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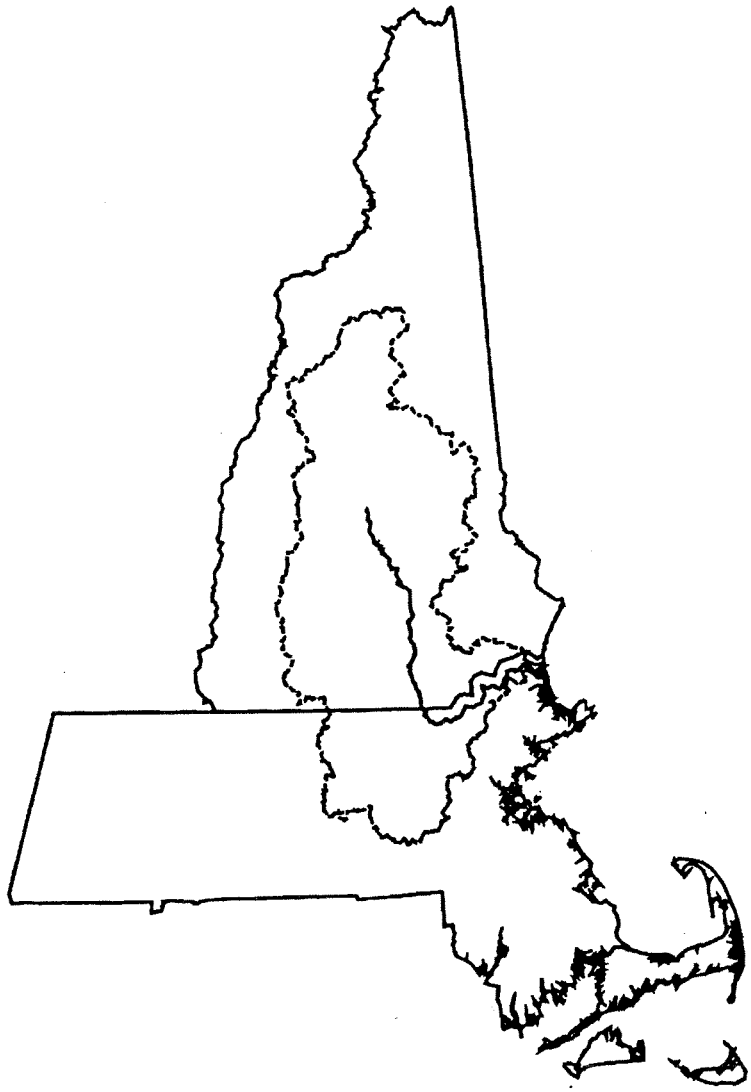
The Merrimack Project

Building Partnerships to Prevent Pollution in a Watershed



SUMMARY REPORT

Commonwealth of Massachusetts
Executive Office of Environmental Affairs
The Office of Technical Assistance for Toxics Use Reduction

Funded by the U.S. EPA, Industrial Pollution Prevention Project Grant X1001588-01-0

June 1995

The following report is a summary of work performed under EPA Grant No. X1001588-01-0 provided through the Industrial Pollution Prevention Project and the Water Management Division, EPA–New England. A more detailed report is available from OTA.

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The Office of Technical Assistance

The Office of Technical Assistance for Toxics Use Reduction (OTA) is a nonregulatory state agency whose purpose is to assist Massachusetts industry in reducing or eliminating the use of toxic substances or the generation of toxic byproducts. The Office offers the following nonregulatory services: free and confidential on-site assessments; conferences and workshops; financial analyses; and written information on toxics use reduction techniques and technologies. OTA was created by the state's Toxics Use Reduction Act of 1989. The Act levies a fee on large quantity users, a portion of which funds OTA programs. OTA works in conjunction with the Toxics Use Reduction Institute and the Massachusetts Department of Environmental Protection. For more information about OTA contact: The Office of Technical Assistance, Executive Office of Environmental Affairs, 100 Cambridge Street, Room 2109, Boston, MA 02202 (617) 727-3260.

Acknowledgements

The following have contributed expertise and support to The Merrimack Project:

The Massachusetts Executive Office of Environmental Affairs: Trudy Coxe, Secretary

EPA Headquarters: Jim Lund

EPA New England (Region I): Joseph Canzano, Bart Hague, Tony DePalma

The Toxics Use Reduction Institute at the University of Massachusetts at Lowell: Ken Geiser, Elizabeth Harriman

The staff of the Northeast Region of the Massachusetts Department of Environmental Protection

The staffs of the Greater Lawrence, Haverhill, Lowell, Newburyport, and Amesbury sewage treatment works

New Hampshire Department of Environmental Services: Robert Varney, Chris Simmers, Vince Perelli, Paul Lockwood, Stephanie D'Agostino

Merrimack River Watershed Council: Ralph Goodno

The Merrimack River Initiative: Barbara Rich, Trish Garrigan, Marcy Berbrick

The Northern Middlesex Council of Governments and the Merrimack Valley Planning Commission

The Massachusetts Department of Environmental Management

Special thanks the founding members of the Merrimack Business Environmental Network

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This information is available in alternate formats upon request.

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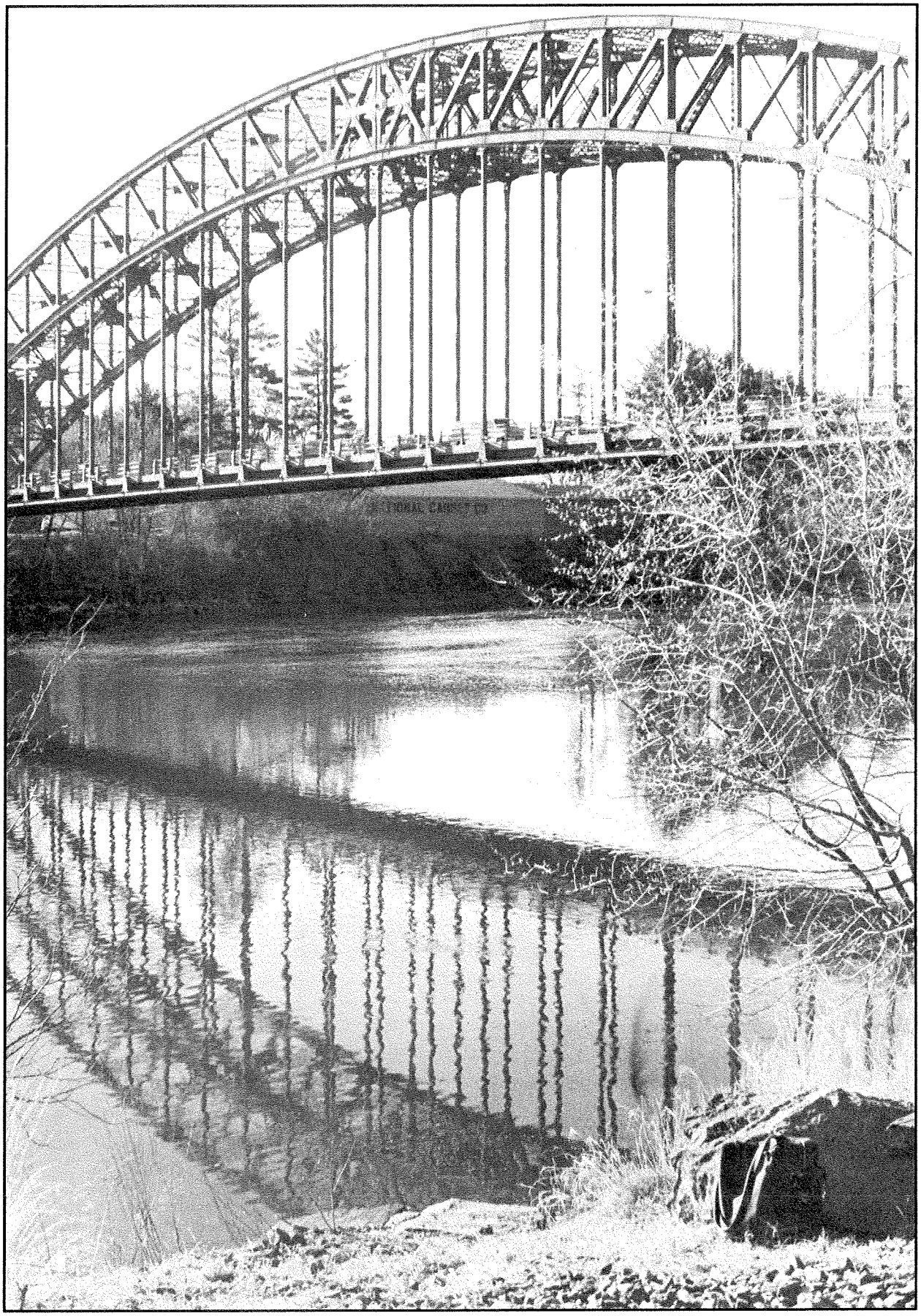


Photo courtesy of the Merrimack River Watershed Council.

The Merrimack River, Tyngsboro, Massachusetts

EXECUTIVE SUMMARY

In the fall of 1991, the Massachusetts Executive Office of Environmental Affairs, Office of Technical Assistance for Toxics Use Reduction (MA OTA) was awarded a $120,000 grant from EPA to develop and implement a program of industrial pollution prevention projects in the Merrimack River watershed. This three-year grant, and a matching grant awarded to the state of New Hampshire, were part of two larger EPA initiatives:

1. The Industrial Pollution Prevention Project (IP3) administered by EPA headquarters in Washington, D.C. which seeks to incorporate pollution prevention into national environmental policy and to promote a pollution prevention ethic among businesses.

2. The Merrimack River Initiative (MRI) administered by EPA New England which seeks to promote a watershed-based approach to natural resource management, planning and protection by encouraging agencies and groups within different political boundaries to work together for the common goal of improving water quality of the Merrimack River.

The objectives of "The Merrimack Project" were:

- to promote pollution prevention as an ethic by working directly with businesses in the Merrimack watershed;

- to identify opportunities to incorporate pollution prevention into regulatory practices and policy, and to coordinate pollution prevention efforts with regulatory agencies;

- to encourage industry, regulators and others to view pollution prevention as a means of achieving both environmental protection in the watershed and economic health for local companies.

The results show significant progress toward the project's objectives. Among the results:

- Pollution prevention outreach and education efforts, including workshops for businesses (several tailored for specific industries) and training sessions for POTW

and regulatory staff, resulted in increased requests by industry for pollution prevention technical assistance. MA OTA staff worked with more than 55 companies in the Merrimack watershed during the project.

- An informal survey found that ten Massachusetts companies together eliminated nearly 1.7 million pounds of toxic pollutants, and 18 companies saved $1.85 million by implementing pollution prevention strategies. A large majority of these companies gave OTA credit for these accomplishments. Several other companies reported reduced pollution and costs savings, but did not have specific numbers; the total amount of pollution prevented and money saved is believed to be much greater than the numbers reported.

- A group of regional businesses that began meeting informally through this project with government officials and environmental advocates to exchange information about pollution prevention has incorporated as a nonprofit organization called the Northeast Business Environmental Network (NBEN). A nonpartisan network dedicated solely to helping its members improve their environmental performance in manufacturing operations, NBEN has been recognized as a model business-government partnership.

- Training and informational exchanges with the Department of Environmental Protection (DEP) that began with this project have evolved into an ongoing exchange between the agencies, including company referrals by DEP to OTA's technical assistance services.

- Information exchange between Massachusetts and New Hampshire environmental agencies resulted in the conduct of joint public events, cooperation in the formation of NBEN, and a unified message promoting pollution prevention in the watershed.

Although an original aim of the project was to compile baseline information concerning pollution in the Merrimack River and to evaluate whether the implementation of preventive techniques could have a positive effect on water quality, project staff encountered substantial difficulties in obtaining baseline information, and in establishing measures for evaluating cause and effect regarding P2 activities. Thus the project staff abandoned this goal and it is impossible at this time to cite numbers showing that the Merrimack Project reduced pollution in the river. It is assumed that the project's success in eliminating the discharge of tons of pollutants is of environmental benefit. More importantly, this project has served as a demonstration of the economic benefit of the use of preventive strategies.

I
PROJECT BACKGROUND

The Merrimack River Watershed

The Merrimack River watershed encompasses 5,010 square miles including the mainstem and its many tributaries. The headwaters of the Merrimack River start in the White Mountains of New Hampshire and flow 180 miles to the Atlantic Ocean at Newburyport, Massachusetts. The watershed represents approximately 33 percent of the land area in New Hampshire, approximately 15 percent of the land area in Massachusetts, and includes all or portions of 200 communities. The Merrimack runs through remote National Forest areas, rural towns, urban areas, and is a resource of great regional significance. It provides drinking water for more than 300,000 people and also is used for recreation, fish and wildlife habitat, irrigation, waste assimilation, power production and scenic enjoyment. It is one of the major "veins" of the New England region. The lower Merrimack region, which includes much of southern New Hampshire and portions of northeastern Massachusetts, is highly industrialized.

The Merrimack River was once considered one of the nation's dirtiest waterways. Contamination from raw sewage and untreated industrial waste had rendered the river unusable for fishing, drinking or recreation. In the past 20 years many of the most obvious pollution sources have been addressed. The Merrimack can now be used for fishing and boating, and sections of the river are used, after treatment, for drinking water.

Agency Background

The MA OTA is among the nation's oldest and largest nonregulatory state agencies that provide pollution prevention technical assistance to industry. Created by the Commonwealth's Toxics Use Reduction Act of 1989, OTA has a staff of more than 30 engineers, chemists, and other professionals who directly assist industry in finding ways to reduce or eliminate the use of toxic materials and the generation of toxic by-products.

Since 1990, MA OTA has made more than 450 site visits to Massachusetts manufacturers to assist them in developing toxics use reduction (TUR) and pollution prevention strategies. In addition, MA OTA also sponsors public workshops and training sessions for various industrial sectors and/or industry managers about pollution prevention opportunities and regulatory compliance issues.

The Merrimack Project* sought to take advantage of MA OTA's extensive experience working not only with businesses, but also with sewage treatment facilities or publicly-owned treatment works (POTWs), and regulatory agencies. To meet the objectives, the project was implemented in three separate components:

— work with POTWs

— work with businesses

— coordination with regulatory programs

* This report focuses on the outcomes of this grant project in Massachusetts. For a full report of the Massachusetts and New Hampshire programs as part of the IP3 project, including policy recommendations, see The Merrimack Project of the Industrial Pollution Prevention Project, published by the Environmental Protection Agency in Washington, D.C., 1995.

II
WORK WITH POTWs

Since MA OTA was founded, a cornerstone of its technical assistance outreach program has involved working with municipal and regional sewage treatment facilities. Because POTW operators are charged with ensuring compliance with National Pollutant Discharge Elimination System (NPDES) permits, they have a vested interest in helping to identify industrial sources of toxic chemicals in their systems and encouraging pollution prevention as a means of reducing the pollutant load on their treatment facilities. Traditionally, POTWs have been strong and cooperative allies in pollution prevention outreach efforts to industry in their service areas.

At the beginning of the Merrimack Project, MA OTA met with the five major POTWs in Massachusetts located on the mainstem of the Merrimack River. These included:

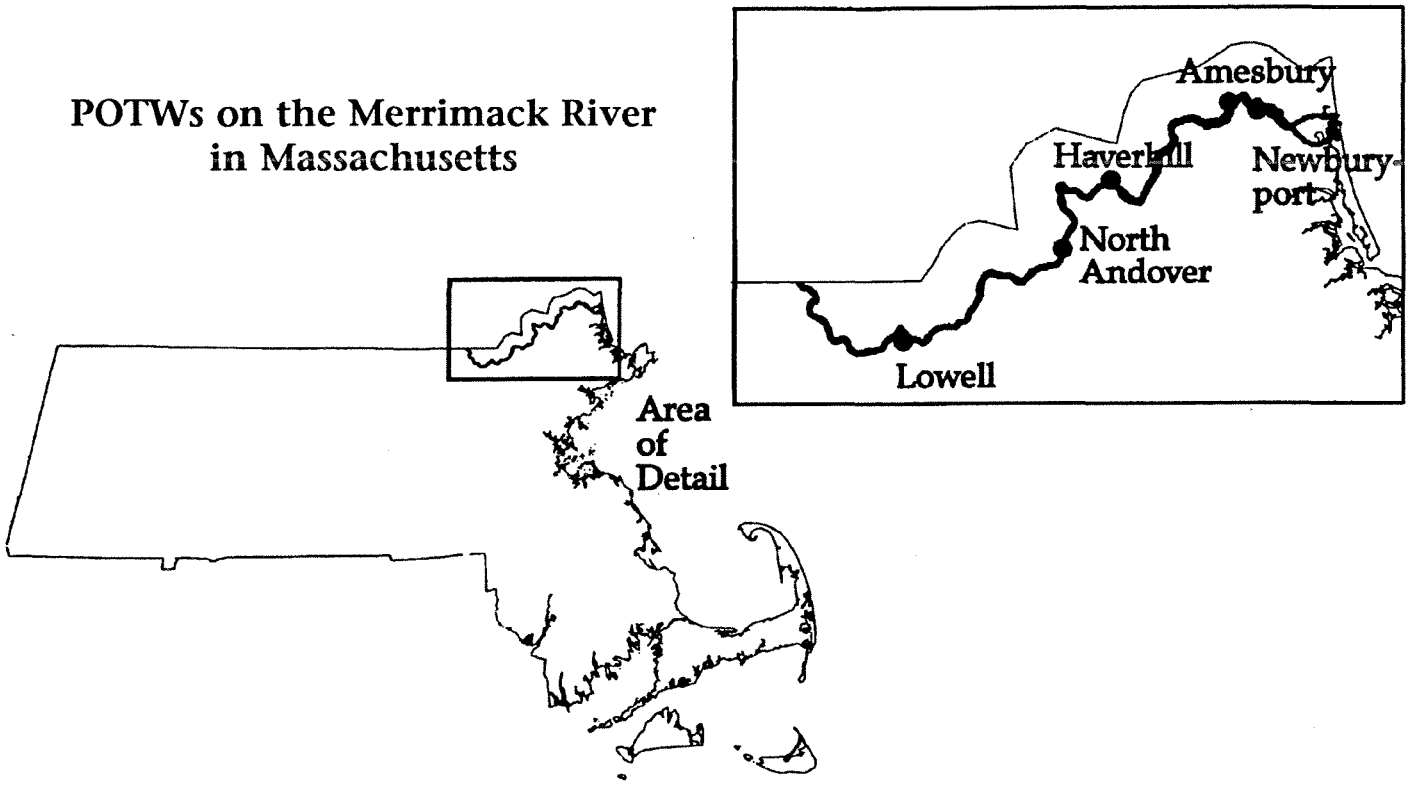
- Newburyport
- Amesbury
- Haverhill
- Greater Lawrence Sanitary District, North Andover
- Lowell

Because OTA had already worked with POTWs through a self-help group of pretreatment coordinators from across the state (the Massachusetts Pretreatment Forum), many of the operators of these facilities had met OTA staff previously and were familiar with the agency.

Although POTW operators reported no significant compliance problems with industrial discharges, they welcomed the opportunity to learn about and promote the preventive approach to water pollution, recognizing that its economic benefits could help offset the costs of treatment. They also cited as serious concerns:

- nonregulated sources of pollution such as nonpoint sources, households and small businesses;
- unpermitted dischargers;
- fats, oils, and grease (FOG) discharges.

The Merrimack Project maintained a focus on industrial sources while also attempting to address these concerns about nonindustrial and nontoxic discharges.



Cooperative Workshops

Working with POTWs, the New Hampshire Department of Environmental Services, and (after its formation) the Business Environmental Network, MA OTA organized industry-specific workshops and conferences on pollution prevention and environmental compliance in general. Invitations to the industry-specific workshops were mailed out by POTWs to dischargers in their area. Approximately 200 attendees learned about specific pollution prevention strategies and technologies, and heard businesses with pollution prevention success stories tell how they saved money or improved quality while avoiding pollution. Target industries for the workshops were selected by analyzing POTW permit lists and local business directories and consulting with POTW operators. The Toxics Use Reduction Institute (TURI) at the University of Massachusetts at Lowell, also assisted in developing and delivering some of the workshops. The workshop locations and topics included:

Greater Lawrence . . . . . .Electroplating

Haverhill . . . . . .Machine shops

Lowell . . . . . .Printed circuit board industry

Amesbury . . . . . .Water conservation

Newburyport . . . . . .FOG issues for restaurants (2 workshops)

The POTWs reported positive outcomes from their involvement in the workshops, including:

- the opportunity to increase awareness of effective means for reducing discharges
- the opportunity to inform the regulated community of the availability of free, confidential assistance
- the creation and maintenance of ongoing relationships with the companies they regulate
- the opportunity to communicate to industries their desire to help industries remain competitive as well as meet environmental compliance requirements
- the opportunity to increase public understanding of the POTW's place in the community, and particularly the fact that increased expenses or savings at the POTW affect the entire community.

The Lowell, Greater Lawrence, Newburyport and Haverhill POTWs have continued the practice of holding public events to educate their dischargers, and requests have come in from other POTWs in the state to conduct similar events.

Work on the Merrimack Project with treatment facilities' staff established new partnerships and strengthened existing partnerships.

Training

MA OTA in the spring of 1992 conducted P2 training for POTW officials in Massachusetts, New Hampshire, and Maine, through the New England Interstate Environmental Training Center.

This training consisted of:

- explanation of the basic concepts of P2
- a discussion of the Massachusetts Blackstone* project which pioneered cross media enforcement and referrals for technical assistance
- a participatory "P2 training exercise", where officials brainstormed process change responses to identified pollution problems.

* For an explanation of the development of the multimedia approach to inspections, see the Central Massachusetts Pollution Prevention Project Summary Report, published in 1993 by OTA.

Changes in POTW practices

After working with MA OTA on cooperative workshops, POTW officials began referring companies to MA OTA for technical assistance. Greater Lawrence Sanitary District responded vigorously, even going out on site visits with MA OTA and NH DES. Since 1991, the other POTWs also have referred companies to MA OTA. MA OTA staff estimates that approximately one half of the company visits in the Merrimack region during the 1991 – 1994 period originated from POTW referrals. The project gave POTW officials a chance to help dischargers, as opposed to simply enforcing against them.

As a result of working with MA OTA on the Merrimack Project, several POTWs gained a better understanding of and appreciation for pollution prevention as a means of helping businesses remain in compliance with discharge limits, or eliminate the use of certain chemicals altogether. The POTWs shared strategies with each other. The Newburyport wastewater treatment plant told other POTW officials how they have incorporated into some permits a requirement that dischargers report chemical purchases to the POTW. The Greater Lawrence Sanitary District has added pollution prevention questions to its full inspection forms. With help from OTA, Haverhill established a used-oil collection facility for residents. Finally, the project increased interaction between POTWs and the state's water pollution control division, leading to improved communications and relations.

III
WORK WITH BUSINESSES

Technical Assistance

MA OTA's Northeast Team provides technical assistance to companies in the Northeastern region of Massachusetts, including the Merrimack River region. As of May 1994, the team had provided on-site assistance to 58 companies. Although a telephone survey found that more than half of the companies claimed to have implemented pollution prevention and benefited therefrom, only 18 of those companies could quantify the benefits from these activities. (Some were able to quantify by means, such as percentages, that could not be aggregated with other company reports). Ten companies together eliminated nearly 1.7 million pounds of toxic pollutants, and 18 companies saved $1.85 million by implementing pollution prevention strategies recommended by MA OTA. (Eight companies quantifying pounds reduced gave OTA credit for 700,000 pounds, and twelve companies gave OTA credit for saving 1.1 million dollars. For specific details on recommendations to companies and outcomes, see Appendix A.)

CATEGORIES OF MERRIMACK COMPANIES WHO RECEIVED CONFIDENTIAL TECHNICAL ASSISTANCE FROM OTA

Electronics manufacturers	10
Machine shops	7
Web coaters	7
Metal platers, finishers	4
Printing industry	3
Printed circuit board manufacturers	2
Spray paint contractors	2
Plastics industry	2
Adhesive manufacturers	2

Others include manufacturers of textiles, paper, furniture, leather products, wood stains, pharmaceuticals and other specialty products.

The Business Environmental Network

MA OTA's extensive experience in educating toxics users about pollution prevention has shown that businesses find other businesses to be more credible sources of information than government agencies. Throughout the Merrimack Project, efforts were made to get businesses with positive results from pollution prevention initiatives to share their strategies with others. Toward this end, one of the Merrimack Project's goals became to establish some type of forum or collaborative of businesses who use toxic materials in their operations and who were interested in implementing cost-saving pollution prevention measures.

In the fall of 1992, MA OTA and NH DES identified companies in the region that had shown an interest in environmental protection and invited them to a meeting to discuss the possibility of forming an environmental business group. Twenty five attendees of the first meeting enthusiastically endorsed the idea of establishing such a group. Participants suggested that members could take turns hosting a meeting and that collectively the group could pick a topic of discussion. Known as the Merrimack Business Environmental Network (MBEN), the group met monthly to discuss pressing regulatory issues and how pollution prevention might help address those issues. OTA served as staff of the organization, arranging the meetings and presentations.

To relate pollution prevention efforts to resource protection, the group sought information about the health of natural resources in the Merrimack River watershed, and included the Merrimack River Watershed Council as a member of the network. In addition, to emphasize that the purpose of the group was to unite the concepts of environmental protection and economic health of local industry, MBEN members adopted the following mission statement:

> *The Merrimack Business Environmental Network is a coalition of businesses, agencies and associations which is committed to a shared concern for the Merrimack Valley, its rivers, and the Valley's quality of life. This Association has made a long-term commitment to seek and implement solutions to promote pollution prevention through improved management and technology, while enhancing the economic viability of the business community.*

The group continued to meet for two years, and with the help of MA OTA and NH DES, the network sponsored two major regional conferences, each attended by approximately 100 people.

The first, held outdoors on a bluff overlooking the Merrimack River in Newburyport, MA, consisted of presentations by government officials concerning regulatory requirements and breakout sessions of company presentations on P2 case studies.

The second MBEN conference focused on new compliance requirements under recent amendments to the federal Clean Air Act. Government officials presented the latest regulatory information, while MBEN members presented case studies on innovative compliance methods, including pollution prevention strategies. Both conferences demonstrated that government technical assistance programs and business environmental networks can serve as conduits for regulatory information, with an emphasis on pollution prevention opportunities.

Publicity about the MBEN conferences led to calls from other watersheds and states about how MBEN developed, a mention in *Pollution Engineering* and an invitation to write an article about MBEN for the *Pollution Prevention Review*. (See Appendix B). In addition, the group received recognition from the Merrimack River Initiative (MRI), which asked MBEN to appoint representatives to become members of the Initiative's Management and Executive Committees.

During the life of the Merrimack Project grant, MBEN received staff support from the MA OTA's Merrimack Project Coordinator. In order to remain active after the grant ended, the group decided in the summer of 1994 to incorporate as a free-standing nonprofit organization that could raise money and hire its own staff person. In an effort to broaden the geographic scope of the network, the group incorporated in August 1994 as the Northeast Business Environmental Network Inc. (NBEN). Bylaws for NBEN stress both the commitment to environmental protection and the nonpartisan nature of the group, emphasizing that NBEN is prohibited from engaging in political lobbying.

Founding Members of the Merrimack Business Environmental Network

Alternate Circuit Technology, Ward Hill, MA

Anton's Cleaners, Tewksbury, MA

Americraft Carton, Lowell, MA

AT&T, North Andover, MA

Cabot Stains, Newburyport, MA

Diceon Electronics, Nashua, NH

Gillette, Andover, MA

HADCO Corp., Salem, NH

Hewlett-Packard Co., Andover, MA

Ideal Tape, Lowell, MA

MA Executive Office of Environmental Affairs, Office of Technical Assistance

M/A COM, Lowell, MA

Merrimack River Watershed Council, Lawrence

Merrimack River Initiative

NH Department of Environmental Services

Raytheon Company, Bedford, MA

Wang Corp., Lowell, MA

As a nonpartisan, nonprofit business network, NBEN sponsored an additional conference on hazardous materials management, pollution prevention and emergency response in the fall of 1994. Once again, presentations were made by government and industry, approximately 100 people attended and participants reported the conference to be extremely useful.

In 1995, at the request of EPA New England's Regional Administrator and with financial support from the Merrimack River Initiative, NBEN took the lead on a project to provide opportunities for businesses and government to work together on regulatory improvement. In April, NBEN sponsored a half-day discussion on Regulatory Improvement Opportunities (RIO) known as the RIO Forum. More than 100 representatives from Massachusetts and New Hampshire businesses and government agencies attended. Breakout sessions allowed small groups to brainstorm about the biggest regulatory barriers to improved environmental performance by industry and possible ways to eliminate those barriers. NBEN has been charged with following up on the recommendations made at the forum by convening small groups of business and government representatives to work together on those issues identified as the most pressing. Those groups will be established and begin working during the summer and fall of 1995.

Although no formal outreach campaign has been developed, word about the development and work of NBEN is spreading. The group has just begun charging dues, and has 35 dues-paying members as of this writing: it also has a mailing list of more than 100 who were members before dues were required. MA OTA has been asked by Salem Sound 2000, a watershed protection group in the Salem, MA area, to assist with the formation of a similar group in that region. In addition, OTA has responded to requests for information about the development of NBEN from Vermont, Connecticut, Washington state, and EPA officials in Washington, D.C.

CONFERENCES SPONSORED BY THE BUSINESS ENVIRONMENTAL NETWORK

9/23/93	Overview of Environmental Issues and P2 Opportunities
2/3/94	Clearing Up the Clean Air Act for Business
10/20/94	Reducing the Risk: A Conference for Companies that Use Hazardous Materials
4/26/95	Air Operating Permits: Real Expectations and Practical Guidance
4/27/95	Regulatory Improvement Opportunities Forum

IV
COORDINATION WITH REGULATORY PROGRAMS

An objective of the Merrimack Project was to coordinate with regulatory programs, both to increase regulators' awareness and understanding of pollution prevention opportunities, and to better define and enhance the relationship between regulation/enforcement and technical assistance.

In addition, MA OTA designed its work on the Merrimack Project to include:

— identifying opportunities and barriers to incorporating pollution prevention in the work of regulatory agencies

— using the project as a pilot to test new initiatives.

MA OTA adopted the strategy of establishing training exchanges and referrals with the MA Department of Environmental Protection (DEP), the state's environmental regulatory agency. At the same time, DEP made waste prevention a top priority and has reorganized accordingly. DEP now makes multi-media inspections, and its FIRST program (Facility Inspections to Reduce the Source of Toxics) is only one of many program innovations that reflect the agency's commitment to making toxics use reduction a priority.

Introductory Training

MA OTA has introduced the concepts both of technical assistance and of pollution prevention to enforcement officials of many agencies. As part of the Merrimack Project the office has assisted with P2 training for EPA inspectors and managers, DEP inspectors and managers, POTW pretreatment coordinators, board of health agents, and audiences made up of regulatory officials of various agencies and authorities.

The concept of nonregulatory technical assistance for pollution prevention initially raised several concerns among enforcement officials. These concerns included:

- that resources would be diverted from enforcement to technical assistance, or that enforcement would somehow be diminished.
- that the touting of pollution prevention could seem to mean a denigration of pollution control.
- that if inspectors made suggestions concerning pollution prevention activities, companies would interpret these suggestions as commands.

MA OTA addressed these concerns with the following points:

- technical assistance can be provided with a minimal devotion of resources, or with the incorporation of the function into existing programs, or with the use of new resources (such as OTA's funding through a fee on large toxics users). Assistance should not replace enforcement, but should complement it because the threat of enforcement is the most important reason companies seek technical assistance and implement pollution prevention. Complementing enforcement with assistance improves the relationship between government and the regulated community. Assistance is the appropriate tool for interacting with those members of the regulated community who want to do the right thing, and simply need a better understanding of the requirements and options.
- although the hierarchy means prevention should be exercised first and foremost, it must be recognized that when it is not implemented, recycling, treatment, or other appropriate management of wastes already generated is still preferable to certain other alternatives. It has been necessary to affirm on many occasions that pollution reduction is a desirable activity, even if it is not prevention.
- inspectors could and should refer companies to a technical assistance agency for specific help, while talking about pollution prevention in general, to indicate the priority the agency places on the approach.

OTA also recommended that inspectors can adopt the strategy of asking questions in lieu of making commands, because asking questions:

- is a nondirective method of illuminating P2 opportunities and pointing a company in the right direction, or discovering worthwhile avenues of investigation.

- denotes respect for the regulated company and can enhance the relationship between the company and the regulator.

Most importantly, dialogue concerning process educates the inspector, which can only improve regulatory practices.

The Relationship of Enforcement and Technical Assistance

In its work to develop policy concerning the interaction between enforcement and technical assistance, OTA has stressed two points:

- confidentiality must be assured or companies will not feel safe consulting with a government agency.
- continued strong enforcement is of paramount importance, because it is a major motivator for companies to implement pollution prevention or seek technical assistance.

In addition, MA OTA strongly supports tailoring of enforcement strategies to encourage prevention, such as:

- waivers
- extra time
- penalty mitigation
- elimination of roadblocks to process changes

MA OTA staff have frequently worked with companies facing short time-frames to address violations. Conventional end-of-the-pipe control equipment is readily available; to supplant the control strategy with a preventive technique may only be possible if the company has the time for investigation and trial.

Coordinated Work with Regulatory Officials

Work with DEP has evolved from training to mutual exchange. MA OTA has been meeting with the Northeast Region of DEP as part of DEP's FIRST (Facility Inspections to Reduce the Source of Toxics) program to expand the Blackstone model of cross media inspections and technical assistance referrals. OTA has delivered a series of seminars, and DEP conducts cross training for OTA on DEP's regulations. OTA has long emphasized to its staff the importance of being up to date on regulations.

The seminars have covered:

- pollution prevention in general;
- cleaning alternatives to solvents;
- alternative finishing systems (low or no VOC painting and coatings such as powder coatings, electrodeposition, and efficient paint transfer systems such as high volume, low pressure spray);
- an overview of the problems posed for those planning pollution prevention activities by restrictive military specifications;
- printing;
- the requirements of the MA Toxics Use Reduction Act (TURA) and Form S reporting.

The OTA team has attended semimonthly inspection review meetings at DEP and has been asked to comment on how to recognize pollution prevention opportunities and how to suggest them during visits.

DEP now sends copies of all Notices of Noncompliance to OTA, and included in these notices is language encouraging the recipient to contact OTA for help. Inspectors often recommend OTA's services to companies.

Other Projects

Massachusetts has received an EPA grant to establish a permanent household hazardous waste collection site in the Merrimack Region. After months of exploration and discussion, OTA and the city of Haverhill worked together to establish a permanent collection site for used oil. Haverhill's POTW is part of the emergency response team, which identified the need for the site in order to address a large number of annual responses to abandoned containers of used oil.

OTA also has produced a pollution prevention guide in flyer format, distributed door-to-door in Newburyport and Amesbury. OTA developed and distributed the guide in conjunction with the towns' health boards and the curbside recycling contractor who serves both towns.

V
CONCLUSIONS

Making pollution prevention the universal ethic in business operations is an ambitious goal, and much work remains to be done towards that end. The results of the Merrimack Project demonstrate that:

- industry and regulatory agencies are very receptive to education and information programs about pollution prevention, and can work together effectively to educate others about specific pollution prevention strategies and the possible benefits.
- businesses that implement pollution prevention can reduce the amount of toxic byproducts reaching the environment and at the same time realize significant cost savings that contribute to the economic health of their operations.
- many businesses are very concerned about environmental protection as well as the bottom line and are willing to share successful pollution prevention strategies with other companies.
- a nonregulatory technical assistance agency can be an effective catalyst in encouraging industry and government to work together toward the joint goals of environmental protection and economic competitiveness.

The lasting results of the Merrimack Project include:

- Many companies in the Merrimack watershed adopting pollution prevention strategies, and changing forever the way they approach the environmental issues relating to their operations. The savings in the Merrimack watershed region total an estimated 1.7 million pounds of pollutants, 700,000 of which are directly attributed to technical assistance staff work, and $1.85 million in cost-savings, $1.1 million of which is directly attributed to technical assistance staff work. Very conservative estimation results were used, non-aggregatable results were not counted, and several companies claiming success did not provide number of pounds of pollution prevention and/or dollars saved. Thus actual savings are believed to be much larger.
- The establishment of the Northeast Business Environmental Network Inc. (NBEN), a model nonpartisan business-government network dedicated to promoting pollution prevention as a means of achieving environmental protection and maintaining economic competitiveness, and providing increased sharing of information among businesses and between businesses and government and environmental organizations.

- An improved understanding of pollution prevention opportunities by regional POTWs and MA DEP inspectors, and collaboration among POTWs, the DEP and MA OTA in promoting pollution prevention as the preferred approach to industrial environmental problems.
- The identification of opportunities to incorporate pollution prevention into environmental regulations and policy.
- Increased understanding that environmental improvements need not be at the expense of economic progress.
- Increased awareness by businesses in the Merrimack region of the importance of local natural resources.
- Increased awareness by governmental officials of the point of view of businesspeople who wish to be environmentally friendly.

Appendix A
TRUE TALES OF TECHNICAL ASSISTANCE

Descriptions of On-Site Visits and Results of Work Performed with Companies in the Merrimack River Watershed as of May 1994

The following are detailed descriptions of technical assistance provided to companies in the Merrimack River watershed by the Massachusetts Office of Technical Assistance (OTA). These descriptions illustrate:

- the kinds of problems companies have and what they seek assistance for
- pollution prevention opportunities that are found in the field
- the kinds of recommendations that are made
- the kinds of activities companies actually follow through with after receiving assistance.

These examples are presented to assist anyone wishing to understand in detail how a pollution prevention technical assistance program actually works.

As of May 1994, MA OTA made site visits at 58 companies in the Merrimack watershed region; 15 companies are discussed here. A complete version of "True Tales" describing work with 33 Massachusetts companies and 14 New Hampshire companies can be found in the "The Merrimack Project of the Industrial Pollution Prevention Project," published by U.S. EPA.

MA OTA delivers all of its services under a legislative requirement of confidentiality. The following descriptions of technical assistance work do not identify the company or describe the company product sufficiently to allow identification, except in some cases, where confidentiality has been waived. The technical assistance was provided by OTA's Northeast Team, consisting of Team Leader Ken Soltys and engineers Marina

Gayle and John Flynn. Some case work was performed by previous OTA staffer Anne Reynolds, OTA's technical chief Bill McGowan, and OTA's assistant director Rick Reibstein.

Special thanks go to the staffs of the Greater Lawrence Sanitary District, and the Lowell, Haverhill, Amesbury and Newburyport treatment works, who all enthusiastically supported, and continue to implement, the preventive approach of the Merrimack Project.

Company A is a job shop performing stamping and deep drawing of metal parts. They recently moved to the area, and determined to start out with a cleaner operation. The company was referred to MA OTA by the Greater Lawrence Sanitary District.

Before contacting OTA, the company had decided it would convert from using trichloroethylene (TCE) to an aqueous-based cleanser in its process lines, and close the loop to reuse wastewater. The company sought OTA's help specifically in how to accomplish closed-loop operations, the type of equipment they would need and where to buy it.

After a site visit that included a walkthrough of the firm's processes, the OTA team presented a number of cleaning options, and assisted the company in comparing and evaluating each option. The company chose the Bowden aqueous degreasing system, which is essentially an industrial soap and water washing machine.

In dealing with wastewater, OTA recommended that a simple filtration unit could be fabricated and connected to the effluent from the vibratory tumbler as needed. The unit could be a portable cart-mounted pump and bag filter, with a small holding tank. If cart-mounted, the unit could also be connected to the sander, preventing the need to use the sump/cyclonic filter/settling tank currently in use. OTA also noted that deburring and polishing operations were creating an explosive dust hazard, and recommended wet grinding; however the company cited difficulties with such an equipment switch. Therefore OTA recommended wet scrubbing of exhaust air, and detailed the information necessary for accurate sizing of such equipment - air flow, fan motor horsepower, duct size and length, anticipated particulate loading, particle size, and hours of operation. OTA also provided information on wet scrubber equipment.

OTA further recommended the installation of closed-loop cooling water systems on spot welders and compression molding machines, which have small cooling water needs. A simple recirculator with cooling coils and fan was all that OTA felt was necessary. OTA also recommended an oil/water separator specifically designed for the condensate from air compressors, citing that there was one 250 standard cubic feet per minute compressor in use, and that historically such compressors produce about 25

drums of oily wastewater per year, at an estimated cost of $80 per drum.

Results: This company reports no initial cost savings in switching to a closed-loop system. The firm's engineering manager says the cost of running the aqueous system is about 20 percent higher than the TCE degreasing system because a greater amount of detergent is needed to achieve the same quality of cleaning. However, the firm no longer buys or uses TCE and does not have spent TCE requiring disposal.

In addition, the firm took OTA's suggestion to install an evaporation system, eliminating the need for dumping an acid neutralizing bath, requiring constant monitoring, to the POTW. The monitoring would have cost approximately $2,500/year.

Company B is a manufacturer of microwave components and semiconductors used in wireless communications and the aerospace industry. Since its initial meetings with OTA, this firm has incorporated pollution prevention into its corporate culture, calculated it has saved $8.6 million to date and has eliminated the purchase and use of 81 tons of toxic chemicals. (These figures are not reflected in the main text of the report because they include pounds reduced at company facilities outside of Massachusetts. The dollar savings is a company estimate of the net present value of their program, which is so high partly due to the rapidly rising cost of freon and TCA. In order to maintain a conservative method of estimation of the value of savings under the Merrimack Project, OTA only looked at the value in one year of one year's savings).

One of the firm's manufacturing division chiefs was investigating cleaning alternatives to freon and TCA when he learned of an OTA event called the "Solvents Bazaar", held in Worcester in 1990. Manufacturers and vendors of alternative cleaning systems demonstrated their equipment for about 100 attendees, who brought dirty parts from their factories, so that they could see whether the alternatives worked. The firm's division chief sent a representative, and was impressed enough to call OTA to request a site visit.

The company was in the process of evaluating the effects of freon and TCA cleaning on wire bonding, component attachments, and soldering. Any metallization has an oxide that starts to build immediately, and thus effective cleaning is essential to good manufacturing of circuitry. The original intent of the program was to find supplemental cleaning; it was not expected that replacement cleaning would be found. There was a sense that the program should investigate ozone friendly cleaners, but the program was not focused on environmental issues.

The division chief credits OTA's visits with "enlightening" the company to the concept of cleaning alternatives, the number of alternatives being developed, and the possibili-

ties for success. Through OTA, the firm learned about work being done at IPC, a printed circuit board trade association. As a result of this contact, the division chief developed an ozone depleting substance (ODS) elimination program that incorporated IPC testing recommendations. The company's program included ionographic testing to determine the amount of ionic residue left on a part; chromatography organic residue determination to detect amounts of organic residue and identify particular contaminants; surface insulation resistance, to indicate the electrical performance of a cleaned part; and SEM Auger Surface Analysis, which is electron beam surface probing to characterize the elements of part surface layers. This regime of careful testing was used on a number of identified cleaning alternatives, and provided a careful measure of cleaning effectiveness.

An alcohol and water based material with some surfactants and saponifiers, manufactured by Kyzen Corp., was eventually selected. Other materials were tested, but the Kyzen product far out-distanced all other candidates in this company's program. According to the company representative, Kyzen's cleaner has virtually no flammability problem, which is unusual with alcohol-based preparations; the material has a flash point so close to boiling point that the material doesn't ignite, but boils instead.

The ODS elimination program has been a success, and is seen as greatly enhancing reliability as well as meeting environmental goals. The success of this program, and the 33/50 program, the new Clean Air Act Amendments, and the state's Toxics Use Reduction Act, has led to a much greater emphasis at this company on environmental issues. The division chief moved from manufacturing to become the corporate head of environment. He has instituted a full-scale planning program, based on the process outlined in the state's Toxics Use Reduction Act. This program evaluates each process line at each of the company's facilities in terms of tracking materials in and waste out.

The program is seen as an effort to improve both manufacturing yield and environmental performance, and is called "Process Parameter Optimization." The materials accounting system has generated accurate information about process steps, about points at which materials become waste, about opportunities for pollution prevention at each process step, and information useful for comparing alternatives and prioritizing projects. The division chief has required the program to be followed at the company's facilities in other states, even though they are not under the jurisdiction of the Toxics Use Reduction Act. The division chief organized a company-wide conference on Design for the Environment, and has proved to be a key member in the formation of the Merrimack Business Environmental Network and then the Northeast Business Environmental Network (described elsewhere in this report). Through the Network, he has acted as a resource for many local businesses on compliance with the CAAA requirements for labelling products made with CFCs.

OTA recommendations made to this company at the first series of meetings also concerned investigation of "no clean" options, and as a result the company has installed

some Nitrogen and Hydrogen atmosphere soldering, which is fluxless (there is no oxidation of the metallic parts without oxygen in the atmosphere), eliminating the need for flux cleaning. Other recommendations concerning fluxless solders have not yet panned out, but the company has an aggressive program of investigation and evaluation.

OTA also recommended rearranging work stations for centralized batch cleaning. Because not every degreaser has as yet been eliminated, (although all TCA will be), OTA's recommendations for increasing the freeboard cooling have been implemented.

The division chief has been a speaker at OTA/DEP workshops for TURA reporters, giving the message that careful evaluation of materials use, pollution generation, and alternative options has greatly benefitted the bottom line of his company, and that the law is requiring activities that are just good business.

Results: The firm has set targets for reducing the use of chemicals identified in EPA's 33/50 program. The targets were set using 1988 as a base year, when 154,000 lbs. of these chemicals were used.

As of May 1994, a reduction of 49,000 lbs. of the 17 chemicals on the 33/50 list has been achieved. The target for 1998 is a 123,000 lb. reduction.

In addition, the firm has achieved 90 percent of its ODS elimination program: about 127,500 lbs of freon/TCA have been eliminated. The company expects to completely eliminate the use of all ODSs by the end of 1995.

Through its pollution prevention efforts, the firm has reaped additional benefits, including the ability to begin notifying its customers that all products are manufactured without the use of ODSs, which is expected to lead to increased sales; elimination of the concerns of employees who were working with hazardous chemicals; and reduced toxics use reporting and compliance requirements.

Company C is an electroplater, referred to OTA by counsel of an enforcement agency because the company had substantial violations. This company's case demonstrates how important enforcement programs are to deal with companies that do not take the initiative to properly address environmental issues.

OTA met with the company on a number of occasions, and supplied information to the company's consultant. The company's chemist attended the Merrimack Project workshops on printed circuit boards, water conservation, and electroplating.

OTA noted evidence of extensive spilling of plating chemicals on the shop floor, and

recommended drain boards and changing the layout to avoid dripping of parts. OTA noted a lack of controls on some hazardous wastes and materials, and recommended a materials control system, which would institute chronological ordering of incoming material, refusal of materials in damaged containers, and inventory control cards to log amounts of withdrawal, dates and initials of individuals. The OTA team also advised the company to contact scrap chemical dealers.

Further, OTA recommended improved rinsing to conserve plating chemicals and water. The company officials indicated that they were familiar with all of these ideas, but after extensive discussion it was apparent that the idea of a dead rinse was new to them. (Dead rinse involves rinsing in still water, allowing the rinsed-off metals to accumulate, and using this as makeup for the evaporating plating bath to save on input of metals and drastically reduce metal discharge). OTA provided information on non-cyanide zinc plating (Isobrite), the supplier of which (Allied-Kelite), will share disposal costs with the customer, and will take back spent nickel and chrome solutions.

OTA also pointed out that false bottoms on the plating tanks would allow for tank cleaning without dumping the entire bath. These bottoms can be constructed of screens with a nominal 200 mesh size.

OTA suggested using recirculating bag filters to extend the life of plating baths, and provided a sketch of what such a system would look like. Team members pointed out that above the baths were rusted, dirty overhead pipes, which were potential sources of contamination to the baths. Pipe insulation would address this as well as provide energy savings.

OTA also discussed metal recovery systems with this company, but did not provide extensive information because at this point the company had not proceeded with any previous suggestions.

This case illustrates an important point about the delivery of technical assistance: at some point a technical assistance team has to evaluate the reception of its work, and consider how best to allocate available resources. It appeared that the company was not seriously evaluating OTA's advice. Because the team was receiving numerous requests for assistance from other companies, work with this company was curtailed.

This situation also raises an important point concerning the relationship of enforcement and technical assistance. If a company calls OTA because it is recommended to do so by an enforcing agent, care must be taken by the enforcement agency not to assume that the company is thus implementing pollution prevention. It may not have been the case with this particular company, but this example suggests that a company may use contact with OTA to project the appearance of pursuing P2. If an enforcement agency wishes to give some leeway to companies that pursue P2 as a strategy for

addressing violations, that agency should request evidence of such work directly from the company. If a company is seeking an advantage based on a claim of working with a technical assistance agency, it seems reasonable to ask what recommendations had been received, and what progress has been made. OTA is bound by confidentiality, and thus it is improper for the enforcing agency to refer to OTA and then expect to call this office and find out what is happening with the company. OTA does recommend to companies that have had violations that they volunteer information to the enforcement agency concerning their implementation of P2.

Results: A follow-up phone call made in March 1994 determined that in fact the company had, contrary to our assessment, taken many of the recommendations seriously and addressed some of our concerns. Most of the pollution prevention measures the company adopted were related to improved housekeeping practices, although some changes were made in rinsing techniques and monitoring on the process lines. The company president says that by installing filtering systems and dead rinses as suggested by OTA, the firm reduced chemical use — cyanide, in particular — by 5 to 10 percent.

The president says those same changes have resulted in "tremendous savings" in the firm's waste treatment costs: the company now spends approximately $1,000 a day on waste treatment, a savings of roughly $50 per day — or $13,000 annually — compared to before P2 strategies were adopted.

The company plans in the future to install a water reclamation and reuse system that will reduce water use by approximately one-third, from 15,000 gallons per day to under 10,000 gallons per day. The firm's president says a 10,000 gallon tank is in place, but the company lacks the capital to complete the system at this time. He repeatedly referred to a lack of capital and fines the firm is paying off as the reason for not implementing other P2 suggestions made by OTA.

Company D is Babco Textron, which machines specialty metal parts for the aerospace industry. The company came to the Haverhill workshop for machine shops, and heard a presentation by General Electric on their new, safer coolant (Blazocut), which this company also used. However, General Electric was recycling their coolant and this company was not. After their visit, OTA staff recommended several changes to Babco's cooling system.

The team pointed out that the existing cotton filters would support bacterial growth - and polypropylene filters would not. Also, the cartridge filters being used, once spent, were taking up considerable space, whereas bag filters (less expensive to buy) are collapsible. The company was already buying bag filters for an aqueous degreaser system, and these could be used on the coolant. Most importantly, Babco had on site an ultra-

filtration system, used for treating effluent water from stone tumblers; this could be used to recycle the coolant. However, OTA pointed out that this was just one feasible method for recycling the coolant, and recommended the company contact GE. Babco was subsequently invited to the GE Lynn plant to review the their coolant recycling system. A variation of this system, incorporating phase separation coalescers, was installed. Ultimately, the ultrafiltration unit was used for recycling the water from the stone tumblers, which had been discharged. The company has agreed to share this information with other companies.

It is worth nothing that the environmental manager at this company was responsible for materials management, and this apparently had resulted in a very effective materials management program, reducing the amount of overstocked chemicals, and cutting the variety of chemicals used from 500 to 162. A computerized inventory, which is used to approve chemical purchases, is linked to MSDSs and tracks usage.

Results: Babco had installed an aqueous cleaning system using Blue Gold cleaner (sodium hydroxide based), and ultrasonic agitation, which replaced a TCA degreaser. The company did agree to act as a referral source for other companies considering such a system, and has been willing to demonstrate it, allowing other companies to bring their dirty parts to their facility for cleaning. Babco's Mike Cowell also made a presentation at the 1992 33/50 EPA conference in Framingham.

Babco had a Zyglo nondestructive testing system, which uses florescent dye to detect flaws. The system uses air atomizers for spraying and a garden hose for rinsing. OTA recommended that Babco use high volume low pressure (HVLP) spray guns to apply the Zyglo, that the air atomizers be used for spray rinsing, and that the rinsate be run through the ultrafiltration unit for dewatering. These recommendations were implemented.

The company has since relied on OTA for help in obtaining clarifications of DEP regulations, and has worked with OTA on refinements to its chemical management system.

This company is in Danvers, and not in the Merrimack River system. However, it is included here because work with the company began with their participation in a Merrimack Project workshop, and the firm has provided information and demonstrations to a number of Merrimack companies with which OTA has worked.

Company E is a metal parts manufacturer which contacted OTA after being notified by the local treatment facility that they were exceeding aluminum discharge limits of 2 mg/L. OTA found technical violations with hazardous waste laws, and emphasized the legal risks the company was taking. The treasurer of the company, who assigned himself as environmental coordinator, was attentive to these remarks, and made OTA aware of some actions that he subsequently took to address improper storage.

OTA recommended that a bath no longer used should be eliminated from the cleaning line, and that the available space be used for dead rinses immediately following caustic cleaning and acid baths. OTA also suggested spray rinsing of parts over the process tanks, and designing racking to maximize drainage.

Results: The company did remove the old bath and installed dead rinses, installed bag filters to extend the life of the chemical baths, and also improved its self-monitoring by using a less expensive aluminum testing method that OTA told them about; a Hach DR 100 Colorimeter (OTA also mentioned that similar test kits could be obtained from LaMotte Chemical - staff always try to avoid recommending just one supplier, and preferably recommend three). It is our understanding that these actions resolved the zinc problem.

After implementing OTA's recommendations, the company's aluminum discharge now averages 1.6 to 1.0 mg/L, reduced from the 2.2 to 2.6 mg/L it averaged before the changes. The company president says the effort was made solely for regulatory compliance and says "very little" pollution is being prevented. Because of the changes, he estimated the company saves 10 percent, or $500 annually, on its water bill.

This company was primarily interested in compliance at lowest cost, demonstrating the need to have regulatory limitations as a requirement. The company also serves as an example of how difficult it can be to get some people to recognize indirect or intangible cost savings. This company had savings from: the space that was opened up to other uses after the dead rinse was removed; the extension of the chemical bath life, (which results in less frequent dumping and reduced purchases); and the fact that the POTW was no longer notifying them of violations (worth at least the value of the fine they would have had to pay if they had not rectified the problem, without considering the cost of legal representation or engineering consultation if the problem had continued). None of these were noted by the company, nor did the company consider the amount of pollution prevented to be significant. OTA calculates that in ten years the amount of the discharge reduction that this company achieved would be approximately 200 pounds of metal not entering the waterway.

Company F is Alternate Circuit Technology (ACT), which contacted OTA when its environmental engineering manager, David Unger, took the class for TURA planners at the Toxics Use Reduction Institute (TURI) at the University of Massachusetts at Lowell. TURA requires that toxics use reduction plans by large quantity toxics users be signed by certified TUR planners.

ACT pursued a federal grant to finance installation of an ion-exchange, reverse osmosis (RO) system for recovering metals and reducing water discharge from plating operations. Under this system, rinse waters go to a 25 gallon per minute RO system, recovering all rinsewater except about 2 gallons, which is discharged.

In addition, ACT followed OTA's suggestion for reclamation of etch material, saving the company from disposing of 40,000 gallons of bulk etch annually. ACT purchased an acid reclamation unit that had been the subject of a presentation by Digital Equipment Corporation at the Merrimack Project's printed circuit board workshop held at the University of Massachusetts at Lowell.

Results: David Unger says the firm has not quantified exact savings realized from use of the RO system, but says since it has been in use, there have been "no upsets" in the system operations, and ACT controls and monitors its water quality. He said the discharges to the POTW were cut by 2 million gallons in the first six months of use of the RO system, which should dramatically reduce the $12,000 annually the firm pays in sewer fees. In addition, because of the etch recycling, ACT saves $7,200 annually in disposal costs.

David Unger said he believes hazardous waste generators greatly benefit from easy access to a nonregulatory agency that can walk through the plant and keep information about what they find confidential. "Most people don't know or just forget about compliance details," he says. "No one can afford the fines, and it doesn't do any good to put companies out of business."

Company G is a contract spray painter which contacted OTA after hearing about us at a seminar. OTA conducted a joint walkthrough with NHDES personnel. The team observed an excess of leftover paint, and recommended purchases of reduced quantities. The team also recommended buying base paint and mixing colors as needed, rather than buying colored preparations.

The team also pointed out a number of actions advisable for better compliance with air and hazardous waste regulations. The team suggested that when the company had overstocked paints, it could offer a discount for their use. The team provided information on respirators for use by employees, and recommended and provided information on operator training in the use of protective devices and in proper spray painting techniques. The team discussed improvements to paint gun cleaning operations that would reduce the amounts of solvents used, the use of a dedicated cleaning station, and the use of a waste exchange for leftover paints.

Almost one year later, the DEP urged the company to call OTA after an inspection. DEP told the company that OTA could assist with the calculation of VOC emissions. (OTA engineer John Flynn had presented to DEP air personnel a computer program he developed for making such calculations, and DEP had made an assessment that the program was useful).

OTA assisted the company in understanding how solvent density, formula weights, and other data are used in calculating VOC emissions. Review of MSDS sheets from suppliers revealed inadequacies, and up-to-date information was obtained. The com-

pany has implemented OTA's method of measuring VOC emissions and tracking them by computer.

OTA made many of the same recommendations that had been discussed previously: reducing VOC emissions by employing a gun cleaning station, improving worker training, and investigating electrostatic painting methods (which dramatically increase paint transfer efficiency). OTA provided information on alternatives to the company's methylene chloride phosphating operations, which are another source of VOCs at the plant, noting that aqueous based cleaning/phosphating systems may require a drying step before paint application. OTA sent notes from a teleconference on painting, held in 1992, for which OTA arranged several downlink sites throughout the state.

Results: This company has taken full advantage of OTA's compliance assistance service: OTA basically prepared the firm's air source registrations, bringing it into compliance. In a recent follow-up phone call, the company reports that it has implemented the good housekeeping and improved purchasing practices OTA recommended and has assigned a staff member to monitor hazardous waste storage and handling. A company manager estimates the firm saves $5,000 a year by reduced purchase of thinner, and now purchases higher quality paints, generating less waste and reducing employee exposure to hazardous materials.

Company H is Brush Wellman Inc., a manufacturer of electrical components, which contacted OTA after receiving a multimedia inspection, jointly conducted by DEP and the Newburyport POTW. On the initial visit, this team found minor hazardous waste violations, and recommended the company make use of available technical assistance services.

OTA found the company had a very clean and well run operation, and had already virtually eliminated TCA and dramatically reduced use of Freon. However, the company reported that the aqueous cleaning now in place did create a problem with water spotting on gold plated parts after a final rinsing with deionized water (there had been no spotting with Freon drying). The company was using a rinsing aid called Cerematek. OTA suggested that the spin drying operation could be supplemented or substituted with mild tumbling in a octagonal barrel tumbler filled with ground corn cobs. This should eliminate the spotting and the need for the Cerematek chemical additions. It was pointed out that the corn cob tumbling would likely burnish the gold, and that the company should evaluate whether or not that was desirable to their customers. They were referred to another company, which had agreed to discuss their experience with corn cob tumbling.

The company had already extended the life of baths by changing filters more frequently and reduced evaporation by using floating plastic balls on the bath surfaces. The firm has pursued OTA's advice to further increase bath life by careful monitoring of pH and constant constituent adjustments to maintain the optimal bath operating parameters.

OTA found that the regulatory violations at the company were the result of confusion concerning requirements, and obtained clarification of the issues, which consisted of dating and satellite storage. The company had extensive air monitoring on site, and appeared to be committed to both compliance and preventive activities.

Results: Jean Borgard, Plating Supervisor, credits OTA with helping BW reduce its use of hydrochloric acid nearly 40 percent (from 26,000 lbs/yr to 16,000 lbs/yr), saving the company roughly $35,000 a year in purchasing costs, plus associated savings in reduced wastewater discharges.

In addition, the firm investigated cleaning and drying options identified by OTA that will allow the elimination of the use of Freon 113. According to Borgard, by eliminating the use of freon, BW could save an additional $40,000 or so annually in chemical purchase and waste hauling and disposal costs.

Borgard said OTA provided information on good housekeeping practices regarding the storage and shipment of hazardous waste, keeping the firm in compliance and preventing the possibility of fines for violations.

The plating supervisor said the most helpful service OTA provided was giving BW the opportunity to "benchmark" or compare its operations with other firms and see how others had successfully reduced the use of toxics.

Company I machines aluminum parts, and learned of OTA's services by attending the Machine Shop Workshop in Haverhill. The company needed help with hazardous waste compliance, and selenium discharges. The company's discharges were uncomfortably close to a new limit set by the local POTW. The company did not know where the aluminum was coming from.

OTA had bath samples analyzed by a laboratory, which is a service OTA provides when necessary to identify P2 options. These tests indicated two sites at which selenium was present in significant amounts, the major source being a chemical used for chromate conversion.

OTA recommended the company use a local laundry equipped to handle oily rags, instead of disposing of wipes. The team suggested that using recirculating filters for the acid and caustic process baths would not only keep them clean and extend their life, but also provide movement of the solution, thus increasing their efficiency. (In-tank filters for acid baths would not require expensive out-of-tank teflon construction). The team advised that evaporative losses could be reduced by using tank lids and closing them during periods of non-use, and provided information on floating media covers, (such as that used by company H). Dead rinse tanks (with filters) were also recommended, which could be used as make-up for the preceding evaporative baths, and

could be replenished by overflow from other running rinses. OTA pointed out that spent acid or alkaline solutions could be used for pH adjustment in wastewater treatment, and that heated baths could be insulated.

OTA explained reactive rinsing: that the same tank could be used for rinsing parts from both acidic and alkaline baths, and that alkaline rinsewater could be reused to rinse parts from the acid cleaning, and that this method saves water and affords some neutralization, saving on the addition of treatment chemicals down the line.

Methods for maintaining bath chemistry were also discussed, and the company was given information about monitoring equipment, including a hand-held fast titrater, and inexpensive resistivity sensors for measuring the level of dissolved chemicals. The sensors can be preset for desired levels and can activate horns or lights for warning operators that rinsewaters need to be drained. This method replaces the calendrical method of replacing bath and rinse waters, (where dumping occurs at a set interval), with a method that only sends waters to treatment when necessary.

Results: The team surmised that the company had not implemented many of the elementary prevention techniques summarized above because there is no chemist on staff. The company was also hampered in its progress on these matters by the departure of the person with whom OTA worked. In addition, the company was planning to move, and thus was reluctant to invest in any changes or new equipment. OTA has recently reestablished contact with the company. The company has plans to switch from TCA, an ozone depleter, to TCE. OTA visited the facility to explain the problems and liabilities inherent in using TCE. In the course of this visit, OTA recommended consulting with Babco Textron to observe their ultrasonic aqueous cleaning system, and employed a sniffer to evaluate emissions from their degreaser. There were no significant readings when the degreaser cover was closed, but when it was open there were observable emissions.

At this company, as well as others, OTA observed less than optimal choices being made to eliminate ODSs (ozone depleting substances) in order to avoid the new Clean Air Act requirements for CFC labelling. OTA has observed a number of companies with plans to switch from TCA to TCE. This is ironic because so much effort has been expended attempting to convince companies to abandon the use of TCE and other chlorinated solvents that result in hazardous waste generation, Superfund cleanups, VOC emissions, occupational exposures, and organic contamination of water. It is noteworthy that the EPA's Significant New Alternatives Program does list TCE as a potential substitute for ODS cleaners. OTA is now spending significant energy to convince companies to continue to explore safer ODS alternatives.

The company is also one of many that calls on OTA primarily when it needs assistance with compliance, and which needs considerable hand-holding in order to implement

process changes. This case illustrates the principle that companies are less likely to institute process changes when they do not fully understand the process they are using.

Company J is a manufacturer of semiconductor devices. The local POTW suggested that because they have a low flow operation, they might be able to go to a zero water discharge system, and suggested they contact OTA.

OTA recommended they contact suppliers of ion exchange equipment, and recommended trials of NMP, hexane, and citrus-based cleaners for removing paraffins. The company did contact vendors and obtain prices.

This company's case illustrates the regulatory confusion regarding zero water discharge systems. The POTW has asked OTA to clarify this matter, and OTA has requested clarification from DEP. DEP met with OTA in 1991 and decided eventually to consider the matter on a case-by-case basis. A consensus has recently developed that case by case resolution is insufficient, because companies need clarification before they proceed with capital investments. DEP has reconvened a committee to devise solutions to the "closed loop, closed door" problem. OTA is playing a significant part in this effort, defining technologies for zero water discharge, and proposing policy and regulatory solutions.

Briefly described, the problem with zero waste water technologies is that if a company closes the loop and begins treating or recycling hazardous waste (which they typically do), they may be considered "treating without a license" - a violation of part B Treatment, Storage and Disposal Facility license regulations under RCRA.

It is possible for regulatory authorities to interpret closed-loop operations as no longer having the potential to affect the facility that receives wastewater— the POTW or receiving water— and thus no longer being adequately regulated by another program - the Clean Water Act.

Although one suggested answer to this quandary is for Clean Water Act authorities to issue zero discharge permits, many pretreatment officials have commented to OTA that they are too busy regulating facilities that do discharge to them, to have to worry about facilities that have sealed their drains and discharge nothing.

GLSD has, however, recognized the benefits of zero water discharge facilities, and has issued "zero discharge" permits. The legal value of these permits has not been tested.

Company K is the Frank C. Meyer company, a print shop. Because of its pollution prevention efforts, this company eliminated the generation of 10 drums of hazardous waste

per week, saving $92,000 annually, and installed a wastewater reclamation and reuse system, saving an additional $46,800 per year.

The company initially contacted OTA at the recommendation of the Greater Lawrence Sanitary District, and asked us to help them determine if their tank and machine washing solutions were suitable for drain disposal. OTA obtained information from GLSD on their effluents and compared it to ink analyses submitted by the company's vendors. It was apparent that the source of zinc, copper and lead loadings was the inks themselves, and OTA recommended that since the inks were likely to be insoluble in water, filtration, starting with a five micron bag, would probably solve the problem. OTA recommended techniques for preventing contamination of wash water with ink waste.

After only one month, the company had already instituted new press clean-up procedures which reduced the amount of solids in wash water more than half, and had successfully used press wash water in the make up of black ink. The company had already mounted a small bag filter and pump - OTA recommended increasing its size. By lowering the pH of their wastewater, the company was now precipitating inks. The wastewater was now suitable for discharge.

This case demonstrates that some companies can be inspired to do pollution prevention simply by introduction to the concepts. These companies benefit greatly from the provision of technical assistance.

Company L, a manufacturer of plastic components, was referred to OTA by a DEP inspector. OTA observed that the facility was very clean and operations appeared to be well run, and complimented the company on this.

The company had selected an aqueous cleaning system to replace TCA, and was having trouble obtaining financing.

VOC emissions from cleaning paint guns were one concern, and information on gun washing systems was provided. In-house distillation or off-site recycling of the spent solvent was discussed. OTA provided information on worker training in spray painting, and HVLP spray guns. There was a possibility that electrostatic coating could be used with the plastic parts, but this would mean that a conductive material would have to be applied first. OTA also described the use of "plural component" spray equipment, which mixes paints as needed in the gun: this avoids the batch mixing of paints, which usually results in mixtures left over. This system allows reduced inventories as well as wastes. OTA also provided information on spray booth filters and a computer controlled matching and blending system.

The highest potential for VOC reductions was by switching from VOC based paints to waterbased systems. The company representative told OTA that it was the first time that consideration had been raised, and it was of interest because the company had received letters from customers asking what they intended to do about the Montreal Protocols.

OTA investigated whether some solid waste generated by the process could be used in bituminous concrete as a filler. OTA did propose to the state highway department that the polyurethane material be evaluated for this use.

Some months later, OTA followed up with further recommendations, which focused on "color management" - scheduling light color applications before dark, and dedicating various spray booths for application of particular colors, to reduce the need for line cleaning.

The company wrote OTA a letter thanking the team for their "excellent work" and expressing appreciation for the existence of an agency that one can turn to for "help vs. fines". The company's operations manager (OM) said OTA was extremely helpful in clarifying issues of labelling, handling, and storage of hazardous waste.

Results: In a March 1994 phone call, the OM said the firm installed an aqueous based washing system and as a result reduced its purchase and use of TCA by 85 percent, from 14 tons annually to approximately 2 tons. He estimated savings in the range of $60,000 a year in purchase, reporting fees, and waste handling and disposal. The firm has been unable to convert to 100 percent aqueous cleaning because certain parts require a molding agent that doesn't wash off with water and detergent. The company is continuing to investigate alternative molding agents.

In addition, the company has found an in-mold painting process that allows the elimination of post-mold painting, priming and degreasing. Although the one-coat in-mold paint is a relatively high emitter of VOCs, the firm has found that the reduction in VOCs from the elimination of the post-mold processes more than offsets the emissions from the paint. Only a few parts are currently painted in the new process, but many more are scheduled to be added in the next several months. The operations manager estimates that when the majority of parts are painted through the in-mold process, the company will save 30 percent of the cost of its entire manufacturing process.

Company M is an electroplating shop strongly urged by the local POTW to contact OTA. This company presented OTA with a problem: dangerous conditions were discovered at the site, and the question was, were they dangerous enough to warrant reporting to DEP? The language of TURA says that imminent threats must be reported.

OTA decided to take the following tack: to discuss with the company the fact that it

was considering whether to report them, and that they would not be reported if the dangerous conditions were immediately addressed. The company did address the dangers, and OTA then made weekly visits to the company for a period of a month, with frequent follow up in the months thereafter. OTA conducted training for the company employees, during which it was made clear to them that they could ask OSHA for an inspection if they felt they were working under dangerous conditions at any time in the future. The company owner agreed to this training and allowed us to talk to the employees and solicit information from them, absenting himself from the office while we met with them.

One concern was a sump located below the raw material storage area floor. The opening to the sump was accessible to any liquid chemical spill, and OTA felt that if acids were spilled, they could react with cyanide salts. The company diked the opening.

Another situation consisted of an open top drum of chromic acid which could have been knocked over into a cyanide rinse collection sump. This drum was removed from the area.

A third situation was the storage of sodium metabisulphate next to the chromic acid tank — mixed together, these can yield hydrogen sulfide. This was immediately remedied.

OTA also pointed out an air pack which was blocked from easy access and had no label showing it had been recently checked. This was remedied.

OTA explained that the company's hazardous waste storage practices were not according to the regulations, and these were put in order.

Other recommendations consisted of installing drain boards, countercurrent rinsing, dead rinses, recirculating particulate filters on both process and rinse tanks, use of ultrasonic agitation on cleaning tanks, regular maintenance of process tank chemistries, and monitoring of the tanks, such as by resistivity meters.

On a later visit, the company complained that their conductivity measurement systems were corroding, and staff recommended equipment that would not corrode. OTA consulted with the manufacturer of the cleaner the company was using, and recommended the proper temperature for its use, and reported that the manufacturer asserted it would work much better with agitation, but not aeration (would cause foaming). OTA recommended noncyanide nickel stripping, and looking into alternatives to cadmium and chromium as well, citing the Sanchem Inc. (Chicago) nonchromate aluminum sealant which has been demonstrated to pass corrosion testing.

In its meeting with employees, OTA heard a lot of complaints about indoor air quality. It turned out that the company had once used adequate ventilation, but had removed the system after receiving complaints from neighbors. OTA pointed out in a letter to the president that this merely transferred the problem to his employees, and that they were unanimous in their concern. OTA strongly suggested restoring ventilation, and adding controls, and pursuing methods of eliminating the problem at the source. OTA also pointed out that there were no emergency procedures in place, and the employees knew nothing about emergency response; we included recommendations about implementing these measures.

At the employee meeting, it was mentioned that several years ago the company had engaged in weekly meetings at which plant operations were discussed with all employees. OTA suggested that these meetings be reinstituted, and that the items for discussion should be whatever chemicals were causing a problem for the wastewater treatment operators, the amounts and types of hazardous wastes generated and the reasons why, and the levels of contaminants in the air.

At last contact, the company had installed some drip boards and had erected a partition between an acid and a cyanide tank, but had not pursued any of the other suggestions to our knowledge. This case illustrates the need for vigorous enforcement programs addressing environmental and occupational safety issues.

Company N is IMI Inc., a printed circuit board manufacturer. OTA's visit resulted from a cold call made to the company following up on a letter stating that we had been notified by DEP that the company had received a notice of noncompliance for hazardous waste storage violations.

Noting what seemed like an unnecessarily complicated process, OTA went over the manufacturing steps with the process supervisor in great detail. The supervisor stated that when the company had problems they would often add a corrective step, rather than change the process at the source of the problem. These steps tended to stay in use long after they were necessary.

After the visit, the company contacted the McDermid company, a supplier of chemicals of higher quality than what the company had been using, and a vendor that offers technical support. McDermid went through the company's process line and made recommendations which resulted in the removal of a substantial number of steps - a line that had 50 steps now has approximately half that.

The supervisor was concerned about water use, and stated that the Myron water control was calling for more water than was necessary. OTA called Myron and recommended that the probes be located where the buildup of dissolved solids would be sensed, and that the conductivity settings be higher than the average conductivity of tap water to allow a reasonable buildup.

OTA also recommended switching to deionized water rinsing for final rinses, drip boards, and the use of dead rinses to replace continuous flow rinses. Some dead rinses could be preceded by spray rinses - the combination should be effective for cleaning inside holes.

The company found that operators were unilaterally making changes in the Myron control settings, and have corrected this, leading to a 50 percent reduction in water use.

OTA noted a large quantity of spent etch, and recommended a Sigma Innovation regeneration system (presented by Digital at the Lowell Printed Circuit Board workshop). The company tells OTA it is now "seriously considering" etch recycling equipment.

OTA recommended filtering oxide baths to prolong their life, and the company is also considering this. OTA recommended continuous filtering of an electroless copper bath, and the company has installed this. OTA noted flaking from the ceiling was contaminating a number of baths, and the company states it is currently upgrading the ceiling and is using covers on the baths at night and on weekends.

A referral to John Lott at Dupont concerning spent film material resulted in advice concerning a new type of film and reduced usage of film, which the company has implemented, resulting in reduced spent film disposal.

Results: According to Ron Zangari, in charge of IMI's waste treatment operations, OTA helped IMI in its search for ways to eliminate the use of TCE. The company stopped using TCE in June 1993, eliminating the purchase and use of nearly 8,000 lbs. at a cost of roughly $4,000 per year plus the associated disposal costs. The firm found that by making changes in other parts of its process lines, it could eliminate the need for cleaning the boards with TCE, which also meant the elimination of a 15-minute step in its production process and improved working conditions for employees. "Nobody wants to work around a chemical with such a bad history," Zangari said.

By implementing water conservation measures, such as monitoring rinses and turning them off when not in use, IMI has realized savings in water use and costs. Five years ago, the firm used 220 gallons per square foot of circuit board manufactured; today use is down to 80 gallons per square foot. Zangari said the next step is closing the loop with a full-scale water recycling system, but he doesn't expect that to happen soon. He said the company is rapidly growing and has other priorities for capital expenditures.

If IMI's search for a method of etch regeneration proves successful, the firm's status would change from a large quantity generator (LQG) to a small quantity generator (SQG). The company already recovers copper from the spent etch.

Zangari believes that the extensive paperwork, filing procedures, and fees involved in recycling hazardous waste provide a disincentive for many companies. "It is easier to manifest the waste and ship it off than to apply for recycling permits. The forms and filings and fees make it very complicated — there must be ways around that. They (government regulatory agencies) should make recycling a more attractive alternative."

Company O, a producer of tags and labels, learned about OTA's services from the Massachusetts DEP. Although it used perchlorethylene in its plating process, the company did not have a compliance problem; the environmental manager sought OTA's help in general waste disposal and environmental improvement issues.

After consulting with OTA technical staff, the firm eliminated perc and switched to a non-toxic cleaner called "Solvit" that also is less expensive than perc. The new cleaner costs half of the price of perc ($6/gallon as opposed to $12/gallon for perc) and the firm uses less than half as much (estimated 2,000 lbs/yr as opposed to 5,000 lbs/yr of perc). Thus, the company saves roughly $3,000 a year in chemical costs alone, and has eliminated use of a VOC.

The environmental manager says he sees great benefit in preventing exposure of employees to perc. Although the firm's use of perc was within regulatory guidelines, he knew "perc was bad." "We basically (switched from perc) for the health and safety of our employees. It's just nicer not to have to deal with it." Among other benefits, the firm no longer has to buy special safety gloves at $40 a pair that were issued to employees working with perc, he says.

The environmental manager credits OTA with helping him properly dispose of aging chemicals that had been stored in his plant in addition to steering him toward the non-toxic cleaner. He also said OTA helped him understand his responsibilities as a small quantity generator (SQG) and verified that he was correctly disposing of waste ink.

How Companies in the Merrimack Valley Built a P2 Self-Help Network

Richard Reibstein, Cynthia Barakatt, and George Frantz

The recent growth of nonregulatory technical assistance programs has created a window of opportunity to expand government-industry cooperation. Simultaneously, businesses are supporting each other to improve environmental performance. Recognizing these trends, the Massachusetts Office of Technical Assistance invited twenty manufacturers based in the Merrimack Valley region to form an environmental self-help network for business. The Merrimack Business Environmental Network, started as an experiment two years ago, has evolved into a successful model of government, industry, and community partnership.

THE MASSACHUSETTS OFFICE of Technical Assistance for Toxics Use Reduction (OTA), like government agencies in many states that provide nonregulatory technical assistance, has had to work hard to gain the trust of the business community.

When hazardous waste source reduction specialists from OTA first offered free on-site consultations in 1986, there were few takers from industry. The passage of the state's Toxics Use Reduction Act in 1989, which includes a strong guarantee of confidentiality to anyone working with OTA, helped ease business fears that OTA staff were really regulators in disguise. Still, even with more than one hundred public events, many conferences, and repeated endorsements by business and political leaders, many companies are not sure that government can simultaneously enforce laws and offer useful advice.

Today, the number of businesses working with government agencies to avoid pollution is growing. By the end of 1993, the Massachusetts OTA had provided assistance to more than 400 businesses and industries across the state. OTA has also been a catalyst to help improve the relationships that businesses have with each other. In fact, a key factor driving the growth of nonregulatory technical assistance in the state has been the willingness of companies to share their pollution prevention (P2) strategies with peers.

Seeing the opportunity to further expand its technical assistance efforts by tapping positive trends in business-to-business and government-to-business cooperation, the OTA decided to try an experiment. Typically, nonregulatory assistance is defined as government helping business, but in this instance OTA proposed the creation of a nonpartisan regional business networking organization in which companies, rather than OTA, could take the lead in disseminating technical and management support.

The group would be supported through a federal Environmental Protection Agency (EPA) grant awarded to OTA for innovative pollution prevention strategies in the Merrimack River watershed region in northeastern Massachusetts and southeastern New Hampshire. The organization's primary purpose would be to serve as a self-help resource for business, but members from the government assistance

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programs and the environmental community would also be included.

In the fall of 1992, OTA asked twenty manufacturers based in the Merrimack Valley region to join them in forming the Merrimack Business Environmental Network (MBEN). The New Hampshire Department of Environmental Services' pollution prevention section and the Merrimack River Watershed Council (an interstate nonprofit environmental group) were also invited to become members.

Nearly two years after the first meeting, MBEN has proved to be a resounding success. It has attracted over seventy businesses of all sizes and from many industries. Small metal-finishing companies, international high-technology manufacturers with facilities in the Merrimack Valley (AT&T, Hewlett-Packard, and Tri-Star), a chain of dry cleaning stores, and a wood stain manufacturer are among the network's members. Moreover, an ongoing dialogue outside of workshops and site visits has developed between businesspeople and OTA's technical assistance specialists. And although MBEN maintains a strict pledge to refrain from any political activities, it has become a recognized source of business views on local and regional environmental issues and projects.

How MBEN Works

By consensus, the group first developed the following mission statement:

> The Merrimack Business Environmental Network is a coalition of businesses, agencies and associations which is committed to a shared concern for the Merrimack Valley, its rivers, and the Valley's quality of life. This Association has made a long-term commitment to seek and implement solutions to promote pollution prevention through improved management and technology, while enhancing the economic viability of the business community.

...the MBEN agenda has quickly broadened to address industry's impact on all media and, importantly, economic concerns.

Initially, members focused on how they could better coordinate their efforts to clean up and prevent industrial contamination of the Merrimack Valley's river resources. But the MBEN agenda has quickly broadened to address industry's impact on all media and, importantly, economic concerns.

Corporate members rotate the responsibility of hosting monthly meetings at their facilities. At these meetings, and additional MBEN-sponsored workshops and seminars, business members exchange ideas on compliance management, ways to achieve competitive advantage by getting ahead of the regulations, technical successes with pollution prevention, and other information that will help them deal with day-to-day business challenges.

For example, several MBEN companies were alerted to chlorofluorocarbon (CFC) labeling requirements when Ed Surette, environmental engineering manager at M/A Com Inc., a microwave manufacturing firm in Lowell, brought it to their attention at a meeting. Because of Surette's presentation, many members were well-pre-

pared weeks later when they began receiving letters from clients wanting to know if they used ozone-depleting chemicals in their manufacturing processes. Surette's presentation also motivated many members to begin work on finding alternatives to CFC refrigerants, scheduled to be phased out starting in 1995.

MBEN members also received a preview of the state's training in toxics use reduction planning and were, thus, able to begin the process ahead of schedule.

At another monthly meeting, James Klecak, manufacturing manager at Americraft Carton, Inc., discussed his firm's use of a prototype P2 system that reduces volatile organic compound (VOC) emissions through reduced use of isopropyl alcohol in the printing process. By using an alcohol substitute, Americraft Carton lowered its emissions by several tons and saved thousands of dollars.

The group's first conference was held at a state park on the banks of the Merrimack River. The conference attracted nearly one hundred representatives from regional businesses who came to hear their peers' views on the latest in proven P2 strategies and technologies. Lee Wilmot, environmental manager at Hadco Corp., a New Hampshire-based firm that manufactures printed circuit boards, gave a presentation about a locally-developed (Beverly, Massachusetts) patented process that his firm uses to recover from 60 to 85 percent pure copper from wastewater streams. The system saves copper by recycling it and eliminates the generation of hazardous sludge from this process.

In addition to attending presentations, conference participants had the option of taking an evening boat ride on the river, a ride specifically intended to remind them of the primary resource that MBEN is interested in protecting.

Why a Business Network?

OTA identified two compelling reasons to start MBEN.

Business trusts business

One was the fact that, even though OTA was having some success convincing businesses to listen to its recommendations concerning pollution prevention, it was clear that companies trusted each other more than a government office. At every OTA conference or workshop, industry attendees seemed most responsive to presentations given by local companies. If an OTA representative suggested a way to reduce acid waste by switching from acid dipping to mechanical cleaning of a metal surface, the idea might or might not be well-received. On the other hand, when an employee of a company stood up and said, "This works and this is how we did it," the audience was much more receptive. Lee Dane, who provided source reduction consulting for the state, called this the "Joe down the block syndrome." It has been noticed time and time again.

...industry attendees seemed most responsive to presentations given by local companies.

To make the most of this "syndrome," OTA staff members have

made a point of contributing to the organization as facilitators, rather than leaders, of the group's activities. Staff members from OTA organize and moderate the meetings, but it is MBEN members who determine the agenda and make organizational decisions by consensus.

Different from trade groups

The second factor was the absence of a business organization in the area that was specifically created to bring together companies from many industries with a mutual commitment to environmental excellence and with no other purpose than to share their strategies.

There is an Environmental Business Council in the region that promotes companies that make environmental products or provide environmental services. By contrast, MBEN discourages members from using its events to establish sales contacts. In fact, MBEN does not allow vendors or consultants selling products or services to attend meetings, except by invitation.

Although trade associations also typically serve companies in a specific industry sector, the MBEN membership includes a full spectrum of large and small manufacturers and service businesses.

In this way, MBEN can stick to its mission and its role as a resource for any kind of company that is faced with environmental requirements or has environmental consequences arising from its activities.

...MBEN differs from trade organizations, because it does not engage in lobbying or other political activities.

Most significantly, MBEN differs from trade organizations, because it does not engage in lobbying or other political activities. Although individual members may offer testimony or comment on proposed regulations or legislation, the group as a whole can not.

Strict adherence to political neutrality has been particularly critical to sustain the organization's emphasis on providing a nonpartisan forum in which businesses can informally discuss issues of environmental concern with other firms, government officials, and environmental groups. OTA has made it clear that, if MBEN ever crossed the line to influence the legislature or the public on a vote or policy decision, OTA would be forced to withdraw as a member.

Measures of Success

Getting companies to attend and host monthly meetings and support MBEN's other activities is not easy. The spark that keeps industry's attention in many cases is the kind of information MBEN delivers.

Spotlight on industry

Because of contacts made through MBEN, business members routinely call each other to ask about P2 techniques or check on the reputation of vendors or products. They seem to particularly relish the opportunity to show off what they have done—not only to prevent pollution from manufacturing processes, but also to show the im-

provements in process efficiency. Indeed, putting the spotlight on what other companies are doing has proved to be exactly what corporate members are looking for.

James Klecak of Americraft Carton recalls that, since his presentation on alcohol substitutes to reduce VOCs in his firm's printing process, a number of printers have visited Americraft's plant to see how it works. "We feel we've played a role in helping other printers in the area get involved in pollution prevention," says Klecak.

Performance yardstick

MBEN members have also noted that, by belonging to an alliance of environmentally progressive companies, they can use fellow members as yardsticks against which to measure themselves.

"When you get involved with a group of people who share a lot of the same beliefs, it is easier to evaluate yourself," says Charles Anton, vice president of Anton's Cleaners, a forty-store chain of dry cleaners. "I think I am environmentally responsible, but until I share my ideas and rub elbows with people who feel the same way, I won't know the level I'm really at."

Informal bridge to regulators

OTA has reason to be pleased not only with the number of businesses reached through this program, but also the improved relations between business and government. Companies and the state's twenty technical assistant specialists now routinely exchange phone calls. In addition, OTA P2 specialists have become an informal conduit of information between businesses and the state's regulators, while respecting the TURA provision of business confidentiality.

New Hampshire has also seen benefits from the establishment of MBEN. "It is definitely helping to break down the barriers," says Chris Simmers of the New Hampshire Department of Environmental Services commissioners office. "I believe that MBEN has led to companies feeling more comfortable about contacting us with questions."

This informal, non-threatening link between regulators and the regulated community is... a major attraction of MBEN.

This informal, non-threatening link between regulators and the regulated community is, for many businesses, a major attraction of MBEN. Mark Chrisos, environmental manager for Raytheon's Missile Systems Division in Bedford, said that his previous contact with government officials was only through regulatory inspections. "It is great to be able to exchange information about regulatory issues in a relaxed, casual atmosphere," says Chrisos.

Business links to environmental community

The membership of the Merrimack River Watershed Council has also proved to be beneficial to businesses and the Council. The Watershed Council has co-sponsored several technical workshops with MBEN. At these events and regular meetings, companies are reminded of environmentalists' concerns in protecting the river, and

the Watershed Council gets to meet businesspeople with a strong interest in seeing industrial pollution prevention efforts succeed in the Merrimack River Valley.

A known source for business views

MBEN is becoming known throughout the region and the state. The Massachusetts Executive Office of Environmental Affairs turned to the network when it was looking for business participation in a statewide watershed management conference last fall. And MBEN recently agreed to accept two seats on the management committee of the Merrimack River Initiative (MRI), a two-state, regional comprehensive watershed protection and planning effort led by EPA's Region I office. This was after several unsuccessful tries by MRI to solicit business input on the Initiative.

In addition, MBEN has caught the attention of environmental groups and others interested in working with business on pollution prevention issues. One Salem-based group interested in watershed protection and management has attended MBEN meetings and met with OTA to seek advice on how to set up a similar organization.

The Network's Future

Once the federal EPA grant ends in the fall of 1994, OTA staff support will be curtailed. As a result, MBEN is in the process of becoming an incorporated nonprofit organization to continue its work as a nonpartisan networking organization. The group is expected to derive much of its operating income from membership dues and fees for workshops and seminars. In addition, MBEN plans to solicit grant funding for special projects and is looking into the possibility of finding a "partner" to share office space as well as administrative and overhead costs. The group plans to hire a full-time staff person to coordinate meetings, workshops, and conferences.

It remains to be seen how MBEN will fare after it incorporates. There is no doubt, however, that what began as an experiment has evolved into a working model for building a network of government agencies, businesses, and environmentalists dedicated to protecting the environment. ◆