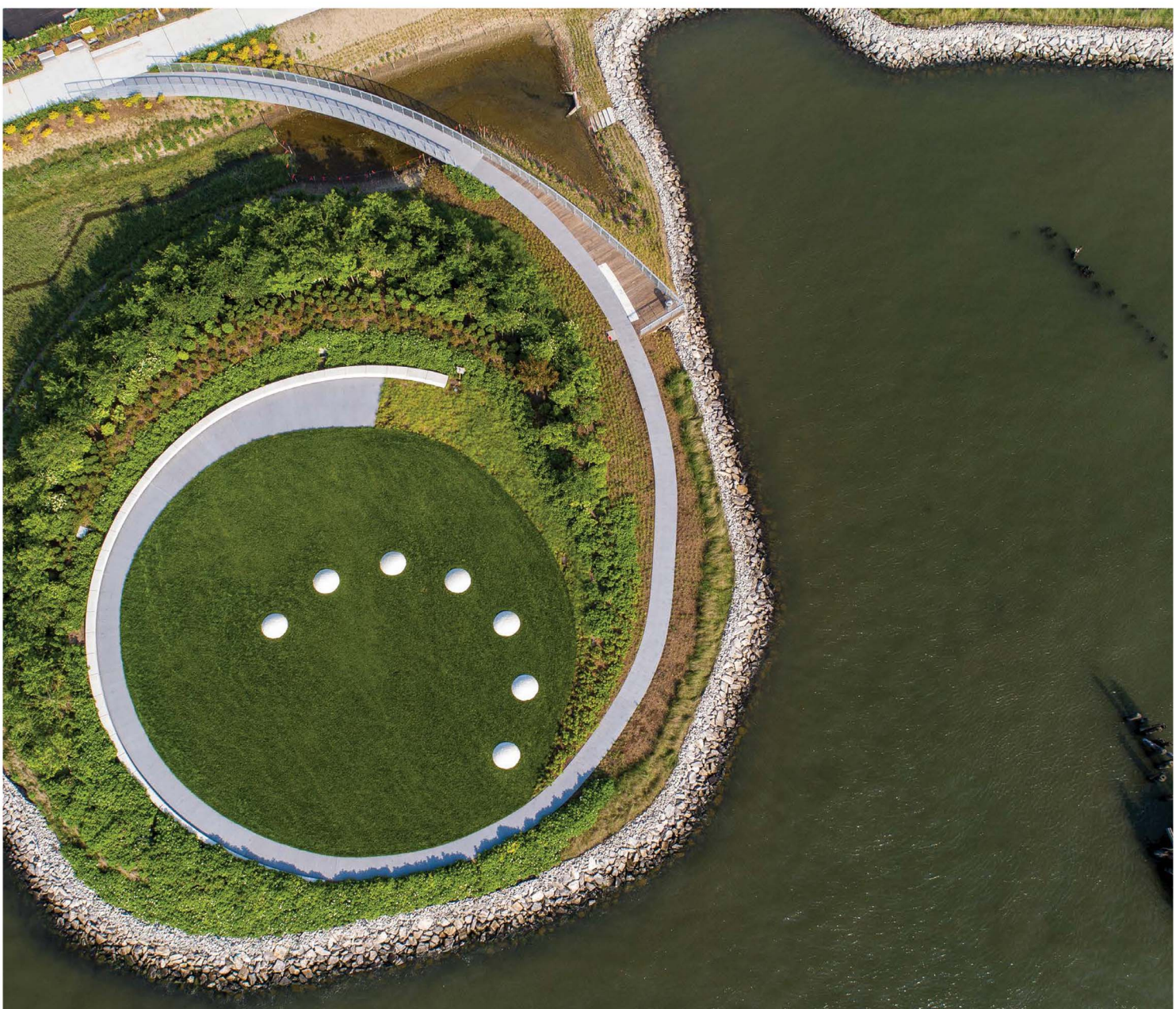
WEDG®

(WATERFRONT EDGE DESIGN GUIDELINES)

Resilience, Ecology, and Access at the Water's Edge



MANUAL VERSION 3.0

OCTOBER 2023

CREDIT 3.1

Choose an Appropriate Edge Composition for the Context and Intended Use

12 PTS

INTENT

Ensure the structural integrity and sustainability of the shoreline and near-shore area using a waterfront edge that has the greatest possible positive impact on the environment and community, given the intended use and context.

DESCRIPTION

This credit aims to promote waterfront edge strategies that balance the needs of the intended use with the physical, ecological, and community context of the site, and provide structural integrity and stability of the edge over time, preventing loss of function. Shorelines may not require stabilization. Careful assessment of the shoreline extent should be completed to understand where banks are naturally stable, what natural edge stabilization techniques can be employed, where hardened shorelines provide critical resilience or erosion control functions, and where natural or nature-based shorelines can be maintained or restored (see **Credit 0.2** and **Credit 4.1**). Methods that employ hardened shoreline structures, such as bulkheads and seawalls, can have a significant negative impact on ecology, including loss of shallow-water and wetland habitat, as well as an overall decline in habitat in the immediate area, and should be minimized wherever possible, except in cases where site conditions prevent their use such as contamination, working waterfront, and heavy industrial uses.[106] Natural shorelines should be maintained to the maximum extent possible; the use of hardened shorelines should be limited to cases where they may be necessary due to site conditions or the use. If hardened shorelines are required, efforts should be made to incorporate natural elements to soften the hard edges (e.g., placing sand over a revetment crest and planting dune grass). Natural and nature-based features (sometimes referred to as "soft," "living," or "ecologically-enhanced" shorelines) can provide comparable stabilization benefits along with enhanced resilience, ecology, and public access.[107, 108, 109]

DESIGN STRATEGIES

Use initial assessment **(Credit 0.2)** to determine where shoreline natural conditions can be maintained. If extents exist where stabilization is needed, use **Appendix B** to determine what an appropriate edge strategy may be for the use and context.

If stabilization is not needed and the natural condition will be maintained, develop a plan for maintenance over time, including any buffers to allow for habitat migration with sea level rise, lake level changes, or natural river meander. If stabilization is needed, use the relevant assessments from **Appendix A** and **Appendix B**, or other peer-reviewed shoreline stabilization guidance reference that includes "soft" or "enhanced" as well as conventional shoreline stabilization methods, to identify the range of possible shoreline strategies. Identify the alternative with the most positive impact from an environmental perspective and first consider whether the desired shoreline enhancement technique is feasible and appropriate based on the site context and project goals. The United States Army Corps of Engineers, as well as multiple states, have developed preferred and streamlined permitting processes for living shorelines stabilization methods.[110] If a hardened stabilization strategy is deemed necessary, provide a rationale for why. For any stabilization strategy selected:

[106] Douglass, S.L. & Pickel, B.H. (1999). The Tide Doesn't Go Out Anymore - The Effect of Bulkheads on Urban Bay Shorelines. *Shore and Beach* 67(2-3), 19-25; Coastal Green Infrastructure and Ecosystem Services Task Force. (2015). Ecosystem-Service Assessment: Research Needs for Coastal Green Infrastructure.; Patrick, C., Weller, D.E., LI, X. & Ryder, M. (2014). Effects of shoreline alteration and other stressors on submerged aquatic vegetation in subestuaries of Chesapeake Bay and the Mid-Atlantic Coastal Bays. *Estuaries and Coasts* 37, 1516-1531; Seitz, R.D. & Lawless, A. S. (2006). Landscape-level impacts of shoreline development on Chesapeake Bay benthos and their predators. In S. Erdle (Ed.), Management, Policy, Science, and Engineering of Nonstructural Erosion Control in the Chesapeake Bay. Proceedings of the 2006 Living Shoreline Summit. CRC Publ. No. 08-164.

[107] National Oceanic and Atmospheric Administration. (2015). Guidance for Considering the Use of Living Shorelines; Knutson, P., Seeling, W. & Inskeep, M. (1982). *Wave Dampening in Spartina Alterniflora Marshes*. Wetlands, 2, 87-104.

[108] Bredes, A., et al. (2023). *Developing guidance for the application of Natural and Nature Based Features (NNBF) on developed shores: A case study from New Jersey, USA*. Regional Studies in Marine Science: 102959.

[109] Miller, J. K., et al. (2022). Ecoshorelines on Developed Coasts Guidance and Best Practices, Stevens Institute of Technology.

[110] USACE Nationwide Permit 54; New Jersey General Permit 17; Maryland Living Shoreline Waiver.

- Develop design and maintenance and adaptive management plans that address structural integrity, environmental management, and adaptability to sea level rise and other climate change effects over time.
- Consider shifts to structural stability (e.g., shear strength of soils) and shape due to increased inundation frequency over time as well as appropriate adaptive management and maintenance strategies **(Credit 0.4)**.
- Consider the effects of potential flooding behind the structure and analyze impacts to adjacent properties and shorelines.
- For soft shoreline strategies such as beaches or marshes, sufficient width, slope, and materials type are critical for success. Consider width and slope available accounting for land elevation and tidal range, future high tide level, changing lake levels, flood conditions and other water level changes. Also consider alternatives to beach sand, such as cobble, which can provide a stable but dynamic beach. In most states strict regulations prohibit the placement of fill below mean high water or tidelands lines due to potential impacts to habitat, indicating a preference for grading in the upland to accommodate appropriate slopes rather than placement of fill material in the water when width is limited.
- For vegetated shorelines, consider native plant species, sun exposure, soil type, and water quality when evaluating alternatives. For example, shellfish reefs may need higher water quality conditions to thrive, and vegetated edges require moderate to high levels of sunlight daily.

As a **natural edge**, mangrove tree roots provide refuge and habitat to birds, fish, invertebrates, and other animals. They provide spawning grounds for many species.

Natural Edge or Natural Shoreline: A waterfront that has created or evolved over time through natural processes. Dunes, beaches, wetlands, mangrove forests, mudbanks, and similar edges are considered natural.

Credit: Joseph Sutkowi, Waterfront Alliance

Mangrove reef walls, a **nature-based feature**, mimic the reef habitats that real mangroves provide.

Nature-Based Feature: Engineered components of a shoreline or other project that are designed to mimic characteristics or performance of natural features for coastal risk reduction, habitat and ecosystem complexity, or other benefits. These often include real natural processes or plants but have an engineered or human-made component. Examples include textured concrete that allows marine life to adhere, planted shoreline revetments, or wetlands protected by an armoring wall.

Credit: Mangrove Reef Walls, LLC

- In riverine environments, consider flood stage, currents, and any potential impacts on stabilization alternatives.
- When employing rip rap or revetments as a shoreline stabilization strategy, incorporate ecological enhancements such as vegetation, natural habitat materials, tide pools, or reef structures to qualify this enhancement as a nature-based solution. Standard rip rap and revetments, which are often made from rock materials that do not contribute to the marine ecosystem, are not considered soft shorelines.
- When a seawall or hardened edge is required, incorporate ecological enhancements as described in **credits 3.4** and **4.4**.
- Consider the effects of sustained high water levels (through heightened lake levels and sea level rise) on the water's edge and upland features to ensure that the site will remain protected across the design life of the project.

ECOncrete's Coastalock interlocking coastal armor in installed at the Port of San Diego creates habitat space while stabilizing the shoreline.

Credit: Jeff Stein | F&L Media, Courtesy of ECOncrete.

For industrial and maritime sites, also consider the following aspects to create resilient and efficient working edges:

- Design height must be appropriate for easy loading and unloading facilities. Consider the impact of overtopping during storm events and either adjust the height or provide for floodproofing and other resilience accommodations upland.
- Reduce potential for scour behind and below (for edges with toe protection) bulkheads and seawalls, due to overtopping of uncapped structures, dredging, erosion, and navigational traffic.
- Select materials resistant to marine borer activity and corrosion but that allow settlement of native marine organisms.
- Design for functionality at multiple water levels. For example, use floating docks that can accommodate a wide range of elevations, integrating a stepped edge or tiered platform that uses a low edge for maritime functionality.

SCORING

If stabilization is pursued but deemed unnecessary for supporting the use and prevention of erosion by the reviewer, no points are awarded for this credit, unless stabilization is employed for habitat restoration purposes. Plans for maintenance and monitoring must be included in the Maintenance and Adaptive Management Plan **(Credit 0.4)**.

Projects may achieve points on one of the following:

- **(4 points)** An assessment of the existing shoreline has been conducted and the current stabilization method is in good condition and maintained in place. This may include an existing hardened shoreline.

- **(4 points)** A newly constructed or significantly modified stabilization method, where necessary based on site assessments **(Credit 0.2)**, is consistent with site and community context (as verified by **Appendix B**), erosion control needs, and intended use. These points are also awarded if no stabilization is needed.

Projects may also achieve one of the following:

- **(2 points)** The site design includes a natural edge or nature-based features along at least 25% of the shoreline, no less than 50 linear feet.
- **(4 points)** The site design includes a natural edge or nature-based features along at least 50% of the shoreline, no less than 50 linear feet.
- **(6 points)** The site design includes a natural edge or nature-based features along at least 75% of the shoreline, no less than 50 linear feet.
- **(8 points)** The site design includes a natural edge or nature-based features along at least 95% of the shoreline, no less than 50 linear feet.

DOCUMENTATION REQUIREMENTS

The narrative (500 words or less) should describe how the project meets the WEDG scoring criteria. The narrative and supporting documents for this credit should provide justification for the edge composition employed along the shoreline. Initial assessment **(Credit 0.2)** should describe how the project team chose an appropriate edge composition for the intended use and site context (refer to **Appendix B**). All projects utilizing a hardened shoreline must justify why a nature-based solution or natural shoreline was infeasible. Additionally, if the design maintains a hardened shoreline in place, also provide documentation to accompany the narrative verifying the condition.

The narrative should note where to find information related to this credit in the Maintenance and Adaptive Management Plan **(Credit 0.4)**. Maintenance planning is required for this credit. Projects that do not address maintenance for this credit will receive zero points.

Supporting materials for this credit include alternatives analysis, site plans and/or construction documents identifying areas of planned maintenance or enhancements to existing shoreline, as well as length and percentage of any new stabilization techniques utilized.