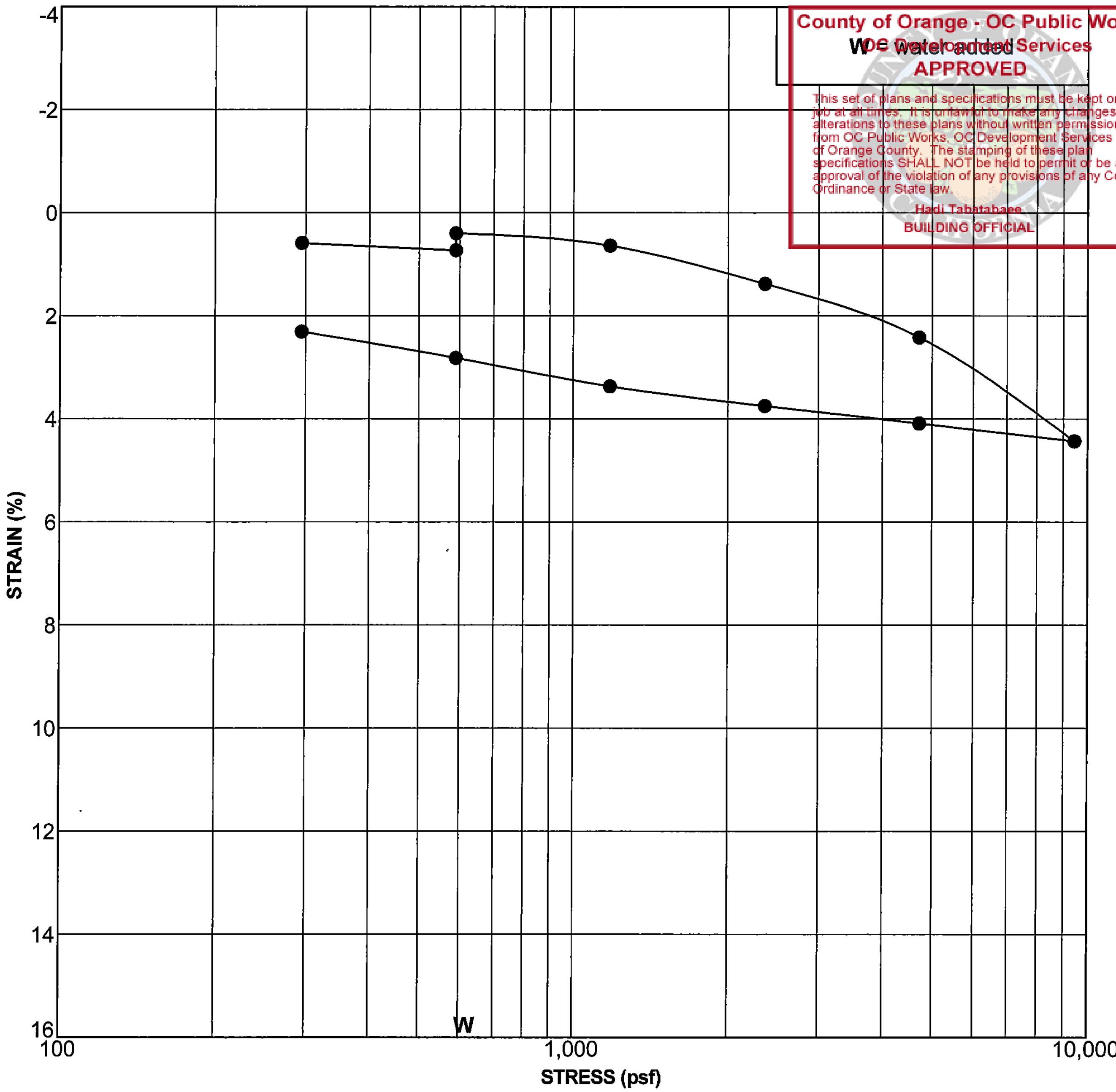
Boring Number	Depth (feet)	Geologic Unit	Symbol	In Situ or Remolded Sample	% Hydro-Collapse	Classification
DH- 1	4.0	Qaf	●	In Situ	0.03	Clayey Sand (SC)

CONSOLIDATION TEST DATA

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

GMU

GMU_CONSOL 11-161-00 (UPDATED ELEV.).GPJ GM&U.GDT 11/26/19

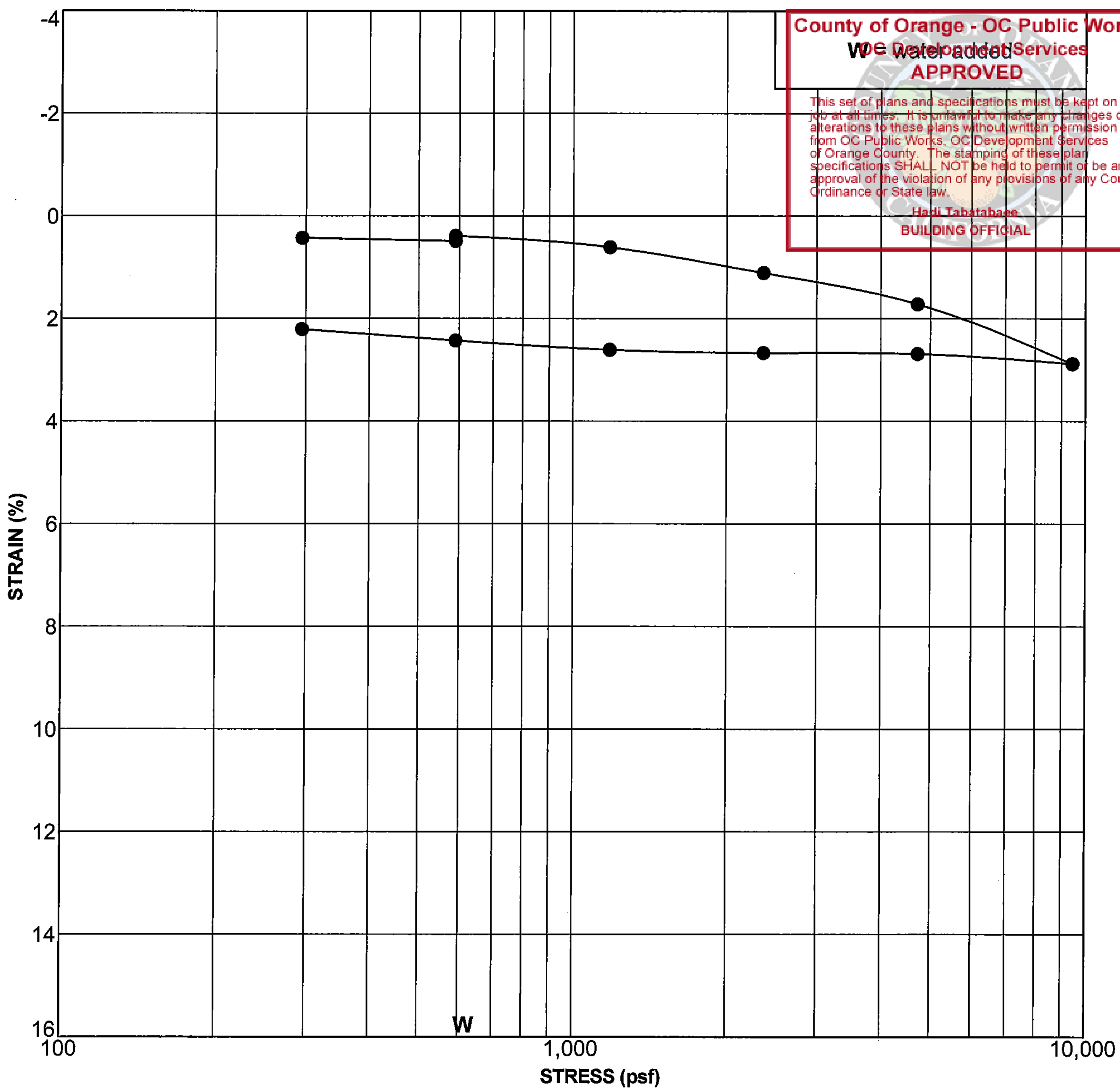


Boring Number	Depth (feet)	Geologic Unit	Symbol	In Situ or Remolded Sample	% Hydro-Collapse	Classification
DH-12	4.0	Qaf	●	In Situ	0.14	Silty Sand and Silty Clay (SM/CL)

CONSOLIDATION TEST DATA

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

GMU



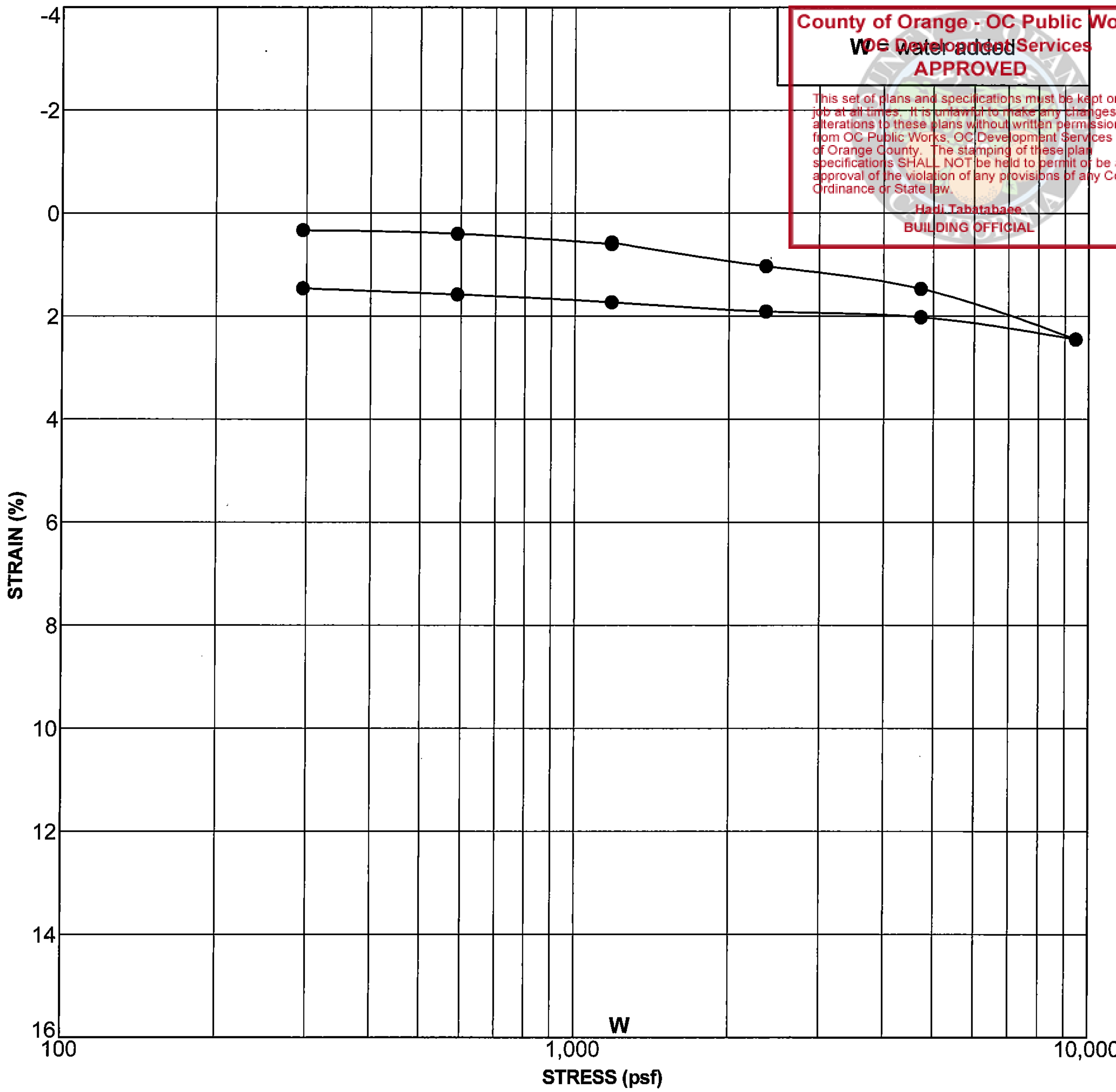
Boring Number	Depth (feet)	Geologic Unit	Symbol	In Situ or Remolded Sample	% Hydro-Collapse	Classification
DH-17	4.0	Qaf	●	In Situ	-0.1	Silty Sand and Sandy Clay (SM/SC)

GMU_CONSOL 11-161-00 (UPDATED ELEV.).GPJ GM&U.GDT 11/26/19

CONSOLIDATION TEST DATA

Project: Dana Point Harbor Revitalization
Project No. 11-161-00

GMU



Boring Number	Depth (feet)	Geologic Unit	Symbol	In Situ or Remolded Sample	% Hydro-Collapse	Classification
DH-19	9.0	Qaf	●	In Situ	-0.03	Silty Clay and Silty Sand (CL/SM)

CONSOLIDATION TEST DATA

Project: Dana Point Harbor Revitalization

Project No. 11-161-00

GMU

APPENDIX B-2

Previous Laboratory Test Results by Others

GMU

APPENDIX B - LABORATORY TESTING

Diaz•Yourman & Associates (DYA) selected soil samples to be tested and the tests to be performed on the selected samples. Laboratory testing was performed by Hushmand Associates, Inc. Laboratory data are summarized on the boring logs in Appendix A and presented on Plates B1 through B14. We have reviewed and concur with the test results and accept full responsibility for their use in our analysis. A summary of the geotechnical laboratory testing is presented in Table B1. Corrosion potential test results are summarized in Table B2.

Table B1 - LABORATORY TESTING SUMMARY

TEST NAME	PROCEDURE	PURPOSE	LOCATION
Percent Passing the No. 200 Sieve	ASTM D1140-92	Classification, index properties	Boring Logs
Moisture Content, Dry Density	ASTM D2216-92	Classification, index properties	Boring Logs
Grain-Size Distribution	ASTM D422-63	Classification, index properties	Plate B1
Atterberg Limits	ASTM D-4318-93	Expansion potential, classification, index properties	Plate B2
Direct Shear	ASTM D3080-90	Shear strength	Plates B3 and B4
Compaction	ASTM D1557-91	Earthwork	Plates B5 and B6
Resistance (R-) Value	ASTM D2844-69 CTM 301	Pavement thickness design	Plates B7 through B10
pH	CTM 532	Corrosion potential	Plates B11 through B14 and Table B2
Resistivity	CTM 532	Corrosion potential	Plates B11 through B14 and Table B2
Soluble Sulfates	CTM 417-B	Corrosion potential	Plates B11 through B14 and Table B2
Soluble Chlorides	CTM 422	Corrosion potential	Plates B11 through B14 and Table B2

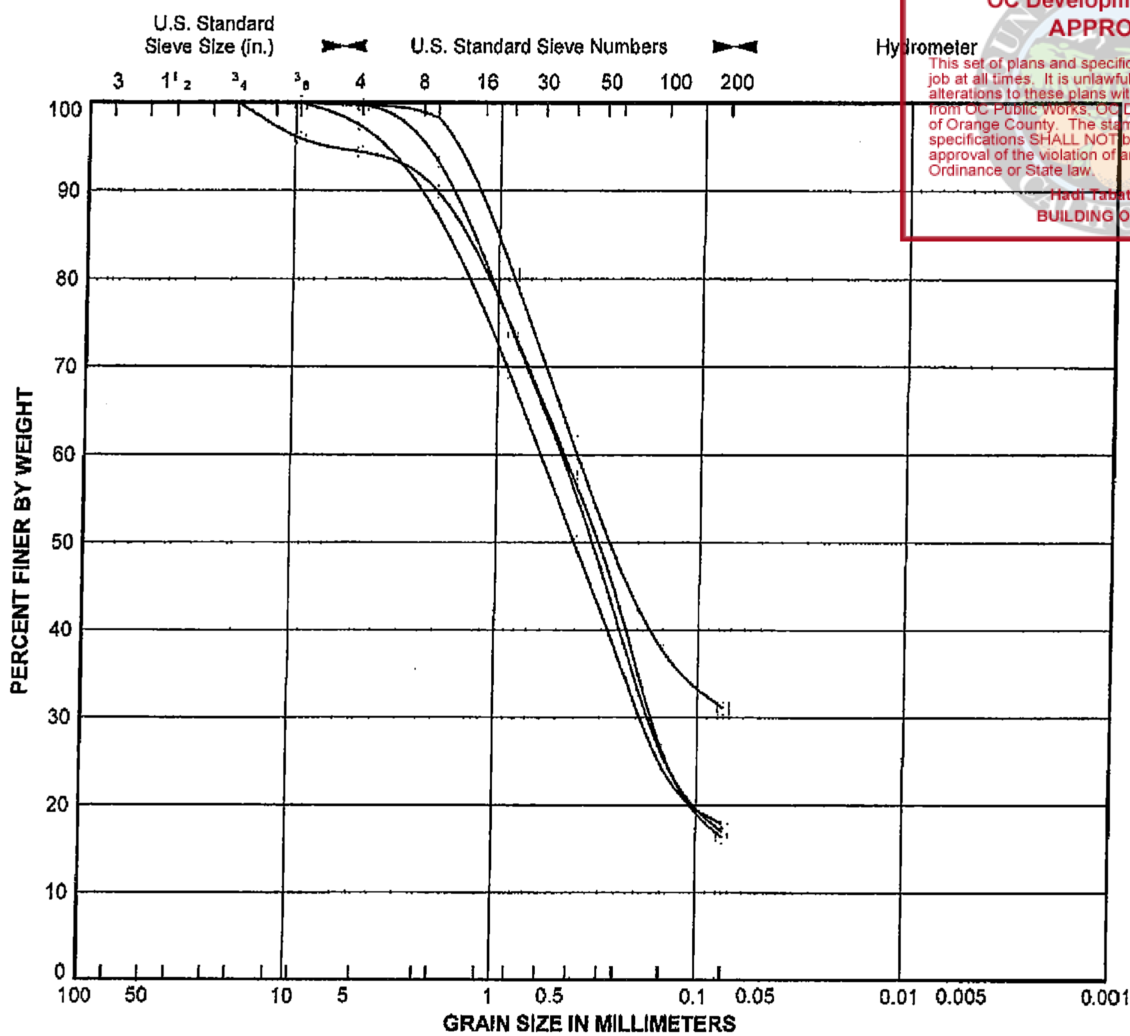
Notes:
- ASTM = American Society for Testing and Materials
- CTM = Caltrans Test Method

Table B2 - CORROSION POTENTIAL TEST RESULTS

Boring No.	B-1	B-2	B-3	B-4
Depth (feet)	5	0-5	0-5	0-5
pH	7.52	9.26	7.35	7.41
Water Soluble Sulfate Content (ppm)	291	190	250	471
Water Soluble Chloride Content (ppm)	311	1387	702	2420
Minimum Resistivity/Moisture Content (ohms-cm / %)	666/24.5	341/34	511/34	179/28.6

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

Template: DY_SIEVE_WIN



COBBLES	GRAVEL		SAND			SILT or CLAY
	Coarse	Fine	Coarse	Medium	Fine	

Laboratory Testing by: Hushmand Associates, Inc.

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
	B- 1	5.0	SILTY SAND (SM)	17	NP	NP	16
	B- 2	3.0	SILTY SAND (SM)	10			31
	B- 3	2.5	SILTY SAND (SM)		NP	NP	17
	B- 4	2.0	CLAYEY SAND (SC)	8	30	10	18

PARTICLE SIZE ANALYSIS

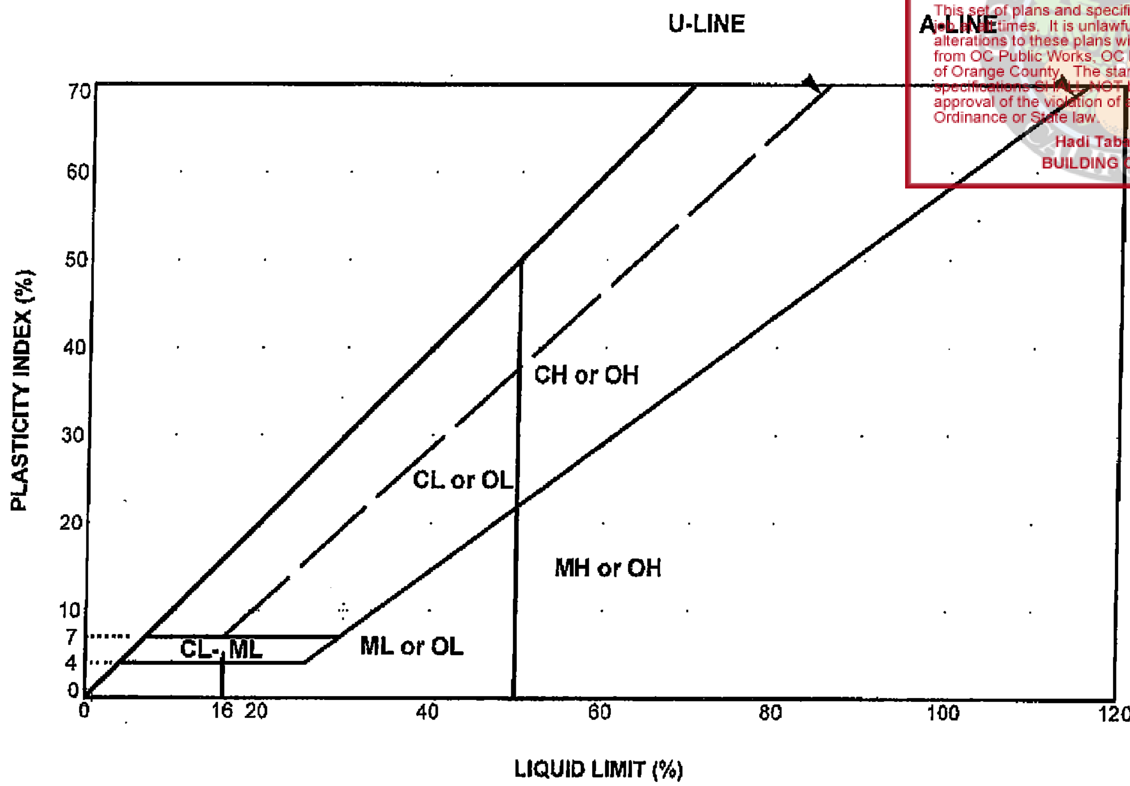
Dana Point Boat Launch

Project No. 2005-022

PLATE

B1

Template: DY_ATTERBERG_CHART_WIN



Laboratory Testing by: Hushmand Associates, Inc.

Symbol	Source	Depth (feet)	Classification	Natural M. C. (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Passing #200 Sieve
	B- 1	5.0	SILTY SAND (SM)	17	NP	NP	NP	16
	B- 3	2.5	SILTY SAND (SM)		NP	NP	NP	17
	B- 4	2.0	CLAYEY SAND (SC)	8	30	20	10	18

PLASTICITY CHART

Dana Point Boat Launch
Project No. 2005-022

PLATE
B2

HAI **HUSHMAND ASSOCIATES, INC.**
Geotechnical and Earthquake Engineers

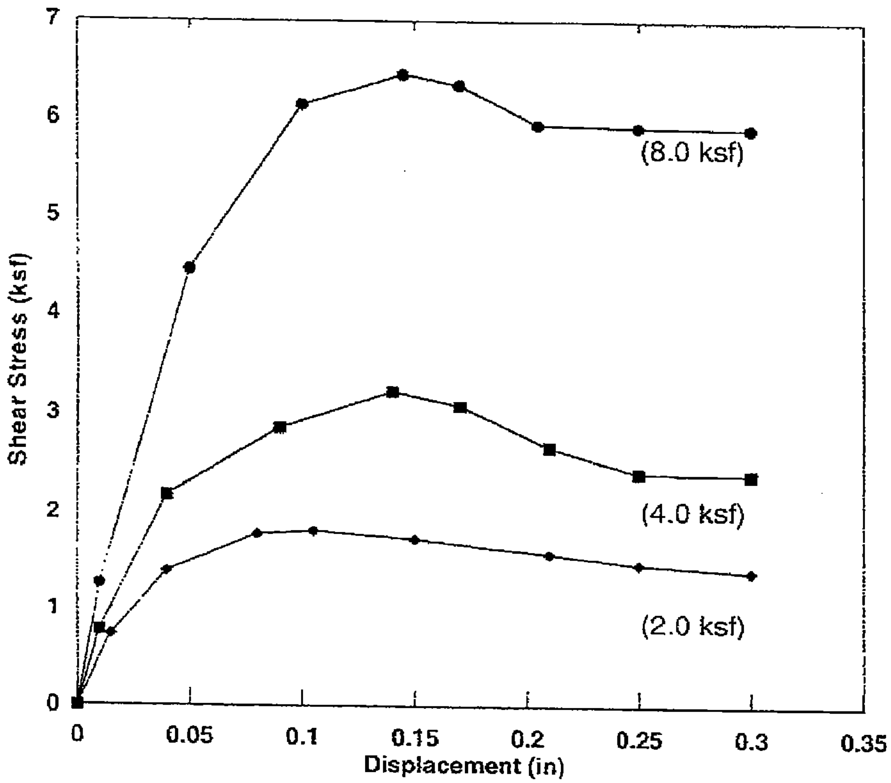
DIRECT SHEAR TEST
(ASTM D3080)

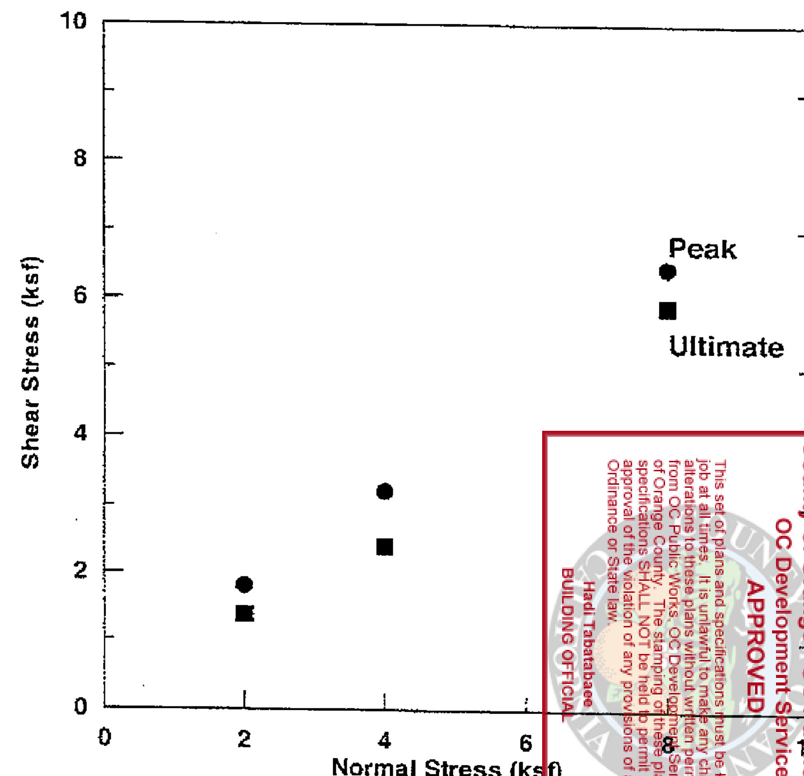
Client: Diaz Yourman & Associates
Project Name: Dana Point Boat Launch
Project Number: 2005-022

HAI Project No.: 03-0417
Tested by: PM
Checked by: JT
Date: 06/12/05

Boring No.: B 1 **Sample No.:** 1 **Depth:** 5'
Sample Description: Olive, Clayey Sand (SC)

Type of test: Consolidated. Drained.
Rate of Displacement: 0.002 in/min.





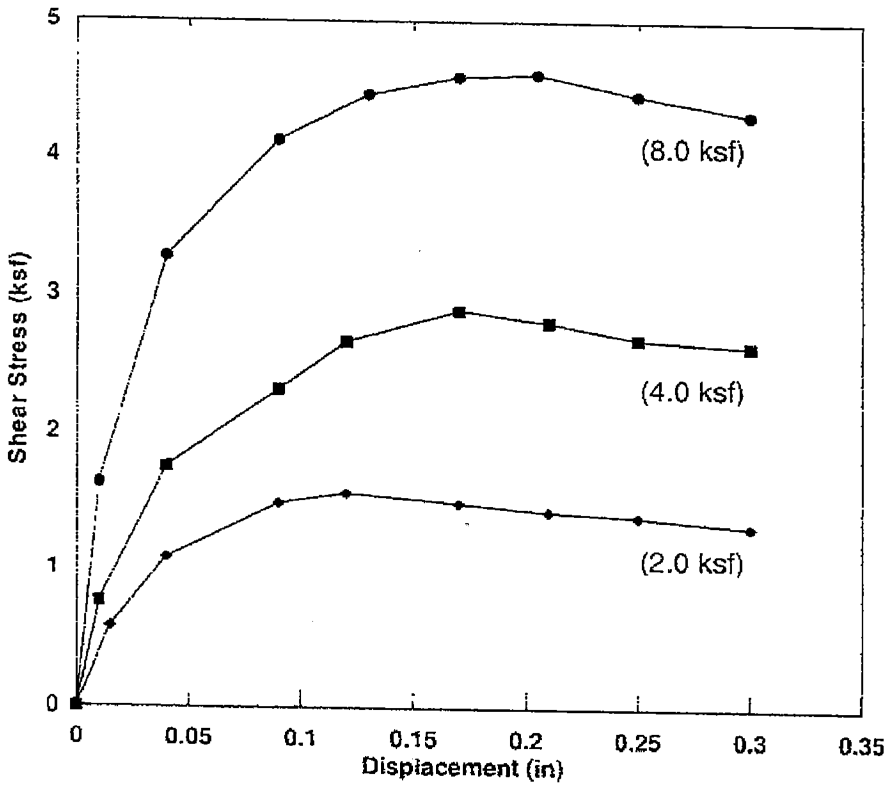
HAI **HUSHMAND ASSOCIATES, INC.**
Geotechnical and Earthquake Engineers

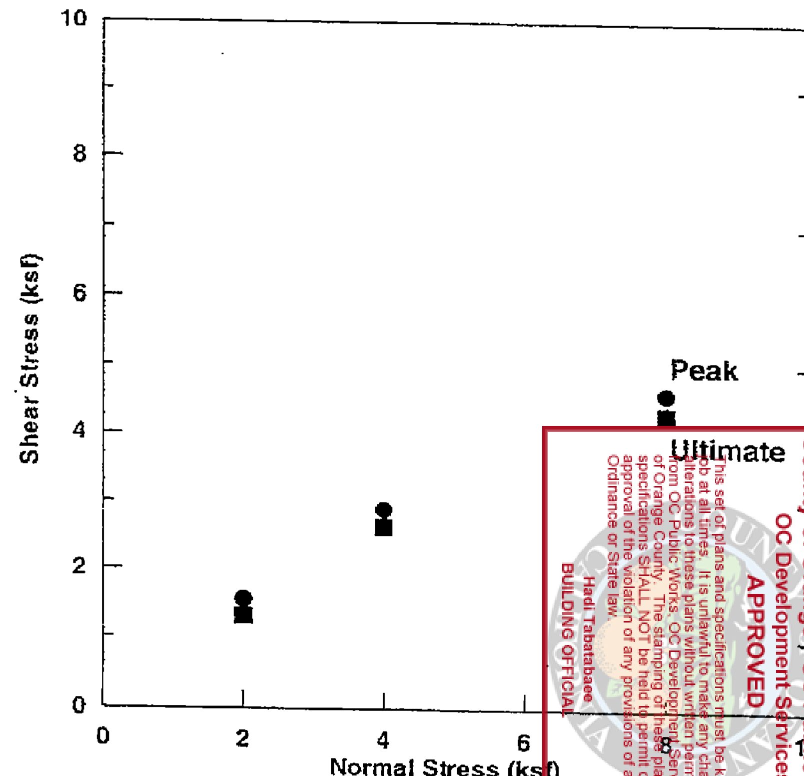
DIRECT SHEAR TEST
(ASTM D3080)

HAI Project No.: 03-0417
Tested by: PM
Checked by: JT
Date: 06/12/05

Client: Diaz Yourman & Associates
Project Name: Dana Point Boat Launch
Project Number: 2005-022
Boring No.: B 2 **Sample No.:** 2 **Depth:** 9'
Sample Description: Dark Olive, Clayey Sand (SC)

Type of test: Consolidated, Drained.
Rate of Displacement: 0.002 in/min.

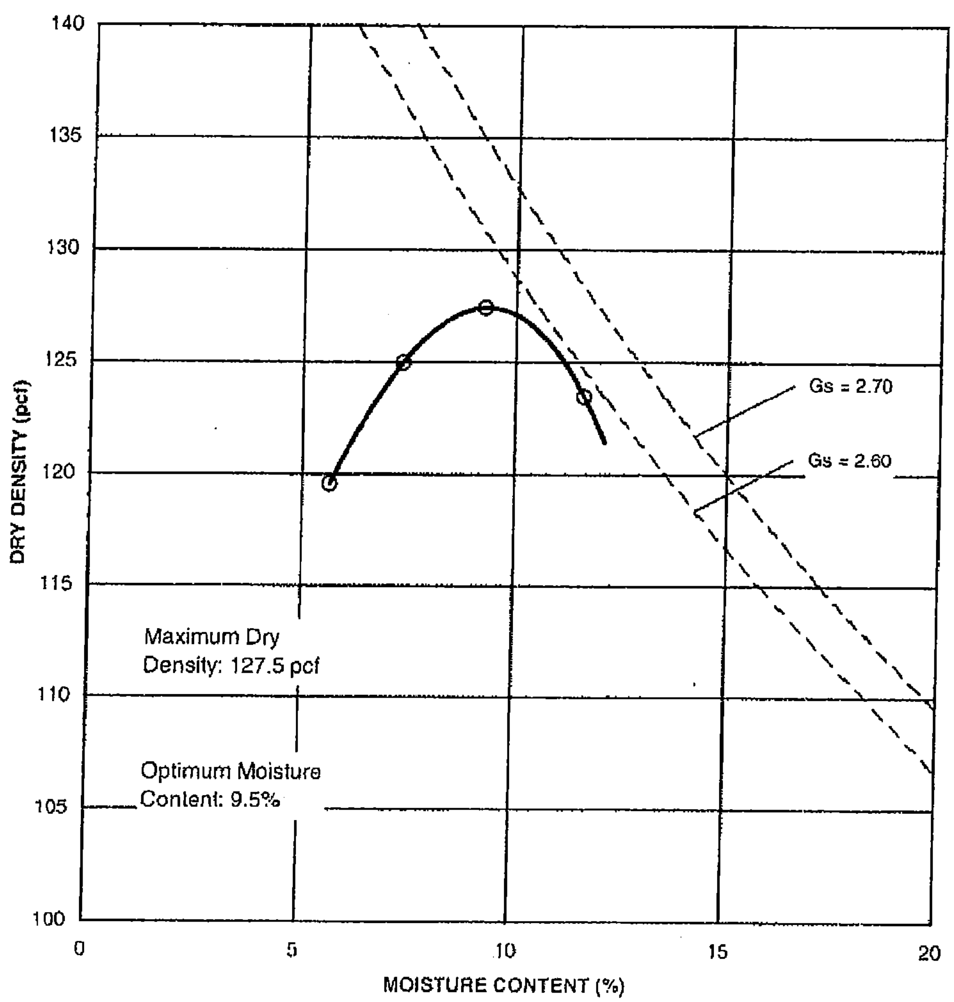




HAI **HUSHMAND ASSOCIATES, INC.**
Geotechnical and Earthquake Engineers

COMPACTION CURVE
ASTM D1557

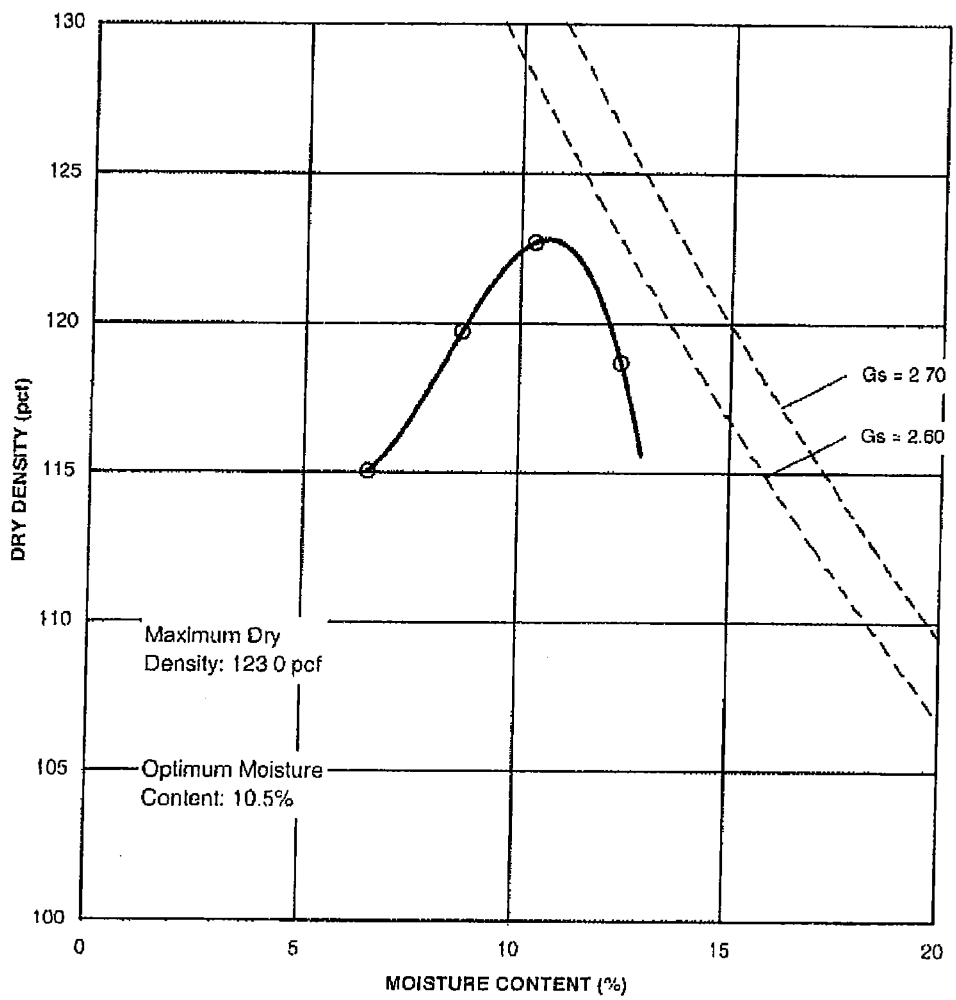
Client :	Diaz Yourman & Associates	*HAI Project No.:*	03-0417
Project Name:	Dana Point Boat Launch	*Tested by:*	PM
Project No.:	2005-022	*Checked by:*	JT
Boring No.:	B 4	*Date:*	6/11/2005
Sample No.:	Bulk *Depth:* ---	*Procedure:*	A
Soil Description:	Light Olive, Clayey Sand (SC)	*Mold Size:*	4 in



HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

COMPACTION CURVE
ASTM D1557

Client:	Diaz Yourman & Associates	**HAI Project No.:**	03-0417
Project Name:	Dana Point Boat Launch	**Tested by:**	PM
Project No.:	2005-022	**Checked by:**	JT
Boring No.:	B 3	**Date:**	6/11/2005
Sample No.:	Bulk **Depth:** ---	**Procedure:**	A
Soil Description:	Light Olive, Silty Sand (SM)	**Mold Size:**	4 in



R - VALUE DATA SHEET

P.N. 2005-022
Boat Launch

PROJECT NUMBER 32230 BORING NUMBER: B-2 Dana Point

SAMPLE DESCRIPTION: Brown Clayey Sand

Item	SPECIMEN a	SPECIMEN b	SPECIMEN c
Mold Number	13	14	15
Water added, grams	52	37	31
Initial Test Water, %	13.9	12.6	12.0
Compact Gage Pressure,psi	150	285	350
Exudation Pressure, psi	216	351	484
Height Sample, Inches	2.54	2.56	2.49
Gross Weight Mold, grams	3199	3209	3185
Tare Weight Mold, grams	2089	2080	2076
Sample Wet Weight, grams	1110	1129	1109
Expansion, Inches x 10exp-4	21	43	48
Stability 2,000 lbs (160psi)	31 / 69	27 / 59	26 / 55
Turns Displacement	4.50	4.25	4.03
R-Value Uncorrected	42	50	54
R-Value Corrected	42	51	54
Dry Density, pcf	116.2	118.7	120.5
DESIGN CALCULATION DATA			
Traffic Index Given:	12.0	12.0	12.0
G.E. by Stability	1.78	1.51	1.41
G. E. by Expansion	0.70	1.43	1.60

Equilibrium R-Value 48 by EXUDATION

Examined & Checked: 8 /26/ 05

REMARKS:
Gf = 1.25
1.1% Retained on the 3/4" sieve.

Steven R. Marvin, RCE 30659

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

LaBelle • Marvin

R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 32230-R2
P.N. 2005-022

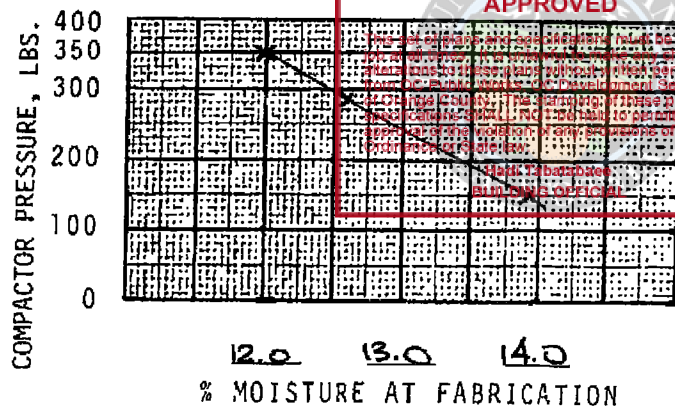
BORING NO. B-2 Dana Pt. Boat Launch

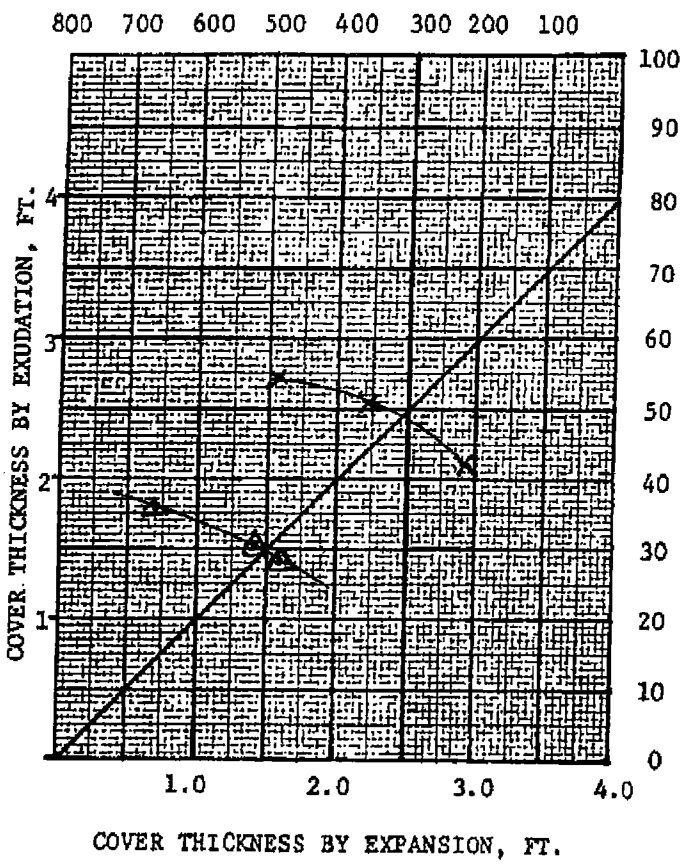
DATE 8.26.05

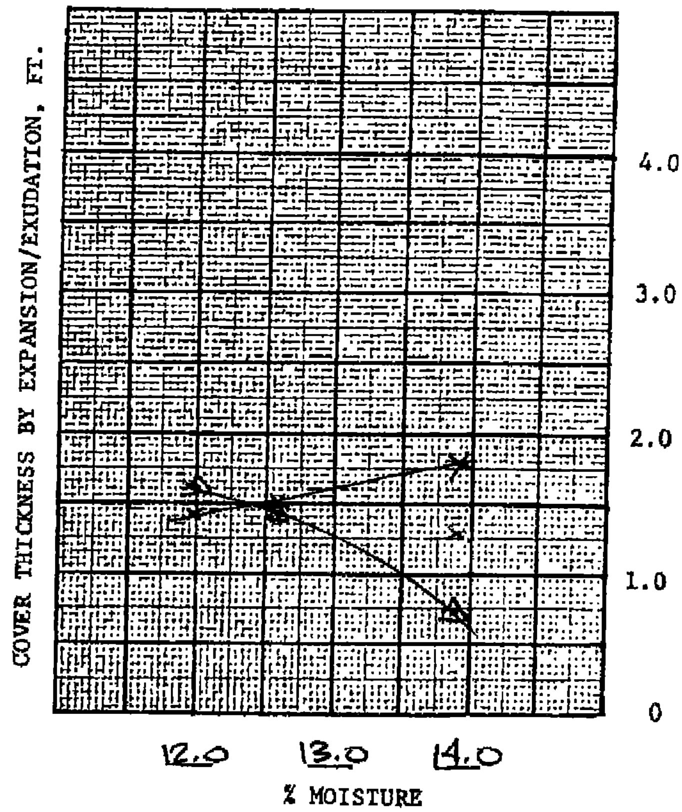
TRAFFIC INDEX Given 12.0

R-VALUE BY EXUDATION 48

R-VALUE BY EXPANSION ~







R-VALUE vs. EXUD. PRES.

T by EXUDATION

EXUD. T vs. EXPAN. T

T by EXPANSION

REMARKS

GE 1.25

LaBelle • Marvin
PROFESSIONAL PAVEMENT ENGINEERING

R - VALUE DATA SHEET

P.N. 2005-022
Boat Launch

PROJECT NUMBER 32230 BORING NUMBER: B-3&4 Dana Point

SAMPLE DESCRIPTION: Brown Slightly Clayey Sand

Item	SPECIMEN a	SPECIMEN b	SPECIMEN c
Mold Number	10	11	12
Water added, grams	42	50	33
Initial Test Water, %	10.6	11.3	9.8
Compact Gage Pressure,psi	350	160	350
Exudation Pressure, psi	283	168	548
Height Sample, Inches	2.55	2.63	2.55
Gross Weight Mold, grams	3265	3269	3255
Tare Weight Mold, grams	2123	2101	2117
Sample Wet Weight, grams	1142	1168	1138
Expansion, Inches x 10exp-4	7	2	17
Stability 2,000 lbs (160psi)	20 / 39	26 / 51	17 / 33
Turns Displacement	4.16	4.53	4.11
R-Value Uncorrected	65	54	70
R-Value Corrected	65	58	70
Dry Density, pcf	122.7	120.9	123.2
	DESIGN	CALCULATION	DATA
Traffic Index Given:	12.0	12.0	12.0
G.E. by Stability	1.08	1.29	0.92
G. E. by Expansion	0.23	0.07	0.57

Equilibrium R-Value	66 by EXUDATION	Examined & Checked: 8 /26/ 05

REMARKS:
Gf = 1.25
0.0% Retained on the 3/4" sieve.

STEVEN R. MARVIN No. C30659 Exp. 06/30/06 CIVIL

Steven R. Marvin, RCE 30659

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

LaBelle • Marvin

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

R-VALUE GRAPHICAL PRESENTATION

County of Orange - OC Public Works
OC Development Services
APPROVED

This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works/OC Development Services of Orange County. The stamping of these plans and specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Hadi Tabatabaee
BUILDING OFFICIAL

PROJECT NO. 32230 P.N. 2005-022

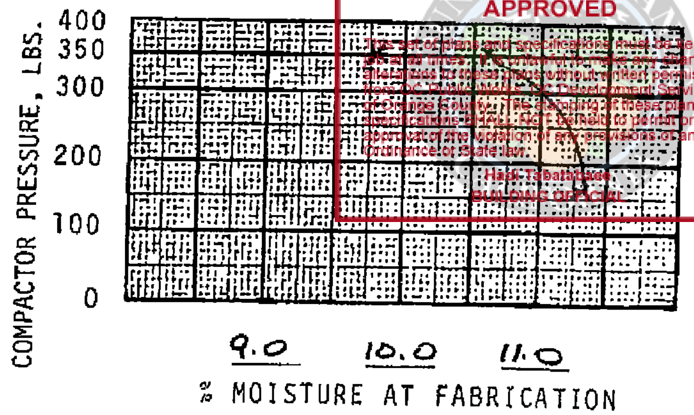
BORING NO. B-3 & 4 Dana Point Boat Launch

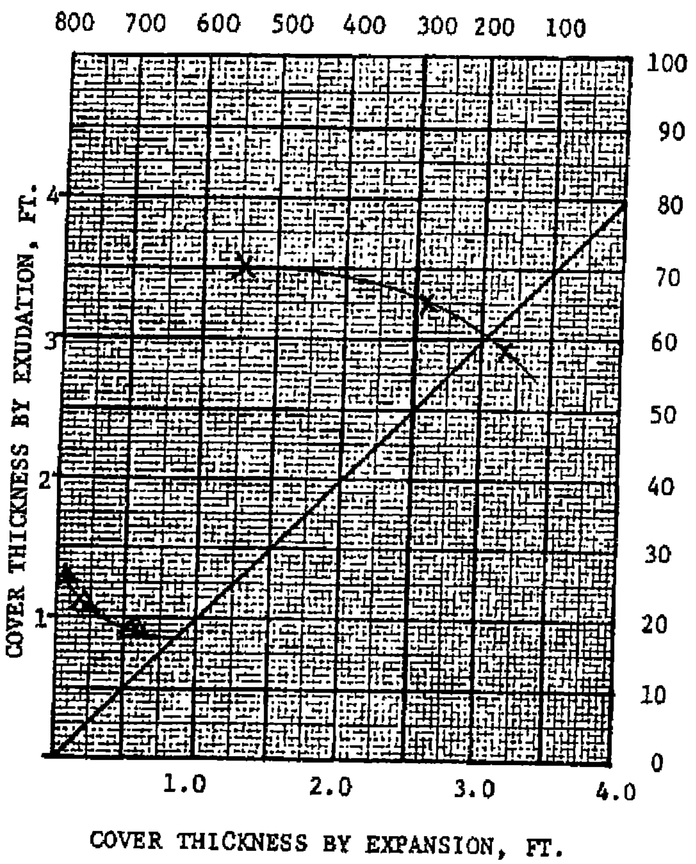
DATE 8-26-05

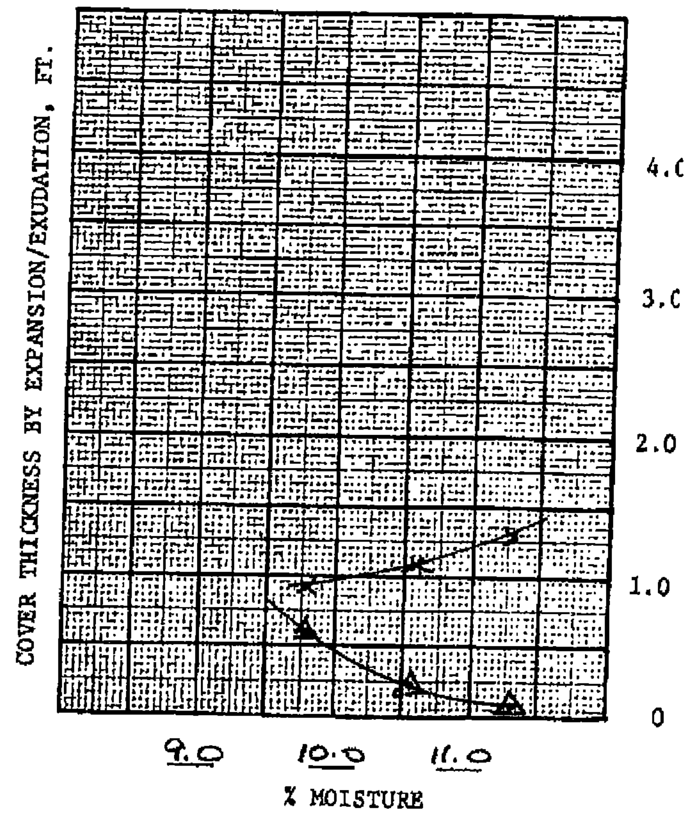
TRAFFIC INDEX Given 12.0

R-VALUE BY EXUDATION 66

R-VALUE BY EXPANSION —







R-VALUE vs. EXUD. PRES. — T by EXUDATION

EXUD. T vs. EXPAN. T — T by EXPANSION

REMARKS

GF=1.25

LaBelle • Marvin
PROFESSIONAL PAVEMENT ENGINEERING

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

HAI Project No.: 03-0417

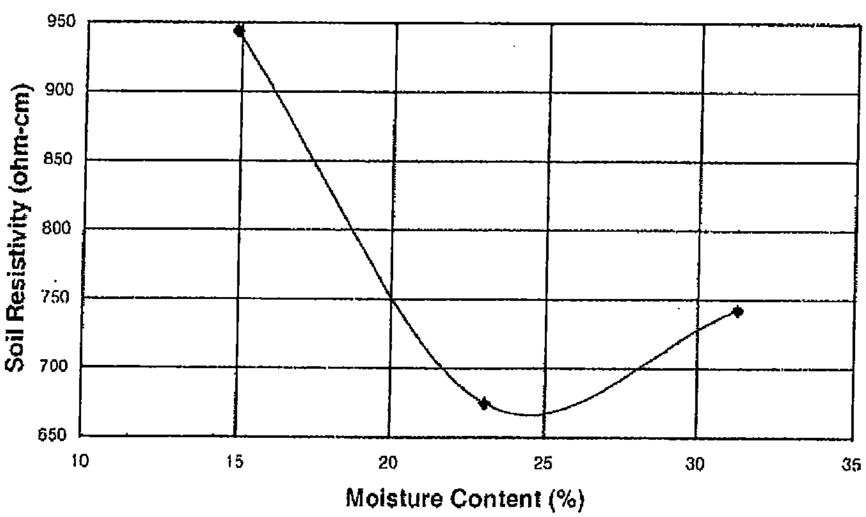
Client: Diaz Yourman & Associates
Project Name: Dana Point Boat Launch
Project No.: 2005-022
Boring No.: B 1
Sample No.: 1
Depth: 5'
Soil Description: Olive, Clayey Sand (SC)

Checked by: JT
Date: 6/15/2005

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	14.86	140	944
2	200	23.06	100	675
3	300	31.26	110	742
4				
5				

Moisture Content (%) (MCi)	6.65
Wet WT. of Soil + Cont. (g)	134.04
Dry Wt. of Soil + Cont. (g)	129.72
Wt. of Container (g)	64.78
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC=(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
666	24.5	291	311	7.52	22



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

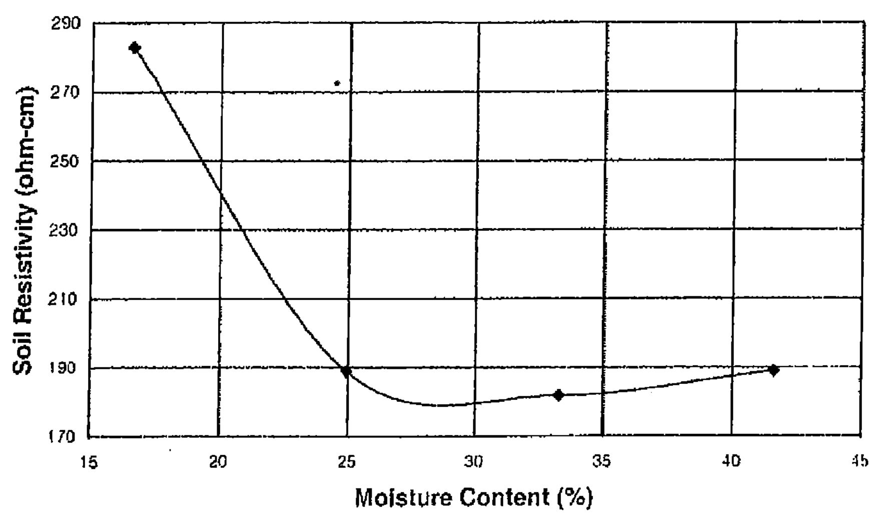
Client : Diaz Yourman & Associates
Project Name: Dana Point Boat Launch
Project No.: 2005-022
Boring No.: B 4
Sample No.: Bulk
Depth: --
Soil Description: Light Brown, Clayey Sand (SC)

HAI Project No.: 03-0417
Checked by: JT
Date: 6/15/2005

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	16.60	42	283
2	200	24.93	28	189
3	300	33.26	27	182
4	400	41.59	28	189
5				

Moisture Content (%) (MCl)	8.28
Wet WT. of Soil + Cont. (g)	108.62
Dry Wt. of Soil + Cont. (g)	105.31
Wt. of Container (g)	65.31
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC=(((1+Mcl/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (·C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
179	**28.6**	**471**	**2420**	**7.41**	**21.8**



HAI **HUSHMAND ASSOCIATES, INC.**
Geotechnical and Earthquake Engineers

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

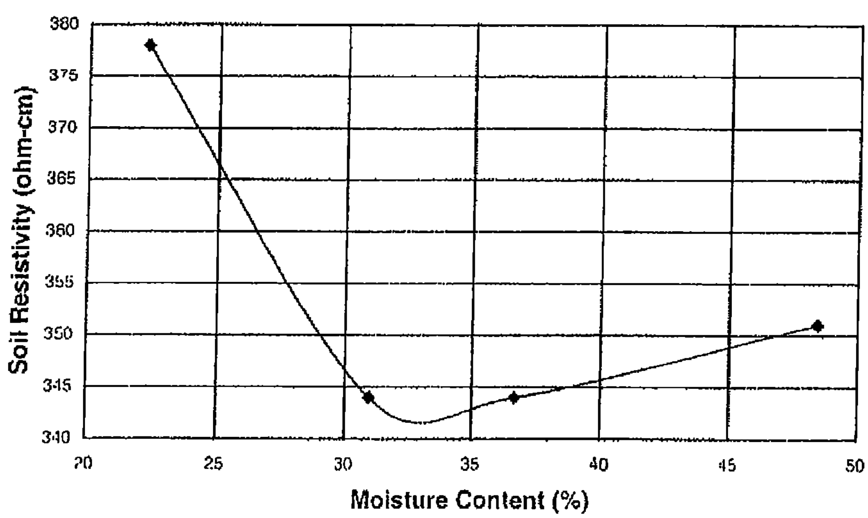
Client : Diaz Yourman & Associates
Project Name: Dana Point Boat Launch
Project No.: 2005-022
Boring No.: B 2
Sample No.: Bulk
Depth: --
Soil Description: Light Brown, Clayey Sand (SC)

HAI Project No.: 03-0417
Checked by: JT
Date: 6/15/2005

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	22.22	56	378
2	200	30.96	51	344
3	300	36.69	51	344
4	400	48.42	52	351
5				

Moisture Content (%) (MCi)	13.49
Wet WT. of Soil + Cont. (g)	168.04
Dry Wt. of Soil + Cont. (g)	152.52
Wt. of Container (g)	37.51
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC=(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
341	**34**	**190**	**1387**	**9.26**	**21.9**



HAI HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

SOIL RESISTIVITY TEST
DOT CA TEST 532 / 643

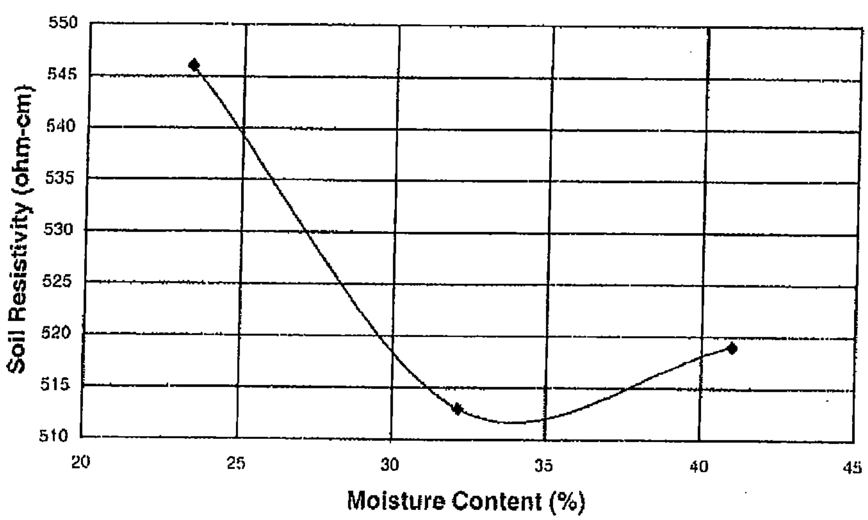
Client : Diaz Yourman & Associates
Project Name: Dana Point Boat Launch
Project No.: 2005-022
Boring No.: B 3
Sample No.: Bulk
Depth: --
Soil Description: Light Brown, Silty Sand (SM)

HAI Project No.: 03-0417
Checked by: JT
Date: 6/15/2005

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	100	23.35	81	546
2	200	32.17	76	513
3	300	40.98	77	519
4				
5				

Moisture Content (%) (MCi)	14.54
Wet WT. of Soil + Cont. (g)	168.63
Dry Wt. of Soil + Cont. (g)	155.57
Wt. of Container (g)	65.77
Container No.	
Initial Soil Wt. (g) (Wt)	1300.00
Box Constant	6.746
MC=(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH: pH	Soil pH: Temp. (°C)
DOT CA Test 532 / 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 532 / 643	
511	34	250	702	7.35	21.8



APPENDIX C

Infiltration Test Results

GMU

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

Falling Head Borehole Infiltration Test

Project Name:	Dana Point Harbor Revitalization	**Date:**	9/12/2018
Project Number:	17-206-02	**Tested By:**	MF
Test Hole Number:	DH-17	**USCS Soil Classification:**	SC
Total Depth :	5.00 feet	**Water Temperature:**	75 F
Test Hole Diameter:	8.00 inches	radius= 4 inches	

Trial	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	H_0	H_f	ΔH	H_{avg}	Unfactored Percolation Rate
			(min)	(min)	(ft)	(ft)	(in)	(in)	(in)	(in)	(in/hour)
1	7:25	7:50	25.0	25.0	2.58	3.57	29.04	17.16	11.88	23.10	2.27
2	7:51	8:16	25.0	50.0	2.57	3.67	29.16	15.96	13.20	22.56	2.58
1	8:16	8:46	30.0	80.0	2.25	3.17	33.00	21.96	11.04	27.48	1.50
2	8:48	9:18	30.0	110.0	2.42	3.33	30.96	20.04	10.92	25.50	1.59
3	9:18	9:48	30.0	140.0	2.29	3.17	32.52	21.96	10.56	27.24	1.44
4	9:48	10:18	30.0	170.0	2.42	3.17	30.96	21.96	9.00	26.46	1.26
5	10:18	10:48	30.0	200.0	2.40	3.29	31.20	20.52	10.68	25.86	1.53
6	10:48	11:18	30.0	230.0	2.46	3.71	30.48	15.48	15.00	22.98	2.40
7	11:18	11:48	30.0	260.0	2.40	3.33	31.20	20.04	11.16	25.62	1.62
8	11:48	12:18	30.0	290.0	2.50	3.48	30.00	18.24	11.76	24.12	1.80
9	12:18	12:48	30.0	320.0	2.33	3.19	32.04	21.72	10.32	26.88	1.43
10	12:48	13:18	30.0	350.0	2.67	3.58	27.96	17.04	10.92	22.50	1.78
11	13:18	13:48	30.0	380.0	2.38	3.13	31.44	22.44	9.00	26.94	1.24
12	13:48	14:18	30.0	410.0	2.42	3.13	30.96	22.44	8.52	26.70	1.19

WATER TEMPERATURE CORRECTION FACTOR:	0.85
SAFETY FACTOR*:	2.25
UNFACTORED INFILTRATION RATE (IN/HR):	1.19
FACTORED INFILTRATION RATE (IN/HR):	0.53

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25	3	0.75
	Predominant soil texture	0.25	2	0.5
	Site soil variablity	0.25	2	0.5
	Depth to groundwater	0.25	2	0.5
			Geotechnical Factor of Safety (SA):	2.25

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borohole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

GMU

*Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

Falling Head Borehole Infiltration Test

Project Name:	Dana Point Harbor Revitalization	Date:	9/12/2018
Project Number:	17-206-02	Tested By:	MF
Test Hole Number:	DH-18	USCS Soil Classification:	SC
Total Depth :	5.00 feet	Water Temperature:	75 °F
Test Hole Diameter:	8.00 inches	radius= 4 inches	

Trial	Start Time	End Time	ΔT (min)	Total Time (min)	Initial Depth of Water (ft)	Final Depth of Water (ft)	H_0 (in)	H_f (in)	ΔH (in)	H_{avg} (in)	Unfactored Percolation Rate (in/hour)
1	7:30	7:55	25.0	25.0	2.16	2.79	34.08	26.52	7.56	30.30	1.12
2	7:56	8:21	25.0	50.0	2.16	2.83	34.08	26.04	8.04	30.06	1.20
1	8:21	8:51	30.0	80.0	1.91	2.58	37.08	29.04	8.04	33.06	0.92
2	8:51	9:21	30.0	110.0	2.16	2.41	34.08	31.08	3.00	32.58	0.35
3	9:21	9:51	30.0	140.0	2.16	2.37	34.08	31.56	2.52	32.82	0.29
4	9:51	10:21	30.0	170.0	2.16	2.41	34.08	31.08	3.00	32.58	0.35
5	10:21	10:51	30.0	200.0	2.16	2.41	34.08	31.08	3.00	32.58	0.35
6	10:51	11:21	30.0	230.0	1.98	2.29	36.24	32.52	3.72	34.38	0.41
7	11:21	11:51	30.0	260.0	1.91	2.29	37.08	32.52	4.56	34.80	0.50
8	11:51	12:21	30.0	290.0	1.99	2.37	36.12	31.56	4.56	33.84	0.51
9	12:21	12:51	30.0	320.0	1.99	2.25	36.12	33.00	3.12	34.56	0.34
10	12:51	13:21	30.0	350.0	1.99	2.29	36.12	32.52	3.60	34.32	0.40
11	13:21	13:51	30.0	380.0	1.91	2.14	37.08	34.32	2.76	35.70	0.29
12	13:51	14:21	30.0	410.0	1.91	2.14	37.08	34.32	2.76	35.70	0.29

WATER TEMPERATURE CORRECTION FACTOR:	0.85
SAFETY FACTOR*:	2.25
UNFACTORED INFILTRATION RATE (IN/HR):	0.28
FACTORED INFILTRATION RATE (IN/HR):	0.12

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25	3	0.75
	Predominant soil texture	0.25	2	0.5
	Site soil variablity	0.25	2	0.5
	Depth to groundwater	0.25	2	0.5
			Geotechnical Factor of Safety (SA):	2.25

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borhole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

***Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.**

GMU

Falling Head Borehole Infiltration Test

Project Name:	Dana Point Harbor Revitalization		Date:	9/12/2018
Project Number:	17-206-02		Tested By:	MF
Test Hole Number:	DH-19		USCS Soil Classification:	SC
Total Depth :	4.00	feet	Water Temperature:	75 °F
Test Hole Diameter:	8.00 inches	radius= 4	inches	

Trial	Start Time	End Time	ΔT (min)	Total Time (min)	Initial Depth of Water (ft)	Final Depth of Water (ft)	H_0 (in)	H_f (in)	ΔH (in)	H_{avg} (in)	Unfactored Percolation Rate (in/hour)
1	7:27	7:52	25.0	25.0	2.58	2.62	17.04	16.56	0.48	16.80	0.12
2	7:54	8:19	25.0	50.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
1	8:19	8:49	30.0	80.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
2	8:49	9:19	30.0	110.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
3	9:19	9:49	30.0	140.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
4	9:49	10:19	30.0	170.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
5	10:19	10:49	30.0	200.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
6	10:49	11:19	30.0	230.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
7	11:19	11:49	30.0	260.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
8	11:49	12:19	30.0	290.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
9	12:19	12:49	30.0	320.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
10	12:49	13:19	30.0	350.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
11	13:19	13:49	30.0	380.0	2.58	2.59	17.04	16.92	0.12	16.98	0.03
12	13:51	2:19	-692.0	-312.0	2.58	2.59	17.04	16.92	0.12	16.98	0.00

WATER TEMPERATURE CORRECTION FACTOR:	0.85
SAFETY FACTOR*:	2.25
UNFACTORED INFILTRATION RATE (IN/HR):	0.01
FACTORED INFILTRATION RATE (IN/HR):	0.01

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25	3	0.75
	Predominant soil texture	0.25	2	0.5
	Site soil variablity	0.25	2	0.5
	Depth to groundwater	0.25	2	0.5
		Geotechnical Factor of Safety (SA):		2.25

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borhole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

*Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.

GMU

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Hadi Tabatabaee
BUILDING OFFICIAL

Falling Head Borehole Infiltration Test

Project Name:	Dana Point Harbor Revitalization	Date:	9/12/2018
Project Number:	17-206-02	Tested By:	MF
Test Hole Number:	DH-20	USCS Soil Classification:	SC
Total Depth :	5.00 feet	Water Temperature:	75 F
Test Hole Diameter:	8.00 inches	radius= 4 inches	

Trial	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	H_0	H_f	ΔH	H_{avg}	Unfactored Percolation Rate
			(min)	(min)	(ft)	(ft)	(in)	(in)	(in)	(in)	(in/hour)
1	7:20	7:45	25.0	25.0	2.67	2.67	27.96	27.96	0.00	27.96	0.00
2	7:46	8:11	25.0	50.0	2.67	2.67	27.96	27.96	0.00	27.96	0.00
1	8:11	8:41	30.0	80.0	2.67	2.67	27.96	27.96	0.00	27.96	0.00
2	8:41	9:11	30.0	110.0	2.67	2.67	27.96	27.96	0.00	27.96	0.00
3	9:11	9:41	30.0	140.0	2.67	2.67	27.96	27.96	0.00	27.96	0.00
4	9:41	10:11	30.0	170.0	2.67	2.67	27.96	27.96	0.00	27.96	0.00
5	10:11	10:41	30.0	200.0	2.67	2.67	27.96	27.96	0.00	27.96	0.00
6	10:41	11:11	30.0	230.0	2.67	2.67	27.96	27.96	0.00	27.96	0.00
7	11:11	11:41	30.0	260.0	2.67	2.92	27.96	24.96	3.00	26.46	0.42
8	11:41	12:11	30.0	290.0	2.67	2.83	27.96	26.04	1.92	27.00	0.26
9	12:11	12:41	30.0	320.0	2.50	2.65	30.00	28.20	1.80	29.10	0.23
10	12:41	13:11	30.0	350.0	2.50	2.67	30.00	27.96	2.04	28.98	0.26
11	13:11	13:41	30.0	380.0	2.56	2.67	29.28	27.96	1.32	28.62	0.17
12	13:41	14:11	30.0	410.0	2.50	2.58	30.00	29.04	0.96	29.52	0.12

WATER TEMPERATURE CORRECTION FACTOR:	0.85
SAFETY FACTOR*:	2.25
UNFACTORED INFILTRATION RATE (IN/HR):	0.16
FACTORED INFILTRATION RATE (IN/HR):	0.07

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25	3	0.75
	Predominant soil texture	0.25	2	0.5
	Site soil variablity	0.25	2	0.5
	Depth to groundwater	0.25	2	0.5
			Geotechnical Factor of Safety (SA):	2.25

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borhole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

GMU

*Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Hadi Tabatabaee
BUILDING OFFICIAL

Falling Head Borehole Infiltration Test

Project Name:	Dana Point Harbor Revitalization	Date:	9/12/2018
Project Number:	17-206-02	Tested By:	MF
Test Hole Number:	DH-21	USCS Soil Classification:	SC
Total Depth :	5.00 feet	Water Temperature:	75
Test Hole Diameter:	8.00 inches	radius=	4 inches

Trial	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	H_0	H_f	ΔH	H_{avg}	Unfactored Percolation Rate
			(min)	(min)	(ft)	(ft)	(in)	(in)	(in)	(in)	(in/hour)
1	7:21	7:46	25.0	25.0	2.50	2.50	30.00	30.00	0.00	30.00	0.00
2	7:49	8:14	25.0	50.0	2.50	2.50	30.00	30.00	0.00	30.00	0.00
1	8:14	8:44	30.0	80.0	2.50	2.50	30.00	30.00	0.00	30.00	0.00
2	8:44	9:14	30.0	110.0	2.50	2.58	30.00	29.04	0.96	29.52	0.12
3	9:14	9:44	30.0	140.0	2.50	2.50	30.00	30.00	0.00	30.00	0.00
4	9:44	10:14	30.0	170.0	2.50	2.50	30.00	30.00	0.00	30.00	0.00
5	10:14	10:44	30.0	200.0	2.50	2.54	30.00	29.52	0.48	29.76	0.06
6	10:44	11:14	30.0	230.0	2.50	2.54	30.00	29.52	0.48	29.76	0.06
7	11:14	11:44	30.0	260.0	2.50	2.50	30.00	30.00	0.00	30.00	0.00
8	11:44	12:14	30.0	290.0	2.50	2.52	30.00	29.76	0.24	29.88	0.03
9	12:14	12:44	30.0	320.0	2.52	2.56	29.76	29.28	0.48	29.52	0.06
10	12:44	13:14	30.0	350.0	2.50	2.58	30.00	29.04	0.96	29.52	0.12
11	13:14	13:44	30.0	380.0	2.50	2.58	30.00	29.04	0.96	29.52	0.12
12	13:44	14:14	30.0	410.0	2.50	2.58	30.00	29.04	0.96	29.52	0.12

WATER TEMPERATURE CORRECTION FACTOR:	0.85
SAFETY FACTOR*:	2.25
UNFACTORED INFILTRATION RATE (IN/HR):	0.10
FACTORED INFILTRATION RATE (IN/HR):	0.05

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25	3	0.75
	Predominant soil texture	0.25	2	0.5
	Site soil variablity	0.25	2	0.5
	Depth to groundwater	0.25	2	0.5
			Geotechnical Factor of Safety (SA):	2.25

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borhole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

*Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

County of Orange - OC Public Works
OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

Falling Head Borehole Infiltration Test

Project Name:	Dana Point Harbor Revitalization	Date:	9/12/2018
Project Number:	17-206-02	Tested By:	MF
Test Hole Number:	DH-22	USCS Soil Classification:	SC
Total Depth :	5.00 feet	Water Temperature:	75 °F
Test Hole Diameter:	8.00 inches	radius= 4 inches	

Trial	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	H_0	H_f	ΔH	H_{avg}	Unfactored Percolation Rate
			(min)	(min)	(ft)	(ft)	(in)	(in)	(in)	(in)	(in/hour)
1	7:43	8:08	25.0	25.0	2.42	3.65	30.96	16.20	14.76	23.58	2.77
2	8:09	8:34	25.0	50.0	2.42	3.50	30.96	18.00	12.96	24.48	2.35
1	8:34	9:04	30.0	80.0	2.42	3.08	30.96	23.04	7.92	27.00	1.09
2	9:04	9:34	30.0	110.0	2.42	3.17	30.96	21.96	9.00	26.46	1.26
3	9:34	10:04	30.0	140.0	2.42	3.17	30.96	21.96	9.00	26.46	1.26
4	10:04	10:34	30.0	170.0	2.42	3.33	30.96	20.04	10.92	25.50	1.59
5	10:34	11:04	30.0	200.0	2.25	3.17	33.00	21.96	11.04	27.48	1.50
6	11:04	11:34	30.0	230.0	2.25	2.88	33.00	25.44	7.56	29.22	0.97
7	11:34	12:04	30.0	260.0	2.38	2.85	31.44	25.80	5.64	28.62	0.74
8	12:04	12:34	30.0	290.0	2.25	2.47	33.00	30.36	2.64	31.68	0.31
9	12:34	13:04	30.0	320.0	2.23	2.43	33.24	30.84	2.40	32.04	0.28
10	13:04	13:34	30.0	350.0	2.25	2.49	33.00	30.12	2.88	31.56	0.34
11	13:34	14:04	30.0	380.0	2.27	2.42	32.76	30.96	1.80	31.86	0.21
12	14:04	14:34	30.0	410.0	2.28	2.49	32.64	30.12	2.52	31.38	0.30

WATER TEMPERATURE CORRECTION FACTOR:	0.85
SAFETY FACTOR*:	2.25
UNFACTORED INFILTRATION RATE (IN/HR):	0.24
FACTORED INFILTRATION RATE (IN/HR):	0.11

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25	3	0.75
	Predominant soil texture	0.25	2	0.5
	Site soil variablity	0.25	2	0.5
	Depth to groundwater	0.25	2	0.5
			Geotechnical Factor of Safety (SA):	2.25

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borhole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

GMU

*Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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OC Development Services
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Hadi Tabatabaee
BUILDING OFFICIAL

Falling Head Borehole Infiltration Test

Project Name:	Dana Point Harbor Revitalization	**Date:**	8/27/2012
Project Number:	11-161-00	**Tested By:**	N/A
Test Hole Number:	DH-10	**USCS Soil Classification:**	SC
Total Depth :	3.25 feet	**Water Temperature:**	75 °F
Test Hole Diameter:	8.00 inches	radius= 4	inches

Trial	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	H_0	H_f	ΔH	H_{avg}	Unfactored Percolation Rate
			(min)	*(min)*	*(ft)*	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*	*(in/hour)*
1	8:54	9:35	41.0	91.0	1.19	1.82	24.72	17.16	7.56	20.94	0.96
2	9:38	10:06	28.0	119.0	1.23	1.65	24.24	19.20	5.04	21.72	0.91
3	10:09	10:38	29.0	148.0	1.27	1.63	23.76	19.44	4.32	21.60	0.76
4	10:40	11:08	28.0	176.0	1.26	1.56	23.88	20.28	3.60	22.08	0.64
5	11:10	11:39	29.0	205.0	1.27	1.55	23.76	20.40	3.36	22.08	0.58
6	11:41	12:22	41.0	246.0	1.25	1.53	24.00	20.64	3.36	22.32	0.40
7	12:25	12:59	34.0	280.0	1.16	1.41	25.08	22.08	3.00	23.58	0.41
8	13:01	13:40	39.0	#REF!	1.10	1.42	25.80	21.96	3.84	23.88	0.46
9	13:42	14:34	52.0	#REF!	1.05	1.42	26.40	21.96	4.44	24.18	0.39
10	14:34	15:09	35.0	#REF!	1.00	1.25	27.00	24.00	3.00	25.50	0.37

WATER TEMPERATURE CORRECTION FACTOR:	0.85
SAFETY FACTOR*:	2.25
UNFACTORED INFILTRATION RATE (IN/HR):	0.35
FACTORED INFILTRATION RATE (IN/HR):	0.15

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25	3	0.75
	Predominant soil texture	0.25	2	0.5
	Site soil variablity	0.25	2	0.5
	Depth to groundwater	0.25	2	0.5
		Geotechnical Factor of Safety (SA):		2.25

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borhole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

***Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.**

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Hadi Tabatabaee
BUILDING OFFICIAL

Falling Head Borehole Infiltration Test

Project Name:	Dana Point Harbor Revitalization		**Date:**	4/8/2015
Project Number:	11-161-03		**Tested By:**	N/A
Test Hole Number:	DH-22		**USCS Soil Classification:**	SC
Total Depth :	7.00	feet	**Water Temperature:**	75 °F
Test Hole Diameter:	8.00 inches	radius= 4	inches	

Trial	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	H_0	H_f	ΔH	H_{avg}	Unfactored Percolation Rate
			(min)	(min)	(ft)	(ft)	(in)	(in)	(in)	(in)	(in/hour)
1	7:10	7:40	30.0	80.0	4.50	4.57	30.00	29.16	0.84	29.58	0.11
2	7:41	8:11	30.0	110.0	4.51	4.53	29.88	29.64	0.24	29.76	0.03
3	8:12	8:42	30.0	140.0	4.48	4.51	30.24	29.88	0.36	30.06	0.04
4	8:42	9:12	30.0	170.0	4.46	4.49	30.48	30.12	0.36	30.30	0.04
5	9:13	9:43	30.0	200.0	4.49	4.51	30.12	29.88	0.24	30.00	0.03
6	9:44	10:14	30.0	230.0	4.45	4.48	30.60	30.24	0.36	30.42	0.04
7	10:15	10:45	30.0	260.0	4.45	4.48	30.60	30.24	0.36	30.42	0.04
8	10:45	11:15	30.0	290.0	4.45	4.48	30.60	30.24	0.36	30.42	0.04
9	11:16	11:46	30.0	320.0	4.44	4.47	30.72	30.36	0.36	30.54	0.04
10	11:47	12:17	30.0	350.0	4.39	4.42	31.32	30.96	0.36	31.14	0.04
11	12:18	12:48	30.0	320.0	4.37	4.40	31.56	31.20	0.36	31.38	0.04
12	12:50	13:20	30.0	350.0	4.37	4.40	31.56	31.20	0.36	31.38	0.04

WATER TEMPERATURE CORRECTION FACTOR:	0.85
SAFETY FACTOR*:	2.25
UNFACTORED INFILTRATION RATE (IN/HR):	0.04
FACTORED INFILTRATION RATE (IN/HR):	0.02

Factor Category	Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) = w x v
Suitability Assessment	Soil assessment methods	0.25	3	0.75
	Predominant soil texture	0.25	2	0.5
	Site soil variablity	0.25	2	0.5
	Depth to groundwater	0.25	2	0.5
			Geotechnical Factor of Safety (SA):	2.25

Concern Level	Factor Value (v)
Low	1
Medium	2
High	3

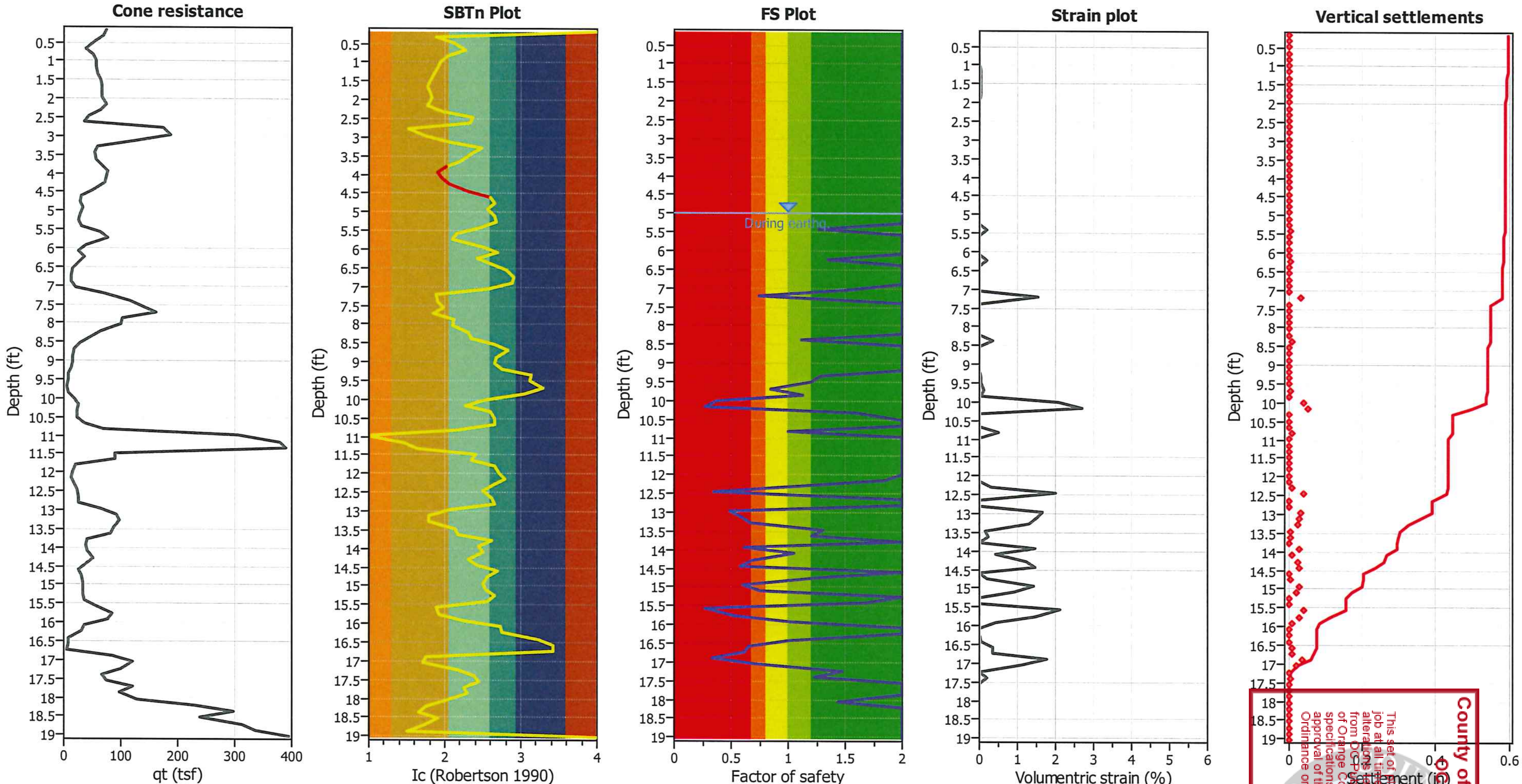
Factor Description	High Concern	Medium Concern	Low Concern
Soil assessment methods	Use of borhole methods to estimate vertical infiltration rate (not recommended, but may be necessary at a planning level). Less than 2 tests per BMP	At least 2 tests per BMP. Use of borehole tests for dry wells or infiltration trenches. Use of infiltrometer or small scale PIT methods for vertical infiltration BMPs.	Extensive infiltration testing such as: PIT testing or infiltrometer testing at 3+ locations per BMP, and/or commitment to construction phase testing and design adaption if necessary.
Predominant soil texture	Silty and clayey soils with significant fines	Finer sandy soils with some loam content	Clean, granular soils (sands)
Site soil variablity	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment.	Soil borings/test pits indicate moderately homogeneous soils.	Multiple soil borings/test pits indicate relatively homogeneous soils.
Depth to groundwater	Groundwater conditions or movement not well understood.	Seasonal high GW at least 10 ft below facility bottom.	Seasonal high GW at least 15 ft below facility bottom.

***Factor of safety should not be less than 2. Additional factor of safety in accordance with Table D-7 of the South Orange County Technical Guidance Document should be applied by the project civil engineer.**

APPENDIX D

CPT Liquefaction, Vertical Seismic Settlement, and Liquefied Soil Strength Analyses

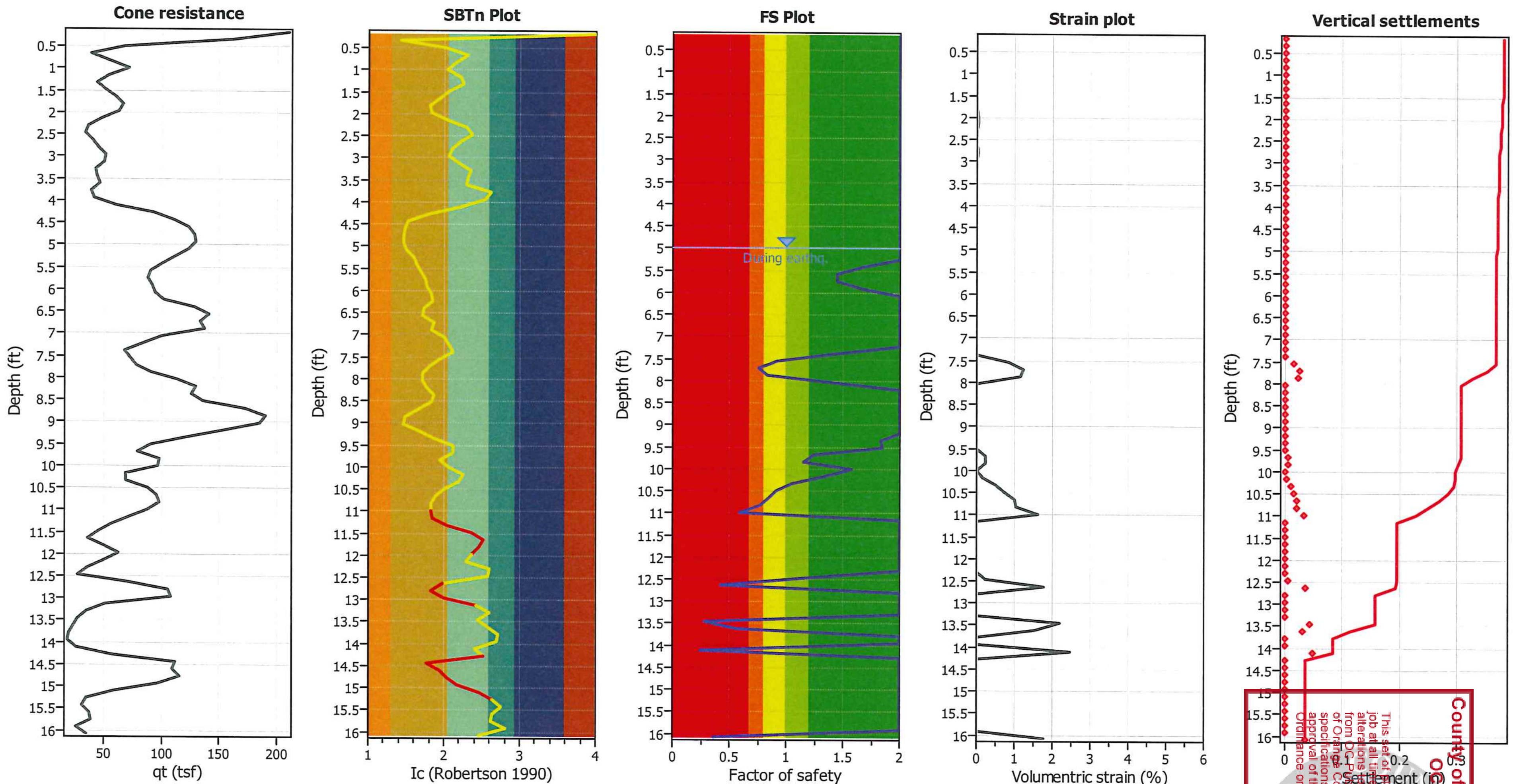
Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

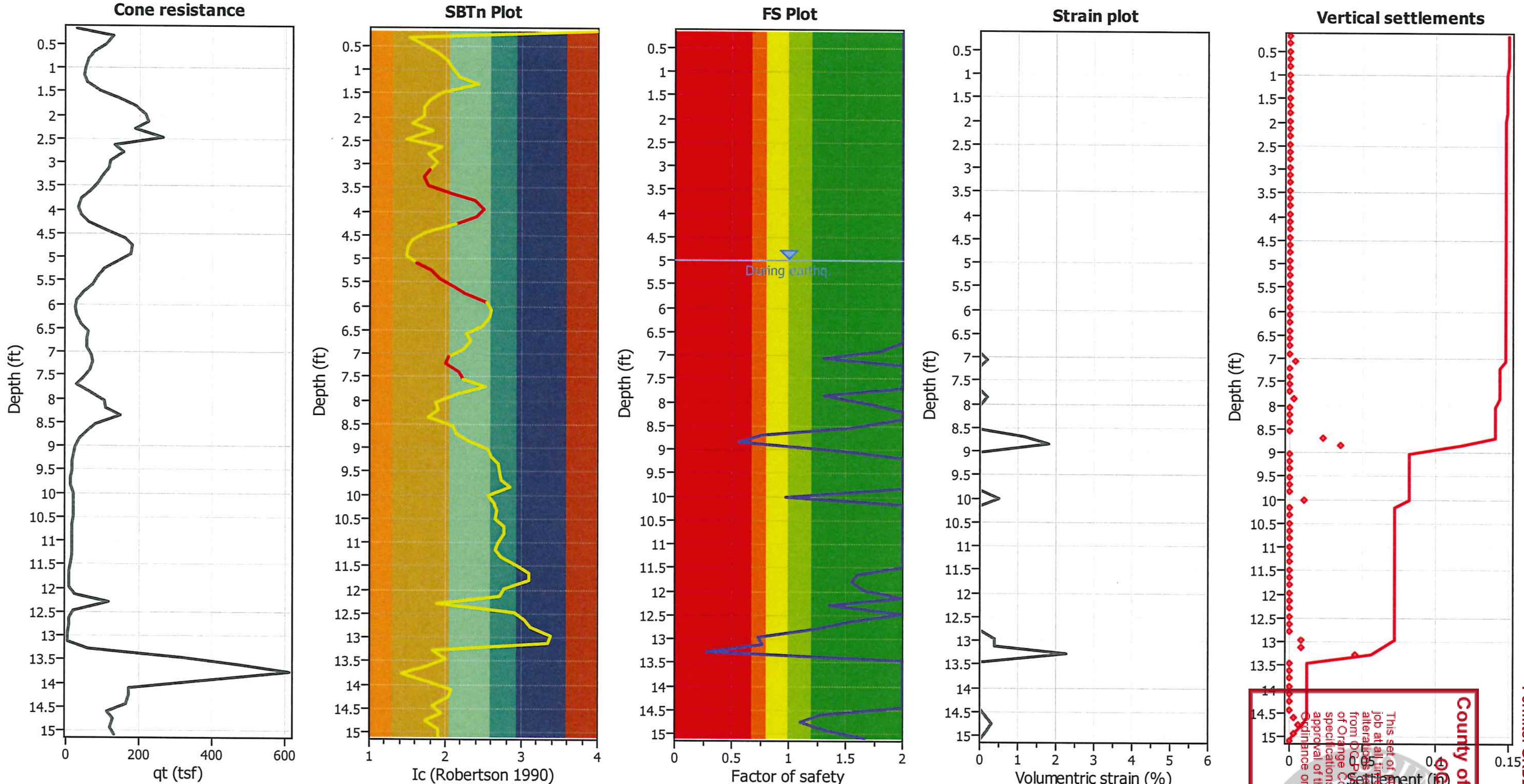
Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

Building&Safety: Ryan Rose
Approval: Geotechnical Reports
Permits: GRD20-0021

1/8/2021

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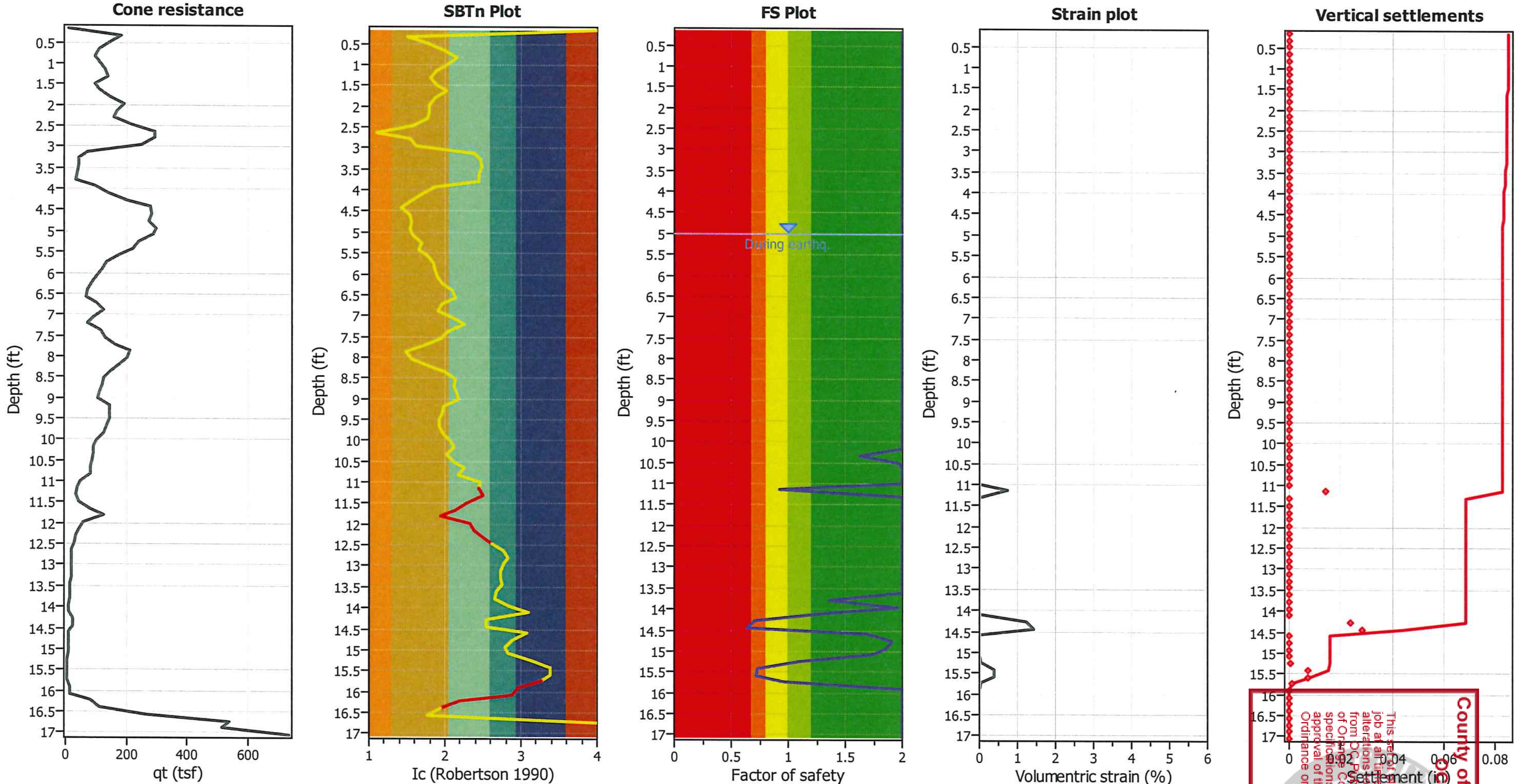
Hadi Tabatabaee
BUILDING OFFICIAL

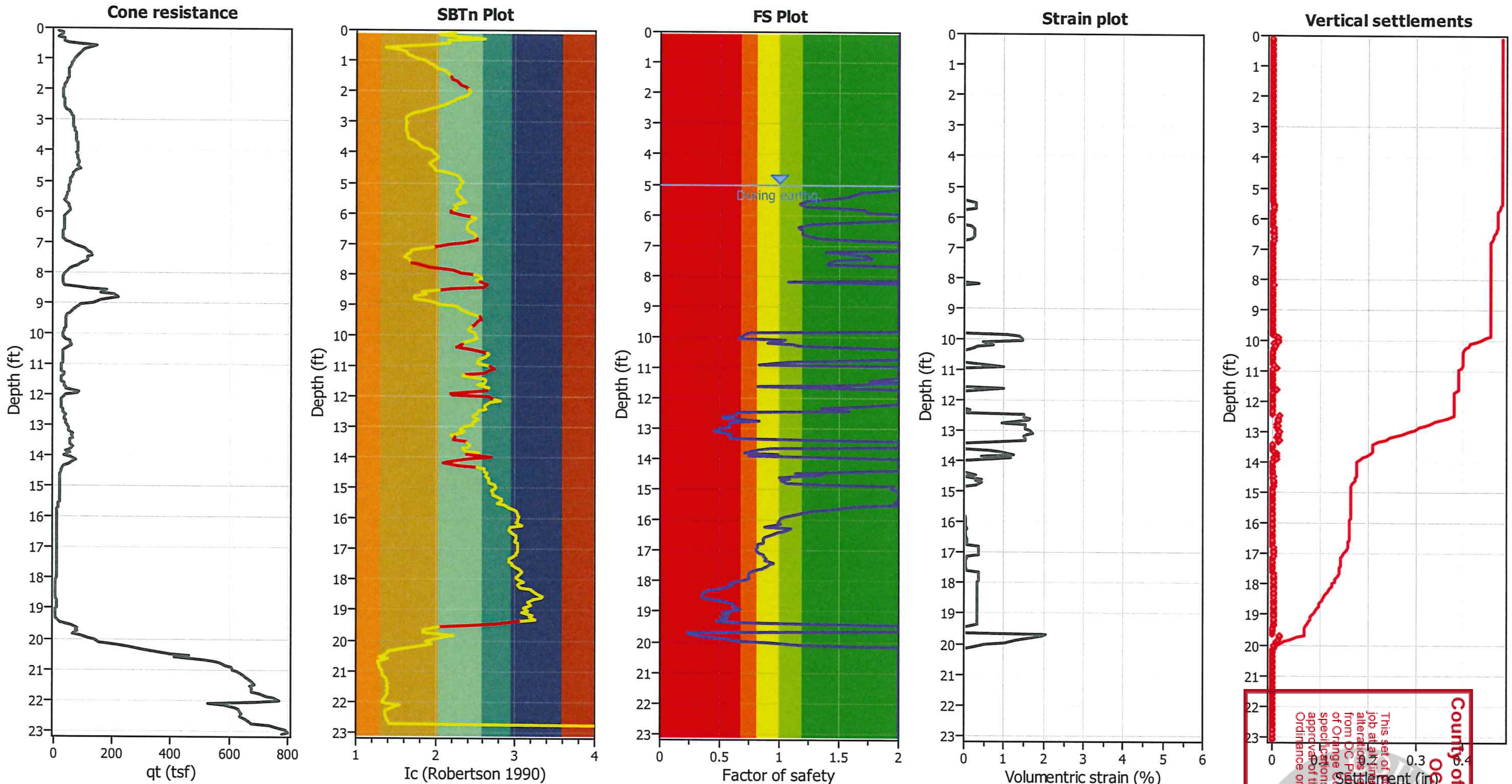
Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

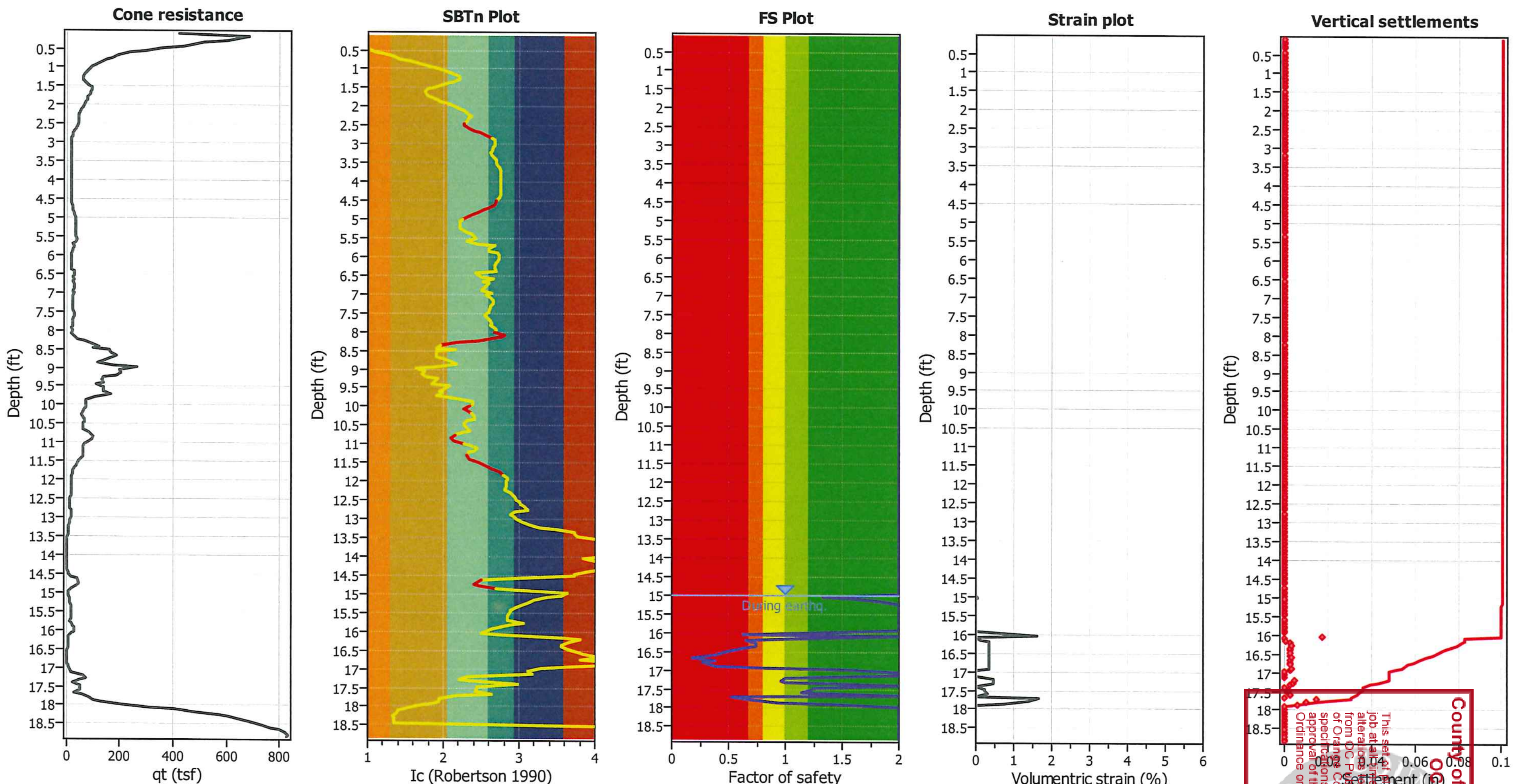
Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

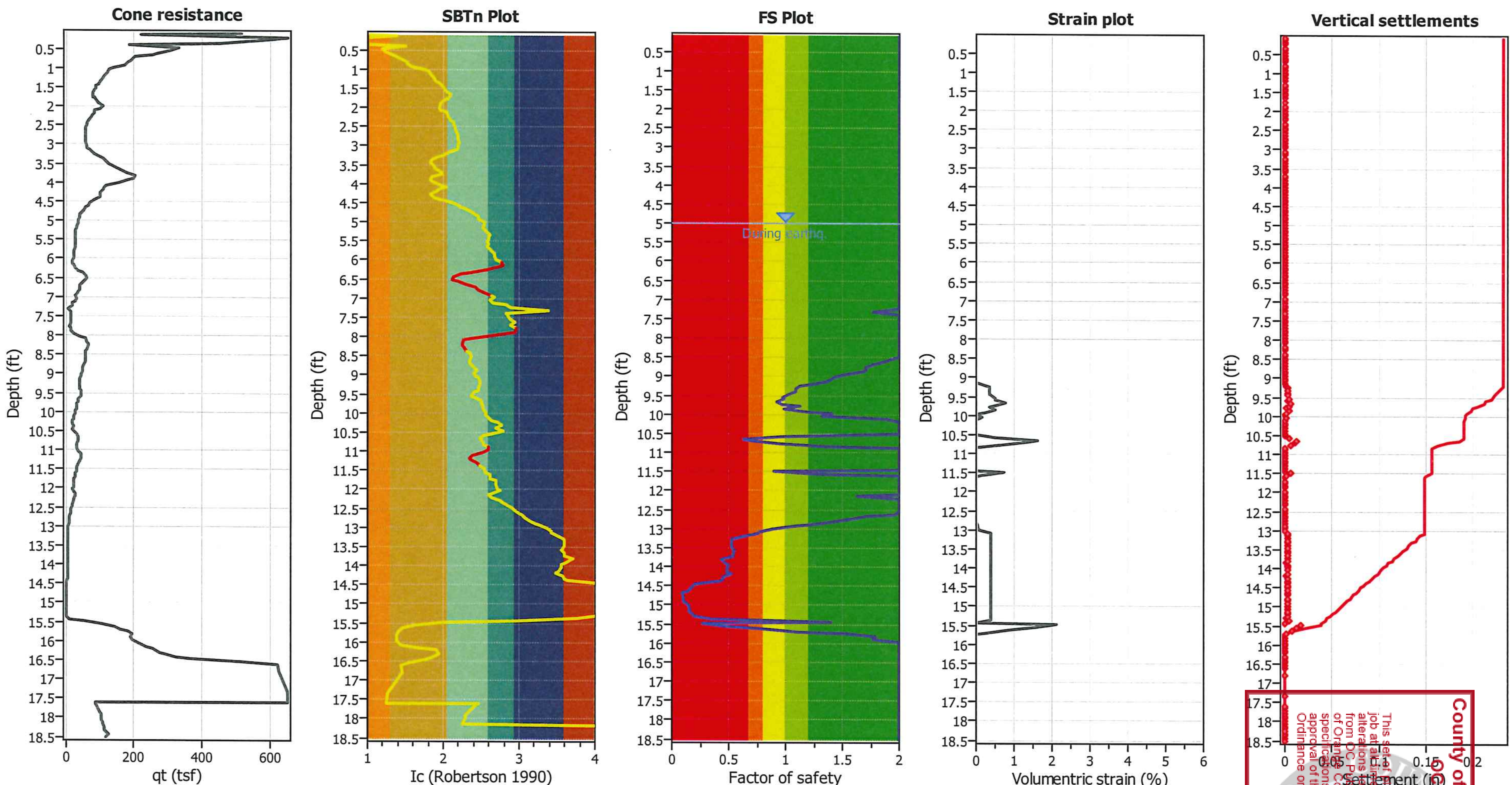
Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

Estimation of post-earthquake settlements

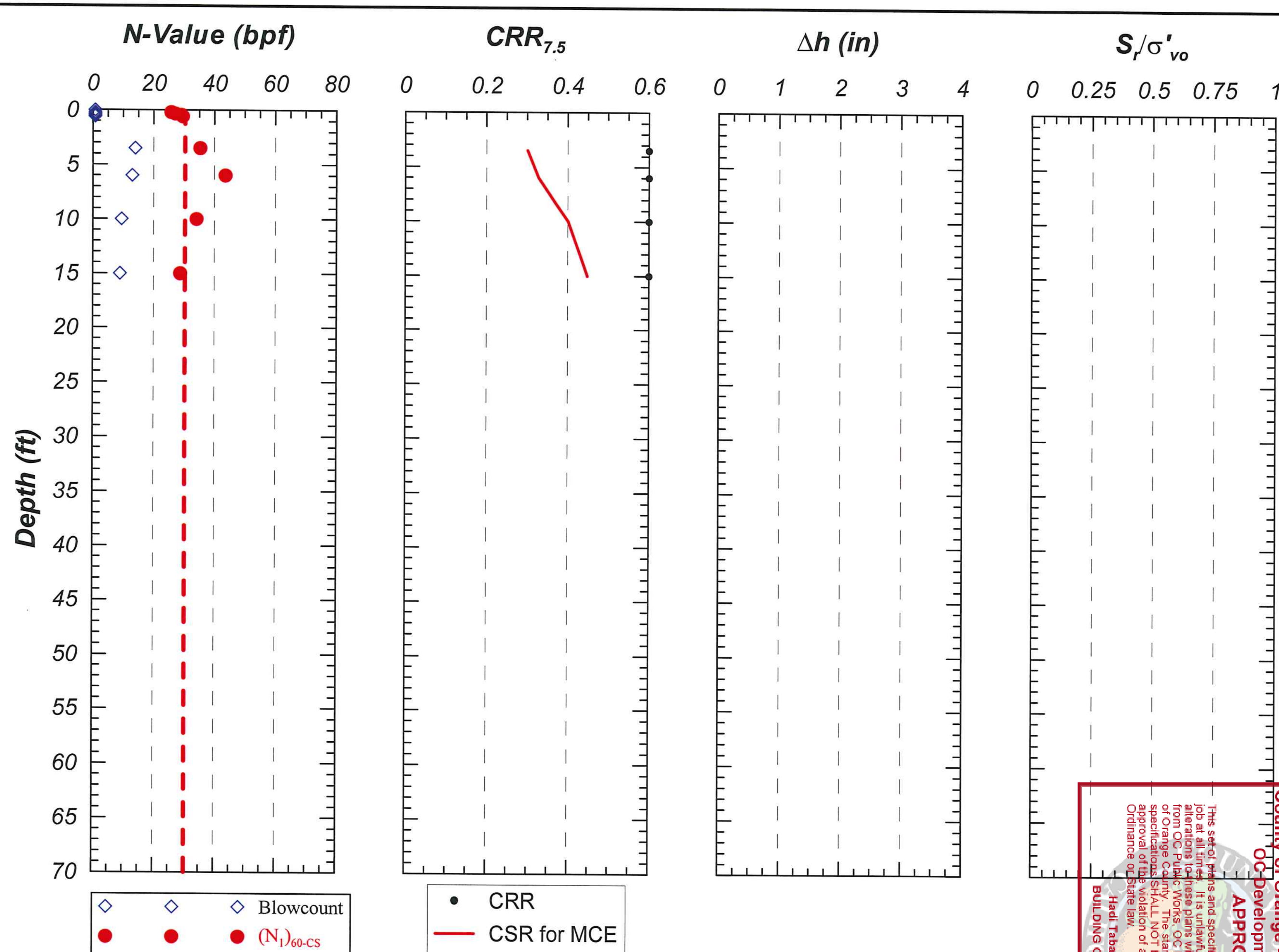


Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

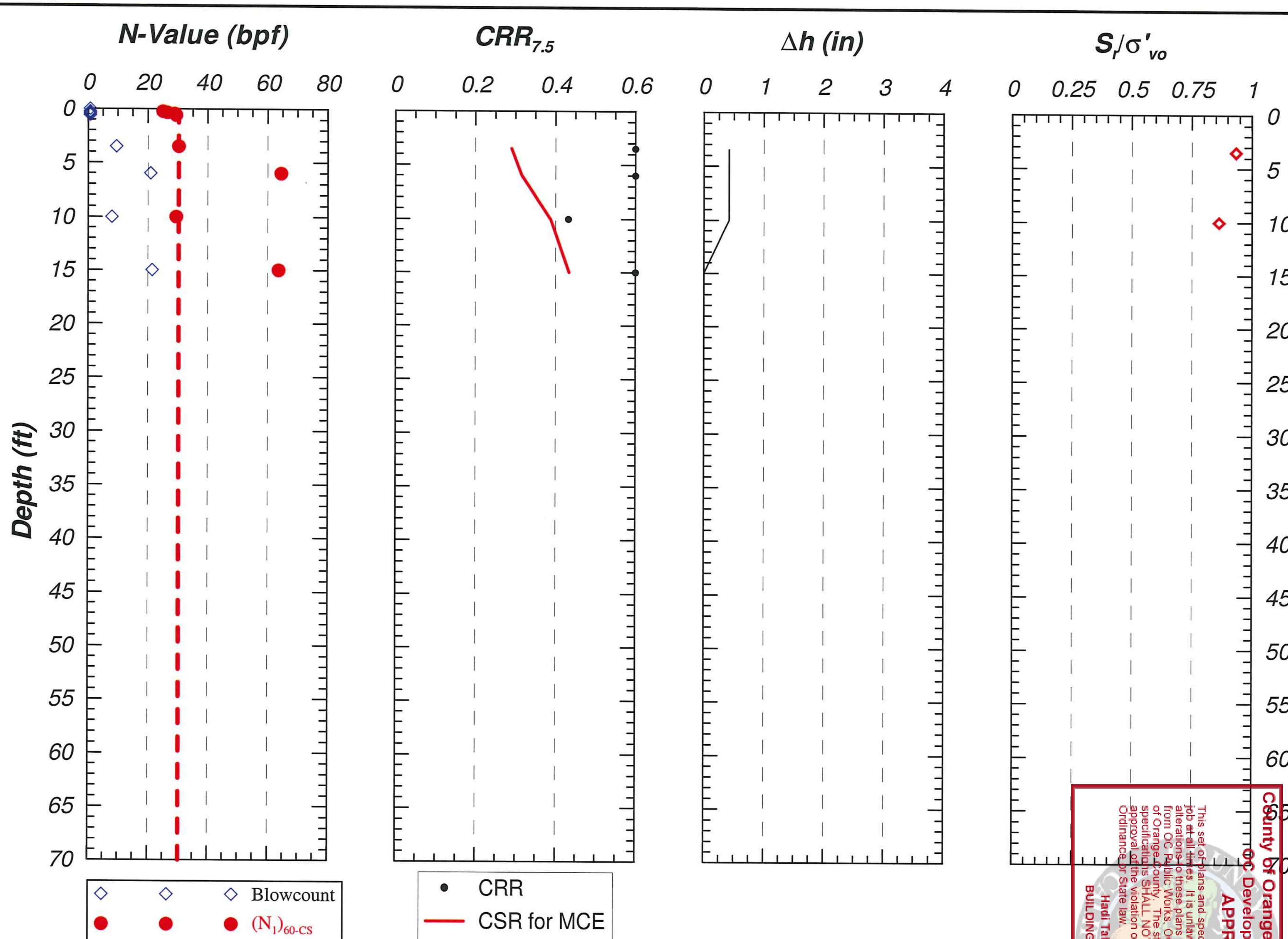
APPENDIX D-1

SPT Liquefaction, Vertical Seismic Settlement, and Liquefied Soil Strength Analyses



GMU	Project Name Dana Point Harbor Commercial Component Project No. 17-206-02	Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction Drill Hole DH-6 Figure D-1 Date Oct. 2013

DH-1.xls, DH-1.grf



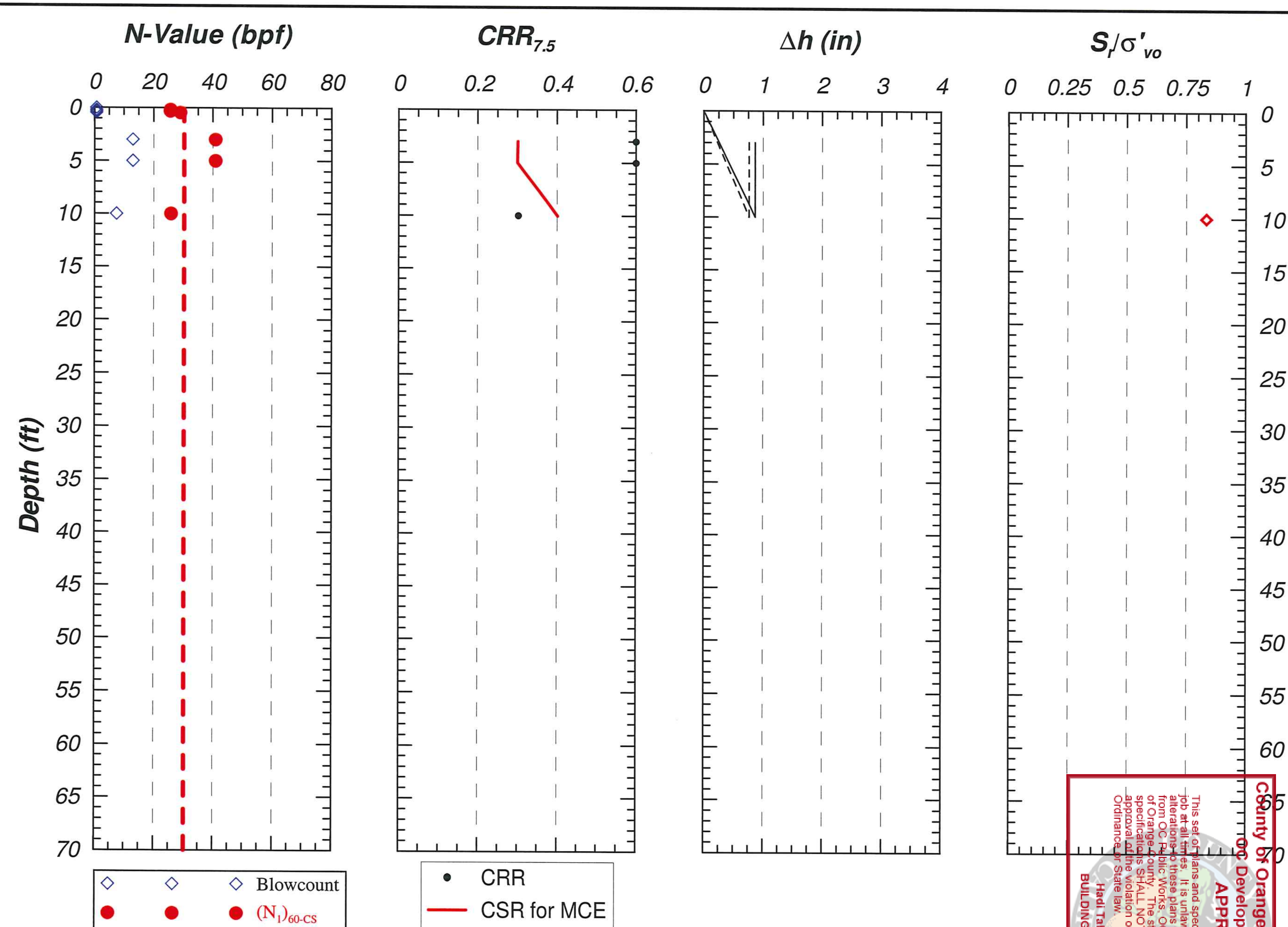
GMU

Project Name
Dana Point Harbor
Commercial Component
Project No.
11-161-00

Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction
Drill Hole DH-12

Figure D-2
Date: Oct. 2013

DH-1.xls, DH-1.grf



GMU

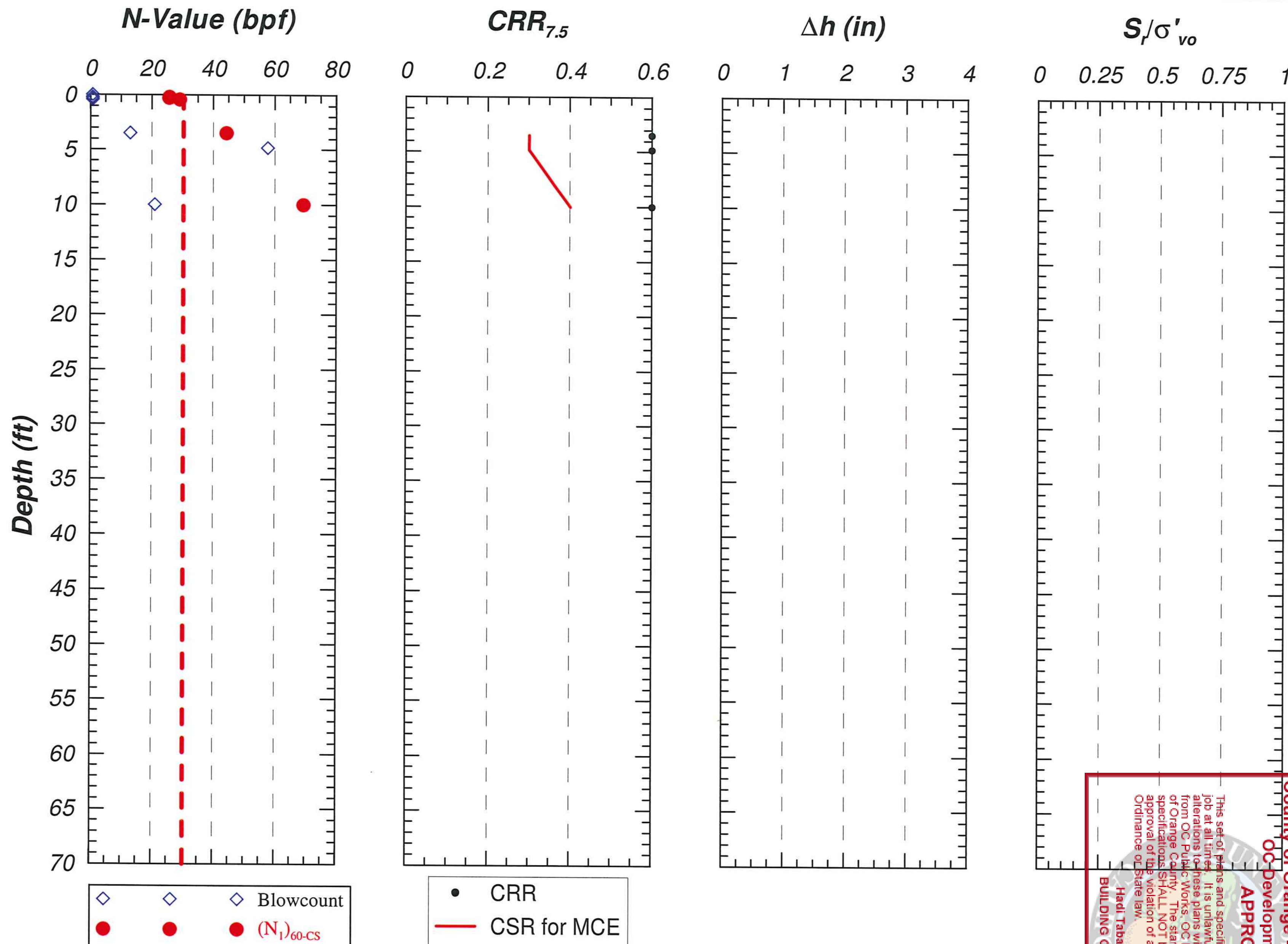
Project Name
Dana Point Harbor
Commercial Component
Project No.
11-161-00

Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction
Drill Hole DH-17

Figure D-3

Date: Oct. 2013

DH-1.xls, DH-1.grf



GMU

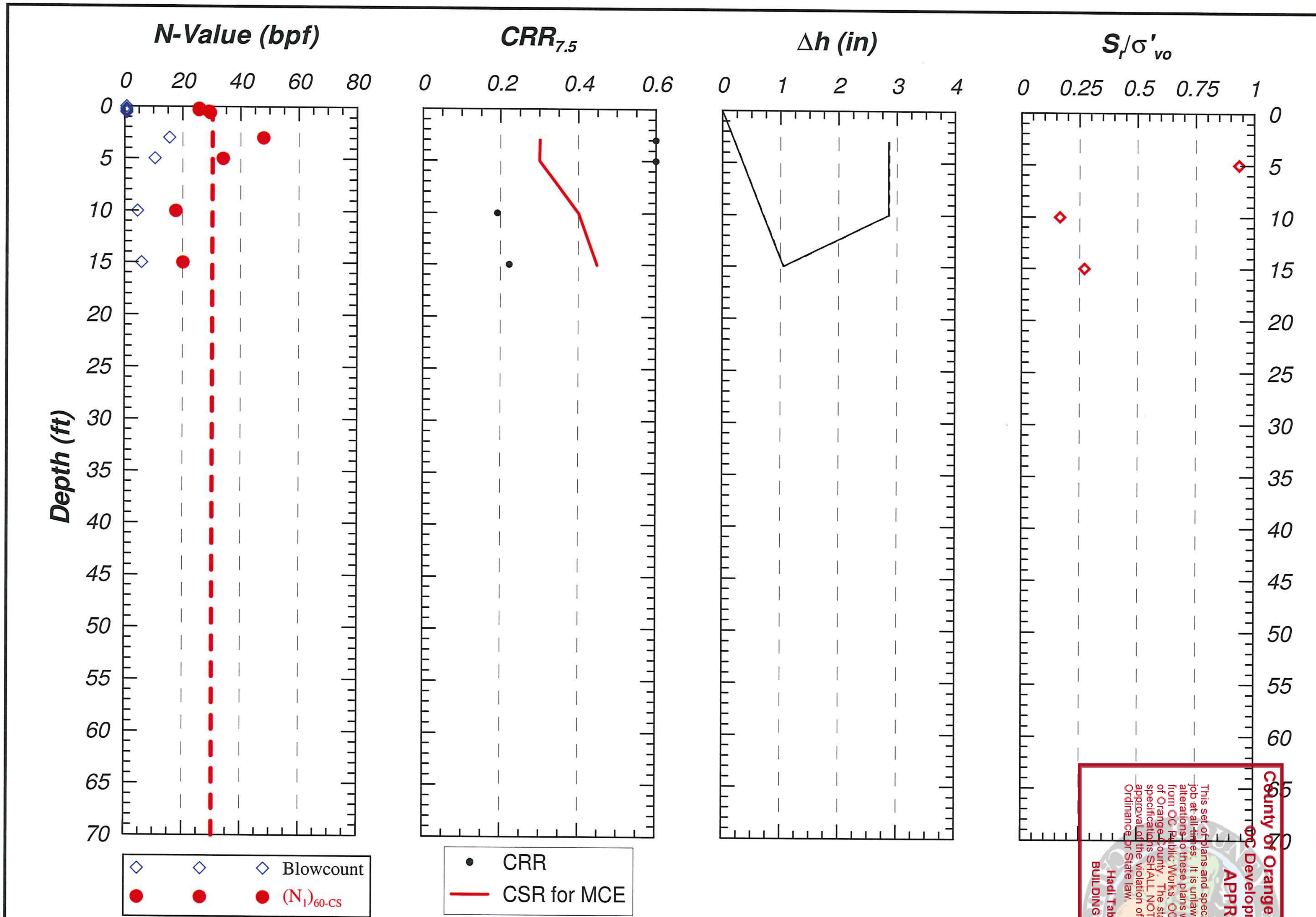
Project Name
Dana Point Harbor
Commercial Component
Project No.
17-206-02

Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction
Drill Hole DH-18

Date Oct. 2013

Figure D-4

DH-1.xls, DH-1.grf



GMU

Project Name
Dana Point Harbor
Commercial Component

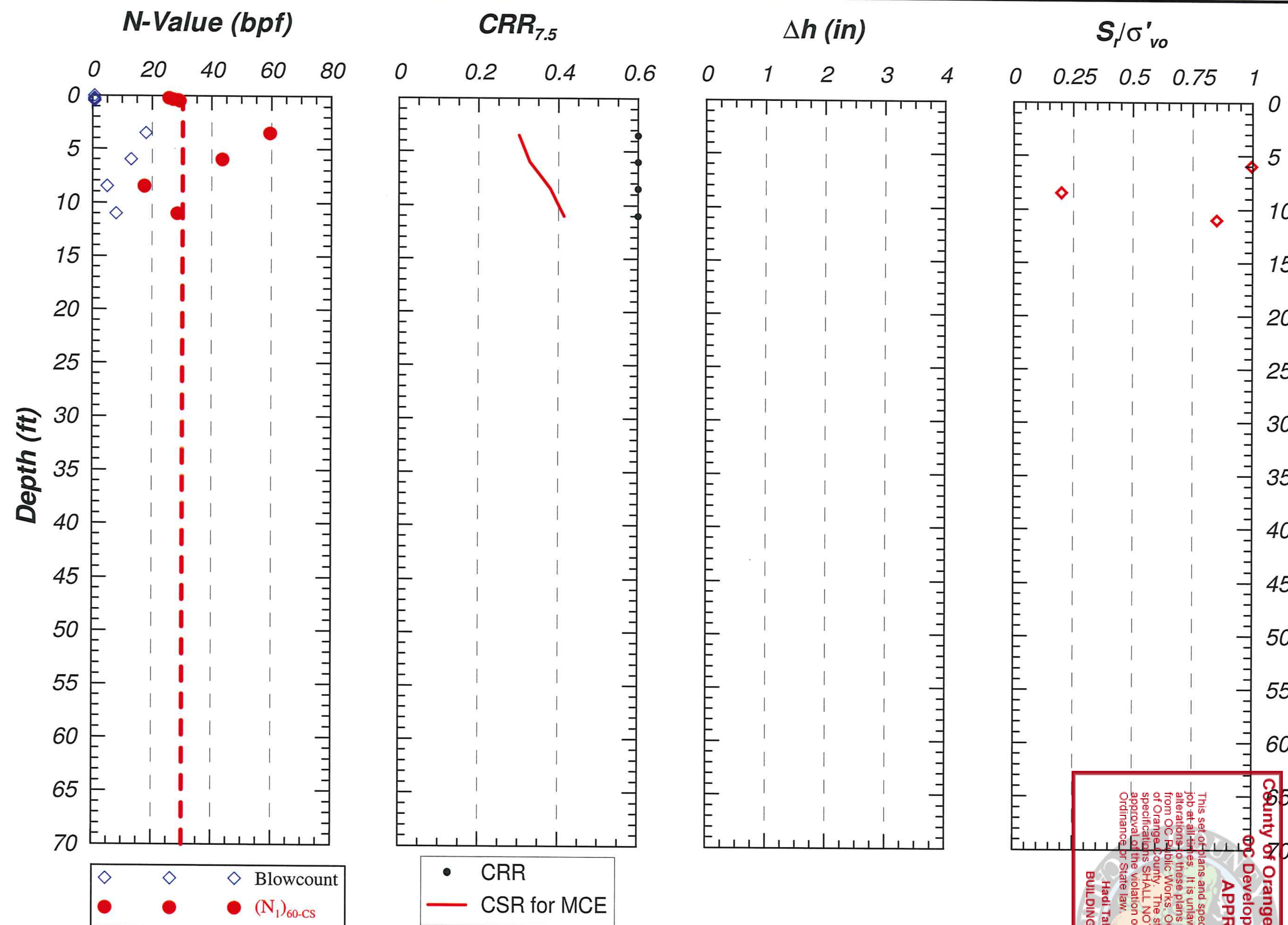
Project No.
11-161-00

Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction
Drill Hole DH-19

Figure D-5

Date: Oct. 2013

DH-1.xls, DH-1.grf



Project Name
Dana Point Harbor
Commercial Component
Project No.
17-206-02

Integrated SPT Method for Estimating
Subsurface Stratification & Liquefaction
Drill Hole DH-25

Figure D-6

Date: Oct. 2013

DH-1.xls, DH-1.grf

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Hadi Tabatabaee
BUILDING OFFICIAL

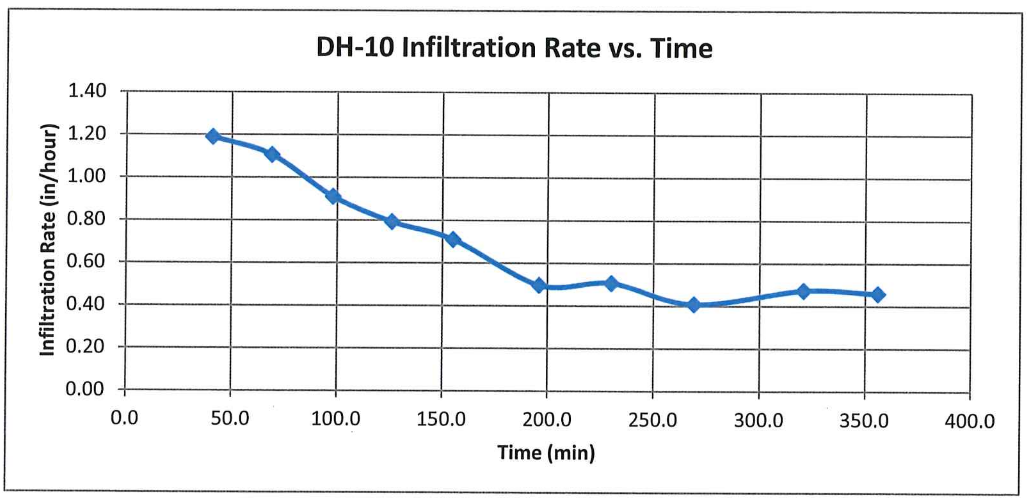
Riverside/Orange County - Infiltration Test in a Boring

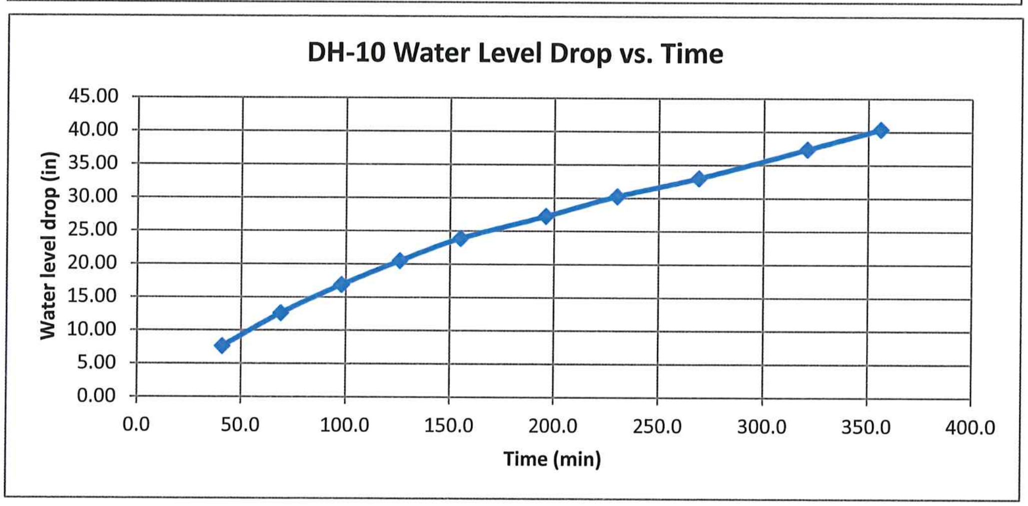
Project Name: DP Harbor Revitalization
Project Number: 11-161-00

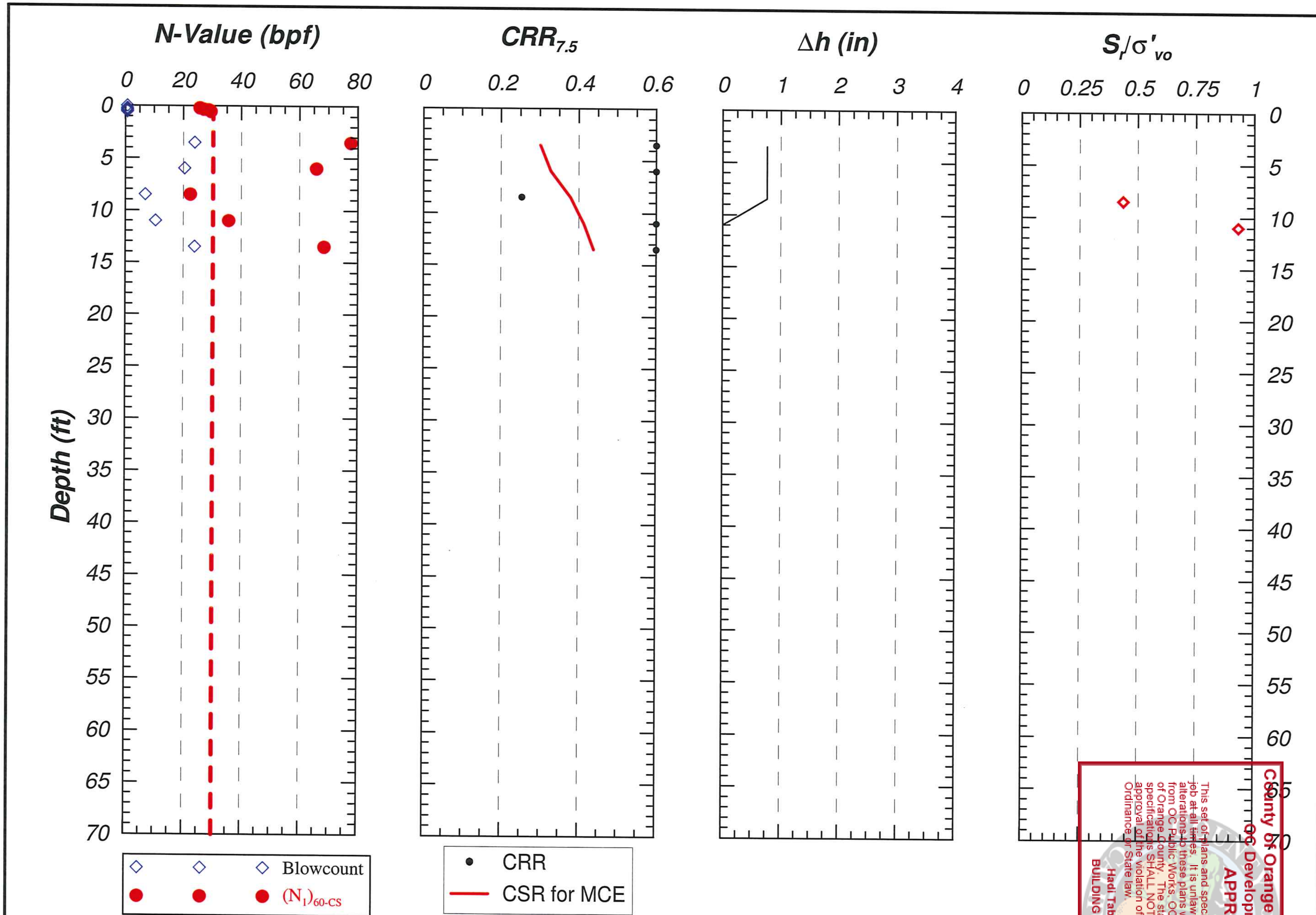
Test Hole Number: DH-10
Total Depth : 3.25 feet 39 inches
Test Hole Diameter: 10.00 inches radius= 5 inches

Trial	Start Time	End Time	ΔT	Total Time	Initial Depth of Water	Final Depth of Water	ΔD	ΣΔD	ΔHavg	Infiltration Rate
			(min)	*(min)*	*(ft)*	*(ft)*	*(in)*	*(in)*	*(in)*	*(in/hour)*
1	8:54	9:35	41.0	41.0	1.19	1.82	7.62	7.62	20.93	1.19
2	9:38	10:06	28.0	69.0	1.23	1.65	5.00	12.62	21.75	1.11
3	10:09	10:38	29.0	98.0	1.27	1.63	4.25	16.87	21.62	0.91
4	10:40	11:08	28.0	126.0	1.26	1.56	3.64	20.51	22.06	0.79
5	11:10	11:39	29.0	155.0	1.27	1.55	3.37	23.88	22.06	0.71
6	11:41	12:22	41.0	196.0	1.25	1.53	3.37	27.25	22.31	0.50
7	12:25	12:59	34.0	230.0	1.16	1.41	3.00	30.25	23.63	0.51
8	13:01	13:40	39.0	269.0	1.19	1.42	2.75	33.00	23.37	0.41
9	13:42	14:34	52.0	321.0	1.05	1.42	4.38	37.38	24.19	0.47
10	14:34	15:09	35.0	356.0	1.00	1.25	3.00	40.38	25.50	0.46

Average Infiltration Rate (in/hour) 0.45



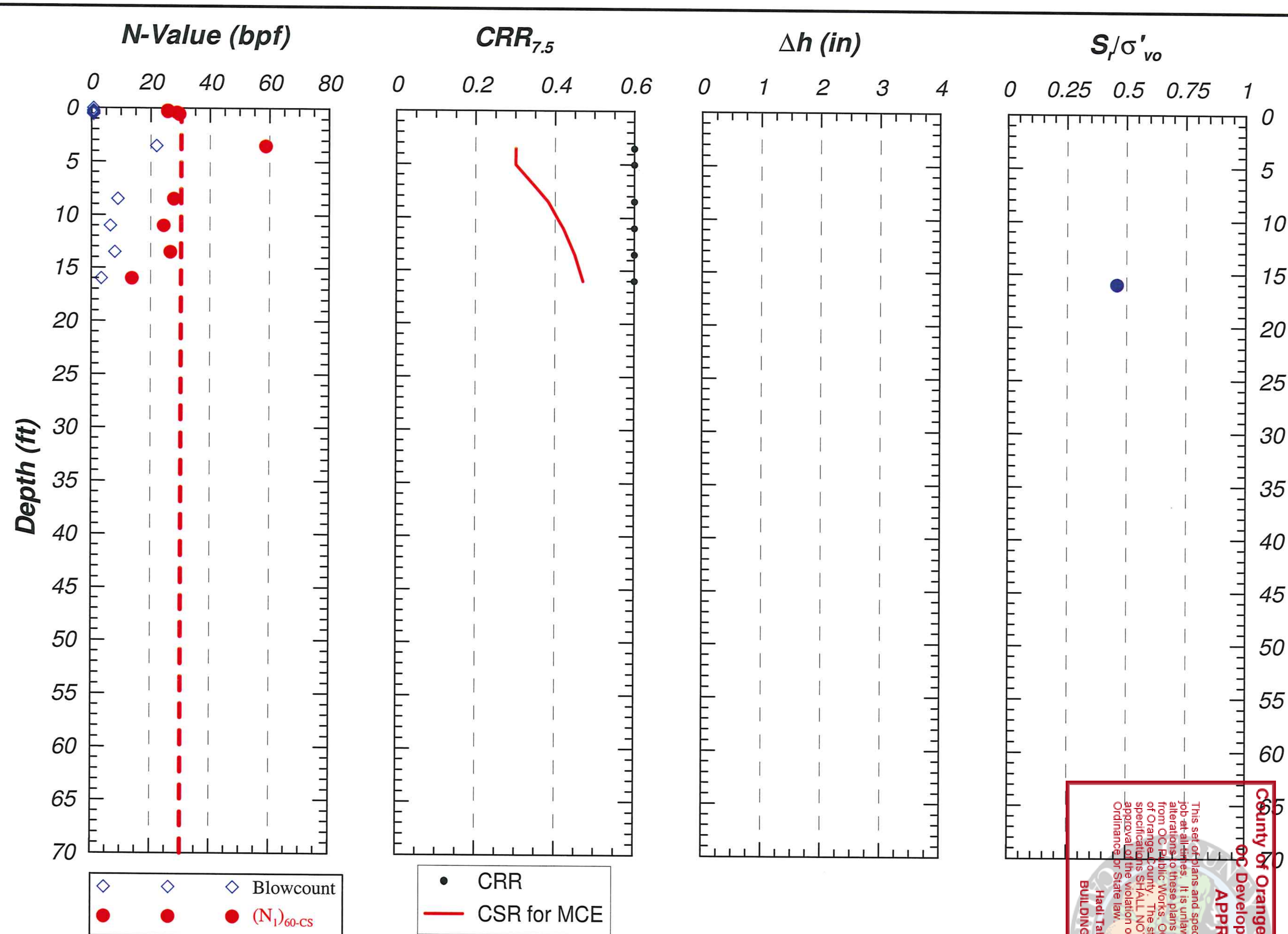




Project Name Dana Point Harbor Commercial Component	Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction Drill Hole DH-26
Project No. 17-206-02	Figure D-7

Date: Oct. 2013

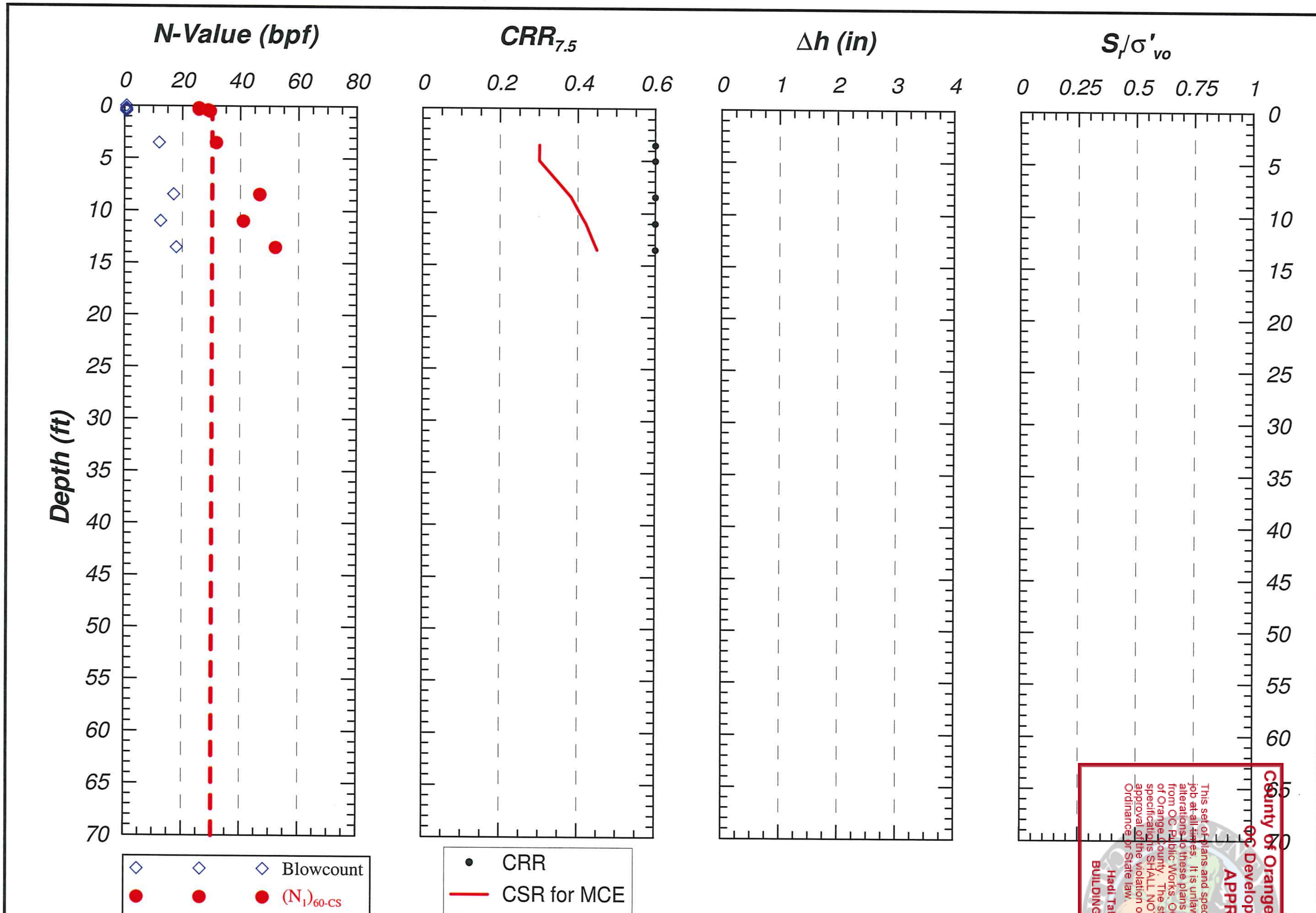
DH-1.xls, DH-1.grf



GMU	Project Name Dana Point Harbor Commercial Component Project No. 17-206-02	Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction Drill Hole DH-29	Figure D-8

Date: Oct. 2013

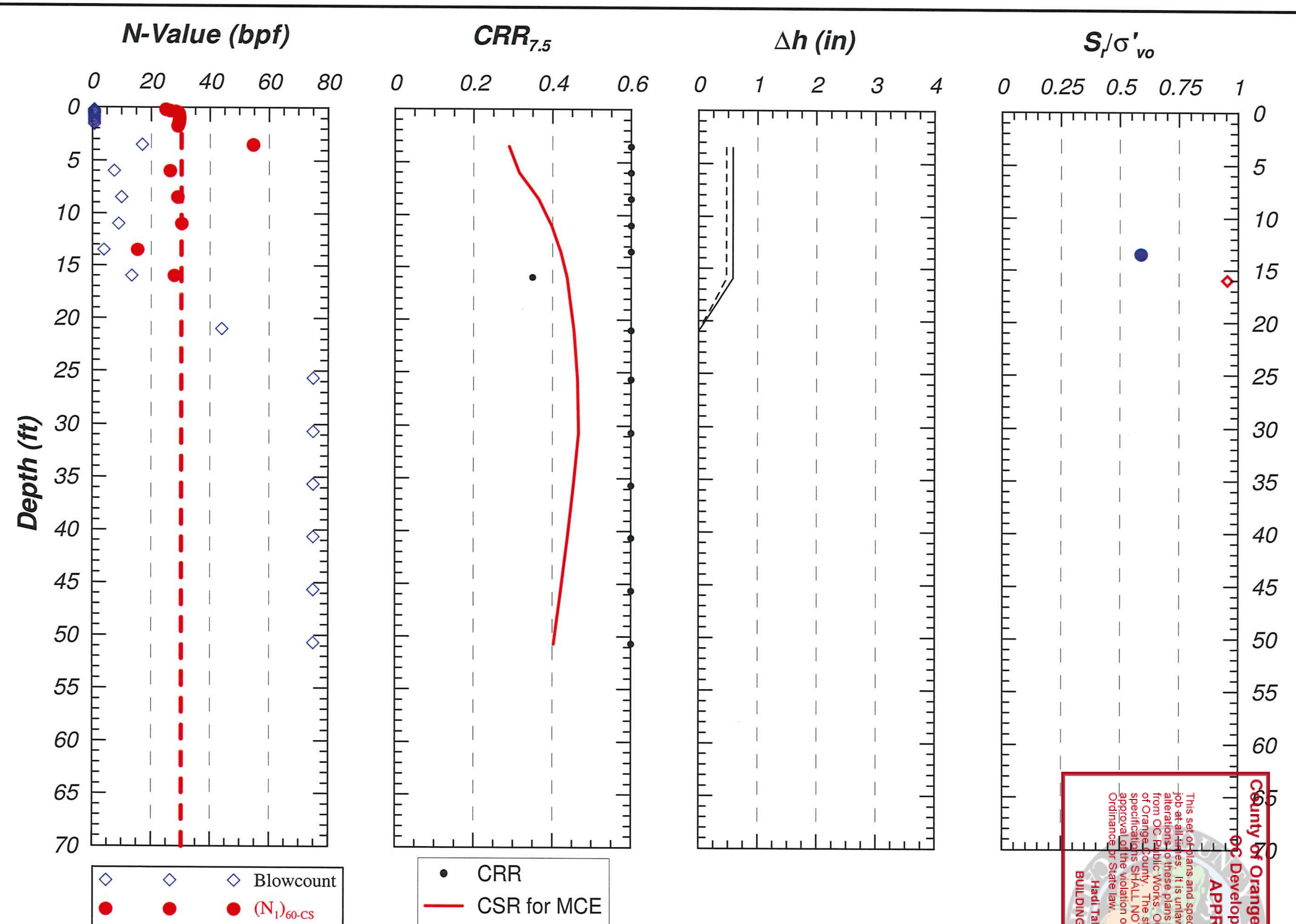
DH-1.xls, DH-1.grf



GMU	Project Name Dana Point Harbor Commercial Component Project No. 17-206-02	Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction Drill Hole DH-34 Figure D-9

Date: Oct. 2013

DH-1.xls, DH-1.grf



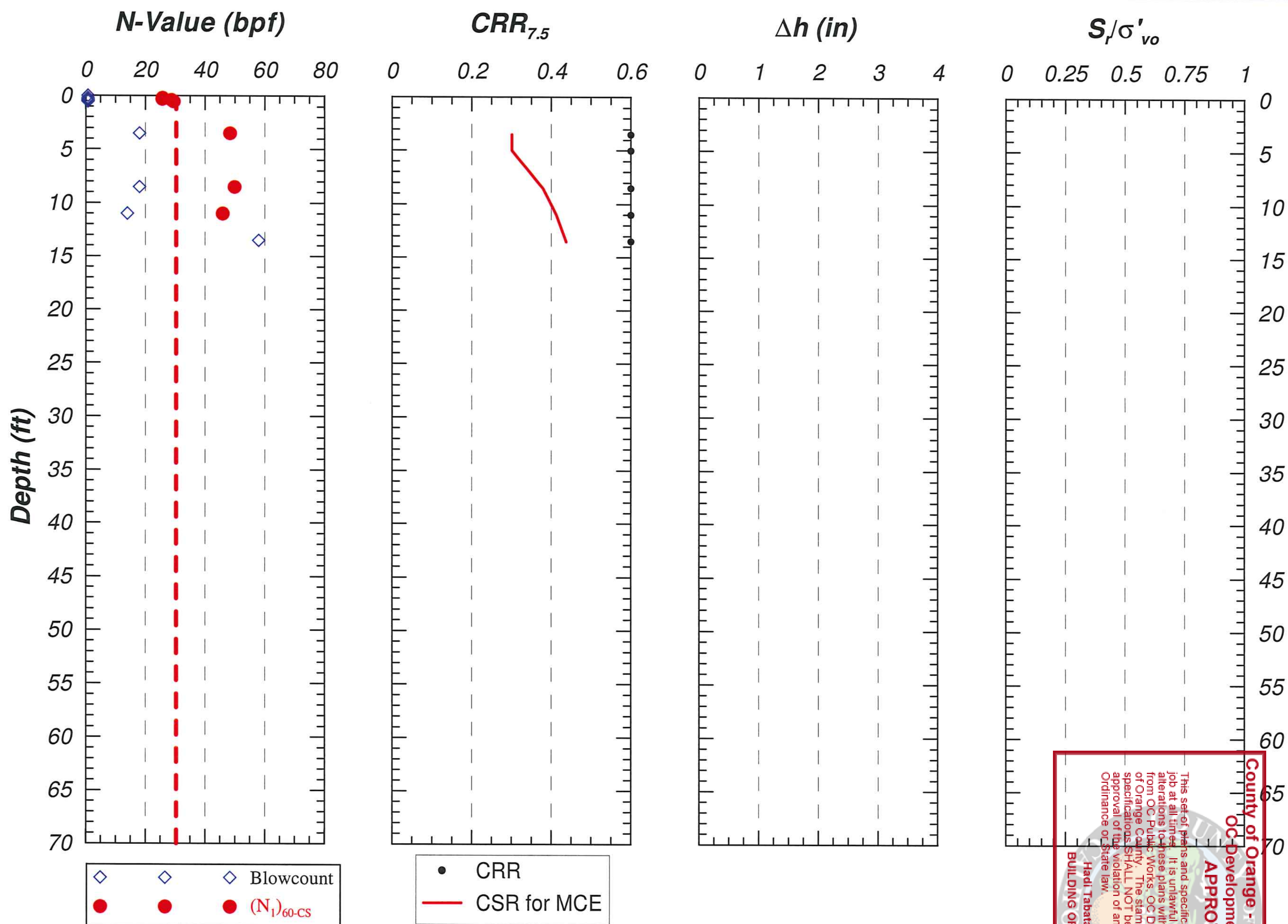
Project Name
Dana Point Harbor
Commercial Component
Project No.
17-206-02

Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction Drill Hole DH-35

Figure D-10

Date: Oct. 2013

DH-1.xls, DH-1.grf



GMU

Project Name
Dana Point Harbor
Commercial Component
Project No.
17-206-02

Integrated SPT Method for Estimating Subsurface Stratification & Liquefaction
Drill Hole DH-46

Figure D-11

Date Oct. 2013

DH-1.xls, DH-1.grf

APPENDIX E

Lateral Spread Analysis

Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Project No. 17-206-02
Section A-A'
November, 2019

Static Analysis, Run 1.1
Post Earthquake Condition
Liquefied Layer 1
Horz Seismic Coef.: 0
Entry and Exit

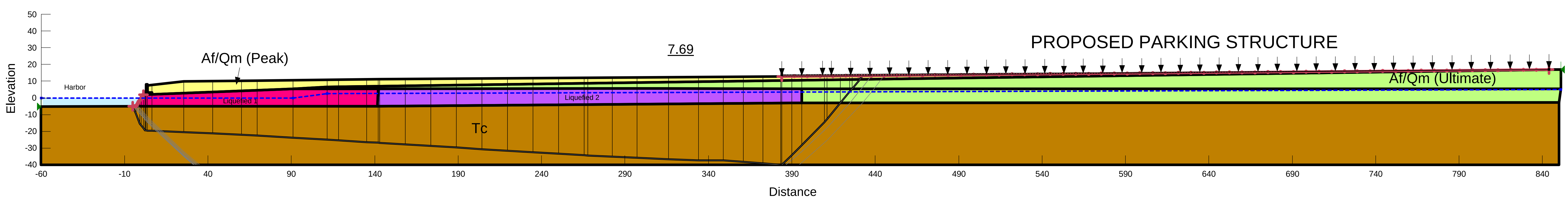
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °

Name: Af/Qm (Ultimate)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 80 psf
Phi': 30 °

Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.17

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.5



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Project No. 17-206-02
Section A-A'
November, 2019

Static Analysis, Run 1.1
Post Earthquake Condition
Liquefied Layer 1
Horz Seismic Coef.: 0
Block Search

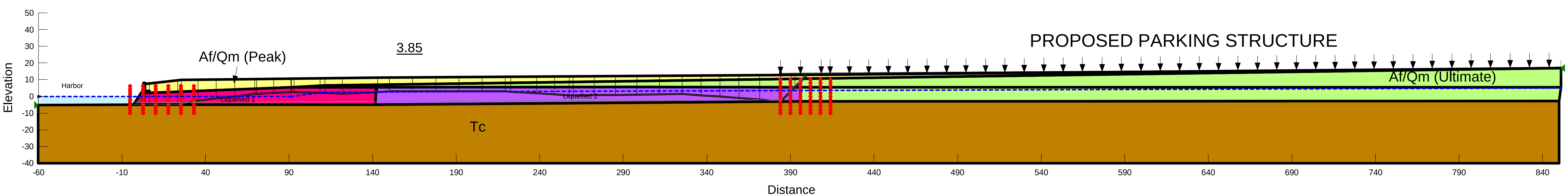
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °

Name: Af/Qm (Ultimate)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 80 psf
Phi': 30 °

Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.17

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.5



Project No. 17-206-02
Section A-A'
November, 2019

Pseudo-Static Analysis, Run 1.2
Liquefied Layer 1
Horz Seismic Coef.: 0.15
Entry and Exit

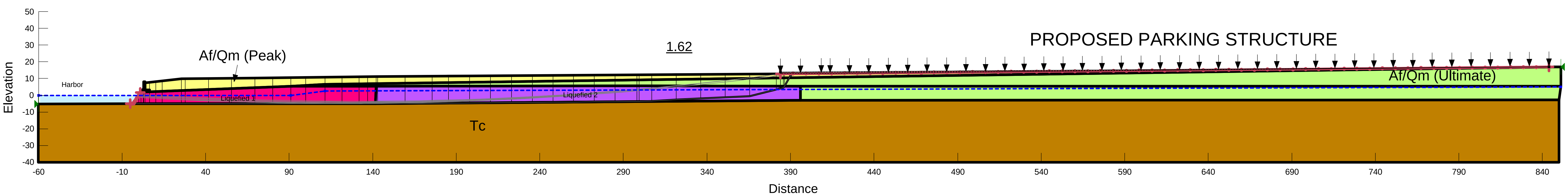
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °

Name: Af/Qm (Ultimate)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 80 psf
Phi': 30 °

Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.17

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.5



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Project No. 17-206-02
Section A-A'
November, 2019

Pseudo-Static Analysis, Run 1.2
Liquefied Layer 1
Horz Seismic Coef.: 0.15
Block Search

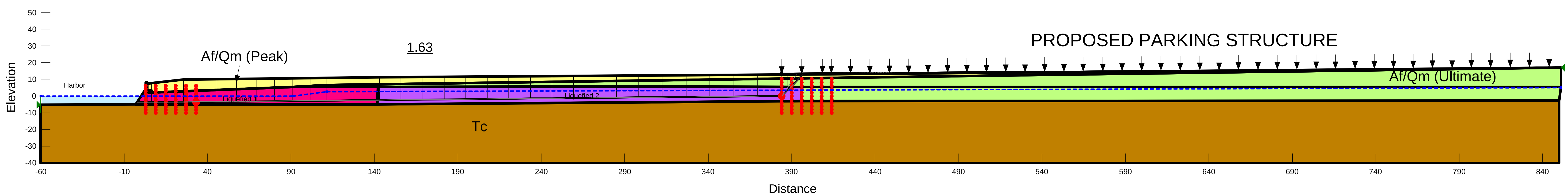
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °

Name: Af/Qm (Ultimate)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 80 psf
Phi': 30 °

Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.17

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.5



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Project No. 17-206-02
Section A-A'
November, 2019

Deformation Analysis, Run 1.3
Liquefied Layer 1
Horz Seismic Coef.: 0.28
Deformation Due to MCE < 6 inches
Entry and Exit

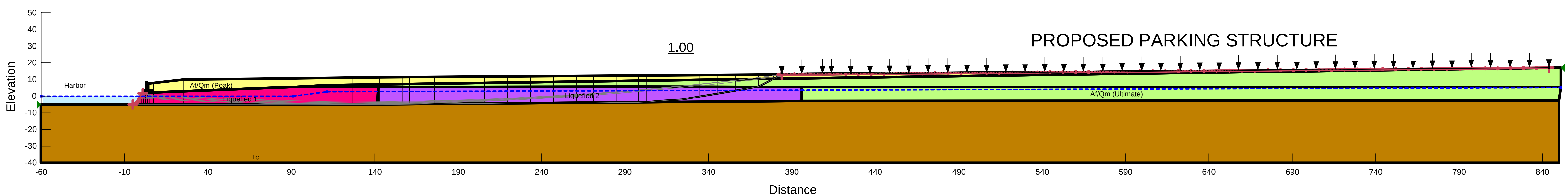
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °

Name: Af/Qm (Ultimate)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 80 psf
Phi': 30 °

Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.17

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.5



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Project No. 17-206-02
Section A-A'
November, 2019

Deformation Analysis, Run 1.3
Liquefied Layer 1
Horz Seismic Coef.: 0.28
Deformation Due to MCE < 6 inches
Block Search

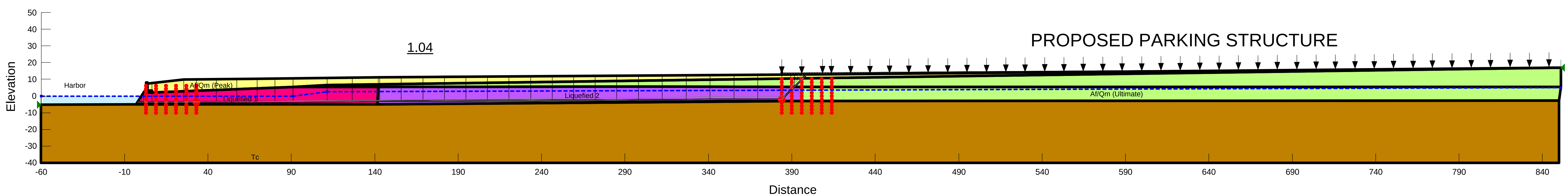
Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °

Name: Af/Qm (Ultimate)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 80 psf
Phi': 30 °

Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.17

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.5



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Project No. 17-206-02
Section B-B'
November, 2019

Static Analysis, Run 1.1
Post Earthquake Condition
Liquefied Layer 1
Horz Seismic Coef.: 0
Entry and Exit

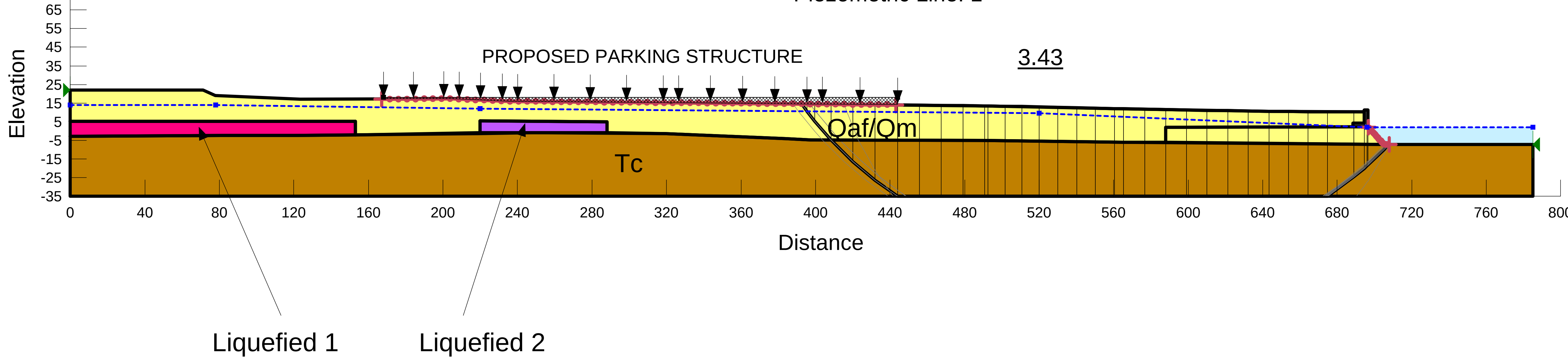
Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °
Piezometric Line: 1

Name: Tc
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 695 psf
Phi': 34 °
Piezometric Line: 1

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °
Piezometric Line: 1

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.45
Minimum Strength: 0
Piezometric Line: 1

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.35
Minimum Strength: 0
Piezometric Line: 1



Project No. 17-206-02
Section B-B'
November, 2019

Static Analysis, Run 1.1
Post Earthquake Condition
Liquefied Layer 1
Horz Seismic Coef.: 0
Block Search

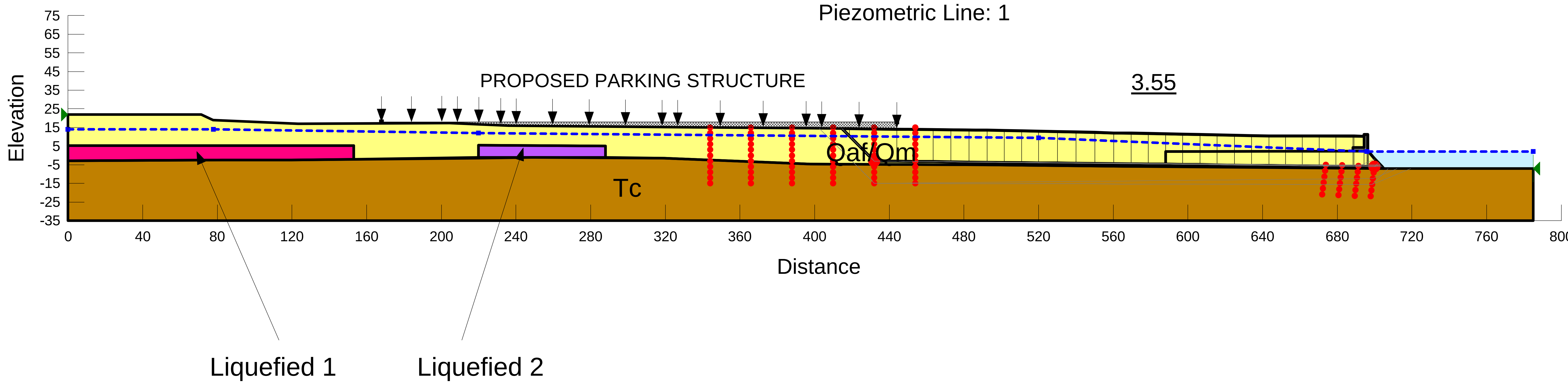
Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °
Piezometric Line: 1

Name: Tc
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 695 psf
Phi': 34 °
Piezometric Line: 1

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °
Piezometric Line: 1

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.45
Minimum Strength: 0
Piezometric Line: 1

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.35
Minimum Strength: 0
Piezometric Line: 1



Project No. 17-206-02
Section B-B'
November, 2019

Pseudo-Static Analysis, Run 1.2
Liquefied Layer 1
Horz Seismic Coef.: 0.15
Entry and Exit

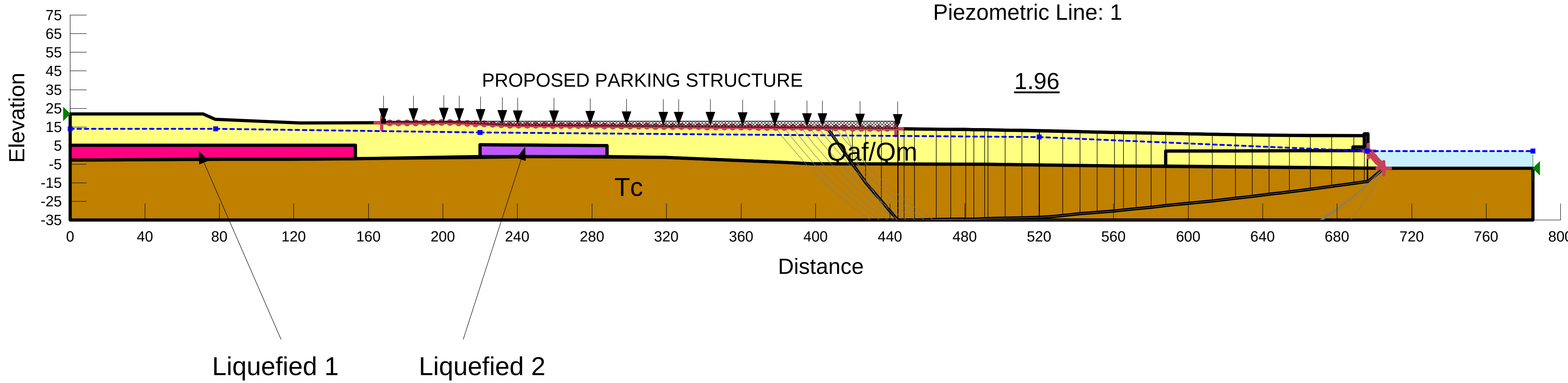
Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °
Piezometric Line: 1

Name: Tc
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 695 psf
Phi': 34 °
Piezometric Line: 1

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °
Piezometric Line: 1

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.45
Minimum Strength: 0
Piezometric Line: 1

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.35
Minimum Strength: 0
Piezometric Line: 1



Project No. 17-206-02
Section B-B'
November, 2019

Pseudo-Static Analysis, Run 1.2
Liquefied Layer 1
Horz Seismic Coef.: 0.15
Block Search

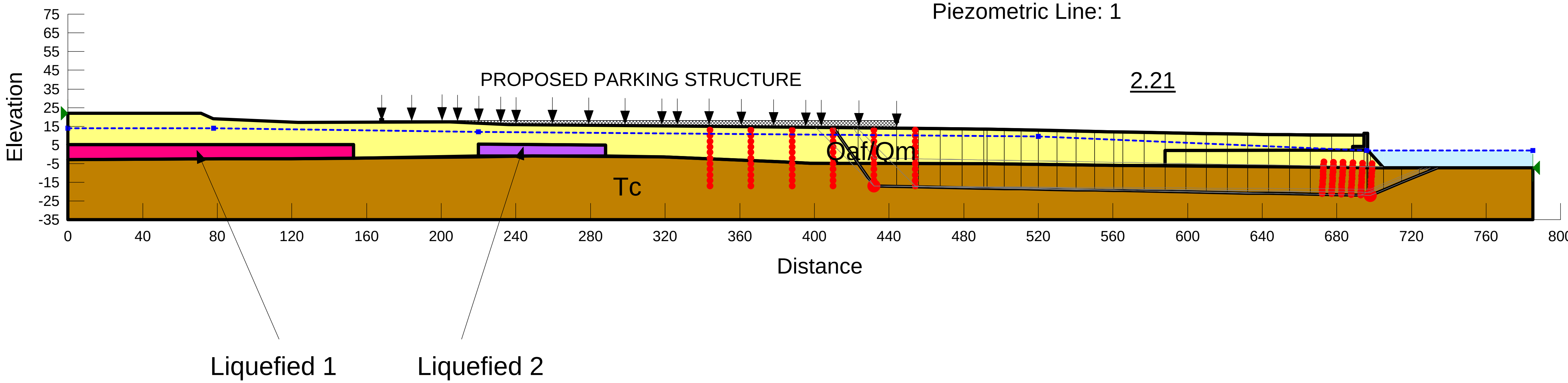
Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °
Piezometric Line: 1

Name: Tc
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 695 psf
Phi': 34 °
Piezometric Line: 1

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °
Piezometric Line: 1

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.45
Minimum Strength: 0
Piezometric Line: 1

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.35
Minimum Strength: 0
Piezometric Line: 1



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Project No. 17-206-02
Section B-B'
November, 2019

Deformation Analysis, Run 1.3
Liquefied Layer 1
Horz Seismic Coef.: 0.6
Deformation Due to MCE < 1.5 inches
Entry and Exit

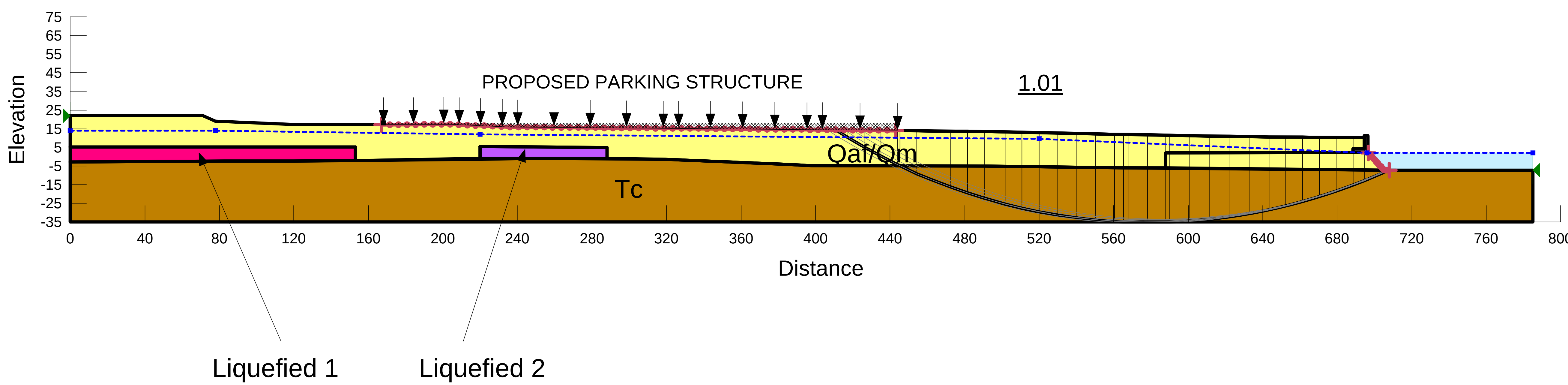
Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °
Piezometric Line: 1

Name: Tc
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 695 psf
Phi': 34 °
Piezometric Line: 1

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °
Piezometric Line: 1

Name: Liquefied 1
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.45

Name: Liquefied 2
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.35



Building&Safety: Ryan Rose 1/8/2021
Approval: Geotechnical Reports
Permits: GRD20-0021

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Project No. 17-206-02
Section B-B'
November, 2019

Pseudo-Static Analysis, Run 1.3
Liquefied Layer 1
Horz Seismic Coef.: 0.45
Deformation Due to MCE < 2.5 inches
Block Search

Name: Af/Qm (Peak)
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 31 °
Piezometric Line: 1

Name: Tc
Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion': 695 psf
Phi': 34 °
Piezometric Line: 1

Name: Concrete
Model: Mohr-Coulomb
Unit Weight: 150 pcf
Cohesion': 14,400 psf
Phi': 50 °
Piezometric Line: 1

Name: Liquefied 1
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.45
Minimum Strength: 0
Piezometric Line: 1

Name: Liquefied 2
Model: S=f(overburden)
Unit Weight: 125 pcf
Tau/Sigma Ratio: 0.35
Minimum Strength: 0
Piezometric Line: 1