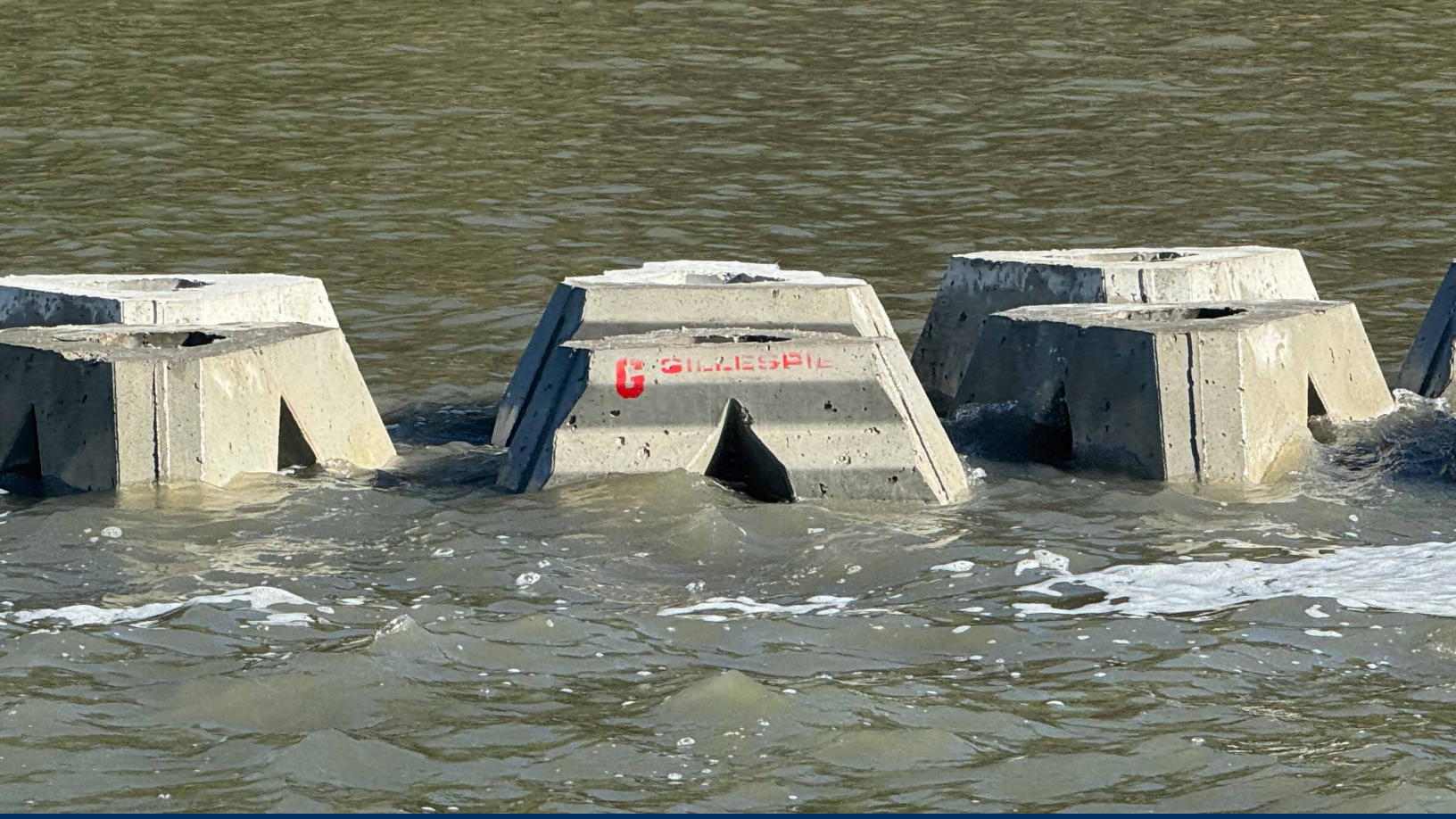
GILLESPIE PRECAST

How Precast Concrete Helps the Environment

Engineered Reef and Living Shoreline Projects
in Maryland and Delaware Waters



Executive Summary

This case study examines how precast concrete structures provide measurable environmental benefits through engineered applications in marine habitat creation and shoreline protection in Maryland and Delaware waters. Through partnerships with conservation organizations and public agencies, Gillespie Precast supported projects that enhanced marine habitat, promoted biodiversity, and reduced shoreline erosion using durable, engineered precast solutions.[1]

Introduction

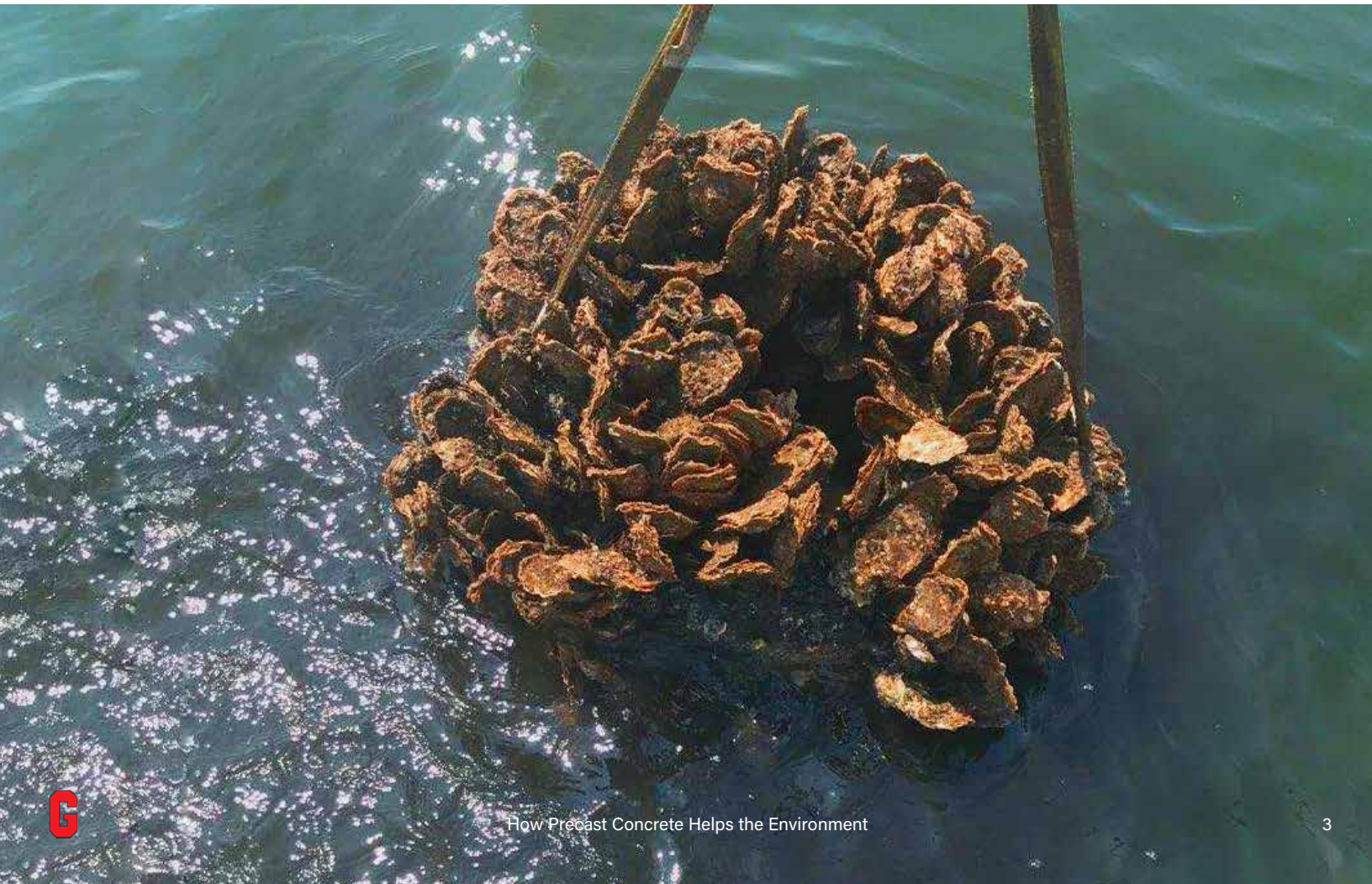
Artificial reef structures and engineered shoreline protection devices represent nature-based solutions that combine ecological function with structural reliability. In Mid-Atlantic coastal waters, artificial reefs provide essential hard substrate in environments otherwise dominated by sand and silt.[2] Precast concrete allows engineers to design reef and shoreline structures with predictable geometry, mass, and durability, accelerating habitat development while maintaining long-term performance.[3]

Engineering Context of Precast Concrete in Marine Environments

Precast concrete is widely used in marine and coastal applications due to its:

- **High durability** in saltwater environments
- **Predictable strength** and dimensional tolerances
- **Ability to be formed** into complex geometries that increase habitat complexity
- **Long service life** with minimal maintenance

When submerged, concrete surfaces promote colonization by benthic organisms such as oysters, barnacles, mussels, and algae, which form the foundation of productive marine food webs.[4]



Case Example 1: CCA Maryland – Reef Ball Habitat Initiative

Project Background

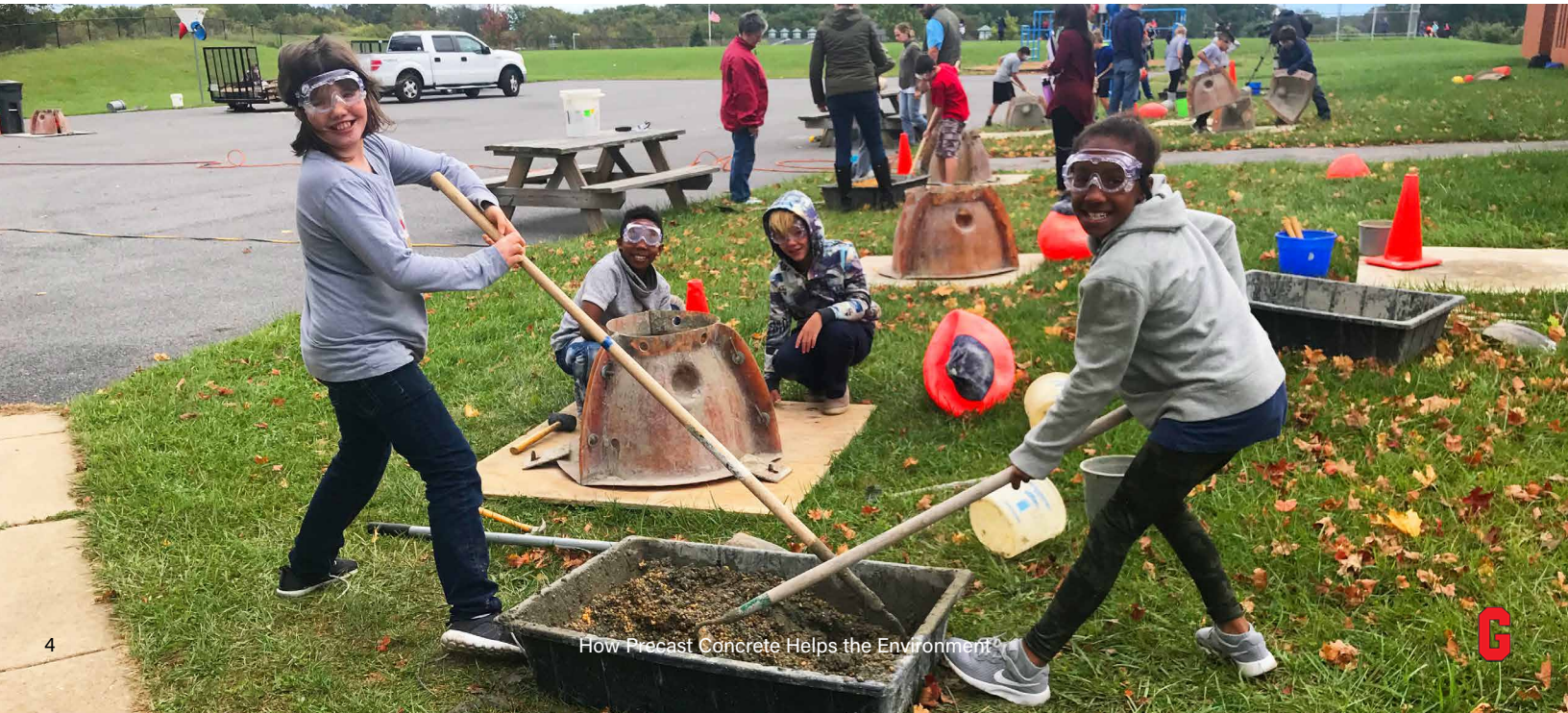
The Coastal Conservation Association (CCA) of Maryland operates the Living Reef Action Campaign, which engages volunteers and students in constructing reef balls and pyramidal reef units for placement in Chesapeake Bay and its tributaries. Reef balls are hollow, perforated concrete domes designed to provide shelter and settlement surfaces for marine organisms.[5]

Environmental Benefits

- **Habitat creation:** Reef balls introduce vertical relief and hard substrate, increasing habitat availability in areas lacking natural reefs.[6]
- **Biodiversity enhancement:** Reef structures attract oysters, invertebrates, and finfish, increasing local species diversity.[7]
- **Water quality improvement:** Oyster colonization on reef structures contributes to filtration of suspended solids and nutrients from the water column.[8]

Gillespie Precast Contribution

Gillespie Precast supported the CCA Maryland program through financial contributions and educational engagement, expanding student participation and promoting awareness of the vital role precast concrete plays in restoring reef habitats.



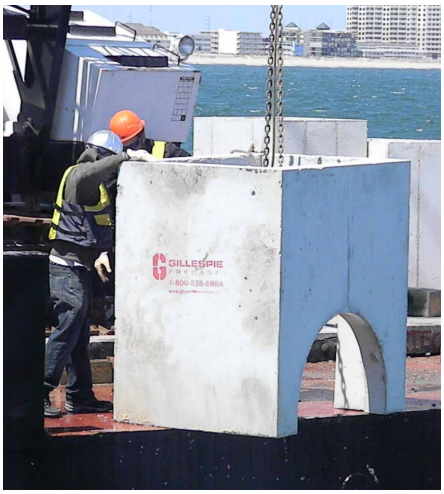
Case Example 2: Ocean City Reef Foundation – Offshore Reef Deployments

Project Overview

The Ocean City Reef Foundation (OCRF) develops artificial reefs offshore of Ocean City, Maryland, using approved materials to create long-term marine habitat. These reefs provide structure in open-ocean environments where natural reef systems are limited.[9]

Environmental Outcomes

- **Immediate habitat complexity:** Concrete reef materials provide stable surfaces for colonization by sessile organisms.[10]
- **Expanded food webs:** Biofouling communities attract fish and crustaceans, supporting recreational and commercial fisheries.[11]
- **Ecosystem services:** Artificial reefs contribute to fishing, diving, and coastal tourism, which depend on healthy marine ecosystems.[12]



Gillespie Precast Role

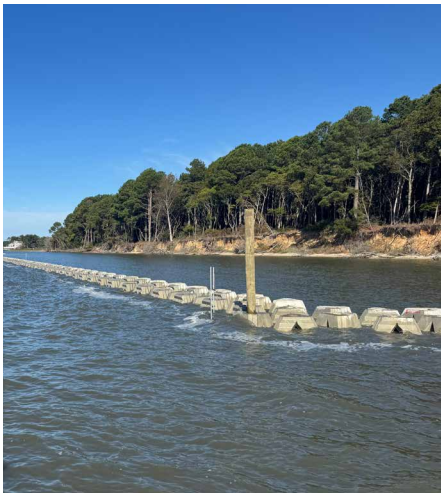
Gillespie Precast donated excess and broken precast concrete pieces that were repurposed by OCRF as reef substrate. This approach diverts material from disposal while creating functional environmental infrastructure.

Case Example 3: Thompson Island Living Shoreline – Wave Attenuation Devices

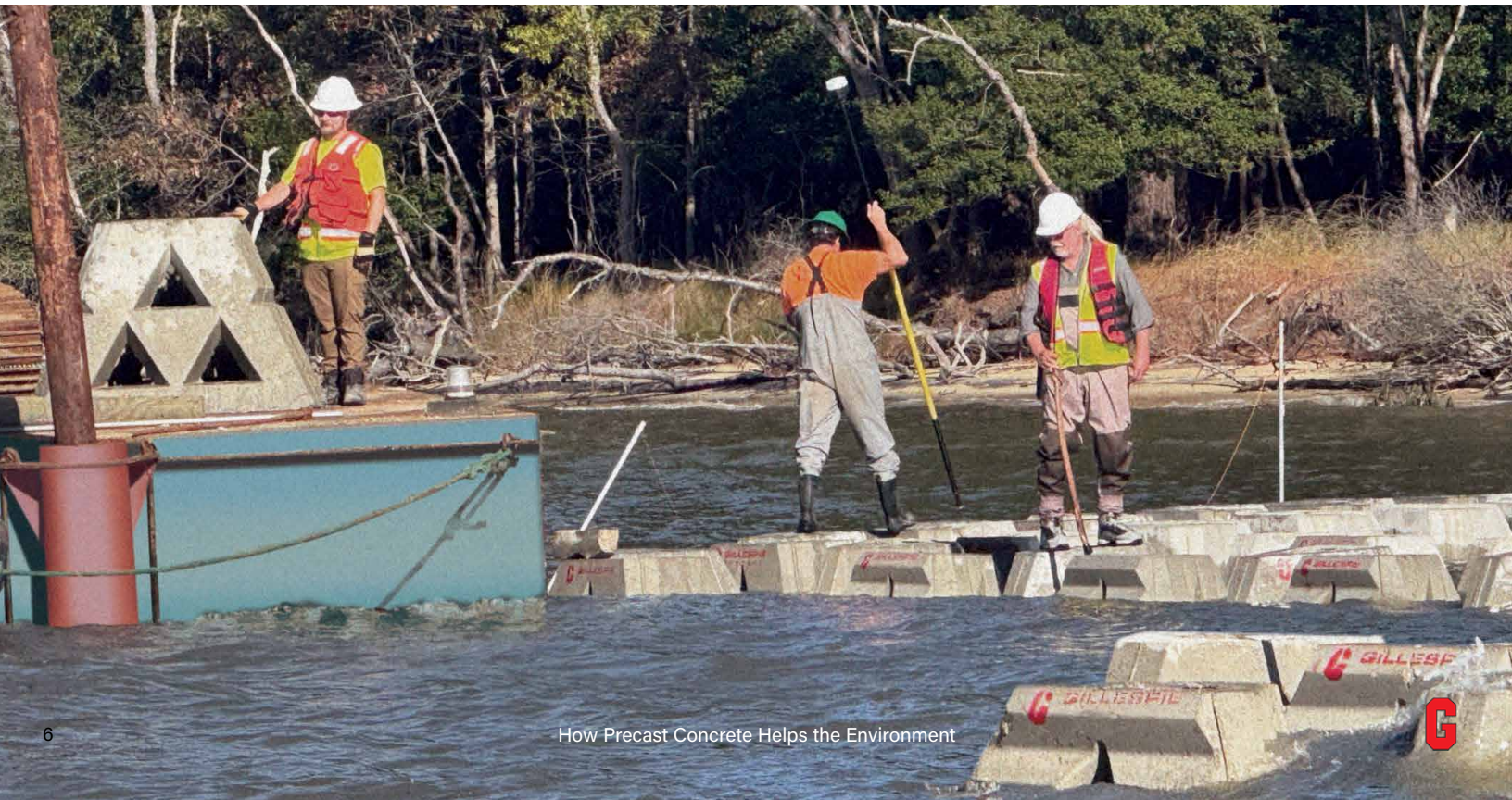
Project Overview

The Thompson Island Living Shoreline Project in Delaware incorporates large precast concrete wave attenuation devices designed to reduce wave energy and prevent shoreline erosion. Gillespie Precast manufactured the hollow, triangular (pyramidal) precast concrete units placed in the water, which are engineered to dissipate wave forces while remaining stable on the bay bottom.[13]

Environmental and Engineering Benefits



- **Erosion reduction:** Wave attenuation devices reduce the energy reaching the shoreline, protecting wetlands and adjacent upland habitat.[14]
- **Structural stability:** Each precast unit weighs approximately 2,600 pounds, allowing it to remain stable without anchoring under normal storm conditions.[15]
- Habitat development: Over time, marine organisms colonize the concrete surfaces, transforming the devices into functional reef habitat.[16]



Cross-Project Environmental Advantages of Precast Concrete

Across these projects, precast concrete provides consistent environmental benefits:

- Long-term durability reduces replacement and disturbance
- Hard substrate supports marine colonization
- Repurposing excess precast reduces industrial waste
- Modular design minimizes installation impacts

These attributes position precast concrete as both engineered infrastructure and environmental asset.

Engineering and Environmental Considerations

Effective use of precast concrete in marine environments requires attention to:

- Mix design for marine exposure
- Geometry and mass for hydrodynamic stability
- Placement accuracy and seabed conditions
- Long-term monitoring of biological and physical performance[17]

Conclusion

The projects described demonstrate that precast concrete can simultaneously meet engineering performance requirements and deliver measurable environmental benefits. From student-built reef balls to professionally engineered wave attenuation systems, precast solutions enhance habitat, improve water quality, and protect vulnerable shorelines while maintaining structural reliability.

Foot Notes

1. Maryland Department of Natural Resources. (2023). Maryland Artificial Reef Initiative.
2. Coastal Conservation Association of Maryland. (2023). Living Reef Action Campaign.
3. U.S. Environmental Protection Agency. (2022). Guidance for Artificial Reef Materials.
4. Ocean City Reef Foundation. (2025). Artificial Reef Development Overview.
5. Coastal Conservation Association of Maryland. (2023). Living Reef Action Campaign.
6. CCA Maryland. (2023). Reef Deployment Projects.
7. Ocean City Reef Foundation. (2025). Ecological Benefits of Artificial Reefs.
8. NOAA Fisheries. (2021). Oyster Reef Ecosystem Services.
9. Ocean City Reef Foundation. (2025). About the Reef Foundation.
10. Ocean City Reef Foundation. (2025). Artificial Reefs.
11. Town of Ocean City, MD. (2024). Ocean City Reef Project.
12. Ocean City Reef Foundation. (2025). Economic and Ecological Impacts.
13. Cape Gazette. (2024). Living Shoreline Construction Begins at Thompson Island.
14. Delaware Center for Inland Bays. (2024). Thompson Island Living Shoreline Project.
15. CoastTV. (2024). Wave Attenuation Devices Target Erosion at Thompson Island.
16. U.S. Environmental Protection Agency. (2022). Artificial Reef Materials Guidance.
17. Maryland Department of Natural Resources. (2023). Monitoring Artificial Reefs.

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Gillespie Precast LLC
PO Box 450
102 Brickyard Road
Chestertown, MD 21620
800.638.6884
www.gillespieprecast.com

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