CALIFORNIA COASTAL COMMISSION
NORTH COAST DISTRICT OFFICE
1385 EIGHTH STREET, SUITE 130
ARCATA, CA 95521
VOICE (707) 826-8950
FAX (707) 826-8960

W10a

CALTRANS INFORMATIONAL BRIEFING

EXHIBITS

Exhibit 1 – CDP 1-18-1078 Special Condition 1, Baseline and Annual Reports (5/1/2020)

Exhibit 2 – CDP 1-18-1078 Special Condition 1, Annual Report (5/1/2021)

Exhibit 3 – CDP 1-18-1078 Special Condition 1, Annual Report (5/10/2022)

Exhibit 4 – CDP 1-18-1078 Special Condition 1, Annual Report (5/10/2023)

M e m o r a n d u m

Making Conservation a California Way of Life

To: California Coastal Commission
1385 Eighth Street, Ste. 130
Arcata, CA 95521

Date: May 1, 2020

File: Eureka-Arcata Highway101
Corridor Improvement Project
HUM 101 / 79.9/86.3
01-36600 / 0100000127

From: Jason Meyer
Senior Environmental Planner
North Region Environmental

SUBJECT: CDP 1-18-1078 Special Condition 1, Baseline and Annual Reports

Special Condition 1. Sea Level Rise and Flooding Impact Monitoring and Reporting

Coastal Development Permit (CDP)1-18-1078 was issued to the California Department of Transportation by the California Coastal Commission on September 12, 2019. The permit covers the Eureka-Arcata U.S. Highway 101 Corridor Improvement Project, which consists of five component projects within a six-mile segment of Highway 101 along the east side of Humboldt Bay. In accordance with CDP 1-18-1078, Special Condition 1, the California Department of Transportation (Caltrans) is submitting the Sea Level Rise and Flooding Impact Monitoring Reports. This document contains the Baseline and the 2020 Annual Report.

The Baseline Report identifies existing water elevation conditions in Humboldt Bay at the North Spit Tide Gauge which provides data applicable to the U.S. Highway 101 Corridor (Corridor) segment. The Baseline Report presents data from April 1, 2019 through March 31, 2020. Additionally, the Baseline Report discusses locations established from which to take reference photographs to annually document King Tides and other extreme tidal events along the Corridor. Photographs of King Tide events from winter 2019/2020 are included.

The 2020 Annual Report documents the same set of water elevation data from the North Spit Tide Gauge as the Baseline Report. Subsequent Annual Reports will utilize the Baseline Report data to identify changes in water elevation conditions over time. Annual Reports include descriptions of any coastal hazards impacts to highway infrastructure along the Corridor, actions taken to address any impacts, and documentation of any closures within the Corridor during the annual reporting period, April 1 through March 31. The Annual Report also provides an update

on progress made in developing the Comprehensive Adaptation and Implementation Plan required by CDP 1-18-1078 Special Condition 2.

A. Baseline Report

A.1. Water Elevation

Water elevation baseline data was accessed for the North Spit Tide Gauge from the NOAA website (NOAA, April 2020) and referenced to NAVD88. The reporting period for this report is April 1, 2019 to March 31, 2020. Monthly maximum water elevations ranged from 7.67 feet to 8.86 feet. The highest observed tide of 8.86 feet was recorded on December 25, 2019. The mean monthly maximum water elevation for the reporting period was 8.21 feet (Figure 1). Monthly mean sea level ranged from 3.66 feet to 3.99 feet with a mean of 3.80 feet for the reporting period (Figure 2).

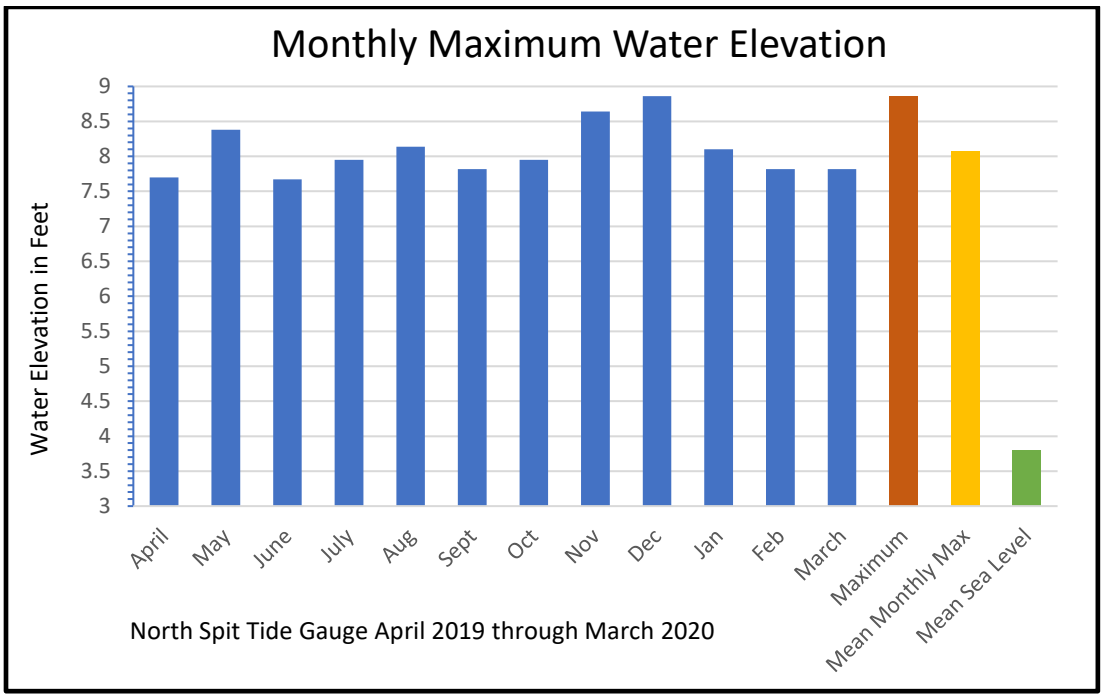


Figure 1 ***Monthly Maximum Water Elevation*** *shows the maximum water elevation by month at the North Spit Tide Gauge from April 1, 2019 to March 31, 2020. Monthly maximum and monthly mean sea level data were collected from the NOAA Tides and Currents webpage. Mean Monthly Maximum and Mean Sea Level were calculated using the NOAA data.*

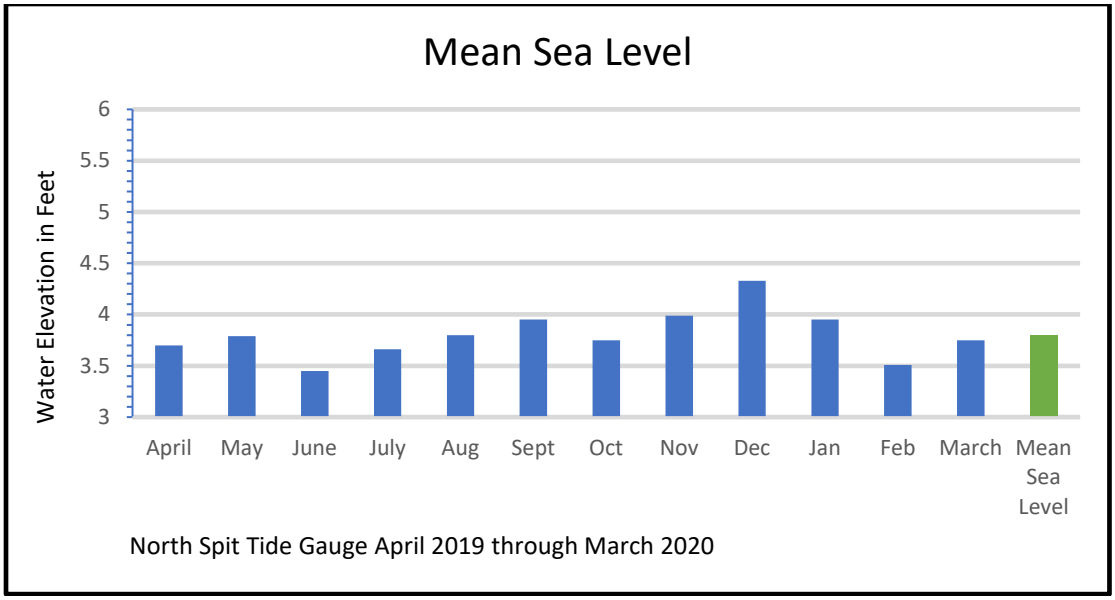


Figure 2 ***Mean Sea Level*** *at the North Spit Tide Gauge for April 1, 2019 through March 31, 2020 was calculated from available monthly sea level means from the NOAA Tides and Currents webpage.*

A.2. Reference Photograph Locations

Reference locations for photographing annual King Tide and extreme tidal events along the Corridor are organized in this Baseline Report in such a way as to easily facilitate replicating photos for future reports from approximately the same location and vantage point (Figure 3, Appendix A). Location selection criteria included accessibility and safety, vulnerability to flooding (Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions, 2019), and locations representing various shoreline cover and land use (Table 1).

For each of the ten selected locations, two to four photo sites were established (Appendix B). Site reference photos for Gannon Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Ave were taken close to high tide on December 23, 2019. Weather conditions were clear with an average wind speed of 2.8 miles per hour and no precipitation. The previous day saw 1.23 inches of precipitation (National Weather Service - Climate Date, Eureka CA Station). Site reference photos for Fay Slough were taken during the King Tide event on January 10, 2020. Weather conditions were cloudy with an average wind speed of 4.6 miles per hour and very minimal precipitation of 0.12 inches for the day. Light precipitation of 0.28 inches was recorded for the previous day. (NWS).

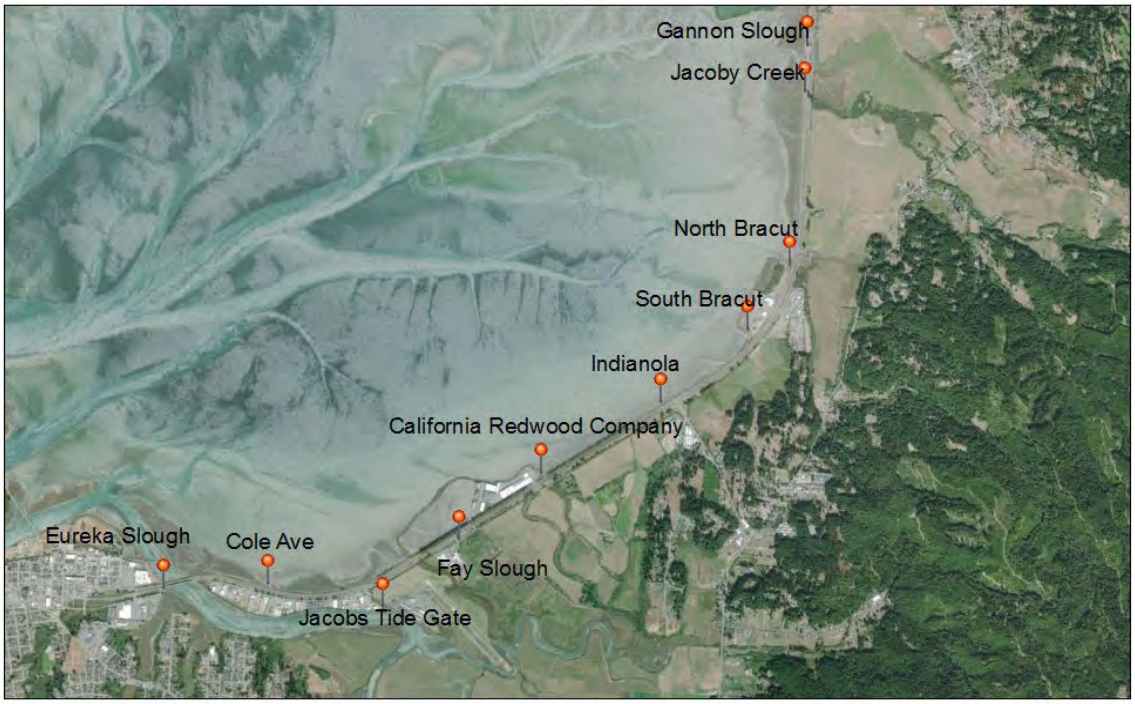


Figure 3 ***Photo Documentation Locations*** *along the Eureka-Arcata 101 Corridor.*

Table 1. Location Selection Criteria

	Accessibility and Safety	Vulnerability to Flooding	Shoreline Cover	Adjacent Land Use / Zoning
Gannon Slough	Good, *Bay Trail*	moderate-high	salt marsh, slough channel	Trail/Natural Resources (NR)
Jacoby Creek	Good, *Bay Trail*	moderate-high	salt marsh, creek channel	Trail/NR
North Bracut	Fair, *behind Bayside Garden Supply*	moderate-high	Bracut dike, railroad grade, vegetation	Businesses/NR and Industrial General
South Bracut	Fair, *near California Trailers*	moderate	Bracut dike, railroad grade, salt marsh	Businesses/NR and Industrial General
Indianola	Caution, *shoulder*	moderate	railroad grade, rock, exposed with areas of erosion	Future Trail/NR
California Redwood Company	Fair, *entrance to CRC*	moderate-high	railroad grade, salt marsh, rock, CRC levee to the south	Future Trail/ NR, Industrial General
Jacobs Tide Gate	Fair, *Airport Rd*	low-moderate	Jacobs Ave south side levee, rock protection	Businesses/Service Commercial
Eureka Slough	Good, *Eureka Waterfront Trail*	high	bank of Eureka Slough, rock, vegetation	Trail/Service Commercial/NR
Cole Ave	Caution, *shoulder*	high	railroad grade, rock, erosion bound by salt marsh to north and south	Future Trail/NR
Fay Slough	Fair, *CDFW parking lot*	subject to inland flooding from Fay Slough	roadside ditch paralleling hwy 101 north	Businesses/Service Commercial/ Coastal Agricultural

B. Annual Report

B.1. Water Elevation

Water elevation data for the 2020 Annual Report reporting period is the same as the Baseline Report as no previous Annual Reports have been completed. Therefore, there are no differentiations or new record maximum elevations to report. Refer to Figures 1 and 2.

B.2. Coastal Hazard Impacts

One temporary ramp closure was documented near the Corridor during the reporting period. A localized heavy precipitation event on September 18, 2019 impacted the State Route 255 southbound onramp onto U.S. Highway 101 near post mile (PM) 85.70. A culvert at this location was unable to accommodate the volume of precipitation, causing debris to accumulate on the shoulder. Debris clean up the following day, September 19, required temporary closure of the ramp for about half a day (Appendix E). This incident was not related to sea level rise. High tide recorded for September 18, 2019 was 7.06 feet.

King Tides for winter 2019/2020 took place January 10, 11, 12 and February 8 and 9, 2020. Caltrans staff photographed King Tide conditions from the established reference locations along the Corridor on January 10 and 11 and February 8, 2020 (Appendix C). Using high tide prediction tables published on the NOAA website, three-hour work windows were identified for when to best document King Tide conditions to capture the highest predicted tide for each day. Three teams of two staff were scheduled three hours each to document tides.

January 10 weather conditions were cloudy with an average wind speed of 4.6 miles per hour and very minimal precipitation of 0.12 inches. Light precipitation of 0.28 inches was recorded for the previous day. Maximum high tide from the North Spit Tide Gauge was 7.88 feet. January 11 weather conditions were mostly cloudy with an average wind speed of 7.3 miles per hour and very minimal precipitation of 0.11 inches. Very minimal precipitation of 0.12 inches was recorded for the previous day. Maximum high tide on January 11 was 8.10 feet. February 8 weather conditions were clear with an average wind speed of 13.1 miles per hour and very minimal precipitation of 0.02 inches. No precipitation

was recorded for the previous day (National Weather Service – Climate Data Eureka CA Station). February 8 high tide was verified as 7.84 feet.

In addition to documenting King Tides, Caltrans staff made efforts to document any observed extreme conditions and locations of erosion. These Additional Photos are included in Appendix D.

B.3. Adaption and Hazards Response

During the reporting period Caltrans implemented one temporary on-ramp closure near the northern end of the Corridor (see above). The hazard impact was due to heavy precipitation and not related to sea level rise. The Caltrans response involved a simple clean up of some debris by maintenance staff.

Additionally, no repair or maintenance was performed by Caltrans or other entities on dikes or berms that protect the highway. No impacts are anticipated that would require a planned response, an amendment to CDP 1-18-1078, or a separate CDP application before the next monitoring cycle.

B.4. Adaptation Plan Progress

Caltrans staff are addressing the requirements of the Comprehensive Adaptation and Implementation Plan (CAIP) required by CDP 1-18-1078 Special Condition 2. Strategies are being developed for thorough data collection and analysis, communication within the Department to ensure input from technical specialists, and collaboration with stakeholders in the region.

An analysis of current hazards in the Corridor including the collection of data provided in the Baseline and 2020 Annual Report and future Annual Reports will provide documentation of water elevation changes over time and highlight any areas of frequent flooding or other coastal hazards. Caltrans is using this information to help identify vulnerabilities in the Corridor and inform upcoming project design as well as long term sea level rise planning.

Two new staff positions have been created and are currently in the hiring process. One position within the Caltrans District 1 Planning Department to focus on the development of long term sea level rise adaptations, working on the Comprehensive Adaptation and Implementation Plan, and coordinating with

outside entities (County, Cities and private). And one position within the North Region Environmental project delivery office to function as a liaison between the California Coastal Commission and the Department. This position will coordinate with Coastal Staff and project staff to facilitate Coastal Development Permits, ensuring Caltrans staff are providing the information Coastal Staff need, and providing direction early in the process as to what issues the Coastal Commission may have with projects and how the project can be designed to address those issues. Both of these positions will continue work on sea level rise adaptations within District 1.

To assist in the identification of vulnerabilities throughout the Corridor, Caltrans is also exploring hiring a Geology graduate student from Humboldt State University (HSU). The student's master's thesis would contribute to Caltrans' vulnerability assessment. This work would assist Caltrans in developing amendment alternatives aimed at evaluating potential accommodation strategies to identified vulnerabilities and provide an opportunity for the assessment to be reviewed by scientific experts in relevant fields.

Caltrans has also engaged HSU students from the Senior Planning Practicum Course to provide a report on the status of sea level rise planning in the Humboldt Bay area. The report would identify stakeholders to be involved in sea level rise adaptation planning for the Corridor. Governmental and non-governmental agencies, private business owners, landowners, and residents would be interviewed to identify concerns and needs, current actions being taken to address sea level rise, perceptions of local sea level rise planning efforts, and what they would like to see in an outreach strategy. This would help inform Caltrans of the various entities they will need to contact for sea level rise planning collaboration and would identify approaches for successful outreach and education campaigns.

Caltrans is also working with Humboldt County, and funded a grant to study sea level rise in the southern portion of the Eureka/Arcata Corridor. The County has been working with local consultants developing models for potential scenarios and reaching out to various stakeholders. Caltrans plans to build on this information and continue reaching out to and working with the various stakeholders.

A timetable for implementation of the CAIP will be developed as planners collect additional data, assess identified vulnerabilities, and consult with technical experts throughout the Department. As sea level rise projections are updated based on best available science, the timetable will be modified.

B.5. Flood Events

No flooding from the Bay was documented during the reporting period. Inland flooding near State Route 255/U.S. Highway 101 interchange on September 18, 2019 is described in section B.2 and documented in Appendix E.

C. Frequent Flood Event Report

The roadway was temporarily closed once during the reporting period due to a localized heavy precipitation event not related to sea level rise (Appendix E).

Appendices:
A- King Tide Photo Locations
B- King Tide Reference Photos
C- King Tide Photos 1/10-11/20 and 2/8/20
D- Additional Hazards Photos
E- Flooding, Erosion, and Coastal Impact Report
F- NOAA and NWS Data

References:

California Department of Transportation (Caltrans). 2019. *Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions*. May 2019.

Observed Weather Reports (2020, April). In *National Weather Service*. Retrieved April 3, 2020, from https://w2.weather.gov/climate/index.php?wfo=eka

Water Level Reports (2020, April). In *NOAA Tides and Currents*. Retrieved April 3, 2020, from https://tidesandcurrents.noaa.gov/reports.html?id=9418767

DEPARTMENT OF TRANSPORTATION
NORTH REGION ENVIRONMENTAL
DISTRICT 1
1656 UNION STREET
EUREKA, CA 9550
(707) 572-7039
www.dot.ca.gov
TTY 711

Making Conservation a California Way of Life.

May 1, 2021

California Coastal Commission
1385 Eighth Street, Ste. 130
Arcata, CA 95521

File: Eureka-Arcata Highway 101 Corridor Improvement Project
HUM 101 / PMS 79.9 / 86.3
01-36600 / 0100000127

SUBJECT: CDP 1-18-1078 Special Condition 1, 2021 Annual Report

Special Condition 1. Sea Level Rise and Flooding Impact Monitoring and Reporting

Coastal Development Permit (CDP) 1-18-1078 was issued to the California Department of Transportation by the California Coastal Commission on September 12, 2019. The permit covers the Eureka-Arcata U.S. Highway 101 Corridor Improvement (Corridor) Project, which consists of five component projects within a six-mile segment of U.S. Highway 101 along the east side of Humboldt Bay. In accordance with CDP 1-18-1078, Special Condition 1, the California Department of Transportation (Caltrans) is submitting the Sea Level Rise and Flooding Impact Monitoring Report. This 2021 Annual Report references the Baseline Report, which was submitted to California Coastal Commission staff on May 1, 2020.

The Baseline Report identified existing water elevation conditions in Humboldt Bay at the North Spit Tide Gauge, which provides data applicable to the Corridor. The Baseline Report presents data from April 1, 2019, through March 31, 2020. Additionally, the Baseline Report established locations from which to take reference photographs to annually document King Tides and other extreme tidal events along the Corridor. The reference photographs, photographs of King Tide events from winter 2019/2020 and winter 2020/2021 are included in the 2021 Annual Report.

The 2021 Annual Report documents data from April 1, 2020, through March 31, 2021. The Annual Report presents water elevation data for the reporting period from the North Spit Tide Gauge. The Baseline Report data is referenced to identify changes in water elevation conditions over time. Additionally, the Annual Report documents any closures due to flooding during the reporting period and includes a brief discussion of any coastal hazards impacts to highway infrastructure along the Corridor. The 2021 Annual Report also provides an update on progress made in developing the Comprehensive Adaptation and Implementation Plan (CAIP) required by CDP 1-18-1078, Special Condition 2.

Jason Meyer
Senior Environmental Planner

A. Baseline Report

A.1. Water Elevation

Water elevation baseline data was accessed for the North Spit Tide Gauge from the National Oceanic and Atmospheric Administration (NOAA) website (NOAA, April 2020, Appendix A) and referenced to NAVD88. The reporting period for the Baseline Report is April 1, 2019, to March 31, 2020. Monthly maximum water elevations ranged from 7.67 feet to 8.86 feet. The highest observed elevation of 8.86 feet was recorded on December 25, 2019. The mean monthly maximum water elevation for the reporting period was 8.07 feet (Figure 1). Monthly mean sea level for the baseline reporting period ranged from 3.66 feet to 3.99 feet with a mean of 3.80 feet for the reporting period (Figure 2).

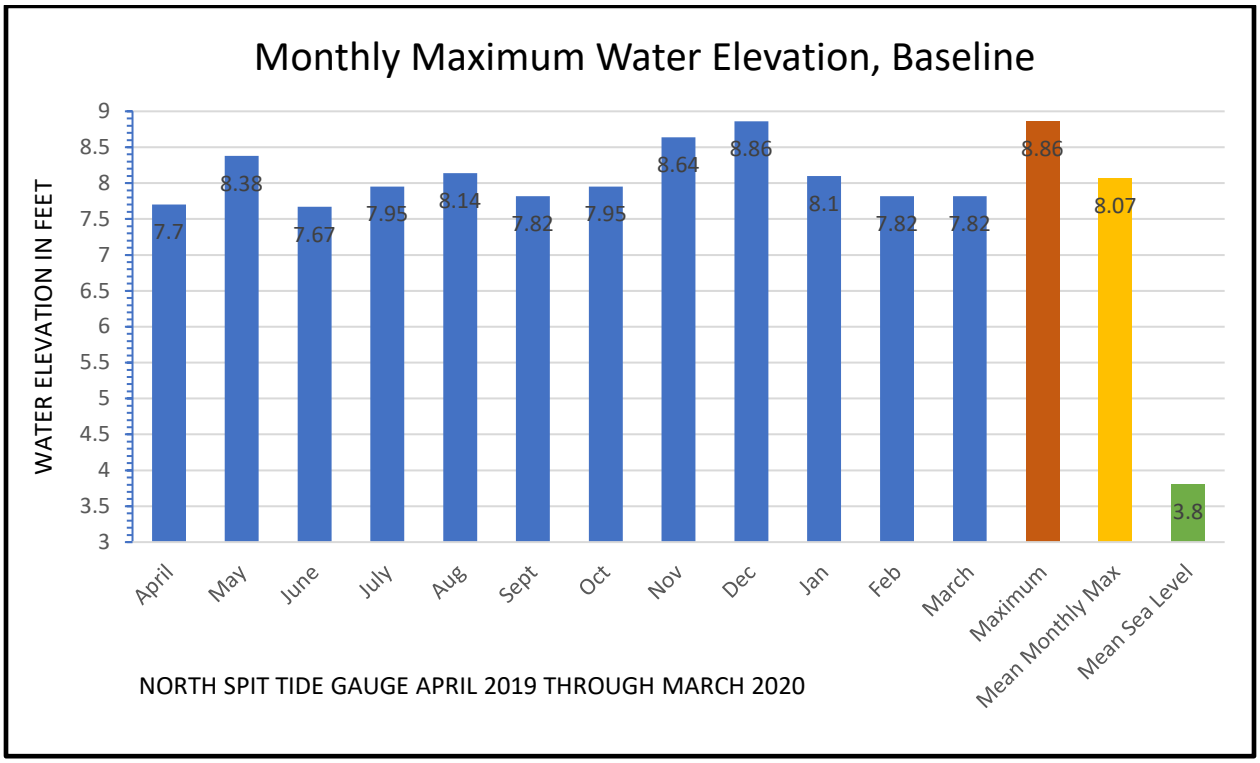


Figure 1. ***Monthly Maximum Water Elevation, Baseline*** *shows the maximum water elevation by month at the North Spit Tide Gauge from April 1, 2019, to March 31, 2020. Monthly maximum and monthly mean sea level data were accessed from the NOAA Tides and Currents webpage. Mean Monthly Maximum and Mean Sea Level were calculated using the NOAA data.*

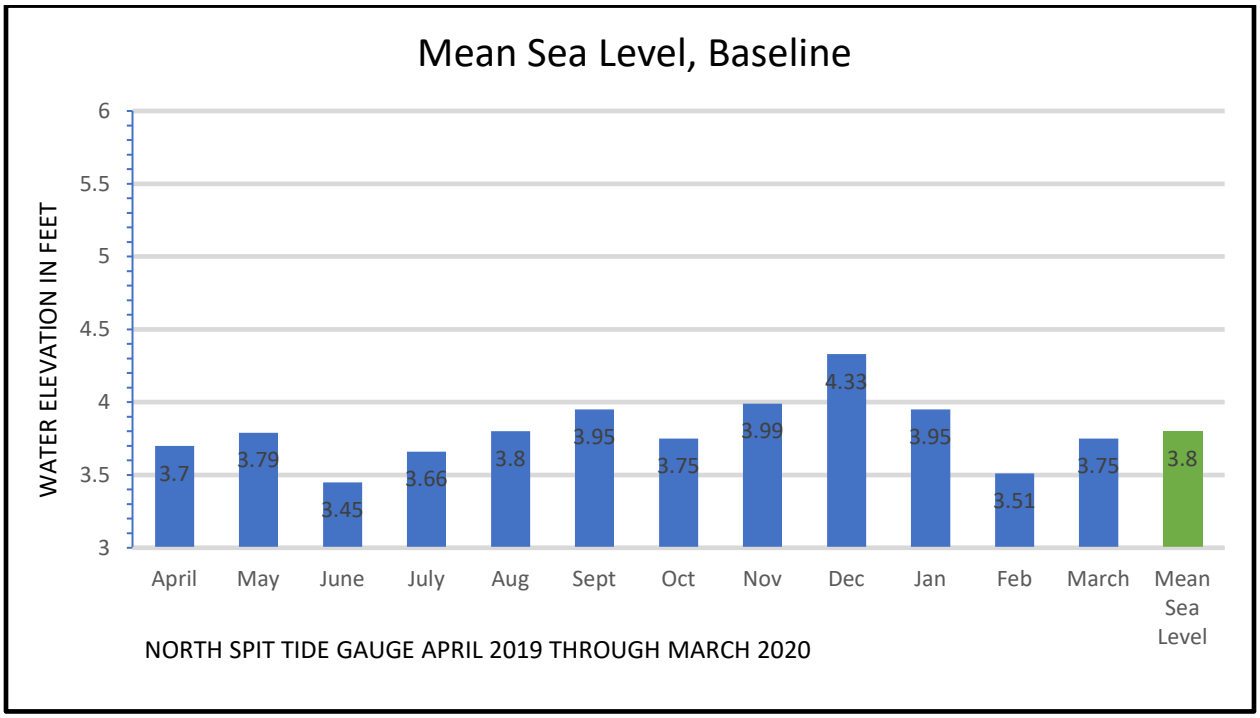


Figure 2. ***Mean Sea Level, Baseline*** *at the North Spit Tide Gauge for April 1, 2019, through March 31, 2020, was calculated from available monthly sea level means from the NOAA Tides and Currents webpage.*

A.2. Reference Photograph Locations

Reference locations for photographing annual King Tide and extreme tidal events along the Corridor are organized to easily facilitate replicating photos for the Annual Reports from approximately the same location and vantage point as the Baseline Report (Appendix B). Photograph location selection criteria included accessibility and safety, vulnerability to flooding (Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions, 2019), and locations representing various shoreline cover and land use (Appendix B).

For each of the ten selected reference locations, two to four specific photo sites were established (Appendix C). Site reference photos for Gannon Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Avenue were taken close to high tide on December 23, 2019. The National Weather Service Daily Climate Report

(NWS, Observed Weather, Eureka CA Station, Appendix A) reported December 23, 2019, weather conditions as clear with an average wind speed of 2.8 miles per hour and no precipitation. The previous day saw 1.23 inches of precipitation. Site reference photos for Fay Slough were taken during the King Tide event on January 10, 2020. Weather conditions were cloudy with an average wind speed of 4.6 miles per hour and very minimal precipitation of 0.12 inch. Light precipitation of 0.28 inch was recorded for the previous day (NWS).

B. Annual Report

B.1. Water Elevation

Water elevation data for the 2021 Annual Report was accessed for the North Spit Tide Gauge from the NOAA Tides and Currents website (NOAA, April 2021, Appendix A) and referenced to NAVD88. The reporting period for the 2021 Annual Report is April 1, 2020, through March 31, 2021. Monthly maximum water elevations ranged from 7.71 feet to 8.65 feet (Figure 3). The highest reported water elevation of 8.65 feet was observed on November 16, 2020, and January 12, 2021. This monthly maximum elevation is 0.21 feet lower than the monthly maximum elevation from the Baseline Report. The mean monthly maximum water elevation for the reporting period was 8.10 feet (Figure 3). Mean monthly maximum water elevation for the 2021 Annual Reporting period is 0.03 feet higher than the Baseline. (Figure 4).

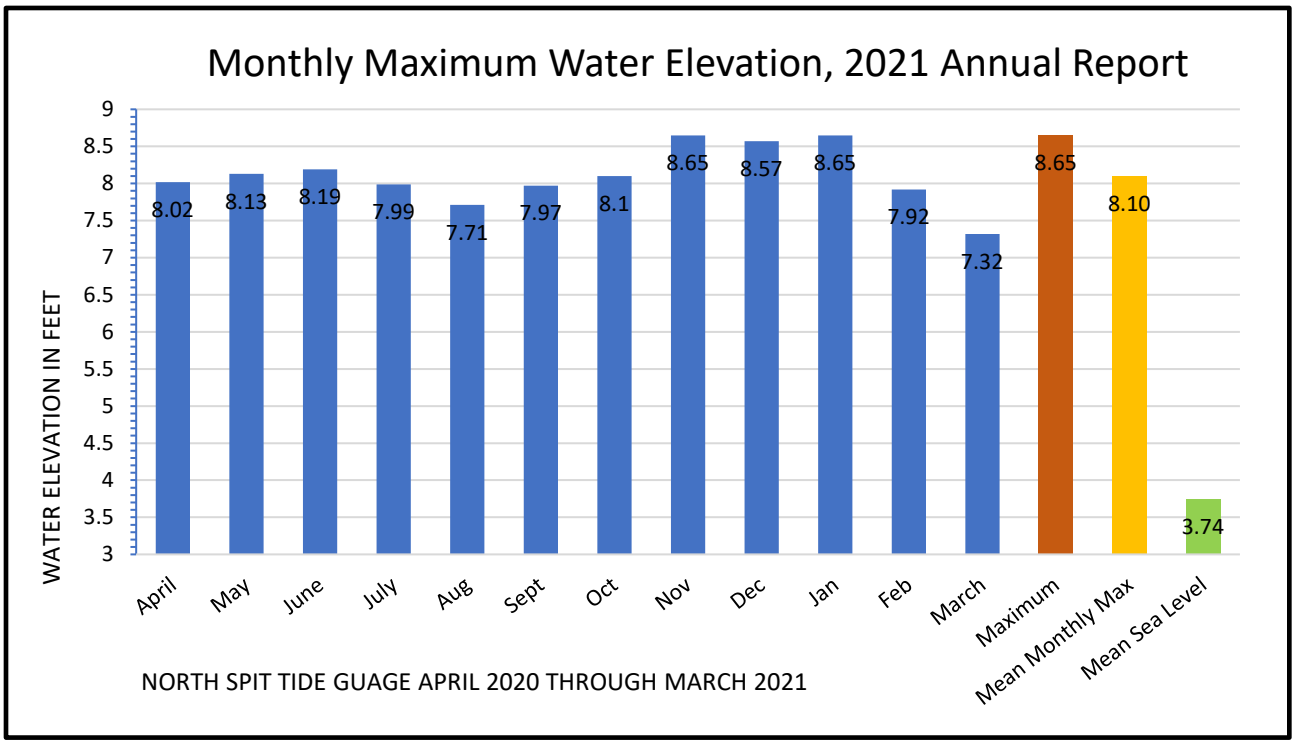


Figure 3. ***Monthly Maximum Water Elevation, 2021 Annual Report*** *shows the maximum water elevation by month at the North Spit Tide Gauge from April 1, 2019, to March 31, 2020. Monthly maximum and monthly mean sea level data were accessed from the NOAA Tides and Currents webpage. Mean Monthly Maximum and Mean Sea Level were calculated using the NOAA data.*

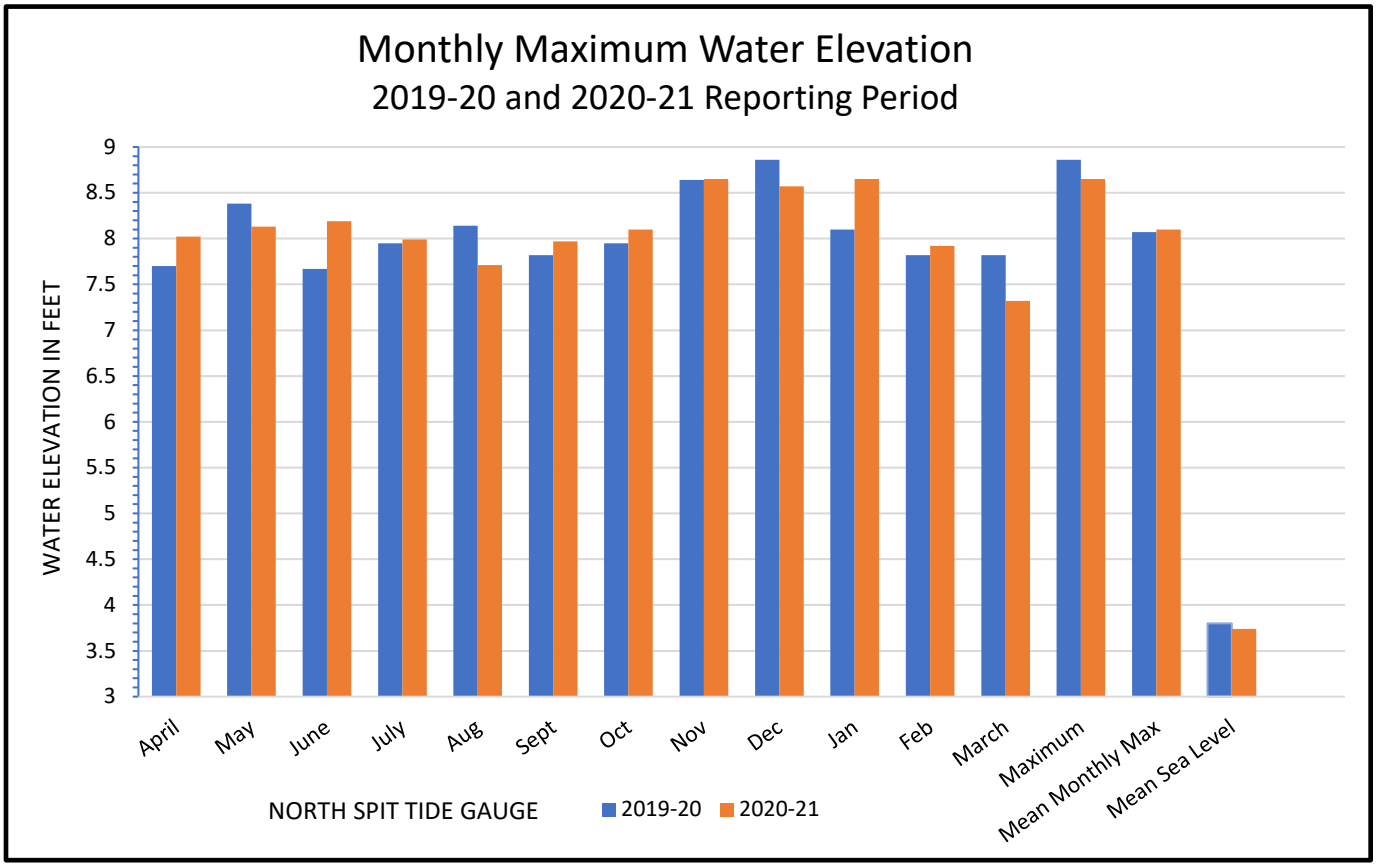


Figure 4. ***Monthly Maximum Water Elevation for the Baseline and 2021 Annual Report*** *shows the maximum water elevation by month at the North Spit Tide Gauge for the Baseline: April 1, 2019 to March 31, 2020 and for the 2021 Annual Report: April 1, 2020 through March 31, 2021. The maximum water elevation, mean monthly maximum, and mean sea level for both reporting periods are also represented.*

Monthly mean sea level for the reporting period ranged from 4.05 feet to 3.54 feet. Mean sea level for the 2021 Annual Report was 3.74 feet (Figure 5). In comparison, the mean sea level reported for the Baseline is 3.8 feet, 0.06 feet higher than the mean sea level for this 2021 Annual Report (Figure 6).

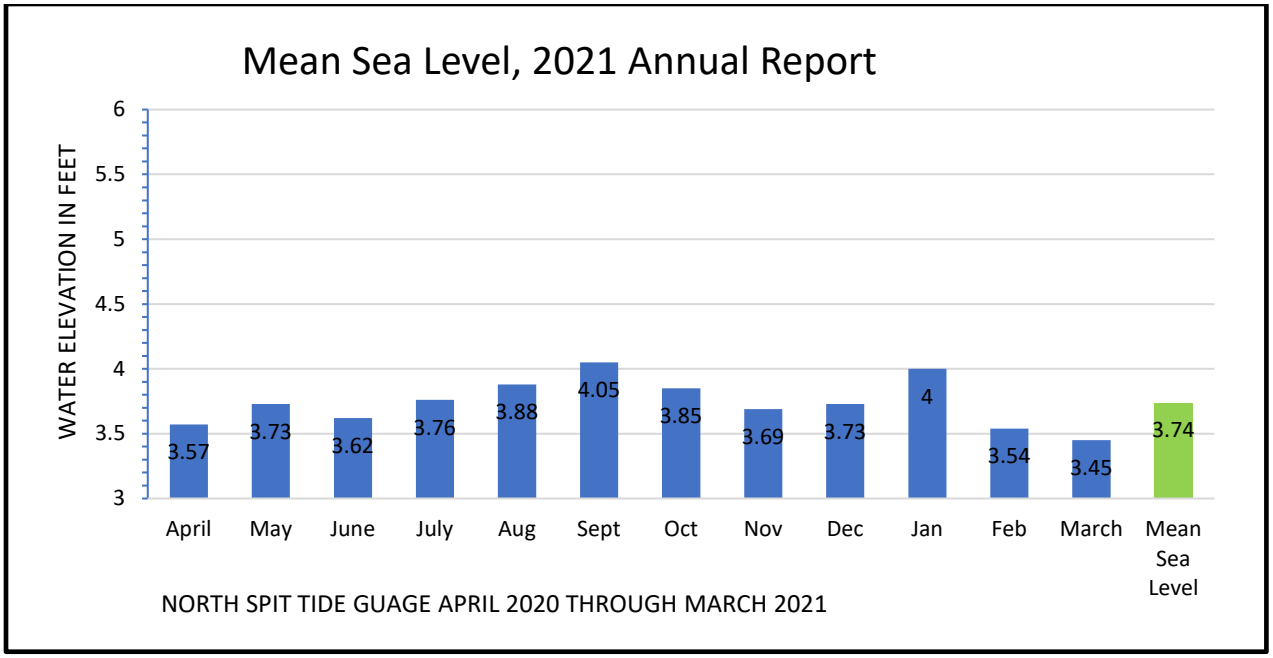


Figure 5. ***Mean Monthly Sea Level*** *at the North Spit Tide Gauge for April 1, 2020, through March 31, 2021, was calculated from available monthly sea level means from the NOAA Tides and Currents webpage.*

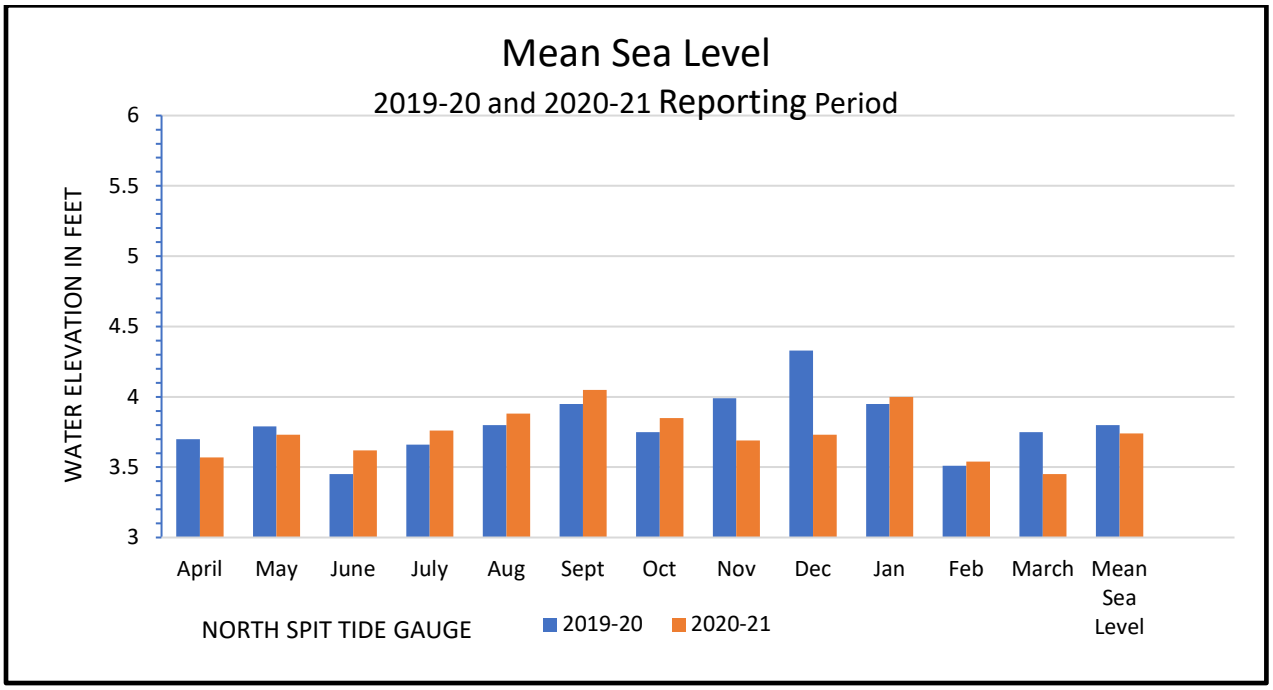


Figure 6. ***Mean Sea Level*** *for the Baseline and the 2021 Annual Report at the North Spit Tide Gauge for April 1, 2019, through March 31, 2020, and April 1, 2020, through March 31, 2021, was calculated from available monthly sea level means from the NOAA Tides and Currents webpage.*

B.2. Coastal Hazard Impacts

No impacts to highway infrastructure within the US. Highway 101 Corridor occurred during the reporting period. No temporary or ongoing flooding was observed and no weather-related incidents such as erosion, overtopping of dikes, or tide gate failures impacted the Corridor. Ponding near the Jacoby Creek Bridge occurred during a period of precipitation due to construction activities at that site. The ponding was remedied by restoring drainage patterns impacted by placement of temporary construction fill.

King Tides for winter 2020/2021 took place December 13, 14, and 15, 2020, and January 11 and 12, 2021. Caltrans staff photographed King Tide conditions from the established reference locations along the Corridor on December 14, 2020, and January 12, 2021 (Appendix C). Using the high tide prediction tables published on the NOAA website, three-hour work windows were identified for when to best document King Tide conditions to capture the highest predicted tide for each day. Three Caltrans staff were scheduled three hours each per day to document the King Tides.

Weather conditions on December 14, 2020, were clear and calm with an average wind speed of 0.9 miles per hour and trace precipitation. Previous day precipitation was measured at 0.73 inch (NWS). Maximum December 14 high tide at the North Spit Tide Gauge was 8.15 feet (NOAA). Weather conditions on January 12, 2021, were cloudy with an average wind speed of 11.5 miles per hour and total precipitation of 0.81 inch for the day. Trace precipitation was recorded the previous day. Maximum high tide on January 12 was 8.65 feet.

In addition to documenting King Tides, Caltrans staff tried to document any observed extreme conditions and locations of erosion within the Corridor. These additional photos are included in Appendix C.

B.3. Adaption and Hazards Response

During the reporting period, Caltrans did not implement any weather- or flooding-related closures within the Corridor.

Additionally, no repair or maintenance was performed by Caltrans or other entities on dikes or berms that protect the highway. No impacts have been identified that would require a planned response, an amendment to CDP 1-18-1078, or a separate CDP application before the next monitoring cycle.

B.4. Adaptation Plan Progress

Coastal Development Permit 1-18-1078, Special Condition 2, directs Caltrans to develop the Comprehensive Adaptation and Implementation Plan (CAIP) to address long-term sea level rise within the Corridor by identifying strategies for protecting, relocating, or adapting the development authorized by CDP 1-18-1078. In 2020, Caltrans created and filled two new staff positions to work in concert to coordinate sea level rise efforts in District 1. The first, a senior environmental planner position within District 1 Planning, will focus on development of the CAIP and coordinating with stakeholders to develop long-term sea level rise adaptation planning. The second position, a senior environmental planner position within North Region Environmental, will function as a liaison between Caltrans and the California Coastal Commission.

Caltrans staff are addressing the components of Special Condition 2 and are developing strategies for thorough data collection and analysis. Staff have been identified to participate in an internal Climate Change Working Group and continue to participate with collaborators and stakeholders in Humboldt County. Caltrans is in the process of joining a sea level rise public participation group affiliated with the Humboldt State Sea Level Rise Initiative. This group is currently developing a schedule of meetings to include the nearly 20 agencies that have expressed interest in participating. Caltrans is also participating in a Technical Working Group on Natural Shoreline Infrastructure in Humboldt Bay for Intertidal Coastal Marsh Restoration and Transportation Corridor Protection hosted by Humboldt County and GHD.

Caltrans partnered with Humboldt County to fund a sea level rise study (Phase 1), which was limited to the shoreline of Humboldt Bay at the northeastern side of the City of Eureka. The County of Humboldt worked with a consultant team and contacted various stakeholders to develop models for potential scenarios. Caltrans has developed a scope of work to complete Phase 2, which would build on this information and expand the study area to include all portions of the Corridor.

Caltrans Headquarters is working with District 1 on a public engagement plan and has completed Adaptation Priorities Reports for each district. These reports include a prioritized list of potentially exposed assets in each Caltrans district. The prioritization methodology in these reports considers factors such as the timing of the climate impacts, their severity and extensiveness, the condition of each asset (a measure of the sensitivity of the asset to damage), the number of system users affected, and the level of network redundancy in the area. Prioritization scores are generated for each potentially exposed asset based on these factors and used to rank them. These reports were preceded by Climate Change Vulnerability Assessments (2019) that described climate change effects in each district and provided a high-level review of potential climate change impacts to each portion of the State Highway System.

To help identify vulnerabilities specific to the Corridor, Caltrans hired a Geology graduate student from Humboldt State University (HSU). The student's master's thesis will contribute to Caltrans' vulnerability assessment through conducting geological research and modeling to assess potential hazards linked to sea level rise along the Corridor. Geological research activities will include three broad components: leveling, geologic/geomorphic mapping and LiDAR differencing, and groundwater. A leveling analysis to identify how the vertical land motion (VLM) varies along the Corridor will be conducted and applied to sea level rise predictions. This work will assist Caltrans in developing amendment alternatives aimed at evaluating potential accommodation strategies to identified vulnerabilities and provide an opportunity for the assessment to be reviewed by scientific experts in relevant fields.

In 2020, Caltrans also engaged HSU students from the Senior Planning Practicum Course to provide a report on the status of sea level rise planning in the Humboldt Bay area. The report identified stakeholders involved in sea level rise adaptation planning for the Corridor. Governmental and non-governmental agencies, private business owners, landowners, and residents were interviewed to identify concerns and needs, current actions being taken to address sea level rise, perceptions of local sea level rise planning efforts, and what they would like to see in an outreach strategy. This helped inform Caltrans of the entities they will need to contact for sea level rise planning collaboration and identified approaches for successful outreach and education campaigns. In March 2021, Caltrans staff were interviewed by planning students for a similar course at HSU.

An analysis of current hazards in the Corridor, including the collection of data provided in the Baseline and 2021 Annual Report and future Annual Reports, will provide documentation of water elevation changes over time and highlight any areas of frequent flooding or other coastal hazards. Caltrans is using this information to help identify vulnerabilities in the Corridor and inform upcoming project design and long-term sea level rise planning.

A timetable for implementation of the CAIP will continue to be developed as staff collect additional data, assess identified vulnerabilities, and consult with technical experts throughout the Department. As sea level rise projections are updated based on best available science, the timetable will be modified.

B.5. Flood Events

No flooding or road closure events occurred during the reporting period.

C. Frequent Flood Event Report

The roadway was not closed during the reporting period; therefore no Frequent Flood Event Report is included with this Annual Report..

References

California Department of Transportation (Caltrans). 2019. *Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions*. May 2019.

Observed Weather Reports (April 2020 and 2021). In *National Weather Service*. Retrieved from https://w2.weather.gov/climate/index.php?wfo=eka

Water Level Reports (April 2020 and 2021). In *NOAA Tides and Currents*. Retrieved from https://tidesandcurrents.noaa.gov/reports.html?id=9418767

Appendix A

NOAA Tides and Current Data and NWS Climate Data

NOAA Tides and Currents Data

Apr 30 2021 16:53 GMT

MAXIMUM, MINIMUM WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 9418767 T.M.: 0 W
Name: North Spit, CA Units: Feet
Type: Mixed Datum: NAVD
Note: [] Inferred Water Level Value Quality: Verified

2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	3.95	3.51	3.75	3.57	3.73	3.62	3.76	3.88	4.05	3.85	3.69	3.73	
Maximum	8.10	7.82	7.82	8.02	8.13	8.19	7.99	7.71	7.97	8.10	8.65	8.57	
Max Day	21	8	13	10	9	5	22	19	20	18	16	13	
Max Time	16:36	18:30	10:12	08:54	08:18	06:24	07:54	07:06	21:36	20:18	19:36	17:54	
Minimum	-1.83	-2.05	-1.11	-1.10	-1.66	-1.85	-1.72	-1.26	-0.32	-1.35	-1.88	-2.37	
Min Day	12	10	10	10	8	7	5	3	16	20	16	16	
Min Time	02:42	02:06	01:42	15:24	14:18	14:48	13:48	13:30	12:42	03:54	01:54	02:24	

2021	Jan	Feb	Mar	Annual
Mean	4.00	3.54	3.45	
Maximum	8.65	7.92	7.32	
Max Day	12	11	4	
Max Time	18:36	19:06	11:12	
Minimum	-1.84	-1.70	-1.13	
Min Day	14	28	1	
Min Time	02:18	02:00	02:36	

*The monthly max/min report information is based on high/low tides only.

Apr 22 2021 18:09 GMT

MAXIMUM, MINIMUM WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 9418767
T.M.: 0 W
Name: North Spit, CA
Units: Feet
Type: Mixed
Datum: NAVD
Note: [] Inferred Water Level Value
Quality: Verified

2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	4.25	4.26	4.03	3.70	3.79	3.58	3.66	3.80	3.95	3.75	3.99	4.33	
Maximum	9.09	8.48	7.92	7.70	8.38	7.67	7.95	8.14	7.82	7.95	8.64	8.86	
Max Day	20	3	25	20	19	16	31	1	30	29	27	25	
Max Time	18:24	18:24	10:42	07:48	07:24	06:12	05:54	06:48	20:36	20:06	19:24	18:24	
Minimum	-2.09	-1.97	-0.58	-1.32	-0.99	-1.75	-1.93	-1.76	-0.54	-1.31	-1.36	-1.24	
Min Day	23	20	18	21	20	5	5	2	1	31	26	27	
Min Time	02:48	01:48	23:54	15:00	14:48	15:00	15:30	14:30	14:54	03:24	01:00	02:18	

2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	3.95	3.51	3.75	3.57	3.73	3.62	3.76	3.88	4.05	3.85	3.69	3.73	
Maximum	8.10	7.82	7.82	8.02	8.13	8.19	7.99	7.71	7.97	8.10	8.65	8.57	
Max Day	21	8	13	10	9	5	22	19	20	18	16	13	
Max Time	16:36	18:30	10:12	08:54	08:18	06:24	07:54	07:06	21:36	20:18	19:36	17:54	
Minimum	-1.83	-2.05	-1.11	-1.10	-1.66	-1.85	-1.72	-1.26	-0.32	-1.35	-1.88	-2.37	
Min Day	12	10	10	10	8	7	5	3	16	20	16	16	
Min Time	02:42	02:06	01:42	15:24	14:18	14:48	13:48	13:30	12:42	03:54	01:54	02:24	

*The monthly max/min report information is based on high/low tides only.

National Weather Service Daily Climate Data for Eureka

000
CXUS56 KEKA 050032
CF6EKA

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: EUREKA CA
MONTH: DECEMBER
YEAR: 2020
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

	TEMPERATURE IN F:						:PCPN:		SNOW:	WIND	:SUNSHINE:		SKY	:PK WND		
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
												12Z	AVG	MX	2MIN			
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	53	39	46	-3	19	0	0.00	0.0	0	0.9	5	340	M	M	5	18	5	M
2	52	35	44	-4	21	0	0.00	0.0	0	0.8	5	270	M	M	5	18	5	M
3	53	42	48	0	17	0	0.00	0.0	0	1.3	5	310	M	M	7	2	5	M
4	57	39	48	0	17	0	0.00	0.0	0	1.5	5	290	M	M	4	28	6	M
5	63	38	51	3	14	0	0.11	0.0	0	3.5	14	180	M	M	8	2	14	M
6	55	38	47	-1	18	0	0.00	0.0	0	2.7	9	360	M	M	1	2	14	M
7	59	37	48	0	17	0	0.00	0.0	0	3.3	9	30	M	M	4	28	9	M
8	57	37	47	-1	18	0	0.00	0.0	0	2.0	6	340	M	M	5	18	9	M
9	55	40	48	0	17	0	0.03	0.0	0	4.1	12	20	M	M	8	28	15	M
10	54	35	45	-3	20	0	0.00	0.0	0	3.3	8	260	M	M	6	1	8	M
11	47	38	43	-5	22	0	0.14	0.0	0	3.1	8	140	M	M	10	1	8	M
12	57	45	51	3	14	0	0.04	0.0	0	2.8	9	18	M	M	10	1	16	M
13	57	43	50	2	15	0	0.73	0.0	0	4.2	10	23	M	M	10		16	M
14	53	37	45	-3	20	0	T	0.0	0	0.9	6	320	M	M	4	18	6	M
15	55	40	48	0	17	0	0.15	0.0	0	2.5	9	12	M	M	10	2	12	M
16	60	43	52	4	13	0	0.87	0.0	0	5.8	12	M	M	M	10	2	20	M
17	53	38	46	-2	19	0	0.10	0.0	0	6.8	14	340	M	M	4	18	17	M
18	54	34	44	-4	21	0	0.00	0.0	0	1.7	9	300	M	M	4	1	9	M
19	60	45	53	5	12	0	0.12	0.0	0	2.3	7	280	M	M	9	18	7	M
20	63	50	57	9	8	0	0.01	0.0	0	1.8	8	320	M	M	7	1	8	M
21	60	43	52	4	13	0	0.43	0.0	0	3.8	13	300	M	M	8	1	25	M
22	51	36	44	-4	21	0	0.00	0.0	0	3.5	13	10	M	M	1		23	M
23	58	31	45	-3	20	0	0.00	0.0	0	1.3	6	300	M	M	0	8	6	M
24	62	33	48	0	17	0	0.00	0.0	0	5.8	14	170	M	M	9		25	M
25	60	49	55	7	10	0	0.60	0.0	0	11.3	17	180	M	M	9		39	M
26	56	40	48	0	17	0	0.11	0.0	0	4.8	12	240	M	M	4		18	M
27	54	35	45	-3	20	0	0.00	0.0	0	1.9	7	50	M	M	3	1	7	M
28	52	33	43	-5	22	0	0.00	0.0	0	2.0	6	330	M	M	0	8	7	M
29	53	32	43	-5	22	0	0.00	0.0	0	2.0	7	330	M	M	4		8	M
30	53	38	46	-2	19	0	0.50	M	M	5.4	17	180	M	M	10		20	M
31	55	43	49	1	16	0	0.02	0.0	0	1.7	7	320	M	M	7	18	8	M
SM	1731	1206		536	0	3.96	0.0	98.8	M	186								

398
CXUS56 KEKA 022021
CF6EKA

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: EUREKA CA
MONTH: JANUARY
YEAR: 2021
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

TEMPERATURE IN F:							:PCPN:		SNOW:		WIND :SUNSHINE:			SKY	:PK WND		
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
												12Z		AVG MX 2MIN				
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	59	41	50	2	15	0	0.43	0.0	0	3.4	10	180	M	M	9	1	18	M
2	57	42	50	2	15	0	0.07	0.0	0	5.3	11	180	M	M	10	1	14	M
3	60	51	56	8	9	0	0.06	0.0	0	9.0	17	160	M	M	10		31	M
4	58	41	50	2	15	0	0.53	0.0	0	8.2	16	180	M	M	9	1	38	180
5	59	37	48	0	17	0	0.00	0.0	0	3.0	10	300	M	M	7		14	M
6	57	41	49	1	16	0	0.41	0.0	0	7.3	16	190	M	M	9		28	M
7	57	38	48	0	17	0	0.17	0.0	0	6.3	18	170	M	M	9	1	25	M
8	56	41	49	1	16	0	0.05	0.0	0	2.8	7	360	M	M	4	1	M	M
9	59	36	48	0	17	0	0.07	0.0	0	4.5	10	180	M	M	4		14	M
10	55	47	51	3	14	0	0.14	0.0	0	2.7	9	280	M	M	10	1	16	280
11	62	42	52	4	13	0	T	0.0	0	5.0	14	200	M	M	7	1	19	M
12	61	55	58	10	7	0	0.81	0.0	0	11.5	16	180	M	M	10		22	M
13	60	51	56	8	9	0	0.30	0.0	0	2.7	10	170	M	M	10	28	18	M
14	61	42	52	4	13	0	0.00	0.0	0	2.8	9	280	M	M	4	2	10	M
15	56	47	52	4	13	0	T	0.0	0	0.0	7	50	M	M	9	18	7	M
16	50	46	48	0	17	0	0.00	0.0	0	1.6	6	290	M	M	10	2	7	M
17	58	40	49	1	16	0	0.00	0.0	0	3.2	14	10	M	M	5	2	25	M
18	58	40	49	0	16	0	0.00	0.0	0	6.2	17	20	M	M	0	8	25	M
19	60	35	48	-1	17	0	0.00	0.0	0	4.0	14	340	M	M	2	8	16	M
20	59	33	46	-3	19	0	0.00	0.0	0	2.0	6	330	M	M	3		7	M
21	54	38	46	-3	19	0	0.29	0.0	0	3.5	12	310	M	M	7		15	M
22	52	42	47	-2	18	0	0.17	0.0	0	8.5	16	360	M	M	9		23	M
23	52	35	44	-5	21	0	0.00	0.0	0	5.4	17	10	M	M	1		24	M
24	46	39	43	-6	22	0	0.42	0.0	0	5.6	16	340	M	M	10		41	350
25	48	33	41	-8	24	0	0.13	0.0	0	2.8	9	50	M	M	6		15	M
26	44	31	38	-11	27	0	0.79	0.0	0	11.0	21	170	M	M	10		49	170
27	49	40	45	-4	20	0	1.51	0.0	0	7.0	12	160	M	M	10	3	20	M
28	51	36	44	-5	21	0	0.54	0.0	0	3.7	10	170	M	M	7	1	14	M
29	52	32	42	-7	23	0	0.01	0.0	0	4.6	12	260	M	M	7	1	14	0
30	57	46	52	3	13	0	0.02	0.0	0	13.0	18	170	M	M	9		30	0
31	58	51	55	6	10	0	0.18	0.0	0	12.8	20	160	M	M	10		35	0
SM	1725	1269		509	0	7.10		0.0		169.4		M	227					

Note: An "M" in any column means the data are Missing for that element.

Column		
1	**DY**	The **day** of the month.
2	**MAX**	The **highest** temperature for the day in degrees Fahrenheit (F).
3	**MIN**	The **lowest** temperature for the day in degrees Fahrenheit (F).
4	**AVG**	The **average** temperature for the day, computed by finding the average of the values in columns 2 and 3, then rounding (if necessary). Example; 55.5 rounds up to 56, 55.4 rounds down to 55 degrees.
5	**DEP**	**Departure** from normal. The difference between column 4 and the 30 year normal temperature for this date. A minus (-) is number of degrees below normal. A zero (0) indicates that the average for that day was the Normal.
6a & 6b	**HDD & CDD**	**Degree Day:** A gauge of the amount of heating or cooling needed for a building using 65 degrees as a baseline. To compute heating/cooling degree-days, take the average temperature for a day and subtract the reference temperature of 65 degrees. If the difference is positive, it is called a "**Cooling Degree Day**". If the difference is negative, it is called a "**Heating Degree Day**". The magnitude of the difference is the number of days. For example, if your average temperature for a day is 50 degrees in September, the difference of the average temperature for that day and the reference temperature of 65 degrees would yield a minus 15. Therefore, you have 15 Heating Degree Days that day. If the average temperature is 77 degrees for a day, you would have 12 Cooling Degree Days (77-65). If the average temperature for the day is 65 degrees, there are no Heating or Cooling degree days. Electrical, natural gas, power, and heating, and air conditioning industries utilize heating and cooling degree information to calculate their energy needs. The Heating season runs from July 1st through June 30th. The Cooling season runs from Jan 1st through Dec 31st.
7	**WTR**	Total **precipitation** for the day to the nearest hundredth of an inch. This includes all forms of precipitation, both liquid and water equivalent of any snow or ice that occurred (T = Trace, some precipitation fell but not enough to measure).
8	**SNW**	Total **snowfall** for the day to the nearest tenth of an inch.
9	**DPTH**	Snow **depth** on the ground to the nearest inch at 1200UTC. 7am EST., 6am CST, 5am MST, 4am PST, 3am AST, etc.
10	**AVG SPD**	**Average wind speed** for the day in miles per hour (mph).
11	**MX SPD**	The **highest wind speed** in mph averaged over a 2 minute period.

12	**2MIN DIR**	The **direction** (in compass degrees divided by 10) from which the wind speed in column 11 came from. (N=36 S=18 W=27 E=09, etc.)
13	**MIN**	The number of **minutes** of sunshine received at the station. Not reported at all locations.
14	**PSBL**	The percentage of **possible** sunshine. Computed by dividing the minutes of sunshine in column 13 by the total possible minutes. Not reported at all locations.
15	**S-S**	The average sky cover between sunrise and sunset in tenths of sky covered. The minimum of "0" means no clouds observed, "10" means clouds covered the entire sky for that day.
16	**WX**	A coded number representing certain types of **weather** observed during the day. 1 = Fog 2 = Fog reducing visibility to 1/4 mile or less 3 = Thunder 4 = Ice pellets 5 = Hail 6 = Glaze or rime 7 = Blowing dust or sand: visibility 1/2 mile or less 8 = Smoke or haze 9 = Blowing snow X = Tornado In the example above on the 12th, you see "138" coded for the day. That means Fog, Thunder and Smoke or Haze were observed at some time during that day.
17	**SPD**	Peak wind **speed** for the day in mph. The highest wind speed observed at the station.
18	**DR**	The compass **direction** from which the peak wind speed came.

Appendix B

Photo Documentation Locations

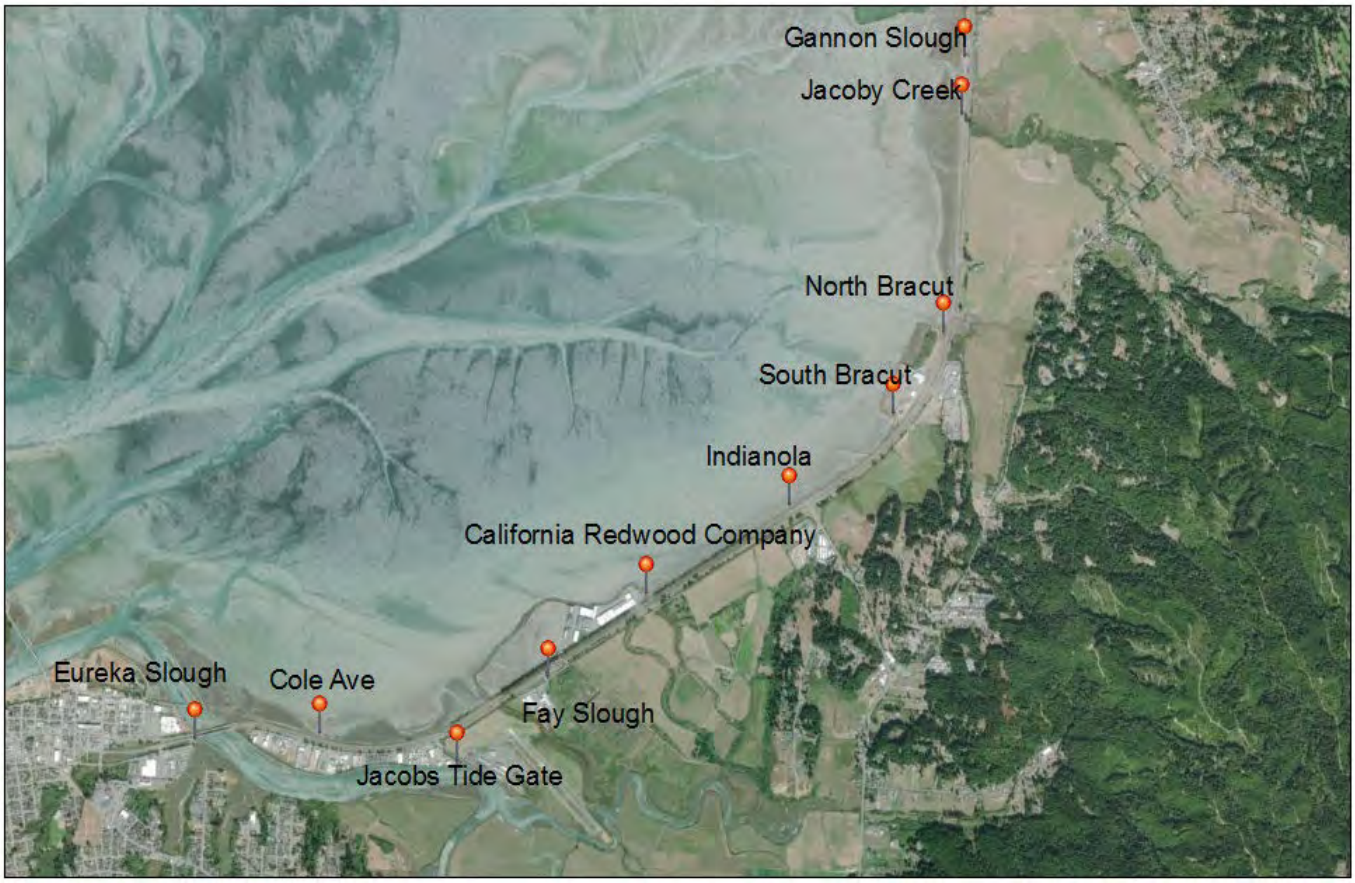


Figure 1 ***Reference Photograph Locations*** *for documenting King Tides and extreme weather events along the Eureka-Arcata 101 Corridor.*

Table 1 ***Location Selection Criteria***

	Accessibility and Safety	**Vulnerability to Flooding**	**Shoreline Cover**	**Adjacent Land Use / Zoning**
Gannon Slough	Good, *Bay Trail*	moderate-high	Salt marsh, slough channel	Trail/Natural Resources (NR)
Jacoby Creek	Good, *Bay Trail*	moderate-high	Salt marsh, creek channel	Trail/NR
North Bracut	Fair, *behind Bayside Garden Supply*	moderate-high	Bracut dike, railroad grade, vegetation	Businesses/NR and Industrial General
South Bracut	Fair, *near California Trailers*	moderate	Bracut dike, railroad grade, salt marsh	Businesses/NR and Industrial General
Indianola	Caution, *shoulder*	moderate	Railroad grade, rock, exposed with areas of erosion	Future Trail/NR
California Redwood Company	Fair, *entrance to CRC*	moderate-high	Railroad grade, salt marsh, rock, CRC levee to the south	Future Trail/ NR, Industrial General
Jacobs Tide Gate	Fair, *Airport Rd*	low-moderate	Jacobs Ave south side levee, rock protection	Businesses/Service Commercial
Eureka Slough	Good, *Eureka Waterfront Trail*	high	Bank of Eureka Slough, rock, vegetation	Trail/Service Commercial/NR
Cole Ave	Caution, *shoulder*	high	Railroad grade, rock, erosion bound by salt marsh to north and south	Future Trail/NR
Fay Slough	Fair, *CDFW parking lot*, *shoulder*	subject to inland flooding from Fay Slough	Roadside ditch paralleling Highway 101 north	Businesses/Service Commercial/ Coastal Agricultural

Appendix C

Photo Documentation

King Tide and Extreme Tidal Event Photo Documentation

Reference Photos

December 23, 2019:

Gannon Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Ave

January 10, 2020:

Fay Slough

2020 Annual Report, Winter 2019/2020 King Tide Photos

January 10 and 11, 2020:

All locations

February 8, 2020:

All locations

2021 Annual Report, Winter 2020/21 King Tide Photos

December 14, 2020:

All locations

January 12, 2021:

All locations

Gannon Slough Photos

Gannon Slough South Reference

Gannon Slough South 2020 Annual Report

1/10/20

1/11/20

2/8/20

Gannon Slough South 2021 Annual Report

12/14/20

1/12/21

Gannon Slough North Reference

Gannon Slough North 2020 Annual Report

1/10/20

1/11/20

2/8/20

Gannon Slough North 2021 Annual Report

12/14/20

1/12/21

Gannon Slough Bay Reference

Gannon Slough Bay 2020 Annual Report

1/10/20

1/11/20

2/8/20

Gannon Slough Bay 2021 Annual Report

12/14/20

1/12/21

Jacoby Creek Photos

Jacoby Creek Left Reference

Jacoby Creek Left 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacoby Creek Left 2021 Annual Report

12/14/20

1/12/21

Jacoby Creek Right Reference

Jacoby Creek Right 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacoby Creek Right 2021 Annual Report

12/14/20

1/12/21

Jacoby Creek RR Reference

Jacoby Creek RR 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacoby Creek RR 2021 Annual Report

12/14/20

1/12/21

Jacoby Creek Bay Reference

Jacoby Creek Bay 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacoby Creek Bay 2021 Annual Report

12/14/20

North Bracut Photos

North Bracut Full Reference

North Bracut Full 2020 Annual Report

1/10/20

1/11/20

2/8/20

North Bracut Full 2021 Annual Report

12/14/20

1/12/21

North Bracut Zoom Reference

North Bracut Zoom 2020 Annual Report

1/10/20

1/11/20

2/8/20

North Bracut Zoom 2021 Annual Report

12/14/20

1/12/21

South Bracut Photos

South Bracut Full Reference

South Bracut Full 2020 Annual Report

1/10/20

1/11/20

2/8/20

South Bracut Full 2021 Annual Report

12/14/20

1/12/21

South Bracut Zoom Reference

South Bracut Zoom 2020 Annual Report

1/10/20

1/11/20

2/8/20

South Bracut Zoom 2021 Annual Report

12/14/20

1/12/21

Indianola Photos

Indianola North Reference

Indianola North 2020 Annual Report

1/10/20

1/11/20

2/8/20

Indianola North 2021 Annual Report

12/14/20

1/12/21

California Redwood Company Photos

Tree trimming work taking place near the photo sites for the California Redwood company on February 8, 2020 prevented Caltrans staff from being able to safely access the site for photo documentation.

CRC Full Reference

CRC Full 2020 Annual Report

1/10/20

1/11/20

CRC Full 2021 Annual Report

12/14/20

1/12/21

CRC Zoom Reference

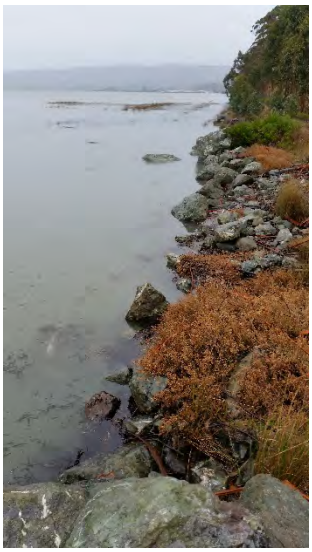
CRC Zoom 2020 Annual Report

1/10/20

1/11/20

CRC Zoom 2021 Annual Report

12/14/20



1/12/21

Eureka Slough Photos

Eureka Slough Zoom Reference

Eureka Slough Zoom 2020 Annual Report

1/10/20

1/11/20

2/8/20

Eureka Slough Zoom 2021 Annual Report

12/14/20

1/12/21

Jacobs Tide Gate Photos

Jacobs Tide Gate East Zoom Reference

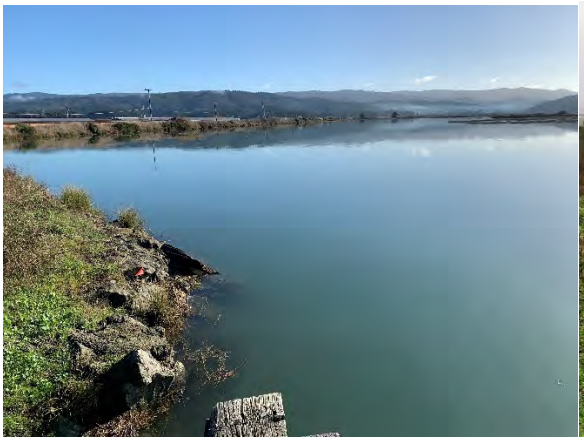
Jacobs Tide Gate East Zoom 2020 Annual Report

1/10/20

1/11/20

2/8/20

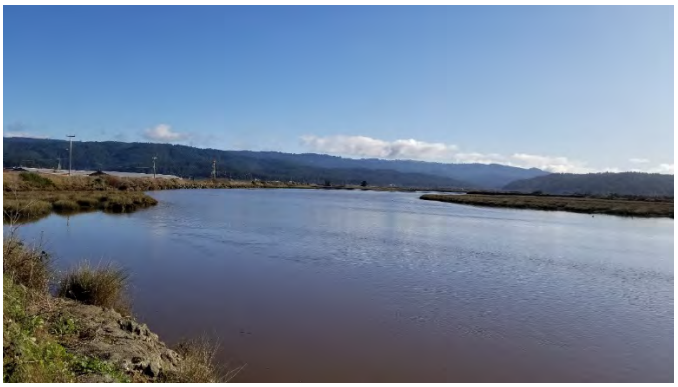
Jacobs Tide Gate East Zoom 2021 Annual report



12/14/20

1/12/21

Jacobs Tide Gate East Reference



Jacobs Tide Gate East 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacobs Tide Gate East 2021 Annual Report

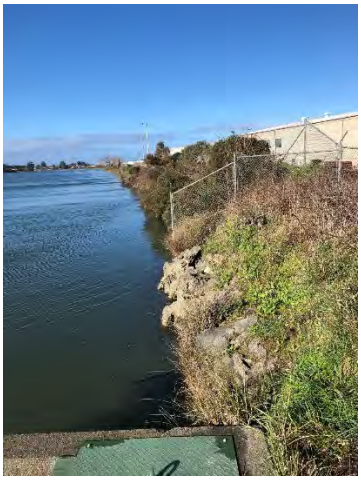
1/12/21

Jacobs Tide Gate West Reference

Jacobs Tide Gate West 2020 Annual Report

1/10/20

1/11/20



2/8/20

Jacobs Tide Gate West 2021 Annual Report

12/14/20

1/12/21

Cole Ave Photos

Cole Ave North Reference

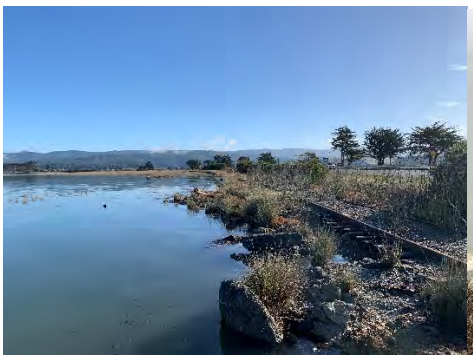
Cole Ave North 2020 Annual Report

1/10/20

1/11/20

2/8/20

Cole Ave North 2021 Annual Report



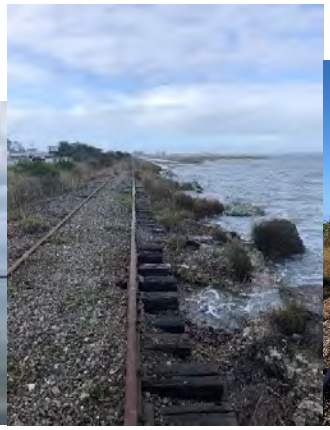
12/14/20

1/12/21

Cole Ave South Reference

Cole Ave South 2020 Annual Report

1/10/20



1/11/20

2/8/20

Cole Ave South 2021 Annual Report

12/14/20

1/12/21

Fay Slough Photos

Fay Slough Mid City South Reference

Fay Slough Mid City South 2020 Annual Report

1/10/20

1/11/20

2/8/20

Fay Slough Mid City South 2021 Annual Report

12/14/20

Fay Slough North Reference

Fay Slough North 2020 Annual Report

1/11/20

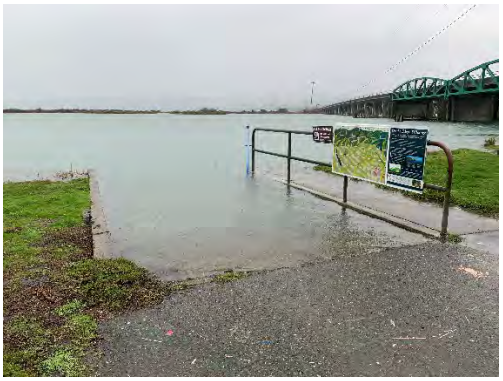
2/8/20

Fay Slough North 2021 Annual Report

12/14/20

Miscellaneous 2021 Annual Report Photos

Jacoby Creek Railroad Bridge 1/12/21



Eureka Slough Bridge Boat Ramp 1/12/21

Indianola South 12/14/20

Indianola North Railroad Erosion 1/12/21

DEPARTMENT OF TRANSPORTATION

NORTH REGION ENVIRONMENTAL
1656 UNION STREET
EUREKA, CA 95501
(707) 572-7039
www.dot.ca.gov
TTY 711

Making Conservation a California Way of Life.

May 10, 2022

California Coastal Commission
1385 Eighth Street, Ste. 130
Arcata, CA 9552

File: Eureka-Arcata Highway 101 Corridor Improvement Project
HUM 101 / PMs 79.9 / 86.3
01-36600 / 0100000127

SUBJECT: CDP 1-18-1078 Special Condition 1, 2022 Annual Report

Special Condition 1. Sea Level Rise and Flooding Impact Monitoring and Reporting

Coastal Development Permit (CDP) 1-18-1078 was issued by the California Coastal Commission to the California Department of Transportation on September 12, 2019. The permit covers the Eureka-Arcata U.S. Highway 101 Corridor Improvement (Corridor) Project, which consists of five component projects within a six-mile segment of U.S. Highway 101 along the east side of Humboldt Bay. In accordance with CDP 1-18-1078, Special Condition 1, the California Department of Transportation (Caltrans) is submitting the Sea Level Rise and Flooding Impact Monitoring Report. This 2022 Annual Report references the Baseline Report, which was submitted to California Coastal Commission staff on May 1, 2020, and the 2021 Annual Report submitted on May 1, 2021.

The Baseline Report and the 2021 Annual Report identify existing water elevation conditions in Humboldt Bay from the North Spit Tide Gauge, which provides data applicable to the Corridor. The Baseline Report (April 1, 2019, through March 31, 2020) and the 2021 Annual Report (April 1, 2020, through March 31, 2021) is referenced in the 2022 Annual Report to identify changes in water elevation conditions over time. The Baseline Report established locations from which to take reference photographs to annually document King Tides and other extreme tidal

events along the Corridor. The reference photographs and photographs of King Tide events from winter 2019/2020, winter 2020/2021, and winter 2021/2022 are included in Appendix C of the 2022 Annual Report.

Annual Reports also document any closures due to flooding and include a brief discussion of any coastal hazards impacts to highway infrastructure along the Corridor during the reporting period. No flooding or coastal hazards impacted the highway during the 2022 reporting period. The 2022 Annual Report also provides an update on progress made in developing the Comprehensive Adaptation and Implementation Plan (CAIP) required by CDP 1-18-1078, Special Condition 2.

If you have questions or need additional information, please contact Felicia Zimmerman at **Felicia.Zimmerman@dot.ca.gov** or (707) 815-5994.

Sincerely,

Jason Meyer
Senior Environmental Planner

Attachment: Sea Level Rise and Flooding Impact Monitoring Report 2022

A. Baseline Report

A.1. Water Elevation

The Baseline Report was provided to the California Coastal Commission on May 1, 2020. Water elevation baseline data for the Baseline Report was accessed for the North Spit Tide Gauge from the National Oceanic and Atmospheric Administration (NOAA) website and referenced to NAVD88 (Appendix A). The reporting period for the Baseline Report is April 1, 2019, to March 31, 2020. Monthly maximum water elevations ranged from 7.67 feet to 8.86 feet. The mean monthly maximum water elevation for the baseline reporting period was 8.07 feet (Figure 1). Monthly mean sea level for the baseline reporting period ranged from 3.66 feet to 3.99 feet with a mean of 3.80 feet for the reporting period (Figure 2).

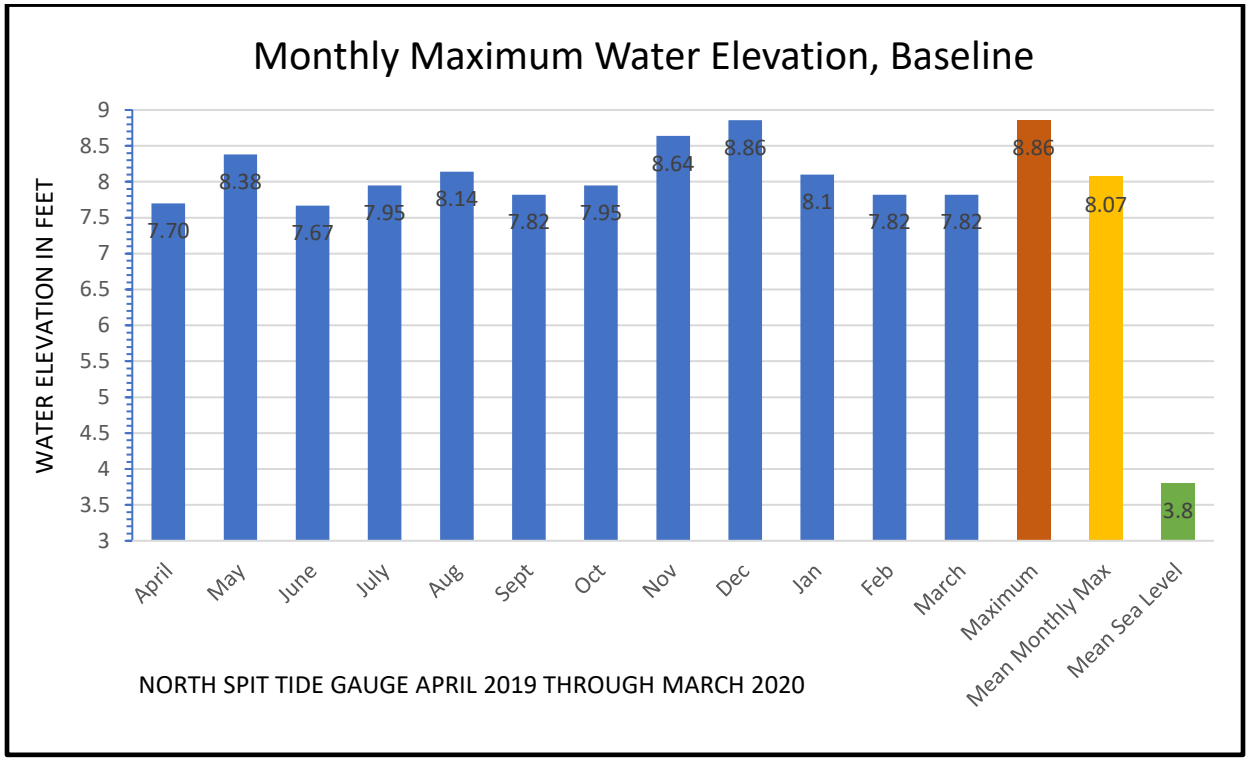


Figure 1. Monthly Maximum Water Elevation, Baseline shows the maximum water elevation by month at the North Spit Tide Gauge from April 1, 2019, to March 31, 2020. Monthly maximum and monthly mean sea level data were accessed from the NOAA Tides and Currents webpage. Mean Monthly Maximum and Mean Sea Level were calculated using the NOAA data.

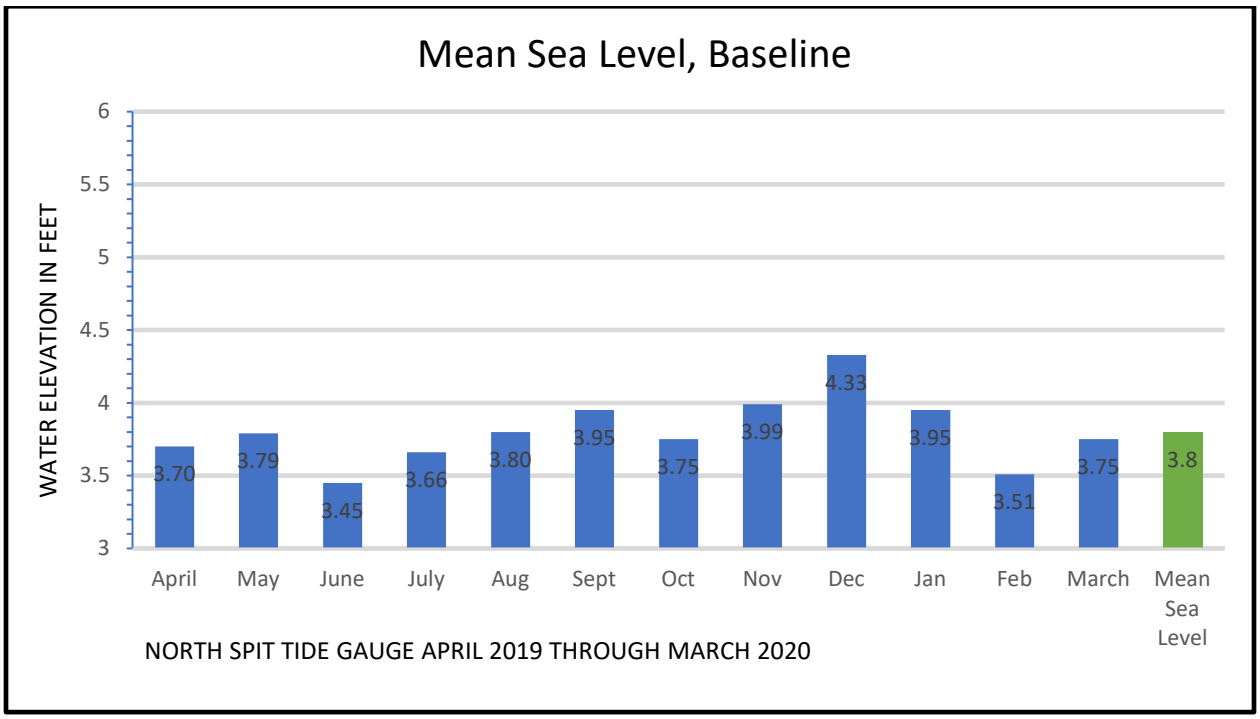


Figure 2. Mean Sea Level, Baseline at the North Spit Tide Gauge for April 1, 2019, through March 31, 2020, was calculated from available monthly mean sea levels from the NOAA Tides and Currents webpage.

A.2. Reference Photograph Locations

Reference locations for photographing annual King Tide and extreme tidal events along the Eureka-Arcata Corridor (Corridor) were established for the Baseline Report and were organized to easily facilitate replicating photos for the Annual Reports (Appendix B). Photograph location selection criteria included accessibility and safety, vulnerability to flooding (Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions, 2019), and locations representing various shoreline cover and land use.

For each of the ten selected reference locations, two to four specific photo sites were established. Site reference photos for Gannon Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Avenue were taken close to high tide on December 23, 2019.

The National Weather Service (NWS) Daily Climate Report reported December 23, 2019, weather conditions as clear with an average wind speed of 2.8 miles per hour and no precipitation. The previous day saw 1.23 inches of precipitation. Site reference photos for Fay Slough were taken during the King Tide event on January 10, 2020. NWS reported cloudy weather conditions with an average wind speed of 4.6 miles per hour and minimal precipitation of 0.12 inch. Light precipitation of 0.28 inch was recorded for the previous day.

B. Annual Report 2022

B.1. Water Elevation

Water elevation data for the 2022 Annual Report for the North Spit Tide Gauge was accessed from the NOAA Tides and Currents website (NOAA, April 2022) and referenced to NAVD88 (Appendix A). The reporting period for the 2022 Annual Report was April 1, 2021, through March 31, 2022. Monthly maximum water elevations ranged from 7.26 feet to 9.38 feet (Figure 3). The highest reported water elevation of 9.38 feet was observed on January 3, 2022. This monthly maximum elevation is 0.73 feet higher than the monthly maximum elevation from the 2021 Annual Report and 0.52 feet higher than the monthly maximum elevation from the Baseline Report. The mean monthly maximum water elevation for the 2022 reporting period was 8.16 feet (Figure 3). This is 0.06 feet higher than the mean monthly maximum from the 2021 Annual Report and 0.09 feet higher than the mean monthly maximum from the Baseline Report (Figure 4).

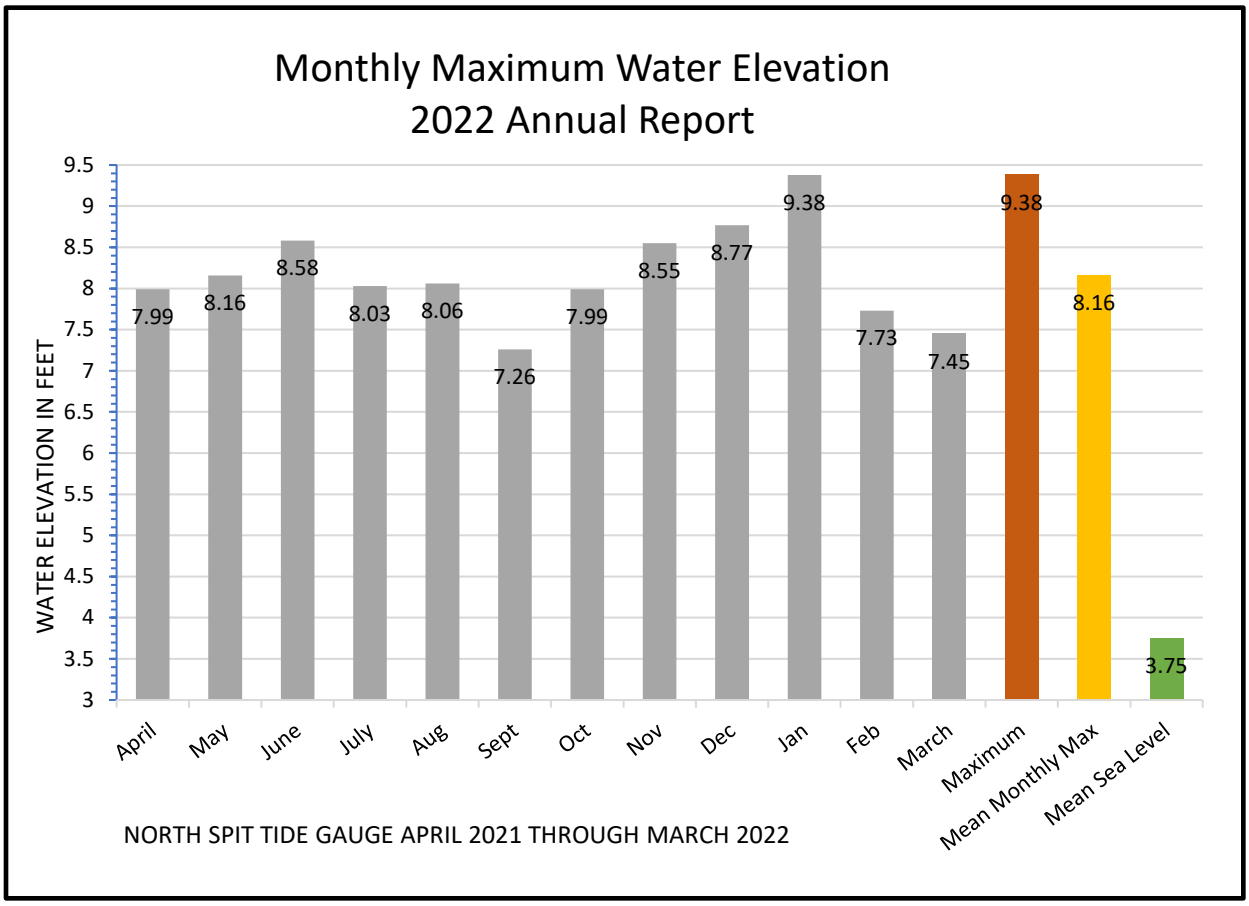


Figure 3. Monthly Maximum Water Elevation, 2022 Annual Report shows the maximum water elevation by month at the North Spit Tide Gauge from April 1, 2021, to March 31, 2022. Monthly maximum and monthly mean sea level data were accessed from the NOAA Tides and Currents webpage. Mean Monthly Maximum and Mean Sea Level were calculated using the NOAA data.

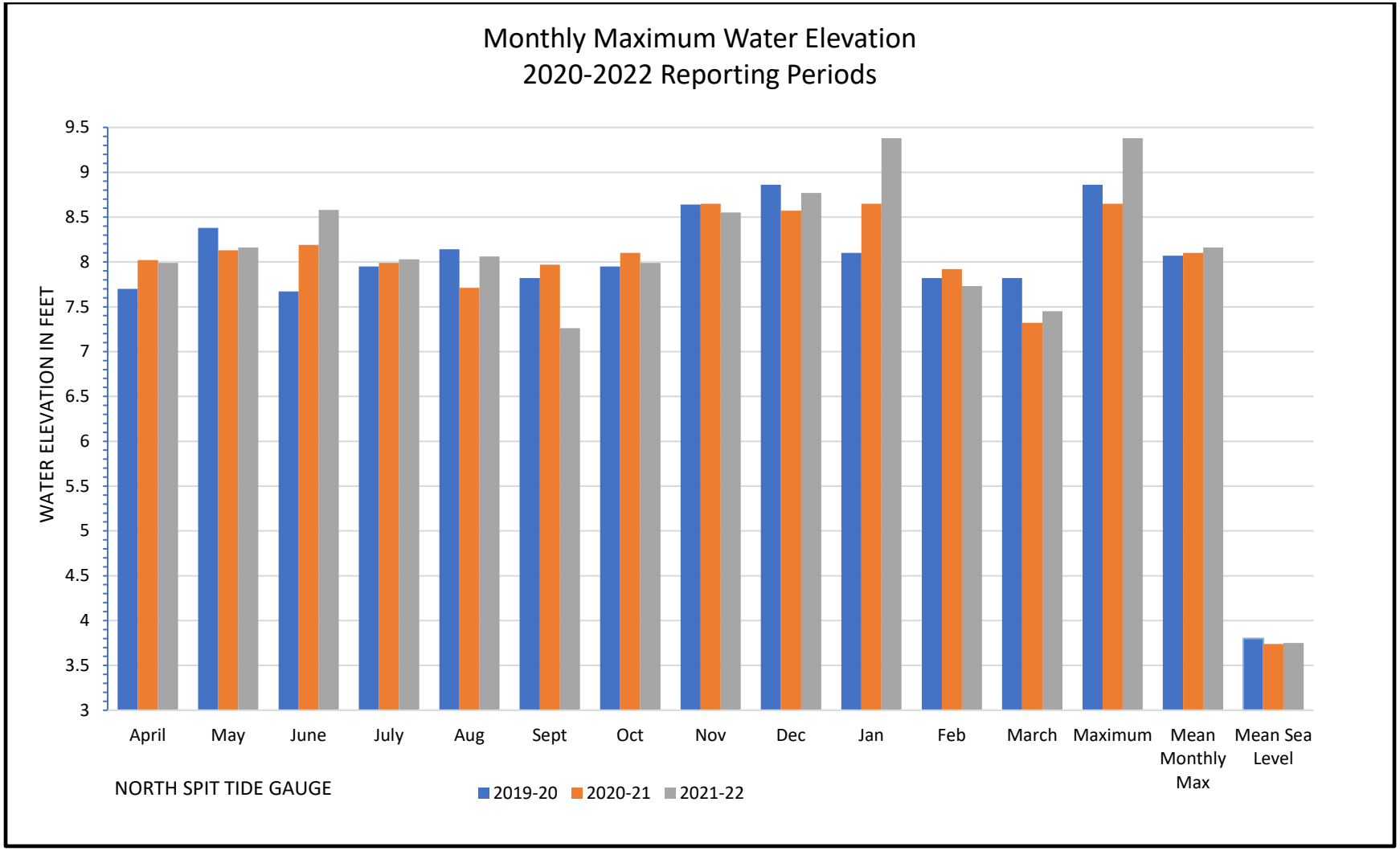


Figure 1. **Monthly Maximum Water Elevation 2020-2022 reports the maximum water elevation by month at the North Spit Tide Gauge for the Baseline Report (April 1, 2019, to March 31, 2020), the 2021 Annual Report (April 1, 2020, through March 31, 2021), and the 2022 Annual Report (April 1, 2021, through March 31, 2022). The maximum water elevation, mean monthly maximum, and mean sea level for the three reporting periods is also represented in the figure.**

B. Annual Report 2022 (continued)

B.1. Water Elevation (continued)

Monthly mean sea level for the 2022 reporting period ranged from 3.40 feet to 4.18 feet. Mean sea level for the 2022 Annual Report is 3.75 feet (Figure 5). The mean sea level for the 2021 reporting period was 0.01 feet lower at 3.74 feet. The Baseline Report mean sea level was 3.80 feet; 0.05 feet higher than the 2022 Annual Report (Figure 6).

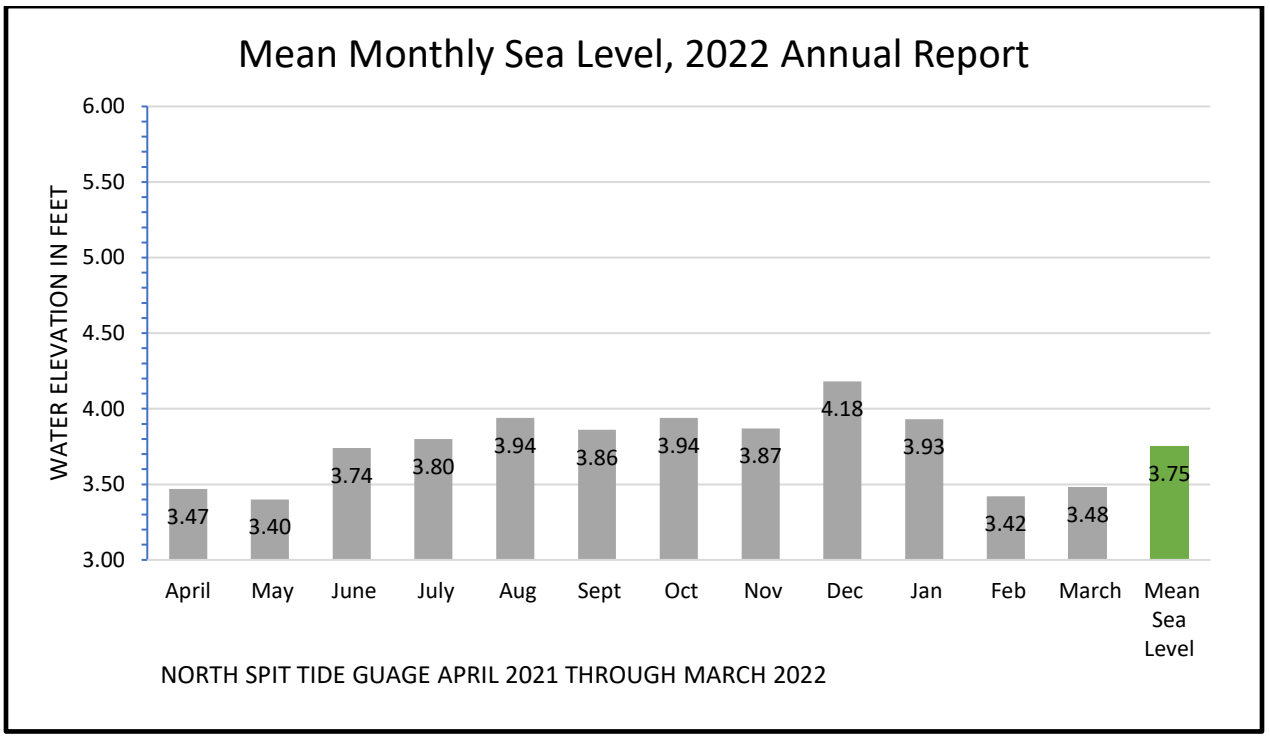


Figure 5. Mean Sea Level at the North Spit Tide Gauge for April 1, 2021, through March 31, 2022, was calculated from available monthly sea level means from the NOAA Tides and Currents webpage.

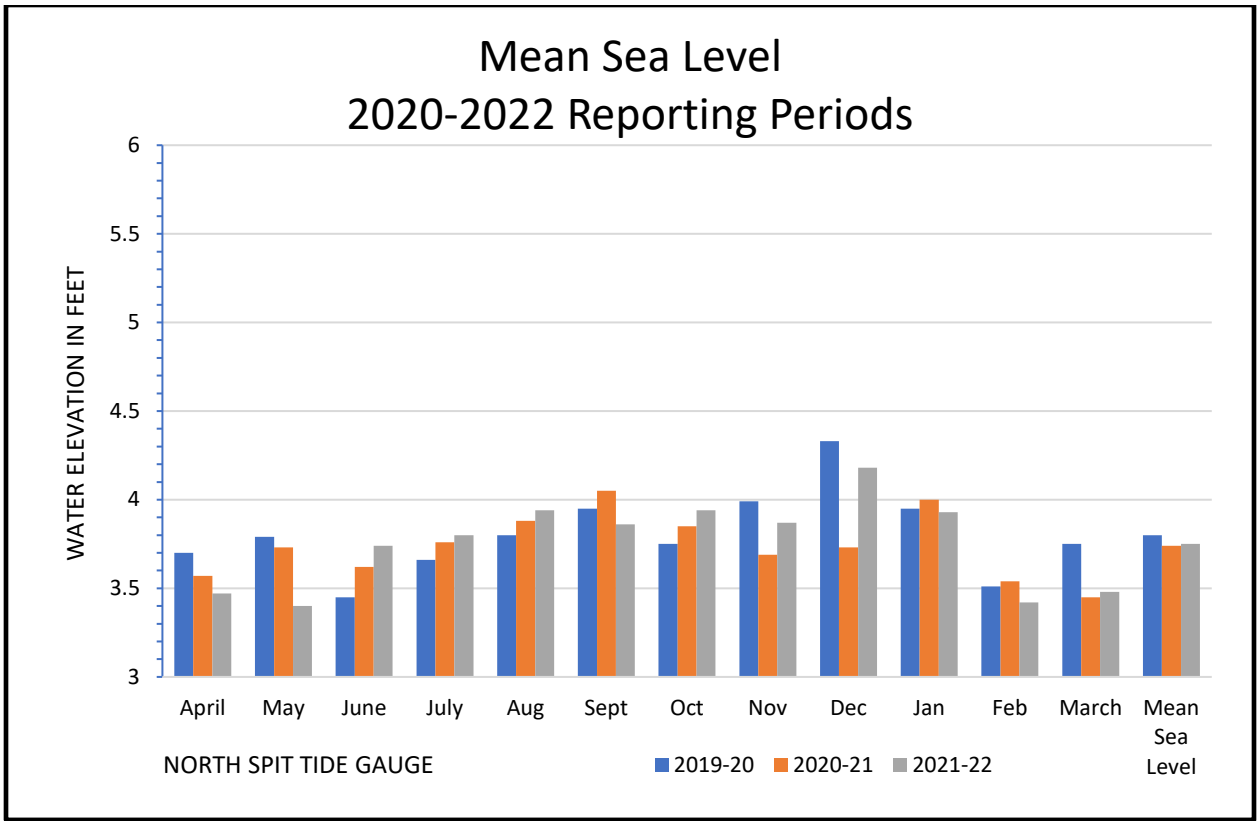


Figure 6. Mean Sea Level for the Baseline Report (2020) through 2022 Annual Report at the North Spit Tide Gauge. The Baseline Report shows monthly mean sea levels from April 1, 2019, through March 31, 2020. The 2021 and 2022 Annual Reports show mean sea levels for April 1, 2020, to March 31, 2021, and April 1, 2021, to March 31, 2022, respectively. Mean sea level was calculated from available monthly sea level data from the NOAA Tides and Currents webpage.

B.2. Coastal Hazard Impacts

No impacts to highway infrastructure within the U.S. Highway 101 Corridor occurred during the 2022 reporting period. No temporary or ongoing flooding was observed and no weather-related incidents (such as erosion, overtopping of dikes, or tide gate failures) impacted the Corridor. Minor erosion impacted the railroad levee, which allowed bay water to flow into the roadside ditch adjacent to U.S. 101 near post mile 82.1. Photos of the localized levee erosion are on pages 42 and 43 of Appendix C.

B.2. Coastal Hazard Impacts (continued)

King Tides for winter 2021/2022 took place December 4 and 5, 2021, and January 1, 2, and 3, 2022. Caltrans staff photographed King Tide conditions from established reference locations along the Corridor on December 4, 2021, and January 3, 2022 (Appendix C). Using the daily tide prediction tables published on the NOAA website, three-hour work windows were identified for when to best document King Tide conditions to capture the highest water elevations for each day. Three Caltrans staff were scheduled three hours each per day to document the King Tides. Additionally, Caltrans utilized drones to capture video and pictures at the Eureka Slough location during the December 4, 2021, King Tides.

Weather on December 4, 2021, included fog and mostly cloudy conditions with an average wind speed of 2.0 miles per hour and 0.53 inch of precipitation for the day. Previous day precipitation was measured at 0.06 inch (Appendix A—National Weather Service Climate Data). Maximum December 4, 2021, high tide at the North Spit Tide Gauge was 8.65 feet (NOAA). Weather conditions on January 3, 2022, were cloudy with an average wind speed of 11.8 miles per hour and total precipitation of 0.64 inch for the day. No precipitation was recorded the previous day (NWS). Maximum high tide on January 3rd was 9.38 feet.

In addition to documenting King Tides at the established reference locations, Caltrans staff photographed any observed extreme conditions, locations of erosion, and subjects of interest within the Corridor. These additional photos are included in Appendix C.

B.3. Adaption and Hazards Response

During the reporting period, Caltrans did not implement any weather- or flooding-related closures within the Corridor.

Additionally, no repair or maintenance was performed by Caltrans or other entities on dikes or berms that protect the highway. No impacts have been identified that would require a planned response, an amendment to CDP 1-18-1078, or a separate CDP application before the next monitoring cycle.

B.4. Adaptation Plan Progress

Coastal Development Permit 1-18-1078, Special Condition 2, directs Caltrans to develop the Comprehensive Adaptation and Implementation Plan (CAIP) to address long-term sea level rise within the Corridor by identifying strategies for protecting, relocating, or adapting the development authorized by CDP 1-18-1078.

In 2021, Caltrans established the District 1 (D01) Climate Change Working Group (CCWG). The mission of the CCWG is to develop a strategy for addressing climate change from long-range planning through maintenance. A goal of the CCWG is to lead on climate action planning through partnership, collaboration, and innovation. Specifically, the CCWG engages stakeholders and the public and prioritizes equity in planning and decision-making. Responsibilities and tasks include: (1) coordinate climate change activities across all functional units; (2) identify and provide support for implementation and updates of climate change adaptation policy and strategies; (3) provide review and assistance; (4) develop and implement outreach and education activities; and (5) provide and/or participate in training needs related to climate change.

Additionally, D01 has created a smaller working group—Sea Level Rise Technical Group—to address needs related to the CAIP for the Eureka-Arcata Corridor. The SLR Technical Group is currently developing the CAIP to include: (1) SLR analysis based on updated, best available science and monitoring reports; (2) evaluation of adaptation alternatives (accommodation, protection, and relocation) and their consistency with Coastal Act policies; (3) a timetable for

implementation; and (4) coordination with local governments, stakeholders, and public interest groups.

In 2022, the Eureka-Arcata Corridor Sea Level Rise Project was nominated for the Non-SHOPP- funded Project Initiation Document (PID) process. For major improvements proposed on the State Highway System, a PID is required to be developed and approved by Caltrans before it can be programmed and proceed to the next phase of project development—the Project Approval and Environmental Document (PA&ED) phase. The project would include, but is not limited to: (1) an incremental approach that is adaptable and scalable; (2) a fix-it-first approach for preserving service along this vital North Coast corridor that many communities rely on; (3) the project is a pro-active response to rising sea levels; (4) reduced risk of overtopping events, inundation and interrupted service along the corridor; and (5) provides more time for stakeholders and partners to collaborate with Caltrans to determine the best plan of action as projected sea levels continue to be evaluated.

It is likely the strategy will evolve over time as more information is gathered and analyzed. The options of retreat and accommodating sea level rise are still on the table. Living shorelines and other hybrid approaches will be evaluated during this process, and no hard armoring is proposed in this nomination. In April 2022, the project nomination was awarded because it met the following criteria: (1) alignment with the Climate Action Plan for Transportation Infrastructure (CAPI), the California Transportation Plan 2050, and Caltrans Strategic Management Plan; (2) addresses the priorities of State Agency partners, Caltrans and its Districts, and regional and local transportation agencies and stakeholders; (3) advances transformative, innovative, and multi-modal projects; and (4) meets eligibility requirements of potential Federal and State competitive programs. The target schedule for the $125 million project is as follows: (1) Planning: 2022-2024; (2) PA&ED: 2024-2027; (3) PS&E: 2027-2029; and (4) Construction: 2029-2031. There will be further refinement of the timeline and the process as Caltrans commences the project programming.

Caltrans District 1 staff continues to participate as a member in several groups related to climate change in the area, including Cal Poly Humboldt's Sea Level Rise Initiative, Humboldt County's Natural Shoreline Infrastructure Technical Working Group, and Humboldt Bay Initiative. District 1 staff worked with a consultant to develop a Public Engagement Plan (PEP), which resulted in four recorded presentations, including a well-attended public meeting workshop (Humboldt Sea Level Rise Public Forum: Caltrans D01, Eureka-Arcata Comprehensive Adaptation and Implementation Plan – 10/27/21 – Public Meeting Workshop) and presentations for Northern Arizona University's Institute for Tribal Environmental Professionals (ITEP) – Virtual Climate Change 101 Course and Pace University's School of Law – Environmental Skills and Practice.

Public engagement support services under the PEP contract were also used to develop a website. To enhance our efforts to add resiliency to the state highway system, we have launched the website *North Coast Climate Action*On this site the public will find information about planning and projects along the U.S. Highway 101 Corridor and in each of the four counties covered by District 1. We have also launched the video series, *Clancy's Climate Change Corner*, to provide the latest news and updates on projects and opportunities to get involved with the sea level rise planning process.

In anticipation of federal and state monies, District 1 staff are working with Caltrans HQ staff to develop a list of adaptation priorities (bridges, culverts, and roadways) based on the previously-completed *District 1 Adaptation Priorities Report* (2021). The Adaptation Reports included a prioritized list of potentially exposed assets in each Caltrans District. The prioritization methodology in these reports considers, amongst other things, the timing of the climate impacts, their severity and extensiveness, the condition of each asset (a measure of the sensitivity of the asset to damage), the number of system users affected, and the level of network redundancy in the area. Prioritization scores are generated for each potentially exposed asset based on these factors, and used to rank them. These reports were preceded by *Climate Change Vulnerability Assessments* (2019) that described climate change effects in each district and provided a high-level review of potential climate change impacts to each portion of the State Highway System.

B.5. Flood Events

No flooding or road closure events occurred during the reporting period.

C. Frequent Flood Event Report

The roadway was not closed during the reporting period; therefore, no Frequent Flood Event Report is included with this Annual Report.

References

California Department of Transportation (Caltrans). 2019. *Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions*. May 2019.

California Department of Transportation (Caltrans). 2019 *CDP 1-18-1078 Special Condition 1, Baseline and Annual Report.* May 2020.

California Department of Transportation (Caltrans). 2019 *CDP 1-18-1078 Special Condition 1, 2021 Annual Report.* May 2021.

Observed Weather Reports (April 21, 2022). In *National Weather Service*. Retrieved from https://forecast.weather.gov/product.php?site=EKA&issuedby=EKA&product=CF6&format=CI&version=6&glossary=0

Water Level Reports (April 21, 2022). In *NOAA Tides and Currents*. Retrieved from https://tidesandcurrents.noaa.gov/reports.html?type=monthlyextremes&bdate=20210421&edate=20220421&units=standard&datum=NAVD&id=9418767&retrieve=Retrieve

Appendix A

NOAA Tides and Current Data and NWS Climate Data

NOAA Tides and Currents Data

Apr 29 2022 20:03 GMT

MAXIMUM, MINIMUM WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 9418767 T.M.: 0 W
Name: North Spit, CA Units: Feet
Type: Mixed Datum: NAVD
Note: [] Inferred Water Level Value Quality: Verified

2021	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	4.00	3.54	3.45	3.47	3.40	3.74	3.80	3.94	3.86	3.94	3.87	4.18	
Maximum	8.65	7.92	7.32	7.99	8.16	8.58	8.03	8.06	7.26	7.99	8.55	8.77	
Max Day	12	11	4	28	27	25	24	22	7	24	5	4	
Max Time	18:36	19:06	11:12	07:48	07:18	07:00	06:42	06:42	07:12	21:00	19:18	18:36	
Minimum	-1.84	-1.70	-1.13	-1.98	-2.41	-2.00	-1.92	-0.92	-0.30	-1.05	-1.75	-2.48	
Min Day	14	28	1	29	27	25	23	20	6	10	7	6	
Min Time	02:18	02:00	02:36	15:18	14:12	14:06	13:00	12:06	13:06	04:00	03:00	02:36	

2022	Jan	Feb	Mar	Annual
Mean	3.93	3.42	3.48	
Maximum	9.38	7.73	7.45	
Max Day	3	1	2	
Max Time	19:30	19:06	19:18	
Minimum	-2.03	-2.54	-1.50	
Min Day	2	2	2	
Min Time	00:48	02:12	01:06	

*The monthly max/min report information is based on high/low tides only.

Apr 30 2021 16:53 GMT

MAXIMUM, MINIMUM WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 9418767 T.M.: 0 W
Name: North Spit, CA Units: Feet
Type: Mixed Datum: NAVD
Note: [] Inferred Water Level Value Quality: Verified

2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	3.95	3.51	3.75	3.57	3.73	3.62	3.76	3.88	4.05	3.85	3.69	3.73	
Maximum	8.10	7.82	7.82	8.02	8.13	8.19	7.99	7.71	7.97	8.10	8.65	8.57	
Max Day	21	8	13	10	9	5	22	19	20	18	16	13	
Max Time	16:36	18:30	10:12	08:54	08:18	06:24	07:54	07:06	21:36	20:18	19:36	17:54	
Minimum	-1.83	-2.05	-1.11	-1.10	-1.66	-1.85	-1.72	-1.26	-0.32	-1.35	-1.88	-2.37	
Min Day	12	10	10	10	8	7	5	3	16	20	16	16	
Min Time	02:42	02:06	01:42	15:24	14:18	14:48	13:48	13:30	12:42	03:54	01:54	02:24	

2021	Jan	Feb	Mar	Annual
Mean	4.00	3.54	3.45	
Maximum	8.65	7.92	7.32	
Max Day	12	11	4	
Max Time	18:36	19:06	11:12	
Minimum	-1.84	-1.70	-1.13	
Min Day	14	28	1	
Min Time	02:18	02:00	02:36	

*The monthly max/min report information is based on high/low tides only.

Apr 22 2021 18:09 GMT

MAXIMUM, MINIMUM WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 9418767
T.M.: 0 W
Name: North Spit, CA
Units: Feet
Type: Mixed
Datum: NAVD
Note: [] Inferred Water Level Value
Quality: Verified

2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	4.25	4.26	4.03	3.70	3.79	3.58	3.66	3.80	3.95	3.75	3.99	4.33	
Maximum	9.09	8.48	7.92	7.70	8.38	7.67	7.95	8.14	7.82	7.95	8.64	8.86	
Max Day	20	3	25	20	19	16	31	1	30	29	27	25	
Max Time	18:24	18:24	10:42	07:48	07:24	06:12	05:54	06:48	20:36	20:06	19:24	18:24	
Minimum	-2.09	-1.97	-0.58	-1.32	-0.99	-1.75	-1.93	-1.76	-0.54	-1.31	-1.36	-1.24	
Min Day	23	20	18	21	20	5	5	2	1	31	26	27	
Min Time	02:48	01:48	23:54	15:00	14:48	15:00	15:30	14:30	14:54	03:24	01:00	02:18	

2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	3.95	3.51	3.75	3.57	3.73	3.62	3.76	3.88	4.05	3.85	3.69	3.73	
Maximum	8.10	7.82	7.82	8.02	8.13	8.19	7.99	7.71	7.97	8.10	8.65	8.57	
Max Day	21	8	13	10	9	5	22	19	20	18	16	13	
Max Time	16:36	18:30	10:12	08:54	08:18	06:24	07:54	07:06	21:36	20:18	19:36	17:54	
Minimum	-1.83	-2.05	-1.11	-1.10	-1.66	-1.85	-1.72	-1.26	-0.32	-1.35	-1.88	-2.37	
Min Day	12	10	10	10	8	7	5	3	16	20	16	16	
Min Time	02:42	02:06	01:42	15:24	14:18	14:48	13:48	13:30	12:42	03:54	01:54	02:24	

*The monthly max/min report information is based on high/low tides only.

National Weather Service Daily Climate Data for Eureka

000
CXUS56 KEKA 050127
CF6EKA

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: EUREKA CA
MONTH: JANUARY
YEAR: 2022
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

TEMPERATURE IN F:							:PCPN:		SNOW:	WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	48	30	39	-8	26	0	0.00	0.0	0	0.8	5	20	M	M	5		6	M
2	52	32	42	-5	23	0	0.00	0.0	0	8.5	16	150	M	M	9		31	M
3	54	47	51	4	14	0	0.64	0.0	0	11.8	17	180	M	M	10		33	M
4	53	47	50	3	15	0	0.59	0.0	0	4.1	10	180	M	M	10		10	M
5	55	46	51	3	14	0	0.22	0.0	0	1.3	6	250	M	M	9	1	8	M
6	56	50	53	5	12	0	0.06	0.0	0	3.6	9	210	M	M	10	2	13	M
7	52	40	46	-2	19	0	0.27	0.0	0	5.3	12	180	M	M	9	1	16	M
8	51	35	43	-5	22	0	0.00	0.0	0	2.3	6	30	M	M	2	1	6	M
9	56	35	46	-2	19	0	0.00	0.0	0	2.4	7	270	M	M	1		7	M
10	60	44	52	4	13	0	T	0.0	0	1.9	6	320	M	M	7		8	M
11	58	41	50	2	15	0	0.00	0.0	0	1.5	7	260	M	M	8	18	9	M
12	60	39	50	2	15	0	0.00	0.0	0	3.7	10	270	M	M	4	1	11	M
13	56	43	50	2	15	0	0.07	0.0	0	3.6	7	350	M	M	7	1	9	M
14	54	40	47	-1	18	0	0.00	0.0	0	3.1	13	10	M	M	2	28	13	M
15	58	41	50	2	15	0	0.00	0.0	0	1.2	6	40	M	M	5	28	6	M
16	54	36	45	-3	20	0	0.00	0.0	0	1.0	6	320	M	M	6	1	7	M
17	51	40	46	-2	19	0	0.00	0.0	0	2.0	6	360	M	M	9	2	8	M
18	49	43	46	-2	19	0	0.00	0.0	0	2.3	9	300	M	M	10	1	9	M
19	53	42	48	0	17	0	0.00	0.0	0	1.3	9	290	M	M	8	2	9	M
20	56	46	51	3	14	0	T	0.0	0	5.5	12	360	M	M	6	18	20	M
21	55	40	48	0	17	0	0.00	0.0	0	4.1	12	20	M	M	6	1	14	M
22	71	37	54	6	11	0	0.00	0.0	0	3.8	10	10	M	M	1		14	M
23	63	39	51	3	14	0	0.00	0.0	0	2.5	7	280	M	M	0	8	10	M
24	58	36	47	-1	18	0	0.00	0.0	0	2.6	13	280	M	M	3		13	M
25	49	41	45	-3	20	0	0.00	0.0	0	1.8	5	310	M	M	9	2	6	M
26	50	37	44	-4	21	0	0.00	0.0	0	2.5	5	360	M	M	5	2	6	M
27	55	33	44	-4	21	0	0.00	0.0	0	2.1	5	270	M	M	1	2	6	M
28	62	34	48	0	17	0	0.00	0.0	0	2.0	6	290	M	M	3		6	M
29	57	35	46	-2	19	0	0.00	0.0	0	3.4	9	310	M	M	0		9	M
30	54	43	49	1	16	0	0.03	0.0	0	2.0	6	330	M	M	7	1	9	M
31	50	41	46	-2	19	0	0.02	0.0	0	11.1	20	10	M	M	5	1	24	M
SM	1710	1233		537		0	1.90	0.0		105.1			M		177			
AV	55.2	39.8								3.4	FASTST		M	M	6		MAX(MPH)	
								MISC ---->		20	10						33	9999

NOTES:
LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

STATION: EUREKA CA
MONTH: JANUARY
YEAR: 2022
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

000
CXUS56 KEKA 030325
CF6EKA

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: EUREKA CA
MONTH: DECEMBER
YEAR: 2021
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

TEMPERATURE IN F:							:PCPN:		SNOW:	WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
									12Z	AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	61	42	52	4	13	0	0.00	0.0	0	2.7	9	360	M	M	2	28	10	M
2	51	48	50	2	15	0	T	0.0	0	1.9	6	340	M	M	10	2	M	M
3	50	45	48	0	17	0	0.03	0.0	0	2.5	6	170	M	M	10	2	7	M
4	50	47	49	1	16	0	0.01	0.0	0	2.0	6	20	M	M	10	1	7	M
5	51	47	49	1	16	0	0.00	0.0	0	1.4	6	10	M	M	10	1	M	M
6	51	44	48	0	17	0	0.35	0.0	0	2.3	7	350	M	M	10	18	M	M
7	57	47	52	4	13	0	0.02	0.0	0	3.7	13	270	M	M	9	2	M	M
8	52	48	50	2	15	0	0.05	0.0	0	7.5	13	30	M	M	10	1	14	M
9	51	37	44	-4	21	0	0.00	0.0	0	7.5	17	10	M	M	1		20	M
10	51	33	42	-5	23	0	0.00	0.0	0	2.0	8	360	M	M	3		M	M
11	51	41	46	-1	19	0	0.56	0.0	0	10.3	20	160	M	M	10		31	M
12	53	46	50	3	15	0	0.49	0.0	0	7.2	12	180	M	M	8	1	M	M
13	49	39	44	-3	21	0	0.89	T	0	6.0	12	190	M	M	10	5	18	M
14	50	34	42	-5	23	0	0.03	0.0	0	2.8	9	270	M	M	5		10	M
15	46	40	43	-4	22	0	0.54	0.0	0	10.2	21	170	M	M	10	1	37	M
16	54	38	46	-1	19	0	0.11	0.0	0	3.6	9	180	M	M	6	1	M	M
17	51	34	43	-4	22	0	0.00	0.0	0	1.3	8	300	M	M	3	1	10	M
18	51	35	43	-4	22	0	0.09	0.0	0	0.7	6	120	M	M	9	1	M	M
19	56	45	51	4	14	0	T	0.0	0	7.9	14	180	M	M	10	1	26	M
20	60	52	56	9	9	0	T	0.0	0	8.5	13	150	M	M	10		25	M
21	59	46	53	6	12	0	0.29	0.0	0	5.5	13	180	M	M	9	1	18	M
22	60	45	53	6	12	0	0.83	0.0	0	5.2	17	190	M	M	10	1	20	M
23	52	43	48	1	17	0	0.47	0.0	0	3.3	12	10	M	M	10		16	M
24	50	41	46	-1	19	0	0.26	0.0	0	7.2	21	280	M	M	10		31	M
25	50	37	44	-3	21	0	0.54	T	0	5.7	15	330	M	M	7	5	23	M
26	45	35	40	-7	25	0	0.96	T	0	8.2	13	270	M	M	10	5	25	M
27	44	36	40	-7	25	0	0.16	0.0	0	6.3	12	300	M	M	9		22	M
28	49	37	43	-4	22	0	0.16	0.0	0	3.4	8	170	M	M	10		10	M
29	50	34	42	-5	23	0	0.21	0.0	0	4.6	12	10	M	M	3		21	M
30	49	34	42	-5	23	0	0.13	0.0	0	1.6	7	260	M	M	8	1	8	M
31	49	33	41	-6	24	0	0.07	0.0	0	2.2	9	40	M	M	7	1	9	M
SM	1603	1263		575		0	7.25	T		145.2			M		249			
AV	51.7	40.7								4.7	FASTST		M	M	8		MAX(MPH)	
								MISC ---->		# 21	170						37 9999	

NOTES:
LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

STATION: EUREKA CA
MONTH: DECEMBER
YEAR: 2021
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

398
CXUS56 KEKA 022021
CF6EKA

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: EUREKA CA
MONTH: JANUARY
YEAR: 2021
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

TEMPERATURE IN F:							:PCPN:		SNOW:		WIND :SUNSHINE:			SKY	:PK WND		
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
												12Z		AVG MX 2MIN				
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	59	41	50	2	15	0	0.43	0.0	0	3.4	10	180	M	M	9	1	18	M
2	57	42	50	2	15	0	0.07	0.0	0	5.3	11	180	M	M	10	1	14	M
3	60	51	56	8	9	0	0.06	0.0	0	9.0	17	160	M	M	10		31	M
4	58	41	50	2	15	0	0.53	0.0	0	8.2	16	180	M	M	9	1	38	180
5	59	37	48	0	17	0	0.00	0.0	0	3.0	10	300	M	M	7		14	M
6	57	41	49	1	16	0	0.41	0.0	0	7.3	16	190	M	M	9		28	M
7	57	38	48	0	17	0	0.17	0.0	0	6.3	18	170	M	M	9	1	25	M
8	56	41	49	1	16	0	0.05	0.0	0	2.8	7	360	M	M	4	1	M	M
9	59	36	48	0	17	0	0.07	0.0	0	4.5	10	180	M	M	4		14	M
10	55	47	51	3	14	0	0.14	0.0	0	2.7	9	280	M	M	10	1	16	280
11	62	42	52	4	13	0	T	0.0	0	5.0	14	200	M	M	7	1	19	M
12	61	55	58	10	7	0	0.81	0.0	0	11.5	16	180	M	M	10		22	M
13	60	51	56	8	9	0	0.30	0.0	0	2.7	10	170	M	M	10	28	18	M
14	61	42	52	4	13	0	0.00	0.0	0	2.8	9	280	M	M	4	2	10	M
15	56	47	52	4	13	0	T	0.0	0	0.0	7	50	M	M	9	18	7	M
16	50	46	48	0	17	0	0.00	0.0	0	1.6	6	290	M	M	10	2	7	M
17	58	40	49	1	16	0	0.00	0.0	0	3.2	14	10	M	M	5	2	25	M
18	58	40	49	0	16	0	0.00	0.0	0	6.2	17	20	M	M	0	8	25	M
19	60	35	48	-1	17	0	0.00	0.0	0	4.0	14	340	M	M	2	8	16	M
20	59	33	46	-3	19	0	0.00	0.0	0	2.0	6	330	M	M	3		7	M
21	54	38	46	-3	19	0	0.29	0.0	0	3.5	12	310	M	M	7		15	M
22	52	42	47	-2	18	0	0.17	0.0	0	8.5	16	360	M	M	9		23	M
23	52	35	44	-5	21	0	0.00	0.0	0	5.4	17	10	M	M	1		24	M
24	46	39	43	-6	22	0	0.42	0.0	0	5.6	16	340	M	M	10		41	350
25	48	33	41	-8	24	0	0.13	0.0	0	2.8	9	50	M	M	6		15	M
26	44	31	38	-11	27	0	0.79	0.0	0	11.0	21	170	M	M	10		49	170
27	49	40	45	-4	20	0	1.51	0.0	0	7.0	12	160	M	M	10	3	20	M
28	51	36	44	-5	21	0	0.54	0.0	0	3.7	10	170	M	M	7	1	14	M
29	52	32	42	-7	23	0	0.01	0.0	0	4.6	12	260	M	M	7	1	14	0
30	57	46	52	3	13	0	0.02	0.0	0	13.0	18	170	M	M	9		30	0
31	58	51	55	6	10	0	0.18	0.0	0	12.8	20	160	M	M	10		35	0
SM	1725	1269		509	0	7.10		0.0		169.4		M	227					

National Weather Service Daily Climate Data for Eureka

000
CXUS56 KEKA 050032
CF6EKA

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: EUREKA CA
MONTH: DECEMBER
YEAR: 2020
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

	TEMPERATURE IN F:						:PCPN:		SNOW:	WIND	:SUNSHINE:		SKY	:PK WND		
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
												12Z	AVG	MX	2MIN			
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	53	39	46	-3	19	0	0.00	0.0	0	0.9	5	340	M	M	5	18	5	M
2	52	35	44	-4	21	0	0.00	0.0	0	0.8	5	270	M	M	5	18	5	M
3	53	42	48	0	17	0	0.00	0.0	0	1.3	5	310	M	M	7	2	5	M
4	57	39	48	0	17	0	0.00	0.0	0	1.5	5	290	M	M	4	28	6	M
5	63	38	51	3	14	0	0.11	0.0	0	3.5	14	180	M	M	8	2	14	M
6	55	38	47	-1	18	0	0.00	0.0	0	2.7	9	360	M	M	1	2	14	M
7	59	37	48	0	17	0	0.00	0.0	0	3.3	9	30	M	M	4	28	9	M
8	57	37	47	-1	18	0	0.00	0.0	0	2.0	6	340	M	M	5	18	9	M
9	55	40	48	0	17	0	0.03	0.0	0	4.1	12	20	M	M	8	28	15	M
10	54	35	45	-3	20	0	0.00	0.0	0	3.3	8	260	M	M	6	1	8	M
11	47	38	43	-5	22	0	0.14	0.0	0	3.1	8	140	M	M	10	1	8	M
12	57	45	51	3	14	0	0.04	0.0	0	2.8	9	18	M	M	10	1	16	M
13	57	43	50	2	15	0	0.73	0.0	0	4.2	10	23	M	M	10		16	M
14	53	37	45	-3	20	0	T	0.0	0	0.9	6	320	M	M	4	18	6	M
15	55	40	48	0	17	0	0.15	0.0	0	2.5	9	12	M	M	10	2	12	M
16	60	43	52	4	13	0	0.87	0.0	0	5.8	12	M	M	M	10	2	20	M
17	53	38	46	-2	19	0	0.10	0.0	0	6.8	14	340	M	M	4	18	17	M
18	54	34	44	-4	21	0	0.00	0.0	0	1.7	9	300	M	M	4	1	9	M
19	60	45	53	5	12	0	0.12	0.0	0	2.3	7	280	M	M	9	18	7	M
20	63	50	57	9	8	0	0.01	0.0	0	1.8	8	320	M	M	7	1	8	M
21	60	43	52	4	13	0	0.43	0.0	0	3.8	13	300	M	M	8	1	25	M
22	51	36	44	-4	21	0	0.00	0.0	0	3.5	13	10	M	M	1		23	M
23	58	31	45	-3	20	0	0.00	0.0	0	1.3	6	300	M	M	0	8	6	M
24	62	33	48	0	17	0	0.00	0.0	0	5.8	14	170	M	M	9		25	M
25	60	49	55	7	10	0	0.60	0.0	0	11.3	17	180	M	M	9		39	M
26	56	40	48	0	17	0	0.11	0.0	0	4.8	12	240	M	M	4		18	M
27	54	35	45	-3	20	0	0.00	0.0	0	1.9	7	50	M	M	3	1	7	M
28	52	33	43	-5	22	0	0.00	0.0	0	2.0	6	330	M	M	0	8	7	M
29	53	32	43	-5	22	0	0.00	0.0	0	2.0	7	330	M	M	4		8	M
30	53	38	46	-2	19	0	0.50	M	M	5.4	17	180	M	M	10		20	M
31	55	43	49	1	16	0	0.02	0.0	0	1.7	7	320	M	M	7	18	8	M
SM	1731	1206		536	0	3.96	0.0	98.8	M	186								

Note: An "M" in any column means the data are Missing for that element.

Column		
1	**DY**	The **day** of the month.
2	**MAX**	The **highest** temperature for the day in degrees Fahrenheit (F).
3	**MIN**	The **lowest** temperature for the day in degrees Fahrenheit (F).
4	**AVG**	The **average** temperature for the day, computed by finding the average of the values in columns 2 and 3, then rounding (if necessary). Example; 55.5 rounds up to 56, 55.4 rounds down to 55 degrees.
5	**DEP**	**Departure** from normal. The difference between column 4 and the 30 year normal temperature for this date. A minus (-) is number of degrees below normal. A zero (0) indicates that the average for that day was the Normal.
6a & 6b	**HDD & CDD**	**Degree Day:** A gauge of the amount of heating or cooling needed for a building using 65 degrees as a baseline. To compute heating/cooling degree-days, take the average temperature for a day and subtract the reference temperature of 65 degrees. If the difference is positive, it is called a "**Cooling Degree Day**". If the difference is negative, it is called a "**Heating Degree Day**". The magnitude of the difference is the number of days. For example, if your average temperature for a day is 50 degrees in September, the difference of the average temperature for that day and the reference temperature of 65 degrees would yield a minus 15. Therefore, you have 15 Heating Degree Days that day. If the average temperature is 77 degrees for a day, you would have 12 Cooling Degree Days (77-65). If the average temperature for the day is 65 degrees, there are no Heating or Cooling degree days. Electrical, natural gas, power, and heating, and air conditioning industries utilize heating and cooling degree information to calculate their energy needs. The Heating season runs from July 1st through June 30th. The Cooling season runs from Jan 1st through Dec 31st.
7	**WTR**	Total **precipitation** for the day to the nearest hundredth of an inch. This includes all forms of precipitation, both liquid and water equivalent of any snow or ice that occurred (T = Trace, some precipitation fell but not enough to measure).
8	**SNW**	Total **snowfall** for the day to the nearest tenth of an inch.
9	**DPTH**	Snow **depth** on the ground to the nearest inch at 1200UTC. 7am EST., 6am CST, 5am MST, 4am PST, 3am AST, etc.
10	**AVG SPD**	**Average wind speed** for the day in miles per hour (mph).
11	**MX SPD**	The **highest wind speed** in mph averaged over a 2 minute period.

12	**2MIN DIR**	The **direction** (in compass degrees divided by 10) from which the wind speed in column 11 came from. (N=36 S=18 W=27 E=09, etc.)
13	**MIN**	The number of **minutes** of sunshine received at the station. Not reported at all locations.
14	**PSBL**	The percentage of **possible** sunshine. Computed by dividing the minutes of sunshine in column 13 by the total possible minutes. Not reported at all locations.
15	**S-S**	The average sky cover between sunrise and sunset in tenths of sky covered. The minimum of "0" means no clouds observed, "10" means clouds covered the entire sky for that day.
16	**WX**	A coded number representing certain types of **weather** observed during the day. 1 = Fog 2 = Fog reducing visibility to 1/4 mile or less 3 = Thunder 4 = Ice pellets 5 = Hail 6 = Glaze or rime 7 = Blowing dust or sand: visibility 1/2 mile or less 8 = Smoke or haze 9 = Blowing snow X = Tornado In the example above on the 12th, you see "138" coded for the day. That means Fog, Thunder and Smoke or Haze were observed at some time during that day.
17	**SPD**	Peak wind **speed** for the day in mph. The highest wind speed observed at the station.
18	**DR**	The compass **direction** from which the peak wind speed came.

Appendix B

Photo Documentation Locations

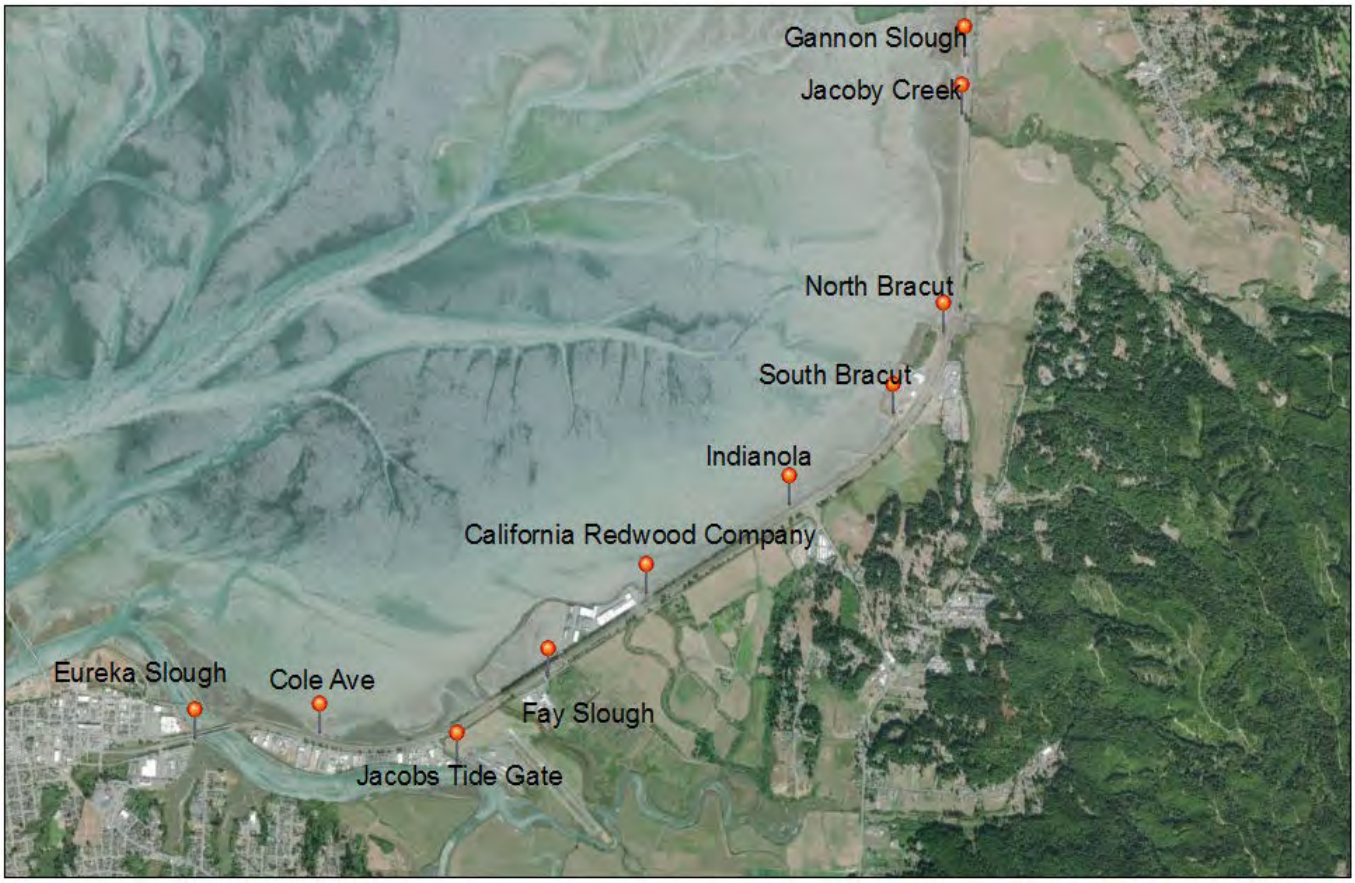


Figure 1 ***Reference Photograph Locations*** *for documenting King Tides and extreme weather events along the Eureka-Arcata 101 Corridor.*

Table 1 ***Location Selection Criteria***

	Accessibility and Safety	**Vulnerability to Flooding**	**Shoreline Cover**	**Adjacent Land Use / Zoning**
Gannon Slough	Good, *Bay Trail*	moderate-high	Salt marsh, slough channel	Trail/Natural Resources (NR)
Jacoby Creek	Good, *Bay Trail*	moderate-high	Salt marsh, creek channel	Trail/NR
North Bracut	Fair, *behind Bayside Garden Supply*	moderate-high	Bracut dike, railroad grade, vegetation	Businesses/NR and Industrial General
South Bracut	Fair, *near California Trailers*	moderate	Bracut dike, railroad grade, salt marsh	Businesses/NR and Industrial General
Indianola	Caution, *shoulder*	moderate	Railroad grade, rock, exposed with areas of erosion	Future Trail/NR
California Redwood Company	Fair, *entrance to CRC*	moderate-high	Railroad grade, salt marsh, rock, CRC levee to the south	Future Trail/ NR, Industrial General
Jacobs Tide Gate	Fair, *Airport Rd*	low-moderate	Jacobs Ave south side levee, rock protection	Businesses/Service Commercial
Eureka Slough	Good, *Eureka Waterfront Trail*	high	Bank of Eureka Slough, rock, vegetation	Trail/Service Commercial/NR
Cole Ave	Caution, *shoulder*	high	Railroad grade, rock, erosion bound by salt marsh to north and south	Future Trail/NR
Fay Slough	Fair, *CDFW parking lot*, *shoulder*	subject to inland flooding from Fay Slough	Roadside ditch paralleling Highway 101 north	Businesses/Service Commercial/ Coastal Agricultural

Appendix C

Photo Documentation

King Tide and Extreme Tidal Event Photo Documentation

Reference Photos

December 23, 2019:

Gannon Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Ave

January 10, 2020:

Fay Slough

2020 Annual Report, Winter 2019/2020 King Tide Photos

January 10 and 11, 2020:

All locations

February 8, 2020:

All locations

2021 Annual Report, Winter 2020/21 King Tide Photos

December 14, 2020:

All locations

January 12, 2021:

All locations

2022 Annual Report, Winter 2021/22 King Tide Photos

December 4, 2021:

All locations

January 3, 2022:

All locations

Gannon Slough Photos

Gannon Slough South Reference

Gannon Slough South 2020 Annual Report

1/10/20

1/11/20

2/8/20

Gannon Slough South 2021 Annual Report

12/14/20

1/12/21

Gannon Slough South 2022 Annual Report

12/4/22

1/3/22

Gannon Slough North Reference

Gannon Slough North 2020 Annual Report

1/10/20

1/11/20

2/8/20

Gannon Slough North 2021 Annual Report

12/14/20

1/12/21

Gannon Slough North 2022 Annual Report

12/4/21

1/3/22

Gannon Slough Bay Reference

1/10/20

1/11/20

2/8/20

Gannon Slough Bay 2021 Annual Report

12/14/20

1/12/21

12/4/21

1/3/22

Jacoby Creek Photos

Jacoby Creek Left Reference

Jacoby Creek Left 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacoby Creek Left 2021 Annual Report

12/14/20

1/12/21

Jacoby Creek Left 2022 Annual Report

12/4/21

1/3/22

Jacoby Creek Right Reference

Jacoby Creek Right 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacoby Creek Right 2021 Annual Report

12/14/20 *1/12/21*

Jacoby Creek Right 2022 Annual Report

12/4/21 *1/3/22*

Jacoby Creek RR Reference

Jacoby Creek RR 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacoby Creek RR 2021 Annual Report

12/14/20

1/12/21

Jacoby Creek RR 2022 Annual Report

12/4/22

1/3/22

Jacoby Creek Bay Reference

Jacoby Creek Bay 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacoby Creek Bay 2021 Annual Report

12/14/20

Jacoby Creek Bay 2022 Annual report

12/4/21

1/3/22

Jacoby Creek Kayaker 2022 Annual Report

12/4/21

North Bracut Photos

North Bracut Full Reference

North Bracut Full 2020 Annual Report

1/10/20

1/11/20

2/8/20

North Bracut Full 2021 Annual Report

12/14/20

1/12/21

North Bracut Full 2022 Annual Report

12/4/21

1/3/22

North Bracut Zoom Reference

North Bracut Zoom 2020 Annual Report

1/10/20

1/11/20

2/8/20

North Bracut Zoom 2021 Annual Report

12/14/20

1/12/21

North Bracut Zoom 2022 Annual Report

12/4/21

1/3/22

North Bracut Railroad 2022 Annual Report

1/3/22

South Bracut Photos

South Bracut Full Reference

South Bracut Full 2020 Annual Report

1/10/20

1/11/20

2/8/20

South Bracut Full 2021 Annual Report

12/14/20

1/12/21

South Bracut Full 2022 Annual Report

12/4/21

1/3/22

South Bracut Zoom Reference

South Bracut Zoom 2020 Annual Report

1/10/20

1/11/20

2/8/20

South Bracut Zoom 2021 Annual Report

12/14/20

1/12/21

South Bracut Zoom 2022 Annual Report

12/4/21

1/3/22

Indianola Photos

Indianola North Reference

Indianola North 2020 Annual Report

1/10/20

1/11/20

Indianola Erosion 2020 Annual Report

2/8/20

Indianola North 2021 Annual Report

12/14/20

1/12/21

Indianola North 2022 Annual Report

12/4/21

1/3/22

California Redwood Company Photos

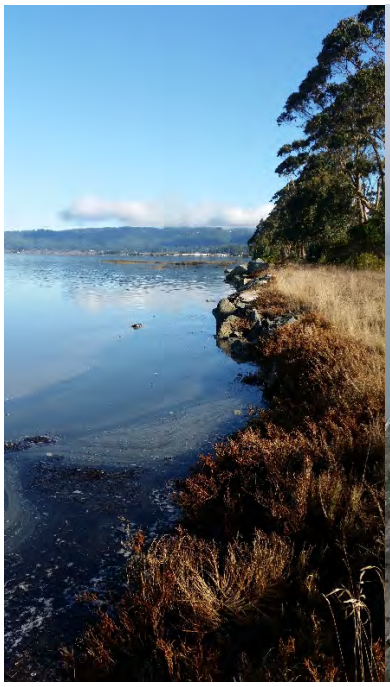
CRC Full Reference

CRC Full 2020 Annual Report

1/10/20

1/11/20

CRC Full 2021 Annual Report



12/14/20

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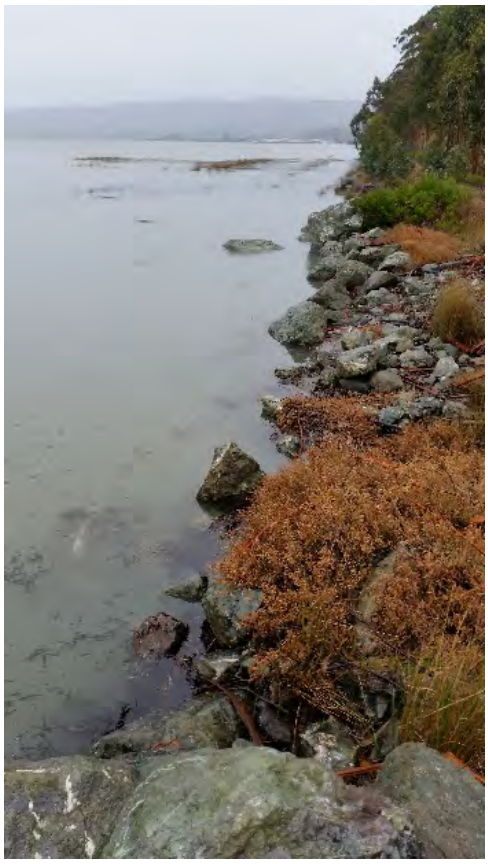
12/4/21

1/3/22

CRC Zoom Reference

1/10/20 *1/11/20*

CRC Zoom 2021 Annual Report



12/14/20 *1/12/21*

12/14/21

1/3/22

Eureka Slough Photos

Eureka Slough Zoom Reference

Eureka Slough Zoom 2020 Annual Report

1/10/20

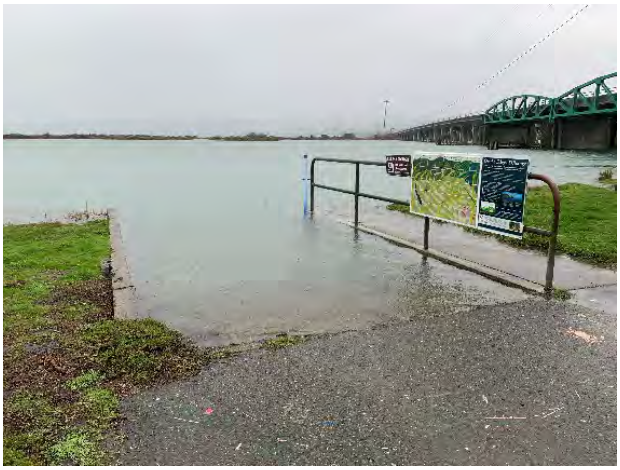
1/11/20

2/8/20

Eureka Slough Zoom 2021 Annual Report

12/14/20 *1/12/21*

Eureka Slough Bridge Boat Ramp 2021 Annual Report



1/12/21 *1/12/21*

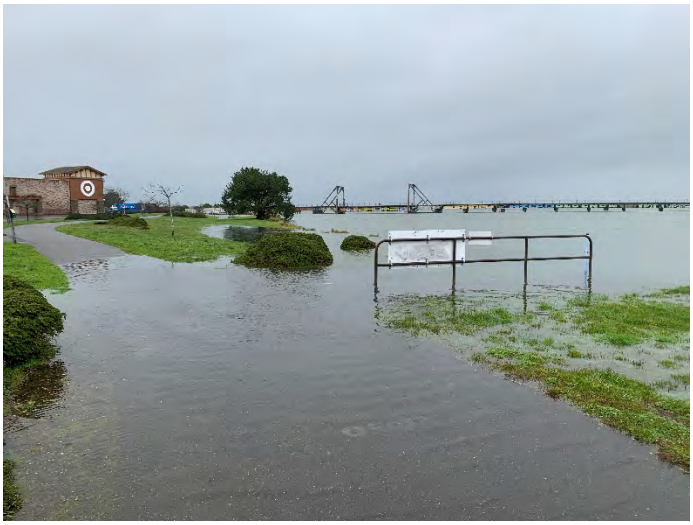
Eureka Slough Zoom 2022 Annual Report

12/4/21

Eureka Slough Bridge Boat Ramp 2022 Annual Report

12/4/21

1/3/22



1/3/22

12/4/21

1/3/22

Jacobs Tide Gate Photos

Jacobs Tide Gate East Zoom Reference

1/10/20

1/11/20

2/8/20

Jacobs Tide Gate East Zoom 2021 Annual Report

12/14/20

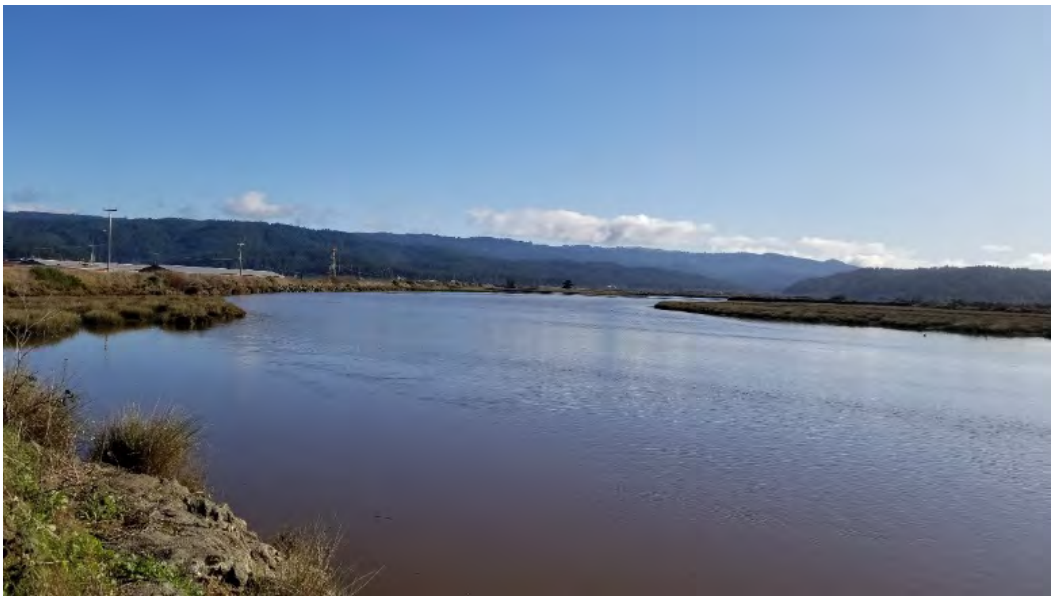
1/12/21

Jacobs Tide Gate East Zoom 2022 Annual Report

12/4/21

1/3/22

Jacobs Tide Gate East Reference



1/10/20

1/11/20

2/8/20

1/12/21

Jacobs Tide Gate East 2022 Annual Report

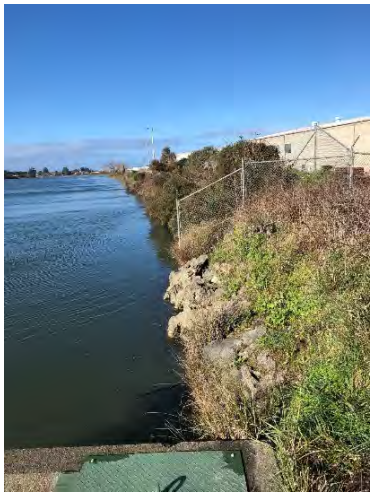
12/4/21

1/3/22

Jacobs Tide Gate West Reference

1/10/20

1/11/20



2/8/20

12/14/20

1/12/21

12/4/21

1/3/22

Cole Ave Photos

Cole Ave North Reference

Cole Ave North 2020 Annual Report

1/10/20

1/11/20

2/8/20

Cole Ave North 2021 Annual Report

12/14/20

1/12/21

Cole Ave North 2022 Annual Report

12/4/21

1/3/22

Cole Ave South Reference

Cole Ave South 2020 Annual Report

1/10/20

1/11/20

2/8/20

Cole Ave South 2021 Annual Report

12/14/20

1/12/21

Cole Ave South 2022 Annual Report

12/4/21

1/3/22

Fay Slough Photos

Fay Slough Mid City South Reference/2020 Annual Report

Fay Slough Mid City South Reference/2020 Annual Report

1/10/20

1/11/20

2/8/20

Fay Slough Mid City South 2021 Annual Report

12/14/20

Fay Slough Mid City South 2022 Annual Report

12/4/21

1/3/22

Fay Slough North Reference/2020 Annual Report

1/11/20 *2/8/20*

Fay Slough North 2021 Annual Report

12/14/20

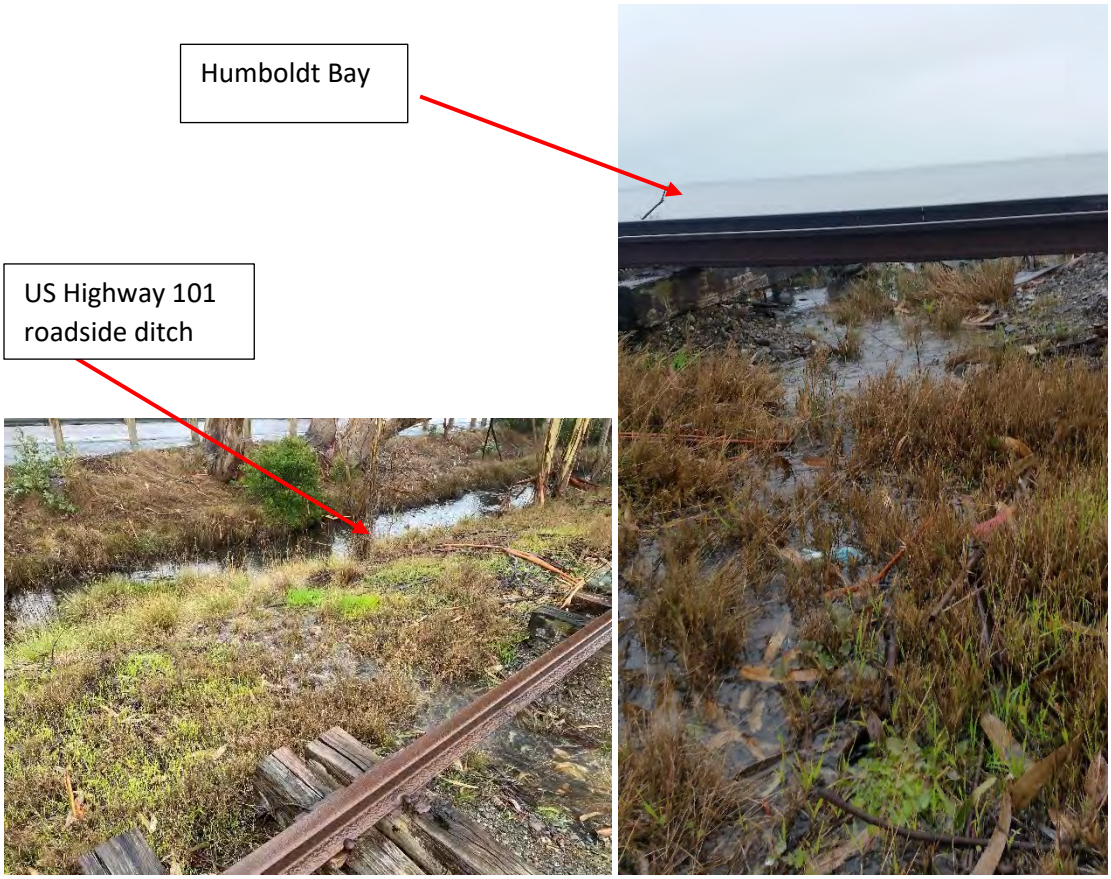
Fay Slough North 2022 Annual Report

12/4/21

1/3/22

12/4/21 *1/3/22*

Railroad Levee Erosion Near PM 82.1, 2022 Annual Report (1/3/22)



DEPARTMENT OF TRANSPORTATION

NORTH REGION ENVIRONMENTAL
1656 UNION STREET
EUREKA, CA 95501
(707) 572-7039
www.dot.ca.gov
TTY 711

Making Conservation a California Way of Life.

May 10, 2023

California Coastal Commission
1385 Eighth Street, Ste. 130
Arcata, CA 95521

File: Eureka-Arcata U.S. Highway 101 Corridor Improvement Project
HUM 101 / PMs 79.9 / 86.3
01-36600 / 0100000127

SUBJECT: CDP 1-18-1078 Special Condition 1, 2023 Annual Report

Special Condition 1. Sea Level Rise and Flooding Impact Monitoring and Reporting

The California Coastal Commission issued to the California Department of Transportation (Caltrans) a Coastal Development Permit (CDP) 1-18-1078 on September 12, 2019. The permit covers the Eureka-Arcata U.S. Highway 101 Corridor Improvement Project (aka the Corridor), which consists of five component projects within a six-mile segment of U.S. Highway 101 along the east side of Humboldt Bay. In accordance with CDP 1-18-1078, Special Condition 1, the California Department of Transportation (Caltrans) is submitting the Sea Level Rise and Flooding Impact Monitoring Report. This 2023 Annual Report references the Baseline Report, which was submitted to California Coastal Commission staff on May 1, 2020, the 2021 Annual Report submitted on May 1, 2021, and the 2022 Annual Report submitted on May 10, 2022.

The Baseline Report, the 2021 Annual Report, and the 2022 Annual Report identify existing water elevation conditions in Humboldt Bay from the North Spit Tide Gauge, which provides data applicable to the Corridor Project. The Baseline Report and Annual Reports are referenced in the 2023 Annual Report to identify changes in water elevation conditions over time.

The Baseline Report established locations from which to take reference photographs to annually document King Tides and other extreme tidal events along the Corridor. The reference photographs and photographs of King Tide events from winter 2019/2020, winter 2020/2021, winter 2021/2022, and winter 2022/2023 are included in Appendix C of the 2023 Annual Report.

Annual Reports also document any closures due to flooding and include a brief discussion of any coastal hazards impacts to highway infrastructure along the Corridor during the reporting period. No flooding or coastal hazards impacted the highway during the 2023 reporting period. The 2023 Annual Report also provides an update on progress made in developing the Comprehensive Adaptation and Implementation Plan (CAIP) required by CDP 1-18-1078, Special Condition 2.

If you have questions or need additional information, please contact Felicia Zimmerman at **Felicia.Zimmerman@dot.ca.gov** or (707) 815-5994.

Sincerely,

Jason Meyer
Senior Environmental Scientist
Branch Chief E3

Attachment: Sea Level Rise and Flooding Impact Monitoring Report 2023

A. Baseline Report

A.1. Water Elevation

The Baseline Report was provided to the California Coastal Commission on May 1, 2020. Water elevation baseline data for the Baseline Report was accessed for the North Spit Tide Gauge from the National Oceanic and Atmospheric Administration (NOAA) website and referenced to NAVD88 (Appendix A). The reporting period for the Baseline Report is April 1, 2019, to March 31, 2020. Monthly maximum water elevations ranged from 7.67 feet to 8.86 feet. The mean monthly maximum water elevation for the baseline reporting period was 8.07 feet (Figure 1). Monthly mean sea level for the baseline reporting period ranged from 3.44 feet to 4.33 feet with a mean of 3.80 feet for the reporting period (Figure 2).

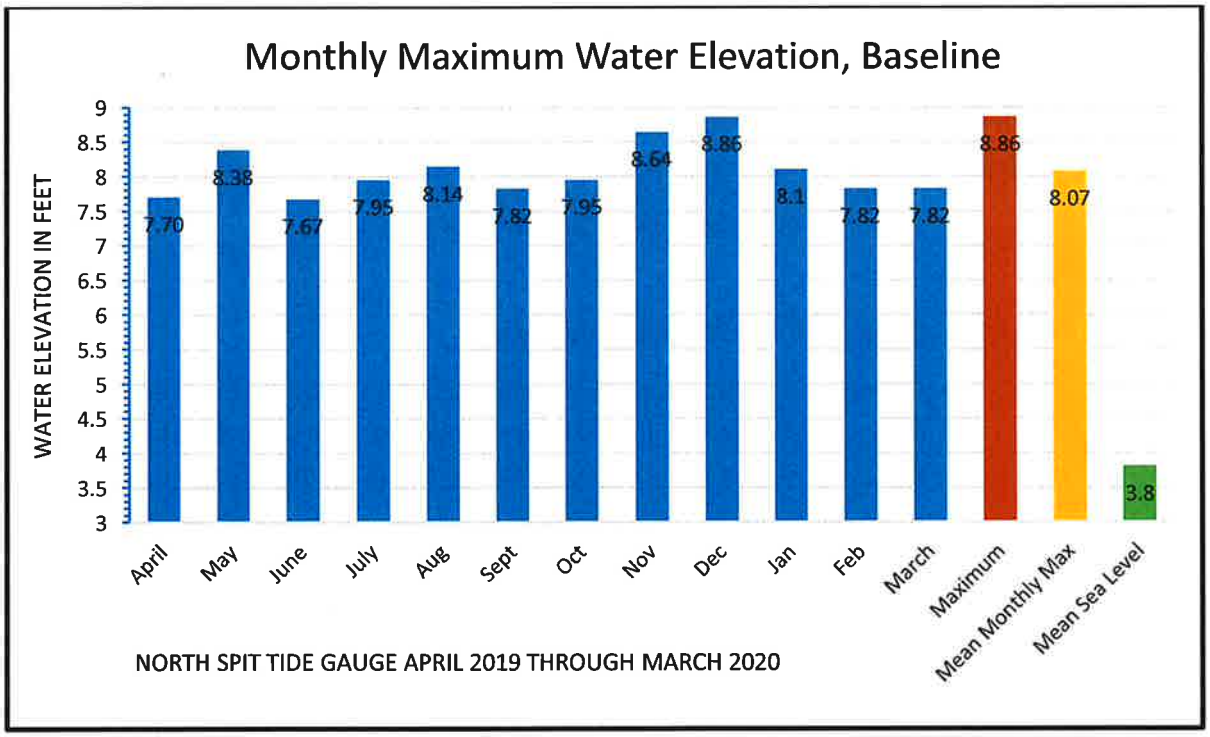


Figure 1. Monthly Maximum Water Elevation, Baseline shows the maximum water elevation by month at the North Spit Tide Gauge from April 1, 2019, to March 31, 2020. Monthly maximum and monthly mean sea level data were accessed from the NOAA Tides and Currents webpage. Mean Monthly Maximum and Mean Sea Level were calculated using the NOAA data.

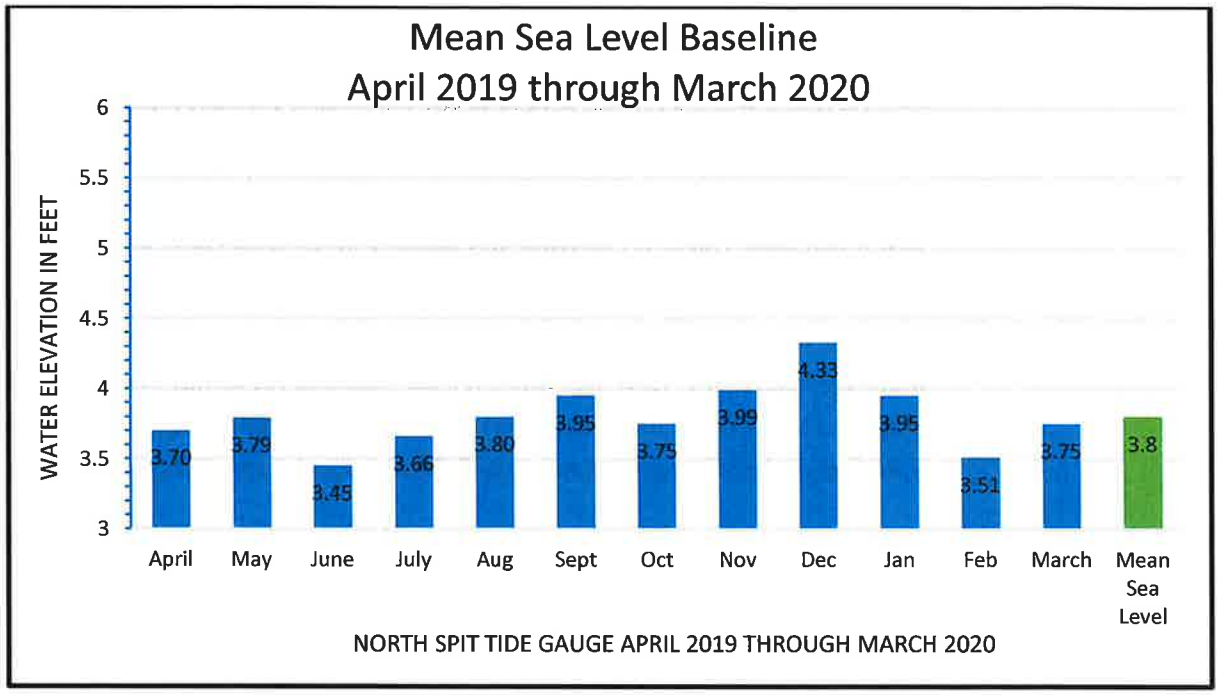


Figure 2. Mean Sea Level, Baseline at the North Spit Tide Gauge for April 1, 2019, through March 31, 2020, was calculated from available monthly mean sea levels from the NOAA Tides and Currents webpage.

A.2. Reference Photograph Locations

Reference locations for photographing annual King Tide and extreme tidal events along the Eureka-Arcata Corridor (Corridor) were established for the Baseline Report and were organized to easily facilitate replicating photos for the Annual Reports (Appendix B). Photograph location selection criteria included accessibility and safety, vulnerability to flooding (Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions 2019), and locations representing various shoreline cover and land use.

Two to four specific photo sites were established at each of the ten selected reference locations: Gannon Slough, Fay Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Avenue.

Site reference photos for Gannon Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Avenue were taken close to high tide on December 23, 2019. The National Weather Service (NWS) Daily Climate Report reported December 23, 2019, weather conditions as clear with an average wind speed of 2.8 miles per hour and no precipitation. The previous day saw 1.23 inches of precipitation. Site reference photos for Fay Slough were taken during the King Tide event on January 10, 2020. NWS reported cloudy weather conditions with an average wind speed of 4.6 miles per hour and minimal precipitation of 0.12 inch. Light precipitation of 0.28 inch was recorded for the previous day.

B. Annual Report 2023

B.1. Water Elevation

Water elevation data for the 2023 Annual Report for the North Spit Tide Gauge was accessed from the NOAA Tides and Currents website (NOAA, April 2023) and referenced to NAVD88 (Appendix A). The reporting period for the 2023 Annual Report was April 1, 2022, through March 31, 2023. Monthly maximum water elevations ranged from 7.67 feet to 8.96 feet (Figure 3). The highest reported water elevation of 8.96 feet was observed on December 23, 2022. This monthly maximum elevation is 0.42 feet lower than the highest monthly maximum elevation from the 2022 Annual Report, 0.31 feet higher than the 2021 Annual Report, and 0.10 feet higher than the monthly maximum elevation from the Baseline Report. The mean monthly maximum water elevation for the 2023 reporting period was 8.29 feet (Figure 3). This is 0.13 feet higher than the mean monthly maximum from the 2022 Annual Report, 0.19 feet higher than the 2021 Annual Report, and 0.22 feet higher than the mean monthly maximum from the Baseline Report (Figure 4).

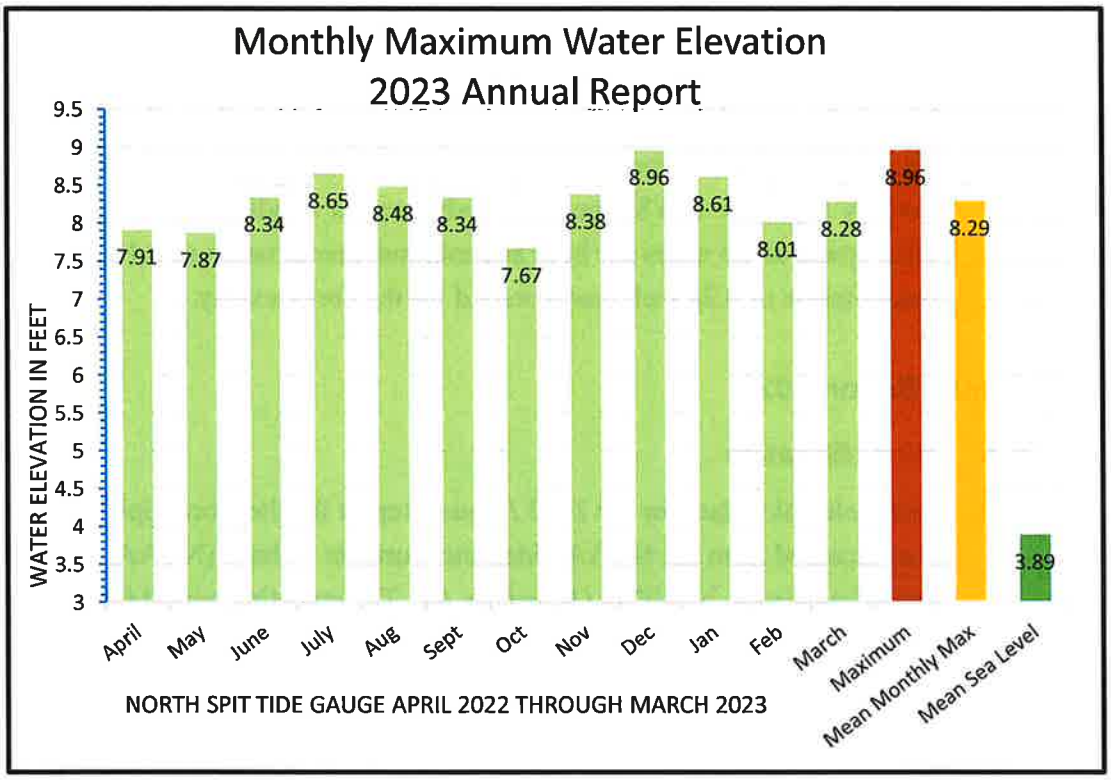


Figure 3. Monthly Maximum Water Elevation, 2023 Annual Report shows the maximum water elevation by month at the North Spit Tide Gauge from April 1, 2022, to March 31, 2023. Monthly maximum and monthly mean sea level data were accessed from the NOAA Tides and Currents webpage. Mean Monthly Maximum and Mean Sea Level were calculated using the NOAA data.

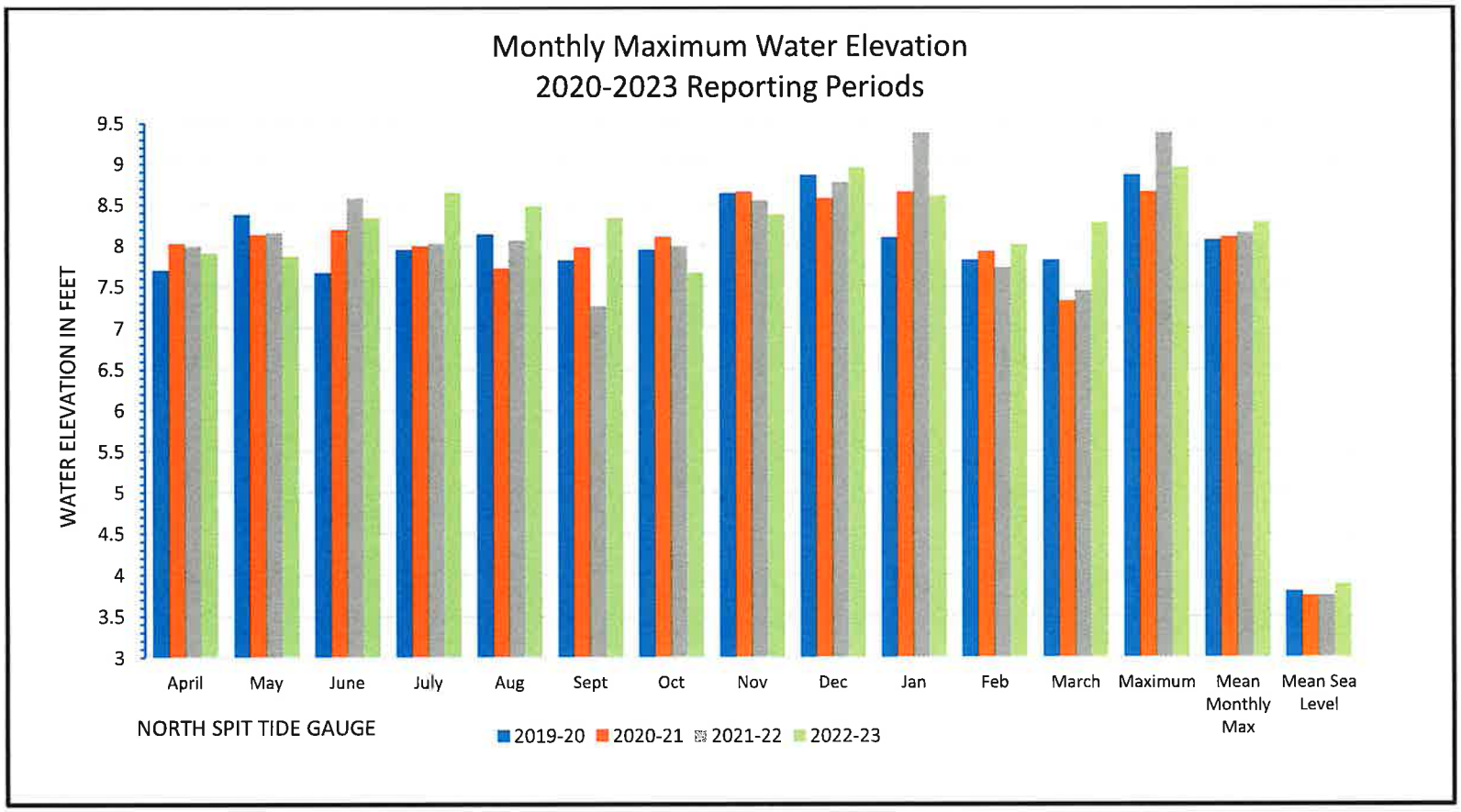


Figure 4. Monthly Maximum Water Elevation 2020-2023 reports the maximum water elevation by month at the North Spit Tide Gauge for the Baseline Report (April 1, 2019, to March 31, 2020), the 2021 Annual Report (April 1, 2020, through March 31, 2021), the 2022 Annual Report (April 1, 2021, through March 31, 2022) and the 2023 Annual Report (April 1, 2022, through March 31, 2023. The maximum water elevation, mean monthly maximum, and mean sea level for the four reporting periods is also represented in the figure.

B. Annual Report 2023 (continued)

B.1. Water Elevation (continued)

Monthly mean sea level for the 2023 reporting period ranged from 3.40 feet to 4.43 feet. Mean sea level for the 2023 Annual Report is 3.89 feet (Figure 5). The mean sea level for the 2022 and 2021 reporting periods was 3.75 feet and 3.74 feet respectively. The Baseline Report mean sea level was 3.80 feet; 0.09 feet lower than the 2023 Annual Report (Figure 6).

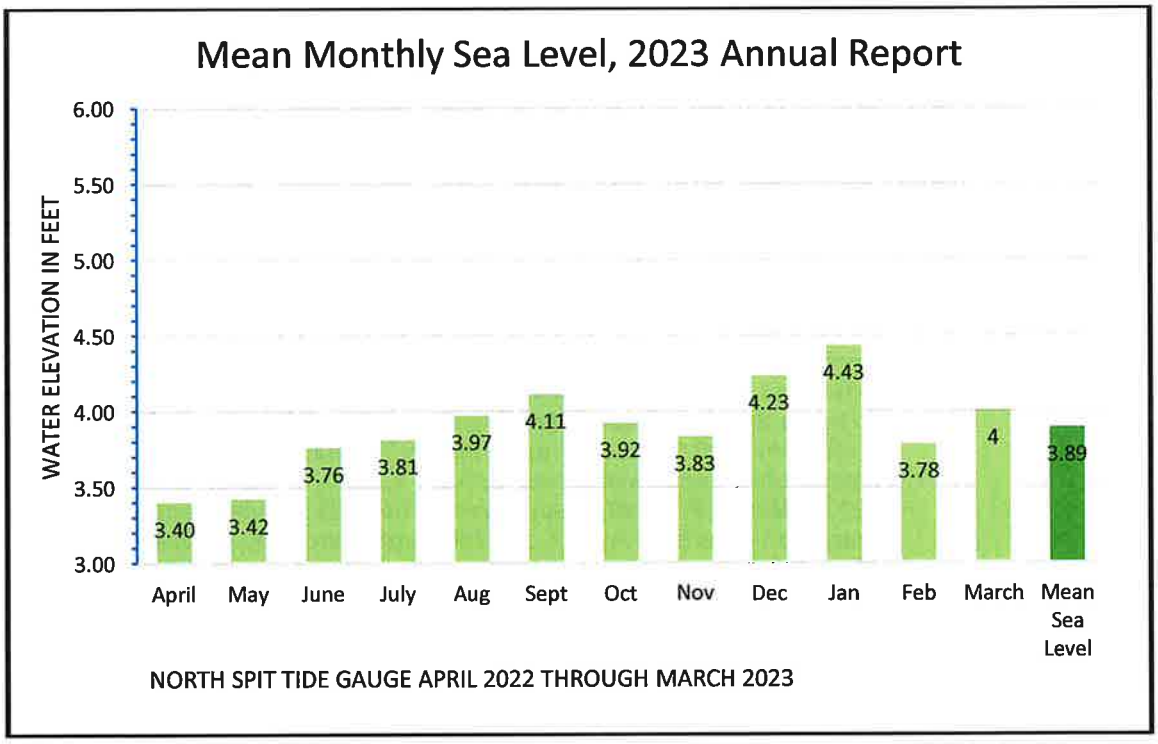


Figure 5. Mean Sea Level at the North Spit Tide Gauge for April 1, 2022, through March 31, 2023, was calculated from available monthly mean sea levels from the NOAA Tides and Currents webpage.

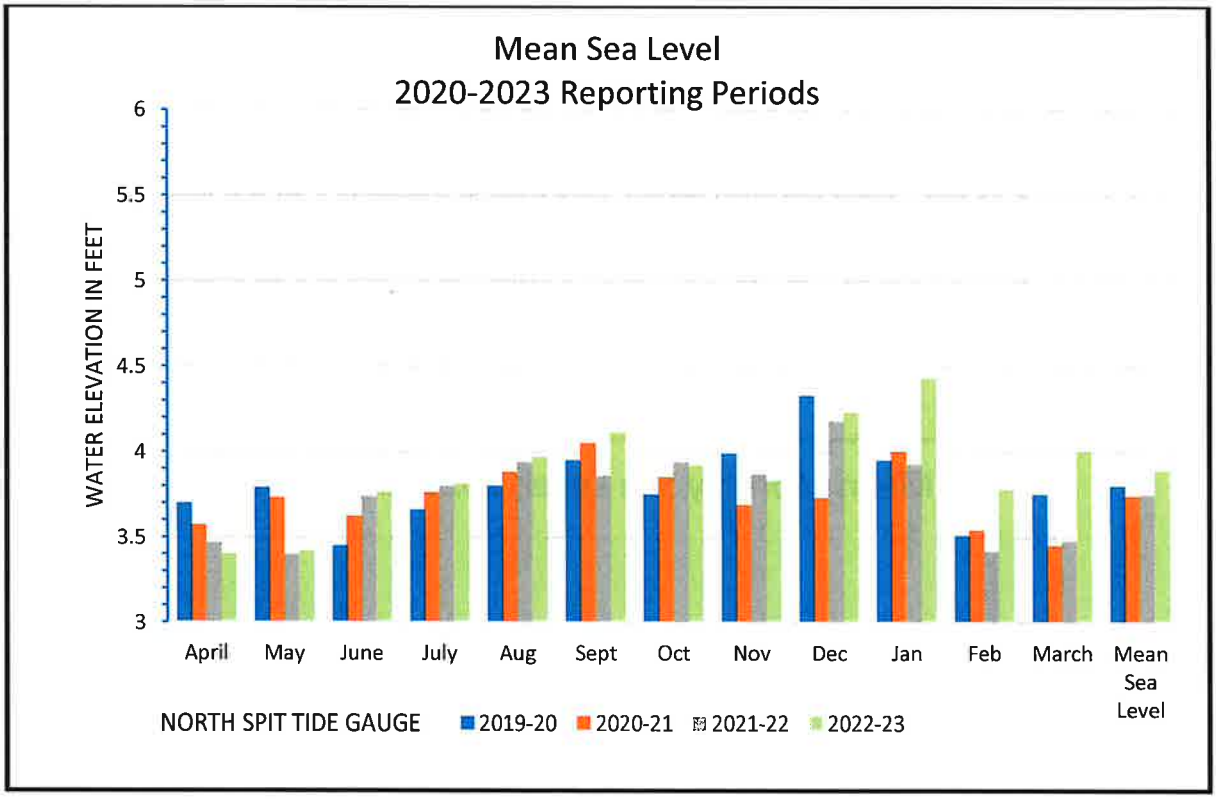


Figure 6. Mean Sea Level for the Baseline Report (2020) through 2023 Annual Report at the North Spit Tide Gauge. The Baseline Report shows monthly mean sea levels from April 1, 2019, through March 31, 2020. The 2021 and 2022 Annual Reports show mean sea levels for April 1, 2020, to March 31, 2021, and April 1, 2021, to March 31, 2022, respectively. The 2023 Annual Report shows monthly mean sea levels from April 1, 2022 through March 31, 2023. Mean sea level was calculated from available monthly sea level data from the NOAA Tides and Currents webpage.

B.2. Coastal Hazard Impacts

No impacts to highway infrastructure within the U.S. Highway 101 Corridor occurred during the 2023 reporting period. No temporary or ongoing flooding was observed and no weather-related incidents (such as erosion, overtopping of dikes, or tide gate failures) impacted the Corridor.

King Tides for winter 2022/2023 took place December 23 and 24, 2022, and January 21 and 22, 2023. Caltrans staff photographed King Tide conditions from established reference locations along the Corridor on December 23, 2022, and January 21, 2023 (Appendix C). Using the daily tide prediction tables published on the NOAA website, three-hour work windows were identified for when to best document King Tide conditions to capture the highest water elevations for each day.

Weather on December 23, 2022, included fog and mostly cloudy conditions with an average wind speed of 4.3 miles per hour and no precipitation for the day. Previous day precipitation was measured at 0.04 inch (Appendix A—National Weather Service Climate Data). Maximum December 23, 2022, high tide at the North Spit Tide Gauge was 8.96 feet (NOAA). Weather conditions on January 21, 2023, were mostly clear with an average wind speed of 2.3 miles per hour and no precipitation for the day. No precipitation was recorded the previous day (NWS). Maximum high tide on January 21, 2023, was 8.61 feet.

B.3. Adaption and Hazards Response

During the reporting period, Caltrans did not implement any weather- or flooding-related closures within the Corridor.

Additionally, no repair or maintenance was performed by Caltrans or other entities on dikes or berms that protect the highway. No impacts have been identified that would require a planned response, an amendment to CDP 1-18-1078, or a separate CDP application before the next monitoring cycle.

B.4. Adaptation Plan Progress

Coastal Development Permit 1-18-1078, Special Condition 2, directs Caltrans to develop the Comprehensive Adaptation and Implementation Plan (CAIP) to address long-term sea level rise within the Corridor by identifying strategies for protecting, relocating, or adapting the development authorized by CDP 1-18-1078.

Since the last Caltrans update on the CAIP, progress has been made in several CAIP areas, including, but not limited to, internal working groups, the 01-0M70 (Eureka Arcata SLR Resilience Project) kick off, Cal Poly Humboldt partnership, and potential partnering and regulatory meetings.

There are two internal working groups that were established in 2021: D1 Climate Change Working Group (CCWG) and the Sea Level Rise Technical Working Group (SLR TWG). The CCWG's mission is to develop a collaborative strategy for addressing climate change utilizing adaptive framework encompassing resources from long-range planning through maintenance. The goals and values of the CCWG are to lead on climate action planning through partnership, collaboration, and innovation on climate action. Specifically, the CCWG will engage stakeholders and the public, and will prioritize equity in planning and decision-making. Responsibilities and tasks include the following: (1) coordinate climate change activities across all functional units; (2) identify and provide support for implementation and updates of climate change adaptation policy and strategies; (3) provide review and assistance; (4) develop and implement outreach and education activities; and (5) provide and/or participate in training needs related to climate change.

The SLR TWG is specifically focused on addressing all needs related to the Special Condition 2 of CDP 1-18-1078, also known as the Comprehensive Adaptation and Implementation Plan (CAIP) for the Eureka-Arcata Corridor. The SLR Technical Group is currently developing the CAIP to include: (1) SLR analysis based on updated, best available science and monitoring reports; (2) evaluation of adaptation alternatives (accommodation, protection, and relocation) and their consistency with Coastal Act policies; (3) a timetable for implementation; and (4) coordination with local governments, stakeholders, and public interest groups.

As previously reported, due to the initial CAIP SLR projection analysis, the district requested funding of a Project Initiation Document (PID) for a project to address the immediate need to keep U.S. Highway 101 operable under 2030 inundation projections. The project is intended to function as an interim project (01-0M270) and is considered a temporary fix until the long-term strategy developed by the CAIP can be permitted and built. Caltrans Planning provided

funding for this short-term strategy PID in FY 2023 and 2024 with a PID target completion date of April 2024. The 01-0M270 (Eureka Arcata SLR Resilience) PID was funded with non-SHOPP funds but does not yet have a funding source for future environmental, design, and construction phases. If this project is funded through construction, the potential project benefits could include, but are not limited to: (1) delivery of a short-term project that can be adapted to the CAIP long-term strategy; (2) preservation of U.S. Highway 101 service along this vital North Coast corridor that many communities rely on; (3) reduction in risk of overtopping events, inundation and interrupted service along the corridor; and (5) allows CAIP stakeholders and partners to continue to collaborate with Caltrans to determine the comprehensive long-term solution.

Work on the PID started in February 2023. The project study proposes to raise the minimum elevation of the corridor to prevent inundation in year 2030. Finally, this project study will allow Caltrans to continue collaborating with our partners to find a long term SLR solution, while reducing the risks of having to intermittently close down U.S. Highway 101 during storm surge and flooding events.

We know that it is likely that the CAIP long-term comprehensive strategy will change over time as more information is gathered and analyzed. The options of retreat and accommodating sea level rise still need to be evaluated as part of the CAIP. The PID project short-term fix will not conflict with the comprehensive long-term strategy and, if the CAIP strategy is to preserve the existing U.S. Highway 101 alignment, living shorelines and other hybrid approaches could be constructed as part of a future long-term project.

Additionally, and concurrently with the PID development process, D1 staff are working diligently on the CAIP. District 1 has also applied for PROTECT Program 2% Planning Set-Aside for Climate Adaptation and Resilience Planning Studies for fiscal year 23/24 to provide support resources for the CAIP. The resources from the PROTECT program will provide the needed support resources for the remainder of the CAIP process, and we are awaiting the evaluation and award process that is being run by Caltrans HQ Office of Air Quality and Climate Change.

Furthermore, we are in the process of finalizing a California Model Agreement (CMA) between D1 Caltrans and Cal Poly Humboldt (formerly known as HSU) for Subject Matter Expert and technical study needs of the CAIP. The CMA between Cal Poly Humboldt will involve two major CAIP-related tasks:
(1) Task 1 - Evaluate Existing and Anticipated Conditions and
(2) Task 2 - Review of Conceptual Adaptation Strategies and Develop Strategies for Analysis and Assessment.

Task 1 tasks will include Cal Poly Humboldt's evaluation of existing and determination of anticipated conditions including:

- Compiling and summarizing existing long-term planning and assessment efforts by Caltrans and other experts.
- Defining existing and projected hydrological hazards including groundwater assessment, Humboldt Bay stillwater levels, local wind setup and wave runup, shoreline/coastal geomorphology, and riverine flood impacts.
- Defining existing geologic hazards such as subsidence, seismic hazards related to earthquakes, liquefaction and tsunami hazards.
- Identification of potential land use and infrastructure impacts.

Task 2 work consists of Cal Poly Humboldt's review of conceptual adaptation strategies, development of analysis and assessment strategies, and provision of design guidance for natural armoring systems.

D1 and Cal Poly Humboldt anticipate having the CMA in effect for a May 2023 Kick Off. The CMA with Cal Poly Humboldt will run through February 2025. D1 staff will work with Cal Poly through our SLR TWG. The contract manager is Clancy De Smet.

D1 staff worked with a consultant to develop a Public Engagement Plan (PEP). D1 staff is planning additional public participation workshops. Also, we used public engagement support services under the Planning Public Engagement Contract (PPEC) to develop a website. To enhance our efforts to add resiliency to the State Highway System we have launched a website North Coast Climate Action. On the website, the public will find information about planning and

projects along the U.S. Highway 101 Corridor and in each of the four counties covered by District 1. We have also launched Clancy's Climate Change Corner (a video series) to provide the latest news and updates on projects and opportunities to get involved with the process. We are currently in the process of re-engaging with the PPEC support services to provide public engagement support for the CAIP process.

D1 staff continues to participate as a member in several groups related to climate change in the area, including: (1) Cal Poly Humboldt's Sea Level Rise Initiative (SLRI); (2) Humboldt County's Natural Shoreline Infrastructure Technical Working Group; and (3) Humboldt Bay Initiative. Also, D1 staff member, Clancy De Smet, is a contributing co-author along with members of the SLRI to the article *A Polytechnic to Address Climate and Community Resilience: Developing a Cal Poly Humboldt Focus in Transformative Sea-Level Rise Research and Planning*, Humboldt Journal of Social Relations, to be published in Summer 2023.

Finally, the CAIP team members (i.e., PDT members) have been identified, and monthly meetings are being scheduled with the team. We are working towards setting up meetings with working groups. We will conduct partnering meetings with City of Eureka, County of Humboldt, City of Arcata, tribal groups, California Coastal Commission, CDFW, U.S. Army Corps of Engineers, NCRWQCB, and USFWS.

In summary, a lot has been done but there is much more work to do to complete the CAIP by the December 2025 deadline. We're working on partnering meetings, public engagement, and technical assistance with Cal Poly Humboldt. The heavy lifting will come in 2023 through the end of the process. Public and partner engagement will be the focus in the near term.

B.5. Flood Events

No flooding or road closure events occurred during the reporting period.

C. Frequent Flood Event Report

The roadway was not closed during the reporting period; therefore, no Frequent Flood Event Report is included with this Annual Report.

References

California Department of Transportation (Caltrans). 2019. *Caltrans Eureka-Arcata Corridor: Sea Level Rise Vulnerabilities and Adaptation Solutions*. May 2019.

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California Department of Transportation (Caltrans). 2019 *CDP 1-18-1078 Special Condition 1, 2021 Annual Report.* May 2021.

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Observed Weather Reports (April 21, 2023). In *National Weather Service*. Retrieved from https://forecast.weather.gov/product.php?site=EKA&product=CLI&issuedby=EKA

Water Level Reports (April 21, 2023). In *NOAA Tides and Currents*. Retrieved from https://tidesandcurrents.noaa.gov/reports.html?type=monthlyextremes&bdate=20220401&edate=20230331&units=standard&datum=NAVD&id=9418767&retrieve=Retrieve

Appendix A

NOAA Tides and Current Data and NWS Climate Data

NOAA Tides and Currents Data

MAXIMUM, MINIMUM WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 9418767 T.M.: 0 W
Name: North Spit, CA Units: Feet
Type: Mixed Datum: NAVD
Note: [] Inferred Water Level Value Quality: Verified

2019 Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	4.25	4.26	4.03	3.70	3.79	3.58	3.66	3.80	3.95	3.75	3.99	4.33
Maximum	9.09	8.48	7.92	7.70	8.38	7.67	7.95	8.14	7.82	7.95	8.64	8.86
Max Day	20	3	25	20	19	16	31	1	30	29	27	25
Max Time	18:24	18:24	10:42	07:48	07:24	06:12	05:54	06:48	20:36	20:06	19:24	18:24
Minimum	-2.09	-1.97	-0.58	-1.32	-0.99	-1.75	-1.93	-1.76	-0.54	-1.31	-1.36	-1.24
Min Day	23	20	18	21	20	5	5	2	1	31	26	27
Min Time	02:48	01:48	23:54	15:00	14:48	15:00	15:30	14:30	14:54	03:24	01:00	02:18

2020 Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	3.95	3.51	3.75	3.57	3.73	3.62	3.76	3.88	4.05	3.85	3.69	3.73
Maximum	8.10	7.82	7.82	8.02	8.13	8.19	7.99	7.71	7.97	8.10	8.65	8.57
Max Day	21	8	13	10	9	5	22	19	20	18	16	13
Max Time	16:36	18:30	10:12	08:54	08:18	06:24	07:54	07:06	21:36	20:18	19:36	17:54
Minimum	-1.83	-2.05	-1.11	-1.10	-1.66	-1.85	-1.72	-1.26	-0.32	-1.35	-1.88	-2.37
Min Day	12	10	10	10	8	7	5	3	16	20	16	16
Min Time	02:42	02:06	01:42	15:24	14:18	14:48	13:48	13:30	12:42	03:54	01:54	02:24

2021 Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	4.00	3.54	3.45	3.47	3.40	3.74	3.80	3.94	3.86	3.94	3.87	4.18
Maximum	8.65	7.92	7.32	7.99	8.16	8.58	8.03	8.06	7.26	7.99	8.55	8.77
Max Day	12	11	4	28	27	25	24	22	7	24	5	4
Max Time	18:36	19:06	11:12	07:48	07:18	07:00	06:42	06:42	07:12	21:00	19:18	18:36
Minimum	-1.84	-1.70	-1.13	-1.98	-2.41	-2.00	-1.92	-0.92	-0.30	-1.05	-1.75	-2.48
Min Day	14	28	1	29	27	25	23	20	6	10	7	6
Min Time	02:18	02:00	02:36	15:18	14:12	14:06	13:00	12:06	13:06	04:00	03:00	02:36

2022 Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	3.93	3.42	3.48	3.40	3.42	3.76	3.81	3.97	4.11	3.92	3.83	4.23
Maximum	9.38	7.73	7.45	7.91	7.87	8.34	8.65	8.48	8.34	7.67	8.38	8.96
Max Day	3	1	2	19	17	16	13	12	10	27	24	23
Max Time	19:30	19:06	19:18	08:36	07:30	08:06	06:06	06:48	06:48	20:12	19:06	18:42
Minimum	-2.03	-2.54	-1.50	-1.13	-2.42	-2.28	-2.20	-1.63	-0.72	-1.26	-2.03	-2.25
Min Day	2	2	2	19	18	15	14	12	8	29	26	25
Min Time	00:48	02:12	01:06	15:36	15:06	14:18	14:06	13:48	12:00	04:00	03:00	02:42

MAXIMUM, MINIMUM WATER LEVEL DATA
National Ocean Service (NOAA)

Station: 9418767 T.M.:
0 W
Name: North Spit, CA Units:
Feet
Type: Mixed Datum:
NAVD
Note: [] Inferred Water Level Value Quality:
Verified

2023 Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	4.43	3.78	4.00	3.68								
Maximum	8.61	8.01	8.28	7.47								
Max Day	4	19	21	10								
Max Time	17:30	18:30	19:24	09:36								
Minimum	-2.55	-1.99	-0.43	-1.20								
Min Day	23	20	25	21								
Min Time	02:24	01:24	16:30	14:30								

***The monthly max/min report information is based on high/low tides only.**

National Weather Service Daily Climate Data for Eureka

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CXUS56 KEKA 021448
CF6EKA
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: EUREKA CA
MONTH: DECEMBER
YEAR: 2022
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

TEMPERATURE IN F:							:PCPN:		SNOW:	WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	12Z DPTH	AVG SPD	MX SPD	2MIN DIR	MIN	PSBL	S-S	WX	SPD	DR
1	49	35	42	-6	23	0	0.42	0.0	0	3.3	10	320	M	M	8		12	M
2	51	32	42	-6	23	0	0.00	0.0	0	4.1	6	140	M	M	6		12	M
3	58	34	46	-2	19	0	0.29	M	0	6.7	17	M	M	M	7		29	160
4	54	45	50	2	15	0	1.35	0.0	0	5.8	10	170	M	M	10	3	17	M
5	54	38	46	-2	19	0	0.13	0.0	0	3.3	9	160	M	M	8		13	M
6	52	33	43	-5	22	0	0.00	0.0	0	0.9	5	290	M	M	0	1	6	M
7	52	33	43	-5	22	0	T	0.0	0	2.9	9	240	M	M	4		16	M
8	51	37	44	-4	21	0	0.61	0.0	0	6.7	16	150	M	M	10		32	M
9	49	37	43	-5	22	0	0.38	0.0	0	11.4	21	180	M	M	10		37	M
10	56	42	49	2	16	0	1.35	0.0	0	8.3	18	180	M	M	9		39	M
11	47	33	40	-7	25	0	0.01	0.0	0	2.9	14	M	M	M	0		14	M
12	49	30	40	-7	25	0	0.00	0.0	0	2.1	9	350	M	M	4	1	9	M
13	49	31	40	-7	25	0	0.00	0.0	0	1.9	7	360	M	M	1	1	8	M
14	49	31	40	-7	25	0	0.00	0.0	0	1.5	6	360	M	M	3		6	M
15	52	31	42	-5	23	0	0.00	0.0	0	1.3	5	270	M	M	1	18	5	M
16	52	31	42	-5	23	0	0.00	0.0	0	0.6	3	130	M	M	1		5	M
17	51	32	42	-5	23	0	0.00	0.0	0	0.7	3	130	M	M	4	1	5	M
18	50	30	40	-7	25	0	0.00	0.0	0	2.1	8	350	M	M	0		12	M
19	49	31	40	-7	25	0	0.00	M	0	1.9	6	320	M	M	10		6	M
20	51	42	47	0	18	0	0.04	M	0	1.4	7	M	M	M	10	1	9	M
21	54	47	51	4	14	0	0.01	0.0	0	1.2	6	330	M	M	10	1	7	M
22	54	46	50	3	15	0	0.04	M	0	0.7	3	M	M	M	10	18	4	M
23	61	46	54	7	11	0	0.00	M	0	4.3	9	M	M	M	9	1	11	M
24	65	44	55	8	10	0	0.02	0.0	0	2.2	12	170	M	M	10	2	13	M
25	58	45	52	5	13	0	0.01	0.0	0	2.8	13	M	M	M	8	2	15	M
26	62	53	58	11	7	0	1.91	0.0	0	8.7	21	180	M	M	10	1	40	M
27	60	45	53	6	12	0	0.33	0.0	0	8.6	23	290	M	M	9	8	35	M
28	53	39	46	-1	19	0	0.01	0.0	0	3.1	13	170	M	M	6		14	0
29	56	47	52	5	13	0	0.38	0.0	0	10.3	17	180	M	M	10	1	20	M
30	58	53	56	9	9	0	1.23	0.0	0	7.0	14	20	M	M	10	1	25	M
31	54	45	50	3	15	0	0.02	0.0	0	8.3	16	1	M	M	9	2	18	M
SM	1660	1198			577	0	8.54	0.0		127.0			M		207			
AV	53.5	38.6								4.1	FASTST		M	M	7		MAX(MPH)	
								MISC ---->		23	290						40	9999

000
CXUS56 KEKA 051230
CF6EKA

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: EUREKA CA
MONTH: JANUARY
YEAR: 2023
LATITUDE: 40 47 N
LONGITUDE: 124 10 W

TEMPERATURE IN F:							:PCPN:		SNOW:	WIND			:SUNSHINE:		SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	12Z DPTH	AVG SPD	MX SPD	2MIN DIR	MIN	PSBL	S-S	WX	SPD	DR
1	53	36	45	-2	20	0	0.00	0.0	0	2.5	8	90	M	M	2		9	M
2	52	38	45	-2	20	0	0.22	M	M	6.0	27	M	M	M	M	1	27	180
3	55	39	47	0	18	0	T	0.0	0	7.4	17	180	M	M	10		28	M
4	62	51	57	10	8	0	1.08	M	0	13.2	28	M	M	M	M	1	48	140
5	56	46	51	3	14	0	0.72	0.0	0	9.1	14	180	M	M	10		30	M
6	59	49	54	6	11	0	0.10	M	0	10.3	15	200	M	M	10	1	29	M
7	56	46	51	3	14	0	0.91	0.0	0	11.6	20	160	M	M	10		40	150
8	58	48	53	5	12	0	0.47	0.0	0	9.6	16	220	M	M	7	3	30	200
9	60	41	51	3	14	0	0.08	0.0	0	8.8	29	160	M	M	5		35	M
10	55	40	48	0	17	0	0.70	0.0	0	9.1	15	160	M	M	9		30	170
11	58	47	53	5	12	0	0.07	M	0	11.9	22	170	M	M	M		40	170
12	67	52	60	12	5	0	0.32	0.0	0	11.0	18	170	M	M	10		35	150
13	59	51	55	7	10	0	0.93	0.0	0	8.8	12	160	M	M	10	1	22	190
14	55	47	51	3	14	0	1.09	0.0	0	10.2	14	210	M	M	10	1	30	190
15	55	41	48	0	17	0	0.24	0.0	0	4.1	8	180	M	M	7		12	M
16	52	38	45	-3	20	0	0.00	0.0	0	3.2	12	20	M	M	6		12	M
17	53	36	45	-3	20	0	0.00	0.0	0	0.9	6	320	M	M	6		6	M
18	50	37	44	-4	21	0	0.83	0.0	0	4.2	12	190	M	M	9		21	300
19	51	34	43	-5	22	0	T	0.0	0	3.1	13	350	M	M	4		18	10
20	54	31	43	-5	22	0	0.00	0.0	0	1.7	6	290	M	M	0		8	M
21	54	33	44	-4	21	0	0.00	0.0	0	2.3	6	120	M	M	6		7	M
22	51	42	47	-1	18	0	0.00	0.0	0	10.9	17	360	M	M	5		25	360
23	54	35	45	-3	20	0	0.00	0.0	0	4.1	12	360	M	M	2		18	M
24	57	35	46	-2	19	0	0.00	0.0	M	2.1	5	340	M	M	0	18	7	M
25	58	35	47	-1	18	0	0.00	0.0	0	1.3	10	360	M	M	0	8	10	M
26	59	36	48	0	17	0	0.00	0.0	0	2.3	8	360	M	M	0	8	10	M
27	51	40	46	-2	19	0	0.00	0.0	0	5.8	14	10	M	M	10	2	17	360
28	51	42	47	-1	18	0	0.07	0.0	0	4.5	12	360	M	M	8		16	360
29	51	35	43	-5	22	0	0.06	M	0	6.6	21	10	M	M	0		24	10
30	56	27	42	-6	23	0	0.00	M	0	3.4	10	340	M	M	0		17	350
31	55	30	43	-5	22	0	0.00	M	0	0.0	M	M	M	M	4		8	M
SM	1717	1238			528	0	7.89	0.0		190.0			M		160			
AV	55.4	39.9								6.1	FASTST		M	M	6		MAX(MPH)	
								MISC ---->		29	160						48	140

Note: An "M" in any column means the data are Missing for that element.

Column		
1	DY	The **day** of the month.
2	MAX	The **highest** temperature for the day in degrees Fahrenheit (F).
3	MIN	The **lowest** temperature for the day in degrees Fahrenheit (F).
4	AVG	The **average** temperature for the day, computed by finding the average of the values in columns 2 and 3, then rounding (if necessary). Example; 55.5 rounds up to 56, 55.4 rounds down to 55 degrees.
5	DEP	**Departure** from normal. The difference between column 4 and the 30 year normal temperature for this date. A minus (-) is number of degrees below normal. A zero (0) indicates that the average for that day was the Normal.
6a & 6b	HDD & CDD	**Degree Day:** A gauge of the amount of heating or cooling needed for a building using 65 degrees as a baseline. To compute heating/cooling degree-days, take the average temperature for a day and subtract the reference temperature of 65 degrees. If the difference is positive, it is called a "**Cooling Degree Day**". If the difference is negative, it is called a "**Heating Degree Day**". The magnitude of the difference is the number of days. For example, if your average temperature for a day is 50 degrees in September, the difference of the average temperature for that day and the reference temperature of 65 degrees would yield a minus 15. Therefore, you have 15 Heating Degree Days that day. If the average temperature is 77 degrees for a day, you would have 12 Cooling Degree Days (77-65). If the average temperature for the day is 65 degrees, there are no Heating or Cooling degree days. Electrical, natural gas, power, and heating, and air conditioning industries utilize heating and cooling degree information to calculate their energy needs. The Heating season runs from July 1st through June 30th. The Cooling season runs from Jan 1st through Dec 31st.
7	WTR	Total **precipitation** for the day to the nearest hundredth of an inch. This includes all forms of precipitation, both liquid and water equivalent of any snow or ice that occurred (T = Trace, some precipitation fell but not enough to measure).
8	SNW	Total **snowfall** for the day to the nearest tenth of an inch.
9	DPTH	Snow **depth** on the ground to the nearest inch at 1200UTC. 7am EST., 6am CST, 5am MST, 4am PST, 3am AST, etc.
10	AVG SPD	**Average wind speed** for the day in miles per hour (mph).
11	MX SPD	The **highest wind speed** in mph averaged over a 2 minute period.

12	**2MIN DIR**	The **direction** (in compass degrees divided by 10) from which the wind speed in column 11 came from. (N=36 S=18 W=27 E=09, etc.)
13	**MIN**	The number of **minutes** of sunshine received at the station. Not reported at all locations.
14	**PSBL**	The percentage of **possible** sunshine. Computed by dividing the minutes of sunshine in column 13 by the total possible minutes. Not reported at all locations.
15	**S-S**	The average sky cover between sunrise and sunset in tenths of sky covered. The minimum of "0" means no clouds observed, "10" means clouds covered the entire sky for that day.
16	**WX**	A coded number representing certain types of **weather** observed during the day. 1 = Fog 2 = Fog reducing visibility to 1/4 mile or less 3 = Thunder 4 = Ice pellets 5 = Hail 6 = Glaze or rime 7 = Blowing dust or sand: visibility 1/2 mile or less 8 = Smoke or haze 9 = Blowing snow X = Tornado In the example above on the 12th, you see "138" coded for the day. That means Fog, Thunder and Smoke or Haze were observed at some time during that day.
17	**SPD**	Peak wind **speed** for the day in mph. The highest wind speed observed at the station.
18	**DR**	The compass **direction** from which the peak wind speed came.

Appendix B

Photo Documentation Locations

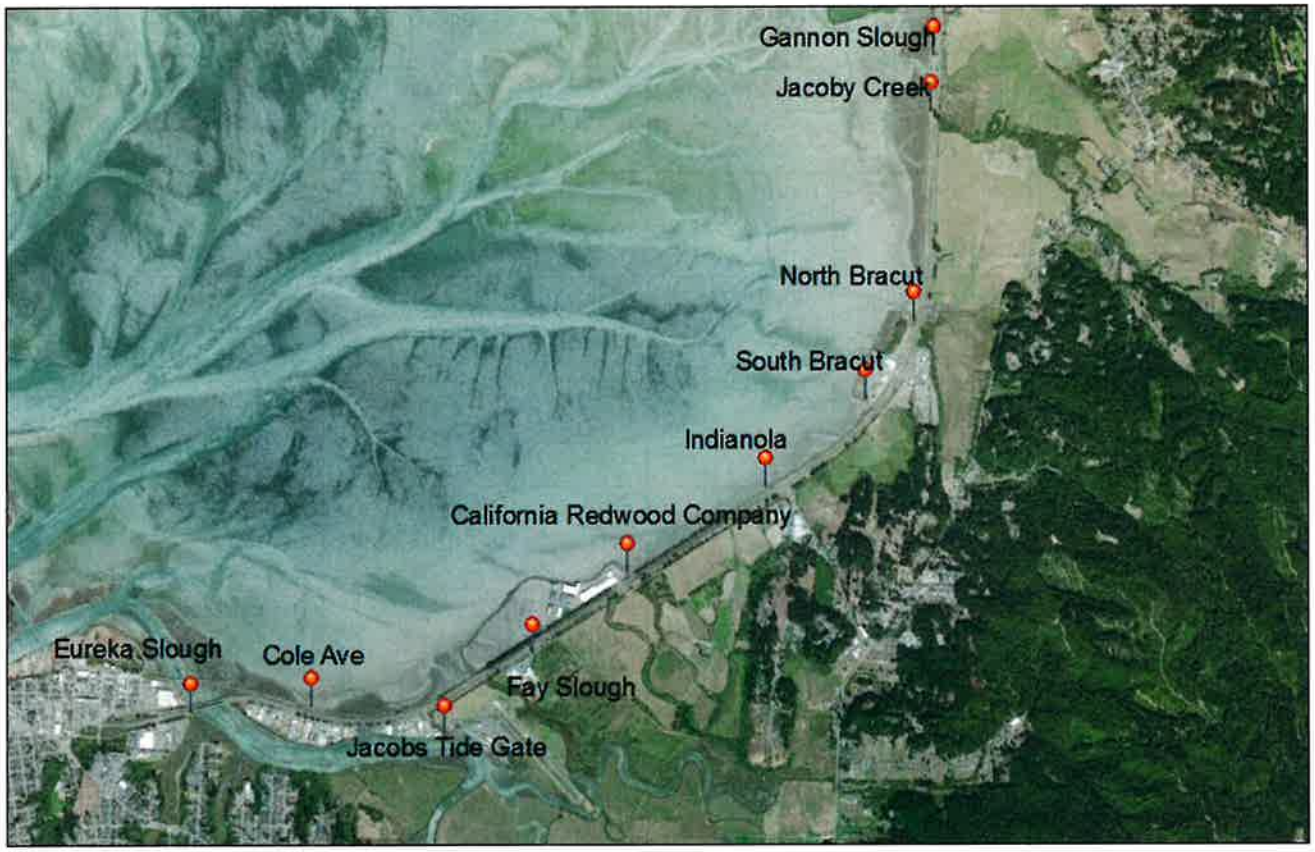

Figure 1 ***Reference Photograph Locations*** *for documenting King Tides and extreme weather events along the Eureka-Arcata 101 Corridor.*

Table 1 ***Location Selection Criteria***

	Accessibility and Safety	**Vulnerability to Flooding**	**Shoreline Cover**	**Adjacent Land Use / Zoning**
Gannon Slough	Good, *Bay Trail*	moderate-high	Salt marsh, slough channel	Trail/Natural Resources (NR)
Jacoby Creek	Good, *Bay Trail*	moderate-high	Salt marsh, creek channel	Trail/NR
North Bracut	Fair, *behind Bayside Garden Supply*	moderate-high	Bracut dike, railroad grade, vegetation	Businesses/NR and Industrial General
South Bracut	Fair, *near California Trailers*	moderate	Bracut dike, railroad grade, salt marsh	Businesses/NR and Industrial General
Indianola	Caution, *shoulder*	moderate	Railroad grade, rock, exposed with areas of erosion	Future Trail/NR
California Redwood Company	Fair, *entrance to CRC*	moderate-high	Railroad grade, salt marsh, rock, CRC levee to the south	Future Trail/ NR, Industrial General
Jacobs Tide Gate	Fair, *Airport Rd*	low-moderate	Jacobs Ave south side levee, rock protection	Businesses/Service Commercial
Eureka Slough	Good, *Eureka Waterfront Trail*	high	Bank of Eureka Slough, rock, vegetation	Trail/Service Commercial/NR
Cole Ave	Caution, *shoulder*	high	Railroad grade, rock, erosion bound by salt marsh to north and south	Future Trail/NR
Fay Slough	Fair, *CDFW parking lot, shoulder*	subject to inland flooding from Fay Slough	Roadside ditch paralleling Highway 101 north	Businesses/Service Commercial/ Coastal Agricultural

Appendix C

Photo Documentation

King Tide and Extreme Tidal Event Photo Documentation

Reference Photos

December 23, 2019:

Gannon Slough, Jacoby Creek, North Bracut, South Bracut, Indianola, California Redwood Company, Jacobs Tide Gate, Eureka Slough, and Cole Ave

January 10, 2020:

Fay Slough

2020 Annual Report, Winter 2019/2020 King Tide Photos

January 10 and 11, 2020:

All locations

February 8, 2020:

All locations

2021 Annual Report, Winter 2020/21 King Tide Photos

December 14, 2020:

All locations

January 12, 2021:

All locations

2022 Annual Report, Winter 2021/22 King Tide Photos

December 4, 2021:

All locations

January 3, 2022:

All locations

2023 Annual Report, Winter 2022/23 King Tide Photos

December 23, 2022:

All locations

January 21, 2023:

All locations

Gannon Slough Photos

Gannon Slough South Reference

Gannon Slough South 2020 Annual Report

1/10/20 *1/11/20* *2/8/20*

Gannon Slough South 2021 Annual Report

12/14/20 *1/12/21*

Gannon Slough South 2022 Annual Report

12/4/22 1/3/22

Gannon Slough North Reference

Gannon Slough North 2020 Annual Report

1/10/20 *1/11/20* *2/8/20*

Gannon Slough North 2021 Annual Report

12/14/20 *1/12/21*

Gannon Slough North 2022 Annual Report

12/4/21 *1/3/22*

Gannon Slough Bay Reference

Gannon Slough Bay 2020 Annual Report

1/10/20

1/11/20

2/8/20

Gannon Slough Bay 2021 Annual Report

12/14/20

1/12/21

Gannon Slough Bay 2022 Annual Report

12/4/21 *1/3/22*

Jacoby Creek Photos

Jacoby Creek Left Reference

Jacoby Creek Left 2020 Annual Report

1/10/20

1/11/20

2/8/20

Jacoby Creek Left 2021 Annual Report

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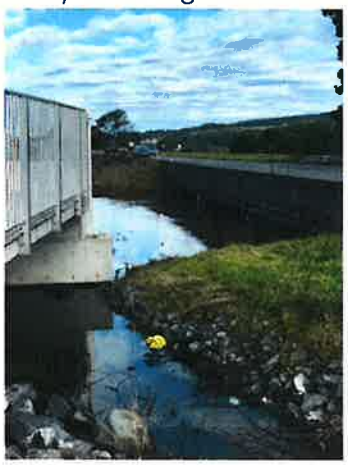
Jacoby Creek Right Reference

Jacoby Creek Right 2020 Annual Report



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Jacoby Creek RR Reference

Jacoby Creek RR 2020 Annual Report

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Jacoby Creek RR 2021 Annual Report

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Jacoby Creek Bay Reference

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Jacoby Creek Bay 2021 Annual Report

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Jacoby Creek Bay 2022 Annual report

12/4/21

1/3/22

Jacoby Creek Kayaker 2022 Annual Report

12/4/21

North Bracut Photos

North Bracut Full Reference

North Bracut Full 2020 Annual Report

1/10/20

1/11/20

2/8/20

North Bracut Full 2021 Annual Report

12/14/20

1/12/21

North Bracut Full 2022 Annual Report

12/4/21

1/3/22

North Bracut Zoom Reference

North Bracut Zoom 2020 Annual Report

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2/8/20

North Bracut Zoom 2021 Annual Report

12/14/20

1/12/21

North Bracut Zoom 2022 Annual Report

12/4/21

1/3/22

North Bracut Railroad 2022 Annual Report

1/3/22

South Bracut Photos

South Bracut Full Reference

South Bracut Full 2020 Annual Report

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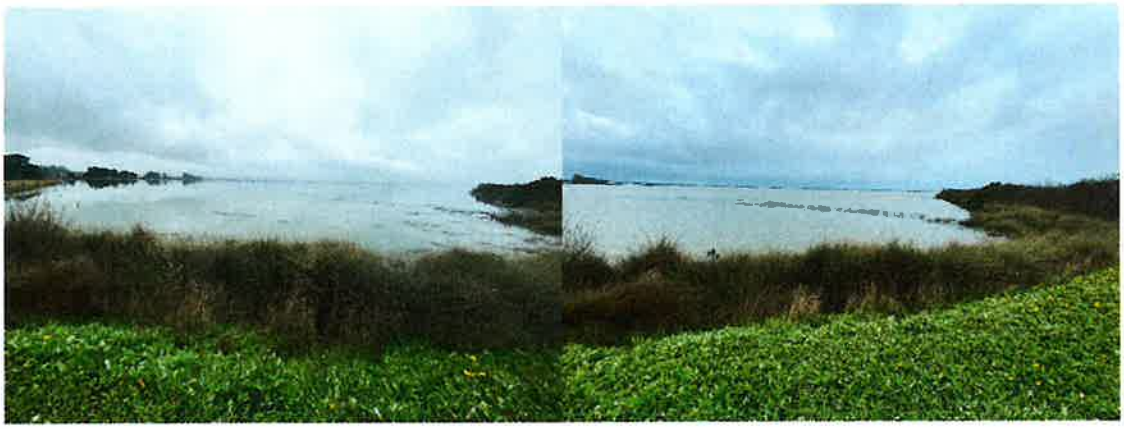
South Bracut Full 2022 Annual Report



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South Bracut Zoom Reference

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2/8/20

South Bracut Zoom 2021 Annual Report

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1/12/21

South Bracut Zoom 2022 Annual Report

12/4/21 *1/3/22*

Indianola Photos

Indianola North Reference

Indianola North 2020 Annual Report

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Indianola Erosion 2020 Annual Report

2/8/20

1/12/21

12/14/20

12/4/21 1/3/22

California Redwood Company Photos

CRC Full Reference

CRC Full 2020 Annual Report

1/10/20 *1/11/20*

CRC Full 2021 Annual Report

12/14/20 *1/12/21*

12/4/21 *1/3/22*

CRC Zoom Reference

CRC Zoom 2020 Annual Report

1/10/20 *1/11/20*

CRC Zoom 2021 Annual Report

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12/14/21 *1/3/22*

Eureka Slough Photos

Eureka Slough Zoom Reference

Eureka Slough Zoom 2020 Annual Report

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2/8/20

Eureka Slough Zoom 2021 Annual Report

12/14/20

1/12/21

Eureka Slough Bridge Boat Ramp 2021 Annual Report

1/12/21

1/12/21

Eureka Slough Zoom 2022 Annual Report

12/4/21

Eureka Slough Bridge Boat Ramp 2022 Annual Report

12/4/21

1/3/22

1/3/22

Eureka Slough Boat Ramp Gauge 2022 Annual Report

12/4/21

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Jacobs Tide Gate Photos

Jacobs Tide Gate East Zoom Reference

Jacobs Tide Gate East Zoom 2020 Annual Report

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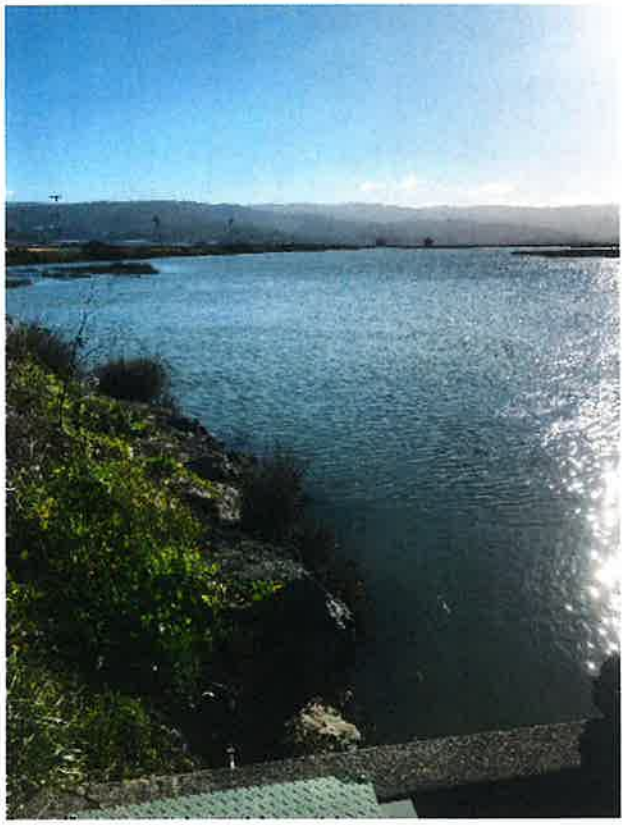
1/11/20



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Jacobs Tide Gate East Zoom 2021 Annual Report

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Jacobs Tide Gate East Zoom 2022 Annual Report

12/4/21 *1/3/22*

Jacobs Tide Gate East Reference

Jacobs Tide Gate East 2020 Annual Report

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2/8/20

Jacobs Tide Gate East 2021 Annual Report

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Jacobs Tide Gate East 2022 Annual Report

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Jacobs Tide Gate West Reference

Jacobs Tide Gate West 2020 Annual Report

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2/8/20

Jacobs Tide Gate West 2021 Annual Report

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Jacobs Tide Gate West 2022 Annual Report

12/4/21 *1/3/22*

Cole Ave Photos

Cole Ave North Reference

Cole Ave North 2020 Annual Report

1/10/20

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2/8/20

Cole Ave North 2021 Annual Report

12/14/20

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Cole Ave North 2022 Annual Report

12/4/21

1/3/22

Cole Ave South Reference

Cole Ave South 2020 Annual Report

1/10/20

1/11/20

2/8/20

Cole Ave South 2021 Annual Report

12/14/20

1/12/21

Cole Ave South 2022 Annual Report

12/4/21

1/3/22

Fay Slough Photos

Fay Slough Mid City South Reference/2020 Annual Report

Fay Slough Mid City South Reference/2020 Annual Report

1/10/20

1/11/20

2/8/20

Fay Slough Mid City South 2021 Annual Report

12/14/20

Fay Slough Mid City South 2022 Annual Report

12/4/21 *1/3/22*

Fay Slough North Reference/2020 Annual Report

Fay Slough North Reference/2020 Annual Report

1/11/20 *2/8/20*

Fay Slough North 2021 Annual Report

12/14/20

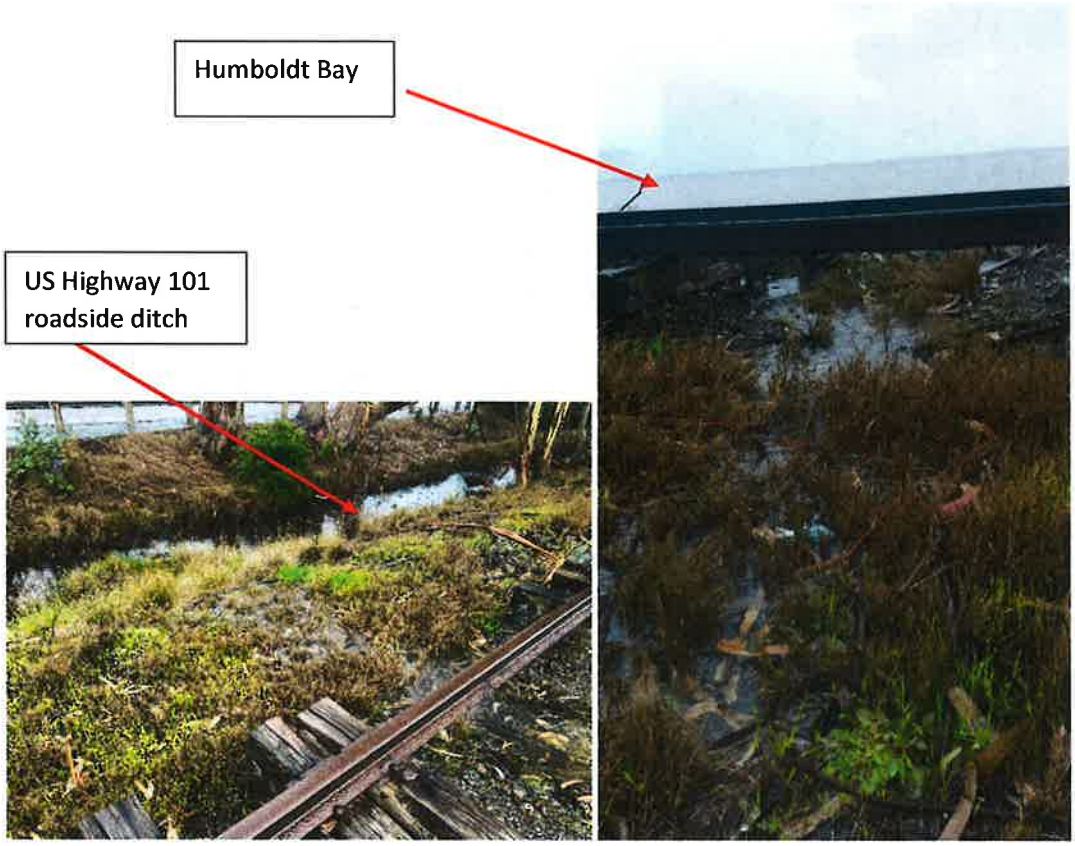
Fay Slough North 2022 Annual Report

12/4/21

1/3/22

12/4/21 *1/3/22*

Railroad Levee Erosion Near PM 82.1, 2022 Annual Report (1/3/22)



Gannon Slough Photos

Gannon Slough South 2023 Annual Report

12/23/22

1/21/23

Gannon Slough North 2023 Annual Report

12/23/22

1/21/23

Gannon Slough Bay 2023 Annual Report

12/23/22

1/21/23

Jacoby Creek Photos

Jacoby Creek Left 2023 Annual Report

12/23/22

1/21/23

Jacoby Creek Right 2023 Annual Report

12/23/22

1/21/23

Jacoby Creek RR 2023 Annual Report

12/23/22

1/21/23

Jacoby Creek Bay 2023 Annual Report

12/23/22

1/21/23

North Bracut Photos

North Bracut Full 2023 Annual Report

12/23/22

1/21/23

North Bracut Zoom 2023 Annual Report

12/23/22

1/21/23

North Bracut Railroad 2023 Annual Report

12/23/22

1/21/23

South Bracut Photos

Sough Bracut Full 2023 Annual Report

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Indianola Photos

Indianola North 2023 Annual Report

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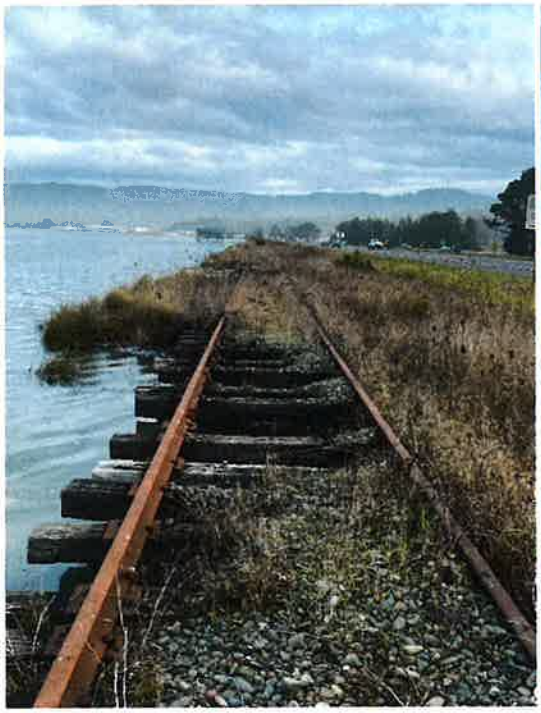
1/21/23

Indianola Erosion 2023 Annual Report



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1/21/23

California Redwood Company Photos

CRC Full 2023 Annual Report

12/23/22

1/21/23

CRC Zoom 2023 Annual Report

12/23/22

1/21/23

Eureka Slough Photos

Eureka Slough Zoom 2023 Annual Report

12/23/22 *1/21/23*

Eureka Slough Bridge Boat Ramp 2023 Annual Report

12/23/22 *1/21/23*

Eureka Slough Boat Ramp Gauge 2023 Annual Report

12/23/22

1/21/23

Jacobs Tide Gate Photos

Jacobs Tide Gate East Zoom 2023 Annual Report

12/23/22

1/21/23

12/23/22 *1/21/23*

Jacobs Tide Gate West 2023 Annual Report

12/23/22 *1/21/23*

Cole Ave Photos

Cole Ave North 2023 Annual Report

12/23/22

1/21/23

Cole Ave South 2023 Annual Report

12/23/22

1/21/23

Fay Slough Photos

Fay Slough Mid City South 2023 Annual Report

12/23/22

1/21/23

Fay Slough North 2023 Annual Report

12/23/22

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