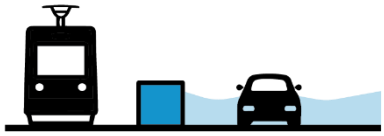
Measure Profile

Barrier Railing

Flood Adaptation Measure

PHYSICAL INFRASTRUCTURE



SHORELINE LOCATION:

Shoreline

Tree-lined pathway alongside the River Thames - London, UK
©Gary Hebding Jr./Alamy Stock Photo

DESIGN LIFE	ADAPTABILITY	IMPACT ON THE WATERFRONT	CONSTRUCTION COST
50 - 100 years	Varies	Minor Intervention	TBD

COASTAL FLOOD HAZARDS MITIGATED:

Sea Level Rise

Storm Surge

Groundwater

Waves

Erosion

MEASURES COMPATIBILITY:

Flood	Seismic
Levee Seawall Raised Structures	All

ECOSYSTEM SERVICES: Measure may affect these shoreline values

Aquatic Habitat	Terrestrial Habitat	Water Quality	Carbon Storage
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DESCRIPTION:

Concrete wall with optional architectural cladding of brick or stone. Wall height will vary depending on existing grades and desired level of flood protection. Above the solid barrier section, a transparent barrier can be incorporated, without compromising views if possible, to limit overtopping and for public safety.

CONSIDERATIONS:

- Design must comply with codes and standards

ADVANTAGES:

- Permanent
- No operational and minimal maintenance cost
- No storage or deployment

DISADVANTAGES:

- Higher upfront cost compared to most deployable measures
- Transparent panels will require periodic cleaning
- Customization required
- Restricts access and should be used in combination with gates

PORT OF SAN FRANCISCO

Waterfront Resilience Program

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		• Potential aesthetic and visual impact • Potential impacts to stormwater management in localized areas
CONSTRUCTION IMPACTS TO THE PUBLIC: • During construction, multi-modal transportation will be rerouted and areas surrounding the site will be subject to construction noise and activities	**SEA LEVEL RISE ADAPTATION OPPORTUNITIES:** • Once built, no capacity to adapt to higher water levels	**CASE STUDIES:** • None cited

DESIGN OPPORTUNITIES:

Ecological Enhancements	Urban Design	Form
• None	• TBD	• TBD

DESIGN CONSIDERATIONS:

- Designed to withstand static and dynamic loads due to soil and hydrostatic pressures; wind, wave and vessel berthing loads (if the measures includes the bulkhead), debris impacts, and seismic performance.
- Gradient and alignment are flexible.
- Overland stormwater discharge along the waterfront may be impeded.

SITE-SPECIFIC CONSIDERATIONS:

- Well suited for waterfront alignment.
- Consider using in combination with planned deployment – bollards and removable panels to provide unobstructed views of the Bay (i.e., custom rails could be used to house removable panels during deployment).

ARCHITECTURAL CONSIDERATIONS:

- The design of the transparent barrier must comply with the relevant codes and standards, and accessibility requirements. The spacing and location of supports should be considered regarding existing views, and the barrier should not obstruct exit doors, stairs or ramps, and egress routes from buildings and public ways. Existing changes in level/grade and/or existing steps should be considered. The materials and their maintenance and repair should also be considered.

HISTORICAL RESOURCE CONSIDERATIONS:

- The transparent barrier should be located/attached in such a manner as to avoid physical damage or obstruct access or views to historic structures. When placed near historic structures, the design of the barrier should be compatible with the character of the structure. The barrier should not be fastened to existing historic building facades, and if deployed in pathways between historic structures, the joints or connections to the adjacent structures should be designed to avoid damage to the historic structures.

URBAN DESIGN CONSIDERATIONS:

- The transparent nature of the barrier should allow for view preservation; however, the solid portion should remain below 2 feet for as much of the length as possible to preserve views. When installed at the waterfront, the overall

height must meet safety/code requirements for guardrails. The permanent barrier should be of high quality and durable materials that relate to the urban context and will withstand the marine environment. Depending on the location, the barriers may pose access and circulation limitations.

INSTALLATION AND CONSTRUCTABILITY CONSIDERATIONS:

- Typical land-based reinforced concrete construction. Local load factors will need to be established for the design of the wall. The general installation procedure includes: 1) preparation of existing grade, 2) construction of foundation or connections to existing foundation, 3) construction of solid barrier, and 4) installation of transparent barrier.

OPERATIONS AND MAINTENANCE CONSIDERATIONS:

- Regular inspection of the barrier for damage and vandalism is required.
- Repair or replacement of damaged areas, plus cleaning of transparent panels as needed over time.
- No storage or deployment action is required.
- Service life can be in excess of 50 years based on loads, design criteria and material used, as well as inspection and maintenance frequency.