



Clean clear water with a plan for long term stability and a thriving ecosystem.

Clean Waterways deploys high capacity environmentally safe filters which use bubbles to clean and oxygenate water.

These filters mechanically separate and extract most dissolved environmental pollutants including synthetic compounds (medicines, pesticides, and herbicides), oils, bacteria, and microalgae. Toxic nutrients and wastes are removed and the resulting cleaner, more oxygenated water promotes natural biology to further help break down sludge for extraction. The concentrated “skimmate” waste can be disposed of as municipal sewage or, if tested safe, can be used for other purposes such as to fertilize crops, grow mangroves, enrich lawns, etc.

This offers an ecologically friendly alternative to the most commonly practiced use of chemicals or strong radicals and removes excess toxic nutrients including nitrogen and phosphorus from dissolved in the environment while oxygenating the water.

Clean Waterways creates a plan for remediating water based on specific waterways by using baseline testing to identify sources of pollution, optimizing filters to water conditions, and working with you. For open water bodies, Clean Waterways can scale to intercept and process wastes and integrate long term systems to reignite sustainable ecology. The systems have been approved by DEP and coast guard but would be reconfirmed based on planning for specific projects.



For Marco island we believe a multi-pronged approach may create the most potent long term results. Multiple systems may be integrated to accommodate your goals and evolved over time to economize environmental remediation.

Preliminary options:

- **1000 gallon per minute protein skimmers (filters) strategically placed in Castaway Waterway, near Canine cove, and/or any other location deemed best for pilot testing with municipal partners.**
- **Paired with nanobubble injectors if needing higher efficiency (can be integrated after weeks/months of operation based on data).**
- **Dockside mini skimmer units deployed at residential and local commercial volunteering locations (quiet, easy to maintain). Creates local involvement, grassroots data, and scalability as well as multi point nutrient extraction and oxygenation “swarm” effects.**
- **Surface slick/oil skimming mini skimmer units stationed dockside at residential and local commercial volunteering locations. Similar to previous, interchangeable but ideal for marinas where petroleum products may “get loose”.**
- **In house total nitrogen, total phosphorus, total coliform/e.coli/enterococcus testing for heat mapping Marco Island sources of pollution and monitoring extraction efficacy and efficiency of waste over time.**
- **Computer monitored water chemistry parameter 24/7 stations. Recording pH, temperature, ORP, salinity, PAR, and dissolved oxygen. Can be deployed anywhere and monitored through cell data.**
- **Floating skimmer pontoon prototypes: Protein skimmer booms create a wall of bubbles with collecting trough at surface to remove skimmate. Highly efficient and economical. Not yet authorized for unmanned use but likely to be permitted with local municipal cooperation.**

Implementation:

Protein skimmers on average can remove about 50% of bacteria and chemicals and about 25% of total nitrogen and phosphorus per pass. Additionally, certain environments have unique conditions such as unforeseen chemistries that impact the water body (bodies). Finally, residential areas and logistically difficult to access water bodies may need considerations for space for the filters and noise produced by the filters. Clean waterways can design, deploy and evolve a plan for the remediation of Marco Island's waterways to fit a budget and logistical considerations. Initial deployments would be guided by city cooperation with ongoing optimisation based on regular testing results to maximize waste removal and guide the ecosystem remediation progress. We are happy to work with and train on site staff to economize and increase the efficiency and productivity of the filter units. A grass roots aspect to recruit residents, local business, and even student volunteers can greatly expand capacity and scope of deployment and data collection and potentially accelerate scaling where needed.

With our environmental scientists, our operations and deployment crew can meet and with municipal staff and experts explore Marco Island's goals, budgets, and timelines to come up with a custom plan for this community's aquatic remediation and restoration.

Estimates:

Total cost low range would start from \$30,000 to set up ~20 mini skimmer units and train residents over 3 months with weekly visits from our technicians to take water quality measurements and optimize waste disposal logistics.

Mid range could include a large protein skimmer base with a 24/7 monitoring computer, a few blockade prototypes deployed during the day, a chase boat for emergencies and occasional sampling, in-house testing corroborated with external testing, and 20 mini skimmer units for around \$150,000 first month and \$80,000 following months.

An all inclusive program could include 3 large skimmers, chase boat for ongoing sampling and local waterways physical debris cleanup, 6 x 24hr water quality monitoring stations, full pollution source “heat mapping” assessed before and ongoing during deployment using in-house testing corroborated with external testing, 50 mini skimmers/surface skimmers w/grassroots training and optimizing, on site and emergency on call staff capable of redeploying a skimmer to a spill area or identified hotspot, nanobubble injector integration if/where needed, and ongoing prototype deployment and optimisation, and expert lectures monthly to inform and entertain residents. This would be in total around \$500,000 for a 3 month pilot.

In all cases we are eager to work with city staff in planning, deployment, and ongoing phases. The goal is to remediate water bodies to a point where they maintain themselves with minimal additional human input. Long term small maintenance skimmers and nanobubble injectors may be recommended based on ongoing pollution locally and local staff and volunteers could be trained to manage these options. If economical long term, the city could invest initially or after pilot operations in mini skimmer and nano bubble units.

Background information and approximate alternative components and project costs:

Skimmers:

- Clarity doubled w/ majority of bacteria removed in 2 passes, single pass if using nanobubble injectors when microalgae is persistent.
- Nitrogen and phosphorus are reduced by a minimum of 10% and up to 80% with each pass.

*Toxic excess N and P are tied up differently in molecules/bacteria/algae between environments.

Setup and 1 month operation per skimmer 40K

3 month operation 90K

Option for nanobubble injectors:

- Injected into the environment near skimmers to compliment
- Destroy harmful blooms of suspended microalgae and bacteria priming for removal with skimmers
- Can be rotated for a few days a week between multiple skimmers
- Additional highly effective local oxygenation

*Initial setup based on skimmer performance with local water pollution composition

*Potential for initial investment or transfer of technology to city for permanence

Setup and 3 month operations 60K

Mini skimmer clusters:

- Deployed at the cities regard with options for private but accessible locations
- Bubble driven and pump/venturi driven formats depending on pollution
- Option for "S.O.P.E"s (surface oil and pollution extractor) assemblies for marinas and public areas with surface slicks
- Optionally purchased by the city or private citizens/companies for long term extraction
 - Deployment, waste disposal logistics, and initial training available

per cluster of 20 with training and 3 months weekly monitoring including limited water chemistry pollution mapping 30K

Water quality and pollutant tracking

- Daily or weekly batches of coliform(total/e.coli/enterococcus), total nitrogen, total phosphorus, turbidity, pH, ORP, Temperature, Salinity, dissolved oxygen, and plant available light (PAR)
- Tracks trends and finds point sources of pollution to direct mitigation strategies

*Would need to be added to other operations as we would not be setup for local monitoring without other infrastructure

Weekly set, 10 sites for 3 months, 15K

Daily set, 10 sites 1 month, 22k

24/7 monitoring using cell linked computers:

- Constant data streaming pH, ORP, Temperature, Salinity, dissolved oxygen, and plant available light (PAR) values
- Tracks trends and identifies patterns of water quality shifts (ideal for tidal water bodies to identify incoming pollution potential)

*Would need to be added to other operations as we would not be setup for local monitoring without other infrastructure

6 units for 3 months w/ emergency service on call 20K

Skimmer blockade prototypes:

- Would be tested initially free of charge alongside other operations and depending on efficacy could be scaled and integrated into mitigation and restoration efforts

*depending on constellation of options selected, integration of a chase boat for sampling, mini skimmer maintenance would be incorporated

*all data collected will be organized in shared drive format with the city submitted weekly in summary or promptly upon request to designated officials in a format agreed upon. It will not be shared externally.

Additional Details:

Clean Waterways operates with marine scientists and a marine veterinarian who work with operations and engineering staff to address environmental pollution using brand new technology. The patented equipment and process of protein skimming is unlike any other marine remediation available as it physically removes wastes dissolved in water without chemicals or radicals. Planning for a project can incorporate coordination with local government, grassroots groups, and student organizations. Clean Waterways can partner with municipalities to find available private or local/state/federal funding for research and remediation once a project is identified. Because some of the technology is patent pending and being developed and optimized, "such as the Skimmer blockade" units, available research funding for pilots with cities and researchers could be applied. Finally, Clean Waterways has a non-profit division which focuses on training and guiding high school aged students on water quality monitoring and reporting along with educating them about coastal water issues. This could be deployed and mobilized to any project for public involvement and data collection. We are happy to offer our array of services to help your waterways.

Thank you for your consideration,

For any additional questions or comments or to follow up with exploring a partnership, please contact our chief science officer:

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