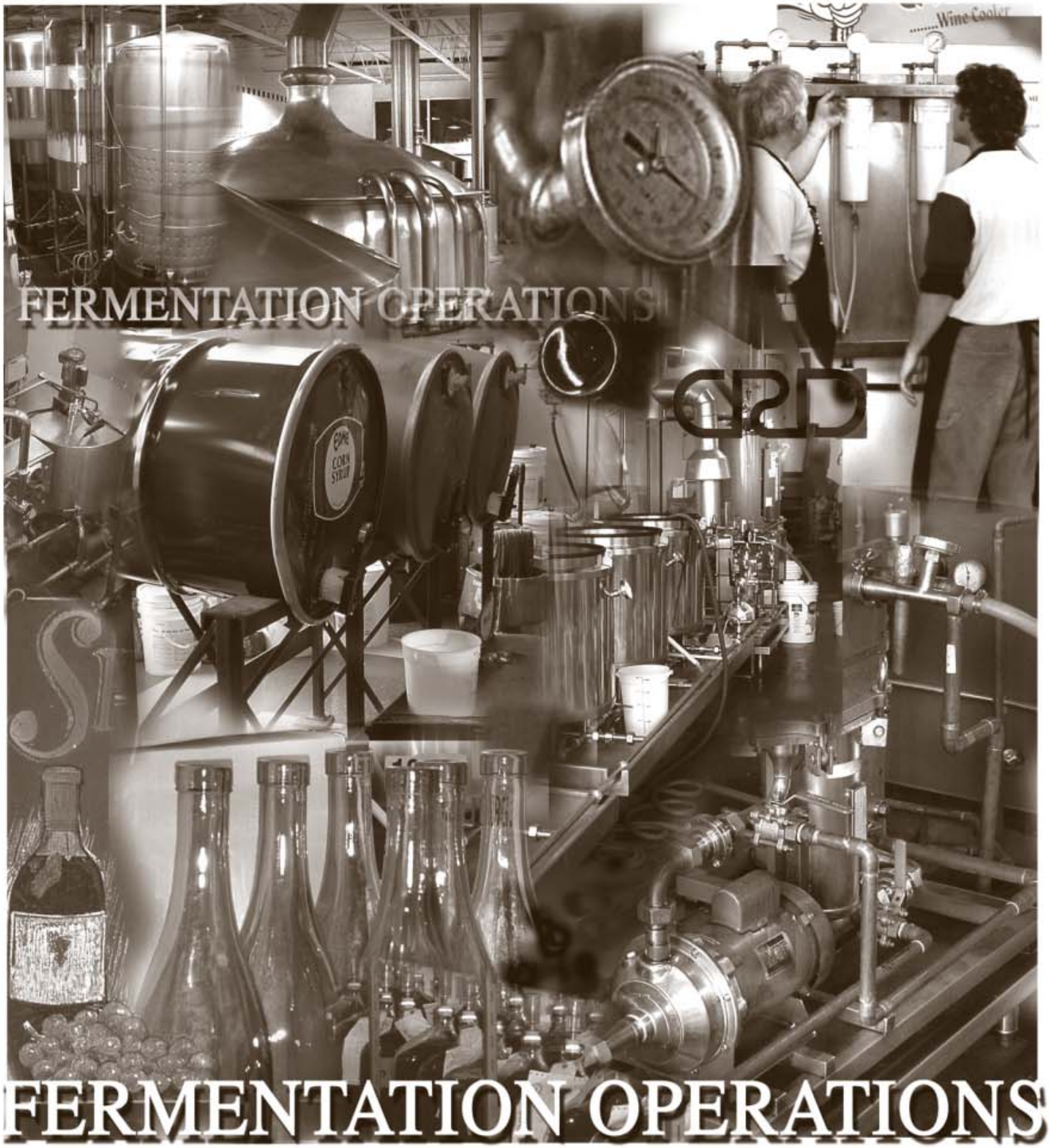
Environmental Regulations & Best Management Practices



Fermentation Operations in the Capital Regional District

ENVIRONMENTAL REGULATIONS & BEST MANAGEMENT PRACTICES

Fermentation Operations in the Capital Regional District

This manual is published by the Regional Source Control Program
For more information please call (250) 360-3256 or visit the CRD
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CRD
Environmental Services

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1.0 INTRODUCTION

The Capital Regional District (CRD) Regional Source Control program has identified fermentation operations as contributing significant amounts of contaminants into the region's sanitary sewer system. The fermentation sector is comprised of about 45 businesses throughout the district, including brewpubs, microbreweries, cottage breweries, brew-on-premises, vint-on-premises, wineries and distilleries. Current waste management practices within the fermentation sector are a concern because they generate large volumes of high-strength organic wastes, often containing caustics and acids, which end up being discharged to the region's sanitary sewer system and the marine receiving environment.

The CRD's Regional Source Control program has prepared this document in cooperation with representatives from the Hobby Brewers Association of BC and sector operators. It serves as a guide to the environmental regulations that apply to fermentation operations within the CRD. It also provides information on best management practices and serves to assist operations in meeting these regulations and improving their overall environmental performance.

1.1 Why are Effluents from Fermentation Operations a Concern?

- Liquid effluent from fermentation operations may contain contaminants such as suspended solids, sulphides and other chemicals and substances in concentrations above the levels specified under the CRD's Sewer Use Bylaw.

- Suspended solids may contribute significantly to the biochemical oxygen demand (BOD) and chemical oxygen demand (COD) loading in municipal sewage. High concentrations of BOD and COD (organic materials) can have an adverse effect on aquatic organisms by removing available oxygen from the water. Some cleaning chemicals can also be toxic to aquatic organisms.

- High organic loadings may contribute to the generation of odours in the sewer system and corrosion of sewer pipes.

- Variable pH, as a result of caustic and acidic cleaners and acidic waste beer or wine, may also be a concern. Caustics and acids are corrosives that may, in large volumes, cause damage to sewer collection and treatment works and shorten the lifespan of sewer infrastructure.

1.2 Summary of Regulatory Requirements

1.2.1 Federal Government

The Canadian government has no specific requirements for the management of fermentation sector wastes. However, regulations adopted under federal enactments

such as the *Transportation of Dangerous Goods Act* contain 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*.

1.2.2 Provincial Government

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

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 Ministry of Water, Land and Air Protection regulates the generation, storage, treatment, recycling and disposal of special wastes to the environment through the *BC Special Waste Regulation* (BCSWR) under the *BC Waste Management Act*. Section 39 of the BCSWR restricts the deposit or discharge of special 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.

1.2.3 Regional Government

1.2.3.1 CRD Sewer Use Bylaw

Under the provincial *Waste Management Act,* the CRD is empowered to regulate the discharge of waste into its own sewers and into sanitary 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 August 10, 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 recently 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 program are to protect:

- the marine-receiving environment,
- public health and safety,
- sewage works,

- wastewater treatment processes, and
- biosolids quality.

The bylaw also ensures:

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

1.2.3.2 Other Regional or Municipal Regulations

Other regulations that may apply to the handling and disposal of wastes from a fermentation operation within the CRD include:

- *Hartland Landfill Tipping Fee and Regulation Bylaw* (CRD), which covers the disposal of wastes at the CRD's Hartland Road sanitary landfill

- CRD Septage Disposal Bylaw, which deals with 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, and

- Municipal plumbing bylaws, which specify requirements for installation and maintenance of plumbing and drainage equipment.

2.0 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**.

A *code of practice* (COP*)* is a regulatory document, developed by the District, which contains 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 under the CRD Sewer Use Bylaw.

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

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

Fermentation operations that follow the **Code of Practice for Fermentation Operations** (Schedule "P" of the Sewer Use Bylaw) are authorized to discharge specific types of waste into the sanitary sewer without a waste discharge permit. The CRD reserves the right, if deemed necessary by the sewage control manager, to require any fermentation 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.

2.1 Application

A fermentation operation is defined as any commercial business or operation where alcoholic beverages are produced including:

- brew pubs,
- brew clubs,
- microbreweries,
- cottage breweries,
- wineries,
- brew-on-premises operations,
- vint-on-premises operations, and/or
- distilleries.

Anyone working in the fermentation sector must follow this code of practice if they want to use the sewer connected to a sewage facility system for wastewater other than that from toilets and washrooms.

2.2 Discharge Regulations

Fermentation operations must not discharge into the sewer non-domestic waste that contains:

- restricted waste as defined in the bylaw (e.g. pH waste lower than 5.5 or higher than 11.0.)

- prohibited waste – anything that could cause a fire or explosion, block the sewers, cause odours or corrode or damage the sewer system

- uncontaminated water in quantities greater than two cubic meters per day (uncontaminated water takes up valuable sewer line capacity that could be used to handle wastewater that needs treatment).

2.2.1 Installation of Treatment Works

Existing operations will be required to have the following treatment works or practices by **January 1, 2003.**

Solids from a mash tun, mash tun washing, brewing kettle, brewing kettle washing, or backflushing mash tun strainers or filters or trub filters must be removed from wastewater prior to discharge to sewer by:

- use of a strainer or a filter with sieve size no greater than 1000 microns (μm); or solids settling in a separate vessel and discharging the decant water, or

- alternate treatment, or combination of treatments, that reduces the discharge quality to below the restricted waste criteria *and* has been accepted in writing by the manager.

Liquid wastes from cleaning and sterilizing activities must be tested for pH and adjusted to a pH between 5.5 and 11.0 prior to discharge to sewer.

Existing operations that produce residue containing yeast on or after **July 1, 2003** must:

- collect and transport the waste from the fermentation operation for off-site waste management, or

- filter the effluent using a filter with a sieve size no greater than 10 microns (μm) prior to discharging to sewer.

2.2.2 Off-Site Waste Management

As an alternative to disposal to sanitary sewer with the required treatment, off-site management is an option.

- Spent grains, hops and trub collected from all filters, mash tuns and kettles should be collected and reused *or* recycled as valuable byproduct for use as animal feed, compost material, cooking ingredients or disposed of in the garbage.

- Residue containing yeast such as wine racking lees and beer fermentation yeast should be removed off-site (and not discharged to sewer) *or* dewatered and disposed of in the garbage.

2.2.3 Installation of Sampling Tees

As of **January 1, 2003**, new fermentation operations must install one or more sampling tees downstream of the connection to sewer of all process waste.

Existing operations – those operating on or before **January 1, 2003 –** must install a sampling tee only if improvements in excess of $2,000 are made to the facility or if they discharge non-domestic waste into a sewer above the restricted waste limits contained in the bylaw.

The sampling tee must be the same diameter as the discharge line and shall be installed so that it opens in a direction at right angles to, and vertically above, the flow in the sewer pipe. It must be readily and easily accessible at all times.

2.3 Registration

All fermentation sector operations under this code of practice must register with the CRD Regional Source Control program and report any subsequent change in the status of their operation to the CRD. See Schedule "H" of Bylaw 2922, Code of Practice Registration Form.

2.4 Record Keeping and Retention

The operator of the fermentation operation must keep written records to show due diligence regarding site activities and to demonstrate that requirements of the code of practice have been met. Please see inside back of cover for a sample *Record Keeping Form for Fermentation Sector Operations.*

Fermentation operations must keep accurate and up-to-date records of treatment methods and procedures for a period of two years. This includes:

- method of removing solids from the mash tun and mash tun wash water,

- method of treatment of kettle wastewater and kettle wash water,

- method(s) of solids removal from wastewater generated by backflushing mash tun strainers or filters, and backflushing trub filters,

- method of treatment to remove yeast residue,

- location of sampling tee, and

- method of pH measurement and pH adjustment for wastewater containing acid and caustic cleaners, and results and dates of pH testing.

3.0 BEST MANAGEMENT PRACTICES

Best management practices (BMP's) 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. BMP's 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 the 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
- Energy recovery from polluting by-products.

The following BMP's will help fermentation business 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 alternatives or biodegradable cleaners and sterilization products, and buying from suppliers who accept materials and containers back for recycling.

Some examples of these BMP's are listed under "Resource Materials" in Section 4.1. Important elements contained in these BMP's are summarized below.

3.1 Treatment Methods

Mash Tun

To prevent solids from being discharged to the sewer during this stage:

- minimize last runnings by measuring or estimating sparge water quantity
- collect spent grains in mash tun and wash water by straining or filtering through a 1000 micron (μm) filter, settling and decanting or vacuuming and not discharging to sewer
- collect spent husks and grains by straining, screening, filtering, settling and decanting or vacuuming and not discharging to sewer.

Boiling Stage

To prevent solids from being discharged to the sewer:

- place grains and leaf hops in filter socks, sparging bags or other containers prior to entering the beer kettle so they can be removed from the kettle at the completion of the cooking process and not discharged into the sewer,
- settle and decant all liquids and solids remaining in the kettle after cooking, or filter with sieve size of no greater than 1000 microns,
- filter wash water used during cleaning of the kettle with sieve size of no greater than 1000 microns (μm), or collect, settle and decant.

Fermentation Stage (beer, wine, coolers and cider)

For used yeast from the fermentation process:

- contain it in the fermentation vessel or plastic bags,
- collect and/or dewater by filter or filter press and reuse or recycle, or
- filter through a 10 micron (μm) filter.

3.2 Solids Management

- Reuse or recycle oak chips collected from racking lees, spent grains, hops and trub from mash tun and kettle and filters as cooking ingredients, animal feed, fertilizer, or compost material. As a last resort, dispose of the collected grains, hops, trub and oak chips in the garbage.

- Use spent yeast as a valuable byproduct (such as cooking ingredients), reuse it in the next fermentation batch, or recycle it as animal feed or fertilizer. As a last resort, dispose of the collected yeast in the garbage.

3.3 Cleaning and Sterilization Products

Investigate ways to reduce the amount of cleaning performed on site. Use clean-in-place systems to conserve water during the cleaning process. Avoid the use of chlorinated caustic chemicals as much as possible and use elbow grease and scrub pads or other manual methods. Other options include the use of biodegradable cleaners to replace caustic and sulphide containing cleaning products.

- Collect liquid wastes from cleaning and sterilizing activities and test for pH, using a pH meter or pH test paper, prior to disposal as outlined in Section 2.2.1. Caustic solutions can be treated by addition of mild acid such as vinegar or citric acid or by bubbling carbon dioxide through the alkaline solution before discharge. Acid solutions can be treated by the addition of baking soda or a weak lime solution.

3.4 Water and Energy Use

- Monitor water consumption to keep track of how much is being used and for what purpose. Where possible, alternatives to water-cooled chilling equipment should be investigated (e.g., air-cooled compressors).

- Install small water meters on hoses, taps and other water lines so that employees can track water use.

- Recover heat from hot processes as much as possible. Heat recovery from the boiling stage and fermentation can be achieved using a heat exchanger.

3.5 Staff/Customer Training

- Provide training to employees in the practices identified in this document.

- Prepare written procedures and give them to each customer. Have staff provide assistance to ensure customers follow the best environmental and safety practices.

3.6 Inspection and Maintenance of Treatment Works

- Inspect filter(s) or sieves for wear on a regular basis and replace when necessary.

- Post proper signage in conspicuous locations displaying contact names and phone numbers in the event of an accidental discharge of prohibited or restricted waste to the sewer or directly to the environment.

3.7 Spill Prevention and Response

- Ensure that adequate and secure storage is provided for beer and wine holding tanks as well as cleaning and sterilization chemicals. Use corrosion-resistant containers that will not overturn easily. Storage with secondary containment should be used as necessary to prevent leaks and spills from draining to the sanitary or storm sewer systems.

- Develop a spill response plan and post it in a conspicuous location.

- Keep adequate amounts of clean-up equipment and supplies in stock at all times.

- Clean up spills immediately. After clean up, the treatment works should be inspected and cleaned, if necessary, before resuming wastewater discharge from the operation.

See Section **6.0** for more information on spill response plans.

3.8 Non-Hazardous Office Wastes

Fermentation operations receive products in a variety of packaging that contributes to the solid waste stream. The following procedures are suggested to help operators reduce the amount of unnecessary packaging used in the industry and improve their overall environmental performance:

- choose products with the highest recyclable material content
- reduce the amount of packaging by selecting supplies or suppliers that use the least amount of packaging or that will take back reusable packaging upon delivery
- regular office waste generated by fermentation operations should be recycled whenever possible
- waste paper, plastic juice bags, carboy fermentor bags, newspaper, glass, cardboard and plastic containers should be recycled whenever possible
- check with the building manager to find out if any recycling programs are already established in the building for segregated wastes and recyclable materials

More resources on solid waste reduction and recycling are available under Section 5.

4.0 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 business owners in each sector code.

4.1 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 COP. Repeat sampling may be necessary if non-compliance with COP 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 $200 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.

5.0 FOR MORE INFORMATION

For more information on the Code of Practice for Fermentation Sector Operations or the CRD Sewer Use Bylaw, please contact the Regional Source Control program at (250) 360-3256 or visit the web site at www.crd.bc.ca/es/sc/.

Other helpful sources of information include:

Background information for the Development of the Code of Practice for Fermentation Operations
http://www.crd.bc.ca/es/sc/pollupre.pdf

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

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

Victoria Compost Education Centre
(250) 386-9676

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

Workplace Hazardous Materials Information Systems (WHMIS)
http://www.hc-sc.gc.ca/ehp/ehd/psb/whmis.htm

Ministry of Water, Land and Air Protection
BC Special Waste Regulation
(250) 387-3648

B.C. Hobby Brewers & Vintners Association (HBVA)
(604) 980-5770

Waste Management Act
http://www.qp.gov.bc.ca/statreg/stat/W/96482_01.htm

5.1 Resource Materials

Earth Tech (Canada) Inc. (July 2002) *Technical Pollution Prevention Guide and Model Code of Practice for Discharges to Sanitary Sewer for Fermentation Sector Operations in British Columbia*

Environment Canada, Environmental Protection Fraser Pollution Abatement (October 1997), *Technical Pollution Prevention Guide for Brewery and Wine Operations in the Lower Fraser Basin.*

6.0 GLOSSARY OF TERMS

Biochemical Oxygen Demand (BOD) A test used to determine the organic content in wastewater. BOD is a measurement of the amount of dissolved oxygen used by microorganisms in the biochemical breakdown of organic matter in wastewater.

Biodegradable cleaners These contain no toxic or biocidal elements or compounds and are readily converted by a biological process into simple inorganic elements and compounds, such as CO_2, H_2O and NH_3.

Boil The boiling of wort in order to extract hop flavours and break down proteins in the liquid.

Brewing kettle A large cooking vessel used for boiling, usually made of stainless steel, copper, granite or aluminum.

Caustic cleaners Chemical compounds with an alkaline base (pH greater than 10.5). The most common active ingredient in caustic cleaners is sodium hydroxide.

Chemical Oxygen Demand (COD) A test used to determine the amount of chemically oxidizable material in wastewater. COD is a measure of that portion of a wastewater stream that will readily oxidize by a chemical oxidant such as an acid.

Code of Practice (COP) A regulatory document developed by the CRD which contains sewer discharge standards, minimum treatment at source requirements, and best management practices for specific industrial, institutional or commercial sectors.

Compliance sampling The regular scheduled sample collection to meet a permit or code of practice requirement. It is also sampling carried out to assess changes in works or practice which are instigated to correct violations or exceedances detected in regularly scheduled and/or audit sampling.

Contaminant A substance that is not naturally present in the environment or is present in elevated amounts; which, if in sufficient concentrations, can adversely affect the environment.

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

Fermentation The production of ethanol and carbon dioxide as a result of the action of yeast on sugar.

Filter bag A bag with a fine weave used to strain out the trub or the grains and or hops while sparging.

Finings Gelatin or other precipitant used to artificially speed up the clarity of the beer.

Hops A plant that produces cone-shaped flowers containing the flavouring and aromatic properties used in beer making.

Lees The proteinaceous material precipitated during fermentation which can be removed by filtration and can be used in animal feed.

Mash Tun The vessel in which sugars are extracted from malt by enzymes on the addition of water to produce sweet wort.

Mashing The process that completes the conversion of starches in grains to sugars by heat and water. The grist (cracked dried-malted barley) is then mixed with warm water in a vat until it forms a mash of porridge-like consistency. Supplementary grains are added as required at this point. The temperature of the mash is raised in steps from 38° C to 70° C allowing for the enzymes to act at each step.

pH The expression of the acidity or basicity of a solution as defined and determined by the appropriate procedure described in standard methods.

Racking Transferring the wort from one container to another by siphon hose, leaving dead yeast cells, sediment, hop dregs and so forth behind.

Sanitary sewer A collection system for domestic, commercial, institutional and industrial wastewater or any combination thereof.

Sparging The system of washing the fermentable sugars from the grains after the mash.

Spill response plan A written plan developed for the operator to respond to any spills at a fermentation sector 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.

Total suspended solids (TSS) The amount of small particles suspended in the wastewater. Suspended solids contribute to the BOD and COD of wastewater and are known to have adverse effects on aquatic organisms.

Trub Waste hops and proteins generated from brew kettle bottoms.

Wastewater The composite of spent or used water and water-carried wastes from a community or industry that is discharged into the sewer.

Wort The liquid resulting from the mashing process or the unfermented liquid which contains sugars and enzymes, partially degraded starch, barley extracts and water before it becomes beer.

Yeast A one-celled microorganism that converts sugars to alcohol.

RECORD KEEPING FORM FOR FERMENTATION SECTOR OPERATIONS

Select One (√): ❑ Beer Brewing ❑ Wine/ciders and coolers ❑ Both
Unit: _____

Section 2.2

Method of pH Measurement for Acid and Caustic Cleaners

_____

Method of pH Adjustment Prior to Discharge to Sanitary Sewer

Acids: _____

Caustics: _____

The Discharger shall Maintain a Log of Dates and Results of pH Adjustment from Section 2.2. Please see Fermentation Operation pH Log Form in Section 3.0 below.

Section 2.3

Method of Solids Removal from Wastewater from the Mash Tun

_____

Method of Solids Removal from Mash Tun Washwater

_____

Method of Treatment of Kettle Wastewater

_____

Method of Treatment of Kettle Wash Water

_____

Method(S) of Solids Removal from Wastewater Generated by Backflushing Mash Tun Strainers or Filters

_____

Method of Solids Removal from Wastewater Generated by Backflushing Trub Filter

_____

Section 2.4

Method of Treatment to Remove Yeast Residue

_____

Section 2.9

Number/Location of Sampling Tees

_____

Section 3.0

Fermentation Operation pH LOG

Date (dd/mm/yy)	**Initial pH reading**	**Method of pH measurement** acids/caustics	**Method of pH adjustment** acids/caustics	**Final pH reading**	**Conducted by**