

Gunderboom, Inc.

## We Solve Tough Environmental Problems



Gunderboom offers custom-engineered products that utilize AFB technology for your site.

Applications of our technology can:

- Provide Clean Water Act, Section 316(b) compliance solutions for water intakes
- Keep recreational beaches open by protecting them from bacterial contamination
- Assure surface water quality standards are met for drinking water supplies
- Facilitate Marine Mammal Protection Act permitting for noise-producing activities
- Enable pile driving, dredging and underwater construction projects to proceed.



Gunderboom, Inc.

In Partnership with Seventy Percent of the Earth

Northeast Office:  
2 White Sands Lane  
Scarborough, ME 04074  
Tel: 207/883-1777  
Fax: 207/883-3864  
E-mail: [mbrunner@gunderboom.com](mailto:mbrunner@gunderboom.com)



Gunderboom, Inc.

## Providing Engineered Solutions to Environmental Challenges

Project engineers, environmental regulators and Gunderboom clients have often identified various aspects of a possible Aquatic Filter Barrier application as potential fatal flaws or the environmental characteristics of the water body as unconquerable challenges.

Though there are, in fact, some challenges that cannot be met by Aquatic Filter Barrier technology, there are many more that have already been addressed or can be addressed with system engineering and design.

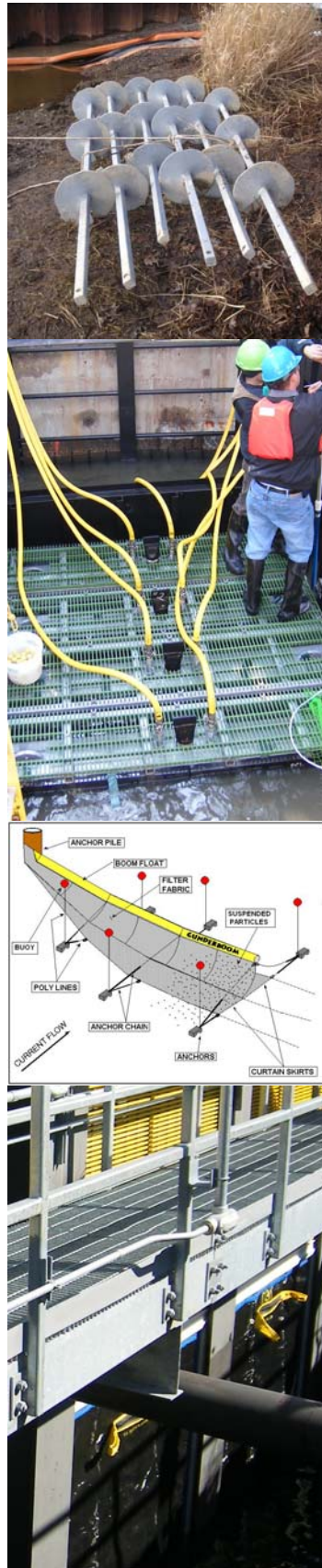
Here we provide some examples of challenges met, and the myriad ways in which they were met with engineering design.



Gunderboom, Inc.

In Partnership with Seventy Percent of the Earth

Northeast Office:  
2 White Sands Lane  
Scarborough, ME 04074  
Tel: 207/883-1777  
Fax: 207/883-3864  
E-mail: [mbrunner@gunderboom.com](mailto:mbrunner@gunderboom.com)



## Solutions for Regulatory Challenges

Innovative solutions very often do not have a precedence when it comes to regulatory considerations, and frequently new parameters need definition. We have worked with owners and agencies to help facilitate and accommodate the best balance of industry and nature through design.

Challenge	Solution	Examples
Regulatory concern for minimal footprint	AFB configuration; choice of system type; choice of anchoring type (use of in-sediment anchoring systems)	Taunton River Desalination Plant MLES (TRDP), Bethlehem Energy Center MLES (BEC)
Regulatory concern for habitat exclusion	Seasonal applications - "open period"; ability to reef fabric up to flotation, floating pool design for no sea floor impact	Lovett Generating Station MLES (Lovett), TRDP, New York City Waterfalls Intake Filter Pools (NYC Waterfalls)
Requirement for high rates of exclusion, including small life stages such as planktonic eggs and larvae	Fine-mesh fabrics with low velocity; specifically target exclusion size with laser perforations	Operational testing: Lovett, TRDP, Arthur Kill Generating Station Pilot Test; Laboratory Testing (Alden Laboratories)
"Impingement" of various life stages on the filter fabric	Extreme low approach velocities; cross currents or ejection away from curtain; AirBurst cleaning	Multiple Alden Laboratory Tests addressing survival

## Solutions for Site-Specific Challenges

No two locations or project sites are alike; we approach each potential application by initially assessing overall feasibility, then by identifying which parameters need more quantification and possible design innovation. We have modeled in laboratories, built pilot systems, worked through fatal flaw development series, improved existing systems, all to the benefit of today's existing products. Finding the solution is our business.

Challenge	Solution	Examples
Clogging or blinding of filter fabric by fine sediments	AirBurst Cleaning System; alternative fabrics (recent improvements in fabrics technology)	Lovett, TRDP, NYC Waterfalls, Alden AirBurst cleaning effectiveness tests
Ability to fully contain or exclude sediment contaminants	Full-depth systems; patented "Y"-Seal on the sea floor to prevent sediment migration on the bottom	Reservoir Protection Systems (Wachusett Lake, MA; Kensico Reservoir, NY); Beach Protection Systems
Ability to operate and filter in extreme high sediment loading conditions	Monitored parameters identify any need for more frequent AirBurst cleaning and automatically trigger cleaning cycles	Lovett, TRDP, Bayonne, NJ in situ AirBurst effectiveness testing (i.e., including cargo carrier and tugboat bottom disturbance event and recovery)
Periodic high debris loading	Strength of fabrics, strength of composite system, flexibility of fabric, design to minimize percentage of flow normal to currents transporting debris; AirBurst system operation; use of debris barriers or deflection devices	Lovett (leaves and submerged trees), TRDP seasonal debris
High currents	Configuration (oblique to flow); strength of system and anchoring	Lovett, NYC Waterfalls, TRDP, Highland Ave. Bridge Demolition Particulate Control System (Highland PCS)
Bi-directional flows	Design of AFB configuration, cross-sectional geometry and anchoring system to withstand and operate effectively with flows in different directions across the tidal cycle	Kachemak Bay PCS, Lovett, TRDP, Highland PCS, NYC Waterfalls, Contra Costa MLES design development

## Solutions for Operational Challenges

Forward-thinking design has always been part of our solutions, with contingencies and durability in mind. Owners benefit from the peace of mind gained by our operational and monitoring computer interface, redundant systems where required, and long-lasting, industrial strength components.

Challenge	Solution	Examples
Knowledge and assurance that a system is functioning as designed and excluding organisms	Environmental sensors to monitor loading and water level differential to see that the curtain is fully in place and parameters are within expected bounds and patterns; biological exclusion testing	Lovett, TRDP, BEC, Astoria
Requirement for efficient and effective operation for locations remote from the intake	Automated systems with sensor feedback and remote alarming and/or control	Lovett, TRDP, BEC, Astoria, Arthur Kill Pilot
Minimal operational requirements or maintenance	Systems with AirBurst: automatic cleaning cycles via control system; irregularities notified via alarms Systems with no AirBurst: passive containment systems; infrequent inspections	Lovett, TRDP, Highland PCS, Mamaroneck, Kensico, Wachusett
Seasonal operation	Design elements to facilitate either retrieval and redeployment or in-water storage in deactivated position, e.g. reefing, towing, zipper section connections	Lovett, TRDP
Concern for possible loss of exclusion	Complete, sealed system with custom-sized perforations achieves 100% exclusion. Any operational breaches can be detected by continuous monitoring and operational adjustments can be made to address.	Lovett, TRDP
Concern for possible failure and system components drawn into intake	Failsafe design; overtopping, redundancies	Lovett, TRDP
Longevity of systems	Strength and durability of fabrics, components, design and fabrication, composite system. Ability to exchange system parts with shorter life cycle while continuing utilization of longer life-cycle items	Lovett, TRDP, Mamaroneck, Kensico, Wachusett
Biological growth on fabric	Natural tendency of filter fabric to not foul; AirBurst System; fabric selection for the application	Kensico, Mamaroneck, Lovett, TRDP, Astoria, BEC, Test Samples at Arthur Kill, Contra Costa, Morro Bay MLES design development
Potential downtime for repairs or cleaning	Procedural systems for quick repairs, efficient in-water cleaning, replacement of interchangeable filter panels	Lovett, TRDP
Flow that is intermittent	Anchoring system account for both directions; Y-Skirt seal on the bottom	Lovett, TRDP
Significant changes in water levels	Cross sectional configuration design to accommodate high and low water levels	Lovett, TRDP, Mamaroneck Beach Protection System (Mamaroneck), Highland PCS, Astoria Generating Station Pilot (Astoria)

