


# THE LAST COASTAL SAND MINE IN THE US: Lapis Dune Ecology Museum and Visitor Center Design

*View of Cemex Plant from Freeway 1, March 2023  
Photo: Anna Asnis*



**Capstone project:**

“The Last Coastal Sand Mine In The Us: Lapis Dune Ecology Museum and Visitor Center Design”

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UCLA Extension Landscape Architecture program

Capstone Studio


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# PROJECT STATEMENT



**This Capstone project addresses environmental degradation caused by sand mining and creates a space to celebrate the area's natural beauty while promoting education and recreation.**

*Monterey Herald file. <https://www.montereyherald.com/2020/05/14/marina-sues-cemex-cal-am-over-desal-slant-well-plan/>*

# PROJECT JUSTIFICATION

The Cemex Lapis Sand Plant is the last remaining coastal sand mine in the US. All other sand plants in the area were closed in 1980s, however, due to a quirk in the law, the Cemex Lapis Plant was allowed to continue operations.

Although the plant does not share its extraction data, scientists estimate that it extracted around 270,000 cubic yards of sand per year from a dredging pond on the beach, which is equivalent to 48 large dump trucks every day. Sand removal affects dunes by altering their natural composition and destabilizing their structure, leading to erosion and loss of protective barriers against coastal storms.

In 2017, CEMEX made an agreement with the California Coastal Commission to restore the sand plant site to natural conditions by Dec. 31, 2025. As part of the agreement, CEMEX must also sell the property to a nonprofit for less than market value. The land will enter a deed restriction that requires dune restoration and public access.

Establishment of a Dune Ecology Museum and Visitor Center at the old Cemex Lapis Plant site can further educate the public about the importance of dunes and contribute to their long-term conservation and preservation.

1.EVALUATION OF EROSION MITIGATION ALTERNATIVES for Southern Monterey Bay, ESA PWA, Published on May 30, 2012

<https://nmsmontereybay.blob.core.windows.net/montereybay-prod/media/research/techreports/esapwa2012.pdf>

2.COASTAL COMMISSION SETTLEMENT AGREEMENT. CCC-17-CD-02 (CEMEX). JULY 13, 2017



*View of Cemex Plant from the Coast, April 2023  
Photo: Anna Asnis*



*Entrance to the plant, April 2023  
Photo: Anna Asnis*

# DESIGN METHODOLOGY: THE CLASSIC

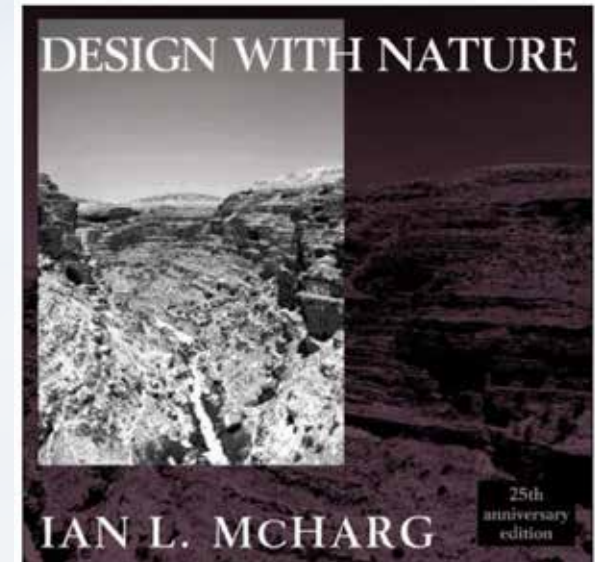
## PRINCIPLES:

### Design with Nature, Ian McHarg :

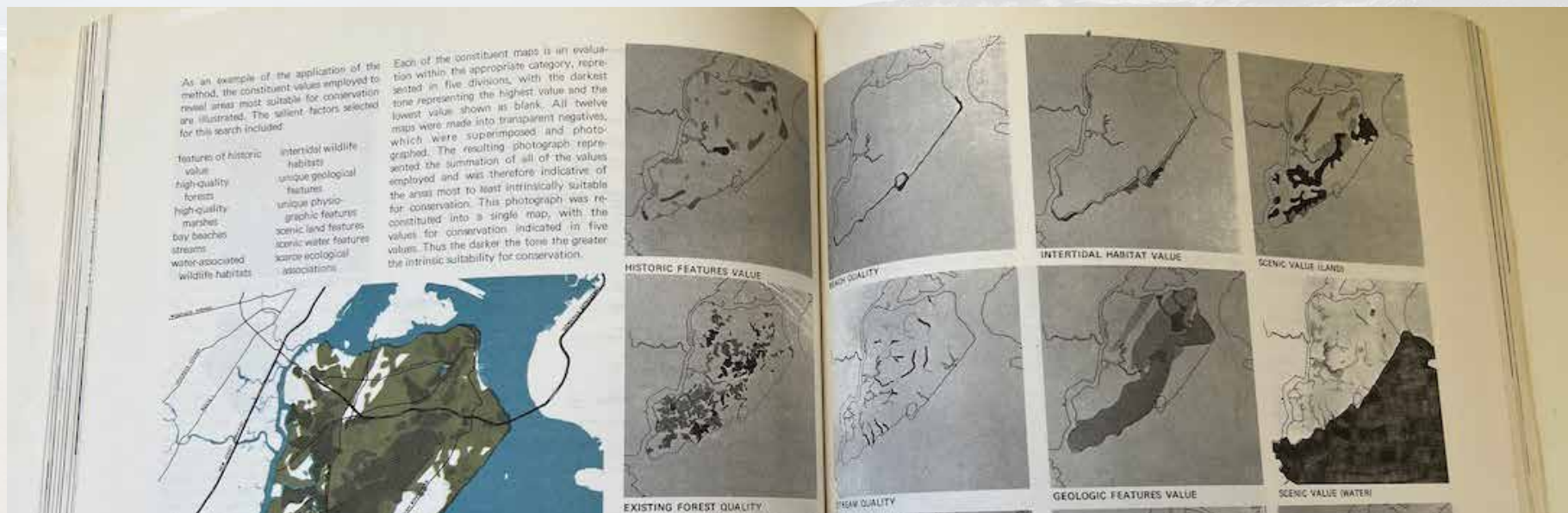
- The natural environment should be the starting point for all design decisions
- Design should be based on a comprehensive understanding of ecological systems.
- Planning should prioritize the protection of natural systems

### How will I use it?

I will overlay site analysis and inventory pages to find the best locations for program elements.



book photos: Anna Asnis



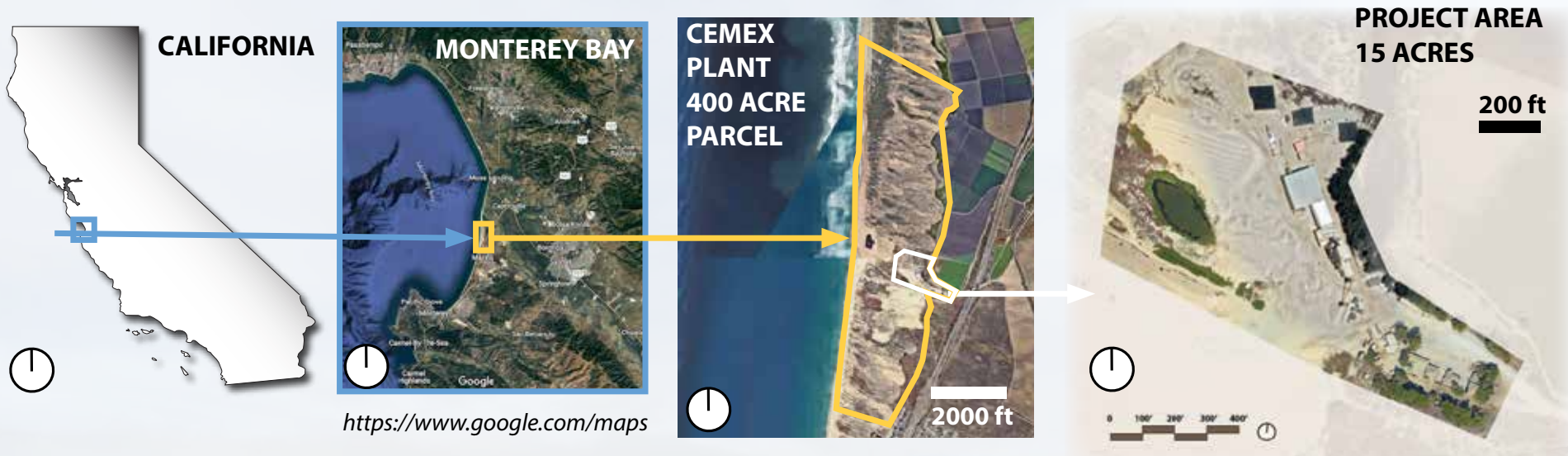


**PART 1. RESEARCH, SITE ANALYSIS, CASE STUDIES**

**PART 2. DESIGN DEVELOPMENT**

**PART 3. FINAL DESIGN**

# LOCATION: 100 LAPIS ROAD, MARINA, CA



## “Lapis” means “Stone” in Latin.

The earliest map of the area I could find is Monterey map from 1912 - there is a place named Lapis - it is right where the new railroad had a special appendix for the sand plant.

I think the name “Lapis” belongs to this area and I decided to use it in the name of my museum

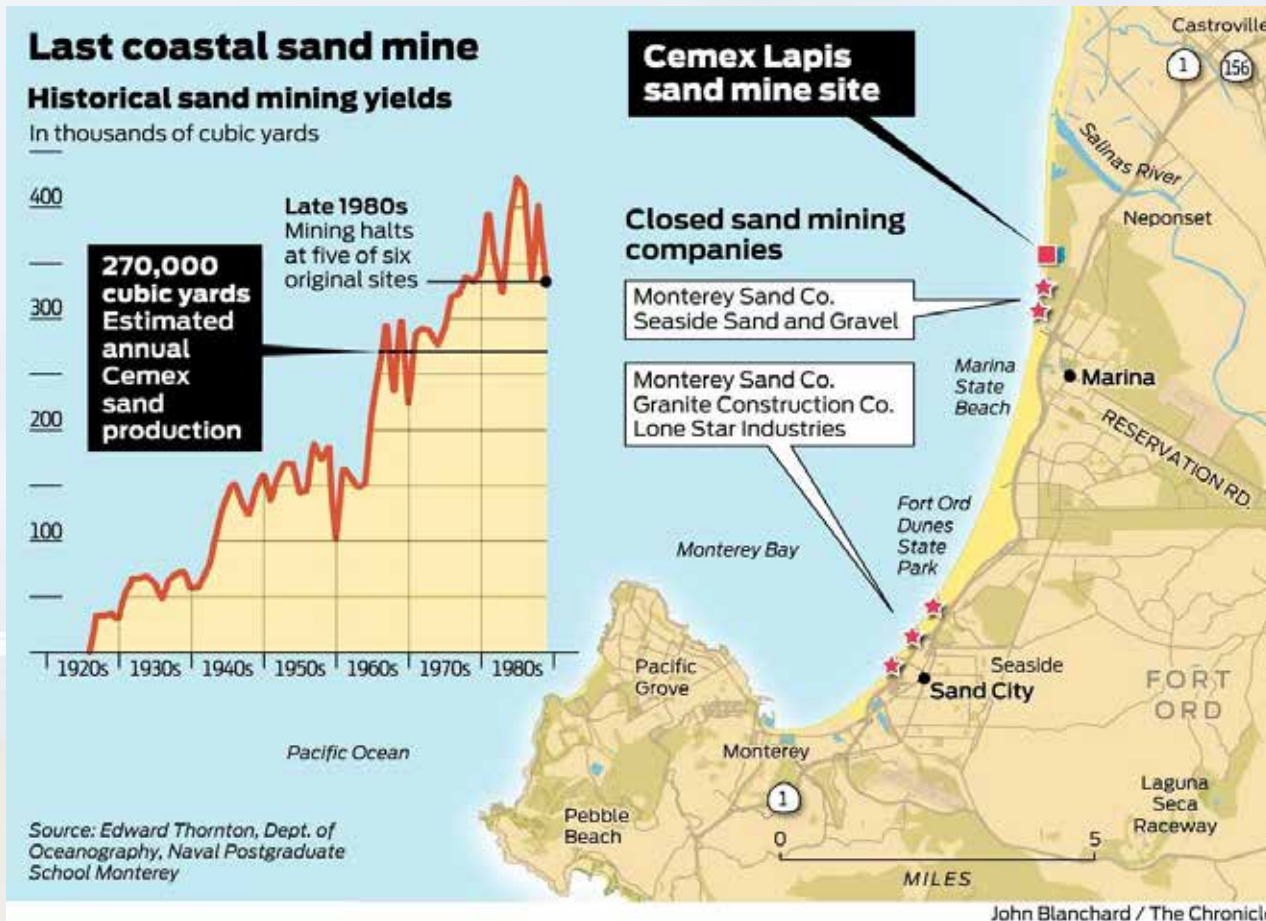


<https://maps.lib.utexas.edu/maps/topo/california/txu-pclmaps-to-po-ca-monterey-1912.jpg>





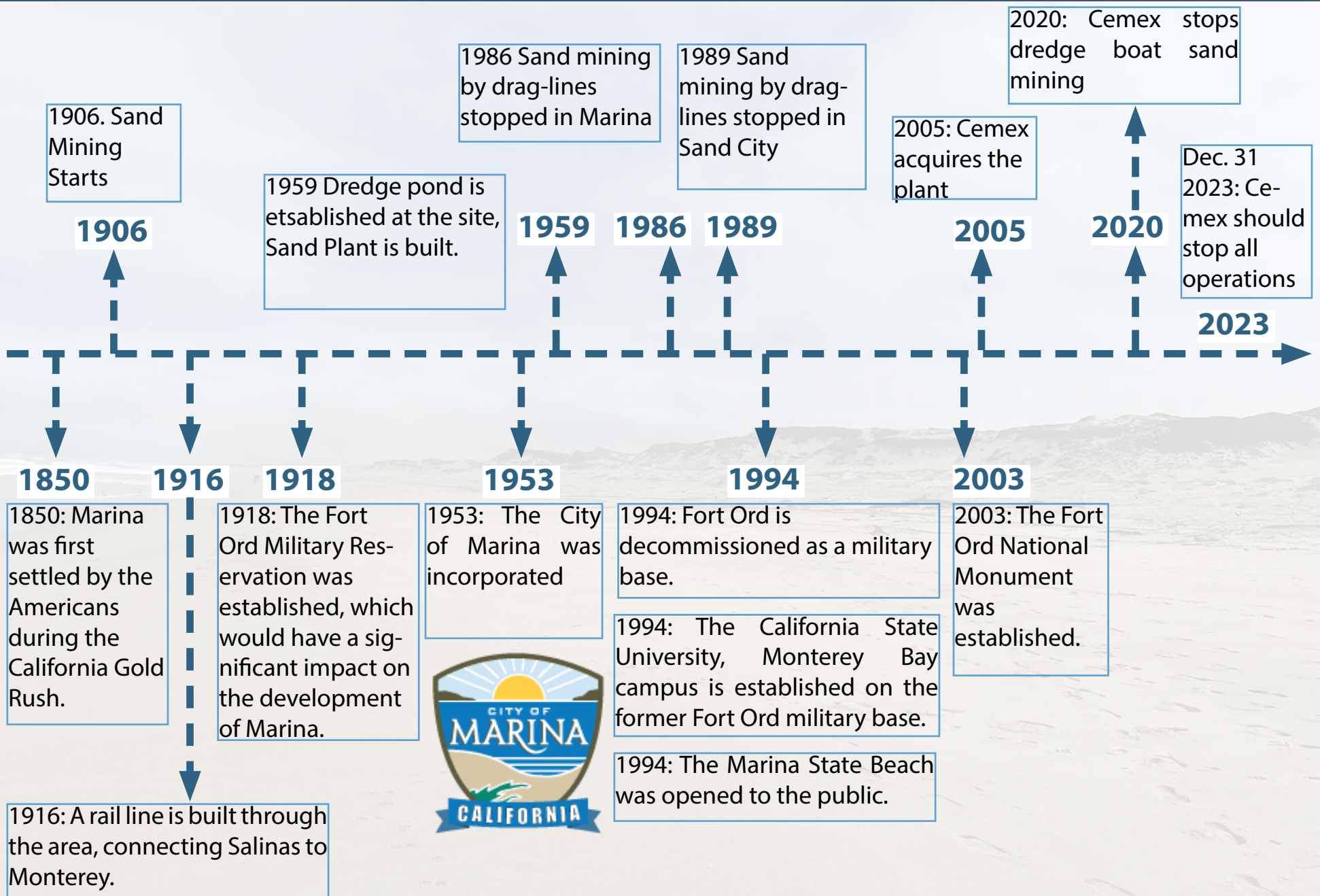
# HISTORY OF SAND MINING, MONTEREY BAY SHORE



## SAND MINING IN THE AREA:

Sand dredging was a major industry along the 31-mile coastline from Santa Cruz to Monterey since 1902, with six sand mining operations in the 1980s. The Lapis mine, opened in 1906, eventually sold to Lone Star Industries, who established a dredge pond in 1959. In the 1980s, dune erosion of 6 to 7 feet per year occurred in some areas, leading to a crackdown on sand mining. The Army Corps shut down five mines in 1990, but Lapis was allowed to remain. Cemex purchased Lapis in 2005, and its extractions went unnoticed by the public and regulators. However, in 2006, the US Geological Survey found that southern Monterey Bay had one of the highest average rates of erosion in California, and a 2015 study linked it to sand mining, which is the sole source of the loss of coarse sand, causing the shoreline to retreat roughly 4 feet per year instead of growing.

# HISTORY OF MARINA, CA AND SAND MINING AT CEMEX PLANT



# SAND MINING AT THIS SITE, SUMMARY

**SAND MINING STARTED IN 1906.**



[https://www.archieven.nl/nl/zoeken?mistart=125&mi-vast=0&mizig=287&miadt=39&milang=nl&misort=ver%7Casc&miview=gal&mizk\\_alle=trefwoord%3AGoederenvervoer](https://www.archieven.nl/nl/zoeken?mistart=125&mi-vast=0&mizig=287&miadt=39&milang=nl&misort=ver%7Casc&miview=gal&mizk_alle=trefwoord%3AGoederenvervoer)

**48 LARGE TRUCKS OF SAND DAILY**



<https://www.istockphoto.com/photo/rusovich-pours-sand-on-the-construction-site-gm1018166602-273730570>

**SHORELINE REDUCTION - 3'-5' A YEAR!**



*The Effects of Armoring Shorelines—The California Experience*  
Gary Griggs  
University of California, Santa Cruz

Stilwell Hall at Fort Ord, built in 1940-  
removed in 2003 due to coastal erosion

**NOVEMBER 2019 - ONE MONTH BEFORE DREDGING STOPPED**

Top image shows dredge pond and dredge boat (white dot at the edge of the pond).



DREDGE  
POND MINING  
STARTED IN  
1959

**APRIL 2023 - 40 MONTHS AFTER DREDGING STOPPED.**

Dredge Pond is filled in with sand after 3 winters!



# SETTLEMENT AGREEMENT AND CEASE AND DESIST ORDER, KEY DATES

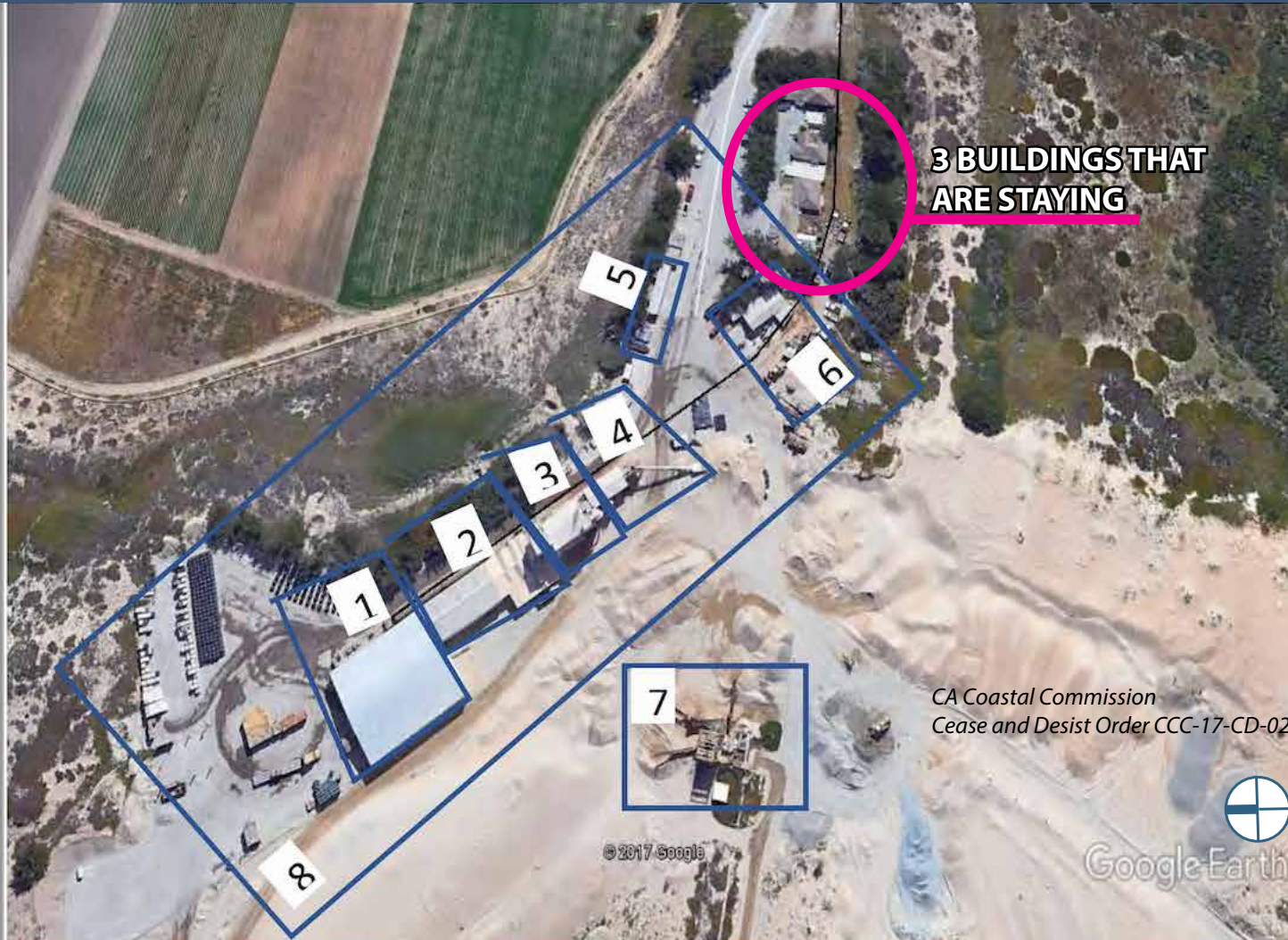
The California Coastal Commission notified Cemex Plant of alleged Coastal Act violations at their sand plant in Marina, CA. CEMEX disputes the allegations, asserting lawful operations. The Consent Settlement Agreement (CCC-17-CD-02) resolves the matter to avoid litigation expenses and uncertainties, but CEMEX denies any violation or liability.

**Respondent shall transfer fee title to all of the Property to a non-profit or governmental entity** or consortium approved by the Commission, in consultation with the City of Marina, ("Buyer"), such approval not to be unreasonably withheld, that commits **to hold and manage the property primarily for conservation purposes**, with the only other allowable uses being for **low-impact, passive recreation purposes or activities, public access, public education, removal activities, activities to restore native habitat**, and activities consistent with existing easements identified by Cemex prior to the Effective Date.



CA Coastal Commission Cease and Desist Order CCC-17-CD-02

# AGREEMENT - BUILDINGS TO REMOVE



In accordance with the terms of the Agreement, the items below shall be removed by December 31, 2024.

The warehouse. This item is shown in the area noted as 1.

The bagging facility. This item is shown in the area noted as 2.

The screening facility. This item is shown in the area noted as 3.

The kiln facility. This item is shown in the area noted as 4.

The offices and scales. These items are shown in the area noted as 5.

The shops and wells. These items are shown in the area noted as 6.

The wet tower. This item is shown in the area noted as 7.

Removal of any other items not listed above, and as required by Reclamation Plan as defined in the Agreement, shown in area noted as 8.



Site Photos: Anna Asnis

# AGREEMENT - FINAL GRADING AND SEEDING AREA



In accordance with the terms of the Agreement, the final grading and seeding of the area noted as 1 by December 31, 2025.

Appendix A  
CCC-17-CD-02  
Page 37 of 39

CA Coastal Commission Cease and Desist Order CCC-17-CD-02

# SITE PHOTOS - BUILDINGS



<https://www.google.com/maps/>

Site Photos: Anna Asnis

# MORE SITE PHOTOS

Site Photos: Anna Asnis

**PLANT VIEW FROM LAPIS ROAD**



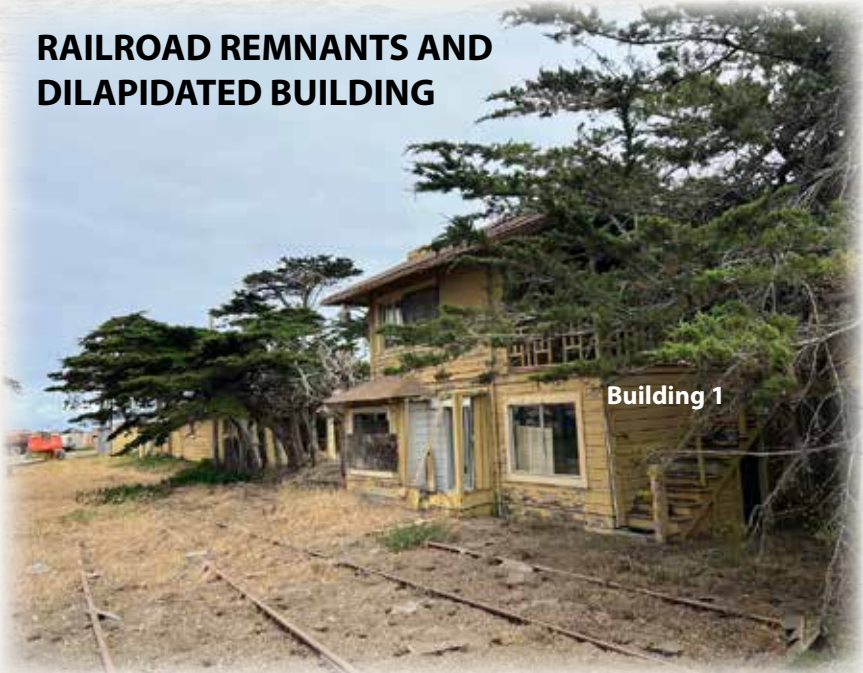
**MAIN ENTRANCE**



**VIEW FROM OCEAN SIDE, DISTURBED DUNES AND CEMEX SAND PLANT AT THE BACK**



**RAILROAD REMNANTS AND DILAPIDATED BUILDING**





# GOALS AND OBJECTIVES

## GOAL:

### ADDRESS ENVIRONMENTAL DEGRADATION

- Restore disturbed dunes - remove invasive plants, plant CA native dune plants to anchor sand.
- Protect restored and existing dunes

## GOAL:

### CELEBRATE AREA'S NATURAL BEAUTY

#### EDUCATE THE PUBLIC ON THE IMPORTANCE OF DUNE HABITAT

Raise public awareness about the importance of preserving these habitats.

Create engaging educational materials about dune habitats, Monterey Bay, Salinas River

Inspire action in support of conservation efforts.

#### ADD PASSIVE RECREATION

→ Provide spaces for passive recreational activities that don't harm the environment.

→ Incorporate design features that promote enjoyment of nature.

→ Ensure accessibility and safety for all visitors.

# PROGRAM ELEMENTS

## Dune Ecology Museum and Visitor Center 3000-4000 sq ft



Photos: SURFACEDESIGN INC.  
<https://www.sdisf.com/lands-end-lookout>

## Boardwalk trail through dunes



Photo: Anna Asnis

## 3D map of Monterey Bay



<https://www.pebblebeach.com/insidepebblebeach/a-preview-of-the-new-pebble-beach-visitor-center/>

## Play Fountain



PHOTO COURTESY: Margaret Coffee

## Lookout Tower



[https://en.wikipedia.org/wiki/Wanne\\_Observation\\_Tower](https://en.wikipedia.org/wiki/Wanne_Observation_Tower)

## Picnic Tables



[https://en.wikipedia.org/wiki/Picnic\\_table](https://en.wikipedia.org/wiki/Picnic_table)

## Public Restroom



<https://publicrestroomcompany.com/park-restroom-design-considerations/>

## Bike trail connection to the site



Photo: Anna Asnis

## Parking: Car, Bike, School Bus



[https://www.rainsmartsolutions.com/permeable\\_gravel\\_pave\\_car\\_parkshtml](https://www.rainsmartsolutions.com/permeable_gravel_pave_car_parkshtml)

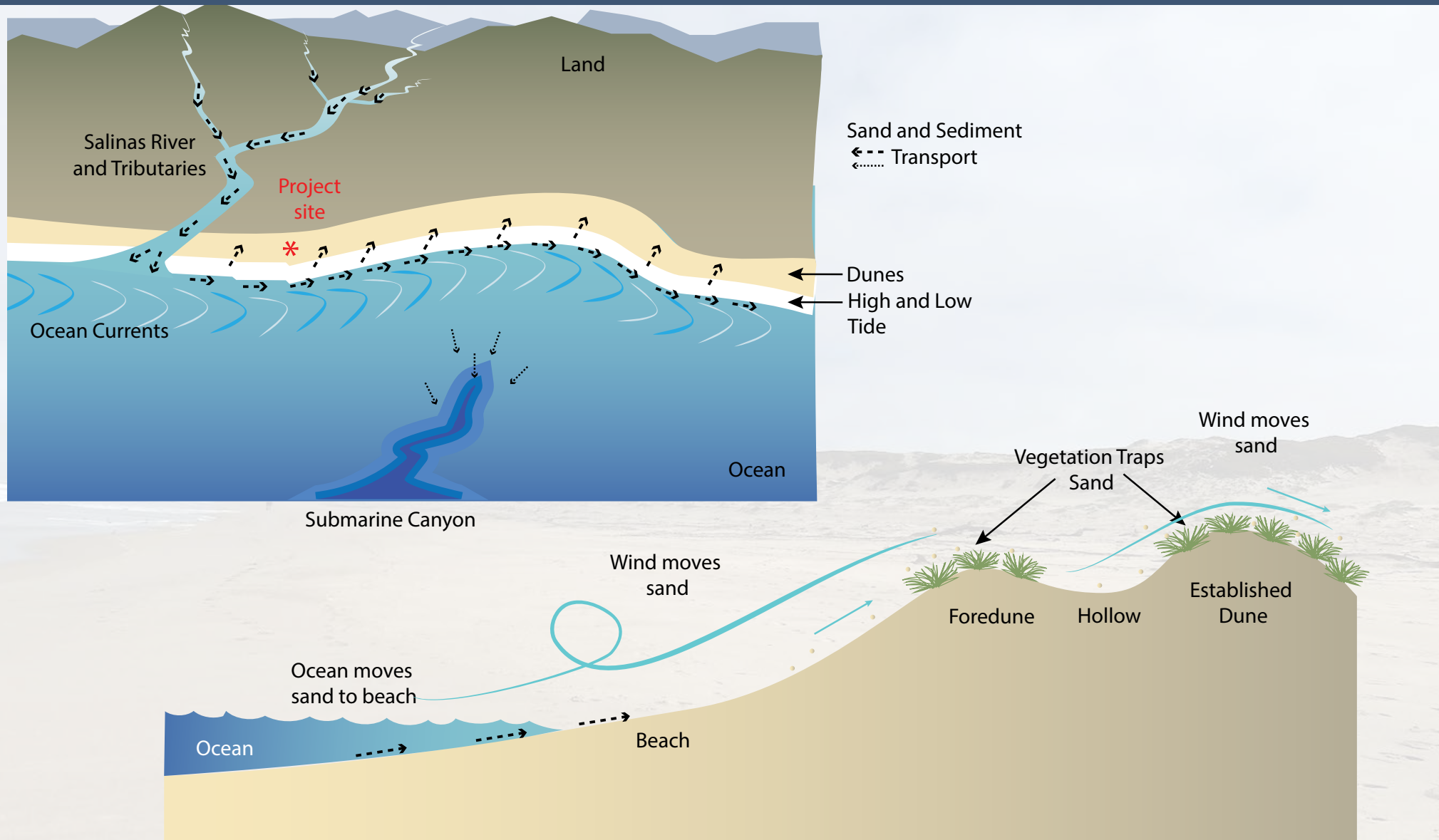
<https://www.theparkcatalog.com/>

## Interpretive Signs



<https://www.americantrails.org/resources/interpretive-signs-and-displays-along-trails>

# WHERE DOES SAND COME FROM?



There is a constant flow of sand from the land into the ocean. Watershed run-off and bluff and hillside erosion bring sand to the beach. Sand grains travel southward down the coast, while finer particles of sediment are carried and deposited further out to sea.

Along the way, sand is washed ashore, temporarily resting on beaches, until it is re-suspended in the ocean by wave action or wind. The one-way journey down the coast ends when sand is blown inland forming sand dunes, or more commonly, when it flows into a submarine canyon.

<https://explorebeaches.msi.ucsb.edu/sandy-beach-life/sand-movement>

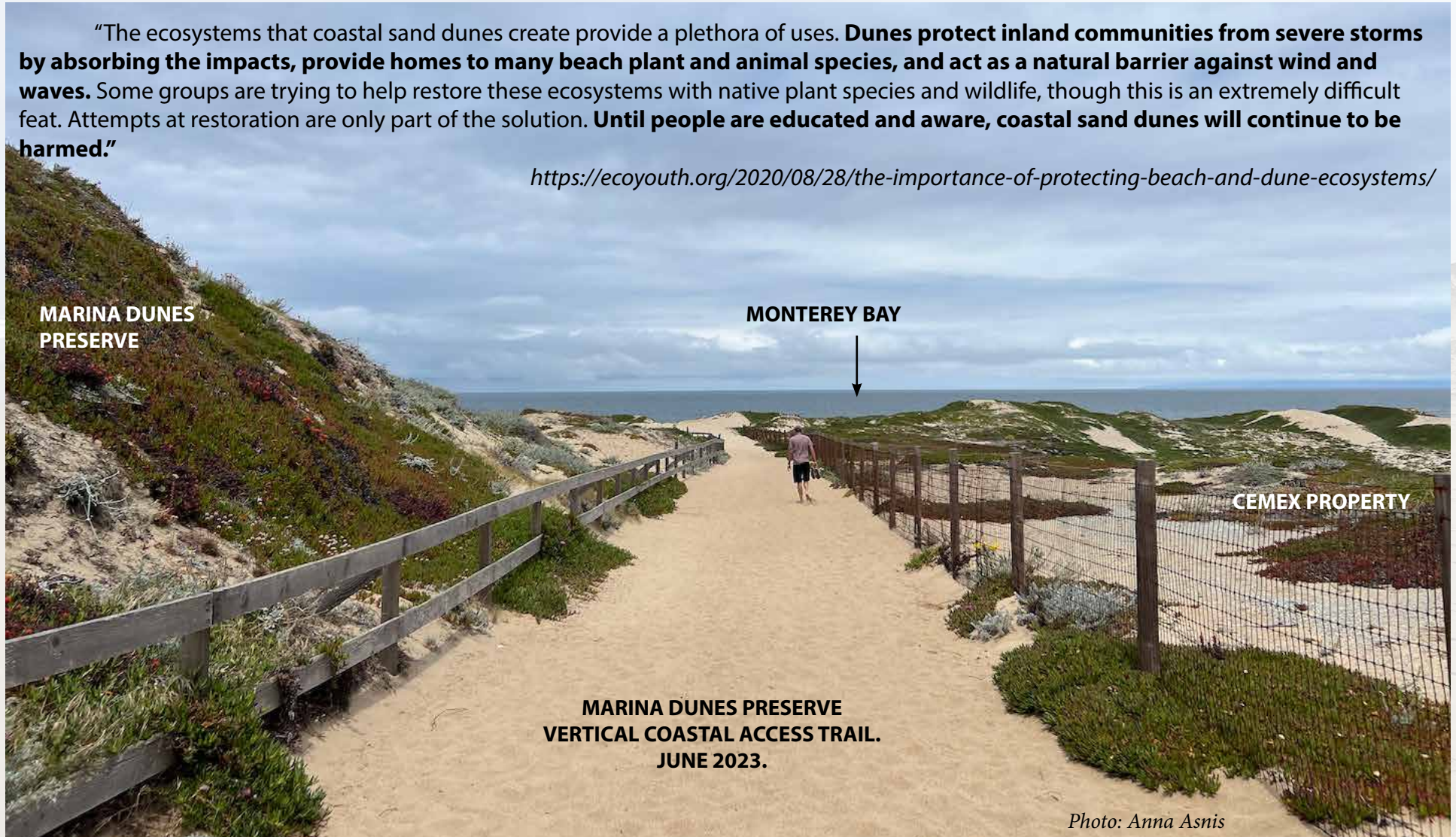
# WHY DO WE NEED TO PROTECT AND RESTORE DUNES?

“California coastal dunes have suffered a disproportionately high amount of human impact because surrounding relatively flat coastal areas are magnets for industry, tourism, recreation and settlement. Dunes are inherently unstable, and repeated and often successful attempts at stabilization have been made since the onset of European settlement in California. Today, the coastal dune landscape of California is altered. As a linear ecosystem, dunes are particularly vulnerable to the effects of fragmentation by industrial, commercial and residential encroachment, the invasion of exotic species, and the impacts of off-road vehicular recreation.”

*Ecology and Restoration of Northern California Coastal Dunes by Andrea J. Pickart and John O. Sawyer, page 1*

“The ecosystems that coastal sand dunes create provide a plethora of uses. **Dunes protect inland communities from severe storms by absorbing the impacts, provide homes to many beach plant and animal species, and act as a natural barrier against wind and waves.** Some groups are trying to help restore these ecosystems with native plant species and wildlife, though this is an extremely difficult feat. Attempts at restoration are only part of the solution. **Until people are educated and aware, coastal sand dunes will continue to be harmed.**”

<https://ecoyouth.org/2020/08/28/the-importance-of-protecting-beach-and-dune-ecosystems/>



# MARINA DUNE HABITAT

Within the City of Marina, there are a wide variety of dune and beach habitats that contain a large number of endemic species and high plant diversity. The Monterey Dunes once contained over 50 native plant species, but that has now been reduced by a combination of factors including human disturbance, erosion, sand-mining, and encroachment from non-native species such as iceplant and Holland dune grass (Dorell/Canepa 2005). Many of these habitats are considered sensitive and home to several sensitive and endangered species.

## Special Status and Notable Dune Species of Concern:

### Plants:

- Seaside Painted Cup (*Castilleja latifolia* ssp. *latifolia*)
- Monterey Spine Flower (*Chorizanthe pungens* var. *pungens*)
- Eastwood's Ericameria (*Ericameria fasciculata*)
- Coast Wallflower (*Erysimum ammophilum*)
- Menzies' Wallflower (*Erysimum menziesii*)
- Coastal Dunes Milk Vetch (*Astragalus tener* var. *titi*)
- Dune Gilia (*Gilia tenuiflora* var. *arenaria*)
- Wild Buckwheat (*Eriogonum latifolium*) \*
- Wild Buckwheat (*Eriogonum parvifolium*) \*
- Bush Lupine (*Lupinus* ssp.) +

### Animals:

- Smith's Blue Butterfly (*Shijimiaeoidea enoptes smithi*)
- Globose Dune Beetle (*Coelus globosus*)
- Black Legless Lizard (*Anniella pulchra nigra*)
- Salinas Kangaroo Rat (*Dipodomys heermanni goldmani*)
- Western Snowy Plover (*Charadrius nivosus nivosus*)

\* only within the range of Smith's Blue Butterfly.

+ only within the range of the Black Legless Lizard.

<https://cityofmarina.org/DocumentCenter/View/13172/Marina-Public-Draft-Land-Use-Plan-Coastal-Hazards?bidId=>



Photo: Anna Asnis

*Lupinus arboreus*



*Castilleja latifolia*

Photo: Anna Asnis

# INVASIVE PLANTS

“The invasion of non-indigenous plant species has been recognized as one of the most serious global threats to natural plant communities. Plant invasions reduce biological diversity by causing populations declines and simplification of ecosystems. the control of non-native plants has been cited as among the most urgent of land management needs.”

Andrea J. Pickart and John O. Sawyer, 1998 . Ecology and Restoration of Northern California Coastal Dunes. Published by California Native Plant Society.

There are several invasive species that need to be removed from Marina dunes: Iceplant (*Carpobrotus edulis*), Narrow-leaved iceplant (*Conicosia pugioniformis*), European beachgrass (*Ammophila arenaria*), *Acacia* spp.

Iceplant is the most prolific, takes up space and pushes out native plants and other species that depend on them - butterflies and lizards.



*Photo: Anna Asnis*

**INVASIVE ICE PLANT - MUST BE REMOVED.**  
*Carpobrotus edulis*

# SNOWY PLOVERS - PROTECTED BIRDS

A Snowy Plover near the Salinas River mouth (c) B. Matheson <https://www.montereyaudubon.org/snowy-plovers>



Photo: Anna Asnis

GROUP OF PLOVERS



Photo: Anna Asnis

PLOVER NESTING HABITAT FENCED OFF FROM HUMANS AND THEIR DOGS

"From Monterey Harbor north to Watsonville and beyond, a long crescent of high dunes defines the Monterey Bay's shore. And no single species better captures both the subtle beauty and fragility of this dune ecosystem than the Western Snowy Plover. "Snowies" can't nest on the Rocky Shore. They can't nest in grasslands, or agricultural fields. They require sand, invertebrates to eat, and to be left more-or-less alone from the intrusions of Homo sapiens.

While Snowy Plovers were once more widespread in Monterey Bay, today they find the conditions they need to nest and survive from roughly Sand City, north to the mouth of the Pajaro River. Here the dunescape is broad enough, unleashed dogs are few enough, and the foot traffic of beachgoers and surf-casters is light enough, that Snowy Plovers can still forage and breed, most seasons. Significant stretches of the coast are nominally protected as California State Parklands. **But a scattering of privately owned footholds in the dunes present a constant risk of development, threatening to extirpate the birds from segments of the shoreline piecemeal."**

<https://www.montereyaudubon.org/snowy-plovers>

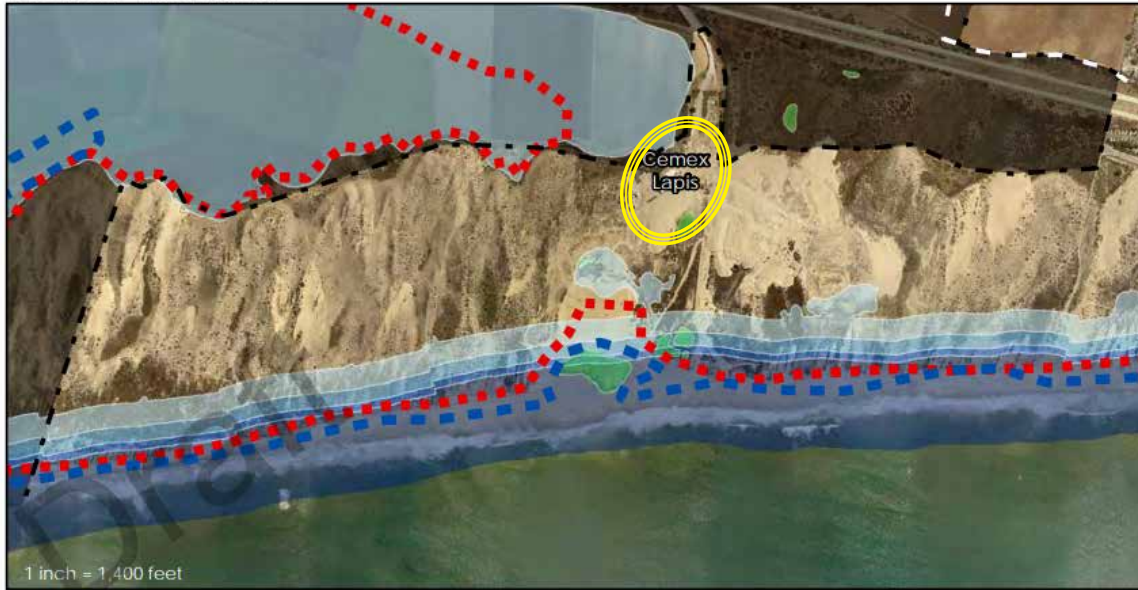


**FORMER DREDGE POND, FILLED WITH SAND AFTER 3 WINTERS 900 FT OF AN ADDITIONAL PLOVER HABITAT!**

**SINCE DREDGE POND IS FILLED IN COMPLETELY WITH SAND AN ADDITIONAL 900 FT OF PLOVER HABITAT IS ADDED TO THE SHORELINE. A WIN FOR THE ENVIRONMENT!**

# TSUNAMI THREAT TO CEMEX PLANT

## North Marina







## TSUNAMI:




On this map it is shown that Cemex property will not be affected by tsunami or coastal erosion in the next 80 years..

### Legend






#### Coastal Storm and Erosion Year (inches/feet)

- Existing (0"/~0') 
- 2030 (9"/~1') 
- 2060 (28"/~2') 
- 2100 (63"/~5') 

#### Tsunami Inundation Lines

-  Science Application for Risk Reduction (SAFRR) - USGS
-  Tsunami Inundation Line
-  California Geological Survey (CGS) Tsunami Inundation Line

### Features

- City Boundary 
- Coastal Zone Boundary 
- Highway 
- Railroad 
- Seasonal or Permanent Ponds 



<https://cityofmarina.org/DocumentCenter/View/13172/Marina-Public-Draft-Land-Use-Plan-Coastal-Hazards?bidId=>

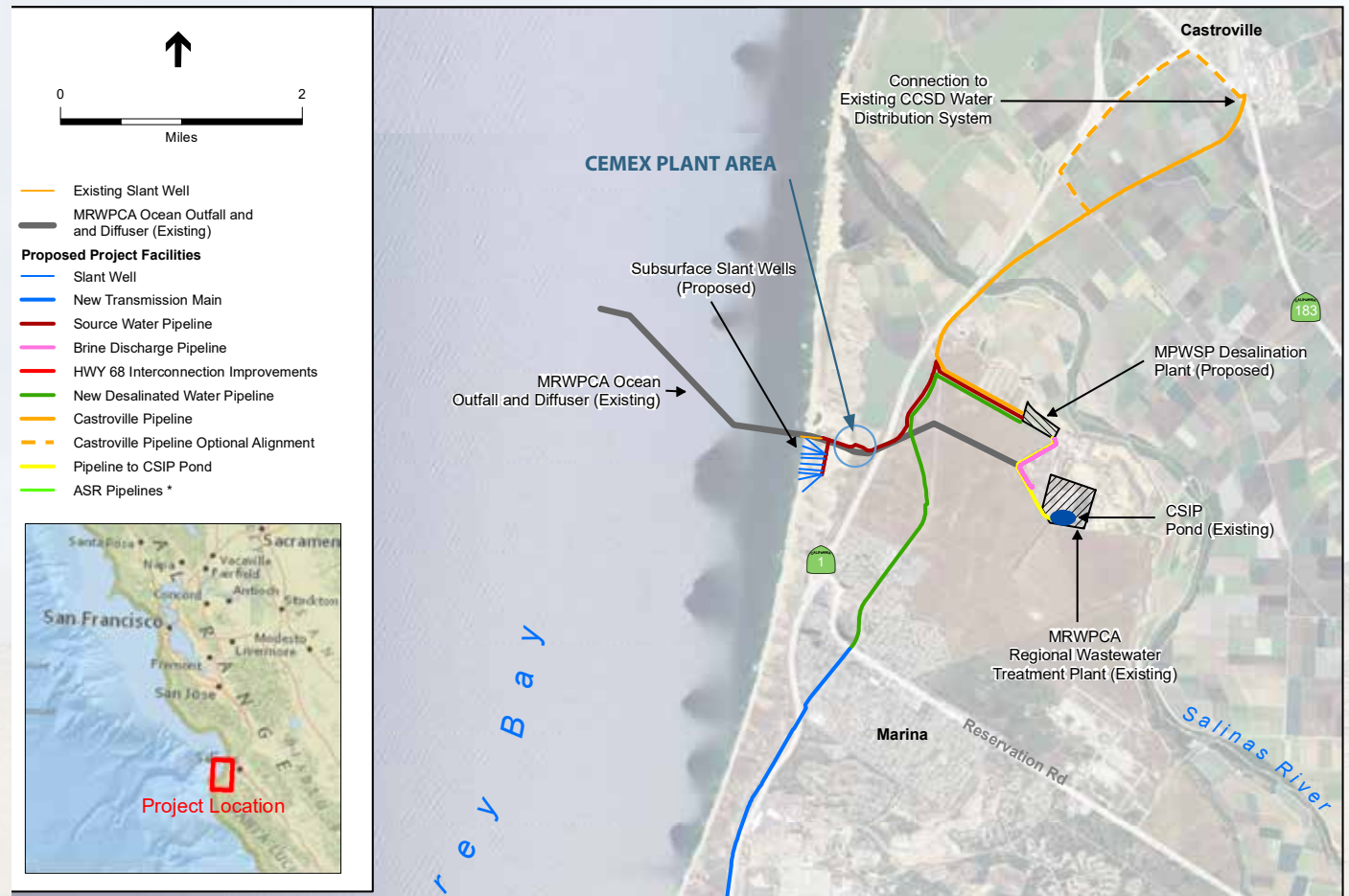


# PROPOSED DESALINATION PLANT

On November 17, 2022, the California Coastal Commission approved the construction of a desalination plant, despite acknowledging its high costs, environmental risks to Monterey Bay, and significant environmental justice concerns. The contentious debate centered on the fairness of locating a for-profit company's facility in Marina, Monterey County, a community that doesn't require the water and includes disadvantaged neighborhoods. The water produced by the expensive plant will primarily benefit wealthier areas such as Carmel-by-the-Sea, Pacific Grove, and Pebble Beach. California American Water, the nation's largest publicly traded water and wastewater company, aims to build the plant to provide drinking water to 100,000 people on the Monterey Peninsula, including the largely Latino community of Castroville. However, the project faces several hurdles, including obtaining permits and resolving a court battle over groundwater rights.

The decision to approve the plant highlights the tension between environmental justice concerns, ecological impacts, and the precarious water supply situation on the Monterey Peninsula. The region heavily relies on over-pumped groundwater, the overtaxed Carmel River, and highly-treated wastewater due to a lack of imported water. While supporters, including Governor Gavin Newsom, state water agencies, and local businesses, argue that the desalination project will alleviate housing shortages and bolster local water supplies, opponents express reservations about the potential harm to sensitive habitats and the distribution of water to wealthier areas, sparking a complex and contentious issue in the region.

<https://calmatters.org/environment/2022/11/desalination-plant-monterey-california/>



NOTE:  
 \*The ASR Pipelines are the ASR Conveyance Pipeline, the ASR Pump-to-Waste Pipeline, and the ASR Recirculation Pipeline. See Figure 3-9a for the individual pipeline alignments.

SOURCE: ESA, 2016

205335.01 Monterey Peninsula Water Supply Project

**Figure ES-1**  
 Monterey Peninsula Water Supply Project Overview

## MY CONCLUSION:

**EVEN IF A DESALINATION PLANT IS EVENTUALLY BUILT ON THIS PROPERTY, THE PUMP EQUIPMENT WILL NOT TAKE TOO MUCH SPACE, DESALINATION PLANT AND THE DUNE MUSEUM CAN CO-EXIST.**

# DEMOGRAPHICS

<https://censusreporter.org/>

## Marina, CA

Population: 22,246  
 Area: 8.9 sq. miles  
 Density: 2,497.4 people per sq.mile  
**Median Age: 34.9**

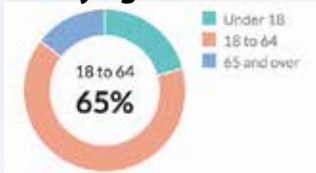


## Monterey County (North Central), CA

Population: 189,694  
 Area: 509.6 sq. miles  
 Density: 372.2 people per sq.mile  
**Median Age 39.9**



### Population by age



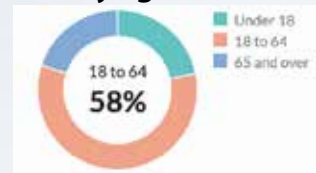
### Median Household Income \$78,795



### Median value \$593,700



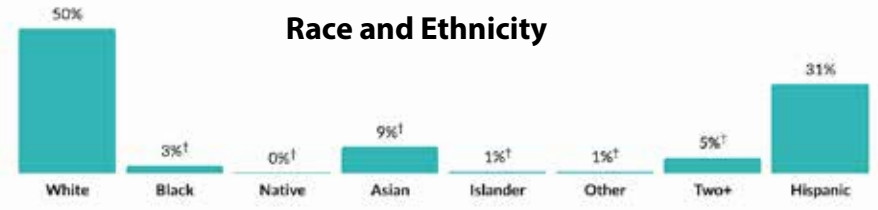
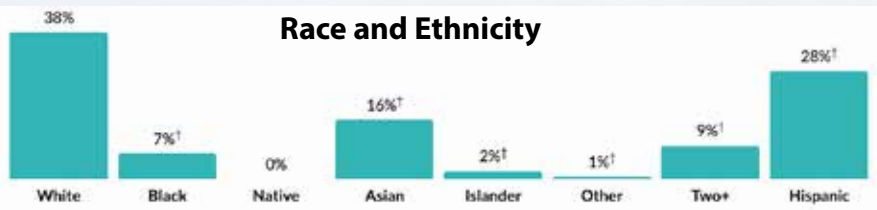
### Population by age



### Median Household Income \$87,426



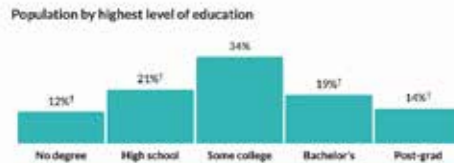
### Median value \$848,000



### Education

**87.6%** High school grad or higher  
about 20 percent higher than the rate in the Salinas, CA Metro Area: 73%  
 a little higher than the rate in California: 84.2%

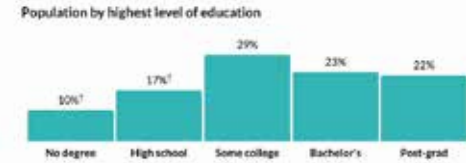
**32.7%** Bachelor's degree or higher  
about 25 percent higher than the rate in the Salinas, CA Metro Area: 26.5%  
 about 90 percent of the rate in California: 35.3%



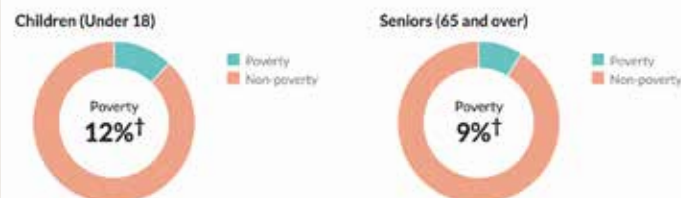
### Education

**89.8%** High school grad or higher  
a little higher than the rate in California: 84.5%  
 about the same as the rate in United States: 89.4%

**44.5%** Bachelor's degree or higher  
about 25 percent higher than the rate in California: 36.2%  
 about 25 percent higher than the rate in United States: 35%

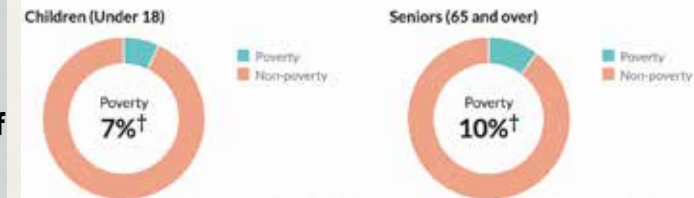


### Poverty: 10.2%



**Marina's population is younger, poorer and more diverse than the population in nearby coastal areas of Monterey County.**

### Poverty: 8.6%





# LOCAL EDUCATIONAL FACILITIES





## DISTANCE FROM CEMEX PLANT AND NUMBER OF STUDENTS:


### HIGHER EDUCATION:

-  CSU MONTEREY BAY (PUBLIC) - 7.2 MILES  
7,500 STUDENTS
-  UC SANTA CRUZ MONTEREY BAY EDUCATION SCIENCE AND TECHNOLOGY CENTER - 5 MILES





### HIGH SCHOOLS:

-  MARINA HIGH SCHOOL (PUBLIC) - 3.9 MILES  
600 STUDENTS
-  LEARNING FOR LIFE (CHARTER) - 4.8 MILES  
128 STUDENTS

### MIDDLE SCHOOLS:

-  LOS ARBOLES MIDDLE SCHOOL (PUBLIC) - 3.3 MILES  
557 STUDENTS

### ELEMENTARY SCHOOLS:

-  IONE OLSON ELEMENTARY SCHOOL (PUBLIC) - 2.3 MILES  
323 STUDENTS
-  MARINA VISTA ELEMENTARY SCHOOL (PUBLIC) - 3.5 MILES  
589 STUDENTS
-  CRUMPTON ELEMENTARY SCHOOL (PUBLIC) - 3.9 MILES  
488 STUDENTS
-  SECOND START-PINE HILL SCHOOL (PRIVATE) - 4.8 MILES  
76 STUDENTS

**TOTAL: 10,261 STUDENTS**

# TOURISM IN MONTEREY COUNTY

MONTEREY County offers the longest coastline of any California county and attracts more than **3 million visitors annually** to destinations such as Fisherman's Wharf, the Cannery and the Monterey Bay Aquarium.

(<https://www.co.monterey.ca.us/government/departments-a-h/administrative-office/economic-development/at-a-glance-county-facts>)

Tourism is the number two industry in Monterey County and number one industry on the Monterey Peninsula. In 2021 Monterey County saw \$2.5 billion in travel spending, a 22 percent decrease of travel spending from 2019. Visitor spending in the destination supported 21,600 jobs and generated \$264 million in state and local tax revenue that supports infrastructure improvements, first responder and emergency services, and other programs and projects that benefit residents of the community.

Monterey County benefits from its scenic location along California's central coast and **expansive outdoor recreation opportunities**.

([https://assets.simpleviewinc.com/simpleview/image/upload/v1/clients/montereycounty/Tourism\\_Impact\\_2022\\_FINAL\\_e10a8a2e-69d8-41b5-85f5-952f35ec1783.pdf](https://assets.simpleviewinc.com/simpleview/image/upload/v1/clients/montereycounty/Tourism_Impact_2022_FINAL_e10a8a2e-69d8-41b5-85f5-952f35ec1783.pdf))



Photo: Anna Asnis



**\$2.6 Billion**



**\$264 Million**



**21,600**



**\$3 Million**

# USERS - SUMMARY

## Local Residents

Marina's population is younger, poorer and more diverse than the population in nearby coastal areas of Monterey County.

**Marina, CA**  
**POPULATION: 22,246**  
Area: 8.9 sq. miles  
Median Age: 34.9

Photo: Anna Asnis



## Students & Teachers

Number Of Students Within  
7 Mile Radius:

CSU MONTEREY BAY : 7,500 STUDENTS  
TWO HIGH SCHOOLS: 728 STUDENTS  
ONE MIDDLE SCHOOLS: 557 STUDENTS  
FOUR ELEMENTARY SCHOOLS: 945 STUDENTS

**TOTAL: 10,261 STUDENTS**

## Tourists\*

\* Monterey County

**VISITORS: 3 Million a Year**

**\$ REVENUE**  
**\$2.6 Billion a Year**

**TAXES: \$264 Million a Year**

**JOBS: 21,600**

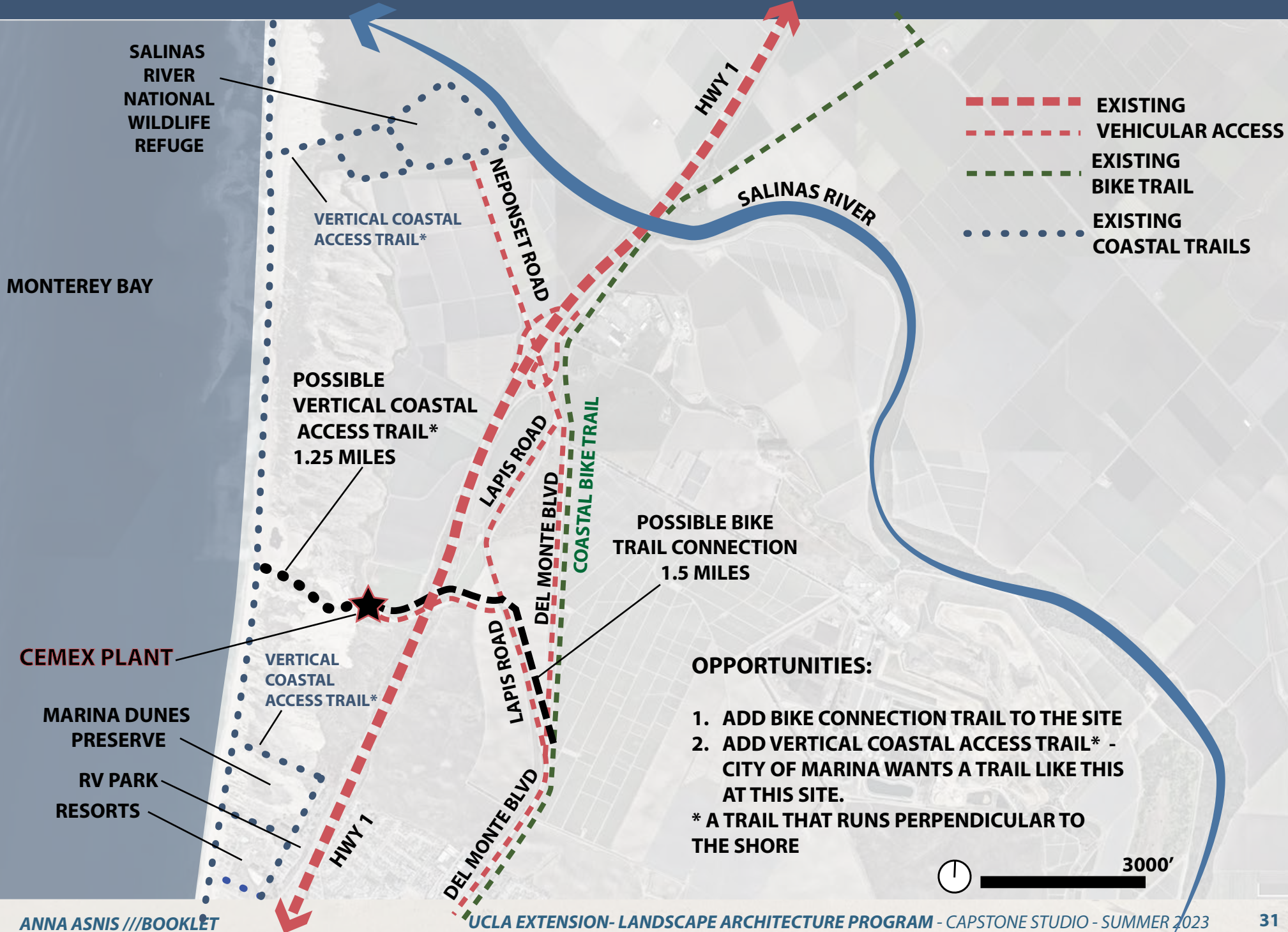
Photo: Anna Asnis



# SITE VICINITY: CONTEXT



# SITE VICINITY CIRCULATION



# COASTAL BIKE TRAIL, MONTEREY BAY, CA

This trail is extremely popular with locals and tourists. There are several bike rental facilities along this trail. Adding a bike trail connection to the Lapis Dune Museum and Visitor Center will make it a great bike ride destination.

Photo: Anna Asnis



**Monterey Bay Coastal Recreation Trail**  
18 mi ★★★★★  
State: California  
Asphalt, Concrete



trailink.com



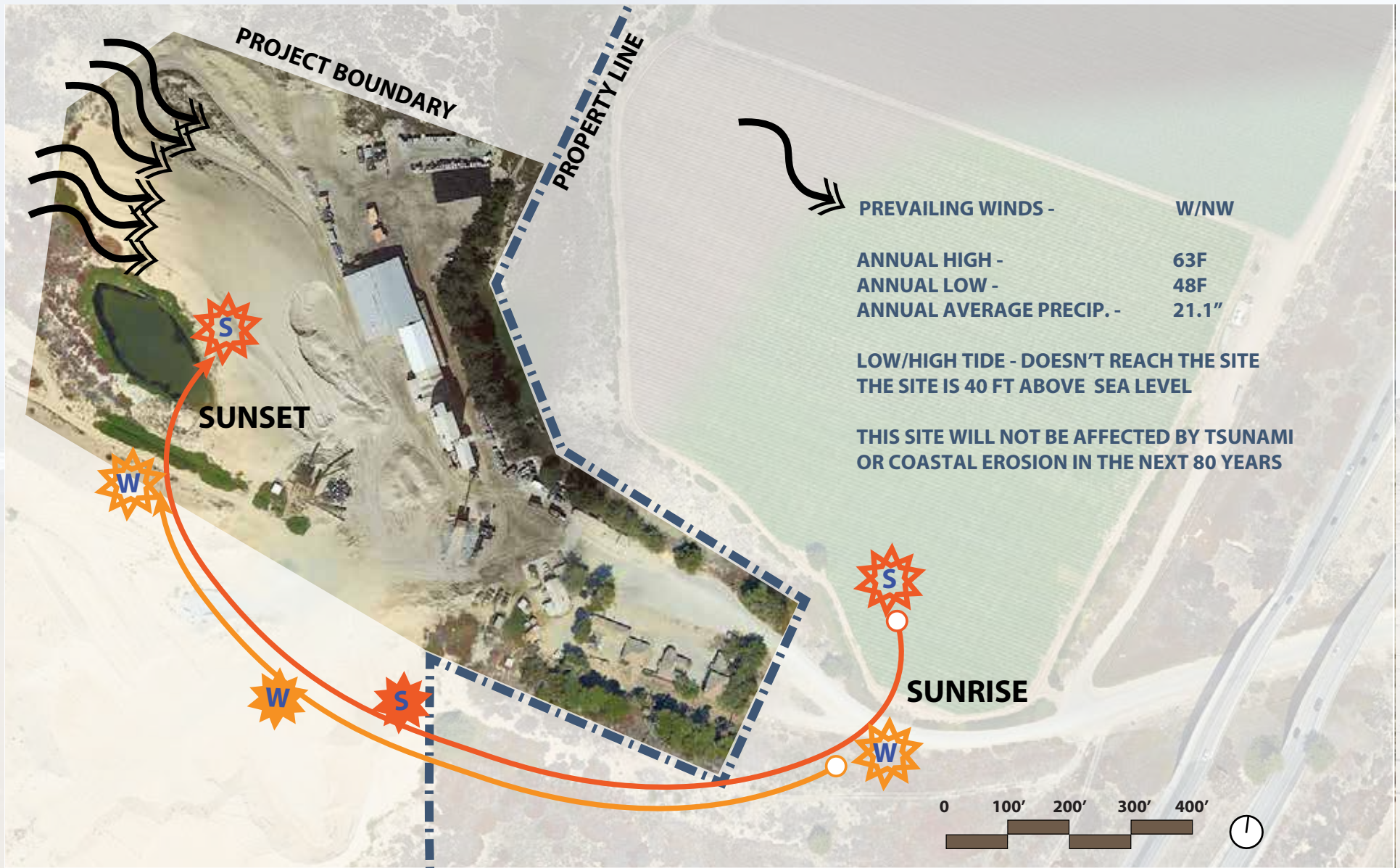
# MONTEREY BAY SHORELINE PARKS & ATTRACTIONS: SUMMARY TABLE

I looked at coastal parks and museums popular with locals and tourists. This research helped me to narrow down facilities that can be included into the design of Lapis Dune Museum and Visitor Center.

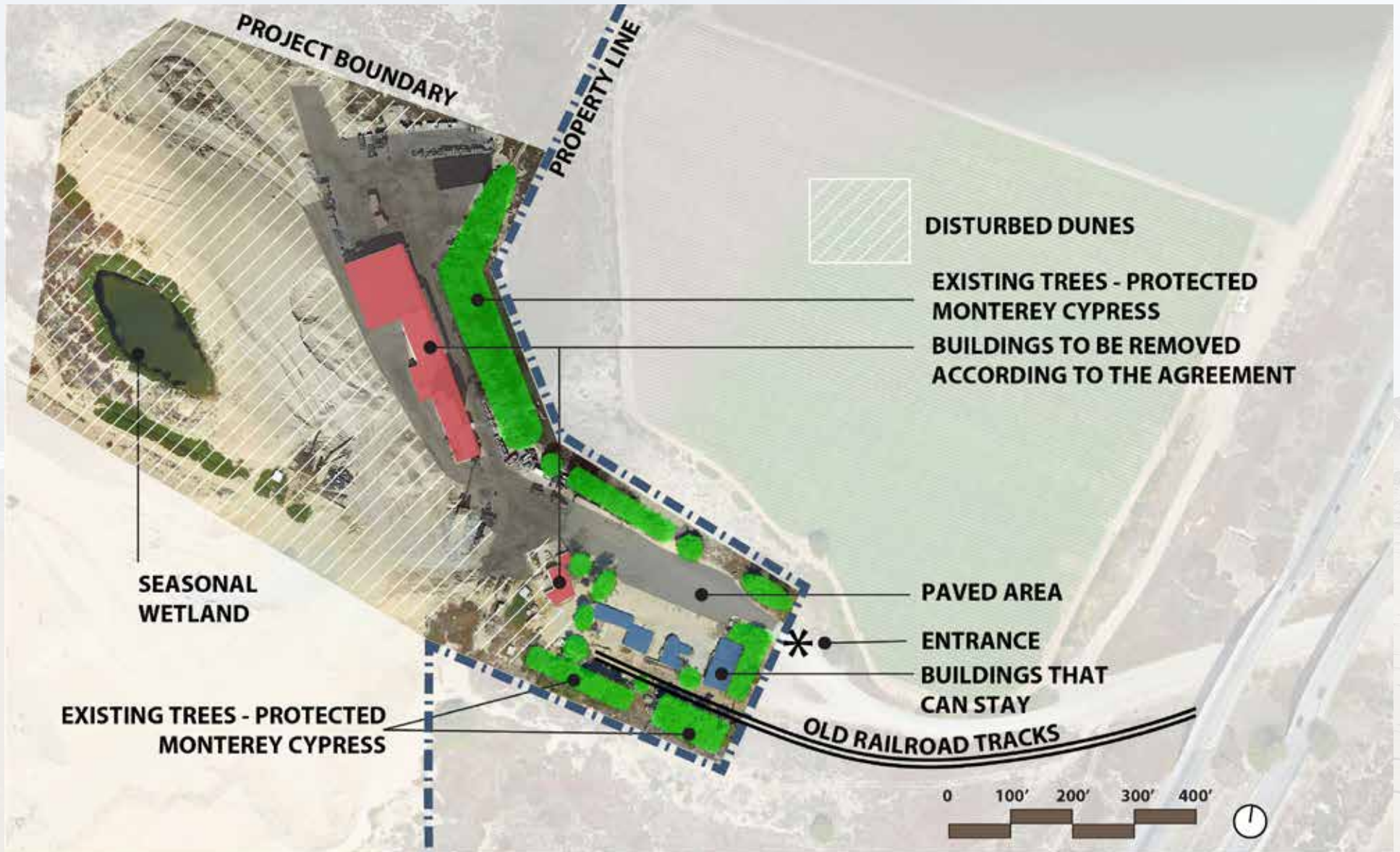


	NAME	PRIVATE OR PUBLIC	DISTANCE TO CEMEX PLANT	\$	HISTORICAL ATTRACTION	SPECIAL ATTRACTION	HIKING TRAILS	BIKE TRAILS	PARKING	PICNIC TABLES	RESTROOMS
	MARINA DUNES PRESERVE	PUBLIC	1 MILE	FREE	-	RESTORED DUNES WITH NATIVE PLANTS		-	-	-	-
	SALINAS RIVER NATIONAL WILDLIFE REFUGE	PUBLIC	2.1 MILES	FREE	-	BIRDING AND WILDLIFE WATCHING				-	-
	MARINA STATE BEACH	PUBLIC	2.7 MILES	FREE	-	HANG-GLIDING, SURFING, KITES		-			
	FORT ORD DUNES STATE PARK	PUBLIC	8 MILES	FREE	✓	FUTURE CAMPING			-	-	-
	EOLIAN DUNE PRESERVE	PUBLIC	8.3 MILES	FREE	-	NATIVE COASTAL DUNE HABITAT				-	-
	MONTEREY BAY AQUARIUM	PRIVATE	13 MILES	ADULTS \$59.95, YOUTH \$49.95, CHILD \$44.95, SENIOR \$49.95, FREE UNDER 4	✓	WORLD-CLASS AQUARIUM	-	-	-	-	
	SPANISH BAY AND ASILOMAR BEACH	PRIVATE AND PUBLIC	17 MILES	FREE FOR ASILOMAR BEACH, \$10.5 PER CAR FOR SPANISH BAY	-	TRAILS, GOLF, NATIVE PLANTS, BEACH, DUNES, HOTEL, RESTAURANTS					-
	SEYMOUR MARINE DISCOVERY CENTER	PUBLIC	35 MILES	ADULT \$12 CHILD (3-17) \$9	-	AQUARIUM, OUTDOOR SCULPTURES				-	
	CEMEX PLANT FUTURE PARK	PUBLIC	0	FREE FOR MARINA RESIDENTS, UNDER \$15 FOR TOURISTS	✓	TBD					

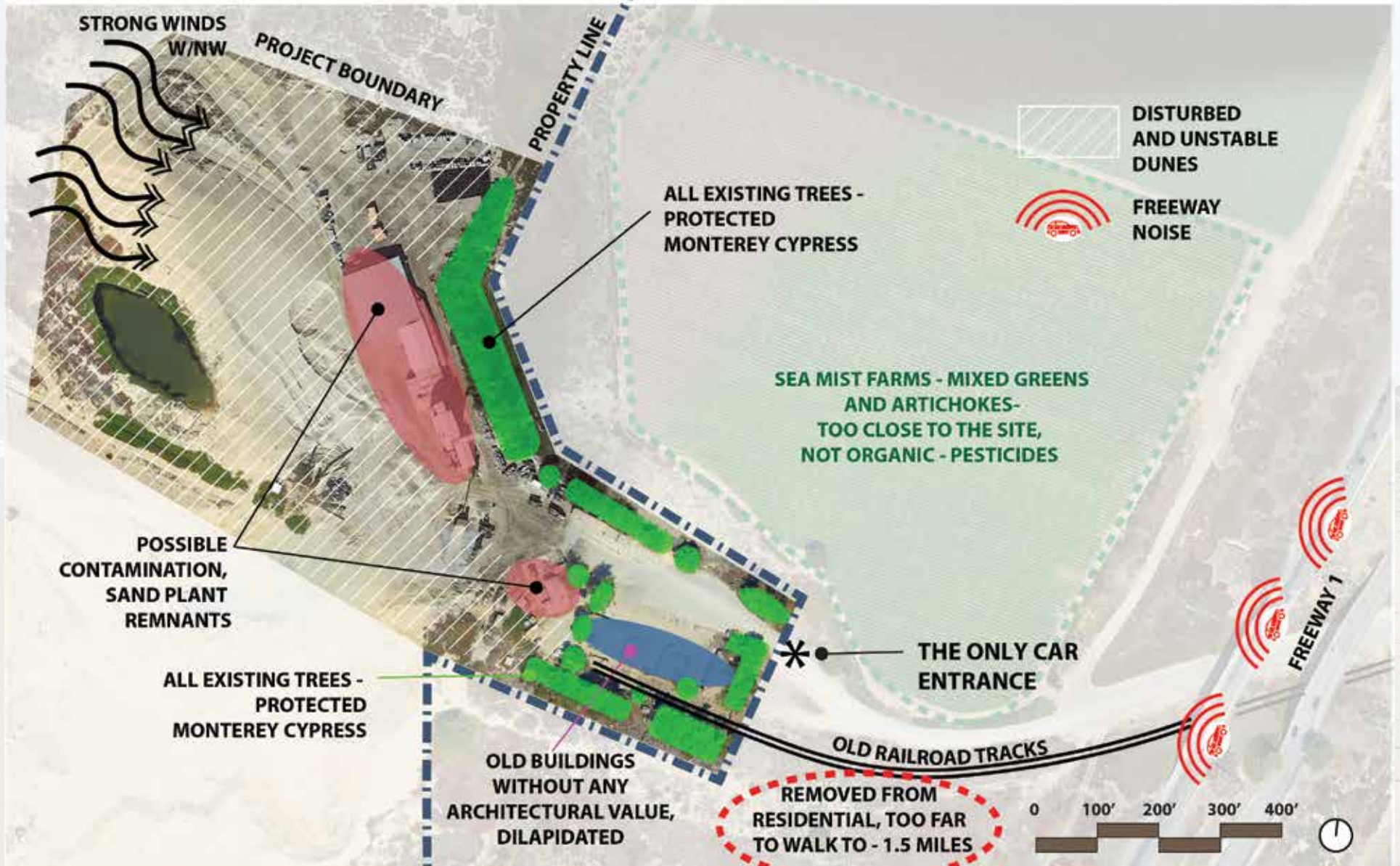
# PROJECT SITE CLIMATE FACTORS



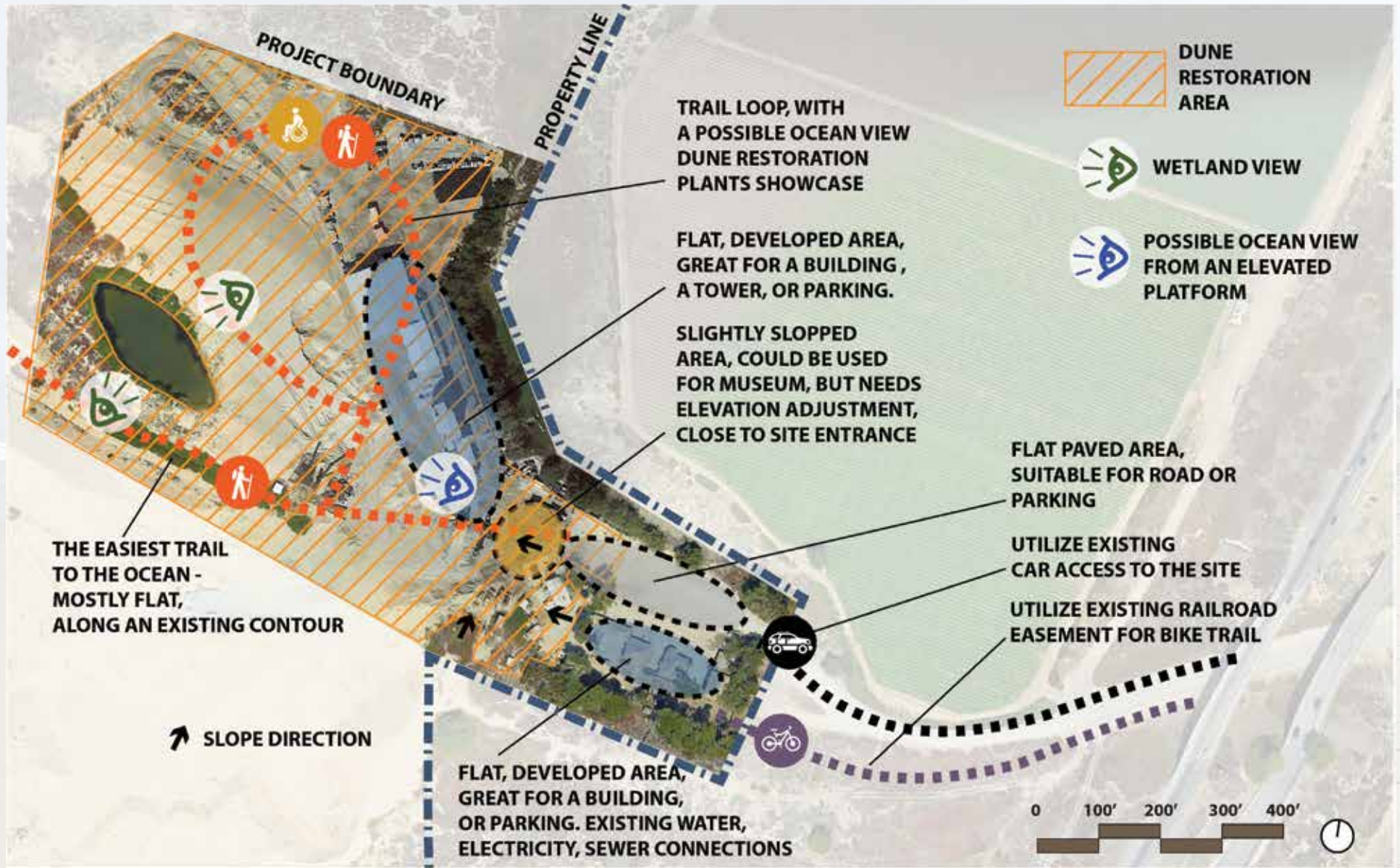
# PROJECT SITE INVENTORY



# PROJECT SITE CONSTRAINTS



# PROJECT SITE OPPORTUNITIES



# CASE STUDIES: MARINA DUNES PRESERVE & SALINAS RIVER NATIONAL WILDLIFE REFUGE



GOOGLE EARTH

**Marina Dunes Preserve** is a 170-acre natural sanctuary on the central coast of California, with a pristine dune ecosystem, hiking trails, and educational opportunities. It boasts rare plant and animal species, including endangered beach layia and Monterey spineflower, and serves as a habitat for Western snowy plover and California least tern.

**Marina Dunes Preserves borders Cemex Lapis Plant property.**

## HISTORY:

Marina Dunes Preserve was established in 2000 through a collaborative effort between the Monterey Peninsula Regional Park District (MPRPD) and the Trust for Public Land. **The preserve is located on a former sand mining site, and its establishment helped to restore the natural dune ecosystem that had been disrupted by decades of mining.** Since then, the MPRPD has worked tirelessly to maintain the preserve's ecological integrity and provide educational opportunities for visitors. Today, Marina Dunes Preserve stands as a testament to the power of conservation and serves as a valuable resource for both the local community and visitors to the central coast.



<https://www.californiabeaches.com/beach/salinas-river-national-wildlife-refuge/>

**Salinas River National Wildlife Refuge** was initially established in 1973 because of its prime location along the Pacific Flyway. During the spring and fall migrations, thousands of birds traveling along the Pacific Flyway flock to the refuge, seeking shelter and food in one of the few remaining wetlands along the central California coast. The refuge also protects several threatened and endangered species, including Western snowy plover, Smith's blue butterfly, and Monterey spineflower.

Salinas river national wildlife refuge is near Cemex Lapis Plant property. It has a Parking lot, information stand, hiking and biking trails and lots of wildlife.

**TAKEAWAY: RESTORED DUNES, TRAILS, EDUCATIONAL SIGNS, NATIVE PLANTS SUITABLE FOR THE AREA.**

# CASE STUDY, VISITOR CENTER: Lands End Lookout, San Francisco, CA

## Lands End Lookout Visitor Center

Facilities include visitor information and gift shop.

Exhibits: Indoor exhibits and videos on the natural and cultural history of the Lands End area, Sutro Baths and Sutro Heights. Outdoor 3-D model of Lands End area.

**Lands End's trails** winds their way around rocky cliffs above the ocean, moving through shady stands of cypress and eucalyptus and emerging on to spectacular views of the shore, headlands, and Golden Gate.

<https://www.nps.gov/goga/planyourvisit/landsend.htm>



**TAKEAWAY: RESTORED DUNES , VIEWS. MATERIAL PALETTE: CONCRETE AND WEATHERED SOLID WOOD BENCHES.**

Photos and text:  
SURFACEDESIGN INC.  
<https://www.sdisf.com/lands-end-lookout>

# CASE STUDY: ACADEMY OF SCIENCES GREEN ROOF, SAN FRANCISCO, CA



One of San Francisco's first sustainable building projects, the California Academy of Sciences supports a stunning 2.5-acre green roof.

The vegetated roof's contours conform to the facilities, offices, and exhibition halls below—rising above the planetarium and the rain forest exhibit and lowering at the central piazza to introduce light and air into the heart of the building.

Following Renzo Piano's original concept drawing, the roof's seven hills are intended to echo the seven major hills of San Francisco.

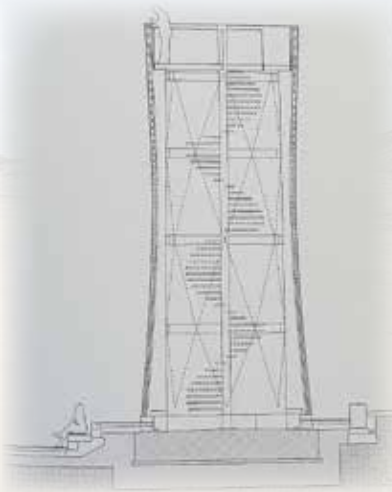
The California native plants that carpet the building were chosen for their adaptability to the Bay Area's seasonal irrigation cycle.

**TAKEAWAY: ADD GREEN ROOF WITH NATIVE PLANTS TO MY MUSEUM BUILDING.**

PHOTOS AND TEXT: <https://www.swagroup.com/projects/california-academy-of-sciences/>



# CASE STUDIES: OBSERVATION TOWERS IN LANDSCAPE



WATCHING TOWER, NORWAY  
Rintala Eggertsson Architects

PHOTOS: <https://www.archdaily.com/212966/seljord-watch-tower-rintala-eggertsson-architects>

LOOKOUT TOWER, GERMANY  
fischer heumann  
landschaftsarchitekten

PHOTOS: <https://fischerheumann.de/>

JOHN JACOB OBSERVATION TOWER,  
HOUSTON, TEXAS  
PDG Architects

PHOTOS: <https://www.pdgarchitects.com/sheldon-tower>

LANDMARK LAUSITZ,  
GERMANY  
Stefan Giers + Susanne  
Gabriel

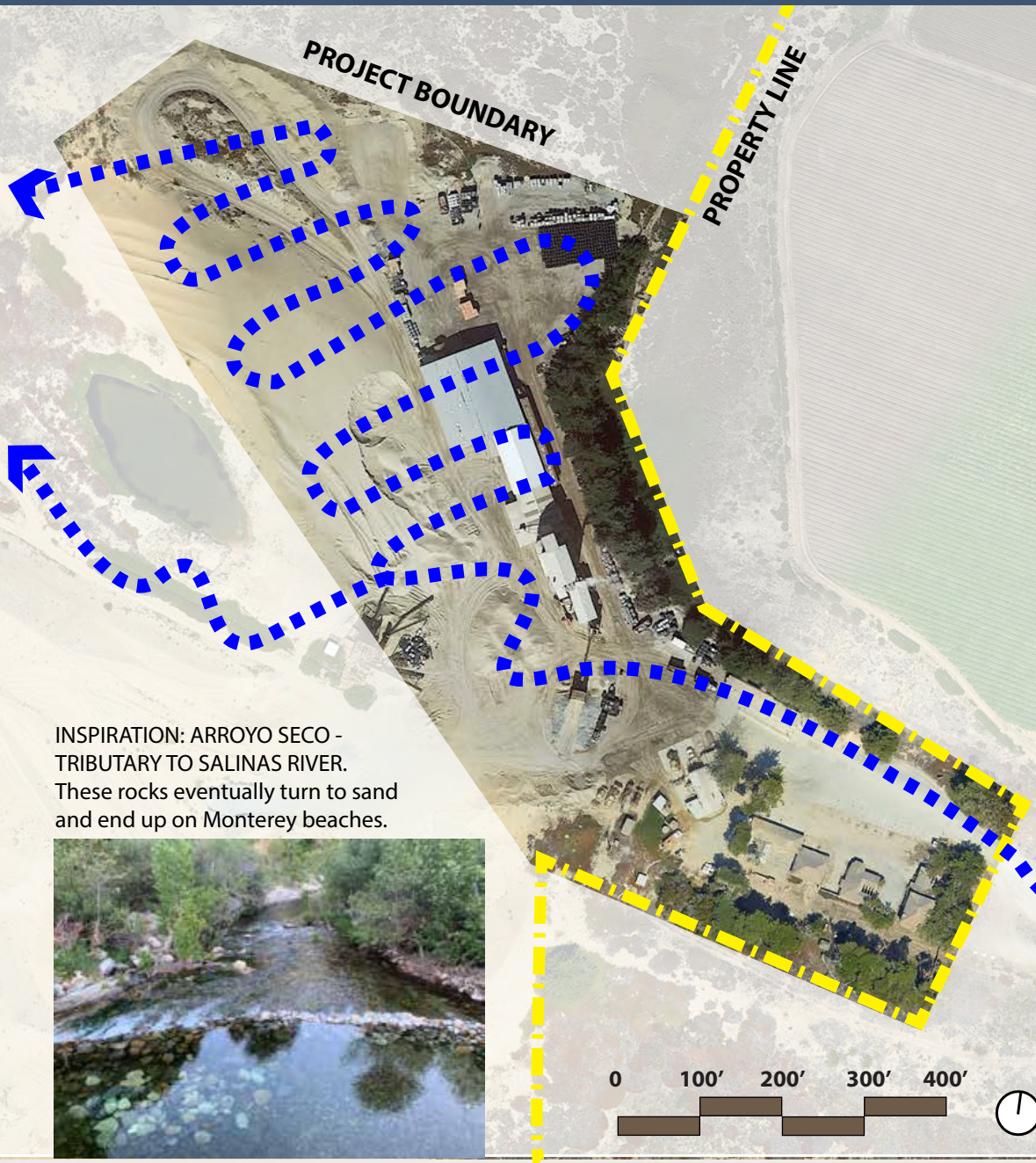
PHOTOS: <https://www.thisispaper.com/mag/landmarke-lausitzer-seenland-rostiger-nagel-stefan-giers-susanne-gabriel>

**TAKEAWAY: THESE WATCH TOWERS IN LANDSCAPE ARE VERY SUCCESSFUL AND POPULAR WITH VISITORS. I SHOULD ADD ONE TO MY DESIGN.**



**PART 1. RESEARCH, SITE ANALYSIS, CASE STUDIES**  
**PART 2. DESIGN DEVELOPMENT**  
**PART 3. FINAL DESIGN**

# PRELIMINARY DESIGN METAPHOR - RIVER



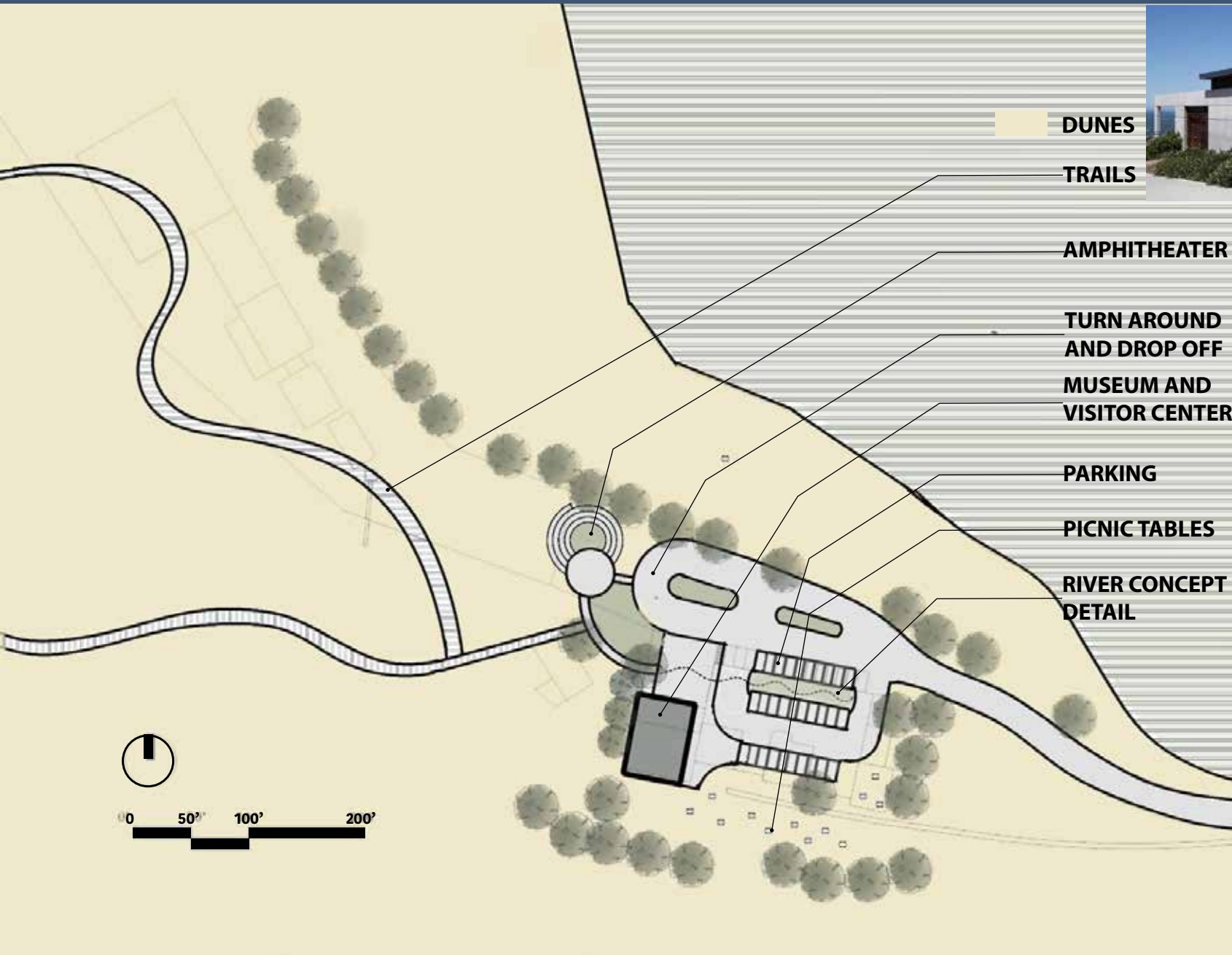
INSPIRATION: ARROYO SECO - TRIBUTARY TO SALINAS RIVER. These rocks eventually turn to sand and end up on Monterey beaches.



The "River" landscape design metaphor embodies the perpetual flow and transformation of elements within a natural setting. Like a river, sand constantly moves from land to ocean. Run-off and erosion bring sand to the beach, resembling tributaries merging into the main stream.

As sand travels south along the coast, finer particles are carried out to sea. Temporary rest on beaches occurs before the sand is re-suspended by waves and wind. Eventually, it forms sand dunes or flows into a submarine canyon, marking the end of the metaphorical river's journey. This metaphor reflects the dynamic, cyclical nature of landscapes, mirroring a river shaping the land it passes through.

# CONCEPT 1: BASIC



**INSPIRATION:  
LANDS LOOKOUT  
VISITOR CENTER  
MODERN  
BUILDING**

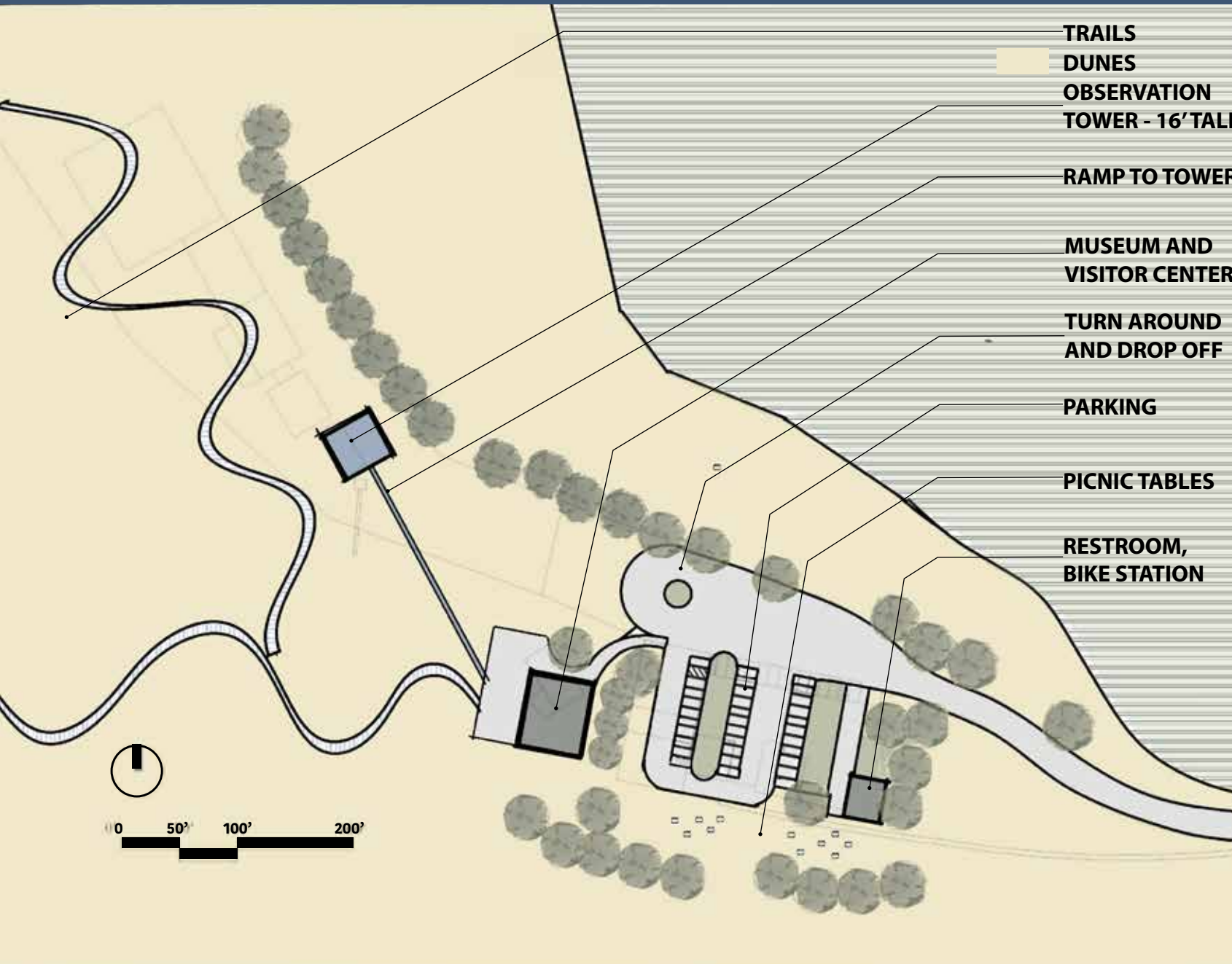
**PROS:**

- LEAST EXPENSIVE
- REUSE A PART OF EXISTING FOUNDATION FOR MUSEUM BUILDING
- AMPHITHEATER
- RIVER CONCEPT IN TRAILS AND A DETAIL THAT CROSSES THE SITE

**CONS:**

- TOO BASIC
- TOO MUCH PAVEMENT

# CONCEPT 2: 16' TALL TOWER



- TRAILS
- DUNES
- OBSERVATION TOWER - 16' TALL
- RAMP TO TOWER
- MUSEUM AND VISITOR CENTER
- TURN AROUND AND DROP OFF
- PARKING
- PICNIC TABLES
- RESTROOM, BIKE STATION

## TOWER AND RAMP INSPIRATION



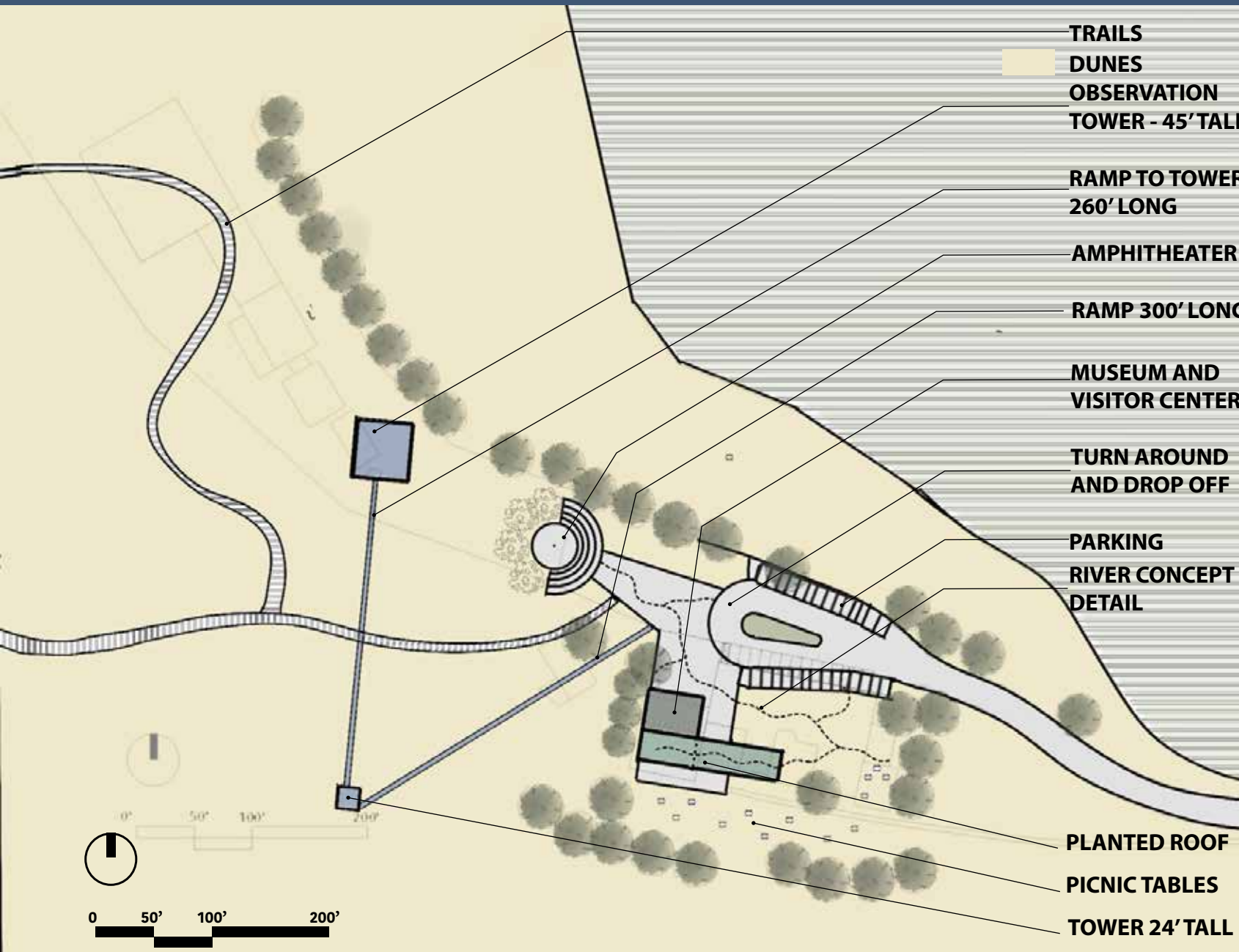
### PROS:

- INTERESTING FEATURE - TOWER
- SEPARATE BUILDINGS FOR RESTROOMS (ALWAYS OPEN) AND MUSEUM.
- 210' RAMP @8%

### CONS:

- THE TOWER IS ONLY 16' TALL
- MORE PAVEMENT
- NO AMPHITHEATER
- RIVER METAPHOR IS ONLY IN TRAILS

# CONCEPT 3: 24' AND 45' TALL TOWERS



- TRAILS
- DUNES
- OBSERVATION TOWER - 45' TALL
- RAMP TO TOWER 260' LONG
- AMPHITHEATER
- RAMP 300' LONG
- MUSEUM AND VISITOR CENTER
- TURN AROUND AND DROP OFF
- PARKING
- RIVER CONCEPT DETAIL
- PLANTED ROOF
- PICNIC TABLES
- TOWER 24' TALL



- PROS:**
- INTERESTING FEATURE - TOWERS AND RAMPS
  - MUSEUM WITH A PLANTED ROOF RAMP
  - 2 RAMPS @8% WITH A REST STOP IN BETWEEN. 300' AND 260' LONG RAMPS. 24' AND 45' TALL TOWERS.
  - LESS PAVEMENT FOR CARS
  - EXTENSIVE RIVER CONCEPT
- CONS:**
- THE MOST COMPLEX DESIGN - EXPENSIVE!

# CONCEPT 3: MUSEUM ELEVATION



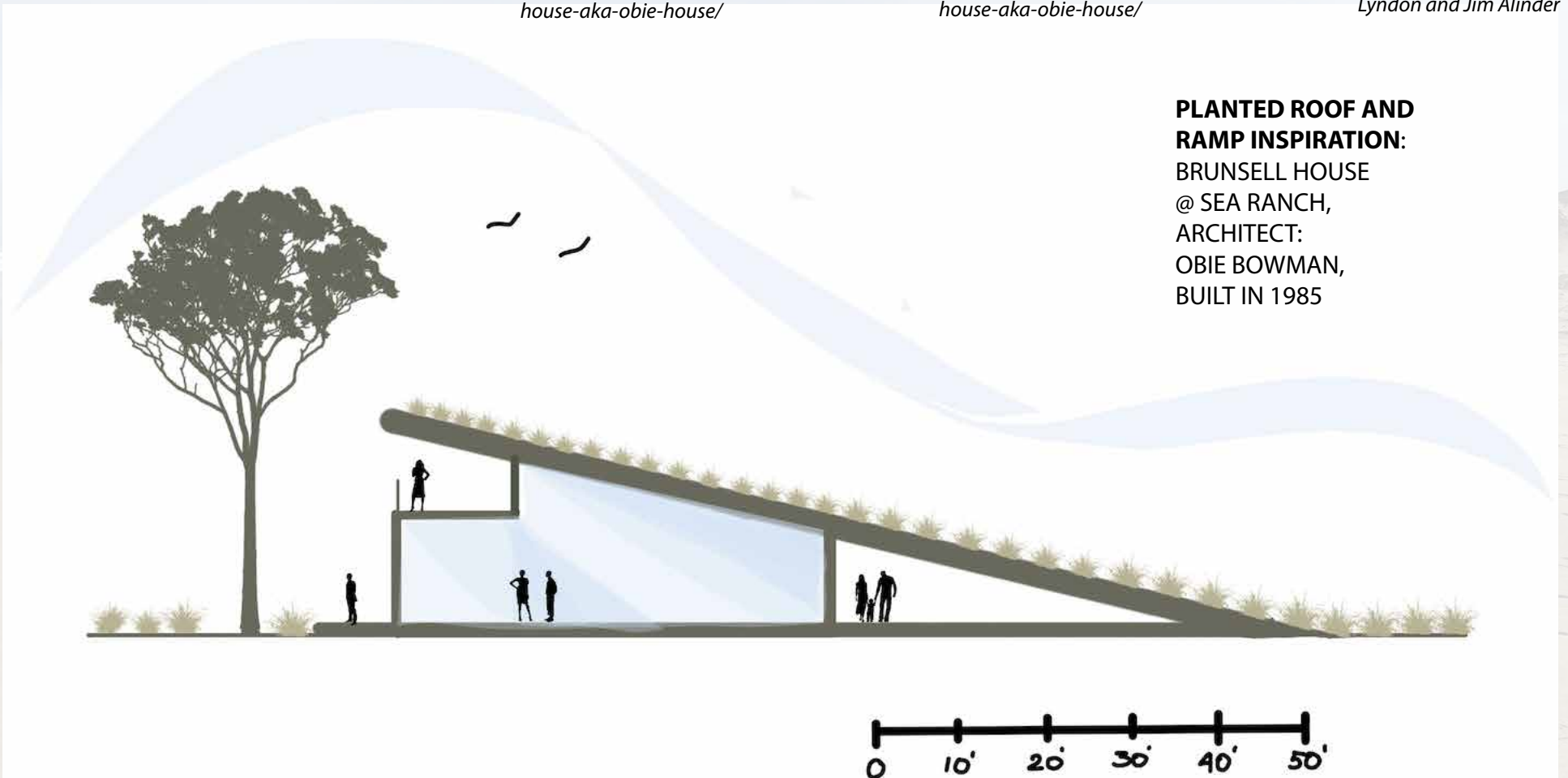
<https://obiebowman.com/brunsell-house-aka-obie-house/>



<https://obiebowman.com/brunsell-house-aka-obie-house/>



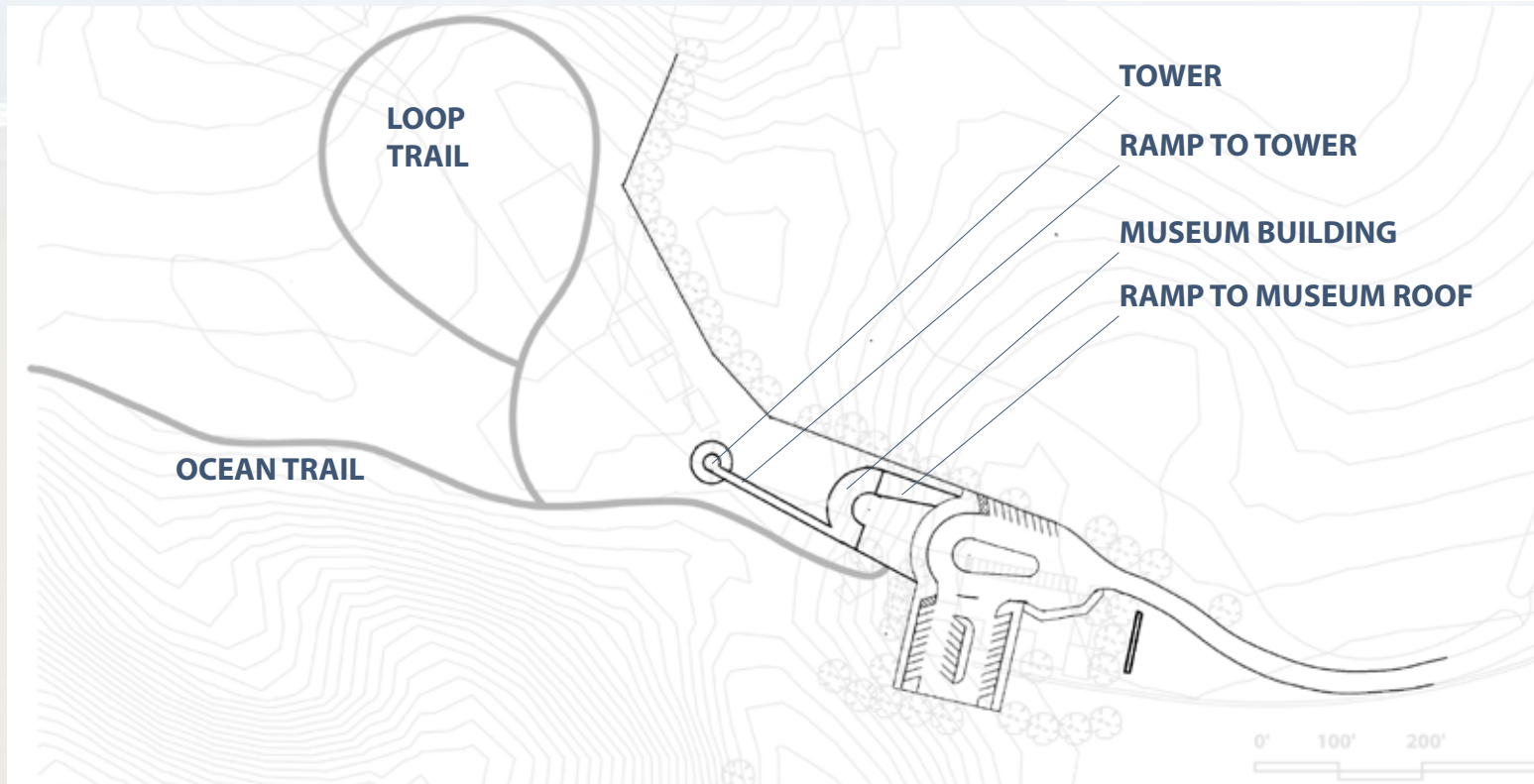
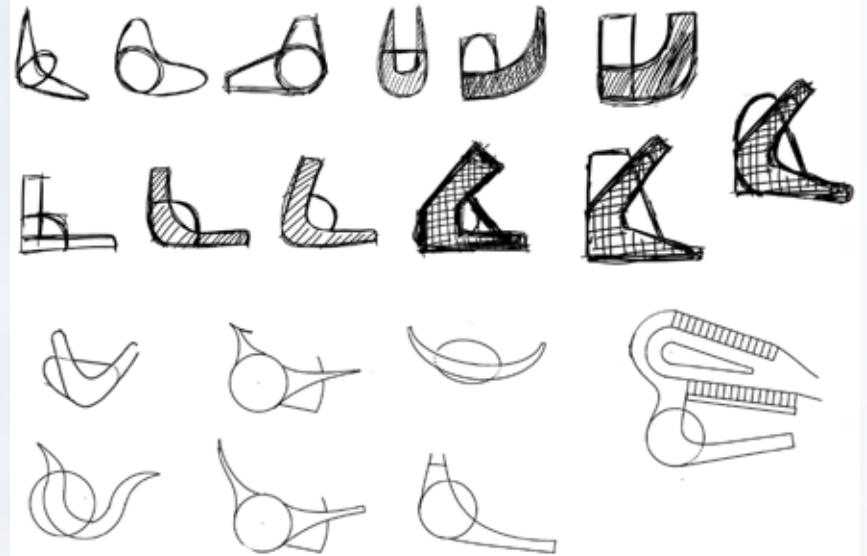
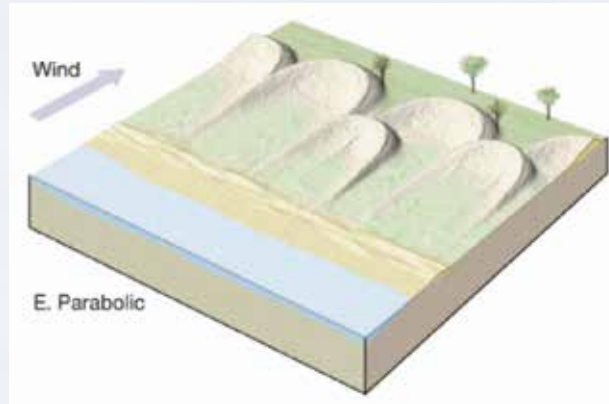
*"The Sea Ranch" book by Donlyn Lyndon and Jim Alinder*



**PLANTED ROOF AND RAMP INSPIRATION:**  
BRUNSELL HOUSE  
@ SEA RANCH,  
ARCHITECT:  
OBIE BOWMAN,  
BUILT IN 1985

# CONCEPT 4: EXPLORATION OF MUSEUM BUILDING SHAPE

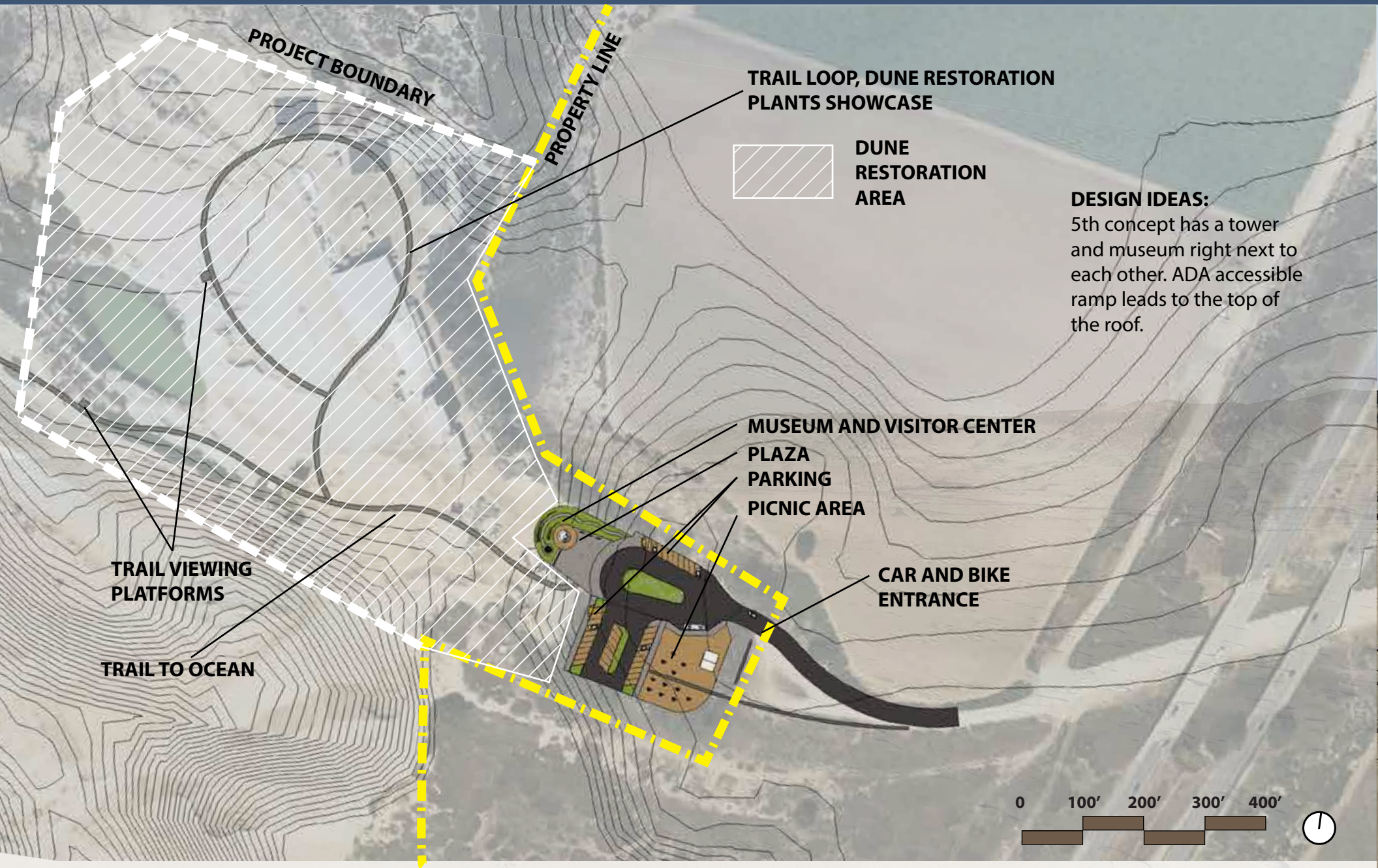
**INSPIRATION:**  
PARABOLIC DUNE



**DESIGN IDEAS:**  
I wanted to design a building that is connected to the ground via a ramp and connected to a lookout tower. I explored all kinds of shapes that were inspired by a parabolic dune - these types of dunes are common in the area.



# CONCEPT 5: MASTER PLAN



**DESIGN IDEAS:**  
5th concept has a tower and museum right next to each other. ADA accessible ramp leads to the top of the roof.

# CONCEPT 5: ENLARGEMENT 1



# CONCEPT 5, PERSPECTIVE: GREEN ROOF CONNECTED TO THE GROUND



**INSPIRATION:** BRUNSELL HOUSE @ SEA RANCH, ARCHITECT: OBIE BOWMAN, BUILT IN 1985



<https://obiebowman.com/brunsell-house-aka-obie-house/>



<https://obiebowman.com/brunsell-house-aka-obie-house/>



"The Sea Ranch" book by Donlyn Lyndon and Jim Alinder

# CONCEPT 5, PERSPECTIVE: MUSEUM ENTRANCE AND PLAZA

OCEAN VIEW  
BETWEEN  
DUNES



BOULDER BORDER, DIVIDES  
PLAZA AND DUNES.  
BOULDERS GET SMALLER  
TOWARDS DUNE TRAIL  
ENTRANCE

LOOKOUT  
TOWER  
72 STEPS, 36'  
HEIGHT AT VIEWING  
PLATFORM

PLAZA  
5% SLOPE



ROOF RAMP  
7% SLOPE



# CONCEPT 5: SECTION-ELEVATION AT MUSEUM PLAZA

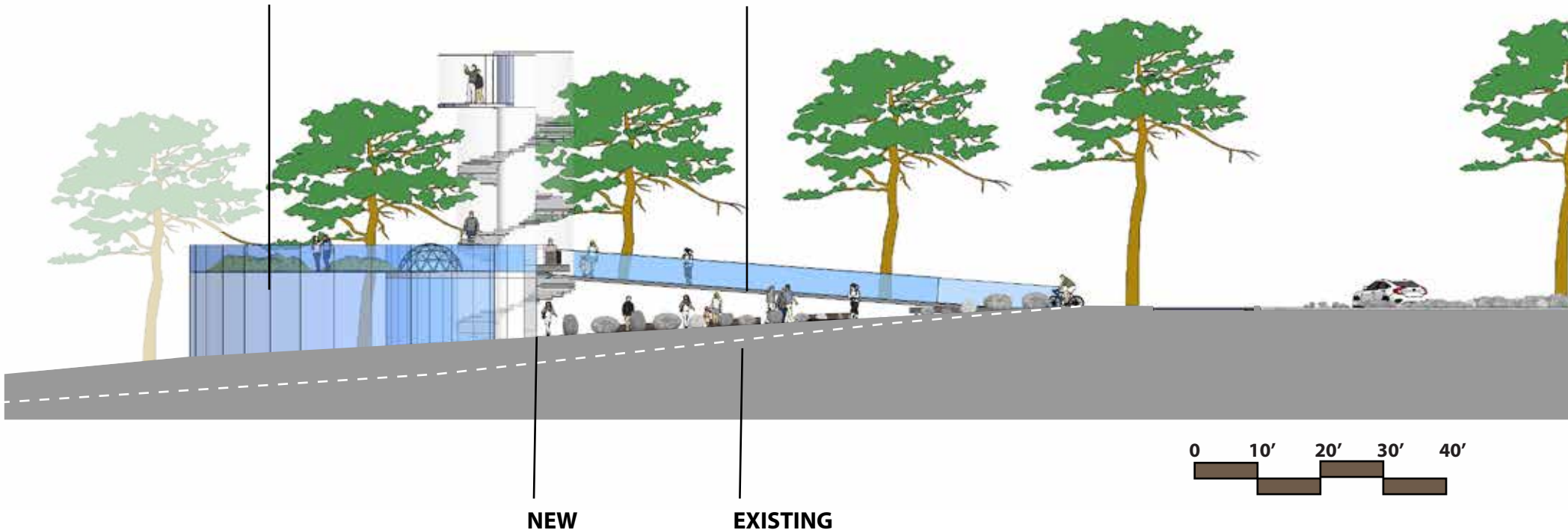
## DESIGN IDEAS:

Because of the slope, this ramp is ADA accessible and it leads to the top of the roof.



MUSEUM AND VISITOR CENTER

RAMP TO GREEN ROOF



## TAKEAWAY FROM CONCEPT 5:

I decided it would be better to include Lookout Tower into the Museum building and to try rotating the building 180 degrees. Bike entrance needs to be separated from the car entrance. Reduce turnaround and consolidate car parking in one area.

# TOWER SHAPE EXPLORATIONS FOR THE FINAL DESIGN



**STRAIGHT  
TALL**



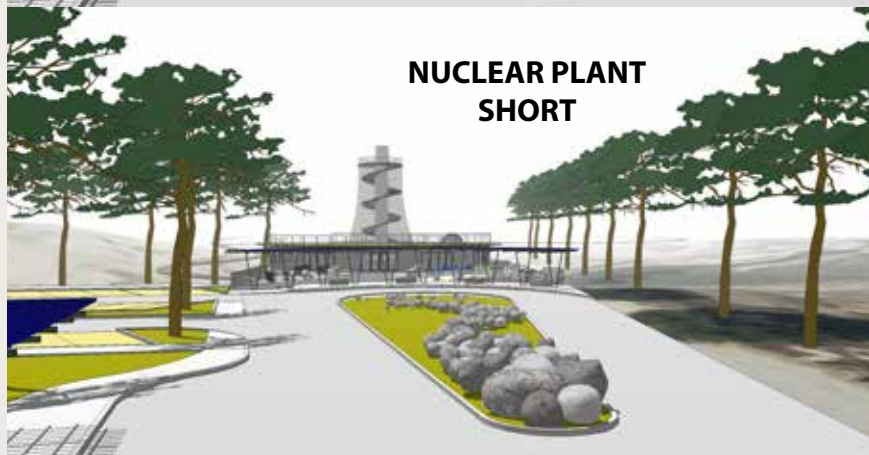
**FUNNEL STRAIGHT  
TALL**



**FUNNEL CURVY  
TALL**



**FUNNEL CURVY  
SHORT**



**NUCLEAR PLANT  
SHORT**

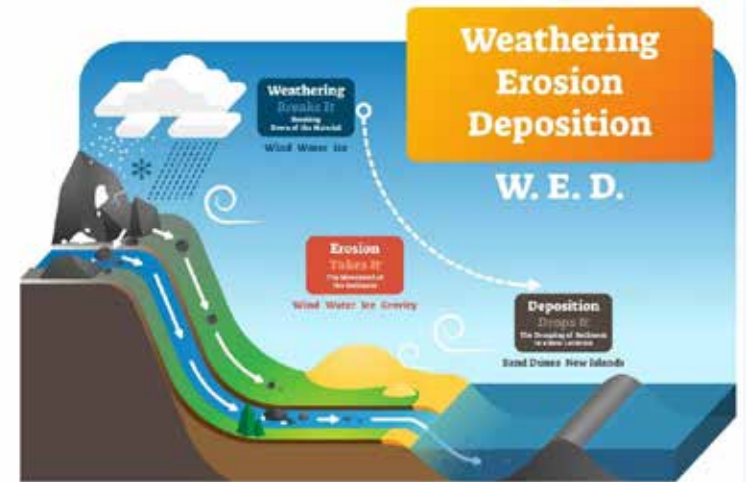
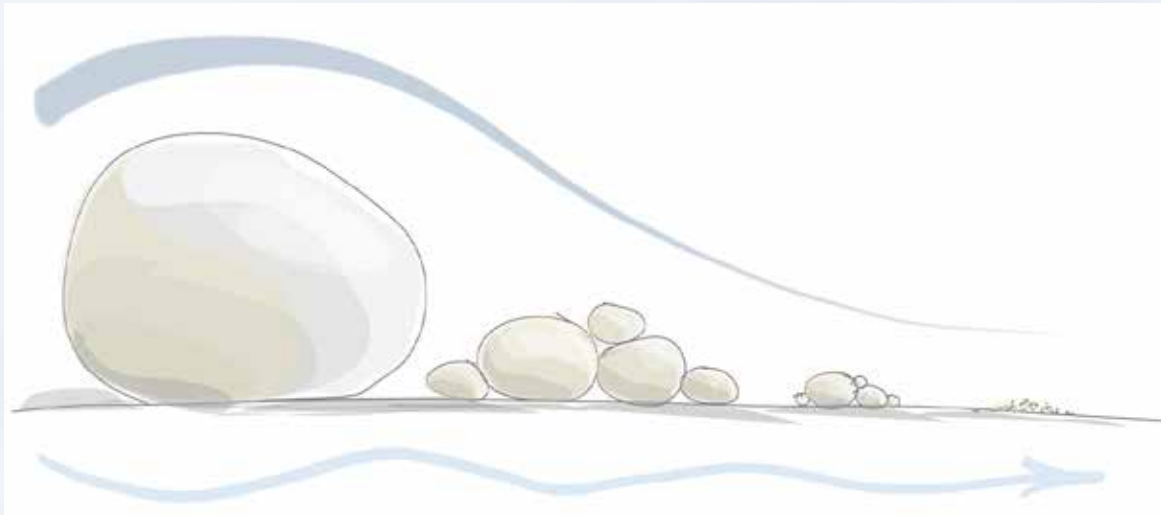


**THE WINNER!**



**PART 1. RESEARCH, SITE ANALYSIS, CASE STUDIES**  
**PART 2. DESIGN DEVELOPMENT**  
**PART 3. FINAL DESIGN**

# DESIGN METAPHOR: FROM BOULDERS TO PEBBLES TO SAND



<https://nittygrittyscience.com/textbooks/earths-changing-surface/section-4-erosion-deposition-mass-movement-glaciers/>

INSPIRATION: ARROYO SECO - TRIBUTARY TO SALINAS RIVER.

These rocks eventually turn to sand and end up on Monterey beaches.



*Photo: Anna Asnis*



**FROM BOULDERS, TO PEBBLES TO SAND - SALINAS RIVER CARRIES SEDIMENT TOWARDS PACIFIC OCEAN.**

LAPIS SAND

*Photo: Anna Asnis*





# DESIGN NARRATIVE AND MATERIALS COLOR PALETTE

## DESIGN NARRATIVE:

The majority of the site is dedicated to dune restoration program. Car entrance to the site stays as is. New bike entrance is added at the old railroad easement. The main attractions at the site are Lapis Dune Ecology Museum and Lookout Tower. I added two dune trails - Loop Trail and Ocean Trail. Both trails are raised above dunes as boardwalks and there are two Wetland Observation Platforms - one at each trail.

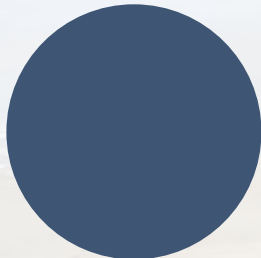
The museum has two plazas, green roof, steps to the roof, Lookout Tower at the top and a glass dome above Monterey bay 3D map inside the museum. The Green Roof and Lookout Tower are ADA accessible with an elevator that goes through Lookout Tower core. The Front Plaza of the Museum has a playful rock fountain and different types of seating. The Back Plaza of the Museum has cafe seating protected with a windbreak wall.

Bike path terminates at Picnic area plaza, that has a separate restroom building, bike parking, railroad garden and 6 picnic tables with barbecues.

There are 34 regular car parking spaces, four ADA accessible spaces. The front of the museum has a turnaround and drop off area with a shade structure and bench seating. Bus parking is located near restrooms and also has a shade structure with bench seating for waiting passengers.

All site plantings are CA Native, suitable for the coastal climate.

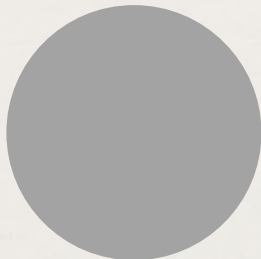
## MATERIALS COLOR PALETTE:



**PACIFIC BLUE**



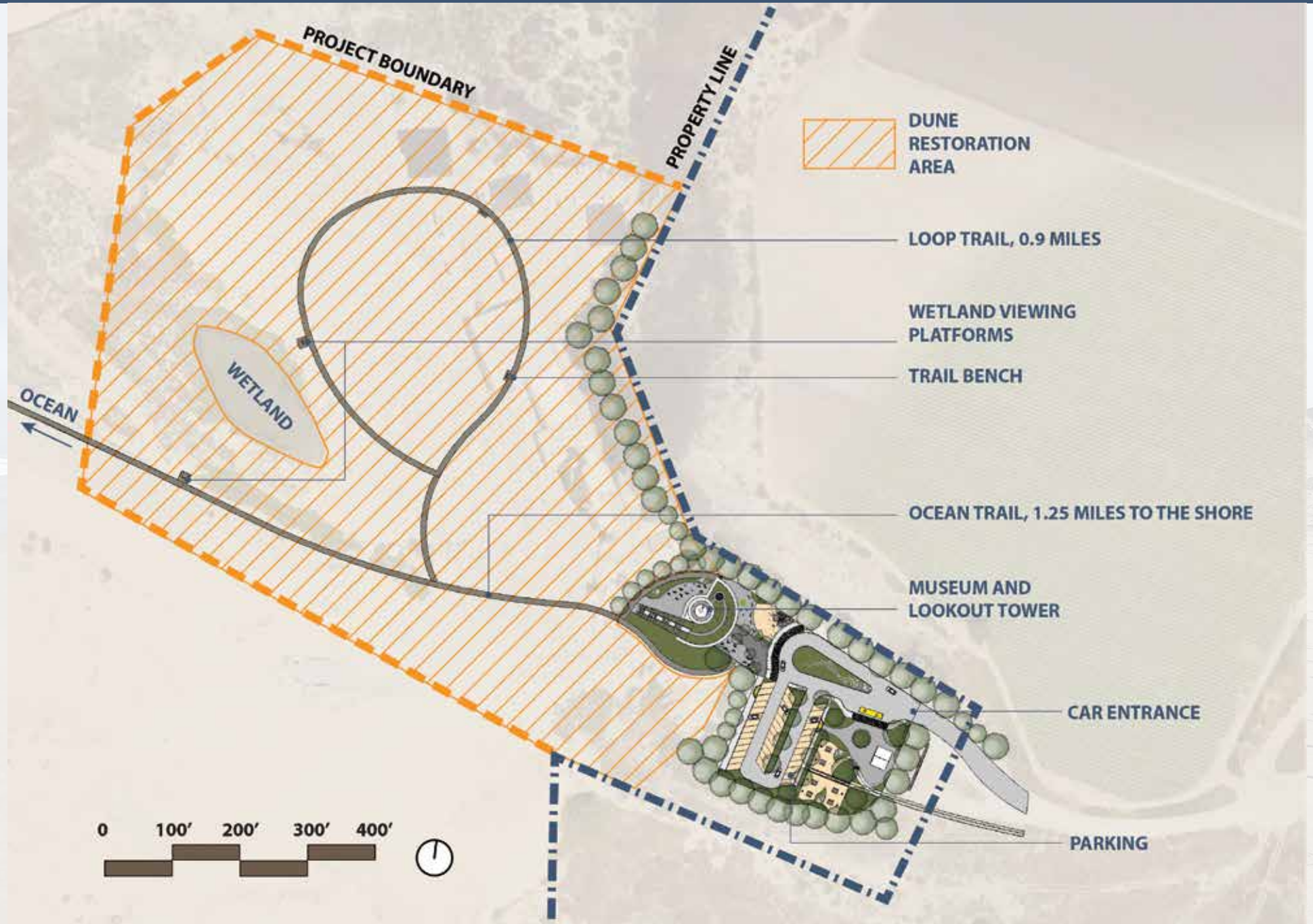
**SAND YELLOW**



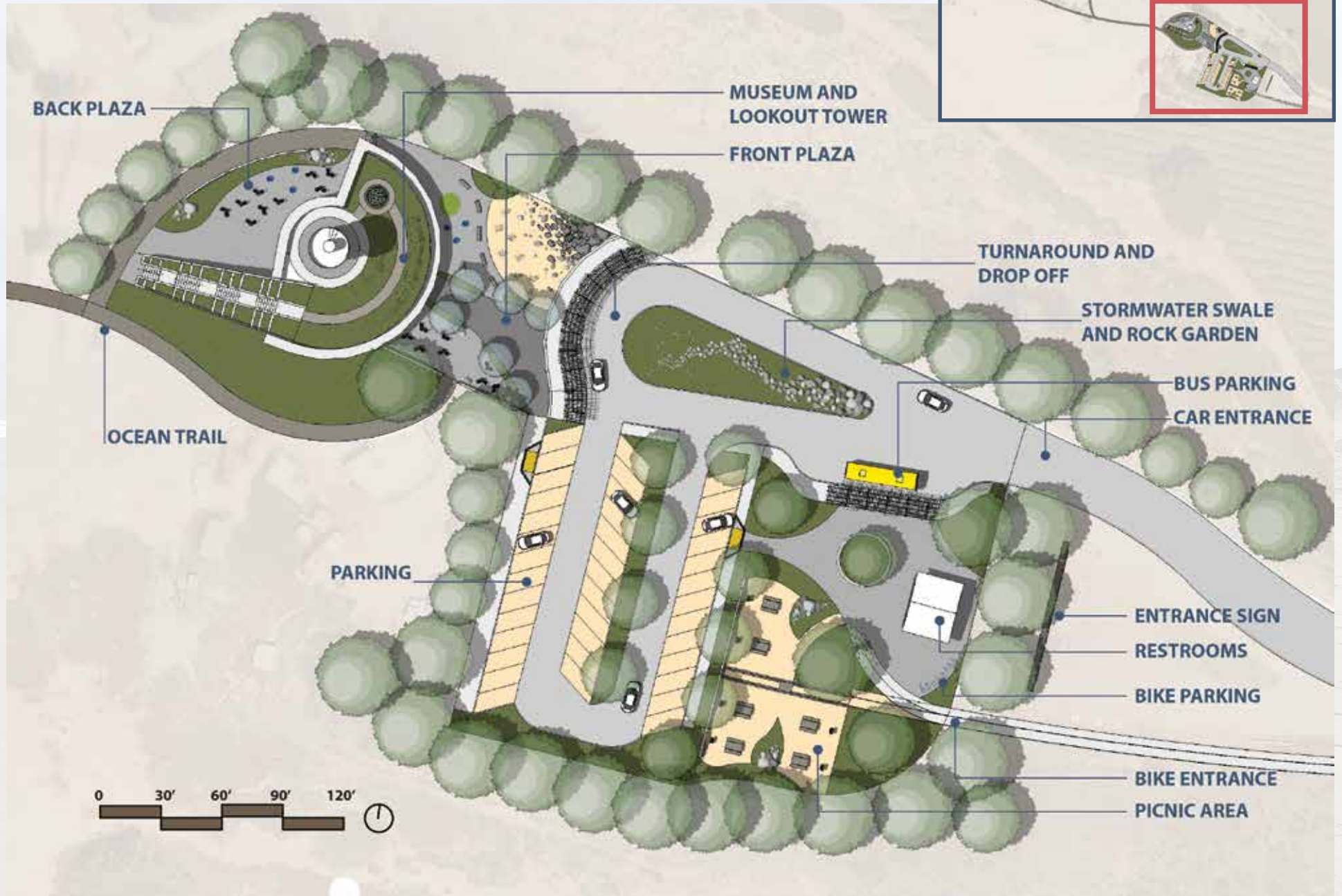
**WEATHERED WOOD GREY**



# FINAL DESIGN CONCEPT MASTER PLAN



# ENLARGEMENT 1



# PERSPECTIVE: MAIN CAR ENTRANCE

MAIN ENTRANCE - EXISTING



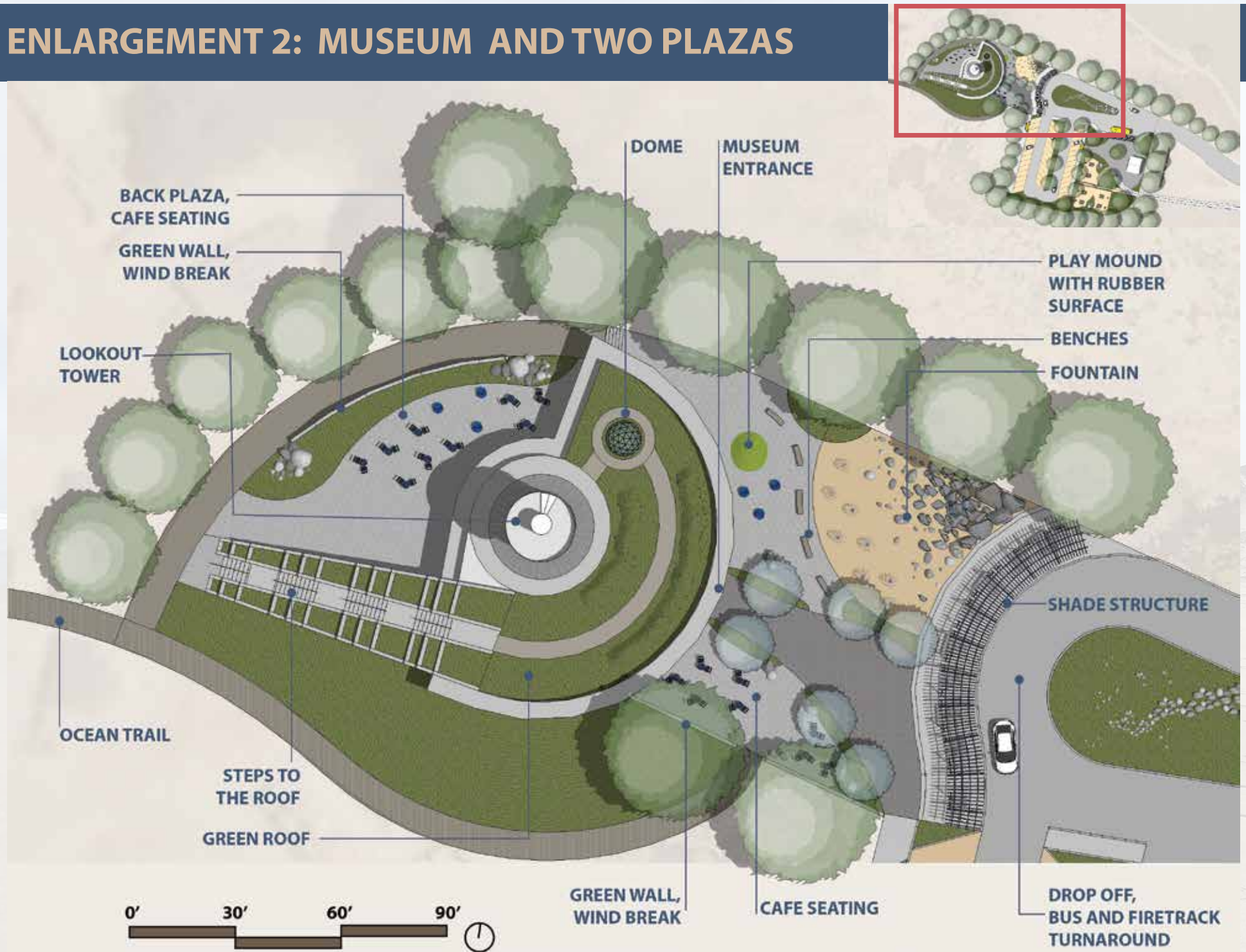
ENTRANCE SIGN

LOOKOUT TOWER

MUSEUM BUILDING



# ENLARGEMENT 2: MUSEUM AND TWO PLAZAS

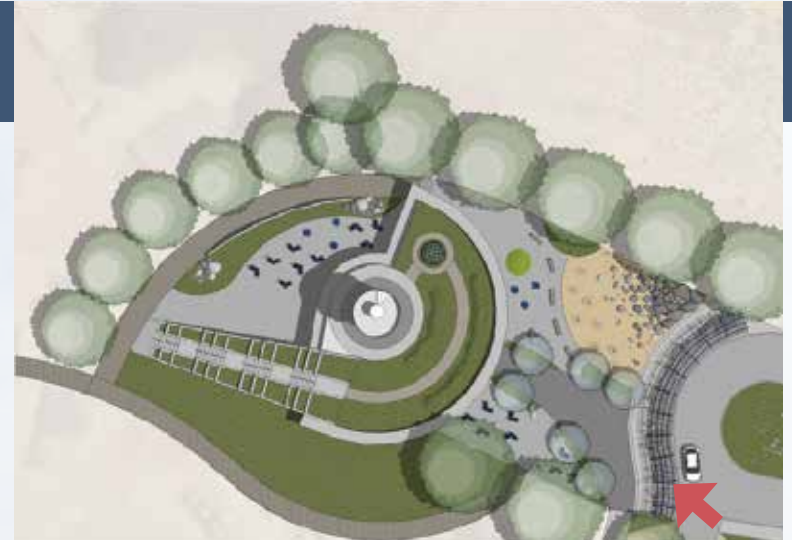


# PERSPECTIVE: MUSEUM FRONT PLAZA



INSPIRATION: LOOKOUT  
TOWER, GERMANY  
fischer heumann  
landschaftsarchitekten

PHOTOS: <https://fischerheumann.de/>



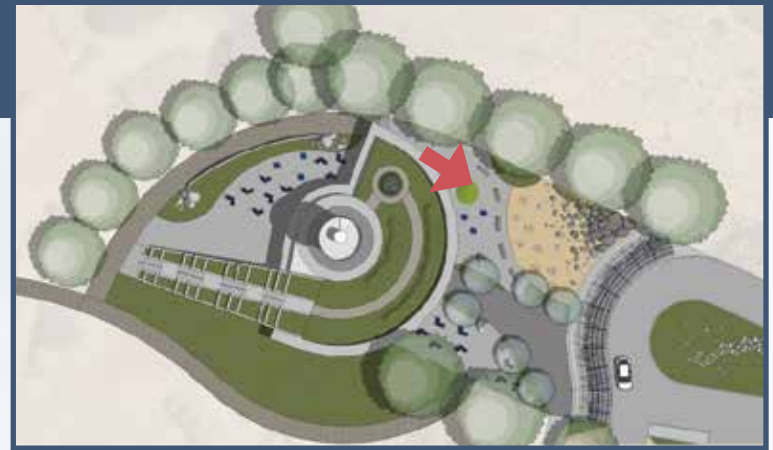
# PERSPECTIVE: FOUNTAIN



## FOUNTAIN INSPIRATION

PHOTO COURTESY: Margaret Coffee

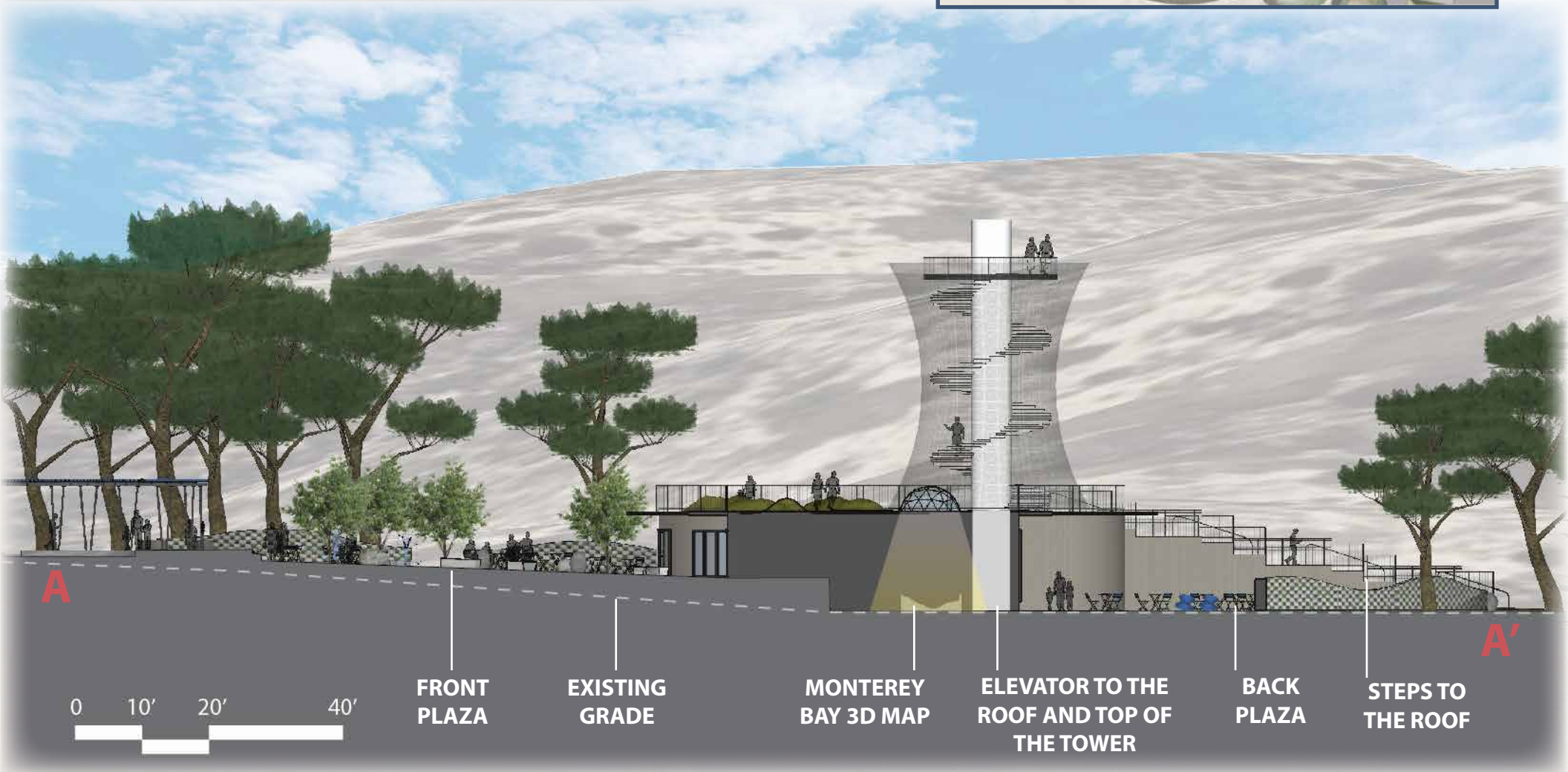
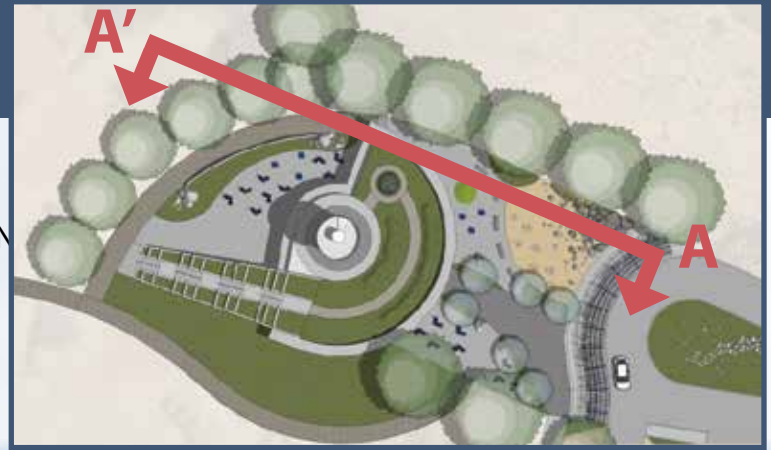
**FOUNTAIN METAPHOR:  
"FROM BOULDERS, TO  
PEBBLES, TO SAND"**



# SECTION-ELEVATION A-A' AT MUSEUM PLAZA

<https://obiebowman.com/brunsell-house-aka-obie-house/>

**INSPIRATION:** BRUNSELL HOUSE @ SEA RANCH, ARCHITECT: OBIE BOWMAN BUILT IN 1985

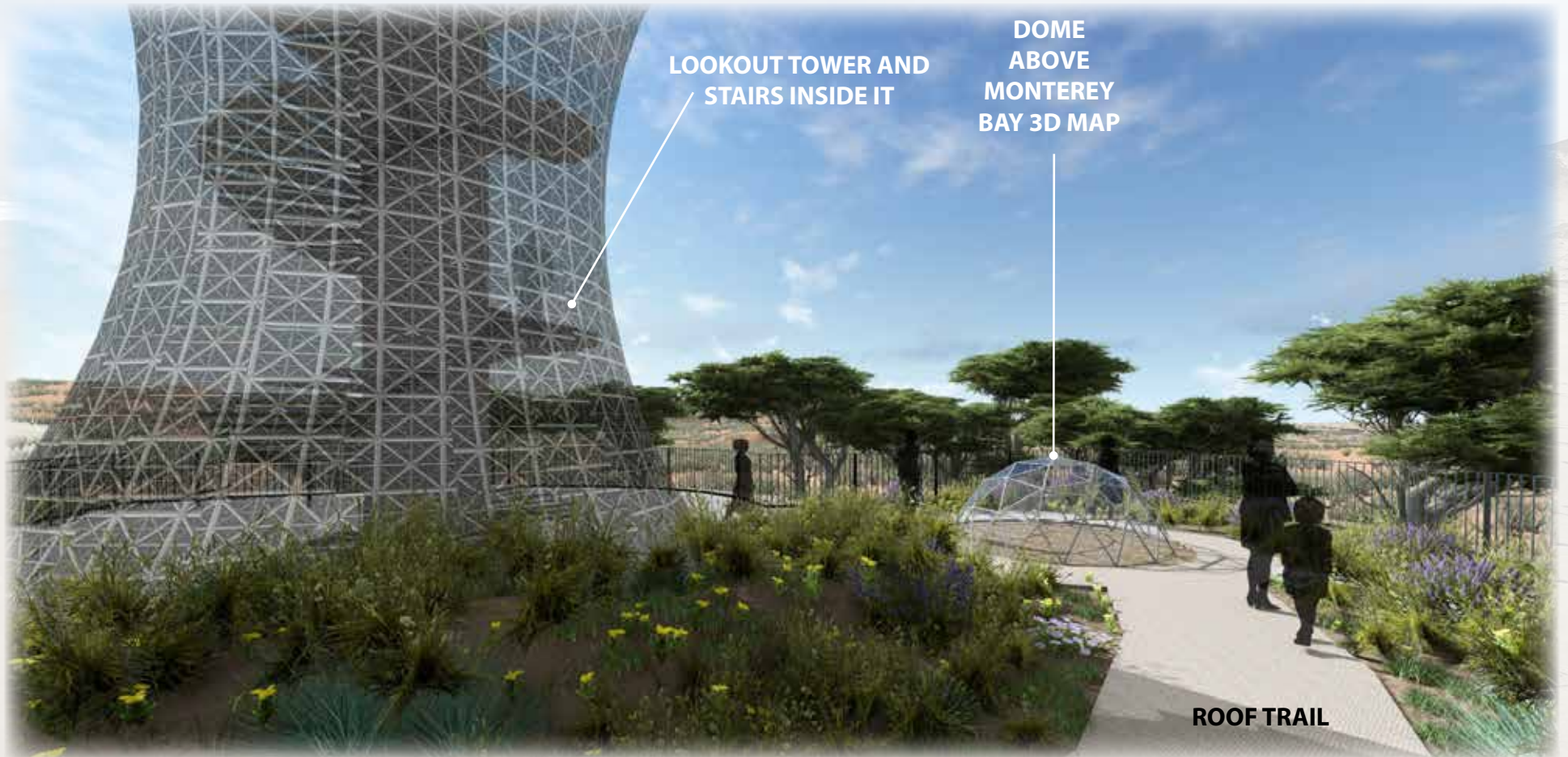
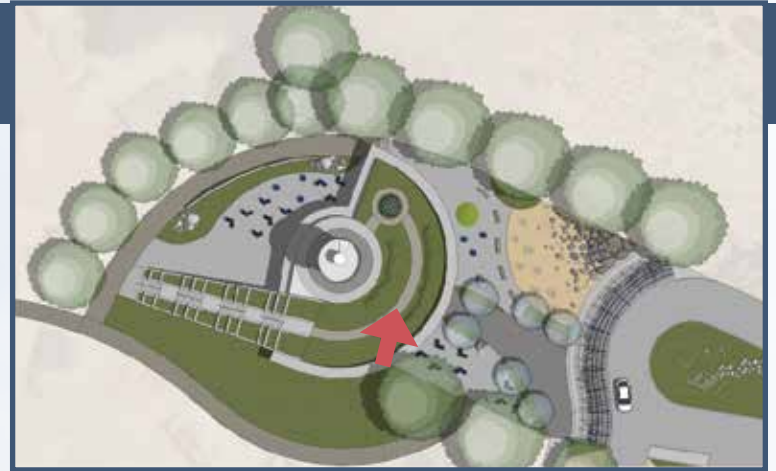




# PERSPECTIVE: MUSEUM ROOF



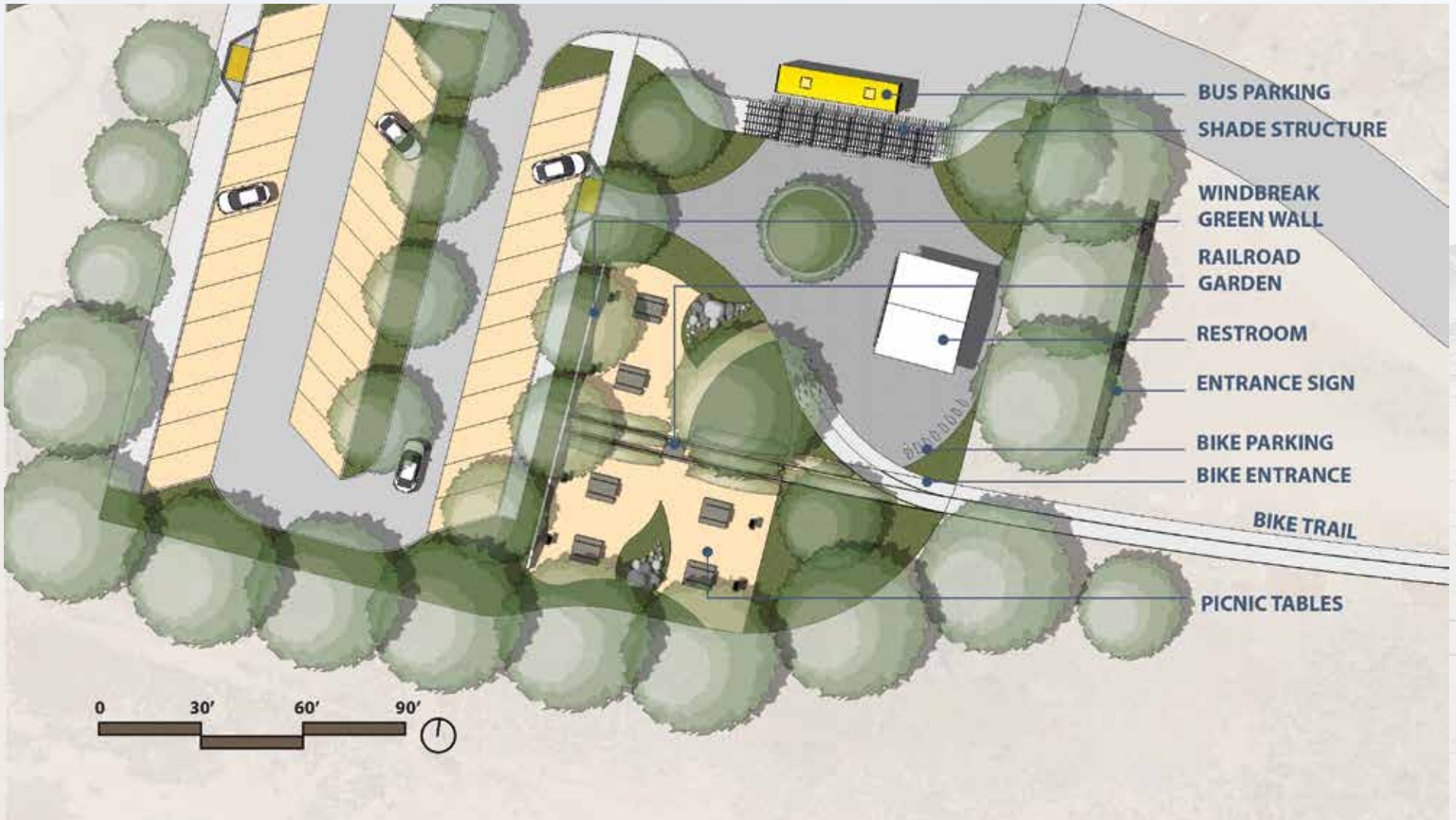
**ROOF INSPIRATION:**  
ACADEMY OF SCIENCES, SF  
PHOTO: <https://www.swagroup.com/projects/california-academy-of-sciences/>



# PERSPECTIVE: STEPS AND BACK PLAZA



# ENLARGEMENT 3: BIKE ENTRANCE & PICNIC AREA



# PERSPECTIVE: BIKE ENTRANCE



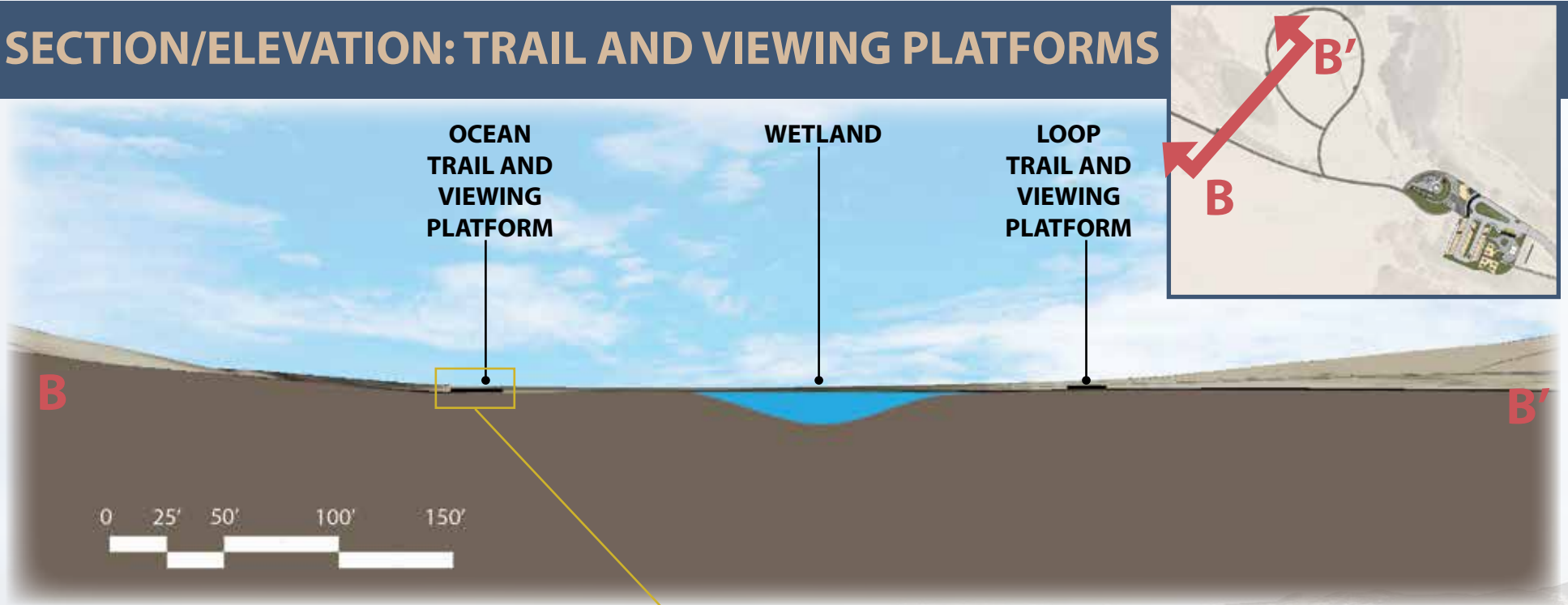
# PERSPECTIVE: PICNIC AREA



**RAILROAD GARDEN**  
**INSPIRATION: HUNTER'S POINT PARK, NY**  
PHOTO: <https://www.swagroup.com/projects/hunters-point-south-waterfront-park/>



# SECTION/ELEVATION: TRAIL AND VIEWING PLATFORMS



## TRAIL AND PLATFORM SECTION, ZOOMED IN

This type of trail requires periodic maintenance - blown in sand removal, boards repair etc. The plus of this design - it is ADA accessible. Special wheelchairs can be provided by the Museum.



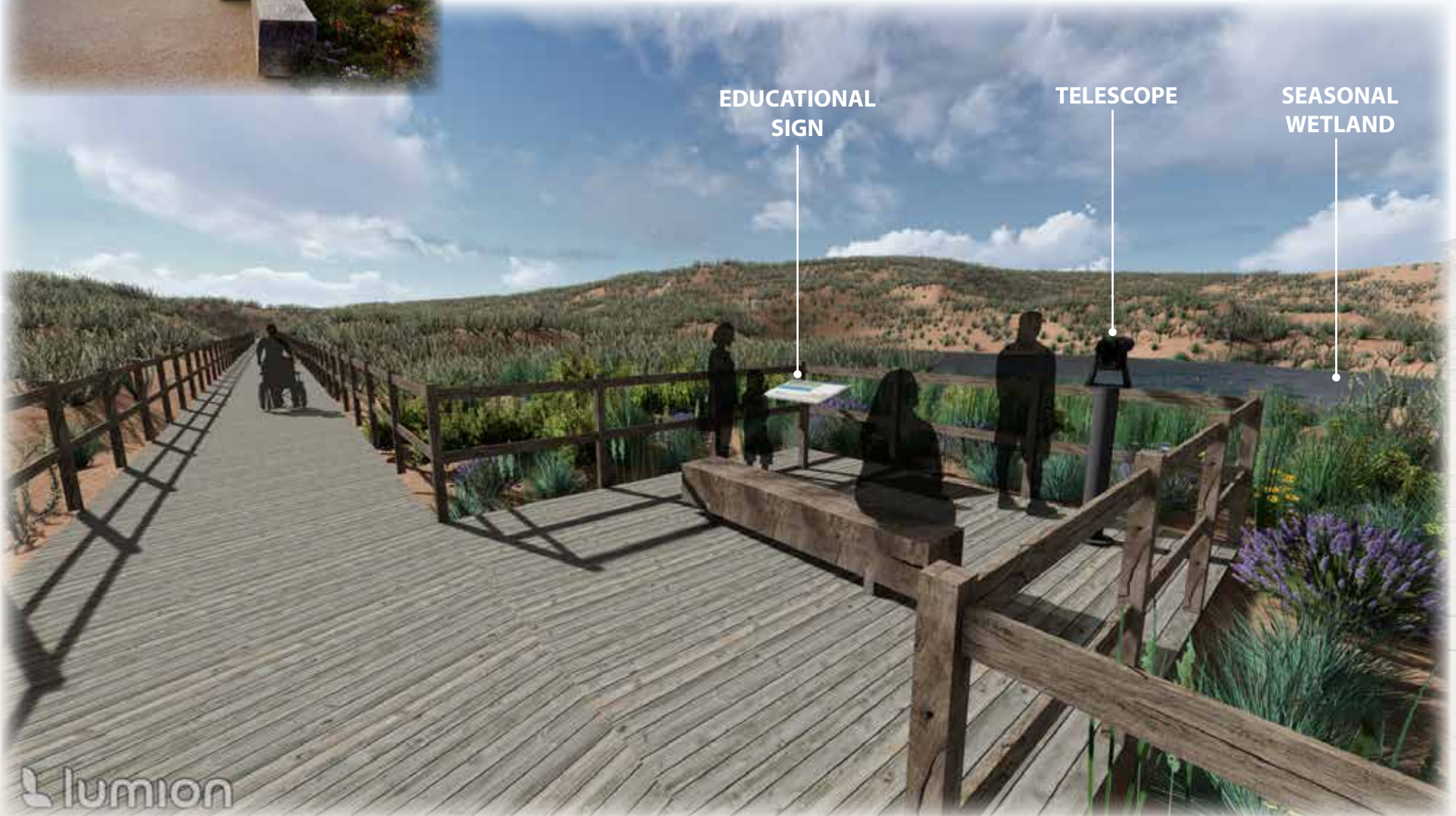
# PERSPECTIVE: TRAIL AND VIEWING PLATFORM



## BENCH INSPIRATION

Photo: SURFACEDESIGN INC.

<https://www.sdisf.com/lands-end-lookout>



# PAVEMENT SURFACE MATERIALS

## "BOULDERS"

MUSEUM FRONT AND BACK PLAZA -  
CIRCULAR PATTERN PERMEABLE PAVER.

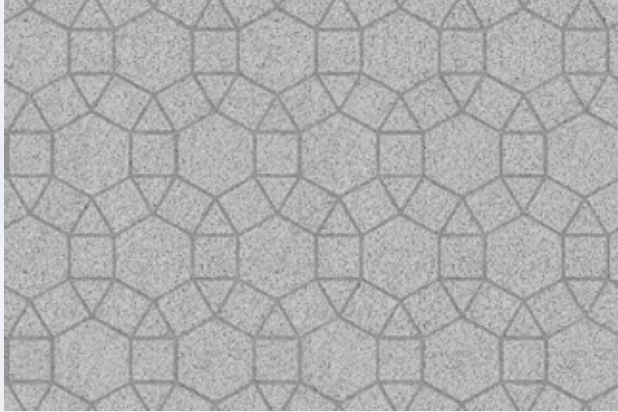


PHOTO: <https://www.sketchuptextureclub.com/>

METAPHOR:  
"FROM BOULDERS TO  
PEBBLES TO SAND"



## "PEBBLES"

MUSEUM ENTRANCE - EXPOSED  
AGGREGATE



PHOTO: <https://www.sketchuptextureclub.com/>

## "SAND"

PARKING - GRAVELPAVE2 AND GRAVEL



PHOTO: ANNA ASNIS

## "SAND"

PICNIC AREA - DECOMPOSED GRANITE



PHOTO: <https://www.jclandscapingllc.com/landscaping-ideas/decomposed-granite-landscaping-installation/>

## "SAND"

FOUNTAIN - THERMOPLASTIC RUBBER  
SURFACE



PHOTO: <https://www.fleckssystems.com/>



# PROPOSED TREES

The design proposes to keep all existing Monterey Cypress trees. There are about 26 new trees added to the site plan. Twenty new Monterey Cypress and Coast Live Oak trees, plus Six Ray Hartman ceanothuses in tree form at the Museum Front Plaza. All proposed trees are native to California and they do well in this coastal climate.

Coast Live Oak and Ceanothus should be planted in a more protected area, Monterey Cypress can be the first line of defense against ocean winds.

## MONTEREY CYPRESS



PHOTO: Anna Asnis

## COAST LIVE OAK



PHOTO: Anna Asnis

## RAY HARTMAN CEANOOTHUS



<https://www.laspilitas.com/nature-of-california/plants/139--ceanothus-ray-hartman>

# PROPOSED ROOF PLANTING

PERENNIALS:

*Fragaria chiloensis*



*Armeria maritima*



*Prunella vulgaris*



*Sedum spathifolium*



ANNUALS:

*Eschscholzia californica*



*Lupinus bicolor*



*Lasthenia californica*



*Plantago erecta*



*Layia platiglossa*



These 9 plants were selected by SWA landscape architecture for their survivability as Academy of Sciences SF roof planting. These plants are CA native and they attract butterflies, birds and insects

PHOTOS: <https://calscape.org/>

PLANT LIST: BOOK. LANDSCAPE INFRASTRUCTURE. Case Studies by SWA . Birkhauser Basel.

# PROPOSED DUNE PLANTING

*Eriogonum latifolium*



*Gilia tenuiflora ssp. arenaria*



*Chorizanthe pungens var. pungens*



*Erysimum menziesii ssp. yadonii*



*Lupinus chamissonis*



*Achillea millefolium*



*Artemisia pycnocephala*



*Corethrogyne filaginifolia*



*Astragalus nuttallii*



These are some of the plants recommended by Burleson Consulting Inc. for Marine Dune Preserve restoration. MDP is bordering Cemex property at the south.

Endangered Smith's Blue Butterfly depends on *Eriogonum latifolium*. Endangered Black Legless Lizard needs *Gilia tenuiflora ssp. arenaria*, *Chorizanthe pungens var. pungens*, and *Erysimum menziesii ssp. yadonii* for survival. .

PHOTOS: <https://calscape.org/>

PLANT LIST: RESTORATION ACTION PLAN. MARINA DUNES PRESERVE. Prepared by: Burleson Consulting Inc.

# NEW SITE CIRCULATION



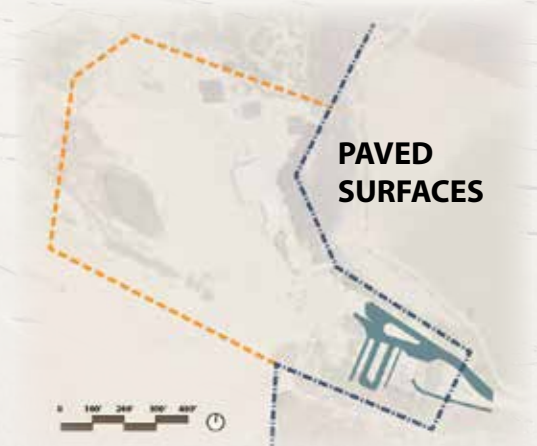
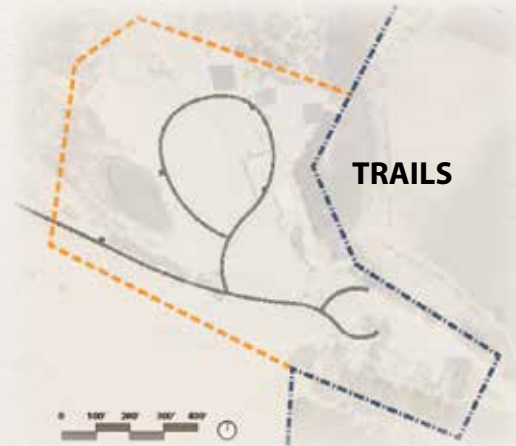
# CONCLUSION

## MASTER PLAN



The majority of the site is covered by CANative plantings. Paved surfaces and buildings are taking up a limited space.

The proposed design addresses environmental degradation caused by sand mining and creates a space to celebrate the area's natural beauty while promoting education and recreation.



# THANK YOU

This project would not be possible without the support and help of many people.

I would like to thank Stephanie Landregan and Melissa McDonald - their support of this program is invaluable.

I would like to thank all the instructors that taught us so much in the past three years - Francisco Behr, Perla Arquieta, Jim Smith, Victor Corona, Laura Razo, Steven Chavez, Steven Lang, Jeff Chamlee, Jason Wan and Nickolas Straabe and others. Special shout out to Meg Coffee - our Capstone project instructor.

I want to extend my heartfelt thanks to Edward Thornton and Jake Smith who answered my questions regarding the Cemex property and helped me with my research.

A special thank you to my husband Ilya and our children Lev and Mila for the support through these years and encouragement to finish the program! They witnessed countless hours I spent on homework, field trips and travel to LA. Now we can finally take a proper summer vacation together!

With Gratitude,  
Anna Asnis,  
September, 2023.

# REFERENCE LIST

All the sources for photos and text are called out right under them. If a photo or a text do not have a source - they are purely mine.

## BOOKS:

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- Ian L. Mcharg, 1971. Design with Nature. Published by Natural History Press Doubleday & Company,Inc. Garden City, New York

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- RESTORATION ACTION PLAN MARINA DUNES PRESERVE, Marina, California. Prepared for: Monterey Peninsula Regional Park District. Prepared by: Burleson Consulting Inc. March 2021

## RESEARCH PAPERS:

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- An Evaluation of the Ongoing Impacts of Sand Mining at the CEMEX Lapis Sand Plant in Marina, California on the Southern Monterey Bay Shoreline; By Robert S. Young, PhD, May 29 2017 <https://coastalcare.org/2017/05/an-evaluation-of-the-ongoing-impacts-of-sand-mining-at-the-cemex-lapis-sand-plant-in-marina-california-on-the-southern-monterey-bay-shoreline-by-robert-s-young-phd/>

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- <https://www.montereyherald.com/2013/08/26/sand-plant-investigated-state-examining-claims-that-cemex-in-marina-mining-more-than-permitted/>
- <https://dredgewire.com/sand-mining-at-the-cemex-plant-in-marina-ends-ahead-of-deadline/>
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- <https://kion546.com/news/2022/08/10/marina-citizens-raise-concerns-over-proposed-calam-desalination-plant/>

**OTHER RESOURCES :** GOOGLE MAPS, GOOGLE EARTH