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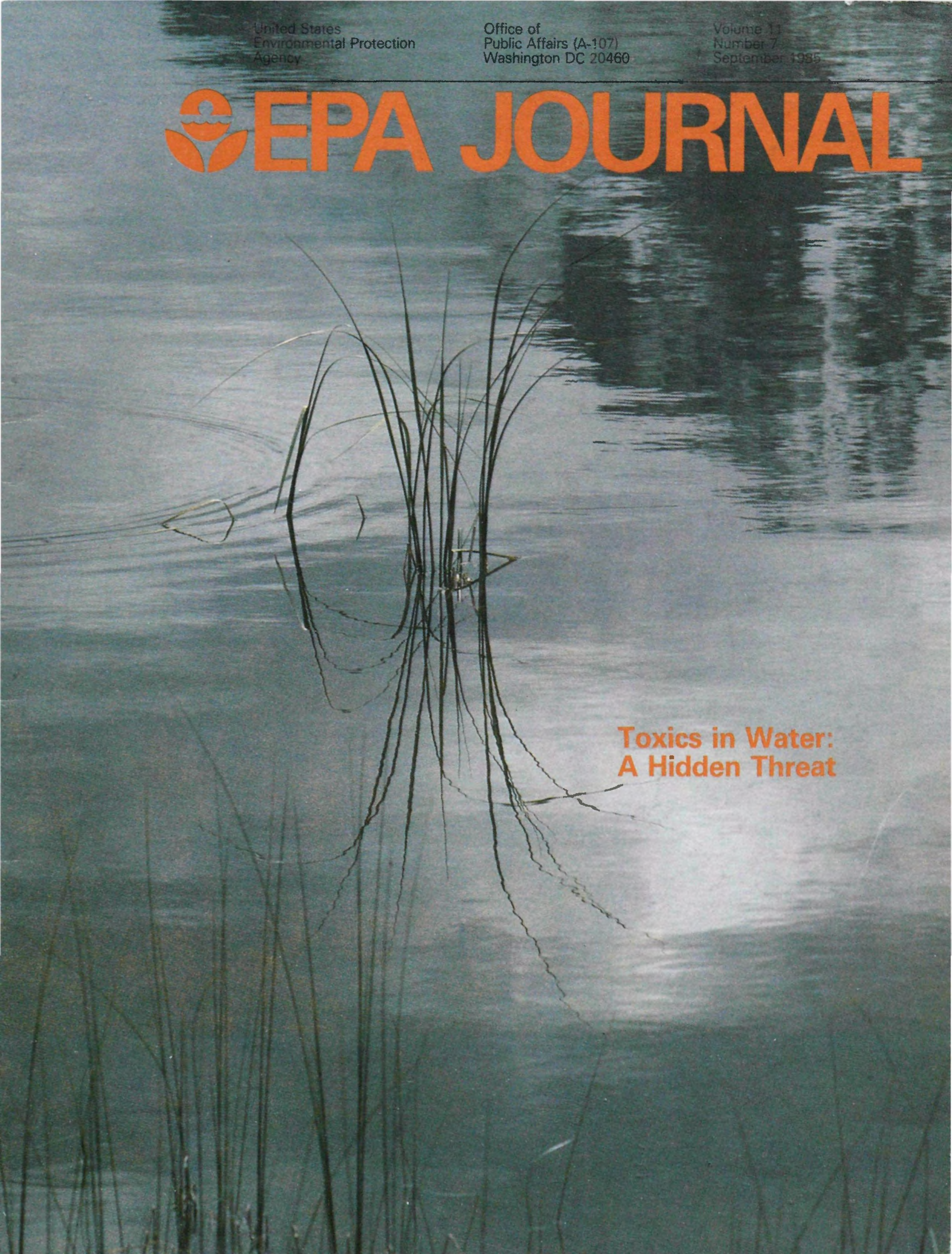

Toxics in Water: A Hidden Threat

Afloat on a homemade raft.

Toxics in Water: A Hidden Threat

A lot has been done to deal with conventional water pollutants such as suspended solids and biochemical oxygen-demanding substances. A crucial task now is to understand and meet the challenge of toxic substances in water. This issue of the *Journal* explores what is being done on this pollution cleanup front.

The issue begins with an overview of the toxics control activities in EPA's Office of Water provided by Henry L. Longest, II, Acting Assistant Administrator of the Office. The agency's current steps to secure better industrial pretreatment of toxic wastes before they are discharged into public wastewater systems are described in another article. EPA's complex effort to limit toxics in water through effluent guidelines is also explained.

The agency's steps to protect drinking water from toxics as well as other pollutants are discussed. Another article reports on an EPA-supported toxics cleanup effort in Massachusetts that may provide lessons with nationwide application. EPA research into the use of fish as sentinels for toxics in the environment is described, as are the agency's actions to control a toxics problem of growing concern, pesticides in ground water.

In other features, excerpts are taken from a recent speech by EPA Administrator Lee M. Thomas examining the problem of one-track approaches to cross-media pollution problems. The recent reassignment of seven senior executives at EPA is discussed in another article.

An experiment under way in Southern California to help accomplish the tough task of finding sites for hazardous waste facilities is reported. A perspective on the national hazardous waste siting problem is given in a companion article.

Concerning another facet of the toxics problem, an article reports on the progress that is resulting from EPA's effort to control these substances from motor vehicles.

Another article features ERAMS—EPA's nationwide system to gather and analyze data on environmental radiation.

This issue of the *Journal* concludes with two regular features—Update and Appointments. □

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EPA is charged by Congress to protect the nation's land, air, and water systems. Under a mandate of national environmental laws, the agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

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Front Cover: Water and Reeds. Water that looks clean could be contaminated with hard to detect toxic pollutants, while water that looks polluted could be free of these substances. Photo by Richard J. Quataert, Folio, Inc.

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Controlling Toxic Water Pollution

by Henry L. Longest, II

The Water Program is often described as a mature one, and in many respects this is true. We have accomplished a great deal in terms of controlling conventional pollutants. It seems, however, that the more progress we achieve, the more we understand how much more remains to be done. As we have worked with municipalities and industries to put permits into place for pollution control, we have discovered more about toxics. As we have moved forward to control point

The more progress we achieve, the more we understand how much more remains to be done.

source pollution, we have learned more about the effects of nonpoint sources of pollution, such as storm water and agricultural runoff. We have discovered new threats to ground water from pesticides and synthetic organic chemicals. And we are increasingly involved in programs to protect oceans and estuaries. We are a mature program and, like most adults, we have assumed new responsibilities at this stage.

Drinking Water

The Safe Drinking Water Act protects our nation's drinking water in three ways: through the National Primary Drinking Water Regulations, the Sole Source Aquifer Program, and the Underground Injection Control Program. The drinking water regulations establish standards for drinking water quality and the sole source aquifer and underground injection control (UIC) programs are dedicated to protecting ground water used as a source of drinking water.

The latest data show that our public water supplies continue to maintain high levels of compliance with the microbiological Maximum Contaminant Level. This represents our continued progress with conventional drinking water contaminants. We have also moved forward on toxics. The first phase of revised drinking water standards for volatile organic chemicals (VOCs) has been proposed, while regulatory proposals for phase two, covering a large number of contaminants, including many pesticides, have been developed and soon should be proposed in the *Federal Register*. In addition, the agency has drafted a proposed regulation requiring systems to monitor for unregulated VOCs as a means of detecting serious ground-water contamination. In that way, we will be able to take appropriate action to protect users long before proposed standards become effective.

On the subject of pesticides, the Office of Drinking Water (ODW) is conducting a survey with the Office of Pesticide Programs that is currently well into the design phase. We expect it will provide a national picture of the extent of pesticides in drinking water drawn from ground water, as well as the geological and use conditions that contribute to the migration of pesticides into ground water. This information will serve as a basis for development of future pesticides and drinking water regulations. In addition, ODW is accelerating development of health advisories that state and local officials use in responding to contamination incidents that affect drinking water.

Our primary concern with the operation of injection wells is the potential threat they pose to the quality of underground sources of drinking water. With more than 180,000 injection wells nationwide, they pose a serious potential threat to public health and the environment. So far, the full program has been delegated in 33 states and territories, EPA runs the program in 19, and five have divided responsibility.

We have already begun the re-permitting of existing wells for the control of hazardous waste disposal and wells related to mineral extraction. Both EPA and the states have also begun the permitting of wells related to oil and gas production and the establishment of a UIC compliance and enforcement presence where EPA must implement programs. We are also preparing to implement the new Resource Conservation and Recovery Act requirements as they relate to UIC, including a major data collection effort to support the Administrator's decisions on the continuance of wells injecting designated hazardous wastes.

Surface Water

Overall, the national strategy to maintain water quality is working. That strategy has been to reduce point source pollution through both technology-based and water quality-based controls. EPA and the states, largely through these controls for conventional pollutants, have reduced the volume of pollutants discharged into the nation's waters. As a

More than 180,000 injection wells nationwide pose a serious potential threat to public health.

result, many streams, lakes, and rivers have shown dramatic improvements, even while the country experienced population growth.

However, the goals of restoring and maintaining water quality for fishing and swimming are still not met in many

(Longest is currently EPA's Acting Assistant Administrator for Water.)

Sport fishing is one aspect of American life that can be affected by toxic substances in water.

bodies of water. Furthermore, the extent of the impact of toxics on water quality remains largely unknown. In 1977, the Clean Water Act was revised and redirected towards the abatement of toxic pollutant discharges.

We have made progress in controlling the direct discharge of many toxic pollutants, especially where our first round of permits contained requirements to control toxic as well as conventional pollutants. Permits now being issued contain new technology requirements. We will complete this permitting process for the major dischargers we regulate during the next few months, the states having delegated authority will complete theirs during fiscal year 1986. In addition, many new permits will contain water quality-based toxics limits.

Our progress in controlling toxic discharges from industrial users of publicly owned treatment works (POTWs) is not so far along. Most indirect dischargers did not have to install controls during the first phase of technology requirements. Our recently issued effluent guidelines are a major challenge to these indirect users, and many are just getting started. Most of them will be regulated through their local POTW. In the last two years, EPA and the delegated states have approved 1,100 local pretreatment programs. These are new programs for most cities, and it will take some time before all requirements are completely enforced. The POTWs themselves will have to meet more stringent toxics control requirements in their effluents, as many municipal permits are being rewritten to increase controls on toxics.

In the last two years, EPA and the delegated states have approved 1,100 local pretreatment programs.

There is much yet to be done in the area of water quality-based controls, so we envision a third round of permits in four or five years to require even more controls on toxics. This is because states will be adopting additional water quality criteria and site-specific studies. EPA has recommended an integrated approach to water quality-based control of toxics. This would combine biological tests of toxicity of the whole effluent and specific criteria for individual chemicals that we know are of concern.

Our integrated approach to monitoring uses both chemical and biological methods to assess and control toxic substances in surface water. In the biological methods recommended, scientists expose fish and other aquatic animals to samples of effluent diluted with varying volumes of receiving water. The effects on the animals are then observed over time and the toxicity of the wastewater is calculated. This

Industries and POTWs will be required to test effluents using biomonitoring techniques.

represents a clearer picture of what is actually going on in the receiving waters, and provides a tool for setting limits in discharge permits to regulate the toxicity of an entire effluent. Industries and POTWs will be required to test effluents using biomonitoring techniques.

Ground Water

Because half of the country's population drinks ground water, and because we have discovered increased ground-water contamination from toxic chemicals, an Office of Ground-Water Protection was established last year in the Office of Water. Its mission is to create a focal point to coordinate EPA ground-water policy, deal with other federal agencies, and support the work of the states. In the first year, a total of $7 million in grants was allocated to the states to develop and implement ground-water programs.

A primary job of this office is to implement the EPA's Ground-Water Protection Strategy, which has four major elements: to build and enhance institutions at the state level; to address problems associated with inadequately controlled sources of contamination; to issue guidelines for EPA decisions affecting ground-water protection and cleanup; and to strengthen EPA's own organization for ground-water management.

Steve Delaney

Around the edge of a Virginia pond. Despite appearances, today's pollution can be hard to detect.

Half of the country's population drinks ground water.

The program is new, but the organization is now in place, both at headquarters and in the regions. The Office of Ground-Water Protection is working with other EPA offices to develop strategies to deal with high-priority issues such as pesticides, toxics, and the problems across the country with data management. We are planning to implement classification guidelines across EPA programs and to develop a cohesive management approach for each classification.

Marine Programs

The Marine and Estuarine programs also deal with toxic issues. Under the Marine Protection, Research and Sanctuaries Act, the agency is charged with carrying out strictly regulated incineration-at-sea activities for the destruction of liquid hazardous wastes. These activities include selecting environmentally safe incineration sites and issuing permits to applicants. The Office of Water is currently revising its proposed regulations on incineration-at-sea in response to public comment. We are also proceeding to implement a comprehensive research strategy that calls for additional test burns, as well as other research activities.

We are working with state and local agencies to develop strategies to manage in-place toxic pollutants at critical locations in the Great Lakes and in selected estuaries. We also plan to develop a national strategy to deal with toxic contamination of sediments. We will continue monitoring studies to identify additional pollutants of concern. As land disposal of hazardous waste is phased out under the new Resource Conservation and Recovery Act amendments, we are assuring that the ocean is only used for hazardous waste disposal when it is demonstrated to be safe.

Although much has been done in the control of water pollution, it is clear that much remains to be done. In poll after poll, the people in this country repeat their interest in protecting our water resources. We hear their call. We continue our persistent work toward a safe, clean environment. □

Pretreatment of Industrial Waste

by Jack Lewis

Damage caused by a massive explosion in the sewer system of Louisville, Ky., on February 13, 1981. An accidental release of hexane from a Ralston Purina plant caused the explosion. EPA imposed the maximum penalty of $62,500 against the company. Explosions and fires are targets of EPA's pretreatment program, not just liquid pollution.

The Louisville Times

Every day U.S. industry discharges billions of gallons of wastewater generated by industrial processes. This liquid waste stream often contains many toxic metals and organic pollutants.

Unfortunately, the discharge point for a large portion of these industries is a municipal sewer system that leads to a publicly owned treatment works (POTW). A 1981 EPA study estimated that roughly 60 percent of the total toxic metals and organics discharged by industry winds up at municipal treatment plants.

This flood of toxic wastewater varies from day to day, and from region to region. Its principal pollutants are toxic metals and organic chemicals. Some important toxic metals are lead, zinc, copper, chromium, cadmium, mercury, and nickel. Toxic organics include benzene, toluene, and trichloroethylene. Each of these substances, to a greater or lesser degree, is known to be harmful to human health. Many are toxic to aquatic life as well.

The U.S. cannot make significant headway against toxic pollution until industry starts treating its pollutants before discharging them.

The consequences of these wastewater discharges have been severe. In 1982, the Association of Interstate Water Pollution Control Administrators estimated that 14,000 stream miles in 39 states had been polluted by toxic substances. The association also estimated that 638,000 acres of lakes in 16 states and 920 square miles of estuaries in eight states had been adversely affected.

A pollution problem this massive requires an equally ambitious control strategy. That is why EPA's pretreatment program is so important. The basic premise behind this program is quite simple: The United States cannot make significant headway against toxic pollution of its surface waters until American industry starts treating its toxic pollutants *before* discharging them into municipal sewer systems.

Industries that send their wastes to POTWs are known as "indirect dischargers." That is because their discharges enter America's surface waters by an indirect route: via municipal sewage treatment works. Direct dischargers, on the other hand, are industries that release their treated wastewater directly to surface waters.

EPA's pretreatment program deals only with indirect dischargers. The program, which is just now moving into its first round of full implementation, is emerging as the most decentralized at EPA. It places a great deal of the responsibility for controlling indirect industrial dischargers directly on local municipalities. These local authorities have primary responsibility for

(Lewis is Assistant Editor of the EPA Journal.)

USDA Photo by Robert C Bjork

By removing toxic chemicals, pretreatment can make leftover sewage sludge safer for reuse.

implementation and enforcement of necessary pretreatment controls.

EPA's pretreatment program dates from the Clean Water Act of 1972 and its 1977 Amendments. This law gives EPA responsibility for assuring that effective local pretreatment programs are established throughout the United States.

The goals of the national pretreatment program are as follows:

• Protection of municipal treatment plant workers. Workers at POTWs run the risk of exposure to toxic substances in wastewater or toxic vapors such as volatile organic solvents or hydrogen sulfide gas;

• Protection of POTWs from interference. Treatment systems designed to deal with human organic waste can be impaired through exposure to toxic substances they were not designed to purify. For example, toxic pollutants can inhibit the cleansing capacity of the microorganisms in the type of treatment system that uses activated sludge;

Ten percent of America's POTWs handle 90 percent of the nation's toxic waste stream from indirect dischargers.

• Protection of surface water from pass-through of toxics. Biological treatment systems at POTWs do remove some of the toxics contributed by indirect industrial dischargers. Adequate treatment of toxics cannot come, however, without treatment systems specifically designed for that purpose. Industrial wastewater treatment facilities designed for high-strength wastes can remove these toxics far more efficiently than publicly owned treatment works. Without pretreatment of toxics at the industrial source, many substances will simply pass through POTWs and enter the waterways;

• Preventing the contamination of municipal sludge. When recycled as fertilizer, municipal sludge can serve as a useful resource. Forty to fifty percent of sludge is currently being recycled in this fashion. Much of it, however, bears labels warning of metals and other toxic residues. The economic uses of sludge cannot be expanded until pretreatment succeeds in reducing sludge contamination. Nor can the enormous costs of proper disposal of toxic sludge be avoided until rigorous pretreatment of industrial wastes becomes a matter of course.

EPA designed a National Pretreatment Program to meet these legally mandated goals. The agency developed a two-tiered regulatory strategy for implementing the program: the first tier consists of general pretreatment regulations; the second entails developing national categorical pretreatment standards that apply to wastes from specific industries.

EPA's General Pretreatment Regulations provide administrative, legal, procedural, and technical guidelines for state and local programs designed to control industrial discharges to municipal treatment plants. These regulations also establish the criteria for determining which POTWs will need to develop and implement a local pretreatment program.

A total of 1,450 POTWs are required to develop a pretreatment program because of their size and the presence of significant industrial dischargers in their systems. Each of these POTWs must develop a specific local control program to address industrial waste that enters its treatment system.

This group represents only the top 10 percent of America's 15,000+ POTWs. That may seem like a small percentage but, in terms of volume, it is not. These 1,450 POTWs handle 90 percent of the nation's toxic waste stream from indirect dischargers. This is no small task. These local programs cover 3.7 billion gallons per day of industrial waste which must be treated as a part of the total wastewater flow to these plants—23.9 billion gallons per day.

Most of these 1,450 POTWs have been slow to come into compliance with the local program requirement. Very few had adequate pretreatment programs in place by the time EPA's compliance deadline rolled around on July 1, 1983. Fortunately, not all POTWs have been so slow in responding to the perils of indirect industrial pollutants. A few even began implementing local control programs before federal pretreatment requirements took effect.

Other POTWs have not been so farsighted. State and federal officials have had to do some prodding to get them to address their pretreatment problems. In April 1985, for example, EPA brought suit against eight POTWs in six states to prompt pretreatment compliance.

As of June 30, 1985, 1,100 POTWs had approved local pretreatment programs in place. EPA expects most of the 350 delinquent POTWs to come into compliance by October 1, 1985, the date set by the agency as its second major deadline. To prompt compliance, EPA is planning a second wave of referrals to the Department of Justice during September.

Fortunately, not all POTWs have been slow in responding to the perils of indirect industrial pollutants.

EPA's General Pretreatment Regulations also provide a framework for implementing and enforcing the second tier of EPA's regulatory approach to pretreatment: categorical pretreatment standards. EPA's categorical standards place exact limits on the discharge of toxics and other pollutants by industrial users of POTWs. In other words, these standards specify the level of pollutant reduction that must occur prior to discharge to the POTW.

Categorical pretreatment standards for specific industries are extremely important to the pretreatment program. They complement pretreatment limits set by individual POTWs in their local programs. Those are limited by local boundaries. Categorical pretreatment standards are not: they apply nationwide, on an industry-by-industry basis. Regardless of whether an industrial facility is located in a city or in the country, it is legally bound to pretreat its waste to the standard set for its industrial category.

This regulatory system is now almost completely operative. Twenty-three pretreatment standards for existing sources are scheduled to be in place by September 30. The industries covered by these standards use over 120 toxic metals and chemicals in their day-to-day operations. Only one industrial group—organic chemicals and plastics—does not yet have final pretreatment standards, but these are expected to be published in final form in March 1986.

Pretreatment standards for the largest of the industrial groupings—electroplaters—had compliance deadlines in April and June 1984. These standards have served as the basis for most of the enforcement actions the agency has taken thus far against indirect dischargers. In October, 1984, EPA filed charges against eight General Motors facilities. This past April, the agency took similar action against three Chrysler facilities. Twenty other cases against electroplating violators are now at one stage or another on EPA's active case docket.

This year and next will be particularly crucial to the success of EPA's pretreatment program. With almost all categorical standards issued and in place, and almost all large POTWs soon to be equipped with approved local pretreatment programs, we should begin to see marked improvements in the quality of the effluent discharged by treatment works into America's waterways as well as in the sludge produced by some of these treatment works for use as fertilizer.

The success of pretreatment in East Providence, R.I., offers a good example of the progress other communities can expect. This New England city forged its pretreatment program through close cooperation between the local Water Pollution Control Division and the many industries clustered in East Providence and the town of Barrington, which is also covered by the program. It became operative in July 1983. As a result, toxic fumes no longer endanger sewage system workers conducting maintenance work at pumping stations. In addition, the treated wastewater the system discharges into the waterways of Rhode Island is much cleaner than it once was. From late 1983 to the spring of 1985, there was a 94 percent drop in ɔpper loadings and a 68 percent decrease in nickel loadings from electroplating dischargers.

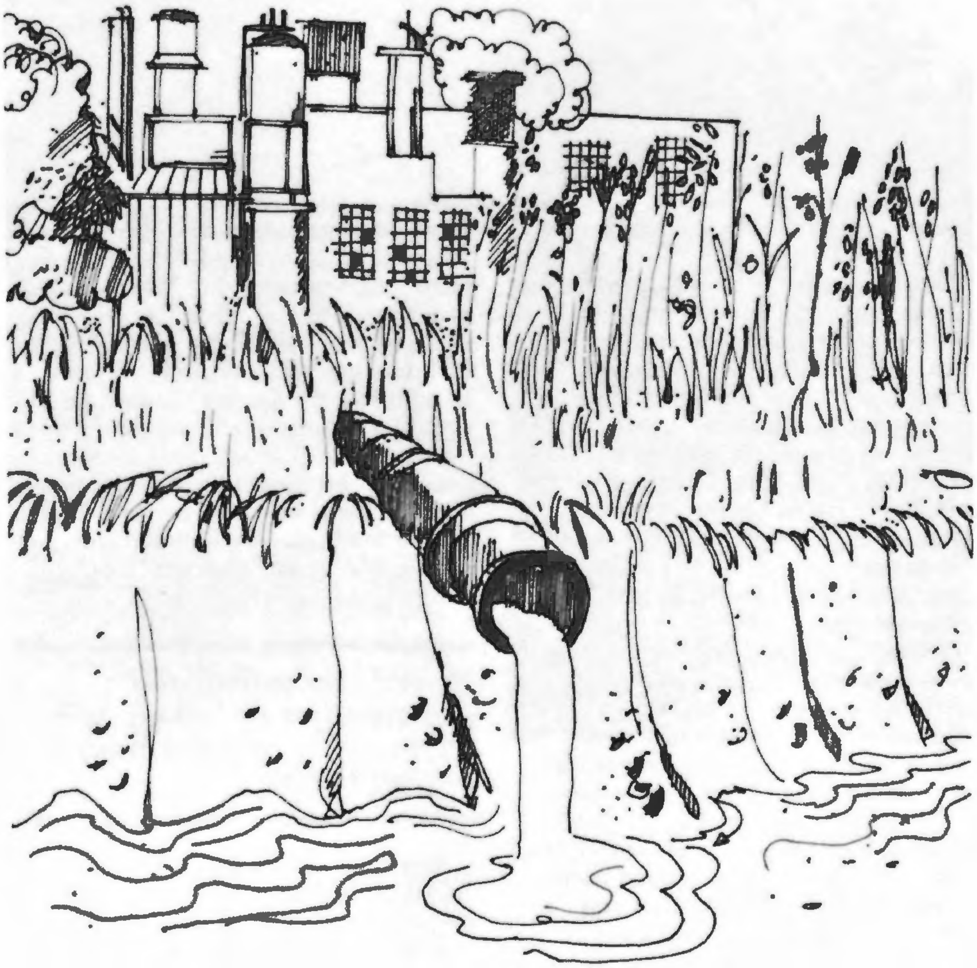
Heavily industrialized communities are likely to witness the most dramatic improvements.

As a general rule, heavily industrialized communities are likely to witness the most dramatic improvements. There should be something in the neighborhood of a 90 percent reduction in discharges of toxic pollutants. POTWs in less industrialized communities should also experience reductions in effluent toxicity, but not to such a great extent.

Overall, EPA projects a 50 percent improvement in the quality of America's sewage effluent and sludge as a result of the pretreatment program—a program implemented at the national, state, and local levels. Surely this is a goal well worth striving to attain—and an achievement both industry and municipal officials can take pride in. □

Fighting Water Toxics with Effluent Guidelines

by Margherita Pryor



Bill Firestone

Effluent guidelines issued by EPA regulate industrial wastewater discharges into public waterways.

Washington is a city accustomed to horrible acronyms, but even its seasoned veterans must quail before EPA's *Federal Register* notices. NSPSs and PSESs, PSNSs and POTWs, BPTs, BCTs, and BATs—all provided courtesy of the CWA via ITD, MDSD, AED, and OWRS, and OW. It takes a soldier hardened in the bureaucratic trenches to withstand such a barrage of alphabetical ammunition.

These acronyms may sound like displaced cartoon characters, but they are really shorthand or EPAspeak for an extensive regulatory effort that in little more than 10 years has revived many of the major bodies of water in the United States, and has begun to reduce their contamination by toxic substances. A decade ago, science couldn't detect some of these compounds. Today, they're being removed at the rate of over 800 million pounds every year.

Getting to this point has been no picnic. The journey has been a long and rocky one, punctuated by lawsuits, deadlines, the combined travail of some 90 different project officers—and paper, lots of paper. (When the paperwork for one rulemaking runs to more than 500,000 pages, we must conclude that some aspects of environmental protection rest on a vast graveyard of fallen timber.)

Part of the reason for the length of the journey has been the sheer complexity of the task. Since 1973, the agency has studied over 70 industrial categories for possible controls, particularly on toxic discharges, and has issued regulations for about 60. The development of these controls (technically called effluent limitations guidelines) is subject to a formidable array of overlapping statutory and technical requirements. Just getting the information on which to base them can be a long, drawn-out process. It took the agency four years, for example, just to develop the analytical methods for detecting and measuring the presence of certain toxic compounds.

EPA settled the lawsuit by agreeing to an unprecedented pace of regulatory development.

Faced with the choice of expending its limited resources on the control of conventional pollutants, which the agency knew how to do, or taking on the seemingly overwhelming problem of toxics, EPA in its beginning years opted for the former. Fecal coliform, suspended solids, oil and grease, extremes of pH, and biological oxygen demand—these were the nasties that were making American waterways unfishable, unswimmable, undrinkable, and unbearable. Conventional pollutants were well-known, with well-known technologies for removing them.

Toxics were another matter altogether. Outside observers grew impatient with the agency's slow progress in that area. In 1976, EPA was sued by the Natural Resources Defense Council (NRDC) and several other environmental groups for failing to discharge its duty to establish specific limits for toxics based on Best

(*Pryor is Contributing Editor of the EPA Journal.*)

Available Technology (BAT).

EPA settled the lawsuit by agreeing to an unprecedented pace of regulatory development. Not only was the agency to promulgate regulations for 21 specified industrial categories within about three and a half years; it also had to develop the analytical tools for measuring 129 toxic pollutants, and identify the technologies for controlling them.

In the jargon of regulators, EPA's effluent guidelines are said to be ***technology-based*** limitations. That is, the limits on substances that can be discharged into public waterways or public sewer systems are derived from the technologies that are available for treating or removing the substances. The limits are applied uniformly to every facility in an industrial category,

It takes years of effort and thousands of pages of analysis to get to these numbers.

regardless of the condition of the receiving water to which the effluent is discharged. This is in contrast to ***water quality-based*** limitations, which are based on the quality of the water to which the effluent is discharged.

Identifying the treatment technologies that will be the basis of the limitations is easier said than done. EPA engineers can't just pick up a handbook of the best available technologies and crunch out the requisite equations.

The heart of an effluent guideline is a couple of pages of numbers—micrograms per liter, kilograms per thousand kilograms of production unit, parts per billion, etc.—that will be used by permit writers in every state to regulate the discharges of each industrial facility or publicly owned treatment works. It takes years of effort and thousands of pages of technical, legal, and economic analysis to get to these numbers.

For the organic chemicals guideline, for example, EPA sent out questionnaires to almost 3,000 facilities. The questionnaire asked for information on individual plant characteristics, production processes, and wastewater treatment technologies in use. A supplemental questionnaire was also sent to 84 facilities known to have installed selected wastewater treatment operations. Sampling was carried out at a dozen plants, at some for as long as 15 to 20 days each. The assumptions and data that support the guideline numbers were subjected to several rounds of critical review by all parties expressing an interest in the guidelines.

Much of the critical review comes during the public comment period required for each proposed regulation. EPA takes seriously the requirement for public participation in the rulemaking process. The agency responds to every substantive comment it receives concerning a proposed standard. According to Devereaux Barnes, Deputy Director of EPA's Industrial Technology Division, the preliminary information requests often spark a given industry to begin reviewing its processes. "They'll come back to us with data they didn't have before we asked for it," says Barnes. "And a lot of times, the information will be substantial enough to change our minds and we'll end up asking for an extension (from the NRDC agreement timetable)."

It is to the industry's advantage to provide EPA with solid data. If a group wants to sue to have a promulgated standard set aside, the standard is not stayed during litigation. "Industry can sue," says Barnes, "but it sues on its own time." Even so, lawsuits have been plentiful. Out of 27 guidelines promulgated under the NRDC

Behind the Effluent Guidelines

1972 Federal Water Pollution Control Act Amendments

Major Provisions

- EPA to develop uniform national standards (effluent limitations guidelines) based on differing levels of treatment provided by available technologies
- Standards to apply to all point sources, whether they are industries that discharge to publicly owned treatment works (POTWs) and through them indirectly to bodies of water, or industries that discharge directly to bodies of water
- Each point source to obtain permit based on appropriate effluent guidelines that specify allowable discharges
- EPA to identify toxic pollutants and develop specific limitations for them

1976 EPA/NRDC Consent Agreement

Major Provisions

- EPA to develop effluent guidelines based on BAT (best available technology) for a group of 21 industrial categories
- EPA to develop effluent guidelines according to court-enforceable deadline, with all guidelines complete by January, 1980
- EPA to give regulatory priority to developing BAT limitations for 129 pollutants and classes of pollutants which agreement defined as "toxic"

1977 Clean Water Act

Major Provisions

- EPA to continue provisions of 1972 Act
- 1977 amendments incorporate provisions of NRDC consent agreement
- EPA to use effluent limitations guidelines to regulate three classes of pollutants: toxics, nonconventional, and conventional.

agreement, EPA has been sued on 21.

Project officers may spend up to 30 percent of their time providing technical support for all this seemingly inevitable litigation as well as helping states and permit writers to implement the guidelines and helping industry comply with them.

EPA also takes care to monitor the economic effects of its regulations, particularly on small businesses. The electroplating industry, by way of illustration, is dominated by many small "mom and pop" operations. When the electroplating guidelines were completed, the agency hired a nonprofit association to write loan applications and hold seminars for the thousands of small facilities expected to be seriously affected by the costs of installing control equipment.

The completion of the NRDC agreement schedule doesn't imply the demise of regulatory development either. The Clean Water Act directs the agency to review guidelines every five years to ensure their adequacy and to study other industries for possible regulation. According to Barnes, the agency has been finding that some industries are generating more toxic wastes than previously expected. New industries, such as transportation sources, oil and gas extraction facilities, and hazardous waste facilities, have yet to be regulated under the requirements of the Clean Water Act.

The development of techniques to detect and control new toxic compounds is also an ongoing process—and one that has kept EPA on the cutting edge of progress in this area. According to ITD Director Jeffery Denit, the Industrial Technology Division has become the center of technical expertise for the characterization and control of industrial wastewater pollution and associated problems. "I continue to believe our strongest asset is our industrial pollution control expertise. In addition to category-specific talents, several of the ITD staff have completed regulations on eight to 12 industries."

Finally, every effluent guideline has to be considered in light of its impact on other environmental problems. Stripping chemicals out of a waste stream, for example, and putting them into the air is no longer an acceptable control treatment for certain toxic compounds. When EPA estimates costs for treating hazardous wastes, those costs must reflect treatment that meets new RCRA requirements.

EPA's ten-year relationship with NRDC and the timetable may be coming to an end, but new work is piling up. As long as we need to use toxic substances, we will also need to control them. □

Approaching a Milestone

In March 1986, EPA's Industrial Technology Division (ITD) will publish a regulation in the *Federal Register*.

This is news? EPA issues scores of regulations every year.

But this is no ordinary regulation.

Call it a significant milestone or a monkey on the agency's back, it marks the end of 10 long years of deadline schedules.

This is the final regulation for the final industrial category requiring control under the terms of the EPA/NRDC consent agreement. It will remove 107 million pounds of toxic pollutants from wastewater generated by the organic chemicals and plastics manufacturing industry, will affect about 1,000 manufacturing plants, and may cost $720 million a year to implement. Most strikingly, it may even put ITD in the business of controlling toxic air emissions as well as wastewater discharges. This is no ordinary notice.

Elwood Forsht doesn't think so, either. For the last three years, Forsht has been the senior project officer for the organic chemicals regulation, and that translates into many months of weeks stretching 60 hours or more. So far, the rulemaking record has reached over 500,000 pages, and that doesn't include the final notice scheduled for March.

"We found that the proposal issued back in 1983 was based on partial industry data," says Forsht. "Since then, we've surveyed the entire industry. Essentially, we conducted a new project from 1983 to 1985."

In this case, Forsht was helped by the fact that industry representatives had endorsed the idea of gathering more data. "There are many corporate philosophies," says Forsht. "Most companies were very cooperative. However, a small minority were very miserly in providing information."

The information is put to good use. According to Forsht, ITD engineers are not ivory tower theorists. "We have a good mixture of backgrounds here," he says. "I worked for Continental Oil before coming to EPA, and I think most of our project officers have worked in industry. While some people came straight from college, overall the bias in our Division is towards industrial experience."

Beyond the individual expertise of project officers, Forsht feels that ITD's 15 years of institutional experience have made it a center of technical expertise that's unique. "Most industry employees are familiar with their own facilities and product areas. Since our studies include all the facilities in a given industrial category, we gain an overall perspective on the entire industry. And of course, the more information we have, the less likely we are to lose our cases in litigation."

Forsht also feels that the review process within EPA is extremely helpful in developing guidelines. "The whole process improves the quality of a regulation," he says. "For example, from my experience with the organic chemicals industry, I think that available technology can achieve any quality of effluent a company selects. It's just a question of what's achievable versus what's affordable. The agency's analysis of the economic impacts provides another important basis for collegial decision-making within EPA."

Will Forsht be sorry to see "his" regulation finished?

"Well," he sighs, "it's all still on the horizon. Even if we're not sued once the guideline is promulgated, we'll spend time putting on workshops and public meetings explaining the regulation and how it will work."

And then?

"And then," he says, "I'd like to go on a six-month vacation." □

Ensuring Safe Drinking Water

by Joseph A. Cotruvo

Steve Delaney

(Dr. Cotruvo is Director of the Criteria and Standards Division in EPA's Office of Drinking Water.)

Protection of our drinking water and restoration of water supplies that have become contaminated is a high priority for EPA. In fact, 1985 will be a banner year for the agency's efforts to revise and strengthen national standards and guidelines that underlie the Safe Drinking Water Act of 1974 and are designed to protect the safety and quality of drinking water at the household faucet.

There are more than 59,000 community water supply systems which serve 25 or more people in the United States, and about 150,000 non-community systems serving non-resident populations. While regulating them is generally a state or local responsibility, EPA determines the national regulations and standards used to assure safety and quality (water coming from the tap should not only be safe to drink, but also should be of esthetically high quality, e.g. having good odor and taste) and works with states to enforce laws so that suppliers will properly monitor, treat, and deliver safe drinking water to consumers.

Although the Safe Drinking Water Act is EPA's main legislative weapon against contaminated drinking water, most of EPA's operating laws are, to a substantial degree, designed to help prevent water pollution. The Clean Water Act; the Resource Conservation and Recovery Act; the Comprehensive Environmental Response, Compensation and Liability Act; the Federal Insecticide, Fungicide, and Rodenticide Act; and the Toxic Substances Control Act all have elements designed to limit the likelihood that consumers will be exposed to health risks from contaminated drinking water.

One unusual feature of the Safe Drinking Water Act itself is the requirement that suppliers notify the public when their water supply becomes contaminated or otherwise fails to meet regulatory requirements, thus giving consumers an opportunity to take an active role in assuring the safety of the drinking water that is provided by their public water system.

What is the Drinking Water Safety Problem?

Although fatal water-borne diseases are no longer a major public health problem in the United States, there are still thousands of water-related microbiologically induced illnesses reported annually. Fortunately, disinfection and filtration processes can eliminate the cause of such illnesses. On the other hand, there is increasing concern over the risks posed by chemical contaminants reaching some drinking water supplies from toxic waste dumps, agricultural use of chemical pesticides, leaking underground storage tanks, untreated or ineffectively treated industrial effluents, and from the disinfection processes and the corrosion of pipes and equipment within the water supply system itself.

While microbiological contamination primarily produces infectious diseases, the chemical pollutants can contribute to risks from chronic toxicity or cancer. Nitrates in drinking water in agricultural areas, for example, can cause a rare disorder in infants that affects the ability of the bloodstream to carry oxygen and results in a condition popularly described as "blue babies." These health concerns are generally associated with failure to protect the original water sources.

Source Contamination

Drinking water sources can be selected that are free of significant biological contaminants or protected from potentially harmful contaminants of human origin, but these same waters are vulnerable to a variety of chemicals usually related to pollution discharge. Ground water in the vicinity of improperly designed waste disposal sites has often been found to be heavily contaminated by migrating chemicals, such as trichloroethylene, vinyl chloride, or pesticides.

Many potential drinking water contaminants are of natural origin. There may be inorganic contaminants such as common salts or trace toxic substances like mercury. Nitrates are common in agricultural areas. Among the inorganic contaminants are localized deposits of arsenic or selenium and sources of radionuclides such as radium and radon gas from the ground. The presence or absence of inorganic ions such as calcium may be related to the risks of cardiovascular diseases associated with the degree of hardness of drinking water.

Most of the verified outbreaks of water-borne diseases were caused by lack of proper facilities or a breakdown in equipment.

The principal immediate risk from drinking water contamination is still biological in origin; most of the 392 verified outbreaks of water-borne diseases between 1971 and 1982 were caused by lack of proper treatment facilities or a breakdown in such equipment. There were 86,000 illnesses associated with these reported outbreaks, among them giardiasis and hepatitis. It is believed that many more outbreaks went undetected or unreported.

Identifying and controlling the risks of water-borne infectious diseases is much simpler than detecting possible carcinogenic risks. Many acute disease effects can be identified by proper population surveillance, then tracked to their probable origin. Water production systems can be sited, built, and operated to reduce the risk of consumer exposure to infection to an extremely low level. Simply stated, everyone knows what needs to be done to assure biologically safe drinking water; the problem is mainly a matter of getting it done in all public drinking water supply systems.

In the case of biological water contamination, the cause and effect relationship became obvious through experience. Epidemiological studies of the spread of water-related diseases provided straightforward risk assessments. The wisdom of risk management decisions such as source protection and treatment was immediately demonstrable without recourse to elegant quantitative risk extrapolation models and cost projections. Chemical contamination is another story. In all but a few exceptional cases those three elements—risk identification, risk assessment by epidemiological data, and demonstrable risk management results—may never be available with any degree of certainty.

Treatment Processes

Technology and operating procedures are available to prevent the introduction of many contaminants, and technology is available to control virtually all of them in drinking water. However, consumer costs can be substantial, especially for small public water supply systems, because they cannot benefit from economies of scale. A wide variety of chemicals are added to drinking water to remove various contaminants. Among them are alum, iron salts, *Everyone knows what needs to be done to assure biologically safe drinking water; the problem is mainly a matter of getting it done.*

polymeric coagulant aids, chlorine and other oxidizing agents, all of which may leave residues or byproducts in the finished water. In fact, the most common source of synthetic chemicals in treated drinking water is the interaction of chlorine or other oxidizing agents with the natural products already there.

Distribution Systems

Also, a substantial amount of drinking water contamination occurs while the water is being transported to consumers after treatment. Pipes are made of copper, galvanized iron, asbestos/cement, lead, or plastic, and polymeric or coal tar coatings are often used. All of these can contaminate water, especially if the water is corrosive to begin with. Lead, copper, cadmium and polynuclear aromatic hydrocarbons in finished water usually come from the distribution of that water, not from its original source. Physical deterioration of the system can also permit biological contamination.

What is EPA Doing About Safe Drinking Water?

The Safe Drinking Water Act provides the mechanism for developing national standards and guidelines that define safe drinking water. The Act's goals are to identify substances that may have any adverse effect on health and determine the level that would result in no anticipated harmful effects, with a margin of safety. Determining a permissible level of exposure to a potentially toxic substance requires evaluating qualitative and quantitative factors such as the identity and health significance of the effects, who among those exposed to the substance is sensitive to it, human biological factors which may be involved in determining the level of risk, and how the substance will act in relation to other substances in the same water.

EPA wrote interim primary and secondary regulations in the mid to late 1970s for 36 inorganic and organic chemicals, radionuclides, and biological contaminants. Since then, drinking water quality concerns have shifted to ground-water contamination problems and the unexpected finding that numerous substances can migrate to ground water because soil wasn't always the protective barrier to aquifers that it appeared to be.

Revised regulations are being developed to update the original interim standards and to expand them in number and scope. Among the emphases are ground water, water-borne biological disease risk, and corrosion.

About 100 substances are being examined for possible regulation. Regulatory goals for the first group of nine volatile synthetic organic chemicals (e.g., trichloroethylene and vinyl chloride) were proposed in June of 1984. In 1985, EPA has scheduled proposals for promulgation of standards for nine volatile organic chemicals, fluoride, about 40 pesticides, inorganic chemicals, and biological contaminants including giardia and viruses, plus radionuclides and monitoring requirements for unregulated organic chemicals. Disinfection treatment-related contaminants are scheduled for proposed standards in late 1986.

A 1,000-community survey of inorganics and radionuclides in drinking water is nearing completion. A joint Office of Drinking Water and Office of Pesticide Programs national monitoring program for pesticides in ground water is also being developed. New legislation amending the Safe Drinking Water Act is moving through Congress. This would increase the number of regulated substances and simplify the regulatory process.

In addition to developing legally enforceable drinking water standards, EPA's Office of Drinking Water also provides guidance on numerous substances detected in drinking water. These documents are called Health Advisories. They include useful information in digest form on the chemistry, toxicology, and treatment technology of many potential drinking water contaminants. One such advisory dealt with permissible drinking water levels of chlordane, an anti-termite product used in many areas. The advisories assist state officials and local water suppliers in responding to emergencies and interpreting the significance of contamination by unregulated chemicals.

The goal of EPA's drinking water program continues to be the safest and best possible water for all of our citizens. Our primary means of attaining this goal is expansion and revision of standards and monitoring so that drinking water suppliers will provide proper water treatment, while we all work to avoid pollution of drinking water sources. EPA and the states are active partners in this ongoing task that is so critical to our nation's health. □

Learning from the Ten Mile River

by Dave Pickman

The Ten Mile River is 22 miles long. While the name is geographically inaccurate, it actually describes the river well. Much less than half is river in the ordinary sense; the rest is wastewater—at times up to 90 percent.

Rising in the rural, wooded uplands of Plainville in southeastern Massachusetts, it passes over 15 dams, through five ponds, past two municipal sewage plants, a score of metal refining and finishing plants and empties into the Seekonk River in Rhode Island at the head of Narragansett Bay.

The Ten Mile is one of the urban industrial rivers chosen by EPA for intensive study as a basis for reissuing permits that will bring such streams up to fishable and swimmable water quality. The policy finally adopted for the Ten Mile and other "effluent dominated" streams may help to set the pattern for controlling toxic pollutants in water bodies everywhere.

Small, heavily contaminated rivers are found in the Northwest, the Great Lakes region, the Atlantic Coast, and the Gulf of Mexico, some of them only industrialized in the mid-twentieth century. Like the Ten Mile River, many are contaminated by metal finishing plants in the expanding "high tech" category.

The Ten Mile has been a factory river for almost two centuries. Its rapid drop from 230 feet to sea level provides water power to drive the wheels of industry, and it has attracted entrepreneurs from the earliest days of America's industrial revolution.

Today, 20 factories and the two municipal sewage treatment plants discharge toxic metal waste to the Ten Mile River. Both municipal plants receive treated metal waste from numerous other metal plating and jewelry firms. Because of this concentration of discharges in a small stream rendered sluggish by numerous dams, conventional treatment is woefully insufficient to protect aquatic life.

Conventional discharge permits, all of which have expired and must be renewed by October 1, 1985, are technology based. The discharger of heavy metals treats wastewater with alum or a similar compound. This takes metal ions out of solution in the form of a whitish "floc" that is removed by settling or filtration. To achieve greater reductions, dischargers must alter their process to a "closed system" in which there is no discharge, or install treatment for all metals similar to that which is used to recover precious silver, gold, and platinum from plating baths.

Throughout the studies, in which one Massachusetts and three EPA laboratories participated along with the University of Massachusetts and the state Division of Fisheries and Wildlife, the key variable was toxicity. Tests for toxicity are like legal trials in which the jurors are fathead minnows and tiny invertebrates called *daphnia pulex*, or similarly sensitive organisms. They vote by dying or surviving, by reproducing normally, abnormally, or proving sterile.

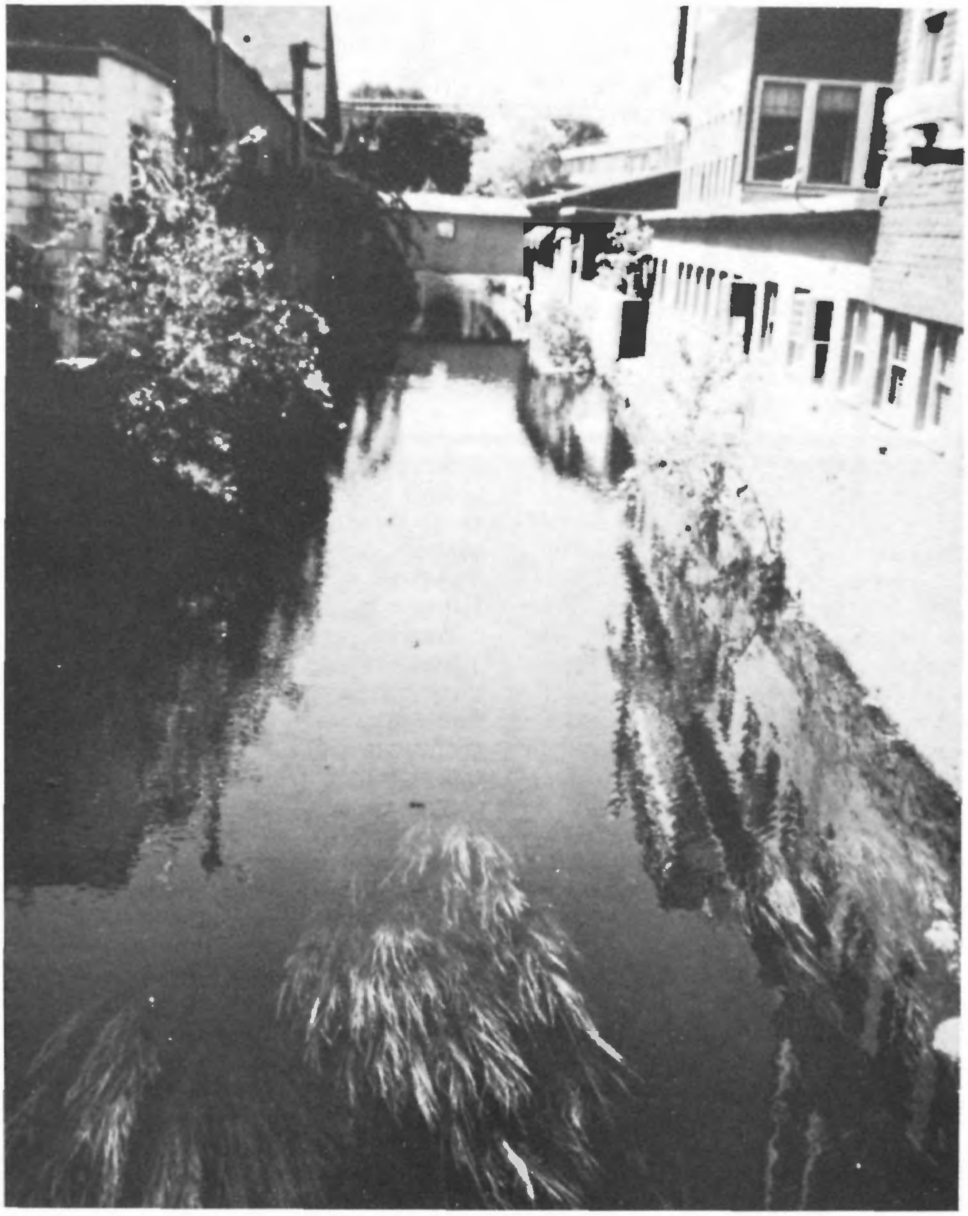
The measurement of toxicity is painstaking. While the studies were in progress, a total of 78 persons were working, many of them college students on summer vacation. Much of the labor is in scientific sampling. That entails bringing samples to the laboratory with proper documentation as to when and how they were gathered.

In a series of tanks, the test organisms are exposed to known concentrations of effluent or in-stream water samples diluted with uncontaminated water from far upstream. They are tested for survival over given periods ranging from one day to one week. They are tested for the number of young they produce and how many of them survive. The NOAEL (no observable acute effects level) is expressed in terms of dilution in uncontaminated water. Except for the waste from two industrial plants, the NOAELs ranged from .035 per cent to 10 per cent, indicating that survival of test organisms required dilutions ranging from 150 to one to 10 to one. "It's clear that we have a long way to go to meet our own water quality standards," said Steve Silva, who heads up the industrial permitting section of EPA's Region 1 office in Boston.

Action on a Polluted River

The Ten Mile River in Massachusetts is far too small to dilute the heavy metals in the effluent from jewelry, electroplating, and metal refining shops that crowd its shores. After extensive study of the "effluent dominated" river, EPA Region 1 Administrator Michael R. Deland and Massachusetts Water Pollution Control Director Thomas C. McMahon have decided to issue renewal permits to polluting industries and two municipal sewage treatment plants based on water quality rather than conventional technology. That decision will mean much more stringent treatment requirements. After this article was written, the proposed new permits were announced and the public comment period began. The whole nation will be watching the final outcome as EPA and Massachusetts press for fishable and swimmable waters—even in a stream that is up to 90 percent effluent.

(Pickman is on the staff of the Office of Public Affairs in EPA Region 1.)



Buildings of the Balfour Company, a jewelry manufacturer and metal plater, line both sides of the Ten Mile River during part of its passage through Attleboro, Mass.

Massachusetts and EPA scientists and engineers have been struggling with the Ten Mile River problems since February, 1984, when EPA announced a "National Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants."

At one point in the informal discussions, the group considered forcing all the industrial plants and both municipal plants to cease all discharges. Then someone pointed out that the dry season flow at the Rhode Island line is 90 percent effluent. If the effluent were eliminated, the river would become a trickle in late summer. In technical language, the river is "effluent dominated." But it has other uses, most of which depend on achieving water-quality criteria.

Five good-sized ponds lie between the narrow, often channelized segments. One has beaches and swimmers. Fishers try their luck in all the unchanneled reaches, though the former trout stream harbors only the hardiest species. Although the fish flesh does not appear to be heavily contaminated, the sediments are. A spring flood could stir up these sediments and poison the stream all the way to Narragansett Bay where valuable fishing and shell fishing would be in the path of biological destruction.

"We have to consider these sediments as a real threat to water quality, even though they are not affecting it right now," said Silva. He and his associates believe that a sharp reduction in metals contamination would permit nature to bury these heavy metals over the years and; let them eventually combine with other soil chemicals to become stabilized. But effluents must be largely demetallized before this natural healing can begin.

"I think we're going to have to issue tough permits," said Silva. "But this won't be the end of the world for these companies and these jobs. Most of the larger companies will tie in with the treatment plants as dozens of neighboring plants already have done. The municipal plants already discharge nine times as much as all the direct discharging companies combined, and they have good reserve capacity. Some companies might have to improve their pretreatment. You can't have too much metal coming in and upsetting the biological treatment of organic waste. And the municipal plants may have to add more treatment for metals—and charge the companies for the capital costs and cost of operation and replacement." Water quality-based metals limitations would be added to ensure that the plants meet standards even with the additional industrial tie-ins.

Three industrial plants already plan to eliminate discharges either by process changes or by tying in to one of the plants. Perhaps others will be able to shut off their discharge pipes during the period allowed for the acquisition of new equipment, process changes, or discharge elimination after new permits are issued.

There is no river too small or too polluted not to be worth saving. That belief was expressed by Congress when it wrote the Clean Water Act in 1972, and it was often repeated in subsequent amendments. "Fishable and swimmable" is the law of the land, and you can't find anyone at EPA or the Massachusetts Division of Water Pollution Control who's willing to say that they should back off. □

On the Lookout for Toxic Danger

by Betty Jackson

The expansion of America's economy since World War II has been made possible, in large measure, by the development of thousands of synthetic organic chemicals. These synthetics have produced a range of wonder fabrics, adhesives, and liquid chemicals, but the byproducts of their production have the potential to contaminate water sources. EPA has been involved in extensive research and testing to measure the effects of these chemicals on all parts of the marine ecology and on human health as well.

Biologists point out that fish have a unique sensitivity to toxicants added to marine and estuarine waters by humans either by design or accident. Although humans may drink, bathe or cook with water, fish live in water and thus are natural sentinels for determining the full impact of various synthetic chemicals on their environment.

In the late 1960s, scientists began to look at fish and shellfish for clues to the origin and prevalence of cancer-related diseases, including leukemia. The National Cancer Institute (NCI) was the prime mover in 1968 for a landmark meeting at the Smithsonian Institution to examine how fish pathology could contribute to cancer research and to stimulate the interest of scientists.

The Registry of Tumors in Lower Animals was established at the Smithsonian Institution to provide a central repository and diagnostic center for fish cancer and to aid in fish pathology research.

(Jackson is a technical writer at EPA's Environmental Research Laboratory at Gulf Breeze, Fla.)

In 1978, NCI and EPA launched a collaborative research effort on the relation of toxic chemicals and cancer in the environment. Under the guidance of NCI, a team of government and university scientists organized by EPA's research laboratory in Gulf Breeze, Fla., set out to determine if fish could be used to monitor cancer in the environment and develop a laboratory test system to screen chemicals for their potential to cause tumors in fish populations.

Interest in the research was high. In the mid-1970s, fishermen and scientists noted unusual frequencies of tumors in fish from the Puget Sound in Washington State, the Hudson River in New York, the Black River in Ohio, and the Fox River in Illinois. The most seriously affected fish fed on the bottom, where chemicals concentrate and can enter the animals' food chain.

The cancer rates varied with the fish and their exposure to pollutant effluents. The bottom-feeding flatfish in Puget Sound appeared more vulnerable than the migratory salmon that inhabited the Sound only during certain seasons. In other instances, some fish appeared less vulnerable to tumors than others.

Researchers in the NCI/EPA project have identified both freshwater and estuarine species that can be used in the laboratory for experimental exposures in cancer research. These species also can be used for on-site testing of suspect polluted waters.

Tests at Gulf Breeze concentrated on an estuarine species, the sheepshead minnow, because many coastal problems with water quality originated in estuarine or confined waters subject to runoff from rains or located near industrial outfalls. Wild populations of the sheepshead minnow can be found in the Gulf and Atlantic coasts as far north as Massachusetts.

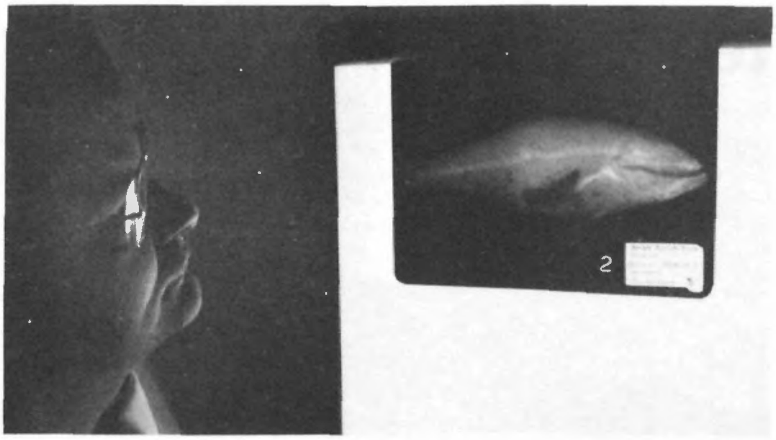
Scientists involved in the NCI/EPA project have positive evidence that the sheepshead minnow can be used to identify cancer-causing toxicants, as can other species, such as the rainbow trout and the bullhead catfish.

Further work by the Gulf Breeze laboratory also sheds light on how fish metabolize and transport cancer agents. The work on the fate of cancer-causing pollutants could be the basis for a fish biochemical screening technique for cancer research within wild fish populations.

The fast generation time of fish is one of their distinct advantages in cancer research. For example, it takes only about six weeks for certain kinds of minnows to mature following hatching, so it is possible to detect the early stages of liver cancer in 14 weeks and to see the development of full-blown tumors in less than 30 weeks. Researchers hope to reduce this early detection time to eight weeks for precancerous signs.

Fish species have other attributes as environmental monitors, not the least of which is cost. Fish are relatively small, readily available, and can be manipulated experimentally. Their home in a laboratory can be as simple as a desk-top tank or, at most, a somewhat larger container with flow-through water for saltwater species. Custom-built laboratory trailers can be moved to specific pollution sites for short- or long-term exposure tests.

Unlike birds and other terrestrial animals, fish are stationary and have less chance of escaping an irritant. They continually consume water, thus insuring some internal exposure to test chemicals dissolved in or carried by their natural environment. As in mammals, the liver of fish is the organ



Pathobiologist John Couch of EPA's Environmental Research Lab in Gulf Breeze, Fla.. examines an x-ray of a bluefish from the James River to diagnose possible cancer.

John Couch and Research Assistant David Bartee prepare fish tissues for analysis of tumors.

that primarily attempts to detoxify any contaminants ingested.

The most significant contribution of aquatic animals in cancer studies, however, may lie in their capacity to bridge the gap between environmental and laboratory evaluation of cancer risks related to toxic chemicals.

From knowledge gained in laboratory and fish studies, scientists should be able to predict and verify responses of representative fish species that are exposed to toxics in the environment. The value of fish species as indicators or sentinels is ultimately that they may eventually help to link cause and effect in the larger environment, and warn of unacceptable risks to humans from specific chemical pollutants.

As a spinoff of the NCI/EPA project, the Gulf Breeze research team conducted a three-year field study beginning in 1981 to examine wild fish populations for diseases in the coastal regions near Pensacola, Fla.; Mobile, Ala.; and Pascagoula, Miss. No serious outbreak of cancer was found, but the team believes that the survey can be used for comparisons in future years if fish tumors become more prevalent.

The survey is regarded by the EPA researchers as further evidence that fish can help health officials uncover pollution problems. If fishermen report a high incidence of tumors in their catch, regulators will suspect that cancer-causing materials are present and could prove harmful to those who use the water or eat the fish. Generally, if the fish are healthy, then the water quality is good. If certain kinds of disease or tumors are at a high frequency, there is reason to suspect that the water quality is not good.

Researchers from the Gulf Breeze laboratory and universities who participated in the NCI/EPA project have published approximately 120 scientific papers and reports on such topics as tumor induction studies, field surveys in fish and shellfish, genetic and mutagenic effects of cancer, and analytical chemistry and biochemistry of carcinogens in fish.

In addition, procedures developed for fish bioassays of waterborne toxics have been adapted in other laboratories throughout the country. The research team plans to continue development of supplemental toxicity tests with fish as well as novel cancer screening methods that may be found serendipitously. It is almost certain that several useful methods will evolve from the project which were simply not anticipated in advance.

Fish species are making a vital contribution to our understanding of the impacts of chemical pollution on our aquatic environment as well as on our personal health. Fish combine so many useful attributes for research and testing that their future involvement in this work seems assured. □

Protecting Ground Water from Pesticides

by Carol Panasewich

Ground water—a vast, invisible natural resource, moving through channels hidden deep beneath the earth's surface. Silent and mysterious, connecting countries and peoples, ground water is the lifeblood of our mother, the earth.

Scientists define ground water as "that water which occurs in the subsurface in a zone of saturation, where all interconnected voids in the rock are filled with water." In lay terms, ground water is water that lies below the surface of the ground and can be drawn into a well. It can be found anywhere from just below the surface of the ground (for example, in swamps) to thousands of feet down.

The volume of ground water within the earth is not known precisely, but it is estimated that 33 to 59 quadrillion gallons of ground water (more than four times the volume of the Great Lakes) lie within a half mile of the earth's surface. This ocean of ground water moves much more slowly than a river, traveling in the range of only a fraction of an inch to a dozen feet per day. Ultimately, ground water does discharge itself into oceans, streams, or lakes. But since it may take many years for this natural recycling process to be completed, contamination of ground water may often be regarded as virtually permanent.

Contamination of ground water may often be regarded as virtually permanent.

Until recently, the layers of soil and rock between man and ground water were thought to protect that resource from contamination. Pesticides, used intensively in some agricultural and other areas, were thought to be absorbed by and bound to the soil until they degraded. Some pesticides were found to run off from the site of application into bordering ponds, lakes, or streams, but ground-water contamination by pesticides was unknown until the late 1970s. In 1979, DBCP was found in a number of wells in several states and aldicarb was discovered in New York ground water, confirming what some agency scientists and others had suspected for several years. Certain pesticides can and do travel from the site of application, through soil and rock layers, and leach to ground water.

As EPA's knowledge and understanding of the characteristics and movement of ground water have increased, so has our curiosity and concern about the presence of pesticides in ground water. Unfortunately, the more we look, the more we find—detections of pesticide residues in ground water are increasing. To date, 16 pesticides have been detected in ground water in 23 states as a result of normal agricultural use, as opposed to improper disposal, spills, or other accidents involving those pesticides.

The agency is concerned because people may be unknowingly exposed to unduly high levels of pesticide residues by drinking water from contaminated wells. Almost half of the U.S. population obtains its drinking water from ground water rather than surface water. Further, the use of ground water is increasing faster than is the use of surface water.

Response

In response, EPA is taking aggressive action, exercising all the pertinent authorities under its jurisdiction to protect public drinking water. To control pesticides in ground water, the agency is using the far-reaching provisions of the amended Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Under that law, EPA is empowered to act on society's behalf to prevent any "unreasonable adverse effects" on people or the environment resulting from pesticide use. The agency must consider and weigh both the risks and the benefits of each pesticide use in order to determine whether it passes the unreasonable adverse effects standard of FIFRA.

In assessing the degree of risk presented by a pesticide, EPA considers its toxicity as well as all possible routes of exposure. Without human or environmental exposure, even the most toxic chemical poses no risk. Pesticides that leach to ground water that is used for drinking provide increased opportunities for human exposure. They may, therefore, present unacceptable risks.

When a pesticide is found to pose an imminent hazard or undue risks to people or the environment, EPA may act to temporarily suspend or permanently cancel its uses. The compound DBCP, for example, was the subject of a series of such regulatory actions by EPA between 1977 and early 1985. A chemical capable of causing cancer, gene mutations, and male sterility, DBCP was canceled for most agricultural use during the late 1970s. When DBCP was found in wells in California as well as other states, apparently as a result of normal agricultural use of the pesticide, other remaining uses also were canceled after an exhaustive court battle. Recently, the last use of DBCP, in Hawaii's pineapple culture, was finally canceled after

(Panasewich is a writer in the EPA Office of Pesticide Programs.)

Pesticides leaching into the ground water from a vineyard such as this could be a threat to drinking water supplies.

Thom McDermott Photography

residues of the pesticide were found contaminating wells near pineapple fields in Oahu and Maui.

A number of other less drastic but nonetheless effective regulatory remedies under FIFRA are being used to address problems from pesticides in ground water. If a situation raises serious questions, but an imminent hazard is not thought to exist, EPA may conduct a special review of the pesticide. This review may or may not lead to initiation of cancellation action. For example, EPA currently is evaluating aldicarb under a special review because that pesticide is acutely toxic to the nervous system and leaches to ground water.

The agency may also decide that the problem could be addressed through the restricted use provisions of FIFRA. That is, EPA may restrict the use of the pesticide to certified applicators (limiting who may use it), or may impose geographical limitations (controlling where it may be used). As an example of the first type of restriction, the agency has decided to restrict the use of simazine and cyanazine to certified applicators, and to require an advisory statement on the labels alerting users to the potential for leaching to ground water. While the producer of cyanazine has agreed to restrict the use of that herbicide voluntarily, the simazine registrant has objected to the restriction. EPA is therefore in the process of initiating a notice of intent to cancel simazine registrations so that the matter may be addressed in administrative hearings, should the registrant so desire. A good example of the geographical type of restriction is aldicarb, which may not be used at all in Suffolk County, N.Y., and Del Norte County, Calif., and is subject to various restrictions in other states because of ground-water concerns.

Assessment and Prevention

While some pesticides in some agricultural areas have leached to ground water, not all do or will. (Based on our current knowledge, we estimate that less than ten percent of all pesticide active ingredients are leachers.) To gain control over the pesticides in ground water problem, EPA must determine which pesticides are sufficiently mobile and persistent to leach; which geographic conditions are conducive to leaching; which agricultural practices enhance leaching potential; and where leaching has occurred or is likely to occur.

By vigorously implementing some additional authorities under FIFRA, EPA can assess the extent of the problem of pesticides in ground water and can prevent future unreasonable risks.

In order to register a pesticide product for use outdoors, the manufacturer must submit data demonstrating what will happen to the chemical under conditions of use in the environment. These laboratory and field data on environmental fate are used to predict which chemicals are sufficiently persistent and mobile to leach to ground water, and in which soil types. EPA is currently obtaining such data, both for new pesticides first coming on the market and for a group of over 100 existing pesticides which may possibly have some leaching potential. New pesticides that can leach may be denied registration or may be registered with use restrictions on their labels. Registered pesticides which are leachers may be restricted, suspended, or canceled.

The only way to detect actual levels of pesticides in ground water is to conduct monitoring studies.

The results of environmental fate studies can be entered into computer models to predict the movement of pesticides through soil under various environmental conditions. These models organize all the available data on meteorology, geology, and environmental fate into a consistent and reproducible prediction of chemical behavior in soil. EPA uses one such model to predict how likely pesticides are to leach and is developing more sophisticated models for the future.

Using environmental fate data and leaching models, EPA can assess the contamination potential of pesticides. However, the only way to detect actual levels of pesticides in ground water is to conduct monitoring studies. Well-planned, systematic monitoring for pesticides in ground water has not yet taken place on a large scale, though the states, EPA and other federal agencies, and pesticide registrants have all contributed a considerable number of small-scale monitoring studies.

To fill this need for comprehensive monitoring, EPA's Office of Pesticide Programs and Office of Drinking Water are designing a national survey of pesticides in drinking water from ground-water sources. The survey, which should be underway next year, will be statistically designed so that national inferences can be drawn from the results. Future monitoring and regulatory efforts may be more accurately targeted based on the results of this EPA survey.

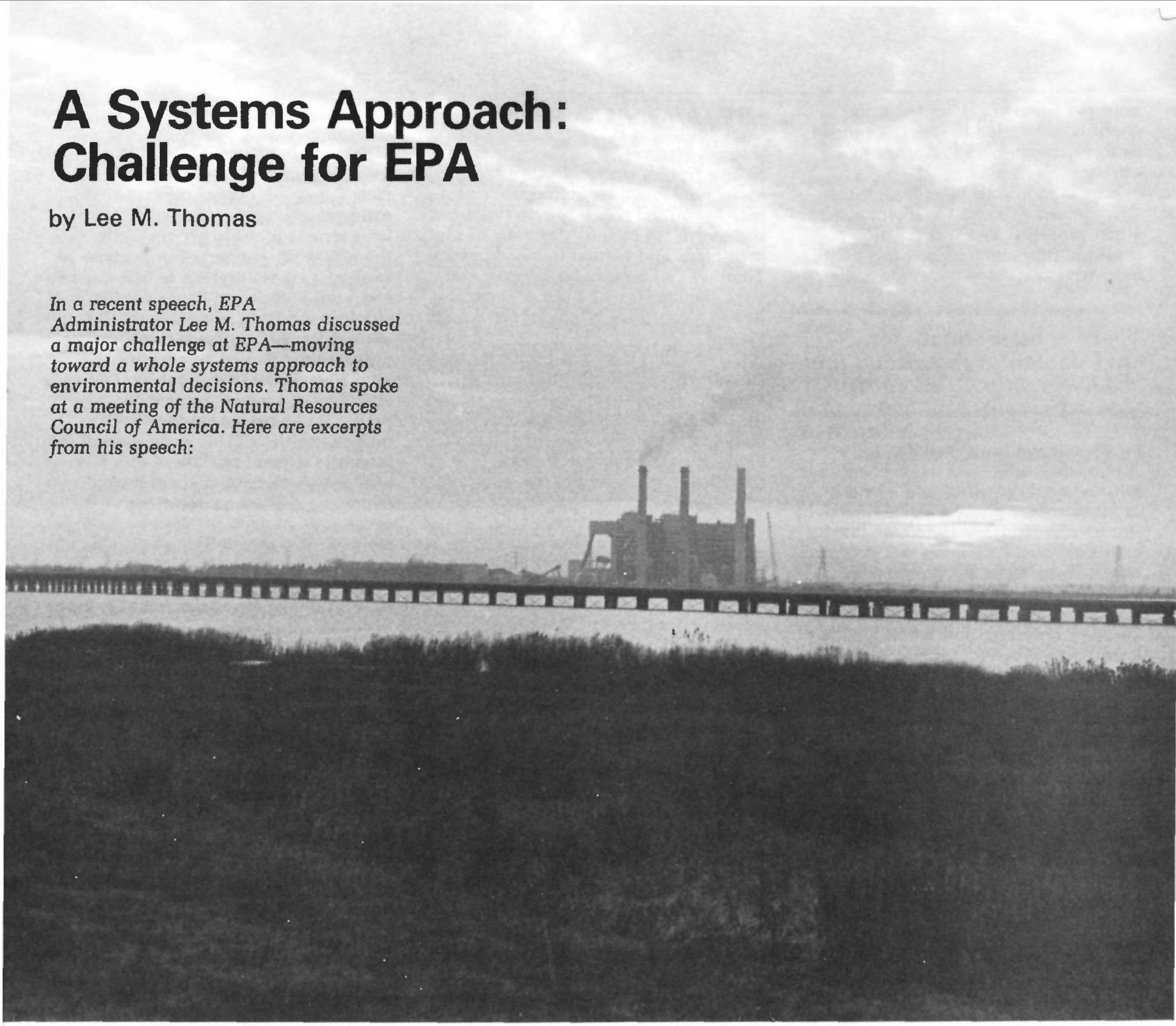
By responding to existing contamination problems, determining the full extent of the pesticides in ground water problem, and preventing future unreasonable risks from pesticides in ground water, EPA is gaining control over the situation. To organize and coordinate these efforts, the agency is drafting a comprehensive strategy which will be available for public review in several months.

Dealing with ground-water questions is highly complex, and given these complexities, there are many issues to be dealt with in EPA's development of its pesticides in ground water strategy. We expect a broad debate on many of these issues as the strategy is developed. There is much to be done, but a good start has been made. □

A Systems Approach: Challenge for EPA

by Lee M. Thomas

In a recent speech, EPA Administrator Lee M. Thomas discussed a major challenge at EPA—moving toward a whole systems approach to environmental decisions. Thomas spoke at a meeting of the Natural Resources Council of America. Here are excerpts from his speech:



National Oceanic and Atmospheric Administration

A power plant in the mid-Atlantic coastal zone. Pollution in one medium such as air can travel to another medium such as water.

For the past 20 years our environmental movement has been teaching a series of great lessons to the American people. It has taught that the environment is a seamless web, that everything is connected to everything else. If you try to kill bugs in a thoughtless way, you may well end up killing fish, birds or animals.

Right now the *major* source of several toxic metal pollutants in the Great Lakes is air deposition. In the upper Great Lakes, air deposition is also the principal source of PCBs. We are also starting to see a rise in the concentration of banned pesticides in Great Lakes fish. We are not sure where it comes from yet, but there is a good possibility that it blows in on the air from hundreds of miles away. It's obvious that no amount of cranking down on water permits is going to stop this sort of water pollution.

In several of our largest cities, a significant source of toxic air pollution may be industrial volatile organic compounds, which evaporate at municipal sewage treatment plants. Tightening pretreatment standards may not solve all of the problems because the volatile organic compounds may still end up in the air if the industrial source plants do not dispose of the waste properly.

Water pollution control also produces an enormous amount of solid waste. Municipal wastewater treatment plants will be generating 10 million tons of sludge annually by 1990. Some of these sludges are contaminated by toxic metals, and finding a safe place to put them has become an increasingly difficult problem for some of our industrial states.

Finally, in our efforts to control air pollution from industrial point sources, we have caused a substantial water pollution problem. It is entirely possible that somewhere in the country, toxic metals are being removed from the air, transferred to a wastewater stream, removed again via water pollution controls, converted to sludge, shipped to an incinerator, and returned to the air.

Now it should be clear from these descriptions that cross-media transfer is a real problem. And it bears the potential for compromising the hard-won achievements of our major

There is no mandate for environmental regulation that produces only a fast shuffle.

environmental programs. For while the American people have made clear their willingness to sacrifice and spend in order to obtain tangible environmental improvements, there is no mandate for environmental regulation that produces only a fast shuffle. People get very disturbed when they are given assurances that a pollution problem is "solved" and then find that it has only been brushed under the rug. We cannot afford to risk the loss of public confidence that this kind of discovery engenders.

What does that mean for EPA? First of all, it means that we have to find a way to analyze whole systems as we create regulations. Since pollutants are going to move among the media, we need some standard for judging whether to encourage the move or to try to stop it. I should say here that cross-media transfer is not of itself a bad thing. The fact is, pollution control is often nothing but cross-media transfer. If the choice is between, say, letting chromium dust float around in the air and putting it into a can, it may make sense to put it into a can. As long as you remember to watch the can.

For most pollution control situations, where human health protection is the highest priority, our standard for judgment is a quantified estimate of risk. Despite well-known uncertainties associated with such estimates, they remain the only feasible way of assessing the probable effects of cross-media transfer.

This is one of the reasons we have advanced the idea of risk assessment and management so strongly at EPA in recent years. The risk management approach includes the idea that risk from pollutants is rarely eliminated through controls. We expect controls to reduce risk, of course. But we can't know how much reduction we have really obtained unless we carefully track the controlled material through all of its man-made and natural transformations. Then we can assess and compare the risks associated with each of them and devise a control solution for the whole system.

Current EPA policy is beginning to support this approach by requiring appropriate regulatory packages to include a statement of what the outcome of the regulation will be in terms of risk reduction. It must specifically consider the risk effects of any cross-media transfers associated with the control practice.

A number of other significant cross-media initiatives are under way.

For the past 18 months we have been engaged in a major review of our statutory base. Part of this review was directed at how our statutes dealt with the undesirable cross-media transfer. We found that the statutes generally give us room to consider cross-media effects in our regulatory decisions as long as there are adequate data to document them. One problem we have, however, is that single-medium programs frequently don't collect data on cross-media impacts.

We are therefore trying to include cross-media considerations in initiatives that deal with major remaining single-medium problems. As already noted, we have found that in some areas substantial air pollution may be the result of sources such as hazardous waste management facilities and wastewater treatment plants. An important part of our forthcoming strategy to control toxics in the air therefore deals with these sources.

Such considerations require a new kind of information. We must continue to direct resources into integrated risk analysis. For example, we must track the flow of particular kinds of pollutants through complex natural or pollution control systems. We can do this for particular chemicals of concern, like dioxin, or for a series of wastes flowing through a particular part of the country. Under our integrated environmental management programs, we are currently studying the "cradle to grave" system of hazardous waste control in the New England region. This analysis will examine how well current or proposed controls reduce risk in the environment as a whole.

For the past few years we have been looking at several industrial regions from the standpoint of integrated risk management. Such regions are likely to have more serious toxics problems than the rest of the country. The purpose of such geographic projects is to help state and local authorities figure out the most efficient way to minimize toxic risk, taking all media into account.

From the national perspective this approach enables us to concentrate our attention and resources in those particular places where the threat to human health is likely to be highest. We intend to expand our use of this form of analysis. A number of states have expressed interest in operating geographic projects on their own. We are making our experience available to them through six state pilot projects—cooperative, jointly funded efforts that we have launched this year.

This agency is bound up in more timetables than the Union Pacific.

Finally, we intend to build a cross-media priority into our annual planning process. This process produces the annual guidance on which the operating programs base their year's work. By combining the planning efforts of all the media offices into a single coordinated process, we may help to avoid the inadvertent cross-media transfers that have characterized many of our previous control policies.

These and similar initiatives will help to change the agency's perspective on cross-media pollution, in that we have the time to figure out the best way to minimize risk across all media and the flexibility to change the way we do things now. But as everyone knows, time and flexibility are the two things we have the least of. This agency is bound up in more timetables than the Union Pacific. The majority of EPA staff is driving as hard as it can to get single-purpose regulations out the door in response to court orders and Congressional mandates. Their main priority, often their sole one, is to make their slice of the pie as effective and defendable as it can be.

As for flexibiliy, the single-medium approach is set up like concrete in the practical, day-to-day administrative operations of EPA. As Administrator, I *must* protect each individual medium as the law directs. While I *may* consider other media in so doing, no statutory phrase *tells* me to look at the environment as a whole and control pollution so as to allow the minimum negative effect on public health and other environmental values.

But surely that is what is needed. Surely that is what environmentalists want.

If EPA is ever going to live up to its name in the fullest sense, if it is ever going to become more than a holding company for single-medium programs, we are going to have to re-examine the roots of environmental policy.

The current statutory structure arises from a general environmental strategy that has been accepted—consciously or not—by nearly everyone who has worked for environmental protection in this country. Let's call it the strategy of the cork.

It consists of putting a regulatory cork in every pollution source you can find as quickly as you can. At first the corks may be somewhat loose and some pollution escapes. But with advances in technology they can be pushed in

It has become clear that each push of the cork is more expensive than the one before it.

tighter. Of course, as we have seen, the pollution will tend to squirt out in new and unexpected places. The solution is a new set of corks, and the process of jamming them in begins all over again. The idea is that if you get enough corks, and put enough pressure behind them, pollution will eventually be eliminated.

Let me repeat here that I do not question the success, up until now, of this medium-by-medium strategy. The single-medium approach has worked. We breathe it and drink it every day. No one would quibble over the progress we have made since 1970 in cleaning up our air and water.

But we know things now that we did not know 15 years ago. We are trying to control many more pollutants. We have to accept the fact that this general environmental strategy may be flawed.

We have to recognize that the cross-media problem is a symptom of that flaw. We must come to understand that the present approach was necessary, but is no longer sufficient for continued environmental progress.

Here are some observations to support that statement. First, it has become clear that each push of the cork, each increment of pollution control, is more expensive than the one before it. Yet it accomplishes less in the way of risk reduction. Cross-media transfer of risk makes this ugly fact even less attractive.

Second, as we look around the world, we see that the nations that are doing the best job on environmental protection are those that are both prosperous and free. The environmental movement has a stake in the prosperity of the country. The American economy has been able to absorb environmental expenses up to now with little strain. That doesn't mean it's invulnerable. Remember that absolute purity is infinitely expensive.

It follows that all reasonable environmental policy discussions must deal with the question of where to stop. How clean is clean? How safe is safe enough? Since we now understand from our analyses of cross-media transfer that every real resting place for pollution entails some residual risk, it appears that some corks are going to have to stay loose for the indefinite future.

How do we move toward an improved environmental strategy? I think we have to keep the whole system in mind whenever we make policy. The kind of integrated analysis I have been describing will help us to do that. At the same time, we have to remember that every pollutant winds up someplace, and it's best for us to decide in advance where we want it to go. We have to learn to accept the risk associated with its best final resting place.

Finally, we have to get serious about source reduction. Do we want industry to spend its money mopping up ever smaller increments of risk, or do we want those resources spent developing processes and products that pollute less? There is already a trend towards source reduction in this country. I'm not sure that we encourage this trend by continually mandating new and more stringent controls. We need fewer fire drills and more fire-proofing.

In closing, I want to reiterate very briefly a few ideas I have on how an agency like EPA should address cross-media issues. Some of these approaches are already policy. Others are still in the thinking stage. A few may require development of new legislative authorities before we can actually carry them out. I'll be looking at these and other ideas in the months ahead, and I need input and advice:

Remember that absolute purity is infinitely expensive.

- We need to review all of our legislative authorities to determine whether language written to afford protection to a single environmental medium in fact encourages unwanted effects in other media. Where we find it, we must be prepared to seek statutory changes. Congress never intended to mandate a game of environmental musical chairs.

- We must have a cross-media focus in our planning, budgeting, program evaluation, and implementation processes so that the work we do reflects a multi-media perspective.

- We need consistency in our risk assessment and risk management activities across all media. In this way, the risk assessments we reach will be comparable with one another. Our decisions and our policies will be uniform and compatible.

- Systems impact statements should be prepared for all single-medium regulations so that we do not overlook cross-media implications of our decisions.

- Finally, the statutes we implement should allow more time for cross-media analysis before promulgation of new rules. It is time for Congress to recognize that each of our decisions will be felt throughout our environmental system, regardless of which statutory authority we use to reach it. We need the time and the flexibility to put together consistent and workable policies. And we need to be held accountable for them. □

Senior Executive Shifts at the Agency

Ronald Brand

Marcia E. Williams

Dr. John H. Skinner

EPA Administrator Lee M. Thomas recently announced the reassignment of seven senior agency executives as part of an ongoing management program designed to increase the diversity of experiences for top and mid-level managers throughout EPA.

The executives chosen for this round of reassignments were all selected because of their sustained high performance, recognized technical competence, and strong leadership skills. Each is being assigned a major leadership post in a top priority program.

"In coming months, I intend to announce additional reassignments," Thomas said. "I am confident that this approach to management will become a part of EPA's institutional framework."

The reassignments were to be effective on different dates.

Effective August 1, 1985:

Ronald Brand, who has been Director of the Office of Management Systems and Evaluation, in the Office of Policy, Planning and Evaluation, was named **Director of EPA's new Underground Storage Tanks Program** in the Office of Solid Waste and Emergency Response. Aided by his extensive management experience, he will be responsible for carrying out those provisions of the Resource Conservation and Recovery Act dealing with the identification, regulation, and maintenance of underground storage tanks containing hazardous materials.

Dr. Thomas Ingersoll has been named Acting Director of the Office of Management Systems and Evaluation.

Effective September 1, 1985:

Marcia E. Williams, Deputy Assistant Administrator for Pesticides and Toxic Substances, will become **Director of the Office of Solid Waste**. A 1985 recipient of the Presidential Rank Award as a Meritorious Senior Executive, she will be responsible for implementing EPA's hazardous waste management regulatory program under the Resource Conservation and Recovery Act.

Susan Vogt, currently Director of the Asbestos in Schools Program, will serve as Acting Deputy Assistant Administrator for Pesticides and Toxic Substances.

Henry L. Longest, II

William N. Hedeman, Jr.

Victor J. Kimm

Michael B. Cook

Dr. John H. Skinner, Director of the Office of Solid Waste, assumes duties as **Director of the Office of Environmental Engineering and Technology** in the Office of Research and Development. He brings to the program a strong understanding of research needs, particularly in the hazardous waste and ground-water management area, and experience in technical assistance and technology transfer.

Dr. Skinner will replace Carl Gerber, who is taking an assignment with the National Science Foundation to work on international scientific issues.

Effective October 1, 1985:

Henry L. Longest, II, Deputy Assistant Administrator for Water, who currently serves as Acting Assistant Administrator for Water, will become **Director of the Office of Emergency and Remedial Response**. An experienced engineer who has been instrumental in the development and implementation of EPA's sewage treatment construction grants program, he will be responsible for implementing the Superfund program for cleaning up abandoned and uncontrolled hazardous waste sites.

William N. Hedeman, Jr., Director of the Office of Emergency and Remedial Response, will take over as **Deputy Assistant Administrator for Water**. Hedeman, an attorney and experienced manager, has broad knowledge in water-related matters in part from heading the Superfund program for four years as well as from previous positions in EPA's Office of Federal Activities and the U.S. Army Corps of Engineers.

Also effective in October:

Victor J. Kimm, Director of the Office of Drinking Water, will become **Deputy Assistant Administrator for Pesticides and Toxic Substances**. A seasoned manager with a variety of policy experiences, Kimm will be able to draw on his water office experiences when addressing such issues as the contamination of ground water by pesticides.

Michael B. Cook, Deputy Director of the Office of Solid Waste, will become **Director of the Office of Drinking Water**. Cook has broad experience in water-related issues from his current assignment, where he must deal with ground-water contamination problems, as well as from previous posts in the water program. □

Taking the Initiative in Hazardous Waste Siting

by David Morell

Public concerns over toxic wastes grow with each truck accident spilling hazardous materials on a crowded freeway, each underground tank leaking hazardous solvents into underground aquifers, and each chemical leak at a factory or toxic dump. There are clamorous demands to officials at all levels of government: "Do something."

But while concern is mounting, places to dispose of hazardous waste are disappearing. In 1980 Southern California had five operating toxic landfills; by the end of 1984 it had none. The BKK Corporation's landfill in West Covina, the largest hazardous waste landfill in the country, closed its gates to any further disposal of hazardous wastes on November 30, 1984.

The region is now at a critical juncture: It must take action to treat these wastes instead of dumping them on the ground. For the past four years, the counties and cities of Southern California, working with state agencies and the federal Environmental Protection Agency, have been addressing the dilemma of building new hazardous waste facilities despite local fear and opposition. Pressures to find new sites for facilities to treat the region's hazardous waste—some 2.5 million tons of it every year—are now very powerful.

The nation's shift from land disposal to treatment began here in California in 1981. That was the year the state adopted new regulations banning land disposal of selected categories of dangerous wastes: strong acids, heavy metals, cyanides, and polychlorinated biphenyls (PCBs), among others. These wastes were to be treated instead. Unfortunately, due to a loophole, little change ensued. Millions of tons of wastes continued to be dumped.

In 1984, however, a new state law closed this loophole. And last November a revised version of the federal statute regulating hazardous wastes came into effect. This law incorporates for nationwide implementation the entire "California list" of those hazardous wastes being phased out for land disposal, and requires the EPA to determine that waste is safe before it can be placed in the ground.

But can the needed sites be found for treatment facilities? Despite continuing controversy, the answer is a qualified yes. Although there was opposition, Los Angeles in 1984 approved an application by BKK to build a large treatment plant in the industrialized Wilmington area near the harbor. Local residents objected, however, and subsequent litigation has stalled construction.

Last December, Los Angeles County's Board of Supervisors unanimously appropriated $500,000 to find 10 to 15 locations for new facilities for the treatment or transfer of wastes, and for the ultimate placement on land of the de-watered residues. These "residuals repositories" would use covers to keep the treatment residues dry from the day of deposit. A draft report has identified 20 possible locations in urban-industrial areas, and six possible locations for residuals repositories.

Last month, representatives of five Southern California counties—Orange, Riverside, San Diego, Santa Barbara, and Ventura—and two cities—Los Angeles and San Diego—formally signed a joint powers agreement creating the Southern California Hazardous Waste Management Authority.

Under the regional authority, each county and major city commits itself to find sites for new hazardous waste facilities in proportion to its own share of waste generation. Actual decisions on sites will continue to be made by the individual jurisdictions, under their existing land-use authorities, but the decisions will now be made in a regional context.

Finding sites, never easy, now at least seems conceivable as regional economic necessity and the politics of equity take precedence over the politics of parochialism and local resistance.

Yet the very public fears that now are pressing governments throughout Southern California to act seem ironically to be paralyzing corporate action. In the wake of the Bhopal disaster in India, insurance companies are backing away from corporate liability policies. Unable to obtain adequate insurance, large corporations are reconsidering plans to build new treatment facilities.

Thus we see an odd situation. Southern California is poised to erect a dozen or more new hazardous waste treatment facilities, but private firms may not be willing to build them.

What choices do we have? A retreat to the era of leaky landfills and surface impoundments is out of the question. Nor can we rely forever on long-distance trucking of dangerous wastes over crowded freeways. And the inequity of moving the region's waste elsewhere is politically untenable.

While a national dialogue is being pursued on liability and insurance, it is of overriding importance to sustain the powerful political momentum apparent in Southern California. It may become necessary for state or local governments to construct and operate the facilities, or for the state or federal government to provide adequate liability coverage as a supplement to private insurance. For there is no doubt we must protect the area's 15 million residents from the threats posed by a growing mountain of toxic chemical waste, while allowing the region to maintain its huge industrial base. □

(Until recently, Morell was a Senior Policy Analyst for EPA's Region 9. He is scheduled to take the post of Special Assistant for Toxics Management for Santa Clara County, California, where Silicon Valley is located. Morell's article originally appeared in the Los Angeles Times. It does not necessarily reflect the views of EPA.)

A Perspective on the Siting Issue

by John H. Skinner

Valley of the Drums, a well-known toxic waste dump near Louisville, Ky.

Without a doubt, the siting of new hazardous waste management facilities is one of the more controversial issues in the entire environmental arena; yet it is clearly one with which the nation must begin to grapple effectively and immediately if we are to succeed in properly managing hazardous wastes under the new Resource Conservation and Recovery Act (RCRA).

Our experiences with many present waste disposal practices point up the great need for upgrading waste management techniques. Inspections of existing land disposal facilities have exposed numerous instances of improper disposal techniques and insufficient monitoring capabilities. Many existing treatment, storage, and disposal facilities either cannot or will not commit to the upgrading necessary to achieve final permit approval; therefore, their operations will terminate. Ground-water protection needs, the development of new, more sophisticated treatment technologies, as well as the probability that at least some wastes will be entirely banned from land disposal pursuant to new authorities under the RCRA Amendments of 1984, effectively mandate a shift away from land disposal toward treatment of hazardous wastes.

(Dr. Skinner has been Director of EPA's Office of Solid Waste. He is assuming the position of Director of the Office of Environmental Engineering and Technology in the agency.)

These facts, coupled with the addition of entirely new waste loads from newly regulated small quantity generators and continuing Superfund cleanups in parts of the system, mean that existing, acceptable treatment capacity is likely to become critically stressed, if not exceeded.

Such a strain on treatment capacity will certainly result in artificially high treatment prices, and could heighten the potential for midnight dumping. Should treatment capacity actually be exceeded, the public could continue to be subject to the negative impacts of outdated and unreliable land disposal methods which clearly would not protect human health and the environment. Such a situation cannot be allowed to develop.

We must begin to focus both national attention and resources on the siting challenge. New, state-of-the-art treatment facilities for neutralization of acids, precipitation of metals, incineration of organics, and other processes must be sited throughout the country, and EPA must take a more active role.

The decision to become more involved in siting issues is not lightly made. We are, and should be, acutely aware that EPA's primary function is that of the regulator. We must neither compromise nor appear to compromise that role in any siting effort. The primary responsibility and authority for the selection of specific locations for particular treatment technologies will continue to rest with state and/or local governments. We are convinced, however, that the challenge of assuring adequate and sound hazardous waste treatment capacity for the country is so intrinsically bound up with our mandate to protect human health and environment, that EPA has an important and appropriate part to play.

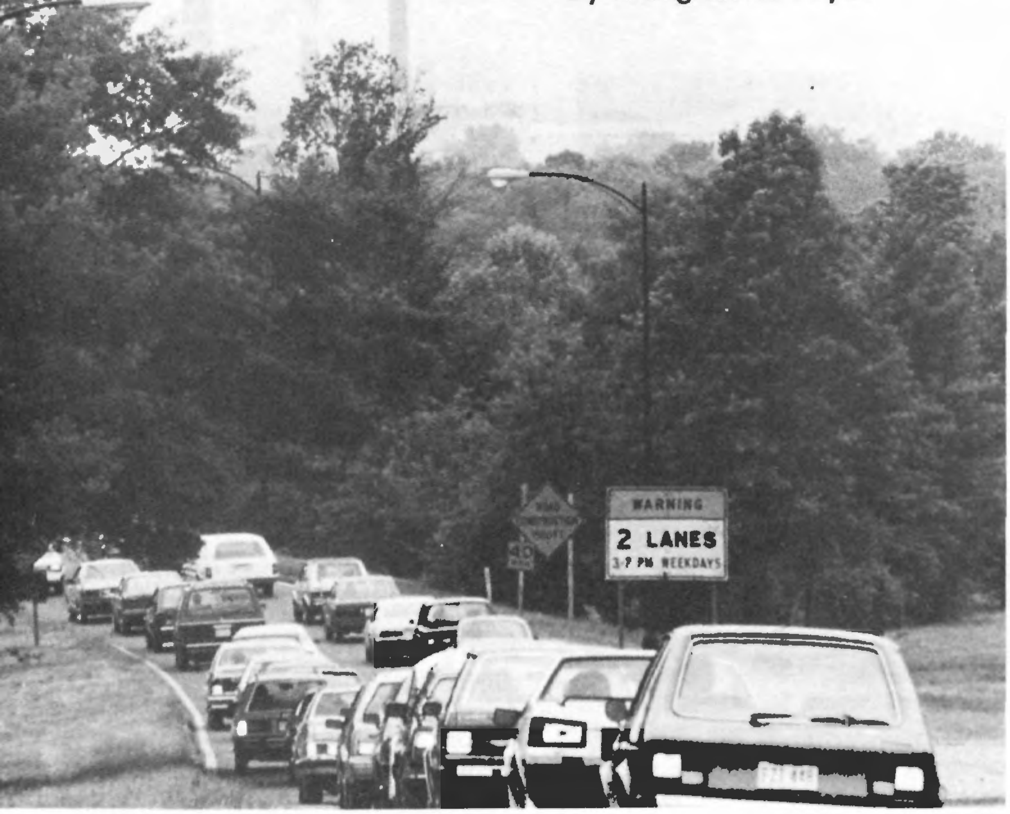
Toward this end, EPA's Office of Solid Waste plans to form a national work group on this topic. A preliminary work plan is being developed. This will delineate EPA's role in siting and explore appropriate means to secure adequate and environmentally sound waste treatment capacity for the future.

Initially, we will work closely with the regions, and the regions with their respective states and local governments, to identify particular characteristics of their waste streams and thereby help to determine treatment types and capacities needed. EPA will also develop general information on specific types of treatment technologies and facilities for public education and outreach efforts. We will also provide state and local training in negotiation and conflict-resolution skills to facilitate mutually acceptable siting decisions. Overall, the agency plans an aggressive outreach effort on this most critical issue, encompassing relevant inter- and intra-agency elements; local governmental associations; industry groups; and scientific, academic, environmental, and public interest organizations.

Siting is not an easy issue for EPA, or for the country as a whole. It is still largely uncharted terrain, full of obstacles. We are, however, committed to the shift from land disposal to modern treatment technologies, the preservation of our ground-water supplies, and the protection of the public health. We have no choice but to become active participants in siting new and environmentally sound treatment facilities. □

Tackling Toxics from Motor Vehicles

by Margherita Pryor



Steve Delaney

Motor vehicles contribute heavily to air pollution problems. In some areas without major "smokestack" sources, they are *the* pollution problem. Of the seven criteria pollutants which EPA regulates under National Ambient Air Quality Standards, vehicles are far and away the primary source for lead and carbon monoxide, and are also a significant source for nitrogen oxides, ozone-forming hydrocarbons, and particulates. Mobile sources also emit known carcinogens such as benzo(a)pyrene, EDB, ethylene dichloride, formaldehyde, and various chlorinated hydrocarbons such as benzene.

Cars not only emit pollutants directly; sometimes their emissions react with other substances in the atmosphere to form additional carcinogenic, mutagenic, or toxic compounds. Formaldehyde, for instance, forms not only in exhaust gases, but also in the atmosphere through photochemical reactions among many kinds of hydrocarbon emissions. Some constituents of particulate emissions have been found in experiments to become more mutagenic when mixed with ozone and nitrogen oxides. And the entire automobile fueling process is a fertile source of hydrocarbon emissions from bulk terminals down to local service stations.

EPA has found that many toxic emissions from motor vehicles are controlled surprisingly well by the standard catalytic converters originally developed to control carbon monoxide, hydrocarbons, and nitrogen oxide. The converters have been found to remove up to 90 percent of some toxic compounds.

But EPA is not depending solely on indirect controls. In January 1986, the lead content in leaded gas will be limited to a maximum of 0.10 grams per gallon. This will have three immediate effects:

- it will reduce direct emissions of lead;
- it will reduce emissions of the lead additives EDB and ethylene dichloride. EDB emissions alone will drop from 300,000 pounds this year to 27,000 pounds in 1986; and
- it will protect catalytic converters—which are designed to work with unleaded fuel—from the disabling effects of leaded gas, and thus provide continued control of toxics.

EPA has taken steps to limit significantly the emission of particulate matter from diesel motor vehicles. This action has come in part due to concerns about the carcinogenicity of diesel particulates. Beginning in 1987, diesel cars nationwide will employ new devices called trap-oxidizers to reduce particulate emissions. Recently enacted rules affecting trucks and buses will also control about 50,000 tons per year of diesel particulates by the year 2000. As a result, the health risk from diesel particulates should be considerably lower than would otherwise be the case.

EPA is also taking new steps to control hydrocarbons associated with gasoline marketing. The agency currently is considering two alternative control methods:

- Requiring stage II vapor recovery systems in gasoline stations. These systems recycle gasoline vapors through special fuel nozzles to prevent the vapors from escaping into the atmosphere; or
- Requiring factory installation of on-board control systems, which include built-in vapor seals in auto fuel tanks.

Another step to control hydrocarbon emissions involves the development of a strategy dealing with fuel volatility. Evaporative hydrocarbons now account for one-third of light-duty hydrocarbon emissions. Evaporative controls on vehicles are not doing the job they are designed to do, in part due to the durability of the controls and in part due to the highly volatile gasoline now being sold. Because commercially available fuel is more volatile than the fuel currently used to certify cars for production, EPA is considering requirements that cars be certified to meet the standards with commercial fuel, or that the volatility of commercial fuel be limited.

The agency is also developing fuel certification procedures to control the increased formaldehyde emissions from cars designed to run on methanol fuel. Other actions include development of testing protocols for new fuels and fuel additives, as well as continued re-evaluation of motor vehicle standards.

There is a long way to go before toxic emissions will be controlled to the agency's satisfaction. But real progress has been made and will continue to be made in the motor vehicle area. □

Tracing the History of ERAMS

by Miles N. Kahn

In October of 1976, routine monitoring activities at the Peach Bottom Atomic Power Plant detected radioactive iodine-131 on the hands and shoes of plant personnel. Further tests revealed that the area around the complex was "highly contaminated." Personnel notified the Pennsylvania Department of Environmental Resources that there was an external radiation problem at the plant.

The day after the initial report, plant safety personnel began decontaminating employees' shoes and vehicles and sending nonessential workers home. Radio stations began broadcasting reports that workers were being sent home because of an accident at the facility. The plant's management made a public statement verifying that radioactive contamination had been found in the vicinity, even though they were not sure of the contamination's source. Things started to get tense.

Fortunately, EPA's Environmental Radiation Ambient Monitoring System (ERAMS) was in full operation. Both the ERAMS active air sampling networks and the standby stations were already collecting and analyzing samples because of a Chinese nuclear test conducted the previous month.

By the evening of the second day of the "Peach Bottom Incident," it became apparent that fallout from the Chinese test was occurring from New England through Virginia, with Florida and South Carolina also reporting increased radioactivity measurements. Analyses of the ERAMS air data revealed that the iodine-131 was due to fallout and not an accident at the plant.

ERAMS air stations operator changing filters in air sampling unit. Filters are changed twice weekly.

Based on the ERAMS analyses, press releases were then drafted by EPA and the state explaining the increased radioactivity. Public concern over safety of the plant was greatly reduced.

Since ERAMS is the nation's single major source for gathering and analyzing environmental radiation data, the system has, over the years, played major roles in fallout-related incidents, such as Peach Bottom. It has also made important contributions involving radiation from other sources. More recently, its potential for monitoring pollutants other than radiation has also been demonstrated.

ERAMS, run by EPA's Office of Radiation Programs (ORP), comprises five measurement programs (drinking water, surface water, air particulates, pasteurized milk, and external gamma radiation) totaling 268 sampling stations across the nation. The drinking water stations take samples representative of the drinking water of about 30 percent of the U.S. population. The air sampling stations also cover about 30 percent of the population, while the milk sampling stations cover over 40 percent of the milk consumed by U.S. citizens.

Samples for all monitoring programs are continuously collected by state and local personnel according to predetermined schedules and sent to the ORP Eastern Environmental Radiation Facility for analysis. The facility, located in Montgomery, Ala., reimburses station operators for equipment and supplies needed to install and operate monitoring stations.

ERAMS is a direct outgrowth of the early concern over radioactive fallout from the atmospheric testing of nuclear weapons. In 1960, this country established several programs to routinely monitor levels of environmental radiation on a national basis. These programs were known collectively as the Radiation Alert Network (RAN). The network was run by the Public Health Service in the old Department of Health, Education, and Welfare. In 1962, a moratorium on atmospheric nuclear testing was declared and essentially ended aboveground testing until the Chinese resumed tests in the mid-1970s.

Fortunately, the RAN was maintained as a precaution. In 1970, when EPA was established, ORP assumed the federal responsibility for monitoring environmental radiation.

In 1973, ORP restructured and consolidated the existing monitoring networks to create the current system. Although the primary function of ERAMS remains that of monitoring radioactivity from fallout, ERAMS is extremely versatile because of the system's extensive, continuous sampling and its analytical capabilities.

In January 1981, a situation similar to "Peach Bottom" developed when increased radioactivity was detected in air samples near the General Atomic Technologies industrial plant in San Diego. Since it was well known that the plant produced radioactive iodine, its detection in local air samples began to cause increasing public concern. These local samples were sent to EPA's radiation facility for further analysis, and the presence of iodine-131 was verified.

However, before the results were released, EPA analyzed ERAMS samples collected from Los Angeles, Berkeley, Santa Fe, and Las Vegas. These analyses showed the same basic results as did the analyses of the samples taken near the San Diego industrial site. After further consideration, the increased radioactivity in all the tested samples was determined to be caused by the Chinese atmospheric test of October 16, 1980. An appropriate press release was drafted by ORP and distributed by the agency, reassuring the public that the General Atomic Technologies plant was not the source of the radioactive iodine.

Routine ERAMS monitoring of the October, 1980, Chinese test also figured in efforts to reassure the public concerning the environmental impact of the Three Mile Island (TMI) accident of March, 1979. Because of expected trends documented by past ERAMS data, the agency was aware that increased radioactivity from the Chinese test could be detected around TMI. The agency subsequently issued a press release to that effect, since a number of private citizens were monitoring radiation in the TMI vicinity with their own instruments and could easily misinterpret any increased radiation readings. Also, selected ERAMS stations in Pennsylvania and surrounding states were activated immediately after the accident. ERAMS data reflected no increased environmental radiation from the plant, a welcome reassurance in an otherwise turbulent episode.

Collecting a surface water sample adjacent to the Montgomery, Ala., water treatment plant. Such samples are collected quarterly at ERAMS surface water sampling stations.

The TMI accident was not the first major involvement of ERAMS in a radiation situation dealing with something other than fallout. For example, in January, 1978, the ERAMS air sampling network was placed on alert as part of Project Morning Light, which put the entire federal radiological emergency response apparatus on alert. At that time, a Russian satellite carrying radioactive materials was about to fall out of orbit and re-enter the earth's atmosphere.

ERAMS was put on alert because of the possibility of residual radioactivity occurring in the lower atmosphere upon satellite burnup. Ultimately, the satellite did not fall in the U.S., and Project Morning Light was disbanded. A similar mobilization of the federal radiological emergency forces occurred in January of 1983, when the Cosmos 4102 satellite, carrying 100 pounds of uranium-235, was out of control and due to plunge to earth. The network's air sampling stations were again alerted but, as before, their information was not needed, since no pieces of the satellite fell in the U.S.

Another important demonstration of ERAMS versatility occurred in 1980 when an ERAMS water sampling station located downstream of the Cooper Nuclear Power Plant in Rulo, Neb., picked up increased levels of radioactivity. In this case, ERAMS periodic water sampling happened to coincide with an accidental release of a small amount of radioactivity from the plant. The plant operators were unaware of the release at the time. After plant management was informed of the sample results, the plant was shut down briefly while corrective actions were taken, possibly avoiding more serious future problems.

By 1981, ERAMS had proved its applicability to many types of radiation situations, and there was a growing belief among ORP staff that the system could be used to monitor other pollutants. In the fall of that year, a milk monitoring project was initiated that demonstrated that ERAMS could also monitor pesticides and toxic substances. Samples from all ERAMS milk stations were analyzed for pesticides and toxics, with trace amounts showing up in samples from 25 percent of the locations. Except for one location, the findings did not indicate any significant health risk, and resulting state action at that location reduced pesticide concentrations to acceptable levels. The EPA Office of Pesticide Programs is now actively studying using ERAMS for its routine milk monitoring.

In addition to the possible application of ERAMS to other EPA programs, the utility of the system's routine data is already widely recognized outside the agency. For instance, the data, distributed in quarterly Environmental Radiation Data reports, are used by the Department of Energy national laboratories, many universities, the Nuclear Regulatory Commission, and the nuclear power industry to establish baseline environmental information. In addition, the World Health Organization also routinely distributes ERAMS data.

According to ORP Acting Director Sheldon Meyers, "while ERAMS is crucial in our national effort to assess and control human exposures to radiation, there is increasing recognition that the system may be applied to other pollutants besides radiation." As Meyers points out, "when you understand some of its history, you understand the potential of ERAMS." □

(Kahn is a public affairs specialist on the staff of EPA's Office of Radiation Programs.)

Update

A review of recent major EPA activities and developments in the pollution control program areas

AIR

Visibility in Pristine Areas

Final regulations have been announced under the Clean Air Act establishing new source review procedures and monitoring strategies for visibility in 19 states and one territory.

The agency is establishing federal visibility procedures for Arizona, California, Colorado, Florida, Hawaii, Idaho, Maine, Michigan, Minnesota, Nevada, New Hampshire, New Jersey, North Dakota, South Dakota, South Carolina, Texas, Vermont, Virginia, West Virginia, and the Virgin Islands. EPA is taking this action by disapproving individual State Implementation Plans and promulgating a federal plan in their place.

The rules will require that new industrial sources or major modifications of existing sources of air pollution near national parks or wilderness areas which have been designated as pristine areas under the Clean Air Act meet specific federal new source review or monitoring requirements.

Standards for Residential Wood Burning Stoves

The agency announced its plans for accelerated development of performance standards for reducing pollutants from new residential wood-burning stoves. EPA's regulations will propose that all new wood-burning stoves be built with state-of-the-art technology which will significantly reduce particulate matter, carbon monoxide, hydrocarbons, and polycyclic organic matter pollution.

The wood-burning stove regulations are one element in EPA's recently announced strategy to deal with toxic air pollutants. It is estimated that wood-burning stoves account for almost half the national emissions of polycyclic organic matter, a group of volatile organics which include several known or suspected human carcinogens (cancer-causing substances).

Nissan to Recall Certain 1981 Cars

Nissan Motor Corporation will recall approximately 67,000 1981 model year vehicles that may be exceeding the federal hydrocarbon and carbon monoxide emission standards. Nissan will recall 280ZX and Maxima vehicles equipped with 2.4 and 2.8 liter engines produced for sale in the U.S., except California.

EPA and Nissan conducted emission testing, which showed that the deterioration of the exhaust gas oxygen sensor caused excess emissions. The sensor monitors the amount of oxygen in the exhaust gas, allowing the fuel injection control unit to adjust the air/fuel mixture for efficient operation of the catalytic converter. The oxygen sensor will be inspected and replaced if necessary.

Chrysler Recalls 129,000 1981 and 1982 Cars

Chrysler Corporation is recalling approximately 129,000 1981 and 1982 model year passenger cars manufactured by Mitsubishi in Japan. The purpose of the recall is to assure that the vehicles meet federal exhaust standards for hydrocarbons, carbon monoxide, and oxides of nitrogen.

The affected cars are the Dodge Colt and Plymouth Champ. The 1981 models of these cars are equipped with either 1.4 liter or 1.6 liter, four-cylinder engines, and the 1982 models are equipped with 1.4 liter engines. California vehicles are not included in the recall.

Chrysler agreed to recall the cars after EPA testing revealed that the 1981 cars were exceeding the agency's hydrocarbon, carbon monoxide, and oxides of nitrogen exhaust standards, and the 1982 cars were exceeding the carbon monoxide exhaust standard.

PESTICIDES

Coyote Control

EPA has granted registration to the pesticide Compound 1080 in the Livestock Protection Collar for limited use on sheep and goats to control coyotes that prey on these farm animals.

The collar consists of a rubber reservoir containing a solution of Compound 1080 and is attached to the neck of the lamb or goat. If a coyote or other predatory animal attacks and breaks the reservoir, it will usually receive a fatal dose. Coyotes normally kill by bites to the throat.

Rodent Control

EPA has placed a series of restrictions on the use of Compound 1018 to control rodents on range and crop lands.

EPA also is requiring additional data from producers of the rodent baits to assure that current registration standards are being met under the Federal Insecticide, Fungicide, and Rodenticide Act.

This action concludes the agency's special review (Rebuttable Presumption Against Registration) of these uses of Compound 1080. EPA initiated the review because of information indicating that use of this compound may be a hazard to nontarget wildlife, particularly threatened or endangered species such as the California condor and the black-footed ferret.

TOXICS

PCB Transformer Fires

Final regulations have been announced by EPA that would further restrict the use of polychlorinated biphenyls (PCBs) in transformers in public buildings.

The rules are designed to protect the public from potential health risks posed by fires from transformers containing PCBs.

The action was prompted by concern over the risks that resulted from transformer fires in Binghamton, N.Y., San Francisco, and Chicago.

The agency has been concerned about the health effects of PCBs for a number of years. Laboratory tests on animals show that PCBs can harm reproduction and growth and can cause skin lesions and tumors. EPA has issued a number of previous regulations designed to prevent public exposure to PCBs.

Chemical Reporting Failure

EPA announced that Diamond Shamrock Chemical Co. has agreed to pay a $900,000 fine for failing to notify the agency before it manufactured or imported three new chemicals. The penalty is the single highest ever collected under the premanufacture notification provision of the Toxic Substances Control Act.

Also, EPA is fining seven companies a total of $160,000 for failing to comply with chemical reporting requirements of the Toxic Substances Control Act.

EPA fined the companies for failing to keep and report information on the manufacture, processing, use, and disposal of certain chemicals, as well as estimates of human exposure. The firms cited either failed to report information to EPA, or failed to file a timely report. Six of the violations involved asbestos reporting rules.

WATER

Final Water Rules for Petroleum Refiners

EPA issued final water pollution rules requiring the petroleum refining industry to more stringently control the discharge of certain wastewater pollutants as well as pollutants in storm water runoff from refinery property.

The rules will require the U.S. crude oil processing industry to significantly reduce allowable discharges to the environment.

Final Water Rules for Nonferrous Metals Industry

EPA issued final rules to control the discharge of certain wastewater pollutants from nonferrous metal forming plants.

The regulation covers discharges from plants forming all nonferrous metal alloys except aluminum, beryllium, and copper. EPA issued copper and aluminum regulations earlier and will issue beryllium regulations in the future.

The announced rule will result in a 97 percent reduction in the discharge of toxic pollutants from nonferrous industry plants. The nonferrous metal alloys regulated include lead-tin-bismuth, magnesium, nickel-cobalt, precious metals, titanium, zinc, zirconium-hafnium, and metal powders. This reduction will remove 5,530 pounds per year of toxic pollutants from direct discharges into streams and an additional 54,500 pounds per year of pollutants discharged to sewage treatment facilities.

Appointments at EPA

Donald J. Ehreth has been named Acting Assistant Administrator for EPA's Office of Research and Development (ORD), effective immediately.

Ehreth has been with EPA since 1972, initially in the water program, and in ORD since 1980.

In October, 1983, he assumed the position of Deputy Assistant Administrator of ORD. In that position, he has designed research programs and conducted assessments aimed at determining the need for regulatory controls as well as measuring the effectiveness of existing regulatory programs aimed at alleviating pollution.

His background is as a Chemical Engineer and Technical Manager specializing in wastewater treatment, water quality management, and hazardous and toxics waste management.

He earned a B.S. in Chemical Engineering from the University of North Dakota and an M.S. in Engineering Administration from the Geroge Washington University.

Steve Delaney

Scouts at this year's Boy Scout Jamboree July 24 to 30 at Fort A.P. Hill in Virginia. Through exhibits and demonstrations, EPA sought to interest the scouts in environmental issues.

Back cover: Rowers in a racing shell. Photo by Robert Shafer, Folio, Inc.

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