Measure Profile

# Beaches

## Flood Adaptation Measure

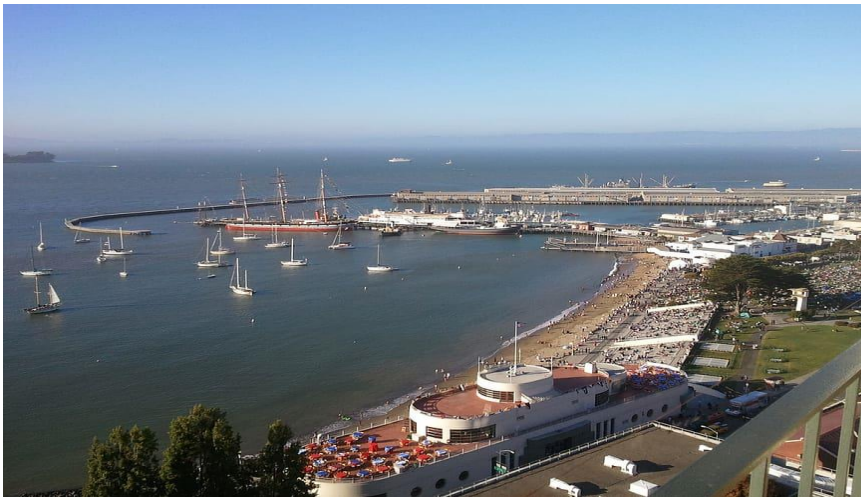
### ECOLOGICAL INFRASTRUCTURE

### WATER LEVEL RANGE:

Up to 100-year flood level

### SHORELINE LOCATION:

Shoreline



*Aquatic Park Beach - San Francisco, CA ©Ariosto Aragão via Wallpaperflare.com*

| DESIGN LIFE | ADAPTABILITY | IMPACT ON THE WATERFRONT | CONSTRUCTION COST |
|---|---|---|---|
| 10-50 years | High | Minor Intervention | TBD |

### COASTAL FLOOD HAZARDS MITIGATED:

Enhancements can provide flood protection when combined with other physical infrastructure

Sea Level Rise 

Storm Surge 

Groundwater 

Waves 

Erosion 

### MEASURES COMPATIBILITY:

| Flood | Seismic |
|---|---|
| Floodwalls, Revetments, Ecological Shorelines | All |

### ECOSYSTEM SERVICES: Measure may affect these shoreline values

| Aquatic Habitat | Terrestrial Habitat | Water Quality | Carbon Storage |
|---|---|---|---|
| — / ↓ | ↑ / — | — | — |

### DESCRIPTION:

Beaches naturally protect and provide a sacrificial buffer to land from waves and rising water levels. This measure includes beach stabilization, nourishment of existing beaches, and creation of new ones by importing sand from other sources. Creation or restoration of beaches can provide habitat for birds or other wildlife, as well as recreational areas.

### CONSIDERATIONS:

- Beaches naturally erode due to wind and waves, particularly during storm events. Without protection structures, beaches will require maintenance via periodic nourishment, which can

### ADVANTAGES:

- Mitigate storm surges and buffer shoreline and backshore erosion.
- Provide benefits such as public access to a water body, recreational use, and ecological enhancements.

### DISADVANTAGES:

- Only suitable for low-lying coastal areas with existing sources of sand. Source sand should match native beach sand.
- Can collect floating debris.
- Require periodic maintenance in

# Beaches

## Flood Adaptation Measure

| | | |
|---|---|---|
| disrupt public use and harm habitat. | • Flexible design. | the form of nourishment, e.g. 3 to 10 years.<br>• Requires high degree of coordination with coastal regulatory agencies. |

### CONSTRUCTION IMPACTS TO THE PUBLIC:

- Minimal public impacts, given limited suitability in densely populated areas. If the land used within polders holds any infrastructure or utilities, access to and protection of these assets would need to be considered to minimize utility disruptions.

### SEA LEVEL RISE ADAPTATION OPPORTUNITIES:

- Through the increase of levee crest elevation, polders can be adapted to different water levels.

### CASE STUDIES:

- None cited.

### DESIGN OPPORTUNITIES:

#### Ecological Enhancements

- Beaches can be integrated with other ecological infrastructure and enhancements. Can provide and protect habitat, enhance biodiversity, and provide a food supply for wildlife, if not disturbed by nourishment.

#### Urban Design

- Creation of recreational access to waterfront.

#### Form

- Form is dynamic, depending upon on wind and wave environment, and existence/placement of protection structures. New beaches require a large horizontal extent.

### DESIGN CONSIDERATIONS:

- Sand is placed on beaches to increase the elevation and distance between the upland areas and the shoreline.
- If sand is being placed on an existing beach, the grain size and color of the fill sand should closely match the native beach sand, and fill sand should be free of any contaminants.
- Because wind, waves, currents, and water levels are drivers of coastal erosion, they are key elements for design and should be well understood and defined.
- Within bays, the potential of wind and waves to transport and settle floating debris on the beach should be considered.

### HISTORICAL RESOURCE CONSIDERATIONS:

- Beach fills should not bury or affect historical structures.
- Wind conditions should be considered to prevent damage due to wind transport of sand.

### SITE-SPECIFIC CONSIDERATIONS:

- The implications of delivering the sand to the project site, by either land or water, should be considered. These include noise; impacts on vehicular, pedestrian and marine traffic; and restrictions to beach use, and other urban life disruptions.
- Site-specific wave and water level conditions are critical for all aspects of beach projects.

# Beaches

## Flood Adaptation Measure

### URBAN DESIGN CONSIDERATIONS:

- Wind conditions should be considered to prevent deposition of sand on roadways and walkways.

### INSTALLATION AND CONSTRUCTABILITY CONSIDERATIONS:

- Stormwater outfalls and culverts must be considered to prevent the inflow of contaminated sediments and water.
- Constructability is generally feasible, if sand sources and marine contractors with adequate equipment are available. Obtaining sand from offshore could complicate construction. Water-side construction would need to consider marine weather and water level time windows to minimize downtime, and beach use to mitigate public use disruption.

### OPERATIONS AND MAINTENANCE CONSIDERATIONS:

- Beach operation needs are generally low and depend on public use. However, beaches will be prone to erosion in varying degrees depending on the wave climate and water levels. Without protection structures, beaches will require maintenance via periodic nourishment.
- Periodic removal of accumulated debris and trash will be required, particularly if recreational use is high.