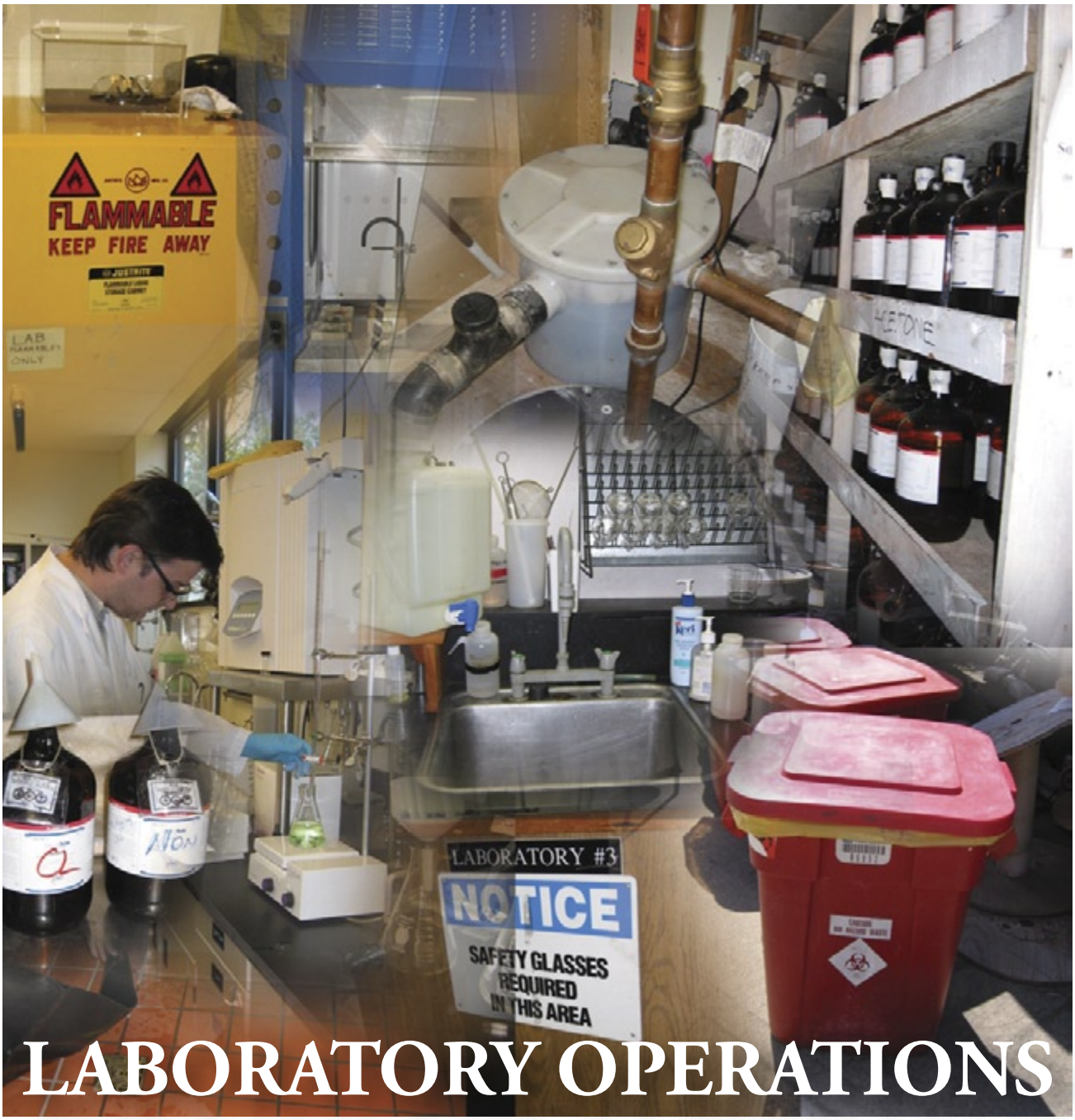
CAPITAL REGIONAL DISTRICT
Environmental Services

Environmental Regulations & Best Management Practices



LABORATORY OPERATIONS

Laboratory Operations in the Capital Regional District

Environmental Regulations and Best Management Practices

Laboratory Operations in the Capital Regional District

This manual is published by the Regional Source Control Program. For more information please call (250) 360-3256, email RSCP@crd.bc.ca or visit the CRD Web site at www.crd.bc.ca

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CAPITAL REGIONAL DISTRICT
Environmental Services

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Introduction

A wide variety of processes and testing methods are conducted in over a hundred different laboratory locations throughout the Capital Regional District (CRD). Many of the activities undertaken in these laboratories produce hazardous waste, including used solvents, metal-containing solutions, organic chemicals, acids and bases that can be collected, reduced or eliminated. Some of these wastes are being disposed of inappropriately to the sanitary sewer system.

The CRD Regional Source Control program has prepared this document in cooperation with representatives from large and small laboratories and academic institutions in the CRD. It serves as a guide to the environmental regulations that apply to laboratory operations within the regional district. It also provides information on best management practices and serves to assist operations in meeting these regulations and improving their overall environmental performance.

Why is Effluent from Laboratory Operations a Concern?

Waste from analytical laboratories is generally more diverse in composition than waste from other commercial businesses. Typically, the wastewater from a laboratory may contain hazardous and restricted wastes from a variety of laboratory procedures. Waste composition in your lab will depend on the type of activities undertaken and services provided. Discharges of contaminants from a single laboratory may be relatively small, however, collectively they can have a significant impact on the region's sanitary sewage collection and treatment systems. Among the contaminants of concern are nickel, copper, zinc, silver and mercury.

Other substances commonly discharged from laboratories that also may have an impact include cyanide, phenolic compounds, spent solvents, formaldehyde, acids and bases, waste reagents and chemicals, used samples, reaction products and cleaners.

In the past, many laboratories disposed of liquid wastes and contaminated wastewater indiscriminately down the drain. Most laboratory drains are connected to a sanitary sewer system. Laboratory chemicals can create hazards such as fire, explosion, air and water pollution, corrosion of sewer pipes or damage to sewage treatment facilities. Disposal of these materials to the sanitary sewer is not acceptable. Wastewater disposal practices must comply with the Capital Regional District's Sewer Use Bylaw.

Summary of Regulatory Requirements

Federal Government

The federal legislation and regulations that may be relevant to laboratory operations in the CRD are summarized as follows:

- *The Transportation of Dangerous Goods Act* contains provisions that apply to the general transportation and handling of hazardous materials.

- The Canadian Environmental Protection Act gives Environment Canada the power to regulate substances that have been declared toxic as defined in the Act. Where import or export of hazardous waste occurs, the Export and Import of Hazardous Waste Regulation under the *Canadian Environmental Protection Act* would apply.

- *The Hazardous Products Act* and the *Controlled Products Regulation* form the basis of the Workplace Hazardous Material Information System (WHMIS) that is used throughout Canada and administered through the Workers' Compensation Board. WHMIS includes the labeling of controlled products and the provision of material safety data sheets (MSDS).

- *The Hazardous Materials Information Review Act* established a commission to rule on the workers' right to know about hazardous products and industry's need to protect confidential product formulations. For workplaces regulated by the federal government, the *Canada Labour Code* provides occupational health and safety requirements including that employers educate and train workers about WHMIS.

Depending on the substances in use in a laboratory, the operator may need to consider the requirements of the *Canadian Environmental Protection Act, Controlled Drugs and Substances Act, Pest Control Products Act, Transportation of Dangerous Goods Act,* and associated regulations.

Provincial Government

BC Regulations
The BC Spill Reporting Regulation requires reporting of spills of any materials that could cause pollution. The regulation identifies the chemicals and the minimum spill quantities that must be reported to the Provincial Emergency Program (PEP).

The Occupational Health and Safety Regulation contains requirements for Workplace Hazardous Materials Information System (WHMIS) training, including chemical labeling, storage and record keeping.

The *BC Plumbing Code* specifies standards for the design and installation of plumbing systems.

The *BC Fire Code Regulation* regulates storage and handling requirements for several groups of substances used in analytical and research laboratories, including flammable and combustible liquids, compressed gases, reactive, radioactive, corrosive, oxidizing, poisonous and infectious substances. The Act contains provisions regarding types and size of storage containers, maximum storage quantities, spill control, fire suppression system requirements and ventilation requirements. For more information, contact your local fire department.

The BC Ministry of Environment regulates the management of hazardous waste through application of the *BC Hazardous Waste Regulation* (BCHWR) under the *BC Environmental Management Act.* Section 39 of the BCHWR restricts the deposit or discharge of hazardous waste into any waste disposal system operated by a municipality or other public authority. Such waste disposal systems include:

- sanitary sewers
- storm sewers or watercourses
- septage disposal facilities, and
- solid waste landfills

Workers' Compensation Board of British Columbia
The *Workers' Compensation Act* contains provisions that apply to the general transportation and handling of hazardous materials. The requirements of the *Occupational Health and Safety Regulation* come under the authority of the *Workers' Compensation Act* and *Workplace Act*. The Workers' Compensation Board of British Columbia (WCB) regulates health and safety issues such as chemical exposure, indoor air quality and biohazards under the provincial *Workers' Compensation Board Regulations* (WCBR). Contact information for the WCBR can be found in the "For more Information section." *see page 21.*

Regional Government

CRD Sewer Use Bylaw
Under the provincial *Environmental Management Act*, the CRD is empowered to regulate the discharge of waste into its own sewers and into sewers owned and operated by member municipalities.

The CRD's Regional Source Control program is one of five liquid waste control programs that the CRD Board committed to during a 1992 referendum on liquid waste. On 10 August 1994, the Board of the CRD passed Bylaw No. 2231, *A Bylaw to Regulate the Discharge of Waste into Sewers Connected to A Sewage Facility Operated by the CRD.* This bylaw has been updated as ***CRD Sewer Use Bylaw 2922, No. 5, 2001***, and is generally referred to as the Sewer Use Bylaw. The main intentions of the Sewer Use Bylaw are to protect:

- the marine-receiving environment
- public health and safety
- sewerage works (*infrastructure*)
- wastewater treatment processes
- biosolids quality

The bylaw also ensures:

- fair and balanced use of the CRD's facilities,
- promotion of responsible waste management practices

Other Regional or Municipal Regulations
Other regulations that may apply to the handling and disposal of wastes from a laboratory operation within the CRD include:

- *Hartland Landfill Tipping Fee and Regulation Bylaw* (CRD), which regulates the disposal of wastes at the CRD's Hartland Road sanitary landfill
- *CRD Septage Disposal Bylaw*, which regulates the discharge of septic tank contents into Septage Disposal Facilities
- Municipal storm sewer bylaws, which regulate the discharge of wastes into municipal stormdrains and watercourses.
- Municipal plumbing bylaws, which specify requirements for installation and maintenance of plumbing and drainage equipment.

Mandatory Requirements

In many cases, companies require a waste discharge permit to discharge industrial or commercial wastes into the sewers. However, the CRD's Sewer Use Bylaw also provides for the discharge of certain types of waste under industry-specific Codes of Practice.

Codes of practice are regulatory documents, developed by the CRD, which contain mandatory sanitary sewer discharge standards for specific industrial, institutional, or commercial sectors. Codes of practice set out minimum effluent treatment, equipment maintenance and record-keeping requirements for various sector operations. A business or organization operating under an approved code of practice does not require a waste discharge permit.

This section summarizes the regulatory requirements contained in the CRD Sewer Use Bylaw that apply to laboratory operations. It is intended for information and guidance purposes only. If there is any discrepancy between this information and the bylaw, the bylaw takes precedence.

The CRD has determined that wastewater from laboratory facilities may contain restricted waste as defined in the bylaw. Facilities that discharge **restricted waste** must either operate under a waste discharge permit, an authorization or a code of practice.

Laboratory operations that follow the **Code of Practice for Laboratory Operations** (Schedule 'S' of the Sewer Use Bylaw) are authorized to discharge restricted waste into a sanitary sewer without a waste discharge permit. The CRD reserves the right, if deemed necessary by the sewage control manager, to require any laboratory operation to obtain a waste discharge permit. All other terms and conditions of the Sewer Use Bylaw apply to the discharge to the sanitary sewer.

Application

A laboratory operation is defined as any commercial, industrial or institutional laboratory or a laboratory operated by a public authority that generates liquid waste in association with activities including, but not limited to:

- agriculture
- analytical service
- aquaculture
- chemical manufacturing
- education
- forestry
- health care
- industrial hygiene
- materials testing
- pharmaceutical manufacturing
- research
- tissue culture
- veterinary medicine

All laboratories must follow this code of practice if they want to use the municipal sewer system for disposal of wastewater (other than wastewater from toilets and washrooms).

Discharge Regulations

Laboratory operations must not discharge into the sewer waste that contains:

- prohibited waste – anything that could cause a fire or explosion, block the sewers, cause odours, or corrode or damage the sewer system
- restricted waste as defined in the bylaw with the exception of biochemical oxygen demand (BOD), chemical oxygen demand (COD), chloride, sulphate, mercury and seawater
- waste containing mercury in concentrations greater than 0.01 milligrams per litre
- waste containing PCBs, dioxin TEQ, halogenated solvents, chlorinated phenols or pesticides
- seawater, in quantities greater than two cubic metres per day, without prior authorization from the manager
- uncontaminated water in quantities greater than two cubic metres per day. (Uncontaminated water takes up valuable sewer line capacity that could be used to handle wastewater that needs treatment.)
- stormwater as defined by the bylaw without prior authorization from the manager

A laboratory may meet these requirements by collecting and transporting wastewater or other substances for off-site waste management. Never dilute samples with water to achieve required discharge limits. Dilution for this purpose is illegal.

A laboratory that treats waste to meet the requirements must test the treated waste prior to discharge to sanitary sewer using an analytical method or methods outlined in standard methods, or an alternative analytical method or methods approved by the manager.

Monitoring Points

Laboratories that commenced operations on or after January 1, 2004 must have installed one or more monitoring points downstream of all laboratory discharges and upstream of any discharge of other waste.

- The monitoring points must be of the same diameter as the outlet pipe so that the monitoring point opens in a direction at right angle to, and vertically above, the flow in the sewer pipe.
- The monitoring points must be readily and easily accessible at all times.
- A laboratory operation that was in operation before January 1, 2004 must install the monitoring points if the laboratory:
    - makes an improvement with a value of $5,000 or more within the laboratory that will increase either or both of the discharge flow of the waste or the amount of any contaminant in the waste;
    - makes an improvement with a value of $5,000 or more that includes any changes to laboratory plumbing; or
    - discharges waste into a sanitary sewer that does not comply with the discharge regulations of the code of practice for laboratory operations. *See Discharge Regulations.*

Storage and Containment

Laboratories must ensure that chemicals and waste are stored using spill containment that will prevent any spilled material from entering a sewer.

Any accumulated stormwater from a spill containment system must not be discharged to

the sewer unless it has been tested to confirm that such discharge will not breach discharge regulations of the code of practice for laboratory operations or the operator has obtained a valid waste discharge permit or authorization under the bylaw.

Spill Response Plans

Existing laboratory operations must have a spill response plan. New facilities have 30 days prior to commencing operation to prepare a plan. The minimum requirements for the plan include: the definition of the roles and responsibilities for spill response, contact names and numbers for the appropriate agencies and a list of all spill response equipment.

- The spill response plan must be posted in a conspicuous location and an appropriate amount of clean-up equipment and supplies must be kept in stock at all times.
- When safe to do so, the operator must immediately carry out the spill response plan to prevent or discontinue the discharge of spilled material into a sewer.
- If spilled material has entered or may enter the sanitary sewer, the spilled material must be removed or treated to meet the discharge regulations of the code of practice for laboratory operations.

Record Keeping and Retention

The operator of laboratory operations must keep written records to show due diligence regarding site activities and to demonstrate that requirements of the code of practice have been met.

- Accurate and up-to-date records must be kept of all disposal or recycling services for wastewater and other substances that are disposed or recycled to meet the requirements of the code of practice for laboratory operations. These records must be kept for a period of two years. These records must include:
  - name, civic and postal address, and telephone number of each disposal or recycling company or facility used by the laboratory
  - type of material transferred to each company or facility
  - quantity of material transferred to each company or facility
  - date of material transferred to each disposal or recycling company or facility
- If an operator treats wastes prior to discharge, records of the results of the testing must be kept for a period of two years.
- The laboratory must keep a list of the types of services provided or general procedures conducted by the laboratory that cause a discharge of waste into the sewer.
- The laboratory must keep an inventory of all chemicals stored in, and used by, the laboratory that are contained in a waste that is discharged into the sewer.
- The laboratory must keep written procedures for all treatment methods used when waste is treated prior to discharge into the sewer.

The list of services provided, inventory of chemicals and the written procedures for treatment methods conducted must be available for inspection on request by an officer.

Best Management Practices

Best management practices (BMPs) are activities developed to help operators reduce the amount of contaminants discharged to the environment, to comply with regulations and to improve overall waste management practices. BMPs are based on the pollution prevention (P2) principle, which emphasizes reducing, or eliminating pollutants and toxic materials at their source rather than removing them from a mixed waste stream. Preference should be given to practices highest in the following P2 hierarchy:

- avoidance, elimination or substitution of polluting products or materials
- reduction in the use of polluting products or materials
- elimination and reduction of the generation of polluting by-products
- reuse and recycling of polluting by-products
- treatment or containment of polluting residual by-products

The following BMPs will help laboratory operators decrease the amounts of contaminants entering the sewer system, comply with regulations, improve their operations and save money through application of pollution prevention principles. Operators are also encouraged to influence suppliers by requesting and purchasing less toxic, alternative products and buying from suppliers who accept materials and containers back for recycling.

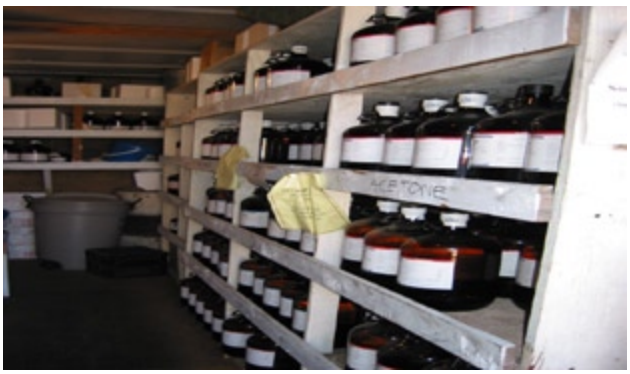
Laboratories use a wide variety of chemicals and processes. This guidebook does not directly address any issues related to human health and safety. If you are concerned about facility health and safety, you should consult the
appropriate regulations such as the *Workers' Compensation Board Regulations* and the *Occupational Health and Safety Regulations*. *See For more Information*.

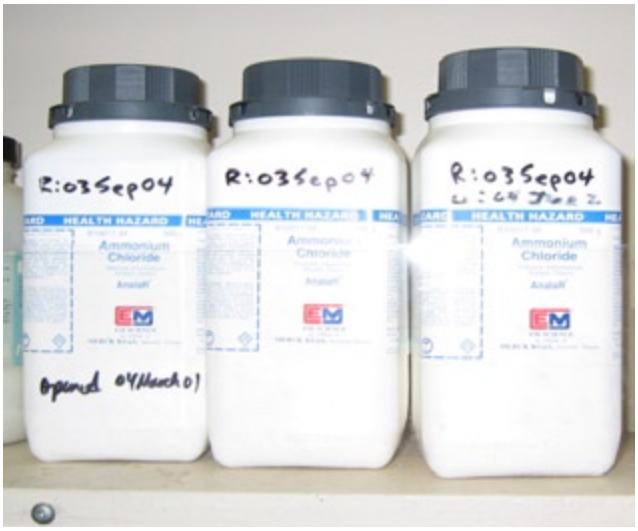
Chemical Inventory Management

Each laboratory operating in the CRD is required to maintain an inventory of the chemicals they have that may be contained in a waste discharged to the sewer. A sure way to minimize this waste is to carefully purchase, track and monitor all chemicals in your laboratory. Implementing an inventory management system can be as straightforward as keeping records of your available chemicals or as complex as a web-based database that strictly monitors all incoming products and outgoing waste. Implementing an inventory tracking system will provide important information about the quantity and rate of use of chemicals in the facility.

Although an inventory management system will be specific to each laboratory, the following suggestions will assist in designing a system to meet your laboratory needs:

- Consider consolidating or coordinating purchasing authority and tightening purchasing controls. A centralized purchasing





program can monitor requests for chemicals, implement policies such as staggered deliveries, sharing of chemicals among common users, and plans for leftover chemicals.

- Think about your potential disposal costs when purchasing chemicals. Many chemicals have an expiry date and deteriorate. Removing chemicals may be 20 to 50 times the original purchase price. Do not buy extra chemicals in bulk for supposed 'savings'.

- Use a 'first in, first out' policy to keep chemicals from becoming outdated and requiring disposal.

- Limit the size of samples that you will accept and guarantee your ability to return samples to the client or supplier.

- In addition to labeling incoming chemicals with storage and safety precautions as required by WHMIS, note the purchase date on the label. This will assist in tracking how quickly chemicals are used. Maintain labels by inspecting them frequently and making new labels as necessary.

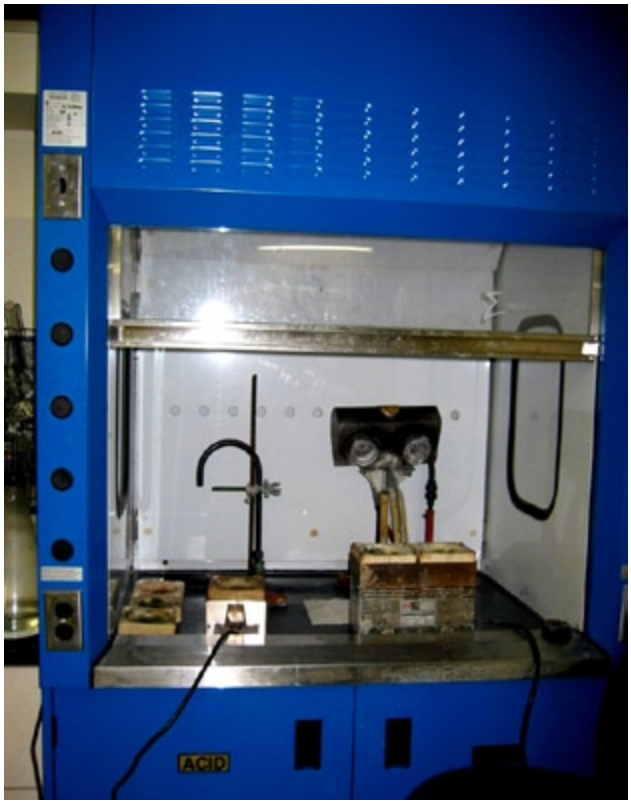
- Establish a chemical product exchange where excess or surplus material may be used by other laboratories rather than being disposed of. This type of exchange is generally limited to unopened containers that have not been contaminated.

- Conduct routine self-audits for all laboratory facilities to minimize reagent accumulation and maximize recycling and sharing of surplus materials.

Fume Hoods

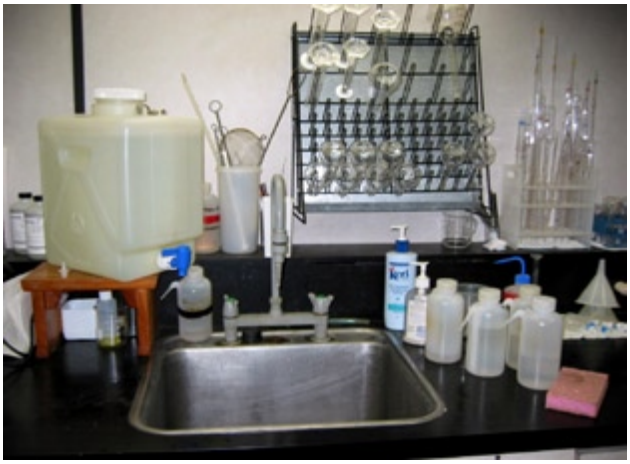
Do not store chemicals in fume hoods. They may interfere with the air flow, clutter up the work space and could potentially spill. Chemicals stored in a fume hood can result in waste discharges. This may damage your plumbing and may cause you to exceed CRD Sewer Use Bylaw discharge limits.

If possible, make sure sinks located in or under fume hoods are covered or have drains that must be opened manually.



Note: The *Occupational Health and Safety Regulation* states a fume hood must not be used for storage of chemicals unless it is used exclusively for this purpose and is labeled with this limitation.

Sinks and Drains



Sinks and drains in the laboratory are prime locations for wastes to enter the sewer. Following the best management practices and minor plumbing modifications listed below will help reduce the likelihood of spilled chemicals or waste entering the sewer through your sinks or drains. *See Metals for information on sediments that may be contaminated (with mercury, for example) accumulating in sink drainpipes on page 15.*

- Never store chemicals in or near safety showers.
- Do not store chemicals above or near sinks.
- Install plugs on safety showers and eye-wash stations that release only when the shower or eyewash is activated.
- Have all drains in your laboratory fitted with plugs and keep them closed when not in normal use to prevent spilled chemicals or wastes from entering the sanitary sewer system.
- Have all your laboratory sinks fitted with remote-controlled drain plugs, similar to those often used on bathroom sinks and bathtubs. If a chemical is inadvertently spilled in the sink, the drain can be plugged without reaching into the sink.

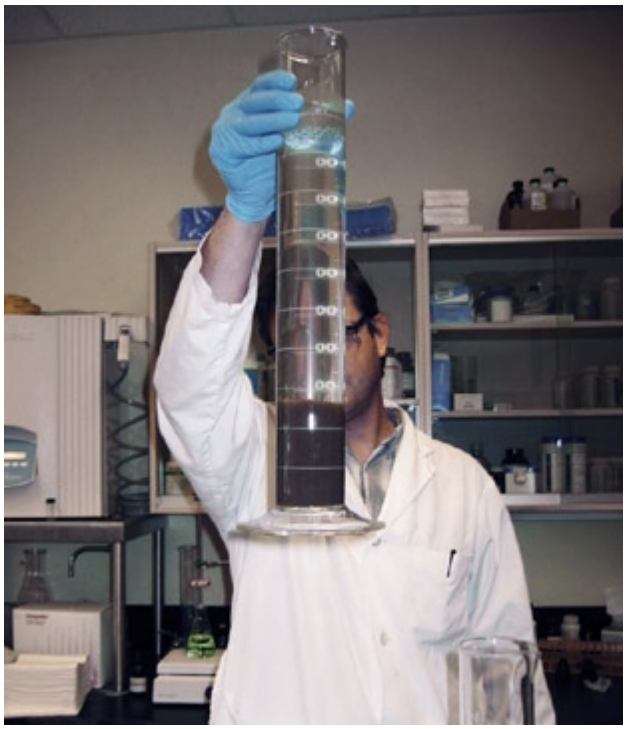
Off-Site Waste Management

Managing the generation and disposal of waste is one of the most important environmental management challenges facing laboratory staff. Common issues that need to be addressed include classification, storage, labeling, treatment, and disposal of lab wastes as well as identifying opportunities to prevent their generation altogether.

A laboratory may collect and transport wastewater or other substances for off-site waste management. Since laboratories are responsible for the wastes they generate and dispose of, it is advisable to find and use a reliable hazardous waste or off-site waste management service. As a general rule, if a product is purchased as a laboratory chemical reagent it should be disposed of as hazardous waste unless it has been determined to be non-hazardous.

Before doing business with an off-site waste management service, ask for references and make sure to check them. Also ask questions about their recycling and disposal practices. All hazardous waste collected by the off-site waste management service should be delivered to a site authorized by the provincial or federal government. Always keep copies of all your transactions. *See Record Keeping and Retention on page 10.*

Treatment of Wastes On-site



Wastewater discharged from laboratories into the sanitary sewer system flows to wastewater treatment facilities that have a limited capacity to remove chemical contaminants. To protect the receiving environment, sewage collection and treatment infrastructure, and biosolids quality, all wastewater discharged to the sanitary sewer must be in compliance with local, provincial and federal regulations. Never dilute samples with water to achieve required discharge limits. Dilution for this purpose is illegal.

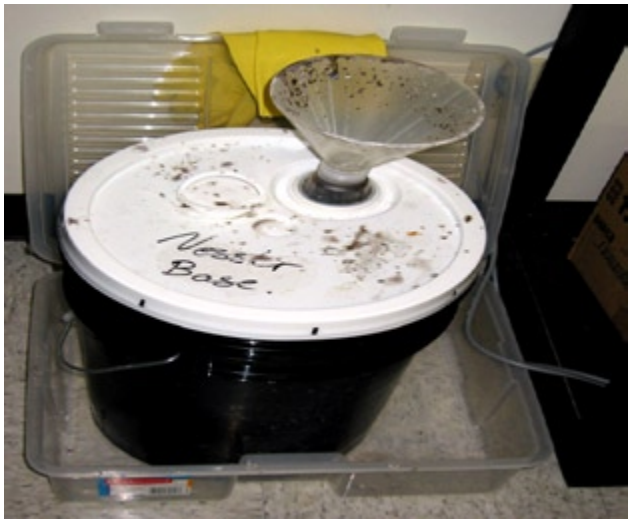
After all feasible pollution prevention and waste minimization opportunities have been explored, appropriate treatment technologies must be used. There is no single comprehensive treatment technology for all laboratory wastes; each waste requires a process designed for its unique characteristics. There are numerous treatment methods that a laboratory can implement to achieve the prohibited and restricted waste limits in the Sewer Use Bylaw.

Some commonly used processes include the following: carbon adsorption, distillation, neutralization, evaporation, filtration and separation. There are many other waste treatment processes. However, the complexity of some of them suggests that only highly skilled laboratory personnel should carry them out.

Prior to deciding on a treatment method for your wastes, make sure that you research appropriate waste reduction techniques, treatment methods and disposal options for the specific wastes that your laboratory produces. Regulations enforced by other agencies may apply to some on-site treatment processes such as application for a provincial air quality permit or having a municipal fire department's approval.

Always ensure that the treatment process you choose does not pose a risk to human health or the environment resulting from such events as fire, violent reactions, heat, toxic mists, fumes, dust or gas, or damage to the structural integrity of the container holding the waste.

If you dispose of treated wastes to the sanitary sewer, keep appropriate records for your treatment processes and any subsequent off-site waste management. *See Record Keeping and Retention on page 10.*



Reagents, Fixatives and Stains

- Stains are made up of a dye and a solvent. Solvents alone may be considered hazardous due to ignitability and toxicity. Do not discharge stains that contain flammable solvents.
- Minimize the volumes of reagents, dyes and stains used and substitute with less hazardous products whenever possible.
- Reduce the size of the bath used for fixing and rinsing slides.
- Stain slides with drops instead of using a dipping bath or, better yet, install an automatic slide stainer.
- Review the product MSDS for information on ingredients. If the products contain metals, are carcinogenic or mutagenic, treat them as hazardous waste for disposal using an off-site waste management company. Some dyes and stains may be treated prior to discharge to the sewer. If you don't have sufficient information to make a good decision on a specific product, deal with it as a hazardous waste.

Formaldehyde

Do not dispose of waste formaldehyde (formalin) into the sanitary sewer. Treat as hazardous waste. Formaldehyde substitutes are commercially available. If you use a substitute, review the ingredients and chemical safety and disposal options in the product MSDS so that you have a clear understanding of the potential impact of the new product.

Distillation is currently being used in laboratories to safely recover formaldehyde. There are kits containing additives available to restore the formaldehyde to its original composition. The concentration of distilled formaldehyde solutions will be different after distillation. Add water or concentrated formaldehyde to readjust to the desired solution strength.

Distillation and recycling of formaldehyde can save your laboratory money. Alcoholic formalin is generally not distilled and recycled because of the difficulty of restoring the original proportions in the formaldehyde and alcohol mixture.

Metals

Metals such as arsenic, cadmium, chromium, copper, lead, silver, mercury and zinc are commonly found in some laboratory reagents. Wastes containing metals should not be discharged to sewer.

- Metals are not treated or eliminated by common laboratory wastewater treatment systems such as limestone sumps. On-site treatment of the waste can include precipitating metals as sulphides, chlorides or hydroxides and recycling or disposal as a hazardous waste. Keep records of your treatment methods and off-site waste management.
- Minimize the use of metal-bearing reagents in the laboratory.
- Use organic cleaning solutions instead of chromic-sulfuric acid mixtures when cleaning glassware.
- Water from re-circulating water systems that have been treated with metal-containing chemicals such as copper, zinc or tributyl tin should not be discharged to the sanitary sewer.

Mercury

Mercury can be found in many laboratories as a chemical compound in some fixatives and stains, and as a liquid metal in laboratory equipment such as polarographs, electrical switches and thermometers. Mercury and its compounds are highly toxic, especially organo-mercury compounds. Inorganic mercury can be transformed into organo-mercury in the environment where it is known to accumulate in the tissues of fish, plants and mammals and to bio-concentrate within the food chain.

Some of the mercury that finds its way into the sewer system may originate from broken laboratory equipment, poor disposal practices and spills. Metallic mercury can settle at low points such as sumps or p-traps (the curved u-shaped section of drain pipe that holds liquid to provide a seal for sewer gasses). Often the slow dissolution of mercury in such locations is significant enough to exceed restricted waste limits in the wastewater discharge to sanitary sewer even after poor disposal practices are eliminated.

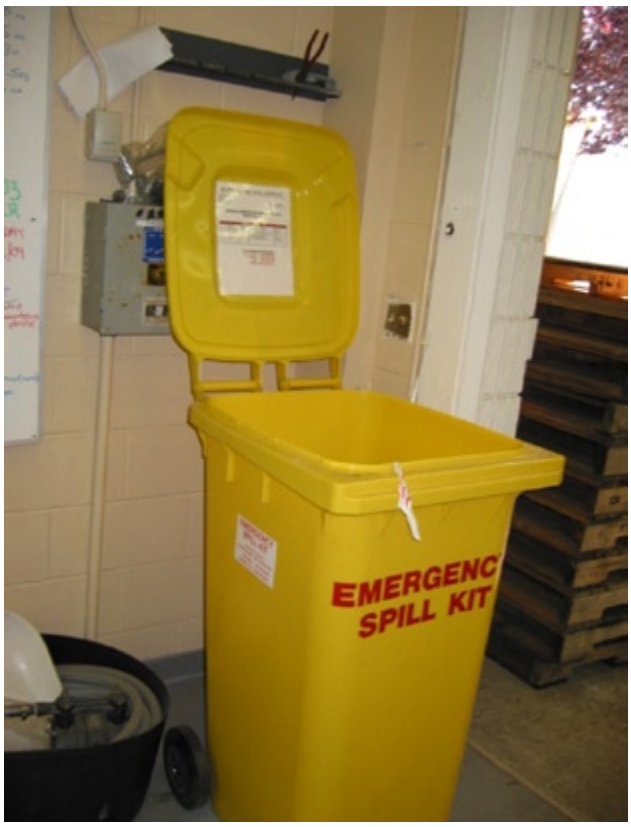
Some reagents may contain mercury that may have been added as a preservative, or may be present as an impurity introduced though a mining or manufacturing process. Ask your chemical distributors very specific questions about their products. For example, ask if a mercury cell process is used to produce the sodium in their sodium-containing products. If they are reluctant to give you this information, ask for a certificate of analysis regarding mercury content. It is important for you to be informed as you are responsible for all wastes generated in your lab.

- Whenever p-traps or sumps are cleaned, it is important that the solid contents are handled as a hazardous waste unless proven otherwise.

- Minimize the use of mercury or substitute with a non-toxic alternative in your laboratory whenever possible. There are mercury-free alternatives to fixatives, stains, and its use in some equipment (such as switches and thermometers).

- If mercury is present in laboratory liquid waste in excess of restricted waste limits it can either be collected and disposed of off-site as a hazardous waste (preferred method – zero discharge) or treated on-site. A common method of treating liquids containing inorganic mercury is through precipitation (for example, as insoluble sulphides) and filtration. The filtered solids can be handled by off-site waste management. The liquid filtrate must be treated to ensure that mercury levels are below the required 0.01 milligrams per litre prior to disposal to sewer. Ensure that appropriate records are maintained.

- Keep a mercury spill kit on site. Never use a vacuum cleaner or a shop-vac to clean up a mercury spill.



Solvents

Many organic solvents are flammable or toxic. Waste solvents must be contained and segregated properly for recovery and disposal such that they do not pose a safety hazard during transportation or storage.

- Many used solvents can be re-distilled for reuse.
- Collect and store waste chlorinated and non-chlorinated solvents in separate containers prior to off-site waste management.
- If laboratory vacuum systems are installed, they should have dry-seal or non-contact water pumps. Vacuum pumps that use contact water may inadvertently discharge small quantities of solvents to the sanitary sewer.

Waste Pesticides

Pesticides include herbicides, insecticides, fungicides and rodenticides. Some laboratories may use these materials at their facilities to control pests, while others may be involved in the testing of pesticide-containing materials as part of their business. The storage, use and disposal of pesticides is regulated at the federal, provincial and levels. The CRD Sewer Use Bylaw
prohibits disposal of pesticides into the sewer system.

Pesticides stored on site must be managed in accordance with label directions. Use the pesticide for its intended purpose according to directions on the label. When applicable, rinse empty containers three times with water and use the rinse water as part of the pesticide application process.

Uncontaminated Water

Uncontaminated water takes up valuable sewer line capacity that could be used to handle wastewater that needs treatment. Reducing discharge of uncontaminated water also reduces potable water use, and the related cost. There are numerous sources of uncontaminated water that originate from laboratory operations. Cooling water applications such as cooling towers and single-pass systems are some sources of uncontaminated water. Single-pass or once through cooling water systems are found in air conditioning units or chillers and are also found on such things as vacuum pumps, water distillation units, reverse-osmosis purification systems and autoclaves.

- Eliminate single-pass cooling systems. Consider installing heat exchangers or re-circulating cooling water systems to conserve waste cooling water. Most single-pass water cooled equipment can be replaced with more efficient air-cooled equipment that pays for itself within a few years in reduced energy, water and sewer costs.
- Optimize cooling tower blowdown (also known as bleed-off) rates to reduce the amount of water discharged to the sewer.
- Some single-pass cooling systems found in vacuum pumps use as much as ten gallons of water per minute. These pumps should

be replaced or retrofitted with re-circulating cooling water systems. The savings gained through reduced water and sewer fees can quickly pay for such modifications.

- Water from re-circulating water systems that have been treated with metal-containing chemicals should not be discharged to the sanitary sewer. *See page 15.*
- Install water-saving devices on sinks and rinse tanks.
- Reduce rinse times if possible (without affecting work procedures).
- Consider replacing glassware washing equipment or autoclaves that use water inefficiently, and avoid cleaning or sterilizing partial loads.
- Reduce the chances of a high volume water release by using security clamps or other devices to prevent loosening of connections, or use an automatic shut-off device. Check for loose connections or breaks in lines to water condensers and cooling systems.
- Check for leaks where they are not easy to see, such as in heat exchangers. Check water bills for anomalies and monitor overnight consumption at the water metre to identify leaks.
- Consider conducting a water audit. *See page 21* for CRD Water Services contact information.

Employee Education

All laboratory workers and employees should understand the importance of utilizing best management practices for waste reduction and water use minimization. Training for new employees and refresher training for all staff is critically important.

- Make sure employees are trained whenever new equipment is installed or new procedures implemented. They should be familiar with the hazards that accompany the material they are using and be aware of potential sources of contamination.
- Explain site layout, water, sewer and drainage plans/diagrams and make sure employees use good housekeeping practices to minimize waste and proper reporting procedures
to document waste handling, storage and disposal.
- Ensure all employees are aware of the spill response plan and are properly trained to carry it out.
- Keep records of all employee training.

General Chemical Management

- You are required to keep an inventory of all chemicals stored in and used by the laboratory that are contained in a waste discharged to sewer.
- Buy only what you need to reduce outdated stock chemicals. Rotate stock to use chemicals in date sequence. Prepare only the quantities of reagents and solutions needed to complete each job.
- Sometimes simple changes to a process can significantly reduce the amount of wastes generated at your laboratory. For example, perform experiments on a microscale whenever feasible. Check your laboratory procedures to see where you can make improvements.
- You can reduce the amount of wastes produced at your laboratory if you increase the amount of materials that are recovered and reused, like solvents and formaldehyde.

- Some laboratories may choose to exchange unused materials between departments or with other businesses.
- Store all materials in their proper containers with the correct label. Up-to-date MSDSs should be kept for each product.
- Store flammable and combustible materials in fireproof cabinets.
- Ensure separate storage of incompatible chemicals to prevent cross-contamination and chemical reactions.

Spill Prevention

In the event of an accident or earthquake, the following practices should help prevent breakage or spills leading to discharge of chemicals to the sewer:

- Reduce spills by storing glassware and other containers on textured rubber mats.
- Keep containers closed when not in use.
- Reduce bottle breakage by ordering chemicals in plastic-coated bottles whenever possible.
- Always transport chemicals in secondary containers or on carts to reduce the risk of spills.
- Always use plastic or insulated holders for solvent bottles.
- Never store chemicals on shelves or in cabinets over sinks; store in approved chemical cabinets or on low shelves.
- Always latch doors on chemical storage cabinets.
- Purchase smaller quantities, small bottles tend to break less often than large ones and larger containers are less likely to be emptied before their shelf life expires.
- Segregate incompatible chemicals to prevent mixing in case of an accidental spill.
- Use separate storage cabinets or physical barriers such as independent secondary containment.
- When transferring liquids from one container to another, use pumps, funnels, spigots or other methods of transfer to minimize chemical splashes and spills.

Non-Hazardous Office Wastes

- Choose products with the least packaging and the highest recyclable material content.
- Recycle waste paper, aluminum cans, newspaper, glass, cardboard and plastic containers.
- If you occupy space in multi-tenant premises, check with the property manager to find out if any recycling programs are already established in the building.

Remember: no amount of hazardous waste is allowed in the Capital Regional District's solid waste system. This includes waste entering garbage cans, dumpsters and the landfill itself. *More information on solid waste reduction and recycling is available from sources listed on page 21.*

Code of Practice Implementation Plan

The implementation plan for CRD codes of practice includes the following components:

- education
- inspection
- monitoring
- enforcement
- administration
- review

The Regional Source Control program staff will carry out activities related to each component in partnership with each code sector.

Inspections, Monitoring and Enforcement

Regional Source Control program staff may carry out inspections, examine records or other documents and take samples of effluent for analysis as specified under the Sewer Use Bylaw. Compliance sampling may also be conducted at anytime on the effluent from operations regulated under a code of practice. Repeat sampling may be necessary if non-compliance with the code is suspected or high contaminant concentrations are detected in previous samples.

A cooperative, gradually-escalating approach to enforcement will be used for all Regional Source Control codes of practice. This approach is established in an enforcement policy that has been approved by the CRD Board.

Where cooperative efforts to achieve compliance using the enforcement policy have failed, warnings and tickets of between $50 and $500 per offence may be issued under the CRD *Ticket Information Authorization Bylaw*. For more serious or continuing offences, fines up to $10,000 per offence per day may be issued under the Sewer Use Bylaw.

For More Information

For more information on the Code of Practice for Laboratory Operations or the CRD Sewer Use Bylaw, please contact the Regional Source Control program at (250) 360-3256, RSCP@crd.bc.ca or visit the CRD website at www.crd.bc.ca

Other helpful sources of information include:

CRD Hotline
(250) 360-3030
hotline@crd.bc.ca

CRD Water Services, Demand Management
(250) 474-9684
www.crd.bc.ca/water

BC Society of Laboratory Science (BCSLS)
720 – 999 West Broadway Ave. Vancouver BC.
V5Z 1K5 (604) 714-1760 or (800) 304-0033
www.bcsls.net

Biomedical Laboratory Code of Practice, Introduction and Checklist
www.p2pays.org/ref/04/03283/0328301.pdf

Biomedical Laboratory Code of Practice Reference Material
www.p2pays.org/ref/04/03283/0328302.pdf

Canadian Association for Environmental Analytical Laboratories (CAEL)
(613) 233-5300
www.caeal.ca

Canadian Centre for Pollution Prevention
100 Charlotte Street, Sarnia, ON N7T 4R2
(519) 337-3423
www.c2p2online.com

Canadian Centre for Pollution Prevention Information Clearinghouse (CPPIC)
www.ec.gc.ca/cppic/search/en/sector.cfm

Canadian Society for Medical Laboratory Science
www.csmls.org

Environmental Protection Agency
BC Ministry of Environment
www.env.gov.bc.ca/epdiv/

Hazardous Waste Regulation
BC Ministry of Environment(250)
387-3648
www.qp.gov.bc.ca/statreg/reg/E/EnvMgmt/EnvMgmt63_88/63_88.htm

Hazardous Waste Transport Licenses
BC Ministry of Environment
http://srmwww.gov.bc.ca:8000/pls/swis/swis_trans_licence.waste_type

Occupational Health and Safety
Canadian Centre for Occupational Health and Safety
1-800-668-4284
www.ccohs.ca

Recycling Council of BC Hotline
1-800-667-4321

Report Hazardous Waste or Chemical Spills
Provincial Emergency Program (PEP)
1-800-663-3456

Workers' Compensation Act
http://regulation.healthandsafetycentre.org

Workers' Compensation Board Regulations (WCBR)
1-888-621-7233
www.wcb.bc.ca

Resource Materials

There are a number of useful reference materials that address laboratory waste minimization techniques, waste management and on-site treatment of hazardous waste. Some are listed below; however, the list is not exhaustive and other references are available.

American Chemical Society, The Waste Management Manual for Laboratory Personnel, Washington, D.C. April 1990

Amour, M.A., Hazardous Laboratory Chemicals Disposal Guide, CRC Press, 1991

ASTM, Standard Guide for Disposal of Laboratory Chemicals and Samples, D 4447-84, 1990

American Chemical society, Laboratory Waste Management: A Guidebook, Washington, D.C. 1994

Canadian Standards Association, Canadian Council of Ministers of the Environment (CCME) Guidelines for the Management of Biomedical Waste in Canada, February 1992

Canadian Standards Association, National Standard of Canada, Requirements for the Competence of Environmental Laboratories, Rexdale, Ontario January 1995

Capital Regional District Water Department, ICI Research, Final Report, Commexus 2003

Environmental Improvement's Task Force on Occupational Health and Safety, Informing Workers of Chemical Hazards: The OSHA hazard Communication Standard, Occupational Exposures to Hazardous Chemicals in Laboratories, American Chemical Society, 1990

Health Canada, Laboratory Biosafety Guidelines, 2nd Edition 1996

National Research Council, Prudent Practices for Disposal of Chemicals from Laboratories, Washington, D.C. National Academy Press, 1983

Queen's Printer, BC Fire Code, Crown Publications

Glossary of Terms

Biosolids is stabilized wastewater sludge resulting from a local government wastewater treatment process which has been sufficiently treated to reduce pathogen densities and vector attraction to allow the sludge to be beneficially recycled in accordance with the requirements of the Organic Matter Recycling Regulation of British Columbia, dated February 2002.

Contaminant is a substance that is not naturally present in the environment or is present in elevated amounts, which, if in sufficient concentration, can adversely affect flora, fauna and/or the environment.

Code of practice (COP) is a regulatory document developed by the District containing mandatory sanitary sewer discharge standards for specific industrial, institutional, or commercial sectors.

District refers to the Capital Regional District (CRD).

Effluent is the liquid flowing out of a facility or household into a sewer system or water body.

Hazardous Waste is any chemical, compound, mixture, substance or article as defined in the *Hazardous Waste Regulation*, pursuant to the *Environmental Management Act of British Columbia.*

Manager refers to the sewage control manager and includes any deputy sewage control manager.

Metals are substances with high atomic weights - such as silver, iron, zinc, copper, lead, mercury, cadmium and arsenic - that exhibit metallic properties. They are generally persistent in the environment, have the potential to accumulate in the food chain and in sewage treatment plant sludge and can cause health effects in organisms.

Milligrams per litre (mg/L). is the weight of a substance in milligrams in one litre of wastewater (may also be referred to as parts per million or ppm).

Monitoring point means an access point to a sewer, private drainage system or other sewer system for the purpose of measuring the rate of flow or volume of wastewater being discharged and for the purpose of collecting representative samples.

MSDS is a widely used abbreviation for Material Safety Data Sheet as defined in the Workplace Hazardous Material Information system (WHMIS). An MSDS contains details of the hazards associated with a chemical, and gives information on its safe use.

Pollution prevention is the use of processes, practices, materials and energy that avoid or minimize the creation of processing and other wastes.

Sanitary sewer means a sewer which carries sanitary waste or wastewater but which is not intended to carry stormwater or uncontaminated water.

Spill response plan is a written plan developed for the operator to respond to any spills at a laboratory operation site. As a minimum, the plan must define the roles and responsibilities for spill response, contact names and numbers for the appropriate agencies and a checklist of all spill response equipment.

Standard Methods is the latest edition of *Standard Methods for the Examination of Water and Wastewater* jointly prepared and published

from time to time by the American Public Health Association, American Water Works Association and the Water Environmental Federation.

Storm drain is a pipe, conduit, drain or other equipment or facilities for the collection and transmission of stormwater or uncontaminated water.

Trucked liquid waste is any waste that is collected and transported from the site where the waste originated by means other than discharge to a sewer, but does not include septage waste, recreational vehicle waste, carpet cleaning waste, or ship and boat waste.

Wastewater means the composite of water and water-carried wastes from residential, commercial, industrial or institutional premises or any other source.

WHMIS is the abbreviation for Workplace Hazardous Material Information System that is administered through the Workers' Compensation Board. WHMIS includes the labeling of controlled products and the provision of material safety data sheets (MSDS).

Notes