A Guide to Selecting Pressure Washing Management Practices and Technologies

Supplement to the Massachusetts Clean Marina Guide

Massachusetts Office of Coastal Zone Management

November 2008

Acknowledgments

This document was produced by Tighe & Bond of Worcester, Massachusetts, for the Massachusetts Executive Office of Energy and Environmental Affairs, Office of Coastal Zone Management (CZM). We thank Marc Richards of Tighe & Bond for his diligent and thoughtful work on the project. Significant content and editorial contributions were made by Jay Baker and Robin Lacey of CZM. We would also like to thank the U.S. Environmental Protection Agency and the Massachusetts Department of Environmental Protection for their review and input. This publication is funded (in part) by a grant/cooperative agreement from the National Oceanic and Atmospheric Administration (NOAA; Award No. NA07NOS4190066). The views expressed herein are those of the author(s) and do not necessarily reflect the views of NOAA or any of its sub-agencies.

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I. Introduction

One of the most challenging environmental issues faced by Massachusetts boatyards, yacht clubs, and marinas today is the proper handling and disposal of pressure washwater. Contaminated washwater generated as a result of hull cleaning and maintenance activities may contain metals, oil and grease, and organic materials that can pollute the clean coastal waters and productive habitats on which the marina industry depends. As a result, a variety of laws and regulations have been enacted to limit the discharge of contaminants associated with pressure washing activities. These regulations can seem overwhelming. However, with careful planning and site assessment work, marina operators can devise and implement appropriate pressure washing practices that are both compliant with regulations and pose a minimal threat to coastal environments.

The Massachusetts Office of Coastal Zone Management (CZM) has developed this expanded guide on pressure washwater management for marinas, yacht clubs, and boatyards (collectively referred to as marinas) in coastal Massachusetts. The guide will help marina operators identify the most environmentally sensitive, cost-effective, and practical suite of pressure washing management practices for their facility, while ensuring that the operator is also aware of regulations relevant to pressure washing activities. While not all site-specific issues related to pressure washing can be addressed in this guide, the following chapters lay the groundwork for the evaluation of existing practices and the preliminary selection of an appropriate pressure washing system. In addition to a thorough review of this guide, we strongly encourage marina operators to review the additional resources identified on page 22, refer to the regulatory and technical assistance contacts provided, and work with a qualified consultant before selecting and implementing a final set of management practices and technologies.

The purpose of this guide is to:

- Summarize key reasons for managing pressure washwater.
- Interpret environmental regulations related to the handling and disposal of pressure washwater.
- Provide guidance on selecting appropriate technologies.
- Give specific examples of successful pressure washwater management approaches.

II. Why Manage Pressure Washwater?

There are many reasons marina operators should be concerned about pressure washwater management and disposal. The most important are:

- **Pressure washwater is contaminated:** Pressure washwater can contain a variety of pollutants including detergents, oil, and grease, as well as dissolved metals from antifouling paints. Ablative bottom paints, which are designed to slowly slough away from the hull, are particularly prone to contaminating washwater with toxic metals such as zinc, copper, and occasionally, lead. In addition, solids suspended in the washwater, such as paint chips and organic materials, can pollute ground and surface water and must be handled properly. While the type and level of contaminants will vary with the type and age of boats being washed, it is never okay to discharge washwater without a permit (see below).
- **Discharging without a permit is illegal:** Boat washwater is classified as an industrial waste under state regulations and as process wastewater under the federal Clean Water Act. Washwater cannot be discharged without a permit. Effective management is important to protect the environment, but also to avoid potential fines and negative publicity associated with non-compliance.

- **It will harm your bay or estuary:** As outlined in Section 2.2 of the *Massachusetts Clean Marina Guide*, the discharge of pollutants from boat maintenance activities can have severe and long-term impacts on the aquatic environment. Solids and dissolved metals contained in the pressure washwater can be toxic to marine life. In addition, improperly managed pressure washing operations can result in unsightly plumes that discolor natural waterways and stain natural features with bottom paint.

III. Fundamentals of Pressure Washwater Management

The simplest way to manage pressure washwater is to eliminate pressure washing activities altogether. However, if hull maintenance remains an important component of your business, you must collect the pressure washwater for proper disposal or recycling. Some key fundamentals of pressure washwater management include:

- **Collect all pressure washwater:** Your facility must prevent washwater from entering coastal waters or the ground and causing environmental damage. It is illegal to discharge any pressure washwater to the ground, sewer, or coastal waters without a permit, and discharge to a septic system is always prohibited.

- **Minimize washwater generation:** The less water used for pressure washing, the less costly it is to collect, treat, and dispose of the wastewater. Using high pressure, low volume cleaning systems can maximize cleaning power while reducing washwater generation. Recycling the washwater, as outlined in Section IV and V of this guide, can save money as well. In addition, storing less washwater at your business will minimize the negative impacts an accidental discharge could have on the surrounding coastal environment.
- **Segregate washwater from stormwater:** Pressure washwater should never be discharged to stormwater collection systems and outfalls, including on-site catch basins, culverts, and drainage swales. Co-mingling (combining) stormwater discharges with non-stormwater sources is prohibited by the U.S. Environmental Protection Agency (EPA) Stormwater Multi Sector General Permit—a permit required by most facilities. (See Section 4.12 of the *Massachusetts Clean Marina Guide*.)
- **Keep detergents, oils, grease, and solids out of the waste stream:** Avoid using detergents and soaps when pressure washing. Use of detergents makes it significantly more difficult and costly to treat the washwater for disposal or recycling. Likewise, bilge waste and other sources of oils or grease should be collected and stored separately so that they do not further contaminate the washwater. Washwater contaminated by oils or grease must be managed as hazardous waste.
- **Switch to non-ablative paints:** By design, ablative paints peel away from the hulls of boats and are more likely than "hard" paints to contaminate washwater. Use of non-ablative paints may reduce the amount of washwater treatment required before disposal or reuse.
- **Identify the final destination and disposal methods of washwater and solids:** It is important to know how washwater and residual solids will be removed from your marina before pressure washing occurs. Marina operators must ensure that pressure washwater and residual solids are properly handled and disposed of once they leave the marina.

IV. Disposal of Pressure Washwater and Solid Residuals

"I have always discharged my washwater to the ground or waterways. Why can I no longer do this?" This is a common question posed by marina operators who discharge pressure washwater to the ground, stormwater drains, septic systems, sewer connections, or directly to waterways. Regulations regarding pressure washwater have been in place for over 30 years. Some common discharge practices are specifically prohibited, while others require permitting from EPA, the Massachusetts Department of Environmental Protection (MassDEP), and/or local sewer authorities. The following pages describe a variety of washwater handling and discharge options that are available to marina operators.

Recycling

Recycling and reuse of pressure washwater is a viable option for eliminating the discharge of wastewater. Advantages of recycling include conserving clean water and minimizing the cost of pressure washwater disposal. Although the washwater will require treatment to remove solids, metals, and other contaminants before reuse, recycling can be an effective way to manage washwater and minimize waste. See Page 9 of this guide for more information on recycling options.

Collection for Off-Site Shipment

A simple option for washwater disposal is to collect the water in a holding tank for off-site shipment. This option may be very effective for small facilities with limited pressure washing activities. Marinas must follow Massachusetts regulations regarding the design and operation of industrial wastewater holding tanks and the shipment of the waste. All industrial wastewater holding tanks must be certified with MassDEP (see Page 11 in this guide for more details on holding tanks), and records of the volume of washwater generated as well as the transporter's information must be maintained.

If your marina generates and collects pressure washwater for off-site shipment, the wastewater must be analyzed to determine the appropriate disposal method. For typical pressure washwater, this analysis should minimally include a test for hazardous metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) and petroleum hydrocarbons (benzene). Check with your hauler for detailed analytical standards. Depending on the level of contaminants, collected wastewater can be taken away by a standard septic hauler or, if necessary, a licensed hazardous waste hauler. Note that if you are connected to a sanitary sewer, and the local waste treatment plant is willing to take the waste, you must dispose of wastewater through the sewer system (see below). See Section VI for more information on identifying appropriate disposal options.

Keep in mind that the generator of the waste (the marina) is responsible for the proper disposal of waste products no matter who is hauling them away. Make sure you know whether your waste is considered hazardous, as well as the types of materials your hauler is licensed to transport before you finalize your disposal plan. Additional information regarding the hazardous waste regulations is presented in Section 4.10 of the *Massachusetts Clean Marina Guide.*

Discharge to Sewer

Another pressure washwater disposal option is to discharge wastewater to a sanitary sewer. To determine whether this is a viable option, marina operators must contact their local sewer authority and obtain discharge standards and potential permit requirements. Depending on the volume and characteristics of the discharge MassDEP may also require the marina to obtain a connection and

discharge permit. The local sewer authority will help you make this determination. Permits will likely require periodic monitoring of the discharge in order to ensure that treatment standards are being met. These standards are typically set forth in a local sewer ordinance or an industrial pre-treatment program. Because the waste will receive additional treatment at the local sewage plant, these standards are often less restrictive than those set by the EPA for a direct discharge to surface waters.

To meet permit conditions, marinas will likely have to treat washwater before discharging, including removal of large solids that may clog the sewer system. If advanced treatment is required, the treatment system may need to be graded by MassDEP, and marina staff members designated to operate the treatment facility will likely need to be certified by the state. Depending on the type and level of treatment necessary, additional requirements regarding operator training, staffing, monitoring, sludge control, and safety may apply. (See Table 1 on page 13 for more information on local and state sewer authority discharge requirements.)

Discharge to Surface Water (Not Recommended)

Discharge of pressure washwater to a river, estuary, or other surface water body requires a number of state, federal, and often, local permits. Surface water discharge of washwater is regulated by EPA under the National Pollutant Discharge Elimination System (NPDES). MassDEP must also certify that the discharge of wastewater does not violate state water quality standards. The permitting process can be complex, and the permits require marinas to meet strict discharge limits that can only be achieved by installing costly treatment systems, implementing extensive discharge testing programs, and utilizing certified wastewater operators. Discharging to surface water is generally not considered practical for marinas.

Discharge to Groundwater (Not Recommended)

Discharging washwater directly to the ground or into dry wells also requires a permit, and discharging washwater to a septic system is prohibited. MassDEP has an established program to oversee pollutant discharges to groundwater in Massachusetts. Facilities must meet specific groundwater quality standards set by the program and, when necessary, install treatment systems to meet these standards. Much like the discharge of washwater to surface waters, the permitting process for discharging to groundwater can be complex. Sufficient treatment levels will require a certified wastewater operator and the treatment goals are very stringent and costly. Discharging to groundwater is generally not considered feasible for marinas.

Disposal of Solids

Pressure washing operations will produce solids (residuals) such as paint chips, biological materials, and other waste. These materials can be separated from the washwater, dried, and disposed of as regular solid waste, provided that they meet the following three criteria:

1) The residuals are tested and determined to be non-hazardous waste. For boat washing residuals, toxic metals or oils and grease in the solids may make them hazardous. The test that determines whether residuals are hazardous is called a Toxicity Characteristic Leaching Procedure (TCLP). A TCLP test determines if any hazardous materials will leach out of the solids if they are disposed of in a landfill. Minimally, a representative sample of the residual solids should be analyzed for the following (numbers in parentheses indicate hazardous waste thresholds in parts per million): arsenic (5.0), barium (100.0), cadmium (1.0), chromium (5.0), lead (5.0), mercury (0.2), selenium (1.0), and silver (5.0); and the petroleum hydrocarbon constituent benzene (0.5). If testing finds that any of these constituents are above the limit, then the batch of residual is considered hazardous and must be disposed of as such.

2) The boat washing residuals are dewatered (dried) such that they will pass a paint filter test. This test is a simple procedure where residuals are placed within a paint filter (available at any paint store) for five minutes. If any liquids drip through the filter during this period, the residuals must be further dewatered and retested for dryness. For more information see the specifications for EPA Method 9095A: Paint Filter Liquids Test at www.epa.gov/sw-846/pdfs/9095b.pdf.

3) The boat washing residuals are mixed with additional, non-hazardous, solid waste at a ratio of 1 to 3 prior to disposal. For example, 1 gallon of solid boat washing residuals could be mixed with 3 gallons of sawdust and disposed of in a dumpster (provided that conditions one and two have been met).

Any chemicals, filters, or other waste associated with pressure washing activities or treatment processes must also meet the above criteria. Generally, boat washing residuals are not found to be hazardous, though, in some cases, they have been shown to contain elevated levels of heavy metals such as lead. Testing of boat washing residuals at least once during the pressure washing season is recommended to determine whether they contain any hazardous waste. Keep in mind, however, that you are always responsible for the proper disposal of your waste, so if you are unsure about the contents of your boat washing residuals, test them! Test solid waste following any changes in pressure washing practices, such as the addition of new treatment chemicals or the washing of boat hulls treated with new types of bottom paints.

Based on the options and environmental regulations outlined above, the best methods for the handling and disposal of pressure washwater at a marina include: 1) eliminating pressure washing activities 2) on-site recycling 3) on-site containment for off-site shipment, or 4) on-site treatment for discharge to sewer. Marinas should take advantage of the resources outlined in Section VII of this guide, contact their local sewer authority, and obtain assistance from CZM or a qualified environmental consultant to obtain information on the latest requirements and regulations.

V. Key Elements of a Pressure Washwater Management System

Clearly, managing pressure washwater requires careful planning. Marina operators need to be aware of technologies available for the collection, treatment, and disposal of washwater. This section outlines typical system components for pressure washwater collection and treatment, as well as criteria that can be used to select an appropriate system. Typical system components are summarized below.

Washwater Collection Pad

All pressure washwater that comes into contact with a boat hull is considered industrial waste or process wastewater and must be collected. The collection system should be designed so that washwater and overspray are collected and kept separate from stormwater, surface water, and groundwater. Marinas should also control the types of pollutants that may enter the washwater by implementing Best Management Practices (BMPs) discussed throughout the *Massachusetts Clean Marina Guide*. Example BMPs include preventing bilge water from entering the collection system, collecting larger solids such as paint chips and marine growth, and preventing boat maintenance work on the collection pads to reduce the risk of accidental spills and unwanted contamination of the collection system.

The design of collection systems will vary greatly depending on the size and layout of the marina, the size and number of boats washed, and pressure washing practices. Collection pads are typically constructed of concrete, asphalt, or for a temporary washing station, a removable rubber or plastic membrane. The washwater generated is collected and conveyed to a holding tank or treatment area. Vertical aprons or curtains can be used to help direct overspray to the collection area. The wash pad is typically sloped so that the washwater drains by gravity into a trench drain or a central sump located

below the pad. Berms may be installed on one or more sides to help direct or contain the washwater flow.

It is important to prevent larger solids from entering the drain or sump. This can be achieved by regularly sweeping dry solids and residue from the collection pad prior to pressure washing or by installing filters or screens at the inlets to the collection drain or trench. Prior to pressure washing, loose debris can be manually removed from the hull to avoid clogging of the collection trench or sump. Reducing the quantity of water used is also important, and can be achieved by using a high pressure/low volume power washer.

It is also critical to design a system that keeps the washwater completely separate from stormwater. Once stormwater comes into contact with pressure washwater, the waste stream is considered a potentially contaminated process wastewater and must be handled as such. Segregation of the wastes can be achieved by: 1) covering the collection grate when the pad is not in use and providing a means to pump out or drain accumulated stormwater, 2) covering the collection pad with temporary tenting or permanent roofing, or 3) installing a bypass valve that directs stormwater to the storm drainage system or stormwater outfall. The bypass valve should be opened only when the collection pad is not in use, and completely free of pressure washing residue.

Wash pads may include the following components:

- Concrete pad situated near an existing travel lift that is equipped with a center trench drain. Boats and travel lifts can be extremely heavy, so the wash pads must be designed to handle this weight.
- Temporary curtains surrounding the boat washing area that direct overspray to the wash pad for treatment.
- Catch basin structure within paved areas that can be isolated from the stormwater system via diversion valves that direct washwater to a collection point. (**Please Note:** The use of bypass valves requires strict adherence to proper operating procedures. Operators must ensure proper containment of pollutants, including complete removal of all washwater and solids prior to the use of the drainage structure for stormwater collection and discharge. Failure to segregate stormwater and pressure washwater may result in significant penalties.)
- Temporary impervious groundcovers, such as heavy rubber membranes, equipped with a center or down gradient sump and pump for the removal of washwater. (These temporary wash pads can be used if space is at a premium and pressure washing activities are limited, or in cases where a facility is planning, but has not yet constructed, a permanent wash pad.)

- Piping system (including any necessary pumps) to transfer washwater to settling chambers, treatment systems, recycling systems, and/or sewer discharge connections.
- Optional piping to provide flexibility for expansion or change-over from sewer discharge to closed-loop recirculation/recycling.

Note that if the wash pad is constructed within 100 feet of a wetland or water body, a Notice of Intent must be filed with the local Conservation Commission to ensure that the construction process and the pad itself conform to regulations associated with the Massachusetts Wetland Protection Act and relevant local by-laws or ordinances (http://www.mass.gov/dep/water/resources/protwet.htm).

Recycling and On-site Treatment Systems

A variety of systems are available to treat pressure washwater so that it can be discharged to the sewer or reused in the pressure washing process. For discharge to the sewer, the goal is to remove pollutants so that the discharge meets the limits required by the sewer discharge permit. For a recycling system, the goal is to remove pollutants so that the recycled water can effectively clean the hulls and not clog the pressure washing system. Some additional treatment for organics may be required to control odors that can build up in the recycled water and to protect pressure wash operators from harmful dissolved contaminants. An advantage of using a recycling system is that it reduces the total volume of water needed for pressure washing and minimizes the volume of waste that would need to be disposed of off-site and/or discharged to the sewer. For either option, the overall purpose of the treatment is to reduce solids, heavy metals, oils, and grease from the pressure washwater.

Many treatment systems, including those for both recycling and discharge to sewer, may incorporate a variety of processes and technologies, some of which are listed below:

- **Oil and grit removal:** For washwater with suspended solids and/or oil, a combination grit chamber and oil trap can be used. This type of system is commonly required by municipalities as one component of a pretreatment system for discharges to sanitary sewers. The grit chamber/oil trap is typically an underground concrete tank or sump with baffles that allows larger particulates such as grit, marine growth, and paint chips to settle to the tank bottom while oils or sheen float to the tank top. The accumulated solids and oils are periodically analyzed and removed for off-site disposal. After grit and oil are removed, the washwater can be sent to subsequent advanced treatment systems to remove dissolved metals and other pollutants, or discharged to the sewer (if it meets discharge standards). Note that grit removal alone may not meet specific discharge limits established by the receiving wastewater treatment facility.
- **Electro-coagulation:** Electro-coagulation is a technology that neutralizes charged particles in solution (including metals, detergents, and petroleum) so they can be settled or filtered from

washwater. Package systems that are easy to operate and maintain are available from a variety of vendors. The advantage of electro-coagulation is that there are typically no filters or separation chemicals required, so daily maintenance is not typically needed. Many types of contaminants, such as emulsified oil and grease, metals, and suspended solids can be removed simultaneously from washwater through this process.

- **Chemical treatment:** Chemical treatment can be used to remove emulsified oil and grease, small particles, and metals. Chemical treatment requires the periodic addition of compounds designed to settle undesirable materials out of the wastewater and is an excellent way to remove particulates. However, its success relies on maintaining specific pH levels and temperatures and proper chemical dosing. For optimal performance, the equipment must be well maintained and operators must be properly trained.
- **Mechanical filtration:** Mechanical filtration can be used to remove solid particles of varying sizes from washwater as well as emulsified oil, grease, and metals. Mechanical filtration encompasses a variety of technologies including reverse osmosis, ultrafiltration, and microfiltration. Generally speaking, technologies that remove the smallest particles (and molecules) are more costly and maintenance intensive. Pretreatment to remove larger organic and solid particles may be required, and careful system operation and maintenance is necessary to prolong the life of the filters.

Note that many if not most treatment systems will include a combination of these technologies. For example, a system might use an oil/grit separator to settle large particles, chemical treatment to consolidate fine particles and dissolved metals, and mechanical filtration to remove the remaining solid waste. As with any technology, effective primary treatment to remove large solids such as paint chips and marine growth will provide for more successful treatment and fewer operation and maintenance problems.

Holding Tanks

The best option for a small marina may be collection, storage, and off-site disposal of washwater. Holding tanks may be either above or below ground. Tanks should be sized to accommodate the anticipated washwater volume and designed to allow for routine pump-out by a vacuum truck. Industrial wastewater holding tanks must be certified by MassDEP, and there are specific design and operation criteria that must be followed. A fact sheet on industrial wastewater holding tanks can be found at www.mass.gov/dep/water/laws/factsht.htm.

Employee Training

Employee training is an important component of any collection or treatment system. The practices recommended here will likely require a change in your marina operations. Staff should be trained to

conduct pressure washing operations in a new way to ensure that pollutants do not enter coastal waters, the ground, or any stormwater system. If you choose to install a treatment system, your staff should be trained by the system manufacturer on the proper operation and maintenance protocol. This training should occur on an annual basis and for any new staff.

VI. System Selection

Selection of an appropriate pressure washwater management system requires careful planning. Marina operators must have a basic understanding of the technologies available for managing wastewater, as well as the constraints and needs of their marina. Selection of an appropriate pressure washwater management system should be based on:

- Quantity and quality of washwater generated.
- Space and surface conditions of the boat washing area.
- Availability of trained staff.
- Access to a sewer connection.
- Discharge permit conditions.
- Water conservation objectives.
- Cost and frequency of operation and maintenance.

As outlined in Section IV of this guide, the best options for pressure washwater management include: 1) eliminating pressure washing activities 2) on-site recycling 3) on-site containment for off-site shipment, or 4) on-site treatment for discharge to sewer. The selection and design of a pressure washing system should always begin with the collection of site-specific information and an evaluation of all pressure washing options, as outlined below.

Doing Your Homework

An essential first step in determining a marina's best washwater management option is the collection of site-specific information. This information can be used to help marina operators determine the most appropriate and cost-effective option. Table 1: Doing your homework, on Page 13 outlines the key pieces of information a marina operator will need to gather before selecting a pressure washing system.

Determining Feasibility and Making a Decision

Once site-specific information is gathered, the marina operator can determine the feasibility of various washwater management options. The feasibility of each washwater management option is largely

dependent on cost, which may include permitting, design, equipment, monitoring, waste disposal, and staffing. Before selecting the best option for your marina, a limited feasibility analysis should be conducted that evaluates the pros and cons of each option, including the associated costs. Table 2, on Page 15 summarizes the major system components, cost factors, and pros and cons of the various pressure washwater management options. To assist in the final decision-making process, additional resources are included at the end of this guide. In addition, a qualified contractor or consultant can be very helpful in selecting and designing pressure washing systems.

Table 1. Doing your homework. Basic information required to select an appropriate pressure washwater management system.

What Is Needed?	Why Is It Needed?	How It Is Obtained?
Location, size, and condition of existing and proposed pressure washing and collection areas	• To determine whether adequate space is available for pressure washing • To determine whether the pressure washing area needs to be relocated or resized to implement the desired washwater management system • To identify pervious surfaces that will require paving, berming, and/or covering to eliminate groundwater discharge • To identify necessary retrofits to existing wash pads. such as berming or separation from the stormwater system • To assess the structural integrity of the wash pad, especially where traversed by travel lifts	• Conduct a site walk • Evaluate surface topography (slopes, level) • Review existing property survey plans • Obtain new property survey for future design work • Obtain boat size information to ensure adequate wash pad length and width
Location of existing utilities including water, electrical, and stormwater collection	• To identify potential sewer discharge locations • To ensure segregation of washwater from stormwater • To determine whether new utilities are required • To determine whether new catch basins or drains are necessary • To identify utilities that must be moved prior to new construction	• Review existing site designs/plans • Contact local sewer authority • Conduct a site walk • Review existing property survey plans
Anticipated volume of washwater including gallons per day, peak discharge, and seasonal total	• To determine whether a holding tank is feasible • To determine appropriate size and type of treatment units	• Estimate the number and types/sizes of boats washed per day • Identify nozzle flow rates to determine pressure wash system capacity/volume generated
Dates of pressure washing activities	• To determine whether discharge times and durations may be restricted by the local sewer authority • To determine appropriate size of pump stations and connections under peak flow conditions	• Evaluate past pressure washing practices • Evaluate flexibility in timing of pressure washing • Contact local sewer authority for restraints on times and volume of discharge

Table 1. (continued)

What Is Needed?	Why Is It Needed?	How It Is Obtained?
Washwater quality	• To ensure that discharge requirements are met by selected treatment practices • To determine whether additional BMPs may be needed to control washwater quality for selected management option	• Perform chemical analysis of representative samples using a MassDEP certified laboratory (see Section IX) • Determine the number and type of hulls that are treated with ablative vs. non-ablative paint • Observe work practices to determine whether oil and grease, antifreeze, or other chemicals enter the washwater stream • Review washwater discharge characteristics of similar operations
Local and state sewer authority discharge requirements	• To determine whether treatment may be required prior to discharge • To determine whether permits are required for discharge • To identify treatment objectives and limits • To identify staffing needs and whether certified wastewater operator may be required	• Contact local sewer authority • Contact MassDEP to determine whether a permit or certification for the discharge is applicable: John.Reinhardt@state.ma.us (617) 292-5667 or Mingyuan.Pan@state.ma.us (617)292-5503 • Contact MassDEP staff to determine operator certification requirements for the proposed pretreatment system: Thomas.Bienkiewicz@state.ma.us (508) 767-2781
Current pressure wash techniques	• To determine whether chemicals that would require additional treatment are used during pressure washing • To identify opportunities to reduce washwater volume and chemical use • To identify opportunities to reduce solids in washwater • To identify other pollutants going into the waste stream, such as oils, grease, anti-freeze, and ablative paints	• Interview marina employees involved in pressure washing • Observe practices • Identify the number of boats coated with ablative paints

Table 2. Pros and cons of various pressure washwater management options.

Management Option	System Components	Associated Costs	Pros and Cons
Do not offer pressure washing service	• None	• Hull maintenance performed using manual methods is more expensive • Potential loss of business to neighboring marinas	PROS: • Zero discharge • No new design or construction costs for washwater collection and treatment CONS: • The increased cost of "dry" hull maintenance • Increased time to perform routine hull maintenance • Potential loss of business to marinas with pressure wash collection and treatment systems
On-Site recycling	• Collection pad and overspray apron • Transfer pumps, valves, and piping • Above or underground storage tank for solids separation and storage of washwater • Washwater treatment system (above or below ground)	• Wash pad, collection system, and treatment system design • Tank, pumps, and treatment system • Construction permits • Construction of pad and equipment installation • Utility connections • Operation and maintenance of treatment system • Testing and disposal cost for solids or residue build-up left from recycling treatment system • Employee training	PROS: • Reduces water demand and water use costs • Cost effective for mid-sized to large pressure washing operations • Eliminates/minimizes discharge • No discharge permit necessary if residual is shipped off-site • Vendor supplied package systems are available CONS: • More expensive to construct than a simple collection and holding system • May need to haul some wastewater at the end of each season • Equipment operation and maintenance requires training and annual expense • Odor build-up can occur without proper management

Table 2. (continued)

Management Option	System Components	Associated Costs	Pros and Cons
On-site storage for off-site disposal	• Collection pad • Transfer pumps, valves, and piping • Solids separation (manual collection, filtering, or gravity systems) • Above or underground storage tank for solids separation and storage of washwater to be recycled	• Design • MassDEP Industrial Wastewater Holding Tank Certification • Tank and pumps • Construction of permanent pad or purchase of temporary pad • Disposal costs of washwater and/or solids • Testing of liquid and solid waste for hazardous materials determination	PROS: • Cost effective for small pressure washing operations • Simple to implement and operate • No on-site treatment required • No discharge permitting or treatment operations • Low design/equipment cost CONS: • Off-site costs to manage waste may be prohibitive for larger volumes, especially if septic hauler is not allowed • Buildup of wastes and contaminants may trigger hazardous waste thresholds, resulting in increased disposal costs • Odor build-up can occur over time
Discharge to sewer	• Collection pad • Transfer pumps, valves, and piping • Above or underground storage tank for solids separation and storage of washwater • Treatment system (above or below ground) used to perform additional treatment of suspended solids, dissolved metals, and/or oils and grease	• Design • Tank, pumps, and treatment system • Construction of pad and permits • Miscellaneous utility connections • Local sewer discharge permit • State sewer connection permit or certification • Monitoring • Operation and maintenance of system • Operator staffing and training costs • Testing and disposal cost for solids or residue left from treatment system	PROS: • Cost effective for large pressure washing operations • Save on off-site disposal costs • Some sewer authorities have simplified the permitting process and have minimal treatment requirements • Vendor supplied package treatment systems are available CONS: • Most systems require operator training and certification • Permits are required and some authorities have strict discharge limitations or may not allow discharge at all • Facility is subject to penalty by sewer authority if there is an exceedance of a discharge limit • Can be expensive if multiple-stage treatment is required • Equipment requires regular maintenance

VII. Case Examples

Massachusetts marinas have addressed pressure washing management issues in a variety of ways. The following are examples of several approaches to handling pressure washwater that minimize or eliminate pressure washwater discharge and fully comply with state, federal, and local regulations.

Treatment and Discharge to Sewer - Cape Yachts, Dartmouth, MA

As part of the recent relocation of Cape Yachts to Dartmouth, they installed a pressure washwater collection and treatment system that discharges to the local sewer. Cape Yachts estimates that approximately 350 boats will be washed per season, generating about 18,000 gallons of washwater per year. The treatment system includes a reinforced concrete pad designed and sized to handle heavy boats. The pad contains a center trench drain for collection of the washwater. Large particles, paint chips, and biological growth settle on the wash pad or in the trench drain. The trench drain flows into a grit chamber for settling of solids. Washwater then discharges to the sewer. After pressure washing is complete and the wash pad and trench drain are completely cleaned, a diversion chamber and valve is used to divert rainfall to the stormwater system. The operation of this system does not require a Graded Wastewater Operator because the only treatment being performed is grit chamber settling. This case example demonstrates the simplest scenario for a system that discharges to a local sewer. Although not currently requested of this marina, it is likely that a discharge monitoring program would be established for similar discharges to a local sewer. To address estimated future demand, the system is equipped with piping that will allow for the installation of a recycling system. Approximate costs are as follows:

Treatment System Cost	NA
New Wash Pad	$25,000
Settling Tanks, Manholes	$12,000
Design	$15,000
Operation and Maintenance	Negligible
Total	**$52,000**

Closed Loop Recycling - Arey's Pond Boatyard, Orleans, MA

Arey's Pond Boatyard installed a closed-loop recycling washwater system at its inland storage facility. Arey's Pond Boatyard washes about 120 small boats annually and the marina staff estimates that this generates about 3,750 gallons of washwater per year, most of which is recycled. This system allows Arey's Pond to move much of its boat washing inland, away from the water. The system includes a new wash pad with a settling chamber for collection of the raw washwater. Large particles, paint chips, and biological growth settle on the wash pad or in the chamber. Washwater then flows into a large MassDEP-certified double-walled underground tank, where smaller solids settle out of suspension. Washwater is then transferred to the treatment system. The system, manufactured by RGF Environmental Systems, Inc., is a physical treatment system. Wastewater passes through multiple filters and an ultraviolet (UV) light/ozone chamber for odor control. Treated water then goes back out to the pressure washer. When the pressure washer is not in use, the recycled water is recirculated through the UV/ozone chamber for additional odor control.

This system is a closed-loop recycling system, and therefore requires no discharge permits. A licensed hauler must periodically remove residual washwater with high pollutant concentrations.

Approximate costs are as follows:

Treatment System Cost	$14,400
New Wash pads	$4,000
Settling Tanks	$8,500
Plumbing & Electrical	$4,000
Engineering	$5,775
Operation and Maintenance	$500 to $1,000/yr (filters, sampling, minor repairs)
Total	**$37,675**

Closed Loop Recycling - Concordia Boatyard, Dartmouth, MA

Concordia Boatyard installed a temporary closed-loop recycling washwater system prior to their proposed marina relocation. This case example demonstrates that economical solutions are available for washwater management. Concordia washes about 250 boats per season and the marina staff estimates that this generates about 12,000 gallons

of washwater per year, most of which is recycled. The system included a temporary collection pad constructed of a heavy rubber membrane equipped with a center sump to collect washwater. Collected washwater was transferred through an on-site treatment system to remove solids, oil, and grease. No storage tanks were installed as washwater was directly transferred to the treatment system and back to the power washer. As with the previous example, this system was a closed-loop recycling system, and therefore required no discharge permits. Approximate costs were as follows:

Treatment System Cost	$10,000
New Wash Pads/Membranes	$2,500
Settling Tanks	NA
Plumbing & Electrical	NA
Engineering	$5,000
Operation and Maintenance	$500/yr (estimated)
Total	**$ 18,000**

Closed Loop Recycling - Merri-Mar Yacht Basin, Newburyport, MA

In 2007, the Merri-Mar Yacht Basin installed a new collection apron and closed-loop recycling treatment system, which will be used to wash about 130-150 boats per year, with an average length of 35 feet.

Merri-Mar's system, designed and manufactured by EBI Consulting (EBI), employs chemical and physical treatment solutions and includes: a concrete wash pad to collect washwater, a chemical reactor tank, reusable filter media, and a treated water collection tank. The wash pad includes a trench drain designed to direct wastewater and solids to a small collection sump where they are automatically transferred to the treatment system. At the end of each day, both the collection apron and trench are pressure washed so that solids are transferred to the sump to be treated and filtered. Larger solids can be removed directly from the trench. The collection sump is equipped with a removable plug that is installed prior to boat washing and is removed after the trench and sump have been cleaned. This ensures that stormwater is not collected, which would increase treatment costs, and that no pressure washwater is discharged to the stormwater system.

This is a batch treatment system. Once 450-500 gallons (13-15 boats) of wastewater have been collected, a treatment chemical is added, which coagulates solids in the washwater, allowing them to settle. The solution is mixed for 10-15 minutes and allowed to settle for an additional 15 minutes. The treated wastewater is then

pumped through a series of filter cloths (20-30 minutes) and collected in a holding tank for reuse as pressure washwater.

The filter chamber cloths are reusable with a life expectancy of 4-5 years. The solids that are recovered are 25-35 percent solid by volume with no free liquid and will pass a paint filter test. In 2007, Merri-Mar generated enough filtered solids to fill ¾ of a 55 gallon drum. Solids were tested and determined to be disposable as a non-regulated solid waste material.

The treated washwater is clear and solids free, and it is aerated to control odor and evaporate organic compounds. A pump continuously recirculates the treated water until needed by the pressure washer. No delays in the pressure washing operations were reported during the fall 2007 hauling season. Finally, the system is closed-loop and does not require any discharge permits or licensed operators to manage the system.

Approximate costs are as follows:

Treatment System Including Wash Pad	$60,000
Annual Chemical	$400
Operation and Maintenance	Negligible
Total	**$60,400**

VIII. Where Do I Get More Help?

Multiple resources are available to help assist with washwater management. Marinas should remember that options and solutions for washwater management are dependent on your individual business and location. Some feasibility planning should always be considered before making decisions. Help is available to marinas from CZM, MassDEP, EPA, environmental consultants, and local sewer authorities. Contacts for many agencies are included in the *Massachusetts Clean Marina Guide*. Resources and treatment vendors can be located via links from many agency websites. Some initial helpful contacts are included below. For the most current list of contacts, please visit www.mass.gov/czm/marinas/pressurewashing.

CZM for general marina technical assistance

- Robin Lacey: robin.lacey@state.ma.us or (617) 626-1220
- Jay Baker: jason.baker@state.ma.us or (617) 626-1204

MassDEP for wastewater and solid waste regulations, holding tank certifications, and operator requirements

- John Reinhardt: john.reinhardt@state.ma.us or (617) 292-5667
- Mingyuan Pan: mingyuan.pan@state.ma.us or (617) 292-5503
- Thomas Bienkiewicz (operator certification): thomas.bienkiewicz@state.ma.us or (508) 767-2781
- MassDEP Regional Solid Waste Section Chiefs: see http://www.mass.gov/dep/about/regional.htm for contact information.

MassDEP for wetland regulations

- MassDEP Regional Offices (http://www.mass.gov/dep/about/region/findyour.htm)

U.S. EPA for stormwater and NPDES regulatory assistance

- Larry Wells:: wells.larry@epamial.epa.gov or (617) 918-1836
- Deborah Cohen: cohen.deborah@epamail.epa.gov or (617) 918-1145
- Thelma Murphy: murphy.thelma@epa.gov or (617) 918-1815

IX. Additional Resources

Massachusetts Clean Marina Guide

www.mass.gov/czm/marinas/guide/macleanmarinaguide.htm

MassDEP Regulation of Industrial Wastewater Holding Tanks & Containers Web Page

www.mass.gov/dep/water/laws/factsht.htm

MassDEP Industrial Wastewater Management Program Web Page

www.mass.gov/dep/water/wastewater/industri.htm

MassDEP Regional Solid Waste Section Chiefs Contact Information

www.mass.gov/dep/about/regional.htm

MassDEP Service Center - Online Searchable Laboratory Listing

www.mass.gov/dep/service/compliance/wespub02.htm

EPA New England Region's Marina Website

www.epa.gov/region1/marinas

EPA Marina Environmental Management Plan Workbook

www.epa.gov/region1/marinas/pdfs/MarinaEMPJuly05.pdf

EPA New England Region's Boat Pressure Washwater Control Technologies Virtual Trade Show

www.epa.gov/region01/assistance/ceitts/bpwvts

EPA Report, Clean Marinas Clear Value: Environmental Business Success Stories

www.epa.gov/owow/nps/marinas/index.html

EPA Report, A Handbook for Marina Operators and Recreational Boaters

www.epa.gov/owow/nps/marinashdbk2003.pdf

A Guide to Selecting Pressure Washing Management Practices and Technologies

Supplement to the Massachusetts Clean Marina Guide

Commonwealth of Massachusetts

Deval L. Patrick, Governor

Timothy P. Murray, Lieutenant Governor

Executive Office of Energy and Environmental Affairs

Ian A. Bowles, Secretary

Massachusetts Office of Coastal Zone Management

Leslie-Ann S. McGee, Director

Bruce K. Carlisle, Assistant Director

Massachusetts Office of Coastal Zone Management

251 Causeway Street, Suite 800, Boston, MA 02114-2136

CZM Information Line: (617) 626-1212

CZM Website: www.mass.gov/czm

This information is available in alternate formats upon request.

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