Exhibit E

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19 July 2024
Project No. M12112.1

Lex Bayer
c/o Jess Fields
jess@fieldarchitecture.com

Subject: Geologic and Coastal Bluff Recession Assessment Report

Reference: 35700 Highway 1, Big Sur, CA 93920
Monterey County APN 243-231-014-000

Dear Client:

In accordance with your authorization, we have initiated a geological and coastal bluff recession investigation for minor additions to an existing home and garage at the referenced site. This report presents the results of our investigation and includes conclusions and recommendations regarding the geologic conditions and coastal bluff recession hazards at the referenced property. Appendix B contains our RECOMMENDED 75-YEAR COASTAL BLUFF EROSION AND INSTABILITY SETBACK MAPS (Three 11 X 17 inch sheets dated 7-19-2024) which is shown in relation to the existing development. We understand this report will be used to either renovate and enlarge the existing residence; or demolish it and site and construct a new residence and outbuilding in a location landward of the recommended bluff setback.

The results of our investigation indicate the proposed construction project is feasible provided the recommendations presented in this report are followed in the development of project plans and specifications. If you have any questions concerning the data or conclusions presented in this report, please call our office.

Sincerely,

HARO, KASUNICH & ASSOCIATES, INC.

Mark Foxx

Mark Foxx
Certified Engineering Geologist #1493

Copies: 1 to Client via email
1 to Jess Fields by email
1 to File

Introduction

This report evaluates the geological conditions and evaluates coastal erosion and bluff recession hazards at 35700 Highway 1 in Monterey (Big Sur), California. The objective of this geologic study is to evaluate the geologic characteristics of the terrace deposits and underlying bedrock material relative to the stability of the coastal bluffs at the site. Figure 1 shows the location of the property:

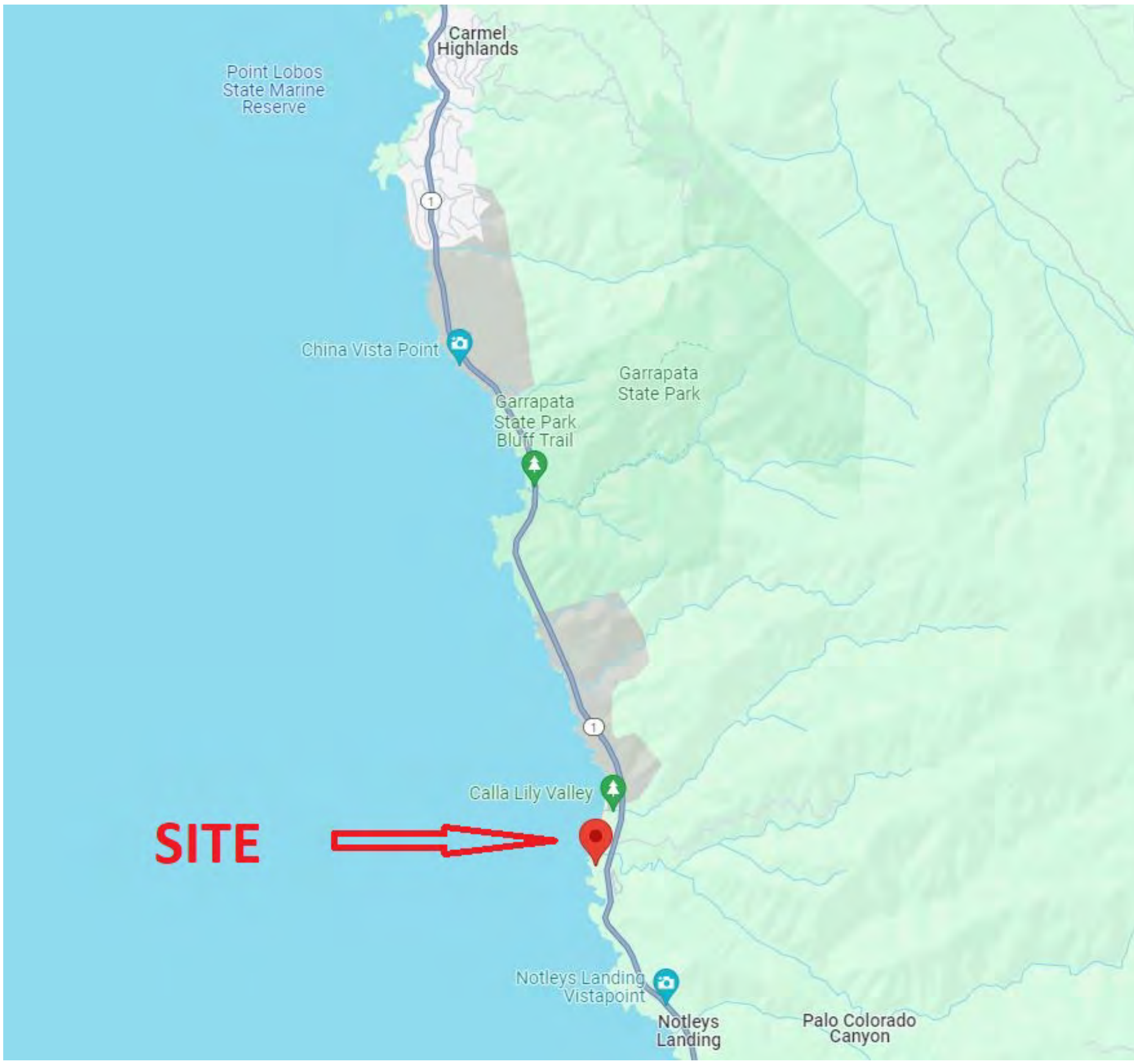


Figure 1: Property Location Map (from Google Maps)

At your request we performed investigations and prepared this geological report, evaluating historical coastal bluff recession for the property located at 35700 Highway 1. Per the Tax Assessor's records, this 2 Acre property contains a 2596 square foot single story main residence with a 514 square foot garage.

In addition to our work at this site, we have reviewed our files associated with nearby work, including other work we did at this site during 2018.

The purpose of our present work is to assess the site and prepare this report containing our preliminary results regarding coastal bluff recession hazards and wave runup hazards to the buildings on the property. The goal of the work is to address where on the site proposed new improvements can be located so they will not be endangered by coastal bluff recession (which includes both surficial erosion and potential slope instability) within the next 75 years.

To date we have done the following:

1) Obtained and reviewed time sequential historical aerial photography from www. californiacoastline.org

2) Utilized a detailed topographic map of the coastal bluffs, building improvements, and driveway. We used the survey work completed by Central Coast Surveying, supplemented by LiDAR surveying done by Walls Land+ Water. This map was developed using GPS, aerial imagery, and LiDAR remote sensing.

3) Reviewed regional geologic maps showing bedrock type, surficial deposits, faulting, etc.

4) Observed coastal bluff geology and erosion processes.

5) Prepared three geologic cross sections.

6) Reviewed subsurface exploratory boring logs prepared by our firm in 2018 and 2022 at this property. Our firm is also preparing a geotechnical report for this property to accompany this report.

7) Evaluated erosion/bluff recession rates.

8) Discussed bluff recession hazards qualitatively.

9) Reviewed field evidence of wave runup and discussed hazards

10) Reviewed tsunami hazard maps

11) Prepared this geologic report with accompanying graphics that gives the results of our study.

Site Conditions

The property and the home are shown below as they appeared in 2019:

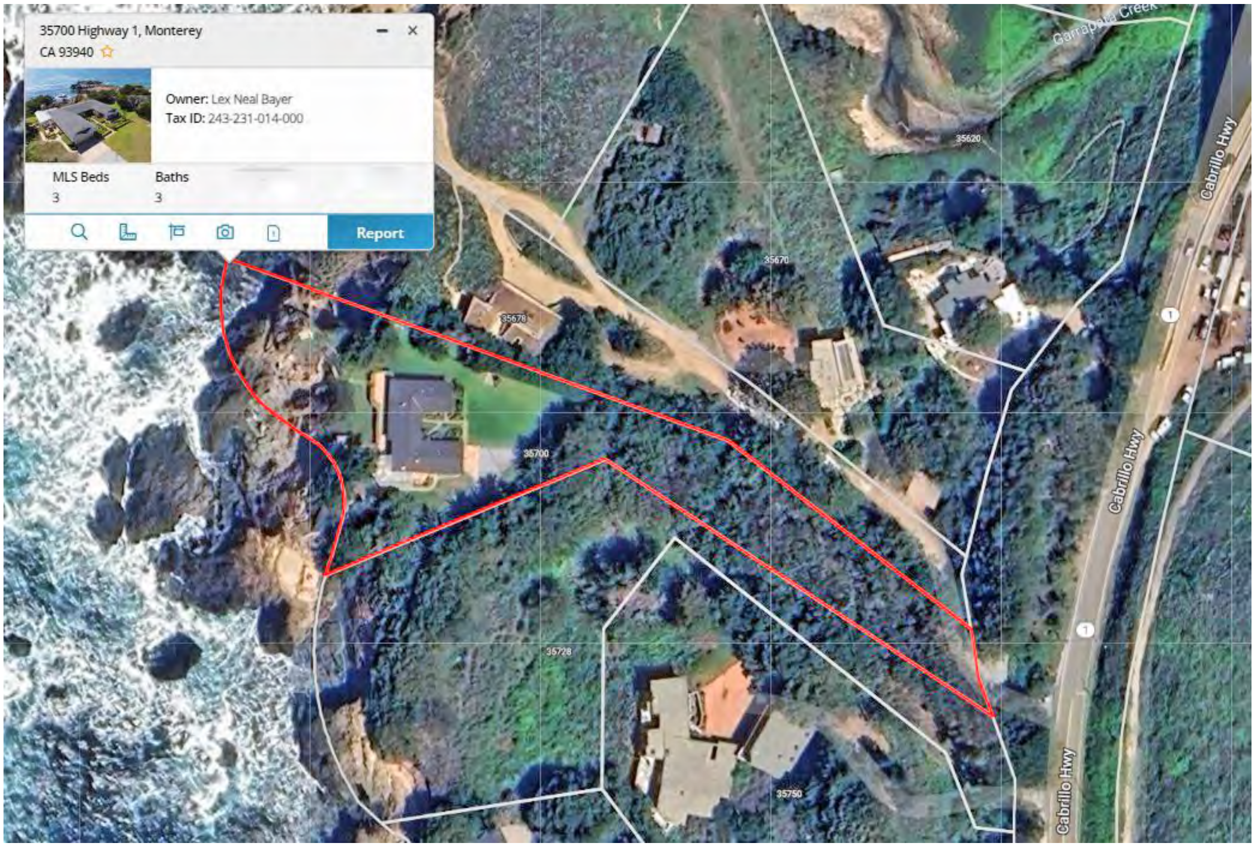
Photograph 1: 2019 Aerial Photograph (courtesy of www.californiacoastline.org)

The photographs below shows a more detailed image of the property:

Photograph 2: 2019 Aerial Photograph
(courtesy of www.californiacoastline.org)

Photograph 3: 2022 Photograph Looking Offshore

As pictured below, the approximate property lines at 35700 Highway 1 (Monterey County APN 243-231-014-000) are shown. We deed for the property describes the seaward boundary as "the shoreline of the Pacific Ocean". That boundary is inaccurately depicted on Photograph 4 below.



Photograph 4: Aerial Image of the Property Showing Approximate Property Lines

The proposed development is located at the seaward edge of a coastal terrace on the seaward side of Highway 1 between Garrapata Creek and Palo Colorado Creek. The home on the property is located at approximately 45 feet NAVD88 elevation.

Figure 2 shows a US Geological Survey topographic map of the site.

Figure 2: US Geological Survey Topographic Map

The geologic conditions at the site, as seen in the coastal bluff face; with erosion resistant sandstone bedrock exposed in the bluff up to about an elevation of 20 to 25 feet NAVD88 or higher along the bluff. A seacave complex exists in the sandstone at the lowermost portion of the bluff on the downcoast (southern) portion of the property. Photograph 3 below shows the bluff in that area and the mouth of the seacave.

At the bluff edge topsoil and terrace deposits overlie weathered sandstone bedrock. On the inland part of the property which slopes up to elevations of 200 feet NAVD88 at Highway 1, young debris fan deposits (and possibly remnant terrace deposits) consisting of sands, silts and gravels overlie the sandstone bedrock. Along the shoreline and coastal bluff face at the property, the terrain is extremely rocky, with sandstone outcrops protruding from the ground surface (see Photographs 5).

Regional Geologic Setting and Conditions

Figure 3 shows a regional geologic map from the California Geological Survey:

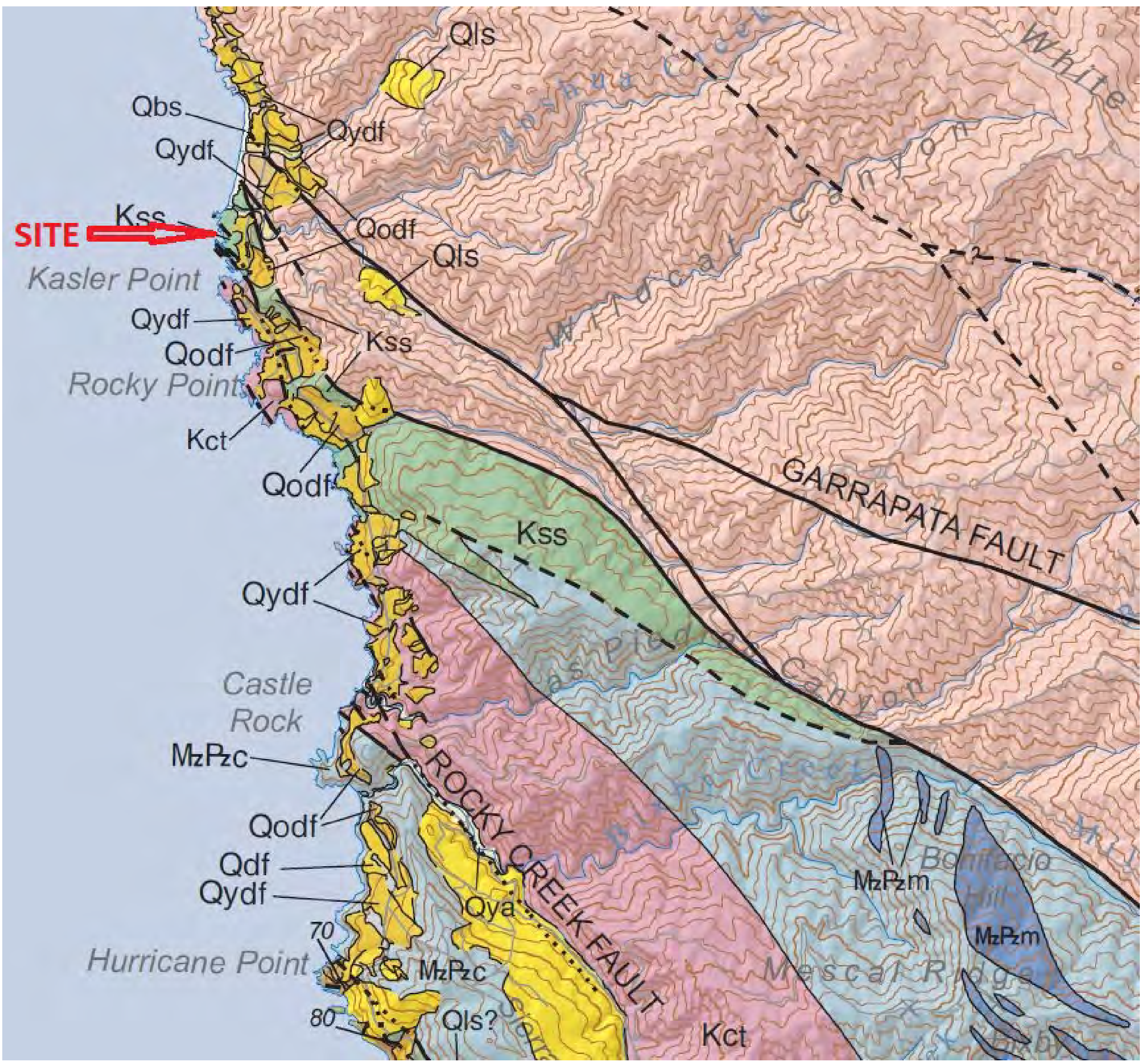


Figure 3: California Geological Survey Regional Geologic Map (Point Sur Quadrangle, Rosenberg and Wills, 2016)

PRELIMINARY GEOLOGIC MAP OF THE POINT SUR 30' × 60' QUADRANGLE, CALIFORNIA
Version 1.0
Compiled by
Lewis I. Rosenberg[1] and Chris J. Wills[2]
2016

Figure 4 shows a closer up view of that regional geologic map from the California Geological Survey:

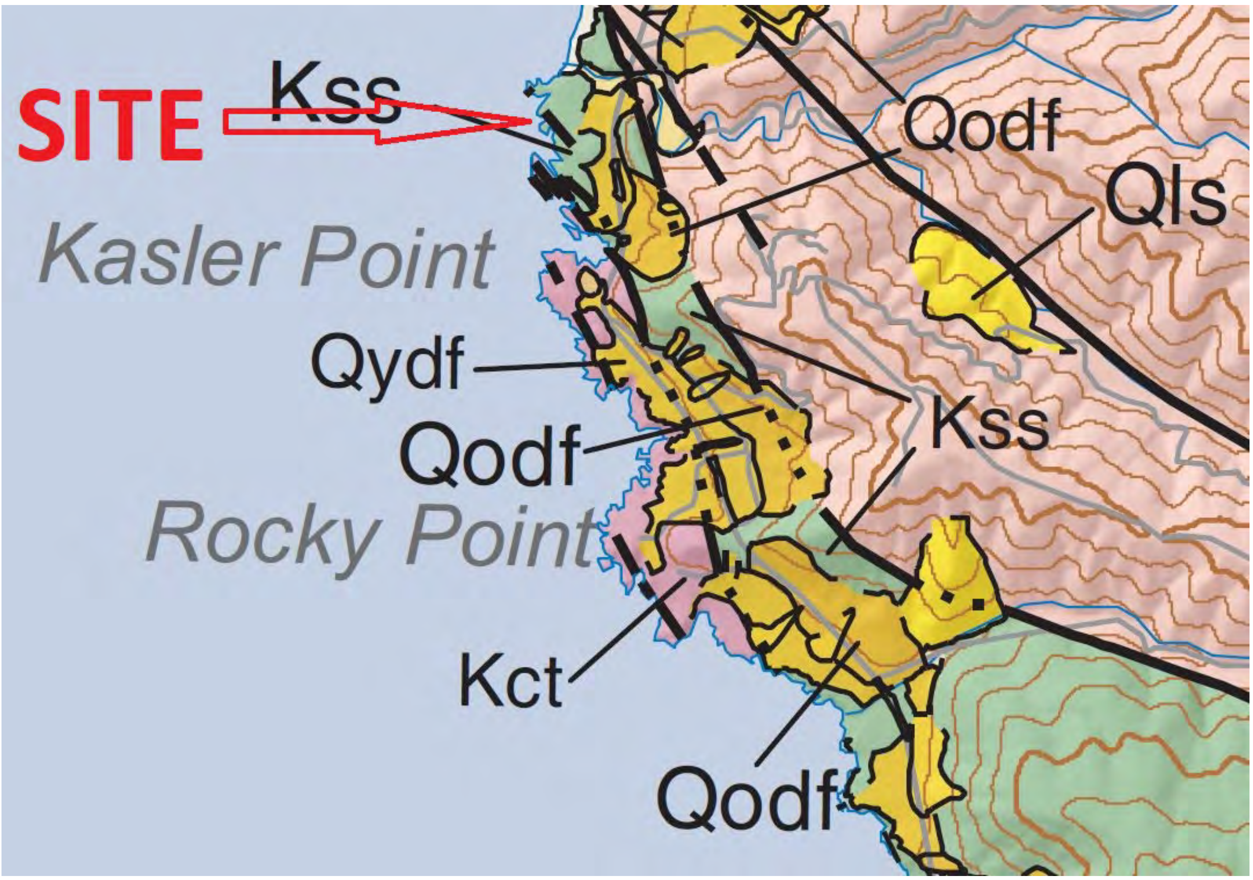


Figure 4: Close Up View of California Geological Survey Regional Geologic Map (Point Sur Quadrangle, Rosenberg and Wills, 2016)

The primary geologic units shown on this California Geologic Survey map in the vicinity of the property include:

SURFICIAL DEPOSITS

Qydf Young debris fan

Marine terrace deposits

Qom Undivided

These are described as:

Qydf **Younger Debris Fan (Holocene to Latest Pleistocene)**—Unconsolidated gravel, sand and silt, bouldery along mountain fronts; deposited mainly by debris flows rather than fluvial processes. Deposits are clearly related to depositional processes that are still on-going. Distinguished from older and most recent debris fan deposits by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation. Deposits consist of poorly bedded reddish brown silty sand with angular rock fragments. Locally contains areas or layers of well-bedded gravelly silty sand that represent stream- deposited alluvium.

Qom **Marine terrace deposits (late Pleistocene)**—Clast-supported deposits of relatively uniform grain size overlying wave cut benches. Some deposits contain subrounded to rounded clasts ranging in size from pebbles to boulders (0.5 – 1 m (2-3 ft) in diameter. May contain dune sand, and grade into dune deposits.

The primary geologic units shown on the California Geological Survey map in the vicinity of the property are young debris fan deposits, primarily upslope from Highway 1.

Our geologic observations of the bluff face and the earth materials found in our exploratory borings indicate that Marine Terrace Deposits exist at the building site and overly a wave cut bedrock platform surface approximately 15 to 20 feet below the ground surface. This deposits appear similiar to other marine terrace deposits found in the Monterey area that are approximately 100,000 years old, and the geomorphology of the terrace is very similar. A 4 to 6 foot thick layer of lag deposits (cobbles) forms the lower portion of the marine terrace deposits.

BEDROCK

On the Figure 4 geologic map, the lithology of the bedrock mapped west of Highway 1 in the vicinity of the property is marine sandstone:

Kss Unnamed marine sandstone

Kss **Unnamed marine sandstone (Late Cretaceous)**—Light gray brown, medium- to coarse-grained pebbly sandstone. Thick-bedded to massive. Large outcrop area in Santa Lucia range south of Arroyo Seco is conformable with overlying Paleocene sandstone. May have been deposited as turbidite sequence on high-relief erosional surface of Salinian Block basement

Our field observations indicate that the bedrock at the property consists of this sandstone, which formed 66 to 100 million years ago.

Caltrans has published geologic maps (Highway Corridor Map Plate 1 Maps 12 and 13 in "Geology and Slope Stability Along the Big Sur Coast" that are shown in Figure 5 below:

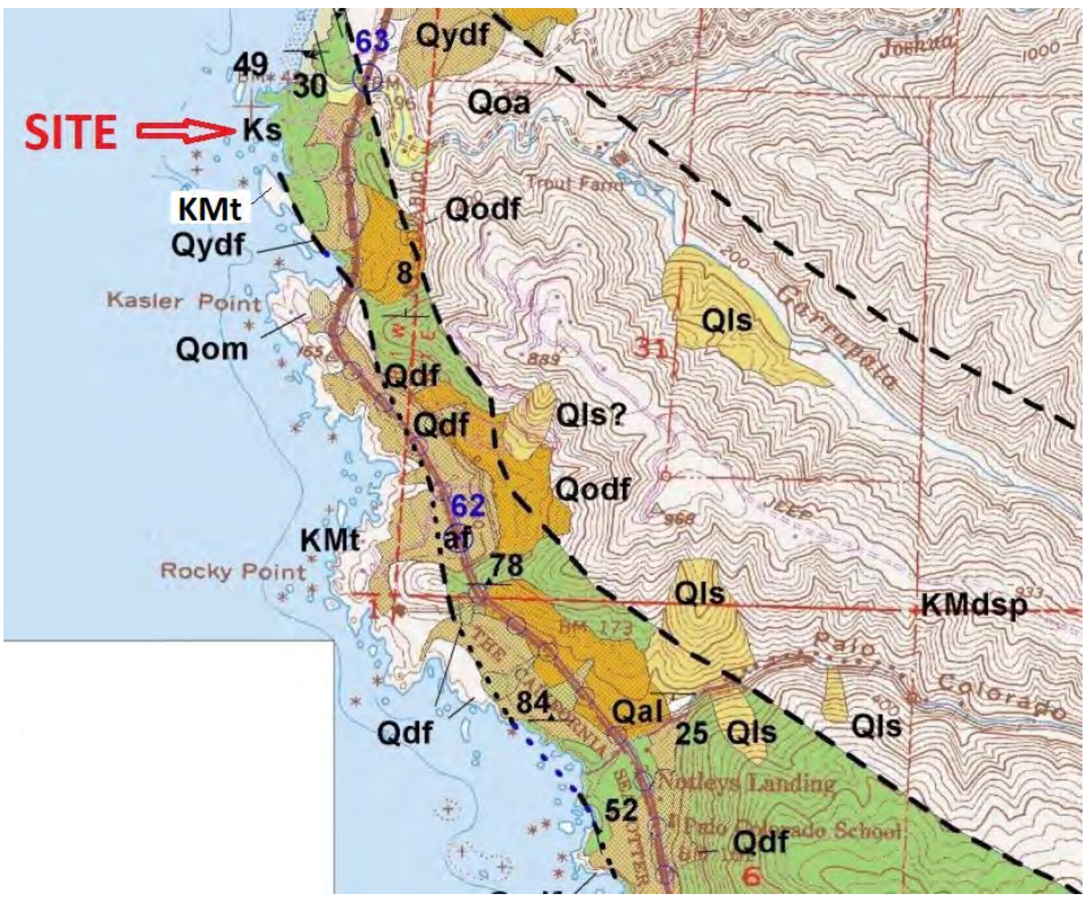


Figure 5: Caltrans Geologic Map

Geology and Slope Stability Along the Big Sur Coast

Highway Corridor Geologic Map

Plate 1 Map 13 of 14

Slightly varying from the Regional Geologic Map (Figures 3 and 4) the primary surficial geologic units shown on the CalTrans geologic map (Figure 5 above) in the vicinity of the property include both the younger debris fan deposits and marine terrace deposits. At the site Caltrans shows the lithology of the bedrock west of Highway 1 in the vicinity of the property as Ks; similar to the KSS mapped on the regional geologic map.

Geologically the building site consists of an uplifted marine terrace environment These debris fan deposits may bury marine terrace deposits that predate them in origin. Where marine terrace deposits exist, they would have likely formed when persistent ocean wave attack cut a platform in the sandstone bedrock during a high stand of sea level on the order of 100,000 years ago. Subsequent tectonic uplift of this portion of the coastline following a drop in sea level preserved a deposit of marine silts, sands and gravels that mantle a relatively level surface on the tonalite/ charnitic tonalite (granitic) igneous bedrock.

Hard sandstone bedrock is visible in the lower 25 feet of the coastal bluff face with weathered topsoil and marine terrace deposits found in the top 15 to 20 feet of the bluff face. In isolated locations we observed calcareously cemented sandstone.

The geologic conditions we observed at the site in the coastal bluff faces and that we found while doing subsurface exploration are consistent.

The maps and cross sections in Appendix B show our interpretation of the site geology, based on aerial photo analysis, field mapping and subsurface exploration.

The property lies within the geological-tectonic units called the Salinian Block that forms the basement complex of the northern Santa Lucia Mountains.

The Salinian Block is composed of a number of fault-bounded blocks composed of sandstone and metamorphic rocks which are discontinuously covered with younger sedimentary rocks and surficial deposits.

As shown in Figure 6, many faults exist in northern Monterey County.

Figure 6: California Geological Survey Regional Fault Map

As shown on this map, the primary fault in the immediate vicinity of the property are the Palo Colorado Fault which comes onshore about 1.8 miles north of the property, and the Sur Fault which comes onshore about 0.9 miles south of the property. Both the Palo Colorado Fault and the Sur Fault have been interpreted to be part of the active San Gregorio-Hosgri fault complex, which is a major fault system in California.

Figure 7 (below) shows the California Geological Survey Regional Map (previously shown in Figure 3) marked up label the Palo Colorado Fault on it, which at its closest point is mapped approximately 800 feet northeast of the homesite.

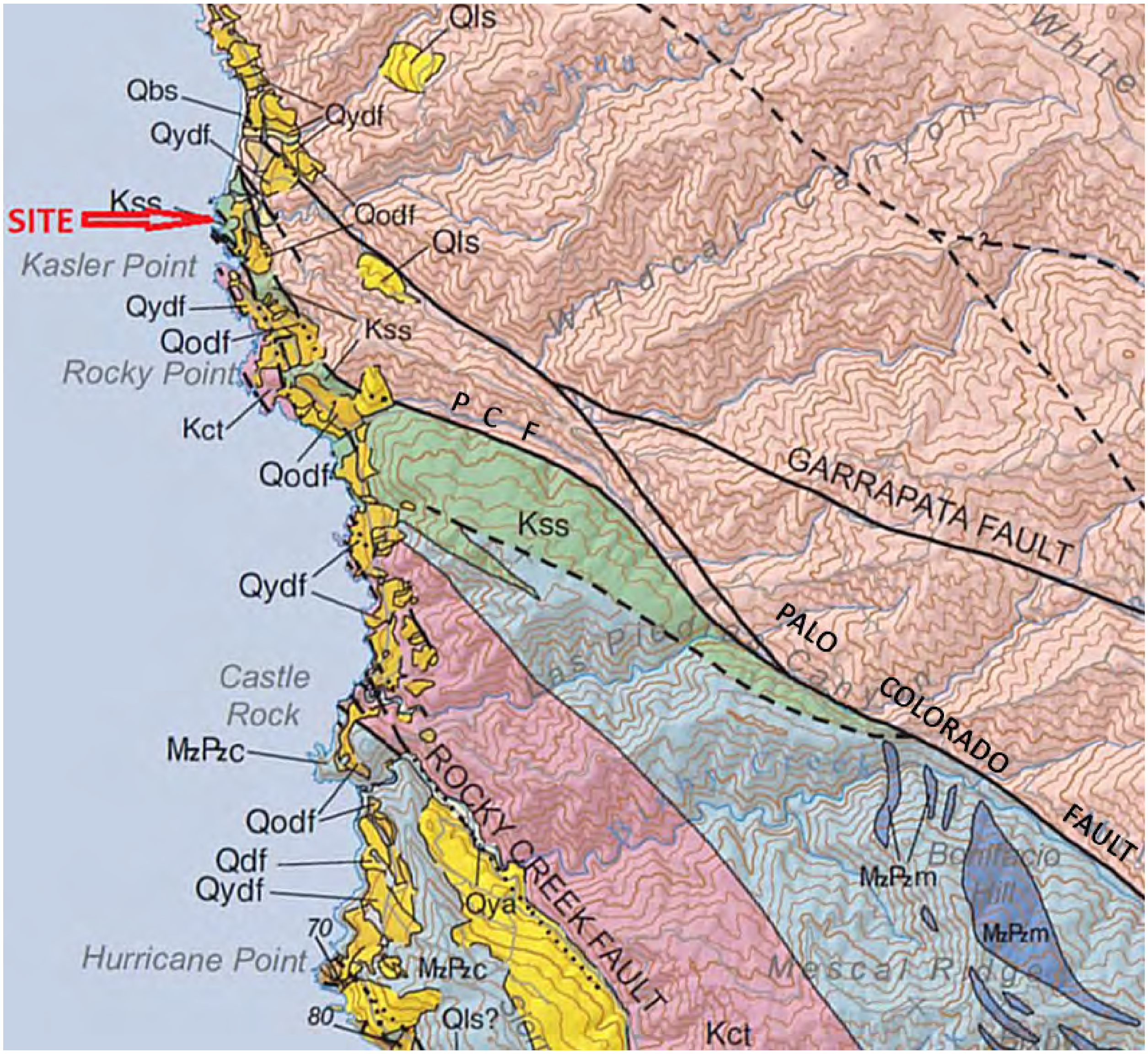


Figure 7: California Geological Survey Regional Geologic Map Marked Up to Show Palo Colorado Fault Name (Point Sur Quadrangle, Rosenberg and Wills, 2016)

Figure 8 shows a view of the relationship of the position of the closest mapped faults to the property on the Monterey County GIS Geologic Hazards map.

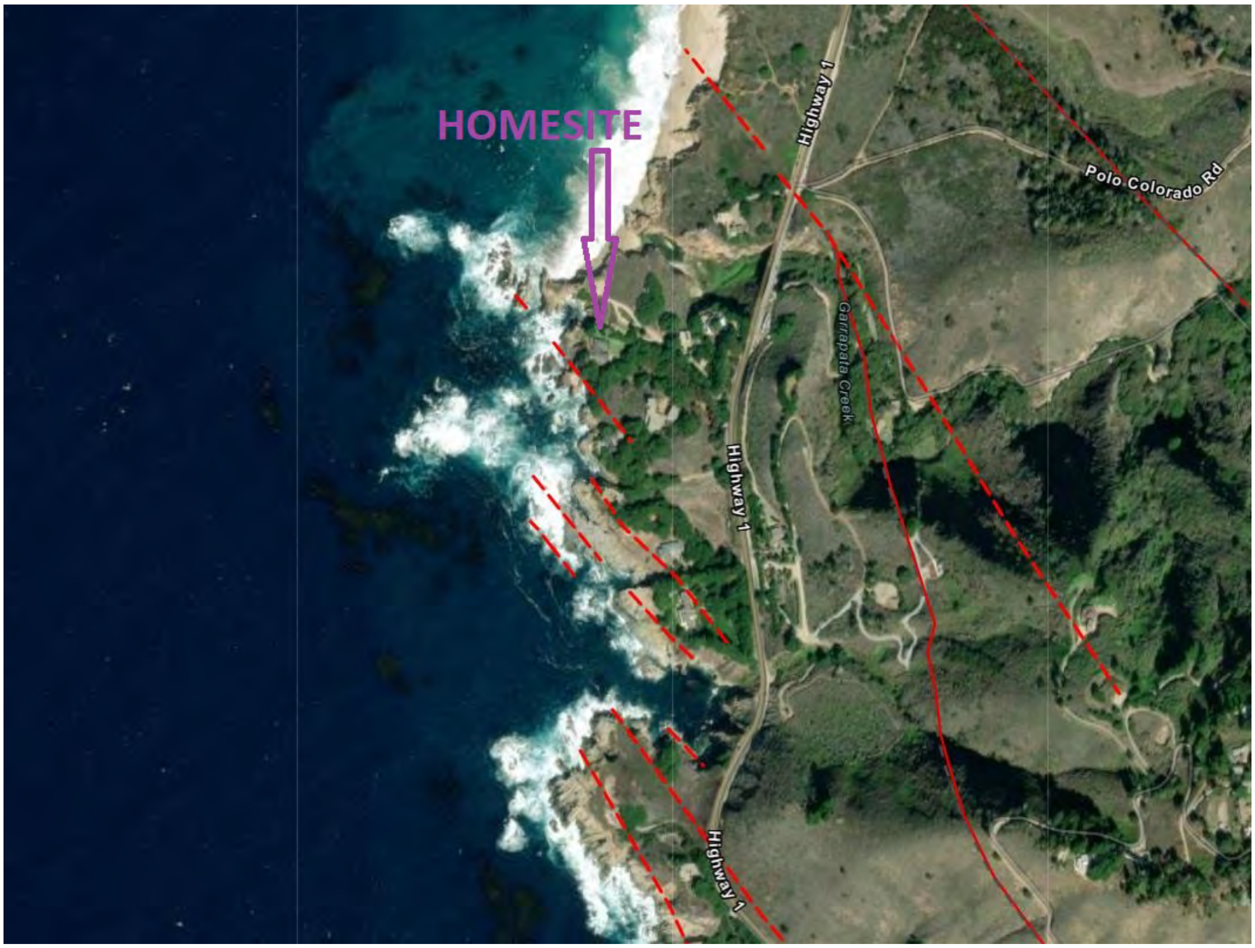


Figure 8: Close Up View of the Monterey County GIS Geologic Hazards Map Showing Mapped Fault Near Property

The faults within the Salinian Block, along with the San Andreas Fault and its eastern branches, comprise a broad system of inter-related, right-lateral, strike-slip faults which have dominated the tectonic history of western California for the past 12-15 million years. The faults that partition the Salinian Block have been generally active throughout most of the Cenozoic time; although these faults are, in general, part of a right-lateral, strike-slip system, they have also controlled the relative vertical movements between the smaller structural blocks within the Salinian Block. California's system of right-lateral, strike-slip faults represents a segment of the boundary between the Pacific and North American crustal plates. Since the Pacific plate has been slipping northwestward with respect to the North American Plate, this movement is accommodated by right-lateral, strike-slip faulting, mostly along the San Andreas Fault itself, which has been more or less continuously active.

The published online Monterey County GIS Map (Figure 9) which shows a short discontinuous fault in the immediate vicinity of the property notes that fault a-is an inferred pre-Quaternary age fault mapped by Gary Greene in 1972. It goes through a seacave complex seaward of the home. This fault does not pose a significant hazard to the existing home or a proposed new home, because based upon it's age it is classified as inactive. Examination of the bluff face and the ceilings of the seacaves in the vicinity of the mapped inactive faults revealed no evidence of active faulting. A fault trace was observed upcoast of and seaward of the residence in the bedrock at the base of the coastal bluff. During our site traverse, our observations were that this fault trace did not displace the overlying terrace deposits; indicating it has been inactive for approximately 100,000 years. We interpret that this fault and the fault mapped by Greene are secondary fault splays that is part of a broad shear zone between the Rocky Creek Fault and the Palo Colorado Fault portrayed on Figure 7. Figure 9 (below) shows the fault mapped by Greene:

Figure 9: Monterey County GIS Map Showing Site with Local Discontinuous Inactive Fault In Relation to Proposed Building Site (at Existing Home Location) at 35700 Highway 1 with Metadata Identifying Fault Attributes

Seismicity

Although California's broad system of strike-slip faults has had a complex history, only some of the fault traces present a seismic hazard to the subject properties. These are the San Andreas Fault, the Monterey Bay Fault zone and on its land extensions (the Tularcitos-Navy Fault is one of these) the King City-Reliz-Rinconada Fault, the Cypress Point Fault, the San Gregorio-Hosgri Fault complex, (of which the Palo Colorado and Sur Fault Zone are part of) and the Zayante-Vergeles Fault. These faults are either active or considered potentially active because they have been in Quaternary time (last 2-3 million years).

San Andreas Fault

The San Andreas Fault is active and represents the major seismic hazard in northern California. The main trace of the San Andreas Fault trends northwest-southeast and extends over 700 miles from the Gulf of California through the Coast Ranges to Point Arena, where the fault extends offshore. The San Andreas Fault lies about 40 miles northeast of the subject property as its closest point.

San Gregorio Fault Zone

This northwest/southeast-trending Fault zone extends over 100 miles. At its northern end, it joins the San Andreas Fault near Bolinas; southward it skirts the San Mateo and Santa Cruz County coast, crosses the mouth of Monterey Bay (seaward of the Monterey Bay Fault zone), and intersects land again north of Point Sur. Recent work suggests that the San Gregorio Fault zone continues southeast to connect with the Hosgri Fault zone, which lies offshore and extends from Cape San Martin to Point Sal south of San Luis Obispo. The total length of the San Gregorio-Hosgri Fault zone would be over 250 miles.

At its closest approach, the San Gregorio Fault zone (which we interpret may include the Palo Colorado, Rocky Creek and Point Sur faults) lies within 800 feet of the subject property. It has been suggested that the San Gregorio Fault zone is capable of a 7.2-7.9 Magnitude earthquakes, with recurrence intervals for earthquakes that produce surface ground rupture within San Gregorio Fault system being 6000 years or less. This fault is mapped by the California Geological Survey as being very close to the proposed development; about 800 feet away. When this fault ruptures, generating an earthquake, seismic shaking may be extremely intense.

Seismic Hazards

Hazards associated with earthquakes in the vicinity of the three coastal erosion “trouble spots” can be placed in three general categories: 1) seismic shaking; 2) surface ground rupture; and 3) ground failure triggered by seismic shaking. These hazards could potentially affect the coastal bluffs and blufftop areas.

Moderate ground shaking is likely at the property during the next 75 years. The probability of surface ground rupture within the property is very low.

The greatest potential seismic hazard on the subject property is seismic shaking. The sandstone is generally not susceptible to landsliding and will not liquefy. The portion of the coastal bluffs that consists of terrace deposits has a very short height; therefore the potential for landsliding is very low. Saturated portions of the terrace deposits may theoretically be subject to liquefaction, however the grain size and density of materials we observed in the coastal bluff do not appear susceptible to liquefaction.

Groundwater

Although we have not observed any significant groundwater seeping out of the bluff close to the proposed improvements, thin zones of perched groundwater may perch in the debris fan deposits that overlie the relatively impermeable bedrock. Seeps periodically may be present where the bedrock-terrace deposit contact intersects the modern coastal bluff. Historical perched groundwater and seepage has contributed to weathering and weakening of the uppermost portion of the sandstone located just below the terrace deposits. A thin zone of perched water upon the weathered, denser bedrock below the terrace deposit material could occur during the wet winter months. Special attention should be paid to any areas of the buildings that are below adjacent grades. If leakage exists or becomes apparent, building foundation waterproofing will be needed. Surface drainage should include provisions for positive gradients so that surface runoff is not permitted to pond adjacent to the top of the coastal bluffs and seep into the backfill of any seawall/retaining wall systems. Where possible, surface drainage should be directed towards areas of the bluff top edge furthest from the home and where the terrace deposits are thinnest.

Wave Runup

Ocean wave runup is controlled by several factors. The property is directly exposed to the Pacific Ocean. The craggy coastline and the direct exposure to the ocean is visually a tremendous asset for the residents of the property to enjoy. Nearshore bedrock outcrops serve to dampen the wave energy and block much of the wave action from reaching the bluff face. The edge of the coastal bluffs above the bedrock may be infrequently overtopped by wave runup and spray during severe ocean storms. Our observations at the site suggest this is more common near the extreme seaward part of the property. We observed evidence of erosion related to wave runup at 3 locations on the property. The limits of that erosion extended up to elevations of 32, 37 and 42 feet NAVD88.The residential improvements are at 45 feet above sea level in an area that is above the reach of wave runup.

Tsunami Inundation

We have reviewed the 2021 Monterey County Tsunami Inundation Map for Emergency Planning for the Soberanes Point Quadrangle. This map shows that the line designating the limit of tsunami inundation is near the bluff edge based on comparison with the USGS Topographic Map and the Topographic Survey for the project. A partial copy of that map is shown in Figure 10 below, and shows that the existing home and the area where improvements are proposed is inland of the hazard (potential inundation) zone. The limit of the mapped tsunami inundation appears to be close to the bluff edge seaward of the existing home and proposed building site.

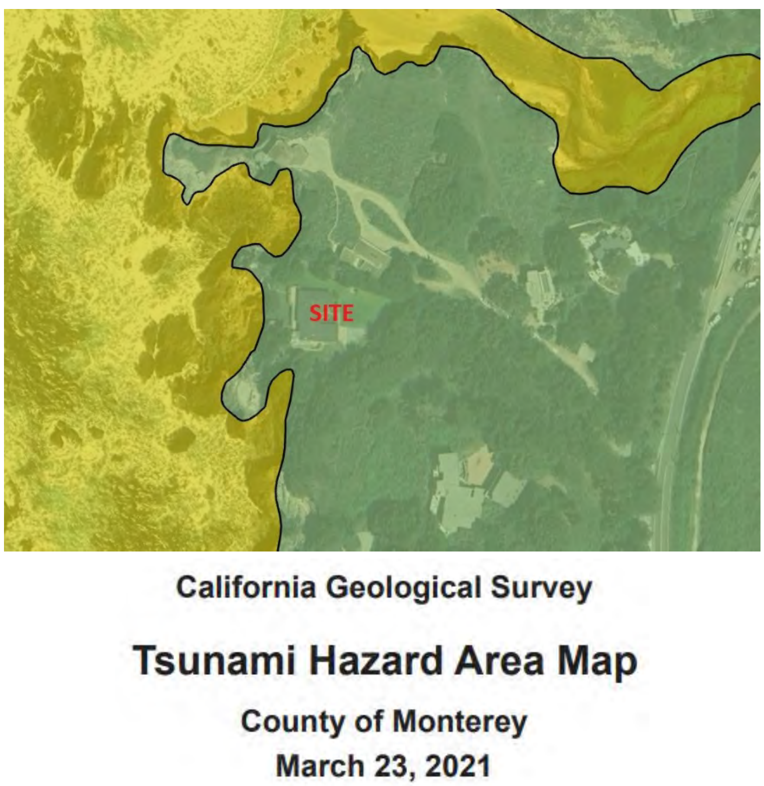


Figure 10: County of Monterey Tsunami Hazard Area Map

Coastal Erosion and Bluff Recession

Other than seismic shaking, coastal erosion related to ocean wave attack is the most significant geologic hazard that may affect the site. Coastal erosion has the potential to undermine improvements, if they are positioned too close to the shoreline. The uncemented nature of the topsoil and marine terrace deposits, coupled with occasional intense coastal storms can result in erosion and bluff recession hazards along the bluff edge in those materials.

A series of 11 time sequential photos obtained from www.californiacoastline.org are presented below, spanning the 47 year period from 1972 to 2019. They reveal there has been relatively little discernible change in the sandstone portion of the bluff face along the edge of the cove where the bluff edge is closest to the proposed improvements in that 47 year period. We attribute the relatively low amount of discernible erosion to the competence of the sandstone.

We examined the bluff face on April 25, 2024 and found the geologic and geomorphic conditions to be virtually identical to those in the October 2019 photograph below:

Photograph 5: Aerial Photograph from October 2, 2019
(courtesy of www.californiacoastline.org)

The Coastal Records Project (www.californiacoastline.org) oblique aerial photographs shown below include time sequential photographs dating back until 1972, showing how the property and coastal bluff have changed over time.

Photograph 6: Aerial Photograph from September 11, 2015
(courtesy of www.californiacoastline.org)

Photograph 7: Aerial Photograph from October 4, 2013
(courtesy of www.californiacoastline.org)

Photograph 8: Aerial Photograph from September 24, 2010
(courtesy of www.californiacoastline.org)

Photograph 9: Aerial Photograph from October 23, 2008
(courtesy of www.californiacoastline.org)

Photograph 10: Aerial Photograph from October 28, 2005
(courtesy of www.californiacoastline.org)

Photograph 11: Aerial Photograph from October 11, 2004
(courtesy of www.californiacoastline.org)

Photograph 12: Aerial Photograph from August 29, 2002
(courtesy of www.californiacoastline.org)

Photograph 13: Aerial Photograph from June, 1987
(courtesy of www.californiacoastline.org)

Photograph 14: Aerial Photograph from April 30, 1979
(courtesy of www.californiacoastline.org)

The 1972 photograph below shows the home in the oldest photo available; from 52 years ago.

Photograph 15: Aerial Photograph from 1972
(courtesy of www.californiacoastline.org)

We also reviewed the configuration of the bluff as visible on 1986 and 1993 vertical aerial photographs, and compared the 1986 conditions to the 2018 and 2023 conditions we observed on Google Earth satellite imagery. Appendix A in this report contains the 1986 aerial photograph and the 2023 Google Earth image that we utilized in our analysis that shows the historical conditions at the property. Unfortunately, the resolution of the 1986 aerial photograph that is presently available to us is less than desirable.

Historical Recession

Historical bluff recession can be evaluated by comparison of historical aerial photographs. The resolution of the photography limits the precision of how closely both bedrock retreat and the bluff edge position can be measured. There are a few spots in the bedrock where we think that bluff retreat of 1 to 2 feet may have occurred in the bedrock due to erosion and/or instability. Review of the photographs from 1972 to 2019 and our 2024 field work allows recognition that no change has occurred in many areas.

The seacave complex downcoast and seaward of the residence is formed entirely in the bedrock, primarily where wave action has eroded along zones of the bedrock close to sea level where the bedrock is weakened by jointing, bedding and/or faulting. It is possible that a portion of the seacave roof could collapse in the future; however we are unable to analyze that precisely or accurately. That is most likely at and within 10 to 15 feet of the seacave mouths (portals) where the bedrock above the seacave is the thinnest and most subject to failure. The inner portions of the seacave complex are narrower in width and in general have thicker (10+ feet) zones of bedrock above them. In most locations that bedrock does not span as far horizontally above the cave openings as the bedrock does at the cave portals. We inspected the seacaves in 2022 and 2024 and no apparent changes had occurred during that timeframe. The seabed and tidelands inside the seacave complex are mostly free of angular bedrock fragments; the bedrock fragments that are there are generally subrounded from long exposure to wave action. A future event where the seacave has undermined the bluff will not affect the setback lines we have estimated relative to the proposed new development, because the primary coastal hazard affecting the setback position is slope instability (landsliding) that could occur during and from future earthquake shaking.

Several inter-related factors affect bluff retreat at this property:

1) Geology; the sandstone bedrock has retreated extremely little; the terrace deposits and topsoil are more susceptible to erosion and recession.

2) The marine terrace deposits, fill and topsoil are found at the highest elevations in the bluff face and are thus only extremely infrequently subject to wave runup and wave impact.

3) At the upper bluff, wave impact forces are non-existent.

4) Bluff retreat rarely occurs uniformly; rather isolated areas usually retreat while most of a stretch of the bluff will not retreat at all in any given storm.

Based on the aerial photography and the on-site observations we have made, we estimate worst case historical bedrock retreat of 1 to 2 feet from 1972 to 2022

The granular marine terrace deposits may have eroded 2 to 4 feet since 1972 in some isolated spots. Heavy vegetative cover and poor aerial photograph resolution impaired our ability to measure this. Thick vegetative growth aids in preventing surficial erosion of the marine terrace deposits.

This suggests that the historical long term average annual recession rate of the bluff edge has been about 0.5 to 1 inches per year there.

Future Sea Level Rise

Sea Level has risen and the rate at which it is rising is accelerating. In general, sea level rise tends to make future coastal bluff recession rates faster than measured historical coastal bluff recession rates.

Sea level has risen about 390 feet globally since the last Ice Age ended about 20,000 years ago. This period of relatively rapid rise (about 11 mm/year or 45 inches/century) ended about 8,000 years ago when sea level essentially stabilized.

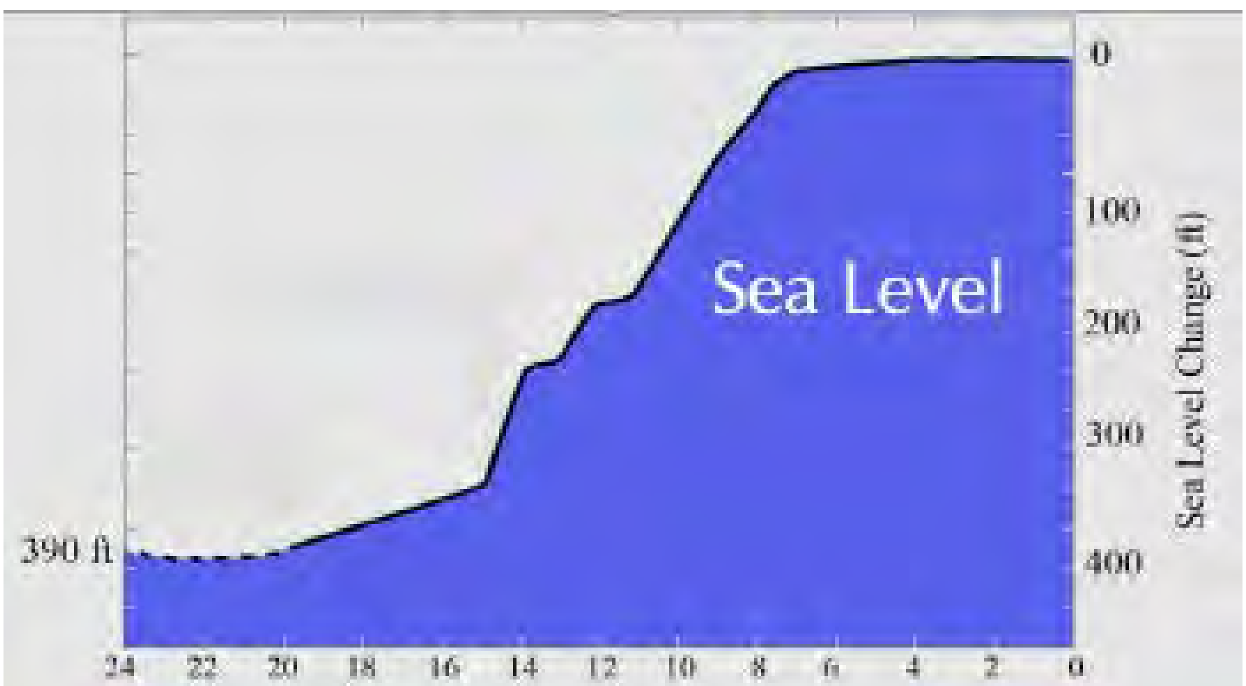


Figure 11: Historical Global Sea Level Rise

Over the past 8,000 years global sea level has risen very slowly, less than one mm/yr. (about 4 inches/century), with this value based on geological evidence. Beginning about 150 years ago, tide gauges or water level recorders began to be established at various places around the coastlines of the world. Based on averaging tide gauge measurements from many different stations scattered around the world, sea level has risen at an average rate of about 1.7 mm/year over the past century (7 inches/100 years).

There is wide agreement among scientists that sea level is rising and that the rate of rise appears to have been accelerating since 1850 and there is evidence that the rate of sea level rise is accelerating. A rising sea level is an adverse condition for the property. If extreme sea level occurs, damage to the property will occur. Rising sea level results in future higher wave runup and greater wave impact because it raises the Stillwater Level. Stillwater Level is the elevation of the ocean surface at the shoreline without any swell or wave activity.

This global sea-level rise is attributed to changes in ocean volume due primarily to two processes: 1) the melting of land ice, and 2) the expansion of seawater as it warms. Melting of ice sheets and glaciers, such as the large ice covers of Antarctica and Greenland, which are linked to changes in atmospheric temperature, have now become the major contributors to sea-level rise. The ice on the planet (on Antarctica, Greenland and in mountains glaciers of the world) contains the equivalent of about 216 feet of total sea-level rise, were it all to melt. Considerable uncertainty regarding climate-carbon cycle feedbacks, ice sheet dynamics and future earth temperatures exists.

Currently there are varied opinions of the specific rates of historic sea level rise and even more variation in the projections of future rates of sea level rise due to different scientists making different assumptions with different analytical methodology. Based on averaging tide gauge measurements from many different stations scattered around the world, sea level has risen at an average rate of about 5-7 inches over the past century. Over the last century sea level has risen about 0.5 feet (about 6 inches). During the last 6,000 years, sea level rose about 0.17 feet (2 inches) per century. The geologic record over the last 20,000 years indicates that sea level rise is not unusual and the rates expected for the near future are less than the peak rates during the last 20,000 years. The peak historical rates were about 3.3 feet per century from 18,000 years ago to 6,000 years ago.

Two satellites were launched in 1993 that have been measuring absolute sea levels from space using satellite altimetry. Continuous altimetry observations from 1993 to the present have made it possible to assess the rise in Global Mean Sea Level (GMSL). Two main factors related to the current global warming explain this GMSL rise: the expansion of the ocean volume and the influx of freshwater from melting ice and glaciers. On the one hand, the global ocean absorbs more than 90% of the excess heat accumulated in the climate system as a result of rising greenhouse gas concentrations in the atmosphere; the average temperature of the oceans is therefore rising and seawater is expanding. On the other hand, the excess heat accumulated in the system causes the polar ice caps (Greenland and Antarctica) and mountain glaciers to melt. This meltwater contributes to the increase in ocean mass and thus to the rise in sea level observed by satellite since 1993. The satellite observations have documented an average global sea-level rise rate averaging 3.6 mm per year (+/-0.3 mm/yr, 90%CI) over the globe and the entire altimeter record. As shown in Figure 12 (below) Global Mean Sea Level has increased 11 CM (4+ Inches) between 1993 and 2024.

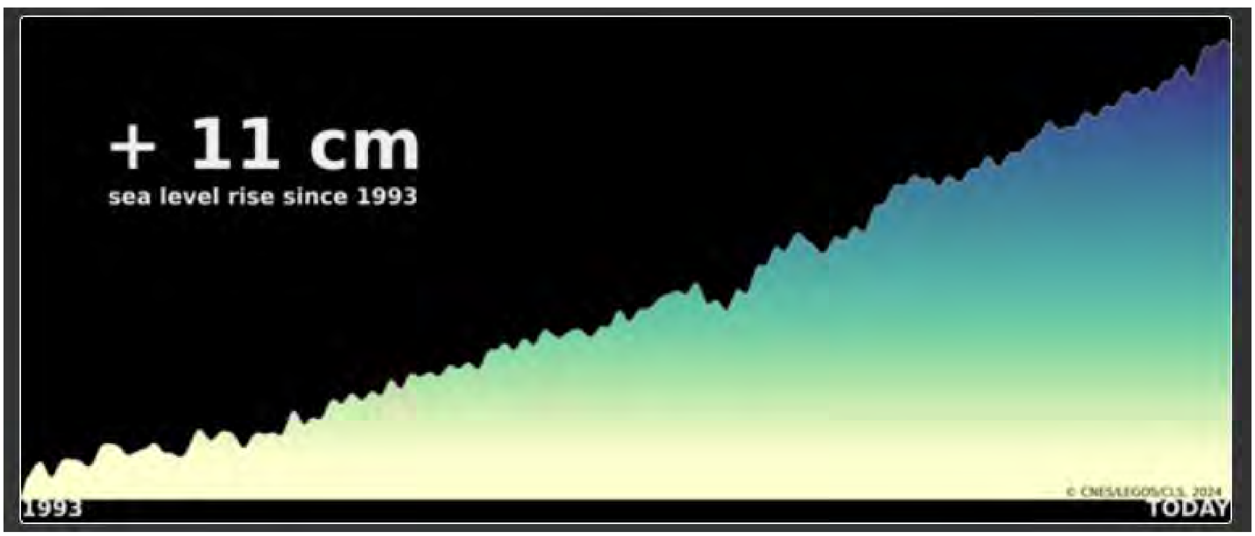


Figure 12: Global Sea Level Rise 1993 to 2024

As shown in Figure 13 (below), there is also evidence that sea level rise rate is accelerating over the altimeter record, this acceleration is estimated at 1.2 mm per year per decade (+/- 0.5 mm/yr/decade, 90%CI). Practically this means that rate of sea level rise has doubled from the 1993-2003 decade (2.1 +/- 1 mm/yr, 90%CI) to the 2013-2023 decade (4.4 +/- 0.5 mm/yr, 90% CI).

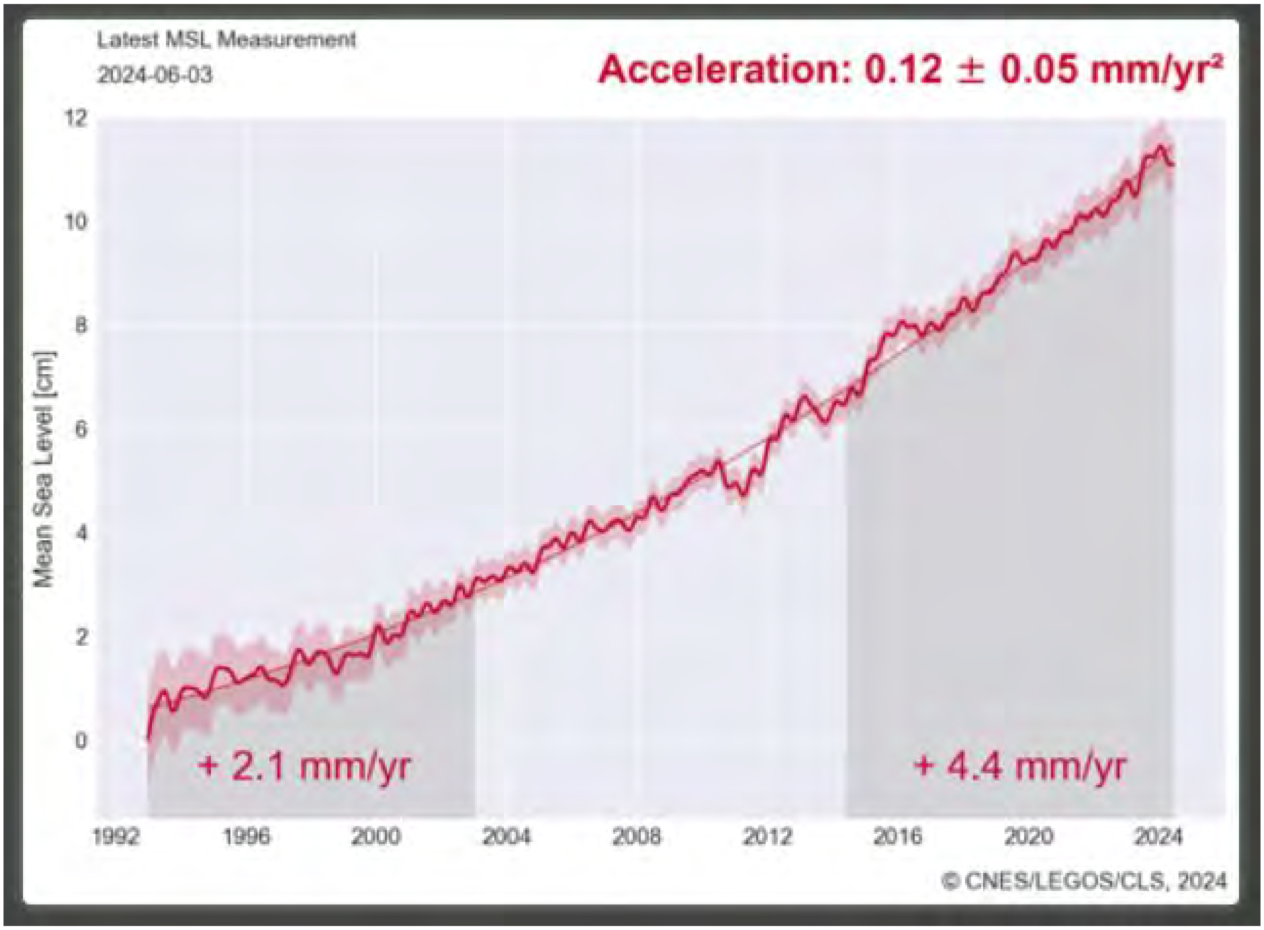


Figure 13: Global Mean Sea Level 1993-2024 (as measured by satellite altimetry) With Rate of Sea Level Rise per Decade and Acceleration Rate Noted

Currently there are varied projections of future rates of sea level rise due to different scientists making different assumptions with different analytical methodology.

Recent research has been presented in a sea-level rise update for California that was completed in June 2024 and has been published by the California State Ocean Protection Council and is entitled "State of California – Sea-Level Rise Guidance 2024" (https://opc.ca.gov/wp-content/uploads/2024/05/Item-4-Exhibit-A-Final-Draft-Sea-Level-Rise-Guidance-Update-2024-508.pdf). This report provides probabilistic projections for future sea levels at the locations of the NOAA coastal tide gauge in Monterey for each decade between 2020 and 2150). This report includes the following data shown in Table 1 (below):

Median values of Sea Level Scenarios, in feet, for each decade from 2020 to 2150, with a baseline of 2000. All median scenario values incorporate the local estimate of vertical land motion.

YEAR	LOW	INT-LOW	INTERMEDIATE	INT-HIGH	HIGH
2020	0.2	0.2	0.2	0.2	0.2
2030	0.2	0.3	0.3	0.4	0.4
2040	0.3	0.4	0.5	0.6	0.7
2050	0.4	0.6	0.7	0.9	1.2
2060	0.5	0.7	1.0	1.4	1.9
2070	0.6	0.9	1.3	2.1	2.8
2080	0.6	1.0	1.7	2.9	3.9
2090	0.7	1.2	2.3	3.7	5.2
2100	0.8	1.4	2.9	4.6	6.4
2110	0.8	1.6	3.6	5.5	7.7
2120	0.9	1.8	4.2	6.2	8.8
2130	0.9	1.9	4.7	6.8	9.7
2140	1.0	2.1	5.2	7.3	10.6
2150	1.1	2.3	5.7	7.9	11.5

Table 1: Projected future sea-level rise values (FEET) for the Monterey tide gauge From the Ocean Protection Council's 2024 Sea-Level Rise Guidance Document.

To be clear, the presented sea level rise values involve a significant number of uncertainties. They are projected from the 50-year sea level record from the Monterey Tide Gauge. All of these values were derived from climate models, which are continuously being refined, but are the best we have at present. What we do know (as shown in Figures 5, 6 and 7) is that the global sea-level rise rate over the past 25 years of satellite altimetry is 3.62 mm/year (about an inch every 7 years) which is about twice as high as the rate measured at Monterey (1.77 mm/year) likely due to natural tectonic uplift of the tide gauge site. In the half century the Monterey Tide Gauge has been operational, it has recorded 3 1/2 inches (0.29 feet) of relative sea level rise.

At the Monterey Tide Gauge the relative sea level trend has been 1.77 millimeters/year with a 95% confidence interval of +/- 0.68 mm/yr based on monthly mean sea level data measured from 1973 to 2023 which is equivalent to a change of 0.58 feet in 100 years.

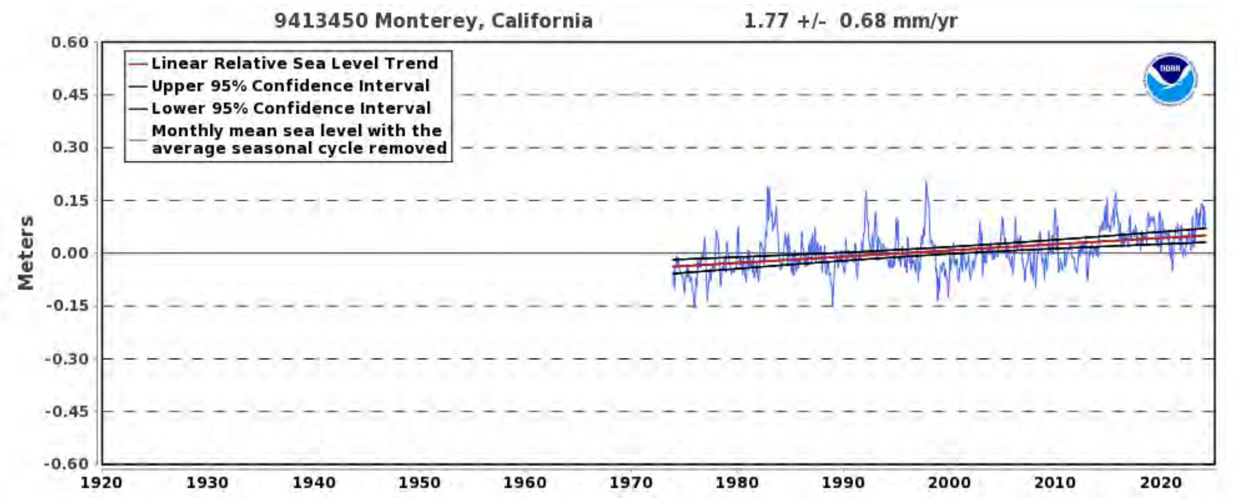


Figure 14: Sea Level Rise at Monterey Tide Gauge 1973-2023

This indicates that the coastline at Monterey is undergoing uplift, which significantly lessens the overall impact of sea-level rise in this area.

Various simplified models have been developed to predict how sea level rise (SLR) might cause acceleration of coastal bluff recession. Those generalized models involve many simplifying assumptions and a great deal of uncertainty. Until reliable site specific models of this phenomena become available (which include factors such as earth material erosion resistance, coastal bluff exposure to wave action, beach scour that changes breaking wave size,etc.), we have chosen to multiply the historical rate of bluff recession by a factor of safety to account for an accelerating rate of recession due to accelerating sea level rise.

How much the rate of future recession increases with increased sea level is dependent on factors like the amount of sea level rise, historical sea cliff retreat rates, surf zone slope, and beach elevation.

As predicted by *Limber, P. W., Barnard, P. L., Vitousek, S., & Erikson, L. H. (2018) in "A Model Ensemble for Projecting Multidecadal Coastal Cliff Retreat During the 21st Century. Journal of Geophysical Research:Earth Surface, 123(7), 1566–1589" (https://doi.org/10.1029/2017JF004401)* and shown in Figure 15 below, the ratio between projected and historical retreat <u>rates</u> for 0.93 meters SLR increase by about 59%, and the ratio between projected and historical retreat <u>rates</u> for 1.5 meters SLR increase by about 114%. For a 4.6 foot (1.4 meter sea level rise (see Table 2 above) in Monterey by 2100 the <u>rate</u> of bluff retreat is predicted to increase by approximately 100%. That rate is based upon a Medium-High Risk Aversion inclination to avoid taking risks in the face of uncertainty which the "State of California – Sea-Level Rise Guidance 2024" document indicates is appropriate for less adaptive, long lifespan (i.e., 2075 and beyond), more vulnerable projects that will experience medium to high consequences if impacted because of underestimating sea level rise. If a Medium Risk Aversion inclination were selected, only a 59% increase in the rate of future bluff retreat is predicted for a 3.1 foot (0.94 meter) sea level rise (see Table 1 above) in Monterey by 2100.

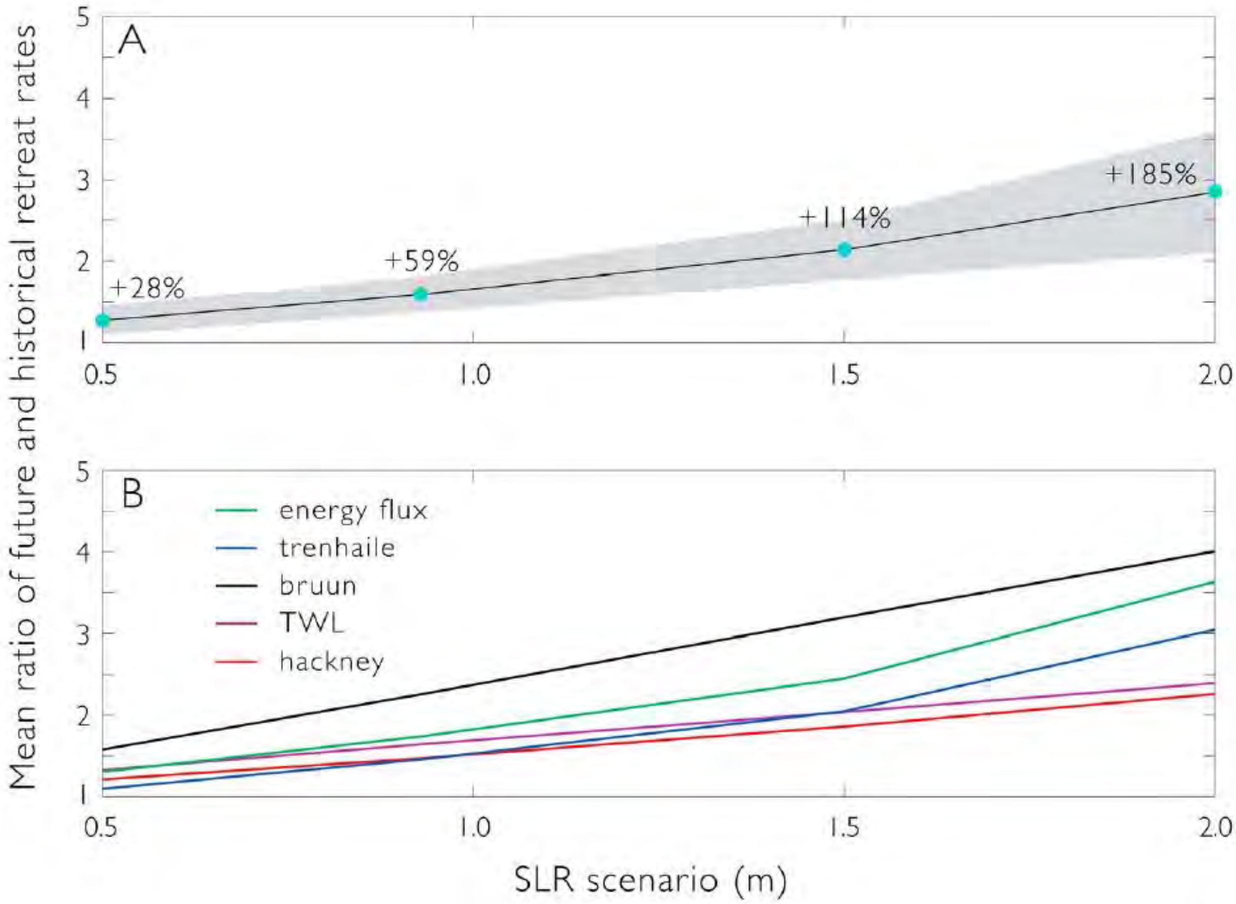


Figure 15: Modeled Future Sea Level Rise (METERS) and Future to Historical Retreat Rate Change Ratios (from Limber, P. W., Barnard, P. L., Vitousek, S., & Erikson, L. H. (2018). A Model Ensemble for Projecting Multidecadal Coastal Cliff Retreat During the 21st Century. Journal of Geophysical Research:Earth Surface, 123(7), 1566–1589. https://doi.org/10.1029/2017JF004401)

Future Bluff Recession Discussion

The sandstone forming the bottom 25 feet of the coastal bluff serves to protect the more erodible marine terrace deposits and surficial soils above that elevation from ocean wave runup impact and erosion. Our field work shows that typically the upper 15 to 20 feet of bluff consists of granular sediments and soils. The maps and cross sections in Appendix B show our interpretation of the site geology, based on aerial photo analysis, field mapping and subsurface exploration. We have surveyed the current improvements on the property (as shown on the map) and have conceptually shown them on 3 cross sections in relation to the ground surface and the top edge of the coastal bluff.

One form of bluff recession is caused by rainfall or wave splash or spray that erodes the bluff face. Because the bluff at the property is composed primarily of relatively strong earth materials (sandstone bedrock) in the lower half, bluff recession from erosion of the bedrock at the property will likely be very slow and sporadic in the future, as it has in the past. Slope instability (landsliding) along the coastal bluff face is another form of the coastal erosion processes that results in landward recession of the top edge of the coastal bluff. The weaker soil and terrace deposit section of the bluff is relatively short in height, and our aerial photograph analysis and site observations indicate substantial bluff recession from landsliding has historically not been occurring. In order to evaluate what portion of the building site is likely to remain stable for at least the next 75 years, engineers and geologists from our firm have evaluated the static and psuedo-static stability (and potential for instability) of the topsoil and terrace deposits that overlie the sandstone bedrock at the site. Our evaluation of potential slope instability indicates that shallow instability could occur along the bluff edge of the property from saturation. That analysis suggests that 4 feet of coastal bluff retreat could occur from landsliding (mass movement) in addition to any grain by grain coastal erosion of the bluff materials.

The historical long term average annual recession rate of the sandstone bedrock at the property has been about 0.25 to 0.5 inches per year. If those rates were to continue into the future for 75 years, in 2099 the top of the sandstone bedrock would have retreated about 1.5 to 3 feet inland of where it is now. To account for future sea level rise of 4.6 feet during the next 75 years, we have conservatively increased this bedrock retreat distance by 50% to be 2.3 to 4.5 feet in the next 75 years.

The historical long term average annual recession rate of the terrace deposits has been about 0.5 to 1 inches per year would suggest that about 3 to 6 feet of marine terrace deposit erosion could cause 3 to 6 feet of recession of the bluff edge in the next 75 years. To account for future sea level rise of 4.6 feet during the next 75 years, we have conservatively increased this marine terrace and soil retreat amount by 50% to be 4.5 to 9 feet in the next 75 years.

We have added together the potential bluff retreat from landsliding (4 feet); the potential bluff retreat from bedrock erosion (2.3 to 4.5 feet); and the potential bluff retreat from marine terrace and soil erosion (4.5 to 9 feet). This results in the total forecast retreat of the top edge of the coastal bluff being 10.8 to 17.5 feet in the next 75 years. Adding a factor of safety margin of 5 feet to this gives a total retreat distance of 15.8 to 22.5 feet 75 years from now (in 2099).

We have shown 22.5 feet of retreat of the top edge of the coastal bluff on both the Map Cross Sections A through C on our RECOMMENDED 75-YEAR COASTAL BLUFF EROSION AND INSTABILITY SETBACK MAP AND CROSS SECTIONS (Three 11 X 17 inch sheets dated 7-19-2024) in Appendix B of this report. This Map and Cross Sections show what portion of the property is likely to remain stable for 75 years (until 2099) and show our RECOMMENDED 75-YEAR BLUFF EROSION AND INSTABILITY SETBACK LINE 22.5 feet inland of where we have mapped the top edge of the existing coastal bluff.

It should be considered that within the next 75 years any improvements seaward of the RECOMMENDED 75-YEAR COASTAL BLUFF EROSION AND INSTABILITY SETBACK LINE may be damaged and need to be sacrificed.

Future coastal erosion is episodic and difficult to predict with precision. It is much more likely that future erosion will occur in sporadic pulses when several feet of retreat occurs at once during an extreme event, than slow steady erosion and retreat will occur at the average annual rates described in this document.

CONCLUSIONS

1. The geology in the vicinity of the subject site consists of sandstone bedrock overlain by recent marine terrace deposits. The bedrock is very resistant to coastal erosion while the terrace deposits are very susceptible to coastal erosion. In some areas the upper few feet of the sandstone is highly weathered and therefore is not as resistant to erosion as the underlying fresher bedrock. However, the weathered bedrock is still much more resistant to erosion than the overlying marine terrace deposits and topsoil.

2. Sea level in the Monterey region is expected to rise by 4.6 feet (1.4 meters) in the next 75 years as presented in the "State of California – Sea-Level Rise Guidance 2024" document published by the California State Ocean Protection Council using an Intermediate-High projection that the document deems appropriate for less adaptive, long lifespan (i.e., 2075 and beyond), more vulnerable projects that will experience medium to high consequences if impacted because of underestimating sea level rise.

The rate that sea level is rising at is accelerating, and increased bluff recession rates will result from that. Figure 15 shows that the resulting rate of bluff recession is projected to be about 100% higher 75 years from now than it is today in Monterey. This does not indicate that the cumulative amount of bluff edge retreat will increase by 100% by then, compared to the retreat that has occurred in the past 75 years (since about 1950). It does suggest that the cumulative amount of bluff edge retreat will increase by about 50% between now and 75 years from now (2099) compared to the amount of retreat that has occurred in the past 75 years (since about 1950).

3. This site has slow erosion rates because much of the coastal bluff face is composed of hard sandstone which is very resistant to erosion, and nearshore bedrock islets serve to diminish wave runup and wave impact. We have projected potential future bluff recession rates by considering historical rates, the potential for increasing sea level and the potential for slope instability.

Our experience indicates that coastal erosion of the terrace deposits and topsoil overlying the sandstone in this area of Monterey County is highly episodic. Very little to no erosion of the coastal bluff may occur for several years or even one or two decades. Then a severe storm or set of storms can selectively cause erosion and bluff retreat.

The historical long term average annual recession rate of the sandstone bedrock at the property has been about 0.25 to 0.5 inches per year. If those rates were to continue into the future for 75 years, in 2099 the top of the sandstone bedrock would have retreated about 1.5 to 3 feet inland of where it is now. To account for future sea level rise of 4.6 feet during the next 75 years, we have conservatively increased this bedrock retreat distance by 50% to be 2.3 to 4.5 feet in the next 75 years.

The historical long term average annual recession rate of the terrace deposits that appears to have historically occurred on the property since 1972 (52 years) has been about 0.5 to 1 inches per year suggests that about 3 to 6 feet of marine terrace deposit erosion could cause 3 to 6 feet of recession of the bluff edge in the next 75 years. To account for future sea level rise of 4.6 feet during the next 75 years, we have conservatively increased this marine terrace and soil retreat amount by 50% to be 4.5 to 9 feet in the next 75 years.

We have added together the potential bluff retreat from landsliding (4 feet); the potential bluff retreat from bedrock erosion (2.3 to 4.5 feet); and the potential bluff retreat from marine terrace and soil erosion (4.5 to 9 feet). This results in the total forecast retreat of the top edge of the coastal bluff being 10.8 to 17.5 feet in the next 75 years. Adding a factor of safety of 5 feet to this gives a total retreat distance of 15.8 to 22.5 feet 75 years from now (in 2099).

4. At the subject property, we recommend that areas seaward of the RECOMMENDED 75-YEAR COASTAL BLUFF EROSION AND INSTABILITY SETBACK MAP AND CROSS SECTIONS (Three 11 X 17 inch sheets dated 7-19-2024) shown in Appendix B be considered to be at potential risk in the next 75 years (by 2099). This map and the accompanying cross sections show our RECOMMENDED 75-YEAR COASTAL BLUFF EROSION AND INSTABILITY SETBACK LINE 22.5 feet inland of where we have mapped the top edge of the existing coastal bluff.

5. The edge of the coastal bluffs above the bedrock may be infrequently overtopped by wave runup and spray during severe ocean storms. Our observations at the site suggest this is more common near the extreme seaward part of the property. We observed evidence of erosion related to wave runup at 3 locations on the property. The limits of that erosion extended up to elevations of 32, 37 and 42 feet NAVD88. That 42 foot location was at the prominent blufftop lookout just upcoast of the existing beach access steps. Rising worldwide sea level may increase the ocean wave runup elevations discussed in this report. At a minimum, such wave runup elevations will rise by the amount of sea level rise that occurs during the life of any structures. Wave splash and wind driven spray should be expected above and landward of those wave runup elevations.

6. Tsunami hazards at the property are low, based on the Monterey County Tsunami inundation Map dated March 2021 prepared by the California Geological Survey.

7. Moderate seismic shaking is expected at the site in the next 50 years. Other than seismic shaking, coastal bluff landsliding is the most significant geologic hazard at the site.

7. A thin zone of perched water upon the weathered, denser bedrock below the terrace deposit material could occur during the wet winter months. Special attention should be paid to any areas of the buildings that are below adjacent grades. If leakage exists or becomes apparent, building foundation waterproofing will be needed. Surface drainage should include provisions for positive gradients so that surface runoff is not permitted to pond adjacent to the top of the coastal bluffs and seep into the backfill of any retaining wall systems. Where possible, surface drainage should be directed towards areas of the bluff top edge furthest from the home and where the surficial deposits are thinnest.

RECOMMENDATIONS

1) At the subject property, we recommend that areas seaward of the RECOMMENDED 75-YEAR BLUFF EROSION AND INSTABILITY SETBACK MAP AND CROSS SECTIONS (Three 11 X 17 inch sheets dated 7-19-2024) shown in Appendix B be considered to be at potential risk in the next 75 years (by 2099). We recommend that new habitable development only be constructed inland of this setback. It is possible that any development or improvements seaward of this setback may be damaged by coastal erosion, bluff retreat and/or bluff instability during the next 75 years.

2) The proposed development and any future development or redevelopment should be designed to incorporate measures (i.e., landscaping and drainage control) that are used to ensure minimized erosion problems during and after construction, so that the development does not have any negative impacts on the stability of the site and adjacent area.

3) We should review any plans that are submitted for permit purposes prior to submittal.

4) Prior to construction of any new foundations, coastal bluff recession should be considered. The location of the proposed new foundations should be verified to insure that they are landward of the recommended 75 year coastal recession setback line shown on the map in Appendix B prior to reinforcing steel being placed and concrete being poured. Improvements seaward of the recommended 75 year coastal recession setback line should be considered sacrificial.

5) Storm runoff dispersal and erosion control measures should be implemented to control storm runoff and prevent erosion from it.

6) Future coastal erosion and bluff recession on the property should be carefully monitored, and when any significant erosion episodes occur, then inspections should be made by qualified professional coastal geologists and/or coastal engineers to allow for prudent subsequent design of remediation and/or coastal protection measures.

7) Removal of any existing improvements (if done) must be done in a manner that minimizes the removal of and any impact to the underlying soils.

Limitations

1. Because of uncertainties that are inherent in the analysis and are beyond the control of HKA, no guarantee or warranty is possible that future recession will occur at the rate predicted. Greater or lesser erosion and recession may occur. In any case, damage to improvements should be expected at some point in the far future. This study should not be used in lieu of appropriate insurance coverage. The owners and occupants of the coastal improvements shall accept the risk of that damage, and HKA recommends that they should purchase appropriate insurance to mitigate the inherent risk.

2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the time, our firm should be notified so that supplemental recommendations can be given.

3. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are called to the attention of the Architects and Engineers for the project and incorporated into the plans, and that the necessary steps are taken to ensure that the Contractors and Subcontractors carry out such recommendations in the field. The conclusions and recommendations contained herein are professional opinions derived in accordance with current standards of professional practice. No other warranty expressed or implied is made.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or to the works of man, on this or adjacent properties. In addition, changes in applicable or appropriate standards occur whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated, wholly or partially, by changes outside our control. Therefore, this report should not be relied upon after a period of three years without being reviewed by an engineering geologist.

APPENDIX A

1986 Vertical Aerial Photography

2023 Google Earth Image

1986 Vertical Aerial Photograph of 35700 Highway 1

April 2023 Google Earth Image of 35700 Highway 1

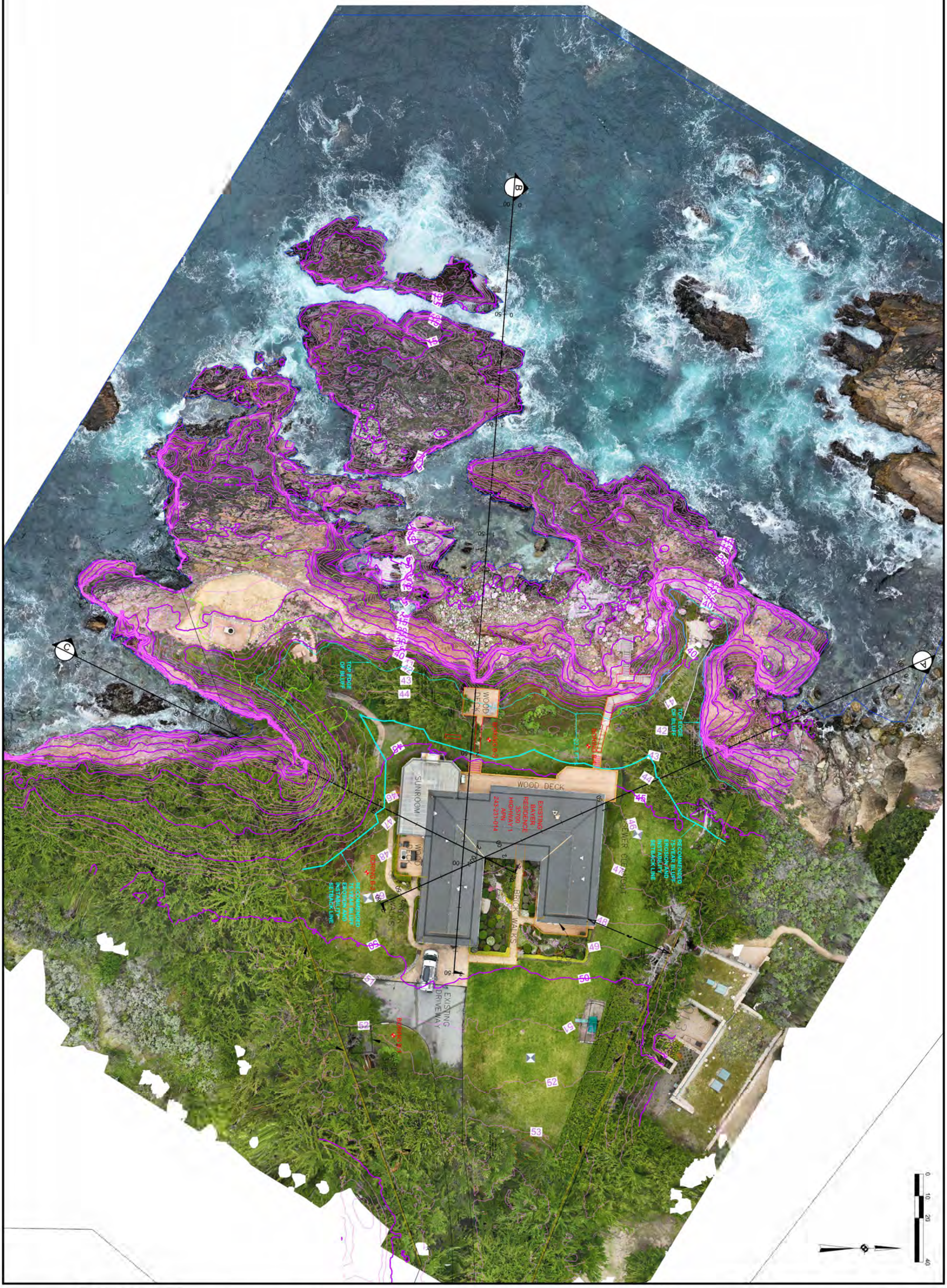
APPENDIX B

RECOMMENDED 75-YEAR COASTAL BLUFF EROSION

AND INSTABILITY SETBACK

MAP AND CROSS SECTIONS

(Three 11 X 17 inch sheets dated 7-19-2024)



HARO, KASUNICH & ASSOCIATES

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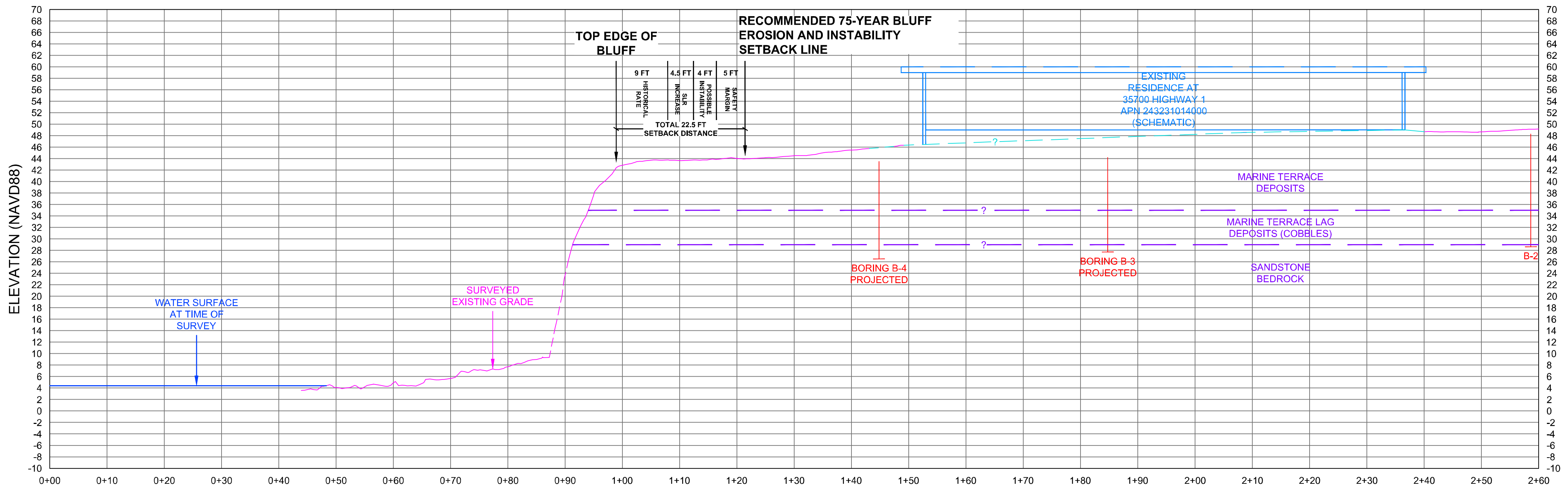
RECOMMENDED 75-YEAR COASTAL BLUFF EROSION AND INSTABILITY SETBACK MAP

BAYER RESIDENCE 35700 HIGHWAY 1, MONTEREY, CA 93940 APN 243231014

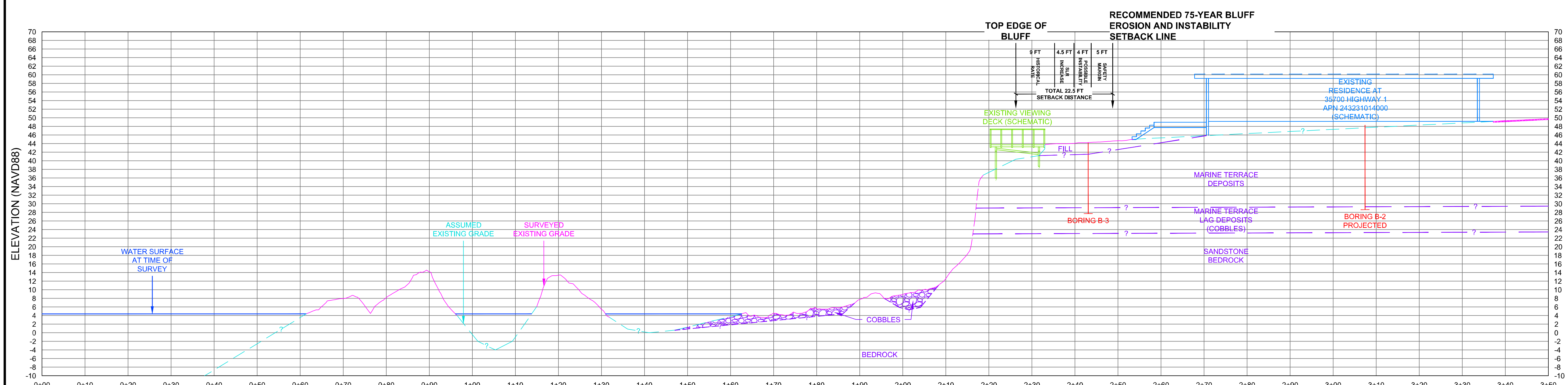
PROJECT:	M12112.1
DATE:	2024-07-19
DESIGN:	MF
DRAWN:	MW
SCALE:	AS SHOWN

SHEET 1 OF 3 SHEETS



CROSS SECTION A

SCALE: AS SHOWN



CROSS SECTION B

SCALE: AS SHOWN

0 6 12 24

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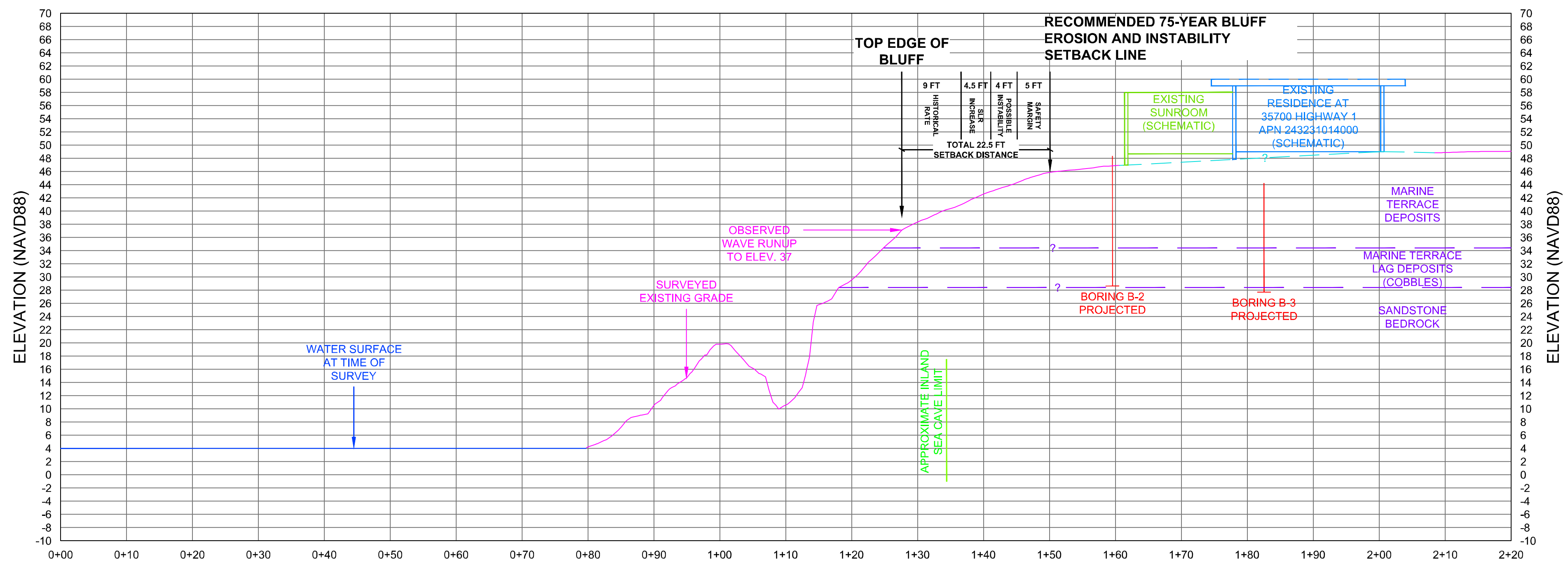
RECOMMENDED 75-YEAR COASTAL BLUFF EROSION AND INSTABILITY SETBACK

CROSS SECTIONS A AND B

BAYER RESIDENCE 35700 HIGHWAY 1, MONTEREY, CA 93940 APN 243231014

PROJECT:	M12112.1
DATE:	2024-07-19
DESIGN:	MF
DRAWN:	MW
SCALE:	AS SHOWN

SHEET 2 OF 3 SHEETS



CROSS SECTION (C)

SCALE: AS SHOWN

0 6 12 24

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RECOMMENDED 75-YEAR COASTAL BLUFF EROSION AND INSTABILITY SETBACK

CROSS SECTION C

BAYER RESIDENCE 35700 HIGHWAY 1, MONTEREY, CA 93940 APN 243231014

PROJECT:	M12112.1
DATE:	2024-07-19
DESIGN:	MF
DRAWN:	MW
SCALE:	AS SHOWN

SHEET 3 OF 3 SHEETS