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GEOLOGICAL REPORT

5 YANKEE BEACH WAY
CARMEL, CALIFORNIA 93923

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Ref No.: 5179-01

Prepared For:

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EXECUTIVE SUMMARY

The subject property is an oceanfront site proposed for remodeling of an existing single-family residence. The property consists of an approximately 0.73 acre oceanfront site with an existing 2,015 square-foot single family residence and an existing 476 square-foot guest house. The Rickard Residence Existing Site Plan prepared by IDG and received by CapRock Geology on January 13, 2025, allowed for temporally accurate topographic data to be assessed regarding the position of proposed remodel. The survey shows elevations of the subject property range from fifty-nine to eighty-seven feet above mean sea level. The house elevation is about 70 feet above sea level.

The subject property lies in a highly seismically active region. No active faults are known to cross the property. The San Andreas Fault has the potential of producing a Richter Magnitude 7.3 earthquake, and the nearby Palo Colorado-San Gregorio fault has the potential to produce a maximum credible earthquake (MCE) of Richter magnitude 7.3, in the next fifty years. Should any of these events occur, it will probably generate moderate to severe ground shaking at the property.

There are significant hazards associated with any construction project on the subject property. Seismic shaking is the most serious hazard, and it is crucial that the recommendations of the soil engineer be rigorously adhered to. Any building must have a well-designed, site specific, engineered foundation. Such a foundation is also crucial to surviving the strong shaking that could be generated at the subject property during a large-magnitude earthquake. Further, it is important that all structures be designed in accordance with the requirements set forth by county ordinance and within the Uniform Building Code's conditions (current edition).

An important factor in maintaining the integrity of the subject property will be the proper channeling of drainage and storm runoff. Appropriate measures should be taken to ensure that surface water drainage on the property is channeled around the proposed homes.
CapRock recommends that collected storm water discharge not be located on, or adjacent to, steep terrain. Surface drainage should be evaluated by the landscaper, civil or geotechnical engineer, or other competent professionals and discharge locations of runoff should be directed away from areas potentially prone to coastal erosion.
The steep slopes of the drainage ditch northwest of the house could be subject to slope failure and erosion. There is an existing redwood retaining wall in the ditch mitigating the potential slope instability to some extent. Evaluation of the stability of the retaining wall by a geotechnical engineer is recommended.
The sea cliff on the western edge of the subject property and associated retreat is the subject of the Drainage and Erosion section of this report.

We have evaluated geologic hazards that may impact the proposed single family residence remodeling project within its design life (50 to 100 years), The geologic risks associated with the proposed project are considered ordinary (Joint Committee on Seismic Safety, 1974). Any structures must have a well-designed, site specific, engineered foundation. Such a foundation is also crucial to surviving the strong shaking that could be generated at the subject property during a large-magnitude earthquake and related ground movement.

INTRODUCTION

This report presents the findings, conclusions, and recommendations of a geological investigation for the above-named site in Monterey County, California. The geologic report is designed to conform to current guidelines of the California Geological Survey. This report is applicable only to the intended project site.

OBJECTIVE

The objective of the geological investigation is to:

1. Evaluate the general geologic conditions at the proposed site by reviewing existing available published and unpublished geologic maps and studies performed by the United States Geological Survey, California Geological Survey, Monterey County Housing and Community Development, Monterey County Water Resources Agency and other reports and aerial photographs made available.

2. Identify geologic factors which could affect proposed land use.

METHOD AND SCOPE OF INVESTIGATION

The geologic investigation consisted of:

1. Review and compilation of available geologic data. The primary sources of geologic data for this report are Dibblee (1999), California Geological Survey (2001), and Rosenberg (2001).

2. Review of available aerial photographs of the site.

3. A field investigation of the site.

4. Preparation of report. This report was prepared to document the findings, conclusions and recommendations based upon the existing data.

PROJECT SITE AND TOPOGRAPHY

The subject property is located in the Carmel Highlands area of Big Sur in Monterey County on the south western side of Yankee Beach Way (Figure 1). The site is located at north Latitude 36.489025 degrees and west Longitude 121.940972 degrees. Topographically, the subject property is located southeast of Yankee Point on a coastal bluff above the Pacific Ocean. Elevations of the subject property range from fifty-nine to eighty-seven feet above mean sea level. The house elevation is about 70 feet above sea level. Slopes on the property are gentle (4%) to steep (30%). Drainage on the property consists of surface runoff and subsurface flow and is controlled by topography and earth materials. There is a large drainage ditch with a metal culvert located on the northern side of the property. Drainage on the subject property and the surrounding area in general is predominantly towards the Pacific Ocean. The drainage of the subject property reflects the regional westward trend and is uninhibited geologically.

GEOLOGIC SETTING

Regional Geology

The subject property is in the Santa Lucia Mountains. The Santa Lucia Range lies between the Pacific Ocean to the west and Carmel Valley to the east, in the central section of the larger Coast Range geomorphic and geologic province. Tectonically, the Santa Lucia Range lies in a portion of the Coast Range known as the Salinian Block. The Salinian Block consists of Cenozoic age sedimentary rocks overlying older metamorphic and igneous rocks. The overall structural grain of the Salinian Block is oriented northwest-southeast. The Santa Lucia Range is fault-controlled, with the orientation of the Range roughly paralleling the orientation of the larger faults, such as the San Gregorio-Palo Colorado, King City-Reliz, and Tularcitos faults. Large- and small-scale faults and folds are characteristic of the Salinian Block.

Local Geology

The subject property is underlain by granitic bedrock which is hornblende-biotite quartz diorite in composition and of the Mesozoic age (Figure 2). The diorite is fractured in a northwest trend leading to propagation of coastal erosion along the fracture lineament. The dioritic bedrock under the subject property is overlain by a thin mantle (< 10-15 feet thick) of Older Debris Fan deposited unconformably near the base of the bluff on the hornblende-biotite rich quartz diorite marine terrace surface. The unconsolidated to loosely cemented debris fan material is generally medium yellowish brown, slightly clayey sand with gravel (Dibblee, 1999). Remnants of marine terraces are common along this part of the coast, these indicate a relatively slow rate of wave erosion and landslide movement (California Geological Survey, 2001). The Mesozoic age granitic bedrock appears to be relatively resistant to land sliding, compared to the Franciscan Complex in the area to the south (California Geological Survey, 2001). No mapped landslides occur on or around the subject property (California Geologic Survey 2001, Nolan, 2011).

Structural Geology

The subject area lies within the geologic and tectonic unit called the Salinian Block. The Salinian Block is an elongate, northwest trending segment of the Coast Ranges, bounded to the northeast and southwest by the San Andreas and San Gregorio-Sur Nacimiento fault zones, respectively (Greene, 1977). The Salinian Block is characterized by a basement of Paleozoic high grade metamorphic rocks and Cretaceous granitic rocks. Overlying these rocks is a sequence of dominantly marine sediments of Paleocene to Miocene age and nonmarine sediments of Pliocene to Pleistocene age (Page, 1970; Greene, 1977). The faults that partition the Salinian Block (Figure 2 & 3), have generally been active throughout the latter third of the Cenozoic Era (approximately 15 million years ago to the present). Although these faults are, in general, part of a right lateral strike-slip fault system, they have also controlled the relative vertical movements between smaller structural blocks within the larger Salinian Block. The relative differences in vertical displacement between the smaller blocks have, in turn, controlled patterns of sediment accumulation for the late Tertiary and Quaternary sediments. The down-dropped basement blocks produced structural basins in which a relatively thick, and in some cases complete, Tertiary sequence accumulated. The upthrown basement blocks produced structural highs in which the Tertiary and Quaternary sedimentary deposits are thin or nonexistent.

Tectonic History

The faults that partition the Salinian Block, along with the San Andreas Fault and its eastern branches, form a broad system of inter-related right lateral strike-slip faults that have dominated the tectonic history of western California since the middle of the Miocene Epoch (approximately 15 million years ago). Western California's system of right lateral strike-slip faults represents a segment of the boundary between the Pacific and North American crustal plates. For roughly the past 15 million years, the Pacific Plate has been slipping towards the northwest with respect to the North American Plate (Atwater, 1970; Graham, 1978). This movement is accommodated by right lateral strike-slip faulting. In California, most of the movement has been taken up by the San Andreas Fault system, which has been more or less continuously active since the Mid-Miocene. However, the other faults in this broad system have also experienced right lateral slip, although the movement on any individual fault has been limited in duration and magnitude compared to the San Andreas Fault. Several strike-slip faults cut the Salinian Block, some of which were active in the past and are now inactive, while others probably began slipping later and remain active today. In summary, the composite faulting history of this seismically active region has been extremely complicated.

REGIONAL SEISMICITY

California and the Monterey Area Coast Ranges have been subjected to considerable earthquake activity. The most severe historical earthquakes in the vicinity of the project site were the 8.3 Magnitude 1906 San Francisco event (U.S.G.S. Prof. Paper 993, 1978), the 6.1 Magnitude 1926 Monterey Bay Earthquake (McCrory, 1977), and the 7.1 Magnitude 1989 Loma Prieta event (Plafker and Galloway, 1989). Although California's broad system of strike-slip faults has a complex history, only some of the fault traces present a seismic hazard to the proposed project. Consequently, the project area could experience seismic activity of various magnitudes emanating from one or more of the numerous faults or fault systems within the region. Active faults are those faults having experienced movement within the last 11,000 years (the Holocene period). Active faults may have the greatest potential for disturbance. Potentially active faults have had movement between 11,000 and 3,000,000 years ago (the Pleistocene period) and have had no movement within the last 11,000 years. Inactive faults have had no movement within the last three million years. The major faults are the San Andreas Fault, the Monterey Bay fault zone and it's possible on land extensions that include the Tularcitos-Navy fault, the King City-Reliz fault, the Palo Colorado-San Gregorio fault zone and the Zayante-Vergeles fault (Figures 2&3). These faults are either active or considered potentially active (Buchanan-Bank and others, 1978; Bullis, 1980;

Jennings, 1975; Greene, 1977; Hall and others, 1974; Burkland and Associates, 1975). Each of the faults is discussed below.

Faults at the Proposed Project Site

Review of published maps (Dibblee, 1999 (Figure 2); Rosenberg, 2001; Greene et al., 1973; Buchanan-Banks et al., 1978) indicates that no faults have been mapped on the subject property. Several large fault systems are present in the area, as well as numerous smaller faults, both named and unnamed. All of these faults are discussed in the following sections (Figure 3).

Aerial Photograph Examination for Faults at the Proposed Project Site

Aerial photographs from 1949 through 2020 were examined for evidence of past faulting on the subject property. No evidence for past faulting was observed in any of the photographs.

San Andreas Fault

The San Andreas Fault typically represents the major seismic hazard in California (Jennings, 1975; Buchanan-Banks and others, 1978). This fault system has experienced right lateral slip movement throughout the later part of the Cenozoic Era (the last 15 million years), and is currently considered very active. The San Andreas Fault is divided into a series of individual segments, each having a characteristic earthquake magnitude, recurrence interval, and slip rate (Sykes & Nishenko, 1984; Lindh, 1983; Hall, 1984; Wesnousky, 1987; U.S. Geological Survey, 1988). There appear to be "characteristic" earthquakes associated with each segment of the fault, and each segment can be expected to experience an earthquake similar in size to others that have historically occurred along the same segment. The portion of the San Andreas Fault closest to the property is the Creeping Section which is located between Pajaro Gap near San Juan Bautista and Parkfield (Sykes & Nishenko, 1984; U.S. Geological Survey, 1988). This segment is approximately 34 miles east of the subject property and is characterized by a high fault slip rate (>3 mm per year) (Wallace, 1990) and persistent micro seismic activity.

The average time between large magnitude earthquake events is referred to as recurrence time. The average recurrence time between earthquakes on the North Coast, San Francisco Peninsula and Southern Santa Cruz Mountains segments is summarized in Table 1. The average expected recurrence time is directly related to the magnitude of the "characteristic earthquake". The longer the average expected recurrence time, the larger the magnitude of the characteristic earthquake. The maximum earthquake for the Southern Santa Cruz Mountains Segment, the portion of the San Andreas Fault System closest to the property, is a Magnitude 7.0. The 1906 rupture section, approximately 30 miles northeast of the subject property, has a maximum Magnitude of 7.9. A

Magnitude 6.5 is the maximum earthquake for the Creeping Segment.

TABLE 1
SAN ANDREAS FAULTS
RECURRENCE TIMES AND CONDITIONAL PROBABILITIES OF EARTHQUAKES
From USGS Working Group, 1990

Fault Segment	Date of Most Recent Event	Expected Magnitude	Expected Recurrence Interval (years)	Level Of Conditional Reliability	Level of Reliability (A) being most)
North Coast	1906	8	201-281	0.02	B
San Francisco Peninsula	1906	7	128-188	0.23	C
Southern Santa Cruz Mountains	1989*	7	84-100	0.01	B
Creeping Segment	1966	6	20-30	0.30	A

The probability of a large (Magnitude 7.0 or greater) earthquake occurring on the various segments of the San Andreas Fault has been estimated using a time-dependent increase in earthquake probability model (Plafker and Galloway, 1989; Lindh, 1983; Sykes and Nishenko, 1984; U.S. Geological Survey, 1988; Nishenko, 1989). This model is based upon the assumption that the potential for a large earthquake on a segment is initially small following a large earthquake and increases as a function of time. Prior to the 1989 Loma Prieta Earthquake, the U.S. Geological Survey (1988) predicted a 20 percent probability of a Magnitude 7.0 earthquake occurring on the San Francisco Peninsula segment and a 30 percent probability of a 6.5 Magnitude earthquake on the Southern Santa Cruz Mountains sub segment between 1988 and 2018. The 1989 Loma Prieta Earthquake probably relieved some stress along the portion between San Juan Bautista and San Jose. Because some stress has been released along this portion of the fault, it is considered likely that the probability of an additional large magnitude earthquake (Magnitude greater than 6.5) in the next 30 years along this segment has been considerably reduced. The probability of a large magnitude earthquake on the North Coast segment of the San Andreas Fault, however, has most likely increased. The effect of the Loma Prieta earthquake on the Creeping Section is not known. The previous discussion applies only to large magnitude earthquakes capable of rupturing the entire fault segment. Small magnitude earthquakes can occur more frequently.

The maximum credible earthquake (MCE) is the largest magnitude earthquake a fault can generate within the presently understood tectonic environment, and is typically higher than the maximum probable earthquake (MPE). The likelihood of a Magnitude 8.0 (MCE) occurring on the San Francisco segment or the Southern Santa Cruz Mountain sub segment is considered very low (U.S. Geological Survey, 1988; U.S. Geological Survey, 1990). The foregoing data suggests the project area should have incorporated into the planning a large Magnitude earthquake (7.5 or higher) along the Southern Santa Cruz Mountains segment of the San Andreas fault during the next fifty years. The data also suggests an extreme event of Magnitude 8.0 or higher is unlikely within the next fifty years.

The inexact science of probabilistic modeling of large magnitude earthquakes is currently being researched, analyzed and modified. The probabilities listed in the report and summarized in Table 1 are based on data collected prior to and since the Loma Prieta Earthquake. This event reduced the likelihood of seismic activity on the Southern Santa Cruz Mountains while increasing the likelihood of earthquakes on other segments.

Palo Colorado-San Gregorio Fault

The main trace of the Palo Colorado-San Gregorio fault (hereafter referred to as the San Gregorio fault) is located approximately 5 miles south of the of the subject property (Greene et al., 1973). This fault is oriented sub-parallel to the San Andreas Fault and stratigraphic offsets across the fault demonstrate right lateral strike-slip motion. The San Gregorio fault is considered highly active. Throughout its length, the San Gregorio fault zone shows stratigraphic evidence of late Pleistocene to Holocene displacement (Clark, et. al., 1984; Weber, et. al., 1979, Buchanan-Banks, et. al., 1978; Graham and Dickenson, 1978; Weber and LaJoie, 1974). In addition, historic seismic activity in the Monterey Bay region may also be attributed to the San Gregorio fault (Greene, 1977; Mitchell, 1928). Hamilton and others (1979) present data showing an average net slip through Neogene time (225 to 1.8 MYBP) of about 0.1 cm/year. They conclude this slow slip rate, with respect to the 1.4 cm/year slip rate on the San Andreas Fault, indicates the San Gregorio fault is not the primary structural element of the translational plate boundary. They further conclude the San Andreas Fault represents the principal plate boundary. More recent research on the slip rate of the San Andreas Fault suggests that the slip rate north of San Juan Bautista may be closer to 1.9 cm per year (Working Group on California Earthquake Probabilities, 1990), which reinforces the interpretation that the San Andreas Fault is the principal plate boundary, rather than the San Gregorio fault.

Greene (1977) uses an empirical relationship between fault half-length and potential earthquake magnitude to suggest the San Gregorio fault zone is capable of Magnitude 7.2-7.9 earthquake activity. Weber and Cotton (1981) present evidence suggesting the recurrence interval for earthquakes producing ground rupture within the San Gregorio fault system is 6,000 years or less. Wesnousky (1986) suggests the recurrence interval of a Magnitude 7.7 earthquake on the San Gregorio fault is about 824 years.

Tuttle (1985) studied seismicity patterns along the San Gregorio fault and noted that certain segments exhibited abnormally low seismic activity. She concluded that the segments from Santa Cruz to San Francisco, and from Monterey to Ragged Point, represented seismic gaps, which she theorized were capable of generating earthquakes of Magnitude 7.2 to 7.4. Tuttle (1985) also observed that the number of Magnitude 4 to 6 earthquakes increased during the twenty year periods preceding the 1926 Monterey Bay (M6.1) and the 1952 Bryson (M6.0) earthquakes.

Rosenberg (1993) noted that four recent earthquakes (Magnitudes 4.6 to 5.2) associated with the southern end of the Ragged Point segment occurred between 1984 and 1991. According to Rosenberg (1993), if Tuttle (1985) is correct in her hypothesis, a Magnitude 6 or larger earthquake is likely in the next decade. Plafker and Galloway (1989) noted a similar pattern of seismicity on the San Andreas Fault before the 1989 Loma Prieta earthquake. Based on the foregoing mapping and analyses, along with calculations performed by EQFault version 3.0, the maximum credible earthquake (MCE) on the San Gregorio fault for the purposes of this report is considered to be a magnitude 7.3.

Monterey Bay Fault Zone and its Onland Extension

The Monterey Bay fault zone is six to nine miles wide and about twenty-five miles long (Greene et al., 1973). The subject property lies approximately 6 miles from the nearest mapped portion of the Monterey Bay-Tularcitos fault zone. Whereas outcrop evidence indicates a variety of strike slip and dip slip movement associated with both onshore and offshore fault traces, earthquake studies suggest the Monterey Bay fault zone is predominately right lateral strike-slip in character (Greene, 1977; Dibblee, 1966). The marine portion of the fault zone consists of many en echelon faults identified using seismic reflections surveys (Greene, 1977). The largest earthquakes tentatively located on the Monterey Bay fault zone are two events measuring 6.1 on the Richter Scale in October 1926 (Greene, 1977). These events may have actually occurred on the nearby Palo Colorado San Gregorio fault system (Greene, 1977). Another earthquake of Modified Mercalli Scale intensity of VII occurred in 1890 and could be attributed to the Monterey Bay fault zone (Burkland and Associates, 1975). The fault zone intersects the coast in the vicinity of Seaside and Fort Ord. At this point, several onshore fault traces have been tentatively correlated with offshore traces in the heart of the Monterey Bay fault zone (Greene, 1977; Clark and others, 1974; Burkland and Assoc., 1975). These fault traces are generally much less active than the San Andreas and Palo Colorado fault zones.

The Monterey Bay-Tularcitos, Monterey Bay, and Navy faults all lie along strike within the Salinian Block and are thought by some investigators to form one continuous zone of faulting (McKittrick, 1987). If the Monterey Bay- Tularcitos Navy fault continues into Monterey Bay and joins the southernmost of the relatively continuous offshore faults, total length would be approximately fifty miles, (Greene et al., 1973). For this investigation, we are assuming that the Monterey Bay Fault Zone does connect with the Navy and Monterey Bay- Tularcitos fault, forming one long fault system. The Navy and Monterey Bay- Tularcitos faults are discussed below.

Navy Fault

The Navy fault has been mapped from near the Naval Postgraduate School in Monterey southeast to Carmel Valley Road. Although the fault was not mapped across the Carmel River alluvium, it is postulated that because of the alignment of the Monterey Bay- Tularcitos fault with the Navy fault, they are the same fault. The Monterey Bay- Tularcitos fault has been mapped from Carmel Road (roughly two miles southeast of the end of the Navy fault), running through the Carmel Valley, extending several miles to the southeast of Jamesburg.

The Navy fault juxtaposes younger Pleistocene Paso Robles Formation with the older Monterey Formation and displays geomorphic evidence suggestive of late Pleistocene or Holocene displacement (Clark and Others, 1974). McKittrick (1987) mapped the onland extensions of the Monterey Bay fault zone and did not extend the Navy fault to meet Carmel Valley Road. The Navy fault is considered active because it experienced at least one small earthquake (maximum 2.5 M) in historic time (Greene, 1977). The Navy fault trends south eastward from Monterey Bay and is thought to be an extension of the Monterey Bay fault zone (Clark and others, 1974). An offset marine terrace represents the youngest Quaternary unit offset by the Navy fault and has an estimated age of approximately 320,000 years (McKittrick, 1987). Dupré (1990) has mapped a structural thrust or possible splay of the Navy fault in an alluvial stream channel. As noted in the previous section, some investigators believe the Navy fault may link the Monterey Bay fault zone and the Monterey Bay- Tularcitos fault.

Monterey Bay-Tularcitos Fault

The Monterey Bay- Tularcitos Fault is a reverse fault that strikes northwest and dips steeply to the southwest separating Tertiary sedimentary rocks from Salinian granites. The activity of the Monterey Bay- Tularcitos fault is uncertain. The Monterey Bay- Tularcitos fault has been variously described by researchers as potentially or possibly active (Rogers Johnson, 1987; Geomatrix report, 1985). The Monterey Bay- Tularcitos fault is actually a zone, about a mile and a half wide, composed of several discontinuous, steeply dipping segments. Several locations along the fault zone suggest the possibility of late Pleistocene or early Holocene movement (McKittrick, 1987; Kingsley Associates, 1988; Rosenberg, 1993). The most recent movement was documented in Carmel Valley, where an offset organic silt horizon revealed a 14C age of 7,780+/-160 yr B.P.(Rosenberg and Clark, 1994). Further study is needed to more accurately constrain the time of last movement. In several locations there is evidence to suggest that such movement has not occurred, including one where Pleistocene terrace deposits have clearly not been offset (Thorup, 1988). Clark and others (1974) suggested that the Monterey Bay-Tularcitos fault zone is not active. The Monterey Bay- Tularcitos fault zone is over 20 miles long, and there are possible connections to the Navy and Monterey Bay fault zone that would combine for a total length of approximately 50 miles. The MCE for the Monterey Bay-

Tularcitos fault had been postulated as a magnitude 6.75 (Geomatrix, 1985). Other investigators have postulated a larger MCE for the Monterey Bay- Tularcitos fault (Wesnousky, 1986). For the purposes of this investigation, we are considering the MCE for the combined Monterey Bay-Monterey Bay- Tularcitos fault zone to be a magnitude 7.1.

Cypress Point Fault

Review of published maps (Dibblee, 1999; Greene et al., 1973; Buchanan-Banks et al., 1978) indicates that an inferred undifferentiated Quaternary (<1.6 million years) onland portion of the Cypress Point Fault is located in Carmel (Figure 4). The Cypress Point Fault is located approximately 3.3 miles from the subject property. The 12 km long (North 37 degrees West), Cypress Point fault is a northwest trending, southwest dipping reverse fault. First motion studies indicate right-slip along the Cypress fault (Rosenberg and Clark, 1994). The Cypress Point fault is capable of generating smaller earthquakes, with less frequency than the San Andreas or Palo Colorado San Gregorio fault zones. The oblique slip Cypress Point fault has been traced over four miles inland (Clark, et. al., 1974), and extends northwestward beneath Monterey Bay as a continuous fault for approximately 3km from Cypress Point and another 3km as en echelon faults to the southern wall of Monterey Canyon (Rosenberg and Clark, 1994). The submerged segment may represent the southwestern most boundary of the Monterey Bay Fault Zone (Greene, 1977). Several small earthquake epicenters are located in the vicinity of the Cypress Point fault (Greene, 1977). Most of these earthquakes occurred during an earthquake swarm between December, 1975, and February, 1976, (Coppersmith and Griggs, 1978). The activity of the Cypress Point fault is equivocal. The onland portion of the fault near Fan Shell Beach does not offset the contact between Quaternary marine terrace deposits and granodiorite (Buchanan Banks and others, 1978; Clark, 1974). Offshore to the northwest along the trace of the Cypress Point fault, a fault offsets geologic units of Pleistocene Age (700,000 10,000 years b.p.) (Buchanan Banks and others, 1978). The connection between this offshore fault and the Cypress Point fault northwest of Pescadero Point does not offset marine terrace deposits, which suggests the fault has not experienced surface ground rupture for at least 10,000 years. In contrast, offshore mapping showed that the Cypress fault displaced Quaternary strata (Rosenberg and Clark, 1994).

Greene (1973) linked the Cypress Point Fault to the Monterey Bay- Tularcitos Fault resulting in a longer fault with higher possible magnitude earthquakes. A more recent map by Dibblee (1999) links the Monterey Bay- Tularcitos to the Navy Fault instead of the Cypress Point Fault, resulting in a shorter Cypress Point Fault and reducing the possible magnitude of earthquakes on the Cypress Point Fault.

Chupines Fault

The Chupines fault is an east west to northwest trending fault with a generally up to the north sense of displacement (Dibblee and Clark, 1973). The Chupines fault dips 63 to 70 degrees to the south and may have 1000 feet of offset at the depth of the granitic basement. The Paso Robles Formation is offset only 6 to 10 feet and is downthrown to the south. The offset in the Paso Robles Formation indicates movement has occurred in the Pleistocene (Clark, et. al.,1974). Sieck (1964) postulated about 300 meters down to the north vertical displacement of granitic basement rocks based upon a gravity survey he conducted. Bowen (1969) mapped segments of the fault that do not offset late Pleistocene terrace deposits, suggesting an inactive fault. Bryant (1985) suggested either post late Miocene faulting along the Chupines fault is minor, or deformation has been manifested primarily as folding rather than faulting. Other lines of evidence indicate that the Chupines fault is an active fault. For instance, mapping by McCulloch and Greene (1989) showed the Chupines fault offsetting Holocene strata and the seafloor. In addition, a number of earthquake epicenters occur within 1km of the surface trace of the fault.

Although the Chupines fault may be active, given the short length of the Chupines fault relative to other faults in the region around the subject property, it is unlikely to have the potential for generating a large magnitude earthquake and we do not consider it to be a major hazard to the subject property.

King City Reliz Fault

An inferred section of the King City Reliz Fault follows the southwest boundary of the Salinas Valley. The King City-Reliz fault (also known as the Rinconada fault) lies approximately 18 miles northeast of the subject property. This fault is thought to have 900 to 2,400 meters vertical displacement (Greene, et al., 1973), and has been considered by some investigators to be capable of generating a 6.5 Richter Magnitude earthquake every twenty five years (Burkland and Assoc., 1975). Buchanan Banks, et. al. (1978) suggest the northernmost 30-35 miles of the King City Reliz fault was active in the Late Pleistocene. The southeastern section of the King City Reliz fault is considered potentially active based on offset Quaternary units, geomorphic evidence, and clusters of earthquake epicenters (Buchanan Banks, et al., 1978; Dibblee, 1966; Jennings, 1975).

The foregoing estimate of earthquake magnitude along the King City-Reliz fault was based upon the supposition that the King City and Reliz faults join, and are effectively one long fault. Recent studies have suggested that the two faults may not be linked, but are discrete faults. If the two faults do not join, then the length of each fault is substantially shortened, and the magnitudes of the Maximum Credible and Maximum Probable Earthquakes associated with each fault are also substantially reduced. However, as investigators are uncertain whether or not these two faults join, for the purposes of this report we are considering the faults to be connected, and the maximum credible earthquake (MCE) for the King City-Reliz fault, also known as the Rinconada fault is considered to be a magnitude 7.3 (EQFAULT version 3.00).

Zayante Vergeles Fault Zone

This northwest southeast trending fault zone lies west of the San Andreas fault and extends fifty-one miles from the Watsonville lowlands into the Santa Cruz Mountains. The Zayante fault lies approximately 30 miles northeast of the subject property. The southern end of the Zayante Vergeles fault zone merges with the San Andreas fault zone. The Zayante fault is primarily a normal fault (Clark and Reitman, 1973) accompanied by right lateral strike-slip movement (Hall, et. al., 1974; Ross, 1973). Stratigraphic and geomorphic evidence indicate the Zayante Vergeles fault has undergone Late Pleistocene and Holocene movement (Buchanan Banks, et. al., 1978). Some historic seismic activity is related to the Zayante fault (Griggs, 1973; Hall, et. al., 1974). The maximum credible earthquake (MCE) for the Zayante fault is between Magnitude 7.1 and 7.4. The recurrence interval is between 6500 years for a Magnitude 7.4 earthquake (Coppersmith, 1979) and 3100 years for a Magnitude 7.1 earthquake (Wesnousky, 1986). The maximum probable earthquake (MPE) is between Magnitude 5.9 and 6.7. The Zayante fault is considered moderately active, however, the potential for a large or major earthquake (M>6.5) is far lower than the potential for the San Andreas fault or the San Gregorio fault.

The Zayante is capable of generating a maximum earthquake of Magnitude 7.+ with a recurrence interval of 6000 years (Coppersmith, 1979). The fault is considered active by the California Division of Mines and Geology (CDMG). A prominent cluster of aftershocks including a Magnitude 5.0 occurred on the Zayante fault after the Loma Prieta earthquake (Benuska, 1990). During the next 100 years, there is a 98 percent probability that any earthquakes on the Zayante fault will not exceed a magnitude 6.7 (Coppersmith, 1979). We therefore consider a magnitude 6.8 earthquake as the largest that is likely to occur on the Zayante fault during the functional lifetime of this project.

Other Faults

In addition to the faults discussed above, there are a number of smaller faults and some unnamed, short fault segments, in the general region of the subject property. Little is known about the activity of most of these faults but given that they are all relatively short length compared to the major faults nearby, they do not appear likely to pose significant hazards to the subject property. As discussed earlier, and again in the following section, any seismic activity on these smaller faults is likely to be dwarfed by the potential seismic activity on the major faults, and thus the major faults are of primary concern when assessing hazards and designing structures on the subject property.

Active Fault Summary

The subject property is situated in a seismically active region in close proximity to known or suspected active faults. The active San Gregorio fault is within approximately 5 miles of the site and is the most likely source of strong seismic shaking (Cao, et al., 2003). The Palo Colorado fault is situated about 5 miles west of the site. This fault is considered to be active (Rosenberg, 2001), and may be connected to the San Gregorio fault but the size and expected frequency of earthquakes on this fault are unknown. The San Andreas fault is highly active and the fault most likely to generate a large magnitude earthquake within the next fifty years. Ground shaking parameters associated with an event along the San Andreas or Palo Colorado-San Gregorio should be used for design purposes. Because the numerous minor faults in the region around the project area have not been active during historical time, recurrence intervals for them are difficult to predict. In addition, because earthquake magnitude is directly related to fault length, the effect of these shorter faults will be masked by the San Andreas and Palo Colorado-San Gregorio faults. Based on deterministic methodology, these smaller potentially active or less active faults are not considered to represent a significant seismic hazard to site development relative to the San Andreas and Palo Colorado-San Gregorio faults.

Table 2:
Regional Fault Table

Fault	Approximate Distance	Direction from Project Site to Fault
Cypress Point	3.3 miles	North
Palo Colorado-San Gregorio	5 miles	South
Monterey Bay-Tularcitos	6 miles	Northeast
King City-Reliz	18 miles	Northeast
Zayante-Vergeles	30 miles	Northeast
San Andreas	34 miles	Northeast
Sargent	37 miles	Northeast
Calaveras	38 miles	Northeast
Ortigilata	59 miles	Northeast
Hayward	55 miles	North

Major Earthquakes

The epicenter of the October 17, 1989, Loma Prieta Earthquake (M=7.1) occurred near the northern end of the San Andreas fault Southern Santa Cruz Mountains sub segment at a depth of eleven miles below the ground surface. This is approximately 40 miles north of the proposed project. The fault plane in this area dips about 70 degrees to the southwest. There was about forty miles of fault rupture at depth. Geodetic data suggests a maximum of 67-inches right lateral motion and 51-inches of vertical thrust motion along the fault zone.

Modified Mercalli Intensity Scale estimates of the intensity of ground shaking as determined from observations of the Loma Prieta earthquake's effects on people, structures, and the earth's surface, indicate a relative intensity in the project area of VI (Plafker and Galloway, 1989).

The California Division of Mines and Geology network of accelerographs measured the local ground response during the Loma Prieta earthquake. Accelerations in the vicinity of the Loma Prieta earthquake's epicenter were measured to be between 0.55g-0.64g. The ground accelerations in Monterey were measured at 0.07g and ground accelerations at Lucia in southern Monterey County were measured at 0.06g. Ground motions in Salinas were measured at 0.12g, while ground motions in Moss Landing are estimated to have been 0.25g (Woodward-Clyde, 1989), and ground motions near Gonzales were measured at 0.06g. According to Plafker and Galloway (1989), for a site 60 miles from the epicenter of the Loma Prieta earthquake, such as the subject property, there is approximately a two-thirds likelihood that ground motion during the earthquake would have been approximately 0.12g or less.

Several aspects of the Loma Prieta earthquake were unusual for events associated with the San Andreas fault, including its relatively deep focal center, the reverse (vertical) component of displacement, the 70 degree, rather than near vertical dip of the slip surface and the lack of surface rupture for an event of this size.

The highest intensities of ground shaking affecting this site in historical times were from the 1906 Great San Francisco earthquake on the San Andreas fault and the 1989 Loma Prieta earthquake, also on the San Andreas fault. Fault rupture during the 1906 earthquake extended as far south as San Juan Bautista. 1906 earthquake intensities based on the modified Rossi Forel scale were roughly comparable to Loma Prieta Earthquake intensities based on the Modified Mercali intensity scale in the project site area (Plafker and Galloway, 1989), (Youd and Hoose, 1978). 1926 ground shaking at the project site from several nearby offshore earthquakes associated with the San Gregorio fault approximated the highest intensities from the 1906 and 1989 earthquakes.

The term ‘Maximum Credible Earthquake’ (MCE) has been defined as the strongest earthquake that is likely to be generated along an active fault zone. The magnitude of the MCE is estimated from the geologic character (length, displacement, segmentation) of the fault and the earthquake history of the fault. Special geologic studies are needed, often with detailed field work, to develop the data needed to determine the most accurate MCE, and the results, in the best of studies, are susceptible to an error of about plus or minus 1/4 of a Richter magnitude. A Magnitude 7.9 on the San Andreas Fault or Magnitude 7.3 on the San Gregorio fault approximates the MCE that would generate the most shaking for this site. MCE magnitudes have been used for design purposes since they are independent of time restrictions. Probability approaches to magnitudes using statistical techniques on necessarily limited data do contain statistical error, as well as bias errors due to lack of randomness. For design considerations, the most shaking that can be expected from large nearby faults would be likely to originate from the San Andreas Fault.

The site will likely experience moderate to strong ground shaking from future earthquakes originating on any of several active faults in the San Francisco Bay region. The historical records do not directly indicate either the maximum credible earthquake or the probability of such a future event. To evaluate earthquake probabilities in California, the USGS has assembled a group of researchers into the "Working Group on California Earthquake

Probabilities" (2003, 2008, 2013) to estimate the probabilities of earthquakes on active faults. These studies have been published cooperatively by the USGS, CGS, and Southern California Earthquake Center (SCEC} as the Uniform California Earthquake Rupture Forecast, Versions 1, 2, and 3 (UCERF, UCERF2, and UCERF3, respectively). In these studies, potential seismic sources were analyzed considering fault geometry, geologic slip rates, geodetic strain rates. historic activity, micro-seismicity, and other factors to arrive at estimates of earthquakes of various magnitudes on a variety of faults in California.

The 2003 study UCERF specifically analyzed fault sources and earthquake probabilities for the seven major regional fault systems in the Bay Area region of northern California. The 2008 study UCERF2 applied many of the analyses used in the 2003 study to the entire state of California and updated some of the analytical methods and models. The 2013 study UCERF3 further expanded the database of faults considered and allowed for consideration of multi-fault ruptures, among other improvements.

Conclusions from the UCERF3 indicate the highest probability of an earthquake with a magnitude greater than 6.7 on any of the active faults in the San Francisco Bay region by 2045 is assigned to the San Andreas Fault, located approximately 34 miles northeast of the site, at 33%.

SEISMIC HAZARDS

Seismic hazards in the vicinity of the proposed project can be placed in three general categories: (1) surface ground rupture, (2) seismic shaking, and (3) seismically induced ground failure which includes liquefaction. Each of these areas are individually discussed.

Surface Ground Rupture

Surface ground rupture occurs when fault movement breaks the ground surface. In general, fault-related surface rupture occurs most commonly on, or in close proximity to, pre-existing active fault traces. It is therefore imperative to locate site improvements away from, and in particular not straddling, active fault traces. An examination of published maps and reports combined with an analysis of aerial photographs from 1949 to 2020 along with a site visit did not reveal any evidence of a fault trace on the subject property. There is therefore a low probability of fault related surface ground rupture at the proposed project site during the next fifty years.

Ground Shaking

Ground shaking is the soil column response to seismic energy transmission. Intensity of ground shaking and the potential for structural damage is greatly influenced by local soil conditions. In the event of a large magnitude earthquake on any of the nearby active or potentially active faults, ground shaking at the proposed project will range from moderate to severe.

Although there are several faults capable of generating ground shaking in the proposed project area, the most likely cause of intense ground shaking during the next fifty years will be an earthquake on the San Andreas Fault, or the nearby Palo Colorado-San Gregorio fault system. It is important that all structures be designed in accordance with the requirements set forth by county ordinance and within the Uniform Building Code's conditions (current edition).

Seismic shaking is a significant hazard present at this site. Seismic shaking at the proposed building site will be moderate to intense during the next major earthquake along the King City-Reliz fault, Monterey Bay- Tularcitos fault, Palo Colorado San Gregorio fault, San Andreas fault, Zayante fault, or other fault systems in the Monterey Bay region. Ground motion parameters which allow a quantitative estimation of the actual motion include: horizontal acceleration, velocity and displacement vertical acceleration, duration of shaking; and high repeatable ground accelerations. Factors affecting ground motion are: magnitude, distance, geologic characteristics of rock along wave path, source mechanism, wave interference, and local soil conditions (Seed & Idriss, 1982). For design purposes, a peak ground acceleration of 0.55g should be used (Applied Technology Council, 2021). Repeatable horizontal ground acceleration estimates for the project site vary among researchers. The probable repeatable ground acceleration should be treated as approximately two-thirds of the attenuated peak ground acceleration estimate (Ploessel and Slossen, 1974). The 0.41g value for repeatable ground acceleration is based on empirical, assumed, and modeled data (Applied Technology Council, 2021). It is possible that the project area may experience accelerations different than deterministic and empirical estimates. Current California Building Code recommendations should be followed.

TABLE 3
DURATION OF GROUND SHAKING

Richter Earthquake Magnitude	Duration of Strong Shaking
5	3 to 6
6	6 to 12
7	16 to 30
7.5	25 to 50

The duration of strong shaking is dependent on magnitude. Dobry, et. al. (1978) have suggested a relationship between magnitude and duration of "significant" or strong shaking expressed by the formula: $\text{Log } D = 0.432 M \quad 1.83$ (where D is the duration and M is the magnitude). On the basis of the above relationship, the duration of strong shaking associated with a Magnitude 7 earthquake is estimated to be about seventeen seconds. A range of shaking duration (16 30 seconds) will probably more accurately reflect the site response over the project lifetime. Table 2 (Dobry and others, 1978) gives estimates of the typical range in duration.

Because of the numerous inherent uncertainties, ground motion parameters must be estimated. There is no unanimity among investigators. It has also been suggested that the common practice of using well defined surface fault segments instead of the entire length of the fault zone or fault system for estimating maximum earthquakes can lead to underestimating earthquake potential, (Freeman and Fuller, 1986). In addition, it is likely that a significant portion of the damaging earthquakes that occur in the coming decades will occur on faults whose potential is poorly understood today (Lindh, 1983).

Ground Failure

The occurrence and extent of the different types of ground failure are related to the intensity and duration of the shaking caused by an earthquake, as well as local soil conditions.

Documentation of historic ground failure resulting from the 1906 San Francisco Earthquake does not identify any ground failure at the site. In the 1906 event, the closest recorded ground failures were along the northern portion of the Salinas River, approximately seventeen miles or more from the subject property (Youd and Hoose, 1978). These failures, restricted to the river margins, included ground settlement, landslides, sand boils and lateral spreading. Along the Monterey Bay shoreline (over five miles to the northwest), there was ground settlement and lateral spreading. 1906 and 1989 ground failure was not documented along the Carmel Bay shoreline near the project site.

At the time of the 1906 San Francisco earthquake this site was undeveloped and it is possible that minor earthquake effects would have not have been documented. However, areas of ground failure resulting from the 1989 Loma Prieta Earthquake in Monterey County are generally coincident with 1906 event. As no ground failures were reported on the subject property during the 1989 earthquake, it is possible that no significant failures occurred during the 1906 earthquake.

The California Bureau of Mines and Geology (Note 42) considers four types of ground failures: 1) liquefaction, 2) lateral spreading, 3) landslides and slope instability hazards, and 4) settlement and differential compaction.

Liquefaction

Liquefaction is the sudden loss of soil strength due to increased pore water pressures caused by the reorientation of soil particles during seismic shaking. Three requirements are needed for an area to be susceptible to liquefaction; 1) the underlying soil must be of low relative density, 2) the soil must be granular, and 3) ground water should be close to the ground surface.

Locations of ground failure resulting from soil liquefaction during the Loma Prieta earthquake were generally coincident with similar areas of ground failure during the 1906 earthquake. Fourteen of the seventeen areas which liquefied in the 1906 earthquake, liquefied in the Loma Prieta earthquake (John Tinsley and Bill Dupré, personal communication, 1990). Liquefaction occurred around the margin of San Francisco Bay in sandy, manmade fills and near Monterey Bay from Santa Cruz to Salinas in both late Holocene and active flood plain deposits of the principal river valleys and in spits, bars, and tidal channels of smaller coastal drainages (O'Rourke, 1989), (Plafker and Galloway, 1989), (Greene, et. al., 1989). No liquefaction was reported by any of these investigators at the subject property.

According to Dupré (1990) and Rosenberg (2006), the potential for liquefaction at the site is low. Figure 6 shows the County of Monterey Liquefaction Map with the project site located in an area of low liquefaction susceptibility.

Lateral Spreading

Lateral spreading is the horizontal movement of soil masses caused by seismic shaking. Usually, such movement is towards an open face and occurs along a weakened strata of saturated soils.

The subject area appears generally well-drained, and slopes range from gentle to steep. In general, groundwater conditions on the subject property are unlikely to favor a high-water table. At present there are some open faces within the subject area where lateral spreading could occur. Care should be taken not to create open faces during any construction in the subject area.

Landslides and Slope Instability Hazards

Landsliding is defined as the downward and outward movement of slope-forming materials composed of natural rock, soils, artificial fills or combinations of these materials (Varnes, 1958). In the region of Big Sur landslides are a common event. This is caused by the steep mountains that drop into an erosional coastline. After reviewing aerial photographs and visiting the site we did not identify any evidence of landslides on the coastal bluffs that were close enough to impact the site. California Geologic Survey (CGS, 2001) created landslide maps of Highway 1 and these did not identify any land sliding on or near the project site. The nearest mapped landslides (CGS, 2001) are about 1 mile away upslope at an elevation of 600 feet.

The steep slopes of the drainage ditch northwest of the house could be subject to slope failure and erosion. There is an existing redwood retaining wall in the ditch mitigating the potential slope instability to some extent. Evaluation of the stability of the retaining wall by a geotechnical engineer is recommended.

Settlement and Differential Compaction

Settlement and differential compaction are the result of a loss of volume resulting from seismic ground shaking. Compaction is more likely in water saturated, low density alluvial material. The most likely areas are paleo-swamps and/or marsh, or strata of fine-grained silts and sands. Generally, for this phenomena to occur, the site soils must be of low relative density and be dilatant. The soils at the subject property do not meet these criteria and therefore are not typically prone to such phenomena.

DRAINAGE AND EROSION HAZARDS

Erosion is the removal of surface soil, sediment, and rock by wind, water, waves, and ice. Rainfall erosion is the most common type of erosion. Rainfall and runoff can initiate slope wash, gullying, siltation, and sedimentation. Rainfall erosion is a function of climatic conditions, topography, soil erodibility, and vegetation type and coverage. Wind erosion is controlled by the same basic factors as rainfall erosion.

There is a large drainage ditch with a metal culvert located on the northern side of the property. Regional drainage is generally west towards the Pacific Ocean. Drainage on the property consists of surface runoff and subsurface flow and is controlled by topography and earth materials.

Flooding

A registered civil engineer should be consulted for an estimation of flood hazards and risks associated with this project. Such an estimation is beyond the scope of this report.

Tsunamis and Seiches

Tsunamis are inundations by oceanic waves generally generated by seismic events. According to the California Geological Survey (2009), low-lying coastal areas generally less than ten feet above sea level are most susceptible to tsunami inundation. There is no historical record of a tsunami higher than nine feet above sea level occurring in the state of California. Since the building portion of the subject property is located approximately 70 feet above mean sea level, a tsunami of average proportions is not considered a hazard. However, any tsunami must be viewed as a potential hazard and evacuation plans be developed accordingly.

According to the Geotechnical Study for the Seismic Safety Element, Monterey County, seiches (fresh water tsunamis) characteristically do not raise the water level in an inland body of water more than a few feet. A seiche is not considered a relevant hazard at the subject property.

CONCLUSIONS

The subject property lies in a highly seismically active region. Although no active faults are known to cross the property, there are several major faults in the region. The nearby King City-Reliz, Monterey Bay- Tularcitos, San Andreas, Zayante and Palo Colorado-San Gregorio faults each have the potential to produce a large magnitude earthquake in the next fifty years. Any of these events that occur will probably generate moderate to severe ground shaking at the property.

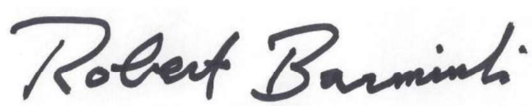
There are significant hazards associated with any construction project on the subject property. Seismic shaking is the most serious hazard, and it is crucial that the recommendations of the soil engineer be rigorously adhered to. Any building must have a well-designed, site specific, engineered foundation. Such a foundation is also crucial to surviving the strong shaking that could be generated at the subject property during a large-magnitude earthquake. Further, it is important that all structures be designed in accordance with the requirements set forth by county ordinance and within the current edition of the Uniform Building Code's conditions.

An important factor in maintaining the integrity of the subject property will be the proper channeling of drainage and storm runoff. Appropriate measures should be taken to ensure that surface water drainage on the property is channeled around the home. The steep slopes of the drainage ditch northwest of the house could be subject to slope failure and erosion. There is an existing redwood retaining wall in the ditch mitigating the potential slope instability to some extent. Evaluation of the stability of the retaining wall by a geotechnical engineer is recommended.

LIMITATIONS
In performing our professional services, we have applied present engineering and scientific judgment and used a level of effort consistent with the standard of practice on the date of this report and the locale of the subject property for similar type studies. CapRock makes no warranty, expressed or implied, in fact or by law, whether of merchantability, fitness for any particular purpose, or otherwise, concerning any of the materials or "services" furnished by CapRock to the client.

This report in no way implies that the subject property will not be subject to earthquake shaking, landsliding, faulting, or other acts of nature. Such events could damage the property and affect the property's value or its viability in ways other than damage to habitable structures. We have not attempted to investigate or mitigate all such risks and we do not warrant the project against them. We would be happy to discuss these risks with you, at your request. This report does not make any attempt to evaluate appropriate foundation design and is not a Geotechnical Report or a Slope Stability Investigation. Subsurface soil conditions can vary both vertically and horizontally. Should you have any questions or comments concerning this Geological Report, please contact us at (831) 595-1544.

Sincerely
CapRock Geology, Inc.



Robert Barminski, R.G., C.E.G.
Principal Geologist

REFERENCES

Cao, T., Bryant, W.A., Rowshandel, B., Branum, D., and Will, C.J., 2003, The revised 2002 California probabilistic seismic hazard maps: California Geological Survey, 44p. Available at: www.consrv.ca.gov/CGS/rghm/psha/fault_parameters/pdf/2002_CA_Hazard_Maps.pdf.

Cayan, D., Tyree, M., Dettinger, M., Hildago, H., Das, T., Maurer, E. Bromirski, P., Graham, N., and Flick, R., 2008, Climate change scenarios and sea level rise estimates for California 2008. Climate Change Scenarios Assessment, California Energy Commission, Public Interest Energy Research Program.

Compton, R. R., 1966; Granitic and Metamorphic Rocks of the Salinian Block, California Coast Ranges, CDMG Bulletin 190, p. 277-287.

Coppersmith, K.J. and Griggs, G.B., 1978, Morphology, Recent Activity and Seismicity of the San Gregorio Fault Zone, in California Division of Mines and Geology Special Report 137, pp. 33-44.

Dibblee, T. W. Jr., 1966; Evidence for Cumulative Offset on the San Andreas Fault in Central and Northern California, CDMG Bulletin 190.

_____1973a, Geologic map of the Point Sur 15-minute quadrangle, Monterey County, California: U.S. Geological Survey Open-File Report 74-1021, scale 1:62,500.

_____1999, Geologic map of the Monterey Peninsula and vicinity, Monterey County, California: Dibblee Foundation, scale 1:62,500, Map No. DF-71.

Dupré, W. R., 1990: Quaternary Geology of the Monterey Bay Region, in Geology and Tectonics of the Central Coast Region, San Francisco to Monterey. American Association of Petroleum Geologists Volume and Guidebook, 314 p.

California Division of Mines and Geology, 1986, Guidelines to geologic/seismic reports:

California Division of Mines and Geology Note 37, 2 p. (Revised 1986 as Note 42).

California Geological Survey, 2001, Landslides in the Highway 1 Corridor: Geology and Slope Stability Along the Big Sur Coast between Point Lobos and San Carpoforo Creek, Monterey and San Luis Obispo Counties, California. http://www.conservation.ca.gov/cgs/rghm/landslides

California Geological Survey, 2009, Tsunami Inundation Map for Emergency Planning, Sobranes Point Quadrangle. California Geological Survey, July 1, 2009.

Graham, S.A., 1978, Role of Salinian Block in Evolution of San Andreas Fault System, California, AAPG Bulletin, V. 62, no. 11, pp. 2214-2231.

Graham, S.A. and Dickenson, W.R., 1978, Evidence of 115 km Right Slip on the San Gregorio-Hosgri Fault Trend, Science, V. 199, pp. 179-181.

Greene, H.G., Lee, W.H.K., McCulloch, D.S., and Brabb, E.E., 1973, Faults and earthquakes in the Monterey Bay region, California: U.S. Geological Survey Miscellaneous Field Studies Map MF-518, 14 p., 4 map sheets, scale 1:200,000.

Greene, H.G., 1990; Regional Tectonics and Structural Evolution of the Monterey Bay Region, Central California: American Association of Petroleum Geologist, Pacific Section, Volume and Guidebook: Geology and Tectonics of the Central California Coast Region, San Francisco to Monterey.

Hall, C.A., 1991, Geology of the Point Sur-Lopez Point region, Coast Ranges, California: A part of the Southern California Allocthon: Geological Society of America, Special Paper 266

Hamilton, D.H., Fisher, D.L., and Jahns, R.H., 1979, Evidence of Late Quaternary Right Slip and other Deformation along the San Gregorio Fault, California, Another View, Geological Society of America Abstracts with Programs, V. 11, p. 437.

Hapke, C.J., and Green, K.R., 2004, Maps showing coastal cliff retreat rates along the Big Sur Coast, Monterey and San Luis Obispo Counties, California. U.S. Geological Survey Scientific Investigations Map 2853.

Hapke, C.J., and Reid, David, 2007, National Assessment of Shoreline Change Part 4: Historical Coastal Cliff Retreat along the California Coast. U.S. Gelogical Survey Open File Report 2007-1133

Jennings, C. W., et al., 1975; Fault map of California, CDMG, California Geology Data Map Series, Map No. 1, Scale 1:2,500,000.

Jennings, C. W., and Strand, R. G., 1958; Geologic map of California, Olaf P. Jenkins Edition, Santa Cruz sheet, CDMG, Scale 1:250,000.

Joint Committee on Seismic Safety of the California Legislature, Jan. 1974, Meeting the Earthquake p.9.

Krinitzsky, E.L., Chang, F.K., and Nuttli, O.W., 1988, Magnitude Related Earthquake Ground Motions, Bull. of Assoc. of Eng. Geol., V. 15, no. 4, pp. 399-423.

Krinitzsky, E.L. and Chang, E.K., 1987, Parameters for Specifying Magnitude Related Earthquake Ground Motions, Report 2-G in State of the Art for Assessing Earthquake Hazards in the United States, Miss. Paper S-73-1, U.S. Army Corp of Engineer, Waterways

NGA [Next Generation Attenuation Models], 2008, available at: http://peer.berkeley.edu/ngawest/nga_models.html Also published in *Earthquake Spectra,* Vol. 24, No. 1, February 2008.

O'Rourke, T. D., 1989; Ground Failures in San Francisco during 1989 and 1906 Earthquakes, 1989 Fall Meeting Late Abstracts, EOS Transactions, American Geophysical Union Feb. 20, 1990, v. 71, no. 8.

Page, B.M., 1970, Sur-Nacimiento Fault Zone of California, Geologic Society of America Bulletin, V.81, no. 3.

Philip Williams and Associates, 2009, California Coastal Erosion Response to Sea Level Rise - Analysis and Mapping. Report: Phillip Williams and Associates, San Francisco, California, for The Pacific Institute. 29 p.

Plafker, G. and Galloway, J.P., editors, 1989, Lessons Learned from the Loma Prieta, California, Earthquake of October 17, 1989, U.S.G.S. Circular 1045, 48 p.

Rosenberg, L.I, 2001, Geologic Resources and Constraints, a technical report for the Monterey County 21 Century General Plan Update Program.

Ross, D.C., 1973, Petrography and Structural Relationships of Granitic Basement Rocks in the Monterey Bay Area, California, U.S.G.S. Journal of Research, V. 1, no. 3, pp. 273-282.

Sadigh, K., 1983, Considerations in the Development of Site-specific Spectra, Proceeding of Conf. XXII; Site-Specific Effects of Soil and Rock on Ground Motion and Implication for Earthquake Resistant Design, U.S.G.S. Open-file Report 83-845.

Seed, H.B. and Idriss, I.M., 1982, Ground Motion and Soil Liquefaction during Earthquakes, Earthquake Eng. Res. Institute, in Engineering Monographs on Earthquake Criteria, Vol 5, Structural Design and Strong Motion Records.

Tuttle, M.P., 1985, Earthquake potential of the San Gregorio-Hosgri fault zone, California: Santa Cruz, University of California, M.S. thesis, 60 p., 2 appendices, 4 plates.

Wallace, R. E., 1970; Earthquake Recurrence Intervals on the San Andreas Fault, GSA Bulletin, v. 81.

Wallace, R. E., 1990: The San Andreas Fault System, California, U.S. Geological Survey, Professional Paper 1515, 283 p.

Wesnousky, S.G., 1986, Earthquakes, Quaternary st faults, and seismic hazard in California: Journal of Geophysical Research, v. 91, no. B12, p. 12587-12631.

Youd, T. L., 1973; Liquefaction, Flow and Associated Ground Failure, U. S. Geological Survey Circ. 688, 12 p.

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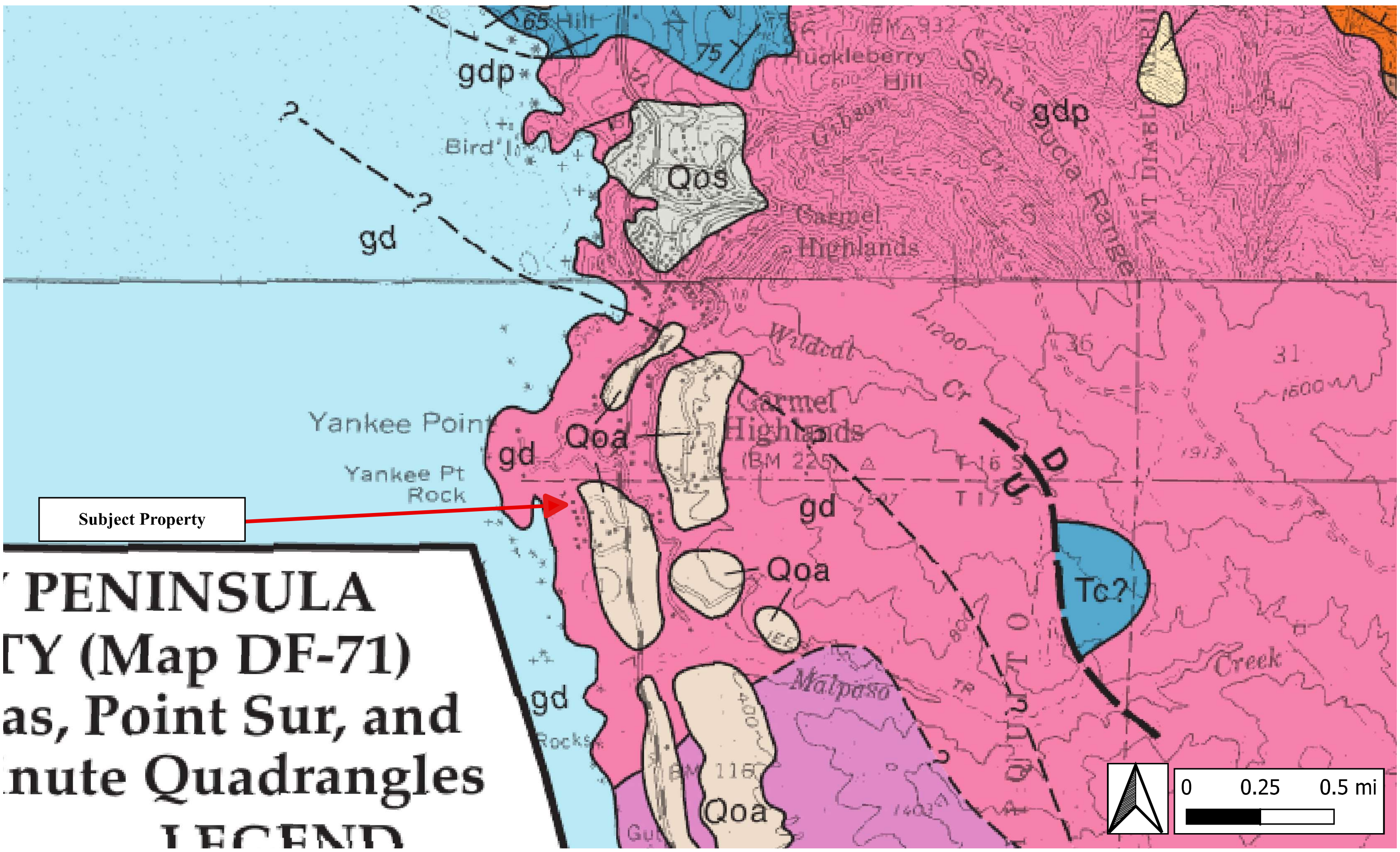
CapRock Geology, Inc. Environmental, Engineering & Marine Geology	Site Location Map 5 Yankee Beach Way Carmel, California Ref. No.: 5179-01	**Figure 1**



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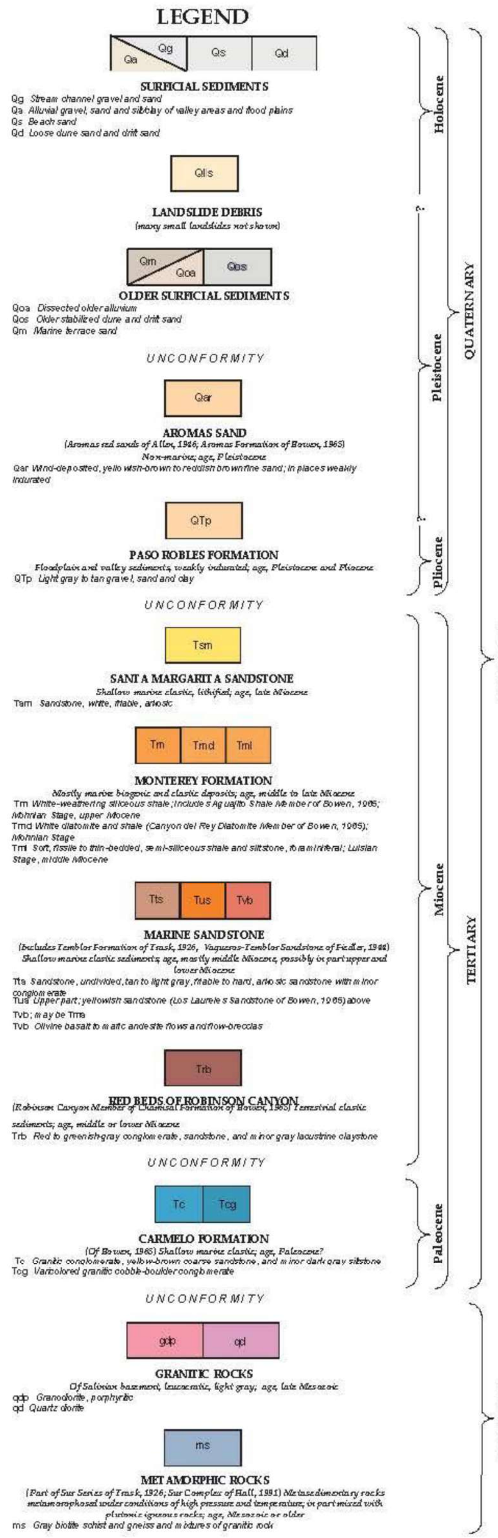
Geologic Map of the Monterey Peninsula and Vicinity
Dibblee, 1999

Figure 2
5 Yankee Beach Way
Carmel, California
5179-01



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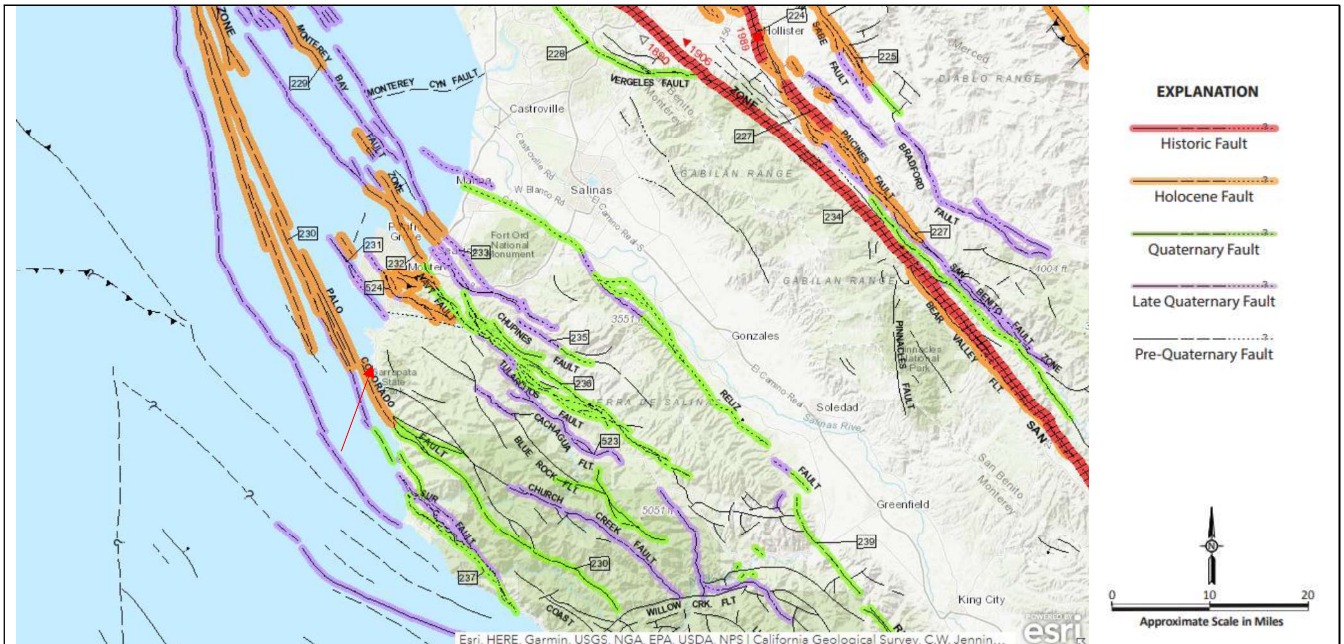
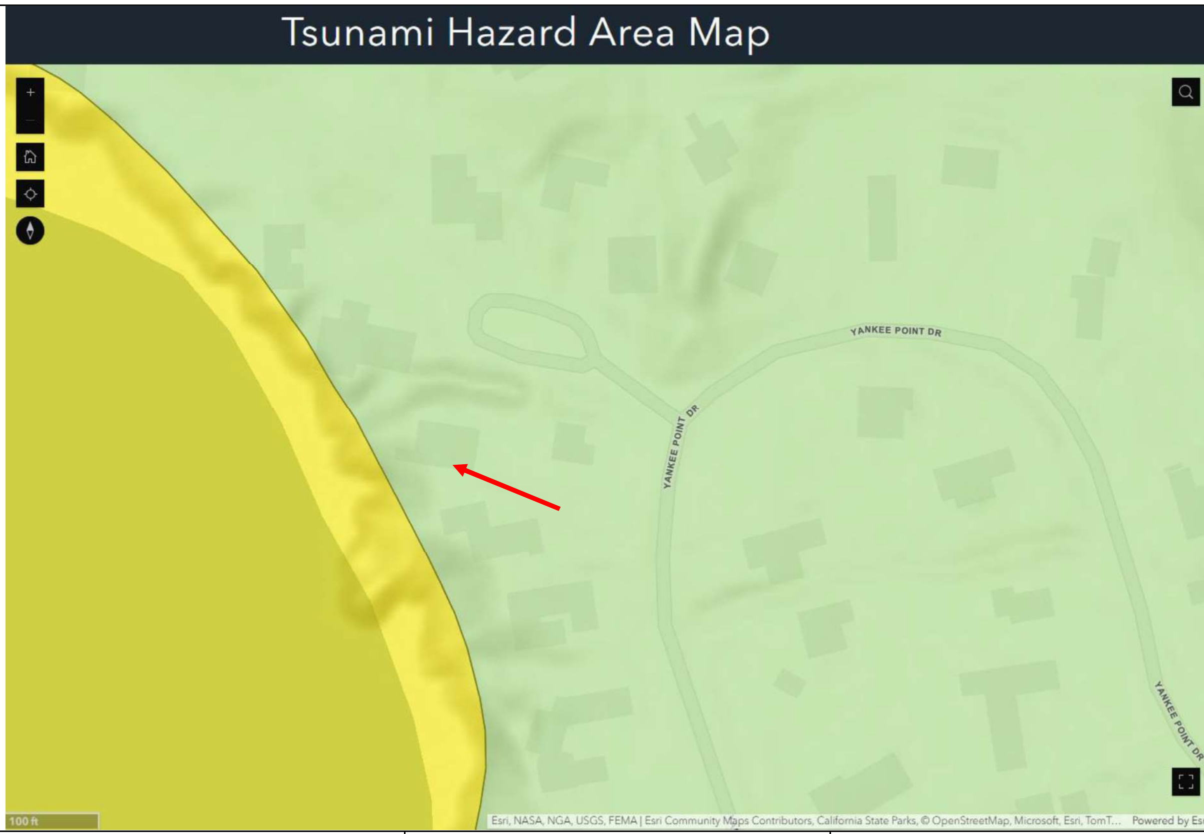
Geology Map Legend
5 Yankee Beach Way
Carmel, California
Ref. No.: 5179-01

Figure 2A



CapRock Geology, Inc. Environmental, Engineering & Marine Geology	Regional Fault Trace Map (Modified from Jennings and Bryant, 2010) 5 Yankee Beach Way Carmel, California Ref. No.: 5179-01	**Figure 3**

CapRock Geology, Inc. Environmental, Engineering & Marine Geology	Local Fault Trace Map (Modified from Jennings and Bryant, 2010) 5 Yankee Beach Way Carmel, California Ref. No.: 5179-01	**Figure 4**



CapRock Geology, Inc. Environmental, Engineering & Marine Geology	Tsunami Hazard Area Map (California Geological Survey, 2021) 5 Yankee Beach Way Carmel, California Ref. No.: 5179-01	**Figure 5** **Legend** **Green Area: Outside Tsunami Hazard Area** **Yellow Area: Inside Hazard Area** **Red Arrow: Site Location**

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Liquefaction Map
(County of Monterey, 2014)
5 Yankee Beach Way
Carmel, California
Ref. No.: 5179-01

Figure 6

Legend

Light Shaded: Low Liquefaction Susceptibly

CapRock Geology, Inc. Environmental, Engineering & Marine Geology	Erosion Hazard Map (County of Monterey, 2014) 5 Yankee Beach Way Carmel, California Ref. No.: 5179-01	**Figure 7** **Legend** **Un Shaded: High Erosion Hazard** **Orange Shaded: Moderate Erosion Hazard**

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Landslide Hazard Map
(County of Monterey, 2014)
5 Yankee Beach Way
Carmel, California
Ref. No.: 5179-01

Figure 8

Legend

Dark Red Shaded: High Landslide Hazard
Pink Shaded: Moderate Landslide Hazard
Green Shaded: Low Landslide Hazard

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Addendum to February 27, 2025 Geological Report

Coastal Bluff Analysis

5179-01

5 Yankee Beach Way

Carmel, California 93923

COASTAL BLUFF RETREAT

Coastal Bluff Erosion

Our investigation for the proposed addition of the coastal bluff erosion hazards have led us to suggest a single set back line of ten feet from bluff line for the property to prevent future construction from being subject to coastal bluff erosion and related ocean bluff landslides. This is reasonable as landsliding and erosion are related; in that the presence of landslide deposits can result in high erosion rates and bluff erosion can create landslides. The proposed addition is outside the ten foot setback from the bluff line.

Coastal Bluff Erosion Rate Study

The coastal bluff erosion study was conducted by analyzing aerial photos and reviewing published coastal bluff retreat rates in the Big Sur/Carmel Highlands area. The aerial photos included in this study: 1949, 1981, 1994, 2012, and 2020 were selected for their similar scales and observable details. Figure 1 (Historical Coastal Bluffs: Aerial Photograph Analysis), displays the crests of the historical bluffs outlined against a satellite image as the base map.

This method of measuring sea cliff retreat rates is the most widely employed method for studying coastal erosion. Newer methods involving use of LIDAR imagery and digital techniques have been developed that are valuable in providing an accessible and standardized methodology for studying coastal retreat over large areas (Hapke and Reid, 2007). These new methods are not expected to improve accuracy for small project site studies.

Figure 1 does not show a steady regression of the sea cliffs over time. The sea cliffs seem to move back and forth across the base map. This is caused by radial distortion and variation in viewing angle that is inherent to aerial photography. Distortion is also caused by the differences in the scales of the photographs. As a certain amount of error is associated with this method it is most accurate in areas with moderate to high retreat rates. In these areas the changes in the coastal bluff's locations are easily distinguishable. This lack of evidence for sea cliff erosion indicates that there has been less than moderate retreat rates in this area since 1949. The morphology of the cliff has also not changed significantly during the study period, 1949-2020.

This lack of change in the shape of the cliff suggests that there have been no large-scale erosional events during the study period.

There has been significant research done by Hapke and Green (2004) and Hapke and Reid (2007) on the erosion rates for the Big Sur section of the California coast. Hapke and Green (2004) estimated erosion rates for the Big Sur coast. The specific site is located at the 68.4 post mile near Study Section 1 outside of the Hapke and Green report. The retreat rate for this section was 12± 7 cm/yr (~0.39 ft/yr) and the average erosion rate is 0.12 m/yr (~0.39 ft/yr). However, these high average rates of erosion are skewed because the results include a few high retreat rates. As a result of these study sections being so long and covering an area with vast topographic variety, we examined the transect locations closest to the property. The data from these locations were interpreted to estimate an average erosion rate of 0.1 feet/yr. The erosion rate of 0.1 feet per year seems reasonable in light of the lack of cliff retreat evident in the aerial photographs covering the period from 1949-2020.

To ensure the safety of the structures it is necessary to have a safety buffer. We recommend that proposed addition construction be setback a minimum of 10 feet from the top of the bluff line. An erosion rate of 0.1 feet/yr of the bedrock amounts to 5.0 feet of erosion in 50 years and 10.0 feet of erosion in 100 years. Consideration of the erosion of the top debris fan sediment indicates that a 5 foot setback is the minimum necessary to account for erosion. We based our analysis of the hazards of landsliding and erosion on conservative expectations. This analysis was qualitative and it is expected that analytical evaluation of slope stability through quantitative slope stability modeling may result in smaller setbacks than those provided here.

It is significant that this study specifically measured average erosion rates for the coastal bluffs. Average numbers are very useful for long-term planning but the actual process of erosion occurs episodically. This means that a large retreat event could account for most of the erosion for in any given area for an interval spanning decades.

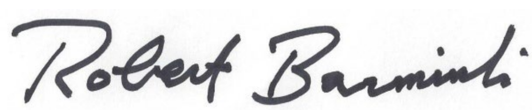
LIMITATIONS

In performing our professional services, we have applied present engineering and scientific judgment and used a level of effort consistent with the standard of practice on the date of this report and the locale of the subject property for similar type studies. CapRock makes no warranty, expressed or implied, in fact or by law, whether of merchantability, fitness for any particular purpose, or otherwise, concerning any of the materials or "services" furnished by CapRock to the client.

This report in no way implies that the subject property will not be subject to earthquake shaking, landsliding, faulting, or other acts of nature. Such events could damage the property and affect the property's value or its viability in ways other than damage to habitable structures. We have not attempted to investigate or mitigate all such risks and we do not warrant the project against them. We would be happy to discuss these risks with you, at your request. This report does not make any attempt to evaluate appropriate foundation design and is not a Geotechnical Report or a Slope Stability Investigation. Subsurface soil conditions can vary both vertically and horizontally. Should you have any questions or comments concerning this Addendum to Geological Report, please contact us at (831) 595-1544.

Sincerely

CapRock Geology, Inc.



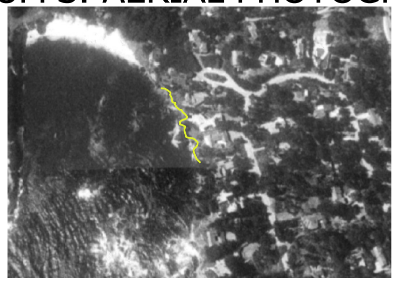
Robert Barminski, R.G., C.E.G.

Principal Geologist

HISTORICAL COASTAL BLUFFS: AERIAL PHOTOGRAPH ANALYSIS

1949

1981



1994

2012

2020

CapRock Geology, Inc.

Historical Coastal Bluffs Analysis
5 Yankee Beach Way
Carmel, California
5179-01

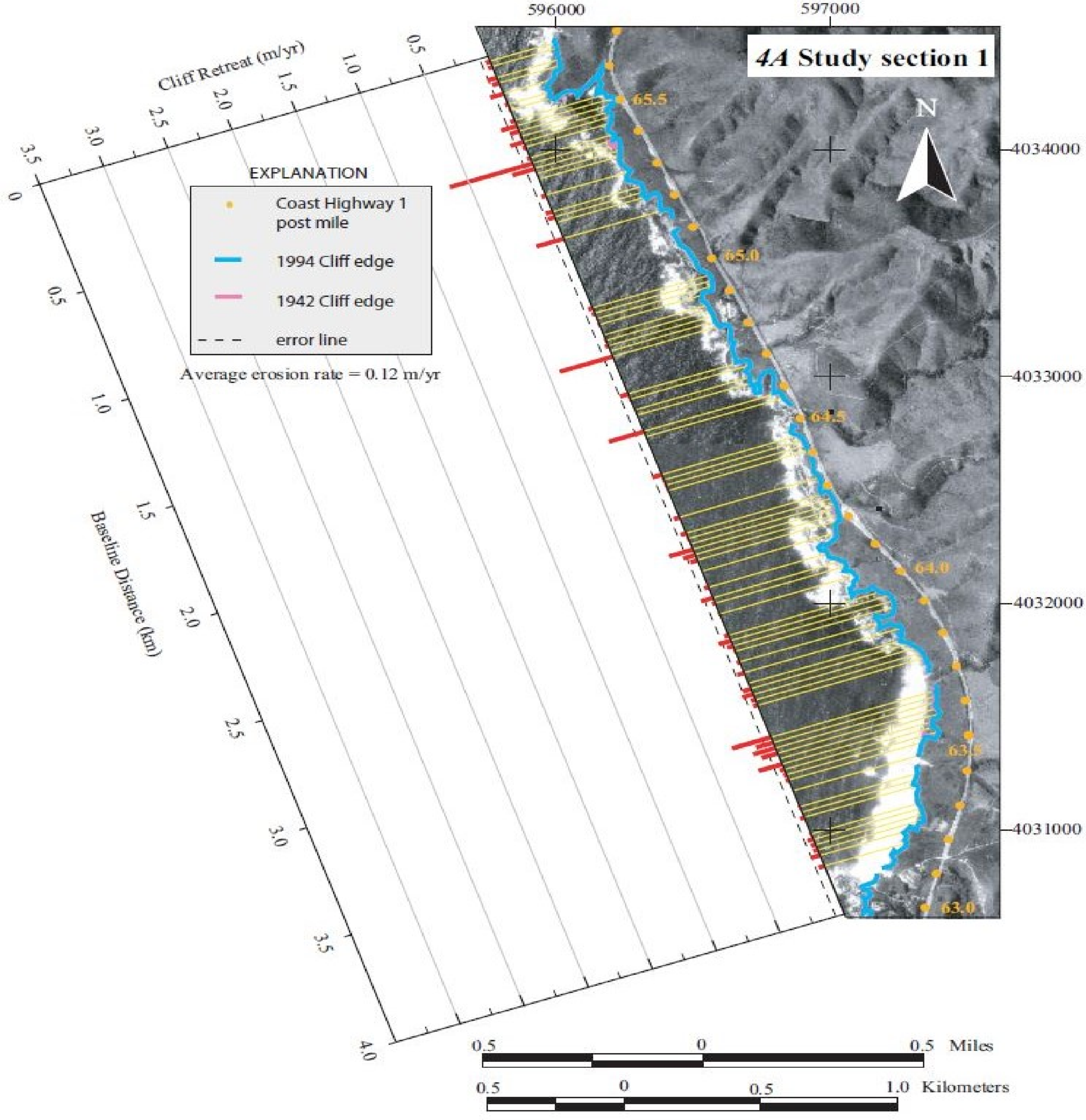


Figure 4A. Cliff retreat rates for study section 1 of the Big Sur coast.

CapRock Environmental, Engineering & Marine Geology	Coastal Cliff Retreat (Hapke and green, 2004)	FIGURE 2

FUEL MANAGEMENT PLAN NOTES:

ALL NEW PLANT MATERIAL ON PROPERTY WILL BE IRRIGATED WITH DRIP IRRIGATION. ONLY EXISTING VEGETATION ON SITE ARE MATURE TREES. ALL TREES ONSITE TO BE KEPT FREE OF DEAD WOOD.

GREEN ZONE: 0'–30' AWAY FROM HOUSE.

GUIDLINES AS FOLLOWS:
- ALL DRY AND DEAD GRASS KEPT TO A HEIGHT OF 4
- MAINTAIN THE ROOF AND GUTTERS OF STRUCTURE FREE OF LEAVES, NEEDLES, OR OTHER DEAD VEGETATIVE GROWTH
- MAINTAIN ANY TREE ADJACENT TO OR OVERHANGING A BUILDING FREE OF DEAD WOOD
- TRIM TREE LIMBS THAT EXTEND WITHIN 10' OF THE OUTLET OF A CHIMNEY
- TRIM DEAD PORTIONS OF TREE LIMBS WITHIN 10' FROM THE GROUND
- REMOVE ALL DEAD FALLEN MATERIAL UNLESS IT IS EMBEDDED IN THE SOIL
- REMOVE ALL CUT MATERIAL FROM THE AREA
- MAINTAIN SCREEN OVER CHIMNEY OUTLET

MANAGEMENT ZONE: 30' – 100' AWAY FROM HOUSE.

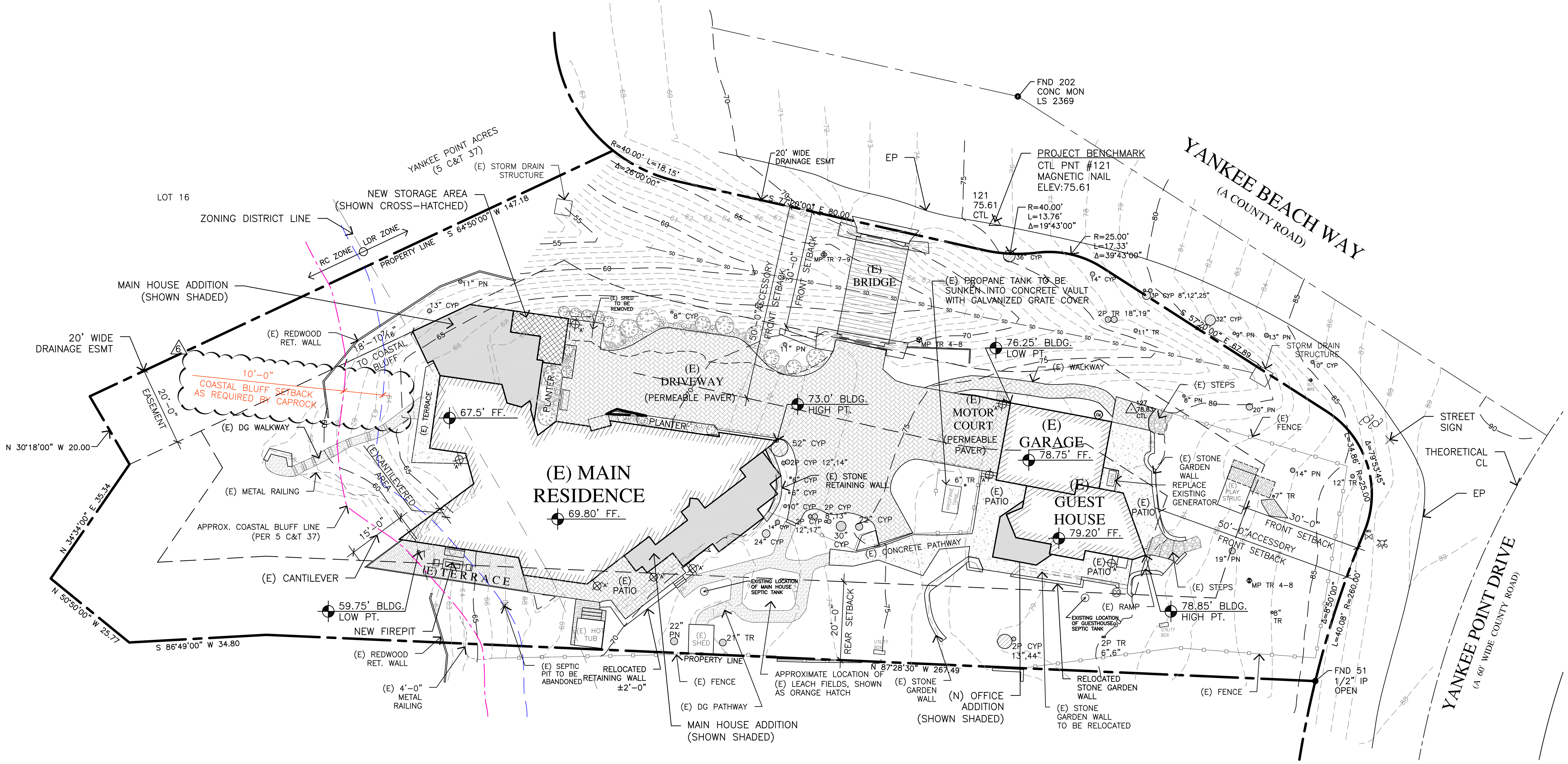
GUIDLINES AS FOLLOWS:
- KEEP ANY NON IRRIGATED VEGETATION LOW TO THE GROUND

EMERGENCY VEHICLE ACCESS:
VEHICLE ACCESS FROM YANKEE BEACH WAY.

EXTERIOR LIGHTING LEGEND

10W MAX. WALL MOUNTED SCONCE FIXTURE

FIXTURE 'A'
MINKA LAVERY OUTDOOR LIGHTING
WALL MOUNTED "WESTGATE" SCONCE W/
WHITE SEEDY GLASS
1 LED BULB
TOTAL WATTAGE NOT TO EXCEED 6 WATTS
(DELIVERED LUMENS 103.8)
W/ PHOTO CONTROL SENSOR



SITE PLAN - PROPOSED

N

1/16"=1'-0"

PLANNING INFO.

- PROPERTY OWNER:
  OLIVER AND BROOKE RICKARD
  1304 SUTTON DRIVE
  COLUMBIA, MO. 65203
- PROJECT ADDRESS:
  5 YANKEE BEACH WAY
  CARMEL, CA 93923
- PROJECT SCOPE:
  - INTERIOR REMODEL TO EXISTING SINGLE FAMILY DWELLING WITH AN ADDITION OF 933 SF.
  - INTERIOR REMODEL OF EXISTING GUESTHOUSE, CONVERTING 89 SF. INTO NEW OFFICE.
  - ADDITION OF 101 SF. TO NEW HOME OFFICE, TOTALING 190 SF. NEW HOME OFFICE.
  - NEW 118 SF. STORAGE AT MAIN RESIDENCE.
  - AFTER THE FACT EMERGENCY PERMIT FOR EXISTING BRIDGE.
- OCCUPANCY: R-3, U
- CONST. TYPE: V-B
- A.P.N.: 243-141-008
- ZONE: LDR/1-D(20)(CZ) | RC-D(20')(CZ)
- STORIES: ONE
- MAX BLDG. HT: 20 FT
- GRADING: 35 CY CUT | 10 CY FILL, SEE CIVIL PLANS
- TREE REMOVAL: NONE
- TOPOGRAPHY: SLOPING
- PROJECT CODE COMPLIANCE:
  2022 CBC, CMC, CPC, CFC, CEC, CALIFORNIA RESIDENTIAL CODE, CALIFORNIA GREEN BUILDING CODE & 2022 CALIFORNIA ENERGY CODE
- LOT AREA: 31,695 SF (0.73 Ac.)
- LOT COVERAGE CALCULATIONS IN LDR ZONE:

	EXISTING	PROPOSED ADDITION	PROPOSED REMOVAL	PROPOSED TOTAL
MAIN BUILDING	2015	1084	–5	3094
GUEST HOUSE	476	0	–89	387
OFFICE	0	190	0	190
GARAGE	506	0	0	506
PLAYHOUSE	69	0	0	69
SHEDS	82	0	–36	46
TOTAL	3148	1274	–130	4292

- LOT COVERAGE "LDR ZONE" ALLOWED: 4,754.7 SF (15%)
- LOT COVERAGE "LDR ZONE" PROPOSED: 4,292 SF (13.5%)
- LOT COVERAGE CALCULATIONS IN RC ZONE:

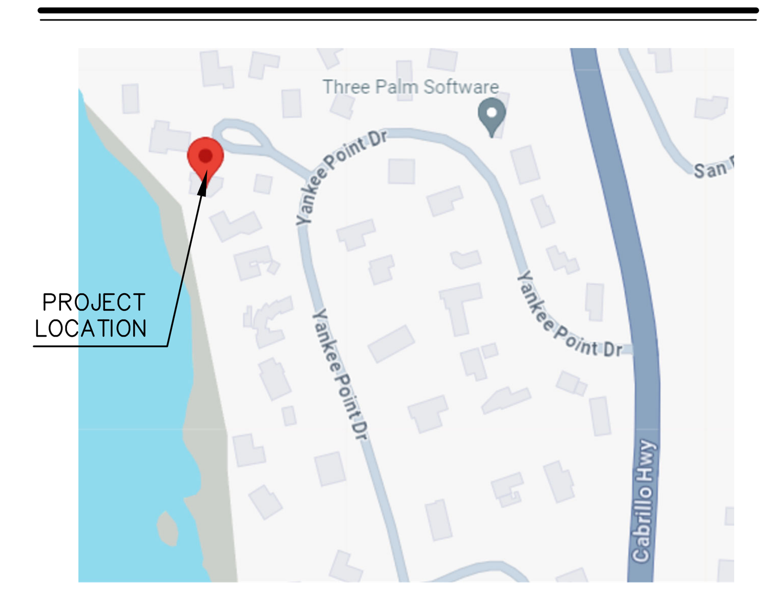
	EXISTING	PROPOSED ADDITION	PROPOSED REMOVAL	PROPOSED TOTAL
MAIN BUILDING	486	0	0	486
TOTAL	486	0	0	486

- LOT COVERAGE "RC ZONE" ALLOWED: 1,584.9 SF (5%)
- LOT COVERAGE "RC ZONE" EXISTING: 486 SF (1.5%)
- F.A.R. CALCULATIONS:

	EXISTING	PROPOSED ADDITION	PROPOSED REMOVAL	PROPOSED TOTAL
MAIN BUILDING	2585	938	–5	3518
GUEST HOUSE	476	0	–89	387
OFFICE	0	190	0	190
GARAGE	506	0	0	506
TOTAL	3567	1128	–94	4601

- F.A.R. ALLOWED: 6,339.6 SF (20%)
- F.A.R. PROPOSED: 4,601 SF (14.5%)

VICINITY MAP



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STAMPS:

PROJECT/CLIENT:

RICKARD RESIDENCE

PROJECT ADDRESS:

5 YANKEE BEACH WAY
CARMEL, CA
93923

APN: 243-141-008

DATE: JUNE 4, 2024
APPLICATION REQ. SUBMITTAL

REVISIONS:

1. OCTOBER 1, 2024 — PLANNING DEPT. SUBMITTAL
2. NOVEMBER 20, 2024 — PLANNING DEPT. SUBMITTAL
3. JANUARY 10, 2025 — PLANNING DEPT. SUBMITTAL
4. FEBRUARY 26, 2025 — PLANNING DEPT. SUBMITTAL
5. SEPTEMBER 22, 2025 — PLANNING DEPT. SUBMITTAL
6. OCTOBER 21, 2025 — PLANNING DEPT. SUBMITTAL

SITE PLAN
EXISTING

SHEET NO.

A1.0