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# memorandum

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| date | July 14, 2025 |
| to | Julia Krog, Mendocino County |
| cc | Nash Gonzalez, Mendocino County |
| from | Shannon Fiala, Elizabeth Felter, ESA |
| subject | FINAL Existing Conditions Analysis for County of Mendocino Sea Level Rise Resilience Strategy (ESA Ref. D202300556.00) |

# 1 Introduction

This memo summarizes and presents the existing conditions analysis for the County of Mendocino Sea Level Rise Resilience Strategy, to describe baseline risks and known vulnerabilities. This technical memo documents the work conducted under Task 1 of the project scope. This memo reviews relevant resources to inventory assets, summarizes impacts of hazards on those assets to date, and describes existing conditions and functions of the Mendocino County coastline to establish the baseline risks. The baseline condition will inform the subsequent sea level rise analysis and asset risk assessment. This memo is not an exhaustive technical report but is rather a summary of existing data, information, and studies necessary to identify existing assets and to review prior analysis. New analysis will be conducted in the subsequent vulnerability assessment task.

## 1.1 Relevant Documents and Resources

- **Mendocino County Community Wildfire Protection Plan**, 2025. Contains information about the fire environment, wildfire hazard assessment and community values, and mitigation strategies, as well as monitoring and evaluation.

- **Mendocino County Drought Resilience Plan**, 2025. Contains information regarding drought and water shortage risk assessment and existing drought response actions, as well as short- and long-term response actions, and implementation considerations.

- **Multi-Jurisdictional Hazard Mitigation Plan (HMP)**, 2021. Contains information about assets and hazard exposure in Mendocino County, Fort Bragg, and Point Arena. The SLR strategy will build on the analysis in the HMP, which identifies flooding as a high-priority hazard.

- **Climate Vulnerability Assessment Report**, Mendocino County Safety Element Update, 2021. Information about sea level rise and climate change-driven shoreline flooding and erosion, including a ranking of asset vulnerability.

- **Mendocino County General Plan Coastal Element**, 2021. This is Mendocino County's certified Local Coastal Program, which contains information about land use policies for coastal development.
- **Caltrans District 1 Adaptation Priorities Report** and **Active Transportation Plan**, 2021. Includes information about roadway segments, bridges, small and large culverts that are vulnerable to coastal hazards and identifies which assets are priorities for adaptation in Caltrans District 1, which includes Del Norte, Humboldt and Mendocino Counties.
- **Municipal Service Reviews:** Conducted by the Mendocino County Local Agency Formation Commission (LAFCo) for coastal special districts.
- **Geographic Information Systems (GIS) Mapping Data**: Includes topography, existing infrastructure, and habitat areas.
- **Historical Information**: Includes photographs documenting changes in the Mendocino County coastline over time.
- **Coastal Hazard and Sea-Level Rise Data**: Includes existing coastal hazard information such as from Federal Emergency Management Agency (FEMA), Pacific Institute, United States Geological Survey's (USGS) Coastal Storm Modeling System (CoSMoS), and other relevant sources (additional coastal data will be gathered and analyzed under Task 3, the Sea Level Rise Analysis and Risk Assessment).

# 2 Setting

## 2.1 Project Location

This project includes the entire Mendocino County coast including the open coast portions of the incorporated city of Fort Bragg. Assessment of inland areas in Fort Bragg surrounding Noyo Harbor is presented in the *Sea Level Rise, Tsunami Hazards, and Resilience Strategy for Noyo Harbor* prepared for Fort Bragg. This project follows the 13 planning areas designated in the County of Mendocino Coastal Element described in Table 1 and shown in Figure 1 below.

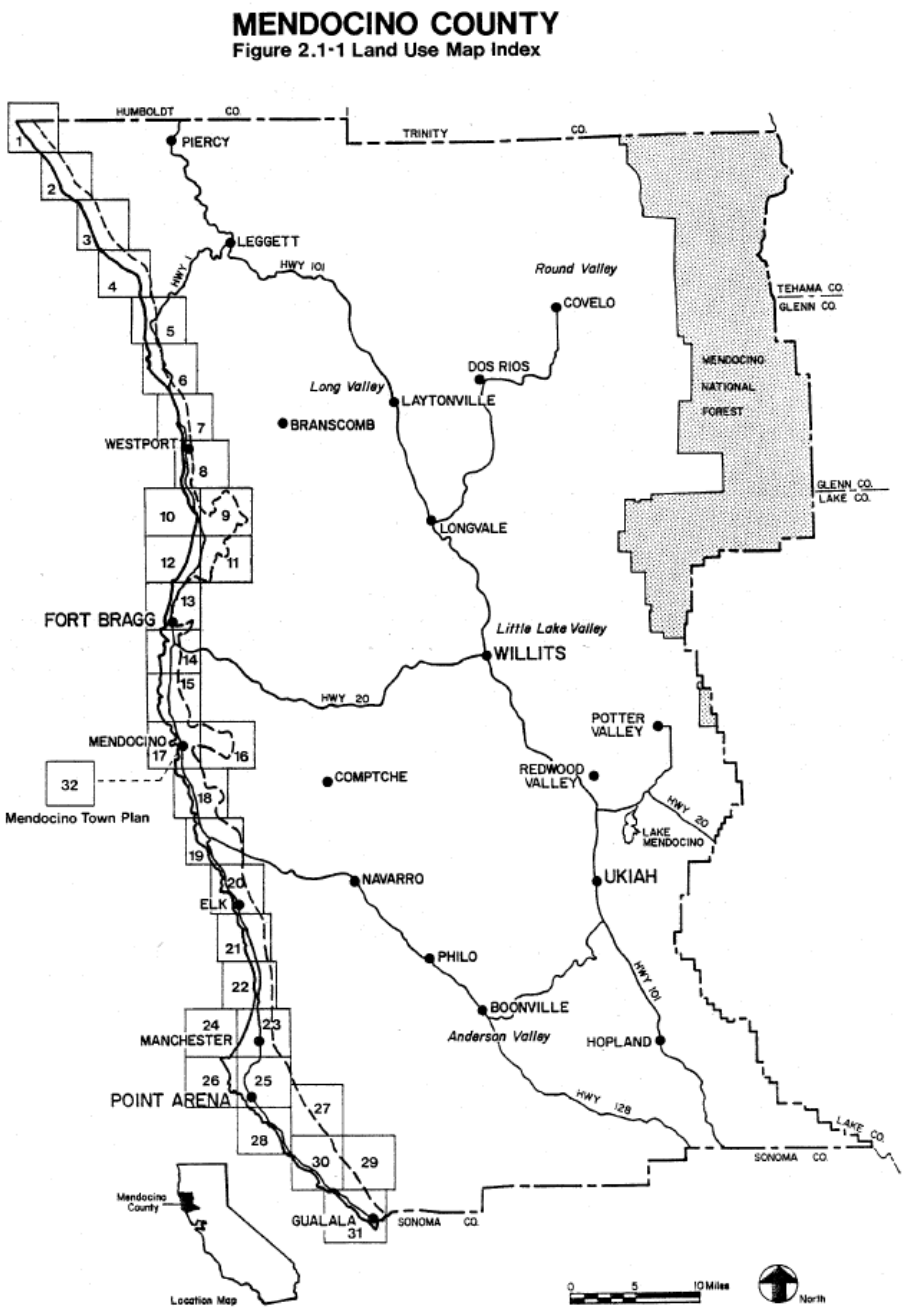
**TABLE 1**
**PROJECT PLANNING ZONES**

| | Land Use Plan: Description of 13 Areas | Planning Area | Communities Described | Land Use Maps |
|---|---|---|---|---|
| 1 | Humbolt County Line to North of Rockport | Lost Coast | none | 1, 2, 3, 4, 5 |
| 2 | Rockport to Little Valley Road | Rockport to Little Valley Road | Westport | 6, 7, 8, 9, 10, 11, 12 |
| 3 | Little Valley Road to Fort Bragg City Limits | North Fort Bragg | Cleone | 11, 12, 13 |
| 4 | Fort Bragg City Limits to Hare Creek | South Fort Bragg Area | Noyo | 13, 14 |
| 5 | Hare Creek to Jug Handle Creek | [blank] | South Fort Bragg | 14 |
| 6 | Jug Handle Creek to Russian Gulch | Jug Handle Creek | Caspar | 14, 15 |
| 7 | Russian Gulch to Van Damme State Park | Big River | Mendocino Town | 15, 16, 17 |
| 8 | Van Damme State Park to Dark Gulch | Little River | Little River | 17, 18 |

| | Land Use Plan: Description of 13 Areas | Planning Area | Communities Described | Land Use Maps |
|---|---|---|---|---|
| 9 | Dark Gulch to Navarro River | Albion | Albion Village | 18, 19 |
| 10 | Navarro River to Mallo Pass Creek | Greenwood/Elk | Elk | 19, 20, 21, 22 |
| 11 | Mallo Pass Creek to Iverson Road | Iverson Road | Irish Beach, Manchester, Point Arena | 22, 23, 24, 25, 26, 27, 28 |
| 12 | Iverson Road to Sonoma County Line | Anchor Bay - Gualala<br>Iverson Road South | Anchor Bay, Gualala | 27, 28, 29, 30, 31 |
| 13 | Mendocino Town Plan<br>(1" = 200'+) | Big River | Mendocino Town | 32 |
| 14 | Gualala Town Plan | Gualala and vicinity | Gualala | 31 |

SOURCE: Mendocino County General Plan Coastal Element 2021

**FIGURE 1**
**PROJECT PLANNING ZONES**



## 2.2 History and Demographics

For approximately 10,000 years, the Pomo people inhabited the coastal areas of what is today known as Mendocino County. They were hunter-gatherers who established seasonal villages along the coast, and permanent settlements inland. The arrival of European settlers in the 19th century disrupted their subsistence practices and ways of life, leading to forced relocations to the Mendocino Indian Reservation, near the Noyo River, in 1865—which then closed two years later. There are 11 federally recognized tribal nations in the county: Cahto Tribe, Coyote Valley Band of Pomo Indians, Guidiville Indian Rancheria, Hopland Band of Pomo Indians, Manchester Band of Pomo Indians, Pinoleville Pomo Nation, Potter Valley Tribe, Redwood Valley Little River Band of Rancheria of Pomo Indians, Round Valley Reservation, and Sherwood Valley Rancheria. There are dozens of tribal cultural sites scattered throughout the county.

The county has over 40 cultural and historic sites in different subregions. These sites include schoolhouses, cemeteries, cottages and homes, hotels, and train depots scattered throughout the county's landscape.[1] Coastal tribes include the Kashaya Pomo and Manchester Band of Pomo Indians; inland tribes with ancestral ties to coastal areas include the Sherwood Valley Rancheria of Pomo Indians and the Round Valley Indian Tribes (including Pomo and Coast Yuki peoples).[2] [3]

Modern development began in the mid-19th century, with the town of Mendocino founded in 1852 as a logging settlement. The coastline was modified with the creation of docks and chutes. The region's forest became central to California's timber industry, and the coastal towns of Albion, Caspar, Little River, and Fort Bragg also emerged around mills and harbors. Mill towns included hotels, homes, stores, and restaurants, and would move as forest resources were depleted. The town of Mendocino has the most buildings still standing from the mill town era in present day and is a historic preservation district.[4] The timber industry significantly shaped Mendocino County from the mid-19th century until the mid-20th century, when developers took an interest in the area following increased tourism interests.

The 20th century also saw federal and military interest in the Mendocino coast. Roads were constructed, and by the 1930s, the alignment of what would become State Route 1 was carved along coastal bluffs, connecting previously isolated towns. Following World War II, the State expanded State Route 1, allowing greater automobile access and enabling coastal tourism. During the war, the U.S. Navy established radar installations and lookout towers along the bluffs, further altering the coastal landscape. Environmentalists and tribal leaders opposed a number of development proposals, including subdivisions of vacation homes throughout the 1960's and a nuclear power plant proposed for Point Arena in 1970. The town of Mendocino reinvented itself as an artists' enclave and historic district.[5] These conservation and environmentalist efforts led to the establishment of state parks, such as Mendocino Headlands State Park in 1974, the establishment of the Mendocino Land Trust in 1976, and the establishment of the statewide California Coastal Commission in 1976. The decline of the timber

[1] https://www.mendocinocounty.gov/home/showpublisheddocument/54483.
[2] https://libguides.sdsu.edu/AmericanIndianStudies/ ;
[3] https://www.doi.gov/sites/doi.gov/files/uploads/12_bia_regions.pdf
[4] https://savingplaces.org/stories/pacific-time-mendocino-county-california?utm_source=chatgpt.com
[5] https://www.mendocinoartcenter.org/

industry led to economic stagnation in many former logging towns, and tourism now drives much of the county's current economy.

Mendocino County has a population of just over 90,000. One quarter of the county's population is 65 years or older, notably higher than the older adult population composition throughout the state (16%). Hispanic or Latino-identifying populations are lower than those statewide (28% vs. 40%), as are populations who are foreign-born (14% vs. 27%), populations identifying as Asian (2% vs. 15%) and Black or African American (1% vs. 5%). Concentrations of populations who identify as American Indian or Alaskan Native are higher in Mendocino County than throughout the entire state (4% vs. 0.4%). Median household income in Mendocino County is $67,454, which is substantially lower than California's median household income of $96,334. The employment rate in Fort Bragg (52%) is also lower than the state's (60%). The older population in the county may contribute to its relatively lower income and employment rates, as these populations may be retirees. Sixty-two percent of residents in Fort Bragg are homeowners, compared to 56% statewide. Eighteen percent of the population identifies as having a disability, which is also substantially higher than the 12% statewide rate.[6]

As measured by CalEnviroScreen, coastal Mendocino County has a relatively low environmental justice burden, with most census tracts below 30th percentile (**Figure 2**). However, a few notable impacts are present. Two tracts in the City of Fort Bragg area are somewhat burdened, with a total score in the 47th (6045010500) and 49th (6045010400) percentiles; these two tracts, and one more tract in the Fort Bragg vicinity (6045010300), have high incidences of asthma—in the 79th percentile. Four tracts at the north and south end of the coastal county have higher groundwater threats, with percentiles between 84-92. The three southernmost census tracts along the coast (6045011102, 6045011002, 6045011001), as well as the northernmost tract (6045010200), have solid waste environmental burdens in the 89th percentile or above. All tracts along Mendocino's coast are over 70% white, apart from one tract in the City of Fort Bragg (6045010500), which is 54% white and 41% Hispanic or Latino. In the southernmost census tract in coastal Mendocino (6045011102), which contains Point Arena and Gualala, 6% of the population identifies as American Indian or Alaskan Native; and the northernmost tract (6045010200) is comprised of 11% American Indian or Alaskan Native—both tracts are markedly higher than the statewide composition of 0.4%.

**FIGURE 2**
**CALENVIROSCREEN 4.0 FOR MENDOCINO COUNTY[7]**
SOURCE: CALENVIROSCREEN 4.0 2025

[6] US Census Bureau (2020-2023)
[7] https://experience.arcgis.com/experience/11d2f52282a54ceebcac7428e6184203/page/CalEnviroScreen-4_0

A model for the Mendocino Coast Recreation and Park District (MCRPD) shows that between 850,000 and 900,000 people visit this region each year. Most head to the North Coast (about 720,000 or 77-80%) while the South Coast sees around 170,000. Summer draws 40% of visitors, spring 25%, fall 20%, and winter 20%, and about half a million find a place to stay in local lodgings.[8]

Low-impact and environmentally responsible tourism has been promoted, but concerns over increased demand, as well as housing shortages, persist. Modeling conducted by Caltrans does not indicate significant population growth in future decades.[9] However, Mendocino County could see an increase in climate change-driven migrants, particularly in its coastal areas, which are considered a climate haven.[10] Providing sufficient housing and infrastructure for future residents has been raised as a concern in public forums.[11]

## 2.3 Existing Shoreline Types

### 2.3.1 Beaches / Dunes

Beaches along Mendocino County's coastline are characterized by a mix of sandy stretches and rocky intertidal zones. These beaches are dynamic environments, shaped by the interplay of ocean currents, wave action, sediment supply from rivers, and littoral drift. They serve as critical habitats for various species and are popular recreational areas. They are vulnerable to erosion, especially during storm events and periods of high wave energy. Due to a combination of high wave energy and relatively steep coastal topography, Mendocino's beaches are narrower, and steeper compared to southern California beaches. Erosion is significant: models from the California Coastal Commission project up to 623 feet of dune retreat along these beaches by 2100 under high sea level rise scenarios (80 inches).[12]

The dune fields at MacKerricher State Park are the largest coastal dune system on the Mendocino coast, stretching inland up to one mile from Ten Mile Beach. Unlike the region's dominant rocky cliffs, these dunes were formed by riverine and wind-driven sediment processes. The dune fields support a diverse array of habitats and species, including critical habitat for several rare and threatened species, such as the western snowy plover and Menzies' wallflower. Over the last 20 years, ongoing restoration efforts led by California State Parks and the Mendocino Land Trust have included removal of invasive species, reintroduction of native dune plants, restoration of natural sand movement and topography, and protection of snowy plover nesting zones.[13] Similarly, the dune fields at Stoneboro Beach provide critical habitat for endangered species, and the area includes a unique mix of grasslands, wetlands, and sandy beachfront.

### 2.3.2 Coastal Bluffs

The county's coastal bluffs are steep landforms composed of sedimentary rocks and soils. These bluffs are subject to natural erosional processes, which will be exacerbated by sea level rise and increased storm intensity. Bluffs erode at an average rate of -1.3 feet per year, with hotspots like Rockport Bay experiencing rates as high as -10.2

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[8] https://www.mendolafco.org/files/713e19d0a/mcrpd_msr.pdf

[9] https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/new-state-planning/transportation-economics/socioeconomic-forecasts/2022/mendocino-2022-a11y.pdf

[10] Lustgarten 2023 study, in New America; https://www.newamerica.org/the-thread/climate-change-human-migration/

[11] https://www.advocate-news.com/2024/10/10/local-agencies-collaborate-to-address-sea-level-rise-and-climate-migration/

[12] 2021 Mendocino County Climate Vulnerability Assessment Report

[13] https://www.parks.ca.gov/pages/734/files/GeoGems%20FINAL%20WEB.pdf

feet per year.[14] Some areas have experienced retreat, threatening infrastructure and habitats atop these bluffs, such as loss of the coastal trail in Fort Bragg. Bluff failures are primarily driven by wave undercutting, groundwater seepage, and seismic activity. Sea caves at the base of bluffs can accelerate bluff erosion. Vegetation plays a role in stabilization, but development and human activity can undermine this natural protection. With rising seas, bluff retreat is expected to accelerate, threatening coastal access, infrastructure (such as State Route 1), and historic development such as downtown Mendocino.

### 2.3.3 Bluff-backed Beaches

Bluff-backed beaches are narrow coastal habitats where sandy or rocky beaches are directly adjacent to coastal bluffs. These areas occur throughout Mendocino County, such as from Westport to Ten Mile River and from the Big River to Manchester State Park, are particularly susceptible to "coastal squeeze," where rising sea levels and fixed landward boundaries (like cliffs or development) prevent the natural landward migration of the beach, leading to habitat loss.[15] With 6.6 ft of sea level rise, bluff-backed beaches in Mendocino County could experience complete or near-complete loss, significantly reducing recreation opportunities and coastal habitat.[16]

### 2.3.4 Rivers and Estuaries

Mendocino County's rivers and estuaries, including the Navarro River Estuary and the Big River Estuary, are vital ecological zones where freshwater mixes with seawater, creating rich habitats for diverse flora and fauna. These estuaries are dynamic, influenced by seasonal river flows, tidal actions, and sediment deposition. They serve as nurseries for fish species and support migratory birds. However, they are sensitive to changes in freshwater inflow, sediment supply, and sea level rise, which can alter salinity gradients and habitat structures. With sea level rise, saltwater intrusion is expected to significantly alter freshwater systems.[17] At Big River Estuary, for example, tidal marshes are projected to migrate inland, but where development or topography constrains movement, ecosystem loss is anticipated.[18]

### 2.3.5 Armored Shorelines

Armored areas—sections of the shoreline protected by seawalls, revetments, riprap, and other hard structures—are relatively limited in Mendocino County compared to urbanized counties, but they are present near critical infrastructure, such as sections of State Route 1 near Hardy and Juan Creeks north of Westport, at Westport Landing, near Lake Cleone in MacKerricker State Park, certain harbor facilities at Fort Bragg's Noyo Harbor, at Caspar Headlands State Beach, at the Little River, at Arena Cove, and in Gualala .[19] Armoring can temporarily protect specific assets in the short term, but often worsens beach and bluff erosion by reflecting wave energy onto adjacent areas.[20] In Mendocino, armored stretches are already showing evidence of flanking erosion, and future sea level rise is expected to render many existing protections insufficient.

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[14] 2009 California Coastal Erosion and Shoreline Change Study, California Coastal Commission

[15] Griggs, G. (2017). Coastal Squeeze: The Land Loss Crisis Along the Shores of California.

[16] 2021 Mendocino County Climate Vulnerability Assessment Report

[17] California Climate Change Center (2009). The Impacts of Sea-Level Rise on the California Coast.

[18] 2021 Mendocino County Climate Vulnerability Assessment Report

[19] Coastal Commission Armor Structure Locations: https://coastal-commission-open-data-site-coastalcomm.hub.arcgis.com/datasets/armor-structure-locations-2/explore, updated February 27, 2025

[20] Griggs, G., Patsch, K., & Savoy, L. (2005). Living with the Changing California Coast. University of California Press.

# 2.4 Historical Storms and Documented Impacts

**TABLE 2**
**HISTORICAL STORMS AND DOCUMENTED IMPACTS**

| Date | FEMA Disaster Number | Significant Impacts |
|---|---|---|
| December 1964 | DR-183 | Christmas Flood of 1964. Intense rainfall led to widespread flooding across Northern California. In Mendocino County, major rivers such as the Eel and Russian Rivers overflowed, causing extensive damage to infrastructure, including the destruction of bridges and roads. The flooding resulted in significant economic losses and disrupted transportation and communication networks. |
| 1974 | DR-432 and DR-412 | Two flooding events, severe rainstorms and widespread flooding closed roads and damaged infrastructure. |
| January 1983 | DR-677 | The 1982-83 El Niño storms brought high winds, heavy rain, and significant flooding throughout all of California. January 26, 1983 storm destroyed the pier at Point Arena, in the southern part of Mendocino County. |
| 1994 | DR-1038 | Economic disaster due to El Niño-related disruptions in the local salmon fishery. |
| January 1997 | DR-1155 | 1997 New Year's Floods. A series of winter storms, fueled by an atmospheric river, brought heavy rainfall and snowmelt, leading to severe flooding in Northern California. The Russian River in Mendocino County reached flood stages, inundating communities, damaging homes and businesses, and causing widespread power outages. |
| January 2017 | DR-4305 and DR-4301 | Northern California experienced its wettest winter in nearly a century, resulting in significant flooding. In Mendocino County, the Russian River rose above flood stage, inundating approximately 500 homes. The flooding caused extensive damage to roads, bridges, homes, agriculture, and led to evacuations in affected areas. |
| February 2019 | DR-4434 and DR-4431 | Series of intense atmospheric river events brought prolonged heavy rainfall and strong winds. The storms caused widespread flooding, road closures, slope failures, and damage to water infrastructure and emergency access routes. Numerous communities were isolated due to debris flows and landslides, prompting evacuation orders and emergency shelter operations. The disaster underscored vulnerabilities in rural transportation networks and stormwater systems. |
| November 2024 | N/A | An atmospheric river brought heavy rainfall to Mendocino County, causing flooding and widespread power outages. Rivers such as the Garcia, Navarro, and Russian Rivers rose significantly, leading to road closures, including State Route 1 at Point Arena. The storm toppled trees and downed power lines, impacting thousands of residents. |

SOURCE: FEMA 2025

# 2.5 Coastal Hydrology

## 2.5.1 Tides and Water Levels

Mendocino County experiences mixed semidiurnal tides, or two daily high tides and two daily low tides of differing elevations. These daily tides also vary with the spring-neap tidal cycles, which occur approximately twice a month.

Coastal engineers use vertical datums, or defined reference surfaces, to estimate the relative elevation of the tides and water levels to the land around it. Measuring the water levels over prolonged periods provides a baseline for understanding typical water levels and how they may change over time. For this study, ESA used the NOAA tide gauge, Arena Cove (Station #9416841) in Mendocino County. Tidal datums for the gauge are shown in **Table 3**.

**TABLE 3**
**TIDAL DATUMS AT ARENA COVE (#9416841), APPLICABLE TO MENDOCINO COUNTY**

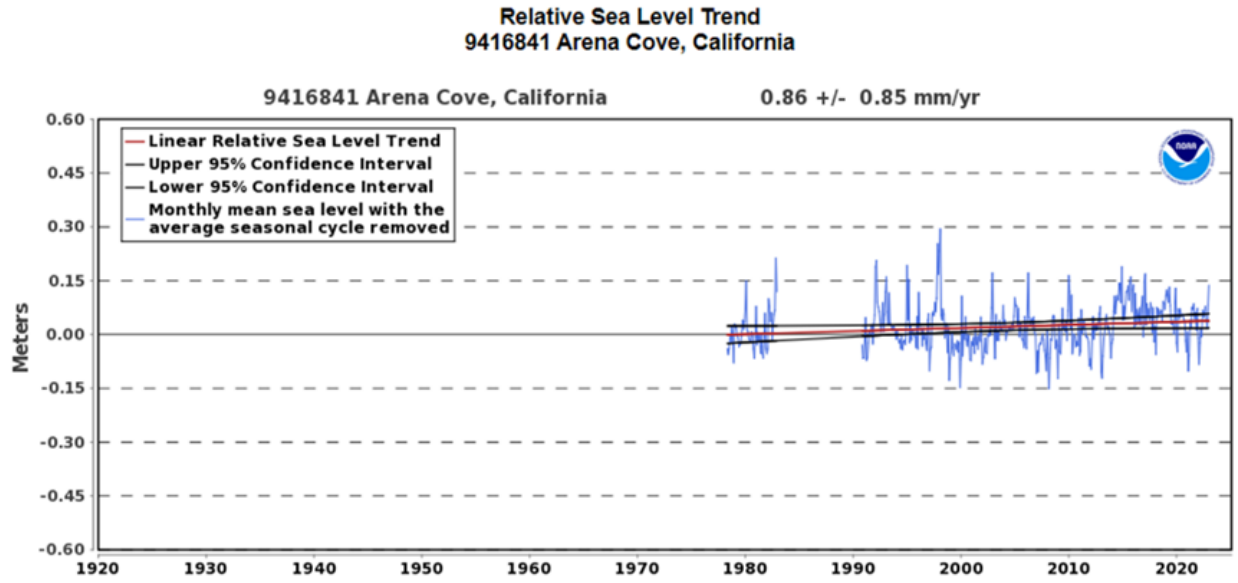
| Tidal datum[a] | Abbreviation | ft NAVD[b] |
|---|---|---|
| Maximum Observed Tide (observed on February 6, 1998) | MOT | 8.53 |
| Highest Astronomical Tide | HAT | 7.48 |
| Mean Higher High Water | MHHW | 5.73 |
| Mean High Water | MHW | 5.06 |
| Mean Tide Level | MTL | 3.04 |
| Mean Sea Level | MSL | 3.00 |
| Mean Low Water | MLW | 1.01 |
| Mean Lower Low Water | MLLW | -0.14 |

NOTES: [a] The tidal datums listed above are from the most recent tidal epoch: 1983-2001.
[b] NAVD = North American Vertical Datum of 1988

SOURCE: NOAA Tides and Currents 2020

The record for the Arena Cove tide gauge dates back to 1978. The relative sea level trend recorded over this period (**Figure 3**) is 0.86 mm/year, which is equivalent to 0.28 ft over 100 years.

**FIGURE 3**
**RELATIVE SEA LEVEL TREND AT ARENA COVE TIDE GAUGE**




SOURCE: NOAA 2024.[21]

The City of Point Arena's *Sea Level Rise Analysis and Vulnerability Assessment for Arena Cove* (ESA 2023) analyzed measured water levels and waves to assess the magnitude and frequency of coastal flooding. Some of the findings, such as how water levels fluctuate due to waves (i.e., dynamic wave setup associated with

[21] https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=9416841

infragravity waves), provide information broadly applicable to the project area. Comparison of the measurements at Arena Cove to local water level measurements and observations across the County will be part of the technical analysis in this project.

## 2.5.2 Wave Climate

The study area is exposed to large swell and large storm seas. Most of the wave exposure comes from waves generated in the north Pacific with predominant swell directions from the west and northwest (ESA 2023). Episodic storms also generate strong winds and seas. Storm-generated waves can vary in direction depending on the season, with spring and summer winds (March through July) typically generating wind swells from the northwest, and winter storms typically generating swell from the southwest. Long-period south swells also reach the study area in summer months from large storms in the Southern hemisphere off the coast of New Zealand, but these typically are not associated with extreme coastal conditions. Based on input from local community members, the most damaging storms are winter storms from the west-southwesterly direction. The Arena Cove Vulnerability Assessment provides additional analysis of water levels and waves based on NOAA water level observations.

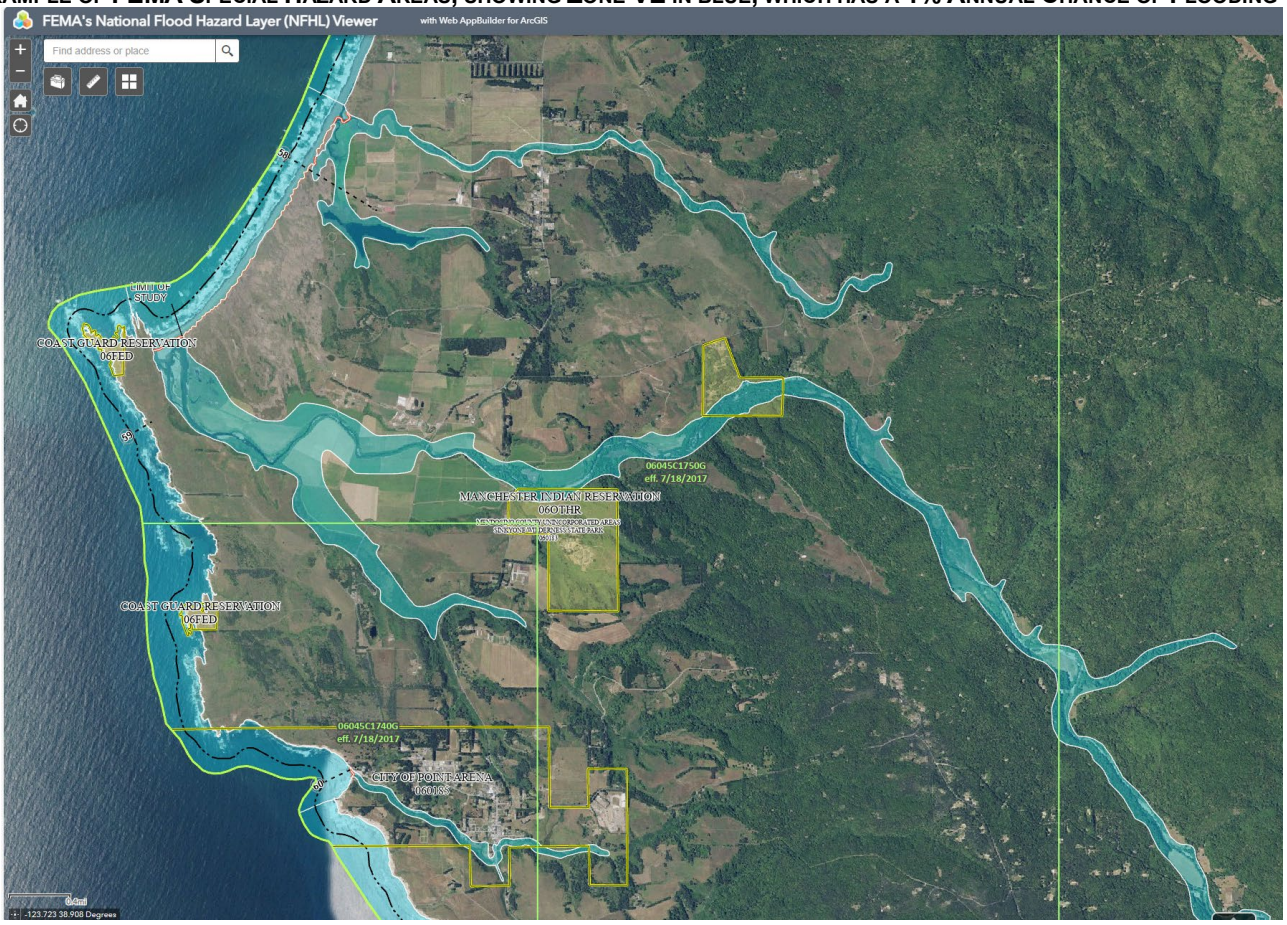
## 2.5.3 Coastal Flooding and Wave Runup Hazards

### *2.5.3.1 FEMA Flood Zones*

FEMA develops Flood Insurance Studies (FISs) and Flood Insurance Rate Maps (FIRMs) for the purpose of informing the public of flood risks. FEMA maps typically show the water levels (Base Flood Elevations) and extents of the 1% (100-year) and 0.2% (500-year) annual chance flood events. These events can happen as a result of flooding from coastal flood sources (ocean water levels and waves), precipitation flood sources (high freshwater runoff), or a combination of both. It is important to note that FEMA considers only existing conditions and does not account for long-term coastal erosion or sea level rise in its mapping.

The FEMA special flood hazard areas for a small portion of the project area are shown in **Figure 4**. Along the Mendocino County coast, areas denoted Zone VE indicate that waves are a main contributor to the base flood elevations (BFEs). Coastal areas denoted Zone AE indicate that while waves may be present, they are significantly lower in elevation. Fluvial flooding dominates the upstream reaches of most coastal rivers.

**FIGURE 4**
**EXAMPLE OF FEMA SPECIAL HAZARD AREAS, SHOWING ZONE VE IN BLUE, WHICH HAS A 1% ANNUAL CHANCE OF FLOODING [22]**




SOURCE: FEMA 2025

### *2.5.3.2 USGS Coastal Storm Modelling System (CoSMoS)*

The USGS's Coastal Storm Modeling System (CoSMoS) (Barnard 2019) provides storm-induced coastal flood and erosion hazard mapping for current conditions, sea level rise scenarios, and a range of storm scenarios (i.e., return periods) for much of the California coast. Currently, however, the flood and beach erosion mapping extends only as far north as Point Arena, so is not available for the majority of Mendocino County. Mapping of bluff erosion is available (see Erosion Hazards below). The USGS anticipates releasing CoSMoS updates for the Mendocino Coast in approximately the fall of 2025.

## 2.5.4 Erosion Hazards

Erosion is a widespread issue within Mendocino County. Future sea level rise will shift the water's edge landward and upward, resulting in larger waves that break closer to shore and higher wave run up. In general, these processes are expected to increase beach and bluff erosion and result in narrower beaches depending on sand supply. Beaches are likely to shift landward and upward as waves erode the ocean-ward shore and deposit

[22] https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd

sediments in the surf zone. The extent to which beaches persist will depend on sediment supply and backshore conditions. Increased sediment loads from the rivers (i.e., if rainfall frequency or intensity increases) or localized erosion of bluffs will increase sediment supply. Depending on the rates of sea level rise and erosion of the backshore, sediment delivery may or may not be enough to keep pace with rising seas. Areas with erosion-resistant barriers (like seawalls and the bluffs) will not erode fast enough to provide space for landward migration of fronting beaches.

The county's Climate Vulnerability Assessment Report indicates an average of over 600 feet of dune retreat, and an average of over 100 feet of cliff retreat by end of century, citing a study by the California Climate Change Center (2009).[23] A study by the Pacific Institute (2009) maps bluff erosion hazards for Mendocino County (**Figure 5**) for 4.6 feet of sea level rise by 2100. This map view is based on ESA's (formerly Philip Williams & Associates') modeling and mapping of flood and coastal erosion response to SLR along the coast of California. As noted above (Section 2.5.3), USGS CoSMoS provides bluff and cliff erosion data, including cliff retreat for various sea level rise scenarios (Barnard et al. 2023). The 5.7 ft sea level rise scenario is shown in **Figure 6**.

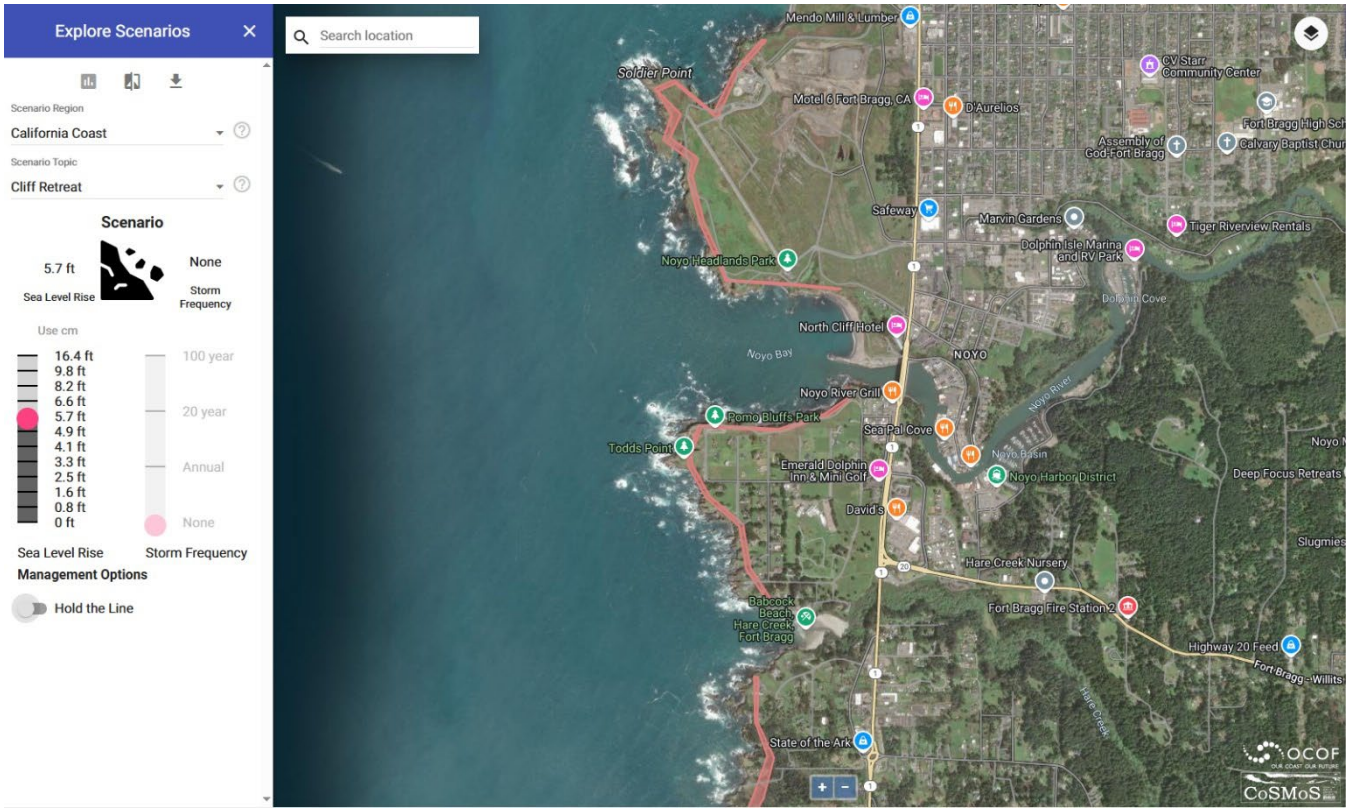
[23] California Climate Change Center. 2009. *The Impacts of Sea-Level Rise on The California Coast*. CEC-500-2009-024-F

**FIGURE 5**
**PROJECTED COASTAL BLUFF EROSION WITH 4.6 FEET (1.4 M) OF SEA LEVEL RISE BY 2100**




SOURCE: PWA 2009

**FIGURE 6**
**USGS COSMOS CLIFF EROSION MAP**




SOURCE: Barnard et al. 2023

Information on cliff and beach erosion with sea level rise will be assessed in later tasks as a part of this project using data from the 2021 USGS study *Modeled Extreme Total Water Levels Along the U.S. West Coast* (Shope et al. 2021).

## 2.6 Sea Level Rise

The State of California Sea Level Rise Guidance document (OPC 2024) provides a synthesis of the best available science on sea level rise in California. The State Guidance gives a range of sea level rise projections by region for low- to high-emissions scenarios (the low being if emissions are greatly reduced in coming years and the high being if emissions continue as they have since the early 21st century). Sea level rise scenarios for Arena Cove are shown in **Table 4**. Scenarios for California are plotted in **Figure 7.**

To support resilience planning, hazards will be assessed using 1, 3, and 6 feet of sea level rise. These water levels provide for analysis of several OPC 2024 scenarios. One foot of sea level rise generally corresponds with near-term projections (2050) for the intermediate-high and high scenarios. Three feet of sea level rise generally corresponds with projections for the years 2070 (high scenario), 2080 (intermediate-high scenario), and 2100 (intermediate scenario). Six feet of sea level rise generally corresponds with projections for the years 2100 (high scenario), 2120 (intermediate-high scenario), and 2150 (intermediate scenario). **Figures 8, 9, and 10** provide a preview of the coastal hazards analysis that will be conducted in later tasks for the County of Mendocino Sea Level Rise Resilience Strategy Project.

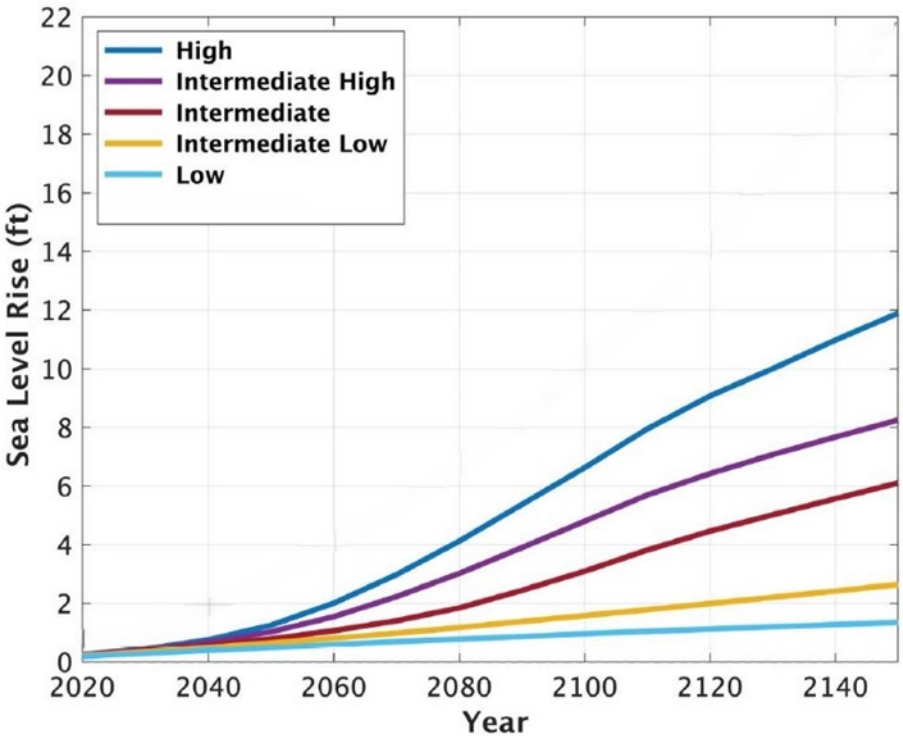
**TABLE 4**
**SEA LEVEL SCENARIOS FOR ARENA COVE (FEET)**

| YEAR | LOW | INTERMEDIATE-LOW | INTERMEDIATE | INTERMEDIATE-HIGH | HIGH |
|---|---|---|---|---|---|
| 2020 | 0.1 | 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 | 0.5 | 0.7 | 0.9 | 1.1 |
| 2060 | 0.5 | 0.7 | 0.9 | 1.4 | 1.8 |
| 2070 | 0.5 | 0.8 | 1.2 | 2.1 | 2.8 |
| 2080 | 0.6 | 1.0 | 1.7 | 2.8 | 3.9 |
| 2090 | 0.7 | 1.2 | 2.2 | 3.6 | 5.1 |
| **2100** | **0.8** | **1.4** | **2.9** | **4.5** | **6.4** |
| 2110 | 0.8 | 1.6 | 3.6 | 5.4 | 7.6 |
| 2120 | 0.9 | 1.7 | 4.1 | 6.1 | 8.7 |
| 2130 | 0.9 | 1.9 | 4.6 | 6.7 | 9.6 |
| 2140 | 1.0 | 2.1 | 5.1 | 7.3 | 10.5 |
| 2150 | 1.0 | 2.3 | 5.6 | 7.8 | 11.4 |

Note: Median values of sea level scenarios with a baseline of 2000. All median scenario values incorporate the local estimate of vertical land motion.

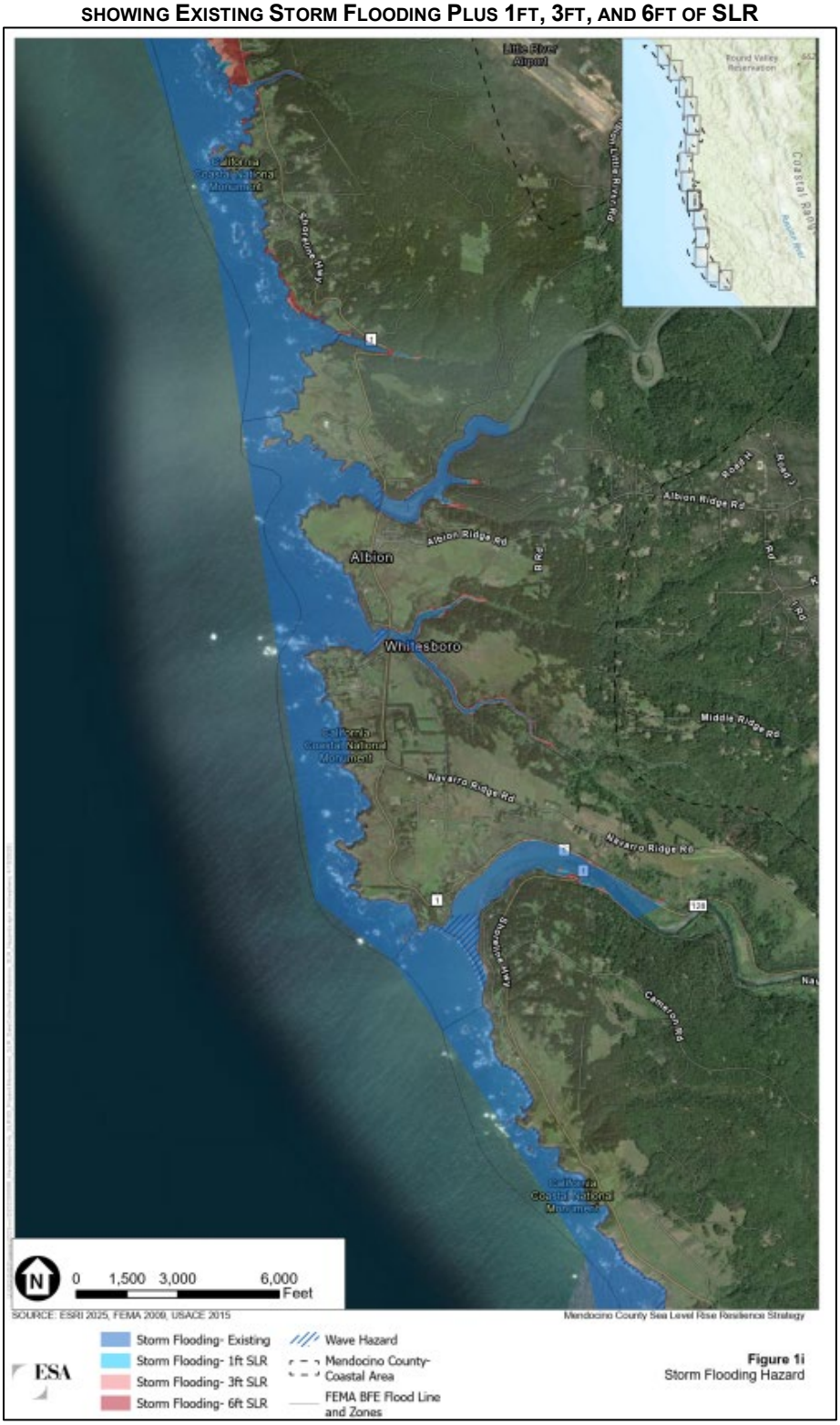
SOURCE: OPC 2024

**FIGURE 7**
**SEA LEVEL RISE PROJECTIONS FOR ARENA COVE, 2020 TO 2150**



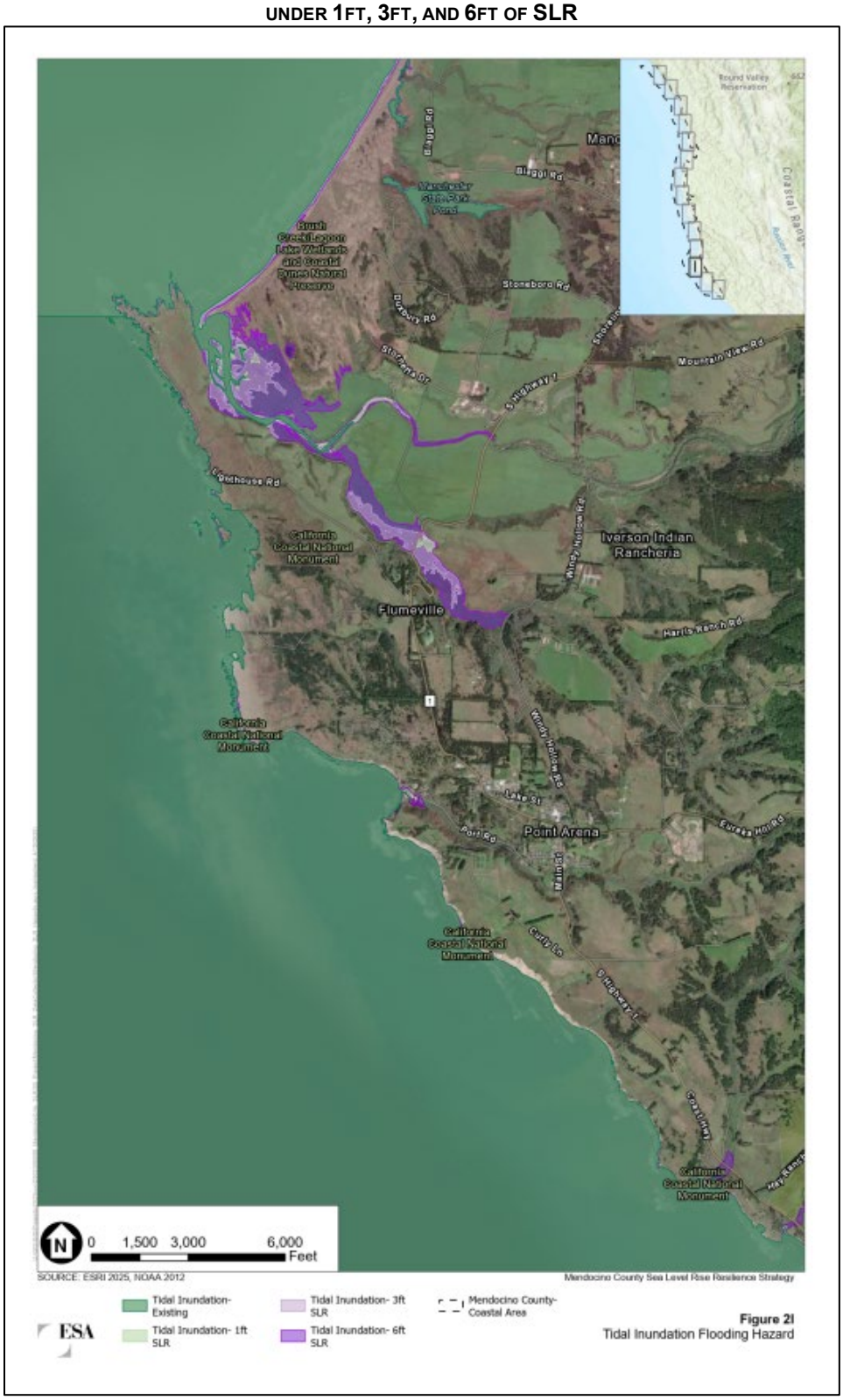

SOURCE: CA OPC 2024

**FIGURE 8**
**EXAMPLE OF STORM FLOODING HAZARDS FOR MENDOCINO COAST, SHOWING EXISTING STORM FLOODING PLUS 1FT, 3FT, AND 6FT OF SLR**




SOURCE: ESA 2025

**FIGURE 9**
**EXAMPLE OF POTENTIAL FOR TIDAL INUNDATION FOR MENDOCINO COAST, UNDER 1FT, 3FT, AND 6FT OF SLR**




SOURCE: ESA 2025

**FIGURE 10**
**EXAMPLE OF POTENTIAL FOR CLIFF EROSION AT 1FT, 3FT, AND 6FT OF SLR, AS WELL AS CLIFF AND DUNE EROSION AT 1 FT, 3FT, AND 6FT OF SLR IN MENDOCINO COUNTY**




SOURCE: ESA 2025

# 3 Inventory of Assets

## 3.1 Preliminary List of Assets

Existing coastal assets were collected from documents and data provided by Mendocino County GIS and other sources. The preliminary list of assets in this document will inform the final asset list that will be used in the vulnerability assessment, and to inform a qualitative ranking of each asset's importance. Assets were preliminarily categorized as critical infrastructure, public access and recreation, habitat resources, historical and cultural resources, and built environment assets.

**TABLE 5**
**PRELIMINARY LIST OF ASSETS**

| Asset | Description |
|---|---|
| **Critical Infrastructure, including water supply, wastewater, energy and transportation assets** | |
| Manchester Trans-Pacific Cable Landing | Internet cable |
| Mendocino Wastewater Treatment Facility | Serving the town of Mendocino |
| Fort Bragg Wastewater Treatment Facility | Serving the town of Fort Bragg |
| Gualala Community Services District (GCSD) Wastewater Treatment Facility | Receives wastewater from the town of Gualala and from the Sea Ranch North pumping facility—which is owned and operated by Sonoma Water |
| Mendocino County Waterworks District 2 | Serving the unincorporated community of Anchor Bay |
| Power plants and other energy transmission infrastructure | Transmission lines along the Mendocino coast, including 115 kV and 60 kV circuits; Substations in Gualala, Point Arena, Elk, Big River, Fort Bragg |
| Communications infrastructure | Including cell phone towers, weather stations, radio towers |
| State Route 1 and State Route 128 | Caltrans facilities, including numerous roadway segments, culverts and bridges that are known to be vulnerable |
| Local Roads | Managed by Mendocino County Public Works Department; including Pt. Cabrillo Drive, near the town of Caspar, locations on Old Coast Highway, Light House Road, Alder Creek Beach Road, Navarro Bluff Road, Spring Grove Road, Brewery Gulch Road, Ocean Drive, North Harbor Drive, South Harbor Drive, Ward Avenue, Omega Drive, Usal Road, and Briceland Road. |
| **Public Access and Recreation assets** | |
| Federal lands | Including King Range National Conservation Area and the California Coastal National Monument |
| Tribal lands | Including Blues Beach |
| State Parks | Including trails, campgrounds and other recreational facilities, such as Sinkyone Wilderness, Westport, Russian Gulch, Jughandle, Mendocino Headlands, Manchester, MacKerricher, Greenwood Creek, Schooner Gulch, Navarro Beach, Van Damme, Caspar Headlands and Inglenook Fen-Ten Mile Beach |
| City Parks | Including trails and parking facilities, such as Glass Beach, Noyo Headlands and Pomo Bluffs |
| Private Campgrounds | Including Anchor Bay Campground, Westport Beach RV Park and Campground, and Albion River Campground |
| Land Trust lands | Including Hare Creek Beach, Navarro Point, Old Smith Ranch, Pelican Bluffs and Seaside Beach |
| California Coastal Trail | Managed primarily by State Parks and other partners |
| California Western Railroad / Mendocino Railway | Managed by Sierra Railroad Company |

| Asset | Description |
|---|---|
| **Habitat and agricultural assets** | |
| Wetlands and environmentally sensitive habitat area (ESHA) | As defined by the California Coastal Act |
| Beaches | Located primarily on public lands |
| Bluffs | Located throughout the county |
| Rivers and estuaries | Located throughout the county |
| Sensitive species populations and their habitats | Including marbled murrelet, tidewater goby, western snowy plover and California red-legged frog |
| Marine Protected Areas (MPAs) | Including Double Cone Rock State Marine Conservation Area, Ten Mile State Marine Reserve, Ten Mile State Marine Conservation Area, MacKerricker State Marine Conservation Area, Point Cabrillo State Marine Reserve, Russian Gulch State Marine Conservation Area, Big River State Marine Conservation Area, Van Damme State Marine Conservation Area, Navarro River Estuary State Marine Conservation Area, Point Arena State Marine Reserve, Sea Lion Cove State Marine Conservation Area, and Saunders Reef State Marine Conservation Area, |
| Areas of Special Biological Significance (ASBS) | Including the King Range ASBS and Jughandle Cove ASBS |
| Critical Coastal Areas | Including MPAs and ASBS |
| Agricultural lands | Specifically those located seaward of State Route 1, including wineries |
| **Historical and cultural resources** | |
| Navarro-by-the-Sea Center | Historic property managed by a non-profit |
| Point Cabrillo Lighthouse | Managed by State Parks |
| Point Arena Lighthouse | Managed by State Parks |
| Westport Cemetery | |
| Albion River Bridge | Managed by Caltrans |
| **Built Environment, including residential and commercial** | |
| Existing Commercial / Residential Development | Including commercial areas, residential areas, vacation home rentals and hotels seaward of State Route 1 in Westport, Arena Cove, Gualala and other locations, such as Ocean Lake Adult Mobile Homes |
| Public Services facilities, such as police stations, fire stations, hospitals, elder care facilities, daycare facilities, schools, churches and government buildings | Specifically those located seaward of State Route 1 |
| Coastal-dependent development | Including wharfs, ports, marinas, and commercial and recreational fishing areas and facilities |
| Contaminated lands | Including Department of Toxic Substances Control Cleanup Site 5812 |
| Coastal armoring | As documented in the Coastal Commission's coastal armoring database |