

## A Guide for Photo Processors

  
**Reduce Waste**  
*May, 1996*  
*Publication 94-138R*

## Department of Ecology Regional Offices

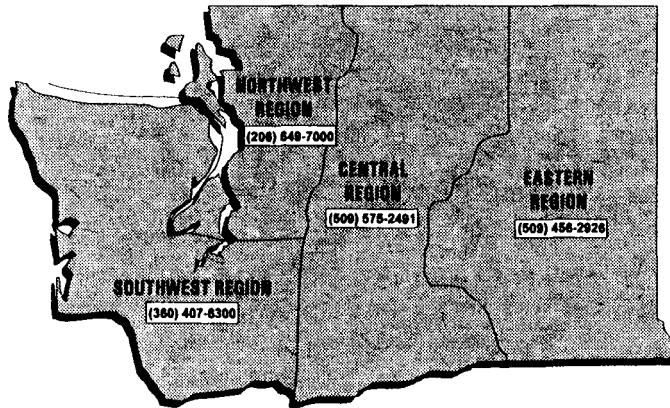


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For questions relating to pollution prevention, you can call 1-800-RECYCLE. General information is available on equipment, service and process changes that can help you reduce and recycle your wastes.

You can also get help for specific pollution prevention problems in your facility by calling your nearest Ecology regional office and asking for a toxics reduction specialist.

For additional information and assistance on regulatory concerns from hazardous wastes, solid waste, water quality or air quality contact the nearest Ecology regional office and ask for the appropriate program specialist.

The first printing of this booklet was printed on 100% post-consumer recycled paper, on a waterless and alcohol free press, using 100% vegetable-based inks. The booklet size is most efficient for minimizing paper waste during cutting.

Subsequent reproductions of this booklet have been photocopied on recycled paper, using electronic originals for continued conservation of natural resources.

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## Why Should Photo Processors Pay Attention to Their Wastes?



If you're a photo processor looking for practical environmental management and pollution prevention information, this booklet is for you.

Photo processors across the state regularly generate wastes that are of concern to the environment. Silver found in used fixer, bleach-fixer, washless stabilizer and C-41RA bleach poses hazardous waste and water quality concerns.

Silver has a very high aquatic toxicity and accumulates in the tissue of aquatic organisms. Because of concerns with silver, used photo processing solutions containing more than five parts per million silver are a state and federal hazardous waste. Many local sewer authorities have even stricter silver limits. With thousands of businesses in Washington State generating silver-bearing wastes, it's important that each one do their part to manage these wastes correctly and keep them out of the soils and waters of the state.

So you play an important role. Silver-bearing and other hazardous wastes don't belong on the ground, untreated down the drain, or in the dumpster. Good waste management practices are important for the following reasons:

- You'll ensure that you're in compliance with federal, state and local waste management regulations and avoid costly penalties.
- You'll provide a safer, healthier workplace for your employees.
- You'll be joining other photo processors in Washington State who are taking pride in maintaining a clean and healthy environment.
- You'll gain customers who know they have made a wise choice in selecting a business that helps protect the environment.

## Your Business and Ecology Regulations



The Department of Ecology (Ecology) is divided into various programs, each with a different environmental emphasis. Ecology is trying to do a better job of linking the requirements of all the programs together in a meaningful way. This helps businesses such as photo processors understand their overall responsibility in meeting Ecology's requirements, rather than learning about them one program at a time. This is commonly called a "multi-media" approach.

Below is a brief description of how key Ecology programs affect photo processors.

### **Hazardous Waste and Toxics Reduction**

Photo processors concern Ecology's Hazardous Waste and Toxics Reduction Program mainly because fixers, bleach fixer, and washless stabilizers accumulate silver during use and become hazardous wastes. Some developers, if they contain more than one percent hydroquinone as an ingredient and are discarded before used, may also be a hazardous waste. Minilab system cleaners may contain hazardous levels of chromium or fail pH limits. Businesses that generate more than 220 lbs. of such hazardous wastes per month (or ever accumulate more than 2,200 lbs. on site) are Regulated Generators and need to get a RCRA ID number from the state (see page 21). Shops that generate less than 220 lbs. are Small Quantity Generators and fall under the jurisdiction of local government (city or county) moderate risk programs (see government contacts insert).

### **Solid Waste and Financial Assistance**

Ecology's Solid Waste and Financial Assistance Program provides statewide guidance and technical assistance to local governments developing and implementing moderate risk management programs for Small Quantity Generators. Solid Waste also provides assistance to businesses concerned with pollution prevention of non-hazardous solid wastes, such as paper, film and plastic.

### **Water Quality**

Photo processors are a concern for Ecology's Water Quality Program because improper disposal of photo processing chemicals can have adverse impacts on the state's groundwater, surface waters and sediments. Such chemicals can affect the proper operation of municipal sewage treatment plants.

Water Quality hopes that through education about proper waste management, businesses will minimize the amount of wastes sent to the sanitary sewer and discharge those wastes necessary in accordance with local sewer limits. More centralized treatment and recovery of silver-bearing waste is one way to do this.

### **Air Quality**

Photo processors have traditionally had minimal air pollution problems. However, odors and emissions, when located close to the public and other businesses (like in a mall or office building with common walls), can bring complaints to the local air authority, and an inspector to your door. So be a good neighbor. It makes both good business and environmental sense.

## Pollution Prevention: Reduce and Recycle Your Wastes



**E**nvironmental management is a growing concern for businesses.

Whether it's a concern about disposal costs, filling our landfills, resource depletion, air pollution, or even your business image, environmental management issues are receiving more and more attention. That's where pollution prevention fits in.

In the world of waste, the greatest economic and environmental benefits usually come from avoiding the generation of waste in the first place. This is known as waste reduction and it's the number one waste management priority in Washington State. Some examples of simple waste reduction techniques include writing on both sides of a piece of paper, using a durable rather than a disposable product, or just not purchasing a product at all if you really don't need it.

It may not be as hard as you think. A good place to start is to walk through your shop and review all the processes which use chemicals or generate solid, liquid or air wastes.

When you begin to look at the wastes generated by your business, you may feel overwhelmed by how much there is to do. To reduce frustration, make incremental changes. Begin in areas where waste reduction and recycling are easiest, then build up to the more complicated items. Even small changes can make a large difference. As you consider each process, ask yourself if you can change the process in some way so that it doesn't produce a waste or if you can lower the toxicity of the products you use.

Identifying materials that your business can recycle is another great way to reduce the amount of waste your business disposes of. Recycling is the state's second waste management priority. Recycling is good because it takes materials that might have once been thrown away and makes them available to be used again. Although recycling is much better than disposing of materials, it is less beneficial than waste reduction because it requires a lot of energy to collect and remanufacture the materials into new products. In addition, for recycling to be successful, products made with recycled materials must be purchased by consumers.

The chart that follows includes most of the wastes you may generate in your photo processing business. To find out more specific information about regulatory compliance, recycling options and alternative chemical products, see the do's and don'ts section beginning on page 7 and the vendor and services section beginning on page 26.

## Photo Processing Waste Streams of Concern

Waste Stream of Concern	Program of Concern	Environmental Concern
Developer	Hazardous Waste	Hydroquinone
Fixer, Bleach Fixer	Hazardous Waste Water Quality	High silver content
C-41 RA Bleach	Water Quality	High silver content
Washless Stabilizer	Hazardous Waste Water Quality	High silver content
System Cleaners	Hazardous Waste Water Quality	High chromium or pH
Plastic Film Containers	Solid Waste	Non-hazardous, re- usable or recyclable
Scrap Film and Paper	Solid Waste	Non-hazardous, re- cyclable
Steel Film Magazines	Solid Waste	Non-hazardous, re- cyclable
Wash Water	Water Quality	Silver

## Practical Do's and Don'ts



Below are some common wastes generated by photo processors, along with do's and don'ts for implementing better pollution prevention and staying in compliance with Ecology regulations. To find out more about how and why Ecology regulates businesses in the areas of hazardous waste, solid waste, water quality and air quality see the discussion on page 3.

While many of the do's and don'ts are suggestions that may help save you money and lead toward regulatory compliance, some do's and don'ts are federal or state regulatory requirements. These will be highlighted in *italics* to distinguish them. Businesses should always check with their local government agencies (city or county) to see if they have additional or more stringent regulatory requirements (see government contacts insert).

### Bleach Solution

The bleach bath converts metallic silver on film back to a silver halide through an oxidation reaction. An iron solution is commonly used to accomplish this. Used C-41 RA bleach may contain up to three parts per million (ppm) silver.

#### Do's

- ✓ If you only use chemical recovery cartridges (CRCs, see page 16) to do on-site silver recovery consider mixing used C-41 RA bleach with your used fixer and washless stabilizer prior to recovery.
- ✓ If you send silver-bearing chemicals off-site for recovery, ask your service company if they will accept C-41 RA for pick up.
- ✓ Consider regenerating your used bleach solutions. Ask your chemical supplier.
- ✓ Make sure your employees know that used C-41 RA bleach maybe a local sewer discharge concern.

#### Don'ts

- ✗ *Don't ever put bleach into a septic system, storm drain, dry well or onto the ground.*
- ✗ Don't put used C-41 RA bleach directly down a sanitary sewer drain — it may exceed sewer discharge limits for silver,
- ✗ Don't put bleach into an electrolytic silver recovery system,

## Developer

Developers change the silver halide into metallic silver. Most developers for black and white film contain a small percentage of hydroquinone. These developers, if disposed as an unused product, will be hazardous due to hydroquinone levels. However, hydroquinone is consumed during use and does not show up in used developer in concentrations that would be considered hazardous waste.

### Do's

✓ Consider! using low replenishment developers for both film and paper. They can substantially reduce replenishment rates.

✓ If possible, purchase developer solutions that contain less than one percent hydroquinone — check with your supplier or look on your Material Safety Data Sheet (see page 24).

✓ Check with your local sewer utility to make sure it will accept used developer in the sanitary sewer.

✓ Make sure your employees know that unused developer may be a hazardous waste.

### Don'ts

✗ *Don't ever put developer into a septic system, storm drain or dry well or onto the ground.*

✗ *Don't dispose of unused or past shelf life developer to the sanitary sewer unless you have permission from your local sewer utility.*

✗ *Don't put developer into silver-bearing wastes when using CRCs (see page 16.) Developer can plug CRCs, causing a dangerous pressure build up.*

## Fixer and Bleach-Fixer Solution

Fixing sets the image areas and removes the light sensitive silver halides that could cause the photo image to darken with time. Fixer allows silver to dissolve out of the film and paper into the solution. As a result, used fixer and bleach-fixing contain higher concentrations of silver than other spent chemicals, usually between 3,000 and 8,000 parts per million. Because of these high silver levels, used fixer is a hazardous waste.

Photo processors typically generate high enough volumes of silver-bearing waste to make on-site silver recovery a realistic option. However, photo processors should investigate the pro's and con's of both off-site and on-site management. See the discussion of on-site versus off-site management beginning on page 14 and see the vendor and services directory beginning on page 26.

## Fixer (con't)

### Do's

#Investigate whether on-site recovery or off-site management is the best option for you (see page 14).

#Consider using low replenishment bleach-fixer. It can substantially reduce replenishment rates.

✓ If you're doing on-site silver recovery, assure compliance with hazardous waste and sewer discharge limits by routinely testing your effluent through a lab accredited for silver analysis (see Testing, page 24).

✓ If you're doing on-site silver recovery, get approval from your local sewer authority to discharge the remaining effluent.

✓ If you're doing on-site silver recovery properly operate and maintain your equipment.

#Make sure your employees know that used fixer and bleach-fixer is a hazardous waste.

✓ Count the amount of used fixer and bleach-fixer generated during the month toward your hazardous waste total (see page 21).

✓ Attach labels to your silver-bearing waste containers, identifying them as hazardous waste.

### Don'ts

✗ *Don't put used fixer into the sanitary sewer unless it meets hazardous waste and sewer discharge limits.*

✗ *Don't pour used fixer into a septic system, storm drain, the ground, surface water or any other drain not connected to a sanitary sewer.*

## Paper Cores

Kodak, Konica, and Agfa will take fiber cores from rolls of photographic paper and color paper plastic core plugs. Each manufacturer will accept these only from their own brands of paper.

### Do's

- #Utilize the available paper core recycling programs (see page 27 for more information).
- ✓ Encourage other film manufacturers to begin their own paper core recycling program.

### Don'ts

- X Don't consider paper cores to be a hazardous waste. If a recycling option is not available, they can be put in the garbage.

## Photographic Solution Filters

Film and paper developing machines contain filters that take out particulate from processing solutions. These are made out of spun cotton similar to cotton swabs. Fixer and washless stabilizer filters probably leach enough silver to be considered hazardous, so these filters should not be put in the garbage unless a business can show that they don't fail the leachability test for silver (see Testing, page 24).

### Do's

- #Drain excess fluid from filters into the appropriate photo chemical waste container.

### Don'ts

- X Don't put filters containing *silver-bearing wastes* into the garbage.

- ✓ Collect drained filters and ask your silver waste hauler to take them for refining.

## Plastic Film Containers

Photo processors often have a surplus of these containers. Most plastic film containers are made of two different kinds of plastic and both are recyclable. Kodak and Agfa accept containers of all brands through their solid waste recycling program. You'll be responsible for shipping costs, but this can be weighed against the cost of throwing them away.

### Do's

#Use Kodak's or Agfa's plastic container recycling programs (see page 27).

✓ Encourage other film manufacturers to begin their own recycling program.

✓ Offer the containers to customers for home use, such as sewing kits or fishing tackle.

### Don'ts

✗ Don't consider plastic film containers to be a hazardous waste. If you cannot find a way to recycle them, they can be put in the garbage.

## Scrap Film and Paper

In color photofinishing, all of the silver is removed from the film or paper during the photofinishing process. Because of this, processed scrap film and paper do not designate as a hazardous waste and can be treated as solid waste. Unprocessed film or paper will have some silver on it, but data indicate that silver in this form will not leach out of a landfill over time. However, soaking film ends in fixer to remove silver will leave a coating of leachable fixer that may make the film ends hazardous.

### Do's

#Look for a recycling company that will collect your unprocessed film ends (see page 27).

✓ If you do on-site silver recovery ask your silver recovery equipment supplier if they will take your scrap film.

### Don'ts

✗ Don't soak film ends in used fixer to remove silver. This will leave a coating of leachable fixer that may make the film ends a hazardous waste.

## Single Use Cameras

Most single use cameras can be returned to the manufacturer for recycling and in some cases for reuse. Fuji, Konica, and Kodak will reimburse photo labs for shipment plus \$.05 per camera. Most often there is a minimum number of cameras required to receive reimbursements. Agfa will accept all brands — no presorting is required, however, no reimbursement is offered.

### Do's

- ✓ Utilize existing camera recycling programs (see page 27).

### Don'ts

- ✗ Except for Agfa, don't send brand name cameras to anyone other than the original manufacturer.
- ✗ Don't throw cameras away after film has been extracted for processing.

## Stabilizer

Washless stabilizer solutions are used in the last step of the photofinishing process. Stabilizers enhance image stability and stop the reaction started by the developing solution. Washless stabilizers typically contain silver in the range of 100 to 300 parts per million, thereby making them a hazardous waste and exceeding local sewer discharge limits.

### Do's

- ✓ Check with your local sewer utility to make sure it is OK to discharge treated stabilizer to the sanitary sewer.
- ✓ If you do on-site silver recovery mix used washless stabilizer with your used fixer and bleach fixer prior to recovery
- ✓ If you send silver-bearing chemicals off-site for recovery, ask your service company if they will accept washless stabilizer for pick up.

### Don'ts

- ✗ *Don't ever put stabilizer into a septic system, storm drain, dry well or onto the ground.*
- ✗ *Don't put untreated washless stabilizer into the sanitary sewer — you will be in violation of hazardous waste and sewer discharge limits.*
- ✗ *Don't forget to count the amount of washless stabilizer generated during the month toward your hazardous waste total (see page 21).*

#Make sure your employees know that used washless stabilizer is a hazardous waste.

## Steel Film Magazines

Steel film magazines have many parts including the magazine, spool, felt tip, and end caps. Kodak, Konica, Fuji and Agfa will accept and recycle all brands of steel film magazines through their solid waste recycling program. Although you will be responsible for shipping costs, you won't be paying to throw them away

### Do's

✓ Utilize steel film magazine recycling programs (see page 27).

#Encourage other film manufacturers to begin their own steel film magazine recycling program.

### Don'ts

✗ Don't consider steel film magazines to be a hazardous waste. If a recycling option is not chosen, they can be put in the garbage.

## Other Wastes

Some color and specialty photo processing shops may use system cleaners and bleaches that result in hazardous wastes due to chromium, cyanide, other heavy metals, or pH (see pH, page 25).

### Do's

✓ If you are currently using a system cleaner that contains a bichromate compound, investigate switching to a system cleaner that does not contain dichromate.

#Make sure that system cleaners and other chemicals you are using do not cause you to exceed your local sewer discharge limit for pH.

### Don'ts

✗ Don't ever put system cleaners or cyanide-containing wastes into a septic system, storm drain, dry well or onto the ground.

## Wash Waters

Wash waters used in the film developing process may contain small amounts of film developing chemicals, including used fixer. Typically, these chemicals are found in very small amounts so that wash waters aren't a hazardous waste. However, in areas with very low sewer discharge limits for silver, even wash waters can present a concern.

### Do's

#Routinely test the silver levels in your wash water to ensure compliance with silver discharge limits.

### Don'ts

✗ Don't dispose of wash water to the sanitary sewer until you find out what your local silver discharge limit is.

## Managing Silver-Bearing Wastes



Photo processors generate used fixer, bleach-fixer, washless stabilizers and C-41 RA bleach as a normal part of doing business. Used fixer and bleach-fixer solutions from photo processors contain up to 8,000 parts per million (ppm) silver. This number greatly exceeds state and federal hazardous waste limits for silver (set at five ppm) and various local water quality discharge limits (see page 20). Even used washless stabilizer contains 100-300 ppm silver and used C-41 RA bleach may contain up to three ppm silver. None of these silver-bearing wastes should be discharged to the sanitary sewer without proper silver recovery, either at your place of business or through off-site management. And they should never be put into storm drains, septic systems or dry wells.

### On-site or Off-site?

Managing silver-bearing wastes is unique because silver has value. Whether you choose on-site treatment, off-site treatment or a combination of both for your waste streams, the choice is yours — and it's an important one. While a business generating large volumes of used fixer may recover the costs of their on-site recovery system in a matter of months, smaller volume producers like grocery store minilabs will take longer to see a similar payoff. It is important to remember that whichever strategy you choose, your business must meet hazardous waste and local sewer discharge limits for silver-bearing wastes.

Many photo processors are already trying to reclaim their used silver-bearing wastes using on-site technologies. These businesses should consider this option carefully. Historically, on-site silver recovery has focused on economics rather than meeting hazardous waste and sewer discharge limits. On-site silver recovery designed to meet such limits is not as simple as plugging in a machine and walking away — it takes a lot of time, effort and trial and error to do it right, and even then may not meet some of the stricter local water quality discharge limits. This booklet contains guidance to help you do a better job if you choose to do on-site recovery.

## **Off-site Management Options**

Off-site management of silver-bearing wastes has certain advantages over on-site recovery. Capital, operation and maintenance costs for equipment are non-existent. Administrative costs, such as analytical monitoring, are not incurred. If a business has space limitations, the off-site option may help ease crowding. Most importantly having your silver-bearing wastes managed off-site will ensure that hazardous waste and local silver discharge limits for silver will not be violated at your facility.

The downside to off-site management maybe in putting your hazardous waste into the hands of a third party. In addition, off-site hauling may create more air pollution due to increased trucking and transport of wastes. If you choose an off-site option, carefully choose the company — you still have ultimate responsibility for the proper management of your wastes.

## **Waste Management Companies**

Consider using a waste management company to pickup your used silver-bearing wastes (see page 30 for a listing), or ask your chemical supplier if they have a program (or will start a program) that will supply you with new chemicals as they pick up and reclaim your old silver-bearing solutions.

The pick up fees charged by many silver recovery and waste management facilities range from \$50-\$100 per service visit. While some will only pick up silver-bearing effluents others will manage other waste streams as well, so shop around. Many facilities will allow spent silver-bearing wastes to be dropped off free of charge but prior arrangements should be made. Other facilities will accept shipments of used fixer through common carriers, such as UPS. (Do not send fixer through the U.S. mail.) Shipping small amounts of silver-bearing wastes is allowed under Department of Ecology and Department of Transportation rules. The cost of shipping a five gallon carboy from Seattle to Spokane ranges from \$12-\$63. These prices include pickup at your business. The common carriers should be contacted directly for the most accurate pricing information.

## **Reclamation At Another Business**

If you generate less than 220 lbs. of total hazardous waste per month (this is approximately 26 gallons and includes used silver-bearing wastes), you have the option of taking it to another business that is willing and properly set up to do on-site silver recovery. Neither Department of Ecology nor Department of Transportation regulates the transport of such Small Quantity Generator (SQG) volumes of silver-bearing waste to another business. This may be an attractive option for businesses with small volumes of silver-bearing waste that do not wish to do on-site recovery themselves. Even if your business generates more than 220 pounds per month, you can still utilize the silver recovery services of another business, although you'll need to use a licensed hauler, manifest the waste and get a RCRA ID number (see page 21).

Also check with your local government moderate risk waste program for similar reclamation services they might, provide (see government contacts insert).

Businesses using this option should request a receipt for wastes accepted. Businesses receiving silver-bearing wastes from Small Quantity Generators need to ensure that these wastes are legitimately recycled and that hazardous waste and local water quality discharge limits are being met. Those businesses receiving silver-bearing wastes from Regulated Generators must follow the hazardous waste requirements outlined on page 21. Businesses receiving silver-bearing wastes from other businesses do not need to count these wastes toward their own monthly hazardous waste total.

## **On-site Recovery Options**

There are several different types of equipment that fall under the broad heading of silver recovery units. The most common units found in photo processing shops are electrolytic recovery units and metallic replacement or chemical recovery cartridges. While other technologies are mentioned, most of the discussion will center around these commonly used technologies.

### **Metallic Replacement or Chemical Recovery Cartridges (CRCs)**

CRCs are hollow canisters that contain steel fibers or fiberglass impregnated with iron filings. Fixer, bleach-fixer, C-41 RA bleach and washless stabilizer are run through the cartridge. When the iron contacts a solution containing dissolved silver, the iron is dissolved and the silver comes out of the solution. CRCs can be used by themselves or after an electrolytic recovery unit.

Using two CRCs in series, in conjunction with other recommended management practices, can reduce silver concentrations to about one ppm — but this takes time and effort and may be achievable only under ideal circumstances. Even with proper care, two CRCs may not be able to meet the sewer discharge limits adopted by many municipalities (see page 20). Costs for photo processors setting up two CRCs in series range from \$200 to \$1,700. Operating, changeover and silver testing costs on a three to six month changeover schedule range from \$150 to \$300 annually.

If you are currently using CRCs or a combination of electrolytic recovery and CRCs for on-site reclamation, the following management practices will help bring you closer toward meeting hazardous waste and sewer discharge limits. These recommendations are not guaranteed to automatically bring a business into compliance — each business will need to monitor its progress to see if hazardous waste and sewer discharge limits are being met.

## Maintaining and Operating CRCs

- At a minimum, businesses choosing to use CRCs for on-site reclamation need to use two in series unless they can document through routine testing that they consistently meet hazardous waste and local water quality discharge limits. Using just one canister, even of high quality will show diminishing returns after being used a few times and will eventually stop working. An electrolytic recovery unit by itself will not meet hazardous waste or sewer discharge limits. If you are using an electrolytic recovery unit, you should also use two CRCs.
- Combine your silver-bearing wastes before treatment. Add washless stabilizers and C-41 RA bleach into spent fixer and run them through CRCs as a single batch. Used washless stabilizers have enough silver in them to make them a hazardous waste, and used **C-41 RA** bleach may have enough silver to exceed some water quality discharge levels.
- Have a sample valve installed between canisters. Use this valve to take samples of the effluent from the first canister. Using silver test papers, check the sample to see when the first canister is spent. Silver test paper can detect silver at levels between 200 and 500 parts per million (ppm). When your first canister reaches this level, it is time to rotate it out, putting your second canister first in line and adding a new, second canister. In addition, if your tubing between canisters is clear plastic, you can visually inspect the solution flowing through — if it is brown or has debris in it, this is a good sign that the working ability of the first canister is spent.
- Monitor the flow of used solutions into the canisters. If the flow is too fast, the proper reaction won't happen inside the canister and you won't meet silver discharge limits. If it is too slow, it may deteriorate the canister too soon. Use a metered pump system or a restricted gravity feed system and keep flow rates at manufacturers recommendations, usually between one and three gallons per hour.
- Test your outflow. If you are doing on-site silver recovery take periodic samples of recovered silver-bearing waste over the life span of a canister and have the waste analyzed for silver to see if it meets hazardous waste and sewer discharge limits. Keep a file with all test data in it — you'll have a starting point from which to make refinements to your on-site process. See the Testing section on page 24.

- Keep a maintenance/changeover log. Perform regular maintenance as recommended in the manufacturer's instruction manual. Work closely with your supplier for help in developing a changeover schedule based on your volumes of silver-bearing solutions. Ask your supplier if they provide a full service waste management arrangement.
- If you're using electrolytic recovery before CRCs, monitor/adjust the pH (see page 25) of the silver-bearing wastes before it enters the CRCs. Using simple pH testing papers as an indicator, keep the pH of silver-bearing wastes entering CRCs between 5.5 and 6.5, which is the optimum range for pulling out the most silver and lengthening the life of the canisters. Look for units that have a sample valve in the tubing entering the canisters where a small sample can be periodically taken. Record pH monitoring levels and occurrences in your maintenance/changeover log.
- Fill CRCs with water before initially putting them into service. This will extend the life of canisters by preventing the steel wool from dissolving as they fill with fixer.

### **Electrolytic Recovery Units**

An electrolytic recovery unit works by attracting positively charged silver ions to a negatively charged cathode that is immersed in used silver-bearing waste. Electrolytic recovery units remove the majority of easily recoverable silver in a nearly pure metallic state. This purity translates into lower refining and shipping costs than other silver recovery methods. An advantage of a properly functioning electrolytic recovery unit is that the solutions processed can be reused in the photofinishing process, given proper attention to pH levels. A disadvantage is that it can only reduce silver concentrations down to a range of 100 to 300 ppm. Without further reclamation, your effluent will not meet hazardous waste or sewer discharge limits. An average unit costs around \$2500.

### **Some Management Practices for Electrolytic Recovery Units**

- For optimum silver recovery efficiency solutions entering an electrolytic recovery unit should have a pH between 7.5-8.0. Since the normal pH of silver-bearing solutions ranges from about 5.5 to around 7, pH adjustment is generally necessary. (See pH, page 25.)
- Do not put bleach into electrolytic units.

## **Chemical Precipitation**

Chemicals can be added to silver-bearing solutions that cause silver to settle to the bottom of the container. Once the clear liquid is removed, the silver sludge is filtered and sent off-site for refining. Although the oldest and cheapest method of silver recovery, this procedure has not been commonly used by photo processors. However, manual systems are available (and automated systems are under development) that can reclaim silver and bring down silver levels of the remaining waste to 3-4 ppm. An automated batch system that reclaims 15 to 20 gallons of silver-bearing waste will cost approximately \$3500.

## **Ion Exchange**

Ion exchange uses a resin that attracts negatively charged silver thiosulfate complex to positively charged sites on the ion exchange resin. When all the positively charged sites are filled, breakthrough occurs and the resin is regenerated and the silver recovered. Ion **exchange** is only used to recover silver from wash waters. Cost, space required, and technical requirements typically make ion exchange suitable only for larger photographic facilities.

## **Reverse Osmosis**

In reverse osmosis, effluent is forced through a thin membrane that has microscopic holes. Water molecules pass through the membrane while larger molecules, such as those containing silver and other contaminants remain. A reverse osmosis unit usually produces purified water, which can be reused as wash water, other process water, or discharged to the sewer, as well as a concentrated effluent stream which is high in silver and other photoprocessing chemicals. The silver must then be removed from this concentrated stream by one of the other silver recovery techniques.

Reverse osmosis units require a large initial capital investment, are high energy users, and have operating problems associated with membrane clogging. For these reasons, photo processors don't commonly use reverse osmosis equipment.

## **Evaporation/Distillation**

Evaporation and distillation units are used to reduce the volume of liquid waste that has been produced. Evaporators discharge vapors coming off of the liquid directly into the air, while distillation units condense the vapors and the resulting liquids are either discharged to a sewer or reused. The sludges or solids that remain are typically hazardous because of the silver they contain. If ammonia is present in the waste stream, as in the case of fixers and bleach-fix, the ammonia must be removed prior to evaporation/distillation. This can be done using activated carbon. Your local air authority should be consulted if you use an evaporator that discharges directly to the air.

# Water Quality Requirements

## Strict Local Sewer Discharge Limits

As the chart below shows, some sewer districts in the state have set their own local silver discharge limits for businesses in order to help the sewage treatment plant meet its own discharge levels for silver. In many locations, sewer discharge levels are so low that businesses using on-site silver recovery technologies such as electrolytic recovery and CRCs will have difficulty meeting these levels. Similar low limits are continuing to be developed in other areas of the state. Businesses located in areas with strict current or future local sewer limits may have no choice but to explore off-site options.

Municipality	Silver Limit (ppm)	Delegated?
Aberdeen	0.2	No
Chehalis	0.2	No
Clark County	0.1	No
Everett	0.69	Yes
Federal Way	0.5	No
Kalama	0.1	No
Lynnwood	0.5	Yes
Olympia (LOTT)	0.2	Yes
Pierce County	0.2	Yes
Richland	0.2	Yes
King County (Metro)	3.0	Yes
Spokane	0.43	Yes
Tacoma	0.2	Yes
Vancouver	0.1	Yes

All businesses conducting on-site silver reclamation should contact their local sewer utility for more information about local limits. See the Water Quality contacts in the government contacts insert.

## Delegated and Non-delegated Sewer Utilities

Some sewer utilities, such as those noted above, are known as "delegated" pretreatment programs. This means that the Department of Ecology (Ecology) has granted regulatory authority to these local entities to pass local ordinances, issue their own discharge permits and run their own programs. Non-delegated sewer utilities are still under the management authority of Ecology's Water Quality program, and sewer discharge permits for businesses are issued by the appropriate Ecology regional office.

# Hazardous Waste Requirements for Photo Processors



## Step 1 Identify Your Waste and Generator Status

Photo processors generate hazardous silver-bearing wastes from fixer, bleach-fix, washless stabilizer and C-41 RA bleach. Developers are also hazardous if they contain more than one percent hydroquinone and are disposed of before use. Used system cleaners may be hazardous due to toxicity and pH. Businesses need to "count" these wastes toward a monthly hazardous waste total. If your total monthly amount of hazardous waste totals over 220 pounds (about 26 gallons) and this count includes more than just silver-bearing wastes, you are a Regulated Generator required to meet compliance Steps 2-11 below. If you are over 220 lbs. but only generate silver-bearing hazardous waste (i.e. no developer, system cleaner or other hazardous wastes) and you recycle this material, you are a Regulated Generator that needs to comply with Steps 2, 3, 8, 9 and 10 below. You are a Small Quantity Generator if you always generate less than 220 pounds of hazardous waste per month or batch and always dispose of the waste before you accumulate more than 2,200 pounds. Small Quantity Generators are required to comply only with Steps 1, 8 (and 3 if you already have an active RCRA ID number).

## Step 2 Obtain a Generator ID Number

If you are a regulated generator, you are required to notify Ecology of your hazardous waste activities and obtain a site-specific RCRA ID number using Ecology's Form 2. Call (360) 407-6737 or your nearest Ecology regional office.

## Step 3 Report Annually

If you have an active RCRA ID number, you must submit an annual report (Ecology's Annual Report Form) by March 1 of each year, even if you have not generated waste in that year. Record your hazardous waste activities for the previous calendar year on this report, including how much waste you've generated or accumulated on-site and waste you've sent off-site. Ecology conducts annual workshops for businesses seeking assistance in completing their annual reports. Call (360) 407-6170 to request an annual report form.

## Step 4 Perform Preventive Maintenance

Hazardous wastes must be handled in a manner that prevents leaks, spills, fires and explosions. Develop and follow a written inspection schedule for all hazardous waste storage areas, containers and tanks and include all emergency safety and monitoring equipment on site,

Keep the necessary emergency equipment (such as fire extinguishers and telephones) on hand and accessible to employees. You must regularly test and maintain all your emergency equipment. Notify police, fire departments and local hospital of the characteristics of hazardous wastes generated at your site, as well as the facility layout and access routes.

## Step 5 Properly Accumulate Hazardous Waste

Photo processors typically generate less than 2,200 lbs. per month. If so, they can accumulate their hazardous waste on site for up to 180 days from the date it is first generated before they must manage it on-site or send it to an appropriate facility. If you generate more than 2,200 lbs. per month you can only accumulate the waste for up to 90 days.

While accumulating wastes, you must follow certain requirements:

- Establish and clearly mark an accumulation area. If constructed after September 30, 1986, it must have a containment system able to hold spills and leaks.
- Place the waste in an appropriate container and mark it with the words "Hazardous Waste", the waste's major risk (such as "Toxic"), and the date you first put waste in the container.

## Step 6 Plan For Emergencies

There must be an emergency coordinator on the premises or on call at all times who is familiar with the operations and activities at the site and has the authority to commit the resources necessary to deal with a hazardous waste emergency. In a small shop, this will probably be the owner or manager.

Makes sure you train your employees to know how to react to different types of emergencies in your shop,

## Step 7 Use Proper Containers

Many-hazardous waste incidents and work related injuries are linked to improper or unsafe container management. To avoid such accidents:

- Accumulate your wastes in containers which are sturdy, leak-proof, properly labeled, and kept closed unless waste is being added or removed. Use your empty product containers as convenient waste accumulation containers.
- Don't accumulate incompatible wastes in the same containers or areas.
- Store reactive and ignitable wastes according to the uniform fire code.

- Maintain a minimum aisle space of 30 inches between container rows.
- Inspect containers at least once a week, keeping a log of inspections.

## **Step 8 Ensure Proper Transportation and Disposal**

Regulated Generators must hire a transporter that has a RCRA ID number and ensure that wastes are handled at a permitted hazardous waste facility or a facility that legitimately recycles and reclaims hazardous waste. Small Quantity Generators can transport their own wastes or make sure they are sent to a permitted facility, a legitimate recycler, or the sanitary sewer (with written authorization only).

## **Step 9 Manifest Shipments of Hazardous Waste**

To ship hazardous wastes off site, Regulated Generators must prepare a Uniform Hazardous Waste Manifest Form which identifies the contents of the shipment, the transport company used and the facility receiving the wastes. This form accompanies the waste from the site where it is generated to its ultimate resting place and then back to you for your records. If you are a Regulated Generator, your waste hauler needs to use a manifest and not just issue a bill of lading or receipt.

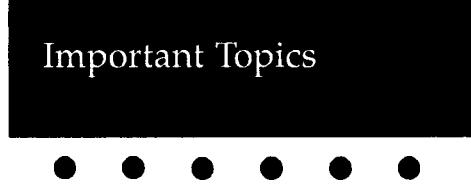
## **Step 10 Don't Speculatively Accumulate**

If you are a Regulated Generator and you accumulate silver-bearing wastes for more than 180 days, you need to document that you are not speculatively accumulating this material. Speculative accumulation means collecting a waste with the hope that it may one day have value. You would need to keep records showing the volume of these materials stored at the beginning of the year, the amount of these materials generated or received during the calendar year, the amount of materials remaining at the end of the calendar year, and be able to show that you recycled, or transported elsewhere for recycling, 75 percent of that year's silver-bearing wastes.

## **Step 11 Keep Records**

There are a number of records that Regulated Generators must prepare and keep on the premises for at least five years, including annual reports and manifest forms. Keep copies of notification reports (Form 2), inspection records, results from waste analyses or tests, and on-site recycling records for as long as you are in business. Small Quantity Generators should also keep records of their hazardous waste management activities.

## Important Topics



### Testing

Businesses discharging reclaimed silver-bearing wastes are responsible for knowing if they meet hazardous waste and sewer discharge limits. Sending a sample of a waste to a laboratory for analysis is the most accurate way to determine if the waste is hazardous or meets sewer discharge limits — and it's relatively inexpensive.

For analyzing concentrations of metals, a total metals test is used to determine compliance with local sewer discharge limits while a TCLP (Toxicity Characteristic Leaching Procedure) test is used to determine whether a waste is hazardous. A total metals test checks for total amount of a metal in a waste while a TCLP checks for the amount that could leach into the ground in a landfill. For used fixer, a total metals test can be used for determining sewer discharge and hazardous waste levels.

If you're using CRCs, regular testing over the life span of a canister may indicate if your maintenance schedule maybe extended, saving you the cost of an additional unit. Once you have established a track record of consistent compliance, you can use those test results and changeover schedules as an indicator of future compliance with regulatory levels. "For example, if you test your silver-bearing waste stream over time and find that it meets hazardous waste and sewer discharge limits, you may use this information for future disposal of reclaimed silver-bearing waste. See page 28 for a list of testing services available.

### Material Data Safety Sheets (MSDSs)

A material safety data sheet (MSDS) should come with each of the chemical products you purchase from a manufacturer or vendor. As a business, you are required to keep MSDSs for all products available to employees. This is a WISHA requirement, MSDSs have a reputation for being long, too technical and difficult to read. Although this maybe true, the ability to scan through an MSDS and pick out the following information is important. MSDSs are valuable because they describe:

- physical and chemical properties of the hazardous substances contained in the product,
- spill cleanup instructions,
- health hazards and appropriate first aid,
- fire and explosion hazards, and
- proper management and disposal practices.

Not all MSDSs are formatted the same, but they are all required to contain certain information. If you want additional information about a chemical product, contact the manufacturer using the phone number provided on the MSDS.

## **pH**

pH is the measure of how acidic or alkaline a solution is, with neutral solutions rating a 7, acidic solutions less than 7, and alkaline solutions greater than 7. Photo processors who choose to use electrolytic recovery units to recover silver from silver-bearing solutions may wish to adjust the pH of these solutions to between 7.5 and 8.0 before use in electrolytic recovery units. If CRCs are used following an electrolytic recovery unit, pH can be adjusted back down to 5.5. Sodium hydroxide is commonly used to adjust solutions upward, while glacial acetic acid is used to adjust solutions downward. Both of these chemicals are hazardous themselves, so employers should carefully weigh the risks to the responsibilities of employees handling such chemicals with the benefits derived from pH adjustment. Check with your service company, vendor, product manufacturer or analytical lab for help in making pH adjustments.

## Vendors and Services



The following is a list of businesses that can provide a variety of environmental and waste management services. This list does not constitute a recommendation, and the Department of Ecology does not assume any liability for the accuracy or completeness of the information provided in this section. *Final determinations of the proper handling and disposal of waste are the sole responsibility of the generator.*

Before agreeing to let them handle your waste, it is recommended that you ask for, and check, the company's references. The following questions might be useful in assessing the management practices of a business you are considering:

✓ How do you manage the waste you collector analyze?

#Do you reduce or recycle waste before disposal? Do you contract out for such services, and if so, to whom?

/ How do you train your employees? Do they have a basic understanding of regulations/liabilities pertaining to my waste stream?

#Are you insured? In some cases it may be appropriate to ask for an RCRA identification number.

✓ Do you or your affiliate companies have any current, recent (3-5 years) or pending enforcement actions or fines with state, federal or local authorities? (Call your nearest Ecology regional office to verify.)

**FILM:** Film manufacturers, recoverers, film product recycling and film collection.

**3M Corporation**  
3M Center  
Building 235-1C-22  
St. Paul, MN 55144  
(800) 944-6664 Hotline

**Agfa of Miles Inc.**  
100 Challenger Rd  
Ridgefield, NJ 07660  
(201) 440-0111 X4778

**AgCo Metalex**  
3701 S. Road  
Mukilteo, WA 98275  
(206) 743-7886

**CMX Corporation**  
6601 S. Glacier St.  
Tukwila, WA 98188-4718  
PO Box 58088 (mail)  
Seattle, WA 98138-1088  
(800) 869-7191

**Fuji Hunt Photographic Chemical**  
PO Box 988  
Paramus, NJ 07653-0988  
TECH (800) 526-0851  
SALES (800) 344-1847

~~Fuji Photo Film USA, Inc.~~

**Fuji Photo Film USA, Inc.**  
555 Taxter Rd  
Elmsford, NY 10523  
(800) 743-3854 Hotline

**Hallmark Refining Corporation**  
PO Box 1446  
1743 Cedardale Road  
Mt. Vernon, WA 98273  
(800) 255-1895

**Kodak**  
Environmental Services  
1100 Ridgeway Ave  
Rochester, NY 14652-6255  
(716) 477-3194 Hotline  
(800) 242-2424 ext.724 Recycling

**Konica USA Inc.**  
440 Sylvan Ave.  
Englewood Cliffs, NJ 07632  
(800) 285-6422

**LMD Resources Puyallup**  
328 5th St. SE  
Puyallup, WA 98372  
(206) 845-5123

**M2 Refining**  
PO Box 1049  
Woodinville, WA 98072  
(206) 483-9199

**Pacific X-Ray Corporation**  
549 Industry Drive (sales office)  
Seattle, WA 98188  
(206) 575-0202

**Polaroid Corporation**  
575-8 Technology Square  
Cambridge, MA 02139  
(617) 386-3548

**Polychrome Corporation**  
631 Central Ave  
**Polychrome Corporation**  
631 Central Ave  
Carlstadt, NJ 07072  
(201) 531-0032

**LABORATORIES & TESTING**

SERVICES: See also "Laboratories-Analytical" and "Laboratories-Testing" in the yellow pages of your phone book.

Am Test Laboratories  
14603 NE 87th St  
Redmond, WA 98502  
(800) CHEMLAB

Analytical & Testing Services  
*[Division of Weyerhauser]*  
32901 Weyerhauser Way South  
Federal Way WA 98003  
(206) 924-6148

Analytical Resources, Inc.  
333 Ninth Ave N  
Seattle, WA 98109  
(206) 621-6490

Analytical Services, Inc.  
12277 134th Court NE, Suite 200  
Seattle, WA 98134  
(206) 820-4551

Aquatic Research, Inc.  
3927 Aurora Ave N  
Seattle, WA 98103  
(206) 632-2715

B & H Consultants, Inc.  
PO Box 82662  
Kenmore, WA 98028  
(206) 488-9831

Bioassay Testing Services  
8455 S 19th  
Tacoma, WA 98465  
(206) 565-5492

Cascade Analytical, Inc.  
3019 G.S. Center Road  
Wenatchee, WA 98801  
(509) 662-1888

Columbia Analytical Services  
PO Box 479  
Kelso, WA 98626  
(360) 577-7222

Envirotech Systems Inc.  
18820 Aurora Ave. N, Suite 201  
Seattle, WA 98155  
(800) 922-9395

Evergreen Analytical Services,  
Inc.  
12831 NE 21st Place  
Bellevue, WA 98005  
(206) 882-2672

Federal Testing  
291/2 Dravus St.  
Seattle, WA 98109  
(206) 283-4202

Friedman & Bruya  
3008-B 16th Ave West  
Seattle, WA 98119  
(206) 285-8282

Groundwater Technology Inc.  
19033 W. Valley Highway Suite D  
104  
Kent, WA 98032  
(206) 285-8282

Hart Crowser, Inc.  
1910 Fairview Ave E  
Seattle, WA 98102  
(206) 324-9530

**Hazcon, Inc.**  
4643 E Marginal Way S #215  
Seattle, WA 98134  
(206) 763-7364

**OMS Laboratories**  
911 Western Ave, Suite 421  
Seattle, WA 98104-1031  
(206) 622-8353

**La Roche Enterprises**  
15210 13th Ave S  
Spanaway WA 98387  
(206) 531-7117

**On-Site Environmental, Inc.**  
2859 152nd Ave NE  
Redmond, WA 98502  
(206) 883-3881

**Lauks Testing Laboratories**  
940 S Harney  
Seattle, WA 98108  
(206) 767-5060

**Orion Environmental Laboratories**  
5007 Pacific Highway E, Suite C-6  
Fife, WA 98424  
(206) 922-9008

**Med-Tox NW**  
19032 66th Ave S C-105  
Kent, WA 98032  
(206) 656-2920

**Pacific Northwest Environmental Lab, Inc.**  
6645 185th Ave NE, Suite 100  
Redmond, WA 98502  
(206) 885-0083

**North Creek Analytical**  
18939 120th Ave. NE, Suite 101  
Bothell, WA 98011  
(206) 481-9200, or  
E. 11115 Montgomery Suite "B"  
Spokane, WA 99206  
(509) 924-9200

**Pacific Testing Laboratories, Inc.**  
3257 16th Ave W  
Seattle, WA 98119-1706  
(206) 282-0666

**Northwest Laboratories of Seattle, Inc.**  
1530 First Ave S  
Seattle, WA 98134  
(206) 622-0680

**Prezant Associates, Inc.**  
711 6th Ave N, Suite 200  
Seattle, WA 98109  
(206) 281-8858

**Olympic Scientific, Inc.**  
975 John Street #100  
Seattle, WA 98109  
(206) 623-5998

**Roar Tech, Inc.**  
N. 522 Fiske St., Suite A  
Spokane, WA 99202  
(509) 535-6757

**Olympus Environmental, Inc.**  
2002 W Valley Highway Suite 600  
Auburn, WA 98002  
(206) 735-6625

**Safety Kleen Corp**  
3210 C ST NE Unit G  
Auburn, WA 98002  
(206) 939-2022, or  
E. 9516 Montgomery  
Spokane, WA 99206  
(800) 669-5902

Sound Analytical Services  
4813 Pacific Highway E  
Tacoma, WA 98424  
(206) 922-2310

Spectra Laboratories, Inc.  
2221 Ross Way  
Tacoma, WA 98421  
(206) 272-4850

Treclen Laboratories  
N 1403 Green St, #4  
Spokane, WA 99202  
(509) 535-5501

PHOTOGRAPHIC (SILVER-BEARING) WASTE & WASTE  
WATER TREATMENT: Fixer, film  
and silver recovery equipment.

Advanced Water Systems, Inc.  
14207 NE 193rd Place  
Woodinville, WA 98072  
(206) 485-0670

AgCo Metalex  
3701 S. Road  
Mukilteo, WA 98275  
(206) 743-7886

Burlington Environmental  
(Sales Ofi'ce)  
PO Box 229.  
Washougal, WA 98671  
(800) 547-2436

Byers Industries Inc.  
6800 NE 59th Place  
Portland, OR 97218  
(800) 547-9670

Chemical Waste Management  
N.W.  
1120 Andover Park E  
Tukwila, WA 98188  
(206) 575-2250

CMX Corporation  
6601 S. Glacier St.  
Tukwila, WA 98188-4718  
(800) 869-7191

Culligan Soft Water  
Service Comapany  
East 25 Third Avenue  
Spokane, WA 99202  
(509) 455-8050

South Sound Culligan  
3635 South Lawrence, Suite J  
Tacoma, WA 98409  
(206) 473-4640

Drew Products  
1717 4th Street  
Berkeley CA 94710  
(800) 624-4506

Enviro's  
210 Marina Park Bldg.  
25 Central Way  
Kirkland, WA 98033-6156  
(206) 827-5525

Envirotech Systems Inc.  
18820 Aurora Ave. N, Suite 201  
Seattle, WA 98155  
(800) 922-9395

Hallmark Refining Corporation  
PO Box 1446  
1743 Cedardale Road  
Mt. Vernon, WA 98273  
(800) 255-1895

Image Control Systems Inc.  
PO Box 9305  
305 9th Ave. N.  
Seattle, WA 98109-0305  
(800) 300-2645

Litho Development & Research  
(LDR)  
510 Strander Blvd.  
Seattle, WA 98188  
(206) 242-9911

LMD Resources Puyallup  
328 5th St. SE  
Puyallup, WA 98372  
(206) 845-5123

M2 Refining  
PO Box 1049  
Woodinville, WA 98072  
(206) 483-9199

Momentum Graphics  
355 Treck Drive  
Seattle, WA 98188  
(206) 575-9494

Northwest Enviroservice  
PO Box 24443  
1700 Airport Way S.  
Seattle, WA 98124  
(800) 441-1090

Pacific X-Ray Corporation  
549 Industry Drive (*sales office*)  
Seattle, WA 98188  
(206) 575-0202

Overlake Photo Express  
1423-130th N.E.  
Bellevue, WA 98005  
(206) 454-5050

Pacific X-Ray  
549 Industry Drive  
Seattle, WA 98188  
(206) 575-0202

Prolab  
123 N.W. 36th St.  
Seattle, WA 98107  
(206) 547-5447

Puget Sound Environmental, Inc.  
13823 Sandy Point East  
Gig Harbor, WA 98329  
(206) 549-6305

Safety Kleen Corp  
3210 C ST NE Unit G  
Auburn, WA 98002  
(206) 939-2022, or  
E. 9516 Montgomery  
Spokane, WA 99206  
(800) 669-5902

Seattle Film Works  
1260 16th Ave W  
Seattle, WA 98119  
(206) 281-1390

Smith Brothers  
16077 SE 98th Ave.  
Clackamas, OR 97015  
(503) 655-2065

.999 Inc.  
1901 N 4th  
Pasco, WA 99301  
(509) 547-5711

Standard Medical Imagin& Inc.  
W. 1915 5th Ave.  
Spokane, WA 99204  
(509) 838-8335

**A**s part of the Department of Ecology's "Snap Shots" campaign, environmental education efforts are being geared toward photo processors, screen printers, lithographic printers and the medical/dental community.

The immediate goals of this effort are 1) to encourage pollution prevention as the first step toward better environmental management on the shop level and 2) to educate the printing and film developing industry on applicable federal, state and local government environmental requirements and options available to meet those requirements.

Long term goals include evaluating our success at improving overall environmental compliance and pollution prevention habits of the industry.

If overall regulatory compliance is not improved significantly during this educational phase, Ecology may take additional actions to encourage compliance, including developing a general state sewer discharge permit for the film developing industry.

While this booklet summarizes some of Ecology's hazardous waste, solid waste, water quality and air quality requirements, it does not replace the regulations themselves. Always refer directly to the regulations for more detail or ask to speak to a hazardous waste, solid waste, water quality or air quality specialist at your nearest Ecology regional office.

Ecology is an Equal Opportunity and Affirmative Action Employer. If you have special accommodation needs, please contact the Hazardous Waste and Toxics Reduction Program at (360) 407-6743 (Voice) or (360) 407-6006 (TDD).

The Department of Ecology thanks the Snap Shots printers and photo processors workgroup participants shown below, for their commitment of time, energy and expertise to this campaign.

**Byer Industries, Inc.**

**Franklin County Public Works Department**

**Inland Technology, Inc.**

**Hallmark Refining Corporation**

**Island County Solid Waste Department**

**Kodak**

**Lewis County Public Health Department**

**Local Hazardous Waste Management Program in King County**

**Pacific Northwest Screen Printing Association**

**Pacific Printing and Imaging Association**

**Photo Marketing Association International**

**Photo Establishment**

**Print NW - Six Sigma**

**Qualex**

**Sun Sportswear**

**Thurston County Environmental Health Department**