Processing KODAK Motion Picture Films, Module 6

Environmental Aspects

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6 Environmental Aspects

INTRODUCTION

Clean water and air are everyone's concern. Without them life as we know it will not survive. At one time we took them for granted, but we no longer can.

At no other time in history has there been a greater awareness of the need to preserve the quality of our environment. Recently, however, increases in population, demand for more products and the ability of technology to produce them cheaply and in quantity began to create an unprecedented influence on the environment, directly and indirectly. The result has been a greater awareness of the need to protect our water and air, and new laws regulating our air emissions, wastewater discharges, and solid and hazardous waste management. New technology has been developed to help us meet the requirements of these laws.

Those involved in photographic processing have a responsibility as individuals and as an industry to comply with these laws. To do this, the effluent discharged by the photographic processing laboratory must be evaluated to determine whether it will meet the limits set by local sewer authorities or regulations governing direct discharges to groundwaters or streams. Should the effluent exceed these limits in any way, pretreatment may be necessary. Any wastes not discharged to sewers or surface waters in accordance with applicable local, state and federal regulations must also be properly managed to prevent environmental stress.

This publication includes current information on biodegradability of processing chemicals, their compatibility with municipal treatment processes, and their effect on aquatic organisms, methods of pretreatment, treatment, and disposal. This publication also provides other Health, Safety, and Environmental Information available from Kodak that will assist with compliance to regulations.

Definition of an Effluent

An effluent is liquid waste leaving its source. There are effluent codes or regulations that control the level of specific chemicals in and general characteristics of waste discharged from various sources. Federal and local governments establish guidelines. Local regulations may be more stringent.

Definition of BOD and COD

The Biochemical Oxygen Demand (BOD) test measures the amount of oxygen that a chemical solution, or effluent consumes over a five-day period through biological degradation. Knowing the oxygen demand of a discharged waste is important because strong oxygen-demanding wastes can overload the aeration capacity of a secondary treatment plant. Discharging improperly treated wastes can deplete the amount of dissolved oxygen in a receiving body of water. The BOD analysis attempts to duplicate in the laboratory the environmental condition in a receiving body of water and to measure the oxygen demand that the chemical or effluent exerts on it. A BOD of 400 mg/L for an effluent means that one litre of the waste would consume 400 milligrams of oxygen in 5 days in a natural stream. As the biochemical oxygen demand increases, more dissolved oxygen is removed from the stream, leaving less for fish and other aquatic life.

A means of measuring the impurity level of domestic and industrial effluents is based upon the fact that all organic compounds (with few exceptions) can be oxidized by the action of strong oxidizing agents, under acid conditions, to carbon dioxide and water. COD (Chemical Oxygen Demand) and BOD analyses do not completely correlate on all samples of photographic effluent because the two methods do not measure the same oxygen-demanding chemicals, but the COD is usually a larger number than the BOD. The COD test is more reproducible than the BOD test.

Other Parameters that Measure Effluent Strength

Heavy Metals. Materials classed as heavy metals are commonly regulated by local sewer codes. They are defined as metals with a specific gravity greater than 5.0. This includes metals such as cadmium, chromium, cobalt, copper, gold, iron, lead, manganese, mercury, molybdenum, nickel, silver, and zinc.

pH. pH indicates how acidic or alkaline (basic) a solution is. It is a measurement of hydrogen-ion concentration and is expressed as the negative logarithm of the hydrogen-ion concentration. pH values run from 0 to 14. The lower numbers indicate acid solution, higher numbers indicate basic solutions, and 7 represents neutral solutions.

Total Dissolved Solids. In potable waters, most matter is in the dissolved form and consists mainly of inorganic salts, small amounts of organic matter, and dissolved gases. As waters become polluted, the amount of undissolved and suspended solids increase, and the dissolved fraction is usually not considered an important effluent parameter.

Total Suspended Solids. Suspended solids are undissolved matter in effluent. A parameter to evaluate the strength of wastewaters. It is used to determine the efficiency of effluent treatment units. The TSS fraction includes the settleable solids component.

General Properties of Photographic Processing Effluents

A study sponsored by the National Association of Photographic Manufacturers (NAPM), Hydroscience, Inc, of Westwood, New Jersey, determined the environmental effect of 45 selected photoprocessing chemicals.* The chemicals in Processes ECN-2, and ECP-2D included in this study were hydroquinone, ethylenediamine, KODAK Color Developing Agent CD-2, KODAK Color Developing Agent CD-3, sodium bisulfite, formaldehyde, hexylene glycol, sodium ferrocyanide decahydrate, sodium tetraborate pentahydrate, ammonium thiosulfate, and sodium thiosulfate pentahydrate.

Study results indicate that, at concentrations estimated to occur in municipal sewage systems and in natural receiving waters, the photoprocessing chemicals are of insignificant environmental consequence. The study further concluded that the photoprocessing wastes are amenable to biological treatment, and upon treatment, do not cause any adverse effects to aquatic organisms indigenous to natural receiving waters. The 45 photoprocessing chemicals investigated had no significant impact on the activity or efficiency of the biomass of a conventional biological wastewater treatment method at the concentrations realistically encountered in municipal or regional sewerage systems. The bioassay experiments showed that, at the concentrations estimated to occur in the receiving water at the point of discharge from a municipal biological treatment plant, none of the photoprocessing chemicals examined would adversely affect the types of organisms represented by the test species. The result of the tests closely correlates with those of tests conducted by Eastman Kodak Company.

General Characteristics of Photographic Processing Effluents

The theoretical concentrations of chemicals in simulated effluents from ECN-2, ECP-2D, D-96 & D-97 processes produced from H-24 formulas and replenishment rates are shown in Theoretical Concentrations for Simulated Effluents from ECN-2, ECP-2D, D-96 & D-97 Processes. The parameters listed are those that are typically analyzed to evaluate water quality. The values shown in the table do not include dilution from any other sources in the processing laboratory (rest rooms, kitchen facilities, etc.). For the purpose of these simulations, it was assumed that only film (no leader) is run and that the solution replenishment rates are exactly as listed in the mechanical specifications for each process. It was also assumed that no chemicals are leached out of the film except for a typical level of silver halide that might be found in a fixer solution utilizing electrolytic desilvering. Silver halide and very small traces of other materials are removed from the photographic product during processing. The calculations are made from the content of the replenisher solutions only. With the exception of silver, which is present as the silver thiosulfate complex, the concentration of most materials removed from films that may be in the waste effluent is not likely to be high enough to be of concern. However, very small amounts of some metal ions may be removed from some Kodak products during processing. The concentration of metal ions in solution may be determined by analysis. If a sample is to be analyzed, it is important that the sample be representative.

Of course, there may be interactions between certain chemicals. For example, acids react with bases, and chemical oxidizing agents react with chemical reducing agents. In some cases, the reaction products are insoluble and thus are collected along with other sludge in the waste-treatment plant.

* National Association of Photographic Manufacturers, Inc., "Environmental Effects of Photoprocessing Chemicals," June 1974.

Table 6-1 Theoretical Concentrations for Simulated Effluents from ECN-2, ECP-2D, D-96, & D-97 Processes

Process	ECN-2[a]	ECN-2[a]	ECN-2[a]	ECP-2D[a]	ECP-2D[a]	ECP-2D[a]	D-96[a]	D-97[a]
	NH_4UL Bleach	Ferricyanide Bleach	KUL Bleach	Persulfate Bleach	NH_4UL Bleach	KUL Bleach	NH_4 Fixer	NH_4 Fixer
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
pH	7.8	7.9	7.8	6.6	6.9	7	7.5	8.5
Alkalinity-Total (As $CaCO_3$)	2000	2300	2000	880	1000	1000	8400	6800
Ammonia-Nitrogen	1100	1000	1000	430	560	480	2000	1400
Bromide	240	190	360	120	270	580	100	190
Chloride	22	23	23	220	120	110	76	21
Fluoride	18	ND	18	52	34	23	330	220
Iodide	36	36	ND	64	60	68	ND	89
Iron	43	45	27	ND	54	69	ND	ND
Nitrate[b]	82	8.5	120	12	160	170	ND	ND
Nitrite	ND	ND	ND	ND	ND	ND	ND	ND
Oil & Grease	37	32	38	40	32	26	5.4	4
Phosphate[b]	13	12	10	55	ND	4.6	ND	5
Phosphorus[b]	42	44.4	41.2	39.4	17.6	18.4	< 1	51.3
Potassium[b]	ND	140	490	ND	ND	630	ND	160
Silver	23.4	24.5	22.4	12.6	12.3	13.8	59.4	48.6
Sodium	2700	2800	2600	1500	1200	1400	8900	6200
Sulfate	5200	4300	4700	1900	1800	2100	1700	1500
Sulfide	6.8	8.3	7.8	1.9	ND	ND	< 1	17
Sulfite	510	570	1080	250	380	250	13020	7050
Thiosulfate	4800	3700	3600	3300	3300	2600	8000	7100
BOD_5	1300	1700	1000	1300	1200	1300	14000	5600
COD	3500	3200	3700	3900	3700	4100	10000	8500
TKN (Total Nitrogen)	1100	1000	1000	500	600	520	2100	1500
Total Dissolved Solids	9500	9500	11000	5500	6400	7900	25000	20000
TOC (Total Organic Carbon)	760	620	840	870	1100	1300	1400	2100
TOD	5000	6000	5000	4800	5000	3500	10000	9300

a All processes are assumed to use an ammonium fixer with 60 percent fixer reuse and to have 90 percent reuse of the bleach (if applicable). Reuse calculations are limited by carry-out assumptions.
b Effluent concentration will vary when an alternate processing sequence is used.

Note: Variation in the chemical discharge is estimated to be plus or minus 10 percent. The COD and BOD_5 values are estimated to be plus or minus 15 and 25 percent respectively.

Some concentrations will vary due to seasoning effects and water quality. The above concentrations are only given as a general guide and are based upon H-24 processing recommendations. Individual processor results will vary.

Characteristics of Selected Effluent Constituents

Ferri- and Ferrocyanides

An active ferricyanide bleach contains ferri- and ferrocyanide. However, in the overall processing effluent, most of the ferricyanide will have been reduced to ferrocyanide by the action of reducing agents present. The ferrocyanide, which has a low level of toxicity, is slowly converted to free cyanide in the presence of oxygen and sunlight. For this reason, some metropolitan areas have established stream or effluent standards for total cyanide, ferri- and ferrocyanide, free cyanide, and cyanides that will release a given quantity of free cyanide on acidification. The maximum permissible concentration of cyanide in sewers is usually in the range of 0.2 to 2 mg/L, expressed as the cyanide ion, CN^-. (Ferrocyanide concentrations may be converted to equivalent potential cyanide ion concentrations by multiplying by 0.74.) Bleach waste should never be discharged directly into a stream. Minimizing the amount of ferrocyanide in the effluent, by regenerating the bleach and using efficient squeegees before and after the bleach, is recommended. Regeneration might be sufficient to meet some local codes. Current methods of regeneration include electrolysis, potassium persulfate and ozonation.

All waste solutions containing bleach may be collected and the ferrocyanide precipitated with ferrous sulfate. The residual solids may qualify for burial in an approved landfill area, or may be treated with alkali to recover the ferrocyanide. Precipitation techniques can reduce ferrocyanide levels in effluent to about 1 mg/L or enough to meet most current sewer codes with normal dilution. Complex ion exchange methods are available that allow removal and reuse of ferrocyanide from dilute waste streams, but the capital and operating costs are high.

Hydroquinone

Tests have shown that hydroquinone can be toxic to particular organisms at relatively low concentrations. However, it is rapidly converted to products significantly less toxic in the total processing effluent. Moreover, it is quickly biodegraded in a waste-treatment plant to non-toxic products. Consequently, if the effluent is given secondary biological treatment, the hydroquinone should not cause any problems.

Boron Compounds

While boron compounds are not particularly toxic to fish and other living species, they can cause some problems when present in irrigation water at levels above 1 mg/L. With processing solutions containing relatively high concentrations of borate, the borate must be diluted to acceptable levels by other wastes, prior to disposal into streams. Although calcium in hard water may precipitate some of the borate, some will remain in the water. The boron concentration in the effluents from processing Kodak color films should pose no serious problem if they are diluted.

Color Developing Agents

The KODAK Color Developing Agents CD-2 and CD-3, in effluents from processes for Eastman color films become toxic to fish at concentrations between 1 and 10 mg/L. Because of chemical changes to the developing agent during processing and sewering, the secondary treatment plant receives concentrations of developing agent far below those estimated from replenishment rates. Bioassay results obtained in the Hydroscience study indicate that the concentrations estimated to occur in any receiving waters are lower than those determined to affect any of the test aquatic organisms.

Formalin

High concentrations of formaldehyde can inhibit biological activity. However, in a processing effluent most of the formaldehyde will combine with sulfite. The very low concentrations of free formaldehyde found in photographic processing effluent will not inhibit waste-treatment processes. Formaldehyde is degraded in such a treatment system.

Oxygen-Demanding Chemicals

Acetate, sulfite, and thiosulfate have low toxicity to aquatic organisms and do not inhibit biological waste-treatment processes, but they do contribute to the oxygen demand of the photoprocessing effluent. Dissolved sulfite is decomposed simply by bubbling air through the solution. Acetate and thiosulfate are rapidly biodegraded.

Aldehydes and Amines

None of theses chemicals (e.g., formaldehyde) in a dilute process effluent adversely affects a biological treatment system. After municipal treatment, the concentration of these chemicals in the effluent is sufficiently reduced to be acceptable for any body of water.

Silver

Free silver ions such as those found in silver nitrate solutions are toxic to bacteria and aquatic organisms. Silver is present in photographic solutions as a silver thiosulfate complex. This complex does not have the toxic characteristics of free silver ion and has no apparent detrimental effects on the operation of a secondary waste-treatment plant. When the complex reaches a waste-treatment plant, it is converted to insoluble silver sulfide or metallic silver through bacterial or chemical action and is thus collected as a solid sludge. Kodak's experience with a 20,000-gallon-per-day waste-treatment plant has shown that a concentration of more than 250 mg/L of silver in the form of silver sulfide does not interfere with the rate of biodegradation of processing wastes. This is a considerably higher level than would be expected in municipal treatment plants. Silver recovery methods such as electrolytic recovery and chemical precipitation can be used to produce effluent containing 20-50 mg/L silver.

Disposal via Sewer / POTW (Indirect Discharge)

Discharging to a Publicly Owned Treatment Works (POTW) is called an indirect discharge because the effluent does not go directly to the environment. Once the wastewater leaves your facility, it travels via the sewer pipes to the POTW for treatment. Most POTWs have both primary and secondary treatment. Primary treatment removes solid pieces of matter that settle out of the wastewater. This step is followed by secondary treatment, a biological process that uses microorganisms to feed on the complex organic matter in the waste and reduce it to a more simple and nonobjectionable state. POTWs must ensure that the waste they receive from businesses, including photographic processing facilities, will not upset this biological process or pass through the POTW untreated. After treating the waste, the POTW discharges it to local surface waters—a river, lake or stream. To ensure the quality of this treated water, every POTW operates under a discharge permit issued to it by either the state or the EPA. To comply with its discharge permit, the POTW can only accept wastewater that it can effectively treat. POTW authorities control the influent wastewater to the plant through the local sewer use code.

Septic Tanks

Discharging to a septic system or to the environment following on-site treatment is called a *direct* discharge because the effluent goes directly from your facility into the environment. Septic systems are underground holding tanks and leach fields that are designed for domestic sewage, not industrial effluent. Septic systems *do not* have the ability to treat photographic processing solutions properly. Discharging to a septic system typically requires a permit from the state or local authorities and is not recommended by Kodak.

Discharging treated photographic processing effluent directly to surface waters also requires a permit. Before issuing a permit, the state would require proof that the facility was sufficiently treating the effluent so that it did not negatively affect the river, lake or stream that was receiving it. Given the high cost of owning and operating an on-site treatment system, very few photo processors choose this option. If you do not know where the drains in your facility lead, check with your landlord or consult the building plans. It is also possible that some of the drains lead to the POTW while some are connected to storm sewers that lead directly to surface waters. You must have this information because it dictates your options for managing the processing effluents.

Haul-Away

The term cradle-to-grave also describes your responsibility for any hazardous waste you generate. In other words, even though you consign your waste to a transporter and a TSDF (treatment, storage, and disposal facility), you remain liable for the safe disposal of the waste. This makes it imperative that you choose the transport company and a TSDF very carefully. Review the following guidelines before you select a company to manage your hazardous waste:

- Use only authorized hazardous waste transporters with EPA ID numbers. Call your state for a listing of all permitted companies.
- Look for a transport company that can provide a full range of services (e.g., help you apply for an EPA ID number, provide waste containers and labels).
- Use only authorized hazardous waste TSDFs with EPA ID numbers. Call your state for a listing of all permitted companies.
- Ask Kodak, your other suppliers, trade associations and business associates for recommendations.
- Visit the facilities of both the transporter and the TSDF to see if they are well maintained. Check that they are fully permitted and insured. Ask if they have received any fines and if so, what were the circumstances.

The KODAK RELAY Program provides an easy option for managing photoprocessing effluents off-site. The program is an effluent pickup service, contracted through Safety-Kleen Corporation, a nationally known, fully licensed environmental service company. Your effluent is picked up and transported to a Safety-Kleen facility for treatment and/or disposal in accordance with applicable state and federal regulations. As part of the service, they provide containers, paperwork, and other assistance. The KODAK RELAY Program may also be a cost-effective waste management system for very small facilities. For more information, visit our Kodak Environmental Services website at www.kodak.com/go/kes.

Disposal of Filters

Filters, which remove particulate from processing solutions, are constructed of many different types of plastics and cloth material. Filters used for silver-bearing solutions, such as fixers or bleach-fixes, should be rinsed prior to disposal or sent to a hazardous waste treatment facility. Collect and treat the rinse water in your silver-recovery system.

Disposal of Small Volumes of Photographic Effluents for Non-Business Owners

As a photographer, you have a unique sensitivity to the environment around you. But, as a non-business owner, you don't have to worry about the environmental and safety regulations that apply to commercial businesses and professional photographers. But you still need to know how to safely handle and dispose of photographic processing chemicals.

An amateur (or non-business owner) is someone who engages in an activity as a pastime rather than a profession. An amateur does not generate (or try to generate) revenue from the use of photography. When you become a professional and charge for your services, you are required by law to comply with certain environmental and workplace safety regulations. As an amateur, you are not required by law to follow those regulations but Kodak can provide you with recommendations on safe-handling and waste-management practices.

KODAK Publication No. J-300, *Environmental Guidelines for Amateur Photographers*, offers suggestions on how to safely handle and dispose of photographic processing chemicals.

Use of Squeegees

Waste loads can be minimized in some processes by reducing the carry-over from one tank to the next by use of squeegees. If less bleach or fixer is carried out of the tank, a lower replenisher rate can be used to maintain the tank standard. Also, if less water from a wash tank is carried into the next processing solution, the replenisher rate can be reduced while maintaining the standard tank concentrations. The use of squeegees is described in each H-24 process module as well as Module 2, *Equipment and Procedures*.

Sump or Holding Tanks for Flow Equalization

The use of large in-line sump tanks for flow equalization of the overall processing laboratory effluent is good protection against the rapid discharge or dumping of "slugs" of processing solution that can cause peak concentrations of effluent chemicals.

An alternate to a large built-in sump is to have a spare tank, preferably on casters, for holding a concentrated solution so that it can be bled into the sewer at about the normal overflow rate for that mix. This problem is discussed further later, "Cleaning Machines and Tanks."

Bleach Regeneration

The amounts of bleach to be sent to the sewer can be substantially reduced by bleach regeneration. The usual method is to collect the tank overflow, and regenerate or reconstitute it to replenisher strength. Ferrocyanide bleach is usually regenerated by using potassium persulfate and ferrocyanide. This method is well established and the procedure is given in Module 5, *Chemical Recovery Procedures*. Regeneration not only minimizes the amount of bleach going to the sewer, but it may also reduce process costs.

A method for regeneration of ferricyanide bleach using ozone is also described in Module 5. The use of ozone eliminates sulfate buildup.

Electrolytic regeneration is also possible and may be a practical and satisfactory method for bleach regeneration. A procedure employing an electrolytic "Nash" cell is described in Module 5. Regeneration or reconstitution procedures for non-ferricyanide bleaches such as persulfate bleach and the "ML" bleach of process ECN-2 are also given in Module 5.

Precipitation of Ferrocyanide

It is possible to use a precipitation technique to remove nearly all of the ferrocyanide from processing effluent. This technique involves collecting any ferricyanide bleach overflow, any fixer overflow that is to be discharged after silver recovery, and the wash waters following the bleach and fixer. Mixing the excess fixer with the wash water and any excess bleach should reduce all ferricyanide to ferrocyanide. A solution of ferrous sulfate, stabilized with sodium dithionite is then added to the bleach-fix wash solution to precipitate the ferrocyanide [$Fe(CN)_6^{-4}$] as ferrous ferrocyanide. A flocculating agent is also added to the tank holding the bleach agent. The ferrous ferrocyanide precipitate may then be removed by settling and decantation or by filtration using a filter press. Resoluabilization and reuse, or incineration should then be considered.

Fixers and Silver Recovery

Fixers contain high concentrations of thiosulfate and some sulfite, and may contribute more than half of the BOD from a processing laboratory.

One way of minimizing the amount of fixer that goes to the drain is to prevent silver from building up to a high level. High silver concentration slows fixation, especially when using sodium fixers. The processing laboratory should recover silver not only for economic benefit, but also because it is a regulated metal, and reduces the amount of the silver going to the sewer, conserving a valuable natural resource. Methods of silver recovery are outlined in Module 5, *Chemical Recovery Procedures*.

The silver may be removed electrolytically on a continuous or batch basis in order to get more life out of the fixer. Even if the fixer is not reused, it should be desilvered before being discarded. KODAK Publication No. J-212, *The Technology of Silver Recovery for Photographic Processing Facilities*, offers suggestions for efficient silver recovery.

If silver-laden fixer or fixer wash water goes to a sewer line, the silver will tend to precipitate as silver sulfide. The presence of sulfide ion in a sewer system makes certain that virtually no free silver ions will reach a treatment plant.

Developer Regeneration

Developer reuse can result in a significant reduction in chemical costs as well as reduction in total oxygen demand of processing effluent. Developer overflow from Process ECP-2D can be reused by appropriate dilution and reconstitution techniques. It is possible that developer overflow from Process ECN 2 can be reused with similar techniques, though the long-term effects of such reuse have not been studied by Kodak.

Cleaning Machines and Tanks

Procedures for machine and tank cleaning are given in Module 2, *Equipment and Procedures*. As previously discussed, direct sewering of large amounts of any concentrated solution, including cleaning solutions, is unlawful and must be avoided.

In cleaning the processing tanks, large holding tanks should be made available to hold the solution drainage from the processing machines. Any acid cleaning solution should be collected separately to prevent the possible emission of sulfur dioxide gas from mixing with developer, and some processing solutions. Thus, holding tanks of substantial capacity will be required for use during acid cleaning.

It is recommended that only one machine be cleaned at a time. The spent cleaning solution can be collected in the holding tank, adjusted for pH, and slowly sent to the sewer while more dilute effluent from the other machines is also being sewered. This will reduce the possibility of adverse effects on a treatment system. Similar care should be taken in cleaning mix and wash tanks.

If you are using KODAK Developer System Cleaner, refer to the Material Safety Data Sheet for disposal instructions.

REGULATIONS ASSOCIATED WITH DISCHARGE OF PHOTOGRAPHIC PROCESSING EFFLUENTS

Typical Municipal Sewer Use Code

Businesses pay for the privilege of using the sanitary sewer and having their wastewater treated at the Publicly Owned Treatment Works (POTW). The local sewer use code is a municipal ordinance (passed by the town or city government) that details the terms for using the sewer. The purpose of the local sewer use code is to ensure that nothing is discharged to the municipal system that could either upset the POTW or pass through it untreated. It does this by limiting the discharge of wastes to amounts the POTW can treat. In this way, the municipality protects the ground and surface waters as well as ensures the POTW complies with its permit.

Interfacing with Local Sewer/POTW Authorities

If you discharge a processing effluent, you are responsible for complying with the local sewer use code. If you do not already have a copy of the code, call the municipal clerk's office and ask for one. If you need some help understanding the local sewer use code, talk with your Kodak representative or call Kodak Environmental Services at 1-800-242-2424.

Municipal inspectors may occasionally visit your facility and take an effluent sample to verify compliance with the local sewer use code. If the sample shows noncompliance, in most cases, the city will work with you to develop a compliance program that could require you to install specific treatment equipment and implement best management practices. In extreme situations, the municipality could issue a regulatory compliance order and/or a fine. Noncompliance can also result in negative publicity. These are all good reasons to ensure that your facility complies with the local sewer use code.

Processing Lab Compliance Responsibilities

To determine the compliance requirements for your photographic processing facility, you must identify those materials at your facility that could be classified as a hazardous waste. Once you have identified those materials, you must determine which of them should be "counted" to determine your generator category. Certain silver-bearing materials may be exempt or excluded based on how they are generated or how they are managed. Once you have determined your generator category, then you can identify those compliance requirements that apply to silver-bearing hazardous wastes at your facility.

While this section describes the requirements for managing silver-bearing hazardous wastes from photographic processing facilities, it is important to note that your generator category is determined by counting the *total* amount of hazardous waste generated at your facility. This total quantity also includes other hazardous wastes such as solvents from maintenance operations or corrosive cleaning liquids.

Surveys/Applications/Permits

To determine your sewer discharge compliance requirements, you must identify all materials that your photographic processing facility discharges to a POTW. You may need a discharge (pretreatment) permit or approval from the POTW. Specific compliance requirements, such as analytical testing or reporting, may also be included in the permit authorization.

If your facility does *not* have a wastewater discharge permit or you are unsure if a permit is required, you should contact the wastewater treatment authority that manages the POTW. Some states also have their own pretreatment permitting program in conjunction with the wastewater treatment authority. The POTW will need to know that your facility performs photographic processing and the volume of wastewater that you are discharging. You should also request a copy of the local sewer use code that applies to your facility.

Some wastewater treatment authorities will require you to complete a discharge survey or application before they will issue a permit. If your facility is not required to obtain a wastewater discharge permit, request a letter that specifically states that no permit is required. Ask the authority to notify you when a change is proposed to the wastewater discharge requirements for your facility.

Silver and Other Parameter Requirements

You will find regulations that apply to silver and silver-bearing materials in many of the environmental laws that are administered by the United States Environmental Protection Agency (USEPA). These laws are designed to protect air, water, and land resources, and to provide information about the chemicals used, stored, and released to the environment. Most state and local agencies also regulate silver. In some cases, state or local regulations may be *more* stringent or include additional requirements not found in federal regulations.

The following is a review of USEPA regulations that apply to silver and silver-bearing materials found in photographic processing facilities. Check with your state or local agencies to determine if additional requirements apply to your facility.

Silver and silver-bearing materials in a photographic processing facility are typically regulated by the USEPA under the following federal laws:

- Resource Conservation and Recovery Act (RCRA)
- Clean Water Act (CWA)
- Safe Drinking Water Act (SDWA)
- Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund)
- Emergency Planning and Community Right-to-Know Act (EPCRA or SARA Title III)

Understanding how silver and silver-bearing materials are regulated by each of these laws will help you determine how these laws affect your facility. How you manage silver-bearing materials will establish your specific regulatory compliance requirements. These requirements can range from fairly simple and inexpensive activities such as maintaining records, to more costly and complex activities such as analytical testing and hazardous waste manifesting.

KODAK Publication No. J-214, *The Regulation of Silver in Photographic Processing Facilities*, provides more information on the federal laws that affect your photographic processing facility.

Sampling and Analytical Requirements

Because of the complexity of analyzing silver, you must be careful when selecting an analytical laboratory to perform silver analysis. The laboratory you select should have a good understanding of, and experience in, analyzing silver. Some states require certification of laboratories that perform analysis for regulatory compliance. Make sure you are using a certified laboratory if your state requires certification.

Environmental Analytical Services from Kodak make the testing and analysis process simple, economical, and accurate. You can benefit from Kodak's extensive expertise in analyzing complex photographic processing solutions and effluents. Strict adherence to EPA-approved testing methods and laboratory certification yield accurate analytical results that you can submit for regulatory compliance demonstration purposes in most states.

SILVER MANAGEMENT

Silver management is more than just silver recovery. It's a systematic way to control your operations from the mixing room to the drain. But its benefits far outweigh the effort that you put into it. Proper silver management ensures that your operations will achieve peak efficiency and meet or exceed all environmental requirements.

That's why Kodak has designed the "Silver Management" series of publications—to help you save three of your most valuable resources: silver, time, and money. The "Silver Management" series offers you the opportunity to learn the tips, share the techniques, and get answers to questions that affect *your* business.

For more information on silver management, visit Kodak Environmental Services on-line at **www.kodak.com/go/kes**.

Sources of Silver in Photographic Processing Facilities

Learn how to increase your revenues by recovering silver from scrap films. KODAK Publication No. J-210, *Sources of Silver in Photographic Processing Facilities*, provides more information on the potential sources of silver in your processing operation. It will help you to evaluate each source to determine if recovering the available silver is worthwhile for your facility.

Measuring Silver in Photographic Processing Facilities

Discover how you can use economical and simple tests to make your processes more efficient. Measuring the silver concentration at various points in your operation provides you with important and extremely useful information. An accurate knowledge of silver concentration helps you to optimize your silver-recovery system, manage the disposal of photoprocessing solutions, and maintain control of silver in processing machines. KODAK Publication No. J-211, *Measuring Silver in Photographic Processing Facilities*, provides information on techniques for determining silver content in processing solutions, wash waters, overflows, effluents, processor filters, and photographic films.

Silver Recovery Technology

Learn which type of silver recovery is the right one for your facility. KODAK Publication No. J-212, *The Technology of Silver Recovery for Photographic Processing Facilities*, describes the most appropriate methods for recovering silver from silver-rich processing solutions and wash waters in different sizes and types of operations. It will help you choose between electrolysis (terminal and in-line), metallic replacement, precipitation, and ion exchange, and includes a helpful table that presents a comparison of costs, efficiency, advantages, and disadvantages. It also describes methods for concentration of solutions: reverse osmosis, distillation, and evaporation.

KODAK Publication No. J-215, *Recovering Silver from Photographic Processing Solutions*, takes a look at the different methods of recovering silver from photographic processing solutions and offers important tips on selecting, operating and troubleshooting silver-recovery equipment and systems. This publication is best characterized as a practical how-to reference guide.

Refining of Recovered Silver

KODAK Publication No. J-213, *Refining Silver Recovered from Photographic Processing Facilities*, will help you to capitalize on your silver-recovery system by explaining the final step in the process. It describes the forms of silver produced by the three most common types of on-site silver recovery. It then explains the procedures used by refiners to remove silver from silver-bearing materials. This publication also offers advice on choosing a refiner.

The Fate and Effects of Silver in the Environment

Silver management makes more sense when you can see how the different forms of silver fit into the big environmental picture. KODAK Publication No. J-216, *The Fate and Effects of Silver in the Environment*, explains the environmental properties of silver, and how and why discharges of silver are regulated. This publication will help you to understand the different forms of silver, how concentrations in the environment are measured, and their potential effects on the environment.

Material Safety Data Sheet (MSDS)

Chemical manufacturers and importers are responsible for developing a MSDS for each hazardous chemical that they produce or imports. Each MSDS must be in English, but like the hazard warnings, can be produced in other languages as supplemental information to help users better understand the hazards associated with the chemicals in the workplace. Each MSDS must contain:

- Identity of the hazardous chemicals in the product
- Physical and chemical characteristics
- Physical and health effects, and physical and health information
- Exposure limits
- Primary routes of entry
- Precautionary and control measures
- Emergency and first-aid information
- Identification of preparer
- Date of preparation

Manufacturers and importers must provide the MSDS at the time of initial shipment to distributors or users. Kodak provides MSDSs by mail at the time of initial purchase of a product and with subsequent orders when changes have been made to the MSDSs. Distributors also have requirements to provide MSDSs to chemical users.

You must make sure that you have a MSDS for each hazardous chemical that you receive at your facility. If your supplier does not provide you with a MSDS, contact the supplier and request the MSDS.

The MSDS for each hazardous chemical that you are currently using must be readily available to employees during each work shift. You can keep MSDSs in a single location for the entire facility or place them in the individual work areas where the chemicals are used. MSDSs are typically maintained in paper form, but you can keep them on microfilm or electronic formats as long as employees have ready access to them.

Kodak provides customers with MSDSs for all photographic processing chemicals. If you need replacement(s) or extra MSDSs for any Kodak chemical, visit the Kodak website at **www.kodak.com/go/MSDS** or call 1-800-242-2424. You will need to supply the catalog (CAT) number of the products for which you need MSDSs.

Hazard Warning Labels

To assist U.S. customers in meeting Occupational Safety and Health Act (OSHA) hazard communication requirements, Kodak provides the following labels for photoprocessing working solution containers and tanks. Customers located outside of the U.S. should contact their local Kodak representative for assistance with determining applicable labeling requirements.

For more information, visit the Kodak website at **www.kodak.com/go/kes**.

Transportation Information

Identifying and classifying a material so that it can be packaged, marked, labeled, placarded, and documented in compliance with regulatory requirements, are important parts of doing business. The transport of hazardous materials requires special consideration. In addition, companies that ship hazardous materials are required to train, test, and certify hazmat employees.

For more information, call 585-722-2400 or visit the Kodak website at **www.kodak.com/go/kes**.

Additional Environmental Information

Eastman Kodak Company has sales offices worldwide to provide customers with products and services to achieve the best image possible. For additional environmental information, call the Kodak office in your area.

GLOSSARY OF TERMS

AA/AE Spectroscopy
Atomic Absorption or Atomic Emission.

Ag
Silver.

Atomic Absorption or Atomic Emission
Spectrophotometers which measure the absorption or emission of specific metallic elements at specific wavelengths. This equipment is commonly used to quantify the levels of metals and metal compounds in waste water effluents.

Best Management Practices
Schedules of activities, prohibition of practices, maintenance procedures and other management practices to prevent or reduce the pollution of waters. BMPs also include treatment requirements, operating procedures and practices to control chemical spillage and leaks or drainage from raw material storage.

Biochemical Oxygen Demand
The BOD test measures the amount of oxygen that a chemical solution, or effluent consumes over a five-day period through biological degradation. Knowing the oxygen demand of a discharged waste is important because strong oxygen-demanding wastes can overload the aeration capacity of a secondary treatment plant. Discharging improperly treated wastes can deplete the amount of dissolved oxygen in a receiving body of water. The BOD analysis attempts to duplicate in the laboratory the environmental condition in a receiving body of water and to measure the oxygen demand that the chemical or effluent exerts on it. A BOD of 400 mg/L for an effluent means that one litre of the waste would consume 400 milligrams of oxygen in 5 days in a natural stream. As the biochemical oxygen demand increases, more dissolved oxygen is removed from the stream, leaving less for fish and other aquatic life.

BMP
Best Management Practices.

BOD
Biochemical Oxygen Demand.

CAS
Chemical Abstract Service.

CERCLA
Comprehensive Environmental Response, Compensation and Liability Act.

CFR
Code of Federal Regulations.

Chain of Custody
A document designed to trace the custody of a sample(s) from the point of origin to final disposition with the intent of legally proving that custody remained intact and that tampering or substitution were precluded.

Characteristic Waste
According to the EPA, a solid waste not otherwise excluded from the definition of a hazardous waste is a hazardous waste if it exhibits one or more of the following four characteristics: 1) ignitability, 2) corrosivity, 3) reactivity or 4) toxicity. The primary responsibility for determining whether a waste exhibits a characteristic rests with the waste generator.

Chemical Abstract Service.
A service of the American Chemical Society that assigns identification numbers to chemicals. The CAS number is the most common reference for chemicals

Chemical Oxygen Demand
Impurity level of domestic and industrial effluents based upon the fact that all organic compounds (with few exceptions) can be oxidized by the action of strong oxidizing agents, under acid conditions, to carbon dioxide and water. COD and BOD analyses do not completely correlate on all samples of photographic effluent because the two methods do not measure the same oxygen-demanding chemicals, but the COD is usually a larger number than the BOD. The COD test is more reproducible than the BOD test.

Chlorine Demand
Chlorine demand is the amount of chlorine needed to reduce the microorganism level in treated effluent to a level safe for discharge to a receiving body of water. More specifically, it is the amount of chlorine needed to provide a certain residual chlorine content (usually 0.5 mg/L) after a specific time (usually 15 minutes). The chlorine-demand test is an old method that depends heavily on test conditions, such as temperature, exposure time, etc. However, it is commonly regulated by sewer codes.

Chromium
Hexavalent chromium (chromium with a valence of 6) is harmful. Some local sewer codes limit the discharge of hexavalent chromium to 0.1 parts per million. When a dichromate bleach is mixed with other processing solutions that are alkaline and with solutions that contain reducing agents, such as thiosulfate, the chromium is precipitated as trivalent chromium hydroxide. The trivalent form is removed at the treatment plant in the primary and secondary sludge.

Cl 2 Demand
Chlorine Demand.

COD
Chemical Oxygen Demand.

Code of Federal Regulations
The codified regulations of all U.S. regulatory agencies; usually cited by volume number, title number, and sections. It is revised and issued annually by the Government Printing Office.

Composite Sampling
Composite sampling consists of taking a number of small samples over a period of time and combining them into one sample. This is a good method for determining average effluent characteristics. These samples can be collected manually and mixed together or can be collected by automatic sampling equipment. The sample can be fixed-volume or a flow-proportional composite type.

Comprehensive Environmental Response, Compensation and Liability Act.
The purpose of CERCLA is to provide authorities with the ability to respond to uncontrolled releases of hazardous substances from inactive hazardous waste sites that endanger public health and the environment. CERCLA established prohibition and requirements concerning closed and abandoned hazardous waste sites, provided for liability of persons responsible for releases of hazardous waste at such sites, and established a trust fund to provide for cleanup when no responsible party could be identified.

Cr
Chromium.

Dilution
Most sewer codes regulate chemical discharges according to their concentration. Although diluting photographic waste reduces the concentration, most sewer codes specifically prohibit dilution of the waste for the sole purpose of meeting the code limits.

Dissolved Oxygen
Biological decomposition of organic matter uses dissolved oxygen. Since fish and most aquatic life are stifled by lack of oxygen, dissolved oxygen determination is a principal measurement in pollution surveys. The DO analysis is part of the BOD test procedure.

DO
Dissolved Oxygen.

DOT
Department of Transportation. DOT oversees and regulates the transportation of hazardous materials. “Hazardous” materials, by DOT definition, are those materials that are capable of posing an unreasonable risk to health, safety and property when transported in commerce. Specific rules apply for proper identification, labeling, shipping papers, packaging and method of transportation.

Effluent Sampling
Sampling and flow-measurement methods designed to provide processing laboratories and treatment authorities with samples that accurately represent the composition of effluents. Sampling programs may be initiated by treatment authorities to: 1. determine whether or not effluents comply with sewer code restrictions, 2. evaluate conditions for a discharge permit, 3. establish treatment charges.

Fe
Iron.

Federal Register
The daily publication of the federal government’s regulatory activities, such as proposed or final regulations, executive orders, settlement of federal lawsuits, etc. Publication of a notice in the Federal Register is legally considered to be notice to all the world.

FID
Flame Ionization Detector.

Flame Ionization Detector
A gas chromatography detector in which the column effluent gas is mixed with hydrogen and burned in air or oxygen. The ions and electrons produced in the flame produce an electric current proportional to the amount of material in the detector. The FID responds to nearly all organic compounds, but it does not respond to air and water, making it exceptionally suited to environmental analysis.

FR
Federal Register.

Gas Chromatography.
A chromatographic separation technique in which the substance (or mixture) to be analyzed is vaporized and diffused along with a carrier gas through a liquid or solid for differential adsorption.

Gas Chromatography/Mass Spectrometry
An analytical technique, especially useful for organic analysis, in which the effluent from gas chromatographic column is introduced into the ion source of a mass spectrometer. The organic compounds are ionized and the ions are separated by their mass/charge ratio in a mass analyzer and detected in characteristic ion fragmentation patterns (mass spectra).

GC
Gas Chromatography.

GC/MS
Gas Chromatography/Mass Spectrometry.

Grab Sample
A grab sample is sometimes called an individual or discrete sample and will only represent conditions at the exact moment it is collected. A grab sample can indicate what is in a batch dump, and a series of grab samples can show the changes that occur in an effluent over a period of time. A grab sample may spot an extreme condition that may be masked by another method.

Hardness
The total concentration of the calcium and magnesium ions in water expressed as calcium carbonate (mg/ $CaCO_3$ /litre). Hard waters from both underground and surface water supplies are most common in areas having extensive geological formations of limestone.

Heavy Metals
Materials classed as heavy metals are commonly regulated by local sewer codes. They are defined as metals with a specific gravity greater than 5.0. This includes metals such as cadmium, chromium, cobalt, copper, gold, iron, lead, manganese, mercury, molybdenum, nickel, silver, and zinc.

Holding Time
The storage time allowed between sample collection and sample analysis when the designated preservation and storage techniques are employed.

ICP
Inductively Coupled Argon Plasma.

Indirect Discharger
This is an industrial user or other non-domestic user that discharges wastewater (pollutants) into a publicly owned treatment works.

Inductively Coupled Argon Plasma
An instrument used for metal analysis because the temperature of the plasma is considerably higher (10,000 K) than the temperature of a flame atomic absorption spectrophotometer. It is also capable of doing multi-element analysis.

Iron
Iron concentration in effluent is commonly regulated because it affects the appearance and taste of water and because it readily oxidizes to the ferric (Fe+3) form, which precipitates and causes rust stains. The iron in photographic effluent is not generally a problem because it is usually present only in the form of stable iron complexes.

Lead
Lead is naturally occurring and has no characteristic taste or smell. Lead in water will combine with different chemicals depending on the acidity and temperature of the water.

LEPC
Local Emergency Planning Committee.

Local Emergency Planning Committee.
A committee required by SARA Title III; the local group responsible for developing and implementing response plans to chemical emergencies.

Material Safety Data Sheet
Hazard and toxicological information required by OSHA's Hazard Communication Standard (29 CFR 1910.1200) to be provided by the manufacturer or distributor for all potentially hazardous substances. It must be made available to employees.

MDL
Method Detection Limit.

Method Detection Limit
The minimum concentration of a compound that can be measured and reported with 99 percent confidence that the value is above zero.

MSDS
Material Safety Data Sheet.

N
Nitrogen.

National Pollution Discharge Elimination System.
In the Clean Water Act, this is the national permitting process for point-source discharges of pollutants into waters of the United States.

Nitrogen
Common forms of nitrogen are: organic, ammonia, nitrite and nitrate. Nitrogen in wastewater can promote the growth of algae.

Notice of Violation
A document issued by the pollution control authority that provides notice that the facility/process is (or was) in violation of its pollutant discharge permit. The NOV will typically outline the steps the owner/operator must take to respond and address the noncompliance situation.

NOV
Notice of Violation.

NPDES
National Pollution Discharge Elimination System.

O & G
Oil and Grease. A variety of organic substances including hydrocarbons, fats, oils, waxes and high molecular weight fatty acids are collectively referred to as oil and grease. Because of low solubility, these substances separate from water and adhere to the interior of pipes and tank walls, reduce the biological treatablilty of waste and produce greasy sludge solids that are difficult to process.

P2
Pollution Prevention. Identifying areas, processes and activities that create excessive waste products or pollutants in order to reduce or prevent them through, alteration or eliminating a process. Such activities and consistent programs can involve cooperative efforts with such agencies as the Departments of Agriculture and Energy.

Pb
Lead.

pH
pH indicates how acidic or alkaline (basic) a solution is. It is a measurement of hydrogen-ion concentration and is expressed as the negative logarithm of the hydrogen-ion concentration. pH values run from 0 to 14. The lower numbers indicate acid solution, higher numbers indicate basic solutions, and 7 represents neutral solutions.

Point Source
In the Clean Water Act, it is any discernible, confined, discrete conveyance from which pollutants are or may be discharged.

POTW
Publicly Owned Treatment Works.

Preservative
Either a chemical or reagent added to a sample to prevent or slow decomposition or degradation of a target analyte or a physical process (such as cooling) used for the same purpose. Both physical and chemical preservation may be used in tandem to prevent sample deterioration.

Publicly Owned Treatment Works
POTW is any device or system used in the treatment (including recycling and reclamation) of municipal sewage or liquid industrial wastes that is owned by a state or municipality.

Recycle/Reuse
Minimizing waste generation by recovering and reprocessing usable products that might otherwise become waste (i.e., recycling of aluminum cans, paper and bottles, etc.).

SARA
Superfund Amendments and Reauthorization Act of 1986.

Settleable Solids
A term to describe solids in suspension that will settle because of the influence of gravity. Only the coarser suspended solids with a specific gravity greater than that of water will settle

Silver
Silver compounds are the basic light-sensitive material used in most of today's photographic films and papers. Processing solutions contain silver because it is dissolved by solutions such as fixers or bleach-fixes, or because it leaches from the film during processing. After silver is removed from the film or paper during fixing or bleach-fixing, it is carried out in the solution and wash overflows, usually in the form of a silver thiosulfate complex. Unlike free silver ion (Ag+), which is toxic to microorganisms, silver thiosulfate complex is relatively nontoxic and is not detrimental to a secondary waste-treatment plant. When this complex reaches a treatment plant, chemical or biological action converts it to insoluble silver sulfide (Ag_2S) and it is collected as a solid sludge.

SIU
Significant Industrial User. Any industrial user that: discharges an average of 25,000 GPD or more of process wastewater to a POTW; contributes a process waste stream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW; is designated as such by the Regulatory Authority on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard; or is subject to federal pretreatment standards under 40 CFR.

Source Reduction
Reducing the amount of materials entering the waste stream from a specific source by redesigning products or patterns of production or consumption (e.g., using returnable beverage containers). Synonymous with waste reduction.

SPDES
State Pollutant Discharge Elimination System.

State Pollutant Discharge Elimination System
A state water quality agency can obtain approval from EPA to have NPDES Permit-Issuing Authority for their state. Just like a NPDES permit, a SPDES permit poses restrictions upon the pollutants found in a permitee's discharge.

Superfund Amendments and Reauthorization Act of 1986.
One portion of the SARA Regulation is Title III, which established requirements for federal, state and local governments and industry regarding emergency planning and community right-to-know reporting on hazardous chemicals. This law increases public access to information about hazardous chemicals in communities and the release of these chemicals into the environment.

TC
Toxicity Characteristic.

TCLP
Toxicity Characteristic Leaching Procedure.

TDS
Toxicity Dissolved Solids.

Threshold Planning Quantity
The amount of a hazardous substance on hand at a facility that triggers emergency planning and community right-to-know under SARA Title III.

TOC
Total Organic Carbon.

TOD
Total Oxygen Demand.

Total Dissolved Solids.
In potable waters, most matter is in the dissolved form and consists mainly of inorganic salts, small amounts of organic matter, and dissolved gases. As waters become polluted, the amount of undissolved and suspended solids increase, and the dissolved fraction is usually not considered an important effluent parameter.

Total Organic Carbon
The organic carbon in wastewater is composed of a variety of organic compounds in various oxidation states. The TOC is a more convenient and direct expression of total organic content than either the BOD or COD, but does not provide the same information. TOC measurement does not replace BOD and COD testing.

Total Oxygen Demand
A measurement of the extent to which a chemical can be oxidized by laboratory incineration. TOD is a larger number than BOD or COD. It is being used with increasing frequency because results can be obtained quickly in the laboratory.

Total Suspended Solids
Suspended solids are undissolved matter in effluent. A parameter to evaluate the strength of wastewaters. It is used to determine the efficiency of effluent treatment units. The TSS fraction includes the settleable solids component.

Toxicity Characteristic
The EPA term for some substances, including heavy metals, a number of pesticides, barium, arsenic and vinyl chloride, that can pollute groundwater by seeping out of landfills. A waste exhibits the characteristic of toxicity if it contains more than a specified level of the listed substances as demonstrated by the TCLP. They are regulated under the authority of the Resource Conservation and Recovery Act.

Toxicity Characteristic Leaching Procedure
The EPA method for determining the amount of toxicity characteristic substances in a waste. A representative sample of waste is subjected to an acidic solution. After 24 hours, the resulting extract is then tested to determine if it contains contamination levels of regulatory concerns. The TCLP is designed to identify wastes that are likely to leach hazardous constituents into groundwater under improper management conditions. EPA has made the assumption that industrial waste would be disposed of with non-industrial waste in an actively decomposing municipal landfill situated over an aquifer

Toxic Substances and Control Act.
This act allows the Environmental Protection Agency to evaluate the toxicity and environmental impact of chemical products being manufactured and sold.

TPQ
Threshold Planning Quantity.

TSCA
Toxic Substances and Control Act.

TSS
Total Suspended Solids.

Turbidity
A measure of the light-transmitting properties of water used to indicate the quality of waters with respect to colloidal matter. Colloidal matter will scatter or absorb light and thus prevent its transmission.

Waste Load
A measurement of the characteristics of an effluent received by a body of water or a treatment plant. Usually expressed in terms of volume and concentration of oxygen demand, chlorine demand, nutrients, specific chemical compounds and suspended solids. These values can be related to the capacity of the receiver to handle the load.

Waste Minimization
Measures or techniques that reduce the amount of wastes generated during industrial production processes; term is also applied to recycling and other efforts to reduce the amount of waste going into the waste stream.

Water Quality Standards
Concentration limits for bodies of water established by federal and state authorities. These are limits for overall characteristics and individual components of water based on the proposed use of the water.

WL
Waste Load.

WQS
Water-Quality Standards.

Zinc
Zinc is seldom found in public water supplies at concentrations over 1 ppm. Because it tends to impact water taste, its concentration in effluents is usually limited to 5 ppm by local sewer authorities.

Zn
Zinc.

MORE INFORMATION

If you have environmental or safety questions about Kodak products or services, visit our Kodak Environmental Services website at www.kodak.com/go/kes or call Eastman Kodak Company at 1-800-242-2424.

Kodak also maintains a 24-hour health hotline to answer questions about the safe handling of photographic chemicals. If you need health-related information about Kodak products, call 1-585-722-5151.

For questions concerning the safe transportation of Kodak products, call Kodak Transportation Services at 1-585-722-2400.

The products and services described in this publication may not be available in all countries. In countries other than the U.S., contact your local Kodak representative, or your usual supplier of Kodak products.

The following publications are available from Kodak Customer Service or from dealers who sell Kodak products.

J-208	*Introducing the "Silver Management" Series*
J-210	*Sources of Silver in Photographic Processing Facilities*
J-211	*Measuring Silver in Photographic Processing Facilities*
J-212	*The Technology of Silver Recovery for Photographic Processing Facilities*
J-213	*Refining Silver Recovered from Photographic Processing Facilities*
J-214	*The Regulation of Silver in Photographic Processing Facilities*
J-215	*Recovering Silver from Photographic Processing Facilities*
J-216	*The Fate and Effects of Silver in the Environment*
J-217	*Using the Code of Management Practice to Manage Silver in Photographic Processing Facilities*
J-300	*Environmental Guidelines for Amateur Photographers*

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Environmental Aspects

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