

## Executive Summary

Planning Solutions prepared this sea level rise analysis for the proposed hotel project located at 0 North Ocean Avenue in Cayucos, San Luis Obispo County, California (APN 064-481-009). The project proposes a three story boutique hotel consisting of 17 rooms, 21 parking spaces, passive and active recreational activities, public beach access and infrastructure.

The purpose of this report is to evaluate the sea level rise (SLR) risk analysis at the project site at low, medium and extreme risk levels and to evaluate potential impacts and adaptive capacity across a range of sea level rise projections and emission scenarios.

The methodology used for this report is provided by The State of California Sea Level Rise Guidance Update, 2018. This document provides a 5 step approach to assess risk by evaluating a range of sea-level rise projections and the impacts or consequences associated with these projections.

The result of the sea level rise projections are summarized below using a project lifespan of 25 years and an outermost lifespan of 50 years:

Risk Type	Sea Level Rise Projection 2045	Sea Level Rise Projection 2070
Low risk	11.4 inches	21 inches
Medium-high risk	19.8 inches	39.6 inches
Extreme risk	27.6 inches	62.4 inches

The probability of sea level rise projections coming to fruition are summarized below using a project lifespan of 25 years and an outermost lifespan of 50 years:

Sea Level Rise	Year 2045	Year 2070
1 foot	8.75%	40% low emissions 68% high emissions
2 feet	0.2%	3% low emissions 8% high emissions
3 feet	0.1%	0.4% low emissions 0.8% high emissions
5 feet	<0.1% low emissions <0.1% high emissions	< 0.1% low emissions 0.1% high emissions

The potential impacts of sea level rise relevant to this site may include:

- Increased erosion on retreating coastal bluffs and beaches,
- Increased risk of cliff failures, and
- Coastal flooding with higher storm surges and flood elevations.

The project as presented possesses innate characteristics that decreases the impact of SLR because:

- The project site is elevated 18 feet above mean sea level,
- The bluff from toe of slope to bluff top averages 9-10 feet in height; SLR would not reach the proposed hotel site on the flat terraced section of the site, and
- The project is setback 38 feet from top of bluff to accommodate the 100 year bluff retreat

The project as proposed is able to adapt to SLR over the next 25 years since SLR is projected to be a minimum of 11.4 inches (low risk aversion) and a maximum of 27.6 inches (extreme risk aversion). The outermost SLR analysis at double the life span of the boutique hotel projects a SLR of 62.4 inches (5 feet 2.4 inches). Since the project site is 18 feet above mean sea level and incorporates a bluff retreat setback of 38 feet, the project as proposed is suitable for this site.

## Conclusion

The Sea Level Rise will not impact this project even at the most extreme projections over the next 50 years.

## Overview

*“Scientists are not certain how fast the ocean will warm and ice will melt. They expect water levels to continue to rise faster, but are not sure just how fast.”*

There is broad scientific consensus that global climate is warming as a result of increased concentrations of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases in the atmosphere. Sea level rise in the coming decades is anticipated to be a major effect of climate change with mostly negative impacts for many coastal regions. There is evidence that sea levels are rising, and evidence that the rate of sea level rise has been increasing in recent years and that it will continue to increase.

The rate of sea level rise is not the same all over the country. In some towns, the sea level is rising much faster than the national average. On the East Coast and the Gulf Coast, the sea is rising by one inch every three years due to sinking land and a slowing Gulf Stream. On the West Coast, the sea level is increasing at a slower pace than the national average because the land is actually rising due to shifting tectonic plates.

### **California**

In the last decade, the speed at which California’s sea level is rising has increased, and is now rising by as much as 1 inch every 10 years. This increase is mostly due to ice melting into the ocean and thermal expansion.

## 1.0 Introduction

This report presents the results of a 5 step approach to assess risk for evaluating a range of sea level rise projections and the impacts associated with these projections as outlined in State of California Sea Level Rise Guidance 2018 Update. This updated document, provides a bold, science-based methodology to assess the risks associated with sea-level rise.

## 1.1 Site Description

The proposed project site is located on a 1.82 acre parcel on North Ocean Avenue within the coastal urban development community of Cayucos, CA. The property is undeveloped and zoned Recreation. A mobile home park lies to the north of the project site across North Ocean Avenue. A 3-story condominium development is adjacent to the west side of the project site. The Pacific Ocean borders the south side and Cayucos Creek borders the easterly property line.



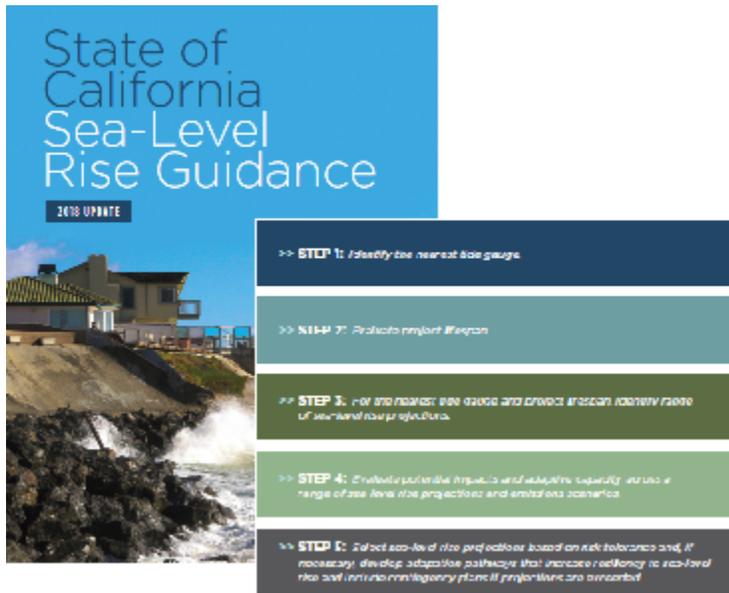
## 1.2 Project Description

Cayucos Boutique Hotel will be constructed on the flat terraced area of the site and setback 38 feet from the bluff. The hotel is 3 stories with 15 rooms, 1 presidential suite, and 1 managers unit (total of 17 units). The boutique hotel features active and passive outdoor recreational activities available to the community and hotel guest.

## 2.0 Purpose

The purpose of this report is to determine the sea level rise (SLR) risk analysis at the project site at low, medium and extreme risk levels and to evaluate potential impacts and adaptive capacity across a range of sea level rise projections and emission scenarios

## 3.0 Method



The State of California Sea Level Rise Guidance Update, 2018, provides a 5 step approach to assess risk by evaluating a range of sea-level rise projections and the impacts or consequences associated with these projections. The 5 steps are:

- **Step 1** - Identify the nearest tide gauge
- **Step 2** - Evaluate project life span
- **Step 3** - For the nearest tide gauge and project lifespan, identify range of sea-level rise projections
- **Step 4** - Evaluate potential Impacts and adaptive capacity across a range of sea level rise projections and emission scenarios
- **Step 5** - Select sea level rise projection based on risk tolerance and, if necessary, develop adaptation pathways that increase resiliency to sea level rise and include contingency plans if projections are exceeded

## Step 3 Method Explanation and Example

The life span of the boutique hotel is projected to be 25 years. Since the lifespan of the hotel is estimated to be until 2045, the sea level rise projections for 2040 and 2050 were averaged according to the projections shown on the tables for Sea Level Rise for Port San Luis Gauge.

### Example

- According to the Sea Level Rise for Port San Luis Gauge, the low aversion projection for the year 2040 is 0.8 ft. / yr. The low aversion projection for the year 2050 is 1.1 ft. / yr.; averaging these two levels provides the low risk aversion for the year 2045 as 0.95 ft. / yr. or 11.4 inches.
  - **Low risk aversion projection average of 0.95 ft. / yr. or 11.4 inches**
    - 2040 = 0.8
    - 2050 = 1.1
- A Sea Level Rise for Port San Luis Gauge is provided for double the lifespan of the project, 50 years, or until the year 2070 to provide outermost SLR information at project site.
  - *2070 = 1.6 to 1.9 average of 1.75 mm/yr. or 21 inches*

This method of analysis was used for low, medium-high, and extreme risk aversion projections as detailed in section 4.0 below.

## Probability of Sea Level Rise Explanation and Calculations

The State of California Sea Level Rise Guidance Update, 2018, provides probability charts for each Tide Gauge. Using the probability charts for Port San Luis Tide Gauge, and the projected 25 year lifespan of the hotel, and the outermost lifespan of 50 years, the probability of the Sea Level Rising at Port San Luis Tide Gauge is calculated as follows:

### High Emission Calculations at 1 foot, 2 feet, 3 feet and 5 feet

- According to the Probability Chart for high emissions the probability of the Sea Level Rising 1 foot in height for 2040 is 1.5% and 16% for 2050; averaging these two statistics for the year 2045 equals 8.75%
- The probability of the Sea Level Rising 2 feet in height for 2040 is 0.1% and 0.3% for 2050; averaging these two statistics for the year 2045 equals 0.2%
- The probability of the Sea Level Rising 3 feet in height for 2040 is 0.1% and 0.1% for 2050; averaging these two statistics for the year 2045 equals 0.1%
- The probability of the Sea Level Rising 5 feet in height for 2040 is 0.1% and 0.1% for 2050; averaging these two statistics for the year 2045 equals 0.1%
- The probability of the Sea Level Rising 5 feet in height for 2070 is 0.1%

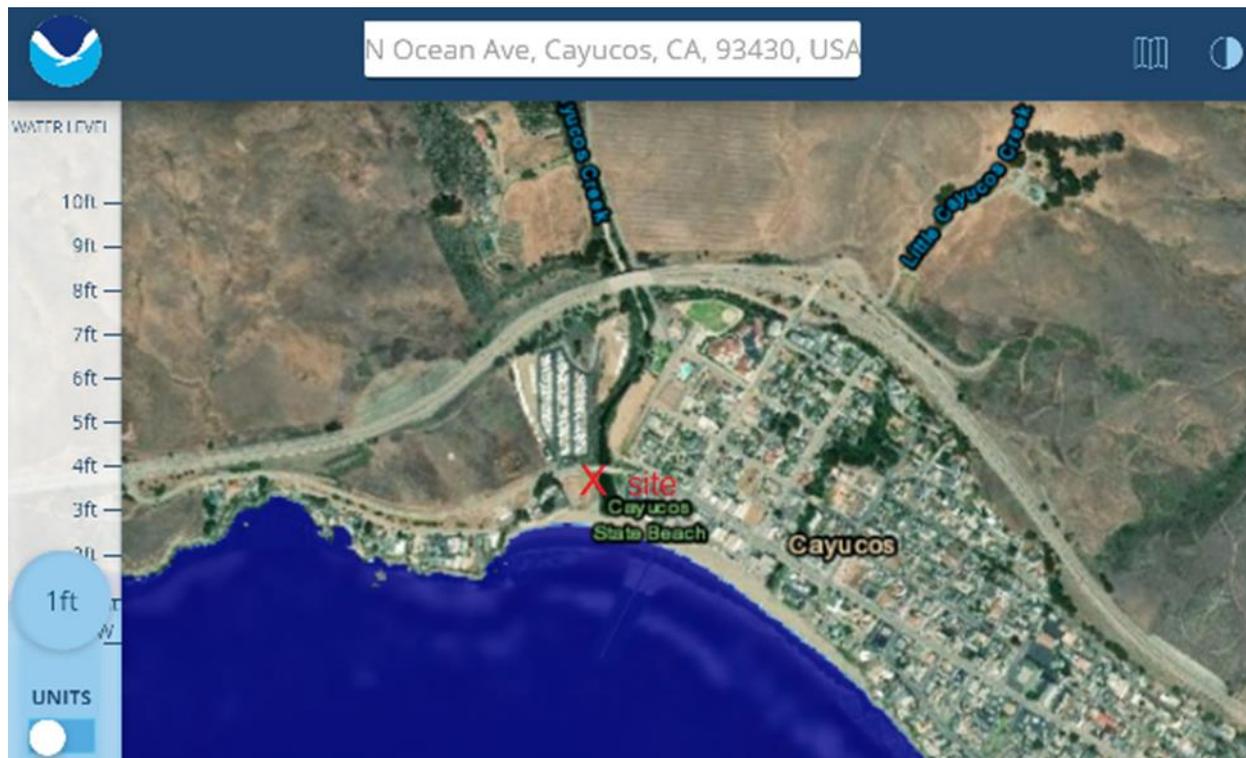
*Appendix 3: Table 20 State of California Sea Level Rise Guidance pg. 76)*



3. **STEP 3** - For the nearest tide gauge and project lifespan, identify range of sea-level rise projections (refer to Exhibit A)

**Low risk aversion projection average of 0.95 ft. / yr. or 11.4 inches**

- i. 2040 = 0.8
- ii. 2050 = 1.1
- iii. 2070 = 1.6 to 1.9 average of 1.75 mm/yr. or 21 inches



*Sea Level Rise of 1 foot by 2045*

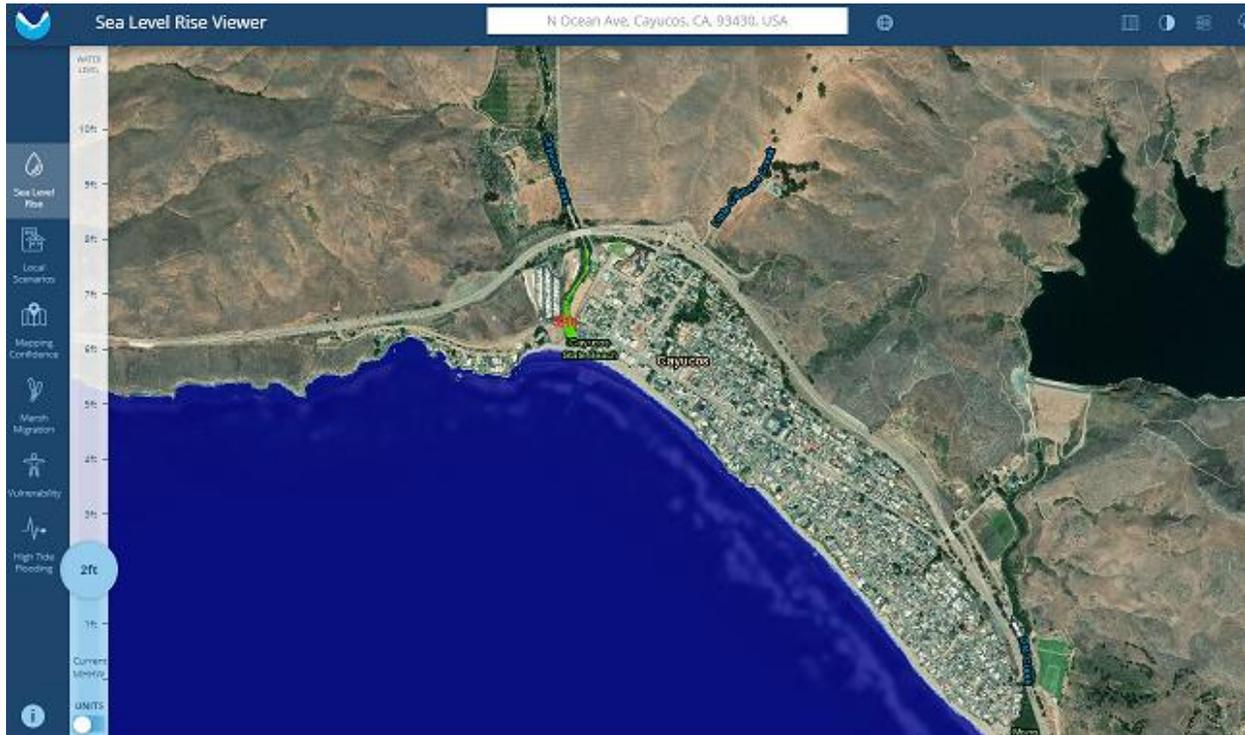
*Probability of Sea Level Rise of 1 foot by 2045 of 1 foot is 8.75%*

*(Graphic depiction is greater than projected sea level rise at low risk level of 11.4 inches)*

<https://coast.noaa.gov/slr/#/layer/slr/1/-13458925.600770887/4224988.665332356/15/satellite/none/0.8/2050/interHigh/midAccretion>

**b. Medium-high risk aversion projection 1.65 ft./yr. or 19.8 inches**

- i. 2040 = 1.3
- ii. 2050 = 2.0
- iii. 2070 = 3.1 to 3.5 average of 3.3 mm/yr. or 39.6 inches



*Sea Level Rise of 2 foot by 2045*

*Probability of Sea Level Rise of 2 feet by 2045 of 2 feet is 0.2%*

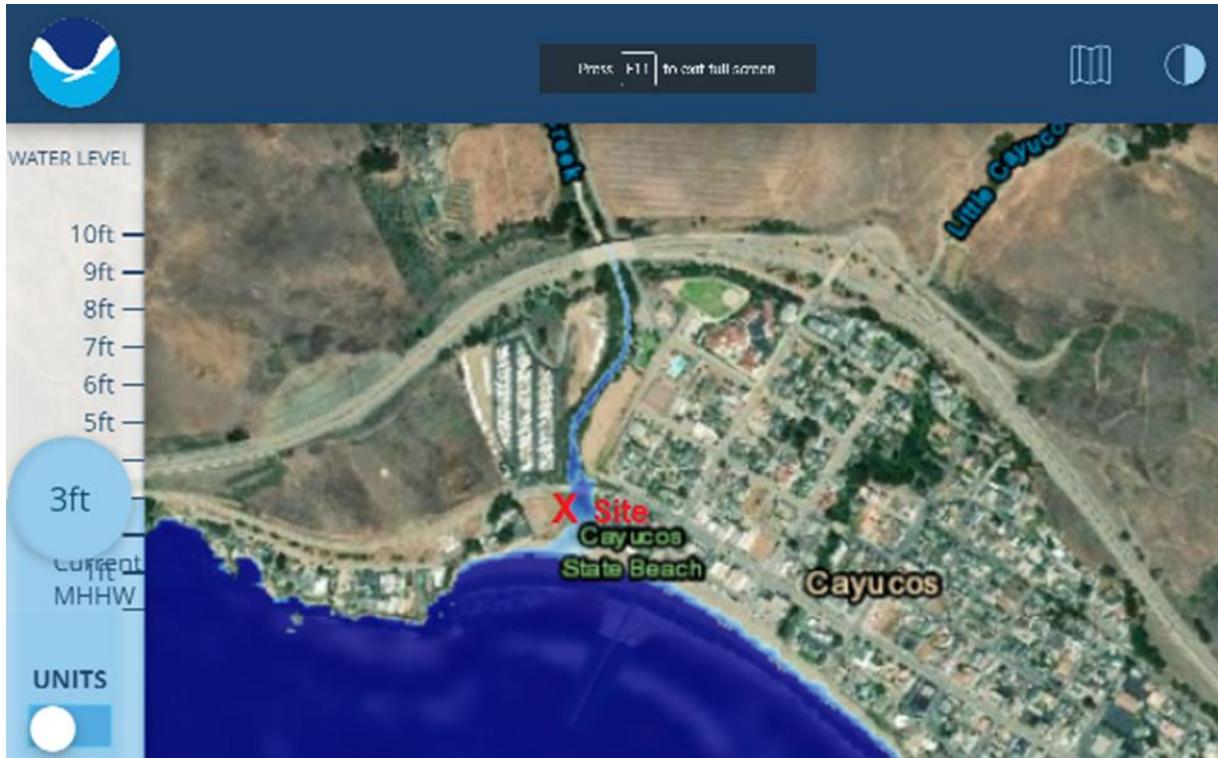
*(Graphic depiction is greater than projected sea level rise at medium-high risk level of 19.8 inches)*

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c. Extreme risk aversion projection 2.3 ft./yr. or **27.6 inches**

- i. 2040 = 1.8
- ii. 2050 = 2.8
- iii. 2070 = 5.2 mm/yr. or 62.4 inches



Sea Level Rise of 3 foot by 2045

Probability of Sea Level Rise of 3 feet by 2045 is 0.1%

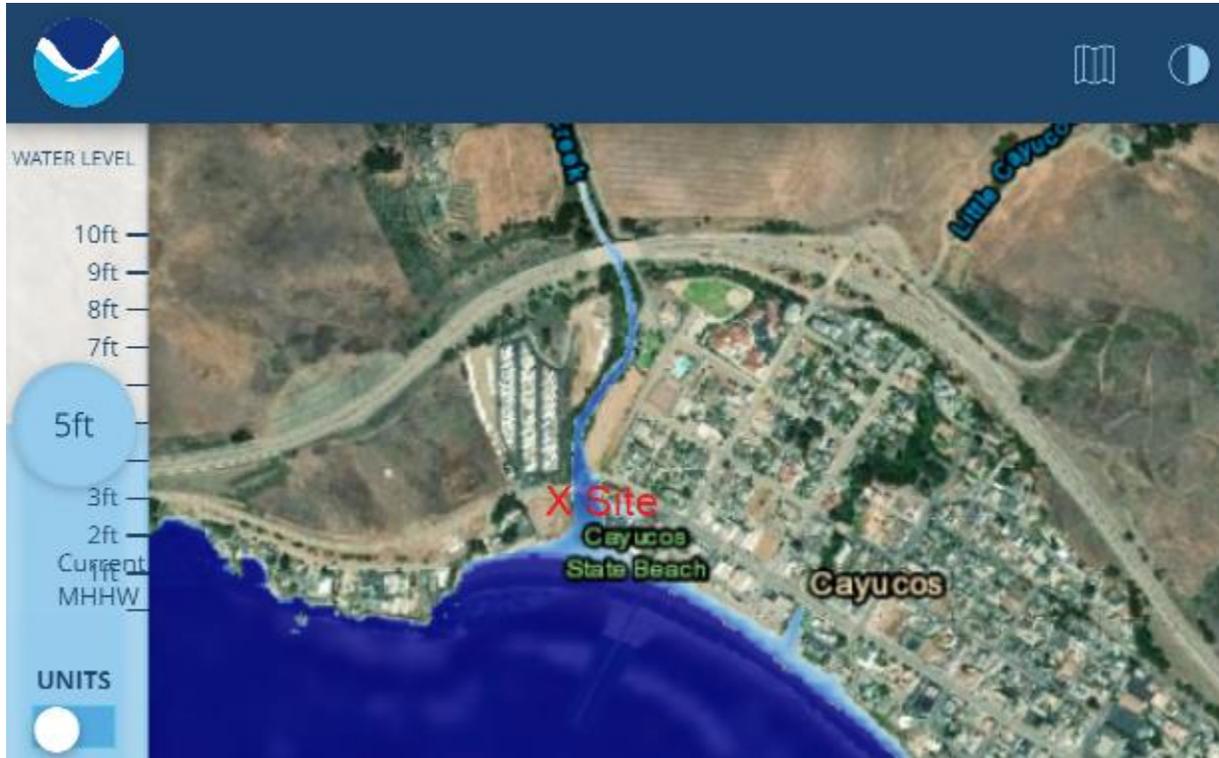
(Graphic depiction is greater than projected sea level rise at extreme risk level of 27.6 inches)

([https://coast.noaa.gov/slr/#/layer/slr/3/-](https://coast.noaa.gov/slr/#/layer/slr/3/-13458925.600770887/4224988.665332356/15/satellite/none/0.8/2050/interHigh/midAccretion)

[13458925.600770887/4224988.665332356/15/satellite/none/0.8/2050/interHigh/midAccretion](https://coast.noaa.gov/slr/#/layer/slr/3/-13458925.600770887/4224988.665332356/15/satellite/none/0.8/2050/interHigh/midAccretion))

## Outermost Sea Level Rise Projection

A Sea Level Rise is provided for double the lifespan of the project, 50 years, or until the year 2070 to provide outermost SLR information at project site.



Sea Level Rise of 5 foot by **2070**

Probability of Sea Level Rise of 5 feet by 2070 is 0.1%

(Graphic depiction is 2.4 inches less than projected sea level rise at extreme risk level of 62.4 inches)

([https://coast.noaa.gov/slr/#/layer/slr/5/-](https://coast.noaa.gov/slr/#/layer/slr/5/-13458925.600770887/4224988.665332356/15/satellite/none/0.8/2050/interHigh/midAccretion)

[13458925.600770887/4224988.665332356/15/satellite/none/0.8/2050/interHigh/midAccretion](https://coast.noaa.gov/slr/#/layer/slr/5/-13458925.600770887/4224988.665332356/15/satellite/none/0.8/2050/interHigh/midAccretion))

4. **STEP 4** - Evaluate Potential Impacts and adaptive capacity across a range of sea level rise projections and emission scenarios
  - a. Consequence of potential impacts
    - i. **Increased erosion on retreating coastal bluffs and beaches**
    - ii. **Increased risk of cliff failures**
    - iii. **Coastal flooding with higher storm surges and flood elevations**
  - b. What is at stake
    - i. **The proposed Cayucos Boutique Hotel**
  - c. Adaptive capacity
    - i. **SLR adaptation can be generally categorized into maintaining the status quo, protection, accommodation, and retreat**
      - i. **Status quo** – this strategy leaves the project site undeveloped resulting in:

1. **An economic loss to the business community of Cayucos through decreased tourism dollars and transient occupancy tax to the county of San Luis Obispo's general fund, and**
  2. **Passive and active recreational activities provided to the community and patrons of the hotel.**
- ii. **Protection** – Protection strategies refer to those strategies that employ some sort of engineered structure or other measure to defend development in its current location without changes to the development itself. Protection strategies can be further divided into “hard” and “soft” defensive measures or armoring. “Hard” armoring refers to engineered structures such as seawalls, revetments, and bulkheads that defend against coastal hazards like wave impacts, erosion, and flooding. “Soft” armoring refers to the use of natural or “green” infrastructure like beaches, dune systems, wetlands, and other systems to buffer coastal areas.
1. **The option to construct a “hard” armoring is not supported by Coastal Act policies**
  2. **The option to employ a soft armoring measure might be supported and implemented east of the project site to protect the sensitive habitat area of Cayucos Creek and the public parking area. This measure requires California Coastal Commission approval and this soft armoring measure might defer SLR impacts on the project site.**
- iii. **Accommodation** - Accommodation strategies refer to those strategies that employ methods that modify existing developments or design new developments to decrease hazard risks and thus increase the resiliency of development to the impacts of SLR. Flood-proofing and relocation of vulnerable utilities to higher elevation are examples of accommodation.
1. **The project as presented possesses innate characteristics that decreases the impact of SLR because:**
    - a. **The project site is elevated 18 feet above mean sea level, and**
    - b. **The bluff from toe of slope to bluff top averages 9-10 feet in height; SLR would not reach the proposed hotel site on the flat terraced section of the site but SLR could impact bluff erosion rate**



- iv. **The outermost SLR analysis at double the life span of the boutique hotel development projects a SLR of 62.4 inches (5 feet 2.4 inches). The project site is 18 feet above mean sea level and incorporates a bluff retreat setback of 38 feet.**

## Conclusion

The Sea Level Rise will not impact this project even at the most extreme projections over the next 50 years.

**Exhibit A**  
Projected Sea Level Rise (in feet) for Port San Luis

		Probabilistic Projections (in feet) (based on Kopp et al. 2014)				H++ scenario (Sweet et al. 2017) *Single scenario
		MEDIAN	LIKELY RANGE	1-IN-20 CHANCE	1-IN-200 CHANCE	
		50% probability sea-level rise meets or exceeds...	66% probability sea-level rise is between...	5% probability sea-level rise meets or exceeds...	0.5% probability sea-level rise meets or exceeds...	
				Low Risk Aversion	Medium - High Risk Aversion	Extreme Risk Aversion
High emissions	2030	0.5	0.4 - 0.6	0.7	0.9	1.1
	2040	0.7	0.5 - 0.9	1.0	1.3	1.8
	2050	0.9	0.7 - 1.2	1.4	2.0	2.8
Low emissions	2060	1.0	0.7 - 1.3	1.7	2.5	
High emissions	2060	1.2	0.9 - 1.6	1.9	2.7	3.9
Low emissions	2070	1.2	0.9 - 1.6	2.0	3.1	
High emissions	2070	1.5	1.1 - 2.0	2.5	3.6	5.2
Low emissions	2080	1.4	1.0 - 1.9	2.4	4.0	
High emissions	2080	1.9	1.3 - 2.5	3.1	4.6	6.7
Low emissions	2090	1.6	1.0 - 2.2	2.9	4.8	
High emissions	2090	2.2	1.6 - 3.0	3.8	5.7	8.3
Low emissions	2100	1.7	1.1 - 2.5	3.3	5.8	
High emissions	2100	2.6	1.8 - 3.6	4.6	7.1	10.2
Low emissions	2110*	1.9	1.3 - 2.7	3.5	6.4	
High emissions	2110*	2.8	2.0 - 3.7	4.7	7.5	12.0
Low emissions	2120	2.0	1.3 - 3.0	4.1	7.6	
High emissions	2120	3.1	2.3 - 4.3	5.5	8.8	14.3
Low emissions	2130	2.2	1.4 - 3.2	4.5	8.6	
High emissions	2130	3.5	2.5 - 4.9	6.3	10.2	16.6
Low emissions	2140	2.4	1.5 - 3.6	5.1	9.7	
High emissions	2140	3.9	2.8 - 5.4	7.1	11.7	19.2
Low emissions	2150	2.5	1.5 - 3.9	5.7	11.1	
High emissions	2150	4.3	3.0 - 6.1	7.9	13.3	22.0

Appendix 3: Sea Level Rise Projection (State of California Sea-Level Rise Guidance pg. 75)

**Exhibit B**

Probability that Sea Level Rise will meet or exceed a particular height (in feet) in Port San Luis

**PORT SAN LUIS - High emissions (RCP 8.5)**

	Probability that sea-level rise will meet or exceed... (excludes H++)								
	1 FT.	2 FT.	3 FT.	4 FT.	5 FT.	6 FT.	7 FT.	8 FT.	9 FT.
2030									
2040	1.5%								
2050	16%	0.3%							
2060	44%	2%	0.2%	0.1%					
2070	68%	8%	0.8%	0.2%	0.1%				
2080	82%	22%	3%	0.7%	0.2%	0.1%	0.1%		
2090	89%	40%	9%	2%	0.7%	0.3%	0.2%	0.1%	0.1%
2100	91%	56%	20%	6%	2%	1%	0.4%	0.2%	0.1%
2150	99%	89%	66%	40%	21%	11%	6%	4%	2%

**PORT SAN LUIS - Low emissions (RCP 2.6)**

	Probability that sea-level rise will meet or exceed... (excludes H++)								
	1 FT.	2 FT.	3 FT.	4 FT.	5 FT.	6 FT.	7 FT.	8 FT.	9 FT.
2060	24%	0.9%	0.1%						
2070	40%	3%	0.4%	0.1%					
2080	52%	6%	1%	0.3%	0.2%	0.1%			
2090	61%	12%	2%	0.7%	0.3%	0.2%	0.1%	0.1%	
2100	67%	19%	4%	2%	0.7%	0.3%	0.2%	0.1%	0.1%
2150	80%	46%	21%	10%	5%	3%	2%	1%	1%

Appendix 3: Table 20 (State of California Sea-Level Rise Guidance pg. 76)

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