GEOTECHNICAL INVESTIGATION

On

PROPOSED RESIDENTIAL DEVELOPMENT

At

18110 Monterey Road
Morgan Hill, California

For

City Ventures

By
Quantum Geotechnical, Inc.

Project No. F019.G
August 6, 2019

QUANTUM GEOTECHNICAL INC.

Project No. F019.G
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Mr. Jason Bernstein
Director of Development
City Ventures
444 Spear Street, Suite 200
San Francisco, CA 94105

Subject: Proposed Residential Development
18110 Monterey Road
Morgan Hill, California
GEOTECHNICAL INVESTIGATION

Dear Mr. Bernstein:

In accordance with your authorization, ***Quantum Geotechnical, Inc.,*** has investigated the geotechnical conditions at the subject site located in Morgan Hill, California

The accompanying report presents the results of our field investigation. Our findings indicate that development of the site for the proposed new residential development is feasible provided the recommendations of this report are carefully followed and are incorporated into the project plans and specifications.

Should you have any questions relating to the contents of this report or should additional information be required, please contact our office at your convenience.

Sincerely,
Quantum Geotechnical, Inc.

Simon Makdessi, P.E., G.E.
President

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PURPOSE AND SCOPE

The purpose of the investigation for the proposed new residential subdivision development located on Monterey Road in Morgan Hill, California, was to determine the surface and subsurface soil conditions at the subject site. Based on the results of the investigation, criteria were established for the grading of the site, the design of foundations for the proposed development, and the construction of other related facilities on the property.

Our investigation included the following:

a. Field reconnaissance by the Soil Engineer;
b. Determine the general seismicity of the site in accordance with the 2016 CBC;
c. Drilling and sampling of five soil borings;
c. Laboratory testing of soil samples;
d. Analysis of the data and formulation of conclusions and recommendations; and
e. Preparation of this written report.

PROPOSED DEVELOPMENT

It is our understanding that the proposed project consists of developing the site for the construction of a subdivision of single family homes, along with new streets, utilities, and other associated improvements. It is assumed that the construction will use wood for the framing of new buildings. Cuts and fills during grading are unknown, but it is anticipated that import fill is needed to raise the site to design grade levels.

SITE LOCATION AND DESCRIPTION

The site is located in northwestern part of Morgan Hill, west of Highway 101 and south of Cochrane Avenue, within level terrain at approximately 90 feet above mean sea level (7), as shown on the "Site Vicinity and Fault Map", Figure 1, attached to Appendix A. The site is triangular in shape, elongated in the north to south direction, and is approximately 4.6 acres in area. The site is bounded by Monterey Road to the west, railroad tracks to the east, and a vacant field on a separate parcel to the south. The site currently consists of vacant, recently tilled field, with one small building on the southeastern corner of the lot. Tall trees line the perimeter of the property.

GENERAL GEOLOGIC CONDITIONS

The site is located within the Coast Ranges Geomorphic Province of California. Throughout the Cenozoic Era, the western part of California has been affected by tectonic forces associated with lateral or transform plate motion between the North American and Pacific crustal plates, which has produced a complex system of northwest-trending faults - the San Andreas, Hayward, and Calaveras Fault systems being the most prominent. Uplift, erosion and subsequent re-deposition of sedimentary rocks within this province have been driven primarily by the northwest-southeast directed strike-slip movement of the tectonic plates and the associated northeast oriented compressional stress. The northwest-trending coastal mountain ranges are the result of an orogeny believed to have been occurring since the Pleistocene epoch (approximately 2-3 million years before present).

The site resides in level terrain at 90 feet above mean sea level (7) within the southern Santa Clara Valley. Based on a review of geologic maps (3), the site is underlain by Pleistocene age alluvial fan deposits. These deposits will generally consist of well consolidated coarser grained material nearer to the crown of the fan and around the area of paleochannels, and finer grained silt and clay deposits nearer to the toe. Site and regional geology are displayed in the "Regional Geologic Map", Figure 2, Appendix A.

The USGS Quaternary Fault database (6) provides a record of quaternary fault surface traces based on historic mapping and observations. Table I, below, lists the USGS Quaternary active fault traces located within 10 miles of the site location. Nearby fault traces are as indicated on Figure 1, "Site Vicinity and Fault Map", attached to Appendix A.

The California Geological Survey seismic hazard zone report for the Morgan Hill quadrangle (2) excludes the site from areas mapped for liquefaction, landslide, and fault surface rupture hazards. According to the California Department of Water Resources, Water Data Library (1), groundwater may be encountered around 20 feet below ground surface within the site vicinity.

Table I
List of Quaternary Faults

Fault ID	Distance from Site (mi)	USGS Activity Level (yrs)
Calaveras	1.0	< 150 ya
Tres Pinos	2.0	<15 kya
Quien Sabe	3.3	< 15 kya
Sargent	3.7	< 15 kya
San Andreas	5.6	< 150 ya
Vergeles	6.1	1.6 mya – 15 kya

Note: mya and kya are abbreviations for million years (mya) and thousand years (kya) ago.

INVESTIGATION

The field investigation was performed over two days on May 7 and May 28, 2019, and included a reconnaissance of the site and the drilling of five exploratory borings at the approximate locations shown on Figure 2, "Site Plan" in Appendix A. The borings extended to depths ranging from 18.5 to 30 feet below current ground surface.

The borings were advanced using truck mounted Mobile B-24 drill rig utilizing 4.5 inch solid flight augers. Visual classifications were made from auger cuttings and the samples in the field. As the drilling proceeded, relatively undisturbed core samples were obtained by means of a 3.0 inch O.D. Modified California split-tube sampler containing 2.5 inch O.D. brass liners, and a 2.0 inch O.D. standard pin split tube sampler. The sampler was advanced into the soils at various depths under the impact of a 140-pound hammer having a free fall of 30 inches. The number of blows required to advance the sampler 12 inches into the soil, after seating the sampler 6 inches, were recorded on the boring logs.

The stratification of the soils, descriptions, location of undisturbed soil samples and blow counts are shown on the respective "Logs of Test Borings" contained within Appendix A.

Laboratory testing was conducted for Atterberg Limits, moisture density, gradation analysis, consolidation, and corrosion potential. The data received from the lab are presented on the boring logs, and summarized in Appendix B.

SUBSURFACE CONDITIONS

The subsurface conditions as encountered in each of the soil borings were generally consistent across the site. The borings generally encountered very stiff and hard, gravelly silt, lean sit and clayey silt with cobbles up to 3 inches within the top several feet. Below this depth, hard sandy to clayey silt material was encountered to the boring termination depths. In boring Q-2, a 7 foot layer of dense silty gravel was encountered and extended to 29 feet where very stiff to hard silty clay was encountered to the termination depth of 30 feet.

The near surface soil registered Plasticity Index (PI) values ranging from 10 to 16, indicating the material to be of low expansion potential.

Groundwater was encountered at 22.5 foot depth in boring Q-2 within the gravel layer, at the time of our exploration. Fluctuations in the groundwater table may occur due to tidal influences, seasonal rainfall and urbanization or nearby development activities.

A more thorough description and stratification of the soil conditions are presented on the respective "Logs of Test Borings" in Appendix A. The approximate locations of the borings are shown on Figure 3, "Site Plan" in Appendix A.

2016 CBC SEISMIC DESIGN CRITERIA

The potential damaging effects of regional earthquake activity should be considered in the design of structures. As a minimum, seismic design should be in accordance with Chapter 16 of the 2016 California Building Code (CBC). The 2016 CBC utilizes the design procedures outlined in the 2010 ASCE 7-10 Standard. Using the criteria in Chapter 20 of ASCE 7-10, in its current condition, the site is classified as Site Class D. The seismic design parameters have been developed using the online "Seismic Design Maps" tool (5) by the Structural Engineering Association (SEA) and Office of Statewide Health Planning and Development (OSHPD) and a site location based on longitude and latitude. The parameters generated for the subject site for a latitude of 37.13835° N, and longitude of 121.66116° W, are presented in the following Table II:

Table II
2016 CBC Seismic Design Criteria

Seismic Parameter	Coefficient	Value
Site Class		D
Peak Ground Acceleration (Site Modified)	PGA_M	0.566
Mapped MCE Spectral Acceleration at Short-Period 0.2 secs	S_s	1.500
Mapped MCE Spectral Acceleration at a Period of 1.0s	S_1	0.600
Adjusted MCE, 5% Damped Spectral Response Acceleration at Short Period of 0.2s	S_{MS}	1.500
Adjusted MCE, 5% Damped Spectral Response Acceleration at Period of 1.0s	S_{M1}	0.900
Design 5% Damped Spectral Response Acceleration at Short Period of 0.2s for Occupancy Category I/II/III	S_{DS}	1.000
Design 5% Damped Spectral Response Acceleration at Period of 1.0s for Occupancy Category I/II/III	S_{D1}	0.600

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

GENERAL

1. From a geotechnical point of view, the site is suitable for the construction of the proposed residential development provided the recommendations presented in this report are incorporated into the project plans and specifications.

2. The most prominent geotechnical feature of this site is the presence of low expansive silt materials within the upper 10 feet, some of which is gravelly and cemented. The proposed structures may be satisfactorily supported on structural post tensioned slabs. Specific foundation design recommendations are provided under the heading Foundations.

DEMOLITION/SITE PREPARATION

3. Prior to any grading, demolition of the existing structures on the site should be completed. Demolition should include the complete removal of all surface and subsurface structures. If any of the following are encountered: concrete, septic tanks, storm inlets, foundations, asphalt, machinery, equipment, debris, and trash, these should also be removed with the exception of items specified by the owner for salvage. In addition, all known underground structures must be located on the grading plans so that proper removal may be carried out. It is vital that ***Quantum Geotechnical Inc.,*** intermittently observe the removal of subsurface structures and be notified in ample time to ensure that no subsurface structures are covered. If ***Quantum Geotechnical Inc.,*** is not contacted to observe the demolition and removal of subsurface structures, further backhoe exploratory investigation will need to be performed prior to the commencement of grading.

4. Excavations made by the removal of the structure should be left open by the contractor for backfill in accordance with the requirements for engineered fill. The removal of underground structures should be done under the observation of the Soil Engineer to verify adequacy of the removal and that subsoils are left in proper condition for placement as engineered fills. Any soil exposed by the removal operations which are deemed soft or unsuitable by the Soil Engineer, shall be excavated as uncompacted fill and be removed as required by the Soil Engineer during grading. Any resulting excavations should be properly backfilled with engineered fill under the observation of the

Soil Engineer. It is important that ***Quantum Geotechnical Inc.,*** be present during removal activities to verify that **all** excavations created by removal of subsurface structures are left open and located on a grading plan. If any excavations are loosely backfilled without our knowledge and these excavations are not located and backfilled during grading, future settlement of these loosely filled excavations could occur and may cause damage to structures and improvements.

GRADING

5. The grading requirements presented herein are an integral part of the grading specifications presented in Appendix C of this report and should be considered as such.

6. Currently, the site contains little to no vegetation and stripping of vegetation and topsoil may not be required. Vegetation conditions may be different at the time of grading, and the extent of any stripping, mowing or discing as part of site preparation, will be revaluated at the time of grading. Any strippings will be stockpiled in an approved area that is unaffected by grading operations until their future use. Organically contaminated soil material may be utilized in landscape areas located outside the building footprint.

7. After site preparation, the top 8 inches of exposed ground should be scarified and compacted to a degree of relative compaction of at least 90% at 2 percent above optimum moisture content as determined by ASTM D1557-12 Laboratory Test Procedure.

8. The site may be brought to the desired finished grades by placing engineered fill in lifts of 8 inches in uncompacted thickness and compacting to a minimum relative compaction of 90% at 2 percent above optimum moisture content for lean clay soil as determined by ASTM D1557-12 Laboratory Test Procedure.

9. All soils encountered during our investigation except those within the top few inches of predominantly organic material, are suitable for use as engineered fill when placed and compacted at the recommended moisture content and provided it does not contain any debris.

SURFACE AND SUBSURFACE DRAINAGE

10. All finish grades should be provided with a positive gradient to an adequate discharge point in order to provide rapid removal of surface water runoff away from all foundations. No ponding of water should be allowed on the pad or adjacent to the foundations. Surface drainage must be designed by the project Civil Engineer and maintained by the property owners at all times. The pad should be graded in a manner that surface flow is to a controlled discharge system.

11. Lot slopes and drainage must be provided by the project Civil Engineer to remove all storm water from the pad and to minimize storm and/or irrigation water from seeping beneath the structures. Should surface water be allowed to seep under the structure, foundation movement resulting in structural cracking and damage will occur. Where possible, finished grades around the perimeter of the structures should be compacted and should be sloped at a minimum 2% gradient away from the exterior foundation. Surface drainage requirements constructed by the builder should be maintained during landscaping. In particular, the creation of planter areas confined on all sides by concrete walkways or decks and the residence foundation is not desirable since any surface water due to rain or irrigation becomes trapped in the planter area with no outlet. If such a landscape feature is necessary, surface area drains in the planter area or a subdrain along the foundation perimeter must be installed.

12. Continuous roof gutters are recommended. According to local government requirements, roof downspout and drain flows should be directed to at grade bio-filtration areas, or raised planter boxes next to the building perimeter, where possible. From a geotechnical and maintenance point of view it is undesirable to discharge water into at grade bio-filtration areas near foundations, because of the possibility of water ponding for sustained periods of time.

BIO-FILTRATION FACILITIES

13. As mentioned earlier, it is undesirable to discharge water into at grade bio-filtration areas near foundations, because of the possibility of water ponding for sustained periods of time, potentially creating excessive moisture related issues. However, certain design features could be made to minimize such potential effects. In addition, the property owners must always maintain the bio-

filtration area to ensure that they are performing as designed and that water does not pond in the area for longer than 48 hours.

14. Typically, the bio-filtration areas consist of an 18 inch layer of sandy loam over 18 inches of permeable gravel material. The top of the bio-filtration area is typically approximately 1 foot below pad grade, therefore, the base of the bio-filtration area will be approximately 4 feet below pad grade. The base of the bio-filtration area will typically contain a perforated pipe to drain any water that may collect within 24 hours. In some situations, the bio-filtration areas may be located immediately adjacent the building structure.

15. Where bio-filtration areas are located closer than 5 feet of the building, the section of loose loam and gravel will provide reduced lateral support, and we recommend a deepened footing be constructed along the perimeter the building adjacent to the bio-filtration area and extending 3 feet beyond in plan length. The depth of the deepened footing will depend on how close the bio-filtration area is located to the building perimeter. As a guide, the footing is to be deepened such that when an imaginary line inclined at 45 degrees from the outside edge base of the footings, it extends below the base of the bio-filtration area excavation. Where bio-filtration areas are located further than 5 feet, no special design is required. Provided the bio-filtration facility is lined with an impermeable liner, no waterproofing of the deepened footing is required.

16. Where bio-filtration areas are located closer than 3 feet of street pavements, a deepened curb footing is required. Where bio-filtration areas are located closer than 1 foot of street pavements, because pavements do not have a positive connection to a deepened curb/footing, the deepened curb/footing may need to be designed as a retaining wall rigid enough to create minimal lateral deflections.

17. Where bio-filtration areas are located closer than 2 feet of hardscape areas, a deepened edge footing is required. The deepened edge should extend at least 1 foot below the subgrade. Where the bio-filtration area is immediately adjacent the hardscape, the deepened edge is to extend at least 3 inches below the base of the bio-filtration system.

FOUNDATIONS

13. Provided the site is prepared as recommended in the "Grading" section, a post-tensioned slab foundation may be satisfactorily used.

Post Tensioned Slab on Grade

14. Post-tensioned slabs should be designed using the following criteria which is based on the design method presented in the Post-Tensioning Institute, Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils (PTI DC10.5-12), 2012. Using the relevant site soil and climatic parameters, the recommended geotechnical criteria for use in the design of the post-tensioned slabs is as follows;

	Swelling Mode	
	Center Lift	Edge Lift
Edge Moisture Variation Distance (e_m)	9.0 feet	5.1 feet
Differential Soil Movement (y_m)	0.59 inches	1.09 inches

The maximum allowable bearing pressure at the base of the slab and for localized thickened footings should not exceed 2,000 p.s.f. for dead plus sustained live loads.

15. As indicated earlier, bio-filtration areas may be designed close to the foundation. Where bio-filtration areas are located closer than 5 feet of the building, the section of loose loam and gravel, will provide reduced lateral support, and we recommend a deepened footing be constructed along the perimeter the building adjacent to the bio-filtration area and extending 3 feet beyond in plan length. The depth of the deepened footing will depend on how close the bio-filtration area to the building perimeter. As a guide, the footing is to be deepened such that when an imaginary line inclined at 45 degrees from the outside edge base of the footings, it extends below the base of the bio-filtration area excavation.

General Construction Requirements for Post-Tensioned Slab

16. Prior to construction of the slab, the slab subgrade should be observed by the Soil Engineer to verify that all under-slab utility trenches greater than 18 inches in width have been properly backfilled

and compacted, and that no loose or soft soils are present on the slab subgrade.

17. The on site near surface soil is non-expansive and if the on-site soil is used to form the building pads, slab subgrade saturation and moisture conditioning is not required. If clayey import material is used to grade the site the slab subgrade should be soaked to saturation (minimum 5% above optimum) to a depth of 12 inches prior to placement of the capillary break or vapor retarder/barrier. This should be verified and approved by the Soil Engineer. The penetration of a thin metal probe to a depth of 10-12 inches generally indicates sufficient saturation.

18. The four (4) inch (minimum thickness) layer of gravel typically placed to provide a capillary break beneath concrete slab-on-grade floors may be omitted beneath the monolithically poured mat slab foundations provided that the slabs are at least 10 inches thick. If it is desired to use a 4 inch layer or thinner of gravel section, the gravel should consist of broken stone, crushed or uncrushed gravel, quarry waste, or a combination thereof. The aggregate shall be free from deleterious substances. It shall be of such quality that the absorption of water in a saturated dry condition does not exceed 3% of the oven dry weight of the sample. The material shall be ¾" minus material with no more than 3% passing the #200 sieve, as specified in Appendix C.

19. A moisture vapor retarder/barrier is recommended beneath all slabs-on-grade that will be covered by moisture-sensitive flooring materials such as vinyl, linoleum, wood, carpet, rubber, rubber-backed carpet, tile, impermeable floor coatings, adhesives, or where moisture-sensitive equipment, products, or environments will exist. We recommend that design and construction of the moisture vapor retarder/barrier conform to Section 1805 of the 2013 CBC and relevant sections of American Concrete Institute (ACI) guidance documents 302.1R-04, 302.2R-06 and 360R-10.

20. The moisture vapor retarder/barrier can be placed above the 4 inches of gravel or directly on the soil subgrade and should consist of a minimum 10 mils thick polyethylene with a maximum perm rating of 0.1 in accordance with ASTM E 1745. Seams in the moisture vapor retarder/barrier should be overlapped no less than 6 inches or in accordance with the manufacturer's recommendations. Joints and penetrations should be sealed with the manufacturer's recommended adhesives, pressure-sensitive tape, or both. The contractor must avoid damaging or puncturing the moisture vapor retarder/barrier and repair any punctures with additional polyethylene properly lapped and sealed. The installation of the vapor retarder membrane must be in conformance with ASTM E1643.

21. A minimum of two inches of wetted sand should be placed over the vapor retarder membrane to facilitate curing of the concrete and to act as a cushion to protect the membrane. The perimeter of the mat should be thickened to bear on the prepared building pad and to confine the sand. During winter construction, sand may become saturated due to rainy weather prior to pouring. Saturated sand is not desirable because the sand cushion may become over saturated, and boil into the concrete causing undesirable structural monopolies of sand pockets within the slab. As an alternate, a sand-fine gravel mixture that is stable under saturated conditions may be used. However, the material must be approved by the Soil Engineer prior to use.

22. Alternatively, the sand layer may be eliminated provided the concrete has a maximum water/cement ratio of 0.45 and a 10 mil Class A vapor retarder membrane, such as Stego® Wrap. In any case, the vapor retarder/barrier should have a maximum perm rating of 0.3 in accordance with ASTM E 1745. Seams in the moisture vapor retarder/barrier should be overlapped no less than 6 inches or in accordance with the manufacturer's recommendations. Joints and penetrations should be sealed with the manufacturer's recommended adhesives, pressure-sensitive tape, or both. The contractor must avoid damaging or puncturing the vapor retarder/barrier and repair any punctures with additional polyethylene properly lapped and sealed.

23. Any exterior concrete flatwork such as steps, patios, or sidewalks should be designed independently of the slab, and expansion joints should be provided between the flatwork and the structural unit.

MISCELLANEOUS CONCRETE FLATWORK

27. Miscellaneous flatwork, driveways, and walkways may be designed with a minimum thickness of 4.0 inches. Control joints should be constructed to create squares or rectangles with a maximum spacing of 15 feet on large slab areas. Walkways should be separated from foundations with a thick expansion joint filler. Control joints should be constructed into walkways at a maximum of 5 feet spacing.

RETAINING WALLS

28. Retaining walls should be designed to resist lateral pressures exerted from a media having an equivalent fluid weight as follows:

Active Condition	=	45 p.c.f. for horizontal backslope
At-rest Condition	=	65 p.c.f.
Passive Condition	=	300 p.c.f.
Coefficient of Friction	=	0.35

29. For a non-horizontal backslope, the active condition equivalent fluid weight can be increased by 1.5 p.c.f. for each 2 degree rise in slope from the horizontal.

30. Active conditions occur when the top of the wall is free to move outward. At-rest conditions apply when the top of wall is restrained from any movement.

31. It should be noted that the effects of any surcharge, traffic or compaction loads behind the walls must be accounted for in the design of the walls.

32. The above criteria are based on fully drained conditions. If drained conditions are not possible, then the hydrostatic pressure must be included in the design of the wall. An additional linear distribution of hydrostatic pressure of 63 p.c.f. should be adopted, in this case.

33. In order to achieve fully-drained conditions, a drainage filter blanket should be placed behind the wall. The blanket should be a minimum of 12 inches thick and should extend the full height of the wall to within 12 inches of the surface. If the excavated area behind the wall exceeds 12 inches, the entire excavated space behind the 12-inch blanket should consist of compacted engineered fill or blanket material. The drainage blanket material may consist of either granular crushed rock and drain pipe fully encapsulated in geotextile filter fabric or Class II permeable material that meets CalTrans Specification, Section 68, with drainage pipe but without fabric. A 4-inch perforated drain pipe should be installed in the bottom of the drainage blanket and should be underlain by at least 4 inches of filter type material. A 12-inch cap of clayey soil material should be placed over the drainage blanket. All back drains should be outlet to suitable drainage devices. Retaining wall less than 3 feet in height should be provided with backdrains or weep holes.

34. As an alternate to the 12-inch drainage blanket, a pre-fabricated strip drain (such as Miradrain) may be used between the wall and retained soil. In this case, the wall must be designed to resist an additional lateral hydrostatic pressure of 30 p.c.f.

35. Piping with adequate gradient shall be provided to discharge water that collects behind the walls to an adequately controlled discharge system away from the structure foundation.

36. The retaining walls or soundwalls may be founded on a friction pier foundation or on spread footing foundations. Spread footing and pier design criteria are given below.

RETAINING WALL/SOUNDWALL FOUNDATION - SPREAD FOOTINGS

37. Spread footings should have a minimum depth of eighteen (18) inches below lowest adjacent pad grade (i.e., trenching depth) for soil subgrade. At this depth, the recommended design bearing pressure for continuous footings should not exceed 2,500 p.s.f. due to dead plus sustained live loads and 3,300 p.s.f. due to all loads which include wind and seismic.

38. To accommodate lateral loads, the passive resistance of the foundation soil can be utilized. The passive soil pressures can be assumed to act against the front face of the footing below a depth of one foot below the ground surface. It is recommended that a passive pressure equivalent to that of a fluid weighing 300 p.c.f. be used. The weight of the soil above the footing can be used in the frictional calculations. For design purposes, an allowable friction coefficient of 0.35 can be assumed at the base of the spread footing.

RETAINING WALL/SOUNDWALL FOUNDATION - PIER FOOTINGS

39. The piers should be designed on the basis of skin friction acting between the soil and the pier. For the soils at the site, an allowable skin friction value of 500 p.s.f. can be used for combined dead and live loads, below a depth of 1 foot. This value can be increased by one-third for total loads which include wind or seismic forces. The size, depth and spacing of the piers is to be determined by the structural engineer.

40. To resist lateral loads, the passive resistance of the soil can be used. The soil passive pressures can be assumed to act against the lateral projected area twice the pier diameter. It is recommended

that a passive pressure equivalent to that of a fluid weighing 300 p.c.f be used below 1 foot of final pad grade.

PAVEMENT AREAS

41. R-value tests were not performed as part of this investigation, as the soil expected at subgrade level is not known and depends on the planned grading. Assuming the subgrade material will consist of on site silty or imported low expansive clay material, we will assume an R-value of 10 for preliminary design.

42. Based on an R-Value of 10, the following flexible pavement sections are recommended.

Traffic Index	AC (inches)	Class II[1] AB (inches)
4.5	4.0	7.5
5.0	4.0	8.5
6.0	4.0	11.0

Notes: [1]Minimum R-Value = 78
R-Value = Resistance Value
All Layers in compacted thickness to Cal-Trans Standard Specifications

43. After underground facilities have been placed in the areas to receive pavement and removal of excess material has been completed, the upper 6 inches of the sub-grade soil shall be scarified, moisture conditioned, and compacted to a minimum relative compaction of 95% in accordance with the grading recommendations specified in this report.

44. All aggregate base material placed subsequently should be compacted to a minimum relative compaction of 95% based on the ASTM Test Procedure of D1557-12 (latest edition). The construction of the pavement areas should conform to the requirements set forth by the latest

Standard Specifications of the Department of Transportations of the State of California and/or City of Morgan Hill, Department of Public Works.

45. If planter areas are provided within or immediately adjacent to the pavement areas, or if permeable pavers are used for some areas of pavement, provisions should be made to control irrigation and surface water from entering the pavement subgrade. Water entering the pavement section at subgrade level, which does not have a means for discharge, could cause softening of this zone and lead to pavement failure. We recommend that for areas of permeable pavers, the subgrade be graded to a low point where a subdrain is constructed to discharge any accumulated water.

UTILITY TRENCHES

46. Applicable safety standards require that trenches in excess of 5 feet must be properly shored or that the walls of the trench slope back to provide safety for installation of lines. If trench wall sloping is performed, the inclination should vary with the soil type. The underground contractor should request an opinion from the Soil Engineer as to the type of soil and the resulting inclination.

47. With respect to state-of-the-art construction or local requirements, utility lines are generally bedded with granular materials. These materials can convey surface or subsurface water beneath the structures. It is, therefore, recommended that all utility trenches which possess the potential to transport water be sealed with a compacted impervious cohesive soil material or lean concrete where the trench enters/exits the building perimeter.

48. Utility trenches extending underneath all traffic areas must be backfilled with native or approved import material and compacted to a relative compaction of 90% to within 6 inches of the subgrade. The upper 6 inches should be compacted to 95% relative compaction in accordance with Laboratory Test Procedure ASTM D1557 (latest edition). Backfilling and compaction of these trenches must meet the requirements set forth by the City of Morgan Hill, Department of Public Works. Utility trenches within landscape areas may be compacted to a relative compaction of 85%.

PROJECT REVIEW AND CONSTRUCTION MONITORING

49. All grading and foundation plans for the development must be reviewed by the Soil Engineer prior to contract bidding or submitted to governmental agencies so that plans are reconciled with soil conditions and sufficient time is allowed for suitable mitigative measures to be incorporated into the final grading specifications.

50. ***Quantum Geotechnical, Inc.*** should be notified at least two working days prior to site clearing, grading, and/or foundation operations on the property. This will give the Soil Engineer ample time to discuss the problems that may be encountered in the field and coordinate the work with the contractor.

51. Field observation and testing during the demolition and/or foundation operations must be provided by representatives of ***Quantum Geotechnical, Inc.*** to enable them to form an opinion regarding the adequacy of the site preparation, the acceptability of fill materials, and the extent to which the earthwork construction and the degree of compaction comply with the specification requirements. Any work related to the grading and/or foundation operations performed without the full knowledge and under the direct observation of the Soil Engineer will render the recommendations of this report invalid. This does not imply full-time observation. The degree of observation and frequency of testing services would depend on the construction methods and schedule, and the item of work.

REFERENCES

1. California Department of Water Resources. Water Resources Library. Accessed on May 31, 2019 via website: http://wdl.water.ca.gov/waterdatalibrary/.

2. California Geological Survey. 2004. "Seismic Hazard Zone Report for the Morgan Hill 7.5-Minute Quadrangle, Santa Clara County, California". Seismic Hazard Zone Report 096.

3. Graymer, R.W., Moring, B.C., Saucedo, G.J., Wentworth, C.M., Brabb, E.E., and Knudsen, K.L. 2006. "Geologic Map of the San Francisco Bay Region". U.S. Geological Survey. Scientific Investigations Map 2918.

4. Nationwide Environmental Title Research, LLC. 2019. Historic Aerials. Accessed on May 31, 2019 from website: https://www.historicaerials.com/viewer.

5. Structural Engineers Association and Office of Statewide Health Planning and Development. 2018. "Seismic Design Maps". Accessed May 31, 2019 from web site: https://seismicmaps.org/.

6. U.S. Geological Survey. 2019. "Quaternary fault and fold database for the United States". Accessed May 31, 2019 from USGS web site: http//earthquakes.usgs.gov/regional/qfaults/.

7. U.S. Geological Survey. 2019. "TNM Elevation Map". Accessed on May 31, 2019 from website: https://viewer.nationalmap.gov/theme/elevation/##bottom.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. It should be noted that it is the responsibility of the owner or his representative to notify ***Quantum Geotechnical, Inc.,*** in writing, a minimum of two working days before any clearing, grading, or foundation excavations can commence at the site.

2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings and from a reconnaissance of the site. Should any variations or undesirable conditions be encountered during the development of the site, ***Quantum Geotechnical,*** will provide supplemental recommendations as dictated by the field conditions.

3. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are brought to the attention of the Architect and Engineer for the project and incorporated into the plans and the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

4. At the present date, the findings of this report are valid for the property investigated. With the passage of time, significant changes in the conditions of a property can occur due to natural processes or works of man on this or adjacent properties. In addition, legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may render this report invalid, wholly or partially. Therefore, this report should not be considered valid after a period of two (2) years without our review, nor should it be used, or is it applicable, for any properties other than those investigated.

5. Not withstanding all the foregoing, applicable codes must be adhered to at all times.

APPENDIX A

Figure 1, Site Vicinity and Fault Map

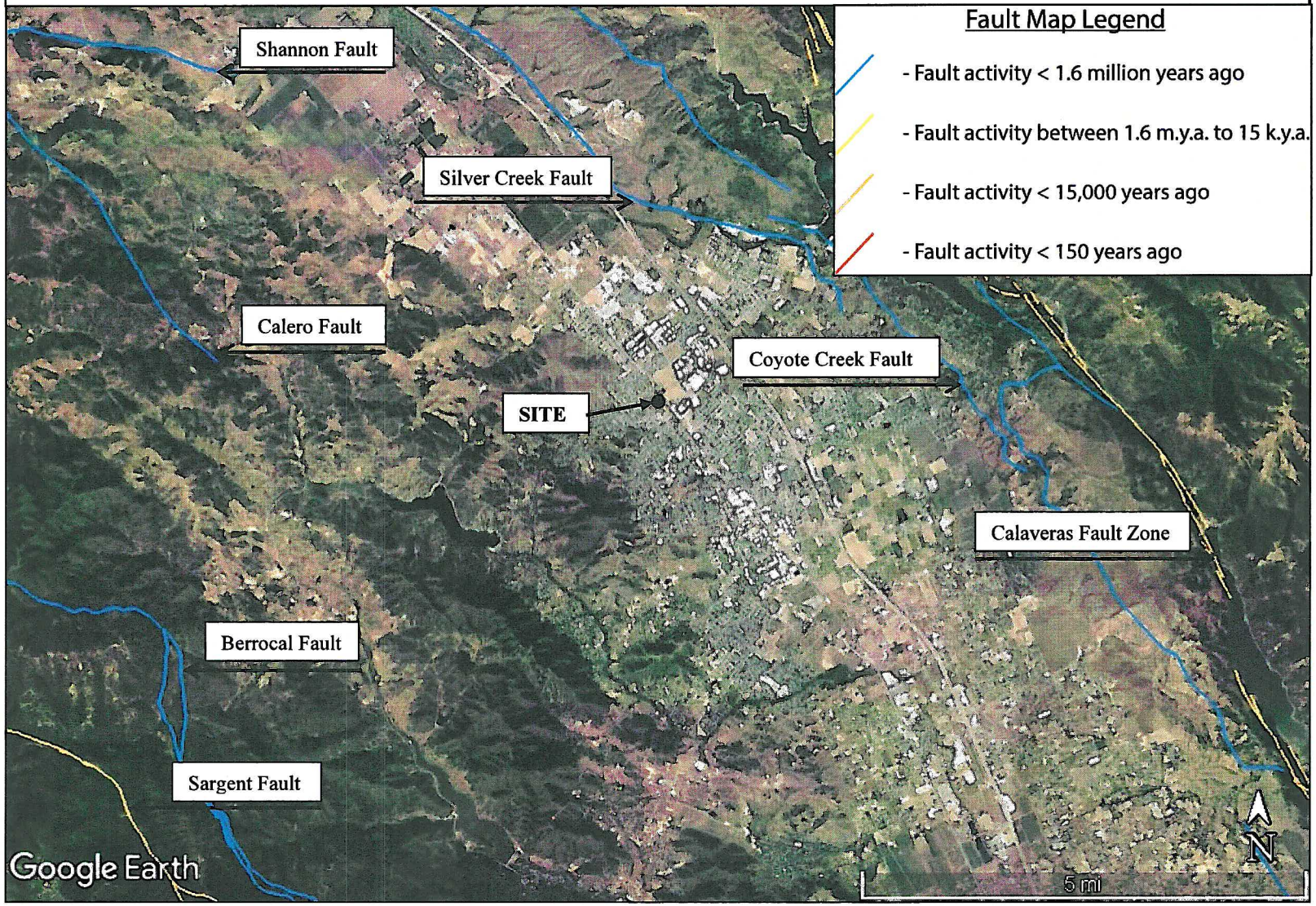
Figure 2, Regional Geology Map

Figure 3, Site Plan

Logs of Test Borings

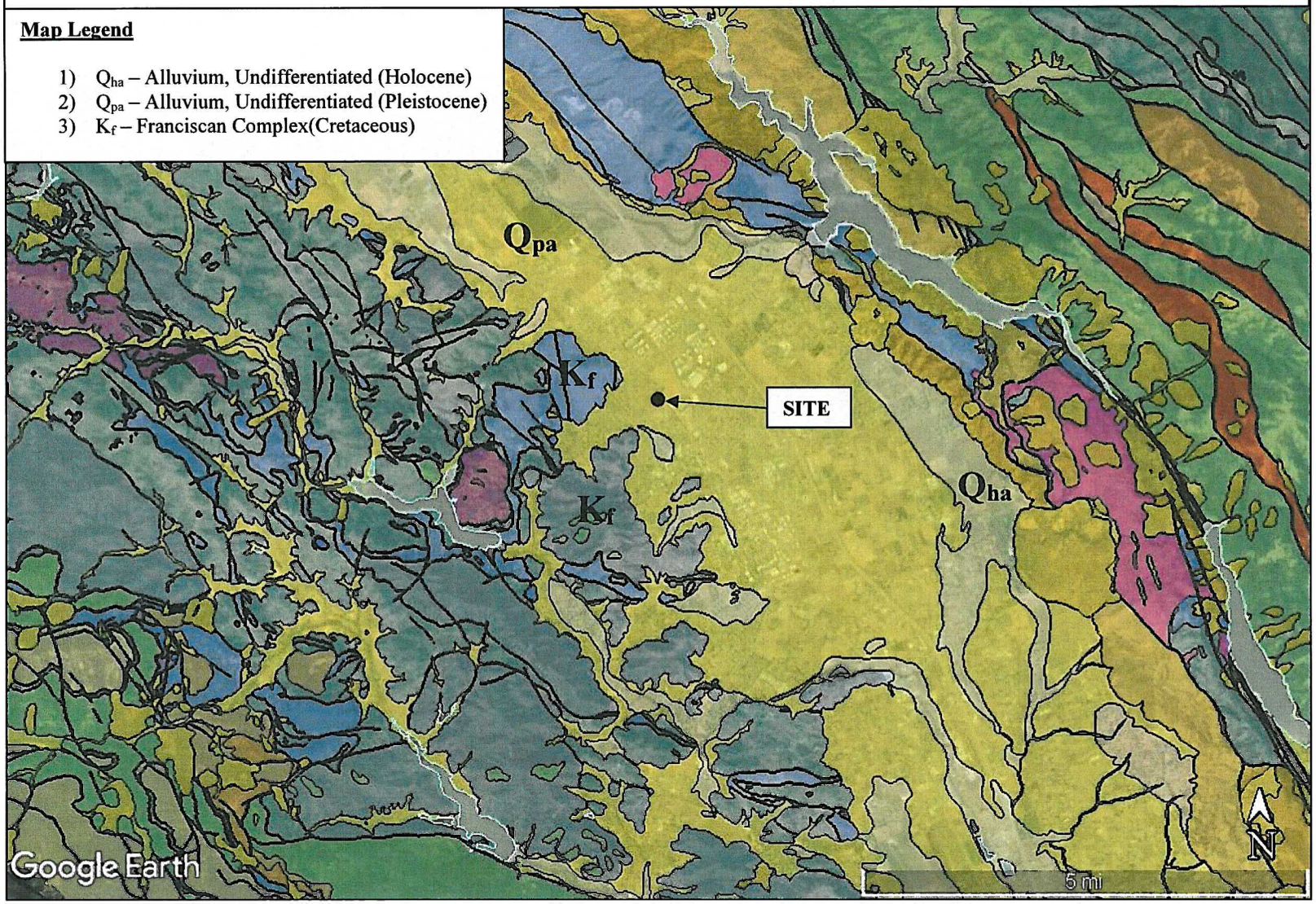
Key to Boring Logs

1. Base Map: Google Earth, 2019
2. Fault Map Overlay: U.S. Geological Survey and California Geological Survey. 2006. Quaternary fault and fold database for the United States. Accessed May 31, 2019 from USGS web site: http//earthquakes.usgs.gov/regional/qfaults/.



QUANTUM GEOTECHNICAL, INC.	SITE VICINITY AND FAULT MAP			
	Proposed Residential Subdivision 18110 Monterey Road, Morgan Hill	Project No. F019.G	Drawn by: D.T.	Figure No. 1

1. Base Map: Google Earth, 2019
2. Geologic Map Overlay: Graymer, R.W., Moring, B.C., Saucedo, G.J., Wentworth, C.M., Brabb, E.E., and Knudsen, K.L. 2006. "Geologic Map of the San Francisco Bay Region". USGS. Scientific Investigations Map 2918.



QUANTUM GEOTECHNICAL, INC.	REGIONAL GEOLOGIC MAP			
	Proposed Residential Subdivision 18110 Monterey Road, Morgan Hill	Project No. F019.G	Drawn by: D.T.	Figure No. 2

QUANTUM GEOTECHNICAL, INC.	SITE PLAN			
	Proposed Residential Subdivision 18110 Monterey Road., Morgan Hill	Project No. F019.G	Drawn by: D.T.	Figure No. 3

Project: **Monterey Road** Project Location: **18110 Monterey Rd., Morgan Hill** Project Number: **F019.G**	Log of Boring Q-1 **Sheet 1 of 1**	**Quantum Geotechnical, Inc.** **1110 Burnett Ave., Ste B** **Concord, CA 94520**

Date(s) Drilled **05/07/19**	Logged By **DT**	Checked By **SM**
Drilling Method **Solid Flight**	Drill Bit Size/Type **4 in.**	Total Depth of Borehole **18.5 ft.**
Drill Rig Type **Mobile B-24**	Drilling Contractor **Hillside Drilling**	Approximate Surface Elevation **90 ft. amsl.**
Groundwater Level and Date Measured **None Encountered**	Sampling Method(s) **Modified California, SPT**	Hammer Data **Rope and Cathead**
Borehole Backfill **Soil**	Location **See Site Plan**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines (-#200)	LL, %	PI, %
90	0		1-1	15	ML		Lean SILT: Dark orange brown with mottled black; dry; hard; minor fine, subrounded gravel.				31	14
			1-2	67				13.4	122.5			
85	5				ML		At 5 ft.: Minor medium sand content.					
			1-3	31				18.4	112.2			
80	10				ML		At 10 ft.: Increase in clay content; decrease in sand content.					
75	15		1-4	29								
					ML		At 18.5 ft.: Drill rig malfunctioned; no sample was collected at this depth.					
70	20						Bottom of Boring at 18.5 ft. No groundwater was encountered.					
65	25											
60	30											

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Project: **Monterey Road** Project Location: **18110 Monterey Rd., Morgan Hill** Project Number: **F019.G**	Log of Boring Q-2 **Sheet 1 of 1**	**Quantum Geotechnical, Inc.** **1110 Burnett Ave., Ste B** **Concord, CA 94520**

Date(s) Drilled **05/28/19**	Logged By **DT**	Checked By **SM**
Drilling Method **Solid Flight**	Drill Bit Size/Type **4 in.**	Total Depth of Borehole **30 ft.**
Drill Rig Type **Mobile B-24**	Drilling Contractor **Hillside Drilling**	Approximate Surface Elevation **90 ft. amsl.**
Groundwater Level and Date Measured **22.5 ft.**	Sampling Method(s) **Modified California, SPT**	Hammer Data **Rope and Cathead**
Borehole Backfill **Soil**	Location **See Site Plan**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines (-#200)	LL, %	PI, %
90	0				CL		Silty CLAY: Dark orange brown; slightly moist; hard; minor fine, subangular gravel.					
			2-1	44				10.2	121.9		27	10
					ML		Gravelly SILT: Dark reddish brown; slightly moist; hard; coarse to fine, subangular to subrounded gravel; minor medium sand.					
			2-2	60				10.9	120.2			
85	5											
					ML		Clayey SILT: Dark orange to olive brown; slightly moist; hard; minor coarse (to 1") to fine, subrounded gravel.					
			2-3	16				18.1				
80	10											
					ML		Sandy SILT: Dark olive brown; slightly moist; hard; medium to fine sand; trace fine, subrounded gravel.					
			2-4	31								
75	15											
			2-5	42								
70	20											
					GP		Silty GRAVEL: Dark olive brown; wet; coarse to fine gravel; dense. ▽					
			2-6	38				11.5		15		
65	25											
			2-7	29	CL		Silty CLAY: Dark olive brown; moist; hard.					
60	30						Bottom of Boring at 30 ft.					

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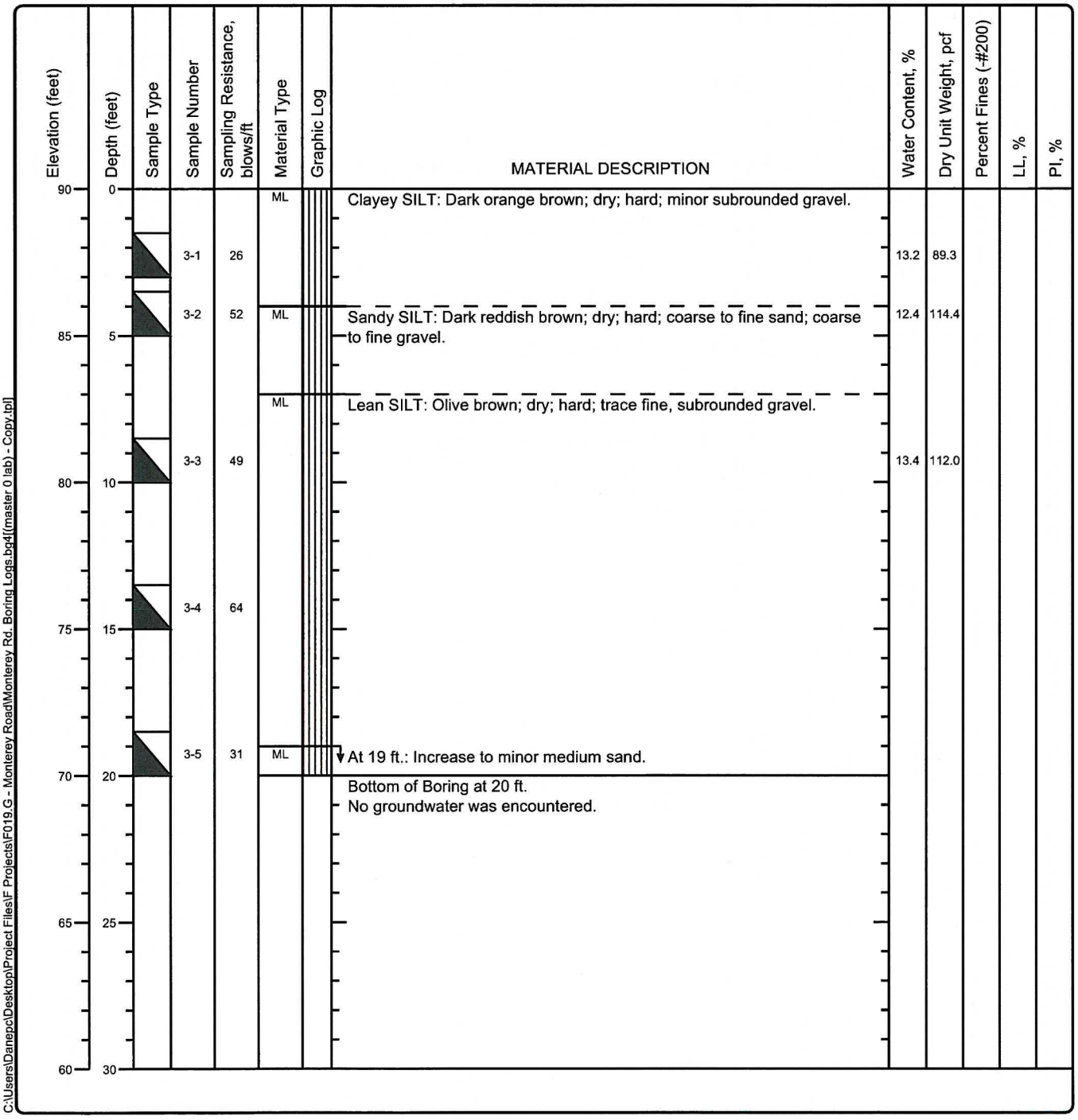
Project: **Monterey Road** Project Location: **18110 Monterey Rd., Morgan Hill** Project Number:	Log of Boring Q-3 **Sheet 1 of 1**	**Quantum Geotechnical, Inc.** **1110 Burnett Ave., Ste B** **Concord, CA 94520**

Date(s) Drilled **05/28/19**	Logged By **DT**	Checked By **SM**
Drilling Method **Solid Flight**	Drill Bit Size/Type **4 in.**	Total Depth of Borehole **20 ft.**
Drill Rig Type **Mobile B-24**	Drilling Contractor **Hillside Drilling**	Approximate Surface Elevation **90 ft. amsl.**
Groundwater Level and Date Measured **None Encountered**	Sampling Method(s) **Modified California**	Hammer Data **Rope and Cathead**
Borehole Backfill **Soil**	Location **See Site Plan**	



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Project: **Monterey Road** Project Location: **18110 Monterey Rd., Morgan Hill** Project Number: **F019.G**	Log of Boring Q-4 **Sheet 1 of 1**	**Quantum Geotechnical, Inc.** **1110 Burnett Ave., Ste B** **Concord, CA 94520**

Date(s) Drilled **05/28/19**	Logged By **DT**	Checked By **SM**
Drilling Method **Solid Flight**	Drill Bit Size/Type **4 in.**	Total Depth of Borehole **20 ft.**
Drill Rig Type **Mobile B-24**	Drilling Contractor **Hillside Drilling**	Approximate Surface Elevation **90 ft. amsl.**
Groundwater Level and Date Measured **None Encountered**	Sampling Method(s) **Modified California, SPT**	Hammer Data **Rope and Cathead**
Borehole Backfill **Soil**	Location **See Site Plan**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines (-#200)	LL, %	PI, %
90	0				ML		Sandy to Clayey SILT: Dark reddish brown; dry; hard; coarse, subangular gravel.					
			4-1	22				11.5	115.1		33	16
			4-2	38				11.3	121.7			
85	5				ML		At 5 ft.: Minor coarse to fine, subrounded gravel.					
					ML		Lean SILT: Dark olive brown with mottled black and orange; moist; hard; trace fine, subrounded gravel.					
			4-3	27				17.3				
80	10											
			4-4	32								
75	15											
			4-5	27								
70	20						Bottom of Boring at 20 ft. No groundwater was encountered.					
65	25											
60	30											

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Project: **Monterey Road** Project Location: **18110 Monterey Rd., Morgan Hill** Project Number: **F019.G**	Log of Boring Q-5 **Sheet 1 of 1**	**Quantum Geotechnical, Inc.** **1110 Burnett Ave., Ste B** **Concord, CA 94520**

Date(s) Drilled **05/28/19**	Logged By **DT**	Checked By **SM**
Drilling Method **Solid Flight**	Drill Bit Size/Type **4 in.**	Total Depth of Borehole **20 ft.**
Drill Rig Type **Mobile B-24**	Drilling Contractor **Hillside Drilling**	Approximate Surface Elevation **90 ft. amsl.**
Groundwater Level and Date Measured **None Encountered**	Sampling Method(s) **Modified California, SPT**	Hammer Data **Auto.**
Borehole Backfill **Soil**	Location **See Site Plan**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines (-#200)	LL, %	PI, %
90	0				ML		Lean SILT with Gravel: Dark olive brown; slightly moist to dry; hard; coarse to fine, subrounded gravel.					
85	5		5-1	37				10.3	121.1			
80	10		5-2	36				18.5	108.3			
75	15		5-3	30				12.0				
70	20		5-4	21	CL		Silty CLAY: Dark olive brown; moist; stiff.					
							Bottom of Boring at 20 ft. No groundwater was encountered.					
65	25											
60	30											

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Project: **Monterey Road** Project Location: **18110 Monterey Rd., Morgan Hill** Project Number: **F019.G**	Key to Log of Boring **Sheet 1 of 1**	**Quantum Geotechnical, Inc.** **1110 Burnett Ave., Ste B** **Concord, CA 94520**

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Percent Fines (-#200)	LL, %	PI, %
1	2	3	4	5	6	7	8	9	10	11	12	13

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample Number: Sample identification number.
5. Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6. Material Type: Type of material encountered.
7. Graphic Log: Graphic depiction of the subsurface material encountered.
8. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9. Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
10. Dry Unit Weight, pcf: Dry weight per unit volume of soil sample measured in laboratory, in pounds per cubic foot.
11. Percent Fines (-#200): The percent fines (soil passing the No. 200 Sieve) in the sample. WA indicates a Wash Sieve, SA indicates a Sieve Analysis.
12. LL, %: Liquid Limit, expressed as a water content.
13. PI, %: Plasticity Index, expressed as a water content.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)

Poorly graded GRAVEL (GP)

SILT, SILT w/SAND, SANDY SILT (ML)

TYPICAL SAMPLER GRAPHIC SYMBOLS

2.5-inch-OD Modified California w/ brass liners

2-inch-OD unlined split spoon (SPT)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)

Water level (after waiting)

Minor change in material properties within a stratum

Inferred/gradational contact between strata

Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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Figure B-1

APPENDIX B

Laboratory Investigation

Summary of Laboratory Test Results

LABORATORY INVESTIGATION

The laboratory testing program was directed towards providing sufficient information for the determination of the engineering characteristics of the site soils so that the recommendations outlined in this report could be formulated.

Moisture content and dry unit weight tests were performed on relatively undisturbed soil samples in order to determine the consistency of the soil and moisture variation throughout the explored soil profile and to estimate the compressibility of the underlying soils.

Sieve analysis testing was performed to determine the fine grained content within a representative soil stratum.

The strength parameters of the foundation soils were obtained by evaluating the penetration resistance (blow counts) during sample recovery.

A summary of all laboratory test results is presented on Table B-I of this appendix and on the respective "Logs of Test Borings", Appendix A.

SUMMARY OF LABORATORY TESTS

TABLE B-1

Sample Number	Depth (ft)	Dry Density (p.c.f.)	Moisture Content (% Dry Wt.)	Sieve Analysis (% passing No. 200 sieve)	Liquid Limit (%)	Plasticity Index
1-2	5.0	122.5	13.4	--	31	14
1-3	10.0	122.2	18.4	--	--	--
2-1	2.0	121.9	10.2	--	27	10
2-2	5.0	120.2	10.9	--	--	--
2-3	10.0	--	18.1	--	--	--
2-6	25.0	--	11.5	14.5	--	--
3-1	3.0	89.3	13.2	--	--	--
3-2	5.0	114.4	12.4	--	--	--
3-3	10.0	112.0	13.4	--	--	--
4-1	3.0	115.1	11.5	--	33	16
4-2	5.0	121.7	11.3	--	--	--
4-3	10.0	--	17.3	--	--	--
5-1	5.0	121.1	10.3	--	--	--
5-2	10.0	108.3	18.5	--	--	--
5-3	15.0	--	12.0	--	--	--

Appendix C

The Grading Specification

Guide Specifications for Rock Under Floor Slabs

THE GRADING SPECIFICATIONS
on
Proposed Residential Development
18110 Monterey Road
Morgan Hill, California

1. General Description

1.1 These specifications have been prepared for the grading and site development of the subject residential development. ***Quantum Geotechnical Inc.***, hereinafter described as the Soil Engineer, should be consulted prior to any site work connected with site development to ensure compliance with these specifications.

1.2 The Soil Engineer should be notified at least two working days prior to any site clearing or grading operations on the property in order to observe the stripping of organically contaminated material and to coordinate the work with the grading contractor in the field.

1.3 This item shall consist of all clearing or grubbing, preparation of land to be filled, filling of the land, spreading, compaction and control of fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades, and slopes as shown on the accepted plans. The Soil Engineer is not responsible for determining line, grade elevations, or slope gradients. The property owner, or his representative, shall designate the person or organizations who will be responsible for these items of work.

1.4 The contents of these specifications shall be integrated with the soil report of which they are a part, therefore, they shall not be used as a self-contained document.

2. Tests

The standard test used to define maximum densities of all compaction work shall be the ASTM D1557-12 Laboratory Test Procedure. All densities shall be expressed as a relative compaction in terms of the maximum dry density obtained in the laboratory by the foregoing standard procedure.

3. Clearing, Grubbing, and Preparing Areas To Be Filled

3.1 If encountered, all vegetable matter, trees, root systems, shrubs, debris, and organic topsoil shall be removed from all structural areas and areas to receive fill.

3.2 If encountered, any soil deemed soft or unsuitable by the Soil Engineer shall be removed. Any existing debris or excessively wet soils shall be excavated and removed as required by the Soil Engineer during grading.

3.3 All underground structures shall be removed from the site such as old foundations, abandoned pipe lines, septic tanks, and leach fields.

3.4 The final stripped excavation shall be approved by the Soil Engineer during construction and before further grading is started.

3.5 After the site has been cleared, stripped, excavated to the surface designated to receive fill, and scarified, it shall be disked or bladed until it is uniform and free from large clods. The native subgrade soils shall be moisture conditioned and compacted to the requirements as specified in the grading section of this report. Fill can then be placed to provide the desired finished grades. The contractor shall obtain the Soil Engineer's approval of subgrade compaction before any fill is placed.

4. Materials

4.1 All fill material shall be approved by the Soil Engineer. The material shall be a soil or soil-rock mixture which is free from organic matter or other deleterious substances. The fill material shall not contain rocks or lumps over 6 inches in greatest dimension and not more than 15% larger than 2-1/2 inches. Materials from the site below the stripping depth are suitable for use in fills provided the above requirements are met.

4.2 Materials existing on the site are suitable for use as compacted engineered fill after the removal of all debris and organic material. All fill soils shall be approved by the Soil Engineer in the field.

4.3 Should import material be required, it should be approved by the soil Engineer before it is brought to the site.

5. Placing, Spreading, and Compacting Fill Material

5.1 The fill materials shall be placed in uniform lifts of not more than 8 inches in uncompacted thickness. Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to obtain uniformity of material in each layer. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either (a) aerating the material if it is too wet, or (b) spraying the material with water if it is too dry.

5.2 After each layer has been placed, mixed, and spread evenly, either import material or native material shall be compacted to a relative compaction designated for engineered fill.

5.3 Compaction shall be by footed rollers or other types of acceptable compacting rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to ensure that the required density has been obtained. No ponding or jetting shall be permitted.

5.4 Field density tests shall be made in each compacted layer by the Soil Engineer in accordance with Laboratory Test Procedure ASTM D1556-15 or D6938-10. When footed rollers are used for compaction, the density tests shall be taken in the compacted material below the surface disturbed by the roller. When these tests indicate that the compaction requirements on any layer of fill, or portion thereof, has not been met, the particular layer, or portion thereof, shall be reworked until the compaction requirements have been met.

5.5 No soil shall be placed or compacted during periods of rain nor on ground which contains free water. Soil which has been soaked and wetted by rain or any other cause shall not be compacted until completely drained and until the moisture content is within the limits hereinbefore described or approved by the Soil Engineer. Approval by the Soil Engineer shall be obtained prior to continuing the grading operations.

6. Pavement

6.1 The proposed subgrade under pavement sections, native soil, and/or fill shall be compacted to a minimum relative compaction of 95% at 2% above optimum moisture content for a depth of 12 inches.

6.2 All aggregate base material placed subsequently should also be compacted to a minimum relative compaction of 95% based on the ASTM Test Procedure D1557-12. The construction of the pavement in the parking and traffic areas should conform to the requirements set forth by the latest Standard Specifications of the Department of Transportation of the State of California and/or City of Morgan Hill, Department of Public Works.

6.3 It is recommended that soils at the proposed subgrade level be tested for a pavement design after the preliminary grading is completed and the soils at the site design subgrade levels are known.

7. Utility Trench Backfill

7.1 The utility trenches extending under concrete slabs-on-grade shall be backfilled with native on-site soils or approved import materials and compacted to the requirements pertaining to the adjacent soil. No ponding or jetting will be permitted.

7.2 Utility trenches extending under all pavement areas shall be backfilled with native or approved import material and properly compacted to meet the requirements set forth by the City of Morgan Hill, Department of Public Works.*

7.3 Where any opening is made under or through the perimeter foundations for such items as utility lines and trenches, the openings must be resealed so that they are watertight to prevent the possible entrance of outside irrigation or rain water into the underneath portion of the structures.

8. Subsurface Line Removal

8.1 The methods of removal will be designated by the Soil Engineer in the field depending on the depth and location of the line. One of the following methods will be used.

8.2 Remove the pipe and fill and compact the soil in the trench according to the applicable portions of sections pertaining to compaction and utility backfill.

8.3 The pipe shall be crushed in the trench. The trench shall then be filled and compacted according to the applicable portions of Section 5.

8.4 Cap the ends of the line with concrete to prevent entrance of water. The length of the cap shall not be less than 5 feet. The concrete mix shall have a minimum shrinkage.

9. Unusual Conditions

9.1 In the event that any unusual conditions not covered by the special provisions are encountered during the grading operations, the Soil Engineer shall be immediately notified for additional recommendations.

10. General Requirements

Dust Control

10.1 The contractor shall conduct all grading operations in such a manner as to preclude windblown dirt and dust and related damage to neighboring properties. The means of dust control shall be left to the discretion of the contractor and he shall assume liability for claims related to windblown material.

GUIDE SPECIFICATIONS FOR ROCK UNDER FLOOR SLABS

Definition

Graded gravel or crushed rock for use under slabs-on-grade shall consist of a minimum thickness of mineral aggregate placed in accordance with these specifications and in conformance with the dimensions shown on the plans. The minimum thickness is specified in the accompanying report.

Material

The mineral aggregate shall consist of broken stone, crushed or uncrushed gravel, quarry waste, or a combination thereof. The aggregate shall be free from deleterious substances. It shall be of such quality that the absorption of water in a saturated dry condition does not exceed 3% of the oven dry weight of the sample.

Gradation

The mineral aggregate shall be of such size that the percentage composition by dry weight, as determined by laboratory sieves (U.S. Sieves) will conform to the following gradation:

Sieve Size	Percentage Passing
¾''	90-100
No. 4	25-60
No. 8	18-45
No. 200	0-3

Placing

Subgrade, upon which gravel or crushed rock is to be placed, shall be prepared as outlined in the accompanying soil report.