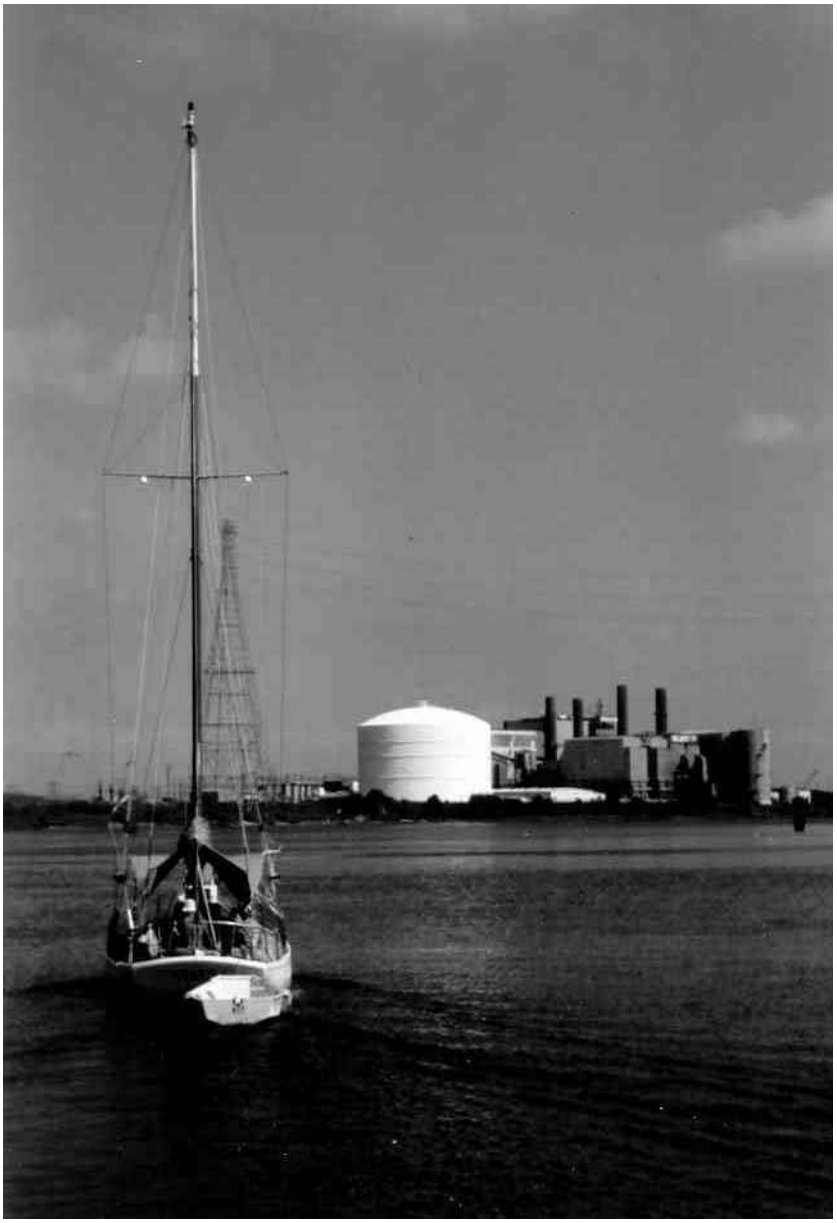

P2 WORKBOOK

THE Elizabeth River Project

Made possible by:

U.S. Environmental Protection Agency Office of Environmental Justice through Pollution Prevention
Virginia Environmental Endowment
Virginia Department of Environmental Quality Supplemental Environmental Projects
National Fish & Wildlife Foundation
Portsmouth General Hospital Foundation
U.S. Environmental Protection Agency Chesapeake Bay Program
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P2 WORKBOOK

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Prepared by

THE Elizabeth River Project

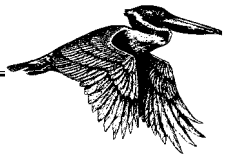

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Table of Contents

Introduction

In our Next Industrial Revolution, regulations can be seen as signals of design failure. They burden industry, by involving government in commerce and by interfering with the marketplace ... If a factory is not emitting dangerous substances and needs no regulation, and can thus compete directly with unregulated factories in other countries, that is good news environmentally, ethically and economically.

- McDonough and Michael Braungart, Atlantic Monthly, October 1998

The Environmental Protection Agency defines pollution prevention (P2) as "the use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes at the source." The EPA further defines the "P2" approach as "the maximum feasible reduction of all wastes generated at production sites."[1] According to the Pollution Prevention Act of 1990 , the recommended priority of environmental management options falls in this order:

1) The highest pollution prevention priority should be source reduction, by design of environmentally friendly products, product changes and source elimination.
2) After exploring source reduction, waste materials can be recycled by reuse or reclamation.
3) If waste materials cannot be recycled, they should be treated prior to release or disposal at a permitted facility.

Ever increasing regulations such as the Resource Conservation and Recovery Act (RCRA), the Clean Water Act (1977), the Emergency Planning and Community Right to Know Act of 1986 (EPCRA), the Clean Air Act Amendments of 1990 (CAA), and the Pollution Prevention Act of 1990 have made the idea of pollution prevention more attractive to the regulated community. In addition, businesses have found that pollution prevention makes good business sense.

Preventing pollution can be easier, safer and less costly than cleaning it up. The pollution prevention approach also frees employees as well as business owners from regulatory liability for pollution. The non-profit, grassroots Elizabeth River Project promotes voluntary pollution prevention as critical to the restoration of the highly industrialized Elizabeth River watershed in Southeastern Virginia. This urban river is designated as one of the three toxic "Regions of Concern" on the Chesapeake Bay by the tri-state Chesapeake Bay Program. Pollutants accumulating over centuries, especially in the Elizabeth River bottom, have been linked to tumors, cataracts and deformities in fish and pose risks for human health as well.

What is good for the Elizabeth River is also good for business. In addition to public health and environmental benefits, pollution prevention benefits your business by reducing operating costs, reducing your risk of civil and criminal liability, and improving your company image with the public and the environmental regulators. Reduced operating costs may include treatment costs, transportation and disposal costs, compliance costs (permitting, monitoring and enforcement), insurance costs, operational costs, and materials costs. You may even find that you can make money by re-using, selling, or recycling waste. Pollution prevention is a win/win for everyone.

Your facility can make the most progress with improving the health of the Elizabeth River, while reducing your own liabilities, by focusing your pollution prevention efforts in two priority areas: reducing toxics, and reducing storm water pollution.

"I preach P2 both to employees and outsiders, because it is the logical solution. We should voluntarily stop pollution at the source. And it is really working! Our plant associates at all levels are constantly thinking of new projects to avoid generating the waste in the first place. The great staff of the Elizabeth River project has been of tremendous help in providing ideas and contacts to enhance our program. The result? Our company has saved a lot of money, helped protect the river, received recognition, and made wonderful friends. I heartily recommend this ERP program for every business in the watershed" - Van White, Manager of Environmental Affairs, Huntsman Corp. soon to become NOVA Chemicals (USA) Inc.

Priority One: Reducing Toxics

A substance is considered toxic if it is poisonous, carcinogenic (cancer-causing) or otherwise harmful to organisms during brief or prolonged exposure. Some toxic pollutants accumulate in the food chain as one larger organism eats many smaller ones that have

been contaminated. Vehicle fluids such as antifreeze, battery acid, gasoline, and brake fluid; most solvents, paints and sealants; pesticides and herbicides are a few examples of substances that are considered toxic pollutants if they enter surface waters. Certain metals such as arsenic, chromium, copper, lead and mercury are also toxic pollutants. These hazardous metals are frequently found in used automotive fluids (such as used oil), pesticides, and certain cleaning products. For instance, kitchen cleaners often contain copper.

Pollution prevention is considered the best way to address the reduction or elimination of toxics. By using source reduction, re-use and recycling techniques, we can reduce the impact of toxics on the Elizabeth River.

The Elizabeth River Project and the Virginia Department of Environmental Quality (VA DEQ) in1996 identified the following toxic pollutants of concern for the Elizabeth River: heavy metals including arsenic, beryllium, chromium, copper, lead, mercury, nickel, cadmium, zinc and selenium, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), tributyl tin (TBT), DDT, phthalate esters, aromatic hydrocarbons, herbicides and pesticides. If these metals or compounds are part of your facility's process or waste stream, helping you solve the challenge of how to eliminate or reduce them is the No. 1 priority of the Elizabeth River Project's River Stars program.

Priority Two: Reducing Pollution in Storm Water Runoff

Storm Water Runoff: Carrying Pollutants in its Path

The water that flows across the land, called storm water runoff or urban runoff, collects pollutants as it travels. Runoff from streets and parking lots picks up oil and grease dripped from cars, asbestos from worn brake linings, and zinc from tires. Pesticides, herbicides, and fertilizers are collected from landscaped areas, and soil is washed from cleared land. Any substance found on the ground can wind up in storm water runoff, including pollutants that settle from the air. Harmful pollutants can also be washed directly into the storm drainage system in rinse water or irrigation runoff without the help of the rain. Because most of this pollution comes from many dispersed sources storm water runoff is often called non-point source pollution, as opposed to a single point such as an industrial outfall pipe (point source pollution).

Watersheds: Land Draining to Waterways

Each waterway and lake is affected by the activities within its watershed, the geographic area from which all surface water flows to that body of water. Since water flows downhill, watershed boundaries are ridges or relative high points. As storm water runoff carries pollutants into waterways and lakes, water bodies are affected by activities far from their shores.

The Elizabeth River watershed includes many small watersheds (also called drainage basins) that drain directly and indirectly to the Elizabeth River and eventually into the Chesapeake Bay. The total Elizabeth River watershed is over 200 square miles including Norfolk, Chesapeake, and parts of Portsmouth and Virginia Beach.

Storm Drains Lead to the River

Our urban and suburban landscape includes a storm water system of pipes, ditches and drains that carry storm water runoff. The system includes built structures such as ditches, catch basins, pipes (storm drains), and lakes and ponds that serve as storm water retention facilities.

The most important thing to remember is that the water in storm drains and other drainage structures leads directly to waterways. Whatever is washed off your property

eventually reaches the Elizabeth River, typically without the benefit of any treatment.

Other drains, including most indoor drains, connect to the sanitary sewer system, which discharges to the Elizabeth River after treatment by the Hampton Roads Sanitation District (HRSD), the agency that operates the regional sewage treatment facilities. The treatment process does not remove all pollutants (particularly toxic ones). Some pollutants can hamper the treatment process, and others pose a safety risk. Therefore, HRSD regulates what can go down the sanitary sewer.

Ways You May be Polluting Most

Most people know that it is illegal to dump toxic chemicals or other pollutants down a storm drain. But you also break the law if you knowingly allow pollutants to be washed into a storm drain with rain or wash water from your property. For instance, you may be polluting if you:

- rinse wash water from a dirty car, greasy engine, or grimy roof vent down a storm drain
- spill antifreeze on the ground without cleaning it up
- allow materials or wastes stored outside to leak
- clear land without taking steps to prevent erosion.

Virtually anything on the ground surface can become a water pollutant, since storm water runoff (or wash water) collects pollutants as it travels. Pollutants on the ground can also soak through the soil and pollute the ground water, another important resource and one that is interconnected with the surface water system. Types of pollutants that can enter storm drains and travel to the river include:

Oil and grease: Some types of oil and grease contain chemicals toxic to aquatic life even at low levels. No type of oil or grease belongs in surface water. Oil and grease can coat fish gills (making it hard for the fish to breathe), block oxygen from entering the water, and clog drainage facilities, which can lead to increased maintenance costs and can cause flooding problems.

Sources of oil and grease pollution include:

- food grease or cooking oil from leaking outdoor trash compactors, dumpsters, or from cleaning equipment outdoors
- motor oil from spills on roads and in parking lots
- accidental spills or intentional disposal of oil in storm drains
- leaking equipment stored outside

Nutrients: Nutrients such as phosphorus and nitrogen are needed by plants to grow, but high levels can be harmful to water quality. Excess nutrient levels can over-stimulate the growth of algae and other aquatic plants, resulting in unpleasant odors, unsightly surface scum, and lowered dissolved oxygen levels from plant decay. Nutrients are most likely to pose a problem in slow moving water such as lakes or sluggish waterways. Common sources of nutrients include lawn and garden fertilizers, detergents containing phosphates, eroded soils, and pet wastes.

Sediments: Sediment, often originating as topsoil, sand, and clay, is the most common pollutant in storm water runoff by volume and weight. Sediment may seem harmless enough (after all, topsoil is a valuable resource), but it poses serious problems in the water. Excess sediment can turn river and lake water cloudy, making it less suitable for recreation, fish life, and plant growth. Sediment is of particular concern in fish bearing waterways where it can smother fish eggs, destroy habitat for insects (a food source for fish), and cover important spawning areas. Uncontrolled sediment can also clog storm drains, leading to increased private and public maintenance costs and flooding problems. Sediment is also of concern because many other pollutants, including bacteria, metals, and some nutrients and toxics, tend to attach to soil particles. Therefore, when sediments enter water they usually carry other pollutants with them. Common sediment sources include eroded soil from cleared land or exposed soil, as well as soil that accumulates on roads and paved parking lots.

Oxygen-demanding substances: Plant debris, food waste, and some chemical wastes fall into a category of water pollutants known as oxygen-demanding substances. Such

substances use dissolved oxygen when they decay or chemically react. If dissolved oxygen levels in water become too low, aquatic animals can become stressed and die. Several species of local fish are particularly at risk because they need high dissolved oxygen levels to live. Oxygen-demanding substances can enter surface water from a number of sources:

- food waste from leaking dumpsters
- landscaping debris dumped near a waterway or lake
- leaves and grass clippings swept into a storm drain
- bulk food products (solid or liquid) spilled during delivery.

A technical assessment for the Elizabeth River Project and VA DEQ (URS, 1996) concluded that 80 percent of new pollutants enter the river as non-point source pollution (water pollution from dispersed sources). This pollution is often a part of storm water runoff -- runoff from parking lots, lawns and other industrial and residential surfaces. Storm water runoff carries pollutants such as oils, fertilizers, pesticides and metals directly to the Elizabeth River through an aging system of storm drains, in most cases with no filtering. This serious environmental threat is the Elizabeth River Project's second priority for assisting area facilities with pollution prevention.

About The River Stars Program

The independent, non-profit Elizabeth River Project offers the River Stars program to provide assistance and recognition for participating organizations in the Elizabeth River watershed. Funded primarily by a grant from the EPA's Environmental Justice Through Pollution Prevention program, with matching funds from public and private sources, the program is designed to help organizations find the resources and information they need to prevent pollution and enhance wildlife habitat, and to recognize them for voluntary steps in these areas. Assistance provided by the Elizabeth River Project staff and volunteers is free and confidential. A modest donation is suggested for materials, and we may ask your permission to recognize you publicly for your progress.

This workbook is one tool in the River Stars program. It provides an introduction to creating a pollution prevention (P2) program and preventing pollution from activities common to many types of businesses. The Elizabeth River Project's River Stars staff and volunteers are available to respond to specific P2 questions beyond the scope of this document. Also refer to our Resources Directory of community services and our Guide to Enhancing Wildlife Habitat for more information.

NOTE: The information in this workbook is subject to change, and may not address all the needs specific to your organization. Telephone numbers and additional sources of information are included to give you access to the most current information.

Program Goals

To participate in the River Stars program at the Commitment Level, your organization is expected to commit to at least one meaningful goal in P2 and/or wildlife habitat enhancement. By implementing your goals and documenting results for peer review, your organization can reach "Achievement Level." Exceptional P2 and habitat enhancement results, along with exemplary community leadership in environmental stewardship, earn an organization the eligibility for "Model Level" recognition. This workbook is designed to help you set goals for P2 in accordance with the River Stars program. For further assistance, the Elizabeth River Project has an extensive P2 library as well as staff and volunteers available for research and assistance.

Checklist

O Step 1 - Read this Pollution Prevention Workbook.

The goal of this workbook is to describe how pollution can occur and the many ways an organization can prevent it. The workbook also outlines how to progress in the River Stars program.

O Step 2 - Conduct a Self-Evaluation.

We suggest that you complete our Pollution Prevention Self Evaluation as an aide to help you evaluate your current conditions. Our volunteers and staff are available to help you, including making site visits if you wish. We also have EPA worksheets and other checklists available for assessing needs specific to your business (processes, raw materials, products, waste streams).

O Step 3 - Set Your Goals.

Use the River Stars Commitment Form to tell us your goals in pollution prevention, as well as any other initiatives (wildlife habitat projects, for instance) you may be planning as a River Star. Effective goals are achievable, measurable, observable, flexible and demanding. Keep in mind that you are expected to show progress toward reaching your goals within one year in order to stay in the River Stars program.

O Step 4 - Take Advantage of Our Help.

The Elizabeth River Project provides trained staff and volunteers to help you, free of charge. We can give on-site advice, help you with presentations, conduct research, identify grant opportunities, and provide referrals to other assistance available around the country. We also offer an extensive library of P2 literature.

O Step 5 - Document Your Success.

Documenting your progress in terms of measurable results is crucial for achieving River Stars recognition, and for you to know your efforts are worthwhile. Be specific in recording when your goals are reached, amounts of waste reduced, and any cost savings or other tangible benefits.

O Step 6 - Bask in the Recognition.

Your documentation will be reviewed by a committee of peers (the Elizabeth River Project's River Stars Panel) to determine if your organization meets the criteria for Achievement or Model Level recognition as a River Star. Pending a final staff review for regulatory compliance,* the Elizabeth River Project with your permission will start promoting you for your achievements. We hold an annual recognition banquet for River Stars, conduct media campaigns, list River Stars and their recognition status in all our major publications and provide you with recognition materials such as plaques and banners for display at your facility.

* Achievement Level River Stars are expected to be in consistent regulatory and permitting compliance, or show significant progress toward compliance. Model Level River Stars must demonstrate consistent compliance.

Pollution Prevention Self Evaluation

Answering these questions should help you evaluate your current level of pollution prevention (i.e. source reduction - reducing or eliminating waste generation). These questions should also give you ideas for new or additional pollution prevention practices. Answers are for your use only and are completely confidential. You may or may not wish to share them with the Elizabeth River Project.

Pollution Prevention Plan

	Yes	No	See Page	Will Do
Do you have a pollution prevention policy, plan or program? Please describe:	❒	❒	p. 19	❒

Operations

	Yes	No	See Page	Will Do
Can you trace your wastes and emissions back to their source?	❒	❒	p. 21	❒
Does your facility currently use any of the following toxics: (If no, skip to page 9.)	❒	❒		

Heavy metals (arsenic, beryllium, chromium, copper, lead, mercury, nickel, cadium, zinc, selenium); polycyclic aromatic hydrocarbons (PAH); polychlorinated biphenyls (PCB); tributyltin (TBT); DDT; phthalate esters; aromatic hydrocarbons; herbicides; pesticides.

<u>These are the toxics of concern for the Elizabeth River. Helping businesses reduce use of these toxics is our number one priority.</u>

Which ones (volumes)?

How are these used?

Do they enter the waste stream?

In what way?

In what amounts?

What avenues have you explored to reduce or eliminate their use?

How can the Elizabeth River Project help your organization reduce these toxics?

	Yes	No	See Page	Will Do
Have you implemented or developed technology to help with pollution prevention? (i.e. aqueous parts washers, treatment systems, etc.) Describe.	❒	❒	p. 21	❒
Have you redesigned processes or substituted products to reduce or eliminate the use of toxic materials?	❒	❒	p. 21, 22	❒

Process 1:

Waste or materials reduced or eliminated:

Type	Volume	Impact

Alternatives used:

Type	Volume	Impact

Process 2:

Waste or materials reduced or eliminated:

Type	Volume	Impact

Alternatives used:

Type	Volume	Impact

Process 3:

Waste or materials reduced or eliminated:

Type	Volume	Impact

Alternatives used:

Type	Volume	Impact

Process 4:

Waste or materials reduced or eliminated:

Type	Volume	Impact

Alternatives used:

Type	Volume	Impact

	Yes	No	See Page	Will Do
Do you have waste products that are reused or recycled by another company? Specify which waste products, amounts, who recycles them.	❒	❒	p. 22, 23	❒
Do you separate toxic materials from non-toxic materials?	❒	❒	p. 24, 25	❒

Purchasing and Accounting Practices

	Yes	No	See Page	Will Do
Do you track costs by process or activity?	☐	☐	p. 30	☐
Does your inventory control prevent overstocking and waste? Describe this process:	☐	☐	p. 30	☐
Do your suppliers provide non-toxic materials or supplies? Which suppliers? Volumes?	☐	☐	p. 30	☐
Do you purchase earth friendly cleaning products? Volumes?	☐	☐	p. 30	☐
Do you purchase materials in returnable or reusable containers?	☐	☐	p. 30	☐
Will your suppliers take back damaged or outdated materials? Which suppliers? Volumes?	☐	☐	p. 31	☐
Do you purchase energy efficient office equipment? What kinds?	☐	☐	p. 31	☐
Do you purchase recycled materials? Which ones?	☐	☐	p. 31	☐
Do you use printing facilities that use soy based inks?	☐	☐	p. 31	☐

Employee Awareness and Training

	Yes	No	See Page	Will Do
Does your organization have employee awareness programs regarding P2? Please describe:	☐	☐	p. 32	☐
Does your organization consistently emphasize the importance of good housekeeping practices and safe materials handling to your employees? How? Are training programs in place?	☐	☐	p. 32	☐
Are employees awarded or recognized for contributing to safety and/or environmentally friendly behaviors or actions? How?	☐	☐	p. 32	☐

Public Relations/Community Involvement

For your organization to be a "Model Level" River Star, your organization will be expected to become a mentor in the community. These questions are intended to give your organization ideas for creating goals to help you become a "Model Level" River Star. However, we also encourage "Entry Level" and "Achievement Level" River Stars to pursue goals in this area.

	Yes	No	See Page	Will Do
Do you promote your product(s) or your firm as being "environmentally friendly"? How?	❒	❒	p. 33	❒
Does your organization share its P2 experiences and successes? How?	❒	❒	p. 33	❒
Do organization employees give talks, presentations or tours explaining or promoting your environmental practices? To whom? How often? About what?	❒	❒	p. 33	❒
Is your organization involved in roundtable discussions regarding P2? How have they helped you spread the word about P2?	❒	❒	p. 33	❒

	Yes	No	See Page	Will Do
Do you work with the community or have community outreach programs about environmental or P2 issues? Please describe:	❒	❒	p. 33	❒
Do you conduct area clean-ups or beautification programs? Please describe:	❒	❒	p. 34	❒
Has your organization won any awards that emphasize environmental awareness or achievements? Which ones?	❒	❒	p. 34	❒

Storm Water Runoff

Storm water runoff is the leading source of new pollution in the Elizabeth River.

Helping you reduce your storm water impact is a priority of the Elizabeth River Project.

	Yes	No	See Page	Will Do
Does your organization inspect and maintain catch basins?	❒	❒	p. 35	❒
Has your organization installed sediment traps in storm drains? How many? How are they maintained?	❒	❒	p. 35	❒
Has your organization installed "do not dump" plaques on storm drains? Where? How are they maintained?	❒	❒	p. 35	❒
Does your organization use and maintain oil/water separators?	❒	❒	p. 36	❒
Does your organization use pollution prevention techniques when washing vehicles or equipment outdoors? Which ones?	❒	❒	p. 37	❒
Is pollution prevention observed in general outdoor maintenance activities?	❒	❒	p. 38, 39	❒
Does your facility have a vehicle fueling area? If so, is secondary containment used?	❒	❒	p. 39	❒
Does your organization observe the proper use of pesticides?	❒	❒	p. 39	❒

	Yes	No	See Page	Will Do
Are any portions of your facility located in a Chesapeake Bay Protection Area? If so, are you aware of the restrictions?	❒	❒	p. 40	❒
Does your organization observe erosion and sediment controls during construction activities? Which ones?	❒	❒	p. 40	❒
Has your organization planted a vegetated buffer along waterways? Along how many river/stream feet/miles? _____ What plants were used? How many?	❒	❒	p. 40, 41	❒
Has your organization established no-mow zones on the facility grounds to reduce pesticide/herbicide usage and runoff? Where? How many square feet/acres?	❒	❒	p. 40, 41	❒
Does your organization follow Integrated Pest Management procedures?	❒	❒	p. 41	❒

Pollution Prevention Plan

Develop a Pollution Prevention Plan

Strategy 1

Pollution prevention (P2) should be a company-wide effort, supported by top management. It is important to write down your company's policy or goal regarding pollution prevention and share it with all company employees.

To be effective, a pollution prevention plan should include:

The company pollution prevention policy. It is important to encourage all employees to read and adopt this policy. "...it is vital to gain the support of staff at all levels very early in the pollution prevention effort."[2]

Identification of one person who takes the lead in P2 efforts (P2 facilitator, manager, coordinator, etc.)

A process for employees to participate on a day to day level. For instance, employees could form a Pollution Prevention Team that identifies and evaluates potential pollution prevention opportunities. It is advantageous to make this team "cross functional": incorporating people with different areas of the company (i.e. engineering, accounting, etc.). Training may be necessary for participation in this team and when/if new pollution prevention strategies are implemented (new or different equipment, process, etc.)

A recognition or award program for employees that identify P2 opportunities or promote environmental awareness and safety.

A process for assessing the waste streams at your facility (Pollution Prevention Opportunity Assessments). Waste types, volumes/amounts, impacts, and costs should be documented for each process. This should cover wastes for all media: solid waste, water waste streams and air. Make sure to identify the true costs of waste generation - including regulatory compliance, paperwork and reporting, loss of production potential, costs of materials in waste stream, storage costs, transportation costs, treatment costs, disposal costs, employee exposure risks and health care costs, and future liability costs. These costs should be allocated by waste stream or process type, not buried in overhead costs. The Facility Pollution Prevention Guide, published by the USEPA in May 1992, includes the procedure for performing a Total Cost Assessment (also called Environmental Cost Accounting) for your waste streams.

Pollution prevention goals. You may want to include specific goals in your P2 plan, or just a process by which goals will be identified. "Objectives should be stated in quantitative terms and should have target dates."[3] Your goals can be a part of the formal plan, or, because the goals are likely to change and be added to over time, you may want to have a separate document for recording goals and progress. Goals should be achievable, measurable, observable, flexible and demanding and should incorporate the following categories (if applicable):

- pollution prevention plan
- operations
- purchasing and accounting practices
- employee awareness and training
- public relations/community involvement
- storm water runoff

A method to track progress. It is important to document specific information about waste elimination, reduction, recycling, re-use and treatment including types, volumes/amounts, and impacts. This information should be as detailed as possible, and should be divided by process. The method should be identified in the plan, however, you may want to track the actual progress as a separate document.

Once goals are selected, measure "baseline" performance for the item so that progress can be measured. For instance, if you decide to recycle a material, measure how much material is currently recycled and how much disposed of as waste before implementing the recycling. Once the recycling is implemented, measure

The U.S. Coast Guard Integrated Support Command, a River Star in Portsmouth has written a formal Pollution Prevention Plan and Opportunity Assessment for their facility which includes goals, an implementation plan, P2 monitoring and achievement reports.

how much each of those categories has changed. Other measurements could include disposal cost avoided, number of employee hours required to implement, training cost for implementation, etc.

Appendices for Awards and Mentoring Efforts. You may want to include an Appendix in your P2 plan for any awards or recognition you receive for your P2 efforts. In addition to the Elizabeth River Project's River Star recognition opportunities, there are many award programs which can boost your facility's reputation and employee morale (see Appendix A for a list of awards). Do not hesitate to publicize your efforts or any events you have to celebrate successes. The public really wants to hear about positive environmental efforts, especially when they are voluntary! In addition, it is a good idea to record participation in community events and other community awareness efforts such as helping another organization with P2 issues. Share information and technology with other companies who have operations similar to yours. They may have ideas you haven't considered as well.

A great place to get ideas for pollution prevention is your employees. Recommendations received by employees, other companies, or other individuals who may come out to your facility to assist you in your P2 efforts should be evaluated for cost and technical feasibility. The USEPA's Facility Pollution Prevention Guide describes the process for evaluating options including a Weighted Sum Method for screening options. Other financial indicators include net present value, internal rate of return, profitability index, and payback period.

The USEPA's Waste Minimization Opportunity Assessment Manual states "Payback periods in the range of three to four years are usually considered acceptable for low-risk investments."[4] Those that pass the evaluation should be implemented. They do not need to be implemented all at once, but a time frame should be recorded for desired strategies. If you need help evaluating your pollution prevention opportunities for their feasibility, please let the Elizabeth River Project help.

Evaluate your P2 program periodically and ask yourself if it still meets your facility's needs. Has the company's policy changed? Does the P2 plan still reflect the company policy? Do we need to appoint another P2 facilitator? Should we change the format of our P2 team? Are we tracking our progress accurately and with enough detail? What is our progress? Do we need to do another assessment to look for additional P2 opportunities? Do we need to update our goals? Are there any strategies that we have overlooked for obtaining more employee support and participation?

If you need any help along the way, THE ELIZABETH RIVER PROJECT is here to help with sources of information and technical contacts.

Operations

Know Your Wastes

Strategy 2

If you want to reduce or eliminate your wastes, it is very important to know what they are and how much you are producing. Waste manifests, invoices for disposal, reports to regulatory agencies, sampling programs and purchase orders, are all good sources of information about your wastes. If you do not have this type of information, you can perform a "waste sort". This technique is very simple: go out to your dumpster and other waste storage areas and inventory types and amounts of waste observed. You can do this process once, or, in order to get more accurate information, repeat the process at different times over a period of a month or two. Make sure to inventory the waste from each process (each individual process may have independent waste storage areas). Ask yourself these questions:

1) What is the main component of our waste? Paper? Cardboard? Solvents? Paints?

2) Is there anything in our wastes that we could reuse or recycle?

3) Is there anything in our wastes that someone else may be able to reuse?

4) Are there any hazardous wastes that we could minimize by substituting another, less toxic material somewhere in the process or by changing the process?

5) What can we do about our purchasing or inventory procedures to reduce any of this waste?

Use the information in the following strategies to come up with ways to reduce the wastes your facility produces. Minimizing waste is a top waste management priority. By reducing waste your company can save money on disposal costs and time spent on preparing wastes for disposal.

New Technology

Strategy 3

Investigate technology that can help you reduce your wastes or emissions. One local chemical company invested money in an emissions incineration device that allowed them to be exempt from certain regulations, saving them much money and aggravation. New aqueous parts washers have proven to remove oil and grease from metal parts just as well as the solvent parts washers. Other examples of new technology to reduce waste include:

- using closed loop dry cleaning machines that condense, distill, filter and recycle perchloroethylene
- installing recovery systems for hazardous material used in processes
- switching to more efficient high volume, low pressure spray guns
- installing distillation units to recover solvents

Norfolk Boat Works, a local repair yard and local River Star on the main branch of the Elizabeth, purchased two dustless sanders for use by their customers.

Process Re-Design

Strategy 4

Process re-design involves changing the process in order to reduce generated waste. Examples include:

- using a closed loop system for dyeing materials (adjusting spent dye solution to return it to the strength necessary for re-use)
- using a physical means for paint removal (closed blasting facility) instead of solvent based paint strippers
- Motorola switched from using flux in its soldering process to using a preparation fluid that eliminates the need to clean the circuit boards with Freon 113 and trichloroethane, eliminating 8,000 pounds of those cleaners per month, per machine.[5]
- finding ways to extend the life of hazardous materials which will in turn minimize the amount of waste produced
- capturing process water for re-use
- using smaller quality control samples and returning them to process

Model Level River Star Naval Base Norfolk changed their process of spraying paint to rolling it for various applications, thus minimizing potential pollution by overspray.

Strategy 5

Product Substitution

Fleet Printing, a River Star in Norfolk substitutes soy-based inks for solvent based inks for several of their customers. This has reduced the amount of solvent wastes produced by this company.

There are many solvents and coatings that are used that may be easily substituted for a less hazardous one. A furniture manufacturer in the northeast realized a 90% reduction in hazardous waste generation when they switched to a water-based coating from a nitrocellulose coating. Their regulatory status changed and insurance rates for fire were decreased by 25%.[6] Appendix B includes some Internet sites that discuss alternatives to solvents and coatings. It is important to realize that product substitution may require some re-training of staff on the procedures for use of the new product.

Consider the following:

- Rather than detergents, use hot water/steam-cleaning methods for washing oil off metal parts such as engines, tools, and equipment.
- Use non-solvent cleaners. You can also reduce pollution by using a solvent parts washer with a recycling service or filtration unit.
- Use non-chlorinated compounds rather than chlorinated ones; they are less toxic and less expensive to dispose of.
- Use waterless hand cleaners.
- Try using safe cleaning alternatives such as baking soda and vinegar.

Strategy 6

Re-Use

River Star BFI Chesapeake uses their used oil from trucks in several heating units at their facility.

See if others can use your leftovers. Many times, there are other uses for those things that are considered waste. Used motor oil can be burned for heat in certain types of space heating equipment, a neighboring facility may be able to use leftover paint or other materials, used furniture can be given to a charity or to employees, scrap wood may be turned into mulch, dirty solvent from one process may be clean enough to use in another process. Also, there are waste exchanges that list items available and items wanted all over the region. These waste exchanges advertise these items on the Internet. See Appendix B for a list of Waste Exchanges and their web site addresses.

Huntsman Corp. (to become NOVA Chemicals (USA) Inc.), Achievement Level River Star on the Southern Branch of the Elizabeth River, collects used instruments that are shipped off-site to be re-built and re-sold to other organizations. Huntsman receives a credit for each instrument.

Recycling

Strategy 7

Take advantage of opportunities to recycle whenever you can. Here's how to make recycling work:

Separate wastes. Keep your wastes in separate containers according to the type of product and keep records of the container contents (keep materials in the original container if possible). Combining different types of waste can prevent recycling and greatly increase disposal costs. For example, uncontaminated waste oil can be recycled, whereas waste oil mixed with solvents requires a much more costly and complicated disposal process.

Avoid phenol. Products containing phenol compounds are often not recyclable. Ask your vendors to suggest phenol-free products.

Recycle what you can. The following materials are potentially recyclable:

- used antifreeze
- used tires
- used car batteries
- engine and lubricating oil
- uncontaminated gasoline and brake fluid
- some solvents such as degreasing agents and paint solvents
- concrete and asphalt
- metal scraps
- latex paint
- drywall/sheetrock
- untreated wood
- landscaping wastes
- cooking oil, fats and greases
- paper and cardboard
- container glass, aluminum and tin

Check the Elizabeth River Project's Resources Directory or the recycling Internet sites listed in Appendix B to find vendors who pick up or accept various recyclable materials.

If you use solvents, consider buying a commercial solvent recovery unit; the smallest units available handle five gallons. Most recovery systems pay for themselves in less than two years. Check with your local Fire Department for installation requirements.

Keep receipts. For documentation purposes, always keep receipts from the recycler showing the amount and specific types of wastes recycled.

Compost landscaping waste. Consider installing a compost facility at your own site and, if you're a landscaping contractor, encourage clients to compost. Be sure to locate your compost area so that it doesn't leach into a waterway or storm drain.

Leave grass clippings to decompose on the lawn. Leaves (ideally shredded first) can be used as mulch on flower beds or composted. Similarly, woody waste can be shredded for mulch.

Never wash fallen leaves or grass clippings down a storm drain or dump them in a waterway or lake. If you don't compost on-site, take plant waste to the Southeastern Public Service Authority (SPSA) regional composting facility. Call SPSA for a list of facilities. If you are doing landscaping for a residential property, you can take advantage of your City's yard waste pick-up program.

River Star Naval Station Norfolk recycles rope, aerosol cans, cardboard, plastic, and aluminum at an on-site recycling center. In 1997 8,000 tons of recyclable materials were sold and diverted from landfills.

River Star Hampton Roads Regional Jail recycles their used cooking oil, cardboard, and glass.

Strategy 8

Keeping a Clean Work Site

Any residue (such as paint chips, metal shavings, or grease) on a surface that drains to a storm drain can be washed to waterways, in violation of state and local laws. Disorganized work places increase the chance of spills.

Keep surfaces that drain to the drainage system clean and organized.

- Keep toxic materials separated from non-toxic materials.
- Regularly sweep or mechanically remove outside wastes such as those found around the dumpster or on the parking lot. Dispose of wastes properly. Don't hose the parking lot to clean it unless you follow the procedures in Strategy 31.
- Place a tarp on the ground during remodeling, painting prep work, sandblasting, or other operations that can create dust or debris.
- Drain fluids such as unused gas, transmission and hydraulic oil, brake fluid, and radiator fluid from vehicles or parts kept in storage. Recycle, reuse or dispose of these fluids properly (see Strategies 6,7 and 12). Leaking vehicles or parts kept on site should be kept in a covered, bermed area.
- Fix leaks on equipment and vehicles. Maintain equipment properly and develop a system to report leaks promptly.
- Cover exposed soils with plants, gravel, or pavement depending on the use of the area. When paving, be sure to provide for proper drainage and treatment of runoff.
- Organize the work place to reduce the chance of spills. For instance, use a funnel when transferring or diluting chemicals and place a tray underneath to catch spills. Place drip pans under the spouts of liquid storage containers. Immediately clean up any spills (see Strategy 11).
- Don't hose down your shop floor if the water can enter a storm drain. It's best to sweep it. Alternatively, you can wash it with a wet mop and dump the waste water down the sanitary sewer system according to their requirements.

Strategy 9

Using Hazardous Products: General Guidelines

Although the goal is to reduce or eliminate the use of hazardous products, sometimes it is unavoidable. It is important to know the proper way to use and handle hazardous materials. If handled improperly, hazardous products can be a source of toxic water pollutants, as well as other environmental and human health risks.

Minimize use of hazardous products. Know the hazards associated with products you use or are considering using. Read labels carefully. Labels such as danger, combustible, warning, caution, poisonous, caustic, corrosive, volatile, explosive, and flammable indicate hazardous products. Also read the material safety data sheets (MSDSs) prepared by manufacturers of hazardous products. Look for non-toxic or less toxic options, and buy only what you need. See Strategy 14 for more information on using the least toxic products.

Store and use products carefully.

- Keep products in original containers, if possible. To keep the label from falling off or weathering, cover it with transparent tape. If you have to transfer the product to a smaller container, use the proper sized funnel and avoid spills. Properly label the new container.
- See Strategy 10 regarding waste and materials storage. Keep corrosive liquids and oxidizers away from flammable ones.
- Don't mix chemical substances unless recommended by the manufacturer.
- Always follow the label directions, and don't use more product than the directions suggest.
- Twice as much does not mean twice the results.
- Use products in well-ventilated areas.

Protect personal health and safety by wearing the necessary protective gear and clothing recommended on the MSDS.

- Order only what you need, and if some is left over, try to find a re-use for the material (Strategy 6). If leftovers can't be re-used or recycled, dispose of them as a hazardous waste (Strategy 12).

Waste and Materials Storage

Strategy 10

If materials and wastes aren't properly stored, pollutants can leak or be washed out by rain water and carried into waterways and lakes.

Cover stockpiled materials. Stockpiles of building and other materials such as lumber, metal products, topsoil, sand, gravel, compost, sawdust, and wood chips must be covered to keep rain from carrying off pollutants such as sediment and nutrients. Consider the following options:

- Place temporary plastic sheeting over stockpiles and secure the cover with weighted objects such as sand bags or old tires.
- Build a covered area for stockpiles. (Be sure it conforms to the Fire Code.)
- Pave the storage area, install a drainage system, and treat the storm water runoff.
- Inspect your dumpster area regularly. Spills and leaks from dumpsters are a common source of pollutants, especially from restaurant dumpsters and other facilities producing damp or oily wastes that are compacted. Liquids should not be placed in a dumpster. If the dumpster leaks, it should be replaced. Alternatively, you can isolate the area around the dumpster and drain it to the sanitary sewer system.
- Keep the dumpster lid tightly closed to keep the rain out and prevent leakage. A more foolproof approach is to build a cover over the dumpster. If the cover is within five feet of the dumpster, it must be non-combustible or be equipped with a sprinkler system. The dumpster should also be locked to prevent others from using it to dispose of hazardous products.
- Use suitable storage containers.
- Make sure that your storage containers are in good condition and lined with a material that won't react with the product or waste. Outdoor storage containers should be rigid, durable, water tight, and rodent-proof.
- Clearly label the contents of all containers.
- Don't mix different types of hazardous waste in a single container.
- Handle containers in ways that won't cause ruptures or leaks, and keep them tightly closed except when you're adding or removing the contents.
- Check with the fire department for containment requirements for reactive or ignitable waste.

Store containers in an appropriate location. If materials are stored outdoors:

- Place each container inside a larger empty one.
- Build a covered area such as a lean-to, pave the surface area beneath, and prevent runoff from entering or leaving the area. Be sure to check with the fire department to make sure your structure conforms to regulations. Also, make sure any containers holding hazardous waste are protected from tampering.

Dike and drain liquid storage areas. For liquid products or wastes stored outdoors, surround the storage area with a curb or dike to provide volume to contain 10 percent of the volume of all the containers or 110 percent of the volume of the largest container, whichever is greater. If the storage area is permanent, install a drain. For used oil, hazardous waste, or materials controlled by the Fire Code, the liquid should drain to a dead-end sump; otherwise, connect it to the sanitary sewer, after checking with the Department of Utilities for connection regulations.

Huntsman Corporation, a River Star in Chesapeake, has paved and bermed its used drum storage area. Any runoff from this area is contained.

Obtain storage permits if needed. Businesses that accumulate or generate more than 220 pounds of hazardous waste per month (or 2.2 pounds if extremely hazardous) may also need a storage permit from the Virginia Department of Environmental Quality. Also, check with your municipality if you plan to construct a storage area (or structurally modify the one you have).

Strategy 11 Spill Prevention and Clean-Up

If you use paints, solvents, oils, gasoline, pesticides, or other materials that can spill, your business needs a spill control plan. This is true even if you handle materials that are normally considered harmless (such as food), because only clean water belongs down a storm drain.

Take steps to prevent spills. Examine your business activities for ways to reduce the chance of spills. For instance:

- Organize the delivery and unloading areas. Ideally, loading/unloading docks should have overhangs or door skirts that enclose the trailer end, and should be designed to prevent run-off of storm water (for example, by being surrounded by a low berm).
- Use a funnel to transfer liquids from one container to another.
- Keep trays on hand to catch spills from leaking or overheating cars.
- Store materials where they won't be knocked over (see Strategy 10 regarding storage).

BFI, a River Star in Chesapeake has an Environmental Response Unit on hand for emergency situations which includes spill clean-up materials, personal protective equipment and other safety equipment.

Consider installing a spill control oil/water separator. See Strategy 29.

Prepare a clean-up plan. Any business that uses oils, gasoline, pesticides, or even bulk food products should prepare for possible spills. State law requires owners of businesses that generate regulated amounts of hazardous waste to have a spill clean-up plan. Federal law requires owners of facilities that store oil products to have a spill prevention and control plan. All businesses should have basic procedures to follow during a spill.

Generally, a clean-up plan includes the following elements:

- Describe the facility (including owner's name and address, activities, and types of chemicals used). Show chemical storage areas, storm drains, and what areas are sloped toward each drain. Also locate and describe spill control devices such as positive control valves.
- Establish who to notify in the event of a spill. See Appendix C for the appropriate contacts.
- Provide specific clean-up instructions for different materials handled on-site, safety requirements, and guidelines for evacuation. General clean-up techniques are listed below.
- Assign people to be in charge of spill clean-up, updating the spill control plan, training staff in clean-up procedures, testing the clean-up kit equipment, and maintaining the inventory.
- Prepare spill containment and clean-up kits which are easy to find and use. Include any needed safety equipment as well as clean-up materials appropriate to the type and quantity of material that could spill. In fueling areas, store absorbent materials in small bags for easy use and keep small drums for storing used absorbent rags.
- Post a plan summary (including clean-up contractors, location of clean-up kits, and who to contact) at appropriate locations.

Clean up spills immediately. If a spill occurs, respond immediately according to your clean-up plan. Protect your safety and the safety of others. Do not enter an area with spilled toxic materials without proper clothing and gear. Be sure to:

- Stop the source of the spill.
- Contain the spill. If the spill involves a liquid, block the flow, for example by placing absorbent materials along the edge of the spill. If there is a chance the spill could enter the storm drain or

sewer, cover the drain inlet (for example, with a rubber mat). If a spilled powder could blow away, contain it by covering it with plastic or, if it won't react with water, by dampening it with wet towels or a light water spray.

- Cover liquid spills with absorbent material. Use materials that can be swept or picked up such as kitty litter, shop rags, sawdust, or vermiculite. The idea is to contain - not disperse - the spill, so don't use emulsifiers or dispersants. If the spill is small and the listed absorbent materials are not available, use rags or paper. For solids such as powders, sweep or wipe up the material.
- Report the spill to the appropriate authorities and call for help as needed (see Appendix C for appropriate contacts). If the spill presents a hazard to public health or safety, call 911 immediately.
- For large spills, use the services of a private clean-up firm.
- Properly dispose of clean-up materials. Never wash spilled materials down a sanitary sewer or storm drain. Cleaning products used to absorb a hazardous waste (such as vermiculite used to soak up spilled degreasers) cannot be put in the garbage. Instead, bag them or place them in a drum, label the container, and dispose of as a hazardous waste (see Strategy 12).
- Vehicle oil is not generally considered hazardous unless it contains a high concentration of metals. For small oil spills, the absorbent materials can be placed inside a sealed container (sealed plastic bags are fine) and put into the garbage can or dumpster.

Waste Disposal

Strategy 12

If it is not possible to totally eliminate all waste produced, proper waste management is extremely important to avoid both environmental and legal problems. Businesses are financially and legally responsible for their waste disposal even if it is handled by a waste contractor. Although the business owner has ultimate responsibility for the proper disposal of hazardous and solid waste, employees are also legally liable. In fact, any person who violates the law by improperly disposing of hazardous waste or any person who knowingly aids another is guilty and could be fined or jailed for each separate violation. In case of a continuing violation each subsequent violation is considered a separate and distinct offense.

Identify whether your waste is considered hazardous. Proper waste disposal depends on the chemical properties of the waste. A hazardous waste is a solid, liquid, or gas that could pose dangers to human health, property, or the environment and can no longer be used for its intended purpose. Likely hazardous wastes include leftover:

- paints
- thinners
- solvents
- cleaning and polishing fluids
- coolants
- pesticides
- petroleum products
- rags completely saturated with gasoline or other hazardous materials.

Other materials that burn or itch on contact with skin, that dissolve metals, wood, paper, or clothing, or that bubble or fume upon contact with water are also probably hazardous. If you don't know whether a product or waste is hazardous, check shipping papers, material safety data sheets (MSDS), and product labels.

Assume a substance is hazardous until you find out otherwise. Prior to safe disposal, place the substance in a sealed container, label it, and store it in a safe place.

If wastes are hazardous, estimate the amount. Determine whether there is less than 220 pounds produced per month or batch (2.2 pounds if the waste is extremely hazardous) or

accumulated at any time. This is approximately half of a 55-gallon drum. Businesses that generate more than this have more disposal requirements than those that generate less.

Stay under 220 pounds of hazardous waste produced or accumulated per month or batch (2.2 pounds if the waste is extremely hazardous), and you will be considered a small-quantity generator (SQG). By state law, if you are a small-quantity generator you must identify your hazardous wastes and understand the required precautions necessary for their handling and disposal. You must dispose or recycle your wastes through a recycling firm, treat them on-site, or have them treated through a treatment, storage and disposal (TSD) facility.

Determine the best disposal method. *Recycling or finding someone who can use the waste are preferred to disposal.* For proper disposal of a specific product read the disposal section of the material safety data sheet (MSDS). The fact that a waste isn't hazardous doesn't automatically mean it can go into your dumpster or down the sanitary sewer. There are also limits on what can go down the sanitary sewer. Call your local storm water department or HRSD for details. Here are the appropriate disposal methods for a variety of materials. Never dump any of them down a storm drain or onto the ground:

- Applicators such as brushes, mops, and rags: If the applicator is used to apply paint that does not contain chromium, lead, or other metals, it can be dried and put in the dumpster. Rags that are saturated with solvents must be stored in a closed container, to contain harmful vapors. If the rag is saturated it must be disposed of as a hazardous waste. If it is just soiled, it can go to a permitted industrial laundry.
- Asphalt and fresh concrete mortars: Disposal depends on the product and manufacturer. Read the product label, consult the supplier, or call one of the listed resource numbers.
- Asphalt pavement: Recycle through a sand and gravel company or take to a demolition landfill.
- Batteries: Recycle lead-acid batteries (such as vehicle batteries). Virginia State law requires lead-acid battery sellers - both wholesale and retail - to accept used batteries in exchange for new ones, if offered by the purchaser.
- Brake fluid may be recyclable through a waste hauler. If not, it must be disposed of as a hazardous waste. Store and separately label the fluid, and be sure not to mix it with recyclable waste oil.
- Carpet cleaning waste: Most carpet cleaning waste can be safely disposed of down an indoor drain to the sanitary sewer, but make sure solids are settled out first so the drain doesn't clog. Check with HRSD for specific requirements.
- Disinfectants, oven cleaners, stain/spot removers, rug/carpet cleaners, and asphalt sealers: Use up according to directions or give to someone who will. Check the MSDS supplied by the manufacturer for possible disposal options. Otherwise, dispose of as a hazardous waste.
- Drain and toilet bowl cleaners: Use up according to directions or find someone who will. Small amounts can be disposed of with liberal amounts of water down an inside drain that leads to the sanitary sewer. Dispose of empty, rinsed containers in the dumpster.
- Fats, cooking oils, and greases: Recycle. Never pour them down a sink leading to the sanitary sewer, even if you add hot water or detergents; this just allows the grease to be carried further down the pipes before solidifying.
- Paint: With permission, leave excess paint with the property owner for touch-ups or disposal as a house-hold hazardous waste. For other facilities, use up excess paint, or find another organization that can use the paint. If a re-use option cannot be found, excess latex paint can be dried in the can or painted on boards and thrown into covered dumpsters (leave the paint-can

lid off so the garbage collectors know that the paint is dry). Latex-based paint is also recyclable. Oil based paint must be disposed of as a hazardous waste. Either kind of paint may be traded through a waste exchange. (Appendix B, Internet Resources).

- Paint thinners: See solvents.
- Pesticides: Many pesticides are considered hazardous waste (if there are leftovers). Unless the pesticide has been banned, try to use up according to the directions or find someone who will. Triple rinse containers before disposal and use the rinse water as a product (see Strategy 36). Otherwise, dispose as hazardous waste.
- Petroleum products such as gasoline, diesel, and kerosene are not considered hazardous wastes if they can still be used and are collected by a waste hauler. If they are recycled, they must be shipped as hazardous wastes. Check re-use options before deciding on disposal.
- Plant Debris: Compost on-site or take plant debris to a composting facility.
- Sealers such as those used on concrete or asphalt: Try to find someone who can use them. If the re-use option is not possible, for small amounts, evaporate. For larger amounts, paint out and let dry, then put in a covered dumpster.
- Solid debris from sweeping, pressure washing, and cleaning catch basins: Due to a variety of possible pollutants, waste of this type should be screened by the Health Department. Swept leaves can be composted.
- Solvents: Allow solvents such as mineral spirits and paint thinner to settle, then strain and re-use the liquid. When the solvent can no longer be re-used, have it recycled or disposed of as a hazardous waste. The solids that are settled out must be disposed of as a hazardous waste.
- Tires: Recycling is the best option.
- Used hydraulic, gear, and engine oil and oil filters: Evaluate the re-use option of using used oil for energy in area heaters. If a re-use option is not possible, recycle used oil, and see if your recycling vendor will also recycle used oil filters. Oil filters - except terne-coated filters such as those used in many trucks - can go in the dumpster if the oil has been drained for 24 hours first. You may be able to recycle drained used oil filters as scrap steel. Terne-coated filters must be disposed of as a hazardous waste.

Properly dispose of hazardous waste you can't re-use or recycle. If you can't recycle or treat your hazardous waste on-site, you need to dispose of it through a treatment, disposal, and storage (TSD) facility - either directly or through a hazardous waste broker or hauler.

Some TSD facilities and waste brokers will pick up your hazardous waste; others require that you deliver it to them. If you're a small quantity generator you can choose to transport your hazardous waste yourself. Regulated generators must use a hauler with an EPA identification number. Many waste haulers, brokers, and TSD facilities operate in this area. Choose carefully, because you are legally responsible for the ultimate fate of your waste. For instance:

- Check references. Seek referrals on reliable companies from businesses similar to yours.
- Make sure the business has an EPA identification number from the Virginia Department of Environmental Quality.
- Find out if they have been recently cited for violations, and if so, what changes they've made in their practices.
- See if they have insurance rider MCS-90 that provides coverage for pollution caused by spills while hauling waste.
- Find out what they will do with your waste. It needs to end up at a treatment, storage, and disposal facility where it can be reprocessed, recycled, blended into fuels, incinerated, or taken to a special landfill.
- Find out what documentation they provide.

Purchasing and Accounting Practices

Strategy 13 Track Costs by Process or Activity

Until the all the costs for a particular process or activity are clearly attributed to that process or activity, it will be difficult to know what the true cost of that activity is and how much the initiation of a pollution prevention strategy in that process will save. For instance, if a particular process generates hazardous waste, the waste disposal costs, regulatory compliance costs, sampling and analysis costs, reporting costs, insurance costs, worker health costs, environmental liability costs, etc. should all be attributed directly to that process.

Allocation of costs to processes and products is one element in EPA's Total Cost Assessment (TCA) of P2 activities. Other elements are feasibility issues and include expanded cost inventory (to include indirect costs, liability costs, and other less tangible benefits) extended time horizon (to account for the liability and less tangible benefits) and use of long term indicators (net present value, internal rate of return and profitability index).[7]

Strategy 14 Inventory Control

Buy only what you need. Purchase products in amounts that can be used completely and maintain a good inventory control system to prevent unnecessary purchases. Consider waste management costs before buying new materials and equipment.

Purchase products that last longer (for example, good quality rather than poor quality tires) and recommend them for your customers. Maintain equipment and products so they last as long as possible.

Buy the least toxic products available. Look for "non-toxic" on the label. Do not let the term "bio-degradable" mislead you. Products labeled with this term are not necessarily safe for the environment, particularly after they are used. For example, a "bio-degradable" degreaser can become a hazardous waste after it is mixed with oil and solvent. Review Material Safety Data Sheets (MSDSs) prior to purchasing materials. Select those materials that do not contain toxic ingredients. Also, consider buying non-toxic cleaning products.

Strategy 15 Containerization

Evaluate the size of the containers you purchase. If you are generating a lot of leftover waste, buy the material in smaller sized containers.

River Star Naval Station Norfolk has an ongoing goal to reduce the container size on purchases of hazardous materials to eliminate waste and protect against potential harmful situations.

Damaged/Outdated Materials

Strategy 16

If materials come in damaged, your supplier should take them back. These materials should not become part of your waste stream. Contact your supplier to make sure they will take back damaged materials and make sure your receiving department is set up to return them. Material or supplies that become damaged in the course of operation may be able to be re-used in another application. Make sure to consider all re-use and recycling options before throwing the material away. If damaged materials are a big part of your waste stream, consider implementing employee training to decrease the opportunity for damage to occur.

Inventory control should include procedures for limiting or eliminating outdated materials. Make sure all inventory is dated and that there is a procedure in place to use older materials first. Do not order more materials or supplies than you will need for a given period of time. If outdated materials cannot be eliminated, check with your supplier to see if they will take them back. Sometimes, the material can be re-used for another application. Make sure to consider all re-use and recycling options before disposal.

Energy Efficiency

Strategy 17

Reducing energy consumption can save money and reduces the pollution generated by power plants (carbon dioxide, sulfur dioxide and nitrogen oxides). Educate your employees about switching off lights. Purchase energy efficient lighting and office equipment. Install temperature control devices on air conditioning or heating units. You could even use the money saved with energy reduction initiatives to have a party for employees that will increase employee morale and educate them about efforts they can make at home.

The EPA's Green Lights' Program reported annual savings per company participating in the program at $113,431 (1996). The EPA now supports this program as well as the Energy Star Buildings program, Energy Star Computer program and "Golden Carrot" TM Super-Efficient Refrigerator program. Appendix B includes an Internet address for EPA's Energy Star programs and products.

Hampton Roads Behavioral Health, a River Star in Norfolk, has timers on its heating and air conditioning units to limit the amount of energy used at these facilities.

Recycled Materials

Strategy 18

Purchase recycled products. Increased purchasing of recycled products is necessary to close the recycling loop. Markets for the recycled materials collected from your business will develop only when you buy back the recyclables in the form of new products.

Buying recycled products also encourages energy and resource conservation. To find out more about buying products made from recycled materials, contact your vendors, or call the Elizabeth River Project.

Inks

Strategy 19

When you send off materials to be printed, support the cause of pollution prevention elsewhere by having them printed with soy-based inks on recycled paper.

Employee Awareness and Training

Strategy 20 Employee Involvement

NORSHIPCO, a local ship repair industry and a River Star on the Southern Branch has initiated an Environmental Star of the Month recognition program for employees that prevent spills or contribute p2 ideas. The award includes a good parking space, $50, recognition in the company newsletter, and the employee's picture is displayed on a company bulletin board.

Many of the steps you can take to prevent pollution need to be followed on a daily basis. Therefore, employee education is key to success.

"In-house" training. All new employees should be aware of those practices that contribute to potential pollution and those that prevent or minimize pollution. Budget for this training. Consider incorporating the following into an "in-house" training program:

- Select the applicable strategies from this manual and include in your training program (i.e. Waste Handling, Spill Prevention and Clean-up, Equipment Maintenance, etc.).
- Include P2 concerns in new employee orientations and in written procedures.
- Provide employees with proper disposal options.
- Conduct "worker right-to-know" training and have material safety data sheets (MSDS) available for easy reference. Show employees how they can identify the hazardous or toxic constituents of materials and let them know that finding less or non-toxic alternatives is a goal of the company.
- Discuss your company's p2 strategies and goals, including any equipment purchased, process changes, re-use and recycling efforts.

Monitor workers to determine how effective the training program is. Provide daily feedback on observed behavior.

Participate in other educational opportunities.

- Attend workshops and read educational materials referenced in this manual.
- Attend other relevant courses such as those sponsored by your trade association.
- Display signs and posters.
- Post an explanation of your p2 strategies in areas where employees and customers will see them. For example, post the spill control plan or install a sign on the dumpster reminding staff to close the cover.
- Put p2 issues/ideas/articles in staff minutes or a company newsletter.
- Borrow videos from the Elizabeth River Project, the Virginia Office of Pollution Prevention, or your manufacturer's association or trade group on p2 or other environmental issues.

Strategy 21 Employee Recognition

It is important to recognize employees who are contributing to pollution prevention within the company. Recognition not only awards those who are actually "living" your company policy, but encourages others to follow their example. Ways to recognize employees for contributing to a pollution prevention program include:

Create incentives for developing or implementing P2. Some of our River Stars have initiated employee incentive programs for employees who participate in locating p2 opportunities, prevent pollution from occurring, keep an especially clean work space, or participate in educational opportunities and community clean up events. These employees deserve special recognition. Incentives might include:

- Naming an "Environmental Employee of the Month" in an employee newsletter.
- Providing a gift certificate or special parking space for the Environmental Employee of the Month.
- Offering an employee that contributes a pollution prevention idea a percentage of cost savings resulting from that idea.
- Cash awards.

Making pollution prevention a part of job performance. Make it known how committed your organization is to pollution prevention by incorporating contributions to the pollution prevention effort into performance evaluations.

Public Relations/Community Involvement

Showing clients what you are doing to protect the environment is good public relations; getting them to do their part can be good for business as well as the environment.

Product Promotion

Strategy 22

Provide educational materials to customers. Why not share your values and pollution prevention policies or mission with your customers? You may find that many customers are glad to know that they are supporting a company that promotes pollution prevention and other environmental initiatives. For the printer that switched to soy-based inks, the customers will have a large part in the success of the initiative - they need to know that the alternative is available and why it is important to support its use. If you produce a product and it is now cleaner or more "environmentally friendly" due to a product substitution or process change, tell your customers. If you recycle and use non-toxic cleaning products in your office, or use energy efficient equipment - tell your customers and patrons. Not only can pollution prevention save you money, it can improve your image.

Sharing Experiences

Strategy 23

Explain pollution prevention to peer businesses. The only way pollution prevention is going to have a significant impact on the Elizabeth River is if more and more companies get involved. An excellent way to make sure participation increases is to mentor another facility.

- Give a presentation at another local business.
- Share some of your cost saving pollution prevention initiatives.
- Help another business develop their own pollution prevention goals.
- Help another organization set up a recycling program or employee recognition program.
- Sponsor a workshop on pollution prevention or good management practices.

Distribute a press release on pollution prevention strategies and awards received. This is a good technique for reaching other businesses and the community at large, as well as providing positive publicity for your company.

Many of our River Stars mentor other facilities and participate in workshops that encourage others to prevent pollution.

Outreach Programs

Strategy 24

In addition to sharing your pollution prevention strategies with other businesses, help educate the community about pollution prevention and habitat enhancement. Put up a display at a local environmental event such as Earth Day or give a tour of your facility to your residential neighbors. Talk to children at a local school about pollution prevention or recycling. Start a Community Advisory Panel to share facility news with the surrounding community.

For one diaper cleaning service that was exceeding discharge limits for zinc, customer education was their pollution prevention strategy. The zinc used in diaper rash ointments was the source of the zinc in the facility's discharge. They offered to buy back the zinc containing ointments and offered promotional zinc free ointments to their customers. They also offered to sell these zinc free ointments at a reduced cost. This educational outreach program reduced the zinc entering the waste stream and saved the facility violation fees.[8]

Strategy 25

Area Clean-Ups

PETA has adopted a street in Norfolk to keep litter free.

Host a Clean the Bay Day or other community clean-up event. This is an excellent way to market your company as "green" while at the same time encouraging others to appreciate their natural surroundings.

Strategy 26

Awards and Incentive Programs

Receiving an award for environmental initiatives can

- promote these initiatives within your organization
- improve employee awareness
- improve your company image
- make your company more viable as a mentor to other facilities.

In addition to the Elizabeth River Project's River Stars recognition efforts, several environmental awards are offered in Virginia for companies that show environmental progress or excellence. These include the Governor's Environmental Excellence Award for Manufacturers, the Virginia Stewardship Awards and various local award programs. Financial incentives for pollution prevention are offered through Center for Innovative Technology, Virginia's Pollution Prevention Grant Program, the Small Business Environmental Compliance Assistance Loan Fund, and the Virginia Alliance for Solar Electricity. Appendix A includes a brief description and contact information for these programs.

Norshipco, Achievement Level River Star on the Southern Branch of the Elizabeth River, proudly displays their "Environmental Star" special parking space.

Storm Water Runoff

Catch Basin Care

Strategy 27

Catch basins are structures located where water enters a storm drain or where pipes intersect. Many catch basins extend below the outlet pipe, which means there's an area at the bottom of the catch basin where sediment and other pollutants can collect.

It's important to maintain catch basins; otherwise any accumulated pollutants can get stirred up during a storm and wash through the outlet pipe to a waterway. If the catch basin doesn't have a catchment area, debris can sometimes block the outlet pipe itself.

Inspect your catch basins regularly. If you own or maintain a business site, check your catch basins at least twice a year to see if they need cleaning. This should be done in the spring and in the fall to clean out leaves.

To find out how deep material has accumulated in your catch basin, insert a thin probe (such as a thin stick or 1/2-inch-thick electrical conduit) between the grates on the storm drain cover. Notice where your probe hits the debris and continue probing to the catch basin bottom to estimate how deep the accumulation is.

Clean out the catch basin as needed. Catch basins should be cleaned out before deposits fill approximately 60 percent of the area below the outlet pipe.

If your catch basin is shallow enough, you may be able to clean it out yourself with a shovel and bucket. If the catch basin cover is rectangular, be careful not to drop it down the opening when you remove it - it can be extremely hard to retrieve! You may want to hire professional help for maintaining catch basins at your site.

Regularly remove debris from storm drain grates. Storm drain grates can become clogged with litter or leaves, especially in the Fall. Regular inspection and removal of debris can help prevent blockages that could lead to localized flooding.

Stencil your storm drains. Stencilled messages that say "Dumping Pollutes, Drains to Waterway" are a good reminder that nothing but water belongs down a storm drain. Just be sure not to spill any paint near or in the storm drain.

Maintaining Other Drainage System Features

Strategy 28

Some commercial sites (as well as certain residential subdivisions) have detention facilities that store storm water runoff and release it slowly, either to pipes that lead to local waterways, or to soak into the ground. Detention facilities come in a variety of sizes and shapes. The most common are vaults, ponds, vegetated swales, and pipes.

Maintain your detention system. If your site has a detention facility, you're obligated to maintain it. Your system may have special maintenance requirements. In general:

- Inspect the system at least annually.
- Repair any damaged or defective structural facilities.
- Regularly remove any debris.

Maintain other drainage system features. Each fall, cut grass and other plants in vegetated swales and open detention ponds and remove the cut vegetation. Otherwise, nutrients taken up by the plants during the growing season will be released into the water when the vegetation dies back in the winter.

Strategy 29

Oil/Water Separators

Properly maintained, an oil/water separator can help collect pollutants and therefore minimize the impact of contaminated runoff on rivers and other water bodies. Oil/water separators are also used as a permanent measure to keep oil out of the sanitary sewer system.

Three types of oil/water separators are commonly used in storm drainage systems:

1. A spill control separator, which is a structure with a T-shaped pipe that traps floating pollutants.
2. American Petroleum Institute (API) separators, which consist of long vaults with baffles. The baffles slow down the water and thereby increase the chance that any oil droplets dispersed in the water will float to the surface and that heavy pollutants will sink to the bottom.
3. A coalescing plate (CPS) separator, which is a vault with closely spaced plates of fiberglass or polypropylene that slow the water and help remove oil.

River Star D.D. Jones Trucking has installed an oil/water separator to collect runoff from truck washing operations.

Find out if you have an oil/water separator. They are only effective if maintained.

Eliminate oil sources to the maximum extent possible. Oil/water separators do not remove all oil before discharge to waterways, and are not meant to receive large amounts of oil. Take steps to eliminate oil sources, such as covering any oily parts stored outdoors or promptly fixing oil leaks on company vehicles.

Maintain your oil/water separator. The following recommendations apply to oil/water separators connected to the storm drainage system. Clean spill-control oil/water separators as you would a regular catch basin and immediately after any spills. A spill-control separator needs to be cleaned before sediments fill 60 percent of the area between the catch basin bottom and the bottom of the T-shaped pipe. Also, oil needs to be removed from the separator whenever there is a visible sheen on the water surface.

Clean an API or CPS oil/water separator as follows:

- Clean the system when there is a visible sheen to the water. On some sites, this is as often as once a month.
- Clean the separator with an approved and environmentally safe method, such as those used by commercial tank-cleaning companies. You can find tank-cleaning services listed in the Yellow Pages.
- Make sure that whoever cleans the system knows they must dispose of the waste oil and sludge in accordance with state regulations. The Health Department can tell you testing and disposal requirements. Do not use septic tank-cleaning services to clean your oil/water separator; there is no legal, environmentally safe way for them to dispose of oily wastes.
- Make sure to properly dispose of any standing water that is removed. Replace the dirty standing water with clean water to prevent oil from being washed out of the separator.
- If your separator has oil absorbent pads, replace them as needed.
- If your separator doesn't have oil absorbent pads, consider putting them in. By maintaining the pads you can reduce or eliminate the need to clean out the entire oil/water separator. Some companies will install and maintain oil absorbent pads.

Washing Facilities, Vehicles and Equipment

Strategy 30

Follow this strategy when washing equipment or vehicles outdoors with water, including low-pressure, high-pressure, and steam cleaning. (Strategy 31 covers pressure washing of facilities). The goal of this strategy is to prevent oil and grease, suspended solids, heavy metals, and toxics from washing into the drainage system.

Select a location for washing. Wash vehicles and equipment at one of the following locations:

- at a commercial washing facility that drains to the sanitary sewer
- inside your building with drainage to the sanitary sewer
- in a separate vehicle or equipment washing building, similar to a commercial car or truck washing business, which drains to the sanitary sewer
- in an unenclosed wash area that meets the requirements described below.

Properly design any unenclosed wash area. If you plan to wash vehicles or equipment outdoors, then the wash area must:

- drain to an oil/water separator and then to the sanitary sewer
- be covered and/or bermed so that an area no bigger than 200 square feet drains to the sanitary sewer
- be paved
- be well marked as a wash area and posted with signs prohibiting oil changes and washing with solvents.

Use other options as a last resort.

- If it is not possible to connect a wash area to the sanitary sewer, collect the water in a dead-end sump, tank, or other device for transport to the sanitary system for proper disposal.
- Alternatively, place a temporary plug over the storm drain and pump the accumulated water to the nearest sanitary sewer. Call the storm water management department for permission to temporarily block a city-owned storm drain.
- Car dealers without washing facilities can wash new vehicles with high pressure, low volume water only; do not use soaps, detergents, or other cleaners. If vehicle surfaces are greasy or oily, this method is not appropriate.

Collect hazardous wash water in a dead-end sump. When washing items that produce rinse water unfit for the sanitary sewer, such as water containing a hazardous waste, use a wash area that drains to a dead-end sump. A sump is a closed pit where liquid can collect and be pumped out later. The wash area should include a curbed concrete pad that is sloped to the sump. Washing should be done with high-pressure, low-volume cleaning equipment. Sump contents can be pumped into temporary holding tanks. Reuse or dispose of the sump contents as a hazardous waste (see Strategy 12).

Outdoor Pressure Washing

Strategy 31

Pressure washing buildings, roofs, and pavement dislodges pollutants such as oil, paint chips, and sealants. Allowing dirty or debris-laden wash water to enter the storm drainage system violates local and state law.

Avoid pressure washing if possible. Use mechanical cleaning methods such as brooms and wire brushes as much as possible. If you are cleaning vehicles or equipment, see Strategy 30.

Manage the waste water appropriately. If you can't avoid pressure washing, use sandbags or other materials to divert the flow of waste to a grassy or vegetated area which does not directly discharge to a storm drain. (This method should not be used if the water contains any hazardous substances.) If such a vegetated area isn't available, divert the waste water to a temporary basin constructed of sandbags or other material or to a storm drain catch basin

which is not in the public right-of-way and which you have temporarily blocked. Then pump the water to a containment vehicle and decant it at an appropriate disposal site. Alternatively, the runoff may be diverted to the sanitary sewer system at the wash location if it meets the city's discharge guidelines.

Dispose of solids. Solids remaining after the water has been removed need to be cleaned up and properly disposed. See Strategy 12 if any solids containing hazardous waste are generated.

Strategy 32 Using Roof Preservatives

Many roof preservatives are pesticides that must be handled with extreme care. Using roof preservatives improperly can lead to toxic pollutants in the water. The moss and other plant material removed from cleaned roofs can use up oxygen if they are allowed to reach waterways.

Select the least hazardous option. Consider whether you can avoid roof preservatives entirely, for example by removing overhanging branches and cleaning the roof regularly.

Properly prepare for application. When cleaning the surface for preservative application, do not allow solids (such as moss and roof particles) to wash to a storm drain or waterway. Sweep the roof surface to remove solids before applying water. Remove solids from water draining from a roof by attaching a sock on the lower end of each down spout to filter solids and/or attach a hose to the end of the downspout and drain filtered water to a vegetated area. See also the information on pressure washing provided in Strategy 31.

Strategy 33 Applying Pavement Seal Coatings

Preparing a surface for coating and handling chemical sealers is a potentially polluting activity. Preparing the surface can dislodge toxic fluids that have dripped from vehicles or been spilled by building occupants. The sealers are also potentially toxic.

Select sealers with care. When purchasing pavement seal coating materials, select the least hazardous option for each situation, check your inventory, calculate how much you need, and buy only that amount.

Store sealers carefully. Keep containers tightly closed in a cool, dry, well-ventilated area, away from sources of ignition. Follow the general storage guidelines in Strategy 10.

Keep pollutants out of storm drains when preparing the surface. Sweep or otherwise mechanically clean the driveway instead of hosing it down. Many toxic pollutants and heavy metals associated with vehicles can build up on driveway surfaces; those pollutants can be washed into storm drains and ultimately to waterways or lakes.

If you must hose a driveway to be coated, divert the wash water away from any storm drains; wash it to the side of the driveway where plants can filter out pollutants. If a lot of sediment collects in the grass, collect and dispose of it properly. If the driveway is sloped, place straw bales at the bottom or divert flow to a safe sediment trapping area.

Apply sealers cautiously. Follow the directions on the label exactly and only apply during dry weather. If sealers spill, soak up with an absorbent material. If the chemical is classified as hazardous, the absorbent material must be disposed as a hazardous waste (see Strategy 12).

Clean or dispose of containers and applicators properly. See Strategy 30 for cleaning equipment and Strategy 12 for details of proper waste disposal. Empty containers retain residue (liquid and/or vapor) and can be dangerous. Empty drums should be completely drained, properly closed, and promptly shipped to the supplier or a drum re-conditioner. In most cases, applicators can be dried and thrown in the garbage.

Handling Fresh Concrete Mortar

Strategy 34

Fresh concrete or other cement-related mortars can cause fish kills if allowed to enter the drainage system. Take steps to ensure mortars are kept out of storm drains and waterways.

Use designated wash-out areas. Clearing and grading permits typically require construction sites to include a wash-out area. Be sure to use it. Never wash fresh concrete mortar into a storm drain or waterway.

Take care when constructing concrete aggregate driveways. Wash out the fines to the side, not down the driveway. If the driveway is sloped, place straw bales at the bottom or divert flow to a depression where the sediment can collect.

Vehicle Fueling

Strategy 35

Gas and diesel spills are common when vehicles are fueled. If the fueling area is improperly designed, oil and grease, metals, and toxics are washed to the drainage system in violation of state and local law. Fuels contain organic compounds and metals that are harmful to aquatic life. To minimize pollution, take the following steps:

- Pave the fueling area using Portland cement concrete, not asphalt; fuel deteriorates asphalt.
- Design the fueling area as a spill containment pad. In other words, design it so that any spills are contained and so that storm water runoff from adjacent areas can't enter it.
- Cover the fueling area. This keeps rain from hitting the ground and washing away any spilled materials. Ideally, the cover should extend several feet beyond the spill containment pad.
- Drain the fueling area to the sanitary sewer. Slope the pad toward drains that connect to the sanitary sewer. (For example, locate longitudinal drains at the perimeter along the "downhill" side of the fuel island and connect them to the sanitary sewer.) Equip the drain with a valve to allow shutoff in the event of a large fuel spill. Connecting to the sanitary sewer requires a permit from the Department of Utilities and HRSD.
- Keep suitable clean-up materials on-site to allow prompt clean-up of any spill. See Strategy 11 regarding spill prevention and clean-up.
- Post signs that instruct fuel pump operators not to overfill gas tanks. Overfilling causes spillage and vents gas fumes to the air. Make sure the automatic shutoff on the gas nozzle works.
- Place any temporary fuel tank (used to fuel vehicles in the field) in a bermed, impervious area. The area should be large enough to contain 110 percent of the tank's total volume. Impervious liners such as heavy mil plastic or Portland cement will work.

Pesticide Use

Strategy 36

Pesticide misuse or misapplication can lead to ground and surface water pollution. Please refer to the Elizabeth River Project's Guide to Enhancing Wildlife Habitat for information regarding the proper use of Pesticides.

Strategy 37 Sensitive Area Protection

Please refer to the Elizabeth River Project's Guide to Enhancing Wildlife Habitat for information regarding sensitive area protection.

Strategy 38 Erosion and Sediment Control

Sediment from poorly managed construction sites can be a significant pollutant. How much soil erodes depends on the amount of exposed soil, soil type, slope, rainfall, and erosion and sedimentation control measures used. Erosion and sediment control efforts should focus first on preventing erosion. However, once soils become mobilized, sediment controls help keep sediment and associated pollutants on site, thereby protecting nearby waterways, wetlands, and lakes.

The Chesapeake Bay Preservation Act (CBPA) and the Clean Water Act require erosion and sediment controls at construction sites and other areas where land is disturbed. If your project requires a clearing and grading permit, a temporary erosion control and sedimentation plan is required before the permit will be issued. The best way to prevent erosion is to keep soils covered by preserving vegetation or using temporary erosion control measures.

Preserve as much native vegetation as possible.

- Be sure to observe clearing limits and comply with all CBPA vegetation preservation and buffer requirements. Do not excavate or fill within 10 tree-trunk widths of any tree to be preserved or any closer to the tree trunk than the tree's furthest branches.
- Time the clearing so it occurs no sooner than necessary for subsequent construction activities.
- Provide temporary vegetation/cover as needed. Alternate cover methods include straw, hay, or wood-fiber mulch; jute mat excelsior, woven straw blankets, or netting; or plastic sheeting with anchors.

Install appropriate sediment controls. Sedimentation ponds and other sediment controls remove or settle out soil and other particles from storm water runoff, usually by filtering or by reducing runoff velocity. These facilities need to be maintained to be effective. Lower cost, non-engineered sediment controls include:

- filter fabric fence - used for sheet or overland flow
- check dams including straw bales, rocks, pea gravel bags, sandbags
- sediment traps for catch basins and drain inlets
- rockberms.

Moderate cost, engineered sediment controls include:

- intercepting ditches
- cut-off trenches
- level spreaders
- gradient terracing/contouring
- swirl concentrators.

Higher cost, engineered sediment controls (many of these can remain in place for permanent water quality treatment) include:

- siltation/sedimentation ponds
- grass-lined swales
- constructed wetlands.

Reduce off-site sediment tracking by using a construction exit pad and/or sheet wash station.

Maintain erosion and sediment controls. Frequently inspect the erosion and sediment control facilities to make sure they are working. This is especially important both before and after a storm. (City permit conditions may require specific monitoring and maintenance.)

Provide permanent vegetation/cover as soon as earthwork is complete. Cleared areas that do not require further construction activity should be permanently vegetated. Options for permanent cover include permanent seeding or hydroseeding, sodding laid perpendicular to the slope, sprigging, or other vegetation. Try to use native and beneficial plants as they require less maintenance and attract native wildlife. Contact the Elizabeth River Project's Habitat Enhancement Committee for help.

Controlling Runoff During Construction

Strategy 39

The greater the volume and velocity of storm water runoff, the more pollutants it can transport to waterways, wetlands, and lakes. Diverting runoff away from exposed soils can greatly reduce the amount of eroded sediment and associated pollutants, especially when runoff enters the site from a larger drainage area. Reducing runoff velocity also reduces the amount of pollutants carried off-site.

Runoff controls can be applied to runoff from the site itself or to runoff entering the site from a larger area. Two types of runoff controls are commonly used during construction - diverting runoff from exposed areas and reducing runoff velocities.

Divert runoff from exposed areas. This can be carried out using a number of relatively inexpensive controls including:

- diversion dikes and ditches to channel runoff
- diversion swales lined with grass, quarry spalls, pavement, or plastic
- constructed berms of soil or rock
- pipe drainage systems including temporary culverts
- flexible downdrains.

Reduce runoff velocities. Techniques to reduce runoff velocities include:

- vegetating exposed soils and ditches
- riprap
- surface roughening
- check dams including straw bales, rocks, pea gravel bags, sandbags
- terracing or contouring the site
- filter fabric fencing.

Landscape Designs for Water Quality

Strategy 40

Plant selection and landscape design can significantly affect water quality through their effects on water infiltration, storm water runoff, and maintenance needs. Please refer to the Elizabeth River Project's Guide to Enhancing Wildlife Habitat for information regarding landscape designs.

Landscape Installation and Maintenance

Strategy 41

Landscape installation and maintenance methods affect both the amount of runoff available to wash pollutants into our surface water and the pollutants potentially washed off. Please refer to the Elizabeth River Project's Guide to Enhancing Wildlife Habitat for information regarding landscape installation and maintenance.

Integrated Pest Management

Strategy 42

Please refer to the Elizabeth River Project's guide to enhancing wildlife habitat for information regarding integrated pest management.

Literature Cited

1 Facility Pollution Prevention Guide, Office of Solid Waste, U.S. Environmental Protection Agency, May 1992.

2 Facility Pollution Prevention Guide, Office of Solid Waste, U.S. Environmental Protection Agency, May 1992.

3 Facility Pollution Prevention Guide, Office of Solid Waste, U.S. Environmental Protection Agency, May 1992.

4 Waste Minimization Opportunity Assessment Manual, p. 22

5 Pollution Prevention Success Stories, USEPA Office of Pollution Prevention and Toxics, EPA/742/96/002, April 1996.

6 Pollution Prevention Success Stories, USEPA Office of Pollution Prevention and Toxics, EPA/742/96/002, April 1996.

7 Facility Pollution Prevention Guide, Office of Solid Waste, U.S. Environmental Protection Agency, May 1992.

8 Pollution Prevention Success Stories, USEPA Office of Pollution Prevention and Toxics, EPA/742/96/002, April 1996.

APPENDIX A

Award/Recognition Programs

The following is a listing of award/recognition programs available in Virginia.

Chesapeake Environmental Improvement Council (CEIC)
Special Programs
P.O. Box 15225
Chesapeake, VA 23328
Phone: (757) 382-6411

The Chesapeake Environmental Improvement Council sponsors an awards program to honor individuals and organizations who have conducted outstanding programs in litter control, recycling or beautification in Chesapeake. The program includes a Certificate of Appreciation, Outstanding Achievement Awards, and the Mayor's Outstanding Service Award. There are seven categories: Business and industry, youth community organization, adult community organization, government agency, communication, educational institution and outstanding citizen. Applications are due by January 15 of each year. The awards are presented during a luncheon on the first Wednesday in March.

The Elizabeth River Project River Star Program
475 Water Street, Suite C103 A
Portsmouth, VA 23704
Phone: (757) 399-7487

This recognition program is sponsored by the Elizabeth River Project to obtain public appreciation for those organizations that achieve pollution prevention goals and/or install wildlife habitats. Levels are commitment, achievement and model. There is no cost to enter the program other than a suggested donation to cover the cost of materials.

Governor's Environmental Excellence Awards for Manufacturers
Virginia Manufacturers Association
P.O. Box 412
Richmond, VA 23218-0412
Phone: (804) 643-7489

This award is sponsored by the Virginia Manufacturers Association (VMA) and is designed to encourage industries to implement the State's pollution prevention policy, promote all aspects of excellent environmental stewardship, and recognize outstanding efforts. Categories include Environmental Projects, Environmental Programs, for both Larger Manufacturers and Smaller Manufacturers (500 or fewer employees). Applications are usually available in April and due back to the VMA in July.

HRSD
Industrial Waste Division
PO Box 5902
Virginia Beach, VA 23471-0902
Phone: (757) 460-7040

HRSD's Pretreatment Excellence P2 Awards Program honors permitted industrial and commercial dischargers for outstanding multi-media P2 efforts. Emphasis is placed on waste water discharges, but other media are given strong consideration. Awards are in seven categories based on discharge flow rates. Applications must be postmarked by March 1st. The award ceremony is held in the beginning of May each year.

Norfolk Environmental Action Awards
Norfolk Environmental Commission
Ernie Morgan Environmental Action Center
3500 Granby Street
Norfolk, VA 23504
Phone: (757) 441-1347

The Norfolk Environmental Commission, Ernie Morgan Environmental Action Center sponsors the Norfolk Environmental Action Awards. Application forms are available after March 1 each year. Awards are for significant contributions to environmental excellence in the categories of business, education, government (including military), individuals, community groups, and youth groups. Awards include Certificate of Recognition, Environmental Award of Excellence, and the Ernie Morgan Award of Service. Awards are presented in October.

Portsmouth Clean Community Commission
Department of Community Quality & Planning Services
Division of Planning & Zoning Services
801 Crawford Street
Portsmouth, VA 23704
Phone: (757) 393-8522

This award program recognizes Portsmouth citizens, groups, organizations, schools and clubs that contribute to litter control, beautification, and the planting or preservation of key landscaped gateways. Applications are available from the Portsmouth Clean Community Commission and are due by the end of September. The recognition ceremony is generally held before the end of October each year.

Virginia Beach Clean Community Commission
City of Virginia Beach
Municipal Center, Building 8
2565 Glebe Road
Virginia Beach, VA 23456-9074
Phone: (757) 427-4104

The Virginia Beach Clean Community Commission recognizes individuals and organizations that contribute to the many initiatives of the commission at an annual recognition breakfast in September. Contributions can be monetary or for volunteer services. Check their Environmental Activities/Programs brochure online at www.virginia-beach.va.us/comunity/environ/ccc.htm.

Virginia Stewardship Awards
Virginia Petroleum Council
701 E. Franklin Street, Suite 105
Richmond, VA 23219
Phone: (804) 225-8248

This award is a public outreach effort co-sponsored by the Virginia Petroleum Council (VPC) and the Office of the Secretary of Natural Resources. The purpose of the program is to promote pollution prevention, recycling, community and school ecology projects, and environmental clean-ups. There are four categories: youth, adult, organization, and communications/education projects. The submittal deadline for applications is April 15. Awards are presented in late May or early June.

Financial Incentive Programs

The following is a listing of grants or other financial incentives pertaining to pollution prevention. In addition to the following grants and funds,Virginia has a tax exemption for pollution control equipment.

CIT Technology Awards
Virginia's Center for Innovative Technology
355 Crawford Street, Suite 200
Portsmouth, VA 23704
Phone: (757) 397-7016

These awards are provided to Virginia companies that are developing a technology-based product or process. The CIT Technology Awards Program includes Challenge Awards, Innovation Awards and Small Business Innovative Research Awards (SBIR). Challenge Awards are for one year research and development efforts. Awards range from $25,000 to $80,000. Innovation Awards are for short-term final development projects. Awards are $25,000 and less. SBIR Awards are used to support SBIR/STTR Phase I winners with up to $18,000 to leverage the company's subcontract to the academic institution (see SBIR Program description).

National Industrial Competitiveness through Energy, Environment and Economics (NICE^3)
Virginia Department of Environmental Quality
Office of Pollution Prevention
P.O. Box 10009
Richmond, VA 23240
Phone: (804) 698-4344

This is a Department of Energy cost sharing grant program for projects that conserve energy, reduce waste, and have a positive economic benefit. Proposals must be submitted through a State energy, pollution prevention, or business development office. Grants up to $400,000 are awarded and fund up to 50% of total project cost for up to 3 years. For information about submittal dates, etc., contact the Virginia DEQ or visit the Department of Energy's web site at http://www.oit.doe.gov.

Pollution Prevention Grant Program
Virginia Department of Environmental Quality
Office of Pollution Prevention
P.O. Box 10009
Richmond, VA 23240
Phone: (804) 698-4344

The Center for Innovative Technology, the A.L. Philpott Manufacturing Center and the Virginia Department of Environmental Quality sponsor this program. These grants are to increase the competitiveness of Virginia's manufacturers through pollution prevention.

Small Business Innovative Research Program
Virginia Office of Innovative Technology
Office of the Secretary of Technology
110 S. 7th Street
Richmond, VA 23219
Phone: (804) 371-5599

Through this program, the EPA makes awards to small, high-tech companies for research and development of cutting-edge technologies. The purpose of the program is to encourage activities that improve the environment while creating jobs, increasing economic growth and productivity, and improve the competitiveness of U.S. businesses. No matching funds are required.

Small Business Environmental Compliance Assistance Loan Fund
Virginia Department of Environmental Quality
Office of Pollution Prevention
P.O. Box 10009
Richmond, VA 23240
Phone: (804) 698-4344

This fund is administered through the Virginia Department of Environmental Quality and will be available in the Spring of 1999. It will be used to make loans or to guarantee loans to small businesses for the purchase and installation of P2 equipment.

Virginia Alliance for Solar Electricity (VASE)
630 Solarex Court
Frederick, MD 21703
Phone: (301) 698-4200

VASE is a joint venture between Solarex, A Business Unit of Amoco/Enron, Virginia Power, Virginia's Center for Innovative Technology, and the Virginia Department of Mines, Minerals and Energy. Cost sharing funds up to approximately one-half the project cost are available for those interested in having photovoltaic (PV) power systems installed at their facility. For large projects, technical and engineering assistance is also available.

APPENDIX B

Internet Resources for Pollution Prevention

These were operational pollution prevention web sites as of fall 1998. Many have links to other helpful sites.

Education

Advanced Technology Environmental Education Center (ATEEC)
http://www.ateec.org

EPA's Environmental Education Homepage
http://www.epa.gov/Region5/enved

Hazardous Materials Training and Research Institute (HMTRI)
http://www.hmtri.org

University of Virginia WWW Virtual Library
http://www.earthsystems.org/Environment.shtml

Energy

Solarex
http://www.solarex.com

U.S. EPA Energy Star Programs & Products
http://www.epa.gov/appdstar/estar/

World Energy Efficiency Association (WEEA)
http://www.weea.org

General

Consortium on Green Design and Manufacturing
http://greenmfg.me.berkeley.edu/green/Home/Index.html

Enviro$ense
http://es.epa.gov/index.html

EPA Office of Pollution Prevention and Toxics (OPPT)
http://www.epa.gov/opptintr/index.htm

National Pollution Prevention Center for Higher Education
http://www.umich.edu/~nppcpub/

National Pollution Prevention Roundtable
http://www.p2.org

Pacific Northwest National Laboratory Pollution Prevention Web Site
http://p2.pnl.gov:2080/p2/

Pacific Northwest Pollution Prevention Resource Center
http://pprc.pnl.gov/pprc/

Pollution Prevention by Design (U.S. Department of Energy)
http://p2.pnl.gov:2080/DFE/

P2 Gems – Toxics Use Reduction Institute
http://www.turi.org/P2GEMS/

Virginia Department of Environmental Quality – Office of Pollution Prevention
http://www.deq.state.va.us/opp/opp.html

Virginia Environmental Services Network
http://www.vesn.org

Landscaping

Environmental Concern Catalog – Native Plants for Wildlife Habitat
http://www.wetland.org

Native Plants for Conservation, Restoration and Landscaping – Riparian Forest Buffers
http://www.state.va.us/~dcr/vaher.html

Virginia Coastal Program Products Catalog
http://www.deq.state.va.us/envprog/coastal.html

Product Alternatives

CAGE – Coatings Alternatives Guide
http://cage.rti.org/

SAGE – Solvent Alternative Guide
http://clean.rti.org/

Publications

Pollution Prevention Information Clearinghouse (PPIC) (EPA)
http://www.epa.gov/opptintr/library/libppic.htm

Recycling and Buying Recycled

Environmental Stewardship Recycling Programs at Los Alamos National Laboratory
http://perseus.lanl.gov/PROJECTS/RECYCLE/

Global Recycling Network (GRN)
http://grn.com/grn/index.html

King County, Washington Recycled Product Procurement Program
http://www.metrokc.gov/procure/green/

Recycler's World
http://www.recycle.net/recycle/

Sustainable Building, Design, Development and Manufacturing

Center for Renewable Energy and Sustainable Development (CREST)
http://www.solstice.crest.org

Sustainable Building Sourcebook
http://www.greenbuilder.com/sourcebook/

Sustainable Business Network
http://www.envirolink.org/sbn/

Technology Resources

EPA Compliance Assistance Centers
Printing: http://www.pneac.org
Metal Finishing: http://www.nmfrc.org
Automotive Services and Repair: http://www.ccar-greenlink.org
Printed Wiring Boards: http://www.pwbrc.org
Chemical Industry: http://www.chemalliance.org

Joint Service Pollution Prevention Technical Library
http://www.enviro.nfesc.navy.mil/p2library/

National Technical Information Service (NTIS)
http://www.ntis.gov

New Jersey Technical Assistance Program
http://www.njit.edu/njtap/

The Virginia Engineer Magazine
http://www.vaeng.com

Virginia's A.L. Philpott Manufacturing Extension Partnership (VPMEP)
(focuses on small to medium sized manufacturers)
http://www.vpmep.org

Virginia's Center for Innovative Technology
http://www.cit.org

Waste Exchange

ISD Central
http://www.tsdcentral.com

RENEW (TNRCC's Waste Exchange Program)
http://www.tnrcc.state.tx.us/admin/topdoc/pd/002/

Waste Minimization

EPA Region 3 Waste Minimization Web Page
http://www.epa.gov/reg3wcmd/waste_minimization.htm

Junk Mail Reduction
http://web.epa.ohio.gov/opp/consume/junkmail.html

Waste Reduction Resource Center (EPA)
http://www.p2pays.org/wrrc/

APPENDIX C

Reporting Pollution Problems

When you notice a problem that could be causing pollution or damaging wildlife habitat, note the location, time of day, and other pertinent information and report the problem immediately. The contacts for reporting problems are:

Emergency Spills

Spills that are an immediate safety hazard	911
VA Department of Emergency Services	1-800-468-8892
VA Department of Environmental Quality	518-2077

Spills in Major Waterways

U.S. Coast Guard	484-8192

Spills and Illegal Discharges to Storm water System

Chesapeake	382-6352
Norfolk	441-2408
Portsmouth	393-8592
Virginia Beach	563-1470

Illegal Dumping

Chesapeake - Environmental Health	382-6378
Norfolk - Environmental Task Force	441-2536
Portsmouth - Environmental Services	393-8189
Virginia Beach - Environmental Offenses Hotline	427-1901
Virginia Department of Environmental Quality (Hazardous only)	518-2000

APPENDIX D

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River Star Ford Motor Co. involves their employees in restoration activities at their site on the Eastern Branch of the Elizabeth River.

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