Final Report

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POLLUTION PREVENTION SUPPORT FOR MULTIMEDIA INSPECTIONS

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U.S. EPA Headquarters

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EXECUTIVE SUMMARY

Multimedia inspections coupled with pollution prevention assistance provide many benefits to business, regulatory agencies and pollution prevention assistance providers. Benefits to the company include less staff time due to fewer inspections and a direct connection to pollution prevention resources. The regulatory agency spends fewer hours overall on inspections because staff are trained in multiple media areas. Pollution prevention assistance services are introduced to companies by regulatory staff, suggesting an imperative for pollution prevention work and opportunity to reduce compliance burden. Pollution prevention assistance providers are introduced to businesses.

The Minnesota Technical Assistance Program (MnTAP) supported the Minnesota Pollution Control Agency (MPCA) in developing a multimedia inspection format, provided pollution prevention assistance to the regulated health care community and achieved pollution prevention results.

Over 18 months, MPCA staff conducted 39 multimedia inspections of hospitals in Greater Minnesota then provided MnTAP's health care specialist with inspection information to facilitate follow up with pollution prevention assistance. Health care was chosen as the pilot for this multimedia inspection project due to increased regulatory oversight of the industry. The health care industry has multiple, complex and often highly regulated wastes including hazardous, infectious and radioactive. Regulatory site visits to Minnesota hospitals in 2003 indicated significant mismanagement of hazardous wastes.

MnTAP received information on 33 MPCA-inspected facilities and followed up with phone calls to 62 different contacts at these facilities. Nearly 43 percent of the facilities were responsive to calls offering assistance. Pharmaceutical waste reduction, especially epinephrine, infectious waste reduction, mercury elimination and chemical risk reduction were the most common areas of concern. This activity lead to pollution prevention site assessments at seven Greater Minnesota facilities and one MnTAP intern project to reduce pharmaceutical waste.

The results of this project indicate multimedia inspections coupled with pollution prevention support minimizes staff time for inspection and improves environmental outcomes. Almost 15 percent of the facilities were able to implement pollution prevention changes during the time of this grant. Those facilities reduced 4850 pounds of waste, plus 7638 grams of mercury, to save $72,800.

INTRODUCTION AND BACKGROUND

Multimedia inspections have the potential to improve environmental outcomes while using staff resources more efficiently. Regulatory inspection staff familiar with multiple media areas--air, waste, water--can conduct multimedia inspections and address compliance issues from each. In addition, regulatory staff can connect companies with pollution prevention staff to conduct follow up pollution prevention assessments.

Pollution prevention, reducing waste at the source, is believed to be the most effective and efficient method to reduce risk to human health and the environment. Industry has many opportunities to use fewer or alternative raw materials to reduce waste or toxicity of the waste. Source reduction can save money, but more importantly, there are fewer or less toxic wastes produced minimizing harm to the environment. Pollution prevention concepts are introduced to business as cost saving and reduction of compliance hassles opportunities.

Multimedia inspections coupled with pollution prevention assistance provide many benefits to business, regulatory agencies and pollution prevention assistance providers. Benefits to the company include less staff time due to fewer inspections and a direct connection to pollution prevention resources. Regulatory agency staff use fewer resources because inspectors are trained in multiple media areas. This is especially valuable due to state budget cuts and the need to do more with less. There can be less need for enforcement because pollution prevention helps reduce waste, thus lowering compliance risk. Pollution prevention assistance services are introduced to companies by regulatory staff, suggesting an imperative for pollution prevention work and opportunity to reduce compliance burden. Pollution prevention assistance providers are introduced to businesses. Finally, there is a greater likelihood of achieving environmental improvements by meeting regulatory requirements and reducing waste.

Regulatory site visits to Minnesota hospitals in 2003 indicated significant mismanagement of hazardous wastes. The health care industry has multiple, complex and often highly regulated wastes including hazardous, infectious and radioactive. In the hazardous waste portion are pharmaceuticals and chemotherapeutic agents, laboratory chemicals, solvents, paints, boiler chemicals, batteries, used oil, disinfectants, sterilants, lead and mercury-containing devices. Some facilities may have more than seventy different hazardous wastes. Most hospitals are now Large Quantity Generators requiring staff training and 90-day hazardous waste storage deadlines. These compliance requirements and high cost of disposal, sometimes involving a $500 per stop pick up charge for Greater Minnesota hospitals, is a significant burden.

Health care was chosen as the pilot for the multimedia inspection project due to an identified need for increased oversight of the industry. The multiple and highly regulated waste streams of the health care industry, emphasis on cost control along with their mission of improving community health, often makes the sector amenable to pollution prevention.

Previous work, Twin Cities Metropolitan Area

Regulatory work coupled with pollution prevention in the health care sector prior to this project is notable. In Minnesota, hazardous waste regulatory oversight has been delegated to the seven Twin Cities metropolitan counties. The Minnesota Pollution Control Agency (MPCA) oversees hazardous waste regulations in the remainder of the state. Pollution prevention assistance for Minnesota businesses is provided by the Minnesota Technical Assistance Program (MnTAP), an outreach program of the University of Minnesota's School of Public Health. Since early 2003, Twin Cities area hospitals have been on notice that inspections were forthcoming. MnTAP assisted Twin Cities area regulatory staff with developing their programs and provided pollution prevention information.

In 2005, 28 Twin Cities hospitals were inspected for hazardous waste violations by metropolitan county staff. Subsequent to the increased regulatory oversight in the Twin Cities area, MnTAP has seen a significant increase in calls for compliance and pollution prevention assistance, and facilities making improvements. Five hospitals implemented formalin distillation. One thousand pounds of mercury and over 62,000 pounds of formalin and hazardous waste have been eliminated. Six facilities have saved $180,000 in purchase and waste disposal costs. Two intern projects were sponsored by MnTAP at metropolitan hospitals subsequent to the regulatory focus.

This report describes the activities, achievements and results, includes a discussion of outcomes and provides suggestions for improving and maintaining a multimedia, pollution prevention inspection program. Outcomes measured include: regulatory staff time saved with a multimedia protocol, number of pollution prevention assessments resulting from the inspections, quantity of pollution prevented and cost savings achieved. The work described in this report was supported by EPA grant X9-83252301, "Pollution Prevention Support for Multimedia Inspections" for the period July 1, 2005 – January 31, 2007.

METHODOLOGY

MPCA has the primary responsibility for regulatory oversight of environmental regulations in Minnesota. Three inspectors from the MPCA were trained internally on multiple media: hazardous waste, air and tanks (a subset of water protection). Additionally MnTAP provided them with information about pollution prevention strategies for the health care sector, including fact sheets and questions for proven pollution prevention techniques; infectious waste reduction, formalin recycling, mercury elimination and ethylene oxide substitution. Pollution prevention and multimedia inspection checklists were created (Appendices A, B, C and D). The inspectors then conducted multi-media inspections of hospitals. After inspection, the inspectors provided MnTAP's health care specialist with copies of inspection checklists and in some cases, copies of inspection notes. MnTAP then followed up with each facility to offer pollution prevention assistance.

MPCA also offered numerous compliance assistance trainings to health care organizations. In addition to providing an overview of regulatory requirements, the trainings provided a short introduction to pollution prevention and MnTAP. MnTAP assisted with the development of this portion of the training.

As part of the increased regulatory focus on the health care sector and integration of multimedia, pollution prevention inspections, MnTAP participated in monthly health care hazardous waste meetings with regulators. MnTAP's health care specialist has twelve years experience working in the health care sector as well as three years experience as a hazardous waste inspector. MnTAP's health care specialist worked with regulatory staff to help them better understand the health care sector, review rules, provide regulatory interpretations and develop fact sheets.

Pollution Prevention Information and Resources Provided at Inspection

The MPCA inspectors referred health care facilities to MnTAP with business cards, fact sheets and/or Web references.

The MnTAP fact sheet *Mercury in Health Care Lab Reagents* was provided to some facilities. This fact sheet assists clinical laboratory staff with identifying whether mercury, usually present as a preservative, is in the reagents they are using. The fact sheet is useful both for hazardous waste evaluation and mercury elimination. <http://www.mntap.umn.edu/health/92-Mercury.htm>

The MnTAP fact sheet *Formalin Recovery in Health Care Labs* was also provided to some facilities. Ten percent formalin, a mixture of formaldehyde (a carcinogen), methanol and water is used as a tissue preservative. Engendering adoption of formalin recovery can be difficult. Used, ten percent formalin is not considered a hazardous waste and, despite its toxicity, is often permitted to be disposed of to the sewer; many hospitals do not implement recycling. Additionally, many smaller hospitals think they do not use formalin in sufficient quantities to make recycling cost effective. Hospitals that have implemented formalin recovery have done so because they acknowledge the environmental risk the formalin poses and the cost savings. <http://www.mntap.umn.edu/health/20-Formalin.htm>

MnTAP's health care Web page <http://mntap.umn.edu/health/index.htm> contains a number of pollution prevention resources and links for the health care sector. In addition to the fact sheets listed above, there are fact sheets for mercury elimination in other areas of the hospital, best management practices for disinfection, reduction of pharmacy waste, linking environmental improvement to accreditation and dental clinic hazardous

waste. In a few cases these fact sheets were offered at inspection to the hospitals, in other cases the hospitals were referred to the Web site.

MnTAP Pollution Prevention Assistance

The pollution prevention assistance provided by MnTAP utilized both MnTAP resources and the tools and recognition programs of Hospitals for a Healthy Environment (H2E). Once a hospital was inspected and the information received by MnTAP, MnTAP's health care specialist followed up via phone call to the contact person/s listed on the inspection forms. Assistance was offered in the form of fact sheets, answering telephone questions or site assessments. MnTAP also provided information on Hospitals for a Healthy Environment's award program for those facilities who indicated work on mercury reduction. Facility staff either requested more information about MnTAP or requested MnTAP fact sheets. Twenty-nine percent (18/62) of the MnTAP calls were not returned.

Telephone calls and emails. MnTAP followed up the 33 multimedia inspection referrals with calls to offer assistance. For most facilities, calls were made to more than one person depending on who was listed on the inspection forms. Of the 62 calls, there were 44 responses from 15 facilities. Total phone and email activity was equal to 137 requests for information or other assistance. Pharmaceutical waste reduction, especially epinephrine, infectious waste reduction, mercury elimination and chemical risk reduction were the most common areas of concern.

Pollution Prevention Site Assessments. Seven pollution prevention site assessments were conducted at health care facilities related to this grant. Technical assistance staff time per assessment averaged 13 hours. Pharmaceutical waste reduction, especially epinephrine, infectious waste reduction, mercury elimination and chemical risk reduction were the most common areas of concern.

Teams. Rice Memorial Hospital and Virginia Regional Medical Center requested MnTAP assistance with their waste reduction teams. MnTAP assisted Rice Memorial's "green team" by providing tools for chemical assessment, environmentally preferable purchasing and formalin distillation. Virginia Regional Medical Center used the information from a pollution prevention site assessment to identify areas of focus for environmental improvement. Both teams continue to use MnTAP as a resource.

Health Care Environmental Awareness and Resource Reduction Team (HEARRT). HEARRT is a partnership between the MPCA and MnTAP. It has quarterly meetings to provide a forum for exchange of environmental and pollution prevention information for health care facilities. As part of the multimedia project, HEARRT also became a venue for health care facilities to discuss compliance issues. It has 165 health care staff members representing 45 facilities on its mailing list. Twenty-five facilities, 12 from Greater Minnesota, on the HEARRT mailing list are actively implementing pollution prevention. During this grant, MnTAP gave presentations on pharmaceutical and infectious waste reduction to HEARRT.

RESULTS

From July 1, 2005 to January 31, 2007, MPCA staff conducted 39 multimedia inspections of hospitals in Greater Minnesota. Greater Minnesota is defined as the geographic area outside of the seven-county Minneapolis/St. Paul region. MnTAP received information on 33 of the MPCA-inspected facilities and followed up with phone calls to 62 different contacts at the 33 facilities. Pollution prevention assessments were conducted at seven Greater Minnesota facilities. One hospital utilized a MnTAP intern to reduce pharmaceutical waste. Table 1 below summarizes the work.

Table 1.

Pollution Prevention Multimedia Inspection Activities in Greater Minnesota	
Hospitals inspected by MPCA using multimedia model	39
Average MPCA time/inspection (includes preparation time, time on site and travel)	8.6 hours
Facilities for which MnTAP received MPCA inspection follow up data	35
MnTAP phone calls to offer assistance	62
Facility contacts responding to calls	44
Facilities responding to calls	15
MnTAP pollution prevention site assessments	7
Facilities to engage in pollution prevention	5
Average MnTAP time per assessment (includes preparation time, time on site, travel and follow up)	13 hours
Facilities implementing pollution prevention suggestions	9
Waste prevented	4850 pounds plus 7638 grams of mercury
Cost savings	$72,800

Nearly 43 percent of the facilities were responsive to calls offering assistance (15 of 35 facilities), while only 20 percent were willing to have a site assessment. Less than 15 percent of the facilities were able to implement pollution prevention changes during the time of this grant.

Cloquet Memorial Hospital was inspected in December 2005. MnTAP contacted them in February 2006 to offer assistance and provide more background on MnTAP's services. In November of 2006, CMH requested a pollution prevention assessment. As a result of the site visit, CMH has eliminated the parts washer in the facilities maintenance department, saving $600 and eliminating 24 gallons of hazardous waste per year. It has also implemented improved infectious waste segregation in the lab saving approximately $1300 annually.

Cook Area Health Services was inspected in January 2006. The costs associated with management of pharmaceutical waste, especially pharmaceutical samples at their clinics prompted them to engage in a MnTAP intern project for summer 2007.

Douglas County Hospital has not been inspected. However, its laboratory staff anticipated a ban on formalin to the sewer due to the increased regulatory oversight and implemented a formalin reclamation system in June 2006. To date they have reduced formalin waste by about 200 gallons per year and are saving $1500.

Falls Memorial Hospital, subsequent to inspection in September 2005, eliminated two mercury reagents in early 2006. This reduced mercury-containing waste by almost 60 gallons per year and saved $1000 in disposal costs.

Hutchinson Area Health Care requested a pollution prevention assessment prior to inspection. They had heard inspections were forthcoming and wanted to be proactive. Subsequent to the assessment, HAHC eliminated all of its remaining mercury, totaling 7553 grams. If these seven items; a mercury barometer, three thermometers and an esophageal dilator set, had been spilled and properly cleaned up, the facility would have spent more than $16,000 (assuming spill clean up costs $1000-$3500 per event). Hutchinson Area Health Care received a 2007 Making Medicine Mercury Free award from H2E.

Rice Memorial Hospital first contacted MnTAP in 2003, subsequent to H2E workshops conducted by MnTAP that same year. Since its hazardous waste inspection in 2006, formalin recycling is planned, potentially eliminating approximately 350 gallons of formalin waste and saving $5400 annually.

St. Joseph's Medical Center requested a pollution prevention assessment prior to inspection in late 2004. It was inspected in August 2005. Subsequent to the inspection, staff at St. Joe's wanted to reduce hazardous waste. They started recycling formalin and Americlear, a flammable solvent, reduced their use of antibacterial soap, reduced wet x-rays and eliminated mercury lab reagents. Thus far recycling formalin and Americlear has eliminated 131 gallons of waste and saved $8200 in purchase and disposal costs. Cost savings due to reduced purchase of x-ray chemicals are $4300 annually. Eliminating one of the mercury containing lab reagents has reduced approximately two gallons of hazardous waste and saved $500.

St. Luke's Hospital had a multimedia inspection conducted in July 2004. St. Luke's requested a pollution prevention assessment after its regulatory inspection and after its return to compliance in July 2005. St. Luke's has eliminated uranyl nitrate, a very toxic lab reagent saving $2800 in disposal costs. It also improved segregation of infectious waste in the laboratory saving an additional $200. St Luke's staff are working to develop an environmentally preferable purchasing program to minimize hazardous waste from entering the facility.

Tri County Hospital had a MnTAP-sponsored intern project summer 2006. The project looked at pharmacy waste and offered recommendations for reduction. Based on the project, TCH reduced its inventory, improved stock rotation and estimates saving $30,000 annually. Also, TCH eliminated the use of 12 gallons per year of phenol, a toxic disinfectant and listed hazardous waste.

Virginia Regional Medical Center was inspected in late 2004 and returned to compliance in 2006. A pollution prevention site assessment was requested in January 2007. As a result of the assessment, VRMC has eliminated two mercury devices, eliminating 85 grams of mercury and potentially saving $6500 if these devices had broken and spilled. VRMC is also implementing a mercury free purchasing program and is considering other environmentally preferable purchasing initiatives such as non- poly-vinyl chloride (PVC) intravenous bags, recycled content paper and elimination of anti-bacterial soaps.

HOSPITALS FOR A HEALTHY ENVIRONMENT (H2E)

Hospitals for a Healthy Environment is a national program designed to provide pollution prevention assistance to the health care sector. H2E was borne out of a memorandum of understanding (MOU) between the U.S. Environmental Protection Agency (EPA) and the American Hospital Association (AHA). The MOU set goals for pollution prevention, including mercury elimination and waste reduction of 50 percent by 2010.

MnTAP was involved with H2E at its inception in 1998. Catherine Zimmer, MnTAP's health care specialist, represented state and local government on H2E's founding board, the Environmental Leadership Council, and chaired two workgroups, chemical and solid waste minimization. The workgroups developed the original pollution prevention plans for health care facilities to use for achieving the goals of H2E. MnTAP continues to use the tools of H2E for its pollution prevention work.

H2E's "Partners for Change" program requires facilities to commit to the goals of H2E. The multimedia inspection project appears to have increased interest in H2E's Partners program. The number of Minnesota health care facilities signed up as H2E Partners has increased from 24 to 35 during this project.

H2E also has an awards program for health care facilities that have met or exceeded environmental performance goals and/or have eliminated 75 percent of their mercury. Three Minnesota facilities won H2E awards during this project.

(For more information on MnTAP's work using H2E tools, see the report *Demonstrating Pollution Prevention (P2) at Healthcare Facilities Using Hospitals for a Healthy Environment (H2E) Product* <www.mntap.umn.edu/health/epareport7-04.pdf>).

DISCUSSION

Staff Time Saved

The results of this project indicate multimedia inspections coupled with pollution prevention support minimizes staff time for inspection and improves environmental outcomes. MPCA staff time for multimedia inspections decreased from an estimate of 20 hours total for individual inspections in the areas of hazardous waste, air and tanks to approximately nine hours for a multimedia inspection. These figures do not include time spent on follow up activities such as enforcement and licensing.

MnTAP staff time for pollution prevention assessments including preparation, travel, time on-site, letter and follow-up averaged about 13 hours per facility. This coupled with the average time MPCA inspectors spent on pollution prevention (41 minutes) provides an estimate of 14 hours per assessment.

MnTAP's reduction in staff time comes from the introduction to pollution prevention by regulatory staff and use of their notes to identify pollution prevention opportunities and speak more succinctly with hospital staff. This was particularly important given the increase of staff time needed for data management discussed below.

Environmental Improvement

All nine of the health care facilities for which MnTAP was able to measure results were prompted to engage in pollution prevention as a result of this project. Four of the nine facilities responded to impending regulatory action by implementing pollution prevention activities. The other five responded to inspections, compliance and disposal costs with waste reduction.

MnTAP's outreach has included quarterly environmental improvement meetings with staff from the health care sector, participation in hazardous waste training, development of resources including fact sheets and Web site and responding to questions on the H2E listserve. It is reasonable to expect other pollution prevention activities have occurred at Minnesota hospitals, but have not been documented.

Increases in Pollution Prevention Activity

One method by which pollution prevention assistance is offered is through phone calls and emails. Pollution prevention activity can be measured by tracking the number of phone calls and emails. Prior to the increased regulatory focus by the metropolitan counties and this project, phone calls and emails averaged less than 200 in 2004. Phone calls and emails increased 13 percent from 2004 to 2006 indicating an increase in pollution prevention interest.

Measuring the amount of waste and costs reduced is the ideal method to measure pollution prevention. Health care waste can have significant health and environmental impacts at the gram, milligram, and even nanogram level (e.g. for mercury and pharmaceuticals), However, reductions tracked in these small units seem to lose significance when amalgamated into collective data recorded in pounds and gallons. Increases in dollars saved due to the increased regulatory activity convey the significant with examples of cost savings increases from $100,000 in 2004 to $228,000 in 2005 and $112,000 in 2006.

Challenges

Facility time lag for interest in pollution prevention

Logic suggested pollution prevention assistance be provided immediately following inspection; experience showed that immediately following and up to 18 months past inspection facilities were not prepared to engage in pollution prevention. Subsequent to inspection facilities were very focused on compliance. Most had not fully evaluated and determined the hazardous wastes in their facilities nor were many of the wastes being properly managed. MPCA's timeline for compliance usually involved a time lag for an enforcement order to be generated, in most cases a Notice of Violation (NOV) and a 60-day response time for the facility. Often, compliance orders involved multiple extensions sometimes lasting over a year. In four cases more significant enforcement action in the form of an Administrative Penalty Order, including financial penalties were levied.

Interestingly, two of those four facilities have requested pollution prevention assistance, but one withdrew its request for assistance once the full impact of the penalty was realized.

The compliance/pollution prevention time lag is illustrated with the following example. Falls Memorial Hospital in International Falls was inspected in October of 2005. While it requested some MnTAP assistance with mercury lab reagent elimination, it did not request a pollution prevention site assessment until April 2007; a time lag of 17 months. The time lag between coming into compliance and engaging in pollution prevention suggests the reason for the relatively low pollution prevention results.

A number of Greater Minnesota hospitals have expressed a future interest in pollution prevention but they are too busy with compliance to work on additional projects. In the next six months, many of the Greater Minnesota hospitals will have made hazardous waste determinations and completed most of their compliance orders. While working to come into compliance, facilities gain a full realization of hazardous waste management, compliance and disposal costs—which can prompt them to look at pollution prevention. With their new hazardous waste data and acknowledgement of costs, MnTAP anticipates more requests for pollution prevention assessments and more implemented pollution prevention activities. MnTAP will continue to follow up with the inspected facilities and conduct pollution prevention site assessments.

Given the time lag between compliance and pollution prevention, MnTAP questioned when to follow up with the inspected facilities. In some cases where MnTAP was able to follow up soon after inspection, staff at the facility had many compliance questions. In other instances, the facilities were interested in pollution prevention but not able to do so at the time.

MnTAP has concluded immediate follow up to inspection is the appropriate. Immediate follow up provides an introduction to pollution prevention concepts and assistance for facilities to consider as they work on compliance. While the time lag may be considerable, 5 of the 15 facilities that responded to MnTAP's calls to offer assistance have engaged in pollution prevention activities.

Protocols for inspections and for pollution prevention follow up

The process did not have well-developed forms or protocols and lacked a schedule for inspectors to send inspection information to MnTAP and for MnTAP to follow up with the facilities. Because this project was a pilot the initial forms and format developed by MnTAP and MPCA pollution prevention staff needed modified over time. When the Hospital Pollution Prevention Form (Appendix A) was determined to be too detailed and burdensome by some of the inspectors, the Healthcare Facility Mulitmedia/P2 Inspection Summary (Appendix B) was developed to replace it. It too, was modified at least once during the project.

Inspectors varied on whether they consistently provided MnTAP with both forms and inspection notes, with how complete the information was and when they would provide the information after an inspection. Having complete information was useful for follow up as it provided a thorough view of a facility's waste and operations and provided a succinct starting point for pollution prevention assistance. Without complete information, MnTAP had to ask numerous questions, often duplicating those at inspection, to assess a baseline waste status.

Inspectors varied in when they provided information to MnTAP after an inspection, ranging from within days or a few weeks to months or more than a year after inspection. When to provide the information and what to provide was not laid out and clearly agreed upon at the beginning of the project. Most of the inspections resulted in an enforcement action, usually in the form of an NOV to the hospital. According to MPCA policy, information about an enforcement case is confidential until the case is closed. This policy resulted in confusion about whether or not inspection forms and notes could be submitted to MnTAP, also resulting in lengthy delays for MnTAP getting inspection information.

As this project is reviewed and fine-tuned, forms will be modified to meet both organizations' needs, a schedule for data submittal should be developed and the questions relating to confidentiality related to enforcement need to be answered.

Data and time management

For MPCA staff, covering two additional media plus pollution prevention adds work to already full loads.

Minnesota has 147 hospitals plus numerous clinics. Hospitals are complex institutions with multiple waste streams. At least nine departments—dialysis, environmental services, facilities/engineering, laboratory, pathology, patient care, pharmacy, radiology and surgery—may generate multiple hazardous wastes. No single entity oversees waste management. Facilities or engineering might oversee hazardous waste, while environmental services manages infectious and solid waste. A safety committee may ultimately coordinate waste management, but each department has control over its procedures and waste generation.

Pollution prevention activities in hospitals are often department specific. For formalin recovery, a contact in the histology lab is needed. A pharmacist is needed to reduce medicinal waste. Eliminating ethylene oxide will take work with surgery staff, and infectious waste reduction may take work with individuals in infection control, safety and environmental services. Contacting, assisting, supporting and following up with activities in a single hospital may involve two to five people. This is labor intensive and also provides data management challenges for the pollution prevention assistance provider. For the 35 hospitals followed up on by MnTAP, 62 individual contact calls were made.

The sheer number of health care facilities, coupled with multiple contacts and multiple waste streams makes data management a big task for a one staff person. Managing data and providing assistance to 33 facilities is unwieldy. MnTAP's healthcare specialist was allotted 15 percent time to work on this project. Often the project took more than 50 percent time. It is anticipated this project will continue in some form with the healthcare sector and possibly other industries. To adequately address pollution prevention assistance to multimedia inspections, more staff time is needed.

CONCLUSION

This 18-month project was successful in piloting the integration of pollution prevention support into multimedia inspections. This pilot project represents a systematic change in the way the MPCA and MnTAP collaborate and do business with respect to regulated parties. MnTAP supported MPCA in the development of a multimedia inspection, provided pollution prevention assistance to the regulated community and achieved pollution prevention results. The results of this project indicate multimedia inspections coupled with pollution prevention support minimize staff time for inspection and improve environmental outcomes. Thirty-nine facilities were inspected, saving an estimated 430 staff hours. Facilities requesting site assessments were provided with 14 hours of direct pollution prevention assistance. Hospitals reduced over two tons of waste and saved $72,800.

Next steps will involve improving the multimedia pollution prevention collaboration between MPCA and MnTAP, defining specific protocols, along with continued assistance to inspected facilities. The Twin Cities metropolitan counties are expanding their regulatory focus to clinics and other health care entities. The increased regulatory focus will continue to provide opportunities for MnTAP to assist other health care facilities who can benefit from implementation of pollution preventing technologies, reduced costs, better use of raw materials, improved employee health and reduced impact on the environment.

APPENDIX A

Hospital Pollution Prevention Form

Facility: _____ Date: _____

Regulating County: _____County Inspector: _____

Beds_____ JCAHO accredited? _____ State Licensed? _____

Most recent survey/inspection date_____

Type of EHS management: _____

Primary Contact: _____Phone _____

Other Regulatory Staff (if any): _____Phone_____

(If there's not sufficient time for some or all P2 questions, then leave as a questionnaire. Provide info to MNTAP for follow up)

General

1. Are you familiar with Hospitals for a Healthy Environment (H2E)?
    a. Are you a Hospitals for a Healthy Environment Partner? Since (date)?
    b. Has this facility won any awards from H2E or other organizations for environmental improvement?
2. Are you familiar with the Healthcare Environmental Awareness and Resource Reduction Team (HEARRT)?
3. Have you used pollution prevention to meet Joint Commission for the Accreditation of Healthcare Organizations (JCAHO) standards for accreditation? In what areas?
    - ☐ minimizing hazardous materials and waste
    - ☐ employee safety
    - ☐ hazardous materials/waste training
    - ☐ minimizing pharmaceutical waste
    - ☐ infectious waste reduction
4. What employee safety or environmental improvement programs or projects are now active?
    - ☑
    - ☑

Resources

Chemical Minimization Plan (H2E) http://www.h2e-online.org/pubs/chemmin/master.pdf
Four Ways to Find Alternative Products (SHP) http://www.sustainablehospitals.org/cgi-bin/DB_Index.cgi
Meeting JCAHO Standards with Pollution Prevention http://www.mntap.umn.edu/health/jcaho.pdf

Hospital Pollution Prevention Form

Mercury - elemental

1. Do you have a mercury management/reduction/elimination program?

2. Have you developed an inventory of mercury-containing equipment?

   Who maintains (name)? Phone number?

3. Have you had any mercury spills in the last year (number)?

   Quantities? How managed (contractor)?

4. Have you set any goals for replacing or retiring mercury-containing equipment?

   Possible suggestions (the more specific and achievable the better)

☐ No new purchases of mercury-containing equipment (sphygmomanometers, esophageal dilators, thermometers, switches, thermostats)?
☐ Replace high-mercury fluorescent lamps and ballasts with lower-content equipment (T-8 or compact fluorescent bulbs)? (Energy efficiency)

Mercury – reagents in labs

5. Do you have a list of mercury-containing reagents you're using?

   By department? Who maintains (name)? Phone number?

6. Do you have centralized materials management and purchasing?

   If not, where are your main control points?

   Who (name)? Phone number?

7. Have you considered/implemented any of the following P2 options?
   - ☐ Non-mercury substitute for B5
   - ☐ Request substitute preservative from suppliers (methyl paraben or propyl paraben rather than thimerosal)
   - ☐ Sodium iodate can substitute for the mercury-oxidizing agent in Hematoxylin and Eosin (H&E) stain
   - ☐ Use ion-selective electrode (ISE) for analysis of chloride instead of colormetric method
   - ☐ Mercury-free (non-merthiolate) polyvinyl alcohol (PVA) is available for O&Ps
   - ☐ Microscale any macro or hand methods?

Mercury in Pharmaceuticals

8. Have mercury-containing pharmaceuticals been identified?

9. Is there a program to eliminate mercury-containing pharmaceuticals where possible?

Resources

- ☑ Hospitals for a Healthy Environment Mercury Elimination Plan www.h2e-online.org/pubs/mercurywaste.pdf
- ☑ Mercury in Health Care Lab Reagents (MnTAP) http://mntap.umn.edu/health/92-Mercury.pdf
- ☑ Mercury in Labs and Pharmacies (MnTAP) www.mntap.umn.edu/health/10a-MercLabs.htm
- ☑ Mercury in Patient Care Areas (MnTAP)www.mntap.umn.edu/health/10c-MercPatient.htm
- ☑ Mercury in Non-Clinical Healthcare Areas (MnTAP) www.mntap.umn.edu/health/10b-MercNonclinic.htm

Hospital Pollution Prevention Form

- ☑ Managing Dental Clinic Waste (MnTAP) http://mntap.umn.edu/health/81-DentalWaste.pdf
- ☑ Mercury in Pharmaceuticals www.premierinc.com/all/safety/resources/mercury/premier_products.jsp

Formalin (37% formaldehyde, methanol, water – diluted 90% with water) - used as fixative in labs; sterilant in dialysis

1. Do you have an inventory of the sources of use for formalin?

   - ☐ Morgue
   - ☐ Surgery
   - ☐ Dialysis
   - ☐ Histology
   - ☐ Pathology
   - ☐ Others?

2. Do you currently have a still or filter system for reclaiming formalin (and perhaps xylene, alcohol)? Location(s)?

   Do they collect from multiple sources? For what areas?

3. How much formalin do you use by departments? Facility-wide?

   Who maintains data (name)? Phone number?

4. IF NO STILLS If >10 gallons used per week, have you considered investing in:

   - ☐ Distillation*
   - ☐ Fractional distillation*
   - ☐ Filtration*
   - ☐ Sequencing options – filtration, then fractional distillation?*
   - ☐ Other reuse/reclaim?
   - ☐ Hiring recycling service?

   *still bottoms, filters, etc may need to be treated as HW, but saves hauling costs, storage space and neutralizer - recycling appears to be less costly (after equipment purchase) than alternatives

5. Fixative options

   - ☑ substitute phenoxy, glyoxal or other compounds
   - ☑ reduce size of specimen containers and amount of formalin to just cover specimens

Resources
Formalin Recovery in Health Care Labs (MnTAP) http://mntap.umn.edu/health/20-Formalin.pdf

Hospital Pollution Prevention Form

Xylene (clearing agent in slide preparation)

1. Do you have an inventory of sources of use for xylene? Histology lab? Pathology lab?
2. How much xylene do you use (volume)?

   Who maintains (name)? Phone number?
3. Have you evaluated alternatives?

   ☐ Americlear (d-limonene, may be distilled)*

   ☐ Histo-solve (iso-alkanes excluding hexane, treated as HW)*

   ☐ Clear-rite 3 (aliphatic hydrocarbon, lower-quality slides)*

   ☐ Others?

   *some process change required (such as changing cover slipping media)
4. Have you evaluated the feasibility of:

   ☐ Distillation*

   ☐ Fractional distillation*

   ☐ Filtration

   ☐ Other reuse/reclaim?

   *still bottoms, filters, etc must be treated as HW

Resources

Solvent Recovery Equipment and Xylene-Free Products (SHP)
http://www.sustainablehospitals.org/cgi-bin/DB_Report.cgi?px=W&rpt=Haz&id=6

Pilot Study of Alternatives to the use of Xylene in a Hospital Histology Laboratory
http://www.h2e-online.org/pubs/news/XyleneAlts.pdf

Ethylene oxide (ETO) – in low-temperature sterilizers (about 50/50 changeover to alternatives?)

1. What kinds of sterilizers do you use?
2. Locations? Central Services? Surgery? Respiratory therapy? Other?
3. Are they in-chamber aeration models?
4. Where does the sterilizers vent?
5. For ETO sterilizers are you aware of any operating limits or control equipment requirements in your air permit for their use? If so, have they driven you to purchase alternative sterilizer technologies? Type? Locations?

Hospital Pollution Prevention Form

6. What size sterilizers do you operate (#)? Table-top? 8.8 cu ft? Larger?
7. How do you purchase ETO? Single-dose cartridge? Cylinders?
8. Have you or your suppliers experienced any accidental releases of ETO in the last 5 years?
9. Have you considered operating procedures to lower ETO use and cycle time?
   - ☐ Lower gas use by 25% by setting temperature to 135 F and increasing time from 2 to 3 hours per load (validate using PVC tubing)
   - ☐ Sterilizing full loads only—use bricks or containers to make full load
   - ☐ Increasing aeration temperature to 135 F max
   - ☐ Pulsing from vacuum to atmospheric and back (>15 minute pulses, with longer intervals at vacuum)
10. Alternatives considered?
    - ☐ Steriflo (new EtO blend with HFC – no ozone-depleting potential) controls flammability and sterilizes faster
    - ☐ Sterrad (sterilizer - $75,000 - plasma phase hydrogen peroxide) – not approved yet for sterilizing some devices like angioscopes, cholecystectomy scopes, surgiscopes, bone flaps, hysterectoscopes, but faster than EtO (especially in aeration cycle) which can mean fewer instrument purchases
    - ☐ Steris (peracetic acid) – just-in-time – items must be used immediately after removal

Resources

Replacing Ethylene Oxide and Glutaraldehyde (EPA) http://www.ciwmb.ca.gov/wpie/Healthcare/EPAEtOGlut.pdf
http://www.sustainablehospitals.org/cgi-bin/DB_Index.cgi

Infectious Waste Reduction

11. What has been done to minimize infectious waste?
    - ☐ Training to improve segregation
    - ☐ Minimize use of disposable items, e.g. sheets, bedpans, emesis basins, drapes, towels
    - ☐ Use of fluid management systems for suction canister waste
    - ☐ Minimize lab sample volumes?
12. Is infectious waste autoclaved or incinerated?

Resources

Suction Canister Waste Reduction mntap.umn.edu/health/91-Canister.htm

APPENDIX B
MN Pollution Control Agency
HEALTHCARE FACILITY MULTIMEDIA/P2 INSPECTION SUMMARY

Facility:_____Date:_____Inspector:_____

Beds_____H2E participant?_____JCAHO survey?_____MDH inspection?_____

Past P2 actions_____

Type of EHS management _____

Facility personnel: _____

(Indicate primary contact, _____

Department or function) _____

Other reg. staff (if any): _____

Time required for inspection: Prep____Travel___On-site HW____On-site other media____

On-site P2_____Follow-up (intended) by activity_____

Priority areas covered:

	Clinical lab	Hist lab	Path lab	Pharm-acy	Onco-logy	Radio-logy	Dental clinic	Morgue	Sterili-zation	Wkshop/ Mainten.	Physical/ Eng'g	Other
HW												
Hg												
Air												
Tanks												

Handed out MnTAP business cards?_____

MnTAP materials? _____Dental Clinics; Managing Waste [81]

_____Disinfection Best Management Practices [73]

_____Meeting JCAHO Standards with Pollution Prevention

_____Mercury in Health Care Lab Reagents [92]

_____Suction Canister Waste Reduction [91]

Findings (noncompliance worthy of LOW or more, priority chemicals, P2 opportunities)

HW issues – chemical, department

Tanks issues

Air issues

P2 opportunities/discussions

Follow-up actions:

Refer to enforcement (which media?)

Send LOW (which issues?)

Require new/corrected reports in LOW?

Any follow-up planned in addition to enforcement?

What timing?

APPENDIX C
MN Pollution Control Agency
Health care Facility Inspection Guide - AIR QUALITY

1.	Does the Facility operate an incinerator?	
2.	Does the Facility have an Air Quality Permit?	Type: #
3.	Has the Facility calculated its PTE? (including **Boilers**, **Furnaces**, **Emergency Generators**)	
4.	Are they in compliance with their permit?	
4.--	All permits: - All records maintained for at least 5 years? - Emission Inventory Reports submitted?	
4.TV	Title V (Part 70) Permits: - Submit Annual Certification? - Submit Semi-annual Deviation Reports? - Meeting Requirements? *(Limits & Requirements, Operators Summary)*	
4.SITF	State Individual Total Facility Permits: - Submit Annual Certification? - Submit Semi-annual Deviation Reports? - Meeting Requirements? *(Limits & Requirements, Operators Summary)*	
4.A	Registration Option A Permits: - PTE is below permit thresholds? - Comply with New Source Performance Standards? - Comply with any other applicable requirements?	
4.C	Registration Option C Permits: - Documents monthly/annual emissions calculations? - Records type and quantity of fuel for each emission unit? - Meets fuel sulfur content limits? - Records sulfur content of each fuel used? - Records hours of operation (if PTE based on hours)? - Maintains vendor certification for each fuel batch?	
4.D	Registration Option D Permits: - Is below Option D thresholds? CO 50T/yr; SO_2 50T/yr NO_X 50T/yr; VOC 50T/yr PM 50T/yr; Lead 0.5T/yr PM_{10a} 50T/yr; HAP_{each} 5T/yr PM_{10na} 25T/yr; HAP_{all} 12.5T/yr	

	- Collects information monthly to calculate emissions? - Documents monthly/annual emissions calculations? - Documents control equipment (if used in calculation)?	

APPENDIX D
MN Pollution Control Agency

Health care Facility Inspection Guide - TANKS

1.	Are [all USTs] and [ASTs >500G] at the Facility registered?	

	For each liquid-containing UST:	Tank #	Tank #	Tank #	Tank #
2.	Installation Date?				
3.	Tank Content:	Fuel Oil Diesel Gasoline Other	Fuel Oil Diesel Gasoline Other	Fuel Oil Diesel Gasoline Other	Fuel Oil Diesel Gasoline Other
4.	Tank Use: Circle ***ALL*** that apply.	Heating Power Fleet Other	Heating Power Fleet Other	Heating Power Fleet Other	Heating Power Fleet Other
5.	IF the tank is used only for heating AND the tank was installed after 08/01/85 THEN the tank and piping require only: **Corrosion Protection**				
6.	IF the tank is used for heating and power AND the content is fuel oil AND the tank was installed after 08/01/85 THEN the tank and piping require only: **Corrosion Protection**				
7.	IF the tank is used for heating and power OR the tank is used only for power AND the content is NOT fuel oil THEN the tank and piping require: **Corrosion Protection** **Spill Containment** **Overfill Protection**				
8.	IF the tank is used for power and fleet OR if the tank is used only for fleet or other				

	THEN the tank and piping require: **Corrosion Protection** **Spill Containment** **Overfill Protection** **Release Detection**				