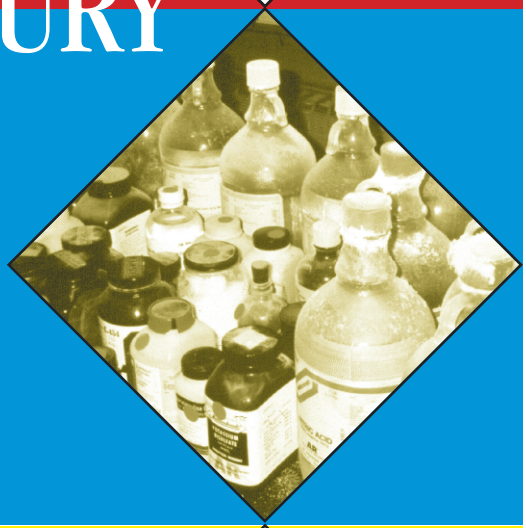
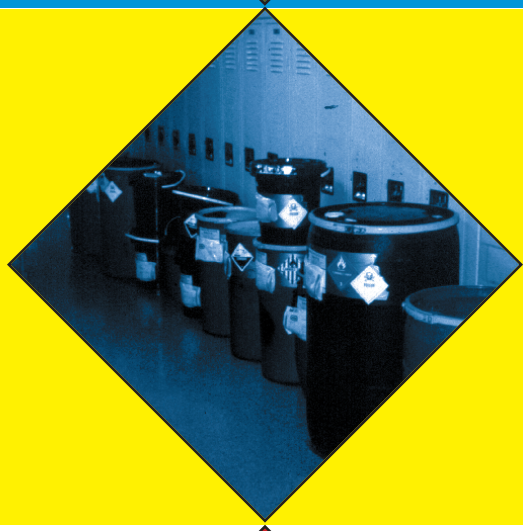
SCHOOL SCIENCE LAB CHEMICAL AND MERCURY CLEAN-OUT PROJECT





Produced by:

Vermont Department of Environmental Conservation

In Association with:

Chittenden Solid Waste District CSWD Comprehensive Waste Management

Association of Vermont Recyclers AVR

Spring 2002

This report was developed by the Vermont Department of Environmental Conservation's Environmental Assistance Division (EAD). The Project was funded by the State Solid Waste Management Assistance Fund (which is supported through a state tax on solid waste disposal).

For additional information or copies, please address all inquires to:

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Waterbury, VT 05671-0411
(802) 241-3472 or Tombe@dec.anr.state.vt.us.

SPRING 2002

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1.0 EXECUTIVE SUMMARY

The Vermont Department of Conservation sponsored and funded a school science laboratory chemical clean-out project in 1999 – 2001 for high schools and middle schools. The main objectives of this project were to:

- Dispose of the current chemicals that were outdated, extremely hazardous or present in excessive quantities.
- Reduce the amount of hazardous chemicals purchased, used and disposed of in school labs.
- Encourage school science labs to remove all mercury compounds and mercury-containing equipment and to discontinue future mercury use.
- Educate science teachers on the proper handling storage and disposal of hazardous chemicals.

Schools were assisted with chemical inventorying (of mercury and other laboratory chemicals), chemical disposal (at no cost to the school), and establishing safe chemical storage systems. In addition to one-time lab chemical cleanouts at participating schools, the program involved teacher training workshops on lab chemical management. Lab chemical management plans describing lab chemical purchase, use and disposal procedures were part of the training and required of all participating schools.

The lab clean-outs were completed at an average cost of $1,100 per school. A total program cost on average per school (including workshops) was $1,450. These costs were kept to a minimum by using state agency staff and the municipal solid waste district staff for packaging and transporting waste off site, as well as waste consolidation at a municipally-owned and operated hazardous waste depot.

Eighty-three middle schools and high schools were cleaned out (representing over 50% of the Vermont student population). Removal of approximately 17,000 pounds of hazardous materials, 3,900 lbs. of non-hazardous materials and 156 pounds of mercury was accomplished as a result of this project.

The project was highly successful and exceeded our initial goals for statewide school participation. The project was more than just a one-time clean-out of school science labs. The training workshops and the requirement for lab chemical management plans should ensure a more lasting effect on proper lab chemical management.

This document includes extensive appendices with brochures, letters, forms, workshop agendas, and lab chemical management plan documents used in this project. We have also discussed the lessons we've learned and insights gained in the project. We hope that this information may be useful to any organizations attempting a similar project.

2.0 BACKGROUND & PROJECT OVERVIEW

BACKGROUND

In 1998, two Vermont schools were closed as a result of mercury releases from vandalism. In 1999, a Vermont school was traced as the source of high levels of cadmium in the local wastewater treatment plant. Many school science labs contain a wide variety of dangerous chemicals that are obsolete, unknown, toxic, reactive, and even explosive. Chemicals are often purchased in excessive amounts, stored incorrectly and disposed of improperly. Many schools do not even maintain lab chemical inventories and are unaware of all chemicals in storage. These practices are placing students, teachers, staff and the environment at risk.

Over the years, Vermont Department of Environmental Conservation (DEC) staff have assisted several schools in lab chemicals sorts and have observed these situations firsthand. Some municipal solid waste districts have also provided disposal assistance to schools but there has never been a focused assistance effort statewide.

PROJECT DESCRIPTION

In order to comprehensively address this problem and the growing concerns about mercury in schools, the Vermont DEC established the *School Science Lab Chemical and Mercury Clean-out Project*. The main objectives of this project were to:

- Dispose of the current chemicals that were outdated, extremely hazardous or present in excessive quantities.
- Reduce the amount of hazardous chemicals purchased, used and disposed of in school labs.
- Encourage school science labs to remove all mercury compounds and mercury-containing equipment and to discontinue future mercury use.
- Educate science teachers on the proper handling storage and disposal of hazardous chemicals.

The project was designed to have a long lasting impact on school science laboratories. Simply doing laboratory clean-outs suggested to us that the problem of chemical stockpiles would recur in the future. We did not want to go back in five or ten years to find that the problem had returned. Our hope was to change behavior by increasing awareness and fostering management commitment. No cost chemical clean-outs and workshops were conducted as an incentive to promote change in chemical purchase, use and disposal habits.

Interested schools initially signed a participation agreement that committed the school to:

1. Assigning a primary contact (science teacher) and a school administrator to attend two training workshops.
2. Eliminating mercury use in the laboratory.

3. Eliminating and disposing of certain dangerous chemicals that have no place in the lab.
4. Developing a Chemical Management Plan to address hazardous waste and chemical management.

In addition to the Participation Agreement, schools were required to pay a participation fee based on student population as follows:

Fee	Student Population
$150	<250
$300	>250 and <1000
$450	>1000

After signing the participation agreement, the school's primary contact and an administrator attended the first of two training workshops. This training covered the basics of operating a safe science laboratory, mercury hazards, and conducting a chemical inventory. After attending this training, schools were tasked with completing a laboratory chemical inventory and generating a list of chemicals for disposal. Some schools were assisted in conducting inventories, while others completed the task unassisted. These chemicals were then removed (usually when school was out of session, including nights, weekends and holiday vacations).

After removal of the chemicals, the school's project coordinator and administrator attended a second training workshop. This second workshop covered indoor air quality in the lab; handling and managing wastes from lab experiments; chemical purchasing procedures; and an introduction to microscale and green chemistry, including techniques, lab exercises and equipment. Teachers were also instructed on the development of a lab Chemical Management Plan through the use of a mock sample plan.

After the second workshop, schools were then tasked with developing and submitting a school specific Chemical Management Plan. Upon completion of the Chemical Management Plans, schools were given a certificate of completion for the project.

PROJECT FUNDING

The project was funded through the State's Solid Waste Management Assistance Fund, which is supported through a state tax on solid waste disposal. The Vermont Agency of Natural Resources allocated $120,000 for the project.

3.0 PROJECT PLANNING AND IMPLEMENTATION

PARTNER ROLES AND RESPONSIBILITIES

DEC partnered with the Chittenden Solid Waste District, Vermont's largest municipal solid waste management district and the Association of Vermont Recyclers, a statewide solid waste education non-profit organization. Both partners were compensated for their time and expenses in project planning and implementation. All three partners met regularly over a six-month period to design the project.

Vermont DEC provided project oversight and management. DEC coordinated the initial meetings with the Vermont Dept. of Education and the statewide associations representing principals, superintendents and school boards, seeking their endorsement and input into project design. DEC provided assistance to teachers in conducting chemical inventories and assisted the Chittenden Solid Waste District in the chemical clean-outs. DEC handled all the administrative aspects of marketing the program to schools, registrations, completion of participation agreements, and following through with schools on completion of all program elements. DEC also made presentations at the workshops and assisted schools in completing their lab Chemical Management Plans on request.

Chittenden Solid Waste District (CSWD) was responsible for handling and disposing of lab chemicals inventoried for disposal. This included sorting chemicals by hazard class, lab packing and transporting chemicals off-site to their state-certified hazardous waste storage depot in Burlington. In addition, CSWD also provided the services of their household hazardous waste transport vehicle (The Rover) and assumed generator status of all the waste chemicals. Chemicals removed from schools were consolidated at CSWD's hazardous waste facility prior to off-site shipment for hazardous waste disposal or treatment. CSWD also assisted with on-site school lab chemical inventories, training of on-site assistance providers in the project, and development of both the chemical inventory forms and the lab Chemical Management Plan.

Other assistance providers in the project included the following:

Association of Vermont Recyclers (AVR) was responsible for the development and logistics of teacher training workshops and assisted with development of the Chemical Management Plan materials.

The Vermont State Police Bomb Squad was instrumental in the handling, removal and proper disposal of shock-sensitive chemicals.

Northeast Kingdom Waste Management District (NEKWMD) provided lab packing and chemical transportation of chemicals for schools in the Northeast Kingdom area of Vermont to the CSWD facility.

Other Vermont Municipal Solid Waste Districts and Alliances were responsible for providing on-site chemical inventory and disposal assistance to schools in their regions.

TRAINING FOR ASSISTANCE PROVIDERS

A one-day train-the-trainer session for assistance providers was conducted to familiarize them with conducting lab chemical inventories in a school setting. The assistance providers trained were recycling and hazardous waste managers for several solid waste districts around the state. An actual chemical inventory was conducted at Lamoille Valley Union High School, using the inventory forms developed for the project. Proper personal protection equipment (supplied) and safety issues were reviewed (such as crystallized and bulging containers). Through first-hand visual and active participation, assistance providers were much more comfortable in conducting chemical inventories and sorts at various schools.

MARKETING THE PROGRAM TO SCHOOLS

A program brochure and cover letter **(Appendix A and B)** was mailed to all Vermont middle and high schools (including school superintendents, principals and school boards). Schools that were interested in the project completed and returned the registration form on the brochure.

PARTICIPATION AGREEMENT AND FEE

All schools that expressed interest (via the completed brochure) were mailed a Participation Agreement ***(Appendix C)*** to sign. This Participation Agreement and the corresponding fee ($250-$450 depending on school population) demonstrated a school's commitment to completing all project elements.

After schools had signed the Participation Agreement[1] , and paid their corresponding fee, they were divided into three groups of 25-30 schools (Round 1, Round 2, and Round 3). The start of the program for each round was staggered six months. Round 1 started with workshop 1, followed by chemical inventories and clean-outs (in the ensuing 3-4 months). Then workshop 2 occurred approximately 6 months after workshop 1. Schools were then given 3 months to develop Chemical Management Plans to complete the program. Round 2 of schools started with workshop 1 during the same month that round 1 received workshop 2. Hence, all clean-outs were completed in Round 1 before round 2 schools started (This cycle was repeated for Round 3).

[1] Clarifications to the original Participation Agreement *(Appendix C)* were developed as questions arose from schools on the intended meaning of the Participation Agreement (Participation Agreement Amendment *Appendix C*). These clarifications included non-laboratory mercury use and elimination, Red Flag listed chemicals, Chemical Management Plan requirements and annual inventory submittal.

FIRST WORKSHOP

The first training workshop covered the following topics: (1) overview of laboratory safety considerations; (2) mercury use in schools; (3) OSHA Hazard Communication and the Laboratory Standard; (4) chemical inventory procedures; (5) safe chemical storage; and (6) chemical spill preparedness and response. See First workshop description in ***Appendix D***.

CHEMICAL INVENTORIES

After completion of the first workshop, teachers and administrators were able to complete a school laboratory chemical assessment. This chemical assessment included a chemical inventory and properly sorting and storing chemicals on shelves. Inventory forms were provided to participating schools in order to assure a complete and accurate inventory of both on-site chemicals and those targeted for disposal (***Appendix E***). Assistance providers, school science teachers and DEC personnel assisted with chemical inventorying, sorting and storing of chemicals.

Many schools still had their chemicals stored alphabetically and throughout individual teachers' classrooms. In order to change this behavior, the Flinn storage guidelines were introduced. Flinn storage guidelines sort chemicals so that there is no chance of reactions between chemicals stored next to one another. It was felt that by going through each individual classroom and storage area, accurate inventories would be completed and proper storage techniques would be addressed. Once an accurate up-to-date chemical inventory was completed, the teachers and DEC personnel reviewed these lists for Red Flag chemicals (included in ***Appendix G,*** the Chemical Management Plan).

Red Flag chemicals were chemicals that were recommended by DEC for reduction or elimination in use due to extreme hazard or toxicity. This list was to be used by the school to critically think about their individual uses of these chemicals and make a determination as to their continued use. From these reviews, and all the chemicals that were unlabeled, expired, hazardous or unwanted, a separate inventory of chemicals targeted for disposal was generated.

This list of targeted chemicals was then marked (via orange dot stickers) so that it would be easier for the individuals conducting the clean-outs to identify and remove chemicals targeted for disposal. This marking system was very effective in reducing the amount of time spent collecting chemicals for disposal.

CHEMICAL CLEAN-OUTS

Disposal inventories were used to determine the number of drums, lab packing supplies and personnel necessary to safely and properly remove these chemicals from each individual school. Chittenden Solid Waste District (CSWD) and the Northeast Kingdom Waste Management District (NEKWMD) conducted the chemical clean-

outs with assistance from DEC. Many of these clean-outs took place on evenings, weekends and holidays in order to prevent any unnecessary chemical exposure to students or staff. Chemicals targeted for disposal were sorted into Department of Transportation hazard classes (flammables, oxidizers, etc.). Sorted chemicals were lab packed and then removed from the school. All removed chemicals were transported to Chittenden's (CSWD) Household Hazardous Waste facility in Burlington, VT for consolidation prior to final hazardous waste destination shipment. The majority of waste chemicals were lab packed and transported in CSWD's certified hazardous waste truck. CSWD's truck, which is a fully licensed and insured hazardous waste truck used primarily for the collection of Household Hazardous Waste (HHW) and Conditionally Exempt Generator (CEG) wastes, dramatically reduced the costs of transportation for the project. Clean Harbors, Inc. conducted one of these chemicals sorts and removal to the CSWD facility. Use of a contractor for clean-outs was used only once during the early stages of the project to assist with a backlog of schools and scheduling problems.

SECOND WORKSHOP

After the disposal of all unwanted chemicals at each school, the science teacher and administrator from each school attended the second workshop with all the schools of their round. Workshop topics included: (1) a summary of clean-out results from the schools in the round; (2) indoor air quality issues in the laboratory; (3) characterizing and handling wastes from laboratory experiments; (4) chemical purchasing strategies to reduce use and waste; (5) overview of the laboratory Chemical Management Plan requirement; and (6) an introduction to microscale and green chemistry. (See workshop details in ***Appendix F.***)

DEVELOPMENT OF A CHEMICAL MANAGEMENT PLAN

After schools attended both workshops, completed their chemical inventory and clean-out, they were tasked with developing and submitting a school-specific Chemical Management Plan (CMP). Schools were provided with guidance and a template (sample plan) for a CMP ***(Appendix G)***.

The major components of the CMP include: an annual review (which calls for schools to review their plan yearly); a policy statement (which states a schools commitment to following the plan); purchasing procedures (to insure that excessive and dangerous chemical purchase is controlled); and on-site chemical management (procedures for chemical storage, inventory, use, waste disposal and spill response).

DEC reviewed and approved plans that were submitted and provided technical assistance to schools as requested in completing the plan.

CERTIFICATION OF COMPLETION

Once a school addressed all of these criteria in a CMP and submitted their school-specific CMP, they were awarded a certificate of completion. This fulfilled all of the requirements of the Participation Agreement.

4.0 PROJECT RESULTS

CHEMICALS REMOVED

The project results are summarized in the table below and a complete chemical disposal table by individual school is in ***Appendix H***.

CLEAN-OUT PROJECTS RESULTS	
Participating Schools	83 Middle & High Schools
Student Population Served	41,906 Students (represents 50% of student population)
Hazardous Chemicals Removed	17,000 Pounds
Non-Hazardous Chemicals Removed	3,900 Pounds
Mercury Removed[1]	625 Pounds (including 156 pounds of elemental mercury)
Cost Per School	$1,100 (per school chemical clean-out) and $1,450 (total program cost per school)

[1]Includes elemental mercury, mercury-added products and mercury-added compounds.

PROJECT COSTS

The total cost for chemical inventorying, lab packing, transportation, and disposal for all three rounds of schools was approximately $92,000. The total cost for all 83 schools to participate in the school clean-out workshops, including printed materials and supplies was under the budgeted $120,000. The lab cleanouts were completed at an average cost of $1,100 per school. An average total program cost per school (including workshops) was $1,450.

5.0 PROJECT CONCLUSIONS AND INSIGHTS

CONCLUSIONS

The School Science Lab Chemical and Mercury Clean-Out Project generally met or exceeded expectations. The project exceeded the goal of cleaning out 75 schools and was completed within the budget for the project. A total of 17,000 pounds of hazardous waste, 3,900 pounds of non-hazardous waste and 625 pounds of mercury, mercury-added products and mercury-added compounds were removed from schools (156 pounds of elemental mercury).

Many of these schools now have trained teachers that are aware of the hazards of the chemicals they purchase, use, store and dispose. In addition, participating schools have disposed of chemicals that are outdated, extremely hazardous or present in excessive quantities. Appropriate chemical storage systems have been set up. These same schools have committed to going mercury-free and developed a Chemical Management Plan. These plans will help schools minimize the purchase and use of hazardous chemicals, prevent the future stockpiling of chemicals and promote sound waste management programs. Schools that rarely or never disposed of hazardous chemicals are now aware of municipal collection programs they can utilize.

The success of our project can be attributed to extensive project planning before the implementation phase and the strong partnership of project implementers who also had the necessary expertise to carry out such a project. Adequate resources were provided, nonetheless careful budget planning and management kept the clean-out costs per school very low. The preventative nature of this project helps to further justify the expenditure of public funds for a project of this nature.

INSIGHTS

In the process of planning and implementing this project, several observations are worth noting and may be of value to others attempting similar projects. These are categorized into Planning, Inventorying, Disposal, Chemical Management Plan, and Future Follow-Up.

PLANNING

- ✓ Project endorsement by the Vermont Department of Education and other school associations was important to legitimize the project to schools. The initial meeting with school leaders at the state level provided valuable information on how to establish contact with schools and to market the program.
- ✓ Local solid waste districts and municipalities were critical to project success. These entities not only provided assistance and helped to market the project, but they also serve as local points of contact for schools in the future for waste management issues.
- ✓ A signed Participation Agreement and participation fees are necessary to ensure a school's commitment to the project.

- ✓ Securing funding prior to project development is important in determining the scope of the project. Although we found ways to reduce the per school cost of the project, most schools were not likely to participate without a large subsidy.
- ✓ Adequate staff time must be allocated to the recruitment phase (follow-up phone calls to non-responders) and to assuring completion of inventories and ultimately the Chemical Management Plans.

INVENTORYING

- ✓ Assistance needs to be provided to schools for on-site chemical inventorying, sorting chemicals by compatibility, and storage area configuration. Some schools will resist or decline assistance in these areas, however, every effort should be made to offer assistance. This ensures that schools thoroughly evaluate their chemical storage practices.
- ✓ Inventory forms must be user friendly, uniform and available on disk or on-line.
- ✓ A deadline for inventory submission must be established. This submission is critical to the clean-out phase, which follows. Schools must do a thorough inventory of their chemicals and make decisions about which chemicals they will retain. A thorough, complete inventory prevents "last minute decisions" and receiving unanticipated chemicals on the clean-out day. This may be a problem if the proper lab packing supplies are not brought to the site.

CHEMICAL DISPOSAL

- ✓ Chemical clean-outs should be conducted after normal school hours, including evenings, weekends and school vacations. This prevents any potential student or staff exposure and provides an ideal work environment (no staff or students to work around).
- ✓ Schools that received technical assistance on inventorying were more likely to "let go" of a chemical that they may have otherwise considered keeping on the shelves.
- ✓ Thorough review of chemical disposal inventories prior to the clean out at a school was necessary to determine the estimated time needed on site as well as supply and packing needs.

CHEMICAL MANAGEMENT PLAN (CMP)

- ✓ The CMP must be provided in an easy-to-follow template with a sample plan.
- ✓ The plan documents should be available on line for download or available on disk. Teachers are extremely busy and don't have time to "reinvent the wheel".
- ✓ Technical assistance to schools during the plan development phase will include reviewing and commenting on their draft plan (which may have inadequacies) or assisting them with specific issues such as handling wastes from experiments and setting up chemical storage areas.

- ✓ A significant amount of time can be spent in getting schools to finally submit an approved plan. However, we felt that it was important to reach closure with each and every school and ensure that project requirements were fulfilled.

FUTURE FOLLOW UP

We plan to maintain contact with schools in the future by sponsoring workshops on specific topics such as microscale chemistry. We will also make staff resources available to help schools with any aspects of lab chemical management on a case-by-case basis. Periodic fact sheets or bulletins are being considered. These efforts will serve as a reminder to schools of the importance of lab chemical management.

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APPENDIX A

School Science Lab
Chemical & Mercury Clean-Out
Project Brochure

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ARE YOUR SCHOOL LABORATORIES HAZARDOUS WASTE SITES?

The State of Vermont Has Money to Help You!

School Science Lab
Chemical and Mercury
Clean-Out Project

School Science Lab Chemical and Mercury Clean-Out Project

A one-time school science lab chemical and mercury clean-out project for all Vermont middle and secondary schools is being offered by the Agency of Natural Resources (ANR) in cooperation with Vermont Solid Waste Districts, Alliances and the Association of Vermont Recyclers(AVR). Funding is available through a generous grant from ANR to assist schools with the clean-out, management and disposal of unwanted and dangerous laboratory chemicals. This project includes the inventory and disposal of laboratory chemicals and training school staff to properly manage hazardous materials in the future.

Why Is It Important For My School To Participate?

In 1998, two Vermont schools had to close as a result of mercury spills. This year, a school was traced as the source of high levels of cadmium (a heavy metal) that showed up at the local wastewater treatment plant. There exists a myth in the community that schools contain "limited" quantities of hazardous materials. This is wrong. Many schools contain a wide variety of dangerous chemicals that are obsolete, inappropriate, unknown, toxic, reactive, and even explosive. Often these chemicals are being purchased in excessive amounts, stored incorrectly, and disposed of improperly.

These practices are putting students, teachers, staff, and the environment at great risk.

What Will Participating Schools Have To Do?

Because ANR is funding the removal of your unwanted or dangerous chemicals, we need a commitment on your part to ensure that chemical management and safe disposal will be priorities in your school science labs in the future. Participating schools must agree to meet the following criteria during the school clean-out project:

- Assign a primary contact responsible for this project at your school. This person will assist with inventorying lab chemicals and aid in the adoption and implementation of a laboratory chemical management plan.
- The primary contact and one school administrator must attend two all-day training workshops concerning how to conduct a chemical inventory, lab safety, chemical spill response, safe handling and storage of chemicals, how to implement a laboratory chemical management plan, purchasing less hazardous lab materials, less toxic science lab curricula, and more.
- Commit to going "mercury- free" school-wide by Fall 2001. (Not including fixed thermostats and fluorescent light bulbs.)
- Commit to eliminating the use of certain toxic or high hazard laboratory chemicals.
- Dispose of all unlabeled, expired and high hazard or toxic chemicals.
- Include a line item in your budget each year for hazardous waste disposal.
- Implement a chemical management plan for your science laboratories.
- Pay a participation fee based on student population. ***Note: These fees are minimal compared to the high costs of hazardous waste disposal.***
- Sign a participating agreement stating your commitment to follow the project criteria.

Fee	Student Population
$150	< 250
$300	>250 and <1000
$450	>1000

How Can My School Participate In This Project?

If your school would like to participate, fill out the pre-registration form below and mail it back to ANR by **July 1, 1999**. Someone will contact you soon after receiving this form to discuss the project in more detail. Sschools will not be "officially registered" for the program until the participation agreement is signed and mailed back to ANR along with the participation fee no later than August 27, 1999. Funding is limited and schools are encouraged to register as soom as possible. To pre-register fill out this form and mail or fax to:

School Clean-out Project
Environmental Assistance Division
Agency of Natural Resources
103 South Main Street
Waterbury VT 05671-0411
Fax: (802) 241-3273
Email: Tombe@dec.anr.state.vt.us

☑ Yes, our school would like to participate in the Lab Chemical Clean-Out Project

School Name _____

School District _____

Contact Person _____

Mailing Address _____

_____

Telephone Number _____

Fax Number _____

E-Mail Address _____

Student Population _____

How Can I Get More Information?

If you have any questions regarding this project or your school's particpation, please contact your local solid waste district, alliance or the Agency of Natural Resources. Schools that are in towns that do not belong to a solid waste district or alliance should call the Agency of Natural Resources.

Agency of Natural Resources
Gary Gulka 802-241-3626

Addison County Solid Waste District
Laura Routh 802-388-2333

Central Vermont Solid Waste District
Deb Fyffe 802-479-4363

Chittenden Solid Waste District
Jen Holliday 802-872-8100 X223

Greater Upper Valley Solid Waste District
Sami Izzo 802-649-2610

Lamoille Regional Solid Waste District
Joyce Majors 802-888-7317

Mad River Solid Waste Alliance
John Malter 802-244-7373

Northeast Kingdom Waste Mgmt District
Alan Pultyniewicz 802-626-3532

Northwest VT Solid Waste District
Mike Loner 802-524-5986

Rutland Area Non-district Towns JMSC/SWAC
Pam Clapp 802-235-2710

Rutland County Solid Waste District
Steve Parker 802-775-7209

St. Johnsbury (WSI)
Jane Southworth 802-254-8698

Windham Solid Waste District
Cindy Sterling 802-257-0272

Association of VT Recyclers (for workshops)
Lauren Traister 802-229-1833

APPENDIX B

Secretary's Letter for Participation

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State of Vermont

Agency of Natural Resources
Department of Environmental Conservation
Environmental Assistance Division
103 South Main Street
Waterbury, VT 05671-0411
802-241-3455

May 18, 1999

Subject: School Science Lab Chemical and Mercury Clean-Out Project

Dear Vermont School Superintendents:

The Agency of Natural Resources, together with the state's Solid Waste Management Districts and Alliances and the Association of Vermont Recyclers (AVR), is offering a *School Science Lab Chemical and Mercury Clean-Out Project,* beginning this fall. For a limited time, funding is available for inventory and disposal unwanted and dangerous science laboratory chemicals and training of school staff in proper and safe lab chemical management. *Since funding is limited, I urge you to review the enclosed materials promptly and consider enlisting your secondary schools in the project.* A mail-back pre-registration form is included in the enclosed brochure, which should be returned to the Agency of Natural Resources by **July 1, 1999.**

The objectives of the Clean-out Project are to:

- Make our science classrooms and labs a safer place for students, faculty and staff

- Eliminate mercury and mercury compounds from secondary schools

- Remove unused, expired, and unknown lab chemicals from storage closest and classrooms

- Train school staff on proper chemical purchasing, use, inventorying, storage and disposal

Participating schools will agree to assign a primary coordinator, attend two training sessions, assist with conducting a laboratory chemical inventory, and adopt and implement a laboratory chemical management plan to minimize future risks. Proper disposal of all unwanted chemicals will be transported and disposed through participating Solid Waste Districts and Alliances. Schools will also agree to pay a participation fee based on school size. (Note: disposal costs generally average $1500-$2500 but can go much higher). The enclosed brochure and Participation Agreement more fully describe the program.

To guarantee enrollment in the project, the pre-registration form on the brochure should be sent to the Agency by **July 1, 1999** and a signed Participation Agreement and fee by **August 27, 1999.** Your school will then be notified of the schedule for training and inventory/cleanout. For further information on the project please contact Gary Gulka at the Vermont Agency of Natural Resources (241-3626) or Jen Holliday at Chittenden Solid Waste Mgmt. District (872-8100).

Sincerely,

John Kassel

Secretary, Vermont Agency of Natural Resources

cc: Vermont Secondary School Principals and Science Teachers, Vermont Principals Association, Vermont School Boards Association, VT Dept. of Education

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APPENDIX C

Participation Agreement
and
Clarifying Amendment

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AGENCY OF NATURAL RESOURCES

SCHOOL SCIENCE LAB CHEMICAL AND MERCURY CLEAN-OUT PROJECT

The Vermont Agency of Natural Resources, in cooperation with Vermont's Solid Waste Management Districts and Alliances and the Association of Vermont Recyclers (AVR) will conduct a laboratory chemical and mercury clean-out project at participating middle and secondary schools in Vermont. The objectives of the project are to eliminate mercury and mercury compounds from school laboratories; remove unused and expired hazardous chemicals; and provide school staff with training on proper chemical purchase, use, storage, and disposal with a focus on reducing the use of chemicals and the generation of waste.

PARTICIPATION AGREEMENT

Each participating school agrees to the following:

1. The school shall designate a primary contact/coordinator for the project who has knowledge of laboratory chemical use at the school and will participate in training, lab chemical inventory, and aid in adoption and implementation of a laboratory chemical management plan under the direction of the project sponsors.

2. The primary contact for the school and one school administrator (with policy and purchasing authority) must attend two training workshops on laboratory chemical management that are a component of this project.

3. The school shall remove all mercury and mercury compounds from its laboratories and storage areas and agrees that it shall not purchase mercury compounds. This includes mercury- containing scientific instruments (thermometers, gauges, etc.) The school also agrees to eliminate mercury-containing devices, where technically and economically feasible to do so, in thermostats, switches, and medical devices present on school property within three years from the date of this agreement.

4. The school shall restrict the purchase and use of potentially unstable, carcinogenic, mutagenic, toxic and reactive chemicals. A list of restricted laboratory chemicals for purchase and use will be developed in consultation with the Vermont Dept. Of Education, science teachers, health and environmental professionals and may be amended from time to time.

5. Dispose of all unlabeled, unknown, expired and excess laboratory chemicals, including those on the restricted chemical list.

6. Adopt and implement a laboratory chemical management plan with assistance and guidance provided by the project sponsors. The plan shall include policies and practices for purchase, use, storage and disposal of hazardous laboratory chemicals.

7. Conduct an annual lab chemical inventory and provide for disposal of laboratory chemicals, with an annual budget line item for hazardous waste disposal.

8. Commit to ongoing training of faculty and staff in hazardous materials management.

9. Commit to payment of a participation fee based on school size as follows:

    - $150 student population of 250 or less
    - $300 student population of 250-1000
    - $450 student population greater than 1000

The undersigned agrees to perform in accordance with this Participation Agreement for the designated school. Any school failing to meet the above commitments will be responsible and liable for full reimbursement of laboratory chemical disposal costs incurred in the project.

Signature of School Administrator _____ Date _____

Name (Print or Type) _____ Phone _____

Title _____

Participating School _____

Primary Contact Name _____

Phone _____

Please send this form to the Agency of Natural Resources at the following address no later than **August 27, 1999** to guarantee enrollment in the project.

School Clean-Out Project
Environmental Assistance Division
Attn: **Tom Benoit**
103 South Main Street
Laundry Building
Waterbury, VT 05671-0411

AGENCY OF NATURAL RESOURCES

SCHOOL SCIENCE LAB CHEMICAL AND MERCURY CLEAN-OUT PROJECT

CLARIFICATIONS TO THE PARTICIPATION AGREEMENT

The following are clarifications to the Participation Agreement for the School Science Lab Chemical and Mercury Clean-Out Project.

Item 3: It is the intention of the project to virtually eliminate the use of mercury and mercury compounds in school science laboratories. We believe that this is a prudent laboratory practice and one that would be strongly supported by parents, school boards and community members. However, in situations where a science teacher finds the use of mercury or mercury compounds essential to the educational program, and the school administration is aware of this use, then such use is allowable under this agreement.

Item 5: This item states that the participating school shall dispose of all unknown, expired, and excess laboratory chemicals, *including those on the restricted chemical list*. In place of a restricted chemical list is the *Red Flag* Chemical List. Schools are not required as a part of this Agreement to dispose of all current stocks of these listed chemicals nor to eliminate all future purchases. However, schools should strongly consider minimizing or eliminating the purchase and use of these chemicals wherever possible, and reducing unnecessary or excessive amounts of these chemicals through this clean-out program.

Item 6: The required *laboratory chemical management plan* of the Agreement is not the equivalent of a Chemical Hygiene Plan, which may be required under Occupational Safety and Health Regulations, although it may address some of the same elements. A template for this plan will be prepared by the project sponsors and presented to project participants at the second training session. This plan template will include required core elements for this program, such as chemical purchase, use, storage, inventory and disposal. In addition, we hope to include in this template the elements of a complete chemical hygiene plan that can be used to meet OSHA requirements, if individual schools choose to do so.

Item 7: Annual chemical inventories required by this program are for the school's own use. An annual inventory should be performed but it is not necessary that the inventory be submitted. The project sponsors will assist schools in determining what an appropriate budget amount is for hazardous waste chemical disposal. It should not be necessary to have a budget for hazardous waste disposal *every year*. With proper chemical management, disposal should be necessary only every few years. In many cases the budgeted amount should be minimal compared to the costs of a one-time clean-out that covers many years of accumulation.

Item 8: This Agreement is a commitment on the part of the school to participate in ongoing training. The project sponsors will make every effort to find and offer continuous low-cost training for school staff in hazardous materials management.

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APPENDIX D

First Workshop
Agenda and Summary

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School Science Lab Chemical and Mercury Clean-Out Project

Participant Training Session I

8:30 - 9:00 am	Registration and Coffee
9:00 - 9:15 am	Welcome/Opening Remarks
	Lauren Traister, Association of Vermont Recyclers
	Gary Gulka, Vermont Agency of Natural Resources
9:15 - 10:15 am	Is Your School Laboratory a Hazardous Waste Site?
	Dr. Ken Roy, Director of Science and Safety, Glastonbury (CT) Public Schools
10:15 - 10:30 am	Coffee Break
10:30 - 11:00 am	Mercury in Schools
	William Bress, Ph.D., Vermont Department of Health
11:00 - 12:00 pm	OSHA Hazard Communication and Laboratory Standard
	Dr. Ken Roy, Director of Science and Safety, Glastonbury (CT) Public Schools
12:00 - 1:00 pm	Lunch
1:00 - 1:20 pm	How to Conduct a Chemical Inventory: Project Specifics
	Jen Holliday, Chittenden Solid Waste District
1:20 - 2:15 pm	Safe Chemical Storage
	John Miller, Vermont Agency of Natural Resources
	Rich St. Gelais, University of Vermont
2:15 - 2:45 pm	Chemical Spill Pre-Planning and Response
	Barry Clayton, Industrial Hygienics Corporation
2:45 - 3:00 pm	Break
3:00 - 3:30 pm	Participation Agreement: What Happens Now
	Gary Gulka, Vermont Agency of Natural Resources
3:30 - 3:45 pm	Topics for Participant Training Session II / Final Questions
	Lauren Traister, Association of Vermont Recyclers

1ST WORKSHOP SUMMARY

The first workshop was approximately 8 hours long and covered how to determine if your school laboratory is a hazardous waste site, mercury in schools, OSHA hazard communication and laboratory standard, how to conduct a chemical inventory, safe chemical storage, and chemical spill planning and response. The topic's summaries are below:

-How to determine if you school laboratory is a hazardous waste site.

Dr. Ken Roy, Director of Science and Safety at the Glastonbury (CT) Public Schools gave a presentation that covered how to determine lab specific hazards, starting with the definition of a laboratory.

> *"Laboratory means a facility where the laboratory use of hazardous chemicals occurs. It is a workplace where relative small quantities of hazardous chemicals are used on a non-production basis."*[3]

Also covered is what constitutes a chemical hazard.

> *"A chemical hazard by Occupational Safety and Health Administration (OSHA) definition is cancer-causing, toxic, corrosive, an irritant, a strong sensitizer, flammable, or reactive, and thus poses a threat to your health and the environment; It is listed in OSHA Act; It has an assigned threshold limit value (TLV) by the American Conference of Government Hygienists (ACGIH)."*[3]

Dr. Roy's presentation also covered the following lab specific hazards:

- Indoor Air quality, such as the ventilation system, including air supply/return lines, fumes hoods and other physical parameters (as well as Bioaerosols).
- Water quality issues such as radon, lead, copper, nitrates, and methane gas in water supplies and how this affects eyewash stations and emergency showers. Dr. Roy also emphasized the need and legal requirement for eyewash stations and emergency showers.
- Electricity needs and issues. This includes the need for Ground Fault Interrupters (GFI) and other electrical safety precautions to prevent electrocution.
- Heavy metals in common lab apparatuses, such as thermometers, fluorescent bulbs, barometers and various chemical reagents.
- Asbestos, such as in old floors, laboratory bench tops and in certain burners pads.
- Chemicals. Specifically addressing the storage of laboratory chemicals including; the location and access control of the storeroom, storage cabinets and unacceptable storage areas, like desk drawers, hoods, countertops, etc.

- Personal Protective equipment. This included the used of latex gloves and potential for reactions, which safety glasses are laboratory approved and lab aprons.

- Radiation. Including radioactive materials ionizing and non-ionizing.

- Biohazards. This covered microbes such as mold and mildew as well as blood borne pathogens.

- External factors affecting the laboratory were also covered. These included roofing, oil based paints and painting, custodial chemicals and cleaning equipment, such as propane buffers.

Dr. Roy summed it all up by saying that only through "Awareness, Assessment and Action can a school maintain a safe and productive school laboratory." [3]

-Mercury in Schools.
William Bress, PH.D. of the Vermont Department of Health gave Vermont specific examples of mercury spills and exposures. This included a spill of mercury in high school's bathroom. This mercury was taken from the science laboratory by a student, and scattered throughout the boy's bathroom. The spill was a perfect example, where everything that could go wrong went wrong. Students were sent home after the spill was discovered in the boy's bathroom. Students then carried the mercury throughout the school, buses and ultimately several private residences. Mr. Bress stated that the area of the spill was not contained nor were the contaminated areas closed of to prevent further spread of the mercury throughout the school.

As a result, the school was closed for several weeks, buses and private homes had to be decontaminated and costs were extremely high. In addition, individual possessions were handled as mercury contaminated waste and several people had to be screened for the possibility of mercury overexposure. Mr. Bress also covered common items and places that mercury is found, the health affects of mercury (both chronic and acute), who is at the greatest risk and several ways to avoid mercury exposure.

-OSHA Hazard Communication and Laboratory Standard.
Dr. Ken Roy, Director of Science and Safety at the Glastonbury (CT) Public Schools explained the OSHA Hazard Communication and Laboratory Standard, how it applies to school laboratories and what needs to be done. The OSHA Hazard Communication and Laboratory Standard has the following basic elements:

- "The standard covers any employee who is engaged in the laboratory use of hazardous chemicals on a laboratory scale (as opposed to an industrial level). Most science teachers in middle and high schools are classified under this application."[4]

- The standard covers Permissible exposure Limits (PELs) and how to determine employee exposure. This requires employers to measure employee exposure to certain chemicals if the PEL is exceeded. It in fact provides monitoring and record keeping standards and requires employee notification of the results.

- Employee Information and Training. This element states that employees must be made aware of the hazards in the laboratory and provided training for these chemicals and any new chemicals. This must include at a minimum; methods to detect the presence of hazardous chemicals, physical and chemical hazards in the laboratory/work area, hazard identification system (National Fire Protection Act), Material Safety Data Sheets (MSDSs) and emergency procedures, work practices, and protective equipment.

- The employer is required to appoint a chemical hygiene officer to develop and implement a Chemical Hygiene Plan (CHP) covering the following:

    i. Standard operating procedure for laboratory operation that all employees are required to follow

    ii. Requirements that fume hoods and other protective equipment are functioning properly, within guidelines and have a maintenance program.

    iii. Provisions for employee information and training, including how often and what type of training (i.e., safety, chemical, etc.)

    iv. Any special circumstance that require prior approval, including protocols for special or new laboratory procedures.

    v. Provisions for medical consultation and examination, including a procedure that has been established to provide for medical assistance in the event of a chemical exposure or incident.

    vi. Designation of personnel responsible for implementation of the CHP including the Chemical Hygiene officer (CHO) and Chemical Hygiene Committee (if appropriate). These people must be qualified by training or experience to provide technical guidance in the development and implementation of the CHP. These people are usually chemistry teachers, department heads or laboratory technicians.

    vii. Provisions for employee protection when dealing with particularly hazardous substances (i.e., reproductive toxins, carcinogens, etc.)

-How to conduct a chemical inventory.

Jen Holliday of the Chittenden Solid Waste District explained that there are two reasons for doing an inventory of all laboratory chemicals in a school. The first is simply for the school to have an accurate inventory of chemicals in storage and the second is to provide the solid waste districts responsible for transporting unwanted chemicals enough information to safely and legally transport the material.

Two spreadsheets, one for chemical to be disposed of (see appendix) and one for chemicals to be keep on site (see appendix) was provided for schools to inventory their chemicals on. These spreadsheets were also

provided to schools on disks in Microsoft excel formats and ClarisWorks formats. The Science Lab Chemical Inventory and Science Lab Chemical Inventory for Disposal spreadsheets are explained below. (See Appendices)

Inventory Sheet "Science Lab Chemical Inventory" (for on-site chemicals to be kept)

- Number of containers
- Chemical Name. No chemical formulas.
- Chemical Form (Solid, liquid, or gas).
- Actual Container Size. Container size had to do with the actual size of the container not the amount of chemical in it. This was used for the purpose of determining lab supplies needed. Some schools have added a column for the actual amount of the chemical on hand (after this column)
- Does the school use the chemical? This question was used to make schools look at how much they used it (if they did) for potential disposal.
- Is it on the Red Flag List? This question was used to make schools look at the chemicals they use and their associated hazardous. It asked them are there alternatives to this chemical? Is there more than I would use in two years? Is the storage of this chemical safe? Am I putting my students or myself at unnecessary risk when this chemical is used in the classroom? Is the concentration of this chemical safe? Any chemicals determined unnecessary could then be properly disposed of.

Inventory Sheet "Science Lab Chemical Inventory for Disposal" (for chemicals to be disposed of)

- Number of containers
- Chemical Name. No chemical formulas.
- Chemical Form (Solid, liquid, or gas).
- Actual Container Size. Container size had to do with the actual size of the container not the amount of chemical in it. This was used for the purpose of determining lab pack supplies and transportation needed.
- Condition of the container (Good, fair, and poor). This was once again used to determine the type of lab pack supplies needed.
- Comments. This was used to describe any unique conditions or attributes.

-Safe Chemical Storage.

John Miller (Rounds 1 and 3) and Tom Benoit of the Vermont Agency of Natural Resources (Round 2) and Rich St. Gelais of the University of Vermont (Round 1) addressed how schools are currently managing their on-site chemicals and how they should be safely and properly handling them. As summary is as follows:

- What chemicals do you have? This question makes the school realize that without an accurate inventory, they have no way of knowing what hazards they have or where they are.

- Where are your chemicals? As stated above, without knowing where your chemicals are you don't know where the potential hazards are. You also don't have control of who can access them or any way to prevent ordering of something you already have.

- How are you chemicals stored? Many school laboratories were storing their chemicals alphabetically (probably for ease in finding them). While this may have been convenient it is not the correct way to store them. Storing chemicals alphabetically only puts incompatible chemical groups together, thus creating a potential hazard. Schools should store their chemicals by reactivity class, such as in the Flinn Scientific system or the J.T. Baker system. Both of these systems, when done properly, prevent incompatibles from being stored next to one another and any reactions from occurring.

- The following are some safe storage guidelines:

    i. Conduct regular inspections to check for leaks, peeling labels, corroded caps, and any chemical incompatibility.

    ii. Affix proper signage outside storage area, as well as a map identifying the storage pattern.

    iii. Place high hazard chemicals in secondary containment.

    iv. Do not store chemicals on the floor or above eye level.

    v. Use anti-roll-off lips on all shelves.

    vi. Use a dedicated acid cabinet, flammables cabinet and poisons cabinet.

    vii. Fume hoods, desk drawers and tabletops are not proper storage locations.

    viii. Do not store chemicals alphabetically- follow the Flinn or Baker storage system.

    ix. Make sure chemicals are labeled with name, hazard and date.

    x. Store chemicals, if possible, in a separate secured room that has adequate ventilation.

    xi. If chemicals are stored in a laboratory make sure students do not have access.

-Chemical Spill pre-planning and response.

Barry Clayton of Industrial Hygienics Corporation defined exactly what constitutes a chemical spill, how to prevent it, pre-plan for it and the proper response for a chemical spill. The following is a summary of his presentation.

- Definition. A hazardous substance is any chemical or material in a quantity or form that may pose an unreasonable risk to health, safety, or the environment when transported, used, stored or released.

- Applicable Regulations that apply to spills and spill training include but are not limited to Vermont Occupational Safety and Health Administration (VOSHA), Hazard Communication, Resource Conservation Recovery Act (RCRA), Hazardous Waste Operations and emergency response, and Material Safety Data Sheets (MSDSs) and labeling.

- Definition. An incidental spill is a minor spill that does not require immediate attention and may be safely cleaned up by properly trained personnel.

- Definition. An uncontrolled release is the accidental release of a hazardous substance from its container. If not contained, stopped and removed, the release or its by-products will pose an eminent hazard to the environment and nearby people.

- Definition. An emergency response is a coordinated response by persons outside the area to an uncontrolled release. Hazards may be high PELs, life threatening conditions, oxygen deficiency, or fire or explosion hazards. Some examples might be gas spills, toxic or unknown spills or highly corrosive or reactive spills. These spills should be reported to the local fire department, Vermont HAZMAT Hotline and the Emergency Management Office.

- An incidental spill verse an emergency is governed not only by the amount spilled but also by site conditions, and the type of material.

- The following are some Chemical Spill Prevention Tips;
    i. Keep the area clean.
    ii. Keep inventory to a minimum, with smaller quantities and sizes of containers.
    iii. Properly store containers and buy shatter resistant bottles.
    iv. Segregate incompatibles.
    v. Use secondary containment.

- Pre-plan for spills by knowing the hazards, having the MSDSs, having the proper Personal Protective Equipment (PPE) and being properly trained and informed.

- Spill Clean-up materials include eye, hand and body protection and proper spill clean-up supplies, such as absorbents, neutralizers, containers, bags, etc.

- Determine the nature of the spill, do you have the appropriate training, supplies, site control, have you notified the appropriate people and taken the necessary safety precautions. All of these should be addressed before spill clean up begins.

-A detailed explanation of the Participation agreement (see Appendix C).

Participating schools were made aware of the conditions of participation in the project. These criteria are as follow:

- Schools must assign a primary contact that is responsible for the project at that school. This person will assist in the inventorying of chemical and in the development and implementation of the laboratory chemical management plan.

- The primary contact and one school administrator must attend two all-day training workshops.

- The school must commit to going "mercury-free" school-wide by Fall 2001. (Not including fixed thermostats and fluorescent light bulbs).

- Commit to eliminating the use of certain toxic or high hazard laboratory chemicals.

- Dispose of all unlabelled, expired and high hazard or toxic chemicals.

- Include a line item in their budget each year for hazardous waste disposal.

- Implement a chemical management plan for your science laboratories.

APPENDIX E

Chemical Inventory Forms (On-site and Disposal)

Science Lab Chemical Inventory (Chemicals Remaining On-site)

School _____ Date _____ Page ____of____

Teacher _____ Room # _____ Location of Chemicals _____

	Number of Containers	CHEMICAL NAME	Solid Liquid or Gas	Container Size	Condition of Container	Does the school use this chemical?	Is it on the red flag list?	Comments
1								
2								
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Science Lab Chemical Inventory (Chemicals For Disposal)

School _____ **Date** _____ **Page** ____**of**____

Teacher _____ **Room #** _____ **Location of Chemicals** _____

	Number of Containers	CHEMICAL NAME	Solid Liquid or Gas	Actual Container Size	Condition of Container	Comments
1						
2						
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APPENDIX F

Second Workshop Agenda and Summary

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School Science Lab Chemical and Mercury Clean-Out Project

Participant Training Session II

8:00 - 8:30 am	Registration and Coffee
8:30 - 8:45 am	Chemical Inventory and Clean-Out: Summary *Jen Holliday, Chittenden Solid Waste Management Division* *Gary Gulka, VT Agency of Natural Resources*
8:45 - 9:45 am	Indoor Air Quality Issues in the Science Laboratory *Mike Rogers, American Lung Association & US EPA*
9:45 - 10:30 am	The Experiment is Over…Now What? *John Miller, VT Agency of Natural Resources*
10:30 - 10:45 am	Coffee Break
10:45 - 11:15 am	Purchasing Strategies *Lauren Traister, Association of Vermont Recyclers*
11:15 - 12:00 pm	Laboratory Chemical Management Plan *Lauren Traister, Association of Vermont Recyclers* *Gary Gulka, VT Agency of Natural Resources*
12:00 - 12:45 pm	Lunch
12:45 - 3:45 pm	Introduction to Microscale and Green Chemistry (Lab Activities) *Dr. Mono Singh, National Microscale Chemistry Center*

2ND WORKSHOP SUMMARY

-Chemical Inventory and Clean-out summary (for each round see Appendix H)
A brief overview was given of what each school had disposed of in a particular round. Many schools found this very surprising.

-Indoor air quality issues.
Mike Rogers of the American Lung Association and the United States Environmental Protection Agency explained exactly what indoor air quality is and what factors contribute to the quality of indoor air. His presentation is summarized below.

- Indoor Air Quality (IAQ) is the temperature, humidity, ventilation, and chemical and biological content of the air inside a building.
- IAQ is important because 90% of an individuals time is spent indoors where pollution is two to five, sometimes as high as 100, times higher than outdoor levels. Children are more at risk then adults.
- Consequences of poor IAQ include; health problems like asthma, flu and cold-like symptoms and in rare cases cancer, reduced learning and productivity, poor public relations, liability and high repair costs when compared to prevention.
- Schools have many unique aspects that affect IAQ. These include tight budgets, densely populated spaces, building may be old and have poor maintenance, space is always changing with the addition of temporary spaces and they have special sources of pollution and odors.
- There are four P's that affect IAQ. These include people, pathways, pollutants and pressure.
- Pressure is the driving force. Air always wants to move from high pressure to low pressure.
- Pathways or the hole of least resistance is where pressure drives the air and pollutants through. Depending on whether a room has positive or negative pressure it may be pulling polluted air in rather than venting it.
- Potential causes of poor IAQ include reduced or inadequate ventilation, building materials and furnishings, deferred maintenance too save money, pesticides, housekeeping supplies and school supplies.
- Many schools don't have an adequate outdoor air supply. This can be caused by blocked paths, broken or disconnected controls, dirty or missing filters, microbial growth in drip pans, ducts, coils or humidifiers, and improper balance, operation and/or maintenance.
- Occupants can also have a positive impact on IAQ, if they understand how buildings work and they take practical steps to prevent and correct problems.

- The science lab is typically not completely physically isolated from the rest of the school, dynamics of the rest of the school affect the science lab, and even with proper exhaust systems some pollutants may escape the lab. These small amounts should be handled by the ventilation system and school practices.

- The US EPA, the American Lung Association and several other groups offer an *IAQ Tools for Schools kit* to help schools prevent indoor air pollutants. This kit includes a videotape: Taking action and ventilation basics, IAQ forms and checklists and an IAQ problem-solving wheel. This is all given free to schools.

-Waste Disposal.

John Miller of the Vermont Agency of Natural Resources explained that waste minimization efforts implemented by schools will make waste disposal a less daunting task and less of a fiscal burden. Proper chemical waste disposal is critical for environmental protection as well as maintaining a safe laboratory. "The Experiments Over…. Now what?" (Appendix E of CMP in Appendix G) can be used for guidance in establishing waste disposal procedures. He noted that not every laboratory experiment's waste is hazardous. In fact, it's easier to make a list of what is hazardous than what is not. Also many hazardous wastes exhibit more that one characteristic depending on the chemical composition and form, thus making different forms of a chemical not equally hazardous. He also noted that;

> *"**IF** a school produces hazardous waste in any of its operations (art, science, shop, maintenance) **THEN** the school is required to have a Notification of Regulated Waste Activity Form on file with the Vermont Agency of Natural Resources, Waste Management Division."*[12]

On-site management procedures for waste disposal should address at a minimum: how to determine whether waste is hazardous or not, how to dispose of non-hazardous waste, how to dispose of hazardous waste, and hazardous waste storage guidelines.

-How to determine whether waste is hazardous or not.

By Determining if it has any of the characteristics of a hazardous waste (VT and Federal definitions) including but not limited to ignitability ((flashpoint less than 100 (flammable liquid) or less than 140 (combustible liquid)), corrosivity ((pH less than 2, (strong acid) or greater than 12.5, (strong base)), reactivity (oxidizers, etc.), toxicity (heavy metals such as Arsenic, lead, mercury, etc.) and any hazardous wastes from non-specific sources (Vermont listed wastes). Avoid mixing hazardous and non-hazardous waste, as the mixture automatically becomes a hazardous waste.

-How to dispose of non-hazardous waste.

Non-hazardous wastes may be dried down (only the liquid not the chemical), sent to the wastewater treatment plant (liquid with prior approval, schools with on-site septic systems were strongly discourage from disposing of chemicals down the drain or disposed of in the trash (solids only with the custodian's and trash hauler's prior approval).

-How to dispose of hazardous waste.

All hazardous waste must be safely and properly handled. This includes pick-up by a licensed hazardous waste hauler and/or, depending on generator status, disposal at a Household Hazardous Waste (HHW) collection event or facility (with prior approval). All hazardous waste generated must be reported to the State of Vermont by a Notification of Regulated Waste Activity Form.

-Hazardous waste storage guidelines.

Chemical wastes awaiting proper disposal should be stored in a separate place, not mixed in among virgin stock chemicals, not in the classroom and not in the hood. Containers should be in good condition, not leaking, closed, except when adding or removing waste, labeled as to their contents (hazardous or non-hazardous), stored only with other compatible wastes and stored inside to prevent freezing.

-Purchasing strategies.

Lauren Traister of the Association of Vermont Recyclers explained how schools could make smart purchasing decisions. Schools must ask themselves the following questions; Do I need this product? Does someone else already have what I need? How much do I really need? What are the hidden costs of using this product? Can I really afford it? And is there a less hazardous alternative?

-Do I need this product?

When a school purchases a hazardous material the "Cradle to Grave" responsibility always applies. This means the school is responsible for the handling, storage, and disposal of the hazardous material from the time it comes in the facility until it is ultimately disposed of.

-Does someone else already have what I need?

Schools are notorious for having supplies everywhere and only certain individuals knowing about them. By having a school-wide inventory & tracking system schools will always know what they have and what they need.

-How much do I really need?

Schools should buy only what they need. As a general rule a two-year supply is enough. Buying in bulk is not always a good idea, there are many hidden costs associated with this, such as transport, storage and disposal.

-What are the hidden costs of using this product? Can I really afford it?

Many hazardous materials require expensive storage cabinets, protective equipment and training to safely store, use and dispose of. In addition, these items require greater administrative tracking than non-hazardous chemicals. There is also increased liability if someone is hurt, fines if violations are found in storage or disposal, increased insurance premiums, spill cleanup and supplies in the event of a spill, and the increased time burden for filing of paperwork, arranging for disposal, inspections and for attending trainings.

-Is there a less hazardous alternative? Schools should consider using curricula that does not require hazardous materials. If you can't eliminate hazardous materials then substitute or minimize the hazardous components. Be sure to compare MSDSs for the least hazardous alternative.

- Schools should; know what they have at all times and purchase only what they need, assign one person the responsibility for all aspects of hazardous materials handling at your school, and whenever possible look for a less hazardous alternative.

-Laboratory Chemical Management Plan.

Gary Gulka of the Vermont Agency of Natural Resources and Lauren Traister of the Association of Vermont Recyclers explained how schools could develop a Chemical Management Plan (CMP) detailing their policies on chemical management and training, chemical storage, on-site chemical use, waste disposal, and spill response. It was also noted that this plan does not meet the requirement that schools develop a Chemical Hygiene Plan, although the CMP contains some of the same components. See section 3.4 for a detailed description of the CMP.

-An introduction to microscale and green chemistry.

Dr. Mono Singh of the National Microscale Chemistry Center explained how microscale or green chemistry could be used by a school to help eliminate or reduce hazardous chemical purchases, storage and disposal. He also gave four-hours of hands-on microscale chemistry classes, that could be performed many of the school's standard laboratory experiments (using microscale chemistry instead). The following is a summary of microscale chemistry presentation.

- -Pollution prevention or waste reduction at the source is the new environmental ethic. No more waste generation, treatment, control and disposal.

- -Microscale chemistry is an environmentally safe pollution prevention method of performing chemical processes using small quantities of chemicals without compromising the quality of the education, analytical rigor or research and development efforts.

- -Microscale chemistry has many environmental benefits that include environmentally safe waste reduction, education and training, improved laboratory air quality, reduction in exposure to chemicals, elimination of explosion and fire hazards, and is extremely cost effective (chemicals, disposal and other supplies).

- -The National Microscale Chemistry Center (NMCC) offers workshops and textbooks on microscale chemistry. In addition, the NMCC participates in research and academic efforts, pollution prevention and disseminates microscale information on the intranet and other routes.

- -The hands-on microscale chemistry portion of the presentation covered how to perform wet analytical chemistry, synthesis and characterization, electrochemistry, distillation and reflux and measurement of physical properties using microscale chemistry equipment.

- -The demonstration also gave a Micro Verses Macro chemistry comparison on costs. The microscale start-up costs would be recovered in fewer chemicals ordered and disposed of.

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APPENDIX G

Laboratory Chemical Management Plan

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Laboratory Chemical Management Program For Vermont Schools

Guidance & Samples

Prepared by:
Association of Vermont Recyclers
Vermont Agency of Natural Resources
Chittenden Solid Waste Management District

This document is part of the School Science Lab Chemical and Mercury Clean-out Project conducted in Vermont 1999-2002

INTRODUCTION

The typical Vermont middle school or high school science lab stocks a variety of hazardous chemicals, some of which may be highly toxic, carcinogenic, corrosive, reactive, or even explosive. One such chemical is elemental mercury, in which past releases from broken thermometers and spills have shut down schools or disrupted classroom instruction. Another potential problem is chemical containers in poor condition coupled with inadequate storage room ventilation. This particular situation can lead to chronic exposure and health ailments in students, teachers and staff. Many of these problems can be avoided through the proper management of laboratory chemicals from the time of purchase, to storage, use and ultimately disposal.

Vermont's School Science Lab Chemical and Mercury Clean-Out project has provided both technical and financial assistance to middle and high schools for inventory and disposal of these unwanted and dangerous chemicals. In addition, by signing the Project's Participation Agreement, all participating schools have committed to the development of a Lab Chemical Management Plan, which will address proper purchase, use, storage and disposal of lab chemicals. The purpose of this guide is to provide schools with the tools to develop a Laboratory Chemical Management Plan that is to be reviewed and updated annually.

Developing and maintaining a Lab Chemical Management Plan should not be a daunting task. This guide provides clear and concise instructions on what to include in a plan. In addition, a sample plan and forms are provided that can be used in the development of your plan. Our hope is that the plan you develop will become a long-term commitment to continual improvement in on-site chemical management and waste prevention.

Please note that the Chemical Management Plan is not a regulatory requirement but rather is a requirement of the Clean-Out Project. (This requirement is referred to in the Participation Agreement signed by each participating school.) There is a regulatory requirement that schools should be aware of that applies to all science laboratories: the Laboratory Standard, administered by the Vermont OSHA. The main component of this regulatory standard is the requirement for a written *Chemical Hygiene Plan* describing procedures to be used in training employees and in the handling of hazardous chemicals in laboratory work. While the Lab Chemical Management Plan has some overlap with a Chemical Hygiene Plan it will not bring you into regulatory compliance with Vermont OSHA.

HOW TO USE THIS GUIDEBOOK

This guide is designed to get your Lab Chemical Management Plan up and running. We do not want you to get bogged down in the semantics of writing a "plan." We have identified four major areas of focus for your plan:

- Annual review
- Administrative Policy
- Purchasing Procedure
- On-Site Chemical Management - storage, inventory, use, waste disposal, and chemical spill response.

Please be sure to read the instructions for each section and refer to corresponding section in the sample plan. These instructions coupled with the attached forms and sample plan will provide the clarity and assistance needed for you to complete your Chemical Management Plan. Remember that a plan will be more effective if it is tailored to your own school and not a carbon copy of the sample plan.

An annual review of your plan, including annual updates to chemical inventories, will be important in making this an effective, living document.

If you need help in completing any parts of your plan, you can call a Solid Waste District Recycling Coordinator, the Environmental Assistance Division, or the Association of Vermont Recyclers for Assistance.

Addison County Solid Waste District
802-388-2333
Central Vermont Solid Waste District
802-229-9383
Chittenden Solid Waste District
802-872-8100 X223
Greater Upper Valley Solid Waste District
802-649-2610
Lamoille Regional Solid Waste District
802-888-7317
Mad River Solid Waste Alliance
802-244-7373
Northeast Kingdom Waste Management District
802-626-3532
Northwest VT Solid Waste District
802-524-5986
Rutland Area Non-District Towns-JMSC/SWAC
802-235-2710
Rutland County Solid Waste District
802-775-7209
Windham Solid Waste District
802-257-0272
Agency Of Natural Resources
1-800-932-7100/ 802-241-3472
Association of Vermont Recyclers
802-229-1833

Laboratory Chemical Management Plan Instructions

Section I: Annual Review

The Laboratory Chemical Management Plan will change from year to year as your school makes improvements towards eliminating mercury and minimizing hazardous chemical use and waste generation. Every year schools must review their Laboratory Chemical Management Plan. A form is helpful to document that this review was done and to record any progress that has been made in achieving the goals outlined in this Plan (see Model Plan: Appendix A).

Section II: Policies

Before launching a full-fledged management program, an internal structure environment for students, faculty and staff is needed. Responsible hazardous materials management involves all levels of the school community: the school board, superintendent, principals, staff, and students. Remember that implementing a management program will be an ongoing process, not an "event."

The school board and administration must set the stage for safe, environmentally responsible hazardous materials management by adopting policies. Policy statements send a clear message to the staff about the administration's commitment. The hallmark of every successful chemical management program is top management's active commitment. (Note: A commitment to on-going training of faculty and staff in hazardous chemical management is a requirement of the School Science Laboratory Chemical and Mercury Clean-out Project.)

Section II (a): Responsibilities and Duties (optional)

In order to implement a Laboratory Chemical Management Plan, it must be clear to individual faculty and staff what their specific roles are. Although this section is optional for schools to include in the Plan, by defining individual responsibilities and duties of existing faculty, your program will be more likely to succeed.

Specific roles to identify may include:

1. Superintendent
2. Principal
3. Laboratory Chemical Management Officer (e.g., science chair)*
4. Laboratory Chemical Management Committee (e.g., science teachers)*
5. Science Teachers
6. Custodians
7. Students

*May only be applicable to larger schools.

Section III: Purchasing Procedures

A critical part of any successful laboratory chemical management program is the implementation of strict guidelines for chemical purchases. Limiting chemical quantities and hazard-levels will almost certainly help minimize waste and provide a healthy and safe environment for students, faculty, and staff.

When developing purchasing procedures, schools should consider the following:

1. It is important for schools to understand what they have in stock before making any new purchases. Inventories are an ideal way to help make this assessment. A purchasing procedure could require conducting an inventory prior to making new purchases.

2. Surplus chemicals are a major waste stream for schools: faculty and staff often buy more chemicals than they need. According to the American Chemical Society, unused chemicals can constitute as much as 40% of the hazardous waste generated by laboratories. Purchasing procedures that place a limit on the quantity of chemicals allowed to be purchased will minimize unnecessary waste.

3. Many laboratory chemicals are not considered "hazardous" as defined by Vermont Hazardous Waste Management Regulations and therefore do not need to be disposed of as a hazardous waste. Purchasing procedures should discourage the use of "hazardous" chemicals as well as chemicals that pose a significant danger to human health and safety (see Model Plan: Appendix B for sample purchasing form). The Red Flag list (see Model Plan: Appendix C) can be used by schools for guidance in purchasing decisions and/or procedures.

4. A redistribution program would help surplus chemicals in one teaching area to be utilized in another area instead of wasted. A purchasing procedure could require faculty to determine what surplus chemicals are available within the school.

5. Smaller packages are preferable:
    - They are emptied faster; there is less chance for decomposition of reactive compounds.
    - Breakage is less in smaller packages.
    - Takes up less valuable storeroom space.
    - Risk of accident and exposure to the hazardous materials is less when handling small containers. Larger containers usually require that the material be transferred to small containers.

6. Schools agreed to eliminate mercury as part of this Science Laboratory Chemical and Mercury Clean-out Project. Purchasing procedures should prohibit the purchase of mercury and mercury containing compounds.

7. Purchasing procedures may also include guidelines on how chemicals are received and distributed in the school.

Section IV: On-Site Chemical Management

The variety of hazardous chemicals found on school premises, especially within a science laboratory, warrants schools to establish effective on-site chemical management of these chemicals and associated wastes. An on-site chemical management program should include procedures for chemical storage, inventory, use, waste disposal, and spill response. By effectively addressing these areas a school may minimize risks as well as

unnecessary expense. Other procedures may also be included to further address human health and safety issues (e.g. personal protective equipment).

Procedures established for on-site chemical management should support goals stated in the school's policy for laboratory chemical management.

Section IV (a): Storage

Improper storage of laboratory chemicals presents an ongoing hazard for schools. There are many chemicals that are incompatible with each other. The common method of storing chemicals in alphabetical order may result in incompatible chemicals being stored next to one another.

Storage procedures should encourage the separation of chemicals into their organic and inorganic families and then to further divide the chemicals into related and compatible families. Both the Flinn Scientific Inc. and the J.T. Baker Inc. offer suggested storage patterns in their catalogs.

Storage procedures should also include labeling of chemicals and chemical waste, signage of chemical storage areas, inspection and restricted access requirements. Labels should include chemical name, hazard warning, and date. Routine inspections should be conducted to check for spills, leaks, chemical compatibility or other storage hazards.

Section IV (b): Inventory

Chemical inventories are a necessary tool (1) to identify current chemical supplies and (2) to determine what is surplus stock for redistribution and (3) to determine what is to be disposed of as waste. A chemical inventory also helps a school identify all hazardous chemical risks and liabilities in the laboratory. Up-to-date inventories provide vital information to firefighters and other emergency responders. On-site chemical management procedures should specify the frequency in which inventories must be updated. (Note: Schools are required to conduct annual inventories as part of the Science Laboratory Chemical and Mercury Clean-Out Project.)

Section IV(c): Use

On-site chemical management procedures should encourage the use of alternative teaching methods. Standard laboratory experiments can be highly hazardous and produce wastes requiring special (and often costly) disposal methods. Alternative lab exercises do exist that use a minimum quantity of the least hazardous, most easily disposable agents. Switching to microscale chemistry, green chemistry, demonstration labs, video instruction or other forms of non-hazardous or less-hazardous curricula will dramatically reduce hazardous waste generation in the laboratory and save money in purchase and disposal costs.

Section IV (d): Waste Disposal

Waste minimization efforts that the school implements will make waste disposal a less daunting task and less of a fiscal burden. Proper chemical waste disposal is critical for environmental protection as well as maintaining a safe laboratory. "The Experiments Over…. Now What?" can be used for guidance in establishing waste disposal procedures (see Appendix E).

On-site management procedures for waste disposal should address:

1. How to determine whether waste is hazardous or not.
2. How to dispose of non-hazardous waste (e.g., neutralization, solidification)
3. How to dispose of hazardous waste (e.g., neutralization, manifesting)
4. Hazardous waste storage guidelines (e.g., labels, location, quantity)

IF a school produces hazardous waste in any of its operations (art, science, shop, maintenance) THEN the school is required to have a Notification of Regulated Waste Activity Form (see Model Plan: Appendix F) on file with the Vermont Agency of Natural Resources, Waste Management Division. Options for waste disposal include certified hazardous waste haulers, solid waste districts or other municipal hazardous waste collection events.

Section IV (e): Chemical Spill Response

Preparedness for chemical spills is essential in minimizing risk to students, faculty, staff and the environment. Many schools already have Emergency Response Contingency Plans in place and should include chemical spill response information. If this information has not been included in the overall response plan, schools are encouraged to document how a chemical spill response would be handled. Response procedures could include:

1. Primary contact person
2. Decision tree to determine incidental vs. emergency spill (i.e., when to call for outside help)
3. Emergency response numbers
4. Location of spill equipment
5. Map of chemical storage area
6. Authorized spill clean-up responders (i.e., who has been trained)
7. Evacuation plan
8. Specific instructions for mercury spills
9. Spill prevention tips

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Laboratory Chemical Management Plan

Safe Science High School
Science Department

<u>Chemical Management Officer</u>
Sally Microscale, Science Chair

<u>Chemical Management Committee</u>
David Hazfree, Chemistry teacher
Mary Mercury-Free, Physics teacher
Jacqueline Flinn, Biology teacher

Section I: Annual Review

The Laboratory Chemical Management Plan shall be reviewed at least annually by the Chemical Management Officer and the Chemical Management Committee (see Appendix A).

Section II: Laboratory Chemical Management Policy

The Safe Science High School is committed to minimizing hazardous chemical use and waste and to providing a healthy and safe environment for its students, faculty and staff. In order to achieve these goals, the school believes that proper chemical management and training are essential to make students and employees aware of potential hazards related to chemical use.

The School will restrict purchase of hazardous chemicals, and purchasing procedures will be followed by all faculty and staff to minimize large quantities of chemicals and/or extremely hazardous chemicals from entering the school.

The School will make every effort to minimize hazardous chemical use and waste generation in the classroom. Where feasible, the School will minimize chemical waste via microscale chemistry, green chemistry, demonstration labs, video instruction or other forms of non-hazardous or less-hazardous curricula.

The School pledges to discontinue the purchase of mercury and mercury compounds and will phase out mercury from school premises, where feasible, by 2003.

Employees have the responsibility to know and follow the policies and procedures contained in the Laboratory Chemical Management Program, to participate actively in training programs, and to conduct their work activities in a manner which minimizes chemical waste generation.

Policy adopted: March 2000.

Section II(a): Administrative Positions and Duties

A. Superintendent
   1. The Superintendent, as Chief Executive Officer, has the ultimate responsibility for chemical management within the school district and must, with other administrators, provide continuing support for district wide chemical management.

B. Principal
   1. Responsible for chemical management in the school, and monitors school employees' compliance with the Laboratory Chemical Management Plan.
   2. Appoint the Chemical Management Officer and Chemical Management Committee.
   3. Responsible for phasing out mercury in the school.

C. Laboratory Chemical Management Officer (CMO)
   1. Work with administration to set policies concerning procurement and disposal of chemicals.
   2. Coordinate requests for acquisition and use of "High Hazard" chemicals (see Appendix B).
   3. Obtain Material Safety Data Sheets for each chemical purchase.
   4. Ensure that employees have received appropriate training, are aware of the Laboratory Chemical Management Plan, and other reference material.
   5. Stay abreast of the current legal requirements concerning chemical management and hazardous waste management, including appropriate training for handling and shipping hazardous waste.
   6. Responsible for coordinating hazardous waste disposal.
   7. Coordinate chemical spill clean-ups.
   8. Oversee annual inventory of laboratory chemicals.
   9. Ensure chemical storage and use is in compliance with school policies and procedures.
   10. Appoint faculty member to oversee chemical storage room (Room 213).
   11. Maintain and regularly update library of alternative science curricula.
   12. Review the Laboratory Chemical Management Plan annually.

D. Laboratory Chemical Management Committee
   1. Work with the Chemical Management Officer to set policies and procedures for chemical management in the school laboratories.
   2. Assist the Chemical Management Officer in assessing purchasing requests for "High Hazard" chemicals.
   3. Review science curricula on an annual basis to determine faculty progress in minimizing chemical use and waste.
   4. Review the Laboratory Chemical Management Plan annually.

E. Science Teacher
   1. Maintain awareness of hazardous waste management regulations and health and safety hazards through participating in training programs and consulting reference materials.
   2. Plan and conduct each laboratory exercise with the least toxic alternatives.

3. Submit a list of experiments annually to the Laboratory Chemical Management Committee noting any lab exercises that use alternative methods.
4. Use good laboratory chemical management practices.
5. Teach proper chemical management to students.
6. Conduct annual inventory of laboratory chemicals.
7. Conduct an inventory each semester of all stored wastes.
8. Conduct a monthly inspection of stored chemicals for signs of leakage, poor storage practices, peeling labels, or any other problems.
9. Ensure that all materials and wastes are labeled, used and disposed of as required.
10. Maintain chemical spill clean-up materials in chemical storage areas.
11. Understand and follow the Laboratory Chemical Management Plan.

F. Custodian

1. Maintain awareness of hazardous waste management regulations and health and safety hazards through participating in training programs and consulting reference materials.
2. Clean science laboratories and storage areas with caution.
3. Avoid cleaning up spills if he/she does not have the proper training – call for help.
4. Do not allow students to enter science laboratories and storage areas without a science teacher present.

Section III: Purchasing Procedures

Faculty will submit purchasing requests annually to the CMO at least one month prior to the deadline for school-wide purchasing. Prior to submitting requests, the following will be done:

1. Complete chemical inventory in their classroom.
2. Check with other faculty to see if they have any surplus of chemicals that you want.
3. Evaluate any special storage and/or handling requirements.
4. Crosscheck Red Flag list.
5. After completing the above steps, submit a purchase order.
   (a) For "Standard" chemicals that do not require special storage and/or handling and/or are not on the Red Flag List, submit the following information: chemical name, quantity (must be less than a 2 year supply), price, and name of supplier.
   (b) For "High Hazard" chemicals that require special storage and/or handling and/or are listed on the Red Flag List, fill out a "Request to Procure and Use a High Hazard Chemical (see Appendix B).

   The CMO will crosscheck the "Standard" purchase order to ensure that "High Hazard" chemicals are not listed. The CMO will also review, assess, and make final determinations on "High Hazard" chemical requests. The Laboratory Chemical Management Committee will provide assistance to the CMO in assessing these "High Hazard" chemical requests. No exceptions will be allowed for purchasing mercury or mercury containing compounds. The CMO must ensure that Material Safety Data Sheets (MSDSs) are obtained with each chemical purchase.
6. When feasible, chemicals should be received at the school during summer break. Custodians may only deliver packages to the appropriate classroom; they may not handle or unpack chemicals. Faculty are

responsible for handling and unpacking their purchases. All chemicals must be labeled with the date they were received and stored in the proper location.

Section IV: On-Site Chemical Management

A. Storage

Chemistry faculty will store all chemicals in Room 213 (chemical storage room). All other science faculty may store chemicals in their respective classroom or in Room 213. A faculty member will be assigned responsibility at the beginning of each school year to oversee the chemical storage room (Room 213). All faculty must follow these storage guidelines for all chemical storage areas:

1. Implement the Flinn storage system where chemicals are stored. Do not store chemicals alphabetically.
2. Label all containers with the chemical name, acquisition date, first-use date, and hazard warnings.
3. Conduct and document monthly inspection of stored chemicals for signs of leakage, poor storage practices, peeling labels, or any other problems.
4. Do not store chemicals on the floor or above eye level.
5. Post an index on the door of each classroom storing chemicals showing the location and storage pattern for all chemicals.
6. Restrict access to chemical storage areas through signage and secure locks. No student or unauthorized faculty will be allowed in storage area unsupervised.

B. Inventory

Faculty will conduct an annual inventory of all chemicals stored in the classroom (see Appendix D). Inventories can be submitted using either a computer spreadsheet or hand-written. The inventory must be submitted to the CMO prior to any new chemical purchasing requests. Annual inventories must be on file with the Safe Science City Fire Department.

Any chemicals identified during the inventory as expired, outdated, unlabeled, unknown, or unwanted must be listed for disposal. These chemicals will be identified with an orange sticker placed on the container and left in their original shelf location. All chemicals with orange stickers will be included in the waste inventory conducted each semester. Mercury and mercury-containing compounds encountered during the inventory must also be listed for disposal.

C. Use

Faculty, where feasible, will minimize chemical use and waste generated via microscale chemistry, green chemistry, demonstration labs, video instruction or other forms of alternative methods of non-hazardous or less-hazardous curricula. No use of mercury and mercury-containing compounds will be allowed in any laboratory experiments.

A library of alternative science curricula will be maintained and updated by the CMO. On an annual basis faculty must review their curricula using these materials to identify ways of minimizing chemical use and

waste. Faculty must submit a list of their experiments annually to the Laboratory Chemical Management Committee noting any lab exercises that use alternative methods. The Laboratory Chemical Management Committee will review science curricula on an annual basis to determine faculty progress in minimizing chemical use and waste.

D. Waste Disposal

Faculty must use the Hazardous Waste Decision Tree to decide appropriate methods for disposing of used or unused chemicals (see Appendix E). Faculty must also adhere to the Practices for Lab Chemical Waste Handling (see Appendix E). Safe Science High School is on a septic system; therefore no liquid chemicals will be disposed of down the drain. Non-hazardous or neutralized liquid chemicals may be solidified for solid waste disposal (i.e. put in the trash). All other non-hazardous solid waste may be disposed of in the trash. Custodians must be notified of any chemical put in the trash for disposal.

All chemical wastes destined for hazardous waste disposal must be stored in the chemical storage area (Room 213) in appropriate containers and segregated for compatibility. All containers must be labeled with content, hazard and dated.

Prior to each semester an inventory of stored wastes (including virgin chemical stock identified as waste) must be completed by faculty and submitted to the CMO. The CMO will coordinate hazardous waste disposal on an annual basis. If large quantities of chemical wastes are being stored (>15 gal.) a non-routine hazardous waste pick-up should be scheduled by the CMO.

A notification of hazardous waste activity has been filed with the Agency of Natural Resources (see Appendix F). EPA ID #021355678 will be used to ship all hazardous wastes from the school. The CMO is responsible for all hazardous waste manifests and associated paperwork. No waste pick-ups will be scheduled during regular school hours.

E. Chemical Spill Response

A chemical spill response kit must be stored in each chemical storage area. In the event of a hazardous chemical spill, faculty must contact the CMO before clean up begins. The CMO will assess the nature of the spill using the School's Emergency Response Contingency Plan to determine appropriate response. Custodians and faculty cannot respond to chemical spills unless appropriate training has been provided. All waste generated from a chemical spill will be treated as hazardous.

APPENDIX A

Annual Review

Laboratory Management Plan	Questions to Consider	Comments	Date & Initial
Section I: Policy	Are we meeting the objectives and goals set forth in the policy? Are there any new objectives and goals that we want to include for the coming year?		
Section II(a): Roles & Responsibilities	Have faculty followed through with their assigned roles and responsibilities? Do we need to assess/change any of the roles and responsibilities?		
Section III: Purchasing	Did faculty submit purchasing requests to CMO as instructed? Were "High Hazard" chemical purchases minimized? Were MSDSs obtained for all chemicals purchased? Were surplus supplies redistributed?		
Section IV(a): On-Site Management - Storage	Were proper storage procedures followed?		
Section IV(b): On-Site Management - Inventory	Was an inventory of each chemical storage area conducted this year? Is the inventory on file with the fire department?		
Section IV(c): On-Site Management - Use	Did faculty review curricula for ways to minimize chemical waste? Did faculty submit curricula to Lab Chemical Management Committee for review? Were reference materials available to faculty on microscale and/or green chemistry labs?		
Section IV(d): On-Site Management - Waste Disposal	Were proper waste disposal procedures followed? Was an inventory of stored wastes completed each semester? Was a Notification of Hazardous Activity filled out and submitted to the Agency of Natural Resources?		
Section IV(e): On-Site Management - Chemical Spill Response	Are chemical spill materials available in each chemical storage area? Has a chemical response plan been incorporated into the Emergency Response Contingency Plan?		
Other - Training	Have faculty and staff been made aware of the Laboratory Chemical Management Plan? Have other training (e.g., chemical spill response, handling hazardous materials, MSDS, etc.) been provided?		
Other - Legal Requirements	Are the CMO and the Lab Management Committee staying abreast of all legal requirements concerning the storage, handling, and disposal of hazardous materials?		

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APPENDIX B

Request to Procure and Use a High Hazard Chemical

Please complete this form and give to the Chemical Management Officer (CMO) for review. The CMO, with the assistance of the Laboratory Chemical Management Committee, will make a final determination as to whether the chemical requested may be purchased.

Faculty name _____

Name of chemical requested _____

Common names, if any _____

Is this chemical on the "Red Flag" list? ❑ yes ❑ no

Any special handling or storage requirements? _____

Name of supplier _____

Quantity requested _____

Chemical will be used (completely):
- ❑ by end of current semester
- ❑ by end of next semester
- ❑ by end of next school year
- ❑ in 2 years

Lab experiment(s) using chemical _____

Will chemical be used by:
- ❑ instructor only
- ❑ entire class

What type of waste will be produced from use of this chemical:
- ❑ Hazardous waste: amt. vol. _____ (to be stored for proper disposal)
- ❑ Non-Hazardous waste (to be disposed of in the trash)
- ❑ Non-Hazardous waste (to be disposed of down the drain)

Incomplete Requests Will Be Automatically Denied.

_____ Faculty Signature

_____ CMO Signature

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APPENDIX C

Vermont School Science Lab Clean-Out Project
'Red Flag' Chemicals List
(9/9/99 Revision)

The following assumptions serve as the basis for selection of the chemicals contained in this listing:

1. The list does not purport to contain all hazardous chemicals that may be found in a school laboratory, only some of the most common.

2. The principal risk groups represented by this list are:

Fire and Explosion	e.g. highly flammable solvents, peroxides, azides
Oxidizers	e.g. nitrates, chlorates, perchlorates, concentrated mineral acids
Poisons	e.g. cyanides, pesticides, heavy metals
Air/Water Reactive	e.g. alkaline metals, phosphorus, calcium carbide
Carcinogens	e.g. acetamide, formaldehyde, nickel, asbestos
Ozone Depletion	e.g. chlorinated solvents (some are also carcinogens)

3. The chemicals listed will often exhibit more than one risk factor and not all these risks are equal.

4. Not all forms of the chemicals listed are equally hazardous. An aqueous solution of a compound may be quite safe to handle while use of its crystalline solid may be quite risky.

5. In addition to its chemical hazards, the frequency of a chemical's use, the size of its container and how long it already has been in storage will affect the desirability keeping it in stock.

6. Depending on the chemical and its intended use, strategies to minimize adverse human exposures and environmental impacts from laboratory chemical use may include:
   - Substituting less hazardous chemicals in certain experiments,
   - Adopting microscale experimental techniques,
   - Restricting use of certain chemicals to classroom demonstrations, or
   - Removing some chemicals from the school entirely.

References:

1. *Prudent Practices for Disposal of Chemicals from Laboratories*, National Academy Press, 1983.

2. Lewis, Richard J. Sr., *Hawley's Condensed Chemical Dictionary*, Twelfth Edition, Van Nostrand Reinhold Company, 1993.

3. U.S. Consumer Product Safety Commission, *School Science Laboratories, A Guide to Some Hazardous Substances*, U. S. Government Printing Office, 1984.

4. U.S. Department of Health and Human Services, *NIOSH Pocket Guide to Chemical Hazards*, U. S. Government Printing Office, 1997.

5. *Laboratory Waste Minimization and Pollution Prevention, A Guide for Teachers*, U. S. Department of Energy and Battle Laboratories.

6. Flinn Scientific, Inc. *Chemical and Biological Catalog Reference Manual* (issued annually)

NOTES ON THE CHEMICALS LIST:

H = This chemical is a regulated hazardous waste when discarded

E = Explosion/Fire hazard **C** = Carcinogen **T**= Toxic **R**= Reactive

HET	Acetaldehyde
C	Acetamide
HE	Acetic Acid (glacial)
HR	Acetic Anhydride
C	Acridine Orange
HCT	Acrylamide
T	Adrenaline
HR	Aluminum Chloride
HTR	Amide compounds
HETR	Ammonia gas
HR	Ammonium Hydroxide (14.8M)
HC	Aniline (or any of its salts)
CT	Antimony compounds
HCT	Arsenic powder & compounds
C	Asbestos
HETR	Azide compounds
HT	Barium & compounds
HEC	Benzene
C	Benzidine
E	Benzoyl Peroxide
HER	Benzyl Alcohol
HC	Beryllium & compounds
HTR	Bromine
HTR	Bromate compounds
HCT	Cadmium powder & compounds
T	Caffeine
HER	Calcium Carbide
HR	Calcium Oxide
HET	Carbon Disulfide
HCT	Carbon Tetrachloride
HER	Carbonyl compounds
HER	Chlorate compounds
HTR	Chlorine
HCT	Chloroform
HCT	Chromium powder & compounds
CT	Cobalt powder & compounds
T	Colchicine
HER	Collodion (nitrocellulose)
HT	Cresols
HTR	Cyanide compounds
HET	Cyclohexane
HET	Cyclohexene
HT	Dichlorobenzene
HC	Dichloroethane
HT	Dichloroethylene
HER	Diisopropyl Ether
HEC	1,4 Dioxane (p-Dioxane)
HET	Ethyl Ether
HT	Ethylene Glycol
HEC	Ethylene Oxide
HCT	Formaldehyde
HCT	Formic acid
HEC	Gasoline
HTR	Hydrochloric Acid (12M)
HTR	Hydrofluoric Acid
HER	Hydrogen Peroxide (30%)
HER	Hydride compounds
C	Hydroquinone
HTR	Iodine
TR	Iodate compounds
HETR	Lead compounds
HER	Lithium metal
HT	Mercury & compounds
HCT	Methylene Chloride
HE	Methyl Ethyl Ketone
HE	Methyl Isobutyl Ketone
T	Napthalene
CT	Nickel powder & compounds
HCT	Nicotine
HER	Nitrate & Nitrite compounds
HTR	Nitric Acid (15.8M)
HECR	Nitro & Nitroso compounds
HER	Perchlorate compounds
HER	Perchloric Acid
HER	Peroxide compounds
HT	Pesticides
HT	Phenol
HR	Phosphoric Acid (14.8M)
HETR	Phosphorus (yellow/white)
HETR	Phosphorus Pentoxide
E	Picric Acid
HER	Potassium metal
HR	Potassium Permanganate
HET	Pyridine
C	Pyrogallic Acid
HT	Selenium compounds
HCT	Silver compounds
HT	Strychnine
HER	Sodium metal
HR	Sulfide compounds
HR	Sulfuric Acid (18M)
HCT	Tetrachloroethylene
E	Tetrahydrofuran
HCT	Thioactamide
HCT	Thiourea
HET	Toluene
HCT	Trichloroethylene
HCT	Urethane (Ethyl Carbamate)

Safe Science H.S. chemical supply inventory — Room 213 — 3/1/2000

chemical name	Flynn store sys.	amount	comments/purchased
2,6 dichloroindophenol sodium salt	org 8	5g	
4-(p-nitrophenylazo)	inorg 4	5g	
acetic acid 1 M	org 1	1 L	
acetone	org 4	500ml	
aluminum metal	inorg 1	30 g	
aluminum oxide	inorg 4	500g	Nov-99
aluminum pot. sulfate	inorg 2	2.2kg	
aluminum sulfate	inorg 2	100g	Sep-99
ammonium chloride	inorg 2	1/4 lb	
ammonium dichromate	inorg 8	500g	Oct-99
ammonium hydroxide	acid cabinet	1.5 L	
ammonium oxalate	inorg 2	500ml	
ammonium sulfate	inorg 2	500g	
aniline blue sol'n	org 9	20ml	
antimony powder	inorg 1	4 oz	
barium	inorg 1	1/4 lb	
barium chloride	inorg. 2	200g	Sep-99
barium nitrate	inorg 3	100g	
barium sulfate	inorg 2	1/4 lb	
benzophenone	org 4	10g	Sep-99
bismuth nitrate	inorg 3	1/4 lb	
borax	inorg 8	1kg	
boric acid	org 9	225g	
bromthymol blue	org 9	200ml	
buffer soln (phosphate)	inorg4	400mls	
cadmium nitrate	inorg 3	20g	
calcium acetate	inorg 2	100g	Sep-99
calcium carbide	inorg 5	2 lb	
calcium carbonate	inorg 4	500g	
calcium chloride	inorg 2	1 lb	
calcium hydroxide	inorg 4	1 lb	
calcium oxide	inorg 4	500g	
charcole	inorg 4	100g	
chromium	inorg. 1	2 kg	
chromium nitrate	inorg 3	100 g	
citric acid	org 1	400g	
cobalt chloride	inorg 3	20g	
cobalt sulfate	inorg 2	25g	
copper granules	inorg 1	113g	
copper metal	inorg 1	100g	
copper powder	inorg. 1	1lb	
corn starch	housewares	1 box	
cupric chloride	inorg 2	1 lb	
cupric nitrate	inorg 3	1/4 lb	
cupric oxide	inorg. 4	1 lb	
cupric sulfate	inorg 2	3kg	
cuprous chloride	inorg 2	160g	
dimethyl glyoxime	org 2	1 oz	
ethyl alcohol	org 2	1000ml	

ferric ammonium sulfate	inorg 2	25g	Sep-99
ferric chloride	inorg 2	1/4 lb	
ferrous chloride, iron II	inorg 2	25g	
ferrous sulfide	inorg 5	1kg	
glacial acetic acid	org 2	10ml	
glycerine	org 2	500ml	
glycerol	org 2	200ml	
guar gum	org 2	500g	
hexamethylenediamine	org 2	75ml	
hydrochloric acid	acid cabinet	2.5 l	
hydrogen peroxide	inorg 6	2 bottles	
iodine	inorg 2	1 oz	
iron filings	inorg 1	1lb	
iso-pentyl alchohol, isoamyl	org 2	100ml	Sep-99
isopropyl rubbing alcohol	org 2	300ml	
lead nitrate	inorg 3	5 lb	
limewater	inorg 4	500ml	
lycopodium powder	org 2	100g	
magnesium carbonate	inorg 4	4 oz	
magnesium chloride	inorg 2	5kg	
magnesium indicator	stains	20ml	
magnesium ribbon	inorg. 1	1 spool	
magnesium sulfate	inorg 2	500g	
manganese dioxide	inorg 4	500g	
manganese metal	inorg 1	1 lb	
marble chips	inorg. 4	2kg	
mercurous nitrate	inorg. 3	28g	
methyl alcohol	org 2	400ml	
methyl orange	org 9	1 oz	
napthalene	inorg 3	500g	
nichrome wire, 16 gauge	inorg 1	4 oz	
nickel chloride	inorg 2	50g	Sep-99
nickel sulfate	inorganic 2	2kg	
nitric acid	acid cabinet	500ml	
petroleum ether	org 3	100ml	Sep-99
phenol red	org 9	1 g	
phenolphthalein	org 9	10ml	
polyvinal alcohol 4%	inorg misc	100ml	
potasium iodide	inorg 2	1 lb	
potasium nitrate	inorg 3	500g	
potassium chlorate	inorg 6	1 lb	
potassium chloride	inorg 2	500g	
potassium chromate	inorg. 8	300g	
potassium dichromate	inorg 8	1kg	
potassium hydroxide pellets	acid cabinet	5 kg	
potassium iodide	inorg 2	25g	Sep-99
potassium nitrate	inorg 3	500g	
potassium permanganate	inorg 8	100g	Sep-99
potassium phosphate	inorg. 2	200g	
potassium sodium tartrate	inorg 2	75g	
potassium thiocyanate	org 7	500ml	
salicylic acid	org 1	1kg	

salt	housewares	1 container	
sebacoyl chloride/hexane	org 3	75ml	
silica	inorg. 1	1kg	
silver chloride	inorg 2	1 lb	
sodium acetate	inorg 2	500g	Sep-99
sodium bicarbonate	inorg 4	1/2 lb	
sodium borate, tetra	inorg 8	300ml	
sodium carbonate	inorg 4	1kg	
sodium chlorate	inorg 6	1 lb	
sodium chloride	inorg 2	1 lb	
sodium chromate	inorg 8	1 lb	
sodium fluoride	inorg 2	50g	
sodium hydrogen phosphate	inorg 2	4oz	
sodium hydroxide	inorg 4	500g	
sodium hypochlorate	inorg 6	800ml	
sodium iodide	inorg 2	100g	
sodium metal	inorg 1	25g	Sep-99
sodium nitrate	inorg 3	100g	
sodium phosphate	inorg 2	50g	
sodium silicate soln.	inorg 2	500ml	
sodium sulfate	inorg 2	500g	
sodium sulfite	inorg 2	500g	Sep-99
stannic chloride	inorg 2	1 lb	
strontium carbonate	inorg 4	200g	
strontium carbonate	inorg 4	1 lb	
strontium nitrate	inorg 3	100g	
sucrose	org 2	1kg	
sudan IV	org 9	5g	
sugar	housewares	5 pounds	
sulfur	inorg 10	100g	
sulfuric acid	acid cabinet	1 L	
thioacetamide sol'n	org 2	10ml	
thymolphthalein soln.	org 9	100ml	
universal indicator	org 9	20ml	
vinegar, household	housewares	2 jugs	
white phosphorus	inorg 1	5g	
zinc metal	inorg. 1	100g	
zinc sulfate	inorg 2	1kg	
zinc, mossy	inorg 1	2 kg	

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APPENDIX E

The Experiments Over... Now What?

A Waste Management Decision Tree
or
What to do when the experiment is done.

I have a waste

- Is it hazardous? → Liquid or solid - It must be disposed as hazardous waste.
- Is it non-hazardous? → Solid - It can go in the trash.
  Liquid - It might get approval to go down the drain to the municipal sewer*

* Down the drain disposal of lab chemicals at schools with on-site septic systems is strongly discouraged, except for minimal quantities from equipment cleaning.

PRACTICES FOR LAB CHEMICAL WASTE HANDLING

1. Non-hazardous liquid wastes may be dried down - hazardous wastes may not.
   - only the water, not the chemical, may be evaporated

2. Chemical wastes awaiting proper disposal should be stored in a separate place:
   - not mixed in among virgin stock chemicals
   - not in the classroom
   - not in the hood

3. Containers of waste awaiting proper disposal should be:
   - in good condition and not leaking
   - kept closed, except when adding or removing waste
   - labeled to identify what they contain
   - labeled to identify that the contents are a hazardous or non-hazardous waste
   - stored only with compatible wastes
   - stored inside and protected from freezing

4. Avoid mixing hazardous and non-hazardous wastes. The mixture automatically becomes a hazardous waste.

WASTES TO HANDLE AS HAZARDOUS

		[EXCEPTIONS]
Strong acids	pH < 2.0	may be neutralized to be non-haz
Strong bases	pH > 12.5	may be neutralized to be non-haz
Flammable liquids	f.p. < 100°F	dilute aqueous solutions
Combustible liquids	f.p. < 140°F	dilute aqueous solutions
Oxidizers		dilute aqueous solutions
For Example:	chlorate, perchlorate, nitrate, nitrite, permanganate, azide, inorganic peroxide	
Heavy Metal Compounds		no exceptions
For Example:	Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver	
Cyanides or sulfides		no exceptions
Chlorinated solvents		no exceptions

WASTES SUITABLE FOR NON-HAZARDOUS DISPOSAL

Sugars
Starches
Vegetable oils, gums, powders

Animal fats
Enzymes
Proteins

Wax
Paraffin

Organic acid solids
Organic acid salts

Culture media
Food products

Indicators
Dyes - dry not pre-made solutions
Stains - dry not pre-made solutions

Buffer mixes and solutions
Ion exchange resins

Boiling beads
Light sticks

Soaps/surfactants/detergents
Chelating agents

Household products - but not those labeled "DANGER"or "POISON"

D*own the drain disposal for only Compounds with both low-toxicity cations AND low-hazard anions:*
[NEUTRALIZE FIRST]

Aluminum	bicarbonate
Ammonium	bisulfite
Bismuth	borate
Calcium	bromide
Copper	carbonate
Gold	chloride
Hydrogen	hydroxide
Iron	iodide
Lithium	oxide
Magnesium	phosphate
Molybdenum	sulfate
Potassium	sulfite
Sodium	thiocyanate
Tin	cyanate
Zinc	

GENERAL CONSIDERATIONS

1. Not every laboratory experiment's waste is a hazardous waste. In fact, it is easier to make a list of what is hazardous than what is not.

2. Laboratory chemicals often exhibit more than one risk factor and not all risks are equal. Be sure to read the container label or the Material Safety Data Sheet for that chemical.

3. Not all forms of a chemical or its wastes are equally hazardous.

4. Talk with your custodians before tossing stuff in the trash.

5. Talk to your local sewer plant operator about what you plan to put down the drain. Local sewer ordinances often place restrictions on what may be disposed in the system.

LEGAL REQUIREMENT

IF a school produces hazardous waste in any of its operations (art, science, shop, maintenance) **THEN** the school is required to have a Notification of Regulated Waste Activity Form on file with the Vermont Agency of Natural Resources, Waste Management Division.

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APPENDIX F

Agency of Natural Resources — Department of Environmental Conservation

VERMONT NOTIFICATION OF REGULATED WASTE ACTIVITY FORM

For Hazardous Waste, Universal Waste, and Used Oil Handlers

1. ☑ First Notification (Provisional ID №, if applicable: VTP-_____-_____-_____)
   ❑ Subsequent Notification (EPA ID №: VT___-_____-_____-_____) (please also complete entire form)
   Reason(s) for change (e.g., name change, change of ownership with date, waste streams, regulatory status): _____
   _____

2. Company Name (as will appear on manifests): Safe Science High School

3. Location Address (e.g., 22 Main St - not P.O. Box or rural route №): 22 Main Street
   City/Town: Pleasantville County: Essex Zip Code: 05325-0674

4. Mailing Address: ☑ same as 3, above; OR _____
   City/Town: _____ State: _____ Zip Code: _____-_____

5. Company Contact Person: (Last Name) Microscale (First Name) Sally
   Job Title: Chemical Management Officer Phone №: (802) 123-4567
   Address: 22 Main Street State: Vermont Zip: 05325-0674

6. Name of Legal Property Owner(s): Pleasantville Union School District
   Address: ☑ same as 3, above; OR ❑ same as 4, above; OR _____
   State: _____ Zip Code: _____-_____ Phone №: (_____) _____-_____

7. Legal land status: ❑ Private (individual(s)/corp(s)) ❑ Federal ❑ State ❑ County ☑ Municipal ❑ Indian ❑ District
   Legal facility-owner status: ❑ Private ❑ Federal ❑ State ❑ County ☑ Municipal ❑ Indian ❑ District

8. Does your company own other facilities or have affiliates in Vermont? ❑ Yes ☑ No
   If yes, please list name(s) & location(s): _____

9. Hazardous Waste Activity (does not include either "used oil" or "universal waste" activities):

   a. Generator Status (consider the total amount of hazardous waste generated per month — not the amount shipped):
      ☑ Conditionally Exempt Generator (< 220 pounds/month of hazardous waste and < 2.2 lbs/mo of acutely hazardous waste generated)
      ❑ Small Quantity Generator (220 to 2,200 pounds/month of hazardous waste and < 2.2 lbs/mo of acutely hazardous waste generated)
      ❑ Large Quantity Generator (> 2,200 pounds/month of hazardous waste or ≥ 2.2 lbs/mo of acute hazardous waste generated)
      (NOTE: 220 pounds = 100 kilograms; 220 pounds of waste with a density similar to water fills approx. ½ of a 55-gallon drum)

   b. Transporter (see instructions before marking this section): ❑ of own waste only ❑ for commercial purposes
      Mode of transportation: ❑ air ❑ rail ❑ highway ❑ water ❑ other: _____

   c. Other Activities (please see instructions before marking this section): ❑ hazardous waste transfer facility
      ❑ on-site recycling (e.g., solvent distillation; not antifreeze or silver recovery) ❑ certified treatment, storage or disposal
      ❑ off-site recycling ❑ hazardous waste fuel burner (Note: on-specification used oil is not hazardous waste fuel)
      Please give details here: _____

Type or print clearly in dark ink. If additional sheets are needed, please mark each appended sheet with the information required by lines 2 and 3; each additional sheet should also be signed by an authorized representative and dated, per line 13. Refer to instructions; for further assistance in completing this form, contact the Hazardous Waste Program at 802-241-3888.

[Please continue on reverse side]

d. Description of Wastes Generated or Handled:

Regulated Waste Description	**EPA/State Waste Code(s)***	**Amount Generated On-site** (in gallons or pounds/month)
Mixed liquid lab wastes (acids or bases)	D002	2 Gallons
Mixed liquid lab wastes (Cadmium, Chromium, Lead)	D006, D007, D008	0.25 Gallons
Photochemical wastes (Silver)	D011	10 Gallons
Waste paint related materials (Lacquers and Thinners)	D001	5 Gallons
Waste parts cleaning solvent	D001	5 Gallons

**** see instructions and attached sheets for frequently-used waste codes; for additional assistance, call 802-241-3888***

10. Used Oil Activity (please mark all that apply):
    a. ❑ Person first claims that used oil fuel meets specifications

    b. ❑ Person who directs used oil to a used oil burner - go to e, below (burner(s) name/address: _____

    c. ❑ Person who burns used oil on-site - go to h, below _____)

    d. ❑ Person who directs shipment of used oil to a re-refinery

    e. ❑ Used Oil Fuel Marketer: ❑ specification used oil ❑ off-specification used oil
    ❑ hazardous waste fuel ❑ Marketer who directs shipment of used oil to other marketers

    f. ❑ Used Oil Collection Facility

    g. ❑ Used Oil Transporter
    (rated @ >10million BTU/hr at manufacturing facility) (integral component of manufacturing process)

    h. ❑ Used Oil Fuel Burner: ❑ specification used oil ❑ off-specification used oil ❑ hazardous waste fuel

    Type of equipment used: ❑ space heater (rated @ <0.5 million BTU/hr) ❑ utility boiler
    ❑ industrial boiler ❑ industrial furnace

    ❑ other (please specify) _____

    Is used oil fuel accepted from an off-site locations to be burned on-site? ❑ Yes ❑ No
    If yes, please list the company/ies and address(es) from which used oil is accepted: _____
    _____

11. Universal Waste Activity: (e.g., batteries, Hg-lamps, PCB ballasts, pesticides) ❑ large quantity handler ❑ destination facility
    Type(s) of universal waste handled: _____

12. Comments: _____

13. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

    Signature of authorized representative: *Sally Microscale* Date: 3/9/2000

    Name: Sally Microscale Title: Chemical Management Officer

APPENDIX H

School Clean-Out Results Table

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SCHOOL SCIENCE LAB CHEMICAL & MERCURY CLEAN-OUT PROJECT
CHEMICALS REMOVED

	SCHOOL NAME	SCHOOL POPULATION	BASES	ACIDS	POISONS	MERCURY	FLAMMABLES	OXIDIZERS	SPONT. COMBUSTIBLE	SULFIDES	ASBESTOS	NON-HAZARDOUS	UNKNOWNS	REACTIVES	PEROXIDES	TOTALS
	1ST ROUND OF SCHOOLS															
1	A D LAWTON SCHOOL	400	10	21	3	5	54					11				104
2	ARLINGTON HIGH SCHOOL	270	0	8	22	39	10	13	3			65				160
3	BARRE TOWN SCHOOL	1150	59	37	29	4	67	33								229
4	BELLOWS FREE ACADEMY	975		5	4	8	66	14	1	8						106
5	BRATTLEBORO UNION HIGH SCHOOL	1200	76	52	148	32	110	105	19	4		273				819
6	CABOT SCHOOL	253	4	20	23	4	186	20	8			60				325
7	CANAAN SCHOOL	280		1	7	4		36	2	1						51
8	CASTLETON VILLAGE SCHOOL	148		6		1	59	3								69
9	COLCHESTER HIGH SCHOOL	750	41	81	82	17	137	31	2			90				481
10	CRAFTSBURY ACADEMY	102	10	12	36	3	23	19	4			22				129
11	EDMUNDS MIDDLE SCHOOL	1000	8	14	18		34	26	13			109				222
12	GREEN MOUNTAIN HIGH SCHOOL	460		2	3	3	2	22	2	4			5			43
13	HARWOOD UNION HIGH SCHOOL	800	27	185	100	19	112	85	22	8		141	19			718
14	LAMOILLE UNION HIGH SCHOOL	850	9	35	41	27	58	64	11	27		225				497
15	LYNDON INSTITUTE	650		12	33	4	24	64	5		8		19			169
16	MT. ANTHONY UNION HIGH SCHOOL	1000		46	47	19	24	64	17		2	140				359
17	MT. MANSFIELD UNION HIGH SCHOOL	900	3	29	17	14		12	2	2		18				97
18	NORTH COUNTRY UNION HIGH SCHOOL	1050	29	245	88	4	201	97	7	1		197	27			896
19	PEOPLES ACADEMY	618			6	5	74	2								87
20	RUTLAND LEARNING CENTER	50														0
21	SPAULDING HIGH SCHOOL	1115		31	13	15	206									265
22	THE PUTNEY SCHOOL	250	120	116	11	10	15	1			5		5			283
23	TWINFIELD UNION SCHOOL	251	18	42	56	4	14	27	13			136				310
24	VERGENNES UNION HIGH SCHOOL	1000	55	154	49	17	111	76	14			287				763
25	WEATHERSFIELD MIDDLE SCHOOL	170	3			4	6	2								15
26	WINDSOR HIGH SCHOOL	950	1		1	2										4
27	WINOOSKI MIDDLE/HIGH SCHOOL	850	31	18		32	52		1							134
	1ST ROUND TOTALS:	**17492**	**504**	**1172**	**837**	**296**	**1645**	**816**	**146**	**55**	**15**	**1774**	**75**	**0**	**0**	**7335**
	2ND ROUND OF SCHOOLS															
28	BARTON ACADEMY	225	9	46	14	6.5		11								86.5
29	BELLOWS FALLS UNION HIGH SCHOOL	560	52	104	97	3.5	45	124	5	1		126	3	4		564.5
30	BFA FAIRFAX	370	1	19	17.25	5	9.5	19				18		2	2	92.75
31	BLACK RIVER HIGH SCHOOL	265	120	20	25.5	4	211	22				30	1	1		434.5
32	BRIGHTON ELEMENTARY	150		18	7	2		7				6				40
33	BROWNS RIVER MIDDLE SCHOOL	497	10	5	3		16	2				3	2			41
34	BURLINGTON HIGH SCHOOL	1100	20	167	38	9	69	14	3			130		1		451
35	COLCHESTER MIDDLE SCHOOL	550	8	11	9	3	21	35				7				94
36	DANVILLE SCHOOL	200	17	30		8	3	32	2.5	11		16		1.5		121
37	GEORGIA MIDDLE SCHOOL	250	37	5	4	5	9	12	1		0.5	8	1			82.5
38	GUILFORD CENTRAL SCHOOL	260	4		2	0.5	3					5				14.5
39	HARTFORD HIGH SCHOOL	726	22	40	30	2	45	30	9	8		28	4	4	1	223
40	MATER CHRISTI SCHOOL	397	13	31	15	7	8	21	8			70		5		178
41	MILTON HIGH SCHOOL	525	63	193	50.75	24	76	66	3	32		192	24	7		730.75
42	MONTPELIER HIGH SCHOOL	500	61	221	129	18	35	87	24				7	10		592
43	MT. ANTHONY UNION HIGH SCHOOL	1158	12	31	11	3	29	3	2				2			93
44	MT. SAINT JOSEPH ACADEMY	200	64	89	56.5	18	38	71	20	3	2		2	25	7	395.5
45	NEWTON SCHOOL	150	20.25	24	3.25	1	4	12				8	2			74.5
46	ORLEANS ELEMENTARY	150	6	38	12.5		1	27				22	6	3.5		116
47	OTTER VALLEY UNION HIGH SCHOOL	824	6	24	33	15.5	28.5	34	0.25	2		65	3	1	5	217.25
48	OXBOW HIGH SCHOOL	700	15	5	8.75	3	39	12	1			7		2		92.75
49	PINE RIDGE SCHOOL	90				5		4								9
50	RUTLAND MIDDLE SCHOOL	412	424	112	27	10	238	23	1			62	2			899
51	RUTLAND TOWN ELEMENTARY	488	3	6	3	2	4	2				10		2		32
52	SHELBURNE COMMUNITY SCHOOL	876	98	95	5	2	37	17	8			45	1	6		314
53	SOUTH BURLINGTON SCHOOL DISTRICT	2000	12	49	54	23	104.5	45	3				7		2	299.5
54	SPRINGFIELD HIGH SCHOOL	670	16	118	68.75	13	82	144	8	8		300		20		777.75
55	WOODSTOCK UNION HIGH SCHOOL	753														0
	2ND ROUND TOTALS:	**15046**	**1113.25**	**1501**	**724.25**	**193**	**1155.5**	**876**	**98.75**	**65**	**2.5**	**1158**	**67**	**95**	**17**	**7066.25**
	3RD ROUND OF SCHOOLS															
56	BAKERSFIELD ELEMENTARY	186	12	17	2.5	1	8	8	1			21		0.5		71
57	BELLOWS FALLS MIDDLE SCHOOL	364	17	52.5		5	3	1				5	2			85.5
58	CHARLOTTE CENTRAL SCHOOL	523	46	23	10.5	8	102	31	5							225.5
59	ESSEX HIGH SCHOOL	1184	37	46	34	8	47	28	4					1		205
60	ESSEX TECHNICAL CENTER	320	242	23	22.25	0.25	1256					424				1967.5
61	FAIR HAVEN UNION HIGH SCHOOL	450				15										15
62	FLOOD BROOK UNION HIGH SCHOOL	309				1	2									3
63	GLOVER COMMUNITY SCHOOL	100	2	4	4	1.5	44	0.5								56
64	HAZEN UNION HIGH SCHOOL	437	328	1	12	6	1	12	0.5			3		1		364.5
65	MANCHESTER ELEMENTARY/MIDDLE SCHOOL	513														0
66	MIDDLEBURY UNION HIGH SCHOOL	755	40	71	50	17	41	39	11	1			5.5			275.5
67	MIDDLEBURY UNION MIDDLE SCHOOL	355		2		1		5				2				10
68	MILL RIVER UNION HIGH SCHOOL	796	165	42	36.25	2	141	99	10	7		66	16	5		589.25
69	NORTH HERO ELEMENTARY	80	0.5	0.5	1	0.5	8	5								15.5
70	NORTHFIELD MIDDLE/HIGH SCHOOL	525	93	126.25	24.25	17	49	89.25	9			152		3		562.75
71	RIVENDELL INTERSTATE SCHOOL DISTRICT	346	211	29	12	5	19	20	2				3	7		308
72	SACRED HEART SCHOOLS	145	4	6		10	3	1								24
73	STOWE MIDDLE/HIGH SCHOOL	396	24	19	14	4	20	27	4			87	8	3		210
74	STRATTON MOUNTAIN SCHOOL	97	1	10	6	1	6	13	1			30	1			69
75	VERMONT ACADEMY	254	13	56	105	24	72	56	16	3		95	2	20	2	464
76	WESTFORD ELEMENTARY	345	11	5	8	1	4.5	3								32.5
77	WHITINGHAM SCHOOL	271	18	31	17	6	33	24	3	2				5		139
78	WILLIAMSTOWN MIDDLE/HIGH SCHOOL	325	23	12.5	25.5	1	22	31	10	1	1	47		7		181
79	WILMINGTON MIDDLE/HIGH SCHOOL	292	91	36.5	11		4	4	1	0.5		36	63			247
	3RD ROUND TOTALS	**9368**	**1378.5**	**613.25**	**395.25**	**135.25**	**1885.5**	**496.75**	**77.5**	**14.5**	**1**	**968**	**100.5**	**52.5**	**2**	**6120.5**
	SCHOOL CLEAN-OUT PROJECT TOTALS:	**41906.00**	**2995.75**	**3286.25**	**1956.50**	**624.25**	**4686.00**	**2188.75**	**322.25**	**134.50**	**18.50**	**3900.00**	**242.50**	**147.50**	**19.00**	**20521.75**

TOTAL MERCURY COLLECTED:	**624.25**	**POUNDS**	**0.31 TONS**
TOTAL WASTE COLLECTED:	**20521.8**	**POUNDS**	**10.26 TONS**
TOTAL HAZARDOUS WASTE COLLECTED:	**16621.8**	**POUNDS**	**8.31 TONS**
TOTAL NON-HAZARDOUS WASTE COLLECTED:	**3900.0**	**POUNDS**	**1.95 TONS**