A Review of Burrard Inlet Effluent Discharges

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Society Promoting Environmental Conservation
Waste Health & Toxics Caucus of the
BC Environmental Network
Georgia Strait Alliance

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White Pond and Walden are great crystals on the surface of the earth, Lakes of Light.... They are too pure to have a market value; they contain no muck. How much more beautiful than our lives, how much more transparent than our characters are they! We never learned meanness of them.

- Henry David Thoreau

INTRODUCTION

Since its inception in 1969, the Society Promoting Environmental Conservation (SPEC) has been concerned about the impact of industrial pollutants entering Burrard Inlet. Between 1999 and 2002, SPEC investigated the impact of permitted liquid waste from a North Burnaby, BC petro-chemical facility on the marine environment of Burrard Inlet. Wanting to place that single source of pollution within the context of total effluents entering the Inlet, SPEC researchers posed the following questions:

- **How many permits are currently in effect and how has the number of permits varied over the past four decades?**

- **How much effluent is entering Burrard Inlet under the existing BC Ministry of Water, Land and Air Protection (MWLAP) effluent permit system?**

- **What regulatory management plans are in place for monitoring and controlling effluent discharges?**

Finding no ready answers, a review of MWLAP permits that relate to Burrard Inlet was undertaken with support from the **Georgia Strait Alliance** and the **BC Environmental Network's Waste, Health and Toxics Caucus**.

Over December, January and February 2002/03, researchers reviewed MWLAP effluent permit records dating from the 1950s, when permits were first issued, to 2002. These records are stored at the MWLAP's Surrey, BC offices. The records list contact information for permittees, the date a permit was issued, amendments to the permit, reasons for amendments, the stipulations of the permit, discharge limits, monitoring requirements, and maps describing where discharges enter Burrard Inlet.

Information about the nature of the permits is tabulated in **Appendix 1** with an analysis of the data with cumulative totals for various effluent categories. Additional information was gathered from literature reviews and discussions with various regulatory agencies in British Columbia. Monitoring records from various permitees were reviewed to determine if permit holders exceeded their permit limits.

This document is the result of that review. It includes a summary of volumes and types of effluent that have been historically discharged into the Inlet, an introduction to the ecosystems of the Inlet and a brief description of existing environmental management regimes. This review also makes recommendations to reduce the amount of industrial effluent pollution now entering Burrard Inlet.

FINDINGS

- The overall number of effluent discharge permits has increased from a single permit in 1957 to 25 active permits in 2002.

- Currently **769 million cubic meters** of wastewater that carry industrial effluents are permitted to be discharged annually into Burrard Inlet. This is the equivalent of 223,014 Olympic size swimming pools.

- Effluent discharges have increased from **32 million cubic meters** permitted for discharge in 1957, to the current level of **769 million cubic meters** in 2002**.**

- Permitted discharge amounts have never decreased for any year since 1957.

- There are no precise figures currently available from the BC Ministry of Water Land and Air Protection that conclusively determine the actual amounts of industrial effluent is being discharged. This make it difficult for monitoring agencies to determine exactly how much effluent is actually ending up in the Inlet.

- In April 2003, the lead administrative agency mandated to prepare programs regarding industrial pollution in Burrard Inlet, the Burrard Inlet Environmental Action Plan (BIEAP) experienced a 50 percent reduction in its capacity to undertake its mandate.

Of particular concern is that current MWLAP permit records do not calculate precise volumes of some toxic materials and trace elements that permits allow to be discharged into Burrard Inlet.

There is insufficient information indicating the extent that substances such as cyanide, lead zinc, residual chlorine, ammonia, nitrates, methyl tertiary butyl ether (MTBE) and PCBs are present in the Inlet. MWLAP sampling studies of toxic materials conducted in 2002 noted higher than acceptable levels of cadmium, chromium, copper and zinc in bottom sediment at various sampling locations in the Inlet.

The study, however, employed inadequate methods for other materials such as PCBs making it "not possible to determine if PCB's are a concern at these sites."

RECOMMENDATIONS

- That the Burrard Inlet Environmental Action Plan agency take immediate and active steps to implement plans and programs to ***"improve water quality in Burrard Inlet by reducing the levels of contaminants entering marine and freshwater system"*** as stated in the *BIEAP Consolidated Environmental Management Plan* (2002).

- That the BC Ministry of Water Land and Air Protection revise their effluent permit recording and monitoring procedures in order to determine the actual amounts of effluent being discharged into Burrard Inlet.

- That MWLAP undertake detailed studies to identify the locations, amounts and levels of toxic substances entering Burrard Inlet.

- That MWLAP review all existing effluent discharge permits with a view to reducing and eliminating industrial pollution from entering the Inlet.

- That MWLAP establish an immediate moratorium on the issuance of any new permits allowing effluent discharge into Burrard Inlet.

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- That MWLAP lower existing permit limits and initiate a systematic review of long-standing unchanged permits.

- That existing permits be amended to specifically list particular effluents being discharged.

EFFLUENT DISCHARGE PERMITS

In British Columbia the Waste Management Act (RSBC 1996 Chapter 482) authorizes the BC Ministry of Water Land and Air Protection to issue a permit that allows a person or corporate body to release waste effluents into the air, water or land. The permit specifies the characteristics and quantity of effluents released.

According to the Act an effluent is "a substance that is discharged into water or onto land and that (a) injures or is capable of injuring the health or safety of a person, (b) injures or is capable of injuring property or any life form, (c) interferes or is capable of interfering with visibility, (d) interferes or is capable of interfering with the normal conduct of business, (e) causes or is capable of causing material physical discomfort to a person, or (f) damages or is capable of damaging the environment".

A MWLAP officer may issue a permit to introduce waste into the environment, to store special waste or to treat or recycle special waste subject to requirements for the protection of the environment that the manager considers advisable. Permit conditions may require permitees to monitor the handling, treating, transporting, discharging and storing of waste.

MWLAP may amend permits for the protection of the environment, on the officer's own initiative or on application by a holder of a permit such as a change of: address or company name, discharge location, discharge volume, effluent type or concentration. MWLAP issues an amendment to the original permit to reflect these changes.

Prior to the establishment in the early 1970s of the Environment Ministry in BC, permits were issued by agencies such as the Pollution Control Branch. The first permit allowing the release of effluents into Burrard Inlet was issued in 1957. This does not represent the extent of industrial effluents being released into the Inlet at

that time. It simply marks the beginning of a methodical regime to monitor and approve effluent dumping.

Table 1. Number of Active Permits

Year	1957	1958	1963	1971	1972	1973	1974	1977	1978
No. of permits	1	2	3	5	6	9	14	15	18
Year	1979	1984	1985	1986	1989	1994	1995	1998	2002
No. of permits	19	19	22	24	25	25	26	27	25

At present 25 industries and municipalities discharge effluents on a continual basis into Burrard Inlet.

The 1970s witnessed the greatest increase in permits as a result of an expanding regulatory framework that reflected a growing public interest and sensitivity toward industrial waste practices.

The MWLAP and its predecessors have been allocating effluent permits to point source polluters since the early 1950s. Records of these permits are accessible to the public as are monitoring reports from point source polluters.

Every permit holder submits monitoring data in a different format, based upon internal monitoring requirements. This method often provides MWALP with more detailed information than is requested in the permits, and so far, no holders have been found to exceed their stated limits.

As well as the permitted discharges, there are non-permitted effluent discharges from stormwater and highway run-off, marinas, and accidental spills from shipping activity within the Harbour (Assessment of Burrard Inlet, 2000). This review has not examined discharged effluent from non-permitted sources.

Permitted pollution comes from a variety of sources including concrete plants, petro-chemical terminals, a jet fuel storage facility, a sugar refinery, and municipal sewage treatment facilities

Table 2. Permit Holders

	Company/Organization	Type of Operation
1	BC Hydro and Power Authority	Burrard Thermal Generating Plant
2	Canada Place Corporation	Hotel and convention center
3	Chevron Canada Ltd.	Petroleum refinery, bulk handing facility
4	Dow Chemical Terminals Canada Inc	Bulk chemical loading facility
5	Ferrer Cove Waste Water Management Assoc.	Residential units
6	General Chemicals Canada Ltd.	Alum manufacturing plant
7	Great Northern Packaging Ltd.	Fish processing plant
8	Greater Vancouver Sewerage and Drainage district	A municipal sewage treatment plant serving West Vancouver, North Vancouver District and the North Vancouver City.
9	Imperial Oil Limited	Petroleum storage and distribution
10	Indian Arm Investments Ltd.	Residential wastewater disposal
11	Kask Bros. Ready Mix Ltd.	Ready-mix cement plant
12	Lafarge Canada Ltd.	Ready-mix cement plant
13	Neptune Bulk Terminals. (Canada) Ltd.	Bulk loading plant
14	Nexen Chemicals Canada Ltd.	Caustic soda, sodium chlorate, hydrochloric acid, handling
15	Ocean Construction Supplies Ltd.	Ready-mix cement plant
16	Petro-Canada Inc	Petroleum refinery
17	Plaza of Nations Management Corp	The British Columbia Place Stadium
18	Rogers Sugar Ltd.	Sugar refinery
19	Shell Canada Products Led.	Petroleum products finishing terminal
20	Sterling Pulp Chemicals Ltd.	Chemical products such as sodium chlorate
21	Trans Mountain Pipe Line Company Ltd.	Jet fuel storage facility
22	Vancouver Public Aquarium Association	Public aquarium
23	Vancouver Wharves Ltd.	A bulk loading terminal
24	West Coast Reduction Ltd.	Animal and fish byproducts reduction and rendering plant
25	Young Men's Christian Association of Greater Vancouver	Summer camp

AMOUNT OF EFFLUENT DISCHARGED INTO BURRARD INLET

Table 3 shows the yearly combined volume of effluent that may be discharged by permitted sources from 1957 to 2002. This ranged from **32 million cubic meters** a year in 1957 to a maximum of **769 million cubic meters** in 2002. The 769 million figure was reached in 1994. For comparison, a standard Olympic pool of 50 by 23 by 3 meters displaces 3,450 cubic meters (m3) of liquid. Therefore, current permits allow the equivalent of 223,014 Olympic pools of effluent to enter Burrard Inlet annually.

Table 3. Yearly Discharge Volumes

Year	Volume ($m^3/y*10^7$)	Year	Volume ($m^3/y*10^7$)	Year	Volume ($m^3/y*10^7$)	Year	Volume ($m^3/y*10^7$)
1957	3.29	1973	11.35	1985	75.57	1998	76.94
1958	3.35	1974	11.42	1986	75.76	2002	76.94
1963	7.08	1978	12.79	1989	76.87		
1971	7.50	1979	12.86	1994	76.94		
1972	8.45	1984	12.92	1995	76.94		

Annual total discharge volumes from 1957 to 2002 calculated from MWLAP permit data.

Another way of determining effluent discharge volumes is by measuring the biochemical oxygen demand, or BOD loading. This refers to the amount of oxygen that would be consumed if bacteria and protozoa oxidized all the organics in one liter of water (ReVelle and ReVelle, 1988).

Table 4. BOD Loading of Burrard Inlet

Year	Volume (kg/y)	Year	Volume (kg/y)	Year	Volume (kg/y)	Year	Volume (kg/y)
1957	230	1973	7180	1985	7877	1998	8369
1958	945	1974	7180	1986	7957	2002	8369
1963	5789	1978	7820	1989	8340		
1971	5975	1979	7826	1994	8369		
1972	6450	1984	7826	1995	8369		

A higher BOD loading is a reflection of poor water quality. BOD loading measures the impact of sewage contamination. For example, water from a clear lake would show a low BOD. The presence of raw sewage and food-processing wastes may give readings in the hundreds or thousands. Table 4 indicates high BOD loading in Burrard Inlet.

Table 5 shows the suspended solids loading of Burrard Inlet. Suspended solid loading represents the total amount of solid matter in a representative water sample that is retained on a membrane filter. It includes all sediment and other constituents that are fluid suspended. The term is equivalent to the term non-filterable residue. Suspended solid loading measures for the Inlet have remained at high levels since the 1980s.

From existing MWLAP records there is not indication of why the suspended solid loading in effluents jumped significantly between 1984 and 1985. More research is required on this question.

Table 5. Suspended Solid Loading

Year	Volume (kg/y)	Year	Volume (kg/y)	Year	Volume (kg/y)	Year	Volume (kg/y)
1957	657	1973	7256	1985	39055	1998	39373
1958	1602	1974	7548	1986	39376	2002	39373
1963	6442	1978	7822	1989	39332		
1971	6526	1979	7829	1994	39373		
1972	6526	1984	7858	1995	39373		

WHAT IS IN THE EFFLUENT

The toxins found in effluents permitted to enter Burrard Inlet includes cyanide, lead zinc, residual chlorine, ammonia, nitrates, methyl tertiary butyl ether (MTBE) and other pollutants. Some of the major contaminants currently permitted by MWLAP to enter the Inlet are listed in Table 6.

Table 6. Substances permitted to enter Burrard Inlet

Ammonia	Phosphate
Phenols	Sulfide
Cyanide	Lead zinc
Chromium	Copper
Ethylene glycol	Nickel
Nitrate	Residual chlorine
Nitrite	MTBE gas additive

From current MWLAP permit records it is not possible to calculate the exact volumes of some of the trace elements that permits allow to be discharged into Burrard Inlet. But a study undertaken for MWLAP in late 2001gives an indication of the concentrations and location of some of the toxic materials found in Burrard Inlet.

In December 2001, BWP Consulting conducted an Assessment of Burrard Inlet Water and Sediment Quality 2000 for the Water Protection Branch of the BC WLAP. Integrated Resource Consultants Inc., a consulting firm with considerable experience, collected all water and sediment samples. Sampling was conducted by trained personnel who followed Resource Inventory Committee (RIC) standards for both water (Cavanagh et al. 1994) and sediment (RIC 1997) sampling.

Water samples were collected at six sites throughout the Burrard Inlet (English Bay at Locarno Park, Vancouver Harbour at Clarke Drive, Vancouver Harbour at Vancouver Wharves, Second Narrows Chevron, Port Moody IOCO and Indian Arm at Cable Crossing), as well as one site in False Creek (False Creek East End), and analyzed for chlorophenols, PCBs, metals and nutrients.

All of the PCBs sampled were present in concentrations below detection limits (<0.1 µg/L), as were both tetra- and pentachlorophenol (detection limits of <0.005 µg/L 2,3,4,5 - tetrachlorophenol, <0.002 µg/L 2,3,4,6 - tetrachlorophenol, and <0.005

μg/L pentachlorophenol). However, although there are currently no water quality objectives proposed for PCB concentrations in water in the Burrard Inlet, the guidelines for the protection of freshwater and marine aquatic life from PCBs range between 0.00025 ng/L for 3,3',4,4',5-pentachlorobiphenyl and 0.04 ng/L for 3,3',4,4'-tetrachlorobiphenyl, and the total concentration of all PCB's should not exceed 0.1 ng/L. Therefore, the detection limits for the analytical method used to measure this parameter were too high by a factor of at least 1000, and so it is not possible to determine if PCB's are a concern at these sites.

The second metal for which a sediment quality objective exists is cadmium. The long-term objective for this metal is a maximum of 1.0 μg/g dry weight. The objective was exceeded in 17 of 27 samples, with a maximum concentration of 2.5 μg/g found in the Ponar grab sample collected from Vancouver Harbour at Vancouver Wharves.

Concentrations of total chromium in sediment ranged from 24 μg/g in the Ponar grab sample from Vancouver Harbour at Clarke Drive to 68.8 μg/g the Port Moody Arm Reed Point Site 1 in the deeper sediment core. The maximum sediment quality objective for this metal is 60 μg/g dry weight, and this objective was exceeded by six of the 27 samples collected at the various sites.

A long-term total copper sediment concentration objective of 100 μg/g dry weight exists for the Burrard Inlet. A total of 18 of the 27 samples analyzed for this metal had concentrations exceeding this objective, with a maximum concentration of 985 μg/g at Vancouver Harbour at Vancouver Wharves. This value (almost ten times the objective value) was considerably higher than the next highest value, 239 μg/g, measured at the Coal Harbour Site 2 in the deeper portion of the core. However, the highest concentrations of copper were almost invariably found at the sites located between 1st and 2nd Narrows.

A sediment quality objective of 150 μg/g dry weight has been proposed for zinc concentrations in Burrard Inlet sediments. Concentrations of zinc measured at the various sites ranged from 73.7 μg/g in the deeper core collected from the False Creek East End site to 575 μg/g at the Vancouver Harbour at Vancouver Wharves site. A total of 19 of the 27 samples had concentrations exceeding the sediment quality objective for zinc.

WATER QUALITY IN BURRARD INLET

There are both point source and non-point sources of water pollution in Burrard Inlet. Direct and traceable sources of pollution include, either treated or untreated effluent from petrochemical operations, ready-mix concrete facilities, sewage treatment and housing developments, power plants and others.

Non-point sources of pollution include road runoff, stormwater and marine activity related pollution. Combined sewer outfalls (CSOs) are single pipes that carry both storm water and municipal sanitary sewage into the Inlet. CSOs are classified by BIEAP as a non-point source of pollution. The location of each CSO, however, is known and discharge levels can be quantified. Approximately 65 percent of the City of Vancouver's sewers are still CSOs. In this review they are treated as non-point sources are not included in any data compilation or recommendations.

MWLAP's report, *Environmental Trends in British Columbia, 2002, State of Environment Reporting* includes the status of water quality of the Inlet based on the Water Quality Index 1998-1999. The following table summarizes these findings.

Table 7. Water Quality Index of Burrard Inlet

Water Quality Index			
Areas within Burrard Inlet	Rating in 2002	Rating in 2000	Rating in 1998
Inner Harbour	N/A	Fair	Fair
Central Harbour	N/A	Fair	Fair
False Creek	N/A	Fair	Borderline
Indian Arm	N/A	Fair	Fair
Outer Harbour	Good	Fair	Fair
Port Moody Arm	N/A	Fair	Fair

According to the five point provincial index, a rating of "fair" indicates that the water condition in the basin sometimes departs from natural or desirable levels.

One of the reasons that the basins are rated as fair is due to the strong currents, which exchange the waters frequently, and dilute the contaminants being discharged into the water. Another contributing factor is the great volume of fresh water entering the Inlet from various rivers and streams along its length.

{Note: The provincial index ranks water quality into five categories ranging from excellent to poor. The categories and their meaning are as follows:

Excellent: the index rank is 0 to 3 and all uses are protected without any being threatened or impaired. Conditions are similar to natural levels.

Good: the index rank is 4 to 17 and all uses are protected with only a minor degree of threat or impairment. Conditions are close to natural levels.

Fair: the index rank is 18 to 43 and most uses are protected with only a few being threatened or impaired. Conditions are sometimes different from natural levels.

Borderline: the index rank is 44 to 59 with several uses threatened or impaired. Conditions are often different from natural levels.

Poor: the index rank is 60 to 100 and most uses are threatened or impaired. Conditions are usually different from natural levels.}

THE SETTING

Burrard Inlet

Burrard Inlet is an 11,300 ha. saltwater arm of Georgia Strait that lies in the heart of Greater Vancouver. Eight GVRD municipalities sharing 190 kms of shoreline in a basin that drains 98,000 has of land border it. As part of the larger Georgia Basin region, Burrard Inlet is a significant component of one of Canada's most productive marine and terrestrial ecosystems. A large urban population and many industrial facilities including the Port of Vancouver all impact on the water quality of the Inlet.

Burrard Inlet is a complex body of water comprised of six distinct sub-areas: the Outer Harbour and English Bay, False Creek, the Inner Harbour, Central Harbour, Port Moody Arm and Indian Arm. Each sub-area displays distinct characteristics in terms of shoreline development, geography, importance to marine, avian and terrestrial species, and the amount of industrial and shipping activity. Apart from the deep water-fjord of Indian Arm, the remainder of the Inlet has been extensively developed for commercial, industrial, residential and recreational uses.

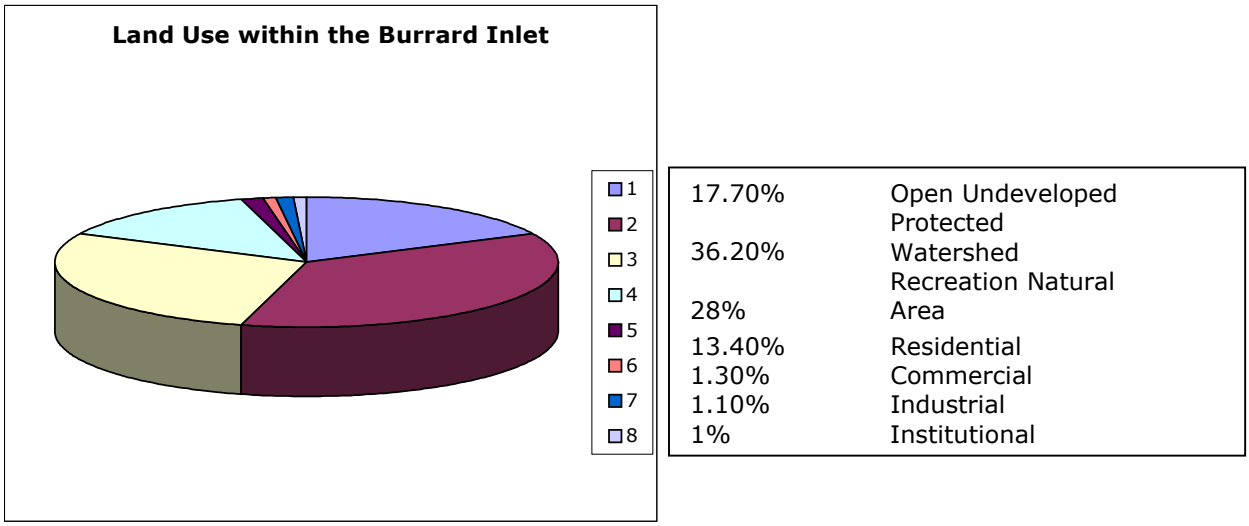
Population

The natural beauty of the Inlet and surrounding area, a highly productive aquatic and terrestrial ecosystem, and historically high rates of population growth, has resulted in increased pressure on the Inlet's natural environment.

Portions of eight municipalities within the Inlet ecosystems are home approximately 600,000 people. Annual population growth over the next 20 years is projected at 1.7 per cent (Georgia Basin, 2002). Increased population can further impact the natural environment.

More progressive and long-term planning on a regional scale is needed in order to manage some of the pressures currently being placed on the Inlet in order to ensure its future sustainability.

Land Use



BIEAP, 2002

Land use within the Inlet is varied, with the largest portion -36 per cent- designated as protected watershed. The second largest allotment – 28 percent - is for natural recreation areas. Commercial, industrial, and institutional use make up a small portion of overall land use within the Inlet.

Oceanography

The six basins of the Inlet were created by glacial activity, and the strong currents characteristic of the Inlet are factors in the dilution of any effluent concentrations being discharged into the Inlet. Fresh water from the Fraser River also plays a role in water quality.

The Outer Harbour has depths of 100m mid-channel and a variety of substrate types such as sand, mud, gravel, cobbles, bedrock and boulders. These characteristics also exist in the Central Harbour, and Port Moody Arm (BIEAP, 2002).

Sills physically separate the Outer from the Inner Harbour at First Narrows, and the Inner from the Central Harbour at Second Narrows. Both the Inner and Central Harbours receive fresh water from the Capilano and Seymour Rivers and have well-circulated waters.

False Creek and Port Moody Arm have water depths of approximately 10m with shallow tidal areas and less circulated waters. These bodies are subject to higher levels of sediment contamination and stagnation.

Indian Arm has an average depth of 120m with broad shallows at the mouth. This leads to limited water exchange. Some studies show that the waters get exchanged in the deeps of the fjord only every 7-10 years (BIEAP, 2002). Indian Arm receives water from the Indian River estuary, and from the Coquitlam watershed.

Species at Risk

According to the Georgia Basin Puget Sound Ecosystems Indicator report (2002), there are currently between 12-16 aquatic and terrestrial species at risk in Burrard Inlet including southern resident Orca whales, rockfish, abalone, and the double crested cormorant. Those that inhabit the waters of the Inlet could be at risk through ingesting, coming into contact with, and living in effluent solutions that are discharged into the Inlet. Loss of natural habitat due to human population pressure is a primary factor affecting species in this region. A number of these species have been listed as either threatened or endangered by provincial and federal agencies.

Compared to the rest of Canada, BC has the highest biodiversity in terms of number of species, and the second highest number of species at-risk.

Some recent studies on the effects of industrial pollutants on marine wildlife raise concerns about possible long-term and far reaching impacts impact of supposedly local effluents. Dr. Peter Ross, a marine toxicologist at the Institute of Ocean Sciences in Sidney, BC, concluded that North Pacific Orca whales are among the most contaminated animals on the planet. He attributes high contamination level to the ingestion by the Orcas of contaminated fish and marine mammals. Ross suggests that the source of contamination is from chemical effluents released along the West Coast of North America and the North Pacific shores of Asia. (Ross, PS, Ellis, GM, Ikononomou, MI, Barrett-Lennard, L, Addison, RF. 2000, *High PCB concentrations in free-ranging Pacific killer whales, Orcinus orca: Effects of age, sex and dietary preference.* Marine Pollution Bulletin.)

ENVIRONMENTAL MANAGEMENT OF BURRARD INLET

Five primary agencies share management responsibilities for Burrard Inlet and its ecosystems. Some of the responsibilities involve overseeing the protection of water quality, regional growth management, managing fish and wildlife resources, and renewing and conducting federal environmental assessments.

The five agencies involved in this management are Environment Canada, Fisheries and Oceans Canada, the Vancouver Port Authority, BC Ministry of Water, Land and Air Protection and the Greater Vancouver Regional District. The Canadian Wildlife Service, and the Canadian Coast Guard also play a role in protecting Burrard Inlet..

The role of the prime agencies is listed on the following page.

Agency Name	Responsibility	Authority
Environment Canada	• Protecting migratory birds	Migratory Birds Convention Act and the Canada Wildlife Act
	• Administering pollution prevention and contamination regulations	Canadian Environmental Protection Act
	• Protecting water quality	Fisheries Act
	• Managing water bodies	Canada Water Act and Federal Water Policy
	• Reviewing and conducting federal environmental assessments	Canadian Environmental Assessment Act
Fisheries and Oceans Canada	• Protecting fish and fish habitat	Fisheries Act and the Oceans Act
	• Protecting the public right of navigation (Canadian Coast Guard)	Navigable Waters Protection Act
	• Reviewing and conducting federal environmental assessments	Canadian Environmental Assessment Act
Vancouver Port Authority	• Managing land and water uses within the Inlet (east of the mouth of the Capilano River	Canada Marine Act and Port 2010 Land Use Plan
	• Managing marine activities in Burrard Inlet (and elsewhere in the Port's jurisdiction)	Canadian Shipping Act, Harbour Operations Manual and Mandatory Mid-Ocean Ballast Exchange Directive
	• Conducting environmental assessments	Canada Port Authority Environmental Assessment Regulations and VPA Environmental Policy and Procedures
BC MWALP	• Managing fish and wildlife resources	Wildlife Act and Fisheries Protection Act
	• Managing pollution discharges to air, water and land, regulating contaminated sites	Waste Management Act and Environment Management Act
	• Managing water quality and quantity	Fish Protection Act, Water Act and the Water Management Act
	• Conducting provincial environmental assessment	BC Provincial Environmental Assessment Act
	• Overseeing provincial parks, ecological reserves and recreation areas	Park Act and the Ecological Reserve Act
Greater Vancouver Regional District	• Regional growth management	Local Government Act
	• Sewage treatment, liquid waste management, air quality management, and solid waste management	BC Waste Management Act

MWLAP regulates pollution discharges and controls waste and contaminated sites. The Vancouver Port Authority manages port operations and the federal lands under its control. The GVRD provides regional sewer and water infrastructure frameworks. Industry and community stewardship groups contribute to the environmental management of the Inlet by taking part in stream and watershed restoration projects, rehabilitating shorelines and creating and enhancing marine habitat, as do First Nations through traditional use studies related to customary use of the Inlet and its environs.

Monitoring requirements to ensure compliance is within permit limits, is on a case-by-case basis. If the MWLAP feels there could be a concern in the quality and quantity of the effluent being discharged, then regular monitoring and submission of results is requested within the permit. The frequency of monitoring varies and may be requested on a monthly, quarterly or yearly basis. MWLAP must ensure that permit holders are in compliance with the permits. Usually MWLAP bases permit limits on the "Pollution Control Objectives – MWLAP" from the late 1970s and early 80s, however, most of the information from these objectives is still deemed relevant today, and permit limits remain largely unchanged.

Every permit holder submits monitoring data in a different format, based upon internal monitoring requirements. This method often provides MWLAP with more detailed information than is required by the permits, and so far, no holders have been found to exceed their stated limits.

In discussions with MWLAP staff, it was learned that compliance officers are dispatched at MWLAP's discretion if they feel there are questionable activities at a permitted site. The compliance officers seldom meet resistance during investigations.

BIEAP

The Burrard Inlet Environmental Action Program (BIEAP) was established in 1991 to "provide a management framework to protect and improve the environmental quality of Burrard Inlet." BIEAP partners are the GVRD, the Vancouver Port Authority, BC MWLAP, Fisheries and Oceans Canada and Environment Canada.

BIEAP provides environmental assessments of development projects within the Burrard Inlet, delivers action plans to engage the local community in shoreline clean-up activities and provides education, training and funding for environmental stewardship.

In January 2002, following an extensive process, the partners developed a Consolidated Environmental Management Plan for Burrard Inlet. The Plan brings together current environment initiatives and identifies priorities to manage activities that affect the Inlet's environment. The Plan is designed to coordinate the programs of BIEAP partners.

The Plan's goals include actions to:

1. Improve water quality in Burrard Inlet by reducing the levels of contaminants entering marine and freshwater systems.
2. Minimize the effect of contaminated soils and sediments on human and ecological health.
3. Maintain and enhance fish and wildlife habitat and the natural biodiversity of the Inlet. and
4. Encourage development that enhances environmental quality.

The Plan identifies the following actions that BIEAP partners will undertake:

1. Continue to coordinate the management of liquid waste.
2. Review and make recommendations on provincial permit discharge standards for industrial waste.

In April 2003, BEIAP experienced a funding reduction with a resultant decrease in 50 per cent to program staff. This was due to reductions in funding and resources from the partner agencies.

APPENDIX 1. Permit holders and permit limits

Data from information on the permits housed with the MWLAP.

PERMIT #	COMPANY NAME	TYPE OF OPERATION	ISSUE/ AMENDMENT DATE	DIRECT DISCHARGE INTO THE BI				MONITORING REQUIREMENTS	NOTES
				Volume m3/day (annual average)	BOD mg/L	Suspended Solids mg/L	Oil and grease mg/L		All pH ranges are for 6.0 - 9.0
PE-00018	Nexen Chemicals Canada Ltd. Partnership, North Vancouver Chlor-Alkali Plant, 100 Amherst Avenue, North Vancouver, BC V7H 1S4 (also called Canadianoxy Industrial Chemicals Ltd. Partnership)	A chlor-alkali plant with discharge of process effluent, cooling water and domestic sewage AND from a cathode washing operation	Oct. 29, 1957 Jan. 11, 2002 Aug. 26, 1994 May 5, 1992 March 26, 1985 Dec. 20, 1972 June 2, 1967 May 3, 1966	90,000 AND for cathode is 140m3/day		20		Quarterly	25 m3/day of domestic sewage, and the rest is to made up of precess effluent, cooling water, and extracted groundwater. Residual chlorine 1.0mg/L, total copper.02mg/L, nickel .02mg/L, zinc .02 mg/L
PE-00022	Petro-Canada Inc., 2800ParkPlace, 666Burrard St. Vancouver, BC V6C 2Z7 was also once called Gulf Oil Canada Ltd, and The British American Oil Co. Ltd.	A petroleum refinery discharging treated stormwater	March 26, 1958 April, 21, 1986 Feb.3, 1976 Feb. 14, 1972 June 6, 1966	1, 725	15	15	5	A suitable sampling facility is to be installed downstream of the retention basin and composite sampling is required once per week.	Also stipluates that coliforms not to exceed 1,800,000 per 100ml, .2 ppm Sulphides, 10ppm phenol
PE-00030	Greater Vancouver Sewerage and Drainage District, 4330 Kingsway, Burnaby, BC V5H 4G8	A municipal sewage treatment plant serving the district of W. Vancouver, plus the district and the City of N. Vancouver	Feb. 17,1959 Feb.04, 1998 June 9, 1995 Dec. 17, 1993 May 18, 1993 Feb. 22, 1979 July 12, 1974 Dec. 2, 1969 June 23, 1969 April 17, 1964 June24, 1963	102,000 and that the rate of discharge won't be greater than 200 gpm	130	130		Maintain data of analysis, flow measurements and daily 5-day BOD and total SS loading data for inspection and submit data, for the previous months. Monthly	chlorine residual in effluent between .2 and 1.0 mg/L and in 1964 stated that colform less than 10,000 /100ml

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				Volume m3/day (annual average)	BOD mg/L	Suspended Solids mg/L	Oil and grease mg/L		All pH ranges are for 6.0 - 9.0
PE-00395	Sterling Pulp Chemicals Ltd. 1700-1075 W. Georgia St. Vancouver, BC, V6E 3G2 (also called Tenneco Canada Inc., and ERC of Canada)	A sodium chlorate manufacturing plant that discharges cooling water and storm water	April 8, 1971 Aug. 27, 1992 Oct. 24, 1988 June 17, 1986 April 7, 1986 Aug. 17, 1981 Feb. 20, 1981	7, 160		20		Quarterly	In 1986, (and before)max. discharge rate was 6, 850 m3/day, and Sodium Chlorate was 100mg/L. In 1981, (and before) total discharge was 6, 230 m3/day. The total chromium is .2mg/L and total zinc is .2 mg/L
PE-00445	Imperial Oil Limited, 2225 Ioco Rd. , RR#1 Port Moody, BC. V3H 3C8	A petrroleum storage and distribution terminal that discharges effluent from storm water runoff, including ground and surface water; tank bottom draw-off waters; septic tank effluent;boiler blowdown; and water from deballasting and butterworthing ships and or barges discharging into BI	Nov. 26,1971/ April 26, 2000, Mar. 20, 1998, Jun. 26, 1996, June 30, 1995, Aug. 20, 1991, Oct.6, 1987, Oct. 24, 1986	8,200 for storm water runoff, tank, and bottom draw-off waters, and septic tank effluent, 3,312 for other discharge	45	20	10	Quarterly	In 1998, (and before)annual average discharge rate of 3, 300 m3/day, and in 1991 permit for 8,200 AND 3,300 In 1997 11,000 m3/day, AND 2,000 m3/day. IN 1986 2,000 m3/day AND 5 mg/L oil and grease Also discharge may include ammonia 1.0mg/L, phenols .15mg/L, cyanide .2ppm, lead.2ppm, chromium .2ppm, zinc .2 ppm, copper .1ppm, nickel .2 ppm.
PE-00449	Shell Canada Products Ltd. 800-885 W. Georgia St. Vancouver, BC V6C 3H1	A petroleum products finishing terminal that discharges treated storm water	Dec. 6, 1971/ March 29, 1993 March 9, 1993, Feb. 18, 1987, Dec. 23, 1975, May 29, 1974	2,400	8.0 lbs/1000BBLS	20	10	Quarterly	IN 1987 the avg. 1,200 m3/day DOUBLE REGISTERED Effleunt may also include cyanide, lead, chromium, zinc and nickel at .2mg/L, and copper .1mg/L and total phosphate 3.0 ppm
PE-01133	General Chemicals Canada Ltd. 300-1111 Melville St. Vancouver, BC V6E 4H7 (also called Allied Canada Inc.)	An alum manufacturing plant that discharges storm water	Feb. 14, 1972/, Aug. 31, 1992, Nov. 4, 1988, May 5, 1986 Jun. 2 1983, July 5, 1972,	200		In. 1972 67,000ppm susp. Solids and 77,000ppm total solids		Quarterly	In 1983, max. effluent is 144 m3/day

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PE-01386	Vancouver Wharves Ltd. 221 W. Esplanade, North Vancouver, BC V7M 3J1	A bulk loading terminal that discharges from the effluent treatment facility for the ore concentrated storage and loading area, northwest parking area, car wash, truck wash, and the dyked methanol tank area	Jun. 13, 1972/ Mar. 28, 1996, Apr. 28, 1995, Aug. 2, 1985, March 19, 1980 Nov. 25, 1974	for treatment facility 10, 900; for methanol tank area 2,500; for yard area of maintenance shop 3,500; the potash storage area 4,800; and for the potash and sulphur storage and loading area 13, 100		50	10	Quarterly	Also allowed to contain copper .3mg/L, iron 1.0 mg/L, lead .2 mg/L, zinc 1.0 mg/L BUT in 1985, Max. rate is 3,500 m3/day for treatment facility, 2,500 m3/day for dyked methanol tank area, 3,000m3/day for yard area of maintenance shop,2,300 m3/day for NW parking area and carwash facility, 6,000 m3/day for potash storage area, 8,700 m3/day for sulphur, potash and phosphate storage and loading area.
PE-01668	Rogers Sugar Ltd. 123 Rogers St. PO Box 2150 Vancouver, BC V6B 3V2	A sugar refinery that discharges effluent from cooling water from non-contact steam turbine oil coolers and stormwater to the BI	July 23, 1973/ Jan. 30, 2001, July 11, 1984, Oct, 26, 1976	3,000 from cooling water from non-contact steam turbine oil coolers, and from stormwater; 5,500 from condenser cooling water and condensates from liquid sugar operations, and stormwater; 67,000 from condenser cooling water and condensates from direct contact vaccum pans, combined with cooling water	30, 30 and 10	25		Quarterly	IN 1984 have discharge from only 2 sources at 5,500 and 11,135 m3/day. In 1976 a discharge of 3,660 m3/day AND 6, 183 m3/day In 1973, a rate of 1, 360, 000 IGPD
PE-02300	Ocean Construction Supplies Ltd. 8955 Shaughnessy St. PO Box 2300, Vancouver, BC V6B 3W6	A ready-mix plant that discharges storm water	Dec. 12, 1974/ Feb. 14, 1989, Jan. 20 1982	rate of discharge for outfalls 1 and 2 is indeterminate, but for 3 is 11 m3/day		50 for outfall 1 and 160 for 2 in 1982	5	Quarterly	In 1974, discharge rate for 3 is 2400 IGPD

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PE-02440	Lafarge Canada Ltd. 1770 W. 7th Ave. Suite 401 Vancouver, BC V6J 4Y6	A ready-mix concrete batch plant that discharges truck wash water, batch plant wash water and storm water	May 7, 1974/ Dec. 14, 1992, July 29, 1986, Oct. 22, 1985	500 for truck wash water, batch plant wash water and storm water, and 36 for storm water		100		Quarterly	In 1986, 630 for outfall 1, and 470 for outfall 2, and 670 m3/day for outfall 3. In 1976 73 m3/day for outfall 1, and indeterminate for the others
PE-03326	British Columbia Research Council, Room A Science Building, UBC, Vancouver, BC	An ocean engineering centre that discharges effluent from testing tanks	Apr. 26, 1974/ June 1. 1984 Jun. 22, 1979,	1,320 once per month					Also contains discharge that is better or equivalent to water with polyethylene oxide additive, and 1.0 mg/L of residual chlorine. Discharge goes to drainage ditch - does it enter the ocean? In 1974 an avg. of 290,000 IGPD discharge.
PE-03678	Trans Mountain Pipe Line Company Ltd. 900-1333 W. Broadway, Vancouver, BC V6H 4C2	A jet fuel storage facility that discharges effluent from a dyked tank farm area	Oct. 18, 1974/ Nov. 24, 1992	the west discharge sump may discharge 26m3/day and 26m3/day for the east discharge sump. In 1974 a max. of 2,000,000 IGPD			5	Quarterly	Total extractable hydrocarbons are to be 5mg/L or less
PE-04970	Chevron Canada Ltd. 1500-1050 Pender St. Vancouver, BC V6E 3T4	A petroleum bulk handling facility and refinery that discharges effluent from storm water runoff and process effluent from a petroleum handling area	Oct. 11, 1978/ Jul. 30, 1992, May 16, 1986	19,550m3/day from storm water runoff and process effluent from a petroleum handling area AND 18,000 m3/day from storm water runoff and uncontaminated cooling water excluding process related effluents		20 and 20	10 from outfall 1, and 5 from outfall 2. In 1986 8 and 5. In 1978 30 lb/day	Quarterly	Also may contain phenols of .5 mg/L. In 1978 1,320 m3/day
PE-05508	Dow Chemical Terminals Canada Inc. 1545 Bay St. N. Vancouver, BC V7J 3M8	A bulk chemical loading facility that discharges effluent	Jul. 6, 1979/ Dec. 14, 1984, Dec. 7, 1984, Sept. 5, 1984	1,575m3/day from a bulk chemical loading facility. IN 1979 an average discharge of 1,520 m3/day				Quarterly	Also the effluent may include 60 mg/L of 1,2 dichloroethane, and 90 mg/L of ethylene glycol

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PE-06833	Kask Bros. Ready Mix Ltd. 840 Sperling Ave. Burnaby, BC V5B 4H8	A ready mix concrete plant that discharges effluent from combined discharge of wash water, spray down and storm water	July 9, 1984/ Dec. 2, 1993	Max. rate 1,600m3/day		50 or less		Quarterly	Discharge goes into ditch then in to the BI ALSO "double registered"
PE-06898	Neptune Bulk Terminals (Canada) Ltd. 3000 Royal Centre, 1055 W. Georgia St. Vancouver, BC V6E 3R3	A bulk loading plant that discharges effluent from the effluent treatment facility from the bulk loading and storage area	March 7, 1986/ Jan. 16, 1995	The max. rate from the bulk loading and storage area is 12,000m3/day	45 (5-day BID)	50		Quarterly	Before 1989, Dec. 31 discharge up to 5,400 then 12,000 m3/d. Also may contain ammonia of 10 mg/L.
PE-06990	Vancouver Public Aquarium Association, 535 Homer Street, Vancouver, BC V6B 2V7	A public aquarium that discharges effluent from the fish tanks, mammal pools and filters	Jan. 24, 1985	max. rate 6,000m3/day from the fish tanks, mammal pools and filters	20	60 average		Quarterly	Also may contain ammonia nitrogen of .4mg/L, nitrate nitrogen 2.0 mg/L, total phosphate phosphorus of 1.0 mg/L, and residual chlorine of .2 mg/L
PE-07164	Plaza of Nations Management Corp. PO Box 49190, 1600 - 595 Burrard St. Vancouver, BC V7X 1K9	The British Columbia Place Stadium that discharges effluent from a cooling system	Apr. 4, 1985/ Apr. 9, 1992	max. rate of 8,200m3/day from a cooling system				Yearly	
PE-07178	BC Hydro and Power Authority, 333 Dunsmuir Street, Vancouver, BC V6B 5R3	The Burrard Thermal Generating Plant that discharges effluent of storm water from a dyked tank farm area	March 1, 1985/ March 13, 2001 May 7, 1990 July 19, 1985	A max. rate 1,650 m3/day of storm water from a dyked tank farm area, 550m3/day from the blowdown from the boiler system and backwash effluent from the sand and carbon filters, 1,700,000m3/day from the cooling water from the turbines and effluent from the turbine house sumps, and 72m3/day from a water treatment		50	5 for outfalls. IN 1985 10mg/L for outfall 4.	Quarterly	In 1985, outfall 1 (dyked tank farm) is at a rate of 1,650m3/day, and outfall 4 from the turbine house is 600 m3/day.In 1985 (March 1) for outfall 2 (blowdown from the boiler system) is 450 m3/day, and there is an outfall 6 (sand and carbon filters) with a discharge of 96m3/day. Also may discharge total residual chlorine of .1 mg/L and total residual chlorine of .02 mg/L

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				plant demineralizer.					
PE-07810	Great Northern Packaging Ltd. 1900-1040 West Georgia St. Vancouver, BC V6E 4H3	A fish processing plant that discharges effluent from a fish canning and pouching operation	April 13, 1989/ Feb. 12, 1999	900m3/day	45	60	15	Yearly	Also may contain residual chlorine of .05 mg/L
PE-07944	Canada Place Corporation, 1001 - 999 Canada Place, Vancouver, BC V6C 3C1	A hotel and convention centre that discharges effluent of cooling water	April 13, 1989/ Oct. 10, 1996	23,700m3/day				Quarterly	Also may discharge .01 mg/L residual chlorine
PE-08035	Young Men's Christian Association of greater Vancouver	A summer camp that discharges effluent of secondary treatment effluent from a sewage treatment plant serving 150-beds	Jan. 18, 1989/ Mar. 1, 1996	24	20	30		Twice per year	
PE-08426	West Coast Reduction Ltd. 1900-1040 West Georgia St. Vancouver BC V6E 4H3	An animal and fish byproducts reduction and rendering plant that discharges effluent from storm water discharge from a grease interceptor and a sampling manhole	Jan. 21, 1994	1,850 m3/day	45	60	15	Quarterly	Also may contain total sulfide of .5mg/L, Ammonia nitrogen 10mg/L , and residual chlorine of .05 mg/L. DOUBLE REGISTERED
PE-12879	Indian Arm Investments Lts.	Six strata residences that discharge effluent	July 25, 1995/ Oct. 28, 1999	8.2	45	45		Twice per year	
PE-13446	Ferrer Cove Waste Water Management	Residential units	May, 28, 1998/ Feb. 5. 1999	7.4	45	60		Twice per year	Fecol coliform 200MPN/100mL

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	Assoc.								
	CANCELLED PERMITS								
PE-1651	The City of Vancouver, City Hall, 453 W. 12th Ave. Vancouver, BC	A municipal sewerage system	July 4, 1973	18,000,000IG typical of a storm overflow discharge from a combined sewer					CANCELLED April01, 1986
PE-02140	International Forest Products Ltd. Suite, 3500 PO Box, 49114, Four Bentall Centre, 1055 Dunsmiur Street, Vancouver, BC V7X 1H7 AKA Weldwood of Canada Ltd.	A sawmill operation	Jan. 18, 1977/ Jun. 05, 1995 Nov, 9, 1992 March 29, 1984	discharge from the turbine condensers and hydraulic debarker 27,300 with max. 24,570of unchlorinated cooling water and 2,730of unchlorinated effluent from the hydraulic debarker for 16 hrs. /day, 5 days /week	170 but until April 15, 1993, 45	225 until April 15, 1993, 90 for combined effluent			CANCELLED ??/?
PE-2241	Pacific Coast Terminals Co. Ltd. 2701 Esplanade street, Port Moody, BC V3H 3P4	A Bulk Loading Terminal	May 8,1986/ Aug. 3, 1973 Feb. 16, 1982 July 1, 1983 oct. 9 1985 May, 8, 1986	Avg. 2,100 with max. of 14,400 for combined effluent, and 20 avg. and 150 max. for each outlet from ethylene glycol tank farm sump and styrene tank farm sump AND Oct. 9, 1985, 1640avg. And 12,000 max combined, and 20 and 150 sumps.		20			styrene 1.0mg/L and ethylene glycol 90 mg/L CANCELLED ????
PE-04481	Arnold Lynn Bennett		TO HALFMOON BAY ???CHECK						

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PE-3130	Texaco Canada Ltd. 1400-1030 W. Georgia St. Vancouver, BC		Oct. 8, 1974	avg. of 7, 650 IG/day with a max of 183, 000 IG /day from a Bulk Storage Terminal		20	5		CANCELLED MAY 27, 1986
PE-5195	Bordignon Construction Ltd. 1500-510 W. Hastings St. Vancouver, BC V6B 1M6	A Masonry plant complex	Oct. 2, 1978	4.55 plus yard drainage		50			CANCELLED Oct. 19, 1984
PE-4972	Bay Forest Products Ltd. 2000-700 West Georgia St. Vancouver, BC	A Sawmill	April 19. 1978	from compressor and machinery cooling water avg. 300					CANCELLED ??? Possibly the 24th of April, 1978
PE-7446	Tolko Industries Ltd. Nova lumber Division, 1700-1075 W. Georgia St. Vancouver, BC V6E 3G2	A Sawmill	Sept. 9, 1987/ June 29, 1990	260 and 8.5 for another, and 8.5 for the third from the hydraulic debarker and cooling water, BEFORE Feb. 28, 1988, max. of 2,150 and after annual avg. of 62		REVIEW!!! !	10		CANCELLED ???

These tables were compiled from existing MWLAP data that is located in their records office in the effluent permit records section.

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ABOUT THE AUTHORS

Sophika Kostyniuk has a Bachelor of Science degree (major in Ecology) from the University of Guelph, Ontario. Her seven years of work experience involved her in fisheries, wildlife and terrestrial vegetation studies. She acted as an environmental planner at Marshall Macklin Monaghan in Toronto, and as a program coordinator for Global Forest Society and Better Environmentally Sound Transportation in Vancouver, BC. Sophika has authored public education pamphlets, web site content and developed school environmental awareness campaigns.

Ling Lin holds a bachelor degree in Chemical Engineering from South China University of Technology. Her work experience includes eight years in the chemical industry and four years in environmental engineering. Ling is currently enrolled in the program of Environmental Engineering Technology at British Columbia Institute of Technology (BCIT). Ling's interests include chemical process design, wastewater treatment, and environmental impact assessment.