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REPORT
TO
MR. GREG KOSTIGEN
24956 LINCOLN STREET
CARMEL, CALIFORNIA
93923

GEOTECHNICAL REPORT FOR THE PROPOSED DRAINAGE IMPROVEMENTS KOSTIGEN RESIDENCE 24956 LINCOLN STREET CARMEL, CALIFORNIA 93923 A. P. N. 009-122-026-000

by

GRICE ENGINEERING, INC.
561 A BRUNKEN AVENUE
SALINAS, CALIFORNIA
MARCH 2021

GRICE ENGINEERING INC

ENGINEERING GEOTECHNICS SEPTIC HYDROLOGY
FOUNDATIONS SOILS EARTH STRUCTURES

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File No. 7270-20.07
March 26, 2021

Mr. Greg Kostigen
24956 Lincoln Street
Carmel, California 93923

Project: Drainage Improvements
Kostigen Residence
24956 Lincoln Street
Carmel, California 93923
A. P. N. 009-122-026-000

Subject: Geotechnical Report

Dear Mr. Kostigen;

Pursuant to your request, we have completed our geotechnical investigation and evaluation of the above named site and drainage features as discussed in this report. It is our opinion that this site has suitable characteristics for the completed or any future development provided the recommendations as given in this report are followed with design and construction in association with an engineer.

As discussed in this report the completed drainage structures addressing erosion caused by community drainage have been constructed suitably and are performing as intended. This and other site conditions are discussed in the following report with recommendations given relative to this and other construction within the report and especially under Special Recommendations.

The report contained herein is made with our best efforts to evaluate the site, determine the site's geotechnical conditions and provide recommendations for these conditions. We submit this report with the understanding that it is the responsibility of the owner, or his representative, to ensure incorporation of these recommendations into the final plans, and their subsequent implementation in the field.

In addition, we recommend that GRICE ENGINEERING, INC., be retained to review the project plans and provide the construction supervision and testing required to document compliance with these recommendations. Should any site condition not mentioned in this report be observed, this office should be notified so that additional recommendations can be made, if necessary.

This report and the recommendations herein are made expressly for the above referenced project and may not be utilized for any other site without written permission of GRICE ENGINEERING, INC.

Please feel free to call this office should you have any questions regarding this report.

Very truly yours,
GRICE ENGINEERING, INC.

03262021DIGITAL

Lawrence E. Grice, P.E.
R.C.E. 66857

NOTICE TO OWNER

Any earthwork and grading performed without direct engineering supervision and materials testing by Grice Engineering Inc., will not be certified as complete and in accordance with the requirements set forth herein.

Foundations placed without observation of bearing conditions will not be certified as being in accordance with the requirements set forth herein.

Inspection of Work

It is recommended that all site work be inspected and tested during performance by this firm to establish compliance with these recommendations.

NOTIFY:	GRICE ENGINEERING INC.	SALINAS	(831) 422-9619
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A minimum of 48 hours (2 working days) notification is required prior to commencement of work so that scheduling for testing and inspections can be made.

Please be advised that costs incurred during inspection and testing of all site work is separate and not considered part of the fees as charged by Grice Engineering, Inc. for the report contained herein.

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GEOTECHNICAL REPORT
for the proposed
DRAINAGE IMPROVEMENTS
KOSTIGEN RESIDENCE
24956 LINCOLN STREET
CARMEL, CALIFORNIA 93923
A. P. N. 009-122-026-000

Introduction, Method and Scope of Investigation

The purpose of this report is to evaluate the geotechnical properties of the site relative to the construction of drainage structures on a single family residential parcel to manage and safely pass local community drainage. From these findings recommendations are given for the design of the development and subsequent construction.

For this purpose, the site was investigated, and prior information concerning construction and subsurface exploration in this area was examined for soils and materials data. The investigation consisted of a detailed site evaluation, which included: a site inspection; a review of literature made available to GRICE ENGINEERING, INC., including Construction Plans from Ecologic Architects; geotechnical drilling and soil sampling; materials evaluation; and analysis of the geotechnical properties of the site soils. This report concludes the results of the investigation and provides recommendations based on that work.

The findings and recommendations contained in this report are applicable only to the above named site and its proposed development, and may not be utilized for any other site or purpose without written permission of GRICE ENGINEERING, INC.

Site Description

The project site is located to the west of 24956 Lincoln Street approximately 200 feet north of its intersection with Second Avenue, in an un-incorporated area of Carmel located in westernmost Monterey County, California. Please refer to the Vicinity and Location Maps and the Site Map in Appendix A for details.

The topography of the 0.17± acre site is located on a west facing slope of moderate inclination. A natural draw descends westward along the northern boundary. Elevation of the parcel is at approximately 255 above mean sea level (msl) along the eastern boundary and descends to approximately 200 feet msl at the middle of the western boundary in the center of the draw. The majority of the site is covered with grass, landscaping, hardscaping and trees.

Currently a single family residence is located centrally on the eastern portion of the site with a driveway from the attached garage on the eastern end providing access to Lincoln Avenue to the east.

Rainfall events during the winter of 2015-2016 winter caused excessive erosion threatening to undermine the foundations supporting the residence. The source of this damaging drainage was from the immediate community to the east which is collected and discharged to the draw. The runoff is collected in a catch basin on the eastern side of Lincoln Street and conveyed to the southwest discharging to grade on the parcel to the north. These structures are controlled by the County of Monterey.

The uncontrolled drainage released onto the parcel to the north eroded the earth along the north to northwestern corner of this residence encroaching on the foundations and stability of the residence.

This report analysis the improvements addressing this uncontrolled public drainage of runoff from streets and surrounding land to the northeast. Corrective measures included installing a 24 inch culvert to safely convey drainage past the residence with discharge to a gabion structure designed to direct the flow to the center line of the draw after decreasing the energy.

These structures replace the natural drainage pattern which consisted of a ravine. Remnants of the ravine can be observed below the referenced residence and continues to the parcel to the west. At that parcel the ravine is again collected into a culvert and conveyed to the drainage of Pescadero Canyon.

Corrective measures were constructed to collect the drainage near to the northern property line in a 24 inch HDPE double wall pipe which is oriented to convey and release the runoff to the natural drainage way descending to the west.

Segmental block retaining structures were constructed around the culvert outlet to provide retention of the fill placed to correct the erosion around the foundation.

Field Investigation

Our field investigation consisted of a site inspection, along with drilling and sampling two exploratory bores and inspection of one exposure to establish the subsurface soil profile, and obtain sufficient soil specimens to determine the soil characteristics. Drilling was accomplished by hand auger, with the spoil constantly examined, classified, and logged by field method in accordance with the Unified Soil Classification Chart[1] which is the basis of ASTM D2487-10. In the hand augured bores Penetration Resistance values were obtained through use of a dynamic cone penetrometer (ASTM Special Technical Publication #399). The blow count as measured in this method is Standard Penetration Resistance.

* *In-situ* refers to the in place state of soil. *In-situ* native soils are those which are in-place as deposited by nature and have not been disturbed by man's actions in the historic past.

Site Soil Profile

As found in the exploratory drilling, the site soils are generally consistent between each of the bores.

The surficial soils were observed to be a brown fine sand containing few amounts of silt. These soils were observed to be loose and moist.

At approximately 2 feet the sands pale in color and few amounts of clayey silts. These soils are medium dense and are generally moist.

At approximately 3 feet a silty clay becomes dominate and is often associated with weathering of the underlaying soft bedrock. This clay is typical medium stiff to stiff and damp to very damp.

The local soft bedrock was observed at a depth of 6.5 feet in the first bore, 2.0 feet in the second bore and is exposed in the bottom of the channel. This bedrock is comprised of various horizons ranging from clays and silts to sands and occasional gravel lenses. Cementation varies from nil to moderate with some portions being of high cementation. Natural scouring in the draw below the residence exposes this bedrock indicating its resistance to erosion.

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[1] Adopted 1952 by Corps of Engineers and Bureau of Reclamation. ASTM D2487 was developed as based on the Uniform Soils Classification Chart and System. The methods are equivalent.

Complete soil characteristics and comments are reported on the boring logs at the depths observed. The logs are located in Appendix B.

Groundwater

No true groundwater was encountered in the bores advanced at this site to the maximum depth of exploration, approximately 9 feet below grade. Some seeps were observed in the side slopes of the channel and are occasionally observed across the area as vertical permeability is limited by the clay horizon and bedrock.

Seismic History

Although no fault traces are thought to directly cross the building site, Monterey County is traversed by a number of faults most of which are relatively minor hazards for the purposes of the site development. As such, this site will experience seismic activity of various magnitudes emanating from one or more of the numerous faults in the region.

Various maps presently exist, allowing observation on the site of distinctive geologic features. Some maps, such as that by Burkland and Associates (Reference No. 10) developed for Monterey County, are compilations from various sources detailing the locations of studied faults. Faults have inherit variances within their zones, and discoveries of new fault segments or entire faults is ongoing. There is also some difference in exact fault line location from source map to map, making precise location of said faults difficult. Therefore, relative to the information contained within this report, the following is considered to be as accurate as is currently possible from information made available to Grice Engineering Inc..

Regional Faults

Of most concern are active faults which have tectonic movement in the last 11,000 years and as such are called Holocene Faults and potentially active faults. The following are those nearest listed (Reference No. 12).

The most active is the San Andreas Rift System (Pajaro), located approximately 29.5 miles to the northeast. It has the greatest potential for seismic activity with estimated intensities of VI-VII Mercalli in this location.

Other fault zones are the Monterey Bay-Tularcitos Fault Zone, the center of which is located approximately 5.0 miles to the northeast, the Rinconada Fault Zone, approximately 13.3 miles to the northeast, the San Gregorio-Palo Colorado (Sur) Fault Zone, approximately 3.3 miles to the southwest, and the Zayante-Vergeles Fault Zone, approximately 25.4 miles to the northeast. These zones are not as liable to rupture as the San Andreas and a seismic event at any of the above fault zones would likely produce earth movements of a lesser intensity at the site.

Local Faults

In addition to the fault zones as discussed above, the local faults are listed below as shown on the following maps, "Preliminary geologic map of the Monterey and Seaside 7.5 minute quadrangles, Monterey County, California, with emphasis on active faults" (Reference No. 15), "Geological Map of the Monterey and Seaside 7.5 minute Quadrangles, Monterey County, California: A Digital Database" (Reference No. 16), "Geologic Map of the Monterey Peninsula and Vicinity, Monterey, Salinas, Point Sur, and Jamesburg 15-Minute Quadrangles, Monterey County" (Reference No. 23), "Fault Activity Map of California: California Geological Survey Geologic Data Map" (Reference No. 33), and "Quaternary Fault and Fold Database for the United States" (Reference No. 47) including the USGS overlay on Google Earth.

TABLE OF LOCAL FAULTS

FAULT, PERPENDICULAR TO SITE	APPROXIMATE DISTANCE FROM SITE	DIRECTION	TIME OF LAST DISPLACEMENT ON FAULT (Ref. 32)
Hatton Canyon Fault	0.50 miles	northeast	Quaternary
Cypress Point Fault, concealed beneath Carmel Bay	1.10 miles	southwest	Quaternary

Liquefaction

The site soils are considered not susceptible to liquefaction as they are generally un-saturated, of relatively thin profile and are underlaid by a soft bedrock.

Historic records of liquefaction indicates this area of Monterey County has not exhibited liquefaction or sand boils, an indication of partial liquefaction.

Differential-Total Settlement - Static and Dynamic

The recommendations given in the Geotechnical Report are such that concerns of settlement are negligible. The total settlement is expected to be less than 1/4 inch and the expected differential settlement less than one half that.

Hydro-Collapse and Subsidence

As observed the near surface soils to an approximate depth of two feet are loose. These soils possess some capacity to settle under hydraulic loading. However this effect is not common in the area. The recommendations given in this report were established to reduce the potential of this occurring.

The area is not within a known Subsidence Zone.

Slope Stability

Inspection of the site indicates that no landslides are located above or below the building area and the area is generally not susceptible to slope failure.

Slope Stability and Erosion

The parcel was evaluated for landslides located above or below the building area. The site evaluation included the method as delineated in "Special Publication 117A Guidelines for Evaluating and Mitigating Seismic Hazards in California" was reviewed as applicable to this site. The following summarizes the findings.

The following methods and publications were utilized to determine the presence of land movement or excessive erosion above and below the project site.

A. On site evaluation of land features.
B. Aerial photographs spanning the time frame from September 6, 1998 to July 10, 2020.
C. Open File Report 7-718, 1977, Green
D. Geologic Map of California - Santa Cruz Sheet, 1958, Jennings etc.
E. Ground Failures in the Monterey Bay Counties Region, Professional Paper 993, Dept. of the Interior.

1. "Are existing landslides, active or inactive, present on, or adjacent (either uphill or downhill) to the project site?"

There are no existing landslides, active or inactive, present on, or adjacent to the project site.

The general area is considered not susceptible to mass slope failure due to the medium dense to dense character of the underlain soils. These soils are a portion of the local soft sandstone bedrock which is generally exposed at or near to grade.

No features or conditions were visually observed during the site exploration which indicate or suggest landsliding has or will occur above or below the project site.

No recorded features were noted on any of the reviewed publications which suggest, imply or note landslides have or will occur above or below the project site.

2. “Are there geologic formations or other earth materials located on or adjacent to the site that are known to be susceptible to landslides?”

There are no geologic formations, or other earth materials located on or adjacent to the site that is known to be susceptible to landslides. The building site is located on a southwestern slope varying in grade from 5% to 25%.

Due to the natural characteristics of the topsoil these materials are compressible. This characteristic is addressed in the Geotechnical Report.

3. “Do slope areas show surface manifestations of the presence of subsurface water (springs and seeps), or can potential pathways or sources of concentrated water infiltration be identified on or upslope of the site?”

Drainage over the silty clay and bedrock is typical in the area. This characteristic is more dominate in incised terrain such as the drainage way passing through the site. Inspection of the drainage noted a few points of sheet flow entering the drainage way. No negative conditions were associated with the drainage.

Drainage over the local terrain is focused to incised terrain with most surface drainage managed by road side gutters, public storm drains and private drainage systems typically discharging to established drainage structures and paved streets.

Inspection of areal photographs spanning the referenced dates indicates the terrain and presence of vegetation has been consistent during that period. The land use during this time span extends undeveloped land to the current residential development.

These characteristics in conjunction with the firm soils indicated a low potential for rapid solifluction or debris flow.

4. “Are susceptible land forms and vulnerable locations preset?”

Due to the sandy nature of the topsoil excess drainage can cause erosion, and high saturation from uncontrolled drainage would promote solifluction or debris flow. These conditions have been experience at this location and are the cause for the construction of the referenced drainage improvements.

5. “Given the proposed development, could anticipated changes in the surface and subsurface hydrology (due to watering of lawns, on-site sewage disposal, concentrated runoff from impervious surfaces, etc.) increase the potential for future landsliding in some areas?”

The area is generally fully developed however modification to existing drainage patterns may occur as the governing agencies often dictate onsite dispersal of runoff as opposed to transport with release to drainage structures or natural drainage ways. Such mandates have caused problems on parcels within the areas and should not be adhered to.

Seismic Strength Loss

The site soils are considered resistant to seismic strength loss and the resulting momentary liquefaction as noted. The relatively short duration of earthquake loading will not provide a significant number of high amplitude stress cycles to alter the strain characteristics. Additionally the clay-silt fraction is not considered quick nor sensitive, as such it will not have the associated loss of strength.

Chemical Reactivity

The area is well developed with structures, generally found on Portland Cement products. Additionally these structures date back to the 1950's or earlier. Much of the concrete used in these structures has remained as cast. The area soils are not known for sulfate reaction with Portland cement products and as such chemical reactivity is not considered a problem in this area.

Expansive Soils

The silty clay above the sandstone is generally of low expansivity. Local structures have experience localized settlement from drying shrinkage of this clay however only very slight problems with heave have been experienced. The recommendations to bear on the sandstone preclude the affects of this.

Surface Rupture and Lateral Spreading

The project site is located 0.50 miles to the southwest of the Hatton Canyon Fault. The site inspection did not reveal any surface features indicating a fault rupture has occurred at the site. The existing structure, driveways and roads do not reveal any strains which would be attributable to subsurface lateral or vertical displacements resulting from fault slip. Therefore surface rupture from fault activity across the site is considered improbable.

The project site is underlain by relatively strong soils and soft bedrock at a shallow depth. These materials are considered resistant to lateral spreading. As such surface rupture from lateral spreading is considered improbable.

Seismicity

It is recommended that all structures be designed and built in accordance with the requirements of the California Building Code's current edition. All buildings should be founded on undisturbed native soils and/or tested and accepted engineering fill to prevent resonance amplification between soils and the structure.

2019 California Building Code Geoseismic Classifications

The California Building Code, 2019 edition (Reference No. 13), provides for seismic design values. These values are to be utilized when evaluating structural elements. The soils profile determination is based on the penetration resistance data developed from advancement of exploratory bores. Using averaged penetration values per depth of soils type gives an overall site value of 15 to 50 blows/foot penetration resistance as per Equation 20.4-3, ASCE 7-16 and Supplement 1 (02/01/19). The geoseismic character is as listed in the following table.

2018 I.B.C. - 2019 C.B.C. EARTHQUAKE LOADS: SECTION 1613				
LATITUDE	36.561100	SOIL PROFILE:	Stiff Soils	
LONGITUDE	-121.923877	SITE CLASS	D	
PERIOD	S	F	Sm	Sd
0.2 sec	Ss = 1.266	Fa = 1.00	Sms = 1.266	Sds = 0.844
1.0 sec NOTE 1	S1 = 0.477	Fv = Note 1	Sm1 =	Sd1 =
Seismic Design Category to be assigned by structural engineer or designer				

Note 1: Refer to Section 11.4.8 ASCE 7-16 for other requirements.

CONCLUSIONS OF INVESTIGATION

In general, the suitable, *in-situ**, native soils and certified engineered fill are acceptable for foundation purposes and display engineering properties adequate for the anticipated soil pressures, providing the recommendations in this report are followed.

Special Recommendations

The drainage structures installed to control encroaching runoff from public areas are considered suitable as constructed provided they are maintained. These structures include a 24 inch culvert, deflection wall, abutment retaining walls and gabion energy reduction baskets.

Comment from Monterey County Agencies has queried the necessity of these structures. The purpose of all these components is required in some form to prevent a recurrence of damaging erosion.

The collection of the free overland drainage, performed by the culvert, is required to manage the direction of flow and reduce the scour of land. Such function could also be performed by a lined channel. Uncontrolled runoff tends to wander as the turbulence of the flowing water will erode the land over which it travels. The durable structure of a culvert or lined channel reduces the occurrences of this.

At the inlet of the culvert is a short, rip-rap lined ravine formed to convene the overland flow from the north and direct it into the culvert. This could have also been partially completed with a pre-made inlet structure commonly referred to as a flared end structure, however some grading and rip-rap placement would be required. In any event a structure would be required to collect the broader drainage and direct the flow into the culvert while minimizing scour.

The culvert terminates at the centerline of the ravine downslope of the residence with the released discharge directed onto energy dissipation baskets. This is considered the safest point of termination as any release off the centerline of the ravine will cause erosion and further mitigation measures will be required.

The purpose of an energy dissipation structure is a required feature to reduce the discharge velocity and guide the released drainage in a proper direction. At this site clast filled wire baskets were utilized. Other materials could be used such as those composed of cast Portland Cement concrete or large clasts (cobbles, boulders) of natural stone.

The retaining structures at the outlet of the culvert are required to support the culvert and upper deflection wall as well as reduce erosion of material up slope of the walls. This includes soils replacing that eroded by the drainage released from the county structure. These structures convene the higher, manipulated grade of the residential developments and public street to the natural grade of the ravine.

The convening of these disparate grades is a necessity to prevent further loss of earth which would eventually result in damage to the residences and roadway. For this gravity structures were used and are comprised of segmental block materials. Other materials such as cast in place concrete or masonry construction could have been utilized.

Due to the rapidity of the grade changes, potential for overwhelming runoff, confined space, and conformation to other features and structures, use of engineered fill to provide such convening would not be suitable.

Inspection of the completed storm water management structure indicates there is no further construction necessary. The elements have performed adequately to reduce erosion of the area and prevent undermining of the residence's foundations or other structural site features.

Any future construction should under the observation of an engineer.

To prevent settlement all future foundations should be embedded into the sandstone bedrock. For on grade structures such as floor slabs all loose or unsuitable materials should be processed as engineered fill.

The area has been developed and as such underground utilities may be located within the area of proposed construction. In addition, buried objects or deeply disturbed soils may also be encountered. As such all care and practice is to be exercised to observe for and locate any such objects. Where these objects are to be removed or use discontinued, they are to be removed in their entirety and all disturbed soils are to be processed as engineered fill.

The base of all excavations and over-excavations are to be inspected by the Soils Engineer prior to further processing, steel or form placement.

Any further site activity, especially grading and foundation excavations, should be under the direction of a qualified Soils Engineer or their Representative.

Should the spectrum of development change, this office should be notified so that additional recommendations can be made, if necessary.

* Suitable, *in-situ,* native soils are those soils which are in-place as deposited by nature and have characteristics adequate for support of the intended load or application.

Foundations and Footings

Geotechnical evaluation indicates that square, round, and continuous spread footings are satisfactory types of support. The minimum embedment for shallow, spread foundations is 12 inches for single stories and 18 inches for two stories into suitable, *in-situ*,* native siltstone. Embedment depths do not take into account the loose upper top soils, disturbed soils or any other unacceptable soils which exist at the site, e.g., any un-engineered fill, landscaping soils, etc.

VERTICAL SOIL PRESSURES[1]	
FOOTING TYPE	DEAD + LL, kips/ft^2
Spread & Isolated	3.5
LATERAL SOIL PRESSURES[1]	
TYPE	VALUE, lbs/ft^2
Active Earth Pressure	30 lbs/ft^3 (Equivalent Fluid Pressure)
Restrained Earth Pressure	49 lbs/ft^3 (Equivalent Fluid Pressure)
Seismic	2 lbs/ft^{3}xH^2 applied at 0.6H
Friction at Base	0.35 × Dead Load
Passive Earth Pressure	325 lbs/ft^3 × H^2 NOTE2
Uplift Friction	215 lbs/ft^2 × H

Notes: LL = Live Load; DL = Dead Load; H = Vertical height of material retained.
One-third increase to be allowed for wind and seismic forces.
[1] For depths into acceptable native materials or engineered fill.
[2] Excludes near surface 0.5 feet of *in-situ* soils.

Pile and Pier foundation information is not provided as none are required or proposed. All foundation excavations are to be cleaned of debris and loose or otherwise unsuitable soils prior to placement of concrete.

* Suitable, *in-situ,* native soils are those soils which are in-place as deposited by nature and have characteristics adequate for support of the intended load or application.

Slabs-on-Grade

All slabs should be constructed over a prepared sub-grade placed on suitable *in-situ** native material or certified engineered fill. The site exploration observed that the existing surficial soils are loose to depths of approximately 1 foot. These soils should not be relied upon for support of slabs on grade or other surficial structures.

As such where any unsuitable soils remain after excavation to subgrade they are to be processed as engineered fill prior to further fill placement or construction of the on grade structure. At a minimum the upper 6 inches of subgrade below all surficial structures should be processed as engineered fill in areas of on grade structures.

The sub-grade materials should be observed and accepted by a qualified Soils Engineer or their representative prior to placement of forms, reinforcing or concrete.

On-grade slabs should be placed over a moisture vapor barrier consisting of a waterproof membrane (Moist Stop, 10 mil Visqueen, or equal) with a 2 inch protective sand cover. The waterproof membrane should be placed over a capillarity break consisting of 4 inches of open graded rock; round and sub-round rock is recommended to prevent puncture of the membrane. Open graded crushed aggregate may be utilized, provided the vapor barrier is protected from puncture by a cushion of filter fabric (Mirafi 140N or equal) laid over the aggregate prior to placement of the membrane. Where such concerns are not warranted, alternative underlayment may be utilized at the owners discretion.

All care and practice required to prevent puncture of the membrane during placement and pouring of covering slabs should be utilized during construction. Unless otherwise required for structural purposes, all slabs should be reinforced with a minimum of No.4, Grade 40, deformed steel reinforcing bar, 24 inches o.c., each way, to prevent separation and displacement in cases of cracking.

* Suitable, *in-situ,* native soils are those soils which are in-place as deposited by nature and have characteristics acceptable for support of the intended load or application.

Specifications for Rock Under Floor Slabs

Definition: Graded gravel of crushed rock for use under floor slabs shall consist of a minimum thickness of mineral aggregate placed in accordance with these specifications and in conformance with the dimensions shown on the project plans. The minimum thickness is specified under the section Slabs-on-Grade above.

Material: The mineral aggregate for use under floor slabs shall consist of broken stone, crushed or uncrushed gravel, quarry waste, or a combination thereof. The aggregate shall be free from adobe, vegetable matter, loam, volcanic tuff, and other deleterious substances. It shall be of such quality that the absorption of water in a saturated dry condition does not exceed 3 percent of the oven dry weight of the sample.

Grading: The mineral aggregate shall be of such size that the percentage composition by dry weight as determined by the use of laboratory sieves, U.S. Standard, in compliance with ASTM C 136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates, will conform to the following grading specification:

SIEVE SIZE	PERCENTAGE PASSING SIEVE
3/4 inch	100 %
No. 4	0 - 10 %
No. 200	0 - 2 %

Placing: Sub-grade upon which gravel or crushed rock is to be placed shall be prepared as outlined in the Recommended Grading Specifications. In addition, the Sub-grade shall be kept moist so that no drying cracks appear prior to pouring slabs. If cracks appear, Sub-grade shall be moistened until cracks close.

Slope Ratio and Drainage

Analysis of site soils indicate that cut and fill slope ratios of 2 horizontal to 1 vertical will be satisfactory provided they are landscaped with soil retaining ground covers and are protected against concentrated over slope drainage.

Surface Drainage and Erosion Control

All concentrated roof and area drainage should be conveyed and released to the existing drainage structure. Concentrated storm or area runoff should never be allowed to discharge to grade in an uncontrolled manner. A sub-surface storm water or area runoff dispersal system **MAY NOT** be used on this site.

Design and construction of the project should fit the topographic and hydrologic features of the site. It is important to minimize unnecessary grading of or near steep slopes. Disturbing native vegetation and natural soil structure allows runoff velocity and transport of sediments to increase.

General surface drainage should be retained at low velocity by slope, sod or other energy reducing features sufficient to prevent erosion, with concentrated over-slope drainage carried in lined channels, flumes, pipe or other erosion-preventing installations.

Runoff flows should be directed into pipes or lined ditches and then onto an energy dissipater before discharging into streams or drainage ways. De-silting should be provided as necessary and may take form of stilling basins, gravel berms, forested/vegetated screens, etc.

Recent changes to the drainage requirements have the potential to alter drainage patterns. This has been observed to effect structures which have otherwise not been affected or to alter the way they are affected. As such new drainage modifications on this and adjacent parcels may negatively affect drainage patterns.

During construction, never store cut and fill material where it may wash into streams or drainage ways. Keep all culverts and drainage facilities free of silt and debris. Keep emergency erosion control materials such as straw mulch, plastic sheeting, and sandbags on-site and install these at the end of each day as necessary.

Re-vegetate and protect exposed soils by October 15. Use appropriate grass/legume seed mixes and/or straw mulch for temporary cover. Plan permanent vegetation to include native and drought tolerant plants. Seeding and re-vegetation may require special soil preparation, fertilizing, irrigation, and mulching.

Subsurface Drains

Use of spun filter fabric is not recommended for use in construction subsurface drains as this type of fabric typically becomes clogged. Should filter fabric be necessary it is recommended that a woven fabric be used such as Mirafi Filterweave 300. Otherwise we would recommend omission of the fabric and placement of Caltrans Class 1, Type ‘A” or “B” drain rock, and that any fabric only be placed near the top of the trench between the gravel and earth backfill or where the gravel extends to grade, 1 foot below finish grade.

CLASS 1		
SIEVE SIZES	**PERCENTAGE PASSING**	
	TYPE A	TYPE B
50.0-mm/2 inches	----	100
37.5-mm/1.5 inches	----	95-100
19.0-mm/0.75 inches	100	50-100
12.5-mm/0.5 inches	95-100	-----
9.5-mm/0.415 inches	70-100	15-55
4.75-mm/No. 4	0-55	0-25
2.36-mm/No. 8	0-10	0-5
75.0-µm/No.200	0-3	0-3

General Grading Recommendations

For those items not directly addressed, it is recommended that all earthwork be performed in accordance with the following.

General: This item shall consist of all clearing and grubbing; preparation of land to be filled; excavation and fill of the land; spreading, compaction and control of the fill; and all subsidiary work necessary to complete the graded area to conform with the lines, grades and slopes as shown on the approved plans.

The Contractor shall provide all equipment and labor necessary to complete the work as specified herein, as shown on the approved plans as stated in the project specifications.

Preparation: Site preparation will consist of clearing and grubbing any existing structures and deleterious materials from the site, and the earthwork required to shape the site to receive the intended improvements, in accordance with the recommended grading specifications and the recommendations as provided above.

All vegetable matter, irreducible material greater than 4 inches and other deleterious materials shall be removed from the areas in which grading is to be done. Such materials not suitable for reuse shall be disposed of as directed.

After the foundation for fill has been cleared, it shall be brought to the proper moisture content by adding water or aerating and compacting to a Relative Compaction of not less than 90% or as specified. The soils shall be tested to a depth sufficient to determine quality and shall be approved by the Soils Engineer for foundation purposes prior to placing engineered fill.

General Fill: General fill shall be placed only on approved surfaces, as engineered fill, and shall be compacted to 90% Relative Compaction. Native soils accepted for fill or existing aggregate fill may be used for fill purposes provided all aggregate larger than 6 inches are removed. The material for engineered fill shall be approved by the Soils Engineer before commencement of grading operations.

Each layer shall be compacted to a Relative Compaction of not less than 90% or as specified in the soils report and on the accepted plans. Compaction shall be continuous over the entire area of each layer.

The selected fill material shall be placed in layers which, when compacted, shall not exceed 6 inches in thickness. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to ensure uniformity of material in each layer. Fill shall be placed such that cross fall does not exceed 1 foot in 20 unless otherwise directed.

When fill material includes rock or concrete rubble, no irreducible material larger than 4 inches in greatest dimension will be allowed except under the direction of the Soils Engineer.

Imported Materials: Materials imported for fill purposes shall be classified as: SAND, group symbol SW, SP, SC or SM, as given in ASTM 2487-10, "The Classification of Soils For Engineering Purposes." In all cases the portion finer than the No. 200 sieve shall not contain any greatly expansive clays and shall be free from vegetable matter and other deleterious materials. The material for engineered fill shall be approved by the Soils Engineer before commencement of grading operations.

Structural Backfill: Trench, wall and structural backfill shall be placed only on approved surfaces, as engineered fill, and shall be compacted to 95% Relative Compaction. Materials imported for backfill purposes shall have a Sand Equivalent of no less than 30 and shall be classified as Clean Sands as designated in “The Classification of Soils For Engineering Purposes” (ASTM 2487-10).

Pavement Grades: All pavement grades shall be of uniform thickness, density and moisture prior to placement of the next grade. Flexure of each or all grades shall not exceed 0.25 inches in 5 feet under an axial load of 18.5 kip.

Aggregate Base Course: All aggregates used for specified base courses, shall be handled in a manner which prevents segregation and non-uniformity of gradation.

Compaction: All re-compacted soils and/or engineered fill should be placed at a minimum 90% Relative Compaction or at the value required for that portion of the work. All pavement sections should be compacted to a minimum of 95% Relative Compaction.

Field density testing shall be completed by the Soils Engineer on each compacted layer or as determined by the Soils Engineer. At least one test shall be made for each 500 cubic yards or fraction thereof, placed with a minimum of two tests per layer in isolated areas. Where a sheeps'-foot roller is used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted materials below the disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof, is below the required density, that particular layer or portion shall be reworked until the required density has been obtained.

Moisture: During compaction moisture content of native soils should be that consistent with the moisture relative to 95% Relative Compaction and in no case should these materials be placed at less than 3 percent above the specific optimum moisture content for the soil in question. The engineer may elect to accept high moisture compacted soils provided the materials are at 95% Relative Wet Density at that moisture content.

The moisture content of the fill material shall be maintained in a suitable range to permit efficient compaction. The Soils Engineer may require adding moisture, aerating, or blending of wet and dry soils.

All earth moving and work operations shall be controlled to prevent water from running into and pooling in excavated areas. All such water shall be promptly removed and the site kept drained.

Tests: All materials placed should be tested in accordance with the Compaction Control Tests: "Density of Soil In-Place by Sand Cone Method" (ASTM D-1556-07), "Moisture-Density Relationship of Soils" (ASTM D-1557-09), and "Density of Soils In-Place by Nuclear Method" (ASTM D-6938-10).

The standard test used to define maximum densities of all compaction work shall be the A.S.T.M. D-1557-09, Moisture Density of Soils, using a 10-pound ram and 18-inch drop. All densities shall be expressed as a relative density in terms of the maximum density obtained in the laboratory by the foregoing standard procedure.

Deleterious Materials: Materials containing an excess of 5% (by weight) of vegetative or other deleterious matter may be utilized in areas of landscaping or other non-structural fills. Deleterious material includes all vegetative and non-mineral material, and all non-reducible stone, rubble and/or mineral matter of greater than 6 inches.

Over-Excavations: Over-excavations, when required, should include the foundation and pavement envelopes. Such excavations should extend beyond edge of development a minimum of 5 feet and to an imaginary line extending away and downward at a slope of 45 degrees from the edge of development. The process shall include the complete removal of the required soils and subsequent placement of engineered fill. After removal of the soils to the required depth, the base of the excavation shall be inspected and approved by the Soils Engineer or his representative prior to further soils processing or placement. Based on this inspection other recommendations may be made.

Existing Conditions: In developed areas underground utilities may be located within the area of proposed construction. In addition, buried objects or deeply disturbed soils may also be encountered. As such all care and practice is to be exercised to observe for and locate any such objects. Where these objects are to be removed or use discontinued, they are to be removed in their entirety and all disturbed soils are to be processed as engineered fill.

Key: All fills on slopes greater than 1 vertical to 6 horizontal shall be keyed into the adjacent soil. The toe of all slopes should be supported by a key cut a minimum of 3 feet into undisturbed soils to the inside of the fills toe. This key should be a minimum of 6 feet in width and slope at no less than 10% into the slope. In addition, as the fill advances up slope benches, 3 feet across, should be scarified into the fill/undisturbed soil interface.

Seasonal Limits: When the work is interrupted by rain, fill operations shall not be resumed until field tests by the Soils Engineer indicate that the moisture content and density of the fill is as previously specified and soils to be placed are in suitable condition

Unusual Conditions: In the event that any unusual conditions are encountered during grading operations which are not covered by the soil investigation or the specifications, the Soils Engineer shall be immediately notified such that additional recommendations may be made.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

The recommendations of this report are based on our understanding of the project as represented by the plans, and the assumption that the soil conditions do not deviate from those represented in this site soils investigation. Therefore, should any variations or undesirable conditions be encountered during construction, or if the actual project will differ from that planned at this time, GRICE ENGINEERING INC. should be notified and provided the opportunity to make addendum recommendations if required.

NOTIFY:	GRICE ENGINEERING INC.	SALINAS	(831) 422-9619
	561-A Brunken Avenue	MONTEREY	(831) 375-1198
	Salinas, California 93901	FAX	(831) 422-1896

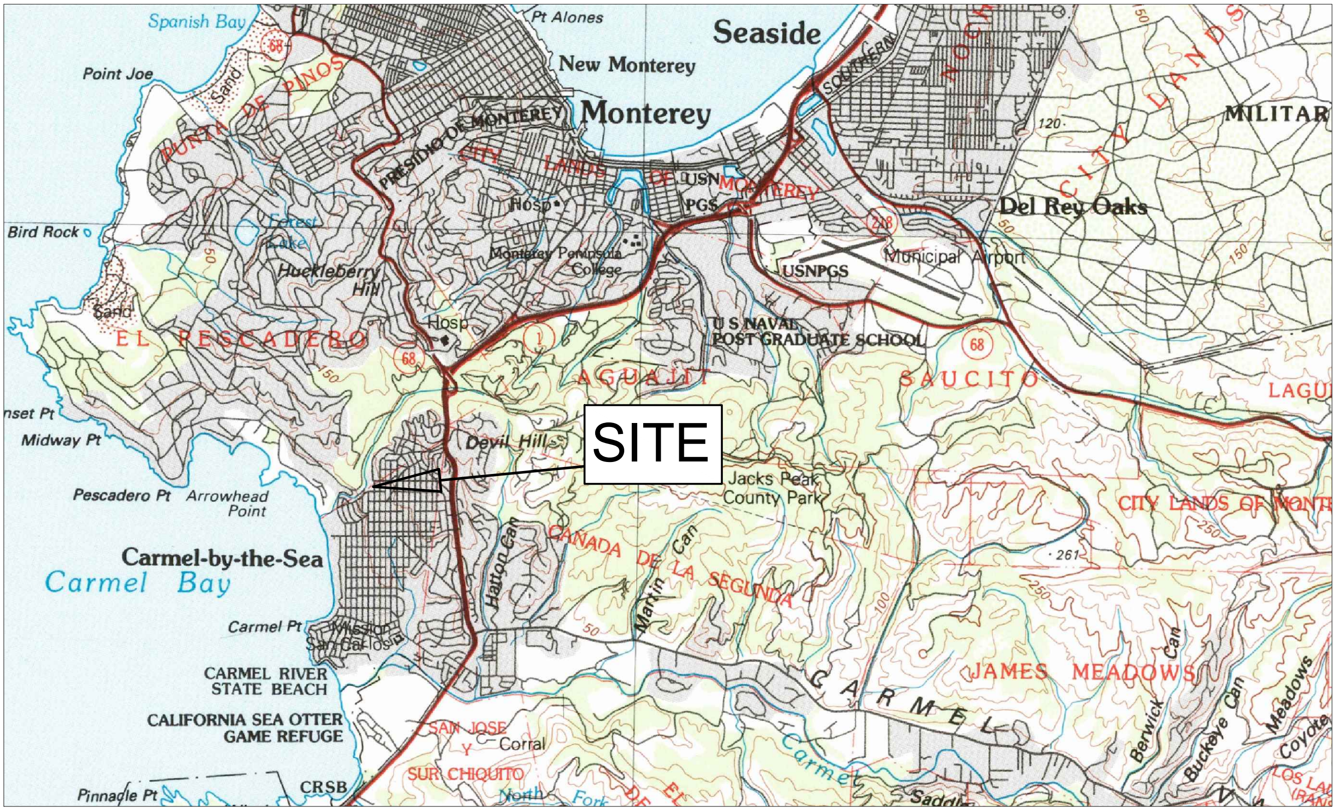
This report is issued with admonishment to the Owner and to his representative(s), that the information contained herein should be made available to the responsible project personnel including the architects, engineers, and contractors for the project. The recommendations contained herein should be incorporated into the plans, the specifications, and the final work.

It is requested that GRICE ENGINEERING INC. be retained to review the project grading and foundation plans to ensure compliance with these recommendations. Further, it is the position of GRICE ENGINEERING INC. that work performed without our knowledge and supervision, or the direction and supervision of a project responsible professional soils engineer renders this report invalid.

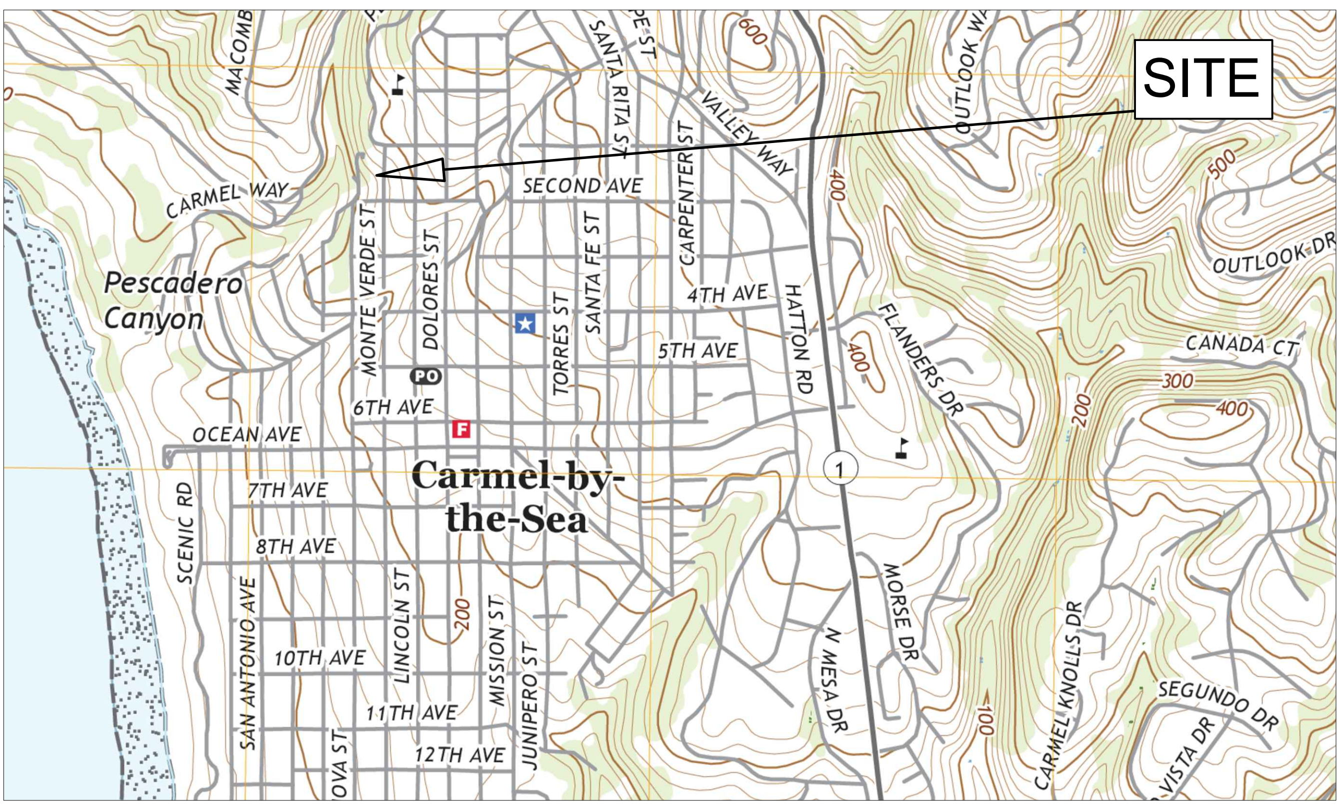
It is our opinion the findings of this report are **valid** as of the **present date**, **however**, changes in the **Codes and Requirements** can occur and change the recommendations given within this report concerning the property. In addition changes in the conditions of a property can occur with the passage of time, due either to natural processes or to the works of man and may affect this property. In addition, changes in **standards** may occur as a result of legislation, or the broadening of knowledge, and these changes may require re-evaluation of the conditions stated herein. Accordingly, the findings of this report may be invalidated wholly, or partially, by changes beyond our control. Therefore, this report is subject to review and should not be relied upon after a period of **three years**.

REVISED 01-07-2011

APPENDIX A



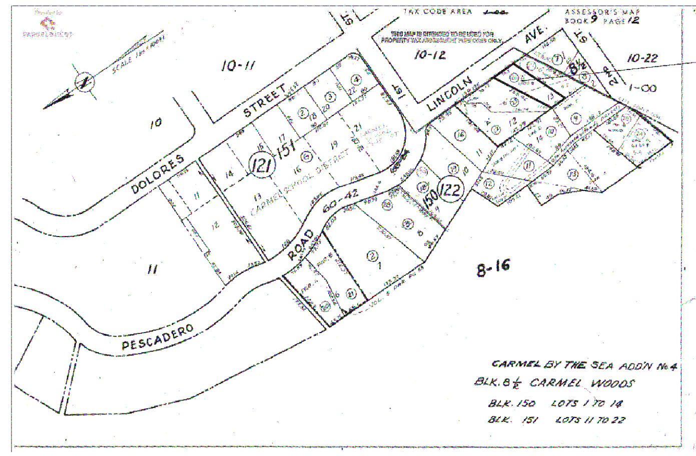
Vicinity Map



Location Map

GRICE ENGINEERING INC
561A Brunken Avenue
Salinas, California 93901
Salinas: (831) 422-9619
Monterey: (831) 375-1198 FAX: (831) 422-1896

Vicinity and Location Map
Drainage Improvements; Kostigen Residence
24956 Lincoln Street, Carmel, California



SCOPE OF WORK

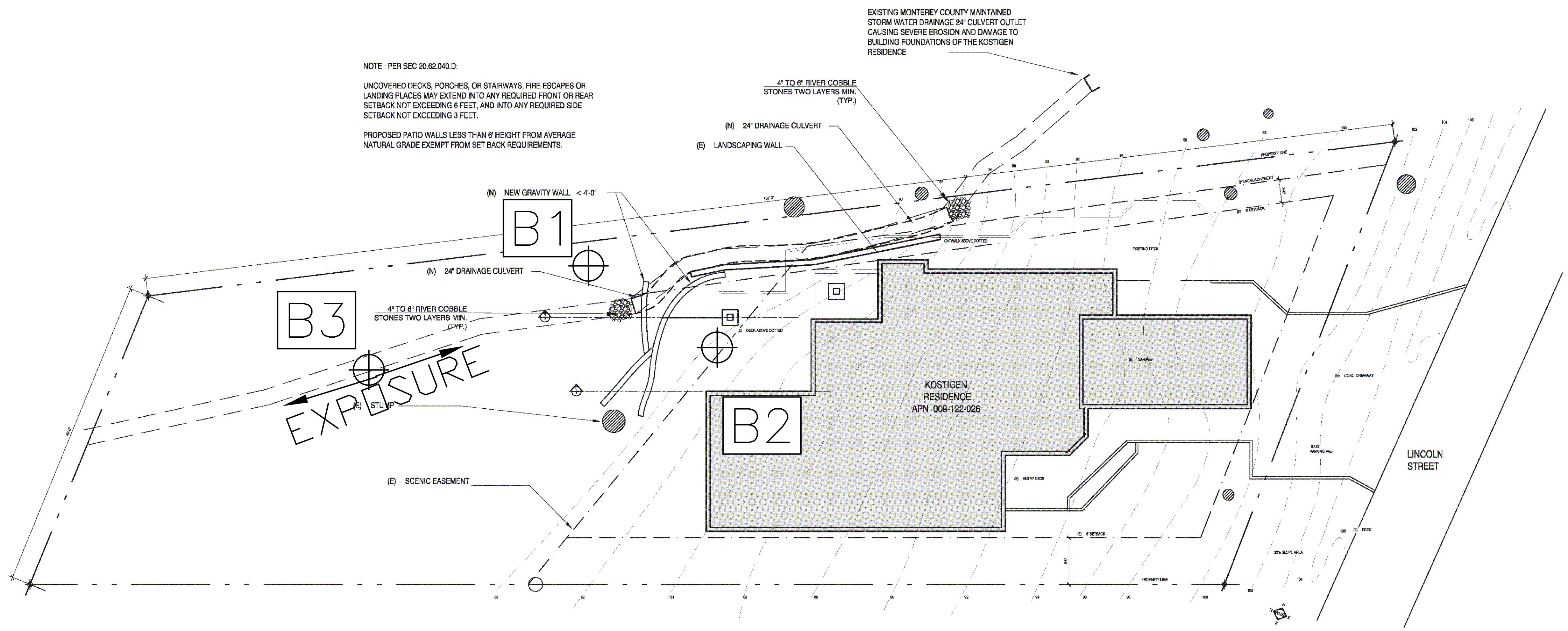
INSTALL GRAVITY WALLS (UNDER 4'-0" HEIGHT) AND 24" DRAINAGE CULVERT TO PROTECT OWNERS HOUSE FOUNDATION FROM EROSION AND PROPERTY DAMAGE DUE TO CITY/COUNTY STORM WATER DRAINAGE SYSTEM

DRAWING LIST

A-1 COVER SHEET, SITEPLAN, ASSESSORS MAP
A-2 ELEVATIONS, SECTIONS

PROJECT DATA

OWNER	**GREG & DONNA KOSTIGEN** 24956 LINCOLN ST . CARMEL, CALIFORNIA, 93923
ARCHITECT	**THOMAS RETTENWENDER, ARCHITECT** PO BOX 6451 CARMEL CA 93921 831-920-8333 THOMAS@ECOLOGICDESIGNLAB.COM
PROPERTY ADDRESS	24956 LINCOLN ST . CARMEL, CALIFORNIA, 93923
APN	009-122-026-000
ZONING	MDR/2-D(CZ)



DATE	TITLE	
SCALE	PROPOSED SITEPLAN AND WITH STORM WATER EROSION CONTROL MEASURES	
DRAWN BY	**KOSTIGEN RESIDENCE EROSION CONTROL PLAN** 24956 LINCOLN ST. CARMEL CA 93923	
JOB NUMBER # 1930		SHEET

Ecologic Architects

Thomas Rettenwender, Architect
Post Office Box 6451 Carmel-by-the-Sea CA 93921 USA
(831) 920 8333
thomas@ecologicdesignlab.com

file: ../../../stamp2019S.pdf

APPENDIX B

Drainage Way Structures; Kostigen Res.; 24956 Lincoln Street, Carmel, California

Boring No. 1

March 26, 2021

Depth	Symbol	Sample	Field BlowCount per 6 inch	Standard Pen. Burmister	Description	Auger Pen.	Density	Moisture	Unconfined	Cohesion	Shear
0.00					(CUTTINGS) Dark brown to brown; striated | SAND; very-fine to fine | few: silt | moist; loose | Native soils either disturbed or placed as fill..						
	SPm										
0.50											
	SPm				(CUTTINGS) Dark brown; lightly mottled | SAND; very-fine to fine | few: silt | moist; loose | Appears to be native topsoil.						
1.00											
1.50			DCPT								
		1.50	8.00	8.00							
					Color is paling, density increasing.						
2.00											
	SPcm				(CUTTINGS) Light brown; lightly mottled | SAND; very-fine to fine | few: clayey silt | damp; loose-medium dense | Appears to be native subsoil.						
2.50											
					Clay content rising						
3.00											
	CL				(CUTTINGS) Light brown to yellowish brown; mottled | silty CLAY; medium plasticity; moderate-slightly pliable | @contact few fine sand decreasing to trace | very damp; medium stiff.						
3.50			DCPT								
		3.50	5.00	5.00							
			8.00	8.00							
4.00											
					Color settles to Tan with motts to yellowish brown, sands are slowly increasing.						
4.50											
5.00											
5.50					Sand content rises rapidly and includes fine gravel for about 6 inches						
					Turns to a very silty clay with generally little very fine sands and trace mica, similar to bedrock						
6.00											
6.50					Getting very resistant						
	ROCK ML				(INFERRED) SANDY SILT STONE | (CUTTINGS) Pale to light brown; yellowish tones; striated | clayey SILT; low plasticity; friable | little to MOST; sand; very fine to fine | trace: mica | damp at contact, moisture decreasing; very stiff increasing to hard.						
7.00											
7.50											
					Sands dominate with a light cementation						
8.00			DCPT								
		8.00	50.00	58.33							
	ROCK CL		1.50		(INFERRED) SANDY CLAY STONE | (CUTTINGS) Pale to light brown; yellowish tones; striated | silty CLAY; low-medium plasticity; slightly pliable | little; sand; very fine to fine | trace: mica | damp; very stiff.						
8.50	Thin horizon										
	ROCK ML				(INFERRED) SANDY SILT STONE | (CUTTINGS) Pale to light brown; yellowish tones; striated | clayey SILT; low plasticity; friable | little to MOST; sand; very fine to fine | trace: mica | moist; hard | Light to moderate cementation..						
9.00											
					End of bore at 9.0 feet. No free water encountered.						
9.50					Bore backfilled with cuttings						
10.00											

Drainage Way Structures; Kostigen Res.; 24956 Lincoln Street, Carmel, California

Boring No. 2

March 26, 2021

Depth	Symbol	Sample	Field BlowCount per 6 inch	Standard Pen. Burmister	Description	Auger Pen.	Density	Moisture	Unconfined	Cohesion	Shear
0.00	SPm				(CUTTINGS) Dark brown; lightly mottled | SAND; very-fine to fine | few: silt | moist; loose | Appears to be native topsoil.						
0.50											
1.00											
1.50					Few amounts of sandstone clasts, soft						
2.00	ROCK CL	2.00	DCPT 29.00	29.00	(INFERRED) Soft bedrock CLAY STONE (CUTTINGS) Bright yellowish brown | silty CLAY (stone); medium plasticity; moderately friable | few: sand; fine | damp; stiff | Appears to be the local bedrock.						
2.50					Percentage of sand wanders						
3.00	ROCK ML				(INFERRED) SANDY SILT STONE | (CUTTINGS) Pale to light brown; yellowish tones; striated | clayey SILT; low plasticity; friable | little to MOST; sand; very fine to fine | trace: mica | moist; very stiff increasing to hard | light cementation.						
3.50											
4.00					Sand running some to MOST						
4.50					HARD; high cementation, refusal End of bore at 4.5 feet. No free water encountered. Bore backfilled with cuttings.						
5.00											
5.50											
6.00											
6.50											
7.00											
7.50											
8.00											
8.50											
9.00											
9.50											
10.00											

Drainage Way Structures; Kostigen Res.; 24956 Lincoln Street, Carmel, California

Boring No. 3

March 26, 2021

Depth	Symbol	Sample	Field BlowCount per 6 inch	Standard Pen. Burmister	Description	Auger Pen.	Density	Moisture	Unconfined	Cohesion	Shear
0.00	SPm				(CUTTINGS) Dark brown; lightly mottled | SAND; very-fine to fine | few: silt | moist; loose | Appears to be native topsoil.						
0.50											
					EXPOSURE IN RAVINE DOWNSTREAM OF DRAINAGE STRUCTURES						
1.00											
1.50					Few amounts of sandstone clasts, soft						
2.00	ROCK CL				(INFERRED) Soft bedrock CLAY STONE (CUTTINGS) Bright yellowish brown | silty CLAY (stone); medium plasticity; moderately friable | few: sand; fine | damp; stiff | Appears to be the local bedrock.						
2.50	ROCK ML				(INFERRED) SANDY SILT STONE; hard, water worn; high cementation.						
3.00											
					End of exposure at 3 feet. Free water at invert of channel on top of bedrock Occasional seeps entering channel on top of durable rock from side slopes						
3.50											
4.00											
4.50											
5.00											
5.50											
6.00											
6.50											
7.00											
7.50											
8.00											
8.50											
9.00											
9.50											
10.00											

UNIFIED SOIL CLASSIFICATION & ASTM D2487: INCLUDING IDENTIFICATION AND DESCRIPTION

Major divisions		FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3 inches and basing fractions on estimated weights)	GROUP SYMBOLS N.	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA
COARSE GRAINED SOILS — More than half of material is **larger** than No. 200 sieve size is	GRAVELS — More than half of coarse fraction is larger than No. 4 sieve size; CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	Give typical name, indicate approximate percentages of sand and gravel, max. size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information, and symbol in parentheses.	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_c = \frac{(D_{30})^2}{(D_{10} \times D_{60})}$ Between one and 3
		Predominatly one size or a range of sizes with some intermediate sizes missing.	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.		Not meeting all gradation requirements for GW
	GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.		Atterberg limits below "A" line or PI less than 4 — Above "A" line with PI between 4 and 7 are **borderline** cases requiring use of dual symbols
		Plastic fines (for identification procedures see CL below).	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics.	Atterberg limits above "A" line or PI greater than 7
	SANDS — More than half of coarse fraction is smaller than No. 4 sieve size; CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	SW	Well graded sands, gravelly sands, little or no fines.		$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_c = \frac{(D_{30})^2}{(D_{10} \times D_{60})}$ Between one and 3
		Predominatly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravelly sands, little or no fines.	EXAMPLE:	Not meeting all gradation requirements for SW
	SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for idendification procedures see ML below).	SM	Silty sands, poorly graded sand-silt mixtures.	**Silty Sand,** gravelly; about 20% hard, angular gravel particles $\frac{1}{2}$ inch maximum size; rounded and subangular sand grains coarse to fine, about 15 % non-plastic fines with low dry strength, well compacted and moist in place, alluvial sand; (SM).	Atterberg limits below "A" line or PI less than 4 — Above "A" line with PI between 4 and 7 are **borderline** cases requiring use of dual symbols
		Plastic fines (for identification procedures see CL below).	SC	Clayey sands, poorly graded sand-clay mixtures.		Atterberg limits above "A" line or PI greater than 7

(For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)

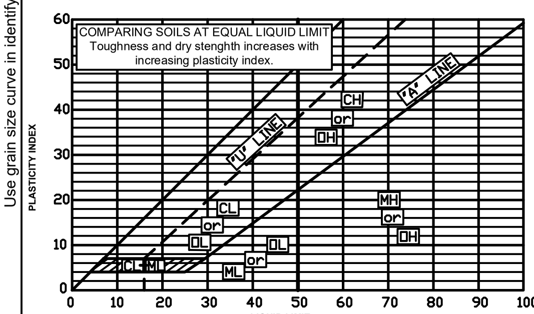
(The No. 200 sieve size is about the smallest particle visible to the naked eye)

Use grain size curve in identifying the fractions as given under field identification.

Determine percetages of gravel and sand from grain size curve. Depending on percentage of fines (fractin smaller than No. 200 sieve size) coarse grained soils are classified as follows:
Less than 5% — GW,GP, SW, SP
More than 12 % — GM, GC, SW, SC
5% to 12% — **Borderline** cases requiring use of dual symbols.

IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE

Major divisions		DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)	GROUP SYMBOLS	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS
FINE GRAINED SOILS — More than half of material is **smaller** than No. 200 sieve size	SILTS AND CLAYS — Liquid limit less than 50	None to slight	Quick to slow	None	ML	Inorganic silts and very vine sands, rock flour, silty or clayey fine sands withg slight plasticity.	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, color in wet conditions, odor if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses.
		Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	
		Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity.	
	SILTS AND CLAYS — Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	For undisturbed soils add information or structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions.
		High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays.	EXAMPLE:
		Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity.	**Clayey silt**, brown, slightly plastic, small percentage of fine sand, numerous vertical root holes, firm and dry in place, loess; (ML).
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.			Pt	Peat and other highly organic soils.	



PLASTICITY CHART

FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS

N. **Boundary** classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For examle GW-GC, well graded gravel-sand mixture with clay binder.
N. All sieve sizes on this chart are U.S. Standard.

FIELD IDENTIFICATION PROCEDURES FOR FINE GRAINED SOILS OR FRACTIONS

These procedures are to be performed on the minus No. 40 sieve size particles, approximately $\frac{1}{64}$ inches. For field classification purposes, screening is not intended; simply remove by hands the coarse particles that interfere with the test.

DILATANCY (Reaction to shaking)

After removing portions larger than No. 40 sieve size, prepare a pot of moist soil with a volume of about one-half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

Place the pot in the open palm of one hand and shake horizontally, stricking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pot which changes to a livery consistancy and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pot stiffens and finnally it cracks or crumbles. The rapidity of appearance of water during shaking and of its diappearance during squeezing assist in identifying the character of the fines in a soil.

Very fine clean sands give the quickes and most distinct reactoin whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

ADOPTED BY: CORPS OF ENGINEERS AND BUREAU OF RECLAMATION-JANUARY 1962

DRY STRENGTH (Crushing characteristics)

After removing particles larger than No. 40 sieve size, mold a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun, or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quality of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sand and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

TOUGHNESS (Consistency near plastic limit)

After removing particles larger that the No. 40 sieve size, a specimen of soil about one-half inch cube in size is molded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface of between the palms into a thread about one-eight inch in diameter . The thread is then folded and rerolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticitiy, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occure below the A-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

IO3-D-347

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SOIL CLASSIFICATION CHART
conforms to Unified Soils Classification and ASTM D2487

REFERENCES

1. American Society of Civil Engineers, **Minimum Design Loads for Buildings and Other Structures, ASCE Standard ASCE/SEI 7-05 Including Supplement No. 1**, 2006, 385 pp.

2. Allen, C. R., 1975; **Geological criteria for evaluating seismicity,** GSA Bull. v. 86, p. 1041-1057.

3. Bailey, E. H., Irwim, W. P. and Jones, D. L., 1964, **Franciscan and Related Rocks, and their significance in the Geology of Western California,** CDMG Bulletin 183, 177 pp.

4. Bailey, E.H., Ed., 1966, **Geology of Northern California,** CDMG Bulletin 190, 507 pp.

5. Blair, M.L. and Spangle, W. E., 1979, **Seismic Safety and Land-Use Planning - Selected Examples from California,** USGS Professional Paper 941-B.

6. Bolt, B. A., 1975; **Geological Hazards,** Springer-Verlag, 328 p.

7. Bryant, W. A., 1985; **Faults in the Southern Monterey Bay area,** CDMG Fault Evaluation Report FER-167, 13 pp.

8. Bullis, K.C., 1980, **Environmental Constraints Analysis of Monterey County, Part I: Seismic and Geologic Hazards,** Monterey County Planning Department, General Update Program, Second printing June 1982, 54pp and appendices.

9. Bullis, K.C., 1981, **Environmental Constraints Analysis of Monterey County, Part I: Flood, Fire and Miscellaneous Hazards; Emergency Preparedness,** Monterey County Planning Department, General Update Program, pp 55-104 and appendices.

10. Burkland and Assoc., 1975, **Seismic Safety Element of the Monterey County General Plan,** 50 pp w/appendices.

11. Burkland and Associates, 1975; **Geotechnical study for the seismic safety element,** Monterey County, California, File No. K3-0113-M1, 125 pp.

12. California Department of Conservation, 2010, **Fault Activity Map of California**, data date same as information on report, Interactive, URL: https://maps.conservation.ca.gov/cgs/fam/

13. California Department of Conservation, 1998, **Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada,** International Conference of Building Officials, Introduction & Maps.

14. 2019 California Building Code, **California Code of Regulations, Title 24, 2 Volumes, California Building Standards Commission**, Based on the 2018 International Building Code.

15. Clark, J. C. and Reitman, J. D., 1973. **Oligocene stratigraphy, tectonics, and paleogeography southwest of the San Andreas fault, Santa Cruz Mountains and Gabilan Range, California Coast Ranges**: U.S. G. S. Professional Paper 783, 18 p.

16. Clark, J. C., Diblee, T. W. Jr., Greene, H. G., and Bowen, O. E., Jr., 1974, **Preliminary geologic map of the Monterey and Seaside 7.5 minute quadrangles, Monterey County, California, with emphasis on active faults,** USGS Miscellaneous Field Studies Map MF-577.

17. Clark, Joseph C., Dupré, William R., & Rosenberg, Lewis I., **Geological Map of the Monterey and Seaside 7.5 minute Quadrangles, Monterey County, California: A Digital Database**, 1997, U. S. Department of the Interior, U. S. Geological Survey, Open-File Report 97-30, Map and Pamphlet, 26 pp.

18. Clark, Joseph C., Brabb, Earl E., & Rosenberg, Lewis I., 2000, **Geologic Map of the Spreckels 7.5-Minute Quadrangle, Monterey County, California,** USGS/Department of the Interior, Map MF-2349 & Pamphlet, 22 pp.

19. Clark, Joseph C. & Rosenberg, Lewis I., March 1999, **Southern San Gregorio Fault Displacement: Stepover Segmentation VS. Through-Going Tectonics,** USGS /Department of the Interior-National Earthquake Hazards Reduction Program, Award number 1434-HQ-98-GR-00007, 22 pp without Appendices

20. Cleveland, G.B., 1975, **Landsliding in Marine Terrace Terrain, California,** CDMG Special Report 119, 24pp.

21. Compton, R. R., 1966; **Granitic and metamorphic rocks of the Salinian Block, California Coast Ranges,** CDMG Bulletin 190, p. 277-287.

22. Diblee, T. W. Jr., 1966; **Evidence for cumulative offset on the San Andreas fault in central and northern California,** CDMG Bulletin 190.

23. Diblee, T. W., Jr., 1999; **Geologic Map of the Monterey Peninsula and Vicinity, Monterey, Salinas, Point Sur, and Jamesburg 15-Minute Quadrangles, Monterey County, California,** Diblee Geological Foundation Map #DF-71.

24. Dickinson, William R., Duccea, Mihai, Rosenberg, Lewis I., Greene, H. Gary, Graham, Stephan A., Clark, Joseph C., Weber , Gerald E., Kidder, Steven, Ernst, W. Gary and Brabb, Earl E., 2005; **Net dextral slip, Neogene San Gregorio-Hosgri fault zone, coastal California: Geologic evidence and tectonic implications**, Geological Society of America, Special Paper 391, 43 pp.

25. Dittmer, E. and Stein, C., 1977, **Salinas Seismic Hazards Technical Report,** Department of Community Development, City of Salinas, 73 pp.

26. Dupre, W. R. and Tinsley, J. C. III, 1980, **Geology and liquefaction potential of northern Monterey and southern Santa Cruz, California**: USGS Miscellaneous Field Studies Map 1199, Scale 1:62,500, 2 sheets.

27. Dupre, W. R., 1990, **Maps Showing Geology and Liquefaction Susceptibility of Quaternary Deposits in the Monterey, Seaside, Spreckels and Carmel Valley Quadrangles, Monterey County, CA**, U. S. Geological Survey and University of Huston, Map #MF-2096, 2 Sheets

28. Durham, D.L., 1974; **Geology of the Southern Salinas Valley Area, California**, USGS Professional Paper 819, 111 pp.

29. Greene, H. G., Lee, W.H.K., McCulloch, D.S., and Brabb, E.E., 1973; **Faults and Earthquakes in the Monterey Bay Region, California**, USGS MF 518, maps and paper, 14pp.

30. Greene, H. G., 1977; **Geology of the Monterey Bay region,** USGS Open-File Report p. 77-718.

31. Hays, W.W., 1980, **Procedures for Estimating Earthquake Ground Motions,** USGS Professional Paper 1114, 77 pp.

32. Jennings, C. W., and Strand, R. G., 1958; **Geologic Map of California, Olaf P. Jenkins edition, Santa Cruz sheet,** Scale 1:250,000, third printing 1971.

33. Jennings, C. W., and Bryant, W. A., 2010 **Fault Activity Map of California: California Geological Survey Geologic Data Map**, No. 6, Map Scale 1:750,000, Includes “An Explanatory Text to Accompany the Fault Activity Map of California”, 94 pp

34. Lee, L. Don, Gudson, Seldon and Kauffman, Marvin E., 1978, **Physical Geology,** 5^{th} Ed., Prentice Hall, Inc, Englewwod Cliffs, New Jersey 07632, 490 pp.

35. Lindh, A. G., 1983; **Preliminary assessment of long-term probabilities for large earthquakes along selected fault segments of the San Andreas fault system in California,** USGS Open File Report 83-63, 15 p.

36. Nason, R. D., and Rogers, T. H., 1967; **Self-guiding map to active faulting in the San Juan Bautista quadrangle, conference on geologic problems of the San Andreas fault system,** Stanford University, scale 1:24,000.

37. Nilsen, T.H., Diblee, T.W. Jr., and Blake, M.C. Jr., 1990, **Geology of the Central Diablo Range, CA,** Field Trip June 2-3.

38. Oakeshott, G. B., 1966; **San Andreas fault in the California Coast Range Province,** in Bailey, E. H., ed., **Geology of Northern California,** CDMG Bulletin 190, p. 357-373.

39. Plafker, G. and Galloway, J.P., eds., 1989 (approved for publication), **Lessons Learned from the Loma Prieta, California, Earthquake of October 17, 1989,** USGS Circular 1045, 48 pp.

40. Ray, R.G., 1960, **Aerial Photographs in Geologic Interpretation and Mapping,** USGS Professional Paper 373, seventh printing, 1984, 230 pp.

41. Real Estate Data Inc., 1980; **Aerial/Map Volume of Monterey County, California,** Photo 110, 2398 NW 119th St., Miami, FLA 33167, fifteenth edition.

42. Robbins, S.L., 1982, **Complete Bouguer Gravity, Aeromagnetic, and Generalized Geologic map of the Hollister 15-minute Quadrangle, CA,** Geophysical Investigations Map GP 945, 2 sheets, Scale 1:62,500.

43. Sarna-Wojcicki, A.M., Pampeyan, E.H. and Hall, N.T., 1975, **Maps Showing Recently Active Breaks Along the San Andreas Fault Between the Central Santa Cruz Mountains and the Northern Gabilan Range, CA,** 2 maps, text is on map 2, Scale 1:24,000.

44. Spangle, Wm. and Associates, Burkland and Associates, and Thorup, Richard R., July 1974; **Faults, Seismicity and Tsunami Hazards: Monterey County, California**: Part of Geological Report, County Map 3, File No. K4-0113-M1.

45. Tinsley, J. C. III, 1975, **Quaternary geology of northern Salinas Valley, Monterey County, California**: Stanford University PhD. thesis, 194 p., map, scale 1:62,500.

46. US Department of Agriculture, Soil Conservation Service, 1978, **Soil Survey, Monterey County, CA,** 226 pages and maps.

47. US Geological Survey, California Geological Survey, 2006**, Quaternary Fault and Fold Database for the United States,** access date same as report, from URL: http://earthquakes.usgs.gov/regional/qfaults/

48. US Geological Survey / California Geological Survey, 2006**, The USGS Store, Map Locator,** access date same as report, from URL: http://store.usgs.gov/ click on 'map locator'

49. USGS Open File Report 88-398, 1988, **Probabilities of Large Earthquakes Occurring in California on the San Andreas Fault,** by the Working Group on California Earthquake Probabilities, 62 pp.

50. Wallace, R. E., 1970; **Earthquake recurrence intervals on the San Andreas fault,** GSA Bulletin, v. 81.

51. Wagner, David L., Greene, H. Gary, Saucedo, George J. and Pridmore, Cynthia L. Compiled by., Watkins, Sarah E., Little, Jason D. and Bizzarro, Joseph J. Digitalized by. 2002, California Department of Conservation, **Geologic Map of the Monterey 30' x 60' Quadrangle and Adjacent Areas, CA** , 3 maps and CD-ROM

52. Ward, P.L. and Page, R.A., 1989, **The Loma Prieta Earthquake of Oct 17, 1989,** USGS Pamphlet, Hdgen, L.D. and Troll, J.A., eds., second printing, revised, January 1990.

53. Wyss, M., 1979; **Estimating maximum expectable magnitude of earthquakes from fault dimensions,** Geology, v. 7, n. 7, p. 336-340.

54. Youd, T. L., and Hoose, S. N., 1978; **Historic ground failures in northern California triggered by earthquakes,** USGS Professional Paper P-993, p. 177